

Operator's Manual

Firmware V6.26 and higher



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Customer Support

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Operator's Manual

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

1. Safety Instructions

General	<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>
Target audience	<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>
OM Location	<p>Keep the AMI Operator's Manual in proximity of the instrument.</p>
Qualification, Training	<p>To be qualified for instrument installation and operation, you must:</p> <ul style="list-style-type: none">♦ read and understand the instructions in this manual as well as the Material Safety Data Sheets.♦ know the relevant safety rules and regulations.

1.1. Warning Notices

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



DANGER

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

- ♦ Follow the prevention instructions carefully.



WARNING

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

- ♦ Follow the prevention instructions carefully.



CAUTION

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

- ♦ Follow the prevention instructions carefully.

Mandatory Signs

The mandatory signs in this manual have the following meaning:



Safety goggles



Safety gloves

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



Electrical shock hazard



Corrosive



Harmful to health



Flammable



Warning general



Attention general



1.2. General Safety Regulations

Legal Requirements

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

Spare Parts and Disposables

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

Modifications

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

WARNING

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.

WARNING



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

1.3. Restrictions for use

Sample Re-requirements

- ♦ Flow rate: 20–60 l/h
- ♦ Temperature: 1–45 °C.
- ♦ Swan recommends that the sample temperature is no more than 20 °C above the ambient temperature.
- ♦ The outlet has to be pressure-free against atmosphere.
- ♦ Sample degasser: Only to be used for turbidity below 1 FNU/NTU.
- ♦ Flow rate of sample inlet at degasser: 10–12 l/h.
- ♦ Maximum turbidity of the sample:
 - Turbiwell 7027 and Power: 200 FNU
 - Turbiwell W/LED: 100 NTU



CAUTION

Wrong measured values due to dirty optical components.

Touching the optical components in the cover of the measuring cell may result in wrong measured values.

Cleaning and re-calibration at SWAN is necessary.

- ♦ Never touch the optical components.



2. Product Description

Application	<p>The AMI Turbiwell is used to measure turbidity in potable water, surface water, effluents and water steam cycles.</p> <p>The turbidimeter is also suitable for the measurement of other liquids of which the turbidity correlates with the concentration of a suspended solid or an emulsified liquid, e.g. oil in water. See chapter ppm Calculation, e.g. "Oil in water", p. 48 for details.</p>
Available Models	<p>The instrument is available in three different models:</p> <ul style="list-style-type: none">♦ AMI Turbiwell 7027: with an IR LED according to ISO 7027♦ AMI Turbiwell W/LED: with white light LED (approved, alternative method to US EPA 180.1)♦ AMI Turbiwell Power: variant on steel panel with IR LED according to ISO 7027
Configurations and Options	<p>The AMI Turbiwell 7027 and the AMI Turbiwell W/LED are available in the following configurations:</p> <ul style="list-style-type: none">♦ Automatic or manual drain valve♦ Sample degasser (option)♦ deltaT flow sensor (option)♦ Flowcontroller (option)♦ On small panel with remote transmitter <p>The AMI Turbiwell Power is equipped with a flow meter as standard and available in the following configurations:</p> <ul style="list-style-type: none">♦ Automatic or manual drain valve
Signal Outputs	<p>Two signal outputs programmable for measured values (freely scalable, linear or bilinear) or as continuous control output (control parameters programmable).</p> <p>Current loop: 0/4–20 mA Maximal burden: 510 Ω</p> <p>Third signal output available as an option. The third signal output can be operated as a current source or as a current sink (selectable via switch).</p>
Relay	<p>Two potential-free contacts programmable as limit switches for measured values, controllers or timer for system cleaning with automatic hold function. Both contacts can be used as normally open or normally closed.</p> <p>Maximum load: 1 A / 250 VAC</p>

Alarm Relay One potential free contact.

Alternatively:

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

Summary alarm indication for programmable alarm values and instrument faults.

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

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

Communication Interface (optional)

- ♦ USB Interface for logger download.
- ♦ RS485 with Fieldbus protocol Modbus or Profibus DP
- ♦ HART interface



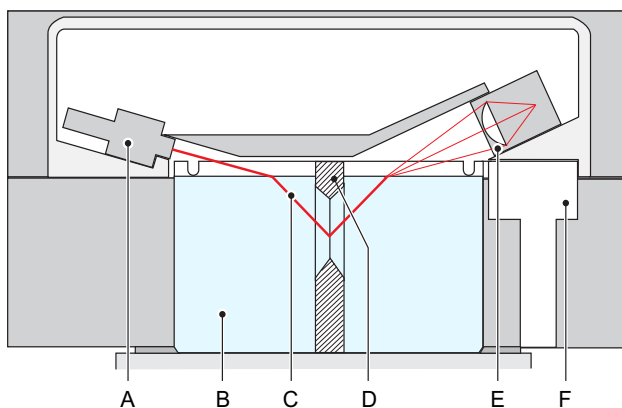
Measuring Principle

Nephelometric system: A water sample colored by dissolved substances is a homogeneous system that only attenuates radiation passing through the sample. A water sample containing undissolved substances attenuates radiation and, additionally, the insoluble particles scatter the radiation unequally in all directions.

To obtain the turbidity value of the sample, the diffuse radiation is determined at an angle of 90°.

The AMI Turbiwell uses a non-contact turbidimeter to avoid fouling of optical surfaces.

The light beam of the LED (light emitting diode) impinges the water surface and is refracted. At an angle of 90°, the detector measures the incoming, scattered light.



A LED

B Sample

C Light beam

D Barrier

E Detector

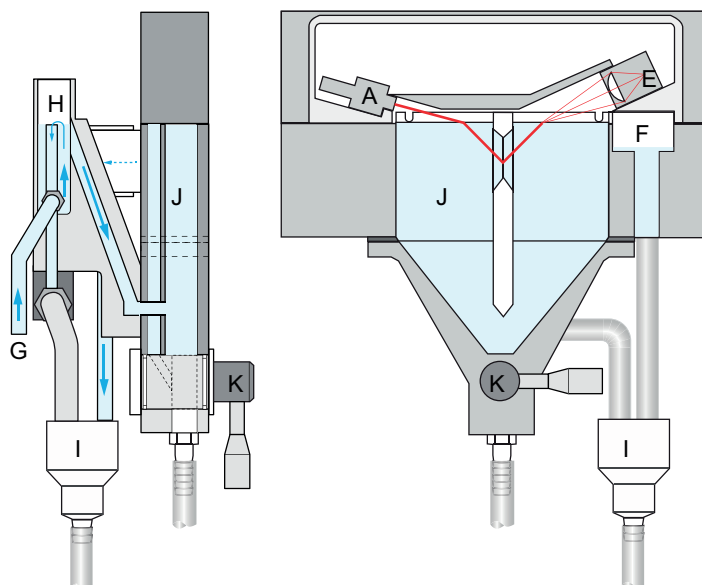
F Drain

The barrier avoids measurement errors due to light reflections.

Depending on the model, the LED emits light with a wavelength of 860 nm (near infrared LED) according to ISO 7027 or in the range from 400 to 600 nm (white LED) as an approved alternative method to US EPA 180.1.

On-line Operation

The sample enters at the sample inlet [G]. The constant head [H] guarantees a constant sample flow into the measuring chamber [J], and air bubbles are removed. Excess sample overflows directly into waste 1 [I]. The sample flows into the measuring chamber, fills it, and then flows via overflow [F] into waste 1. The LED beam impinges continuously on the calm surface.



A LED
E Detector
G Sample inlet
H Constant head

I Waste 1
J Measuring chamber
K Manual drain valve waste 2

If the optional sample degasser is used, the sample first flows through this device before entering the measuring chamber.

The drain valve [K] is used to empty the measuring chamber for maintenance work like cleaning the measuring chamber or performing a verification.

Verification For the verification, three different verification kits (low turbidity, high turbidity, liquid) can be used. The kits are available as an option.

Calibration The AMI Turbiwell is factory-calibrated, therefore it is not necessary to perform a calibration in the field. The emission intensity of the LED is monitored by an external photodiode. A loss of intensity due to aging will be automatically compensated.

To meet the requirements of some public authorities it is possible to calibrate the instrument with a formazine standard.

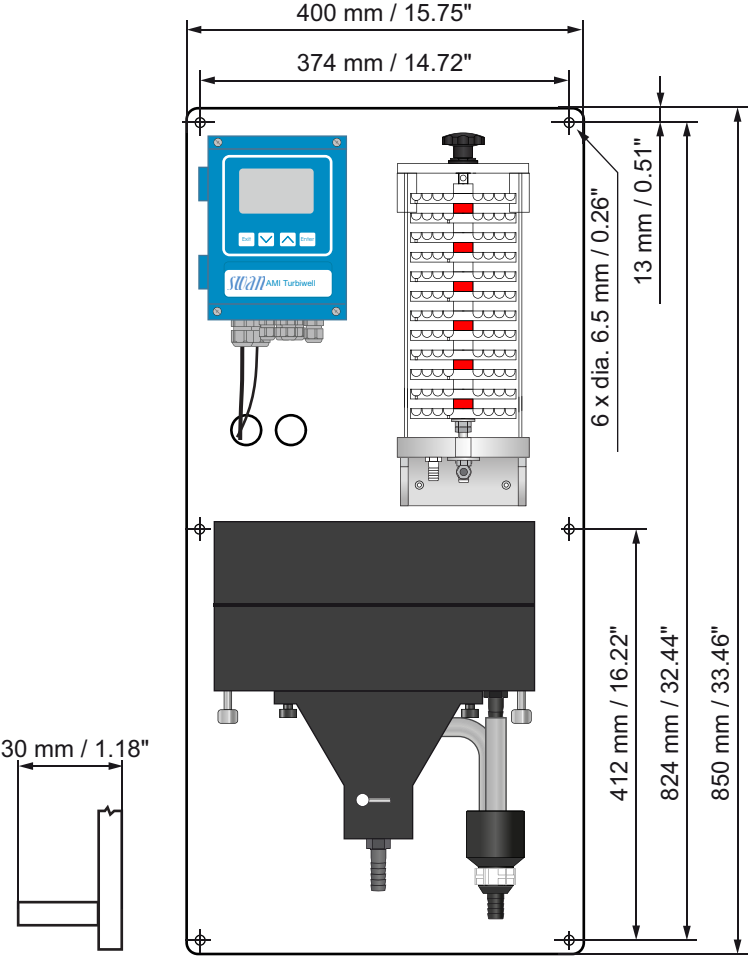
2.1. Instrument Specification

Power Supply	AC variant:	100–240 VAC ($\pm 10\%$) 50/60 Hz ($\pm 5\%$)
	DC variant:	10–36 VDC
	Power consumption:	max. 35 VA
Transmitter Specifications	Housing:	aluminum housing with a protection degree of IP 66 / NEMA 4X
	Range of operation:	-10 to +50 °C
	Storage and transport:	-30 to +85 °C
	Humidity:	10–90% rel., non condensing
Sample Requirements	Display:	backlit LCD, 75 x 45 mm
	Flow rate:	approx. 20–60 l/h (flow rate through measuring chamber: approx. 10–15 l/h)
	Sample temperature:	1–45 °C (sample temperature max. 20 °C over ambient temperature)
	Inlet pressure:	1–10 bar with flow controller option
	Outlet pressure:	pressure free
Note:		
<ul style="list-style-type: none"> • If the maximum sample temperature of 45 °C is exceeded for a short time, the instrument will not be damaged. • Swan recommends that the sample temperature is no more than 20 °C above ambient temperature. With increasing temperature difference condensation will form to a higher extent, but the measurement will not be affected. However, it is possible that a temperature difference significantly higher than 20 °C will cause condensation directly on the optics, which can lead to incorrect measurements. 		
On-site Requirements	The analyzer site must permit connections to:	
	Sample inlet:	Nozzle diam. 10 mm
	Sample outlet:	2 drains diam. 16 mm, tubing 15 x 20 mm, which must end in a pressure free waste of sufficient capacity.

**Turbidimeter
Specifications**

Measuring range:	0.000–200.0 FNU, Turbiwell 7027 0.000–200.0 FNU, Turbiwell Power 0.000–100.0 NTU, Turbiwell W/LED
Precision:	$\pm(0.003 \text{ FNU} + 1\% \text{ of reading})$
Accuracy (based on formazine):	Range 0–40 FNU: $\pm(0.01 \text{ FNU} + 2\% \text{ of reading})$ Range >40 FNU: $\pm 5\% \text{ of reading}$
Response time:	t_{90} typically 3 min
Chamber volume:	0.75 l
Calibration:	Factory-calibrated with formazine
Light emitting diode:	- IR LED (860 nm) or - white light LED (400–600 nm)

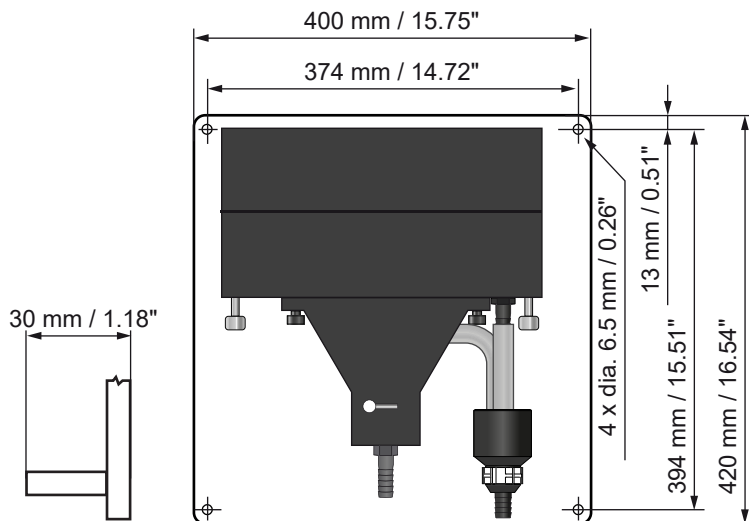
Dimensions Turbiwell 7027 and Turbiwell W/LED	Panel:	PVC
	Dimensions:	400x850x200 mm
	Screws:	6 pieces, 5 or 6 mm diameter
	Weight:	11.0 kg



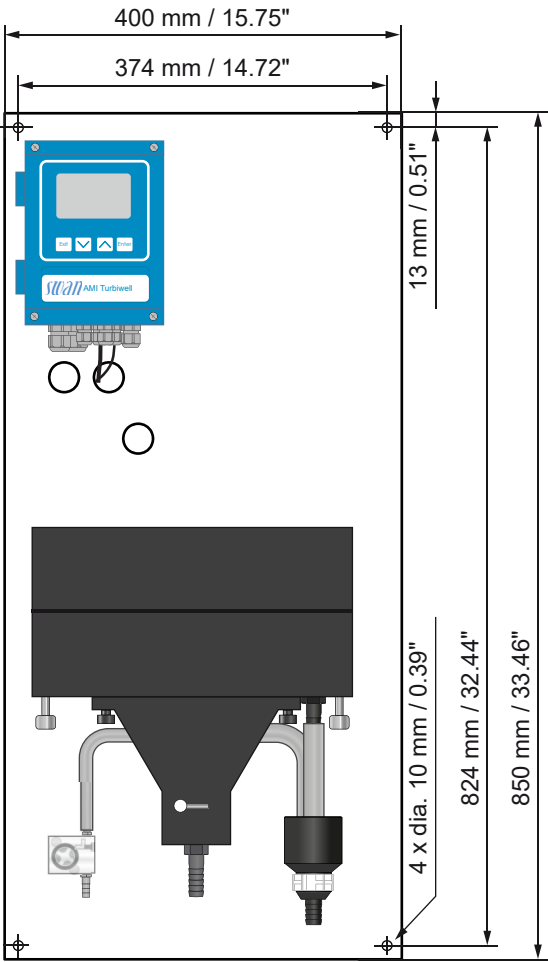
Dimensions
Swansensor
Turbiwell

Turbidity meter mounted on small PVC plate for use with separate transmitter.

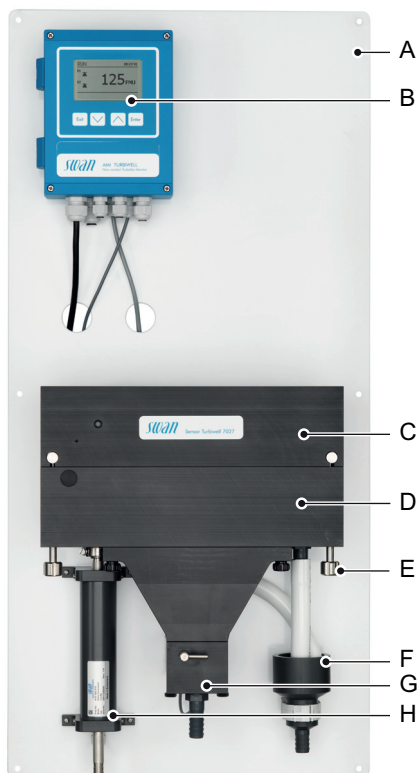
Dimensions: 400x420 mm
Screws: 4 pieces, 5 or 6 mm diameter
Weight: 3.5 kg



Dimensions Turbiwell Power	Panel:	stainless steel
	Dimensions:	400x850x150 mm
	Screws:	4 pieces, 8 mm diameter
	Weight:	14.0 kg



2.2. Instrument Overview



- | | |
|--|--------------------------------------|
| A Panel | E Quick fastener screw |
| B Transmitter | F Waste 1 |
| C Cover with optical measurement system | G Drain valve |
| D Measuring chamber | H deltaT flow sensor (option) |

3. Installation

3.1. Installation Checklist

On-site requirements	AC variant: 100–240 VAC ($\pm 10\%$), 50/60 Hz ($\pm 5\%$) DC variant: 10–36 VDC Power consumption: 35 VA maximum. Protective earth connection required. Sample line with sufficient sample flow and pressure (see Instrument Specification , p. 14).
Installation	Mount the instrument in vertical position. Display should be at eye level. Connect the sample inlet and waste lines. Adjust the measuring chamber to horizontal position with the adjusting screw. Check with spirit level.
Electrical Wiring	Do not switch on the Instrument until all electrical connections have been made. Connect all external devices like limit switches, current loops and pumps, see Connection Diagram , p. 38. Connect power cord.
Power-up	Turn on the sample flow and wait until the measuring chamber is completely filled. Switch on power.
Instrument Setup	Program all parameters for external devices (interface, etc.). Program all parameters for instrument operation (limits, alarms).
Run-in time	Let the instrument operate for 24 h without interruption at normal sample conditions to rinse out any pollution from manufacturing and transport.
Matching	Each verikit has to be matched with the current calibration values before it can be used for a verification.
Verification	Never perform before the run-in time is over and before the measured value is stable. Can be performed to verify the device functions.

3.2. Mounting of Instrument Panel

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

- ♦ The instrument must only be installed by trained personnel.
- ♦ Mount the instrument in vertical position.
- ♦ For ease of operation mount it so that the display is at eye level.

Installation of PVC panel

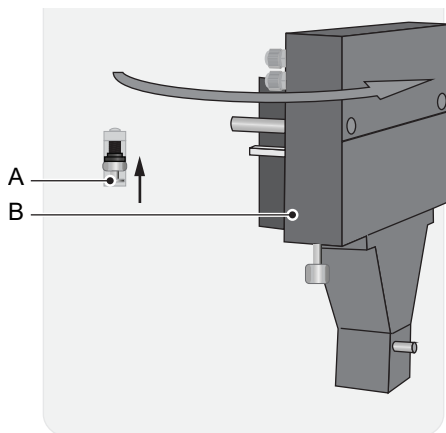
- ♦ For the installation a kit containing the following installation material is available:
 - 6 screws 6x60 mm
 - 6 dowels
 - 6 washers 6.4/12 mm

Installation of steel panel

- ♦ For the installation a kit containing the following installation material is available:
 - 4 screws 8x60 mm
 - 4 dowels
 - 4 washers 8.4/24 mm

Mounting requirements Installation note

The instrument is only intended for indoor installation. For dimensions, see [Instrument Specification, p. 14](#).



For easy mounting or unmounting of parts behind the measuring chamber [B], the measuring chamber can be swiveled out. To swivel out the measuring chamber, push the locking pin [A] upwards and pull the measuring chamber forward.

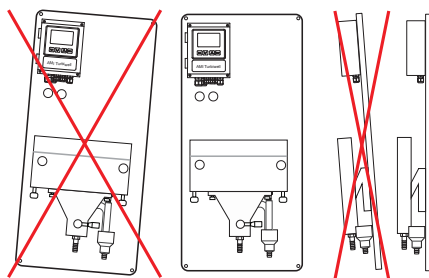


CAUTION

Inaccurate measured values

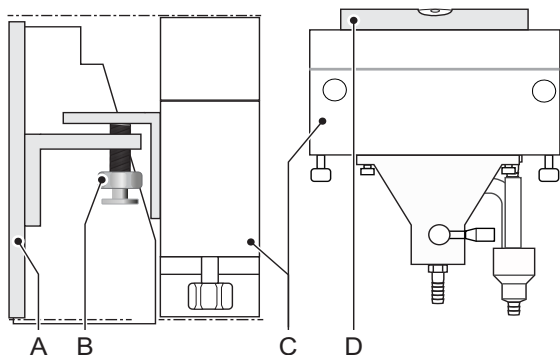
If the AMI Turbiwell is not exactly aligned in horizontal and vertical direction, this can lead to inaccurate measured values.

- ♦ Exactly align the panel in horizontal and vertical direction
- ♦ Use a spirit level to align the panel.



After the panel has been installed and aligned exactly, adjust the Turbiwell measuring chamber as follows:

- 1 Put a spirit level onto the measuring chamber [C].
- 2 Turn the adjusting screw [B] clockwise or counter-clockwise until the measuring chamber is aligned exactly horizontal.

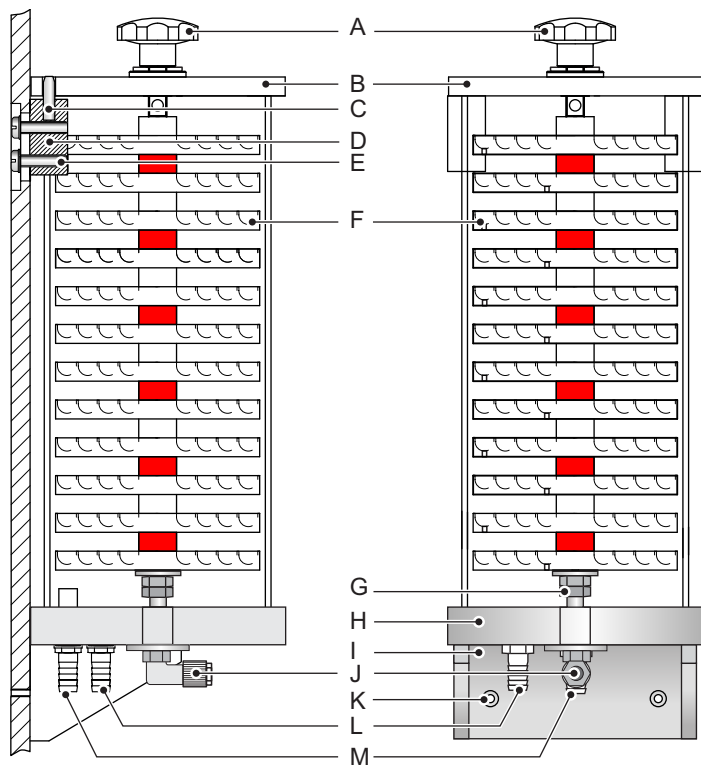


A Panel
B Adjusting screw

C Measuring chamber
D Spirit level

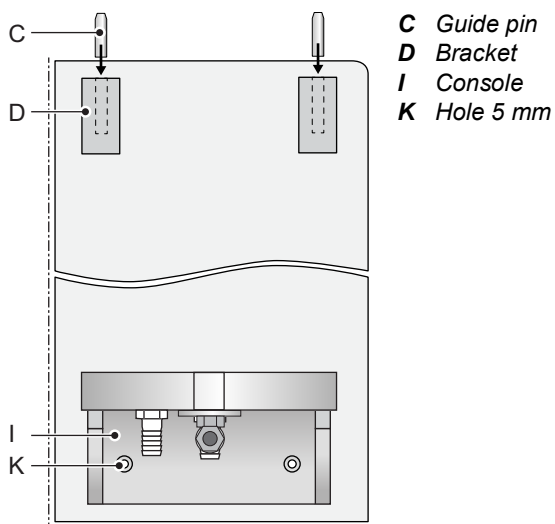
3.3. Installation of Sample Degasser Option

Overview

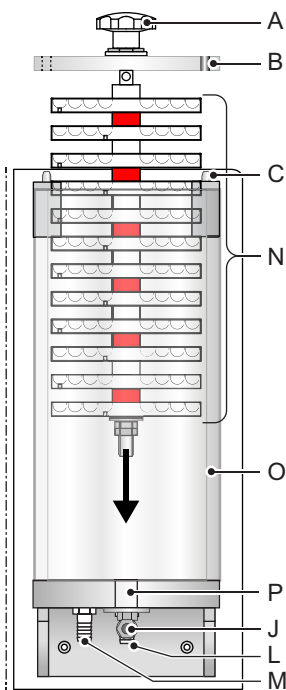


- | | |
|------------------------------------|--------------------------------------|
| A Star knob | H Base plate |
| B Cover | I Console |
| C Cylinder pin (diam. 6 mm) | J Sample inlet |
| D Bracket | K Hole 5 mm |
| E Fixing screws (4 pcs) | L Outlet to measuring chamber |
| F Plates (12 pcs) | M Overflow to waste |
| G Counter nut | |

Installation

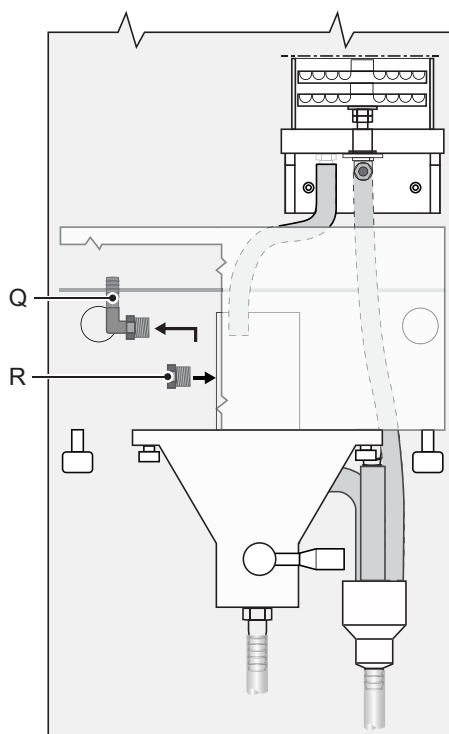


- 1 Screw the brackets [D] to the panel with the enclosed M6 x 16 screws
- 2 Roughly align the brackets and slightly tighten the screws.
- 3 Insert the guide pins [C] into the bores of the brackets.
- 4 Screw the console [I] to the panel with the M4 x 16 screws [K].



- A** Star knob
- B** Cover with guide pin holes
- C** Guide pin
- J** Sample inlet
- L** Outlet to waste
- M** Outlet to constant head
- N** Degasser labyrinth
- O** Acrylic glass tube
- P** Threaded hole

- 5** Put the acrylic glass tube [O] onto the base plate.
- 6** Insert the degasser labyrinth [N] into the acrylic glass tube.
- 7** Screw the degasser labyrinth into the threaded hole [P]. Do not yet tighten firmly.
- 8** Align the brackets such that the guide pins are inserted in the guide pin holes of the cover.
- 9** Tighten the brackets firmly.
- 10** Tighten the degasser labyrinth.
- 11** Connect the longer tube to the hose nozzle [L] and put its end into the waste.
- 12** Connect the shorter tube to the hose nozzle [M] and put its end into the constant head.
- 13** Connect the sample line to the elbow junction [J].



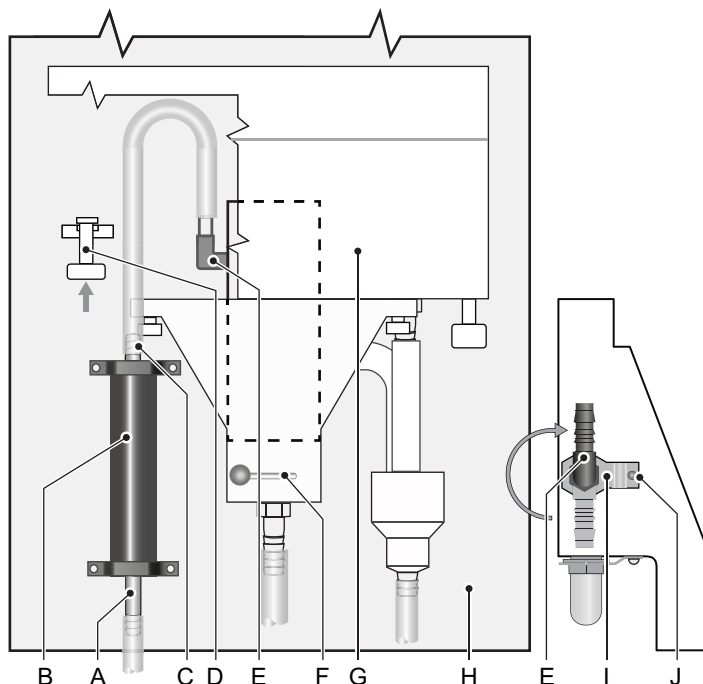
Q Elbow hose nozzle

R Blind screw

- 14** Replace the elbow hose nozzle [Q] on the constant head with the enclosed blind screw [R].

3.4. Installation of deltaT Option

Overview



- | | |
|----------------------------|-----------------------------|
| A Sample inlet | F Manual drain valve |
| B deltaT sensor | G Measuring chamber |
| C Sample outlet | H Panel |
| D Locking pin | I Locking plate |
| E Elbow hose nozzle | J Screw |

Installation Install the deltaT sensor in vertical position with the sample inlet [A] looking downwards.

- 1 Push the locking pin [D] upward to unlock the measuring chamber.
- 2 Swivel the measuring chamber [G] out.
- 3 Remove the sample inlet tube from the elbow hose nozzle [E].
- 4 Unscrew and remove the screw [J].
- 5 Remove the locking plate [I].

- 6 Turn the elbow hose nozzle [E] upwards clockwise.
- 7 Install the locking plate [I]
- 8 Tighten the screw [J].
- 9 Screw the deltaT sensor [B] to the panel in vertical position.
- 10 Connect the tube supplied with the installation kit to the sample outlet [C] of the deltaT sensor and to the sample inlet (elbow hose nozzle [E]) of the constant head.
- 11 Connect the sample inlet tube to sample inlet [A] of the deltaT sensor.
- 12 Push the locking pin upward and swivel the measuring chamber back.
- 13 Make sure that the measuring chamber rests in locked position.

**Electrical
Connection**



WARNING

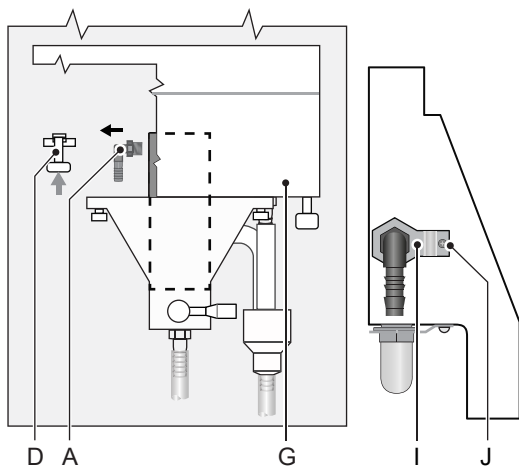
Electrical shock hazard

Before opening the AMI Transmitter switch power off.

- 14 Use one of the PG7 cable glands to feed the cable of the sensor into the AMI transmitter housing.
- 15 Connect the cable to the terminals according to the [Connection Diagram, p. 38](#).

3.5. Installation of Flowcontroller Option

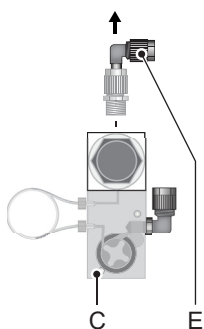
- Preparations**
- 1 Push the locking pin [D] upward to unlock the measuring chamber.
 - 2 Swivel the measuring chamber [G] out.
 - 3 Remove the sample inlet tube from the elbow hose nozzle [A].
 - 4 Unscrew and remove the screw [J].
 - 5 Remove the locking plate [I].
 - 6 Unscrew the elbow hose nozzle [A] from the constant head.



A Elbow hose nozzle
D Locking pin
G Measuring chamber

I Locking plate
J Screw

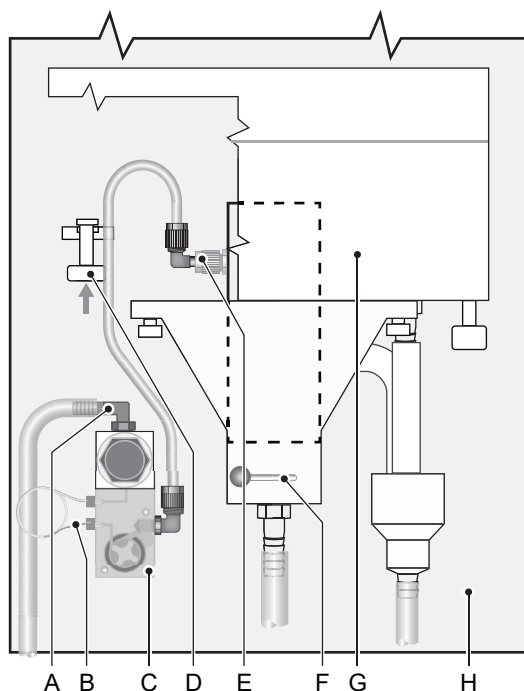
- 7** Unscrew the elbow fitting [E] from the inlet of the Flowcontroller.



C Flowcontroller
E Elbow fitting

- 8** Remove the teflon tape from the threads of fittings [A] and [E] and wrap them with new teflon tape.
- 9** Screw the elbow fitting [E] to the inlet of the constant head and the elbow hose nozzle [A] to the inlet of the flow controller.
- 10** Install the locking plate [I].
- 11** Tighten the screw [J].

Overview



- | | |
|---|-----------------------------|
| A Sample inlet of Flowcontroller | E Elbow fitting |
| B Capillary | F Manual drain valve |
| C Flowcontroller | G Measuring chamber |
| D Locking pin | H Panel |

Installation

- 12** Screw the Flowcontroller [C] to the panel.
- 13** Connect the tube supplied with the installation kit to the sample outlet of the Flowcontroller and to the sample inlet [E] of the constant head.
- 14** Connect the sample inlet tube to sample inlet [A] of the Flowcontroller. Depending on the inlet pressure, secure the tube to the elbow hose nozzle [A] with a clamp.
- 15** Push the locking pin upward and swivel the measuring chamber back.
- 16** Make sure that the measuring chamber rests in locked position.

Electrical Connection



WARNING

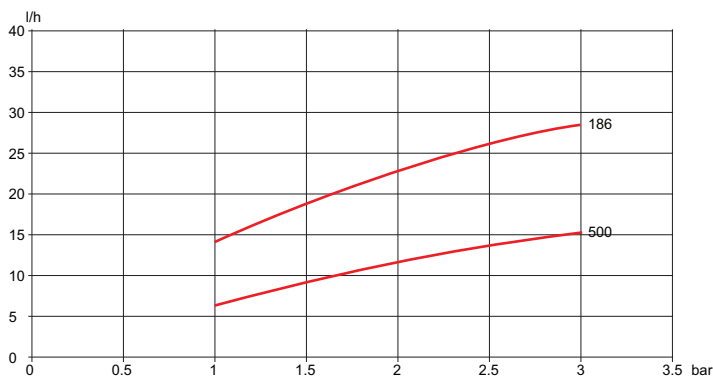
Electrical shock hazard

Before opening the AMI Transmitter switch power off.

- 17 Use one of the PG7 cable glands to feed the cable of the sensor into the AMI transmitter housing.
- 18 Connect the cable to the terminals according to the [Connection Diagram, p. 38](#).

Exchanging the capillary

The capillary determines the flow resistance and the maximum flow rate. With the pressure regulator at the inlet side of the capillary the flow rate can be adjusted within the given range, see diagram below. The standard capillary is an FEP tube with an inner diameter of 1 mm and a length of 500 mm. If you have a low sample pressure or you need a high sample flow, a shorter capillary with 186 mm length can be used.



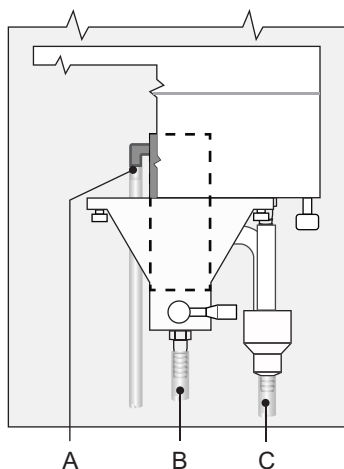
3.6. Connect Sample and Waste

- Sample inlet** The AMI Turbiwell can be ordered in different configurations. Use plastic tubes with inner diameter 10 mm for:
- ♦ connection to the constant head
 - ♦ connection to the deltaT flow meter
 - ♦ connection to the Flowcontroller

Use plastic tubes with outer diameter 6 mm for connection to the degasser.

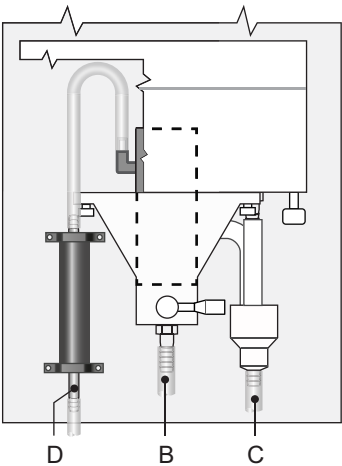
- Waste** Use 1/2" tubes and connect them to the hose nozzles of the drain [B] and waste [C] and place them into an atmospheric drain of sufficient capacity.

Basic configuration



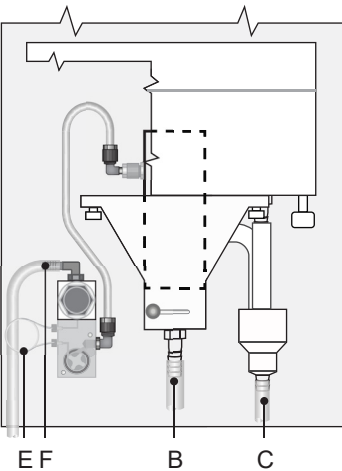
- A** Constant head sample inlet
B Drain
C Waste

deltaT sensor



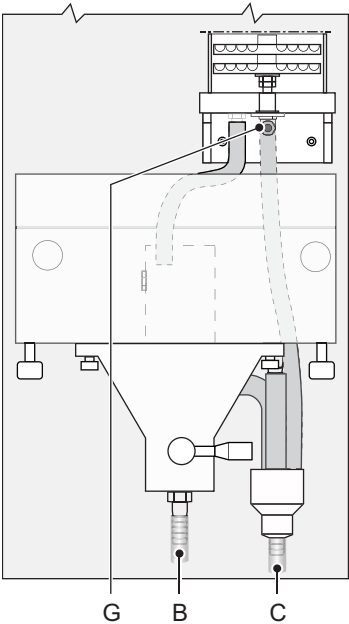
- D** *deltaT sensor sample inlet*
- B** *Drain*
- C** *Waste*

Flowcontroller



- E** *Capillary*
- F** *Flowcontroller sample inlet*
- B** *Drain*
- C** *Waste*

Degasser



- G** Degasser sample inlet
- B** Drain
- C** Waste

3.7. Electrical Connections



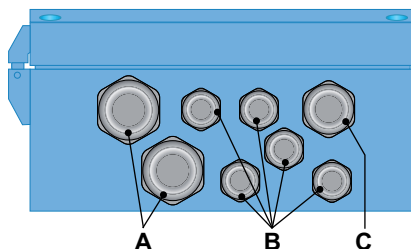
WARNING

Electrical hazard.

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

Cable thicknesses

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



A PG 11 cable gland: cable $\varnothing_{outer}$ 5–10 mm

B PG 7 cable gland: cable $\varnothing_{outer}$ 3–6.5 mm

C PG 9 cable gland: cable $\varnothing_{outer}$ 4–8 mm

Note: Protect unused cable glands

Wire

- ♦ For Power and Relays: Use max. 1.5 mm² / AWG 14 stranded wire with end sleeves.
- ♦ For Signal Outputs and Input: Use 0.25 mm² / AWG 23 stranded wire with end sleeves.



WARNING

External Voltage.

Externally supplied devices connected to relay 1 or 2 or to the alarm relay can cause electrical shocks

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



WARNING

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

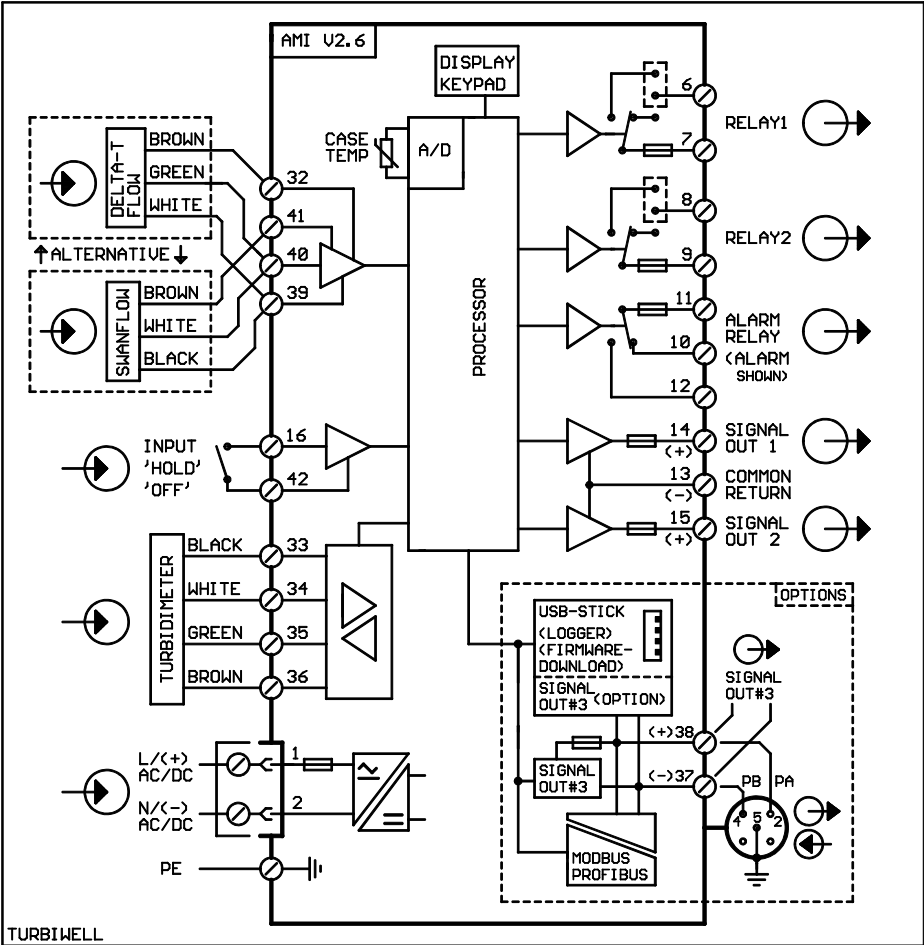


WARNING

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



3.7.1 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.

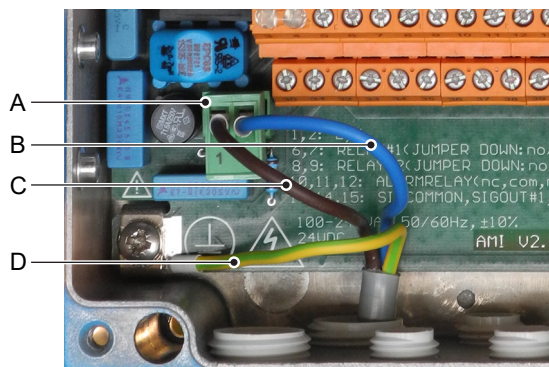
3.7.2 Power Supply



WARNING

Risk of electrical shock

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



- A** Power supply connector
- B** Neutral/(-) conductor, Terminal 2
- C** Phase/(+) conductor, Terminal 1
- D** Protective earth PE

Note: The protective earth wire (ground) has to be connected to the grounding terminal.

Installation requirements

The installation must meet the following requirements.

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

3.8. Relay Contacts

3.8.1 Input

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

Terminals 16/42
If signal output is set to hold, measurement is interrupted if input is active.
For programming see menu 5.3.4, p. 101.

3.8.2 Alarm Relay

Note: Max. load 1 A (time-lag) / 250 VAC

Alarm output for system errors.
Error codes see Error List, p. 76

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

	Terminals	Description	Relay connection
NC ¹⁾ Nor- mally Closed	10/11	Active (opened) during normal operation. Inactive (closed) on error and loss of power.	
NO Normally Open	12/11	Active (closed) during normal operation. Inactive (opened) on error and loss of power.	

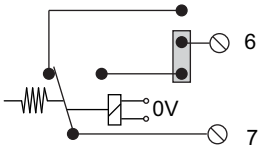
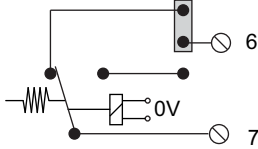
1) usual use

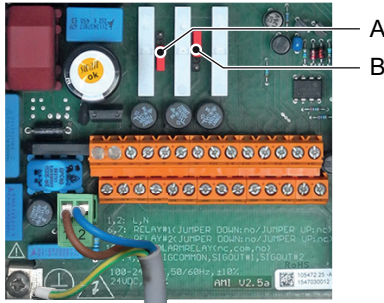
3.8.3 Relay 1 and 2

Note: Max. load 1 A/250 VAC

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

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

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



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

For programming see Menu Installation [5.3.2](#) & [5.3.3](#), p. 97.



CAUTION

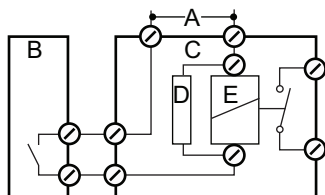
Risk of damage of the relays in the AMI Transmitter due to heavy inductive load.

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

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

Inductive load

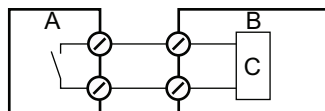
Small inductive loads (max 0.1 A) as for example the coil of a power relay can be switched directly. To avoid noise voltage in the AMI Transmitter it is mandatory to connect a snubber circuit in parallel to the load. A snubber is not necessary if an AMI relaybox is used.



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

Resistive load

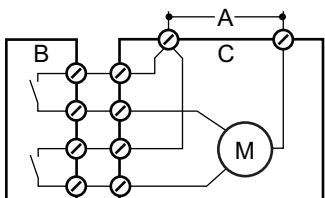
Resistive loads (max. 1 A) and control signals for PLC, impulse pumps and so on can be connected without further measures



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

Actuators

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



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

3.9. Signal Outputs

3.9.1 Signal Output 1 and 2 (current outputs)

Note: Max. burden 510 Ω

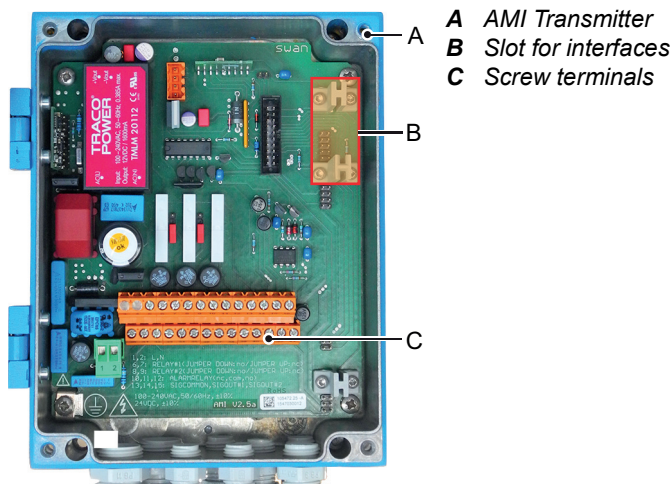
If signals are sent to two different receivers, use signal isolator (loop isolator).

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

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

For programming see [Program List and Explanations, p. 86](#), Menu Installation.

3.10. Interface Options



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

- a Profibus or Modbus connection
- a HART connection
- an USB Interface

3.10.1 Signal Output 3

The AMI Turbiwell can display a maximum of two measured values:

- ♦ the measured turbidity and
- ♦ the sample flow, if a flow sensor is installed.

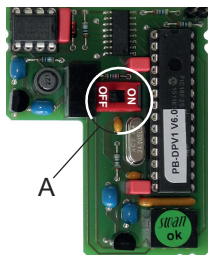
Therefore, there is no need to install the optional third signal output.

3.10.2 Profibus, Modbus Interface

Terminal 37 PB, Terminal 38 PA

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

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



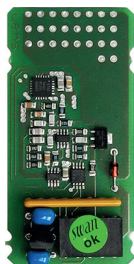
Profibus, Modbus Interface PCB (RS 485)

A On - OFF switch

3.10.3 HART Interface

Terminals 38 (+) and 37 (-).

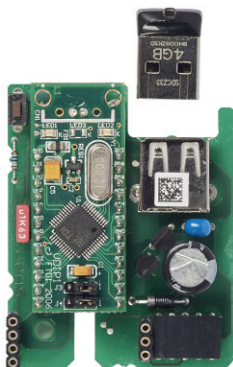
The HART interface PCB allows for communication via the HART protocol. For detailed information, consult the HART manual.



HART Interface PCB

3.10.4 USB Interface

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



USB Interface

4. Instrument Setup

Open sample flow	<p>Open the sample flow and wait until the measuring chamber is full and the sample flows via overflow into the waste. Switch on power. First, the analyzer performs a self test, displays the firmware version and then starts normal operation.</p>
Programming	<p>Program all parameters for external devices (interface, etc.). Set all parameters for instrument operation (limits, alarms).</p>
Run-in period	<p>If the turbidity value is very low (<1 FNU/NTU) rinsing may take several hours (~24 h). Rinse until a constant value is displayed.</p>

4.1. Adjusting the deltaT Flow Sensor (Option)

The accuracy of the flow measurement depends on the ambient temperature of the installation location. The deltaT flow sensor is factory calibrated at 20 °C (±20 % accuracy). If the temperature is higher or lower, the deltaT flow sensor can be adjusted.

To adjust the deltaT sensor proceed as follows:

Run in	<p>After installation let the sensor run in for at least 1h.</p>
Determine the flow rate	<ol style="list-style-type: none"> 1 Put the sample outlet of the instrument into a measuring cup with a sufficient volume for 10 min. 2 To get the flow rate in l/h, calculate the amount of water contained in the measuring cup with factor 6. ⇒ <i>The flow rate in l/h results from the multiplication of the amount of water after 10 min by 6.</i>
Adjust slope	<ol style="list-style-type: none"> 1 Navigate to <Installation>/<Sensors>/<Flow>, choose <Slope> and press [Enter]. 2 If the calculated flow rate is higher than the displayed flow rate increase the Slope value. 3 If the calculated flow rate is lower than the displayed flow rate decrease the Slope value. 4 Press [Exit] and save with [Enter]. 5 Compare the calculated flow rate with the displayed flow rate. ⇒ <i>If the flow rates are roughly equal, the adjustment is finished.</i> 6 Else repeat steps 1 to 5.

4.2. Calibration, Matching and Verification

- Calibration** If required by the local regulatory authority, a calibration can be carried out at the customer's site. This calibration is performed with a specified formazine standard, see [Calibration, p. 59](#) for details. The zero point defined during factory calibration is not changed by this calibration, but only the slope of the calibration line. The calibration is accepted if the deviation is less than 25% of the factory calibration. The long-term stability of the AMI Turbiwell can be verified with a verification kit that must be matched against the current calibration.
- Matching** Matching a verikit is necessary to measure and store the specific turbidity of a verikit. Each subsequent verification using the respective verikit is based on this value.
With a verikit that has been matched, you can carry out a periodic verification. The deviation must be within 10% of the reference value.
- Verification** Perform a verification with a verikit (see [Swan Verification Kit, p. 64](#)) or a wet verification (see [Wet Verification, p. 72](#)) after run-in time to check the instrument performance.

4.3. ppm Calculation, e.g. “Oil in water”

Note: If ppm is chosen, the matching and verification functions are not available.

General

The AMI Turbiwell is also suitable for the measurement of other liquids of which the turbidity correlates with the concentration of a suspended solid or an emulsified liquid. In such applications, the turbidity is normally displayed in ppm. A submenu allows the user to perform a calibration of such processes.

The calibration line is defined by 2 points: zero point and a scale point (slope). For the determination of the zero point, a sample without the opacifier ($x = 0$) must be supplied to the AMI Turbiwell. The average value over a defined time period is automatically saved as the zero point.

For the determination of the slope, the AMI Turbiwell must be supplied with a sample with a known concentration of turbidity material (opacifier). The concentration of the opacifier must be entered into the transmitter (i.e. 2.5 ppm). The average value over a defined time is automatically saved as slope (scale point).

The calibration line is calculated from this data.

Note: Two restrictions regarding this calibration method must be considered:

- *The reading is only valid if the zero does not change. This means that the background turbidity which is caused by different properties or different suspended solids must be constant!*
- *In general, the correlation of the displayed value (ppm) and content of the opacifier is only approximately linear in a limited range. Due to that fact the sensitivity is strongly dependent on the chosen concentration (scale point). If the scale point is chosen so that it is close to a limit value or a control point (i.e. setpoint), the error caused by non-linearity in this range can be minimized.*

It must also be taken into consideration that the turbidity of a sample does not only depend on the concentration of the suspended solid or emulsified liquid, but also on the drop size, respectively, particle size distribution function. This property of the sample should not differ substantially.

Considerations

Considerations for a reliable measurement:

- ♦ The sample must always have the same grade of homogenization to receive quantitative results. Adequate homogenization can be achieved with a centrifugal or a gear pump.
- ♦ The distance and the time period from sampling to measurement should be short enough to ensure that the drop size does not essentially change.
- ♦ It is not possible to avoid the accumulation of a thin layer of oil on the walls of pipes, fittings and measuring chamber when measuring samples with permanent oil content. If the oil concentration in the sample decreases, part of the oil layer is removed. This is a very slow process so it can take a long time until the actual concentration is displayed correctly. In the case of measurements with varying concentrations, an (automatic) cleaning of the sampling system is recommended, especially when low concentrations need to be determined with a high accuracy.
- ♦ The solubility of most oils in water is very low but depending on the type of oil, several ppm are dissolved in water. This dissolved oil cannot be detected by turbidimeters. The value of the dissolved part of the oil must be added to the undissolved part to determine a limit value correctly.
- ♦ The sensitivity varies in different oils. A typical comparative value for 1 ppm of oil is 0.5 FNU/NTU.

**Activate ppm
calculation**

To activate <ppm calculation>, navigate to menu <Installation>/<Sensors>/<Dimension>.
Choose ppm, press [Enter], press [Exit].
Choose <Yes> and press [Enter] to save.

**Process
calibration**

The following must be considered before starting calibration:

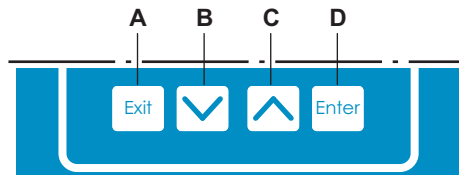
- ♦ Drain the measuring chamber and clean it if necessary.
- ♦ For the calibration, oil-free process water and oil is needed. The calibration solutions are prepared in a vessel with a volume of approx. 10 liters.
- ♦ Homogenize the solution with a circulating pump or a motorized stirrer before and during the calibration.
- ♦ Connect the outlet of the vessel with the sample inlet of the AMI Turbiwell.
- ♦ Adjust the sample flow to approx. 20 liters per hour by a control valve.
- ♦ The signal must be stable while the sample is flowing. To check the stability, navigate to menu 2.2.1 <Diagnostic>/<Sensors>/<Turbidity> and observe the raw signal.

To start with calibration navigate to menu 3.1, <Maintenance>/<Process Cal. ppm>. There you can choose between

- ♦ Detect Zero:
The zero value determination is carried out with oil-free process water.
- ♦ Specify slope:
A sample with a known oil concentration is used to determine the slope. The entered process value is used as the setpoint of the calibration sample.

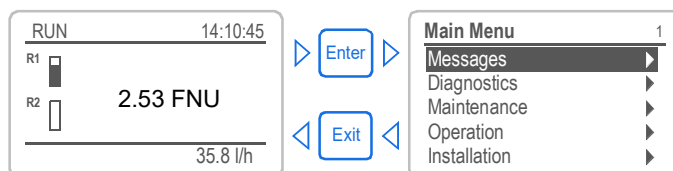
5. Operation

5.1. Function of the Keys

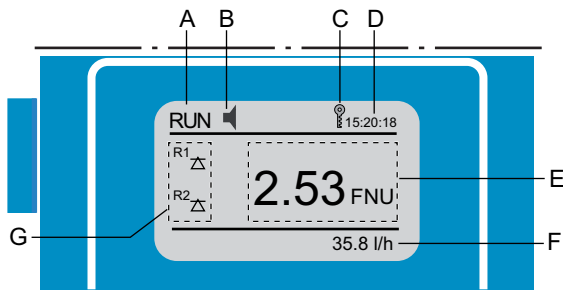


- A** to exit a menu or command (rejecting any changes) to move back to the previous menu level
- B** to move DOWN in a menu list and to decrease digits
- C** to move UP in a menu list and to increase digits
- D** to open a selected sub-menu
to accept an entry

Program Access, Exit



5.2. Measured Values and Symbols on the Display



- | | | |
|----------|----------------------------------|---|
| A | RUN | normal operation |
| | HOLD | input closed or cal delay: Instrument on hold (shows status of signal outputs). |
| | OFF | input closed: Control/limit is interrupted (shows status of signal outputs). |
| B | ERROR |  Error  Fatal Error |
| C | Transmitter control via Profibus | |
| D | Time | |
| E | Process value | |
| F | Sample Flow | |
| G | Relay Status | |

Relay status, symbols

- | | | |
|---|---|-----------------------------------|
|  |  | upper/lower limit not yet reached |
|  |  | upper/lower limit reached |
|  | control upw./downw. no action | |
|  | control upw./downw. active, dark bar indicates control intensity | |
|  | motor valve closed | |
|  | motor valve: open, dark bar indicates approx. position | |
|  | timer | |
|  | timer: timing active (hand rotating) | |

5.3. Software Structure

Main Menu	1
Messages	▶
Diagnostics	▶
Maintenance	▶
Operation	▶
Installation	▶

Messages	1.1
Pending Errors	▶
Maintenance List	▶
Message List	▶

Menu 1: Messages

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

Diagnostics	2.1
Identification	▶
Sensors	▶
Sample	▶
I/O State	▶
Interface	▶

Menu 2: Diagnostics

Provides user relevant instrument and sample data.

Maintenance	3.1
Verification	▶
Matching	▶
Calibration	▶
Simulation	▶
Set Time	01.01.05 16:30:00

Menu 3: Maintenance

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

Operation	4.1
Sensors	▶
Relay Contacts	▶
Logger	▶

Menu 4: Operation

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

Installation	5.1
Sensors	▶
Signal Outputs	▶
Relay Contacts	▶
Miscellaneous	▶
Interface	▶

Menu 5: Installation

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

5.4. Changing Parameters and Values

Changing parameters

The following example shows how to change the logger interval:

Logger 4.4.1
Log interval 30 min
Clear logger no

1 Select the parameter you want to change.

2 Press [Enter]

Logger 4.1.3
Log interval Interval.
Clear logger 5 min
10 min
30 min
1 Hour

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

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

⇒ The selected parameter is highlighted but not saved yet.

Logger 4.1.3
Log interval 10 min
Clear logger no

5 Press [Exit].

⇒ Yes is highlighted.

Logger 4.1.3
Log interval Save ?
Clear logger Yes
no

6 Press [Enter] to save the new parameter.

⇒ The system reboots, the new parameter is set.

Changing values

Alarm 5.3.1.1.1
Alarm High 200.0 FNU
Alarm Low 0.000 FNU
Hysteresis 10.0 FNU
Delay 5 Sec

1 Select the value you want to change.

2 Press [Enter].

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

Alarm 5.3.1.1.1
Alarm High 180.0 FNU
Alarm Low 0.000 FNU
Hysteresis 10.0 FNU
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

The AMI Turbiwell is factory-calibrated using a primary standard (formazine) prior to shipment. The instrument does not require any further calibration before use. A verification is recommended quarterly using the Swan Verification Kit, a secondary standard, instead of calibration with a primary standard.

Recalibration with a primary standard is only necessary if verification of the turbidity meter fails or after significant maintenance or repair work.

Preventive maintenance frequency depends on water quality, on the application, and on national regulations.

Turbidity below 1 FNU/NTU:

Every week	Check sample supply for dirt. Check sample flow.
Monthly	Check measuring chamber for dirt. If necessary, clean it with a brush and/or drain the measuring chamber. If there is a growth of algae, disinfect the sample degasser and measuring chamber with concentrated NaOCl. Use a pipette to dose the disinfectant.
Quarterly	Perform a verification.
Yearly	Dismount the sample degasser and clean it with a brush.

Turbidity above 1 FNU/NTU:

Daily to every week	Check sample supply for dirt. Check sample flow.
Weekly to Monthly	Rinse the measuring chamber. If the sample contains algae, disinfect the measuring chamber with concentrated NaOCl. Use a pipette.
Quarterly	Perform a verification.

6.2. Cleaning the Measuring Chamber



CAUTION

Wrong measured values due to dirty optical components

Touching the optical components in the cover of the measuring cell may result in wrong measured values.

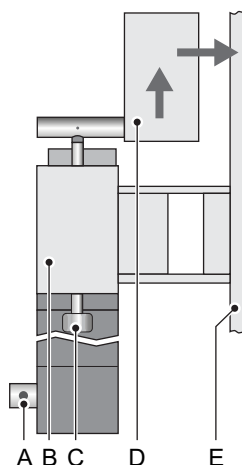
Cleaning and re-calibration at SWAN is necessary.

- ◆ Never touch the optical components during maintenance work.

Signal outputs and relays

During the cleaning routine, no turbidity or flow alarms are issued. The measured value is kept at the last valid value and the relays are frozen. If programmed, the controller continues based on the last valid value.

Cleaning



- A Drain valve
- B Measuring chamber
- C Quick fastener screw
- D Cover
- E Panel

- 1 Select <Maintenance>/<Clean meas. chamber>.
 - ⇒ The instrument counts down 1200 seconds during which the measuring chamber can be checked and cleaned.
 - The routine can be terminated at any time by pressing [Enter].
 - The counter can be restarted by pressing an arrow key.
- 2 Stop sample flow.
- 3 Release the two quick fastener screws [C].
 - ⇒ The cover automatically slides up.

- 4 Move the cover completely backwards.
- 5 If the measuring chamber is strongly polluted, remove algae etc. from the barrier and measuring chamber walls with a soft brush.
- 6 Open the drain valve to flush out the polluted water.
- 7 Remove calcareous depositions using a common household deliming agent in standard concentration. For that, fill up the measuring chamber, add the deliming agent.
- 8 Wait several minutes, then remove the calcareous depositions with a soft brush.
- 9 Open the drain valve to flush out the polluted water.
- 10 Close the drain valve, start sample flow and wait until the measuring chamber has been filled.
- 11 Open the drain valve to flush again.
- 12 If necessary repeat steps 9 and 10.
- 13 Move the cover right to the front.
- 14 Press the cover down and fix it with the quick fastener screws.

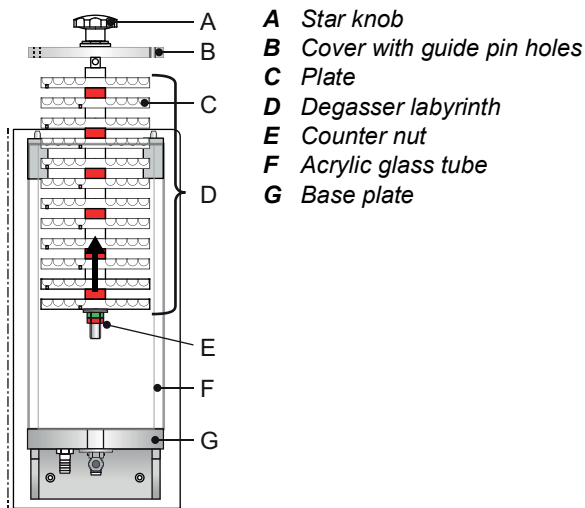
Note: *Before exiting the routine or before the 1200 seconds have elapsed, completely fill and close the measuring chamber and open the flow regulating valve.*

Run-in Period After cleaning, wait approximately 1 h (depending on the sample flow) until a stable value is displayed.

6.3. Cleaning the Degasser

Note: Use a soft brush and a mild detergent. Eliminate calcareous depositions with a common household deliming agent in standard concentration.

Cleaning To clean the degasser proceed as follows:



- 1 Stop sample flow.
- 2 Wait until the sample degasser is empty.
- 3 Turn the star knob [A] counter-clockwise to unscrew and remove the degasser labyrinth from the base plate [G].
- 4 Remove the acrylic glass tube [F].
- 5 Loosen the counter nut [E] and remove both, counter nut and nut.
- 6 Remove the plates [C] from the guide rod.
- 7 Clean the plates and the acrylic glass tube with a soft brush and mild detergent.
- 8 Eliminate calcareous depositions using a common household deliming agent in standard concentration.
- 9 Rinse the plates and acrylic glass tube with clean water.
- 10 Assemble alternately a plate with a white and a red distance holder to the guide rod. Start with a white plate.

- 11 Wipe the sample degasser bottom plate with a soft tissue. Make sure that the gasket is clean.
- 12 Put the acrylic glass tube onto the base plate.
- 13 Insert the degasser labyrinth into the acrylic glass tube.
- 14 Tighten the degasser labyrinth finger tight with the star knob
- 15 Open the sample flow.
- 16 Check for leakage.

6.4. Calibration

The AMI Turbiwell is calibrated at the factory using formazine and the curve is permanently stored in the transmitter. In addition, the emission intensity of the LED is monitored by an external photodiode. This automatically compensates for an age-related loss of intensity. A recalibration of the AMI Turbiwell is therefore not necessary.

However, some state regulations require a periodic recalibration of turbidity measuring instruments. Therefore, a calibration procedure is described below. To find out whether a periodic recalibration is required, contact your local regulatory authority.

Note: *The zero point defined during factory calibration is not changed, but only the slope of the calibration line.*

The calibration is performed with a 20 FNU/NTU formazine standard. To make the formazine standard, the following aids are required:

- ♦ Deionized water with a turbidity < 0.1 FNU/NTU
- ♦ Formazine standard 4000 NTU produced according to EPA 180.1, ASTM 2130B or ISO 7027
- ♦ The following laboratory equipment



- A** Pipette 5 ml
- B** Fast-release pipette pump
- C** Rubber stopper
- D** Volumetric flask

**Prepare the
20 NTU
formazine
standard**

- 1 Put the pipette into the fast-release pipette pump.
- 2 Make sure that the pump piston is pushed in completely.
- 3 Turn the pump wheel until the formazine standard 4000 NTU reaches the 5 ml level of the pipette.
- 4 Put the pipette into the volumetric flask and press the fast release lever until the pipette is empty.
- 5 Fill the volumetric flask with 1 liter of deionized dilution water.



WARNING

Health hazard

Formazine is harmful to the environment.

- ♦ At no means recirculate it into the water system.

Perform calibration

In the maintenance menu, choose calibration and follow the instructions on the screen.

Maintenance	3.32
Verification	▶
Matching	▶
Calibration	▶
Simulation	▶
Set Time	01.01.05 16:30:00

- 1 Navigate to menu <Maintenance>/<Calibration> and press [Enter].

Calibration	3.32.5
- Stop sample flow	
- Open meas. chamber	
<Enter> to continue	

- 2 Stop sample flow.
- 3 Open the measuring chamber.

Calibration	3.32.5
- Plug drain 1 with a rubber stopper	
<Enter> to continue	

- 4 Seal the overflow [E] with the rubber stopper [F].
See [Seal the overflow, p. 63](#).

Calibration	3.32.5
- Open Drainage Valve	
- Drainage valve open?	
- Empty meas. chamber	
<Enter> to continue	

- 5 Open the drain valve [D] until the measuring chamber is empty.
⇒ *If equipped with automatic drainage, the drain valve opens and closes automatically.*

Calibration	3.32.5
- Close Drainage Valve	
- Drainage valve closed?	
- Fill with Formazine	
- Close meas. chamber	
<Enter> to continue	

- 6 Then close the drain valve again.
- 7 First fill the overflow chamber [C] with the formazine standard.
- 8 Then fill the measuring chamber [B] until the formazine standard overflows via constant head [G].
- 9 Close the measuring chamber.
- 10 Press [Enter] to start calibration.

Calibration	3.32.5
Current Value	10.1 FNU
Factor (0.75 - 1.25)	0.92
<Enter> to continue	

⇒ *After the calibration has been finished, the current value and the calculated factor are displayed. If the calculated factor is within the limit of 0.75–1.25 the calibration is accepted.*

Calibration	3.32.4
Factor existing	1.00
Factor new	0.92
<div>Keep existing</div> <div>Save new</div>	

Calibration	3.32.5
- Open meas. chamber	
- Drainage valve open?	
- Remove rubber stopper	
- Rinse meas. chamber	
<div><Enter> to continue</div>	

Calibration	3.32.5
- Close meas. chamber	
- Close Drainage Valve	
- Drainage valve closed?	
<div><Enter> to continue</div>	

Calibration	3.32.4
- Match Verikit?	
<div>Yes</div> <div>No</div>	

Calibration	3.32.5
- Start sample flow	
<div><Enter> to finish</div>	

You are prompted to choose between:
 [Keep existing]
 and
 [Save new].

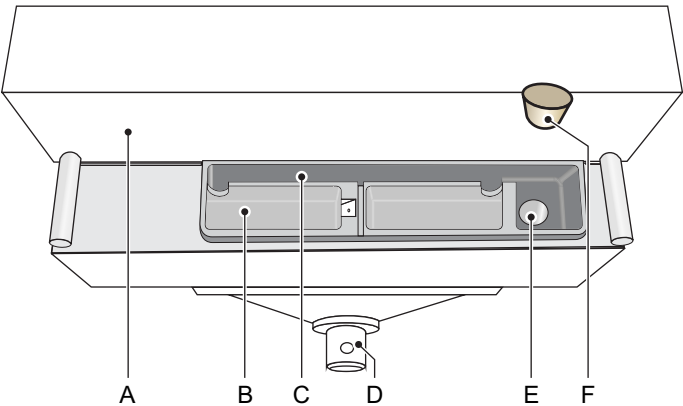
- 11 Open the measuring chamber.
- 12 Open the drain valve.
- 13 Remove the rubber stopper.
- 14 Rinse the measuring chamber with sample.
- 15 Close the measuring chamber.
- 16 Close the drain valve.
- 17 Press [Enter].

You are asked whether you want to match the Verikit. Without a matched Verikit it is not possible to perform a verification. It is also possible to match a Verikit later, see [Matching, p. 64](#).

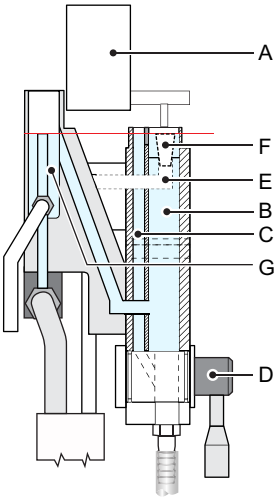
- 18 Start sample flow.

Possible error messages, see [Troubleshooting, p. 75](#).

**Seal the
overflow**



- | | |
|----------------------------|-----------------------------|
| A Cover | D Drain valve |
| B Measuring chamber | E Overflow (drain 1) |
| C Overflow chamber | F Rubber stopper |



- | |
|-----------------------------|
| A Cover |
| B Measuring chamber |
| C Overflow chamber |
| D Drain valve |
| E Overflow (Drain 1) |
| F Rubber stopper |
| G Constant head |

6.5. Verification

Due to the technology and design of the instrument, a calibration is not required. However, a periodic check of the instrument performance can be performed. The check can be performed either with a Swan Verification Kit or with a wet verification. To find out which methods are approved, contact your local regulatory authority.

6.5.1 Swan Verification Kit

There are two different types of Swan Verification Kits:

- ♦ Solid verification kits consisting of a glass prism with a defined turbidity value:
 - 7027 High
 - 7027 Low
 - W/LED High
 - W/LED Low
- ♦ Liquid verification kit: A small cuvette that can be filled with an aqueous suspension or emulsion.

Note: For solid verification kits, a recertification is recommended every two years.

The procedure is essentially the same for both types of verification kits. If a liquid verification kit is used, also follow the instructions for filling in section [Verification Kit Turbiwell Liquid, p. 69](#).

Matching

Each verification kit has to be matched with the latest calibration before it can be used for a verification. The <Matching> function can be started in menu <Maintenance>/<Matching>.

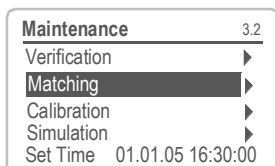
Up to 10 Verikits can be matched for one AMI Turbiwell. An existing Verikit can be overwritten but not deleted.

Note: It is very important that the drainage valve is closed during the matching process. Otherwise wrong measured values caused by residual light will result.

- Instruments equipped with automatic drainage: No action necessary. The drainage valve opens and closes automatically.
- Instruments with a manual drainage valve: Close the drainage valve before matching.

The signal outputs are frozen during matching. When the matching is finished, the signal outputs remain frozen for the time programmed in <hold after cal.>. During this time the display shows HOLD.

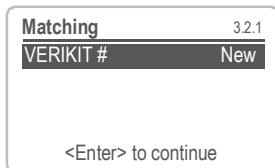
For possible error messages, see [Troubleshooting, p. 75](#).



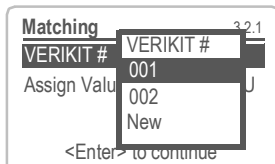
- 1 Navigate to menu <Maintenance>/<Matching>.



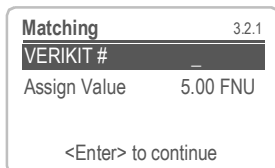
- 2 Select <Solid Verikit> or <Liquid Verikit>.



- 3 Verikit "New" is highlighted.
- 4 Select "[Enter]" to continue" using the [] key and press [Enter].
⇒ VERIKIT # is highlighted



If there are already matched Verikits, you can choose the desired Verikit from a list and jump to step 8. Otherwise continue with step 5.



- 5 Press [Enter].
⇒ A cursor appears.
- 6 Enter the 1st character with the [] or [] key.
- 7 After each character press [Enter] to proceed with the next character.
⇒ A maximum of 10 characters is possible. For each character you want to step over, press [Enter].

Matching		3.2.1
VERIKIT #	s1	
Assign Value	5.00 FNU	
<Enter> to continue		

Matching		3.2.5
- Close inlet valve		
- Open meas. chamber		
- Drainage valve open?		
- Empty meas. chamber		
<Enter> to continue		

Matching		3.2.5
- Drainage valve closed?		
- Mount test unit		
- Close meas. chamber		
<Enter> to continue		

Matching		3.2.5
Actual value	21.6 FNU	
Assign. value	24 FNU	
Deviation	-9.9%	
<Enter> to continue		

Matching		3.2.5
- Open meas. chamber		
- Remove Test unit		
- Close meas. chamber		
- Open inlet valve		
<Enter> to finish		

- 8 Select "Assign Value" with the [] key and press [Enter].
- 9 Set the required value using the [] and [] keys.
 - Solid verikit: Enter the value printed on the label of the verikit.
 - Liquid verikit: Enter the FNU/NTU value of the standard.

- 10 Stop the sample flow.
- 11 Open the measuring chamber.
- 12 Open the drain valve [D].
- 13 Wait until the measuring chamber is empty.
- 14 Then close the drain valve again.
- 15 Install the Verikit, see [Installation of the Verikit, p. 68](#).
- 16 Close the measuring chamber.
- 17 Press [Enter].

⇒ *The matching process is running.*

Note: *With a Liquid Verikit, only the assigned value is displayed.*

- 18 After successful matching, press [Enter].
- 19 Open the measuring chamber.
- 20 Remove the Verikit.
- 21 Close the measuring chamber.
- 22 Start the sample flow.
- 23 Press [Enter] to finish.

Verification

Verification 3.1.2

SWAN Verikit

Other method

Verification 3.1.1

VERIKIT # VERIKIT #

001

002

003

<Enter> to continue

Verification 3.1.5

- Close inlet valve

- Open meas. chamber

- Drainage valve open?

- Empty meas. chamber

<Enter> to continue

Verification 3.1.5

- Drainage valve closed?

- Mount test unit

- Close meas. chamber

<Enter> to continue

Verification 3.1.5

Actual value 21.7 FNU

Reference value 21.6 FNU

Deviation 0.1 %

<Enter> to save

Verification 3.1.5

- Open meas. chamber

- Remove Test unit

- Close meas. chamber

- Open inlet valve

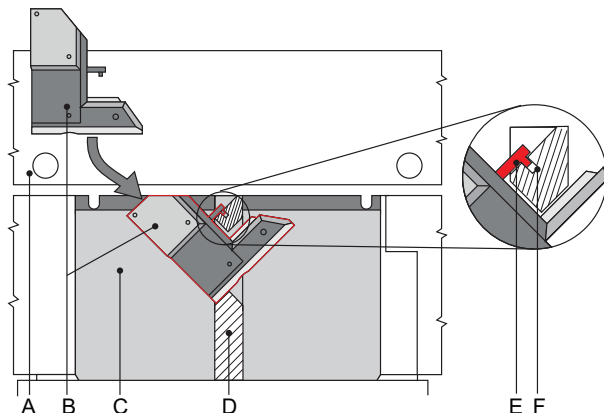
<Enter> to finish

- 1 Navigate to menu <Maintenance>/<Verification> and press [Enter].
- 2 Select SWAN Verikit and press [Enter].
- 3 Choose a Verikit from the list.
- 4 Press [Enter].
- 5 Stop sample flow.
- 6 Open the measuring chamber.
- 7 Open the drain valve if the instrument is not equipped with an automatic drain valve.
- 8 Wait until the measuring chamber is empty.
- 9 Close the drain valve.
- 10 Install the verification kit (see [Installation of the Verikit, p. 68](#)).
- 11 Close the measuring chamber.
- 12 Wait until the verification is finished.
- 13 Open the measuring chamber.
- 14 Remove the verification kit.
- 15 Close measuring chamber.
- 16 Start sample flow.
⇒ The Verification results are stored in the Verification history, see [87](#).

For possible error messages see [Troubleshooting, p. 75](#).

Installation of the Verikit

Insert and fix the verification kit as shown below. If a liquid verification kit is used, also perform the steps described in [Preparation before use, p. 70](#).



- | | |
|----------------------------|--|
| A Cover | D Barrier |
| B Verification kit | E Fixing plate with cylindrical pin |
| C Measuring chamber | F Hole |

Note: To avoid misting of the glass prisms, make sure that the Verikit and the measuring chamber have the same temperature. Avoid touching the optical surfaces when working with the verification kit.

- 1 Insert the verification kit [B] into the slot of the barrier [D] located in the measuring chamber [C].
- 2 Fix the verification kit by putting the cylindrical pin [E] into the hole [F] of the barrier.
- 3 Make sure the verification kit is fixed correctly.
- 4 Close the measuring chamber.

The signal outputs are frozen during verification. When the verification is finished, the signal outputs remain frozen for the time programmed in <hold after cal.>. During this time the display shows HOLD.

**Verification
Kit Turbiwell
Liquid**

The Verification Kit Turbiwell Liquid can be filled with any aqueous suspension or emulsion, provided that the suspension or emulsion is compatible with the materials used.

Housing: PET
Windows: PMMA
Screw plugs: PVDF

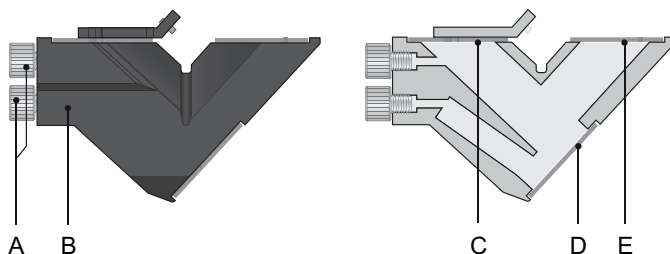
Note: *The Verification Kit Turbiwell Liquid is suitable for verification, but not for calibration!*

WARNING



Please observe the necessary safety precautions when handling hazardous chemicals.

- ♦ Read the Safety Data Sheets carefully!



A Screw plugs

B Cuvette

C Window (light beam in)

D Window (light beam out)

E Window (light beam out)

Filling To fill the Verification Kit Turbiwell Liquid, proceed as follows:

- 1 Unscrew both screw plugs [A].
- 2 Fill 13.5 to 14 g of the standard into the cuvette through one of the openings.

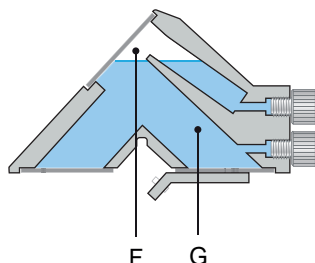
Note: *The cuvette must not be completely filled with liquid, otherwise it may be damaged by overpressure if the temperature rises.*

- 3 Close the cuvette with the two screw plugs.
- 4 Perform the steps specified in [Preparation before use, p. 70](#).
- 5 Perform the matching procedure, see [Matching, p. 64](#).

**Preparation
before use**

Before inserting the verification kit into the measuring chamber, perform the following steps:

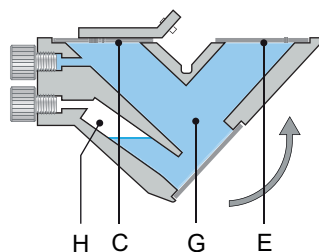
- 1 Shake to obtain a homogeneous mixture.
- 2 Place the cuvette as shown below. Tap against the cuvette to let all air rise to the top.



F Air bubble

G Standard

- 3 Turn the cuvette counterclockwise.
- 4 Make sure that all air is in position [H]. There must be no air bubbles on the windows [C] and [E].



C Window (light beam in)

G Standard

E Window (light beam out)

H Air bubble

- 5 Proceed with sections [Installation of the Verikit, p. 68](#) and [Verification, p. 67](#).

Refilling

Before filling with a new standard, fill the cuvette with water and shake well to remove all residues. After each refill, the matching procedure (see [Matching, p. 64](#)) must be repeated.

Cleaning the Verification Kit



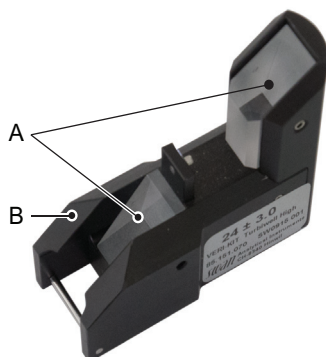
Solid
verification kit

CAUTION

Damage to optical surfaces

Never use organic agents i. e. alcohol to clean the optical surfaces of the verification kit.

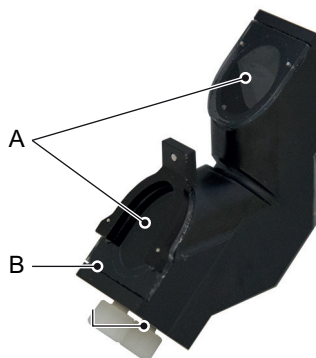
- ♦ Use a dry cleaning cloth for lenses to clean the optical surfaces [A]. If necessary, moisten with demineralized water.
- ♦ If the verification kit is wet, dry it with warm air of max. 50 °C.



A Acrylic glass prisms
B Housing

Solid verification kit: If the verification is still out of range after cleaning, send the verification kit back to the manufacturer for cleaning and recertification.

Liquid
verification kit



A Acrylic glass windows
B Housing

6.5.2 Wet Verification

Wet verification can be used instead of verification with a Verikit. It is performed with a standard with a known turbidity filled into the measuring chamber instead of the sample.

Note: When performing a wet verification do not use a standard below 1 FNU/NTU.

Maintenance	3.1
Verification	▶
Matching	▶
Calibration	▶
Simulation	▶
Set Time 01.01.05 16:30:00	

Verification	3.1.2
Swan Verikit	
Other method	

Other method	3.1.2.5
- Close inlet valve.	
- Open meas. chamber	
- Open drainage valve	
- Empty meas. chamber	
<Enter> to continue	

Other method	3.1.2.5
- Plug drain 1 with a rubber stopper.	
<Enter> to continue	

Other method	3.1.2.5
- Close Drainage Valve	
- Fill with standard	
- Close meas. chamber	
<Enter> to continue	

- 1 Navigate to menu <Maintenance>/<Verification> and press [Enter].
- 2 Choose <Other method> and press [Enter].
- 3 Stop sample flow.
- 4 Open the measuring chamber.
- 5 Open the drain valve if the instrument is not equipped with an automatic drain valve.
- 6 Wait until the measuring chamber is empty.
- 7 Seal the overflow [E] with the rubber stopper [F].
See [Seal the overflow, p. 63](#).
- 8 Close the drainage valve.
- 9 Fill the measuring chamber with the standard.
- 10 Close the measuring chamber.
- 11 Press [Enter].

Other method		3.1.2.5
Reference value	14.0 FNU	
<Enter> to continue		

12 Enter the turbidity of the standard as the reference value.

13 Press [Enter].

Other method		3.1.2.5
Actual value	21.7 FNU	
Reference value	21.6 FNU	
Deviation	0.1%	
Progress	<div style="width: 50%;"></div>	

⇒ *The verification is running.*

Other method		3.1.2.5
Actual value	21.7 FNU	
Reference value	21.6 FNU	
Deviation	0.1%	
<Enter> to save		

14 Press [Enter] to save.

Other method		3.1.2.5
- Open Drainage Valve.		
- Empty meas. chamber.		
- Remove rubber stopper.		
<Enter> to continue		

15 Open the drainage valve.

16 Empty the measuring chamber.

17 Remove the rubber stopper.

Other method		3.1.2.5
- Close Drainage Valve.		
- Open inlet valve.		
<Enter> to finish		

18 Close the drainage valve.

19 Open the inlet valve.

20 Press [Enter] to finish.

6.6. Longer Stop of Operation

Do not switch off the instrument if your operation is suspended for less than a week. Power consumption is very low and the turbidimeter remains ready for use.

If water hardness is very high, lime deposition may precipitate.

- 1** Stop sample flow.
- 2** Switch off power.
- 3** Empty measuring chamber by opening the drain valve. (With automatic drain valve option, select <Maintenance>/<Drainage>/<Manual operation>/<Motor valve>/<open> menu item).
- 4** If necessary clean the measuring chamber (see [Cleaning the Measuring Chamber, p. 56](#)).

7. Troubleshooting

7.1. Calibration Errors

Error message: Deviation too big!! Please check manual.

Possible cause	Corrective Action
Wrong formazine standard.	Check formazine standard. If necessary prepare a new formazine standard, see Prepare the 20 NTU formazine standard, p. 60.
Measuring chamber dirty.	Clean measuring chamber, see Cleaning the Measuring Chamber, p. 56.

7.2. Matching Errors

Error message: Deviation too big!! Please check manual.

Possible cause	Corrective Action
Calibration	Perform a new calibration, see Calibration, p. 59.
Verification kit dirty.	Clean the verification kit, see Calibration, p. 59.

7.3. Verification Errors

Error message: Deviation too big!! Please check manual.

Possible cause	Corrective Action
Verification kit dirty.	Clean the verification kit, see Calibration, p. 59.
Verification kit reference value.	Perform a new matching, see Matching, p. 64. Check if the correct Verikit is used.
Wrong Verikit in use.	Check if the correct Verikit is used.

7.4. Error List

Error

Non-fatal Error. Indicates an alarm if a programmed value is exceeded.

Such Errors are marked **E0xx** (bold and black).

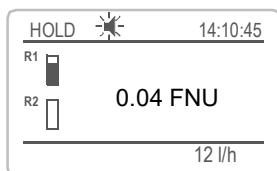
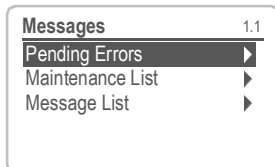
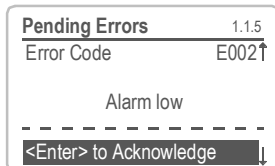
Fatal Error (blinking symbol)

Control of dosing devices is interrupted.

The indicated measured values are possibly incorrect.

Fatal Errors are divided in the following two categories:

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



Error or fatal Error

Error not yet acknowledged.

Check **Pending Errors 1.1.5** and take corrective action.

Navigate to <Messages>/
<Pending Errors>

Press [ENTER] to acknowledge the Pending Errors.

⇒ *The Error is reset and saved in the Message List.*

Error	Description	Corrective action
E001	Alarm high	<ul style="list-style-type: none"> – check process – check programmed value 5.3.1.1.1, p. 97
E002	Alarm low	<ul style="list-style-type: none"> – check process – check programmed value 5.3.1.1.25, p. 97
E005	Range	<ul style="list-style-type: none"> – turbidity out of range – disappears if measuring chamber is filled
E009	Sample Flow high	<ul style="list-style-type: none"> – check sample flow – check programmed value 5.3.1.2.2, p. 97
E010	Sample Flow low	<ul style="list-style-type: none"> – establish sample flow – clean instrument – check programmed value 5.3.1.2.31, p. 97
E013	Case Temp. high	<ul style="list-style-type: none"> – check case/environment temperature – check programmed value 5.3.1.4, p. 97
E014	Case Temp. low	<ul style="list-style-type: none"> – check case/environment temperature – check programmed value 5.3.1.5, p. 97
E017	Control Timeout	<ul style="list-style-type: none"> – check control device or programming in Installation, Relay contact, Relay 1 & 5.3.2 & 5.3.3, p. 97
E018	Turbi disconnected	<ul style="list-style-type: none"> – shut off power – check wiring
E020	Lamp off	<ul style="list-style-type: none"> – close measuring chamber cover
E024	Input active	<ul style="list-style-type: none"> – See If Fault Yes is programmed in Menu 5.3.4, p. 101
E026	IC LM75	<ul style="list-style-type: none"> – call service
E028	Signal output open	<ul style="list-style-type: none"> – check wiring on signal outputs 1 and 2
E030	EEProm Frontend	<ul style="list-style-type: none"> – call service

Error	Description	Corrective action
E031	Calibration Recout	– call service
E032	Wrong Frontend	– call service
E033	Power-on	– none, normal status
E034	Power-down	– none, normal status

7.5. Replacing Fuses



WARNING

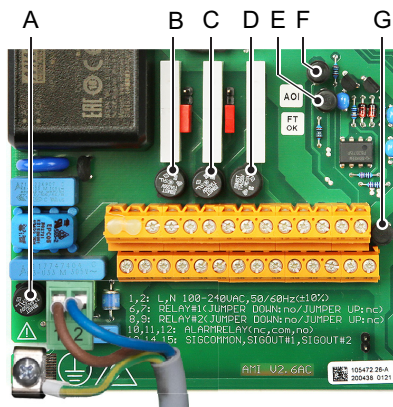
External Voltage.

Externally supplied devices connected to relay 1 or 2 or to the alarm relay can cause electrical shocks

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

Find and repair the cause for the short circuit before replacing the fuse.

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



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

8. Program Overview

For explanations about each parameter of the menus see [Program List and Explanations, S. 86](#).

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

8.1. Messages (Main Menu 1)

Pending Errors	Pending Errors	1.1.5*	* Menu numbers
1.1*			
Message List	Number	1.2.1*	
1.2*	Date, Time		
Maintenance List	Maintenance List	1.3.5*	
1.3*			

8.2. Diagnostics (Main Menu 2)

Identification	Designation	AMI Turbiwell
2.1*	Version	V6.26-10/21
	Version TURBI	1.35
	Factory Test	
	2.1.4*	
	Operating Time	
	2.1.5*	

Sensors 2.2*	Turbidity 2.2.1*	<i>Turbidity FNU/NTU</i> (Raw value) <i>Quotient</i> <i>Scale Factor 1</i> <i>Offset FNU/NTU</i> <i>Case Temp.</i>	* Menu numbers
	Miscellaneous 2.2.2*	2.2.2.1*	
	History 2.2.3*	Cal. History 2.2.3.1*	2.2.3.1.1*
		<i>Number</i> <i>Date, Time</i> <i>Factor cal.</i> <i>Factor active</i>	
		Ver. History 2.2.3.2*	2.2.3.2.1*
		<i>Number</i> <i>Date, Time</i> <i>Verikit #</i> <i>Meas. Value</i> <i>Deviation</i>	
		VERI-KIT History 2.2.3.3*	2.2.3.3.1*
		<i>Number</i> <i>Date, Time</i> <i>Verikit #</i> <i>Assign. Value</i> <i>Meas. Value</i>	
	Process Cal. ppm 2.2.3*	<i>Zero deviation</i> <i>Slope</i>	If Dimension ppm is selected
Sample 2.3*	<i>Sample ID</i> <i>Sample Flow</i> <i>delta T 1</i> <i>delta T 1</i>	2.3.1*	
I/O State 2.4*	<i>Alarm Relay</i> <i>Relay 1/2</i> <i>Input</i> <i>Signal Output 1/2</i>	2.4.1* 2.4.2*	
Interface 2.5*	<i>Protocol</i> <i>Baud rate</i>	2.5.1*	(only with RS485 interface)

8.3. Maintenance (Main Menu 3)

If FNU or NTU is selected as unit:

Verification	SWAN VERIKIT #	3.1.1*	* Menu numbers
3.1*	Other Method	3.1.2*	
Matching	Solid Verikit	SWAN VERIKIT #	3.2.1.1*
3.2*	3.2.1*	Follow screen instructions	
	Liquid Verikit	SWAN VERIKIT #	3.2.1.2*
	3.2.2*	Follow screen instructions	
Calibration	Calibration	Progress	
3.32*	3.32.1*		

If ppm is selected as unit:

Process Cal. ppm	Detect Zero	3.1.1*
3.1*	Specify Slope	3.1.2*

Regardless of the unit selected:

Simulation	Alarm Relay	3.4.1*		
3.4*	Relay 1	3.4.2*		
	Relay 2	3.4.3*		
	Signal Output 1	3.4.4*		
	Signal Output 2	3.4.5*		
Set Time	(Date), (Time)			
3.5*				
Drainage	Manual operation	Motor valve		
3.6*	3.6.1*	3.6.1.1		
	Parameters	Mode	3.6.2.1*	
		3.6.2*	Start Time	3.6.2.2*
			Duration	3.6.2.3*
			Delay	3.6.2.4*
			Signal outputs	3.6.2.5*
			Output/Control	3.6.2.6*
Clean meas. chamber				
3.7*				

8.4. **Operation (Main Menu 4)**

Sensors	<i>Filter Time Const.</i>	4.1.1*		
4.1*	<i>Hold after Cal.</i>	4.1.2*		
Relay Contacts	Alarm Relay	Alarm	<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*
	Relay 1&2	<i>Setpoint</i>	4.2.x.100*	
	4.2.2* & 4.2.3*	<i>Hysteresis</i>	4.2.x.200*	
		<i>Delay</i>	4.2.x.30*	
	Input	<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*	
Logger	<i>Log Interval</i>	4.3.1*		
4.3*	<i>Clear Logger</i>	4.3.2*		

8.5. Installation (Main Menu 5)

Sensors	<i>Sensor type</i>	5.1.1*	* Menu numbers	
5.1*	<i>Dimension</i>	5.1.2*		
	Flow	<i>Flow measurement</i>	5.1.3.1*	
	5.1.3*	<i>Slope</i>	5.1.3.2*	
	<i>Offset</i>	5.1.4		
Signal Outputs	Signal Output 1 & 2	<i>Parameter</i>	5.2.1.1 & 5.2.2.1*	
5.2*	5.2.1* & 5.2.2*	<i>Current Loop</i>	5.2.1.2 & 5.2.2.2*	
		<i>Function</i>	5.2.1.3 & 5.2.2.3*	
		Scaling	<i>Range Low</i>	5.2.x.40.10*
		5.2.x.40	<i>Range High</i>	5.2.x.40.20*
Relay Contacts	Alarm Relay	Alarm	<i>Alarm High</i>	5.3.1.1.1*
5.3*	5.3.1*	5.3.1.1*	<i>Alarm Low</i>	5.3.1.1.25
			<i>Hysteresis</i>	5.3.1.1.35
			<i>Delay</i>	5.3.1.1.45
		Sample Flow	<i>Flow Alarm</i>	5.3.1.2.1*
		5.3.1.2*	<i>Alarm High</i>	5.3.1.2.2*
			<i>Alarm Low</i>	5.3.1.2.36*
		<i>Case Temp. high</i>	5.3.1.4*	
		<i>Case Temp. low</i>	5.3.1.5*	
	Relay 1 & 2	<i>Function</i>	5.3.2.1 & 5.3.3.1*	
	5.3.2* & 5.3.3*	<i>Parameter</i>	5.3.2.20 & 5.3.3.20*	
		<i>Setpoint</i>	5.3.2.300 & 5.3.3.300*	
		<i>Hysteresis</i>	5.3.2.400 & 5.3.3.400*	
		<i>Delay</i>	5.3.2.50 & 5.3.3.50*	
	Input	<i>Active</i>	5.3.4.1*	
	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*	

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

9. Program List and Explanations

1 Messages

1.1 Pending Errors

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

1.2 Message List

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 error (circular buffer).

1.3 Maintenance List

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

2 Diagnostics

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

2.1 Identification

- 2.1.1 *Designation*: Designation of the instrument.
- 2.1.2 *Version*: Firmware of the instrument (e.g. V6.26-10/21).
- 2.1.3 *Version TURBI*, e.g. 1.35.
- 2.1.4 **Factory test**: Test date of the instrument, motherboard and front-end QC test.
- 2.1.5 **Operating time**: years, days, hours, minutes, seconds.

2.2 Sensors

- 2.2.1 **Turbidity**:
Turbidity: in FNU/NTU.
Raw value: Turbidity in counts.
Quotient: Division of detector signal by reference signal.
- 2.2.2 **Miscellaneous**
 - 2.2.2.1 *Case Temp.*: Current temperature in °C of electronics housing.

2.2.3 History

2.2.3.1 Cal. History: Only for diagnostic purposes. Review the values of the last calibrations. Max. 64 data records are memorized.

- 2.2.3.1.1 *Number:* Calibration counter.
Date, Time: Date and time of the calibration.
Factor cal.: Factor of the last calibration.
Factor active: Current factor in use for the measurement.

2.2.3.2 Ver. history: Only for diagnostic purposes. Review the values of the last verifications. Max. 64 data records are memorized.

- 2.2.3.2.1 *Number:* Verification counter.
Date, Time: Date and time of the verification.
Verikit #: Name of the verikit.
Meas value: The measured value of the verification.
Deviation: Shows the deviation in % from the reference value. The reference value is measured and stored during the "Matching".

2.2.3.3 VERI-KIT History:

- 2.2.3.3.1 *Number:* Matching counter.
Date, Time: Date and time of the matching.
Verikit #: Name of the verikit.
Assign. Value: The value on the label of the Verikit which was entered during Matching.
Meas. Value: The measured value is stored as reference value for the verification.

Available if ppm is chosen, see menu [5.1.2, p. 93](#)

2.2.3 Process Cal. ppm

- 2.2.3.1 *Zero:* 1st calibration point. Background of sample without component in FNU/NTU.
Slope: Factor in FNU, NTU or ppm.

2.3 Sample

- 2.3.1 *Sample ID:* Shows the identification assigned to a sample. This identification is defined by the user to identify the location of the sample.
Sample flow: Flow in l/h (if Q-Flow or Q-Hflow is selected).
 If deltaT flow is selected, additionally:
deltaT 1: Temperature measured at sample inlet of deltaT sensor
deltaT 2: Temperature measured at sample outlet of deltaT sensor

2.4 I/O State

2.4.1- 2.4.2 Shows the actual status of all in- and outputs.

Alarm Relay: Active or inactive

Relay 1 and 2: Active or inactive

Input: Open or closed

Signal Output 1 and 2: Actual current in mA

Signal Output 3: if option is installed

2.5 Interface

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

3 Maintenance

3.1 Verification

3.1.1 SWAN Verikit: Press [Enter] to select the Verikit you need for the verification. Further details see [Verification, p. 64](#).

3.1.2 Other method: Other method is a wet verification with a standard with a known turbidity filled into the measuring chamber instead of the sample. Further details see [Wet Verification, p. 72](#).

3.2 Matching

3.2.1 Solid Verikit

3.2.1.1 SWAN Verikit #: Press [Enter] to select the Verikit you want to match or enter a new Verikit for matching. Further details see [Matching, p. 64](#).

3.2.2 Liquid Verikit

3.2.2.1 SWAN Verikit #: Press [Enter] to select the Verikit you want to match or enter a new Verikit for matching. Further details see [Matching, p. 64](#).

3.3 Calibration

Available if FNU or NTU is chosen, see menu [5.1.2, p. 93](#).

3.32.5 *Calibration:* After selecting Calibration press [Enter] and follow the instructions on the screen. Further details see [Calibration, p. 59](#)

3.4 Simulation

To simulate a value or a relay state, select the

- ♦ alarm relay,
- ♦ relay 1 and 2
- ♦ signal output 1 and 2

with the [] or [] key.

Press the <Enter> key.

Change the value or state of the selected item with the [] or [] key.

Press the <Enter> key.

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

Alarm Relay: Active or inactive

Relay 1 and 2: Active or inactive

Signal Output 1 and 2: Actual current in mA

Signal Output 3: If option is installed actual current in mA

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

3.5 Set Time

Adjust date and time.

3.6 Drainage

The following settings are only valid for instruments equipped with an automated drain valve (auto-drain).

3.6.1 Manual operation

3.6.1.1 *Motor valve:* Opening or closing of the drain valve.

Note: *Manual operation can be used anytime regardless of the draining mode selected in menu 3.6.2.1. During a manually started draining cycle the following applies:*

- *The measurement is continued normally and alarms are issued.*
- *The signal outputs are set to "Hold" and the controller outputs to "Off". The settings under 3.6.2.5 and 3.6.2.6 do not apply.*

3.6.2 Parameters

3.6.2.1 *Mode:* possible modes are: interval, daily, weekly, off, Input, Field-bus.

3.6.2.1 *Interval*

- 3.6.1.20 *Interval*: The draining interval can be programmed within a range of 1–23 h.
- 3.6.2.3 *Duration*: Enter the duration of the draining valve being opened.
 Range: 5–300 sec.
- 3.6.2.4 *Delay*: During duration plus the delay time the signal and control outputs are held in the operating mode.
 Range: 0–1'800 sec.
- 3.6.2.5 *Signal Outputs*: Select operating mode of the signal output:
- Hold*: Signal outputs hold the last valid measured value. Measurement is interrupted. Errors, except fatal errors, are not issued.
 - Off*: Signal outputs are switched off (set to 0 or 4 mA). Errors, except fatal errors, are not issued.
- 3.6.2.6 *Output/Control*: Select operating mode of the controller output:
- Hold*: Controller continues based on the last valid value.
 - Off*: Controller is switched off.

3.6.2.1 *daily*

- The start of a draining cycle can be set to any time of day.
- 3.6.1.21 *Start time*: to set the start time proceed as follows:
- 1 Press [Enter], to set the hours.
 - 2 Set the hour with the [▲] or [▼] keys.
 - 3 Press [Enter], to set the minutes.
 - 4 Set the minutes with the [▲] or [▼] keys.
 - 5 Press [Enter], to set the seconds.
 - 6 Set the seconds with the [▲] or [▼] keys.
- Range: 00:00:00–23:59:59
- 3.6.2.3 *Duration*: see Interval
- 3.6.2.4 *Delay*: see Interval
- 3.6.2.5 *Signal Outputs*: see interval.
- 3.6.2.6 *Output/Control*: see interval.

3.6.2.1 *weekly*

The start of a draining cycle can be programmed for one or more days of the week. The programmed start time is valid for all selected days.

3.6.2.22 Calendar:

- 3.6.2.22.1 Start time: The programmed start time is valid for each of the programmed days.
- 3.6.2.22.2 *Monday*: Possible settings, on or off to
- 3.6.2.22.8 *Sunday*: Possible settings, on or off
- 3.6.2.3 *Duration*: see Interval
- 3.6.2.4 *Delay*: see Interval
- 3.6.2.5 *Signal Outputs*: see interval.
- 3.6.2.6 *Output/Control*: see interval.

3.6.2.1 Off

The automatic draining is switched off.

3.6.2.1 Input

The draining is controlled via input.

- 3.6.2.3 *Duration*: see Interval
- 3.6.2.4 *Delay*: see Interval
- 3.6.2.5 *Signal Outputs*: see interval.
- 3.6.2.6 *Output/Control*: see interval.

3.6.2.1 Fieldbus

The draining is controlled via Fieldbus.

- 3.6.2.3 *Duration*: see Interval
- 3.6.2.4 *Delay*: see Interval
- 3.6.2.5 *Signal Outputs*: see interval.
- 3.6.2.6 *Output/Control*: see interval.

3.7 Clean meas. chamber

Counts down 1200 seconds in which the measuring chamber can be inspected and cleaned.

During this time, no turbidity or flow alarms are issued. The measured value is kept at the last valid value and the relays are frozen. If programmed, the controller continues based on the last valid value.

The routine can be terminated at any time by pressing [Enter].

The counter can be restarted by pressing an arrow key.

Note: Before exiting the routine or before the 1200 seconds have elapsed, completely fill and close the measuring chamber and open the flow regulating valve.

3.1 Process Cal. ppm

Available if ppm is chosen, see menu 5.1.2, p. 93

- 3.1.1 *Detect Zero*: 1st calibration point. Determination of the zero point in a sample without component to be calibrated.
- 3.1.2 *Specify Slope*: 2nd calibration point. A sample with known concentration of component to be calibrated is used to determine the slope.
Range: 0.0–999.9 ppm

Note: See chapter *ppm Calculation*, e.g. “Oil in water”, p. 48 for further details.

4 Operation

4.1 Sensors

- 4.1.1 *Filter time constant*: Used to damp noisy signals. The higher the filter time constant, the slower the system reacts to changes of the measured value.
Range: 5–300 sec
- 4.1.2 *Hold after cal*: To allow the instrument to stabilize again after calibration. During cal. and hold time the signal outputs are frozen, alarms and limits are not active.
Range: 0–6000 sec

4.2 Relay Contacts

See chapter 5 Installation.

4.3 Logger

The instrument is equipped with an internal logger. The logger data can be copied to a PC with an USB stick if option USB interface is installed.

The logger can save approx. 1500 data records. Records consists of: Date, time, alarms, measured value, flow, raw value, signal, reference, case temperature.

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

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

- 4.3.2 **Clear logger**: If confirmed with yes, all data is erased and a new data series is started.

5 Installation

5.1 Sensors

- 5.1.1 *Sensor type*: Display of the used sensor type (e.g. Well IR)
- 5.1.2 *Dimension*: Choose the measurement unit (FNU, NTU or ppm)
- 5.1.3 Flow**: Select a flow measurement method.
- 5.1.3.1 *Flow measurement*: Select the type of flow sensor if a flow sensor is installed. Possible flow sensors:
- | Flow measurement |
|------------------|
| None |
| Q-Flow |
| Q-HFlow |
| deltaT |
- Q-Flow / Q-HFlow
- 
- deltaT
- 
- 5.3.1.2 *Slope*: Only available if deltaT flow has been selected. Increase or decrease the slope to adjust the sample flow, see [Adjusting the deltaT Flow Sensor \(Option\)](#), p. 46.
- 5.1.4 *Offset*: A manual offset of the measured value can be set.
Range: -1.000 to +1.000 FNU/NTU

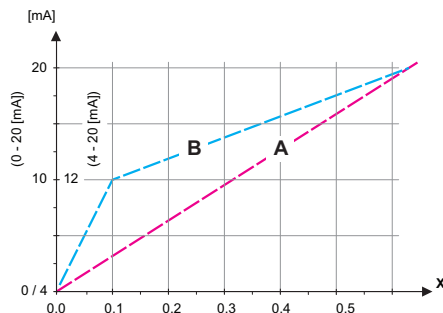
5.2 Signal Outputs

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

- 5.2.1 & 5.2.2 Signal Output 1 & 2**: Assign process value, the current loop range and a function to each signal output.
- 5.2.1.1 *Parameter*: Assign one of the process values to the signal output.
Available values: Meas. value, Sample flow.
- 5.2.1.2 *Current Loop*: Select the current range of the signal output.
Make sure the connected device works with the same current range.
Available ranges: 0–20 [mA] or 4–20 [mA]
- 5.2.1.3 *Function*: Define if the signal output is used to transmit a process value or to drive a control unit. Available functions are:
- ♦ Linear, bilinear or logarithmic for process values.
See [As process values](#), p. 94
 - ♦ Control upwards or control downwards for controllers.
See [As control output](#), p. 95

As process values

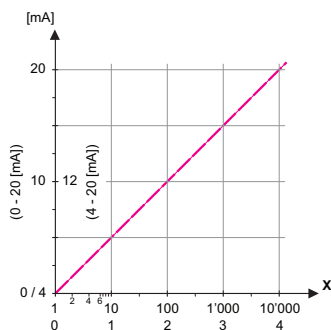
The process value can be represented in 3 ways: linear, bilinear or logarithmic. See graphs below.



A linear

X Measured value

B bilinear



X Measured value (logarithmic)

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

Parameter Meas. value

5.2.1.40.10 Range low: 0.000 FNU/NTU

5.2.1.40.20 Range high: 250 FNU/NTU

Parameter Sample Flow

5.2.1.40.11 Range low: 0.0 l/h

5.2.1.40.21 Range high: 100.0 l/h

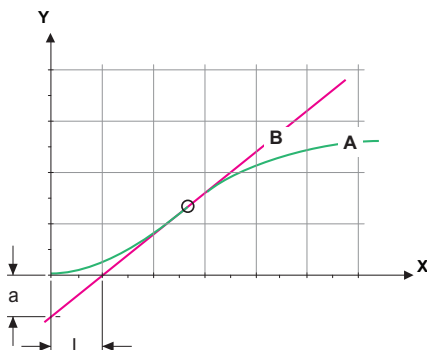
**As control
output**

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, Control Timeout



A Response to maximum control output $X_p = 1.2/a$
B Tangent on the inflection point $T_n = 2L$
X Time $T_v = L/2$

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

- 5.2.1.43 Control Parameters:** Meas. value
- 5.2.1.43.10 **Setpoint:** User-defined process value (Measured value or flow)
Range: 0–250 FNU/NTU
- 5.2.1.43.20 **P-Band:** Range below (upwards control) or above (downwards control) the set-point, within the dosing intensity is reduced from 100% to 0% to reach the set-point without overshooting.
Range: 0–250 FNU/NTU
- 5.2.1.43 Control Parameters:** Sample flow
- 5.2.1.43.11 **Setpoint:** User-defined process value (Measured value or flow)
Range: 0–100.0 l/h
- 5.2.1.43.21 **P-Band:** Range below (upwards control) or above (downwards control) the set-point, within the dosing intensity is reduced from 100% to 0% to reach the set-point without overshooting.
Range: 0–100.0 l/h
- 5.2.1.43.3 **Reset time:** The reset time is the time till the step response of a single I-controller will reach the same value as it will be suddenly reached by a P-controller.
Range: 0–9'000 sec
- 5.2.1.43.4 **Derivative time:** The derivative time is the time till the ramp response of a single P-controller will reach the same value as it will be suddenly reached by a D-controller.
Range: 0–9'000 sec
- 5.2.1.43.5 **Control timeout:** If a controller action (dosing intensity) is constantly over 90% during a defined period of time and the process value does not come closer to the setpoint, the dosing process will be stopped for safety reasons.
Range: 0–720 min

5.3 Relay Contacts

- 5.3.1 Alarm Relay:** The alarm relay is used as cumulative error indicator. Under normal operating conditions the contact is active.
The contact is inactive at:
- ◆ power loss
 - ◆ detection of system faults like defective sensors or electronic parts
 - ◆ high case temperature
 - ◆ lack of reagents
 - ◆ process values out of programmed ranges.
- Program alarm levels, hysteresis values and delay times for the following parameters:
Meas. value, Sample Flow

5.3.1.1 Alarm

- 5.3.1.1.1 **Alarm High:** If the measured value rises above the alarm high value, the alarm relay is activated and E001, is displayed in the message list.
Range: 0–250 FNU/NTU
- 5.3.1.1.25 **Alarm Low:** If the measured value falls below the alarm low value, the alarm relay is activated and E002 is displayed in the message list.
Range: 0–250 FNU/NTU
- 5.3.1.1.35 **Hysteresis:** Within the hyst. range, the relay does not switch. This prevents damage of relays contacts when the measured value fluctuates around the alarm value.
Range: 0–250 FNU/NTU
- 5.3.1.1.45 **Delay:** Duration, the activation of the alarm relay is retarded after the measured value has risen above/fallen below the programmed alarm.
Range: 0–28'800 Sec

5.3.1.2 Sample Flow: Define at which sample flow a flow alarm should be issued.

- 5.3.1.2.1 **Flow Alarm:** Program if the alarm relay should be activated if there is a flow alarm. Choose between yes or no. The flow alarm will always be indicated in the display, pending error list, saved in the message list and the logger.
Available values: Yes or no

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

- 5.3.1.2.2 **Alarm High:** If the measured values rises above the programmed value E009 will be issued.
Range: 0–100 l/h
- 5.3.1.2.31 **Alarm Low:** If the measured values falls below the programmed value E010 will be issued.
Range: 0–100 l/h
- 5.3.1.4 **Case Temp. high:** Set the alarm high value for temperature of electronics housing. If the value rises above the programmed value E013 is issued.
Range: 40–75 °C
- 5.3.1.5 **Case Temp. low:** Set the alarm low value for temperature of electronics housing. If the value falls below the programmed value E014 is issued.
Range: -10 to +10 °C

5.3.2 & 5.3.3 Relay 1 and 2: The contacts can be set as normally open or normally closed with a jumper. See [Relay 1 and 2, p. 41](#). The function of relay contacts 1 and 2 is defined by the user.

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

- 1** First select the functions as:
 - Limit upper/lower,
 - Control upwards/downwards,
 - Timer
 - Fieldbus,
- 2** Then enter the necessary data depending on the selected function.

5.3.2.1 Function = Limit upper/lower:

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

- 5.3.2.20** *Parameter:* select a process value
 Available values: Meas. value, Sample flow.
- 5.3.2.300** *Setpoint:* If the measured value rises above respectively falls below the set-point, the relay is activated.
 Range: 0–250 FNU/NTU
- 5.3.2.400** *Hysteresis:* within the hysteresis range, the relay does not switch. This prevents damage of relay contacts when the measured value fluctuates around the alarm value.
 Range: 0–250 FNU/NTU
- 5.3.2.50** *Delay:* Duration, the activation of the alarm relay is retarded after the measured value has risen above/fallen below the programmed alarm.
 Range. 0–7200 Sec

5.3.2.1 Function = Control upwards/downwards:

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

- 5.3.2.22** *Parameter:* select a process value (Meas. value)
- 5.3.2.32** Choose the respective actuator:
 - ♦ Time proportional
 - ♦ Frequency
 - ♦ Motor valve

Actuator = Time proportional

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

- 5.3.2.32.20 *Cycle time*: duration of one control cycle (on/off change).
 Range: 0–600 sec.
- 5.3.2.32.30 *Response time*: Minimal time the metering device needs to react.
 Range: 0–240 sec.
- 5.3.2.32.4 Control Parameters:**
 Range for each Parameter same as [5.2.1.43, p. 96](#)
 Actuator = Frequency
- Examples of metering devices that are pulse frequency driven are the classic membrane pumps with a potential free triggering input. Dosing is controlled by the repetition speed of dosing shots.
- 5.3.2.32.21 *Pulse frequency*: Max. pulses per minute the device is able to respond to. Range: 20–300/min.
- 5.3.2.32.31 Control Parameters:**
 Range for each Parameter same as [5.2.1.43, p. 96](#)
 Actuator = Motor valve
- Dosing is controlled by the position of a motor driven mixing valve.
- 5.3.2.32.22 *Run time*: Time needed to open a completely closed valve
 Range: 5–300 Sec.
- 5.3.2.32.32 *Neutral zone*: Minimal response time in % of the runtime. If the requested dosing output is smaller than the response time, no change will take place.
 Range: 1–20 %
- 5.3.2.32.4 Control Parameters:**
 Range for each Parameter same as [5.2.1.43, p. 96](#)
- 5.3.2.1 Function = Timer:
- The relay will be activated repetitively depending on the programmed time scheme.
- 5.3.2.24 *Mode*: Operating mode (interval, daily, weekly)
- 5.3.2.24 *Interval*
- 5.3.2.340 *Interval*: The interval can be programmed within a range of 1–1'440 min.
- 5.3.2.44 *Run Time*: Enter the time the relay stays active.
 Range: 5–32'400 Sec.
- 5.3.2.54 *Delay*: during run time plus the delay time the signal and control outputs are held in the operating mode programmed below.
 Range: 0–6'000 Sec.

- 5.3.2.6 **Signal Outputs:** Select operating mode of the signal output:
- Cont.:* Signal outputs continue to issue the measured value.
- Hold:* Signal outputs hold the last valid measured value. Measurement is interrupted. Errors, except fatal errors, are not issued.
- Off:* Signal outputs are switched off (set to 0 or 4 mA). Errors, except fatal errors, are not issued.

- 5.3.2.7 **Output/Control:** Select operating mode of the controller output:
- Cont.:* Controller continues normally.
- Hold:* Controller continues based on the last valid value.
- Off:* Controller is switched off.

5.3.2.24 **daily**

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

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

- 1 Press [Enter], to set the hours.
- 2 Set the hour with the [▲] or [▼] keys.
- 3 Press [Enter], to set the minutes.
- 4 Set the minutes with the [▲] or [▼] keys.
- 5 Press [Enter], to set the seconds.
- 6 Set the seconds with the [▲] or [▼] keys.

Range: 00:00:00–23:59:59

- 5.3.2.44 **Run Time:** see Interval

- 5.3.2.54 **Delay:** see Interval

- 5.3.2.6 **Signal Outputs:** see Interval

- 5.3.2.7 **Output/Control:** see Interval

5.3.2.24 **weekly**

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

5.3.2.342 Calendar:

- 5.3.2.342.1 **Start time:** The programmed start time is valid for each of the programmed days. To set the start time see [5.3.2.341, p. 100](#).
 Range: 00:00:00–23:59:59

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

5.3.2.342.8 *Sunday*: Possible settings, on or off

5.3.2.44 *Run Time*: see Interval

5.3.2.54 *Delay*: see Interval

5.3.2.6 *Signal Outputs*: see Interval

5.3.2.7 *Output/Control*: see Interval

5.3.2.1 Function = Fieldbus

The relay will be switched via the Profibus input. No further parameters are needed.

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

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

No: Input is never active.

When closed: Input is active if the input relay is closed

When open: Input is active if the input relay is open

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

Continuous: Signal outputs continue to issue the measured value.

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

Off: Set to 0 or 4 [mA] respectively. 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 close when input is active. Message E024 is stored in the message list.

Yes: Message E024 is issued and stored in the message list. The Alarm relay closes when input is active.

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

5.4 Miscellaneous

- 5.4.1 *Language*: Set the desired language.
Available settings: German/English/French/Spanish
- 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. All matched Verikits are deleted.
- 5.4.3 *Load Firmware*: Firmware updates should be done by instructed service personnel only.
- 5.4.4 **Password**: Select a password different from 0000 to prevent unauthorized access to the menus "Messages", "Maintenance", "Operation" and "Installation".
Each menu may be protected by a *different* password.
If you forgot the passwords, contact the closest SWAN representative.
- 5.4.5 *Sample ID*: Identify the process value with any meaning full text, such as KKS number.
- 5.4.6 *Line Break Detection*: Define if message E028 should be issued in case of a line break on signal output 1 or 2.
Choose between <Yes> or <No>.

5.5 Interface

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

5.5.1 *Protocol:* **Profibus**

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

5.5.1 *Protocol:* **Modbus RTU**

- 5.5.21 Device address: Range: 0–126
- 5.5.31 Baud rate: Range: 1200–115 200 Baud
- 5.5.41 Parity: Range: none, even, odd

5.5.1 *Protocol:* **USB stick**

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

5.5.1 *Protocol:* **HART**

- Device address: Range: 0–63

10. Default Values

Operation

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

Installation

Sensor	Dimension:	FNU
	Flow; Flow measurement:	None
Signal Output	Parameter:	Meas. value
1 & 2	Current loop:	4 –20 mA
	Function:	linear
	Scaling: Range low:	0.0 FNU/NTU
	Scaling: Range high:	10.0 FNU/NTU
Alarm Relay	Alarm high:	200 FNU/NTU
	Alarm low:	0.000 FNU/NTU
	Hysteresis:	10 FNU/NTU
	Delay:	5 s
	Sample Flow: Flow Alarm:	yes
	Sample Flow: Alarm High:	40.0 l/h
	Sample Flow: Alarm Low:	6.0 l/h
	Case temp. high:	65 °C
	Case temp. low:	0 °C
Relay 1 & 2	Function:	limit upper
	Parameter:	Meas. value
	Setpoint:	100 FNU/NTU
	Hysteresis:	5.00 FNU/NTU
	Delay:	5 s

If Function = Control upw. or dnw:

Parameter: Meas. value	
Settings: Actuator: Frequency	
Settings: Pulse Frequency:	120/min
Settings: Control Parameters: Setpoint:	100 FNU/NTU
Settings: Control Parameters: P-band:	5.00 FNU/NTU
Settings: Control Parameters: Reset time:	0 s

	Settings: Control Parameters: Derivative Time:	0 s
	Settings: Control Parameters: Control Timeout:	0 min
	Settings: Actuator:	Time proportional
	Cycle time:	60 s
	Response time:	10 s
	Settings: Actuator:	Motor valve
	Run time:	60 s
	Neutral zone:	5%
	If Function = Timer:	
	Mode:	Interval
	Interval:	1 min
	Mode:	daily
	Start time:	00.00.00
	Mode:	weekly
	Calendar; Start time:	00.00.00
	Calendar; Monday to Sunday:	Off
	Run time:	10 s
	Delay:	5 s
	Signal output:	cont
	Output/Control:	cont
Input	Active	when closed
	Signal Outputs	hold
	Output/Control	off
	Fault	no
	Delay	10 s
Miscellaneous	Language:	English
	Set default:	no
	Load firmware:	no
	Password:	for all modes 0000
	Sample ID:	- - - - -
	Line break detection	no

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