



## OPTISYS TUR 1050 Technical Datasheet

Compact measuring system for turbidity

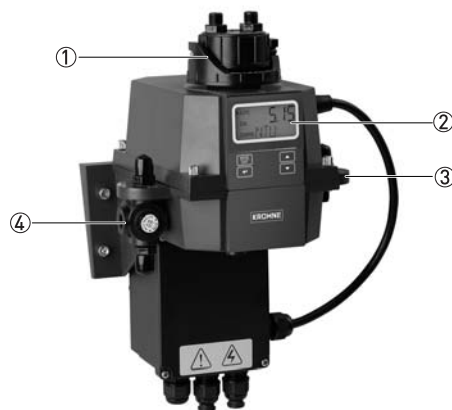
- Measurement according to ISO 7027 / US EPA 180.1
- Simple calibration with reusable liquid calibration standards
- Minimum maintenance due to automatic ultrasonic cleaning system

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## 1.1 Turbidity measuring system with innovative cuvette technology

The compact turbidity measuring system **OPTISYS TUR 1050** uses the 90° scattered light method to scan liquid samples in glass cuvettes. This means that the measurement optics are not directly exposed to the sample and thus require less maintenance.

Because the measuring cuvette can be simply and quickly replaced by standard cuvettes of known turbidity, a recalibration is possible within a few minutes. Another feature is the automatic ultrasonic cleaning function which removes deposits from the cuvette wall and lengthens service intervals in this way.



- ① Flow-through unit with cuvette
- ② Display and operating unit
- ③ Sample outlet
- ④ Sample inlet with pressure regulator

**Highlights**

- 90° scattered light method according to ISO 7027 / US EPA 180.1
- Measuring range: 0...100 NTU/FNU or 0...1000 NTU/FNU
- Rapid response time due to small measurement volume
- Simple calibration with reusable liquid calibration standards
- Automatic ultrasonic cleaning to prevent mineral deposits
- Compact, space-saving design
- Integrated shut-off valve for maintenance work
- Optimal back pressure setting to avoid gas bubbles through integrated outlet valve
- Active current output / 2 alarm relays
- RS 485 / Modbus interface

**Industries**

- Potable water treatment
- Water supply
- Process industry

**Applications**

- Monitoring the potable water quality
- Filter monitoring
- Monitoring of contamination

## 1.2 Options and variants

### White or infrared light version



The OPTISYS TUR 1050 is available with two different light sources. One with a NIR-LED for compliance with ISO 7027 and alternatively a version with a white light lamp for compliance with US EPA regulations.

Additionally a version with an extended measuring range of 1000 NTU/FNU is available .

### Calibration kit



The calibration kit contains three cuvettes with liquids of three different turbidities (0.02, 10 and 100 / 1000 NTU/FNU). With the help of this accessory you can do a precise recalibration within a few minutes.

### 1.3 Measuring principle

According to the US EPA definition, turbidity is the cloudy appearance of water caused by the presence of suspended and colloidal matter. In the waterworks field, a turbidity measurement is used to indicate the clarity of water. Technically, turbidity is an optical property of the water based on the amount of light reflected by suspended particles and colloidal matter.

According to ISO 7027 turbidity values below  $< 40$  NTU are measured with the  $90^\circ$  scattered light method. Light source and receiver are positioned in a  $90^\circ$  angle to each other. The light transmitted from the source is directed in equal strength to the reference receiver and into the medium. The light is reflected from the particles and fractions of the scattered light are received by the detector, which is positioned in a  $90^\circ$  angle. The meter compares the light from reference and scattered light receiver and calculates the turbidity value.

The measuring units for the turbidity are:

- NTU (Nephelometric Turbidity Unit)
- FNU (Formazin Nephelometric Unit)

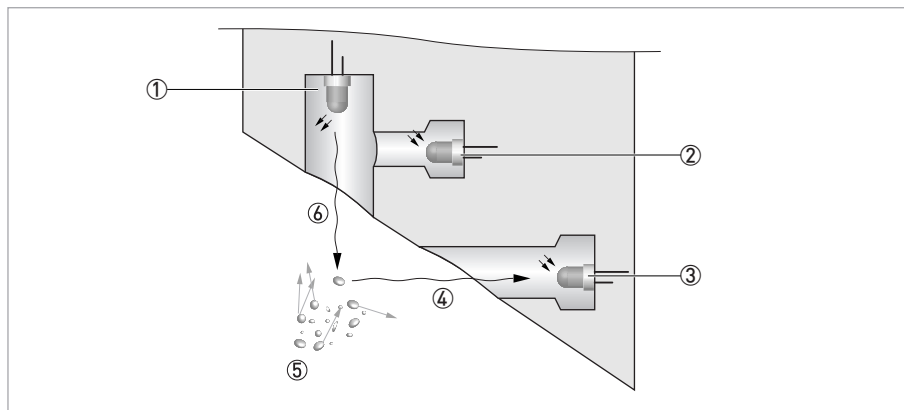


Figure 1-1: Measuring principle for turbidity measurement

- ① Light source
- ② Reference sensor
- ③ Sensor
- ④ Reflected light beam
- ⑤ Particles
- ⑥ Emitted light beam

## 2.1 Technical data table

- *The following data is provided for general applications. If you require data that is more relevant to your specific application, please contact us or your local sales office.*
- *Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website (Downloadcenter).*

### Measuring system

Measuring principle	90° scattered light method
Application range	Turbidity measurement of liquids according to ISO 7027 and US EPA 180.1
Measuring range	0.02...100 NTU/FNU or 0.02...1000 NTU/FNU

### Design

The measurement system consists of a sensor and a signal converter and is only available as compact version.	
<b>Display and user interface</b>	
Display	Multi-line liquid crystal backlight display
Operating and display language	English
<b>Other properties</b>	
Response time	Min. 5 seconds, adjustable
Alarms	Two programmable, 120...240 VAC, 2A form C relay

### Measuring accuracy

Reference conditions	+1...+50°C / +33.8...+122°F
	95% relative humidity
	Altitude up to 2000 m / 6600 ft
Accuracy	< 40 NTU/FNU: $\pm 2\%$ of reading or $\pm 0.02$ NTU/FNU whichever is greater
	> 40 NTU/FNU: $\pm 5\%$ of reading
Resolution	0.0001 NTU/FNU (below 10 NTU/FNU) selectable

### Operating conditions

<b>Note: the device is not appropriate for outdoor use!</b>	
<b>Temperature</b>	
Process and ambient temperature	+1...+50°C / +34...+122°F
Storage temperature	-20...+60°C / -4...+140°F
<b>Pressure</b>	
Process pressure	0.07...14 bar / 1...200 psi (built-in regulator set at 1 bar / 15 psi)
Ambient pressure	Atmospheric, altitude up to 2000 m / 6600 ft
<b>Flow velocity</b>	
Minimum	0.1 l/min / 0.026 gal/min
Maximum	1 l/min / 0.26 gal/min
<b>Other conditions</b>	
Humidity	Display and operating unit: up to 95% relative humidity (non-condensing)
Protection category	Enclosure is designed to meet IP 66 / NEMA 4X

### Installation conditions

Dimensions	For detailed information refer to <i>Dimensions and weight</i> on page 9.
Weights	Shipping weight: 2.5 kg / 5.5 lbs

### Materials

Sensor housing	ABS
Wetted parts	Nylon, borosilicate glass, silicon, polypropylene, stainless steel AISI 304

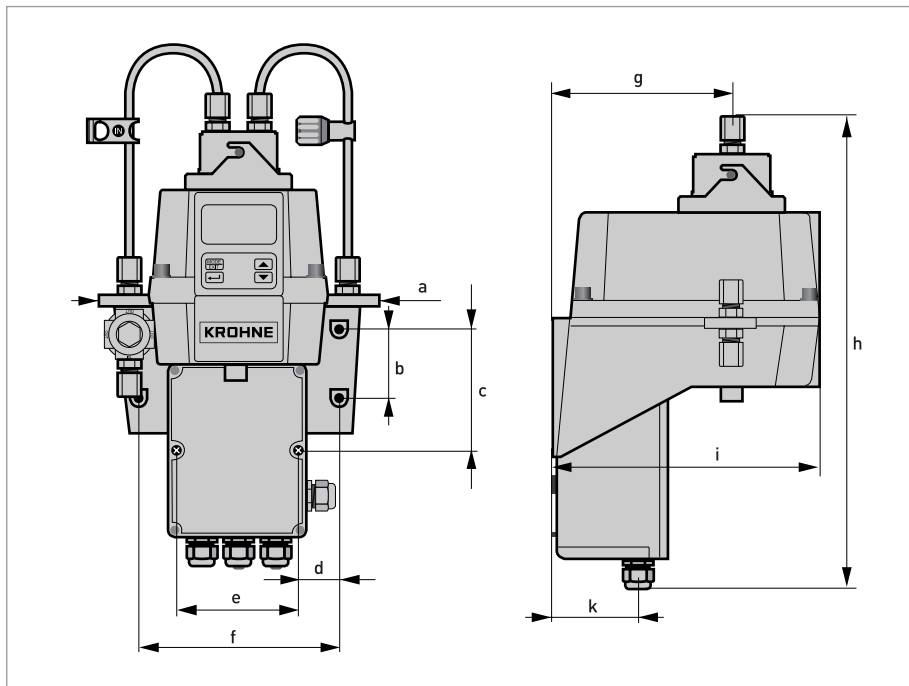
### Electrical connections

Galvanic insulation	Double insulated, pollution degree 2, over voltage category II (all in- and outputs are electrically isolated from each other and from power and earth ground)
	Option: transformer isolated current output
<b>Power supply</b>	
Voltage	100...240 VAC, 47...63 Hz
Power consumption	80 VA
<b>Outputs</b>	
Current output	1 x 4...20 mA, active, 15 VDC power source, max. load 600 Ω
Modbus	Bi-directional, RS-485 Modbus RTU/ASCII
Relays	2 x relay 120...240 VAC, freely programmable

### Approvals and certifications

CE	This device fulfils the statutory requirements of the EC directives. The manufacturer certifies successful testing of the product by applying the CE mark.
ETL	Listed to UL 61010B-1 and certified to CSA 22.2 No. 1010.1-92

## 2.2 Dimensions and weight



	Dimensions	
	[mm]	["]
a	208	8.19
b	51	2.0
c	90	3.54
d	30	1.18
e	87	3.43
f	148	5.83
g	131	5.16
h	347	13.66
i	197	7.76
k	62	2.44

Shipping weight: 2.5 kg / 5.5lbs

### 3.1 General notes on installation

*Inspect the packaging carefully for damages or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.*

*Do a check of the packing list to make sure that you have all the elements given in the order.*

*Look at the device nameplate to ensure that the device is delivered according to your order.  
Check for the correct supply voltage printed on the nameplate.*

### 3.2 Intended use

The OPTISYS TUR 1050 series consists of a white light (WL) version and an infrared (IR) version. Both versions are designed to measure online the turbidity of water. Furthermore the two following different measuring ranges are available: 0.02...100 NTU/FNU or 0.02...1000 NTU/FNU

### 3.3 Requirements of the device

The device was designed to require very low input pressure. Though the device offers a wide pressure range, as it has an integrated pressure regulator:

- Input pressure range: 0.07...14 bar / 1...200 psi (built in regulator set at 1 bar / 15 psi)
- Maximum allowable flow rate of the cuvette: 0.1...1 l/min / 0.026...0.26 gal/min
- Maximum fluid temperature: +50°C / +122°F

### 3.4 Installation order

*Installation, assembly, start-up and maintenance may only be performed by appropriately trained personnel. The regional occupational health and safety directives must always be observed.*

To install the device in the correct way, follow the order of the following sections and their instructions.

#### 3.4.1 Placing the desiccant pouch and the humidity indicator

*A missing or saturated desiccant pouch affects not only the performance of the whole device, but can also destroy the internal electronics!*

*If the seal at the device base does not fit properly or is defective, the lifetime of the desiccant decreases. Therefore assure the following items:*

- *Do not start-up the device with a desiccant pouch missing, replace a saturated pouch!*
- *Replace the desiccant pouch when the display shows the message "DESC".*
- *Inspect the enclosure seal each time you replace the desiccant.*
- *If the seal is not properly seated or damaged, reseal or replace it!*

Execute the following steps to insert or replace the desiccant pouch and the humidity indicator (Humonitor® card) or to inspect the seal:

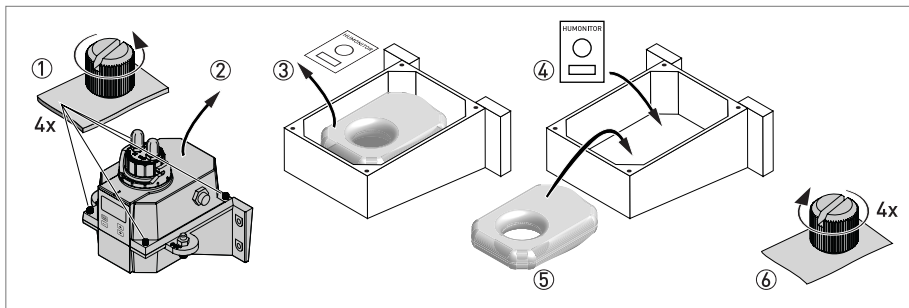


Figure 3-1: Desiccant pack (desiccant pouch with humidity indicator)

*The desiccant degrades prematurely after removing the protective packaging. Therefore do not open the packaging before usage, install the desiccant pouch quickly and close the device as soon as possible.*

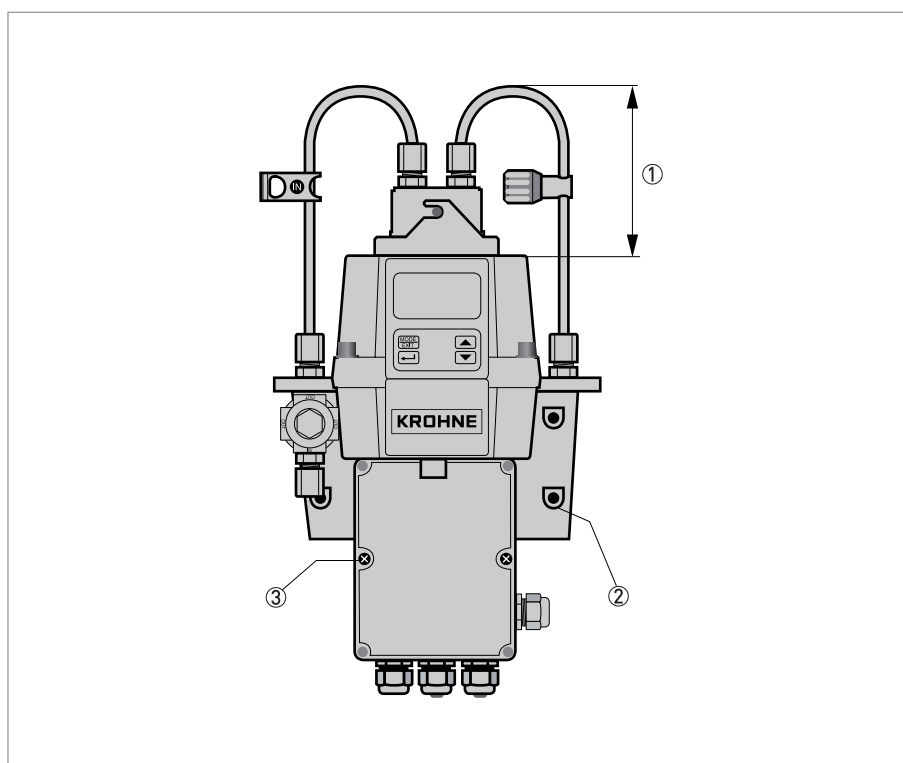
- Move the lock ring counterclockwise and pull out the ultrasonic cuvette with flow-through holder (detailed information on page 16).
- Unscrew the four corner thumbscrews of the electronic device manually according to ① in the following drawing (if the screws are too tight, use a screwdriver for slotted grub screws).
- Remove the upper half of the electronic device ②.
- Prior to installing the desiccant pouch for the first time, remove the shipping support (plastic tube with a red flag reaching outside) within the upper part of the device; after removing you can discard the tube.
- If you want to replace the desiccant pouch and the humidity indicator, take them out at first ③.
- Take the shrink packed desiccant pouch and the humidity indicator out of the protective packaging.

- Put the humidity indicator on the bottom of the lower part of the electronic device and lay the desiccant pouch on it ④ and ⑤.
- Inspect the seal and reseal or replace it if necessary.
- Reassemble everything in reverse order ⑥.
- To expedite the recognition of the new desiccant, reset the powered device by disconnecting the sensor interconnect cable for two seconds and reconnecting it.

### 3.4.2 Selecting site and mounting

The preferred way of mounting of the device is wall mounting. If this is not possible, you can mount the device on any suitable level surface. Irrespective of this possibilities always note the following guidelines:

- Choose a location that is easily accessible for operation and service and that is as close as possible to the sampling point to ensure a quick response time (maximum distance: 3 m / 10 ft)
- Leave at least 20 cm / 8" of free space above the device for easy service (e.g. removal of the flow head and insertion of calibration cuvettes), see position number ① in the following drawing.
- Ensure that the front display rests at eye level.
- Refer to chapter "Dimensions" for the device dimensions.
- Use screws M6 / 1/4" to fix the electronic device ② and M4 / 3/16" to fix the junction box power assembly ③.



*The design of the device recommends that the junction box power assembly cradles in a hutch below the electronic device. Therefore the correct procedure is to fix the junction box power assembly first and then mount the electronic device on top of it.*

### Mounting procedure

- Take a water-level, a pencil and ruler and use the dimensions provided in the handbook to mark the six mounting hole locations on the mounting surface.
- Drill six holes into the mounting surface and insert six screw anchors into them.
- Use screws M4 / 3/16" to fix the junction box power assembly at first.
- Put the electronic device on top of the junction box power assembly and use screws M6 / 1/4" to fix it.

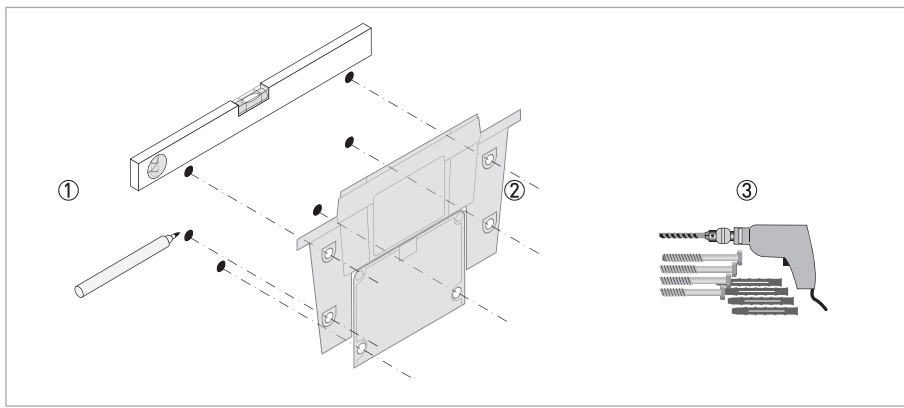


Figure 3-2: Mounting field terminal box

### 3.4.3 Connecting the hoses

The scope of delivery contains two tubings with fittings (intake tubing, drain tubing) for the connection between the flow-through holder and the flow intake and flow drain. The intake tubing has a shut-off clamp and the drain tubing has a backpressure valve. Connect the hoses according to the following drawing:

*Do not connect the sensor interconnect cable with the upper part of the device now and regard the installation order in the chapter "Electrical connections"! The reason is that you will have to do the internal wiring at first and the connection of the sensor interconnect cable afterwards, the reverse order could damage the device!*

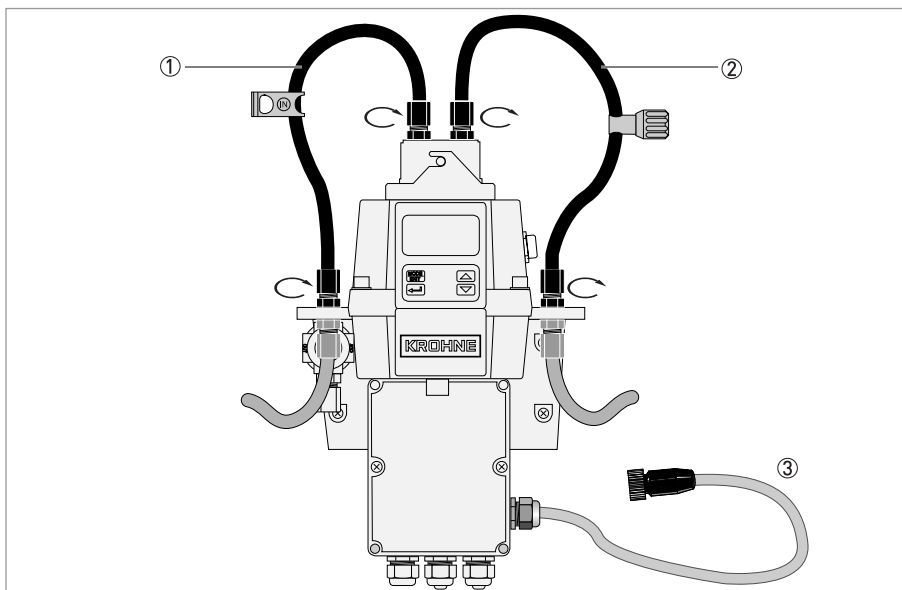


Figure 3-3: Connecting the hoses

- ① Intake tubing with shut-off clamp
- ② Drain hose with backpressure valve
- ③ Sensor interconnect cable

The hose for the connection between the sampling point and the device as well as the hose for the flow drain do not belong to the scope of delivery. For this purpose use hoses with the following specifications:

- Inner diameter: 4.75 mm / 3/16".
- Outer diameter: 8 mm / 5/16".
- Flexible and opaque hose material to prevent algae growth if direct sunlight can reach the hose.

Assemble the plumbing and connect the hoses according to the following drawing:

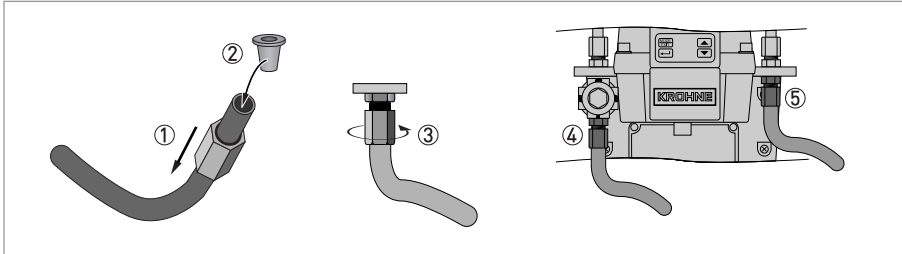


Figure 3-4: Procedure to assemble the plumbing and connect the hoses

- Slip the coupling nut over the hose ①
- Insert spreading ring into the hose ②
- Fix the nut on the thread of the pressure regulator ③
- Intake hose connection ④
- Drain hose connection ⑤

*To prevent that the drain water causes any damages, assure that the drain hose leads to a suitable drain site.*

### 3.4.4 Drain vent

*The manufacturer accepts no responsibility for damage caused by the introduction of vapours, fluids or other materials into the device process stream which are not compatible with the device's wetted materials. Always note the list of wetted parts in the technical data table before introducing any media into the device process stream!*

The device has a drain vent in the "Out" bulkhead fitting. The drain vent allows atmospheric equalization, thus helping to alleviate bubble formation in the cuvette.

*During initial flow minor leakage may occur at the drain vent. This will subside once the normal flow is established.*

In some pressurised systems there may occur a continuous leakage at the drain vent hole. Therefore the scope of delivery contains a seal screw that you can insert into the vent hole and tighten.

### 3.4.5 Inserting and fixing the ultrasonic cuvette with flow-through holder

*Never insert a cuvette with visible moisture or water on the glass or the transducer into the upper part of the device, because this could destroy or damage the electronics or the transducer! Always clean and dry the cuvette with a soft cloth just before inserting it. The dehumidification system cannot remove large droplets of water, only residual moisture!*

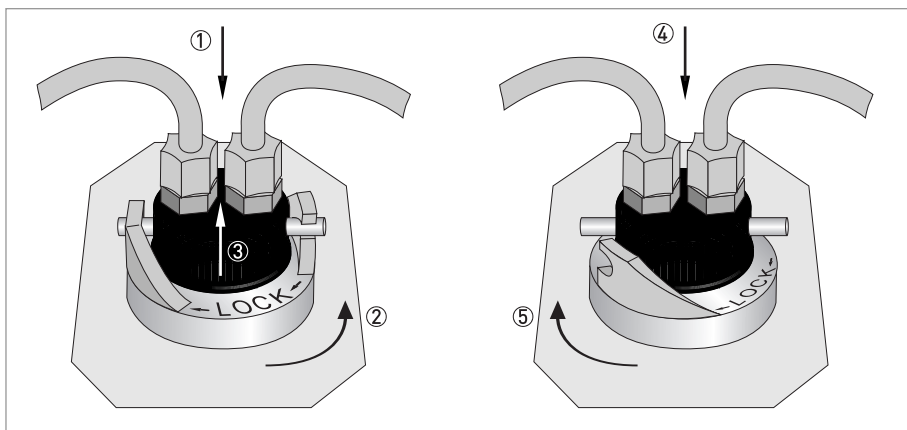


Figure 3-5: Procedure for inserting and fixing the ultrasonic cuvette with flow-through holder

*The device can only detect a new cuvette if it works in the normal operation mode ("AUTO"). If the device operates correctly after inserting a new cuvette, "AUTO" will flash on the display.*

## 4.1 Safety instructions

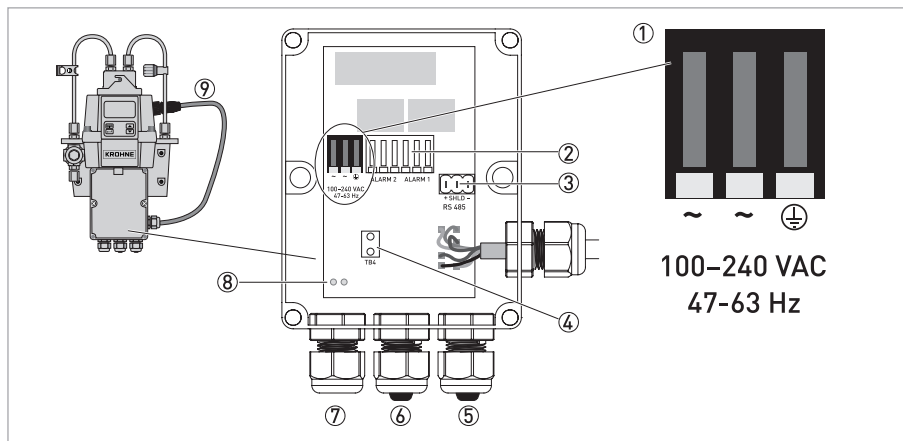
*All work on the electrical connections may only be carried out with the power disconnected. Take note of the voltage data on the nameplate!*

*Observe the national regulations for electrical installations!*

*Observe without fail the local occupational health and safety regulations. Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.*

*Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.*

## 4.2 Description of board and bulkheads



**Figure 4-1: Description of board and bulkheads**

- ① Power supply terminal block
- ② Alarms relay
- ③ 4...20 mA/RS 485 terminal block
- ④ Power cable strain relief
- ⑤ 4...20 mA/RS 485 cable bulkhead
- ⑥ Alarm cable bulkhead
- ⑦ Power cable bulkhead
- ⑧ Holes for strain relief strap
- ⑨ Sensor interconnect cable

All of the electrical connections to the device run via the junction box power assembly. For shipment the manufacturer inserts plugs into the alarm and the 4...20 mA/RS 485 cable bulkhead to waterproof the device.

### 4.3 Circuit breaker and specifications of power supply

*The manufacturer strongly recommends to place a circuit breaker prior to the power connection. Use this circuit breaker to de-energise all cables before starting any installation or service work, otherwise a perilous electric shock can happen.*

*The device has a switching power supply which demands 100...240 VAC and 47...63 Hz. To avoid damage or destruction of the device always assure that the power supply meets this specifications!*

*The power cord does not belong to the scope of delivery.*

### 4.4 Cable specifications

- The power cable bulkheads accept the following cable diameter range: 5.8...10 mm / 0.23...0.39".
- All terminals accept wires in the range of 14...28 AWG.
- Stripping of insulation to a length of 6 mm / ¼".

### 4.5 Installation order of the electrical connections

*Installation, assembly, start-up and maintenance may only be performed by appropriately trained personnel. The regional occupational health and safety directives must always be observed.*

*To prevent damage or destruction of all devices, always regard the following items:*

- *Ensure that the meter itself and all devices that should be connected to the outputs are de-energised before establishing a cable connection!*
- *Before fixing a cable, look on the labels on the board and especially regard polarities!*

To establish the electrical connections in the correct way, follow the order of the following sections and their instructions.

#### 4.5.1 Connecting the cables in the junction box power assembly

*The device involves a line voltage that could endanger life! Only qualified electricians are allowed to perform the electrical installation of the device. Always note all local and government recommendations and methods for installation of electrical connections to and between the device and other peripheral devices.*

*The manufacturer accepts no responsibility that the device is watertight again after the electrical installation. Assure the water tightness after the terminal box was wired for operation. If any of the bulkheads does not tighten a cable or plug properly this jeopardises the ratings of the device and may cause a perilous electric shock.*

##### Connection procedure

- Open the terminal box with a screwdriver.
- Remove the plugs in the cable bulkheads if you want to conduct a cable through them.
- Strip all needed wires to a length of 6 mm / 1/4".
- Fix the cable on the terminal like in the following drawing ① to ⑤.
- Use the strain relief strap to reduce the tension on the power terminals ⑥.
- Close the terminal box and assure that it is properly sealed.

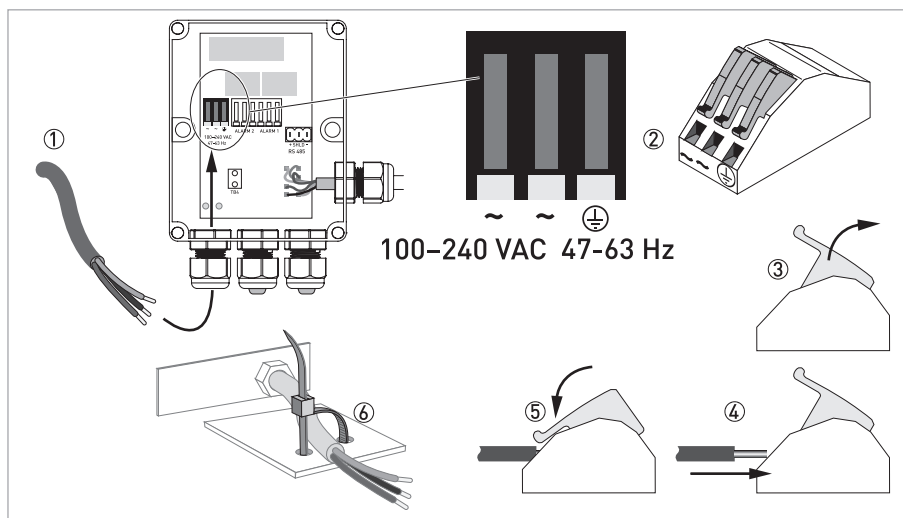


Figure 4-2: Connecting the cables in the junction box power assembly

### 4.5.2 Alarms terminal (signal output)

The terminals "ALARM 1" and "ALARM 2" are mechanical relays rated at 240 VAC and 2 A. The abbreviations on the board and below the terminal have the following meanings:

- NO: Normally open
- NC: Normally closed
- C: Common

As the configuration of the alarms is fail-safe, the normal state is a power supplied device and non-active alarms.

### 4.5.3 RS 485 or 4...20 mA signal output

*The installation of the 4...20 mA isolator will render the RS-485 non-operational. Shifting between the 4...20 mA (analog) and the RS-485 (digital) output mode works with the help of the software.*

*Transformer isolated outputs are available as a factory installed option.*

The 4...20 mA output is energised by a 15 VDC power source and can drive loads up to 600  $\Omega$ . It is isolated from line power and earth ground.

The RS 485 half-duplex digital interface (2-wire) operates with differential levels that are unsusceptible to electrical interferences. This is why the usage of cable lengths up to 900 m / 2950 ft is possible. Independent of the output mode (analog or digital) always note the following items:

- For ease of connecting, remove the plug in terminal block (the labels of the connections are beneath this block).
- Do not run 4...20 mA or RS 485 cables in the same conduit as power as this could lead to signal interferences.
- When using the RS 485 interface, equip the last device on each bus with a 120  $\Omega$  terminating resistor to eliminate signal reflection on the line.

The electrical connection is independent of the output mode (analog or digital) and is shown in the following figure:

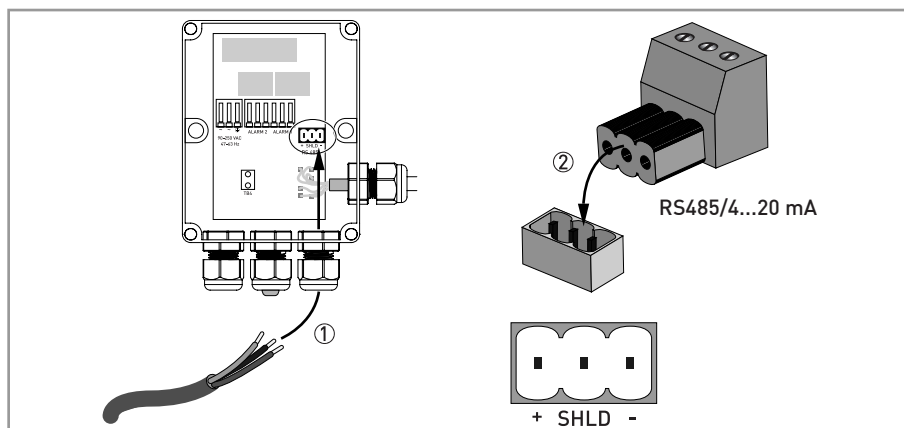


Figure 4-3: Signal output connection

#### 4.5.4 Connecting the sensor interconnect cable

*Always connect the sensor interconnect cable with the upper part of the device last of all! The reason is that if you connect the sensor interconnect cable before the internal wiring, energising the device with power could destroy or damage the device!*

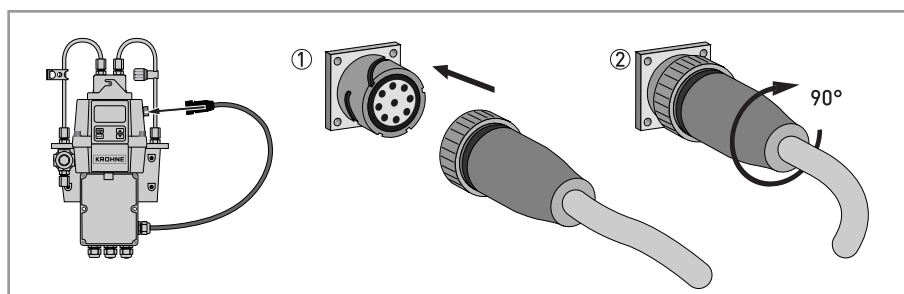


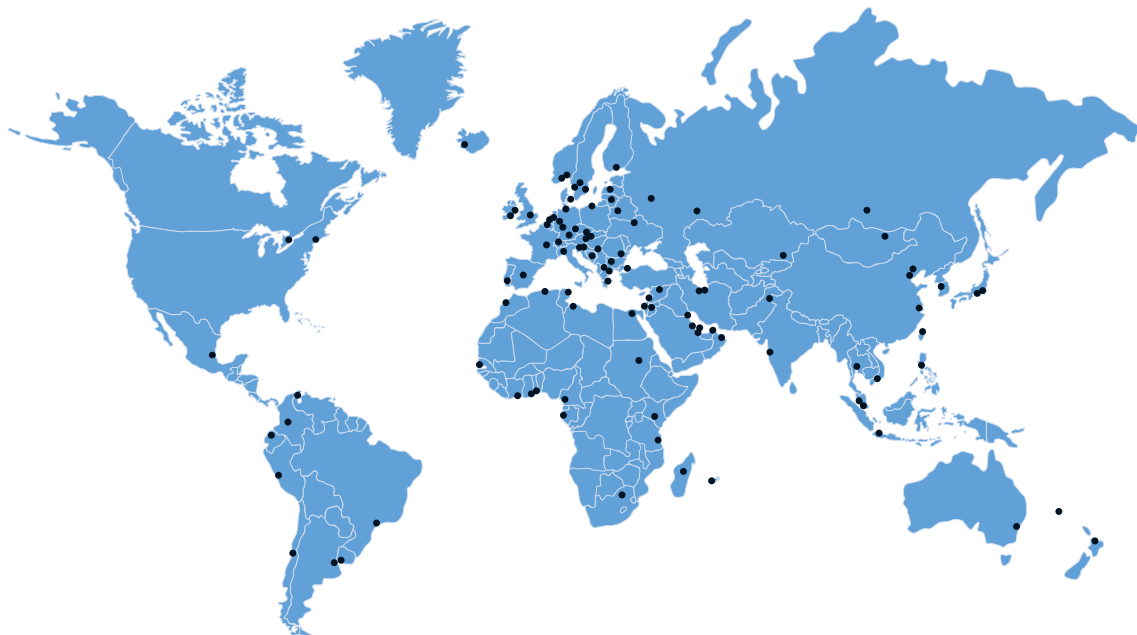
Figure 4-4: Connecting cable

## 5.1 Order code

*The characters of the order code highlighted in light grey describe the standard.*

		Type / Housing converter									
		1	OPTISYS TUR 1050								
		Measuring range									
		0	0...100 NTU/FNU								
		1	0...1000 NTU/FNU								
		Features									
		1	EPA 180.1 white light								
		2	ISO 7027 infrared light								
		Process conditions									
		1	0...+50°C / +32...+122°F, 0...14 bar / 0...203 psi								
		Signal outputs									
		5	1 x 4...20 mA, RS 485								
		Relays									
		2	2 x freely programmable								
		Operating language									
		1	Standard								
		Power supply									
		1	100...240 VAC								
		Options									
		0	None								
		Documentation									
		0	None								
		1	English								
		2	German								
		3	French								
VGA S	4										Order code





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Head Office KROHNE Messtechnik GmbH  
Ludwig-Krohne-Str. 5  
47058 Duisburg (Germany)  
Tel.: +49 203 301 0  
Fax: +49 203 301 10389  
[info@krohne.com](mailto:info@krohne.com)

The current list of all KROHNE contacts and addresses can be found at:  
[www.krohne.com](http://www.krohne.com)

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