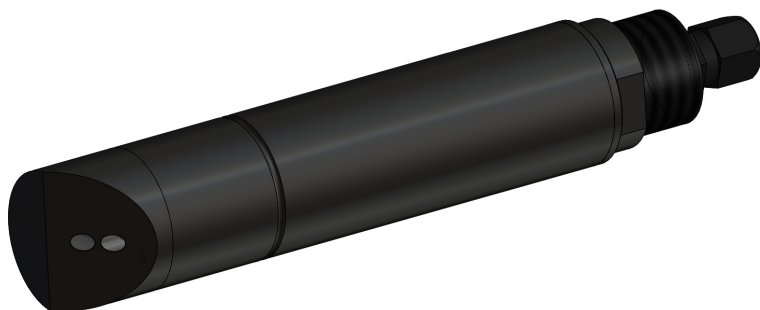

Operating instructions

Turbidity sensor

TR10
TR100



Please read this manual before starting up!

To be retained for future reference.

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1 Product description

The infrared turbidity sensors are used for optical measurement of turbidity in pure and process water up to 10 NTU (TR10) or up to 100 NTU (TR100). The sensors use the 90° scattered light method.

Applications

- Measurement of turbidity in pure and drinkable water
- Measurement of turbidity in primary, industrial and recirculating water

Features and benefits

- Reliable concentration measurement using optical measuring method
- Scattering method with pulsating infrared light beams
- Black rigid PVC sensor body
- No mechanically moving parts
- Pre-processing of measured values in the sensor, resulting in low sensitivity of signal transmission
- Immediate installation and easy maintenance

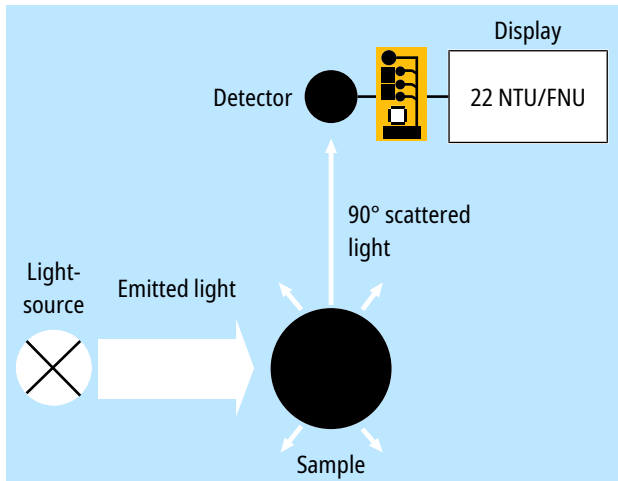
Turbidity measurement with the 90° scattered light method

Turbidity is the scattered component of a light beam that is deflected from its original course by optically denser particles in the medium, e.g. solid particles.

The measurements are made using the standardised 90° scattered light method in accordance with ISO 7027 / EN 27027. The measuring method is based on the Tyndall effect.

The turbidity of the medium is determined from the amount of scattered light. The emitted infrared light beam is scattered by the particles in the medium. The scattered beams are measured by scattered light receivers that are positioned at an angle of 90° to the transmitted light. The measured scattered light signals are converted into frequency signals.

The frequency signals are assigned to the corresponding turbidity units and solid matter concentrations and appear in the display.



Principle of 90° scattered beam measurement:

$$I_s = I_0 \cdot A \cdot C \cdot f(\alpha)$$

I_0 = Intensity of the transmitted light

I_s = Intensity of the scattered light

A = Geometric factor

C = Concentration

$f(\alpha)$ = Angular correlation

P = Particle

1.1 Scope of delivery

The scope of delivery includes:

- 1 x TR10/TR100 infrared turbidity sensor with 10 m cable
- 1 x Operating instructions
- Optional: Measuring cell holder

2 Dimensions

All dimensions in millimetres (mm).

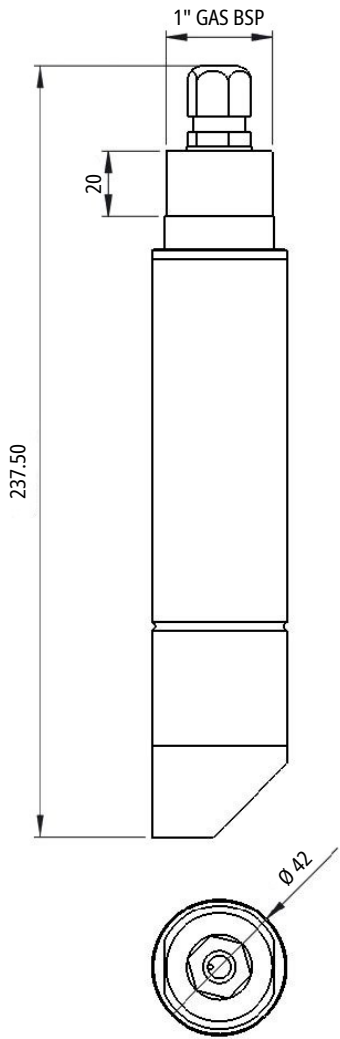


Fig. 1: Dimensions TR100

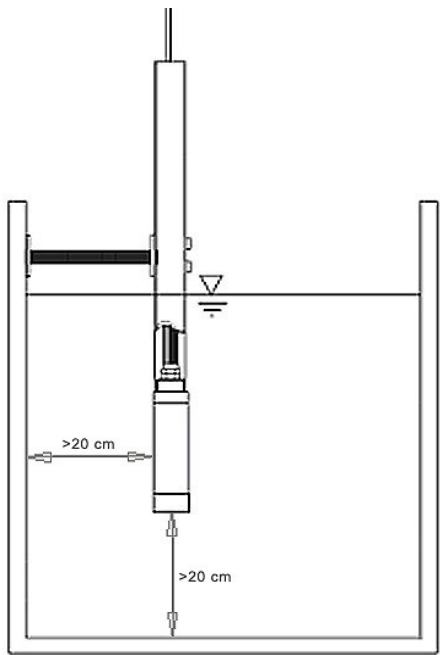
3 Technical data

Specification	Value
Materials	• Black PVC housing • Special glass optics with oleophobic treatment • O-rings (viton and silicone)
Thread	1" GAS
Measuring range	• 0–10 NTU • 0–100 NTU
Measurement procedure	90° scattered light
Resolution	• 0.01 NTU for the 0–10 NTU scale (0.001 NTU to 9.999 NTU) • 0.1 NTU for the 0–100 NTU scale
Accuracy	• $\pm 1\%$ at measuring point 0–10 NTU • $\pm 2\%$ at measuring point 0–50 NTU • $\pm 5\%$ at measuring point 0–100 NTU
Reproducibility	• ± 0.05 NTU f.s. 10 NTU • ± 0.5 NTU f.s. 100 NTU
Response time	T90 < 60 s
Calibration	1-point and/or 2-point for scale
Operating temperature	0–40°C
Maximum operating pressure	4 bar
Mechanical protection	IP68 (sensor and cable)
Cable	10 m integrated
Power supply	12...24 V DC
Maximum absorption	3 W
Outputs	RS485 (4–20 mA optional)

Table 1: Technical data

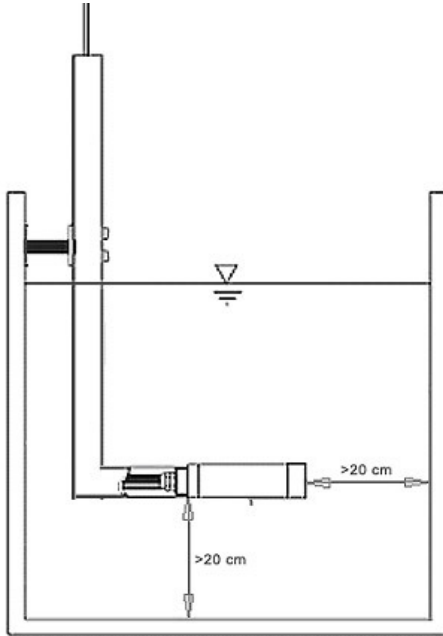
4 Installation

4.1 Installation in a tank



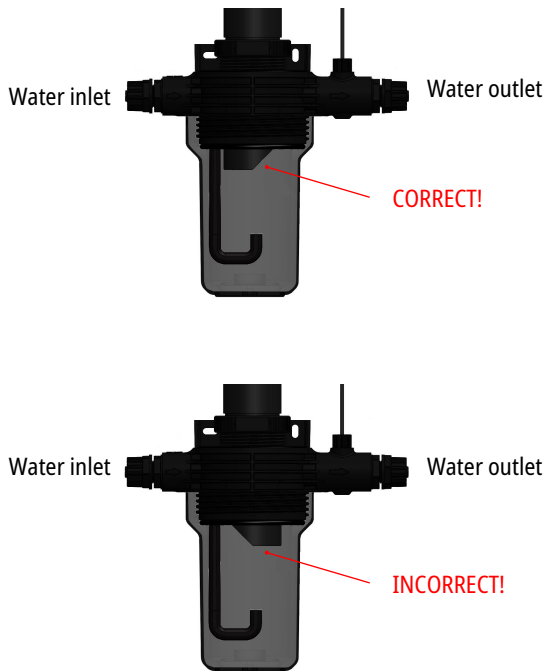
Install the probe in the tank so that it is immersed at least 20 cm and the distance to the walls and bottom of the tank is not less than 20 cm.

4.2 Installation in a duct



Install the probe in the duct so that it is immersed at least 20 cm and the distance to the walls and floor of the duct is not less than 20 cm.

4.3 Installation in the measuring cell holder



Insert the probe into the measuring cell holder, paying attention to the position shown in the figure above.

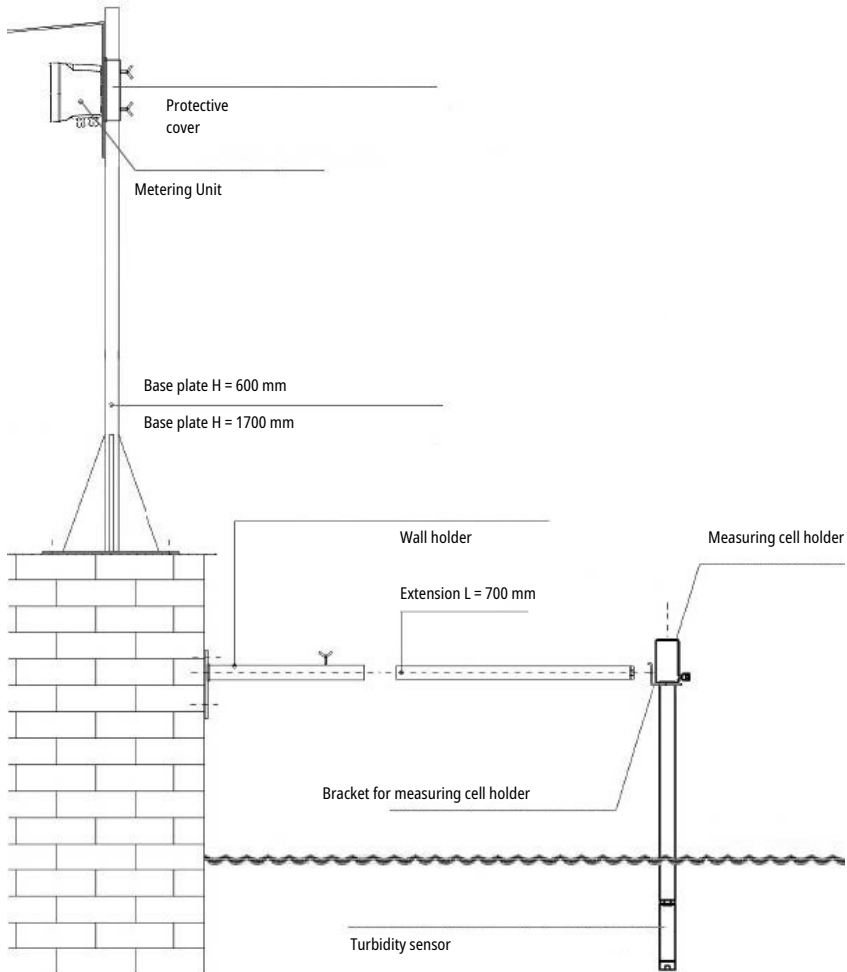
To make it easier to insert the probe body correctly, there is a mark indicating the direction of flow.

If the probe is installed in the measuring cell holder, the calibration curve must be changed to compensate for the offset of the wall of the probe holder itself, which is why you must specify when ordering whether the probe is to be installed in the probe holder.

NOTICE! Each probe holder has its own structure, which can slightly interfere with the measurement; therefore, every combination of sensor and holder must be calibrated together.

It is recommended to install a tap at the water outlet of the probe holder to reduce the flow and thus create pressure inside the probe holder itself, which helps to eliminate air bubbles.

4.4 Anchoring to poolside devices



5 Calibration

You can calibrate the TR10/TR100 turbidity sensor in several ways:

At two points

You trace the calibration line by using two known solutions: the first point close to 0 NTU and the second at a value as close as possible to the working point.

First point

The first point of the curve is calibrated. Go to the menu for 2-point calibration, but only calibrate the first point. In this way, it is possible to calibrate the measured value if the value read is lower than 1 NTU but does not match a known reference.

Second point

The second point of the curve is calibrated. Go to the menu for 2-point calibration, but only calibrate the second point. In this way, it is possible to adjust the measured value if the value read is higher than 1 NTU but does not match a known reference.

Single point

This calibration mode allows you to change the offset of the entire straight line and should only be performed if the turbidity value of the point to be adjusted is above 1 NTU, as the sensor does not allow the offset to be changed if the turbidity values are too low.

Let the water circulate with the known solution and make sure that there are no air bubbles in the circuit. To eliminate any bubbles, you can generate a small amount of pressure that closes the output flow.

The liquid can also remain in the measuring cell holder, but you must watch out for deposits that could falsify the measured value.

Wait about 4-5 minutes for the reading to stabilise and continue with calibration by entering the value of the known solution.

6 Troubleshooting

Fault	Remedial measures	Reference
Incorrect measured values (too high, too low) compared to laboratory results	1. In the event that the measured values do not match those of a reference device, a standard calibration in process water or a one/two-point calibration with standard solutions can be carried out. During the calibration phase, it is important to store the probe preferably in a dark container for which the dimensions ensure a distance of at least 5 cm from the container wall. 2. Make sure that the probe measures at a distance of at least 10 cm from the walls. 3. If you have not solved the problem after checking the first two points, clean the windows of the probe with a cloth soaked in water or alcohol. If the measuring oscillation is very strong, the averaging time of the electronic measuring filter can be increased (see the technical manual of the device). 4. Check the working range of the probe. 5. If a bypass installation is carried out, check that the probe holder has been cleaned correctly and that no turbidity above 200 NTU has been applied.	
Frozen measured values	1. Clean the windows of the probe. 2. Check that the probe has not been installed too close to the walls of the tank.	
Communication error of the probe	1. Check the electrical connections. 2. Check that the presence of electrical extensions has been correctly implemented.	

Fault	Remedial measures	Reference
Fault in the output current	1. Check the electrical connections of the probe using the technical manual. 2. Check the maximum probe load (500 Ohm).	

Table 2: Troubleshooting

[illegible]



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