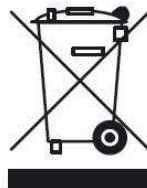




# USER MANUAL



## 3S-TRB Turbidity / Suspended Solids Sensor



Electrical equipment marked with this symbol can not be disposed of through home or public waste disposal systems after 12 August 2005. In accordance with local and national European regulations (EU Directive 2002/96 / EC), users must return the equipment which is unsuccessful or can no longer be used to the manufacturer, which have to provide free of charge disposal.

Note: To return devices at the end of their useful life, accessories supplied by the manufacturer and all auxiliary items for recycling, contact the manufacturer or the vendor of the device to arrange proper disposal.

## INDEX

Sezione 1 - SAFETY INFORMATION	4
1.1 Warnings and safety information	4
Sezione 2 - GENERAL INFORMATION	5
2.1 Technical specifications	5
2.2 Instrument description	6
2.3 Applications	6
2.4 Method description	6
Sezione 3 - INSTALLATION	7
3.1 Opening the package	7
3.2 Product code	7
3.3 Wall mounting dimensions	7
3.4 Mounting the instrument	8
Sezione 4 - CALIBRATION	11
4.1 About the method	11
4.2 Calibration	11
4.3 Process calibration	13

## 1 - SAFETY INFORMATION

### 1.1 Warnings and safety information

Before installing and operating the analyzer, read this manual thoroughly. Please pay particular attention to all the labels applied to the analyzer and to all the hazard information indicators in this manual.



This symbol indicates that you must refer to this manual for proper use of the equipment. Only qualified operators, properly trained on the use and maintenance of the analyzer can carry out service activities on the equipment.

The manufacturer shall not be held responsible under any circumstances for improper use of the equipment.

The head of department and the machine operator must comply with the following rules and with the provisions of current legislation on the safety and health of workers.

The use, maintenance, and repair of the instrument are permitted only to persons authorised for such operations. These operators must be physically and mentally capable to perform such activities, which can not be performed under the influence of alcohol and drugs.

When the instrument is not being used it must be protected from voluntary or involuntary activation, after disconnecting the power supply.

Failure to follow the instructions given and/or failure to pay attention to the hazard indicators may cause serious risks of physical damage to operators and breaks or malfunctioning of the analyzer.

All the components of the instrument are placed within a panel closed by a door with a special key, supplied only to maintenance operators.

The instrument must then be used under operating conditions with the door closed.

## 2 - GENERAL INFORMATION

### 2.1 Technical specifications

Measured parameters	Turbidity / Suspended Solids
Measuring principle	Light scattering, ISO 7027-1:2016 method.
Measuring range	High Range: 0 - 4000 NTU Low Range: 0 - 10 NTU
Accuracy	High Range: < 5% or 0.3 NTU Low Range: < 2% or 0.01 NTU
Limit of detection	High Range: 0.1 NTU Low Range: 0.01 NTU
Analysis Frequency	< 1 s
Sample	Pressure: pressure-free vessel (depth up to 60 m) Temperature: 5 - 50 °C (41 - 122 °F) Flow Rate: 80 to 500 mL/min Connection: 6 mm (¼-in.) Drain: pressure-free, atmospheric drain
Body Material	High Range: Titanium Low Range: Stainless Steel 316L
Dimensions	∅ 36 mm, L 156 mm
Weight	Approx. 1 kg (2.2 lbs)
Power Supply	Voltage: 12 VDC, powered by the 3S-PC1000 controller
Outputs	Via 3S-PC1000 controller (analog, digital, relays)
Installation	With optional fast-loop reservoir (only included in the low range version), pipe-mounted (high range only)
Protection Grade	IP68

## 2.2 Instrument description

The 3S-TRB turbidity sensor is a probe designed for industrial water analyses. Its primary function is to measure the level of turbidity, or cloudiness, in the water.

The probe is available in two versions, the high range version 3S-TRB and the low range version 3S-TRB-L.

The high range sensor has a range of 0 - 4000 NTU (nephelometric turbidity units), which covers a wide range of turbidity levels. It also has a high level of accuracy, with a resolution of 0.1 NTU. This allows for precise measurements, even in challenging environments. The design is compact and robust, the titanium body offer great protection up to a depth of 60 m.

The low range sensor has a range of 0 - 10 NTU, with a very high level of accuracy and a resolution of 0.01 NTU.

The sensors are designed to be durable and reliable, with a robust construction that can withstand harsh industrial environments. It is easy to use, with a simple and intuitive interface that allows for quick and easy calibration and measurement. The probe needs minimum maintenance and can be installed right out of the box, without initial configuration.

## 2.3 Applications

The sensor can be used to measure the turbidity or the amount of suspended solids in a water sample.

It can be used for a range of applications, including potable water, industrial wastewater, and ultrapure water.

## 2.4 Method description

The sensor is based on the ISO 7027-1:2016 method to determine the concentration of suspended particles in a sample of water.

The incident light scattered at right angles from the sample is captured by a photodiode, which produces an electronic signal that is converted to a turbidity value using a calibration curve.

## 3 - INSTALLATION

### 3.1 Opening the package

For safety reasons, when removing the packaging of the equipment, please check for any visible defects and, if necessary, inform the supplier.

Parts inside the package apart from the user manual:

	High Range	Low Range
A	3S-TRB turbidity sensor	3S-TRB-L turbidity sensor
B	Probe cable (6 m)	

### 3.2 Product code

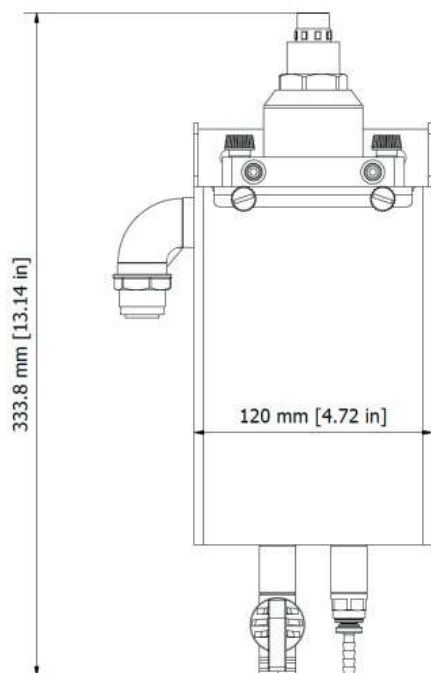
The product code is an alphanumeric code that identify your 3S Analyzers product and its configuration. For the 3S turbidity sensors the codes are the following:

3S-TRB - High Range Turbidity Probe

3S-TRB-L - Low Range Turbidity Probe

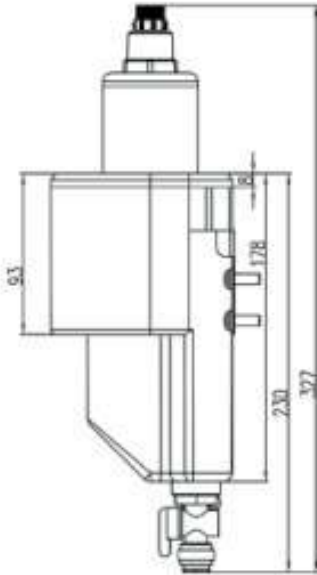
### 3.3 Wall mounting dimensions

High Range



Recirculating sample reservoir cod. A46U10035 is included in the scheme as a reference but should be purchased separately.

## Low Range



The recirculating sample reservoir for the low range version is included in the probe purchase.

### 3.4 Mounting the instrument

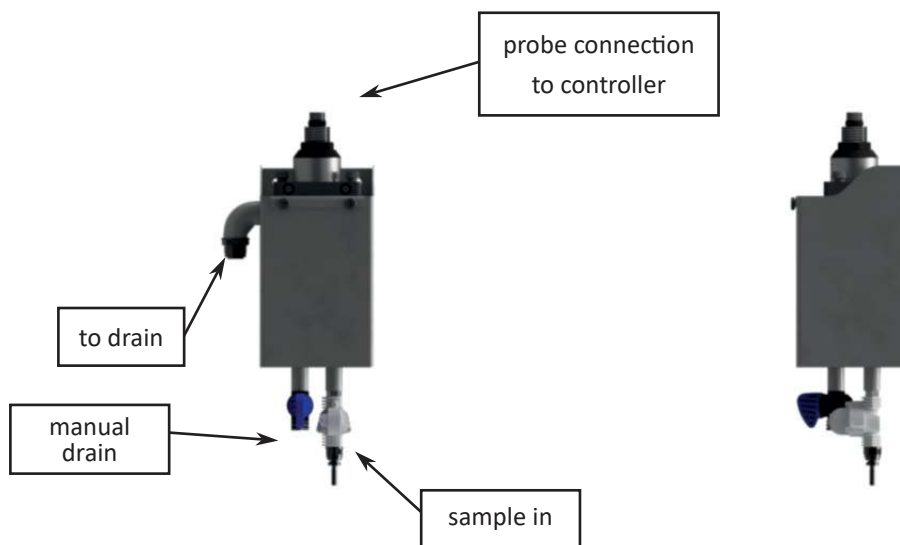
The 3S-PC1000 controller and the sample reservoir must be mounted vertically on a wall or support suitable for their weight and not subject to vibrations. Use suitable screws (not included in the supply) and fasten them only on the side brackets (ear clips) of the instrument and in the holes of the tank metal plate. Mount them so as to get the display at eye height (160 cm, 63 in).

Since the probe connections and flow sensor connectors are on the right side of the analyzer, install sample reservoir underneath the analyzer, in a way that is reachable from the right side. Please, also consider that the surrounding space must allow easy opening of the analyzer door and easy access to the sample reservoir for cleaning or maintenance.

A minimum distance of 10 cm is required between the sides of the instrument and any other obstacle.



High Range



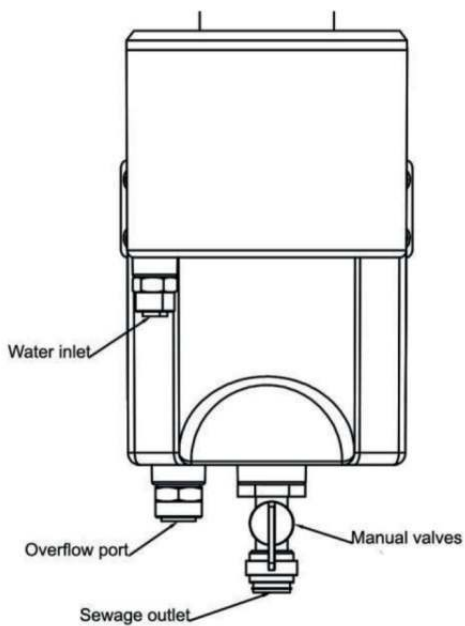
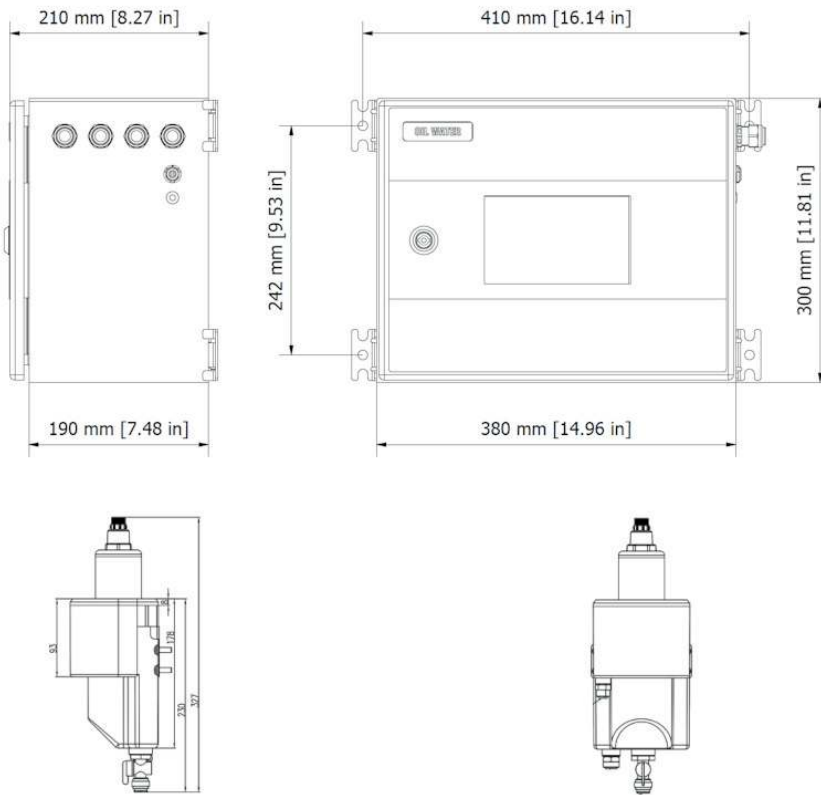
The sample reservoir (cod. A46U10035 for the high range version, not included) should be mounted preferably under the controller. The sample line must be connected to the inlet below the container, optionally a flow sensor can be installed on the same line to detect the presence of the sample.

The reservoir has a side arm to drain the excess liquid and to maintain a constant sample flow. The side arm must be connected to the drain.

When the container is installed in a proper position the probe can be inserted into its slot and secured with the clamp.

Finally, attach the probe connector to the analyzer.

Low Range



The sample reservoir (included with the purchase of the low range probe) should be mounted preferably under the controller. Connect the sample line to the water inlet on the left side. Then connect the outlet to drain. The manual drain outlet can be connected to drain or left free.

## 4 - CALIBRATION

### 4.1 About the method

The probe is calibrated using standard solutions which are analyzed in the same way as the sample.

In order to ensure correct measurement performance, the probe should be calibrated periodically, best results are obtained if it has been recently cleaned and serviced.

The firstv calibration point is the blank (zero), which is usually done by analyzing demineralized water. A part from the blank, one other point is needed for the calibration curve.

The 3S-PC1000 controller is able to manage two probes with independent calibration curves, up to five points each.

Please refer to the 3S-PC1000 user manual for detailed instructions to perform a multi-point calibration with the 3S-TRB probe.

### 4.2 Calibration

The probe can be calibrated using a turbidity standard, with value expressed in NTU or equivalent unit. A common substance for turbidity calibration is formazin, in the example it will be used to calibrate the 3S-TRB probe with a full scale of 400 NTU.

#### **Chemicals**

- Formazin turbidity standard solution 4000 NTU
- Demineralized water

#### **Instrumentation**

- 100 ml glass measuring cylinder
- 1000 ml volumetric flask

#### **Blank**

The blank is measured using demineralized water.

#### **Standard**

Accurately transfer 100 ml of formazin standard solution 4000 NTU to a 1000 ml volumetric flask and then fill the flask to the mark with demineralized water. The obtained solution has a turbidity of 400 NTU.

The dilute standard solution should be shaken right before use.

## Blank

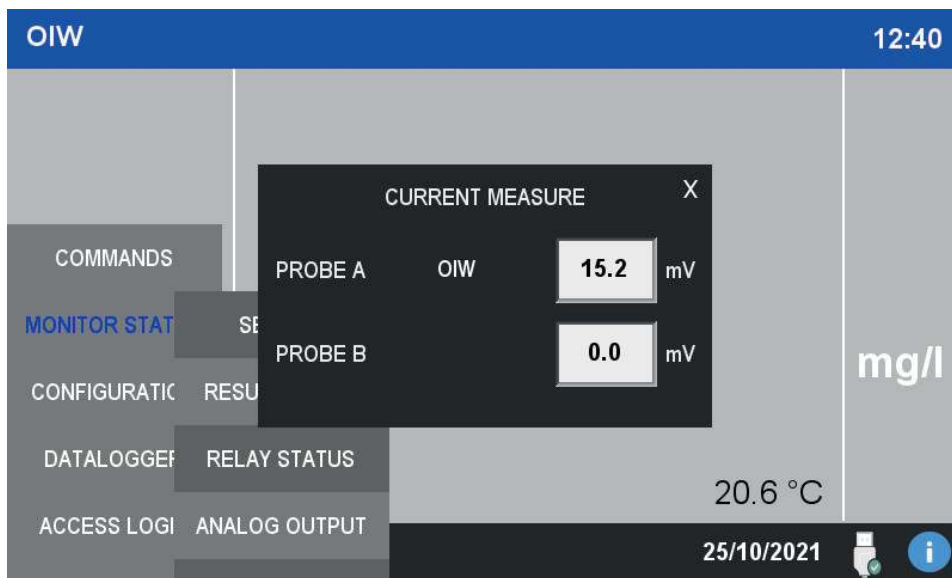
The blank is measured using demineralized water.

## Procedure

To take the blank measurement fill a dark container with demineralized water. The container should be large enough to host the probe with a space of at least 5 cm from the side walls and from the bottom of the container. It is important to keep light away from the probe while taking the measurement. You can use a stand to help the probe stay in position.

The sensor signal can be read from the MONITOR STATUS > SENSOR page. Wait until stabilization then take note of the measurement, this is the blank.

Replace the water in the container with the 400 NTU standard solution. Once the probe is in position and the reading is stable, take note of the measurement.

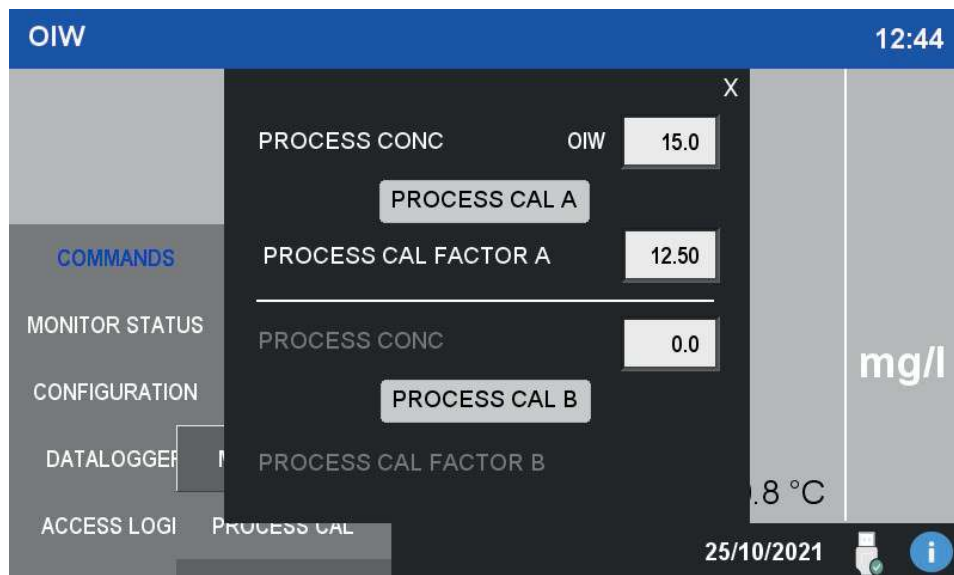


## 4.3 Process calibration

Alternatively, the probe can be calibrated using a real sample whose concentration is known. To do this, the same setup described in the previous section can be prepared. The calibration can also be done directly on the installed sample line, if real time results are available.

The process calibration can be performed through the following steps:

1. Take a sample representative of the water stream to be analyzed, at least 1 liter. Follow good sampling techniques to have reliable results.
2. Determine the concentration of the analyte of interest using a reference instrument or a laboratory analysis of the sample .
3. Immerse the probe in the sample and wait for a stable result.
4. Go to COMMANDS > PROCESS CAL



5. Press and hold PROCESS CAL A (or B depending on the probe you want to calibrate if more than one are present).
6. The process calibration is now completed, the new measurements will be corrected with the factor calculated in the procedure.

Note: is it possible to calculate the factor analyte/standard and put it directly in the process factor field on the same page.