4670 series
High range turbidity systems
Measurement made easy
Long-term, reliable performance turbidity systems with low cost-of-ownership

Choice of flow-through and dip turbidity systems
• easy installation in open channels or tanks
• suitable for turbidity measurements up to 2000 FTU

Automatic sensor cleaning
• reduces maintenance requirements
• optimizes performance sensitivity

Secondary standards for calibration
• accurate, repeatable, simple, safe
• realize significant cost savings by reducing the use of primary standards

Reliable and accurate measurement
• unaffected by ambient light
• automatic bubble rejection to compensate for erroneous readings due to degassing
ABB’s 4670 range of turbidity systems

ABB’s 4670 series turbidity systems are available as in-situ dip systems suitable for turbidity measurement in open channels and tanks, or as a flow-through design suitable for water applications that have high turbidity values.

Measurement ranges are configurable between 0 and 100 FTU and between 0 and 2000 FTU. The systems can also be configured to display readings in mg/l or ppm for suspended solids measurement in addition to FTU.

All systems are provided with ABB’s auto-cleaning function and are available with dry secondary calibration standards for accurate reliable turbidity measurement with reduced cost of ownership.

Applications

Typical applications for the 4670 range of high range turbidity systems include:

- Suspended solids / turbidity measurement in industrial effluent discharges
- Suspended solids / turbidity measurement of effluent discharge from sewage treatment works
- Turbidity level monitoring in the outflow channel from sludge dewatering plants

For low range turbidity applications (for example, potable water turbidity monitoring) refer to ABB’s 4690 range of turbidity systems (see data sheet DS/4690–EN).
Reliable measurement

ABB’s 4670 range of turbidity systems are designed for reliability, ease-of-use and maintenance simplicity. The sensors are available in flow and dip versions and are supplied with auto-cleaning to minimize maintenance, overcome optical fouling and optimize performance.

Measurement technique

The 4670 series of high range turbidity sensors measure turbidity by absorption (or attenuation) of a light beam passing through the sample.

This is probably the most straightforward method of measuring turbidity. A light beam is transmitted through the sample, the intensities of which are measured by a photodetector in line with the light source. The measurement of turbidity using Absortiometers can be affected by the presence of dissolved colour. However, such effects are minimized by performing the measurement at a wavelength of 880 nm which is in the infrared region.

Automatic cell cleaning

The 4670 range of turbidity sensors feature an auto-clean system. This feature consists of a mechanical wiper assembly that physically wipes clean the optical cell at user-programmable intervals from every 15 minutes up to every 24 hours.

The highly efficient automatic cleaning process overcomes the problem of optical fouling and ensures that performance can be maintained for long periods without the need for manual intervention.

Automatic bubble rejection

Turbidity readings can be affected by short-term spikes, usually due to the effect of the sample degassing. The 4670 analyzer has an automatic bubble rejection feature that, when enabled, applies a digital filter to the measured results removing spurious high readings.
Simple to calibrate
The 4670 can be calibrated either by using a chemical standard such as Formazine, or by using the optional secondary calibration device.

The dry secondary calibration standard is a key feature of the 4670 turbidity systems that simplifies routine instrument verification and removes the need for the use of chemical standards.

Each secondary standard is supplied factory-certified against a primary formazine standard.

Benefits of using ABB’s secondary standards

- Minimum analyzer downtime
  - Simple and fast procedure to verify analyzer performance.

- Low cost-of-ownership
  - Reduce usage of consumable chemical standards and the time taken to prepare such standards.

- Minimize employees’ exposure to Formazine
  - Formazin is highly toxic and a suspected carcinogen.

- Repeatable and reliable
  - Removes any chemical standard preparation errors.

Simple to use
- The secondary standard is simply inserted into the sensor assembly optical light path enabling the pre-calibrated optomechanical filter to divert a fixed quantity of light to the detector that corresponds to the calibrated turbidity value.

Flexible installation
A choice of in situ dip and flow-through sensor designs together with panel- and wall-mount transmitter options makes it flexible to install for a variety of applications.

Simple to maintain
As with all analyzers, the key to success is the reliability of the sensing device coupled with simple maintenance procedures.

The 4670 turbidity sensing systems are designed to be as maintenance-free as possible. The inherent product design and auto-clean feature minimize the amount of maintenance required to regular calibration verification checks and periodic replacement of the wiper blade. All the sensing systems can be site-serviced without the need of a skilled technician.

Confidence in service
To complement the system’s well proven design, unrivalled accuracy and reliability in service, the entire sensing loop is regularly self-monitored to ensure the light source is operating within specification, thereby eliminating the risk of electrical drift. In addition, the function of the wiper module is continuously validated, thereby assuring the correct performance of the cleaning function.
7997-400, 7997-401 dip and 7997-405 flow turbidity sensors specification

**Range**
Programmable 0 to 100 to 0 to 1000 FTU and 0 to 2000 mg/l
The maximum range for suspended solids measurement is dependent upon the coefficient value of the sample.

**Extended range**
0 to 2000 FTU

**Measurement principle**
Transmitted light

**Measurement characteristic**
Logarithmic, based on Formazine

**Resolution**
1 FTU

**Repeatability**
Better than 1 % of span

**Accuracy (0 to 1000 FTU)**
±2 % FSD
(limited by the uncertainty of Formazine)

**Accuracy (0 to 2000 FTU)**
Better than ±10 % of span

**Temperature drift**
0.2 FTU/°C (0.1 FTU/°F)

**Flow rate (7997-405 only)**
0.5 to 2 l/min-1

**Integral wiper cleaning system**
Programmable operational frequency every 0.25 hour, 0.5 hour, 0.75 hour or in multiples of 1 hour up to 24 hours

**Sample operating temperature**
0 to 50 °C (32 to 122 °F)

**Dip stem length**
7997-400 1 m (3.3 ft)
7997-401 2 m (6.6 ft)

**Pressure (7997-405 only)**
Up to 3 bar (43.5 psi)

4670 transmitter specification

**General**

**Measured value**
5-digit x 7-segment backlit LCD

**Information**
16-character, single line, dot matrix, backlit LCD

**Units of measurement**
All models: NTU and FNU
mg/l and ppm for high range models

**Accuracy**
±0.2 % of reading, ±1 digit

**Linearity**
±0.1 % FSD

**Auto-clean timing (7998011, 7998012)**
Programmable 15 min, 30 min, 45 min or 1 hour up to 24 hours in 1 hour increments

**Environmental data**

**Operating temperature limits**
–20 to 55 °C (–4 to 131 °F)

**Storage temperature limits**
–25 to 55 °C (–13 to 131 °F)

**Operating humidity limits**
Up to 95 % RH non-condensing

**Power supply**

**Voltage requirements**
100 to 130 V, 200 to 260 V, 50/60 Hz

**Power consumption**
< 6 VA AC

**Error due to power supply variation**
Less than 0.1 % for +6 % –20 % variation from nominal supply

**Insulation**
Mains to earth (line to ground) 2 kV RMS
### Relay outputs and set points

**No. of relays**
Two

**Relay contacts**
- Single pole changeover
  - Rating: 250 V AC 250 V DC max.
  - 3 A AC 3 A DC max.
  - Loading:
    - (non-inductive): 750 VA 30 W max.
    - (inductive): 750 VA 3 W max.

**Insulation**
- 2 kV RMS contacts to earth (ground)

**No. of set points**
Two

**Set point adjustment**
Programmable

**Set point hysteresis**
±1 % fixed

**Local set point annunciation**
Red LED

### Retransmission

**No. of retransmission signals**
- One fully isolated programmable 0 to 10 mA, 0 to 20 mA or 4 to 20 mA optional second current output

**Accuracy**
±0.25 % FSD ±0.5 % reading

**Resolution**
- 0.1 % at 10 A, 0.05 % at 20 mA

**Max. load resistance**
750 Ω (20 A max.)

### Mechanical data

**Model 4670 Wall- / Pipe-mount transmitter**
- **Wall-mounting**
- **Protection** IP66 / NEMA4X
- **Dimensions** 160 mm (6.30 in.) wide x 214 mm (8.43 in.) high x 68 mm (2.68 in.) deep
- **Weight** 2 kg (4½ lb)

**Model 4675 Panel-mount transmitter**
- **Panel-mounting** (¼ DIN)
- **Protection** IP66 / NEMA4X front
- **Dimensions** 96 mm (3.78 in.) wide x 96 mm (3.78 in.) high x 191 mm (7.52 in.) deep
- **Weight** 1.5 kg (3¼ lb)
- **Panel cut-out:** 92\(\frac{15}{32}\)" x 92\(\frac{9}{32}\)"
  - 92\(\frac{15}{32}\)" x 92\(\frac{9}{32}\)"
  - 92\(\frac{15}{32}\)" x 92\(\frac{9}{32}\)"
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  - 92\(\frac{15}{32}\)" x 92\(\frac{9}{32}\)"
Overall dimensions
Dimensions in mm (in.)

7997-400 & 7997-401 Sensors

- 1000 (39.0) 2000 (78.7)
- 93.5 (3.68)
- 212.5 (8.37)
- 70 (2.75) CRS
- 40 (1.57) max.
- 30 (1.18) min. using M6

7997-405 Sensor

- 240 (9.45)
- 30 (1.18) approx.
- Optical emitter / wiper cable to transmitter via junction box
- Sensor
- Clamping ring
- 1/2 in. BSP connections
- Mounting bracket
- 46.5 (1.9) CRS
- 118 (4.81) CRS
- 135 (5.3)
- 4 holes Ø7 (0.3)

4670 wall- / pipe-mount transmitter

- 160 (6.3)
- 250 (9.84)
- 214 (8.43)
- 232 (9.13)
- 69 (2.72)

4675 panel-mount transmitter

- 96 (3.78)
- 191 (7.52)
- 12 (0.47)
- 92 (3.62)
- 92 (3.62) +0.8
- 92 (3.62) +0.003
- 92 (3.62) -0
- 92 (3.62) -0
- 92 (3.62) -0
Electrical connections

Panel-mount transmitter connections

Wall- / Pipe-mount transmitter connections

### Mounting

<table>
<thead>
<tr>
<th>Terminal number</th>
<th>Mounting</th>
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<tbody>
<tr>
<td>1</td>
<td>Wall</td>
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<tr>
<td>2</td>
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<td>7</td>
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</tr>
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<td>8</td>
<td>Panel</td>
</tr>
</tbody>
</table>

### Cleaner

- +12 V switched emitter supply
- +12 V cleaner/ receiver supply
- Signal input
- Cleaner detect signal

### Power supply

- 0 V common

### Relay 1

- NC
- C
- NO

### Relay 2

- NC
- C
- NO

### Link to earth (ground) stud on case

### Earth (ground) stud on case

### Turbidity sensor

- 7997-400 series
- Serial RS485
- Turbidity sensor

### Retransmission output

- 1
- 2 - Rx+
- 3 - Tx-
- 4 - TX+
- 5 - Tx-
- 6 - 0V (Optional)

### 2nd retransmission output

- 1 - NC
- 2 - C
- 3 - NO
- 4 - NC
- 5 - C
- 6 - NO

### Power supply

- N - Neutral
- L - Line
- Earth

### Earth (ground) stud on case

### Braid
## Ordering information

<table>
<thead>
<tr>
<th>Turbidity system</th>
<th>467 X/XX X</th>
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<tbody>
<tr>
<td>Wall-mounting transmitter (IP66/NEMA4X)</td>
<td>0</td>
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<tr>
<td>Range programmable from 0 to 1 NTU to 0 to 250 NTU or 0 to 50 FTU to 0 to 1000 FTU (extended range 0 to 2000 FTU). Complete with high and low alarm relays and isolated current output (programmable 0 to 10 mA, 0 to 20 mA or 4 to 20 mA) and auto-clean. Power supply 110 / 240 V AC</td>
<td></td>
</tr>
<tr>
<td>As above with 2 outputs</td>
<td>1</td>
</tr>
<tr>
<td>As above with Modbus</td>
<td>6</td>
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<tr>
<td>Panel-mounting transmitter (IP66/NEMA4X 96 x 96 mm DIN case)</td>
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<tr>
<td>Range programmable from 0 to 1 NTU to 0 to 250 NTU or 0 to 50 FTU to 0 to 1000 FTU (extended range 0 to 2000 FTU). Complete with high and low alarm relays and isolated current output (programmable 0 to 10 mA, 0 to 20 mA or 4 to 20 mA) and auto-clean. Power supply 110 / 240 V AC</td>
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**Sensor type**

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<tr>
<td>1 m Dip system, range 0 to 1000 FTU max. (extended range 0 to 2000 FTU), 0 to 100 FTU min., 0 to 2000 mg/l utilizing light absorption. Process connections, N/A. Complete with auto-clean. (7997-400 sensor).</td>
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<tr>
<td>2 m Dip system, range 0 to 1000 FTU max. (extended range 0 to 2000 FTU) 0 to 100 FTU min., 0 to 2000 mg/l utilizing light absorption. Process connections, N/A. Complete with auto-clean. (7997-401 sensor).</td>
<td>41</td>
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<tr>
<td>Flow-through system, range 0 to 1000 FTU max. (extended range 0 to 2000 FTU) 0 to 100 FTU min., 0 to 2000 mg/l utilizing light absorption. Process connections, ½ in. BSP. Complete with auto-clean. (7997-405 sensor).</td>
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**Documentation language**

<table>
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