Ultralow back scatter
– enables true zero setting, to ensure accurate and reliable results below 0.1 NTU

Dry secondary standards supplied for zero and span verification
– accurate, repeatable, simple; eliminates the need for formazine solutions

Virtual lifetime zero
– ensures high accuracy and long term performance with minimum maintenance

Auto-clean systems
– optimizes performance and reduces maintenance on low and high turbidity samples

On-line diagnostics
– provides assurance of performance of the auto-clean function

Flow and dip systems
– satisfies a wide range of applications

Conforms to ISO7027

Long-term, reliable performance turbidity systems with low cost of ownership
**4670 Series Turbidity Systems**

An ABB turbidity system comprises a 4670 wall-mounting or 4675 panel-mounting, analyzer, together with one of four sensor types designed to meet specific applications.

**Turbidity Sensors**
The sensors are available in flow and dip versions and, where appropriate, are supplied with auto-cleaning to minimize maintenance to overcome optical fouling and optimize performance.

**Model 7997-202** — a flow-through system, utilizing the 90° scattered light principle. It is designed specifically for monitoring final-treated potable water and filtered water where accurate results below 0.1 NTU are demanded. The unit operates over the range 0 to 30 NTU with a minimum operating range of 0 to 1 NTU.

High stability is the key to the virtual lifetime zero and the ultra low backscatter permits the unit to be used with full confidence below 0.1 NTU.

**Model 7997-201** — a flow-through system utilizing the 90° scattered light principle and is designed to operate over the range 0 to 30 NTU with a minimum operating range of 0 to 1 NTU. It is the ideal solution for clean water applications. Auto-cleaning is a standard feature, together with on-line diagnostics.

**Model 7997-200** — a flow-through system, utilizing the 90° scattered light principal, designed to operate over the range 0 to 250 NTU. It is ideal for monitoring raw water on potable water treatment plants.

Incorporates auto-cleaning as standard and, used with the 4670 or 4675 Analyzers, operates from 0 to 25 NTU, up to 250 NTU, by programming the 4600 Series to the required range.

**Model 7997-300** — also a flow-through system but is designed for high levels of turbidity and utilizes the absorption principal of measurement. It operates over the range of 0 to 500 FTU with a minimum range of 0 to 100 FTU.

This model incorporates auto-cleaning as standard and is used primarily for effluent discharge monitoring and on water intakes where the river water can become very turbid. It is also used extensively on Filter Backwash applications.

**7997-400 Series** — two dip versions are available with dip stem lengths of 1m and 2m. They are designed primarily for use in open channels and tanks. A third version, **Model 7997/405**, is a flow-through system and is used on water applications which have very high turbidity values.

All three operate over the range of 0 to 2000FTU with an increased accuracy specification when used over the range of 0 to 1000FTU. The minimum range is 0 to 100FTU. These systems are completely unaffected by ambient light.
Dry Secondary Calibration Standard
A key feature of the systems is the dry secondary calibration standard, which simplify routine calibration and virtually eliminate the need for chemical standards, a major safety factor. This is available for all models including the dip system and provides a very convenient, repeatable and safe calibration technique.

Ease of Maintenance
As with all analyzers, the key to success is the reliability of the sensing device coupled with simple maintenance procedures. The sensing systems are very easy to maintain and can be site-serviced without the need of a skilled technician.

Automatic Cleaning
Automatic cleaning is an essential feature which overcomes the problem of optical fouling and ensures that performance is maintained for long periods (up to 6 months) without the need for manual intervention. This feature has proven invaluable even on apparently ‘clean’ water samples where small amounts of iron/manganese can cause fouling problems.

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 by the processor thereby assuring the correct performance of the cleaning function.

Ease of Calibration
Calibration can be carried out using Formazine standard or by using the optional secondary calibration device which can be ordered separately.

This enables both zero and span checks to be carried out.
Electrical Connections

4675/500 Panel-mounting Version for use with 7997–202 Sensors

4675/500 Panel-mounting Version for use with 7997–200 series, 7997–300 and 7997-400 Sensors

* Discard unused yellow wire in multicore cable
4670/500 Wall-mounting Version for use with 7997–202, 7997–200 series, 7997–300 and 7997–400 Sensors

**Note.** 2nd retransmission output available when RS485 serial communications not used.
Specification

7997-200 Turbidity Sensor

Range
Programmable 0 — 25 NTU to 0 — 250 NTU and
0 — 500mg/l (or p.p.m.) *

Measurement Principle
90° scattered light measurement. Compliant to ISO7027

Measurement Characteristic
Linear based on Formazine

Resolution
0.1 NTU

Repeatability
Better than 1% of span

Accuracy
±2% of FSD (limited by uncertainty in Formazine standards) from
0 to 100 NTU
±5% from 100 to 250 NTU

Temperature drift
0.005 NTU/10°C (0.003 NTU/10ºF)

Response time
Varies with flow rate, typically 90% step change in
2 minutes at 1 l/min.

Flow rate
0.5 l to 1.5 l/min

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

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

Sample Pressure
Up to 3 bar (43.5 psi)

7997-201 & 7997-202 Turbidity Sensors

Range
Programmable 0 — 1 NTU to 0 — 30 NTU

Measurement Principle
90° scattered light measurement. Compliant to ISO7027

Measurement Characteristic
Linear based on Formazine

Resolution
0.01 NTU

Repeatability
Better than 1% of span

Accuracy
±2% FSD (limited by uncertainty in Formazine standards)

Temperature drift
0.005 NTU/10°C (0.003 NTU/10ºF)

Response time
Varies with flow rate, typically 90% step change in less than
45s at 1 l/min

Flow rate
0.5 l to 1.5 l/min

Integral wiper cleaning system (7997-201 only)
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)

Sample pressure
Up to 3 bar (43.5 psi)

* Note. The maximum range for suspended solids measurement is dependent upon the coefficient value of the sample.
7997-300 Turbidity Sensor

Range
Programmable 0 — 100 FTU to 0 — 500 FTU and 0 to 1000mg/l (or ppm) *

Measurement Principle
Transmitted light

Measurement Characteristic
Logarithmic based on Formazine

Resolution
1 FTU

Repeatability
Better than 1% of span

Accuracy
±2% of FSD
(limited by uncertainty in Formazine standards)

Temperature drift
0.2 FTU/^C (0.1 FTU/^F)

Response time
Varies with flow rate, typically 90% step change in 2 minutes at 1 l/min

Flow rate
0.5 l to 1.5 l/min

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)

Pressure
Up to 3 bar (43.5 psi)

7997-400, 7997-401 Dip & 7997-405 Flow Turbidity Sensors

Range
Programmable 0 — 100 to 0 — 1000 FTU and 0 — 2000mg/l *

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

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 1m (3.3 ft)
7997-401 2m (6.6 ft)

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

* Note. The maximum range for suspended solids measurement is dependent upon the coefficient value of the sample.
...Specification

4670-5/500 Analyzer Models

Display

Measured value
5-digit x 7-segment backlit LCD

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

Ranges
- Used with 7997-202/201: 0 — 1 to 0 — 30 NTU
- Used with 7997-200: 0 — 25 to 0 — 250 NTU
- Used with 7997-300: 0 — 100 to 0 — 500 FTU and 0 — 1000mg/l
- Used with 7997-400/401/405: 0 — 100 to 0 — 1000 FTU and 0 — 2000mg/l

Units of measurement
NTU and FTU all models
mg/l on models 7997-300 and 7997-400

Accuracy
± 0.2% FSD, ± 1 digit

Linearity
± 0.1% FSD

Auto-clean timing
Programmable 15min, 30min, 45min 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 130V, 200 to 260V, 50/60Hz

Power consumption
< 6VA 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) 2kV RMS

Relay Outputs and Set Points

No. of relays
Two

Relay contacts
Single pole changeover
Rating
250V AC
250V DC max.
3A AC
3A DC max.

Loading (non-inductive)
750VA
30W max.

Inductive
750VA
3W max.

Insulation
2kV 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 10mA, 0 to 20mA or 4 to 20mA
Optional – second current output

Accuracy
± 0.25% FSD ± 0.5% reading

Resolution
0.1% at 10mA, 0.05% at 20mA

Max. load resistance
750Ω (20mA max.)

Mechanical Data

Model 4670/500
Wall-mounting
Protection
IP66/NEMA4X

Dimensions
160mm (6.30 in.) wide x 214mm (8.43 in.) high x 68mm (2.68 in.) deep

Weight
2kg (4 1/2 lb)

Model 4675/500
Panel-mounting (1/4 DIN)
Protection
IP66/NEMA4X front

Dimensions
96mm (3.78 in.) wide x 96mm (3.78 in.) high x 191mm (7.52 in.) deep

Weight
1.5kg (3 1/4 lb)

Panel cut-out:
92\(\frac{9}{16}\) mm x 92\(\frac{6}{16}\) mm
(3.62\(\frac{3}{16}\) in. x 3.62\(\frac{3}{16}\) in.)
Overall Dimensions

Dimensions in mm (in.)

46.5 (1.9) CRS
155.5 (6.35) CRS

Wiper Cable to Junction Box
Fit sample outlet tube
Receiver Cable to Junction Box
Fit sample inlet tube
12mm (0.5) ID
Fit drain tube
12mm (0.5) ID

6 holes 7 (0.3) Ø for mounting

7997-202 Sensor

Dimensions in mm (in.)

46.5 (1.9) CRS
155.5 (6.35) CRS

Emitter Cable to Junction Box
Fit sample outlet tube
Receiver Cable to Junction Box
Fit sample inlet tube
12mm (0.5) ID
Fit drain tube
12mm (0.5) ID

118 (4.81) CRS

7997-200 & 7997-201 Sensors

Dimensions in mm (in.)

46.5 (1.9) CRS
155.5 (6.35) CRS

Emitter Cable to Junction Box
Fit sample outlet tube
Receiver Cable to Junction Box
Fit sample inlet tube
12mm (0.5) ID
Fit drain tube
12mm (0.5) ID

118 (4.81) CRS

Wiper Cable to Junction Box

6 holes 7 (0.3) Ø for mounting

7997-300 Sensor

Dimensions in mm (in.)

46.5 (1.9) CRS
155.5 (6.35) CRS

Emitter Cable to Junction Box
Fit sample outlet tube
Receiver Cable to Junction Box
Fit sample inlet tube
12mm (0.5) ID
Fit drain tube
12mm (0.5) ID

118 (4.8) CRS

7997-400 & 7997-401* Sensors

Dimensions in mm (in.)

70 (2.75) CRS

Wiper Cable to Junction Box

Emitter Cable to Junction Box
Fit sample outlet tube
Receiver Cable to Junction Box
Fit sample inlet tube
12mm (0.5) ID
Fit drain tube
12mm (0.5) ID

1000 (39)
2000 (78.7)*

40 (1.57) max.
30 (1.18) min.

using M6

25 (1)

93.5 (3.68)

212.5 (8.37)
7997-405 Sensor

Model 4670/500 Wall-mounting Version

Model 4675/500 Panel-mounting Version
## Ordering Information

<table>
<thead>
<tr>
<th>Turbidity Systems</th>
<th>467</th>
<th>X</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Analyzer Type</strong></td>
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<tr>
<td>Wall-mounting Turbidity Analyzer case IP66/NEMA4X. Range programmable from 0 — 1 NTU to 0 — 500 NTU or 0 — 50 FTU to 0 — 1000 FTU (extended range 0 to 2000 FTU). Complete with High and Low alarm relays and isolated current output (programmable 0 to 10mA, 0 to 20mA or 4 to 20mA) and auto-clean. Power supply 110/240V AC</td>
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<tr>
<td>Panel-mounting Turbidity Analyzer 96 x 96mm DIN case IP66/NEMA4X. Range programmable from 0 — 2 NTU to 0 — 250 NTU or 0 — 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 10mA, 0 to 20mA or 4 to 20mA) and auto-clean. Power supply 110/240V AC</td>
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<tr>
<td><strong>Sensor Type</strong></td>
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<tr>
<td>Flow-through system, range 0 to 30 NTU max., 0 to 1 NTU min., utilizing 90° scattered light. Process connections, inlet/outlet barb hose use 12mm ID tube.</td>
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<tr>
<td>Flow-through system, range 0 to 250 NTU max., 0 to 25 NTU min., utilizing 90° scattered light. Process connections, barb hose use 12mm ID tube inlet/6mm ID tube outlet. Complete with auto-clean.</td>
<td>2</td>
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<tr>
<td>Flow-through system, range 0 to 30 NTU max., 0 to 1 NTU min., utilizing 90° scattered light. Process connections, barb hose use 12mm ID tube inlet/6mm ID tube outlet. Complete with auto-clean.</td>
<td>2</td>
<td>1</td>
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<tr>
<td>Flow-through system, range 0 to 500 FTU max., 0 to 100 FTU min., 0 to 1000mg/l utilizing light absorption. Process connections, barb hose use 12mm ID tube inlet/6mm ID tube outlet. Complete with auto-clean.</td>
<td>3</td>
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<tr>
<td>Dip system, range 0 to 1000 FTU max. (extended range 0 to 2000 FTU), 0 to 100 FTU min., 0 to 2000mg/l utilizing light absorption. Process connections, N/A. Dip stem length 1m. Complete with auto-clean.</td>
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<tr>
<td>Dip system, range 0 to 1000 FTU max. (extended range 0 to 2000 FTU), 0 to 100 FTU min., 0 to 2000mg/l utilizing light absorption. Process connections, N/A. Dip stem length 2m. Complete with auto-clean.</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 2000mg/l utilizing light absorption. Process connections, 1/2 in. BSP. Complete with auto-clean.</td>
<td>4</td>
<td>5</td>
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<tr>
<td><strong>Language</strong></td>
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<td>English language manual</td>
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<tr>
<td>Spanish language manual</td>
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</table>
Pipe-mounting Bracket
If required, part no. 4600/0138

Connection Cable
All systems are supplied with 5m of connection cable. For longer lengths, up to a maximum of 100m, please order:

For Model 467X/1
0233–840 Connection cable

For Models 467X/2, 467X/3 and 467X/4
0233–828 Connection cable

Secondary Standard – supplied as an optional extra
7997/050 Secondary standard for 467X/1 (nom. value 0.8 to 2.0 NTU)
7997/087 Secondary standard for 467X/20X (nom. value 60 to 120 NTU)
7997/170 Secondary standard for 467X/21X (nom. value 0.8 to 2.0 NTU)
7997/170 Secondary standard for 467X/22X (nom. value 0.8 to 2.0 NTU)
7997/160* Secondary standard for 467X/4 (nom. value 50 to 80 FTU)
7997/161* Secondary standard for 467X/4 (nom. value 600 to 750 FTU)
7997/162* Secondary standard for 467X/4 (nom. value 800 to 900 FTU)
7997/163* Secondary standard for 467X/4 (nom. value 120 to 160 FTU)
7997/165* Secondary standard for 467X/3 (nom. value 150 to 200 FTU)
7997/166* Secondary standard for 467X/3 (nom. value 300 to 360 FTU)
* Instrument specific and must be ordered with the system.