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PRODUCT DATASHEET

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T56

Clarity® II Turbidimeter

- **COMPLETE SYSTEM** includes single or dual input analyzer, sensor(s), and debubbler assembly
- **CHOOSE U.S. EPA METHOD 180.1 or ISO METHOD 7027** compliant sensors
- **RESOLUTION** 0.001 NTU
- **EASY TO USE 56 ANALYZER** with four analog outputs and four programmable alarm relays
- **INTUITIVE, USER-FRIENDLY MENU** in nine languages makes setup and calibration easy
- **HART® DIGITAL COMMUNICATIONS** – standard
- **Data and Event Logger** – stores thirty days of data for output on USB 2.0 memory stick



Features and Applications

The Clarity II turbidimeter is intended for the determination of turbidity in water. Low stray light, high stability, efficient bubble rejection, and a display resolution of 0.001 NTU make Clarity II ideal for monitoring the turbidity of filtered drinking water. Clarity II is also suitable for applications other than drinking water treatment including monitoring of filtered water discharges, condensate returns, and clarifiers.

Both US EPA 180.1 and ISO 7027 compliant sensors are available. US EPA 180.1 sensors use a visible light source. ISO 7027 sensors use a near infrared LED. For regulatory monitoring in the United States, US EPA 180.1 sensors must be used. Regulatory agencies in other countries may have different requirements.

The Clarity II turbidimeter consists of an analyzer, with either one or two signal input boards, sensor(s), and a debubbler/measuring chamber and cable for each sensor. The cable plugs into the sensor and the analyzer, making setup fast and easy. Sensors can be located as far as 50 ft (15.2 m) away from the analyzer.

The Clarity II turbidimeter incorporates the easy-to-use 56 intelligent analyzer. Menu screens and prompts are so intuitive on the large LCD display that a manual is practically not needed. 4-20mA analog outputs are fully scalable. Every unit includes four alarm relays with interval timer functions. Alarms are fully programmable for high/low logic and dead band. To simplify start-up and programming, the analyzer automatically recognizes installed turbidity signal boards and detects whether an EPA 180.1 or ISO 7027 sensor is being used.

Clarity II is available in an optional configuration in which the analyzer, sensor(s), and debubbling flow cell(s) are mounted on a single back plate. The sensor cables are pre-wired to the analyzer, so setup is exceptionally fast and easy. All the user does is mount the unit on a wall, bring in power and sample, and provide a drain. To order this option, consult the factory.

Specifications - Analyzer

Enclosure: Polycarbonate. Type 4X/CSA 4X IP66

Dimensions: 6.2 x 6.2 x 5.2 in. (157 x 157 x 132 mm)

Conduit openings: Accepts 1/2" or PG 13.5 conduit fittings.

Display: Large 3.75 x 2.2 in. (95.3 x 55.9 mm) high resolution color LCD for large process variables and user-definable display of diagnostic parameters. Back-Lighting is user adjustable. Main display can be customized to meet user requirements.

Measurement character height: 0.5 in. (13mm)

Security Code: 3-digit code prevents accidental or unauthorized changes in instrument settings and calibration.

Languages: English, French, German, Italian, Spanish, Portuguese, Chinese, Russian and Polish

Units: Turbidity (NTU, FTU, or FNU); total suspended solids (mg/L, ppm, or no units)

Display resolution-turbidity: 4 digits; decimal point moves from x.xxx to xxx.x

Display resolution-TSS: 4 digits; decimal point moves from x.xxx to xxxx

Calibration methods: User-prepared standard, commercially prepared standard, or grab sample. For total suspended solids user must provide a linear calibration equation.

Ambient Temperature and Humidity: 0 to 55°C, (32 to 131°F); RH 5 to 95% (non-condensing)

Altitude: For use up to 2000 meters.

Storage Temperature: -20 to 60°C, (-4 to 140°F)

Real time clock back-up: 24 hours

Power: 85 to 265 VAC, 47.5 to 65.0 Hz. 20W min. input power.

Equipment protected by double insulation.

Inputs: Single or dual input, EPA 180.1 or ISO 7027 sensors

Outputs: Four 4-20 mA or 0-20 mA isolated current outputs. Fully scalable. Maximum load: 550 ohm. Output 1 has superimposed HART signal

Output Dampening: 0-999 seconds

Current Output Accuracy: ±0.05 mA @25°C

Alarms: Four process alarm relays for turbidity or temperature. Relays can also be programmed for timer, TPC, or fault alarm operation instead of as a process alarm. Each relay can be configured independently. Alarm logic (high or low activation) and deadband are user-programmable.

Terminal Connections Rating:

Power connector (3-leads); 24-12 AWG wire size.

Signal board terminal blocks; 26-16 AWG wire size.

Current output connectors (2-leads); 24-16 wire size.

Alarm relay terminal blocks: 24-12 AWG wire size.

RFI/EMI: EN-61326



LVD: EN-61010-1

Hazardous Location Approvals – Analyzer

CSA approvals:



Class I, Division 2, Groups A, B, C, & D

Class II, Division 2, Groups E, F, & G

Class III T4A Tamb= 50°C

Evaluated to the ANSI/UL Standards. The 'C' and 'US' indicators adjacent to the CSA Mark signify that the product has been evaluated to the applicable CSA and ANSI/UL Standards, for use in Canada and the U.S. respectively.

FM approvals:



Class I, Division 2, Groups A, B, C, & D

Class II & III, Division 2, Groups E, F, & G

T4 Tamp = -10 deg C to 60 deg C

Relays: Form C, single pole, double throw, epoxy sealed.

| Maximum Relay Current | |
|-----------------------|-----------|
| Power | Resistive |
| 28 VDC 5.0 A | 5.0 A |
| 115 VAC 5.0 A | 5.0 A |
| 230 VAC 5.0 A | 5.0 A |

Field wiring terminals: Removable terminal blocks for power, analog outputs, and sensors

Specifications - Sensor

Method: EPA 180.1 or ISO 7027 (using 860 nm LED source). Must be specified when ordering.

Incandescent lamp life: one year (EPA 180.1)

LED life: three years (ISO 7027)

Wetted materials: Delrin®, glass, EPDM

Accuracy after calibration at 20.0 NTU:

0 - 1 NTU: $\pm 2\%$ of reading or ± 0.015 NTU, whichever is greater.

0 - 20 NTU: $\pm 2\%$ of reading

NOTE: turbidity values of 2-200 NTU can be measured but frequent cleaning may be required to maintain turbidity measurements.

Cable: 20 ft (6.1 m) or 50 ft (15.2 m). Maximum 50 ft (15.2 m). Connector is IP65.

Maximum Pressure: 30 psig (308 kPa abs)

Temperature: 40 - 95°F (5 - 35°C)

Sensor body rating: IP65 when cable is connected

Specifications - General

Weight/shipping weight:

Sensor: 1 lb/2 lb (0.5 kg/1.0 kg)

Analyzer: 2 lb/3 lb (1.0 kg/1.5 kg)

Debubbler: 3 lb/4 lb (1.5 kg/2.0 kg)

(rounded to the nearest lb or 0.5 kg)

Specifications subject to change without notice.

Specifications - Debubbler and Flow Chamber

Dimensions: 18.1 in. x 4.1 in. diam. (460 mm x 104 mm diam.) (approx.)

Wetted materials: ABS, EPDM, Delrin¹, polypropylene, nylon

Inlet: Compression fitting accepts 1/4 in. OD tubing; fitting can be removed to provide 1/4 in. FNPT

Drain: Barbed fitting accepts 3/8 in. ID tubing; fitting can be removed to provide 1/4 in. FNPT. Must drain to atmosphere.

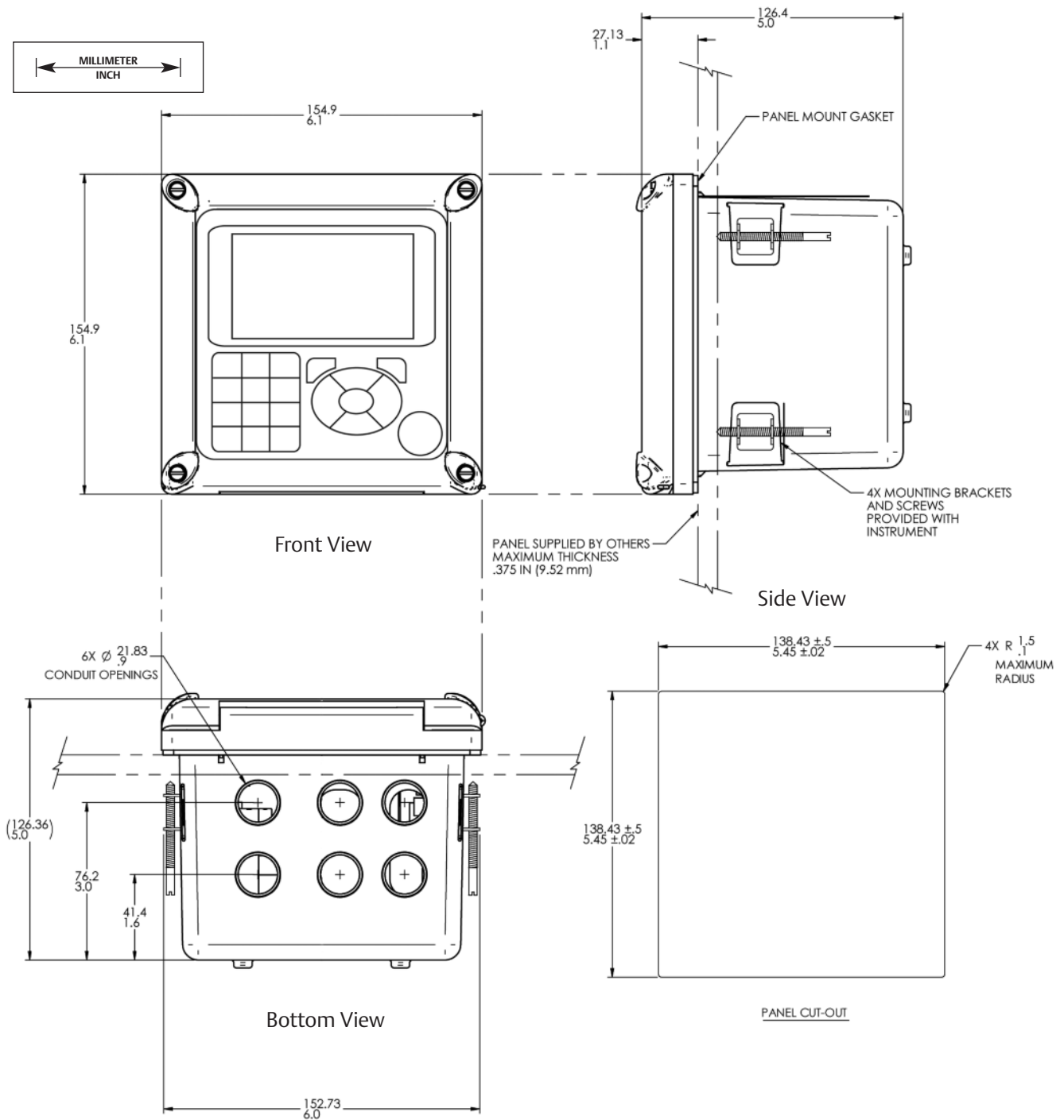
Sample temperature: 40 - 95°F (5 - 35°C)

Minimum inlet pressure: 3.5 psig (125 kPa abs). 3.5 psig will provide about 250 mL/min sample flow.

Maximum inlet pressure: 30 psig (308 kPa abs). Do not block drain tube.

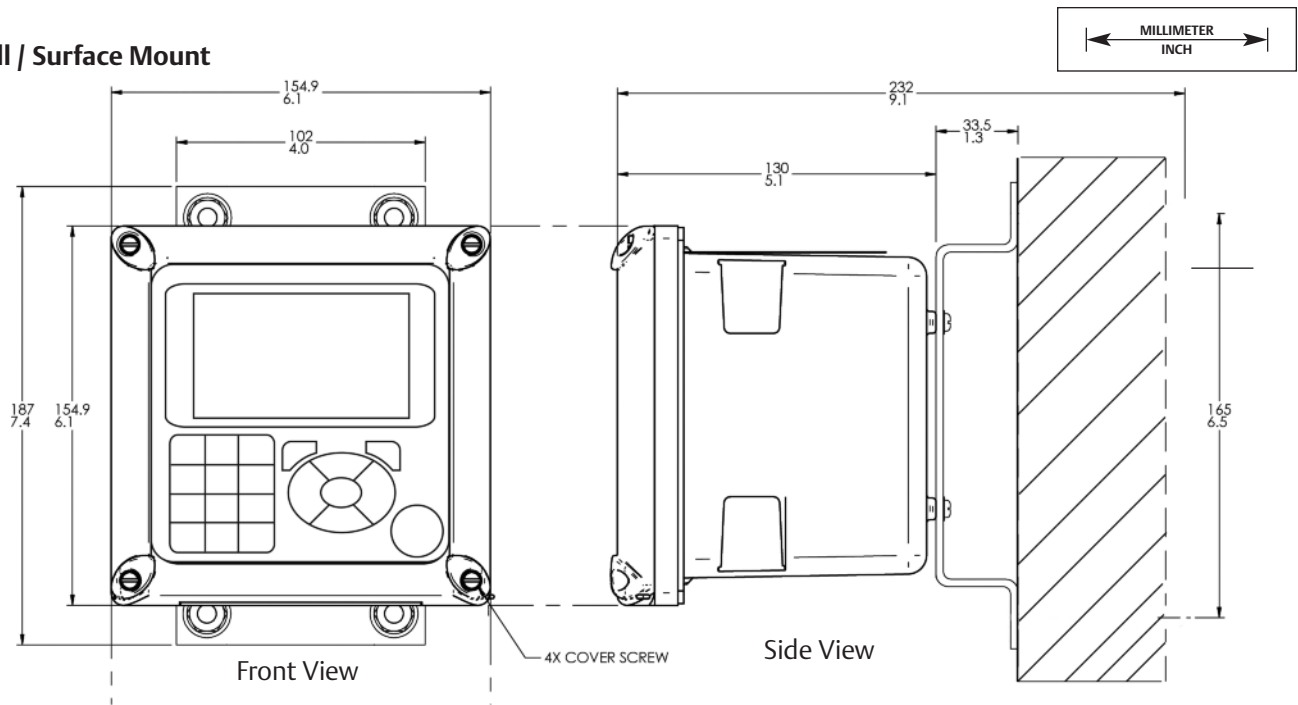
Recommended sample flow: 250 - 750 mL/min

¹ Delrin is a registered trademark of DuPont Performance Elastomers

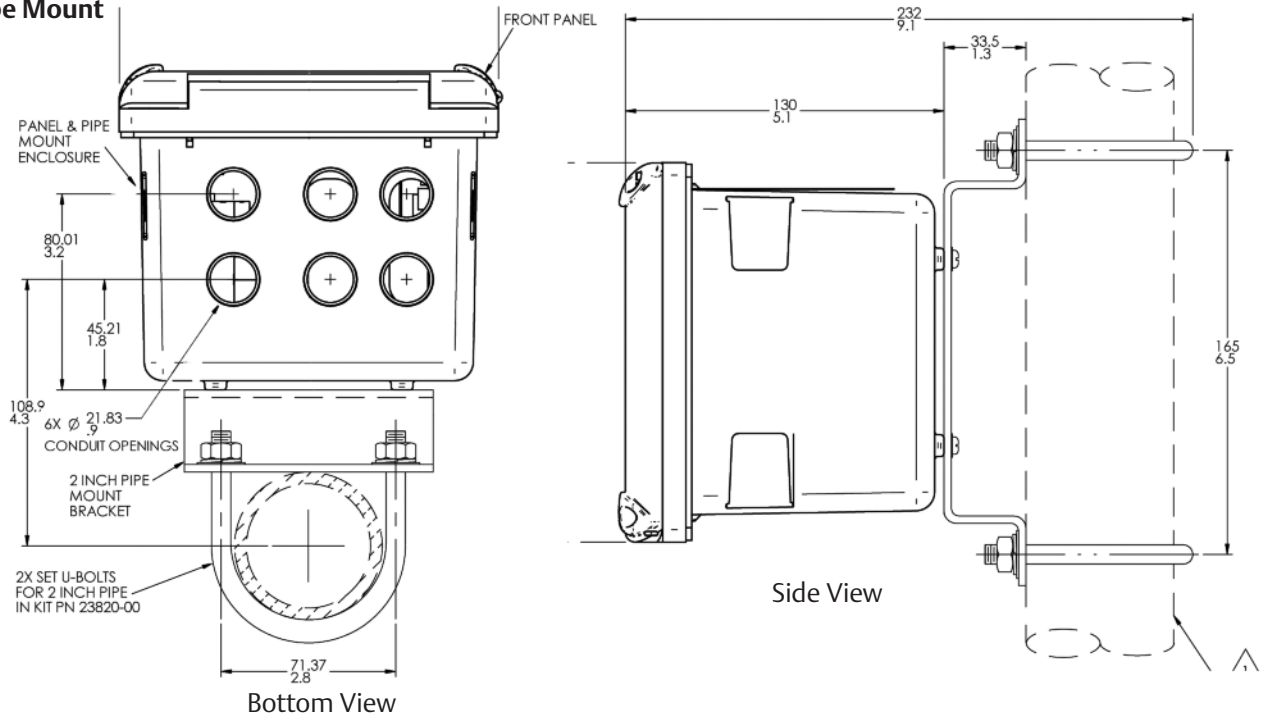


Panel mount dimensions. The front panel is hinged at the bottom. The panel swings down for easy access to the wiring locations.

Wall / Surface Mount

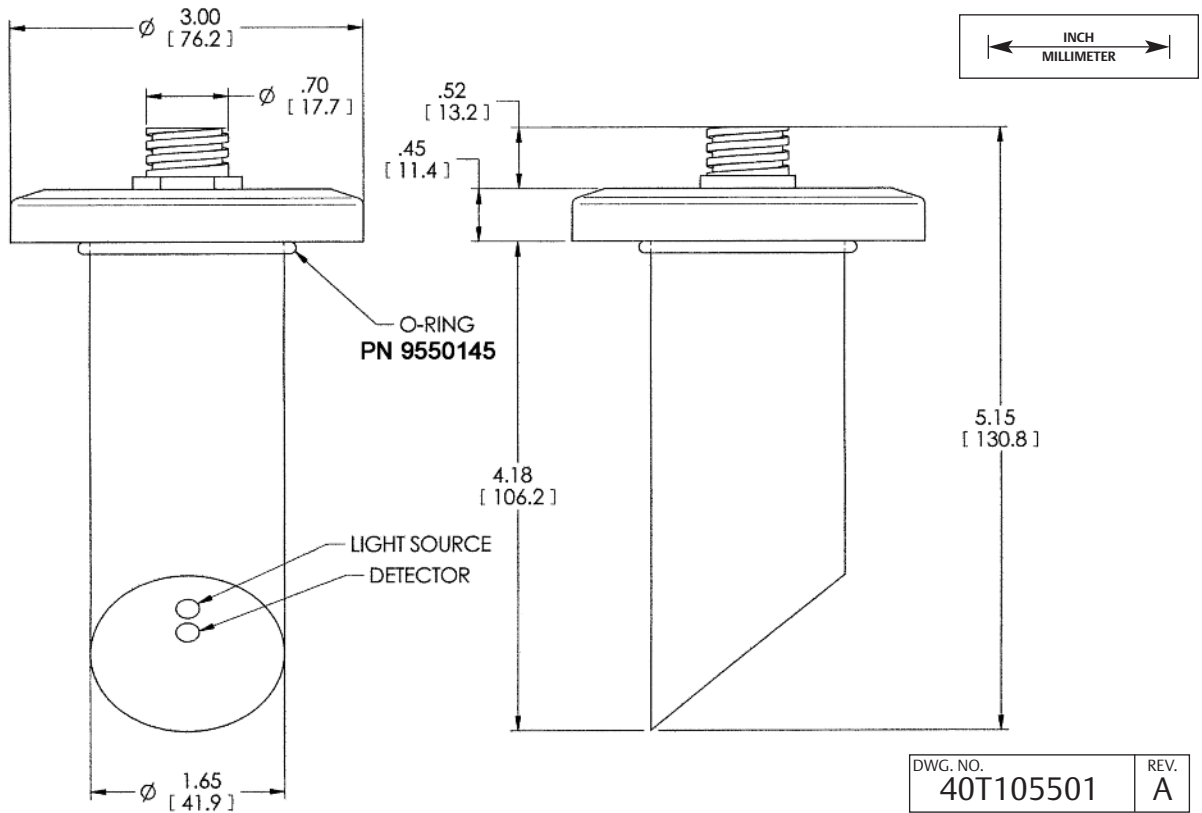


Pipe Mount

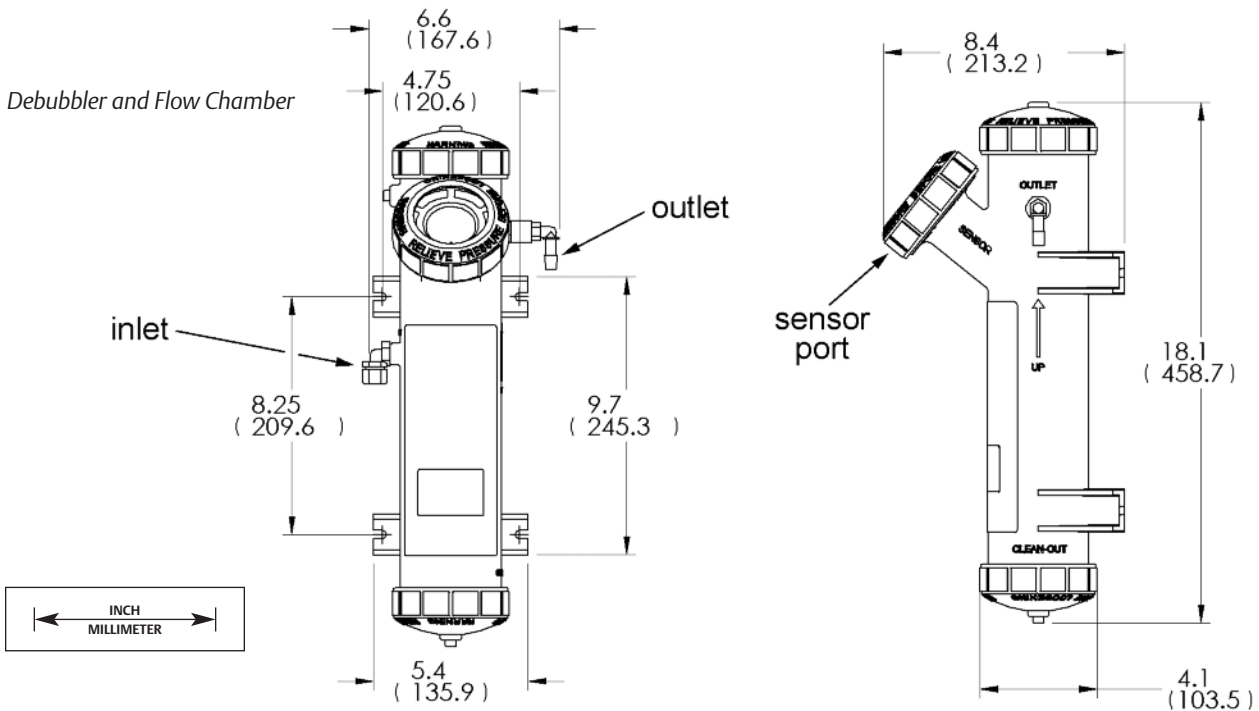


Pipe/Wall Mount dimensions (Mounting bracket PN:23820-00). The front panel is hinged at the bottom. The front panel is hinged at the bottom. The panel swings down for easy access to the wiring locations.

Turbidity Sensor



Debubbler and Flow Chamber



Sample Engineering Specification

CLARITY II ONLINE TURBIDIMETER (EPA or ISO)

TURBIDIMETER

1. The turbidimeter is a complete system consisting of sensor, analyzer, flow chamber/debubbler, and interconnecting cable. The analyzer accepts input from either one or two sensors. Both US EPA Method 180.1 and ISO Method 7027 sensors are available. The analyzer automatically recognizes which sensor is being used.
2. The turbidimeter has the following accuracy (after calibration with 20.0 NTU standard): 0 - 20 NTU: $\pm 2\%$ of reading or 0.015 NTU, whichever is greater
3. The response time at 4 gph (250 mL/min) to 90% of final value following a step change is 4.5 minutes.
4. The sensor is constructed of corrosion-resistant Delrin with glass lamp and detector windows.
5. Incandescent lamp life (US EPA-compliant sensor) is at least one year. LED life (ISO-compliant sensor) is at least three years.
6. The sensor includes advanced diagnostics, which will continuously measure the lamp intensity and automatically adjust the lamp output thereby maintaining the correct lamp intensity, correct for lamp drifting and aging, and allow for longer sensor operation with reduced calibration requirements.
7. The measuring chamber is constructed of ABS and Delrin. A bubble removal section allows entrained bubbles to escape from the sample before measurement.
8. The turbidimeter accepts a sample stream having temperature between 40 and 95°F (5 and 35°C) with inlet pressure as high as 30 psig (308 kPa abs) with drain to open atmosphere.
9. The sample chamber includes a two-stage removal of entrained bubbles and outgassed bubbles to prevent erroneous turbidity readings.
6. A user-defined security code is available to protect against accidental or unauthorized changes to program settings and calibration.
7. Bubble rejection, signal averaging, and output hold features are available.
8. The analyzer continuously monitors itself and the sensor for faults. The analyzer displays fault and warning messages when problems such as lamp/LED failure, weak lamp, or sensor failure are detected.
9. The single input and dual input analyzers have four current outputs. User-selectable 0-20 mA and 4-20 mA outputs are provided. Outputs are isolated with 550 ohm maximum load.
10. Four relays are standard. All alarms are fully programmable for high/low logic and deadband. All alarms can be configurable as fault alarms. Interval timers can be enabled.
11. Environmental limits for the analyzer are 32 to 131°F (0 to 55°C) and 5 to 90% relative humidity.
12. Interconnecting cable plugs into the sensor and analyzer. Integral cable or cable with fly leads are not permitted. Maximum cable length shall be 50 ft (15.2 m).
13. Field wiring terminal blocks for power, sensor and analog outputs are removable for ease of wiring.
14. The analyzer enclosure is Type 4X/CSA 4X and IP66, and the power requirements shall be in the range of 85 – 265 Vac, 47.5 – 65.0 Hz.
15. If so programmed, the analyzer converts measured turbidity to a total suspended solids (TSS) reading using a linear equation entered by the user. Units for TSS are user selectable among ppm, mg/L, or no units.
16. HART digital communications is included.

CALIBRATION

1. The analyzer offers three methods of Calibration: two-point slope calibration with de-ionized water and diluted Formazin, standard calibration to a commercial standard, and calibration to a grab sample measured on a reference turbidimeter.
2. A maximum of 300 mL of calibration standard is required to calibrate the analyzer.
3. Accessories, unless noted: Calibration Cup, Cal kits with Formazin.

The Clarity II Turbidimeter includes a one-year factory warranty.

The system will include a Rosemount Analytical T56 Clarity II turbidimeter or approved equal.

ANALYZER

1. The analyzer features a large color back-lit display.
2. The analyzer measures turbidity in the range 0 to 5 NTU with a display resolution of 0.001 NTU. Display units are user selectable among NTU, FTU, and FNU.
3. The analyzer displays menu items and prompts in a language selected by the user. The languages are English, German, French, Spanish, Italian, Portuguese, Chinese, Russian and Polish.
4. The analyzer allows direct button key access to comprehensive diagnostics from the main display screen.
5. The analyzer allows the user to customize the readouts on the main display screen.

Ordering Information

The **Clarity II** is a complete system for the determination of turbidity in water. It consists of an analyzer and one or two sensors with a debubbler/measuring chamber assembly and a cable for each sensor. Four alarm relays are standard. A calibration cup is available as an option. Because a sensor cannot be calibrated without a calibration cup, at least one cup must be ordered. Calibration standard (formazin or polymer spheres) must be ordered as a separate item.

| T56 TURBIDITY SYSTEM | |
|----------------------|--|
| CODE | Sensor |
| 01 | EPA Sensor |
| 02 | ISO Sensor |
| 40 | Two EPA Sensors |
| 41 | Two ISO Sensors |
| CODE | Measuring Chamber |
| 10 | Debubbler Flow Chamber (required -01, -02) |
| 60 | Two Debubbler flow Chambers (required -40, -41) |
| CODE | Sensor Cable |
| 20 | 20' (6.1 m) cable |
| 21 | 50' (15.2 m) cable |
| 50 | Two 20' (6.1 m) cables |
| 51 | Two 50' (15.2 m) cables |
| 23 | One 20' (6.1 m) cable, One 50' (15.2 m) cable |
| CODE | Instrument |
| 30 | Single Input Turbidity instrument (56-03-27-38-HT) (required -01, -02) |
| 31 | Dual Input Turbidity instrument (56-03-27-37-HT) (required -40, -41) |
| CODE | Optional Option |
| 71 | Calibration cup (recommended for calibration) |

Ordering Example With Codes: T56 -01 -10 -20 -30

Accessories

| PN | DESCRIPTION | WEIGHT | SHIPPING WT |
|-----------------|--|-----------------|---------------|
| 23554-00 | Cable Gland Kit for 54e, XMT, 1055, 1056, 56, Quantity 5 | 1 lb (0.5 kg) | 2 lb (1.0 kg) |
| 23820-00 | Pipe mounting kit, includes U-bolts, mounting bracket, nuts, washers, and screws | 2 lb (1.0 kg) | 4 lb (2.0 kg) |
| 23820-01 | 2" Pipe Mounting Bracket, Stainless Steel | 2 lb (1.0 kg) | 4 lb (2.0 kg) |
| 24101-00 | Calibration cup | 1 lb (0.5 kg) | 2 lb (1.0 kg) |
| 24138-00 | Sensor cable, turbidity, 3' | 1 lb (0.5 kg) | 2 lb (1.0 kg) |
| 8-0108-0002-EPA | Replacement sensor, US EPA-compliant | 1 lb (0.5 kg) | 2 lb (1.0 kg) |
| 8-0108-0003-ISO | Replacement sensor, ISO-compliant | 1 lb (0.5 kg) | 2 lb (1.0 kg) |
| 24103-00 | Flowmeter kit, includes valved rotameter and fittings | 1 lb (0.5 kg) | 1 lb (0.5 kg) |
| 9240048-00 | Tag, stainless steel, specify markings | .1 lb (0.05 kg) | 1 lb (0.5 kg) |
| 9550145 | O-ring for sensor, external, fits molded debubbler | .1 lb (0.05 kg) | 1 lb (0.5 kg) |
| 24170-00 | Molded debubbler with integral flow chamber | 3 lb (1.5 kg) | 4 lb (2.0 kg) |
| 9550322 | O-ring for upper and lower debubbler caps | .1 lb (0.05 kg) | 1 lb (0.5 kg) |
| 1-0901-0009-EPA | Replacement lamp board kit, EPA | .1 lb (0.05 kg) | 1 lb (0.5 kg) |
| 1-0901-0010-ISO | Replacement lamp board kit, ISO | .1 lb (0.05 kg) | 1 lb (0.5 kg) |

Calibration Standards

| PN | DESCRIPTION | WEIGHT | SHIPPING WT |
|------------|--|---------------|---------------|
| 060-761855 | Calibration kit (includes 4000 NTU formazin standard, pipet, pipet bulb, and volumetric flask) | 1 lb (0.5 kg) | 2 lb (1.0 kg) |
| 905-761854 | Formazin standard, 4000 NTU, 125 mL | 1 lb (0.5 kg) | 1 lb (0.5 kg) |

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