

# 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  $\pm 0.015$  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, Delrin<sup>1</sup>, 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.

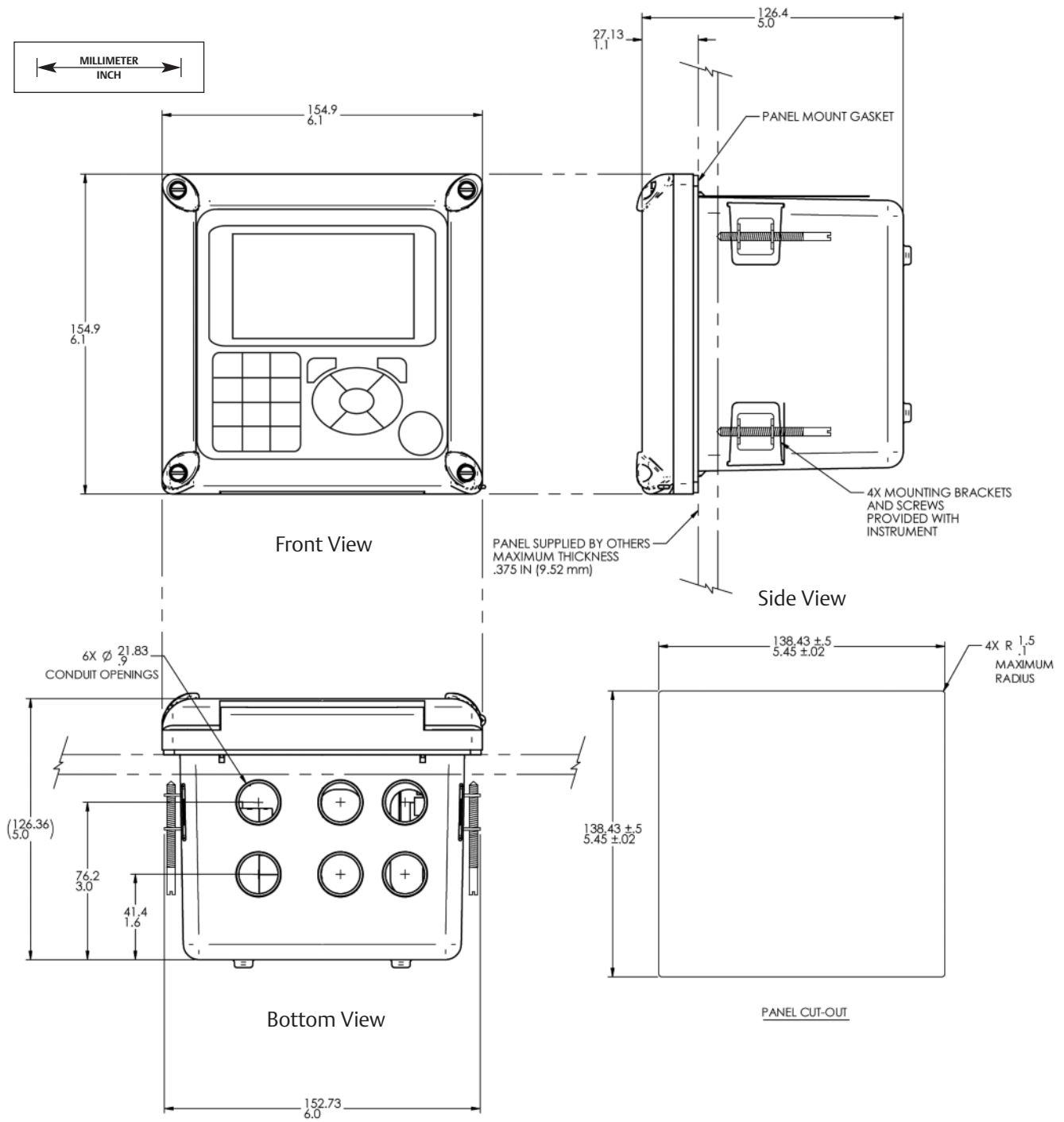
**Sample temperature:** 40 - 95°F (5 - 35°C)

**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.

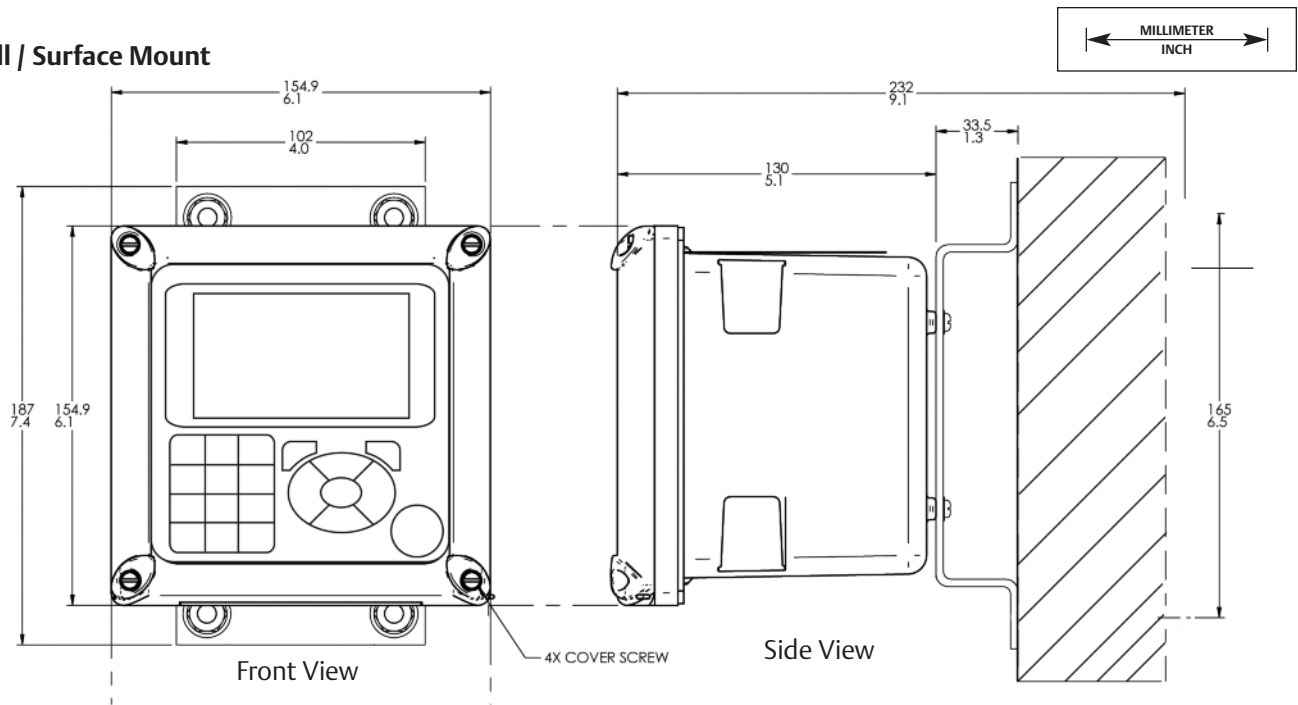
**Recommended sample flow:** 250 - 750 mL/min

<sup>1</sup> Delrin is a registered trademark of DuPont Performance Elastomers

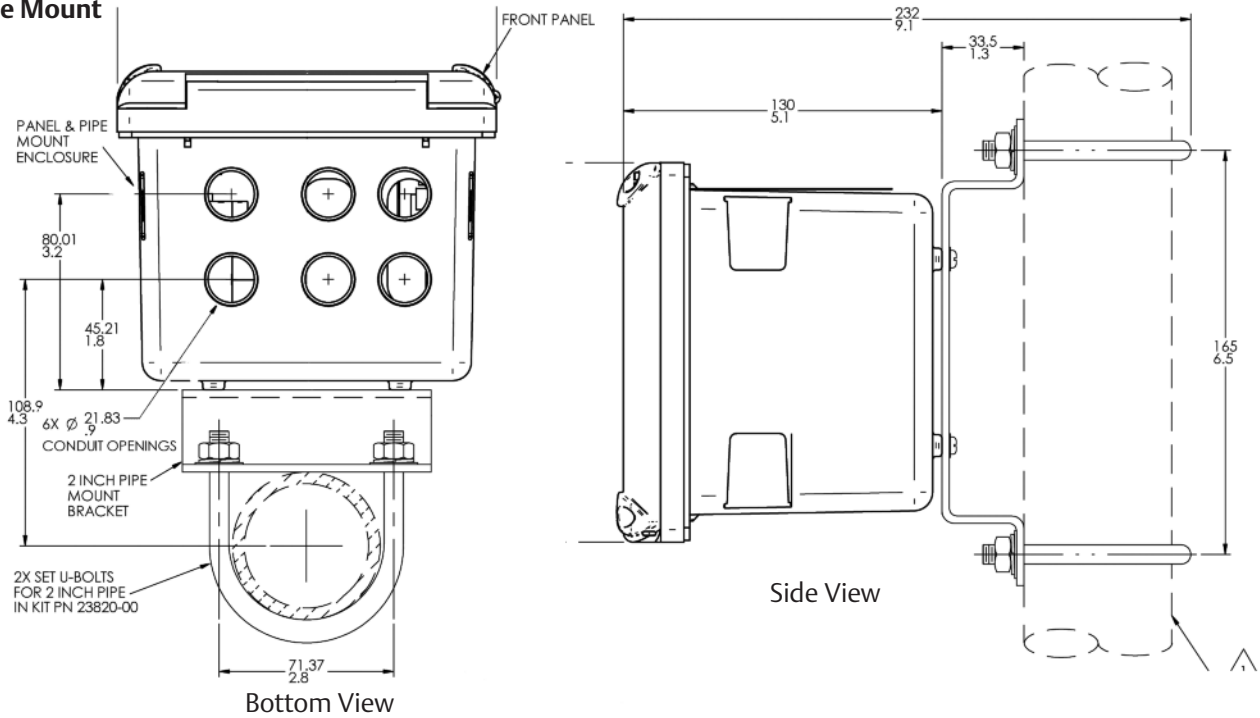


Panel mount dimensions. The front panel is hinged at the bottom. The panel swings down for easy access to the wiring locations.

**Wall / Surface Mount**

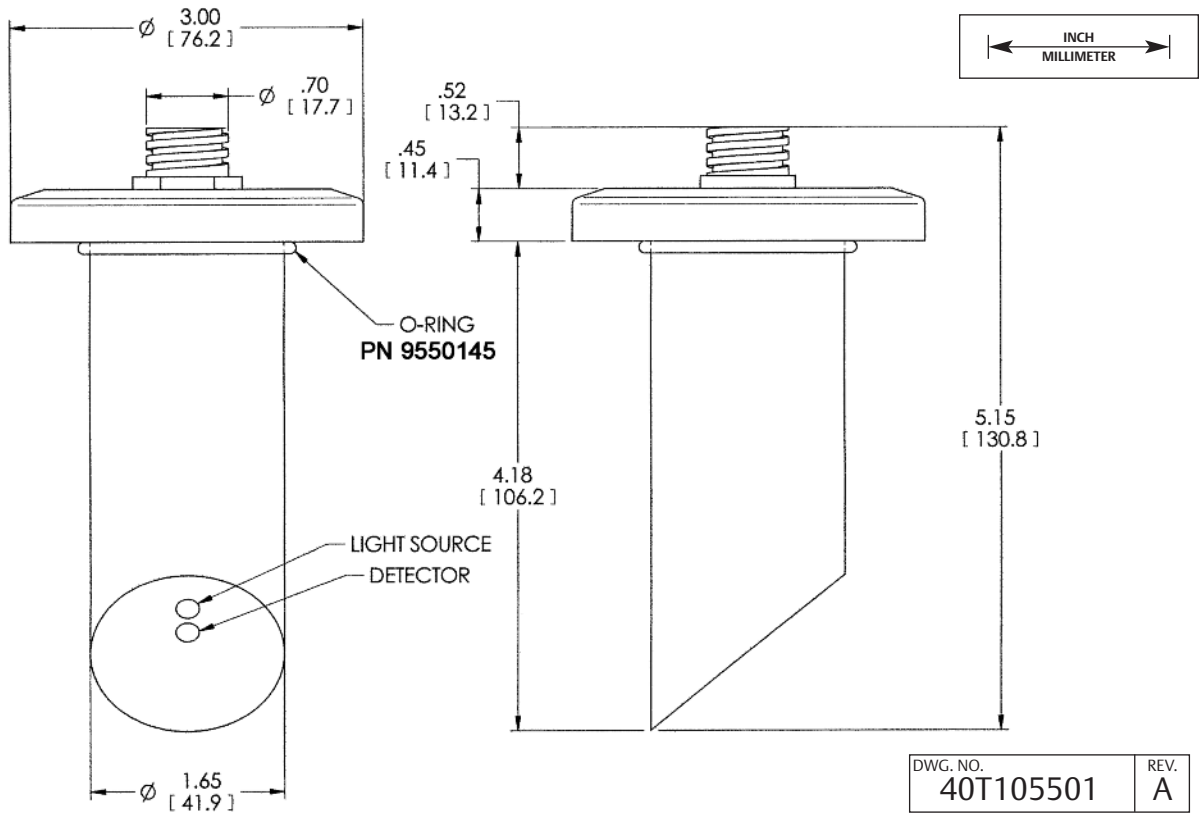


**Pipe Mount**

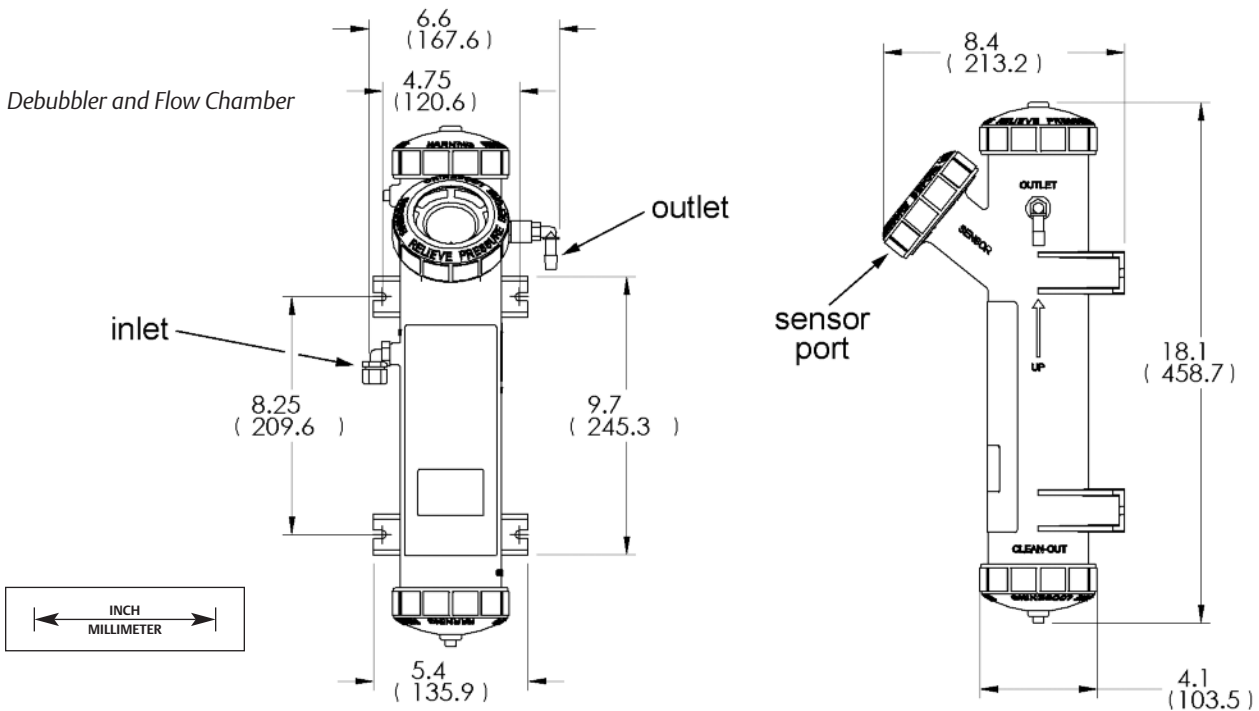


Pipe/Wall Mount dimensions (Mounting bracket PN:23820-00). The front panel is hinged at the bottom. The front panel is hinged at the bottom. The panel swings down for easy access to the wiring locations.

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)

*This page left intentionally blank*

*This page left intentionally blank*

 [facebook.com/EmersonRosemountAnalytical](https://facebook.com/EmersonRosemountAnalytical)

 [AnalyticExpert.com](http://AnalyticExpert.com)

 [twitter.com/RAIhome](https://twitter.com/RAIhome)

 [youtube.com/user/RosemountAnalytical](https://youtube.com/user/RosemountAnalytical)



Credit Cards for U.S. Purchases Only.



### Emerson Process Management

2400 Barranca Parkway  
Irvine, CA 92606 USA  
Tel: (949) 757-8500  
Fax: (949) 474-7250  
[rosemountanalytical.com](http://rosemountanalytical.com)

© Rosemount Analytical Inc. 2014

©2014 Rosemount Analytical, Inc. All rights reserved.

The Emerson logo is a trademark and service mark of Emerson Electric Co. Brand name is a mark of one of the Emerson Process Management family of companies. All other marks are the property of their respective owners.

The contents of this publication are presented for information purposes only, and while effort has been made to ensure their accuracy, they are not to be construed as warranties or guarantees, express or implied, regarding the products or services described herein or their use or applicability. All sales are governed by our terms and conditions, which are available on request. We reserve the right to modify or improve the designs or specifications of our products at any time without notice.

**ROSEMOUNT**<sup>®</sup>  
Analytical

  
**EMERSON**<sup>™</sup>  
Process Management