

# 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 MODEL 1056 ANALYZER with two analog outputs and four programmable alarm relays
- INTUITIVE, USER-FRIENDLY MENU in seven languages makes setup and calibration easy
- HART® DIGITAL COMMUNICATIONS - available

*Clarity II is a trademark of Emerson Process Management.*



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

The Clarity II turbidimeter consists of an analyzer, which accepts either one or two signal input boards, sensors, 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 Model 1056 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.

## 1.2 SPECIFICATIONS — ANALYZER

**Enclosure:** Polycarbonate. Type 4X/CSA 4 (IP65)  
**Dimensions:** Overall 155 X 155 X 131 mm (6.10 X 6.10 X 5.15 in.) Cutout: 1/2 DIN 139mm (5.45 x 5.45 in.)  
**Conduit openings:** Accepts 1/2" or PG 13.5 conduit fittings.  
**Display:** Monochromatic graphic liquid crystal display. 128 x 96 pixel display resolution. Backlit. Active display area: 58 x 78mm (2.3 x 3.0 in.)  
**Security Code:** 3-digit code prevents accidental or unauthorized changes in instrument settings and calibration.  
**Languages:** English, German, Spanish, Italian, French, Portuguese, Chinese.  
**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 50°C, (32 to 122°F); RH 5 to 95% (non-condensing)  
**Altitude:** For use up to 2000 meters.  
**Storage Temperature Effect:** -20 to 60°C, (-4 to 140°F)  
**Power:** Ordering code -02:20-30VDC 15W min. input power -03:85 to 265 VAC, 47.5 to 65.0 Hz. 15W min. input power.


Equipment protected by double insulation.

**Input:** One or two isolated sensor inputs  
**Outputs:** Two 4-20 mA or 0-20 mA isolated current outputs. Fully scalable. Maximum load: 550 ohm. Output 1 has superimposed HART signal (options -32, -33 only)  
**Current Output Accuracy:** ±0.05 mA @25°C  
**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 -

Options for CSA: -01, 02, 03, 20, 21, 22, 24, 25, 26, 27, 30, 31, 32, 34, 35, 36, 37, 38, AN, and HT.

 -LR 34186 Class I, Division 2, Groups A, B, C, & D  
 C US 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

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



Maximum Relay Current		
	Resistive	Inductive
28 Vdc	5.0 A	3.0 A
115 Vac	5.0 A	3.0 A
230 Vac	5.0 A	1.5 A

## CAUTION

### RISK OF ELECTRICAL SHOCK

**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  
**LED life:** three years  
**Wetted materials:** Delrin<sup>1</sup>, glass, EPDM  
**Accuracy after calibration at 20.0 NTU:**  
 0 - 1 NTU: ±2% of reading or ±0.015 NTU, whichever is greater.  
 0 - 20 NTU: ±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 — 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  
**Response Time:** The table shows the time in minutes to percent of final value following a step change in turbidity.

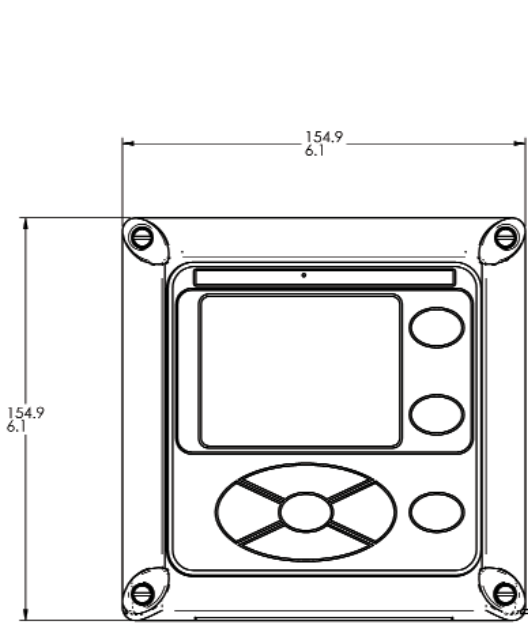
<sup>1</sup>Delrin is a registered trademark of DuPont Performance Elastomers.

## SPECIFICATIONS — MISCELLANEOUS

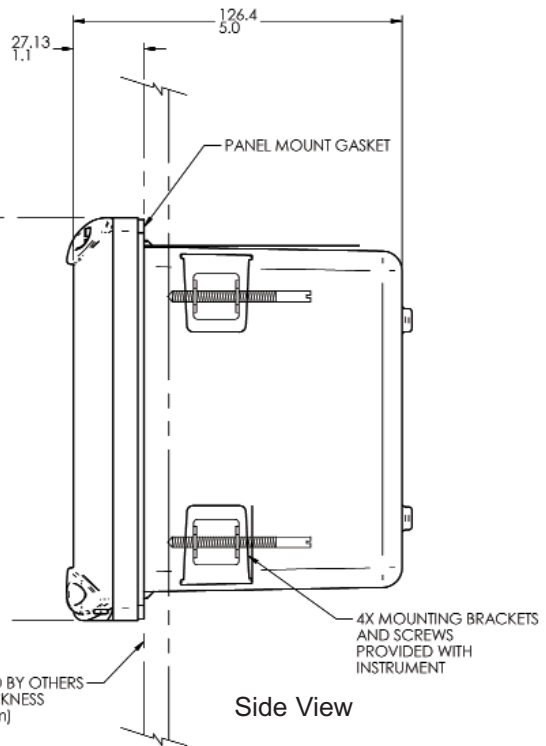
**Weight/shipping weight:**  
 Sensor: 1 lb/2 lb (0.5 kg/1.0 kg)  
 Analyzer: 2 lb/3 lb (1.0 kg/1.5 kg)  
 Debubbler: 3 lb/4 lb (1.5 kg/2.0 kg)  
 (rounded to the nearest lb or 0.5 kg)

Specifications subject to change without notice.

# PANEL MOUNT DIMENSIONS

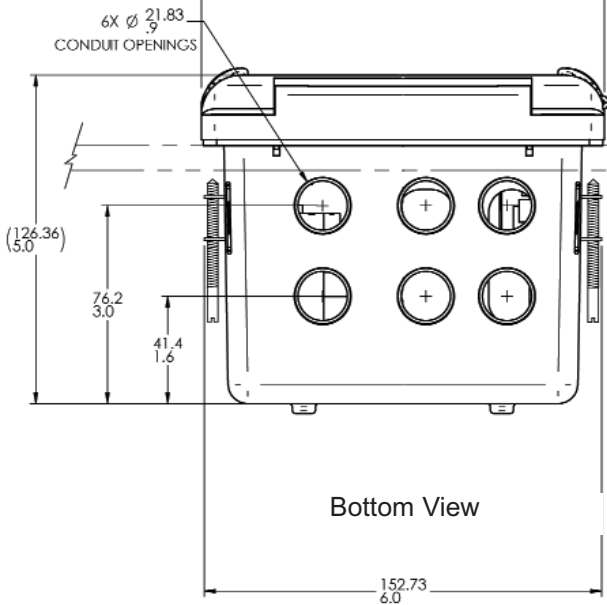


Front View

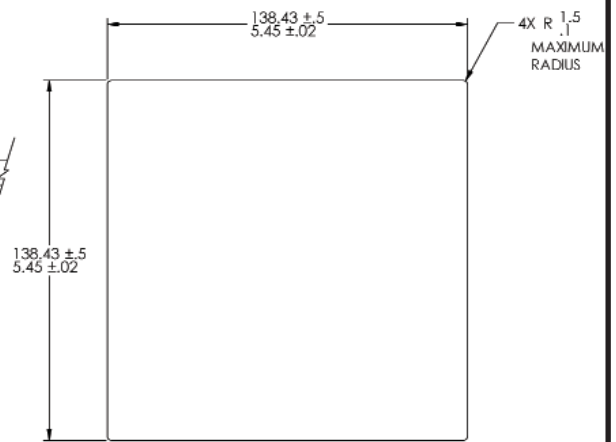


Side View

SIDE VIEW



Bottom View



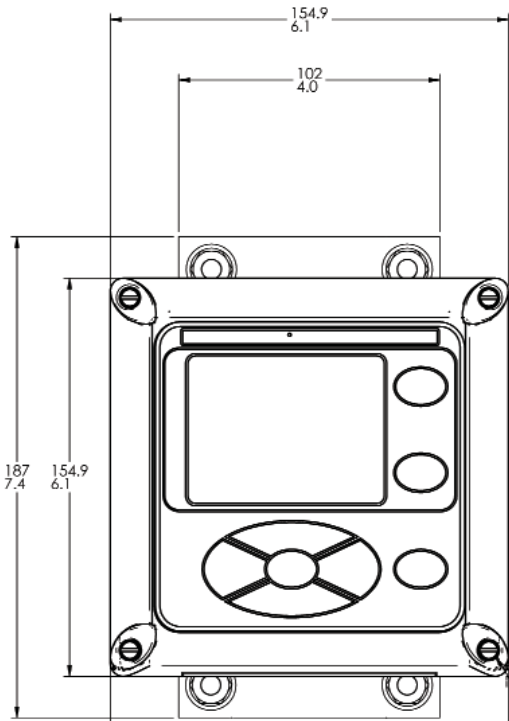
PANEL CUT-OUT

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

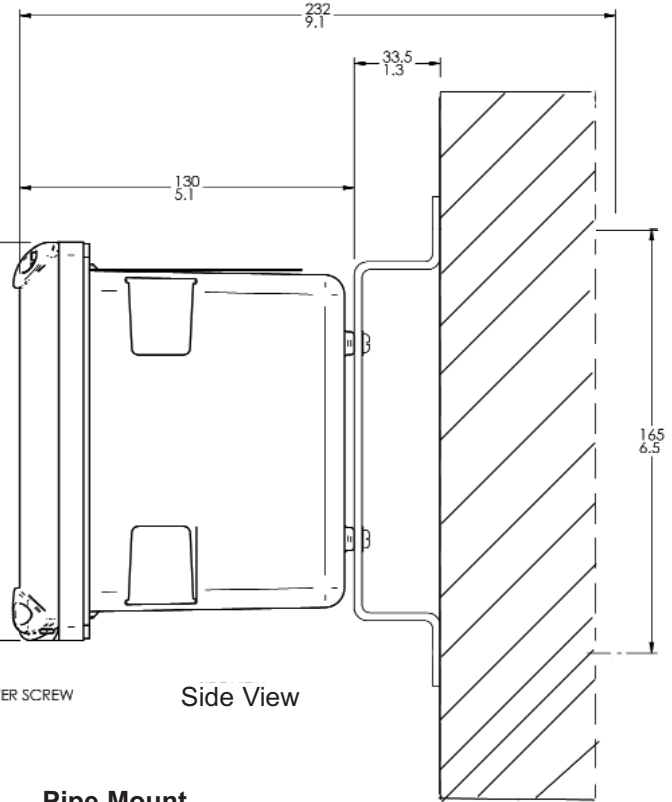
# PIPE/ WALL MOUNT DIMENSIONS (Mounting bracket PN:23820-00)



## Wall / Surface Mount

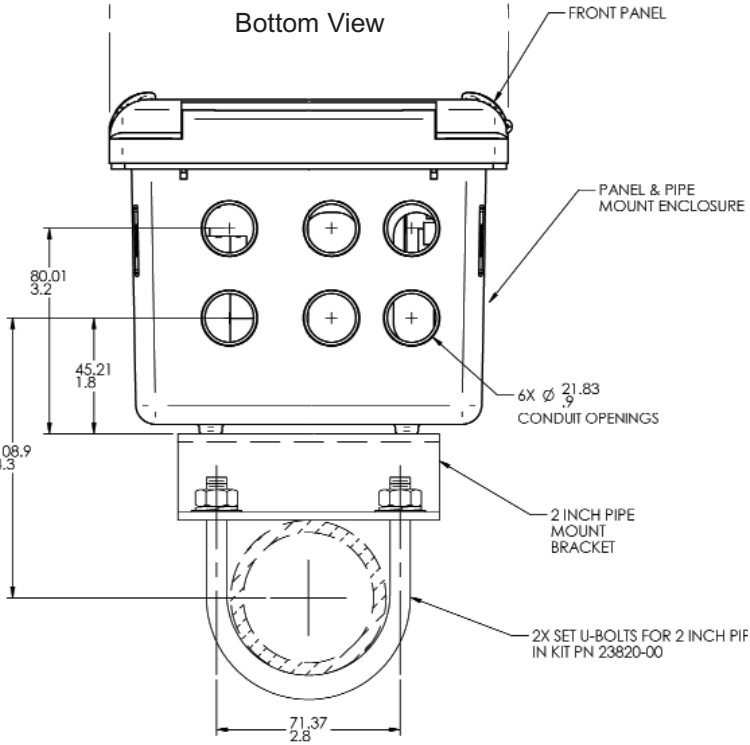


Front View

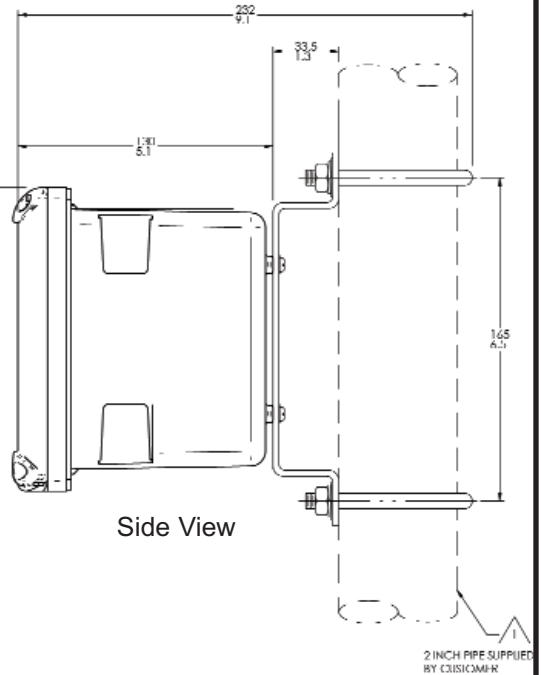


Side View

## Pipe Mount

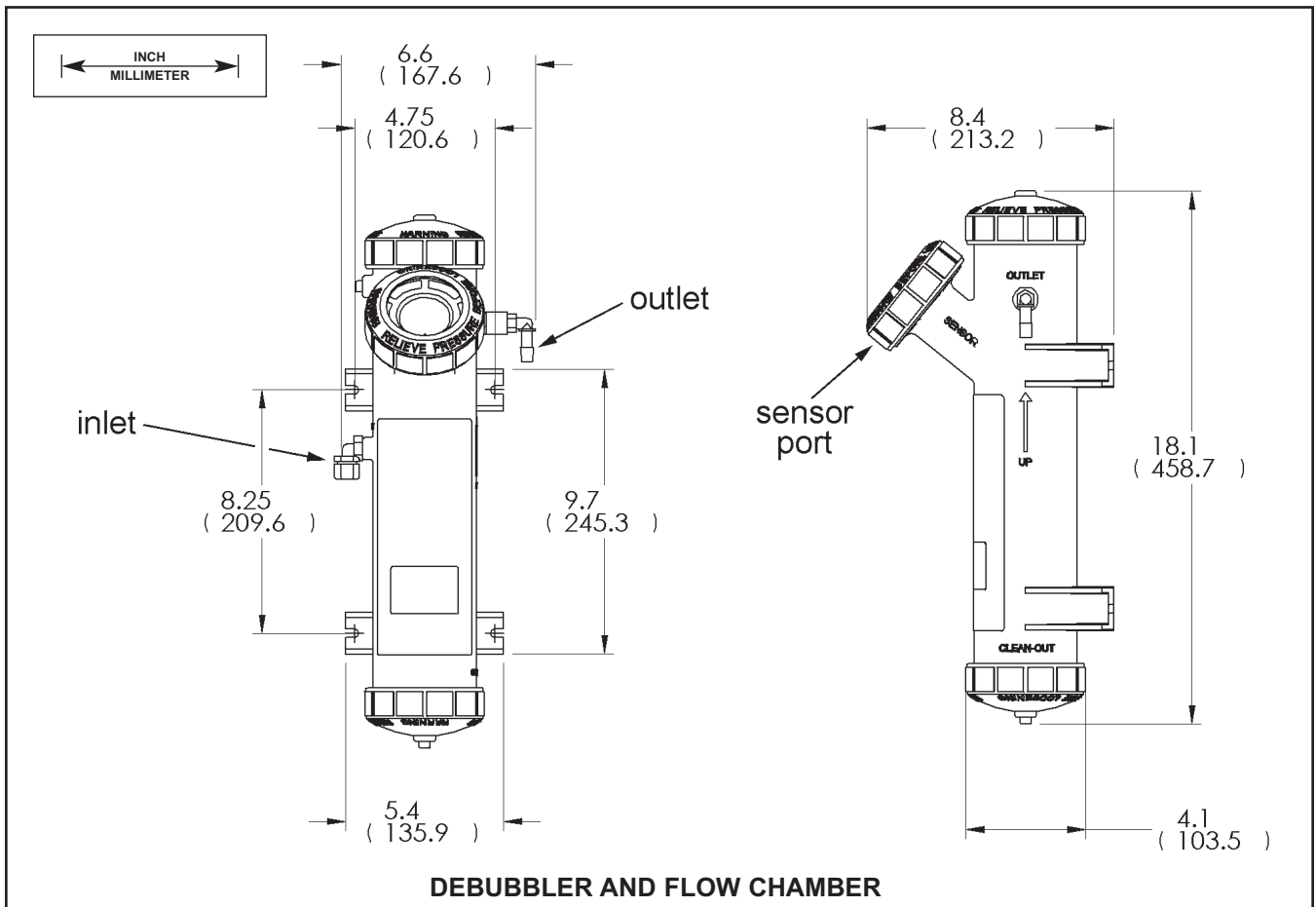
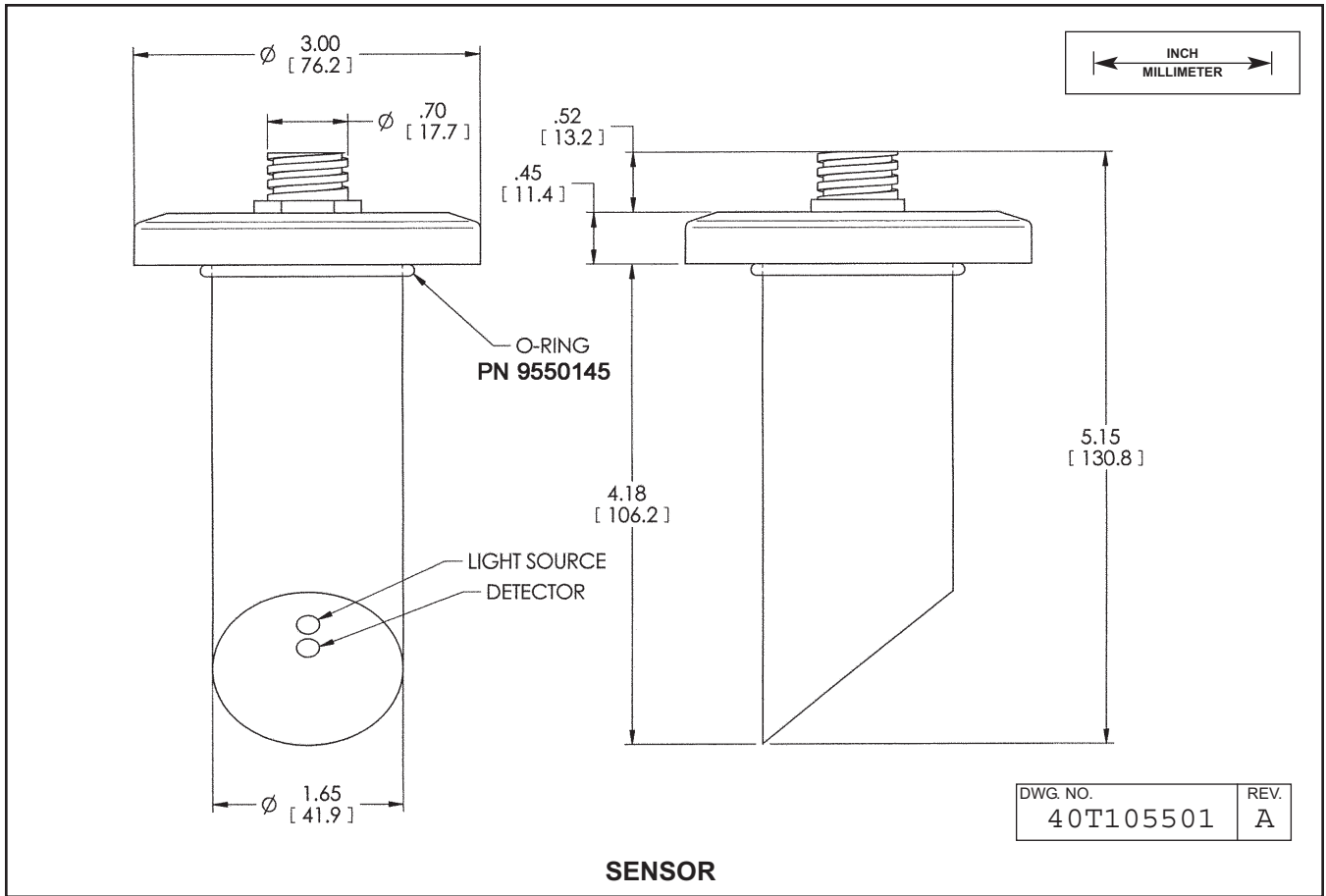


BOTTOM VIEW



Side View

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



# SAMPLE ENGINEERING SPECIFICATION

## CLARITY II ONLINE TURBIDIMETER (EPA or ISO)

### TURBIDIMETER

1. The turbidimeter shall be a complete system consisting of sensor, analyzer, flow chamber/debubbler, and interconnecting cable. The analyzer shall accept input from either one or two sensors. Both USEPA Method 180.1 and ISO Method 7027 sensors shall be available. The analyzer shall automatically recognize which sensor is being used.
2. The turbidimeter shall have the following accuracy (after calibration with 20.0 NTU standard): a) 0 - 5 NTU:  $\pm 2\%$  of reading or 0.015 NTU, whichever is greater; b) 0 - 20 NTU:  $\pm 2\%$  of reading
3. The response time at 4 gph (250 mL/min) to 90% of final value following a step change shall be 4.5 minutes.
4. The sensor shall be constructed of corrosion-resistant Delrin with glass lamp and detector windows.
5. Incandescent lamp life (USEPA-compliant sensor) shall be at least one year. LED life (ISO-compliant sensor) shall be at least three years.
6. The sensor shall include 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 shall be constructed of ABS and Delrin. A bubble removal section shall allow entrained bubbles to escape from the sample before measurement.
8. The turbidimeter shall accept 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 shall include a two-stage removal of entrained bubbles and outgassed bubbles to prevent erroneous turbidity readings.
6. A user-defined security code shall be available to protect against accidental or unauthorized changes to program settings and calibration.
7. Bubble rejection, signal averaging, and output hold features shall be available.
8. The analyzer shall continuously monitor itself and the sensor for faults. The analyzer shall display 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 shall have two current outputs, and the dual input analyzer shall have dual output. User-selectable 0-20 mA and 4-20 mA outputs shall be provided. Outputs shall be isolated with 550 ohm maximum load.
10. Four relays are standard. All alarms shall be fully programmable for high/low logic and deadband. All alarms can be configurable as a fault alarms. Interval timers can be enabled.
11. Environmental limits for the analyzer shall be 32 to 122°F (0 to 50°C) and 10 to 90% relative humidity.
12. Interconnecting cable shall plug into the sensor and analyzer. Integral cable or cable with fly leads shall not be permitted. Maximum cable length shall be 50 ft (15.2 m).
13. Field wiring terminal blocks for power, sensor and analog outputs shall be removable for ease of wiring.
14. The analyzer enclosure shall be Type 4X/CSA 4 (IP65), and the power requirements shall be in the range of 85 – 265 Vac, 47.5 – 65.0 Hz or 20-30 VDC.
15. If so programmed, the analyzer shall convert measured turbidity to a total suspended solids (TSS) reading using a linear equation entered by the user. Units for TSS shall be user selectable among ppm, mg/L, or no units.
16. HART digital communications shall be available as an ordering option.

### ANALYZER

1. The analyzer shall have a large back-lit display.
2. The analyzer shall measure turbidity in the range 0 to 5 NTU with a display resolution of 0.001 NTU. Display units shall be user selectable among NTU, FTU, and FNU.
3. The analyzer shall display menu items and prompts in a language selected by the user. The languages shall be English, German, French, Spanish, Italian, Portuguese and Chinese.
4. The analyzer shall allow direct button key access to comprehensive diagnostics from the main display screen.
5. The analyzer shall allow the user to customize the read-outs on the main display screen.

### CALIBRATION

1. The analyzer shall offer 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 shall be required to calibrate the analyzer.
3. Accessories, unless noted: Calibration Cup, Cal kits with Formazin.

The Clarity II Turbidimeter shall include a one-year factory warranty.

The analyzer shall be Rosemount Analytical Model 1056 Clarity II turbidimeter or approved equal.

## 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.

<b>MODEL T1056 TURBIDITY SYSTEM</b>	
<b>CODE</b>	<b>Sensor</b>
01	EPA Sensor
02	ISO Sensor
40	Two EPA Sensors
41	Two ISO Sensors
<b>CODE</b>	<b>Measuring Chamber</b>
10	Debubbler Flow Chamber (required -01, -02)
60	Two Debubbler flow Chambers (required -40, -41)
<b>CODE</b>	<b>Sensor Cable</b>
20	20' (6.1 m) cable (required -01, -02)
21	50' (15.2 m) cable (required -01, -02)
50	Two 20' (6.1 m) cables (required -40, -41)
51	Two 50' (15.2 m) cables (required -40, -41)
23	One 20' (6.1 m) cable, One 50' (15.2 m) cable (required -40, -41)
<b>CODE</b>	<b>Instrument</b>
30	Single Input Turbidity instrument (1056-03-27-38-AN) (required -01, -02)
31	Dual Input Turbidity instrument (1056-03-27-37-AN) (required -40, -41)
32	Single Input/HART Turbidity instrument (1056-03-27-38-HT) (required -01, -02)
33	Dual Input/HART Turbidity instrument (1056-03-27-37-HT) (required -40, -41)
<b>CODE</b>	<b>Optional Option</b>
71	Calibration cup (recommended for calibration)
<b>T1056</b>	<b>-01 -10 -20 -30 EXAMPLE</b>

## ACCESSORIES

<b>PN</b>	<b>DESCRIPTION</b>	<b>WEIGHT</b>	<b>SHIPPING WT</b>
23554-00	Cable Gland Kit for Model 54e, XMT, 1055, 1056, 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, USEPA-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)
1-901-0010-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)



*The right people,  
the right answers,  
right now.*

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*Specifications subject to change without notice.*



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