

4000TOC Sensor



THORNTON

Leading Pure Water Analytics

4000TOC Sensor

- Fast, continuous measurements
- No reagents or chemicals needed
- No moving parts
- Meets USP <643>, <645>, Ch P, EP 2.2.44, and JP requirements
- Compact wall-mount sensor design/NEMA 4X enclosure for skid mounting

Continuous On-Line Measurement Total Organic Carbon Monitoring

METTLER TOLEDO

Features

- On-line continuous measurement for fastest response
- Advanced UV lamp design extends stability and wavelength emission over lamp life
- Sample Conditioning Coil (included) can prevent CO₂ permeation into the water sample and will stabilize inlet flow, pressure and temperature irregularities
- Local LED Sensor status indication

Benefits

- Continuous flow design provides rapid detection of system changes
- No gases or reagents to handle, store or replace and no moving parts minimize routine maintenance and service intervals
- Plug and measure sensor design reduces installation and setup time
- Real-time continuous monitoring for precise data trending and better process control
- Wide dynamic operating range meets the needs of pure and ultrapure water applications
- Meets USP (643), (645), EP 2.2.44, Ch.P and JP requirements for the Pharmaceutical Industry
- Sensor platform allows easy integration into water purification make-up and distribution system designs
- Compact NEMA 4X rated enclosure for demanding industrial environments
- Meets ASTM D5173 standard test method for on-line TOC monitoring
- Conductivity/temperature sensor and measurements traceable to NIST and ASTM D1125 and D5391

Measurement technology - UV Oxidation / Differential Conductivity

The 4000TOC Sensor uses proven ultraviolet oxidation with differential conductivity as the method to effectively determine TOC concentrations. High performance Thornton conductivity sensors provide continuous conductivity measurement before and after sample oxidation. This is accomplished using a continuous flow-through spiral quartz tube design that allows the sample to flow continuously through the sensor. This design maximizes exposure to the 185 nanometer UV light, while minimizing measurement response time. This simple and effective design requires no reagents or chemicals and includes no moving mechanical components.

Applications

Pure and Ultrapure water production requires monitoring of organic contamination throughout the treatment process. The 4000TOC Sensor provides continuous, fast, and reliable monitoring of TOC levels from post RO waters to point-of-use. With continuous on-line measurements, the 4000TOC Sensor ensures TOC excursions will not be missed.

Pharmaceutical-grade waters must meet strict water quality requirements. This highly regulated industry mandates the monitoring of Total Organic Carbon levels for PW (Purified Water), WFI (Water for Injection) and HPW (Highly Purified Water). The instruments used in this application must also undergo periodic testing to verify the ability to accurately measure TOC. Testing requirements are described in the USP Chapter (643), EP 2.2.44, Ch.P and JP. The 4000TOC Sensor provides the performance needed to meet these requirements, and USP (645) for conductivity, while offering added benefits such as continuous on-line measurement in a low-maintenance, industrial package. The 4000TOC Sensor can operate at elevated temperatures to 100°C, where steam and periodic hot water sanitizing is required.

Recycle and reclaim applications take advantage of the fast analysis time. The 4000TOC Sensor provides continuous monitoring, not lengthy batch cycles. This provides the system operator with time to respond to TOC excursions caused by process variability.

Power generation makeup water treatment – from reverse osmosis to demineralizers, the 4000TOC Sensor provides fast reliable monitoring of TOC contamination in the water system. Organic contamination can be detected before it enters the steam cycle where its breakdown to organic acids can accelerate corrosion.

Product Support

The following 4000TOC products and services are also available:

- Factory Instrument Calibration
- Customized Hands-On-Training
- Service and Calibration Contracts
- System Suitability Testing
- On-Site Calibration

Please contact your local Mettler-Toledo Thornton office for more information.

4000TOC Performance Specifications

TOC Sensor	
Measurement Range	0.05 - 1000 ppbC ($\mu\text{gC/L}$)
Accuracy	± 0.1 ppb C for TOC < 2.0 ppb (for water quality > 15 $\text{M}\Omega\text{-cm}$ [.067 $\mu\text{S/cm}$]) ± 0.2 ppb C for TOC > 2.0 ppb and < 10.0 ppb (for water quality > 15 $\text{M}\Omega\text{-cm}$) $\pm 5\%$ of measurement for TOC > 10.0 ppb (for water quality 0.5 to 18.2 $\text{M}\Omega\text{-cm}$)
Repeatability	± 0.05 ppb C < 5 ppb, $\pm 1.0\%$ > 5 ppb
Resolution	0.001 ppbC ($\mu\text{gC/L}$)
Analysis Time	Continuous
Initial response time	< 60 seconds
Limit of Detection	0.025 ppbC
Conductivity Sensor	
Conductivity Accuracy	$\pm 1\%$, 0.02-20 $\mu\text{S/cm}$ $\pm 3\%$, 20-100 $\mu\text{S/cm}$; 0.1 Constant Sensor*
Cell Constant Accuracy	$\pm 2\%$
Temperature Sensor	PT1000 RTD, Class A
Temperature Accuracy	$\pm 0.25^\circ\text{C}$
Sample Water Requirements	
Temperature	0 to 100 $^\circ\text{C}$ **
Particle Size	<100 micron
Minimum Water Quality	$\geq 0.5 \text{ M}\Omega\text{-cm}$ ($\leq 2 \mu\text{S/cm}$), pH < 7.5 ***
Flow Rate	≥ 20 mL/min
Pressure	4 to 200 psig (0.3 bar to 13.6 bar) at sample inlet connection ****
General Specifications	
Case Dimensions	11" [280mm] W x 7.4" [188mm] H x 5.25" [133mm] D
Weight	5.0 lb. (2.3 kg)
Enclosure material	Polycarbonate plastic, flame retardant, UV and chemical resistant UL # E75645, Vol.1, Set 2, CSA #LR 49336
Enclosure rating	NEMA 4X, IP65 Industrial environment
Ambient Temperature/ Humidity rating	5 to 50 $^\circ\text{C}$ / 5 to 80% Humidity, non-condensing
Power requirements	100 - 130VAC or 200 - 240VAC, 50/60 Hz, 25W Maximum
Local Indicators	Four LED lights for Fault, Error, Sensor Status and UV Lamp ON
Ratings/Approvals	CE Compliant, UL and cUL (CSA Standards) listed, NEMA 4X, IP65 Conductivity and temperature sensors traceable to NIST, ASTM D1125 and D5391. Meets ASTM D5173 Standard Test Method for On-Line Monitoring of Carbon Compounds in Water by UV Light Oxidation
Sample Connections	
Inlet connection	0.125" [3mm] O.D. (6' [2m] FDA compliant PTFE tubing supplied)
Outlet connection	0.125" [6mm] O.D. Barb connection (5' [1.5m] flexible tubing provided)
Inlet Filter	316SS, inline 60 micron
Wetted parts	316SS/Quartz/PEEK/Titanium/PTFE/Polyurethane (outlet tubing only)/EPDM
Wall Mount	Standard, mounting tabs provided
Pipe Mount	Optional, with pipe-mount bracket accessory (for nominal pipe sizes 1" [2.4 cm] to 4" [10 cm])
Maximum Sensor Distance	300ft [91m]

* Readout in equivalent S/m ranges selectable at M300 TOC

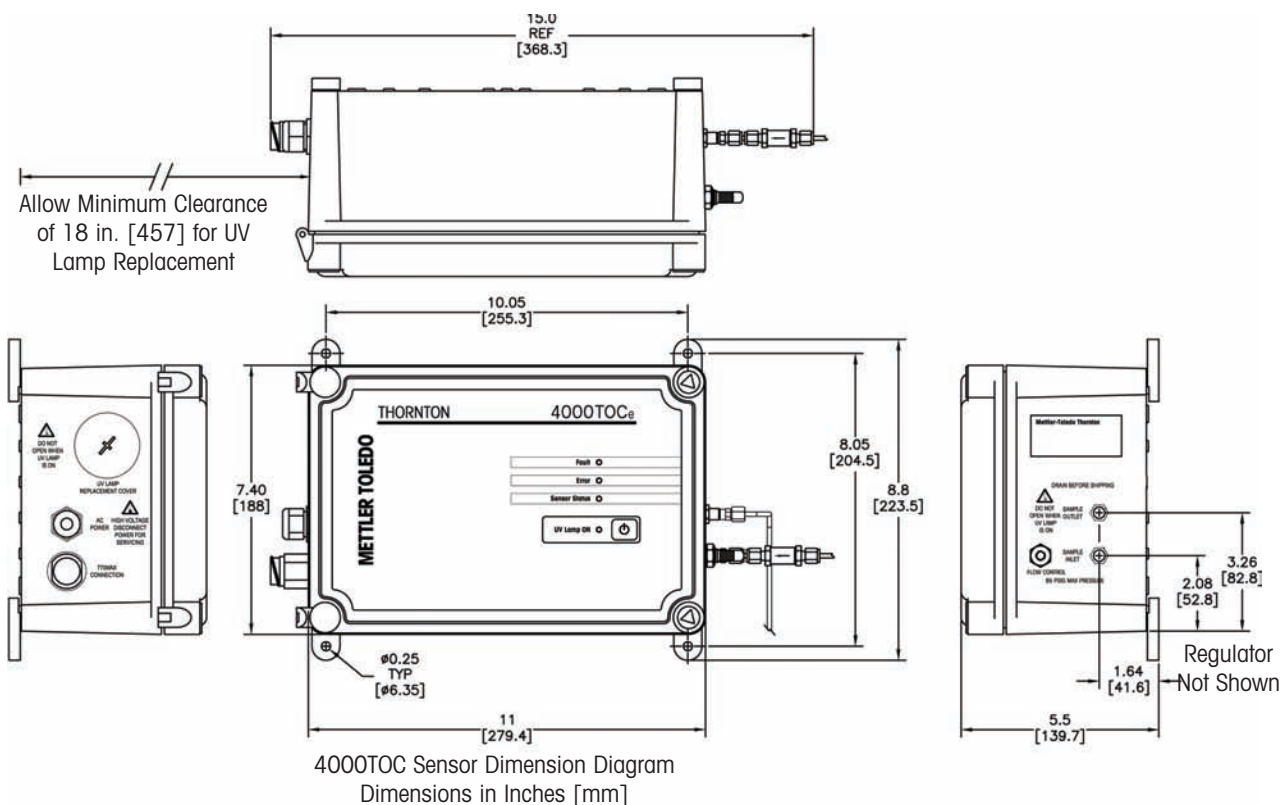
** Temperature above 70 $^\circ\text{C}$ requires Sample Conditioning Coil (included)

*** For power plant cycle chemistry samples, pH may be adjusted by measurement after cation exchange.

**** Process pressure above 85 psig (5.9 bar) requires optional High Pressure Regulator p/n 58 091 552.

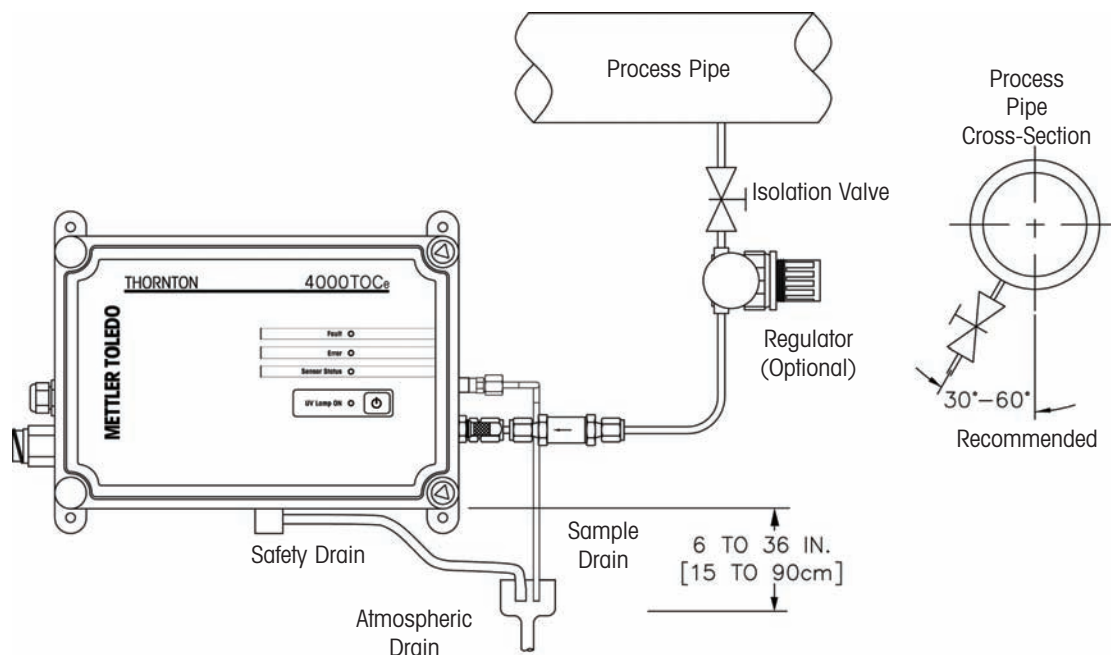
Specifications subject to change without notice.

Dimensional Data



4000TOC Sensor Installation

The Thornton 4000TOC Sensor minimizes installation and setup time. Two tubing connections are required, one for the sample inlet, and one for the oxidized sample outlet. An isolation valve is recommended at the sample point for shutoff, as needed (valve not supplied by Thornton).



Dimensions in inches [mm]

M300 TOC Transmitter

- Back-lit four-line display
- Two large display lines for easy long distance viewing
- Multi-Lingual menus

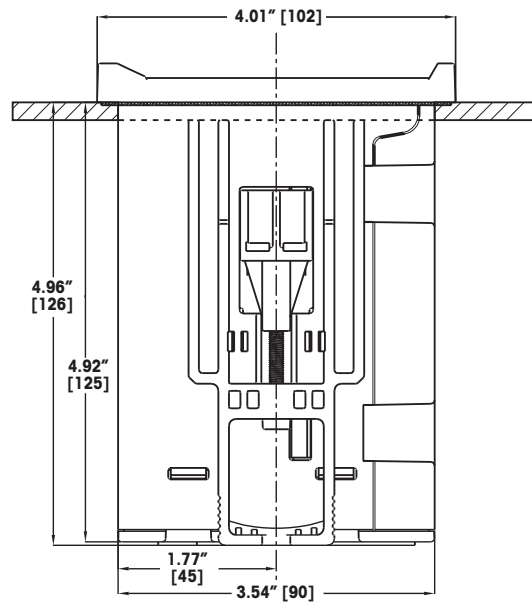
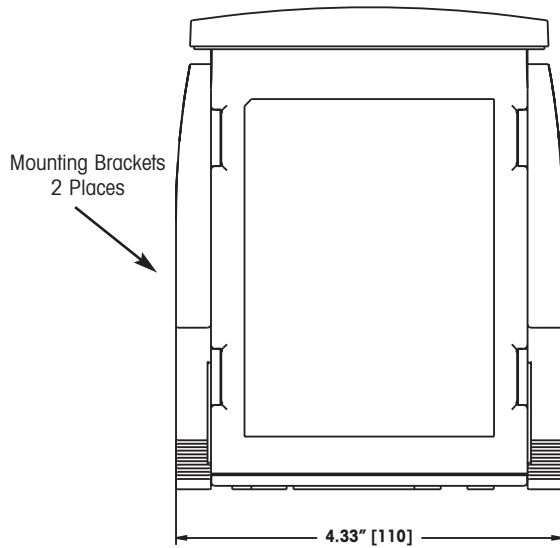
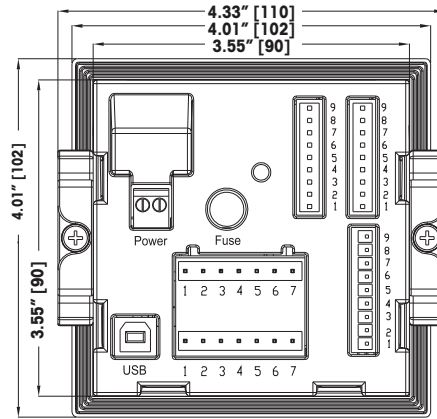
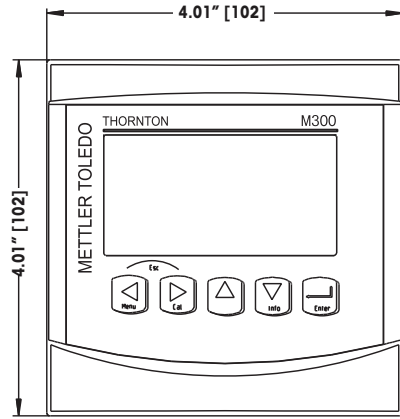


Specifications

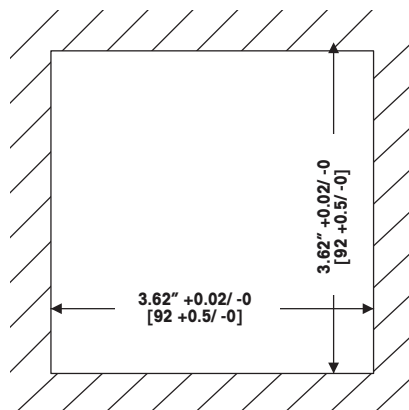
Functional	
TDS Ranges (CaCO ₃ and NaCl)	Cover equivalent conductivity ranges
Conductivity Resolution	Four significant digits, auto-ranged
Temperature Resolution	0.1 °
Update rate	Display and outputs, once per second
Temperature Compensation for Conductivity/Resistivity	Selectable as: Std (standard high purity Thornton/Light) none
Sensor maximum distance	91 m (300 ft)
Outputs	
Setpoints/Alarms	4 - high, low, outside, between, USP or EP
Analog outputs	Two powered 0/4-20 mA outputs, 22 mA alarm, 500 ohms maximum load; not for use with externally powered circuits
Analog output accuracy	± 0.05 mA
Analog output scaling	Linear, bi-linear, logarithmic (1,2,3 or 4 decades), auto-ranging
Relays	All contacts are potential free, with adjustable hysteresis and time delay
2 SPDT	250 VAC/30 VDC, 3 A, resistive
2 SPST reed	300 VDC, 0.5 A, 10 W
Digital communications	USB, type B connector, for service interface
Discrete input	Accepts dry contact closure for remote PID control auto/manual selection
Enclosure/Power	
Operator interface	4 line back-lit LCD; 5-tactile keys
1/4 DIN Model Dimensions (H x W x D)	4.01 x 4.01 x 5.51 in (102 x 102 x 140 mm)
Max. Depth, - panel mounted	4.96 in (126 mm), excluding plug-in connectors
1/2 DIN Model Dimensions (H x W x D)	5.90 x 5.90 x 4.57 in (150 x 150 x 116 mm)
Max. Depth, - panel mounted	3.46 in (88 mm)
Material	Polycarbonate
Weight, 1/4 DIN Models	1.5 lb (0.7 kg)
Weight, 1/2 DIN Models	2 lb (1 kg)
UL Electrical Environment	Installation (overvoltage) Category II
Ratings/Approvals	UL listed, CE compliant; NEMA 4X, IP 65 - 1/2 DIN wall mount and 1/4 DIN panel seal
EMC Emissions	According to EN55011 Class A
Power	Universal 100-240 VAC, 50-60 Hz or 20-30 VDC; 5 W (on power loss, all settings are retained in non-volatile memory without batteries)
Environmental	
Storage temperature	-40 to 70 °C (-40 to 158 °F)
Ambient temperature operating range	-10 to 50 °C (14 to 122 °F)
Relative humidity	0 to 95%

M300 TOC Transmitter

Dimensions for 1/4 DIN panel-mount models

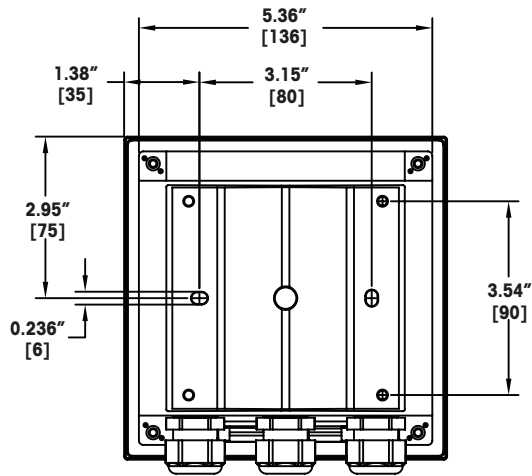
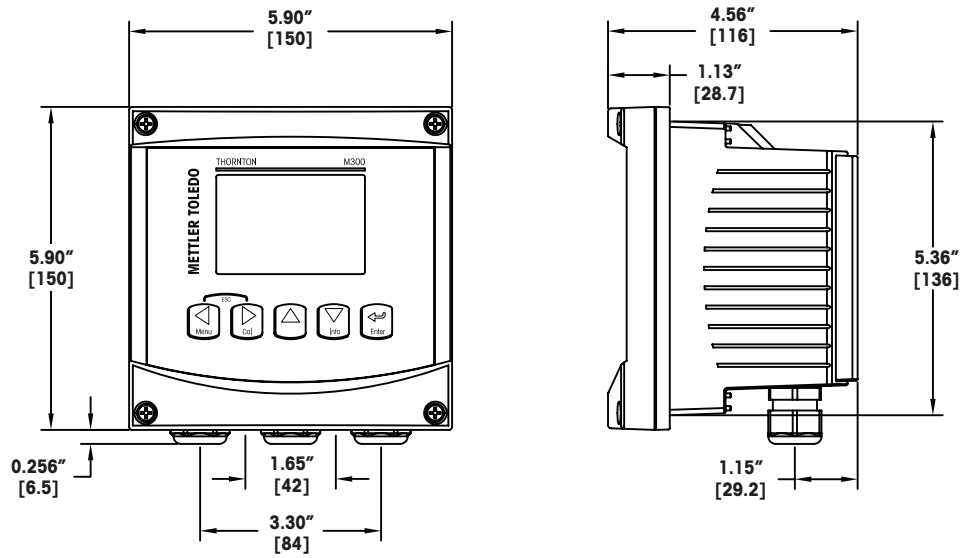


Dimensions for 1/4 DIN panel cutout

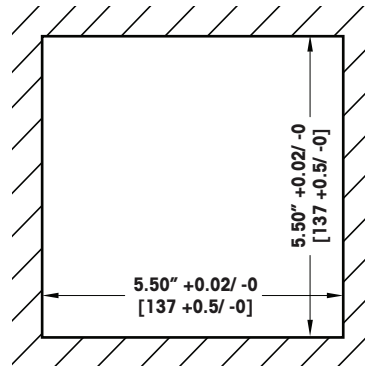


Dimensions in inches [mm]

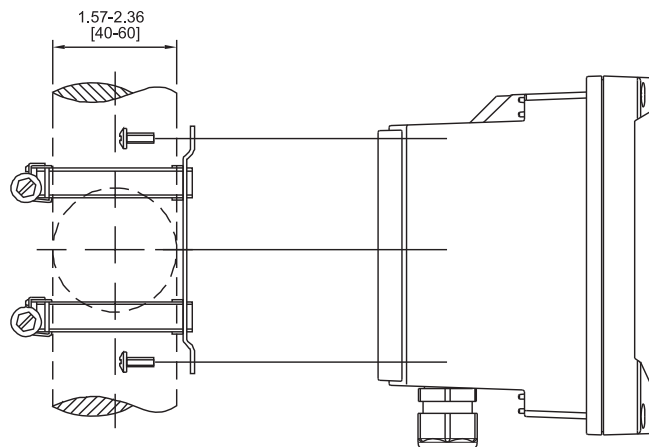
Dimensions for 1/2 DIN wall/panel-mount models



Panel Cutout Dimensions



Dimensions for 1/2 DIN pipe mount kit



Dimensions in inches [mm]

4000TOC Sensor Ordering information

Description	Part No.
4000TOC Sensor, 110 VAC, 50/60 Hz	58 036 021
4000TOC Sensor, 220 VAC, 50/60 Hz	58 036 022
System Suitability and Calibration	
Calibration & System Suitability Test Kit (SST & Calibration Standards Sold Separately)	58 091 559
Validation Support Package	58 091 558
Combined System Suitability Standards and Calibration Solutions Set (Use with SST/Cal Kit 58 091 559. Includes solutions from 58 091 526 & 58 091 529)	58 091 537
System Suitability Standards (for use with SST/Cal Kit 58 091 559, includes 500 ppb as Sucrose, 500 ppb as p-Benzoquinone and reagent water for one test)	58 091 526
Calibration Standards (for use with SST/Cal Kit 58 091 559, includes 500 ppb as Sucrose, 250 ppb as Sucrose verification, and reagent water)	58 091 529
Accessories	
Kit, Tool, TOC Sensor	58 091 520
Kit, Pipe mounting, for 1-1/2" nominal pipe size	58 091 521
Kit, Pipe mounting, for 2" nominal pipe size	58 091 522
Kit, Pipe mounting, for 3" nominal pipe size	58 091 523
Kit, Pipe mounting, for 4" nominal pipe size	58 091 524
High Pressure Inlet Regulator, 1/4" NPT-female	58 091 552
Outlet Drain Tube	58 091 553
Replacement Parts	
Replacement Inlet Filter Element, 60 micron (Pkg.2) (Recommended w/ lamp change)	58 091 551
Replacement UV lamp (recommended every 4500 hours of operation)	58 079 513
Kit, Fuse, Sensor PCB (for use on both 110 and 220 VAC models)	58 091 519

M300 TOC Transmitter Ordering Information

Description	Part No.
M300 TOC ¼ DIN Enclosure (Panel mounting kit included)	58 006 302
M300 TOC ½ DIN Enclosure	58 006 312
Accessories	
Panel Mount Kit for 1/2 DIN models	52 500 213
Pipe Mount Kit for 1/2 DIN models	52 500 212
Patch Cords	
1 ft (0.3 m)	58 080 270
5 ft (1.5 m)	58 080 271
10 ft (3.0 m)	58 080 272
15 ft (4.5 m)	58 080 273
25 ft (7.6 m)	58 080 274
50 ft (15.2 m)	58 080 275
100 ft (30.5 m)	58 080 276
150 ft (45.7 m)	58 080 277
200 ft (61.0 m)	58 080 278
300 ft (91.4 m)	58 080 279

www.mt.com/thornton

Visit for more information

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Quality certificate.

Development, production and testing to ISO 9001.



A certified ServiceXXL provider.



CE Compliant



UL listed
Meets Canadian Standards