

# Analytical Sensors



## THORNTON

Leading Pure Water Analytics

### ISM® Sensors for M800 & M300 Transmitters

UniCond® Conductivity/Resistivity

pH/ORP

Dissolved Oxygen

Ozone



## Digital Liquid Analysis Sensors Optimized for Pure Water Treatment

METTLER TOLEDO

# ISM Digital Analytical Sensors

## with Plug and Measure capability

**METTLER TOLEDO Thornton M800 and M300 ISM process analytical instrumentation provides reliable, accurate measurements of conductivity/resistivity, pH/ORP, dissolved oxygen and dissolved ozone. On-board digital measurement and Intelligent Sensor Management (ISM) technology provide the utmost in convenience and control of sensor performance.**

### **Quick and easy installation thanks to “Plug and Measure” capabilities**

Operational errors at the transmitter are virtually eliminated since all relevant status and configuration information is automatically transferred from the sensor to the transmitter during startup. UniCond conductivity/resistivity sensors provide an exceptionally wide measurement range, reducing inventory and variety of spare sensors.

### **Sensor Features and Benefits**

- ISM Sensors are immediately recognized at installation
- Measurements are available within seconds of connection
- ISM capabilities communicate type, model, serial number, full calibration data, plus historical data with the M800 transmitter
- Sensors can be pre-calibrated in the laboratory and then installed in situ
- On-line sensor diagnostics ensure continuous process surveillance
- Historical calibration and exposure information enables real-time predictive maintenance programs the M800 transmitter

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## Applications

- Pure water treatment for ultrapure semiconductor rinsing, critical power/steam makeup and pharmaceutical waters
- Semiconductor processing in rinsers and wet benches with precise resistivity measurement and temperature compensation
- Power plant cycle chemistry and stator cooling monitoring with especially accurate temperature compensation for specific and cation conductivity and pH plus very low maintenance dissolved oxygen measurement
- Pharmaceutical water monitoring to meet USP, EP, JP and other pharmacopeias' conductivity requirements
- Reclaim, recycle and wastewater treatment for the above industry applications for contaminant detection, diversion and neutralization



The built-in measuring circuits, digital signal conversion and comprehensive memory give ISM sensors advanced performance, reliability and simplified startup. UniCond conductivity/resistivity sensors provide factory calibration accuracy and the widest measurement range in every installation, with Plug and Measure convenience. ISM Sensors for pH, ORP, dissolved oxygen and ozone store process exposure data to enable real-time predictive maintenance when used with M800 transmitters.

# UniCond Conductivity/Resistivity Sensors with ISM®

**UniCond conductivity/resistivity sensors for the Thornton M800 and M300 ISM transmitters provide exceptionally wide measurement ranges due to their advanced built-in measuring circuit. The measuring circuit eliminates interference from leadwire resistance and capacitance. Only digital signals go back to the transmitter. Advanced measuring techniques further contribute to superior accuracy over the expanded range.**

## Sensor Selection Criteria

- Conductivity or resistivity range – resistivity (Mohm-cm) = 1/conductivity (µS/cm)
- Mounting type – Insertion or submersion
- Process connection type and size
- Chemical compatibility, including cleaning and disinfection processes. Rely on process experience or consult Thornton for unusual process composition. PEEK is compatible with ozone and other oxidizers. Monel is recommended for exposure to hydrofluoric acid.
- Temperature requirements, including steam and/or hot chemical cleaning



## Two-Electrode UniCond Sensor Specifications

Accuracy	0.01 cm <sup>-1</sup> sensor: ± 1% 0.1 cm <sup>-1</sup> sensors: ± 1% for 0.02-5,000 µS/cm; ±3% > 5,000 µS/cm
Repeatability	± 0.25%
Temperature Sensor	Pt1000 RTD, IEC 60751, Class A, with NIST-traceable calibration
Temperature Accuracy	± 0.1 °C at 25 °C
Maximum Sensor Distance	300 ft (91m)
Finish (Sanitary 0.1 cm <sup>-1</sup> Sensors)	Ra 8 microinches (0.2 micrometers), 316L SS is electropolished
Insulator Material	PEEK
Connector	IP65, mates with 58 080 27X series cable

Fitting	Insertion Length "X" in (mm)	Fitting/Body Material	Range (µS/cm) <sup>1</sup>	Cell Const. (cm <sup>-1</sup> )	Electrode Material	Max Pressure/Temp Psig (bar) at °F (°C)	Part No.
3/4" NPTM	1.35 (34)	PTFE/SS	0.02-50,000	0.1	Titanium	250 (17) / 200 (93)	<b>58 031 404</b>
3/4" NPTM	5.19 (132)	PTFE/SS	0.02-50,000	0.1	Titanium	250 (17) / 200 (93)	<b>58 031 409</b>
3/4" NPTM	1.35 (34)	PTFE/SS	0.02-50,000	0.1	Monel	250 (17) / 200 (93)	<b>58 031 407</b>
3/4" NPTM	5.19 (132)	PTFE/SS	0.02-50,000	0.1	Monel	250 (17) / 200 (93)	<b>58 031 408</b>
1/2" NPTM	1.14 (29)	PTFE/SS	0.02-50,000	0.1	Titanium	250 (17) / 200 (93)	<b>58 031 406</b>
3/4" NPT	2.38 (60)	PTFE/SS	0.002-500	0.01	Titanium	250 (17) / 200 (93)	<b>58 031 410</b>
DIN DN25 Bund <sup>3</sup>	2.38 (60)	316L SS	0.02-3,000	0.1	316L SS	203 (14) / 266 (130) & 450 (31) / 77 (25)	<b>58 031 416<sup>2</sup></b>
ISO DN25 Bund <sup>4</sup>	2.38 (60)	316L SS	0.02-3,000	0.1	316L SS		<b>58 031 417<sup>2</sup></b>
1.5" Tri-Clamp®	2.17 (55)	316L SS	0.02-3,000	0.1	316L SS		<b>58 031 412<sup>2</sup></b>
1.5" Tri-Clamp®	3.38 (86)	Titanium	0.02-50,000	0.1	Titanium		<b>58 031 413<sup>2</sup></b>
1.5" Tri-Clamp®	3.38 (86)	316L SS	0.02-3,000	0.1	316L SS		<b>58 031 414<sup>2</sup></b>
2" Tri-Clamp®	4.13 (105)	316L SS	0.02-3,000	0.1	316L SS		<b>58 031 415<sup>2</sup></b>

<sup>1</sup> Megohm-cm = 1/µS/cm

<sup>2</sup> FDA compliant materials with certification to meet EN10204 3.1. & USP <88> Class VI

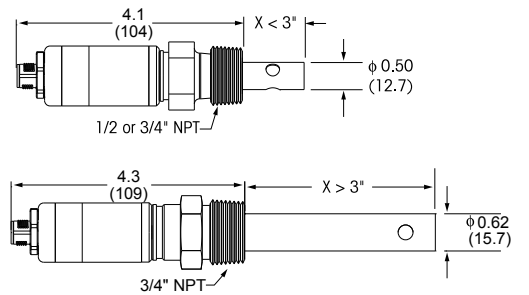
<sup>3</sup> Aseptic DN25 per DIN11864-3, Form A and DIN11866, Series A

<sup>4</sup> Aseptic DN/OD33.7 per DIN11864-3, Form A and DIN11866, Series B

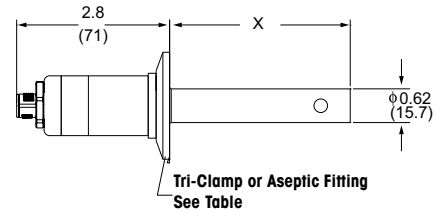
® Tri-Clamp is a registered trademark of Alpha Laval

# Two-Electrode UniCond Conductivity/Resistivity Sensors

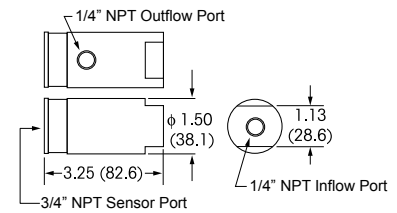
## NPT 0.01 and 0.1 Constant



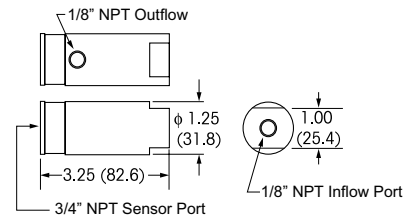
## Sanitary 0.1 Constant



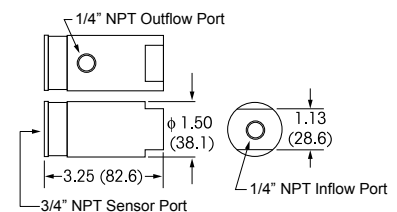
## 316SS Flow Housing, 1/4" NPT\* 58 084 019



## 316SS Flow Housing, 1/8" NPT\* 58 084 000 (1000-30)



## PVDF Flow Housing, 1/4" NPT\* 58 084 001 (1000-31)



\*For 0.1 constant, 3/4" NPT short conductivity sensors only

Dimensions: inches (mm).

## Four-Electrode UniCond Conductivity Sensors

### Four-Electrode UniCond Sensor Specifications

Accuracy	4%
Repeatability	± 2%
Temperature Sensor	Pt1000 RTD, IEC 60751, Class A, with NIST-traceable calibration
Temperature Accuracy	± 0.5 °C
Maximum Sensor Distance	300 ft (91m)
Insulator Material	body material
Connector	IP65, mates with 58 080 27X series cable

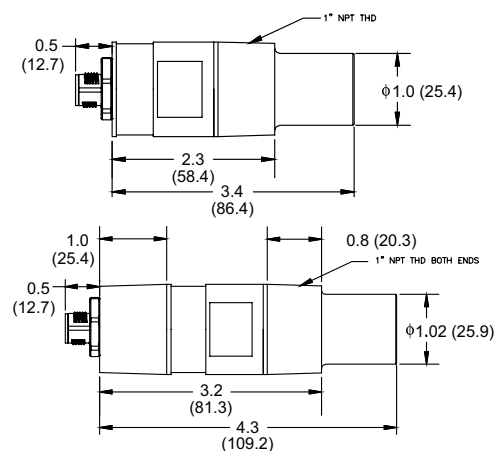
Fitting	Insertion Length "X" in (mm)	Fitting/Body Material	Range (µS/cm)*	Electrode Material	Max Pressure/Temp Psig (bar) at °F (°C)	Part No.
1" NPTM	1.1 (28)	PEEK	10-1,000,000	Hastelloy	100 (7) / 200 (93) 200 (14) / 77 (25)	<b>58 031 421</b>
1" NPTM	1.1 (28)	CPVC	10-1,000,000	316L SS	50 (3.5) / 176 (80) &	<b>58 031 422</b>
1" NPTM	1.1 (28)	CPVC	10-1,000,000	Hastelloy	100 (7) / 77 (25)	<b>58 031 423</b>
1.5" Tri-Clamp®	1.0 (25)	PEEK	10-1,000,000	316L SS	200 (14) / 122 (50) &	<b>58 031 424†</b>
2" Tri-Clamp®	1.0 (25)	PEEK	10-1,000,000	316L SS	70 (4.8) / 284 (140)	<b>58 031 425†</b>
1.5" Tri-Clamp®	1.0 (25)	PEEK	10-1,000,000	Hastelloy		<b>58 031 426†</b>

\* Megohm-cm = 1µS/cm

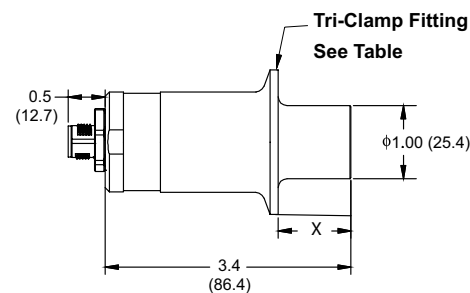
† FDA compliant materials with certification to meet EN10204 3.1. & USP <88> Class VI

® Tri-Clamp is a registered trademark of Alpha Laval

### NPT 4-E



### Sanitary 4-E



## UniCond Conductivity/Resistivity Sensor Cables

For connections between Thornton ISM conductivity sensors and ISM instruments.

Length	Part No.
1 ft (0.3 m)	<b>58 080 270</b>
5 ft (1.5 m)	<b>58 080 271</b>
10 ft (3 m)	<b>58 080 272</b>
15 ft (4.5 m)	<b>58 080 273</b>
25 ft (7.6 m)	<b>58 080 274</b>
50 ft (15.2 m)	<b>58 080 275</b>
100 ft (30.5 m)	<b>58 080 276</b>
150 ft (45.7 m)	<b>58 080 277</b>
200 ft (61 m)	<b>58 080 278</b>
300 ft (91 m)	<b>58 080 279</b>



## Conductivity Standard Solutions

Provided for sensor verification, recalibration or validation, conductivity standards are produced, analyzed, and documented in the METTLER TOLEDO Thornton ISO 9001 certified facility. Production is done with processes similar to those used to calibrate high-accuracy Thornton conductivity sensors. Standards are provided with label and certificate with lot number, certified value, expiration date, plus ASTM and NIST traceability data. These standards are analyzed and used at equilibrium with the atmosphere.

Standard	Accuracy	Shelf Life	Part No.
25 $\mu\text{S/cm}$ , 500 mL, HCl	$\pm 3\%$	6 mo	<b>58 078 001</b>
100 $\mu\text{S/cm}$ , 500 mL, KCl	$\pm 1\%$	12 mo	<b>58 078 002</b>
1000 $\mu\text{S/cm}$ , 500 mL, KCl	$\pm 1\%$	12 mo	<b>58 078 003</b>
10,000 $\mu\text{S/cm}$ , 500 mL, KCl	$\pm 1\%$	12 mo	<b>58 078 004</b>
100,000 $\mu\text{S/cm}$ , 500 mL, KCl	$\pm 1\%$	12 mo	<b>58 078 005</b>



# ISM pH and ORP Sensors

Thornton offers ISM pH sensors with a platinum solution ground that can also provide ORP measurement at the ISM transmitter. A variety of housings match installation requirements.

## Specifications

Measuring Electrode	Glass pH, platinum ORP/solution ground
Reference Electrode	Silver-silver chloride with double junction or equivalent
Temperature Compensator	NTC included in all sensors
pH Range	0-14
Maximum Flow	10 ft/s (3 m/s)
Maximum Cable Lengths	262 ft. (80 m)

A complete pH or ORP installation requires **1** an electrode, **2** a housing and **3** an AK9 cable, from each of the tables below. Each installation requires an M300 ISM or M800. In the table below, a double line divides groups of compatible electrodes and housings.

## Electrode (1)

Application	Rating	Fitting / Material	Part No.
pH & ORP, general purpose, high pressure	See housing limits	Pg 13.5 glass, platinum	<b>52 005 381</b> 4260i-SG-120
pH & ORP, general purpose, & moderately pure water*	0-100 °C 60 psi (4 bar)	Pg 13.5 glass, platinum	<b>52 005 373</b> 3250i-SG-120
pH & ORP, retractable	See housing limits	Pg 13.5 glass, platinum	<b>52 005 382</b> 4260i-SG-225

## Housing (2)

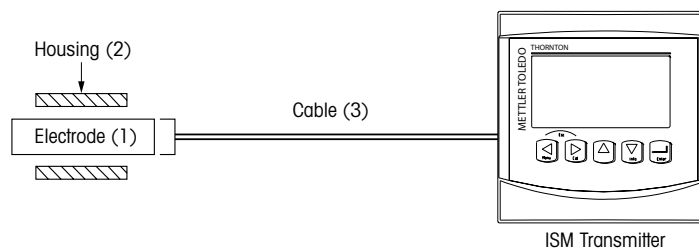
Connection / Material / Rating	Part No.
3/4" NPT insertion or submersion** / CPVC 100 psi (7 bar) at 20 °C & 30 psi (2 bar) at 80 °C	<b>53 300 021</b>
3/4" NPT insertion or submersion** / PVDF 87 psi (6 bar) at 20 °C & 15 psi (1 bar) at 100 °C	<b>52 401 520</b>
1" weld tee / PVC / 50 psi (3.5 bar) at 60 °C	<b>58 084 014</b> <b>(41 722 3001)</b>
Retractable 1-1/2" NPT / CPVC / 75 psi (5 bar), 80 °C	<b>58 084 002</b> <b>(1000-40)</b>
Retractable 1-1/2" NPT / PVDF / 75 psi (5 bar), 100 °C	<b>58 084 003</b> <b>(1000-41)</b>
Retractable 1" NPT / 316 SS / 100 psi (7 bar), 100 °C	<b>58 084 004</b> <b>(1000-42)</b>

\* For use with moderately pure waters (conductivity 5-50 µS/cm) use 53 300 021 housing in 3/4" NPT earth-grounded metal pipe tee with flow <100 mL/min and discharge to open drain. For higher purity and/or higher accuracy in pure water see the pHure Sensors, pages 10-13.

\*\* For insertion in plastic pipe, use 3/4 x 1" reducing bushing and 1" pipe tee. For submersion w/plastic pipe, use 3/4 x 1" reducing coupling and 1" pipe.

## AK9 pH/ORP Cable (3)

Cable Length	Part No.
1 m (3.3 ft)	<b>59 902 167</b>
3 m (9.8 ft)	<b>59 902 193</b>
5 m (16.4 ft)	<b>59 902 213</b>
10 m (32.8 ft)	<b>59 902 230</b>
20 m (65.6 ft)	<b>52 300 204</b>
30 m (98.4 ft)	<b>52 300 393</b>
50 m (164 ft)	<b>52 300 394</b>
80 m (262 ft)	<b>52 300 395</b>



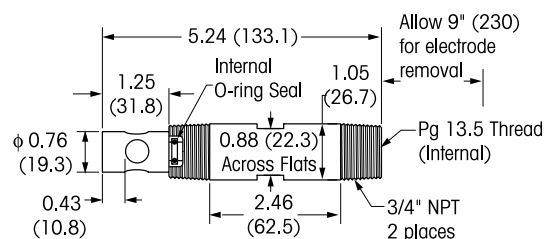


# ISM pH and ORP Sensors

## Electrodes



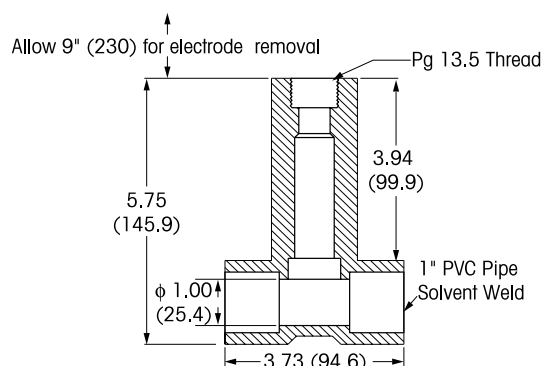
## Housings



53 300 021 & 52 401 520



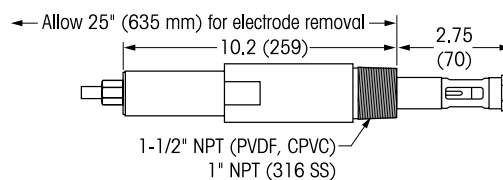
(41 722 3001)



41 722 3001



(1000-40)



58 084 00X  
1000-4X

Dimensions: inches (mm).

# pHure Sensors with ISM

## Applications for pure water pH measurement

Reverse osmosis – pH adjustment of clean recycle water or between membranes in two pass systems to optimize rejection rates

Power plant cycle chemistry – monitoring and controlling pH levels to comply with guidelines and minimize corrosion and scaling

pH measurement in low-conductivity waters requires special precautions. It must be made on a side-stream sample in a closed, metal, flow-through chamber with low flowrate and discharge to open drain. This ensures a sample uncontaminated by carbon dioxide from the air, low and constant sample pressure at the reference electrode, and electrical shielding to promote stability. The sample line should be short and small in diameter to minimize sample delays and to minimize waste of pure water.

Key to pure water pH measurements has been the use of a flowing-junction type of reference electrode which forces electrolyte through the reference junction to provide the same conditions in various samples. The flowing junction produces nearly the same potential in pure water as in the much more conductive calibrating buffer solutions. However, a flowing junction requires some form of electrolyte reservoir that can make installation, service and calibration more cumbersome and increases cost.

The METTLER TOLEDO Thornton pHure Sensor uses a special internally-pressurized gel electrolyte reference electrode to produce similar results to a flowing junction but with much more convenient installation and maintenance. The electrode also includes a low resistance pH glass membrane, an integral, fast-responding NTC, and an AK9 connection. The flow housing provides a controlled flow path with minimum volume to encourage power plant corrosion particles to flush through instead of accumulating as with a large flow bowl.

All components of the pHure Sensor have been optimized for performance and value and conform to ASTM Standard D5128. Various lengths of cable can be selected to provide flexibility in locating the sensor. No preamplifier is required.

## Specifications

Wetted Materials	316 SS, glass, silicone rubber
Process Connections	1/4" NPT(F) in/out
Flow Housing Volume	5 mL with electrode in place
Maximum Pressure	Atmospheric pressure for optimum stability; operational 0-35 psig (0-2.5 bar); can safely withstand 100 psig (7 bar)
Sample Temperature	32-176 °F (0-80 °C), short term to 212 °F (100 °C)
Sample pH	1-11
Sample Flowrate	50-150 mL/min
Sample Conductivity	> 1.5 µS/cm
Connection	AK9 cable from sensor directly to instrument, included
Components Included	52 003 821 combination pH electrode, 58 084 010 (02385) flow housing and AK9 cable

Description	Part No.
pHure Sensor with 3 ft (1 m) cable	<b>58 032 406</b>
pHure Sensor with 10 ft (3 m) cable	<b>58 032 407</b>
pHure Sensor with 16 ft (5 m) cable	<b>58 032 408</b>
pHure Sensor with 33 ft (10 m) cable	<b>58 032 409</b>
Replacement ISM combination electrode with temperature compensator	<b>52 003 821</b>

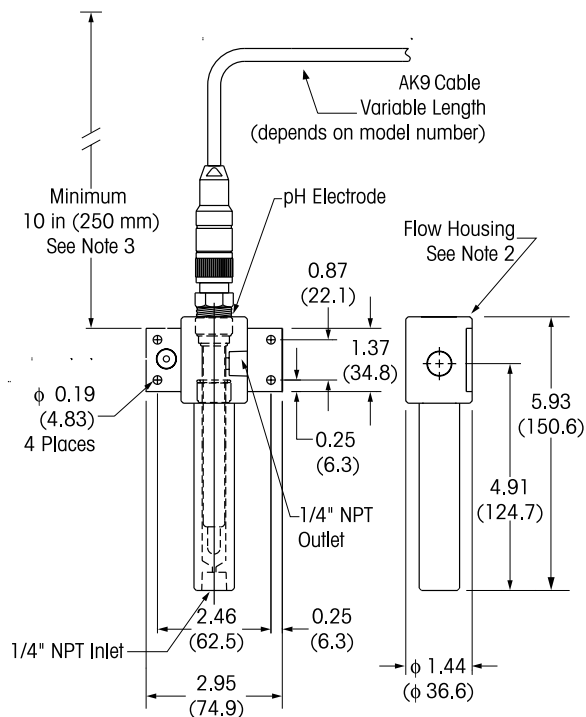
Note: For flowing electrolyte option see pages 12-13.

# pHure Sensors with ISM

## pHure Sensor Features



## pHure Sensor Dimensions



### Notes:

1. Dimensions: inches (mm)
2. Electrode/Flow housing assembly must be in upright position as shown.
3. Allow at least 10 in. (250 mm) clearance to remove sensor.

## pH and ORP Accessories

pH and ORP (Redox) Standard Buffer Solutions	Part No.
pH Buffer, 4.01, 250 mL	51 340 057
pH Buffer, 7.00, 250 mL	51 340 059
pH Buffer, 9.21, 250 mL	51 300 193
pH Buffer, 10.00, 250 mL	51 340 056
ORP Buffer, 220 mV, 6 x 250 mL	51 340 081



# pHure Sensor LE

## Reliable pH Measurement in Pure Waters

The METTLER TOLEDO Thornton pHure Sensor Liquid Electrolyte (LE) for M800 and M300 ISM transmitters use free-flowing liquid electrolyte to provide the most accurate pH measurement available in pure waters. The electrode includes a special pH glass membrane, an integral, fast-responding temperature sensor, and AK9 cable connections. All components of the pHure Sensor LE have been optimized for low conductivity performance and value, and conform to ASTM Standard D5128. Various lengths of cable can be selected to provide flexibility in locating the sensor.

### Features

- Free-flowing liquid electrolyte
- Accurate, fast responding temperature compensator
- Special glass membrane
- Solution ground connection
- Low volume 316 stainless steel flow housing
- Easily refillable electrolyte chamber
- Integral buffer containers

### Applications

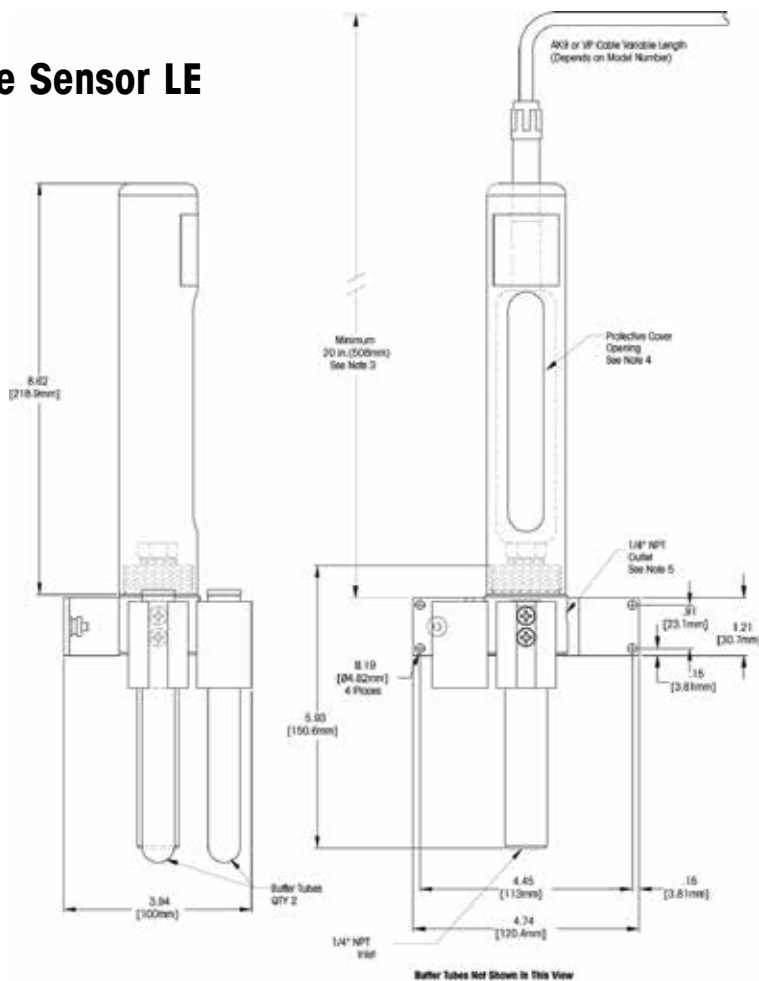
- Power plant cycle chemistry where pH measurement in very low conductivity water is critical
- Reverse osmosis – pH adjustment of clean recycle water or between membranes in two pass systems to optimize rejection rates
- Monitoring and controlling pH levels to comply with guidelines and minimize corrosion and scaling

### Specifications

Wetted materials	Glass pH, platinum ORP
Process connections	1/4" NPT(F) in /out
Flow housing volume	5 ml with electrode in place
Maximum pressure	Atmospheric pressure for operation, can safely withstand 7 bar(g) (100 psig)
Sample temperature	0 to 100°C (32 to 212°F)
Sample pH	1–12 pH
Sample flowrate	50 to 150 ml/min
Sample conductivity	> 0.3 µS/cm for highest accuracy
Connection	AK9 cable from sensor to instrument
Reference electrode	3M KCl
Components included	Combination pH electrode, 3 molar KCl electrolyte
Flow housing, syringe, and cable	



# pHure Sensor LE



## Notes:

1. Dimensions: inches (mm)
2. Electrode / pH housing assembly must be in upright position as shown.
3. Allow at least 20 in. (508 mm) clearance to remove sensor.
4. Protective cover support opening to face forward as shown when screwed onto housing.
5. Recommended tubing size 3/8" (9.5 mm) or larger running downward to open drain.

Description	Part No.
<b>pHure Sensor LE ISM used with M800 &amp; M300 ISM</b>	
pHure Sensor LE ISM, 1m (3ft) AK9 cable	<b>58 032 420</b>
pHure Sensor LE ISM, 3m (10ft) AK9 cable	<b>58 032 421</b>
pHure Sensor LE ISM, 5m (16ft) AK9 cable	<b>58 032 422</b>
pHure Sensor LE ISM, 10m (33ft) AK9 cable	<b>58 032 423</b>

## Replacement Parts

ISM replacement electrode for M800 & M300 ISM	<b>30 039 086</b>
Electrolyte filling syringe	<b>58 079 020</b>
Housing with protective cover	<b>58 084 017</b>

## Accessory

Replacement electrolyte 3M KCl 250 mL bottle	<b>51 340 049</b>
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# Pure Water Optical DO Sensor

## Fast Response, Reduced Maintenance

**The Pure Water Optical Dissolved Oxygen Sensor with Intelligent Sensor Management (ISM) technology provides high accuracy, fast response, and increased stability in demanding low ppb-level applications.**

Outstanding measurement performance with low detection limit, minimum drift, and short response time significantly improves oxygen monitoring. METTLER TOLEDO's proprietary OptoCap™ sensing element provides very accurate oxygen determination and easy maintenance without electrolyte handling. Additionally, the OptoCap eliminates the need for polarization, making the measuring system readily available and reducing downtime.

Intelligent Sensor Management (ISM) simplifies sensor handling and provides diagnostic tools for predicting sensor maintenance before measurements are affected.

### Features Overview

- Very high accuracy
- Fast response
- Enhanced stability and reliability
- Reduced maintenance and downtime
- No dissolved hydrogen interference
- No flow sensitivity

### Typical Applications

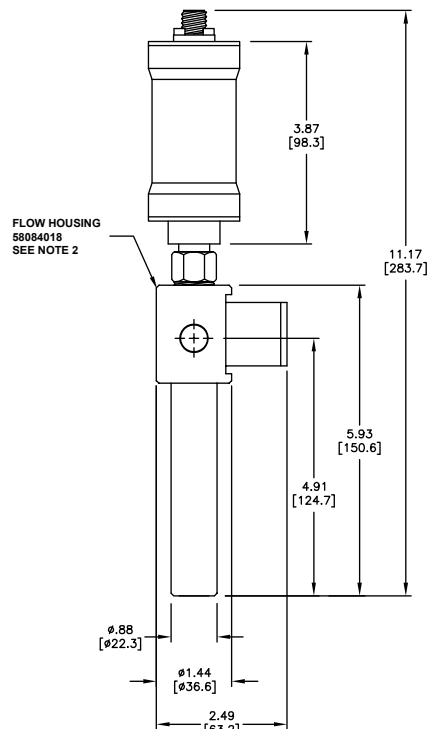
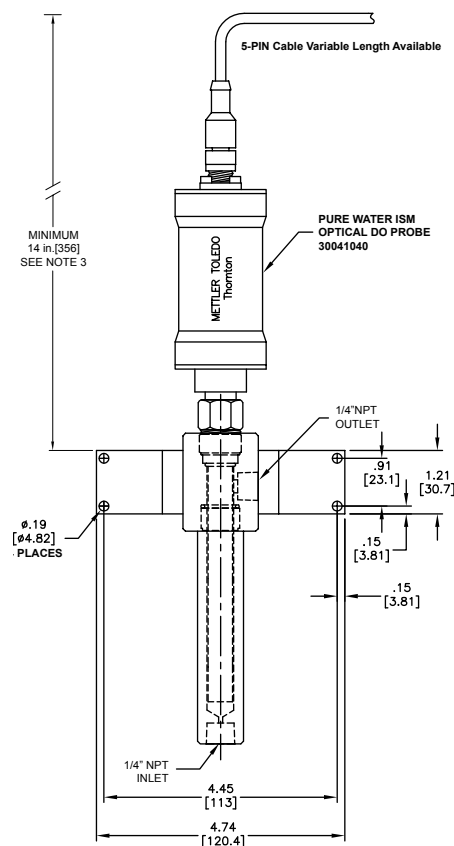
- Power plant cycle chemistry monitoring
- Generator stator cooling
- Semiconductor ultrapure water
- Pure water treatment systems



### Specifications

Operating range	0 – 5000 ppb
System accuracy	± 1% of reading or 1 ppb, whichever is greater
Response time at 25 °C (77 °F) (Air – N <sub>2</sub> )	98% of final value in < 20 s
Sampling rate	Adjustable between 1 and 60 seconds; Set to 10 seconds
Sample flow rate	50 – 800 ml / min
Temperature compensation	Automatic
Measuring temperature range	10 – 50 °C (50 – 122 °F)
Environmental temperature range	0 – 121 °C (32 – 250 °F)
Operating pressure	0.2 – 12 bar (2.9 – 174 psi absolute)
Mechanical pressure resistance	Maximum 12 bar (174 psi absolute)
Sample connections	¼" NPT
Wetted materials	Stainless steel, silicone, EPDM O-Ring
Cable length Probe to M800	1 – 10 m (3 – 33 ft)
Components needed	Optical DO probe, housing and cable
Sensor diameter	12 mm

# Pure Water Optical DO Sensor



- Notes:
- 1. Dimensions: inches (mm)
  - 2. Electrode / flow housing assembly must be in upright position as shown.
  - 3. Allow at least 14 in. (356 mm) clearance to remove sensor.

## Ordering Information

For new installations order the sensor, housing and a cable based on the length required.

Sensor Used with Thornton M800 Transmitter *	Order No.
Pure Water ISM Optical DO Sensor	30 041 040

Required Accessories	
Pure Water Stainless Steel Housing	58 084 018

Sensor Cable	
2 m (6.6 ft)	52 300 379
5 m (16.4 ft)	52 300 380
10 m (32.8 ft)	52 300 381
15 m (49.2 ft)	52 206 422

Spare Parts	
OptoCap Replacement Kit	52 206 403

\* Power limitations allow only one optical DO sensor on a 2-channel M800 or two optical DO sensors on a 4-channel M800. The other channels can be used for other parameters such as pH or conductivity.

# High Performance ISM DO Sensors

**Thornton's High Performance ppb-level dissolved oxygen measurement capability excels in demanding low ppb-level applications. It provides a precise zero and a highly accurate response over the entire measurement range.**

## Features

- Plug and Measure capability
- Very fast response
- Intelligent Sensor Management
- Low maintenance with drop-in modular membrane
- Excellent long-term stability



The polarographic probe uses a gas-permeable membrane through which oxygen passes to produce an electrochemical reaction and current flow in direct proportion. The membrane is stainless steel mesh-reinforced PTFE for exceptional durability. Behind that membrane is the platinum cathode where oxygen reacts to produce the measurement signal. The cathode is surrounded by a guard electrode which prevents stray oxygen from the sides of the membrane or inside of the probe from adding to the signal. The guard ring is the key to the very rapid downscale response. The electrochemical reaction is completed at the silver anode. Full temperature compensation accounts for effects on both membrane permeability and solubility of oxygen in water.

## Applications

**Power plant cycle chemistry** monitoring of DO enables control of oxygen scavenger with phosphate, caustic or all-volatile treatment. With oxygenated treatment it can be used to regulate oxygen feed. Compliance with cycle chemistry guidelines and specifications for DO can be ensured with this very accurate and responsive measuring system. Cycling plants can benefit from its rapid downscale response, assuring real-time reporting of even the fastest deoxygenation during startup.

**Semiconductor ultrapure water** for some processes requires low DO levels to prevent oxidation of wafer surfaces between stages. The ISM transmitter can provide a solid ppb-level DO measurement plus a simultaneous resistivity measurement in the same instrument.

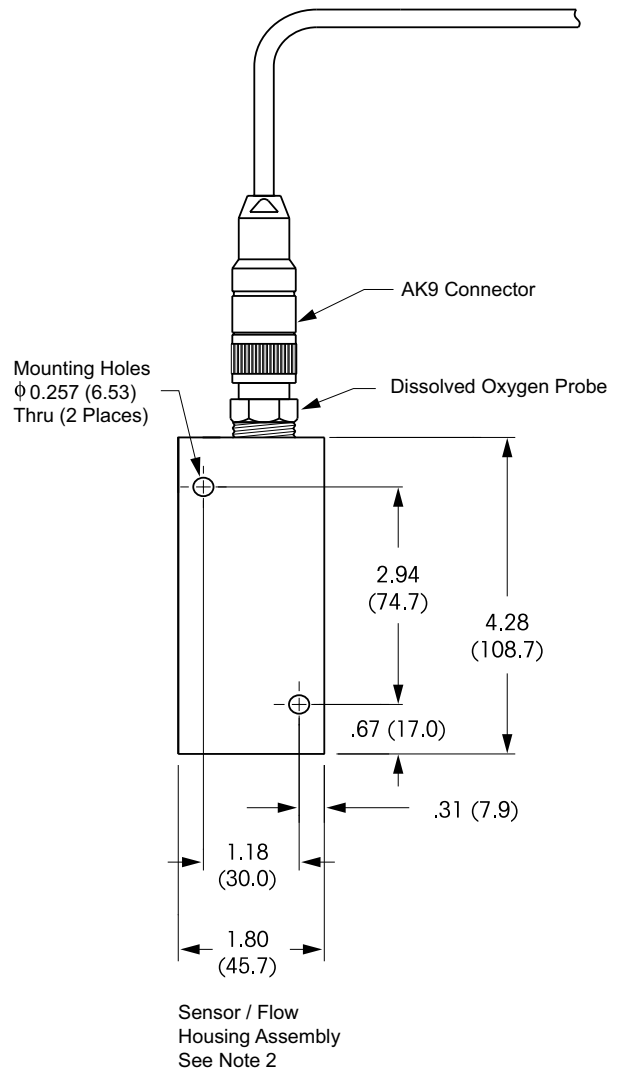
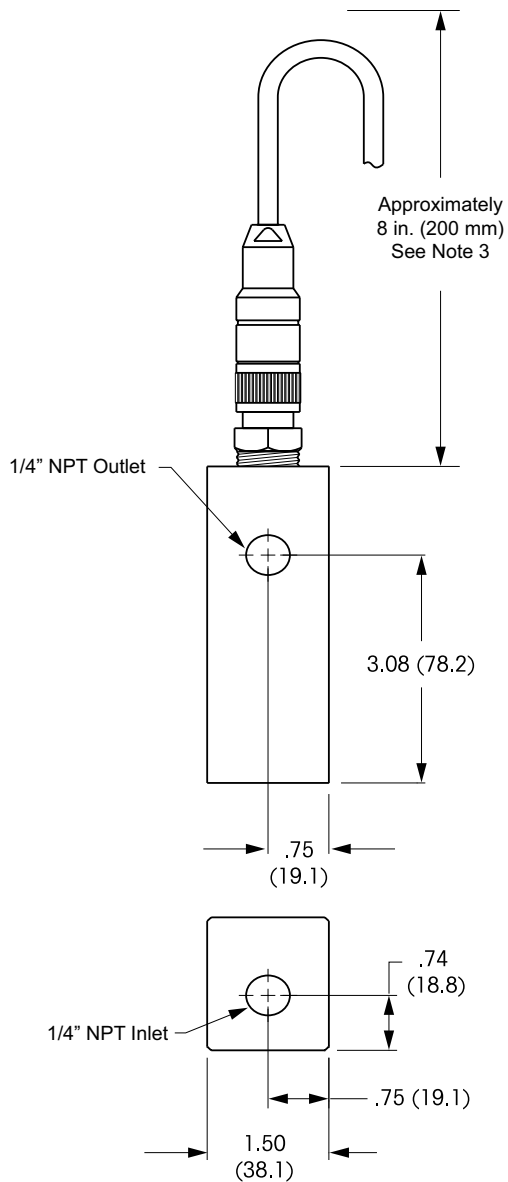
**Pure water treatment systems** with deaerators to produce water for the above applications can be reliably monitored with the M300 ISM system. The second measurement channel is available for conductivity, resistivity, pH or ORP monitoring.

## Specifications

Sample Flowrate	50-1,000 mL/min
Sample Temperature	0-60 °C (32-140 °F) for temperature compensation; can tolerate 100 °C
Sample Pressure	0-5 bar (72 psig)
Sample Connections	1/4" NPT
Wetted Materials	Polyacetal flow housing, polyphenylene sulfide probe body, PTFE membrane reinforced with stainless steel and silicone rubber, Viton and silicone rubber o-rings
Cable Length	Probe to instrument, 3 to 33 ft (1 to 10 m)
Weight	1 kg (2 lb) with flow housing
Response Time	98% response in 90 seconds
Operating Range	0-10,000 ppb (µg/L)
System Accuracy	± 1% of reading or 1 ppb, whichever is greater; ± 0.5 °C
Components Included	52 201 209 ISM DO Probe with spare electrolyte, 58 084 009 (17490) Housing, AK9 Cable



# High Performance ISM Dissolved Oxygen Sensors



Description	Part No.
DO probe, flow housing & 3 ft (1 m) cable	<b>58 037 404</b>
DO probe, flow housing & 10 ft (3 m) cable	<b>58 037 405</b>
DO probe, flow housing & 16 ft (5 m) cable	<b>58 037 406</b>
DO probe, flow housing & 33 ft (10 m) cable	<b>58 037 407</b>
Replacement DO Probe	<b>52 201 209</b>
Maintenance kit (electrolyte & 4 membranes)	<b>52 200 024</b>

## Notes:

1. Dimensions: inches (mm) unless noted otherwise
2. Sensor/Flow housing assembly must be in upright position as shown
3. Allow approximately 8 in. (200 mm) clearance to remove sensor

# ISM Dissolved Ozone Sensors

Thornton's highly reliable dissolved ozone measurement capability uses a proven sensor design with rapid and accurate response to ozone concentrations. At the low end, its excellent sensitivity gives positive detection of zero ozone after destruction by UV light.

## Features

- Rapid, accurate response
- Positive zero detection
- Low maintenance with drop-in modular membrane
- Plug and Measure operation



The polarographic probe uses a gas-permeable membrane through which ozone passes to produce an electrochemical reaction and current flow in direct proportion. The membrane is reinforced silicone for durability. It is pre-mounted in a membrane cartridge which allows exceptionally easy replacement of electrolyte and membrane when necessary. Behind the membrane is the platinum cathode where ozone reacts to produce the measurement signal. The electrochemical reaction is completed at the silver anode. Full temperature compensation accounts for effects of both membrane permeability and solubility of ozone in water.

## Applications

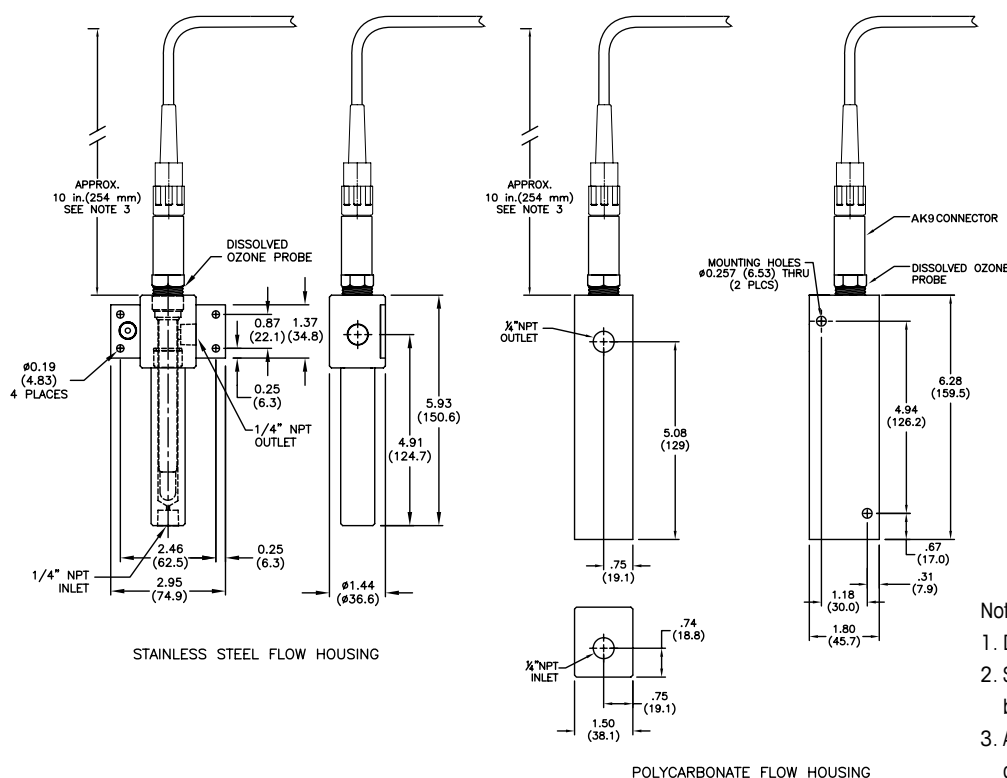
**Pharmaceutical water systems** can assure complete sanitization by controlling ozonation based on an ozone measurement downstream of the storage tank. To guarantee removal of all ozone downstream of UV destruction (and satisfy the 'no added substances' requirement), a second ozone measurement can confirm a zero level. When the entire distribution system is ozonated with the UV lights off, a third measurement at the return of the distribution piping can show when an adequate ozone level has been achieved throughout the loop. Thornton M300 instrumentation can monitor two points for ozone and/or conductivity with the same instrument.

**Semiconductor ultrapure water** ozone sanitization can be controlled by monitoring the ozone concentration downstream of the ozonator and UPW storage tank. To be sure all ozone has been decomposed after UV lights, a second ozone measurement can confirm a zero level. Thornton multi-parameter capability can provide solid ppb-level ozone measurements plus simultaneous resistivity measurements in the same instrument.

**Bottled water systems** monitor ozonation levels to be sure of proper sanitization of the water, which in turn sanitizes the bottle and seal. Continuous measurement and control to proper ozone levels is a key quality practice that promotes consistent good taste and long shelf life. Thornton equipment can provide this measurement continuously at minimal cost.

**Beverage systems** frequently use ozonated water in place of chemicals for the clean-in-place (CIP) operations when changing between flavors. Instead of using acids, caustic or chlorine, ozone can provide the cleaning and disinfection without risk of objectionable residuals or byproducts. Ozone monitoring and control are essential to enable repeatable CIP operations. Thornton instrumentation meets these requirements cost effectively.

## ISM Dissolved Ozone Sensors



### Specifications

Sample Flowrate	200 - 500 mL/min with housing; 1-3 ft/s (0.3-1 m/s) without housing
Sample Temperature	5-50 °C (41-122 °F) for measurement, probe can withstand 100 °C (212 °F)
Sample Pressure	Normal operation, atmospheric; can withstand 3 bar (45 psig)
Sample Connections	1/4" NPT
Sample Composition	Must not contain dissolved hydrogen which interferes with measurement
Wetted Materials	Polycarbonate or 316 SS flow housing, 316 SS probe, silicone rubber membrane
Cable Lengths	3 ft (1 m) to 33 ft (10 m) with VP cable
Weight	0.5 kg (1 lb) with flow chamber
Response Time, T90*	30 s
Operating Range	0-1,000 ppb (µg/L); 0-1.00 ppm (mg/L) short term; 0-500 ppb(µg/L); 0-0.5 ppm (mg/L) continuous
Relative System Accuracy	± 4% of reading or 3 ppb, which ever is greater; 0.5 °C
Included Parts	Probe with spare electrolyte, 17743 (58 084 012) Polycarbonate or 02385 (58 084 010) SS flow housing and AK9 cable as specified

\* Upscale response may be slower if sensor has recently been exposed to high ozone concentration.

Description	Model 6510i Part No.
ISM Ozone sensor with PC housing, 1 m cable	58 041 436
ISM Ozone sensor with PC housing, 3 m cable	58 041 437
ISM Ozone sensor with PC housing, 5 m cable	58 041 438
ISM Ozone sensor with PC housing, 10 m cable	58 041 439
ISM Ozone sensor with SS housing, 1 m cable	58 041 446
ISM Ozone sensor with SS housing, 3 m cable	58 041 447
ISM Ozone sensor with SS housing, 5 m cable	58 041 448
ISM Ozone sensor with SS housing, 10 m cable	58 041 449
Maintenance Kit (4 membranes & electrolyte)	52 201 218
Replacement Probe	30 013 675

# M800 Transmitter

## Features:

- 1/2" DIN wall/panel/pipe mount enclosure
- Color touchscreen display
- 2 and 4-channel models
- 2 additional pulse flow inputs
- Full predictive sensor diagnostics with iMonitor screens
- Menus available in English, Chinese, French, German, Italian, Japanese, Korean, Portuguese, Russian, Spanish



See M800 technical data sheet 52 121 822 for more details.

# M300 ISM Transmitter

## Features:

- 1/4" DIN panel mount and 1/2" DIN wall/panel/pipe mount enclosure
- 1 and 2-channel models
- 4-line backlit display
- Menus available in English, French, German, Italian, Japanese, Portuguese, Russian, Spanish



See M300 ISM data sheet ML0140 for more details.

[www.mt.com/thornton](http://www.mt.com/thornton)

Visit for more information

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Development, production and testing to ISO 9001

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