

## THORNTON

Leading Pure Water Analytics

### M300 Transmitters

Conductivity / Resistivity

pH / ORP

Dissolved Oxygen

Dissolved Ozone

Flow / Total Flow

# Analytical Transmitters



## M300 Transmitters

for Comprehensive Liquid Analysis

METTLER TOLEDO

# The standard for measurement in pure water treatment

The **METTLER TOLEDO THORNTON M300** series of process analytical instruments provide **single-channel, multi-channel and multi-parameter models to measure conductivity/ resistivity, pH/ORP, dissolved oxygen, ozone and flowrate. Both ¼ DIN and ½ DIN enclosures are available for especially convenient panel, wall and pipe mounting.**

## Features

- Large backlit 4-line display
- Compact ¼ DIN panel-mounting with NEMA 4X, IP65 panel seal
- Robust ½ DIN wall-mounting with NEMA 4X, IP65 back cover
- User-selectable dual-level password protection
- On-line sensor diagnostics for pH
- Internal PID control with relay or analog output
- USB port for configuration and data acquisition
- Direct sensor inputs for all parameters
- Compatible with existing Thornton sensors
- Plug-in terminal connectors for easy wiring
- Universal AC/DC power supply
- Multiple languages: English, French, German, Italian, Spanish
- CE compliant, UL Listing pending for US and Canadian standards



## Applications

**Pure and ultrapure water treatment** for 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 exceptionally accurate temperature compensation for specific and cation conductivity and pH and very low maintenance dissolved oxygen measurement.

**Pharmaceutical water monitoring** to meet USP, EP, and JP conductivity requirements including built in tables of alarm limits.

**Reclaim, recycle and wastewater treatment** for the above industry applications for contaminant detection, diversion and neutralization.

	Parameter	Channels	Outputs	Specs on page*
Model selection	Conductivity / Resistivity	1	2 analog; 4 relays	3
	Conductivity / Resistivity	2	4 analog; 4 relays	3
	pH ORP	1	2 analog; 4 relays	4
	Conductivity / Resistivity, pH / ORP			
	Dissolved Oxygen, Ozone	2	4 analog; 6 relays	5 - 6
	Flow	1	2 analog; 4 relays	4
	Flow	4	4 analog; 4 relays	4

\*physical and electrical specifications on page 7, order numbers on page 10

# M300 Conductivity / Resistivity Models

- One & Two channel models
- Highest accuracy measurement & temperature compensation
- Wide range of measurement allows verification in ASTM standards even for pure water measurements
- Two- & four-electrode conductivity/resistivity measurements
- Reverse osmosis % rejection computation on two-channel models
- Direct acid & caustic concentration readout
- USP <645> & EP alarm setpoints



## Measurement Specifications

Functional	
Conductivity/Resistivity Ranges	
0.01 Constant Sensor	0.002 to 200 μS/cm (5000 ohm-cm to 500 Mohm-cm)
0.1 Constant Sensor	0.02 to 2000 μS/cm (500 ohm-cm to 50 Mohm-cm)
10 Constant Sensor	50 to 40,000 μS/cm (25 to 20 Kohm-cm)
4-electrode Sensor	0.01 mS/cm to 650 mS/cm (1.54 ohm-cm to 100 Kohm-cm) readout in equivalent S/m ranges is selectable
Concentration Ranges of HCl, NaOH, H <sub>2</sub> SO <sub>4</sub>	0-20%, 0-15%, 0-20%
TDS Ranges (CaCO <sub>3</sub> and NaCl)	cover equivalent conductivity ranges
Calculated Parameters (2-channel)	% Rejection, power plant calculations of pH based on specific and cation conductivity, and CO <sub>2</sub> based on cation and degassed conductivity
Resolution	four significant digits, auto-ranged
Update rate	display and outputs, once per second
Temperature Measurement Range	-40 to 200°C (-40 to 392 °F), resolution 0.1°
Temperature Sensor Input	RTD, Pt1000 (Pt100 with adapter)
Temperature Compensation	selectable as: Std (standard high purity Thornton/Light), Light 84, Std referenced to 75°C, linear %/°C, 50% glycol, 100% glycol, cation, ammonia, isopropyl alcohol, none
Sensor maximum distance	61 m (200 feet); 15 m (50 ft) with 4-electrode sensors

Performance	
Conductivity/Resistivity Accuracy	± 0.5% of reading or 0.5 ohm, whichever is greater, up to 18 Mohm-cm
Repeatability	± 0.1% of reading
Temperature Relative Accuracy	± 0.25 °C (± 0.45 °F)
Temperature Resolution	0.01 °
Temperature Repeatability	± 0.13 °C (± 0.23 °F)

Outputs – see p.7 for ratings	Single channel	Two channel
Setpoints/Alarms	2 - high, low, outside, between, USP, EP	6 - high, low, outside, between, USP or EP
Relays	2 SPDT, 2 SPST reed	2 SPDT, 1 SPST NO, 1 SPST NC, 2 SPST reed
Analog Output Signals	2	4
Discrete Inputs	1	2

## M300 pH/ORP Models

- Direct electrode input
- On-line sensor diagnostics for measuring and reference electrode
- Auto buffer recognition with extensive buffer library
- Internal PID control
- Combined high/low setpoint for alarming outside a band
- Solution temperature compensation for pure water ionization effects as well as conventional electrode temperature compensation
- Automatic sensor cleaning



### Measurement Specifications

Functional	
pH, ORP Ranges	-1.00 to 15.00 pH, -1500 to 1500 mV
Temperature Range	- 30 to + 130°C (-22 to 266 °F)
Temperature Sensor	RTD, Pt1000 (Pt100 with adapter)
Temperature Compensation	automatic / manual for electrode output, plus adjustable solution temperature coefficient for solution ionization effects
Update rate	display and outputs, once per second
Calibration	1- or 2- point, with auto buffer recognition
Diagnostics	selectable continuous checking of membrane resistance and reference diaphragm/junction resistance (with solution ground sensors)
Sensor Maximum Distance	10 m (33 ft)
Performance	
pH, ORP Relative Accuracy	± 0.03 pH, ± 2 mV
pH, ORP Resolution	0.01 pH, 1 mV
Temperature Accuracy	± 0.25 °C (± 0.45 °F)
Temperature Resolution	0.1 °C
Outputs – see p.7 for ratings	
Setpoints/Alarms	4 - high, low, outside, or between
Relays	2 SPDT, 2 SPST reed
Analog Output Signals	2
Discrete Inputs	1

# M300 Multiparameter Models

- Two Field-configurable channels for any pair of parameters:
- Conductivity/resistivity, pH/ORP, dissolved oxygen and/or dissolved ozone
- Reduces number of instruments and amount of panel space
- Includes all features of single parameter instruments



## Measurement Specifications

Functional	
Conductivity/Resistivity Ranges	
0.01 Constant Sensor	0.002 to 200 $\mu\text{S}/\text{cm}$ (5000 ohm-cm to 500 Mohm-cm)
0.1 Constant Sensor	0.02 to 2000 $\mu\text{S}/\text{cm}$ (500 ohm-cm to 50 Mohm-cm)
10 Constant Sensor	50 to 40,000 $\mu\text{S}/\text{cm}$ (25 to 20 Kohm-cm)
4-electrode Sensor	0.01 mS/cm to 650 mS/cm (1.54 ohm-cm to 100 Kohm-cm)
	readout in equivalent S/m ranges is selectable
Concentration Ranges of HCl, NaOH, H <sub>2</sub> SO <sub>4</sub>	0-20%, 0-15%, 0-20%
TDS Ranges (CaCO <sub>3</sub> and NaCl)	cover equivalent conductivity ranges
RO % Rejection	0-100% (computed from two conductivity measurements)
Conductivity Resolution	four significant digits, auto-ranged
pH, ORP Ranges	-1.00 to 15.00 pH, -1500 to 1500 mV; resolution 0.01 pH, 1 mV
Dissolved Oxygen Ranges	0-20,000 ppb or $\mu\text{g}/\text{L}$ ; 0-20 ppm or mg/L, 0-200% saturation; resolution 0.1 ppb or $\mu\text{g}/\text{L}$
Dissolved Ozone Ranges	0-5,000 ppb or $\mu\text{g}/\text{L}$ , 0-5 ppm or mg/L; resolution 0.1 ppb or $\mu\text{g}/\text{L}$
Temperature Measurement Range	-40 to 200 °C (-40 to 392 °F); resolution 0.1 °
Temperature Sensor Input	RTD, Pt1000 (Pt100 with adapter)
Update rate	display and outputs, once per second
Temperature Compensation	
Conductivity/Resistivity	selectable as: Std (standard high purity Thornton/Light), Light 84, Std referenced to 75°C, linear %/°C, 50% glycol, 100% glycol, cation, ammonia, isopropyl alcohol, none
pH	automatic / manual for electrode output, plus adjustable solution temperature coefficient for solution ionization effects
Dissolved Oxygen	automatic, for membrane permeability and oxygen solubility
Dissolved Ozone	automatic, for membrane permeability and ozone solubility
Conductivity/Resistivity Calibration	1-point; 2-point for 4-E sensors
pH Calibration	1- or 2-point, with auto buffer recognition
pH Diagnostics	selectable continuous checking of membrane resistance and reference diaphragm/junction resistance (with solution ground sensors)
Dissolved Oxygen Calibration	air/comparison, zero
Dissolved Ozone Calibration	comparison, zero
Sensor maximum distance	61 m (200 ft); 15 m (50 ft) with 4-electrode sensors
Performance	
Accuracy	
Conductivity/Resistivity	$\pm 0.5\%$ of reading or 0.5 ohm, whichever is greater, up to 18 Mohm-cm
pH, ORP	$\pm 0.03$ pH, $\pm 2$ mV
Dissolved Oxygen	$\pm 1\%$ ( $\pm 2\%$ with long life probe) of reading or $\pm 1$ ppb, system accuracy
Dissolved Ozone	$\pm 2\%$ of reading or $\pm 3$ ppb, system accuracy
Outputs – see p. 7 for ratings	
Setpoints/Alarms	6 - high, low, outside, between, USP or EP
Relays	2 SPDT, 1 SPST NO, 1 SPST NC, 2 SPST reed
Analog Output Signals	4
Discrete Inputs	2

# M300 Flow Models

- Available in one and four channel models
- Accept input from most pulse flow sensors
- Compute total flow with high resolution
- Configurable for batch control
- Compute reverse osmosis % recovery on four channel model



## Measurement Specifications

Functional	
Flowrate Range	0 to 9999 GPM, L/min, m <sup>3</sup> /hr
Total Flow Range	0 to 9,999,999 Gallons, 37,850,000 Liters, 37,850 m <sup>3</sup>
RO % Recovery Range	0 to 100%
Flow Velocity Range	equivalent ft/s, m/s
Frequency Range	1 to 4000 Hz
Calculated Parameters (4-channel)	ratio, sum and difference of two flowrates
Resolution	4 significant digits, auto-ranged; up to 8 digits for total flow
Update rate	display and outputs, once per 2 seconds
Input pulses	low <1.0 volt; high >1.4 volts (36 volts max)

Performance	
Accuracy	± 0.5 Hz
Repeatability	± 0.2 Hz

Outputs – see p. 7 for ratings	Single channel	Four channel
Setpoints/Alarms	4 - high, low, outside, or between	8 - high, low, outside, or between
Relays	2 SPDT, 1 SPST NO, 1 SPST NC	2 SPDT, 1 SPST NO, 1 SPST NC
Analog Output Signals	2	4
Discrete Inputs, for external totalizer reset	1	2



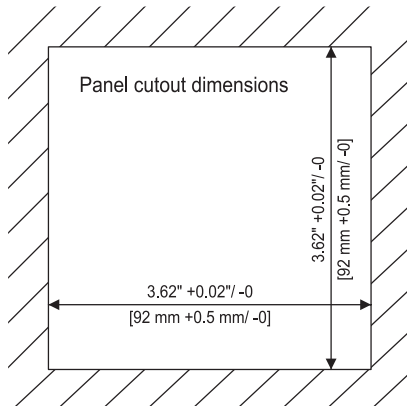
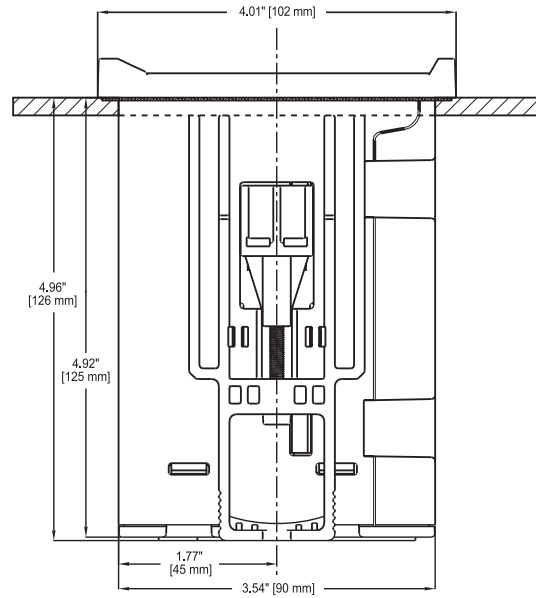
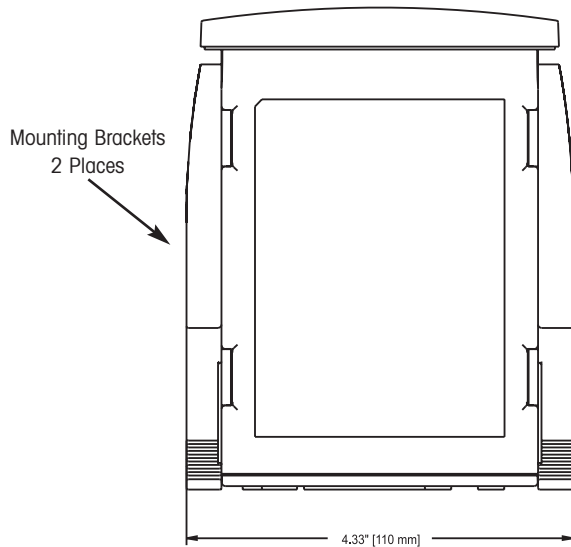
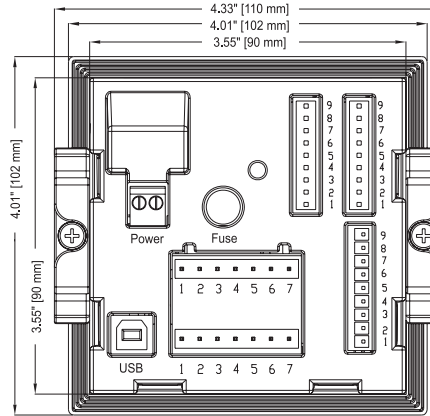
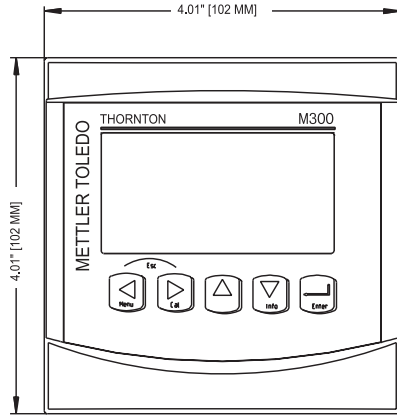
# Physical & Electrical Specifications - all models



<b>Enclosure/Power</b>	
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	ABS/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 (pending, US & Canada), 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)
<b>Environmental</b>	
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%
<b>Outputs</b>	
Analog outputs (as specified for individual models)	powered 0/4-20 mA, 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 (as specified for individual models)	all contacts are potential free, with adjustable hysteresis and time delay
SPDT, SPST NO, SPST NC	250 VAC/30 VDC, 3 A, resistive
SPST reed	300 VDC, 0.5 A, 10 W
Digital communications	USB, type B connector, for remote configuration and data acquisition
Discrete input (as specified for individual models)	accepts dry contact closure for remote flow totalizer reset or remote PID control auto/manual selection
<b>PID Control</b>	
Display	auto/manual status and % output on bottom line of display
Settings	auto/manual, setpoint, deadband, non-linear corner points, control limits, proportional gain, integral reset time (min.), derivative rate time (min.)
Manual Station	controlled by up/down arrow keys in manual mode; remote auto/manual selection by discrete input
Control Output Types	one or two analog signals, relays—pulse frequency, or relays—pulse length

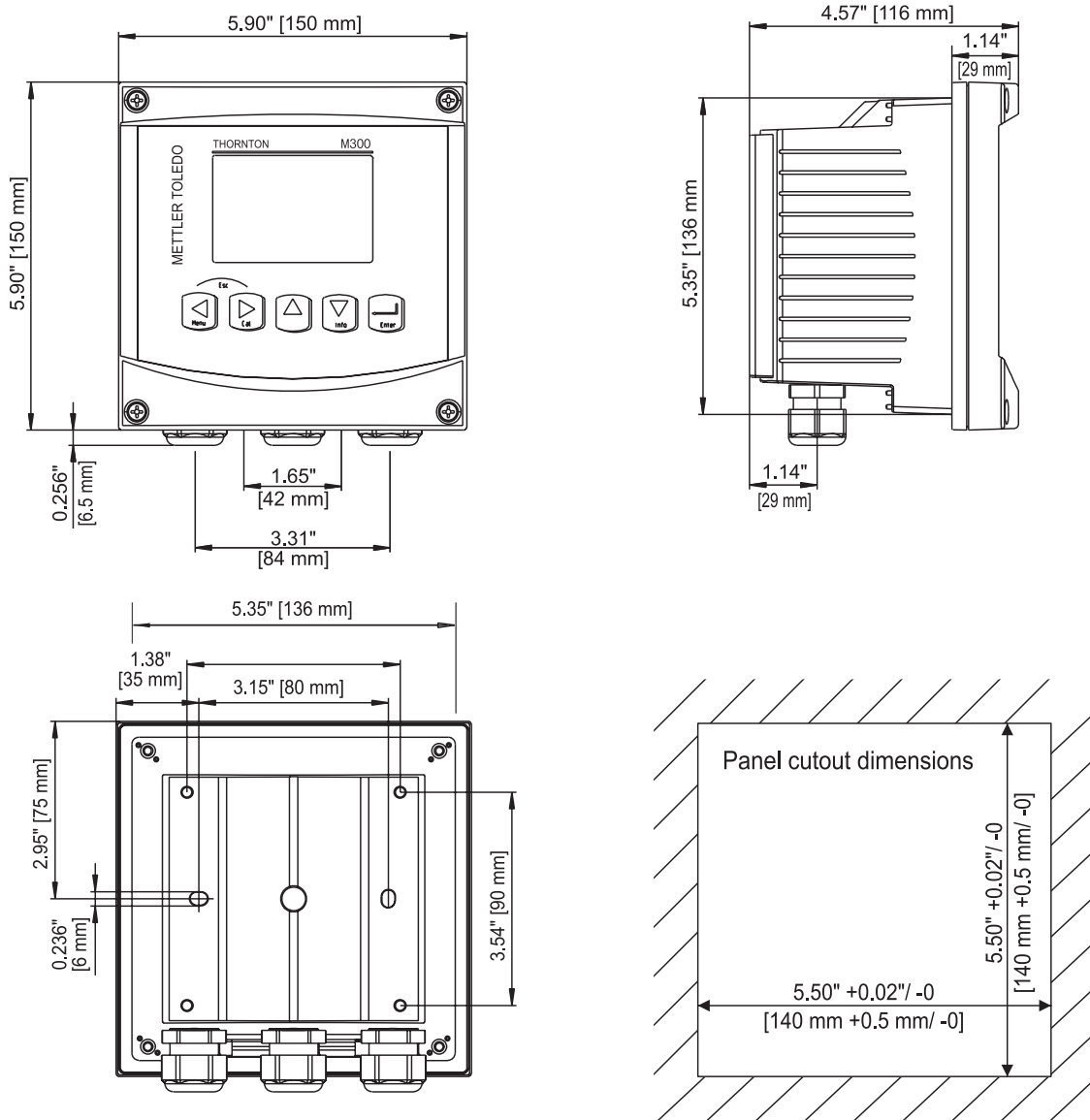
# Dimensional information

Dimensions for 1/4 DIN panel-mount models

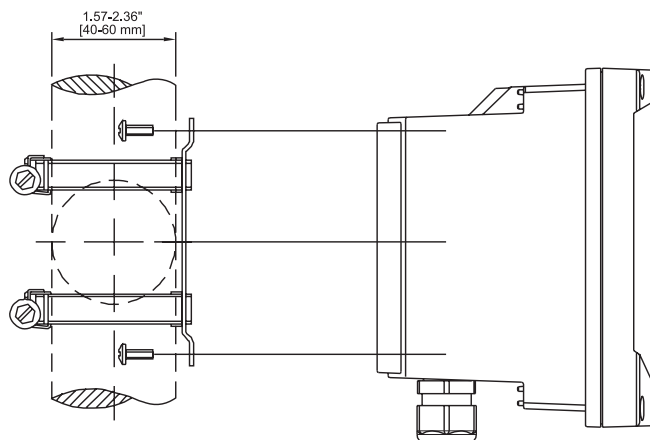




## Dimensions for 1/2 DIN wall/panel-mount models



## Dimensions for 1/2 DIN pipe mount kit



# Ordering Information

## M300 Transmitters

Description		Part Number
<b>1/4 DIN enclosure – panel mounting kit included</b>		
M300	1-channel Conductivity/Resistivity	58 002 301
M300	2-channel Conductivity/Resistivity	58 001 304
M300	1-channel pH/ORP	58 001 303
M300	2-channel Multiparameter	58 001 306
M300	1-channel Flow	58 004 302
M300	4-channel Flow	58 001 305
<b>1/2 DIN enclosure – panel/wall/pipe mount*</b>		
M300	1-channel Conductivity/Resistivity	58 002 311
M300	2-channel Conductivity/Resistivity	58 001 314
M300	1-channel pH/ORP	58 001 313
M300	2-channel Multiparameter	58 001 316
M300	1-channel Flow	58 004 312
M300	4-channel Flow	58 001 315

\* Panel and pipe mounting require kits, listed below, ordered separately.

## Accessories

Description	Part Number
Panel Mount Kit for 1/2 DIN models	52 500 213
Pipe Mount Kit for 1/2 DIN models	52 500 212
Conductivity Calibration Module	58 082 300
Adapter, VP to Standard, for calibrating conductivity with VP Patch Cord	58 080 102
Configuration Software & Data Logger Kit	58 077 300
Adapter Panel - M300 to 200/2000 cutout	58 083 305

## Conductivity Sensor Cables

Description	Part Number	
	Standard	VP*
1 ft (0.3 m)	1001-67	-
5 ft (1.5 m)	1005-67	58 080 201
10 ft (3 m)	1010-67	58 080 202
15 ft (4.5 m)	1015-67	58 080 203
25 ft (7.6 m)	1025-67	58 080 204
50 ft (15.2 m)	1050-67	58 080 205
75 ft (23 m)	-	58 080 206
100 ft (30.5 m)	1110-67	58 080 207
200 ft (61 m)	1120-67	58 080 208

\* For VP Conductivity sensors only.

## pH / ORP / Dissolved Oxygen / Ozone Sensor Cables

Description	Part Number
<b>pH, Dissolved Oxygen**, Ozone</b>	
3 ft (1 m) VP, -30 to 70 °C	52 300 107
10 ft (3 m) VP, -30 to 70 °C	52 300 108
16 ft (5 m) VP, -30 to 70 °C	52 300 109
33 ft (10 m) VP, -30 to 70 °C	52 300 110
High temp 3 ft (1 m) VP, -40 to 135 °C	52 300 111
High temp 10 ft (3 m) VP, -40 to 135 °C	52 300 112
High temp 16 ft (5 m) VP, -40 to 135 °C	52 300 113
High temp 33 ft (10 m) VP, -40 to 135 °C	52 300 114

### ORP

3 ft (1 m) AS9	10 001 0102
10 ft (3 m) AS9	10 001 0302
16 ft (5 m) AS9	10 001 0502
33 ft (10 m) AS9	10 001 1002

\*\* For long life dissolved oxygen sensor 58 037 220 only, use standard conductivity cables in previous table.

## Calibration / Verification Solutions

Description	Part Number
<b>Conductivity Standard Solutions</b>	
Conductivity standard, 25 µS/cm, 500 mL, HCl, ± 3%	58 078 001
Conductivity standard, 100 µS/cm, 500 mL, KCl, ± 1%	58 078 002
Conductivity standard, 1000 µS/cm, 500 mL, KCl, ± 1%	58 078 003
Conductivity standard, 10,000 µS/cm, 500 mL, KCl, ± 1%	58 078 004
Conductivity standard, 100,000 µS/cm, 500 mL, KCl, ± 1%	58 078 005



### pH and ORP (Redox) Standard Buffer Solutions

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, 468 mV, 6 x 30 mL	51 319 058
ORP Buffer, 220 mV, 6 x 250 mL	51 340 081





## M300 Conductivity Calibration Module 58 082 300

- Includes resistances for all ranges of conductivity/resistivity and temperature
- Used with 1- and 2- channel conductivity and multiparameter models
- With NIST-traceable certificate of calibration
- Enables efficient QA program
- Includes standard patch cord connection; 58 080 102 adapter available for use with VP patch cords

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

Visit for more information

**Mettler-Toledo Thornton, Inc.**

36 Middlesex Turnpike  
Bedford, MA 01730 USA  
Tel. +1-781-301-8600  
Fax +1-781-301-8701  
Toll Free +1-800-510-PURE  
thornton.info@mt.com

Subject to technical changes  
© Mettler-Toledo Thornton, Inc.  
ML0122 Rev.B 02/07



**Quality certificate.**  
Development, production and testing to ISO 9001.



A certified ServiceXXL provider.