

# Smart Conductivity

**THORNTON**

Leading Pure Water Analytics

- ASTM & NIST Traceable Calibration
- Smart Sensor Technology
- Two & Four Electrode Designs
- NPT & Tri-Clamp Connections



## 770MAX Conductivity/Resistivity Sensors

**METTLER TOLEDO**

## Sensor Selection Criteria

- Conductivity or resistivity range — resistivity (Mohm-cm) = 1/conductivity ( $\mu\text{S}/\text{cm}$ )
- Mounting type — Insertion, retractable or submersion
- Pipe connection type and size
- Chemical compatibility, including cleaning and disinfection processes. Rely on process experience or consult Thornton for unusual process composition. PEEK is recommended for exposure to ozone and other oxidizers. Monel is recommended for exposure to hydrofluoric acid.
- Temperature requirements, including steam and/or hot chemical cleaning
- Suspended solids — 234-series four-electrode sensors have flat surfaces which are less likely to accumulate solids and are easier to clean than others.

Thornton conductivity sensors are industry standards for determining water purity and solution concentration. Smart conductivity sensors are a key part of the 770MAX Multiparameter Analyzer/Transmitter measuring system. Each sensor includes data stored in its non-volatile memory which is communicated to the instrument as soon as it is connected. Data includes measurement identification, cell and temperature calibration constants, date of last calibration, serial number, etc., to provide especially fast, simple and reliable startup and documentation. In addition, all wiring is conveniently handled through connectors.

Thornton ISO9001 factory calibrations are NIST and ASTM traceable using Thornton's unique ultrapure auto-loop calibration system. High installed accuracy is supported through four-wire measurement technology for both conductivity/resistivity and temperature.

USP pharmaceutical water monitoring requirements are met by 233-series sensors which provide accurate conductivity and temperature measurement. 316L Tri-Clamp mounting sensors have a Roughness Average (Ra) of 8 microinch surface finish. 234- Series four-electrode sensors are ideal for monitoring clean-in-place (CIP) solution concentrations.

Auto-loop Conductivity Sensor Calibration System





230-531  
50 Constant



230-431  
10 Constant



233E223  
0.1 Constant Sanitary



3/4" NPT  
0.1 Constant



234-631  
4-Electrode



230-211 in 1000-30  
Flow Chamber



230-207  
Submersible



234-633  
4-Electrode Sanitary



230-212 in 1000-41  
Retractable Housing

<b>Cell Constant Accuracy:</b>	± 1%; ± 5% system accuracy for 4-E and 230-431 Sensors
<b>Cell Constant Repeatability:</b>	± 0.25%; ± 2% for 4-E and 230-431 Sensors
<b>Temperature Sensor:</b>	Pt1000 RTD, IEC 746, Class A, except thermistor for 230-531
<b>Temperature Accuracy:</b>	± 0.1 °C at 25 °C, except 230-531
<b>Cable Jacket Material:</b>	230- and 234-series - PVC, 80 °C rating; 233-series - Teflon, 200 °C rating
<b>Connector Rating:</b>	NEMA 4X, IP65
<b>Maximum Sensor Distance:</b>	300 ft (91 m), except 4-Electrode sensors, which have reduced accuracy with patch cord length greater than 50 ft (15 m) at high conductivity.
<b>Surface Finish</b>	
<b>(metal sanitary sensors):</b>	Ra 8 microinches (0.2 micrometers), 316L SS is electropolished

Fitting	Insertion Length "X" in (mm)	Cable Length ft (mm) / Connector	Fitting Material	Range (μS/cm)*	Cell Const. (cm <sup>-1</sup> )	Electrode Material	Insulator Material	Max Pressure/Temp Psig (bar) at °F (°C)	Part No.
3/4" NPTM	12.12 (308)	1.5 (0.5)	Teflon/SS	0.01-3000	0.1	Titanium	PPS	250 (17) at 200 (93)	230A201
3/4" NPTM	5.19 (132)	1.5 (0.5)	Teflon/SS	0.01-3000	0.1	Titanium	PEEK	250 (17) at 200 (93)	230-206
3/4" NPTM	1.15 (29)	10 (3)	PVDF	0.01-3000	0.1	Titanium	PEEK	100 (7) at 203 (95) & 500 (34) at 77 (25)	230-207
3/4" NPTM	1.14 (29)	1.5 (0.5)	Noryl	0.01-3000	0.1	Titanium	PEEK	250 (17) at 200 (93)	230-210
3/4" NPTM	1.35 (34)	1.5 (0.5)	Teflon/SS	0.01-3000	0.1	Titanium	PEEK	250 (17) at 200 (93)	230-211
Retractable for 1000-4X housing	2.75 (70)	1.5 (0.5)	SS	0.01-3000	0.1	316L SS	PEEK	58 (4) at 268 (131) & 100 (7) at 203 (95) & 250 (17) at 77 (25)	230-212
1/2" NPTM	1.14 (29)	1.5 (0.5)	Teflon/SS	0.01-3000	0.1	Titanium	PEEK	250 (17) at 200 (93)	230-216
3/4" NPTM	1.35 (34)	1.5 (0.5)	Teflon/SS	0.01-3000	0.1	Monel	PEEK	250 (17) at 200 (93)	230-251
3/4" NPTM	5.19 (132)	1.5 (0.5)	Teflon/SS	0.01-3000	0.1	Monel	PPS	250 (17) at 200 (93)	230-261
3/4" NPTM	5.19 (132)	1.5 (0.5)	Teflon/SS	0.01-3000	0.1	Titanium	PPS	250 (17) at 200 (93)	230-271
3/4" NPTM	2.38 (60)	1.5 (0.5)	Teflon/SS	0.001-2000	0.01	Titanium	PEEK	250 (17) at 200 (93)	230-101**
3/4" NPTM	3.41 (87)	1.5 (0.5)	Teflon/SS	10-200,000	10	Graphite	Noryl	250 (17) at 200 (93)	230-431
1" NPTM	4.90 (125)	1.5 (0.5)	PVDF	10-1,000K	50	Graphite	Epoxy	100 (7) at 200 (93)	230-531
1" NPTM	1.1 (28)	10 (3)	PEEK	10-800,000†	4-E	Hastelloy	PEEK	100 (7) at 200 (93) & 200 (14) at 77 (25)	234-630
1" NPTM	1.1 (28)	10 (3)	CPVC	10-800,000†	4-E	316L SS	CPVC	50 (3.5) at 176 (80)	234-631
1" NPTM	1.1 (28)	10 (3)	CPVC	10-800,000†	4-E	Hastelloy	CPVC	100 (7) at 176 (80)	234-635
1.5" Tri-Clamp	3.38 (86)	1.5 (0.5)	Titanium	0.01-3000	0.1	Titanium	PEEK	150 (10) at 311 (155) & 450 (31) at 77 (25)	233E221***
1.5" Tri-Clamp	3.38 (86)	1.5 (0.5)	316L SS	0.01-3000	0.1	316L SS	PEEK		233E223***
2.0" Tri-Clamp	4.13 (105)	1.5 (0.5)	316L SS	0.01-3000	0.1	316L SS	PEEK		233E227***
1.5" Tri-Clamp	1.00 (25)	1.5 (0.5)	PEEK	10-800,000†	4-E	316L SS	PEEK	200 (14) at 122 (50) & 70 (4.8) at 284 (140)	234-633***
2.0" Tri-Clamp	1.00 (25)	1.5 (0.5)	PEEK	10-800,000†	4-E	316L SS	PEEK		234-634***

\* Megohm-cm = 1/(μS/cm)

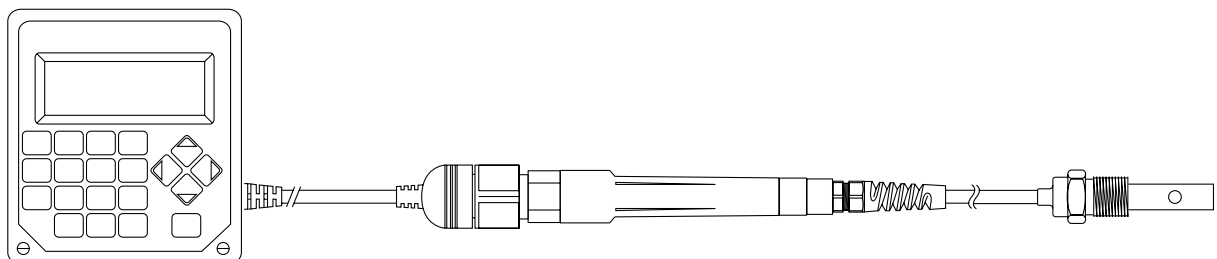
\*\* Recommended for non-aqueous samples

\*\*\* Include material certification to meet EN10204 3.1B.

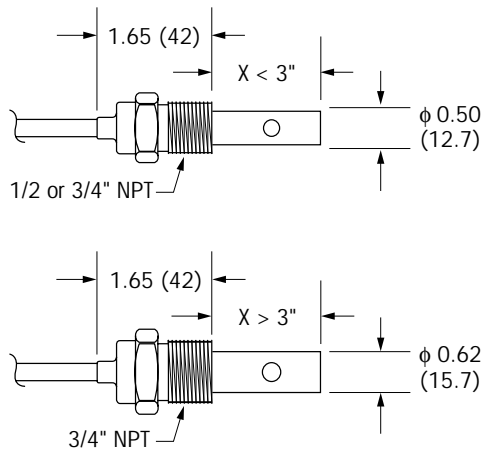
† For measurements above 400,000 μS/cm, 770MAX software version must be 2.4 or higher (after July 2002).

Certification of calibration included with all 0.1 and 0.01 constant sensors; may be requested at additional cost on others.

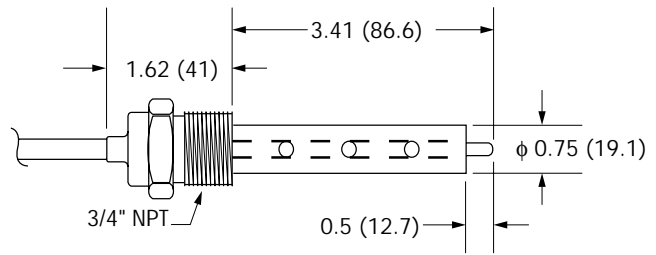
## Smart Sensor Wiring



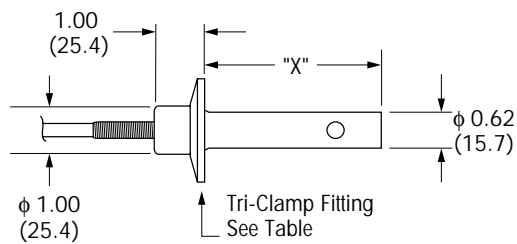
**NPT 0.01 and 0.1 Constant**



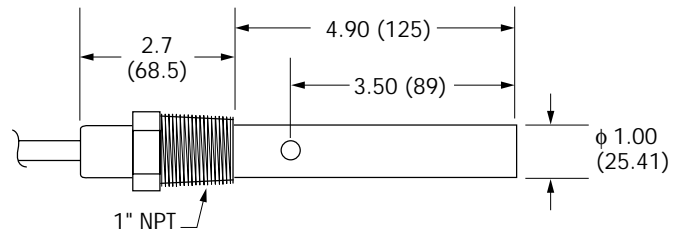
**10 Constant 230-431**



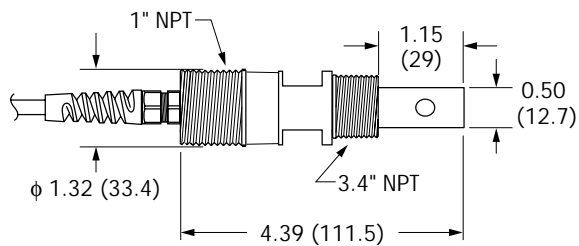
**Sanitary 0.1 Constant 233-\_-\_-**



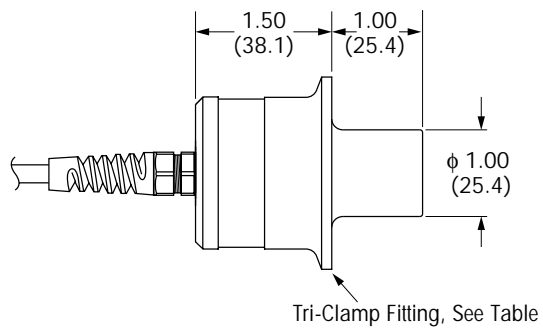
**50 Constant 230-531**



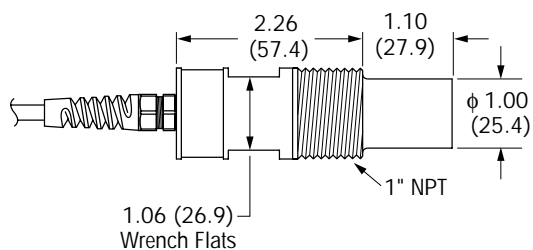
**Submersion 0.1 Constant 230-207**



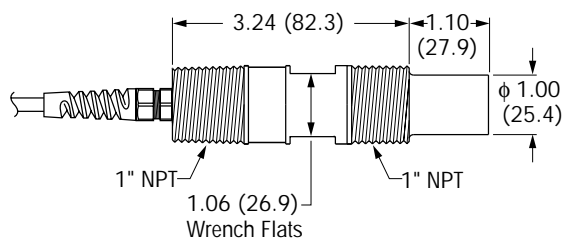
**Sanitary 4-Electrode 234-633 & 234-634**



**NPT 4-Electrode 234-630**

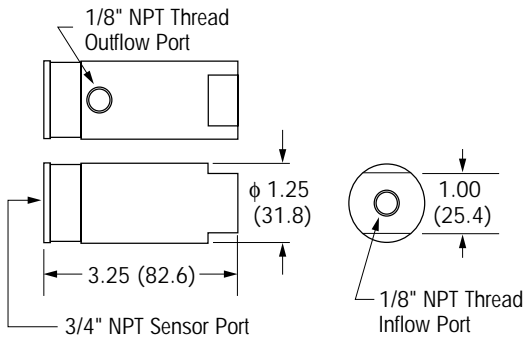


**NPT 4-Electrode 234-631 & 234-635**

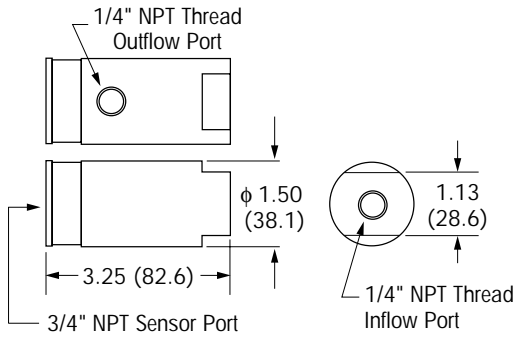


Dimensions: inches (mm). See sensor table for "X" dimensions.

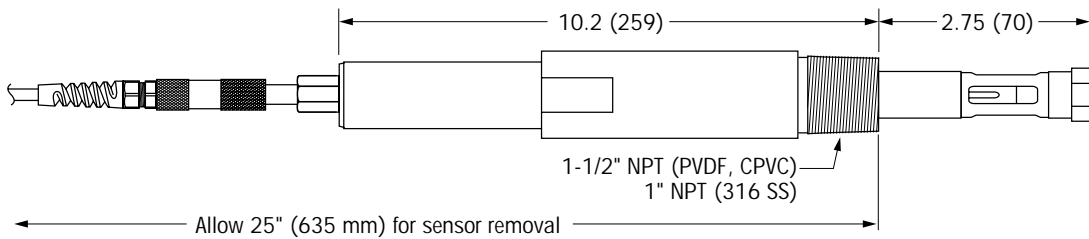
### 316SS Flow Housing 1000-30



### PVDF Flow Housing 1000-31

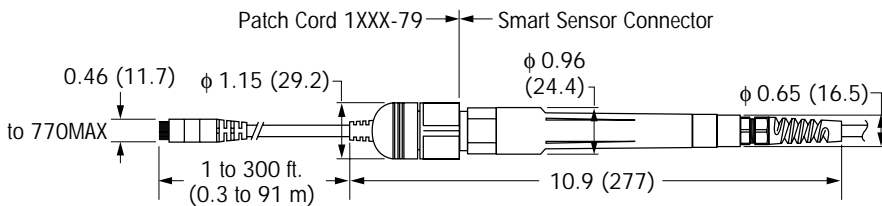


### 230-212 Sensor and 1000-4\_ Retractable Housing



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### Smart Sensor Connector and Patch Cord



## Accessories

Description	Part No.
Conductivity Flow Housing - 316 Stainless Steel, 1/8" NPTF inlet/outlet, 3/4" NPTF sensor port	1000-30
Conductivity Flow Housing - PVDF, 1/4" NPTF inlet/outlet, 3/4" NPTF sensor port	1000-31
CPVC Retractable Housing (for 230-212) - 1-1/2"NPTM 75 psi (5 bar), -5 to 80 °C, Viton o-rings	1000-40
PVDF Retractable Housing (for 230-212) - 1-1/2" NPTM 75 psi (5 bar), -5 to 100 °C, Viton o-rings	1000-41
316 SS Retractable Housing (for 230-212) - 1" NPTM 100 psi (7 bar), -5 to 120 °C, Viton o-rings	1000-42

## Smart Sensor Patch Cords

Length	Part No.
1 ft. (0.3 m)	1001-79
5 ft. (1.5 m)	1005-79
10 ft. (3 m)	1010-79
15 ft. (4.5 m)	1015-79
25 ft. (7.6 m)	1025-79
50 ft. (15.2 m)	1050-79
100 ft. (30.5 m)	1100-79
150 ft. (45.6 m)	1115-79
200 ft. (61 m)	1120-79
300 ft. (91 m)	1130-79

Observe length limitations of 4-electrode sensors.



For the most current product information visit:

[www.thorntoninc.com](http://www.thorntoninc.com)

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**Mettler-Toledo Thornton, Inc.**  
36 Middlesex Turnpike  
Bedford, MA 01730 USA  
Telephone: +1-781-301-8600  
Toll-Free: 1-800-510-PURE

**Customer/Technical Service**  
Telephone: +1-781-301-8690  
Toll-Free: 1-800-642-4418  
Cust Service Fax: +1-781-271-0214  
Tech Service Fax: +1-781-271-0675

email: [info@thorntoninc.com](mailto:info@thorntoninc.com)  
[www.thorntoninc.com](http://www.thorntoninc.com)

ML0072 Rev.F1 02/04