

TB2CS

Conductivity sensor

2-Electrode

Superior accuracy in low level conductivity measurement ranges



Measurement range from 0 to 199.9 μ S/cm and 0 to 19.99 mS/cm

Resolution to 0.001 μ S/cm in lowest range

Corrosion resistant 316 stainless steel measurement electrodes

— No sandblasting or other alterations to increase surface area

No calibration required

Rugged design

— Sensor mounts directly into process line

NEMA 4X cast aluminum junction box

— Provides easy access to process wiring

High pressure and temperature ratings

Certifiable cell constants (upon request)

Two-Electrode Conductivity Sensors - Model TB2

The rugged, industrial grade Model TB2 Two-Electrode Conductivity Sensor installs directly into the process line or ABB flow cell. The sensor design allows for cell constants of 0.01, 0.10, and 1.00 and a maximum compensated measurement range of zero to 19.99 millisiemens per centimeter. Mounting configurations include inline, submersible, hot tap, and flow-through. A unique flow cell is available for flow-through installations. Polyether ether ketone (PEEK) insulator tip material and 316 stainless steel measurement electrodes provide corrosion resistance in all low to medium conductivity measurement applications.

The fixed cell constant makes the Model TB2 sensors essentially calibrated upon installation and thus especially well suited for low conductivity measurements. The sensor has an integral temperature compensation element and measurement electrodes that have not been sandblasted or altered in any way. These features guarantee the sensors as easy to install, reliable, and accurate for all industrial conductivity measurement needs.

Choosing the Correct Conductivity Sensor

ABB manufactures three types of conductivity sensors: two-electrode, four-electrode, and toroidal conductivity. Each sensor type has its own unique advantages. Two-electrode conductivity sensors are only available for low to medium conductivity ranges, with a maximum conductivity of 19.99 millisiemens per centimeter. Four-electrode and toroidal conductivity sensors are generally used in medium to high conductivity measurement ranges, applications with aggressive chemicals, and applications that tend to coat or scale the measurement electrode. Refer to the appropriate product specification for more information on four-electrode and toroidal conductivity sensors.

1. Determine the range of conductivity measurement desired. Although they can be used at higher conductivity ranges, the optimum for two-electrode sensors is zero to 199.9 microsiemens per centimeter or the 0.01 cell constant. Table 1 lists the cell constants for two-electrode conductivity sensors and their respective ranges.

Table 1. Conductivity Ranges

Cell Constant	Conductivity Range
0.01	0 to 1.999 $\mu\text{S/cm}$, 0 to 19.99 $\mu\text{S/cm}$, 0 to 199.9 $\mu\text{S/cm}$
0.10	0 to 19.99 $\mu\text{S/cm}$, 0 to 199.9 $\mu\text{S/cm}$, 0 to 1,999 $\mu\text{S/cm}$
1.00	0 to 199.9 $\mu\text{S/cm}$, 0 to 1,999 $\mu\text{S/cm}$, 0 to 19.99 mS/cm

2. Make sure that the process chemistry is compatible with 316 stainless steel measurement electrodes. This material is compatible with most process fluids except for some acids. ABB manufactures four-electrode conductivity sensors with special measurement electrode materials and toroidal conductivity sensors for processes that attack 316 stainless steel.
3. Establish the maximum process temperature and pressure.
4. Determine the sensor installation method: inline threaded, inline sanitary fitting, inline ball valve insertion, submersible, or flow cell. Table 2 lists the sensors compatible with each method.
5. Select either a Pt 100 or Pt 1000 integral temperature compensation element. The Type TB82TE Two-Electrode Conductivity Transmitter and Type TB84TE Two-Electrode Conductivity Analyzer both accept either temperature compensation element type. The AX41 accepts a Pt 1000 temperature element.
6. Determine the length of cable needed to reach from the sensor to the instrument. Order the cable as either integral to the sensor or by using the junction box and extension cable as separate items.
7. Use the information from Steps 1 through 6 and the ordering guides to create a sensor model number. One choice must be made in all positions of the ordering guide.

Installation Methods

Table 2 lists the sensors and their applicable installation methods. Complete information about each sensor is located in the appropriate section under **Specifications, Dimensions, and Ordering Guides.**

Table 2. Installation Methods

Sensor	Installation Methods
TB25	Inline Tri-clamp fitting (sterilizable)
TB254	Inline: twist lock insertion, threaded Ryton® receptacle; submersible
TB26	Inline: direct insertion (tee), hot tap ball valve insertion, hot tap threaded compression fitting; submersible
TB264	Inline 25mm (sterilizable), flow cell; submersible
TB27	Inline high pressure hot tap ball valve insertion

Flow Cells

The flow cell (Fig. 1) is available for both conductivity and pH sensors. It is designed for use with Model TB264 Two-Electrode Conductivity Sensors, Model TB464 Four-Electrode Conductivity Sensors, and Model TB561 and TBX561 pH/ORP Sensors. Multiple inlet and outlet ports provide flexibility with installation, calibration, and mounting configurations. The sensor can be inserted and removed from the flow cell quickly and easily without disconnecting the sensor from the instrument or junction box. Refer to Table 3 for the flow cell kit part numbers.

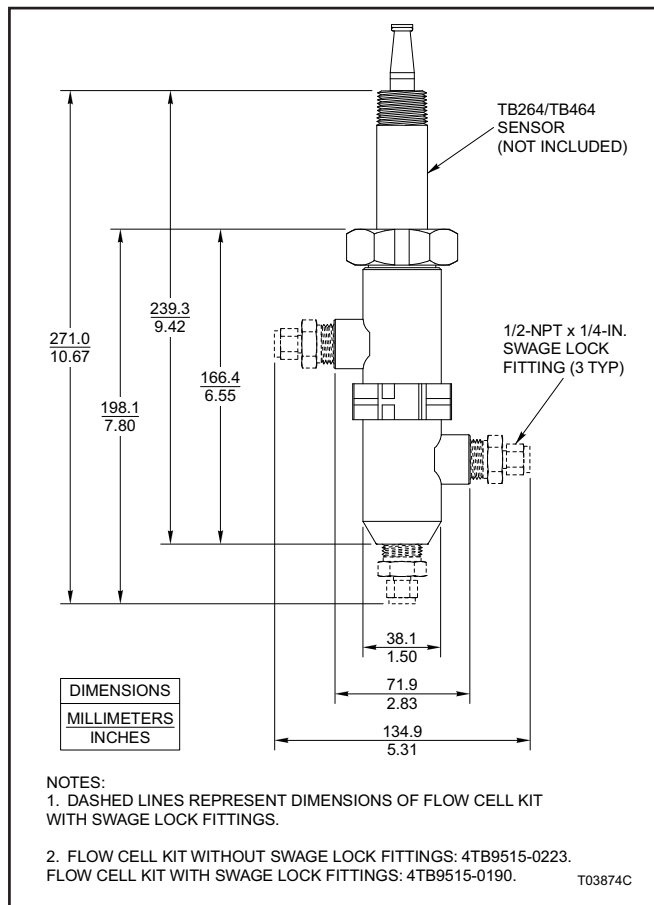


Figure 1. Flow Cell

Table 3. Flow Cell Kits

Part Number	Description
4TB9515-0190	Kit, flow cell with swage lock fittings
4TB9515-0223	Kit, flow cell without swage lock fittings

Junction Box

The junction box (Fig. 2) is a standard item, selected from the ordering guide, typically used with an extension cable for direct connection to ABB transmitters and analyzers.

Temperature Compensation

The effect of temperature on conductivity is significant. Temperature must be compensated to a reference temperature, typically 25-degrees Celsius (77-degrees Fahrenheit), for accurate measurements. All of the conductivity sensors covered in this specification have either a Pt 100 or Pt 1000 integral temperature compensation element. These are located deep enough inside the tip of the sensor to ensure a fast and accurate response to temperature changes.

The integral temperature compensation elements are compatible with both the Type TB82TE transmitter and Type TB84TE analyzer. These instruments are capable of several different modes of temperature compensation: manual, automatic for potassium chloride (KCl), user-entered coefficient in percent per degree Celsius, and three types for pure water (trace acid, trace base, and neutral salt). Other choices are available to match various acid and base solutions.

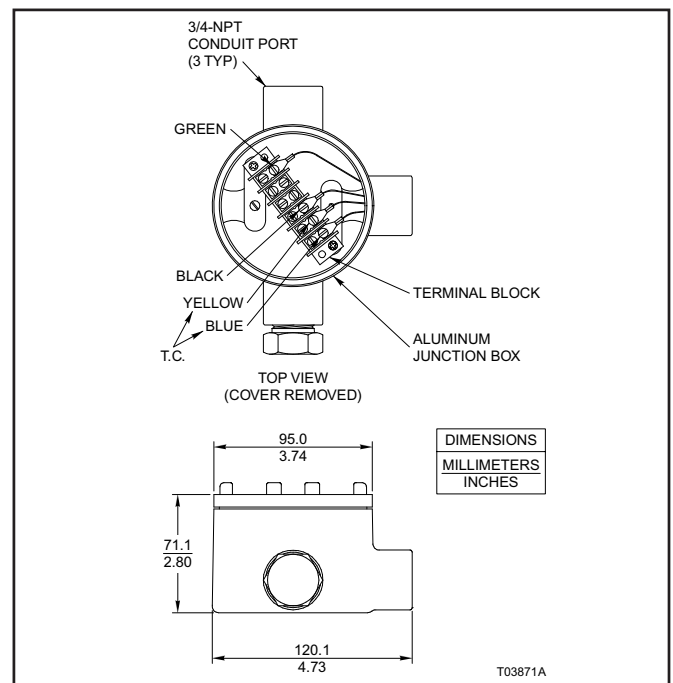


Figure 2. Junction Box

Specifications, Dimensions, and Ordering Guides

ABB offers several two-electrode conductivity sensors. The following sections contain detailed specifications, dimensions, and ordering guides for each sensor.

Model TB25 Sensors

Model TB25 sensors (Fig. 3) have an integral Tri-Clamp® fitting for use in sterilizable services. A Food and Drug Administration (FDA) approved silicone potting material around the body of the sensor seals the measurement electrode tip. The first style available has an extended face that places the measurement electrodes into the process past the fitting. The extended face style is narrow enough to allow cleaning chemicals or steam to surround the body of the measurement electrode. This assures crevice free cleaning. The second style has a Tri-Clamp fitting that is flush with the sensor body. The Model TB25 sensor specifications are listed in Table 4 and Table 5 is the ordering guide. The dimensions are shown in Figure 4.

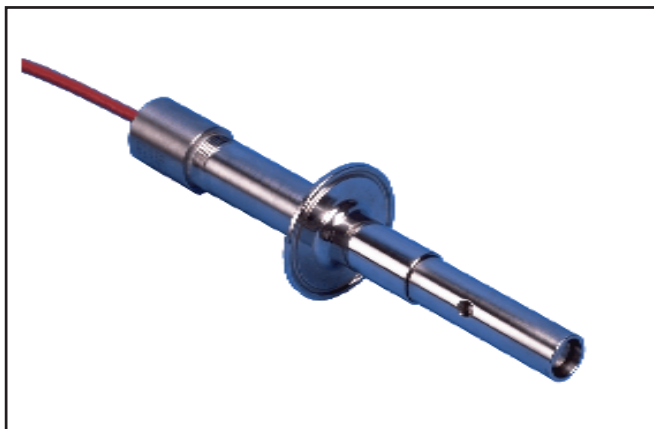


Figure 3. Model TB25 Sensor

Table 4. Model TB25 Sensor Specifications

Applications (typical)

Dairy, beverage, food, pharmaceutical, any service where process lines must be sterilized and/or chemical steam cleaning takes place.

Special features

Integral Tri-Clamp flange.
Complete rangeability.

Sensor Mounting

Tri-Clamp.

Materials

Sensor body, measurement electrode, flange:	316 stainless steel
Insulator:	PEEK
O-rings (internal):	Ethylene propylene
Potting material:	FDA approved silicone

Ratings (max.)

Temperature:	175°C (347°F)
Pressure:	862kPa at 175°C (125 psi at 347°F)

Tri-Clamp Conductivity Sensor

	Model TB25								
Cell Constant									
0.01		0 . 0 1							
0.10		0 . 1 0							
1.00		1 . 0 0							
Integral Temperature Compensation Element									
Pt 1000			1						
O-Ring Material									
Standard (ethylene propylene)				1					
Measurement Electrode Material									
316 stainless steel					1				
Reserved									
For future use						0			
Flange									
1.5 in. Tri-Clamp							1		
2.0 in. Tri-Clamp								2	
Flush, 1.0-in./ 1.5 in Tri-Clamp									5
Cable Length, in meters (feet)									
No cable, junction box included									0
1.5 (5.0)									1
3.0 (10.0)									2
7.6 (25.0)									5
15.2 (50.0)									A
30.5 (100.0)									C
Insulator Tip Material									
PEEK									2

Stainless steel sensor tag: 4TB5003-0003
 Mylar sensor tag: 4TB5003-0002
 Interconnecting cable from sensor to analyzer: 4TB3004-0008 (specify length when ordering)

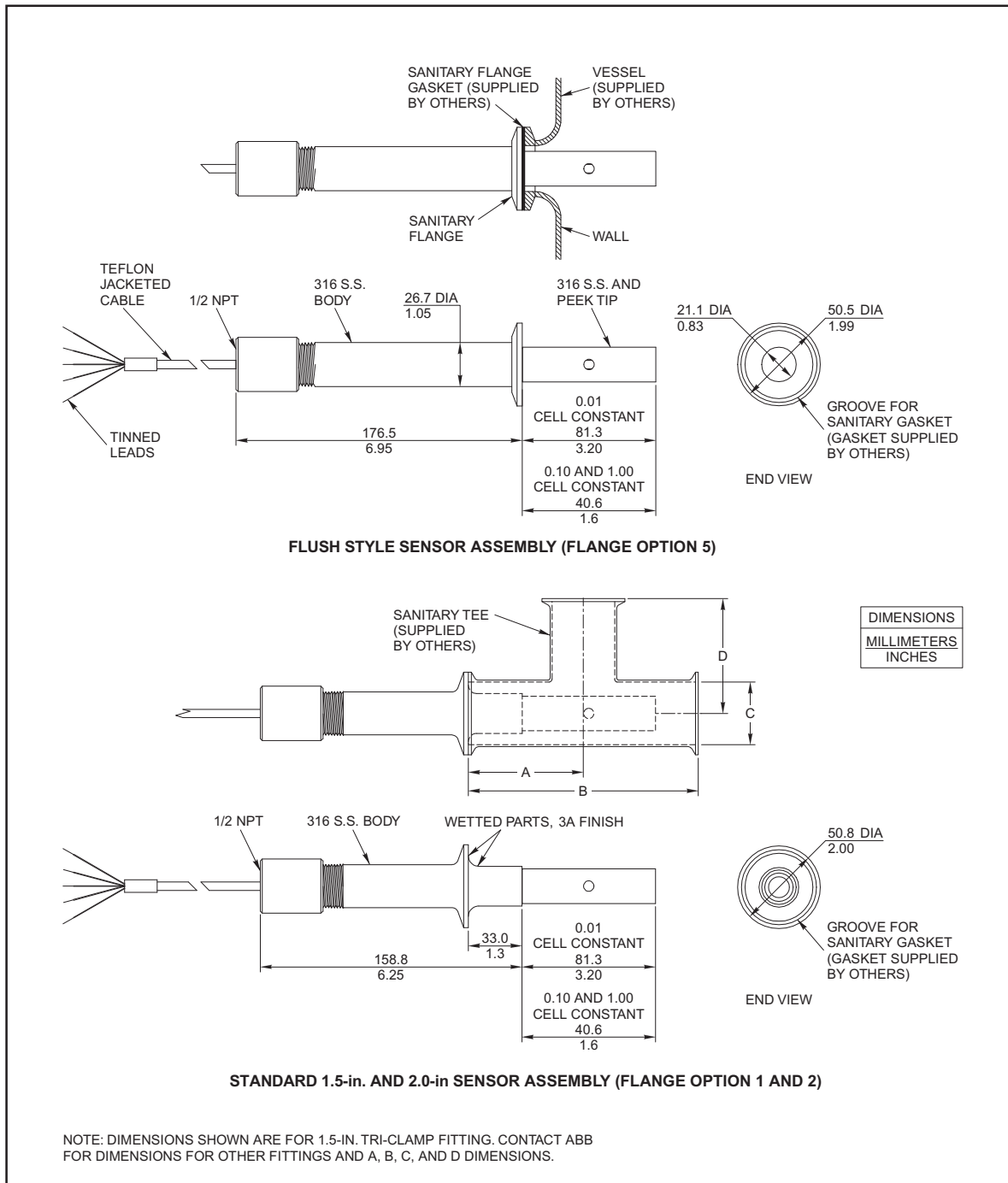


Figure 4. Model TB25 Sensor Dimensions

Model TB254 Sensors

Model TB254 sensors (Fig. 5) can be installed either inline or used for submersible applications. Inline applications consist of 1-NPT receptacles where the sensor is either inserted and twisted 90 degrees or inserted and held in place by a cap nut. Easy, yet flexible installation makes this sensor ideal for general use conductivity measurements. The Model TB254 sensor specifications are listed in Table 6 and Table 7 is the ordering guide. The dimensions are shown in Figure 6.



Figure 5. Model TB254 Sensor

Table 6. Model TB254 Sensor Specifications

Applications (typical)

Cooling towers, packaged water systems, exchange columns, heat exchangers, all other low to medium range conductivity measurements.

Special features

Twist lock and Ryton threaded receptacle make sensor access quick and easy.

Materials:

Sensor body: Measurement	Ryton
Electrode:	316 stainless steel
Insulator:	PEEK
O-rings:	Ethylene propylene (internal) and Buna-N (external)
1-NPT twist lock receptacle:	316 stainless steel
Threaded receptacle:	Ryton
Ratings (max.)	
Temperature	100°C (212°F)
Pressure:	690 kPa at 100°C (100 psi at 212°F)

Sensor Mounting

In-line: 1-inch NPT receptacles
 Submersion: rear 3/4" NPT for support pipe

Ryton Body, PEEK Tip Conductivity Sensor

Model TB254

Cell Constant								
0.01	0	.	0	1				
0.10	0	.	1	0				
1.00	1	.	0	0				
Integral Temperature Compensation Element								
Pt 1000	1							
O-Ring Material								
Standard (ethylene propylene)	1							
Measurement Electrode Material								
316 stainless steel			1					
Reserved								
For future use					0			
Mounting Accessories								
None						0		
Stainless receptacle							2	
Ryton threaded receptacle								3
Cable Length, in meters (feet)								
No cable, junction box included								0
1.5 (5.0)								1
3.0 (10.0)								2
7.6 (25.0)								5
15.2 (50.0)								A
30.5 (100.0)								C
Insulator Tip Material								
PEEK								2

Stainless steel sensor tag: 4TB5003-0003
 Mylar sensor tag: 4TB5003-0002
 Interconnecting cable from sensor to analyzer: 4TB3004-0008 (specify length when ordering)

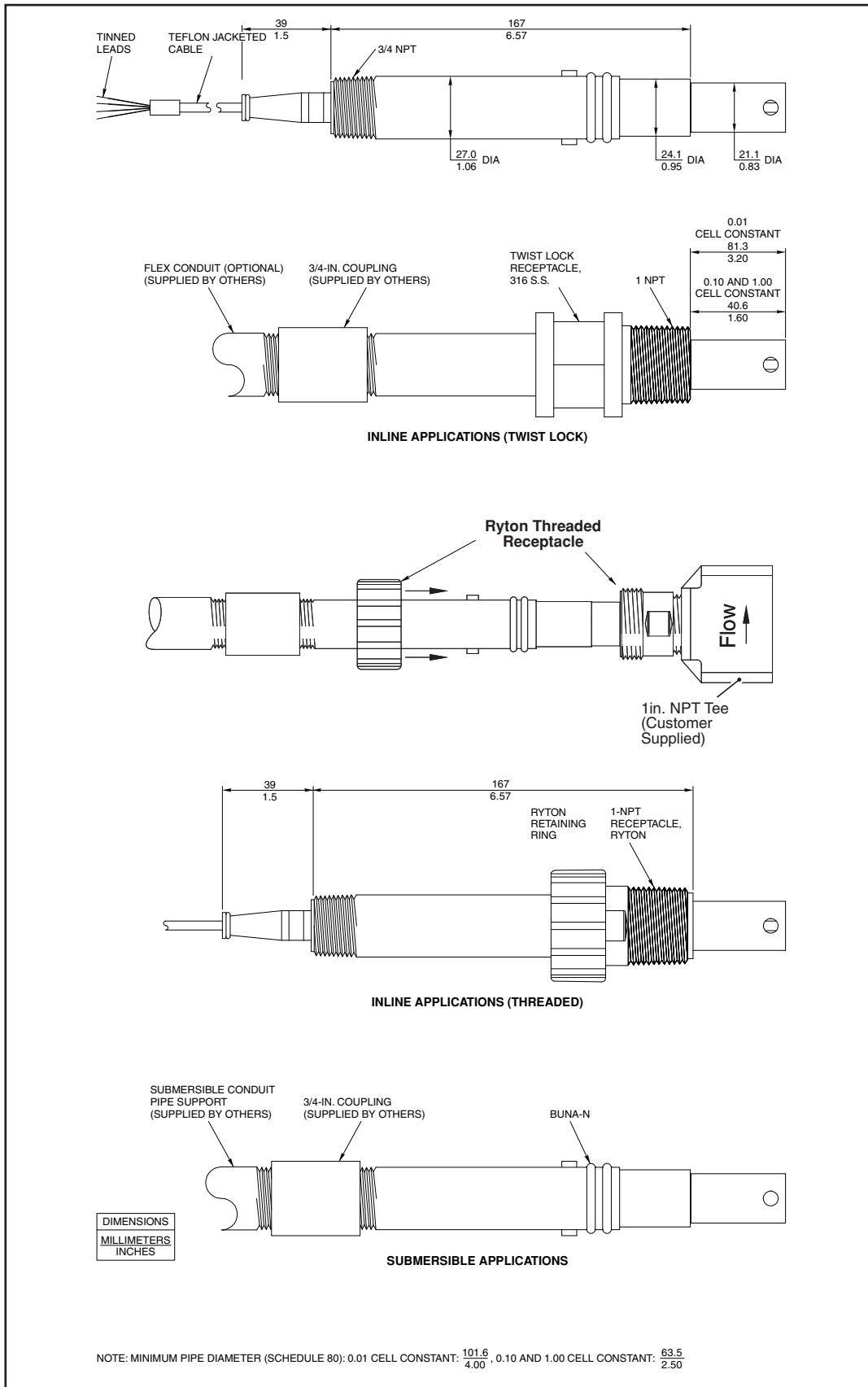


Figure 6. Model TB254 Sensor Dimensions

Model TB26 Sensors

Model TB26 sensors (Fig. 7) are easily installed into process lines and vessels via the integral 3/4-NPT threads, submersed directly into lines and vessels via the 1/2-NPT backthreads, or inserted into a process line or vessel through a ball valve. The ball valve provides isolation between the sensor and the process, allowing sensor insertion and removal while the line or vessel is full. This is accomplished by using a 1-1/2 inch standard ball valve. A compression fitting with flushing ports allows the operator to wash away any left over process fluid after removing the sensor. The flushing ports also provide a quick and easy place to take a grab sample for calibration. Variable sensor lengths are available for all Model TB26 sensor styles. The hot tap sensor can be used with the compression fitting and without the ball valve to provide even greater installation flexibility. The Model TB26 sensor specifications are listed in Table 8 and Table 9 is the ordering guide. The dimensions are shown in Figure 8.

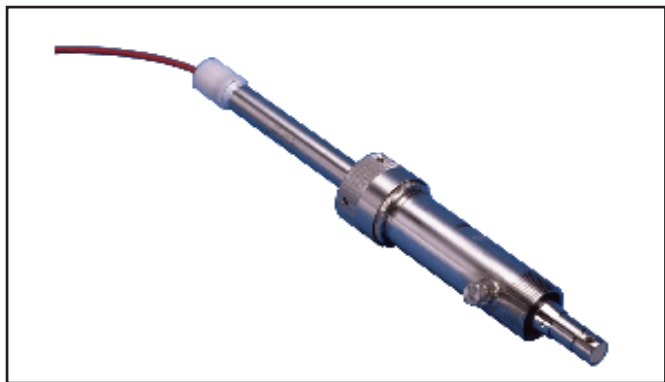


Figure 7. Model TB26 Sensor with Block and Drain Compression Fitting

Table 8. Model TB26 Sensor Specifications

Applications (Typical)

Pure water, low conductivity, boiler measurements, cooling towers, condensate, exchange columns, heat exchangers, all other low to medium range conductivity measurements.

Special features

Interchangeable and replaceable sensor tips, antiblowout lip on hot tap versions is machined into sensor body providing safety without restraining lanyards that are often left unused.

Materials ¹

Sensor body and measurement electrode:	316 stainless steel
Insulator:	PEEK
O-rings:	Ethylene propylene
Packing gland ferrule:	Teflon®

Ratings (max.)

Insertion/submersion

Temperature:	200°C (392°F)
Pressure:	1551 kPa at 200°C (225 psi at 392°F)

Hot Tap

Temperature:	200°C (392°F)
Pressure:	690 kPa at 200°C (100 psi at 392°F)

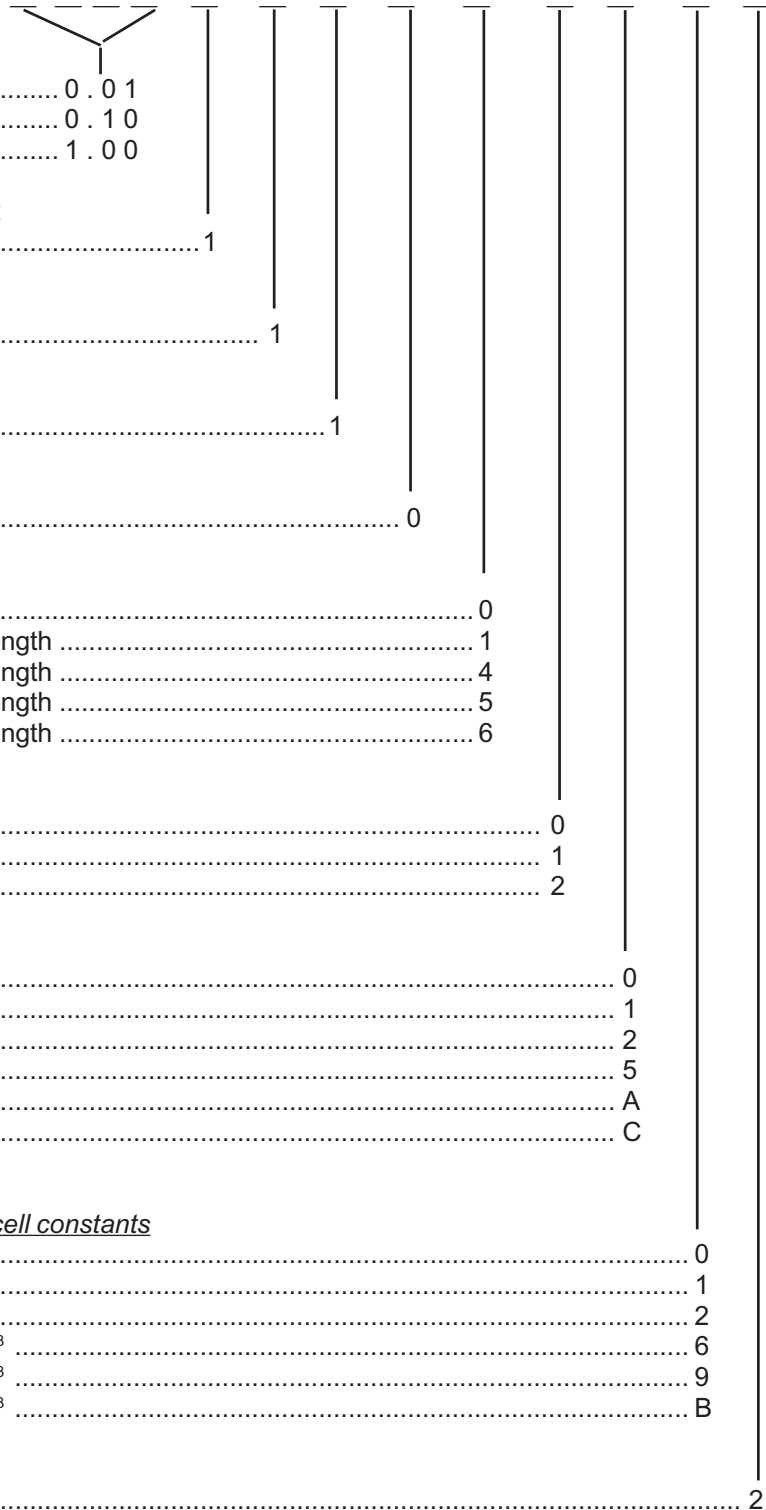
Sensor Mounting

In-line:	3/4" NPT process connection
Hot-tap:	1-1/2" NPT extraction housing
Submersion:	rear 1/2" NPT for support pipe

Note 1: Contact ABB for other available materials.

Insertion/Submersion/Hot Tap Conductivity Sensor

Model TB26



Cell Constant									
0.01	0 . 0 1								
0.10	0 . 1 0								
1.00	1 . 0 0								
Integral Temperature Compensation Element									
Pt 1000	1								
O-Ring Material									
Standard (ethylene propylene)	1								
Measurement Electrode Material									
316 stainless steel	1								
Reserved									
For future use	0								
Style									
Inline/Submersible, 3/4 NPT	0								
Hot tap, no hardware, 406-mm (16-in.) length	1								
Hot tap, no hardware, 610-mm (24-in.) length	4								
Hot tap, no hardware, 762-mm (30-in.) length	5								
Hot tap, no hardware, 914-mm (36-in.) length	6								
Mounting Accessories									
None	0								
Compression hardware, hand tight ¹	1								
Compression hardware, wrench tight ¹	2								
Cable Length, in meters (feet)									
No cable, junction box included	0								
1.5 (5.0)	1								
3.0 (10.0)	2								
7.6 (25.0)	5								
15.2 (50.0)	A								
30.5 (100.0)	C								
Insertion Length in mm (inches)									
<u>0.01 cell constant</u>	<u>0.10/1.00 cell constants</u>								
104.1 (4.1) ²	48.3 (1.9) ²								0
124.5 (4.9) ³	66.0 (2.6) ³								1
137.2 (5.4) ³	78.7 (3.1) ³								2
188.0 (7.4) ³	129.5 (5.1) ³								6
226.1 (8.9) ³	167.6 (6.6) ³								9
251.5 (9.9) ³	193.0 (7.6) ³								B
Insulator Tip Material									
PEEK	2								

Stainless steel sensor tag: 4TB5003-0003
Mylar sensor tag: 4TB5003-0002
Interconnecting cable from sensor to analyzer: 4TB3004-0008 (specify length when ordering)

Notes: 1. Hot tap sensor styles only.
2. Standard length all sensor styles.
3. Not for hot tap sensor styles.

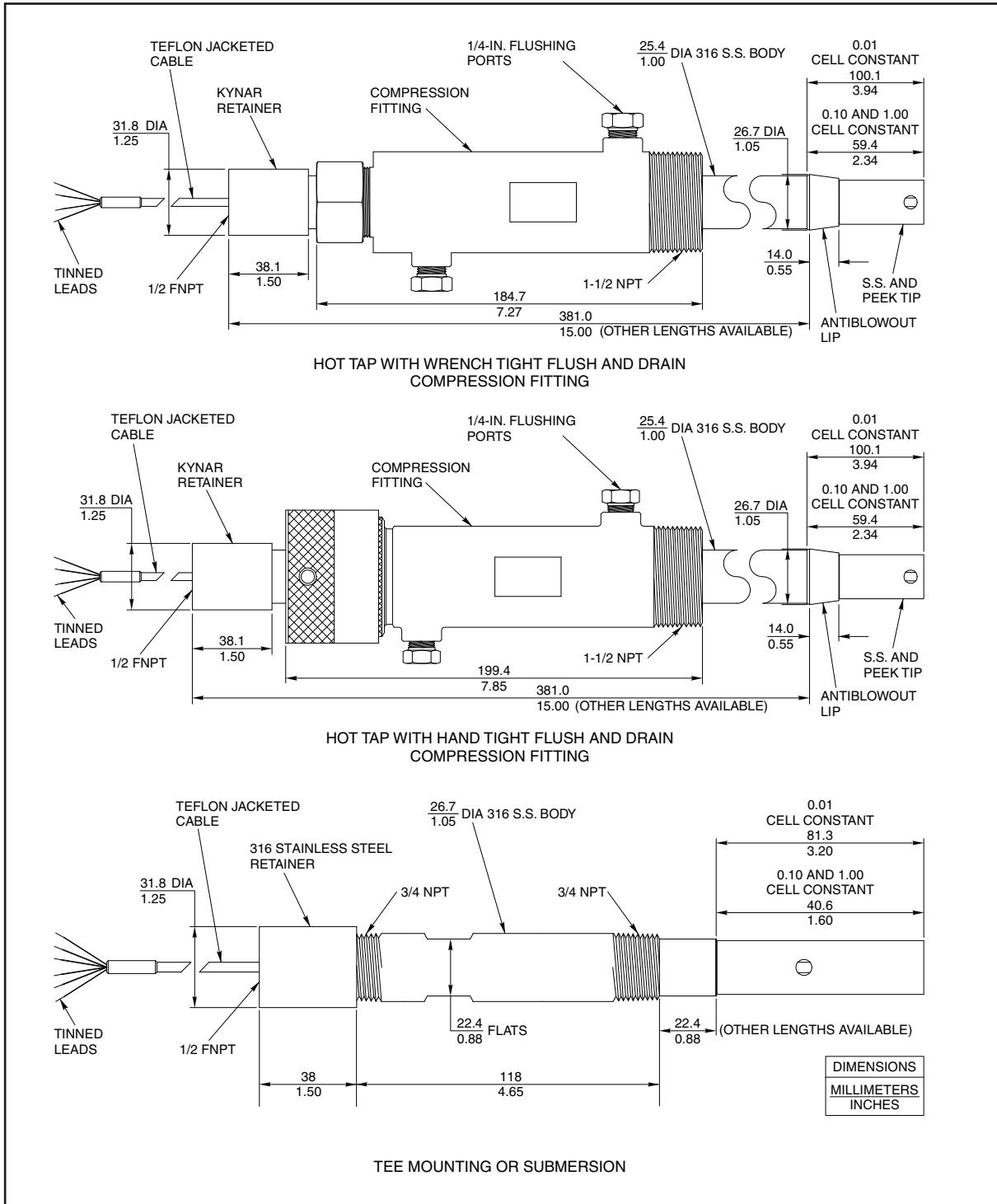


Figure 8. Model TB26 Sensor Dimensions

Model TB264 Sensors

Model TB264 sensors (Fig. 9) can be installed either inline via a 25-millimeter style fitting or used for flow cell applications. Inline applications consist of using an existing 25-millimeter port or purchasing a bushing and holder nut. This sensor quickly and easily installs into the flow cell. The Model TB264 sensor specifications are listed in Table 10 and Table 11 is the ordering guide. The dimensions are shown in Figure 10.

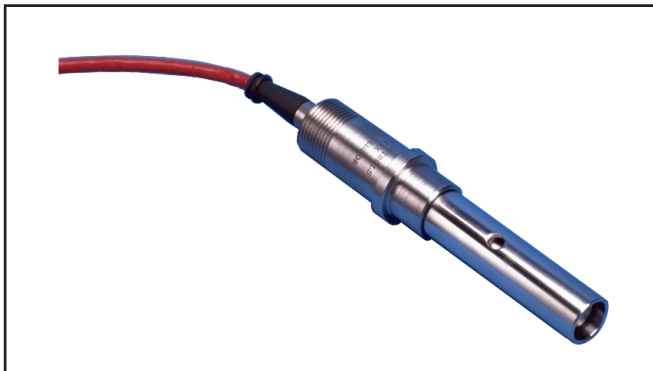


Figure 9. Model TB264 Sensor

Table 10. Model TB264 Sensor Specifications

Applications (typical)

Cooling towers, packaged water systems, exchange columns, heat exchangers, all other low to medium range conductivity measurements.

Special features

Easy installation into either flow cell or any available 25-mm port. Flexible insertion depth.

Materials

Sensor body and measurement electrode: 316 stainless steel
 Insulator: PEEK
 O-rings: Ethylene propylene

Ratings (max)

Temperature: 200°C (392°F)
 Pressure: 1379 kPa at 200°C (200 psi at 392°F)

Sensor Mounting

In-line: 25-mm process connection
 Flow cell: Used with ABB 316SS flowcells. See Figure 1, page 3.

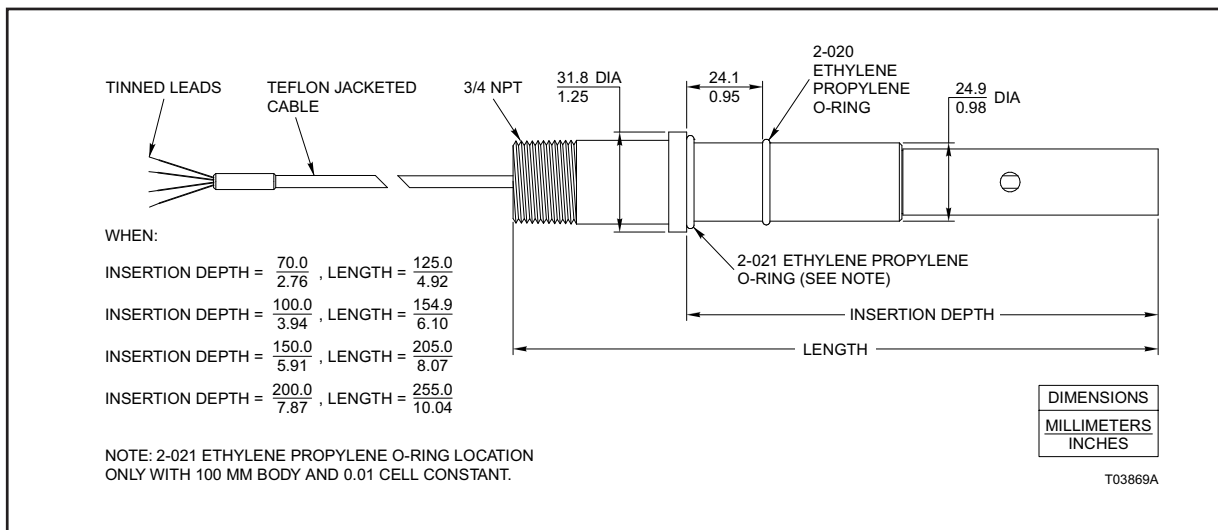


Figure 10. Model TB264 Sensor Dimensions

Model TB27 Sensors

Model TB27 sensors (Fig. 11) can be inserted or removed from process lines or vessels via a ball valve without disturbing the process. The Model TB27 sensor is designed for applications that exceed standard hot tap sensor pressure ratings and for operator safety. An extraction housing isolates the operator from the process fluid. This housing has 1/4-inch ports for flushing, draining, pressurizing, or depressurizing this chamber. Ruggedly constructed of 316 stainless steel, these sensors withstand the most demanding processes and measurement requirements. The Model TB27 sensor specifications are listed in Table 12 and Table 13 is the ordering guide. The dimensions are shown in Figure 12.

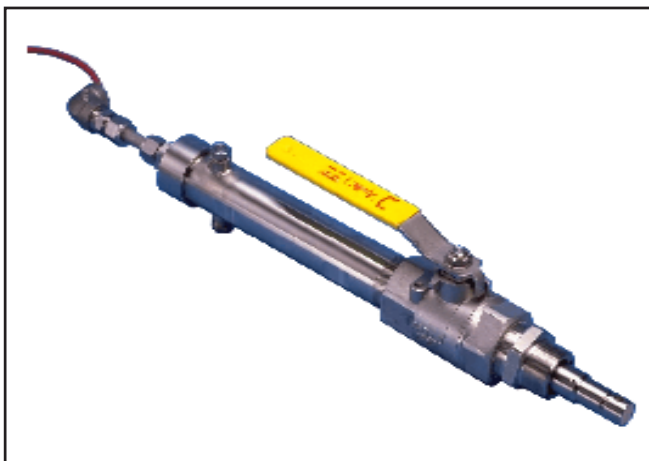


Figure 11. Model TB27 Sensor

Table 12. Model TB27 Sensor Specifications

Applications (typical)

Boil condensate, sealed vessel monitoring, toxic chemical monitoring, heat exchangers, all other low to medium range conductivity measurements that have higher pressures or where operator safety is a concern.

Special features

Interchangeable and replaceable sensor tips. High pressure capability. Purgeable sensor extraction housing.

Materials ¹

Sensor body, measurement electrode, valve, extraction housing, insertion assembly, and compression fitting:

Insulator:	316 stainless steel PEEK
O-rings:	Ethylene propylene
Compression fitting ferrule:	Kynar® (PVDF)

Ratings (max.)

Temperature:	200°C (392°F)
Pressure:	2,068 kPa at 200°C (300 psi at 392°F)

Sensor Mounting

Hot-tap:	1-1/4" NPT
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Note 1. Contact ABB for other available materials.

High Pressure Hot Tap Conductivity Sensor

Model TB27

Cell Constant								
0.01	0	.	0	1				
0.10	0	.	1	0				
1.00	1	.	0	0				
Integral Temperature Compensation Element								
Pt 1000	1							
O-Ring Material								
Standard (ethylene propylene)	1							
Measurement Electrode Material								
316 stainless steel	1							
Reserved								
For future use					0			
Mounting Accessories								
None (includes ball valve)						0		
Cable Length, in meters (feet)								
No cable, junction box included							0	
1.5 (5.0)							1	
3.0 (10.0)							2	
7.6 (25.0)							5	
15.2 (50.0)							A	
30.5 (100.0)							C	
Insulator Tip Material								
PEEK								2

Stainless steel sensor tag: 4TB5003-0003
 Mylar sensor tag: 4TB5003-0002
 Interconnecting cable from sensor to analyzer: 4TB3004-0008 (specify length when ordering)

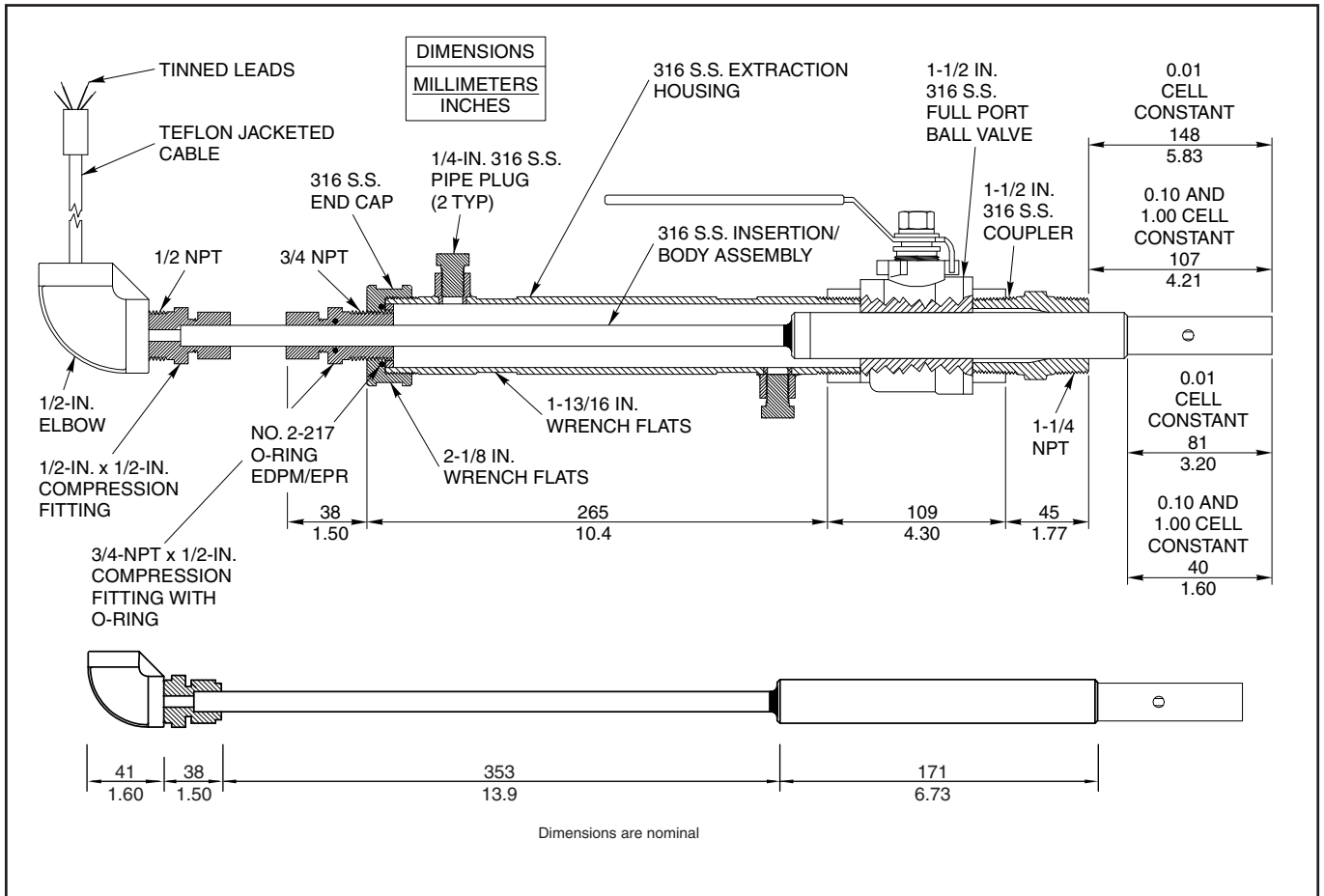


Figure 12. Model TB27 Sensor Dimensions

Notes

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