TBX5
pH, Redox (ORP) sensors
With diagnostics

The most durable pH/Redox (ORP) sensors in the world

Next Step™ Solid State reference
— eliminates poisoning, pumping and plugging

Advantage™ Series with solution ground rod
— permits continuous sensor diagnostics

Comprehensive selection of measuring electrodes
— sensors designed to suit all application requirements

Combination style construction
— measuring, reference and temperature elements, all in one compact body

Insertion, submersion, flow-through and hot-tap
— increases flexibility of installation

Operating temperatures up to 140°C (284°F)
— the highest glass temperature limit on the market

Operating pressures up to 21 bar (300 psi) and higher
— the highest pressure limit on the market
The Most Durable pH/Redox (ORP) Sensors in the World

A well-deserved reputation for ruggedness, longevity and accuracy hallmark the TB(X)5 Series pH/Redox sensors. The sensors are easily applied to most industrial measurement needs. They are renowned for their ability to outperform conventional sensors in the industries’ toughest process applications.

Solid-state Next Step™ reference technology is the foundation for all TB(X)5 Series electrodes. The totally solid inner reference chamber is charged with potassium chloride (KCl). This non-liquid reference all but eliminates poisoning, plugging and pumping problems that plague conventional liquid, slurry and gel designs.

The Next Step Advantage™ series incorporates a solution ground rod that enables sensor diagnostics.

All measurement functions are combined in one compact body: reference, measuring electrode, temperature sensor and ground rod. Using an integral potted cable, a completely sealed assembly is provided without in-process high impedance connections.

These advances in reference design, combined with superior glass electrode technology, result in an industrial sensor with unequalled durability and flexibility.

Wide Variety of Sensors for Most Industrial Applications

ABB offers a wide variety of standard sensors for most applications. These include variations in body style, measuring electrode type and shape, temperature compensator, junction type and shape and cable. Next Step Advantage™ sensors also allow choice of solution ground and O-ring materials.

Durable Electrodes

The TB(X)5 electrode design eliminates failures due to thermal stress caused by rapid temperature excursions. Unlike other sensors that use a large inner air bubble for expansion absorption, TB(X)5 electrodes use a unique inner plunger; providing more effective protection against temperature fluctuations.

The glass contains no barium, cobalt or uranium oxides. The impedance is low enough to maintain signal integrity, yet high enough to remain chemically durable with little or no sodium ion (Na⁺) error.

The electrodes are available in several measuring element types ensuring greatest process optimization.

Sensor Construction

Electrode Types and Ratings

<table>
<thead>
<tr>
<th>Code</th>
<th>Type</th>
<th>Description</th>
<th>Range</th>
<th>Operating Temperatures</th>
<th>Impedance at 25°C (77°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Flat glass</td>
<td>High density duty with heavy fouling. Electrode flush with liquid junction. Low Na⁺ error.</td>
<td>0 to 14pH</td>
<td>0 to 100</td>
<td>60 to 212</td>
</tr>
<tr>
<td>2</td>
<td>General purpose glass</td>
<td>For light to medium duty and lower temperature applications. Not for high pH.</td>
<td>0 to 12pH</td>
<td>0 to 100</td>
<td>32 to 212</td>
</tr>
<tr>
<td>3</td>
<td>High Temperature Glass</td>
<td>Versatile and suitable for high and low pH, strong chemicals and high temperature rated cabling</td>
<td>0 to 14pH</td>
<td>0 to 140</td>
<td>50 to 284</td>
</tr>
<tr>
<td>5</td>
<td>Redox (ORP)</td>
<td>Platinum (Pt) element.</td>
<td>0 to ±2000mV</td>
<td>0 to 140</td>
<td>32 to 284</td>
</tr>
<tr>
<td>A</td>
<td>Redox (ORP)</td>
<td>Gold (Au) element.</td>
<td>0 to ±2000mV</td>
<td>0 to 140</td>
<td>32 to 284</td>
</tr>
<tr>
<td>F</td>
<td>Fluoride/Acid</td>
<td>Resistant to etching by up to several percent HF and strong acids.</td>
<td>0 to 12pH</td>
<td>0 to 80</td>
<td>50 to 176</td>
</tr>
<tr>
<td>J</td>
<td>Coating resistant</td>
<td>Versatile and suitable for high and low pH, strong chemicals.</td>
<td>0 to 14pH</td>
<td>0 to 140</td>
<td>50 to 284</td>
</tr>
</tbody>
</table>

Notes: 1) 0 to 121°C (32 to 250°F) for sterilization cycles 2) 50°C (122°F) max. recommended for high HF concentration
Body Style

Sensor bodies are constructed of Kynar (PVDF) or Ryton (PPS). TB5 Series sensors use Solid-State Next Step™ references. The TBX5 Series denotes Next Step Advantage™ types with integral solution ground.

Sensor Models and Applications

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Solid-state Next Step™</th>
<th>Next Step Advantage™</th>
<th>Body</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>TB551</td>
<td>TBX551</td>
<td>PPS</td>
<td></td>
<td>In-line, Twist-lock, Submersion</td>
</tr>
<tr>
<td>TB556</td>
<td>TBX556</td>
<td>PVDF</td>
<td></td>
<td>In-line, Threaded, Submersion</td>
</tr>
<tr>
<td>TB557</td>
<td>TBX557</td>
<td>PVDF</td>
<td></td>
<td>Ball valve retract, Hot-tap</td>
</tr>
<tr>
<td>TB561</td>
<td>TBX561</td>
<td>PVDF</td>
<td></td>
<td>In-line, Sterilizable</td>
</tr>
<tr>
<td>TB564</td>
<td>TBX564</td>
<td>PVDF</td>
<td></td>
<td>High pressure retract, Hot-tap</td>
</tr>
<tr>
<td>TB567</td>
<td>TBX567</td>
<td>PPS</td>
<td></td>
<td>In-line, High pressure</td>
</tr>
</tbody>
</table>

Reference Junction Styles

To promote TB(X)5 electrode process efficiency, reference junctions are available as either wood or PTFE, each also offered in flush or notched forms.

The hardwood junction is recommended for all general purpose duties particularly those requiring high resistance to coating. PTFE junctions are promoted for continuous processes over 11.0 pH or those containing known wood delignifiers such as strong caustics, bleaches and other oxidizers.

Flush junctions have no process protrusions and therefore supply excellent self-cleaning properties when used with flat glass and fitted at 90° in process pipelines.

Notched junctions provide an integral protection guard for normal bulb-style glasses and are especially suited for retractable and immersion sensors.

Reference Junction Selection

<table>
<thead>
<tr>
<th>Sensor TB(X)</th>
<th>Flush</th>
<th>Electrodes</th>
<th>Notched</th>
<th>Electrodes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wood</td>
<td>PTFE</td>
<td>Wood</td>
<td>PTFE</td>
</tr>
<tr>
<td>551</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>556</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>557</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>561</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>564</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>567</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
</tr>
</tbody>
</table>

Note. ✓ = Valid selection  ✗ = Invalid selection

Electrodes Types

Type 1 – Flat Glass
Type 2 – General Purpose Glass
Type 3 – High Temperature Glass
Type F – Fluoride/Acid Resistant Glass
Type J – Coating Resistant Glass
Temperature Compensation

Temperature compensators enable analyzers to adjust for temperature effects on the glass pH electrode output (Nernst). Selected analyzers can also use this measurement to compensate for solution pH temperature effects.

Sensors can be ordered with integral temperature sensors or as external units.

The integral temperature compensator is available in two forms; Balco 3k and Pt100.

Cable Options

TB(X)5 sensors offer complete flexibility of cabling options throughout the range. All cables are potted inside the sensor ensuring environmental protection.

The standard cable length for most sensors is 1.5m (5 ft.). However, cables can be supplied as any continuous size up to 9m (30 ft.).

Standard accessories include junction boxes and submersion (immersion) couplers, typically used with extension cables for direct connection to ABB-TBI instruments.

Extension cables also permit distances between sensor and instrument of up to 30m (100 ft.) without external preamplifier.

A BNC/TC to pin terminal adapter is available for connection to TB82, TB84, 4630 and AX46 Series instruments.

Sensors with pin terminals are selected with code option ‘T’.
### Solid State and Next Step Reference Sensor Cables and Junction Box Wiring (TB5 Models)

<table>
<thead>
<tr>
<th>ORP/Redox Sensors Without Temperature Compensator</th>
<th>pH Sensors With Temperature Compensator</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Diagram" /></td>
<td><img src="image2.png" alt="Diagram" /></td>
</tr>
<tr>
<td>Male BNC Type 'F' cable</td>
<td>Male BNC and Tinned Temperature Compensator Leads Type 'F' cable</td>
</tr>
<tr>
<td>Pin Leads Type 'T' cable</td>
<td>Male BNC and Extension Cable Connector on Temperature Compensator Leads Type 'F' cable</td>
</tr>
<tr>
<td>Extension Cable (Cable 4TB3011-1XXX)</td>
<td>Pin Leads Type 'T' cable</td>
</tr>
<tr>
<td>Female BNC – to Sensor or Junction Box</td>
<td>Extension Cable (Cable 4TB3011-1XXX)</td>
</tr>
<tr>
<td><img src="image3.png" alt="Diagram" /></td>
<td><img src="image4.png" alt="Diagram" /></td>
</tr>
<tr>
<td>Female BNC – to Sensor or Junction Box</td>
<td>Female BNC to Male BNC Extension with Temperature Compensator Connector to Tinned Leads (Cable 4TB 3011-2XXX)</td>
</tr>
<tr>
<td>Pin Leads To TB82, TB84 and AX46</td>
<td>Pin Leads To TB82, TB84 and AX46</td>
</tr>
<tr>
<td>Pin Extension Cable (Cable 4TB3011-3XXX)</td>
<td>Pin Extension Cable with Temperature Compensator Connector (Cable 4TB3011-4XXX)</td>
</tr>
<tr>
<td><img src="image5.png" alt="Diagram" /></td>
<td><img src="image6.png" alt="Diagram" /></td>
</tr>
<tr>
<td>Junction Box Wiring (4TB5023-0162)</td>
<td>Female BNC to pin leads adaptor (4TB9515-0164)</td>
</tr>
<tr>
<td><img src="image7.png" alt="Diagram" /></td>
<td>Temperature compensator extension cable connector to pin leads adaptor (4TB9515-0277)</td>
</tr>
</tbody>
</table>

**Note.**
Junction box not supplied with cable gland kit (PN: 4TB9515-0244)
**Models TB551 & TBX551 Ryton Sensors**

Models TB(X)551 sensors are in-line flow-through or submersible (immersion), general purpose, twist-lock style sensors. The sensor body is molded from chemically resistant Ryton (PPS).

The sensor can be adapted to 1 in. fittings by either a threaded Ryton receptacle or a twist-lock receptacle. The twist-lock receptacle is available in Kynar (PVDF) or stainless steel.

Optional electrode guards protect the electrode in submersion (immersion) applications.

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**Specification**

**Applications**
- In-line, flow-through, submersible (immersion)

**Max. pressure/temperature**
- 690kPa (100 psi) at 140°C (284°F)

**Features**
- Low cost, universal type.
- Adapter for twist-lock, or threaded-cap, insertion

**Material**
- Body: Ryton (Polyphenylene Sulphide)
- Junction: Wood or PTFE
- Junction types: Flush

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**Models TB(X)551 Ryton Sensors**

**Overall Dimensions – Models TB(X)551**

![Dimensions Diagram](image)
### Ordering Information – Models TB(X)551

![Table of Ordering Information](image)

**Notes.**

1) For direct connection to APA592, TB82, TB84, 4630/35 and AX46 transmitters or other supplier devices, using terminal blocks.

2) Not available for Redox(ORP) electrodes (codes 5 & A).

3) Not available for fluoride-resistant electrodes (code F). Compatible with APA592, TB82, TB84, 4630/35 and AX46 instruments.

4) Kalrez O-rings only for solution ground sleeve. External O-rings are Viton.

5) There are two options to connect to a transmitter using terminal blocks:
   - Option 1 – use BNC/TC to PIN adapter with conduit fitting or BNC/TC to PIN adapter. In either case temperature compensator code must be 2 or 4.
   - Option 2 – select T in integral cable code, not designed for use with extension cables or junction box.

6) TB551: junction box mounted on sensor. Cable length approx. 102mm (4 in.). Requires extension cable.

7) TB(X)551: when selecting JB or JS, cable length is approx. 102mm (4 in.). Requires extension cable. If junction box is ordered separately and longer cable lengths are required, enter length under code for integral cable.
Models TB556 & TBX556 Kynar Sensors

Models TB(X)556 Sensors are threaded style sensors suitable for submersion (immersion) and insertion into the process pipes. Mounting thread size is 3/4 in. NPT.

The sensor is available in several insertion lengths from the standard 40mm (1.5 in.) to a maximum of 127mm (5 in.).

The sensor body is molded from chemically resistant Kynar (PVDF).

Overall Dimensions – Models TB(X)556

<table>
<thead>
<tr>
<th>Dimensions in mm (in.)</th>
<th>Notched Sensor Submersible Applications</th>
<th>Notched Sensor Flow Applications</th>
<th>Sensor with Junction Box</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4 in. NPT</td>
<td>3/4 in. NPT</td>
<td>3/4 in. NPT</td>
<td>3/4 in. NPT</td>
</tr>
<tr>
<td>7/8 in. Wrench Flats</td>
<td>7/8 in. Coupling (Customer Supplied)</td>
<td>7/8 in. Tee (Customer Supplied)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>96.0 (3.74)</td>
<td>27.9 (1.10) Min. 38.1 (1.5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>127.0 (5.00)</td>
<td>120.0 (4.73)</td>
<td>238.1 (9.38)</td>
</tr>
<tr>
<td></td>
<td>120.0 (4.73)</td>
<td>95.0 (3.74)</td>
<td>22.2 (0.80)</td>
</tr>
<tr>
<td>Note. 27.9mm (1.1 in.)</td>
<td>71.1 (2.80)</td>
<td>27.9 (1.10) Min. 38.1 (1.5)</td>
<td></td>
</tr>
<tr>
<td>insertion depth not available on TBX Advantage sensors with solution grounds</td>
<td></td>
<td>Standard</td>
<td></td>
</tr>
</tbody>
</table>

Specifications

- **Applications**
  - 3/4 in. NPT process connection, In-line, submersion (immersion)

- **Max. pressure/temperature**
  - 690kPa (100 psi) at 80°C (176°F)
  - 276kPa (40 psi) at 140°C (284°F)

- **Material**
  - Body: Kynar (PVDF) as standard
  - Junction: Wood or PTFE
  - Junction types: Flush, Notched

Flow-through

Specify insertion depth in code

Submersion/Immersion

With notched junction
## Ordering Information – Models TB(X)556

<table>
<thead>
<tr>
<th>Standard Solid-state Sensors</th>
<th>Next Step™ In-line, Threaded, Submersible (Immersion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Solution Ground Rod</td>
<td>Kynar Body pH/ORP Sensor Assembly (40 psi @ 140°C; 100 psi @ 90°C)</td>
</tr>
</tbody>
</table>

### Measuring Electrode

- **1**: Flat glass (10 to 100°C, 0 to 14 pH) for high particulates with flow at 90°
- **2**: Glass, pH (0 to 100°C, 0 to 12 pH)
- **3**: High Temperature Glass (0 to 140°C, 0 to 14 pH)
- **5**: Platinum, Redox (ORP)
- **A**: Gold, Redox (ORP)
- **F**: Glass, pH, Fluoride-resistant (10 to 80°C, 0 to 12 pH)
- **J**: Coat-resistant glass/high temperature (5 to 140°C, 0 to 14 pH)

### Integral Thermocompensation

- **0**: None
- **1**: 3kΩ Tinned leads
- **2**: 3kΩ Extension cable connector
- **3**: Pt100 Tinned leads
- **4**: Pt100 Extension cable connector

### Liquid Junction

- **1**: Wood, flush
- **3**: PTFE, flush
- **5**: Wood, notched
- **6**: PTFE, notched
- **A**: Wood, flush, Next Step reference
- **B**: PTFE, flush, Next Step reference
- **D**: Wood, notched, Next Step reference
- **E**: PTFE, notched, Next Step reference

### Solution Ground Rod Material

- **1**: 316 stainless steel
- **2**: Titanium
- **3**: Hastelloy® B2

### O-Ring Material

- **1**: Viton®
- **2**: EPDM
- **3**: Silicone
- **4**: Kalrez®

### Body Style

<table>
<thead>
<tr>
<th>0</th>
<th>Submersible (Immersion) probe</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.8 in. insertion depth</td>
</tr>
<tr>
<td>1</td>
<td>1.1 in. insertion depth</td>
</tr>
<tr>
<td>2</td>
<td>1.5 in. insertion depth</td>
</tr>
<tr>
<td>3</td>
<td>2.0 in. insertion depth</td>
</tr>
<tr>
<td>4</td>
<td>2.5 in. insertion depth</td>
</tr>
<tr>
<td>5</td>
<td>3.0 in. insertion depth</td>
</tr>
<tr>
<td>6</td>
<td>3.5 in. insertion depth</td>
</tr>
<tr>
<td>7</td>
<td>4.0 in. insertion depth</td>
</tr>
<tr>
<td>8</td>
<td>4.5 in. insertion depth</td>
</tr>
<tr>
<td>9</td>
<td>5.0 in. insertion depth</td>
</tr>
</tbody>
</table>

### Integral Sensor Cable

- **T**: BNC connector, feet
- **F**: Tinned/Pin leads, feet
- **O**: Use when JB (below) are selected
- **J**: 1 ft (0.3m) to 30 ft (8.8m) enter length (in 5 foot increments)
- **B**: With junction box
- **S**: Less junction box

### Sensors for self-checking (with Solution Ground Rod)

**Notes.**

1. Not available for Redox (ORP) electrodes (codes 5 & A).
2. Not available for fluoride-resistant electrodes (code F). Compatible with TB82, APA592, TB84, 4630/35 and AX46 instruments.
3. 0.8 in. insertion option not available with Liquid Junction options D & E.
4. 5.0 in. insertion option not available with Liquid Junction options 1, 3, A, B.
5. Manufactured as 1.5 in. depth, includes cable strain relief.
6. There are two options to connect to a transmitter using terminal blocks:
   - Option 1 – use BNC/TC to PIN adapter with conduit fitting or BNC/TC to PIN adapter. In either case temperature compensator code must be 2 or 4.
   - Option 2 – select T in integral cable code, not designed for use with extension cables or junction box.
7. For direct connection to type TB82, APA592, TB84, 4630/35 and AX46 transmitters, or other supplier devices, using terminal blocks.
8. TB556: junction box or submersible (immersion) connector mounted on sensor. Cable length approx. 102mm (4 in.). Requires extension cable for connection to transmitter. If junction box is ordered separately and longer cable lengths are required, enter cable length in code for integral cable.
Models TB557 & TBX557 Hot-Tap Retractable Sensors

Models TB(X)557 sensors are hot tap, ball valve insertion sensors. They enable sensor maintenance or replacement without interrupting the process.

An integral safety anti-blowout lip is incorporated into the sensor design, preventing accidental sensor removal. Unlike chain restraints, this safety-by-design is an integral part of the sensors’ construction.

The sensor is inserted through a standard 1 1/2 in. or 1 1/4 in. full port ball valve which is sold separately.

Connection to a ball valve is by compression fitting available in either hand-tight with 1 1/4 in. NPT threads or wrench-tight with 1 in. NPT threads.

Additional fittings enable the assembly to be flushed and drained in situ and use a 1 1/2 in. NPT thread for connection to the ball valve.

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Specification

**Applications**
- Insertion, Hot-tap

**Max. pressure/temperature**
- 690kPa (100 psi) at 80°C (176°F)
- 276kPa (40 psi) at 140°C (284°F)

**Features**
- Insert/retract without disturbing process flow
- Replaceable electrode
- Anti-blowout lip
- No internal high-impedance connection

**Material**
- Electrode Body: Kynar (PVDF) as standard
- Sensor sheath variants: 316 stainless steel, Hastelloy or Titanium
- External O-rings: Viton
- Junction: Wood or PTFE
- Junction types: Flush (Flat only), Notched
- Lengths: Standard 406mm (16 in.), Maximum 1524mm (60 in.)

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Overall Dimensions – Ball Valve

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Overall Dimensions – Compression Fittings
...Overall Dimensions – Models TB(X)557

Dimensions in mm (in.)

<table>
<thead>
<tr>
<th>Component</th>
<th>Dimension (mm)</th>
<th>Dimension (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kynar Back Piece</td>
<td>27.9</td>
<td>1.10</td>
</tr>
<tr>
<td>Viton O-Rings</td>
<td>222.9 (8.78)</td>
<td>(Other Lengths Available)</td>
</tr>
<tr>
<td>Sheath</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replaceable Sensor</td>
<td>26.7 Dia</td>
<td>(1.05)</td>
</tr>
<tr>
<td>No. 019 Viton O-Rings</td>
<td>22.9 Dia</td>
<td>(0.89)</td>
</tr>
<tr>
<td>Electrode</td>
<td>21.0 Dia</td>
<td>(0.83)</td>
</tr>
<tr>
<td>Reference Junction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replacement Sensor Detail</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kynar Body</td>
<td>95.0 (3.74)</td>
<td></td>
</tr>
<tr>
<td>3/4 in. NPT</td>
<td>71.1 (2.80)</td>
<td></td>
</tr>
<tr>
<td>3/4 in. Conduit Port (2 Typ.)</td>
<td>120.0 (4.73)</td>
<td></td>
</tr>
<tr>
<td>Optional Compression Fitting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand-tight 316 Stainless Steel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>or Titanium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 1/4 in. NPT</td>
<td>97.8 (3.85)</td>
<td></td>
</tr>
<tr>
<td>1 1/4 in. NPT Full Port Ball Valve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand-tight Compression Fitting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 1/4 in. 316 Stainless Steel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Close Nipple</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optional Compression Fitting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wrench-tight 316 Stainless Steel,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Titanium or Hastelloy-C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
- Dimensions in mm (in.)
- (Other Lengths Available)
## Ordering Information – Models TB(X)557

### Measuring Electrode
- Rat glass pH (10 to 140°C, 0 to 14pH) for high particulates with flow at 90°
- Glass pH (0 to 100°C, 0 to 12pH)
- High Temperature Glass (5 to 140°C, 0 to 14pH)
- Platinum, Redox (ORP)
- Gold, Redox (ORP)
- Glass, pH, Fluoride-resistant (10 to 80°C, 0 to 12pH)
- Coat-resistant glass/high temperature (6 to 140°C, 0 to 14pH)

### Integral Temperature compensator
- None
- 3Ω Tinned leads
- 3Ω Extension cable connector
- PT100 Tinned leads
- PT100 Extension cable connector

### Reference Junction
- Wood, flush
- PTFE, flush
- Wood, notched
- PTFE, notched
- Wood, flush, Next Step reference
- PTFE, flush, Next Step reference
- Wood, Notched, Next Step reference
- PTFE, Notched, Next Step reference

### Solution Ground Rod Material
- 316 stainless steel
- Titanium
- Hastelloy B2

### O-Ring Material
- Viton
- EPDM
- Silicone
- Kalrez

### Body Style
- Replacement TB(X)557 electrode only
- 16 in. Titanium sheath
- 16 in. Hastelloy C sheath
- 16 in. 316 Stainless Steel sheath
- 20 in. Titanium sheath
- 24 in. Titanium sheath
- 30 in. Titanium sheath
- 20 in. Hastelloy C sheath
- 24 in. Hastelloy C sheath
- 30 in. Hastelloy C sheath
- 20 in. 316 Stainless Steel sheath
- 24 in. 316 Stainless Steel sheath
- 30 in. 316 Stainless Steel sheath
- 36 in. Titanium sheath
- 60 in. 316 Stainless Steel sheath

### Accessory Hardware
- None
- 316 Stainless Steel compression fitting, wrench-tight
- Hastelloy C compression fitting, wrench-tight
- 316 Stainless Steel compression fitting, hand-tight
- Titanium compression fitting, hand-tight
- 316 Stainless Steel compression fitting, wrench tight with flush and drain assembly
- Titanium compression fitting, wrench tight with flush and drain assembly
- 316 Stainless Steel compression fitting, hand tight with flush and drain assembly
- Titanium compression fitting, hand tight with flush and drain assembly
- 316 Stainless Steel compression fitting, hand tight with flush and drain assembly, EPDM O-rings
- Titanium compression fitting, hand tight with flush and drain assembly, Kalrez O-rings
- Titanium compression fitting, hand tight with flush and drain assembly, EPDM O-rings
- Titanium compression fitting, hand tight with flush and drain assembly, Kalrez O-rings
- Titanium compression fitting, hand tight with flush and drain assembly, EPDM O-rings
- Titanium compression fitting, hand tight with flush and drain assembly, Kalrez O-rings

### Length, Integral Sensor Cable
- 1 ft (0.3m) to 29 ft (8.8m) enter length (in 5 foot increments)
- BNC connector, feet
- Tinned/Pin leads, feet
- Use when JB or J1 to J8 below are selected

### Sensors for self-checking (with Solution Ground Rod)
- Next Step™ Advantage, Ball Valve Insertion, Hot Tap, Kynar Body pH/ORP Sensor Assembly
  (40 psi @ 140°C; 100 psi @ 90°C)
Notes.

1) Not available for Redox(ORP) electrodes (codes 5 & A).
2) Not available for fluoride-resistant electrodes (code F).
3) Flush junctions for Flat electrodes only (code 6).
4) Unless noted, standard hardware kits have Viton O-rings. Ball valve and process coupling sold separately.
5) Applicable for all body styles. Mandatory for replacement sensors (code 0 in Body Style section).
6) There are two options to connect to a transmitter using terminal blocks:
   Option 1 – use BNC/TC to PIN adapter with conduit fitting or BNC/TC to PIN adaptor. In either case temperature compensator code must be 2 or 4.
   Option 2 – select T in integral sensor code, not designed for use with extension cables or junction box.
7) For direct connection to type APA592, TB82, TB84, 4630/35 and AX46 transmitters, or other supplier devices, using terminal blocks.
8) TB557: junction box mounted on sensor. Cable length varies to match body length style. Order code for body style and accessory hardware anything except zero. Requires extension cable. Order code for temperature compensator must be 0, 2 or 4.
9) TB(X)557: junction box mounted on sensor. Cable length approx. 102mm (4 in.). Order code for body style and accessory hardware anything except zero. Code – # # # # # # 0, J, B. Requires extension cable. If junction box is ordered separately and longer cable lengths are desired, enter cable length in integral sensor code.
10) Standard cable length of 4 ft (1.2m) as measured from rear of sensor assembly with 16 in. sheath only. Max. 29 ft (8.8m) cable only available with 16 in. sheath. Longer sheaths decrease length accordingly.
11) Applicable to sensors with junction boxes only.
12) Supplied with Integral Sensor Cable option 0 and Integral Temperature compensator options 2 and 4 only.

Notes.

1) Not available for Redox(ORP) electrodes (codes 5 & A).
2) Not available for fluoride-resistant electrodes (code F).
3) Flush junctions for Flat electrodes only (code 6).
4) Unless noted, standard hardware kits have Viton O-rings. Ball valve and process coupling sold separately.
5) Applicable for all body styles. Mandatory for replacement sensors (code 0 in Body Style section).
6) There are two options to connect to a transmitter using terminal blocks:
   Option 1 – use BNC/TC to PIN adapter with conduit fitting or BNC/TC to PIN adaptor. In either case temperature compensator code must be 2 or 4.
   Option 2 – select T in integral sensor code, not designed for use with extension cables or junction box.
7) For direct connection to type APA592, TB82, TB84, 4630/35 and AX46 transmitters, or other supplier devices, using terminal blocks.
8) TB557: junction box mounted on sensor. Cable length varies to match body length style. Order code for body style and accessory hardware anything except zero. Requires extension cable. Order code for temperature compensator must be 0, 2 or 4.
9) TB(X)557: junction box mounted on sensor. Cable length approx. 102mm (4 in.). Order code for body style and accessory hardware anything except zero. Code – # # # # # # 0, J, B. Requires extension cable. If junction box is ordered separately and longer cable lengths are desired, enter cable length in integral sensor code.
10) Standard cable length of 4 ft (1.2m) as measured from rear of sensor assembly with 16 in. sheath only. Max. 29 ft (8.8m) cable only available with 16 in. sheath. Longer sheaths decrease length accordingly.
11) Applicable to sensors with junction boxes only.
12) Supplied with Integral Sensor Cable option 0 and Integral Temperature compensator options 2 and 4 only.
Models TB561 & TBX561 Sterizable Sensors

Models TB(X)561 sensors are designed for sterilizable or in-line applications and for measurements in process vessels or lines requiring periodic sterilization or cleaning. They are also used in the TB18 Safe-T-Clean valve and 4TB9515-0190 stainless steel flow cell.

The sensors are designed for use with a bushing and union nut but can also be retro-fitted into standard DN25 bushings with 0.983 in. to 0.995 in. internal diameters. All hardware required for use with the TB18 Safe-T-Clean or 4TB9515-0190 Flowcell is included with valve or Flowcell when purchased.

Specification

Applications
Batch processing with steam or chemical sterilization, fermenters, glass-lined reactors, pharmaceuticals, food and beverage

Max. pressure/temperatures
690kPa (100 psi) at 90°C (176°F)
448kPa (65 psi) at 121°C (250°F)
276kPa (40 psi) at 140°C (284°F)

Material
- Electrode body: Kynar (PVDF) as standard
- Junction: Wood or PTFE
- Junction types: Flush, Notched

Insertion depths
- 70mm, 100mm, 150mm or 200mm
- (100mm required for TB18 Safe-T-Clean valve and Flowcell)

Models TB561 and TBX561 Sensors

Overall Dimensions – Models TB(X)561

Dimensions in mm (in.)

<table>
<thead>
<tr>
<th>Component</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holder Nut</td>
<td>152.4 (6.00)</td>
</tr>
<tr>
<td>Kynar Sensor Body</td>
<td></td>
</tr>
<tr>
<td>No. 020 Viton O-Ring</td>
<td></td>
</tr>
<tr>
<td>Front View</td>
<td></td>
</tr>
<tr>
<td>Flow cell (Requires 100 mm sensor)</td>
<td></td>
</tr>
</tbody>
</table>

Order Code 070: L = 70.0 (2.76)
Order Code 100: L = 100.0 (3.94)
Order Code 150: L = 150.0 (5.91)
Order Code 200: L = 200.0 (7.87)

Notes:
1. DASHED LINES REPRESENT DIMENSIONS OF FLOW CELL KIT WITH SWAGE LOCK FITTINGS.
2. FLOW CELL KIT WITHOUT SWAGE LOCK FITTINGS 4TB9515-0223
   FLOW CELL KIT WITH SWAGE LOCK FITTINGS 4TB9515-0190

Safe-T-Clean Sensor Valve TB18
(Requires 100mm sensor with flush liquid junction)
# Ordering Information – Models TB(X)561

<table>
<thead>
<tr>
<th>Standard Solid-state Sensors</th>
<th>Next Step™ Sterilizable Kynar Body pH/ORP Sensor Assembly (65 psi @ 121°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Solution Ground Rod</td>
<td>TB561</td>
</tr>
</tbody>
</table>

## Measuring Electrode
- 1: Flat glass (10 to 100°C, 0 to 14pH) for high particulates with flow at 90°
- 2: Glass, pH (0 to 100°C, 0 to 12pH)
- 3: High Temperature Glass (5 to 140°C, 0 to 14pH)
- 5: Platinum, Redox (ORP)
- A: Gold, Redox(ORP)
- F: Glass, pH, Fluoride-resistant (10 to 80°C, 0 to 12pH)
- J: Coat-resistant glass/high temperature (5 to 140°C, 0 to 14pH)

## Integral Temperature Compensator
- 1: None
- 2: 3x3 Tinned leads
- 3: Pt100 Tinned leads
- 4: Pt100 Extension cable connector

## Reference Junction
- 1: Wood, flush
- 2: PTFE, flush
- 3: Wood, notched
- 4: PTFE, notched
- 5: Wood, flush, Next Step reference
- 6: PTFE, flush, Next Step reference
- 7: Wood, notched, Next Step reference
- 8: PTFE, notched, Next Step reference

## Solution Ground Rod Material
- 1: 316 stainless steel
- 2: Titanium
- 3: Hastelloy B2

## O-Ring Material
- 1: Viton
- 2: EPDM
- 3: Silicone
- 4: Kalrez

## Insertion Depth
- 0: 70mm
- 1: 100mm
- 2: 150mm
- 3: 200mm

## Units of Measure, Integral Sensor Cable
- BNC connector, feet
- Tinned/Pin leads, feet
- Use when JB/JS (below) are selected

## Integral Sensor Cable
- 1 ft (0.3m) to 30 ft (9m) enter length in (5 foot increments)
- With junction box
- Less junction box/submersible coupler

### Notes
1. For direct connection to type TB82, APA592, TB84, 4630/35 and AX46 transmitters or other supplier devices, using terminal blocks.
2. Not available for Redox(ORP) electrodes (codes 5 & A).
3. Not available for fluoride resistant electrodes (code F). Compatible with TB82, TB84, APA592, 4630/35 and AX46 instruments.
4. Insertion depth measured from wetted face of sensor flange to tip of guard.
5. There are two options to connect to a transmitter using terminal blocks:
   - Option 1 – use BNC/TC to PIN adapter with conduit fitting or BNC/TC to PIN adapter. In either case temperature compensator code must be 2 or 4.
   - Option 2 – select T in integral cable code, not designed for use with extension cables or junction box.
6. TB561: junction box mounted on sensor. Cable length approx. 102mm (4 in.). Requires extension cable. If junction box is ordered separately and longer cable lengths are required enter length under code position for integral cable.
7. Not compatible with all TB18 Safe-T-Clean valve styles.
Models TB564 & TBX564 High Pressure Hot-tap Retractable Sensors

Models TB(X)564 are high pressure, hot-tap, ball-valve, insertion sensors. They permit sensor maintenance or replacement without interrupting the process.

For safety reasons, it is recommended that the operating pressure be reduced below 690kPa (100psi) during insertion and retraction of the sensor assembly.

Specification

Applications
High pressure, hazardous materials

Max. pressure/temperature
2065kPa (300psi) at 140°C (284°F)

Features
Insert/retract without complete process shutdown*
Retraction housing for safety
Taps for flushing or pressurizing

Material
Electrode body Kynar (PVDF)
Ball-valve/hardware 316 stainless steel
External O-rings Viton
Junction Wood or PTFE
Junction Types Flush Notched

* Safe operating pressure limits are recommended during retraction/insertion; max. 690kPa (100 psi).

Overall Dimensions – Models TBX564

[Diagram showing dimensions in mm (in.)]

Note:
All pipe threads have Loctite PST sealant applied at the Factory.
### Ordering Information – Models TBX564

<table>
<thead>
<tr>
<th>Standard Solid-state Sensors</th>
<th>Next Step™, High Pressure Hot-tap pH/Redox (ORP) Sensor Assembly (300 psi @ 140°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Solution Ground Rod</td>
<td></td>
</tr>
</tbody>
</table>

#### Measuring Electrode
1. Flat glass (10 to 100°C, 0 to 14pH) for high particulates with flow at 90°
2. Glass, pH (0 to 100°C, 0 to 12pH)
3. High Temperature Glass (5 to 140°C, 0 to 14pH)
4. Platinum, Redox (ORP)
5. Gold, Redox (ORP)
6. Glass, pH, Fluoride-resistant (10 to 80°C, 0 to 12pH)
7. Coating-resistant glass/high temperature (5 to 140°C, 0 to 14pH)

#### Integral Temperature compensator
0. None
1. 3kΩ Tinned leads
2. 3kΩ Extension cable connector
3. Pt100 Tinned leads
4. Pt100 Extension cable connector

#### Reference Junction
1. Wood, flush
2. Wood, notched
3. Wood, flush, Next Step reference
4. Wood, Notched, Next Step reference
5. PTFE, flush, Next Step reference
6. PTFE, Notched, Next Step reference

#### Solution Ground Rod Material
1. 316 stainless steel
2. Titanium
3. Hastelloy B2

#### O-Ring Material
1. Viton
2. EPDM
3. Silicone
4. Kalrez

#### Body Style
0. Standard, Kynar sensor body

#### Accessory Hardware
0. Replacement sensor only
9. Model TBX564 sensor assembly, with ball valve and coupling
A. Model TBX564 sensor assembly, without ball valve and coupling

#### Units of Measure, Integral Sensor Cable
- Not for TBX564
- BNC connector, feet
- Tinned/Pin leads, feet (Recommended)
0. Use when JB/JS (below) are selected

#### Integral Sensor Cable
- J B: With junction box
- J S: Less junction box

### Notes.
1. For direct connection to type TB82, APA592, TB84, 4630/35 and AX46 transmitters or other supplier devices using terminal blocks.
2. Not available for Redox (ORP) electrodes (codes 5 & A).
3. Not available for fluoride-resistant electrodes (code F). Compatible with TB82, APA592, TB84, 4630/35 and AX46 instruments.
4. Integral cable type T recommended, otherwise installation of BNC connector kit is required.
5. There are two options to connect to a transmitter using terminal blocks:
   - Option 1 – use BNC/TC to PIN adapter with conduit fitting or BNC/TC to PIN adapter. In either case temperature compensator code must be 2 or 4.
   - Option 2 – select T in sensor cable code, not designed for use with extension cables or junction box.
6. Junction box mounted on insertion rod. Cable length approx. 254mm (10 in.). Requires extension cable to connect to transmitter. Order code for temperature compensator must be 0, 2 or 4. If sensor is ordered without accessory hardware a junction box must be ordered separately.
7. Requires BNC field mount for replacement sensors.
8. Maximum pressure: 690 kPa (100 psi).
Models TB567 & TBX567 High Pressure In-Line Sensors

Models TB(X)567 sensors are high pressure, in-line sensors. Their permissible pressure and temperature ratings are unique in the industry.

The assembly comprises two parts: a 316 stainless steel housing and a molded Ryton sensor body.

For applications above 1725kPa (250psi), please consult ABB.

Overall Dimensions – Models TB(X)567

Dimensions in mm (in.)
Ordering Information – Models TB(X)567

<table>
<thead>
<tr>
<th>Standard Solid-state Sensors</th>
<th>Next Step™ In-Line High Pressure pH/Redox (ORP) Sensor Assembly (200 psi @ 140°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Solution Ground Rod</td>
<td></td>
</tr>
</tbody>
</table>

Measuring Electrode
- Glass, pH (0 to 100°C, 0 to 12pH)
- High Temperature Glass (to 140°C, 0 to 14pH)
- Platinum, Redox (ORP)
- Gold, Redox (ORP)
- Glass, pH Fluoride-resistant (to 80°C, 0 to 12pH)
- Coat-resistant glass/high temperature (to 140°C, 0 to 14pH)

Integral Temperature compensator
- None
- 3kΩ Tinned leads
- 3kΩ Extension cable connector
- Pt100 Tinned leads
- Pt100 Extension cable connector

Reference Junction
- Wood, flush
- PTFE, flush
- Wood, flush, Next Step reference
- PTFE, flush, Next Step reference

Solution Ground Rod Material
- 316 stainless steel
- Titanium
- Hastelloy B2

O-Ring Material
- Viton
- EPDM
- Silicone
- Kalrez

Body Style
- Model TB(X)567 Sensor body

Accessory Hardware
- None
- Model TB(X)567 316 stainless steel sensor housing

Units of Measure, Integral Sensor Cable
- BNC connector, feet
- Tinned/Pin leads
- Use when J8/J10 (below) are selected
- 1 ft (0.3m) to 30 ft (8.8m) enter length (in 5 foot increments)
- With junction box
- Less junction box

Notes.
1) For direct connection to type TB82, APA592, TB84, 4630/35 and AX46 transmitters or other supplier devices using terminal blocks.
2) Not available for Redox/ORP electrodes (codes 5 & A).
3) Not available for fluoride-resistant electrodes (code F). Compatible with TB82, TB84, 4630/35 and AX46 instruments.
4) There are two options to connect to a transmitter using terminal blocks:
   Option 1 – use BNC/TC to PIN adapter with conduit fitting or BNC/TC to PIN adapter. In either case temperature compensator code must be 2 or 4.
   Option 2 – select T in sensor cable code, not designed for use with extension cables or junction box.
5) Junction box mounted on sensor. Cable length approx. 254mm (10 in.). Requires extension cable to connect to transmitter. Order code for temperature compensator must be 0, 2 or 4. If sensor is ordered without accessory hardware a junction box must be ordered separately.
Accessories

Automatic Cleaners

ABB sensors are designed to resist fouling and plugging especially when placed in sufficient velocity.

Sometimes a lack of velocity or the precipitative properties of the liquid require the use of an automatic cleaner.

ABB supplies jet-wash type cleaning facilities for submersion (immersion) TB556 sensors with 1½ in. insertion depth.

When coupled to a customer-supplied solenoid valve delivering wash fluid, effective cleaning can be initiated by ABB pH instrumentation such as the TB84PH or AX46 Series. For example, the TB84PH can be configured:

- Wash cycle time 0 to 99.99 hours
- Wash on time 0 to 999 seconds
- Wash recovery time 0 to 999 seconds
- Hold function ON or OFF

Hydraulic Cleaner Application Example

Hydraulic Cleaner with Models TB(X)556 Sensor

<table>
<thead>
<tr>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model</strong></td>
</tr>
<tr>
<td>4TB5205-0232</td>
</tr>
<tr>
<td><strong>Materials</strong></td>
</tr>
<tr>
<td>PVC, Polypropylene</td>
</tr>
<tr>
<td>316 stainless steel</td>
</tr>
<tr>
<td><strong>Max. pressure/temperature</strong></td>
</tr>
<tr>
<td>690kPa (100 psi) at 40°C (104°F)</td>
</tr>
<tr>
<td>276kPa (40 psi) at 60°C (140°F)</td>
</tr>
</tbody>
</table>
### Accessories

**Ball-Valve Kits for TB(X)557 Sensors**

For use with compression fittings without flush and drain assemblies:

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4TB5205-0174</td>
<td>1¼ in. 316 stainless steel ball valve kit for use with 1 in. wrench tight compression fitting*</td>
</tr>
<tr>
<td>4TB5205-0255</td>
<td>1½ in. 316 stainless steel ball valve kit for use with 1 in. wrench tight compression fitting*</td>
</tr>
<tr>
<td>4TB5205-0217</td>
<td>1¼ in. 316 stainless steel ball valve kit for use with 1¼ in. hand tight compression fitting*</td>
</tr>
<tr>
<td>4TB5205-0254</td>
<td>1½ in. 316 stainless steel ball valve kit for use with 1¼ in. hand tight compression fitting*</td>
</tr>
<tr>
<td>4TB5205-0175</td>
<td>1½ in. Kynar (PVDF) ball valve kit for use with 1 in. wrench tight compression fitting*</td>
</tr>
<tr>
<td>4TB5205-0218</td>
<td>1½ in. Kynar (PVDF) ball valve kit for use with 1½ in. hand tight compression fitting*</td>
</tr>
</tbody>
</table>

* Kits include ball valve and appropriately sized process connector and reducing bushing.

For use with compression fittings with flush and drain assemblies:

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4TB5205-0285</td>
<td>1½ in. 316 stainless steel ball valve with 1½ in. process connector</td>
</tr>
</tbody>
</table>

**Miscellaneous**

<table>
<thead>
<tr>
<th>Description</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female BNC to pin leads adaptor</td>
<td>4TB9515-0164</td>
</tr>
<tr>
<td>Cable Grip with reducer (1½ in. to 1 in) for use with junction box</td>
<td>4TB9515-0244</td>
</tr>
<tr>
<td>Temperature compensator extension cable connector to pin leads adaptor</td>
<td>4TB9515-0277</td>
</tr>
</tbody>
</table>

### Acknowledgements

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