

# CONTACTING CONDUCTIVITY/RESISTIVITY SENSORS

## Applications

- Drinking Water
- Power
- Industrial Water



## Ultimate accuracy from ultra-pure to high conductivity applications.

### High Performance Design

These sensors are manufactured to exacting tolerances using high quality, rugged materials for demanding applications, including ultra-pure water, clean-in-place (CIP), and boiler/condensate monitoring. Each sensor is tested to determine its unique, absolute four-digit cell constant. Additionally, each sensor has a Pt 1000 RTD temperature element built in for exceptionally fast response to changes in temperature with  $\pm 0.1^{\circ}\text{C}$  accuracy.

### Resistivity and Conductivity Measurement Capability

These enhanced performance sensors measure from  $0.057 \mu\text{S}/\text{cm}$  or  $18.2 \text{ M}\Omega$  (theoretically pure water) up to  $200,000 \mu\text{S}/\text{cm}$ .

### Versatile Mounting Styles

#### Compression Fitting Sensors

Feature titanium electrodes and a compression fitting for universal installation with up to 4 inches (102 mm) insertion depth. The 1/2-inch or 3/4-inch male NPT compression fitting are offered in Kynar® (PVDF) or 316 stainless steel. A longer version of this sensor is available for use with a 316

stainless steel ball valve hardware assembly to insert/retract the sensor from the process without stopping the flow. The longer version can also be used for insertion through a compression fitting. Maximum insertion depth is 7 inches (178 mm).

#### Non-Metallic General Purpose Sensors

These sensors have graphite electrodes and 3/4-inch male NPT threaded Ryton® bodies. Mount into a standard 3/4-inch pipe tee, 1-1/2-inch Hach union hardware (for 10 Cell Constant sensor only), or fasten onto the end of the pipe.

#### High Pressure and High Temperature Sensors

Designed for monitoring boiler water and condensate in return lines. They have 316 stainless steel electrodes and threaded bodies (3/4-inch male NPT). They can be fastened into a boiler wall using a 3/4-inch weldolet or mounted into a process line using a standard 3/4-inch stainless pipe tee.

#### Sanitary Clean-in-Place (CIP) Style Sensors

Feature 316 stainless steel electrodes and an integral 1-1/2-inch or 2-inch flange. These sensors can be installed using standard sanitary mounting hardware.



Be Right™

## Specifications\*

### Cell Constants and Measuring Ranges

Sensor Cell Constant	Inherent Measuring Range	
	Conductivity ( $\mu\text{S}/\text{cm}$ )	Resistivity (Mohm)
0.05	0–100	0.002–20
0.5	0–1000	0.001–20
1	0–2000	not applicable
5	0–10000	not applicable
10	0–200000	not applicable

<b>Temperature Measurement Range</b>	–20 to 200°C (–4 to 392°F)
<b>Accuracy</b>	±2% of reading above 200 $\mu\text{S}/\text{cm}$
<b>Sensitivity</b>	±0.5% of reading
<b>Response Time</b>	90% of reading within 30 seconds of step change
<b>Repeatability</b>	±0.5% of reading
<b>Operating Temperature</b>	–20 to 200°C (–4 to 392°F)

<b>Flow Rate</b>	0–3 m/s (0–10 ft./s), maximum, fully immersed
<b>Temperature Compensator</b>	Pt 1000 RTD
<b>Transmission Distance</b>	100 m (328 ft.), maximum 1000 m (3280 ft.), maximum when used with a termination box
<b>Standard Probe Cable Length (integral)</b>	Digital Probe: 7 m (23 ft.) Analog Probe: 6 m (20 ft.)
<b>Sensor Cable</b>	Digital: PUR (polyethylene) 5-conductor, shielded, rated to 150°C (302°F)  Analog: Integral (no junction box) 6 wire cable (4 conductors and two isolated shield wires)  Analog with Junction Box Head: (optional) 6-position terminal strip supplied in integrally-mounted junction box (polypropylene, aluminum, or 316 stainless steel)

\*Subject to change without notice.

	<b>Model 3422-series Compression Fitting</b>	<b>Model 3433-series Non-metallic General Purpose</b>	<b>Model 3444-series Boiler/ Condensate</b>	<b>Model 3455-series Sanitary (CIP) Flange</b>
<b>Temperature/ Pressure Limits (See Note 1)</b>	When used with Kynar® (PVDF) compression fitting: 150°C at 1.7 bar (302°F at 25 psi).  When used with manufacturer-supplied 316 stainless steel compression fitting: 150°C at 13.7 bar (302°F at 200 psi).  When used with 316 stainless steel ball valve hardware assemblies: 125°C at 10.3 bar (257°F at 150 psi).	150°C at 6.8 bar (302°F at 100 psi) or 20°C at 13.7 bar (68°F at 200 psi).  When used with hardware, a lower rated mounting hardware or piping material may limit the temperature and pressure ratings listed above.	Sensor with integral cord grip: 200°C at 20.7 bar (392°F at 300 psi).  Sensor with integral polypropylene J-box Head: 92°C at 20.7 bar (198°F at 300 psi).  Sensor with integral aluminum or 316 SS J-box head: 200°C at 20.7 bar (392°F at 300 psi).	When used with manufacturer-supplied sanitary mount hardware assemblies: 125°C at 10.3 bar (257°F at 150 psi) (See Note 2)
<b>Wetted Materials</b>	Titanium electrodes (316 stainless steel outer electrode for extended sensor body style used with ball valve assembly), PTFE Teflon® insulator, and treated Viton® O-ring seals	Graphite electrodes, Ryton® body, and Viton® O-ring seals	316 stainless steel and titanium electrodes, PEEK insulator, and fluoroelastomer O-ring seals	316 stainless steel electrodes, PTFE Teflon® insulator, and pufluoroelastomer O-ring seals

### NOTES

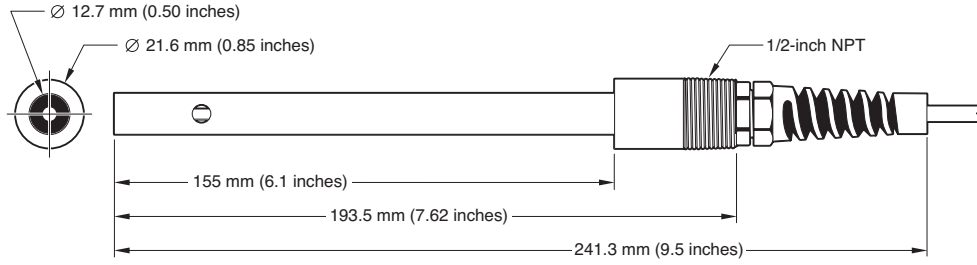
- For conductivity applications above 70°C (158°F), use the Digital Gateway (P/N 61207-00) with the appropriate sensor. Please contact Hach Technical Support for further details.
- Other brands of mounting hardware assemblies and sanitary clamps may reduce the listed rating.

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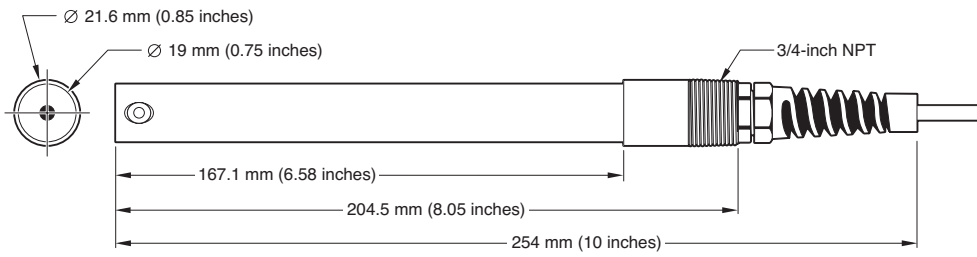
## Dimensions

### Model 3422-series Compression Fitting Sensor

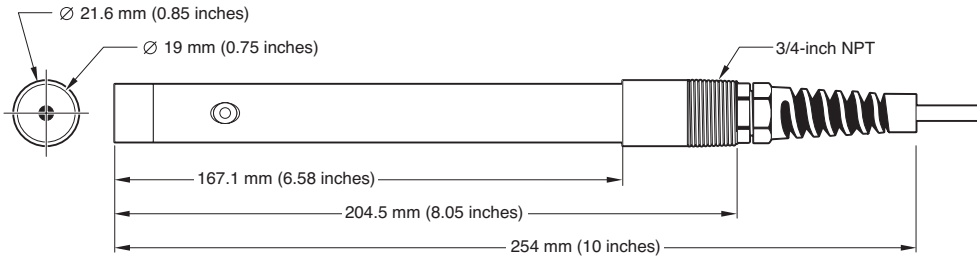
*Compression-Style Sensor, 0.5-in. Diameter*



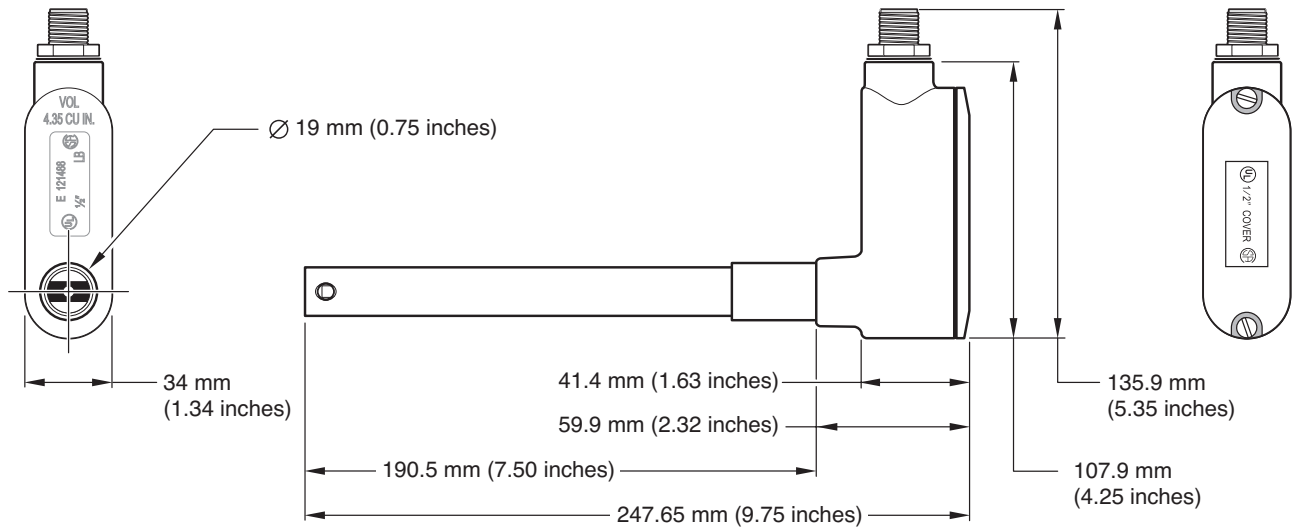
*Compression-Style Sensor, 0.75-in. Diameter*



*Compression-Style Sensor with Teflon® Tip*

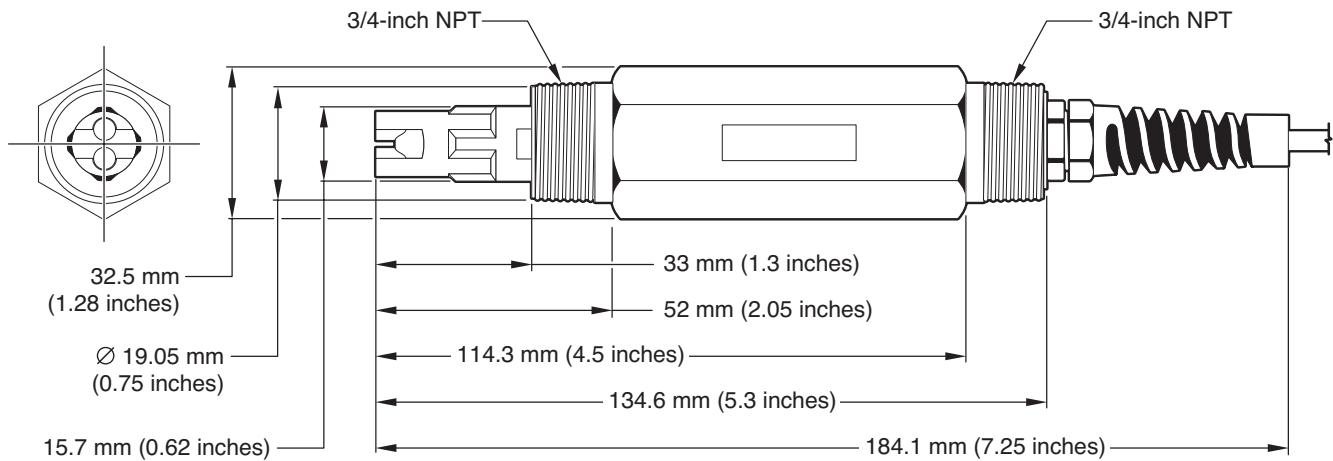


*Compression-Style Sensor with Integral Junction Box*

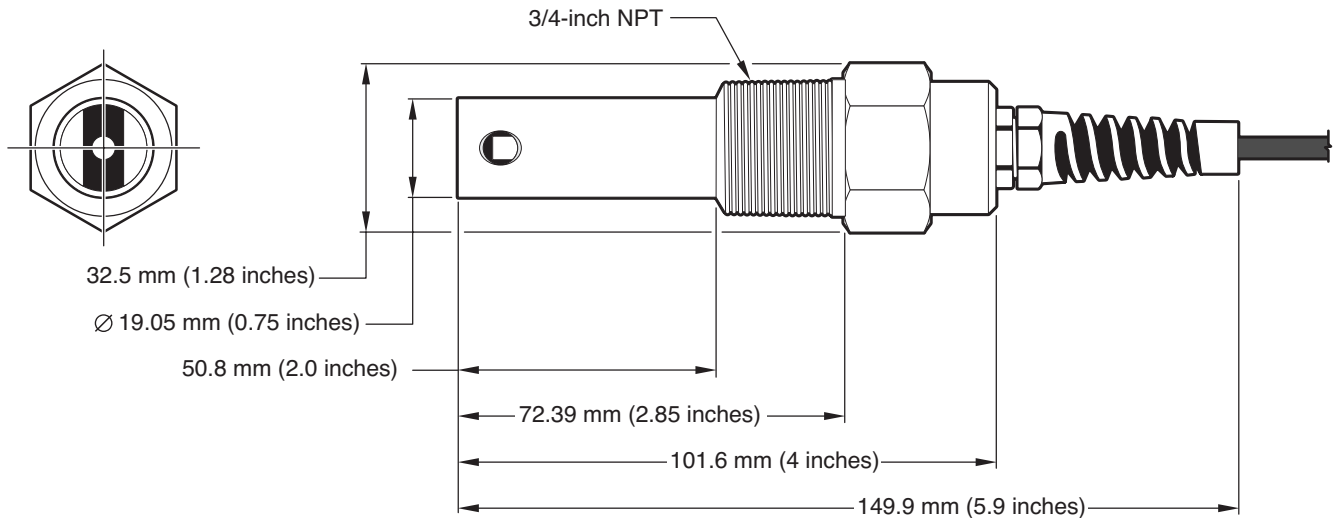


## Dimensions

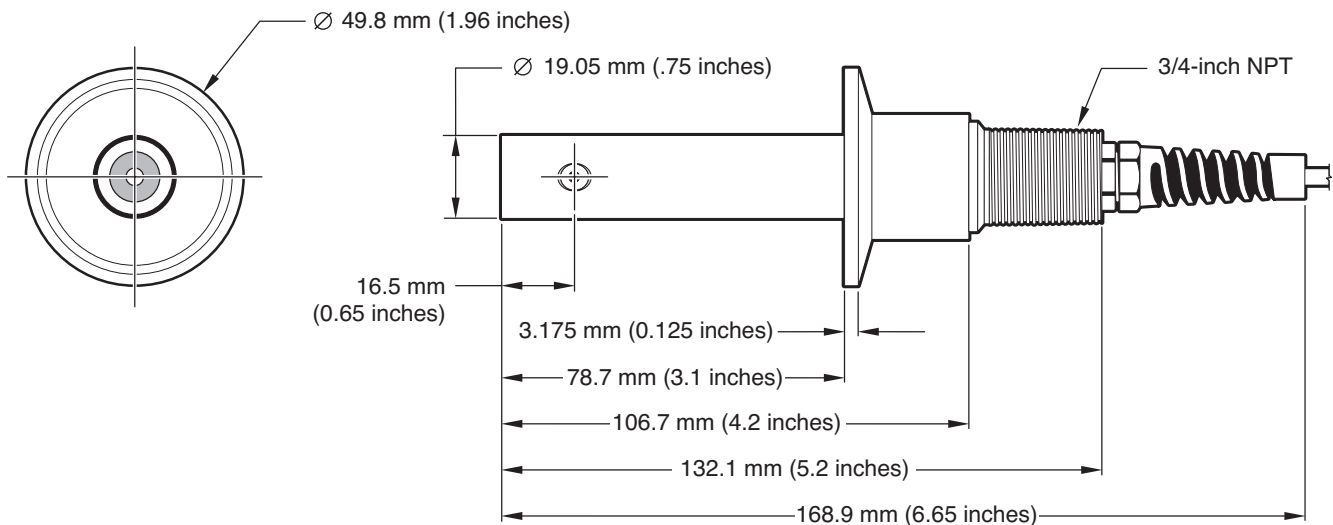
### Model 3433-series Non-metallic General Purpose Sensor



### Model 3444-series Boiler/Condensate Sensor



### Model 3455-series Sanitary (CIP) Flange Sensor



## Ordering Information

### Compression Fitting Sensors

Designed for ultrapure water and pure water applications, these small, enhanced performance contacting conductivity sensors provide the required absolute cell (K) constant accuracy, and ultrafast-acting temperature compensation. Materials of construction extend sensor operating life with no degradation in measurement reliability.

#### 3422 sc Digital Compression Fitting Sensors

All digital compression fitting sensors have titanium electrodes and include built-in digital electronics and integral 7 m (23 ft.) cable terminated with connector for the sc Digital Controllers. For insertion applications only. (For immersion applications, order 3422 Analog Compression Fitting Sensors.) For other cell constants and configurations, please contact your Hach Sales Representative.

Product Number	Cell Constant	Compression Fitting Style
<b>D3422A1</b>	0.05	1/2-inch NPT Kynar® (PVDF)
<b>D3422A2</b>	0.05	1/2-inch NPT 316 stainless steel
<b>D3422B3</b>	0.5	3/4-inch NPT Kynar® (PVDF)
<b>D3422C3</b>	1.0	3/4-inch NPT Kynar® (PVDF)
<b>D3422D3</b>	5.0	3/4-inch NPT Kynar® (PVDF)
<b>D3422E3</b>	10	3/4-inch NPT Kynar® (PVDF)

#### Digital Gateway

**6120700** Use the Digital Gateway to connect analog Hach 3400-series conductivity sensors to the Hach sc1000 Digital Controller.

#### 3422 Analog Compression Fitting Sensors

All analog compression fitting sensors have titanium electrodes and include an integral 6 m (20 ft.) cable terminated with stripped and tinned wires. For other cell constants and configurations, including options for integral junction boxes, please contact your Hach Sales Representative.

Product Number	Cell Constant	Compression Fitting Style
<b>3422A1A</b>	0.05	1/2-inch NPT Kynar® (PVDF)
<b>3422A2A</b>	0.05	1/2-inch NPT 316 stainless steel
<b>3422A3A</b>	0.05	3/4-inch NPT Kynar® (PVDF)
<b>3422B3A</b>	0.5	3/4-inch NPT Kynar® (PVDF)
<b>3422C3A</b>	1.0	3/4-inch NPT Kynar® (PVDF)
<b>3422D3A</b>	5.0	3/4-inch NPT Kynar® (PVDF)
<b>3422E3A</b>	10	3/4-inch NPT Kynar® (PVDF)

#### Accessories for Digital and Analog 3422-series Sensors

##### Compression Fittings

<b>4H1285</b>	1/2-inch 316 Stainless Steel Fitting
<b>4H1135</b>	3/4-inch 316 Stainless Steel Fitting
<b>1000F1236-111</b>	1/2-inch PVDF (Kynar®) Fitting
<b>1000F1236-122</b>	3/4-inch PVDF (Kynar®) Fitting

##### Low-volume Flow Chambers

For use only with a 0.05 cell constant sensor. These tees limit sample volume to approximately 20 mL for high-purity water applications.

<b>1000G3316-101</b>	Kynar® (PVDF) 1/2-inch pipe tee
<b>1000A3316-102</b>	316 SS 1/2-inch pipe tee

#### Mounting Hardware for Digital and Analog 3422-series Sensors

##### 316 Stainless Steel Ball Valve Mounting Hardware

Ball valve mounting hardware assemblies consist of a 1-inch stainless steel ball valve, internal Viton® seals, 1-inch NPT stainless steel close nipple, and steel guard with safety cables.

<b>MH113M2C</b>	For 0.05 cell constant sensor (1/2-inch diameter)
<b>MH114M3C</b>	For all other sensors (3/4-inch diameter)

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## Ordering Information *Continued*

### Non-metallic General Purpose Sensors

The Model 3433-series graphite electrode sensors are low-cost and offer advanced features. They are specifically designed for general purpose measuring applications that require a non-metallic sensor. Ryton® body is compatible with most acidic, basic, and salts measurements.

#### 3433 sc Digital Non-Metallic, General Purpose Sensors

All digital general purpose sensors come complete with a non-metallic sensor with graphite electrode, 3/4-inch male NPT threaded Ryton® body with integral 6 m (20 ft.) cable, digital gateway, and 1 m (3.3 ft.) digital extension cable. When ordering a replacement sensor, please select the appropriate sensor from the "Replacement Sensor" column.

<i>Product Number</i>	<i>Cell Constant</i>	<i>Replacement Sensor</i>
<b>D3433B8</b>	0.5	<b>3433B8A</b>
<b>D3433E8</b>	10	<b>3433E8A</b>

#### Digital Gateway

**6120700** Use the Digital Gateway to connect analog Hach 3400-series conductivity sensors to the Hach sc1000 Digital Controller.

#### 3433 Analog Non-Metallic, General Purpose Sensors

All analog general purpose sensors come complete with a non-metallic sensor with graphite electrode and 3/4-inch male NPT threaded Ryton® body with integral 6 m (20 ft.) cable terminated with stripped and tinned wires. For other configurations, including options for integral junction boxes, please contact your Hach Sales Representative.

<i>Product Number</i>	<i>Cell Constant</i>
<b>3433B8A</b>	0.5
<b>3433E8A</b>	10

#### Mounting Hardware for Digital and Analog Model 3433-series Sensors

##### Union Mounting Hardware

**MH576N3MZ** All-PVC assemblies include: 1-1/2-inch pipe tee, 1-1/2-inch close nipple, 1-1/2-inch Hach-modified union

### Boiler/Condensate Sensors

The Model 3444-series enhanced performance contacting conductivity sensors are specifically designed for high temperature and high pressure applications. They are especially convenient for direct boiler wall installations.

#### 3444 sc Digital Boiler/Condensate Style Sensors

All digital boiler/condensate style sensors have 316 stainless steel electrode electrodes, 3/4-inch male NPT threaded 316 stainless steel body with integral 6 m (20 ft.) cable, digital gateway, and 1 m (3.3 ft.) digital extension cable. When ordering a replacement sensor please select the appropriate sensor from the "Replacement Sensor" column.

<i>Product Number</i>	<i>Cell Constant</i>	<i>Replacement Sensor</i>
<b>D3444B8</b>	0.5	<b>3444B8A</b>
<b>D3444D8</b>	5.0	<b>3444D8A</b>

#### Digital Gateway

**6120700** Use the Digital Gateway to connect analog Hach 3400-series conductivity sensors to the Hach sc1000 Digital Controller.

#### 3444 Analog Boiler/Condensate Style Sensors

All analog boiler/condensate style sensors have 316 stainless steel electrodes and 3/4-inch male NPT threaded 316 stainless steel body with integral 6 m (20 ft.) cable terminated with stripped and tinned wires. For other configurations, including options for integral junction boxes, please contact your Hach Sales Representative.

<i>Product Number</i>	<i>Cell Constant</i>
<b>3444B8A</b>	0.5
<b>3444D8A</b>	5.0

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## Ordering Information *Continued*

### Sanitary (CIP) Flange Sensors

These CIP-ready, enhanced performance contacting conductivity sensors are designed for direct mounting into processes using CIP type fittings. Applications may include food, pharmaceutical, high purity water, reverse osmosis, waste treatment, and other processes.

#### 3455 sc Digital Sanitary (CIP) Flange Style Sensors

All digital sanitary (CIP) flange style sensors have 316 stainless steel electrodes, integral 6 m (20 ft.) cable, digital gateway, and 1 m (3.3 ft.) digital extension cable. When ordering a replacement sensor please select the appropriate sensor from the "Replacement Sensor" column.

<i>Product Number</i>	<i>Cell Constant</i>	<i>Installation Style</i>	<i>Replacement Sensor</i>
<b>D3455A6</b>	0.05	Sanitary (CIP) 1-1/2-inch flange	<b>3455A6A</b>
<b>D3455C7</b>	1.0	Sanitary (CIP) 2-inch flange	<b>3455C7A</b>
<b>D3455E7</b>	10	Sanitary (CIP) 2-inch flange	<b>3455E7A</b>

#### Digital Gateway

**6120700** Use the Digital Gateway to connect analog Hach 3400-series conductivity sensors to the Hach sc1000 Digital Controller.

#### 3455 Analog Sanitary (CIP) Flange Style Sensors

All analog sanitary (CIP) flange style sensors have 316 stainless steel electrodes with integral 6 m (20 ft.) cable terminated with stripped and tinned wires. For other configurations, including different flange sizes and integral junction box options, please contact your Hach Sales Representative.

<i>Product Number</i>	<i>Cell Constant</i>	<i>Installation Style</i>
<b>3455A6A</b>	0.05	Sanitary (CIP) 1-1/2 inch flange
<b>3455C7A</b>	1.0	Sanitary (CIP) 2 inch flange
<b>3455E7A</b>	10	Sanitary (CIP) 2 inch flange

#### Mounting Hardware for Digital and Analog Model 3455-series Sensors

##### Sanitary 1-1/2-inch Mounting Hardware

<b>9H1388</b>	1-1/2-inch sanitary tee
<b>9H1382</b>	1-1/2-inch heavy duty sanitary clamp

##### Sanitary 1-1/2-inch Gasket

<b>9H1381</b>	EDPM (standard)
<b>9H1383</b>	Viton® (optional)

##### Sanitary 2-inch Mounting Hardware

<b>9H1310</b>	2-inch sanitary tee
<b>9H1132</b>	2-inch heavy duty sanitary clamp

##### Sanitary 2-inch Gasket

<b>9H1327</b>	EDPM (standard)
<b>9H1384</b>	Viton® (optional)

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## Ordering Information *Continued*

### Accessories for all 3400-series Contacting Conductivity Sensors

#### Cables

Digital cables are used only with digital sensors or gateways when connecting to the sc Digital Controllers.

<b>6122400</b>	Digital Extension Cable, 1 m (3.3 ft.)
<b>5796000</b>	Digital Extension Cable, 7.7 m (25 ft.)
<b>5796100</b>	Digital Extension Cable, 15 m (50 ft.)
<b>5796200</b>	Digital Extension Cable, 31 m (100 ft.)

Analog cables are used only with analog sensors, junction box, and controller.

<b>1W1100</b>	Analog Interconnect Cable, order per foot
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#### Digital Termination Box

Used with digital extension cables when the desired cable length between the digital sensor/digital gateway and the sc Digital Controller is between 100 m (328 ft.) and 1000 m (3280 ft.).

<b>5867000</b>	Digital Termination Box
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#### Analog Junction Box

Used with analog interconnect cable when the desired cable length between analog sensor and analog controller is greater than the standard length of sensor cable. Each junction box includes terminal strip and gasket.

<b>60A2053</b>	Junction Box, Surface-mount, aluminum (includes mounting hardware)
<b>60A9944</b>	Junction Box, Pipe-mount, PVC (for 1/2-inch diameter pipe, includes mounting hardware)
<b>60G2052</b>	Junction Box, Pipe-mount, PVC (for 1-inch diameter pipe, includes mounting hardware)
<b>76A4010-001</b>	Junction Box, NEMA 4X (no mounting hardware included)

#### Conductivity Reference Solutions

Please specify the desired conductivity value when placing your order.

<i>Product Number</i>	<i>Description</i>	<i>Volume</i>
<b>25M3A2000-119</b>	100-1000 $\mu\text{S/cm}$	1 liter
<b>25M3A2050-119</b>	1000-2000 $\mu\text{S/cm}$	1 liter
<b>25M3A2100-119</b>	2000-150,000 $\mu\text{S/cm}$	1 liter
<b>25M3A2200-119</b>	200,000-300,000 $\mu\text{S/cm}$	1 liter

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