# 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 µS/cm or 18.2 M $\Omega$  (theoretically pure water) up to 200,000 µS/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<sup>®</sup> (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.



#### Specifications\*

**Cell Constants and Measuring Ranges** 

Sensor Cell	Inherent Measuring Range			
Constant	Conductivity (µS/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		

Temperature
Measurement Range

–20 to 200°C (–4 to 392°F)

**Accuracy** ±2% of reading above 200 μS/cm

**Sensitivity**  $\pm 0.5\%$  of reading

**Response Time** 90% of reading within 30 seconds

of step change

**Repeatability**  $\pm 0.5\%$  of reading

Operating Temperature -20 to 200°C (-4 to 392°F)

**Flow Rate** 0–3 m/s (0–10 ft./s), maximum, f

ully immersed

**Temperature** Pt 1000 RTD **Compensator** 

**Transmission Distance** 100 m (328 ft.), maximum

1000 m (3280 ft.), maximum when

used with a termination box

Standard Probe Cable Digit Length (integral) Analo

Digital Probe: 7 m (23 ft.) Analog Probe: 6 m (20 ft.)

Sensor Cable

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.

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

#### **NOTES**

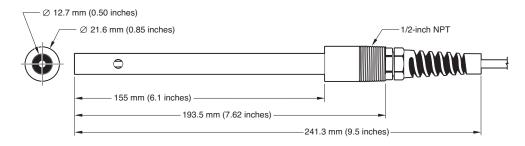
- 1. For conductivity applications above 70°C (158°F), use the Digital Gateway (P/N 61207-00) with the appropriate sensor. Please contact Hach Technical Support for further details.
- 2. Other brands of mounting hardware assemblies and sanitary clamps may reduce the listed rating.

Viton® is a registered trademark of E.I. DuPont de Nemours + Co.; Ryton® is a registered trademark of Phillips 66 Co.; PEEK® is a registered trademark of ICI Americas, Inc.; Kynar® is a registered trademark of Pennwalt Corp.

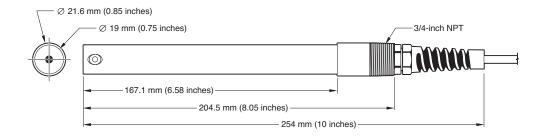
#### **Dimensions**

#### Model 3422-series Compression Fitting Sensor

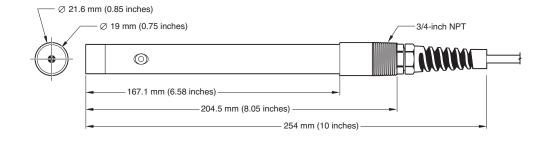
#### Compression-Style Sensor, 0.5-in. Diameter



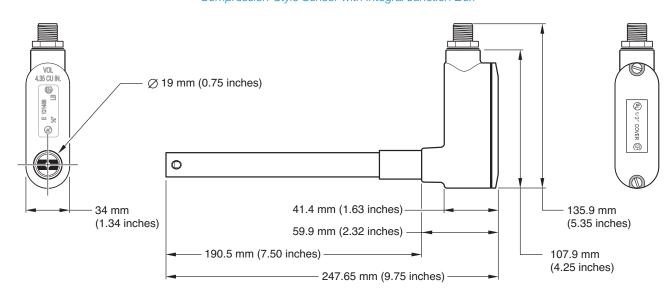
#### Compression-Style Sensor, 0.75-in. Diameter



#### Compression-Style Sensor with PTFE Tip

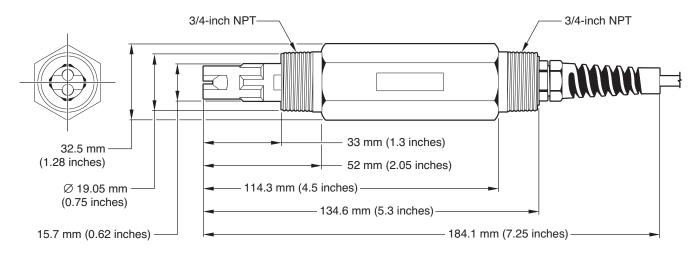


#### Compression-Style Sensor with Integral Junction Box

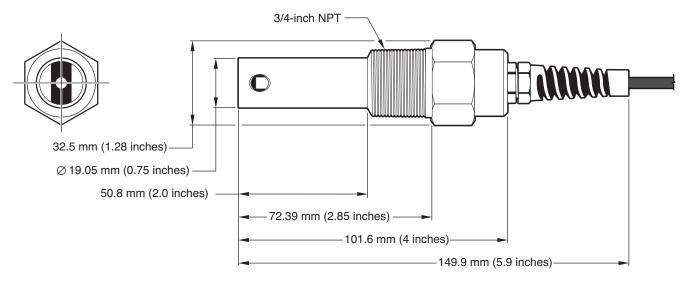


#### **Dimensions**

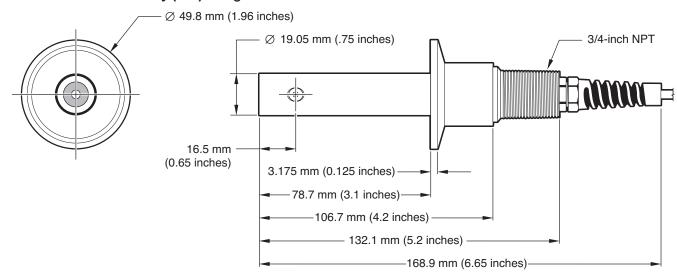
#### Model 3433-series Non-metallic General Purpose Sensor



#### 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
D3422A1	0.05	1/2-inch NPT Kynar <sup>®</sup> (PVDF)
D3422A2	0.05	1/2-inch NPT 316 stainless steel
D3422B3	0.5	3/4-inch NPT Kynar <sup>®</sup> (PVDF)
D3422C3	1.0	3/4-inch NPT Kynar® (PVDF)
D3422D3	5.0	3/4-inch NPT Kynar® (PVDF)
D3422E3	10	3/4-inch NPT Kynar <sup>®</sup> (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
3422A1A	0.05	1/2-inch NPT Kynar <sup>®</sup> (PVDF)
3422A2A	0.05	1/2-inch NPT 316 stainless steel
3422A3A	0.05	3/4-inch NPT Kynar <sup>®</sup> (PVDF)
3422B3A	0.5	3/4-inch NPT Kynar® (PVDF)
3422C3A	1.0	3/4-inch NPT Kynar® (PVDF)
3422D3A	5.0	3/4-inch NPT Kynar <sup>®</sup> (PVDF)
3422E3A	10	3/4-inch NPT Kynar <sup>®</sup> (PVDF)

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

#### **Compression Fittings**

 4H1285
 1/2-inch 316 Stainless Steel Fitting

 4H1135
 3/4-inch 316 Stainless Steel Fitting

 1000F1236-111
 1/2-inch PVDF (Kynar®) Fitting

 1000F1236-122
 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.

**1000G3316-101** Kynar<sup>®</sup> (PVDF) 1/2-inch pipe tee **1000A3316-102** 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.

MH113M2C For 0.05 cell constant sensor (1/2-inch diameter)

HH114M3C For all other sensors (3/4-inch diameter)

Continued on next page.

#### **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<sup>®</sup> 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.

Product Number Cell Constant Replacement Sensor

**D3433B8** 0.5 **3433B8A D3433E8** 10 **3433E8A** 

#### **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<sup>®</sup> 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.

 Product Number
 Cell Constant

 3433B8A
 0.5

 3433E8A
 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.

Product Number Cell Constant Replacement Sensor

**D3444B8** 0.5 **3444B8A D3444D8** 5.0 **3444D8A** 

#### 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.

 Product Number
 Cell Constant

 3444B8A
 0.5

 3444D8A
 5.0

#### **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.

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

#### **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.

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

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

9H1388	1-1/2-inch Mounting Hardware 1-1/2-inch sanitary tee 1-1/2-inch heavy duty sanitary clamp	9H1310	2-inch Mounting Hardware 2-inch sanitary tee 2-inch heavy duty sanitary clamp
9H1381	1-1/2-inch Gasket EDPM (standard) Viton® (optional)	•	<b>2-inch Gasket</b> EDPM (standard) Viton <sup>®</sup> (optional)

Continued on next page.

#### **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.

Digital Extension Cable, 1 m (3.3 ft.)
 Digital Extension Cable, 7.7 m (25 ft.)
 Digital Extension Cable, 15 m (50 ft.)
 Digital Extension Cable, 31 m (100 ft.)

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

**1W1100** Analog Interconnect Cable, order per foot

#### **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.).

**5867000** Digital Termination Box

#### **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.

60A2053 Junction Box, Surface-mount, aluminum (includes mounting hardware)

Junction Box, Pipe-mount, PVC (for 1/2-inch diameter pipe, includes mounting hardware)
 Junction Box, Pipe-mount, PVC (for 1-inch diameter pipe, includes mounting hardware)

76A4010-001 Junction Box, NEMA 4X (no mounting hardware included)

#### **Conductivity Reference Solutions**

Please specify the desired conductivity value when placing your order.

 Product Number
 Description
 Volume

 25M3A2000-119
 100-1000 μS/cm
 1 liter

 25M3A2050-119
 1000-2000 μS/cm
 1 liter

 25M3A2100-119
 2000-150,000 μS/cm
 1 liter

 25M3A2200-119
 200,000-300,000 μS/cm
 1 liter

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