

# DIFFERENTIAL pH AND ORP SENSORS

## Applications

- Drinking Water
- Wastewater
- Industrial Water
- Power



Wide range pH glass  
(HF resistant glass also available)



## The smart choice for accurate, reliable, and dependable pH/ORP measurement.

Hach Digital pHD sc sensors are available in convertible (PEEK® or Ryton®), insertion, and sanitary body styles. Three electrodes are used in these sensors to increase measurement accuracy and eliminate sensor ground loops.

### Differential Electrode Measurement Technique

This field-proven technique uses three electrodes instead of the two normally used in conventional pH sensors. Process and reference electrodes measure the pH differentially with respect to a third ground electrode. The end result is unsurpassed measurement accuracy, reduced reference junction potential, and elimination of sensor ground loops. These sensors provide greater reliability, resulting in less downtime and maintenance.

### Patented Technology

The former GLI, now a Hach Company brand, invented the Differential Electrode Technique for pH measurement in 1970. The pHDTM sensor series (U.S. Patent Number 6395158B1, May 28, 2002) takes this field-proven technology to a new level.

### Replaceable Salt Bridge/Protector

The unique, replaceable salt bridge holds an extraordinary volume of buffer to extend the working life of the sensor by protecting the reference electrode from harsh process conditions.

### Built-in Encapsulated Preamp

Encapsulated construction protects the sensor's built-in preamp from moisture and humidity, ensuring reliable sensor operation. The preamp in the pHD analog sensor produces a strong signal, enabling the sensor to be located up to 1000 m (3280 ft.) from the analyzer.

### Durable Body Materials

Both the digital and analog pH and ORP differential sensors feature a durable PEEK® body for chemical compatibility with most process solutions. For less aggressive solutions, Hach offers a Ryton® sensor in a convertible style for pH and ORP measurement. A sensor with a stainless steel body is available for immersion applications.

### Versatile Mounting Styles

Sensors are available in four mounting styles—convertible, insertion, immersion, and sanitary.

### Differential Sensor Warranty

Hach Company offers an outstanding warranty on its differential sensors. We will replace any differential sensor that fails due to defects in materials or workmanship within one year from the date of shipment, and up to 30 months on a prorated basis for any failure.



## Specifications\*

### pH Sensors

Some industrial applications require accurate measurement and control below 2 or above 12 pH. In these special cases, please contact Hach Technical Support for further details.

<b>Measuring Range</b>	-2 to 14 pH
<b>Sensitivity</b>	±0.01 pH
<b>Stability</b>	0.03 pH per 24 hours, non-cumulative
<b>Operating Temperature</b>	Digital Sensor: -5 to 70°C (23 to 158°F)  Analog Sensor with Digital Gateway: 5 to 105°C (23 to 221°F)  Immersion Sensor: 0 to 50°C (32 to 122°F)
<b>Flow Rate</b>	3 m (10 ft.) per second, maximum
<b>Sensor Pressure/ Temperature Limits</b>	Digital: 6.9 bar at 70°C (100 psi at 158°F)  Analog: 6.9 bar at 105°C (100 psi at 221°F)
<b>Built-in Temperature Element</b>	NTC 300 ohm thermistor for automatic temperature compensation and analyzer temperature readout
<b>Transmission Distance</b>	100 m (328 ft.), maximum 1000 m (3280 ft.), maximum when used with a termination box
<b>Sensor Cable (integral)</b>	4 conductor cable with one shield and polyurethane jacket; rated to 105°C (221°F); 10 m (33 ft.) standard length
<b>Wetted Materials</b>	PEEK® or Ryton® (PVDF), salt bridge of matching material with Kynar® junction, glass process electrode, titanium ground electrode, and Viton® O-ring seals  (Please contact Hach Technical Support for available wetted O-ring materials.)

### ORP (Redox) Sensors

For best ORP measuring results in solutions containing zinc, cyanide, cadmium or nickel, Hach recommends using the pHD sc ORP sensor equipped with an optional gold electrode.

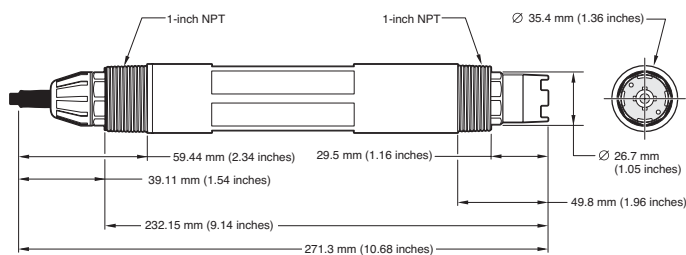
<b>Measuring Range</b>	-1500 to +1500 mV
<b>Sensitivity</b>	±0.5 mV
<b>Stability</b>	2 mV per 24 hours, non-cumulative
<b>Operating Temperature</b>	Digital Sensor: -5 to 70°C (23 to 158°F)  Analog Sensor with Digital Gateway: -5 to 105°C (23 to 221°F)  Immersion Sensor: 0 to 50°C (32 to 122°F)
<b>Flow Rate</b>	3 m (10 ft.) per second, maximum
<b>Sensor Pressure/ Temperature Limits</b>	Digital: 6.9 bar at 70°C (100 psi at 158°F)  Analog: 6.9 bar at 105°C (100 psi at 221°F)
<b>Built-in Temperature Element</b>	NTC 300 ohm thermistor for analyzer temperature readout only—no automatic temperature compensation necessary for ORP measurement
<b>Transmission Distance</b>	100 m (328 ft.), maximum 1000 m (3280 ft.), maximum when used with a termination box
<b>Sensor Cable (integral)</b>	4 conductor cable with one shield and polyurethane jacket; rated to 105°C (221°F); 10 m (33 ft.) standard length
<b>Wetted Materials</b>	PEEK® or Ryton® (PVDF), salt bridge of matching material with Kynar® junction, glass and platinum (or plastic and gold) process electrode, titanium ground electrode, and Viton® O-ring seals

*\*Subject to change without notice.*

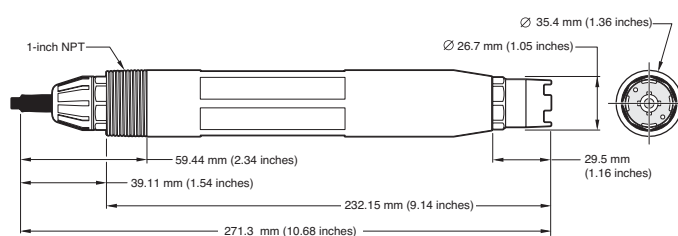
*PEEK® is a registered trademark of ICI Americas, Inc.; Ryton® is a registered trademark of Phillips 66 Co.; Kynar® is a registered trademark of Pennwalt Corp.; Viton® is a registered trademark of E.I. DuPont de Nemours + Co.*

## Dimensions

Convertible Style



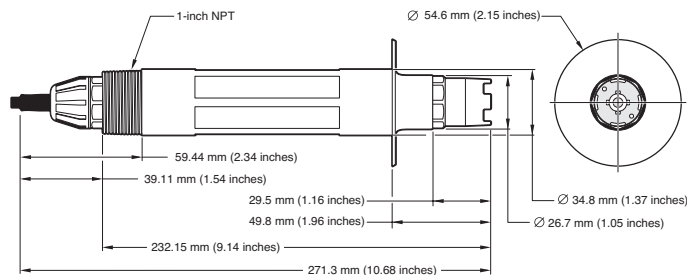
Insertion Style



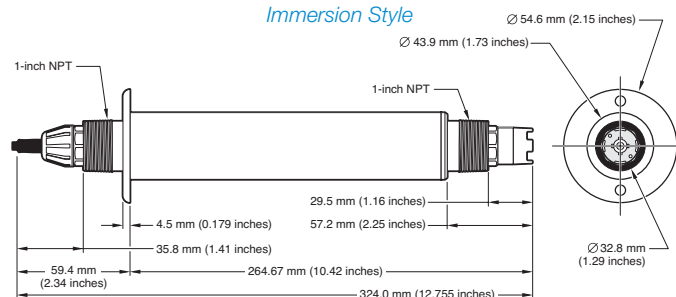
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## Dimensions *continued*

Sanitary Style



Immersion Style



## Ordering Information

### pH<sup>sc</sup> Digital Differential pH/ORP Sensors

All digital sensors include built-in digital electronics and integral 10 m (33 ft.) cable terminated with connector for the Hach SC Digital Controllers.

#### pH Sensors

Prod. No.	Body Material	Body Style*	Electrode Material	Max Temp
DPD1P1	PEEK <sup>1</sup>	Convertible	Glass, General Purpose	70°C (158°F)
DPD1P3	PEEK <sup>1</sup>	Convertible	Glass, HF-resistant	70°C (158°F)
DPD2P1	PEEK <sup>1</sup>	Insertion	Glass, General Purpose	70°C (158°F)
DPD3P1	PEEK <sup>1</sup>	Sanitary	Glass, General Purpose	70°C (158°F)
DPD1R1	Ryton <sup>2</sup>	Convertible	Glass, General Purpose	70°C (158°F)
DPD1R3	Ryton <sup>2</sup>	Convertible	Glass, HF-resistant	70°C (158°F)
DPS1	Stainless Steel	Immersion	Glass, General Purpose	50°C (122°F)

<sup>1</sup>Polyetheretherketone <sup>2</sup>Polyphenylene Sulfide

#### ORP Sensors

Prod. No.	Body Material	Body Style*	Electrode Material	Max Temp
DRD1P5	PEEK <sup>1</sup>	Convertible	Platinum	70°C (158°F)
DRD1P6	PEEK <sup>1</sup>	Convertible	Gold	70°C (158°F)
DRD2P5	PEEK <sup>1</sup>	Insertion	Platinum	70°C (158°F)
DRD1R5	Ryton <sup>2</sup>	Convertible	Platinum	70°C (158°F)
DRD1R6	Ryton <sup>2</sup>	Convertible	Gold	70°C (158°F)
DRS5	Stainless Steel	Immersion	Platinum	50°C (122°F)

<sup>1</sup>Polyetheretherketone <sup>2</sup>Polyphenylene Sulfide

### Digital Gateway

**6120500** Digital Gateway, convert pHD analog sensors to digital output for connecting to SC1000 digital controller

### pH Analog Sensors

All analog sensors include built-in preamplifier and integral 4.5 m (15 ft.) cable terminated with stripped and tinned wires.

#### pH Sensors

Prod. No.	Body Material	Body Style*	Electrode Material	Max Temp
PD1P1	PEEK <sup>1</sup>	Convertible	Glass, General Purpose	95°C (203°F)
PD1P3	PEEK <sup>1</sup>	Convertible	Glass, HF-resistant	95°C (203°F)
PD2P1	PEEK <sup>1</sup>	Insertion	Glass, General Purpose	95°C (203°F)
PD3P1	PEEK <sup>1</sup>	Sanitary	Glass, General Purpose	95°C (203°F)
PD1R1	Ryton <sup>2</sup>	Convertible	Glass, General Purpose	95°C (203°F)
PD1R3	Ryton <sup>2</sup>	Convertible	Glass, HF-resistant	95°C (203°F)

<sup>1</sup>Polyetheretherketone <sup>2</sup>Polyphenylene Sulfide

#### ORP Sensors

Prod. No.	Body Material	Body Style*	Electrode Material	Max Temp
RD1P5	PEEK <sup>1</sup>	Convertible	Platinum	95°C (203°F)
RD1P6	PEEK <sup>1</sup>	Convertible	Gold	95°C (203°F)
RD2P5	PEEK <sup>1</sup>	Insertion	Platinum	95°C (203°F)
RD1R5	Ryton <sup>2</sup>	Convertible	Platinum	95°C (203°F)
RD1R6	Ryton <sup>2</sup>	Convertible	Gold	95°C (203°F)

<sup>1</sup>Polyetheretherketone <sup>2</sup>Polyphenylene Sulfide

\*Definitions of body styles:

- Convertible – 1-inch NPT threads at both ends, designed for tee-mounting or other flow through mountings, and pipe mounting for immersion
- Insertion – no threads on the electrode end, designed for use with insertion valve assembly
- Sanitary – 2-inch flange for a tri-clover style fitting
- Immersion – used with chain mounting or pipe mounting

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## Ordering Information *continued*

### pHD sc Digital and pHD Analog Sensor Accessories

#### Cables

Extension cables are used only with digital sensors or digital gateways when connecting to an SC Digital Controller.

<b>6122400</b>	Digital Extension Cable, 1 m (3.2 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.)

Interconnect 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

Required when the cable between the sensor/gateway and SC Digital Controller is 100 m (328 ft.) to 1000 m (3280 ft.)

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

Required when the cable between the analog sensor and controller is greater than standard sensor cable. 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)

#### Salt Bridges

The double junction salt bridge on the standard cell of all Hach pHD sensors is field-replaceable.

<b>SB-P1SV</b>	PEEK Sensor and Salt Bridge Body, Kynar (PVDF) Outer Junction
<b>SB-P2SV</b>	PEEK Sensor and Salt Bridge Body, Ceramic Outer Junction
<b>SB-P1SP<sup>1</sup></b>	PEEK Sensor and Salt Bridge Body, Kynar (PVDF) Outer Junction
<b>SB-R1SV</b>	Ryton Sensor and Salt Bridge Body, Kynar (PVDF) Outer Junction

<sup>1</sup>Special perfluoroelastomer O-ring in place of the Viton® O-ring

#### pHD Sensor Reagents and Standards

<b>25M1A1025-115</b>	Standard Cell Solution, 500 mL
<b>25M8A1002-101</b>	Gel Powder, for high temperature applications, 2 g

#### pH Buffers

<b>2283549</b>	pH 7, 500 mL (1 pint)
<b>2283449</b>	pH 4, 500 mL (1 pint)
<b>2283649</b>	pH 10, 500 mL (1 pint)

#### ORP Reference Solutions (in resealable plastic bottles)

<b>25M2A1001-115</b>	200 mV 500 mL (1 pint)
<b>25M2A1002-115</b>	600 mV 500 mL (1 pint)

### Mounting Hardware for pHD sc Differential Sensors

#### Sanitary Mount

<b>MH018S8SZ</b>	316 SS
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Includes 2-inch sanitary tee and heavy-duty clamp. Cap and EPDM compound gasket supplied with sensor; can be ordered separately.

#### Union Mount

<b>6131300</b>	CPVC
<b>6131400</b>	316 SS

Includes standard 1-1/2 inch tee, union pipe with adapter, sealing hub, and lock ring and Viton® O-ring.

#### Flow-through Mount

<b>MH334N4NZ</b>	CPVC
<b>MH314N4MZ</b>	316 SS

Includes a standard 1-inch tee in respective material.

#### Insertion Mount

Digital		Analog	
<b>5646300</b>	CPVC	<b>5646400</b>	CPVC
<b>5646350</b>	316 SS	<b>5646450</b>	316 SS

Includes a 1-1/2 inch ball valve, 1-1/2 inch NPT close nipple, sensor adapter with two Viton® O-rings and wiper, extension pipe, pipe adapter, back tube, and lock ring.

#### Immersion Mount

##### Standard Hardware

Digital		Analog	
<b>6136400</b>	CPVC	<b>MH434A00B</b>	CPVC
<b>6136500</b>	316 SS	<b>MH414A00B</b>	316 SS

Includes 1-inch by 4 ft. pipe and 1-inch x 1-inch NPT coupling. (Pipe-mount junction box with terminal strip included in analog hardware.)

##### Handrail Hardware

<b>MH236B00Z</b>	CPVC
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Includes 1-1/2 inch by 7.5 ft. CPVC pipe, and swivel/pivot/ pipe clamp assembly.

##### Chain Mount Hardware

<b>2881900</b>	316 ss
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Includes stainless steel bail, nuts, and washers. Does not include chain. To be used with stainless steel immersion sensor only.

##### Ball Float Hardware

<b>6131000</b>	CPVC
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Includes 1-1/2 inch by 7.5 ft. CPVC pipe, ball float assembly, and swivel/pivot/ pipe clamp assembly.