Data Sheet PD/901
Supersedes PD/501

pHD™ Differential pH and ORP Sensors

Available in convertible (PEEK® or Ryton®), insertion, and sanitary body styles (pictured).

Common Features

■ pHD™ 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. For complete details on the Differential Sensor technology, request GLI Technical Bulletin TB-P5. For general pH measurement information, ask for our Technical Handbook on pH.

■ Patent Applied For.
Back in 1970, GLI invented the Differential Electrode Technique for pH measurement applications and patented its design. The pHD™ sensors series (patent applied for) 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. The salt bridge simply threads onto the end of the sensor if replacement is needed.

■ Built-in Encapsulated Preamp.
Encapsulated construction protects the sensor's built-in preamp from moisture and humidity, ensuring reliable sensor operation. This preamp produces a strong signal, enabling the sensor to be located up to 3000 ft. (914 m) from the analyzer.

■ Durable PEEK® Body Material.
The pHD™ Differential pH and ORP sensors feature a durable PEEK® body for chemical compatibility with most process solutions. For less aggressive solutions, GLI offers a Ryton® sensor in a convertible style for pH and ORP measurement.

Versatile Sensor Mounting

■ Convertible Body Style.
The convertible style sensor features 1-inch NPT threads on both ends of its body to mount:

- Into standard 1 inch pipe tee.
- Into GLI adapter pipe for union mounting with standard 1-1/2 inch pipe tee.
- Onto end of pipe for immersion into a vessel.

■ Insertion Body Style
The insertion style sensor is similar, but has no threads on the electrode end. When used with a GLI ball valve hardware assembly, the sensor can be inserted into/retracted from the process without stopping the flow.

■ Sanitary Body Style
The sanitary style sensor has an integral 2-inch flange, special cap, and EPDM compound gasket for use with GLI 2-inch sanitary tees and mounting hardware.

■ New and Retrofit Hardware
Mounting hardware for new and existing installations is offered in a variety of materials for all sensor body styles.

Specifications

	pH Sensors (see Note 1)	ORP (Redox) Sensors (see Note 2)
Wetted Materials:	PEEK® or Ryton® body, salt bridge of matching material with Kynar® (PVDF) junction, glass process electrode, titanium ground electrode, and Viton® O-ring seals (pH sensor with optional HF-resistant glass process electrode has 316 stainless steel ground electrode, and perfluoroelastomer wetted O-rings; consult factory for other available wetted O-ring materials)	PEEK® or Ryton® body, salt bridge of matching material with Kynar® (PVDF) junction, glass supported platinum (or gold) process electrode, titanium ground electrode, and Viton® O-ring seals
Operating Temperature Range	23 to 203°F (-5°C to +95°C)	23 to 203°F (-5°C to +95°C)
Pressure/Temperature Limits (without mounting hardware)	100 psi at 221°F (6.9 bar at 105°C)	100 psi at 221°F (6.9 bar at 105°C)
Maximum Flow Rate	10 ft. (3 m) per second	10 ft. (3 m) per second
Built-in Temperature Element	NTC 300 ohm thermistor for automatic temperature compensation and analyzer temperature readout	NTC 300 ohm thermistor for analyzer temperature readout only -- no automatic temperature compensation necessary for ORP measurement
Measuring Range	0-14 pH	-1500 to +1500 mV
Sensitivity	Less than 0.005 pH	Less than 0.5 mV
Stability	0.03 pH per 24 hours, non-cumulative	2 mV per 24 hours, non-cumulative
Maximum Transmission Distance	3000 ft. (914 m)	3000 ft. (914 m)
Sensor Cable (integral)	5 conductor (plus two isolated shields) cable with XLPE (cross-linked polyethylene) jacket; rated to 302°F (150°C); 15 ft. (4.5 m) standard length	5 conductor (plus two isolated shields) cable with XLPE (cross-linked polyethylene) jacket; rated to 302°F (150°C); 15 ft. (4.5 m) standard length

NOTES:

1. Most pH applications fall in the 2.5-12.5 pH range. A GLI pHD™ Differential pH sensor with the wide-range glass process electrode performs exceptionally well in this range. Some industrial applications require accurate measurement and control below 2 or above 12 pH. In these special cases, please contact GLI for further details.

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

Ordering Information

pHD™ Differential PEEK® Sensors

MODEL NUMBER

PD pH sensor with PEEK® body, built-in preamplifier, and integral 15 ft. (4.5 m) long cable terminated with stripped and tinned wires

RD ORP sensor with PEEK® body, built-in preamplifier, and integral 15 ft. (4.5 m) long cable terminated with stripped and tinned wires

BODY STYLE

1P Convertible (1-inch NPT at both ends -- see Note A)
2P Insertion (no threads on electrode end)
3P Sanitary (2-inch flange for Tri-Clover fitting)

ELECTRODE MATERIAL

1 Glass, wide-range (0-14 pH; general purpose -- only for pH)
3 Glass, HF-resistant (only for pH -- see Note B)
5 Platinum (only for ORP -- see Note C)
6 Gold (only for ORP -- see Note C)

Product Number

Choose one from each category.

pHD™ Differential Ryton® Sensors

■ **Model PD1R1 pH Sensor**

Ryton® convertible style sensor has built-in preamplifier, standard wide-range glass pH electrode, and integral 15 ft. (4.5 m) long cable terminated with stripped and tinned wires.

■ **Model RD1R5 ORP Sensor**

Ryton® convertible style sensor has built-in preamplifier, standard platinum ORP electrode, and integral 15 ft. (4.5 m) long cable terminated with stripped and tinned wires.

NOTES:

A. When immersion mounting a convertible style sensor, it is recommended to order an optional protector made of the same material as the sensor (1000F3374-002 for PEEK® protector or 1000F3374-003 for Ryton® protector). The protector, shown in Figure 1 on page 4, threads onto the end of the sensor.

B. A pH sensor with HF-resistant glass electrode is constructed with PFE (perfluoroelastomer) internal O-rings.

C. For best ORP measuring results in solutions containing zinc, cyanide, cadmium or nickel, specify the gold electrode.

Sensor Accessories (order separately):

- **Salt Bridges for GLI pHD™ Differential Sensors**

  The double junction salt bridge on the standard cell of all GLI pHD™ Differential Technique sensors is field-replaceable, and includes an appropriate O-ring. Salt bridges are shipped in specified quantities in a salt solution. Please specify the desired salt bridge part number and quantity.

Salt Bridge Usage Guide

Part Number	For GLI pHD™ Differential Sensors With:	Salt Bridge Materials	
		Body	Outer Junction
SB-P1SV	PEEK® body	PEEK®	Kynar® (PVDF)
SB-R1SV	Ryton® body	Ryton®	Kynar® (PVDF)

NOTE: Each salt bridge has a ceramic inner junction and Viton O-ring, and contains binary, equi-transferrant fill solution.

- **Standard Cell Solution -- 25M1A1025-115**

  Specially formulated solution to replenish standard cell chamber in GLI Differential sensors while replacing salt bridge. Packaged in resealable, 500 ml bottle.

- **Interconnect Cable -- 1W1100**

  This interconnect cable extends the distance between sensor and analyzer. It is identical to the sensor cable, including a cross-linked polyethylene jacket rated to 150°C. It is supplied with the ends unfinished (not stripped or tinned). Specify required length in whole feet.

- **Junction Box -- 60A2053**

  Surface-mount, aluminum junction box includes a terminal strip and cover gasket.

- **pH Buffers (in resealable 1-pint plastic bottles):**

  3A0421 -- pH 7 Buffer
  3A0422 -- pH 4 Buffer
  3A0942 -- pH 10 Buffer

- **Self-contained Air Blast Cleaning Systems:**

  1000A3335-005 -- For 115 VAC operation
  1000A3335-006 -- For 230 VAC operation

  Each system includes Kynar® (PVDF) washer head with 25 ft. (7.6 m) long tubing for air delivery, a quick-disconnect tube fitting, and a compressor housed in a NEMA 4X enclosure.

- **Air/Water Blast Cleaning Washer Head -- 1000A3335-004**

  Kynar® (PVDF) washer head includes 1/4-inch barb fitting (see drawing on page 7). This washer head is only intended for immersion applications with a user-supplied air or water wash system.

Ordering Information (continued)

New Installation Mounting Hardware for pHD™ 1-inch Sensors

NOTE: Mounting hardware does not include sensor or interconnect cable. Each must be ordered separately.

FIGURE 1 Immersion Mount

Standard **Handrail**

(optional protector pictured)

Material	Part Number
CPVC	MH434A00B
316 SS	MH414A00B

Above hardware includes 1-inch dia. by 4 ft. long pipe and 1-inch x 1-inch NPT coupling in respective material, and pipe-mount junction box with terminal strip.

Material	Part Number
CPVC	MH236B00Z

Above handrail hardware includes 1-1/2 inch diameter by 7.5 ft. long CPVC pipe, and a unique swivel/pivot/pipe clamp assembly.

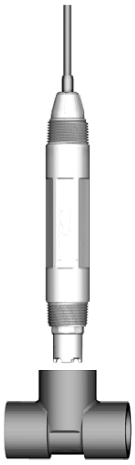
Optional PEEK® Protector -- 1000F3374-002
Optional Ryton® Protector -- 1000F3374-003

FIGURE 3 Union Mount

Material	Part Number
CPVC	MH536N4NZ
316 SS	MH516N9Z

Hardware includes standard 1-1/2 inch tee, special union pipe with adapter, sealing hub, and lock ring in respective material, and Viton® O-ring.

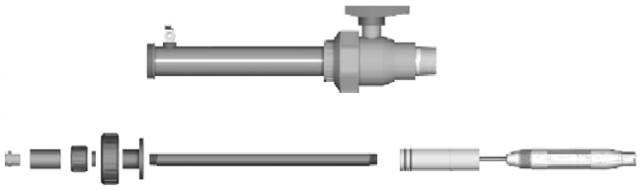
FIGURE 2 Flow-through Mount



Material	Part Number
CPVC	MH334N4NZ
316 SS	MH314N4MZ

Hardware includes a standard 1-inch tee in respective material.

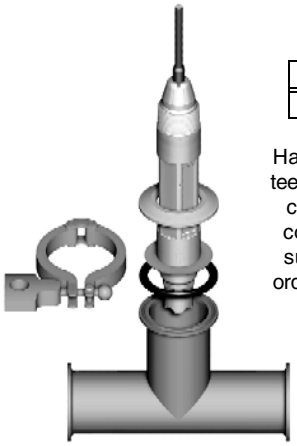
FIGURE 4 Insertion Mount



Material	Part Number
CPVC	MH736M4MZ
316 SS	MH716M4MZ

Hardware includes a 1-1/2 inch ball valve in respective material, 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.

FIGURE 5 Sanitary Mount



Material	Part Number
316 SS	MH018S8SZ

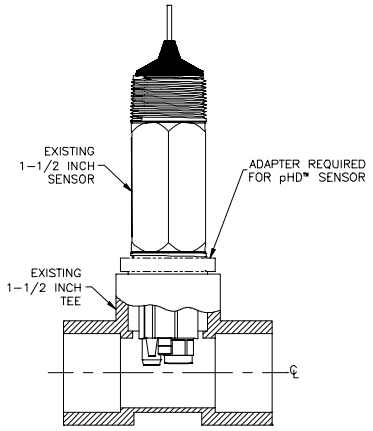
Hardware includes 2-inch sanitary tee and heavy duty clamp. Special cap (70F1037-004) and EPDM compound gasket (9H1327) are supplied with sensor but can be ordered separately as spare parts.

Ordering Information (continued)

Existing Installation Retrofit Mounting Hardware for pHD™ 1-inch Sensors

(Drawings below show existing sensor mounted in existing hardware, and required adapter.)

Flow-through Mount



Adapters for Existing 1-1/2 inch NPT Tee:

- CPVC Adapter 60F2018-001
- 316 SS Adapter..... 60F2018-002

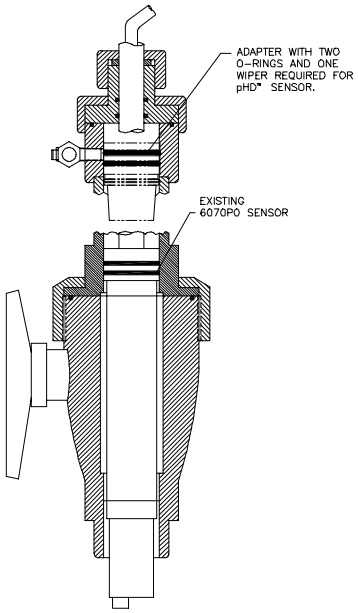
Adapters for Existing 1-1/2 inch BSPP Tee:

- CPVC Adapter 60F2018-003
- 316 SS Adapter..... 60F2018-004

Adapters for Existing 1-1/2 inch BSPT Tee:

- CPVC Adapter 60F2018-005
- 316 SS Adapter..... 60F2018-006

Insertion Mount



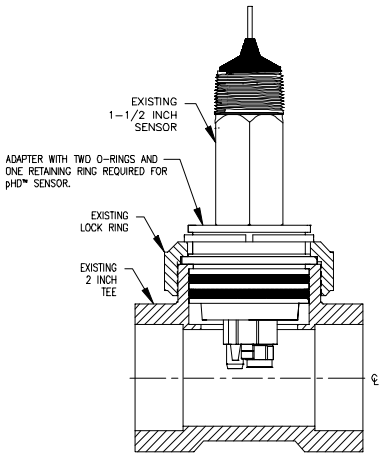
Adapters for Existing 2-inch Ball Valve Assembly:

- CPVC Adapter..... 60A2040-001
- 316 SS Adapter..... 60A2040-002

Each adapter includes a Teflon wiper and two Viton® O-rings.

Union Mount

For LCP or Ryton Sensor

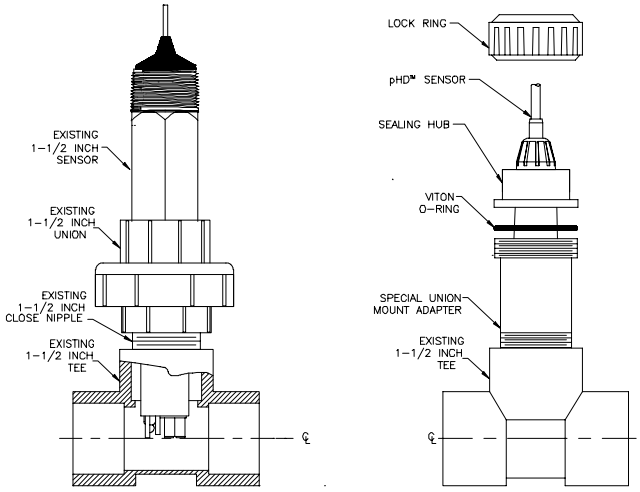


Adapters for Existing 2-inch NPT Tee:

- CPVC Adapter 60A9753-001
- 316 SS Adapter..... 60A9753-002

Each adapter includes a retaining ring and two installed Viton® O-rings.

For Epoxy Sensor



Adapter Kit for Existing 1-1/2 inch NPT Tee:

- CPVC Adapter Kit..... 60A2100-001

Kit includes special union mount adapter pipe, sealing hub, lock ring, and Viton® O-ring.

pHD™ Differential pH/ORP Sensors

PEEK® Sensor

1. The pH or ORP sensor shall be of Differential Electrode Technique design using two electrodes to compare the process value to a stable internal reference standard buffer solution. The standard electrode shall have non-flowing and fouling-resistant characteristics.

2. The sensor shall have a hex-shaped body to facilitate mounting, and shall be constructed of PEEK® material for exceptional chemical resistance and mechanical strength. This material shall enable the sensor to be installed in metal fittings without leakage usually caused by heating and cooling cycles when dissimilar materials are threaded together.

3. The sensor shall have a:

   a) Convertible body style featuring 1-inch NPT threads on both ends to mount into a standard 1-inch pipe tee, into a GLI adapter pipe for union mounting with a standard 1-1/2 inch tee, or onto the end of a pipe for immersion into a vessel.

   b) Insertion body style featuring 1-inch NPT threads only on the cable end to mount into a GLI ball valve hardware assembly, enabling the sensor to be inserted into or retracted from the process without stopping the process flow.

   c) Sanitary body style featuring an integral 2-inch flange to mount into a GLI 2-inch sanitary tee. The sanitary body style sensor shall include a special cap and EDPM compound gasket for use with the GLI sanitary hardware.

4. The built-in electronics of the sensor shall be completely encapsulated for protection from moisture and humidity.

5. The sensor shall have a built-in preamplifier to enable the signal to be transmitted up to 3000 ft. (914 m) with standard cabling.

6. The sensor signal shall have an integral temperature sensor to automatically compensate measured values for changes in process temperature.

7. The sensor shall include a titanium ground electrode (standard) to eliminate ground loop currents in the measuring electrodes.

8. The sensor shall be GLI International, Inc. Model PDXP-series for pH measurement or Model RDXP-series for ORP measurement.

Ryton® Sensor

1. The pH or ORP sensor shall be of Differential Electrode Technique design using two electrodes to compare the process value to a stable internal reference standard buffer solution. The standard electrode shall have non-flowing and fouling-resistant characteristics.

2. The sensor shall have a hex-shaped body to facilitate mounting, and shall be constructed of Ryton® material for exceptional chemical resistance and mechanical strength. This material shall enable the sensor to be installed in metal fittings without leakage usually caused by heating and cooling cycles when dissimilar materials are threaded together.

3. The sensor shall have a convertible body style featuring 1-inch NPT threads on both ends to mount into a standard 1-inch pipe tee, into a GLI adapter pipe for union mounting with a standard 1-1/2 inch tee, or onto the end of a pipe for immersion into a vessel.

4. The built-in electronics of the sensor shall be completely encapsulated for protection from moisture and humidity.

5. The sensor shall have a built-in preamplifier to enable the signal to be transmitted up to 3000 ft. (914 m) with standard cabling.

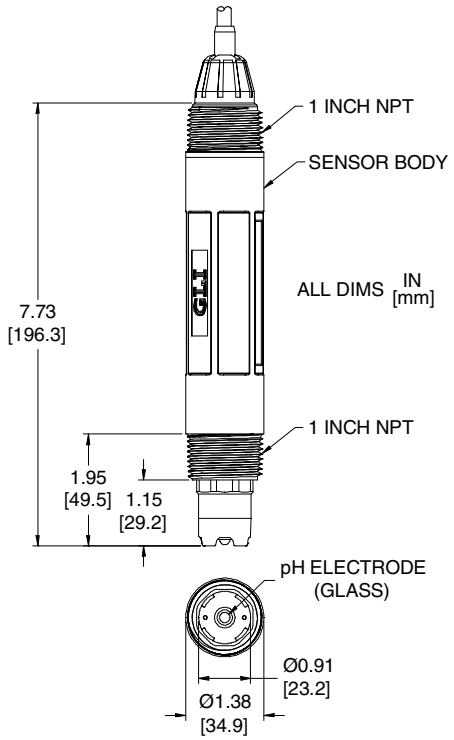
6. The sensor signal shall have an integral temperature sensor to automatically compensate measured values for changes in process temperature.

7. The sensor shall include a titanium ground electrode (standard) to eliminate ground loop currents in the measuring electrodes.

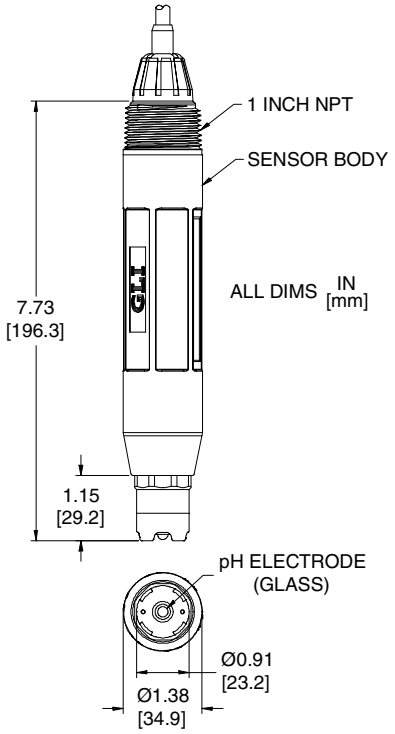
8. The sensor shall be GLI International, Inc. Model PD1R1 for pH measurement or Model RD1R5 for ORP measurement.

Dimensions

Convertible Style Sensor

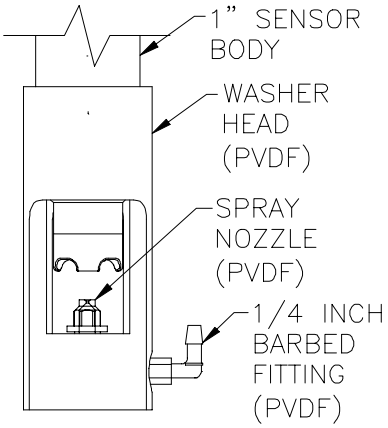


Insertion Style Sensor

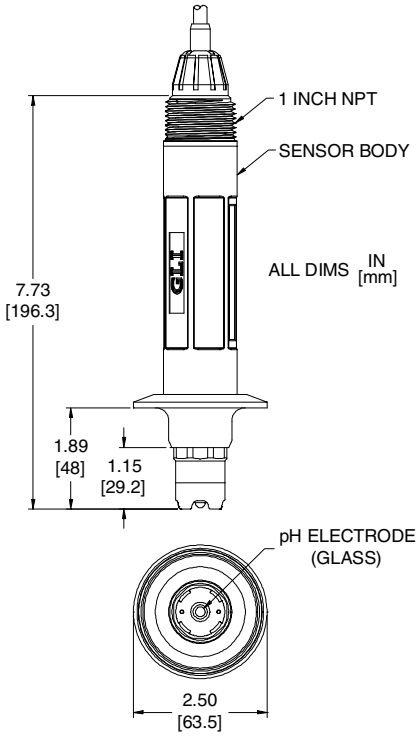


Air/Water Blast Cleaning Washer Head Accessory

(only for convertible style sensors used in immersion applications)



Sanitary Style Sensor



To complete an exceptional pH measurement system, choose the analyzer that's right for you...

Model P63 pH Analyzer

The advanced **Model P63** pH analyzer features enhanced multi-list menu operation in various languages. During operation, it provides instructional prompts, making it extremely easy to set up and operate.

The P63 can be used with GLI Differential sensors, conventional combination electrodes, or electrode pairs. This premium analyzer has all the capabilities expected of a high-end analyzer, including complete diagnostics. True predictive diagnostics forecast the end of sensor life, while reactive diagnostics alert you to important system changes. Its built-in logbook records up to 100 system events. Request Data Sheet PR63.

Model P53 pH/ORP Analyzer

The **Model P53** is a 1/2 DIN, full-featured analyzer with multi-list menu operation in various languages. This versatile, mid-priced analyzer can be used for pH or ORP measurement, and accepts GLI Differential sensors, conventional combination electrodes, or electrode pairs.

The large backlit graphic LCD displays measured pH, process temperature, both analog output values, and the status of up to four relays. The P53 exceeds U.S. and meets European standards for EMI and RFI emissions and immunity. Request Data Sheet PR53.

Model P33 pH/ORP Analyzer

The **Model P33** is a panel-mount, 1/4 DIN analyzer. This low-priced, full-featured analyzer was specifically designed for the OEM and cost conscious end user.

The P33 can be used for pH or ORP measurement, and accepts GLI Differential sensors, conventional combination electrodes, or electrode pairs. The backlit LCD simultaneously displays measured pH and process temperature. Other features include two analog outputs and two SPDT relays. The P33 uses a simple function menu operation in various languages. It exceeds U.S. and meets European standards for EMI and RFI emissions and immunity. Request Data Sheet PR33.

Model PRO-P3 pH/ORP Transmitter

The **Model PRO-P3** is a compact, NEMA 4X universal-mount transmitter with menu-guided operation. Screens can be selected for display in English or Spanish. (Different languages such as French or German can also be substituted.)

The PRO-P3 can be used for pH or ORP measurement, and accepts GLI Differential sensors, conventional combination electrodes, or electrode pairs. Its clear display simultaneously shows measured pH and process temperature. Other features include use in a two, three or four-wire hookup arrangement and passcode access. It exceeds U.S. and meets European standards for EMI and RFI emissions and immunity. Request Data Sheet PRO-P3.