

# Model Q22PXX2

## Universal pH Sensor

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## PRODUCT WARRANTY

Analytical Technology, Inc. (Manufacturer) warrants to the Customer that if any part(s) of the Manufacturer's equipment proves to be defective in materials or workmanship within the earlier of 18 months of the date of shipment or 12 months of the date of start-up, such defective parts will be repaired or replaced free of charge. Inspection and repairs to products thought to be defective within the warranty period will be completed at the Manufacturer's facilities in Collegeville, PA. Products on which warranty repairs are required shall be shipped freight prepaid to the Manufacturer. The product(s) will be returned freight prepaid and allowed if it is determined by the manufacturer that the part(s) failed due to defective materials or workmanship.

This warranty does not cover consumable items, batteries, or wear items subject to periodic replacement including lamps and fuses.

Gas sensors carry a 12 months from date of shipment warranty and are subject to inspection for evidence of misuse, abuse, alteration, improper storage, or extended exposure to excessive gas concentrations. Should inspection indicate that sensors have failed due to any of the above, the warranty shall not apply.

The Manufacturer assumes no liability for consequential damages of any kind, and the buyer by acceptance of this equipment will assume all liability for the consequences of its use or misuse by the Customer, his employees, or others. A defect within the meaning of this warranty is any part of any piece of a Manufacturer's product which shall, when such part is capable of being renewed, repaired, or replaced, operate to condemn such piece of equipment.

This warranty is in lieu of all other warranties ( including without limiting the generality of the foregoing warranties of merchantability and fitness for a particular purpose), guarantees, obligations or liabilities expressed or implied by the Manufacturer or its representatives and by statute or rule of law.

This warranty is void if the Manufacturer's product(s) has been subject to misuse or abuse, or has not been operated or stored in accordance with instructions, or if the serial number has been removed.

Analytical Technology, Inc. makes no other warranty expressed or implied except as stated above.

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# Part 1 - Introduction

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## 1.1 General

The Q22PXX2 Universal pH Sensor is designed to allow non-Quantum pH analyzers to utilize the same robust features of the standard Quantum Q22P sensor. The Q22PXX2 sensor may be used as a direct replacement sensor in non-Quantum pH analyzers.

The Q22PXX2 emulates a standard, unamplified, combination electrode. It requires no power supply and provides a linear millivolt output in the range of – 500 mV to +500 mV, that is linear over the pH range of 0-14 pH. The sensor may be ordered to include temperature compensation output elements consisting of a Pt1000 RTD, Pt100 RTD, or integral automatic compensation. Other elements may be specially ordered if necessary.

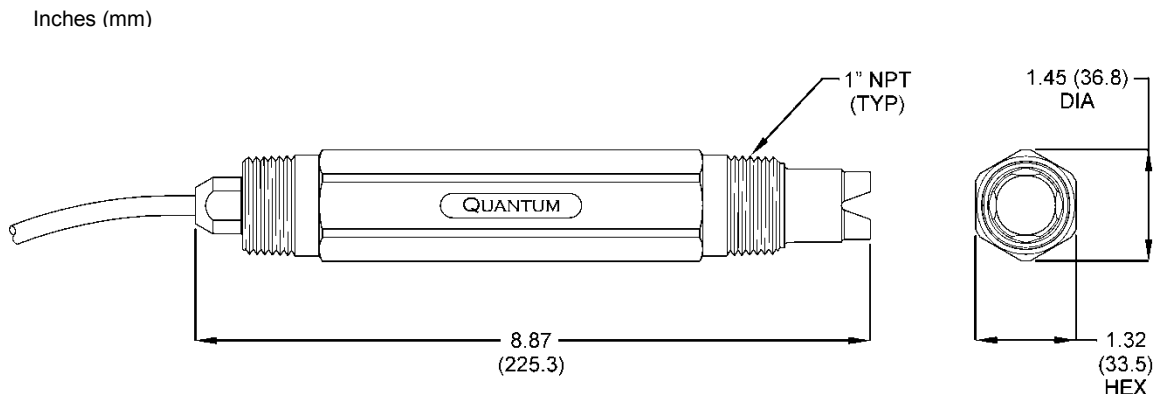
## 1.2 Sensor Features

- A high volume, dual junction saltbridge is utilized to maximize the in-service lifetime of the sensor. The annular junction provides a large surface area to minimize the chance of fouling. Large electrolyte volume and dual reference junctions minimize contamination of the reference solution. The saltbridge is replaceable.
- The reference element of the sensor is a second glass pH electrode immersed in a reference buffer solution. This glass reference system greatly increases the range of sensor applications.
- An integral preamplifier is encapsulated in the body of the sensor. This creates a low impedance signal output which ensures stable readings in noisy environments and increases the maximum possible distance between sensor and transmitter to 3,000 feet (914 meters).
- System diagnostics warn the user in the event of electrode breakage, loss of sensor seal integrity or integral temperature element failure.
- Pt1000 RTD. The temperature element used in ATI sensors is highly accurate and provides a highly linear output.

### 1.3 Sensor Specifications

<b>Measuring Range</b>	0 to 14.00 pH
<b>Sensitivity</b>	0.002 pH
<b>Stability</b>	0.02 pH per 24 hours, non-cumulative
<b>Wetted Materials</b>	PEEK, ceramic, titanium, glass, Viton, EDPM (optional: 316 stainless steel with 316SS body)
<b>Temperature Compensation</b>	Pt1000 RTD
<b>Sensor Cable</b>	6 Conductor (5 are used) plus 2 shields, 15 feet (4.6 meters) standard length
<b>Temperature Range</b>	-5 to +95 °C (23 to 203 °F)
<b>Pressure Range</b>	0 to 100 psig
<b>Maximum Flow Rate</b>	10 feet (3 meters) per second
<b>Max. Sensor-Analyzer Distance</b>	3,000 feet (914 meters)
<b>Sensor Body Options</b>	1" NPT convertible, 1¼" insertion, 1½" or 2" sanitary-style
<b>Weight</b>	1 lb. (0.45 kg)

- Notes:* 1. The type of hardware used to mount the sensor may limit the maximum temperature and pressure ratings. Please consult the hardware manufacturer's specifications to obtain the relevant temperature and pressure rating information.
2. The maximum flow rate specification is lower for process solutions with low ionic conductivity or high suspended solids concentration. High flow rates in low ionic conductivity processes may cause a measurement error due to static electrical discharge. High flow rates in processes with high suspended solids concentration may decrease the functional life of the sensor by eroding the pH-sensitive glass electrode.



**Figure 1-1 Q22P Sensor Dimensions (Standard, Convertible-style)**

#### 1.4 Important Notes

- The glass electrode must be wetted at all times to ensure proper functionality. Q22P sensors are shipped with a fluid-filled cap over the electrode to enable immediate use (remove cap before installing, save for storage and shipping purposes). Electrodes that have dried out for any reason should be hydrated for 24 hours to restore full functionality.
- Hydrofluoric acid (HF) will dissolve conventional glass electrodes. For applications involving hydrofluoric acid, a pH sensor with antimony electrode is recommended (ATI Model Q22P3, see Page 21 for ordering details).



The standard Q22P process electrode is made of glass and can break if not handled properly. Should the electrode ever break, USE CAUTION when handling the sensor to avoid serious cuts.

## Part 2 – Installation

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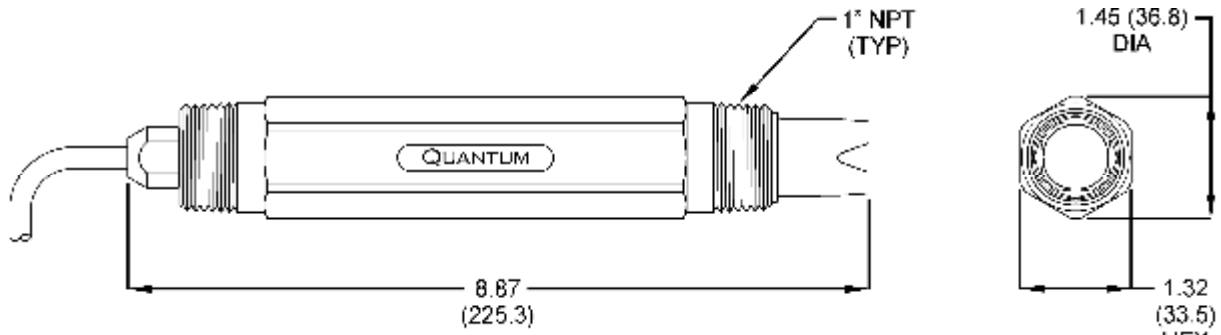
### 2.1 General

The Q22P pH Sensor is designed for industrial and municipal process applications. Mounting options include flow-through, submersion, insertion (special hardware required).

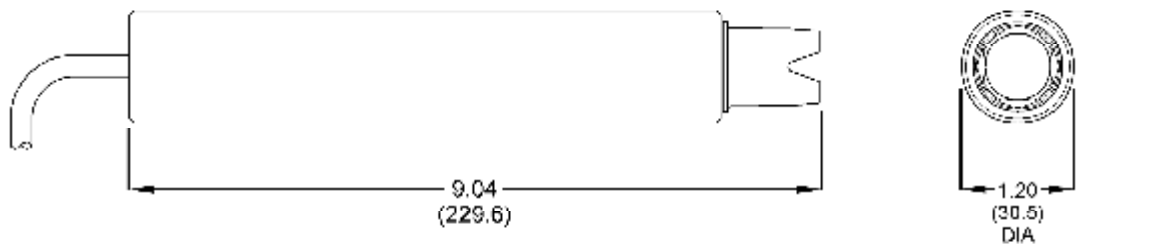
The sensor should be mounted vertically (electrode face down) whenever possible. When mounting on an angle, make sure sensor is at least 10° above horizontal. Do not mount sensor completely on its side or upside down.

Do NOT use a sealant (e.g., pipe dope) when mounting the insertion or convertible style sensor. Use industrial/plumber pipe tape when needed.

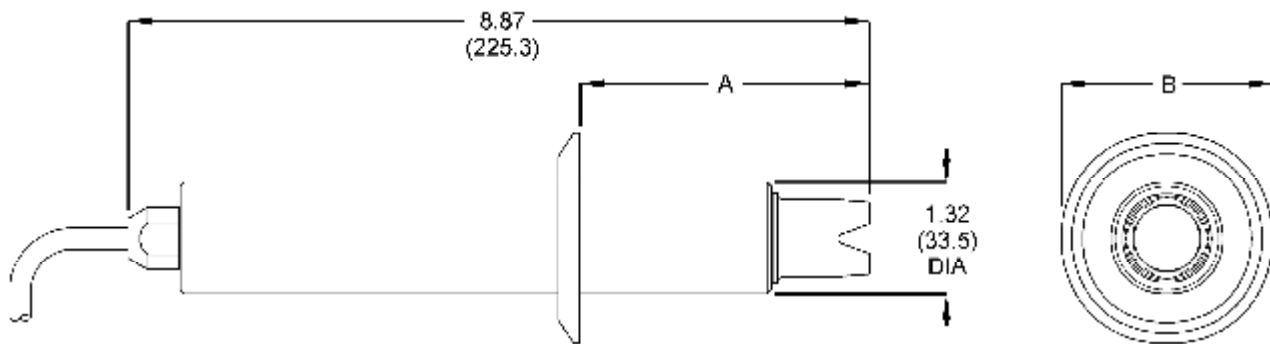
Inches (mm)



**CONVERTIBLE SENSOR**



**INSERTION SENSOR**



**SANITARY SENSOR**

SENSOR SIZE	A	B
1-1/2"	2.75 (70.0)	1.88 (50.4)
2"	3.50 (88.9)	2.50 (63.5)

**Figure 2-1 Q22 Sensor Types**



## 2.2 Electrical

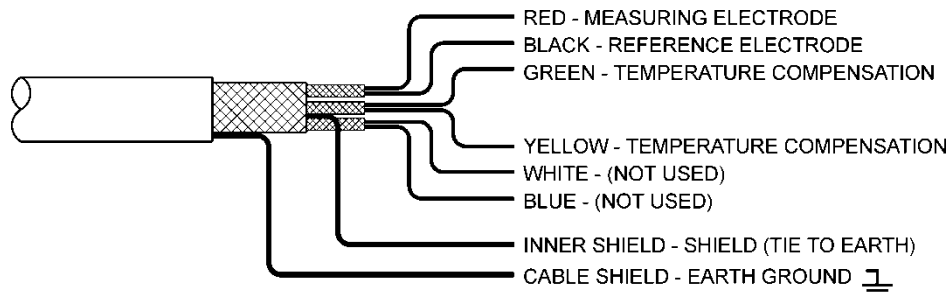
The Model Q22P Sensor has a built-in, self-powered preamplifier and comes standard with 15 feet of 6 conductor (only 5 are used) double shielded cable. The cable is permanently attached to the sensor, and a PEEK cordgrip is used to seal around the cable. Nevertheless, the cable should always be kept as clean and dry as possible.



**WARNING: DO NOT connect sensor cable to power lines. Serious injury result!**

Take care to route sensor cable away from AC power lines, adjustable frequency drives, motors, or other noisy electrical signal lines. Do not run signal lines in the same conduit as AC power lines. Run signal cable in dedicated metal conduit if possible. For optimum electrical noise protection, run an earth ground wire to the ground terminal in the transmitter

Refer to Figure 2-3, Cable Description and Figure 2-4, Wiring Diagram for illustrative details on electrical installation.



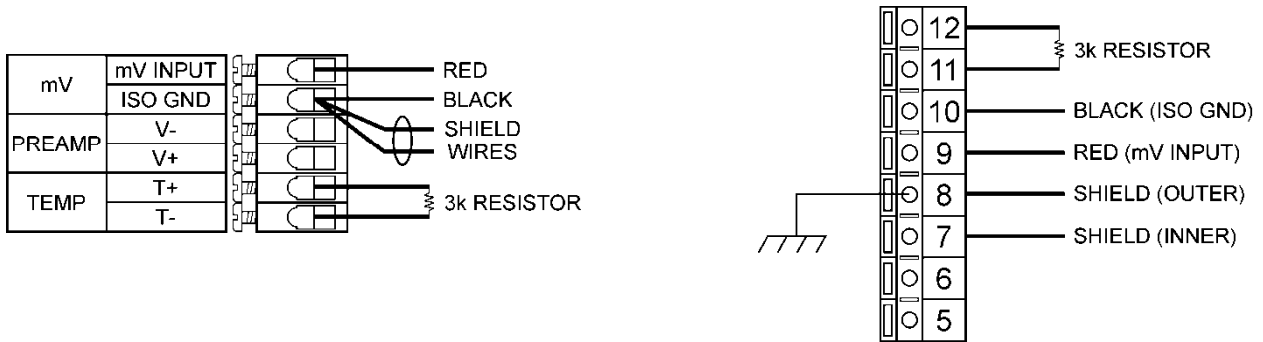
**Figure 2-2 Cable Description, Model Q22P**



Only ATI's custom 6-wire shielded interconnect cable must be used when connecting the Model Q22P sensor to the analyzer. This high-performance, double shielded, polyethylene jacketed cable is specially designed to provide the proper signal shielding for the sensor used in this system. No substitutions can be made. Substituted cables may cause problems with system performance.

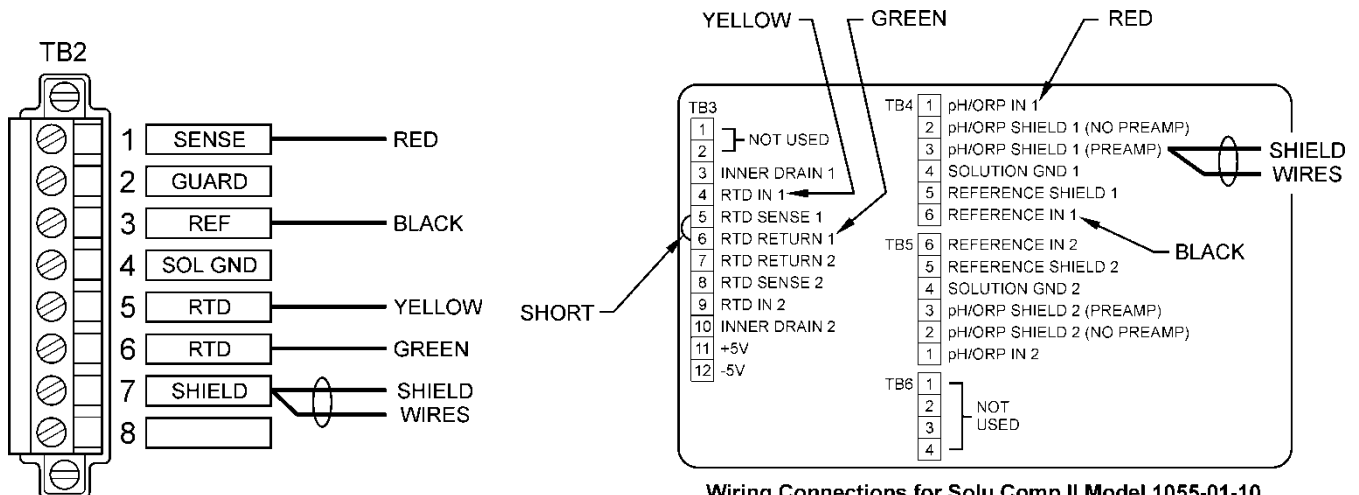
### 2.3 Common pH Monitor Connections

The illustrations in Figure 2-2 show the connections for several common non-Quantum pH analyzers. If a specific case is required but is not illustrated here, use the sensor REFERENCE, MEASURE, and TC designations, and match them to the analyzer requirements. Otherwise, contact the ATI factory directly and a technician will provide assistance.



**A. Signet Model 8710**

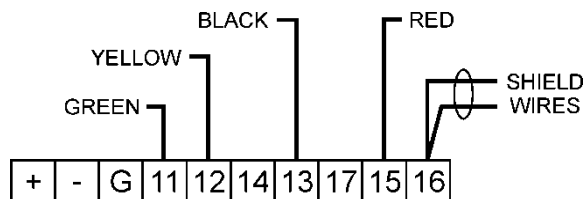
**B. Signet Model 8750 (Pt1000 RTD)**



**Wiring Connections for Solu Comp II Model 1055-01-10 (Panel Mount with 115/230 Vac Power)**

**C. TBI-Bailey Model TB82 (Pt100 RTD)**

**D. Rosemount Solu Comp II Model 1055**



**E. Yokogawa Model PH200 (Pt1000 RTD)**

## Part 3 – Maintenance and Troubleshooting

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**WARNING: EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2.**

### 3.1 Cleaning the Sensor

Keep the sensor as clean as possible for optimum measurement accuracy - this includes both the saltbridge and the measuring electrode glass. Frequency of cleaning depends upon the process solution.

Carefully wipe the measuring end of the sensor with a clean soft cloth. Then rinse with clean, warm water - use distilled or de-ionized water if possible. This should remove most contaminate buildup.

Prepare a mild solution of soap and warm water. Use a non-abrasive detergent (such as dishwashing liquid).



**NOTE: DO NOT use a soap containing any oils (such as lanolin). Oils can coat the glass electrode and harm sensor performance.**

Soak the sensor for several minutes in the soap solution.

Use a small, extra-soft bristle brush (such as a mushroom brush) to thoroughly clean the electrode and saltbridge surfaces. If surface deposits are not completely removed after performing this step, use a dilute acid to dissolve the deposits. After soaking, rinse the sensor thoroughly with clean, warm water. Placing the sensor in pH 7 buffer for about 10 minutes will help to neutralize any remaining acid.



**NOTE: DO NOT soak the sensor in dilute acid solution for more than 5 minutes. This will help to prevent the acid from being absorbed into the saltbridge.**



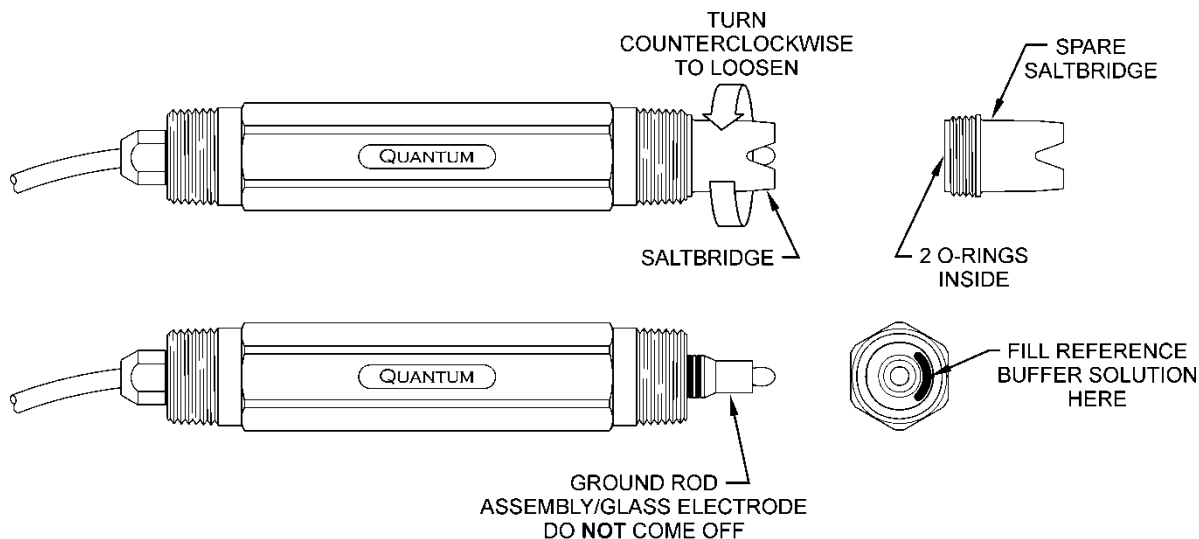
**WARNING: ACIDS ARE HAZARDOUS. Always wear eye and skin protection when handling. Follow all Material Safety Data Sheet recommendations. A hazardous chemical reaction can be created when certain acids come in contact with process chemicals. Make this determination before cleaning with any acid, regardless of concentration.**

### 3.2 Replacing the Saltbridge and Reference Buffer Solution

1. Hold the sensor with the process electrode pointing up. Place a cloth or towel around the saltbridge. Turn the saltbridge counterclockwise (by hand) to loosen and remove the saltbridge. Do NOT use pliers.
2. Pour out the old reference buffer by inverting the sensor (process electrode pointing down). If the reference buffer does not run out, gently shake or tap the sensor.
3. Rinse the reference chamber of the sensor with de-ionized water. Fill the reference chamber of the sensor with fresh Reference Cell Buffer. The chamber holds 6 to 7 mL of solution. MAKE SURE that 6 to 7 mL is used when refilling. The chamber should be FULL.
4. Inspect the new saltbridge to verify that there are 2 o-rings inside the threaded section of the saltbridge
5. Place the new saltbridge over the ground assembly of the sensor. Place a cloth or towel around the saltbridge and hand-tighten the saltbridge by turning it clockwise.



**NOTE:** Every ATI Q22P Sensor includes a spare bottle of Reference Buffer Solution, 7.0 pH. This is NOT typical pH 7 buffer, it is a special “high-capacity” buffer developed to ensure the highest possible stability of the reference portion of the pH measurement. No substitutions should be made.



**Figure 3-1 Replacing the Saltbridge and Reference Buffer**

### 3.3 Troubleshooting

The first step in resolving any measurement problem is to determine whether the trouble lies in the sensor or the transmitter. Since measurement problems can often be traced to dirty sensor electrode glass and/or saltbridge, cleaning the sensor using the method outlined in Section 3.1 should always be the first step in any troubleshooting.

Check the wiring thoroughly and refer back to the illustrations in this manual, as well as the operating manual for the instrument to which the sensor is connected. With longer sensor cables, carefully review the wiring path, any junction boxes, and the shield connections (for this sensor, twist the shield wires together). In many cases, it will shorten troubleshooting time if all connecting cable is bypassed and the Q22PXX2 sensor cable is connected directly to the analyzer during test.

The sensor **MUST** be thoroughly hydrated before proceeding with these tests. If the sensor has been left out and has dried, it must be soaked in tap water for at least 2-3 hours before any tests are attempted. This is necessary in order to re-hydrate the glass electrodes. If the sensor has been left out of solution too long (over one day), the saltbridge may be too dried out to recover. It also may be necessary to replace the saltbridge and the internal fill solution.

When the sensor is placed into fresh 7 pH buffer, the millivolt output of the sensor in should be in the range of -50 to +50 mV across the BLACK (-) and RED (+) sensor leads. It is ideally 0 mV at 25°C; however, any value in this range is acceptable. The difference between the acceptable reading and the actual reading is known as the sensor "offset" value. Excessively high/low offset generally indicates problems in the reference side of the sensor. If the offset is out of range, re-do procedures 3.1 and 3.2, then re-calibrate the sensor.

The span value of the sensor also has tolerance - it is acceptable down to 80% of the ideal value. Therefore, the acceptable output span value, across the RED and BLACK leads, is anything equal to or above 47.3 mV/pH. A low span generally indicates that the usable life of the measuring electrode is expiring or that the sensor is very dry or dirty. Repeat procedures 3.1 and 3.2 to correct. Typical electrode life for a Quantum Q22PXX2 pH sensor is 3-5 years but is highly dependent on the application.

°C	RTD Ω
20	1078
25	1097
30	1117
35	1136

**NOTE:** Verify that the sensor’s temperature element is functioning properly by measuring the resistance between the sensor’s **YELLOW** and **GREEN** wires. The nominal resistance value of a Pt1000 RTD at 25 °C is 1097 ohms, for the Pt100 RTD, it is 109.7 ohms. Use the following table as a guide to the approximate resistance values for the Pt100

pH	mV
2.00	+296
4.00	+178
7.00	0
9.18	-129
10.00	-178

**NOTE:** The mV values listed above are for ideal conditions (sensor offset = 0 mV) and therefore represent midpoints in a range. The table shows the difference in mV which should be seen when going from one pH value to another. For example, at 7.00 pH, the mV reading will be from –50 to +50 mV (at room temperature) if the sensor is working properly. If the reading is exactly +20 mV, then going to 4.00 pH buffer should produce a reading of +198 mV, or a difference of +178 mV.

## Part 4 – Parts and Ordering Information

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### MODEL Q22P - A - B - C - D - E - 1 - F pH SENSOR

Suffix A - Electrode Type

- 1 - Industrial Glass
- 2 - Municipal Glass
- 3 - Antimony Metal

Suffix B - Temperature Element

- 2 - Pt 1000
- 3 - Pt 100

Suffix C - Output

- 2 -  $\pm 500$  mV
- 3 - 0 to 2 VDC

Suffix D - Body Material

- 1 - PEEK
- 2 - 316SS

Suffix E - Mounting Style

- 1 - Convertible
- 2 - Insertion
- 3 - Sanitary-Style, 1½"
- 4 - Sanitary-Style, 2"

Suffix E - Cable Length

- 1 - 15'
- 2 - 30'
- 9 - Special (See Note A)

**Note A:** All cable lengths greater than 30 feet will be charged a \$25 fee plus \$1 per foot of cable greater than 30 feet.

**Note B:** Insertion and Sanitary Mounting Styles must use 316SS Body Material. The 316SS material is ONLY available with the Insertion or Sanitary Mounting Styles.

### OPTIONS

09-0034	pH 4 Buffer, 1000 mL
09-0036	pH 7 Buffer, 1000 mL
09-0037	pH 10 Buffer, 1000 mL
05-0057	pH/ORP Sensor Regeneration Kit for P1, R1, and R2 sensors
05-0067	pH/ORP Sensor Regeneration Kit for P2 sensor