

## INpHO™ Probe Model 4PT Series Iridium Oxide pH Electrode Assemblies



The SensIrOx INpHO™ Probe provides a convenient means for pH measurement in extreme temperature and pressure conditions. A proprietary process for depositing the oxide layer on an iridium indicator electrode provides stable response over a wide pH range. An optional silver/silver chloride reference electrode is available in the same package when a combination electrode is required. To decrease interference from reducing agents, a polymer coating is applied to both the indicator and reference electrodes in applications which do not require rapid response time. An optional version is available for applications requiring greater speed in non-reducing environments.

The electrodes are mounted into a ¼" NPT male pipe-thread fitting. The electrical connection is designed for use with industry-standard pH meters or high-impedance voltmeters.

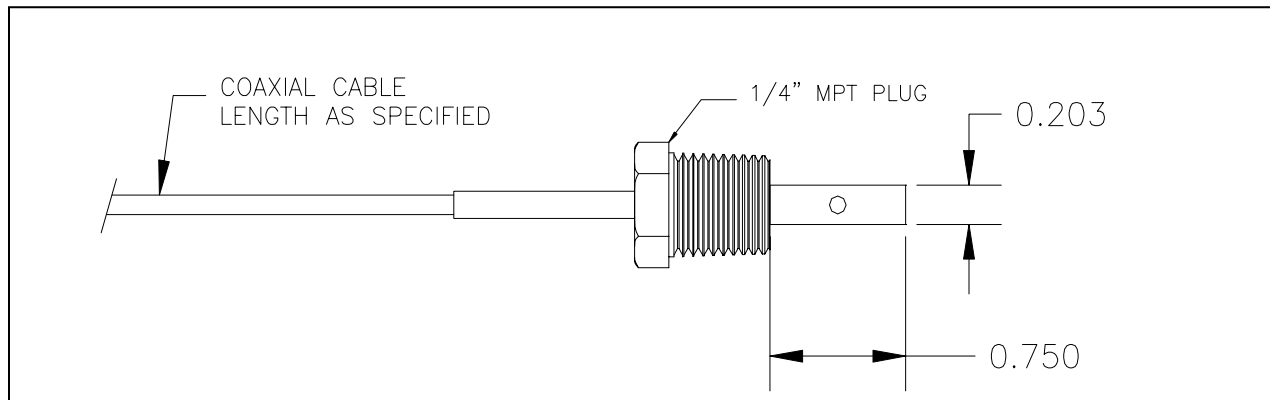
| Parameter                                   | Value                |                                  | Conditions                               |
|---|----------------------|----------------------------------|--|
| pH Response (slope)                         | min.<br>typ.<br>max. | 57 mV/pH<br>59 mV/pH<br>64 mV/pH |  |
| Time Constant (to 66%) *                    | max.                 | 5 minutes                        |  |
| pH Range                                    | min.                 | 1.0                              | In the absence of an oxidizing agent. ** |
|   | max.                 | 9.0                              |  |
| Operating Temperature ***                   | min.                 | 0 °C                             |  |
|   | max.                 | 85 °C                            |  |
| Operating Pressure ***                      | max.                 | 200 psi                          |  |
| Drift                                       | max.                 | .05 pH units/day                 | After 36 hour initial break-in.          |
| Temperature Dependence (of E <sub>0</sub> ) | typ.                 | -.03 pH units/°C                 |  |
|   | max.                 | -.05 pH units/°C                 |  |

\* 10 seconds for optional uncoated version, which must not be exposed to redox interference.

\*\* Oxidizing agents reduce the pH range to 2.0-9.0.

\*\*\* Custom applications requiring higher temperatures/pressures can be achieved with special components – Contact SensIrOx for assistance.

Part Numbering Scheme: 4PT -S (single) -L (L = 0.75, 3, 6") -U (uncoated)  
-C (combination) (length of probe extension) -C (coated)



# **INSTRUCTIONS FOR USE**

## **Storage and Handling**

For short term-storage between uses, the pH electrode assembly should be stored wet, with the sensor elements immersed in deionized H<sub>2</sub>O or buffer solution. If buffer solution is used, its pH value should be approximately the same as the expected measurement range. Color-coded buffer solutions should not be used with the optional uncoated version, as some dyes can poison the indicator electrode surface.

For long-term dry storage, the electrode assembly should be rinsed in deionized H<sub>2</sub>O and air dried before storage. Protection from dust, impact, contamination, and extreme temperatures should be provided.

## **Calibration**

For a pH electrode-only (single) version of the probe, the conventional 2-point calibration procedure offered on most standard pH meters may be used; additional calibration points will result in greater accuracy. In applications requiring high accuracy, recalibration on a regular basis will improve results. Typical drift is approximately 0.05 pH units/day, so a recalibration schedule should take this drift rate into account.

Calibrating a combination electrode requires procedures specific to each application. The full procedure is outlined in the SensIrOx Technical Note "Calibrating pH Probes in a Constant-Chloride Environment." (Please refer to [www.SensIrOx.com](http://www.SensIrOx.com).)

For stable readings, a break-in period of approximately 36 hours is required. This break-in should be done by immersing the electrodes in a buffer or test solution of approximately the same pH value as the solution to be measured. Gentle agitation of the solution will speed the break-in process. Electrical connections may or may not be made during break-in.

## **Installation**

The INpHO™ probes are housed in a ¼" NPT male fitting. Installation follows standard techniques for pipe thread assembly. Threads should be lubricated with an appropriate thread compound or Teflon® tape. Torque the assembly to the same value as used in other system components. Over-torquing may result in failure of the internal seals in the assembly. During installation and removal, care should be taken to avoid damage to the tube projecting from the NPT fitting, as this is where the electrode(s) is (are) located.

Electrical cable mounting and routing also follows standard techniques. The cable is strain-relieved at both the connector and the electrode ends, but should be secured so as to avoid excessive force, either bending or pulling. The maximum rated temperature of the cable is 85°C, and should not be exceeded.

## **Measurement**

A commercial pH meter can be used, as can a high input impedance voltmeter. Input impedance of at least 10<sup>9</sup>Ω (1000MΩ) is recommended; impedances less than this can reduce measurement accuracy and reduce the useful life of the electrodes.

The standard electrical connection is coaxial cable terminated with a male BNC connector. The center conductor is connected to the indicator electrode. The shield is connected to the reference electrode in combination electrode assemblies, and is isolated from the assembly body in both combination and single electrode assemblies. Other connections are available as customer special orders.

## **Safety Precautions**

While the active elements consist of small quantities of relatively inert compounds (iridium oxide and silver chloride), normal precautions should be taken to avoid ingestion or inhalation of these compounds, particularly in the event of damage to the electrode assembly.

If used in a pressurized system, the maximum rated pressure of the electrode assembly should not be exceeded. In critical applications, pressure testing under controlled conditions is strongly recommended.

## **Technical Support**

Technical questions and information requests should be directed to: [www.SensIrOx.com](http://www.SensIrOx.com) or (614) 985-0667.