

Isco 701 pH/ Temperature Module

Installation and Operation Guide



Part #60-9003-065
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Foreword

This instruction manual is designed to help you gain a thorough understanding of the operation of the equipment. Teledyne Isco recommends that you read this manual completely before placing the equipment in service.

Although Teledyne Isco designs reliability into all equipment, there is always the possibility of a malfunction. This manual may help in diagnosing and repairing the malfunction.

If a problem persists, call or e-mail the Teledyne Isco Technical Service Department for assistance. Simple difficulties can often be diagnosed over the phone.

If it is necessary to return the equipment to the factory for service, please follow the shipping instructions provided by the Customer Service Department, including the use of the **Return Authorization Number** specified. **Be sure to include a note describing the malfunction.** This will aid in the prompt repair and return of the equipment.

Teledyne Isco welcomes suggestions that would improve the information presented in this manual or enhance the operation of the equipment itself.

Teledyne Isco is continually improving its products and reserves the right to change product specifications, replacement parts, schematics, and instructions without notice.

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701 pH/Temperature Module

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701 pH/Temperature Module

Section 1 Introduction and Programming

1.1 Overview

The 701 pH/Temperature Module is one of Isco's interchangeable modules for the 6700 Series Samplers. The module uses a pH probe with an internal temperature sensor to measure the acidity or alkalinity and the temperature of a liquid.

You can install the module only on a 6700 Series controller. The pH probe can be used in nearly any installation where it can be mounted and retrieved for periodic maintenance and calibration.

 **WARNING**

The module has not been approved for use in hazardous locations as defined by the National Electrical Code. Before installing any device in a dangerous location review the safety precautions in the sampler manual. Check applicable guidelines, codes, and regulations of federal, state, city, and county agencies.

1.2 Function of the Probe

The pH probe measures the acidity or alkalinity of an aqueous solution by determining the relative quantity of dissociated hydrogen ions, H⁺ (actually H₃O⁺) in the solution. A larger quantity of H⁺ ions indicates acidity, while a smaller quantity of H⁺ ions indicates alkalinity. The H in pH stands for Hydrogen and the p stands for power.

The normal scale for pH runs from 0 to 14, with 0 being most acidic and 14 being most alkaline. Distilled water at 25° C is neutral at 7, based on the fact that the dissociation constant (number of H⁺ and OH⁻ [hydroxyl] ions present) for pure water at 25° C is 10⁻⁷.

A dissociation constant is a number that indicates the amount of ionic dissociation occurring for a given substance after it is dissolved in aqueous solution. Dissociation constants vary widely for substances depending on the nature of the chemical bonds within the substance.

Each number on the pH scale between 7 and 0 equals a tenfold increase in H⁺ ion concentration. Each number between 7 and 14 equals a tenfold decrease of H⁺ ion concentration. The measurement of wastewater pH is commonly made to monitor the effect of treatment chemicals added to raise or lower the pH.

Water that has been used for various industrial processes may deviate substantially from 7. Chemicals are often added to the water to bring the pH close to that of neutral water, which is 7.

For example, if the effluent has a concentration of heavy metal ions, they must be removed before discharge. Raising the pH of solutions containing transition-metal ions will cause them to precipitate, which can be removed as sludge. The resultant solution will be high in pH and will require acid to neutralize it.

The pH probe is intended for use in applications where there are sulfide and/or metal ion concentrations. It is recommended for applications where poisoning ion concentrations are greater than 100 parts per billion.

1.3 How the pH Probe Works

The pH probe is a combination of two electrochemical half-cells. Together they provide a low-voltage signal that corresponds to the hydrogen-ion concentration of a solution.

If you look at the pH probe, you will see a glass bulb on one end. This is called the **glass mono electrode**. The glass is of a special composition sensitive only to hydrogen ions. This electrode is exposed to the solution to be measured. The specific sensitivity to hydrogen ions prevents interference from other ions that may be present in the solution.

The glass membrane produces an electrical potential proportional to hydrogen ion activity. The other electrode, called the **reference electrode**, completes the circuit between the glass electrode and the solution.

The two electrodes can be separate, or built into a single housing. The Isco pH probe combines both electrodes in a single housing and also contains an amplifier to reduce the extremely high impedance of the circuit. This improves the reaction of the probe to stray capacitance and reduces interference caused by electrical noise in the vicinity.

Like any other chemical reaction, pH measurement is affected significantly by temperature. Consequently, temperature compensation is provided. The Isco pH probe has a built-in temperature sensor that is exposed for faster response.

When the ion selective electrode and the reference electrode are connected to a high impedance voltmeter and submerged in solution, ions move to the surface of the membrane. The electrical charge on the ions creates a potential difference across the barrier between the solution and the membrane. This voltage difference is proportional to the activity of the ion in solution.

The potential translates into a reading of pH. With the module, the voltage is sent first to a preamplifier inside the probe to reduce the impedance of the circuit and improve the signal to noise ratio, and then on to the module.

1.4 Technical Specifications

The following table contains technical data for the Iseo 701 pH/Temperature Module and Probe, including weight, physical dimensions, materials, and operational specifications.

Table 1-1 Technical Specifications for the 701 pH/Temperature Module	
General Notes: 1. All weights may vary ± 0.2 lb (± 0.1 kg). 2. All lengths may vary $\pm \frac{1}{4}$ inch (± 0.64 cm).	
Module Weight:	1.1 lbs (0.5 kg)
Sensor Weight:	0.9 lbs (0.4 kg)
Module Dimensions:	4.9 x 5.7 x 2.0 inches (12.4 x 14.5 x 5.1 cm)
Module Material:	Polystyrene
Operational Temperature:	32°F to 120°F (0°C to 49°C)
Storage Temperature:	0°F to 140°F (-18°C to 60°C)
Module Enclosure:	NEMA 4X and 6, IP67
Power:	Provided by sampler.
Memory:	Nonvolatile programmable Flash. Can be field updated through the sampler.
Readings:	Programmable through the sampler at 1, 2, 5, 10, 15, and 30 minute intervals.
pH Resolution:	0.1 pH unit
Temperature Resolution:	0.20°F (0.10°C)
Range:	0 to 14 pH units

Table 1-2 Technical Specifications for the pH/Temperature Probe	
Sensor Dimensions:	3/4" dia. NPT, 6 inches long (1.9 cm dia., 15.2 cm long)
Cable Length:	25 feet (7.6 m)
Probe material:	Stainless Steel
Cable Material:	PVC
pH Range:	0 to 14 pH units
pH Amplifier Accuracy:	± 0.1 pH units from 0 to 11.9 pH. ± 0.2 pH units from 12.0 to 14.0 pH
Liquid Junction Configuration:	Annular
Element Type:	Silver-Silver Chloride (Ag-AgCl)
Liquid Junction Material:	Porous Teflon®
Reference Electrolyte:	Double Junction – Inner Chamber: KCL-AgCl – Outer Chamber: KNO3
Temperature Range:	32°F to 230°F (0°C to 110°C)

Teflon is a registered trademark of DuPont de Nemours, E.I., & Co., Inc.

1.5 Programming Notes

When a module is installed, the sampler adds the necessary screens for programming. These screens appear in Figures 1-1 and 1-2.

Note

An * (asterisk) appears next to the reading if the module was unable to take a reading. If an * appears, the reading displayed is the last available reading.

You must have the module installed before turning the controller on. When the controller is turned on it looks for a module. If the module is installed after the controller is turned on you will not be able to program the sampler for use with the module. For more information see the Programming section in the sampler manual.

1.6 Programmed Enable

When a pH/Temperature Module is installed, additional enable options are available. The options will be pH *or* TEMPERATURE, or pH *and* TEMPERATURE. For more information, see Sampler Enable in the sampler manual.

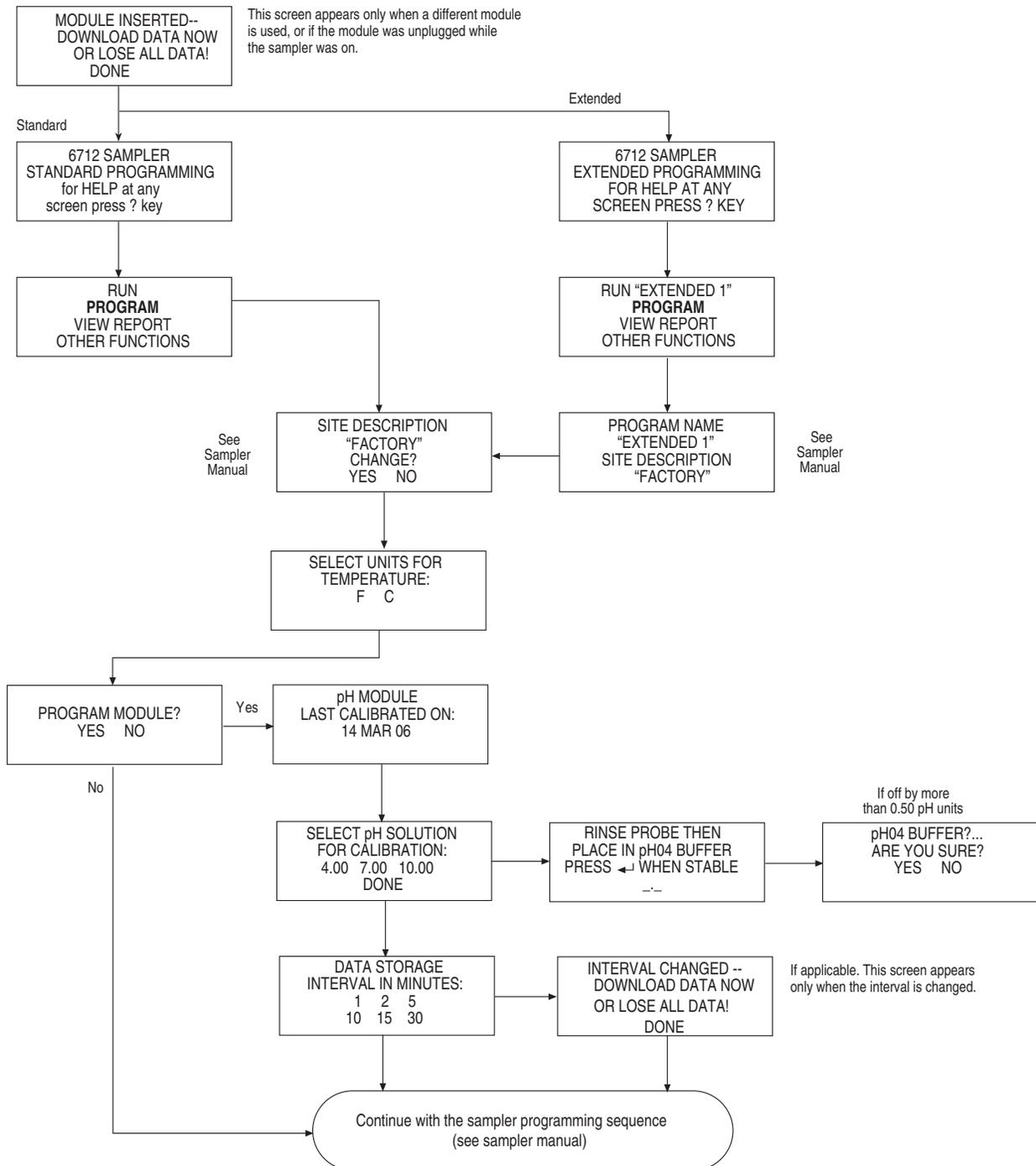


Figure 1-1 Programming the sampler to use the 701 Module

701 pH/Temperature Module
 Section 1 Introduction and Programming

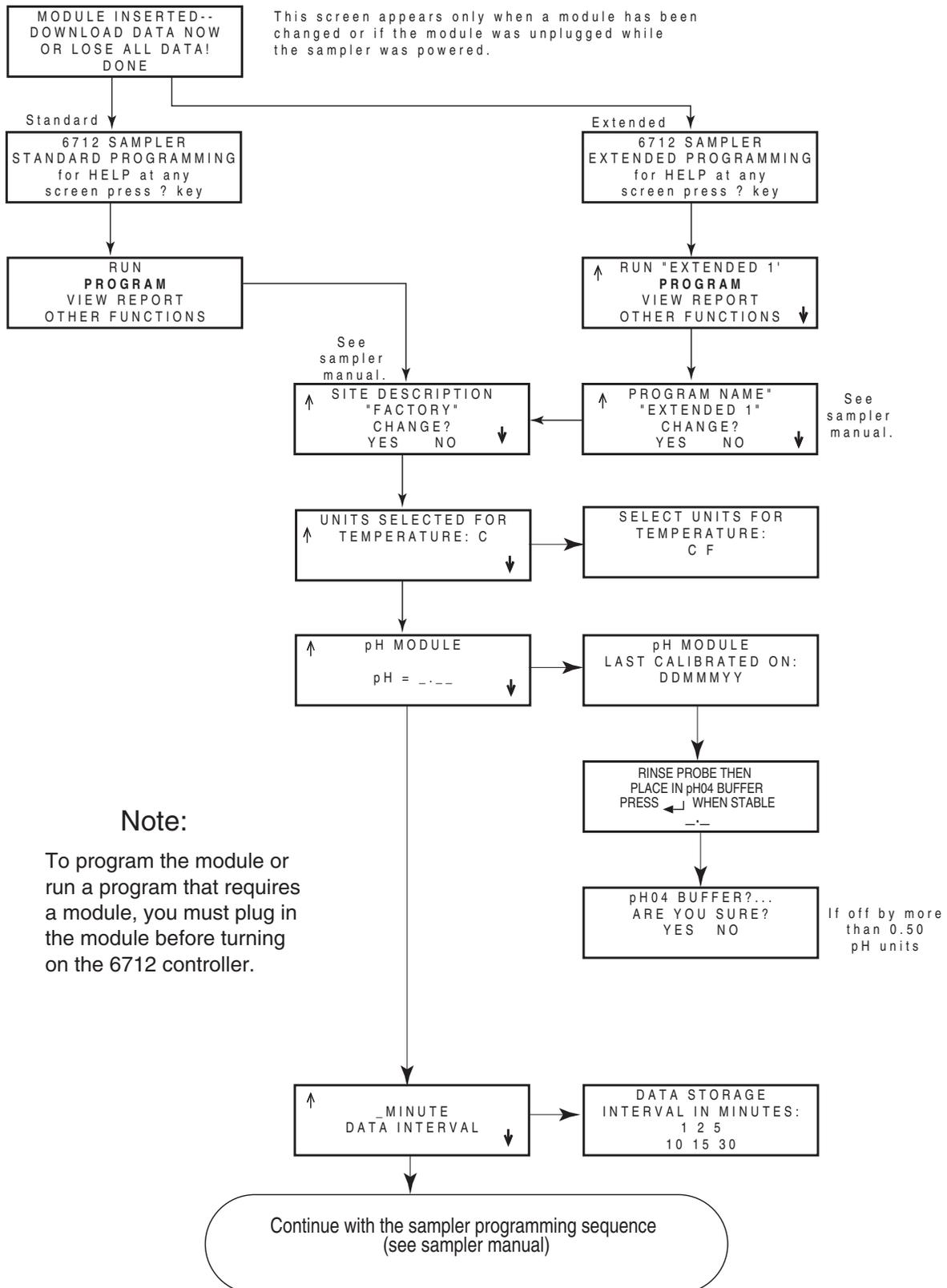


Figure 1-2 Quick View: Programming the sampler to use the 701 Module

1.7 Installing the Module

To install the module:

1. Turn the sampler off.
2. Remove the connector cap in the module bay and move it aside.
3. Slide the module into the bay.
4. Push the module to be sure the connector is firmly seated.

To remove the module, turn the sampler off. Depress the silver button and pull the module from the bay. Replace the connector cap in the module bay.

1.8 Installation Checklist

1. Install the module then turn the sampler on.
2. Program the sampler and calibrate the module's pH reading.
3. Install the probe.
4. Connect the probe's cable to the module.
5. Set up the sampler. See the sampler manual.
6. Run the program.

1.9 Calibrating the pH Module

The pH module uses a two-part calibration for the pH probe using commercially prepared calibrated buffer solutions. For accurate readings you must clean and recalibrate the probe on a regular basis. How often depends on the operating conditions.

Flow streams with a high grease content will coat the sensing surfaces of the probe quickly, clogging them and slowing the response time or stopping it altogether.

Calibrating the module can be done with two or three points. With two point calibration (pH 4 and 7, pH 4 and 10, or pH 7 and 10) the module creates a linear relationship from pH 0 to 14 through these two points. With three point calibration (pH 4, 7, and 10) the module creates a linear relationship from pH 0 to 7 through pH 4 and 7 and creates another linear relationship from pH 7 to 14 using calibration points pH 7 and 10.

701 pH/Temperature Module

Section 2 Installation

2.1 Installation Guidelines

<input checked="" type="checkbox"/> Note

Remember to unscrew the rubber guard cap from the sensing end of the probe after you install it, or the probe will be unable to sense the flow stream.

The guard cap is to protect the probe during shipment and storage and to keep the glass membrane and liquid junction from drying out. If you remove the probe from the stream for any reason, clean it and replace the cap after filling with 4.0 buffer solution. Never store the probe dry or without the cap in place.

Always mount the probe in an easily-accessible location. The probe will need cleaning, calibration, and eventual replacement.

2.1.1 Stream Conditions

Install the probe only in streams that have continuous flow.

For proper operation, there must also be enough flow or liquid to submerge the sensing end of the probe completely.

If flow in the stream is intermittent (dry for periods of time), the pH probe sensing bulb will dry out and its response time will become slow. This will be a problem in situations where pH changes rapidly. If the probe remains dry long enough, it will be ruined. Never let the sensing end of the probe dry out.

Installation in streams with high grease content may result in poor performance and require frequent maintenance.

The pH Probe will operate satisfactorily mounted either horizontally or vertically in the stream. However, horizontal mounting is more secure, and presents less of a trap for debris.

2.1.2 Vertical Mounting

If you mount the pH probe vertically, mount it securely. Never suspend the probe by its cable, particularly over streams that run at high levels and high velocities, or streams that carry debris which could damage the sensor.

2.1.3 Horizontal Mounting

For horizontal mounting, the probe fastens to a sensor carrier that snap-fits to an Isco mounting ring. The mounting rings fit various diameters of round pipes. They are held in place by the outward force of spring pressure in the smaller sizes and by a screw arrangement in the larger sizes. After mounting the probe in the ring or strap, route the cable out of the stream so it will not trap debris that could clog the sewer. Isco recommends mounting

the probe facing upstream, as there is a stop on the sensor carrier that is not effective when the probe is facing downstream.

2.2 Installation in Round Pipes

Consult your Isco Mounting Rings instruction manual for detailed hardware information.

The following sections describe sensor installation using the two options available for mounting sensors in pipes or round-bottomed flow streams. For pipes up to 15" (38.1 cm) in diameter, **stainless steel self-expanding mounting rings (Spring Rings)** are available. For pipes larger than 15" in diameter, Teledyne Isco offers the **Scissors Rings (Universal Mounting Rings)**.

2.2.1 Spring Rings

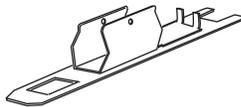
To install a spring ring, you compress the ring, slip it inside the pipe, and then allow it to spring out to contact the inside diameter of the pipe. The inherent outward spring force of the ring firmly secures it in place. A typical self-expanding mounting ring (with a probe mounted on it) is shown in Figure 2-1.

These mounting rings are available for use in pipes with inside diameters of 6" (15.2 cm), 8" (20.3 cm), 10" (25.4 cm), 12" (30.5 cm), and 15" (38.1 cm). The Isco part numbers for the various size mounting rings available are listed in Appendix A. These part numbers include not only the ring, but also the miscellaneous hardware necessary to mount the sensor on the ring.

 **CAUTION**

Always wear leather gloves when handling the rings (either type). The metal is finished, but there is still a possibility of cutting your hands on the edges.

Attaching the Sensor to the Ring



**pH probe carrier
part #60-3208-001**

Attach the sensor by snapping the probe carrier into the slots in the ring (Figure 2-1).

This method of attaching the sensor allows for easy removal in case servicing becomes necessary.

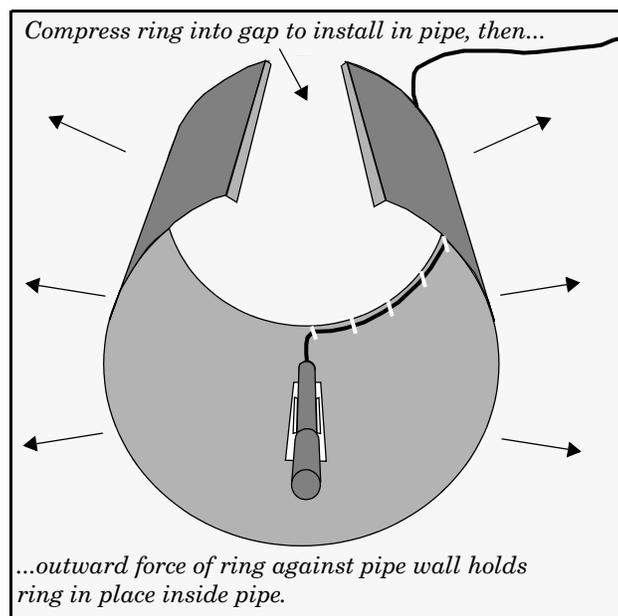


Figure 2-1 Sensor Installed on a Spring Ring

Completing the assembly

To complete the sensor-spring ring assembly procedure, attach the sensor cable to the downstream edge of the ring. Follow the cable routing shown in Figure 2-1. Other routing directions may affect measurement accuracy. The cable can actually create a stilling well downstream from the sensor, causing the level to read low. Use the self-locking plastic ties supplied with the ring. Install the ring in the pipe by compressing it. Press inward on both sides and slide the ring into the pipe.

Route the sensor cable out of the stream and secure it in position by placing the ties through the holes in the mounting ring and then locking them around the cable, as shown. To prevent debris from catching on the cable, it is important to attach the cable to the mounting ring so it offers as little resistance to the flow as possible.

The spring ring may need anchoring. Under conditions of high velocity (greater than 5 feet per second or 1.5 meters per second), the ring may not have sufficient outward spring force to maintain a tight fit inside the pipe. The ring may start to lift off the bottom of the pipe in a waving fashion, or may even be carried downstream.

This problem is more prevalent in the larger diameter pipes (10", 12", and 15", and in pipes with smooth inside surfaces, such as plastic pipes). If any of these conditions are present, or if movement of the mounting ring is detected or suspected, you must anchor the ring in place. You can do this by setting screws through the ring into the pipe, or by other appropriate means. If there is a problem with the smaller diameter rings, it may be sufficient to simply increase the outward spring force of the ring by bending it into a less round configuration.

2.2.2 Scissors Rings

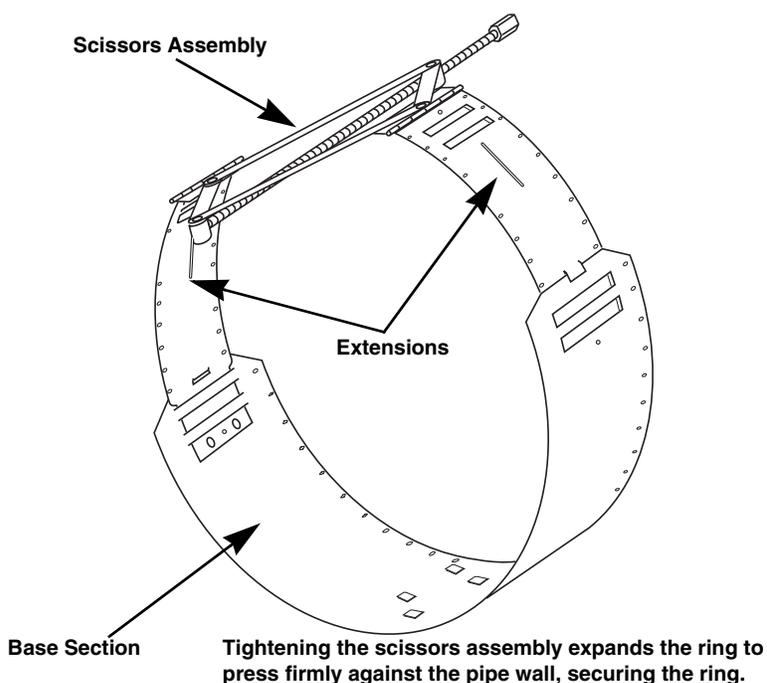
For pipes larger than 15" in diameter, Teledyne Isco offers the adjustable Scissors Ring (also known as the Universal Mounting Ring). This device consists of two or more metal strips that lock together with tabs to form a single assembly. There is a base section where the sensors are mounted, one or more extension sections (usually), and a scissors section at the top that expands the entire assembly and tightens it inside the pipe. The scissors mechanism includes a long screw that increases the width as it is tightened.

The assembled rings fit pipe diameters from 16" to 80". Secure the unit in place by tightening the scissors mechanism with a $\frac{5}{8}$ " socket wrench or other suitable tool. Ring sections are .040" thick half-hard 301 stainless steel sheet. All other parts are also stainless steel, except for the plastic cable ties in the hardware kit.

Each extension, 1, 2, 3, and 4, adds 9.0", 21.5", 31.5", or 41.5", respectively, to the circumference of the ring. Used alone, the base section fits pipe that is approximately 16" to 18" in diameter. The 9.0" (the smallest) extension exists so that in larger pipe sizes, where large variations in circumference can occur, you can use one or two of these extensions to take up or remove slack, to bring the scissors mechanism into a position where it can be effectively tightened.

Mounting ring kits are available for different pipe sizes. A kit is also available for partial pipe applications (see your Mounting Rings manual). For a listing of part numbers and ordering information, see Appendix A.

To prevent debris from catching on the cable, it is important to attach the cable to the mounting ring so it offers as little resistance to the flow as possible. Attach the sensor cable to the downstream edge of the ring, using the self-locking plastic ties supplied with the ring. Place the ties through the holes in the edge of the mounting ring and then lock them around the cable.



2.3 Scissors Ring Adjustment

2.3.1 Street Level Installation System

The Street Level Installation System provides a way to install the probe in a round pipe without entering a manhole. This system uses multi-section poles and expansion rings that fit 6, 8, 10, 12, and 15 inch round pipes in manholes as deep as 15 feet. The system includes an instruction manual. Contact the factory or your representative for details.

2.4 Other Installation Methods

Isco's mounting hardware can be installed or adapted for use in many channels. The paragraphs below list additional pH probe installation methods.

2.4.1 Rectangular, Trapezoidal, and Earthen Channels

The Sensor Mounting Plate (part #68-3000-051) may be used to mount the pH probe in these channels. The stainless steel plate has tabs to mount up to three sensors. It is secured in concrete channels by driving studs into the channel bottom and bolting the plate to the studs. In an earthen channel, the plate can be held in place by driving in stakes.

2.4.2 U-Channels

It is possible to mount the pH probe and carrier in a U-channel with a scissors ring base section. Attach the base section to the channel wall with studs fired from a power-actuated stud gun.

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Section 3 Maintenance

3.1 Storage and Maintenance of pH Probe

Whenever the pH probe is in storage or out of solution, you must be careful to keep the glass sensor bulb wet. Always store the probe with the rubber cover screwed completely over the threaded end of the sensor. Exposure to air causes the glass membrane to dry out. This makes it very slow to respond in solution. Prolonged or repeated dehydration of the bulb may ruin the probe completely.

The pH sensitive glass can become conditioned to its environment, especially when it is continuously exposed to high pH (10 and above) solutions. The glass does have a memory and will respond slowly when exposed to a lower pH solution after having been in a high pH solution for any significant period of time.

Storage of a pH probe in a 4.0 buffer solution is recommended as this has a regenerative effect on the glass and does not put a memory on it. Tap water will work if 4.0 buffer solution is not available. Deionized water is good for quick rinses to clean the element, but not for prolonged storage of an electrode. Continuous exposure of the ion-sensitive membrane to a wetted, but nonionic solution will improperly condition the membrane.

The reference electrode is also adversely affected when allowed to dry out. Salt crystals from the electrolyte or precipitates of the solution measured will form salt bridges either within or on the surfaces of the liquid junction, causing the reference to be less conductive and resulting in a higher reference impedance.

This condition will typically worsen until the unit no longer functions. Soaking the reference electrode in a 4.0 pH solution, or tap water if the buffer is not readily available, may bring the reference back to life. Boiling the electrode in 4.0 buffer solution or tap water could revive the electrode in more severe situations. If none of these works, replace the probe.

3.2 Probe Life

All pH probes are consumable items, meaning that they will eventually fail and have to be replaced.

During the working life of the probe you will have to clean and recalibrate it periodically. Grease and debris will interfere with the probe's ability to measure pH accurately. Grease will coat the end of the probe. Grease is an insulator, keeping the ions from reaching the glass membrane and porous liquid junction, thus failing to create a voltage potential.

The pH probe has reached the end of usable life when you can no longer calibrate the probe (after cleaning) to 4 and 7. Another indication of end of life is when the probe eventually calibrates satisfactorily, but takes too long to stabilize (more than 10 minutes).

Such a probe could not possibly respond to a situation of rapidly-changing pH. If your situation requires faster response, you might consider end-of-life to have occurred when stabilization time reaches five or seven minutes.

3.3 Flash Memory and Software Upgrades

The module has Flash memory to store its software. With Flash technology, you can upgrade your module's software without sending it back to the factory or replacing the chip. Simply connect a computer to the sampler with the module installed and run the Flash update program.

 Note

When updating the Flash memory the module must be attached to the sampler and power must be supplied to the sampler.

3.4 Repairing the Module

The module has no user-serviceable parts. Its case is completely sealed to protect the internal components. To repair the unit, the case must be broken open and replaced. If you think your module requires repair, contact Teledyne Isco's Technical Service Department for information on returning it to the factory.

701 pH/Temperature Module

Appendix A Accessories

Accessories and replacement parts can be purchased by contacting Isco's Customer Service Department.

Table A-1 Accessories	
pH Module w/ Probe (includes module, probe, pH 4, 7, and 10 buffers, rinse, and manual)	68-6700-052
pH/Temp Sensor (includes module, probe, pH 4, 7, and 10 buffers, rinse, and manual)	68-6700-054
pH/Temp Probe	60-9004-126
pH Module Manual	60-9003-065
pH Probe Mount Assembly	60-3208-001
Electrode Rinse Solution	479-0010-00
pH 4 Buffer	479-0001-04
pH 7 Buffer	479-0001-07
pH 10 Buffer	479-0001-10
Spring Mounting Ring 6" Dia	68-3200-007
Spring Mounting Ring 8" Dia	68-3200-008
Spring Mounting Ring 10" Dia	68-3200-009
Spring Mounting Ring 12" Dia	68-3200-010
Spring Mounting Ring 15" Dia	68-3200-011
Extension Kit For 16"-23" Pipe	68-3000-042
Extension Kit For 16"-36" Pipe	68-3000-043
Extension Kit For 39"-43" Pipe	68-3000-044
Extension Kit For 45"-49" Pipe	68-3000-045
Extension Kit For 58" - 62" Pipe	68-3000-046
Extension Kit For 72" Pipe	68-3000-047
Extension Kit For 16"-80" Pipe	68-3000-048
Base Button Assembly	60-3004-171
Scissors Adjustment Assembly	60-3004-170

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Appendix B Material Safety Data

This appendix to the manual provides Material Safety Data Sheets for the solutions used with the pH probe.

Teledyne Isco cannot guarantee the accuracy of the data. Specific questions regarding the use and handling of the products should be directed to the manufacturer listed on the MSDS.

ORION MATERIAL SAFETY DATA SHEET

SHEET 1 OF 2

Orion Research Incorporated
THE SCHRAFFT CENTER
529 MAIN STREET, BOSTON, MA 02129 USA
TELEPHONE 617-242-3900

I. PRODUCT IDENTIFICATION

PRODUCT NAME perpHect Buffer 4	CATALOG NO. 910410, 910425, 910450	EFFECTIVE DATE 06/01/91
HAZARDOUS DOT None	IATA None	
SHIPMENT LABELLING: None	TITLE Quality Assurance Chemist	
PREPARED BY <i>[Signature]</i>	TITLE Director Regulatory Matters	
APPROVED BY <i>[Signature]</i>		

II. HAZARDOUS INGREDIENTS (IDENTITY INFORMATION)

HAZARDOUS COMPONENTS* SPECIFIC CHEMICAL IDENTITY: COMMON NAME(S)	CAS NO.	%	OSHA PEL	ACGIH TLV	LD 50 mg/Kg
Potassium Hydrogen Phthalate (KHP)	877-24-7	1.01	None	None	None listed.
Amaranth Red Dye (C ₂₀ H ₁₁ N ₂ O ₁₀ S ₃ Na)	915-67-3	0.005	None	None	1,000 (IPR-MUS)
** De-ionized Water (H ₂ O)	7732-18-5	98.985	None	None	190,000 (IPR-MUS)

III. PHYSICAL DATA

BOILING POINT 760 mm Hg 100°C	FREEZING POINT 0°C
SPECIFIC GRAVITY (H ₂ O = 1) 1.0	VAPOR PRESSURE @ NA *
pH @ 25 °C 4.01	SOLUBILITY IN WATER, % BY WT. @ Miscible
VOLATILES, % BY WT. N A	EVAPORATION RATE (BUTYL ACETATE = 1) N A
VAPOR DENSITY (AIR = 1) N A	
APPEARANCE AND ODOR Light Red, Odorless Liquid	

IV. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (TEST METHOD) Not Flammable	AUTOIGNITION TEMPERATURE N A
FLAMMABLE LIMITS IN AIR, % BY VOLUME: LOWER N A	UPPER N A
EXTINGUISHING MEDIA Water, CO ₂ , Dry Chemical, Foam or Spray	
SPECIAL FIRE-FIGHTING PROCEDURES None	
UNUSUAL FIRE AND EXPLOSION HAZARDS None	

* Chemicals which are not classified as hazardous per U.S. OSHA guidelines (29CFR Parts 1915.2 or 1916.2) or the Massachusetts Substance List (105CMR670.000 Appendix A) will not necessarily be listed on this form even though one or more may be a constituent of this product.

Liability is expressly disclaimed for any loss or injury arising out of the use of this information or the use of any materials designated. Safe use of the materials is the responsibility of the user.

Document No. 205568-001
Rev. A

- * NA = Not Available/Not Applicable
- * * Non-hazardous Component

Printed in U.S.A.
Form MSDS/0191

ORION MATERIAL SAFETY DATA SHEET

SHEET 2 OF 2

PRODUCT NAME: perpHect Buffer 4

CATALOG NO.: 910410, 910425,
910450

V. REACTIVITY DATA

STABILITY:	CONDITIONS TO AVOID
UNSTABLE <input type="checkbox"/>	None
STABLE <input checked="" type="checkbox"/>	
INCOMPATIBILITY (MATERIALS TO AVOID)	Nitric Acid
HAZARDOUS DECOMPOSITION PRODUCTS	None
HAZARDOUS POLYMERIZATION:	CONDITION TO AVOID
MAY OCCUR	WILL NOT OCCUR <input checked="" type="checkbox"/>
	None

VI. HEALTH HAZARD DATA

ROUTE(S) OF ENTRY:	INHALATION?	SKIN?	INGESTION?
	No	Yes	Yes
HEALTH HAZARDS (ACUTE AND CHRONIC)	Chronic: Possible skin irritant for prolonged exposure.		
Acute: Low hazard because of low concentration of salts.			
CARCINOGENICITY:	NTP?	IARC MONOGRAPHS?	OSHA REGULATED?
	(Suspect)	(Animal Positive)	(Not Found)
SIGNS AND SYMPTOMS OF EXPOSURE			
Irritation or redness of the skin.			
MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE			
Possible aggravation of skin diseases.			
EMERGENCY AND FIRST AID PROCEDURES			
Wash contact area with water. If ingested, give large amounts of water and consult physician.			

VII. PRECAUTIONS (SAFE HANDLING AND USE)

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Wash down drain with water if local law allows.
WASTE DISPOSAL METHOD
Consult with and observe all federal, state, and local laws when disposing of this product.
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
Suitable for general storage. This product is not regulated under SARA Title III.
OTHER PRECAUTIONS
Not affected by Cal. Prop 65. NFPA Rating: Scale (0-4) Health 1, Fire 0, Reactivity 1, Specific - None.

VIII. CONTROL MEASURES

RESPIRATORY PROTECTION (SPECIFY TYPE)		None	
VENTILATION	LOCAL EXHAUST	No	SPECIAL No
	MECHANICAL (GENERAL)	No	OTHER No
PROTECTIVE GLOVES		EYE PROTECTION	
Yes (any type)		Safety Glasses	
OTHER PROTECTIVE CLOTHING OR EQUIPMENT			
No			
WORK/HYGIENIC PRACTICES			
No eating or drinking while working with this product.			

ORION MATERIAL SAFETY DATA SHEET

SHEET 1 OF 2

Orion Research Incorporated
THE SCHRAFFT CENTER
529 MAIN STREET, BOSTON, MA 02129 USA
TELEPHONE 617-242-3900

I. PRODUCT IDENTIFICATION

PRODUCT NAME pHfect Buffer 7	CATALOG NO. 910710, 910725, 910750	EFFECTIVE DATE 06/01/91
HAZARDOUS SHIPMENT LABELLING: DCT None	IATA None	
PREPARED BY <i>Thomas G. Kelly</i>	TITLE Quality Assurance Chemist	
APPROVED BY <i>John Orlovsky</i>	TITLE Director Regulatory Matters	

II. HAZARDOUS INGREDIENTS (IDENTITY INFORMATION)

HAZARDOUS COMPONENTS* SPECIFIC CHEMICAL IDENTITY, COMMON NAME(S)	CAS NO.	%	OSHA PEL	ACGIH TLV	LD 50 mg/Kg
Potassium Phosphate (KH ₂ PO ₄)	7778-77-0	0.284	None	None	None Listed
Sodium Phosphate (Na ₂ HPO ₄)	7558-79-4	0.413	None	None	298 (1VN-DOG)
Sodium Chromate (Na ₂ CrO ₄)	7775-11-3	0.013	50 ug/mg3	50 ug/m3	57 (IRR-RAT)
Potassium Dichromate (K ₂ CrO ₇)	778-50-9	0.003	50 ug /m3	50 ug/m3	37 (1NR-RAT)
** De-Ionized Water (H ₂ O)	7732-18-5	99.287	None	None	190,000 (ORL-DOG)

III. PHYSICAL DATA

BOILING POINT 760 mm Hg 100°C	FREEZING POINT 0°C
SPECIFIC GRAVITY (H ₂ O = 1) 1.0	VAPOR PRESSURE @ NA
pH @ 25 °C 7.00	SOLUBILITY IN WATER, % BY WT. @ Miscible
VOLATILES, % BY WT. NA	EVAPORATION RATE (BUTYL, ACETATE = 1) NA
VAPOR DENSITY (AIR = 1) NA	
APPEARANCE AND ODOR Light Yellow, Odorless Liquid	

IV. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (TEST METHOD) Not Flammable	AUTOIGNITION TEMPERATURE NA	
FLAMMABLE LIMITS IN AIR, % BY VOLUME:	LOWER NA	UPPER NA
EXTINGUISHING MEDIA Water, CO ₂ , Dry Chemical, Foam or Spray		
SPECIAL FIRE-FIGHTING PROCEDURES None		
UNUSUAL FIRE AND EXPLOSION HAZARDS None		

- Chemicals which are not classified as hazardous per U.S. OSHA guidelines (29CFR Parts 1915.2 or 191F.2) or the Massachusetts Substance List (10SCMR670.000 Appendix A) will not necessarily be listed on this form even though one or more may be a constituent of this product.

Liability is expressly disclaimed for any loss or injury arising out of the use of this information or the use of any materials designated. Safe use of the materials is the responsibility of the user.

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- NA = Not Available/Not Applicable
- Non-hazardous Component

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ORION MATERIAL SAFETY DATA SHEET

SHEET 2 OF 2

PRODUCT NAME: perpHect Buffer 7

CATALOG NO.: 910710, 910725,
910750

V. REACTIVITY DATA

STABILITY:		CONDITIONS TO AVOID	
UNSTABLE <input type="checkbox"/>	STABLE <input checked="" type="checkbox"/>		
INCOMPATIBILITY (MATERIALS TO AVOID)		Magnesium and Sodium metals	
HAZARDOUS DECOMPOSITION PRODUCTS		Possible evolution of fumes from phosphates if heated.	
HAZARDOUS POLYMERIZATION:		CONDITION TO AVOID	
MAY OCCUR <input type="checkbox"/>	WILL NOT OCCUR <input checked="" type="checkbox"/>	None	

VI. HEALTH HAZARD DATA

ROUTE(S) OF ENTRY:	INHALATION?	SKIN?	INGESTION?
	No	No	Yes
HEALTH HAZARDS (ACUTE AND CHRONIC) Low Hazard for both acute and chronic because of low concentration of salts.			
CARCINOGENICITY:	NTP?	IARC MONOGRAPHS?	OSHA REGULATED?
	Not Found	Not Found	Not Found
SIGNS AND SYMPTOMS OF EXPOSURE Irritation of skin.			
MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE Possible aggravation of skin diseases.			
EMERGENCY AND FIRST AID PROCEDURES Wash off contact area with water. If ingested, give large amounts of water and contact a physician.			

VII. PRECAUTIONS (SAFE HANDLING AND USE)

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED Wash down drain with water if local law allows.
WASTE DISPOSAL METHOD Consult with and observe all federal, state and local laws when disposing of this product.
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING SARA Title III: Releases of Na_2HPO_4 are subject to reporting under Sec. 302 of Title III.
OTHER PRECAUTIONS NFPA Rating: Scale (0-4) Fire 0, Health 0, Reactivity 0, Specific - None. Not affected by CAI Proposition 65.

VIII. CONTROL MEASURES

RESPIRATORY PROTECTION (SPECIFY TYPE)			
		None	
VENTILATION	LOCAL EXHAUST	No	SPECIAL No
	MECHANICAL (GENERAL)	No	OTHER No
PROTECTIVE GLOVES		No	EYE PROTECTION Safety Glasses
OTHER PROTECTIVE CLOTHING OR EQUIPMENT No			
WORK/HYGIENIC PRACTICES No eating or drinking while working with this product.			

ATI ORION MATERIAL SAFETY DATA SHEET

Sheet 1 of 2

Orion Research Incorporated
THE SCHRAFFT CENTER
529 Main Street, Boston, MA 02129 USA
Telephone 617-242-3900

I. PRODUCT IDENTIFICATION

Product Name pH Buffer 10	Catalog No. 911010, 911025	Effective Date 07/20/93
Hazardous Shipment Labelling: DOT None	IATA None	
Prepared By <i>[Signature]</i>	Title Quality Assurance Chemist	
Approved By <i>[Signature]</i>	Title Director Regulatory Matters	

II. HAZARDOUS INGREDIENTS (IDENTIFY INFORMATION)

Hazardous Components* Specific Chemical Identity: Common Name(s)	CAS NO.	%	OSHA PEL	ACGIH TLV	LD 50mg/Kg
Sodium Bicarbonate (NaHCO ₃)	144-55-8	0.209	None	None	4220 (ORL-RAT)
Sodium Carbonate (Na ₂ CO ₃)	497-19-8	0.264	None	None	117 (PR-MUS)
Methylparaben (C ₈ H ₉ O ₃)	99-76-3	0.001	None	None	NA
FD&C Blue (C ₃₇ H ₃₆ N ₂ O ₈ S ₃ *2Na)	384445-9	0.0005	None	None	5.5g 1Kg (SCU-RAT)TD Lo
**Deionized Water (H ₂ O)	7732-18-5	99.526	None	None	190,000 (ORL-DOG)

III. PHYSICAL DATA

Boiling Point 750 mm Hg 100°C	Freezing Point 0°C
Specific Gravity (H ₂ O=1) 1.0	Vapor Pressure @ NA
pH @ 25°C 10.01	Solubility In Water, % By Wt @ Miscible
Volatiles, % By Wt. NA	Evaporation Rate (BUTYL ACETATE = 1) NA
Vapor Density (AIR = 1) NA	
Appearance and Odor Light blue, odorless liquid	

IV. FIRE AND EXPLOSION HAZARD DATA

Flash Point (test Method) Not flammable	Autoignition Temperature NA
Flammable Limits in air, % by volume: Lower NA Upper NA	
Extinguishing Media Water, CO ₂ , Dry chemical, foam or spray	
Special Fire-Fighting Procedures None, non-flammable	
Unusual Fire and Explosion Hazards None	

- * Chemicals which are not classified as hazardous per U.S. OSHA guidelines (29CFR Parts 1915.2 or 1916.2) or the Massachusetts Substance List (105CMR670.000 Appendix A) will not necessarily be listed on this form even though one or more may be a constituent of this product
- * NA Not available/not applicable
- ** Non-hazardous component

Liability is expressly disclaimed for any loss or injury arising out of the use of this information or the use of any materials designated. Safe use of the materials is the responsibility of the user.

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Form MSDS/1192

ATI ORION MATERIAL SAFETY DATA SHEET

Sheet 2 of 2

PRODUCT NAME: perpHect Buffer 10 Catalog No.: 911010, 911025

V. REACTIVITY DATA

Stability:	Conditions to Avoid		
Unstable	Stable	X	
Incompatibility (Materials to avoid)	NaK alloy, NH ₄ H ₂ PO ₄ , AL, P ₂ O ₅ , H ₂ SO ₄		
Hazardous Decomposition Products	CO ₂ Upon heating to decomposition		
Hazardous Polymerization:	Condition to Avoid		
May Occur	Will Not Occur	X	None

VI. HEALTH HAZARD DATA

Route(s) Of Entry:	Inhalation?	Skin?	Ingestion?	
	No		Yes	Yes
Health Hazards (acute and chronic)	Acute: Non-hazardous due to the low levels of salt present. Chronic: Possible irritation of skin			
Carcinogenicity:	NTP?	IARC Monographs? ***	OSHA regulated?	
	Not found	(animal positive)	Not found	
Signs and Symptoms of Exposure	Irritation of skin			
Medical Conditions Generally Aggravated By Exposure	Could aggravate diseases of the skin.			
Emergency And First Aid Procedures	Wash off contact area with water. If ingested, give large amounts of water. Contact physician.			

VII. PRECAUTIONS (SAFE HANDLING AND USE)

Steps To Be Taken In Case Material Is Released Or Spilled	Clean up and set aside for waste disposal.
Waste Disposal Method	Consult with and observe all Federal, State and Local laws when disposing of this product.
Precautions To Be Taken In Handling And Storing	Suitable for any general handling and storage.
NFPA Rating: Scale (0-4) Fire 0, Health 1, Reactivity 0, Specific - None. Net affected by CAL Proposition 65	

VIII. CONTROL MEASURES

Respiratory Protection (specify type)	None	
Ventilation	Local Exhaust	Special
	No	No
Ventilation	Mechanical (General)	Other
	No	No
Protective Gloves	Yes	Eye Protection
		Safety glasses
Other Protective Clothing Or Equipment	No	
Work/Hygienic Practices	No eating or drinking while working with this product	

Teledyne Isco One Year Limited Factory Service Warranty*

This warranty exclusively covers Teledyne Isco instruments, providing a one-year limited warranty covering parts and labor.

Any instrument that fails during the warranty period due to faulty parts or workmanship will be repaired at the factory at no charge to the customer. Teledyne Isco's exclusive liability is limited to repair or replacement of defective instruments. Teledyne Isco is not liable for consequential damages.

Teledyne Isco will pay surface transportation charges both ways within the 48 contiguous United States if the instrument proves to be defective within 30 days of shipment. Throughout the remainder of the warranty period, the customer will pay to return the instrument to Teledyne Isco, and Teledyne Isco will pay surface transportation to return the repaired instrument to the customer. Teledyne Isco will not pay air freight or customer's packing and crating charges. This warranty does not cover loss, damage, or defects resulting from transportation between the customer's facility and the repair facility.

The warranty for any instrument is the one in effect on date of shipment. The warranty period begins on the shipping date, unless Teledyne Isco agrees in writing to a different date.

Excluded from this warranty are normal wear; expendable items such as pH sensors, charts, ribbon, lamps, tubing, and glassware; fittings and wetted parts of valves; and damage due to corrosion, misuse, accident, or lack of proper maintenance. This warranty does not cover products not sold under the Teledyne Isco trademark or for which any other warranty is specifically stated.

No item may be returned for warranty service without a return authorization number issued by Teledyne Isco.

This warranty is expressly in lieu of all other warranties and obligations and Teledyne Isco specifically disclaims any warranty of merchantability or fitness for a particular purpose.

The warrantor is Teledyne Isco, 4700 Superior, Lincoln, NE 68504, U.S.A.

*** This warranty applies to the USA and countries where Teledyne Isco does not have an authorized dealer. Customers in countries outside the USA, where Teledyne Isco has an authorized dealer, should contact their Teledyne Isco dealer for warranty service.**

Before returning any instrument for repair, please call, fax, or e-mail the Teledyne Isco Service Department for instructions. Many problems can often be diagnosed and corrected over the phone, or by e-mail, without returning the instrument to the factory.

Instruments needing factory repair should be packed carefully, and shipped to the attention of the service department. Small, non-fragile items can be sent by insured parcel post. **PLEASE BE SURE TO ENCLOSE A NOTE EXPLAINING THE PROBLEM.**

Shipping Address: Teledyne Isco - Attention Repair Service
4700 Superior Street
Lincoln, NE 68504 USA

Mailing Address: Teledyne Isco
PO Box 82531
Lincoln, NE 68501 USA

Phone: Repair service: (800) 775-2965 (lab instruments)
(866) 298-6174 (samplers & flow meters)
Sales & General Information: (800) 228-4373 (USA & Canada)

Fax: (402) 465-3001

Email: IscoService@teledyne.com



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