

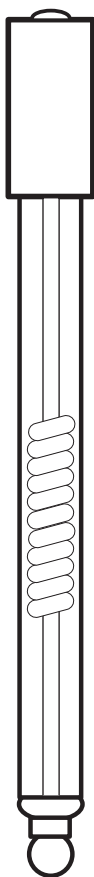
# pH

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Orion 82-02, 82-03, 82-35,  
82-56, 82-63

## Orion PerpHect<sup>®</sup> ROSS<sup>®</sup> Electrodes

INSTRUCTION MANUAL



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ORION Series A meters and 900A printer are protected by U.S. patents 5,108,578, 5,198,093 and German patents D334,208 and D346,753.

Sure-Flow electrodes are protected by European Patent 278,979 and Canadian Patent 1,286,720.

ionplus electrodes and Optimum Results solutions are protected by US Patent 5,830,338.

ROSS Ultra electrodes have patents pending.

ORION ORP Standard is protected by US Patent 6,350,367.

ORION Series A conductivity meters are protected by US Patent 5,872,454.

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The specifications, descriptions, drawings, ordering information and part numbers within this document are subject to change without notice.

This publication supersedes all previous publications on this subject.

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# GENERAL INFORMATION

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## Introduction

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This manual contains instructions for the PerpHecT® ROSS® series of pH electrodes. Operation and maintenance instructions for the following electrodes are included

<b>Orion No.</b>	<b>Description</b>
8202BN	PerpHecT ROSS Combination pH Electrode, 0 - 14 pH, glass body
8203BN	Semi-micro PerpHecT ROSS Combination pH Electrode, 0 - 14 pH, glass body
8235BN	Flat surface PerpHecT ROSS Combination pH Electrode, 0 - 14 pH, epoxy body
8256BN	PerpHecT ROSS Combination pH Electrode, 0 - 14 pH, epoxy body with bulb guard
8263BN	Spear tip PerpHecT ROSS Combination pH Electrode, 0 - 14 pH, glass body

PerpHecT electrodes are the highest quality and most accurate pH electrodes available. PerpHecT electrodes are manufactured to tighter tolerances and offer even greater accuracy and precision than our standard electrodes. When combined with our PerpHecT meters, the most precise pH measurements are possible. The PerpHecT meters have patented LogR™ technology, allowing the user to make temperature compensated pH measurements without the need of a separate ATC probe.

The PerpHecT Ross series of electrodes provide readings stable to 0.01 pH in less than 30 seconds, even in the extreme case of samples varying from one another by 50 °C or more. Results are three to five times more precise than those obtained with conventional electrodes. Because drift is less than 0.002 pH per day, restandardization is minimized.

PerpHecT LogR temperature measurement and compensation specification are based on the use of PerpHecT and PerpHecT Ross brand electrode.

Use of other brand electrodes may impact performance.

## Required Equipment

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**pH Meter** - Any Orion PerpHecT® pH meter, or other

pH/ISE meter with appropriate connectors. For use on meters requiring U.S. Standard connectors, use BNC to U.S. Standard adapter, Orion 090032.

**Electrode** - Combination PerpHecT pH Electrode

**Beakers** - Plastic or glass.

**Magnetic Stirrer** - Suggested for precision measurements.

## Required Solutions

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**pH Buffers** - Two are recommended for precise measurement. The first, near the electrode isopotential point (pH 7), and the second near the expected sample pH (e.g., pH 4 or 10).

**ROSS® Internal Filling Solution** - 3 M KCl, Orion 810007. Do not use any filling solution which contains silver, electrode damage may result.

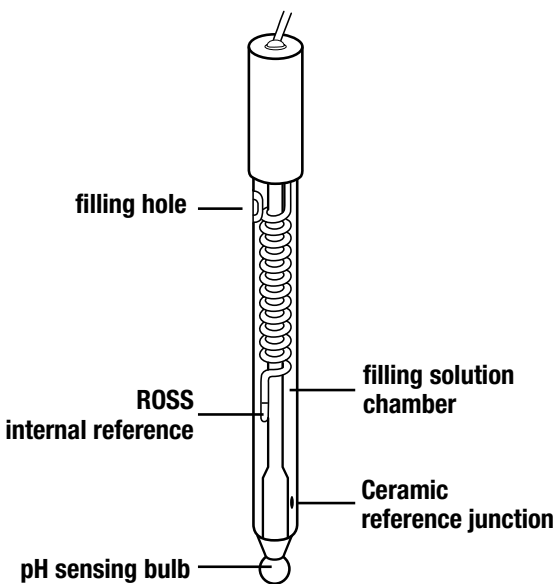


Figure 1: Orion 8202— PerHect ROSS Combination Electrode

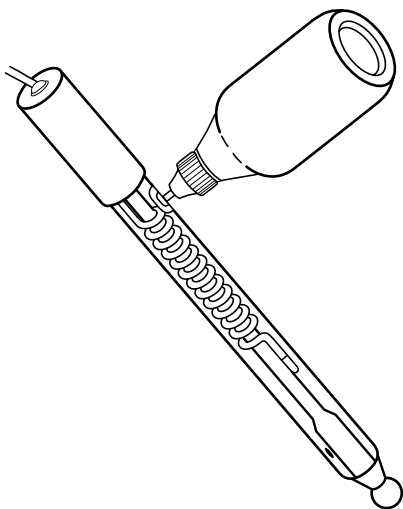
# USING THE ELECTRODE

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## Electrode Preparation

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1. Remove the protective shipping cap from sensing element and save for storage.
2. Clean any salt deposits from exterior by rinsing with distilled water.
3. Uncover filling hole by removing plastic sleeve and add ROSS® Filling Solution, Orion 810007, to electrode. See **Figure 2**. To maintain an adequate flow rate, the level of filling solution must always be above the reference junction and at least one inch above the sample level when immersed. The filling hole should be open whenever the electrode is in use.
4. Place the electrode in the electrode holder and suspend in air for 15 minutes to thoroughly wet the reference junction. Once the junction is wet, do not allow the electrode to dry out.
5. Shake down the electrode (as with a clinical thermometer) to remove air bubbles.
6. Soak electrode in pH Electrode Storage Solution, Orion 910001, for one hour. If Orion Storage Solution is not available, use 200 mL pH 7 buffer to which about 1 gram KCl has been added, as a temporary substitute.
7. Connect electrode to meter.



**Figure 2: Filling an Electrode**

## Sample Requirements

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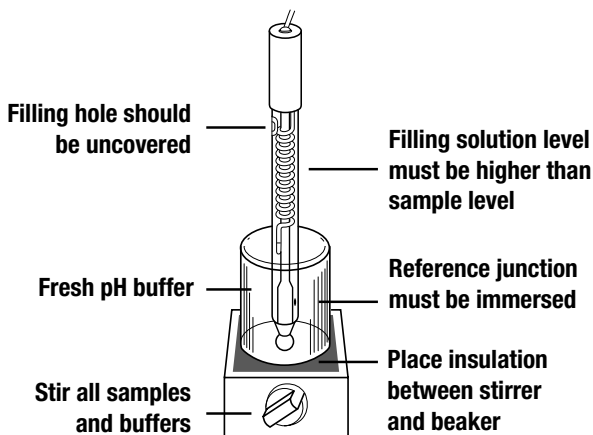
One of the benefits of the PerpHecT<sup>®</sup> ROSS<sup>®</sup> pH Electrode is that the filling solution composition may be changed depending on sample requirements.

The ROSS pH Electrode Filling Solution, Orion 810007 is 3 M KCl. For solutions which precipitate in the presence of chloride ion, the electrode could be filled with 10% KNO<sub>3</sub>, Orion 900003.

Samples should be aqueous if using epoxy body electrodes (e.g., Orions 8256 or 8235).

In organic solutions, use an all glass PerpHecT ROSS Electrode. For good results a minimum of 20% water must be present in the sample. If there is a great deal of drift when using the PerpHecT ROSS Electrode filled with ROSS Filling Solution (Orion 810007), try filling the electrode with a mixture of methanol and water saturated with KCl.

**Figure 3: Measuring Hints**

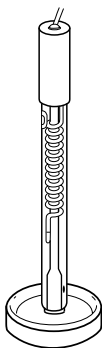


# MEASURING HINTS

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See **Figure 3**

- Always use fresh buffers for calibration. Choose buffers that are no more than 3 pH units apart.
- Check electrode slope daily by performing two buffer calibration. Slope should be 92 to 102%.
- Except as noted in Sample Requirements, only use ROSS® Internal Filling Solution, Orion 810007, for PerpHecT® ROSS Combination pH Electrodes. Do not use any filling solution which may contain silver.
- Remove filling hole cover during measurement to ensure uniform flow of filling solution.
- Between measurements, rinse electrodes with distilled water and then with the next solution to be measured.
- Stir all buffers and samples.
- Place a piece of insulating material (e.g., Styrofoam or cardboard) between magnetic stirrer and beaker to prevent error from transfer of heat to sample. Since PerpHecT ROSS Electrodes respond faster than conventional electrodes, changes in pH which result from temperature changes will be noticed.
- Avoid rubbing or wiping electrode bulb, to reduce chance of error due to polarization.
- Orion 8235 may be used on any moist surface or in liquids. See **Figure 4**.



**Figure 4: Use of Orion 8235**

# PH CALIBRATION & MEASUREMENT

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## General Calibration Procedure

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For detailed calibration and temperature compensation procedures, consult your meter instruction manual. When using these electrodes with a PerpHecT® pH meter, consult the meter's instruction manual for procedures on three buffer calibration, manual calibration, temperature calibration, or LogR™ compensated pH measurements.

## Single Buffer Calibration

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1. Choose a buffer near expected sample pH.
2. Buffer should be at same temperature as sample. If buffer and samples are at varying temperatures, temperature compensation is recommended.
3. Set up meter according to meter instruction manual.
4. Rinse electrode first with distilled water and then with the buffer being used for calibration.
5. Place the electrode in the buffer. Wait for a stable display. Set the meter to the pH value of the buffer at its measured temperature. See **Table 1**. (A table of pH values at various temperatures is supplied on Orion buffer bottles.) Proceed to **pH Measurement** section.

## Two-Buffer Calibration

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This procedure is recommended for precise measurement.

1. Ensure that all buffers are at the same temperature. If samples are at varying temperatures, temperature compensation is recommended. Refer to your pH meter instruction manual.
2. Select two buffers which bracket the expected sample pH. The first should be near the electrode isopotential point (pH 7) and the second near the expected sample pH (e.g., pH 4 or pH 10).
3. Rinse electrode first with distilled water and then with first (pH 7) buffer.
4. Place the electrode in first (pH 7) buffer. Wait for a stable display. Set the meter to the pH value of the buffer at its measured temperature. (A table of pH values at various temperatures is supplied on Orion buffer bottles). See **Table 1**.
5. Rinse electrode first with distilled water and then with the second buffer.
6. Place the electrode in the second buffer. When display is stable, set meter to the pH value of the buffer at its measured temperature as described in the meter instruction manual.
7. If all steps are performed correctly, proceed to the pH Measurement section. If any of the above procedures do not work, refer to **Troubleshooting**.

**Table 1**  
**pH Values of Buffers at Various Temperatures**

Nominal value at 25 °C Buffer	Temperature				
	0 °C	5 °C	10 °C	20 °C	30 °C
<b>1.68</b>	1.67	1.67	1.67	1.67	1.68
<b>3.78</b>	3.86	3.84	3.82	3.79	3.77
<b>4.01</b>	4.00	4.00	4.00	4.00	4.02
<b>6.86</b>	6.98	6.95	6.92	6.87	6.85
<b>7.00</b>	7.11	7.08	7.06	7.01	6.98
<b>7.41</b>	7.53	7.50	7.47	7.43	7.40
<b>9.18</b>	9.46	9.40	9.33	9.23	9.14
<b>10.01</b>	10.32	10.25	10.18	10.06	9.97

<b>40 °C</b>	<b>50 °C</b>	<b>60 °C</b>	<b>70 °C</b>	<b>80 °C</b>	<b>90 °C</b>
1.69	1.71	1.72	1.74	1.77	1.79
3.75	3.75				
4.04	4.06	4.09	4.13	4.16	4.21
6.84	6.83	6.84	6.85	6.86	6.88
6.97	6.97	6.97	6.99	7.03	7.08
7.38	7.37				
9.07	9.01	8.96	8.92	8.89	8.85
9.89	9.83				

## pH Measurement

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1. Calibrate the electrode as described in previous section.
2. Rinse the electrode with distilled water and then with sample.
3. Place the electrode in the sample.
4. When the display is stable, record sample pH.

# ELECTRODE STORAGE

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To ensure a quick response and free-flowing liquid junction, the sensing element and reference junction must not be allowed to dry out.

## **Short-term Storage (up to one week)**

Soak electrode in pH Electrode Storage Solution, Orion 910001. If Orion Storage Solution is not available, use 200 mL pH 7 buffer to which about 1 gram KCl has been added, as a temporary substitute.

## **Long-term Storage (more than one week)**

The reference chamber should be filled and the filling hole securely covered. Cover the sensing element and reference junction with the protective cap containing a few drops of storage solution. Before returning the electrode to use, prepare it as a new electrode.

# ELECTRODE MAINTENANCE

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1. Inspect the electrode for scratches, cracks, salt crystal build-up, or membrane/junction deposits.
2. Rinse off any salt build-up with distilled water, and remove any membrane/junction deposits as directed in the cleaning procedures below.
3. Drain the reference chamber, flush it with fresh ROSS® Filling Solution, Orion 810007, and refill the chamber.

## Cleaning Procedures

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**General** - Soak in 0.1 M HCl or HNO<sub>3</sub> for half an hour, followed by soaking in storage solution for at least one hour.\*

A second general cleaning procedure involves soaking the electrode in a 1:10 dilution of house-hold laundry bleach or a 0.1-0.5% liquid detergent solution in hot water with vigorous stirring for 15 minutes.\*

### Removal of Membrane/Junction Deposits

**Protein** - Soak in 1% pepsin in 0.1 M HCl, for 15 minutes or 10% Sodium hypochlorite solution for 5 minutes.\*

**Inorganic** - Soak in 0.1 M tetrasodium EDTA solution for 15 minutes.\*

**Grease and Oil** - Rinse with mild detergent or methanol solution.\*

\* After any of these cleaning procedures, drain and refill the reference chamber and soak the electrode in pH Storage Solution for at least one hour.

# TROUBLESHOOTING

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Follow a systematic procedure to isolate the problem. The pH measuring system can be divided into four components for ease in troubleshooting: pH meter, electrodes, sample/application and technique.

## pH Meter

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The meter is the component which is easiest to eliminate as a possible cause of error. Orion pH meters are provided with an instrument checkout procedure and shorting cap for convenience in troubleshooting. Consult your pH meter instruction manual for directions.

## Electrodes

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### To test electrode operation:

1. Connect electrode to a working meter.
2. Set function switch to absolute mV mode.
3. Immerse electrode in fresh pH 7 buffer.
4. Displayed value should be  $0 \pm 30$  mV.
5. Rinse electrode and immerse in fresh pH 4 buffer.
6. Displayed value should be approximately 160 mV to 180 mV greater than in step 4. (Actual mV values may change as electrode ages, but mV differences will remain 160 to 180 mV).

If electrode fails this procedure, clean thoroughly as directed in **Electrode Maintenance**. If electrode response is slow or drifting, drain and refill with fresh ROSS® Filling Solution, Orion 810007. See **Measuring Hints**. If cleaning and maintenance fail to rejuvenate the electrode, replace the entire electrode.

## **Sample/Application**

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The electrode and meter may operate with buffers but not with your sample. In this case, check sample composition for interferences, incompatibilities or temperature effects.

## **Technique**

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If trouble persists, review operating procedures. Reread calibration and measurement sections to be sure proper technique has been followed.

## Assistance

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After troubleshooting all components of your measurement system, contact The Technical Edge<sup>SM</sup> for Orion products. Within the United States call 1.800.225.1480, outside the United States call 978.232.6000 or fax 978.232.6031. In Europe, the Middle East and Africa, contact your local authorized dealer. For the most current contact information, visit [www.thermo.com](http://www.thermo.com).

# ELECTRODE CHARACTERISTICS

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## Temperature Effects

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The most common cause of error in pH measurements is temperature. There are at least five ways that temperature variations can affect pH:

- Electrode Slope
- pH Buffers
- Samples
- Reference Element Drift
- Temperature Sensor Errors

### Electrode Slope Changes

The electrode slope will change with variations in temperature. Slope changes may be compensated manually, automatically with an automatic temperature compensation probe (ATC) or with LogR™ technology on PerpHecT® pH meters. PerpHecT meters calculate the slope value based on the temperature input and automatically correct the measured pH values.

### Buffer and Sample pH Changes

Buffer and sample pH values vary with temperature because of their temperature dependent chemical equilibria. The problem of differing pH values is easily solved by calibrating the electrode with characterized standard buffers whose true pH values versus temperature are known. pH buffer values at different temperatures are given in **Table 1**. PerpHecT pH meters calibrate with the correct pH buffer values based on the manual, ATC or LogR temperature value. The problem of the sample equilibrium varying with temperature in an uncharacterizable manner will always remain. Therefore, calibration and measurement at the same temperature is recommended and pH values should be reported along with temperature.

## **Reference Element Drift**

Drift can occur when the internal reference elements inside the pH and reference portions of the electrode are reaching thermal equilibrium after a temperature change. Long-term drift or slow response can last until the sample and electrode are at the same temperature. PerpHecT® ROSS® pH electrodes use a patented internal reference to minimize equilibration time.

## **Temperature Sensor Errors**

When a pH and temperature probe are placed into a sample that varies significantly in temperature, the readings can drift for two reasons. First, the temperature response of the electrode and temperature probe may not be similar which prolongs equilibration and drift. Second, a sample may not have a uniform temperature. Therefore the pH electrode and temperature probe are responding to different environments.

Using LogR™ technology, PerpHecT meters sense the temperature directly from the PerpHecT ROSS pH electrode. The pH and temperature response is identical and both measurements occur at the sensing bulb. Therefore drift is minimized and errors due to environmental differences are eliminated.

## Use with PerpHecT® pH Meters

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When these PerpHecT electrodes are used with an Orion PerpHecT pH meter, enhanced temperature compensation is achieved without the need of a separate ATC probe. Using LogR™ technology, the temperature of the solution is measured through the resistance of the pH electrode. PerpHecT pH electrodes are constructed to match the PerpHecT meter specifications, giving you optimum performance and accuracy in LogR mode.

It is necessary to calibrate each electrode for temperature, before proceeding with a pH measurement utilizing LogR technology. Refer to the PerpHecT meter instruction manual for more details. For maximum precision, a three point temperature calibration is recommended. A one point temperature calibration should not be used if measuring below 20 °C. To help choose the appropriate technique, the following tables below illustrate the expected pH compensation error, comparing a 1, 2 and 3 point temperature calibration. The accuracy values are valid only when temperature calibration is performed within the stated temperature range. The higher temperature range data will apply to measurements made above that temperature range, provided that calibration points are within 20 °C of each other. When highly accurate pH results are desired, use of a separate ATC probe is recommended. Refer to your PerpHecT pH meter instruction manual to select the appropriate ATC probe for the system.

### One Point Temperature Calibration

Electrode °C	avg. temp. error 20 - 30	avg. temp. error 30 - 50	avg. pH comp. error 20 - 30	avg. pH comp. error 30 - 50
8202	0.13	0.07	0.002	0.001
8203	0.24	0.17	0.003	0.002
8235	0.91	0.95	0.011	0.011
8256	0.09	0.10	0.001	0.001

### Two Point Temperature Calibration

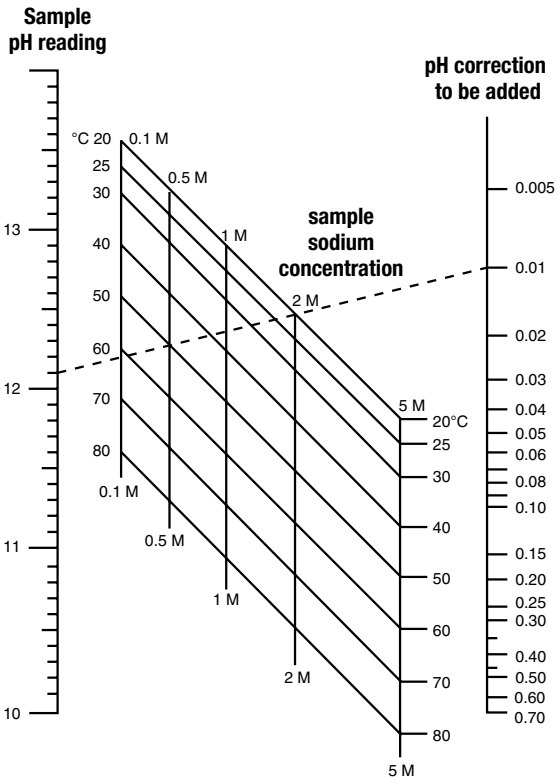
Electrode °C	avg. temp. error 0 - 25	avg. temp. error 20 - 40	avg. pH comp. error 0 - 25	avg. pH comp. error 20 - 40
8202	0.36	0.10	0.004	0.001
8203	0.13	0.02	0.002	0.000
8235	0.04	0.14	0.000	0.002
8256	0.22	0.06	0.003	0.001

### Three Point Temperature Calibration

Electrode °C	avg. temp. error 0 - 25	avg. temp. error 20 - 40	avg. pH comp. error 0 - 25	avg. pH comp. error 20 - 40
8202	0.04	0.03	0.000	0.000
8203	0.04	0.01	0.000	0.000
8235	0.07	0.06	0.001	0.001
8256	0.04	0.06	0.000	0.001

## Interferences

Sodium ion is the principal interference of the pH electrode, causing increasing error at higher pH (lower hydrogen ion activities) and at higher temperatures. Because the pH membrane is composed of special low sodium error glass, error due to sodium is negligible when measuring at pH values less than 12. When measuring at pH values greater than 12, add the correction value from the nomograph in **Figure 5** to observed pH reading.



### Example:

pH reading	12.10
Sodium concentration	0.5 M
Temperature	50 °C
Correction	0.01
Corrected pH reading	12.11

# WARRANTY

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For the most current warranty information, visit [www.thermo.com](http://www.thermo.com).

The Thermo Electron Corporation, Orion products warranty covers failures due to manufacturer's workmanship or material defects from the date of purchase by the user. User should return the warranty card and retain proof of purchase. Warranty is void if product has been abused, misused, or repairs attempted by unauthorized persons.

Warranties herein are for product sold/installed by Thermo or its authorized dealers.

Any product sold by a U.S. or Canadian distributor must be returned to Thermo for any warranty work. Please contact our Technical Service department for further information. A Return Authorization Number must be obtained from The Technical EDGE<sup>SM</sup> For Orion Products before returning any product for in-warranty repair or replacement.

In the event of failure within the warranty period, Thermo will at the company's option, repair or replace product not conforming to this warranty. There may be additional charges, including freight, for warranty service performed in some countries. For service, call Thermo or its authorized dealer outside the United States and Canada. Thermo reserves the right to ask for proof of purchase, such as the original invoice or packing slip.

Field Service is available on Orion BOD AutoEZ<sup>TM</sup>, EZ Flash<sup>®</sup> GC Accessory and TEA Analyzer<sup>®</sup>. Contact our Field Service department for details on quotations, service, other field service-related activities.

The following products are warranted to be free from defects in material and workmanship in the period listed below from the date of purchase from the user or from the date of shipment from Thermo, whichever is earlier, provided use is in accordance with the operating limitations and maintenance procedures in the instruction manual and when not having been subjected to accident, alteration, misuse, abuse or breakage of electrodes:

## **Thirty-six months from date of purchase by the user (or forty-two months from date of shipment from Thermo)**

- Waterproof Meters (Orion 630, 635, 830A, 835A, 260A, 261S, 265A, 266S, 130A, 131S, 135A, 136S, 1230, 142 and 842), Conductivity Meters (Orion 105Aplus<sup>TM</sup>, 115Aplus<sup>TM</sup>, 125Aplus<sup>TM</sup>, 145Aplus<sup>TM</sup>, 150Aplus<sup>TM</sup> and 162A), PerpHect<sup>®</sup> pH/ISE Meters (Orion 310, 320, 330, 350, 370) pH/ISE Meters (Orion 210Aplus<sup>TM</sup>, 230Aplus<sup>TM</sup>, 250Aplus<sup>TM</sup>, 290Aplus<sup>TM</sup>, 410Aplus<sup>TM</sup>, 420Aplus<sup>TM</sup>, 520Aplus<sup>TM</sup>, 525Aplus<sup>TM</sup>, 710Aplus<sup>TM</sup>, 720Aplus<sup>TM</sup> and 920Aplus<sup>TM</sup>), pHuture MMS<sup>TM</sup> Meters (Orion 535A and 555A),

pH/Conductivity Meter (Orion 550A), Dissolved Oxygen Meters (Orion 805Aplus™, 810Aplus™, 850Aplus™ and 862A).

**Twenty-four months from date of purchase by the user (or thirty-six months from date of shipment from Thermo)**

- Orion ROSS Ultra® Electrodes, AQUAfast® IV Colorimeters, AQUAfast® IV Turbidimeter, Orion 925 Flash Titrator™, Series 100 DuraProbe™ Conductivity Cells and Series 800 Dissolved Oxygen Probes.

**Twelve months from date of purchase by the user (or eighteen months from date of shipment from Thermo)**

- Laboratory pH Meters, (Orion 301, 611 and 940), SensorLink®, pHuture™ pH Meters (Orion 610 and 620), Smart Chek™ meters, Sage® Pumps, Cahn® Balances, 930 Ionalyzer®, 950 ROSS™ FAST QC™ Titrator, 960 Titrator PLUS®, Karl Fischer Titrators, Autosamplers, Liquid Handling Devices, Liquid Handling Automation Workstations (Orion AS2000, AS2500 and AS4000), Pumps (Orion SP201, SP201-HR, SP201-S, Peristaltic and Rinse), pHuture® Conversion Box, Wine Master®, 607 Switchbox, rf link™, AQUAfast® II Colorimeters, Vacuum Degasser and Flowmeter.
- Orion EZ Flash® GC Accessory, Orion TEA Analyzer® 610 and 510 excluding consumable items carry twelve months warranty only.
- Orion Ion Selective Electrodes, ionplus® Electrodes, ROSS™ Electrodes, Sure-Flow® Electrodes, PerpHecT® Electrodes, AquaPro Professional Electrodes, No Cal™ pH electrodes, Standard Line pH Electrodes, Tris pH Electrodes, KNIpHE® electrode, ORP Triode™ (Orion 9180BN), pHuture™ pH Probes (Orion 616500) and pHuture MMS™ Quatrode™ and Triode™ (Orion 616600 and 617900), Orion 97-08 DO Probe, Series 100 Conventional Conductivity Cells, temperature probes and compensators (except those products noted).
- Orion 93 and 97 ionplus Series sensing modules are warranted to give six months of operation if placed in service before the date indicated on the package, except 93-07 and 97-07 Nitrate modules are warranted to give ninety days of operation if placed in service before the date indicated on the package.

**Six months from date of purchase by the user (or twelve months from date of shipment from Thermo)**

- Orion Flash Titration™ Probe (Orion 092518), pHuture™ Electrode (Orion 615700), pHuture MMS™ Pentrode™ (Orion 617500), Quatrode™ (Orion 617800) and Triode™ (Orion 615800), Low Maintenance Triode™ (Orion 9107BN), ORP Low Maintenance Triode™ (Orion 9179BN), and PerpHect® Low Maintenance Triode™ (Orion 9207BN), Waterproof Triode™ (Orion 9107WP, 9107WL, 9109WL and 9109WP), QuiKcheK® Meters and Micro Electrodes.

**Three months from date of purchase by the user (or six months from date of shipment from Thermo)**

- Economy Line Electrodes, Orion 91-05, 91-06, 91-15, 91-16, 91-25, 91-26, 91-35, 91-36, 92-06. Warranty also includes failure for any reason (excluding breakage), except abuse, provided the electrode is not used in solutions containing silver, sulfide, perchlorate, or hydrofluoric acid; or in solutions more than one (1) Molar in strong acid or base at temperatures above 50 °C.

**“Out-of-Box” Warranty - Should any of the following products fail to work when first used, contact Thermo immediately for replacement.**

- Orion Solutions, Standards, Reagents, Cables, Ferrules, Tubing, Line adapters, Printers, Software, Cases, Stands, Probe Membranes, AQUAfast® Test Strips, EZ Flash® columns, Liquid Handling Probes, Adapter Plates and Racks and general accessories.

For products in the catalog not listed in this warranty statement, please visit our website at: [www.thermo.com](http://www.thermo.com)

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# ORDERING INFORMATION

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## Electrodes

<b>Orion No.</b>	<b>Description</b>
8202BN	PerpHecT® ROSS® Combination pH Electrode, 0 - 14 pH, glass body
8203BN	PerpHecT ROSS semi-micro Combination pH Electrode, 0 - 14, glass body
8235BN	PerpHecT ROSS flat surface Combination pH Electrode, 0 - 14, epoxy body
8256BN	PerpHecT ROSS Combination pH Electrode, 0 - 14 pH, epoxy body
8263BN	PerpHecT ROSS Spear tip Combination pH Electrode, 0 - 14 pH, glass body

## Accessories

<b>Orion No.</b>	<b>Description</b>
927005	PerpHecT Epoxy Body ATC Probe
927006	PerpHecT Glass Body ATC Probe
927007	PerpHecT Stainless Steel ATC Probe
810007	ROSS Internal Filling Solution, 3 M KCl, five 50 mL bottles
910001	pH Electrode Storage Solution, 475 mL bottle
910104	pH 4.01 Buffer, 475 mL bottle
910107	pH 7.00 Buffer, 475 mL bottle
910110	pH 10.01 Buffer, 475 mL bottle
910410	perpHect <sup>®</sup> Buffer pH 4, 10 pk.
910425	perpHect Buffer pH 4, 25 pk.
910710	perpHect Buffer pH 7, 10 pk.
910725	perpHect Buffer pH 7, 25 pk.
910110	perpHect Buffer pH 10, 10 pk.
910125	perpHect Buffer pH 10, 25 pk.
911110	perpHect Electrode Rinse, 10 pk.
911125	perpHect Electrode Rinse, 25 pk.

# SPECIFICATIONS

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## pH Range

0 - 14

## Isopotential Point

pH 7

## Temperature Range

0 - 100 °C

## Standard Cap Diameter

16 mm

## Cap Length

30 mm

<b>Electrodes</b>	<b>Length (excluding cap)</b>	<b>Diameter</b>
8202	120 mm	12 mm
8203	165 mm	12 mm (12 mm section is 65 mm long)  6 mm (6 mm section is 100 mm long)
8235	120 mm	12 mm
8256	120 mm	12 mm
8263	110 mm	12 mm (12 mm section is 87 mm long)  4.5 mm (4.5 mm section is 23 mm long)

## NOTES

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## **Environmental Instruments**

Water Analysis

### **North America**

166 Cummings Center  
Beverly, MA 01915 USA  
Tel: 978-232-6000  
Dom. Fax: 978-232-6015  
Int'l. Fax: 978-232-6031

### **Europe**

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England, CB6 2HY  
Tel: 44-1353-666111  
Fax: 44-1353-666001

### **Far East**

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Wanchai, Hong Kong  
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**For updated contact information, visit [www.thermo.com](http://www.thermo.com)**

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