IOTRODE™ Electrodes

Laboratory Ion Selective Electrodes & Accessories

Laboratory Organic Ion Selective Electrodes

Most complete line of organic membrane industrial grade ion selective electrodes offered anywhere. Offering many ions not available from any other manufacturers such as: Lithium, Barium, Carbonate, Nitrite and many others. Also offering superior detection limits and linear measurement ranges for many more common ions such as Sodium, Potassium, Calcium, Nitrate, Perchlorate and many others. **Revolutionary solid state manufacturing methods allow for ultra-thick ion sensitive membrane construction for significantly longer lifetime, and better performance under heavy and continuous use**.

Laboratory Reference Electrodes

Our line of refillable double & triple junction glass reference electrodes provides the most accurate potential for low and ultra-low levels measurements and measurements with complex ionic backgrounds. Silver / Silver Chloride reference system outputs values that correlate readily to our integrated (combination) industrial ion selective sensors.

Laboratory Solid State Ion Selective Electrodes

Offering a complete line of solid state ion selective electrodes including Chloride, Bromide, Iodide, Sulfide, Silver, Cyanide and many others. **Our unique manufacturing technology provides the lowest detection limits in the industry, often required for many intensive analytical determinations. Revolutionary solid state manufacturing methods allow for ultra-thick ion sensitive membrane construction for significantly longer lifetime, and better performance under heavy and continuous use.**

Laboratory ISE Instrumentation

2100 Lab Meter

Display and calibrate in ppm, ppt, % or any other units of your choice. RS-232 output: sends data to printer or PC on programmed time intervals, when reading is stable, or manually. Perfect for the continuous logging of data for research projects. Lightweight and portable design is also ideal for mobile installations.

Advanced Sensor Technologies, Inc. 603 North Poplar Street, Orange, CA 92868-1011
Tel.: (714) 978-2837, Fax: (714) 978-6339 Website: www.astisensor.com IOTRON™ Trademark of ASTI

IOTRODE™ Electrodes

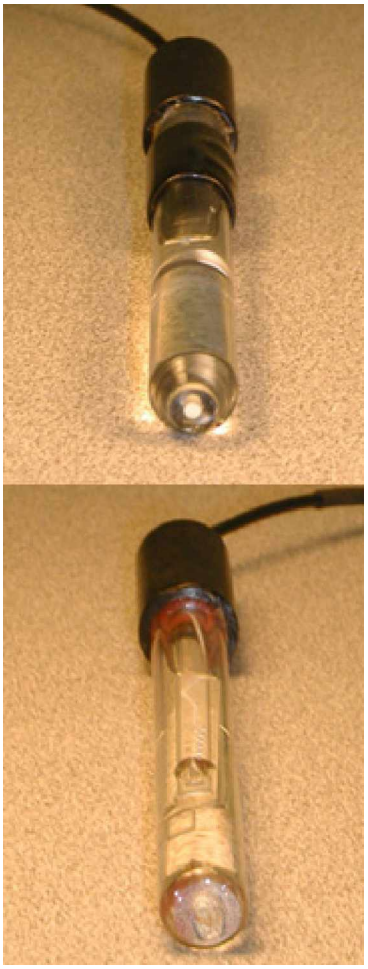
Laboratory Ion Selective Electrodes & Accessories

Iotrode ™ Industrial Grade Ion Selective Electrodes for Laboratory Use

Iotrode™ Organic Membrane & Solid State Ion Selective Electrodes

- Specially Engineered Organic Membrane give the best detection limits, selectivities and stability for a wide range of cations and anions - Can be stored dry for many models, inquire to ASTI to details
- Lowest Detection Limits in the industry for trace analysis
- All Models can be stored dry for prolonged periods of time
- Excellent low drift characteristics and good performance over a broad range of temperatures
- Most solid state membranes can be repolished to restore electrode performance to optimum after physical damage to crystal. Inquire to ASTI for technical details.

Iotrode ™ Industrial Grade Reference Electrodes for Laboratory Use



Iotrode ™ Double & Triple Junction Reference Electrodes:

- Glass construction ensures chemical resistance to a wide range of media. Plastic bodied construction is specially suited for fluoride and silver media.
- Large Porous Ceramic ensures good solution contact with little fouling
- Flowing Refillable System Option Ensures Maximum Accuracy for many different measurement applications
- Immobilized Reference offers best lifetime and performance in lab through impregnated nonporous cross linked conductive polymer, for low maintenance laboratory needs
- Double & Triple Junctions ensure low drift, long service lifetime and maximum possible accuracy

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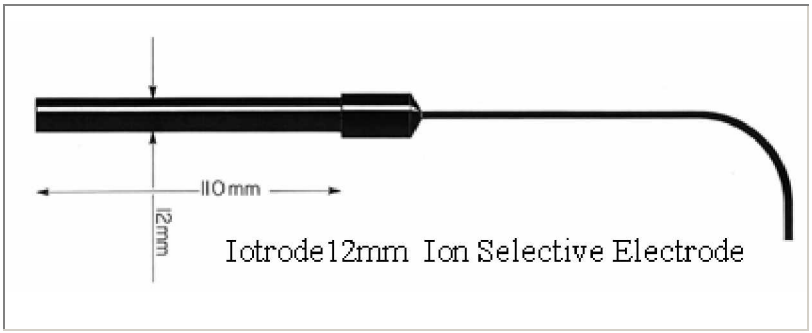

Iotrode ™ Organic Membrane Ion Selective Electrode Selection Guide

Ion Measured	Model Number	Interfering Ions*** See General Specs for Details	Iotrode™ Reference Electrode	Lowest + Limit of Detection	Linear Measurement Range	pH Range
Potassium (K^+)	AB 400	Na^+ ($4X10^3$), Li^+ ($4X10^3$), NH_4^+ (60), Mg^{+2} ($5X10^5$), Ca^{+2} ($1.5X10^4$)	RC 401 RC 501	$5X10^{-7}$ Molar .0200 ppm	1 - $5X10^{-6}$ Molar 39,000 - 0.195	2 - 12
Ammonium (NH_4^+)	AB 410	Na^+ ($5X10^3$), K^+ (5), H^+ ($1X10^5$)	RC 401 RC 501	$2X10^{-7}$ Molar .004 ppm	0.1 - $5X10^{-6}$ Molar 1,800 - 0.090 ppm	2 - 10
Amines (Salt) ($R\text{-}NH_3^+ Cl^-$)	AB 420	**Inquire to Factory**	RC 401 RC 501	10^{-5} Molar as n-hexyl-ammonium-chloride	0.1 - $5X10^{-5}$ Molar as n-hexyl-ammonium-chloride	6 - 8
Sodium (Na^+)	AB 430	Li^+ (10^2), K^+ (300), Mg^{+2} ($1.5X10^2$), Ca^{+2} ($6X10^2$)	RC 401 RC 501	$5X10^{-7}$ Molar .020 ppm	1 - $5X10^{-6}$ Molar 40,000 - 0.200 ppm	2.5 - 11
Calcium (Ca^{+2})	AB 440	Na^+ (10^2), K^+ (167), Mg^{+2} ($5X10^3$)	RC 401 RC 501	$5X10^{-7}$ Molar .020 ppm	1 - $5X10^{-6}$ Molar 40,000 - 0.200 ppm	2.5 - 11
Magnesium (Mg^{+2})	AB 450	Na^+ ($3X10^4$), K^+ ($2X10^3$), Ca^{+2} (20)	RC 401 RC 501	$5X10^{-7}$ Molar .012 ppm	1 - $5X10^{-6}$ Molar 24,300 - 0.121 ppm	2.5 - 11
Nitrate (NO_3^-)	AB 470	ClO_4^- (10^{-3}), ClO_3^- (0.2), Br^- (6.7), Cl^- (10^2), HCO_3^- (10^{-1}), $H_2PO_4^-$ (10^3), F^- (10^3)	RC 401 RC 501	$5X10^{-6}$ Molar .310 ppm	1 - 10^{-5} Molar 62,000 - 0.620 ppm	2 - 12

Perchlorate (ClO_4^-)	AB 480	NO_3^- (0.5), ClO_3^- (0.2), Br^- (0.4), Cl^- (20), HCO_3^- (20), $H_2PO_4^-$ (20), F^- (20)	RC 401 RC 501	$5X10^{-6}$ Molar .500 ppm	$1 - 10^{-5}$ Molar 100,000 - 1.0 ppm	2 – 12
Lithium (Li^+)	AB 490	Na^+ (250), K^+ (200), Mg^{+2} ($2X10^4$), NH_4^+ ($1X10^3$)	RC 401 RC 501	$1X10^{-6}$ Molar 0.007 ppm	$0.1 - 6X10^{-6}$ Molar 700 - 0.042 ppm	2 - 12
Barium (Ba^{+2})	AB 500	H^+ (30), Li^+ ($1.5X10^3$), Na^+ (300), Cs^+ (550), K^+ (300), NH_4^+ (1250) Mg^{+2} ($5X10^7$), Ca^{+2} (50)	RC 401 RC 501	$3X10^{-5}$ Molar 4.11 ppm	$0.1 - 3X10^{-4}$ Molar 13,700 - 41.1 ppm	4 - 7
Cadmium (Cd^{+2})	AB 510	K^+, Na^+, Cu^{2+}, Ni^{2+}, Pb^{2+}, Ca^{2+} Co^{2+}, Mg^{+2}, Zn^{+2}, Al_3^+, NH_4^+ Mn^{+2}, Fe^{+2}, Cs^+, Li^+, Ba^{+2} (approximately 10^3 for all ions listed)	RC 401 RC 501	10^{-5} Molar 1.12 ppm	$10^{-2} - 5X10^{-5}$ Molar 1,120 - 5.6 ppm	3 - 6
Lead (Pb^{+2})	AB 530	Hg^{2+} (0.25), Ag^+ (0.32), Cu^{2+} ($2X10^3$), Na^+ ($3.1X10^3$) Li^+ ($3.1X10^3$), Cd^{2+} ($5X10^3$) NH_4^+ (10^4)	RC 401 RC 501	$3X10^{-7}$ Molar 0.062 ppm	$1.6X10^{-2} - 10^{-6}$ Molar 3,315 - 0.207 ppm	3 - 6
Silver (Ag^+)	AB 540	Hg^{2+} (200), K^+ ($6.3X10^4$), Na^+, Cu^{2+}, Ni^{2+}, Pb^{2+}, Ca^{2+} ($8X10^4$) Sr^{2+} (10^5), Co^{2+} ($4X10^5$) Mg^{+2} ($2X10^5$), Zn^{+2} ($4X10^5$) Cd^{2+} ($2.5X10^5$)	RC 601	$3X10^{-7}$ Molar 0.033 ppm	$0.1 - 10^{-6}$ Molar 10,790 - 0.108 ppm	2.5 - 8.5 in $AgNO_3$
Cesium (Cs^+)	AB 560	H^+ (500), Li^+ ($2.5X10^4$), Na^+ (5000), Rb^+ (30), K^+ (300), NH_4^+ (600) Mg^{+2} (10^5), Ca^{+2} (10^5)	RC 401 RC 501	10^{-5} Molar 1.33 ppm	$0.1 - 3X10^{-5}$ Molar 13,290 - 3.99 ppm	2 - 12
Carbonate (CO^{-3})	AB 600	SCN^- (0.4), Cl^- (10^5), Br^- ($6.6X10^3$), Salicylate (.0005), HPO_4^- ($8X10^4$), NO_3^- (40) SO_4^- ($1.25X10^5$)	RC 401 RC 501	Application Dependent **Inquire to Factory**	Application Dependent **Inquire to Factory**	Application Dependent
Chloride (Cl^-)	AB 610	Br^- (1), SCN^- (1.5), Salicylate (2.5), HCO_3^- ($3.1X10^5$), HPO_4^- ($8X10^5$), SO_4^- ($2X10^6$), F^- ($4X10^5$), Acetate ($1.25X10^5$), NO_3^- ($1.5X10^3$), ClO_3^- (65)	RC 401 RC 501	10^{-5} Molar .355 ppm	$10^{-1} - 5X10^{-5}$ Molar 3,545 - 1.772 ppm	2 - 12

Nitrite (NO_2^-)	AB 620	SCN^- ($1.5X10^3$), Benzoate ($1X10^4$), Acetate ($1X10^4$), Salicylate (250), HCO_3^- ($1X10^4$), Cl^- ($1X10^4$), NO_3^- ($1X10^4$)	RC 401 RC 501	$5X10^{-6}$ Molar .230 ppm	10^{-1} - 10^{-5} Molar 4,600 - .460 ppm	2 – 10
Hydronium (H_3O^+ - pH)	AB 650	Na^+ (10^{10}), K^+ (10^{10}), Ca^{+2} (10^{10}) Excellent Selectivity in biological media	RC 401 RC 501	N/A	N/A	6 - 8
Tetrafluoro Borate (BF_4^+)	AB 660	ClO_4^- (0.5), SCN^- (2.2), I^- (2.3), ClO_3^- (7.6), NO_3^- (40), Br^- (120), CN^- (125), NO_2^- (130), Cl^- (650), CO_3^- (11,500), HPO_4^- (21,000), SO_4^- (22,000)	RC 401 RC 501	$2.2X10^{-6}$ Molar .191 ppm	10^{-1} - 10^{-5} Molar 8,680 - .868 ppm	3 - 11.5

Guide Notations for 12mm Ion Selective Electrodes:

***Interfering Ions are expressed in ratios of permissible excess. The value defines the point at which the response to the interfering ion is more than one standard deviation of the measured ion.

+ This ratio is defined by the following quotient: (Concentration of Interfering Ion in Molarity / Concentration of Measured Ion in Molarity)

The lowest limit of detection and linear measurement range are expressed in units of Molarity followed by the equivalents in units of parts per million (ppm)

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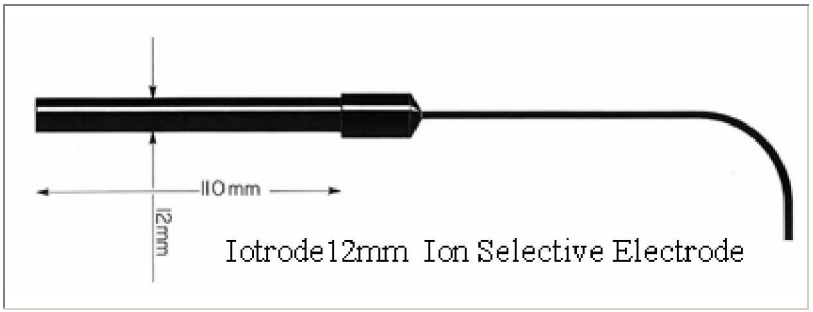
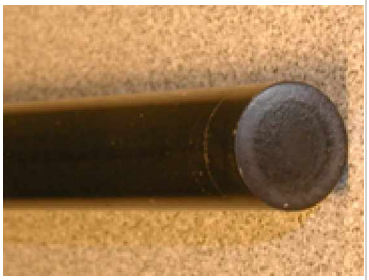
IOTRODE™ Electrodes

Laboratory Ion Selective Electrodes & Accessories



Iotrode ™ Solid State Membrane Ion Selective Electrode Selection Guide



Ion Measured	Model Number	Interfering Ions*** See General Specs for Details	Iotrode™ Reference Electrode	Lowest + Limit of Detection	Linear Measurement Range	pH Range
Fluoride (F^-)	AB 100	OH^- (10)	RC 601	$5X10^{-8}$ Molar .001 ppm	Saturated - 10^{-6} Molar Saturated - 0.019 ppm	0 - 13
Chloride (Cl^-)	AB 110	OH^- (80), Br^- ($3X10^{-3}$), I^- ($5X10^{-7}$), S^{2-} (Trace)	RC 401 RC 501	$3X10^{-6}$ Molar .105 ppm	1 - 10^{-5} Molar 35,000 - 0.350 ppm	2 - 11
Sulfide (S^-)	AB 120	Hg^{2+} (Trace)	RC 501	10^{-17} Molar $3.2X10^{-13}$ ppm	1 - 10^{-7} Molar 32,000 - 0.003 ppm	11 - 13
Bromide (Br^-)	AB 130	OH^- ($3X10^4$), Cl^- (400), I^- ($2X10^{-4}$), S^{2-} (Trace)	RC 401 RC 501	$5X10^{-7}$ Molar .040 ppm	1 - 10^{-6} Molar 80,000 - 0.080 ppm	1 - 12
Iodide (I^-)	AB 140	OH^- (10^8), Cl^- (10^6), Br^- ($5X10^3$), S^{2-} (Trace)	RC 401 RC 501	10^{-8} Molar .001 ppm	1 - $5X10^{-8}$ Molar 127,000 - 0.006 ppm	1 - 13
Thiocyanate (SCN^-)	AB 150	OH^- ($3X10^4$), Cl^- (400), I^- ($2X10^{-4}$), S^{2-} (Trace)	RC 501	$5X10^{-7}$ Molar .029 ppm	1 - $5X10^{-6}$ Molar 58,000 - 0.290 ppm	2 - 10
Cyanide (CN^-)	AB 160	OH^- (10^8), Cl^- (10^6), Br^- ($5X10^3$), S^{2-} (Trace)	RC 501	10^{-7} Molar .002 ppm	10^{-2} - $5X10^{-7}$ Molar 260 - 0.013 ppm	11 - 13
Silver (Ag^+)	AB 170	Hg^{2+} (Trace)	RC 601	10^{-17} Molar $1.1X10^{-12}$ ppm	1 - 10^{-7} Molar 107,900 - 0.011 ppm	1 - 13

Guide Notations for 12mm Ion Selective Electrodes:

***Interfering Ions are expressed in ratios of permissible excess. The value defines the point at which the response to the interfering ion is more than one standard deviation of the measured ion.

+ This ratio is defined by the following quotient: (Concentration of Interfering Ion in Molarity / Concentration of Measured Ion in Molarity)

The lowest limit of detection and linear measurement range are expressed in units of Molarity followed by the equivalents in units of parts per million (ppm)

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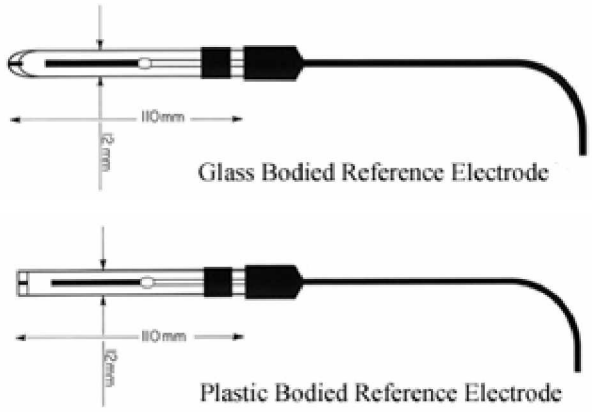
Iotrode ™ Industrial Grade Reference Electrodes for Laboratory Use



Iotrode™ Double & Triple Junction Reference Electrodes:

- Glass construction ensures chemical resistance to a wide range of media. Plastic bodied construction is specially suited for fluoride and silver media.
- Large Porous Ceramic ensures good solution contact with little fouling
- Flowing Refillable System Option Ensures Maximum Accuracy for many different measurement applications
- Immobilized Reference offers best lifetime and performance in lab through impregnated nonporous cross linked conductive polymer, for low maintenance laboratory needs
- Double & Triple Junctions ensure low drift, long service lifetime and maximum possible accuracy

Iotrode ™ Reference Electrode Selection Guide

Reference Electrode Type	Model Number	Filling Solution (s) *Primary* *Secondary* *Tertiary (if applicable)*	Temperature Range ° Celsius	Material of Construction	Special Notes
Immobilized Gel Double Junction	RC 301	Saturated KCl Saturated KCl Not Applicable	-25 - 65 Continuous, Maximum (-30 - 85) Intermittent	Glass	For Low Maintenance Laboratory Measurements Low Temperatures
Flowing Refillable Double Junction	RC 401	Saturated KCl Saturated KCl or KNO_3-Refillable Not Applicable	-5 - 100 Continuous	Glass	Suitable for Most ISE Measurements
Flowing Refillable Triple Junction	RC 501	Saturated KCl Saturated KCl/KNO_3 Application Dependent - Refillable	-5 - 100 Continuous	Glass	Best Reference for Most ISE Measurements
Flowing Refillable Double Junction	RC 601	Saturated KCl Saturated KCl or KNO_3-Refillable Not Applicable	5 - 70 Continuous	Plastic	Suitable for Most ISE Measurements Recommended for fluoride and silver

12mm Laboratory Organic & Solid State Membrane Ion Selective Electrodes

General Specifications for 12mm Organic Ion Selective Electrodes:

- Electrodes are manufactured with 1 meter of cable and BNC Connector. No other options are available at this time. See above drawing for dimension details of ISE electrodes.
- Organic Membrane Electrodes are manufactured with rigid PVC bodies.
- Electrodes are manufactured with 16mm caps.
- Organic Membrane Electrodes are rated to 5 - 40° Celsius Continuous, Maximum 0 - 60° Celsius Intermittent
- Standard Shelf Life is 1 year from date of manufacture.
- ***Interfering Ions are expressed in ratios of permissible excess. The value defines the point at which the response to the interfering ion is more than one standard deviation of the measured ion. This ratio is defined by the following quotient:
(Concentration of Interfering Ion in Molarity / Concentration of Measured Ion in Molarity)
- The lowest limit of detection and linear measurement range are expressed in units of Molarity followed by the equivalents in units of parts per million (ppm)

General Specifications for 12mm Solid State Ion Selective Electrodes:

- Electrodes are manufactured with 1 meter of cable and BNC Connector. No other options are available at this time. See above drawing for dimension details of ISE electrodes.
- Solid State Membrane Electrodes are manufactured with Ryton (PPS) bodies.
- Electrodes are manufactured with 16mm caps.
- Solid State Membrane electrodes are rated to 5 - 50° Celsius Continuous, Maximum -5 - 100° Celsius Intermittent
- Standard Shelf Life is 1 year from date of manufacture.
- ***Interfering Ions are expressed in ratios of permissible excess. The value defines the point at which the response to the interfering ion is more than one standard deviation of the measured ion. This ratio is defined by the following quotient:
(Concentration of Interfering Ion in Molarity / Concentration of Measured Ion in Molarity)
- The lowest limit of detection and linear measurement range are expressed in units of Molarity followed by the equivalents in units of parts per million (ppm)

12mm Laboratory Reference Electrodes

General Specifications for 12mm Reference Electrodes:

- Electrodes come complete with 1 meter of cable and standard Reference Pin Connector. No other options are available at this time. See above drawing for dimension details of reference electrodes.
- Glass construction reference electrode are manufactured with Pyrex Glass Bodies and Large Surface Porous Ceramic Junctions. Plastic construction reference electrode are manufactured with PVC bodies and large surface Porous Ceramic Junctions.
- Reference Model RC 301 is only recommended for applications where ease of use and convenience (non-refillable immobilized gel system) are the primary requirement of the application. For maximum accuracy, reference model RC 401, 501 & 601 should be employed.
- The standard pH range for All Reference Electrodes is 0-14.
- Reference Electrodes use Ag/AgCl Half-Cells.
- Reference Electrodes come standard with 16mm Caps.
- Standard Shelf Life is 1 year from date of manufacture.
- Make sure to review the recommended reference electrode for the ion selective measurement that will be performed.

Bench top Laboratory Ion Selective / pH / ORP / mV Meters

Model 2100 Bench top Laboratory ISE / pH / ORP / mV Meter

Selectable 0.001/0.01 pH resolution with ±0.002/0.01 pH accuracy!

- Two line, dot matrix scrolling display provides clear instructions for setup and calibration
- Ion concentration mode offers direct display of ion readings in ppm, ppt, % or any other units of your choice
- RS-232 output: sends data to printer or PC on programmed time intervals, when reading is stable, or manually
- Calculates and displays slope/offset of electrode automatically; check electrode quality and conform to standard test method quality checks
- Calibration alarm signals when meter needs recalibration—user-defined interval ensures regularly scheduled recalibration
- Real-time clock stamps stored and calibration data with date and time—suitable for GLP documentation

2100 Lab Meter

General Specifications for Model 2100 Laboratory Meters:

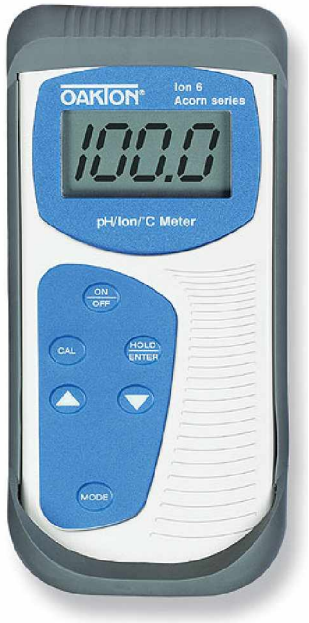
- Use the pH 2100 meter to document large volumes of critical ISE, pH or mV data sets. Large dot matrix display shows pH, ion or mV reading plus temperature (°C). Meter sends measurements to a printer or PC with the touch of a button, or on timed intervals. Free software allows you to download data to your computer in a format easy to import into spreadsheet programs.
- Customize up to five pH calibration points, or select standard NIST or US Standard buffer sets. Meter displays last calibration date and time.
- Meter features a built-in clock with timer and alarm. Other features include memory of up to 50 readings with date and time, selectable manual or Automatic Temperature Compensation (ATC), analog recorder output and a selectable "Ready" function.
- Detachable electrode holder arm holds electrodes firmly in place. Includes instruction card that stores underneath meter for quick reference. 110/220 VAC.

Model 2100 Ion Selective / pH / ORP / mV Meter Complete Specifications

Measurements	pH	mV's	ISE	Temperature	General
Measures: pH mV Relative mV Ion °C	pH Range: -2.000 to 16.000 pH pH Resolution: 0.001/0.01 pH pH Accuracy: ±0.002/0.01 pH pH Calibration: Up to 5 customizable calibration points, or USA or NIST standard buffer sets	mV Range: ±1800.0 mV mV Resolution: 0.1 mV mV Accuracy: ±0.2 mV	Ion Range: 0.000 to 19900 Ion Resolution: ± least significant digit Ion Accuracy: ±0.5% of the reading	Temperature Range: -5 to 105°C Temperature Resolution : 0.1 °C Temperature Accuracy: ±0.5°C	Memory: up to 50 readings with date and time RS-232: Yes Dimensions:9" x 7" x 2.4" (23 x 18 x 6 cm) Shipping weight: 3.0 lb (1.4 kg)

IOTRON™
PORTABLE pH / ORP / Ion METER SPECIFICATIONS

Acorn™ Ion 5 and Ion 6 Meters



- Direct readout of ion concentration units
- mV measurement mode allows you to check electrode performance.
- Compact size fits right in pocket.
- ±500 mV range is compatible with almost all ISE electrodes.

These rugged, economical meters are very easy to use. Choose from two models. Both feature hold and auto-off functions, splash-resistant keypad and large LCD.

Meters include four AAA batteries, instructions, and a protective rubber boot which offers sturdy protection for meter and acts as meter stand for benchtop use.

Ion 6 Meter Kit includes the Ion 6 meter, pH electrode, ATC probe, rubber boot, buffer pouches, solution bottles, 500-mL rinse bottle, four AAA batteries, instruction and hard carrying case.

Type		Meter only
Model		Ion 6
Range	pH	0.00 to 14.00 pH
	mV	500 to +500 mV
	ion	0.01 to 1999 ppm
	Temperature	0.0 to 100.0°C
Resolution	pH	0.01 pH
	mV	1 mV
	ion	0.01 ppm (0.1 to 199.9 ppm) |1 ppm (200 to 1999 ppm)
	Temperature	0.1°C
Accuracy	pH	±0.01 pH
	mV	±1 mV
	ion	±0.5%
	Temperature	±0.5°C
Calibration		Up to 3: pH; 4.01; 7.00; 10.00 (pH)
Output		Ion/pH/mV/temp
Display		3 1/2-digit LCD
Battery life		200+ hours continuous

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