

Electrode Handbook

pH

EUTECH
INSTRUMENTS
Technology Made Easy ...

Ag⁺

Na⁺

Ca²⁺

CO₂

F⁻

Li⁺

Fe²⁺

How Eutech Instruments

makes technology easy...

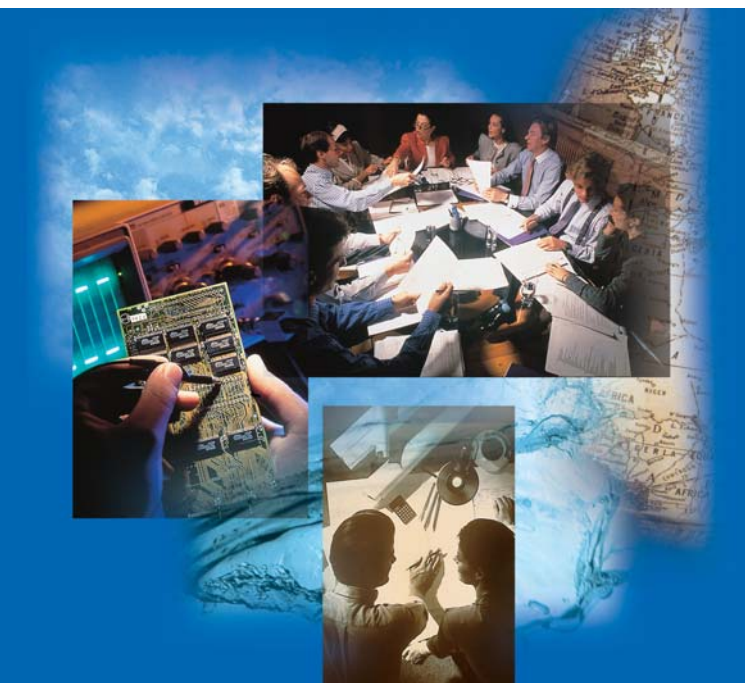


Background

Established in 1990, Eutech Instruments is a dynamic ISO9001-certified company dedicated to developing sensor-based instrumentation for water quality analysis and is rapidly positioning itself as a leader in the field of electrochemical instrumentation. A pioneer in developing ASIC-based (Application Specific Integrated Circuit) instruments, Eutech Instruments has gained international awards and recognition for its achievements in sensor technology, software programming and product design. Eutech Instruments currently manufactures several instruments which incorporate proprietary patents and trademarks.

Accurate, consistent, reliable

Underlying its strong commitment to Research and Development, is the constant drive by its team of scientists and engineers to apply new, emerging technologies to the design and manufacture of advanced instruments that are **accurate, consistent** and **reliable**. Eutech Instrument's R&D team simplifies technological procedures in the laboratory and in the field, and thrives on meeting new technological challenges.



The result is the creation of a unique line of microprocessor-based instruments and chemical sensor systems. Eutech Instruments offers a comprehensive range of laboratory and field instrumentation for water analysis and continuous on-line process instruments for the monitoring and control of pH, Total Dissolved Solids (TDS), Conductivity, Redox Potential (ORP), Dissolved Oxygen (DO), Temperature and Ion Concentration Analysis. Eutech Instruments' product portfolio includes pocket-size testers, hand-held and bench-top meters, and industrial process controllers packed with advanced and user-friendly features.

Eutech Instruments' line of products meets tomorrow's needs today. By manufacturing more than a hundred different products, in several market segments, Eutech Instruments has rapidly established itself as a manufacturer of quality products at competitive prices. Having an extensive product line has won Eutech Instruments the renowned Frost & Sullivan Engineering Award 2001 for Best Product Line Strategy which credits the

company for demonstrating the most insight into customer needs and product demands.

Eutech Instruments' global reach

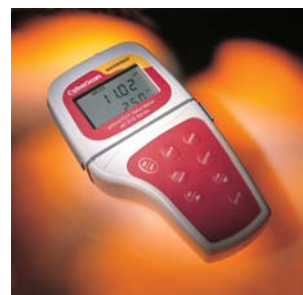
Consistently supporting its valued customers and end-users alike, Eutech Instruments' products are marketed in over fifty countries worldwide, through an extensive network of distributors and associated companies. Eutech Instruments products are certified to comply with global testing standards for electromagnetic emission and interference in Europe, Australia and New Zealand. Increasing global concern for water quality is constantly expanding the length and breadth of Eutech Instruments' markets. Having forged close links with clients and strategic partners. Eutech Instruments' strategy for the coming millennium is to better meet its objective of providing industry the know-how to realize the potential of advanced technologies in the field of electrochemical instrumentation. The formation of partnerships and strategic alliances with research institutions, government agencies and private sector firms worldwide allows Eutech Instruments to adopt a proactive stand in anticipating the needs of industry, and to incorporate state-of-the-art features in the design and manufacture of instrumentation. These efforts are in keeping with Eutech Instruments' underlying mission, to make technology easy to use by producing leading edge instrumentation. Currently Eutech Instruments owns two manufacturing facilities in Singapore and Malaysia. Eutech Instruments Singapore has a full-fledged value-chain operation which comprises manufacturing, logistics, marketing, R&D and customer service for worldwide support to customers and vendors.





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1.0 Introduction to pH measurement

1.1 Basic theory and application of pH measurement

pH refers to the power or exponent of hydrogen where 'p' stands for power and 'H' is the symbol of the element Hydrogen.

pH is defined as the negative logarithm of the molar concentration of the active hydrogen ions, $pH = -\log H^+$.

pH provides a convenient way to compare the relative acidity or alkalinity of a sample at a given temperature. For example, pure water has a neutral pH of 7, where the activities of hydrogen and hydroxide ions are equal. If the activity of hydrogen ion is greater than that of hydroxide ion the sample is described as acidic. In general, as the level of hydrogen ion activity increases, the pH decreases. A pH below 7 is known as acidic. On the contrary, as the level of hydrogen ion activity decreases, the pH increases. A pH above 7 is known as alkaline or basic.

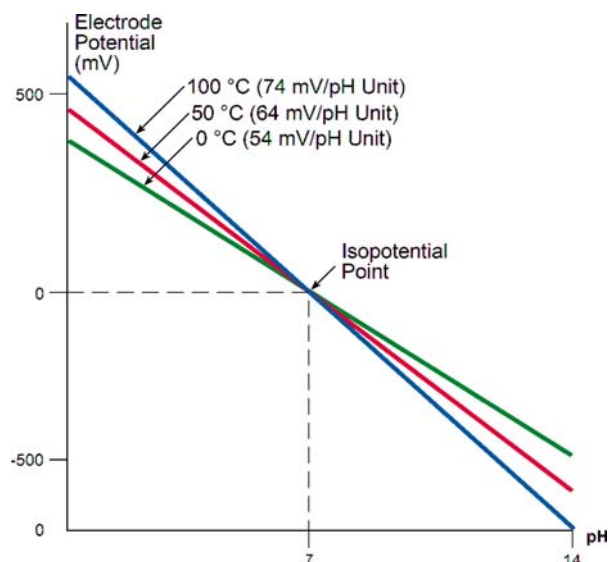
1.2 Use of electrodes for pH measurement

pH measurement is usually done with the use of a combination electrode. The combination electrode is an electrode system formed by a glass sensing half-cell and an internal reference half-cell. As the reference junction acts as the medium of conductor between the reference electrolyte and the sample to be measured, it must allow free movement of electrons through the junction and into the sample. A potential develops on the membrane surface when a pH electrode comes into contact with a sample and its value varies with the pH of the sample. This variation in potential is measured in mV by a meter and is converted to direct pH values.

1.3 Slope

The 'slope' is the voltage produced per pH. In theory, the value is 59.12mV per pH at 25°C. Practically, the value ranges between 50 and 58 mV.

1.4 Influence of temperature on pH measurement



Temperature variations can affect pH. However at a certain pH, usually 7, temperature will not have an effect on the potential of the system. This is known as the 'isopotential point'.

If automatic compensation is not practical, the following equation can be used to determine error:
Magnitude of error = $-0.003 \text{ pH}/^\circ\text{C}/\text{pH unit from pH7}$

Note: The temperature compensation here refers to electrode related temperature variation and not solution related variations.





2.0 pH electrodes

2.1 Selection criteria

Eutech combination electrodes offer the convenience of having the reference and measuring electrodes combined in a single housing. They are offered in a variety of configurations to suit most laboratory and field application needs.

Refillable vs Sealed Design

	Refillable Design	Sealed Design	
	Refill hole allows reference electrolyte replenishment.	No refill hole. The reference electrolyte is usually a gel.	
	Can be used many times over.	Replacement of the electrode is necessary when it gets contaminated.	
	Has to be refilled when fill solution is low.	Virtually no maintenance is required.	

Reference Construction

Refillable Reference Cell

Selected for high accuracy, stability, and longer electrodes life. Refillable types sacrifice convenience and ease of maintenance.

Sealed Reference Cell

Sealed gel-filled reference electrodes are designed for convenience where minimal maintenance is required. Slightly lower accuracy and shorter life must be taken into account.

Patented Twist-Cap Design

Unlike conventional designs using rubber sleeves, Eutech's 620 series refillable electrodes feature patented refill-hole with twist-cap design; easy-to-use and leak-proof. Refilling of reference electrolyte is hassle-free and quick with no wastage.



Twist-open the cap to expose the refilling hole.



Pour in reference electrolyte with the refilling bottle (that is supplied with all electrodes)



Twist-close the cap.



Glass vs Plastic Body

Glass Body	Plastic Body
Glass withstands high temperatures of 100°C or more.	Not recommended for temperatures above 80°C.
Resistant to corrosive materials and solvents.	Moderate resistance to highly corrosive materials and solvents.
Fragile and breaks easily.	Durable and withstands rough handling.
Good for laboratory use and is easy to clean.	Good for field use because it is tough and hard to break.

Electrode Construction

Glass Body Electrodes

Ideally suited for most routine pH measurements for accuracy, high temperature, and ease of cleaning.

Epoxy Body Electrodes

A good choice for applications where rough handling and breakages are a problem.

Single vs Double Junction

Single Junction	Double Junction
Ideal for general purpose applications.	Prevents interference between the inner fill solution and sample.
Ag ⁺ ions are in contact junction and this can cause chemical interaction with sulphur. Not suitable for biological samples or tris buffers.	Electrolyte is free of Ag ⁺ ions. Suitable for use with biological samples. Can be used instead of calomel reference electrodes.

Internal Reference Types

Calomel Reference (Hg/Hg₂Cl₂)

Calomel reference electrodes can give potentials accurate to within 1/100 millivolt. Both its reproducibility and potential stability are superior to those of the Ag/AgCl electrode, although only at a constant and relatively low temperature. Calomel is subject to a constant and relatively low temperature fluctuation with a temperature limitation of 80°C. Calomel is recommended for clinical measurement and samples containing protein, tris buffers, and for high purity water applications.





Silver/Silver Chloride Reference (Ag/AgCl)

Ag/AgCl reference electrodes are largely hysteresis-free and can be used at higher temperatures with lower temperature coefficients. Ag/AgCl is the best general purpose reference with a wide temperature range (-5 to 110°C).

Double Junction



A double junction reference is constructed with an Ag/AgCl inner chamber and a chemically compatible reference solution in the outer chamber. It is recommended for samples containing organic compounds, proteins, heavy metals, and other compounds that interact with silver, such as bromides, iodides, cyanides. and sulfides.

Types of Reference Junctions

Annular Junction Fast electrode response. 	Porous HDPE Junction Low electrolyte flow hence more durable. 	Flushable Junction Cleanses by pumping out electrolyte to remove residue thus eliminating clogging problems in viscous samples. 	Open pore Junction About 200 times larger than ceramic junctions, ensures increased electrolyte flow for stable junction potential. 
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General Purpose vs Specialty Applications

Most electrodes come in different stem lengths and diameters for specific applications.

 General Purpose Applications Usually measures 120mm (length) by 12mm (diameter) and can be used for general applications.	Specialty Applications Effective for specific applications. For instance the spear tip sensor can be used for the direct pH testing of semi-solids and soft materials. Sleeve type electrode ensures high electrolyte flow so it is ideal for low ionic strength and viscous sample measurements. On the other hand, a flat surface tip electrode is used for flat samples like paper or cloth. Micro-stem electrode fits into thin stem NMR tubes or small vessels. For harsh use, a durable tough bulb electrode that is resistant to breakage might be recommended. 
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Reference Junctions

Some glass combination electrodes feature an anti-fouling annular ceramic junction. The annular junction is formulated with a special ceramic which encircles the glass bulb. Numerous pores in the ceramic provide lower resistance and more stable pH readings. The plastic body combination electrodes come standard with a specially formulated porous ceramic plug junction. Sleeve junction provides the highest flow rate for difficult samples.

Membrane Glass Types

X-1 is especially suited for low temperature, nonaqueous solutions and pH measurements under 12.

X-2 is best suited for most pH measurements where minimal or no Na^+ is present. It is a low-resistant glass with a very fast and stable response and is designed for pH ranges of 0 to 13 and temperatures of 0°C to 135°C .

X-3 is especially formulated for continuous, long-term use at high temperatures, particularly in strong alkaline solutions above pH 11. It experiences negligible Na^+ ion error above 13 pH. The impedance of the glass is much higher than other glasses, and a slower response will be experienced at room temperature and below. Response time will increase as the temperature is elevated.

2.2 Electrodes – Selection Guide

Application Code	Description
A	General purpose, aqueous pH measurements. Quality control, general laboratory and aquarium water.
B	Tris buffers, clinical, and biological media containing proteins, creams, fats and cosmetics.
C	Research measurements, fruit juices, beer, milk and yogurt.
D	High viscosity solutions such as emulsions, suspensions, paints and varnishes where frequent cleaning of the reference is necessary.
E	Non aqueous solutions. Must be used with special reference electrolyte EC-RE-015.
F	Low temperature measurements.
G	Low ionic strength solutions, such as high purity water.
H	High temperature measurements.
I	Surface measurements such as paper, skin, textile, leather and agar plates.
J	Solid or semi-solid samples such as cheese, meats, fruits, bread, or other similar sample.
K	Rugged use; Ruggedized electrode tip. Aqueous media in general.
L	Portable pH meter; Field and school use.

Glass Body Combination pH Electrodes

Code No	Glass Type	App. Code	pH Range	Temp. Range (°C)	Length x Dia (mm)	Internal Reference Element
EC-FG73504	X-2	A, F	0-13	0 to 100	110 x 12	Ag/AgCl Refillable
EC-FG73905	X-2	B, C, G	0-13	-5 to 80	110 x 12	Calomel Refillable
EC-FG73792	X-2	H, O	0-13	0 to 110	110 x 12	Ag/AgCl Double Junction Sealed
EC-FG73593	X-2	H	0-13	0 to 100	110 x 12	Ag/AgCl Sealed
EC-FG73701	X-2	E, O	0-13	0 to 100	110 x 12	Ag/AgCl Double Junction Refillable
EC-FG74519	X-3	H, T	0-14	5 to 110	110 x 12	Ag/AgCl Sealed
EC-FG43902	X-2	B, C, M	0-13	-5 to 80	55 x 4	Calomel Refillable
EC-FG63506	X-2	A, D	0-13	0 to 100	55 x 8	Ag/AgCl Refillable
EC-FG43902	X-2	B, C, M	0-13	-5 to 80	180 x 4	Calomel Refillable
EC-FG43904	X-2	B, C, M	0-13	-5 to 80	55 x 4	Calomel Refillable
EC-FG73521	X-2	Q	0-13	0 to 100	110 x 12	Ag/AgCl Refillable
EC-FG63511	X-2	J	0-13	0 to 100	25 x 8	Ag/AgCl Sealed
EC-FG53912	X-2	B, J	0-13	-5 to 80	25 x 6	Calomel Refillable
EC-FG52910	X-1	B, S	0-12	-5 to 80	55 x 6	Calomel Refillable
EC-FG72520	X-1	I	0-12	0 to 100	110 x 12	Ag/AgCl Refillable
EC-FG73711	X-2	D, O	0-13	0 to 100	110 x 12	Ag/AgCl Double Junction Refillable
EC-FG73511	X-2	D	0-13	0 to 100	110 x 12	Ag/AgCl Refillable
EC-FG72710LI	X-2	E	0-13	0 to 100	110 x 12	LiCl Double Junction Refillable
EC-620-130	X-2	A, B, C, G, L, O, Q, R	0-14	0 to 80	160 x 12	Ag/AgCl Double Junction Refillable
EC-620-131	X-2	A, B, C, D, L, O, Q, R	0-14	0 to 80	130 x 12	Ag/AgCl Double Junction Sealed
EC-620-133	X-2	A, B, I, O, Q	2-14	0 to 50	25 x 6	Ag/AgCl Double Junction Sealed
EC-620-185	X-2	A, B, K, L, O	0-14	-5 to 100	102 x 10	Ag/AgCl Double Junction Refillable
EC-620-181	X-2	A, K	0-14	0 to 80	102 x 10	Ag/AgCl Refillable
EC-620-183	X-2	A, B, K	0-14	0 to 80	102 x 10	Ag/AgCl Double Junction Refillable
EC-620-286	X-2	A, B, G	0-14	-5 to 80	106 x 10	Calomel Refillable
EC-620-293	X-2	B, N, P	0-14	-5 to 80	150 x 6	Calomel Refillable
EC-620-095	X-2	B, N, P	0-14	0 to 80	254 x 3	Calomel Refillable
EC-620-096	X-2	B, N, P	0-14	0 to 80	127 x 3	Calomel Refillable
EC-620-297	X-2	B, N, P	0-14	-5 to 100	165 x 5	Ag/AgCl Refillable



Plastic Body Combination pH Electrodes

Code No	Glass Type	App. Code	pH Range	Temp. Range (°C)	Length x Dia. (mm)	Internal Reference Element
EC-FE74526	X-3	T	0-14	-5 to 80	115 x 12	Ag/AgCl Sealed
EC-FE72511	X-1	I	0-12	0 to 100	115 x 12	Ag/AgCl Sealed
EC-FE53901	X-2	B, N, P	0-13	-5 to 80	155 x 6	Calomel Sealed
EC-FC72521	X-1	A, L, R	1-13	0 to 80	110 x 12	Ag/AgCl Sealed
EC-FC72521R	X-1	A, L, R	1-13	0 to 80	110 x 12	Ag/AgCl Refillable
EC-FC72522	X-1	A, L, O R	1-13	0 to 80	110 x 12	Ag/AgCl Double Junction Sealed
EC-FC72522R	X-1	A, L, O R	1-13	0 to 80	110 x 12	Ag/AgCl Double Junction Refillable
EC-620-132	X-2	A, B, G L, O, Q	0-14	0 to 60	120 x 12	Ag/AgCl Double Junction Sealed
EC-620-109	X-2	B, D, G L, Q	0-14	0 to 100	175 x 12	Ag/AgCl Double Junction Refillable
EC-620-116	X-2	A, B, D G, L, Q	0-14	0 to 100	175 x 12	Ag/AgCl Double Junction Refillable
EC-620-300	X-2	A, B, L	0-14	-5 to 80	106 x 10	Calomel Refillable

Plastic Body Combination ORP Electrodes

Code No	Sensor Type	App. Code	Temp. Range (°C)	Length x Dia. (mm)	Internal Reference Element
EC-FE79602	Platinum Band	U, V	0 to 80	110 x 12	Ag/AgCl Sealed
EC-FE77689	Antimony	Y	0 to 80	110 x 12	Ag/AgCl Sealed
EC-FE78602	Gold Disc	W	0 to 80	110 x 12	Ag/AgCl Sealed
EC-FC79601	Platinum Pin	U	0 to 80	110 x 12	Ag/AgCl Sealed
EC-FE79601R	Platinum Pin	U	0 to 80	110 x 12	Ag/AgCl Refillable
EC-FC79602	Platinum Pin	U, X	0 to 80	110 x 12	Ag/AgCl Double Junction Sealed
EC-FE79602R	Platinum Pin	U, X	0 to 80	110 x 12	Ag/AgCl Double Junction Refillable

Application Code	Description
M	Micro sample, such as semi-micro cuvettes and NMR tube.
N	Test tube measurements.
O	Reference contamination problems which require a double junction reference, such as media containing sulfides, bromides, iodides, and cyanides.
P	Measurements in long, narrow vessels.
Q	Soil pH measurements.
R	Swimming pool pH control under continuous flow conditions.
S	Isoelectric focusing gels and other surface measurements that require a small diameter flat tip
T	Photographic chemical; high pH sample (12 to 14 pH).
U	ORP measurements for general purpose.
V	Swimming pool ORP measurement.
W	ORP measurement for cyanide use.
X	ORP measurement requiring a double junction reference.
Y	Hydrofluoric acid and abrasive solution measurements.
Z	Potentiometric measurements of chlorides and other halides.

* All electrodes are supplied with standard cable length of 1m and BNC connectors. Refer Price-list for electrodes with longer cable length.

3.0 pH electrodes for precision measurement

3.1 Open pore pH electrodes

Catering to the discerning laboratory professional, this series of open-pore electrodes make use of single pore capillary reference junctions, about 200 times larger than typical ceramic junctions. As a result, the electrodes are almost impossible to clog even in difficult samples. If used in combination with specially formulated electrolyte, the flow rate into the pore is faster and leads to better contact between the reference electrode and sample. This in turn, generates a shorter response time and more accurate measurements.



Unique fluid-gel electrolyte and open-pore junction design - Provides a faster flow rate and improved contact for quick, stable and highly accurate readings.



Refillable double liquid junction - Suitable for high ion concentration samples; also performs well in low ion concentration and partly aqueous samples.



Solid polymer-gel electrolyte - Besides being pressure resistant and maintenance-free, polymer gel provides a more stable matrix as compared to other gelled electrode reference systems. This enhances the ability of the electrode to produce reliable results in dirty, ion-weak or protein samples, low pH samples and in presence of organic solvents. The rugged spear tip electrode is one that uses polymer gel electrolyte to provide reliable performance needed for difficult samples and is ideal for soft foods.



Model	EC-620-130
Measuring pH range	0 to 14 pH
Temperature Range	0 to 80 °C
Shaft Material	Glass
Liquid junction type	Open pore
Reference junction	Double junction
Reference type	Ag/AgCl refillable
Shape of membrane	Cylindrical
Shaft Length	160mm
Diameter	12mm



Model	EC-620-131
Measuring pH range	0 to 14 pH
Temperature Range	0 to 80 °C
Shaft Material	Glass
Liquid junction type	Open pore
Reference junction	Double junction
Reference type	Polymer sealed
Shape of membrane	Cylindrical
Shaft Length	130mm
Diameter	12mm



Model	EC-620-132
Measuring pH range	0 to 14 pH
Temperature Range	0 to 60 °C
Shaft Material	Epoxy
Liquid junction type	Open pore
Reference junction	Double junction
Reference type	Polymer sealed
Shape of membrane	Cylindrical
Shaft Length	120mm
Diameter	12mm

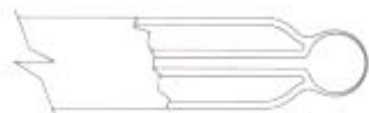


Model	EC-620-133
Measuring pH range	2 to 14 pH
Temperature Range	0 to 50 °C
Shaft Material	Glass
Liquid junction type	Open pore
Reference junction	Double junction
Reference type	Polymer sealed
Shape of membrane	Spear tip
Shaft Length	25mm
Diameter	6mm

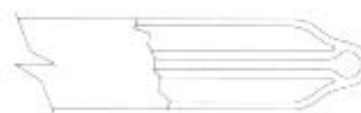
3.2 Specialty pH electrodes

Rugged Bulb - Five times thicker than regular bulbs

The tough tip electrode features a rugged bulb that is 40mil (1.0mm) thick as compared to 8mil (0.2mm) in a standard bulb. Yet the rugged bulb electrode is able to produce fast, accurate and consistent measurements.



8mil (0.2mm) Standard Bulb Electrode



40mil (1.0mm) Standard Bulb Electrode

Conversion (1 mil = 0.0254mm)

Up to 40 times more durable than conventional glass pH electrodes, the rugged bulb electrode does not sacrifice response times. It is the perfect answer in applications where frequent breakage of glass bulb electrodes is a problem, and plastic body electrode is not a practical option. This rugged tough tip combination electrode can weather much punishment - making them an excellent choice for demanding applications in the plant, field and classroom. This double-junction electrode comes with Ag/AgCl internal element, porous ceramic outer junction and KCl electrolyte that does not interfere with tris buffers.



EC-620-183

Model	EC-620-183
Measuring pH range	0 to 14 pH
Temperature Range	0 to 80 °C
Shaft Material	Glass
Liquid junction type	Ceramic
Reference junction	Double junction
Reference type	Ag/AgCl refillable
Shape of membrane	Cylindrical
Shaft Length	102mm
Diameter	10mm

Model	EC-620-185
Measuring pH range	0 to 14 pH
Temperature Range	-5 to 100 °C
Shaft Material	Glass
Liquid junction type	Ceramic
Reference junction	Double junction
Reference type	Ag/AgCl refillable
Shape of membrane	Cylindrical
Shaft Length	102mm
Diameter	10mm



Long Thin Stem

Long thin-stem electrodes with diameter up to 8mm are ideal for small sample testing in NMR tubes, centrifuge, test tubes or small vessels.



EC-620-096

Model	EC-620-096
Measuring pH Range	0 to 14 pH
Temperature Range	0 to 80 °C
Shaft Material	Glass
Liquid Junction Type	Annular
Reference Junction	Single junction
Reference Type	Calomel refillable
Shape of Membrane	Cylindrical
Shaft Length	127mm
Diameter	3mm



EC-620-293

Model	EC-620-293
Measuring pH Range	0 to 14 pH
Temperature Range	-5 to 80 °C
Shaft Material	Glass
Liquid Junction Type	Annular
Reference Junction	Single junction
Reference Type	Calomel refillable
Shape of Membrane	Cylindrical
Shaft Length	150mm
Diameter	6mm





EC-620-109

Flushable Junction

The flushable annular junction allows instantaneous refreshing of junction by pressing the electrode cap. This action cleans clogs effortlessly. This versatile electrode is ideal for testing dirty water, low ionic strength solutions and solutions with heavy metals or organics.

Model	EC-620-109
Measuring pH Range	0 to 14 pH
Temperature Range	0 to 100 °C
Shaft Material	Epoxy
Liquid Junction Type	Flushable
Reference Junction	Double junction
Reference Type	Ag/AgCl refillable
Shape of Membrane	Cylindrical
Shaft Length	175mm
Diameter	12mm

Model	EC-620-116
Measuring pH Range	0 to 14 pH
Temperature Range	0 to 100 °C
Shaft Material	Epoxy
Liquid Junction Type	Flushable
Reference Junction	Double junction
Reference Type	Ag/AgCl refillable
Shape of Membrane	Cylindrical
Shaft Length	175mm
Diameter	12mm

4.0 pH electrodes for routine measurements

4.1 General purpose pH electrodes

Plastic body Combination Electrodes

Eutech's plastic body combination electrodes are suitable for a wide range of general purpose laboratory and field applications. Electrode housing is made of specialty engineering plastic that has high impact resistance and withstands the rigours of rugged use up to 3 bar pressure and temperatures up to 80 °C.

Choose from two models: single-or double-junction, sealed (gel-filled) or refillable. Standard-size sealed models are filled with polymerised reference electrolyte. Rugged plastic body improves electrode durability. Glass pH bulb is recessed for protection. Use refillable electrodes (with open refill hole) for fast, stable response.

Model	EC-FC72521
Measuring pH Range	1 to 13 pH
Temperature Range	0 to 80 °C
Shaft Material	Plastic
Liquid Junction Type	Porous HDPE pin
Reference Junction	Single junction
Reference Type	Ag/AgCl sealed
Shape of Membrane	Sphere
Shaft Length	110mm
Diameter	12mm

Model	EC-FC72521R
Measuring pH Range	1 to 13 pH
Temperature Range	0 to 80 °C
Shaft Material	Plastic
Liquid Junction Type	Porous HDPE pin
Reference Junction	Single junction
Reference Type	Ag/AgCl refillable
Shape of Membrane	Sphere
Shaft Length	110mm
Diameter	12mm



EC-FC72521



Model	EC-FC72522
Measuring pH Range	1 to 13 pH
Temperature Range	0 to 80 °C
Shaft Material	Plastic
Liquid Junction Type	Porous HDPE pin
Reference Junction	Double junction
Reference Type	Ag/AgCl sealed
Shape of Membrane	Sphere
Shaft Length	110mm
Diameter	12mm

Model	EC-FC72522R
Measuring pH Range	1 to 13 pH
Temperature Range	0 to 80 °C
Shaft Material	Plastic
Liquid Junction Type	Porous HDPE pin
Reference Junction	Double junction
Reference Type	Ag/AgCl refillable
Shape of Membrane	Sphere
Shaft Length	110mm
Diameter	12mm



Glass-body Combination Electrodes

This laboratory grade glass body electrode has a refillable Ag/AgCl reference. Annular junction delivers fast, stable response and is ideal for general purpose applications in laboratory and field environments.

Model	EC-FG73504
Measuring pH Range	0 to 14 pH
Temperature Range	0 to 100 °C
Shaft Material	Glass
Liquid Junction Type	Annular
Reference Junction	Single junction
Reference Type	Ag/AgCl refillable
Shape of Membrane	Cylindrical
Shaft Length	110mm
Diameter	12mm



4.2 Specialty pH electrodes

Long Thin Stem

Long thin-stem electrodes below 8mm diameter are available for small sample testing in NMR tubes, centrifuge, test tubes or small vessels.

Model	EC-FE53901
Measuring pH Range	0 to 13 pH
Temperature Range	-5 to 80 °C
Shaft Material	Epoxy
Liquid Junction Type	Annular
Reference Junction	Single junction
Reference Type	Calomel sealed
Shape of Membrane	Cylindrical
Shaft Length	155mm
Diameter	6mm

EC-FE53901



Model	EC-FG63506
Measuring pH Range	0 to 13 pH
Temperature Range	0 to 100 °C
Shaft Material	Glass
Liquid Junction Type	Annular
Reference Junction	Single junction
Reference Type	Ag/AgCl refillable
Shape of Membrane	Sphere
Shaft Length	55mm
Diameter	8mm

EC-FG63506



Model	EC-FG43904
Measuring pH Range	0 to 13 pH
Temperature Range	-5 to 80 °C
Shaft Material	Glass
Liquid Junction Type	Annular
Reference Junction	Single junction
Reference Type	Calomel refillable
Shape of Membrane	Cylindrical
Shaft Length	55mm
Diameter	4mm

EC-FG43904



Sleeve Design

Sleeve design provides high electrolyte flow rate, suitable for improved response time in emulsions, slurries, suspensions and solutions of low ionic strength. Unique reference design and fill solution minimize drift and give excellent performance at high temperatures. Sleeve can be loosened or removed for easy cleaning.

Model	EC-FG73711	EC-FG73511
Measuring pH Range	0 to 13 pH	0 to 13 pH
Temperature Range	0 to 100 °C	-5 to 80 °C
Shaft Material	Glass	Glass
Liquid Junction Type	Sleeve	Sleeve
Reference Junction	Double junction	Single junction
Reference Type	Ag/AgCl refillable	Calomel refillable
Shape of Membrane	Sphere	Sphere
Shaft Length	110mm	110mm
Diameter	12mm	12mm



EC-FG73511



EC-FG73905

Organic Sample Measurement

The calomel reference electrode is ideal for biotechnology applications with organics, proteins, tris buffers or metals. It is able to withstand solutions that react with silver.

Model	EC-FG73905
Measuring pH Range	0 to 13 pH
Temperature Range	-5 to 80 °C
Shaft Material	Glass
Liquid Junction Type	Annular
Reference Junction	Single junction
Reference Type	Calomel refillable
Shape of Membrane	Sphere
Shaft Length	110mm
Diameter	12mm

Spear tip Design

The rugged spear tip electrode is ideal for testing semi-solids and soft foods. Featuring annular junction for fast response, this refilling electrode has Ag/AgCl reference. The single junction electrode is suitable for lab gels, plant materials and other general purposes.

Model	EC-FG63511
Measuring pH Range	0 to 13 pH
Temperature Range	0 to 100 °C
Shaft Material	Glass
Liquid Junction Type	Annular
Reference Junction	Single junction
Reference Type	Ag/AgCl refillable
Shape of Membrane	Spear
Shaft Length	55mm
Diameter	8mm



Model	EC-FG53912
Measuring pH Range	0 to 13 pH
Temperature Range	-5 to 80 °C
Shaft Material	Glass
Liquid Junction Type	Annular
Reference Junction	Single junction
Reference Type	Calomel refillable
Shape of Membrane	Spear
Shaft Length	25mm
Diameter	6mm

5.0 Other electrodes

5.1 ORP electrodes

Choose a single junction electrode for field, clean water, and other general purpose applications or a double junction electrode for samples containing heavy metals and organics. The platinum sensor is suitable for most general uses whereas the gold sensor is ideal for cyanide/chromate and ozone applications.

Model	EC-FC79601	EC-FC79601R
Measuring ORP Range	-1000 to 1000 mV	-1000 to 1000 mV
Temperature Range	0 to 80 °C	0 to 80 °C
Shaft Material	Plastic	Plastic
Junction Type	Platinum pin	Platinum pin
Reference Junction	Single junction	Single junction
Reference Type	Ag/AgCl sealed	Ag/AgCl refillable
Shape of Membrane	Cylindrical	Cylindrical
Shaft Length	115mm	115mm
Diameter	12mm	12mm



Model	EC-FC79602
Measuring ORP Range	-1000 to 1000 mV
Temperature Range	0 to 80 °C
Shaft Material	MPC
Junction Type	Platinum pin
Reference Junction	Double junction
Reference Type	Ag/AgCl sealed
Shape of Membrane	Cylindrical
Shaft Length	115mm
Diameter	12mm



Model	EC-FC79602R
Measuring ORP Range	-1000 to 1000 mV
Temperature Range	0 to 80 °C
Shaft Material	Plastic
Junction Type	Platinum pin
Reference Junction	Double junction
Reference Type	Ag/AgCl refillable
Shape of Membrane	Cylindrical
Shaft Length	115mm
Diameter	12mm





EC-FE79601



Model	EC-FE79601
Measuring ORP Range	-1000 to 1000 mV
Temperature Range	0 to 80 °C
Shaft Material	Epoxy
Junction Type	Platinum band
Reference Junction	Single junction
Reference Type	Ag/AgCl sealed
Shape of Membrane	Cylindrical
Shaft Length	115mm
Diameter	12mm

5.2 Ion Selective Electrodes (ISE)

Eutech has a large selection of Ion Selective Electrodes (ISE) to suit a wide variety of applications. Each electrode has a typical response time of 20 to 30 seconds but will vary with solution concentration. Gas sensing electrodes also include replacement membranes. Eutech offers three electrode types: Membrane/Solid State, Gas Sensing, and Glass bulb.

Choose from single junction or double junction electrodes. Single junction electrodes are ideal for clean water applications. Use double junction electrodes for testing dirty water and solutions with heavy metals or organics. All electrodes are refillable and include 15ml of electrolyte, filling pipette and instructions. Solid state electrodes also include polishing strips.



Ion Selective Electrode



5.3 ISE general application guide

Ion Selective Electrode Applications	Concentration Range	Temperature/ pH Range	Interferences
Ammonia (NH₃) High purity power station water, fish tanks, sea water, waste water, plating baths, air/stack gases, and biological samples Type: gas sensing	(0.01 to 17,000 ppm) 5 x 10 ⁻⁶ to 1.0 M	0 to 50°C / above 11	Volatile amines
Ammonium (NH₄⁺) Boiler feed water, natural water and fertilizers Type: polymer membrane, epoxy combination	(0.01 to 18,000 ppm) 5 x 10 ⁻⁶ to 1.0 M	0 to 50°C / 4 to 10	K ⁺
Bromide (Br⁻) Water, wine, plant tissue, and clinical analysis Type: solid state, epoxy combination	(0.4 to 79,000 ppm) 5 x 10 ⁻⁶ to 1.0 M	0 to 80°C / 2 to 14	S ²⁻ , I ⁻ , CN ⁻ , high Cl ⁻ and NH ₃ levels
Cadmium (Cd⁺²) Plating baths Type: solid state, epoxy combination	(0.01 to 11,200 ppm) 1 x 10 ⁻⁷ to 0.1 M	0 to 80°C / 2 to 12	Ag ⁺ , Hg ⁺² , Cu ⁺² , high Pb ⁺² and Fe ⁺² levels
Calcium (Ca⁺²) Water softening systems, boiler feed water, drinking/mineral water, clinical analysis, and food applications Type: polymer membrane, glass combination	(0.2 to 40,000 ppm) 5 x 10 ⁻⁶ to 1.0 M	0 to 50°C / 3 to 10	Pb ⁺² , Hg ⁺² , Cu ⁺² , Ni ⁺² , Fe ⁺² , Mg ⁺² , Zn ⁺² , Ba ⁺² , K ⁺² , K ⁺ , Na ⁺
Carbon Dioxide (CO₂), Carbonate (CO₃⁻²) Soft drinks/carbonated beverages, wine, beer, fermentation processes, bacterial cultures Type: gas sensing	(4.4 to 440 ppm) 1 x 10 ⁻⁴ to 1 x 10 ⁻² M	0 to 50°C / 4.8 to 5.2	Volatile weak acids
Chloride (Cl⁻) River/tap water, plant tissue, soils, boiler feed water, clinical analysis, sweat, urine, cement, plating baths, and food samples Type: solid state, epoxy combination	(1.8 to 35,500 ppm) 5 x 10 ⁻⁵ to 1.0 M	0 to 80°C / 2 to 12	S ²⁻ , I ⁻ , CN ⁻ , Br ⁻ , OH ⁻ , NH ₃ , S ₂ O ₃ ⁻² ,
Copper (Cu⁺²) Plating baths and water Type: solid state, epoxy combination	(0.0006 to 6350 ppm) 1 x 10 ⁻⁸ to 0.1 M	0 to 80°C / 2 to 12	Ag ⁺ , Hg ⁺² , high Cl ⁻ , Br ⁻ , Fe ⁺² and Cd ⁺² levels
Cyanide (CN⁻) Plating baths, waste water and plant tissue Type: solid state, epoxy combination	(0.13 to 260 ppm) 5 x 10 ⁻⁶ to 0.01 M	0 to 80°C / 11 to 13	S ²⁻ , I ⁻ , Br ⁻ , Cl ⁻
Fluoride (F⁻) Drinking/natural water, waste water, air/stack gases, acids, sea water minerals, soils, food, biological fluids, toothpaste/mouth wash, coal, carbonated beverages, and bone Type: solid state, epoxy combination	0.02 ppm to saturated (1 x 10 ⁻⁶ M to saturated)	0 to 80°C / 5 to 8	OH ⁻
Iodide (I⁻) Milk, feeds, plants and pharmaceuticals Type: solid state, epoxy combination	(0.006 to 127,000 ppm) 5 x 10 ⁻⁸ to 1.0 M	0 to 80°C / 0 to 14	S ²⁻ , CN ⁻ , Br ⁻ , Cl ⁻ , NH ₃ , S ₂ O ₃ ⁻²
Lead (Pb⁺²) Plating baths and organic compounds Type: solid state, epoxy combination	(0.2 to 20,7000 ppm) 1 x 10 ⁻⁶ to 0.1 M	0 to 80°C / 3 to 8	Ag ⁺² , Hg ⁺² , Cu ⁺² , high Cd ⁺² and Fe ⁺² levels
Nitrate (NO₃⁻) Surface/drinking water, sewage effluent, soil extracts, fertilizers, plant tissue, meat, potatoes, spinach, beets, baby food Type: polymer membrane, epoxy combination	(0.5 to 62,000 ppm) 7 x 10 ⁻⁶ to 1.0 M	0 to 50°C / 2.5 to 11	ClO ₄ ⁻ , I ⁻ , CN ⁻ , BF ₄ ⁻
Potassium (K⁺) Waste water, river/tap water, clinical analysis, saliva, serum, fertilizers, soils, and wines Type: polymer membrane, epoxy combination	(0.04 to 39,000 ppm) 1 x 10 ⁻⁶ to 1.0 M	0 to 50°C / 2 to 12	Cs ⁺ , NH ₄ ⁺ , Tl ⁺ , H ⁺ , Ag ⁺ , Li ⁺ , Na ⁺ , Tris1 ⁺
Silver/Sulfide (Ag⁺/S⁻²) Sewage effluent, soils, sediments, plating baths and photographic fixing solution Type: solid state, epoxy combination	(0.01 to 107,900 ppm Ag ⁺) (0.003 to 32,100 ppm S ⁻²) 1 x 10 ⁻⁷ to 1.0 M (Ag ⁺ , S ⁻²)	0 to 80°C / 2 to 12	Hg ⁺²
Sodium (Na⁺) Steam condensates in power plants, clinical analysis, serum, foods, wine, glass, sea water, swimming pools, fish farms and aquariums Type: glass membrane, glass combination	(0.02 ppm to saturated) 1 x 10 ⁻⁶ M to saturated	0 to 80°C / 5 to 12	H ⁺ , K ⁺ , Li ⁺ , Ag ⁺ , NH ₄ ⁺ , Rb ⁺ , Cs ⁺ , Tl ⁺



Electrode	Standard 0.1 M Solution	Standard 100 ppm Solution	Standard 1000 ppm Solution	Ion Strength Adjuster (ISA)
EC-NH301-01B	EC-SCS-AA1-BT	EC-SCS-AA2-BT	EC-SCS-AA3-BT	EC-ISA-AA1-BT
EC-NH403-01B	EC-SCS-AM1-BT	EC-SCS-AM2-BT	EC-SCS-AM3-BT	EC-ISA-AM1-BT
EC-BRO03-01B	EC-SCS-BR1-BT	EC-SCS-BR2-BT	—	EC-ISA-BR1-BT
EC-CD03-01B	EC-SCS-CD1-BT	EC-SCS-CD2-BT	—	EC-ISA-CD1-BT
EC-CAL02-01B	EC-SCS-CA1-BT	EC-SCS-CA2-BT	EC-SCS-CA3-BT	EC-ISA-CA1-BT
EC-CO201-01B	EC-SCS-CO1-BT	EC-SCS-CO2-BT	EC-SCS-CO3-BT	EC-ISA-CO1-BT
EC-CLO03-01B	EC-SCS-CL1-BT	EC-SCS-CL2-BT	EC-SCS-CL3-BT	EC-ISA-CL1-BT
EC-CU03-01B	EC-SCS-CU1-BT	EC-SCS-CU2-BT	—	EC-ISA-CU1-BT
EC-CN03-01B	—	—	—	—
EC-FO03-01B	EC-SCS-FL1-BT	EC-SCS-FL2-BT	EC-SCS-FL3-BT	EC-ISA-FL1-BT
EC-IO03-01B	EC-SCS-IO1-BT	EC-SCS-IO2-BT	—	EC-ISA-IO1-BT
EC-PB03-01B	EC-SCS-PB1-BT	EC-SCS-PB2-BT	—	EC-ISA-PB1-BT
EC-NO303-01B	EC-SCS-NT1-BT	EC-SCS-NT2-BT	EC-SCS-NT3-BT	EC-ISA-NT1-BT
EC-K03-01B	EC-SCS-KO1-BT	EC-SCS-KO2-BT	—	EC-ISA-KO1-BT
EC-AGS03-01B	EC-SCS-SS1-BT	EC-SCS-SS2-BT	—	EC-ISA-SS1-BT
EC-NA02-01B	EC-SCS-LNA1-BT	EC-SCS-LNA2-BT	EC-SCS-LNA3-BT	EC-ISA-LNA1-BT



6.0 Accessories



pH Buffer Solutions

pH buffer solutions, available in 480ml and 1liter leak-proof bottles. Buffer values include pH 1.68, 4.01, 7.00, 9.00, 10.01 and 12.45. Coloured coded buffers with dispenser tops are available in selected models for instant recognition. pH 4 - red, pH 7 - yellow and pH 10 - blue. These are available in 480ml and 1l bottles. COA can be downloaded from the website.



pH Buffer Sachets

Single use buffer sachets are vacuum-sealed and air-tight with ± 0.01 pH accuracy at 25 °C. These NIST-traceable buffers are shipped in a box of 20 sachets. The available values are pH 4, 7, 10 and deionised water for rinsing. Simply insert electrode into a buffer sachet, calibrate, rinse and discard used solutions properly when done. No wastage and contamination-free; convenient for laboratory and outdoor use.

Reference Refilling Electrolyte

Several types of reference fill solutions are available: 4M KCl saturated (with AgCl) for Ag/AgCl single junction electrodes; 4M KCl saturated for Ag/AgCl double junction electrodes or 4M KCl for Calomel (Hg/Hg_2Cl_2) electrodes and other specialty electrodes.

Electrode Cleaning & Storage Solutions

Remove protein or grease and oil deposits from electrodes with cleaning solution which contains pepsin. After cleaning or when electrode is not being used, always keep pH electrodes in some storage solution to ensure proper working condition.



Flexible Electrode Holder

Electrode holder clasps up to four standard electrodes (14mm dia. max) and one ATC probe with a swivel arm that can be rotated 360°. Furthermore it allows any positioning of electrodes at constant vertical angle - either move side to side or up and down for added convenience.

Description	Ordering Code
Colourless pH 1.68 buffer solution (480ml)	EC-BU1BT
Colourless pH 4.01 buffer solution (480ml)	EC-BU4BT
Colourless pH 7.00 buffer solution (480ml)	EC-BU7BT
Colourless pH 9.00 buffer solution (480ml)	EC-BU9BT
Colourless pH 10.01 buffer solution (480ml)	EC-BU10BT
Colourless pH 12.45 buffer solution (480ml)	EC-BU12BT
Red colour coded pH 4.01 buffer solution (480ml)	EC-BU4BTC
Yellow colour coded pH 7.00 buffer solution (480ml)	EC-BU7BTC
Blue colour coded pH 10.01 buffer solution (480ml)	EC-BU10BTC
Red colour coded pH 4.01 buffer solution (1 Litre)	EC-BU4BT1LITC
Yellow colour coded pH 7.00 buffer solution (1 Litre)	EC-BU7BT1LITC
Blue colour coded pH 10.01 buffer solution (1 Litre)	EC-BU10BT1LITC
NIST-traceable pH 4.01 buffer sachets (pack of 20 pcs x 20ml)	EC-BU4BS
NIST-traceable pH 7.00 buffer sachets (pack of 20 pcs x 20ml)	EC-BU7BS
NIST-traceable pH 10.01 buffer sachets (pack of 20 pcs x 20ml)	EC-BU10BS
NIST-traceable deionised rinse water sachets (pack of 20 pcs x 20ml)	EC-RIN-WT
ORP Quinhydrone 255 mV (480ml)	EC-ORPQUIN
ORP Quinhydrone 86 mV (480ml)	EC-ORPQUIN086
ORP Pre-treatment 475 mV (480ml)	EC-ORPPRE
Refilling electrolyte for single junction Ag/AgCl electrodes (480ml)	EC-RE001
Refilling electrolyte for double junction Ag/AgCl electrodes (480ml)	EC-RE002
Electrode storage solution (480ml)	EC-RE005
Protein removal solution (480ml)	EC-DPC-BT
Flexible electrode holder with swivel arm	EC-PHELTSDC

7.0 Maintenance and technical tips

7.1 Measurement system and calibration

pH Meter

The pH meter functions as a specialized voltmeter capable of accurately measuring small voltage changes at extremely high impedance of pH electrode and adjusts to pH and voltage characteristics of electrode system.

Most modern pH meters incorporate automatic or/and manual temperature compensation to correct for variation in pH value of a given solution with sample temperature. Newer microprocessor-based meters are programmed to solve the Nernst equation, taking into account electrode voltage, efficiency and temperature. Most meters provide automatic buffer recognition for calibration, error messages and diagnostic circuitry to simplify operation and reduce operator error.

Calibration Buffers

These solutions of known pH value are used to adjust the pH meter/electrode system to display precise measurements. Buffers are available as ready-to-use solutions, in sachets and capsules. All buffers have special characteristic of resisting pH change upon dilution or acid/base contamination to a certain extent. Some solutions are standardized against NIST-certified pH references for calibrating meters with resolution up to 0.001 pH.

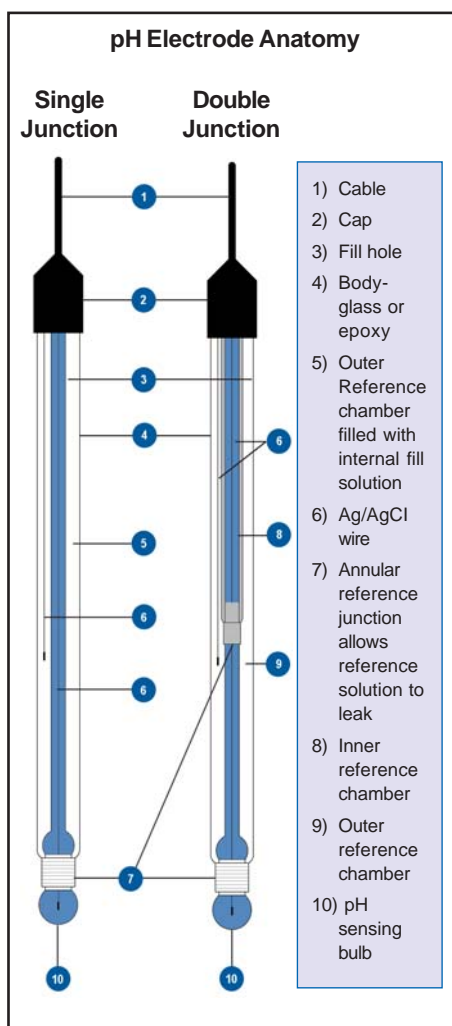
Electrode System

The electrode system consists of two half cells: a pH indicating electrode, which develops a potential dependent on the pH of a solution and a reference electrode which provides a constant potential and completes the electrical circuit. Nowadays combination electrode - both half cells joined coaxially - is frequently used for the convenience and compactness it offers.

Calibration

Electrode must be calibrated daily or regularly to ensure accurate, repeatable measurements with a variety of commercial pH calibration buffer solutions.

For optimal accuracy, calibration or standardization should be performed with fresh pH buffer value close to that of the sample to be tested. When the sample of pH is unknown, a two-point calibration is performed: first with pH 7 (close to the electrode's zero-potential point), followed by an acid or base buffer whose value brackets the expected pH value of the sample. Although one-point calibration suffices for fairly reliable measurement, three-point or even five-point calibration yields the most accurate results across the entire measurement range. Make sure the pH meter caters for a choice of pH calibration buffer set, namely the USA, NIST or DIN reference buffer standards.



7.2 Testing of pH meter and electrode

pH Meter with mV (millivolt) readout

Attach a shorted BNC cap to the meter's BNC input and change pH to mV measurement mode. Observe and note the mV reading should read about 0.0 mV. If measured reading exceeds ± 0.2 mV, the meter has to be electronically calibrated.

Electrode

Connect pH electrode to pH/mV meter and toggle to mV measurement mode. Immerse electrode and calibrate using a fresh pH 7 buffer first, then rinse with deionised water, followed by either pH 4 or 10 calibration. When done, check the slope/offset display of the meter for diagnosis of electrode characteristics. Alternatively if the meter does not offer slope/offset display function, determine the % of electrode's slope. For example, if pH 7 yields -5.0 mV, and at pH 4 the mV reading is 165 mV, the net change is 170 mV. Divide this value by 177.5, and multiply it by 100 to determine the % of electrode's slope (i.e. 95.7%). For new electrodes, their slope should be between 95% and 102%. If the slope falls below 92%, clean the electrode.

7.3 Use and care of electrodes

Maintenance and Storage of pH Electrodes

Most electrodes are delicate measuring instruments that require proper care and maintenance to produce accurate and reliable results, and to prolong useful life.

Always keep pH electrode moist when not in use for a period of time, best using electrode storage solution or pH 7 buffer as storage media for soaking electrode. DO NOT store electrode in distilled or deionised water as this will cause ions to leach out of the glass bulb and reference electrolyte, causing slow, sluggish response.

Electrode may be shipped with either protective cap or electrode soaking bottle to prevent cracking or scratching, and to keep the glass bulb moist. Remove the electrode gently from storage bottle and rinse it with distilled water before use. For long-term storage, always keep electrode with the bottle on - fill the bottle with sufficient storage solution to cover the bulb and replenish as needed.

Handling

Electrode should be rinsed between sample measurements and calibrations with distilled or deionised water. Blot electrode dry to gently dislodge excess water. Dry it with a lint-free wiping paper if necessary as rubbing causes electrode to be charged electrostatically. Never use polymer or plastic body electrodes in samples containing organic solvents.

Refillable Electrodes

The filling solution in refillable electrodes should be filled up, but not past, the refill hole. Make sure that refill hole is left open when measuring to ensure that the fill solution flows properly through the reference junction.

7.4 Rejuvenation and reconditioning of electrodes

As electrodes age, their efficiency is reduced; symptoms include sluggish or erratic readings. This aging is usually caused either by contamination of glass membrane, or by blockage of the liquid junction reference. Below are a few remedial procedures to improve performance of such electrodes.

Unblocking Reference Junction

A blocked or clogged reference junction attributes to about 80% of all pH measurement difficulties; resulting in extremely slow response, off-scale readings and electrically noisy measurements. Procedures for unblocking the junction depend on the type of reference junction electrode in use:

◆ Gel-filled electrodes

Soak electrode in warm water (about 60 °C) for 5 to 10 minutes to reestablish contact. Or place electrode in warm saturated KCl solution (60 °C) and allow both electrode and solution to cool down to room temperature.

◆ Liquid-filled electrodes

Sleeve and annular junction

Drain electrode, rinse cavity with distilled water and refill with fresh electrolyte. Rotate the sleeve to re-establish flow if necessary for sleeve-type electrodes.

◆ Ceramic junction

For calomel types only

Soak electrode in warm water for about 10 minutes, and check for electrolyte flow. Or soak electrode tip in concentrated HCl for 5 to 10 minutes (use adequate ventilation and precautionary measures when performing this task). Rinse electrode, then check for electrolyte flow again.

For silver/silver chloride types only

Soak electrode in warm saturated KCl solution (60 °C) for about 10 minutes, and check for electrolyte flow. Or soak electrode tip in concentrated ammonium hydroxide for 5 to 10 minutes (use adequate ventilation and precautionary measures when performing this task). Rinse electrode, then check for electrolyte flow.

For ceramic junctions only

If junction remains clogged, gently sand the junction area (be certain not to contact glass bulb), and check for electrolyte flow.

Cleaning Glass pH Membrane

Dirty glass membrane is usually indicated by beads of water forming on the bulb when rinsing with distilled water. The bulb can be cleaned as follows:-

◆ For protein

Soak in fresh protein removal solution EC-DPC-BT for 30 minutes, rinse thoroughly before use.

◆ For inorganic deposits

Wash with EDTA, ammonia or acids

◆ For grease and similar films

Wash with acetone, methanol, etc.

Reconditioning Glass pH Membrane

Prolonged use, excessive alkaline immersion, or high temperature operation will cause surface leaching of the membrane glass; resulting in erratic or sluggish response which cannot be remedied by clearing the electrode. Immerse electrode tip into 0.1N HCl for less than 5 minutes, and rinse with water. Immerse electrode tip into 0.1N KOH for 5 minutes, and rinse thoroughly with water. Check for electrode's performance. If the problem persists, repeat the steps but note frequent HCl/KOH treatment can shorten electrode life.



Eutech Instruments manufactures a comprehensive range of laboratory and field instrumentation for water analysis as shown below:

- (a) Standard Hand-held Meters
- (b) Waterproof Hand-held Meters
- (c) Waterproof Testers
- (d) Laboratory Bench Meters
- (e) Touchscreen Bench Meters
- (f) Industrial Process Controllers
- (g) Economy Palm-sized Meters

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