electrochemistry handbook

Fisher Scientific

high-quality, user-friendly and cost-effective instruments for every application and budget!

Fisher Scientific accumet Electrodes

pH Electrodes For Virtually Any Sample Type

When selecting a pH system, choose your meter based on what features you need, i.e. resolution, output, memory, etc. Choose the corresponding pH electrode for your meter based primarily on your sample type and conditions, i.e. wastewater with sulfides, room temperature, student use, 5 days/week, etc.

Take a glance in the Fisher Scientific catalog and you will find 100's of pH electrodes to choose from. While many electrodes might be work adequately for a particular application, not all will perform equally or last as long as others. Usually in situations in which a pH electrode "didn't last long", the electrode is not matched well for the application resulting in poor performance, and ultimately failure. Understanding the different electrode options that are available and knowing how to use them to your advantages is a critical step to getting the most out of your pH measurement system.

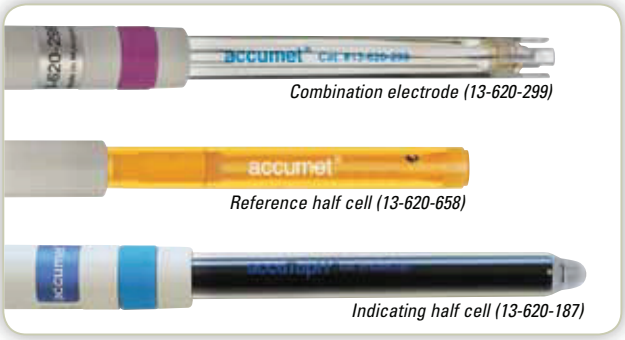
The following guide is designed to help you understand the ABC's of electrode selection. If you are still undecided or have questions regarding any product, your Fisher Scientific representative and our electrochemistry experts (888-358-4706 or accumet@fishersci.com) are there to help guide you!

›› The ABC's Of Electrode Selection

Combination Or Half-Cell

There are two components within a pH electrode system. A pH indicating (or sensing) electrode develops a potential dependent on the pH, and the reference electrode which provides a constant potential to completes the electrical circuit. Combination electrodes have both the indicating and reference electrodes "combined" into one electrode. Alternatively, separate half-cell electrodes can be used. Since reference electrodes often outlast sensing electrodes, replacing indicating electrodes can mean lower replacement costs than replacing an equivalent combination electrode.

In practical terms, nearly all electrodes used today are combination electrodes. There are many reasons including; many pH meters require an adapter to accept half-cell electrodes, handling multiple electrodes is un-desirable (or impossible with small samples!), half cells don't have built in ATC and therefore require a third electrode for temperature compensation, the complexity of diagnosing electrode problems and most of all, the reduced cost and performance of today's combination electrode designs.



Combination electrode (13-620-299)

Reference half cell (13-620-658)

Indicating half cell (13-620-187)

Verdict: Use a combination electrode unless the method you must follow calls for half-cells. You'll have many more choices available to you. Combination cells may or may not have a temperature sensor built-in.

Glass Or Plastic Body

It probably goes without saying, but if an electrode literally breaks into pieces, it is useless and can not be repaired. Combination glass and combination plastic electrodes use an indicating electrode with a glass sensing bulb on the end. This is important for several reasons. First, plastic electrodes are not immune from breakage. Second, if an electrode breaks it will likely be at the tip, not the body itself. A plastic electrode with little to no bulb protection defeats the purpose of a plastic electrode in the first place.

To decide on which to use, let us look at the advantages and disadvantages of each, starting with the glass body electrode. Glass electrodes are easier to clean and maintain since they can tolerate just about any solvent and inorganic material (with the exception of HF!) and can handle higher temperatures quite nicely – typically to 100 °C. The fact that glass electrodes also have a glass sensing bulb is also an advantage. Since the seal that combines the bulb to the body is similar material, it is one less thing that can go wrong during measurement and doesn't become the source of junction potential as it does in plastic electrodes. This is especially important consideration for applications that have repeated and extreme heating and cooling – the expansion and contraction that occurs is handled much better by glass electrodes. The downside of glass electrodes is fairly easy – they are generally more expensive then plastic, and they have a greater potential for breakage.

Plastic electrodes are less expensive than glass equivalents and can usually take much abuse in the lab and in the field. Most electrodes with built-in temperature compensation elements are plastic due to the complexity in manufacturing them. As a result, they are most popular with field and portable meters, but can also be used in laboratory environments (such as 13-620-631). To protect the glass sensing bulb, many plastic electrodes use an integral housing that limit the bulb exposure, but often can be difficult to clean.

Verdict: Glass electrodes are definitely worth the upgrade if you have significant temperature fluctuations. If bulb breakage is a concern, consider Fisher Scientific accumet accuTupH electrodes with thick glass bulbs! If you want ATC built-in to your electrode, expect to settle for plastic.

Refillable Or Non-Refillable (Gel)

All pH electrodes use/leak solution. Refillable electrodes do so more quickly, and can be replenished when they require more filling solution. Gel filled electrodes do so very slowly and when they run out or the gel is no longer flowing, can not be replenished and must be replaced.

Refillable electrodes are generally more expensive than gel-filled equivalent electrodes but respond much faster. They also last longer, because the filling solution can be replaced indefinitely; however the periodic addition of filling solution that is required also happens to be the main disadvantage. Another downside is that when the filling hole is left open for an extended period, dried salt may be left behind which often involves cleaning. The act of refilling and opening and closing the fill hole with Fisher Scientific accumet electrodes is extremely easy due to the patented filling mechanism. It takes just seconds to open the hole and a few seconds more to fill the probe.

Gel-filled electrodes are less expensive, require less maintenance, and are usually plastic. High quality gel formulations have also extended the once limited shelf-life in recent years.

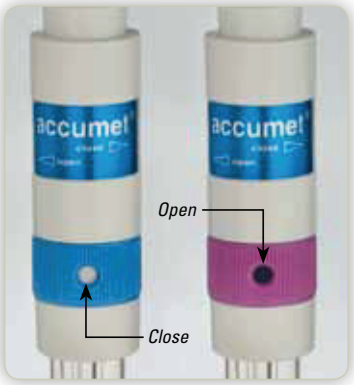
Verdict: Refillable electrodes are usually worth the extra maintenance – especially if it's a Fisher Scientific accumet electrode.

Single Or Double-Junction (Tris Compatible)

The single-junction electrode on the left has a black, clogged junction and is no longer responsive.

This decision is extremely important and should not be overlooked. If you will be measuring samples that have sulfides, proteins, heavy metals, TRIS, or anything that might react with silver, or if you will be testing samples that are unknown, use a double-junction electrode. Calomel electrodes would also be suitable but have fallen out of favor due to mercury content and regulations that ban shipments of them in specific states in the US. Single-junction electrodes are less expensive, but offer no other advantages. If you use a single-junction electrode in a solution with TRIS, it's just a matter of time before it fails.

Verdict: If you will only measure drinking water, you can save money by using a single-junction pH electrode. If you have TRIS, sulfides, proteins, heavy metals or are measuring samples that are unknown, look for a Fisher Scientific accumet electrode with a purple ring – indicating that is it compatible.



Refillable electrodes use our patented twist open and close mechanism.

Color coded electrode bands simplify electrode selection:

- **Purple = TRIS Compatible**
- **Blue = General Purpose**

Over 30 years of experience in the design, development, and manufacture of electrodes go into each Fisher Scientific accumet electrode.

We offer electrodes that provide fast, accurate measurements in hundreds of different applications – including yours!

A complete line for every application: made with care and precision. All Fisher Scientific accumet electrodes feature continuous electrical shielding and insulation of the internal elements, cable and connectors for extremely stable, reproducible readings with a minimum of electrical noise. Each electrode is individually tested, serialized to meet GLP requirements, and backed by a knowledgeable support staff **(888-358-4706 or accumet@fishersci.com)** and 1 year warranty.

Fisher Scientific accumet pH Electrodes

High Performance Models For Critical Research

State-of-the-art design for fast, accurate measurements despite sample temperature differences – plus extra durability. Feature innovative reference system that controls chemical equilibria, prevents precipitation of solution components at reference element from 0 to 100 °C; plus internal electrolyte with minimal temperature coefficient. Result: highly predictable, super reliable electrodes that respond quickly at any temperature. Cycle between 25 and 80 °C samples, reach reproducible pH in 30 seconds (vs. 1 to 3 minutes for other electrodes). Drift and accuracy problems are virtually eliminated.

Read sample pH in <20 seconds, correct to ±0.02 pH; pH value stays constant at any temperature. Best of all, these electrodes read pH consistently at elevated temperatures – and without premature loss in performance.

Choice of standard-size glass body, epoxy body with flushable junction, and glass body with flushable junction.

accu•pHast R pH Electrodes

Catalog No.	13-620-195	13-620-196	13-620-197
Special	accu•pHast R	accu•pHast R accuFlow	accu•pHast R accuFlow
Parameter	pH	pH	pH
Combination Or Half Cell	Combination	Combination	Combination
ATC Connection	n/a	n/a	n/a
Refillable Or Gel (Sealed)	Refillable	Refillable	Refillable
Refill Solution	SP138-500	SP138-500	SP138-500
Junction Type	Double	Double	Double
Glass Or Plastic Body	Glass	Plastic	Glass
Max Temp	100 °C	80 °C	100 °C
Length x Diameter (mm)	102 x 12	102 x 12	102 x 12
Note:	High performance, ideal for samples temp variation	High performance, flushable junction for tough samples	High performance, flushable junction for tough samples

Fast and accurate for samples at widely varying temperatures. Patented design: dual ceramic junctions, sealed reference, and special internal electrolyte to eliminate slow response when measuring samples at different temperatures in quick succession. Accurate to ±0.01 pH at 25 °C and ±0.05 pH from -5 to 100 °C. Response times of 20 seconds or less. Negligible drift.

Isolated reference and outer KCl fill solution prevent clogging from silver-compound precipitates. Unique pH bulb is filled with special crystals to speed thermal equilibrium. Choice of four styles: standard-size glass body, MicroProbe™ extra-long glass body, extra-long epoxy body, and pH/ATC epoxy body.

accu•pHast pH Electrodes

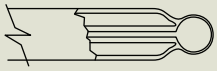
Catalog No.	13-620-296	13-620-297	13-620-298	13-620-113	13-620-114
Special	accu•pHast	accu•pHast long & narrow	accu•pHast long	accu•pHast	accu•pHast
Parameter	pH	pH	pH	pH/ATC	pH/ATC
Combination Or Half Cell	Combination	Combination	Combination	Combination	Combination
ATC Connection	n/a	n/a	n/a	13-620-16	13-620-19
Refillable Or Gel (Sealed)	Refillable	Refillable	Refillable	Refillable	Refillable
Refill Solution	SP138-500	SP138-500	SP138-500	SP138-500	SP138-500
Junction Type	accupHast (Tris compatible)	accupHast (Tris compatible)	accupHast (Tris compatible)	accupHast (Tris compatible)	accupHast (Tris compatible)
Glass Or Plastic Body	Glass	Glass	Plastic	Plastic	Plastic
Max Temp	100 °C	80 °C	80 °C	80 °C	80 °C
Length x Diameter (mm)	102 x 10	165(L) x 75 x 5	140 x 10	143 x 10	143 x 10
Note:	High performance, ideal for samples temp variation	High performance	High performance	See page 34 for list of discontinued meters using 13-620-16 ATC	ATC fits XL, AB, and AR meters

Fisher Scientific accumet pH Electrodes

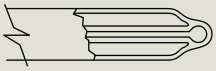
Top Selling Rugged Glass And Capillary Junction Electrodes

Five times thicker than conventional glass pH electrodes. For applications where glass bulbs break frequently and epoxy body electrodes aren't practical. Up to 40 times tougher than conventional glass pH electrodes, without sacrificing response times.

13-620-185 also utilizes accupHast temp reference for top performance from a rugged glass electrode.



8-mil standard electrode



40-mil accuTupH rugged bulb

accuTupH+ & accuTupH pH Electrodes

Catalog No.	13-620-185	13-620-632	13-620-183A	13-620-182A	13-620-181	13-620-187
Special	accuTupH+, accu•pHast	accuTupH	accuTupH	accuTupH, US Standard Connector	accuTupH	accuTupH
Parameter	pH	pH/ATC	pH	pH/ATC	pH	pH indicating
Combination Or Half Cell	Combination	Combination	Combination	Combination	Combination	Half Cell, BNC
ATC Connection	n/a	13-620-19	n/a	n/a	n/a	n/a
Refillable Or Gel (Sealed)	Refillable	Refillable	Refillable	Refillable	Refillable	n/a
Refill Solution	SP138-500	SP138-500	SP138-500	SP138-500	SP135-500	n/a
Junction Type	accupHast (Tris compatible)	Double	Double	Double	Single	n/a
Glass Or Plastic Body	Glass	Glass	Glass	Glass	Glass	Glass
Max Temp	100 °C	100 °C	100 °C	100 °C	100 °C	100 °C
Length x Diameter (mm)	102 x 10	102 x 12	102 x 12	102 x 10	102 x 10	106 x 12
Note:	Rugged & fast temp response, high performance, includes bulb protector	Rugged, Tris compatible,includes bulb protector. ATC for AB, AR, and XL meters.	Rugged, Tris compatible, includes bulb protector. Included with AB150B and XL kits	Rugged, Tris compatible, includes bulb protector. US Std Connector (not BNC)	Rugged, general purpose. includes bulb protector	Rugged, use with reference half cell

Single-pore capillary junction provides a flow channel about 200 times larger than typical reference junctions. Combined with a specially formulated flowing gel reference electrolyte (13-636-430), provides a fast, virtually clog-free reference. The result is a faster, more stable pH measurement.

accuCap Capillary Junction Electrodes

Electrolyte & syringe (13-636-430)

Catalog No.	13-620-130	13-620-131	13-620-132	13-620-133
Special	accuCap	accuCap	accuCap	accuCap, spear tip
Parameter	pH	pH	pH	pH
Combination Or Half Cell	Combination	Combination	Combination	Combination
ATC Connection	n/a	n/a	n/a	n/a
Refillable Or Gel (Sealed)	Refillable	Gel	Gel	Gel
Refill Solution	13-636-430	n/a	n/a	n/a
Junction Type	Capillary open pore (Tris compatible)	Capillary open pore (Tris compatible)	Capillary open pore (Tris compatible)	Capillary open pore (Tris compatible)
Glass Or Plastic Body	Glass	Glass	Plastic	Glass
Max Temp	80 °C	80 °C	60 °C	50 °C
Length x Diameter (mm)	160 x 12	130 x 12	120 x 12	80(L) x 25 x 6
Note:	Research quality, included with XL series pH kits	Non-refillable glass electrodes like this are hard to find	General purpose	Spear tip and 6 mm diameter useful for semi solids & small samples

Fisher Scientific accumet pH Electrodes

pH Electrodes To Match Your Application Type

Refillable Glass pH Electrodes





Catalog No.	13-620-285	13-620-223A	13-620-291	13-620-292	13-620-293
Special	n/a	n/a	Semi-micro	Semi-micro	Semi-micro
Parameter	pH	pH	pH	pH	pH
Combination Or Half Cell	Combination	Combination	Combination	Combination	Combination
ATC Type	n/a	n/a	n/a	n/a	n/a
Refillable Or Gel (Sealed)	Refillable	Refillable	Refillable	Refillable	Refillable
Refill Solution	SP135-500	SP138-500	SP135-500	SP135-500	SP138-500
Junction Type	Single	Double	Single	Single	Calomel
Glass Or Plastic Body	Glass	Glass	Glass	Glass	Glass
Max Temp	100 °C	100 °C	100 °C	100 °C	80 °C
Length x Diameter (mm)	102 x 12	102 x 12	100 x 6	150 x 6	160(L) x 120 x 6
Note:	General purpose. Included with AB15+ and AB15 kits. Includes bulb protector	Tris compatible, includes bulb protector	6 mm diameter for small samples, test tubes	Same as 13-620-291 but longer	Tris compatible

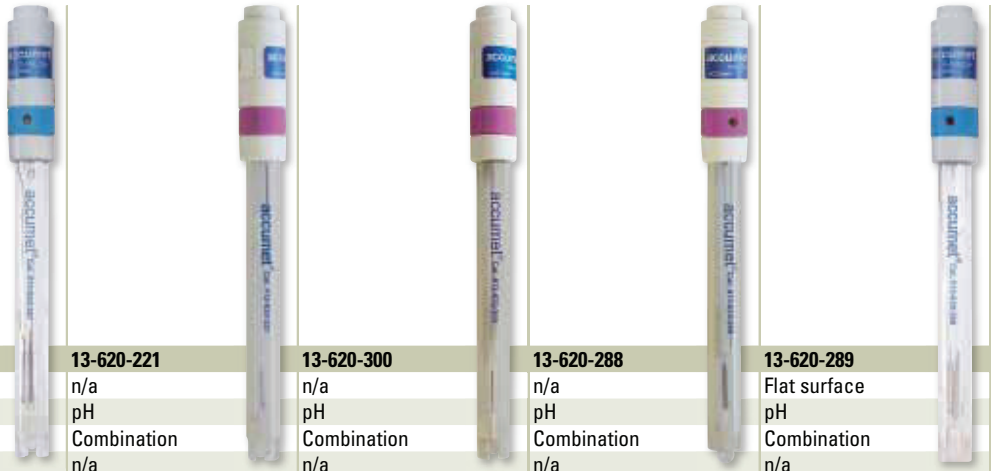
Micro pH And pH/ATC Refillable Electrodes





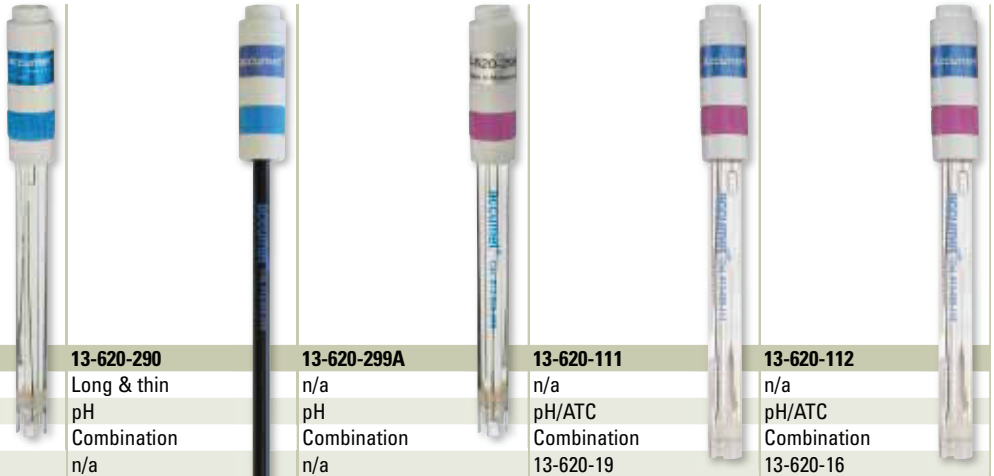
Catalog No.	13-620-95	13-620-96	13-620-530A	13-620-632	13-620-631
Special	MicroProbe	MicroProbe	n/a	accuTupH	n/a
Parameter	pH	pH	pH/ATC	pH/ATC	pH/ATC
Combination Or Half Cell	Combination	Combination	Combination	Combination	Combination
ATC Type	n/a	n/a	13-620-19	13-620-19	13-620-19
Refillable Or Gel (Sealed)	Refillable	Refillable	Refillable	Refillable	Refillable
Refill Solution	SP138-500	SP138-500	SP135-500	SP138-500	SP138-500
Junction Type	Calomel (Tris compatible)	Calomel (Tris compatible)	Single	Double	Double
Glass Or Plastic Body	Glass body / Teflon stem	Glass body / Teflon stem	Plastic	Glass	Plastic
Max Temp	80 °C	80 °C	80 °C	100 °C	80 °C
Length x Diameter (mm)	254(L) x 150 x 3	127(L) x 38 x 3	106 x 12	102 x 12	106 x 12
Note:	Tris compatible, small samples, long test tubes / NMR	Tris compatible, small samples	ATC for AB, AR, and XL meters	Rugged, Tris compatible, includes bulb protector. ATC for AB, AR, and XL meters.	Tris compatible, ATC for AB, AR, & XL meters. Included with AB150, AB200, & AB250 kits.

Refillable Plastic pH Electrodes



Catalog No.	13-620-287A	13-620-221	13-620-300	13-620-288	13-620-289
Special	n/a	n/a	n/a	n/a	Flat surface
Parameter	pH	pH	pH	pH	pH
Combination Or Half Cell	Combination	Combination	Combination	Combination	Combination
ATC Type	n/a	n/a	n/a	n/a	n/a
Refillable Or Gel (Sealed)	Refillable	Refillable	Refillable	Refillable	Refillable
Refill Solution	SP135-500	SP138-500	SP138-500	SP138-500	SP135-500
Junction Type	Single	Double	Calomel	Calomel	Single
Glass Or Plastic Body	Plastic	Plastic	Plastic	Plastic	Plastic
Max Temp	80 °C	80 °C	80 °C	80 °C	80 °C
Length x Diameter (mm)	106 x 12	102 x 10	106 x 12	106 x 12	114 x 13
Note:	Same as 13-620-530A without ATC	Tris compatible, includes bulb protector	Tris compatible, with integral bulb guard	Tris compatible	Flat surface for agar, cheese, food, and more

Gel-Filled Plastic pH Electrodes



Catalog No.	13-620-108A	13-620-290	13-620-299A	13-620-111	13-620-112
Special	n/a	Long & thin	n/a	n/a	n/a
Parameter	pH	pH	pH	pH/ATC	pH/ATC
Combination Or Half Cell	Combination	Combination	Combination	Combination	Combination
ATC Type	n/a	n/a	n/a	13-620-19	13-620-16
Refillable Or Gel (Sealed)	Gel	Gel	Gel	Gel	Gel
Refill Solution	n/a	n/a	n/a	n/a	n/a
Junction Type	Single	Single	Double	Double	Double
Glass Or Plastic Body	Plastic	Plastic	Plastic	Plastic	Plastic
Max Temp	80 °C	80 °C	80 °C	80 °C	80 °C
Length x Diameter (mm)	106 x 12	178 x 6	106 x 12	106 x 12	106 x 12
Note:	Ecomomical, general purpose	Tall flasks, bottles	Ecomomical, Tris compatible	ATC for AB, AR, and XL meters	See page 34 for list of discontinued meters using 13-620-16 ATC

Fisher Scientific accumet pH Electrodes

New pH/ATC Electrodes For Non-accumet Meters

- Combination pH mercury-free electrodes with built-in temperature compensation
- Fast, accurate response from 5 to 80 °C
- Double-junction pH/ATC electrodes compatible with Tris, proteins and sulfides
- Epoxy body is impact resistant and ideal for rough handling

All electrodes have a BNC connector and ATC connector; ATC will differ with meter type. 3-ft cable and electrode storage bottle are included, refillable models also include a 30 mL bottle of filling solution.

Universal pH/ATC Electrodes




Catalog No.	13-620-31C	13-621-701	13-621-702	13-621-703
Parameter	pH/ATC	pH/ATC	pH/ATC	pH/ATC
Combination Or Half Cell	Combination	Combination	Combination	Combination
ATC Connection	RCA (Cinch) plug	RCA (Cinch) plug	3.5 audio plug	Banana plug
Refillable Or Gel (Sealed)	Refillable	Gel	Gel	Gel
Refill Solution	SP135-500	n/a	n/a	n/a
Junction Type	Single	Double	Double	Double
Glass Or Plastic Body	Plastic	Plastic	Plastic	Plastic
Max Temp	80 °C	80 °C	80 °C	80 °C
Length x Diameter (mm)	106 x 12	106 x 12	106 x 12	106 x 12
Note:	ATC for Mettler™, Pinnacle™ and Corning™ meters	ATC for Mettler™, Pinnacle™ and Corning™ meters	ATC for Beckman™ meters	ATC for WTW™ and Pinnacle™ (part numbers ending with "P")



Catalog No.	13-620-111T	13-620-111	13-620-631
Parameter	pH/ATC	pH/ATC	pH/ATC
Combination Or Half Cell	Combination	Combination	Combination
ATC Connection	Mini DIN	Mini phone	Mini phone
Refillable Or Gel (Sealed)	Gel	Gel	Refillable
Refill Solution	n/a	n/a	SP138-500
Junction Type	Double	Double	Double
Glass Or Plastic Body	Plastic	Plastic	Plastic
Max Temp	80 °C	80 °C	80 °C
Length x Diameter (mm)	106 x 12	106 x 12	106 x 12
Note:	ATC for Thermo Scientific Star meters	ATC for Denver / Sartorius meters	ATC for Denver / Sartorius meters

Fisher Scientific accumet pH And Half Cell Electrodes

pH/ATC Electrodes For Portable Fisher Scientific accumet Meters

pH/ATC Electrodes For Field Use, accuTupH Half Cell





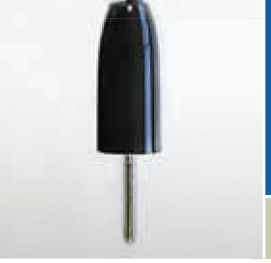
Catalog No.	13-620-AP52	13-620-AP61	13-620-AP50A	13-620-AP55	13-620-187
Special	n/a	n/a	n/a	n/a	accuTupH
Parameter	pH/ATC	pH/ATC	pH/ATC	pH/ATC	pH indicating
Combination Or Half Cell	Combination	Combination	Combination	Combination	Half cell, BNC
ATC Type	13-620-16	13-620-AP53	13-620-AP53	13-620-20	n/a
Refillable Or Gel (Sealed)	Gel	Refillable	Refillable	Refillable	n/a
Refill Solution	n/a	SP138-500	SP135-500	SP135-500	n/a
Junction Type	Double	Double	Single	Single	n/a
Glass Or Plastic Body	Plastic	Plastic	Plastic	Plastic	Glass
Max Temp	80 °C	80 °C	80 °C	80 °C	100 °C
Length x Diameter (mm)	102 x 12	102 x 12	102 x 12	102 x 12	106 x 12
Note:	ATC for AP60 & AP100 series meters	ATC for AP60 & AP100 series meters. Replaces 13-620-AP51	ATC for AP60 & AP100 series meters	ATC for AP70 & AP80 series meters	Rugged, use with reference half cell

Half-Cell Electrodes





Catalog No.	13-620-284	13-620-294	13-620-295	13-620-51	13-620-52
Special	n/a	n/a	Low na error	Ships dry	Ships filled
Parameter	pH indicating	pH indicating	pH indicating	Reference	Reference
Combination Or Half Cell	Half cell, BNC	Half cell, BNC	Half cell, BNC	Half cell, pin	Half cell, pin
ATC Type	n/a	n/a	n/a	n/a	n/a
Refillable Or Gel (Sealed)	n/a	n/a	n/a	Refillable	Refillable
Refill Solution	n/a	n/a	n/a	SP138-500	SP138-500
Junction Type	n/a	n/a	n/a	Calomel	Calomel
Glass Or Plastic Body	Glass	Plastic	Plastic	Glass	Glass
Max Temp	100 °C	80 °C	80 °C	80 °C	80 °C
Length x Diameter (mm)	106 x 12	106 x 12	106 x 12	106 x 12	106 x 12
Note:	Use with reference half cell	Use with reference half cell	Ideal for samples >pH 11, use with reference half cell	Pin connector, use with indicating half cell	Pin connector, use with indicating half cell



Fisher Scientific accumet Electrodes

Reference Electrodes Use Common Pin Connector Type

Half Cell Reference Electrodes





Catalog No.	13-620-79	13-620-57	13-620-62	13-620-61	13-620-258
Special	Minature	–	Sleeve junction	Reverse sleeve	–
Parameter	Reference	Reference	Reference	Reference	Reference
Combination Or Half Cell	Half cell, pin	Half cell, pin	Half cell, pin	Half cell, pin	Half cell, pin
Refillable Or Gel (Sealed)	Refillable	Refillable	Refillable	Refillable	Refillable
Refill Solution	SP138-500	SP138-500	SP138-500	SP138-500	SP138-500
Junction Type	Calomel	Calomel	Calomel	Calomel	Calomel
Glass Or Plastic Body	Glass	Glass	Glass	Glass	Plastic
Max Temp	80 °C	80 °C	80 °C	80 °C	80 °C
Length x Diameter (mm)	41 x 12	106 x 12	106 x 12, 16 (with sleeve)	106 x 12, 16 (with sleeve)	106 x 12
Note:	Pin connector, use with indicating half cell	Pin connector, non-aqueous samples, use with indicating half cell	Pin connector, for viscous samples, use with indicating half cell	Pin connector, for viscous samples, use with indicating half cell	Pin connector, use with indicating half cell

Half Cell Reference Electrodes






Catalog No.	13-620-259	13-620-53	13-620-216	13-620-273	13-620-46	13-620-658
Special	–	–	–	–	–	–
Parameter	Reference	Reference	Reference	Reference	Reference	Reference
Combination Or Half Cell	Half cell, pin	Half cell, pin	Half cell, pin	Half cell, pin	Half cell, pin	Half cell, pin
Refillable Or Gel (Sealed)	Gel	Refillable	Refillable	Refillable	Refillable	Refillable
Refill Solution	n/a	SP135-500	1M sodium sulfate	SP138-500	SP135-500	Inner 13-620-433 Outer 13-620-434
Junction Type	Calomel	Single	Single	Double	Single	Double
Glass Or Plastic Body	Plastic	Glass	Glass	Glass	Plastic	Plastic
Max Temp	80 °C	100 °C	100 °C	100 °C	100 °C	100 °C
Length x Diameter (mm)	106 x 12	106 x 12	106 x 12	106 x 12	108 x 13	108 x 13
Note:	Pin connector, use with indicating half cell	Pin connector, use with indicating half cell	Pin connector, use with indicating half cell (13-620-122 rec-ommended) Ag and Cl titrations.	Pin connector, use with indicating half cell	Pin connector, use with indicating half cell	Pin connector, bromide, chloride, copper, iodide, lead, nitrate, silver/ sulfide, redox, and pH applications requiring sample-compatible electrolyte, use with indicating half cell