Fisherbrand
QUALITY. RELIABILITY. VALUE.

Fisherbrand Focus

Whatever your application Fisherbrand has a solution for you

ELECTROCHEMISTRY

Focus on pH

Fisherbrand and Fisher Chemical working together to deliver reliable and essential products that meet your most demanding electrochemistry requirements

Fisher Scientific

Fisher Scientific's trusted, well established and proprietary product range, Fisherbrand is committed to providing quality products at affordable prices. Fisherbrand offers a broad selection of laboratory supplies and consumables covering a diverse range of applications such as chromatography, liquid handling, electrophoresis, pH and electrochemistry. It's the smart way to achieve cost savings over branded products without having to compromise on quality.

Watch our *Meet the Family* video to discover more

In addition to the extensive Fisherbrand range, Fisher Scientific is your partner of choice for chemicals and bioreagents. Fisher Chemical and Fisher Bioreagents deliver convenience, quality and consistency and are the leading provider of chemicals and bioreagents to many research sectors, such as academia, pharmaceuticals, biotechnology and healthcare.

- Fisher Chemical offers more than 4,000 chemicals of the highest quality, including 'dry' reagents, ready made solutions and high purity solvents. All chemicals are ISO 9001:2008 certified and undergo rigorous quality assurance and testing procedures, ensuring excellent lot-to-lot and bottle-to-bottle consistency. Supported by a clear and simple grade and application structure, choosing the product that best suits your requirements is easy.
- Fisher Bioreagents offers over 1,000 products dedicated to molecular biology research, biochemistry and cellular biology. It is your single source for high purity products

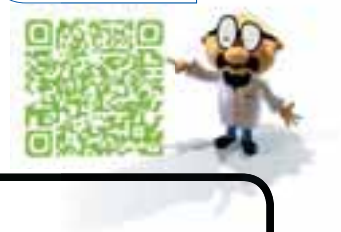
Fisherbrand® Fisher Chemical Fisher BioReagents®

Together Fisherbrand, Fisher Chemical and Fisher Bioreagents offer reliable and essential laboratory products, helping you to produce your best work each and every day.

New products are constantly being introduced into the Fisherbrand family
For the full range visit www.eu.fishersci.com/fisherbrand

This brochure is dedicated to providing you with a comprehensive overview of our pH and electrochemistry portfolio as well as highlighting supplementary products from the Fisherbrand family. Featuring a range of instruments, consumables and Fisher Chemical, as well as useful product resources such as selection guides, troubleshooting guides, FAQ's and workflows, it is a great lab companion.

Watch our *Focus on pH and Electrochemistry* video to discover more



Frequently asked questions (FAQ's)

This brochure features some of the most frequently asked questions about electrochemistry and pH measurement as received by our Life Science and Chemical Specialists, together with the answers they provided. However, if you are unable to find the answer to your question, are stuck and need help or are simply confused and unsure of which product best suits your research needs, the Product Support Team are here and ready to respond to your enquiries.

Contact our Product Support Advisors

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Email: tsse@thermofisher.com

Tel: +358 9 8027 6280
Email: fisher.fi.techsupport@thermofisher.com

Tel: +47 22 95 59 59
Email: psq.no@thermofisher.com

Laboratory Reagents Handbook

For a fuller range of Fisher Chemical and Fisher Bioreagents, please refer to our Laboratory Reagents handbook. This handbook features...

For the analytical chemist:

- Over 4400 Fisher Chemical products dedicated to many analytical applications, including Optima LC/MS grade solvents and high purity acids for Trace Elemental analysis
  - Colour coded applications
  - Physical & chemical data
  - Hazard, packaging and storage information
  - Detailed specifications

Fisher Chemical

For the life scientist:

- A dedicated section relating to four key application areas
  - Protein Chemistry
  - Molecular Biology
  - Cell Biology
  - Core Bioreagents

Fisher BioReagents®

To order your copy visit www.eu.fishersci.com/catalogues

Contents

Electrochemistry

FOCUS ON WATER ANALYSIS WORKFLOW

Depend on Fisherbrand, Fisher Chemical and Fisher Bioreagents to provide products for every step of your water analysis workflow.

Fisherbrand® Fisher Chemical Fisher BioReagents®

Microbiology

Legionella, E. coli, Enterococcus, Pseudomonas, Staphylococcus, Streptococcus, Salmonella

- Incubators
- Safety cabinets
- Microscopes
- Colony counters
- Petri dishes
- Media
- Swabs

Sample Preparation

- Balances
- Centrifuges
- Centrifuge tubes
- Chemicals
- Dialysis tubing
- Overhead stirrers
- Pipettors and pipettor tips
- Sonic dismembrators
- Syringe filters
- Vortexers

Sample Storage

- Bags
- Bottles
- Freezers/Refrigerators
- Thermometers

Sample Transportation

- Carriers
- Trays
- Thermometers

Sampling

- Bags
- Beakers
- Bottles
- Cylinders
- Funnels
- Petri dishes

Elementary Analysis

Main : Na, K, Ca, Mg
Secondary : Pb, Hg, Cr, As, Sc

- ICE 3300 for one element
- ICAP for multi-elements
- Mono elementary standards
- Multi elementary standards

Chromatography

Pesticides, traces…

- LCMS
- HPLC
- GC
- Flasks
- Syringes
- Columns
- Solvents
- Chemicals

Focus on accumet™ benchtop meters refer to pages 10 to 15

Lab Analysis

- Benchtop pH meters
- Benchtop conductivity meters
- Benchtop dissolved oxygen meters
- Electrodes
- pH buffers
- Conductivity standards
- pH indicator sticks/reels
- Thermometers
- Timers

For information on the full range of products featured also refer to Fisherbrand Supplemen pages 47 to 67

Focus on accumet™ portable meters refer to pages 16 to 20

Field Analysis

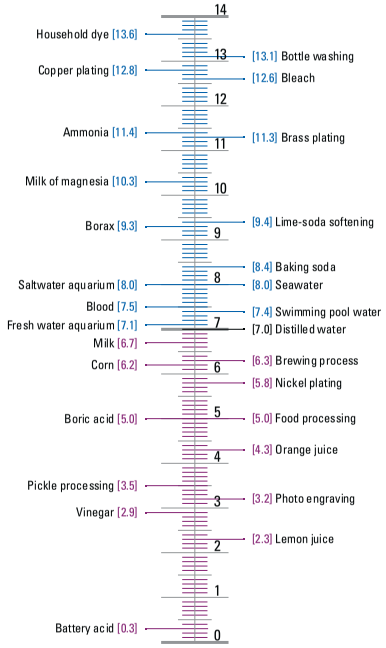
- Handheld pH meters
- Handheld conductivity meters
- Handheld dissolved oxygen meters
- Electrodes
- pH buffers
- Conductivity standards
- pH indicator sticks/reels

For information on the full range of products featured also refer to Fisherbrand Supplement pages 47 to 67.

INTRODUCTION TO ELECTROCHEMISTRY

Next to temperature and mass, pH is the third most common laboratory measurement. It crosses over many disciplines from water/wastewater analysis, basic research and development, environmental, chemical and life sciences, and an endless number of industrial applications.

Below are some examples of pH in a few common industrial and household products



pH is used as a convenient way to compare the relative acidity or alkalinity of a solution at a given temperature. The term pH itself is derived from a combination of "p" for the word power and "H" for the symbol of the element hydrogen. Together the meaning is the power of hydrogen.

Therefore, the pH is the degree of acidity or alkalinity of a solution based on the hydrogen ion activity, represented by the equation:

$$pH = -\log [H+]$$

Stated mathematically, pH is the negative logarithmic value of the hydrogen ion. As it is based on a log scale, each pH unit represents a factor of 10, so a solution with a pH of 5 is 100 times more acidic than pH of 7.

pH is measured on a scale of 1-14, 1 being very acidic, 14 being very alkaline and 7 neutral. A pH of 7 describes a neutral solution because the activities of hydrogen and hydroxide ions are equal. When the pH is below 7, the solution is described as acidic because the activity of hydrogen ion is greater than that of hydroxide ion and as the hydrogen ion activity increases, so the pH value decreases. Conversely, when the pH is above 7, the solution is described as basic (or alkaline) because the activity of hydroxide ion is greater than that of hydrogen ion.

pH can be measured in a number of different ways. These include basic tests such as using test papers (litmus paper for example) and chemicals (e.g. universal indicators), through to using more sophisticated items of equipment such as colorimeters and photometers and electrochemical sensors. This brochure will focus on electrochemistry, the most accurate of all the methods.

ACCUMET™ ELECTROCHEMISTRY METERS

This next section provides an overview of the comprehensive range of Fisherbrand accumet™ electrochemistry meters and accessories. These instruments represent the state of the art for measuring pH, mV (ORP), ion concentration, conductivity, total dissolved solids (TDS), dissolved oxygen, and temperature. Most of these instruments are capable of measuring more than one of these parameters.

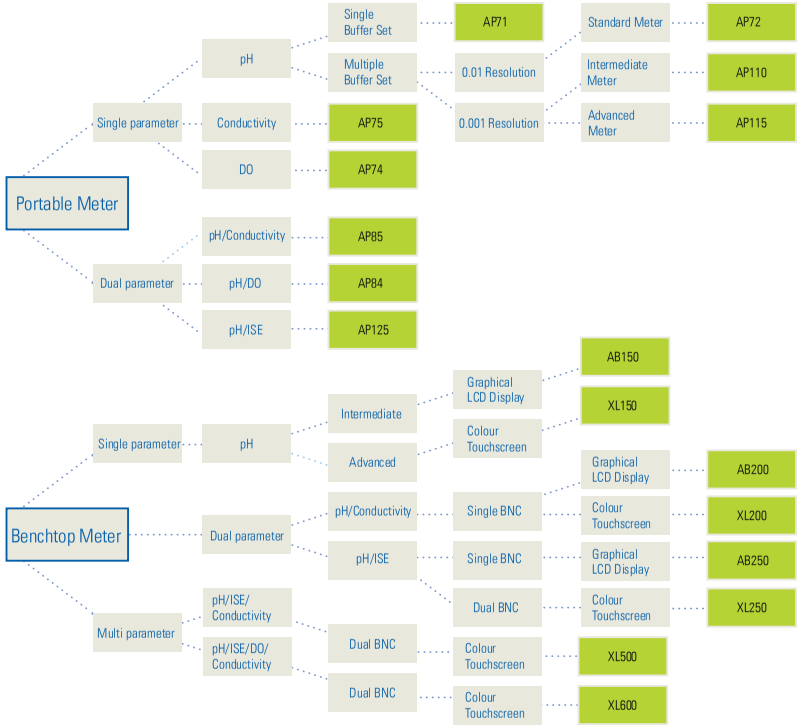
The Fisherbrand **accumet™ AB** series of benchtop meters offer accuracy, simplified performance and innovative features such as a backlit display, multiple views, date/time for GLP requirements, expanded memory, custom buffer calibration options, a calibration alarm, three-position electrode holder, stirring capability, upgradeable software, and the option to mount on a wall. The meters can be set to display local language and feature user prompts and context-specific «help» screens.

The AB150 from this range is Fisher Scientific's top selling pH meter and is the instrument of choice for routine laboratory pH needs. Two further models have recently been added to this range - the AB250, with ISE capability, and the AB200, the first AB multi-parameter instrument for both pH and conductivity.

The Fisherbrand **accumet™ XL** series of benchtop meters bring more advanced designs, including a large vivid colour touchscreen with multiple channels and new features including two stirring probe ports, a three-position electrode holder, upgradeable software, and USB and RS232 connectivity, making these popular meters better than ever. Similar to the AB series, the XL series can be set to display local language and feature user prompts and context-specific «help» screens.

The Fisherbrand **accumet™ AP** series of handheld portable meters are ideal for the researcher 'on the go'. For both indoor and outdoor use, the AP series feature soft touch keys with comfort grip, making one-handed operation a breeze. Other features include rugged waterproof housing (IP67 rated), a large LCD screen with backlighting and easy-to-use plain language text.

The accumet™ AB, XL and AP series of pH meters all offer high quality, user-friendly and cost-effective instruments for every application and budget. The diagram below will guide you to selecting the right meter for your particular application.



Fisherbrand accumet™ AB and XL Benchtop Meter Series

The Fisherbrand accumet™ AB and XL series of benchtop meters are available either as meters only, which also include the electrode arm, RS232 and USB cables, power supply and user manual, or else as a kit, which includes the meter, appropriate electrode and probes, electrode arm, RS232 and USB cables, power supply and manual.

Within this range, the AB150 is Fisher Scientific's top selling pH meter. It is the perfect choice for all laboratories as an accurate, easy-to-use pH/mV meter with exceptionally high accuracy and resolution. Find out more about the AB150 and the rest of our newly expanded and upgraded range of benchtop meters in this section.

To view the instruction manuals for the following range of accumet™ benchtop meters visit www.eu.fishersci.com/fisherbrand.

Selection Guide for Benchtop Meters

Find the right accumet™ benchtop meter for your particular application using the selection guide below.

Model	AB150	AB200	AB250	XL150	XL200	XL250	XL500	XL600
Page	11	11	12	13	13	14	14	15
Colour Touch Screen				•	•	•	•	•
pH-mV (BNC) / Temp	•	•	•	•	•	••	••	••
Ion Selective-mV (BNC) / Temp			•			••	••	••
Conductivity / TDS / Resistivity / Salinity / Temp		•			•		•	•
Dissolved Oxygen / Temp								•
Stirring Probe	•	•	•	•	••	••	••	••
USB Device / RS-232	•	•	•	•	•	•	•	•
USB Host / RS-232 / RJ-45 (Ethernet)				•	•	•	•	•

•• = Dual Channel Capacity

accumet™ AB Series

- Multiple views
- Backlight display
- Date/time for GLP requirements
- Customer buffer calibration options
- 3 position electrode holder
- Stirring capability
- Upgradeable software
- Wall mounting available

pH Meter, AB150

Intuitive, simple operation and high accuracy in a compact, affordable meter

Technical Specification

pH

Range	-2.000 to 20.000pH
Resolution	0.1/0.01/0.001pH
Accuracy	±0.002pH + 1LSD
Buffer Sets	USA: 2.000, 4.010, 6.997, 10.013, 12.000
	NIST: 1.678, 4.010, 6.865, 9.184, 12.460
	DIN: 1.090, 3.060, 4.650, 6.790, 9.230, 12.750
	FSCI: 1.000, 3.000, 6.000, 8.000, 10.000, 13.000
	CUSTOM: Any 2-5 values, ≥1.0pH unit apart
Slope Display	Yes, up to 5 different slopes with offset
Temp Compensation	Automatic or manual (0 to 100°C / 32 to 212°F)

mV Mode

Range	±2000.0mV / Rel.mV
Resolution	0.1mV
Accuracy	±0.2mV or ±0.05% whichever is greater
Offer Adjustment	Up to ±150mV

Temperature Mode

Resolution	0.1°C / 0.1°F
Accuracy	±0.3°C / ±0.5°F
Calibration	Offset in 0.1° increments; offset range: ±5°C / 9°F
Output	RS-232 (phono plug), mini-B USB, stirrer
Language Selection	English, French, Spanish, German, Italian, Chinese, Korean, Portuguese
Memory	500 data sets, viewable
Datalogging	Manual, timed (selectable every 3 to 3600 seconds). Printer or CSV format

Cat. No	Description
12840633	AB150 Meter - Includes meter, electrode arm, RS232 & USB cables, 100/240V power supply, and manual
12870633	AB150 Kit - Includes meter, TRIS compatible pH/ATC electrode (Cat. No 11500194), electrode arm, RS232 & USB cables, 100/240V power supply, and manual
12880633	AB150 BioBasic Kit - Includes meter, TRIS compatible accuTupH pH electrode (Cat. No 11550174), ATC probe (Cat. No 10236064), electrode arm, 110/220V power supply, and manual

pH Meter, AB200

An accurate, affordable, multi-parameter instrument

Technical Specification

pH

Range	-2.000 to 20.000pH
Resolution	0.1/0.01/0.001pH
Accuracy	±0.002pH + 1LSD
Buffer Sets	USA: 2.000, 4.010, 6.997, 10.013, 12.000
	NIST: 1.678, 4.010, 6.865, 9.184, 12.460
	DIN: 1.090, 3.060, 4.650, 6.790, 9.230, 12.750
	FSCI: 1.000, 3.000, 6.000, 8.000, 10.000, 13.000
	CUSTOM: Any 2-5 values, ≥1.0pH unit apart
Slope Display	Yes, up to 5 different slopes with offset
Temp Compensation	Automatic or manual (0 to 100°C / 32 to 212°F)

Conductivity Mode

Range	0.00µS to 500.0mS
Resolution	0.01 / 0.1µS ; 0.001 / 0.01 / 0.1mS
Accuracy	±1% full scale
Coefficient (Per °C)	Linear & pure ; adjustable 0.000 to 10.000%
Normalization	15.0 to 30.0°C

Temperature Mode

Resolution	0.1°C / 0.1°F
Accuracy	±0.3°C / ±0.5°F
Calibration	Offset in 0.1° increments; offset range: ±5°C / 9°F
Output	RS-232 (phono plug), mini-B USB, stirrer
Language Selection	English, German, French, Italian & Spanish
Memory	500 data sets, viewable
TDS Mode	
Range:	0.00ppm to 500ppt (@ TDS factor 1.00)
Resolution	0.00ppm to 500ppt (@ TDS factor 1.00)
Accuracy	0.01 / 0.1ppm ; 0.001 / 0.01 / 0.1ppt
TDS Factor	±1% full scale
Datalogging	Manual, timed (selectable every 3 to 3600 seconds). Printer or CSV format

Cat. No	Description
12800643	AB200 Meter - Includes meter, electrode arm, RS232 & USB cables, 100/240V power supply, and manual
12810643	AB200 Kit - Includes meter, TRIS compatible pH/ATC electrode (Cat. No 11500194), Conductivity/Temp probe (Cat. No 11550164), electrode arm, RS232 & USB cables, 100/240V power supply, and manual

pH Meter, AB250

Versatile BNC connection for pH, redox/ORP, or ion selective measurements

Technical Specification

pH
- Range: -2.000 to 20.000pH
- Resolution: 0.1/0.01/0.001pH
- Accuracy: ±0.002pH + 1LSD
- Buffer Sets: USA: 2.000, 4.010, 6.997, 10.013, 12.000
  NIST: 1.678, 4.010, 6.865, 9.184, 12.460
  DIN: 1.090, 3.060, 4.650, 6.790, 9.230, 12.750
  FSCI: 1.000, 3.000, 6.000, 8.000, 10.000, 13.000
  CUSTOM: Any 2-5 values, ≥1.0pH unit apart
- Slope Display: Yes, up to 5 different slopes with offset
- Temp Compensation: Automatic or manual (0 to 100°C / 32 to 212°F)

mV Mode
- Range: -2.000 to 20.000pH
- Resolution: 0.1/0.01/0.001pH
- Accuracy: ±0.002pH + 1LSD
- Offer Adjustment: Up to ±150mV

Ion Mode
- Range: 0.001 to 19999 (±2000mV)
- Resolution: 0.001 / 0.01 / 0.1 / 1 (automatic)
- Units: ppm, mg/L, molar
- Accuracy: 0.5% full scale (monovalent ion)
  1% full scale (divalent ion)
- Cal Points: 2 to 6 points from one of following groups
  0.001, 0.01, 0.1, 1, 10, 100
  0.01, 0.1, 1, 10, 100, 1000
  0.02, 0.2, 2, 20, 200, 2000
  0.1, 1, 10, 100, 1000, 10000
  0.05, 0.5, 5, 50, 500, 5000

Temperature Mode
- Resolution: 0.1/0.01/0.001pH
- Accuracy: ±0.002pH + 1LSD
- Calibration: Offset in 0.1° increments; offset range: ±5°C / 9°F

Output: RS-232 (phono plug), mini-B USB, stirrer

Language Selection: English, French, Spanish, German, Italian, Chinese, Korean, & Portuguese

Memory: 500 data sets, viewable

Datalogging: Manual, timed (selectable every 3 to 3600 seconds). Printer or CSV format

Cat. No	Description
12850633	AB250 Meter - Includes meter, electrode arm, RS-232 & USB cables, 100/240V power supply, and manual
12860633	AB250 Kit - Includes meter, TRIS compatible pH/ATC electrode (Cat. No 11500194), electrode arm, RS-232 & USB cables, 100/240V power supply, and manual

11550164

11500194

10236064

11550174

Replacement Parts and Accessories for AB Series

Cat. No	Description
11550174	TRIS compatible accuTupH combination electrode, double-junction, glass body, refillable
11500194	TRIS compatible pH/ATC combination electrode, double-junction, plastic body, refillable
10236064	ATC probe for AB/XL series benchtop meters
11550164	Conductivity cell 2-cell with ATC epoxy body for AB200 and XL series meters, cell constant 1.0, sensing range of 20µS to 20mS

For best results, connect optional stirrer probe, Cat. No 12860653 (refer to page 21) for efficient mixing and fast, accurate measurements!

Refer to pages 21 to 22 for further information on the range of probes and accessories for accumet™ meters

accumet™ XL Series

- Colour touch screen
- Two stirring probe ports
- Three position electrode holder
- Upgradeable software
- USB & RS232 connectivity

pH Meter, XL150

Simple yet powerful, large full-colour touch screen for easy operation

Technical Specification

pH
- Range: -2.000 to 20.000pH
- Resolution: 0.1/0.01/0.001pH
- Accuracy: ±0.1 / 0.01 / 0.002 ±1LSD
- Buffer Sets: USA: 2.00, 4.01, 7.00, 10.01, 12.00
  NIST: 1.68, 4.01, 6.86, 9.18, 12.46
  DIN 19267: 1.09, 3.06, 4.65, 6.79, 9.23, 12.75
  FSCI: 1.00, 3.00, 6.00, 8.00, 10.00, 13.00
  Pure Water: 4.10, 6.97, 9.15
  CUSTOM: 2-5 points; any values ≥1.0pH units apart

mV Mode
- Range: ±2000mV / Rel mV
- Resolution: 0.1
- Accuracy: ±0.2

Temperature Mode
- Resolution: -5.0 to 105.0°C
- Accuracy: 0.1°C (0.1°F)
- Calibration: ±0.2°C (±0.3°F)

Output: RJ45, RS232, USB-A, mini-B USB, two stirrer ports

Language Selection: English, French, Spanish, German, Italian, Chinese, Korean, & Portuguese

Datalogging: 2000-reading datalog capability

Cat. No	Description
12890633	XL150 Meter - Includes meter, electrode arm, RS-232 & USB cables, 100/240V power supply, and manual
12820643	XL150 Kit - Includes meter, TRIS compatible accuTupH pH electrode (Cat. No 11550174), ATC probe (Cat. No 10236064), electrode arm, RS232 & USB cables, 110/220V power supply, and manual

pH Meter, XL200

No need to swap probes – measure and display two channels simultaneously

Technical Specification

pH
- Range: -2.000 to 20.000pH
- Resolution: 0.1/0.01/0.001pH
- Accuracy: ±0.1 / 0.01 / 0.002 ±1LSD
- Auto Buffer Recognition: 5 preset buffer groups + custom

mV Mode
- Range: ±2000mV / Rel mV
- Resolution: 0.1
- Accuracy: ±0.2

Temperature Mode
- Resolution: -5.0 to 105.0°C
- Accuracy: 0.1°C (0.1°F)
- Calibration: ±0.2°C (±0.3°F)

Conductivity Mode
- Range: -5.0 to 105.0°C
- Resolution: 0.1°C (0.1°F)
- Accuracy: ±0.2°C (±0.3°F)

Output: RJ45, RS232, USB-A, mini-B USB, two stirrer ports

Language Selection: English, French, Spanish, German, Italian, Chinese, Korean, & Portuguese

Cat. No	Description
12830643	XL200 Meter - Includes meter, electrode arm, RS-232 & USB cables,100/240V power supply, and manual
12840643	XL200 Kit - Includes meter, TRIS compatible accuTupH pH electrode (Cat. No 11550174), ATC probe (Cat. No 10236064), Conductivity/Temp probe (Cat. No 11550164), electrode arm, RS232 & USB cables, 100/240V power supply, and manual

pH Meter, XL250

Multiple BNC ports allow flexibility

Technical Specification

pH
- Range: -2.000 to 20.000pH
- Resolution: 0.1/0.01/0.001pH
- Accuracy: ±0.1 / 0.01 / 0.002 ±1LSD
- Auto Buffer Recognition: 5 preset buffer groups + custom

mV Mode
- Range: ±2000mV / Rel mV
- Resolution: 0.1
- Accuracy: ±0.2

Temperature Mode
- Resolution: -5.0 to 105.0°C
- Accuracy: 0.1°C (0.1°F)
- Calibration: ±0.2°C (±0.3°F)

Ion Mode
- Range: 1 x 10^{-6} to 9.99 x 10^{10}
- Resolution: 0.1 / 0.01 / 0.001
- Accuracy: ±0.5% full scale (monovalent ion)
- 1% full scale (divalent ion)

Output: RJ45, RS232, USB-A, mini-B USB, two stirrer ports

Language Selection: English, French, Spanish, German, Italian, Chinese, Korean, & Portuguese

Cat. No	Description
12850643	XL250 Meter - Includes meter, electrode arm, RS-232 & USB cables, 100/240V power supply, and manual
12860643	XL250 Kit - Includes meter, TRIS compatible accuTupH pH electrode (Cat. No 11550174) , ATC probe (Cat. No 10236064), electrode arm, RS232 & USB cables, 110/220V power supply, and manual
12870643	XL250 Fluoride Kit - Includes meter, fluoride electrode (Cat. No 11510154), TRIS compatible accuTupH pH electrode (Cat. No 11550174), ATC probe (Cat. No 10236064), electrode arm, RS-232 & USB cables, 110/220V power supply, and manual
12890643	XL250 Ammonia Kit - Includes meter, ammonia electrode (Cat. No 11510134), TRIS compatible accuTupH pH electrode (Cat. No 11550174), ATC probe (Cat. No 10236064), electrode arm, RS-232 & USB cables, 110/220V power supply, and manual

pH Meter, XL500

Multi-channel operation simplifies your lab work

Technical Specification

pH
- Range: -2.000 to 20.000pH
- Resolution: 0.1/0.01/0.001pH
- Accuracy: ±0.1 / 0.01 / 0.002 ±1LSD
- Auto Buffer Recognition: 5 preset buffer groups + custom

mV Mode
- Range: ±2000mV / Rel mV
- Resolution: 0.1
- Accuracy: ±0.2

Temperature Mode
- Resolution: -5.0 to 105.0°C
- Accuracy: 0.1°C (0.1°F)
- Calibration: ±0.2°C (±0.3°F)

Ion Mode
- Range: 1 x 10^{-6} to 9.99 x 10^{10}
- Resolution: 0.1 / 0.01 / 0.001
- Accuracy: ±0.5% full scale (monovalent ion)
- 1% full scale (divalent ion)

Conductivity Mode
- Range: 0 to 500.0mS
- Resolution: 0.01 / 0.1µS ; 0.001 / 0.01 / 0.1mS
- Accuracy: ±1% full scale

Output: RJ45, RS232, USB-A, mini-B USB, two stirrer ports

Language Selection: English, French, Spanish, German, Italian, Chinese, Korean, & Portuguese

Cat. No	Description
12880643	XL500 Meter - Includes meter, electrode arm, RS-232 & USB cables, 100/240V power supply, and manual
12800653	XL500 Kit - Includes meter, TRIS compatible accuTupH pH electrode (Cat. No 11550174), ATC probe (Cat. No 10236064), Conductivity/Temp probe (Cat. No 11550164), electrode arm, RS-232 & USB cables, 100/240 V power supply and manual

pH Meter, XL600

A complete lab in one instrument

Technical Specification

pH
- Range: -2.000 to 20.000pH
- Resolution: 0.1/0.01/0.001 selectable
- Accuracy: ±0.1/0.01/0.002 ±1LSD
- Cal. Points: Up to 6 preset or 5 custom
- Buffer Sets: USA: 2.000, 4.010, 6.997, 10.013, 12.000
- NIST: 1.678, 4.010, 6.865, 9.184, 12.460
- DIN: 1.090, 3.060, 4.650, 6.790, 9.230, 12.750
- FSCI: 1.000, 3.000, 6.000, 8.000, 10.000, 13.000
- CUSTOM: Any 2-5 values, ≥1.0pH unit apart
- Slope Display: Yes, with offset
- Multiple Slope Display: Yes, up to 5 different slopes
- Temp Compensation: Automatic or manual (0 to 100°C / 32 to 212°F)
- Temp Range (Meter): 0.0 to 100.0°C / 32.0 to 212.0°F
- Inputs: BNC, ATC

mV Mode
- Range: ±2000.0mV
- Rel. mV Range: ±2000.0mV
- Resolution: 0.1
- Accuracy: ±0.2mV or ±0.05% whichever is greater
- Offset Adjustment: Up to ±150mV

Temperature Mode
- Resolution: 0.1°C / 0.1°F
- Accuracy: ±0.3°C / ±0.5°F
- Calibration: Offset in 0.1° increments; Offset range: ±5°C / 9°F

Ion Mode
- Range: 0.001 to 19999 (±2000mV)
- Resolution: 0.001 / 0.01 / 0.1 / 1 (automatic)
- Units: ppm, mg/L, molar
- Accuracy: 0.5% full scale (monovalent ion)
- 1% full scale (divalent ion)
- Cal Points: 0.001, 0.01, 0.1, 1, 10, 100
- 0.01, 0.1, 1, 10, 100, 1000
- 0.02, 0.2, 2, 20, 200, 2000
- 0.1, 1, 10, 100, 1000, 10000
- 0.05, 0.5, 5, 50, 500, 5000

Conductivity
- Range: 00.00µS to 500.0mS
- Resolution: 0.01 / 0.1µS; 0.001 / 0.01 / 0.1mS
- Accuracy: ±1% full scale
- Cal. Points: Automatic (4 points); maximum 1 per range
- Manual (5 points); maximum 1 per range
- Cell Constant: 0.010 to 10.000
- Cell Types: 2 or 4 cell with ATC
- Coefficient (Per °C): Linear & pure; adjustable 0.000 to 10.000 %
- Normalization: 15.0 to 30.0°C / 59.0 to 86.0°F
- Compensation: Automatic with supplied cell or manual
- Temp Compensation: 0.0 to 100°C / 32.0 to 212.0°F (0.0 to 80°C / 32.0 to 176.0°F with supplied cell)

Output: RJ45, RS232, USB-A, mini-B USB, two stirrer ports

Language selection: English, French, Spanish, German, Italian, Chinese, Korean, & Portuguese

Datalogging: Manual, timed selectable every 3 to 86400 sec. (24hours)

TDS
- Range: 0.00ppm to 500ppt (@ TDS factor 1.00)
- Resolution: 0.01 / 0.1ppm; 0.001 / 0.01 / 0.1ppt
- Accuracy: ±1 % full scale
- Cal. Points: Up to 5
- TDS Factor: 0.400 to 1.000

Cat. No	Description
12820653	XL600 Meter - Includes meter, electrode arm, RS-232 & USB cables,100/240V power supply, and manual
12810653	XL600 Kit - Includes meter, TRIS compatible accuTupH pH electrode (Cat. No 11550174), ATC probe (Cat. No 10236064), conductivity/temp probe (Cat. No 11550164), electrode arm, RS-232 & USB cables, 100/240V power supply, and manual
12830653	XL600 Deluxe Kit - Includes meter, self-stirring BOD probe (Cat. No 11530184), TRIS compatible accuTupH pH electrode (Cat. No 11550174), ATC probe (Cat. No 10236064), conductivity/temp probe (Cat. No 11550164), electrode arm, RS-232 & USB cables, 100/240V power supply, and manual

11550174 **10236064** **11550164** **11510154** **11510134** **11530184**

Replacement Parts and Accessories for XL Series

Cat. No	Description
11550174	TRIS compatible accuTupH combination electrode, double-junction, glass body, refillable
10236064	ATC probe for AB/XL series benchtop meters
11550164	Conductivity cell 2-cell with ATC epoxy body for AB200 and XL series meters, cell constant 1 20µS to 20mS
11510154	Fluoride electrode, solid state ISE combination, refillable, BNC connection plastic body interferences OH- 110mm x 13mm 80°C max. temperature, 0.02ppm to saturated range
11510134	Ammonia electrode, gas sensing ISE combination, refillable, BNC connection plastic body interferences amines/metal cations 108mm x 12mm 60°C max. temperature, 0.009 to 1,700ppm range
11530184	DO/BOD/temp probe, self-stirring

For best results, connect optional stirrer probe, Cat. No 12860653 (refer to page 21) for efficient mixing and fast, accurate measurements!

Refer to pages 21 to 22 for further information on the range of probes and accessories for accumet™ meters

Fisherbrand accumet™ AP Portable Meter Series

The accumet™ AP series of waterproof, portable meters provide accurate measurements anytime, anywhere.

The **AP71 and AP72** meters feature advanced pH meter functions in a waterproof, dustproof housing that floats. These meters read pH, mV or relative mV, and temperature in °C. The AP72 meter also reads temperature in °F. Both meters have excellent ±0.01pH accuracy. The ergonomic design of the AP71 and AP72 meter fits comfortably in your hand. Use the detachable electrode bracket to position the electrode for one-handed operation. Advanced setup mode lets you customise meter parameters and check electrode slope and offset to ensure electrode accuracy. The AP71 and AP72 pH meters are ideal for basic pH and mV readings in both harsh environmental conditions and general laboratory applications.

The **AP74 and AP84** meters read dissolved oxygen in mg/L, ppm, or % saturation. They use barometric pressure and salinity offset to ensure high accuracy with independent 100%, zero and offset adjustment capabilities. The adjustable backlit display is ideal for taking readings in low light. Probe includes 10ft standard cable length. These meters also feature a galvanic probe which allows the user to take dissolved oxygen measurements immediately, without the warm-up time of other probe designs. Advanced features also include display of probe diagnostics. The waterproof, dustproof housing floats, and is very easy to clean. The AP84 meter also takes pH readings with ±0.01pH accuracy.

The **AP75 and AP85** meters measure both conductivity and TDS plus temperature, with a housing that's perfect for rough conditions. These waterproof, dustproof meters float, and are very easy to clean. Advanced setup mode lets you customise meter parameters. Auto-ranging for conductivity and TDS measurements offers fast response over the entire range. Adjust temperature coefficient from 0 to 10% per °C or °F for accurate compensation in almost any solution. The AP75 meter offers a real-time clock, expanded memory function, and selectable cell constant. The AP85 meter measures pH, conductivity and TDS plus temperature. AP85 also features five-point pH calibration with ATC and auto-buffer recognition.

The **AP100** series meters are small enough for a shirt pocket, yet smart enough for any laboratory. The kits include an unbreakable pH/temperature electrode that is refillable for a fast response and the longest life. The AP125 accepts any ion selective electrode (ISE) with a BNC connection for direct ion concentration measurement from 0.001 to 99,999ppm.

In this section discover why this range of Fisherbrand accumet™ portable meters are perfect for the researcher 'on the go'.

To view the instruction manuals for the following range of accumet™ benchtop meters visit www.eu.fishersci.com/fisherbrand.

Selection Guide for Portable Meters

Find the right accumet™ portable meter for your particular application using the selection guide below

Model	AP71	AP72	AP74	AP84	AP75	AP85	AP110	AP115	AP125
Page	17	17	18	18	19	19	20	20	20
pH	•	•		•		•	•	•	•
Conductivity					•	•			
Dissolved Oxygen			•	•					
ISE									•
ATC	•	•	•	•	•	•	•	•	•
Date/Time		•	•		•			•	•
Data Point Storage	16	50	50		50		200	200	200

accumet™ AP Series

AP71 and AP72 pH Meters

Durable and reliable portable meters

- Measures pH, mV, and relative mV to 0.01pH and 0.1mV
- Dual display shows pH or mV, and temperature
- Push-button pH calibration with auto-buffer recognition
- Manual or automatic temperature compensation
- Store and recall 16 readings with corresponding temperature

AP72 meter also features:
- Real-time clock stamps stored data and calibration data with date and time
- Expanded memory stores up to 50 readings
- Selectable pH buffer sets
- Standard US, NIST, and DIN buffers
- Selectable automatic endpoint freezes reading when stable
- °C/°F selectable

	Model No	AP71	AP72
pH	Range, pH	-2.00 to 16.00	
	Resolution, pH	0.01	
	Accuracy, pH	±0.01	
	pH calibration	5 (1.68, 4.01, 7.01, 10.01, 12.45)	6 (US: 1.68, 4, 7, 10, 12.45; NIST: 1.68, 4.01, 6.86, 9.18, 12.45; or DIN: 1.09, 2.06, 4.65, 6.79, 9.23, 12.75)
Temperature	Range, °C	0.0 to 100.0°C	0.0 to 100.0°C, 32.0 to 212.0°F
	Resolution, °C	0.1°C / 0.1°F	
	Accuracy, °C	±0.5°C / ±0.5°F	
General	Memory	Stores 16 data sets	Stores 50 data sets

Cat. No	Description
11590254	AP71 Meter- Includes meter, AAA batteries, and manual
11580254	AP71 Meter Kit - Includes meter, pH/ATC electrode (Cat. No 11570174), refill solution, hard carrying case, 60mL sample bottles of storage solution, rinse water, pH4 and pH7 buffers, AAA batteries, and manual
11570254	AP72 Meter- Includes meter, AAA batteries, and manual
11560254	AP72 Meter Kit - Includes meter, pH/ATC electrode (Cat. No 11570174), refill solution, hard carrying case, 60mL sample bottles of storage solution, rinse water, pH4 and pH7 buffers, AAA batteries, and manual

Replacement Parts and Accessories for AP71 and AP72 Meters

Cat. No	Description
11570174	Replacement pH/ATC probe, plastic body, for AP80 and AP70 series, 762mm (30 inch) cable
11539144	Temperature probe for AP71 and AP72, 316 stainless steel, 3ft cable

11570174

11539144

Refer to pages 21 to 22 for further information on the range of probes and accessories for accumet™ meters

AP74 and AP84 Dissolved Oxygen Meters

Choose AP74 for DO/temp only or AP84 for pH/DO/temp

- Durable waterproof design with IP67 rating
- No meter warm-up required
- Adjustable backlit display
- Dual display shows mg/L (ppm) or % saturation plus temperature
- °C/°F selectable
- Independent 100% and zero adjustment calibrations
- Key in salinity and pressure manually; the meter does the rest
- Three year warranty

AP84 meter also features:
- pH measurement with auto-buffer recognition
- Meter displays probe diagnostics, view slope, offset, and mV values

AP74 meter also features:
- Real-time clock stamps stored data and calibration data with date and time
- Memory function stores and recalls up to 50 readings

	Model No	AP74	AP84
DO	Range, DO	Concentration (mg/L or ppm): 0.00 to 20.00 % Saturation: 0.00 to 200.0	
	Resolution, DO	Concentration (mg/L or ppm): 0.01 % Saturation: 0.1	
	Accuracy, DO	±1.5% full-scale	
	Calibration	2 Point (0%, 100%), 1 point (mg/L)	
pH	Range, pH	-	-2.00 to 16.00
	Resolution, pH	-	0.01
	Accuracy, pH	-	±0.1
	pH calibration	5 (1.68, 4.01, 7.00, 10.00, 12.45)	
Temperature	Range, °C	0.0 to 50.0	
	Resolution, °C	0.1	
	Accuracy, °C	±0.3	
General	Memory	Stores 50 data sets	
	Dimensions, mm	190 x 95 x 57	
	Mass, g	600	

Cat. No	Description
11530254	AP74 Meter - Includes meter, dissolved oxygen/temp probe (Cat. No 12784506), electrolyte, two membrane cap assemblies, polishing disk, AAA batteries, and manual
11520254	AP74 Kit - Includes meter, dissolved oxygen/temp probe (Cat. No 12784506), electrolyte, two membrane cap assemblies (Cat. No 10030073) and hard carrying case, polishing disk, AAA batteries, and manual
11590244	AP84 Meter - Includes meter, dissolved oxygen/temp probe (Cat. No 12784506), electrolyte, two membrane cap assemblies (Cat. No 10030073), polishing disk, AAA batteries, and manual
11580244	AP84 Kit - Includes meter, dissolved oxygen/temp probe (Cat. No 12784506), pH electrode (Cat. No 12865443), electrolyte, two membrane cap assemblies (Cat. No 10030073), hard carrying case, polishing disk, AAA batteries, and manual

Replacement Parts and Accessories for AP74 and AP84 Meters

Cat. No	Description
12784506	Replacement dissolved oxygen/temperature probe with 10ft submersible cable
10030073	DO replacement membrane assembly, pre-assembled membrane, membrane lock, O-ring, cap
12865443	Replacement pH electrode for AP84, ABS body, 10ft cable, 25mm diameter

12784506

Refer to pages 21 to 22 for further information on the range of probes and accessories for accumet™ meters

AP75 and AP85 Conductivity Meters

Rugged waterproof portable meters

- Completely waterproof and dustproof
- °C/°F selectable
- ±1% full-scale accuracy for conductivity and TDS measurements
- Switch from conductivity and TDS with the press of a button
- Dual display shows conductivity or TDS plus temperature
- Auto-ranging for conductivity across five ranges
- Five point conductivity and TDS calibration

AP85 meter also features:
- pH measurement with five-point pH calibration and auto-buffer recognition

AP75 meter also features:
- Real-time clock stamps stored data and calibration data with date and time
- Memory function stores and recalls up to 50 readings

	Model No	AP75	AP85
Conductivity/ TDS	Range, conductivity	0.0mS/cm to 199.9mS/cm	
	Range, TDS	0.00ppt to 200ppt	
	Accuracy, conductivity	±1% full scale	
Temperature	Range, °C	0.0 to 100.0	
	Resolution, °C	0.1	
	Accuracy, °C	±0.5, ±0.2	
pH	Range, pH	-	-2.00 to 16.00
	Resolution, pH	-	0.01
	Accuracy, pH	-	±0.01
	pH calibration	-	5 (1.68, 4.01, 7.00, 10.00, 12.45)
General	Memory	Stores 50 data sets	
	Cell constant	0.1, 1, 10	1
	Calibration	Up to 5 points	

Cat. No	Description
11550254	AP75 Meter - Includes meter, conductivity/TDS/temp probe (Cat. No 11346192), batteries, and instruction manual
11540254	AP75 Kit - Includes meter, conductivity/TDS/temp probe (Cat. No 11346192), conductivity calibration solutions, sample bottle, batteries, instruction manual, and hard plastic carrying case
11510254	AP85 Meter - Includes meter, pH/ATC electrode (Cat. No 11570174), conductivity/TDS/temp probe, AAA batteries, and manual
11500254	AP85 Kit: Includes meter, pH/ATC electrode (Cat. No 11570174), conductivity/TDS/temp probe (Cat. No 11346192), pH buffer solutions, conductivity calibration solutions, AAA batteries, and manual

Replacement Parts and Accessories for AP75 and AP85 Meters

Cat. No	Description
11570174	Replacement pH/ATC probe, plastic body, for AP80 and AP70 series, 762mm (30 inch) cable
11346192	Replacement conductivity/TDS/temperature probe

11570174

11346192

Refer to pages 21 to 22 for further information on the range of probes and accessories for accumet™ meters

AP100 Series pH Meters

Pocket-sized portable meters for indoor or outdoor use

- Large LCD with backlighting and plain language text making it easy to view and use
- Durable waterproof IP67 housing
- pH resolution and date/time to meet GLP (AP115, AP125)
- 200 data point internal memory
- Three year meter warranty and one year electrode warranty

	Model No	AP110	AP115	AP125
pH	Range, pH	-2.00 to 20.00	-2.00 to 20.00	-2.00 to 20.00
	Resolution, pH	0.1/0.01	0.1/0.01/0.001	0.1/0.01/0.001
	Accuracy, pH	±0.01	±0.002	±0.002
	pH calibration	Up to 5 or 6 points from 3 sets: USA: 2.00, 4.00, 7.00, 10.00, 12.00 NIST: 1.68, 4.01, 6.86, 9.18, 12.45 EURO: 1.00, 3.00, 6.00, 8.00, 10.00, 13.00		
mV	Range, mV	±2,000	±2,000	±2,000
	Resolution, mV	0.1/1	0.1/1	0.1/1
	Accuracy, mV	±0.2/2	±0.2/2	±0.2/2
	Calibration, mV	Calibration points: 1Rel mv		
Ion, concentration (AP125 only)	Range, concentration	-	-	0.001 to 99,999
	Resolution, concentration	-	-	1, 2 or 3 significant digits
	Accuracy, concentration	-	-	Monovalent: 0.5% full scale, Trivalent: 1% full scale
	Calibration	-	-	Available values: 0.1, 0.5, 1, 2, 5, 10, 50, 100, 500, 1,000 Calibration points: from 2 to 5
Temperature	Range, °C	-5 to 100	-5 to 100	-5 to 100
	Resolution, °C	0.1	0.1	0.1
	Accuracy, °C	±0.3	±0.3	±0.3
	Calibration, temperature	Calibration points: 1 (ATC) and 1 (MTC) Available values: 1 point ±5 adjustment (ATC), -5 to 100 default adjustment (MTC)		
General	Clock	-	Yes, date/time and GLP	

Cat. No	Description
11580184	AP110 Meter - Includes meter, 9V battery, and manual
11590184	AP110 Kit - Includes meter, pH/ATC electrode (Cat. No 11560194), refill solution, hard carrying case, sample bottles, pH calibration packets, 9V battery, and manual
11560184	AP115 Meter - Includes meter, 9V battery, and manual
11570184	AP115 Kit - Includes meter, pH/ATC electrode (Cat. No 11560194), refill solution, hard carrying case, sample bottles, pH calibration packets, 9V battery, and manual
11540184	AP125 Meter - Includes meter, 9V battery, and manual
11550184	AP125 Kit - Includes meter, pH/ATC electrode (Cat. No 11560194), refill solution, hard carrying case, sample bottles, pH calibration packets, 9V battery, and manual

Replacement Parts and Accessories for AP100 Series Portable Meters

Cat. No	Description
11560194	pH/ATC electrode refillable, single-junction epoxy body for AP100 series portable meters

Refer to pages 21 to 22 for further information on the range of probes and accessories for accumet™ meters

Probes and Other Accessories for accumet™ Meters

accumet™ Benchtop Stirring Probe

- Provides mixing without the need for magnetic stir bars or stir plates
- Saves valuable bench space
- Quiet operation
- Adjustable speed control
- No additional power required
- Multi-parameter XL benchtop models can accept up to two probes for simultaneous stirring
- Compatible with the following models: XL150, XL200, XL250, XL500, XL600, AB150, AB250, AB200

Cat. No	Description
12860653	accumet™ benchtop stirring probe
12840653	Replacement paddle with stirring rod
11510234	Electrode holding arm and bracket for AB & XL series benchtop meters

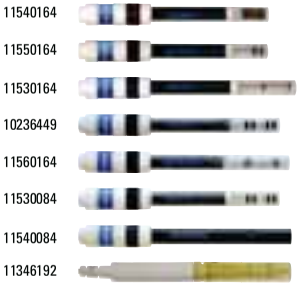
Conductivity, Dissolved Oxygen and Temperature Probes

Conductivity/temperature electrodes for AB200, XL200, XL500, and XL600 benchtop meters

Cat. No	Sensor Type	Body Type	Nominal Cell Constant	Ideal Range
11540164	2-Cell	Plastic	0.1	0.5 to 2,000µS
11550164	2-Cell	Plastic	1	20µS to 20mS
11530164	2-Cell	Plastic	10	1 to 200mS
10236449	4-Cell	Glass	1	10µS to 100mS
11560164	4-Cell	Glass	10	1 to 200mS
11530084	4-Cell	Plastic	1	10µS to 100mS
11540084	4-Cell	Plastic	10	1 to 200mS

Cell for accumet™ AP75 and AP85 portable meters

11346192	2-Cell	Ultem	1	20µS to 20mS



Dissolved oxygen probes and accessories XL600 benchtop meters

Cat. No	Description
11530184	Self-stirring DO/BOD/temp probe
11590224	Adapter to connect YSI™ self stirring DO probes To AB, XL series meters
10319657	Membrane kit for 11530184. Includes six membrane caps, polishing disk, and electrolyte filling solution

ATC/temperature probes

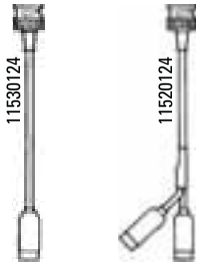
Cat. No	Description
10236064	ATC for XL and AB series benchtop meters
11539144	ATC for AP72 and AP71 portable meters
11540234	ATC for AP100 series portable meters

All temperature probes are stainless steel and have a 3-ft cable.

Cables and Other General Accessories

Adapter cables

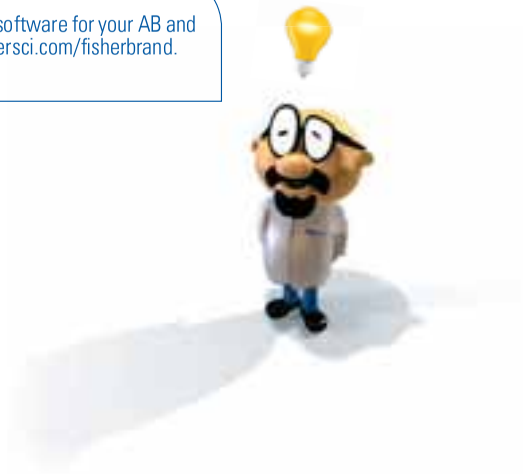
Cat. No	Description
11530124	Pin plug to BNC input jack. Use with metallic electrodes having pin connectors
11520124	Dual-pin plugs to BNC input jack



Other replacement parts and accessories

Cat. No	Description
12880653	Compact thermal printer for AB and XL series, 100 to 240V. Includes two rolls paper and four plug types for global use
12890653	Replacement thermal paper for 12880653 (pack of 2 rolls)
11510234	Electrode arm and bracket for all AB and XL series benchtop meters
12800663	Optical USB mouse. Compatible with any XL series
12850653	Replacement power supply for AB150, AB200, AB250, XL150, XL200, XL250,XL500, XL600, 100/240 VAC
12870653	Replacement RS-232 output cable for PC and printer

To download your free communication software for your AB and XL accumet™ meters visit www.eu.fishersci.com/fisherbrand.



pH ELECTRODES

pH Electrode Theory

pH electrode measurements are made by comparing the readings in a sample with the readings in standards whose pH has been defined (i.e. standard buffers). When a pH sensing electrode comes in contact with a sample, a potential develops across the sensing membrane surface that varies with pH. A reference electrode provides a second, unvarying potential to quantitatively compare the changes of the sensing membrane potential. Combination pH electrodes are composed of a sensing electrode with the reference electrode built into the same electrode body. Combination electrodes provide the same selectivity and response as a half-cell system, but offer the convenience of working and maintaining only one electrode. A meter serves as the readout device and calculates the difference between the reference electrode and sensing electrode potentials in millivolts. The millivolts are then converted to pH units and shown on the meter display. The sample or standard solution is the final component of the system.

Electrode behaviour is described by the Nernst equation:
$E = E_o + (2.3\ RT/nF) \log aH+$

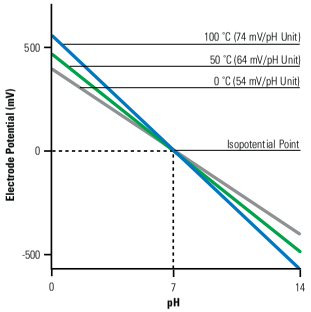
Where E is the measured potential from the sensing electrode, E_o is related to the potential of the reference electrode, (2.3 RT/nF) is the Nernst factor and log aH+ is the pH. The Nernst factor, 2.3 RT/nF, includes the Gas Law constant (R), Faraday's constant (F), the temperature in degrees Kelvin (T) and the charge of the ion (n). For pH, where n = 1, the Nernst factor is 2.3 RT/F. Since R and F are constants, the factor and therefore electrode behaviour is dependent on temperature.

The electrode slope is a measure of the electrode response to the ion being detected and is equivalent to the Nernst factor. When the temperature is 25°C, the theoretical Nernst slope is 59.16mV/pH unit. Fisherbrand accumet™ pH meters display the slope as a percentage of the theoretical value. For example, a 98.5% slope is equivalent to a slope of 58.27mV/pH unit for a two-point calibration. The pH meter detects the pH sensing bulb signal, reference signal and temperature signal and uses these values to calculate the pH using the Nernst equation. Fisherbrand accumet™ pH meters contain pH versus temperature values for commonly used buffers. This allows the meter to recognise a particular pH buffer and calibrate with the correct buffer value at the measured temperature.

Relationship between pH and Temperature

The most common cause of error in pH measurements is temperature. Temperature variations can influence pH for the following reasons:

- The electrode slope will change with variations in temperature.
- Buffer and sample pH values will change with temperature.
- Measurement drift can occur when the internal elements of the pH and reference electrodes are reaching thermal equilibrium after a temperature change.
- When the pH electrode and temperature probe are placed into a sample that varies significantly in temperature, the measurements can drift because the temperature response of the pH electrode and temperature probe may not be similar and the sample may not have a uniform temperature, so the pH electrode and temperature probe are responding to different environments.



Electrode slope changes can be compensated for by using an automatic temperature compensation (ATC) probe. Fisherbrand accumet™ pH meters calculate the electrode slope based on the measured temperature of the pH buffers. The meter will automatically adjust the pH buffer value to the actual pH of the buffer at the measured temperature.

The pH values of buffers and samples will change with variations in temperature because of their temperature-dependent chemical equilibria. The pH electrode should be calibrated with buffers that have known pH values at different temperatures. Since pH meters are unable to correct sample pH values to a reference temperature, due to the unique pH versus temperature relationship of each sample, the calibration and measurements should be performed at the same temperature and sample pH values should be recorded with the sample temperature.

Nominal pH Value at 25°C	0°C	5°C	10°C	20°C	30°C	40°C	50°C	60°C	70°C	80°C	90°C
1.68	1.67	1.67	1.67	1.67	1.68	1.69	1.71	1.72	1.74	1.77	1.79
4.01	4.00	4.00	4.00	4.00	4.02	4.04	4.06	4.09	4.13	4.16	4.21
6.86	6.98	6.95	6.92	6.87	6.85	6.84	6.83	6.84	6.85	6.86	6.88
7.00	7.11	7.08	7.06	7.01	6.98	6.97	6.97	6.97	6.99	7.03	7.08
9.18	9.46	9.40	9.33	9.23	9.14	9.07	9.01	8.96	8.92	8.89	8.85
10.01	10.32	10.25	10.18	10.06	9.97	9.89	9.83	9.79	9.78	9.78	9.80
12.46	12.79	12.73	12.67	12.52	12.36	12.17	11.96	11.73	11.47	11.19	10.89

Electrode Selection

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

While many electrodes might 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 advantage is a critical step to getting the most out of your pH measurement system.

The following section will provide you with an overview of the different types of electrode available for use with the accumet™ range. If, however, you have any further questions concerning electrode selection, then please contact our Product Support Advisors.

Combination or Half-Cell?

There are two components within a pH electrode system. A pH indicating (or sensing) electrode, which develops a potential dependent on the pH of the sample, and the reference electrode, which provides a constant voltage for the meter to compare against. These two cells also help complete the electrical circuit between the meter and the sample. Combination electrodes have both the indicating and reference electrodes "combined" into one electrode. Alternatively, separate half-cell electrodes can be used. Since reference electrodes are often outlasted by sensing electrodes, you only need to swap out one electrode at a time and this can mean lower costs compared to replacing with an equivalent combination electrode each time.

In practical terms, nearly all electrodes used today are combination electrodes. There are many reasons for this, for example, many pH meters require an adapter to accept half-cell electrodes, handling multiple electrodes is undesirable (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 but consistent performance of today's combination electrode designs.

Glass or Plastic Body?

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 adequately handle higher temperatures, with the bulb typically able to go up 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. This is especially important consideration for applications that involve 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 to discern – 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 more 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. 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.

In addition to the body material of the electrode, different body styles are also available for use when measuring certain sample types. As well as the standard, familiar electrode shape, the Fisherbrand range incorporates spear type electrodes (for measuring semi solids, meats, cheeses etc), thin stem semi micro electrodes (for small samples and where space is limited) and the Tuff-Tip electrodes, for when a more robust electrode is necessary (Refer to 'pH Electrode Features' page 25 for further information).

Refillable or Non-Refillable?

All pH electrodes use and inevitably leak solution. Refillable electrodes do so more quickly, but can be easily replenished when they require more filling solution. However, gel-filled electrodes leak very slowly, but when they run out or the gel is no longer flowing, cannot 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 requirement for solution top-up is inconvenient and 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.

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.

Single or Double-Junction (TRIS compatible)?

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 favour due to their mercury content. 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. For dirty samples and those high in particulates, "sleeve" type junctions will offer the longest life span. Whilst other electrodes can become clogged and unresponsive with these sample types, the sleeve type junction reduces the risk of clogging, thereby maximising the electrode's lifespan. Therefore whilst these are generally the most expensive electrodes, they will need replacing much less frequently in difficult sample types. The sleeve junction electrodes are also TRIS compatible.

pH Electrode Features

pH Electrode Styles

- **Standard Size**
  12mm electrode diameter for use in a wide variety of sample sizes

- **Semi-micro**
  6mm to 8mm electrode diameter for sample sizes down to 200µL

- **Micro**
  1mm to 5mm electrode diameter for samples as small as 0.5µL and containers as small as 384 well plates

- **Tuff-Tip**
  When glass is required, the extra durable pH bulb prevents breakage

- **Spear Tip**
  For piercing solid or semi solid samples and measuring small volume samples

- **Flat Surface Tip**
  For measuring surfaces of solid or gel samples and measuring small volume samples

pH Electrode Body Materials

Glass Body
- Compatible with virtually any sample, including solvents
- Easy to clean

Plastic Body
- Extremely durable and rugged to prevent breakage
- Value-priced

pH Electrode Junctions

Sleeve and Laser-Drilled Hole (Open)
- Best junction for dirty, difficult samples
- Junction is clog-free and easy to clean
- Ideal for thick or viscous samples, compatible with all sample types

Ceramic and Glass Capillary
- Better junction for routine lab or field use
- Junction is high quality and durable
- Ideal for most applications and samples

Wick and Glass Fibre
- Good junction for routine lab or field use
- Junction used with rugged plastic electrodes
- Ideal for aqueous samples

Use the selection guide below to help you choose the the right Fisherbrand electrode for your particular application.

pH Electrode Selection Guide

Sample/Application Type	Recommended Electrode Type	Cat. No
General Purpose for many common sample types, e.g., aqueous samples, drinking water etc	Glass bodied	11749798
	Plastic bodied	11706358
Food and drink, e.g., juices, baby food, cheese	Tuff-Tip	11755638
	Spear tip	11736209
Environmental samples, e.g., wastewater, soils, sea water	Tuff-Tip	11755638
Low ionic strength e.g., treated effluent, deionised water **Non-aqueous** e.g., solvents, alcohols	Sleeve junction	11726358
Life science samples, Tris-containing reagents, proteins etc	Tuff-Tip	11755638
Small samples e.g., samples stored in test tubes, small flasks and beakers	Thin stem Semi micro	11769798
High-viscosity samples, e.g., slurries, suspended solids	Sleeve junction	11726358

pH Electrode Connectors

The type of pH electrode connector can vary according the brand of the meter as well as the electrode type. The following information provides you with a brief overview of these connectors. However, if you require any further assistance connecting your electrode to your meter contact our Product Support Advisors.

- The **BNC** connector is accepted by the vast majority of modern pH meters. It is characterised by its locking twist action.

- The **DIN** connector, although not as common as a BNC, is still used by several different meter types.

- The **S7** (screw cap) connectors are becoming more popular due to their flexibility. Electrodes with an S7 head can be connected to a variety of meter inputs using a separate cable.

Refer to 'Electrode Accessories' page 27 for the Fisherbrand electrode adapter cables which will allow you to connect probes from alternative manufacturers to your accumet™ pH meter.

11706358
11776348

11749798
11739798

11786338
11726358

11769798

11709818

11755638
11765638
11775638
11785638

11736209

pH Electrodes

Cat. No	Electrolyte	Style	Body Material	pH Range	Temperature Range°C	Dimensions, mm	Cable	Connector	Sample/ Applicaton Type
11706358	Gel	-	Plastic	0 to 13	0 to 80	12 x 120	1m	BNC	General/field purpose
11776348	Gel	-	Plastic	0 to 13	0 to 80	12 x 120	1m	DIN	General/field purpose
11786348	Gel	-	Plastic	0 to 14	0 to 80	12 x 120	-	S7	General/field purpose
11749798	KCL 4M + AgCl	-	Glass	0 to 13	0 to 80	12 x 120	1m	BNC	General/laboratory purpose
11739798	KCL 4M + AgCl	-	Glass	0 to 13	0 to 80	12 x 120	1m	DIN	General/laboratory purpose
11786338	KCL 4M + AgCl	-	Glass	0 to 14	0 to 80	12 x 160	-	S7	Laboratory purpose
11726358	KCL 3M + AgCl	Sleeve junction	Glass	0 to 14	0 to 80	12 x 120	-	S7	Laboratory purpose Low inonic strength Nonaqueous/viscous samples
11769798	KCL 4M + AgCl	Micro electrode	Glass	0 to 13	0 to 80	6 x 115	1m	BNC	Small samples
11709818	KCL 4M + AgCl	Micro electrode	Glass	0 to 13	0 to 80	6 x 115	1m	DIN	Small samples
11736209	Gel	Spear tip	Glass	1 to 11	0 to 70	6 x 92	-	S7	Food and drink
11755638	Gel	Tuff-Tip	Plastic	0 to 14	-5 to 100	12 x 120	1m	BNC	Environmental samples
11765638	Gel	Tuff-Tip	Plastic	0 to 14	-5 to 100	12 x 120	1m	DIN	Environmental samples
11775638	Gel	Tuff-Tip, double junction	Plastic	0 to 13	-5 to 100	12 x 120	1m	BNC	Environmental samples
11785638	Gel	Tuff-Tip, double junction	Plastic	0 to 13	-5 to 100	12 x 120	1m	DIN	Environmental samples

** Tuff-Tip is a robust alternative to conventional laboratory pH electrodes where membrane breakage is a problem. The rugged pH bulb is protected by unique Tuff-Tip shape making this electrode shock proof*

11768452

11778452

11758452

ORP Electrodes

Cat. No	Electrolyte	Body Material	pH Range	Temperature Range°C	Dimensions, mm	Cable	Connector
11768452	Gel	Plastic	±1500 mV	0 to 80	12 x 120	1m	BNC
11778452	Gel	Plastic	±1500 mV	0 to 80	12 x 120	1m	DIN
11758452	Gel	Plastic	±1500 mV	0 to 80	12 x 120	-	S7

Electrode Accessories

Cat. No	Desctiption	Dimensions, mm
11746348	Connector cable S7 to BNC, 1m	12 x 120
11736348	Connector cable S7 to DIN, 1m	12 x 120

STANDARD BUFFER SOLUTIONS FOR pH METER CALIBRATION

Next to temperature and mass, pH is the third most common laboratory measurement, and buffer solutions (such as phosphate buffered saline, PBS) are frequently used as a means of keeping pH at a nearly constant value in a wide variety of chemicals and biochemical applications. For example, many enzymes only work under very precise conditions so it is very important that the buffer maintains the correct pH; if the pH moves outside of a narrow range, the enzyme may stop working and denature. Industrially, buffers are used in fermentation processes and in setting the correct conditions for dyes used in colouring fabrics.

For such very precise work it is important that pH meters are calibrated before each measurement. Standard buffer solutions, of known pH value, allow calibration of the meter/electrode system to ensure that accurate measurements are taken subsequently. Certified accurate buffers are available from Fisher Chemical as ready-to-use colour coded solutions, concentrated solutions, capsules and prepackaged salts. All have the special characteristic of resisting pH change in the event of dilution or acid/base contamination. It is generally recommended to use a minimum of two-point standardisation; first with a buffer value close to the electrode systems zero potential (typically pH 7); and also with an additional acid or base buffer whose values encompasses the expected pH value of the sample (refer to 'pH Electrode Calibration' pages 33 to 34). For best accuracy, the calibration should be performed with ATC at the same temperature as the expected samples.

In this section you will discover that Fisher Chemical have all the standard buffers you need. Manufactured to exacting standards and packaged for convenience, you'll find a buffer to meet virtually every laboratory or field application.

Colour Coded Buffer Solutions

Cat. No	Description	Quantity, mL
10457711	Buffer colour coded solution pH4.00 (phthalate) red, stabilised with 10ppm mercury (II) chloride, traceable to NIST	500
10427260	Buffer colour coded solution pH4.00 (phthalate) red, stabilised with 10ppm mercury (II) chloride, traceable to NIST	1,000
11432694	Buffer colour coded solution pH4.00 (phthalate) red, stabilised with 10ppm mercury (II) chloride, traceable to NIST	2,500
10774371	Buffer colour coded solution pH4.00 (phthalate) red, stabilised with 10ppm mercury (II) chloride, traceable to NIST	5,000
10080200	Buffer colour coded solution pH4.00 (phthalate) red, stabilised with 10ppm mercury (II) chloride, traceable to NIST	10,000
10164863	Buffer colour coded concentrated solution pH4.00 (phthalate) red, stabilised with 10ppm mercury (II) chloride (one ampoule makes 500mL)	100
10090200	Buffer colour coded concentrated solution pH4.00 (phthalate) red, stabilised with 10ppm mercury (II) chloride (each ampoule makes 500mL)	6 x 100
10000642	Buffer colour coded solution pH7.00 (phosphate) yellow, stabilised with 10ppm mercury (II) chloride, traceable to NIST	500
10477830	Buffer colour coded solution pH7.00 (phosphate) yellow, stabilised with 10ppm mercury (II) chloride, traceable to NIST	1,000
11402704	Buffer colour coded solution pH7.00 (phosphate) yellow, stabilised with 10ppm mercury (II) chloride, traceable to NIST	2,500
10171570	Buffer colour coded solution pH7.00 (phosphate) yellow, stabilised with 10ppm mercury (II) chloride, traceable to NIST	5,000
10131620	Buffer colour coded solution pH7.00 (phosphate) yellow, stabilised with 10ppm mercury (II) chloride, traceable to NIST	10,000
11412704	Buffer colour coded concentrated solution pH7.00 (phosphate) yellow, stabilised with 10ppm mercury (II) chloride (each ampoule makes 500mL)	6 x 100
10774074	Buffer colour coded solution pH10.00 (borate) blue, traceable to NIST	500
10284240	Buffer colour coded solution pH10.00 (borate) blue, traceable to NIST	1,000
11462704	Buffer colour coded solution pH10.00 (borate) blue, traceable to NIST	2,500
10102100	Buffer colour coded solution pH10.00 (borate) blue, traceable to NIST	5,000
10459750	Buffer colour coded solution pH10.00 (borate) blue, traceable to NIST	10,000
10293862	Buffer colour coded concentrated solution pH10.00 (borate) blue (one ampoule makes 500mL)	100
11472704	Buffer colour coded concentrated solution pH10.00 (borate) blue (each ampoule makes 500mL)	6 x 100

pH2 Buffers

Cat. No	Description	Quantity, mL
10703324	Buffer standard solution pH2.00 (glycine), stabilised with 10ppm mercury (II) chloride, traceable to NIST	500
10578040	Buffer standard solution pH2.00 (glycine), stabilised with 10ppm mercury (II) chloride, traceable to NIST	1,000
11482684	Buffer standard solution pH2.00 (glycine), stabilised with 10ppm mercury (II) chloride, traceable to NIST	2,500
10080632	Buffer concentrated solution pH2.00 (glycine) stabilised with 10ppm mercury (II) chloride (one ampoule makes 500mL)	100
10214390	Buffer concentrated solution pH2.00 (glycine) stabilised with 10ppm mercury (II) chloride (each ampoule makes 500mL)	6 x 100

pH3 Buffers

Cat. No	Description	Quantity, mL
10104823	Buffer standard solution pH3.00 (phthalate), stabilised with 10ppm mercury (II) chloride, traceable to NIST	500
10111430	Buffer standard solution pH3.00 (phthalate), stabilised with 10ppm mercury (II) chloride, traceable to NIST	1,000
11492684	Buffer standard solution pH3.00 (phthalate), stabilised with 10ppm mercury (II) chloride, traceable to NIST	2,500

pH4 Buffers

Cat. No	Description	Quantity, mL
11463363	Buffer tablets pH4.00 (phthalate) makes 100mL of solution per tablet	50 tablets
10545151	Buffer standard solution pH4.00 (phthalate), stabilised with 10ppm mercury (II) chloride, traceable to NIST	500
10675492	Buffer standard solution pH4.00 (phthalate), stabilised with 10ppm mercury (II) chloride, traceable to NIST	1,000
11402694	Buffer standard solution pH4.00 (phthalate), stabilised with 10ppm mercury (II) chloride, traceable to NIST	2,500
10040190	Buffer standard solution pH4.00 (phthalate), stabilised with 10ppm mercury (II) chloride, traceable to NIST	5,000
10305950	Buffer standard solution pH4.00 (phthalate), stabilised with 10ppm mercury (II) chloride, traceable to NIST	10,000
11493363	Buffer concentrated solution pH4.00 (phthalate) stabilised with 10ppm mercury (II) chloride (each ampoule makes 500mL)	6 x 500
10234390	Buffer standard solution BS pH4.00 (phthalate) stabilised with 10ppm mercuric chloride BS 1647, traceable to NIST	1,000
11413843	Buffer concentrated solution BS pH4.00 (phthalate), stabilised with 10ppm mercuric chloride (one ampoule makes 500mL)	100
10457711	Buffer solution pH4.00 (phthalate) stabilised with 10ppm mercuric chloride standard buffer solution	500
10164863	Buffer solution pH4.00 (phthalate) ampoule colour coded stabilised with 10ppm mercuric chloride volumetric analysis solutrate	100

pH5 Buffers

Cat. No	Description	Quantity, mL
10609483	Buffer standard solution pH5.00 (phthalate), stabilised with 10ppm mercury (II) chloride, traceable to NIST	500
10588230	Buffer standard solution pH5.00 (phthalate), stabilised with 10ppm mercury (II) chloride, traceable to NIST	1,000
11452694	Buffer standard solution pH5.00 (phthalate), stabilised with 10ppm mercury (II) chloride, traceable to NIST	2,500

For up to date GHS information on Fisher Chemical products listed please refer to the safety data sheet available from www.eu.fishersci.com

pH6 Buffers

Fisher Chemical

Cat. No	Description	Quantity, mL
10690404	Buffer standard solution pH6.00 (phosphate), stabilised with 10ppm mercury (II) chloride, traceable to NIST	500
10000210	Buffer standard solution pH6.00 (phosphate), stabilised with 10ppm mercury (II) chloride, traceable to NIST	1,000
11462694	Buffer standard solution pH6.00 (phosphate), stabilised with 10ppm mercury (II) chloride, traceable to NIST	2,500
10695682	Buffer BS standard solution pH6.87 (phosphate), stabilised with 10ppm mercury (II) chloride, traceable to NIST	1,000
11482694	Buffer concentrated solution pH6.87 (phosphate) stabilised with 10ppm mercury (II) chloride	6 x 100

pH7 Buffers

Fisher Chemical

Cat. No	Description	Quantity, mL
11473363	Buffer tablets pH7.00 (phosphate), makes 100mL per tablet	50 tablets
10082521	Buffer standard solution pH7.00 (phosphate), stabilised with 10ppm mercury (II) chloride, traceable to NIST	500
10151570	Buffer standard solution pH7.00 (phosphate), stabilised with 10ppm mercury (II) chloride, traceable to NIST	1,000
11492694	Buffer standard solution pH7.00 (phosphate), stabilised with 10ppm mercury (II) chloride, traceable to NIST	2,500
10010210	Buffer standard solution pH7.00 (phosphate), stabilised with 10ppm mercury (II) chloride, traceable to NIST	5,000
10616072	Buffer standard solution pH7.00 (phosphate), stabilised with 10ppm mercury (II) chloride, traceable to NIST	10,000
10535341	Buffer concentrated solution pH7.00 (phosphate) stabilised with 10ppm mercury (II) chloride (one ampoule makes 500mL)	100
11403373	Buffer concentrated solution pH7.00 (phosphate) stabilised with 10ppm mercury (II) chloride (each ampoule makes 500mL)	6 x 100
10000642	Buffer solution pH7.00 (phosphate) stabilised with 10ppm mercuric chloride Standard Buffer Solution	500

pH8 Buffers

Fisher Chemical

Cat. No	Description	Quantity, mL
10593854	Buffer standard solution pH8.00 (borate), traceable to NIST	500
10070210	Buffer standard solution pH8.00 (borate), traceable to NIST	1,000
11422704	Buffer standard solution pH8.00 (borate), traceable to NIST	2,500
10164373	Buffer standard solution pH8.00 (borate), traceable to NIST	10,000
10764074	Buffer concentrated solution pH8.00 (borate), one ampoule makes 500mL	100
11432704	Buffer concentrated solution pH8.00 (borate), each ampoule makes 500mL	6 x 100

pH9 Buffers

Fisher Chemical

Cat. No	Description	Quantity, mL
11403543	Buffer tablets pH9.2 (borate), makes 100mL per tablet	50 tablets
10395792	Buffer standard solution pH9.00 (borate), traceable to NIST	2,500
10082531	Buffer standard solution pH9.2 (borate), traceable to NIST	500
10142000	Buffer standard solution pH9.2 (borate), traceable to NIST	1,000
11442704	Buffer standard solution pH9.2 (borate), traceable to NIST	2,500
10030180	Buffer standard solution pH9.2 (borate), traceable to NIST	5,000
10419370	Buffer standard solution pH9.2 (borat), traceable to NIST	10,000
10246531	Buffer concentrated solution pH 9.2 (borate), one ampoule makes 500mL	100
11413373	Buffer concentrated solution pH9.2 (borate), each ampoule makes 500mL	6 x 100
11472694	Buffer BS standard solution pH9.225, stabilised with 10ppm mercury (II) chloride, traceable to NIST	1,000
10395750	Buffer BS standard solution pH9.23 (borate), traceable to NIST	1,000

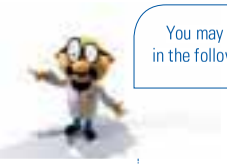
pH10 Buffers

Fisher Chemical

Cat. No	Description	Quantity, mL
10789234	Buffer standard solution pH10.00 (borate), traceable to NIST	500
10429560	Buffer standard solution pH10.00 (borate), traceable to NIST	1,000
11452704	Buffer standard solution pH10.00 (borate), traceable to NIST	2,000
10274240	Buffer standard solution pH10.00 (borate), traceable to NIST	5,000
11483363	Buffer concentrated solution pH10 (borate), each ampoule makes 500mL	6 x 100

For up to date GHS information on Fisher Chemical products listed please refer to the safety data sheet available from www.eu.fishersci.com

pH Accessories



You may also be interested in the following pH accessories

Full Range Indicators

Fisher Chemical

Cat. No	Description	pH range	Colour change	Quantity, mL
10366340	Full range indicator pH range 1 to 13, contains methylated spirit	1.0-13.0	colour chart on bottle	100
10488610	Full range indicator pH range 1 to 13, contains methylated spirit	1.0-13.0	colour chart on bottle	500

Universal Indicators

Fisher Chemical

Cat. No	Description	pH range	Colour change	Quantity, mL
10090470	Universal indicator pH range 4 to 10, contains methylated spirit	4.0-10.0	colour chart on bottle	100
10468420	Universal indicator pH range 4 to 10, contains methylated spirit	4.0-10.0	colour chart on bottle	500
10705351	Universal indicator pH range 4 to 10, contains methylated spirit	4.0-10.0	colour chart on bottle	2,500

pH Indicator Paper, Sticks

- 85mm x 6mm sticks with different indicator papers sealed onto each strip
- The pH is determined by comparison with a colour chart supplied. The sticks are sufficiently long to avoid contact between the fingers and the test sample

Cat. No	Description	pH range	pack size
10642751	pH indicator paper stick non-bleeding supplied with colour comparison chart	0.0 to 14.0	100 sticks
10018080	pH indicator paper stick non-bleeding supplied with colour comparison chart	0.0 to 6.0	100 sticks
10017950	pH indicator paper stick non-bleeding supplied with colour comparison chart	1.7 to 3.8	100 sticks
10353641	pH indicator paper stick non-bleeding supplied with colour comparison chart	3.6 to 6.1	100 sticks
10333501	pH indicator paper stick non-bleeding supplied with colour comparison chart	4.5 to 10.0	100 sticks
11386454	pH indicator paper stick non-bleeding supplied with colour comparison chart	6.0 to 7.7	100 sticks
10271751	pH indicator paper stick non-bleeding supplied with colour comparison chart	7.0 to 14.0	100 sticks

pH Indicator Paper, Reels

- Dispenser reels each, 5m x 7mm (l x w), except 10433151 which is 5m x 10mm (l x w).

Cat. No	Description	Type	Colour change	pH range	pack size
11567382	pH indicator paper reel	Litmus red	Red to blue	5.0 to 8.0	4
11577382	pH indicator paper reel	Litmus blue	Blue to red	5.0 to 8.0	4
10482341	pH indicator paper reel	pH	pH specific	1.0 to 14.0	4
11507392	pH indicator paper reel	pH	pH specific	1.0 to 11.0	4
11517392	pH indicator paper reel	pH	pH specific	0.5 to 5.5	4
11527392	pH indicator paper reel	pH	pH specific	4.0 to 7.0	4
11537392	pH indicator paper reel	pH	pH specific	6.4 to 8.0	4
11547392	pH indicator paper reel	pH	pH specific	8.0 to 10.0	4
11557392	pH indicator paper reel	pH	pH specific	9.0 to 13.0	4
11567392	pH indicator paper reel	pH	pH specific	12.0 to 14.0	4
10433151	pH indicator paper reel	pH, three colour	pH specific	1.0 to 11.0	4

Wash Bottles, HDPE

- Labelled and colour coded for most commonly used solvents
- High density polyethylene
- 500mL capacity
- Translucent with coloured closure
- Comes with vented 38mm closure to prevent solvent drips

Cat. No	Label	Closure colour	pack size
11745233	Acetone	Red	6
11755233	Bleach	White	6
11765233	Deionised water	Natural	6
11775233	Distilled water	Natural	6
11785233	Ethanol	Natural	6
11795233	Isopropanol	Yellow	6
11705243	Methanol	Green	6
11715243	Saline	Natural	6
11725243	Soap	Natural	6
11735243	Universal	Natural	6
11745243	Water Solvent	Natural	6
11765243	Cleaning	Natural	6

For up to date GHS information on Fisher Chemical products listed please refer to the safety data sheet available from www.eu.fishersci.com

TECHNICAL RESOURCES

Here to give you a helping hand!

Fisher Scientific's Product Support Team is your dedicated information resource. Our Product Support Advisors are all highly qualified professionals who are here to support and guide you to the fastest, most effective and efficient answer to your enquiry.

Areas of technical expertise include:

- Bioreagents and Life Science
- Chemicals and Chromatography
- Consumables
- Equipment
- Safety

This section features a number of helpful resources such as how to prepare and calibrate your electrode and how to store and clean your electrode as well as a troubleshooting guide and FAQ's. If, however, this information does not resolve your issue, or if you have questions not covered below

Contact our Product Support Advisors

Tel: +46 31 352 32 00
Email: tsse@thermofisher.com

Tel: +358 9 8027 6280
Email: fisher.fi.techsupport@thermofisher.com

Tel: +47 22 95 59 59
Email: psq.no@thermofisher.com

pH Electrode Preparation

You will need:


pH meter
pages 10 to 20

Electrode
pages 27


Wash bottles
pages 31


pH buffers
pages 29 to 30


Water
pages 45

The following is a general procedure for preparing most pH electrodes. However, it is important that you also refer to the user guide or instruction manual for your particular electrode for any specific preparation requirements.

1. Remove the protective shipping cap, sleeve or bottle from the electrode pH-sensing bulb and save the cap, sleeve or bottle for storage. If the electrode has a storage bottle covering the pH-sensing bulb, unscrew the storage bottle cap before removing the electrode from the storage bottle.
2. Clean any salt deposits from the electrode exterior by rinsing it with distilled water.
3. If the electrode is refillable, uncover the fill hole and add the appropriate filling solution to the electrode. To maintain an adequate flow rate, the level of filling solution must always be above the reference junction and at least one inch above the sample level. The fill hole should be open whenever the electrode is in use.
4. Gently shake the electrode downward (similar to a clinical thermometer) to remove any air bubbles that may be trapped inside the electrode.
5. Soak the electrode in a standard pH electrode storage solution, for at least 30 minutes.
6. Connect the electrode to the meter.
7. Select at least two standard pH buffers that bracket the expected sample pH.

pH Electrode Calibration

You will need:


pH meter
pages 10 to 20

Electrode
pages 27


Wash bottles
pages 31


pH buffers
pages 29 to 30


Water
pages 45


Beaker
pages 47


Stirrer
pages 58


Magnetic follower
pages 58


accumet™ stirrer probe
pages 21

Calibration Recommendations

- Always pour fresh pH buffers into clean beakers for calibration. Choose buffers that are one to three pH units apart.
- Check the electrode slope daily by performing at least a two-buffer calibration. The slope should be 92 to 102% (54.43 to 60.34 mV per pH unit).
- If the electrode is refillable, uncover the fill hole during calibration to ensure a uniform flow of filling solution. The filling solution level inside of the electrode must be at least one inch above the buffer solution level.
- The buffer solution level must be above the pH electrode reference junction when the electrode is immersed in the buffer.
- Between buffers, rinse the electrode with distilled water and then with the next buffer. To reduce the chance of error due to polarisation, avoid rubbing or wiping the electrode bulb. Use a lint-free tissue and gently blot the bulb.
- Use a magnetic stir plate and stir bar or the accumet™ benchtop stirring probe to stir all buffers and samples at a moderate, uniform rate. The stirrer probe can be used with the AB and XL series of benchtop meters.
- Place a piece of insulating material, such as cardboard, between the magnetic stir plate and beaker to prevent measurement errors from the transfer of heat to the sample.
- Handle the micro pH electrodes with care. Do not touch the pH bulb and stem against the bottom or walls of the sample containers.

Calibration Procedure

Two or more buffers

This procedure is recommended for precise measurements.

1. Verify that the pH electrode was prepared correctly and connect the electrode to the meter.
2. Select two pH buffers that bracket the expected sample pH. The first buffer should be near the electrode isopotential point (pH 7) and the second buffer should be near the expected sample pH (pH 4 or pH 10). The pH buffers should be at same temperature as the sample. If the buffers and samples are at varying temperatures, temperature compensation is recommended.
3. Rinse the electrode with distilled water and blot it dry with a lint-free tissue.
4. Place the electrode into the first buffer. When the reading is stable, set the meter to the pH value of the first buffer at the measured temperature. Refer to the meter instruction manual for a detailed procedure. The table on page 34 provides pH values for buffers at various temperatures.
5. Rinse the electrode with distilled water and blot it dry with a lint-free tissue.
6. Place the electrode into the second buffer. When the reading is stable, set the meter to the pH value of the second buffer at the measured temperature. Refer to the meter instruction manual for a detailed procedure. The table on page 34 provides pH values for buffers at various temperatures.
7. The meter should display a 92 to 102% slope or 54.43 to 60.34mV per pH unit, depending on the pH meter. Refer to the meter instruction manual for details on how the meter displays the calibration information.

One buffer

1. Verify that the pH electrode was prepared correctly and connect the electrode to the meter.
2. Select a pH buffer that is near the expected sample pH. The pH buffer should be at same temperature as the samples. If the buffer and samples are at varying temperatures, temperature compensation is recommended.
3. Rinse the electrode with distilled water and blot it dry with a lint-free tissue.
4. Place the electrode into the buffer. When the reading is stable, set the meter to the pH value of the buffer at the measured temperature and set the calibration slope to 100% or 59.16mV per pH unit, depending on the pH meter requirements. Refer to the meter instruction manual for a detailed procedure. Please note that a single point calibration is not as accurate as a multi point one and should only be done when absolutely necessary as it relies on a near perfect electrode to give good readings. Where possible always use a minimum two point calibration. The table below provides pH value for buffers at various temperatures.

Nominal pH Value at 25°C	0°C	5°C	10°C	20°C	30°C	40°C	50°C	60°C	70°C	80°C	90°C
1.68	1.67	1.67	1.67	1.67	1.68	1.69	1.71	1.72	1.74	1.77	1.79
4.01	4.00	4.00	4.00	4.00	4.02	4.04	4.06	4.09	4.13	4.16	4.21
6.86	6.98	6.95	6.92	6.87	6.85	6.84	6.83	6.84	6.85	6.86	6.88
7.00	7.11	7.08	7.06	7.01	6.98	6.97	6.97	6.97	6.99	7.03	7.08
9.18	9.46	9.40	9.33	9.23	9.14	9.07	9.01	8.96	8.92	8.89	8.85
10.01	10.32	10.25	10.18	10.06	9.97	9.89	9.83	9.79	9.78	9.78	9.80
12.46	12.79	12.73	12.67	12.52	12.36	12.17	11.96	11.73	11.47	11.19	10.89

pH Electrode Measurements

TechSupport

You will need:

pH meter

pages 10 to 20

Electrode

pages 27

Wash bottles

pages 31

pH buffers

pages 29 to 30

Water

pages 45

Beaker

pages 47

Stirrer

pages 58

Magnetic follower

pages 58

accumet™ stirrer probe

pages 21

Sample Requirements

Electrodes with an plastic body should only be used in aqueous solutions.

- Electrodes with a glass body may be used in nonaqueous solutions and solutions that contain organic solvents. A minimum of 20% water must be present in the sample for the best measurement results.
- The standard Ag/AgCl electrodes, micro Ag/AgCl electrodes and economy electrodes contain a single junction silver/silver chloride reference that will become clogged in solutions that contain silver complexing or binding agents such as TRIS buffer, proteins and sulfides. Frequent cleaning may be required when measuring these solutions, which will shorten the electrode life. Proteins cause the additional problem of coating the pH-sensing bulb, so extra care should be taken to keep the electrode clean while measuring samples that contain proteins.

pH Measurement Procedure

1. Verify that the pH electrode has been prepared and calibrated correctly. If the electrode is refillable, make sure that the fill hole is uncovered and the filling solution level is at least one inch above the sample solution level.
2. Rinse the electrode with distilled water and blot it dry with a lint-free tissue.
3. Place the electrode into the sample. Use a magnetic stir plate and clean stir bar or the accumet™ benchtop stirring probe to stir the sample at a moderate, uniform rate.
4. When the measurement is stable, record the pH value and temperature of the sample.

Measurement Recommendations

- Check the electrode slope daily by performing at least a two buffer calibration. The slope should be 92 to 102%.
- Unless otherwise specified, only use the recommended filling solution in refillable pH electrodes.
- If the electrode is refillable, uncover the fill hole during measurements to ensure a uniform flow of filling solution. The filling solution level inside the electrode must be at least one inch above the sample solution level.
- The sample solution level must be above the pH electrode reference junction when the electrode is immersed in the sample.
- Between measurements, rinse the electrode with distilled water and then with the next solution to be measured. To reduce the chance of error due to polarisation, avoid rubbing or wiping the electrode bulb. Use a lint-free tissue and gently blot the bulb.
- Use a magnetic stir plate and stir bar or the accumet™ benchtop stirring probe to stir all buffers and samples at a moderate, uniform rate. The stirrer probe can be used with the AB and XL series of benchtop meters.
- Place a piece of insulating material, such cardboard, between the magnetic stir plate and beaker to prevent measurement errors from the transfer of heat to the sample.
- If the electrode is refillable and the electrode is used in dirty or viscous samples or the electrode response becomes sluggish, empty the electrode completely and hold the reference junction under warm running water. Empty any water from the electrode and fill it with fresh filling solution. For a more thorough cleaning, refer to the 'pH Electrode Cleaning Procedures' section page 37
- Flat surface electrodes may be used on any moist surface or in liquids.
- Handle micro pH electrodes with care. Do not touch the pH bulb and stem against the bottom or walls of the sample containers.

pH Electrode Maintenance

TechSupport

You will need:

pH meter	Electrode	Wash bottles	Beaker	Pipettor
				
pages 10 to 20	pages 27	pages 31	pages 47	pages 56 to 57

Looking After Your Electrode

1. On a weekly basis, inspect the pH electrode for scratches, cracks, salt crystal build-up, or membrane/junction deposits.
2. Rinse off any salt build-up with distilled water. Remove any membrane/junction deposits by soaking the electrode in a 0.1M HCl for 15 minutes or soaking the electrode in a 0.1M KCl solution heated to 55°C for 15 minutes. If the electrode is dirty, clogged or coated, refer to the 'pH Electrode Cleaning Procedures' section pages 37 for a more thorough electrode cleaning procedure.
3. If a refillable electrode is used, drain the reference chamber, flush it with distilled water until all of the salt crystal build-up inside of the electrode is removed, flush it with fresh filling solution and then finally fill the reference chamber with further fresh filling solution.
4. Soak the electrode in standard pH electrode storage solution for 1 to 2 hours.

Filling and Draining a Refillable pH Electrode

To fill an electrode, install the flip spout cap onto the filling solution bottle and lift the flip spout to a vertical position. Insert the spout into the electrode fill hole and add filling solution up to the fill hole. If a flushable electrode is used, push down on the electrode cap to allow a few drops of filling solution to drain out of the electrode and release the cap to reset the renewable junction. Push down and release the cap until the junction returns to its original position and add filling solution up to the fill hole. To drain most electrodes, insert a lint-free tissue or pipette into the fill hole and remove all of the filling solution. If a pipette is used, do not insert it too far into the electrode and do not touch the inner glass tube with the pipette. To drain a flushable pH electrode, make sure that the fill hole is uncovered, place a waste beaker under the electrode and push down on the electrode cap to remove all of the filling solution. The filling solution will flow out of the renewable junction near the pH bulb.

pH Electrode Storage

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To ensure a quick electrode response and an unclogged electrode junction, the electrode should never be stored dry and the pH-sensing bulb and reference junction must not dry out. Always store the pH electrode in pH electrode storage solution.

Short Term Electrode Storage (up to one week)

Soak the electrode in pH electrode storage solution. To minimise the chance of breakage, the micro pH electrodes should be attached to an electrode stand and suspended in a beaker that contains storage solution. The electrode should not touch the sides or bottom of the beaker.

Long Term Electrode Storage (more than one week)

If the electrode is refillable, fill the reference chamber up to the fill hole with the appropriate electrode filling solution and securely cover the fill hole with parafilm. Cover the pH-sensing bulb and reference junction with a protective cap, sleeve or storage bottle containing storage solution. Before returning the electrode to use, prepare it as a new electrode.

pH Electrode Cleaning Procedures

TechSupport

You will need:

Transfer pipette	Electrode	Wash bottles	Beaker	Water
				
pages 56	pages 27	pages 31	pages 47	pages 45

One of the most common reasons for a pH electrode not working properly is because it is dirty, clogged or coated with sample. Cleaning a dirty, clogged or coated electrode restores proper electrode performance and prolongs its useful life.

The following instructions provide a starting point for developing an effective cleaning procedure.

1. Choose a suitable cleaning solution.
2. Shake the cleaning solution. Pour enough of the cleaning solution into the beaker to cover the electrode junction.
3. Soak the electrode for five to ten minutes in the cleaning solution while moderately stirring the solution. Electrodes with wick junctions may require more cleaning time.
4. Remove the electrode from the cleaning solution and rinse it thoroughly with distilled water.
5. If cleaning a refillable electrode, remove the filling solution from the electrode using a plastic pasteur pipette and add fresh filling solution to the electrode. Repeat this step two or three times for optimal electrode performance.
6. If cleaning a flushable electrode, flush a few drops of filling solution through the electrode junction by pressing down on the electrode cap. Ensure that the junction flushes and resets properly. Refill the electrode with filling solution.
7. Soak the electrode in standard pH electrode storage solution for at least 30 minutes.
8. Rinse the electrode thoroughly with distilled water and measure samples as usual. If the electrode response is slow or the electrode does not calibrate correctly, repeat the cleaning procedure. Viscous samples and samples that contain solid materials often require additional cleaning and additional filling solution changes.

General Rules and Tips

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- When using refillable electrodes, open the fill hole during calibration and measurement – but remember to close it afterwards when finished!
- The level of electrolyte in the outer cavity of refillable electrodes should be kept above the level of the solution being measured to prevent reverse electrolyte flow.
- When taking measurements, the electrode need only be immersed far enough to cover both the glass pH sensing bulb and reference junction to obtain accurate readings.
- Electrodes perform best when they are hydrated. However, if they dry out they can be reconditioned to normal performance again. Soaking in electrode storage solution helps to optimise and re-establish the thin hydration layer on the sensing bulb that is critical to pH measurement.
- Rinsing the electrode with deionised or distilled water between samples is fine, but storage in deionised or distilled can be detrimental as it will rob critical ions from the sensing bulb. Also, avoid wiping or touching the sensing bulb so as to maintain the hydration layer and avoid producing any electrical charge.
- Moving or touching the electrode cable may result in unstable readings due to the high impedance (resistance) of the pH glass membrane and introduce noise.
- To eliminate temperature errors associated with the electrode, manual or automatic temperature compensation (ATC) should be used for best accuracy. Since temperature changes pH, the sample temperature should always be noted with pH readings. i.e.) record results as "pH8.43 @ 23.2°C", instead of just "pH8.43".
- Always use fresh pH buffers for calibration. Excessive air exposure and sunlight can alter the buffer's value – especially pH10 buffers which are particularly susceptible to drift.

TROUBLESHOOTING GUIDE

TechSupport

Here are some of the most commonly experienced problems associated with pH and other electrochemical measurements, along with some useful suggestions for solving them.

Problem	Cause	Suggestions
	pH	
Meter will not calibrate	Meter	• 'Short out' meter in mV mode by inserting one end of a paper clip in to the centre of the BNC connection, touch outer edge with other end. Meter should read 0mV. If you get a different reading, meter may be in need of repair.
	Buffers	• Ensure that fresh buffer solutions are always used • Rinse electrode between buffer solutions • Are pH buffers more than 1.0pH unit apart? Custom pH calibrations must be more than 1.0pH unit apart.
	Electrode	• Ensure that electrode has been stored correctly (refer to pages 37) • Check electrode for cracks/scratches etc. • Clean electrode (refer to pages 37) • Drain, flush and refill electrode • Replace electrode
	Technique	• Make sure that reading is being given sufficient time to stabilise
Meter is giving erratic readings or readings are not stable	Electrode	• Check electrode for cracks/scratches etc. • Clean electrode (refer to pages 37) • Drain, flush and refill electrode (ensure fill solution level is high) • Uncover fill hole during measurement • Shake any air bubbles out of electrode • Is electrode tip cracked? If so replace electrode. • Electrodes will typically last 6-12 months. If beyond this, the electrode may need replacing
	Technique	• Make sure that reading is being given sufficient time to stabilise
Electrodes are typically lasting <6 months when being used with Tris buffers/protein samples	Electrode	• For Tris buffer and protein samples, a double junction electrode is typically needed. Refer to 'pH Electrode Selection Guide' page 26 for further advice
New electrode has arrived with white crystalline build up	Electrode	• The fill solution has crystallised around the electrode. This is harmless and will not alter performance. It just needs to be wiped away or simply rinsed off.
Electrode bulb/body is cracked and leaking	Electrode	• Replace electrode. Refer to the 'pH Electrode Selection Guide' page 26 for further advice.
Instrument reads inaccurate temperature	ATC Probe	• Calibrate using water bath or known accurate thermometer • Faulty thermistor– repair or replace.
Other potential problems	Temperature	• Is sample being measured at constant room temperature? If not, then ATC (automatic temperature compensation) probe may be useful • If this is not possible, then efforts should be made to make measurements at a consistent temperature (e.g. 25°C)
	Operator technique	• Ensure operator is properly trained in measurement technique (refer to meter instruction manual for further information)
	Sample type	• Whilst Tris buffers can pose a particular problem, other samples may also require a specific electrode type. Particulate samples and solid/semi solid samples may also present a problem. Refer to 'pH Electrode Selection Guide' page 26 for further advice or contact Fisher Scientific Product Support Team if unsure.

Problem	Cause	Suggestions
Conductivity		
Conductivity	Meter	• Perform self test or meter diagnosis programme (refer to meter instruction manual for further information)
	Conductivity cell	• Is correct cell constant being used for the sample? Low and high conductivity samples will likely require a different cell constant to be selected. Refer to the table in the FAQ section, page 43, for further information.
	Technique	• Make sure that reading is being given sufficient time to stabilise • Ensure operator is properly trained in measurement technique (refer to meter instruction manual for further information)
accumet™ Meter Specific Issues		
ISE Display reads "- - -"	Two point calibration has not been performed.	• Perform two point calibration (refer to page 33)
Conductivity - Can't adjust or can't calibrate	Conductivity calibration standards/ Settings	• AUTO calibration values (84µS, 1413µS,12.88mS, or 111.8mS) are not used. Change Cal Method to MANUAL.
Conductivity - second calibration point replaces the first	Settings	• Only one point per range can be calibrated. Re-consider your SINGLE or MULTI Cal Method setting.
TDS - Standard does not match	Settings	• Adjust TDS factor as needed to correct value.
"OR" or "UR" error message	Meter	• "Over range" or "Under range" condition - check that electrode is connected
Forgotten password	Meter	• Please send a written request with your name, contact information, and instrument serial number to Fisher Scientific Product Team Email: fisheruk.productsupport@thermofisher.com; a temporary password will be issued

If you still cannot resolve your issue or have any questions at all, then

Contact our Product Support Advisors

Tel: +46 31 352 32 00
Email: tsse@thermofisher.com

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Frequently asked questions (FAQ's)

This section lists some of the most frequently asked questions about electrochemistry and pH measurement as received by our Life Science and Chemical Specialists, together with the answers they provided. If you are unable to find the answer to your question, are stuck and need help or are simply confused and unsure of which product best suits your research needs, the Product Support Team are here and ready to respond to your enquiries.

Contact our Product Support Advisors

pH

Q. I am looking to test samples containing Tris buffers, which electrode shall I use?
A. A number of electrodes could be suitable, but what's important is that it is a "double junction" electrode. Refer to the 'pH Electrode Selection Guide' on page 26 or further advice.

Q. My electrodes are failing within a short time frame, what could be the issue?
A. Not all electrodes are suitable for all sample types. Refer to the 'pH Electrode Selection Guide' page 26 or for further advice contact the Fisher Scientific Product Support Team.

Q. I've heard of some samples I should be wary of using standard electrodes in, what are they?
A. Standard electrodes use silver ions in their reference system. Proteins, Tris buffers and general biological samples all react with silver ions and this reaction can lead to the electrode having a shorter life span.

Q. I am having trouble calibrating my meter, what could I be doing wrong?
A. Fresh buffer solutions (preferably certified to a known standard) should always be used. The age of an electrode should also be considered. Electrodes have a useful lifetime of approximately 6 months to a year, and should be treated as a consumable.

Technical Resources

Q. Which pH buffers should I use to calibrate my electrode?
A. To ensure accurate and reliable readings, we always recommend calibrating in three pH buffers, normally pH 4, 7 and 10. However, depending on the accuracy you actually require, this can be done at as few as two pH points (e.g. 4 and 7 or 7 and 10) or as many as five points on the Fisherbrand accumet meters. Important points to remember when choosing pH buffers are to make sure that they encompass the typical pH range that you expect your samples to fall within, and to never calibrate at points more than 3 pH units apart (calibrating at 4 and 10 for example will not give good results). Always calibrate at pH7 regardless.

Q. How regularly should I calibrate?
A. The meter should be calibrated regularly using fresh buffers. If used on a daily/weekly basis, then this should be before each use. If the meter is in constant use throughout each day, then it may better calibrating midway through each day as part of a calibration routine.

Q. Will the temperature of my sample be an issue?
A: The pH value of any sample varies with temperature, so for accurate readings it is always best to measure the temperature too. If you are measuring at a different temperature to which you calibrate at it may be worth considering an "ATC" (automatic temperature compensation) probe, or an electrode with one built in to measure this. Modern pH meters will adjust the slope value of the electrode as the temperature changes, ensuring the readings stay accurate.

pH Values of Buffers at Various Temperatures	0°C	5°C	10°C	20°C	30°C	40°C	50°C	60°C	70°C	80°C	90°C
1.68	1.67	1.67	1.67	1.67	1.68	1.69	1.71	1.72	1.74	1.77	1.79
4.01	4.00	4.00	4.00	4.00	4.02	4.04	4.06	4.09	4.13	4.16	4.21
6.86	6.98	6.95	6.92	6.87	6.85	6.84	6.83	6.84	6.85	6.86	6.88
7.00	7.11	7.08	7.06	7.01	6.98	6.97	6.97	6.97	6.99	7.03	7.08
9.18	9.46	9.40	9.33	9.23	9.14	9.07	9.01	8.96	8.92	8.89	8.85
10.01	10.32	10.25	10.18	10.06	9.97	9.89	9.83	9.79	9.78	9.78	9.80
12.46	12.79	12.73	12.67	12.52	12.36	12.17	11.96	11.73	11.47	11.19	10.89

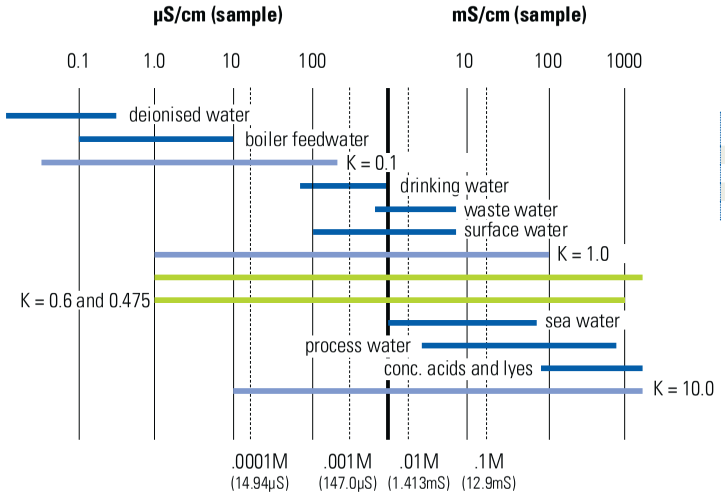
Q. Can I mix and match meters and electrodes from different manufacturers?
A. This is generally not a problem. The vast majority of manufacturers nowadays use a "BNC" connection between the electrode and the meter for standard pH electrodes. This can however cause an issue when using an ATC probe, as these connectors are not standardised and are manufacturer specific.

Q. How regularly should I clean my electrode?
A. As regularly as possible. Cleaning and maintaining it will help prolong the electrode's life. It is worth noting that you must be careful not to leave an electrode soaking in aggressive cleaning solutions once clean. This could end up damaging the electrode. Key points to remember:

- Never re-use buffers
- Never polish the bulb
- Never store the electrode dry or in de-ionised water
- Never stir the sample or buffers with the electrode
- Never cover the reference fill hole during measurement
- Regularly change the reference fill solution

Conductivity

Q. I am looking to measure pure water samples. Is this possible?
A. This is possible. What's important is the conductivity cell constant (also known as the "K" value). A cell constant of 0.1 would be needed for pure water samples. Each cell constant has a limited sensing range so please make sure you choose one whose range encompasses that of your expected sample conductivity. See below for examples of sample types, approximate conductivity values, and suitable cell constants:



Sample	Conductivity (µS)
Pure water	0.055
Tap water	50
Sea water	53.000
5% NaOH	223.000

Q. Can I mix and match meters and conductivity cells from different manufacturers?
A. There is currently no standard connection for meters and conductivity cells yet and all manufacturers use a different system. It is therefore recommended that you stick to conductivity cells from the same manufacturer as your meter.

Q. Will temperature affect my conductivity measurement?
A. Temperature can have a substantial effect on conductivity. Raising the temperature obviously affects the chemical properties of aqueous solutions. This in turn contributes to the solution's conductivity. Typically, conductivity varies by 1 to 3% per degree °C

Q. How should I store my conductivity cell?
A. Conductivity cells require minimal storage compared to other electrode types. They can be stored in deionised water in between measurements. For overnight storage, they can be simply rinsed in deionised water and then stored dry.

Q. When should I calibrate my conductivity meter?
A. This should be done on a regular basis, before each use if possible (possibly as part of a daily calibration routine).

FISHER CHEMICAL

Fisher Chemical offers more than 4,000 chemicals of the highest quality including 'dry' reagents, ready made solutions and high purity solvents. All chemicals are ISO 9001:2008 certified and undergo rigorous quality assurance and testing procedures, ensuring excellent lot-to-lot and bottle-to-bottle consistency. Supported by a clear and simple grade and application structure, choosing the product that best suits your requirements is easy.

Below is a list of chemicals commonly used in electrochemical applications.

Indicators

Cat. No	Description	Quantity
10101760	Bromocresol green, pure, solution 0.04%, indicator grade	500mL
10070070	Bromocresol purple, pure, solution 0.04%, indicator grade	500mL
10080070	Bromophenol blue, pure, solution 0.04%, indicator grade	500mL
10213330	Bromophenol blue, pure, 0.2%, solution in Methylated spirits	500mL
10314980	Bromothymol blue, pure, solution 0.04%, indicator grade	500mL
10418980	Cresol purple, pure, solution 0.04 %, pH indicator	100mL
10030080	Cresol red, pure, solution 0.02 % pH indicator	500mL
10283850	Dimidium bromide-disulfine, extra pure, SLR, blue indicator stock solution	100mL
10234340	Bicarbonate indicator solution, pure, concentrated stock reagent	250mL
10486870	Bicarbonate indicator solution, pure, concentrated stock reagent	500mL
10548230	Iodine solution - Wij's, pure, indicator grade	1L
11492734	Iodine solution - Wij's, pure, indicator grade	2.5L
10284340	Litmus solution, pure, indicator grade	500mL
10549190	Methylene blue, pure, solution 0.015%, redox indicator	500mL
10579000	Methyl orange, pure, solution 0.04%, C.I. 13025, indicator grade	500mL
10060270	Methyl orange-xylene cyanol FF, pure, indicator grade	500mL
10020280	Methyl red, solution 0.01%, pure, spirit soluble, C.I 13020, indicator grade	500mL
10695112	Methyl red, pure, solution 0.025%, indicator grade	500mL
10214110	Methyl red, pure, solution 0.01%, indicator grade	500mL
10615502	Methyl violet, pure, solution 1%, CI 42555, indicator grade	500mL
10579190	Phenolphthalein solution, 0.2% in industrial methylated spirit (IMS)	500mL
11478742	Phenolphthalein solution, 0.2% in industrial methylated spirit (IMS)	2.5L
10274200	Phenolphthalein solution, 1% in industrial methylated spirit (IMS)	500mL
10191620	Phenol red, pure, solution 0.02% in water, indicator grade	500mL
10765921	Thymol blue, pure, 0.04% solution, indicator grade	500mL
10090470	Universal indicator, pH range 4 to 10, for pH measurement	100mL
10468420	Universal indicator, pH range 4 to 10, for pH measurement	500mL
10366340	Full range indicator, pH range 1 to 13, for pH measurement	100mL
10488610	Full range indicator, pH range 1 to 13, for pH measurement	500mL

Stains

Cat. No	Description	Quantity
10325900	Benedict's reagent, pure, qualitative	1L
10274290	Benedict's reagent, pure, quantitative	1L
10466870	Canada balsam, pure, dried, in xylene	100mL
10598040	Fehling's solution No. 1, pure, to B.P. 1988	1L
10101480	Fehling's solution No. 2, pure, to B.P. 1988	1L
11492714	Fehling's solution No. 1, pure, to Lane and Eynon modification	2.5L
11402724	Fehling's solution No. 2, pure, to Lane and Eynon modification	2.5L
10191520	Folin & Ciocalteu's phenol reagent, pure	500mL
10655112	Leishman's stain, pure, in 100% methanol	100mL
10131910	Millon's reagent, pure	100mL
10356330	Nessler's solution, pure, for detection and determination of NH3 and salts	500mL
11402774	Schiff's reagent, pure, for determination of aldehydes	500mL
10439190	Leishman's stain, pure, in 100% Methanol	100mL
10439190	Thymolphthalein, pure, solution 0.2%, indicator grade	500mL

Reagents for COD

Cat. No	Description	Quantity
11498103	Chloride colour reagent, pure	4.5L
11412724	Ficodox®, pure, mixed COD reagent	2.5L
10518240	Potassium dichromate, for COD, solution 0.021 M, (0.125N)	1L
10020230	Silver nitrate, for COD, solution 1000 g/l	500mL
11492774	Silver sulfate, for COD, solution 5% w/v (d = 1.84) in sulfuric acid	2.5L

For up to date GHS information on Fisher Chemical products listed please refer to the safety data sheet available from www.eu.fishersci.com

Fisher Chemical

Reagents for Analysis

Cat. No	Description	Quantity
10203330	Cetyl trimethylammonium bromide, for analysis	100gr
10020160	Hydrogen peroxide, 6% w/v, 20 volumes for analysis	1L
11432664	Hydrogen peroxide, 6% w/v, 20 volumes for analysis	2.5L
10345770	Water, for analysis	5L
10589770	Water, for analysis	10L
10626852	Water, for analysis	25L

Standard Solutions for Volumetric Analysis

Cat. No	Description	Quantity
11482674	Acetic acid, solution 1M, (1N approx.6%) ready to use	2.5L
11472674	Acetic acid, solution 2M, (2N approx.12%) ready to use	2.5L
11492674	Acetic acid, 0.1M (0.1N), ampoule solutrate	6 ampoules
11402684	Ammonium iron(II) sulfate, solution 0.025M ready to use	2.5L
10060180	Ammonium iron(II) sulfate, solution 0.1M (0.1 N) ready to use	1L
10639672	Ammonium thiocyanate, solution 0.1M (0.1 N) ready to use	1L
11433833	Ammonium thiocyanate, concentrated solution 0.1M (0.1N), ampoule	6 ampoules
10635112	Barium chloride, solution 1M (2N) ready to use	1L
10244340	Cerium(IV) sulfate, solution 0.1M, (0.1N) ready to use	1L
11443833	Cerium(IV) sulfate, concentrated solution 0.05M, (0.05N) , ampoule	6 ampoules
11453833	Ethylenediaminetetraacetic acid, trisodium salt, concentrated solution 0.2N (0.1M), ampoule	6 ampoules
11442714	Ethylenediaminetetraacetic acid, disodium salt, solution 0.02N ready to use	2.5L
10010190	Ethylenediaminetetraacetic acid, disodium salt, solution 0.02N ready to use	1L
10558230	Ethylenediaminetetraacetic acid, disodium salt, solution 0.2N ready to use	1L
11412714	Ethylenediaminetetraacetic acid, disodium salt, solution 0.2N ready to use	2.5L
10000190	Ethylenediaminetetraacetic acid, disodium salt, solution 0.2N ready to use	10L
11463833	Ethylenediaminetetraacetic acid, disodium salt, concentrated solution 0.02N, ampoule	6 ampoules
11442724	Hydrochloric acid, pure, solution 5M, bench reagent, ready to use	2.5L
11442734	Hydrochloric acid, solution 0.02M (0.02N) ready to use	2.5L
10733991	Hydrochloric acid, solution 0.02M (0.02N) ready to use	1L
10325710	Hydrochloric acid, solution 0.1M (0.1N) ready to use	1L
11422734	Hydrochloric acid, solution 0.1M (0.1N) ready to use	2.5L
10510921	Hydrochloric acid, solution 0.1M (0.1N) ready to use	5L
10439560	Hydrochloric acid, solution 0.1M (0.1N) ready to use	10L
10522533	Hydrochloric acid, solution 0.2M (0.2N) ready to use	1L
11412734	Hydrochloric acid, solution 0.2M (0.2N) ready to use	2.5L
10646262	Hydrochloric acid, solution 0.5M (0.5N) ready to use	1L
11482724	Hydrochloric acid, solution 0.5M (0.5N) ready to use	2.5L
10467640	Hydrochloric acid, solution 1M (1N) ready to use	1L
11472724	Hydrochloric acid, solution 1M (1N) ready to use	2.5L
10488020	Hydrochloric acid, solution 1M (1N) ready to use	5L
10284480	Hydrochloric acid, solution 1M (1N) ready to use	10L
10214440	Hydrochloric acid, solution 2M (2N) ready to use	1L
11462724	Hydrochloric acid, solution 2M (2N) ready to use	2.5L
10605882	Hydrochloric acid, solution 5M (5N) ready to use	1L
11452724	Hydrochloric acid, solution 5M (5N) ready to use	2.5L
11478333	Hydrochloric acid, solution 5M (5N) ready to use	5L
11423803	Hydrochloric acid, concentrated solution 0.1M (0.1N), ampoule	6 ampoules
11402734	Hydrochloric acid, concentrated solution 0.5M (0.5N), ampoule	6 ampoules
11473833	Hydrochloric acid, concentrated solution 1M (1N), ampoule	6 ampoules
10625112	Iodine, solution 0.05M (0.1N) ready to use	1L
11462734	Iodine, solution 0.05M (0.1N) ready to use	2.5L
10294240	Iodine, solution 0.5M (1N) ready to use	1L
11462744	Nitric acid, 60%, concentrated solution 1N, ampoule	6 ampoules
10756101	Nitric acid, solution 0.1M (0.1N) ready to use	1L
10459560	Nitric acid, solution 1M (1N) ready to use	1L
11442744	Nitric acid, solution 1M (1N) ready to use	2.5L
11432744	Nitric acid, solution 2M (2N) ready to use	2.5L
10244490	1,10-phenanthroline ferrous, pure, solution 0.025M ready to use	100mL
10656262	Potassium bromate-bromide, concentrated solution 0.0167M, ampoule	6 ampoules
10479750	Potassium bromate-bromide, solution 0.0167M, (0.1N) ready to use	1L
10112100	Potassium chloride, 4M (4N) pure electrode filling solution	100mL
10070180	Potassium chloride, 4M pure electrode filling solution with silver chloride	100mL
10744181	Potassium chloride, pure saturated electrode filling solution	100mL
10358383	Potassium chloride, solution 3M ready to use	1L
11432754	Potassium dichromate, solution 0.0167M (0.1N) ready to use	2.5L
10111720	Potassium hydroxide, solution 0.1M, (0.1N), (alcoholic) ready to use	1L
11482754	Potassium hydroxide, solution 0.1M (0.1N), (alcoholic) ready to use	2.5L
10744951	Potassium hydroxide, solution 0.5M (0.N), (alcoholic) ready to use	1L
11472754	Potassium hydroxide, solution 0.5M (0.5N), (alcoholic) ready to use	2.5L
10366112	Potassium hydroxide, solution 0.1M (0.1N), (methanol) ready to use	1L

For up to date GHS information on Fisher Chemical products listed please refer to the safety data sheet available from www.eu.fishersci.com

10080190	Potassium hydroxide, solution 1M (1N), (alcoholic) ready to use	1L
11492754	Potassium hydroxide, solution 1M (1N), (aqueous) ready to use	2.5L
11422764	Potassium hydroxide, concentrated solution 0.1M (0.1N), (aqueous), ampoule	6 ampoules
11463793	Potassium hydroxide, concentrated solution 1M (1N), (aqueous), ampoule	6 ampoules
10191760	Potassium iodate, solution 0.05M ready to use, stabilised with 10ppm mercury(II) chloride	1L
10705721	Potassium permanganate, solution 0.02M (0.1N) ready to use	1L
11462764	Potassium permanganate, solution 0.02M (0.1N) ready to use	2.5L
10294670	Potassium thiocyanate, solution 0.1M (0.1N) ready to use	1L
10214680	Silver nitrate solution, pure, 0.025M (0.025N) ready to use	1L
10124713	Silver nitrate, solution 0.0282M (0.0282N) ready to use	250mL
10449370	Silver nitrate, solution 0.02M, (0.02N) ready to use	1L
10060220	Silver nitrate, solution 0.1M (0.1N) ready to use	1L
10111910	Silver nitrate, solution 0.1M (0.1N) ready to use	2.5L
10640423	Silver nitrate, solution 0.1M (0.1N) ready to use	10L
10746101	Silver nitrate, solution 0.5M (0.5N) ready to use	1L
10725911	Silver nitrate, solution (1N) ready to use	1L
11402914	Sodium acetate, concentrated solution 0.1M, ampoule	1L
10316430	Sodium arsenite, solution 0.05M (0.1N) ready to use	1L
10776291	Sodium carbonate, solution 0.05M (0.1N) ready to use	1L
11432784	Sodium carbonate, solution 0.5M (1N) ready to use	2.5L
11453803	Sodium carbonate, concentrated solution 0.05M (0.1N) ampoule	6 ampoules
11473793	Sodium chloride, concentrated solution 0.1M (0.1N) ampoule	6 ampoules
11452784	Sodium hydroxide solution 2M (2N), BP and NIST standard solution, free from carbonate, ready to use	2.5L
10734951	Sodium hydroxide solution 2M (2N), BP and NIST standard solution, free from carbonate, ready to use	5L
10070190	Sodium hydroxide solution 2M (2N), BP and NIST standard solution, free from carbonate, ready to use	1L
10141860	Sodium hydroxide, solution 0.1M (0.1N), free from carbonate, ready to use	1L
11432794	Sodium hydroxide, solution 0.1M (0.1N), free from carbonate, ready to use	2.5L
10637032	Sodium hydroxide, solution 0.1M (0.1N), free from carbonate, ready to use	5L
10224630	Sodium hydroxide, solution 0.1M (0.1N), free from carbonate, ready to use	10L
10316190	Sodium hydroxide, solution 0.2M (0.2N), free from carbonate, ready to use	1L
11412794	Sodium hydroxide, solution 0.2M (0.2N), free from carbonate, ready to use	2.5L
10436602	Sodium hydroxide, solution 0.5M ready to use	1L
10438410	Sodium hydroxide, solution 0.5M ready to use	5L
10151810	Sodium hydroxide, solution 0.5M ready to use	10L
10765141	Sodium hydroxide, solution 1M (methanol) ready to use	1L
10528240	Sodium hydroxide, solution 1M (1N), free from carbonate, ready to use	1L
10755141	Sodium hydroxide, solution 1M (1N), free from carbonate, ready to use	5L
10666452	Sodium hydroxide, solution 1M (1N), free from carbonate, ready to use	10L
11433423	Sodium hydroxide, concentrated solution 0.1M (0.1N) ampoule	6 ampoules
11492784	Sodium hydroxide, concentrated solution 0.5M (0.5N) ampoule	6 ampoules
11483793	Sodium hydroxide, concentrated solution 1M (1N) ampoule	6 ampoules
10151860	Sodium nitrite, solution 0.5M (0.5N) ready to use	1L
11492794	Sodium thiosulfate, concentrated solution (2.5M to produce 0.5M /0.5N) ampoule	6 ampoules
10429180	Sodium thiosulfate, solution 0.1M (0.1N) ready to use	1L
11482794	Sodium thiosulfate, solution 0.1M (0.1N) ready to use	2.5L
10753694	Sodium thiosulfate, solution 0.1M (0.1N) ready to use	5L
10121910	Sodium thiosulfate, solution 0.1M (0.1N) ready to use	10L
11482804	Sodium thiosulfate, concentrated solution 0.1M (0.1N) ampoule	6 ampoules
11492804	Sulfuric acid, solution 0.01M (0.02N) ready to use	2.5L
10254150	Sulfuric acid, solution 0.01M (0.02N) ready to use	1L
10355710	Sulfuric acid, solution 0.05M (0.1N) ready to use	1L
10152050	Sulfuric acid, solution 0.05M (0.1N) ready to use	2.5L
10244150	Sulfuric acid, solution 0.05M (0.1N) ready to use	10L
10723611	Sulfuric acid, solution 0.1M (0.2N) ready to use	1L
11472804	Sulfuric acid, solution 0.1M (0.2N) ready to use	2.5L
10274100	Sulfuric acid, solution 0.1M (0.2N) ready to use	10L
11462804	Sulfuric acid, solution 0.25M (0.5N) ready to use	2.5L
10713611	Sulfuric acid, solution 0.25M (0.5N) ready to use	1L
10734761	Sulfuric acid, solution 0.5M (1N) ready to use	1L
10734761	Sulfuric acid, solution 0.5M (1N) ready to use	1L
11452804	Sulfuric acid, solution 0.5M (1N) ready to use	2L
10529000	Sulfuric acid, solution 0.5M (1N) ready to use	10L
11442804	Sulfuric acid, solution 1M (2N) ready to use	2.5L
10090250	Sulfuric acid, solution 1M (2N) ready to use	1L
11493793	Sulfuric acid, concentrated solution 0.05M (0.1N) ampoule	6 ampoules
10305810	Tetra-n-butyl ammonium hydroxide, solution 0.1 M (0.1N) in toluene/methanol, ready to use	1L
11422814	Titanium(III) chloride, solution 0.2 M (0.2N) ready to use	2.5L
11413803	Zinc sulfate, concentrated solution 0.05M ampoule	6 ampoules

For up to date GHS information on Fisher Chemical products listed please refer to the safety data sheet available from www.eu.fishersci.com

This section features key Fisherbrand consumables and apparatus to supplement your pH and electrochemistry needs. Once again Fisherbrand demonstrates that it's going that extra mile to continually deliver you quality, affordable products.

SAMPLE COLLECTION

Glassware

Beakers, squat form

- Borosilicate glass
- Squat form with spout and graduations
- ISO 3819 DIN 12331

Cat. No	Capacity, mL	Height, mm	Exterior diameter, mm	Pack qty
11597392	25	50	34	10
11507402	50	60	42	10
11942213	100	70	50	10
11527402	150	80	60	10
12907600	250	95	70	10
11547402	400	110	80	10
11982213	600	125	90	10
11567402	800	135	100	10
11577402	1,000	143	105	1
11587402	2,000	185	130	1
11507412	5,000	270	170	1

Bottles

- Borosilicate glass, reagent and media, screw neck
- Graduated and supplied with blue polypropylene cap and pouring ring
- Chemically resistant
- Autoclavable

Cat. No	Capacity, mL	Height, mm	Exterior diameter, mm	Pack qty
10202921	10	105	56	10
11738151	250	143	70	10
11972243	500	181	86	10
11982243	1,000	230	101	10
11369493	2,000	267	136	1

Cylinders, borosilicate glass, Class A

- Graduated in blue ceramic markings
- Individual reorder code on each item
- Pouring spout
- Hexagonal base
- DIN 12680 BS 604 ISO 4788

Cat. No	Capacity, mL	Graduations, mL	Pack qty
11517832	10	0.2	2
11527832	25	0.5	2
11537832	50	1.0	2
11547832	100	1.0	2
11557832	250	2.0	2
11567832	500	5.0	2
11577832	1,000	10.0	2

Cylinders, borosilicate glass, Class B

- Graduated in blue ceramic markings
- Individual reorder code on each item
- Pouring spout
- Hexagonal base
- DIN 12680 BS 604 ISO 4788

Cat. No	Capacity, mL	Graduations, mL	Pack qty
11507702	5	0.1	2
11517702	10	0.2	2
11527702	25	0.5	2
11537702	50	1.0	2
11547702	100	1.0	2
11557702	250	2.0	2
11567702	500	5.0	2
11577702	1,000	10.0	2
11587702	2,000	20.0	1

Funnels, borosilicate glass, conical

Cat. No	Top diameter, mm	Pack qty
11572423	55	10
11582423	75	10
11592423	100	10
11502433	150	1
11512433	200	1

Funnels, soda lime glass, conical

Cat. No	Top diameter, mm	Stem length, mm	Pack qty
11502423	35	40	1
11512423	45	45	1
11522423	50	50	1
11532423	55	55	1
11542423	60	60	1
11552423	70	70	1
11562423	100	100	1

Plasticware

Beakers, squat form, polypropylene, ultra clear

- Large pouring spout and moulded graduations
- Not suitable for stirrer hotplates

Cat. No	Capacity, mL	Pack qty
11572283	25	10
11512293	500	10

Beakers, tri-cornered, polypropylene

- Suitable for use with commonly used acids, alkalis and solvents
- Each beaker has three drip-free pouring spouts
- Moulded graduations, stackable

Cat. No	Capacity, mL	Subdivisions, mL	Height, mm	O.D., mm	Pack qty
11759398	100	10	72	58	100
11769398	250	10	90	76	100
11799398	1,000	50	145	115	100

Bottles, narrow mouth, HDPE

Cat. No	Capacity, mL	O.D., mm	Pack qty
11735383	30	38 x 84	72
11745383	60	48 x 99	72
11765383	250	61 x 132	72
11775383	500	71 x 171	48
11785383	1,000	91 x 213	24
11907974	125	48 x 99	500
11937964	250	61 x 132	250
11997954	500	71 x 171	125
11977924	1,000	91 x 213	50

Bottles, wide mouth, HDPE

Cat. No	Capacity, mL	O.D., mm	Pack qty
11775243	30	36 x 64	72
11785243	60	38 x 86	72
11795253	250	62 x 132	72
11775253	500	74 x 168	48
11745253	1,000	81 x 201	24
11917974	125	51 x 99	500
11947964	250	62 x 132	250
11907964	500	74 x 168	125
11987924	1,000	81 x 201	50

Bottles, wide mouth, HDPE, amber

Cat. No	Capacity, mL	O.D., mm	Pack qty
11927914	60	36 x 64	72
11967944	125	38 x 86	72
11977944	250	62 x 132	72
11957924	500	74 x 168	48
11937914	1,000	81 x 201	24

Bottles, wide mouth, PP

Cat. No	Capacity, mL	O.D., mm	Pack qty
11917934	30	36 x 64	72
11927934	60	38 x 86	72
11937934	125	51 x 99	72
11947934	250	62 x 132	72
11927924	500	74 x 168	48
11957904	1,000	81 x 201	24

Bottles, wide mouth, LDPE

Cat. No	Capacity, mL	O.D., mm	Pack qty
11957934	30	36 x 64	72
11967934	60	38 x 86	72
11977934	125	51 x 99	72
11987934	250	62 x 132	72
11937924	500	74 x 168	48
11967904	1,000	81 x 201	24

Bottles, wide neck, LDPE, translucent

- Clear bottles with blue polypropylene screw closure
- Leakproof

Cat. No	Capacity, mL	Neck size, mm	Height, mm	O.D., mm	Pack qty
11547443	30	33/R3	45	36	12
11553232	60	33/R3	80	36	12
11563232	125	38/R3	93	50	12
11583232	250	58/R3	114	61	12
11593232	500	58/R3	140	76	12
11513242	1,000	70/R3	200	90	6

Carboys

Cat. No	Capacity, mL	material	Pack qty
Carboy			
13458029	900	HDPE	1
13478029	2,000	HDPE	1
13448029	900	PP	1
13468029	2,000	PP	1
Carboy with Spigot			
13438039	900	HDPE	1
13408039	2,000	HDPE	1
13418039	900	PP	1
13428039	2,000	PP	1

Cylinders, graduated, with spout

- Large rounded bases ribbed for reinforcement and stability
- Calibrated 'To Contain/To Deliver' at 20°C - meets ASTM laboratory standards
- Chemical, heat and impact resistant makes these cylinders excellent for long term use
- No meniscus to confuse readings - eliminates guesswork

Cat. No	Capacity, mL	Pack qty
Cylinder PPCO		
11947884	10	12
11957884	25	12
11967884	50	12
11997874	100	8
11907884	250	8
11967874	500	6
11937874	1,000	4
11927874	2,000	2
Cylinder PMP		
11907894	25	18
11917894	50	18
11977884	100	12
11917884	500	8
11977874	1,000	6
11947874	2,000	4

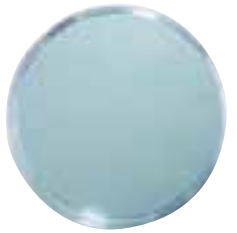
Funnel, polypropylene

Cat. No	Capacity, mL	Pack qty
Funnel, analytical		
12652425	12	36
12662425	23	36
12672425	37	36
12682425	50	36
12692425	100	36
12602435	150	24
12612435	225	24
Funnel, powder		
12622435	50	36
12632435	100	36
12642435	225	24
12652435	750	24
Funnel, utility		
12662435	40	72
12682435	100	72
12672435	140	72
12692435	210	72
12602445	410	24
12622445	500	12

Petri dishes, plastic, round

- Inner packs of 20

Cat. No	Ø x H, mm	Vent	Pack qty
Aseptic			
12694785	90 x 14.2	3	600
12664785	90 x 16.2	3	600
12644785	90 x 16.2	0	600
12654785	90 x 16.2	1	600
Sterile			
12604795	90 x 14.2	3	600
12674785	90 x 16.2	3	600
12684785	90 x 16.2	1	600



Scoops, polypropylene

Cat. No	Capacity, mL	Length, overall, mm	Pack qty
11567852	25	135	5
11577852	50	160	5
11587852	100	200	5
11597852	250	260	1
11507862	500	315	1
11517862	1,000	385	1

Swabs

- All swabs have a round, compact and shred resistant head for sample taking
- Produced under strict ISO 9002/EN 29002 standards. CE marked No.98 06 0119, Class II A

Cat. No	Description	Dimensions, mm	Pack qty
Sterile in tube, sterilised by ethylene oxide			
11502483	Wood with cotton tip	150 x 2.5	500
11512483	Polystyrene with cotton tip	150 x 2.5	500
11522483	Aluminium with cotton tip	150 x 0.9	500
11532483	Snappable polystyrene with PETE tip	150 x 2.5	500
Sterile in peel pack, sterilised by ethylene oxide			
11552483	Snappable polystyrene with cotton tip	150 x 2.5	1,000
11542483	Wood with cotton tip	150 x 2.5	1,000
Transport swabs, sterile in peel pack, sterilised by irradiation, expires 30 months after sterilisation date			
11562483	Amies. Snappable polystyrene applicator with viscose tip	150 x 2.5	100
12977960	Amies, with charcoal. Snappable polystyrene applicator with viscose tip	-	100
Non-sterile			
11572483	Polypropylene with cotton tip	150 x 2.5	4,000
11582483	Snappable polystyrene PETE tip	150 x 2.5	4,000
11592483	Aluminium with cotton tip	150 x 0.9	1,000
12977970	Wood with cotton	-	10,000

SAMPLE IDENTIFICATION

Counter-Pen™ digital meter

- Beep at each keystroke for safe and effective counting
- LCD display with counting up to 99.999 units
- Total count function and easily accessible reset button

Cat. No	Description	Pack qty
11862710	Counter-Pen™	1

Pens, permanent marker

- Produce precise lines of 0.3mm width
- Perfect marking pens for lab samples, microscope slides, photographic slides, glass and plastic beakers, and plastic sample bags
- Writes on all surfaces including glass, film, wood, plastic, metal, rubber, and porcelain
- Instant writing, long storage time, and dry-out prevention are assured by an airtight ring seal cap
- Permanent ink dries in a split second and is waterproof and fade-proof

Cat. No	Colour	Pack qty
11734386	6 black, 2 each red, blue, green	12

SAMPLE PREPARATION

Mini centrifuge

- Speed, rpm: max. 6,000
- Dimensions (W x D x H), mm: 153 x 128 x 104
- UV resistant plastic
- Includes two interchangeable rotors six place standard rotor and an eight place strip rotor

Cat. No	Description	Pack qty
13406188	Mini centrifuge	1

Midi centrifuge

- Speed, rpm: 500 to 12,500
- Dimensions (W x D x H), mm: 203 x 171 x 114
- Tool-free quick change rotor system
  Supplied with two rotors:
  - twelve place standard rotor with lid for 1.5/2.0mL tubes
  - eight place strip rotor for four 0.2mL tube strips or 32 single tubes
  - twelve 0.2mL & 0.5mL adapters for customised use

Cat. No	Description	Pack qty
12972041	Midi centrifuge	1

Centrifuge tubes, 0.6mL to 2.0mL

Locking-lid microcentrifuge tubes with polypropylene Snap-Cap™

- Convenient, pierceable locking lids snap into place with one-handed operation
- Certified free of DNase, RNase, ATP and pyrogen
- Autoclavable
- Withstand freezing -80 °C

Cat. No	Capacity, mL	RCF, x g (max.)	Pack qty
11706467	1.5	24,000	500
11313633	2.0	24,000	500

Siliconised low-retention microcentrifuge tubes

- Snap-Cap™ lid provides a secure seal, even over extended periods

Cat. No	Capacity, mL	Height x diameter, mm	Pack qty
11323653	0.6	30 x 10	500
11986955	1.5	40 x 13	250

Microtube 0.6 to 2mL graduated

- Flap cap
- Withstand up to 30,000xg
- Free of DNase, RNase

Cat. No	Capacity, mL	Height x diameter, mm	Pack qty
11916955	0.6	30.5 x 7.5	500
11926955	1.5	40.6 x 11	500
11936955	2.0	40.6 x 11	500

Centrifuge tubes 15mL and 50mL

- A large white marking area makes it easy to label samples
- Tubes are sterilised by gamma radiation and are non-cytotoxic

Centrifuge tubes 15mL

- Polypropylene
- Available with a blue plug seal closure with a double-start thread design that provides a tight secure seal
- Graduated in 0.5mL subdivisions from 2mL to 14.5mL, 17mm x 119mm
- Packed in racks

Cat. No	Closure style	RCF, x g [max.]	Inner pack qty	Pack qty
11849650	Flat top	6,000	50	500
11755075	Flat top	6,000	-	500
11765075	Plug seal	6,000	-	500

- Polyethylene terephthalate (PET)
- Packed in racks

Cat. No	Closure style	RCF, x g [max.]	Inner pack qty	Pack qty
11879640	Plug seal	1,800	50	500

Centrifuge tubes 50mL

- Polypropylene
- Graduated in 5mL subdivisions from 5mL to 50mL, 28mm x 115mm
- All are sterile except 11829650

Cat. No	Closure style	RCF, x g [max.]	Pack type	Inner pack qty	Pack qty
11819650	Flat top	9,400	Rack	25	500
11899640	Plug seal	9,400	Rack	25	500
11809650	Plug seal	9,400	Sleeve	25	500
11829650	Plug seal	9,400	Sleeve	25	500

- Polyethylene terephthalate (PET)
- Plug seal

Cat. No	RCF, x g [max.]	Pack type	Inner pack qty	Pack qty
11839650	1,800	Rack	25	500

Microcentrifuge tube rack

- Each rack can hold 4 x 50mL conical tubes, 12 x 15mL conical tubes, 32 x 1.5mL microtubes or 32 x 0.5mL microtubes
- Rack measures 174mm x 95mm x 52mm
- Autoclavable

Cat. No	Description	Pack qty
11700055	Four way tube rack, assorted colours (blue, green, pink, yellow and orange)	5

Rota Rack™

- Each module of the small Rota-Rack™ holds 6 x 15mL tubes, 9 x 1.5/2mL tubes, 12 x 0.5/0.6mL tubes or 32 independent 0.2mL PCR* tubes or 4 x 8 tube strips
- Each rack has modules in green, pink, blue and yellow, and is fully autoclavable

Cat. No	Description	Pack qty
11394085	Rota-Rack™, micro tubes	each

Dialysis tubing

NEW

- Regenerated cellulose dialysis tubing
- Available range 3,500 to 14,000Da
- Pack includes two locking membrane clamps and a pair of surgical scissors
- Tubing is supplied on a compact polystyrene spool that eliminates adsorption of glycerin from membranes
- Dispenser box is packaged in a plastic bag with a desiccant for humidity control

Cat. No	Description	Pack qty
15203857	Dialysis tubing, 14.6mm diameter, 30m roll, 6 to 8kDa MWCO	1
15213857	Dialysis tubing, 20.4mm diameter, 30m roll, 6 to 8kDa MWCO	1
15223857	Dialysis tubing, 25.5mm diameter, 30m roll, 6 to 8kDa MWCO	1
15233857	Dialysis tubing, 31.8mm diameter, 30m roll, 6 to 8kDa MWCO	1
15243857	Dialysis tubing, 6.37mm diameter, 15m roll,12 to 14kDa MWCO	1
15293847	Dialysis tubing, 15.9mm diameter, 15m roll,12 to 14kDa MWCO	1
15253857	Dialysis tubing, 28.6mm diameter, 15m roll,12 to 14kDa MWCO	1
15283847	Dialysis tubing, 6.37mm diameter, 30m roll,12 to 14kDa MWCO	1
15273847	Dialysis tubing, 15.9mm diameter, 30m roll,12 to 14kDa MWCO	1
15263847	Dialysis tubing, 21.0mmM diameter, 30m roll,12 to 14kDa MWCO	1
15253847	Dialysis tubing, 28.6mm diameter, 30m roll,12 to 14kDa MWCO	1
15233847	Dialysis tubing, 12.1mm diameter, 15m roll, 3,500Da MWCO	1
15263857	Dialysis tubing, 29.3mm diameter, 15m roll, 3,500Da MWCO	1
15273857	Dialysis tubing clamp, sealing width up to 46mm	10
15243847	Dialysis tubing clamp, sealing width up to 65mm	10

Dispenser, bottle top

NEW

- Excellent chemical compatibility
- Fully autoclavable
- Easy to calibrate
- Removable piston
- Springless precision valve mechanism
- Anti-drip cap
- Fits on most common sizes of bottle
- Traceability to an NABL accredited laboratory

Cat. No	Capacity, mL	Pack qty
12867913	0.25 to 2.5	each
12877913	0.5 to 5	each
12887913	1 to 10	each
12897913	2.5 to 30	each
12807923	5 to 60	each
12817923	10 to 100	each

Pipette fillers, universal

NEW

- The side-mounted thumbwheel is effortlessly manipulated for exact aspiration or drop-wise delivery
- The plunger is easily depressed for quick dispensing
- Colour coded barrel indicates pipette size

Cat. No	Description	Pack qty
15209805	Pipette filler, universal, blue, 2mL	each
15239805	Pipette filler, universal, green, 10mL	each
15229805	Pipette filler, universal, red, 25mL	each
15219805	Pipette controller	each

Pipette fillers, bulb

- Moulded rubber bulb, approx. 60mL capacity, with three glass ball valves which can be controlled by finger pressure
- No metal parts to corrode and can be used for all liquids except those which attack rubber
- Can be used on bulb or cylindrical pipettes from 2mL to 50mL

Cat. No	Colour	Pack qty
11890950	Red	1

Pipettes, Pasteur, glass

Cat. No	Length, mL	Type	Inner pack Qty	Pack qty
11546963	150	Unplugged	250	1,000
11566963	230	Unplugged	250	1,000

Pipettes, serological, straight, polystyrene

- Nonpyrogenic and noncytotoxic warranty
- DNase and RNase free
- Paper / plastic unit packaging, unit plastic packaging or in bulk
- Sterilisation using gamma irradiation

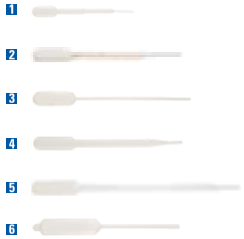
Cat. No	Capacity, mL	Graduations, mL	Colour	Inner pack qty	Pack/qty
Pipettes individually wrapped plastic/plastic					
11819660	1	0.01	Yellow	1	1,000
11879650	2	0.01	Green	1	500
11839660	10	0.1	Orange	1	200
Pipettes individually wrapped paper/plastic					
11849181	1	0.01	Yellow	1	1,000
11859181	2	0.01	Green	1	500
11869181	5	0.1	Blue	1	200
11879181	10	0.1	Orange	1	200
11839181	25	0.2	Red	1	200
11889181	50	0.5	Purple	1	100
Pipettes multipack					
11889650	1	0.01	Yellow	25	1,000
11869650	2	0.01	Green	25	500
11899650	5	0.1	Blue	50	500
11859660	50	0.5	Purple	25	100

Pipettes, transfer

NEW

- Low density polyethylene
- Transparent
- Graduated or non-graduated
- Sterile options available
- Various packaging formats

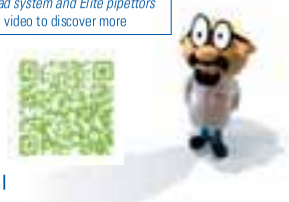
	Cat. No	Description	Sterile	Length, mm	Drop volume, µL	Drop per mL	Pack qty
1	**13469118**	Transfer pipette PE, 1mL	No	104	33	30	400
	13429118	Transfer pipette PE, 1mL, graduated, inner pack of 20	Yes	150	33	30	500
2	**13439108**	Transfer pipette PE, 3mL, graduated	No	155	40	25	500
	13479108	Transfer pipette PE, 3mL, graduated, inner pack of 10	Yes	155	40	25	500
	13409118	Transfer pipette PE, 3mL, graduated, inner pack of 20	Yes	155	40	25	500
3	**13459118**	Transfer pipette PE, 4mL, thin stem	No	150	33	30	500
4	**13459108**	Transfer pipette PE, 4mL	No	150	33	50	500
5	**13449108**	Transfer pipette PE, 7mL, extra long	No	300	50	20	100
6	**13449118**	Transfer pipette PE, 10mL, jumbo	No	170	56	18	200



Pipettors, manual, Elite™

- Soft-touch tip ejector
- Optimal fit to SureOne™ pipettor tips
- Fully autoclavable
- Comfortable, lightweight handle with finger rest
- Extremely low plunger forces

Watch our *SureOne™ filter tip reload system and Elite pipettors* video to discover more



Single channel

Cat. No	Volume, µL	Pack qty
11815762	0.2 to 2	1
11825762	0.5 to 5	1
11835762	1 to 10	1
11845762	2 to 20	1
11855762	5 to 50	1
11865762	10 to 100	1
11875762	20 to 200	1
11885762	100 to 1,000	1

Multichannel

Cat. No	Volume, µL	Pack qty
11815772	1 to 10	1
11825772	2 to 20	1
11835772	5 to 50	1
11845772	10 to 100	1
11855772	20 to 200	1
11865772	100 to 1,000	1
11875772	500 to 5,000	1
11885772	1,000 to 10,000	1

Pipettor tips, filter, universal fit, SureOne™

- Sterile packaging with outer sleeve protects tips from exterior contamination

	Cat. No	Volume, µL	Pack type	Colour	Inner Pack qty	Pack qty
	10µL micropoint tip, graduated at 2µL					
1	**11903466**	0.1 to 10	Filtered sterile	Clear	96	960
	11933416	0.1 to 10	Bulk	Clear	-	1,000
	10µL extended length micropoint tip, graduated at 2.5µL					
	11913466	0.1 to 10	Filtered sterile	Clear	96	960
	11983416	0.1 to 10	Bulk	Clear	-	1,000
	20µL universal bevelled tip					
2	**11943466**	2 to 20	Filtered sterile	Clear	96	960
	100µL universal bevelled tip					
3	**11953466**	10 to 100	Filtered sterile	Clear	96	960
	200µL universal bevelled tip					
4	**10124314**	1 to 200	Bulk	Yellow	-	1,000
	200µL universal micropoint tip, graduated at 10µL, 50µL and 100µL					
5	**11963466**	20 to 200	Filtered sterile	Clear	96	960
	1,000µL universal micropoint tip, graduated at 100µL, 200µL, 500µL and 1,000µL					
6	**11973466**	10 to 1,000	Filtered sterile	Clear	96	960
	1,250µL universal micropoint tip, graduated at 100µL, 200µL, 500µL and 1,000µL					
7	**10778535**	100 to 1,250	Racked sterile	Clear	96	960
	Micropoint tip Eppendorf style					
8	**11903426**	0.1 to 20	Bulk	Clear	-	1,000

Reagent reservoirs

Cat. No	Capacity, mL	Material	Sterile	Pack qty
11908495	50	PVC	No	100
11988485	50	PS	Yes	80
11978485	50	PS	Yes	200
11998485	100	PS	Yes	200

Syringe filters

NEW

- Available in a variety of membrane types: polyethersulfone (PES), nylon, polytetrafluoroethylene (PTFE), polyvinylidene fluoride (PVDF) and regenerated cellulose (RC)
- 3 different sizes 13mm, 25mm and 33mm

Cat. No	Membrane	Diameter, mm	Pore size, µm	Sterile	Pack qty
15206869	PES	33	0.2	Yes	50
15216869	PES	33	0.45	Yes	50
15121499	Nylon	25	0.2	No	50
15131499	Nylon	25	0.45	No	50
15161499	PTFE	13	0.2	No	100
15171499	PTFE	13	0.45	No	100
15141499	PTFE	25	0.2	No	50
15151499	PTFE	25	0.45	No	50
15181499	PVDF	33	0.2	Yes	50
15191499	PVDF	33	0.45	Yes	50
15181489	RC	25	0.2	No	50
15101499	RC	25	0.45	No	50

Spatula balance, Traceable™

- Measuring range of 0g to 300g
- Holds 32mL (1.1 fluid ounces)
- Readability: 0.1g
- Accuracy: ±0.2g
- Chemical/corrosion resistant ABS plastic construction

Cat. No	Description	Pack qty
11744416	SpatulaBalance™	1

Stirrers, magnetic, unheated, mini

- Powerful enough to stir 1L of liquid at up to 2,000rpm
- Manufactured from a tough polypropylene with a clear, chemically resistant polycarbonate top
- With instructions, stir bar and power adapter

Technical Specification

Vessel capacity, L ..... 1 (max)
Vessel diameter, mm ..... 85 (max)
Speed range, rpm ..... 350 to 2,000
Dimensions [w x d x h], mm ..... 143 x 66 x 143
Mass, g 400
Electrical supply 230V, 50Hz

Cat. No	Description	Pack qty
11577493	Basic mini stirrer Fisherbrand	1
11597493	Basic mini stirrer, Caffeine	1
11507503	Basic mini stirrer, Alchemist	1
11517503	Basic mini stirrer, DNA	1
11527503	Basic mini stirrer, Periodic Table	1
11537503	Basic mini stirrer, White Crystal	1

Magnetic followers, set, PTFE, cylindrical

- Set of 18 cylindrical followers in a compartmented box, comprising two each of the following sizes: 10mm x 6mm, 15mm x 4.5mm, 20mm x 6mm, 25mm x 6mm, 30mm x 6mm, 40mm x 8mm, 60mm x 10mm, 70mm x 10mm

Cat. No	Description	Pack qty
10226853	Magnetic followers	1

Magnetic follower restrainer

- Retrieve magnetic stirring bars easily from vessels with the handheld Spinbar™ restrainer

Cat. No	Description	Pack qty
11532912	Magnetic follower restrainer	1

Stirrer, overhead, compact

NEW

- Compact size ideal for fume hood or enclosed workstation and small volume applications
- Brushless DC motor is efficient, with less heat and maintenance-free
- Belt driven transmission is smooth and quiet, with high-power efficiency
- Easy-to-use intuitive controls - stirrer remembers last speed before powered off
- Chemical resistant, sealed keypad and splashproof housing
- Through shaft makes impeller adjustment easy
- Adjustable chuck up to 10mm

Technical Specification

Speed range, rpm ..... 40 to 2,000
Maximum torque (Ncm) 70
Horsepower 1/15
Maximum volume (L) 25
Maximum viscosity (cps) 15,000

Cat. No	Description	Pack qty
15203807	Compact overhead stirrer, general purpose mixing	1

Stirrer, overhead, high torque, digital

NEW

- Durable, unbeatable quality - TENV cast aluminum housing coated with chemical resistant epoxy paint
- Brushless DC motor is efficient, with less heat and maintenance-free
- Belt driven transmission is smooth and quiet, with high-power efficiency
- Adjustable chuck up to 10mm
- Chuck guard protects the user from moving chuck and protects the chuck itself from splashes
- Electronic speed control, two- speed transmission maintains set speed at all viscosities
- Transmission changes automatically to high torque or high speed range
- Zero torque feature similar to a tare feature on a scale
- Sealed keypad is easy-to-use, intuitive and water tight
- Through shaft makes impeller adjustment easy

Technical Specification

Speed range, rpm ..... 20 to 3,000
Maximum torque (Ncm) 341
Horsepower 1/15
Maximum volume (L) 60
Maximum viscosity (cps) 50,000

Cat. No	Description	Pack qty
15293797	High torque, digital overhead stirrer	1

Accessories for overhead stirrers

NEW

Cat. No	Description	Pack qty
12977096	Chuck and key set	1
12987096	Safety stand with base 711mm x 25mm diameter rod	1
12907106	Stirrer clamp	1
12917106	Crossed blade impeller 400mm length x 50mm diameter	1
12927106	Straight blade impeller 400mm length x 50mm diameter	1
12937106	Pivoting blade impeller 400mm length x 60mm diameter	1
12947106	Collapsible blade impeller 400mm length x 90mm diameter	1
11920305	Square blade impeller 400mm x 70mm square	1
11900305	Pitched blade propeller 400mm x 64mm diameter	1
11984985	Compact stand with base 457mm x 8mm (for 15203807 only)	1
12987116	Pitched blade propeller 25mm diameter x 8mm bore	1
12997116	Pitched blade propeller 38mm diameter x 8mm bore	1
12907136	Shaft 300mm length x 8mm diameter	1
12917136	Shaft 300mm length x 9.5mm diameter	1
12927136	Shaft 457mm length x 8mm diameter	1
12937136	Shaft 457mm length x 9.5mm diameter	1
12947136	Shaft 508mm length x 9.5mm diameter	1
12957136	Shaft 610mm length x 8mm diameter	1
12967136	Shaft 610mm length x 9.5mm diameter	1
12977136	Shaft 762mm length x 9.5mm diameter	1
12997136	Vinyl chuck cover (for 15203807 only)	1

Sonic dismembrator

NEW

- Four models available:
  - Model 50 Sonic Dismembrator: Processes 0.2 to 50mL, 50 watts, continuous or remote operation, (footswitch optional) lightweight converter (340g) for hand-held operation
  - Model 120 Sonic Dismembrator: Processes 0.2 to 50mL, 120 watts, programmable from 1 second to 10 hours, overload protection, pulse mode (1 second to 59 seconds), energy display (watts and Joules), lightweight converter (340g) for hand-held operation
  - Model 505 Sonic Dismembrator: Processes 0.5 to 500mL, 500 watts, programmable from 1 second to 10 hours, overload protection, pulse mode (1 second to 59 seconds), energy display (watts and Joules)
  - Model 705 Sonic Dismembrator: Processes 0.2 to 1,000mL, 700 watts, touch screen display, programmable from 1 second to 99 hours, save up to 10 different programs, overload protection, pulse mode (1 second to 24 hours), energy display (real-time watts and cumulative Joules), temperature monitoring (requires, optional temperature probe), full amplitude control from 1-100%

- Applications include
  - Cell disruption
  - Homogenisation
  - ChIP/DNA shearing
  - Nanoparticle dispersion
  - Protein extraction
  - Sonochemistry
  - Soil extraction
  - Mixing

Cat. No	Description	Pack qty
12961151	Model 50: Includes generator, converter, 3mm probe, cables, wrench set, manual, 230V, 50/60Hz, 203mm x 190mm x 152mm (W x L x H)	1
12337338	Model 120: Includes generator, converter, 3mm probe, cables, wrench set, manual, 230V, 50/60Hz, 203mm x 330mm x 152mm (W x L x H)	1
12893543	Model 505: Includes generator, converter, 13mm probe, cables, wrench set, manual, 230V, 50/60Hz, 203mm x 387mm x 216mm (W x L x H)	1
12931151	Model 705: Includes generator, converter, 13mm probe, cables, wrench set, manual, 230V, 50/60Hz, 203mm x 387mm x 216mm (W x L x H)	1

Accessories

Cat. No	Description	Pack qty
12991181	Cup horn for indirect processing of individual sealed tubes or vials, 38mm cup diameter, for 120 watt sonicator	1
12706908	Cup horn for indirect processing of up to 8 (2mL) tubes/vials , 63mm cup diameter, for 500 watt sonicator	1
12357338	Eight-tip horn positioner, 3.1mm tip diameter, for 120 watt sonicator	1
12961161	Footswitch for hands-free operation of 50 watt sonicator	1
12981171	Microtip probe 1.6mm diameter, 0.2mL to 5mL processing volume for 700 watt sonicator	1
12921181	Microtip probe 1.9mm diameter, 0.2mL to 5mL processing volume, for 50 and 120 watt sonicators	1
12991171	Microtip probe 3.1mm diameter, 0.5mL to 15mL processing volume for 500 and 700 watt sonicators	1
12911181	Microtip probe 3.1mm diameter, 0.5mL to 15mL processing volume, for 50 and 120 watt sonicators	1
12931181	Microtip probe 6.3mm diameter, 5mL to 50mL processing volume, for 120 watt sonicator	1
12901181	Microtip probe 6.3mm diameter, 5mL to 50mL processing volume, for 500 and 700 watt sonicators	1
12921171	Probe 12.7mm diameter, 10mL to 250mL with replaceable tip, for 500 and 700 watt sonicators	1
12971161	Probe 19.05mm diameter with replaceable tip, 25mL to 500mL processing volume	1
12901171	Probe, 25.4mm diameter with replaceable tip 50mL to 1000mL for 700 watt sonicator	1
12951171	Replacement tip 12.7mm diameter, for 500 and 700 watt sonicators	1
12961171	Replacement tip 19.05mm diameter, for 500 and 700 watt sonicators	1
12911171	Solid tip probe 12.7mm diameter, 10mL to 250mL processing volume, for 500 and 700 watt sonicators	1
12981161	Solid tip probe, 19.05mm diameter, 25mL to 500mL processing volume	1
12991161	Solid tip probe, 25.4mm diameter, 50mL to 1000mL processing volume for 700 watt sonicator	1
12353745	Sound enclosure with converter clamp, 254mm x 254mm x 508mm (W x L x H external dimensions), for 120 watt sonicator	1
12893553	Sound enclosure, 343mm x 775mm x 330mm (W x L x H external dimensions), for 500 and 700 watt sonicators	1
12883563	Stand with 12.7mm x 610mm rod and converter clamp for 500 and 700 watt sonicator	1

Vortexer, mini

NEW

- Small, compact vortex mixer
- Fixed speed 2800rpm
- Orbit 4.5mm
- 2 Year warranty

Cat. No	Description	Pack qty
15212985	Vortexer, Mini	1

Vortex mixers

- Wizard model features unique infrared tube sensing system
- Protection: IP42
- Speed, rpm: 0 to 3,000
- Orbit diameter, mm: 4.5
- Dimensions [w x d x h], mm: 180 x 220 x 70
- Mass, kg: 2.4
- Electrical supply: 230V, 50Hz

Cat. No	Description	Pack qty
11726744	Vortex mixer, Classic	1
11746744	Vortex mixer, Wizard	1

SAMPLE STORAGE

Bags, sample, polyethylene, sterile

- Secure, contaminant free bags to ensure dependable analysis results
- Made from heavy gauge, virgin polyethylene that meets FDA specifications
- Can accommodate solid, semi-solid and liquid materials
- Easy to use, just insert sample and seal by twirling the bag away from you four times and bending wire ends inward
- Choice of round wire or flat wire closures (flat wire closures provide extra strength to seal larger and heavier samples)
- Available in a variety of sizes and with clear or printed write on labels

Cat. No	Capacity, mL	Pack qty
Clear, unlabelled with round wire closure		
11914385	60	500
11924385	120	500
11904395	530	500
11944395	710	500
11964405	800	500
11954405	1,200	500
With writing patch and round wire closure		
11944405	60	500
11954385	120	500
11914395	530	500
11974395	710	500
13108187	1,800	250
11738046	3,000	250
Clear, unlabelled, with flat wire closure		
11738036	530	500
13158167	710	500
11974405	1,200	500
11768026	1,600	250
With writing patch and flat wire closure		
11984395	530	500
11904405	710	500
11984385	1,600	250

Containers, specimen, polypropylene, autoclavable

- For use with liquid, semi-solid and solid samples
- Inert to most chemicals
- Graduated
- With or without non-autoclavable polyethylene snap-on lid
- Sterile containers with lids are individually wrapped
- Non-sterile and sterile containers without lids are bulk packed

Cat. No	Lid	Sterile, Yes /No	Colour	Capacity, mL	Pack qty
11779378	Yes	Yes	Translucent	130	500
11769378	No	Yes	Translucent	130	500
11964395	No	No	Translucent	130	500
11799378	Yes	Yes	Translucent	240	500
11789378	Yes	Yes	Translucent	240	500
11984375	No	No	Translucent	240	500

Cat. No	Description	Sterile, Yes /No	Pack qty
11924395	Lids for specimen containers	Yes	500
11974385	Lids for specimen containers	No	500

Containers, storage, Tubby™

- Stackable storage containers to help with laboratory organisation or transportation of products
- Removable dividers
- For keeping gloves, tubes, tips, pipettes and other small items organised and tidy
- Stackable and proportionately sized to utilise space efficiently

Cat. No	Description	Dimensions, (w x d x h), mm	Pack qty
11938014	Tubby™, with 5 tubs, 5 lids and 15 dividers	330 x 200 x 115	5

SAMPLE TRANSPORTATION

Disposable carriers, Lab Caddy™

- Laminated cardboard holds up to 72 petri dishes, 20 flasks (75cm²)
- White

Cat. No	Description	Pack qty
11938004	Disposable flask carrier	2
11928004	Disposable petri dish carrier	2

Trays, utility

- Lightweight solution for transporting tubes and smaller items

Cat.No	Description	Pack qty
11740634	Utility tray with 13mm OneRack™	1
11750634	Utility tray with 16mm OneRack™	1

THERMOMETERS AND TIMERS

Thermometers

Thermometer/calendar, timer, Traceable™

- Temperature range: 23 to 122°F and –5 to 50°C
- Shows time, date, day of the week and temperature
- Huge 54mm digits provide superior visibility
- Monitors room temperature in °C or °F
- Accuracy 0.01%

Cat. No	Description	Pack qty
11795833	Thermometer/calendar, timer, Traceable™	1

Thermometer, wide range, Traceable™

NEW

- Designed for rough handling
- Fast-response microprocessor updates the display twice a second
- Water-resistant case
- Range is -328 to 2498°F and -200 to 1370°C
- Resolution of 0.1° and 1°
- Accuracy: ±1°C between -50°C to 740°C
- Dimension, mm: 82.5 x 178 x 38

Cat. No	Description	Pack qty
11749765	Thermometer, wide range, Traceable™	1

Thermometer, digital, infrared, with pocket clip, Traceable™

- Point and shoot at any surface and take a reading in less than one second
- Non-invasive, no touch measurements, ideal for food preparation, life sciences, pharmaceuticals, petroleum, clean rooms, electronics and field use
- Range: -33°C to 220°C and -27°F to 428°F
- Resolution: 0.1°C
- Accuracy: ±1°C
- Dimensions, mm: 83 x 19

Cat. No	Description	Pack qty
11709785	Thermometer, infrared supplied with battery, key chain, lanyard and Traceable™ certificate	1

Thermometer/clock/humidity meter, digital, Traceable™

- With an ISO 17025, A2LA Traceable™ Certificate to NIST (National Institute of Standards Technology)
- Clock displays AM/PM or 24 hour clock at the touch of a button
- Accuracy 0.01%
- Temperature range 0.0°C to 50°C/32°F to 122°F, accuracy ±1°C, resolution 0.1°C
- Humidity range 20% to 90%, resolution ±1%, accuracy ±4%

Cat. No	Description	Pack qty
11725843	Thermometer with clock and humidity monitor	1

Humidity/temperature meter, memory, Traceable™

NEW

- 15.8mm high digits
- Reads °F/°C
- Chemical and shock resistant ABS plastic housing
- Dual recall memories
- Includes: wall mount, bench stand, fast response solid state sensors, and two AAA batteries

Cat. No	Description	Pack qty
11765843	Humidity/temperature meter, memory, Traceable™	1

Thermometer, big-digit, Traceable™

NEW

- View from up to 25 feet
- External-probe sensor and internal-ambient sensor
- Maximum and minimum temperature memory
- External probe range is -58.0 to 158.0°F (-50.0 to 70.0°C)
- Ambient sensor (inside case) range is 23.0 to 122.0°F (-5.0 to 50.0°C)
- Resolution: 0.1°C
- Accuracy: ±1°C
- Dimensions, mm: 70 x 108 x 19

Cat. No	Description	Pack qty
11759755	Thermometer, Big-Digit, Traceable™	1

Thermometer, digital, refrigerator/freezer, Traceable™

- Range is -58 to 158°F and -50 to 70°C
- Resolution of 1°
- Accuracy of ±1°C
- Dimensions, mm: 70 x 108 x 19

Cat. No	Description	Pack qty
11873460	Thermometer, digital, refrigerator/freezer,Traceable™	1

Thermometer/timer, alarm, Traceable™

NEW

- Display shows time, current temp, and alarm temp setting
- Curved stainless-steel probe
- Adjustable viewing angle
- Range: 32 to 392°F and 0 to 200°C
- Resolution: 1°
- Accuracy is ±2°C
- Dimensions, mm: 70 x 76 x 13

Cat. No	Description	Pack qty
11729735	Thermometer/Timer, alarm, Traceable™	1

Thermometers, digital, refrigerator/freezer Plus™, Traceable™

- Temperature buffered bottle insulates sensor from rapid temperature changes with high and low settable alarms
- Traceable™ to NIST, certificate supplied
- Temperature range -50°C to 70°C (-58°F to 158°F)
- Resolution 0.1°C and accuracy ±1°C
- 3m micro-cable permits refrigerator doors to close on it
- Dimension, mm: 82.5 x 63.5 x 16

Cat. No	Description	Pack qty
11705853	Thermometer refrigerator/freezer Plus™	1

Thermometer, refrigerator, hi-accuracy 0.01°, Traceable™

NEW

- Reads two locations, e.g. refrigerator and freezer, simultaneously
- Triple display shows current and max/min readings, recording time and date of max/min readings
- Temperature range: -50°C to 70°C
- Resolution: 0.01°C
- Accuracy ±0.3°C
- Dimensions, mm: 70 x 108 x 19

Cat. No	Description	Pack qty
11725853	Thermometer, refrigerator, hi-accuracy 0.01°, Traceable	1

Hygrometer/thermometer/barometer/dew point pen, Traceable™

NEW

- Probe is sealed in glycol solution
- Minimum/maximum memory
- Signals out of range conditions
- Dimensions, mm: 38 (diameter) x 203

Cat. No	Description	Pack qty
11745853	Hygrometer/thermometer/barometer/dew point pen, Traceable™	1

Thermometer, digital, lollipop, waterproof, Traceable™

- Resolution: 0.1°C
- Accuracy: 1°C
- Waterproof/shockproof
- Range: -50°C to 300°C/-58°F to 572°F

Cat. No	Description	Pack qty
11785853	Lollipop™ thermometer	1

Thermometer, Digital-Bottle™ refrigerator/freezer Traceable™

NEW

- Display shows high, low and current temperatures
- Temperature range: -30.0°C to 85.0°C
- Resolution: 0.1°C
- Accuracy: ±1.0°C between -20.0°C to 85.0°C
- Bottle dimensions, mm: 25.4 x 25.4 x 64.5
- Holder dimensions, mm: 57 x 57 x 28.6

Cat. No	Description	Pack qty
11709745	Thermometer, Digital-Bottle™ refrigerator/freezer Traceable™	1

Humidity/temperature/dew point meter, digital, Traceable™

NEW

- Simultaneously displays all three current readings
- Sits anywhere in the lab and updates every 30 seconds
- Relative humidity range: 1 to 99%
- Ambient temperature and dew point range: 14 to 140°F (-10 to 60°C)
- Resolution: 0.1%

Cat. No	Description	Pack Qty
15264006	Humidity/temperature/dew point meter, digital, Traceable™	1

Fisherbrand Supplement

Timers

Barometer and clock workstation, Traceable™

NEW

- Ideal for recording ambient changes in the lab
- Displays temperature and time of day/date
- May be wall mounted
- Barometric pressure range: 23.62 to 31.01 inHg / 800 to 1050 mbar
- Resolution: 0.063inHg/1mbar, Accuracy: ±6 mb (890 to 1020 mb)
- Temperature range: -9 to 70°C (-22 to 158°F)
- Resolution: 0.5°, Accuracy: ±1°C (between 32 to 104°F/0 to 40°C)
- Dimension, mm: 197 x 63.5 x 76.2

Cat. No	Description	Pack qty
15273966	Barometer and clock workstation, Traceable™	1

Stopwatch, waterproof/shockproof Traceable™

NEW

- Waterproof to three atmospheres with O-ring seal
- Times to 24hr
- Seconds resolution for first 30min
- Accuracy: 0.01%,
- Dimensions, mm: 53 x 59 x 12.5

Cat. No	Description	Pack qty
11755833	Waterproof/Shockproof Stopwatch Traceable™	1

Timer, Clip-It™, Traceable™

NEW

- Counts down, alarms, and has stopwatch mode
- Clips to your lab coat, belt, notebook, clipboard, or anywhere
- Six digit LCD display shows the time remaining in hours, minutes, and seconds
- Dimensions, mm: 51 x 38 x 19
- Timing range: 100 hours to 1 second - Resolution: 1 second

Cat. No	Description	Pack qty
11765873	Timer, Clip-It™, Traceable™	1

Timer/countdown clock, Traceable™

- Double display
- Each channel has a distinct alarm
- Automatically counts up from zero
- ABS impact-resistant case
- Resolution: 1 second
- Accuracy: 0.01%
- Dimensions, mm: 76 x 63.5 x 13

Cat. No	Description	Pack qty
11507493	Timer/countdown clock Traceable™	1

Timer, count down/up, Traceable™

- Counts down/up, to/from 24hr with alarm
- Two timing channels
- Memory
- Clock

Timer	Description	Pack qty
12695296	Countdown/up timer Traceable™	1

Timer, extra, extra large digit, Traceable™

NEW

- Double display
- Extreme digit size for easy viewing
- Timer countdowns and alarms on single channel for ease-of-use
- Counts up during alarming indicating elapsed time since alarming
- Timing range: 99 minutes, 59 seconds
- Resolution: 0.1°
- Accuracy is 0.01%

Cat. No	Description	Pack qty
15204016	Timer, extra, extra large digit, Traceable™	1

Timer, multicoloured,Traceable™

- Counts down and alarms on 4 separate channels
- Counts up during alarming indicating elapsed time since alarming
- Times up to 99hr, 59min, 59s
- Accuracy: 0.01%
- Resolution: 1 second
- Dimensions, mm: 70 x 57 x 13

Cat. No	Description	Pack Qty
11775863	Timer, multicoloured, Traceable™	1

Timer, three-channel alarm, Traceable™

NEW

- Run three channels at same time
- Alarm volume for high decibel to low decibel
- Functions as a stopwatch and a clock
- Timing range: 99 hours, 59 minutes, 59 seconds
- Resolution: 1 second
- Accuracy: 0.001%
- Dimensions, mm: 83 x 76 x 35.4

Cat. No	Description	Pack qty
11725863	Timer, three-channel alarm, Traceable™	1

Timer, four-channel alarm, Traceable™

- Extra-loud, high decibel alarm
- Features include stopwatch, time-out and a clock
- Memory returns to previously programmed time
- Timing range: 99 hours, 59 minutes, 59 seconds
- Resolution: 1 second
- Accuracy: 0.01%
- Dimensions. mm: 70 x 63.5 x 13

Cat. No	Description	Pack qty
11745863	Timer, four-channel alarm, Traceable™	1

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