Electrodes

Ingeniously Practical

STARTER ELECTRODES SELECTOR GUIDE

pH Electrodes							
Application	**Sample Type**	**Recommendations**	**Double Junction**	**Standard**	**Economy/ Basic**	**IP Rated**	**Micro**
Education	Student Use	Epoxy body for added durability	ST260	–	ST210 / ST310	–	N/A
General Purpose	Most sample types	Suitable for general purpose measurements	ST260	ST350	ST310	–	N/A
Emulsions	Foods, cosmetics, oils	Open junction to prevent clogging	–	ST350	ST230	–	N/A
Flat Surfaces	Paper, cheese, meat, agar	Flat surface tip and double junction Ag/AgCl reference (no sample contact with silver)	–	STSURF	–	–	N/A
Biological/ Pharmaceutical	TRIS buffer, proteins, enzymes	Double junction Ag/AgCl reference (no sample contact with silver)	ST260 / ST420	–	–	–	N/A
Low Ionic Strength	Treated effluent, deionized water, distilled water	Refillable for better contact and stable measurements	ST420	STPURE	–	–	N/A
Small Sample Size	Microtiter plates, test tubes, small flasks and beakers as small as 0.2 mL	Small diameter to fit into narrow sample containers	N/A	N/A	N/A	–	STMICRO8
Small Sample Size	TRIS buffer, proteins, sulfides, fits 96 microwell plates	Small diameter to fit into narrow sample containers	N/A	N/A	N/A	–	STMICRO5
Viscous Liquids	Slurries, suspended solids, sludges	Open junction to prevent the electrode from clogging	–	ST350	ST230 / ST280	–	N/A
Waters	Acid rain, boiler feed water, distilled water, rain water,	Double junction Ag/AgCl reference and refillable for better contact	ST260	–	–	–	N/A
Waters	Drinking water, tap water	Epoxy body for added durability	–	ST350	ST310	–	N/A
Waters	Wastewater, seawater	Double junction Ag/AgCl reference and epoxy body for added durability	–	ST270 / ST272	ST230	–	N/A
Harsh Environments	Field or plant use, rugged use	Epoxy body for added durability and polymer or gel filled for easy maintenance	–	–	ST320	ST320 IP67	N/A
High Ionic Strength	Acids, bases, brines, pH > 12 or pH < 2	Open junction for better contact and stable measurements	–	–	ST230	–	N/A
Soft Samples	Piercing fruits, cheese and meats	Spear tip for piercing samples	–	ST270	–	–	N/A

STARTER ELECTRODES SELECTOR GUIDE

			ORP Electrodes		Conductivity Electrodes		Dissolved Oxygen Electrodes	
Application	**Sample Type**	**Recommendations**						
Education	Student use	Epoxy body for added durability	–	STORP1	STCON3	–	STDO11	–
General Purpose	Most sample types	Suitable for general purpose measurements	–	STORP1	STCON3	–	STDO11	–
Emulsions	Foods, cosmetics, oils	Open junction to prevent clogging	–	N/A	–	N/A	–	STDO21
Flat Surfaces	Paper, cheese, meat, agar	Flat surface tip and double junction Ag/AgCl reference (no sample contact with silver)	–	N/A	–	STCON7	–	STDO21
Biological/ Pharmaceutical	TRIS buffer, proteins, enzymes	Double junction Ag/AgCl reference (no sample contact with silver)	–	N/A	–	STCON7	–	N/A
Low Ionic Strength	Treated effluent, deionized water, distilled water	Refillable for better contact and stable measurements	–	N/A	STCON3	STCON8	–	STDO21
Small Sample Size	Microtiter plates, test tubes, small flasks and beakers as small as 0.2 mL	Small diameter to fit into narrow sample containers	–	N/A	–	N/A	–	N/A
Small Sample Size	TRIS buffer, proteins, sulfides, fits 96 microwell plates	Small diameter to fit into narrow sample containers	–	N/A	–	N/A	–	N/A
Viscous Liquids	Slurries, suspended solids, sludges	Open junction to prevent the electrode from clogging	–	N/A	–	N/A	–	STDO21
Waters	Acid rain, boiler feed water, distilled water, rain water,	Double junction Ag/AgCl reference and refillable for better contact	–	STORP1	STCON3	–	STDO11	–
Waters	Drinking water, tap water	Epoxy body for added durability	–	STORP1	STCON3	–	–	STDO21
Waters	Wastewater, seawater	Double junction Ag/AgCl reference and epoxy body for added durability	STORP2	–	–	STCON7	–	STDO21
Harsh Environments	Field or plant use, rugged use	Epoxy body for added durability and polymer or gel filled for easy maintenance	–	–	–	STCON7	–	STDO21
High Ionic Strength	Acids, bases, brines, pH > 12 or pH < 2	Open junction for better contact and stable measurements	–	–	–	–	–	–
Soft Samples	Piercing fruits, cheese and meats	Spear tip for piercing samples	–	–	–	–	–	–

STARTER ELECTRODES

OHAUS Precision Powers the Starter Electrodes

- All sturdy and durable electrodes are constructed of either plastic or glass shafts and built to withstand daily use.
- Options available for electrodes with temperature sensing, which powers automatic temperature compensation and ensures accurate measurements.
- All electrodes fit perfectly in the electrode holders on OHAUS bench meters and electrode clips on all OHAUS portable meters.

Parameters	pH, reference, oxidation-reduction potential (ORP), conductivity, dissolved oxygen (DO), temperature measurement
Construction	Glass, plastic or metal
Design Features	Can be used in conjunction with all Starter bench and portable meters

Construction

Glass

Plastic

Metal

Parameters

pH Measure-ment · Conduct-ivity · Total Dissolved Solids · Salinity · Oxidation Reduction Potential · Dissolved Oxygen · Temper-ature

STARTER ELECTRODES

Models

	Model	ST5000, AB41PH, AB33PH, AB23PH, ST300	AB33M1	AB33EC, AB23EC, ST300C	ST300D	ST400M	ST400	ST400D	Temperature	Shaft Material	Item No.
pH Electrode	ST210	●	●							Plastic	83033966
	ST230	●	●							Glass	83033968
	ST260	●	●							Glass	30129357
	ST270	●	●							Glass	30240974
	ST272	●	●							Plastic	30393265
	ST280	●	●							Glass	30681114
	STMICRO5	●	●							Glass	30087566
	STMICRO8	●	●							Glass	30087569
	STPURE	●	●							Glass	83033969
	STSURF	●	●							Plastic	30129470
	ST310	●	●						●	Plastic	83033965
	ST320	●	●						●	Plastic	83033967
	ST320 IP67					●	●		●	Plastic	30468960
	ST350	●	●						●	Glass	30129354
	ST410	●	●							Glass	30656037
	ST420	●	●							Glass	30681115
Reference Electrode	STREF1	●	●							Glass	30059253
Orp Electrode	STORP1	●	●							Plastic	30038555
	STORP2	●	●							Glass	30038553
Conductivity Probe	STCON3		●	●						Plastic	83033972
	STCON3 IP67					●				Plastic	30468962
	STCON5		●	●						Glass	30681116
	STCON7		●	●						Steel	30080693
	STCON8		●	●						Glass	30681117
	STCON8 w/glass chamber		●	●						Glass	30681235
Dissolved Oxygen Sensor	STDO11				●					Plastic	30031639
Temperature Sensor	STTEMP30	●	●		●				●	S.Steel	83033970

STARTER ELECTRODES

Accurate and precise measurement has been our main focus since our inception in 1907. After more than a century of developing balances that have provided the reliable and precise weight determination that is essential to laboratory applications, OHAUS is proud to also offer our expertise in measurement in a line of electrochemistry products.

The Starter Series includes pH, reference, oxidation-reduction potential (ORP) electrodes, as well as conductivity, dissolved oxygen (DO) and temperature electrodes that can be used in conjunction with our bench and portable meters. In this section, you will find essential information regarding OHAUS' portfolio of Starter sensors, including product specifications and sample types they were designed to measure. In addition to the sensors, information regarding accessories such as conductivity and pH solutions used for calibration, are included.

Basic Theory of pH

pH is a one of the most commonly measured parameters in chemical and life science research, as well as is many different industries, including water and wastewater treatment, food technology, environmental protection, production and agriculture.

pH is defined as the negative logarithm of the hydrogen ions concentration in the sample:

pH = -log [H+]

pH provides a convenient way to compare the relative acidity or alkalinity of a sample at a given temperature.

pH electrodes produce different mV values in solutions with different pH. Ideally, at 25°C, a pH electrode should produce a slope of 59.16mV per 1 pH unit.

Electrodes for pH Measurement

pH measurement is usually conducted using a combination electrode that consists of a pH-sensitive glass electrode that is sensitive to hydrogen ions present in the sample as well as a reference electrode that has a constant potential value.

A potential is developed on the membrane surface when a pH electrode comes into contact with a sample.

pH meters measure variations in the potential and convert it directly to a corrsponding pH value, according to the Nernst equation:

E = E0 + (2.303RT/nF)log[H+]

pH measurement is sensitive to temperature changes. However, at a pH of 7, temperature will not have an effect on the potential of the system.This is known as the isopotential point. OHAUS' 3-in-1 electrodes are convenient tools that contain a built-in temperature electrode that can be used together with a meter to compensate temperature changes without the need for an external temperature electrode.

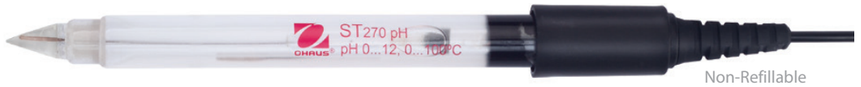
PH ELECTRODES STRUCTURE

Glass Shaft

Plastic Shaft

Shaft Body Material	Characteristic	Advantage
Glass Shaft	Can withstand high temperatures and is resistant to corrosive materials and organic solvents.	Ideal for laboratory use, easy to clean
Plastic Shaft	Not recommended for usage at temperatures above 80 ˚C. Moderate resistance to highly corrosive materials and organic solvents.	Durable and sturdy

Refillable



Non-Refillable

Fill Type	Characteristic	Advantage
Refillable	Reference electroytes can be replenished when necessary.	Reusable
Non-Refillable	The electrode must be replaced when contaminated.	No maintenance is required

Ceramic Junction

Annular Junction

Reference Junction Type	Characteristic	Advantage
Ceramic Junction	This standard junction consists of a porous piece of ceramic which allows the electrolyte to slowly flow out of the electrode.	Stable and simple to use.
Annular Junction	Formulated with a special ceramic which encircles the glass bulb. Numerous pores in the ceramic provide lower resistance and more stable pH readings.	Not easily blocked, Ideal for muddy samples

PH ELECTRODES

Maintenance and Storage of pH Electrodes

pH electrodes are delicate measuring instruments that require proper care and maintenance to produce accurate and reliable results as well as to ensure a long useful life.

Always keep the pH electrode moist when not in use by using an electrode storage solution (3M KCl). DO NOT store the electrode in distilled or deionized water as this will cause ions to leak out of the glass bulb and reference electrolyte, causing a slow and sluggish response.

Electrodes may be shipped with either protective caps or in electrode soaking bottles to prevent cracking or scratching and to keep the glass bulbs moist. Remove the electrode gently from the storage bottle and rinse it with distilled water before use. For long-term storage, always keep the electrode in the bottle in enough storage solution to cover the bulb. Replenish the bottle as needed.

	ST410	ST420	ST350	ST320	ST320 IP67	ST310	ST272	ST270
pH Range	0 to 14	2 to 12	0 to 14	0 to 14	0 to 14	0 to 14	2 to 12	0 to 14
Tempture	5 to 90°C	5 to 90°C	0 to 100°C	0 to 80°C	0 to 80°C	0 to 80°C	0 to 50°C	0 to 100°C
Type of junction	Ceramic	Ceramic	Annular Ceramic	Fiber Pin	Fiber Pin	Ceramic	Annular Ceramic	Annular Ceramic
Shaft Material	Glass	Glass	Glass Body	Epoxy Body	Epoxy Body	Epoxy Body	Epoxy Body	Glass Body
Connector	BNC	BNC	BNC&Cinch	BNC & Cinch	BNC & Cinch	BNC & Cinch	BNC	BNC
Sensor Type	Combined Electrode	Combined Electrode	3 in1	3 in1	3 in1	3 in1	Combined Electrode	Combined Electrode
Reference System	Ag/AgCl Double Junction	Ag/AgCl Double Junction	Ag/AgCl	Ag/AgCl	Ag/AgCl	Ag/AgCl	Ag/AgCl	Ag/AgCl
Reference electrolyte	3.3 M KCl	3.3 M KCl	3.3 M KCl	Gel Filled	Gel Filled	3.3 M KCl	Gel Filled	Gel Filled
Cable	1 m	1 m	1 m	1 m	3 m	1 m	1 m	1 m
Fill Type	Refillable	Refillable	Refillable	Non-refillable	Non-refillable	Refillable	Non-refillable	Non-refillable
Description	Double Junction combination pH electrode	Double Junction combination pH electrode	pH/ATC with glass body	pH/ATC with epoxy body, low maintenance	pH/ATC with epoxy body, low maintenance gel	pH/ATC with epoxy body, refillable	Combination pH electrode with stainless steel cutting blade	Combination pH electrode, glass body, spear tip
Application	Strong Acid/ Alkali Solution	Low ionic strength solutions. TRIS, protein, sulfide, or any other samples that react chemically with the Ag/AgCl reference element.	Top performance for QC and research	General purpose, high performance	High performance ph analysis in the field	General purpose for everyday use	For meat, cheese and sludge where glass alone may break	For meat, cheese and fruit samples
Feature	Chemical resistant glass body	Chemical resistant glass body	Chemical resistant glass body	Epoxy body for ruggedness	Epoxy body and built-in ATC	Long-lasting	Annular junction prevents clogging	Annular junction prevents clogging

PH ELECTRODES

OHAUS Starter series electrochemistry instruments include electrodes that support advanced pH analysis, including a glass shaft 3-in-1 electrode, micro sample, double salt-bridge, and flat surface pH electrodes.

OHAUS launched several pH electrodes, include glass shaft 3-in-1 ST350, micro sample pH electrode STMICRO5 and STMICRO8; double-salt bridge pH electrode ST260 which is fit for tris-buffer solution pH measurement, flat surface pH electrode STSURF and puncture electrodes ST270 and ST272.

	ST280	ST260	ST230	ST210	STMICRO8	STMICRO5	STPURE	STSURF
pH Range	0 to 14	0 to 14	0 to 14	0 to 14	0 to 14	0 to 14	2 to 12	0 to 14
Tempture	5 to 60°C	0 to 100°C	0 to 100°C	0 to 80°C	0 to 100°C	0 to 100°C	0 to 80°C	0 to 100°C
Type of junction	Open Junction	Ceramic	Annular Ceramic	Ceramic	Annular Ceramic	Annular Ceramic	Ground Glass	Ground Glass
Shaft Material	Glass	Glass Body	Glass Body	Epoxy Body	Glass Body	Glass Body	Glass Body	Epoxy Body
Connector	BNC	BNC	BNC	BNC	BNC	BNC	BNC	BNC
Sensor Type	Combined Electrode	Combined Electrode	Combined Electrode	Combined Electrode	Combined Electrode	Combined Electrode	Combined Electrode	Combined Electrode
Reference System	Ag/AgCl	Ag/AgCl Double Junction	Ag/AgCl	Ag/AgCl	Ag/AgCl	Ag/AgCl	Ag/AgCl	Ag/AgCl
Reference electrolyte	Polymer gel	3.3 M KCl	3.3 M KCl	3.3 M KCl	3.3 M KCl	3.3 M KCl	3.3 M KCl	3.3 M KCl
Cable	1 m	1 m	1 m	1 m	1 m	1 m	1 m	1 m
Fill Type	Non-Fillable	Refillable	Refillable	Refillable	Refillable	Refillable	Refillable	Refillable
Description	Open junction combination pH electrode	Double junction refillable combination pH electrode	Combination pH electrode with rugged bulb	Combination pH electrode with epoxy body	Combination pH electrode with glass body, long length	Combination pH electrode with glass body, semi-micro tip	Combination pH electrode	Combination pH electrode with epoxy body, flat surface
Application	Highly suspended, dirty samples	Use in dirty water or TRIS, sulfide and protein samples	For soil, sludge, colloids, viscous material	For routine applications	For routine or research applications	For samples with size constraints For samples with size limitations	For samples with low ionic strength	Measure moist surfaces such as agar gel lates, meats and cheese
Feature	Toughened bulb for rugged lab use	Long-lasting	Toughened bulb for rugged lab use	Economical	Measure samples as small as 0.5 mL in tube	Measure samples as small as 0.2 mL in 96 well plates	Economical	A flat pH bulb and refillable designs

REFERENCE ELECTRODES

Basic Principle of Reference Electrodes

Reference eletrodes have a stable and well defined electrochemical potential. A measured potential in an electrochemical cell is determined against a defined potential value of a reference electrode.

STREF1 is Silver/Silver Chloride (Ag/AgCl in Saturated KCl), which represents another type of reference electrode.

Storage and Maintenance

Maintenance of reference electrodes can help avoid stability problems and keep them in proper working condition.

Check that the reference electrode compartments are filled with electrolyte solution and the junction is not blocked.

Model	STREF1
Item Number	30059253
Description	Silver/Silver Chloride (Ag/AgCl)
E vs. SHE (Standard Hydrogen Electrode) (V)	0.198
Connector	2mm Banana
Dimensions (Shaft)	110 x 12 mm
Cable Length	1 m

ORP ELECTRODES

Basic Principle of ORP

Oxidation-Reduction Potential (ORP) electrodes test for the overall availability of electrons in a medium, specifically the ratio of positive and negative ions in the solution. They are also sometimes referred to as Redox electrodes.
ORP is the only practical method used to electronically monitor sanitizer effectiveness and it is also commonly tested in water, such as swimming pools and aquariums.
ORP is expressed in millivolts (mV). -1000 mV to 1000mV is a common range for ORP tests. The pH value influences the ORP value significantly.

Storage and Maintenance

To ensure accurate measurements, it is important to keep the electrode clean. Contamination can cause inaccurate results and slow response times.

Model	STORP2	STORP1
Item Number	30038553	30038555
Shaft Material	Glass	Plastic
Temperature Range	0°C to 100°C	0°C to 80°C
Internal Reference Type	Ag/AgCl	Ag/AgCl
Refillable/Non-refillable	Refillable	Non-refillable, Gel
Reference Junction Type	Annular Ceramic	Ceramic Pin
Refilling Reference Electrolyte	3M KCl Solution	3M KCl Gel
Dimensions (Shaft)	120 x 12 mm	120 x 12 mm
Cable Length	1 m	1 m
Temperature Sensor	No	No
Connector	BNC	BNC
Zero Potential Value	86mV±15mV	86mV±15mV
Grade Difference	≥ 165mV	≥ 165mV

CONDUCTIVITY ELECTRODES

Basic Theory of Conductivity

Conductivity is measured in a wide range of industries and gives a readout of total ionic concentration within the sample. It is a rapid and inexpensive way of determining the ionic strength of a solution.

A basic conductivity cell consists of a pair of electrodes that are placed in a sample. The ratio of the distance between the electrodes (D) and their surface area (A) is known as the cell constant K:

$K = D/A\ [cm^{-1}]$

Calibration

Cell constants at time of manufacture are listed on many conductivity cells. It is recommended that you always determine the exact cell constant by using a calibration standard. Calibration is essential since the cell constant can vary by 10% or more from the nominal value and they do change over time. Once calibrated, they do not change quickly and do not require frequent calibration like a pH electrode. It is important to calibrate 25 ºC or know the value of your calibration standard at different temperatures. The cell constant changes only if the surface of the electrode changes, for example through fingerprints, deposits, scratches or enclosed air bubbles.

Benefits of 4-Electrode Cells

- All have durable plastic bodies
- No error from cable resistance, allowing for longer cable lengths
- Minimum effect on accuracy from electrode polarization and contamination
- Wide measurement range
- Unaffected by deposits on cell surface

Model	STCON3	STCON3 IP67
Item Number	83033972	83033972
Measuring range	2 µS/cm - 200 mS/cm	2 µS/cm - 200 mS/cm
Temperature range	0°C to 50°C	0°C to 50°C
Cable Length	1 m	3m
Connector Type	Mini-DIN	CTW
Cell Material	4 rings stainless steel	4 rings stainless steel
Cell Constant	1.5 - 2.0 cm^{-1}	1.5 - 2.0 cm^{-1}
Shaft Material	Plastic	Plastic
Shaft Length	130 mm	130 mm
Shaft Diameter	14 mm	14 mm
Temperature probe	NTC 30 kΩ	NTC 30 kΩ
Description	Widest conductivity range	Widest conductivity range
Application	For lab and field applications	For lab and field applications
Feature	Removable guard	Removable guard

CONDUCTIVITY ELECTRODES

Storage and Maintenance

The conductivity electrode should be stored in a clean and dry environment. They can be stored in deionized water in-between measurements. For storage overnight or longer, conductivity cells should be rinsed thoroughly in deionized water and stored dry.

If they become contaminated they should be cleaned. Refer to user guides for specific instructions for different electrode materials.

Precautions and Limitations

Do not expose the shaft to organic solvents when cleaning or when taking measurements.

1. Do not use the electrode outside the recommended temperature range.

2. Calibrate the electrode with standard solution for an accurate measurement.

Benefits of 2-Electrode Cells

- Available in glass, allows use in most samples
- Best for ultra-pure water measurements
- Multiple cell materials available, platinum or stainless steel
- Different cells designed to measure multiple specific ranges
- Option for flow cell or flow-thru design

Model	STCON5	STCON7	STCON8 w chamber
Item Number	30681116	30080693	30681235
Measuring range	50 µS/cm - 2 mS/cm	0.02 µS/cm - 200 µS/cm	0.055 µS/cm - 300 µS/cm
Temperature range	0°C to 80°C	0°C to 60°C	0°C to 80°C
Cable Length	1 m	1 m	1m
Connector Type	Mini-DIN	Mini-DIN	Mini-DIN
Cell Material	2 Ring platinum	2 Ring 316L	2 Ring platinum
Cell Constant	1 cm^{-1} ± 0.2	0.1 cm^{-1} ±0.02	0.1 cm^{-1} ±0.02
Shaft Material	Glass	Steel	Glass
Shaft Length	155 mm	95 mm	155mm
Shaft Diameter	12 mm	12 mm	12 mm
Temperature probe	NTC 30 kΩ	NTC 30 kΩ	NTC 30 kΩ
Description	Standard conductivity range	Low conductivity range	Low ionic strength solutions, deionized water, and ultra pure water.
Application	For lab applications	For Boiler feed water, pure water	For ultra pure water applications
Feature	Chemical resistant glass body	Rugged Steel	Platinized glass/platinum
Other	N/A	N/A	Includes detachable glass chamber

DISSOLVED OXYGEN ELECTRODES

Basic Principle of Dissolved Oxygen (DO) Electrodes

There are three types of commonly used oxygen sensors: polarographic, galvanic and optical (luminescence) sensors.

STDO11 is a galvanic DO electrode and the simplest among the three electrodes. It produces its own electric current.

The cathode is silver and the anode is zinc. Oxygen passes through the membrane and is reduced at the cathode to increase the electrical signal (current) read by the electrode. As oxygen increases, the signal increases.

Galvanic sensors are active at all times and will degrade in storage as well as during use. They do not need to polarize (warm up) before calibration or measurement while polarographic electrodes take 15 minutes to several hours to warm up.

The STDO21 optical dissolved oxygen sensors measure the interaction between oxygen and certain luminescent dyes. These sensors are ideal for long-term monitoring applications due to their minimal maintenance requirements. STDO21 also does not require any warm-up time or stirring when taking a measurement. Over a long period of time, the dye degrades and the sensing element and membrane will need to be replaced, but this replacement is very infrequent compared to electrochemical sensor membrane replacement.

Storage and Maintenance

Carefully remove the protective bottle from the tip of the electrode by unscrewing the lid and removing the bottle. Remove the shorting plug from the connector and store in a safe place. Be careful because the protective bottle lid is tightly fit on the electrode.

STDO11 should be stored in a moist environment to keep the membrane from drying out, but do not store directly in water.

Model	STDO11
Item Number	30031639
Connection	BNC
Cable Length	1.1 m
Shaft Length	120 mm
Shaft Diameter	12 mm
Shaft Material	Plastic
Temperature Range	0°C to 50°C
Measurement Range	0 - 200%

TEMPERATURE ELECTRODES & SOLUTIONS

Temperature Compensation

Temperature variations can affect measurement values.
OHAUS offers a standalone temperature electrode, STTEMP30.
It can be used in conjunction with Bench and Portable meters.

Model	STTEMP30
Item Number	83033970
Shaft Material	Stainless Steel
Shaft Length	120 mm
Temperature Range	0-100 ˚C
Cable Length	1 m
Connection	Cinch

Standard Solutions

pH Buffer Solutions
1.68, 4.01, 6.86, 7.00, 9.18, 10.01, and 12.45 buffer solutions are available in 250ml bottles.

Conductivity standards
Four conductivity standard solutions for calibration include:
10µS/cm, 84µS/cm, 1413µS/cm and 12.88 mS/cm.

Reference Refilling Electrolyte
3M KCl saturated with AgCl reference fill solution for Ag/AgCl single junction electrodes.

Electrode Protection Solutions
After cleaning or when the electrode is not in use, always keep it in storage solution. To ensure proper conditions for pH electrodes, we offer pH electrode protection solution (3M KCl, 125ml).

ESSENTIALS OF PH MEASUREMENT

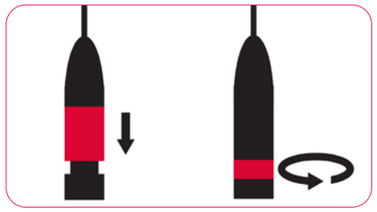
Electrode calibration is necessary in order to establish the slope and zero point of the electrode. Since both of these can change over time, frequent calibration is necessary. The frequency of calibration depends on the application, with some applications requiring daily calibration while others may require only weekly or monthly calibration. More frequent calibration is recommended when measuring in heavily contaminated, low-ion, strongly acidic, and high temperature solutions.
The following is a general procedure for preparing most pH electrodes.

Perform Routine Maintenance

- On a weekly basis, inspect the pH electrode for scratches, cracks, salt crystal build-up, or membrane/junction deposits.
- Keeping an electrode clean can help eliminate calibration issues. Clean any salt deposits from the electrode exterior by rinsing it with distilled water before use. Always check the meter and electrode manuals for calibration and routine maintenance information.
- Place the electrode for 10 minutes in 0.1 M HCl or 0.1 M NaOH. If the buildup is not removed, the solution should be cautiously heated up to 45 ˚C - 55 ˚C for 10 minutes before the acid or alkaline concentration is increased.

Open the Refill Slider/Ring

- For pH electrodes featuring a refillable reference, the first step to calibrating and/or taking a measurement is to open the refill opening. Depending on the model, the refill opening is either a slider (left image) or a ring (right image). The refilling opening must always be open during calibration and measurement.



Check the Electrolyte Level

- For refillable electrodes, ensure the fill level of the electrolyte is at least 2 cm above the level of the measurement solution. Replace the electrolyte if it has become contaminated.

Check the Selected Buffer Set

- The pH values of buffer solutions are temperature dependent and the response can vary from manufacturer to manufacturer. Also, the pH values of buffers in a buffer set can vary from one set to another. Modern pH meters automatically adjust for the respective temperature profile once the buffer set used has been correctly set.

Use Fresh, Unused, Unexpired Buffers

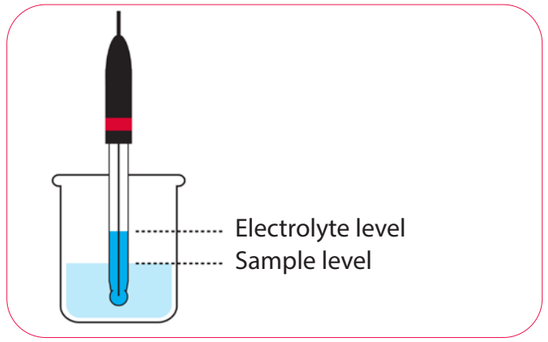
- Once buffers are used for calibration, they are assumed contaminated and should not be used again. Reusing buffers can lead to slow pH electrode response or the inability to calibrate. The cause of calibration failure is difficult to determine if the pH buffers have already been used. Used buffer solutions can be kept for rinsing the calibration container and the electrode between calibration points.
- Expired buffer solutions should not be used and buffer bottles should not be left open. Carbon dioxide in the air can change the pH of basic buffer solutions, so basic buffer bottles should only briefly be opened. Use opened containers of buffer as soon as possible.

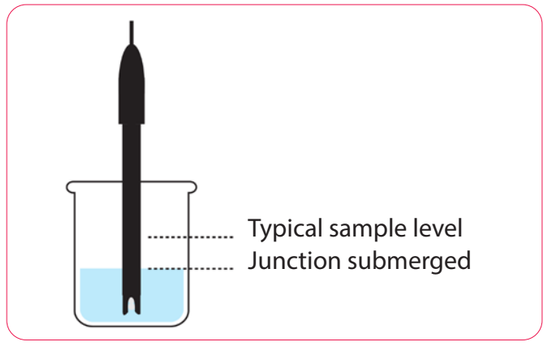
Expiration dates are printed on the label of the buffer bottle, and according to the LOT code
visit ohaus.com/Lot-Certificates

ESSENTIALS OF PH MEASUREMENT

The Reference Junction Should be Immersed

- The reference junction must be completely submerged in solution. The temperature sensor must also be in solution in order to accurately compensate pH for temperature.
- The sample solution level must be above the pH electrode reference junction when the electrode is immersed in the sample.





Perform at Least a 2-Point Calibration

- It is best to perform at least a 2-point calibration and pH 7 buffer must be one of those points.
- The pH buffers used should differ by at least two pH units and should bracket the expected in situ pH conditions. Calibration points need to bracket your sample range. Unless the sample is expected to be above pH 7, basic buffers should not be used, as their pH value quickly changes by absorbing CO^2.
- When measurements are performed over a large range of pH values, it is recommended that one takes at least 3 calibration points. A 1-point calibration will only determine the zero point, not the electrode slope. The range of use of 1-point calibrations is limited and should only be completed with pH 7 buffer. The pH value obtained can be used to compare to previous results, but is not an absolute value.
- Between buffers, rinse the electrode with distilled water and then with the next buffer. To reduce the chance of error due to polarization, avoid rubbing or wiping the electrode bulb. Use a lint-free tissue and gently blot the bulb.
- The first calibration point should be pH 7. Although it is not always required, it is best to begin calibration with pH 7 buffer.

PH MEASUREMENT OF DIFFERENT SAMPLE TYPES

pH measurements of flat samples and very small samples

- Some samples are too small even for a micro sensor to measure accurately. In such cases, a surface sensor is the optimal configuration. The sample must be moist enough for the pH-sensing bulb and the reference junction to make adequate contact with the sample. If necessary, add a drop of distilled water or potassium chloride to wet the surface before placing the electrode on the sample. For the best reproducibility, all samples should have the same amount of liquid added before measurement.
- Surface pH sensors prevent sample contamination: Direct contact of the pH sensor with the sample during measurement can be a critical source of contamination. Reference electrolyte may flow into the sample; in addition, there is a risk of carryover from the rinsing solution, and residues may be present on the sensor. Pipetting at least 100 µL of sample onto a flat, clean surface and measuring with a flat membrane sensor can prevent such problems.

pH measurements in solid samples

- Solid and semi-solid samples include cheese, meat, powders, paper and agar gels. Standard pH electrodes are generally not able to withstand the pressure of being pushed into a solid sample; therefore one needs a special electrode which is able to penetrate the sample in order to measure the pH. There are many methods available for measuring the pH of solid and semi-solid samples that include using a flat surface pH electrode, using a spear tip pH electrode, and mixing or blending a fixed amount of sample with distilled water. The Ohaus electrodes most suitable for these kinds of applications are the ST272 pH electrode. While their spear shaped point enables them to pierce the sample, the membrane shape ensures accurate measurements. This electrode is typically used for quality control or checking production processes of cheese and meat.

pH measurements in dirty samples

- Measuring the pH of dirty samples can be somewhat tricky, since the dirt in the sample can hinder correct measurements. Sludge, suspension, colloid, slurry and viscous samples include wastewater, mud, paper pulp and corn syrup. The risk of blockages with such samples would be very high if one were to use a pH electrode with a ceramic junction. These samples clog the electrode junction and coat the pH-sensing bulb, resulting in slow electrode response, measurement drift and pH measurement errors.

ICON LEGEND

Applications

OHAUS Corporation

Headquartered in Parsippany, NJ, OHAUS Corporation manufactures an extensive line of balances and scales, lab equipment and lab instruments that meet the weighing, sample processing and measurement needs of multiple industries. We are a global leader in the laboratory, industrial and education markets, as well as a host of specialty markets, including the food preparation, pharmacy and jewelry industries. An ISO 9001:2008 manufacturer, OHAUS produces lab balances, industrial scales, lab equipment and lab instruments that are precise, reliable and affordable, and backed by industry-leading customer support.

OHAUS Europe GmbH

Heuwinkelstrasse 3,
8606 Nänikon,
Switzerland

e-mail: ssc@ohaus.com
Tel: 0041 22 567 53 19
e-mail: tsc@ohaus.com
Tel: 0041 22 567 53 20

www.ohaus.com

The management system governing the manufacture of this product is ISO 9001:2015 certified.

Ingeniously Practical