

Funel

Expert in Electrochemistry

FUNEL ANALOG ELECTRODE HANDBOOK

Water Quality Monitoring Instruments

Customizable Analog Electrode Solutions

pH • ORP • Dissolved Oxygen • Fluoride Ion • Sodium Ion



Accurate
Measurement



Stable
Performance



Customizable
Solutions



Industrial
Durability

Professional • Reliable • Customizable

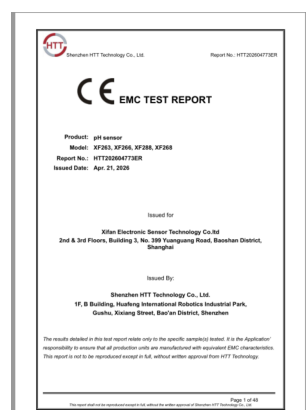
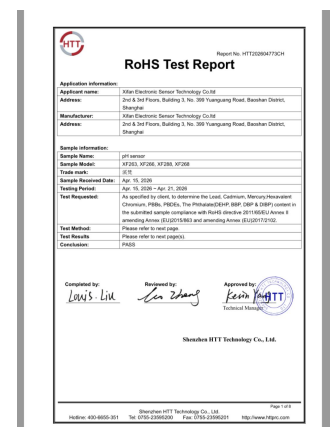
Funel Electronic Sensor Technology Co.,Ltd

Our team is filled with talented individuals who use top-notch international production equipment and skills to create industry-leading sensors. We've earned numerous technical patents and the esteemed title of "National High-tech Enterprise". Our portfolio includes pH electrodes, ORP electrodes, dissolved oxygen electrodes, residual chlorine electrodes, fluoride ion electrodes, and trace oxygen sensors. These products are widely used in various industries such as microbial fermentation, food and beverage, brewing, metallurgy, chemical processes, power plants, slurry, wastewater treatment, desulfurization, pure water, photovoltaic semiconductors, and new energy. They excel particularly well in harsh conditions, such as high temperatures, high pressure, and corrosive environments.

Our products, which match or even surpass the quality of international counterparts, are compatible with a variety of pH meter transmitters and have been praised by users across industries. Today, our brand has carved out a significant presence in the market and continues to grow in popularity.

At HNT, we are committed to integrity, quality, professionalism, and sincerity. We put our customers at the heart of everything we do. Beyond providing high-quality, precise, and stable products, we offer top-notch technical consultation and after-sales service. We look forward to joining hands with our customers in striving for the rise of our national brand.

中国仪器仪表协会
成员单位



Simulated Electrode

pH/ORP ELETRODE



DO (polarographic)

Sodium ion

Fluoride Ion



XF240

Economic and Long-Lasting



Description of application:XF240 electrode adopts a structural design different from the conventional plastic shell electrodes on the market, and it is equipped with a single-liquid junction industrial-grade glass electrode inside. This design offers both the stability and ultra-long service life of industrial-grade electrodes, and maintains cost-effective cost control. The shell is made of ABS mixed fiberglass material, which has strong corrosion resistance. It has 3/4NPT threads at the top and bottom, taking both immersion and pipeline installation into account .

Specification

Measuring range:	0~14pH
Temperature range:	0~80℃
Pressure resistance:	0~2Bar
Temperature Probe:	PT100 / PT1000 or NTC
Slope:	>95%
Membrane resistance:	<250MΩ
Offset Value(E0):	7±0.25pH
Response Time:	<30S
Junction:	Porous Ceramic
Electrolyte:	Gel
Number of junction:	one
Thread:	3/4NPT thread up and down
Shaft Material:	ABS Glass Fiber
Electrode length:	144mm
Membrane Glass:	High Alkali Glass (HA)
Connection cable type:	Integrated direct connection

Characteristics

- ABS mixed fiberglass shell material offers robust chemical corrosion resistance
- IP68 water resistance
- Exceptional long term time drift performance
- Sturdy sensitive film and resistant to mechanical impact
- The double thread allows for direct process installation

Extending capabilities

- ABS mixed fiberglass material can be upgraded to polyphenylene sulfide (PPS)material
- The built-in single-liquid junction glass electrode can be upgraded to a double liquid junction glass electrode
- pH sensitive film can be customized to low-resistance sensitive film (HL)
- The single-point multi-pore ceramic core can be upgraded to double-point or triple-point, or customized to a ring-shape tetrafluoride salt bridge
- The cable length can be extended up to 60M

Typical Applications:

Domestic sewage, Industrial waste water, Agriculture, Aquaculture, Municipal, Circulating water, Surface water, Supporting water treatment equipment

XF263

High Performance and Wide Application



The XF263 pH electrode is made of acid&alkali-resistant sensitive membrane blown into a cylindrical shape with 0.2-0.4mm thickness. The sensitive area is large and resistant to mechanical impact; the electrode is made of pressure-resistant Ag/AgCL/KCl GFT polymer gel external reference system and pressure-resistant intermediate electrolyte system, which can withstand the maximum osmotic pressure of 6 Bar during the process solution. The porous ceramic core or TEFLON is used as the salt bridge, and the stability of the liquid junction potential is a leader in the field of rapid and accurate measurement. It is also a star product of the Xifan company. Its strong tolerance to strong oxidizing media, solvents and acid and alkali solutions makes it suitable for extremely demanding industrial applications.

Specification

Measuring range:	0~14pH
Temperature range:	0~100°C
Pressure Range:	6 Bar MAX
Temperature Probe:	NTC10K、NTC2.252K、NTC22K、PT100、PT1000etc
Factory Slope:	>95 %
Membrane resistance:	<250MΩ
Offset Value(E0):	7±0.25pH
Response Time:	<30S
Junction:	Porous Ceramic
Electrolyte:	Gel
Number of junction:	Two
Thread:	PG13.5
Shaft Material:	Glass
Immersing Depth:	120/150/225/325/425mm
Membrane Glass:	High Alkali Glass (HA)
Connector:	S8/S8M/S7/VP/K8S/K2

Characteristics

- Good repeatability and stability
- Double liquid junction structure design, strong anti-pollution ability, high temperature resistance
- IP68 water resistance
- Does not react chemically with solvents and strong acids and bases
- Long-term excellent time drift performance
- 0-14pH full range measurement, resistant to long-term acid and alkali medium
- The sensitive membrane is sturdy and resistant to mechanical impact

Extending capabilities

- The electrode insertion depth can be customized
- The single-point porous ceramic core can be upgraded to double-point or triple-point, or can be customized to a ring-shaped Teflon salt bridge
- All types of cable connection forms can be customized
- The cable length can be extended up to 60M

Typical Applications:

Strong acid and alkali, industrial wastewater, electroplating, printing and dyeing, electronics, chemical medium

XF264

Solution for desulfurization and denitrification industry



The XF264 pH electrode adopts a pressure-resistant cylindrical bubble, GMT special mixed gel intermediate electrolyte and double ceramic salt bridge can maintain good measurement performance and long-term life in desulfurization and denitrification conditions containing sulfurions, multiple suspended particle particles, high heavy metal ions, and can withstand high temperature and high pressure. It is the first choice of pH electrodes for the desulfurization and denitrification industry.

Specification

Measuring range:	0~14pH
Temperature range:	0~100°C
Pressure Range:	0~3Bar,6 Bar MAX
Temperature Probe:	NTC10K、NTC2.252K、NTC22K、PT100、PT1000etc
Slope:	>95%
Membrane resistance:	<250MΩ
Offset Value(E0):	7±0.25pH
Response Time:	<30S
Junction:	Porous Ceramic
Electrolyte:	Mixed Gel(Specialized for Desulfurization)
Number of junction:	Two
Thread:	PG13.5
Shaft Material:	Glass
Immersing Depth:	120/150/225/325/425mm
Membrane Glass:	high temperature resistant glass sensitive membrane
Connector:	S8/S8M/S7/VP/K8S/K2

Characteristics

- Double ceramic salt bridge, not easy to block, making the liquid junction potential lower
- GMT special mixed gel intermediate electrolyte, resistant to sulfurion immersion
- Double liquid junction structure design, long life
- IP68 water resistance
- The sensitive membrane is sturdy and resistant to mechanical impact
- Stable measurement, long life

Extending capabilities

- The electrode insertion depth can be customized
- Double ceramic core can be upgraded to a ring-shaped Teflon salt bridge
- All types of cable connection forms can be customized
- The cable length can be extended up to 60M

Typical Applications:

Desulfurization and denitrification industry, waste gas treatment

XF266

Best choice for Hydrofluoric Acid Medium



The unique hydrofluoric acid-resistant glass sensitive membrane of the XF266 pH electrode is different from ordinary hydrofluoric acid-resistant glass. It has stronger corrosion resistance to hydrofluoric acid and significantly extends the life span of the electrode. It can withstand a maximum of 4000ppm hydrofluoric acid concentration. This tolerance concentration has far exceeded imported similar products, and it has better measurement accuracy and response speed than metal antimony electrodes. It is favored by customers in the semiconductor, petrochemical, steel wastewater, metal processing and other fields.

Specification

Measuring range:	0~14pH
Temperature range:	0~100°C
Pressure Range:	0~3Bar, 6 Bar MAX
Temperature Probe:	NTC10K, NTC2.252K, NTC22K, PT100, PT1000etc
Slope:	>95%
Membrane resistance:	<50MΩ
Offset Value(E0):	7±0.25pH
Response Time:	<30S
Junction:	Porous Ceramic
Electrolyte:	Gel(Specialized HF-resistant)
Number of junction:	Two
Thread:	PG13.5
Shaft Material:	Glass
Immersing Depth:	120/150/225/325/425mm
Membrane Glass:	hydrogen fluoride resistant glass sensitive membrane (HF)
Connector:	S8/S8M/S7/VP/K8S/K2

Characteristics

- Hydrofluoric acid-resistant glass sensitive membrane (HF), can withstand a maximum concentration of 4000ppm
- Double liquid junction structure design, long life
- IP68 water resistance
- The sensitive membrane is sturdy and resistant to mechanical impact
- Stable measurement, long life

Extending capabilities

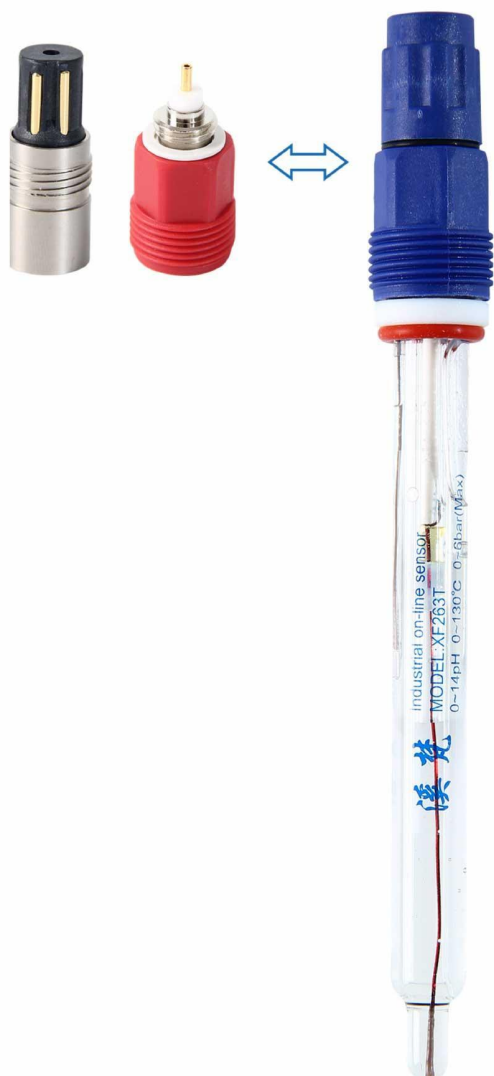
- The electrode insertion depth can be customized
- The single-point porous ceramic core can be upgraded to double-point or triple-point, or can be customized to a ring-shaped Teflon salt bridge
- The electrolyte can be customized to adapt to more complex conditions
- All types of cable connection forms can be customized

Typical Applications:

Semiconductor industry, petrochemical industry, steel wastewater, metal processing, electroplating electronics

XF263T

Solution for high temperature conditions



All components of the XF263TpH electrode can withstand high temperatures within 150°C, and it uses a high-temperature resistant glass sensitive membrane (HT), high-temperature resistant polymer gel, and its durable design is very suitable for high temperature and high pressure conditions, even under high chemical pollution processes. It can also meet the requirements of harsh sterile biological technology applications using CIP and SIP, and it can still be used after repeated autoclave sterilization or sterilization at 140°C.

Specification

Measuring range:	0~14pH
Temperature range:	0~130°C
Pressure Range:	6 Bar MAX
Temperature Probe:	NTC10K、NTC2.252K、NTC22K、PT100、PT1000etc
Slope:	>95%
Membrane resistance:	<250MΩ
Offset Value(E0):	7±0.25pH
Response Time:	<30S
Junction:	Porous Ceramic
Electrolyte:	Gel(Specialized for high temperature)
Number of junction:	Two
Thread:	PG13.5
Shaft Material:	Glass
Immersing Depth:	120/150/225/325/425mm
Membrane Glass:	high temperature resistant glass sensitive membrane(HT)
Connector:	S8/S8M/S7/VP/K8S/K2

Characteristics

- Super high temperature resistance
- Double liquid junction structure design, strong anti-pollution ability
- IP68 water resistance
- Does not react chemically with solvents and strong acids and bases
- Long-term excellent time drift/temperature drift performance
- Sturdy sensitive membrane and resistant to mechanical impact
- Fully withstand high-pressure sterilization and in-situ disinfection, with more than 30 fermentation batches

Extending capabilities

- The electrode insertion depth can be customized
- The single-point porous ceramic core can be upgraded to double-point or triple-point, or can be customized to a ring-shaped Teflon salt bridge
- All types of cable connection forms can be customized
- The cable length can be extended up to 60M
- The main body glass can be upgraded to imported Schott glass

Typical Applications:

Biopharmaceuticals, food and beverages, sugar making, chlor-alkali, petrochemicals, electricity, semiconductor electronics industry

XF232 (For Fermentation)

Special electrode for fermentation industry



The XF263TpH electrode can withstand high temperature and high pressure for a long time (121-130°C), and it uses a liquid-adding type with large bubble structure. The electrolyte can be supplemented, which greatly extends the life of the electrode and the fermentation batch. The insertion depth can be customized, and it is the first choice pH electrode for professional fermentation customers.

Specification

Measuring range:	0~14pH
Temperature range:	0~130°C
Pressure Range:	0~3Bar, 6 Bar MAX
Temperature Probe:	NTC10K、NTC2.252K、NTC22K、PT100、PT1000etc
Slope:	>95%
Membrane resistance:	<250MΩ
Offset Value(E0):	7±0.25pH
Response Time:	<30S
Junction:	Porous Ceramic
Electrolyte:	Liquid (Specialized For high temperature)
Number of junction:	Two
Thread:	PG13.5
Shaft Material:	Glass
Immersing Depth:	225/325/425mm
Membrane Glass:	high temperature resistant glass sensitive membrane(HT)
Connector:	S8/S8M/S7/VP/K8S/K2

Characteristics

- Super high temperature resistance
- Double liquid junction structure design, strong anti-pollution ability
- IP68 water resistance
- Can add electrolyte
- Long-term excellent time drift/temperature drift performance
- The sensitive membrane is sturdy and resistant to mechanical impact
- Can fully withstand high-pressure sterilization and in-situ disinfection, with more than 30 fermentation batches

Extending capabilities

- The electrode insertion depth can be customized
- The single-point porous ceramic core can be upgraded to double-point or triple-point
- The pre-electrode specifications can be customized
- The cable length can be extended up to 100M

Typical Applications:

Biopharmaceuticals Food and Beverage

XF263L

Solution for low temperature medium



The XF263L pH electrode uses a low-temperature resistant intermediate electrolyte that can still operate well at low temperatures, so that the electrode can measure accurately at low temperatures above -20°C, and maintain the same response speed as at normal temperature, providing the best for many low temperature complex conditions. solution.

Specification

Measuring range:	00~14pH
Temperature range:	-20~100°C
Pressure Range:	0~3Bar,6Bar MAX
Temperature Probe:	NTC10K、NTC2.252K、NTC22K、PT100、PT1000etc
Slope:	>95%
Membrane resistance:	<250MΩ
Offset Value(E0):	7±0.25pH
Response Time:	<30S
Junction:	Porous Ceramic
Electrolyte:	Gel(Specialized for low temperature)
Number of junction:	Two
Thread:	PG13.5
Shaft Material:	Glass
Immersing Depth:	120/150/225/325/425mm
Membrane Glass:	High Alkali Glass (HA)
Connector:	S8/S8M/S7/VP/K8S/K2

Characteristics

- Super low temperature resistance
- Double liquid junction structure design, strong anti-pollution ability
- IP68 water resistance
- Does not react chemically with solvents and strong acids and bases
- Long-term excellent time drift/temperature drift performance
- The sensitive membrane is sturdy and resistant to mechanical impact

Extending capabilities

- The electrode insertion depth can be customized
- The single-point porous ceramic core can be upgraded to double-point or triple-point, or can be customized to a ring-shaped Teflon salt bridge
- All types of cable connection forms can be customized
- The cable length can be extended up to 60M

Typical Applications:

Frozen brine, surface water, chemical industry, laboratory use

XF268

Suitable for high temperature pure water



All components of the XF268pH electrode are made of high temperature resistant materials, and the maximum temperature resistance can reach 130°C, making it the first choice for customers in the high temperature pure water application industry.

Specification

Measuring range:	0~14pH
Temperature range:	0~130°C
Pressure Range:	0~3Bar, 6 Bar MAX
Temperature Probe:	NTC10K、NTC2.252K、NTC22K、PT100、PT1000etc
Slope:	>95%
Membrane resistance:	<50MΩ
Offset Value(E0):	7±0.25pH
Response Time:	<30S
Junction:	Porous Ceramic
Electrolyte:	Gel(low Concentration for high temperature)
Number of junction:	Two
Thread:	PG13.5
Shaft Material:	Glass
Immersing Depth:	120/150/225/325/425mm
Membrane Glass:	low resistance glass sensitive membrane (HL)
Connector:	S8/S8M/S7/VP/K8S/K2

Characteristics

- The conductivity range of the applicable medium is 5-300uS/cm
- Super high temperature resistance
- Double liquid junction structure design, long life
- IP68 water resistance
- The sensitive membrane is sturdy and resistant to mechanical impact
- Accurate measurement, fast response time

Extending capabilities

- The electrode insertion depth can be customized
- The single-point porous ceramic core can be upgraded to double-point or triple-point
- All types of cable connection forms can be customized
- The cable length can be extended up to 60M

Typical Applications:

Electricity, boiler water, high temperature pure water

XF268 (Adding Electrolyte)

Suitable for high temperature pure water



The XF268(Adding Electrolyte) pH electrode is an advanced version of XF268, mainly reflected in its electrolyte is an adding-liquid type, which greatly delays the life of the electrode, making it the first choice for customers in the power industry.

Specification

Measuring range:	0~14pH
Temperature range:	0~130°C
Pressure Range:	0~3Bar, 6 Bar MAX
Temperature Probe:	NTC10K、NTC2.252K、NTC22K、PT100、PT1000etc
Slope:	>95%
Membrane resistance:	<50MΩ
Offset Value(E0):	7±0.25pH
Response Time:	<30S
Junction:	Porous Ceramic
Electrolyte:	Gel(low Concentration for high temperature)
Number of junction:	Two
Thread:	PG13.5
Shaft Material:	Glass
Immersing Depth:	120/150/225/325/425mm
Membrane Glass:	low resistance glass sensitive membrane (HL)
Connector:	S8/S8M/S7/VP/K8S/K2

Characteristics

- The conductivity range of the applicable medium is 5-300uS/cm
- Super high temperature resistance
- Double liquid junction structure design, long life
- IP68 water resistance
- The sensitive membrane is sturdy and resistant to mechanical impact
- Accurate measurement, fast response time

Extending capabilities

- The electrode insertion depth can be customized
- The single-point porous ceramic core can be upgraded to double-point or triple-point

Typical Applications:

Electricity, boiler water, high temperature pure water

XF263i

Genuine Industrial-grade Digital pH Electrode



The XF263i pH electrode integrates the transmitter into the electrode itself by rethinking the communication between the electrode, end-users, and process control systems. The traditional transmitter functions are replaced by a built-in microprocessor in the electrode, allowing the electrode and transmitter to be integrated. The electrode can directly output an RS485 signal. Unlike conventional electrodes on the market that are only suitable for environmental water bodies such as surface water, the XF263i electrode can also accurately measure in complex industrial environments.

Specification

Measuring range:	0~14pH
Temperature range:	0~100°C
Pressure Range:	0~3Bar, 6 Bar MAX
Temperature Probe:	NTC22K
Slope:	>95%
Membrane resistance:	<250MΩ
Offset Value(E0):	7±0.25pH
Response Time:	<30S
Junction:	Porous Ceramic
Electrolyte:	Gel
Number of junction:	Two
Length:	144mm
Shaft Material:	ABS Glass Fiber
Immersing Depth:	60mm
Membrane Glass:	High Alkali Glass (HA)
Connector:	Integrated direct connection
Power Supply:	6-30VDC
Communication Method:	MODBUS RTU RS485

Characteristics

- Standard MODBUS RTU protocol RS485 communication output with strong resistance to environmental interference.
- Made of special ABS mixed glass fiber material, providing strong corrosion resistance.
- Designed with a double liquid junction structure for long lifespan
- IP68 water resistance
- Sturdy sensitive membrane and resistant to mechanical impact
- Accurate measurement with fast response time

Extending capabilities

- Customizable electrode insertion depth
- Single-point porous ceramic core can be upgraded to dual-point or triple-point
- Customizable specifications for the front electrode
- Cable length can be extended up to 100 meters

Typical Applications:

wastewater treatment, equipment matching, secondary water supply, surface water, industrial processes

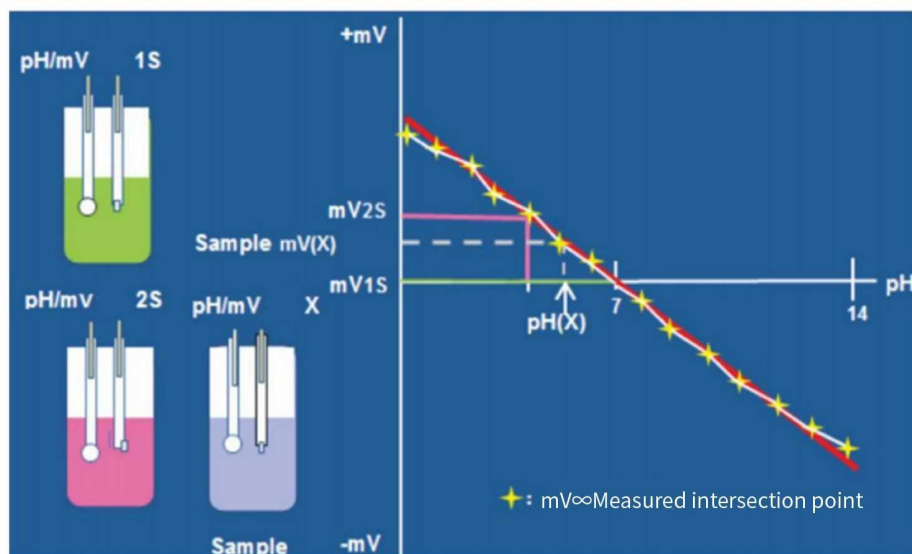
1.pH Measurement

The electrode is characterized by its zero point and its slope.

In addition to the two-point calibration, other methods exist which can monitor the performance of the electrode.

For instance, a so called one-point calibration may be performed, provided that the slope remains constant.

Two-point calibration shown as:



Two buffer solutions chosen according to the desired accuracy and measuring range should be used. The value of the first buffer solution should be close to zero mV (at pH 7). The second buffer solution should have a pH value within the measuring range. It should be noted that the two buffer solutions must have a difference in pH values of at least two pH units. As already mentioned, the pH value is temperature dependent. Therefore, it is important that the temperature curve of the buffer is known. Additionally, the buffer and the electrode must be at the same temperature, or you must wait for the temperature to reach equilibrium.

2. Temperature Compensation

According to Mettler Toledo data, the Nernst slope depends on temperatures.

T(C)	Theoretical Slope(mV/1pH)	mV/1°C
0	54.2	0.198
20	58.16	0.2
25	59.16	0.198
37	61.54	0.199
50	64.12	0.198
75	69.08	0.198

According to Nernst's law $E = E^0 + \text{slope} \cdot \text{pH}$, according to the above table, for every 1°C increase in temperature during measurement, the electrode slope changes by nearly 0.2mV. The instrument can use this to correct the slope of the electrode's timely temperature and achieve temperature compensation effect.

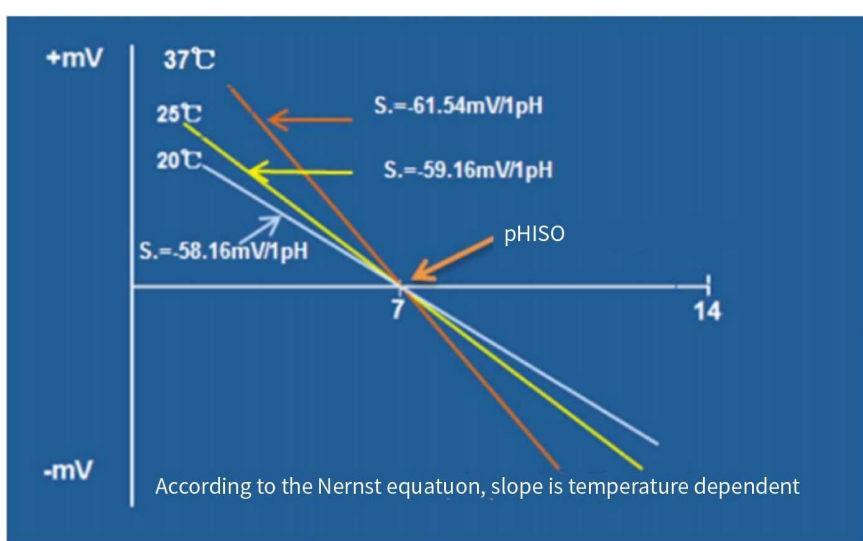
pH electrodes are available in two styles for customers to choose from:

1. pH electrode without temperature compensation:

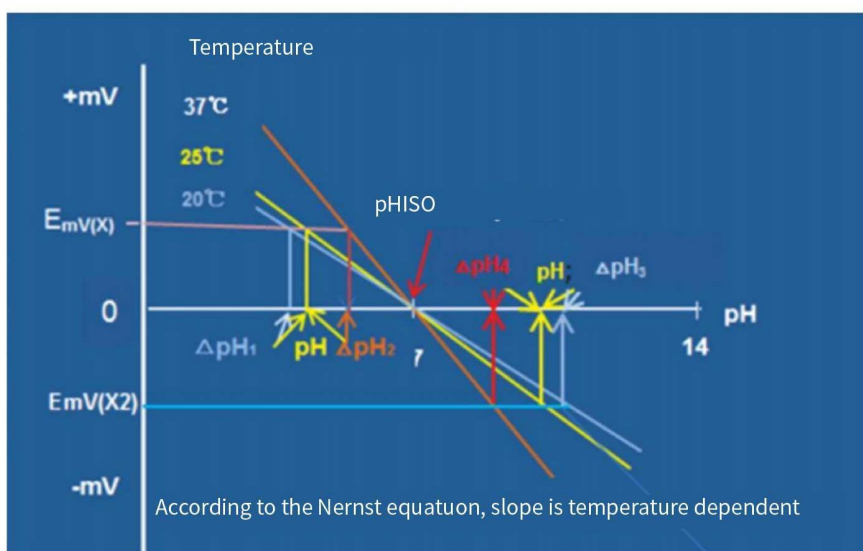
suitable for use in situations where the calibration temperature is close to the measurement temperature, or when the measured value is near the isoelectric point (pHISO) of pH 7. It can tolerate larger measurement deviations (>0.2 pH) based on specific testing requirements.

2. pH electrode with temperature compensation:

This type of pH electrode is suitable for situations where there is a significant temperature difference between the measured liquid and the calibration solution, or when higher measurement accuracy is required.



If there is a significant deviation between the calibration temperature and the measurement temperature, it will result in acid-base deviation in the measurement. For example, when calibrated at 25°C and measured at 20°C, there will be a ΔpH_1 acid error. When measured at 37°C, higher than the calibration temperature, there will be a ΔpH_2 alkali error.



However, beyond the isoelectric point (pHISO), the situation is reversed. When measured below the calibration temperature at 20°C, there will be a $\Delta\text{pH}3$ alkali error, and when measured at 37°C, higher than the calibration temperature, there will be a $\Delta\text{pH}4$ acid error. Therefore, pH electrodes with temperature compensation are crucial for customers who require higher measurement accuracy.

3. How to Handle the electrode

1. The normal pH electrode should have a conversion coefficient (slope%) within the range of 92% to 102%. If it is below 92%, the electrode may need cleaning, and if cleaning does not restore it, the electrode should be replaced. If it is above 102%, the buffer solution may be contaminated.

2. After prolonged use, if the pH electrode exhibits a delayed response time and a decrease in slope, and if the equilibrium potential point (pHISO) deviates, you can remove the electrode from the protective sleeve and clean the surface of the glass membrane and the impurities on the porous ceramic core (or TEFLON) of the salt bridge. For general grease contamination, you can use a detergent for cleaning. For protein contamination, soaking the electrode in a solution of proteinase/enzyme and dilute hydrochloric acid can help remove it. For heavier grease-type contamination, acetone or alcohol can be used for cleaning. Water can be used to rinse off scale/precipitate impurities. Afterward, rinse the electrode with distilled water and soak it in a 3MKCl solution for at least 6 hours to restore its performance before putting it back into use.

3. If the above-mentioned steps fail to restore the electrode's performance, you can immerse the sensitive membrane of the pH electrode in a chemical polishing solution of 4-6% hydrofluoric acid for one minute. After removing it, immediately rinse it with clean water and then thoroughly clean it with distilled water. Subsequently, soak it in a 3MKCl electrolyte for at least 6 hours and recalibrate it before putting it back into application.

Note: Chemical polishing treatment with hydrofluoric acid can cause significant damage to the sensitive glass membrane of the pH electrode. The polishing time should not be too long, and the frequency should be limited. If the electrode's performance cannot be restored even after activation, it may need to be replaced.

4. When the electrode is in standby mode, the sensitive membrane and the salt bridge should be immersed in a protective sleeve containing a 1-3M KCl solution. It should not be placed in steam. Additionally, the protective cap (connector) of the electrode should be covered to prevent moist air from entering and causing electrical leakage.

5. Before inserting the electrode into the protective sleeve, moisten the lower end of the electrode shaft (near the salt bridge) with water to increase lubrication. This helps prevent the O-ring inside the protective sleeve from gripping the electrode too tightly, which could lead to distortion and breakage.

XF253

Widely Used and Durable



The XF253 ORP electrode is widely used and known for its durability. A large-area, high-purity platinum ring process is utilized to ensure a stable potential measurement. The reference system of the electrode follows the industrial-grade pH electrode reference, making it a suitable replacement for similar products from other brands. It can achieve satisfactory results in various media that require measuring oxidation-reduction potential and can withstand long-term high temperatures.

Specification

Measurement range:	-1999mV~1999mV
Temperature range:	0~130°C
Pressure range:	0~3Bar,6BarMAX
Temperature Probe:	NTC10 K、NTC2.252K、NTC22K、PT100、PT1000etc
Slope:	>95%
Response Time:	<30S
Junction:	Porous Ceramic
Electrolyte:	Synthetic Gel(Specialized for high temperature)
Number of Junction:	Two
Thread:	PG13.5
Shaft Material:	Glass
Immersing Depth:	120/150/225/325/425mm
Connector:	S8/S8M/S7/VP/K8S/K2

Characteristics

- Wide measurement range
- Excellent high-temperature resistance
- Dual-liquid junction structure for long lifespan
- IP68 water resistance
- Large-area platinum ring for stable measurements
- Suitable for various complex working conditions

Extending capabilities

- Customizable electrode insertion depth
- Single-point porous ceramic core can be upgraded to dual-point or triple-point
- Customizable cable connection types
- Cable length can be extended up to 60 meters

Typical Applications:

Production processes, chemical processes, industrial wastewater, equipment compatibility

XF253i

A true industrial-grade digital ORP electrode



XF253i ORP integrates the transmitter into the electrode itself by rethinking the communication between the electrode, end-users, and process control systems. The traditional transmitter functions are replaced by a built-in microprocessor in the electrode, allowing the electrode to directly output RS485 signals. Unlike conventional electrodes on the market that are only suitable for environmental water bodies such as surface water, the XF253i ORP electrode can accurately measure in complex industrial environments.

Specification

Measurement range:	-1999mV~1999mV
Temperature range:	0~100°C
Pressure range:	0~3Bar,6 Bar MAX
Temperature Probe:	NTC22 K
Slope:	>95 %
Response Time:	<30S
Junction:	Porous Ceramic
Electrolyte:	Synthetic Gel(Specialized for high temperature)
Number of Junction:	Two
Length:	144mm
Shaft Material:	ABS Glass Fiber
Immersing Depth:	65mm
Connector:	Integrated direct connection
Power Supply:	6-30VDC
Communication Method:	MODBUS RTU RS485

Characteristics

- Standard MODBUS RTU protocol RS485 communication output with strong environmental interference resistance
- Special ABS fiberglass material for excellent corrosion resistance
- Dual-liquid junction structure for long lifespan
- IP68 water resistance
- Accurate measurement with fast response time
- NPT3/4 thread for direct installation into the process

Extending capabilities

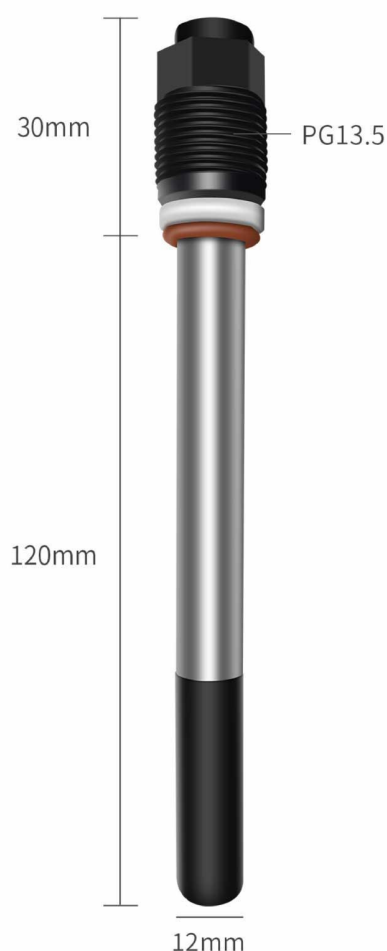
- Customizable electrode insertion depth
- Single-point porous ceramic core can be upgraded to dual-point or triple-point
- Cable length can be extended up to 100 meters

Typical Applications:

Wastewater treatment, equipment compatibility, swimming pools, surface water, industrial processes

XF803

Suitable for high-precision dissolved oxygen measurement:



The XF803 dissolved oxygen electrode is a polarographic dissolved oxygen sensor. Its membrane is made of PTFE/silicone and stainless steel wire mesh. It is processed and formed using a special technique, ensuring a secure and reliable performance, offering the best measurement accuracy at a lower price.

Specification

Measurement range:	0~40mg/L, 0-400%
Resolution:	0.01mg/L
Accuracy:	$<\pm 0.3\text{mg/L}$
Zero Error:	$<0.1\text{mg/L}$
Temperature range:	0~60°C
Pressure range:	0~0.5Bar
Temperature Probe:	NTC22 K
Output:	$>50\text{nA}$
Response Time:	$<10\text{S}$
Calibration:	Zero Calibration/Full Scale Calibration
Thread:	PG13.5
Shaft Material:	Stainless Steel+ PC (membrane sleeve)
Immersing Depth:	120mm
Connector:	S8M
Protection Level:	IP68 water resistance

Characteristics

- Large electrolyte capacity, requiring less maintenance
- Specially designed wire mesh membrane to withstand bubble impact
- Strong resistance to acid and alkali corrosion
- Stainless steel + PC material housing for durability and long lifespan.
- IP68 water resistance
- Precise measurement with fast response time
- PG13.5 thread allows for direct installation into the process

Extending capabilities

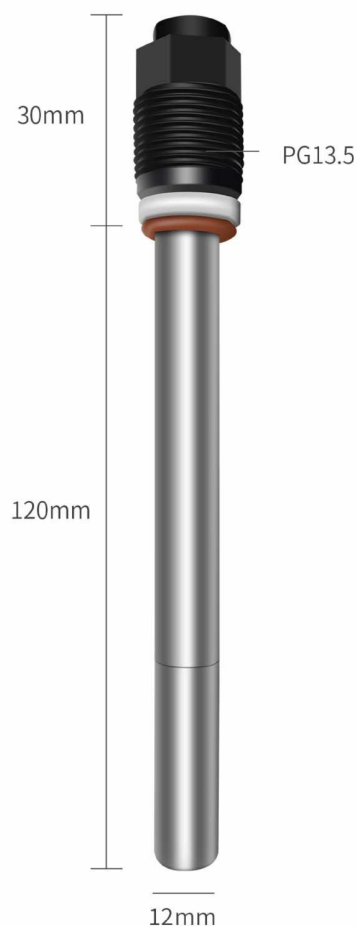
- Customizable electrode insertion depth
- Housing material can be customized to full plastic.
- The maximum cable length can be extended up to 30 meters

Typical Applications:

Domestic wastewater, industrial wastewater, aquaculture, municipal water supply, natural water, and water treatment equipment

XF803M

Innovative maintenance-free electrode



The XF803M dissolved oxygen electrode features a fully stainless steel housing design, and its membrane adopts an innovative technology of solidified colloidal electrolyte, specifically designed for the wastewater treatment industry. Unlike traditional polarographic dissolved oxygen electrodes, this electrode does not require electrolyte or membrane cap replacement, achieving a maintenance-free period of one to two years, significantly reducing maintenance costs for customers.

Specification

Measurement range:	0~40mg/L,0-400%
Resolution:	0.01mg/L
Accuracy:	<±0.3mg/L
Zero Error:	<0.1mg/L
Temperature range:	0~80°C
Pressure range:	0~0.5Bar
Temperature Probe:	NTC22 K
Output:	>50nA
Response Time:	<10S
Calibration:	Zero Calibration/Full Scale Calibration
Thread:	PG13.5
Shaft Material:	Stainless Steel
Immersing Depth:	120mm
Connector:	S8M
Protection Level:	IP68 water resistance

Characteristics

- Solidified colloidal electrolyte for maintenance-free operation
- Specially designed wire mesh membrane to withstand bubble impact
- Strong resistance to acid and alkali corrosion
- Full stainless steel body for durability and long lifespan
- IP68 water resistance
- PG13.5 thread allows for direct installation into the process

Extending capabilities

- Customizable electrode insertion depth
- The maximum cable length can be extended up to 30 meters

Typical Applications:

Domestic wastewater, industrial wastewater, aquaculture, municipal water supply, natural water, and water treatment equipment

XF806

Dissolved Oxygen electrode for High-temperature Conditions



XF806 dissolved oxygen electrode is designed for oxygen measurement in limited space or small-volume containers with the highest accuracy and cleanliness. The sensor is equipped with a VP connector and a durable 316L stainless steel material, suitable for CIP, in-situ steam sterilization, and high-pressure autoclaving. The high sensor cleanliness prevents contamination during the process. The membrane cap is made of high-quality imported materials, ensuring stable performance even in high-temperature and high-pressure conditions.

Specification

Measurement range:	0~40mg/L, 0-400%
Resolution:	0.01mg/L
Accuracy:	<±0.3mg/L
Zero Error:	<0.1mg/L
Temperature Range:	0~130°C
Pressure Range:	0~5Bar
Temperature Probe:	NTC22 K
Output:	>60nA
Response Time:	<60S
Calibration:	Zero Calibration/Full Scale Calibration
Thread:	PG13.5
Shaft Material:	Stainless Steel
Immersing Depth:	120mm
Connector:	VP4
Protection Level:	IP68 water resistance

Characteristics

- Withstands 120-130°C steam sterilization
- High-quality imported membrane cap for high-temperature and high-pressure resistance
- Full 316L stainless steel body for durability, long lifespan, and meeting hygienic requirements
- Can withstand more than 40 fermentation batches

Extending capabilities

- Customizable electrode insertion depth
- Customizable cable connections
- The maximum cable length can be extended up to 30 meters

Typical Applications:

Biotechnology fermentation, pharmaceutical and chemical industry, food and beverage, animal and plant cell culture, bacterial reproduction research

XF900

Suitable for high-precision dissolved oxygen measurement



The XF900 Dissolved Oxygen Electrode is a spectral micro dissolved oxygen electrode with features of simple manufacturing, long service life, and measurement accuracy up to the $\mu\text{g/L}$ level. This sensor has temperature compensation function, effectively improving measurement accuracy. Additionally, the sensor has optimized the thickness of the oxygen-permeable membrane and response time, making it suitable for detecting low concentrations of dissolved oxygen in pure water.

Specification

Measurement range:	0.1 $\mu\text{g/L}$ (ppb) ~20.00mg/L(ppm)
Resolution:	90% response time < 60 seconds
Accuracy:	$\pm 0.2\mu\text{g/L}$
Zero Oxygen:	10min < 5ppb
Drift:	1.5% (at constant temperature)
Protection Level:	650-700mV
Temperature Compensation:	NTC22K, 30K (user-defined)
Calibration:	Zero calibration, full-scale calibration
Calibration Interval:	Once every 2 months
Maintenance Interval:	Once every 3~6 months
Medium Flow Rate:	Minimum 0.02m/s

Characteristics

- Fast response speed, high-precision measurement
- Superb sealing waterproof film for superior structural performance
- IP68 water resistance

Extending capabilities

- Customizable insertion depth
- Shaft Material can be customized with stainless steel or plastic
- Customizable cable length
- Can be equipped with dissolved oxygen analyzer

Typical Applications:

Power, semiconductor industry, petrochemical, steel, pharmaceutical, nuclear power, and other industries

NL600

Sodium ion electrode



NL600 sensor is designed for measuring sodium ion concentrations and typically utilizes liquid membrane or ion exchange membrane technology to achieve selective response. The electrode features characteristics such as temperature resistance and resistance to contamination. It is easy to use, fast, and accurate, making it widely used in industries such as power plants and boiler water where sodium ion-containing aqueous solutions need to be measured. It is particularly suitable for control and online monitoring in the water treatment processes of power plants.

Specification

Sensitive membrane:	Glass membrane
Sensor type:	Half-cell
Measurement range:	10 ⁻⁶ ~1 mol/L
Temperature range:	0~80°C
Temperature Probe:	NTC10K、Pt1000、Pt100etc.
Sample Solution:	pH 9-12
Interfering Ions:	NH ⁺ 、K ⁺ 、Ag ⁺ 、Li ⁺ 、H ⁺ ect.
Response Time:	Dependent on Na ⁺ concentration, typically between 1 to 2 minutes
Membrane Resistance:	<250mΩ
Length:	120mm
Shaft Material:	PPS
Connector:	S7
Thread:	3/4 pipe thread
Cable Length:	5m(can be extended)

Characteristics

- Compatible with ion meters or pH/mV meters for measurement
- Resistant to contamination with a sensitive membrane
- Wide measurement range, capable of measuring concentrations as low as 10⁻⁶
- IP68 waterproof rating
- Stable measurements and long lifespan

Extending Capabilities

- Customizable insertion depth
- Customizable cable length

Typical Applications:

Power plants, wastewater treatment, boiler water, etc

FL600

Industrial Fluoride Ion Combination Electrode



FL600 industrial fluoride ion composite electrode is made of lanthanum oxide single crystal film, porous polytetrafluoroethylene (PTFE) ring junction, and solidified gel electrolyte. The electrode has characteristics of temperature resistance, pressure resistance, and pollution resistance. It is easy to use, fast, and accurate, and can measure fluoride ions in turbid and colored solutions. It is widely used in industries such as solar materials, semiconductor materials, and metallurgical industry for measuring fluoride-containing aqueous solutions, especially suitable for control and online monitoring in wastewater treatment processes.

Specification

Principle:	Potentiometry
Membrane Glass:	LaF ₃ Single Crystal Film
Measuring range:	0.1-10000 ppm
Temperature range:	0~80°C
Pressure range:	0~1Bar
Temperature Probe:	NTC10K、Pt1000、Pt100etc.
Slope:	58±2 mV(25°C)
Sample Solution:	pH 5-7
Interfering Ion:	OH ⁻ 、Fe ³⁺ 、Al ³⁺ 等
Response Time:	95% <10sec(10ppm,25°C)
Offset Value:	>380mV (Using ddH ₂ O, Rinsing Potential)
Length:	150mm
Shaft Material:	PPS
Thread:	3/4 pipe thread
Cable Length:	5meter or 10meter (with Dual Shields)

Characteristics

- Sensitive membrane resistant to pressure and pollution
- Large range measurement range, with a minimum measurable fluoride ion content of 0.1ppm
- IP68 waterproof rating
- Stable measurement and long-lasting lifespan

Extending Capabilities

- Customizable insertion depth
- Customizable cable length

Typical Applications:

Tap water, wastewater treatment, electronic materials, metallurgical industry

XF-PH5000

PH/ORP Transmitter



XF-PH5000 pH/ORP transmitter is designed for compactness and can be used with analog pH or ORP electrodes. It features measurement, display, transmission, alarm, and communication functions, making it flexible to meet various online pH or ORP monitoring needs. The transmitter utilizes an LCD high-definition display with a smart menu that can be switched between Chinese and English, providing customers with a simple and user-friendly operation. It can also adapt to the demanding requirements of various field conditions.

Specification

Screen parameters: 2.8-inch high-definition monochrome screen (320*240)

Measurement range: pH: 0~14.00pH ORP: -2000~ +2000mV

Resolution: pH: 0.01pH; ORP: 1mV

Basic error: pH: ± 0.02 pH; ORP: ± 1 mV

Automatic or manual temperature compensation range: -20~150°C

Temperature compensation types: NTC10k/PT100/PT1000; NTC22k/NTC2.252k

Stability: pH: ≤ 0.02 pH/24h; ORP: ≤ 2 mV/24h

Current output: 4~20mA (load resistance $< 500\Omega$) Accuracy: $\pm 0.2\%$

Communication output: RS485 Modbus RTU

Two sets of relay control contacts: 3A 250VAC, 3A 30VDC

Power supply options: 220VAC $\pm 10\%$; 24VDC

Instrument dimensions: 113.5*118*136mm

Instrument installation methods: Panel-mounted/Pipe-mounted/Wall-mounted

Installation opening size: 92×92mm

Instrument operating environment: Ambient temperature: -10~60°C; Relative humidity: not exceeding 90%

Waterproof Protection Level: IP67

Characteristics

- High-definition large screen display for easy data reading and operation
- Software digital filtering for strong anti-interference ability
- Intelligent calibration technology that automatically recognizes calibration points
- IP67 protection rating for robust operation in all weather conditions
- Supports tag number input and various parameter correction functions

Typical Applications:

Thermal power plants, chemical industry, fertilizer production, printing and dyeing, desulfurization and denitrification, surface treatment, metallurgy, environmental protection, pharmaceuticals, biochemistry, food, tap water

XF-DO5000

Dissolved Oxygen Transmitter



XF-DO5000 dissolved oxygen transmitter is designed for compactness and can be used with various conductivity electrodes with different constants. It features measurement, display, transmission, alarm, and communication functions, making it flexible to meet various online conductivity/TDS monitoring needs. The transmitter utilizes an LCD high-definition display with a smart menu that can be switched between Chinese and English, providing customers with a simple and user-friendly operation. It can also adapt to the demanding requirements of various field conditions.

Specification

Screen parameters: 2.8-inch high-definition monochrome screen (320*240)

Basic error: pH: $\pm 1\%$

Automatic or manual temperature compensation range: $-20\sim 150^{\circ}\text{C}$

Temperature compensation types: NTC10k/NTC22k/NTC2.252k/T100/PT1000

Stability: $<1\%/24\text{h}$

Current output: 4~20mA (load resistance $<500\Omega$) Accuracy: $\pm 0.2\%$

Overall protection level: IP67

Two sets of relay control contacts: 3A 250VAC, 3A 30VDC

Installation opening size: 92×92mm

Instrument installation methods: Panel-mounted/Pipe-mounted/Wall-mounted

Current output: 4-20mA (load resistance $<500\Omega$)

Power supply options: 220VAC $\pm 10\%$; 24VDC

Instrument dimensions: 113.5*118*136mm

Instrument operating environment: Ambient temperature: -10 to 60°C ; Relative humidity: not exceeding 90%

Characteristics

- High-definition large screen display for easy data reading and operation
- Software digital filtering for strong anti-interference ability.
- Multiple compensation technology to ensure measurement accuracy
- IP67 protection rating for robust operation in all weather conditions
- Supports tag number input and various parameter correction functions

Typical Applications:

Thermal power plants, chemical industry, fertilizer production, printing and dyeing, desulfurization and denitrification, surface treatment, metallurgy, environmental protection, pharmaceuticals, biochemistry, food, tap water

XF-DO5100

Trace Dissolved Oxygen Transmitter



The XF-DO5100 analog industrial online trace oxygen transmitter features a compact design with built-in precision small signal measurement processing and anti-interference circuitry. It can be used in conjunction with a polarographic dissolved oxygen electrode, providing measurement, display, transmission, and alarm functions. It is suitable for various online dissolved oxygen monitoring needs, especially for online measurement applications of ppb-level trace dissolved oxygen.

Specification

Screen parameters: 2.8-inch high-definition monochrome screen (320*240)

Instrument Dimensions: 113.5*118*136mm

Operating Environment: Ambient Temperature: -10 to 60 degrees Celsius;

Relative Humidity not exceeding 90%

Instrument Mounting Options: Panel mount/pipeline mount/wall mount

Resolution: 0.01 $\mu\text{S}/\text{cm}$

Mounting Hole Size: 92×92 mm

Basic Error: $\pm 1\%$

Overall Protection Level: IP67

Auto or Manual Temperature Compensation Range: -20~150°C;

Stability: <1%/24 hours

Communication Output: RS485 Modbus RTU

Alarm Settings: Upper/Lower Limit Alarms (adjustable hysteresis and delay)

Temperature Compensation: NTC10k/PT100/PT1000/NTC30k

Current Output: 4-20mA (load resistance <500 Ω); Accuracy: $\pm 0.2\%$

Instrument Power Supply (optional): 220VAC $\pm 10\%$; 24VDC

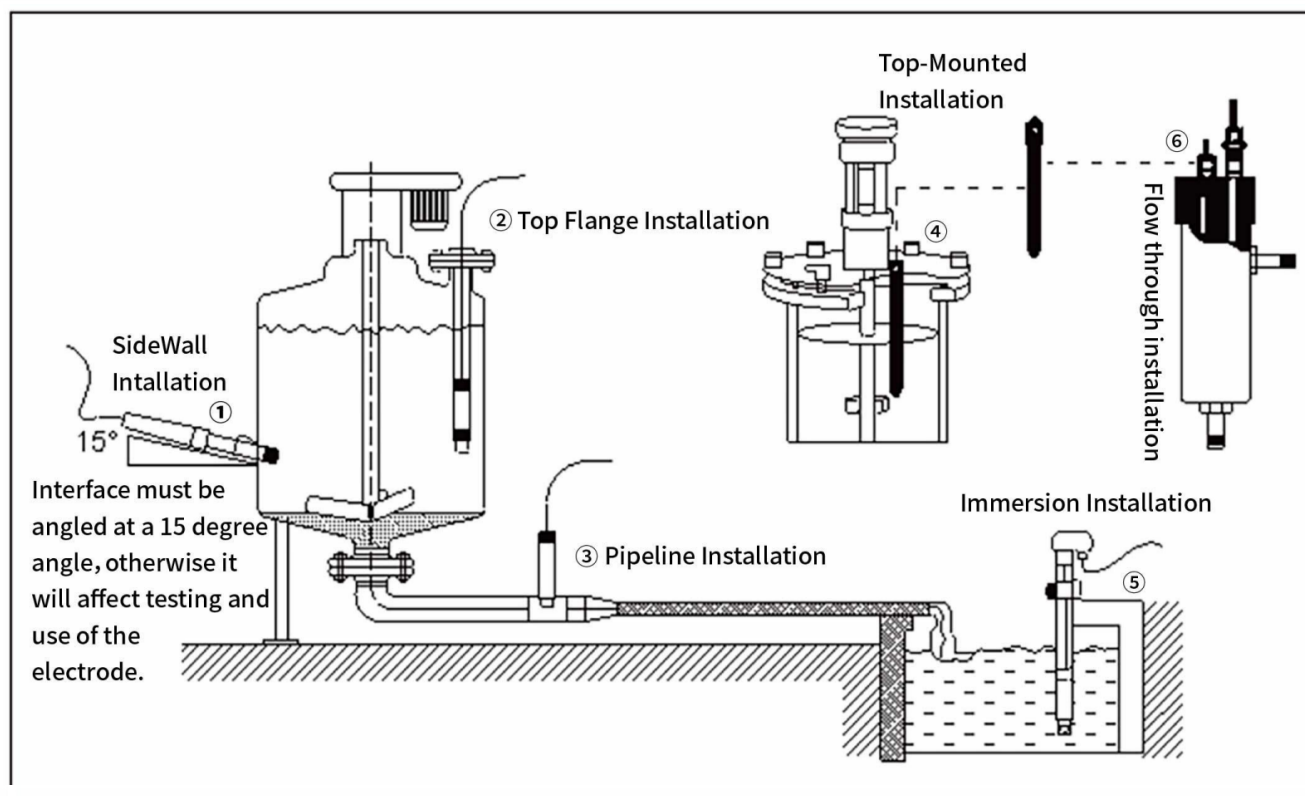
Characteristics

- High-definition large screen display for easy data reading and operation
- Software digital filtering for strong anti-interference capability
- Multiple compensation technologies to ensure measurement accuracy
- IP67 protection level for robust operation in all weather conditions
- Support for tag number input and various parameter correction functions

Typical Applications:

Power, Semiconductor industry, Petrochemical, Steel, Pharmaceutical, Nuclear Power, and other industries

Funel Company provides a wide range of installation accessories. According to various applications, each type of connection has specific requirements for strength, safety, cleanliness, optimized performance, corrosion resistance, insertion depth, or actual space. This includes process connection parts from simple insertion-type immersion joints to complex automated systems.



When choosing a sleeve, the main considerations are:

1. Fixed or retractable sleeve
2. Connection inlet: top insertion, side insertion, etc.
3. Connection method: fastening nut, NPT thread, etc.
4. Connection hole diameter (inner diameter)
5. Insertion depth
6. Material for the liquid contact part: stainless steel, PVC, etc.
7. Process sealing material (O-ring/Gasket)



PTFE electrode sleeve



Stainless steel 316L
electrode sleeve



Flanged top-insertion
PTFE sleeve



Flanged top-insertion stainless steel sleeve



Weld-in stainless steel sleeve



Sanitary clamp-type stainless steel sleeve



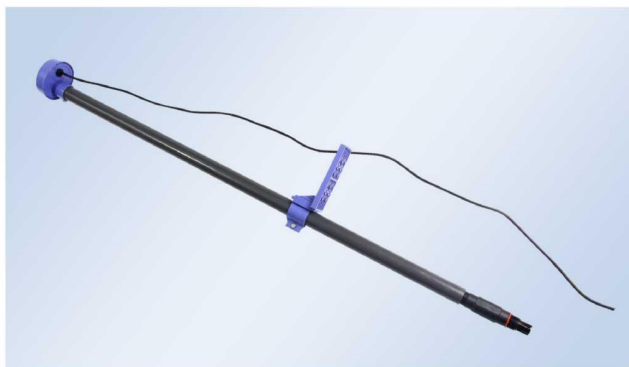
Manual retractable stainless steel sleeve



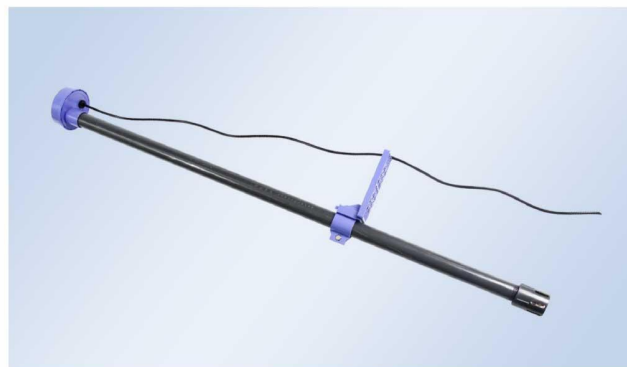
Online plug-in with ball valve stainless
steel sleeve



Pneumatic retractable stainless steel sleeve



Plastic shell electrode immersion mounting bracket



Glass electrode immersion mounting bracket



Clamp quick-install stainless steel mounting bracket



Flanged stainless steel PTFE-lined mounting bracket



Pipeline flanged stainless steel flow cell



Stainless steel flow cell



Acrylic single-pass flow cell



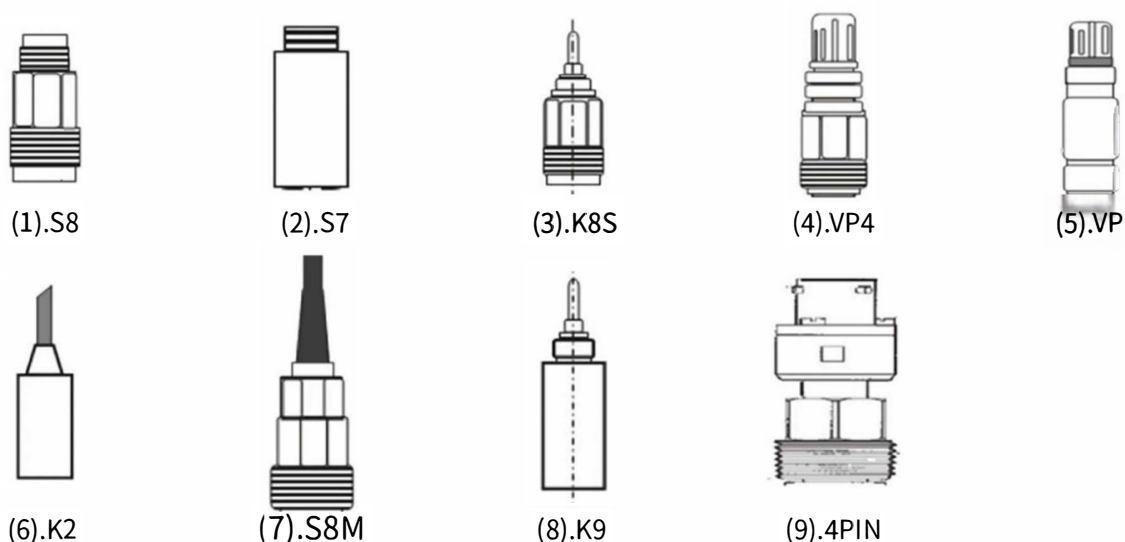
Acrylic double-pass flow cell



Stainless Steel Instrument Box

The cable that links the sensor and the transmitter plays a crucial role in guaranteeing reliable process measurements. Besides transmitting specific parameter signals, it also conveys information like temperature, solution grounding, and power voltage. With the aid of internal cable shielding and suitable cable connectors, we can ensure a noise-free and dependable signal transmission. There are various cables available to cater to specific installation needs, and we have listed the commonly used cables and sensor connectors below.

1. International electrode interfaces include:



2. In response to these electrode interfaces, Funel Company offers a range of matching wire cables of different lengths, equipped with AS9, AK9, VP6, 4PIN and other types of sockets.

(1) . Matching cable with AS9 socket (custom length according to different needs):



Connect with S7&S8 interface

(2) .Equipped with AK9 socket for compatible cable (length can be configured according to customer needs)



Connect with K8S&K9 interface

(3) . $\phi=7\text{mm}$ /7-core circuit cable with VP6 socket, suitable for pH/DO electrodes with VP or VP4 interface



(1) . Matching cable with AS9 socket (custom length according to different needs):



To ensure the proper operation and optimal performance of the measurement system, it is important to carefully select each component. The components required for a complete measurement system include sensors, sleeves, process connections, cables, and transmitters.

1. Select Sensor

Funel Company's sensors offer advantages of precise stability and long lifespan. However, appropriate choices should be made based on the application and specific process environment. The key considerations include the measurement medium, measurement range, operating temperature range, operating pressure range, accuracy, built-in temperature compensation, and any other special requirements.

2. Choose Transmitter

Transmitters are components that transmit information to the user and convert sensor readings into displayable measurement data. They can transmit data to process control systems and also perform standard relay control. There are various transmitters available to meet different application and functional requirements. (Note: This product is not suitable for explosive environments.)

Key considerations include temperature output, data recording, self-cleaning functionality, time and date display, waterproof rating, relevant certifications, power supply requirements, and transmitter installation form.

3. Choose Sleeves

Sleeves are used to support the sensor or establish contact between the sensor and the process medium. Key considerations include the material of the sleeve, with options such as PTFE and 316L stainless steel.

4. Process Connections

Process connections are used to secure electrodes or sleeves to containers, reactors, pipelines, or open tanks/pools.

Key considerations include the type of connection (straight or angled), sleeve, flange, bracket, flow cell/cup, appropriate thread, and suitable material.

5. Electrode Leads

Electrode leads are typically available in standardized lengths, such as 5 meters, 10 meters, 15 meters, and so on. The lengths are commonly specified in meters. For conventional analog signal electrodes, it is recommended to keep the length within 30 meters, with an absolute limit of 60 meters.



Biopharmaceuticals

Mastering the pulse of life sciences,
A trusted partner,
Helping you improve operational
efficiency while effectively reducing costs.

We focus on:

- **Industry:** Biopharmaceuticals
- **Processes:** Bioprocessing and purification



Food and Beverage

Quality assurance, trusted,
We are committed to helping you improve
product quality, ensuring compliance,
and saving resources.

We focus on:

- **Sub-industries:** Dairy products, liquid beverages, and grain processing
- **Processes:** Reactor mixing



Industrial Processes

Competitive advantage, safety and reliability,
Providing you with various parameters
required in your process flow, ensuring
process compliance, and helping you achieve
operational excellence.

We focus on:

- **Industry:** Plating, Printing and Dyeing, Electronics, Metal Processing, Chemicals, Papermaking, and Chemical Engineering
- **Processes:** Surface cleaning, electroplating and phosphating, reactor processes



Power and Energy

With reliable product performance and extensive practical experience, We help customers confidently address the challenges of environmental protection, safety, and energy efficiency, providing comprehensive support.

We focus on:

- **Industry:** Intelligent buildings, waste-to-energy, heating, power generation
- **Processes:** Desulfurization and denitrification, circulating water systems, boiler feedwater

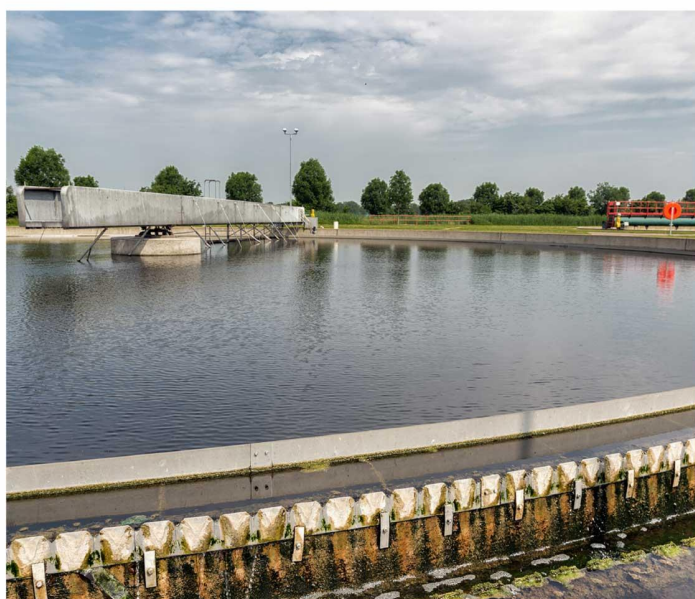


Metallurgy and Mining

Precise stability, safety, and efficiency, Real-time monitoring of data in complex operating conditions, Helping you tackle various challenges.

We focus on:

- **Sub-industries:** Mining, mineral processing, metallurgy, steelmaking
- **Processes:** Electrolysis, extraction, flotation



Water and Wastewater

Water, the source of life, Partnering with experienced and comprehensive product ranges, Improving user efficiency, reducing costs without compromising water quality standards.

We focus on:

- **Industry:** Municipal wastewater, industrial wastewater, surface water
- **Processes:** MBR (Membrane Bioreactor), SBR (Sequencing Batch Reactor), A²O (Anaerobic-Anoxic-Oxic)



Funel