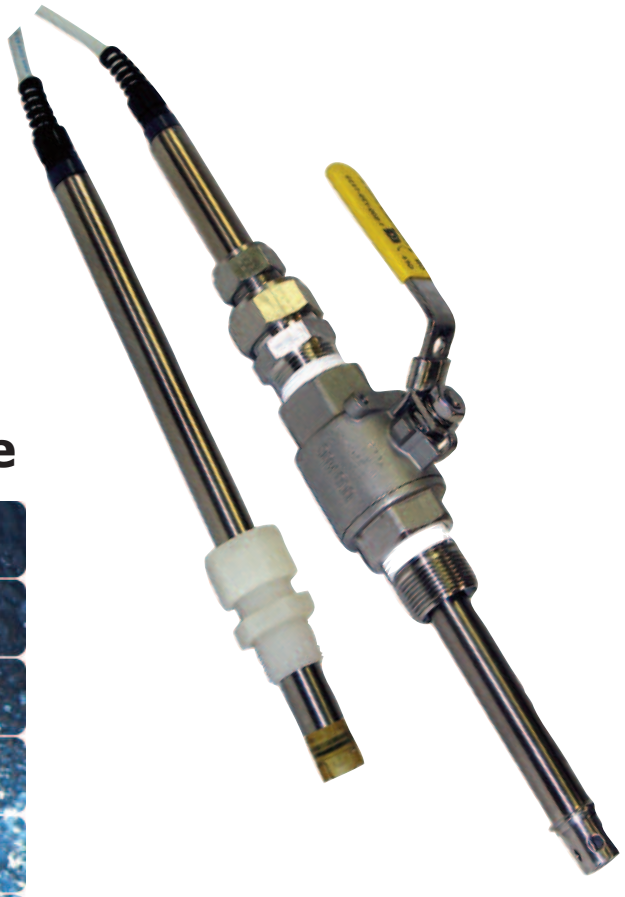
Sensors and Electrodes

ELECTRO-CHEMICAL DEVICES

S10 & S17 Sensors

pH, ORP, Specific Ion, Dissolved Oxygen,
Conductivity & Resistivity Measurement



the ECD 6 Point Advantage

Electro-Chemical Devices offers a complete line of liquid analytical sensors - pH, ORP, Specific Ion, Dissolved Oxygen, Conductivity & Resistivity. The ECD technically advantage has 6 points of design flexibility to configure the sensor to best fit your application.

the ECD 6 Point Advantage

1. **Multiple individual measurement parameters** in the same mechanical configuration- pH, ORP, Specific Ion, Dissolved Oxygen, Conductivity & Resistivity

2. Readily available **application specific sensor cartridges**. Many unique pH electrode design formulations and materials of construction which are field proven and selected for long life and accuracy.

3. Long life **replaceable sensor cartridges** lowers the overall operating cost. Optional **SENTINEL "PrepHault"** sensor life indicator.

4. **Various process fittings with adjustable insertion lengths** - 3/4" NPT compression fitting, sanitary fitting, and valve retractable fittings.

5. **Industrial housing materials for compatibility with process fluid.** Stainless Steel, Titanium, Hastelloy, Polypropylene or PVDF (Kynar™). Standard 10" or 17" optional custom lengths.

6. **Built-in electronic signal conditioning** for noise-free signal transmission.

S10 & S17 Sensors

S10 & S17 Sensor Overview - The ECD sensor family consists of two Universal Sensor Designs, the Model S10, an immersion or insertion sensor and the Model S17 a valve retractable sensor. The fully rebuildable S10 and S17 sensors have a rugged 316 stainless steel body that includes a sensing element, a temperature module and a signal conditioner for the process variable with cabling. Measurement cartridges for pH, ORP, Specific Ion, Dissolved Oxygen, Conductivity and Resistivity are available. The S10/S17 built-in electronic signal conditioner minimizes the influence of extraneous noise allowing the sensor to be located hundreds of feet from the instrument. Housings are available in 316 Stainless Steel (standard), Titanium, Hastelloy, Polypropylene, or PVDF and also in optional custom lengths.

S10 Sensor

The S10 Sensor uses a ¾" MNPT compression fitting as the process connection. This allows a variable insertion length to accommodate installation in pipe tees, flow cells, or through tank walls and if the fitting is reversed the sensor can be installed in a pipe for submersion in a tank.

The S17 Sensor uses a 1" MNPT ball valve, 1"x ¾" reducer and a ¾" MNPT compression fitting as the process connection. Loosening the compression fitting allows the sensor to slide freely through the ball valve for either insertion into the process or retraction from the process. Once retracted, the ball valve can be closed and the sensor removed for maintenance or replacement without shutting down the process line.

S17 Sensor

pH and ORP Electrode Cartridges

The S10 and S17 sensors use **replaceable electrode cartridges** to provide application specific solutions for the most demanding pH measurements. Available in either Radel (PES) or PEEK construction with full crown, double or single tine style pH bulb protection. Various pH glass formulations are available for General Purpose, High Temperature or Aggressive Chemical applications. These formulations are blown into spherical bulbs (best response), hemispherical bulbs (more durable) or a slightly radiused flat surface (easily cleaned) to address the process conditions. A Platinum tip replaces the pH glass bulb on ORP electrodes. The reference electrodes have double or triple junction reference cells with porous Teflon® and ceramic junctions and various electrolytes. This vast array of possibilities will solve most application problems - we have refined this offering to three widely used electrodes for most installations- consult our technical support staff for other unique electrode configurations.

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2005145 – This **General Purpose Electrode** has a two tine Radel body, double junction reference and slightly radiused pH bulb. While suitable for higher temperatures it is optimized for fast and stable readings in ambient temperature applications. Neutralizations, waste effluent monitoring, rinse applications and potable water are just a few of the suggested applications.

2005005 – This **High Temperature Electrode** has a full crown Radel body, double junction reference and spherical pH bulb. This electrode is designed for the process control or neutralization of most mineral acids and bases in applications up to 130°C. The triple junction design is resistant to sulfide ion poisoning making it ideal for use in petroleum refineries and metal processing plants.

2005066 – This **Chemically Resistant Electrode** has a two tine PEEK body, double junction reference and slightly radiused pH bulb. The PEEK body is suitable for use in most aggressive solvents, oxidizing solutions and acids or bases. This electrode is optimized for a harsh chemical environment and is suitable for service up to 130°C. Chemical separations and solvent recovery in the CPI and pharmaceutical industries along with chlorine production and flotation in mining are suggested applications.

2005167 – This **ORP (Oxidation Reduction Potential) Electrode** has a two tine Radel body, double junction reference and a platinum tip. This general purpose sensor can be used for monitoring the oxidant level of cooling towers, swimming pools, aquariums or the de-chlorination of waste water. Metal finishing and mining also provide applications such as cyanide destruction and monitoring chrome plating baths.

SENTINEL

All reference electrodes degrade over time, some become poisoned, some depleted of electrolyte, and both cases cause the measurement to drift. **SENTINEL** is a feature that monitors the reference electrode potential and displays the drift graphically and/or with a 4-20 mA output providing a predictive maintenance alert before there is a problem. The **SENTINEL** option is available on all mV based sensors, pH, ORP and Specific Ion.

Specific Ion (pION) & Dissolved Oxygen (DO) Electrode Cartridges

Ion selective electrodes are not limited to laboratory use; some are suitable for continuous online measurement. ECD offers Specific Ion Electrode cartridges to measure Bromide, Chloride, Cyanide, Fluoride, Sulfide, Calcium, Potassium and Sodium ions. Specific Ion electrodes measure the activity (concentration) of the ion in solution, the "free" ion, not a complexed version. Cyanide, Fluoride and Sulfide ions only exist in a specific pH range as free ions and outside this pH range some percentage of the total concentration is complexed as H(X) which cannot be seen by the sensor. These measurements can be pH compensated using the dual channel C22 Controller and a pH sensor to determine the total ion concentration. The other sensors may be subject to interferences caused by competing ions in the solution. Consult with the factory on all new installations.

Specific Ion (pIon) Electrode Cartridges

Part#	Type	Measurement Range	pH Range	Temperature Range
2005083	Ammonium	0.05 - 18,000 ppm	2-10 pH	0°-40°C
2005062	Bromide	1 - 80,000 ppm	2 - 12pH	0°-50°C
2005043	Calcium	0.1 - 40,000 ppm	2.5 - 10 pH	0°-40°C
2005008	Chloride	2 - 35,000 ppm	2 - 12 pH	0°-50°C
2005042	Cyanide	0.1 - 260 ppm	11 - 13 pH	0°-80°C
2005063	Fluoride	0.02 - 2,000 ppm	5 - 8 pH	0°-80°C
2005086	Nitrate	0.1 - 1000 ppm	2 - 12 pH	0°-40°C
2005034	Potassium	0.1 - 40,000 ppm	2 - 12 pH	0°-40°C
2005031	Sodium	0.2 - 23,000 ppm	2 - 14 pH	0°-80°C
2005022	Sulfide	0.01 - 32,000 ppm	11 - 14 pH	0°-80°C
2005022	Silver	0.1 - 107,000 ppm	2 - 14 pH	0°-80°C

Dissolved Oxygen Electrode Cartridge

The ECD dissolved oxygen electrode is a galvanic cell with a lead anode, silver cathode and Teflon membrane. The cartridge is ready to use as received, there are no solutions or membranes to install before the electrode can be used. The membrane is protected by a single tine PEEK body allowing for easy cleaning. Designed for ppm level measurements it is ideal for environmental water measurements, aerobic waste treatment and digesters.

Part#	Type	Measurement Range	Pressure Range	Temperature Range
2005622	Dissolved or Gaseous Oxygen	0 - 20 ppm (mg/L) 250% Saturation	0 - 50 psig	-5°- 80°C

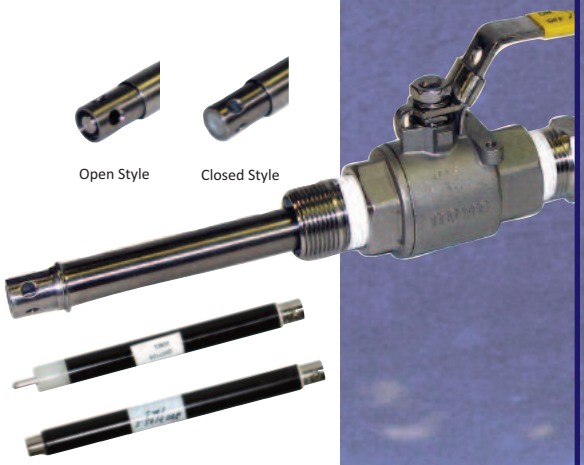
Conductivity Measurements

Two competing technologies are used to measure Conductivity; **Contacting Conductivity**, an impedance measurement between two metal contacts in the solution or **Toroidal Conductivity, a non-contacting measurement** made between two coils inside the sensor inductively coupled through the solution's conductivity. Toroidal sensors excel in the higher conductivity ranges and coating or corrosive environments. Contacting sensors can measure from very low conductivities, (resistivity measurements) to very high conductivities but they are subject to coating and corrosion issues. The Contacting Conductivity S10 and S17 sensors come in three ranges, Low Range, 1µS – 20µS, High Range, 50µS – 20mS and Resistivity, 2MΩ – 50MΩ.

the ECD 6 Point Advantage

Conductivity and Resistivity Cartridges

Replaceable cartridges optimize the measurement over a specified range. Each cartridge has a specified range of ½ to 2 times the specified value, i.e. a Specified Value of 20µS provides an optimal range of 10µS – 40µS. Seventeen cartridges are available to cover the range of 50MΩ resistivity to 50mS conductivity. The cartridge provides the inner contact of the measurement with the housing providing the other contact. The standard wetted materials are 316 Stainless Steel, PVDF and VITON o-rings. Three front end guard styles are offered; open for resistivity or low conductivity measurements, closed for high conductivity measurements and a 3A approved sanitary front end for food and pharmaceutical applications.

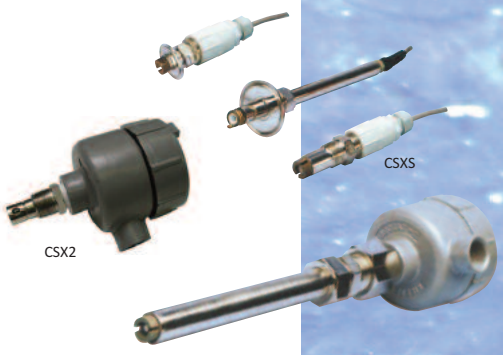


Toroidal Sensors - (non-contacting)

The S10 and S17 Toroidal sensors have a ¾" diameter PVDF body, not the stainless steel used for the other measurements. The sensors are sealed and there are no replaceable cartridges. These sensors are ideal for high conductivity solutions like % concentration measurements or any application that coats or corrodes the standard contacting conductivity sensors. The measurement range is from 0.5 mS to 1000 mS.

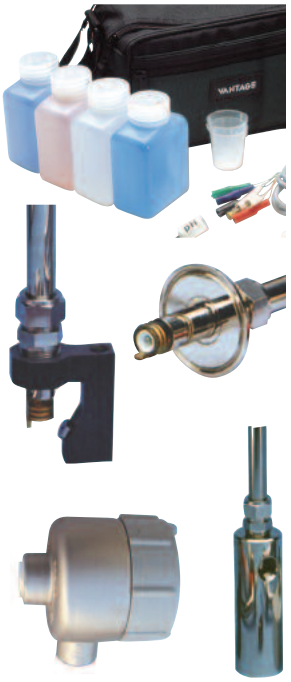
CSX Series Sensors

The CSX1 High Temperature- High Pressure sensors are designed for service to 230°C and 660 psig. These insertion style ¾" MNPT, 316 stainless steel sensors have PEEK insulators and are available with or without an integral signal conditioner. The junction box is rated Class I, Div I, Groups C & D, Class II, Groups E, F and G hazardous locations. The CSXS sensors are rated for service to 150°C and 225 psig and use RYTON®, KYNAR® or Teflon® insulators. These ¾" MNPT, stainless steel insertion style sensors are available in various fixed insertion lengths. An aluminum junction box is mounted on the rear of the sensor that contains a terminal block and optional signal conditioner.



Accessories and Ordering Information

Part #	Description
1000070	Panel Mounted Flow Cell for S10, 1/2” FNPT through, PVC
1000071	Panel Mounted Flow Cell for S10, 1/2” FNPT through, PVDF
1000072	Panel Mounted Flow Cell for S10, 1/2” FNPT through, 316 SS
2000263	Handrail Mounting Kit, includes PVC extension pipe and 304 SS Hardware
1000235	Raft Float Assembly Kit, includes Float, Boom and Swivel Mount Hardware
1000122	PVC Spray Cleaning Nozzle for 3/4” Metallic Housings
1000154	PVC Spray Cleaning Nozzle for 1” PVDF or PP Housings
1000051	NEMA 4X Junction Box 5 point Terminal block, Remote mounting
2001030	ABS Black Plastic junction Box, Sensor Mounted
2000948	Aluminum Junction Box, sensor Mounted
2000756	Sanitary Flange Fitting, 2”, for use with S10 (also in 1” and 2 1/2” size)
2000076	25 mm Port Fitting, Ingold Style, for use with S10
2010XXX	pH Calibration Solutions, pH 4.01(100), 7.00(101), 10.0(103), 500 ml bottles
2010XXX	Conductivity Cal Solutions, 1mS(150), 10mS(151), 100mS(155), 500 ml bottles
2010170	ORP Calibration Solution, 500 ml bottles



Ordering Information

PH S10 – T23 – CBL – S – EG – 75HT

Function & Style	Instrument	Cable Length	Material	Electrode Guard	Process Connection
PH **MV** (ORP) **MV** (pION) **DO**	**S10** or **S17**	**T23** **T28** **C22**	**CBL** (10 ft. Std.) **CBL20** (20 ft.) **CBL**** (** ft.) ** Consult Factory	**S**tainless Steel **T**itanium **H**astelloy C **K**ynar	**75** ¾” 316 SS Gland nylon Ferrule (S10) **75HT** ¾” 316 SS Gland Teflon Ferrule (S10) **75K** ¾” KYNAR Gland and Ferrule (S10) **VSS** 1” 316 SS Valve Retraction Assembly **VKY** 1” KYNAR Valve Retraction Assembly

Toroidal Conductivity

CS17 – CBL20 – 100 mS – K – TOR – EPR – VKY

Function & Style	Cable Length	Range	Material	Toroidal	O-Ring Material	Process Connection
Toroidal **CS10** (Insertion) **CS17** (Retractable)	**CBL** (10 ft. Std.) **CBL20** (20 ft.) **CBL**** (** ft.) ** Consult Factory	**0 -0.5 mS** **0 -50 mS** **0 -1 mS** **0 -100 mS** **0 -2 mS** **0 -200 mS** **0 -5 mS** **0 -500 mS** **0 -10 mS** **0 -1S**	**K**ynar	**Viton** (std) **EPR** **SIL** **FSIL** **CV75** **KLZ** (KALREZ)	**75** ¾” KYNAR Gland **VKY** 1” KYNAR Valve Retractable Assembly

Contacting Conductivity

CS17 – T23 – CBL20 – T – 2 µS – EPR – VTT

Function & Style	Instrument	Cable Length	Material	Range	O-Ring Material	Process Connection
RS10 (Insertion) **RS17**(Retractable) **CS10** (Insertion) **CS17** (Retractable)	**T23** **T28** **C22**	**CBL** (10 ft. Std.) **CBL20** (20 ft.) **CBL**** (** ft.) ** Consult Factory	**S**tainless Steel **T**itanium **H**astelloy C	Resistivity **2, 20, 50 MΩ** Low Range **1,2,5,10, 20µS** High Range **0.1 to 50 mS**	**Viton** (std) **EPR** **SIL** **FSIL** **CV75** **KLZ**	**75** **75HT** **75K** **VSS** **VKY** (see above for explanation)

Product Specifications

S10 & S17
All Sensors

Dimensions:
S10 - ¾"OD x 13¾" Length
S17 - ¾" OD x 24" Length

Cable Length:
10 ft. standard
Optional lengths in 10 ft increments
6 conductor shielded (Belden 8786)

Housing Materials:
Standard: 316 Stainless Steel
Optional: Titanium (T), grade 2
Hastelloy (H), C-22
PVDF (K)

O-Ring Materials:
Standard: Viton™ (VIT)
Optional: Ethylene Propylene (EPR),
Fluorosilicone (FSIL)
Silicone (SIL)
Kalrez™ (KLZ)
CV75 (CV)

Process Connections:
S10

-75 ¾" 316 SS gland fitting with nylon ferrule
-75HT ¾" 316 SS gland fitting with Teflon™ ferrule
-75SF ¾" 316 SS gland fitting with stainless steel ferrule
-75TFE ¾" Teflon™ gland fitting with Teflon™ ferrule
-100 1" Teflon™ gland fitting for PVDF housing only

S17

-VSS 1" 316 SS valve retraction assembly
-VKY 1" PVDF valve retraction assembly

Shipping Weight:
S10 2.5 lbs (1.2 kg)
S17 2.75 lbs (1.25 kg)
S17-VSS 5.8 lbs (2.65 kg)

PHS10 & PHS17
pH measurement

Measurement Range:
0-14 pH

Temperature Range:
0˚- 90˚ C

Optional HT version:
0˚- 140˚C

Pressure Range:
0 - 100 psig @ 90˚C

Optional HP version:
0 - 300 psig @ 140˚C

Temperature Compensation:
Automatic 0˚- 100˚C
Accuracy ± 0.2˚C over the range
3,000 ohm BALCO RTD

MVS10 & MVS17
ORP & Specific Ion

Measurement Range:
ORP: -2000 mV to 2000 mV
pIon: Sensor Specific,ppb, ppm &ppt

Temperature Range:
0˚- 90˚ C

Pressure Range:
0 - 100 psig @ 90˚C

Temperature Compensation:
Automatic 0˚- 100˚C
Accuracy ± 0.2˚C,3K ohm BALCO RTD

DOS10 & DOS17
Dissolved Oxygen

Measurement Range:
0-20 ppm, 0-150% SAT

Temperature Range:
0˚- 90˚ C

Pressure Range:
0 - 65 psig @ 90˚C

Temperature Compensation:
Automatic 0˚- 100˚C
Accuracy ± 0.2˚C over the range
3,000 ohm BALCO RTD

CS10/RS10 &CS17/RS17
Conductivity/Resistivity

Measurement Ranges:
Low Range Sensor: 1µS to 20µS
High Range Sensor: 50µS to 20 mS
Resistivity: 2 MΩ to 50 MΩ

Temperature Range:
-5˚ to 100˚C

Optional HT version:
-5˚ to 150˚C

Pressure Range:
CS/RS10 0 - 100 psig
CS/RS17 0 - 100 psig
Optional HP version:
CS/RS10 0 - 300 psig

Temperature Compensation:
Automatic 0˚- 100˚C
Accuracy ± 0.2˚C,100K ohm thermistor

CS10 & CS17
Toroidal Conductivity

Measurement Ranges:
0.5mS to 1000mS

Temperature Range:
-5˚ to 100˚C

Pressure Range:
CS10 0 - 100 psig
CS17 0 - 300 psig

Temperature Compensation:
Automatic 0˚- 100˚C
Accuracy ± 0.2˚C, 100K ohm thermistor

Body material:
KYNAR (PVDF)

CSX Series

Measurement Ranges:
1.0µS to 50mS

Temperature Range:
0˚ to 150˚C (CSX2 to 200˚C)

Pressure Range:
0 - 250 psig (CSX2 to 400psig)

Temperature Compensation:
Automatic 0˚- 150˚C
Accuracy ± 0.2˚C, 10K ohm platinum RTD

Wetted Materials:
316 SS and ceramic

Specifications subject to change without notice.

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