

SP3 & SP3X SERIES

SMART SENSORS



The SP3 and SP3X Smart Sensors can be configured for many liquid measurements by selecting among many flexible type of sensors such as:

- Amperometry style sensor cartridges for pH, specific ion (pION), or ORP
- Galvanic style sensor cartridge for ppm or ppb Dissolved Oxygen analysis
- Polarographic sensor for free chlorine, total chlorine, and chlorine dioxide
- Conductive style sensor for contacting conductivity, inductive (Toroidal) conductivity, or resistivity
- Optical sensors: Optically activated Dissolved Oxygen, Turbidity & Total Suspended Solids

See detailed sensor configuration matrix on pages 5 - 7 for available sensor set up. Contact factory if selection not available.

Electrodes for SP3 / SP3X Sensors

Fixed Electrodes - Conductivity

Conductivity is a measurement of a solution's ability to conduct electricity. The SI unit expressed in conductivity is micro-Siemens (μS), mili-Siemens (mS) or Siemens (S). Conductivity is a non-ion specific sensor and it can be correlated to total dissolved solids (TDS) measurement, which is commonly used to gauge water purification system's performance. The electrical conductivity of a solution is determined by measuring the resistance of solution between two fixed electrode surfaces, ideal for ($1\mu\text{S}$ to 50 mS). Alternatively, when solution conductivity is high (50mS to 1S), an inductive method, Toroidal type sensors, can be utilized for the measurement.

Contacting Conductivity:

Available in both SP3 / SP3X sensor platform, range of this sensor is $1\mu\text{S}$ to 50mS . Typically used from high purity water application to industrial waste water application. Material of contacting conductivity probe is SS316, Titanium (General Purpose & FM), Hastelloy, or Poly Propylene

Non-Contacting Toroidal Conductivity:

Toroidal conductivity is available for range of 50mS to 1S , applied for sea water or solution with high salinity. Material for Toroidal Conductivity is Kynar (PVDF) by standard, and available for SP3 sensor platform.

Optical Sensors: Turbidity & Suspended Solids (TSS), Optical DO (ODO)

Turbidity & Suspended Solids (TSS) Sensor:

The Turbidity & Suspended Solids (TSS) sensor comes with two optical configurations, which minimizes the error from reflecting surfaces: front mounted optics – ideal for direct immersion into basin style pool, side mounted optics – ideal for flowing processes in pipeline or flow cell. Water Proof or water resistant cable allowing the most robust use onsite, see SP3-TSS brochure for details.

Optical Dissolved Oxygen (ODO) Sensor:

The Optical Dissolved Oxygen sensor uses fluorescence quenching to determine the oxygen concentration in water. The use of the optical method minimizes maintenance, increases reliability and improves the long term accuracy of the Oxygen measurement. See SP3-ODO brochure for details.



Replaceable Electrodes: pH, ORP, Specific Ion (pION), DO

Designed for toughness while keeping measurements versatility, the SP3 and SP3X sensor probes comes with interchangeable and replaceable electrodes that can be adapted for the most demanding applications.

- Chemical Resistant & Physically Rugged Electrode Body
- Chemical Resistant O-rings
- Long Electrode Life span
- Rugged glass bulbs
- Rugged bulb Protection against Physical Stress
- Optional sensor diagnostic for pH, ORP or pION electrodes displayed on the transmitter



Measurements done by Teledyne Electrodes for SP3 / SP3X Sensor:

Measurement	Range	pH Range Required	Temperature Range	Sentinel Diagnostics
Ammonium	0.05 to 18,000 ppm	2 to 8 pH	32° to 104°F (0° to 40°C)	Y
Bromide	1 to 80,000 ppm	1 to 12 pH	32° to 176°F (0° to 80°C)	Y
Cadmium	0.1 to 11,200 ppm	3 to 9 pH	32° to 176°F (0° to 80°C)	Y
Calcium	0.1 to 40,000 ppm	3 to 11 pH	32° to 104°F (0° to 40°C)	Y
Chloride	2 to 30,000 ppm	1 to 12 pH	32° to 176°F (0° to 80°C)	Y
Copper	1 to 6,300 ppm	2 to 6 pH	32° to 176°F (0° to 80°C)	Y
Cyanide	0.1 to 260 ppm	10 to 14 pH	32° to 176°F (0° to 80°C)	Y
Dissolved O ₂ (ppb)	0.01 to 20 ppm	No Limitation	14° to 176°F (-10° to 80°C)	N
Dissolved O ₂ (std.)	1 to 20 ppm	No Limitation	14° to 176°F (-10° to 80°C)	N
Fluoride	0.02 to 2,000 ppm	2 to 8 pH	32° to 176°F (0° to 80°C)	Y
*High Temp. pH	0 to 14	No Limitation	32° to 266°F (0° to 130°C)	Y
Lead	2 to 20,700 ppm	4 to 8 pH	32° to 176°F (0° to 80°C)	Y
Nitrate	0.1 to 14,000 ppm	3 to 11 pH	32° to 104°F (0° to 40°C)	Y
ORP	-1500mV to +1500mV	No Limitation	14° to 176°F (-10° to 80°C)	Y
Potassium	0.1 to 40,000 ppm	2.5 to 11 pH	32° to 104°F (0° to 40°C)	Y
Silver	0.1 to 107,000 ppm	1 to 12 pH	32° to 176°F (0° to 80°C)	Y
Sodium	0.2 to 23,000 ppm	6 to 12 pH	32° to 176°F (0° to 80°C)	Y
Standard pH	0 to 14	No Limitation	14° to 194°F (-10° to 90°C)	Y
Sulfide	0.01 to 32,000 ppm	11 to 14 pH	32° to 176°F (0° to 80°C)	Y

* Contact factory for this application.

Specifications

	SP3 Smart Sensor	SP3X Smart Sensor
Dimensions	3/4" O.D. x 10", 17", 24", 30", 36"	
Body Material	SS316, Titanium, Hastelloy (C22), Kynar (PVDF), Polypropylene (PP)	SS316, Titanium (FM Only), Hastelloy (C22), Kynar (PVDF), Polypropylene (PP)
O-Ring	Viton, Ethylene Propylene (EPR), Viton 75 (VIT75), Kalrez (KLZ), CV75	
Probe Glands	3/4" SS316, Ti, Hastelloy, PVDF, PP or 1" PVDF, PP	
Retraction Valves	1" SS316, Ti, Hastelloy, PVDF	
Sensor Cable Connector	Integral (no connector), Straight (axial) detachable connector	FM B3X Barrier & Connector, ATEX/IECEx Connector
Cable Length	No Cable - if detachable connector 10ft, 20ft, 30ft, 40ft, 50ft, 100ft	10ft, 20ft, 30ft, 50ft
T-Handle	No Handle, T-handle with Lanyard (std. for Valve Retraction)	
Electrode: pH	Range: 0 to 14 *Temperature: 14° to 194°F (-10° to 90°C) Optional: 32° to 266°F (0° to 130°C) Pressure Range: 0-100 psig @ 194°F (90°C) Temp. Comp.: 32° to 212°F (0-100°C) (Auto), ± 0.36°F (0.2°C)	
Electrode: ORP	Range: -2000mV to +2000mV *Temperature: 14° to 176°F (-10° to 80°C) Pressure Range: 0-100 psig @ 194°F (90°C) Temp. Comp.: 32° to 212°F (0-100°C) (Auto), ± 0.36°F (0.2°C)	
Electrode: pION	Range: See sensor data sheet, ppb, ppm & ppt *Temperature: See sensor data sheet Pressure Range: 0-100 psig @ 194°F (90°C) Temp. Comp.: 32° to 212°F (0-100°C) (Auto), ± 0.36°F (0.2°C)	
Electrode DO	Range: 0 to 20 ppm, 0 to 150% SAT *Temperature: 14° to 176°F (-10° to 80°C) Pressure Range: 0-65 psig @ 194°F (90°C) Temp. Comp.: 32° to 212°F (0-100°C) (Auto), ± 0.36°F (0.2°C)	
Conductivity & Resistivity	Range: 1uS to 50uS, 0-20 Mohm *Temperature: 23° to 212°F (-5° to 100°C) Optional: 23° to 302°F (-5° to 150°C) Pressure Range: 0-100 psig @ 194°F (90°C) Temp. Comp.: 32° to 212°F (0-100°C) (Auto), ± 0.36°F (0.2°C)	
Inductive Conductivity (Toroidal)	Range: 0.5mS to 1000mS *Temperature: 23° to 212°F (-5° to 100°C) Pressure Range: 0-100 psig @ 194°F (90°C) Temp. Comp.: 32° to 212°F (0° to 100°C) (Auto), ± 0.36°F (0.2°C)	N/A
Optical DO (ODO)	Range: 0-20 mg/L (0-20 ppm), 0-200% SAT, 0-400 hPa (0-6 psi) *Temperature: 41° to 122°F (5° to 50°C) Response Time: T90 = 60 sec Accuracy: < 2% of Range Repeatability: ± 0.5% of Range Resolution: 0.01 ppm or 0.01% SAT Process Connection: G1 Thread or 3/4" FNPT	N/A
Turbidity & Suspended Solids (TSS)	Range: 0-1000NTU, 0-4000NTU, or <40NTU (Flow Cell/Debubbler ONLY) *Temperature: 41° to 122°F (5° to 50°C) Pressure: 50 psi / 3.5 bar max. in flow cell Sensor Body: CPVC or Polypropylene (opt.) Process Connection: 1" NPT	N/A

*Although some electrode temperature ratings may be higher than that of the sensor probe (SP3/SP3X) the lower rating is the official temperature rating of the complete sensor apparatus.

Model Codes

	Code	SP3	SP3X
A-Measurement	0	SP3 Digital Sensor: pH, ORP, pION	
	1	SP3 Digital Sensor: Dissolved Oxygen	
	2	SP3 Digital Sensor: Conductivity - 1uS to 50mS	
	3	SP3 Digital Sensor: Inductive Cond. - 1mS to 1S	N/A
	4	SGTC Sensor: No Digital Preamp	N/A
	5	Diagnostic SP3 Digital Sensor pH, ORP, pION	
	6	SP3 Digital Sensor: ppb Dissolved Oxygen	
	7	SP3 Digital Sensor: Resistivity - 0.00-50Mohm	
B-Sensor Style	0	Insertion	
	1	Valve retractable style with blow out protector	
C-Housing	00	316SST - 10", 3/4" OD (Std - Insertion)	
	01	316SST - 17", 3/4"OD (Std - Valve Retractable)	
	02	316SST - 24", 3/4" OD	
	03	316SST - 30", 3/4" OD	
	04	316SST - 36", 3/4" OD	
	10	Titanium - 10", 3/4" OD	
	11	Titanium - 17", 3/4"OD	
	12	Titanium - 24", 3/4" OD	
	13	Titanium - 30", 3/4" OD	
	14	Titanium - 36", 3/4" OD	
	20	HASTELLOY - 10", 3/4" OD	
	21	HASTELLOY - 17", 3/4"OD	
	22	HASTELLOY - 24", 3/4" OD	
	23	HASTELLOY - 30", 3/4" OD	
	24	HASTELLOY - 36", 3/4" OD	
	40	KYNAR (PVDF) - 10", 3/4" OD - Inductive Cond.	N/A
	41	KYNAR (PVDF) - 17", 3/4" OD - Inductive Cond.	N/A
	50	Polypropylene - 10", 3/4" OD	
	51	Polypropylene - 17", 3/4"OD	
	52	Polypropylene - 24", 3/4" OD	
	53	Polypropylene - 30", 3/4" OD	
	54	Polypropylene - 36", 3/4" OD	
	XX	Other Materials/Length (Custom)	
D-Process Connection	00	No Fitting or Valve Assembly	
	01	3/4" MNPT 316SS Gland, Nylon Ferrule	
	02	3/4" MNPT 316SS Gland, TFE Ferrule	
	03	3/4" MNPT 316SS Gland, SST Ferrule	
	04	3/4" MNPT Hastelloy Gland, TFE Ferrule	
	05	3/4" MNPT Titanium Gland, TFE Ferrule	
	06	3/4" MNPT, All Polypropylene Fitting	
	07	3/4" MNPT, All Kynar Fitting	

	Code	SP3	SP3X
D-Process Connection	08	3/4" MNPT, All TFE Fitting	
	09	3/4" MNPT, Fitting Set For 1" Ball Valve	
	10	1" MNPT All Nylon Fitting	
	11	1" MNPT All Polypropylene Fitting	
	12	1" MNPT All Kynar Fitting	
	29	Other Materials/Lengths (Custom)	
	30	1" NPT SS316 Valve, Nylon Ferrule	
	31	1" NPT SS316 Valve, TFE Ferrule	
	32	1" NPT SS316 Valve for 3/4" Inductive Cond.	
	33	1" NPT Hastelloy Valve	
	34	1" NPT Titanium Valve	
	40	1" NPT Kynar Valve	
	41	1" NPT Kynar Valve for 3/4" Inductive Cond.	N/A
	42	1" NPT Polypropylene Valve	
	43	1" NPT Polypropylene Valve for 3/4" Inductive Cond.	N/A
		Reserved for Future Use	
E-Sensor Connectors	0	None, Integral Sensor Cable	N/A
	1	Detachable Sensor Connector, Straight (Axial)	N/A
	3	N/A	FM Approved Sensor Assembly w/ B3X Barrier & Connector
	4	N/A	FM Approved Connector Only (use as spare sensor)
	5	N/A	ATEX/IECEX Approved Connector
F-Cable Length	0	No Cable	N/A
	1	10 ft.	10 ft.
	2	20 ft.	20 ft.
	3	30 ft.	30 ft.
	4	40 ft.	N/A
	5	50 ft.	50 ft.
	A	100 ft.	N/A
	X	Other Length (Contact Factory)	
G-Handle	0	No "T" Handle	
	1	"T" Style Handle with Lanyards for Valve	
	5	3/4" T Handle with Detachable Connector - Insertion	N/A
	6	3/4" T Handle with Detachable Connector - Valve	N/A
	7	1" T Handle with Detachable Connector - Insertion	N/A
	8	1" T Handle with Detachable Connector - Valve	N/A
H-O-Rings for Electrode and Process Connection	0	VITON	
	2	EPR	
	3	KALREZ	
	7	EPR Valve and Fitting O-Ring	
	8	KALREZ Valve and Fitting O-Ring	
I-Electrodes	000	Select for No Electrode, Conductivity and Resistivity	

	Code	SP3	SP3X
I-Electrodes	001	General Purpose, Radel Body, TFE REF, Flat pH Glass 14° to 194°F (-10° to 90°C)	
	003	High Purity Water, Radel Body, TFE REF, Full pH Glass 14° to 194°F (-10° to 90°C)	
	030	Platinum ORP, PT CAP, Peek Body, TFE REF, 14° to 176°F (-10° to 80°C)	
	031	Platinum ORP, PT WIRE, PES Body, TFE REF, 14° to 176°F (-10° to 80°C)	
	040	DO, 0 - 20 ppm, Peek Body, Glavanic, Lead/Silver, 14° to 176°F (-10° to 80°C), 2 MIL	
	042	DO, 0 - 20 ppm, Peek Body, Glavanic, Lead/Silver, 14° to 176°F (-10° to 80°C), 5 MIL	
	043	DO, ppb, Peek Body, Glavanic, 14° to 176°F (-10° to 80°C)	
	070	Ammonia, Radel Body, TFE REF, 0.05 - 18,000 ppm 32° to 104°F (0° to 40°C)	
	071	Ammonium, Radel Body, TFE REF, 0.05 - 18,000 ppm 32° to 104°F (0° to 40°C)	
	072	Bromide, Radel Body, TFE REF, 1 - 80,000 ppm 32° to 176°F (0° to 80°C)	
	073	Cadmium, Radel Body, TFE REF, 0.1 - 11,200 ppm, 32° to 176°F (0° to 80°C)	
	074	Calcium, Radel Body, TFE REF, 0.1 - 40,000 ppm, 32° to 104°F (0° to 40°C)	
	075	Chloride, Radel Body, TFE REF, 2 - 30,000 ppm, 32° to 176°F (0° to 80°C)	
	076	Copper, Radel Body, TFE REF, 1 ppb - 6,300 ppm, 32° to 176°F (0° to 80°C)	
	077	Cyanide, Radel Body, TFE REF, 0.1 - 260 ppm, 32° to 176°F (0° to 80°C)	
	078	Fluoride, Peek Body, TFE REF, 0.02 - 2,000 ppm, 32° to 176°F (0° to 80°C)	
	079	Lead, Radel Body, TFE REF, 0.02 - 20,700 ppm, 32° to 176°F (0° to 80°C)	
	080	Nitrate, Radel Body, TFE REF, 0.1 - 14,000 ppm, 32° to 104°F (0° to 40°C)	
	081	Nitrite, Radel Body, TFE REF, 0.5 - 460 ppm, 32° to 104°F (0° to 40°C)	
	082	Potassium, Radel Body, TFE REF, 0.1 - 40,000 ppm, 32° to 104°F (0° to 40°C)	
	083	Silver, Radel Body, TFE REF, 0.1 - 107,000 ppm, 32° to 104°F (0° to 40°C)	
	084	Sodium, Radel Body, TFE REF, 0.2 - 23,000 ppm, 32° to 176°F (0° to 80°C)	
	085	Sulfide, Radel Body, TFE REF, 0.01 - 32,000 ppm, 32° to 176°F (0° to 80°C)	
	301	General Purpose, Radel Body, TFE REF, Full pH Glass 14° to 194°F (-10° to 90°C) (w/ Diagnostic)	
	303	High Purity Water, Radel Body, TFE REF, Full pH Glass 14° to 194°F (-10° to 90°C) (w/ Diagnostic)	
	330	Platinum ORP, PT CAP, Peek Body, TFE REF, 14° to 176°F (-10° to 80°C) (w/ Diagnostic)	
	370	Ammonia, Radel Body, TFE REF, 0.05 - 18,000 ppm, 32° to 104°F (0° to 40°C) (w/ Diagnostic)	
	371	Ammonium, Radel Body, TFE REF, 0.05 - 18,000 ppm, 32° to 104°F (0° to 40°C) (w/ Diagnostic)	
	372	Bromide, Radel Body, TFE REF, 1 - 80,000 ppm, 32° to 176°F (0° to 80°C) (w/ Diagnostic)	
	373	Cadmium, Radel Body, TFE REF, 0.1 - 11,200 ppm, 32° to 176°F (0° to 80°C) (w/ Diagnostic)	
	374	Calcium, Radel Body, TFE REF, 0.1 - 40,000 ppm, 32° to 104°F (0° to 40°C) (w/ Diagnostic)	
	375	Chloride, Radel Body, TFE REF, 2 - 30,000 ppm, 32° to 176°F (0° to 80°C) (w/ Diagnostic)	
	376	Copper, Radel Body, TFE REF, 1 ppb - 6,300 ppm, 32° to 176°F (0° to 80°C) (w/ Diagnostic)	
	377	Cyanide, Radel Body, TFE REF, 0.1 - 260 ppm, 32° to 176°F (0° to 80°C) (w/ Diagnostic)	
	378	Fluoride, Peek Body, TFE REF, 0.02 - 2,000 ppm, 32° to 176°F (0° to 80°C) (w/ Diagnostic)	
	379	Lead, Radel Body, TFE REF, 0.02 - 20,700 ppm, 32° to 176°F (0° to 80°C) (w/ Diagnostic)	
	380	Nitrate, Radel Body, TFE REF, 0.1 - 14,000 ppm, 32° to 104°F (0° to 40°C) (w/ Diagnostic)	
	381	Nitrite, Radel Body, TFE REF, 0.5 - 460 ppm, 32° to 104°F (0° to 40°C) (w/ Diagnostic)	
	382	Potassium, Radel Body, TFE REF, 0.1 - 40,000 ppm, 32° to 104°F (0° to 40°C) (w/ Diagnostic)	
	383	Silver, Radel Body, TFE REF, 0.1 - 107,000 ppm, 32° to 104°F (0° to 40°C) (w/ Diagnostic)	
	384	Sodium, Radel Body, TFE REF, 0.2 - 23,000 ppm, 32° to 176°F (0° to 80°C) (w/ Diagnostic)	
	385	Sulfide, Radel Body, TFE REF, 0.01 - 32,000 ppm, 32° to 176°F (0° to 80°C) (w/ Diagnostic)	



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