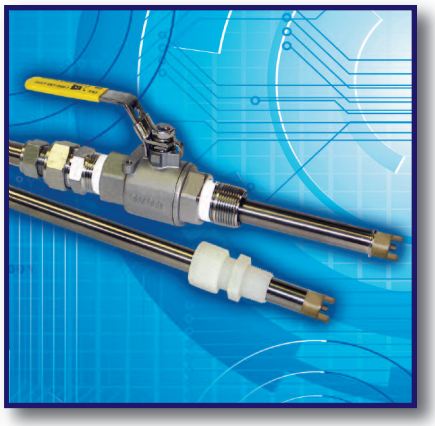
# Fluoride Ion Sensors

## Electro-Chemical Devices

| Features | Benefits |
|---|---|
| • Model S80 Universal Style Sensors | • Insertion, Immersion or Valve Retractable Service |
| • Multiple materials of construction | • 316 Stainless Steel, Titanium, Hastelloy |
| • Integral Signal Conditioner | • Noise free transmission |
| • Replaceable Electrode Cartridge | • Simple and Economical Service |
| • Available with pH compensation | • Wide range of service from 2 pH to 8 pH |



Model S80 Sensors
*Fluoride Ion Sensors*

## Description

The Model S80 universal sensors provide a stable and economical platform for the in line measurement of pH, ORP, Specific Ion, Dissolved Oxygen, Conductivity or Resistivity. The Model S80 is an insertion or immersion style sensor for use in pipe Tees or on the end of a Stand Pipe for immersion into a tank or pond. The Model S80 is also available as a valve retractable design allowing insertion or removal of the sensor into a pipe without interrupting the process flow. Both sensor designs use easily replaceable electrode cartridges. ECD offers several ion selective electrode cartridges suitable for continuous online measurement.

The Fluoride Ion Selective Electrode cartridge develops a millivolt potential proportional to the concentration of free fluoride ions in the measured solution. The model S80 Fluoride Ion sensors are used with the Model T80 Transmitter with its dual channel and pH compensation capabilities. These analyzers will measure free fluoride ions from 0.02 ppm to 2,000 ppm in the optimum pH range of 5-8 pH. Outside this pH range, large errors will occur in the acid range and small errors will occur in the alkaline pH ranges.

In acidic solutions fluoride ions react to form hydrofluoric acid, HF, pKa = 3.2, at 3.2 pH half of the available fluoride ions are HF and half are the measureable $F^-$. This characteristic can be compensated for by adding a pH sensor into the measurement loop. The T80 analyzer will report the total Fluoride ion concentration by measuring the available free fluoride and adjusting the value in accordance with the measured pH value. Hydroxide ions, $OH^-$, interfere with the fluoride measurement, 10 hydroxide ions generate the same signal as 1 fluoride ion. This accounts for an error of 1.7 ppb at pH 8, 17 ppb at pH 9 and 0.17 ppm at pH 10.

Fluoride ions will complex with aluminum, silicon, iron (+3), and other polyvalent cations as well as hydrogen and these fluoride ion complexes will not be “seen” by the sensor. If any of these chemicals are present in the measured solution the analyzer will report a lower concentration than the true value.

The sensor is calibrated in two standard solutions differing in concentration by a factor of 10, i.e. 10 ppm and 100 ppm. This calibration sets the slope of the electrode, mV/decade and a zero potential for the sensor. In many cases the process solution’s ionic strength and pH value differ widely from the calibration solutions characteristics. This will affect the zero potential of the fluoride sensor but not the slope causing an offset in the measurement. The offset is eliminated by performing a process standardization. When the sensor has stabilized in the process solution take a grab sample of the process and determine the fluoride ion concentration and the adjust the analyzer to read this laboratory determined value.

# Fluoride Ion Sensors

## Specifications

### Model S80 Fluoride Sensors
Combination electrode cartridge with a Lanthanum Fluoride measurement cell and a single junction, KCl/AgCl, reference electrode

### Electrode Slope
54 ± 5 mV per decade of concentration change

### Measurement Range
Fluoride: 0.02 to 2,000 ppm
pH: 2 to 8 pH

### Temperature Range
0° C to 80° C (32° F to 176° F)

### Pressure Range
0 - 50 psig (0 - 3.5 bar)

### Response Time
T90 in 10 seconds

### Electrode Life
6 to 12 months

### Interfering ions
Hydroxide, 0.1 selectivity (10 $OH^-$ = 1 $F^-$)

### Wetted Materials
PEEK, epoxy, LaF crystal, PTFE, 316 SS, Viton O-Ring

### Process Connections
S80 Insertion: ¾" MNPT compression fitting
S80 Valve Retractable: 1" MNPT Ball Valve

### Model T80 Transmitter
General purpose, ½ DIN, NEMA 4X, 110/220 VAC, 24 VDC or 4-20 mA loop powered, CE Marking, single or dual channel, (1) or (2) 4-20 mA outputs, optional (3) Alarm Relays 250 VAC 3 amp, MODBUS RTU (standard) or HART 7, Auto ranging display, ppb → ppm → ppthousand

| Part No. | Model and Product Description |
|---|---|
| S80-00-0002-0100-078 | S80 Fluoride, $F^-$ insertion style sensor with ¾" 316 SS compression fitting, 316 SS body, ¾" Diameter. x 10" length, 10 ft cable |
| S80-00-0002-0300-078 | S80 Fluoride, $F^-$ insertion style sensor with ¾" 316 SS compression fitting, 316 SS body, ¾" Diameter. x 10" length, 30 ft cable |
| S80-01-0131-0110-078 | S80 Fluoride, $F^-$ Valve Retractable Style with 1" Ball Valve Assembly, 316 SS body, ¾" Diameter x 17" length, 10 ft cable |
| S80-01-0131-0310-078 | S80 Fluoride, $F^-$ Valve Retractable Style with 1" Ball Valve Assembly, 316 SS body, ¾" Diameter x 17" length, 30 ft cable |
| T80-10-21-00-1 | Model T80 Single Channel Transmitterr, 110/220 VAC, (1) 4-20 mA outputs, (3) Alarm Relays, UM |
| T80-11-21-20-1 | Model T80 Dual Channel Transmitterr, 110/220 VAC, (2) 4-20 mA outputs, (3) Alarm Relays, UM |

| Part No. | Spare Parts and Accessories Description |
|---|---|
| 2005063.VIT | Fluoride Ion Electrode, PEEK body, dbl junction Teflon Ref, 0.02-2,000 ppm, 0°-80°C |
| 2010400 | Fluoride Ion Calibration Solution, 50% TISAB II, 1.0 ppm |
| 2010401 | Fluoride Ion Calibration Solution, 50% TISAB II, 10.0 ppm |
| 2010431 | Fluoride Ion Calibration Solution, 50% TISAB II, 100 ppm |
| 2000250-1 | Polishing Strip Kit, abrasive cleaning strips for Ion electrodes |
| S80-00-0002-0100-010 | S80 pH, insertion style sensor with ¾" 316 SS compression fitting, 316 SS body, ¾" Diameter. x 10" length, 10 ft cable with General Purpose pH electrode (for pH compensated measurement) |
| 2005103.VIT | pH electrode cartridge, fluoride resistant, PEEK body, dbl junction Teflon Reference |

*Specifications subject to change without notice.*

**Represented by:**

**Electro-Chemical Devices**

CERTIFIED ISO9001 QUALITY SYSTEM