

FLUORIDE ION MONITORS

Models: **FBM-100A (Panel Mounting)**
FBM-160 (Field Mounting)

The Models FBM-100A and FBM-160 provide fast and continuous detection of free fluoride ion concentration in water. They are widely used for monitoring water treatment processes and effluent from wastewater plants. They are also used in the semiconductor industry to monitor "washed-water" from plants that use hydrogen fluoride. The Model FBM-100A is suitable for panel mounting while the Model FBM-160 is designed for outdoor, field mounting. These instruments also feature an optional water jet cleaner for the ion electrode.

The measurement method differs from the more complex JIS K 0102 specified method. It has the advantage of being a much simpler method. However, this measurement method can be influenced by wide pH and temperature variations of the sample. Please refer to the paragraph describing "Sample Conditions" to decide on suitability for your particular application.

Features

- Fast response time: for a sample containing 2mg/L fluoride ions, an alarm will be generated within 30 seconds at 90% response.
- Low, middle and high ranges available as standard (0~20, 0~200, 0~2000 mg/L).
- 4 alarm outputs available. These can be configured based on user's requirements such as concentration alarms, instrument error, under cleaning, etc.. Concentration alarms are adjustable for delay time and band width.
- Control outputs (100 VAC) are available for external electrode cleaners such as water-jet cleaner.
- Output for sample temperature measurement is available (Model FBM-160).
- RS-232C output signal for measured concentration, sample temperature, concentration alarms etc. is available as an option.

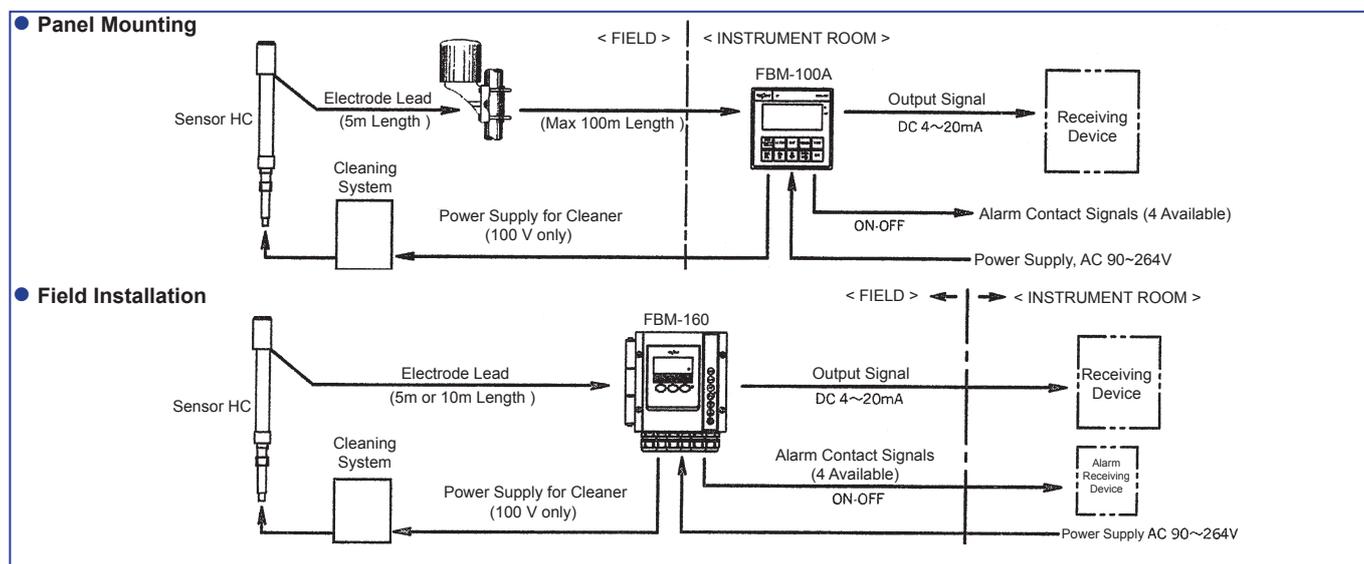


Model FBM-100A



Model FBM-160

Typical System Configuration



Common Specifications

Model Codes: FBM-100A (panel mounting)
FBM-160 (outdoor, field mounting)

Measurement Method: Fluoride Ion Selective Electrode

Display: Digital, LCD type

Measurement Ranges: 0.0~99.9 mg/L, 0~999 mg/L or 0~9990 mg/L

Output Signal: 4~20mA DC, isolated, 650 Ohm Load

Output Range: Adjustable within measurement range (minimum 1/10 F.S.). Factory settings: 0.0~20 mg/L, 0~200 mg/L, 0~2000 mg/L.

Sample Temperature: 0~50 deg C

Digital Output Signal (Option): RS232C, Asynchronous, half duplex, 9600 Baud. Data transmitted includes ion concentration, electrode signal, sample temperature, concentration alarms, under maintenance, under cleaning, instrument fault status etc..

Contact Switching Outputs: 4 outputs available (normally open contacts). Select from high limit, low limit, under cleaning, under maintenance, meter error (factory setting is OFF). Delay times and band width are adjustable for the high and low limit alarms. Contact rating: 250 VAC, 3A, or 30VDC, 3A.
NOTE: One set of contacts on the Model FBM-160 is normally closed when de-energized. It is possible to use this contact as a power fail alarm output signal.

Cleaning System Control Outputs: Internal timer provides 100VAC, 2A output to drive cleaning system such as water jet cleaner at pre-set intervals. Cleaning cycle adjustable between 0.1~48.0. Cleaning duration adjustable between 1~999 secs. Cleaning pulse adjustable between 1~19 times. Standby time after completion of cleaning adjustable from 0.0 to 99.9 minutes.

Temp Compensation: Fluoride ion electrode is corrected using Nernst equation (within 0~40 deg C of sample temperature).

Performance: **Linearity:** within +/-8% FS (excluding sensor) within +/-30% FS (with sensor)
Repeatability: within +/-5% FS (excluding sensor) within +/-30% FS (with sensor)
Response time: (90%): within 15 seconds (excluding sensor) within 60 seconds (with sensor)

Self Diagnostics: **Calibration Error:** Displays E0~5
Temperature Sensor Error: Displays E-12
Memory Error: Displays E-20/21
Burn out or error signal is output

Operating Power: 90~264 VAC, 50/60 Hz

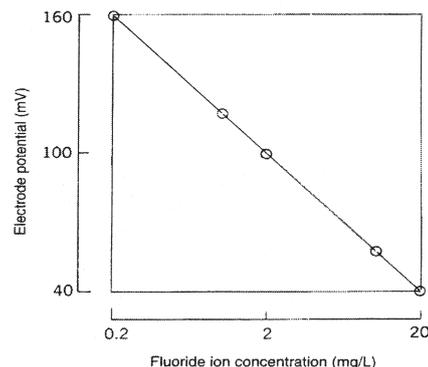
Power Consumption: Approx. 10VA (FBM-100A)
Approx. 11VA (FBM-160)

Individual Specifications

	FBM-100A	FBM-160
Installation	Panel mounting (panel cut-out : 92 x 92 mm)	Outdoor, filed installation (50A pipe, wall or rack mounting)
External dimensions	96(w) x 96(h) x 90(d) mm	181(w) x 180(h) x 95(d) mm
Enclosure Rating	Indoor installation type (IP-30)	Outdoor installation type, dust and splash proof (IP-65)
Materials of construction	Main body: Aluminium Display: Polyester	Main body: Aluminium die cast Display: Polyester
Surface finish	Display: Pale Yellow	Main body: Metallic silver
Cable entry	Not applicable	G1/2 x 6 (with 6~12mm diameter cable gland)
Ambient Temp and humidity	-10~50 deg C 90% RH or less (no condensation)	-20~55 deg C 95% RH or less (no condensation)
Weight	Approx. 0.5 kg	Approx. 2 kg
Water Temp output signal	Not applicable	Adjustable in 10 deg C widths with 1 deg C units. Factory setting 0.0~50.0 degC

Principle of Operation

The fluoride ion selective electrode generates an electromotive force corresponding to the fluoride ion concentration in water. The relationship between the concentration and the electromotive force is logarithmically linear as shown in the diagram to the right. The instrument, calibrated with standard solution, can determine the fluoride ion concentration of the sample by just immersing the electrode into the sample.



Sample Conditions

- Sample pH: To be stable within pH4~9 (see Note 1)
- Sample Temperature: To be stable within 0~40 deg C (see Note 2)
- Sample Conductivity: 50 mS/m (500 microS/cm) or greater
- Flow velocity: 0.01~0.2 m/s
- Coexisting components: Low values of calcium, aluminium, iron etc. (see Note 3)

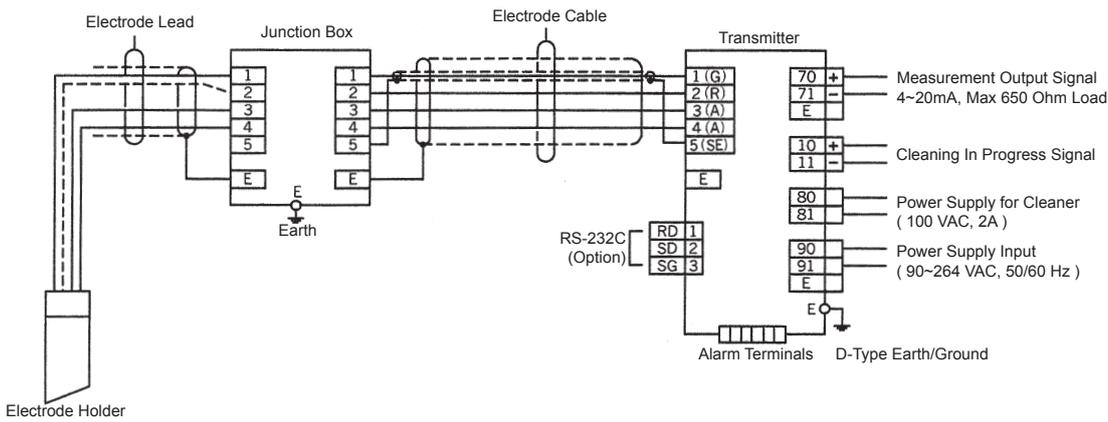
NOTE 2:
 Calcium salts present in the sample dissolve in greater quantities with increasing sample temperatures causing a positive interference on measurement result. The sample temperature should be kept as stable as possible and kept below 40 degC in order to avoid maintenance troubles.

NOTE 1:
 This instrument cannot detect fluoride under sample conditions of pH 4 or less because HF exists as molecules (not ionized) under these condition. For samples of pH 9 or above, the influence from OH- ions increases and influences the measurement. Also for large variations in pH, the fluoride conditions change and it may change compounds that cannot be detected. For reliable measurement, the pH value should be kept as stable as possible.

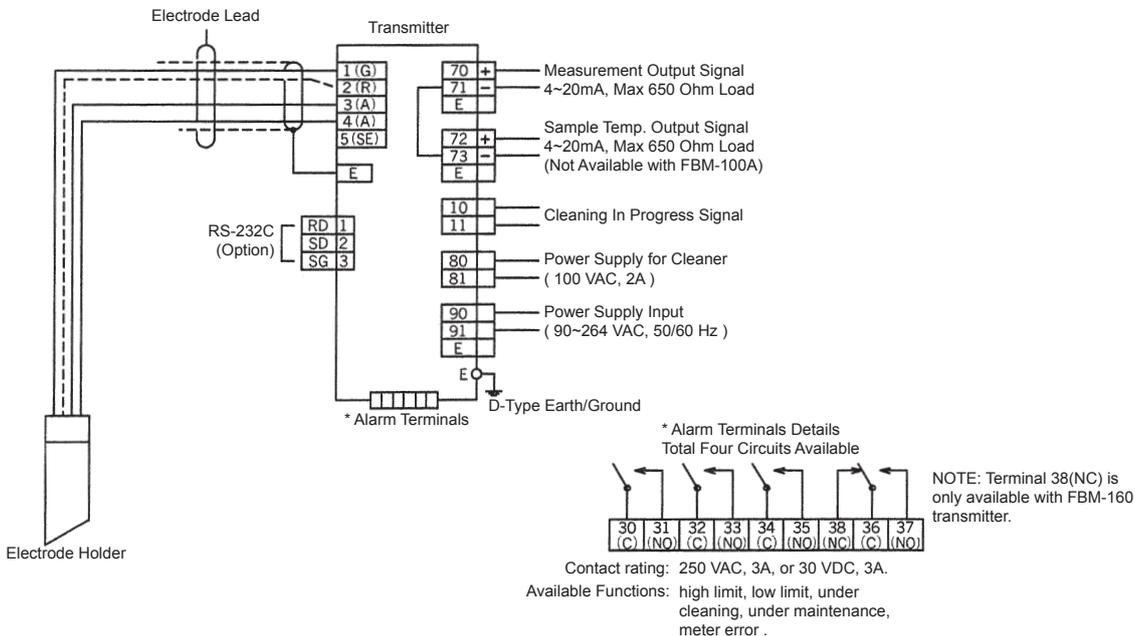
NOTE3:
 Calcium, aluminium, iron, etc. can combine with fluoride to form compounds that are different from fluoride ions and cannot therefore be detected by this instrument. Under these circumstances, the measured value would be different to that obtained from the conventional JIS measurement method. The conventional JIS method measures total fluoride (including the above mentioned compounds by distillation method).

Terminal Connections

● Electrode Connection via Junction Box (FBM-100A)



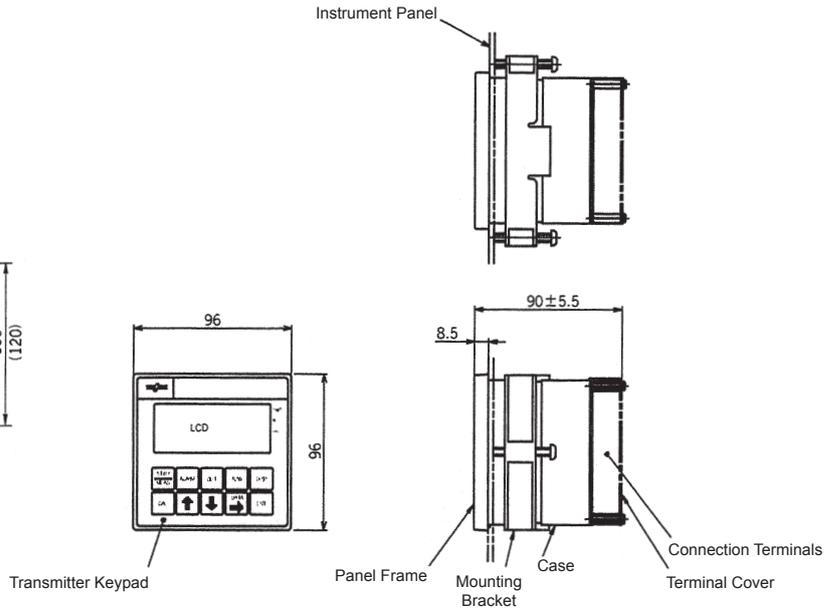
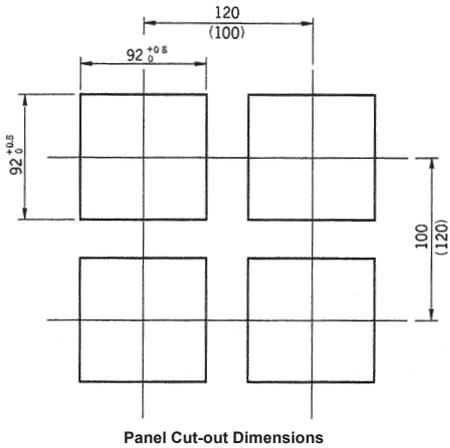
● Direct Electrode Connection to Transmitter (FBM-160)



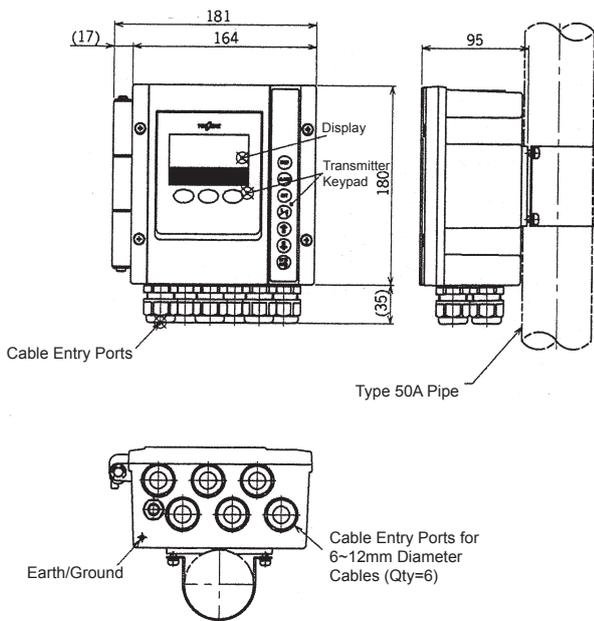
Dimensions

(Units: mm)

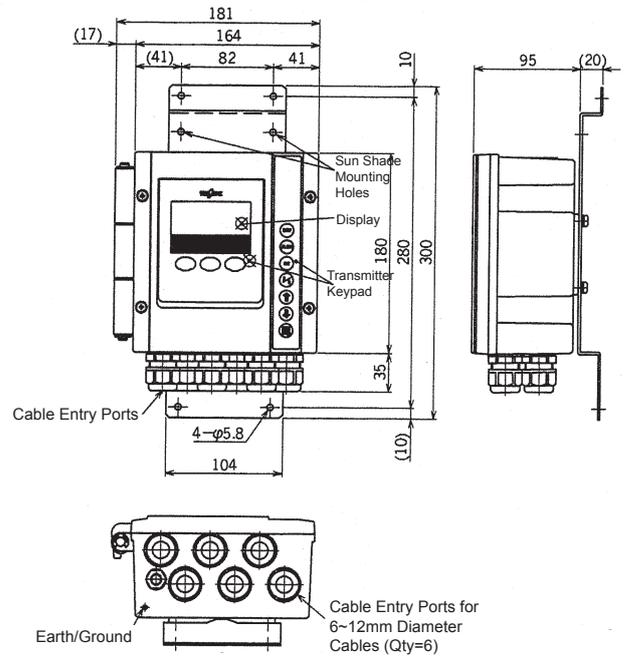
● FBM-100A Panel Mounting



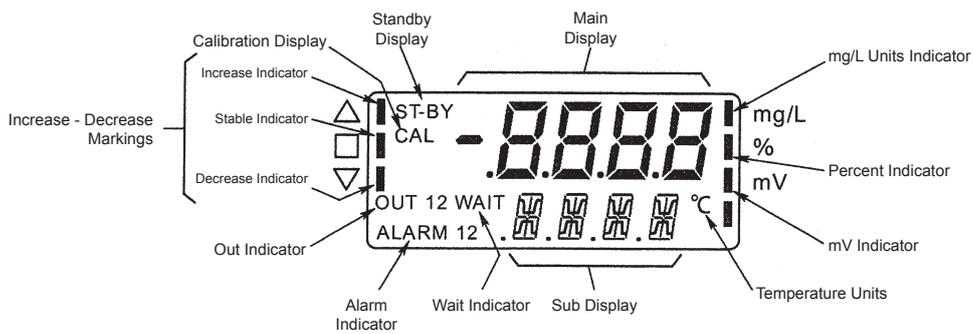
● FBM-160 Pole Mounting



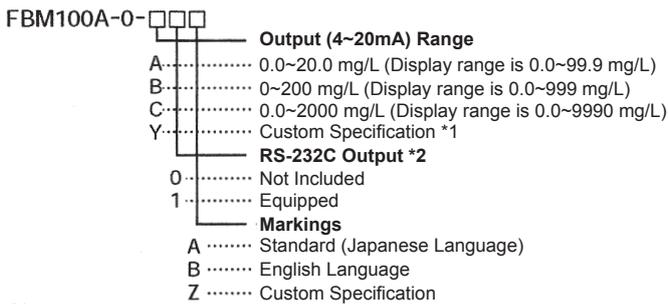
● FBM-160 Wall or Rack Mounting



Display Configuration

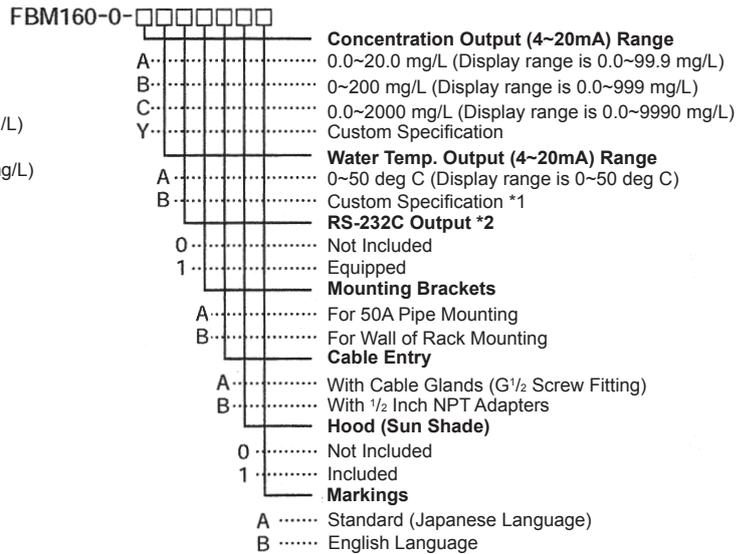


Product Codes



*1
For "Custom Spec", please specify 1/10 of Full Scale or greater for measurement display range for each range (examples 0-10 mg/L, 0-500 mg/L, 0-100 mg/L, 0-50000 mg/L).

*2
The RS232C output includes the following as well as ion concentration and water temperature: high limit alarm, high-high limit alarm, under maintenance, under cleaning, instrument malfunction etc..



*1
For "Custom Spec", please specify 1/10 of Full Scale or greater for measurement display range for each range (examples 0-10 mg/L, 0-50 mg/L, 0-100 mg/L, 0-30 degC).

*2
The RS232C output includes the following as well as ion concentration and water temperature: high limit alarm, high-high limit alarm, under maintenance, under cleaning, instrument malfunction etc..

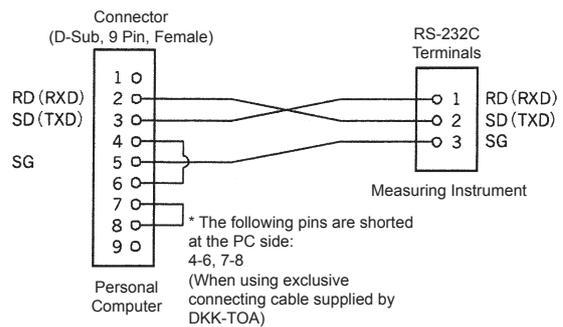
Options

● RS-232C Output

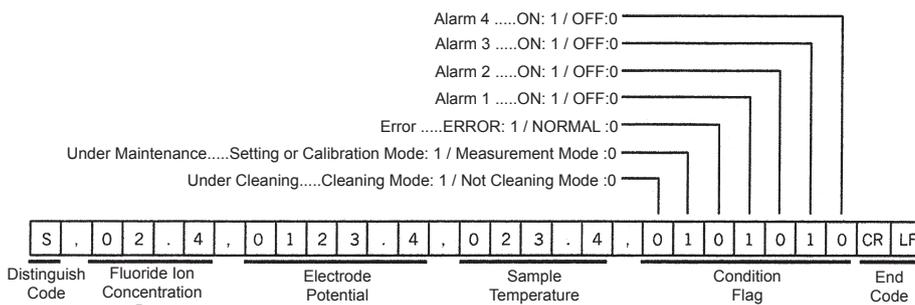
If RS-232C is selected as "Equipped" then digital data including status alarms etc. is available for download to PC or other RS232C peripheral device.

RS-232C Terminal Connections

Terminal No	Signal Symbol	Description	Direction
1	RD (RXD)	Receive	Input
2	SD (SXD)	Transmit	Output
3	SG	Ground	



RS-232C Cable Pin Assignment

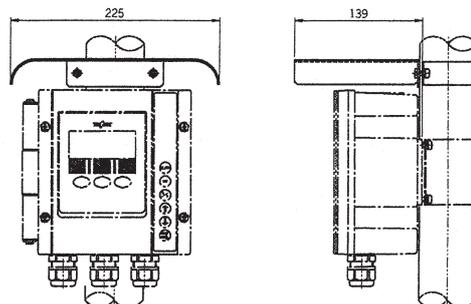


RS-232C Data Protocol

● FBM-160 Hood (Sun Shade)

Recommended if FBM-160 is installed outdoors in direct sunlight.

Material: 304 Series Stainless Steel
Installation: 50A Pipe Mounting
Code No.: 7049930K

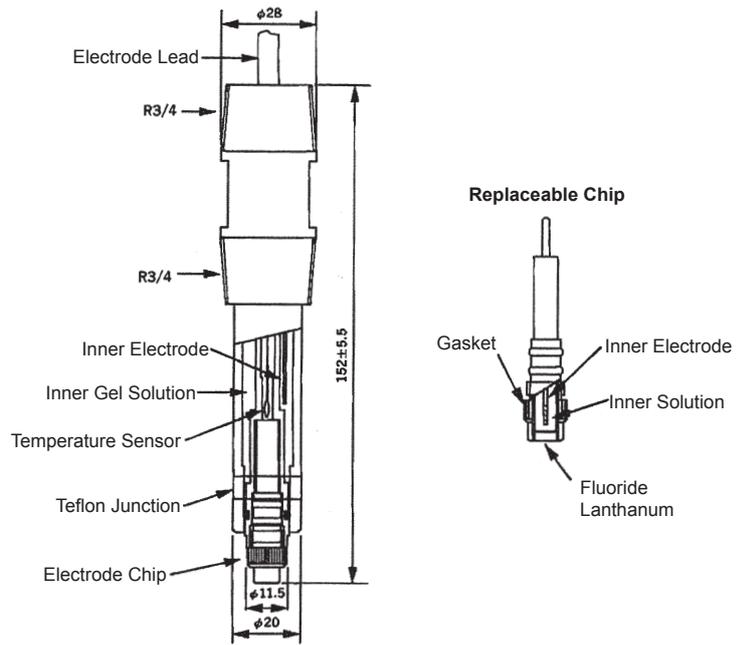


Fluoride Ion Electrode

Construction and Specifications

The electrode comprises a main body made from epoxy resin with a fluoride resin junction and a replaceable electrode chip. The electrode chip includes a sensor membrane (fluoride Lanthanum) and body (epoxy resin). The sensor has a polyethylene guard. This design allows the electrode chip to be easily replaced (for example when membrane quality degrades) without having to change the complete sensor assembly.

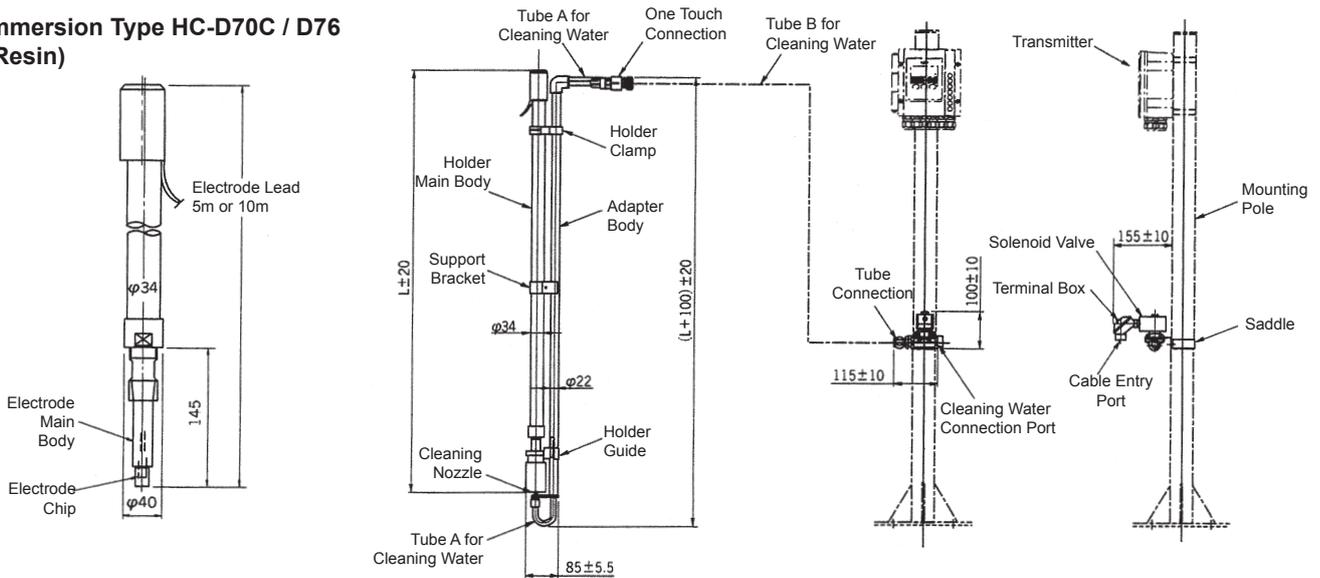
Product Name	ELCP-81- [] F
Sensor Membrane	Fluoride Lanthanum
Measurement Range	0.1~10000 mg/LF ⁻
Allowable Temp. Range	-10 to 50 deg C
Operating Temperatures	-5 ~ 40 deg C
Operating Pressures	0 ~ 0.2 Mpa
Inner Electrode	Silver/ Silver Chloride
Reference Inner Solution	Gel KCL (non supply type)
Junction Materials	Epoxy resin, 4 fluoride ethylene resin, fluoride gum, Delrin
Replaceable Electrode Chip	EL 7208L



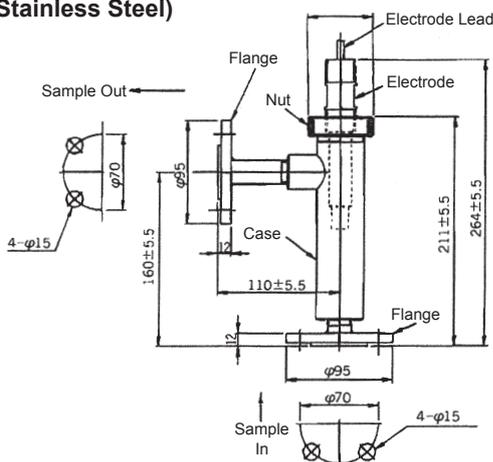
Electrode Holder Dimensions

(Units: mm)

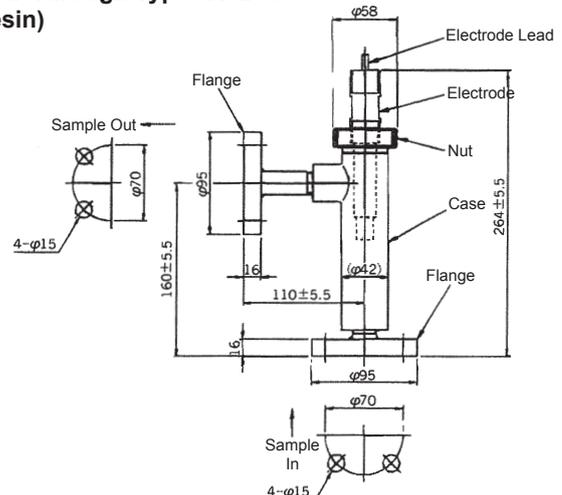
Immersion Type HC-D70C / D76 (Resin)



Flow-Through Type HC-D82 (316 Stainless Steel)



Flow-Through Type HC-D86 (Resin)

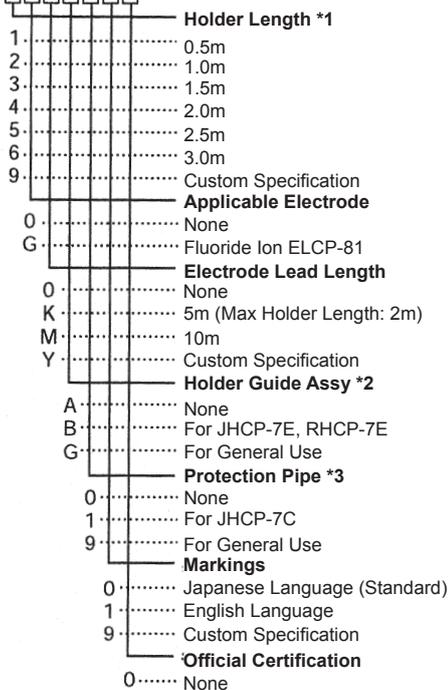


Electrode Holder Product Codes

Immersion Type

- HC-D70C (PVC)
- HC-D70F (PVDF)
- HC-D76 (PP)

HCD70C-2-□□□□□□□□
 HCD70F-2-□□□□□□□□
 HCD76-2-□□□□□□□□



*1
 Recommended maximum holder length for HC-D76 is 3m.

*2
 Required when combining with cleaner and /or mounting bracket for ZN-7.

*3
 Ensure that you select the holder guide assembly and protection pipe for the same type of cleaner.

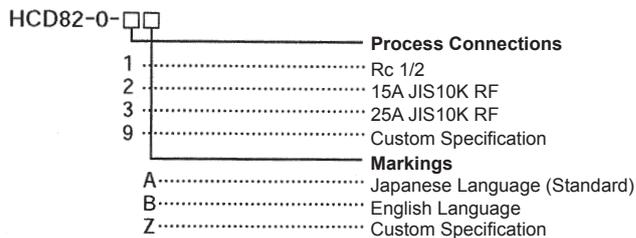
NOTE:
 Operating temperatures for each holder are given below. However, please note that maximum allowable temperature also depends on type of electrode combined with the holder.

Model	Temperature Range
HC-D70C	-5 ~ 60 deg C
HC-D70F	-5 ~ 95 deg C
HC-D76	-5 ~ 80 deg C

Model	Replaceable Chip	Temperature Range
ELCP-81	7208L	-5 ~ 40 deg C

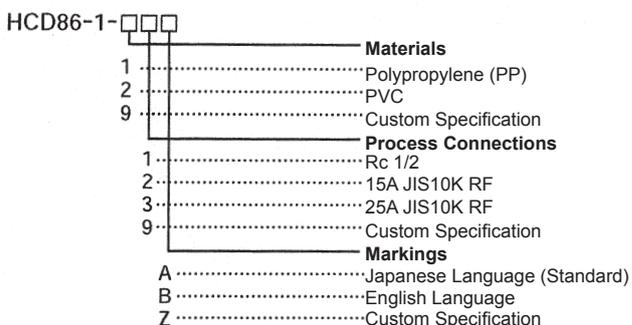
Spare Parts:
 Fluoride ion standard sol., F⁻ 1000mg/L 500mL (p/n 143F077)
 Ion strength adjustment tablet, pH5~AB 500mL (p/n 143A053)

HC-D82 Flow Through Type (316 Stainless Steel)



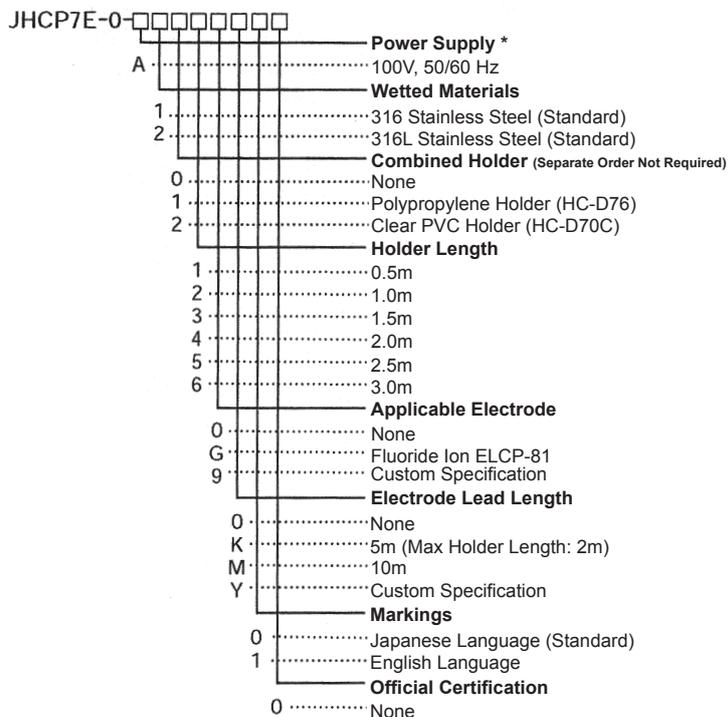
Electrode to be combined needs to be ordered separately.
 ELCP81-0-[JF
 Applicable pressure: 0~0.2 MPa

HC-D86 Flow Through Type (Resin)



Electrode to be combined needs to be ordered separately.
 ELCP81-0-[JF
 Applicable pressure: 0~0.15 MPa

JHCP-7E Immersion Type with Water Jet Cleaning System



* Power for the cleaning system is provided through the transmitter. When operating with power supplies other than 100V, a step down transformer must be separately purchased (Model ZP, 35VA).

