

FLUORIDE ION MONITORS

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 distillation 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.



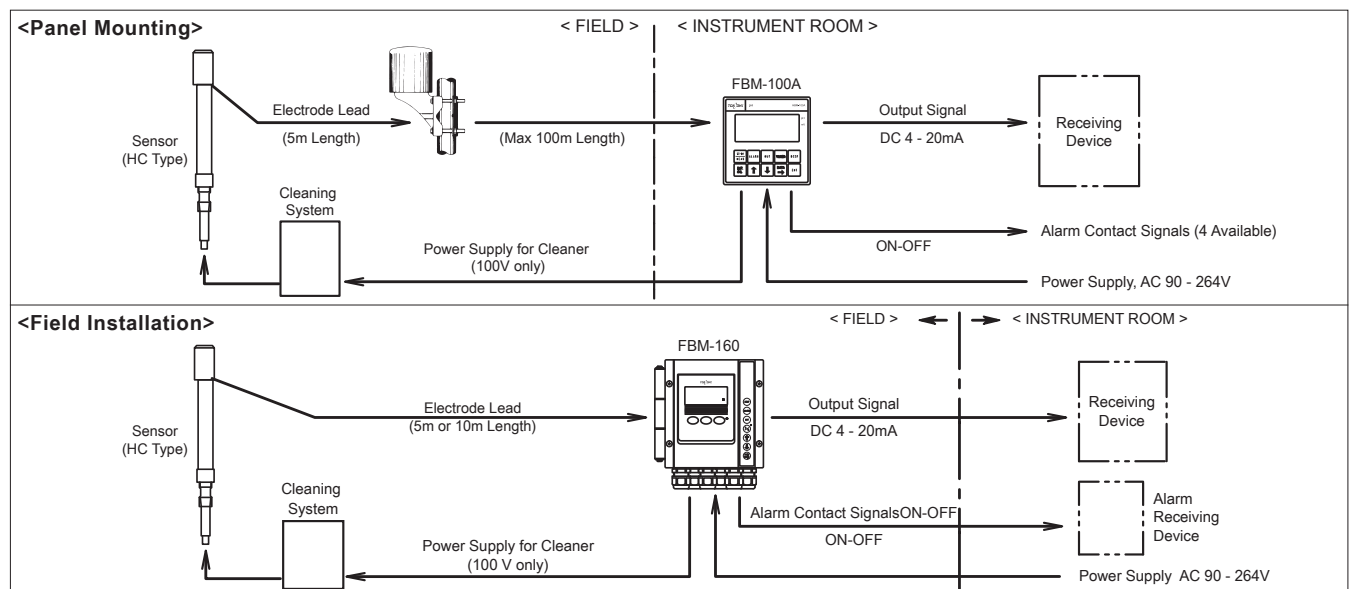
FBM-100A



FBM-160

- Control outputs are available for external electrode cleaners such as water-jet cleaner. The voltage of this driving power source is equal to that of operating power.
- 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.

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 - 99.9mg/L, 0 - 999mg/L or 0 - 9990mg/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 - 20mg/L, 0 - 200mg/L,
 0 - 2000mg/L.
Sample Temperature : 0~50 deg C
Digital Output Signal : RS232C, Asynchronous, half duplex,
 (Option) 9600 Baud. Data transmitted includes ion
 concentration, electrode signal, sample
 temperature, concentration alarms, under
 maintenance, under cleaning, instrument
 fault status etc..
Contact Switching : 4 outputs available (normally open
Outputs 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.

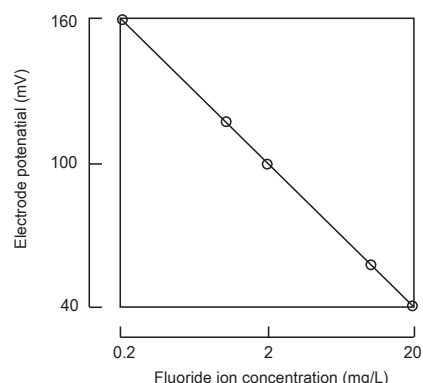
Cleaning System : By the internal timer, driving power source
Control Outputs is periodically supplied to the water jet
 cleaner. The voltage of this driving power
 source is equal to that of operating power.
 Wash circle; 0.1 to 48hours controllable
 Wash time; 1~999seconds controllable
 The number of cleaning pulse; 1 to
 19times controllable
 The waiting time after washing; 0 to
 9.9minutes controllable
Temp Compensation : Fluoride ion electrode is corrected using
 Nernst equation (within 0 to 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 to 5
 Temperature Sensor Error: Displays E-12
 Memory Error: Displays E-20/21Burn 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 to 50 deg C 90% RH or less (no condensation)	-20 to 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 deg C

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 pH 4 - 9 (see Note 1)
 Sample Temperature : To be stable within 0 - 40deg C (see Note 2)
 Sample Conductivity : 50 mS/m (500 microS/cm) or greater
 Flow velocity : 0.01 - 0.2 m/s
 Coexisting : Low values of calcium, aluminium, iron components etc. (see Note 3)

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.

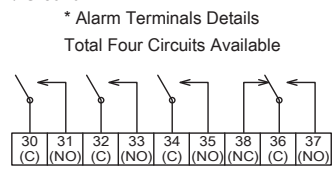
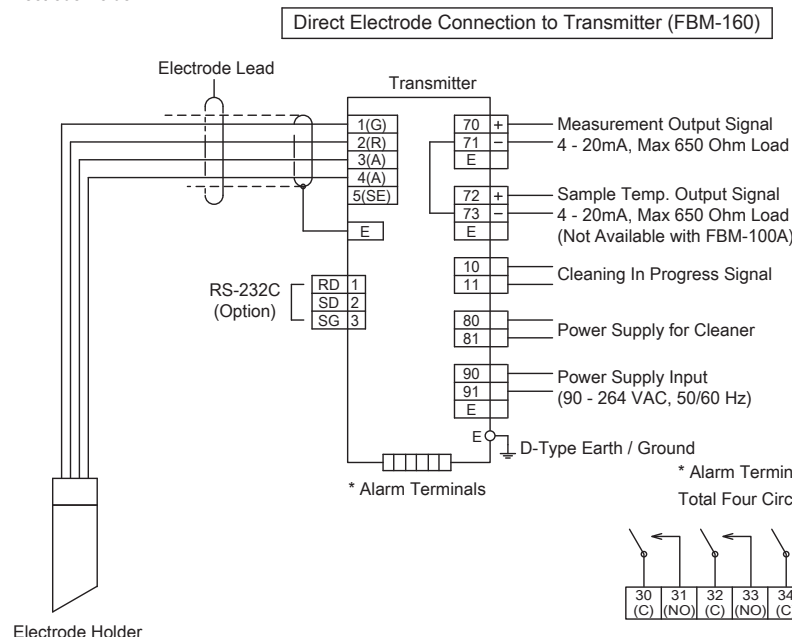
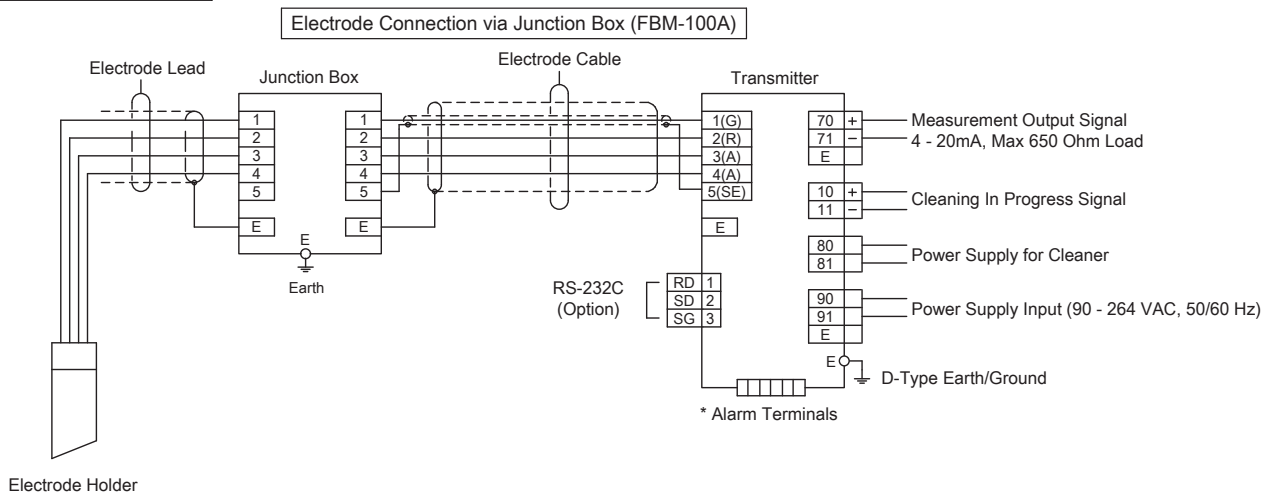
NOTE 2:

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.

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 distillation measurement method. The conventional distillation method measures total fluoride (including the above mentioned compounds by distillation method).

Terminal Connections



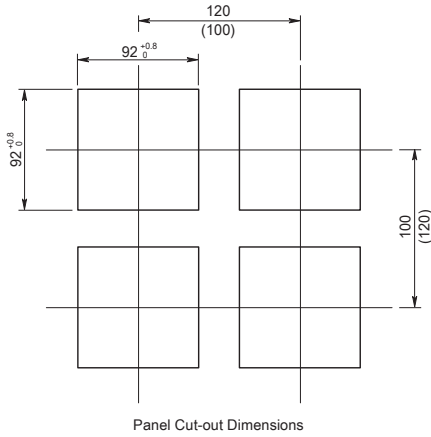
NOTE: Terminal 38 (NC) is only available with FBM-160 transmitter.

Contact rating: 250 VAC, 3A, or 30 VDC, 3A.
 Available Functions: high limit, low limit, under cleaning, under maintenance, meter error.

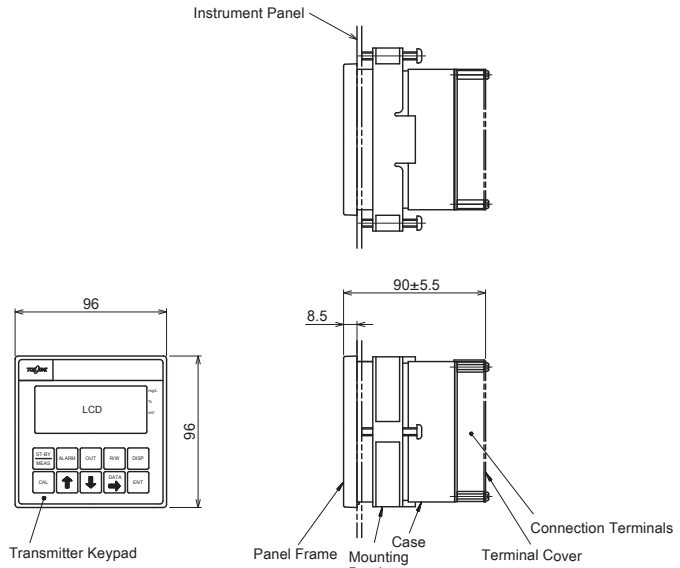
Dimensions

Unit : mm

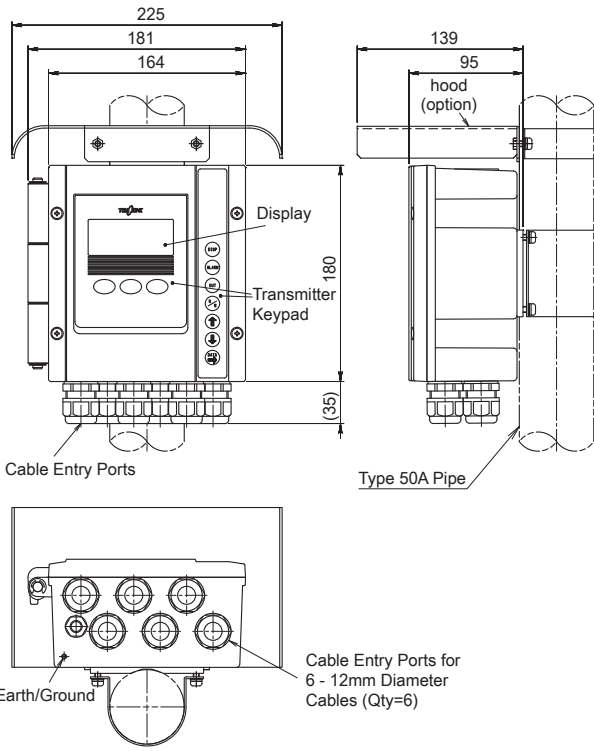
● **FBM-100A Panel Mounting**



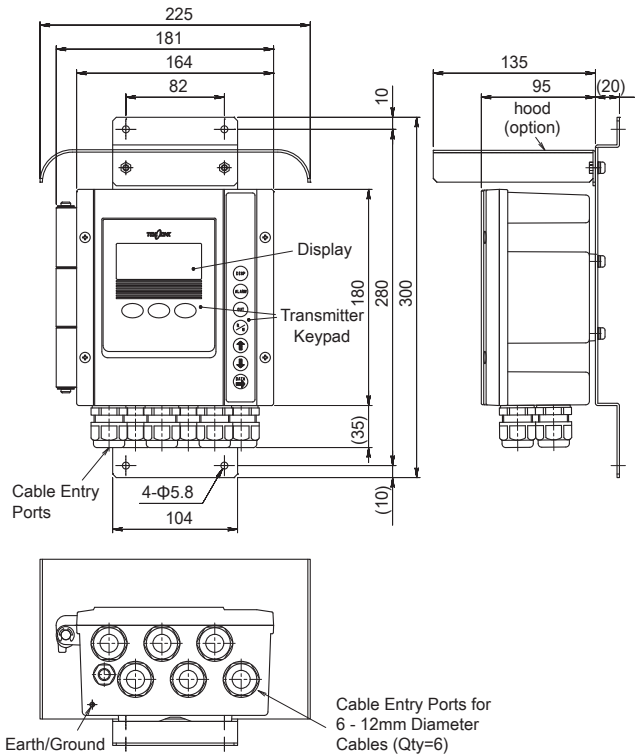
Panel Cut-out Dimensions



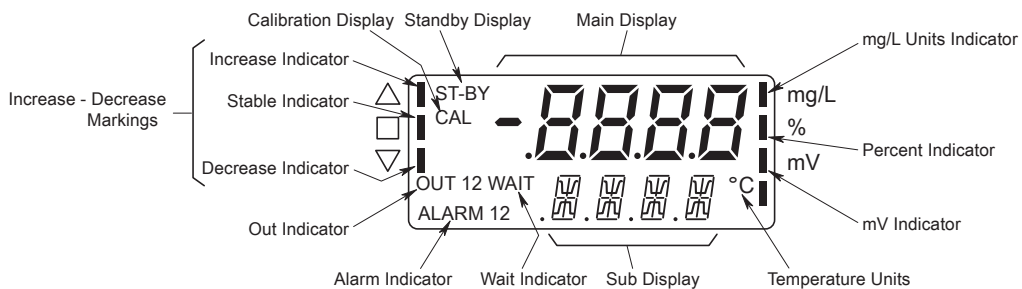
● **FBM-160 Pole Mounting**



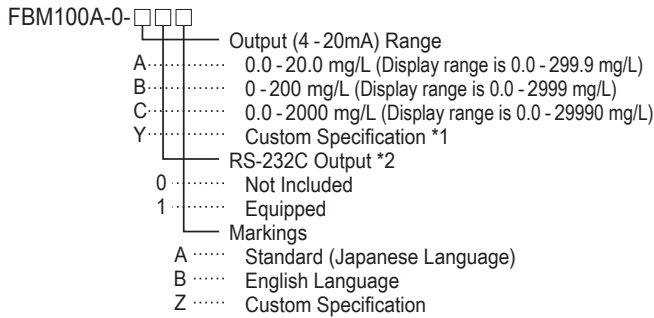
● **FBM-160 Wall or Rack Mounting**



Display Configuration



Product code



- *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 - 5000 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..

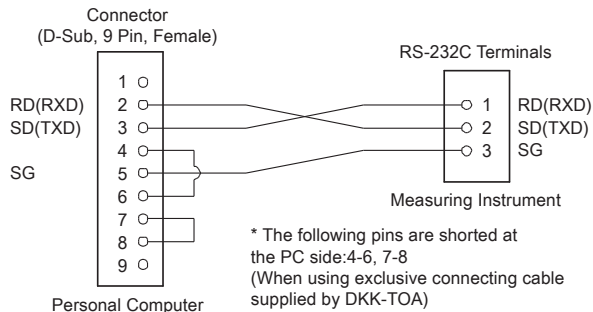
Options

● RS-232C Output

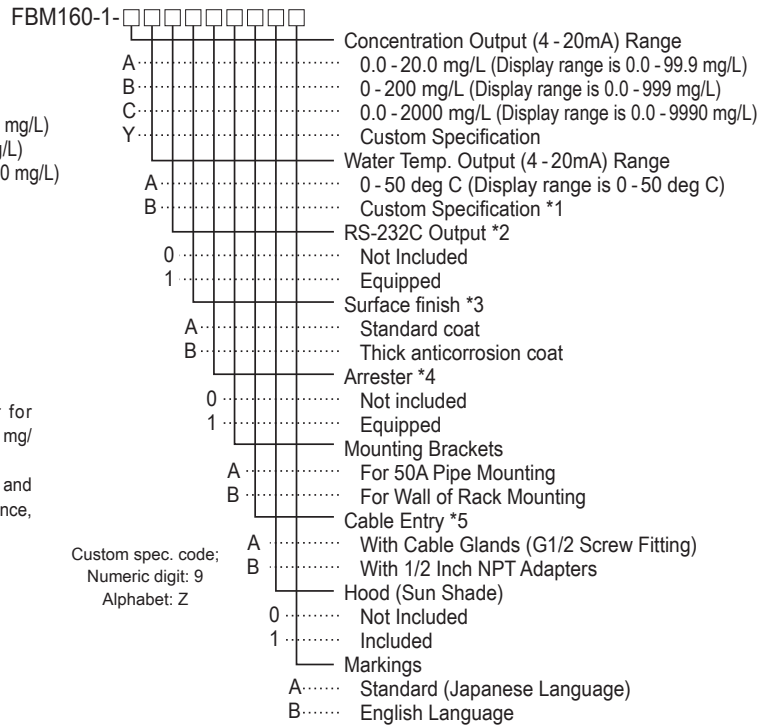
If RS-232C is selected as Equipped then digital data including status alarms etc. is available for download to PC or other RS232C peripheral device.

RS-232C Terminal Connections

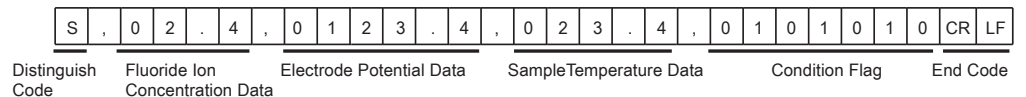
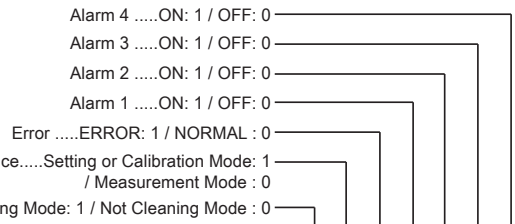
Terminal No	Signal Symbol	Description	Direction
1	RD (RXD)	Receive	Input
2	SD (TXD)	Transmit	Output
3	SG	Ground	



RS-232C Cable Pin Assignment*



- *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..
- *3. Standard coat: Undercoat and topcoat is melamine resin . The average film thickness 30µm or more. The degree of brilliance is G40. Thick anticorrosion coat: Undercoat and middlecoat is epoxy resin. Topcoat is Polyurethane resin. The average film thickness 100µm or more. The degree of brilliance is G80.
- *4. Arrester (easy type) is attached to the power line and the transmission line.
- *5. Wiring port is six ports with Φ6 - 12 cablegland. If you remove this cablegland, the screw for conduit pipe is G1/2.



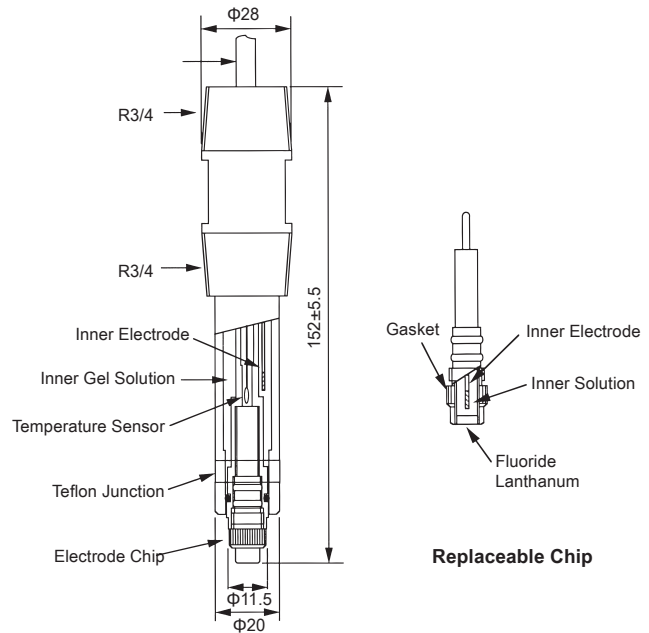
RS-232C Data Protocol

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 to 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

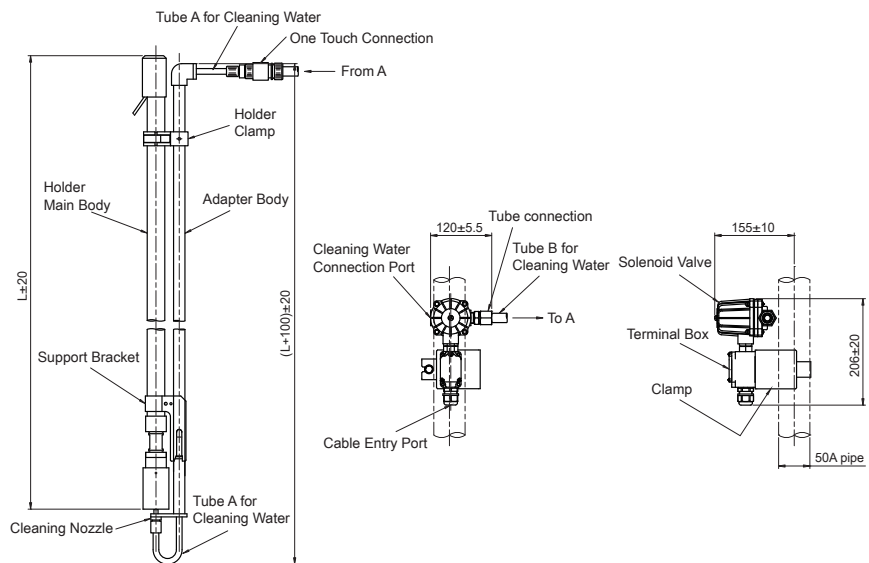
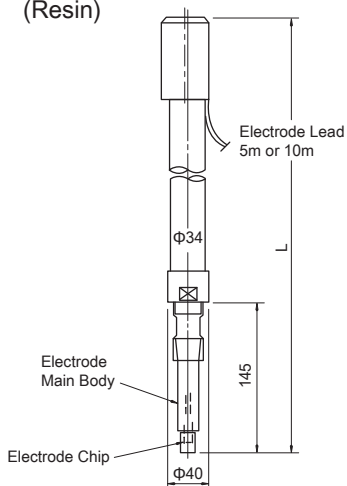


Electrode Holder Dimensions

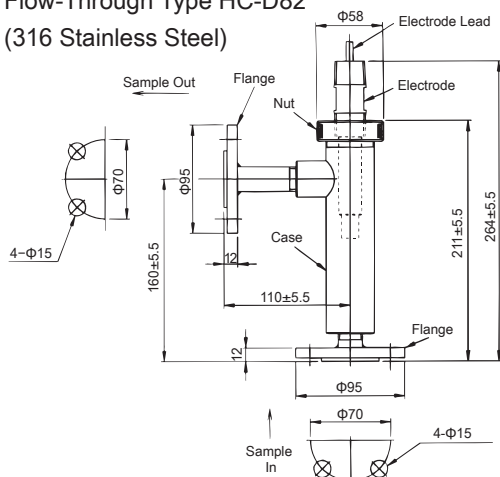
Unit : mm

● Immersion Type with Water Jet Cleaner JHCP-7E

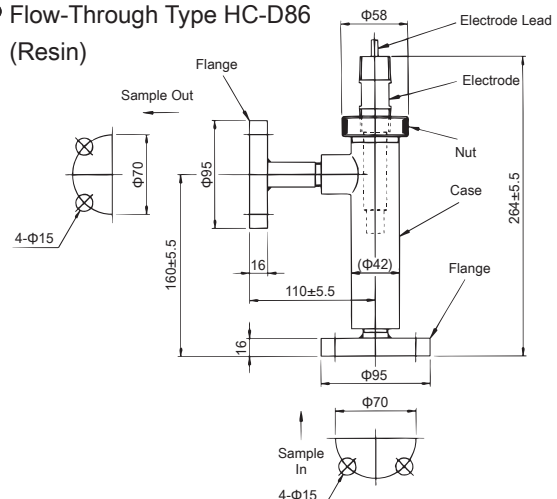
● Immersion Type HC-D70C / D76 (Resin)



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



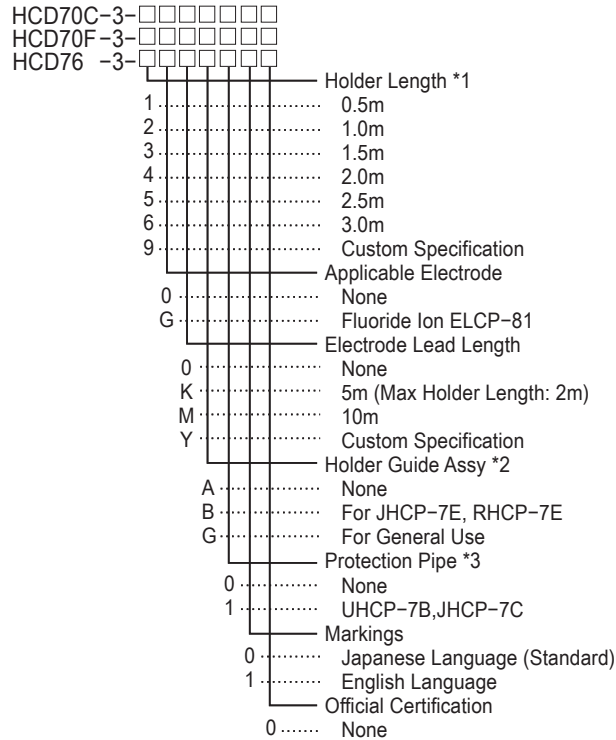
● Flow-Through Type HC-D86 (Resin)



Electrode Holder Product Codes

Immersion Type

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



*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 to 60 deg C
HC-D70F	-5 to 95 deg C
HC-D76	-5 to 80 deg C

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

Spare Parts:

Undiluted solution for calibration solution adjustment (According to the instruction manual, please use the undiluted solution by adding ion strength adjustment tablet to Fluoride ion standard sol. and diluting with water.)

Fluoride ion standard sol., F- 1000mg/L 500mL (p/n 143F077)

Ion strength adjustment tablet, pH5~AB 500mL (p/n 143A053)

Standard sol for calibration:

• Standard sol with ion strength adjustment tablet
 (Please use the standard sol as it is.)

• Fluoride ion standard sol., F-2mg/L 500mL (P/N:6507970K)

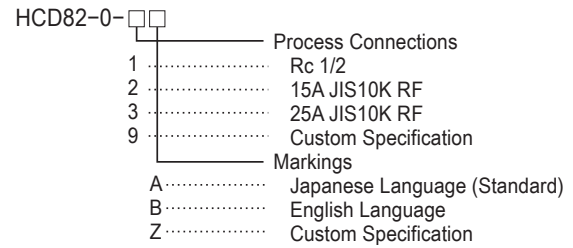
• Fluoride ion standard sol., F-20mg/L 500mL (P/N:6507980K)

• Fluoride ion standard sol., F-200mg/L 500mL (P/N:6511190K)

• Fluoride ion standard sol., F-2000mg/L 500mL (P/N:6511200K)

• Fluoride ion standard sol., F-3000mg/L 500mL (P/N:6511220K)

HC-D82 Flow Through Type (316 Stainless Steel)

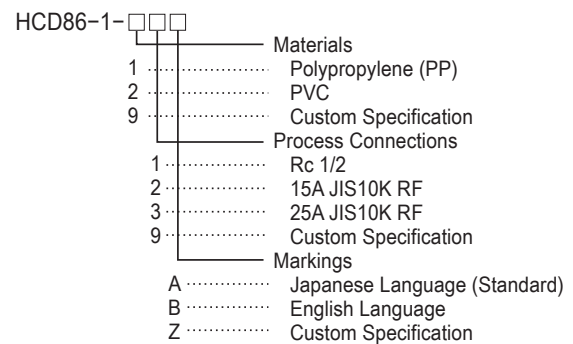


Electrode to be combined needs to be ordered separately.

ELCP81-0-[JF]

Applicable pressure: 0~0.2 MPa

HC-D86 Flow Through Type (Resin)

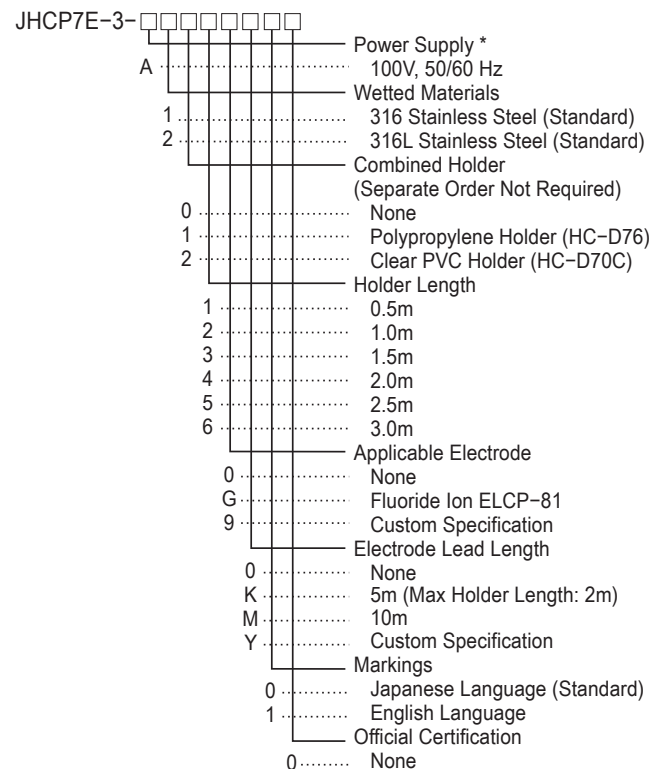


Electrode to be combined needs to be ordered separately.

ELCP81-0-[JF]

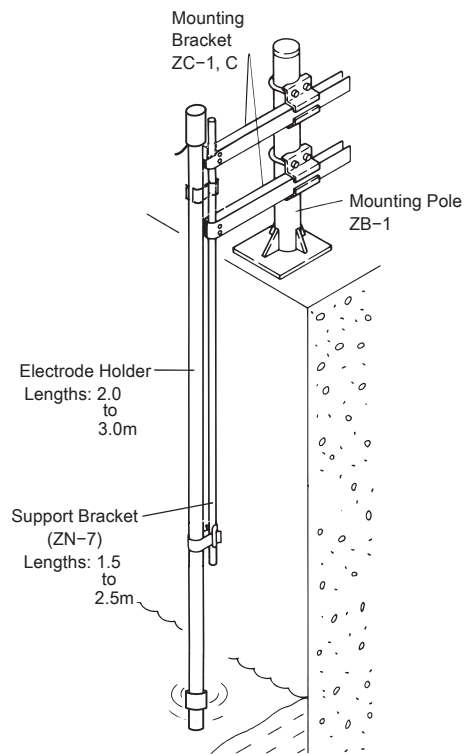
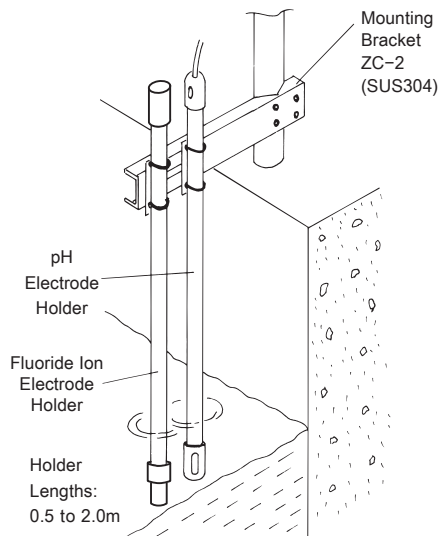
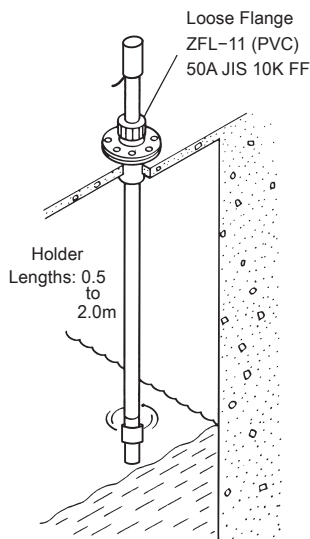
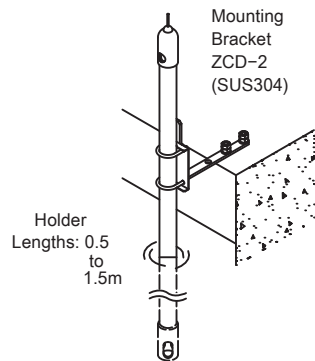
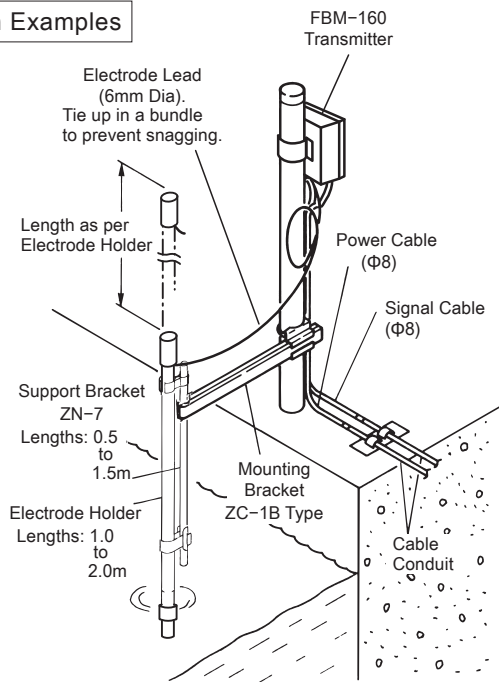
Applicable pressure: 0~0.15 MPa

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).

Installation Examples



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Please read the operation manual carefully before using products.