SPECIFICATION SHEET

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.

FBM-100A

FBM-160

Features

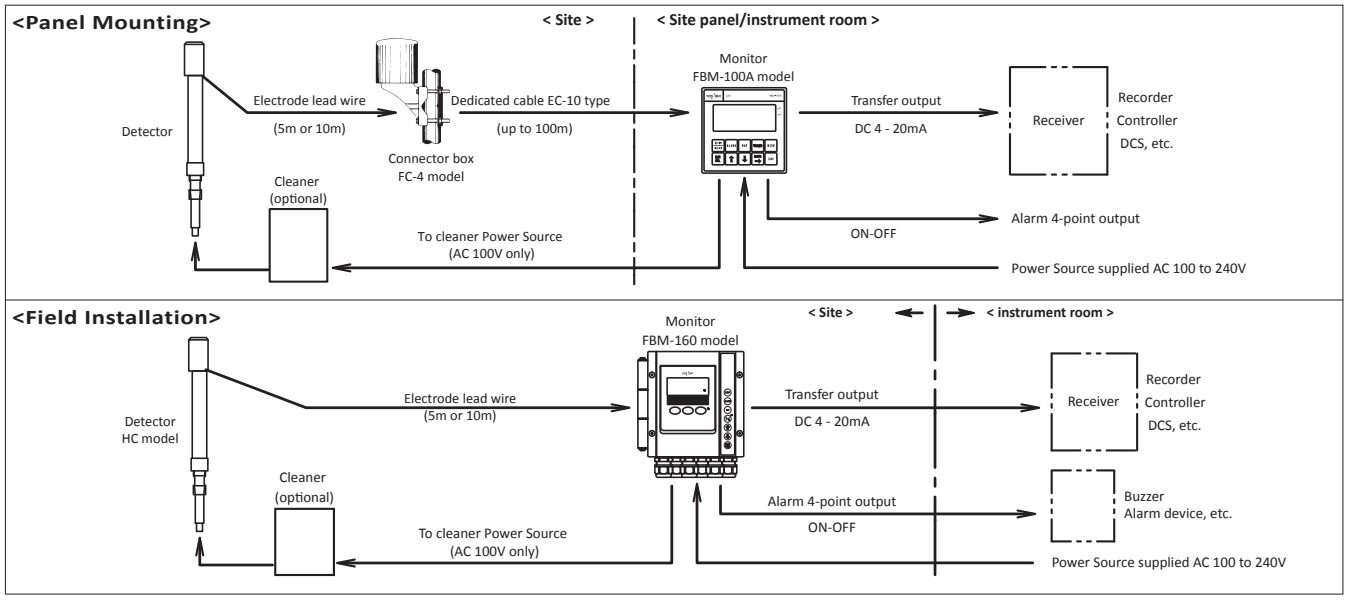
○Rapid response: If the sample is low in impurities, it detects Concentration as low as 2mg/L in about 60 seconds (90% response).

○Typical Range is low, medium, and high (0 to 20, 200, and 2000mg/L). You can specify from three ranges.

○4-point alarms: In addition to the upper and upper limits of Concentration, instrument failure and Power Source Contacts for interruption (FMB-160 type only), cleaning, maintenance, etc. can be outputted. Concentration alarms can be set to any sensitivity and delay time.

○Washer control output: circumference of water jet washer (option)
Outputs 100 VAC Power Source to be operated temporally.

Composition diagram



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 to 99.9mg/L, 0 to 999mg/L or 0 to 9990mg/L
Output Signal : 4 to 20mA DC, isolated, 650 Ohm Load
Output Range : Adjustable within measurement range (minimum 1/10 F.S.).
Factory settings; 0.0 to 20mg/L, 0 to 200mg/L, 0 to 2000mg/L.
Sample Temperature : 0 to 50 deg C
Alarm function :
And Force ... 4 circuitry; Alarm1 to 3 make contacts (a contact) Alarm4 transfer contact (c-contact)
Contact capacity ... AC 250V 3A (resistive load) or DC 30V 3A (resistive loading)
Aircraft Efficiency ... Can be selected from upper/lower limit alarm, cleaning, maintenance, or instrument failure.
Bandwidth and action delay time can be set for upper/lower limit alarms.
*For FBM-160 type, one of the circuits can output a closed contact signal with Power Source disconnection at the transfer contact (contact 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..
Cleaner control output : Periodically supplies a driving power source (AC 100V 2A or less) to the water-jet cleaner with an internal timer. Wash cycle 0.1 to 48.0 hours variable
Cleaning time 1 to 999 seconds Variable
Variable cleaning pulse number 1 to 19 times Variable
Wait time after washing 0.0 to 99.9 min variable
Temp Compensation : Fluoride ion electrode is corrected using Nernst equation (within 0 to 40 deg C of sample temperature).
Performance : ± within 8% FS (without detector)
Linearity (With calibration solution)
Repeatability... electrode is used to measure the sample water. However, Repeatability is approximately ±30%.
90% response time: Within 15 seconds (without detector)
Within 60 seconds (detector combination)
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 to 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)
Material and Finish	Main unit: Aluminum Display Part: Polyester-resin Aluminum ground color Display part: light yellow	Aluminum die cast polyester resin Painting Color: Metallic Silver
Cable entry	–	G1/2 x 6 (with 6 to 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	None	Adjustable in 10 deg C widths with 1 deg C units. Factory setting 0.0 to 50.0 deg C

Sampling water conditioncondition

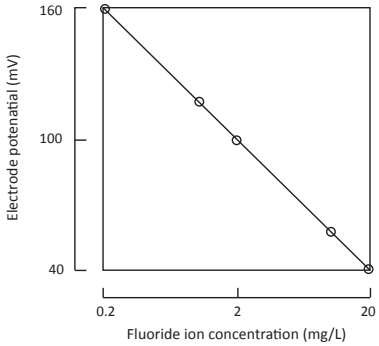
pH : Less variable at pH4 to 9.. Note 1
Temperature: : Less variable at 0 to 40 °C.. Note 2
Electrical conductivity : 50 mS/m (500μS/cm) or more
Flow rate : 0.01 to 0.2m/s
Co-existing ingredients : No large amounts of calcium, aluminum, iron, etc. are contained... Note 3

Note 1.
Fluorine is present as a HF-molecule (not ionized) at pH4 or below, so this monitor cannot be detected. Above pH9, the OH-ion will have a greater effect, resulting in a higher indication. In addition, if the pH fluctuates greatly, the state of the fluorine compound may change and the fluoride ion may be liberated, or conversely, it may change to a compound that cannot be detected, so we recommend using it in a place where the pH fluctuates as little as possible.
NOTE 2:
Fluorine, which is precipitated in the form of calcium fluoride, is partially dissolved due to the change in the sample water temperature, and becomes fluoride ion. This may cause a change in the indicator value. Therefore, it is recommended to measure at a constant Temperature at 40°C or below as much as possible.
NOTE3:
Calcium, aluminum, iron, etc. combine with fluorine to form a compound different from fluoride ion. Since such compounds cannot be detected by this monitor, they are lower than JIS method (by distilling and measuring the total fluorine by decomposing the above compounds).

Measurement Principle

The fluoride electrode generates a constant electromotive force depending on Concentration of the fluoride ion in the solution. This relation is shown in the graph on the right. The electromotive force of the electrode is linearly related to the logarithm of the fluoride ion Concentration.

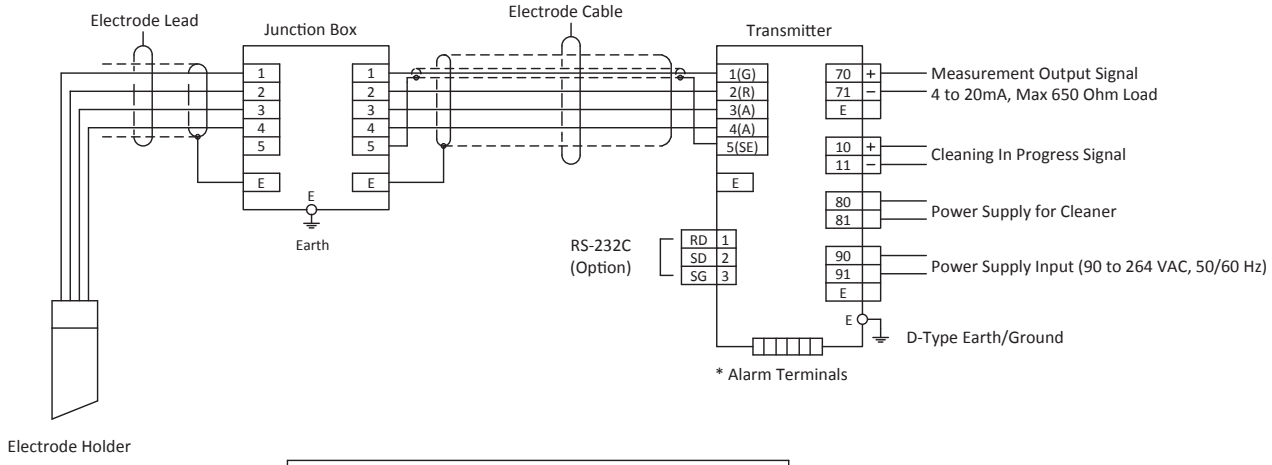
If the instrument is calibrated using a reference solution in advance, the fluoride-ion Concentration can be measured simply by immersing the sensor in the sample.



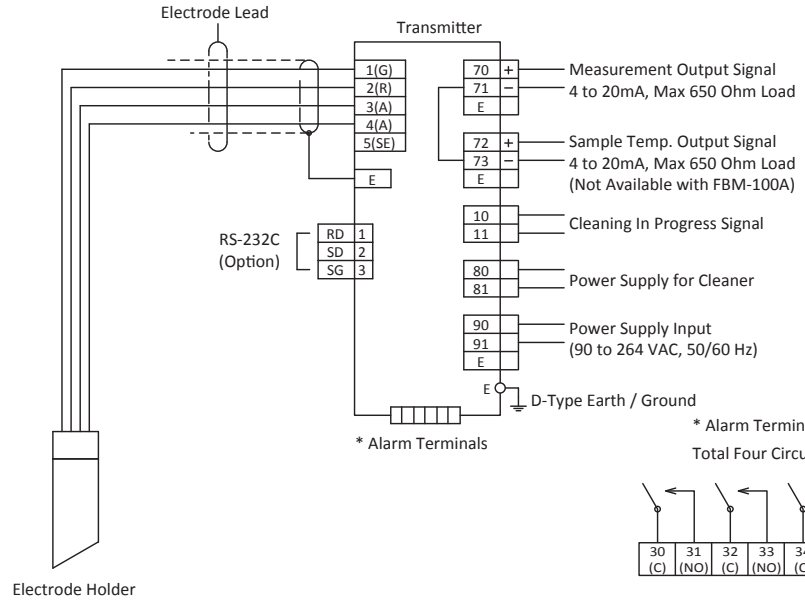
●Fluoride Ion The relation between Concentration and electromotive force of an electrode

Terminal Connections

Electrode Connection via Junction Box (FBM-100A)

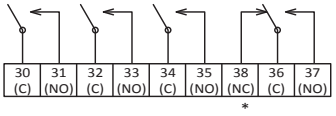


Direct Electrode Connection to Transmitter (FBM-160)



* Alarm Terminals Details

Total Four Circuits Available



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

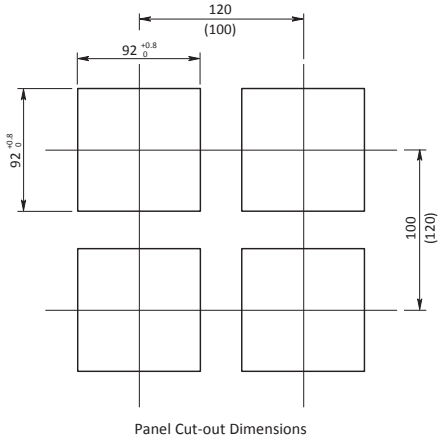
Contact rating: 250 VAC, 3A, or 30 VDC, 3A.

Available Functions: high limit, low limit, under cleaning, under maintenance, meter error.

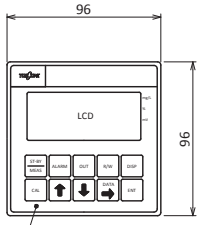
Dimensions

Unit : mm

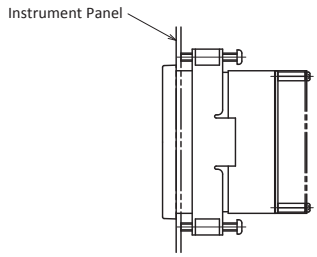
● FBM-100A Panel Mounting

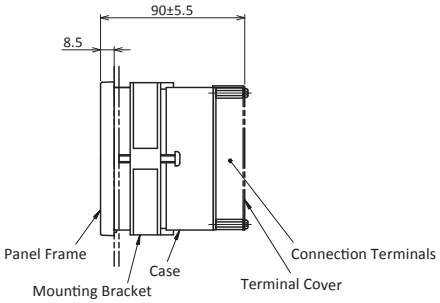


Panel Cut-out Dimensions

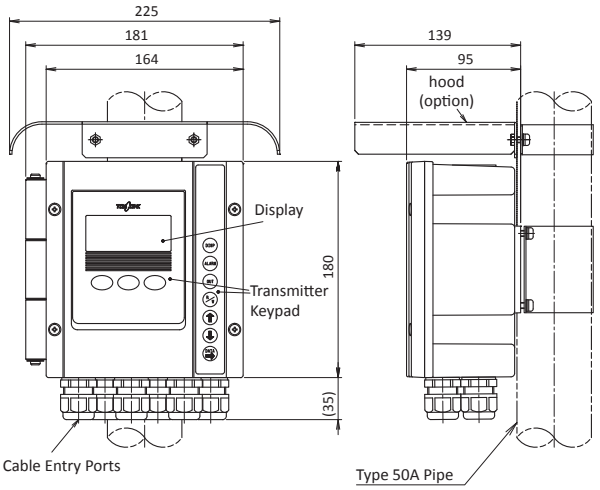


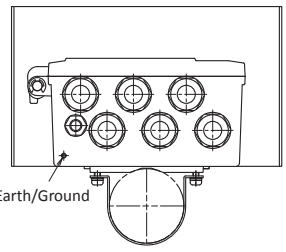
Transmitter Keypad



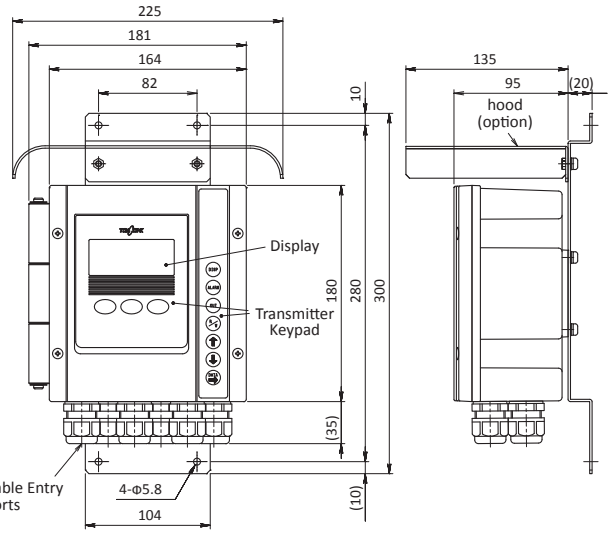


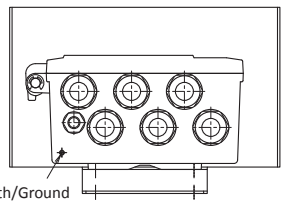
● FBM-160 Pole Mounting



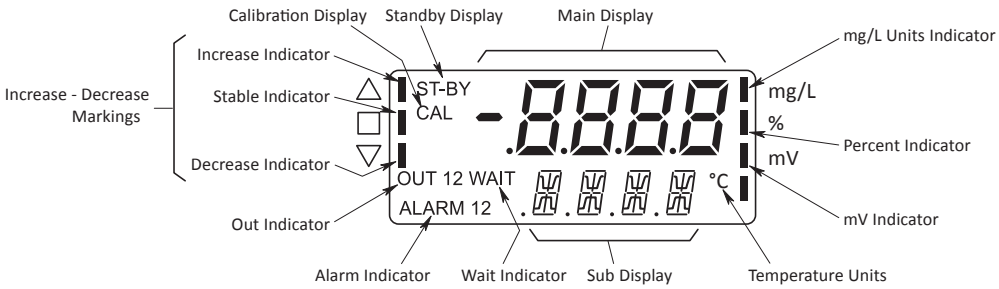


● FBM-160 Wall or Rack Mounting





Display Configuration



Product code

FBM100A-0-□□□

- Output (4 to 20mA) Range
  - A: 0.0 to 20.0 mg/L (Display range is 0.0 to 99.9 mg/L)
  - B: 0 to 200 mg/L (Display range is 0.0 to 999 mg/L)
  - C: 0 to 2000 mg/L (Display range is 0.0 to 9990 mg/L)
  - Y: Custom Specification *1
- RS-232C Output *2
  - 0: Not Included
  - 1: Equipped
- Markings
  - A: Standard (Japanese Language)
  - B: English Language

*1. If specified otherwise, please let us know about 1/10FS or more of each of the three types of measured Display Range.
< Example > 0 to 10 mg/L 0 to 50 mg/L 0 to 100 mg/L 0 to 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..

FBM160-1-□□□□□□□□□

- Concentration Output (4 to 20mA) Range
  - A: 0.0 to 20.0 mg/L (Display range is 0.0 to 99.9 mg/L)
  - B: 0 to 200 mg/L (Display range is 0.0 to 999 mg/L)
  - C: 0 to 2000 mg/L (Display range is 0 to 9990 mg/L)
  - Y: Custom Specification *1
- Water Temp. Output (4 to 20mA) Range
  - A: 0 to 50 deg C (Display range is 0 to 50 deg C)
  - B: Custom Specification *1
- RS-232C Output *2
  - 0: Not Included
  - 1: Equipped
- Surface finish *3
  - A: Standard coat
  - B: Thick anticorrosion coat
- Arrester *4
  - 0: Not included
  - 1: Equipped
- Mounting Brackets
  - A: For 50A Pipe Mounting
  - B: For Wall of Rack Mounting
- Wiring opening for power supply / transfer / signal cables *5
  - A: Cable gland for φ6 to φ12
  - B: Wire tube screw G1/2 when cable gland is removed.
  - C: NPT1/2 (6 adapters included)

Custom spec. code;
Numeric digit: 9
Alphabet: Z

- Hood (shade)
  - 0: None
  - 1: With (50A pipe-mounted) (cord No.7049930K)
  - 2: Equipped (wall installation) (code No.: 69304500)
- Markings
  - A: Standard (Japanese Language)
  - B: English Language

*1. Measurement of Concentration and liquid temperature, respectively, when "Other designation" is specified.
Notify us of the constant Display Range of 1/10FS or more.
<Example> 0 to 10mg/L 0 to 50mg/L
0 to 100mg/L 0 to 30deg C

*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 to 12 cablegland. If you remove this cablegrand, the screw for conduit pipe is G1/2.

Options

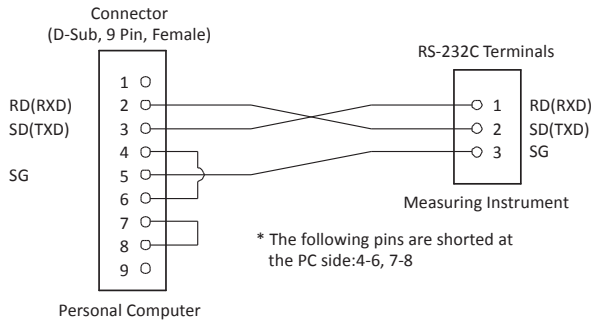
● RS-232C Output

When RS-232C output is "present", it is RS-232C to the terminal part.

The communication terminal is added, and the digital data of measurement values and various alarms can be captured to a computer.

RS-232C Terminal Connections

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



Composition of dedicated communication cable*

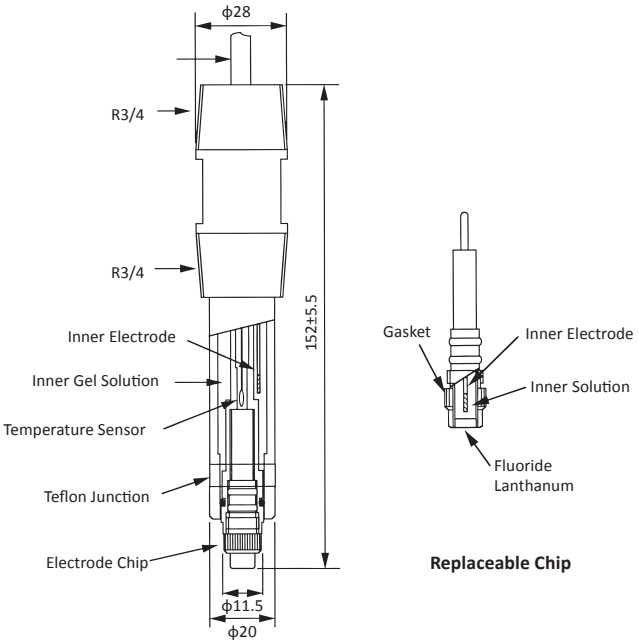
*FBM-160 type is this terminal block, but FBM-100A type is a connector.
(NOTE) The length of the communication cable is 10m or less.

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.

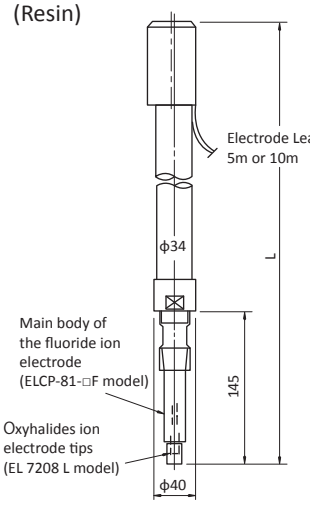
Product Name	ELCP-81- [ ] F
Sensor Membrane	Fluoride Lanthanum
Measurement Range	0.1 to 10000 mg/LF¯
Allowable Temp. Range	-10 to 50 deg C
Operating Temperatures	-5 to 40 deg C
Operating Pressures	0 to 0.2 Mpa
Inner Electrode	Silver/ Silver Chloride
Reference Inner Solution	Gel KCL (non supply type)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



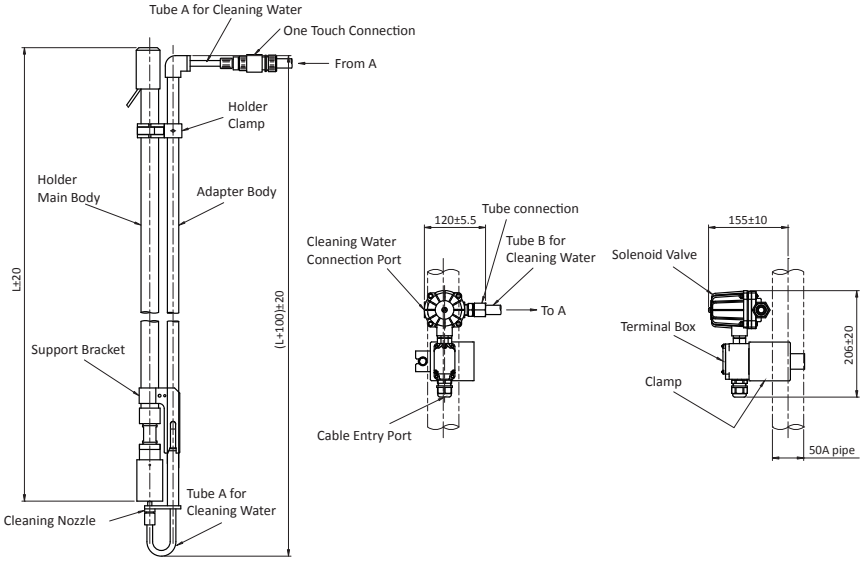
Electrode Holder Dimensions

Unit : mm

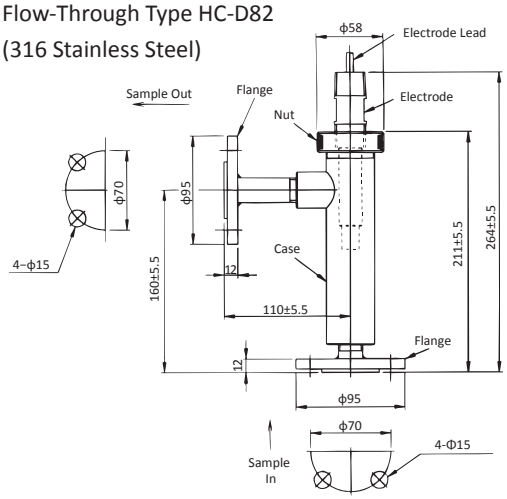
● Immersion Type HC-D70C / D76 (Resin)



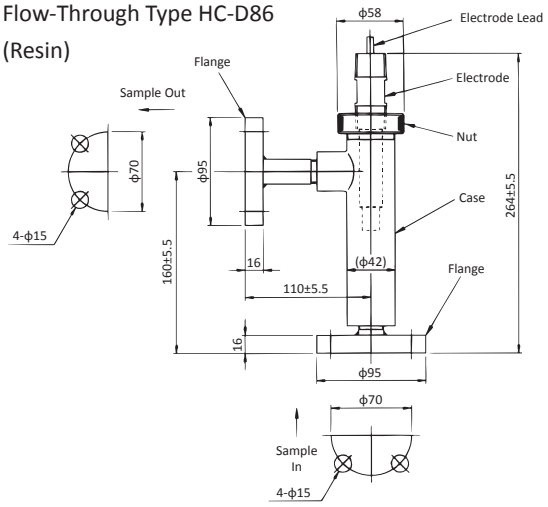
● Immersion Type with Water Jet Cleaner JHCP-7E



● 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−3−□□□□□□□
HCD70F−3−□□□□□□□
HCD76 −3−□□□□□□□

- Holder Length *1
  - 1 ····· 0.5m
  - 2 ····· 1.0m
  - 3 ····· 1.5m
  - 4 ····· 2.0m
  - 5 ····· 2.5m
  - 6 ····· 3.0m
  - 9 ····· Custom Specification
- Applicable Electrode
  - 0 ····· None
  - G ····· Fluoride Ion ELCP−81★
- Electrode Lead Length
  - 0 ····· None
  - K ····· 5m (Max Holder Length: 2m)
  - M ····· 10m
  - Y ····· Custom Specification
- Holder Guide Assy *2
  - A ····· None
  - B ····· For UHCP−7B,RHC−7A,JHCP−7E, RHCP−7E
  - G ····· For General Use

Last number of numerical sequence: 9

Last character of alphabetical sequence: Z

- Protection Pipe *3
  - 0 ····· None
  - 1 ····· UHCP−7B, JHCP−7C
- Markings
  - 0 ····· Japanese Language (Standard)
  - 1 ····· English Language
- Official Certification
  - 0 ····· None

★ Examination unavailable

*1. Holder length of HC-D76 type is up to 3m (due to large deflection).
*2. Required when combining with ZN-7 type and indicating mounting bracket.
*3. With the holder guide assay ensure that you select holder guide assay and protective tube for the same washer..
NOTE: With the holder guide assay ensure that you select holder guide assay and protective tube for the same washer.

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

<Standard solution for calibration>
- Ionic Strength Adjuster added reference solution (Use as the calibration solution. Correct value upon dilution. You cannot get it.)
- Fluoride Ion Standard Solution F¯2 mg/ L 500mL (Code No.6507970K)
- Fluoride Ion Standard Solution F¯20mg/L 500mL (Code No.6507980K)
- Fluoride Ion Standard Solution F¯200mg/L 500mL (Code No.6511190K)
- Fluoride Ion Standard Solution F¯2000mg/L 500mL (Code No.6511200K)
- Fluoride Ion Standard Solution F¯3000mg/L 500mL (Code No.6511220K)

<Calibration solution preparation stock solution>
(Add Ionic Strength Adjuster to the fluoride-ion standard solution according to Manual and dilute with water to adjust the calibration solution of the specified Concentration.)
- Fluoride Ion Standard Solution F¯1000mg/L 500mL (Code No.143F077)
- Ion strength preparation pH5-AB 500 mL (Code No.143A053)

HC-D82 Flow Through Type (316 Stainless Steel)

HCD82−0−□□

- Process Connections
  - 1 ····· Rc 1/2
  - 2 ····· 15A JIS10K RF
  - 3 ····· 25A JIS10K RF
  - 9 ····· Custom Specification
- Markings
  - A ····· Japanese Language (Standard)
  - B ····· English Language
  - Z ····· Custom Specification

Please arrange separately for combination electrode ELCP81-0-□F MOP :0 to 0.2 MPa

HC-D86 Flow Through Type (Resin)

HCD86−1−□□□

- Materials
  - 1 ····· Polypropylene (PP)
  - 2 ····· PVC
  - 9 ····· Custom Specification
- Process Connections
  - 1 ····· Rc 1/2
  - 2 ····· 15A JIS10K FF
  - 3 ····· 25A JIS10K FF
  - 9 ····· Custom Specification
- Markings
  - A ····· Japanese Language (Standard)
  - B ····· English Language
  - Z ····· Custom Specification

Please arrange separately for combination electrode.
ELCP81-0-□F Operating pressure :0 to 0.15 MPa

JHCP-7E Immersion Type with Water Jet Cleaning System

JHCP7E−3−□□□□□□□□□

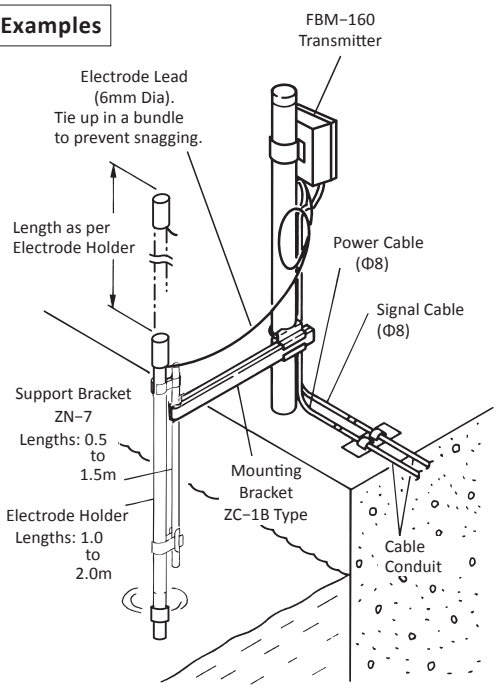
- Power Supply *1
  - A ····· 100V, 50/60 Hz
- Wetted Materials
  - 1 ····· 316 Stainless Steel (Standard)
  - 2 ····· 316L Stainless Steel
- Combined Holder (Separate Order Not Required) *2
  - 0 ····· None
  - 1 ····· Polypropylene Holder (HC−D76)
  - 2 ····· Clear PVC Holder (HC−D70C)
- Holder Length *3
  - 1 ····· 0.5m ↑ detector is determined.
  - 2 ····· 1.0m
  - 3 ····· 1.5m
  - 4 ····· 2.0m
  - 5 ····· 2.5m
  - 6 ····· 3.0m
- Applicable Electrode
  - 0 ····· None
  - G ····· Fluoride Ion ELCP−81★ (Brush was not possible)
- Electrode Lead Length *2
  - 0 ····· None
  - K ····· 5m (Max Holder Length: 2m)
  - M ····· 10m
  - Y ····· Custom Specification
- Markings
  - 0 ····· Japanese Language (Standard)
  - 1 ····· English Language
- Official Certification
  - 0 ····· None

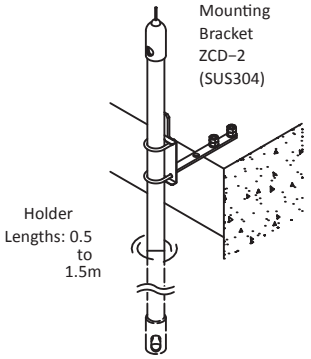
Code of special specification
Numeric digits: 9
Alphabetic digits: Z

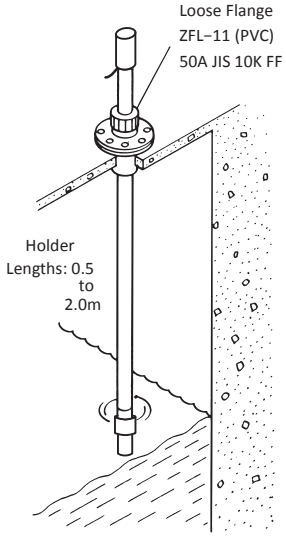
★ Examination unavailable

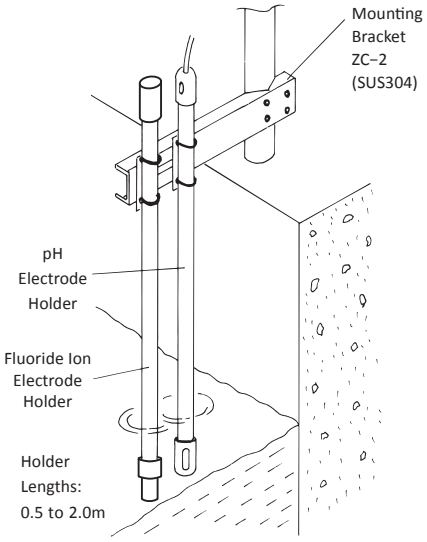
*. Power Source fed to the detector via an FBM-type monitor. For Power Source greater than or equal to AC 100V, an antihypertensive trans (ZP:35VA) is required between the FBM-type and the detector. (Separately installed)

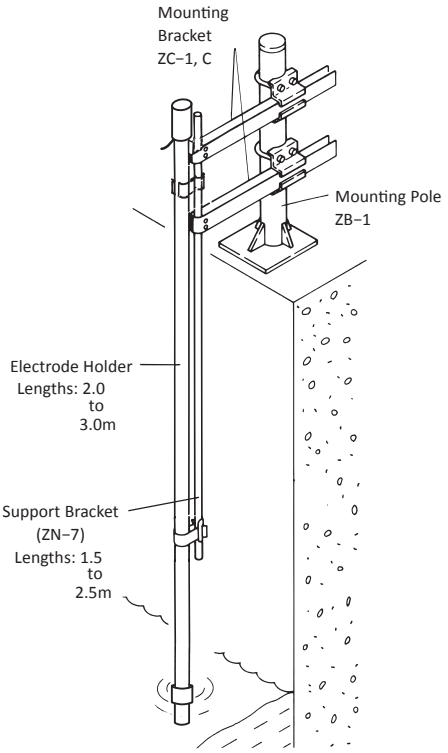
Installation Examples











DKK-TOA CORPORATION

⚠ CAUTION Please read the operation manual carefully before using producuts.

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