SPECIFICATION SHEET

Fluoride Ion Monitor FMS-4

This device is a fluoride ion monitor with automatic calibration and automatic cleaning functions. It employs a simple measurement method using an ion selective electrode (non-distillation measurement), making it suitable for continuous monitoring of water quality in factory wastewater, rivers, and lakes.

Conventional method for measuring the total amount of fluorine requires distillation. This is a time-consuming process and must be performed by a highly skilled operator.

By eliminating the distillation process, this model is able to continuously measure the concentration of fluoride ion by mixing an ionic strength adjuster with the sample water, the influence of coexisting components in the sample water is suppressed, and stable measurement values are ensured by keeping the ionic strength and pH constant.

Features

○A reduction by half of reagent consumption compared with the previous model.

By stabilizing the flow rates of reagents and samples and reducing the internal volume of the measurement cell, we reduced the consumption of ionic strength adjusters and samples to 1/2 of that of our conventional model (FMS-3) without compromising performance such as responsiveness.

This also reduced the volume of waste liquid, lowering running costs and environmental impact.

○Space-saving design

By reducing reagent consumption, we downsized the reagent tanks installed inside the instrument, thereby making the entire instrument more compact.

Furthermore, the front-access maintenance structure has significantly reduced the installation space required.

○Supports various measurement data output methods

Measurement data is output via analog transmission output and digital communication output (Modbus/RTU).

Data can also be recorded to a USB flash drive in CSV format for up to approximately one year.

An optional recorder can be installed to enable recording on chart paper.

○Compliance and certification marks (CE, cCSAus)

Some specifications of certified products differ from standard specifications. Some options are not supported. Please contact us for details.

Standard Specifications

Product name	: Fluoride ion monitor
Model	: FMS-4
Measurement method	: Ion selective electrode method (Ionic strength adjuster mixing method)
Measurable range	: 0.1 to 1000 mg/L
Measurement range	: 0.10 to 10.00 mg/L (standard) 0.20 to 20.00 mg/L 1.0 to 100.0 mg/L 10 to 1000 mg/L
Repeatability	: Less than ±10% of read value (with Hi, Lo calibration solution)
Response	: 15 minutes or less at 90% response (after pre-treatment tank)
Temperature compensation	: Constant temperature measurement method * Can be used together with the temperature compensation function
Measurement method	: Continuous measurement and intermittent measurement (minimum interval; 1 hour)
Automatic calibration	: Periodic calibration with a fixed period or period adjusted by ACAS (Automatic Calibration Cycle Adjustment System) Interval; 1 to 99 days (Initial; 7 days)
Automatic wash	: Periodic wash ● Wash sample line and measurement cell by acid ● Wash sample line by city water Interval; 1 to 999 hours (Initial; 8 hours)
Display	: Color LCD touch screen (7 inch)
Measurement point	: 1 channel
Analog output	: Linear output, 4 to 20 mA DC, Load resistance; 600Ω or less

External contact output : 10 points (9 NO contacts, 1 NC contact)
Power off (NC contact), Failure 1 (serious), Failure 2 (minor), Concentration higher alarm, Concentration high alarm, Concentration low alarm, Under calibration, Under wash, Under maintenance, Under measurement
Contact capacity; 30V DC, 0.1A

External contact input : 6 points; (Non-voltage contact input)
Measurement start, Measurement stop, Calibration start, Wash start, Continuous / intermittent switching, Waste solution switch
ON-resistance; 50 Ω or less,
Short-circuit current; Max.10mA,
Open-circuit voltage; DC 12V

Digital I/O : RS-485 1 point
Protocol; Modbus/RTU
* Remote monitoring (measurement values, etc.) and remote operation (starting measurements, etc.) are possible.

Recording : Equipment memory; 1 month's worth of data is recorded every minute. The data can be displayed as a graph on the screen.
USB flash drive; 1 year's worth of data is recorded every minute.

Ion electrode : Fluoride ion selective electrode, EL7200

Reference electrode : ELR-009

Power supply : 100V AC ±10%, 50/60 Hz (Other options available)

Power consumption : Max. 240VA, approx. 120VA on average (at an ambient temperature of 25ºC, excluding options)

Sample water conditions : Water temperature; 2 to 40ºC (no freezing)
Pressure; 0.01 to 0.05 MPa
SS; 50 mg/L or less (particle diameter; 100 µm or less)
Flow rate; Approx. 1 to 3 L/min
* If the sampling point is far away, the response will be slow. In this case, install a bypass line near the main unit.
pH; pH4 to 9
Coexisting components;
* The following cases may affect the measurement. Please contact us for details.
(1)When metal ions such as calcium and aluminum are coexist; It is necessary to select an appropriate ionic strength adjuster.
(See the [Reference] section.)
(2)When the salt concentration in the sample is high; The dissociation of fluoride ions is inhibited, so measures such as diluting the sample water may be necessary.

Wash water conditions : Equivalent to city water (Turbidity level; 2 or less, Color level; 5 or less)
Water temperature; 2 to 40ºC (no freezing)
Pressure; 0.1 to 0.5 MPa
Consumption; Approx. 2 L/time

Reagent : Ionic Strength Adjuster
(Standard; TISAB-11),
Flow rate; Approx. 0.2 mL/min
* For some samples, increasing the flow rate (addition amount) may be effective, and the flow rate can be set up to a maximum of 0.9 mL/min. Please consult with us in advance.
Tank capacity; 10 L
Consumption; Approx. 9 to 10 L/month (continuously measurement, flow rate 0.2 mL/min)

Calibration solution : HI (high concentration) calibration solution
LO (low concentration) calibration solution
(2 types of calibration solution)
Consumption; Less than 5 L/month
Tank capacity; 5 L

Acid cleaning solution : HCL 3w/v%
* 5 w/v% and 10 w/v% hydrochloric acid are also available. Higher concentrations may shorten the electrode life.
Consumption; Less than 2.5 L/month
(at a wash interval of 8 hours)
Tank capacity; 10 L

Construction : Indoors self-standing cabinet

Dimensions : 500 (W) × 450 (D) × 1500 (H) mm

Weight : Approx. 100 kg
(except reagent, optional features)

Installation conditions : Indoor. No direct sun light.
Ambient temperature; 0 to 40ºC
Humidity; Less than 85% RH
(no condensation)

Optional features :
- Power supply
  with built-in transformer compatible with various power supply voltages
- Measuring channel
  Up to 3 channels. dimensions are as follows:
  Dimensions for 2ch;
  1000 (W) × 500 (D) × 1650 (H) mm
  Dimensions for 3ch;
  1500 (W) × 500 (D) × 1650 (H) mm
- Ionic strength adjuster
  selectable according to coexisting components in sample water
- Recorder
  1 to 3 pen type
  Chart type 100 mm wide, length 16 m
- Air cleaning
  The sample water filter is backwashed with bubbling air-mixed washing water.
- Waste solution recovery mechanism
  Separates and recovers calibration solution 20 L drain tank can be attached.
- Low concentration calibration unit
  (3-point calibration)
  LL (low concentration) Calibration solution
  Tank capacity; 1 L
- Leak detector
  installed in bottom pan
- Junction box
  compatible with AC contact output
  Contact capacity; 100V AC, 2A
- Certifications
  CE, cCSAus

[Reference] Coexisting Components and Ionic Strength Adjuster

In ion concentration measurement using the ion selective electrode method, an ionic strength adjuster is added to the sample water to maintain the ion concentration of the measurement solution at a high constant value. This suppresses the effects of salt concentration fluctuations contained in the sample water, enabling stable measurement. The ionic strength adjuster has the following functions.

(1) pH buffering function (Makes the sample pH constant.)

Fluorine in water exists in the form of HF molecules in low pH regions (less than 4) and cannot be measured with ion electrodes. On the other hand, in high (more than 8) pH regions, the electrode reading fluctuates significantly. For this reason, the ionic strength adjuster has a pH buffering function that adjusts the pH to around 5.

(2) Dissociation of bound fluorine function

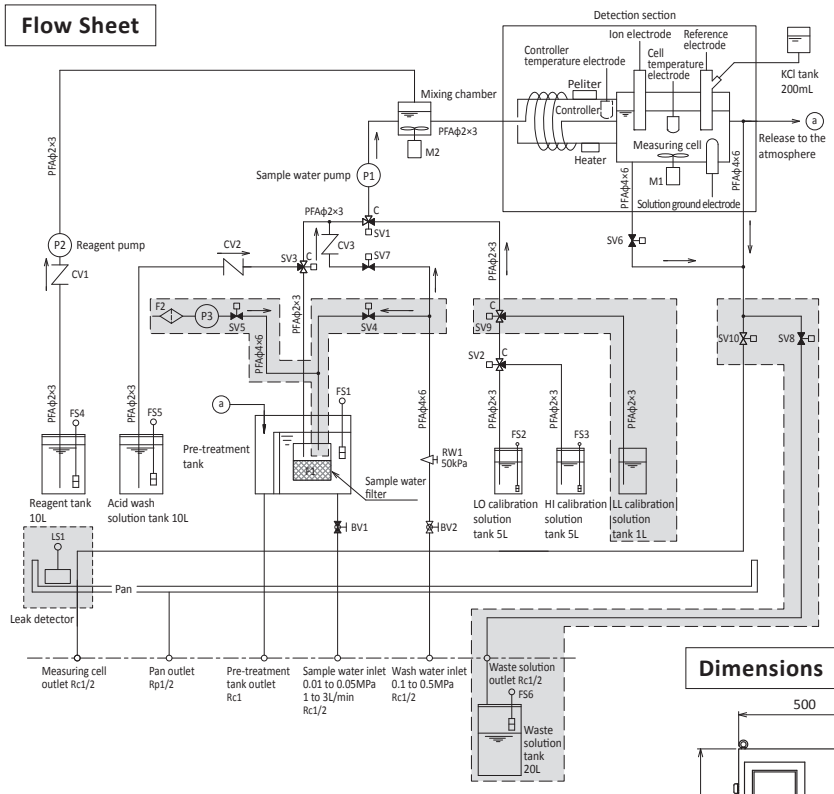
Some fluorine is bound to metal ions such as calcium, aluminum, and iron, existing as complex ions or fluorine compounds, which cannot be detected by ion electrodes, resulting in lower indicated value.

By adding substances with stronger binding affinity to metals than fluorine, the bonds between fluorine and metals can be dissociated.

* Selection of Ionic Strength Adjusters: In fluorine removal treatment of wastewater, calcium or aluminum is usually added for precipitation removal, so these metals coexist. When measuring such wastewater, use an ionic strength adjuster with dissocation of fluorine compound function. On the other hand, when the sample does not contain substances that bind with fluorine, or when measuring only fluorine existing in ionic form, an ionic strength adjuster with only pH buffering function is appropriate. The following is a lineup of Ionic Strength Adjusters for fluorine measurement.

Ionic Strength Adjusters Lineup		
Model	Product code	Remarks
TISAB-11(10L)	143A278	This ionic strength adjuster has the function of dissociating the bond between fluoride and metal. However, if calcium ions are present in extremely high concentrations in the sample, crystals may precipitate, potentially affecting the measurement, such as clogging the measurement line.
TISAB-01(10L)	143A277	This ionic strength adjuster has only buffering function. Use with samples that do not contain metal ions that form complexes with fluorides.

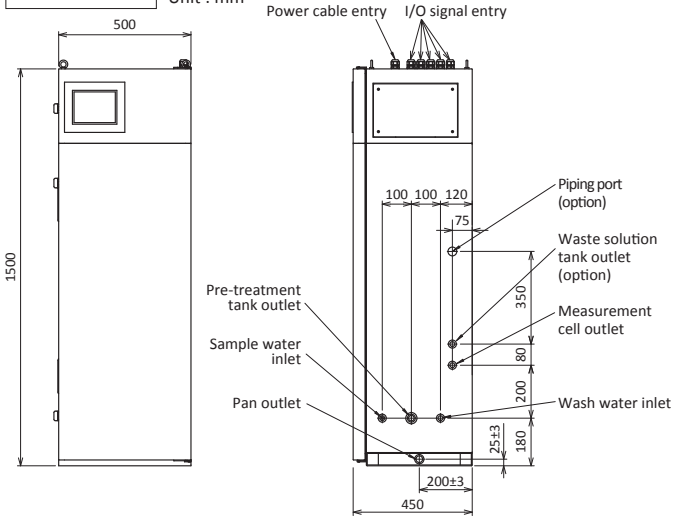
Flow Sheet



Symbol	Description	Remarks
SV1 to 10	Solenoid valve	SV4, 5, 8, 9, 10 are optional.
BV1, 2	Ball valve	
CV1 to 3	Check valve	
P1, 2	Peristatic pump	
P3	Air pump	Optional
RW1	Reducing valve	
F1, 2	Filter	
M1, 2	Motor	
FS1to 6	Float switch	FS6 is optional

Dimensions

Unit : mm



Product code

FMS4-1-□□□□□□□□□□□□□□□

- Power supply *1
  - A: 100V AC, 50/60 Hz
  - B: 110V AC, 50/60 Hz
  - C: 115V AC, 50/60 Hz
  - D: 120V AC, 50/60 Hz
  - E: 200V AC, 50/60 Hz
  - F: 220V AC, 50/60 Hz
  - G: 230V AC, 50/60 Hz
  - H: 240V AC, 50/60 Hz
  - J: 100V AC, 50/60 Hz (CE/CSA certification)
  - K: 110V AC, 50/60 Hz (CE/CSA certification)
  - L: 115V AC, 50/60 Hz (CE/CSA certification)
  - M: 120V AC, 50/60 Hz (CE/CSA certification)
  - N: 200V AC, 50/60 Hz (CE/CSA certification)
  - P: 208V AC, 50/60 Hz (CE/CSA certification)
  - Q: 220V AC, 50/60 Hz (CE/CSA certification)
  - R: 230V AC, 50/60 Hz (CE/CSA certification)
  - S: 240V AC, 50/60 Hz (CE/CSA certification)
  - Z: Custom spec.
- Measuring channel
  - 1: 1 channel (standard)
  - 2: 2 channel parallel measurement *2
  - 3: 3 channel parallel measurement *2
  - 9: Custom spec.
- Measurement range for 1st channel *3
  - A: 0.10 to 10.00 mg/L
  - B: 0.20 to 20.00 mg/L
  - C: 1.0 to 100.0 mg/L
  - D: 10 to 1000 mg/L *4
  - Z: Custom spec. *5
- Measurement range for 2nd channel *3
  - A: 0.10 to 10.00 mg/L
  - B: 0.20 to 20.00 mg/L
  - C: 1.0 to 100.0 mg/L
  - D: 10 to 1000 mg/L *4
  - Y: Not applicable
  - Z: Custom spec. *5
- Measurement range for 3rd channel *3
  - A: 0.10 to 10.00 mg/L
  - B: 0.20 to 20.00 mg/L
  - C: 1.0 to 100.0 mg/L
  - D: 10 to 1000 mg/L *4
  - Y: Not applicable
  - Z: Custom spec. *5
- Ionic strength adjuster *6
  - 1: TISAB-11 (standard)
  - 2: TISAB-01
  - 9: Custom spec.
- Recorder (100mm)
  - 0: None (standard)
  - 1: 1 pen type
  - 2: 2 pen type
  - 3: 3 pen type
  - 9: Custom spec.
- Air cleaning (sample water filter with bubbling)
  - 0: None (standard)
  - 1: Supplied
- Waste solution recovery unit (separation of calibration solution)
  - A: None (standard)
  - B: Supplied (no tank)
  - C: Supplied (20 L tank included)
- Low concentration calibration unit (3 point calibration)
  - 0: None (standard)
  - 1: Supplied
- Leak detector (bottom of cabinet)
  - 0: None (standard)
  - 1: Supplied
  - 9: Custom spec.
- Junction box (option unit for AC power type contact output)
  - 0: None (standard)
  - 1: Supplied
- Language (of documents)
  - A: Japanese (standard)
  - B: English
  - Z: Custom spec.
- Certifications
  - 0: None (standard)
  - 1: CE/CSA certification applicable

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

*1. If a power supply other than AC 100V is used, or if certification apply, a transformer will be incorporated. Please inform us of the power supply specifications.
*2. If there is a large distance between sampling points, there may be a response delay.
*3. The analog output (4 to 20mA) corresponds to a range from 0 to the upper limit of the measurement range.
*4. Depending on the sample's condition, measurement may not be possible. Please consult us for details.
*5. Please indicate the desired measurement range.
*6. The 10L of the ionic strength adjuster (approx. 4 weeks supply) is included as one of the standard accessories. You can change the above. Please specify in advance.

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

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