SPECIFICATION SHEET

TOADKK

Fluoride Ion Analyzer FMS-4

The FMS-4 monitors continuously fluoride ion concentration in industrial wastewater using an Ion Selective Electrode (ISE) with auto-calibration and auto-cleaning functions.

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 a special total ion strength adjustment buffer (TISAB) with the sample. (This TISAB is capable of ionizing some of the non-ionic fluorine. As a result, the instrument is able to measure both fluoride ion and some of the non-ionic fluorine and provides a useful tool for preventing the leakage of fluorine in your facilities.)

Features

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

Flowrates of the sample and the TISAB are reduced by half (comparing to former model FMS-3) without performance degradation by flow stabilization and decreasing dead volume in the measurement system. This improvement leads to saving running cost and low impact to the environment.

○ Expanded range of the TISAB

The ion selective electrode measures the fluoride ion with the TISAB. A different range of TISAB can be selected to fit the characteristics of the sample and the purpose of measurement. (See the “Reference” section for details.)

○ Automatic Calibration cycle Adapting System (ACAS)

During monitoring wastewater the sensor is regularly exposed to dirt and other impurities. The accumulation of this dirt on the sensor is the most common cause of instrument malfunction. Regular cleaning and calibration by the auto-cleaning and auto-calibration functions at appropriate intervals are essential to ensuring the consistent accuracy of measurements. The “Automatic Calibration cycle Adapting System (ACAS)” resets the on-going auto-cleaning and auto-calibration schedules when it detects a decline in the sensitivity of the ISE. Effective cleaning by the ACAS prevents measurement accuracy from degrading.

○ USB memory for retrieving measurement data

Measurement results are sent to the host system via analog transmission or digital communication (Modbus). The calibration and measurement data can also be saved in CSV format to a USB memory device, allowing you to process and analyze data on a computer.

○ Space-saving design

Reducing reagent consumption provides down-sizing the instrument by shrinking the reagent tank. In addition, the unit features a structure that allows maintenance to be performed from the front, thereby dramatically reducing the amount of space needed for installation.

Standard Specifications

Product name : Fluoride ion analyzer
Model : FMS-4
Measurement method : Ion selective electrode method (TISAB addition method)
Measurement ranges : F^-; 0.1~1000mg/L
Ranges : F^-; 0.10~10.00 mg/L (standard)
F^-; 0.20~20.00 mg/L
F^-; 1.0~100.0 mg/L
F^-; 10~1000 mg/L
Repeatability : Less than ±10% of reading (with calibration solution)
Response : 15 minutes or less at 90% response (after adjustment tank)
Temperature compensation : Constant temperature measurement method (can be used together with the temperature compensation function)
Measurement method : Continuous measurement and intermittent measurement (shortest cycle; 1 hour)
Automatic calibration : Periodic calibration or ACAS
Periodic calibration cycle setting range : 1 to 99 days (normally 7days)
Automatic cleaning : Periodic cleaning
1) Cleaning sample line and measurement cell by acid
2) Cleaning sample line by city water
3) Backwashing of sample filter by aerated city water (optional feature)
Periodic cleaning cycle setting range; 1 to 999 hours
Display : Color LCD touch screen (7 inch)
Measurement point : 1 channel
(Simultaneous measurement of up to 3 channels is available as an optional feature. In this case, the unit dimensions are different.)
Output signals
Analog output : Linear output, 4~20 mA DC, Load resistance; 600Ω or less
Contact output : Power interrupt (B contact), instrument failure 1 (major failure), instrument failure 2 (minor failure), concentration upper limit, concentration elevated upper limit, concentration lower limit, calibrating, cleaning, maintenance, and measurement
*Contact capacity for all of the above; 30 VDC 0.1A (AC is available as an optional feature.)
External contact input switching signals : Start measurement, start calibration, start cleaning, stop measurement, continuous/intermittent switching, and effluent level sensor switch
*No-voltage contact input
On-resistance; 50Ω or less, Short-circuit current; Max. 10 mA, Open-circuit voltage; 12 VDC
Digital I/O : RS-485 interface
Protocol; Modbus/RTU
* Digital communication can be used to monitor measured values, operation status (measurement, calibration, cleaning etc.) and the occurrence of abnormal conditions. It can also be used to perform remote maintenance operations, such as issuing calibration commands and cleaning commands. For details, please consult one of our sales representatives.
Sensor electrode : Fluoride ion selective electrode, EL7204L
Reference electrode : ELR-009
Power supply : 100V AC ±10%, 50/60Hz
Power consumption : Max. 240 VA, approx. 120 VA on average (at an ambient temperature of 25ºC)
Sample water conditions : Water temperature; 2~40ºC (no freezing)
Pressure; 0.01~0.05 MPa
SS; 50 mg/L or less (particle diameter; 100 μm or less)
Flow rate; Approx. 1 to 3 L/min (If there is a considerable amount of distance between the sampling point and the main unit, install a by-pass line that runs close to the main unit. This will prevent delays in response by the sample water.)
(Range.0~less than 200mg/L - pH4~8
Range.0~200mg/L or more - pH5~9)
Interfering substances
If the sample contains substances such as calcium and aluminum, some of the fluoride ions might combine with these substances to form compounds in which the fluorides are not ionized. In these conditions, adding the TISAB can be enable these fluorides to be detected. (For details, see the “Reference” section.) However, it is important to note that if the sample contains very high concentrations of interfering metal ions, these ions might combine with the TISAB. If this happens, the solution will crystallize and might cause the instrument to malfunction. Please consult us in advance when preparing to analyze samples that contain high concentrations of interfering ions.
Wash water conditions : City water or the equivalent (Turbidity level; 2 or less, Color level; 5 or less)
Water temperature; 2~40ºC (no fleezing)
Pressure; 0.1~0.5 MPa
Consumption; Approx. 5 L per a wash
Acid cleaning solution : HCl 3% W/V (standard)
Consumption; Less than 2 L/month (at a cleaning interval of 8 hours)
Tank capacity; 10 L
*Select 5% W/V or 10% W/V, based on the degree of contamination. Note that using a higher concentration can shorten the life of the electrode.
Reagent : TISAB
Standard flow rate; Approx. 0.2 mL/min (variable rate, max. of 0.9 mL/min)
Tank capacity; 10 L (Adjuster consumed during 0.2 mL/min continuous measurements; Approx. 9~10 L/month)
*The TISAB type used depends on the coexisting substances the sample contains. See the “Reference” section for details.
Calibration solution : HI (high concentration) calibration solution and LO (low concentration) calibration solution

Consumption; Less than 5 L/month
Tank capacity; 5 L
*LL (extremely low concentration) calibration is available as an optional feature.

Construction : Indoor self-standing frame (IP21)
Dimensions : 500 (W) x 1500 (H) x 450 (D) mm
Weight : Approx. 100 kg (except reagent)
Installation conditions : Indoor. No direct sun light.
Ambient temperature; 0~40ºC (no sample /wash water freezing)
Ambient humidity; Less than 85%RH (no condensation)

Optional features :
* Measurements can be simultaneously conducted on up to 3 channels.
* Recorder; 100 mm wide, 16 m long (1 pen type)
* Air cleaning (aerated city water backwashing for sample water filter)
* 20 L effluent tank
* Effluent recovery unit (fluoride standard solution only)
* Low concentration calibration unit (for 3-point low concentration calibration)
* Leak detector (mounted on the drain pan at the bottom)
* Junction box (available for AC power type contact output)

Reference: Coexisting substances and TISAB

When using the ion selective electrode method to measure ion concentrations, a TISAB is added to the sample to raise the total ion concentration of the solution. This helps to ensure the accuracy of readings. In the fluoride ion concentration analysis, the TISAB fulfills two important functions.

The first function of the TISAB is to keep the pH of the sample solution at a constant level. When the pH level is less than 4, the ion selective electrode cannot detect fluorides in the water because hydrogen fluoride exists as molecules (that are not ionized). However, when the pH level exceeds 8, the instrument issues higher readings because the fluoride ion selective electrode is influenced by the pH level. To avoid these errors and inaccuracies, a pH buffer of approximately 5 is added before conducting measurements.

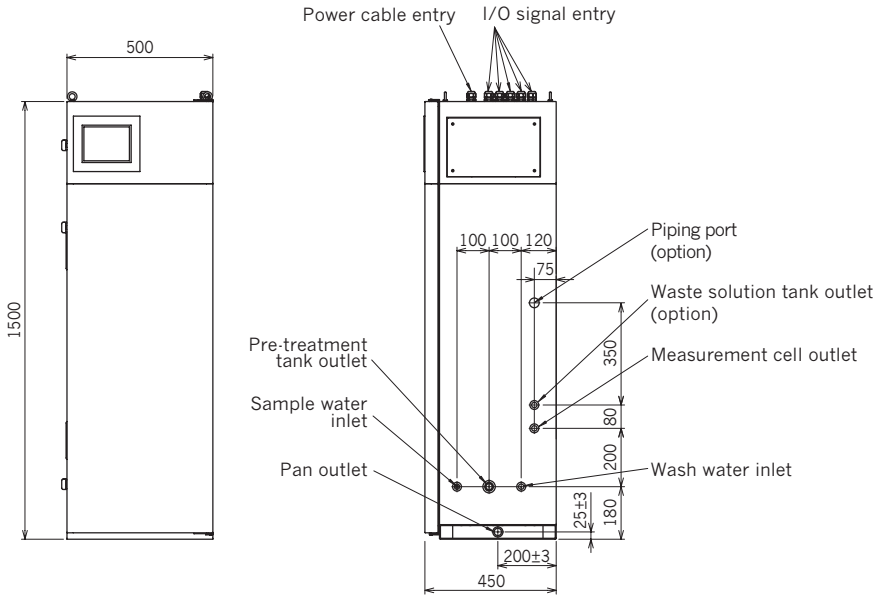
The second function of the TISAB is to dissociate the fluoride ions from complexes or molecular compounds combining with metal ions. This causes the fluoride ions to dissociate by breaking down the complex or molecular compounds made up of fluoride ions and metal ions. The adjuster includes substances that form a stronger bond with metal ions. The fluoride ions can be separated from metal ions and detected by the ion selective electrode.

Depending on the sample conditions, in some cases you might be able to obtain a reading closer to the total fluoride content by increasing the volume of the TISAB. In this analyzer, the volume of the TISAB in sample water can be increased at a ratio of 1:1 (standard ratio of sample water : TISAB = 10:1).Because of custom spec, please consult us at the time of ordering, .

On the other hand, there are times when a TISAB with only a pH buffer is more effective. This is true for cases in which the sample water does not contain any substances–such as calcium, aluminum, and iron–that can lead to lower readings by combining with fluorides and form compounds. A TISAB with only a pH buffer is also effective when seeking to detect only free fluoride ions in water. The following table shows our selection of TISABs for fluoride ion analysis.

TISAB lineup		
Model	Product code	Remarks
TISAB-11(10L)	143A278	This TISAB can break down metallic fluoride compounds. However, if there is an extremely high concentration of calcium ions in the sample, they might combine with the TISAB and bring about precipitation. If this occurs, the line might become blocked.
TISAB-01(10L)	143A277	For the measurement of the sample after separation cleaning of the calcium fluoride deposition without excess dose of calcium during fluoride treatment process.

Dimensions Unit : mm



Product code

FMS4-0-□□□□□□□□□□□□□

- Power supply
  - 1 — 100V AC, 50/60Hz
  - 9 — Custom spec. *1
- 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 — 0.1~10 mg/L
  - B — 0.2~ 20 mg/L
  - C — 1~100 mg/L
  - D — 10~1000 mg/L *4
  - Z — Custom spec. *5
- Measurement range for 2nd channel *3
  - A — 0.1~10 mg/L
  - B — 0.2~ 20 mg/L
  - C — 1~100 mg/L
  - D — 10~1000 mg/L *4
  - Y — Not applicable
  - Z — Custom spec.*5
- Measurement range for 3rd channel *3
  - A — 0.1~10 mg/L
  - B — 0.2~ 20 mg/L
  - C — 1~100 mg/L
  - D — 10~1000 mg/L *4
  - Y — Not applicable
  - Z — Custom spec. *5
- TISAB *6
  - 1 — TISAB-11 (standard)
  - 2 — TISAB-01
  - 9 — Custom spec.*7
- Recorder
  - 0 — None (standard)
  - 1 — 1 pen type
  - 9 — Custom spec. *8
- Air cleaning (sample water filter with bubbling)
  - 0 — None (standard)
  - 1 — Supplied
- Effluent recovery unit (separation of calibration solution)
  - 0 — None
  - 1 — Supplied (no tank)
  - 2 — Supplied (20 L tank included)
- Low concentration calibration unit (3 point calibration)
  - 0 — None
  - 1 — Supplied
- Leak detector (bottom of cabinet)
  - 0 — None
  - 1 — Supplied
  - 9 — Custom spec.
- Junction box (option unit for AC power type contact output)
  - 0 — None
  - 1 — Supplied
- Language (of documents)
  - 0 — Japanese (standard)
  - 1 — English
  - 9 — Custom spec.

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

*1: If you are using an AC power supply that is not 100V AC, a step-down transformer may be required.
Make sure to tell us the power specifications of your site in advance.

*2: If there is a large distance between sampling points, there may be a response delay.

*3: In 0 to the upper limit of measurement range, analog output is 4 ~ 20mA.

*4: The condition of certain samples prevents them from being analyzed. Please consult us for details.

*5: Please indicate the desired measurement range.

*6: The 10L of the TISAB (approx. 4 weeks supply) is included as one of the standard accessories. You can change the above. Please specify in advance.

*7: pH buffer solution with a function equivalent to PH5-AB which is used for EMF-100 is also available

*8: Please specify the type of recorder (2 pen or 3 pen) when needed.

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

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