

SPECIFICATION SHEET



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)	Sensor electrode	: Fluoride ion selective electrode, EL7204L
Measurement ranges	: F ⁻ ; 0.1~1000mg/L	Reference electrode	: ELR-009
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	Power supply	: 100V AC ±10%, 50/60Hz
Repeatability	: Less than ±10% of reading (with calibration solution)	Power consumption	: Max. 240 VA, approx. 120 VA on average (at an ambient temperature of 25°C)
Response	: 15 minutes or less at 90% response (after adjustment tank)	Sample water conditions	: Water temperature; 2~40°C (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 bypass 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 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.
Temperature compensation	: Constant temperature measurement method (can be used together with the temperature compensation function)	Wash water conditions	: City water or the equivalent (Turbidity level; 2 or less, Color level; 5 or less) Water temperature; 2~40°C (no freezing) Pressure; 0.1~0.5 MPa Consumption; Approx. 5 L per a wash
Measurement method	: Continuous measurement and intermittent measurement (shortest cycle; 1 hour)	Acid cleaning solution	: HCl 3% W/V (standard) Consumption; Less than 2L/month (at a cleaning interval of 8 hours) Tank capacity; 10L *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.
Automatic calibration	: Periodic calibration or ACAS	Reagent	: TISAB Standard flow rate; Approx. 0.2mL/min (variable rate, max. of 0.9mL/min) Tank capacity; 10L (Adjuster consumed during 0.2mL/min continuous measurements; Approx. 9~10L/month) *The TISAB type used depends on the coexisting substances the sample contains. See the "Reference" section for details.
Periodic calibration cycle setting range	: 1 to 99 days (normally 7days)	Calibration solution	: HI (high concentration) calibration solution and LO (low concentration) calibration solution
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		

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; 0~40°C (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

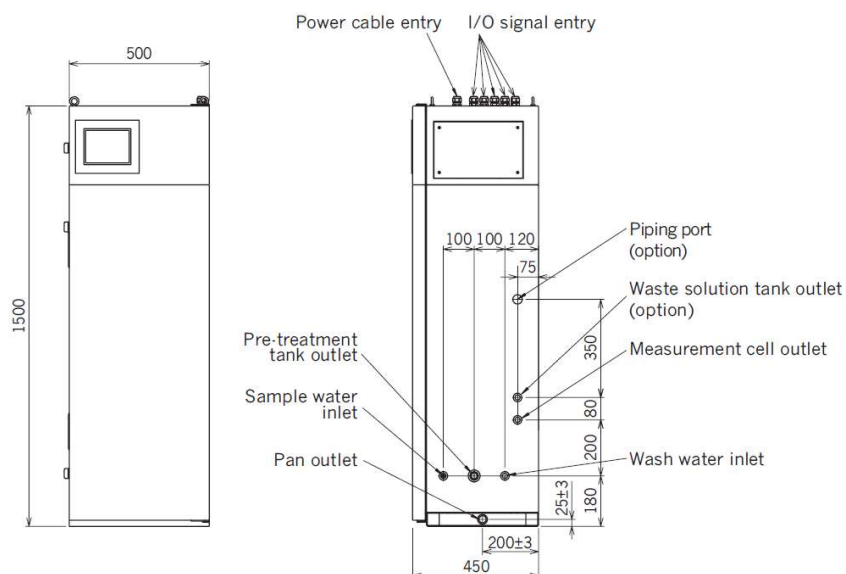
compounds made up of fluoride ions and metal ions. The adjuster includes substances that form a stronger bond with metal ions. The fluoride ions can be separated from metal ions and detected by the ion selective electrode.

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





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CAUTION

Please read the operation manual carefully
before using products.

<http://www.toadkk.co.jp/english>

Information and specifications are subject to change without notice.

Issued on 27/5/2016