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This standard was revised in 7, 1995

JAPANESE INDUSTRIAL STANDARD

Continuous Analyzers for Fluorine
Compounds in Ambient Air

JIS B 7958-1980



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Translated

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This English translation is prepared at the expense of
Japan External Trade Organization (JETRO).

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Continuous Analyzers for Fluorine
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1. Scope

This Japanese Industrial Standard specifies the continuous analyzers used for measuring concentration of gaseous inorganic fluorine compounds in ambient air as fluorine concentration based on the ionic electrode method and absorptiometry, hereinafter referred to as the "analyzers".

2. Common Items

The common items concerning the analysis used for the ionic electrode method shall be in accordance with JIS K 0105.

The common items concerning the analysis used for the absorptiometry shall be in accordance with JIS K 0115.

3. Definitions

For the purposes of this standard, the following definition apply and others shall be in accordance with JIS K 0105, JIS K 0212, JIS K 0213 and JIS Z 8103.

- (1) gaseous inorganic fluorine compound Inorganic fluorine compound which passes through a filter of hole diameter 0.8 μm
- (2) zero gas Gas used for calibration of the minimum scale value of analyzer

Applicable Standards and Reference Law: See page 22.

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- (3) equivalent solution Instead of calibration gas, a standard solution prepared to obtain the equivalent indication to the effect used with that gas, and there are following solutions.
- (a) Equivalent solution for zero adjustment
 - (b) Equivalent solution for span adjustment
 - (c) Equivalent solution for scale calibration
- (4) zero drift Fluctuation of indication for the minimum scale of the analyzer during a certain period of time
- (5) span drift Fluctuation of indication corresponding to the scale span of the analyzer during a certain period of time
- (6) interference component Coexisting component which interferes measurement
- (7) set flow rate Flow rate of sample ambient air set for the analyzer

4. Ionic Electrode Method

4.1 Principle This method is to collect gaseous inorganic fluorine compounds contained in a constant quantity of sample ambient air into a constant quantity of buffer solution (¹) and to dissolve. The gaseous inorganic fluorine compound concentration in the sample ambient air shall be obtained periodically by measuring the fluorine ion concentration in this buffer solution according to the ionic electrode method. The measuring frequency shall, as a rule, be 3 h. For the collection method of gaseous inorganic fluorine compound contained in the sample ambient air, there are the following 2 classes.

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- (1) Dry Collection Type Introduce the ambient air with a constant flow rate into a sample absorption tube. On the inner wall of sample absorption tube is made alkali film using absorption solution. After absorbing the gaseous inorganic fluorine compounds contained in the ambient air, the wall surface shall be washed with buffer solution of definite quantity and be collected and dissolved.
- (2) Wet Collection Type Make sample ambient air contact with buffer solution directly with a constant rate and gaseous inorganic fluorine compounds contained in a constant quantity of the sample ambient air shall be collected and dissolved in the buffer solution of definite quantity.

Note (¹) The solution contains known concentration of fluorine ion.

4.2 Performances The analyzers shall comply with the following performances:

- (1) Measuring Range The measuring range shall be, as fluorine concentration, 0 to 5 $\mu\text{g}/\text{m}^3$, 0 to 10 $\mu\text{g}/\text{m}^3$, 0 to 20 $\mu\text{g}/\text{m}^3$ or 0 to 5 ppb, 0 to 10 ppb or 0 to 20 ppb, and be able to make change over of 1 to 3 ranges.

Remark: 1 $\mu\text{g}/\text{m}^3$ corresponds to 1.266 ppb [20°C, 760 mmHg (1013 mbar)].

- (2) Reproducibility (Repeatability) For reproducibility, pour equivalent solution for zero adjustment (in accordance with the provision of 6.3) and equivalent solution for span adjustment (in accordance with the provision of 6.3) into the measuring cell alternatively for 3 times, and obtain the deviation from the mean value of respective measured values. The deviation shall be within the range of $\pm 2\%$ of the maximum scale value for each measuring range.

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- (3) Zero Drift The zero drift, shall be measured continuously for 24 h under the same conditions ⁽²⁾ and the variation, when the analyzer indications are measured by using equivalent solution for zero adjustment (in accordance with the specifications of 6.3), at the beginning and after 24 h, shall be within $\pm 4 \%$ of the maximum scale value for each measuring range.

Note ⁽²⁾ The same conditions mean the following ranges:

Ambient temperature	: $\pm 5^{\circ}\text{C}$ within the range of allowable using temperature
Humidity	: relative humidity 85 % or less
Atmospheric pressure	: within ± 5 mbar
Power source voltage	: within $\pm 2 \%$ of rated voltage
Power source frequency	: within ± 0.2 Hz of rated frequency

- (4) Span Drift The span drift shall be measured continuously for 24 h under the same conditions ⁽²⁾, when the analyzer indications are measured at the beginning and after 24 h by using equivalent solution for span adjustment (in accordance with the specifications of 6.3), the variation, exclusive of zero drift, shall be within $\pm 5 \%$ of the maximum scale value for each measuring range in 24 h.
- (5) Indication Error After carrying out zero adjustment and span adjustment, when measured by using equivalent solution for scale calibration (in accordance with the specifications of 6.3) in the vicinity of intermediate scale, the indication error for the corresponding fluorine concentration shall be within $\pm 4 \%$ of the maximum scale value for each measuring range.

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- (6) Warming-up Time For warming-up time, the analyzer shall be stabilized in 4 h or less from closing the power source, and thereafter zero drift and span drift shall comply with the specifications of 4.2 (3) and (4).
- (7) Stability for Ambient Temperature Variation The stability for ambient temperature variation shall comply with the specifications of 4.2 (3) and (4), even though the ambient air temperature varies by $\pm 5^{\circ}\text{C}$ within the working allowable temperature range.
- (8) Stability of Sample Ambient Air Flow Rate For the set flow rate, time dependent degradation of flow rate shall be not more than 10 % for 10 days in succession.
Moreover, the width of instantaneous fluctuation of float of flowmeter shall be within ± 5 %.
- (9) Stability of Taking and Supply of Buffer Solution For the set taking quantity of buffer solution, the repeated error shall be within ± 4 %.
- (10) Stability for Fluctuation of Power Source Voltage Even when the power source voltage fluctuates within ± 10 % of the rated voltage, the fluctuation of indicated value shall be within ± 1 % of the maximum scale value for each measuring range.
- (11) Transmission Output When requiring transmission output other than that for a recorder, it shall be d.c. 0 to 1 V or 1 to 5 V (internal resistance 500 Ω or less in both) or d.c. 4 to 20 mA, having linear proportional relation with fluorine concentration.

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- (12) Withstand Voltage In the analyzer using commercial power source, when a.c. 1000 V is applied for 1 min between the power source terminals en bloc and the outer case under ordinary temperature and ordinary humidity ⁽³⁾, abnormalities shall not be caused.

Note ⁽³⁾ The ordinary temperature and the ordinary humidity mean $20 \pm 15^{\circ}\text{C}$ and $60 \pm 20 \%$ respectively.

- (13) Insulation Resistance In the analyzer using commercial power source, the insulation resistance between the power source terminals en bloc and the outer case shall be not less than 2 M Ω , when measured with a 500 V insulation resistance tester specified in JIS C 1301 or JIS C 1302, under the ordinary temperature and the ordinary humidity (3).

Remark: The tests of (12) and (13) shall be carried out under stopped condition of analyzer operation.

4.3 Constitution

4.3.1 General Constitution

4.3.1.1 Dry Collection Type The analyzer of dry collection type shall be composed of filter, gas absorption part, flowmeter, sample ambient air suction pump, absorption solution tank, buffer solution tank, drain tank, absorption solution taking-supply part, buffer solution taking-supply part, measuring cell, amplifier, indicating recorder, controller, etc.

Fig. 1 shows an example of the constitution of whole analyzer.