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**Continuous analyzers for methane in
emission gas**

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Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of Economy, Trade and Industry, through deliberations at the Japanese Industrial Standards Committee according to the proposal of establishing a Japanese Industrial Standard from Japan Electric Measuring Instruments Manufacturers' Association (JEMIMA)/Japanese Standards Association (JSA), with a draft of Industrial Standard based on the provision of Article 12 Clause 1 of the Industrial Standardization Law.

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Contents

	Page
1 Scope.....	1
2 Normative references.....	1
3 Terms and definitions	2
4 Types and measuring ranges of continuous analyzers	2
5 Performances of continuous analyzers	3
6 Construction	3
6.1 General construction	3
6.2 Composition	4
6.3 Sampling parts	5
6.4 Analyzers	6
6.5 Signal for indication recording	12
7 Performance test.....	12
7.1 Test conditions	12
7.2 Test gas	12
7.3 Calibration.....	13
7.4 Test method	13
8 Test report.....	15
9 Marking	16
10 Instruction for use	16
Annex 1 (informative) Analyzers with a gas chromatographic hydrogen flame ionization detection method	17
Annex 2 (informative) Continuous analyzers for methane in emission gas with a sample non-extractive method	19

Continuous analyzers for methane in emission gas

1 Scope This Japanese Industrial Standard specifies the continuous analyzer system and continuous analyzers (hereafter referred to as “continuous analyzers”), which are capable of measuring continuously for a long term through setting up at a job site, for the purpose of continuous measurement of methane concentration in emission gas which is generated with combustion of fuels and others or, is exhausted into chimneys or ducts to dissipate in the air during various manufacturing processes, in factories and establishments, as well as in gas discharged from waste repositories, coal disposal facilities, or communities.

In addition, this Standard uses the measuring principles based on a non-dispersive infrared absorption method, Fourier transform infrared absorption method (FTIR) and selective-combustion system hydrogen flame ionization detection method.

NOTES 1 As continuous analyzers based on other measuring principles, those based on a gas chromatographic hydrogen flame ionization detection method and a sample non-extractive method (path monitor) are shown in Annex 1 (informative) and Annex 2 (informative).

2 This Standard aims to investigate and manage situations of greenhouse gas emissions as countermeasures against global warming. In addition, although gas exhausted into the chimneys in factories and establishments is called flue gas, this Standard covers gases exhausted not only from the chimneys but also from ducts, waste repositories and coal disposal facilities, as well as from the communities. Thus, the word “emission gas” will be used to expand the scope of subjects.

2 Normative references The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS B 7551	<i>Variable area flowmeters</i>
JIS C 1302	<i>Insulation resistance testers</i>
JIS K 0003	<i>Reference material—Standard gas—Carbon dioxide</i>
JIS K 0055	<i>General rules for calibration method of gas analyzer</i>
JIS K 0095	<i>Methods for sampling of flue gas</i>
JIS K 0151	<i>Non-dispersive infrared gas analyzer</i>
JIS K 0211	<i>Technical terms for analytical chemistry (General part)</i>
JIS K 0212	<i>Technical terms for analytical chemistry (optical part)</i>
JIS K 0213	<i>Technical terms for analytical chemistry (Electrochemistry part)</i>
JIS K 0215	<i>Technical terms for analytical chemistry (analytical instrument part)</i>
JIS Z 8103	<i>Glossary of terms used in measurement</i>

3 Terms and definitions For the purpose of this Standard, the terms and definitions given in JIS K 0211, JIS K 0212, JIS K 0213, JIS K 0215, JIS Z 8103 and the following terms and definitions apply.

- a) **sample gas** gas obtained by pretreating flue gas through a primary filter, a dehumidifier, etc. for the purpose of introducing in analyzers
- b) **control gas** gas containing no gas to be measured
- c) **zero gas** gas used for calibration of a minimum scale value of a continuous analyzer
- d) **span gas** gas used for calibration of a maximum scale value of a continuous analyzer
- e) **zero drift** fluctuation of indicated value in an interval corresponding to the minimum scale of a continuous analyzer
- f) **span drift** fluctuation of indicated value in an interval corresponding to the maximum scale of a continuous analyzer
- g) **setup flow** flow of a sample gas and a calibration gas, etc. specified for the continuous analyzer
- h) **ppm** volume ratio of concentration expressed in parts per million
- i) **vol%** volume ratio of concentration expressed in percentage
- j) **ppmC** concentration unit of hydrocarbons expressed as carbon number equivalent by multiplication of hydrocarbon concentration (ppm) with the number of carbon atom or CH_x group constituting the molecule
- k) **total hydrocarbon** collective term for hydrocarbons measured by hydrogen flame ionization detection method
- l) **non-methane hydrocarbon** total hydrocarbons excluding methane
- m) **indication error** percentages of the difference between the indicated value at the time of introducing an intermediate gas and its displayed concentration to the maximum scale
- n) **response time** combined time of lag time and rise time required for the indicated value of the continuous analyzer to reach a value corresponding to 90 % of the last indicated value after introduction of a test gas
- o) **minimum detection limit** percentage of twice standard deviation of indicated value at the time of flowing a zero test gas to the maximum scale

4 Types and measuring ranges of continuous analyzers The continuous analyzers are classified according to their principles and each measuring range of these continuous analyzers (hereafter referred to as a “range”) are as shown in table 1.

In addition, the range shall be suitably selected from ranges shown in table 1.

Table 1 Types and ranges of continuous analyzers

Type	Range (ppm)	Substance to be measured	Applied conditions
IR absorption method	0 to 500 to 0 to 25 000 ⁽¹⁾	Methane	Applicable when the influence of co-existing carbon dioxide can be neglected or the influence can be removed.
Selective combustion type hydrogen flame ionization detection method	0 to 500 to 0 to 25 000 ⁽¹⁾	Methane	Applicable when the influence of co-existing non-methane hydrocarbons can be neglected or the influence can be removed.

Note ⁽¹⁾ The range was specified in consideration of an explosive limit of methane.

5 Performances of continuous analyzers The continuous analyzer shall satisfy the performances specified in table 2 when the performance test is carried out according to clause 7.

Table 2 Performance of continuous analyzers

Item	Performance	Test method
Repeatability	± 2 % of maximum scale value	7.4 a)
Zero drift	± 2 % of maximum scale value	7.4 b)
Span drift	± 2 % of maximum scale value	7.4 c)
Indication error	± 4 % of maximum scale value	7.4 d)
Minimum detection limit	1 % of maximum scale value or less	7.4 e)
Response time	240 s or less	7.4 f)
Influence of interfering component	± 5 % of maximum scale value	7.4 g)
Stability of indicated value to the fluctuation of flow of sample gas	± 2 % of maximum scale value	7.4 h)
Stability of indicated value to power source voltage	± 2 % of maximum scale value	7.4 i)
Withstand voltage	No abnormality shall be allowed.	7.4 j)
Insulation resistance	5 M Ω or more	7.4 k)

6 Construction

6.1 General construction The construction of continuous analyzers shall comply with the following items.

- The shape shall be right with good assembly and finishing in every part, and the construction shall be robust.
- The continuous analyzer shall be free from risk under normal operation and be safely and smoothly operated.

- c) Each part of the continuous analyzer shall be constructed so as not to easily go out of order mechanically or electrically and cause dangerous conditions.
- d) The continuous analyzer shall be constructed so as to function well even by formation of dew condensation, etc.
- e) The parts contacting heat developing part such as a light source or a heater shall be constructed so that no deformation caused by heat or change in functions occurs.
- f) The continuous analyzer shall be constructed so as to be easy to operate without fear of danger at the time of maintenance or checking.

6.2 Composition The measurement is carried out according to a sample gas extractive method that sample gas is extracted from emission gas and supplied continuously to an analyzer through a duct and a device for pretreatment of samples. As shown in figure 1 and figure 2, the continuous analyzer consists of a sample collecting part, an analyzer, etc. Figure 1 shows an example of a construction for measuring methane concentration in the gas generated on combustion of fuel and others and exhausted in a chimney or duct to dissipate it in the air, and figure 2 shows an example for measuring methane concentration in the gas discharged from a coal disposal facility and community.

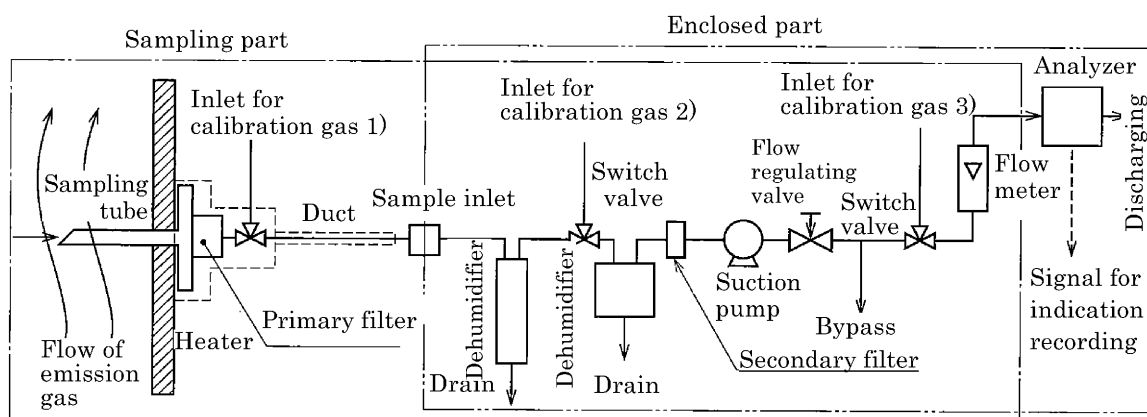


Figure 1 Construction example for a sample gas extractive method (1)

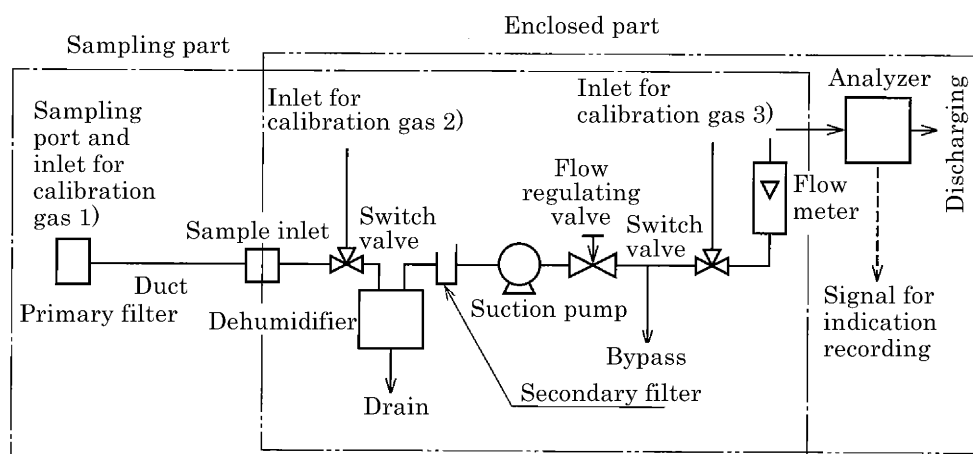


Figure 2 Construction example for a sample gas extractive method (2)

6.3 Sampling parts The parts shall have functions to remove dust in emission gas, remove moisture or maintain constant moisture, if necessary, and continuously supply a predetermined required amount of the sample gas to the analyzer, while inhibiting the loss of component to be measured as far as possible. It shall be in accordance with **JIS K 0095**. The parts consist of a sampling tube, primary filter, duct, dehumidifier, secondary filter, suction pump, flowmeter, switch valve, throttle valve and inlet for calibration gas, etc., and materials for each part shall be selected according to the property of the emission gas.

- a) **Sampling tube** A sampling tube is a tube attached to a chimney wall, etc. to collect sample gas, and it shall be made of stainless steel, ceramics, quartz, etc.
- b) **Primary filter** A primary filter is a filter to remove dust in emission gas and shall be used at such a temperatures as not to condense moisture. The net of filter shall be made of glass fibres, stainless steel, etc.
- c) **Duct** A duct is a tube to introduce the emission gas from the primary filter to a sample inlet, and shall be generally made from tetrafluoroethylene resin. It shall be heated, if necessary, to prevent condensation of moisture in the suction path.
- d) **Dehumidifier** A dehumidifier is a device to remove moisture in emission gas using methods including air cooling (ambient air temperature) and electronic cooling, or a semi-permeable membrane gas phase dehumidifying method by selective infiltration of water vapor. Multiple dehumidifiers may be placed depending on the property of the emission gas.
- e) **Secondary filter** A secondary filter is a filter to remove fine dust in sample gas and shall be made of glass fibre, tetrafluoroethylene resin, etc.
- f) **Suction pump** A suction pump is a pump to suck sample gas, etc. and a diaphragm pump is generally applicable. The part contacting the gas shall be made of corrosion-resistant material, for example, a hard vinyl chloride resin, etc.