

JIS

JAPANESE INDUSTRIAL STANDARD

Portable Type Methane Detector

JIS M 7653—1987

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by

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JAPANESE INDUSTRIAL STANDARD

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Portable Type Methane Detector

M 7653-1987

1. Scope

This Japanese Industrial Standard specifies the portable type methane detector to measure the concentration of methane in coal mine and the like, hereinafter, referred to as "detector". However, those detectors whose detection principle is interferometric method are excluded.

2. Classification

The detectors shall be classified into diffusion type detector and suction type detector according to sampling method of air to be detected.

3. Performance

3.1 Indication Accuracy The indication accuracy, when tested according to 5.2, shall meet Table 1.

Table 1. Permissible Deviations

Unit: volume %

Range of concentration to be measured	Permissible deviation
0 to 2.0	Within ± 0.2
0 to 5.0	Within ± 0.4
0 to 10.0	Within ± 0.6
0 to 100	Within ± 6

3.2 Repeatability The repeatability, when tested according to 5.3, shall meet Table 1.

3.3 Stability The stability, when tested according to 5.4, shall meet Table 2.

Applicable Standard:

JIS C 0901-Electrical Apparatus for Use in Gassy Coal Mines

Reference Standards:

JIS Z 8103-Glossary of Terms Used in Instrumentation

JIS Z 9001-General Rules for Sampling Inspection Procedures

Table 2. Permissible Deviations

Unit: volume %

Range of concentration to be measured	Permissible deviation
0 to 2.0	Within ± 0.3
0 to 5.0	Within ± 0.5
0 to 10.0	Within ± 0.8
0 to 100	Within ± 8

3.4. Influence of Inclination The influence of inclination, when tested according to 5.5, shall meet Table 2.

3.5. Impact Resistance The impact resistance, when tested according to 5.6, shall meet Table 2.

3.6. Influence of Temperature Variation The influence of temperature variation, when tested according to 5.7, shall meet Table 2.

3.7. Time Lag of Gas Detection The time lag of gas detection, when tested according to 5.8, shall meet Table 3.

Table 3. Permissible Deviations of Time Lag of Gas Detection

Unit: sec

Classification of detector	Permissible deviation
Diffusion type detector	Within 60
Suction type detector	Within 30

3.8. Influence of Variation of Power Source Voltage The influence of variation of power source voltage, when tested according to 5.9, shall meet Table 2.

3.9. Diffusion Resistance The diffusion resistance, when tested according to 5.10, shall meet Table 2.

4. Construction

The detector shall consist of detecting part and indicating part and shall be constructed so that it introduces the air to be detected at detecting position into the detecting part by diffusion or suction and detects gas concentration to convert electric signal and indicate gas concentration by the indicating part separated from or combined in one body with the detecting part, and shall meet following every item.

- (1) It shall be light in weight and small so as to carry conveniently and shall be easy to handle and maintain.
- (2) The construction of every part shall have sufficient strength and durability and the portion in detector to be equipped with electrical circuit shall be of explosion-proof construction complying with JIS C 0901.
- (3) For the metallic material corrosion resistant material shall be used or that conducted with complete surface corrosion prevention treatment and whose painting is finished excellently so as not to fade out or be peeled easily shall be used.
- (4) The polymer material to be used in the main constructions shall be flame resistant.
- (5) In the case of requiring counter-measures for static electricity, for the carrying tool of detector, a material having static electricity charge prevention performance shall be used.
- (6) Every part shall work smoothly and accurately according to its purpose and shall not generate deviation easily.
- (7) The fact that the device is in working state shall be easily discernible.
- (8) The calibration shall be possible to be conducted easily.

5. Test Methods

5.1 Standard condition of Test Place The standard condition of test place shall be 20 ± 5 °C in temperature, 65 ± 10 % in relative humidity and 1013 ± 30 hPa in atmospheric pressure.

5.2 Indication Accuracy Test Establish the working state of detector and after the work stabilization time indicated in detector, hereinafter, referred to as "defined stabilization time" has elapsed, conduct calibration with the gas for test of methane concentration near to 80 % of measuring concentration range, hereinafter, referred to as "calibration" and introduce in the detecting part the gas for test of varied concentration to 3 points high, middle and low of measuring concentration range to examine the difference of each indicated value of detector and concentration of gas for test.

5.3 Repeatability Test Establish the working state of detector and after the defined stabilization time has elapsed, introduce in the detecting part the clean air and gas for test of concentration near to the center of measuring concentration range alternatively 3 times in each and examine the difference of indicated value at each time relative to the mean value of indicated values of concentration of gas for test.

5.4 Stability Test Establish the working state of detector and after the defined stabilization time has elapsed, conduct calibration, introduce in the detecting part the gas for test of concentration near to the center of measuring concentration range, examine the difference of indicated value of detector and concentration of gas for test and then conduct test of (1) or (2).

- (1) Detector for Intermittent Use Allow to stand as it is in non-current-carrying state for 2 hours, then establish anew the working state, and after the defined stabilization time has elapsed, introduce in the detecting part the gas for test of 5.4 to examine the difference of indicated value of detector and concentration of gas for test.
- (2) Detector for Continuous Use Allow to stand still as it is in working state for 2 hours and then introduce in the detecting part the gas for test of 5.4 to examine the difference of indicated value of detector and concentration of gas for test.

5.5 Inclination Test Establish the working state of detector, after the defined stabilization time has elapsed, conduct calibration, incline the detector in 30 degrees in front and rear, left and right, introduce in the detecting part the gas for test near to the center of measuring concentration range and examine the difference of indicated value of detector and concentration of gas for test.

5.6 Impact Test Place on the concrete floor the pine plate or cedar plate of thickness 30 mm, drop on this plate from height 100 mm the calibrated detector in working state, and then introduce in the detecting part the gas for test of concentration near to the center of measuring concentration range to examine the difference of indicated value of detector and concentration of gas for test. However, drop the detector so that the indicating part of concentration, indicating lamp, adjustable grip, etc. do not contact directly with plate.

5.7 Temperature Test Establish the working state of detector under room temperature near to 20°C, after the defined stabilization time has elapsed, conduct calibration, put in the constant temperature test baths of 0°C and 40°C and after 90 minutes, conduct the test specified in 5.4 (1) or 5.4 (2) at each temperature. However, do not execute the allowing to stand as it is for 2 hours.

5.8 Test for Time Lag of Gas Detection Establish the working state of detector, and after the defined stabilization time has elapsed, introduce in the detecting part the gas for test of concentration near to the center of measuring concentration range to examine the 90 % response time.

5.9 Test of Power Source Voltage Variation Establish the working state of detector, after the defined stabilization time has elapsed, conduct calibration, vary the power source voltage of detector by + 10 % of rated voltage and introduce in the detecting part the gas for test of concentration near to the center of measuring concentration range to examine the difference of indicated value of detector and concentration of gas for test.

5.10 Diffusion Test conduct exclusively on the detector equipped with tightly closed air chamber, allow the detector as it is in working state to stand as it is for 6 hours in the test bath of concentration of gas for test 2.5 volume % and then establish the gas concentration on test bath to concentration near to the center of measuring concentration range to examine the difference of the indicated value of detector and gas concentration.

6. Inspection

6.1 Type Inspection As for type inspection, at each time when the new design, remodeling or change of production technical condition is conducted, sample one or more detector(s) from the first lot to conduct the test specified in 5. and the results shall meet the specifications of 3. and 4.

6.2 Product Inspection As for delivery inspection, conduct the tests specified in 5.2, 5.3 and 5.4 on each product of detector and the results shall meet 3.1, 3.2 and 3.3, respectively.

Further, the product inspection may be conducted by the sampling inspection plan.

7. Designation of Products

The products shall be designated with detecting principle and sampling plan of air to be detected.

Example: Catalytic combustion - diffusion type portable methane detector

8. Indication

The detector shall be indicated with the following items:

- (1) Name or name of article
- (2) Name of gas to be detected and its measuring concentration range.
- (3) Instrument number and year and month of manufacture
- (4) Manufacturer's name or its mark
- (5) Work stabilization time
- (6) Ranges of pressure used and temperature used

9. Cautions for Handling

The detector shall be appended with handling instruction and the following items shall be described.

- (1) Operating method
- (2) Distinction of intermittent use or continuous use
- (3) Range of temperature to be used and caution to avoid abrupt change of temperature
- (4) Method of measurement under high pressure and low pressure
- (5) Work stabilization time and time lag of detection

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- (6) Period of time for capable continuous use and period of endurance of detecting part
- (7) Cautions for impact and vibration
- (8) Influence of other gases and vapour
- (9) Method of calibration and frequency of calibration
- (10) Other necessary items

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