

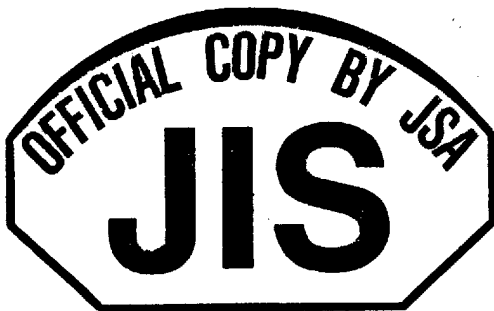
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JAPANESE INDUSTRIAL STANDARD

Reflection Type Smokemeters for Automobile Diesel Engine

JIS D 8004—1986



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JAPANESE INDUSTRIAL STANDARD

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Reflection Type Smokemeters for
Automobile Diesel Engine

D 8004-1986

1. Scope

This Japanese Industrial Standard specifies the reflection type smoke meters, hereinafter referred to as the "smokemeters", to be used in measuring the density of exhaust smoke in accordance with JIS D 1101.

2. Definitions

For the purposes of this standard, the following definitions apply:

- (1) pollution level The degree of pollution with exhaust gas of the filter paper for exhaust smoke density measurement, hereinafter referred to as the "filter paper", specified in JIS D 1101.
- (2) radiance factor A factor that has been expressed in percentage, obtaining L/L_0 from the luminance L of the surface of an object and the luminance L_0 of the standard white surface of magnesium oxide placed under a specific lighting and observational conditions.
- (3) suction volume The volume of exhaust gas sucked in by operating the suction piston with mounting the filter paper to the inserting part for filter paper of the suction device.
- (4) dead volume The total of inside volumes of the pipe way, branch part, valve and enlarged portion of the filter paper inserting part, from the extracting end to the filter paper inserting part.

3. Types and Rating

The types and ratings of the smokemeters shall be as given in the following:

- (1) Types The types shall be as given in the following:
 - (a) Manual Type (A type using circular filter paper)
 - (b) Automatic Type (A type using tape filter paper)
- (2) Power Source and Rated Frequency The power source of the smokemeters shall be dry cell, galvanic cell or single phase a.c. 100 V, and the rated frequency shall be 50 Hz or 60 Hz for exclusive use, or 50 Hz and 60 Hz for common use.

Applicable Standards and Reference Standard: See page 7.

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4. Performances

The performances of the smokemeters shall be as given in the following:

- (1) Suction Volume The suction volume, when subjected to the test in accordance with the testing method of 7. (1), shall be 330 ± 15 ml.
- (2) Dead Volume The dead volume shall be 10 % or under of the suction volume, when it is calculated in accordance with the method of 7. (2).
- (3) Airtightness The airtightness, when subjected to the test in accordance with the testing method of 7. (3), shall be 60 ml or under in descending water volume.
- (4) Suction Time The suction time, when subjected to the test in accordance with the testing method of 7. (4), shall be 1.4 ± 0.2 s.
- (5) Polluted Area of Filter Paper The polluted area of filter paper, when subjected to the test in accordance with the testing method of 7. (5), shall be 8 ± 0.24 cm².
- (6) Working Performance of Suction Piston The working performance of suction piston, when subjected to the test in accordance with the testing method of 7. (6), shall be free from any rapid change of speed and shall work smoothly throughout the overall stroke.
- (7) Linearity of Pollution Level Indicating Scale The pollution level indicating scale, when subjected to the test in accordance with the testing method of 7. (7), shall be within 3 % the maximum scale value (100 %) in the difference between the respective indicated values and the pollution levels in respect to the radiation factors of the standard colour chips.
- (8) Repeatability When tests are repeatedly conducted as specified in 7. (8) by means of the pollution level measuring device, the deviations from the mean value of the respective indicated values shall be within ± 2 % of the maximum scale value (100 %).
- (9) Stability against Variation of Power Source Voltage When tested in accordance with the testing methods of 7.(9), the variation of indicated values shall be within ± 1.5 % of the maximum scale value (100 %).
- (10) Response Time The response time, when subjected to the test in accordance with the testing method of 7. (10), shall be 3 sec or under.
- (11) Insulation Resistance The insulation resistance, when subjected to the test in accordance with the testing method of 7.(11), shall be 5 M Ω or over. However, this does not apply to the case of a battery built-in type.

5. Construction

The smokemeter is composed of a sampling device which collects exhaust gas through filter paper and a pollution level measuring device which measures the pollution level of the filter paper, and its fundamental construction shall be given in Attached Fig. 1, Attached Fig. 2 (Sampling Device), Attached Fig. 3 (Detecting Part) and Attached Fig. 4 (Indicating Part).

5.1 Sampling Device The sampling device shall be composed of a sampling part, a suction device part and a connecting pipe for sampling, and shall conform to the respective items of the following:

- (1) **Sampling Part** The sampling part shall be fitted to the exhaust pipe and be capable of sucking the exhaust gas easily, and its sampling hole shall not be directly exposed to the dynamic pressure of the sample gas.
 - (a) A fitting shall be provided through which the end position of the sampling part can be installed to the centre of the exhaust pipe as far as possible.
 - (b) The sampling part shall be provided with the cooling fins for cooling the sampled gas.
- (2) **Suction Device Part** The suction device shall be provided with a filter paper inserting part and a suction pump part, and be capable of sucking the volume of gas specified in 4. (1) easily.
 - (a) The filter paper inserting part shall be so constructed that the mounting and demounting of the filter paper can be carried out with ease, and when the filter paper has been mounted, the airtightness of the filter paper holding part shall satisfy 4. (3).
 - (b) The suction pump part shall work smoothly to suck the exhaust gas of a definite volume.
- (3) **Connecting Pipe for Sampling** The connecting pipe for sampling shall be a flexible pipe which is fitted on both ends with heat resistant couplings each connectable to the sampling part and the suction device part.

5.2 Pollution Level Measuring Device The pollution level measuring device, composed of a detecting part and a indicating part, shall conform to the following respective items, and be equipped with the standard colour chips for calibration of approximately 50 % in pollution level.

- (1) **Detecting Part** The detecting part shall be of a construction which transduces the reflection of the polluted filter paper to electric signals through photoelectric element, introducing a luminous flux from light source.
 - (a) The facet of the detecting part which faces the filter paper shall be flat and smooth.
 - (b) The optical axis of the electric lamp shall be aligned to the centre of the filter paper perpendicularly.
 - (c) The lamp chamber shall be so constructed that long hours lighting of the electric lamp gives no adverse effect to the performance of the photoelectric element.
 - (d) The construction shall be such that the exchange of the electric lamp is carried out with ease.
 - (e) The photoelectric element shall satisfy (7), (8), (9) and (10) of 4. and have the performances of a selenium cell or equal to it.