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**Petroleum products—
Diesel fuel—
Determination of cold filter
plugging point**

ICS 75.160.20

Descriptors : light fuel oil, filters, permeability measurement, mechanical properties
of fluids, solidification, pouring tests

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International Trade and Industry through deliberations at the Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law. Consequently **JIS K 2288 : 1993** is replaced with **JIS K 2288 : 2000**.

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Petroleum products—Diesel fuel— Determination of cold filter plugging point

1 Scope This Japanese Industrial Standard specifies the method to measure cold filter plugging point of diesel fuel.

Remarks : The use of this Standard may involve hazardous reagents, operations and equipment. This Standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this Standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

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

JIS B 2401 *O-rings*

JIS B 7184 *Profile projectors*

JIS B 7410 *Liquid-in-glass thermometers for testing of petroleum products*

JIS K 2251 *Crude petroleum and petroleum products—Sampling*

JIS K 2269 *Testing methods for pour point and cloud point of crude oil and petroleum products*

JIS K 8034 *Acetone*

JIS K 8593 *Petroleum ether*

JIS K 8680 *Toluene*

JIS K 9701 *Heptane*

JIS P 3801 *Filter paper (for chemical analysis)*

JIS Z 8402-6 *Accuracy (trueness and precision) of measurement methods and results—Part 6 : Use in practice of accuracy values*

JIS Z 8801 *Test sieves*

3 Definition For the purpose of this Standard, the definition used in this Standard is as follows.

plugging point The cold filter plugging point is defined as the highest temperature (expressed as a multiple of 1 °C) at which the fuel, when cooled under the prescribed conditions, will not flow through the mesh filter with 45 µm mesh aperture or requires more than 60 s for 20 mL to pass through or fails to return completely to the test jar.

Remarks : Plugging point is often called **CFPP** (cold filter plugging point).

4 Summary of method The fuel sample of 45 mL is taken in a test jar, then is cooled under specified conditions and, at interval of 1 °C, a vacuum of 1.96 kPa corresponding to 200 mm water gauge is applied to draw the fuel through a fine wire mesh filter with 45 µm mesh aperture. The duration required by 20 mL sample to pass through the mesh filter is measured.

Thus, read the temperature at which the sample needs more than 60 s to pass through the mesh filter, or sample cannot pass through the filter, and the temperature is made as the plugging point.

Remarks : Automatic testers are available for obtaining the plugging point. In these, when doubtful in the test result, the above method shall apply.

Informative reference : This test method is established on the basis of **IP 309/96** (*Diesel and domestic heating fuels—Determination of cold filter plugging point*).

5 Reagents Reagents shall be as follows.

- a) **Toluene** Specified in **JIS K 8680**.
- b) **Heptane** Specified in **JIS K 9701**.
- c) **Petroleum ether** Specified in **JIS K 8593**.
- d) **Acetone** Specified in **JIS K 8034**.

6 Tester The tester for cold filter plugging point is composed of the following from a) to m). Fig. 1 shows an example of the tester.

- a) **Test jar** This test jar, made of clear glass, cylinder type with flat bottom, has a shape and dimensions as shown in Fig. 2, and has an etched mark at 45 mL level.
- b) **Filter unit with wire mesh** The filter unit is composed of wire mesh, wire mesh holder, filter body, cap, filter base, O-ring, and others. Fig. 3 shows its construction, shape, and dimensions of each part.

Wire mesh is made of twill weave by stainless steel wire with 45 µm nominal aperture specified in **JIS Z 8801**, and cut out to make a circle with 14 mm to 15 mm diameter.

The material of O-ring shall be Class 2 specified in **JIS B 2401**.

Remarks 1 Test method of checking wire mesh: Check the aperture and diameter of metal wire using a profile projector specified in **JIS B 7184** or device having equal to or superior in performance. When being magnified 80 to 100 times and being checked, its standard dimensions shall be within the tolerance shown in Informative reference Fig. 1.

- 2 The wire mesh holder shall be of plug type or screw type, and when the filter unit with wire mesh was set up, it shall hold the wire mesh correctly without twist.

- c) **Stopper of test jar** The stopper, made of oil-resistant plastics, has shape and dimensions as shown in Fig. 4, with a pointer, and shall fasten a thermometer.

Remarks : The pointer, when the tester for cold filter plugging point was constructed, can be used to make it easy to set the end point of thermometer $1.5 \text{ mm} \pm 0.2 \text{ mm}$ upper than the bottom of a test jar.

- d) **Supporting ring** Made of oil-resistant plastics, and Fig. 5 shows its example.

The supporting ring can stably hang vertically the jacket in a cooling bath and shall be constructed so as to set the stopper of test jar at concentric position.

- e) **Jacket** A watertight cylindrical jacket with flat bottom, made of brass or stainless steel, with the dimensions given in Fig. 6.

- f) **Insulating ring and spacer** Made from oil resistant plastics, with the shape and dimensions given in Fig. 7.

The insulating ring and spacer is used to insulate the test jar from the bottom and sides of the jacket by a definite distance. The spacer shall fit closely to the test jar and loosely inside the jacket.

- g) **Pipette** Made from clear glass, with the shape and dimensions as shown in Fig. 8.

- h) **Thermometer** Thermometer number 9(PP) and 10(PP) specified in **JIS B 7410**.

- i) **Vacuum source** Vacuum pump or water pump, capable of keeping constant flow rate of air which passes through the vacuum controlling device.

Remarks : The flow rate of $15 \text{ L} \pm 1 \text{ L/h}$ of air is preferable. When plural samples are measured at the same time, the flow rate of air shall be controlled to be $15 \text{ L} \pm 1 \text{ L/h}$ per one sample.

- j) **Vacuum controlling device** Capable of sucking sample under definite vacuum of 1.96 kPa. The following prescribed example is preferable.

The device is composed of 2 glass bottles whose height is at least 350 mm and capacity is at least 5 L and of water manometer, and one glass bottle is filled adequately with water. Into this glass bottle keeping water, insert a glass pipe for air suction, and control the depth of water to make the reduced pressure of the water manometer to be 1.95 kPa to 1.97 kPa. Place another 5 L empty bottle between this glass bottle and the water manometer, and this empty jar works as a vacuum reservoir to secure a constant reduced pressure. Fig. 1 shows the layout of an apparatus.

- k) **Stop watch** Graduated to 0.2 s.

- l) **Filter paper** Second class for qualitative analysis specified in **JIS P 3801**.

- m) **Cooling bath** The cooling bath shall be of a shape and size suitable for supporting vertically the jacket in cooling medium, by the depth of $85 \text{ mm} \pm 2 \text{ mm}$, and capable of keeping the bath temperature as shown in Table 1.

If several testing units are placed in one large cooling bath, the distance between the jacket walls shall be at least 50 mm. The bath temperature shown in Table 1 shall be used, according to the different level of expected cold filter plugging points.