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**Determination of flash point —
Part 4 : Cleveland open cup method**

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Contents

	Page
Introduction	1
1 Scope	1
2 Normative references.....	1
3 Terms and definitions	2
4 Principle.....	2
5 Reagents	3
6 Apparatus	3
7 Preparation of apparatus.....	4
8 Sampling and preparation of sample.....	5
9 Sample handling.....	5
10 Procedure.....	6
11 Calculation.....	7
12 Expression of results	8
13 Precision	8
14 Test report.....	9
Annex A (normative) Cleveland open cup apparatus	10
Annex B (normative) Verification of apparatus.....	15
Annex JA (informative) Classification of test methods	18
Annex JB (informative) Comparison table between JIS and corresponding International Standard	19

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 Petroleum Association of Japan (PAJ), with a draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law.

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Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

JIS K 2265 consists of the following 4 parts, under the general title “*Determination of flash point*”:

Part 1 : Tag closed cup method

Part 2 : Rapid equilibrium closed cup method

Part 3 : Pensky-Martens closed cup method

Part 4 : Cleveland open cup method

Determination of flash point – Part 4: Cleveland open cup method

Introduction

This Japanese Industrial Standard has been prepared based on the second edition of **ISO 2592** published in 2000 with some modifications of the technical content in order to conform to the domestic actual situation.

The portions underlined with dots in this part of **JIS K 2265** are the matters modified from the original International Standard. A list of modifications with the explanations is given in Annex JB.

The use of this part of **JIS K 2265** may involve hazardous materials, operations and equipment. This part of **JIS K 2265** does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this test method to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

1 Scope

This part of **JIS K 2265** specifies a procedure for the determination of flash and fire points of petroleum products using the Cleveland open cup apparatus. It is applicable to petroleum products having an open cup flash point above 79 °C (except for crude oils and fuel oils). The crude oils and the fuel oils are most commonly tested by the closed cup procedure described in **JIS K 2265-3**.

NOTE 1 Flash point and fire point are indications of the ability of a substance to form a flammable mixture with air under controlled conditions. They are effective properties that may contribute towards the assessment of overall flammability and combustibility of a material.

NOTE 2 This Standards group includes the test methods shown in Annex JA.

NOTE 3 The International Standard corresponding to this part of **JIS K 2265** and the symbol of degree of correspondence are as follows.

ISO 2592:2000 *Determination of flash and fire points—Cleveland open cup method* (MOD)

In addition, a symbol (MOD) which denotes the degree of correspondence in the contents between the relevant International Standard and **JIS** shows modification according to **ISO/IEC Guide 21**.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of **JIS K 2265**.

The most recent editions of the standards (including amendments) indicated below shall be applied.

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

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

NOTE : The corresponding International Standard: **ISO 3170** *Petroleum liquids—Manual sampling* (MOD)

JIS K 2265-3 *Determination of flash point—Part 3: Pensky-Martens closed cup method*

NOTE : The corresponding International Standard: **ISO 2719** *Determination of flash point—Pensky-Martens closed cup method* (MOD)

JIS Q 0033 *Uses of certified reference materials*

NOTE : The corresponding International Standard: **ISO Guide 33** *Uses of certified reference materials* (IDT)

JIS Q 0034 *General requirements for the competence of reference material producer*

NOTE : The corresponding International Standard: **ISO Guide 34** *General requirements for the competence of reference material producers* (IDT)

JIS Q 0035 *Certification of reference materials—General and statistical principles*

NOTE : The corresponding International Standard: **ISO Guide 35** *Reference materials—General and statistical principles for certification* (IDT)

JIS Z 8401 *Guide to the rounding of numbers*

JIS Z 8402-4 *Accuracy (trueness and precision) of measurement methods and results—Part 4: Basic methods for the determination of the trueness of a standard measurement method*

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

ISO 3171 *Petroleum liquids—Automatic pipeline sampling*

3 Terms and definitions

For the purposes of this part of **JIS K 2265**, the following terms and definitions apply.

3.1 flash point

lowest temperature of the test portion, corrected to a barometric pressure of 101.3 kPa, at which application of an ignition source causes the vapour of the test portion to ignite momentarily and the flame to propagate across the surface of the liquid under the specified conditions of test

3.2 fire point

lowest temperature of the test portion, corrected to a barometric pressure of 101.3 kPa, at which application of an ignition source causes the vapour of the test portion to ignite and sustain burning for a minimum of 5 s under the specified conditions of test

4 Principle

The test cup is filled to a specified level with the test portion. The temperature of the test portion is increased rapidly at first and then at a slow constant rate as the flash point is approached. At specified temperature intervals, a small test flame is passed across the test cup. The lowest temperature at which application of the test flame causes the vapour above the surface of the liquid to ignite is taken as the flash point at ambient barometric temperature. To determine the fire point, the test is continued until the application of the test flame causes the vapour above the test portion to ignite and burn for at least 5 s. The flash point and fire point obtained at ambient barometric pressure are corrected to standard atmospheric pressure using an equation.

5 Reagents

5.1 Cleaning solvent

The solvent shall be suitable for removal of traces of sample from the test cup and cover.

NOTE : The choice of solvent will depend upon the previous material tested, and the tenacity of the residue. Low volatility aromatic (benzene-free) solvents may be used to remove traces of oil, and mixed solvents, such as toluene-acetone-methanol (TAM), may be efficacious for the removal of gum-type deposits.

5.2 Verification liquids

A series of certified reference materials (hereafter referred to as a “CRM”) or the secondary working standard (hereafter referred to as a “SWS”) as specified in Annex B.

5.3 Steel wool

Any grade capable of removing carbon deposits without damage to the test cup.

6 Apparatus

6.1 Flash point test apparatus

Cleveland open cup apparatus specified in Annex A.

If automated equipment is used, ensure that it has been established that the results obtained are within the precision of this part of **JIS K 2265** and that the test cup and test flame applicator conform to the dimensional and mechanical requirements specified in Annex A and the test procedure conforms to clause 10. If automated testers are used, the user shall ensure that all the manufacturer's instructions for adjusting and operating the instrument are followed.

In cases of dispute, the flash point as determined manually shall be considered the referee test.

6.2 Shield

It shall be a three-plate folding metal screen. Each plate shall be approximately 460 mm square and 610 mm high, and having an open front.

6.3 Thermometer

A thermometer No. 32 (COC) as specified in JIS B 7410 is used...

In addition, when an electric type of temperature-measuring devices may be used, they may meet the requirements for accuracy and have the same response as the thermometers mentioned above.

6.4 Barometer

The readable scale shall be the digit of 0.1 kPa at minimum.

Barometers pre-corrected to give sea level readings, such as those used at weather stations and airports, shall not be used.

In addition, although there are some barometers whose reading is corrected to 0 °C automatically, this correction is not necessary.

7 Preparation of apparatus

7.1 Location of apparatus

Place the apparatus on a level and steady surface in a draught-free room. Shield the top of the apparatus from strong light by any suitable means, to permit detection of the flash point.

When draughts cannot be avoided, it is good practice to surround the apparatus with a shield of suitable size.

When testing samples that produce toxic vapours, the apparatus may be located in a draught chamber with an individual control of air flow, adjusted so that vapours can be withdrawn without causing air currents over the test cup during the test.

7.2 Cleaning the test cup and accessory

Wash the test cup and its accessories with an appropriate solvent to remove any traces of gum or residue remaining from a previous test. Dry the test cup using a stream of clean air to ensure complete removal of the solvent used. If any deposits of carbon are present, remove them by rubbing with steel wool. An apparatus shall be cleaned and maintained according to the manufacturer's instructions.

7.3 Preparing the test cup

Before use, cool the test cup to at least 56 °C below the expected flash point.

7.4 Assembly of apparatus

Support the thermometer in a vertical position with the bottom of the bulb 6 mm from the bottom of the test cup, located at a point halfway between the centre and side of the test cup on a diameter perpendicular to the arc (or line) of the sweep of the test flame, and on the side opposite to the test flame applicator.

NOTE : The immersion line engraved on the thermometer will be 2 mm below the level of the rim of the test cup when the thermometer is properly positioned. An alternative method is to gently lower the thermometer until it contacts the bottom of the test cup, and then raise it 6 mm.

7.5 Verification of apparatus

Verification of apparatus shall be as follows.

- a) Verify the correct functioning of the apparatus at least once a year by testing a CRM. The result obtained shall be equal to or less than $R/\sqrt{2}$ from the certified value of the CRM, where R is the reproducibility at the time of certification of this CRM.

Periodical verification checks should be made using SWS.

A recommended procedure for apparatus verification using CRMs and SWSs, and the production of SWSs, is given in Annex B.

- b) The numerical values obtained during the verification check shall not be used to provide a bias statement, nor shall they be used to make any correction to the flash points subsequently determined using this apparatus.

8 Sampling and preparation of sample

8.1 Sampling method

A test portion for test shall be sampled and prepared according to the sampling of a primary sample and the preparation of a secondary sample as specified in **JIS K 2251**, or according to the methods which are specified in an equivalent National Standard. In the case of automatic sampling, the sampling and preparation may be in accordance with ISO 3171.

8.2 Preparation method

Place samples in tightly sealed containers, appropriate to the material being sampled. Its quality shall be sufficient for a test.

For safety purposes, ensure that the sample container is only filled to between 85 % to 95 % of its capacity.

In the case of performing at least two tests, the amount of a sample to be subdivided should be chosen so that the conditions of 9.1 may be applied.

8.3 Storage method

Store the samples in conditions to minimize vapour loss and pressure build-up. Avoid storing the samples at temperatures in excess of 30 °C.

9 Sample handling

9.1 Subsampling

Subsample at a temperature at least 56 °C below the expected flash point. If an aliquot of the original sample is to be stored prior to testing, ensure that the container is filled to at least 50 % of its capacity.