
**Determination of flash/no flash — Closed
cup equilibrium method**

*Essai de point d'éclair de type passe/ne passe pas — Méthode à l'équilibre
en vase clos*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 1516 was prepared jointly by Technical Committees ISO/TC 28, *Petroleum products and lubricants* and ISO/TC 35, *Paints and varnishes*.

This third edition cancels and replaces the second edition (ISO 1516:1981), which has been technically revised.

Annex A of this International Standard is for information only.

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Introduction

This International Standard describes one of two closed cup equilibrium methods for carrying out a flash/no flash test for paints, varnishes, petroleum and related products, and it should be read in conjunction with the second equilibrium method, ISO 3680 ([2] in the bibliography), when selecting a method.

The determination of the flash point using the same equipment is described in ISO 1523.

This test method does not determine the flash point of the product under test, but merely its behaviour at the selected equilibrium temperature as may be required to comply with laws or regulations relating to the storage, transport and use of flammable products. For this purpose, it is unnecessary to determine the exact flash point, but it is necessary to determine whether or not flashing occurs at a given temperature. By the procedure specified, differences between test apparatus of various standard designs are minimized by ensuring that the test is carried out only when the product under test and the air/vapour mixture above it in the test vessel are considered to be in temperature equilibrium.

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Determination of flash/no flash — Closed cup equilibrium method

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

1 Scope

This International Standard specifies a method to determine if paints, varnishes, paint binders, solvents, petroleum or related products, when maintained at a selected equilibrium temperature and under the conditions of the test, give off sufficient flammable vapour to cause ignition on application of an external source of flame applied in a standard manner.

This International Standard is not applicable to water-borne paints which may, however, be tested using ISO 3680 ([2] in the bibliography).

The method is suitable for use over the temperature range $-30\text{ }^{\circ}\text{C}$ to $110\text{ }^{\circ}\text{C}$, depending on the use of different apparatus listed in Table 1.

The interpretation of results obtained from solvent mixtures containing halogenated hydrocarbons should be considered with caution, as these mixtures can give anomalous results.

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2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 1513:1992, *Paints and varnishes — Examination and preparation of samples for testing*

ISO 1523:2002, *Determination of flash point — Closed cup equilibrium method*

ISO 2719:—¹⁾, *Determination of flash point — Pensky-Martens closed cup method*

ISO 3170:1988, *Petroleum liquids — Manual sampling*

ISO 3171:1988, *Petroleum liquids — Automatic pipeline sampling*

ISO 13736:1997, *Petroleum products and other liquids — Determination of flash point — Abel closed cup method*

ISO 15528:2000, *Paints, varnishes and raw materials for paints and varnishes — Sampling*

1) To be published. (Revision of ISO 2719:1988)

ASTM D56-00, *Standard Test Method for Flash Point by Tag Closed Tester*

DIN 51755:1974, *Testing of mineral oils and other combustible liquids; determination of flash point by the closed tester according to Abel-Pensky*

3 Term and definition

For the purposes of this International Standard, wherein ignition source is recognized as being a flame, the following term and definition applies.

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 and the flame to propagate across the surface of the liquid under the specified conditions of test

4 Principle

The test portion is placed in a suitably designed closed cup mounted in a thermostatically controlled bath. After the test portion has been maintained at the selected equilibrium temperature conditions for at least 10 min, an ignition trial is carried out by directing a small flame into the test cup. Whether or not the test flame causes the vapour above the test portion to ignite, is recorded.

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5 Chemicals and materials (standards.iteh.ai)

5.1 **Cleaning solvent**, for removal of traces of the previous test portion 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 may be effective for the removal of gum-type deposits.

5.2 **Verification liquids**, see ISO 1523.

6 Apparatus

6.1 **Test cup and lid**: a closed cup with, where specified, an internal level indicator, and lid, as specified in the standards listed in Table 1.

The test cup shall be fitted with a tightly fitting cover which carries an opening slide and an ignition device capable, when the slide is open, of positioning an ignition flame, with a diameter of between 3 mm and 4 mm, at the approximate centre of the opening in the lid. When positioned, the tip of the ignition device shall be between the planes of the lower and upper surfaces of the lid at a point on a radius passing through the centre of the opening. The apparatus shall be designed such that an ignition trial can be performed by opening the slide, positioning and removing the nozzle of the ignition device, and closing the slide again in a period of between 2 s and 3 s. A mechanically driven device for carrying out this operation is permitted provided that it can be shown that it meets the specification.

NOTE The source of flame in the ignition device may be any suitable flammable gas.

6.2 **Test cup thermometer**, as specified for use with the test cup in the standards listed in Table 1.

NOTE Other types of temperature measuring devices may be used, provided that they meet the requirements for accuracy and have the same response as the thermometers specified in the standards listed in Table 1.

Table 1 — Applicable temperature range

Standard test method	Temperature range °C
ISO 2719 Pensky-Martens	10 to 110
ISO 13736 Abel	– 30 to 80
ASTM D56 Tag	up to 93
DIN 51755 Abel-Pensky	– 30 to 65

6.3 Thermostated bath, containing a suitable liquid, thermostated and capable of being adjusted to, and maintained at, the required temperature $\pm 0,5$ °C.

6.4 Thermostated bath thermometer, capable of measuring the bath temperature with the same accuracy as that of the test cup thermometer (6.2).

6.5 Support, designed such that the test cup is immersed in direct contact with the liquid in the thermostated bath, in such a position that the level of the test portion in the cup is the same as that of the liquid and that the cover and upper edge are horizontal. For an example, see Figure 1, which illustrates the use of the Abel test cup.

6.6 Barometer, accurate to 0,1 kPa. Barometers precorrected to give sea-level readings, such as those used at weather stations and airports, shall not be used.

6.7 Heating bath or oven (if required), capable of meeting the requirements for the pretreatment of samples that are semi-solid or solid at ambient temperature. See 9.1.4.

6.8 Cooling bath or refrigeration unit (if required), capable of cooling the sample to at least 10 °C below the test temperature. See 9.3.

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7 Apparatus preparation

7.1 Location of the apparatus

Set up the apparatus in a draught-free position and preferably in subdued light.

7.2 Preparation of the thermostated bath

Bring the temperature of the thermostated bath (6.3) to, and maintain it at, the selected equilibrium test temperature $\pm 0,5$ °C (see 10.3).

7.3 Preparation of the flash point apparatus

Carefully clean and dry the test cup (6.1), its cover and thermometer (6.2). Bring them to a temperature at least 2 °C below the selected equilibrium test temperature (see 10.3).

7.4 Apparatus verification

Verify the correct functioning of the apparatus at least once a year by testing a certified reference material (CRM) (see 5.2) in accordance with the procedures for apparatus verification given in ISO 1523.

It is recommended that more frequent verification checks are made using secondary working standards (SWSs).