INTERNATIONAL STANDARD

ISO 1523

Third edition
2002-03-01

Determination of flash point — Closed cup equilibrium method

Détermination du point d'éclair — Méthode à l'équilibre en vase clos

Reference number
ISO 1523:2002(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.ch
Web www.iso.ch

Printed in Switzerland

Contents

Page

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 1523 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 1523:1983), which has been technically revised.

Annex A of this International Standard is for information only.

Introduction

This International Standard describes one of two closed cup equilibrium methods for the determination of the flash point of paints, varnishes, petroleum and related products, and it should be read in conjunction with the second equilibrium method, ISO 3679 ([5] in the bibliography), when selecting a method.

The determination of the flash/no flash temperature using the same equipment is described in ISO 1516 ([4] in the bibliography).

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.

Determination of flash point — 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 the flash point of paints, varnishes, paint binders, solvents, petroleum or related products.

This International Standard is not applicable to water-borne paints which may, however, be tested using ISO 3679 ([5] in the bibliography).

The method is suitable for use over the temperature range – 30 °C to 110 °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.

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 2719:—[1)] , *Petroleum products and lubricants — 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*

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*

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

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 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 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 heating bath. The temperature of the bath is slowly raised at such a rate that the difference in temperature between the liquid in the bath and the test portion in the cup never exceeds 2 °C, and the temperature of the test portion does not rise at a rate greater than approximately 0,5 °C in 1,5 min.

During the heating-up period, ignition trials are carried out at intervals of not less than 1,5 min. The lowest temperature at which a flash occurs is noted.

5 Chemicals and materials

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 annex A.

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.

6.3 Heating bath, containing a suitable liquid, capable of being heated at the required temperature rate (see 10.10), and of adequate size and heat capacity to meet the requirements of 10.10.

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

6.4 Heating bath thermometer, capable of measuring the test 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 heating/cooling 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.

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 heating bath

Bring the temperature of the heating bath (6.3) to a temperature 5 °C below the expected flash point (see the last paragraph of 10.1).

7.3 Preparation of the test cup

Carefully clean and dry the test cup (6.1), its cover, thermometer (6.2) and where appropriate, the stirrer. Bring them to a temperature at least 5 °C below the expected flash point (see the last paragraph of 10.1).

7.4 Apparatus verification

7.4.1 Verify the correct functioning of the apparatus at least once a year by testing a certified reference material (CRM) (A.2.1). 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 of the method (see 13.2).

It is recommended that more frequent verification checks be made using secondary working standards (SWSs) (A.2.2).

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