INTERNATIONAL STANDARD

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Petroleum and related products — Determination of emulsion stability of fire-resistant fluids —

Part 1: Fluids in category HFAE

Pétrole et produits connexes — Détermination de la stabilité d'émulsion de fluides difficilement inflammables —

Partie 1: Fluides de catégorie HFAE

Reference number
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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 2.

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 document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 20783-1 was prepared by Technical Committee ISO/TC 28, *Petroleum products and lubricant*.

ISO 20783 consists of the following parts, under the general title *Petroleum and related products — Determination of emulsion stability of fire-resistant fluids*:

— *Part 1: Fluids in category HFAE*

— *Part 2: Fluids in category HFB*

Petroleum and related products — Determination of emulsion stability of fire-resistant fluids —

Part 1:
Fluids in category HFAE

WARNING — The use of this part of ISO 20783 may involve hazardous materials, operations and equipment. This part of ISO 20783 does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this part of ISO 20783 to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

1 Scope

This part of ISO 20783 specifies a test method to assess the stability of emulsions within the category HFAE, as defined in ISO 6743-4[1)], made up with waters having clearly-defined concentrations of salts. This method is applicable only to HFAE fluids and not to HFAS fluids.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3170:—[2)], *Petroleum liquids — Manual sampling*

ISO 3696:1987, *Water for analytical laboratory use — Specification and test methods*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
stability
ability of a fluid to remain of a uniform composition and consistency for extended periods of time, without the formation of layers having compositions different to the bulk or the separation of components or ingredients

1) ISO 6743-4:1999, *Lubricants, industrial oils and related products (class L) — Classification — Part 4: Family H (Hydraulic systems)*.

2) To be published. (Revision of ISO 3170:1988)

3.2
oil separation
production, in the form of droplets or a continuous layer at the surface of the test sample, of a separate phase that has a distinct difference in colour, generally more or less dark yellow, and a distinct phase boundary that separates it from the bulk of the test sample

3.3
creaming
production of a layer at the surface of the test sample with a white to yellow-white colour, showing a consistency different from the rest of the sample, but not necessarily a distinct separation boundary

4 Principle

A sample of emulsifying oil is used to make up an emulsion with a standard test water with which it has been declared to be compatible by the manufacturer. The emulsion is stored for a specified period at a specified temperature. Observations of the stability of the emulsion are made at the end of the storage period.

5 Reagents

5.1 **Demineralized water**, meeting the requirements of Grade 2 of ISO 3696:1987.

5.2 **Potable water**, i.e. tap water, unless the mains supply is contaminated with particulate or high soluble mineral content.

5.3 **Acetone** (CH_3COCH_3), general purpose reagent (GPR).

5.4 **Propan-2-ol** (isopropyl alcohol) ($CH_3CHOHCH_3$), general purpose reagent (GPR).

5.5 **Strong oxidizing solution**.

The reference strong oxidizing solution is chromosulfuric acid (see warning), but for the majority of circumstances, alternative non-chromium containing solutions have been found to be satisfactory.

Laboratory detergents may be used for the cleaning process provided that they give the same results as the strong oxidizing solution.

WARNING — Chromosulfuric acid is a health hazard. It is toxic, a recognized carcinogen as it contains Cr(VI) compounds, highly corrosive and potentially hazardous in contact with organic materials. When using chromic acid cleaning solution, eye protection and protective clothing are essential. Never pipette the cleaning solution by mouth. After use, do not pour cleaning solution down the drain, but neutralize it with great care owing to the concentrated sulfuric acid present, and dispose of it in accordance with standard procedures for toxic laboratory waste (chromium is highly dangerous to the environment).

Non-chromium containing, strongly oxidizing acid cleaning solutions are also highly corrosive and potentially hazardous in contact with organic materials, but do not contain chromium, which has special disposal problems.

6 Apparatus

6.1 **Flasks**, 150 ml or 200 ml capacity, with graduated necks (Hirschsohn flasks) as shown in Figure 1.

6.2 **Cork bungs**, to fit the flasks (6.1).

6.3 **Oven**, capable of maintaining a temperature of (70 ± 2) °C or (50 ± 2) °C.

Dimensions in millimetres

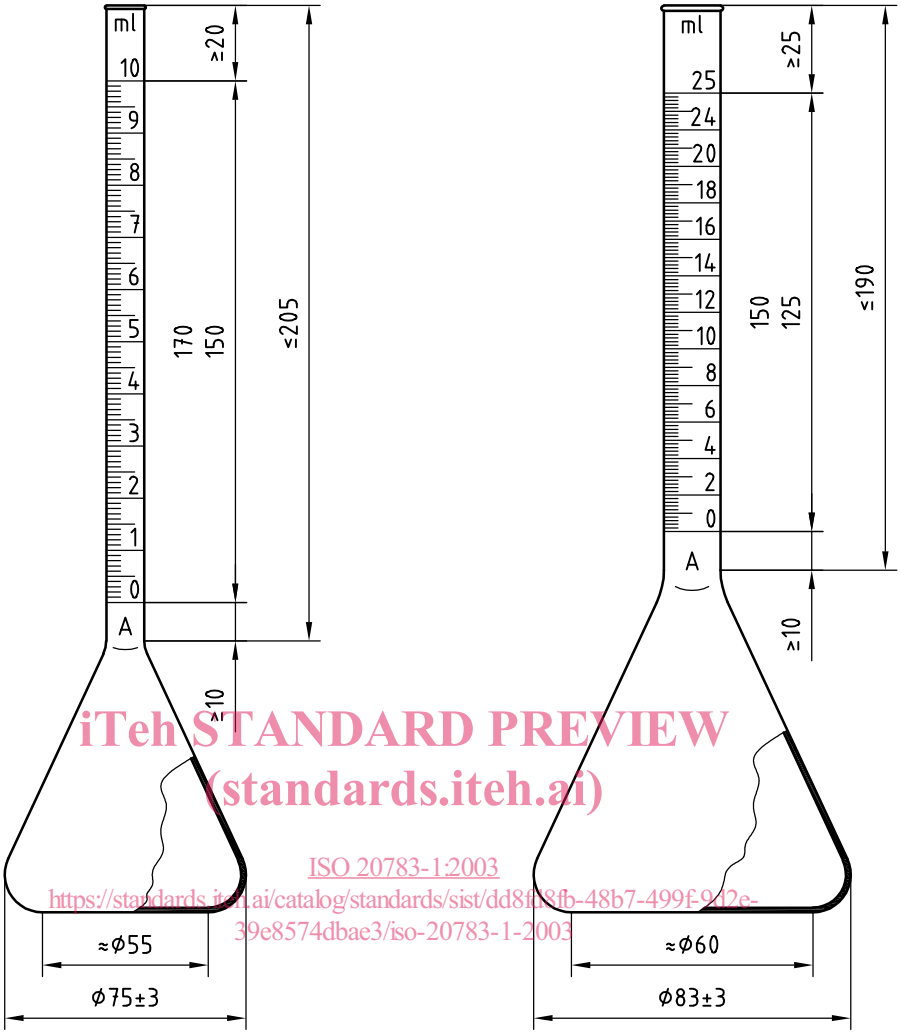

Figure 1 — Hirschsohn flasks

7 Samples and sampling

7.1 Unless otherwise specified, samples of emulsifying oil shall be obtained by the procedures described in ISO 3170.

7.2 Prepare 1 l of emulsion using one of the standard test waters described in Annex A (normally the hardest of the waters with which the manufacturer has declared the emulsifying oil to be compatible). Use the proportion of emulsifying oil recommended by the manufacturer for normal applications. Vigorous shaking by hand is usually sufficient to emulsify the oil, but reference should be made to the supplier's instructions regarding mixing.

Other proportions may be used if required and by agreement with the parties concerned.

8 Test conditions

On agreement between the parties concerned, one of the following two test conditions shall be chosen:

a) Test condition 1:

— test temperature: (70 ± 2) °C

— test duration: (168 ± 2) h

b) Test condition 2

— test temperature: (50 ± 2) °C

— test duration: (600 ± 2) h

9 Procedure

9.1 Prepare three flasks (6.1) of either capacity. However, if there is reason to expect much separation, it is advisable to use the larger ones. Clean the flasks by washing them in strong oxidizing solution (5.5) and rinsing with potable water (5.2) followed by demineralized water (5.1). Allow them to dry, either in the oven (6.3) or by a final rinse of acetone (5.3) or propan-2-ol (isopropyl alcohol) (5.4) followed by air drying at ambient temperature. Fill the flasks with the prepared emulsion (7.2) to approximately the middle of the graduated scale. Insert a cork bung loosely into each flask.

9.2 Adjust the temperature of the oven to the value required by the test condition chosen. Place the stoppered flasks in the oven and maintain the oven at the temperature and for the test duration required by the chosen test condition.

9.3 Ensure that while the emulsion is being heated to the test temperature, the cork bungs are not displaced and the emulsion level does not rise above the top graduation mark of the flasks. When the emulsion has reached the test temperature, ensure that the cork bungs are inserted tightly to prevent evaporation.

9.4 At the end of the test time and while the flasks and their contents are still hot, assess the emulsions in the test flasks visually according to the categories for oil separation and creaming given in Tables 1 and 2. Record the categories observed for each of the test flasks.

9.5 Record the presence of any water separation at the bottom of the flasks.

Table 1 — Oil separation (A)

Category	Description
1A	No oil separation
2A	Traces of oil (oil drops or a ring of oil)
3A	Continuous film of oil (see the Note)
NOTE Oil separation at the sides of the flasks is classified under category 2A.	

Table 2 — Creaming (R)

Category	Description
1R	No creaming
2R	$<$ 1 ml of creaming
3R	$>$ 1 ml of creaming

10 Expression of results

10.1 Express the result of the assessment of separation as the category designation for which at least two identical results were obtained. If three different categories are obtained, repeat the test. If, upon repeating the test, three different categories are again obtained, report the result as 3A.

10.2 Express the result of the assessment of creaming as the category designation for which at least two identical results were obtained. If three different categories are obtained, repeat the test. If, upon repeating the test, three different categories are again obtained, report the result as 3R.

10.3 Express the result of the assessment of stability as the two category designations for separation and for creaming.

EXAMPLE Three individual results for a fluid show categories 1A, 1A, 2A for oil separation and 2R, 2R, 3R for creaming. The result of the assessment of stability is 1A — 2R.

11 Precision

The precision of this test method has not been determined. However, for guidance, in co-operative interlaboratory tests carried out at 40 °C with a water of hardness equivalent to 400 mg/l of calcium carbonate, a 95 % confidence limit was established if the total amount of oil separation and creaming was no greater than 0,1 ml after 25 h standing.

12 Test report

The test report shall contain at least the following information:

a) a reference to this part of ISO 20783;

b) the type and complete identification of the product tested, including the water type used for the preparation of the emulsion and the percentage concentration of the emulsifying oil used to make up the emulsion tested;

c) the test condition (see Clause 8);

d) the result of the assessment of stability;

e) the presence or absence of water separation at the bottom of the flasks;

f) any deviation, by agreement or otherwise, from the procedure specified;

g) the date of the test.