
**Petroleum and related products —
Determination of pH of fire-resistant
fluids within categories HFAE, HFAS and
HFC**

*Pétrole et produits connexes — Détermination du pH des fluides
difficilement inflammables de catégories HFAE, HFAS ou HFC*

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ISO 20843:2003

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Foreword

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ISO 20843 was prepared by Technical Committee ISO/TC 28, *Petroleum products and lubricants*.

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Introduction

HFAE, HFAS and HFC fluids are used in hydraulic systems where the running conditions require fire-resistant fluids. The determination of the pH of aqueous hydraulic fluids is useful to monitor the product in service. Any important variation can be the sign of bacterial proliferation and may have an impact on the corrosion-protection properties.

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Petroleum and related products — Determination of pH of fire-resistant fluids within categories HFAE, HFAS and HFC

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 test method to determine the pH value of non-flammable fluids within categories HFAE, HFAS and HFC, as classified in ISO 6743-4¹⁾.

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 Principle

The pH value is established by using a pH meter which measures the potential difference between two electrodes immersed in the fluid being tested. One of the electrodes should be of glass and the other should be of calomel.

NOTE A grouped electrode device can also be used.

The pH measurement is carried out at 20 °C.

The measurement should be carried out as soon as possible after sampling, less than 48 h if possible, to avoid errors due to possible oil release and/or pH changing.

4 Reagents and materials

4.1 Water, conforming to Grade 2 of ISO 3696.

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)

4.2 Standard solutions to calibrate the pH meter

4.2.1 Buffer solution, pH 7,00 at 20 °C

Dissolve 3,800 g of potassium dihydrogen orthophosphate (KH_2PO_4) and 3,415 g of disodium hydrogen phosphate (Na_2HPO_4) in water (4.1) and dilute to 1 000 ml at 20 °C.

Before use, the potassium dihydrogen orthophosphate shall be dried for 2 h at a temperature between 110 °C and 120 °C.

4.2.2 Buffer solution, pH 9,22 at 20 °C

Dissolve 3,80 g of disodium tetraborate decahydrate ($\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$) in water (4.1) and dilute to 1 000 ml at 20 °C.

4.2.3 Buffer solution, pH 11,72 at 20 °C

Dissolve 1,42 g of disodium hydrogen phosphate (Na_2HPO_4) in a 100 ml solution of carbonate-free sodium hydroxide (NaOH) (0,1 mol/l) and dilute to 1 000 ml at 20 °C with water (4.1).

NOTE Ready mixed buffer solutions available on the market may be used in place of the buffer solutions listed in 4.2.1 to 4.2.3. Use the buffer solutions within the period indicated on the bottle (in the case of a ready mixed buffer) or within a period of 3 months after preparation.

4.3 Cleaning reagents

4.3.1 Toluene (C_7H_8), of analytical quality.

4.3.2 Propan-2-ol ($\text{C}_3\text{H}_8\text{O}$), of analytical quality.

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5 Apparatus

5.1 pH meter

5.2 Glass electrode and reference electrode or a grouped electrode device

5.3 Thermometer, with a range from 0 °C to 100 °C graduated in 1 °C.

5.4 Analytical balance, capable of weighing to the nearest 0,1 mg.

6 Sampling

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

7 Procedure

7.1 Calibration of pH meter

Calibrate the pH meter (5.1) at 20 °C in accordance with the manufacturer's instructions, preferably using the buffer solutions specified in 4.2.

The pH value of these solutions should lie on either side of the expected pH value of the fluid being tested.

7.2 Measurement of pH

The pH measurement should be carried out as soon as possible after sampling (see Clause 6), less than 48 h if possible, to avoid errors due to possible oil release and/or pH changing.

Pour the fluid to be tested into a glass beaker and adjust to a temperature of $20\text{ °C} \pm 1\text{ °C}$. Carefully clean the electrodes in water (4.1), immerse them in the fluid under test, and read off the pH value from the meter (5.1) after a stabilization time of approximately 1 min. If there is an oil separation on the surface of the fluid, avoid any oil deposit on the measuring part of the glass electrode which could modify the contact potential and give rise to measurement errors.

After the test, clean the electrodes with toluene (4.3.1) followed by propan-2-ol (4.3.2).

8 Expression of results

Report the pH value to the nearest 0,1 unit of pH.

9 Precision

9.1 General

The precision of this test method has been estimated.

9.2 Repeatability, r

The difference between two test results obtained by the same operator with the same apparatus under constant operating conditions on identical test material would in the long run, in the normal and correct operation of the test method, exceed the following value in only one case in twenty.

HFAE, HFAS and HFC fluids, $r = 0,2$

9.3 Reproducibility, R

The difference between two single and independent test results obtained by different operators working in different laboratories on identical test material would in the long run, in the normal and correct operation of the test method, exceed the following value in only one case in twenty.

HFAE and HFAS fluids: $R = 0,6$

HFC fluids: $R = 0,3$

10 Test report

The test report shall contain at least the following information:

- a) a reference to this International Standard;
- b) the type and complete identification of the product tested, including, for HFAE and HFAS fluids, the water type and percentage of concentrate used to make up the fluid;
- c) the result of the test (see Clause 8);
- d) any deviation, by agreement or otherwise, from the procedures specified;
- e) the date of the test.

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