International Standard

ISO 13357-1

Third edition
2025-03

Petroleum products — Determination of the filterability of lubricating oils —

Part 1: Procedure for oils in the presence of water

Produits pétroliers — Détermination de la filtrabilité des huiles lubrifiantes —

Partie 1: Méthode pour les huiles en présence d'eau

Reference number
ISO 13357-1:2025(en)

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 28, *Petroleum and related products, fuels and lubricants from natural or synthetic sources*.

This third edition cancels and replaces the second edition (ISO 13357-1:2017), which has been technically revised.

The main changes are as follows:

— included the use of gravimetric measurement techniques;

— included the use of alternative membranes when testing higher viscosity oils.

A list of all parts in the ISO 13357 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

To minimize wear on the components of an oil-lubricated system, it is important to reduce the concentrations of circulating hard contaminant particles. This is particularly important for hydraulic power systems, for systems whose performance and reliability rely on the maintenance of small clearances and orifices, or for systems that include rolling element bearings as components. These contaminants are removed by the use of filters. The ability of an oil to pass through fine filters, without plugging them, is called its filterability. This document describes a laboratory test procedure for assessing the filterability of mineral oils which have been subjected to prolonged hot contact with water. Filterability so determined is not a physical characteristic of the oil, but represents an estimation of its behaviour in service.

This document describes two measurements, referred to as “stages”. The stage I determination is based on a comparison of the mean flow rate of a fluid through a test membrane with its initial flow rate. Oils having good stage I filterability, but a poor stage II performance (see below), are not likely to have performance problems in use, unless extremely fine system filters are utilized.

The stage II determination is based upon the ratio between the initial flow rate of the fluid through the test membrane and the rate at the end of the test. This part of the procedure is a more severe test and is more sensitive to the presence of gels and fine silts in the oil. Silts and gels can be present in an oil when it is produced or can be formed as an oil ages, especially when hot. An oil with good stage II filterability is unlikely to have filtration problems even in extreme conditions and with fine (less than 5 µm) filtration present. It is thus suitable for use in more critical hydraulic and lubrication systems.

This procedure was developed primarily for hydraulic oils having ISO viscosity grades up to 100, and, apart from the filtration apparatus, was designed to be implemented using mainly standard laboratory apparatus. A modified procedure that includes gravimetric measurements rather than volumetric ones is provided in Annex B. Further, the method has been adapted to test oils of higher viscosity grade than 100 using a coarser membrane filter.

This document defines a method for assessing the filterability of oils in the presence of contaminating water. Some oils will exhibit poorer filterability characteristics in these conditions. ISO 13357-2 is used to investigate the filterability of an oil which is used in applications where the presence of water in the oil is unlikely. An oil which has good filterability in the presence of contaminating water does not necessarily have equally good filterability in dry conditions. An oil having good filterability only when wet is not likely to be generally acceptable.

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Petroleum products — Determination of the filterability of lubricating oils —

Part 1:
Procedure for oils in the presence of water

WARNING — The use of this document can involve hazardous materials, operations and equipment. This document does not purport to address all of the safety problems associated with its use. It is the responsibility of users of this document to take appropriate measures to ensure the safety and health of personnel prior to application of the document, and fulfil statutory and regulatory requirements for this purpose.

1 Scope

This document specifies a procedure for the evaluation of the filterability of lubricating oils in the presence of water. The procedure only applies to mineral-based oils, since fluids manufactured from other materials (e.g. fire-resistant fluids) can be incompatible with the specified test membranes. This document is applicable to oils of viscosity up to ISO viscosity grade (VG) 100, as defined in ISO 3448. Within the range described, the variation in filterability due to viscosity is included within the precision range of this document. The procedure is not suitable for some hydraulic oils on which specific properties are conferred by the use of insoluble or partially soluble additives, or by particularly large molecular species. These additives include some viscosity index modifiers and some friction modifying additives.

This document can also be applied to oils of ISO viscosity grades (VG) 150, 220 and 320, as defined in ISO 3448, using the specified 3,0 µm rated membranes. These oils are widely used as heavy-duty lubricants in equipment such as paper making machines and rolling mills. Within the range described, the filterability as defined is not dependent on the viscosity of the oil.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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, *Petroleum liquids — Manual sampling*

ISO 3448, *Industrial liquid lubricants — ISO viscosity classification*

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

ISO 4788, *Laboratory glassware — Graduated measuring cylinders*

ISO 6614:1994, *Petroleum products — Determination of water separability of petroleum oils and synthetic fluids*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

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