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**Lubricants, industrial oils and  
related products (class L) — Family H  
(Hydraulic systems) — Specifications  
for hydraulic fluids in categories  
HETG, HEPG, HEES and HEPR**

*Lubrifiants, huiles industrielles et produits connexes (classe L) —  
Famille H (Systèmes hydrauliques) — Spécifications applicables aux  
fluides hydrauliques des catégories HETG, HEPG, HEES et HEPR*

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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](http://www.iso.org/directives)).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at [www.iso.org/patents](http://www.iso.org/patents). ISO shall not be held responsible for identifying any or all such patent rights.

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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](http://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*, Subcommittee SC 4, *Classifications and specifications*.

This fourth edition cancels and replaces the third edition (ISO 15380:2016), which has been technically revised.

The main changes are as follows:

- addition of [Clauses 3](#) and [6](#);
- deletion of Annexes B and C;
- updating of the environmental requirements for environmentally acceptable products;
- precision with respect to the stage of the filterability tests, wet and dry.

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](http://www.iso.org/members.html).

## Introduction

The specifications for hydraulic fluids based upon mineral oils (H) are described in ISO 11158 and the specifications for fire-resistant hydraulic fluids (HF) are given in ISO 12922. This document gives specifications for environmentally acceptable hydraulic fluids (HE). These fluids are biodegradable and have a low eco-toxicity. They are designed to minimize the impact upon the environment in the event of a leak or spill.

[Table A.1](#) contains guidelines for changing fluids from mineral-based oils to environmentally acceptable fluids.

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# Lubricants, industrial oils and related products (class L) — Family H (Hydraulic systems) — Specifications for hydraulic fluids in categories HETG, HEPG, HEES and HEPR

## 1 Scope

This document specifies the requirements for environmentally acceptable hydraulic fluids and is intended for hydraulic systems, particularly hydraulic fluid power systems. The purpose of this document is to provide guidance and requirements for suppliers and users of environmentally acceptable hydraulic fluids, and for the direction of original equipment manufacturers of hydraulic systems.

This document stipulates the requirements for environmentally acceptable hydraulic fluids at the time of delivery.

Classification of fluids used in hydraulic application is defined in ISO 6743-4. This document encompasses the four categories of environmentally acceptable fluids covered by ISO 6743-4, namely HETG (triglycerides), HEPG (polyglycols), HEES (synthetic esters) and HEPR (polyalphaolefins and other synthetic hydrocarbons).

## 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 1817, *Rubber, vulcanized or thermoplastic — Determination of the effect of liquids*

ISO 2049, *Petroleum products — Determination of colour (ASTM scale)*

ISO 2160, *Petroleum products — Corrosiveness to copper — Copper strip test*

ISO 2592, *Petroleum and related products — Determination of flash and fire points — Cleveland open cup method*

ISO 2909, *Petroleum products — Calculation of viscosity index from kinematic viscosity*

ISO 3016, *Petroleum and related products from natural or synthetic sources — Determination of pour point*

ISO 3104, *Petroleum products — Transparent and opaque liquids — Determination of kinematic viscosity and calculation of dynamic viscosity*

ISO 3170, *Petroleum liquids — Manual sampling*

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

ISO 3675, *Crude petroleum and liquid petroleum products — Laboratory determination of density — Hydrometer method*

ISO 4259-1, *Petroleum and related products — Precision of measurement methods and results — Part 1: Determination of precision data in relation to methods of test*

ISO 4259-2, *Petroleum and related products — Precision of measurement methods and results — Part 2: Interpretation and application of precision data in relation to methods of test*

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ISO 4259-3, *Petroleum and related products — Precision of measurement methods and results — Part 3: Monitoring and verification of published precision data in relation to methods of test*

ISO 4259-4, *Petroleum and related products — Precision of measurement methods and results — Part 4: Use of statistical control charts to validate 'in-statistical-control' status for the execution of a standard test method in a single laboratory*

ISO 4263-1, *Petroleum and related products — Determination of the ageing behaviour of inhibited oils and fluids — TOST test — Part 1: Procedure for mineral oils*

ISO 4263-3, *Petroleum and related products — Determination of the ageing behaviour of inhibited oils and fluids using the TOST test — Part 3: Anhydrous procedure for synthetic hydraulic fluids*

ISO 4406, *Hydraulic fluid power — Fluids — Method for coding the level of contamination by solid particles*

ISO 6072, *Rubber — Compatibility between hydraulic fluids and standard elastomeric materials*

ISO 6245, *Petroleum products — Determination of ash*

ISO 6247, *Petroleum products — Determination of foaming characteristics of lubricating oils*

ISO 6296, *Petroleum products — Determination of water — Potentiometric Karl Fischer titration method*

ISO 6341, *Water quality — Determination of the inhibition of the mobility of *Daphnia magna* Straus (Cladocera, Crustacea) — Acute toxicity test*

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

ISO 6618, *Petroleum products and lubricants — Determination of acid or base number — Colour-indicator titration method*

ISO 6619, *Petroleum products and lubricants — Neutralization number — Potentiometric titration method*

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

ISO 7120, *Petroleum products and lubricants — Petroleum oils and other fluids — Determination of rust-preventing characteristics in the presence of water*

ISO 7346-2, *Water quality — Determination of the acute lethal toxicity of substances to a freshwater fish [*Brachydanio rerio* Hamilton-Buchanan (Teleostei, Cyprinidae)] — Part 2: Semi-static method*

ISO 8192, *Water quality — Test for inhibition of oxygen consumption by activated sludge for carbonaceous and ammonium oxidation*

ISO 9120, *Petroleum and related products — Determination of air-release properties of steam turbine and other oils — Impinger method*

ISO 9439, *Water quality — Evaluation of ultimate aerobic biodegradability of organic compounds in aqueous medium — Carbon dioxide evolution test*

ISO 11500, *Hydraulic fluid power — Determination of the particulate contamination level of a liquid sample by automatic particle counting using the light-extinction principle*

ISO 12185, *Crude petroleum and petroleum products — Determination of density — Oscillating U-tube method*

ISO 12937, *Petroleum products — Determination of water — Coulometric Karl Fischer titration method*

ISO 13226, *Rubber — Standard reference elastomers (SREs) for characterizing the effect of liquids on vulcanized rubbers*



ISO 13357-1, *Petroleum products — Determination of the filterability of lubricating oils — Part 1: Procedure for oils in the presence of water*

ISO 13357-2, *Petroleum products — Determination of the filterability of lubricating oils — Part 2: Procedure for dry oils*

ISO 14593, *Water quality — Evaluation of ultimate aerobic biodegradability of organic compounds in aqueous medium — Method by analysis of inorganic carbon in sealed vessels (CO<sub>2</sub> headspace test)*

ISO 14635-1, *Gears — FZG test procedures — Part 1: FZG test method A/8,3/90 for relative scuffing load-carrying capacity of oils*

ISO 14669, *Water quality — Determination of acute lethal toxicity to marine copepods (Copepoda, Crustacea)*

ISO 16221, *Water quality — Guidance for determination of biodegradability in the marine environment*

ISO 20763, *Petroleum and related products — Determination of anti-wear properties of hydraulic fluids — Vane pump method*

ISO 26422, *Petroleum and related products — Determination of shear stability of lubricating oils containing polymers — Method using a tapered roller bearing*

EN 16807, *Liquid petroleum products — Bio-lubricants — Criteria and requirements of bio-lubricants and bio-based lubricants*

EN 17181, *Lubricants — Determination of aerobic biological degradation of fully formulated lubricants in an aqueous solution — Test method based on CO<sub>2</sub>-production*

ASTM D2272, *Standard Test Method for Oxidation Stability of Steam Turbine Oils by Rotating Pressure Vessel*

ASTM D2532, *Standard Test Method for Viscosity and Viscosity Change After Standing at Low Temperature of Aircraft Turbine Lubricants*

ASTM D6081, *Standard Practice for Aquatic Toxicity Testing of Lubricants: Sample Preparation and Results Interpretation*

ASTM D6866, *Standard Test Methods for Determining the Biobased Content of Solid, Liquid and Gaseous Samples Using Radiocarbon Analysis*

### 3 Terms and definitions

No terms and definitions are listed in this document.

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>
- IEC Electropedia: available at <https://www.electropedia.org/>

### 4 Sampling

Sampling of hydraulic fluids for the purpose of this document shall be carried out in accordance with the pertinent procedure specified in ISO 3170. A representative test specimen should be taken for analysis.

Any drum, barrel, tanker compartment or other type of container delivered to the end user may be sampled and analysed at the purchaser's discretion.

## 5 Requirements of environmentally acceptable hydraulic fluids

### 5.1 General

For the purpose of this document, hydraulic fluids shall be triglycerides, polyglycols, synthetic esters, polyalphaolefins and related hydrocarbon products. The classification of these hydraulic oils shall be in accordance with ISO 6743-4 for categories HETG, HEPG, HEES and HEPR. The minimum category-defining base oil type content for each category shall be in accordance with the requirements of [Table 1](#).

**Table 1 — Minimum category-defining base fluid content for each category**

Category	Mass fraction	Category defining base fluid <sup>a</sup> type content of the total fluid formulation	Total base fluid content of the fluid formulation
HETG	%	>50	≥70
HEPG	%	>50	≥70
HEES	%	>50	≥70
HEPR	%	>50	≥70

<sup>a</sup> Category-defining base fluid is identified as the relevant triglycerides, polyglycols, synthetic esters, polyalphaolefins and related hydrocarbon products.

Environmentally acceptable hydraulic fluids shall comply with the requirements of EN 16807, as follows: HETG, HEPG, HEES and HEPR shall comply with the biodegradability and the toxicity requirements. Additionally, HETG and HEES shall comply with the carbon of biological origin requirements (see [Table 2](#)).

The requirements published in EN 16807 are intended as baseline requirements for all bio-based lubricants, and represent minimum requirements compared to, for example, the European Ecolabel for Lubricants<sup>[3]</sup>. With the exception of content of carbon of biological origin, these requirements can also be minimum requirements for other types of environmental standards existing in the world.

In a product line of either of the categories, for all grades of a line that uses the same additive package and the same range of base stocks, toxicity requirements may be tested only on the lightest, medium and heaviest grade of the line.

The characteristics of the fluids shall comply with the limiting values set out in [Table 2](#) and with the limiting values of the relevant fluid category set out in [Tables 3](#) to [6](#). The test methods and standards listed in [Tables 2](#) to [6](#) shall apply.

**Table 2 — Environmental requirements for categories HETG, HEPG, HEES and HEPR**

Characteristic of test	Unit	Requirement	Test method or applicable standard
Biodegradability resulting in mineralization of the organic material, 28 d, min.	%	60	ISO 14593 <sup>c</sup> or ISO 9439 <sup>c</sup> or ISO 16221 <sup>c</sup> or EN 17181 <sup>c</sup>
Toxicity <sup>a</sup>			
Acute fish toxicity, 96 h, LC50	mg/l	> 100	ISO 7346-2 <sup>c</sup>
Acute daphnia or copepods toxicity, 48 h, EC50	mg/l	> 100	ISO 6341 <sup>c</sup> or ISO 14669 <sup>c</sup>
Bacterial inhibition, 3 h, EC50	mg/l	> 100	ISO 8192 <sup>c</sup>
Content of carbon of biological origin, min. <sup>b</sup>	%	25	ASTM D6866

<sup>a</sup> Water-soluble fluids shall be tested in accordance with the test method cited. Fluids with low water solubility shall be tested using water-accommodated fractions, and shall be prepared in accordance with ASTM D6081.

<sup>b</sup> Applies only to HETG and HEES type products.

<sup>c</sup> The interpretation of the results of this test method is currently limited due to missing or inapplicable precision data. In case of dispute or doubt, a referee test should be performed in an independent laboratory.

The biodegradability and aquatic toxicity tests should be performed in a laboratory operating in accordance with ISO/IEC 17025 or according to good laboratory practice (GLP).

## 5.2 Biodegradability

In case of dispute, the referee method for compliance with the biodegradability requirement shall be the method specified in EN 17181. In order to check the procedure during the referee process, a reference compound of known biodegradability shall be tested in parallel. Aniline shall be used when testing water-soluble test compounds. For poorly water-soluble test substances, high oleic reference oil (HORO) shall be used.

## 5.3 Acute daphnia or copepods toxicity

In case of dispute, the referee method for compliance with the invertebrate requirement shall be the method specified in ISO 6341.

In order to check the procedure during the referee process, a reference compound of known toxicity shall be tested in parallel. Tetrapropylenebenzenesulfonic acid shall be used when testing water-soluble test compounds. For poorly water-soluble test substances potassium 2,4,5-trichlorophenoxyacetate shall be used.

All other detailed specifications of each category mentioned in this document are provided in [Tables 3](#) to [6](#), respectively, and as indicated below:

- [Table 3](#): category HETG;
- [Table 4](#): category HEPG;
- [Table 5](#): category HEES;
- [Table 6](#): category HEPR.

All of the categories listed above pertain to lubricants, industrial oils and related products of Group HE, i.e. environmentally acceptable hydraulic fluids, a typical application of which is in general hydraulic systems. The composition of each category is specified in the title of [Tables 3](#) to [6](#). These elements are taken from ISO 6743-4.