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ISO/FDIS 8068

Lubricants, industrial oils and related products (class L) — Family T (Turbines) — Specifications for lubricating oils for turbines

Lubrifiants, huiles industrielles et produits connexes (classe L) — Famille T (Turbines) — Spécifications pour les huiles lubrifiantes pour turbines

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Foreword

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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*, Subcommittee SC 4, *Classifications and specifications*.

This third edition cancels and replaces the second edition (ISO 8068:2006), which has been technically revised. It also incorporates the Amendment ISO 8068:2006/Amd 1:2019.

The main changes are as follows:

- updating of the environmental requirements for environmentally acceptable products;
- introduction of steam demulsibility for steam and combined cycle single shaft turbine grades;
- precision with respect to the stage of the filterability tests, wet and dry;
- addition of new viscosity grades for TGCH and THCH categories;
- addition of an EP category for TGCH.

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.

Introduction

New requirements for steam and gas turbine lubricants have arisen from technological changes including the increased efficiency of turbines, more severe operating conditions (cycling, peaking duty) and the increased use of alternative fuels. In addition, the simultaneous operation of gas and steam turbines with the same lubrication circuit means that lubricants are expected to satisfy the requirements for both steam and gas turbine lubrication.

The growing concern over environmental protection has led to the use of lubricants that show minimum toxicity towards flora and fauna. Lubricants used in hydraulic power plants, showing risks of leakage either on surface or ground water, are of particular concern. Therefore, minimum aquatic toxicity is required for these lubricants. In addition, biodegradability is desired to respect the ecosystem.

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Lubricants, industrial oils and related products (class L) — Family T (Turbines) — Specifications for lubricating oils for turbines

WARNING — The handling and use of products as specified in this document can be hazardous, if suitable precautions are not observed. This document does not purport to address all of the safety problems associated with its use. It is the responsibility of the users of this document to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

1 Scope

This document specifies the minimum requirements for lubricants for turbine oils, as delivered. It is intended to be used in conjunction with ISO 6743-5.

This document specifies the requirements for a wide variety of lubricants for the lubrication of most types of turbines for power generation, including steam turbines, gas turbines, single shaft combined cycle turbines with common lubrication system and hydraulic turbines. This document does not specify the requirements for lubricants for wind turbines, which are covered in ISO 12925-1.

The following lubricants are considered:

- mineral oils, of either API groups I, I⁺, II, II⁺, III, including group III from GTL (gas to liquid) process. Some API groups II and III are suitable for high temperature gas turbines;
- synthetic lubricants, ester and polyalphaolefin types intended for high temperature gas turbines;
- synthetic lubricants, ester and polyalphaolefin types, environmentally acceptable for use in hydraulic turbines;
- fire resistant phosphate-ester type lubricants.

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 760, *Determination of water — Karl Fischer method (General method)*

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, *Determination of flash and fire points — Cleveland open cup method*

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

ISO 3016, *Petroleum products — Determination of pour point*

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

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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 or relative density — Hydrometer method*

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*

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 4263-4, *Petroleum and related products — Determination of the ageing behaviour of inhibited oils and fluids — TOST test — Part 4: Procedure for industrial gear oils*

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

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 6743-5, *Lubricants, industrial oils and related products (class L) — Classification — Part 5: Family T (Turbines)*

ISO 7120:1987, *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*

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 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*

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ISO 14593, *Water quality — Evaluation of ultimate aerobic biodegradability of organic compounds in aqueous medium — Method by analysis of inorganic carbon in sealed vessels (CO₂ 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 14935, *Petroleum and related products — Determination of wick flame persistence of fire-resistant fluids*

ISO 20764, *Petroleum and related products — Preparation of a test portion of high-boiling liquids for the determination of water content — Nitrogen purge method*

ISO 20823, *Petroleum and related products — Determination of the flammability characteristics of fluids in contact with hot surfaces — Manifold ignition test*

EN 14832, *Petroleum and related products — Determination of the oxidation stability and corrosivity of fire-resistant phosphate ester fluids*

EN 14833, *Petroleum and related products — Determination of the hydrolytic stability of fire-resistant phosphate ester fluids*

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 CO₂-production*

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

ASTM D2711-22, *Standard Test Method for Demulsibility Characteristics of Lubricating Oils*

ASTM D4636-17, *Standard Test Method for Corrosiveness and Oxidation Stability of Hydraulic Oils, Aircraft Turbine Engine Lubricants, and Other Highly Refined Oils*

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*

DIN 51589-1, *Determination of water separation ability of lubricating oils and low-flammability fluids after contact with steam*

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

Unless otherwise specified in commodity specifications, samples shall be drawn in accordance with ISO 3170.

5 Requirements for turbine oils

Fluids, when tested under the prescribed methods specified in [Tables 4 to 12](#), shall be in accordance with the limits set out in [Table 4 to 12](#), where applicable.

The appearance of the delivered oils shall be clear and bright and free of any visible particulate matter, under visible light at ambient temperature.

These oils shall not contain any viscosity index improver.

Most of the test methods specified in the tables contain a precision statement. In cases of dispute, the procedures described in ISO 4259-2 shall apply. In such cases, it is expected that the conditions specified in ISO 4259-1, ISO 4259-3, ISO 4259-4 and ISO 4259-5 are met. Water content shall be determined in accordance with ISO 760, ISO 6296, ISO 12937 or ISO 20764. In cases of dispute, ISO 20764 shall be used.

The elastomer compatibility index shall be determined in accordance with ISO 1817 and under the conditions listed in [Table 1](#) according to the product category. The standard reference elastomers specified in ISO 13226 shall be used. [Table 2](#) shows acceptable changes of properties. Other elastomers and other limits may be used or specified by the end user depending on the purpose and conditions of actual use. In addition, the turbine oil shall be compatible with all material constituents of the circuit.

Table 1 — Test conditions for the determination of the elastomer compatibility index

Fluid	Symbol ^a	Suitable elastomer ^b	Test temperature ± 1 °C	Test duration ± 2 h	
Mineral oils	TSA, TGA, TSE, TGE, TGB, TGSE, TGF, TGSE, THA, THE	SRE-NBR 28/PX	100	168	1 000
		SRE-HNBR/1	130		
		SRE-FKM/2X	150		
Synthetic esters	TGCE THCE	SRE-NBR 28/PX	60	168	1 000
		SRE-HNBR/1	100		
		SRE-FKM/2X	100		
Synthetic hydrocarbons	TGCH THCH	SRE-NBR 28/PX	100	168	1 000
		SRE-HNBR/1	130		
		SRE-FKM/2X	150		
Alkyl phosphate ester	TSD	SRE-EPM/1	100	168	1 000
Aryl phosphate ester	TGD	SRE-FKM/2X	100		

^a See ISO 6743-5 for an explanation of the symbols in this column.

^b See ISO 13226 for details on the elastomer references.

Table 2 — Acceptable limits for change of properties

Immersion time h	Maximum volume swell %	Maximum volume shrinkage %	Hardness change IRHD ^a	Maximum tensile stress change %	Maximum elongation change %
168	15	-4	±8	-20	-20
1 000	20	-5	±10	-50	-50

^a IRHD = international rubber hardness degree.

6 Specific environmental requirements for THCH and THCE grades

6.1 General

For the purpose of this document, hydraulic turbine fluids shall be synthetic esters, polyalphaolefins and related hydrocarbon products. The classification of these hydraulic turbine fluids shall be in accordance with ISO 6743-5 for categories THCH and THCE.