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Lubricants, industrial oils and related products (Class L) — Family C (gears) —

Part 3: Specifications for greases for enclosed and open gear systems

Lubrifiants, huiles industrielles et produits connexes (Classe L) — Famille C (engrenages) —

Partie 3: Spécifications des graisses pour engrenages sous carter et engrenages nus

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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 documents 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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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*.

A list of all parts in the ISO 12925 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

Lubricants for gear systems are used in diverse types of gear designs, ranging from simple parallel spur gears to bevel gears (straight or helical), worm gears and hypoid gears. Industrial gear systems, which are either of opened type or enclosed type, vary in size from small enclosed systems used in machine tools to very large systems used in mining, steel mills and cement plants.

Lubricants for these applications vary in composition from refined straight mineral oils to more complex blends, based on mineral oils, synthetic oils (e.g. poly α-olefins, esters, poly-glycols) and additives friction modifying and/or extreme-pressure. Viscosity grades according to ISO 3448[5] vary, depending on the type of application and range, from the low viscosity ISO VG 32 to high viscosity ISO VG 1 500, even more for the very low velocities and very high loads. In exceptional cases, viscosity grades can be even higher. Temperature conditions to which the gear systems are exposed also vary considerably, not only due to the ambient conditions of operation, but also depending on the sliding between the gear teeth, on the size of the casings, on the presence on the circulating systems of heat exchangers, on the vicinity of sources of heat like in the cement industry or in the steel industry.

Greases can also be used for the splash lubrication of enclosed gears or for the application on open gear teeth.

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Lubricants, industrial oils and related products (Class L) — Family C (gears) —

Part 3: Specifications for greases for enclosed and open gear systems

1 Scope

This document establishes a classification and specifies the minimum requirements for mineral or synthetic base stock-based greases for the categories CKG and CKL according to ISO 6743-6 intended for the lubrication of enclosed and open gear systems.

This document does not cover the extreme cases of use in terms of temperature and extreme charges conditions. For use in exceptional conditions, suppliers and purchasers of lubricants are intended to mutually agree on the testing methods and the acceptability criteria of the products, not covered by this document.

NOTE 1 This document can be read in conjunction with ISO 6743-6, ISO 6743-9[1], ISO 12924[3] and ISO 6743-99[2].

NOTE 2 For the purpose of this document, the terms "% *(m/m)*" and "% (*V/V*)" are used to represent respectively the mass fraction and the volume fraction of a material.

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 2137, *Petroleum products and lubricants — Determination of cone penetration of lubricating greases and petrolatum*

ISO 2176, *Petroleum products — Lubricating grease — Determination of dropping point*

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

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

ISO 3733, *Petroleum products and bituminous materials — Determination of water — Distillation 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 6341, *Water quality — Determination of the inhibition of the mobility of Daphnia magna Straus (Cladocera, Crustacea) — Acute toxicity test*

ISO 6299, *Petroleum products — Determination of dropping point of lubricating greases (wide temperature range)*

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ISO 6743-6, *Lubricants, industrial oils and related products (class L) — Classification — Part 6: Family C (gear systems)*

ISO 7346-1, *Water quality — Determination of the acute lethal toxicity of substances to a freshwater fish [Brachydanio rerio Hamilton-Buchanan (Teleostei, Cyprinidae)] — Part 1: Static method*

ISO 8692, *Water quality — Fresh water algal growth inhibition test with unicellular green algae*

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

ISO 10253, *Water quality — Marine algal growth inhibition test with Skeletonema sp. and Phaeodactylum tricornutum*

ISO 11007, *Petroleum products and lubricants — Determination of rust-prevention characteristics of lubricating greases*

ISO 11009, *Petroleum products and lubricants — Determination of water washout characteristics of lubricating greases*

ISO 13737, *Petroleum products and lubricants — Determination of low-temperature cone penetration of lubricating greases*

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 14635-3, *Gears — FZG test procedures — Part 3: FZG test method A/2, 8/50 for relative scuffing load-carrying capacity and wear characteristics of semifluid gear greases*

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

ISO 22285, *Petroleum products and lubricants — Determination of oil separation from grease — Pressure filtration method*

ISO 22286, *Petroleum products and lubricants - Determination of the dropping point of grease with an automatic apparatus*

ISO 23572, *Petroleum products — Lubricating greases — Sampling of greases*

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

EN 16640, *Bio-based products — Bio-based carbon content — Determination of the bio-based carbon content using the radiocarbon method*

EN 17181, *Lubricants — Determination of aerobic biological degradation of fully formulated lubricants in an aqueous solution — Test method based on CO_2-production*

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

DIN 51819-2, *Testing of lubricants — Mechanical-dynamic testing in the roller bearing test apparatus FE8 - Part 2: Test method for lubricating greases - applied test bearing: oblique ball bearing or tapered roller bearing*

OECD 208, *Terrestrial Plant Test — Seedling Emergence and Seedling Growth Test*

3 Terms and definitions

No terms and definitions are listed in this document.

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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, sampling of gear greases shall be carried out in accordance with the relevant procedure described in ISO 23572. The sample shall be evaluated on a representative portion. Any drum, barrel, tanker compartment or any type of container delivered to the end user may be sampled and analysed at the discretion of the purchaser.

5 Greases for gear systems

5.1 Penetrability of gear greases

Gear greases are greases of NLGI consistencies, as per ISO 6743-99, in the range of 000 to 1, i.e. greases that are very soft up to soft at ambient temperature.

5.2 Classes of gear greases

5.2.1 Greases for enclosed gear systems CKG

These are generally NLGI 000, 00, 0 consistency grade greases, made from mineral or synthetic base stocks (most generally in the ISO VG 150 to 460 range), thickeners of various types (most generally conventional lithium or lithium/calcium soaps), antioxidants and corrosion inhibitors. They might also contain additives to improve the load carrying properties. These greases are generally used with splash lubrication.

5.2.2 Greases for open and semi-enclosed gear systems CKL

These are generally NLGI 0, 1, less frequently 2 consistency grade greases made from mineral or synthetic base stocks (most generally in the ISO VG 680 to 3200 range), thickeners of various types (most generally conventional lithium or lithium/calcium soaps), antioxidants and corrosion inhibitors. They might also contain additives to improve the load carrying properties and solid lubricants like graphite, molybdenum disulfide, etc.

6 Classification of greases for gear systems

6.1 Classification of greases for enclosed gear systems

Table 1 gives the classification of greases for enclosed gear systems. The ISO-L symbol is completed by the NLGI grade.

Table 2 gives the classification of greases for enclosed gear systems for applications requiring environmentally acceptable products: biodegradability and/or low eco-toxicity. The ISO-L symbol is completed by the NLGI grade.

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