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Lubricants, industrial oils and related products (class L) — Classification —

Part 15: Family E (Internal combustion engine oils)

Lubrifiants, huiles industrielles et produits connexes (classe L) — Classification —

Partie 15: Famille E (Huiles pour moteurs à combustion interne)

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 6743-15 was prepared by Technical Committee ISO/TC 28, *Petroleum products and lubricants*, Subcommittee SC 4, *Classifications and specifications*.

This second edition cancels and replaces the first edition (ISO 6743-15:2000), Clause 4, Table 5 and Annexes A and B of which have been technically revised.

ISO 6743 consists of the following parts, under the general title *Lubricants, industrial oils and related products (class L) — Classification*:

— *Part 1: Family A (Total loss systems)*

— *Part 2: Family F (Spindle bearings, bearings and associated clutches)*

— *Part 3: Family D (Compressors)*

— *Part 4: Family H (Hydraulic systems)*

— *Part 5: Family T (Turbines)*

— *Part 6: Family C (Gears)*

— *Part 7: Family M (Metalworking)*

— *Part 8: Family R (Temporary protection against corrosion)*

— *Part 9: Family X (Greases)*

— *Part 10: Family Y (Miscellaneous)*

— *Part 11: Family P (Pneumatic tools)*

— *Part 12: Family Q (Heat transfer fluids)*

— *Part 13: Family G (Slideways)*

— *Part 14: Family U (Heat treatment)*

— *Part 15: Family E (Internal combustion engine oils)*

— *Part 99: General*

Introduction

This part of ISO 6743 (second edition) describes categories pertaining to both two-stroke cycle and four-stroke cycle gasoline engine oils intended for use in “land-based small engines”. This term, “land-based small engines”, is a common industry description intended to separate the types of engines described in this second edition from the generally larger, two-stroke and four-stroke engines utilized in passenger cars, light-, medium- and heavy-duty trucks and other industrial equipment. The new four-stroke cycle engine oil categories added in this second edition primarily describe the unique performance requirements for engine oils used in motorcycles, motor scooters, all-terrain vehicles (ATVs) and related equipment. Although specification categories for larger four-stroke cycle engine oils, such as those used in passenger cars and light-, medium- and heavy-duty trucks, are envisioned for future inclusion in this part of ISO 6743, the standard categories for those engine oils are not yet developed and do not appear in this second edition.

Lubricants, industrial oils and related products (class L) — Classification —

Part 15: Family E (Internal combustion engine oils)

1 Scope

This part of ISO 6743 establishes the detailed classification, in tabular form, of engine lubricating oils for use in the following internal combustion engines:

a) two-stroke cycle, spark-ignition gasoline engines that employ a crankcase scavenging system and are used in transportation, leisure and utility applications, such as motorcycles, snowmobiles, chainsaws (hereinafter referred to as two-stroke engine oils);

b) four-stroke cycle, spark-ignition gasoline engines that employ a common sump containing the lubricant for both the engine and the drive train/starter/transmission of motorcycles, motor scooters, all-terrain vehicles (ATVs) and related equipment (hereinafter referred to as four-stroke engine oils).

Outboard motor and marine engine applications are described in Annex A.

It is expected that this part of ISO 6743 be read in conjunction with ISO 6743-99 [1].

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 3448, *Industrial liquid lubricants — ISO viscosity classification*

3 Terms and definitions

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

3.1
lubricity
ability of a product to reduce wear and friction, other than by its purely viscous properties

3.2
detergency
property of an engine oil to prevent and/or remove deposits from the surfaces of an engine resulting in a degree of cleanliness of the interior engine parts with respect to deposits, such as varnish and carbon, originating from the engine oil or the fuel

3.3
exhaust smoke
visible emissions that consist of solid particulates and aerosol droplets from unburned or partially burned engine oil and/or fuel and that are emitted from an exhaust pipe

3.4
exhaust system blocking
accumulation of deposits, usually from unburned portions of the engine oil and/or fuel, in an exhaust system consisting of cylinder exhaust port, exhaust pipe and muffler

3.5
cold sticking of piston rings
condition in which the ring is free in its groove while the engine is running but stuck when the piston is cold, normally indicated by the absence of varnish or other deposits on the outer face of the ring and no signs of blow-by on the piston skirt

NOTE There is no associated power loss.

3.6
hot sticking of piston rings
condition in which the ring is stuck in its groove while the engine is running, normally indicated by varnish or other deposits on the outer face of the ring, by signs of blow-by on the piston skirt, or both

NOTE There can be associated power loss.

3.7
coefficient of friction
dimensionless ratio of the friction force, F, between two bodies to the normal force, N, pressing these bodies together

NOTE A distinction is often made between static coefficient of friction and dynamic coefficient of friction; these terms relating the relative motion of the bodies tangential to the normal force.

3.8
lubricant frictional properties
description of a lubricating fluid's initial coefficients of friction and the behaviour of its friction coefficients over a range of time, sliding velocities and temperatures experienced during the equipments life cycle

NOTE Certain types of friction components in motorcycle drive trains/starters and transmissions require lubricants with relatively higher or lower friction coefficients for satisfactory operation. Maintenance of static and dynamic coefficients of friction in a lubricant used in these drive train/starter/transmission components operated over a range of temperatures and time is critical.

4 Symbols used

4.1 The detailed classification of family E has been established by defining the main applications of this family and the categories of products required for these main applications.

4.2 Each category is designated by a symbol consisting of a group of three letters, which together constitute a code.

NOTE The first letter of the code (E) identifies the family of the product considered. The second and third letters, in the specific case of two-stroke oils, correlate these ISO categories, EGB, EGC and EGD with the corresponding JASO categories FB, FC and FD, and indicate the intended global usage of the categories. Similarly, for four-stroke engine oils, the second and third letters correlate these ISO categories, EMA and EMB, with the corresponding JASO categories, MA and MB. In the specific case of ISO-L-EMA, there are two subcategories, ISO-L-EMA1 and ISO-L-EMA2. These categories further differentiate lubricants with relatively higher coefficients of friction (EMA) into two distinct categories.

A user of this part of ISO 6743 may choose whether to use EMA1 or EMA2, or simply to use the broader category EMA. In any case, only one of the designations may be used at the same time. Refer to ISO 24254 [6] for a more detailed description of these subcategories, including guidelines for usage. There are no similar subcategories within ISO-L-EMB.

The designation of each category may be supplemented by a number denoting the viscosity grade of the lubricant in accordance with ISO 3448.

4.3 In the present classification system, products are designated in a uniform manner. For example, a particular product may be designated in the complete form, i.e. ISO-L-EGD or ISO-L-EMA or ISO-L-EMA1, or in either of two abbreviated forms, i.e. L-EGD or EGD or L-EMA or EMA or L-EMA1 or EMA1.

5 Detailed classification

The detailed classification is shown in Table 1.

Table 1 — Classification of lubricants for land based small gasoline engines

Code letter	General application	Particular application	More specific application	Typical composition and properties	Symbol ISO-L	Typical applications
E	Internal combustion engines	Spark-ignition gasoline fuelled	Two-stroke cycle	Lubricating base stocks and detergent/ dispersant/inhibitor additives to impart lubricity and detergency.	EGB	General performance engines not requiring protection against exhaust system deposits and not requiring a reduced level of exhaust smoke.
				Lubricating base stocks and detergent/ dispersant/inhibitor additives to impart lubricity and higher detergency. Synthetic fluids added to reduce exhaust smoke and inhibit power reducing exhaust deposits.	EGC	General performance engines requiring protection against exhaust system deposits and which may benefit from a reduced level of exhaust smoke.
				Lubricating base stocks and detergent/ dispersant/inhibitor additives to impart lubricity and higher detergency. Synthetic fluids added to reduce exhaust smoke and inhibit power reducing exhaust deposits. Additional detergency is provided to prevent piston ring sticking in severe service.	EGD	Engines requiring protection against exhaust system deposits and which may also benefit from a reduced level of exhaust smoke. These engines may also benefit from the use of a lubricant with higher detergency performance.
			Four-stroke cycle	Lubricating base stocks and detergent/dispersant/inhibitor additives to impart lubricity, wear protection, oxidation control and detergency. Viscosity modifiers may or may not be used. Lubricant friction-modifying additives are not normally present.	EMA/ EMA1/ EMA2	General performance engines employing a common lubricant sump for both engine and drive train/starter/transmission components. In these engines, the drive train/starter/transmission components are designed to operate with lubricants having relatively high friction coefficients.
				Lubricating base stocks and detergent/ dispersant/inhibitor additives to impart lubricity, wear protection, oxidation control and detergency. Viscosity modifiers may or may not be used. Lubricant friction-modifying additives are also employed to reduce and/or modify the frictional properties of the oil.	EMB	General performance engines employing a common lubricant sump for both engine and drive train/starter/transmission components. In these engines, the drive train/starter/transmission components are designed to operate with lubricants having relatively low friction coefficients.

Annex A
(informative)

Background and supplemental information about the classification of two-stroke cycle gasoline engine oils

A.1 Introduction

Table 1 of this part of ISO 6743, created in 1996, specifies the performance classification of two-stroke cycle gasoline engine oils, based on physical and chemical properties, and performance indices that are derived from five important performance parameters: lubricity, initial torque, detergency, exhaust smoke and exhaust system blocking. This part of ISO 6743 is based upon the test procedures and specifications developed by the Japanese Automobile Standards Organization (JASO) of the Society of Automotive Engineers of Japan, Inc. (JSAE). JASO was joined in this effort by the American Society for Testing and Materials (ASTM) and the Coordinating European Council for the development of performance tests for lubricants and engine fuels (CEC). A series of tests was conducted to establish whether the JASO test methods would meet European OEM requirements. It was determined that a detergency test of greater severity than JASO M341 [2], that showed good discrimination of oils with greater detergency performance than the reference oil, was required. The CEC L-079 [3] test method was developed by CEC L-058 with the assistance of JASO. Subsequently, JASO expanded their performance classification system to include a new category, JASO FD. A similar test procedure to the CEC L-079-A-99 detergency test procedure was developed. Equivalency between data obtained using either of these two test procedures has been established and either test may be used to develop data for use in ISO-L-EGD or JASO FD. At the same time that JASO added the category FD, they also deleted the category FA. The ISO and JASO performance classification systems for two-stroke cycle engine oils are now harmonized.

The performance requirements specified in this classification are minimum requirements based on current knowledge. This part of ISO 6743 will be updated, when necessary, in order to adapt to the needs of evolving engine technologies. ASTM, CEC and JASO plan to work together to define new test procedures and/or revised performance limits.

Some two-stroke cycle gasoline engines and specific duty cycles require lubricants with performance characteristics different from those defined in this part of ISO 6743. Manufacturer owners' manuals should, therefore, be consulted by the end user to ascertain the proper lubricant.

Two-stroke engine oils categorized by this part of ISO 6743 may be used in crankcase-scavenged, two-stroke cycle, spark-ignition gasoline engines used in transportation, leisure and utility applications, such as motorcycles, snowmobiles, chainsaws, etc. (See also Clause A.2 regarding outboard applications.)

A.2 Other related specifications

The National Marine Manufacturers Association (NMMA) maintains a performance specification system for engine oils used in two-stroke cycle outboard motors. The current designation for this specification is NMMA TC-W3® [7]. NMMA certifies the performance of engine oils meeting this specification and licenses the use of the trademarked logo. These trademark licenses are annually renewable. Recognizing the growing use of four-stroke cycle engines in outboard motor applications, NMMA developed a specification for engine oils for use in marine four-stroke cycle engines. This specification, NMMA FC-W® [8] is maintained by NMMA and a certification program similar to that for NMMA TC-W3® has been established.

Annex B
(informative)

Background and supplemental information about the classification of four-stroke cycle gasoline engine oils

World-wide lubricant performance standards have not existed for four-stroke engine oils used in motorcycles, motor scooters, ATVs and related equipment. As a result, manufacturers of these types of equipment have experienced problems where four-stroke engine oils not meeting the unique requirements of these engines have been used. The Society of Automotive Engineers of Japan, INC. (JSAE) established a system for specifying and certifying the performance of engine oils for use in these applications. This system is incorporated in the documents JASO T903 [4] and JASO T904 [5]. The Japanese Automobile Standards Organization (JASO) with JSAE approached ISO/TC 28/SC 4 with a request to develop International Standards based on the JASO T903 specifications. The work item was assigned to ISO/TC 28/SC 4/WG 12 and representatives of the Coordinating European Council investigation group, IL-058, and ASTM D02 B0 06 were recruited to assist in the evaluation and development of these new International Standards.

The performance requirements specified in this classification are minimum requirements based on current knowledge. This part of ISO 6743 will be updated, when necessary, in order to adapt to the needs of evolving engine technologies. ASTM, CEC and JASO plan to work together, as needed, to define new test procedures and/or revised performance limits.

A range of engine performance requirements embodied in the American Petroleum Institute (API), the International Lubricant Standardization and Approval Committee (ILSAC), the European Automobile Manufacturers Association (ACEA) and the CCMC specifications are incorporated in this part of ISO 6743. Some four-stroke cycle gasoline engines and specific duty cycles may require lubricants with performance characteristics different from those defined in this part of ISO 6743. Manufacturer owners' manuals should, therefore, be consulted by the end user to ascertain the proper lubricant. The specification of viscosity grades is left to the manufacturer discretion, within the allowable ranges of performance in the areas of volatility, shear stability and high temperature, high shear viscosity.

Bibliography

[1] ISO 6743-99, *Lubricants, industrial oils and related products (class L) — Classification — Part 99: General*

[2] JASO M341, *Two-stroke-cycle gasoline engine — Engine oils — Detergency test procedure*

[3] CEC L-079, *Two stroke gasoline engine detergency test (Honda AS 27 motor scooter engine)*

[4] JASO T903, *Motorcycles — Four-stroke cycle gasoline engine oils*

[5] JASO T904, *Motorcycles — Four-stroke cycle gasoline engine oils — Test procedure for friction property of clutch system*

[6] ISO 24254, *Lubricants, industrial oils and related products (class L) — Family E (internal combustion engine oils) — Specifications for oils for use in four-stroke cycle motorcycle gasoline engines and associated drivetrains (categories EMA and EMB)*

[7] NMMA TC-W 3®, *Two-Stroke Cycle Gasoline Engine Lubricants*

[8] NMMA FC-W®, *Four-Stroke Cycle, Water-Cooled Gasoline Engine Lubricant*

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