
Lubricants, industrial oils and related products (class L) — Family E (Internal combustion engine oils) — Specifications for two-stroke-cycle gasoline engine oils (categories EGB, EGC and EGD)

Lubrifiants, huiles industrielles et produits connexes (classe L) — Famille E (Huiles pour moteurs à combustion interne) — Spécifications applicables aux huiles pour moteurs deux-temps à essence (catégories EGB, EGC et EGD)





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Foreword

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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 13738 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 13738:2000), which has been technically revised.

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1 Scope

This International Standard specifies the requirements of lubricating oils (hereinafter referred to as “two-stroke oils”) to be used in two-stroke-cycle spark-ignition gasoline engines which employ a crankcase scavenging system and are used in transportation, leisure and utility applications, such as motorcycles, snowmobiles and chainsaws.

The requirements specified in this International Standard are applicable to the categories of two-stroke oils, EGB, EGC and EGD, covered in ISO 6743-15, which defines the classification of lubricating oils for use in internal combustion engines.

NOTE Clause A.4 provides supplementary information regarding outboard motor applications.

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

ISO 3987, *Petroleum products — Determination of sulfated ash in lubricating oils and additives*

CEC L-079-A-99¹⁾, *Two-stroke gasoline engine detergency test (Honda AS 27 motor scooter engine)*

JASO M340²⁾, *Two-stroke-cycle gasoline engine — Engine oils — Lubricity test procedure*

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

JASO M342, *Two-stroke-cycle gasoline engine — Engine oils — Smoke test procedure*

JASO M343, *Two-stroke-cycle gasoline engine — Engine oils — Exhaust system blocking test procedure*

1) CEC: Coordinating European Council for the development of performance tests for fuels, lubricants and other fluids.

2) JASO: Japanese Automobile Standards Organization of the Japanese Society of Automotive Engineers (JSAE).

3 Terms and definitions

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

3.1 lubricity
ability of a lubricant to minimize friction between, and damage to, metal surfaces in relative motion under load

NOTE Lubricity is a qualitative term.

3.2 initial torque index
relative average output torque of the reference oil and the candidate oil at 200 °C in the lubricity test

3.3 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

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

3.5 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

3.6 reference oil
prepared two-stroke oil, of known performance, which is used for comparison to categorize the performance of a candidate oil

3.7 candidate oil
two-stroke oil whose performance is subject to evaluation in the test method

3.8 performance index
relative index determined by comparing the weighted test results of the candidate oil with the weighted test results of the reference oil and normalizing the weighted test results of the reference oil to 100

NOTE In some test methods, the performance indices can require calculating the inverse ratio of candidate and reference weighted test results.

EXAMPLE Lubricity index; initial torque index; detergency index; exhaust smoke index; piston skirt deposit index; exhaust system blocking index.

3.9 standard index
index which specifies the minimum performance level required for a candidate oil to be classified in the category defined by the standard index

3.10**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.

3.11**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.

4 Two-stroke oil requirements**4.1 Physical and chemical property requirements**

In addition to prescribed performance requirements, candidate oil shall also satisfy the physical and chemical property requirements given in Table 1. These physical and chemical properties have been selected to minimize internal leakage in oil injection pumps and reduce the tendency toward preignition due to ash-derived combustion chamber deposits.

Table 1 — Physical and chemical property requirements for ISO two-stroke oil standards

Requirement	Limit	Test method
Kinematic viscosity at 100 °C, mm ² /s	≥ 6,5	ISO 3104
Sulfated ash, mass %	≤ 0,18	ISO 3987

4.2 Performance requirements

The performance of two-stroke oils is classified into three grades, as indicated in Table 2, based on the six performance indices derived from four engine tests. The grades are EGB, EGC and EGD, from lower to higher performance. A standard reference oil, designated JATRE-1, is used in all test methods and its performance establishes the standard index of 100.

Regarding the classification of candidate oil, each performance index of the candidate oil shall meet the standard index given in Table 2. A candidate oil shall be classified according to the lowest category to which any one of the six candidate performance indices corresponds.

NOTE An example of the assignment of a category to a candidate oil is given in Annex A.

In the case of multiple engine tests being used to assess a candidate oils performance, a statistically based methodology should be used. For two tests, the mean of the candidate performance indices shall be equal to or exceed the standard index. For three or more tests, one test shall be discarded, and the mean of the remaining performance indices shall be equal to or exceed the standard index.

Table 2 — Performance requirements according to category

Performance parameter	Minimum performance requirement ^a			Test procedure
	EGB	EGC	EGD	
Lubricity	95	95	95	JASO M340
Initial torque	98	98	98	JASO M340
Detergency	85	95	—	JASO M341
	—	—	125	JASO M341 or CEC L-079-A-99
Piston skirt deposits	85	90	—	JASO M341
	—	—	95	JASO M341 or CEC L-079-A-99
Exhaust smoke	45	85	85	JASO M342
Exhaust system blocking	45	90	90	JASO M343

^a Each number represents an index, taking JATRE-1 as 100.

Annex A (informative)

Supplementary information on the purpose and use of this International Standard

A.1 General

This International Standard, elaborated in 1996, specifies the performance classification of two-stroke cycle gasoline engine oils, based on physical and chemical properties, and performance indices which are derived from six important performance parameters: lubricity, initial torque, detergency, piston skirt deposits, exhaust smoke and exhaust system blocking. This International Standard is based upon the test procedures and specifications developed by the Japanese Automobile Standards Organization (JASO) of the Japanese Society of Automotive Engineers (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 fuels, lubricants and other fluids (CEC). The CEC L-079-A-99 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.

Lubricants meeting this International Standard may be applied to crankcase-scavenged two-stroke-cycle spark-ignition gasoline engines used in transportation, leisure and utility applications, such as motorcycles, snowmobiles, chainsaws. See also A.4 regarding outboard motor applications.

A.2 Purpose

This International Standard aims to correctly classify two-stroke oils according to their performance level. The intent is to enable engine manufacturers to better communicate the lubricant needs of their engines to consumers and thus assist the consumer in selecting the proper lubricant from the many available in the marketplace. By doing so, it is hoped that the service life of two-stroke cycle engines may be extended, thereby increasing consumer satisfaction.

A.3 Examples of assignment of performance classification

Examples of the assignments of performance classifications to two different two-stroke oils (candidate oil A and candidate oil B) are shown in Table A.1. Candidate oil A is assigned the classification "EGC", while candidate oil B is classified "EGB". Note that although candidate oil B meets the lubricity, initial torque, detergency, piston skirt deposits and exhaust system blocking requirements of EGC, it fails to meet the exhaust smoke requirement of EGC and, therefore, shall be classified no higher than EGB.

Table A.1 — Example of performance classification assignment

Evaluation item	EGC limits	Candidate oil A		Candidate oil B	
		Performance index	Judgement on performance	Performance index	Judgement on performance
Lubricity	95	98	EGC	100	EGC
Initial torque	98	100	EGC	99	EGC
Detergency	95	100	EGC	99	EGC
Piston skirt deposits	90	104	EGC	102	EGC
Exhaust smoke	85	105	EGC	65	EGB
Exhaust system blocking	90	95	EGC	100	EGC
Judgement on performance classification of candidate oil	—	EGC		EGB	

A.4 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[®] [3] 3). NMMA certifies the performance of engine oils meeting this specification and licenses the use of the trademarked logo. These trademark licenses are annually renewable.

3) NMMA TC-W3[®] is an example of a suitable product available commercially. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of this product.

Bibliography

- [1] ISO 6743-15, *Lubricants, industrial oils and related products (class L) — Classification — Part 15: Family E (Internal combustion engine oils)*
- [2] ISO 6743-99, *Lubricants, industrial oils and related products (class L) — Classification — Part 99: General*
- [3] NMMA TC-W3[®], *Two-stroke-cycle gasoline engine lubricants*

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