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МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ

Petroleum products and lubricants — Petroleum lubricating oils for turbines (categories ISO-L-TSA and ISO-L-TGA) — Specifications

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*Produits pétroliers et lubrifiants — Huiles lubrifiantes de pétrole pour turbines (catégories
ISO-L-TSA et ISO-L-TGA) — Specifications*

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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 8068 was prepared jointly by Technical Committee ISO/TC 28, *Petroleum products and lubricants*, and IEC/TC 10, *Fluids for electrical applications*.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

Petroleum products and lubricants — Petroleum lubricating oils for turbines (categories ISO-L-TSA and ISO-L-TGA) — Specifications

1 Scope and field of application

This International Standard specifies required characteristics of mineral oils as delivered that are primarily intended for use as lubricants and control fluids for steam turbine systems requiring oils of category TSA and that may be used for gas turbines using oils of category TGA and for water turbines (ISO 6743-5). These oils are not intended for service when extreme pressure properties are required.

Two types of oil are defined : type AR with air-release requirements, and type B with no air-release requirements.

2 References

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

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

ISO 2719, *Petroleum products — Determination of flash point — Pensky-Martens closed cup method.*

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

ISO 3016, *Petroleum oils — Determination of pour point.*

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

ISO 3170, *Petroleum products — Liquid hydrocarbons — 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, *Petroleum products — Determination and application of precision data in relation to methods of test.*

ISO 4263, *Petroleum products — Inhibited mineral oils — Determination of oxidation characteristics.*

ISO 6247, *Petroleum products — Lubricating oils — Determination of foaming characteristics.¹⁾*

ISO 6614, *Petroleum oils and synthetic fluids — Determination of demulsibility characteristics.*

ISO 6618, *Petroleum products and lubricants — Neutralization number — Colour indicator titration method.¹⁾*

ISO 6743-5, *Lubricants, industrial oils and related products (class L) — Classification — Part 5 : Family T (Turbines).¹⁾*

ISO 7120, *Petroleum products — Inhibited mineral turbine oils — Determination of rust-preventing characteristics in the presence of water.¹⁾*

ISO 7624, *Petroleum products — Inhibited mineral turbine oils — Determination of oxidation stability.¹⁾*

DIN 51 381, *Testing of lubricants and hydraulic fluids; determination of air release properties, Impinger method.²⁾*

DIN 51 589 Part 1, *Testing of lubricating oils and related products; water separation ability after steam treatment; testing of lubricating oils.²⁾*

1) At present at the stage of draft.

2) Method in ISO/TC 28 work program.

3 Sampling

Sampling shall be carried out on delivery in accordance with the relevant procedures described in ISO 3170. Sampling equipment described in ISO 3170 may be used as applicable. All tests shall be carried out on a representative portion of the sample.

Any barrel, drum, tanker compartment or other container may be sampled at the discretion of the purchaser.

NOTE — Further samples may be required to confirm the cleanliness of the flexible pipe work or tanker bottom compartment valve manifold.

4 Required characteristics

Oils shall be refined petroleum oils, formulated to provide rust protection and oxidation stability and may contain selective additives as required to achieve satisfactory operating characteristics.

Oils shall not contain viscosity index improvers.

The appearance of the oil shall be clear bright, and free from visible foreign matter when the oil is examined with transmitted light through a thickness of approximately 10 cm and at ambient temperature.

Oils shall be in accordance with the limiting values in table 1 or in table 2 when tested in accordance with the specified methods.

For the determination of flash point and oxidation stability, alternative test methods are permitted and shall be chosen according to national practice. In national implementations of this International Standard, the method to be used for the determination of these properties shall be specified.

Attention is drawn to ISO 4259, which covers the use of precision data in the interpretation of the test results; this procedure shall be used in cases of dispute.

NOTE — Products complying with the requirements of this International Standard should be suitable for service with exposure to water and/or hydrogen.

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**Table 1 – Specification for type AR turbine oils
(with air-release requirements)**

Property	Unit				Method of test
Viscosity grade – ISO 3448		32	46	68	
Kinematic viscosity at 40 °C, min. max.	mm ² /s ¹⁾	28,8 35,2	41,4 50,6	61,2 74,8	ISO 3104
Viscosity index, min. ²⁾	–	80	80	80	ISO 2909
Pour point, max. ³⁾	°C	– 6	– 6	– 6	ISO 3016
Density at 15 °C	kg/dm ³	report	report	report	ISO 3675
Flash point, min. – Cleveland open cup, – Pensky-Martens closed cup	°C °C	177 165	177 165	177 165	ISO 2592 ISO 2719
Total Acid Number, TAN ⁴⁾	mgKOH/g	report	report	report	ISO 6618
Foaming, max. Sequence I 24 °C Sequence II 93,5 °C Sequence III 24 °C	ml ml ml	450/nil 100/nil 450/nil	450/nil 100/nil 450/nil	450/nil 100/nil 450/nil	ISO 6247
Air release at 50 °C, max.	min	5	6	8	DIN 51 381
Water separability, – 1st method max. – 2nd method at 54 °C to 3 ml emulsion max.	s min	300 30	300 30	360 30	DIN 51 589 Part 1 ISO 6614
Rust-preventing properties after 24 h	–	pass	pass	pass	ISO 7120 Procedure B
Corrosiveness to copper, 3 h at 100 °C, max. rating	ISO 8068:1987	1b	1b	1b	ISO 2160
Oxidation stability – 1st method Total acidity, max. and Sludge, max. – 2nd method Time to total acid number of 2,0 min.	mgKOH/g % (m/m) h	1,8 0,40 2 000	1,8 0,40 2 000	1,8 0,40 1 500	ISO 7624 ISO 4263

1) mm²/s is equivalent to cSt.

2) A lower viscosity index, as might be associated with pour point requirements which necessitate a naphthenic oil, is possible by agreement between purchaser and supplier. (Any modifications to the requirements to be agreed between purchaser and supplier do not form part of the Standard.)

3) For applications at low temperatures, by agreement between purchaser and supplier, the pour point should be at least 10 °C lower than the minimum temperature of the oil in the equipment. (Any modifications to the requirements to be agreed between purchaser and supplier do not form part of the Standard.)

4) Initial total acid number is influenced by the presence of functional additives.

**Table 2 — Specification for type B
(without air-release requirements) turbine oils⁵⁾**

Property	Unit				Method of test
Viscosity grade — ISO 3448		32	46	68	
Kinematic viscosity at 40 °C, min. max.	mm ² /s ¹⁾	28,8 35,2	41,4 50,6	61,2 74,8	ISO 3104
Viscosity index, min. ²⁾	—	80	80	80	ISO 2909
Pour point, max. ³⁾	°C	– 6	– 6	– 6	ISO 3016
Density at 15 °C	kg/dm ³	report	report	report	ISO 3675
Flash point, min. — Cleveland open cup, — Pensky-Martens closed cup	°C °C	177 165	177 165	177 165	ISO 2592 ISO 2719
Total Acid Number, TAN ⁴⁾	mgKOH/g	report	report	report	ISO 6618
Foaming, max. Sequence I 24 °C Sequence II 93,5 °C Sequence III 24 °C	ml ml ml	400/nil 100/nil 400/nil	400/nil 100/nil 400/nil	400/nil 100/nil 400/nil	ISO 6247
Water separability, — 1st method max. — 2nd method at 54 °C to 3 ml emulsion max.	s min	300 30	300 30	360 30	DIN 51 589 Part 1 ISO 6614
Rust-preventing properties after 24 h	—	pass	pass	pass	ISO 7120 Procedure B
Corrosiveness to copper, 3 h at 100 °C, max. rating	—	1b	1b	1b	ISO 2160
Oxidation stability — 1st method Total acidity, max. and Sludge, max. — 2nd method Time to total acid number of 2,0 min.	mgKOH/g % (m/m) h	1,8 0,40 2 000	1,8 0,40 2 000	1,8 0,40 1 500	ISO 7624 ISO 4263

1) mm²/s is equivalent to cSt.

2) A lower viscosity index, as might be associated with pour point requirements which necessitate a naphthenic oil, is possible by agreement between purchaser and supplier. (Any modifications to the requirements to be agreed between purchaser and supplier do not form part of the Standard.)

3) For applications at low temperatures, by agreement between purchaser and supplier, the pour point should be at least 10 °C lower than the minimum temperature of the oil in the equipment. (Any modifications to the requirements to be agreed between purchaser and supplier do not form part of the Standard.)

4) Initial total acid number is influenced by the presence of functional additives.

5) Field service has indicated that when the lubricating oil is used for a control fluid at pressures greater than 70 bar, the values in table 2 are acceptable.

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