TECHNICAL REPORT

ISO TR 10481

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Lubricants, industrial oils and related products — Class L — Specifications of categories L-AN, L-FC, L-FD and L-G used for machine tools

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Lubrifiants, huiles industrielles et produits connexes — Classe L — Spécifications des catégories L-AN, L-FC, L-FD et L-G utilisées pour les machines-outils

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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 main task of technical committees is to prepare International Standards, but in exceptional circumstances a technical committee may propose the publication of a Technical Report of one of the following types:

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— type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;

— type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;

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— type 3, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/TR 10481, which is a Technical Report of type 2, was prepared by Technical Committee ISO/TC 28, *Petroleum products and lubricants*, Sub-Committee SC 4, *Classifications and specifications*.

This document is being issued in the type 2 Technical Report series of publications (according to subclause G.4.2.2 of part 1 of the ISO/IEC Directives, 1992) as a "prospective standard for provisional application" in the field of lubricants for machine tools because there is an urgent need for guidance on how standards in this field should be used to meet an identified need.

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This document is not to be regarded as an "International Standard". It is proposed for provisional application so that information and experience of its use in practice may be gathered. Comments on the content of this document should be sent to the ISO Central Secretariat.

A review of this type 2 Technical Report will be carried out not later than two years after its publication with the options of: extension for another two years; conversion into an International Standard; or withdrawal.

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Lubricants, industrial oils and related products — Class L — Specifications of categories L-AN, L-FC, L-FD and L-G used for machine tools

1 Scope

This document is intended to provide the main properties and the corresponding requirements for the categories of lubricants recommended in ISO/TR 3498 for the lubrification of machine tools.

For the time being, only the lubricant categories L-AN, L-FC, L-FD and L-G which belong to product families:

A: total loss systems;

F: spindle bearings, bearings and associated clutches;

G: slideways;

are included.

Data for the other categories L-HM, L-HL, L-CKB, L-CKC, L-HV, L-HG, L-XBCEA will be incorporated in this document when the corresponding specifications are available.

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2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Technical Report. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this Technical Report are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 1817:1985, *Rubber, vulcanized — Determination of the effect of liquids.*

ISO 2160:1985, *Petroleum products — Corrosiveness to copper — Copper strip test.*

ISO 2592:1973, *Petroleum products — Determination of flash and fire points — Cleveland open cup method.*

ISO 2719:1988, *Petroleum products and lubricants — Determination of flash point — Pensky-Martens closed cup method.*

ISO 2909:1981, *Petroleum products — Calculation of viscosity index from kinematic viscosity.*

ISO 3016:—[1], *Petroleum products — Determination of pour point.*

ISO 3104:1976, *Petroleum products — Transparent and opaque liquids — Determination of kinematic viscosity and calculation of dynamic viscosity.*

ISO 3170:1988, *Petroleum liquids — Manual sampling.*

ISO 3448:1992, *Industrial liquid lubricants — ISO viscosity classification.*

ISO/TR 3498:1986, *Lubricants, industrial oils and related products (class L) — Recommendations for the choice of lubricants for machine tools.*

ISO 3675:1993, *Crude petroleum and liquid petroleum products — Laboratory determination of density or relative density — Hydrometer method.*

1) To be published. (Revision of ISO 3016:1974)

ISO 4259:1992, *Petroleum products — Determination and application of precision data in relation to methods of test.*

ISO 4263:1986, *Petroleum products — Inhibited mineral oils — Determination of oxidation characteristics.*

ISO 6247:—[2], *Petroleum products — Lubricating oils — Determination of foaming characteristics.*

ISO 6614:—[3], *Petroleum oils and synthetic fluids — Determination of water separability.*

ISO 6618:1987, *Petroleum products and lubricants — Neutralization number — Colour-indicator titration method.*

ISO 7120:1987, *Petroleum products and lubricants — Petroleum oils and other fluids — Determination of rust-preventing characteristics in the presence of water.*

ASTM D 892-89, *Standard test method for foaming characteristics of lubricating oils.*

ASTM D 4172-88, *Standard test method for wear preventive characteristics, lubricating fluid (four-ball method).*

3 Requirements

The requirements for the categories of lubricant considered are given in table 1. The properties relate to the products at the time of delivery. The use of precision data in the interpretation of the test results is described in ISO 4259. This procedure shall be used in cases of dispute.

4 Hygiene and safety

The handling, storage, application and disposal of lubricant products must conform with the appropriate existing hygiene and safety regulations, and the following precautionary statement adopted by TC 28: "WARNING: The use of this standard may involve hazardous materials, operation and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use."

5 Packaging and marking

5.1 Packaging

All lubricant products shall be packaged in suitable containers conforming with applicable regulations.

5.2 Marking

Packages shall carry the following information:

— brand name of product;

— ISO designation code (including viscosity grade);

— supplier's production code and date of production;

— precautionary and safety advice;

— net capacity;

— lot number.

6 Sampling

Sampling shall be carried out according to ISO 3170.

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2) To be published.

3) To be published. (Revision of ISO 6614:1983)

Table 1 — Lubricants for machine tools and related products — Properties and requirements

No.	Property or test	Units	Reference for test method	Category AN (older type of equipment)		Category FD					Category FC					Category G				
				Class		Class					Class					Class				
				68	220	2	5	10	22	32	2	5	10	22	32	68	100	150	220	320
1	Kinematic viscosity at 40 °C 1)	mm^2/s	ISO 3104	from 61,2 to 74,8	from 198 to 242	from 1,98 to 2,42	from 4,14 to 5,06	from 9 to 11	from 19,8 to 24,2	from 28,8 to 35,2	from 1,98 to 2,42	from 4,14 to 5,06	from 9 to 11	from 19,8 to 24,2	from 28,8 to 35,2	from 61,2 to 74,8	from 90 to 110	from 135 to 165	from 198 to 242	from 288 to 352
2	Viscosity index		ISO 2909	+		not applicable			+		not applicable			+		+				
3	Density at 15 °C	kg/m^3	ISO 3675	+		+					+					+				
4	Neutralization number	mg KOH/g	ISO 6618	+		+					+					+				
5	Clarity		to be determined	clear and bright	bright	clear and bright					clear and bright					clear and bright		bright		
6	Flash point open cup method	°C	ISO 2592	≥ 180		not applicable		≥ 140			not applicable		≥ 140			≥ 180				
7	Flash point closed cup method	°C	ISO 2719	no requirement		≥ 85	≥ 110	no requirement			≥ 85	≥ 110	no requirement			no requirement				
8	Foaming characteristics at 24 °C at 93 °C at 24 °C after test at 93 °C	ml	ASTM D 892 ISO 6247	no requirement		T* ≤ 100	S* ≤ 10	T* ≤ 100 ≤ 100 ≤ 100		S* ≤ 10 ≤ 10 ≤ 10	T* ≤ 100	S* ≤ 10	T* ≤ 100 ≤ 100 ≤ 100		S* ≤ 10 ≤ 10 ≤ 10					
9	Copper strip (3 h at 100 °C)	index	ISO 2160	≤ 2		≤ 2 2)		≤ 2			≤ 2 2)		≤ 2			≤ 2 2)				
10	Corrosion-preventive properties	index	ISO 7120 (method A)	no requirement		"pass"					"pass"					"pass"				
11	Pour point	°C	ISO 3016	≤ −9	≤ −6	≤ −18			≤ −15		≤ −18			≤ −15		≤ −9			≤ −3	
12	Antiwear properties		based on ASTM D 4172	no requirement		+ 3)					not applicable					+ 3)				
13	Demulsibility 4)	ml·min	ISO 6614	no requirement		+ 5)					+ 5)					no requirement				
14	Compatibility with construction materials		ISO 1817	6)		6)					6)					6)				
15	Oxidation stability		ISO 4263	not applicable		not applicable		≥ 1 000 h to reach 2 mg KOH/g			not applicable		≥ 1 000 h to reach 2 mg KOH/g			no requirement				

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No.	Property or test	Units	Reference for test method	Category AN (older type of equipment)		Category FD					Category FC					Category G				
				Class		Class					Class					Class				
				68	220	2	5	10	22	32	2	5	10	22	32	68	100	150	220	320
16	Antistick-slip test		to be determined[7]	not applicable		no requirement					no requirement					+				
17	Compatibility with working fluid			not applicable		[6]					[6]					[6]				

NOTE — T* = tendency, S* = stability, + designates properties which are important to the manufacturer, but vary with machine design, construction, operating environment, etc. Values for these properties should be provided by the lubricant supplier and compared to the minimal requirements established by the manufacturer.

1) The kinematic viscosity at 40 °C for lubricants should be within the limits of viscosities defined in ISO 3448 and that determine the classes of the corresponding viscosities. The SI units for viscosity are square metres per second (m^2/s). Its submultiple is square millimetres per second (mm^2/s) = centistoke (cSt).

2) Copper strip corrosion is limited to 3 h at 60 °C.

3) Although the four-ball method is debatable, it allows selection of lubricants exhibiting antiwear properties over those which do not have any of these properties. The following limits and conditions are proposed:

— wear scar diameter: ⩽ 0,5 mm;
— load: 20 daN;
— time: 60 min.;
— rotational speed: 1 500 r/min.

4) Adopt 25 °C as heating bath temperature for lubricants of viscosity grade ⩽ 32.

5) This property is not applicable to water-soluble oils nor oils used in mist or aerosol lubrication.

6) Subject to an exchange of information between the supplier, user and manufacturer.

7) Method to be defined by agreement between supplier and user on the basis of data provided by the supplier.

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