INTERNATIONAL STANDARD

ISO 12925-1

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Lubricants, industrial oils and related products (class L) — Family C (Gears) —

Part 1:
Specifications for lubricants for enclosed gear systems

Lubrifiants, huiles industrielles et produits connexes (classe L) — Famille C (Engrenages) —

Partie 1: Spécifications des lubrifiants pour systèmes d'engrenages sous carter

Reference number
ISO 12925-1:1996(E)

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.

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.

International Standard ISO 12925-1 was prepared by Technical Committee ISO/TC 28, *Petroleum products and lubricants*, Subcommittee SC 4, *Classifications and specifications*.

ISO 12925 consists of the following parts, under the general title *Lubricants, industrial oils and related products (class L) — Family C (Gears)*:

— *Part 1: Specifications for lubricants for enclosed gear systems*

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Introduction

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

Lubricants for these applications vary in composition from refined straight mineral oils to complex blends of fatty oils and synthetic products. Some of these are treated with chemical additives to impart or enhance desirable performance properties. Viscosity grades also vary depending on the type of application, from the low viscosity ISO VG 32 to high viscosity ISO VG 1 500. In exceptional cases, viscosity grades may be even higher. Temperature conditions to which the gear systems are exposed also vary considerably, due not only to the ambient conditions of operation but also to the proximity of the gear systems to heat sources, as in the case of cement plants.

This part of ISO 12925 has been formulated to cover lubricants for enclosed gear systems most commonly used by the industry. It does not cover extreme ranges of application in terms of gear design, operating temperatures and load conditions. For such applications, suppliers and purchasers of the lubricant should mutually agree on test methods and their acceptable limits not covered by this part of ISO 12925.

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Lubricants, industrial oils and related products (class L) — Family C (Gears) —

Part 1:
Specifications for lubricants for enclosed gear systems

1 Scope

This part of ISO 12925 establishes the specifications relative to family C (gears) for lubricants, industrial oils and related products of Class L (see ISO 6743-6). This part of ISO 12925 deals only with lubricants for industrial gears in enclosed systems. Lubricants for motor vehicle gears and open industrial gears are not covered.

This part of ISO 12925 should be read in conjunction with ISO 6743-6, which deals with the classification of gear lubricants. Six categories of lubricant intended for continuous lubrication of enclosed gears are covered by this part of ISO 12925 . These categories are CKB, CKC, CKD, CKE, CKS and CKT as classified in ISO 6743-6.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 12925. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 12925 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 2160:—[1],	*Petroleum products - Corrosiveness to copper - Copper strip test.*
ISO 2592: —[2],	*Petroleum products - Determination of flash and fire points - Cleveland open cup method.*
ISO 2909:1981,	*Petroleum products - Calculation of viscosity index from kinematic viscosity.*
ISO 3016:1994,	*Petroleum products - Determination of pour point.*
ISO 3448:1992,	*Industrial liquid lubricants - ISO viscosity classification.*
ISO 6247: —[3],	*Petroleum products - Lubricating oil - Determination of foaming characteristics.*
ISO 6614:1994,	*Petroleum products - Determination of water separability of petroleum oils and synthetic fluids.*

1) To be published. (Revision of ISO 2160:1985)
2) To be published. (Revision of ISO 2592:1973)
3) To be published.

ISO 6743-6:1990, *Lubricants, industrial oils and related products (class L) - Classification - Part 6: Family C (Gears).*

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

ASTM D 943-81 (R 1991), *Standard test method for oxidation characteristics of inhibited mineral oils.*

ASTM D 2711-86, *Standard test method for demulsibility characteristics of lubricating oils.*

ASTM D 2893-88, *Standard test method for oxidation characteristics of extreme - pressure lubrication oils.*

DIN 51354-2:1990, *Testing of lubricants - FZG gear test rig - Method A/8,3/90 for lubricating oils.*

3 Specifications

Detailed specifications for each category mentioned in this part of ISO 12925 are provided in tables 1 to 6, as indicated below:

a) table 1: category CKB;

b) table 2: category CKC;

c) table 3: category CKD;

d) table 4: category CKE;

e) table 5: category CKS;

f) table 6: category CKT.

The composition, properties and typical applications of each category are stated at the top of the tables. These elements are taken from ISO 6743-6.

Table 1 — Specifications for lubricants for enclosed gears of category CKB

Composition and properties: Refined mineral oils with oxidation stability, anticorrosion (ferrous and nonferrous metals) and antifoam properties

Typical application: Gears operating under light load

Property	Test method	Specifications										
Viscosity grade	ISO 3448	VG 32	VG 46	VG 68	VG 100	VG 150	VG 220	VG 320	VG 460	VG 680	VG 1 000	VG 1 500
Appearance	1)	Bright and clear	Bright and clear	Bright and clear	Bright and clear	Bright and clear	Bright	Bright	Bright	Bright	Bright	Bright
Viscosity index, min.	ISO 2909	90	90	90	90	90	90	90	90	85	85	85
Pour point, max. °C	ISO 3016	-12	-12	-12	-12	-9	-9	-9	-9	-3	-3	-3
Flash point, min. °C	ISO 2592	180	180	180	200	200	200	200	200	200	200	200
Foaming tendency / stability, max. ml	ISO 6247	100/10	100/10	100/10	100/10	100/10	100/10	100/10	100/10	100/10	100/10	100/10
Copper corrosion, 3 h at 100 °C, max.	ISO 2160	1	1	1	1	1	1	1	1	1	1	1
Demulsibility:	ISO 6614											
- Test temp.: 54 °C, time to emulsion value 40-37-3, max. min		30	30	30	-	-	-	-	-	-	-	-
- Test temp.: 82 °C, time to emulsion value 40-37-3, max. min		-	-	-	30	-	-	-	-	-	-	-
Normal method:	ASTM D 2711											
- Free water, min. ml		-	-	-	-	30	30	30	30	30	30	30
- Emulsion, max. ml		-	-	-	-	2	2	2	2	2	2	2
- Water-in-oil, max. ml		-	-	-	-	0,5	0,5	0,5	0,5	0,5	0,5	0,5
Rust test : Methods A and B	ISO 7120	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Oxidation stability: hours to reach 2,0 AN, min.	ASTM D 943	1 000	1 000	1 000	1 000	1 000	1 000	1 000	1 000	1 000	1 000	1 000

1) There is presently no accepted test method. Visual observation is to be reported as indicated. The objective is to ensure that the lubricant does not appear turbid or contain suspended or settled impurities.

Table 2 — Specifications for lubricants for enclosed gears of category CKC

Composition and properties: Oils of category CKB with enhanced extreme pressure and antiwear properties

Typical application: Gears operating at a stabilized oil temperature that remains normal or medium, and under high load

Property	Test method	Specifications										
Viscosity grade	ISO 3448	VG 32	VG 46	VG 68	VG 100	VG 150	VG 220	VG 320	VG 460	VG 680	VG 1 000	VG 1 500
Appearance	1)	Bright and clear	Bright and clear	Bright and clear	Bright and clear	Bright and clear	Bright	Bright	Bright	Bright	Bright	Bright
Viscosity index, min.	ISO 2909	90	90	90	90	90	90	90	90	85	85	85
Pour point, max. °C	ISO 3016	-12	-12	-12	-12	-9	-9	-9	-9	-3	-3	-3
Flash point, min. °C	ISO 2592	180	180	180	200	200	200	200	200	200	200	200
Foaming tendency/stability, min. ml	ISO 6247	100/10	100/10	100/10	100/10	100/10	100/10	100/10	100/10	100/10	100/10	100/10
Copper corrosion, 3 h at 100 °C, max.	ISO 2160	1	1	1	1	1	1	1	1	1	1	1
Demulsibility:	ASTM D 2711											
Method: Appendix X2 Modification (90 ml water at start):												
- Free water, min. ml		80	80	80	80	80	80	80	80	80	80	80
- Emulsion, max. ml		1	1	1	1	1	1	1	1	1	1	1
- Water-in-oil, max. ml		2	2	2	2	2	2	2	2	2	2	2
Rust test: Methods A and B	ISO 7120	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Oxidation stability:	ASTM D 2893											
Test temp.: 95 °C												
- Viscosity increase at 100 °C, max. %		6	6	6	6	6	6	6	6	6	6	6
- Precipitation number, max.		0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
Load-carrying property FZG A/8,3/90 °C Fail stage, min.	DIN 51354-2	12	12	12	12	12	12	12	12	12	12	12

1) There is presently no accepted test method. Visual observation is to be reported as indicated. The objective is to ensure that the lubricant does not appear turbid or contain suspended or settled impurities.

Table 3 — Specifications for lubricants for enclosed gears of category CKD

Composition and properties: Lubricants of category CKC, with enhanced thermal/oxidative stability that permits high temperature use **Typical application:** Gears operating at a high stabilized oil temperature, and under high load												
Property	**Test method**	**Specifications**										
Viscosity grade	ISO 3448	VG 32	VG 46	VG 68	VG 100	VG 150	VG 220	VG 320	VG 460	VG 680	VG 1 000	VG 1 500
Appearance	1)	Bright and clear	Bright and clear	Bright and clear	Bright and clear	Bright and clear	Bright	Bright	Bright	Bright	Bright	Bright
Viscosity index, min.	ISO 2909	90	90	90	90	90	90	90	90	85	85	85
Pour point, max. °C	ISO 3016	-12	-12	-12	-12	-9	-9	-9	-9	-3	-3	-3
Flash point, min. °C	ISO 2592	180	180	180	200	200	200	200	200	200	200	200
Foaming tendency/stability, max. ml	ISO 6247	100/10	100/10	100/10	100/10	100/10	100/10	100/10	100/10	100/10	100/10	100/10
Copper corrosion, 3 h at 100 °C, max.	ISO 2160	1	1	1	1	1	1	1	1	1	1	1
Demulsibility: Method: Appendix X2 Modification (90 ml water at start): - Free water, min. ml - Emulsion, max. ml - Water-in-oil, max. ml	ASTM D 2711	 80 1 2	 80 1 2	 80 1 2	 80 1 2	 80 1 2	 80 1 2	 80 1 2	 80 1 2	 80 1 2	 80 1 2	 80 1 2
Rust test : Methods A and B	ISO 7120	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Oxidation stability: Method: modified Test temp.: 121 °C - Viscosity increase at 100 °C, max. % - Precipitation number, max.	ASTM D 2893	 6 0,1	 6 0,1	 6 0,1	 6 0,1	 6 0,1	 6 0,1	 6 0,1	 6 0,1	 6 0,1	 6 0,1	 6 0,1
Load-carrying property FZG A/8,3/90 °C Fail stage, min.	DIN 51354-2	12	12	12	12	12	12	12	12	12	12	12
1) There is presently no accepted test method. Visual observation is to be reported as indicated. The objective is to ensure that the lubricant does not appear turbid or contain suspended or settled impurities.												

Table 4 — Specifications for lubricants for enclosed gears of category CKE

Composition and properties: Lubricants of category CKB, ensuring low coefficient of friction **Typical application:** Gears operating under high friction (e.g. worm gear)									
Property	**Test method**	**Specifications**							
Viscosity grade	ISO 3448	VG 68	VG 100	VG 150	VG 220	VG 320	VG 460	VG 680	VG 1 000
Appearance	1)	Bright and clear	Bright and clear	Bright and clear	Bright	Bright	Bright	Bright	Bright
Viscosity index, min.	ISO 2909	90	90	90	90	90	90	85	85
Pour point, max. °C	ISO 3016	-12	-12	-9	-9	-9	-9	-3	-3
Flash point, min. °C	ISO 2592	180	200	200	200	200	200	200	200
Foaming tendency/stability, min. ml	ISO 6247	100/10	100/10	100/10	100/10	100/10	100/10	100/10	100/10
Copper corrosion, 3 h at 100 °C, max.	ISO 2160	1	1	1	1	1	1	1	1
Rust test : Methods A and B	ISO 7120	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Oxidation stability:	ASTM D 2893								
Test temp.: 95 °C									
- Viscosity increase at 100 °C		2)	2)	2)	2)	2)	2)	2)	2)
- Precipitation number		2)	2)	2)	2)	2)	2)	2)	2)
Friction coefficient	3)	2)	2)	2)	2)	2)	2)	2)	2)

1) There is presently no accepted test method. Visual observation is to be reported as indicated. The objective is to ensure that the lubricant does not appear turbid or contain suspended or settled impurities.

2) To be reported.

3) There is presently no method known that qualifies for this part of ISO 12925. This property, very important to category CKE oils, is being retained in the table for eventual adoption of an appropriate method. Until then, it is up to the supplier and purchaser of the lubricant to mutually agree on a method of reporting this property.

Table 5 — Specifications for lubricants for enclosed gears of category CKS

Composition and properties: Lubricants with oxidation stability, antifriction and anticorrosion (ferrous and nonferrous metals) properties usable under extreme temperature conditions (low and high)

Typical application: Gears operating at a very low, low or very high stabilized fluid temperature and under light load

Property	Test method	Specifications								
Viscosity grade	ISO 3448	VG 46	VG 68	VG 100	VG 150	VG 220	VG 320	VG 460	VG 680	VG 1 000
Appearance	1)	Bright and clear	Bright and clear	Bright and clear	Bright and clear	Bright	Bright	Bright	Bright	Bright
Viscosity index, min.	ISO 2909	90	90	90	90	90	90	90	85	85
Pour point, max. °C	ISO 3016	-36	-36	-36	-24	-24	-18	-18	-15	-15
Flash point, min. °C	ISO 2592	180	180	200	200	200	200	200	200	200
Foaming tendency/stability, max. ml	ISO 6247	100/10	100/10	100/10	100/10	100/10	100/10	100/10	100/10	100/10
Copper corrosion, 3 h at 100 °C, max.	ISO 2160	1	1	1	1	1	1	1	1	1
Rust test: Methods A and B	ISO 7120	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Oxidation stability: Method: modified Test temp.: 150 °C	ASTM D 2893									
- Viscosity increase at 100 °C, max. %	2)	6	6	6	6	6	6	6	6	6
- Precipitation number, max.		0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1

1) There is presently no accepted test method. Visual observation is to be reported as indicated. The objective is to ensure that the lubricant does not appear turbid or contain suspended or settled impurities.

2) Other test temperatures between 121 °C and 150 °C may be used, if mutually agreed between the supplier and purchaser of the lubricant.

Table 6 — Specifications for lubricants for enclosed gears of category CKT

Composition and properties: Lubricants of category CKS usable under extreme temperature conditions (low and high) and under high load **Typical application:** Gears operating at a very low or very high stabilized fluid temperature and under high load										
Property	**Test method**	**Specifications**								
Viscosity grade	ISO 3448	VG 46	VG 68	VG 100	VG 150	VG 220	VG 320	VG 460	VG 680	VG 1 000
Appearance	1)	Bright and clear	Bright and clear	Bright and clear	Bright and clear	Bright	Bright	Bright	Bright	Bright
Viscosity index, min.	ISO 2909	90	90	90	90	90	90	90	85	85
Pour point, max. °C	ISO 3016	-36	-36	-36	-24	-24	-18	-18	-15	-15
Flash point, min. °C	ISO 2592	180	180	200	200	200	200	200	200	200
Foaming tendency/stability, max. ml	ISO 6247	100/10	100/10	100/10	100/10	100/10	100/10	100/10	100/10	100/10
Copper corrosion, 3 h at 100 °C, max.	ISO 2160	1	1	1	1	1	1	1	1	1
Rust test: Methods A and B	ISO 7120	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Oxidation stability: Method : modified Test temp.: 150 °C - Viscosity increase at 100 °C, max. % - Precipitation number, max.	ASTM D2893 2)	 6 0,1	 6 0,1	 6 0,1	 6 0,1	 6 0,1	 6 0,1	 6 0,1	 6 0,1	 6 0,1
Load-carrying property FZG A/8,3/90 °C Fail stage, min.	DIN 51354-2	12	12	12	12	12	12	12	12	12

1) There is presently no accepted test method. Visual observation is to be reported as indicated. The objective is to ensure that the lubricant does not appear turbid or contain suspended or settled impurities.

2) Other test temperatures between 121 °C and 150 °C may be used, if mutually agreed between the supplier and purchaser of the lubricant.

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