
Lubricants, industrial oils and related products (class L) — Family R (Products for temporary protection against corrosion) — Guidelines for establishing specifications

*Lubrifiants, huiles industrielles et produits connexes (classe L) —
Famille R (Produits de protection temporaire contre la corrosion) — Lignes
directrices pour l'établissement de spécifications*

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Printed in Switzerland

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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 3.

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.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of normative document:

- an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;
- an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed every three years with a view to deciding whether it can be transformed into an International Standard.

Attention is drawn to the possibility that some of the elements of this ISO/TS 12928 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/TS 12928 was prepared by Technical Committee ISO/TC 28, *Petroleum products and lubricants*, Subcommittee SC 4, *Classifications and specifications*.

Annexes A, B, C, D and E of this Technical Specification are for information only.

Introduction

Considering the difficulties of establishing an international specification for products for temporary corrosion protection, it has been decided to publish guidelines for establishing specifications under the form of an ISO Technical Specification.

This document contains, in annexes A to E, suggested test methods to evaluate some properties.

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Lubricants, industrial oils and related products (class L) — Family R (Products for temporary protection against corrosion) — Guidelines for establishing specifications

1 Scope

This Technical Specification has been prepared with the following purposes:

- to facilitate the application of ISO 6743-8 and to specify the characteristics to be taken into account when establishing specifications for a given application;
- to enable these characteristics to serve as a basis for discussion between the end user and the supplier.

This Technical Specification does not cover specific requirements which should be examined separately with a view to a common agreement between the end user and the product supplier.

This Technical Specification does not cover the health, safety, disposal and environment areas which should be dealt with separately, according to the regulations or laws in force in each country.

2 Normative references

[ISO/TS 12928:1999](#)

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The following normative documents contain provisions which, through reference in this text, constitute provisions of this Technical Specification. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this Technical Specification are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 2137:1985, *Petroleum products — Lubricating grease and petrolatum — Determination of cone penetration.*

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

ISO 3696:1987, *Water for analytical laboratory use — Specification and test methods.*

ISO 6743-0:1981, *Lubricants, industrial oils and related products (class L) — Classification — Part 0: General.*

ISO 6743-8:1987, *Lubricants, industrial oils and related products (class L) — Classification — Part 8: Family R (Temporary protection against corrosion).*

EN 10130:1991, *Cold rolled low carbon steel flat products for cold forming — Technical delivery conditions.*

NF T 60-166:1994, *Temporary protection against corrosion — Method of preparing metallic probes for the evaluation of the properties of preservative products.*

NF T 60-170:1994, *Temporary anticorrosion products — Assessment of the covering capacity by dipping.*

NF X 41-002:1975, *Protection against physical, chemical and biological agents — Salt spray test.*

3 Explanations of symbols used

3.1 General

In the column headed "ISO-L" in Tables 1 to 5, the various categories are designated in abbreviated form.

Whereas the complete designation should be ISO-L-RA, ISO-L-RB, etc., it is generally admitted to designate products in the abbreviated form L-RA, L-RB, etc., or even RA, RB, etc.

In the complete designation, the prefix letter "L" designates the class "Lubricants, industrial oils and related products". The letter "R" indicates the family "Products for temporary protection against corrosion" in accordance with ISO 6743-8.

3.2 Plain (neat) products

In the ISO 6743-8 classification, the neat products are designated by the groups of letters RA, RC, RD and RL. For the products RC and RD, the doubling of the second letter indicates that the product exhibits water displacing properties.

The numerical group following the group of letters corresponds to the average kinematic viscosity of the oils, expressed according to ISO 3448.

3.3 Solvent based products

In the ISO 6743-8 classification, the solvent based products are designated by the groups of letters RE, RF, RG, RP, RM. For the products RE and RF, the doubling of the second letter indicates that the product exhibits water displacing properties.

The mention of a numerical group following the group of letters designating the class of viscosity according to ISO 3448 is not mandatory.

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3.4 Water miscible products

In the ISO 6743-8 classification, the concentrates intended to be mixed with water by the end user to form aqueous products are designated by RB, RH, RP and RM. For the RB and RH products, the doubling of the second letter indicates that the product exhibits waters displacing properties.

Addition of viscosity class, ISO 3448, is not seen as necessary.

3.5 Plastic compounds and paste products

In the ISO 6743-8 classification, plastic compounds applied as a hot melt are designated by RT, the paste products, which may be applied either hot or cold, are designated by RK.

The mention of a numerical group designating viscosity class ISO 3448 is not necessary. For the grease products it is possible to give the NLGI class, defined by ISO 6743-0, determined by measurement of consistency in accordance with ISO 2137.

4 Specification guide

4.1 General

Generally, specifications are made of sets of characteristics, differing according to the nature of the products.

These characteristics relate to:

- the physico-chemical properties of the product (as delivered);
- the properties after water dilution (for those products used diluted using water);
- the corrosion protection performance;
- the properties of protective film.

For each category of product (neat, solvent based, water miscible, plastic, pasty) Tables 1 to 5 give characteristics which will define the product for the intended application.

The lists of characteristics is not exhaustive.

4.2 Neat products

4.2.1 Physico-chemical characteristics

See Table 1.

These concern the characteristics currently used to characterize the petroleum products by physical characteristics (e.g.: density, flash-point, pour-point) and chemical characteristics (e.g.: ash content, metal content, water content, neutralization/saponification numbers).

4.2.2 Performance characteristics

See Table 1.

These are the characteristics the most difficult to determine, because they shall be representative of the properties required in numerous, various and specific industrial applications.

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There are very few standardized methods; some non-standard tests exist but they are very particular or taken from parts of standards relating to products or general documents.

For the products, the performance characteristics have been divided into two sets:

- a) protection characteristics, e.g.: protection duration in a humidity cabinet, cyclic humidity cabinet, water displacing properties, fingerprint neutralization;
- b) characteristics of the film, e.g.: coverage, removability, compatibility with electrophoretic coatings, compatibility with welding without prior degreasing.

4.3 Solvent based products

4.3.1 Physico-chemical characteristics

See Table 2.

These are divided into two sets: those relating to the product as it is (as delivered) and those relating to the dry extract (residue remaining after solvent evaporation). These characteristics are those currently used to characterize the petroleum products in the physical areas (e.g.: density, kinematic viscosity, flash-point, pour-point, softening point, penetrability, dropping point) and chemical areas (e.g.: ash content, metals content, neutralization/saponification numbers, chlorine and sulphur contents).

4.3.2 Performance characteristics

See Table 2.

Table 1 — Guideline for establishing specifications of neat products for temporary protection against corrosion

No.	Physico-chemical characteristics ^a	Units	ISO-L ^b				ISO Standard	Other standards or methods
			RA (light film)	RC (oily film)	RD ^c (oily film)	RL ^d (oily film)		
1.1	Odour	Rating	X	X	X	X		Olfactory
1.2	Appearance	Rating	X	X	X	X		Visual
1.3	Colour	Rating	X	X	X	X	ISO 2049	
1.4	Viscosity	mm ² /s	X at 20 °C	X at 40 °C	X at 40 °C	X at 40 °C	ISO 3104	
1.5	Density at 15 °C	kg/m ³	X	X	X	X	ISO 3675 or ISO 12185	
1.6	Storage stability	Rating	X	X	X	X		NF T 60-167 ^e
1.7	Flash point	°C	X	X	X	X	ISO 2719/ ISO 2592	
1.8	Fire point	°C	-	X	X	X	ISO 2592	
1.9	Pour point	°C	X	X	X	X	ISO 3015	
1.10	Water content	% (m/m)	X	X	X	X	ISO 3733	
1.11	Sulfated ash content	% (m/m)	X	X	X	X	ISO 3987	
1.12	Elemental content ^f	% (m/m)	X	X	X	X		To be indicated
1.13	Neutralization number	mgKOH/g	X	X	X	X	ISO 6618	
1.14	Saponification number ^g	mgKOH/g	X	X	X	X	ISO 6293	
1.15	Aromatic carbon content ^h	%	X	X	X	X		Brandes
Protection								
Protection duration ⁱ :								
1.16	- humidity cabinet	h	X	X	-	-		j
1.17	- cyclic humidity cabinet	Cycles	X	X	X	-		k
1.18	- salt spray ^l	h	-	-	X	X	ISO 3768	NF X 41-002
Staining tendency:								
1.19	- long duration	Rating	-	-	X	X		See annex B
1.20	- short duration	Rating	X	X	X	-		NF T 60-176 ^e
1.21	Behaviour to UV/daylight exposure ^m	Rating	-	-	X	X		
1.22	Exposure outer shelter	Rating	-	-	X	X		See annex C
1.23	Fingerprint neutralization	Rating	-	X	-	-		n
1.24	Water displacement	Rating	-	X (to RCC)	X (to RDD)	-		o
1.25	Wet skin pass products compatibility	Rating	-	-	X	-		See annex A

Table 1 — (continued)

No.	Physico-chemical characteristics ^a	Units	ISO-L ^b				ISO Standard	Other standards or methods
			RA (light film)	RC (oily film)	RD ^c (oily film)	RL ^d (oily film)		
Film characteristics								
1.26	Coverage	g/m ²	X	X	X	X		NF T 60-170 ^e
1.27	Wetting/film homogeneity	Rating	X	X	X	-		See Annex D
1.28	Removability	Rating	X	X	X	X		NF T 60-159 ^e
1.29	Compatibility with electrophoretic coatings	Rating	-	-	X	-		See annex E
1.30	Compatibility with welding without grease removal ^p	Rating	-	-	X	-		

^a In the above list of characteristics, one shall choose those that are useful to define product performance for the foreseen application. This list is not exhaustive.

^b In the columns below, "X" means that the characteristic applies to the type of product.

^c RD Products: other properties such as ability to facilitate deep drawing, exposure outside shelter in specific environments, could be requested. Methods and limits shall be negotiated between the end user and the supplier.

^d RL Product: other properties could be requested. Methods and limits shall be negotiated between the end user and the supplier. Wettability and film homogeneity; outdoor exposure (ISO 2810 - NF T30-056); compatibility with coating (for example: Tarnish); removability; film resistance to erosion and outdoor exposure; resistance to humid and corrosive atmosphere (e.g. sulfur dioxide ISO 3231, ISO 6988, NF T30-055).

^e English translation available from AFNOR or BS 1133 section 6.1, appendix A.

^f For special applications, the absence of elements such as, heavy metals, sulfur, chlorine, phosphorus, boron can be requested. The concentration limits of these elements shall be negotiated between the end user and the supplier.

^g The presence of some chemicals in the formulation may interfere with the determination of this characteristic. This characteristic may be useful for products requiring deep drawing properties.

^h For RA products, if they contain a solvent, nature and type shall be specified. For all product types, the aromatic content may be determined on the base stock by infrared spectrometry (Brandes method). PCA content by IP 346/NF T60-605 on the base stock may be requested.

ⁱ The protection performance of the products can be established either on the delivered product, or on the aged product. The ageing conditions shall be negotiated between the end user and the supplier. Most generally ageing is performed on the metal panels on which a film of the product has been applied.

^j NF T 60-173, ASTM D 1748/IP 366 or BS 1133:1991 section 6.1, appendix K.

^k NF T 60-174 or DIN 50017/DIN 51386-1.

^l For RD products only if they exhibit a protection duration of more than 24 h.

^m Method to be agreed between the end user and the supplier.

ⁿ NF T 60-165 or MIL C 15074 D.

^o NF T 60-168, IP 178 or BS 1133:1991 section 6.1, appendix B.

^p This characteristic can only be evaluated in actual use.

Table 2 — Guideline for establishing specifications of solvent based products for temporary protection against corrosion

No.	Physico-chemical characteristics ^a	Units	ISO-L ^b					ISO Standard	Other standards or methods	
			RE (oily film)	RF (waxy to dry film)	RG (bituminous film)	RM ^c (pealable film)	RP (waxy to dry film)			
2.1	Appearance	Rating	X	X	X	X	X	ISO 2049 d e	Visual	
2.2	Odour	Rating	X	X	X	X	X		Olfactory	
2.3	Colour	Rating	X	X	X	X	X			
2.4	Density at 15 °C	kg/m ³	X	X	X	X	X			
2.5	Viscosity	-	X	X	X	-	X			
2.6	Flash point	°C	X	X	X	X	X		ISO 2719	
2.7	Dry extract	% (m/m)	X	X	X	X	X		ISO 3251	NF T 30-084
2.8	Storage stability	Rating	X	X	X	X	X			NF T 60-167 ^f
On the dry extract										
2.9	Dropping point	°C	-	X	-	X	-	ISO 2176		
2.10	Sulphated ash content	% (m/m)	X	X	X	X	X	ISO 3987		
2.11	Elements content ^g	% (m/m)	X	X	X	X	X		To be indicated	
2.12	Softening point	°C	-	X	-	X	-		NF T 60-147	
		°C			X				EN 1427	
2.13	Penetration	10 ⁻⁴ m	-	X	-	X	-	ISO 2137	h	
		10 ⁻⁴ m			X				EN 1426	
Performance characteristics										
Protection duration:										
2.14	- humidity cabinet	h	X	X	X	X	-		i	
2.15	- cyclic humidity cabinet	cycles	X	X	-	X	X		j	
2.16	-salt spray	h	X	X	X	X	X	ISO 3768	NF X 41-002	
2.17	Exposure outer shelter ^k	h	X	X	X	X	-		See annex C	
2.18	Outdoor exposure ^k	Rating	-	X	X	X	-		NF T 30-056	
2.19	Water displacement	Rating	X (to REE)	X (to RFF)	-	-	-		l	
2.20	Finger print neutralisation	Rating	X	X	-	-	-		m	
2.21	Behaviour UV/daylight exposure ^k	Rating	X	X	-	X	X		n	
Film characteristics										
2.22	Appearance	Rating	X	X	X	X	X		Visual	
2.23	Hardness ^o	Rating	-	X	X	X	X	ISO 1522	NF T 30-016	
2.24	Thickness	min	X	X	X	X	-	ISO 2808	p	
2.25	Film selfhealing properties		X	X	X	X	-		q	
2.26	Film adhesivity/pealability ^r	Rating	-	-	-	X	X (dry)			

Table 2 — (continued)

No.	Physico-chemical characteristics ^a	Units	ISO-L ^b					ISO Standard	Other standards or methods
			RE (oily film)	RF (waxy to dry film)	RG (bituminous film)	RM ^c (pealable film)	RP (waxy to dry film)		
2.27	Drying time ^s	h	-	X	X	X	X	ISO 1517/ ISO 3678	
2.28	Coverage	g/m ²	X	X	X	X	X		NF T 60-170 ^f
2.29	Flexibility	Rating	-	-	X	-	X	ISO 1519/ ISO 6860	BS 1133, section 6, appendix E
2.30	Removability	Rating	X	X	X	-	-		NF T 60-159 ^f
2.31	Film homogeneity/wetting	Rating	X	X	X	X	X		See annex D

^a In the above list of characteristics, one shall choose those that are useful to define product performance for the foreseen application. This list is not exhaustive. For all products, the nature and characteristics of the solvents shall be specified. The solvents used shall comply with the local regulations concerning health, safety and environmental protection.

^b In the columns, below "X" means that the characteristic applies to the type of product

^c RM products: other properties could be requested such as behaviour to outdoor exposure; compatibility with paints, lacquer, coatings; resistance to humid and corrosive atmospheres (e.g. sulfur dioxide: ISO 3231, ISO 6988, NF T 30-055). Methods and limits shall to be negotiated between the end user and the supplier.

^d The method for evaluation of density must be chosen depending on the nature of the product using: ISO 2811, ISO 3675 or ISO 12185.

^e The method for evaluation of viscosity must be chosen depending on the rheological properties of the product. Among possible methods: ISO 9262 (Brookfield method), ISO 2431 (flow cup method).

^f English translation available from AFNOR or BS 1133:1991, section 6.1, appendix A.

^g For special applications the absence of elements such as heavy metals, sulfur, chlorine, phosphorus, boron can be requested. The concentration limits of these elements shall be negotiated between the end user and the supplier.

^h NF T 60-123, DIN 51579 or ASTM D 1321.

ⁱ NF T 60-173, ASTM 1748/IP 366 or BS 1133:1991, section 6.1, appendix K.

^j NF T 60-174 or DIN 50017/DIN 51386-1.

^k Film thickness must be specified.

^l NF T 60-168, IP 178 or BS 1133:1991, section 6.1, appendix B.

^m NF T 60-165 or MIL C 15074 D.

ⁿ Method to be agreed between the end user and the supplier.

^o When applicable (sufficient film thickness).

^p May be calculated from the coverage of the product, determined by NF T 60-170 or measured by NF T 30-120, according to product nature.

^q Method to be agreed between the end user and the supplier. Salt spray testing of the panel covered with a film of the test product, with an indented cross may be used.

^r Applicable to RP pealable by of RM waxy dry products.

^s Complete apparent time for the waxy dry films - May be also evaluated by BS 1133:1991, section 6.1, appendix E.