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Lubricants, industrial oils and related products (Class L) — Family D (compressors) —

Part 1: Specifications of categories DAA and DAB (lubricants for reciprocating and drip feed rotary air compressors)

Lubrifiants, huiles industrielles et produits connexes (classe L) — Famille D (compresseurs) —

Partie 1: Spécifications pour les catégories DAA et DAB (lubrifiants pour compresseurs alternatifs et compresseurs rotatifs alimentés au goutte à goutte)

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 28, *Petroleum and related products, fuels and lubricants from natural or synthetic sources*, Subcommittee SC 4, *Classifications and specifications*.

A list of all parts in the ISO 6521 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Lubricants for compressors are used in various compressor designs. The lubricants for these applications can vary in composition, from straight mineral oils to more complex blends, based on mineral oils, synthetic oils (e.g. poly α-olefins, esters, poly-glycols), and additives. The additives most currently used are antioxidants, rust and copper corrosion inhibitors. They can be supplemented by detergents and dispersing additives to improving the cleanliness of the hottest parts of the compressors, e.g. the inlet and the exhaust valves in reciprocating compressors.

These lubricants are also able to lubricate the mechanical parts of the compressors (crankshaft and connecting rods bearings, crossheads, rolling bearings).

Lubricants, industrial oils and related products (Class L) — Family D (compressors) —

Part 1: Specifications of categories DAA and DAB (lubricants for reciprocating and drip feed rotary air compressors)

1 Scope

This document specifies the minimum requirements for mineral or synthetic based lubricants intended for use in reciprocating and drip feed rotary air compressors (vane compressors) with the compression chamber(s)/cylinders lubricated by direct lubricant injection.

NOTE This document can be read in conjunction with ISO 6743-3[1].

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 2160, *Petroleum products — Corrosiveness to copper — Copper strip test*

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

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

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

ISO 3016, *Petroleum and related products from natural or synthetic sources — Determination of pour point*

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

ISO 3170, *Petroleum liquids — Manual sampling*

ISO 3448, *Industrial liquid lubricants — ISO viscosity classification*

ISO 3675, *Crude petroleum and liquid petroleum products — Laboratory determination of density — Hydrometer method*

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

ISO 4259 (all parts), *Petroleum and related products — Precision of measurement methods and results*

ISO 6245, *Petroleum products — Determination of ash*

ISO 6247, *Petroleum products — Determination of foaming characteristics of lubricating oils*

ISO 6296, *Petroleum products — Determination of water — Potentiometric Karl Fischer titration method*

ISO 6614, *Petroleum products — Determination of water separability of petroleum oils and synthetic fluids*

ISO 6615, *Petroleum products — Determination of carbon residue — Conradson method*

ISO 6617, *Petroleum-based lubricating oils — Aging characteristics — Determination of change in Conradson carbon residue after oxidation*

ISO 6618, *Petroleum products and lubricants — Determination of acid or base number — Colour-indicator titration method*

ISO 6619, *Petroleum products and lubricants — Neutralization number — Potentiometric titration method*

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

ISO 12185, *Crude petroleum and petroleum products — Determination of density — Oscillating U-tube method*

ISO 12937, *Petroleum products — Determination of water — Coulometric Karl Fischer titration method*

ISO 20764, *Petroleum and related products — Preparation of a test portion of high-boiling liquids for the determination of water content — Nitrogen purge method*

ASTM D1160, *Standard Test Method for Distillation of Petroleum Products at Reduced Pressure*

DIN 51352-2, *Testing of lubricants; determination of ageing characteristics of lubricating oils; Conradson carbon residue after ageing by passing air through the lubricating oil in the presence of iron(III) oxide*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Sampling

Sampling of compressor oils for the purpose of this document, unless otherwise specified, shall be carried out in accordance with the relevant procedure described in ISO 3170. The sample shall be evaluated on a representative portion. Any drum, barrel, tanker compartment or any type of container delivered to the end user may be sampled and analysed at the discretion of the purchaser.

5 Requirements

Compressor oil samples, when tested under the prescribed methods, shall be in accordance with the limits set out in Tables 1 and 2.

The aspect of the delivered oil shall be clear and bright and free of any visible particulate matter, under visible light at ambient temperature.

Most of the test methods specified in Tables 1 and 2 contain a precision statement. In cases of dispute, the procedure described in the ISO 4259 series shall apply.

NOTE 1 Some equipment manufacturers or customers can have additional requirements covering e.g. characteristics such as elastomer and materials compatibility, anti-wear behaviour, detergent properties.

NOTE 2 These lubricants can also be used to lubricate the other mechanical parts of the compressors (crankshaft and connecting rod bearings, crossheads, rolling bearings). They might be also able to fulfil the required properties.

6 Specifications

6.1 Specifications for ISO-L-DAA air compressor oils

These lubricants are refined mineral oils with suitable oxidation and corrosion inhibitors; they can also contain some additional detergent additives to improve the cleanliness of the exhaust valve systems in reciprocating compressors. They are intended to lubricate reciprocating and rotary air compressors operating within the parameters of a normal duty cycle as defined in ISO 6743-3[1].

These lubricants shall be in accordance with the specifications given in Table 1.

6.2 Specifications for ISO-L-DAB air compressor oils

These lubricants are either refined mineral oils, part-synthetic or synthetic oils with suitable oxidation and corrosion inhibitors; they may also contain some additional detergent additives to improve the cleanliness of the exhaust valve systems in reciprocating compressors. They are intended to lubricate reciprocating and rotary air compressors operating within the parameters of a severe duty cycle as defined in ISO 6743-3[1].

These lubricants shall be in accordance with the specifications given in Table 2.

Table 1 — Specifications of ISO-L-DAA category

Characteristics	Unit	Test method	ISO — L– DAA				
Viscosity grade		ISO 3448	32	46	68	100	150
Viscosity at 40 °C	mm^2/s	ISO 3104					
— minimum			28,8	41,4	61,2	90	135
— maximum			35,2	50,6	74,8	110	165
Viscosity at 100 °C	mm^2/s	ISO 3104	Report				
Viscosity index		ISO 2909	Report				
Density	kg/m^3	ISO 12185 or ISO 3675	Report				
Pour point (minimum)	°C	ISO 3016	–18	–15	–12	–9	–9
Flash point (Cleveland open cup) (minimum)	°C	ISO 2592	175	195	195	205	210
Flash point (Closed cup) (minimum)	°C	ISO 2719	162	182	182	192	198
Copper corrosiveness (maximum)	rating	ISO 2160	1	1	1	1	1
Acid number	mg KOH/g	ISO 6618 or ISO 6619	Report				
Water content (maximum)[a]	% m/m	ISO 6296 or ISO 12937	0,02				
Sulfated ash or oxide ash	% m/m	ISO 6245 or ISO 3987	Report				
Rust preventing characteristics	rating	ISO 7120 B	Shall pass				
Demulsibility[b]: maximum time to reach an emulsion volume of 3 ml	min	ISO 6614	30 at 54 °C			30 at 82 °C	
Foaming		ISO 6247					
Sequence I at 24 °C	ml/ml		150/0	150/0	150/0	150/0	150/0
Sequence II at 93 °C	ml/ml		50/0	50/0	50/0	50/0	50/0
Sequence III at 24 °C after 93 °C	ml/ml		150/0	150/0	150/0	150/0	150/0
Oxidation stability:		ISO 6617					
Carbon Conradson residue increase[c]	%		2,0				2,5
Evaporation losses	%		Report				

[a] In case of dispute, use ISO 20764.

[b] This property does not apply to products containing detergents and dispersing additives.

[c] ISO 10370[2] can be used as an alternative method to ISO 6615 for the determination of the Conradson residue.

Table 2 — Specifications of ISO-L-DAB category

Characteristics	Unit	Test method	ISO — L — DAB				
Viscosity grade		ISO 3448	32	46	68	100	150
Viscosity at 40 °C	mm^2/s	ISO 3104					
— minimum			28,8	41,4	61,2	90	135
— maximum			35,2	50,6	74,8	110	165
Viscosity at 100 °C	mm^2/s	ISO 3104	Report				
Viscosity index		ISO 2909	Report				
Density	kg/m^3	ISO 12185 or ISO 3675	Report				
Pour point (minimum)	°C	ISO 3016	−18	−15	−12	−9	−9
Flash point (Cleveland open cup) (minimum)	°C	ISO 2592	175	195	195	205	210
Flash point (Closed cup) (minimum)	°C	ISO 2719	162	182	182	192	198
Copper corrosiveness (maximum)	rating	ISO 2160	1	1	1	1	1
Acid number	mg KOH/g	ISO 6618	Report				
Water content (maximum)[a]	% m/m	ISO 6296 or ISO 12937	0,02				
Sulfated ash or oxide ash	% m/m	ISO 6245 or ISO 3987	Report				
Rust preventing characteristics	rating	ISO 7120 B	Shall pass				
Demulsibility[b]: maximum time to reach an emulsion volume of 3 ml	min	ISO 6614	30 at 54 °C			30 at 82 °C	
Foaming		ISO 6247					
Sequence I at 24 °C	ml/ml		150/0	150/0	150/0	150/0	150/0
Sequence II at 93 °C	ml/ml		50/0	50/0	50/0	50/0	50/0
Sequence III at 24 °C after 93 °C	ml/ml		150/0	150/0	150/0	150/0	150/0
Characteristics of the 20 % distillation residue obtained by distillation under reduced pressure:		ASTM D1160					
Carbon Conradson residue	% m/m	ISO 6615 or ISO 10370	0,3	0,3	0,3	0,3	0,6
Maximum viscosity at 40 °C of the residue	mm^2/s	ISO 3104	5 times of the viscosity of the new oil				
Oxidation stability		DIN 51352-2					
Carbon Conradson residue after aging[c]	%		2,5		3,0		
Evaporation losses	%		Report				

[a] In case of dispute, use ISO 20764.

[b] This property does not apply to products containing detergents and dispersing additives.

[c] ISO 10370[2] can be used as an alternative method to DIN 51551-1[3] for the determination of the Conradson residue.