

# TECHNICAL SPECIFICATION

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

### Part 2: Specifications of categories DAG, DAH and DAJ (Lubricants for flooded rotary air compressors)

*Lubrifiants, huiles industrielles et produits connexes (Classe L) —  
Famille D (Compresseurs) —*

*Partie 2: Spécifications des catégories DAH, DAI et DAJ (Lubrifiants  
pour compresseurs d'air rotatifs à injection d'huile)*

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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 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](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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](http://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](http://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  $\alpha$ -olefins, esters, poly-glycols), with appropriate antioxidants, rust and corrosion inhibitors, extreme-pressure and anti-wear additives, possibly associated with detergent and dispersing agents.

In flooded rotary air compressors, the compressor oil is injected with the air at the inlet port. The oil serves as a coolant and limits the air temperature increase due to compression, allowing higher compression rates in one stage. The oil is submitted to high oxidative stresses; the oil/air mixture is submitted to temperatures up to 100 °C and even more. It is important to limit oil degradation.

In addition, oil has to be separated from the air at the exit of the compressor; this separation is achieved using coalescing filters. Oil oxidation has the effect of disturbing the functioning of these filters, leading to pressure drop increase and loss of the separating efficiency and, as a consequence, the oil consumption increase. Oil oxidation stability is therefore of utmost importance.

Presently, there is no method making consensus to assess the oxidation stability of flooded rotary compressor oils (see [Annex B](#)). Waiting for the development of a sound and accepted method, a technical specification is proposed.

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

## Part 2: Specifications of categories DAG, DAH and DAJ (Lubricants for flooded rotary air compressors)

### 1 Scope

This document specifies the minimum requirements for mineral or synthetic based lubricants, as delivered, and intended for use in flooded rotary air compressors (vane and screw).

This document can be read in conjunction with ISO 6743-3.

NOTE For the purposes of this document, the term "% (m/m)" is used to represent the mass fraction of a material.

### 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 4259-2, *Petroleum and related products — Precision of measurement methods and results — Part 2: Interpretation and application of precision data in relation to methods of test*

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 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 6743-3, *Lubricants, industrial oils and related products (class L) — Classification — Part 3: Family D (Compressors)*

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 14635-1, *Gears — FZG test procedures — Part 1: FZG test method A/8,3/90 for relative scuffing load-carrying capacity of oils*

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

### 3 Terms and definitions

No terms and definitions are listed in this document.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://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 pertinent 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 General requirements

The appearance 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 used in the specifications tables (see [Tables A.1, A.2](#) and [A.3](#)) contain a precision statement. In cases of dispute, if the conditions of the ISO 4259 series can be met with the relevant test method, the procedure described in ISO 4259-2 shall apply.

**NOTE** Some OEM or customers can have additional requirements when the product is applied in their equipment. It is possible for these requirements to cover characteristics such as elastomer and materials compatibility, anti-wear behaviour, load carrying ability, detergent properties, etc.

These lubricants are also used to lubricating the other mechanical parts of the compressors (multiplication gears, rolling bearings, vane-rings systems, screw systems). They shall be able to fulfil the required properties.

## 6 Specifications

### 6.1 Specifications for ISO-L-DAG air compressor oils

These lubricants are refined mineral oils, part synthetic or synthetic oils with suitable oxidation and corrosion inhibitors, in combination with anti-wear and/or extreme-pressure additives; they can also contain some additional detergent additives.

They are intended to lubricate flooded rotary air compressors operating within the parameters of a normal duty cycle as defined in ISO 6743-3. For this type of oil, the normal draining cycle is up to 2 000 hours.

These lubricants shall be in accordance with the specifications given in [Table A.1](#).

### 6.2 Specifications for ISO-L-DAH air compressor oils

These lubricants are refined mineral oils, part synthetic or synthetic oils with suitable oxidation and corrosion inhibitors, in combination with anti-wear and/or extreme-pressure additives; they can also contain some additional detergent additives.

They are intended to lubricate flooded rotary air compressors operating within the parameters of a heavy-duty cycle as defined in ISO 6743-3. For this type of oil, the normal draining cycle lies between 2 000 hours and 4 000 hours.

These lubricants shall be in accordance with the specifications given in [Table A.2](#).

### 6.3 Specifications for ISO-L-DAJ air compressor oils

These lubricants are refined mineral oils, part synthetic or synthetic oils with suitable oxidation and corrosion inhibitors, in combination with anti-wear and/or extreme-pressure additives; they can also contain some additional detergent additives.

They are intended to lubricate flooded rotary air compressors operating within the parameters of a heavy-duty cycle as defined in ISO 6743-3. For this type of oil, the normal draining cycle is above 4 000 hours.

These lubricants shall be in accordance with the specifications given in [Table A.3](#).

## Annex A

### (normative)

## Specifications tables

Table A.1 — Specifications of ISO-L-DAG category

Characteristic	Unit	Test method	ISO -L- DAG		
ISO grade		ISO 3448	32	46	68
Viscosity at 40 °C		ISO 3104			
— minimum	mm <sup>2</sup> /s		28,8	41,4	61,2
— maximum	mm <sup>2</sup> /s		35,2	50,6	74,8
Viscosity at 100 °C	mm <sup>2</sup> /s	ISO 3104		report	
Viscosity index		ISO 2909		report	
Density	kg/m <sup>3</sup>	ISO 12185 or ISO 3675		report	
Pour point (minimum)	°C	ISO 3016	-18	-15	-12
Flash point (COC) (minimum)	°C	ISO 2592	175	195	195
Flash point (Closed cup) (minimum)	°C	ISO 2719	162	182	182
Copper corrosiveness (maximum) (3 h, 100 °C)	rating	ISO 2160	1	1	1
Acid number	mg KOH/g	ISO 6618 or ISO 6619		report	
Water content (maximum) <sup>a</sup>	% (m/m)	ISO 6296 or ISO 12937		0,02	
Sulphated ash or oxide ash	% (m/m)	ISO 6245 or ISO 3987		report	
Rust preventing characteristics	rating	ISO 7120 B	Shall pass		
Demulsibility <sup>b</sup> : maximum time to reach an emulsion volume of 3 ml	minutes	ISO 6614	30 @ 54 °C		
Foaming		ISO 6247			
Sequence I @ 24 °C	ml/l		150/0	150/0	150/0
Sequence II @ 93 °C	ml/l		50/0	50/0	50/0
Sequence III @ 24 °C, after 93 °C	ml/l		150/0	150/0	150/0
Air release properties	minutes	ISO 9120	< 5	< 10	< 10
Extreme pressure properties		ISO 14635-1			
Failure load stage	rating		Report		
Oxidation stability		See Annex B	Limits to be agreed between end user and supplier based on Annex B		

<sup>a</sup> In case of dispute, ISO 20764 shall apply.

<sup>b</sup> Does not apply to products containing detergents and / or dispersing additives.

Table A.2 — Specifications of ISO-L-DAH category

Characteristic	Unit	Test method	ISO -L- DAH		
ISO grade		ISO 3448	32	46	68
Viscosity at 40 °C		ISO 3104	28,8	41,4	61,2
— minimum	mm <sup>2</sup> /s		35,2	50,6	74,8
— maximum	mm <sup>2</sup> /s				
Viscosity at 100 °C	mm <sup>2</sup> /s	ISO 3104	report		
Viscosity index		ISO 2909	report		
Density	kg/m <sup>3</sup>	ISO 12185 or ISO 3675	report		
Pour point (minimum)	°C	ISO 3016	-18	-15	-12
Flash point (COC) (minimum)	°C	ISO 2592	175	195	195
Flash point (Closed cup) (minimum)	°C	ISO 2719	162	182	182
Copper corrosiveness (maximum) (3 h, 100 °C)	rating	ISO 2160	1	1	1
Acid number	mg KOH/g	ISO 6618 or ISO 6619	report		
Water content (maximum) <sup>a</sup>	% (m/m)	ISO 6296 or ISO 12937	0,02		
Sulphated ash or oxide ash	% (m/m)	ISO 6245 or ISO 3987	report		
Rust preventing characteristics	rating	ISO 7120 B	Shall pass		
Demulsibility <sup>b</sup> : maximum time to reach an emulsion volume of 3 ml	minutes	ISO 6614	30 @ 54 °C		
Foaming		ISO 6247			
Sequence I @ 24 °C	ml/l		150/0	150/0	150/0
Sequence II @ 93 °C	ml/l		50/0	50/0	50/0
Sequence III @ 24 °C after 93 °C	ml/l		150/0	150/0	150/0
Air release properties	minutes	ISO 9120	< 5	< 10	< 10
Extreme pressure properties		ISO 14635-1			
Failure load stage	rating		Report		
Oxidation stability		See <a href="#">Annex B</a>	Limits to be agreed between end user and supplier based on <a href="#">Annex B</a>		

<sup>a</sup> In case of dispute ISO 20764 shall apply.

<sup>b</sup> Does not apply to products containing detergents and / or dispersing additives.

Table A.3 — Specifications of ISO-L-DAJ category

Characteristic	Unit	Test method	ISO -L- DAJ		
ISO grade		ISO 3448	32	46	68
Viscosity at 40 °C		ISO 3104			
— minimum	mm <sup>2</sup> /s		28,8	41,4	61,2
— maximum	mm <sup>2</sup> /s		35,2	50,6	74,8
Viscosity at 100 °C	mm <sup>2</sup> /s	ISO 3104	report		
Viscosity index		ISO 2909	report		
Density	kg/m <sup>3</sup>	ISO 12185 or ISO 3675	report		
Pour point (minimum)	°C	ISO 3016	-18	-15	-12
Flash point (COC) (minimum)	°C	ISO 2592	175	195	195
Flash point (Closed cup) (minimum)	°C	ISO 2719	162	182	182
Copper corrosiveness (maximum) (3 h, 100 °C)	rating	ISO 2160	1	1	1
Acid number	mg KOH/g	ISO 6618 or ISO 6619	report		
Water content (maximum) <sup>a</sup>	% (m/m)	ISO 6296 or ISO 12937	0,02		
Sulphated ash or oxide ash	% (m/m)	ISO 6245 or ISO 3987	report		
Rust preventing characteristics	rating	ISO 7120 B	Shall pass		
Demulsibility <sup>b</sup> : maximum time to reach an emulsion volume of 3 ml	minutes	ISO 6614	30 @ 54 °C		
Foaming		ISO 6247			
Sequence I @ 24 °C	ml/l		150/0	150/0	150/0
Sequence II @ 93 °C	ml/l		50/0	50/0	50/0
Sequence III @ 24 °C after 93 °C	ml/l		150/0	150/0	150/0
Air release properties	minutes	ISO 9120	< 5	< 10	< 10
Extreme pressure properties		ISO 14635-1	Report		
Failure load stage	rating		Report		
Oxidation stability		See <a href="#">Annex B</a>	Limits to be agreed between end user and supplier based on <a href="#">Annex B</a>		

<sup>a</sup> In case of dispute, ISO 20764 shall apply.

<sup>b</sup> Does not apply to products containing detergents and / or dispersing additives.