
Lubricants, industrial oils and related products (class L) — Family T (Turbines) — Specifications of triaryl phosphate ester turbine control fluids (category ISO-L-TCD)

Lubrifiants, huiles industrielles et produits connexes (classe L) — Famille T (Turbines) — Spécifications des fluides de régulation de turbines à base d'esters de triaryl phosphate (catégorie L-T-CD)



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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

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.

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.

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WARNING — The handling and use of products as specified in this International Standard may be hazardous, if suitable precautions are not observed. This International Standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the users of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

1 Scope

This International Standard specifies the characteristics of unused triaryl phosphate ester fluids for turbine governor controls and other hydraulic systems in electrical power stations.

NOTE Fluids used in this application are classified under category TCD of ISO 6743-5:—^[1].

These fluids are difficult to ignite and show little tendency to propagate flame, but cannot be considered non-flammable. Such fluids should only be filled into systems designed for their use and where recommended by the equipment manufacturer.

Regular maintenance of these fluids is important. Detailed information on their maintenance and associated safety procedures is given in IEC 60978^[3] or should be obtained from equipment manufacturers and fluid suppliers.

2 Normative references

The following referenced documents are indispensable for the application 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 760:1978, *Determination of water — Karl Fischer method (General method)*

ISO 2592:2000, *Determination of flash and fire points — Cleveland open cup method*

ISO 3016:1994, *Petroleum products — Determination of pour point*

ISO 3104:1994, *Petroleum products — Transparent and opaque liquids — Determination of kinematic viscosity and calculation of dynamic viscosity*

ISO 3170:2004, *Petroleum liquids — Manual sampling*

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

ISO 3675:1998, *Crude petroleum and liquid petroleum products — Laboratory determination of density — Hydrometer method*

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

ISO 4406:1999, *Hydraulic fluid power — Fluids — Method for coding the level of contamination by solid particles*

ISO 6072:2002, *Hydraulic fluid power — Compatibility between fluids and standard elastomeric materials*

ISO 6247:1998, *Petroleum products — Determination of foaming characteristics of lubricating oils*

ISO 6614:1994, *Petroleum products — Determination of water separability of petroleum oils and synthetic fluids*

ISO 6619:1988, *Petroleum products and lubricants — Neutralization number — Potentiometric titration method*

ISO 9120:1997, *Petroleum and related products — Determination of air-release properties of steam turbine and other oils — Impinger method*

ISO 11500:1997, *Hydraulic fluid power — Determination of particulate contamination by automatic counting using the light extinction principle*

ISO 12185:1996, *Crude petroleum and petroleum products — Determination of density — Oscillating U-tube method*

ISO 14935:1998, *Petroleum and related products — Determination of wick flame persistence of fire-resistant fluids*

ISO 15597:2001, *Petroleum and related products — Determination of chlorine and bromine content — Wavelength-dispersive X-ray fluorescence spectrometry*

ISO 20823:2003, *Petroleum and related products — Determination of the flammability characteristics of fluids in contact with hot surfaces — Manifold ignition test*

IEC 60247:2004, *Insulating liquids — Measurement of relative permittivity, dielectric dissipation factor ($\tan \delta$) and d.c. resistivity*

EN 14832:2005, *Petroleum and related products — Determination of the oxidation stability and corrosivity of fire-resistant phosphate ester fluids*

EN 14833:2005, *Petroleum and related products — Determination of the hydrolytic stability of fire-resistant phosphate ester fluids*

3 Composition

These products are organic phosphate esters with the organic constituents consisting entirely of aryl or substituted aryl groups. The composition of commercial fluids is complex and several different chemical types are available.

Additives may be incorporated to improve stability and to reduce foaming. Use of viscosity index improvers is not allowed.

4 Dyes

The use of dyes for identification purposes is allowed, if required.

5 Sampling

Unless otherwise specified in commodity specifications, samples shall be drawn in accordance with ISO 3170.

Additional information on sampling as given in IEC 60978^[3] should also be taken into account.

6 Required characteristics

The appearance of the fluid shall be clear and free from visible foreign matter when a representative sample of the fluid is examined at ambient temperature by transmitted visible light using a clear glass container of approximately 100 mm diameter.

Fluids complying with this International Standard shall meet the limits given in Table 1 when tested in accordance with the specified methods.

7 Precision and interpretation of test results

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

Table 1 — Required characteristics of unused triaryl phosphate ester turbine control fluids

Fluid characteristics		Units	Viscosity grades (ISO 3448)		Test methods
			32	46	
Kinematic viscosity at 40 °C	minimum	mm ² /s	28,8	41,4	ISO 3104
	maximum	mm ² /s	35,2	50,6	
Kinematic viscosity at 0 °C	maximum	mm ² /s	2 000	2 500	
Density at 15 °C	maximum	kg/m ³	1 200	1 200	ISO 3675 or ISO 12185
Neutralization number ^a	maximum	mg KOH/g	0,1	0,1	ISO 6619
Water content	maximum	g/kg	1,0	1,0	ISO 760
Pour point	maximum	°C	−15	−15	ISO 3016
Manifold ignition test	minimum	°C	700	700	ISO 20823
Wick flame persistence	maximum	s	10	10	ISO 14935
Fire point	minimum	°C	300	300	ISO 2592
Foaming characteristics:					
sequence I (24 °C)	maximum	ml	150/0	150/0	ISO 6247
sequence II (93,5 °C)	maximum	ml	30/0	30/0	
sequence III (24 °C)	maximum	ml	150/0	150/0	
Air release value at 50 °C	maximum	min	5	6	ISO 9120
Water separability:					
time to reach 3 ml emulsion ^d	maximum	min	15	15	ISO 6614
Direct current resistivity at 20 °C	minimum	MΩ · m	50	50	IEC 60247
Chlorine content	maximum	mg/kg	50	50	ISO 15597
Cleanliness	maximum	rating	−/15/12	−/15/12	ISO 4406 ^b
Oxidation stability:					
acid number	maximum	mg KOH/g	1,5	1,5	EN 14832
mass change Fe	maximum	mg	1,0	1,0	
mass change Cu	maximum	mg	2,0	2,0	
Hydrolytic stability:					
Increase in acid number	maximum	mg KOH/g	0,5	0,5	EN 14833
Elastomer compatibility: 150 °C/168 h (FKM2) or 130 °C/168 h (EPDM1)					
volume change ^c	maximum	%	+15 −4	+15 −4	ISO 6072
hardness change ^c	maximum	IRHD	± 8	± 8	
change in tensile strength ^c	maximum	%	−20	−20	
elongation at break ^c	maximum	%	− 20	− 20	

^a The neutralization number method provides for the determination of both total acid number and strong acid number. The requirement in this International Standard is for the measurement of total acid number.

^b ISO 4406 is the procedure for codifying the number and size of particles in the sample. ISO 11500:1997 is the recommended method for counting and sizing particles and is currently under revision. However, the existing version refers to the calibration of the automatic counting equipment according to ISO 4402 which has been replaced by ISO 11171^[2].

^c The limits shown for seal compatibility are for reference purpose and should not be taken as the direct basis on which elastomer compatibility is to be determined, because it also depends on the purpose and conditions of use (ISO 6072).

^d The result is reported as mentioned in ISO 6614, i.e. volume of oil-volume of water-volume of emulsion (time): example: 40-37-3 (10), the maximum specified is 40-37-3 (15).