BRITISH STANDARD

BS EN
61221:2004

Petroleum products and lubricants — Triaryl phosphate ester turbine control fluids (category ISO-L-TCD) — Specifications

The European Standard EN 61221:2004 has the status of a British Standard

ICS 29.120; 75.120

National foreword

This British Standard is the official English language version of EN 61221:2004. It is identical with IEC 61221:2004. It supersedes BS EN 61221:1996 which will be withdrawn on 2007-09-01.

The UK participation in its preparation was entrusted to Technical Committee GEL/10, Fluids for electrotechnical applications, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 8, an inside back cover and a back cover.

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EUROPEAN STANDARD **EN 61221**

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ICS 29.120; 75.120

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English version

Petroleum products and lubricants – Triaryl phosphate ester turbine control fluids (category ISO-L-TCD) - Specifications

(IEC 61221:2004)

Produits pétroliers et lubrifiants – Fluides de régulation de turbines à base d'esters de triarylphosphate (catégorie ISO-L-TCD) – Spécifications (CEI 61221:2004)

Mineralölerzeugnisse und Schmiermittel - Triaryl-Phosphatester-Turbinen-Steuerflüssigkeiten (Kategorie ISO-L-TCD) – Anforderungen (IEC 61221:2004)

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Ref. No. EN 61221:2004 E

Foreword

The text of document 10/583/FDIS, future edition 2 of IEC 61221, prepared by IEC TC 10, Fluids for electrotechnical applications, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61221 on 2004-09-01.

This European Standard supersedes EN 61221:1995.

The main changes with respect to EN 61221:1995 include:

a) introduction of new tests to define fire resistance, namely the Manifold Ignition and Wick flame persistence tests;

b) flame persistence tests;

c) introduction of a pour point requirement;

d) a change to the Sequence II foaming requirement;

e) introduction of a cleanliness requirement;

f) introduction of an elastomer compatibility requirement;

g) use of ISO test methods equivalent to the original DIN tests.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2005-06-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2007-09-01

Annex ZA has been added by CENELEC.

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Endorsement notice

The text of the International Standard IEC 61221:2004 was approved by CENELEC as a European Standard without any modification.

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PETROLEUM PRODUCTS AND LUBRICANTS – TRIARYL PHOSPHATE ESTER TURBINE CONTROL FLUIDS (CATEGORY ISO-L-TCD) – SPECIFICATIONS

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.

Fluids used in this application are classified under category TCD of ISO 6743-5.

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.

IEC 60247, *Insulating liquids – Measurement of relative permittivity, dielectric dissipation factor (factor tan δ) and d.c. resistivity*

IEC 60978, *Maintenance and use guide for triaryl phosphate ester turbine control fluids*

ISO 760, *Determination of water – Karl Fischer method (General method)*

ISO 2592, *Determination of flash and fire points – Cleveland open cup method*

ISO 3016, *Petroleum products – 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 *Petroleum products – Determination and application of precision data in relation to methods of test*

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

ISO 6072, *Hydraulic fluid power – Compatibility between fluids and standard elastomeric materials*

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

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

ISO 6619, *Petroleum products and lubricants – Neutralisation number – Potentiometric titration method*

ISO 6743-5, *Lubricants, industrial oils and related products (class L) – Classification – Part 5: Family T (Turbines)*

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

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

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

EN 14832, *Petroleum and related products – Determination of the oxidation stability and corrosivity of phosphate ester fluids* [1]

EN 14833, *Petroleum and related products – Determination of hydrolytic stability of phosphate ester fluids*[2]

ISO 14935, *Petroleum and related products – Determination of wick flame persistence of fire resistant fluids*

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

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

3 General

These fluids are difficult to ignite and show little tendency to propagate a flame, but cannot be considered as 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, handling and associated safety procedures is given in IEC 60978 or can be obtained from the suppliers of these fluids.

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1 EN 14832 is the future CENELEC reference. This publication, currently at the DIS stage, was formerly ISO 15595 and DIN 51373:1984 (see resolution 8 of ISO/TC 28 N2200).

2 EN 14833 is the future CENELEC reference. This publication, currently at the DIS stage, was formerly ISO 15596 and DIN 51348:1990 (see resolution 8 of ISO/TC 28 N2200).

4 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 permitted.

Fluids may be dyed for identification purposes, if required.

5 Sampling

Sampling shall be carried out on delivery in accordance with the relevant procedures described in 6.2 and 6.3 of ISO 3170.

Additional information on sampling is given in IEC 60978.

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 standard shall meet the limiting values in Table 1 when tested in accordance with the specified methods.

7 Precision and interpretation of test results

Most of the methods of test specified in Table 1 contain a statement of the precision, i.e. repeatability and reproducibility to be expected from them. In case of dispute, the procedure described in ISO 4259 which uses precision data in the interpretation of test results, shall be used.

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

Fluid characteristics		Unit	Viscosity grade (ISO 3448)		Test method
			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[1]	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[2]	minimum	°C	700	700	ISO 20823
Wick flame persistence[2]	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		Min	5	6	ISO 9120
Water separability	maximum	Min	15	15	ISO 6614
DC resistivity at 20 °C	minimum	MΩm	50	50	IEC 60247
Chlorine content	maximum	mg/kg	50	50	ISO 15597
Cleanliness	maximum		-/15/12	-/15/12	ISO 11500[3] ISO 4406[3]
Oxidation stability					
Neutralization number	maximum	mg KOH/g	1,5	1,5	EN 14832
Weight change Fe	maximum		1,0	1,0	
Weight change Cu	maximum	mg	2,0	2,0	
		mg			
Hydrolytic stability: Increase in neutralization number	maximum	mg KOH/g	0,5	0,5	EN 14833
Elastomer compatibility: 150°C /168 h (FKM2) or 130 °C/168 h (EPDM 1)					ISO 6072[4]
. relative volume change[4]	maximum	%	+15/-4	+15/-4	
. relative hardness change[4]	min/max	IRHD	±8	±8	
. change in tensile strength[4]		%	-20	-20	
. elongation at break[4]		%	-20	-20	

[1] The neutralization number method allows the determination of both total acid number and strong acid number. The requirements in this standard is for the measurement of total acid number.

[2] Fire resistance is also usually specified by means of spray ignition test performance but the preferred test methods are still undergoing conversion to the ISO format (future ISO 15029-2 and ISO 15029-3). Once the ISO methods have been published, this requirement will be included in the standard. However, the fire resistance of the phosphate esters used in this application is well known and can be defined ad interim by the above procedures.

[3] ISO 11500 is the recommended test method for counting and sizing of particles and is currently under revision. The existing version refers to the calibration of automatic counting equipment according to ISO 4402 but this standard has been replaced by ISO 11171. ISO 4406 is the procedure for codifying number and size of particles in the sample.

[4] The limits shown for seal compatibility are for reference purposes and should not be taken as the direct basis on which elastomer compatibility is to be determined as it will depend on the purpose and conditions of use. ISO 6072 is currently under revision at the FDIS stage.

Bibliography

ISO/WD 15029-2/3, *Petroleum and related products – Determination of spray flame persistence of fire-resistant fluids – (Part 2/3 methods to be established)*

ISO 11171, *Hydraulic fluid power – Calibration of automatic particle counters for liquids*

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Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE Where an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60247	- [1)]	Insulating liquids - Measurement of relative permittivity, dielectric dissipation factor (tan d) and d.c. resistivity	EN 60247	2004 [2)]
IEC 60978	- [1)]	Maintenance and use guide for triaryl phosphate ester turbine control fluids	-	-
ISO 760	- [1)]	Determination of water - Karl Fischer method (General method)	-	-
ISO 2592	- [1)]	Determination of flash and fire points - Cleveland open cup method	EN ISO 2592	2001 [2)]
ISO 3016	- [1)]	Petroleum Oils - Determination of pour point	-	-
ISO 3104	- [1)]	Petroleum products - Transparent and opaque liquids - Determination of kinematic viscosity and calculation of dynamic viscosity	EN ISO 3104	1996 [2)]
ISO 3170	- [1)]	Petroleum liquids - Manual sampling	EN ISO 3170	2004 [2)]
ISO 3448	- [1)]	Industrial liquid lubricants - ISO viscosity classification	-	-
ISO 3675	- [1)]	Crude petroleum and liquid petroleum products - Laboratory determination of density - Hydrometermethod	EN ISO 3675	1998 [2)]
ISO 4259	- [1)]	Petroleum products - Determination and application of precision data in relation to methods of test	EN ISO 4259	1995 [2)]

1) Undated reference.

2) Valid edition at date of issue.

Publication	Year	Title	EN/HD	Year
ISO 4406	- [1)]	Hydraulic fluid power - Fluids - Method for coding the level of contamination by solid particles	-	-
ISO 6072	- [1)]	Hydraulic fluid power - Compatibility between fluids and standard elastomeric materials	-	-
ISO 6247	- [1)]	Petroleum products - Determination of foaming characteristics of lubricating oils	-	-
ISO 6614	- [1)]	Petroleum products - Determination of water separability of petroleum oils and synthetic fluids	-	-
ISO 6619	- [1)]	Petroleum prodcuts and lubricants - Neutralization number - Potentiometric titration method	-	-
ISO 6743-5	- [1)]	Lubricants, industrial oils and related products (class L) - Classification Part 5: Family T (Turbines)	-	-
ISO 9120	- [1)]	Petroleum and related products - Determination of air-release properties of steam turbine and other oils - Impinger method	-	-
ISO 11500	- [1)]	Hydraulic fluid power - Determination of particulate contamination by automatic counting using the light extinction principle	-	-
ISO 12185	- [1)]	Crude petrolelum and petroleum products - Determination of density - Oscillating U-tube method	EN ISO 12185	1996 [2)]
		Petroleum and related products - Determination of the oxidation stability and corrosivity of phosphate ester fluids	EN 14832	- [3)]
		Petroleum and related products - Determination of hydrolytic stability of phosphate ester fluids	EN 14833	- [3)]

3) draft CEN standard.

Publication	Year	Title	EN/HD	Year
ISO 14935	- [1)]	Petroleum and related products - Determination of wick flame persistence of fire resistant fluids	EN ISO 14935	1998 [2)]
ISO 15597	- [1)]	Petroleum and related products - Determination of chlorine and bromine content - Wavelength-dispersive X-ray fluorescence spectrometry	-	-
ISO 20823	- [1)]	Petroleum and related products - Determination of the flammability characteristics of fluids in contact with hot surfaces - Manifold ignition test	-	-

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