

Classification of insulating liquids according to fire point and net calorific value



Thorne & Derrick
+44 (0) 191 410 4292
www.powerandcables.com

The European Standard EN 61100:1992 has the status of a
British Standard

UDC 621.315.615:536.4:614.83

Cooperating organizations

The European Committee for Electrotechnical Standardization (CENELEC), under whose supervision this European Standard was prepared, comprises the national committees of the following countries:

Austria	Italy
Belgium	Luxembourg
Denmark	Netherlands
Finland	Norway
France	Portugal
Germany	Spain
Greece	Sweden
Iceland	Switzerland
Ireland	United Kingdom

This British Standard, having been prepared under the direction of the Cables and Insulation Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 March 1993

© BSI 12-1999

The following BSI references relate to the work on this standard:

Committee reference CIL/10
Special announcement
BSI News October 1992

ISBN 0 580 21983 6

Amendments issued since publication

Amd. No.	Date	Comments

Contents

	Page
Cooperating organizations	Inside front cover
National foreword	ii
<hr/>	
Foreword	2
Text of EN 61100	3
<hr/>	
National annex NA (informative) Committees responsible	Inside back cover
National annex NB (informative) Cross-references	Inside back cover
<hr/>	

National foreword

This British Standard has been prepared under the direction of the Cables and Insulation Standards Policy Committee and is the English language version of EN 61100:1992 *Classification of insulating liquids according to fire point and net calorific value*, published by the European Committee for Electrotechnical Standardization (CENELEC). It is identical with IEC 1100:1992 published by the International Electrotechnical Commission (IEC).

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 6, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

UDC 621.315.615:536.4:614.83

Descriptors: Liquid electrical insulating materials, classification, fire point, calorific value, designation

English version

Classification of insulating liquids according to fire point and net calorific value

(IEC 1100:1992)

Classification des isolants liquides selon le
point de feu et le pouvoir calorifique inférieur
(CEI 1100:1992)

Klassifikation von Isolierflüssigkeiten nach
dem Brandverhalten und unteren Heizwert
(IEC 1100:1992)

This European Standard was approved by CENELEC on 1992-03-24. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

Central Secretariat: rue de Stassart 35, B-1050 Brussels

Foreword

The text of document 10(CO)261, as prepared by IEC Technical Committee No 10: Fluids for electrotechnical applications, was submitted to the IEC-CENELEC parallel vote in July 1991.

The reference document was approved by CENELEC as EN 61100 on 24 March 1992.

The following dates were fixed:

- latest date of publication of an identical national standard (dop) 1993-05-01
- latest date of withdrawal of conflicting national standards (dow) 1993-05-01

Annexes designated “normative” are part of the body of the standard. In this standard, Annex ZA is normative.

Contents

	Page
Foreword	2
Introduction	3
1 Scope	3
2 Normative references	3
3 Characteristics selected for the classification	3
3.1 Fire-point	3
3.2 Net calorific value	3
4 Classification	4
4.1 Classification according to fire-point	4
4.2 Classification according to net calorific value	4
4.3 Examples of designation	4
Annex ZA (normative) Other international publications quoted in this standard with the references of the relevant European publications	5

Introduction

IEC Publication 76-2:1976, *Power transformers — Part 2: Temperature rise*, includes a classification system for identifying transformers based on type of cooling medium and the method of coolant circulation. Insulating liquids were classified therein according to their fire behaviour into classes O (mineral oil or equivalent combustible synthetic insulating liquids), and L (non-flammable synthetic insulating liquids). In 1984, IEC/TC 10 undertook a classification of insulating liquids according to fire behaviour. Pending IEC/TC 10 proposals, CENELEC/TC 14 drafted such a classification based on fire-point adding to the former classes O and L a new class K for liquids with fire-point above 300 °C.

While the value of fire-point to indicate the relative ease of ignition of a liquid is widely recognized, the degree of fire hazard depends on the rate of heat release during a fire. Therefore, it seemed desirable to include an additional classification property related to the heat energy generated by the liquid during its combustion.

The classification system of insulating liquids described in this standard uses two fire-related characteristics: fire-point and net calorific value. When suitable, internationally standardized methods for the determination of heat release or other characteristics of fire behaviour become available, they may be incorporated in this classification.

The intention is not to provide a complete evaluation of all aspects of fire hazard, neither to establish an order of merit of insulating liquid, but only to set in the same class those liquids that may require similar type and amount of safeguards for fire protection.

1 Scope

This International Standard defines a system for classifying insulating liquids according to fire-point and net calorific value. The characteristics on which the system is based are given together with limiting values.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards:

IEC 76-2:1976, *Power transformers — Part 2: Temperature rise*.

ISO 2592:1973, *Petroleum products — Determination of flash and fire-points — Cleveland open cup method*.

ISO 1928:1976, *Solid mineral fuels — Determination of gross calorific value by the calorimeter bomb method, and calculation of net calorific value*.

ASTM D 240:1985, *Heat of combustion of liquid hydrocarbon fuels by bomb calorimeter*.

3 Characteristics selected for the classification

The characterization of the fire behaviour of insulating liquids is a complex subject which requires many properties of the liquid to be considered, e.g. fire-point, flash-point, net calorific value, heat release rate, oxygen index, corrosivity and toxicity of decomposition products, opacity of smoke and fire propagation rate. Some of these properties are well defined by existing ISO methods and some are already used in existing standards, for example, net heat of combustion in various national regulations governing building construction materials. There are also characteristics which are not yet internationally standardized in methodology terms.

It is considered that classification must be based on characteristics quantifiable by a standardized procedure of known precision. On this basis the characteristics retained for this classification are fire-point and net calorific value.

3.1 Fire-point

The fire-point is determined according to ISO 2592.

3.2 Net calorific value

The net calorific value or net heat of combustion is determined according to ASTM D 240 or equivalent national standards using the adiabatic method. The bomb calorimeter used is described in ISO 1928.

4 Classification

The classification of insulating liquids is defined by a letter followed by a number.

4.1 Classification according to fire-point

Three classes have been defined:

- Class O, if the fire-point is less than or equal to 300 °C.
- Class K, if the fire-point is above 300 °C.
- Class L, if the insulating liquid has no measurable fire-point.

4.2 Classification according to net calorific value

Three classes have been defined:

- Class 1, if the net calorific value is greater than or equal to 42 MJ/kg.
- Class 2, if the net calorific value is less than 42 MJ/kg and greater than or equal to 32 MJ/kg.
- Class 3, if the net calorific value is less than 32 MJ/kg.

NOTE The density may be relevant. In order to obtain the net calorific value in MJ/litre, the results expressed in MJ/kg should be multiplied by the density in kilogram per litre.

4.3 Examples of designation

O1: Fire-point = 180 °C,	net calorific value = 48 MJ/kg.
K1: Fire-point = 310 °C,	net calorific value = 48 MJ/kg.
K3: Fire-point = 340 °C,	net calorific value = 28 MJ/kg.
L3: No measurable fire-point,	net calorific value = 12 MJ/kg.

NOTE It is not mandatory that the complete code, in particular the numerical symbol connected with the net calorific value, be reflected in the nameplate of the equipment.

Annex ZA (normative)**Other international publications quoted in this standard with the references of the relevant European publications**

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

IEC Publication	Date	Title	EN/HD	Date
76-2 (mod)	1976	<i>Power transformers</i>	HD 398.2 S1	1980
		<i>Part 2: Temperature rise</i>	+ A1	1988

Other publications

ISO 2592:1973, *Petroleum products — Determination of flash and fire-points — Cleveland open cup method.*

ISO 1928:1976, *Solid mineral fuels — Determination of gross calorific value by the calorimeter bomb method, and calculation of net calorific value.*

ASTM D 240:1985, *Heat of combustion of liquid hydrocarbon fuels by bomb calorimeter.*

National annex NA (informative) Committees responsible

The United Kingdom participation in the preparation of this European Standard was entrusted by the Cables and Insulation Standards Policy Committee (CIL/-) to Technical Committee CIL/10, upon which the following bodies were represented:

Association of Consulting Engineers
Chemical Industries Association
Electricity Industry in United Kingdom
ERA Technology Ltd.
Health and Safety Executive
Institute of Petroleum
Transmission and Distribution Association (BEAMA Ltd.)

The following bodies were also represented in the preparation of the standard, through subcommittees and panels:

British (AC) Capacitor Manufacturers' Association (BEAMA Ltd.)
British Cable Makers' Confederation
British Lubricants Federation Ltd.
National Association of Waste Disposal Contractors

National annex NB (informative) Cross-references

Publication referred to	Corresponding British Standard
IEC 76-2:1976	BS 171 <i>Power transformers</i> BS 171-2:1978 <i>Specification for temperature rise requirements</i>
ISO 2592:1973	BS 4689:1980 <i>Method for determination of flash and fire points of petroleum products: Cleveland open cup method</i>

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover.
Tel: 020 8996 9000. Fax: 020 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: 020 8996 9001. Fax: 020 8996 7001.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre.
Tel: 020 8996 7111. Fax: 020 8996 7048.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration.
Tel: 020 8996 7002. Fax: 020 8996 7001.

Copyright

Copyright subsists in all BSI publications. BSI also holds the copyright, in the UK, of the publications of the international standardization bodies. Except as permitted under the Copyright, Designs and Patents Act 1988 no extract may be reproduced, stored in a retrieval system or transmitted in any form or by any means – electronic, photocopying, recording or otherwise – without prior written permission from BSI.

This does not preclude the free use, in the course of implementing the standard, of necessary details such as symbols, and size, type or grade designations. If these details are to be used for any other purpose than implementation then the prior written permission of BSI must be obtained.

If permission is granted, the terms may include royalty payments or a licensing agreement. Details and advice can be obtained from the Copyright Manager.
Tel: 020 8996 7070.

BSI
389 Chiswick High Road
London
W4 4AL



**THORNE &
DERRICK
INTERNATIONAL**

Thorne & Derrick
+44 (0) 191 410 4292
www.powerandcables.com