

Insulating and sheathing materials of electric and optical cables — Common test methods —

Part 4-2: Methods specific to polyethylene and polypropylene compounds — Tensile strength and elongation at break after conditioning at elevated temperature — Wrapping test after conditioning at elevated temperature — Wrapping test after thermal ageing in air — Measurement of mass increase — Long-term stability test — Test method for copper-catalyzed oxidative degradation

The European Standard EN 60811-4-2:2004 has the status of a British Standard

ICS 29.035.20; 29.060.20

National foreword

This British Standard is the official English language version of EN 60811-4-2:2004. It is identical with IEC 60811-4-2:2004. It supersedes BS EN 60811-4-2:2000 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee GEL/20, Electric cables, to Subcommittee GEL/20/17, Low voltage cables, 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;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled “International Standards Correspondence Index”, or by using the “Search” facility of the *BSI Electronic Catalogue* or of British Standards Online.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its 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, the EN title page, pages 2 to 17 and a back cover.

The BSI copyright notice displayed in this document indicates when the document was last issued.

Amendments issued since publication

Amd. No.	Date	Comments

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 24 September 2004

© BSI 24 September 2004

ISBN 0 580 44483 X

English version

**Insulating and sheathing materials of electric and optical cables –
Common test methods
Part 4-2: Methods specific to polyethylene and polypropylene compounds -
Tensile strength and elongation at break after conditioning at elevated temperature -
Wrapping test after conditioning at elevated temperature - Wrapping test after thermal
ageing in air - Measurement of mass increase - Long-term stability test -
Test method for copper-catalyzed oxidative degradation
(IEC 60811-4-2:2004)**

Matériaux d'isolation et de gainage des câbles
électriques et optiques - Méthodes d'essai communes
Partie 4-2: Méthodes spécifiques pour les mélanges
polyéthylène et polypropylène - Résistance à la traction
et allongement à la rupture après conditionnement à
température élevée - Essai d'enroulement après
conditionnement à température élevée - Essai
d'enroulement après vieillissement thermique dans l'air -
Mesure de l'augmentation de masse - Essai de stabilité
à long terme - Méthode d'essai pour l'oxydation
catalytique par le cuivre
(CEI 60811-4-2:2004)

Isolier- und Mantelwerkstoffe für Kabel und isolierte
Leitungen - Allgemeine Prüfverfahren
Teil 4-2: Besondere Prüfverfahren für Polyethylen- und
Polypropylen-Mischungen - Zugfestigkeit und
Reißdehnung nach Vorbehandlung bei erhöhter
Temperatur - Wickelprüfung nach Vorbehandlung bei
erhöhter Temperatur - Wickelprüfung nach thermischer
Alterung in Luft - Messung der Masseaufnahme -
Langzeit(Lebensdauer)-Prüfung - Prüfverfahren der
Sauerstoffalterung unter Kupfereinfluss
(IEC 60811-4-2:2004)

This European Standard was approved by CENELEC on 2004-07-01. 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, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, 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 20/686/FDIS, future edition 2 of IEC 60811-4-2, prepared by IEC TC 20, Electric cables, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60811-4-2 on 2004-07-01.

This European Standard supersedes EN 60811-4-2:1999.

The principal changes with respect to EN 60811-4-2:1999 are:

- a) a measurement of tensile strength is included in Clause 8;
- b) Clause 10 is now the only method in EN 60811 for the wrapping test after thermal ageing in air;
- c) two ageing conditions are now specified for the long-term stability test in Annex A.

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) | 2005-04-01 |
| – latest date by which the national standards conflicting with the EN have to be withdrawn | (dow) | 2007-07-01 |

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60811-4-2:2004 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 60811-5-1 NOTE Harmonized as EN 60811-5-1:1999 (modified).

CONTENTS

1	General	4
1.1	Scope.....	4
1.2	Normative references	4
2	Terms and definitions	4
3	Test values.....	5
4	Applicability	5
5	Type tests and other tests.....	5
6	Pre-conditioning.....	5
7	Median value	5
8	Tensile strength and elongation at break after conditioning at elevated temperature	5
8.1	General	5
8.2	Conditioning procedure.....	5
8.3	Tensile strength and elongation tests after conditioning at elevated temperature	6
8.4	Expression of results	6
9	Wrapping test after conditioning at elevated temperature	6
9.1	General	6
9.2	Conditioning procedure.....	6
9.3	Test procedure	6
9.4	Evaluation of results	6
10	Wrapping test after thermal ageing in air.....	6
10.1	General	7
10.2	Apparatus.....	7
10.3	Sampling	7
10.4	Ageing procedure	7
10.5	Test procedure	7
10.6	Evaluation of results	7
11	Mass increase of insulation.....	8
11.1	General	8
11.2	Sampling	8
11.3	Test procedure	8
11.4	Calculation	8
	Annex A (normative) Long-term stability test.....	9
	Annex B (normative) Test method for copper-catalyzed oxidative degradation of polyolefin insulated conductors (Oxidation Induction Time (OIT) test)	12
	Annex ZA (normative) Normative references to international publications with their corresponding European publications.....	16
	Bibliography	17
	Figure B.1 – Representative melting endotherm for Indium	15
	Figure B.2 – Evaluation of OIT from recorded-time-based thermogram	15

INSULATING AND SHEATHING MATERIALS OF ELECTRIC AND OPTICAL CABLES – COMMON TEST METHODS –

Part 4-2: Methods specific to polyethylene and polypropylene compounds – Tensile strength and elongation at break after conditioning at elevated temperature – Wrapping test after conditioning at elevated temperature – Wrapping test after thermal ageing in air – Measurement of mass increase – Long-term stability test – Test method for copper-catalyzed oxidative degradation

1 General

1.1 Scope

This part of IEC 60811 specifies the test methods for testing polymeric insulating and sheathing materials of electric and optical fibre cables for power distribution and communications, including cables used on ships and in offshore applications. These test methods apply specifically to polyolefin insulation and sheath.

1.2 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 60811-1-1:1993, *Common test methods for insulating and sheathing materials of electric cables – Part 1: Methods for general application – Section 1: Measurement of thickness and overall dimensions – Tests for determining the mechanical properties*

IEC 60811-1-3:1993, *Insulating and sheathing materials of electric and optical cables – Part 1: General application – Section 3: Methods for determining the density – Water absorption tests – Shrinkage test*

ISO 188, *Rubber, vulcanized or thermoplastic – Accelerated ageing and heat-resistance tests*

2 Terms and definitions

For the purposes of this standard, a distinction is made between low density, medium density and high-density PE as shown below:

Type of polyethylene	Density at 23 °C ^a g/cm ³
Low-density polyethylene	≤ 0,925
Medium-density polyethylene	>0,925 ≤ 0,940
High-density polyethylene	> 0,940
^a These densities refer to unfilled resins, as determined by the method specified in Clause 8 of IEC 60811-1-3.	