

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

**Part 4: Methods specific to polyethylene
and polypropylene compounds —**

**Section 1: Resistance to environmental
stress cracking —**

**Wrapping test after thermal ageing in
air —**

**Measurement of the melt flow index —
Carbon black and/or mineral content
measurement in PE**

The European Standard EN 60811-4-1:1995 has the status of a
British Standard

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted by Technical Committee GEL/20, Electric cables, to Subcommittee GEL/20/3, Insulation and sheath, upon which the following bodies were represented:

- Association of Consulting Engineers
- British Approvals Service for Cables
- British Cable Makers Confederation
- British Plastics Federation
- British Railways Board
- British Rubber Manufacturers' Association Ltd.
- British Telecommunications plc
- Department of Trade and Industry (Consumer Safety Unit, CA Division)
- Electricity Association
- ERA Technology Ltd.
- GAMBICA (BEAMA Ltd.)
- Institution of Incorporated Executive Engineers
- London Underground Ltd.
- Ministry of Defence
- Queen Mary and Westfield College
- Telecommunications Cables Group of BCMC
- Warrington Fire Research Centre

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Contents

	Page
Committees responsible	Inside front cover
National foreword	ii
Foreword	2
Text of EN 60811-4-1	3
List of references	Inside back cover

National foreword

This Section of BS EN 60811 has been prepared by Subcommittee GEL/20/3 and is the English language version of EN 60811-4-1:1995 *Insulating and sheathing materials of electric cables — Common test methods — Part 4: Methods specific to polyethylene and polypropylene compounds — Section 1: Resistance to environmental stress cracking — Wrapping test after thermal ageing in air — Measurement of the melt flow index — Carbon black and/or mineral content measurement in PE*, published by the European Committee for Electrotechnical Standardization (CENELEC). It is identical with IEC 811-4-1:1985, including Corrigendum May 1986 and Amendment 2:1993 (including Amendment 1:1988), published by the International Electrotechnical Commission (IEC).

This standard supersedes BS 6469-4.1:1992, which is withdrawn.

Cross-references

Publication referred to	Corresponding British Standard
EN 60811-1-3:1995 (IEC 811-1-3:1993) ^a	BS EN 60811 <i>Insulating and sheathing materials of electric cables — Common test methods</i> Part 1 <i>General application</i> Section 3:1995 <i>Methods for determining the density — Water absorption tests — Shrinkage test</i>

^a IEC 811-1-3:1985 has been superseded by IEC 811-1-3:1993.

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 18, 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.

English version

Insulating and sheathing materials of electric cables
Common test methods
Part 4: Methods specific to polyethylene and polypropylene
compounds
Section 1: Resistance to environmental stress cracking —
Wrapping test after thermal ageing in air — Measurement
of the melt flow index
Carbon black and/or mineral content measurement in PE

(IEC 811-4-1:1985 + corrigendum May 1986 + A2:1993)

Matériaux d'isolation et de gainage des câbles électriques
Méthodes d'essais communes
Part 4: Méthodes spécifiques pour les mélanges polyéthylène et
polypropylène
Section 1: Résistance aux craquelures sous contraintes dues à
l'environnement — Essai d'enroulement après vieillissement
thermique dans l'air — Mesure de l'indice de fluidité à chaud —
Mesure dans le PE du taux de noir de carbone et/ou des charges
minérales
(CEI 811-4-1:1985 + corrigendum mai 1986 + A2:1993)

Isolier- und Mantelwerkstoffe für Kabel und isolierte Leitungen
Allgemeine Prüfverfahren
Teil 4: Besondere Methoden für Polyäthylen und Polypropylen
Compounds
Hauptabschnitt 1: Spannungsrißbeständigkeit Wickelprüfung
nach thermischer Alterung in Luft — Messung des
Schmelzindex Bestimmung des Ruß- und/oder Füllstoffgehalts
in PE
(IEC 811-4-1:1985 + Corrigendum Mai 1986 + A2:1993)

This European Standard was approved by CENELEC on 1995-03-06. 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.

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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 the International Standard IEC 811-4-1:1985, with its corrigendum May 1986 and its amendment 2:1993 (including amendment 1:1988), prepared by IEC TC 20, Electric cables, was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 60811-4-1 on 1995-03-06 without any modification.

This European Standard supersedes HD 505.4.1 S2:1990. Where reference is made to HD 505.4.1 S2:1990 in another standard, users should refer to this EN 60811-4-1 for the current information.

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) 1996-03-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1996-12-01

Annexes designated “normative” are part of the body of the standard. Appendices and annexes designated “informative” are given for information only. In this standard, Annex ZA is normative and Appendix A and Appendix B are informative. Annex ZA has been added by CENELEC.

Contents

	Page		Page
Foreword	2	8.8 Summary of test conditions and requirements for procedures A and B	8
1 Scope	3	9 Wrapping test after thermal ageing in air	8
2 Test values	3	9.1 General	8
3 Applicability	3	9.2 Apparatus	8
4 Definitions	3	9.3 Sampling	8
5 Type tests and other tests	3	9.4 Ageing procedure	8
6 Pre-conditioning	3	9.5 Test procedure	9
7 Median value	3	9.6 Evaluation of results	9
8 Resistance to environmental stress cracking	3	10 Measurement of the melt flow index	9
8.1 General	3	10.1 General	9
8.2 Apparatus	4	10.2 Apparatus	9
8.3 Preparation of the test sheets	6	10.3 Test samples	10
8.4 Conditioning of the test sheets	6	10.4 Cleaning and maintenance of the apparatus	10
8.5 Visual examination of the test sheets	6	10.5 Method A	10
8.6 Test procedure	6	10.6 Method C	11
8.7 Evaluation of results	7	11 Carbon black and/or mineral filler content measurement in PE	11
		11.1 Sampling	11
		11.2 Test procedure	12
		11.3 Expression of results	12
		Appendix A Tools and Reagents	15
		Appendix B Corresponding clauses and sub-clauses in IEC Publications 538 and 540 and IEC Publication 811	16
		Annex ZA (normative) Normative references to international publications with their corresponding European publications	18
		Figure 1	4
		Figure 2	4
		Figure 3	4
		Figure 4	5
		Figure 5	5
		Figure 6 — Test tube with inserted brass channel specimen holder as in Sub-clause 8.2.11, containing ten test specimens	5
		Figure 7	7
		Figure 8 — Apparatus for determining melt flow index (showing large external diameter cylinder, die-retaining plate A and insulating plate B)	13
		Figure 9 — Die (showing small external diameter cylinder with an example method of retaining the die)	14
		Table 1 — Time intervals (as a function of melt flow index) used in obtaining the cut-offs and mass of the charge put into the cylinder for methods A and C	11

1 Scope

This standard specifies the test methods to be used for testing polymeric insulating and sheathing materials of electric cables for power distribution and telecommunications including cables used on ships. This Section 1 of Part Four gives the methods for measurement of the resistance to environmental stress cracking, for wrapping test after thermal ageing in air, for measurement of melt flow index and for measurement of carbon black and/or mineral filler content, which apply to PE and PP compounds, including cellular compounds and foam skin for insulation.

2 Test values

Full test conditions (such as temperatures, durations, etc.) and full test requirements are not specified in this standard; it is intended that they should be specified by the standard dealing with the relevant type of cable.

Any test requirements which are given in this standard may be modified by the relevant cable standard to suit the needs of a particular type of cable.

3 Applicability

Conditioning values and testing parameters are specified for the most common types of insulating and sheathing compounds and of cables, wires and cords.

4 Definitions

For the purpose of these tests, a distinction shall be made between low density, medium density and high-density PE:

Low-density polyethylene	$\leq 0.925 \text{ g/cm}^3$	} 23 °C
Medium-density polyethylene > 0.925	$\leq 0.940 \text{ g/cm}^3$	
High-density polyethylene	$> 0.940 \text{ g/cm}^3$	

NOTE These densities refer to unfilled resins as determined by the method specified in Clause 8 of Publication 811-1-3: Common Test Methods for Insulating and Sheathing Materials of Electric Cables, Part 1: Methods for General Application — Section 3: Method for Determining the Density — Water Absorption Tests — Shrinkage Test.

5 Type tests and other tests

The test methods described in this standard are primarily intended to be used for type tests. In certain tests, where there are essential differences between the conditions for type tests and those for more frequent tests, such as routine tests, these differences are indicated.

6 Pre-conditioning

All the tests shall be carried out not less than 16 h after the extrusion or vulcanization (or cross-linking), if any, of the insulating or sheathing compounds.

7 Median value

When several test results have been obtained and ordered in an increasing or decreasing succession, the median value is the middle value if the number of available values is odd, and is the mean of the two middle values if the number is even.

8 Resistance to environmental stress cracking

8.1 General

These test procedures apply only to the original granules used as sheathing materials.

Procedure A

Applies to materials which will encounter less severe cable system conditions and environments.

Procedure B

Applies to materials which will encounter more severe cable system conditions and environments.

8.2 Apparatus

8.2.1 Heatable press for producing moulded test sheets, with platens which are larger than the backing plates.

8.2.2 Two rigid metal backing plates 6 ± 0.5 mm thick and about 200 mm $\times$ 230 mm area, each drilled with a hole from one edge so that a temperature sensor can be located within 5 mm of the centre of the plate.

8.2.3 Two separator sheets, about 200 mm $\times$ 230 mm, for instance aluminium foil 0.1 mm to 0.2 mm thick.

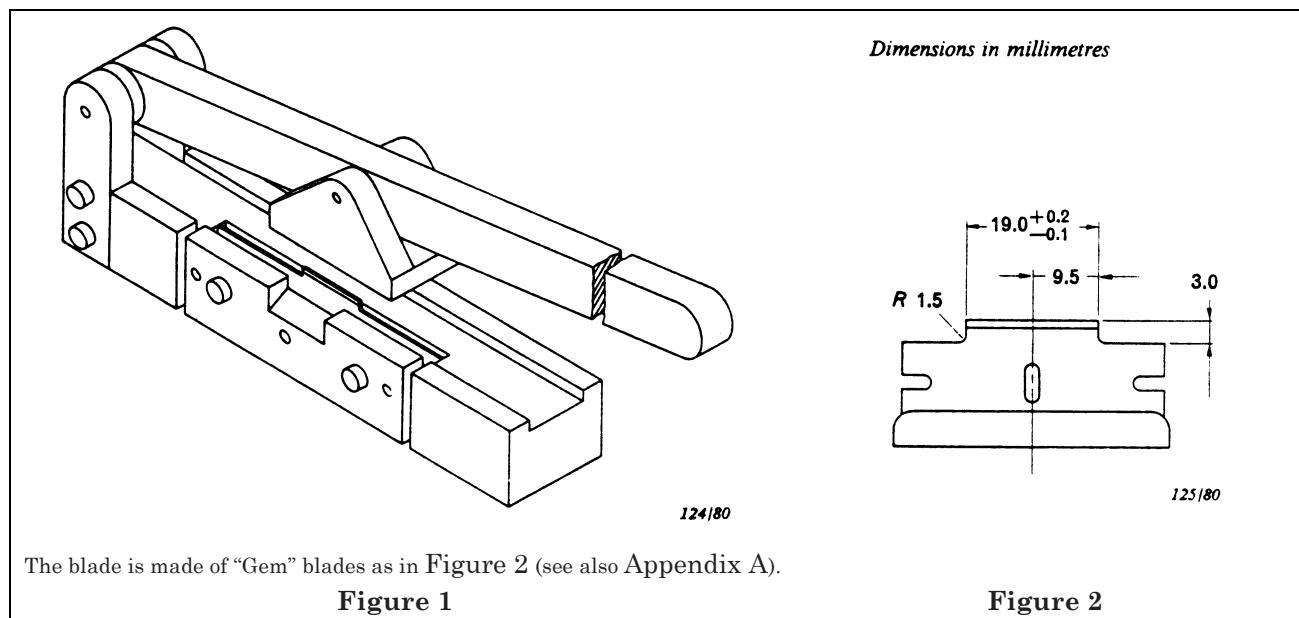
8.2.4 Suitable moulding chases for producing test sheets, 150 mm $\times$ 180 mm $\times$ 3.3 ± 0.1 mm with internal corners rounded to a radius of 3 mm.

8.2.5 Electrically heated air oven with forced air circulation and programming device which lowers temperature at a rate of 5 ± 0.5 °C/h.

8.2.6 Clean, sharp, undamaged blanking die with blanking press suitable for cutting test pieces 38.0 ± 2.5 mm $\times$ 13.0 ± 0.8 mm or other suitable devices.

8.2.7 Dial gauge, with plane gauging faces 4 mm to 8 mm in diameter and a gauging pressure of 5 N/cm² to 8 N/cm².

8.2.8 Notching device as in Figure 1 with blades as in Figure 2.



8.2.9 Bending clamp assembly as in Figure 3 with vice or other suitable device ensuring the symmetrical closing of the clamping jaws.

