



SLOVENSKI STANDARD SIST EN 50290-2-24:2002

01-september-2002

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SIST HD 624.4 S1:1997

Communication cables - Part 2-24: Common design rules and construction: PE sheathing (Note: Applies only in conjunction with EN 50290-2-20)

Communication cables -- Part 2-24: Common design rules and construction - PE sheathing

Kommunikationskabel -- Teil 2-24: Gemeinsame Regeln für Entwicklung und Konstruktion - PE-Mantelmischungen

Câbles de communication -- Partie 2-24: Règles de conception communes et construction - Polyéthylène pour gainage

Ta slovenski standard je istoveten z: EN 50290-2-24:2002

ICS:

- 29.035.20 Úlæ cã } ã Á { ^ } ã [|æã \ã Plastics and rubber insulating materials
- 33.120.10 Koaksialni kabli. Valovodi Coaxial cables. Waveguides

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EUROPEAN STANDARD

EN 50290-2-24

NORME EUROPÉENNE

EUROPÄISCHE NORM

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ICS 29.035.20; 33.120.10

Supersedes HD 624.4 S1:1996

English version

Communication cables
Part 2-24: Common design rules and construction –
PE sheathing

Câbles de communication
Partie 2-24: Règles de conception
communes et construction –
Polyéthylène pour gainage

Kommunikationskabel
Teil 2-24: Gemeinsame Regeln
für Entwicklung und Konstruktion –
PE-Mantelmischungen

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This European Standard was approved by CENELEC on 2001-11-01. 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, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, 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

This European Standard was prepared by a joint working group of the Technical Committees CENELEC TC 46X, Communication cables, and CENELEC TC 86A, Optical fibres and optical fibre cables.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 50290-2-24 on 2001-11-01.

This European Standard supersedes HD 624.4 S1:1996.

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) 2002-08-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2004-08-01

Annexes designated "normative" are part of the body of the standard. In this standard, annexes A, B and C are normative.

This European Standard has been prepared under the European Mandate M/212 given to CENELEC by the European Commission and the European Free Trade Association.

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1 Scope

This Part 2-24 of EN 50290 gives specific requirements for PE sheathing compounds used in communication cables.

It is to be read in conjunction with Part 2-20 of EN 50290.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

- | | |
|-------------------|---|
| EN 60811-1-1:1995 | Insulating and sheathing materials of electric and optical cables - Common test methods -- Part 1-1: General application - Measurement of thickness and overall dimensions - Tests for determining the mechanical properties (IEC 60811-1-1:1993) |
| EN 60811-1-2:1995 | Insulating and sheathing materials of electric cables - Common test methods Part 1-2: General application -- Thermal ageing methods (IEC 60811-1-2:1985 + corr. May 1986 + A1:1989) |
| EN 60811-1-3:1995 | Insulating and sheathing materials of electric and optical cables - Common test methods -- Part 1-3: General application - Methods for determining the density - Water absorption tests - Shrinkage test (IEC 60811-1-3:1993) |
| EN 60811-1-4:1995 | Insulating and sheathing materials of electric and optical cables - Common test methods -- Part 1-4: General application - Tests at low temperature (IEC 60811-1-4:1985 + corr. May 1986 + A1:1993) |
| 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 (IEC 60811-4-1:1985) |
| EN 60811-4-2:1999 | Insulating and sheathing materials of electric and optical fibre cables - Common test methods - - Part 4: Methods specific to polyethylene and polypropylene compounds Section 2: Tensile strength and elongation at break after pre-conditioning - Wrapping test after thermal ageing in air - Measurement of mass increase - Long - term stability test - Test method for copper - catalysed oxidative degradation (IEC 60811-4-2:1990, mod.) |

3 Requirements

In case of specific applications, additional performances could be needed. Relevant test methods and requirements shall be included in the detail specifications of the cables.

Table 1 - Black PE sheathing compounds

Characteristics		Test method	Unit	Grades ¹⁾		
				LD/MD	HD	LLD
1	Maximum rated temperature at cable for which the compound can be used		° C	70 ²⁾	80	80
2	Density ¹⁾ (without carbon black)	EN 60811-1-3 clause 8	g/cm ³	≤ 0,940	> 0,940	≤ 0,940
3	Melt flow index ¹⁾ (see note 1)	EN 60811-4-1 clause 10	g/10 min	≤ 0,4 ≤ 2,5 ³⁾	≤ 1,0	≤ 2,0
4	Mechanical characteristics	EN 60811-1-1 9.2				
4.1	In state of delivery					
4.1.1	Tensile strength - median, min		MPa	10	18	16
4.1.2	Elongation at break - median, min		%	300	300	500
4.2	After ageing	EN 60811-1-2 8.1				
	Ageing conditions - temperature - duration		° C h	100 ± 2 24 x 10	100 ± 2 24 x 10	100 ± 2 24 x 10
	Elongation at break - median, min		%	300	300	500
5	Shrinkage ³⁾	EN 60811-1-3 clause 11				
	Test conditions					
	- sample length (if not otherwise specified)		mm	200	200	200
	- temperature		° C	4)	4)	4)
	- duration		h	4)	4)	4)
	Result to be obtained - shrinkage, max		%	4)	4)	4)
1) to be given by the supplier 2) 80 °C for MD 3) for special application 4) in the relevant cable specification						

Table 1 - Black PE sheathing compounds (Cont'd)

Characteristics		Test method	Unit	Grades ¹⁾						
				LD/MD	HD	LLD				
6	Performances after pre-conditioning (for sheath in direct contact with filling compound) Test conditions - temperature - duration	Annex A	° C h	60/70 ± 2 7 x 24	60/70 ± 2 7 x 24	60/70 ± 2 7 x 24				
6.11	Result to be obtained Tensile strength - median, min						MPa	10	18	16
6.12	Elongation at break - median, min									
7	Carbon black content ⁵⁾	EN 60811-4-1 clause 11	%	2,5 ± 0,5	2,5 ± 0,5	2,5 ± 0,5				
8	Carbon black dispersion ⁵⁾	Annex B		To meet	To meet	To meet				
9	Stress cracking ⁵⁾ (see note 2)	EN 60811-4-1 clause 8 Procedure B		To meet	To meet	To meet				

⁵⁾ For inner sheath applications, non black PE compounds can be used, then items 7, 8, 9 may not apply.

NOTE 1 If required, MFI may be measured on sheath with other values to be specified.

NOTE 2 Stress cracking test on raw material may not be sufficient to guarantee a stress cracking performance on finished product. Therefore an additional test has to be performed either on complete cable or on a piece of sheath taken from complete cable, in accordance with the test methods described in annex C.

Table 2 - Coloured PE sheathing compounds

Characteristics		Test method	Unit	Grades ¹⁾		
				LD/MD	HD	LLD
1	Maximum rated temperature at cable for which the compound can be used		° C	70 ²⁾	80	80
2	Density ¹⁾	EN 60811-1-3 clause 8	g/cm ³	≤ 0,940	> 0,940	≤ 0,940
3	Melt flow index ¹⁾ (see note 1)	EN 60811-4-1 clause 10	g/10 min	≤ 0,4 ≤ 2,5 ³⁾	≤ 1,0	≤ 2,0
4	Mechanical characteristics	EN 60811-1-1 9.2				
4.1	In state of delivery					
4.11	Tensile strength - median, min		MPa	10	18	16
4.12	Elongation at break - median, min		%	300	300	500
4.2	After ageing	EN 60811-1-2 8.1				
	Ageing conditions - temperature - duration		° C h	100 ± 2 24 x 10	100 ± 2 24 x 10	100 ± 2 24 x 10
	Elongation at break - median, min		%	300	300	500
5	Shrinkage ³⁾	EN 60811-1-3 clause 11				
	Test conditions - sample length (if not otherwise specified) - temperature - duration		mm ° C h	200 4) 4)	200 4) 4)	200 4) 4)
	Result to be obtained - shrinkage, max		%	4)	4)	4)
¹⁾ to be given by the supplier on the basic resin ²⁾ 80 °C for MD ³⁾ for special application ⁴⁾ in the relevant cable specification						

Table 2 - Coloured PE sheathing compounds (Cont'd)

Characteristics		Test method	Unit	Grades ¹⁾		
				LD/MD	HD	LLD
6	Performances after pre-conditioning (for sheath in direct contact with filling compound) Test conditions - temperature - duration Result to be obtained Tensile strength - median, min Elongation at break - median, min	Annex A	° C h MPa %	60/70 ± 2 7 x 24 10 300	60/70 ± 2 7 x 24 18 300	60/70 ± 2 7 x 24 16 500
7	Stress cracking ⁵⁾ (see note 2)	EN 60811-4-1 clause 8 Procedure B		To meet	To meet	To meet

⁵⁾ For inner sheath applications, item 7 may not apply – Natural grades can be used

NOTE 1 If required, MFI may be measured on sheath with other values to be specified.

NOTE 2 Stress cracking test on raw material may not be sufficient to guarantee a stress cracking performance on finished product. Therefore an additional test has to be performed either on complete cable or on a piece of sheath taken from complete cable, in accordance with the test methods described in annex C.

Guidance to use:

Natural or coloured polyolefin cable sheaths, containing conventional antioxidant stabilisers degrade rapidly when subjected to natural daylight weathering through photocatalysed oxidation (actinic degradation). Degradation is manifested by discolouration of the sheath followed immediately by loss of mechanical properties and spontaneous cracking.

This ageing process is accelerated in situations where the sheath is physically stressed, for example at sharp bends. Under temperate European climates failure can occur within two years of exposure. Ageing will not only occur on installed cables but also on cables stored externally on drums or reels where the cables have been inadequately protected from solar radiation.

Ultraviolet stabilisation systems may be incorporated in the sheath compound to extend the induction period before the onset of failure. Such systems will permit prolonged external storage of cables but their performance does not approach that of conventional sheaths containing a minimum of 2 % of carbon black. Consequently they are unsuitable for external use where long service lives are required, especially where the cable will be installed in exacting climatic conditions such as aerial cables

Annex A
(normative)

Performances after pre-conditioning

To perform the test, use EN 60811-4-2 with the following modifications¹:

1 Scope - Second paragraph

Replace "...elongation at break..." by "...tensile strength and elongation at break...".

6 Pre-conditioning

Replace the existing title by the following new title:

6 Conditioning

8 Elongation at break after pre-conditioning

Replace the existing title and text of this clause by the following new title and text:

8 Tensile strength and elongation at break after pre-conditioning

8.1 General

This text is intended for filled cables for polyolefin insulations with a wall thickness of more than 0,8 mm and for polyolefin sheaths in direct contact with filling compound.

8.2 Pre-conditioning procedure

A sample of complete cable of sufficient length shall be pre-conditioned in air (i.e. suspended in an oven). The duration of the test and the temperature of the air maintained continuously shall be as follows:

- 7 x 24 h at 60 °C for filling compound having a nominal drop-point above 50 °C and up to an including 70 °C.
- 7 x 24 h at 70 °C for filling compound having a nominal drop-point above 70 °C.

After pre-conditioning, the cable sample shall be left at ambient temperature for at least 16 h without being exposed to direct sunlight. Then the sheath and cores to be tested shall be taken from the cable and shall be cleaned by suitable means.

8.3 Tensile strength and elongation tests after pre-conditioning

Tensile strength and/or elongation tests, with respect to requirements in the cable standard, on test pieces according to 8.2 shall be performed in accordance with clause 9 of EN 60811-1-1 without any further ageing treatment.

¹) The modifications listed are intended for revision of EN 60811-4-2 (IEC 60811-4-2).

9 Wrapping test after pre-conditioning

9.2 Test procedure

Replace the existing title and text of the subclause by the following new title and text:

9.2 Pre-conditioning procedure

The pre-conditioning shall be carried out in accordance with 8.2 of this standard. Then the cores to be tested shall be taken from the cable and shall be cleaned by suitable means.

9.3 Evaluation of results

Replace the existing title and text of the subclause by the following new title and text:

9.3 Test procedure

Test pieces according to 9.2 shall be subjected to a winding test in accordance with the method specified in 10.5.2.

For cellular insulations including foam-skin having a wall thickness below or equal to 0,2 mm the pull exerted on the exposed conductor shall be reduced to about 7,5 N/mm² with respect to the conductor cross-section.

Add a new subclause:

9.4 Evaluation of results

After cooling down to ambient temperature, the test pieces shall show no cracks when examined with normal or corrected vision without magnification. The test may be repeated once only if one test piece fails.

10.5 Test procedure

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Replace the existing text by the following new text, inserting two subclauses:

10.5.1 Test pieces according to 10.3 shall be subjected, after ageing in accordance with 10.4, to a winding test at ambient temperature.

10.5.2 The conductor shall be laid bare at one end. A weight shall be applied to the exposed conductor end, exerting a pull of about 15 N/mm² ± 20 % with respect to the conductor cross-section. Ten windings shall be made on the other end of the test piece by means of a winding device in accordance with 10.2.2 on a metal mandrel at a speed of about one revolution per 5 s. The winding diameter shall be 1 to 1,5 times the test piece diameter. Subsequently, the test pieces wound on the mandrel shall be removed from the latter and shall be kept in their helical form for 24 h at 70 ± 2 °C in the vertical position, substantially in the middle of the heating chamber in accordance with 10.2.3.