SLOVENSKI STANDARD
SIST HD 624.4 S1:1997

01-december-1997

Materials used in communication cables - Part 4: PE sheathing

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Werkstoffe für Kommunikationskabel -- Teil 4: PE-Mantelmischungen

Matériaux utilisés dans les câbles de communication -- Partie 4: Polyéthylène pour gainage

Ta slovenski standard je istoveten z: **HD 624.4 S1:1996**

ICS:

29.035.20	Plastiļ ni in gumeni izolacijski materiali	Plastics and rubber insulating materials
33.120.10	Koaksialni kabli. Valovodi	Coaxial cables. Waveguides

SIST HD 624.4 S1:1997 **en**

HARMONIZATION DOCUMENT

DOCUMENT D'HARMONISATION

HARMONISIERUNGSDOKUMENT

HD 624.4 S1

August 1996

ICS 29.040.20

Descriptors: Communication cables, PE sheathing

English version

Materials used in communication cables
Part 4: PE sheathing

Matériaux utilisés dans les câbles de communication
Partie 4: Polyéthylène pour gainage

Werkstoffe für Kommunikationskabel
Teil 4: PE-Mantelmischungen

This Harmonization Document was approved by CENELEC on 1996-07-02. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for implementation of this Harmonization Document on a national level.

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

This Harmonization Document exists in three official versions (English, French, German).

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CENELEC

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

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Foreword

This Harmonization Document was prepared by the Technical Committee CENELEC TC 46X, Communication cables.

The text of the draft was submitted to the formal vote and was approved by CENELEC as HD 624.4 S1 on 1996-07-02.

The following dates were fixed:

- latest date by which the existence of the HD has to be announced at national level (doa) 1996-12-01
- latest date by which the HD has to be implemented at national level by publication of a harmonized national standard or by endorsement (dop) 1997-06-01
- latest date by which the national standards conflicting with the HD have to be withdrawn (dow) 1997-06-01

For products which have complied with the relevant national standard before 1997-06-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 2002-06-01.

This document forms part of a series of standards on materials used in communication cables which will include the following parts:

Part 1: PVC insulation compounds
Part 2: PVC sheathing compounds
Part 3: PE insulation
- Table 1: Solid
- Table 2: Cellular (including foam-skin)

Part 4: PE sheathing
- Table 1: Black PE sheathing compounds
- Table 2: Coloured PE sheathing compounds

Part 5: Polypropylen insulation
Part 6: Halogen free flame retardant insulation compounds
Part 7: Halogen free flame retardant thermoplastic sheathing compounds
Part 8: Filling compounds for filled cables
Part 9: Cross-linked PE insulation compounds

The different parts include specific requirements for communication cables; common characteristics are aligned as far as possible on existing Harmonization Documents, if any, and in as far as these may apply to communication cables.

Specific test methods have been appended to this part 4 of the HD, awaiting their future introduction in the standards for common test methods of cables.

These methods are given in the normative annexes A, B and C, which are part of the body of this HD.

Table 1 - Black PE sheathing compounds

	Characteristics	Test method	Unit	Grades *		
				LD/MD	HD	LLD
1	**Maximum rated temperature at cable for which the compound can be used**		° C	70**	80	80
2	**Density** * (without carbon black)	HD 505.1.3 § 8	g/cm^3	≤ 0,940	> 0,940	≤ 0,940
3	**Melt Flow Index** * **(Note 1)**	HD 505.4.1 § 10	g/10 min	≤ 0,4 ≤ 2,5***	≤ 1,0	≤ 2,0
4	**Mechanical characteristics**	HD 505.1.1 § 9.2				
4.1	In state of delivery Tensile strength - median,min.		MPa	10	18	16
	Elongation at break - median,min.		%	300	300	500
4.2	After ageing	HD 505.1.2 § 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** ***	HD 505.1.3 § 11				
	Test conditions					
	- sample length (if not otherwise specifed)		mm	200	200	200
	- temperature		° C	****	****	****
	- duration		h	****	****	****
	Result to be obtained - shrinkage, max.		%	****	****	****

* to be given by the supplier
** 80 °C for MD
*** for special application
**** in the relevant cable specification

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

	Characteristics	Test method	Unit	Grades		
				LD/MD	HD	LLD
6	**Performances after pre-conditioning** (for sheath in direct contact with filling compound)	Annex A				
	Test conditions - temperature - duration		° C h	60/70 ± 2 7 x 24	60/70 ± 2 7 x 24	60/70 ± 2 7 x 24
	Result to be obtained Tensile strength - median,min.		MPa	10	18	16
	Elongation at break - median,min.		%	300	300	500
7	**Carbon black content**	HD 505.4.1 § 11	%	2,5 ± 0,5	2,5 ± 0,5	2,5 ± 0,5
8	**Carbon black dispersion**	Annex B		To meet	To meet	To meet
9	**Stress cracking (Note 2)**	HD 505.4.1 § 8 Procedure B		To meet	To meet	To meet

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.

Note 3 For inner sheath applications, non black PE compounds can be used, then items 7, 8, 9 may not apply.

Table 2 - Coloured PE sheathing compounds

	Characteristics	Test method	Unit	Grades *		
				LD/MD	HD	LLD
1	**Maximum rated temperature at cable for which the compound can be used**		° C	70**	80	80
2	**Density** *	HD 505.1.3 § 8	g/cm^3	≤ 0,940	> 0,940	≤ 0,940
3	**Melt Flow Index** * (Note 1)	HD 505.4.1 § 10	g/10 min	≤ 0,4 ≤ 2,5***	≤ 1,0	≤ 2,0
4	**Mechanical characteristics**	HD 505.1.1 § 9.2				
4.1	In state of delivery Tensile strength - median,min.		MPa	10	18	16
	Elongation at break - median,min.		%	300	300	500
4.2	After ageing	HD 505.1.2 § 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** ***	HD 505.1.3 § 11				
	Test conditions					
	- sample length (if not otherwise specifed)		mm	200	200	200
	- temperature		° C	****	****	****
	- duration		h	****	****	****
	Result to be obtained - shrinkage, max.		%	****	****	****

* to be given by the supplier on the basic resin
** 80 °C for MD
*** for special application
**** in the relevant cable specification

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

	Characteristics	Test method	Unit	Grades		
				LD/MD	HD	LLD
6	**Performances after pre-conditioning** (for sheath in direct contact with filling compound)	Annex A				
	Test conditions - temperature - duration		° C h	60/70 ± 2 7 x 24	60/70 ± 2 7 x 24	60/70 ± 2 7 x 24
	Result to be obtained Tensile strength - median,min.		MPa	10	18	16
	Elongation at break - median,min.		%	300	300	500
7	**Stress cracking (Note 2)**	HD 505.4.1 § 8 Procedure B		To meet	To meet	To meet

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.

Note 3 For inner sheath applications, item 7 may not apply - Natural grades can be used

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 occur not only 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 HD 505.4.2 with the following modifications : *

Title page, page 3 (contents), pages 5 and 9 (heading), clause 1

Change the text with respect to the new title of clause 8.

Page 9 - 1. Scope - Second paragraph

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

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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 sub-clause 8.2 shall be performed in accordance with clause 9 of HD 505.1.1 without any further ageing treatment.

** The modifications listed are intended for revision of HD 505.4.2 (IEC 811-4-2)*

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9 Wrapping test after pre-conditioning

9.2 Test procedure

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

9.2 Pre-conditoning procedure

The pre-conditiong shall be carried out in accordance with sub-clause 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 sub-clause by the following new title and text :

9.3 Test procedure

Test pieces according to sub-clause 9.2 shall be subjected to a winding test in accordance with the method specified in sub-clause 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/mm^2 with respect to the conductor cross-section.

Add a new sub-clause 9.4 :

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.

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10.5 Test procedure

Replace the existing text by the following new text, inserting two sub-clauses :

10.5.1 Test pieces according to sub-clause 10.3 shall be subjected, after ageing in accordance with sub-clause 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/mm^2 ± 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 sub-clause 10.2.2 on a metal mandrel at a speed of about one revolution per 5s. 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 sub-clause 10.2.3.

Annex B (normative) *

Test Methods For The Assessment Of Carbon Black Dispersion In Polyethylene Using A Microscope

B.1 Introduction

The methods below describe procedures for assessing the uniformity of dispersion of carbon black in a compound or extrusion.

B.2 Scope

These methods describe procedures for assessing the carbon black dispersion in polyethylene using a microscope.

Procedure A is primarily intended for use with polyethylene compounds but may be used for extrusions.

Procedure B is intended for use with polyethylene extrusions or mouldings only.

B.3 Principle

Procedure A

A small sample of the material is squeezed into a thin layer 20µm to 30µm thick between two microscope slides heated to either 170°C to 210°C or a higher temperature if specified in the material specification.

The pressed sample is examined microscopically by transmitted light. The frequency and size distribution of particles and agglomerates is measured and graded by comparison with the table of Annex A.

The uniformity of dispersion is assessed by comparison with the photomicrographs of Annex B.

Procedure B

A microtome section of the material, 10 µm to 20 µm thick, is examined as per Procedure A.

B.4 Apparatus

The following apparatus is required.

B.4.1 Hotplate

Capable of being controlled at the required temperature.

* based on ISO document at draft stafe, as CD 13949