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Komunikacijski kabli - 2-24. del: Skupna pravila za načrtovanje in konstrukcija - Polietilenske zmesi za oplaščenje

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

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English Version

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

To be completed | To be completed

This draft European Standard is submitted to CENELEC members for enquiry.
Deadline for CENELEC: 2020-10-09.

It has been drawn up by CLC/TC 46X.

If this draft becomes a European Standard, 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.

This draft European Standard was established by CENELEC in three official versions (English, French, German).
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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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CENELEC

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

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European foreword

This document (prEN 50290-2-24:2020) has been prepared by CLC/TC 46X “Communication cables”.

This document is currently submitted to the Enquiry.

The following dates are proposed:

• latest date by which the existence of this document has to be announced at national level	(doa)	dor + 6 months
• latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	dor + 12 months
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	dor + 36 months (to be confirmed or modified when voting)

This document will supersede EN 50290-2-24:2002 and all of its amendments and corrigenda (if any).

1 Scope

This document gives specific requirements for polyethylene sheathing compounds, as given in Table 1, for use in inner and outer sheathing of communication cables including fibre optic cables.

It is expected to be read in conjunction with EN 50290-2-20, the product standards EN 50407 series, EN 50117 series, EN 60794 series and other applicable product standards.

Using raw material and type test data as outlined in this document, the raw material supplier will have sufficient data to demonstrate compliance and warrant that the material is suitable for the specified application.

There are several routes used for manufacture of polyethylene and as a consequence a number of different types of polyethylene are defined as given in Table 1.

Table 1 — Polyethylene materials (informative)

Abbreviation	Material type	Reactor process	Polymer structure	Maximum operating temperature[a] °C
LDPE[b]	Low density polyethylene	High pressure/ temperature radical reaction	Long chain branched	+70
LLDPE	Linear low density polyethylene	Low pressure/ temperature catalytic reaction	Significant short chain branching	+80
MDPE	Medium density polyethylene	Low pressure/ temperature catalytic reaction	Short chain branched	+80
HDPE	High density polyethylene	Low pressure/ temperature catalytic reaction	Limited short chain branching	+80

[a] Further guidance on operating temperature is contained in EN 50290–2-20

[b] Upper process capability for density 0,930 g/ml. Normally density range 0,917–0,925 g/ml

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

EN 50289-4-17, *Communication cables - Specifications for test methods - Part 4-17: Test methods for UV resistance evaluation of the sheath of electrical and optical fibre cable*

EN 50290-2-20, *Communication cables - Part 2-20: Common design rules and construction - General*

EN 60811-406, *Electric and optical fibre cables - Test methods for non-metallic materials - Part 406: Miscellaneous tests - Resistance to stress cracking of polyethylene and polypropylene compounds (IEC 60811-406)*

EN 60811-407, *Electric and optical fibre cables - Test methods for non-metallic materials - Part 407: Miscellaneous tests - Measurement of mass increase of polyethylene and polypropylene compounds (IEC 60811-407)*

EN 60811-501, *Electric and optical fibre cables - Test methods for non-metallic materials - Part 501: Mechanical tests - Tests for determining the mechanical properties of insulating and sheathing compounds (IEC 60811-501)*

EN 60811-511, *Electric and optical fibre cables - Test methods for non-metallic materials - Part 511: Mechanical tests - Measurement of the melt flow index of polyethylene compounds (IEC 60811-511)*

EN 60811-605, *Electric and optical fibre cables - Test methods for non-metallic materials - Part 605: Physical tests - Measurement of carbon black and/or mineral filler in polyethylene compounds (IEC 60811-605)*

EN 60811-606, *Electric and optical fibre cables - Test methods for non-metallic materials - Part 606: Physical tests - Methods for determining the density (IEC 60811-606)*

EN 60811-607, *Electric and optical fibre cables - Test methods for non-metallic materials - Part 607: Physical tests - Test for the assessment of carbon black dispersion in polyethylene and polypropylene (IEC 60811-607)*

EN ISO 868, *Plastics and ebonite - Determination of indentation hardness by means of a durometer (Shore hardness) (ISO 868)*

EN ISO 11357-6, *Plastics - Differential scanning calorimetry (DSC) - Part 6: Determination of oxidation induction time (isothermal OIT) and oxidation induction temperature (dynamic OIT) (ISO 11357-6)*

ISO 974, *Plastics — Determination of the brittleness temperature by impact*

ISO 11359-2, *Plastics — Thermomechanical analysis (TMA) — Part 2: Determination of coefficient of linear thermal expansion and glass transition temperature*

DIN 51900-1, *Testing of solid and liquid fuels - Determination of gross calorific value by the bomb calorimeter and calculation of net calorific value - Part 1: Principles, apparatus, methods*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Compound test requirements

The tests are to be carried out on granules or moulded plaques produced from granules of compound. Specific requirements are shown in Table 2. This data shall be provided by the compound supplier. Relevant test methods, requirements and limits shall be included in any supply specification of the compound.

In the case of special applications, additional requirements could be specified.

5 Cable test requirements

The anticipated performance assumes standard cable design and conventional process technology and is specified in Table 3. Using type test data, the compound supplier is expected to demonstrate compliance and warrant that the material is suitable for the specified application.

In the case of special applications, additional requirements could be specified.

6 Ageing considerations

Natural or coloured polyolefin cable sheaths, containing conventional antioxidant stabilizers degrade rapidly when subjected to natural daylight weathering through photo-catalysed 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 stabilization systems shall be incorporated in the natural sheath compound to extend the induction period before the onset of failure in external applications. The best ultraviolet protection is a minimum of 2 % of well dispersed carbon black (see Table 2).

7 Health, safety and environmental (HSE) requirements

The compounds are subject to health, safety and environmental requirements as defined in EN 50290-2-20. Any deviations or compliance failures shall be identified by the compound supplier and necessary corrective actions to be undertaken agreed with cable maker.

Table 2 — Polyethylene sheathing compounds - physical properties of granules

Characteristics [a]		Test method	Unit	Types			
				LD	LLD	MD	HD
1	**Density** [b, c]	**EN 60811-606**	**g/cm^3**	**≤ 0,925**	**≤ 0,925**	**> 0,925 ≤ 0,940**	**> 0,940**
2	Melt flow index (190 °C/2,16 kg)	**EN 60811-511**		**To be reported by the supplier**			
3	**Hardness Shore D (1 s)**	**EN ISO 868**	**[-]**	**> 45**	**> 50**	**> 54**	**> 56**
4	**Low temperature brittleness**	**ISO 974**	**°C**	**< −76**	**< −76**	**< −76**	**< −76**
5	**Mechanical characteristics**	**EN 60811-501**					
5.1	**Tensile strength: median, min.**		**MPa**	**10**	**16**	**16**	**18**
5.2	**Elongation at break: median, min.**		**%**	**300**	**300**	**300**	**300**
6	Oxidative Induction Time (200 °C)	EN ISO 11357-6	**min.**	**> 50**	**> 50**	**> 50**	**> 50**
7	Measurement of mass increase [d], max.	**EN 60811-407**	**%**	**10**	**9**	**7**	**6**
8	Coefficient of linear thermal expansion	**ISO 11359-2**	**°C-1**	**To be reported by the supplier**			
9	Calorific value	**DIN 51900-1**	**kJ/kg**	**To be reported by the supplier**			
10	UV stability of natural compound (non-coloured)	**EN 50289-4-17**		**To be reported by the supplier**			
11	UV stabilizer for non-black colour	**-**		**To be reported by the supplier, if an UV stabilizer is required**			
12	Stress cracking: (10 % Igepal in water) F0 [e]	**EN 60811-406, method B**	**h**	**> 1000**	**> 1000**	**> 1000**	**> 1000**
13	Carbon black content [e, f]	**EN 60811-605**	**%**	**2,5 ± 0,5**			
14	Carbon black dispersion: agglomerate [e, f]	**EN 60811-607**		**Shall not be greater than grade 3**			
15	Carbon black dispersion: appearance [e, f]	**EN 60811-607**		**Shall not be worse than photomicrograph B**			

Characteristics [a]	Test method	Unit	Types			
			LD	LLD	MD	HD

[a] All values of Table 2 shall be provided by the compound supplier, see Clause 4.

[b] Value for base polymer. The addition of 2,5 % carbon black will raise the nominal value by 0,012 g/cm^3

[c] Tolerance for the nominal value of a specific compound is ± 0,003 g/cm^3

[d] To be measured on a sample cut from a pressed plaque of 0,5 mm. Test specimen according to EN ISO 527 (all parts) is a convenient sample format. The test fluid is petroleum jelly (used as cable core filling material); exposure duration 168 h in fluid at temperature 70 ± 5 °C.

[e] For inner sheath and dummy cable element applications non-black PE compounds can be used and items 12, 13, 14 and 15 need not apply, see Clause 6.

[f] Not applicable for other colours than black. Non-black PE compounds can be used and items 13, 14 and 15 need not apply, see Clause 6. EN 50289-4-17 contains guidelines for the use of different ultraviolet stabilized products.

Table 3 – Cable sheath properties

	Characteristics	Test method	Unit	Types			
				LD	LLD	MD	HD
1	**Mechanical characteristics** **Results to be obtained**	**EN 60811-501**					
1.1	**Tensile strength: median, min.**		**MPa**	**10**	**16**	**16**	**18**
1.2	**Elongation at break: median, min.**		**%**	**300**	**300**	**300**	**300**
2	**Elongation at break after ageing** **- temperature** **- duration** **Result to be obtained - median, min.**	**EN 60811-401**	**°C** **h** **%**	**100 ± 2** **10 × 24** **300**	**100 ± 2** **10 × 24** **300**	**100 ± 2** **10 × 24** **300**	**100 ± 2** **10 × 24** **300**
3	**Mechanical characteristics after conditioning at elevated temperature (in direct contact with filling compound)** **- temperature [a, b]** **- duration**	**EN 60811-512**	**°C** **h**	**60/70 ± 2** **7 × 24**	**60/70 ± 2** **7 × 24**	**60/70 ± 2** **7 × 24**	**60/70 ± 2** **7 × 24**
3.1	**Tensile strength** **Result to be obtained** **- median, min.**	**EN 60811-501**	**MPa**	**10**	**16**	**16**	**18**