
**Komunikacijski kabli - 2-38. del: Skupna pravila načrtovanja in konstrukcija -
Polipropilenska izolacija za koaksialne kable**

Communication cables - Part 2-38: Common design rules and construction -
Polypropylene insulation for coaxial cables

Kommunikationskabel - Teil 2-38: Gemeinsame Regeln für Entwicklung und Konstruktion
- Polypropylen-Isoliermischungen für Koaxialkabel

Câbles de communication - Partie 2-38: Règles de conception communes et construction
- Polypropylène pour enveloppes isolantes pour câbles coaxiaux

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CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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European foreword

This document (EN 50290-2-38:2016) has been prepared by CLC/TC 46X "Communication cables".

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2017-03-14
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2019-03-14

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1 Scope

This Part 2-38 of EN 50290 gives specific requirements for Polypropylene (PP) compounds to be used for the insulation of coaxial cables. It is to be read in conjunction with EN 50290-2-20, EN 50117 and other applicable product standards.

Grades PP-S1 and PP-F1 correspond to materials specified in the previous version 50290-2-25. These relatively soft Polypropylene compounds have good low temperature properties and are highly stabilized.

Grades PP-S2 and PP-F2 exhibit properties more typical of Polypropylene and are designed for general Coax applications where high crush resistance and superior dielectric properties are needed.

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

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 50289-3-17, *Communication cables - Specifications for test methods - Part 3-17: Mechanical test methods - Adhesion of dielectric and sheath*

EN 50289-3-9, *Communication cables - Specifications for test methods - Part 3-9: Mechanical test methods - Bending tests*

EN 60216 (all parts), *Electrical insulating materials – Thermal endurance properties (IEC 60216)*

EN 60811-401, *Electric and optical fibre cables - Test methods for non-metallic materials - Part 401: Miscellaneous tests - Thermal ageing methods - Ageing in an air oven (IEC 60811-401)*

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 60811-502, *Electric and optical fibre cables - Test methods for non-metallic materials - Part 502: Mechanical tests - Shrinkage test for insulations (IEC 60811-502)*

EN 60754-2, *Test on gases evolved during combustion of materials from cables - Part 2: Determination of acidity (by pH measurement) and conductivity (IEC 60754-2)*

EN ISO 527 (all parts), *Plastics – Determination of tensile properties (ISO 527)*

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

EN ISO 1133 (all parts), *Plastics – Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics (ISO 1133)*

EN ISO 1183 (all parts), *Plastics – Methods for determining the density of non-cellular plastics (ISO 1183)*

EN ISO 179-1, *Plastics - Determination of Charpy impact properties - Part 1: Non-instrumented impact test (ISO 179-1)*

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)*

3 Raw material requirements

The tests are to be carried out on granules or moulded plaques produced from granules of compound. This data are to be provided by the compound supplier. For compounds intended for foam application the properties shall be measured on unexpanded compound or the base polymer without blowing agent. Relevant test methods, requirements and limits shall be included in any supply specification of the raw material.

Specific requirements are shown (Table 1, Table 2 and Table 3). In the case of special applications, additional requirements could be specified.

4 Cable test requirements

The anticipated performance assumes standard cable design and conventional process technology and is specified (Table 4). Using type test data the raw material 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.

5 Health, safety and environmental regulations

The materials are subject to Health, Safety and Environment (HSE) requirements as defined in EN 50290-2-20. Any deviations or compliance failures shall be identified by the raw material supplier and necessary corrective actions to be undertaken agreed with the cable maker.

Table 1 - Insulation compound - physical properties of granules

Characteristics ¹⁾		Test method	Unit	Solid		Foam	
				PP-S1 ⁶⁾	PP-S2 ⁶⁾	PP-F1 ⁶⁾	PP-F2 ⁶⁾
1	Density ²⁾	EN ISO 1183	g/cm ³	≤ 0,915	≤ 0,915	≤ 0,915	≤ 0,915
2a	Melt flow index (230°C/2,16 kg) ³⁾	EN ISO 1133	g/10 min	To be recorded	To be recorded	To be recorded	To be recorded
3	Hardness Shore D (1 s) ⁴⁾	EN ISO 868	[-]	> 62	> 67	> 62	> 67
4	Low Temperature brittleness (Charpy) (-20°C, Energy (unnotched))	EN ISO 179-1	kJ/m ²	> 25	> 10	> 25	> 10
5	Mechanical characteristics Tensile strength- median, min.	EN ISO 527	MPa	25	25	25	25
6	Oxidative Induction Time (200 °C) ⁵⁾	EN ISO 11357-6	min	> 30	> 15	> 30	> 15

1) All values of Table 1 shall be provided by the compound supplier, see Clause 3.
 2) Median; value limits ± 0,003 g/cm³.
 3) Median; value limits ± 25 %.
 4) Median value to be specified by supplier. Specification limits ± 3[-].
 5) If a blend of polymer is used, the OIT shall be performed on the blend and not the individual components.
 6) For definitions see Clause 1.

Table 2 – Insulation compound - dielectric properties

Characteristics ¹⁾		Test method	Unit	Solid		Foam ²⁾	
				PP-S1	PP-S2	PP-F1	PP-F2
1	Dielectric constant (f1), 1MHz ³⁾	IEC 60250	[-]	≤ 2,27	≤ 2,27	≤ 2,27	≤ 2,27
2	Dissipation factor (f1), 1MHz ^{4, 5)}	IEC 60250	[-]	< 0,000 30	< 0,000 08	< 0,000 30	< 0,000 08
3	Dielectric constant (f2), 1,9GHz ^{3, 6)}	IEC 60250 or EN 62562	[-]	-	TBD	-	TBD
4	Dissipation factor (f2), 1,9GHz ^{4, 6)}	IEC 60250 or EN 62562	[-]	-	< 0,000 22	-	< 0,000 22
5	Gradient of Dissipation Factor ⁷⁾		[-]	-	To be recorded	-	To be recorded

1) All values of Table 2 shall be provided by the compound supplier, see Clause 3.

2) Compounds not containing active nucleant or chemical blowing agent should be tested as solid insulations.

3) Median value to be specified by supplier. Specification limits ± 0,02.

4) Median value to be specified by supplier. Specification limits ± 10 %.

5) Alternative frequencies may be used. Lower frequency (f1) should be in range 1 – 10 MHz.

6) Alternative frequencies may be used Upper frequency (f2) should be in range 1–10 GHz.

7) Calculation: Gradient = (Tan delta (f2) [-] – Tan delta (f1) [-]) / (log (f2) – log (f1)).

Table 3 – Insulation compound combustion properties

Characteristics ^{1, 2)}		Test method	Unit	Values
1	Acidity pH Conductivity	EN 60754-2	[-] μS/mm	> 4,3 < 10
2	Toxicity	Under consideration		

1) All values of Table 3 shall be provided by the compound supplier, see Clause 3

2) Only to be performed if specified in the relevant product standard

Table 4 – Wire coaxial insulation properties

Characteristics		Test method	Unit	Solid		Foam ¹⁾	
				PP-S1	PP-S2	PP-F1	PP-F2
1	Maximum rated temperature of cable for which the compound can be used	EN 60216 ²⁾	°C	90	70	90	70
2a	Mechanical characteristics ³⁾	EN 60811–501					
2.1	Tensile strength-median,min.		MPa	15	15	na	na
2.2	Elongation at break-median,min.		%	300	300	na	na
3	Bending test at low temperature Temperature Mandrel diameter Number of turns Result to be obtained (during one cycle)	EN 50289–3-9, 4.3.1, Procedure 1	°C	-30 8 x Dia 1 No crack	-15 8 x Dia 1 No crack	-30 8 x Dia 1 No crack	-15 8 x Dia 1 No crack
4	Thermal ageing - temperature - duration	EN 60811–401	°C h	125 ± 2 10 x 24	100 ± 2 7 x 24	125 ± 2 10 x 24	100 ± 2 7 x 24
4a	Elongation at break after ageing ³⁾ Result to be obtained-median,min.	EN 60811–501	%	125	125	na	na
or/4b	Bending test after ageing Temperature Mandrel diameter Number of turns Result to be obtained (during one cycle)	EN 50289–3-9, 4.3.1, Procedure 1	°C	Ambient 8 x Dia 1 No crack	Ambient 8 x Dia 1 No crack	Ambient 8 x Dia 1 No crack	Ambient 8 x Dia 1 No crack
5	Shrinkage - temperature - duration Result to be obtained-max.	EN 60811–502	°C h %	100 ± 2 1 5	100 ± 2 1 5	100 ± 2 1 5	100 ± 2 1 5
6	Strip force ^{4, 5)}	EN 50289–3-17	N	> 5	> 5	> 5	> 5

1) Includes foam skin.

2) Informative. Any procedure based on the Arrhenius principals which can predict a greater than 20 000 h life expectancy at the indicated temperature. See EN 50290–2-20 for guidance.

3) Only to be carried out if the insulation can be removed from the conductor without damage and/or the insulation thickness is less than 0,8 mm.

4) Conductor skin permitted if needed to achieve required result.

5) Test length (L) = 25mm unless otherwise specified in cable product standard