

Električni kabli – Pribor – Značilnosti materialov – 1. del: Fingerprinting in preskušanje tipa za smolne zmesi

Electric cables – Accessories – Material characterisation – Part 1: Fingerprinting and type tests for resinous compounds

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Part 1: Fingerprinting and type tests for resinous compounds

(to be completed)

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This draft Harmonization Document is submitted to CENELEC members for CENELEC enquiry.
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It has been drawn up by Technical Committee CENELEC TC 20.

If this draft becomes a Harmonization Document, 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.

This draft Harmonization Document was established by CENELEC in three official versions (English, French, German).

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CENELEC

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Foreword

This draft Harmonization Document was prepared by a task force under the direction of WG 11 of CENELEC TC 20, Electric cables. As agreed at the Setubal meeting (June 2004) it is submitted to CENELEC enquiry.

When published it will supersede HD 631.1 S1:1998.

HD 631 is planned to have 4 parts:

Part 1: Fingerprinting and type tests for resinous compounds

Part 2: Fingerprinting and type tests for heat shrinkable components for low voltage applications

Part 3: Fingerprinting for heat shrinkable components for medium voltage applications from 3,6/6 (7,2) kV up to 20,8/36 (42) kV

Part 4: Fingerprinting for cold shrinkable components for low and medium voltage applications up to 20,8/36 (42) kV

NOTE It has been assumed in the preparation of this document that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

WARNING This Harmonized Document calls for the use of substances and/or procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

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1 Scope

This Harmonization Document specifies the conditions and sequences of tests for

- a) fingerprinting (as defined in 3.12),
- b) type testing (as defined in 3.13)

of the solvent free polymerizable, reacting resinous compound intended to be used for electrical insulation and mechanical protection in cable accessories covered by EN 50393, HD 629.1 S2 and HD 629.2 S2, for low and medium voltage up to 20,8/36 (42) kV.

Fingerprinting and type testing of materials do not have a mandatory link to type testing of accessories. They shall be regarded as stand-alone tests, but can be used in combination with the accessory type tests.

NOTE This standard is based on existing European practices and experience.

2 Normative references

The following referenced documents are indispensable for the application 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 50393 1), *Test methods and requirements for accessories for use on distribution cables of rated voltage 0,6/1,0 (1,2) kV*

EN 60243-1, *Electric strength of insulating materials — Test methods — Part 1: Test at power frequencies (IEC 60243-1)*

EN 61234-2, *Electrical insulating materials — Methods of test for the hydrolytic stability — Part 2: Moulded thermosets (IEC 61234-2)*

HD 429, *Methods of test for volume resistivity and surface resistivity of solid electrical insulating materials (IEC 60093)*

HD 629.1 S2 1), *Test requirements on accessories for use on power cables of rated voltage from 3,6/6(7,2) kV up to 20,8/36(42) kV — Part 1: Cables with extruded insulation*

HD 629.2 S2 1), *Test requirements on accessories for use on power cables of rated voltage from 3,6/6(7,2) kV up to 20,8/36(42) kV — Part 2: Cables with impregnated paper insulation*

IEC 60250, *Recommended methods for the determination of the permittivity and dielectric dissipation factor of electrical insulating materials at power, audio and radio frequencies including metre wavelengths*

EN ISO 179, *Plastics — Determination of Charpy impact strength (ISO 179)*

EN ISO 291, *Plastics — Standard atmospheres for conditioning and testing (ISO 291)*

EN ISO 527, *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 1675, *Plastics — Liquid resins — Determination of density by the pycnometer method (ISO 1675)*

EN ISO 2555, *Plastics — Resins in the liquid state or as emulsions or dispersions — Determination of apparent viscosity by the Brookfield test method (ISO 2555)*

EN ISO 3521, *Plastics — Unsaturated polyester and epoxy resins — Determination of overall volume shrinkage (ISO 3521)*

EN ISO 4895, *Plastics — Liquid epoxy resins — Determination of tendency to crystallize (ISO 4895)*

ISO 7056, *Plastics laboratory ware — Beakers*

ASTM D 92, *Standard test method for flash and fire points by Cleveland Open Cup*

1) At draft stage.

3 Terms and definitions

3.1

resinous compound

compound for cable accessories made by the mixture of at least two components (resin and reagent)

NOTE For some applications additional components such as filler may be needed.

3.2

resin

liquid organic material that cures as a result of polymerization by means of reagents (e.g. hardener or accelerator) without releasing additional volatile products

3.3

reagents

substance or compound of substances which causes, when added to resin, hardening of resin by cross linking of molecules or accelerates hardening of resin

3.4

pot life

time available to mix the components of the resinous compound together and pour or inject the compound into the cable accessory, such that it continues to smoothly and cohesively flow

3.5

“use before date” (shelf-life)

date until which a resinous compound, when stored under specified conditions of temperature and humidity, retains specified properties

3.6

gel time

time required for the curing mixture to reach a gelatinous state as defined by the test method

3.7

density

ratio of mass to volume

3.8

tendency to crystallization

measurement of the ability of epoxy base resin to not change state (liquid to solid) by a certain temperature close to water freezing point for a fixed time

3.9

exotherm peak temperature

highest temperature that is reached during the hardening process of a defined volume of a resinous compound after mixing at a defined temperature

3.10

hardness

determination of the indentation of a material by means of durometers or by penetration of a needle (soft material)

3.11

hydrolysis stability

measurement of the resistance to hydrolysis of resinous compounds exposed to the simultaneous influence of water and temperature which may lead to an irreversible change in mechanical and or electrical properties of the compound

3.12

fingerprinting

tests made to establish and subsequently confirm the properties of materials or components used in cable accessories

3.13**type tests**

tests made on materials or components of a cable accessory in order to demonstrate satisfactory performance characteristics to meet the intended application

3.14**deviation**

variation of a property between original test values and the test values measured on later samples, the last expressed as a percentage of the former

4 General requirements**4.1 Classification**

Resinous compounds are classified according to their application in categories as follows:

Table 1 - Categories of resinous compounds

Voltage Class	Function	Characteristic
Low Voltage (L)	Mechanical Protection (MP)	Cures in water (W)
Medium Voltage (M)	Insulation (I)	

A resinous compound is identified by a combination of categories.

For example: Low voltage resinous compound for mechanical protection: **LMP**;
 Low voltage resinous compound for insulation, curing in presence of water: **LIW**;
 Low voltage resinous compound for insulation & mechanical protection: **LMP/LI**.

Tests for fingerprinting and type testing are carried out in accordance with each of the resinous compound categories.

4.2 Packaging

Packaging shall be sufficient to ensure that any stated shelf life of the resinous compound components is maintained when stored under specified conditions of temperature and humidity.

4.3 Marking and labelling**4.3.1 General**

The following information, in the relevant national language(s), shall be printed or labelled on the resinous compound components packaging and on the accessory kit.

4.3.2 Resinous compound components

Each individual part of the resinous compound, or the resinous compound component if packed separately shall be printed or labelled on its packaging with:

- 1) supplier's name or logo;
- 2) part number or identification;
- 3) lot number or production date;
- 4) specified storage conditions, if any;
- 5) "Use before date" (shelf-life);
- 6) health and safety marking according to relevant EU or national legislation (see also Annex A);
- 7) mixing and application instructions;
- 8) disposal instruction;
- 9) resinous compound categories.

4.3.3 Accessory kit

Each accessory kit containing a resinous compound shall be printed or labelled on its packaging and shall at least indicate:

- 1) the specified storage conditions, if any;
- 2) the "Use before date" (shelf life);
- 3) the health and safety marking according to relevant EU or national legislation.

5 Resinous compound fingerprinting

5.1 General

Tests shall be carried out based on the category of the resinous compound as defined in Table 1.

5.2 Sampling

If fingerprinting of resinous compound is carried out as a stand-alone test, then the samples used for the initial test shall be taken from material available as agreed between manufacturer and user.

If fingerprinting of resinous compound is carried out in combination with a accessory type test, then the samples used for the initial test shall be taken from the same batch as those used in the accessory type test. In the event that no material from the same batch is available, then the samples used for the initial test shall be taken from material available as agreed between manufacturer and user.

5.3 Sequence of tests

Sequences of tests shall be carried out on the resinous compound in the following four stages, in accordance with Table 2:

- Stage 1: individual components prior to mixing;
- Stage 2: resinous compound just after mixing (curing stage);
- Stage 3: cured resinous compound (original);
- Stage 4: cured resinous compound after thermal ageing (dry).

Table 2 — Fingerprinting tests: tests methods and requirements

Number	Property	Test method	Units	Max. acceptable deviation ^{a)}	Comments
		Resin categories			
				LMP/LMPW/M MP/ MMPW	LI/LIW MI/ MIW
Stage 1 – Individual components prior to mixing					
1	Viscosity	EN ISO 2555	Pa.s	± 10 %	
Stage 2 – Resinous compound just after mixing (curing stage)					
2	Gel time	7.2	min.	± 25 %	
3	Exotherm at 23 °C Peak temperature Time to peak	7.4	°C min	± 10 % ± 20 %	
Stage 3 – Cured resinous compound (original)					
4	Density non-filled compound Density filled compound	EN ISO 1675 EN ISO 1675	g/cm ³ g/cm ³	± 2 % ± 10 %	
5	Impact strength (without notch)	EN ISO 179	kJ/m ²	± 25 %	
6	Shore hardness	EN ISO 868		± 5	
7	Tensile	EN ISO 527	Mpa	± 25 %	
8	Elongation	EN ISO 527	%	± 25 %	
9	Volume resistivity	HD 429	Ω.cm	-	
Stage 4 – Cured resinous compound after thermal ageing (dry)					
10	Weight loss	Annex B		± 20 %	
11	Change in impact strength (without notch)	Annex B		± 25 %	

a) From value for original lot of compound.