



SLOVENSKI STANDARD
oSIST prEN 50397-1:2020

01-junij-2020

Oplaščeni vodniki za nadzemne vode in ustrezeni pribor za naznačene izmenične napetosti nad 1 kV, ki ne presegajo 36 kV - 1. del: Oplaščeni vodniki

Covered conductors for overhead lines and the related accessories for rated voltages above 1 kV AC and not exceeding 36 kV AC - Part 1: Covered conductors

Kunststoffumhüllte Leiter und zugehörige Armaturen für Freileitungen mit Nennspannungen über 1 kV und nicht mehr als 36 kV Wechselspannung -- Teil 1: Kunststoffumhüllte Freileitungsseile

Conducteurs gainés pour lignes aériennes et accessoires associés pour des tensions assignées supérieures à 1 kV en courant alternatif et ne dépassant pas 36 kV en courant alternatif – Partie 1: Conducteurs gainés

Ta slovenski standard je istoveten z: prEN 50397-1

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29.060.20	Kabli	Cables
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English Version

Covered conductors for overhead lines and the related accessories for rated voltages above 1 kV AC and not exceeding 36 kV AC - Part 1: Covered conductors

Conducteurs gainés pour lignes aériennes et accessoires associés pour des tensions assignées supérieures à 1 kV en courant alternatif et ne dépassant pas 36 kV en courant alternatif - Partie 1: Conducteurs gainés

To be completed

This draft European Standard is submitted to CENELEC members for enquiry.
Deadline for CENELEC: 2020-06-12.

It has been drawn up by CLC/TC 20.

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). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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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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European Committee for Electrotechnical Standardization
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Europäisches Komitee für Elektrotechnische Normung

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73 **European foreword**

74 This document (prEN 50397-1:2020) has been prepared by WG13 "Covered Overhead Line Conductors"
75 of CLC/TC 20 "Electric cables".

76 This document is currently submitted to the Enquiry.

77 The following dates are proposed:

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

78 This document will supersede EN 50397-1:2006 and all of its amendments and corrigenda (if any).

79 The EN 50397 series consists of three parts:

80 — Part 1, "Covered conductors"; and

81 — Part 2, "Accessories for covered conductors: Tests and acceptance criteria"; and

82 — Part 3, "Guide to use"

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<https://standards.iteh.ai/catalog/standards/sist/f6ec1fa4-ccf5-4a5d-92ef-50afbeb0bd34/sist-en-50397-1-2021>

83 Introduction

84 The EN 50397 series covers the construction, performance and test requirements for covered conductors
85 for overhead lines having a nominal voltage U above 1 kV AC up to and including 36 kV AC, and for the
86 related accessories.

87 Covered conductors consist of a conductor surrounded by a covering made of insulating material as
88 protection against accidental contacts with other covered conductors and with grounded parts such as
89 tree branches, etc. In comparison with insulated conductors, this covering has reduced properties, but is
90 able to withstand the phase-to-earth voltage temporarily.

91 Since covered conductors are unscreened, they are not touch-proof, i.e. they should be treated as bare
92 conductors with respect to electric shock.

93 This document does not cover aspects related to the installation of overhead lines such as determination
94 of clearances, spans, sags, etc.

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[SIST EN 50397-1:2021](https://standards.iteh.ai/catalog/standards/sist/f6ec1fa4-ccf5-4a5d-92ef-50afbeb0bd34/sist-en-50397-1-2021)

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95 **1 Scope**

96 This document contains the requirements for covered conductors with or without integrated longitudinal
 97 watertightness and/or semi-conductive conductor screen for applications in overhead lines with rated
 98 voltages U above 1 kV a.c. and not exceeding 36 kV a.c.

99 **2 Normative references**

- 100 The following documents are referred to in the text in such a way that some or all of their content
 101 constitutes requirements of this document. For dated references, only the edition cited applies. For
 102 undated references, the latest edition of the referenced document (including any amendments) applies.
- 103 EN 50182:2001, *Conductors for overhead lines - Round wire concentric lay stranded conductors*
- 104 EN 60811-201, *Electric and optical fibre cables - Test methods for non-metallic materials - Part 201:*
 105 *General tests - Measurement of insulation thickness (IEC 60811-201)*
- 106 EN 60811-401:2012,¹ *Electric and optical fibre cables - Test methods for non-metallic materials - Part*
 107 *401: Miscellaneous tests - Thermal ageing methods - Ageing in an air oven (IEC 60811-401:2012)*
- 108 EN 60811-402, *Electric and optical fibre cables - Test methods for non-metallic materials - Part 402:*
 109 *Miscellaneous tests - Water absorption tests (IEC 60811-402)*
- 110 EN 60811-501:2012,² *Electric and optical fibre cables - Test methods for non-metallic materials - Part*
 111 *501: Mechanical tests - Tests for determining the mechanical properties of insulating and sheathing*
 112 *(IEC 60811-501:2012)*
- 113 EN 60811-502, *Electric and optical fibre cables - Test methods for non-metallic materials - Part 502:*
 114 *Mechanical tests - Shrinkage test for insulations (IEC 60811-502)*
- 115 EN 60811-507, *Electric and optical fibre cables - Test methods for non-metallic materials - Part 507:*
 116 *Mechanical tests - Hot set test for cross-linked materials (IEC 60811-507)*
- 117 EN 60811-508:2012,³ *Electric and optical fibre cables - Test methods for non-metallic materials - Part*
 118 *508: Mechanical tests - Pressure test at high temperature for insulation and sheaths (IEC 60811-*
 119 *508:2012)*
- 120 EN 60811-605:2012, *Electric and optical fibre cables - Test methods for non-metallic materials - Part 605:*
 121 *Physical tests - Measurement of carbon black and/or mineral filler in polyethylene compounds*
 122 *(IEC 60811-605:2012)*
- 123 EN 62219, *Overhead electrical conductors - Formed wire, concentric lay, stranded conductors*
 124 *(IEC 62219)*
- 125 EN 62230, *Electric cables - Spark-test method (IEC 62230)*
- 126 HD 605 S3:2019, *Electric cables - Additional test methods*
- 127 IEC 60502-2:2014, *Power cables with extruded insulation and their accessories for rated voltages from 1*
 128 *kV ($U_m = 1,2$ kV) up to 30 kV ($U_m = 36$ kV) – Part 2: Cables for rated voltages from 6 kV ($U_m = 7,2$ kV)*
 129 *up to 30 kV ($U_m = 36$ kV)*

¹ As impacted by EN 60811-401:2012/A1:2017.

² As impacted by EN 60811-501:2012/A1:2018.

³ As impacted by EN 60811-508:2012/A1:2017.

130 3 Definitions

131 For the purpose of this document, the following definitions apply.

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

- 133 • IEC Electropedia: available at <http://www.electropedia.org/>
- 134 • ISO Online browsing platform: available at <http://www.iso.org/obp>

135 3.1 Definitions relating to tests

136 3.1.1

137 type tests

138 T

139 tests required to be made before supplying a type of product covered by this document on a general
140 commercial basis in order to demonstrate satisfactory performance characteristics to meet the intended
141 application

142 Note 1 to entry: These tests are of such nature that, after they have been made, they need not be
143 repeated unless changes are made in the material, design or manufacturing process which might change
144 the performance characteristics

145 3.1.2

146 sample tests

147 S

148 tests made on samples of completed product or components taken from the completed product adequate
149 to verify that the finished product meets the design specifications

150 3.1.3

151 routine tests

152 R

153 tests made on all production lengths to demonstrate their integrity

154 3.2

155 rated voltage

156 the reference voltage for which the conductor is designed and which serves to define the electrical tests

157 Note 1 to entry: The rated voltage is expressed by the value U , expressed in kilovolts, where U is the r.m.s. value
158 between any two-phase conductors.

159 4 Covered conductors

160 4.1 Code designation

161 Covered conductors shall be designated as follows:

Type code	CC;
Covering material	S (for semi-conductive conductor screen, if any), X (for cross-linked polyethylene), T (for thermoplastic polyethylene);
Conductor material and cross-section	according to EN 50182;
Conductor design	W (for watertight), K (for compacted);
Rated voltage U in kV	...kV.

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162 EXAMPLE 1 OF DESIGNATION

163 “CCX 66-AL3 WK 20kV” is a XLPE-covered conductor with a rated voltage of 20 kV, longitudinal
164 watertight compacted conductor of aluminium alloy AL3 and a nominal conductor cross-section of
165 66 mm².

166 EXAMPLE 2 OF DESIGNATION

167 “CCST 66-A3F W 20 kV” is a thermoplastic polyethylene covered conductor with a rated voltage of 20 kV,
168 longitudinal watertight conductor with formed aluminium alloy wire AF3 and a nominal conductor cross-
169 section of 66mm².

170 **4.2 Construction requirements**

171 **4.2.1 Conductor**

Number of conductors: 1

Conductor material: aluminium alloy or steel reinforced aluminium

Nom. cross-section: 25 mm² to 400 mm² for all conductors

Conductor design: the conductors may be compacted or non-compacted, with round wire or profiled wire.

172 Information on bare conductors with round wires in frequent use can be found in the national lists,
173 contained in EN 50182:2001, Annex F. However, for the purpose of this document, conductors may be
174 selected from any national table. Conductors deviating in design from the standard values shall be given
175 by the manufacturer, but fulfilling all requirements given in EN 50182.

176 Information about conductors made from profiled wires shall be provided by the manufacturer.

177 Non-compacted conductors shall comply with EN 50182 or EN 62219 (with the exception of the filling, if
178 any).

179 For compacted conductors, based on conductors according to EN 50182, the following paragraph
180 applies:

181 The outer diameter of the compacted conductor shall be 95 % (± 1 % for 7 and 19-wire
182 constructions, $\pm 1,5$ % for 37-wire constructions) of the diameter given in EN 50182. The rated tensile
183 strength (RTS) shall be at least 95 % of the value given in EN 50182. The DC resistance shall not exceed
184 the value given in EN 50182 by more than 5 %.

185 **4.2.2 Filling**

186 The stranded conductor may be longitudinally watertight by means of adequate measures as e.g. filling
187 with an adequate mass. The filling mass or other materials for obtaining the longitudinal watertightness,
188 shall be compatible with the conductor material and the material of the covering (see Table 2).

189 **4.2.3 Covering**

190 The covering shall consist of a cross-linked polyethylene compound, which shall comply with the
191 requirements according to Table 1, column 3 or of a thermoplastic polyethylene compound, complying
192 with the requirements according Table 1, column 4.

193 It shall be possible to remove the covering without damage to the conductor.

Table 1 — Properties of the covering materials

1	2	3	4
	Unit		
Compound designation		X	T
Basic material		XLPE	PE
Maximum operating temperature of the conductor	°C	90 a	70
Mechanical properties			
before ageing on sample (EN 60811-501:2012, 4.2)			
minimum tensile strength	MPa	12,5	12,5
minimum elongation at break	%	200	300
after ageing on sample (of EN 60811-401:2012⁴, 4.2.3.2)			
Temperature	°C	135	110
Duration	h	168	336
minimum tensile strength	MPa	-	12,5
maximum variation T1/T0	%	± 25	-
minimum elongation at break	%	-	300
maximum variation T1/T0	%	± 25	-
after ageing on complete product sample^b (EN 60811-401:2012⁵, 4.2.3.4)			
Temperature	°C	100 ± 2	100 ± 2
Duration	h	168	168
minimum tensile strength	MPa	-	12,5
maximum variation T2/T0	%	± 25	-
minimum elongation at break	%	-	300
maximum variation T2/T0	%	± 25	-
Physical and chemical properties			
hot set test (EN 60811-507)			
temperature	°C	200	-
duration	min	15	-
mechanical stress	MPa	0,2	-
maximum elongation under load	%	175	-
maximum residual elongation	%	15	-
pressure test at high temperature (EN 60811-508:2012⁶, 4.3)			

⁴ As impacted by EN 60811-401:2012/A1:2017.

⁵ As impacted by EN 60811-401:2012/A1:2017.

⁶ As impacted by EN 60811-508:2012/A1:2017.

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1	2	3	4
	Unit		
temperature	°C	-	80
duration	h	-	4
coefficient k	-	-	0,8
maximum depth of indentation	%	-	50
Gravimetric water absorption (EN 60811-402)			
temperature	°C	85	85
duration	h	336	336
maximum variation of mass	mg/cm ²	1	1
shrinkage test (EN 60811-502)			
distance L between marks	mm	200	200
duration	h	1	1
temperature	°C	130 ± 3	100 ± 3
maximum shrinkage	%	4	4
Shore D hardness (HD 605 S3:2019, 2.2.1)			
minimum hardness	ShD	-	55
<p>^a Maximum operating temperature of the conductor is limited to 80 °C due to mechanical reasons.</p> <p>^b For use together with watertight conductors only. Adequate measures e.g. neutral capping to prevent leakage of filling material shall be taken.</p>			

195 An UV-protection shall be provided. Covering materials having a content of carbon black of (2,5 ± 0,5) %
 196 are considered to have adequate protection. Otherwise protection against UV shall be demonstrated
 197 fulfilling the UV-test specified in Chapter 6, Table 2, No.4.3.

198 The nominal thickness of the covering shall be calculated according to the following formula:

199
$$S = 0,11 U$$

200 where

S is the nominal thickness of the covering in mm (rounded to one decimal place);

U is the rated voltage (see 3.2) in kV.

201 The nominal thickness of the covering shall be not less than 2,3 mm.

202 The minimum thickness of the covering at any place shall not be less than the nominal value by more
 203 than (0,1 mm + 10 % of the nominal value). The mean value of the thickness of the covering shall not
 204 exceed the nominal value by more than (0,1 mm + 10 % of the nominal value).

205 A semi-conductive conductor screen, if any, shall not be measured as covering thickness.

206 The covering shall be applied onto the conductor by extrusion of one or more material layers. In screened
 207 versions (constructions), the extruded conductor screen should permanently connect to the closest layer
 208 of insulation.