SLOVENSKI STANDARD
SIST EN 50149:2012

01-september-2012

Nadomešča:
SIST EN 50149:2002

Železniške naprave - Stabilne naprave električne vleke - Kontaktni ožlebljeni vodniki iz bakra in zlitin

Railway applications - Fixed installations - Electric traction - Copper and copper alloy grooved contact wires

Bahnanwendungen - Ortsfeste Anlagen - Elektrischer Zugbetrieb - Rillenfahrdrähte aus Kupfer und Kupferlegierung

Applications ferroviaires - Installations fixes - Traction électrique - Fil rainurés en cuivre et en cuivre allié

Ta slovenski standard je istoveten z: EN 50149:2012

ICS:

29.280 Električna vlečna oprema Electric traction equipment

SIST EN 50149:2012 en

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 50149

June 2012

ICS 29.280

Supersedes EN 50149:2001

English version

Railway applications - Fixed installations - Electric traction - Copper and copper alloy grooved contact wires

Applications ferroviaires - Installations fixes - Traction électrique - Fil rainurés en cuivre et en cuivre allié

Bahnanwendungen – Ortsfeste Anlagen – Elektrischer Zugbetrieb – Rillenfahrdrähte aus Kupfer und Kupferlegierung

This European Standard was approved by CENELEC on 2012-04-30. 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.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists 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.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization

Comité Européen de Normalisation Electrotechnique

Europäisches Komitee für Elektrotechnische Normung

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Ref. No. EN 50149:2012 E

Contents

Page

Foreword 5
1 Scope 6
2 Normative references 6
3 Terms and definitions 6
4 Characteristics of wires 6
4.1 Wire designation system 6
4.2 Material designation 7
4.3 Appearance and condition 7
4.4 Identification 7
4.4.1 General requirements 7
4.4.2 Normal and high strength copper (CuETP, CuFRHC, CuHCP, CuOF) 8
4.4.3 Copper-silver alloy (CuAg 0,1) 8
4.4.4 Copper-cadmium alloy (CuCd 0,7, CuCd 1,0) 8
4.4.5 Copper-magnesium alloy (CuMg 0,2, CuMg 0,5) 8
4.4.6 Copper-tin alloy (CuSn 0,2, CuSn 0,4) 8
4.5 Configuration, profile and cross sections 9
4.5.1 Clamping grooves 9
4.5.2 Cross-section areas 10
4.5.3 Profiles 10
4.5.4 Configurations 10
4.6 Electrical properties 10
4.6.1 Resistivity 10
4.6.2 Resistance per kilometre 11
4.7 Mechanical properties 12
4.7.1 Tensile strength and percentage elongation after fracture 12
4.7.2 Additional requirements 15
4.7.3 Microwaves on longitundinal axis of wire 15
4.8 Joining drawing stock or intermediate rod stock 15
5 Checking the characteristics of wires 16
5.1 Material composition 16
5.2 Appearance and condition 16
5.3 Profiles and dimensions 16
5.4 Electrical properties 16
5.5 Mechanical properties 16
5.5.1 Breaking load and percentage elongation after fracture 16
5.5.2 Reverse bend test 17

5.5.3 Torsional strength test 19
5.5.4 Winding property test 19
5.5.5 Microwaves on longitundinal axis of wire 19
5.6 Mass per unit length 20
5.7 Joining of wire 20
5.8 Integrity of wire 20
6 Ordering and delivery conditions 20
6.1 Conditions and specification of the order 20
6.2 Packaging 21
6.3 Tolerance on wire length 21
6.4 Wire drum markings 21
7 Verification of compliance 21
7.1 Certification of compliance and test results 21
7.2 Selection of sample and tests by manufacturer 21
7.3 Inspection by customer 22
Annex A (normative) Standardised configurations 23
Annex B (informative) Common alloy compositions and designations 30
Annex C (informative) Physical properties 31
Annex D (informative) A-deviations 33
Annex E (normative) Special national conditions 34

Tables

Table 1- Configurations and cross sections 10
Table 2 - Maximum resistivity 11
Table 3 - Maximum resistance / kilometre 12
Table 4 - Tensile strength and percentage elongation after fracture 13
Table 5 - Breaking loads 14
Table 6 - Guide for selection of samples 22
Table B.1 – Some possible material compositions and designations 30
Table C.1 - Wire mass 32

Figures

Figure 1 - Set out of identification groove 8
Figure 2 - Two identification grooves 9
Figure 3 - One identification groove 9
Figure 4 - Three identification grooves 9
Figure 5 - One offset identification groove 9
Figure 6 - Clamping groove types 9
Figure 7 – Limit on microwaves in wire 15
Figure 8 – Reverse bend test – Test rig 18
Figure 9 - Reverse bend test - Method 19
Figure A.1 - Configuration of AC-80 contact wire 23
Figure A.2 - Configuration of AC-100 contact wire 23
Figure A.3 - Configuration of AC-107 contact wire 24
Dimensions in millimetres 24
Figure A.4 - Configuration of AC-120 contact wire 24
Figure A.5 - Configuration of AC-150 contact wire 25
Figure A.6 - Configuration of BC-100 contact wire 25
Figure A.7 - Configuration of BC-107 contact wire 26
Figure A.8 - Configuration of BC-120 contact wire 26
Figure A.9 - Configuration of BC-150 contact wire 27
Figure A.10 - Configuration of BF-100 flat bottom contact wire 27
Figure A.11 - Configuration of BF-107 flat bottom contact wire 28
Figure A.12 - Configuration of BF-120 flat bottom contact wire 28
Figure A.13 - Configuration of BF-150 flat bottom contact wire 29
Figure E.1 - Clamping groove types 34
Figure E.2 – Configuration of CF-100 and CF-120 contact wire 35

Foreword

This document (EN 50149:2012) has been prepared by CLC/SC 9XC "Electric supply and earthing systems for public transport equipment and ancillary apparatus (Fixed installations)".

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) 2013-04-30
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2015-04-30

This document supersedes EN 50149:2001.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

1 Scope

This European Standard specifies the characteristics of copper and copper alloy wires of cross sections of 80 mm², 100 mm², 107 mm², 120 mm² and 150 mm² for use on overhead contact lines.

It establishes the product characteristics, the test methods, checking procedures to be used with the wires, together with the ordering and delivery condition.

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 1655:1997, *Copper and copper alloys — Declarations of conformity*

EN 1977:1998, *Copper and copper alloys — Copper drawing stock (wire rod)*

EN ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature (ISO 6892-1)*

EN 10204:2004, *Metallic products — Types of inspection documents*

IEC 60468:1974, *Method of measurement of resistivity of metallic materials*

ISO 7801:1984, *Metallic materials — Wire — Reverse bend test*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
drawing stock or intermediate rod stock
wire generally of circular shape, whose cross section is larger than the wire cross section, from which the contact wire is then drawn

3.2
wire
electric conductor of an overhead contact line with which the current collector makes contact and is characterised by two clamping grooves

Note 1 to entry The wire herein after will be referred to as wire or wires.

4 Characteristics of wires

4.1 Wire designation system

The wire designation shall consist of

- denomination (Wire);
- number of this European Standard (EN 50149);

- configuration designation (see 4.5.4);
- material designation, either symbol or number (see Table B.1, or material as agreed between purchaser and manufacturer).

EXAMPLE:

Wire EN 50149 – AC-120 – CuMg0,5

or

Wire EN 50149 – AC-120 – CW128C

or

Wire EN 50149 – AC-120 – CuMg0,5 (high conductivity)

4.2 Material designation

The drawing stock or intermediate rod stock shall be a copper or copper silver alloy as defined in EN 1977:1998 or another copper alloy. Annex B gives the designations of the drawing stocks or intermediate rod stocks for some possible composition of the wire. At the time of tender the user shall specify explicitly the material(s) he wants or he is allowed to apply.

NOTE Copper cadmium alloys are not recommended for use for environmental reasons.

4.3 Appearance and condition

The wires shall not present any imperfections (roughness, sliver, seam, inclusion or cracks) liable to affect the mechanical and/or electrical properties specified in this European Standard or to cause difficulties during installation/operation.

The surface shall be clean and free of oxide inclusions or sulphide generated during the manufacturing process or foreign substances such as pickling residue.

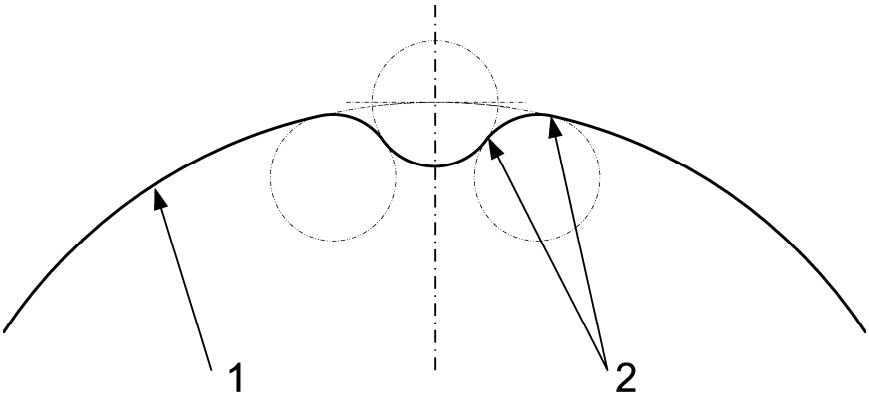
The colour of the metallic bright surface immediately after manufacturing may change due to atmospheric influence. This is acceptable.

4.4 Identification

4.4.1 General requirements

All wires manufactured from alloys shall be clearly identified. For normal and high strength copper and copper-silver, copper-cadmium, copper-magnesium and copper-tin alloys the method of identification shall be by identification grooves as shown below. For other alloys the identification method (whether grooves or other method) shall be agreed between purchaser and manufacturer.

Identification grooves shall be set out as shown in Figure 1. The centre of the middle circle shall be on the projected circle of the contact wire. The connection between two successive arcs shall be without a straight line.



Key

1 diameter of wire

2 tangential connection between successive arcs

Figure 1 - Set out of identification groove

4.4.2 Normal and high strength copper (CuETP, CuFRHC, CuHCP, CuOF)

Wires of copper have no identification grooves[1)].

4.4.3 Copper-silver alloy (CuAg 0,1)

Wires of copper alloy with silver shall incorporate two identification grooves on the upper lobe of the wire in accordance with Figure 2.

4.4.4 Copper-cadmium alloy (CuCd 0,7, CuCd 1,0)

Wires of copper alloy with cadmium shall incorporate one identification groove on the upper lobe of the wire in accordance with Figure 3[1)].

4.4.5 Copper-magnesium alloy (CuMg 0,2, CuMg 0,5)

Wires of copper alloy with magnesium shall incorporate three identification grooves on the upper lobe of the wire in accordance with Figure 4.

4.4.6 Copper-tin alloy (CuSn 0,2, CuSn 0,4)

Wires of copper alloy with tin shall incorporate one identification groove set at an angle of 24° on the upper lobe of the wire in accordance with Figure 5.

[1)] See Annex E, Special National Condition for United Kingdom.

Dimensions in millimetres

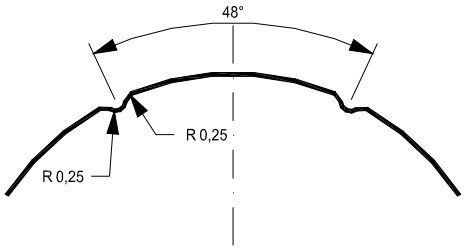


Figure 2 - Two identification grooves

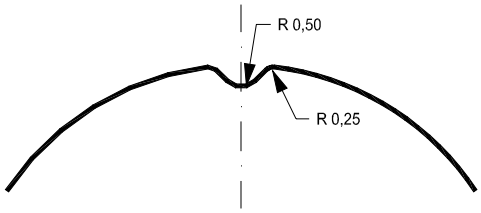


Figure 3 - One identification groove

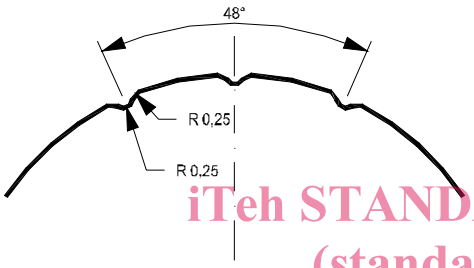


Figure 4 - Three identification grooves

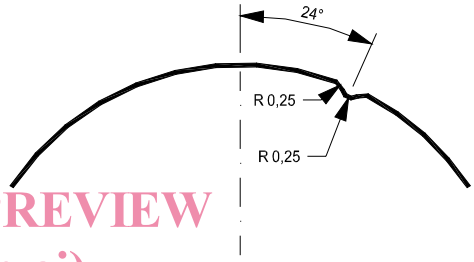


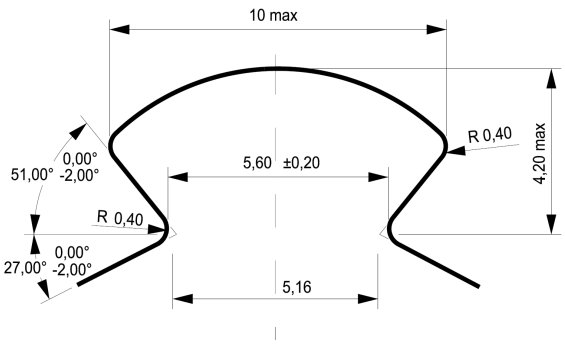
Figure 5 - One offset identification groove

4.5 Configuration, profile and cross sections

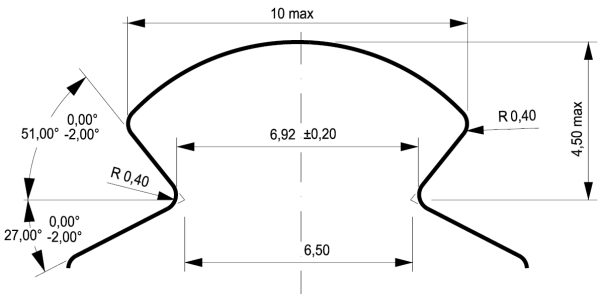
4.5.1 Clamping grooves

Whatever cross section of the wire is used, the dimensions of the clamping grooves shall be in accordance with either type A or type B as given in Figure 6.

Dimensions in millimetres



Type A clamping groove



Type B clamping groove

Figure 6 - Clamping groove types

4.5.2 Cross-section areas

This European Standard details the following nominal cross sections: 80 mm², 100 mm², 107 mm², 120 mm² and 150 mm².

4.5.3 Profiles

Profiles are of two main types, the circular profile and the flattened profile.

4.5.4 Configurations

The configurations of the wires shall be in conformance with Table 1 and are defined as combinations of the profile shape, the nominal cross section and the type of clamping groove.

The dimensions of each configuration are shown in Annex A.

Table 1- Configurations and cross sections

Nominal cross sections	**Clamping groove Type A**		**Clamping groove Type B**			
mm²	Circular		Circular		Flat	
	Designation	Fig.No in Annex A	Designation	Fig.No in Annex A	Designation	Fig.No in Annex A
80	AC-80	1				
100	AC-100	2	BC-100	6	BF-100	10
107	AC-107	3	BC-107	7	BF-107	11
120	AC-120	4	BC-120	8	BF-120	12
150	AC-150	5	BC-150	9	BF-150	13

4.6 Electrical properties

4.6.1 Resistivity

The resistivity of the wire at 20 °C shall not exceed the values in Table 2 for alloys listed in Annex B. For other copper alloys the values shall be as agreed between purchaser and manufacturer.