SLOVENSKI STANDARD

SIST EN 50149:2002

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

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

ICS 29.280

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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

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

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Ref. No. EN 50149:2001 E

Foreword

This European Standard was prepared by SC 9XC, Electric supply and earthing systems for public transport equipment and ancillary apparatus (fixed installations), of the Technical Committee CENELEC TC 9X, Electrical and electronic applications for railways.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50149 on 1999-08-01.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2001-09-01
- latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2002-08-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annexes A and D are normative and annexes B and C are informative.

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1 Scope

This standard specifies the characteristics of copper and copper alloy wires of cross sections of 80, 100, 107, 120 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

This European Standard incorporates by dated and undated reference provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated within it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 1655	1997	Copper and copper alloys - Declarations of conformity
EN 1977	1998	Copper and copper alloys - Copper drawing stock (wire rod)
EN 10002-1	1990	Metallic materials - Tensile testing -- Part 1: Method of test (at ambient temperature)
EN 10204	1991	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 Definitions

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

4 Characteristics of wires

4.1 Material designation

The drawing stock or intermediate rod stock shall be a copper or copper silver as defined in standard EN 1977 or a copper cadmium, copper magnesium or copper tin alloy. Table 1 gives the designations of the drawing stocks or intermediate rod stocks for the possible composition of the grooved contact wire. At the time of tender the user shall specify explicitly the material(s) he wants or he is allowed to apply.

Table 1 - Material composition and designation

Material designation			Composition in %						
				Elements					
Material group	**Designation**	**Material Nr.**		**Cu**	**Bi**	**O**	**P**	**Pb**	**other elements**
Normal and high strength copper	Cu-ETP [1]	CW004A	min max	99,90 -	0,0005	0,040		0,005	0,03
	Cu-FRHC [1]	CW005A	min max	99,90 -		0,040			0,04
	Cu-OF [1]	CW008A	min max	99,95 -				0,005	0,03
	Cu-HCP [1]	CW021A	min max	99,95 -		0,0005	0,002 0,007	0,005	0,03
				Cu	**Bi**	**O**		**Ag**	**other elements**
Normal and high strength copper-silver-alloy	CuAg0,10	CW013A	min max	Rest -		0,0005	0,040	0,08 0,12	0,03
				Cu	**Mg**	**SN**	**Cd**	**P**	**other elements**
Copper-magnesium alloy	CuMg 0,2	CW127C	min max	Rest	0,1 0,3			0,01	0,1
	CuMg 0,5	CW128C	min max	Rest	0,4 0,7			0,01	0,1
Copper-tin alloy	CuSn 0,2 [1]	CW129C	min max	Rest		0,15 0,55			0,1
Copper-cadmium-alloy	CuCd 0,7	CW130C	min max	Rest			0,5 0,8		0,1
	CuCd 1,0	CW131C	min max	Rest			0,8 1,2		0,1

1) See annex D, special national condition for France: CuSn 0,4 has the same parameters as CuSn 0,2.

NOTE 1 Composition of all copper types are in accordance to EN 1977.

NOTE 2 In some countries, national regulations impose restrictions on the use of copper cadmium alloys. See annex C.

4.2 Appearance and condition

The wires shall not present any imperfections (roughness, sliver, seam, inclusion) liable to affect the mechanical and/or electrical properties specified in this 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 and is acceptable.

4.3 Identification grooves

To identify the different copper (alloys) used as contact wire, identification grooves are used;

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

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

4.3.2 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 1.

4.3.3 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 2 [1)].

4.3.4 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 3.

4.3.5 Copper-tin alloy (CuSn 0,2)

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 4.

1) See annex D, special national condition for United Kingdom.

IDENTIFICATION GROOVES

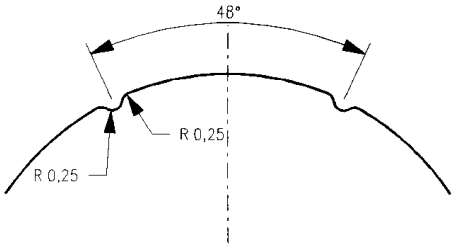


Fig.1 Two Identification Grooves.

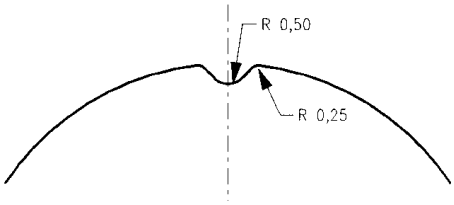


Fig.2 One Identification Groove.

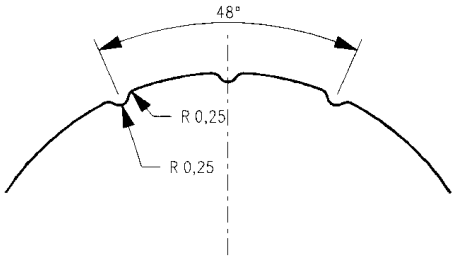


Fig.3 Three Identification Grooves.

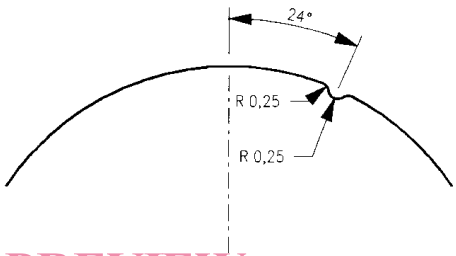
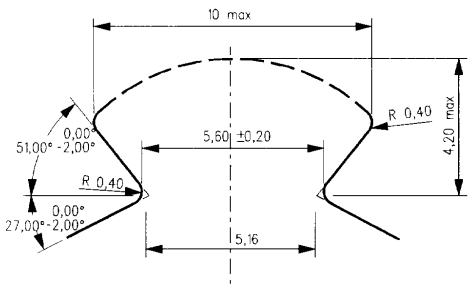


Fig.4 One Offset Identification Groove.

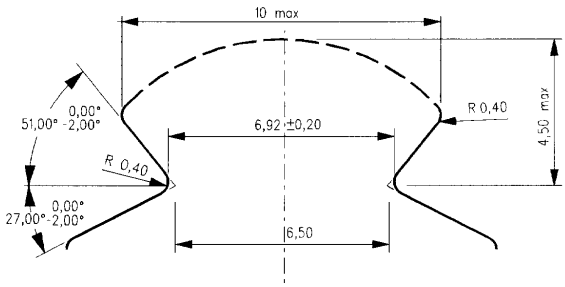
4.4 Configuration and cross sections

4.4.1 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 5.



Type A clamping groove



Type B clamping groove

Figure 5 - Clamping groove types

4.4.2 Cross-section areas

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

4.4.3 Profiles

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

4.4.4 Configurations

The configurations of the wires shall be in conformance with Table 2 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 2- Configurations and cross sections

Nominal cross sections	Clamping groove Type A		Clamping groove Type B			
mm²	Circular		Circular		Flat	
	Item	Fig.No in annex A	Item	Fig.No in annex A	Item	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

4.4.5 Tolerance on cross sectional area

The manufactured cross sectional area shall be within a tolerance of + or - 3% of the nominal value.

4.5 Electrical properties

4.5.1 Resistivity

The resistivity of the wire at 20°C shall not exceed the values in Table 3.

Table 3 - Maximum resistivity

Material	Resistivity in 10^{-08} Ohmmetre max
Cu-ETP	1,777
Cu-FRHC	1,777
Cu-HCP	1,777
Cu-OF	1,777
CuAg0,10	1,777
CuMg0,2	2,240
CuMg0,5	2,778
CuSn0,2	2,395
CuCd0,7	2,005
CuCd1,0 [1)]	2,155

1) See annex D. Special national condition for France CuSn 0,4 has the same parameters as CuCd 1,0.

4.5.2 Resistance per kilometre

The resistance per unit length at 20°C shall not exceed the resistance value specified in Table 4.

The calculation used to determine the electrical resistance per kilometre at 20°C is specified in B.1 and is based on the values of resistivity in Table 3.

Table 4 - Maximum resistance

values in ohm/Km at 20°C [1)]

Nominal cross section mm²	Material designation						
	Cu-ETP , Cu-OF , Cu-FRHC Cu-HCP	CuAg0,10	CuMg0,2	CuMg0,5	CuSn0,2	CuCd0,7	CuCd1,0 [2)]
80	0,229	0,229	0,289	0,385	0,309	0,258	0,278
100	0,183	0,183	0,231	0,286	0,247	0,207	0,222
107	0,171	0,171	0,216	0,268	0,231	0,193	0,208
120	0,153	0,153	0,192	0,239	0,206	0,172	0,185
150	0,122	0,122	0,154	0,191	0,165	0,138	0,148

1) Calculated on minimum cross sectional area
2) See annex D, special national condition for France, CuSn 0,4 has the same parameters as CuCd 1,0.