SLOVENSKI STANDARD
SIST EN 62004:2010

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Toplotno odporna žica iz aluminijeve litine za vodnike nadzemnih vodov (IEC 62004:2007, spremenjen)

Thermal resistant aluminium alloy wire for overhead line conductor

Wärmebeständige Drähte aus Aluminiumlegierung für Leiter von Freileitungen

Fils en alliage d'aluminium résistant à la chaleur pour les conducteurs de lignes aériennes

Ta slovenski standard je istoveten z: **EN 62004:2009**

ICS:

29.060.10	Žice	Wires
29.240.20	Daljnovodi	Power transmission and distribution lines
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English version

Thermal-resistant aluminium alloy wire for overhead line conductor (IEC 62004:2007, modified)

Fils en alliage d'aluminium résistant à la chaleur pour les conducteurs de lignes aériennes (CEI 62004:2007, modifiée)

Wärmebeständige Drähte aus Aluminiumlegierung für Leiter von Freileitungen (IEC 62004:2007, modifiziert)

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

Central Secretariat: Avenue Marnix 17, B - 1000 Brussels

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Foreword

The text of the International Standard IEC 62004:2007, prepared by IEC TC 7, Overhead electrical conductors, together with common modifications prepared by CENELEC BTTF 129-1, Thermal-resistant aluminium alloy wire for overhead line conductor, was submitted to the formal vote and was approved by CENELEC as EN 62004 on 2009-05-01.

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)	2010-05-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2012-05-01

This European Standard is a consolidated version consisting of the text of the International Standard IEC 62004:2007 plus the agreed common modifications, which are identified by a vertical line in the left margin of the text.

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1 Scope

This European Standard is applicable to thermal-resistant aluminium alloy wires before stranding for manufacture of stranded conductors for overhead lines. It specifies the mechanical, electrical and thermal-resistant properties of wires in the diameter range commercially available.

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 50183:2000, *Conductors for overhead lines - Aluminium-magnesium-silicon alloy wires*

EN 60889:1997, *Hard-drawn aluminium wire for overhead line conductors* (IEC 60889:1987)

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

ISO 7802, *Metallic materials - Wire - Wrapping test*

3 Terms and definitions

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

3.1
diameter
mean of two measured values at right angles taken at the same cross section

NOTE For non-round wires, the equivalent diameter of the round wire with the same section is used.

3.2
type
thermal-resistant aluminium alloy wires defined as “AT1”, “AT2”, “AT3” and “AT4”

3.3
thermal-resistant aluminium alloy wire
all types of aluminium-zirconium alloy wire, used at operation temperature higher than that of conventional aluminium-magnesium-silicon alloy wire, as specified in EN 50183, or hard-drawn aluminium wire for overhead line conductors, as specified in EN 60889, with an allowable operating temperature as described in Table 1.

The operation temperature of conventional hard-drawn aluminium wires as well as conventional aluminium-magnesium-silicon alloy wires is limited with 80 °C

4 Designation

The wire designations included in this standard are as follows:

– thermal-resistant aluminium alloy wire with maximum allowable continuous operating temperature of 150 °C, designated AT1;

– extra high-strength, thermal-resistant aluminium alloy wire with maximum allowable continuous operating temperature of 150 °C, designated AT2;

– super thermal-resistant aluminium alloy wire with maximum allowable continuous operating temperature of 210 °C, designated AT3;

– extra thermal-resistant aluminium alloy wire with maximum allowable continuous operating temperature of 230 °C, designated AT4.

5 Values for thermal-resistant aluminium alloy wire

For calculation purposes, the values given in Table 1 shall be used for thermal-resistant aluminium alloy wire.

Table 1 – Values for thermal-resistant aluminium alloy wire

Type	AT1	AT2	AT3	AT4
Density at 20 °C (g/cm^3)	2,703	2,703	2,703	2,703
Allowable continuous operating temperature (40 years) (°C)	150	150	210	230
Allowable operating temperature in 400 h (°C)	180	180	240	310
Coefficient of linear expansion (/°C)	23×10^{-6}	23×10^{-6}	23×10^{-6}	23×10^{-6}
Constant-mass temperature coefficient of resistance at 20 °C (/°C)	0,004 0	0,003 6	0,004 0	0,003 8

6 Requirement

6.1 Material

The wires shall be of aluminium-zirconium alloy having a composition appropriate to the mechanical, electrical and thermal-resistant properties specified hereunder for type AT1, AT2, AT3 and AT4, respectively. The supplier should provide the purchaser on request with the analysis certificate of the raw material.

6.2 Freedom from defects

The wires shall be smooth and free from all imperfections such as cracks, roughness, grooves, inclusions or other defects which may endanger the performance of the product.

6.3 Diameter and tolerance on diameter

The nominal diameter of the wires shall be expressed in millimetres to two decimal places. Each measured value of wire diameter shall not depart from the nominal diameter by more than the amounts given in Table 2.

For the purpose of checking compliance with the above requirement, the diameter shall be determined by the mean of the two measurements at right angles taken at the same cross-section.

Table 2 – Diameter and tolerance on diameter

Nominal diameter		Tolerance
Over mm	Up to and including mm	
–	3,00	± 0,03 mm
3,00	–	± 1 %

6.4 Tensile stress

The wire shall comply with the requirements given in Table 3. The tensile stress of a single wire shall be computed by dividing the breaking load by the cross-sectional area. The cross-sectional area shall be determined using the measured diameter of the test specimen.

For non-round wire, shaped before stranding, its equivalent diameter of the round wire with the same section shall be used and the calculation result of tensile stress shall comply with the requirements given in Table 3.

The tensile stress of the non-round wire shaped during stranding may be measured after un-stranding, whose value shall be not less than 95 % of the applicable stress requirements given in Table 3.

6.5 Elongation

Each measured value of wire elongation shall not be less than the amounts given in Table 3.

Table 3 – Tensile stress and elongation of wires (before stranding)

Type	Nominal diameter mm		Tensile stress minimum MPa	Minimum elongation at 250 mm %
	Over	Up to and including		
AT1	–	2,00 [a]	171	1,3
	2,00	2,30		1,4
	2,30	2,60	169	1,5
	2,60	2,90	166	1,6
	2,90	3,50	162	1,7
	3,50	3,80		1,8
	3,80	4,00	159	1,9
	4,00	4,50 [a]		2,0
AT2	–	2,60 [a]	248	1,5
	2,60	2,90	245	1,6
	2,90	3,50	241	1,7
	3,50	3,80		1,8
	3,80	4,00	238	1,9
	4,00	4,50 [a]	225	2,0
AT3	–	2,30 [a]	176	1,5
	2,30	2,60	169	
	2,60	2,90	166	1,6
	2,90	3,50	162	1,7
	3,50	3,80		1,8
	3,80	4,00	159	1,9
	4,00	4,50 [a]		2,0
AT4	–	2,60 [a]	169	1,5
	2,60	2,90	165	1,6
	2,90	3,50	162	1,7
	3,50	3,80		1,8
	3,80	4,00	159	1,9
	4,00	4,50 [a]		2,0

[a] For nominal diameters below the smallest and diameters above the biggest, the requirements have to be agreed between purchaser and supplier.

6.6 Electrical resistivity

The electrical resistivity at 20 °C shall not be greater than the value given in Table 4.

Table 4 – Electrical resistivity

Type	AT1	AT2	AT3	AT4
Resistivity at 20 °C, max. (nΩ×m)	28,735	31,347	28,735	29,726
(conductivity, corresponding to IACS)	(60,0 %)	(55,0 %)	(60,0 %)	(58,0 %)
NOTE IACS stands for the International Annealed Copper Standard (see IEC 60028).				

6.7 Thermal-resistant property

The residual ratio of the tensile stress after heating the wire for the designated duration and temperature given in Table 5 shall not be individually less than 85 % and average of 90 % at room temperature compared with the initial measured value before heating.

Table 5 – Duration and temperature of heating to affirm thermal-resistant property

Duration h	Temperature °C	AT1	AT2	AT3	AT4
1	Temperature of heating	230	230	280	400
	Tolerance in temperature	+ 5 – 3	+ 5 – 3	+ 5 – 3	+ 10 – 6
400	Temperature of heating	180	180	240	310
	Tolerance in temperature	+ 10 – 6	+ 10 – 6	+ 10 – 6	+ 10 – 6

6.8 Length and tolerance on length

The nominal length of each coil or reel of wire and the tolerance on length shall be subject to an agreement between the purchaser and the manufacturer.

6.9 Joints

Joints may be made prior to final drawing. A joint shall be made by electric butt welding, butt cold upset welding, cold pressure welding or other approved methods. Those joints shall be made in accordance with good commercial practice. A joint could be made in the finished wire, provided that

a) the coil is 500 kg or heavier,

b) there is not more than one joint in such coils,

c) not more than 10 % of such coils shall contain a joint,

d) when requested by the purchaser, the manufacturer shall provide evidence that the joints have a tensile strength of not less than 130 MPa,

e) coils containing a joint made in the finished wire shall be clearly identified.

6.10 Wrapping

The wire shall not be broken in the test according to 7.3.7.