

Factsheet

Copper – Aluminium



Characteristics of copper and aluminium

Property	Copper (Cu-ETP)	Aluminium (1350)	Units
Electrical conductivity (annealed)	58.5	35.5	10 ⁶ S/m
Electrical conductivity (annealed)	100	61	%IACS
Electrical resistivity (annealed) at 20°C	17.2	28.2	nΩ·m
Thermal conductivity at 20°	401	237	W/(m·K)
Thermal expansion coefficient	17 x 10 ⁻⁶	23 x 10 ⁻⁶	/°C
Tensile strength (annealed)	200-250	50-60	N/mm ²
Tensile strength (half hard)	260-300	85-100	N/mm ²
Elastic modulus	116-130	70	N/mm ²
Thermal storage capacity	0.092	0.214	Cal/gr.°C
Fatigue strength (annealed)	62	35	N/mm ²
Fatigue strength (half hard)	117	50	N/mm ²
Specific heat	385	900	J/kgK
Density	8.96	2.70	g/cm ³
Melting point	1.085	660	°C
Electrochemical potential	+0.339	-1.706	V
Raw material price (01-09-2021)	8154	2829	€/tn
Availability estimate	~30-40	~100	Years

Comparison of copper and aluminium in cable

Conditions	Copper	Aluminium
Equal cross-section	1	1
Weight	1	0,33
Resistance	1	1,6
Conductivity	1	0,625
Current carrying capacity	1	0,8
Equal conductivity	1	1
Cross-section	1	1,6
Diameter	1	1,3
Weight	1	0,49
Equal thermal expansion	1	1
Cross-section	1	1,4
Diameter	1	1,17

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Installation of aluminium building and ground cables

Consider:

Interoperability of accessoires and aluminium

Workmansip quality

Physical properties of accessoires

Thermal expansion differences

Creep and voltage drop conditions

Aluminium oxide layer is broken during termination

Material grade of conductor

Proper tightening (torquing) of connection

Periodic inspection of electric connections

Compatable oxide inhibitor

Environmental conditions

Protect metal interface against electrolytic attack (Al potential -1.706V)

Reasons to choose aluminium

Weight advantage due to lower density in relation to copper but lower electrical properties

Lower raw material price than copper

Reduction of long term dependency of copper due to higher availability of aluminium (the third most abundant by mass fraction after hydrogen and nitrogen, 8.3% in earth crust.)

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