Factsheet Copper – Aluminium





Characteristics of copper and aluminium

Property	Copper (Cu-ETP)	Aluminium (1350)	Units
Electrical conductivity (annealed)	58.5	35.5	10º 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
Tenisle strength (annealed)	200-250	50-60	N/mm²
Tensile strength (half hard)	260-300	85-100	N/mm²
Elastic modulus	116-130	70	N/mm²
Thermal storage capacity	0.092	0.214	Cal/gr.°C
Fatigue strength (annealed)	62	35	N/mm²
Fatigue strength (half hard)	117	50	N/mm²
Specific heat	385	900	J/kgK
Density	8.96	2.70	g/cm³
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
Weight	1	0,42

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Installation of aluminium building and ground cables

Consider:	
Interoperability of accesoires and aluminium	
Workmansip quality	
Physical properties of accessoiries	
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.)