

# Factsheet

## Copper – Aluminium



### Characteristics of copper and aluminium

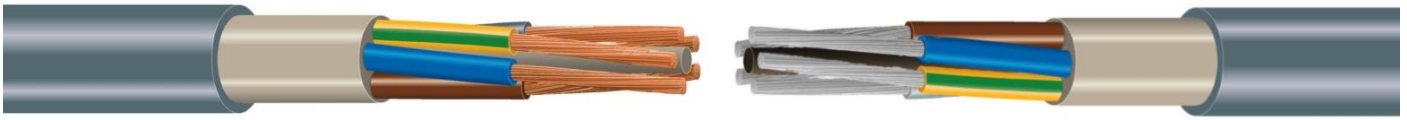
Property	Copper (Cu-ETP)	Aluminium (1350)	Units
Electrical conductivity (annealed)	58.5	35.5	10 <sup>6</sup> S/m
Electrical conductivity (annealed)	100	61	%IACS
Electrical resistivity (annealed) at 20°C	17.2	28.2	nΩ·m
Thermal conductivity at 20°	401	237	W/(m·K)
Thermal expansion coefficient	17 x 10 <sup>-6</sup>	23 x 10 <sup>-6</sup>	/°C
Tensile strength (annealed)	200-250	50-60	N/mm <sup>2</sup>
Tensile strength (half hard)	260-300	85-100	N/mm <sup>2</sup>
Elastic modulus	116-130	70	N/mm <sup>2</sup>
Thermal storage capacity	0.092	0.214	Cal/gr.°C
Fatigue strength (annealed)	62	35	N/mm <sup>2</sup>
Fatigue strength (half hard)	117	50	N/mm <sup>2</sup>
Specific heat	385	900	J/kgK
Density	8.96	2.70	g/cm <sup>3</sup>
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
<b>Equal cross-section</b>	<b>1</b>	<b>1</b>
Weight	1	0,33
Resistance	1	1,6
Conductivity	1	0,625
Current carrying capacity	1	0,8
<b>Equal conductivity</b>	<b>1</b>	<b>1</b>
Cross-section	1	1,6
Diameter	1	1,3
Weight	1	0,49
<b>Equal thermal expansion</b>	<b>1</b>	<b>1</b>
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 accessories and aluminium
- Workmanship quality
- Physical properties of accessories
- 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
- Compatible 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.)