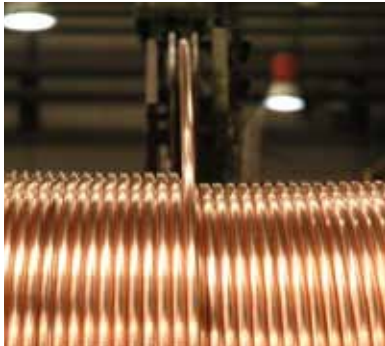


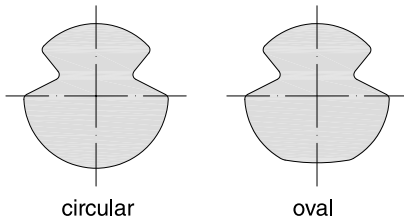
Grooved contact wire



*The widest range of alloys,
properties, profiles and technical characteristics*

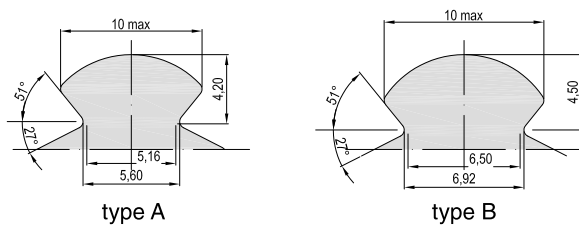
Profiles

There are two types of profile:



Attachment grooves

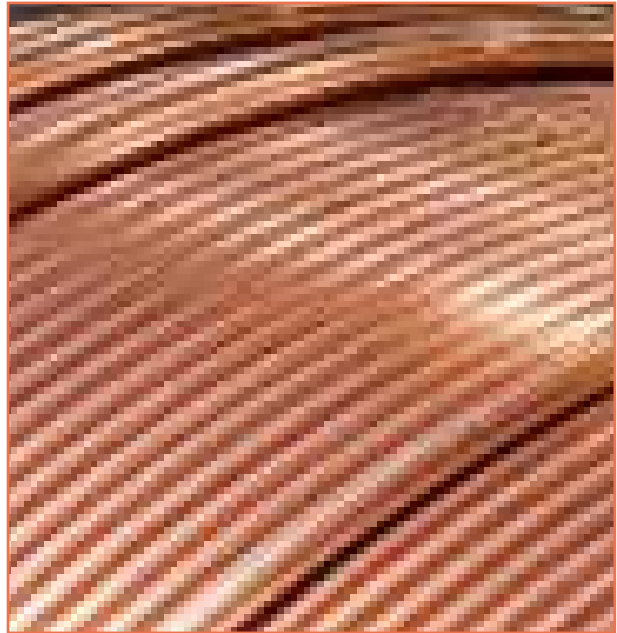
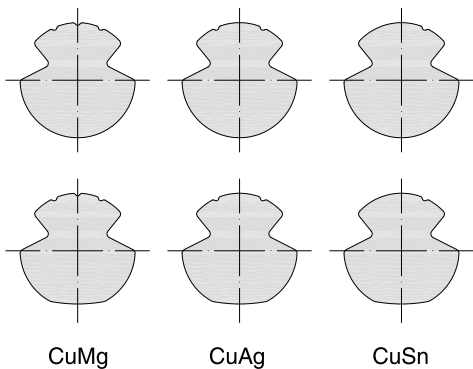
There are two types of groove:



Identification grooves

To distinguish the materials used in manufacturing contact wire different types of groove are used:

- Cooper: without groove
- Copper-Tin: one groove
- Copper-Silver: two grooves
- Copper-Magnesium: three grooves



The widest range of alloys, properties, profiles and technical characteristics

Types of copper and alloys

EVELHIS
high-speed technology

				Composition in %					
				Elements					
	Name	No. material		Cu	Bi	O	P	Pb	Other elements
Copper	Cu-ETP	CW004A	min. max.	99.90 -	0.0005	0.04		0.005	0.03
	Cu-FRHC	CW005A	min. max.	99.90 -		0.04			0.04
	Cu-OF	CW008A	min. max.	99.95 -	0.0005			0.005	0.03
	Cu-HCP	CW021A	min. max.	99.95 -	0.0005		0.007		0.03
Copper-Silver				Cu	Bi	O		Ag	Other elements
	CuAg0.10	CW013A	min. max.	Rest -	0.0005	0.04		0.08 0.12	0.03
Copper-Magnesium				Cu	Mg	SN	Cd	P	Other elements
	CuMg0.2	CW127A	min. max.	Rest -	0.1 0.3			0.01	0.1
	CuMg0.5	CW128A	min. max.	Rest -	0.4 0.7			0.01	0.1
Copper-Tin	CuSn0,2/0.4	CW129A	min. max.	Rest -		0.15 0.55			0.1

EN 50149

When electrical conductivity is not a determining factor in the design of the overhead power cable and, in contrast, emphasis is placed on the mechanical characteristics, alloys are chosen with elements that enable the mechanical resistance of the conventional materials to be improved.

Copper

Copper is mainly used for conventional lines. It is the material possessing the best conductivity, but wears out more easily than the products made with its alloys.

CuAg - Copper-Silver

Silver is used as an alloy element to increase the resistance of the base material to the annealing, which enables greater thermal stability to be achieved of the products that make up the overhead power cable without sacrificing mechanical or electrical characteristics, and in consequence improve its durability.

The widest range of alloys, properties, profiles and technical characteristics

CuSn - Copper-Tin

Materials made with Copper-Tin alloys have a very high mechanical resistance that enables high hanging tensions to be applied, sufficient for providing greater wave propagation speeds on the overhead power cable and, as a consequence, can obtain greater train running speed.

CuMg - Copper-Magnesium

The greater the speed of the trains on the line, the greater the hanging tensions used must be and the materials must possess better mechanical characteristics.

To achieve this, on high-speed lines conductivity is sacrificed in favour of resistance to traction, which enables higher tensions, an increase in wave propagation speed of the overhead power cable and, as a consequence, the trains can run at a greater speed.

EVELHIS - Evolution in electrification: high speed

The EVELHIS™ technology developed by LFL surpasses the standards established by international regulations in materials used for high speed. It is based on copper-magnesium alloys improved to increase their technical uses.

EVELEC - Evolution in electrification

Sometimes the conventional design of the overhead power cables does not enable complex problems to be dealt with, such as accelerated wear or need for improved mechanics without excessively prejudicing electrical conductivity. In these cases the design of the specific materials for each situation is a tool of great value.

La Farga Advanced Materials has developed the new generation EVELEC™ copper, a material which based on micro-alloys, improves the wearing resistance between 30% and 50% compared to products commonly used on conventional lines.



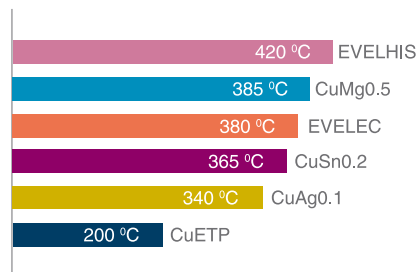
Comparison of the different materials

BC-150						
Properties	CuETP	CuAg0.1	EVELEC (*)	CuSn0.2	CuMg0.5	EVELHIS (*)
Electrical resistance (ohm/km)	0.122	0.122	0.136	0.165	0.191	0.167
Weight/m (g/m)	1293-1374	1293-1374	1345	1298-1378	1293-1374	1345
Conductivity (% IACS)	97.1	97.1	84	72	62.2	68
Minimum failure (KN)	52.4	52.4	60.5	61.1	68.4	75.7
Minimum traction resistance (N/mm ²)	360	360	400	420	470	501
Lengthening (%A200)	3-8	3-8	4	2-8	3-10	4
Rpn 0.2 minimum (N/mm ²)	347	352	375	385	-	442
Guideline annealing temperature (°C)	200	340	380	365	385	420

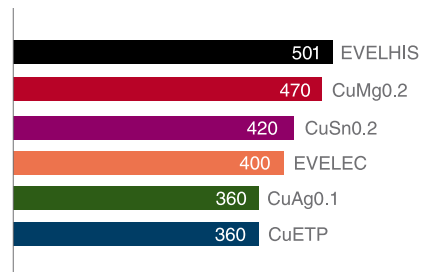
Values according to norm EN-50149 * Values obtained according to real samples

Mechanical and electrical properties

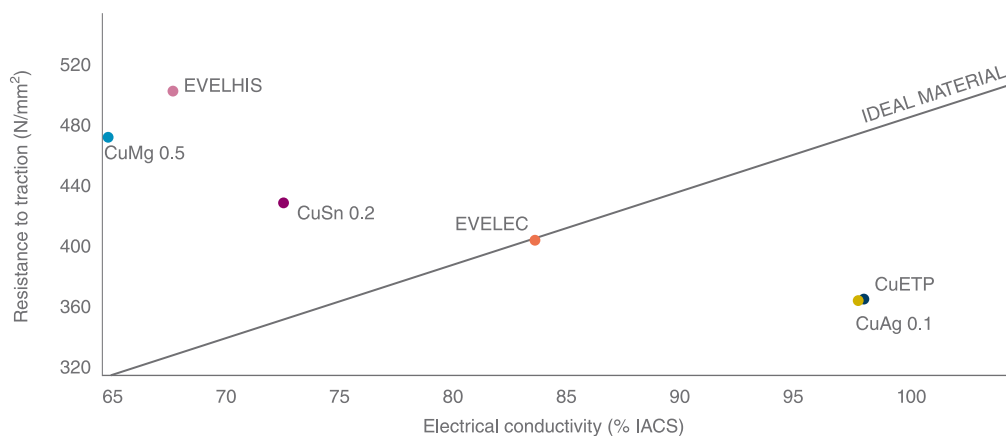
Annealing temperature:



Resistance to traction (N/mm²) for BC 150 mm²:



Mechanical and electrical properties of contact wire



LAFARGA

yourcoppersolutions

Ctra. C17z Km 73,5 - 08508 Les Masies de Voltregà (Barcelona)

Tel. +34 93 859 42 81/ 82

+34 93 859 40 20

Fax. +34 93 859 55 30

yourcoppersolutions@lafarga.es

www.lafarga.es

www.yourcoppersolutions.info

