

Copper

Chemical Composition

COPPER WIRE FOR ELECTRICAL APPLICATIONS

COMPOSITION OF Cu-ETP (CW004A) AND Cu-OF (CW008A) COPPER EN 13602

Designation of the material		European Standard (EN)	Composition in % (mass fraction)					
			Min. Cu	Max. Bi	Max. O	Max. Pb	Other elements (please see note)	
Symbolic	Numerical	EN					total max.	
Cu-ETP	CW004A	EN 13602	99.90	0.0005	0.04	0.005	0.03	Ag, O
Cu-OF	CW008A	EN 13602	99.95	0.0005	–	0.005	0.03	Ag

COPPER WIRE FOR GENERAL USES

CHEMICAL COMPOSITION EN 12166

Designation of the material		European Standard (EN)	Composition in % (mass fraction)								Other elements (please see note)	
			Min. Cu	Min. P	Max. P	Min. Be	Max. Be	Max. Co	Max. Fe	Max. Ni	total	excluded
Symbolic	Numerical	EN										
Cu-DHP	CW024A	EN 12166	99.9 ¹⁾	0.015	0.04	-	-	-	-	-	-	-
Cu-Be2	CW101C	EN 12166	Remainder	-	-	1.8	2.1	0.3	0.2	0.3	-	0.6

1) Including up to a maximum of 0.015% silver.

NOTE - The total of other elements (other than copper) is defined as the sum of Ag, As, Bi, Cd, Co, Cr, Fe, Mn, Ni, O, P, Pb, S, Sb, Se, Si, Sn, Te and Zn, subject to the exclusion of any individual elements specified.

Equivalents

EUROPEAN (EN)	AMERICAN ASTM	JAPANESE (JIS)	CHINESE GB
Cu-ETP	C11000	C1100	-
Cu-OF	C10200	C1020	-
Cu-DHP	C12200	C1220 / C1221	-
Cu-Be2	-	-	-

Mechanical properties

MECHANICAL PROPERTIES EN 13602

Mechanical properties for wires without coatings

Designations		Metallurgical condition ^{a)}	Nominal diameter		Tensile strength R _m	Elongation
			mm		N/mm ²	At or A ₂₀₀ mm
Material			above	up to & including	min.	min. %
Symbolic	Numerical					
Cu-ETP Cu-OF	CW004A CW008A	A010	0.04 ^{b)}	0.08	(200)	10
		A015	0.08	0.16	(200)	15
		A021	0.16	0.32	(200)	21
		A022	0.32	0.50	(200)	22
		A024	0.50	1.00	(200)	24
		A026	1.00	1.50	(200)	26
		A028	1.50	3.00	(200)	28
		A033	3.00	5.00	(200)	33
		R460	0.16	1.12	460	-
		R440	1.12	1.50	440	-
		R430	1.50	2.00	430	-
		R420	2.00	2.40	420	-
		R400	2.40	3.00	400	-
		R390	3.00	3.55	390	-
		R380	3.55	4.00	380	-
		R370	4.00	4.50	370	-
		R360	4.50	5.00	360	-

NOTE - The values in brackets are not required by this standard, they are given for information purposes only.

a) The metallurgical conditions specified as A... fall under the "annealed" category and those specified as R... the "cold drawn" category.

b) Including the value 0.04

MECHANICAL PROPERTIES EN 12166

Designations		Metallurgical condition	Nominal thickness			Tensile strength Rm		Conventional yield strength at 0.2% Rp 0.2 N/mm ²
			mm			N/mm ²		
Material Symbolic	Numerical	Metallurgical condition	from	above	to	min.	max.	N/mm ²
					M			
Cu-DHP	CW024A	R200	1.5	-	20.0	200	270	(60)
		H040	1.5	-	20.0	-	-	-
		R270	1.0	-	8.0	270	-	(250)
		H065	1.0	-	8.0	-	-	-
		R250	-	8.0	20.0	250	-	(230)
		H055	-	8.0	20.0	-	-	-
		R330	1.0	-	8.0	330	-	(290)
		H090	1.0	-	8.0	-	-	-
		R300	-	8.0	15.0	300	-	(250)
		H090	-	8.0	15.0	-	-	-
		R400	1.0	-	8.0	400	-	(360)
		H105	1.0	-	8.0	-	-	-
		R350	-	8.0	12.0	350	-	(320)
		H105	-	8.0	12.0	-	-	-
		R390	0.2	-	1.0	390	540	(220)
		R410	-	1.0	10.0	410	540	(200)
H090	0.2	-	10.0	-	-	-		
R550	1.0	-	10.0	510	610	(485)		
H120	1.0	-	10.0	-	-	-		

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Designations		Nominal thickness			Tensile strength Rm		Conventional yield strength at 0.2% Rp 0.2	
		mm			N/mm ²			
Material		Metallurgical condition	from	above	to	min.	max.	N/mm ²
Symbolic	Numerical							
Cu-Be2	CW101C	R580	1.0	-	10.0	580	690	(570)
		H170	1.0	-	10.0	-	-	-
		R750	0.2	-	1.0	750	1140	(929)
		R750	-	1.0	10.0	750	1140	(800)
		H220	0.2	-	10.0	-	-	-
		R1130	0.2	-	1.0	1130	1350	(1090)
		R1100	-	1.0	10.0	1103	1520	(1050)
		H350	0.2	-	10.0	-	-	-
		R1190	1.0	-	10.0	1190	1450	(1150)
		H360	1.0	-	10.0	-	-	-
		R1270	1.0	-	10.0	1270	1450	(1250)
		H370	1.0	-	10.0	-	-	-
		R1310	0.2	-	1.0	1310	1520	(1380)
		H390	0.2	-	1.0	-	-	-
		R1310	-	1.0	10.0	1310	1520	(1300)
		H380	-	1.0	10.0	-	-	-

NOTE 1 - The values in brackets are not required by this standard, they are given for information purposes only.

NOTE 2- 1N/mm² equals 1MPa.

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Finishes

- Can be supplied with a tinned or nickel plated surface finish, or others on request.

Tolerances

DIAMETER TOLERANCES OF ROUND WIRE EN12166

Nominal Diameter Value		Tolerances				
above	up to & including	Class A	Class B	Class C	Class D	Class E
-	0.25	± 0.005	-	-	-0.025;0	-0.006;0
0.25	0.5	± 0.005	-	-	-0.03;0	-0.010;0
0.5	1.0	± 0.012	-	-	-0.03;0	-0.014;0
1.0	2.0	± 0.02	-0.10;0	-0.05;0	0.0	-0.025;0
2.0	4.0	± 0.03	-0.10;0	-0.05;0	0.0	-0.025;0
4.0	8.0	± 0.04	-0.12;0	-0.05;0	-0.05;0	-0.030;0
8.0	10.0	± 0.06	-0.15;0	-0.09;0	-0.06;0	-0.035;0
10.0	18.0	± 0.08	-0.18;0	-0.11;0	-0.07;0	-0.040;0

TOLERANCES 13602

Diameter tolerances

nominal diameter		max. diameter tolerance	Max. roundness.
above	up to & including		
0.08	0.25	± 0.003mm	0.006mm
0.25	0.4	± 0.004mm	0.008mm
0.4	5	± 1%	2%

STANDARD LENGTH TOLERANCES

NOMINAL LENGTH	TOLERANCE
$L \leq 1000 \text{ mm.}$	+/- 1 mm.
$1000 < L \leq 4000$	- 0mm. / +3 mm.