

**Wrought and Low-alloyed Copper Alloys—Compositions, Properties, Standards and Uses**

Description	EN Number	EN Symbol	Nearest Old BS Equiv.	Cu %	Be %	Cr %	Ni %	P %	Si %	Others %	0.2% Proof Strength (N/mm <sup>2</sup> )	Tensile Strength (N/mm <sup>2</sup> )	Elongation (%)	Hardness (HV)	Approx. Conductivity (% IACS)	1652 Plate Strip Sheet Circles	1654 Strip for Springs, Connectors	12163 Rod	12164 Rod for Free Machining	12165 Forging Stock	12166 Wire	12167 Profiles, Rectangular Bar	12168 Free Machining Hollow Rod	12420 Forgings	12449 Tubes	Characteristics and Uses	
Heat-treatable Alloys	CW100C	CuBe1.7	CB101	Rem.	1.6-1.8	-	0.3	-	-	0.3 Co	200-1100	410-1300	35-3	100-400	38		BHRY									Highest strength, non-sparking, non-magnetic. Used for oil/gas drilling equipment, miniaturised components.	
Heat-treatable Alloys	CW101C	CuBe2	-	Rem.	1.8-2.1	-	0.3	-	-	0.3 Co	200-1300	410-1400	20-2	100-420	38	HR	BHRY	HMR		HM	HMR	HMR		M		Highest strength, non-sparking, non-magnetic. Used for oil/gas drilling equipment, miniaturised components.	
Heat-treatable Alloys	CW102C	CuBe2Pb	-	Rem.	1.8-2.0	-	0.3	-	-	0.3 Co 0.2-0.6 Pb	200-1300	410-1400	20-4	100-210	45				MR		HMR					Highest strength, non-sparking, non-magnetic. Used for oil/gas drilling equipment, miniaturised components.	
Heat-treatable Alloys	CW103C	CuCo1Ni1Be	-	Rem.	0.4-0.7	-	0.8-1.3	-	-	0.8-1.3 Co	135-760	250-800	25-3	100-230	60	HR		HMR		HM	HMR	HMR		M		High electrical/thermal conductivity. High temperature use. Used for electronic controls/connectors.	
Heat-treatable Alloys	CW104C	CuCo2Be	C112	Rem.	0.4-0.7	-	0.3	-	-	2.0-2.8 Co	135-900	240-800	25-3	90-230	60	HR	HRY	HMR		HM	HMR	HMR		M		High electrical/thermal conductivity. High temperature use. Used for electronic controls/connectors.	
Heat-treatable Alloys	CW105C	CuCr1	CC101	Rem.	-	0.5-1.2	-	-	0.1	-	100-440	220-500	30-8	70-185	80											Good conductivity & strength at elevated temperatures.	
Heat-treatable Alloys	CW106C	CuCr1Zr	CC102	Rem.	-	0.5-1.2	-	-	0.1	0.03-0.3 Zr	100-440	220-540	35-5	55-175	80					HM	HMR	HMR		M		Good conductivity & strength at elevated temperatures due to Zr, Used for trolley wire e.g. Japanese bullet train.	
Heat-treatable Alloys	CW107C	CuFe2P	-	Rem.	-	-	-	0.015-0.15	-	2.1-2.6 Fe 0.03 Pb 0.05-0.20 Zn	110-450	300-500	13-5	50-180	60		HR				HMRG				HMR	Good electrical/thermal conductivity, electronic components. Used for lead frames (EN 1758), finned tubes (EN 12735).	
Heat-treatable Alloys	CW108C	CuNiP	C113	Rem.	-	-	0.8-1.2	0.15-0.25	-	-	140-730	250-800	30-5	80-240	50											High strength & high electrical conductivity (up to 60% IACS).	
Heat-treatable Alloys	CW109C	CuNi1Si	-	Rem.	-	-	1.0-1.6	-	0.4-0.7	0.02 Pb	100-570	300-590	30-5	80-220	45					HM	HMR	HMR		M		High strength & high electrical conductivity (up to 60% IACS).	
Heat-treatable Alloys	CW110C	CuNi2Be	-	Rem.	0.2-0.6	-	1.4-2.4	-	-	0.3 Co	135-900	240-800	25-3	90-230	60	HR	HRY	HMR				HMR				High electrical/thermal conductivity. High temperature use. Used for electronic controls/connectors.	
Heat-treatable Alloys	CW111C	CuNi2Si	-	Rem.	-	-	1.6-2.5	-	0.4-0.8	0.02 Pb	100-620	300-700	35-5	80-220	38	HR	HR	HMR		HM	HMR	HMR		M	HMR	High strength & high electrical conductivity (up to 60% IACS).	
Heat-treatable Alloys	CW112C	CuNi3Si1	-	Rem.	-	-	2.6-4.5	-	0.8-1.3	0.02 Pb	120-780	320-800	30-5	80-230	40											High strength & high electrical conductivity (up to 60% IACS).	
Heat-treatable Alloys	CW120C	CuZr	-	Rem.	-	-	-	-	-	0.1-0.2 Zr	40-350	180-350	30-14	40-135	95						HM	HMR	HMR		M		Used at high temperatures. High conductivity. Used for resistance and spot welding electrodes, circuit breakers, switch blade jaws.
Non Heat-treatable Alloys—Free Machining	CW113C	CuPb1P	-	Rem.	-	-	-	0.003-0.012	-	0.7-1.5 Pb	200-320	250-360	7-2	90-110	86				MR							Free machining copper (MI 80%), IACS of up to 94%. Used for electrical applications, MIG welding gun nozzles & pins.	
Non Heat-treatable Alloys—Free Machining	CW114C	CuSP	C111	Rem.	-	-	-	0.003-0.012	-	0.2-0.7 S	200-320	250-360	7-2	90-110	94				MR		HMR		HM			Free machining copper (MI 80%), IACS of up to 94%. Used for electrical applications, MIG welding gun nozzles & pins.	
Non Heat-treatable Alloys—Free Machining	CW118C	CuTeP	C109	Rem.	-	-	-	0.003-0.012	-	0.4-0.7 Te	200-320	250-360	7-2	90-110	94				MR		HMR		HM			Free machining copper (MI 80%), IACS of up to 94%. Used for electrical applications, MIG welding gun nozzles & pins.	
Non Heat-treatable Alloys—Other	CW115C	CuSi1	-	Rem.	-	-	-	0.02	0.8-2.0	0.05 Pb	300-400	510-760	15-6	145-200												Special wire products.	
Non Heat-treatable Alloys—Other	CW116C	CuSi3Mn	CS101	Rem.	-	-	-	0.05	2.7-3.2	0.7-1.3 Mn 0.05 Pb	200-890	380-900	50-3	90-220												Good corrosion resistance and strength. Used for nails, marine fixings, welding wire.	
Non Heat-treatable Alloys—Other	CW117C	CuSn0.15	-	Rem.	-	-	0.02	0.015	-	0.10-0.15 Sn		250-490	9-2	60-140	88											Strip for lead frames (EN 1758) & Sheet & Strip Building (EN 1172). Used for plug-in connector pins.	
Non Heat-treatable Alloys—Other	CW119C	CuZn0.5	-	Rem.	-	-	-	0.02	-	0.1-1.0 Zn	140-320	220-480	42-6	40-115	80	HR										Sheet & strip building (EN 1172).	
Non Heat-treatable Alloys—Other	CW124C	CuSi3Zn2P	-	Rem.	-	-	0.20	0.01-0.20	2.5-3.5	0.10 Pb 1.0-3.0 Zn	80-550	370-650	50-5	65-180											HMR	General purpose tubes.	
Non Heat-treatable Alloys—Other	CW125C	CuFe0.15Sn0.1P	-	Rem.	-	-	-	0.015-0.055	-	0.05-0.2 Fe 0.05-0.25 Sn	60-520	250-400	40-3												HMR	General purpose tubes.	

**About this table**

This table shows the BS EN material designations, compositions, typical mechanical properties and relevant BS EN Standards for wrought low-alloyed copper alloys. Information on general characteristics and uses, and conductivity, is also provided. Small additions of particular elements can produce copper alloys with a number of different properties such as free-machining and high strength. These low alloyed coppers include copper-beryllium, copper-chromium and copper-tellurium. The table shows compositions—either a range or maximum—and typical uses. Note that not all elements listed as impurities are shown here. For the full chemical composition you should refer to the standard or the Copper and copper alloys. Compendium of compositions and products PD CEN/TS 13388, available from the BSI shop (<https://shop.bsigroup.com/ProductDetail/?pid=000000000030266560>).

**Table notes**

Compositions are given as either a range or a maximum. For more detail, the appropriate standard(s) should be consulted. 1652 and 12163 are for general purposes. 1N/mm<sup>2</sup> = 1MPa  
 B – mandatory spring bending limit  
 C – minimum electrical conductivity  
 G – mandatory grain size  
 H – mandatory hardness  
 M – as manufactured  
 R – mandatory tensile strength  
 X – no mandatory tensile properties  
 Y – mandatory 0.2% proof strength

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