

**Wrought Copper-zinc and Copper-tin Binary Alloys—Compositions, Properties, Standards and Uses**

Description	EN Number	EN Symbol	Nearest Old BS Equiv.	Cu %	P %	Pb %	Sn %	Zn %	Others %	0.2% Proof Strength (N/mm <sup>2</sup> )	Tensile Strength (N/mm <sup>2</sup> )	Elongation (%)	Hardness (HV)	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		
Copper-zinc (Brass)	CW500L	CuZn5	CZ125	94.0-96.0	-	0.05	0.1	Rem.	0.3 Ni	60-420	240-420	45-4	50-125	HR									HMR	Very good cold working properties. Conductivity 56% IACS. Used for ordnance, connectors, contacts, shell casings, detonator caps.		
Copper-zinc (Brass)	CW501L	CuZn10	CZ101	89.0-91.0	-	0.05	0.1	Rem.	0.3 Ni	120-560	240-600	45-2	60-165	HR		HMR								HMR	Very good cold working properties. Conductivity 44% IACS. Used for architecture, ordnance leadframes, wave guides, rotor bars, detonator caps, shell casings.	
Copper-zinc (Brass)	CW502L	CuZn15	CZ102	84.0-86.0	-	0.05	0.1	Rem.	0.3 Ni	120-590	260-630	50-2	65-170	GHR	HRY	HMR								HMR	Very good cold working properties. Conductivity 37% IACS. Used for architecture (BS EN 1172), contacts, radiators, conduits, costume jewellery, heat exchangers.	
Copper-zinc (Brass)	CW503L	CuZn20	CZ103	79.0-81.0	-	0.05	0.1	Rem.	0.3 Ni	120-590	260-630	50-2	65-170	GHR		HMR								HMR	Very good cold working properties. Conductivity 33% IACS. Used for architecture contacts, radiators, conduits, costume jewellery, heat exchangers.	
Copper-zinc (Brass)	CW504L	CuZn28	-	71.0-73.0	-	0.05	0.1	Rem.	0.3 Ni	120-420	310-500	30-2	90-160												Very good cold working properties for extreme deep drawing and cold forging applications.	
Copper-zinc (Brass)	CW505L	CuZn30	CZ106	69.0-71.0	-	0.05	0.1	Rem.	0.3 Ni	130-430	300-490	55-1	65-200	GHR	HRY	HMR								HMR	Very good cold working properties for extreme deep drawing and cold forging applications. Most ductile copper alloy.	
Copper-zinc (Brass)	CW506L	CuZn33	-	66.0-68.0	-	0.05	0.1	Rem.	0.3 Ni	120-420	300-500	50-2	65-160	GHR											Good cold working properties for deep drawing and cold forging applications.	
Copper-zinc (Brass)	CW507L	CuZn36	CZ107	63.5-65.5	-	0.05	0.1	Rem.	0.3 Ni	130-500	280-580	50-3	65-190	GHR	HR	HMR								HMR	Good cold working, simple forming.	
Copper-zinc (Brass)	CW508L	CuZn37	CZ108	62.0-64.0	-	0.1	0.1	Rem.	0.3 Ni	130-500	280-580	50-3	65-190	GHR		HMR								HMR	Good cold working, simple forming.	
Copper-zinc (Brass)	CW509L	CuZn40	CZ109	59.0-61.5	-	0.2	0.2	Rem.	0.3 Ni	200-420	340-500	45-6	90-150	HR		HMR								HMR	Hot working, limited ductility at room temperature. Muntz metal. Available as hollow rod.	
Copper-zinc (Brass)	CW510L	CuZn42	-	57.0-59.0	-	0.2	0.3	Rem.	0.3 Ni	220-350	360-500	20-2	95-170			HMR	HMR	MH						HMR	Lead free. Approved for drinking water contact under 4MS. Hot worked. 50% machining index. Available as hollow rod.	
Copper-zinc (Brass)	CW511L	CuZn38As	-	61.5-63.5	-	0.2	0.1	Rem.	0.02-0.15 As 0.3 Ni	200-250	280-400	30-8	70-135			HMR	HMR	MH						HMR	DZR. 40% machining index. Approved for drinking water contact under 4MS. Available as hollow rod.	
Copper-tin (Phosphor Bronze)	CW450K	CuSn4	PB101	Rem.	0.01-0.4	0.02	3.5-4.5	0.2	0.2 Ni	290-610	190-850	50-5	75-230	HR	HRY											Readily cold worked. Good corrosion and corrosion fatigue properties. Conductivity 21% IACS. Used for architecture (BS EN 1172), springs, instrument components, wire cloth, mesh, condenser tube-plates and vessels, and electronic components.
Copper-tin (Phosphor Bronze)	CW451K	CuSn5	PB102	Rem.	0.01-0.4	0.02	4.5-5.5	0.2	0.2 Ni	240-670	310-720	55-2	75-230	HR	HRY	HMR										Readily cold worked. Good corrosion and corrosion fatigue properties. Conductivity 17% IACS. Used for springs, instrument components, wire cloth, mesh, condenser tube-plates and vessels, and electronic components.
Copper-tin (Phosphor Bronze)	CW452K	CuSn6	PB103	Rem.	0.01-0.4	0.02	5.5-7.0	0.2	0.2 Ni	260-800	350-900	55-3	80-250	HR	BHRY	HMR									HMR	Strength increases as tin content increases. Readily cold worked. Good corrosion resistance and corrosion fatigue properties. Conductivity 16% IACS. Used for springs, instrument components, wire cloth, mesh, condenser tube plates and vessels and electronic components.
Copper-tin (Phosphor Bronze)	CW453K	CuSn8	PB104	Rem.	0.01-0.4	0.02	7.5-8.5	0.2	0.2 Ni	280-800	390-920	40-4	85-270	HR	BHRY	HMR									HMR	High strength, excellent wear resistance. Used for switchgear, pump and valve components.
Copper-tin (Phosphor Bronze)	CW454K	CuSn3Zn9	-	Rem.	0.2	0.1	1.5-3.5	7.5-10.0	0.2 Ni	200-620	320-700	40-2	80-210	HR	HR											Good formability, conductivity and corrosion resistance. Applications in building, electrical, industrial and consumer goods.
Copper-tin (Phosphor Bronze)	CW455K	CuSn4Pb2P	-	Rem.	0.2-0.4	1.5-2.5	3.5-4.5	0.3	0.2 Ni	400-500	480-550	10-5	150-210												HMR	Free-machining phosphor bronze.
Copper-tin (Phosphor Bronze)	CW456K	CuSn4Pb4Zn4	-	Rem.	0.01-0.4	3.5-4.5	3.5-4.5	3.5-4.5	0.2 Ni	350-680	450-750	15-2	150-210													Good conductivity, excellent machinability antigalling. Used for bushes, bearings, pinions, shafts and gears.
Copper-tin (Phosphor Bronze)	CW457K	CuSn4Te1P	-	Rem.	0.1-0.4	-	4.0-5.0	0.3	0.2 Ni	300-400	380-480	15-2	140-160													Free-machining phosphor bronze.
Copper-tin (Phosphor Bronze)	CW458K	CuSn5Pb1	-	Rem.	0.01-0.4	0.5-1.5	3.5-5.5	0.3	0.2 Ni	350-680	450-750	15-2	150-210													Free-machining phosphor bronze.
Copper-tin (Phosphor Bronze)	CW459K	CuSn8P	-	Rem.	0.2-0.4	0.05	7.5-8.5	0.3	0.3 Ni	220-680	390-750	40-5	85-210												HMR	Excellent wear resistance, bearings.
Copper-tin (Phosphor Bronze)	CW460K	CuSn8PbP	-	Rem.	0.2-0.4	0.1-0.5	7.5-9.0	0.3	0.3 Ni	280-550	460-650	40-5	125-180												HMR	Free-machining phosphor bronze.

**About this table**

This table provides information on copper-zinc (brass) and copper-tin (phosphor bronze) wrought copper alloys. Compositions, typical mechanical properties, relevant standards, characteristics and uses are shown.

Complex brasses, those copper-zinc alloys with additional alloying elements are shown in wrought copper-zinc-lead (leaded brasses). Information is ordered by description and EN number.

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.

For more detail, the appropriate standard(s) should be consulted.

**Table notes**

Compositions are given as either a range or a maximum. The material conditions defined by the standards are given and—where mandatory—this is indicated

1652, 12163 and 12449 are for general purposes. 1653 is for boilers, pressure vessels and hot water storage units.

1N/mm<sup>2</sup> = 1MPa

- B – mandatory spring bending limit
- G – mandatory grain size
- H – mandatory hardness
- M – as manufactured
- R – mandatory tensile strength
- M – as manufactured

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