

BRASS ALLOY CW713R

Forging brass with high strength and durability in the form of rod and profile.
Hot forgeability is very good.

Composition

CW 713 R	Cu	Zn	Pb	Al	Fe	Ni	Mn
Limits	57.0-59.0%	Rem	0.2-0.8%	1.3-1.6%	0.2-0.4%	<1.0%	1.5-2.0%

Sn	Si	Other
0.2-0.4%	0.4-0.8%	<0.3%

Standardization

The alloy is, according to international standards, equivalent in composition to

CW713R	CuZn37Mn3Al2PbSi
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SS-EN 12164, rod for free machining purposes

SS-EN 12165, wrought and unwrought forging stock

SS-EN 12167, profiles and rectangular bars for general purposes

Structure type

β -phase together with some α -phase, lead phase and manganese, iron and silicon rich phase.

Application example

Rod and profile:

Hot forged details for change gear quadrants and synchronization rings. Wearing parts.

Dezincification resistance

The alloy CW713R is not dezincification resistant.

Heat treatment

Heat treatment is normally not considered for the alloy.

Workability

Hot workability is very good. Suitable temperature 650-750°C. Among other things the alloy is intended for hot forging. One should, when heating before forging, ensure that the temperature does not exceed the specified range and that time at elevated temperature is as short as possible. Otherwise, the material can have significant grain growth that can easily lead to cracks during forging.

Cold workability is poor. The material should not be cold worked.

Physical properties

Property	Value	Unit
Density	8200	kg/m ³
Melting temperature	870-890	°C
Heat capacity at 20°C	0.38	kJ/(kg°C)
Resistivity at 20°C	83	nΩm
Conductivity at 20°C	13 21%	MS/m IACS ¹
Thermal conductivity at 20°C	100	W/m°C
Thermal expansivity, 20-300°C	21*10 ⁻⁶	°C
Modulus of elasticity	110	GPa
Modulus of shearing	35	GPa

1) IACS = International Annealed Copper Standard. 100% IACS is equivalent to a resistivity of 17.241 nΩm and a conductivity of 58 MS/m.

Corrosion resistance

Copper is a relatively noble metal. Copper and its alloys therefore show little tendency to react with the environment. As a result of this, the copper materials generally have good corrosion resistance. However, corrosion may occur under disadvantageous unfavorable conditions. The type of corrosion which may occur depends on both the environment and the composition of the alloy.

The corrosion resistance of CW713R is

Corrosion types	Corrosion resistance	Comment
Stress Corrosion Cracking, SCC	Satisfactory	This type of corrosion only occurs in the simultaneous presence of high stresses in the material and a corrosive medium containing ammonia and moisture. (See Heat treatment.)
Dezincification, DZR	Poor	This type of corrosion only occurs when the material is exposed to water or a moist atmosphere, preferentially at elevated temperature and at the presence of chlorides.
Erosion corrosion	Quite good	

Machinability

High surface quality is easy to achieve. The chips are short.

Tool and cutting data. Tungsten carbide according to ISO-group K10.

Cutting data	Tungsten carbide	High speed steel
Rake angle	2-6°	0-3°
Back rake angle	0°	0°
Clearance angle	4-6°	0-6°
Cutting speed	Approx. 300 m/min or faster	Approx. 150 m/min or faster
Cutting fluid	Dry or cutting oil	Emulsion or cutting oil

Brazing

The alloy contains aluminum. This implies that the fluxing agent used must be able to solve aluminum oxide.

The following applies to the different welding methods:

Welding method	Suitability	Comment
Braze welding	Poor	Cannot be carried out with good results because of the minimal difference between the melting temperature of the base metal and the working temperature of the solder.
Brazing (hard soldering)	Satisfactory, can be carried out with a silver solder and silver-phosphorus-copper solder	Difficult to carry out with a phosphorus-copper solder and cannot be carried out with satisfactory results with a brass solder (see Braze welding).
Soldering	Satisfactory	Can be carried out

Surface treatment

Mechanical surface treatment such as grinding, brushing, blasting and polishing is carried out by conventional methods.

Pickling (non-oxidizing pickling) is suitably carried out with diluted sulphuric acid at room temperature.

Pickling to a metallically clean surface (oxidizing pickling) is suitably carried out in a pickling bath containing oxidants such as peroxide, nitric acid or dichromate. For pickling to a high gloss, baths containing nitric acid are mainly used.

Chemical and electrolytic polishing is easy to carry out with mixtures of concentrated acids, e.g. phosphoric acid, nitric acid and acetic acid.

Polishing is suitably carried out with commercial cleaning products for copper.

Dark dyeing is easy to carry out by wet chemical methods, dark sulphide or oxide layers being obtained.

Varnishing with clear varnish means that the appearance obtained after cleaning or dyeing, for example, is retained for a long time. Clear varnishes containing a discoloring inhibitor are available for demanding applications.

Metallization (metallic surface coating) is easy to carry out.

Mechanical properties

CW713R from Nordic Brass Gusum meets and exceeds the quality demands defined in the standards. To give an idea of the mechanical properties some empirical values, according to the material grade "M" in the EN standard, are listed below. These values are to be considered as guideline values for the delivered material.

Property	Value	Unit
Rm, Tensile strength	>620	MPa
Rp02, Yield strength	~480	MPa
A5, Fracture elongation	>15	%
Brinell hardness	~160	HB