BRASS ALLOY CW617N

Forging brass in the form of rod and profile, intended for applications where an alloy with lower lead content than CW614N is needed. The alloy has very good forge ability and good machinability. Alloy CW617N is approved according to the 4MS list for applications in contact with drinking water, product groups B-D.

Composition

CW617N	Cu	Zn	Pb	Al	Fe	Ni	Sn	Other
Limits	57.0-59.0%	Rem	1.6-2.5%	<0.05%	<0.3%	<0.3%	<0.3%	<0.2%*

*According to 4MS

Standardization

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

CW617N	CuZn40Pb2

SS-EN 12164, rod for free machining purposes
SS-EN 12165, wrought and unwrought forging stock
SS-EN 12166, wire for general purposes
SS-EN 12167, profiles and rectangular bars for general purposes

Structure type

(α+β)-phase together with lead phase.

Application example

Rod.
Hot forged details, particularly hot pressed with punches.

Residual stress level

Rod must show no evidence of cracking after testing according to SS-ISO 6957 Copper alloys – "Ammonia test for determining resistance to stress corrosion". Moderate stress according to the standard must be applied.

Dezincification resistance

The alloy CW617N is not dezincification resistant

Physical properties

Property	Value	Unit
Density	8500	kg/m^3
Melting temperature	875-890	°C
Heat capacity at 20°C	0.38	kJ/(kg°C)
Resistivity at 20°C	62	nΩm
Temperature coefficient for resistance at 20°C, 0-100°C	0.0017	°C
Conductivity at 20°C	15 28%	MS/m IACS[1]
Thermal conductivity at 20°C	120	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.

Heat treatment

Stress-relief annealing. Temperature 330-350°C. Time 2-4 hours. Stress-relief annealing should be carried out after all cold working which gives high residual tensile stresses in the material. It may also be justified after machining. This eliminates the risk of stress corrosion cracking caused by internal stresses.

Soft annealing. Temperature 500-550°C. Time 1-2 hours.

Workability

Hot workability is very good. Suitable temperature 650-775°C. 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 in the hot worked and annealed condition is satisfactory. The workability decreases as hardness increases. For stress-relief annealing after cold working see Heat treatment.

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 CW617N 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

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

Tool and cutting data. Tungsten carbide according to ISO-group K 10.

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

Welding and brazing

The high lead content means that in welding, the material becomes hot brittle and the weld is porous. The following applies to the different welding methods:

Welding method	Suitability	Comment
Fuse welding and resistance welding	Poor	Cannot be carried out with good results.
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	Difficult to carry out with a phosphorus-copper solder and cannot be carried out with satisfactory results with a brass solder (see Braze

	solder	welding).
Soldering	Excellent	Very easy to carry 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

CW617 N 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 state "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	>400	MPa
Rp02, Yield strength	~340	MPa
A5, Fracture elongation	>15	%
Brinell hardness	~120	HB