

## BRASS ALLOY CW511L AquaNordic® - Rod

CW511L Aqua Nordic® is a free cutting and forging brass in the form of rod. The alloy has very good dezincification resistance. The alloy is lead free and is approved according to the 4MS list, use for drinking water applications, product groups B-D. The alloy is also approved by Kiwa Sverige AB according to Type approval 1303 for components with contact with drinking water.

### Composition

CW511L	Cu	Zn	Pb	Sn	Fe
Limits	62.5–63.5%	Rem	<0.1%	≤0.1%	≤0.1%

Al	Ni	As	Mn		Other
≤0.05%	≤0.1%	0.02-0.05%	<0.1%		<0.2%

### Standardization

The alloy is, according to international standards.

CW511L	CuZn38As. The alloy is to be found in 4MS Composition List category 2.
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SS-EN 12163, rod for general purposes

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

SS-EN 12168, hollow rod for free machining purposes

### Structure type

$\alpha$ -phase. Some  $\beta$ -phase may occur.

### Application example

Rod:

Fitting parts in contact with water where there are stringent requirements for dezincification resistance.

### 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 is dezincification resistant, according to ISO 6509 and AS 2345-2006.

#### Heat treatment

**Stress-relief annealing.** Temperature 330-350°C. Time 1-2 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** (Dezincification resistance annealing). Temperature 500-550°C. Time 1-2 hours.

#### Workability

**Hot workability** is good.

**Cold workability** is good.

#### Mechanical properties

Nordic Brass Gusum quality AquaNordic® rod, meets and exceeds the quality demands, with 15-30%, defined in the CW511L standards. To give an idea of the mechanical properties some empirical values, according to the material condition "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	>330	MPa
Rp02, Yield strength	~240	MPa
A5, Fracture elongation	>40	%
Brinell hardness	~95	HB

#### 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 AquaNordic® correspond to CW511L.

Corrosion types	Corrosion resistance	Comment
Stress Corrosion Cracking, SCC	Very good	
Dezincification, DZR	Very good	

### Machinability

The alloy is possible to be machined in CNC-machines and cam-type automated machines but not as easy as traditional free cutting brass with high content of lead, like CW614N. The chips can be mixed with leaded alloys like CW617, CW614N and CW602N on the return.

**AquaNordic®** bar give lower cutting forces, less vibrations, less stickiness, better chip breaking and less burr formation compared to low leaded brass with the same content.

**Tooling and cutting data:** PVD-coated carbide, according to ISO-group K10. The given values vary according to the current machine tool, the cutting tool and type of operations

Cutting data	PVD-coated carbide <sup>1)</sup>	PVD-coated HSS
Rake angle $\gamma_o$	15-25°	15-35°
Clearance angle $\alpha_o$	6-11°	6-14°
Cutting speed $v_c$	150 m/min or faster	100 m/min or faster
Feed $f_n$	0,05-0,20 mm/edge	0,05-0,20 mm/edge
Chip breaker	Type MM or ground <sup>2)</sup>	Ground on rake face
PVD-coated tools	TiAlNO	Low friction type
Coolant	Oil or emulsion	Oil or emulsion

1. Uncoated carbide can be used efficiently when the chip breaking properties are critical. A thick and more brittle chip is achieved but also higher cutting forces in comparison to cutting with coated carbide. CVD-coated carbide is not recommended, it has often to large edge radius (blunt).

2. Chip breaker is needed in most turning applications. This breaker should be relatively open. If the chip breaker is to narrow, the cutting forces will be higher than necessary.

### Welding and brazing

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 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	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.

### Recycling and Environment information

AquaNordic®, with a lead content < 0,1% is not only approved in the environment classification system as BASTA, Byggsvarubedömningen and Sunda Hus, furthermore also in an international level by the EU, through 4MS composition list, and by the American authority. The alloy fulfils, all for the moment known demands.

All returns from this alloy can be handled without any restrictions of mixing and can therefore be used as a base of all of our alloy alternatives.