



# BRASS 58A (CuZn39Pb3)

Pb alloyed free machining brass

**Particularities** The brass 58A (CuZn39Pb3) is the most used brass for machining on automatic machines/lathes. It has an excellent machinability. Furthermore, it can be easily warm formed.

**Applications and uses** Many different applications

Standards	Material number
	CW614N (former DIN 2.0401)
EN	CuZn39Pb3
ISO	CuZn38Pb3
UNS / ASTM	C38500
NF	CuZn40Pb3
SNV	CuZn39Pb3
UNI	P-CuZn40Pb2
JIS	C3603

Chemical composition (%wt)	Cu	Pb	Ni	Fe	Sn	Al	others	Zn
	57	2.5	max.	max.	max.	max.	max.	balance
	59	3.5	0.30	0.5	0.3	0.005	0.2	

**Dimensions and tolerances**

- Round bars and cold drawn: 1 – 22 mm ISO h8 (h9)
- Closer tolerances on request.

**Executions and Delivery condition**

Standard delivery condition: thermally stress relieved

- Round bars and shaped bars: in length of 3 m +50/0
- bar ends: pointed, chamfered
- Straightness: 0.5 mm/m

Other executions on request

**Availability** Standard dimensions on stock, see: [Sale program](#)

Mechanical properties	Standard delivery condition:		thermally stress relieved			
	According to DIN 12164 Bars:		condition: cold drawn (not stress relieved!)			
	Designation	Rm (MPa)	R <sub>0.2%</sub> (MPa)	A (%)	Hardness Hv/HB	
Ø 2 – 6 mm:	R550	550	(440)	--	(150)	
Ø 2 – 14 mm:	R500	500	(390)	8	(150)	
Ø 2 – 40 mm:	R430	430	(250)	10	(120)	

**Cutting conditions**

Machining index: 100 (Europe: CuZn39Pb3 = 100; USA: CuZn36Pb3 = 100)

Machinability: very good

forms short acicular, needle like chips

- The brass 58A in the R550 (Rm = 550 MPa) hard condition can still be more easily machined than in the semi-hard R400 (Rm = 400 MPa) condition.
- Cutting speed: V<sub>c</sub> ≈ 60 - 120 m/min.

The optimal cutting conditions depend on the machine tool, the cutting tools, the chip dimensions (cutting depth and feed), the cutting speed, the lubricant-cooling fluid, the tolerances and surface roughness to be produced, and, obviously, the experience of the machinist.



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**Microstructure**

The CuZn39Pb3 brass A58 is a two phases alloy Alpha-Beta in solid solutions. The Alpha phase is cubic face centered, the Beta phase, richer in Zn, is cubic centered.

- The alloyed Pb addition is not soluble. Pb is present as fine particles uniformly distributed, predominantly at the grain boundaries.
- The Pb addition permits a better control of the grain size during annealing.
- The volume Pb concentration is approximately 1.5%vol.
- Pb strongly favors the machinability by forming small acicular chips.

**Forming**

Warm: 625 – 725°C, good formability  
 Cold: limited  
 • The cold reduction before annealing is limited to 20%.

**Welding**

Gas, arc, WIG and MIG: difficult, not recommended  
 Resistance welding: average  
 • A not fully controlled welding operation can lead to Zn loss by dezincification of the surface zone. The temperature of evaporation of Zn is 906°C only.  
 • The high Pb content of the Brass 58A renders its welding particularly challenging, because the solidification shrinkage of the weld pools favors the formation of tensile internal stresses in the assembled components.

**Brazing**

Average

**Soldering**

Very well adapted to soldering

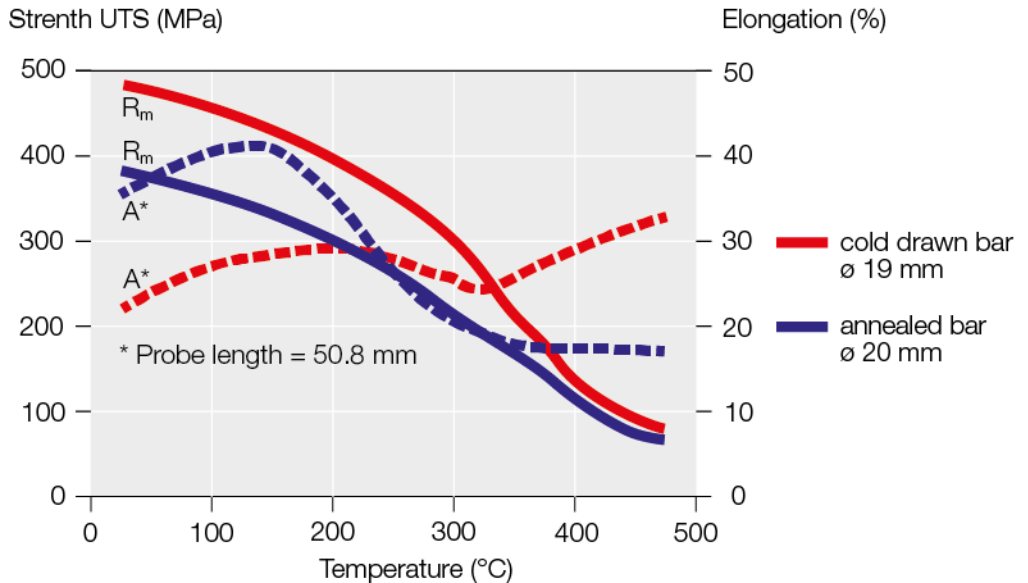
**Gluing**

Well adapted to gluing

**Heat treatments**

Soft anneal: 450 – 600 °C  
 Thermal stress relief: 250 – 350 °C  
 • A stress relieving anneal may reduce the strength of the heat-treated material.

**Diagram of the mechanical properties**





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**Polishing**  
 Mechanical: very well adapted  
 Chemical: less adapted  
 Electrolytic: less to poorly adapted

**Laser marking**  
 Fairly difficult  
 • The presence of Pb makes the laser marking more difficult, requiring additional attention and precautions.

**Electroplating**  
 Very well adapted

**Corrosion resistance**  
 • The corrosion resistance of the Brass 58A (CuZn39Pb3) in water, saline and organic solutions is not as good as with the single phase, homogeneous Alpha brass. Its Beta phase richer in Zn is more sensitive to corrosion.  
 • Under given circumstances, a “dezincification” of the surface zone may take place in soft water having a high Cl content and low carbonates content.

**Stress Corrosion Cracking (SSC):**

- Under the influence of internal, external or of both tensile stresses, the Brass 58A (CuZn39Pb3) exposed to ammoniac, amines, or ammonium salts, can crack, or even break catastrophically by SSC.
- The tensile stresses prevalent in operation, or build in during assembly of the parts, may significantly increase the SSC risk.
- SSC can also be prevented, by submitting the finished machined parts, or assemblies, to a stress relieving treatment before their final use.
- The usage of thermally stress-relieved bars, as those supplied by L. Klein SA, contribute to reduce – eliminate this risk.

**Physical properties**

Properties	Units	Temperature (°C)			
		20	200	300	400
Density	g cm <sup>-3</sup>	8.47			
Young modulus of elasticity E	GPa	97			
Electrical resistance	Ω mm <sup>2</sup> m <sup>-1</sup>	0.066	0.083		
Thermal coefficient of the electrical resistance	K <sup>-1</sup>	1.7*10 <sup>-2</sup>			
Specific thermal conductivity	MS/m	15	12		
Thermal expansion	m m <sup>-1</sup> K <sup>-1</sup>	20–100°C	20–200°C	20–300°C	20–800°C
	10 <sup>-6</sup>	19.3	21.0	21.4	24.7
Thermal conductivity	W m <sup>-1</sup> K <sup>-1</sup>	-200°C	20°C		
		50	123		
Specific heat	J kg <sup>-1</sup> K <sup>-1</sup>	20°C	100 - 300°C		
		0.377	0.398		
Magnetism	diamagnetic: in the absence of free Fe only				
Magnetic susceptibility	cm <sup>3</sup> /g	-0.173			
		1.39*10 <sup>-4</sup> with 0,15% free Fe present			
Melting range	875-890°C				

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