

Wrought copper-chromium-zirconium alloy **CCZr** (CuCr1Zr) alloy 1050

CCZr is a material with high strength values and high recrystallisation temperature combined with very good electrical and thermal conductivity. These properties are achieved by heat treatment. The Zr - additive causes an increase in the hot notch toughness compared to the Zr-free variants still used abroad in some cases.

ZOLLERN brand	CCZr
EN designation	CuCr1Zr
EN material no:	CW106C

EN 12420:1999 Forgings
EN 12163:2016 Bars drawn
EN 12167:2016 Profiles drawn

// National designations / ISO

DIN	CuCrZr
DIN	2.1293
ISO	≈ CuCr1
USA	C18150 (≈ C18200)
GB	CC 102
F	U - Cr 0.8 Zr

≈ (substantial coherence)

// Composition (weight by per cent in %)

Cu	Cr	Zr	Fe	Si	Other
Rest	0.5 – 1.2	0.03 – 0.3	< 0.08	< 0.1	< 0.2

also available with Cr 0.60-0.80 and Zr 0.08-0.11

// Strength properties at room temperature

(minimum values)

[1] EN 12420:1999 [2] EN 12163:2016 min. 200 Kg [3] EN 12167:2016 min. 200 Kg	$R_{p0.2}$ N/mm ²	R_m N/mm ²	A_5 %	HB
[1] Forged parts and die pressed parts	270	360	15	110
[2], [3] Bars and profiles, drawn up to Ø 30 mm or thickness	420	470	8	150- 180

// Strength properties at elevated temperatures (reference values)

Temperature	°C	20	200	300	400	500
0.2% limit	$R_{p0.2}$ N/mm ²	340	300	275	250	190
Tensile strength	R_m N/mm ²	460	380	340	300	230
Elongation	A_5 %	26	24	24	28	30

// Physical properties

Density at 20 °C	8.9 kg/dm ³
Melting temperature/range	1070 – 1080°C
Coefficient of linear expansion from 20° to 100°C	$17 \times 10^{-6} \text{ } ^\circ\text{C}^{-1}$
from 20° to 300°C	$18 \times 10^{-6} \text{ } ^\circ\text{C}^{-1}$
Specific heat at 20°C	0.394 J/g × °C
Thermal conductivity at 20°C	3.35 W/cm × °C
Electr. conductivity at 20°C	> 43 MS/m > 75 % IACS
Electr. resistance at 20°C	0.0233 Ω mm ² /m
Temperature coefficient of the electrical resistance (0 - 100°C)	0.0031 °C ⁻¹
Permeability	< 1.01
Young's modulus	130 KN/mm ²

// Dynamic strength values at room temperature (reference values)

Rotational bending fatigue strength R_{bw} at 20×10^6 load cycles	170 N/mm ²
Notched impact energy (ISO - V/KV)	150 joules

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Application examples

Due to the much better hardness and strength values compared to pure copper, with still very good electrical conductivity, CCZr is suitable for parts subject to high electrical and strength stresses. Since the recrystallisation temperature is approx. 500°C, the material is also used for thermally stressed parts. These are, for example

- Short-circuit rings and short-circuit bars, exciter bars and contact bolts for electrical engineering.
- Seam welding discs and spot welding caps for resistance welding.
- Electrode holders and jaws for flash butt welding machines.
- Parts for high voltage switches.
- Heat sinks and cooling elements in accelerator facilities and fusion reactors.
- Ingot moulds for non-ferrous metal, grey or continuous steel casting, also casting wheels. Here the favourable creep behaviour also has an effect.

Relaxation annealing	300 – 350°C
Soft annealing	600 - 800°C
Soft soldering	good
Brazing	not suitable because of softening
Welding	not very suitable for gas, shielding gas or resistance welding. Electron beam welding should be carried out in the "solution annealed" condition and then the component should be hardened
Surface treatment	Good polishing and galvanisability

// Experimental conditions

Stress 96.5 N/mm²
Temperature 175°C
Test time 1000 h

// Creep extension

1.12 % for SE-Cu
0.09 % for Cu Ag 0.10 P

Stress 142 N/mm²
Temperature 200°C
Test time 1000 h

0.1 % for Cu Cr Zr

Machinability

CCZr has good hot and cold forming properties. Particularly good cold formability is found in the "solution annealed" condition. During machining CCZr behaves better than pure copper during machining. Flow chips do not form for as long. The machinability index is approx. 30 where CuZn39Pb3 = 100.

All information is given to the best of our knowledge. This does not constitute a guarantee of properties. Our liability shall be determined in accordance with the individual contractual provisions or our general terms and conditions.