

# High Conductivity Copper Powders

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## **ACuPowder International, LLC**

901 Lehigh Avenue, Union, NJ 07083 USA  
Phone: (908) 851-4500 X590 Fax: (908) 851-4597



**Dial Extension 521 For additional Technical Assistance**

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## FABRICATION OF HIGH CONDUCTIVITY PARTS USING ACUPOWDER 5058 COPPER POWDER

High electrical conductivity in the range of 90-95% IACS can be obtained by using **ACuPowder 5058** copper powder for the fabrication of P/M parts. P/M techniques overcome the machining problems associated with cast copper, eliminate scrap and simultaneously yield good mechanical properties with electrical and thermal conductivity.

### PROCESSING RECOMMENDATIONS

The grade of **ACuPowder** Copper powder best suited for high conductivity applications is our **5058**. The powder is shipped in sealed drums, which should be kept closed until the time of actual usage. Precautions should be taken to avoid contamination during all stages of handling and processing. Oxidation and contamination of the powder will detrimentally affect the electrical conductivity.

One hundred parts of **5058** copper is blended with 0.75 parts of lithium stearate and compacted between 20-30 TSI. Thicker parts should be compacted at lower pressures to facilitate complete lubricant burn-off.

The compacted parts are preheated at 500°C (932°F) in a reducing atmosphere, preferably dissociated ammonia, to completely burn-off the lubricant. This is followed by sintering also in a reducing atmosphere, preferably dissociated ammonia, at a temperature of 950°C (1742°F) for a total hot-zone time of 60 mins. The atmosphere gas should be used generously and allow maintenance of a clean, uncontaminated hot zone.

The sintered parts are coined at about 50 TSI to increase the density and electrical conductivity and also to meet the required dimensional tolerances. Coining is especially recommended for parts that are initially compacted at low pressures.

Depending on the final mechanical property, and conductivity requirements, the coined part may be annealed or even re-sintered and re-coined.

### Typical Properties of 5058 Copper Powder

Purity (%)	99.8
H2 Loss (%)	0.18
A.D. (g/cc)	3.1
Flow (sec.)	26
Screen Analysis +100	Tr
- 325	58

### Properties at Optimum Processing Conditions

Fabricating Variables	5058
Compacting Pressure, TSI	30
Pre-Heat Temperature, °C	500
Time in minutes	15
Sintering Temperature, °C	950
Time in minutes	60
Furnace Atmosphere	Diss. NH <sub>3</sub>
<b>As-Pressed Properties</b>	
Green Density, g/cc	7.53
Green Strength, PSI	1800
<b>As-Sintered Properties</b>	
Sintered Density, g/cc	8.3
Dimensional Change, in/in	-0.035
% Theoretical	94.7%
Tensile Strength, PSI	28,800
Elongation, %	40
Electrical Conductivity % IACS @ 20°C	90
<b>Coined Properties</b>	
Coining Pressure, TSI	50
Density, g/cc	8.64
% Theoretical	96.9
Tensile Strength	37,000
Elongation, %	18
Electrical Conductivity % IACS @ 20°C	92.5