



Q10plus v2.0 Pure Cu

Parameters for the Arcam EBM Q10plus v2.0

Data in this material datasheet represents material built with 50 µm layer thickness and in a vacuum atmosphere. Values listed are typical.



Pure Copper

Copper is a widely used material class with multiple subsets of copper alloys for various fields of application.

Pure copper has one of the highest electrical and thermal conductivities of all metals. It shows good corrosion resistance in several environments as well as antibacterial behavior.

The electrical and thermal conductivity in particular make pure copper an excellent choice for applications such as heat exchangers and induction coils, but also for electrification components which are gaining attention from the industry.

Arcam EBM Q10plus v2.0 Pure Copper

The Arcam EBM Pure Copper process runs at a powder bed temperature of around 300° C and can manufacture high purity copper with excellent thermal and electrical conductivity as well as high density. The EBM process enables highly complex geometries resulting in higher component efficiency or reduced material consumption. The unique EBM environment ensures outstanding copper purity thanks to the high vacuum levels and a uniquely high productivity due to the high energy absorption of electrons compared to other AM modalities. No heat treatment or stress relief is needed to achieve below properties.



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This material is developed to Development level (D-material), see “Arcam EBM Maturity Levels” section. The parameter set has been partially developed for a limited range of geometries, chemistries and applications as proof of concept. The parameter set needs further optimization to suit the specific needs for individual applications.

POWDER AND CHEMISTRY

- Powder material not supplied by GE Additive, recommendations can be provided
- Powder chemistry used to generate presented properties available in Table 1 below
 - Note: the parameter set developed is tied to a specific powder specification. Variation in powder chemistry might cause process variations
- Powder size distribution: 45-105 μm

Table 1 – Chemical composition of the powder. The chemical composition of the powder is defined by a purity >99.95 % copper and complies with the OFHC material class (except an increased oxygen level, O <300 ppm)

Element	Cu	O	P
(wt.-%)	>99.95	<0.03	<0.005

MACHINE CONFIGURATION

- Arcam EBM Q10plus v2.0
- EBM Control 5.3.74

AVAILABLE PARAMETERS

- Development level (D-material) parameter set available, see section “Arcam EBM Maturity Levels”

MATERIAL PROPERTIES

- Test coupons printed with the Arcam EBM Pure Copper parameter set show outstanding physical properties with regards to conductivity and ductility. All data below is based on as-built material testing, without prior HIP or heat treatment of test coupons

Table 2 – Achieved electrical and mechanical properties of as-built Arcam EBM Pure Copper

Typical properties, as-built condition	Horizontal	Vertical
Electrical Conductivity	57 MS/m (> 98 % IACS)	
Ultimate Tensile Strength, R_m	200 Mpa	170 MPa
0.2% Yield Strength, $R_{p0.2}$	125 MPa	105 Mpa
Elongation at break, Z%	35 %	31 %
Reduction of Area, A%	58 %	34 %

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ARCAM EBM MATURITY LEVELS

Development Material (D-material)

- Mechanical data available for limited build envelope and conforming to relevant industrial standards
- Capable of building complex geometries, mechanical data not guaranteed
- Offered to all customers as a general release

Production Material (P-material)

- Fully verified according to Arcam EBM Process Verification
- Mechanical data available for full build envelope and conforming to relevant industrial standards
- Capable of building a wide range of complex geometries, including typical applications for the relevant industries
- Offered to all customers as a general release

Industrialized Material (I-Material)

- Can be developed either with a P or D Material as a starting point
- Optimized for production for a customer with a specific application
- Can be developed by the customer, require appropriate training and time
- Development service to I material is offered by GE Additive AddWorks as fast track