Meltio CuCrZr

CuCrZr

CuCrZr is a high-strength, high-conductivity copper alloy for demanding electrical and mechanical applications. It is non-magnetic, corrosion-resistant, and withstands temperatures up to 400°C. Ideal for aerospace, automotive, and railway cables, it offers excellent flex life and redrawability. Eco-friendly and free of lead, cadmium, and beryllium.

General Properties

Wire Diameter	Weight on Spool	Spool Type	Wire Coating	Melting Point	Wire Density	Recom. Build plate	Drive Wheels	Inertization[2]
1.0 mm	15 kg	BS300	Uncoated	1083 ºC	8.94 g/cm³	304 Steel	1.0 U-Groove	Full Chamber

Chemical Composition

Cu	Cr	Zr
99.88 -99.34	0.1-0.6	0.02 -0.06

ISO/ASTM 52942:2020: Group C [4]

Tested Print Hollow Profiles

Laser	Profile name	Meltio TRL[1]	Laser Power [W]	Energy Density [J/mm3]	Deposition Rate [g/h]	Volume rate [cc/h]	Relative Density [%]	Max Pore/Defect [µm]
450 nm	**Hollow 1P Rev 8 2 mm 2025-02-13**	Develop	1000	83.33	386	43.18	-	-
	Hollow 1P Rev 9 3 mm 2025-02-25	Develop	1000	83.86	384	42.95	-	-
450 nm	**Solid Rev 6 2025-06-30**	Develop	1400	69.44	651	72.71	-	-
	Hollow 1P Rev 2 2025-06-27	Develop	1400	82.96	541	60.40	-	-
	Hollow 2P Rev 6 2025-07-07	Develop	1400	138.89	316	35.79	-	-

* Printing profiles available in our official Slicers: **Meltio Horizon** for standalone Printers and **Meltio Space** for Laser Integration Kits.
** Profiles developed for the 1.4Kw blue head will be available for Meltio Space for laser integration kits.

Structural Properties

ASTM E8/E8M UNE EN ISO 6892-1 UNE EN ISO 6507-1	Wire	Blue Laser			
		Heat Treatment		As Printed	
		XY	XZ	XY	XZ
Ultimate Tensile Strength [MPa]	380	WIP	WIP	WIP	WIP
Yield Strength [MPa]	280	WIP	WIP	WIP	WIP
Elongation [%]	15	WIP	WIP	WIP	WIP
Hardness [HV-30]	-	-	-	-	WIP

Reference Standards

	Wrought *(ASTM B740)*
Ultimate Tensile Strength [MPa]	450
Yield Strength [MPa]	350
Elongation [%]	20
Hardness [HV-30]	-

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Internal Structure [3]

Micrography

The microstructure of the CuCrZr alloy is primarily composed of equiaxed grains typical of copper-based systems. The grains appear with varying contrast under optical microscopy due to crystallographic orientation differences. Both light and dark regions correspond to the copper matrix, which constitutes approximately 99% of the alloy composition. The remaining alloying elements, chromium (Cr) and zirconium (Zr), are present in small amounts and are not easily distinguishable using standard optical microscopy.

Blue Laser

Meltio Material Datasheet

Meltio CuCrZr

CuCrZr

1.Meltio TRL Classification System

The manufacturing process of Copper and Aluminum using Meltio's Blue Laser technology has certain limitations. Currently, thin-walled geometries (produced in a single pass) can be reliably manufactured. However, solid or bulky components present challenges due to variations in material behavior and thermal properties as the volume and mass increase. While small solid volumes of these materials can be printed, scalability remains an area of ongoing development.

Additionally, the technological readiness of Copper and Aluminum printing is currently between **Technology Readiness Level (TRL) 3 and 4,** indicating that it is still in the experimental validation and optimization stages. In contrast, other Meltio materials, such as steels, nickel and titanium alloys, have reached higher maturity levels, ranging from TRL 7 to 9, with validated applications in industrial environments.

To clearly communicate the development and readiness level of materials within the Meltio ecosystem, an internal classification system has been established, aligned with the standard Technology Readiness Levels (TRL). This framework offers a structured reference for customers, partners, and integrators regarding the current validation stage and industrial applicability of each material.

Meltio Tier	TRL	Description
Meltio Explore	1–3	Exploratory phase focused on researching new alloys and process configurations. Designed for R&D environments aiming to push the boundaries of the technology.
Meltio Develop	4–6	Active development stage. Functional results have been achieved, with evolving process parameters. Suitable for concept validation and pre-industrial applications.
Meltio Qualified	7-8	Material and process qualified for demanding applications. High repeatability and reliability, ready for integration into real-world production environments.
Meltio Proven	9	Fully validated in industrial settings. Material used in end-use parts with proven performance in actual production. Represents the highest level of technological maturity.

2.Inertization

Inertization of Meltio M600 machinery can be performed in two ways: localised inertisation or full chamber inertization. Both options are designed to ensure a controlled environment during the 3D printing process and prevent oxygen contamination of reactive materials.

Localised Inertization:
In this mode, the shielding gas is supplied locally through the shield nozzle located in the deposition head, with a flow rate of approximately 20 L/min. This method is suitable for most applications where oxygen control in the work area is necessary without requiring a completely isolated environment.

Full Chamber Inertization:
For more demanding applications, it is possible to perform a full chamber inertization. In this case, the chamber must be preconditioned before the printing process is started, reaching an oxygen concentration of 50 ppm. It is essential to control the oxygen concentration in the chamber, as reactive materials can absorb oxygen even when the part is hot, not only when it is in the melt pool.

The choice of inertisation method depends on the properties of the material to be used and the specific requirements of the printing process, ensuring the highest quality and integrity of the manufactured parts.

3.Internal Structure

Micrography

The micrography were obtained from a 10x10x60 mm printed block using the Blue laser. The metallographic analysis followed ASTM E3-11:2017 standards, ensuring proper preparation and examination of the microstructure and were analyzed by an external laboratory. (*CETEMET i+d+i@cetemet.es*)

4. Material Classification (ISO/ASTM 52942:2020)

The metallic material specified in this technical data sheet is classified in accordance with the ISO/ASTM 52942:2020 – Additive Manufacturing — Metallic Materials — Classification. This standard defines a harmonised system for the designation and categorisation of metallic materials used in additive manufacturing, ensuring consistent identification and traceability.

CuCrZr is designated within **Group C**, corresponding to precipitation hardened copper alloys.