



GE Additive

13
Al

| | | | | | |
|----------|----------|----------|----------|----------|----------|
| 22 Ti | 24 Cr | 26 Fe | 27 Co | 28 Ni | 29 Cu |
|----------|----------|----------|----------|----------|----------|

ARCAM EBM Q10plus CoCr

ARCAM EBM Q10plus V1.0 with EBM Control 5.2

Data in this material datasheet represents material built with 70µm layer thickness in a vacuum atmosphere on a ARCAM EBM Q10plus V1.0 with EBM Control 5.2 and Process Theme 5.2. Values listed are typical.



Cobalt Chromium

Parts are fabricated from cobalt chrome alloys like ASTM F75 or F3213 CoCr when excellent resistance to high temperatures, corrosion and wear are critical. It is an appropriate selection where nickel-free components are required, such as in orthopedic and dental applications due to the hardness and bio-compatibility necessary for long-term performance. Cobalt chrome alloys are used in additive manufacturing to print parts that often benefit from hot isostatic pressing (HIP), which combines high temperatures and pressures to induce a complex diffusion process that strengthens grain structures, producing fully dense metal parts.

ARCAM EBM Q10plus V1.0 CoCr

The parameters for the Q10 V1.0 are developed based on the processes developed from previous iterations and information from other machines. The current process has a layer thickness parameter of 70µm and demonstrates properties that meet ASTM F3213 standards.

Thousands of developmental hours and testing have resulted in a parameter with increased productivity and mechanical properties, delivering the best of both worlds.



ARCAM EBM Q10plus V1.0

With appropriate approval* CoCr can be used for aerospace, dental, and orthopedic applications

Data in this material datasheet represents material built with 70µm layer thickness in a vacuum atmosphere on an ARCAM EBM Q10plus V1.0. Values listed are typical.

POWDER CHEMISTRY

CoCr powder chemical composition according to ASTM F3213 with a powder size distribution of 45-105 µm. For more information on CoCr powder, visit <https://www.advancedpowders.com/contact>.

MACHINE CONFIGURATION

- ARCAM EBM Q10plus V1.0
- EBM Control Version 5.2
- Vacuum
- Stainless Steel Start Plate and Recoater

AVAILABLE PARAMETERS

- Process Theme 5.2 – 70µm

THERMAL STATES

1. As-Built
2. Hot Isostatic Pressed (HIP)
 - a. 1200 °C ±10 °C and 1000bar ± 50bar for 240min ± 30min

TYPICAL BUILD RATE

| | (cm ³ /h) |
|---------------------------------|----------------------|
| Typical Build Rate ¹ | 18.7-29.6 |

¹Measured by using standard Factory Acceptance Test layout. Range dependent on melt volume

PHYSICAL DATA AT ROOM TEMPERATURE

| Plane | Surface Roughness Ra (µm) | Bend (deg) |
|-------|---------------------------|------------|
| XZ | 56 | >105 |
| YZ | 45.5 | >105 |

| Thermal State | Relative Density (%) | | Hardness (HV) | |
|---------------|----------------------|-------|---------------|-----|
| | H | V | H | V |
| As-Built | 99.48 | 99.48 | -- | -- |
| HIP | 99.58 | 99.58 | 320.5 | 318 |

TENSILE DATA

Tensile Adhesion Testing according to ASTM E8

| Test Temperature: RT Thermal State | 0.2% Yield Strength (MPa) | | Ultimate Tensile Strength (MPa) | | Elongation (%) | | Reduction of Area (%) | |
|---------------------------------------|---------------------------|-----|---------------------------------|------|----------------|-----|-----------------------|-----|
| | H | V | H | V | H | V | H | V |
| As-Built | 681 | 676 | 634 | 950 | 0.5 | 1.8 | 0.9 | 4.7 |
| HIP | 555 | 567 | 1011 | 1036 | 19 | 14 | 19 | 16 |

H: HORIZONTAL (XY) orientation
V: VERTICAL (Z) orientation

ARCAM EBM Q10plus V1.0

* All of the figures contained herein are approximate only. The figures provided are dependent on a number of factors, including but not limited to, process and machine parameters, and the approval is brand specific and/or application specific. The information provided on this material data sheet is illustrative only and cannot be relied on as binding.

ge.com/additive

2

Diamond Cubic Cell Shape

Tensile Adhesion (MPa)

57.7

PRS Abrasion

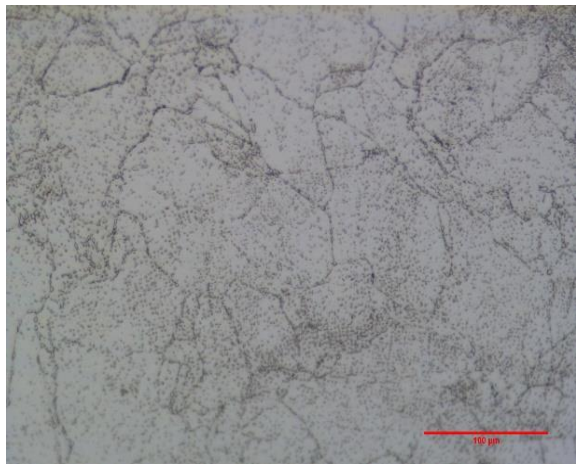
Unit Cell Size

1.7 mm

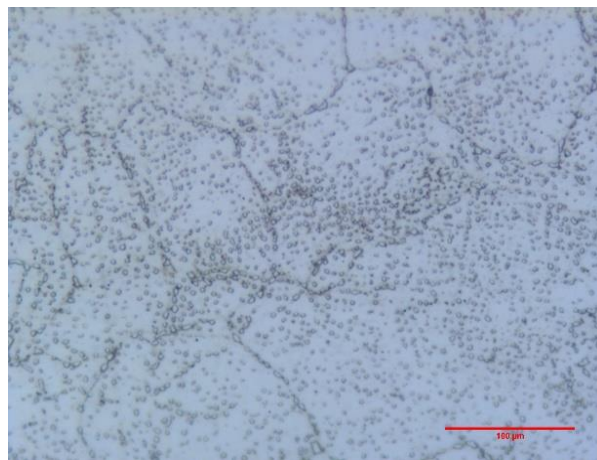
1.2 mm

| Mass Loss* (g) | Final Density (g/cm ³) | Structural Volume (cm ³) | Porosity (%) |
|----------------|------------------------------------|--------------------------------------|--------------|
| 0.03 | 2.52 | 0.8 | 70 |
| -- | 5.04 | 1.6 | 41 |

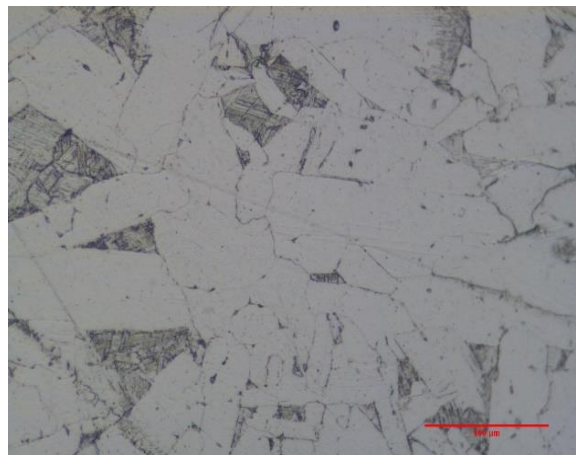
MICROSTRUCTURE



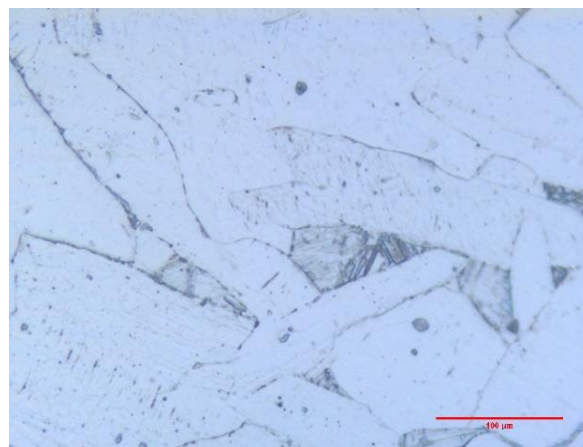
As-Built, XY Plane



As-Built, XY Plane,



HIP, XY Plane



HIP, XY Plane

* Masses measured after 3 minutes and 9 minutes of the PRS-process