

Material Product Data Sheet

H13 Hot Work Tool Steel Powder for Additive Manufacturing

Powder Products:

MetcoAdd H13-A, MetcoAdd H13-B

1 Introduction

MetcoAdd™ H13-A and H13-B are martensitic, iron-chromium, air-hardenable steel powder products with chemistries similar to AMS 6408, AISI H13, ASTM H13, SAE H-13 and Werkstoff No. 1.2344 / X40CrMoV 5-1-1.

Room temperature static properties of PBF-LB processed and heat treated material coupons have been shown to be comparable to those of AMS 6408.

For reference purposes Oerlikon has processed MetcoAdd H13-A using fixed parameters and 40 µm layer thickness to provide data below. Additional testing has been performed by an extensive network of consortia and customer partners on a broader range of machine types. Properties may be optimized based on application specific requirements.

Components manufactured using MetcoAdd H13-A or MetcoAdd H13-B exhibit high toughness, excellent hot hardness and are very resistant to thermal fatigue cracking.

Please note:

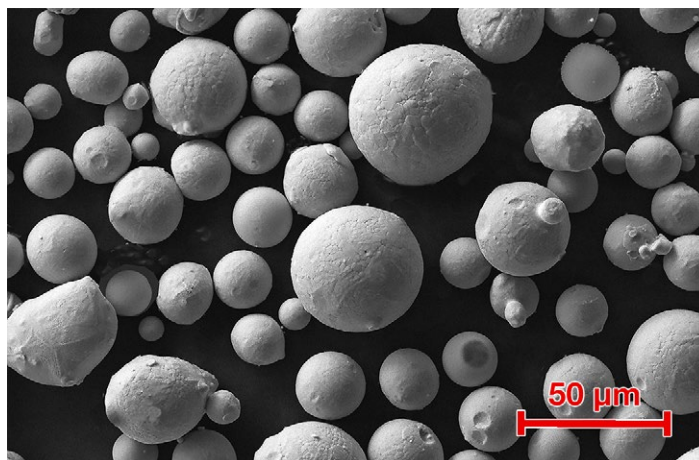
MetcoAdd H13 series materials must be printed at elevated temperatures that are above their Ductile-to-Brittle-Transition-Temperature (DBTT) of about 200 °C (392 °F) if nearly crack-free structures are mandatory for the as-printed part. Printing at or above the Martensite Start (MS) temperature for these materials of approximately 350 °C (662 °F) is even more preferred and produces crack-free components of the highest as-printed densities.

1.1 Typical Uses and Applications:

- Hot work dies for casting
- Casting dies for aluminum and magnesium
- Hot forging and stamping dies
- Hot shear blades
- Plastic injection molds

Quick Facts	
Classification	Alloy, Fe-based
Chemistry	Fe 5.2Cr 1.3Mo 1Si 1V 0.4C
Manufacture	Gas atomized (Argon)
Morphology	Spheroidal
Apparent Density	> 4 g/cm ³ (typical)
Solidus (typical)	1371 °C (2500 °F)
Liquidus (typical)	1482 °C (2700 °F)
Purpose	Additive Manufacturing
Process	MetcoAdd H13-A: Laser Powder Bed Fusion (PBF-LB) MetcoAdd H13-B: Directed Energy Deposition (DED) ^a

^a For additive manufacture printing build-up and/or repair only



Typical morphology of MetcoAdd H13-A gas atomized powder for additive manufacturing.

2 Material Information

2.1 Chemical Composition

Product	Weight Percent (nominal)					
	Fe	Cr	Mo	Si	V	C
MetcoAdd H13 series	Balance	5.2	1.3	1.0	1.0	0.4

2.2 Particle Size Distribution and Hall Flow

Product	Nominal Range [µm]	D90 [µm]	D50 [µm]	D10 [µm]	Hall Flow (s/50 g)
MetcoAdd H13-A	-45 +15	50	34	21	≤ 25
MetcoAdd H13-B	-90 +45	---	---	---	---

For the nominal range, particle size analysis 45 µm or above measured by sieve (ASTM B214), analysis below 45 µm by laser diffraction (ASTM C 1070, Microtrac). Fractional analysis (D90, D50, D10) are nominal values by laser diffraction. Hall Flow: ASTM B213.

2.3 Key Selection Criteria

- MetcoAdd H13-A is designed for the manufacture of components using L-PBF and offers optimized spreadability and dense packing.
- MetcoAdd H13-B is designed for processing using DED.
- Choose MetcoAdd H13 series for applications where hot strength and toughness are required and where thermal fatigue crack resistance is a must.

2.4 Related Products

- Oerlikon Metco offers other steel powders for additive manufacturing including stainless steels, maraging steels other tool steels and more. We offer a range of iron-, nickel-, cobalt- and titanium-based additive manufacturing metal powders that have been optimized for either powder-fed or powder-bed processes. Please contact your Oerlikon Metco Account Representative for more information.

2.5 Specifications

Product	Specifications (similar to)
MetcoAdd H13 series materials	UNS T20813 AMS 6408 AISI H13 ASTM H13 SAE H-13 Werkstoff No. 1.2344 / X40CrMoV 5-1-1

3 Key Processing Information

3.1 Typical Post Heat Treatment Properties (MetcoAdd H13-A) ^{a, b, c}

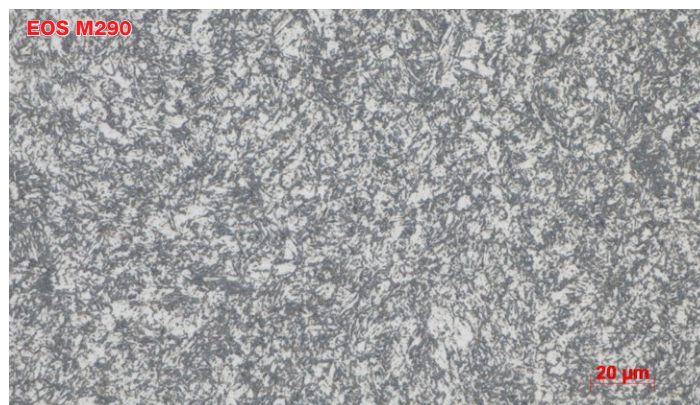
Specification		Concept Laser M2 Cusing	EOS M290
Ultimate Tensile Strength (MPa), XY/Z		1894 ± 12 / 1886 ± 16	1899 ± 7 / 1903 ± 12
Yield Strength (MPa), XY/Z	ASTM E8	1512 ± 14 / 1510 ± 14	1531 ± 37 / 1538 ± 31
Elongation at break %, XY/Z		10 ± 1 / 10 ± 1	11 ± 1 / 11 ± 1
Hardness (VHN ₃₀₀)	ASTM E384-17	568 ± 7	571 ± 5
Relative Density %	Internal Specification	> 99.8	> 99.9

^a Disclaimer: All data published in this datasheet has been shared for reference purposes only and is not sufficient to design or certify parts. No warranty or guarantee is made against these results.

^b Bounds are based on one standard deviation of each population with ten samples per orientation and machine. Test specimens were 6.35 mm (0.25 in) diameter round bars machined from coupons 75 x 75 x 13 mm (3 x 3 x 0.5 in). Direction XY data is an average of both X and Y horizontal build orientations.

^c Solutionize at 1010 °C ± 14 °C (1850 °F ± 25 °F) for 45 min. Cool to room temperature at a rate equivalent to air cooling. Temper at 537 °C (1000 °F) for 4h and air cool.

3.2 Post Heat Treatment Microstructure, Vertical Build Direction (MetcoAdd H13-A)



3.3 Additive Manufacturing Services

Oerlikon AM is an excellent source for pilot and production run additive manufacturing services and is ready to serve

your needs. Please contact your Oerlikon Metco account manager for more information or contact Oerlikon AM directly through their web site at www.oerlikon.com/am.

4 Commercial Information

4.1 Ordering Information and Availability

Product	Order No.	Package Size	Availability	Distribution
MetcoAdd H13-A	1100784	10 lb (approx. 4.5 kg)	Stock	Global
MetcoAdd H13-B	1100785	10 lb (approx. 4.5 kg)	Stock	Global

4.2 Handling Recommendations

- Blend contents prior to use to prevent segregation
- Keep in the original container, or an approved alternative, tightly closed when not in use
- Powder from previously opened containers should be stored in a humidity-controlled environment

4.3 Safety Recommendations

See the SDS 50-2134 (Safety Data Sheet) in the version localized for the country where the material will be used. SDS are available from the Oerlikon web site at www.oerlikon.com/metco (Resources – Safety Data Sheets).