

# FePHX

## Fe-based FeCrNiAl Alloy Powder for Additive Manufacturing 90/45 µm, Gas Atomized Designed for LMD

**FePHX powder, chemical composition with reference to Uddeholm Corrax**

### DESCRIPTION

FePHX Alloy powder is a gas atomized Fe-based FeCrNiAl alloy powder engineered for additive manufacturing (AM). This material is an iron-chromium-nickel-aluminium and precipitation-hardening alloy that features achievable hardness of up to 50HRC post heat treatment.

The material has exceptional resistance to corrosion and weldability which allows FePHX to be applied for a wide range of applications in injection molding. It has exceptional tolerance during heat treatments and maintains uniformity of its properties.

### KEY PROPERTIES

- Excellent resistance to corrosion and oxidation
- Adjustable hardness through ageing heat-treatment
- Exceptional toughness and ductility
- Excellent weldability
- Great polish ability

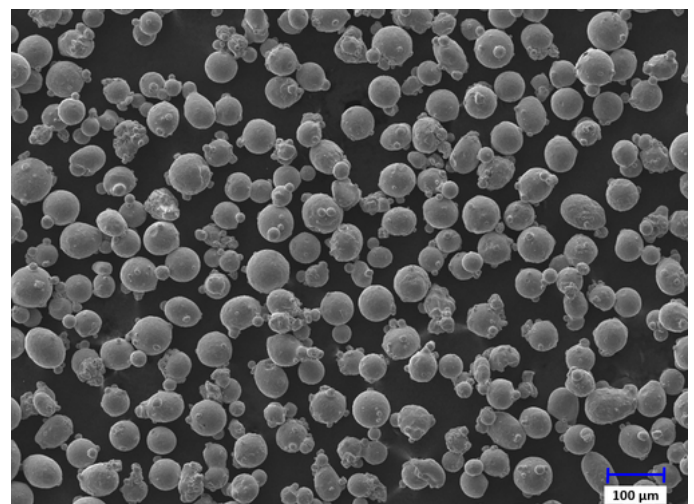
### APPLICATIONS

- Injection moulding tools for aggressive materials e.g. PVC
- Medical and food grade moulding tools
- Extrusion dies

### POWDER CHEMICAL COMPOSITION

Element	Min. (wt%)	Max. (wt%)
Fe	Bal.	Bal.
Cr	11	13
Ni	8.4	10
Al	1.2	2.0
Mo	1.1	1.7
Mn	-	0.4
Si	-	0.4
C	-	0.05
S	-	0.035
P	-	0.035

### SEM IMAGE



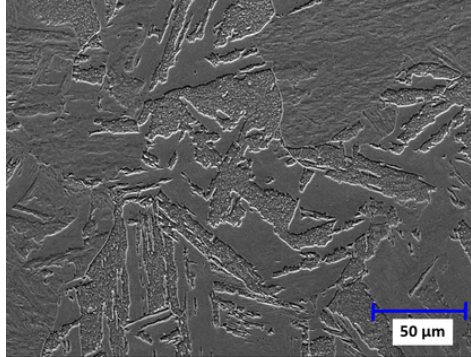
# POWDER PROPERTIES (ISO 4490, ISO 3923-1)

Particle Size Distribution ( $\mu\text{m}$ )	Hall Flow (s/50g)	Apparent Density ( $\text{g}/\text{cm}^3$ )
45 - 90	17.5	3.93

## MICROGRAPHS



Polished Surface



Microstructure

## PHYSICAL PROPERTIES (ISO 3369)

Average Defect Percentage (%)	Density ( $\text{g}/\text{cm}^3$ )
< 0.10	7.70

## MELTING POINT

Celsius ( $^{\circ}\text{C}$ )	Fahrenheit ( $^{\circ}\text{F}$ )
1430	2606

## HARDNESS (ISO 6507-1)

HV <sub>0.5</sub>
300

## MECHANICAL PROPERTIES (ISO 6892-1)

Condition	Orientation	Ultimate Tensile Strength (MPa)	0.2% Yield Stress (MPa)	Elongation at break (%)
As-Built	Horizontal	946 $\pm$ 2	729 $\pm$ 16	13.0 $\pm$ 0.7
	Vertical	940 $\pm$ 4	735 $\pm$ 23	12.0 $\pm$ 0.8
Heat-Treated*	Horizontal	1588 $\pm$ 4	1513 $\pm$ 8	7.0 $\pm$ 0.6
	Vertical	1605 $\pm$ 5	1520 $\pm$ 12	6.0 $\pm$ 2.1

Solution Annealing: 850°C for 30 mins, nitrogen cooling      Age Hardening: 525°C for 4h, nitrogen cooling

## PROCESS INFORMATION:

The properties reported in this Technical DataSheet are applicable to Makino AM powders tested and distributed by Makino and processed on Makino LMD machine utilizing parameters in accordance with relevant operating guidelines (inclusive of setup conditions and maintenance). The properties are obtained by following recommended protocols. Further information regarding the methods used by Makino can be provided upon inquiry.

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## CONTACT US:

Our Safety Datasheet (SDS) is available upon request. For more information or support please contact Makino at [sales-am@makino.com.sg](mailto:sales-am@makino.com.sg) or visit [www.makino.com.sg](http://www.makino.com.sg)

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