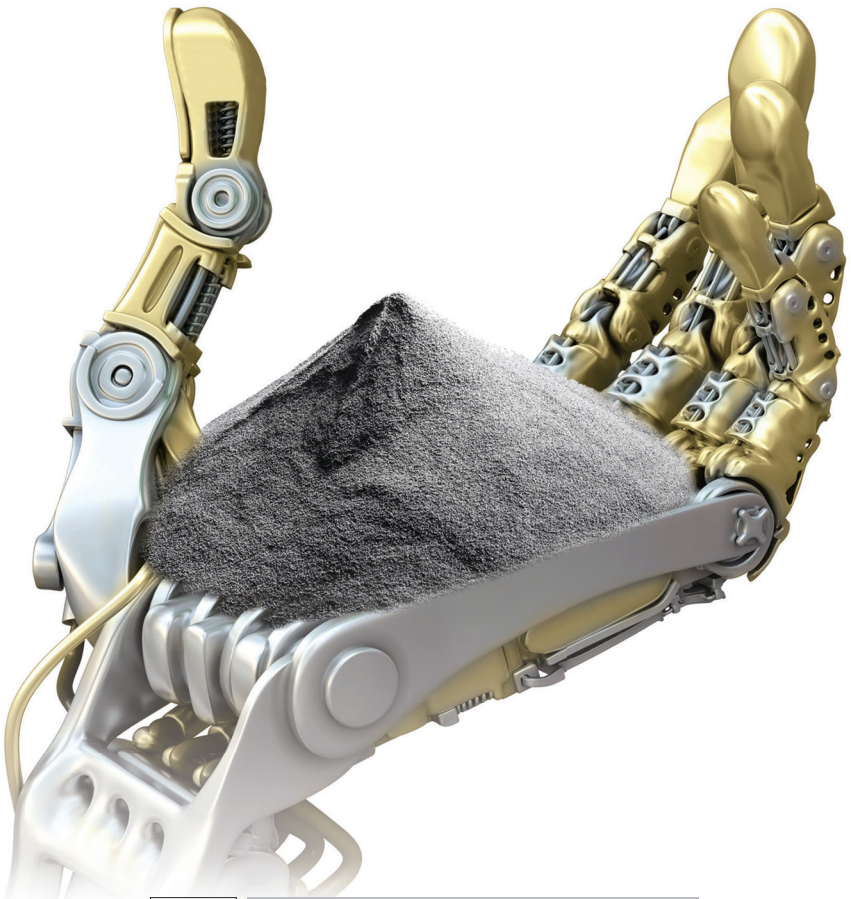




AncorMax[®] 225

Warm-Die Compaction

PROCESSING GUIDE



HOEGANAES
CORPORATION

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	AncorMax 225
Market Introduction	2013
Lubricant % (typical)	0.25
Powder Heating	No
Powder Temperature	Powder Heating Not Required
Die Heating Required	Yes
Part Temperature	90 °C - 112 °C (195 °F - 235 °F)

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	AncorMax 225
Punch Heating	No
Desired Punch Temp	—
Minimum Pressure	NA
Density Increase of 0.75% Acrawax C	0.15 g/cm ³ @ 760 MPa (110,000 psi)
Carbide Tools	Yes
Part Height Limit	25 mm (1 inch)

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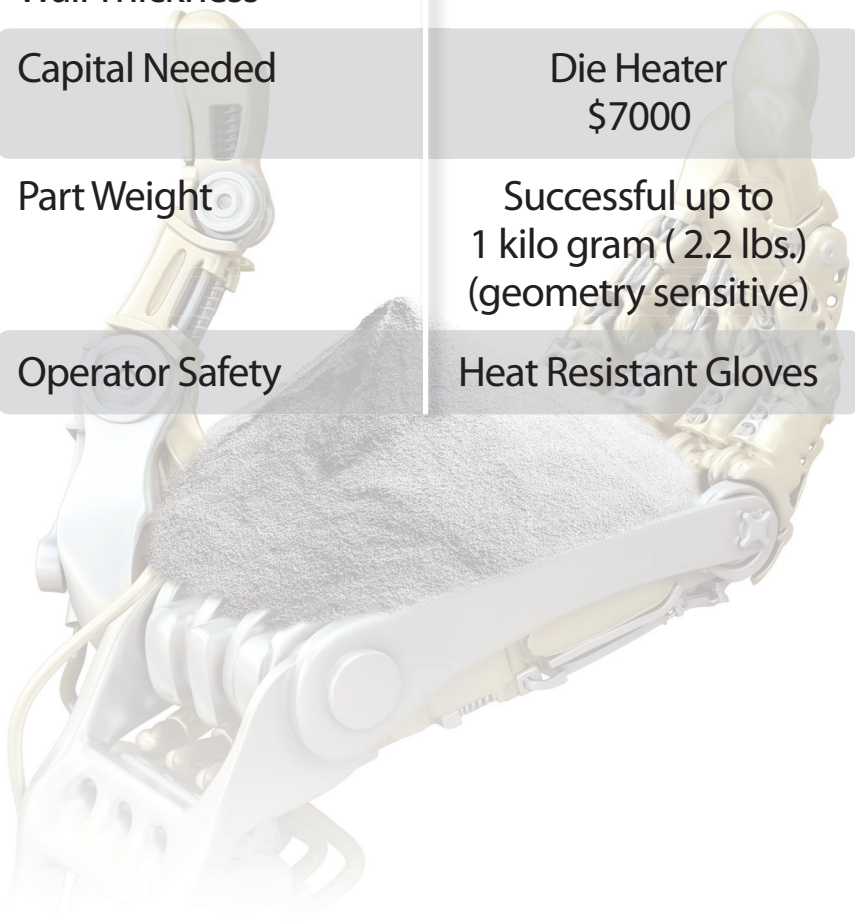


	AncorMax 225
Set-Up Time	Die Heater
Press Speed	Standard PM Limits
Apparent Density (typical)	3.3 / 3.4 g/cm ³
Insulate Tool from Die Table	Yes
Lubricant Burn-Off	Cleanest, similar to regular lubricants

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	AncorMax 225
Maximum Wall Thickness	19 mm (0.75 inch)
Capital Needed	Die Heater \$7000
Part Weight	Successful up to 1 kilo gram (2.2 lbs.) (geometry sensitive)
Operator Safety	Heat Resistant Gloves





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Checklist Prior to Sampling

- Preliminary discussions/literature review between Hoeganaes and parts maker
- Calculate the pore-free density of the selected material
- Verify that the target density is less than 98% of the pore-free density (practical limits are 97% @ 760 MPa [110,000 psi] and 98% @ 830 MPa [120,000 psi])
- Hoeganaes Corporation prepares a 200 kg (450 pound) sample premix and corresponding Certificate of Analysis
- Preparation of the compacting press for die/powder heating – see following list

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Die Heating Recommendations

- Six (6) cartridge heaters (8 for larger dies wired in parallel, inserted in the bottom of the die)
 - Two (2) controllers
- Alternating heaters around the perimeter of the die insert to be operated by the same controller
- For dies < 15 cm (6 inches) in diameter heaters should be at least 1.5 kW and should be at least 2 kW for larger dies

2 THERMOCOUPLE HOLES
180° APART

DIE CAVITY

INSERT

GREEN HEATERS
OPERATED BY
CONTROLLER 2

RED HEATERS
OPERATED BY
CONTROLLER 1

UNDERSIDE OF TOOL



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Suggested Die Heating Arrangement

- NEMA box to house all the components
 - Two (2) heater receptacles to connect the 6 or 8 heater cartridges
 - Two (2) heater controllers that also indicate the temperature
 - One (1) thermocouple input to operate both controllers



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Cartridge Heaters in Die



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Checklist Prior to/During Trial

- Ensure proper electrical connections
- Heaters in parallel and thermocouples in place
- Insure heater cartridge wires will not be damaged by press motions
- Temperature settings and tool clearances per specific requirements (see details)
- Ensure die fill level is set for the correct mass of powder
- Slowly increase the tonnage to the desired level
- If the surface temperature of the ejected part is below the target slowly increase the set points
- Monitor the part mass and tonnage throughout for consistency

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AncorMax 225 Trial

- Verify tool clearances of 0.010 to 0.015 mm per side (0.0004 to 0.0006 inches)
- Initially set the controllers to 80 °C (175 °F)
- Verify the die temperature using a hand held surface contact thermocouple
 - Ensure that the temperature is uniform around the perimeter of the die insert
- After 25 parts the target part surface temperature is 105 °C (range of 90 °C to 105 °C) (225 °F [range of 195 °F to 235 °F])
- Continue to monitor the temperatures throughout the trial