

Additive manufacturing module for *Mastercam*.

True additive travel paths

Additive process simulation

Intuitive graphical interface

Seamless integration into Mastercam

CAM for hybrid manufacturing



www.camufacturing.com





Select from the Mastercam toolbar and select the CAD entities to process The following entity types are supported:

- Solids
- Surfaces
- Polygon meshes





Geometry parameters

- The part may be defined by multiple solids, surfaces or polygon meshes.
- Extended travel path control is provided via containment boundaries, Z height restrictions and boundary start point control.

Planar Slice Additive Travel Pat	h (Laser Cladding) ×			
General	Geometry (solids, surfaces, pmesh entities)			
Geometry Toolpath Boundary	Selected entities: (1) Show			
Process	Containment			
Passes 5 Axis Bead Geometry Fill Process Passes 5 Axis Bead Geometry	Selected boundaries: (6)			
	Start of toolpaths			
	Selected line: (0)			
	Slice full part Upper Z slice limit: 0.0 Lower Z slice limit: 0.0			
	OK Cancel Apply Help			

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General travel path parameters

- The geometry may be sliced in any plane
- Slices may be offset to leave stock for machining
- User can select boundary / fill pass order
- Supports clearance Z moves to avoid tool collisions

Planar Slice Additive Travel Path (La	ser Cladding)			×
General Geometry	Slice Plane: Top			~
Geometry Toolpath Boundary Process Passes 5 Axis Bead Geometry Fill Process Passes 5 Axis Bead Geometry	Slice Plane: Top Slice height (spacing): Z shift: Contour offset: Arc chord tolerance: Clearance height: Initial clearance height: Comment:	0.2 5.0 0.2 0.003 1.0 4.0 Set Miscellane	inches inches inches inches inches inches	For each layer Do boundary first Do fill first Retract to Clearance Retract to Clearance Between surfaces Between all fill and boundary passes
		ОК	Cancel	Apply Help



Process parameters (laser cladding shown) for the boundary travel paths

• Separate parameters may be defined for the fill travel paths

Planar Slice Additive Travel Path	(Laser Cladding)	\times
General Geometry Toolnath	Process Parameters Spot Size	
Boundary	Bead width = spot size 0.5 inches	
Passes 5 Avic	Travel speed: 30.0 inches / min.	
Bead Geometry	Laser power: 4000.0 Watts	
Process Passes 5 Axis Bead Geometry	Dwell time for start of flow: 0.0 seconds	
	Feed rate: 1.0	
	Source (i) 1 () 2	
		_
	OK Cancel Apply Help	



Pass parameters for the boundary travel paths

• Can identify and fill voids left due to overlap settings

Canada	
Geometry	Boundary Pass Parameters
Toolnath	✓ Program boundary passes
Boundary	Number of beads: 12
Process	Pass overlap: 60.0 % of boundary bead width
Passes	
5 Axis	Max pass overlap: 75.0 % of boundary bead width
Bead Geometry	Start/stop overlap: 90.0 % of boundary bead width
ill	Lead-in / Lead-out
Process	Lead-in length: 0.04 inches
Passes	
5 Axis Baad Connector	Lead-out length: 0.04 inches
bead Geometry	
	Void Detection
	Attempt to fill voids



5 axis parameters for the boundary travel paths

• Lead-lag and side tilt are supported for both boundary and fill passes





Fill pass parameters

- Fill travel path angle may be changed for each layer
- 3 fill styles are supported
- Separate corner power and travel speed settings for each style (laser cladding shown)

Planar Slice Additive Travel Path (Las	er Cladding) X		
General Geometry Toolpath Boundary Process Passes 5 Axis Bead Geometry Fill Process	Fill Pass Parameters Program fill passes Pass overlap: 50.0 % of fill bead width		
	Maximum pass overlap: 75.0 % of fill bead width Boundary overlap: 50.0 % of boundary bead width Starting fill angle: 0.0 deg. Change in angle per layer: 90.0 deg.	Cladding Fill Style × Fillet radius on path corners: 20.0 0-40% of geometry Laser power on path corners: 4000.0 Watts	
Passes 5 Axis Bead Geometry	Minimum fill length: 0.118 inches Lead-in / Lead-out 0.04 inches Lead-in length: 0.04 inches	Travel Speed on Corners Same as fill passes travel speed 30.0 inches / min.	
	Fill style: Smart Zigzag Optimize to surface features Simple Zigzag Inking passes with rapids One Way OK Cancel		



The laser cladding additive operation is added to the Operation Manager

- Travel path is fully associative to both operation and geometry
- Operation parameters may be edited at any time
- If geometry is edited, the operation can simply be regenerated
- Backplot and machine simulation are supported



Additive Travel Path Simulation



- A virtual model of the additive part can be created and used to validate subsequent machining operations
- Model is stored in Mastercam as a polygon mesh and can be exported to other CAM systems for use as a stock model
- Optionally, a Mastercam stock model can also be generated and used with subsequent machining operations in Mastercam





Additive Stock Model

Machined Stock Model



Un-machined stock

NC Output (laser cladding shown)



Uses standard Mastercam post-processing engine (MP)

• Can be customized for any additive process

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00001
(Bracket)
(DATE=DD-MM-YY - 05-03-15 TIME=HH:MM - 23:24)
(MCX FILE - D:\MY DOCUMENTS\MCX\ADDITIVE MANUFACTURING\WIDGET.MCX-8)
(NC FILE - D:\MY DOCUMENTS\MY MCAMX8\MILL\NC\WIDGET.NC)
(MATERIAL - P20 SS)
G20
G0 G64 G17 G40 G80 G90 G93 G98
( Initial Tool )
G0 G54 G90 X6.1357 Y.01 CO. A0. M5
Z-.9969
/ M101 (LASER READY ON)
/ M103 (POWDER 1 ON)
/ M105 (SHIELDING GAS ON)
/ G4 P8
/ ( Powder feedrate: 10. )
/ ( Laser Power = 3000 Watts )
G1 G93 X6.135 Y0. Z-.9969 CO. AO. F999.99
/ M102
G1 X6.1252 Y-.1492 Z-.9969 CO. AO. F160.54
G1 X6.0958 Y-.2958 Z-.9969 CO. AO. F160.54
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Relating process parameters to bead geometry and vice versa



Contact Us





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