SYNOVA

Metal Cutting System

Powered by
Synova Laser MicroJet®
& Makino

MCS Series

Cool Laser Machining

www.synova.ch

Advanced Laser Cutting Systems

The MCS family of machines integrates Synova's cutting edge Laser MicroJet® (LMJ) technology with a Makino-based platform. The 3-axis MCS 300 with optional rotary axis enables high-precision metal and hard material machining such as cutting, drilling or grooving.

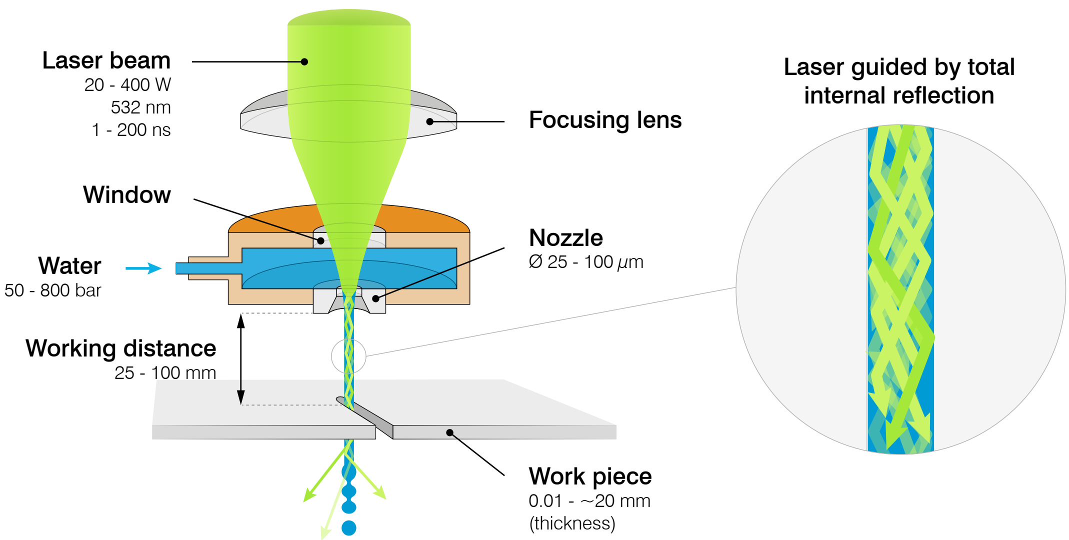
The MCS 500 with five simultaneous axes is specifically designed for 3D machining needs and drilling of cooling holes in hot section components of industrial gas turbines and jet engines. A wide range of materials such as super-alloys with thermal-barrier coating can be processed in one simple step, without cracks or delamination in the ceramic coating and extremely low recast in the metal structure.

Thanks to built-in subsystems such as laser generation and water treatment, the overall LMJ system footprint is considerably reduced. The running costs of the LMJ systems are low since there is no tool wear, few consumables and low waste rates.

Synova Laser MicroJet® Technology

The Laser MicroJet® is a hybrid method of machining, which combines a laser with a "hair-thin" water jet that precisely guides the laser beam by means of total internal reflection in a manner similar to conventional optical fibers. The water jet continually cools the cutting zone and efficiently removes debris.

As a "cold, clean and controlled laser", Synova's LMJ technology resolves the significant problems associated with dry lasers such as thermal damage, debris deposition, taper and lack of accuracy.



Materials & Operations

Metals: Super-alloys, stainless steel, aluminum, copper, nickel, titanium etc.

Hard materials: Ceramics, polycrystalline CBN (PcBN), polycrystalline diamonds (PCD), monocrystalline diamonds (MCD), CVD diamonds, tungsten carbide (WC)

Ceramic-matrix composites (CMCs): Carbon, alumina, silicon carbide

Operations:

- **MCS 300:** Cutting, drilling, grooving, shaping in 3 axes, trenching, milling, dicing, engraving, profiling
- **MCS 500:** Cutting, drilling, grooving, shaping in 3 and 5 axes, trenching, milling, dicing, engraving, profiling

Key Benefits

Fast and Accurate

- Hole-drilling in 8 mm thick super-alloy (0.76 mm Ø) in 70 sec.
- High mechanical precision with a tolerance of +/- 1.5 μm (very small kerf width down to 30 μm)
- High aspect ratio in hole-drilling (up to 1:20)

Cool and Clean

- Virtually no heat impact thanks to water jet cooling capability
- Clean surfaces, no depositions or burrs
- Cylindrical beam resulting in perfectly parallel kerfs and drilled holes

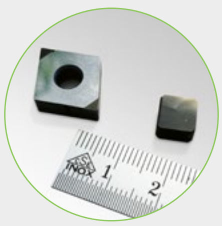
User-friendly

- No laser focusing or distance control required
- No need of resin or protective layers
- No or very little post treatment necessary

Main Industries and Applications

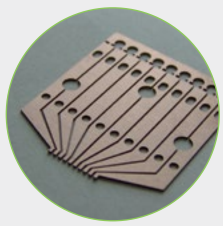
Energy
Hole-drilling of industrial gas turbines (Super-alloys)

Aerospace/ Aviation
Hole-drilling of jet engine components (Super-alloys)



Tool Making
2D & 3D machining of inserts (Hard materials)

Automotive
Machining of automotive parts (Metals)



Micro-Machining
Cutting of high-precision parts (Sensitive materials)

General Specifications

		MCS 300	MCS 500
Axes			
Working volume	mm (W x D x H)	400 x 300 x 200	500 x 400 x 500
B axis		360° (Rotation, optional)	-100° to 50° (Tilt)
C axis		-	360° (Rotation)
Drive		Linear/ Servo	Linear/ Servo
Maximum stroke	mm (X, Y, Z)	480 x 310 x 210	760 x 400 x 500
Accuracy (positioning)	µm	+/- 1	+/- 1.5
Repeatability	µm	+/- 1	+/- 1
Maximum XY speed	m/ min	60	60
Acceleration (linear)	G	1	0.4
CNC control (Mitsubishi)		3-axis or 3+1-axis	3+2-axis/ 5-axis
Laser			
Laser type		Diode pumped solid state Nd:YAG, pulsed	Diode pumped solid state Nd:YAG, pulsed
Wavelength	nm	532 (1064)	532
Maximum power	W	100	200
Beam transmission (optical fibre)	µm (core diameter)	150/ 200	200
Water Pump			
Water consumption	l/ h (average)	10	10
Water pressure	bar (max.)	500	500
Jet nozzle diameter	µm	30-120	50-100
Utilities			
Electrical power	V	AC 200	AC 200
3 phases	Hz	50/ 60	50/ 60
Power consumption	kVA (max.)	12	12
Compressed air, oil free	bar	7-8	7-8
Dimensions/ Weight (incl. peripheral equipments)			
Dimensions	mm (W x D x H)	2140 x 4300 x 2000	2340 x 3440 x 2750
Weight	kg	4100	4400
Options			
		Air dryer, air booster, mist collector, signal tower, compensator, power meter, oscilloscope, vision measurement system, manual jet angle correction	Chiller for laser, transformer, mist collector, air dryer, air booster, power meter, vision measurement system, touch probe, oscilloscope, breakthrough detection, backstrike protection, manual jet angle correction, signal tower

The specifications are subject to change without notice due to technical changes. The MCS machines incorporate the worldwide patented technology of water jet guided laser, invented at the Swiss Federal Institute of Technology in Lausanne, Switzerland. These machines conform to CE regulations.

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Contact information available at: www.synova.ch

FLY_ENG005_022017CH, lesur.ch, Printed on FSC paper