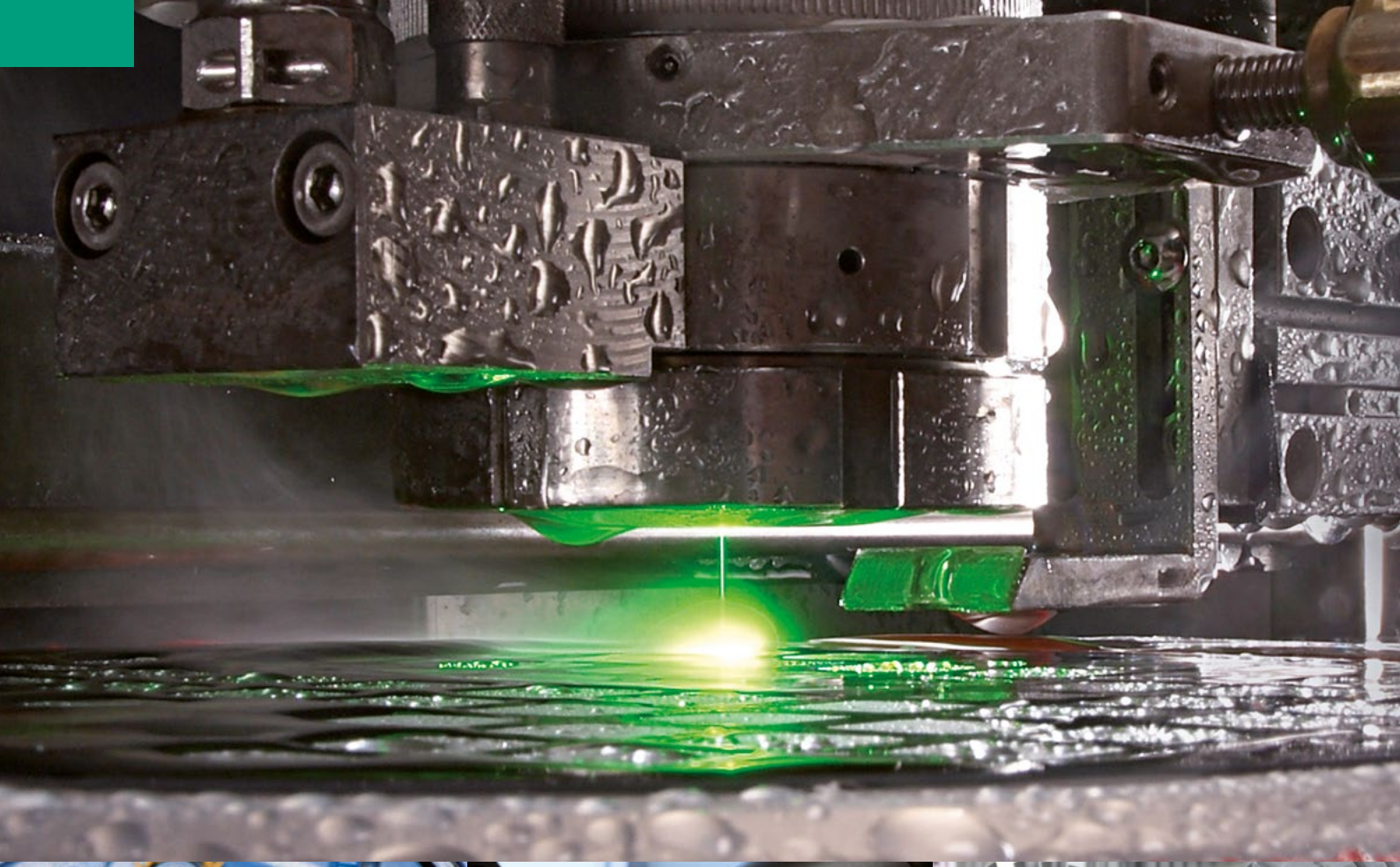


Industrial Applications

SYNOVA

Cool Laser Machining

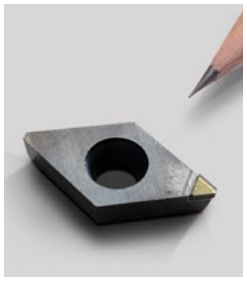
www.synova.ch

Industries & Applications

Energy & Aerospace

Synova's Laser MicroJet (LMJ) systems offer hole-drilling and diffuser-machining solutions for the aerospace and power generation industries. Our 3 to 5 axis Metal Cutting System (MCS) machines are specifically designed for drilling precise cooling holes in hot section components of jet engines and gas turbines, e.g. blades and vanes with and without pre-coated thermal barrier film (TBC). They also cut ceramic-matrix composites (CMCs) smoothly and without thermal damage, micro-cracks and taper.

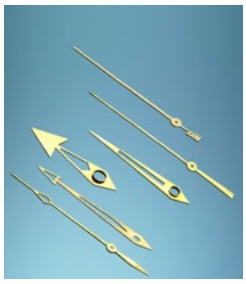
Tool



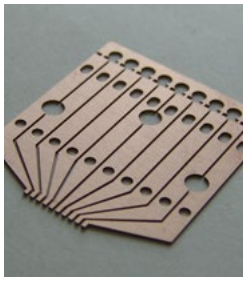
LMJ systems are able to cut any type of conductive and non-conductive hard material used for cutting tools ranging from tungsten carbides and ceramics to lab-grown diamond materials. The laser cutting systems with 3 axes are ideal for 2D cutting, drilling, grooving or slicing of PCD, SCD, PcBN or CVD diamond tool inserts, leaving smooth cutting surfaces and sharp edges. The 5-axis machines enable high-precision 3D ablation (shaping) for cutting multiple clearance angles and chamfering K-land edges.

Watch

The cool and clean water jet guided LMJ technology is ideally suited for cutting silicon and thin metals e.g. brass, Durnico or copper alloys such as CuBe that are extremely susceptible to thermal effects. Synova's LCS machines with 3 or 5 axes cut watch movement components and decorative parts with the accuracy and quality required for the watch industry: free of mechanical stress, heat damage and with low roughness.



Micro-machining



LMJ machines are flexible cutting systems that can process small and complex structures where conventional methods reach their limits. They can cut a wide range of materials, including titanium, ceramics and superalloys for various industries (medical, automotive, textile, electronics, consumer goods).

Machine Solutions

LCS Series

Laser Cutting System

General Specifications*		LCS 50	LCS 150
Axes			
Working volume	mm (W x D x H)	175 x 50 x 50 LCS 50-5: 50 x 50 x 50	125 x 200 x 100
Linear axis XY		Linear motor	Linear motor
Linear axis Z		Ball screw + AC motor	-
Rotary axis B (+102° to -12°)		LCS 50-5: Torque motor	-
Rotary axis C (360°)		LCS 50-5: Torque motor	-
Accuracy	µm	+/- 3	+/- 5
Repeatability	µm	+/- 1	+/- 2
Maximum XY speed	mm/s	500	300
Maximum Z speed Maximum B speed Maximum C speed	mm/s RPM RPM	300 LCS 50-5: 200 LCS 50-5: 1200	- - -
Acceleration	G	0.4	0.5
CNC control		3-axis (LCS 50-5: 5-axis) (Bosch-Rexroth)	2-, 3- or 4-axis (Delta Tau)
Laser			
Laser type		DPSS Nd: YAG, pulsed	DPSS Nd: YAG, pulsed
Wavelength	nm	532	532/ 1064
Average power	W	20-200	20-200
Water Jet			
Nozzle diameter	µm	30-60	25-80
Dimensions/ Weight			
Dimensions (machine)	mm (W x D x H)	800 x 1200 x 1650	1050 x 800 x 1870
Dimensions (utilities cabinet)	mm (W x D x H)	700 x 2300 x 1600	700 x 2300 x 1600
Weight (machine)	kg	730 kg (LCS 50-5: 750)	1170
Weight (utilities cabinet)	kg	700–750	700–750
Options			
		• CAD CAM software 2D • Automatic jet angle correction • High-pressure water pump (800 bar) • (LCS 50-5: CAD CAM software 3D Tooling)	• Rotary axis • Z-axis with jet angle correction • Chiller • Chuck with vacuum • CAM + Pattern recognition software

* The specifications are subject to change without notice due to technical changes.

LCS Series

Laser Cutting System

General Specifications*		LCS 300	LCS 800
Axes			
Working volume	mm (W x D x H)	300 x 300 x 100	630 x 850
Linear axis XY		Linear motor	Linear motor
Accuracy	µm	+/- 3	+/- 5
Repeatability	µm	+/- 1	+/- 2
Maximum XY speed	mm/s	1000	1000
Acceleration	G	1	1
CNC control (Delta Tau)		2-, 3- or 4-axis	2-axis
Laser			
Laser type		DPSS Nd: YAG, pulsed	DPSS Nd: YAG, pulsed
Wavelength	nm	532/ 1064	532/ 1064
Average power	W	20-200	20-200
Water Jet			
Nozzle diameter	µm	25-80	30-100
Dimensions/ Weight			
Dimensions (machine)	mm (W x D x H)	1165 x 950 x 1920	2000 x 1650 x 1800
Dimensions (utilities cabinet)	mm (W x D x H)	700 x 2300 x 1600	700 x 2300 x 1600
Weight (machine)	kg	880	3500
Weight (utilities cabinet)	kg	700-750	700-750
Options			
		• Rotary axis • Z-axis with jet angle correction • Chiller • Chuck with vacuum • CAM + Pattern recognition software	• Transformer • Chiller • Z-axis (100 mm)

* The specifications are subject to change without notice due to technical changes.

MCS Series

Metal Cutting System

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
Accuracy (positioning)	μm	+/- 1	+/- 1.5
Repeatability	μm	+/- 1	+/- 1
Maximum XY speed	mm/s	1000	1000
Acceleration (linear)	G	1	0.4
CNC control (Mitsubishi)		3-axis or 3+1-axis	3+2-axis/ 5-axis
Laser			
Laser type		DPSS Nd:YAG, pulsed	DPSS Nd:YAG, pulsed
Wavelength	nm	532/ 1064	532
Maximum power	W	100	200
Water Jet			
Nozzle diameter	μm	30-100	50-100
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 • Compensator • Power meter • Oscilloscope • Jet angle correction	• Chiller for laser • Transformer • Mist collector • Air dryer • Air booster • Power meter • Touch probe • Oscilloscope • Breakthrough detection • Backstrike protection • Jet angle correction

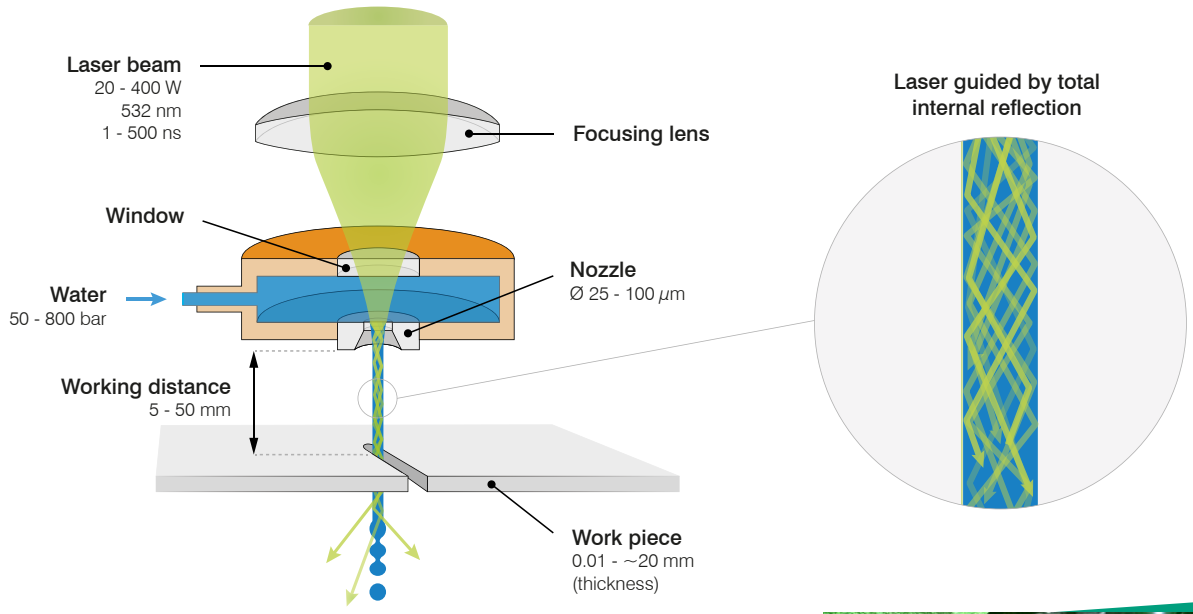
* The specifications are subject to change without notice due to technical changes.

Laser MicroJet® Technology

The water jet guided laser is an advanced cutting technology, which combines the low-temperature and large working distance advantages of water jet cutting with the precision and speed of conventional dry laser cutting.

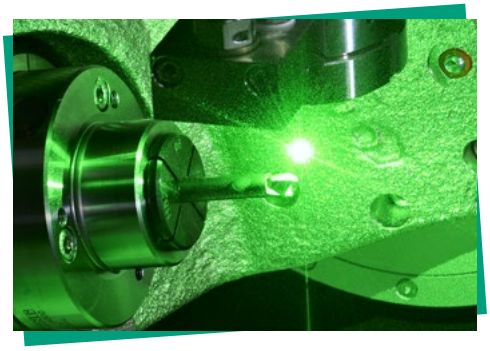
How does the LMJ work?

The Laser MicroJet (LMJ) 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 work piece during laser ablation and efficiently removes debris, leaving a clean cutting surface.



What are the advantages?

As a “cold, clean and controlled laser”, Synova’s LMJ technology resolves the significant problems associated with dry lasers such as thermal damage, deformation, particle deposition and taper.



Materials that can be machined:

Metals: Superalloys, stainless steel, aluminium, copper, brass, gold, Durnico, CuBe, shape-memory alloys, titanium, nickel etc.

Superhard materials: Polycrystalline CBN (PcBN), polycrystalline diamond (PCD), single crystalline diamond (SCD), CVD diamond, natural diamond, tungsten carbide (WC)

Ceramics: Ceramic-matrix composites (CMCs), silicon carbide (SiC), silicon nitride (SiN), zirconia (ZrO2), HTCC/LTCC, aluminium nitride (AlN), aluminium oxide (Al2O3)

Composites: Carbon fiber reinforced plastics (CFRP)

Custom Automation

Synova's Laser MicroJet machines can be equipped with several different automation types in order to enable work in automatic mode.

Band feed

System with two reels and a pull and grip mechanism, which continuously advances the material to be machined, carrying processed pieces and waste material away. Band feed systems are commonly used in the watchmaking or micro-machining industries.

Bowl feeder

System that presents parts one-by-one, oriented in a particular direction to machine for further processing. Vibratory bowl feeders are often found in the automotive or electronics industries.

Robot/ Automated line

Our machines also interface with robots on rails. A robotic arm runs on a linear motion track tending multiple machines. It performs several tasks such as transporting and positioning work pieces. These automated lines are employed in various industries to run 24/7 and increase productivity, as for example, in the aviation industry.

The Fusion of Water and Light

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Contact information available at: www.synova.ch

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