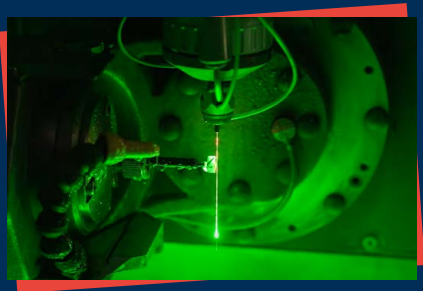
# SYNOVA

## Laser Cutting System

Powered by
Synova Laser MicroJet®

**LCS 50**



Cool Laser Machining

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# High-Precision Laser Cutting System

The LCS 50 is Synova's most compact and cost-efficient Laser MicroJet® (LMJ) machine. The LCS 50 is designed for machining industrial diamond tools and other small work pieces that require precision cutting, drilling, grooving or slicing.

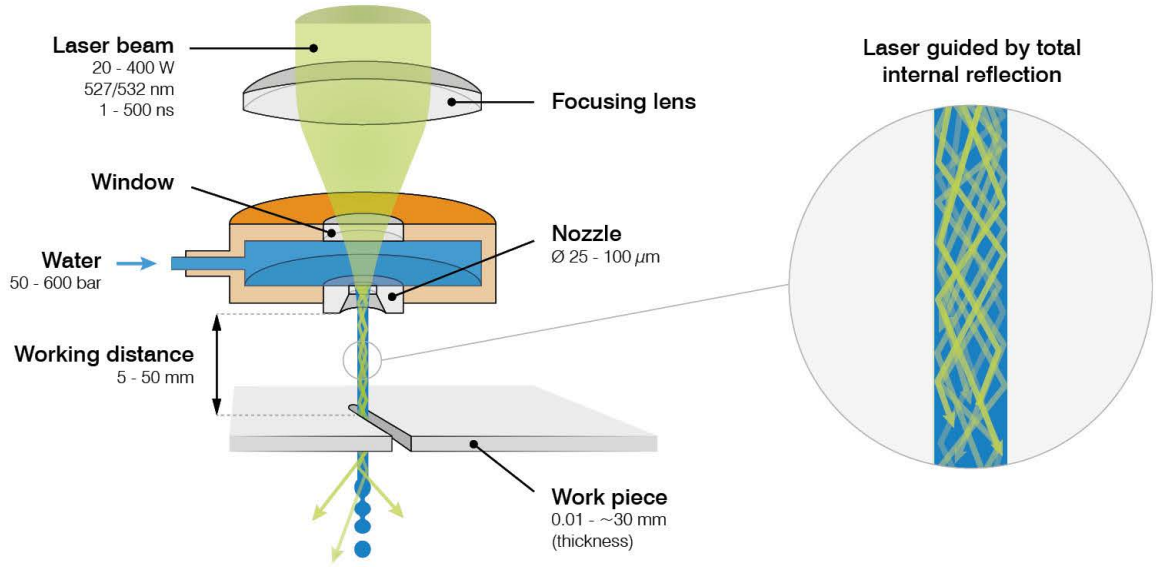
The machine uses linear motor axes (LCS 50-3) and additional B and C rotary axes with torque motors enabling 3D cutting and shaping (LCS 50-5).

The state-of-the-art CNC machine system includes a high-power green laser, a compact high-pressure water pump with an ultra-pure water unit, a 21.5-inch touch-screen control panel and a vision system with motorized zoom.

# 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, micro-cracks, debris deposition, taper and lack of accuracy.




# Materials & Operations

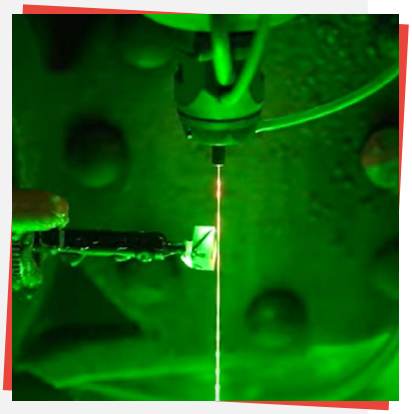
**Superhard materials:** Polycrystalline CBN (PcBN), polycrystalline diamond (PCD), single crystalline diamond (SCD), CVD diamond, natural diamond, tungsten carbide (WC)

**Metals:** Stainless steel, gold, Durnico, CuBe, copper, brass, aluminium, shape-memory alloys (Nitinol), titanium, nickel, superalloys etc.

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

**Operations:**

- **3-axis machine:** 2D cutting, drilling, slicing, grooving
- **5-axis machine:** 3D shaping, cutting, drilling, slicing, edge grinding (K-land edges, single or multiple clearance angles), grooving, milling, engraving, turning



# Key Benefits

### Sharp and Smooth

- Cylindrical beam resulting in parallel kerfs (no V-shape)
- Smooth cutting surfaces and sharp edges (Ra as low as 0.15 $\mu$m)
- Virtually no heat impact thanks to water jet cooling capability

### Fast and Accurate

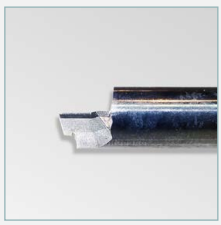
- Finish cutting of 1.6 mm PCD and cemented carbide in 5 mm/min.
- High mechanical precision with a tolerance of +/- 3 $\mu$m
- Very small kerf width (down to 30 $\mu$m)

### Clean and Easy

- Clean surfaces, no depositions or burrs
- No or very little post treatment required
- No laser focusing or distance control required

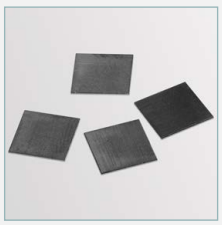
**LCS 50 with Utilities Cabinet**

# Main Industries & Applications



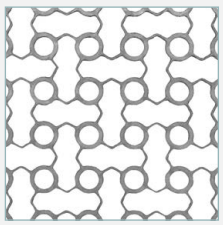
**Tool Manufacturing**
Edge grinding of inserts (PCD)

**Technical Ceramics**
Sample part processing (Alumina)



**Diamond**
Slicing of lab-grown diamonds (CVD diamond)

**Watchmaking**
Cutting of escape wheels (CuBe)



**Medical**
Cutting of medical implants (titanium)

## General Specifications

| | | LCS 50-3 | LCS 50-5 |
|---|---|---|---|
| **Axes** | | | |
| Working volume (with vision control) | mm (W x D x H) | 182 x 60 x 100 | 50 x 50 x 50 |
| Table size/ Chuck rotation axis | mm (W x D)/ mm Ø | 360 x 125 | 5.0 – 5.5 |
| Linear axis XY | | Linear motor | Linear motor |
| Linear axis Z | | Ball screw + AC motor | Ball screw + AC motor |
| Rotary axis B (-12° to 102°) | | - | Torque motor |
| Rotary axis C (N x 360°) | | - | Torque motor |
| Maximum stroke | mm (X,Y,Z) | 250 x 60 x 100 | 250 x 60 x 100 |
| Accuracy (X,Y) (after compensation) | µm | +/- 3 | +/- 3 |
| Repeatability (X,Y) | µm | +/- 1 | +/- 1 |
| Maximum XY speed | mm/s | 1000 (X) / 300 (Y) | 1000 (X) / 300 (Y) |
| Maximum Z speed | mm/s | 300 | 300 |
| Maximum B speed | RPM | - | 200 |
| Maximum C speed | RPM | - | 1200 |
| Acceleration (X,Y) | G | 1 | 1 |
| CNC control (Bosch-Rexroth) | | 3-axis | 5-axis |
| **Laser** | | | |
| Laser types | | Diode pumped solid state, pulsed | Diode pumped solid state, pulsed |
| Wavelength | nm | 527/532 | 527/532 |
| Average power | W | 50-200 | 50-200 |
| Beam transmission (optical fibre) | µm (core diameter) | 100-200 | 100-200 |
| **Water Pump** | | | |
| Water flow/ water consumption | l/ h (average) | 1/ 10 | 1/ 10 |
| Water pressure | bar (max.) | 600 | 600 |
| Nozzle diameter | µm | 25-80 | 25-80 |
| **Utilities** | | | |
| Electrical power | VAC | 3 x 400 V + N + PE | 3 x 400 V + N + PE |
| 3 phases | Hz | 50/60 | 50/60 |
| Power consumption (total) | kVA (max.) | 11 | 11 |
| Compressed air, oil free | bar | 6 | 6 |
| **Dimensions/Weight** | | | |
| Dimensions (machine without arm, screen and signal tower) | mm (W x D x H) | 800 x 1200 x 1650 | 800 x 1200 x 1650 |
| Dimensions (utilities cabinet) | mm (W x D x H) | 700 x 1800 x 1600 | 700 x 1800 x 1600 |
| Weight (machine) | kg | 730 | 750 |
| Weight (utilities cabinet) | kg | 700 | 700 |
| **Features** | | | |
| | | Automatic jet angle correction, CAD CAM software, Positioning sensor, Jet protection system, Touch probe, Breakthrough detection, Integrated pulse monitoring, Chiller for axes (only LCS 50-5) | |

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

SYNOVA

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