

No HAZ, No burrs



# SYNOVA



## XL Laser Cutting System

Powered by  
Synova Laser MicroJet®

### XLS Series



### Cool Laser Machining

[www.synova.ch](http://www.synova.ch)



# High-Quality, High-Precision XL Laser Cutting System

The XLS Laser Cutting System integrates Synova's state-of-the-art Laser MicroJet® (LMJ) technology with a wide machine platform and table for large work pieces. The 5-axis XLS 1005 with optional C2 rotary axis allows high-precision 2D and 3D machining of metals and ceramics, free of heat affected zone (HAZ) and burrs.

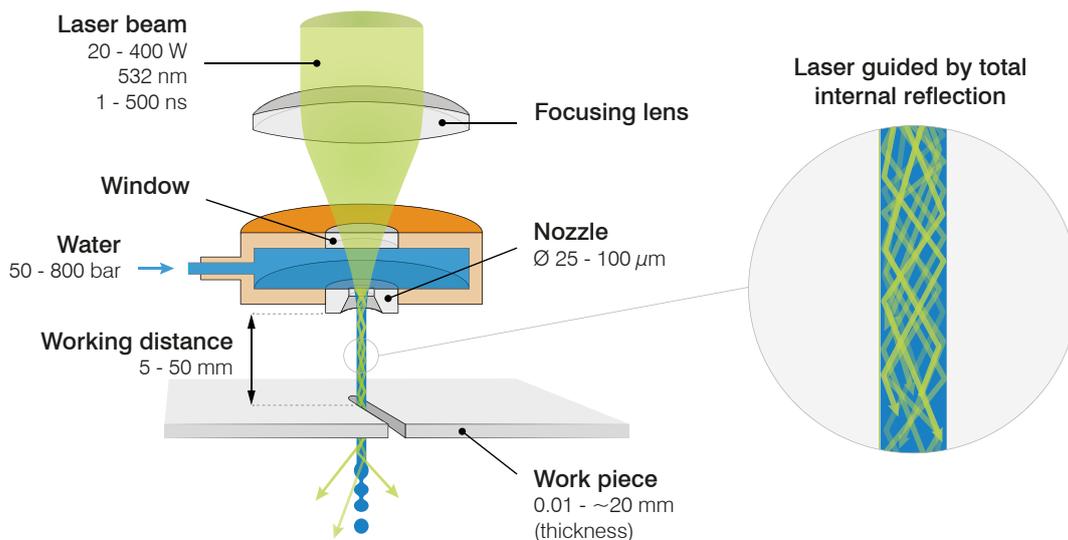
The XLS 1005 with five simultaneous axes is specifically designed for 3D machining needs and drilling of cooling holes in hot section components of industrial gas turbines and jet engines. A wide range of materials such as superalloys with thermal barrier coating (TBC) can be processed in one single step, without cracks or delamination in the ceramic coating and extremely low recast in the metal structure.

Due to the large door, workpieces are easily loaded into the machine, either manually or by robot. Custom automation is available (e.g. conveyor belt, robotic arm).

## 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:** Superalloys, stainless steel, aluminium, copper, nickel, titanium etc.

**Ceramics:** Ceramic-matrix composites (CMCs), silicon carbide (SiC), silicon nitride (SiN), zirconia (ZrO<sub>2</sub>), HTCC/LTCC, aluminium nitride (AlN), aluminium oxide (Al<sub>2</sub>O<sub>3</sub>)

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

### Operations:

3D cutting and shaping, drilling, slotting, grooving, trenching, milling, slicing, edge grinding, engraving, profiling



# Key Benefits

## Fast and Accurate

- High mechanical precision with a tolerance of  $\pm 10 \mu\text{m}$  (very small kerf width down to  $60 \mu\text{m}$ )
- High aspect ratio in hole-drilling (up to 1:20)
- Fast ablation of shaped holes (10-20 sec.)

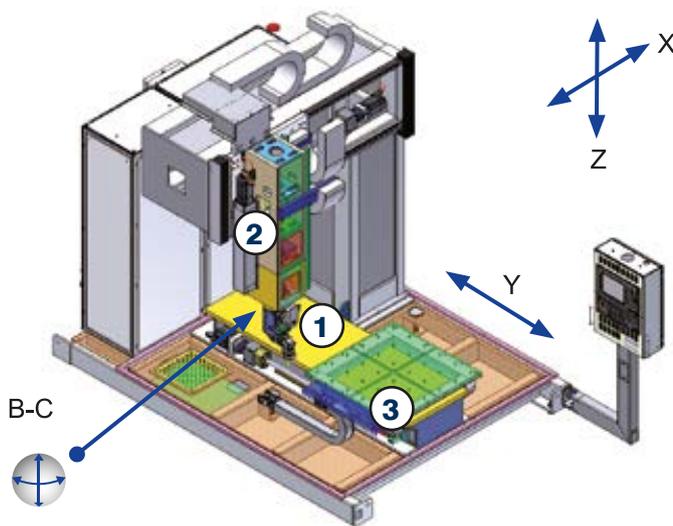
## Cool and Clean

- 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

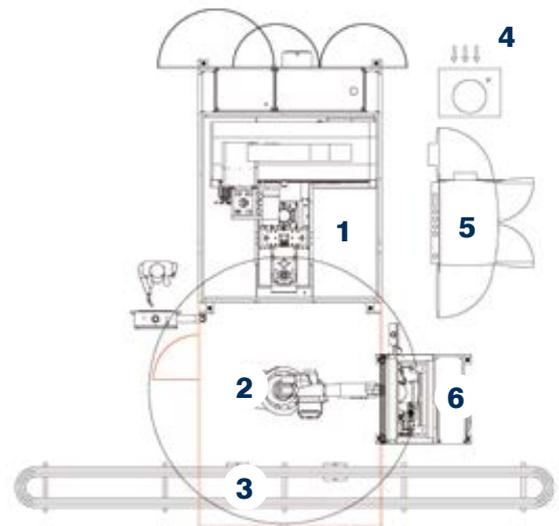
- No laser focusing or distance control required
- No need of resin or protective layers
- No post treatment necessary

### Axis arrangement (Full 3D functionality)



- 1 Rotary/swiveling axis (B-C) (processing optics)
- 2 X, Z axis (processing optics)
- 3 Y axis (workpiece)

### Layout example



- 1 XLS 1005
- 2 Transfer handling device
- 3 Conveyor belt
- 4 Cooler
- 5 Laser
- 6 Rinsing/drying station

## Main Industries and Applications



**Energy**  
Hole-drilling of industrial gas turbines



**Energy**  
Cutting of gas turbine components



**Aerospace**  
Hole-drilling of turbine blades



**Aerospace**  
Cutting of jet engine components



**Automotive**  
Machining of automotive parts

## General Specifications

## XLS 1005

### Axes

Work piece size	mm
Work piece weight	kg (max.)
Linear axis XY	
Linear axis Z	
Rotary axis B (+110° to -110°), tilting the head	
Rotary axis C (400°), rotating the head	
Maximum stroke	mm (X,Y,Z)
Accuracy (positioning)/ Repeatability	μm
Accuracy (positioning)/ Repeatability (rotary axes)	sec
Maximum XY speed	m/min
Maximum Z speed	m/min
Maximum B speed	RPM
Maximum C speed	RPM
CNC control (Sinumerik 840 D SL)	

### Laser

Laser types	
Wavelength	nm
Power	W
Beam transmission (optical fibre)	μm (core diameter)

### Water Pump

Water flow for jet	l/h (average)
Water pressure	bar (max.)
Nozzle diameter	μm

### Utilities

Electrical power	VAC
3 phases	Hz
Power consumption	kVA
Compressed air, oil free	bar

### Dimensions/ Weight

Dimensions (machine)	mm (W x D x H)
Dimensions (utilities cabinet)	mm (W x D x H)
Weight (machine)	kg
Weight (utilities cabinet)	kg

### Options

Height > 700, diameter > 800	
500	
Ball screw + AC motor (Optional: Linear motor)	
Ball screw + AC motor	
Harmonic Drive + AC motor (Optional: Torque motor)	
Harmonic Drive + AC motor (Optional: Torque motor)	
1000 x 1200 x 1000	
+/- 10	
+/- 20	
45	
30	
50	
50	
5-axis	

Diode pumped solid state Nd: YAG, pulsed	
532	
200/400	
200/300	

1	
500	
60-100	

3 x 400	
50	
25	
5-6	

2450 x 3400 x 3300	
700 x 2300 x 1600	
8000-9000	
700-750	

- C2 axis (6<sup>th</sup> axis), rotating the work piece
- Mist collector
- Pulse monitoring
- Touch probe
- Smart factory functions
- Automatic offset calibration and alignment
- Anti-collision software
- CAD CAM software
- Chiller
- Camera for observation
- Hand wheel
- Tele diagnostic

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