

# SMARTSPLICER™

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CO<sub>2</sub> laser system for fiber splicing and glass processing

- Patent pending Axicon Splicing™ optical beam shaping technology for uniform and highly precise annular laser power distribution
- For cladding diameters up to 2.5 mm
- No consumables such as process gas, filaments or electrodes needed
- Vertical operation for Gravity Splicing™, or horizontal operation
- User friendly design with intelligent tool holders

E!7422 Smart Splice.



The SMARTSPLICER™ is an advanced laser fusion splicing and glass processing system designed for the production of high power and sensitive photonics components of various kinds. It features a powerful and clean laser heat source which enables completely contamination free and localised glass melting and shaping with low maintenance requirements and no need for consumables such as process gas, filaments or electrodes.

Precision beam shaping optics – based on the patent pending Axicon Splicing™ technology – converts the CO<sub>2</sub> laser beam into an annular shape that spans the geometry of the fiber or optical component under processing. This way optical power is distributed symmetrically and evenly to the defined processing area.

The diameter of the laser ring can be controlled by software along with other vital process parameters. This makes the SMARTSPLICER™ easy to configure and optimise for different fiber diameters and glass processing operations. These include splicing of single and multimode fibers as well as gradient index and photonic crystal fiber, fiber to end-cap splicing, tapering and the manufacturing of high power fiber laser components such as mode field adapters and pump combiners.

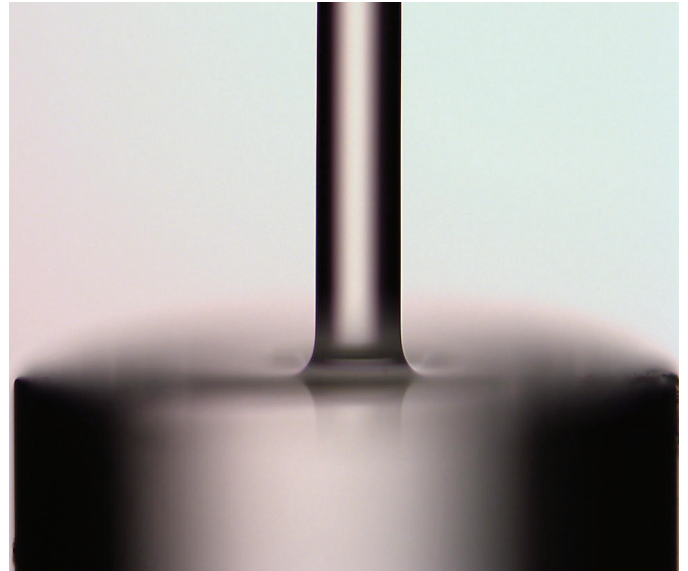
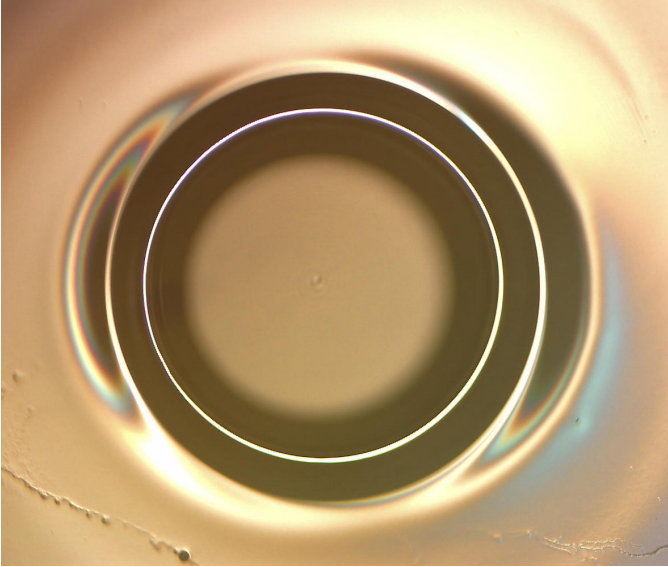
A highly stable fiber translation and alignment system, along with precision optics and mechanics, ensures consistency and reproducibility of production results and gives the

user the capability to undertake the most challenging glass processing operations.

The system can be operated in either horizontal or vertical orientation. In vertical orientation the force of gravity facilitates processes such as tapering and lensing. Intelligent tool holders allow the machine to be customised for user specific applications.

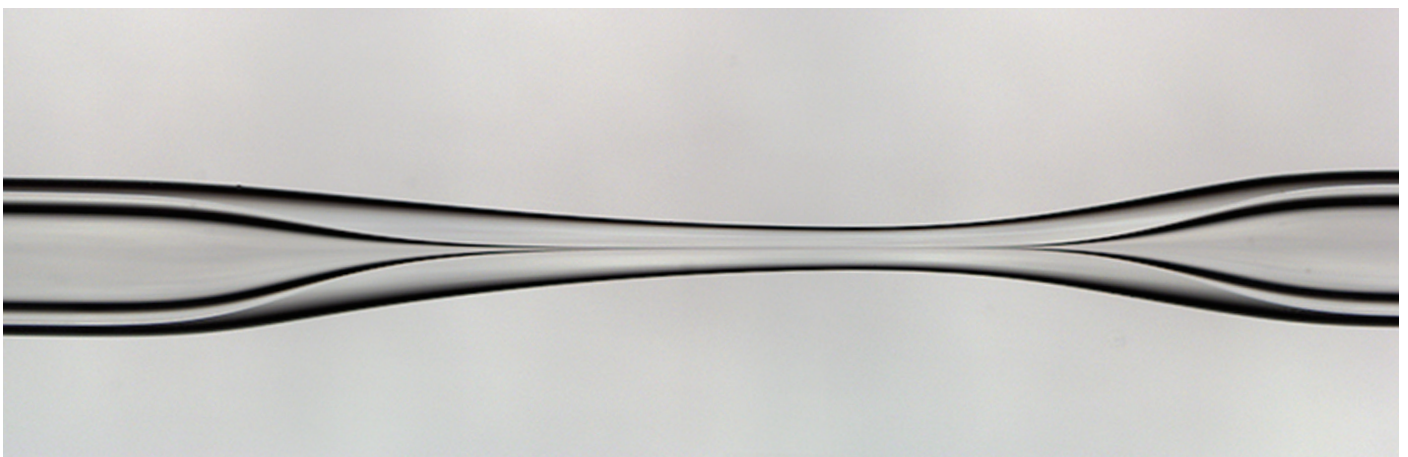
The optical system of the SMARTSPLICER™ has been designed by Fraunhofer IOF of Jena, Germany. This cooperation with a leading research institute that has a broad expertise in optics and precision mechanics has enabled the industrial realisation of splicing and glass processing methods that are at the international forefront of technology.





#### End-cap splicing

The SMARTSPLICER™ is a versatile tool for end-cap splicing. The picture to the right above shows a high-resolution photograph showing a typical multimode fiber to end-cap splice done with Axicon Splicing™ technology. To the left is a microscopic view of a fiber to end-cap splice. The closed double ring shows a closed fillet weld implying a high mechanical strength. *Photo courtesy of Fraunhofer IOF.*



#### Tapering, glass processing

The photograph shows a tapered capillary with collapsed center. Tapering of capillaries is important for making fiber bundles and different fiber combiners. *Photo courtesy of Fraunhofer IOF.*



## SPECIFICATIONS FOR SMARTSPLICER

Heating Source	Ring formed CO <sub>2</sub> laser beam
Laser Safety	Emergency laser cut off Class 4 laser system. Optional upgrade to Class 1
Laser Beam Shaping	Laser ring focus and diameter directly controllable by operator
Laser Beam Control	High power stability Optional feedback system can be equipped
Applicable Fiber Diameter	80 µm to 2500 µm
Typical Splice Loss	<0.1 dB
Typical Splice Strength	Same as original material
Cameras	Two side view cameras for aligning processes Field of view: 2.68 mm horizontal & 3.56 mm vertical Optional bottom view camera for end cap alignment Optional end view camera for PM and PCF fiber alignment
Measurement capabilities	Measurement of processes and final component with cameras Force sensors for process control Optional additional measurement equipment
Tool Holders	NYFORS fiber holders (optional) End cap holders (optional) Rotators for PM or PCF fibers (optional)
X/Y stage resolution	0,02 µm
Maximum Z travel Length	180+ mm
Z Travel resolution	0,4 µm (optional 0,025 µm)
Maximum Taper Ratio	1:10
Taper speed	Typically 2 mm/sec
Device Control	Complete control with built in computer and specialized software USB connection Optional Network capabilities Optional PCI-express cards
Electric Power	100 - 240 VAC