LS-Shape

Beam conditioning module

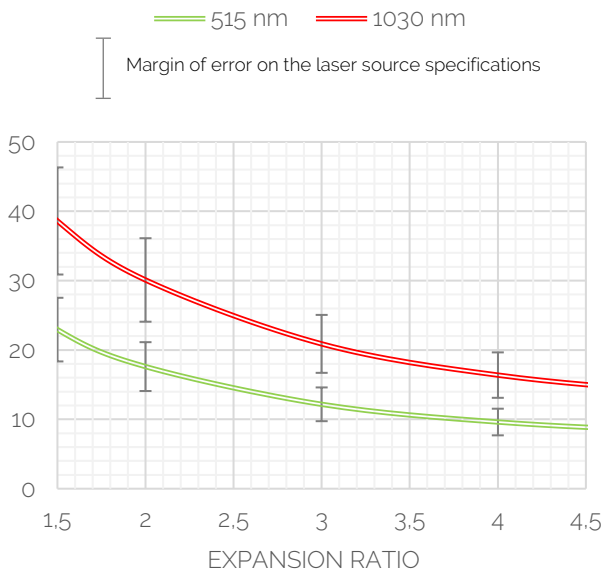
Dedicated to laser **microprocessing**, the LS-Shape is a unique beam conditioning module, inevitable for **mastering fine laser processes**. In particular, it makes it possible to precisely control the size of the laser impacts on the workpiece, as well as the transmitted power.

While it is not relevant to have access to a lot of fine parameter tuning on conventional marking or machining applications, **ultrashort processes** require much more attention on pulse overlap or power density, or on the preservation of a **perfect optical quality**. It is however difficult to prevent from astigmatism on enlarged beams for example. Beam attenuation is also tricky due to changes on beam geometrical shape with AOMs, or on pulse length with diode current modulation. Finally, fixed beam expanders lead to a spot size uncertainty of around 30 % due to the laser source and commercial variable beam expanders first reduce the beam diameter before expanding it, boosting non-linear self-focusing effects and increasing the risk of damaging the lens coating. The LS-Shape is the solution for all these points.

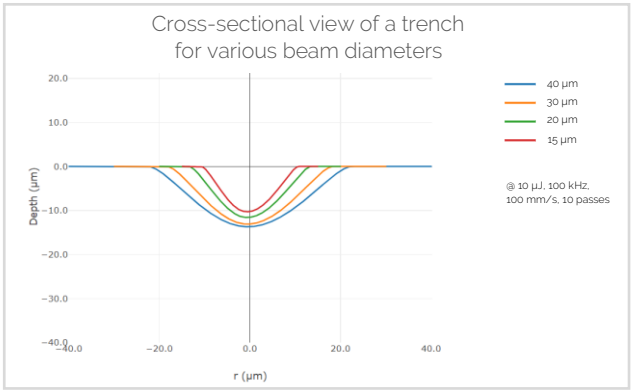
Apart from the choice of laser, it is this beam conditioning which defines the **process quality**, **efficiency**, and **repeatability**. The LS-Shape is the right tool for this optimization and its quick alignment steps make its **integration** very easy. Finally, for high productivity installations, replacement of this module is immediate to continue the production, while the repair is done.

Two LS-Shape versions are available: The LS-Shape Access includes an attenuator and a beam expander, both manual, and a motorized beam shutter with position sensors for safety monitoring. The LS-Shape Flex includes the same functions but all motorized, and a photodiode for monitoring the power during the process and for automatically linearize the attenuator. Directly connected to a computer through an ethernet interface, the LS-Shape Flex can be driven by ASCII commands or by our software KYLA™, a full **microprocessing software** able to communicate with several stages, cameras, and lasers.

Typical spot diameter (µm) with 100 mm objective and dual-wavelenghth laser



Cross-sectional view of a trench for various beam diameters



Key features

- Dual wavelength 515 + 1.030 nm
- Motorized safety shutter with sensors
- Variable beam expander (x1,5 to x4,5)
- Variable attenuator
- Beam dump
- Power measurement (Flex version)
- Optical design for high-power ultra-short lasers

Specifications	LS-Shape Access	LS-Shape Flex
Input aperture	10 mm (Advised beam diameter of max 6 mm)	
Wavelength	Dual wavelength 515 +/- 3 nm & 1.030 +/- 6 nm (343 +/- 2 nm upon request)	
Max input peak energy density	80 µJ/mm² @ 300 fs – 1.030 nm* 40 µJ/mm² @ 300 fs – 515 nm*	
Max input peak power density	16 W/mm² @ 300 fs – 1.030 nm* 8 W/mm² @ 300 fs – 515 nm*	
Max input power	100 W	
Input polarization	Linear laser polarization required	
Output aperture	20 mm (Advised beam diameter of max 12 mm)	
Transmission	> 90%	
Shutter closing time	< 50 ms	
Shutter position sensors	2 sensors for open position, 2 sensors for closed position	
Beam dump capacity	50 W continuously, 100 W during 1 min (water cooled option for continuous operation up to 100 W)	
Beam expansion	Manual setting x1 to x5 Divergence settings to focus at the same height Automatic protection of the optics during the settings	Motorized settings x1 to x5 Divergence settings to focus at the same height Automatic protection of the optics during the settings
Attenuation	Manual setting based on polarization (Min and max values dependent on input polarization linearity)	Motorized setting based on polarization (Min and max values dependent on input polarization linearity) Automatic linear calibration
Power measurement	None	Power sampling with calibrated ratio
Alignment	Factory aligned Reference irises for easy on-site alignment	
Size	398 x 108 x 126 mm	398 x 200 x 126 mm
Power supply	24 V – 1 A	24 V – 2 A
Shutter	24 V input to open 24 V outputs for sensors	
PC interface	None	Ethernet

**: Due to fused silica, at higher energies or powers, self-focusing effects may appear, which could eventually damage the following optical components.*