

CO₂ Fusion Splicer



GPX4000LZ
CO₂ Fiber
Processing
System

Capabilities



Splice



Taper/Combine

vytran® CO₂ Laser Fiber Processing System

Thorlabs' Vytran® Optical Fiber Glass Processors are versatile platforms designed for fabricating fiber splices, tapers, couplers, terminations, and combiners. These systems are ideal for applications involving single mode, multimode, polarization-maintaining, photonic crystal, multicore, soft glass, and other specialty fibers.

The GPX4000LZ is an integrated fiber processing platform equipped with a 40 W CO₂ laser and a graphite filament heater that offer controlled, precise heating of optical fibers. The uniform, high-temperature heating provided by the laser enables users to process glass fibers up to Ø2 mm and splice end caps up to Ø5 mm. The graphite filament heater allows users to splice fibers and fabricate tapers of varying sizes. The combination of a CO₂ laser and filament heater provides a universal fiber processing system for fused fiber component manufacturing and advanced fiber processing needs.

Like our other Vytran fiber processors, the GPX4000LZ employs True Core Imaging® technology to provide high-resolution images for fiber measurement and alignment. Precise control of process parameters via an integrated control system enables highly automated processing for high-volume manufacturing.

THORLABS

Fiber Processor Features

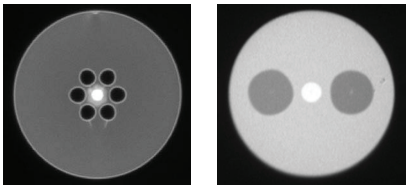
Integrated CO₂ Laser for Precise Fiber Processing

The primary heat source for the GPX4000LZ is a 40 W CO₂ laser with an annular beam output for uniform, residue-free heating of the fiber. The output power is adjustable for fine tuning of process parameters, and a feedback loop ensures power stability during heating. Unlike filament furnace heating, laser-based heating requires no purge gas or consumable filament for operation.

This all-in-one platform has two separate optical heads, optimized for CO₂ laser splicing and end capping, respectively. Additionally, the user can easily change out the CO₂ laser optical head for a filament furnace heat source, enabling use with existing manufacturing processes.

True Core Imaging® for Automated Fiber Measurement and Alignment

The GPX4000LZ utilizes our True Core Imaging® technology to provide high-resolution images for fiber measurement and alignment. An integrated digital CCD camera and mirror tower provide both side-view and end-view imaging of the fiber cladding and core. These features allow for automated measurement of fiber properties (core/cladding diameters, cleave quality evaluation, etc.).



Photonic Crystal Fiber PM Fiber

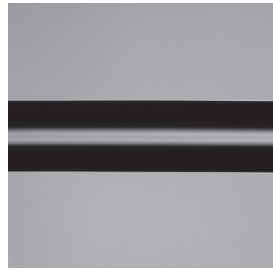
Specifications

| Item # | GPX4000LZ | |
|--|--|--------------------------------------|
| Heat Source Specifications | | |
| Primary Fiber Heating Source | CO ₂ Laser | |
| Laser Wavelength | 10.55 μm (Minimum) 10.63 μm (Maximum) | |
| Laser Output Power | 40 W ^a | |
| Laser Safety Features | Metal Cover with Interlock; Class 1 Enclosure Automatic Laser Power Cutoff Triple Redundancy Safety Measures | <div>CLASS 1 LASER PRODUCT</div> |
| Laser Beam Control | Closed-Loop Feedback System | |
| Secondary Fiber Heating Source | Filament Fusion Furnace | |
| Splicing Specifications | | |
| Splice Loss | 0.02 dB (Typical) for Single Mode Fiber with Filament Fusion | |
| Strength Enhancement Method | Fire Polish (Filament Fusion Only) | |
| Fiber Alignment Method | Fully Automatic – True Core Imaging | |
| Alignment Specifications | | |
| XY Fiber Positioning Resolution | 0.2 μm via Stepper Motor | |
| Z Travel (CO ₂ Laser Heating) | Furnace: 85 mm Fiber Holding Block: 105 mm | |
| Z Travel (Filament Heating) | Furnace: 180 mm Fiber Holding Block: 180 mm | |
| Z Positioning Resolution | 0.25 μm via Stepper Motor | |
| Rotational Alignment | Fully Automated – Can Align Stress Members | |
| Rotation Travel | 190° for Each Holding Block | |
| Rotation Drive Resolution | 0.02° | |
| PC Control and Software | Control Software and Common Splice Application Files Included | |

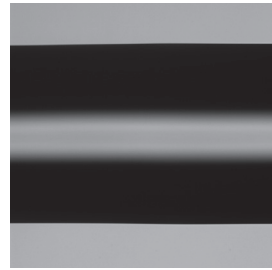
a. Output Power Measured at 25 °C

Fiber Splicing and Tapering

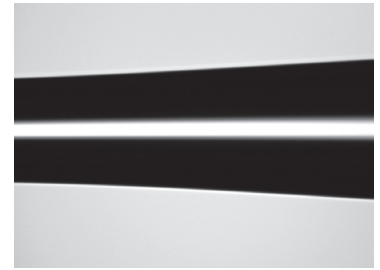
The combination of graphite filament heating and CO₂ laser heating allows our Vytran® Fiber Processing Systems to accurately splice fibers up to Ø2 mm. In addition, the filament furnace can also be used for creating tapers of various lengths by heating the fiber to its softening point and then applying a tensile force to elongate the fiber, reducing the cross section of the fiber.



Two Ø400 µm Fibers
after Splice



Two Ø1 mm Fibers
after Splice

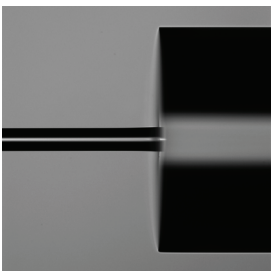


Ø1 mm Fiber Tapered to Ø400 µm

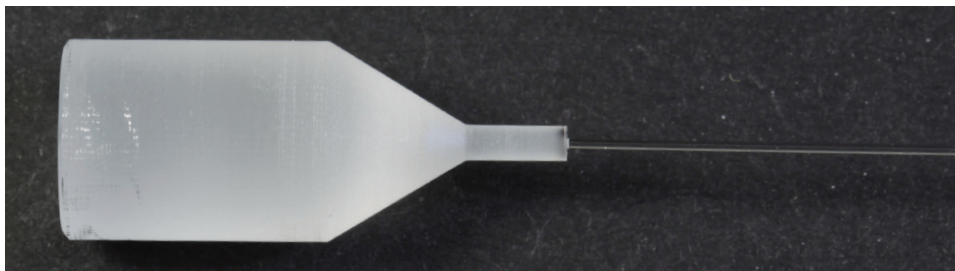
End Caps

Vytran Fiber Processing Systems are well-suited for fusing silica end caps (up to Ø5 mm) to high-power-beam-delivery fibers. End caps reduce the power density at the glass-to-air interface, which enables higher power handling.

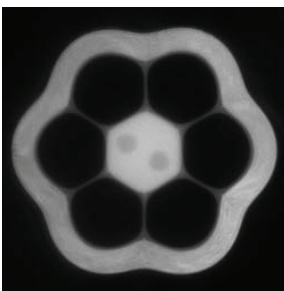
The 40 W CO₂ laser directly heats the fiber via absorption, and the adjustable annular ring of the laser enables precise heating of the targeted fusion area. This ensures higher quality splices by minimizing fiber deformation during heating and faster splice times by reducing the amount of mass heated during processing.



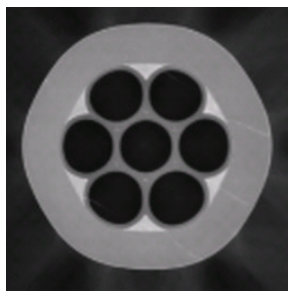
Ø1.25 mm Silica End Cap
Fused onto Ø125 µm Fiber



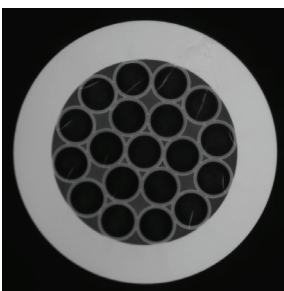
Ø8 mm End Cap with Ø1 mm Lead-In Fused to Ø400 µm Core Fiber



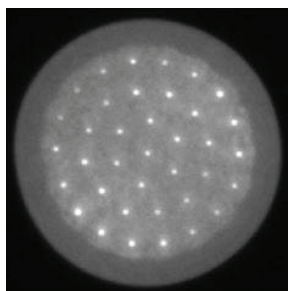
6 + 1 PM Combiner



7-to-1 Combiner



19-to-1 Combiner



37-to-1 Combiner

Fused Fiber Components

The GPX4000LZ fiber processor can be used to fuse fibers into side-by-side or bundle configurations for manufacturing fused tapered couplers or pump/output combiners. Through precise control of heating and tapering parameters, the user is able to fabricate devices with very low loss.

Contact Us

*Contact Thorlabs for assistance
in selecting components for your
specific application.*

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