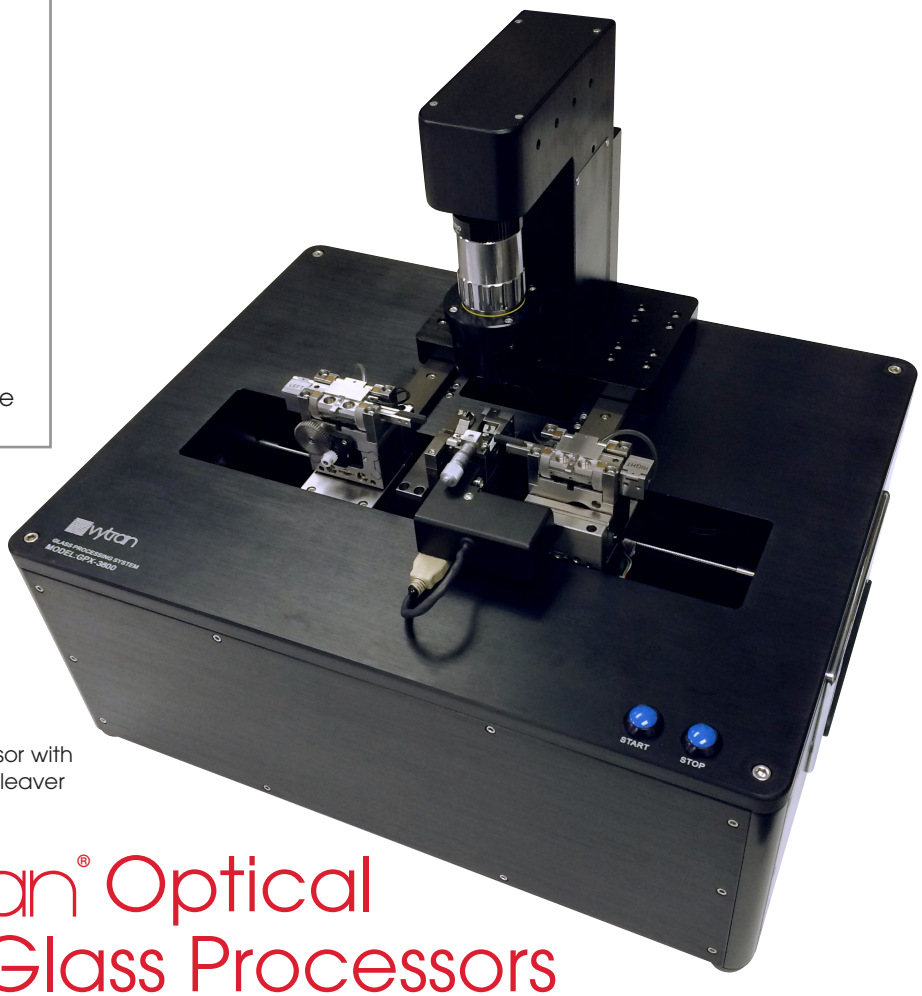
Glass Processors

Capabilities

Cleave

Splice

Taper/Combine



GPX3800
Glass Processor with
Integrated Cleaver

vytran® Optical Fiber Glass Processors

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

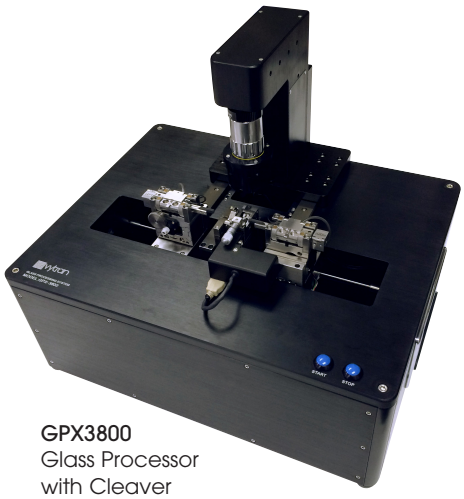
All of our glass processors use a proven filament fusion heating process, which enables stable, controlled, and precise heating of both standard and large-diameter optical fibers. High-resolution images for fiber measurement and automated alignment during the entire process are provided using our True Core Imaging® system.

Five baseline GPX3000 Series Workstations are available for processing fibers with claddings up to Ø1.7 mm. The GPX3800, GPX3850, and GPX3900 feature an integrated fiber cleaver and real-time hot imaging for process monitoring. All GPX3000 Workstations can also be upgraded with a coupler / combiner manufacturing fixture and optional fused biconic tapering (FBT) software.

THORLABS

GPX Series Glass Processors

GPX3400
Glass Processor



GPX3800
Glass Processor
with Cleaver

Features

- Fabricate Splices, Tapers, Terminations, Couplers, and Combiners
- Automated XY and Rotation Alignment
- Compatible with Single Mode, Multimode, Polarization-Maintaining, and Specialty Fibers
- Side-View/End-View Imaging and Splice Loss Determination using True Core Imaging® Technology
- Software with Process Development GUI and Splice Process Library

Thorlabs offers five glass processing workstations (shown in the table below). Each workstation can be customized with several upgrades such as a liquid cooler or coupler/combiner manufacturing fixtures. Users can purchase the filament assembly and fiber holder inserts separately, allowing users to choose the most appropriate components for their process.

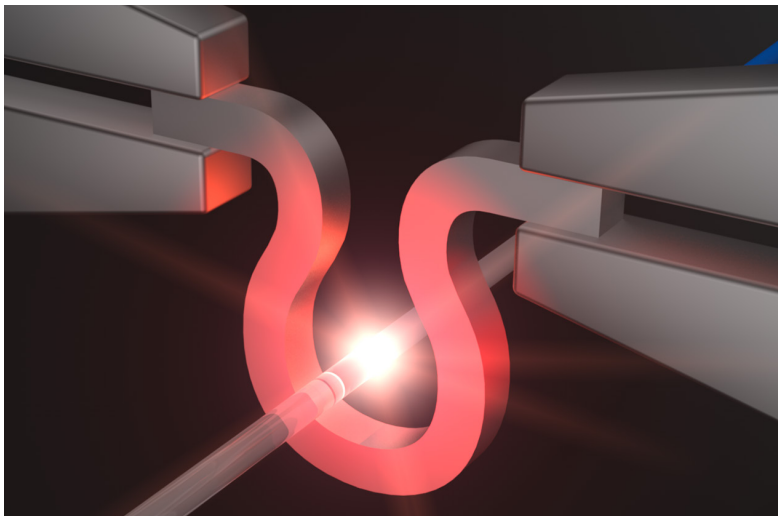
Selection Guide

Item #	GPX3400	GPX3600	GPX3800	GPX3850	GPX3900
Accepted Fiber Cladding (Max)	Ø1.25 mm	Ø1.7 mm	Ø1.25 mm	Ø1.7 mm	Ø1.25 mm
Integrated Cleaver	No		Yes		
Hot Image Camera	No[a]		Yes		
Liquid Cooler	Optional	Included	Optional	Included	Optional
Low-Power Mode for Soft Glass Fibers	No				Yes

a. Hot image camera can be configured as a custom option upon request. Please contact techsales@thorlabs.com with requests.

Filament Fusion Technology

Our GPX3000 Series Glass Processors feature a furnace assembly with a filament-based fusion heater. Compared to conventional arc fusion heaters, filaments provide uniform and precisely controlled, high-temperature heating of large diameter fibers. The fusion heat source is isolated from the environment; therefore, filament fusion splicing is not dependent on ambient conditions.



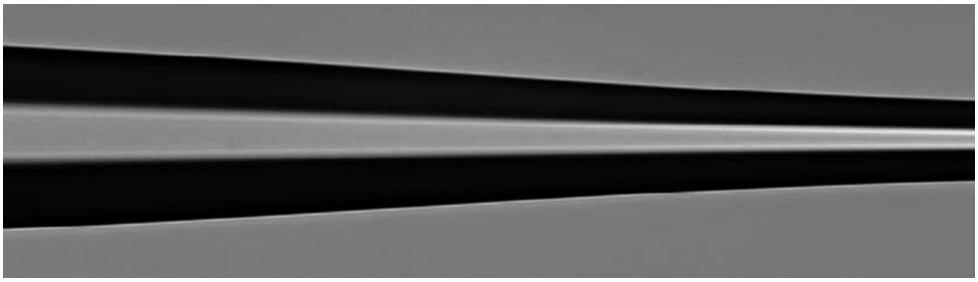
The filament uniformly heats the fiber which enables the fabrication of low-loss splices and adiabatic tapers.

The filament heater is an omega-shaped loop of graphite, iridium, or tungsten (shown to the right), which is contained within a protective shroud. Because filament material and size can be interchanged easily, a wide range of fiber cladding diameters and specialty fiber types can be accommodated using the same system. Our GPX3900 processor is additionally equipped with a Low-Power Mode, well-suited for processing of soft glass fibers such as Thorlabs' fluoride fibers.

Precise control over fiber position and orientation enables a number of advanced fiber processing applications from low-loss splicing in dissimilar fibers to the creation of adiabatic fiber tapers, fiber terminations, or fused fiber couplers. After fusion, a fire polishing process significantly increases splice strength through a rapid heat treatment of the splice region.

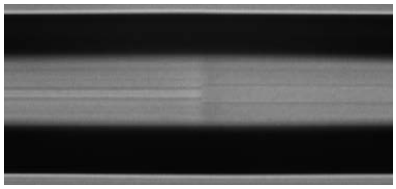
Tapering

All Vytran glass processor configurations are capable of tapering (altering the cross-sectional diameter) or drawing out (increasing the length) of a fiber. This is accomplished by using the filament furnace to heat the fiber to its softening point and then applying a tensile force to elongate the fiber, reducing the cross section of the fiber. The filament furnace provides more uniform heating of the fiber while tapering compared to arc splicers. The fiber holders provide up to 180 mm of z-axis travel, enabling the fabrication of long tapers up to 150 mm in length. The software GUI also includes a tension monitor and control function, which can accurately monitor drawing conditions during tapering.

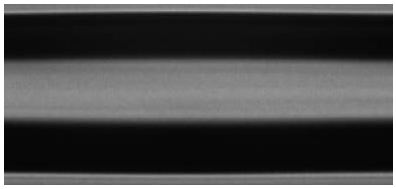


Ø20 µm Core, Ø400 µm Cladding Large-Mode-Area (LMA) Fiber Tapered to Ø125 µm Cladding

Before Splicing



After Splicing



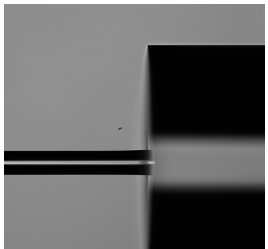
Two fibers with dissimilar cores before and after splicing. The dissimilar cores are clearly visible before the cores are thermally expanded.

Mode Field Adapters (MFA) and NA Converters

In many applications, large-mode-area gain fibers may need to be coupled to fibers with a non-matching mode field diameter or NA. Glass processors can help optimize coupling between dissimilar fibers by altering the mode field diameter or NA of one fiber to match the other. This is accomplished by applying heat prior to splicing and/or physically tapering the fibers to change the core diameter. In the example shown to the left, two fibers (single mode fiber and Ø20 µm large-mode-area fiber) have dissimilar core sizes. In the lower image, the small-cored fiber has been thermally expanded by diffusing the core dopants and then spliced to the large-mode-area fiber.

Fiber Terminations

The combination of a large range of processing temperatures, significant Z travel, and exact fiber positioning, make these glass processors ideal for use in developing advanced fiber terminations such as catheters, fiber probes, and ball lenses.



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

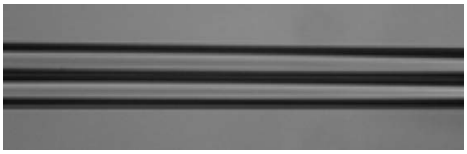
End Caps

Glass processors are well-suited for fusing silica end caps to high-power beam delivery fibers. Techniques are available for the collapse of photonic crystal fiber and fusing silica end caps to silica-silica fibers. Precise end cap lengths can be fabricated with the LDC401 Large-Diameter Fiber Cleaver.

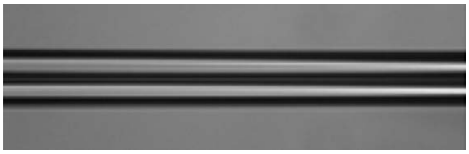
Couplers, Output Combiners, and Power Combiners

Vytran Glass Processors 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.

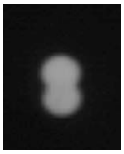
Before Fuse (Side View)



After Fuse (Side View)



After Fuse (End View)



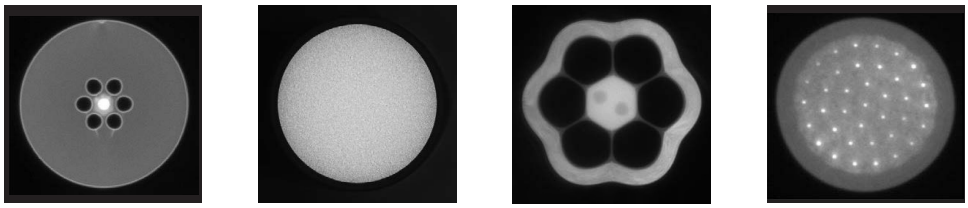
View from the glass processor of two single mode fibers tapered and fused together for 50:50 coupling. Spacing between the fiber cores is approximately 15 to 20 µm.

Features

True Core Imaging® for Automated Fiber Measurement and Alignment

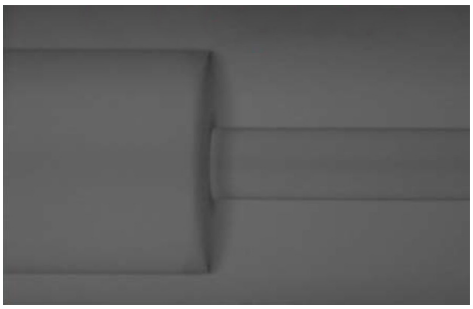
These GPX Glass Processors utilize our True Core Imaging technology to provide high-resolution images for fiber measurement and alignment. A digital CCD camera and mirror tower are integrated into the fiber processing workstation, incorporating both side-view and end-view imaging of the fiber cladding and core. These features allow for automated measurement of fiber properties (core/cladding diameters, cleave quality evaluation, etc.) and enable calculation of an accurate splice loss for splices with similar or dissimilar fiber types.

Example of End-View Illumination with Specialty Fibers

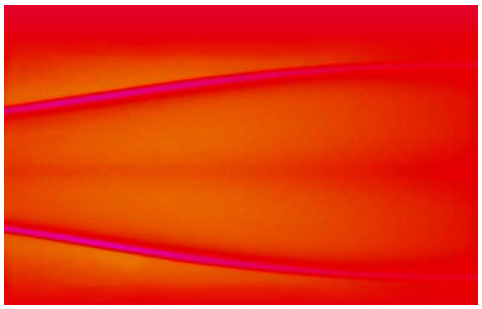


Photonic Crystal Fiber | Image Guide | 6 + 1 PM Combiner | 37-to-1 Combiner

Hot Imaging Camera (Included with GPX3800, GPX3850, and GPX3900)



Hot Image of End Cap Splicing



False Color Overlay of Tapering

- Obtain Real-Time Images of Fibers During the Splicing/Tapering Process
- Integrated ND Filters Block Heating Light
- False Color Overlay Available
- Quickly Develop Processes And Optimize Parameters

Integrated Fiber Cleaver (GPX3800, GPX3850, and GPX3900 Only)

Select glass processors feature a fiber cleaver integrated into the splice head that is compatible with fiber claddings up to Ø400 µm. The cleaver uses a "tension-and-scribe" process. As seen in the image below, tension is applied along the length of the fiber followed by an automatic scribing process utilizing a diamond cleave blade. After the blade scribes the fiber, tension is maintained, causing the scribe to propagate across the fiber width and complete the cleave.

Replacement Cleave Blade

- 0.08" (2.0 mm) Long Diamond Blade
- User Installable on Compatible Systems
- Approximately 5000 Cleaves at One Location (About 10 Locations over Blade Lifetime)

ACL83

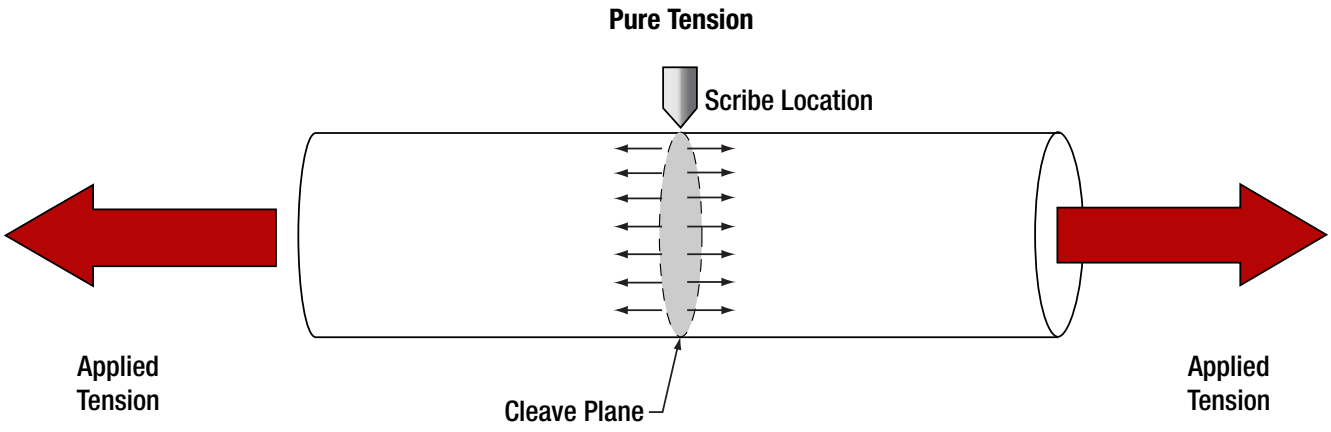
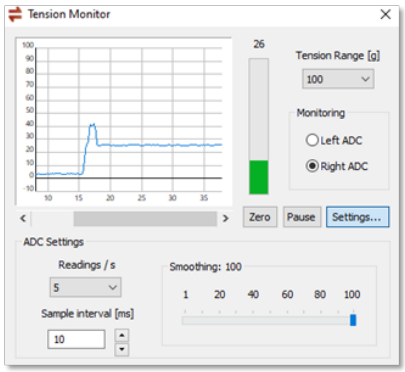


Illustration of Tension-and-Scribe Procedure used to Create a Flat Cleave

Process Software and Splice Library

- Included with Each Glass Processor Workstation
- Core Library of Popular Process Files for Common Splicing and Tapering Procedures
- Create Splice Files for New Processes or Customize Existing Files
- Tension Monitor and Control System Provides Feedback During Tapering Process



Software Tension Monitor Window

Selected Specifications

Item #	GPX3400	GPX3600	GPX3800	GPX3850	GPX3900
Splicing					
Fiber Cladding Diameter	≤1.25 mm	≤1.7 mm	≤1.25 mm	≤1.7 mm	≤1.25 mm
Max Filament Power	400 W				400 W (Standard) 80 W (Low-Power Mode)
Filament Power Resolution[a]	0.1 W				0.1 W (Standard) 0.01 W (Low-Power Mode)
Splice Loss	0.02 dB (Typical)[b]				
Splice Strength	>250 kpsi[c]				
Polarization Cross Talk	PANDA: >35 dB; Other PM Fiber Types: >30 dB				
Alignment					
Fiber Z-Axis Movement	180 mm (Max)				
Z-Axis Movement Resolution	0.25 µm via Stepper Motor				
XY Axis Positioning Resolution	0.02 µm via Stepper Motor				
Rotation Travel	200°				
Rotation Drive Resolution	0.02°				
Tapering					
Tapering Length	~2 mm to 150 mm[d]				
Tapering Ratio (Max)	Adiabatic Tapers up to 1:10; Non-Adiabatic Tapers up to 1:100				
Tapering Speed	1 mm/s (Typical)[e]				
Adiabatic Tapering Loss	<0.01 dB (Typical)				
General					
Size	16.0" x 12.5" x 6.3" (410 mm x 320 mm x 160 mm)				
Weight	45 lbs (20 kg)				
External Power Supply	Universal Input: 96 - 260 VAC, 47 - 63 Hz, Single Phase; Glass Processor Input: 12 V and 48 V DC, 10 A; PC Input: 115 or 230 VAC, 47 - 63 Hz, Single Phase				
Gas Supply	Argon, >99.999% Purity at 12 psig (Not Included)				
Operating Temperature	15 to 40 °C				

a. This is the software monitor readout resolution. The temperature resolution will depend on the filament being used, and is not measured by the software.
b. For Ø125 µm Single Mode Fiber.
c. Measured for a single mode fiber prepared using an LDC401 Cleaver or other appropriate fiber preparation equipment.
d. Dependent on Taper Geometry.
e. Tapering speed depends highly on the type of process used. 1 mm/s is a typical speed for a standard tapering process.

Optional Upgrades

Liquid Cooling System (Included with GPX3600 and GPX3850)

GPXWCS

Specifications

Item #	GPXWCS
Cooling Capacity	590 W[a]
Reservoir Capacity	10 Speed Levels up to 4 L/min
Reservoir Capacity	157 mL (5.3 fl oz)
Radiator	Aluminum; 2 x 120 mm Fans
Power Consumption	20 W (Max)
Power Supply	12 VDC (via Molex Connector) 110/120 VAC with Power Adapter
Weight	8.00 lbs (3.63 kg)

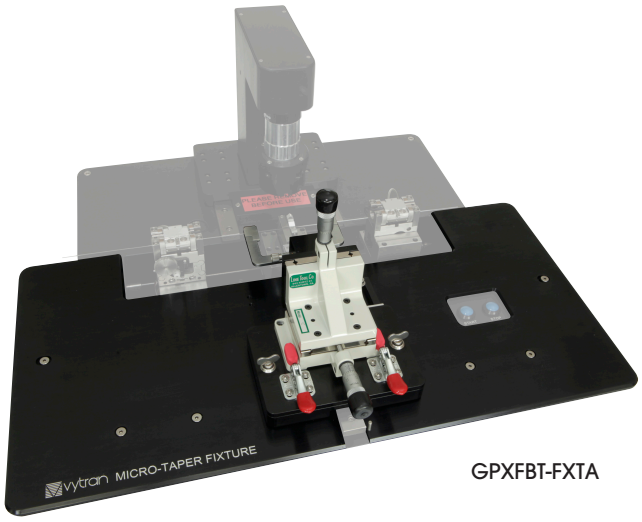
a. At 25 °C Ambient Temperature and 4 L/min Coolant Flow Rate

The GPXWCS Liquid Cooling System is an optional add-on for our Vytran Glass Processors that helps keep the furnace assembly cooled during extended heating operations. It is highly recommended for customers interested in fiber tapering, mode adapter, or fiber termination applications. This cooling system is included when purchasing the GPX3600 and GPX3850 workstations. Tubing and fittings for connecting to a Vytran Glass Processor are included.

Micro-Taper / Coupler Fixtures and Software Add-Ons

Features

- GPXFBT-FXTA Fixture with Adjustable Fiber Gripper for Transporting Tapers and Couplers
- GPXFBT-FXTB Fixture with Removable Taper Holder for *In Situ* Packaging
- GPXFBT-SFT Software Add-On Enables Fused Biconic Taper (FBT) Processing
- Purchase Separately or as a Kit



GPXFBT-FXTA

These optional add-ons for the Vytran Glass Processors are designed to aid microtaper and fused fiber coupler processing. The software package enables finer control over heating and fiber pulling parameters during active FBT processes, resulting in improved yields and high repeatability between runs.

The fiber gripper on the GPXFBT-FXTA Adjustable Fixture can accomodate taper lengths from 0 to 3.15" (0 to 80 mm). The GPXFBT-FXTB Removable Taper Holder Fiber Fixture option acts as a pick-up and removal apparatus for the user to safely and securely transport the fabricated taper or coupler for secondary processing or *in situ* packaging.

Large-Diameter Cleavers

LDC401A
Large-Diameter
Fiber Cleaver,
Flat or Angled Cleaves

Features

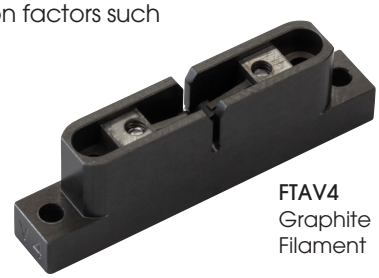
- Cleave Glass Fibers with Claddings from Ø80 µm to Ø1.25 mm
- Flat Cleaves or Angled Cleaves up to 15°
- Programmable via Handheld Controller
- Holding Blocks and Inserts are Compatible with GPX Glass Processors

Build Your System

Furnace Assemblies

A selection of graphite, iridium, and tungsten filament assemblies for fibers with claddings up to Ø1800 µm are available. The approximate filament heating lifetime is 40 minutes; however, this can vary depending on factors such as argon quality, splice/taper duration, and fiber glass quality.

- Graphite, Iridium, or Tungsten Filament with Protective Shroud
  - Graphite: Higher Temperatures with Less Outgassing
  - Iridium: Lower Temperatures Ideal for Soft-Glass Fibers (e.g., Chalcogenide or Fluoride)
  - Tungsten: Temperatures between Graphite and Iridium; Heats and Cools Quickly, Ideal for Pulsed Operation
- Multiple Size Options to Accommodate Claddings from 80 µm to 1800 µm



FTAV4
Graphite Filament

Fluorine-Doped Fused Silica Capillary Tubes

These 170 mm capillary tubes are ideal for the manufacture of high-power fiber laser combiners and other specialty applications. In the process of fiber combination, the fibers that will be joined are inserted into a capillary tube; then the tube is fused and tapered down into a solid glass element. The capillary tube traps light within the combiner and the tapered element acts as a multimode waveguide.

FTB02
Fluorine-Doped Fused Silica Capillary Tube

Fiber Holding Block Inserts

Each glass processor is equipped with two fiber holding blocks that secure the fiber during fusion or tapering. A fiber holding block can fit two inserts (one top and one bottom) that are designed to accept a range of fiber diameters. Two top and two bottom inserts are required to operate a glass processor. The types of inserts that are available for purchase are shown below.

Standard Bottom Inserts

VHE20
Dual-Sided Bottom Insert

- Multiple Size Options over Ø773 µm to Ø3198 µm Range
- Single-Sided and Dual-Sided Versions Available

Top Inserts

- Multiple Size Options for Fiber Outer Diameters from 57 µm to 3198 µm
- Single-Sided and Dual-Sided Versions Available
- Inserts with Indent for LED Light Illumination of Fiber End Face Available

VHB00
Top Insert with LED Indent

Multi-Fiber Bottom Inserts

- Designed to Hold 2 or 3 Fibers in Close Proximity using One Insert
- Multiple Sizes and Slot Options Available (Side-by-Side, Double-V, and Triple-V Slots)
- Use When Making Fused Couplers or Fiber Combiners
- Vacuum Holes for Aligning Fibers within Grooves or Slots

VHD320P
Double-V-Slot Bottom Insert with Alignment Pins

Transfer Bottom Inserts

- Multiple Size Options for Fiber Outer Diameters from 112 µm to 1047 µm
- Use to Transfer Fibers Between Vytran Systems
- VHT1 Transfer Clamp and Graphite V-Groove Required for Operation

VHF400
Transfer Bottom Insert

Contact Us

Contact Vytran for assistance in selecting components for your specific application.

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