

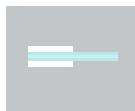


# GPX-3000 SERIES OPTICAL FIBER GLASS PROCESSORS



## Glass Processing and Fusion Splicing for Standard and Large Fiber Diameters

Strip



Clean



Cleave



Splice



Taper



Recoat



Test



光技術をサポートする

株式会社オプトサイエンス

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# GPX-3000 Series

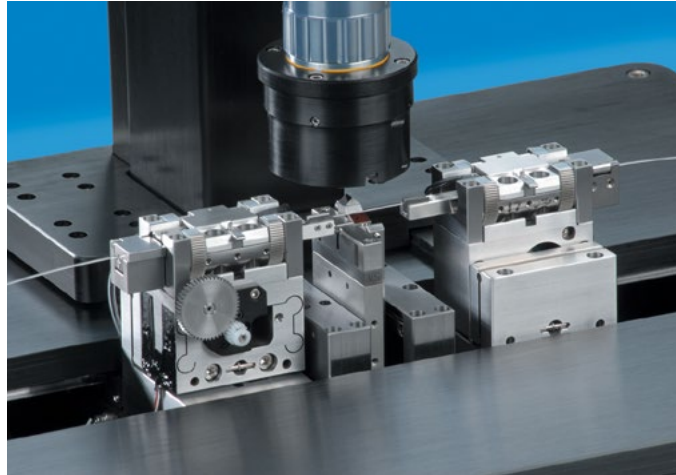
## A Glass Processor and a Fusion Splicer

For more than 23 years Vytran has pioneered glass processing and specialty fiber splicing, and developed a comprehensive applications library that is in use in our GPX-3000 Series optical fiber processors. The GPX-3000 Series is a versatile glass processing and fiber splicing platform designed for fabricating splices, tapers, couplers, fiber terminations and combiners on optical fibers from 40  $\mu\text{m}$  to 2 mm in diameter.

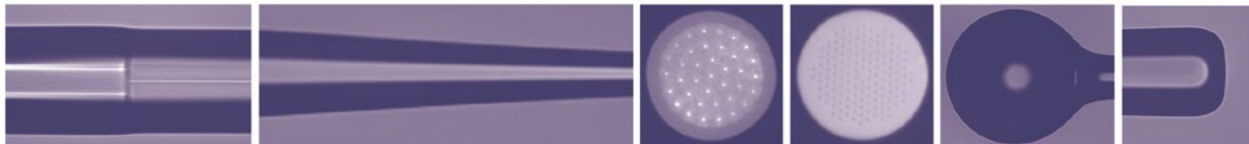
All GPX systems incorporate a filament “furnace” assembly that provides an environment-free, stable, high-temperature heat source for precise control of glass processing conditions. An embedded real time control system and powerful machine-level macro programming language allow the user to develop unique event-driven routines, enabling fast and flexible optical fiber processing development.

All high-level system communication is through a user-friendly PC-based graphical interface, allowing easy operation and convenient data storage.

Unique in the industry, GPX systems were specifically designed to provide users with a compact, fully integrated, consistent, high-performance glass processing solution—not



simply a lab tool that aggregates hardware functionalities. The result is an unmatched product family that is ideal for developing and producing in high volume the fused components and large-diameter splices necessary for fiber lasers and other specialty applications.



- Fusion splicing • Fiber tapering and drawing • Fiber lensing • Mode adapters
- N.A. converters • Thermal core expansion • Pump and output combiners
- Fiber couplers • End caps

## Key Markets



Optical Communication



Fiber Laser



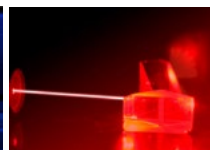
Defense and Aerospace



Medical Device



Sensing



Research and Development

# GPX-3000 Series

## Key Features / Benefits

### Unique Tools for Creating Fiber-Based Fused Components; Splicing and Tapering for Standard and Specialty Fibers

Includes host of features

*Fast and accurate positioning + image processing + application software*

#### High-resolution microscopic imaging system coupled with high-resolution digital CCD camera

- *Enables low-loss, high-strength splices*
- *Permits fiber end face inspection and necessary measurements for creating high-performance fused components*

#### Filament fusion

- *Allows production of a myriad of fused components*
- *Precise adjustable temperature level accommodates wide variety of glass types*

#### Easy to use

*Intuitive graphical user interface allows simple operation; data storage*

#### Clean Fusion

*Enables high-power fiber laser manufacture*

#### Furnace travel of up to +/- 65 mm

*Produce long tapers, package couplers and more*

#### Fully integrated mechanical system

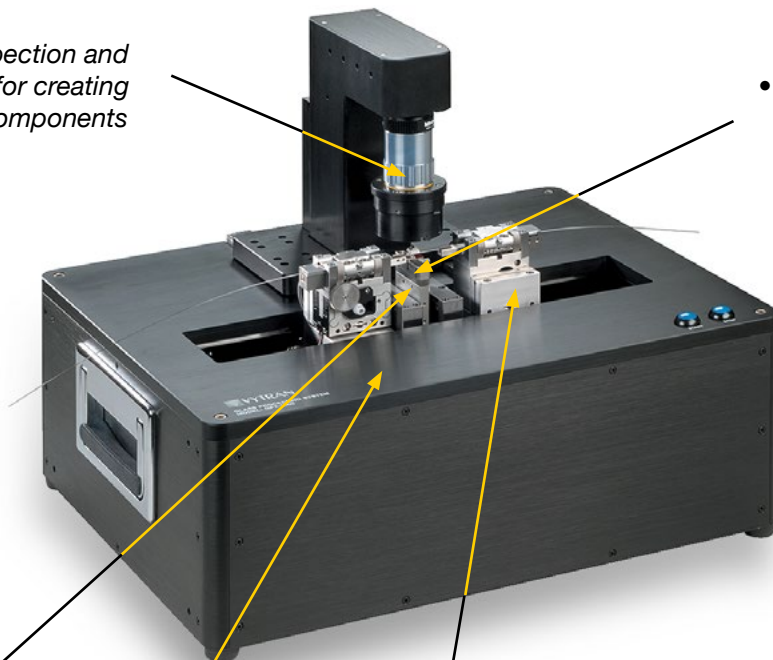
*Exact fiber positioning during processing*

#### Fiber holding block travel of up to 180 mm

*Ideal for tapering-related applications*

#### Versatile fiber holding fixtures –inserts, transfer jigs

- *Precisely manufacture fused components (tapers, combiners, end caps)*
- *Specialty large-diameter fiber splicing*

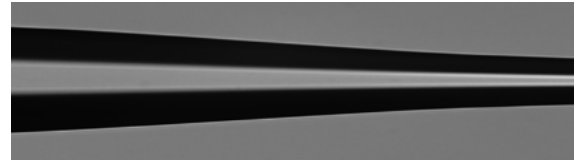


# GPX-3000 Series

## Glass Processing Capabilities

### Tapering and Drawing

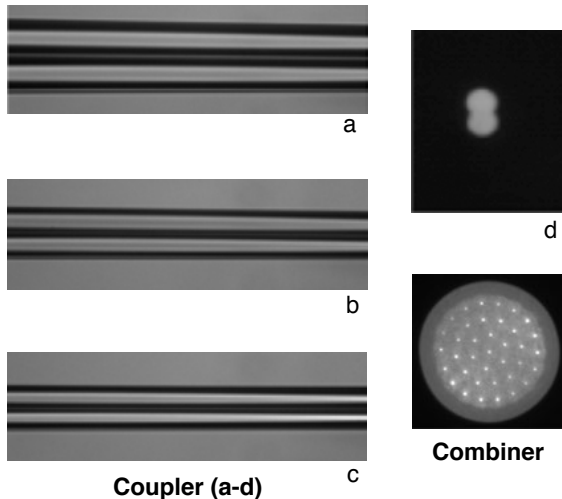
All GPX-3000 configurations are capable of tapering and drawing fibers and capillaries with a processing length up to 180 mm. The operator simply enters the physical characteristics of the desired taper into a taper interface menu, and a low-level machine control macro is generated. An optional tension monitoring and control system is available for precise control of drawing conditions.



Taper

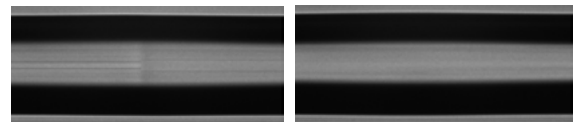
### Couplers and Combiners

GPX-3000 systems can fuse fibers side-by-side or into bundle configurations—essential for creating fused tapered couplers and pump or output combiners. Through precise control of heating and pulling conditions, the operator is able to develop application-specific coupler and combiner solutions that feature very low loss.



### Mode Adapters and N.A. Converters

GPX-3000 systems are ideal for use when large mode area double clad gain fibers must be coupled to dissimilar input or output fibers, as is typical in fiber laser systems. A GPX system can help optimize the signal and/or pump coupling between these fibers by physically tapering the fibers to change the mode field diameter of the signal fibers (Mode Adapter) or the N.A. of the pump fibers (N.A. Converter).



Mode Adapter Before

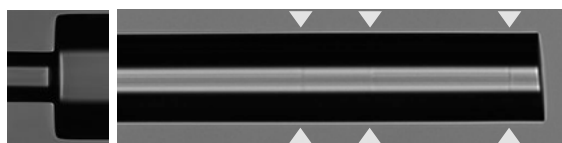
Mode Adapter After

### Thermal Core Diffusion

GPX-3000 systems can be used to thermally diffuse the core dopants of a fiber, thereby changing its waveguide characteristics. A controlled heat distribution profile along the length of a fiber can be easily programmed for the adiabatic expansion of the mode field diameter. This technique allows low-loss splices between highly dissimilar fibers.

### End Caps

GPX-3000 systems are well-suited for fusing silica end caps to power beam delivery fibers. Techniques are available for the collapse of photonic crystal fiber and fusing silica end caps to silica-silica fibers. Use with Vytran's model LDC-400 fiber cleaver to easily fabricate precise end cap lengths.

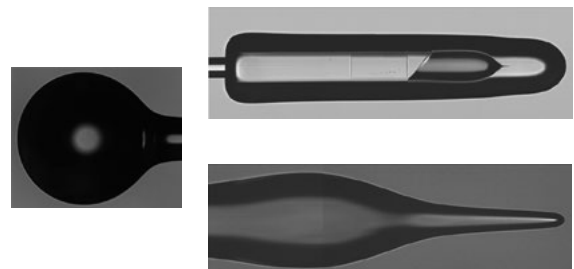


End Cap

Fiber Lens

### Fiber Terminations

Because they combine filament fusion, control over a large range of processing temperatures, long tapering abilities, macros software and exact fiber positioning, GPX-3000 Systems are ideal for use in developing fiber terminations such as catheters, fiber probes, ball lenses and more.



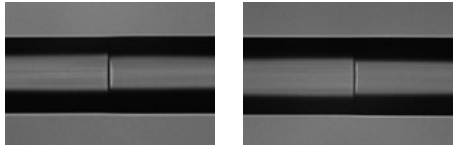
For any other processing contact us at [Vytran.com](http://Vytran.com).

# GPX-3000 Series

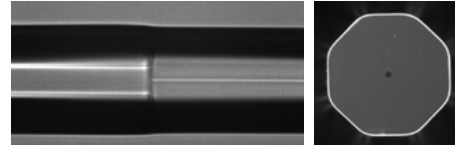
## Fusion Splicing for Standard and Specialty Fibers

Vytran's filament fusion technology is a consistent and reliable method for making high-strength, low-loss splices. During filament fusion, the splice region is purged with an inert gas and a resistive heating element supplies the precise amount of thermal energy necessary for fiber fusion. The size, shape and power delivery of the resistive heating element can be changed to suit the application, easily scaling to very large diameter fibers. The filament furnace assembly can also be moved along the length of the fiber, making possible many specialty processing applications, such as post-splice fire-polishing for strength enhancement.

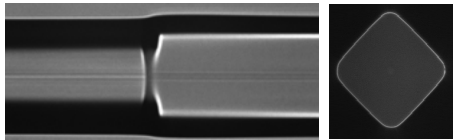
**GPX-3000 systems can be used to splice a wide variety of specialty fibers. Following is a small selection of examples.**



**Grin Lens Splicing**



**Octagonal Yb Doped Fiber Cleave and splice to HI-1060-FLEX**



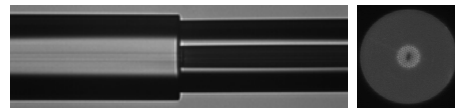
**Square Yb Doped Fiber Cleave and Splice to HI-1060-FLEX**



**PCF Cleave and Splice to SMF-28**



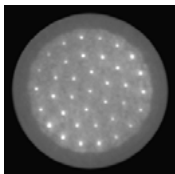
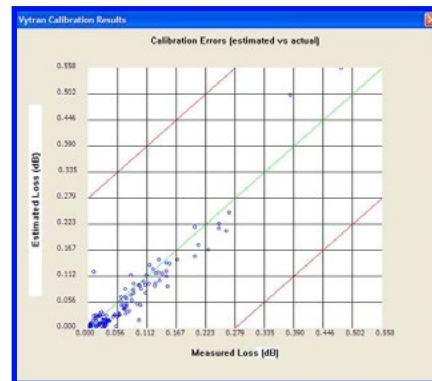
**Chalcogenide Fiber Splice**



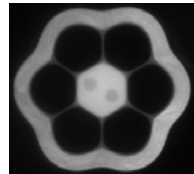
**PM-NL 3 μm Hollow Core PCF Cleave and Splice to SMF-28**

## Splice Loss Determination

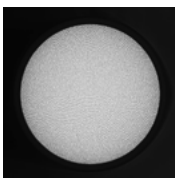
GPX-3000 systems incorporate True Core Imaging™ technology for precise core alignment prior to splicing. Because this provides a clear view of the fiber's inner core, an accurate estimation of splice loss can be achieved based on an analysis of the completed splice. Vytran has developed a proprietary algorithm that accurately calculates loss for splicing a variety of similar or dissimilar fiber types.



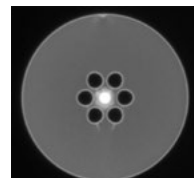
**37 to 1 Combiner**



**6 + 1 PM Combiner**



**Image Guide**



**PCF**

## End-View Imaging

GPX-3400 and 3600 feature an End-View Imaging system for looking directly at the ends of the fibers prior to splicing. This is used in conjunction with high-resolution rotary positioners for automated alignment of polarization maintaining fibers through either image-based or active feedback control. End-View Imaging is also a powerful tool when working with fiber laser gain fibers, which may have non-circular claddings or micro-structured cores.



# GPX-3000 Series Specifications

	生産中止 GPX-3100	生産中止 GPX-3300	GPX-3400	GPX-3600
Fiber Type Non PM	MM, SM, PCF, LMA, circular, non-circular, silica, soft glass (Call factory for your type)			
Fiber Type PM	N/A		Panda, Elliptical, Bow-Tie and many others (call factory for your type)	
Max. Fiber Cladding Diameter	2.0 mm in soft glass 1.5 mm in Silica	1.25 mm		1.7 mm (up to 2 mm <sup>(1)</sup> )
Fusion Method	Filament Fusion			
Filament Temperature Range	Room temperature to 2,500°C			
Typical Splice Loss	0.02 dB for SMF (ITU-T G.652)			
Loss Estimation <sup>(2)</sup>	N/A	Included (Proprietary method based on coupled mode theory)		
Typical Splice Strength	>250 kpsi for SMF (ITU-T G.652) using LDC-400 or appropriate fiber preparation equipment			
Strength Enhancement	N/A	Included - Fire Polish		
Polarization Cross-Talk	N/A		Panda >35 db, Others >30 dB	
Fiber Side Viewing	Side View core imaging True Core Imaging™			
Fiber End Viewing	Included for PM alignment and for fiber facet inspection <sup>(3)</sup>			
Fiber Alignment Method	Manual <sup>(4)</sup>	Fully automated <sup>(5)</sup>		
Fiber Inspection and Measurement <sup>(6)</sup>				
Core diameter	Included - Automatic measurement			
Cladding/fiber diameter	Included - Automatic measurement			
End face Inspection	Inspection via display			
Cleave angle	Included - Automatic measurement			
Splice loss estimation	Included - Automatic measurement			
Active power alignment	Included			
Furnace "Z" Movement	±90 mm from home position <sup>(7)</sup>	±90 mm from home position <sup>(8)</sup>		
Max. Fiber "Z" Movement	180 mm			
"Z" Movement Resolution <sup>(9)</sup>	0.25 μm			
X-Y Fiber Positioning Resolution <sup>(9)</sup>	N/A	0.02 μm		
Rotation Alignment	N/A	Fully automated <sup>(10)</sup>		
Rotation Drive Resolution <sup>(9)</sup>	N/A	0.02°		
Rotation Travel	N/A	190°		
Tapering	Yes			
Maximum tapering length	Up to 150 mm <sup>(11)</sup> (maximum travel 180 mm)			
Minimum tapering length	~2 mm <sup>(11)</sup>			
Maximum tapering ratio	Standard adiabatic up to 1:10 - Capable to up to 1:100			
Maximum tapering speed	Process dependent	Process dependent (typically 1 mm/s)		
Taper property	Adiabatic and taper shape programmable			
Typical adiabatic tapering loss	<0.01 dB			
PC Control and Proprietary Software	Included			
Mouse	Included			
GUI	One Step Splice™ in Operator Mode - Process Development Mode with password protection			
Applications Software				
Splice files	Built in library of most common fibers - Very large library available (contact Vytran)			
Splice memory	>> than 10,000 Splices			
E-Splice™	Internet ready volume manufacturing			
Remote data access	Ethernet			
Remote control	Ethernet			
Remote inspection	Ethernet			
Monitor Features	High resolution full color (1024x768)			
Core Applications	Low and high temperature glass fusion splicing; PCF processing; creating end caps, tapers; producing high-power-laser fused components such as tapers, pump and laser combiners, pump/signal combiners, MFA, fiber lenses, capillary tubing, long period gratings and many others - Please contact Vytran			
Engineering Services	For more than 23 years Vytran has developed a library of glass processing applications and provided engineering services. Please contact us for guidance on your specific application.			
Installation and Training	Included 2 or 3 days based upon product type and options			
Safety	No need of laser safety requirements			

# GPX-3000 Series Specifications Cont.

	生産中止 GPX-3100	生産中止 GPX-3300	GPX-3400	GPX-3600
Physical				
Size	16.0" x 12.5" x 6.3" (410 x 320 x 160 mm)			
Weight	45 lbs (20 kg)			
Power	External power supply unit, universal input: 90-260 VAC, 47-63 Hz, single phase			
	GPX-3000 input: 12V and 48V DC 10A			
	PC input: 115 or 230 VAC, 47-63 Hz, single phase			
Gas Supply	Argon , Zero grade at 12 PSIG			
Environmental				
Operating temp range (°C)	15 to 40°C			
Operating pressure range	From sea level to 2000m			
Operating humidity range	0 to 75% non condensing			
Storage temp range (°C)	From -20° to 60°C			
Storage humidity range	0 to 90% non condensing			
Usage condition	Fiber optic manufacturing environment			
Shock	Transportation across world in cargo plane			
Accessories included				
	Tool kit - Argon regulator			
Filaments	6 pieces of replacement Tungsten filament loops: (3pcs) F85-12520-N50 (3pcs) F100-12525-N10	8 pieces of replacement filaments: (4pcs) GF-1.0-1.0-0.46-V2-16 (4pcs) GF-1.5-2.0-0.75-V4-16	4 pieces of replacement filaments: (1pc) GF-1.0-1.0-0.46-V2-16 (1pc) GF-1.5-2.0-0.75-V4-16 (1pc) GF-2.4-3.0-1.65-V6-16 (1pc) GF-2.4-3.0-0.61-T4-16	
Inserts	Six (6) sets of bottom inserts: (2pcs) FHB-97-500 (2pcs) FHB-97-750 (2pcs) FHB-69-1000/1250 (2pcs) FHB-69-1500/1750 (2pcs) FHB-69-2000/2250 (2pcs) FHB-69-2500 Four (4) sets of top inserts: (2pcs) FHB-13-0000 (2pcs) FHB-13-0500/0750 (2pcs) FHB-13-1000/1250 (2pcs) FHB-13-1500/1750	Five (5) sets of bottom inserts: (2pcs) FHB-97-250 (2pcs) FHB-97-400 (2pcs) FHB-97-500 (2pcs) FHB-97-750 (2pcs) FHB-69-1000/1250 Three (3) sets of top inserts: LDC-15-0000 LDC-15-0500/0750 LDC-15-1000	Five (5) sets of bottom inserts: (2pcs) FHB-97-250 (2pcs) FHB-97-400 (2pcs) FHB-97-500 (2pcs) FHB-97-750 (2pcs) FHB-69-1000/1250 Three (3) sets of top inserts: LDC-15-0000-LED LDC-15-0500/0750-LED LDC-15-1000	
Transfer Clamp GPX-3000/ LDC-400/200	N/A		Included	
Options				
Tension monitor and control system			Optional	
Combiner/coupler packaging fixture			Optional	
Tapering filaments			Optional	
LDC-400	Fully compatible mechanically (including LDC-200 family)			
Tutorials	Vytran offers a large range of customized training and tutorial at our application centers. (New Jersey - UK - Germany - China)			

- (1) Contact Vytran
- (2) True Core Imaging™ technology for accurate loss estimation
- (3) Real time image processing system viewed directly on PC monitor
- (4) Fixed V-Groove in fiber holding block for tapering, FBT coupler and combiner applications
- (5) True Core Imaging™ or external feedback
- (6) CCD-based imaging system
- (7) Max travel with fiber holding blocks fully extended
- (8) Max travel with fiber holding blocks parked
- (9) Stepper motor controlled
- (10) Fully automated End-View alignment technology for PANDA, Bow Tie, elliptical clad or elliptical core fibers. External extinction ratio feedback for automatic active rotation of all PM fiber types
- (11) Depending on taper geometry

# GPX-3000 Series Specifications cont.

The splicing capabilities of the various GPX-3000 configurations are summarized in the table below. In general, the GPX-3100 is best suited for large-diameter multi-mode fibers, while the GPX-3300, 3400 and 3600 are suitable for both single mode and multi-mode applications.

	40 $\mu\text{m}$ to 1000 $\mu\text{m}$	1.2 mm	1.8 mm	2 mm	Multimode Fiber	Single mode Fibers	Double clad	PM Fibers
生産中止 GPX-3100	●	●	●	●	●	●	●	
生産中止 GPX-3300	●	●			●	●	●	
GPX-3400	●	●			●	●	●	●
GPX-3600	●	●	●		●	●	●	●

## Related Products:



### LDC-400 Large Diameter Cleaver

Fully automated precision cleaver for standard, large-diameter and specialty fibers.

[www.vytran.com/product/LDC-400](http://www.vytran.com/product/LDC-400)



### PTR-200-XLR and PTR-200-MRC Fiber Recoaters

Extended-length and standard manual recoaters that restore acrylate coating to stripped fiber.

[www.vytran.com/product/ptr-200\\_series](http://www.vytran.com/product/ptr-200_series)



### LFS-4000 Large Fiber Splicer

Filament fusion splicer for standard, large-diameter and specialty fibers. Fully compatible with GPX-3000 Series and LDC-400.

[www.vytran.com/product/LFS-4000](http://www.vytran.com/product/LFS-4000)



[www.vytran.com](http://www.vytran.com)

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