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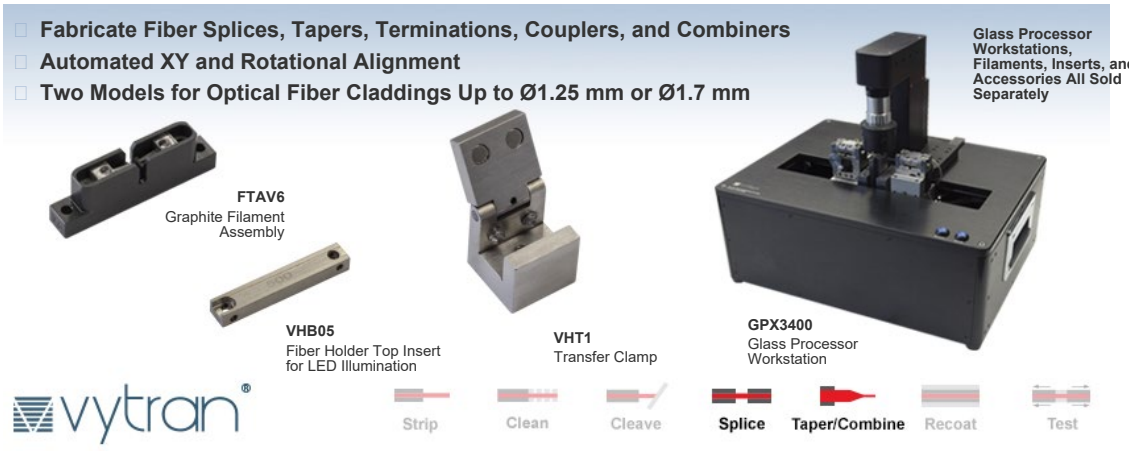
VHD320P - July 15, 2024

Item # VHD320P was discontinued on July 15, 2024. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

VYTRAN® AUTOMATED GLASS PROCESSORS

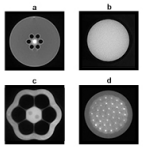


Hide Overview

OVERVIEW

Features

- Fabricate Splices, Tapers, Terminations, Couplers, and Combiners
- Automated XY and Rotation Alignment
- Compatible with Single Mode, Multimode, Polarization-Maintaining, and Specialty Fibers (See *Applications* Tab for Examples)
- Create Low-Loss (~0.02 dB) Splices in Standard Glass Fibers (See *Specs* Tab for Details)
- Side-View/End-View Imaging using True Core Imaging™ Technology
- Software with Process Development GUI and Splice Process Library (See *Software* Tab for More Information)



Click for Details
End-view images of fibers with internal structure. Shown are a) photonic crystal fiber, b) image guides, c) 6+1 PM fiber combiner, and d) 37 to 1 fiber combiner.

Build Your System

- Glass Processor Workstation for Fibers with Claddings Up to Ø1.25 mm (GPX3400) or Up to Ø1.7 mm (GPX3600)
- Choose from Graphite, Iridium, and Tungsten Filament Assemblies (One FTAV4 Graphite Filament Pre-Installed in System)
- Choose Top and Bottom Inserts (Two Top Inserts and Two Bottom Inserts Required; See *Fiber Holder Inserts* Tab for More Information)
- Optional Multi-Fiber Holder Bottom Inserts (For Making Couplers or Combiners)
- Optional Fluorine-Doped Capillary Tubes (For Making Specialty Couplers or Combiners)
- Optional Liquid Cooling System for Tapering Applications (One Included with the GPX3600)
- Optional Fiber Taper Software and Handling Fixtures
- Optional Fiber Combiner Loading Fixture
- Optional Ultrasonic Cleaner for Preparing Fibers Prior to Splicing
- Optional Mountable Gooseneck Light

Thorlabs' Vytran® Optical Fiber Glass Processors are versatile platforms designed for fabricating splices, tapers, couplers, terminations, and combiners using optical fibers. The glass processors sold on this page feature automated pre-splice alignment for the XY position of the fiber edge and rotational orientation of the fiber core. These systems are ideal for splicing applications involving polarization-maintaining fibers, photonic crystal fibers, and other specialty fibers with microstructured cores. The GPX3400 glass processor is compatible with fibers up to Ø1.25 mm cladding while the higher power GPX3600 can process fibers up to Ø1.7 mm cladding.

These glass processors incorporate a filament-based furnace assembly that provides a uniform and precisely controlled, high-temperature heat source. Because filament material and size can be interchanged easily (ten different filament options are available below), a wide range of fiber cladding diameters and specialty fiber types can be accommodated using the same system. 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 (please see the *Applications* tab for examples).

True Core Imaging

These fiber processing systems employ 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 to allow for clear side-view and end-view images (see example images to the right) of the fiber cladding and core. This imaging feature allows for automated measurement of fiber properties (core/cladding diameters, cleave angle, etc.) and provides feedback for the automated alignment system. The VHB00 or VHB05 top insert (sold below) is required in order to use automated end-view alignment.

Options and Accessories

A complete glass processor requires the purchase of a glass processor workstation (choose one below), two top inserts (sold separately below), two bottom inserts (sold separately below), and a >99.999% purity argon gas tank (not available from Thorlabs). The *Fiber Holder Inserts* tab has information to aid in choosing pairs of fiber holder inserts, as well as insert installation instructions. An FTAV4 Graphite Filament (for Ø125 - Ø600 µm cladding) is included with each glass processor; additional filaments made from different materials or for other fiber cladding diameters are sold separately below. See the *Tutorial Videos* tab above for videos on how to install filaments and perform filament maintenance. An ultrasonic cleaner for preparing fibers for splicing can be purchased separately below.

Several optional add-ons are available for these systems to enable specialized applications. The GPXWCS Liquid Cooling System helps cool the furnace assembly when the filaments are used for extended heating times and is recommended for customers interested in creating long fiber tapers. It comes included with the high-power GPX3600 and can be purchased as an add-on for the GPX3400. Multi-fiber holder bottom inserts are used when fabricating couplers or combiners and are designed to hold two or three fibers in close proximity during heating. The GPXM45 bottom insert with 45° mirror is an optional accessory for providing an additional method for inspection of fiber end faces and alignment of fiber components. Thorlabs also offers a Fiber Taper Software Add-On and Taper Handling Fixtures (sold below), which include software application files and fixture upgrades that enable high repeatability when fabricating and handling microtapers, nanotapers, fused fiber couplers, or wavelength division multiplexers. The software add-on and fixtures can be purchased separately or together as a kit. We also offer the GPXCFXL Fixture that supports the positioning of fiber bundles during combiner fabrication. The GPXL1 Gooseneck Light is available for end-view illumination of the fiber or for general lighting during alignment. It can be mounted to the left or right side of the workstation.

Compatible Vytran Fiber Processing Systems							
Fiber Preparation Station (Strip and Clean)	Large-Diameter Fiber Cleavers	Portable Large-Diameter Fiber Cleavers	Large-Diameter Fiber Splicer	CO_2 Laser Glass Processing System (Splice and Taper)	Automated Glass Processing Systems with Integrated Cleaver (Cleave, Splice, and Taper)	Automated Glass Processing Systems (Splice and Taper)	Recoaters, Proof Testers, and Recoaters with Proof Testers

Hide Specs

SPECS

Item #	GPX3400	GPX3600
Splicing Specifications		
Silica Fiber Types (Non PM)	Single Mode, Multimode, Photonic Crystal, Large Mode Area, Non-Circular[a]	
Silica Fiber Types (PM)	PANDA, Elliptical, Bow-Tie[a]	
Fiber Cladding Diameter	Up to 1.25 mm (Max)	Up to 1.7 mm (Max)
Fusion Method	Filament Fusion	
Max Filament Temperature	3000 °C	
Max Filament Power	400 W	
Filament Power Resolution[b]	0.1 W	
Splice Loss	0.02 dB (Typical)[c]	
Splice Strength	>250 kpsi (Typical)[d]	
Strength Enhancement	Fire Polish	
Polarization Cross Talk	PANDA: >35 dB Other PM Fiber Types: >30 dB	
Fiber Inspection		
Fiber Side Viewing	True Core Imaging™ Technology	
Fiber End Viewing	Facet Inspection and PM Core Alignment (VHB00 or VHB05 Top Insert Required)	
Core / Cladding / Fiber Diameter	Automated Measurement	
End Face Inspection	Inspection via GUI Display	
Cleave Angle	Automated Measurement	
Fiber and End Face Alignment		
Fiber Z-Axis Movement	180 mm (Max)	
Z-Axis Movement Resolution	0.25 µm via Stepper Motor	
XY Axis Fiber Positioning Resolution	0.02 µm via Stepper Motor	
Rotation Alignment	Fully Automated End-View Alignment for Panda, Bow Tie, Elliptical-Core Fibers External Extinction Ratio Feedback for Automatic Alignment of PM Fiber Types	
Rotation Drive Resolution	0.02°	
Rotation Travel	200°	
Tapering		
Tapering Length	~2 mm to 150 mm[e]	
Tapering Ratio (Max)	Adiabatic Tapers up to 1:10 Non-Adiabatic Tapers up to 1:100	
Tapering Speed	1 mm/s (Typical)[f]	
Adiabatic Tapering Loss	<0.01 dB (Typical)	
Computer and Software		
PC Computer	Included	
Splice Files	Built-In Library for Common Fibers and Processes	
Physical		
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)	
Environmental		

Operating Temperature	15 to 40 °C
Altitude Range	0 to 2000 m Above Sea Level
Operating Humidity	0% to 75% Relative Humidity (Non-Condensing)
Storage Temperature	-20 to 60 °C
Storage Humidity	0% to 90% Relative Humidity (Non-Condensing)

a. Other fiber types than those listed are compatible. Contact Tech Support to determine if your fiber type can be used.
b. This is the software monitor readout resolution. The corresponding temperature resolution will depend on the filament being used, and is not measured by the software.
c. For Ø125 µm Cladding Single Mode Fiber
d. Measured for single mode fiber prepared using an LDC401 Series Cleaver or other appropriate fiber preparation equipment.
e. Dependent on Taper Geometry
f. Tapering speed depends highly on the type of process used. 1 mm/s is a typical speed for a standard tapering process.

Hide Fiber Holder Inserts

FIBER HOLDER INSERTS

Fiber Holder Inserts Selection Guide (Top Inserts and Standard or Transfer Bottom Inserts)

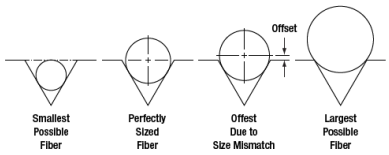
Introduction

Fiber Holder Inserts, which are designed to hold various sized fibers within the glass processors, must be purchased separately. Standard and transfer bottom inserts have V-grooves to hold the fiber, while the top inserts each feature a recessed, flat surface that clamps the fiber against the V-groove in the bottom insert. Each top and bottom insert is sold individually, as the fiber outer diameter clamped by the left and right holding blocks may not be the same. At least two top inserts and two bottom inserts are required to operate the glass processor. For multi-fiber inserts, which are used to make fused couplers or combiners, the recommended top inserts are listed in the multi-fiber insert table.

The table below indicates the maximum and minimum outer diameters that can be accommodated by different combinations of top and bottom inserts. It also indicates how far offset the fiber will be for recommended combinations of top and bottom inserts. Note that this outer diameter may be the fiber cladding, jacket, or buffer. If one side of the fiber is being discarded, it is preferable to clamp onto the cladding of this section except in special cases (such as non-circular fiber) where the coating or buffer may be preferable. Sections of fiber that are not being discarded should always be clamped on the coating or buffer in order to avoid damaging the glass. This may require different sets of fiber holder inserts to be used in the left and right holding blocks. In this case, it is important to minimize the difference in the offsets introduced by the left and right sets of inserts when attempting to produce high-quality splices.

Fiber Holder Insert Selection Chart

1. **First, select the bottom insert that matches your fiber size most closely.**
   Example: For a Ø800 µm fiber, the VHF750 insert is the closest match, since it is only 50 µm smaller.
2. **On the chart below, look to the right of your chosen bottom insert. Select a compatible top insert based on the accepted diameter size range shown in each cell.**
   Example: For the Ø800 µm example fiber from step 1, the green cell is in the 750 µm groove column for the VHA05 top insert, which has two grooves. The numbers listed in the green cell indicate that this combination of inserts is good for fibers from 728 to 963 µm in diameter. Our Ø800 µm fiber is within this range, so this is a good choice. There are several other options as well that will accommodate a Ø800 µm fiber as well, but the green shading in the chart indicates that the 750 µm groove in the VHA05 provides the best fit.
3. **The second line of numbers in each cell shows the range of offsets that can be expected for any given combination of top and bottom inserts. When selecting inserts for the right and left fiber holding blocks, try to minimize the offsets between the pairs of inserts on each side.**
   Example: If we choose a VHF750 bottom insert and the Ø750 µm groove in the VHA05 top insert, we can use fiber as small as 728 µm, in which case the center of the fiber would sit 23 µm below the surface of the bottom insert. We could also clamp a fiber as large as 963 µm, in which case the center of the fiber would sit 213 µm above the surface of the bottom insert. We could interpolate to find the offset experienced by our hypothetical 800 µm fiber, but it turns out that in a 60° V-groove, the offset is equal to the outer diameter difference. So in our example, that means that the center of our fiber is going to sit 50 µm above the bottom insert surface, since it is 50 µm larger than the fiber that the bottom insert was designed for (800 - 750 = 50).
4. **Holding blocks designed for fibers less than Ø1000 µm have vacuum holes, designed to aid in aligning small fiber within the groove, while bottom inserts for fibers of Ø1000 µm or larger do not have these holes.** The glass processors have a vacuum pump that provides a small holding force via these holes, keeping small fibers in place as the clamps are lowered. Inserts with vacuum holes are indicated by a superscript "d" in the table below.



Each V-groove can accommodate a range of fiber sizes.

Legend	
	Best Fit
	Second Best Fit: Try these options if the best fit does not incorporate your fiber sizes.
	Third Best Fit: Try these options if the other two categories do not incorporate your fiber sizes.

Top Insert Item #		VHA00[a] VHB00[b]	VHA00[a]	VHA05[c] VHB05[b]		VHA10[c]		VHA15[c]		VHA20[c]		VHA25	VHA30
Accepted Diameter (Nominal)		**≤320 µm**	**400 µm**	**500 µm**	**750 µm**	**1000 µm**	**1250 µm**	**1500 µm**	**1750 µm**	**2000 µm**	**2250 µm**	**2500 µm**	**3000 µm**
Bottom Insert Item #	**Accepted Diameter (Nominal)**	**Min / Max Accepted Diameter (µm) Min / Max Fiber Offset (µm)**											
VHF160[d,e]	**160 µm**	112 / 208 -49 / 48	-	-	-	-	-	-	-	-	-	-	-
VHF250[d,e]	**250 µm**	177 / 320 -73 / 69	275 / 323 23 / 74	-	-	-	-	-	-	-	-	-	-
VHF400[d,e]	**400 µm**	279 / 519 -122 / 119	377 / 517 -23 / 117	410 / 519 -9 / 119	-	-	-	-	-	-	-	-	-
VHF500[d,e]	**500 µm**	346 / 592 -153 / 93	447 / 647 -53 / 147	476 / 711 -24 / 211	560 / 795 61 / 296	-	-	-	-	-	-	-	-
VHF750[d,e]	**750 µm**	516 / 759	617 / 970	643 / 878	728 / 963	812 / 1047	-	-	-	-	-	-	-

		-234 / 9	-132 / 221	-107 / 128	-23 / 213	62 / 297							
VHE10[c]	1000 µm	-	-	773 / 1008 -172 / 63	858 / 1093 -88 / 147	943 / 1178 -3 / 232	1036 / 1271 90 / 325	-	-	-	-	-	-
	1250 µm	-	-	-	1034 / 1269 -176 / 59	1119 / 1354 -91 / 144	1212 / 1447 2 / 237	1288 / 1523 78 / 313	-	-	-	-	-
VHE15[c]	1500 µm	-	-	-	-	1280 / 1515 -172 / 63	1373 / 1608 -79 / 156	1449 / 1684 -2 / 233	1534 / 1769 82 / 314	-	-	-	-
	1750 µm	-	-	-	-	-	1534 / 1770 -159 / 76	1611 / 1846 -83 / 152	1695 / 1930 2 / 237	1772 / 2007 78 / 313	-	-	-
VHE20[c]	2000 µm	-	-	-	-	-	-	1787 / 2022 -171 / 64	1871 / 2106 -86 / 149	1947 / 2183 -10 / 225	2032 / 2267 74 / 309	-	-
	2250 µm	-	-	-	-	-	-	-	2033 / 2268 -167 / 68	2109 / 2344 -91 / 144	2193 / 2429 -6 / 229	2278 / 2513 78 / 313	-
VHE25	2500 µm	-	-	-	-	-	-	-	-	2270 / 2505 -172 / 64	2355 / 2590 -87 / 148	2439 / 2675 -2 / 233	2609 / 2844 167 / 402
VHE30	3000 µm	-	-	-	-	-	-	-	-	-	2692 / 2944 -256 / -4	2777 / 3029 -171 / 81	2946 / 3198 -2 / 250

a. One side of the VHA00 is flat to provide additional clamping force for fibers with very small outer diameters.
b. The VHB00 and VHB05 top inserts are equipped with an indent for LED illumination of the fiber end faces.
c. These inserts are dual sided to accomodate two different ranges of fiber outer diameters.
d. These bottom inserts have vacuum holes to aid in aligning small fibers when used with the glass processors.
e. These transfer inserts are longer and can be used with the VHT1 to transport fiber between the GPX Glass Processors, LDC401 and LDC401A Fiber Cleavers, and FPS301 Fiber Preparation Station

Fiber Holder Insert Assembly and Installation

After you select the correct fiber inserts for your nominal fiber diameter, the fiber inserts need to be installed into the fiber holding blocks, as shown in the video below to the left. Standard fiber inserts are meant to remain installed in a system when processing fibers of the same size, while fiber transfer inserts are used to move a fiber from one compatible Vytran machine to another between processing steps. Transfer inserts consist of a fiber holder bottom insert, fiber transfer clamp, and graphite V-groove that require assembly as shown in the video below to the right.

Transfer Insert Assembly Instructions

Fiber Insert Installation Instructions

Hide Tutorial Videos

TUTORIAL VIDEOS

Introduction

To assist new or returning GPX users with operating their glass processors, we have created a series of tutorials aimed at teaching the basic skills needed to run this machine including hardware installation, software familiarization, filament setup, and processing fibers. To read the text in the videos, we strongly recommend viewing them at full screen, 1080p resolution. If you require assistance performing other operations using your GPX glass processor, please contact Tech Support.

Quick Links	Setup and Nomenclature	Hardware Installation	Software Introduction	Filament Setup	Processing

Setup and Nomenclature

To assist new or returning GPX glass processor users with operating their glass processors, we have created a series of tutorials aimed at teaching the basic skills needed to run this machine including lab bench setup, argon setup, and common nomenclature. To read the text in the videos, we strongly recommend viewing them at full screen, 1080p resolution. If you require assistance performing other operations using your GPX glass processor, please contact Tech Support.

Introduction

This video provides an introduction to GPX glass processors and LFS large fiber splicers.

Lab Bench Setup

This video provides an overview of the tools needed to set up and operate the GPX glass processor.

Argon Setup

This video provides details for setting up your argon gas supply to operate the GPX glass processor in an oxygen free environment.

GPX Nomenclature

This video outlines the key features, functions, and terminology for Thorlabs' Vytran GPX glass processor.

Power Up/Down

This video demonstrates the proper power up and power down procedure to follow when operating the GPX series glass processing systems.

Back to Top

Hardware Installation

The GPX series glass processors use an omega-shaped filament to heat glass components for splicing or tapering. Filaments are chosen based on the diameter of the fibers to be processed and what process will be performed. Once the appropriate filament is chosen, it must be installed by the user.

To accommodate a range of fiber diameters, top and bottom fiber holding inserts are chosen based on the size of fiber to be processed. Once chosen, the inserts can be installed to position fibers along the fiber line of the unit. While standard inserts remain mounted in the fiber holding blocks, transfer inserts can facilitate the movement of a fiber between Vytran devices, allowing users to perform multiple processes to a section of fiber without needing to realign the fiber end. This is thanks to the reference ball and matching surface present on the transfer inserts and fiber holding blocks, respectively. Transfer inserts are assemblies made from a fiber transfer clamp, special bottom insert, and a graphite v-groove.

Filament Installation

This video demonstrates how to install or replace a filament in the GPX filament tower.

Fiber Insert Installation Instructions

This video shows how standard fiber holder inserts are installed in the GPX fiber holding blocks.

Transfer Insert Assembly Instructions

This video shows how to assemble a transfer insert for use between compatible Vytran equipment.

Back to Top

Software Introductions

Many Vytran fiber processors, including the GPX glass processing workstation, use the FFS3 software package to control all parameters of the setup, fusion, and tapering. This software has a variety of tools and functions; the following videos will help familiarize users with the basic menus and toolbars commonly used in day-to-day operation.

File Menu

This menu provides similar functions to other programs' file menus, such as opening and saving files.

View Menu

This menu can be used to configure which toolbars are displayed as well as switching on and off various information windows and alignment guides.

Configuration Menu

This menu can be used to configure the user interface and machine-specific parameters. Many parameters available through this menu are set during manufacture and should not be altered.

Main Toolbar

This toolbar gives users quick access to common functions required to run the fiber processor.

Camera Control and Movement Control Toolbar

These toolbars, in combination, allow fibers to be moved for focus and alignment along the fiber line.

Back to Top

Filament Setup

Once familiarized with the FFS3 software, users can set up the filament for processing glass. A newly installed filament must be centered along the fiber line to ensure even heating around glass components being processed. Once centered, brand new filaments must be burned in before use. The burn-in process consists of bringing the filament to a high temperature and back down to room temperature using a routine included in the software. This routine is performed six times with a one-minute cooldown between each execution. A new filament only needs to be burned in once.

The power required to heat a filament to the same temperature will vary over the life of the filament. To adjust for the filament's age, a normalization process can be carried out, which consists of heating two fiber tips and measuring the resulting rounding. Regular normalization of a filament ensures consistent performance over its life. At the end of its life, a filament can be refurbished by Vytran; contact Tech Support for more information on filament refurbishing.

Filament Centering

This video demonstrates the process for centering a filament around a fiber using the FFS3 control software.

Filament Burn In

This video demonstrates the burn-in process for new filaments.

Filament Normalization

This video demonstrates the normalization process including the steps carried out by the FFS3 software and values used to hone the filament's performance.

Back to Top

Processing

Users should familiarize themselves with how to align fibers along the fiber line. Once comfortable aligning fibers, users can begin with splicing same-sized single mode or multimode fibers. Users who can successfully perform these operations will have a basic understanding of fiber processing with GPX systems, allowing them to approach more advanced or specialized techniques for their particular application. The GPX series of glass processors can perform splices and tapers on a variety of glass components. Our engineering staff can help design splicing programs in the FFS3 software to automate processing components for your specific application.

Performing a Splice (SM and MM Fibers)

This video provides an overview of the steps involved in splicing single mode or multimode fibers with the GPX glass processor.

Performing a Splice (PM Fibers)

This video provides details on the rotational alignment process needed in splicing PM fibers with the GPX glass processor.

Manual Fiber Alignment

This video shows the steps to manually align fibers for splicing, which is useful in process development for advanced applications.

Making a Fiber Taper

This video demonstrates the setup, operation, and characterization of a drawn fiber taper with the GPX glass processor.

Lensed Fiber Tip

This video will demonstrate the capability of GPX series glass

Fiber Bundle

In this video, we will demonstrate how to make a fiber bundle

processors to produce and measure drawn fiber lenses.

using a Thorlabs Vytran GPX Glass Processing System.

Back to Top

Hide Software

SOFTWARE

Each glass processor and splicer is shipped with a monitor and a PC pre-installed with our FFS3 software, which is used to operate each system. This software package allows users to control all parameters of the set-up, fusion, and tapering. Each step can be initiated by the user through the graphical user interface (GUI) or through one-button splice process files that run automated routines.

Common splicing and tapering routines, including those listed to the right, come preinstalled on the system. The GUI and splice library software enable users to create their own splice files for new processes or to customize existing files as necessary. Additionally, an add-on software package is available that includes application files for specialized applications that can be purchased separately below. Please contact Tech Sales for inquiries regarding your specific application.

Included Splice Files		
Filament	**FTAV2 (Graphite V2)**	**FTAV4 (Graphite V4)**
Splice Files	• Burn-In • Ø125 µm Normalization • Ø125 µm Single Mode Fiber Splice • Ø125 µm Polarization-Maintaining Fiber Splice	• Burn-In • Ø125 µm Normalization • Ø125 µm Single Mode Fiber Splice • Ø400 µm Normalization • Ø400 µm Fiber Splice • Ø400 µm to Ø250 µm Taper

End-View Alignment

End-view alignment is used for splicing polarization-maintaining fibers such as elliptical-core fiber (PM or PZ), PANDA or bow-tie polarization-maintaining fiber, or a hybrid splice between any of these. These types of fiber require a rotational alignment in addition to the XY alignment to align the stress regions within the cladding region.

The end-view alignment process is initiated by pulling the fibers back so that an end-view mirror can be inserted between two fiber end faces. An LED illuminates the fiber cladding, allowing the software to image the fiber end. Then, the image of the fiber end face is displayed and used to automatically align the cores of the two fibers. PM alignment parameters can be set for each fiber type as shown in Figure 1. This window consists of four parameters: diameter (fiber cladding), fiber type, and two PM geometry parameters for both the left and right fiber. If these parameters are not known, it is possible to directly measure them using the displayed image of the fiber end face.

Click to Enlarge

Figure 1. Screenshot of PM Fiber Alignment Configuration Window

Tension Monitor and Control

The Tension Monitoring System, shown in Figure 2, is included with all Vytran® glass processors to provide feedback during a tapering process. Users can then pre-load a tension to the fiber before heating the fiber to begin the tapering process and also use the tension feedback to modify the taper process parameters as necessary.

As an example, a standard Ø400 to Ø200 µm taper should be pre-tensioned to approximately 20 g. The desired pre-tension is applied by pulling the fiber in fine steps using one of the fiber holding blocks. Feedback loops can be set during the taper process to monitor the tension in the fiber. For example, if the tension drops to 0 or negative values, the heating should be decreased because the glass has been softened too much. Conversely, if the tension increases beyond a given set point, heating should be increased because the fiber has not been sufficiently softened.

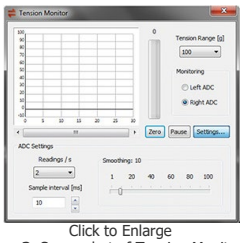


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Figure 2. Screenshot of Tension Monitor and Control System

Fiber Taper Geometry

Users can define the specifications for fiber tapers using the Taper Properties menu, shown in Figure 3.

During the tapering process, three different regions are created. Initially, the fiber is elongated and tapered under constant heating creating the "down taper" region where the fiber diameter is decreasing. Once the fiber has been tapered down to a desired diameter, a constant rate of elongation is applied so that there is a region with a reduced, but constant diameter, known as the "waist" of the fiber. Finally, the pulling velocity on the fiber is reduced until finally it is no longer elongating, creating the "up taper." The filament temperature and pull velocities are controlled to achieve the desired geometry of the fiber.

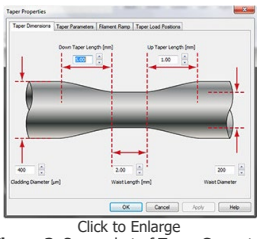

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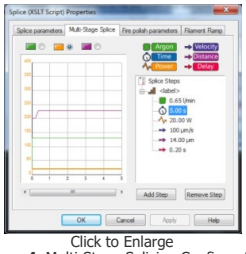
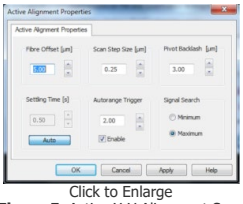
Figure 3. Screenshot of Taper Geometry Customization Window



Click to Enlarge
Figure 4. Multi-Stage Splicing Configuration

Multi-Stage Splicing
For special applications, the software can run several splice steps in a sequence. Users can independently set the splice parameters for each step, as shown in Figure 4. Alternatively, multiple independent splice files from the user's library can be executed in order. The system will then perform a complex splicing function according to the sequence of the selected splice files.



Click to Enlarge
Figure 5. Active X-Y Alignment Scan Properties

Active Alignment
The active alignment method is typically used for fiber that has a high core eccentricity. In this case, standard imaging methods cannot always ensure proper alignment of the fiber cores. Instead, the cores are aligned using the output from an optical power meter as feedback to maximize the power transmission between the two fibers. This is done by scanning one fiber across the other with a given scan step size and taking a power meter reading at each position. At the end of the scan, the fiber is moved back to the position at which the optical power was either maximized or minimized. Parameters for this scan, such as step size and fiber offset position, can be set within the software to ensure accurate alignment, as shown in Figure 5.

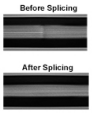
Hide Applications

APPLICATIONS

Thorlabs' Vytran® Optical Fiber Glass Processors are versatile, fully integrated glass processing and fiber splicing platforms for fabricating splices, tapers, and custom terminations with high precision and low loss. Featuring a comprehensive applications library, these processes can be performed for many different fiber sizes and types. Examples of a few fiber splicing/processing applications are listed in the sections below and highlighted in the video to the right.

Filament Fusion

Fusion Splicing is a process of joining two optical fibers end-to-end using heat. The goal is to fuse the two fibers together in such a way that light passing through the fibers is not scattered or reflected by the splice while ensuring that the splice and the region surrounding it should be almost as strong as the original fiber. The glass processors use a resistive graphite, iridium, or tungsten filament shaped like an upside-down omega to provide the heat necessary for fusion.



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

Once the two fibers to be spliced are aligned, the splice head is repositioned so that the filament is centered under the fiber ends. Power is then applied to the filament to raise its temperature to a level hot enough to fuse the fibers together, typically about 3000 °C. Because the filament would oxidize if it were brought to such a high temperature in air, high-purity argon gas is used to purge the splicing chamber of oxygen during the filament fusion process. In order to keep the fibers clean and improve splice strength, the purging gas (not available from Thorlabs) is set to flow over the fibers at a high rate during the fusion process.

Mode Adapters 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 to physically taper the fibers to change the core diameter. In the example shown to the right, 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 together.

Fiber Processing Applications

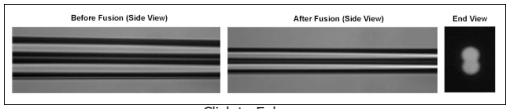
Tapering and Drawing
All Vytran glass processor configurations are capable of tapering (altering the cross-sectional diameter) or drawing out (increasing the length) of a fiber. This is accomplished by using the filament furnace to heat the fiber to its softening point and then applying a tensile force to elongate the fiber, reducing the cross section of the fiber. The fiber holders provide up to 180 mm of z-axis travel, enabling the fabrication of long tapers up to 150 mm in length. This process can be programmed through the GUI by entering the physical characteristics of the desired taper into a taper interface menu (see the *Software* tab for details). The software GUI also includes a tension monitor and control function, which can accurately monitor drawing conditions during tapering.

Click to Enlarge
Ø20 µm core, Ø400 µm cladding large-mode-area (LMA) fiber tapered to Ø125 µm cladding.

Fiber Terminations
These glass processing systems, which have an integrated platform that combines precise fiber positioning, control over the filament fusion process, and long tapering/drawing lengths, are ideal for adding or fabricating complex terminations to the ends of bare fibers. Examples of developed terminations include ball lenses, fiber catheters, and fiber probes.

End caps are large-core-diameter, short-length fibers used to diffuse the beam intensity of high-power fibers to prevent damage to fiber end faces. Glass processors are well suited for fusing large-core-silica end caps to the ends of power beam delivery fibers. We recommend using an LDC401 or LDC401A Fiber Cleaver to fabricate end caps with precise lengths.

Couplers and Combiners
Glass processors can fuse fibers side-by-side or into bundle configurations; this process is critical for fabricating fused fiber couplers and pump or output combiners. Through precise control of heating and tapering conditions and using multi-fiber holding block inserts, the operator is able to develop application-specific coupler and combiner solutions that feature very low loss.



Click to Enlarge
Two single mode fibers tapered and fused together for 50/50 coupling in a glass processor.
Spacing between the fiber cores is approximately 15 to 20 µm.

Hide Demo Rooms

DEMO ROOMS

vytran a division of THORLABS

Product Demonstrations

Thorlabs has demonstration facilities for the Vytran® fiber glass processing systems offered on this page within our Morganville, New Jersey; Shanghai, China; Exeter, Devonshire; and Bergkirchen, Germany offices. We invite you to schedule a visit to see these products in operation and to discuss the various options with a fiber processing specialist. Please schedule a demonstration at one of our locations below by contacting technical support. We welcome the opportunity for personal interaction during your visit!

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Hide Selection Guide

SELECTION GUIDE

Vytran® Optical Fiber Glass Processor Selection Guide							
Item #		**GPX3400**	**GPX3600**	**GPX3800**	**GPX3850**	**GPX3900**	**GPX4000LZ**
Splicing Fiber Cladding Diameter	80 µm to 250 µm	✓	✓	✓	✓	✓	✓[a]
	250 µm to 1.25 mm	✓	✓	✓	✓	✓	✓
	1.25 mm to 1.7 mm	-	✓	-	✓	-	✓[b]
	1.7 mm to 2 mm	-	-	-	-	-	✓[b]
End Cap Fiber Diameter	250 µm to 2 mm	-	-	-	-	-	✓[c]
	250 µm to 5 mm	-	-	-	-	-	✓[d]
Fiber Type	Multimode	✓	✓	✓	✓	✓	✓
	Single Mode	✓	✓	✓	✓	✓	✓
	Double Clad	✓	✓	✓	✓	✓	✓
	Polarization Maintaining	✓	✓	✓	✓	✓	✓
	Soft Glass	-	-	-	-	✓	-
Automated Measurement and Alignment		✓	✓	✓	✓	✓	✓
End-View Illumination and Imaging[e]		✓	✓	✓	✓	✓	✓
Tension Monitor and Control System		✓	✓	✓	✓	✓	✓
Integrated Fiber Cleaver		-	-	✓	✓	✓	-
Real-Time Hot Image Monitoring		-	-	✓	✓	✓	✓
Liquid Cooling System		Optional Add-On	✓	Optional Add-On	✓	Optional Add-On	Optional Add-On
Fused Taper Software Enhancement and Handling Fixtures		Optional Add-On					-

Fiber Combiner Loading Fixture	Optional Add-On	-

a. For Splicing Using Filament Heating Mode
b. For Splicing Using CO_2 Laser Heating Mode
c. Using Splice Head Configuration
d. Using End Cap head Configuration
e. Requires VHB00 or VHB05 Top Insert for LED Illumination

Hide Vytran Glass Processor Workstations - One Required

Vytran Glass Processor Workstations - One Required

- Includes Glass Processor Workstation and Computer with Control Software
- Splice/Taper Optical Fibers Up to Ø1.25 mm (GPX3400) or Ø1.7 mm (GPX3600)
- Ideal for Single Mode, Multimode, Polarization-Maintaining, and Specialty Fibers
- Automatic XY and Rotational Alignment
- Fiber Z-Axis Travel of 180 mm

These Vytran Glass Processor Workstations feature automatic XY and rotational alignment of the fiber and are especially designed for processing polarization-maintaining fibers as well as specialty fibers with microstructured cores. The GPX3400 and GPX3600 can splice fibers with outer diameters up to 1.25 mm or 1.7 mm, respectively.

The precision fiber handlers can position a fiber in XY with a resolution of 0.25 µm and rotate a fiber up to 190° with a resolution of 0.02°. The included fiber holders can translate up to 180 mm along the fiber axis, allowing the filament to heat large portions of the input fiber(s). This extended heating range is ideal for many applications including thermally diffusing core dopants to achieve low-loss splices between highly dissimilar fibers or for fabricating long adiabatic fiber tapers. The fiber holding blocks can also pull vacuum through fiber holder inserts with vacuum holes to help secure the fiber within the insert.

The workstation includes the fiber holders, furnace assembly, CCD camera for imaging, PC and monitor pre-installed with the control software, and mirror tower for side- and end-view imaging. Each processor workstation is fitted with a high-purity PTFE gas line and a gas regulator equipped with a CGA-580 output port; a DIN 477 Number 6 output port connector is also included. An FTAV4 Graphite Filament Assembly (for Ø125 µm - Ø600 µm Cladding) comes pre-installed in the system; additional graphite, iridium, or tungsten filaments are sold separately below. Top and bottom inserts for the fiber holders, both of which are required to operate the glass processor workstation, can also be purchased separately below. Nylon-tipped setscrews are used to secure the inserts in the fiber holding blocks; replacement 2-56, 1/8" long SS2SN013 setscrews are available in packs of 10.

Installation and training by one of our application engineers is recommended for this system; please contact Tech Support for more details.

Components Included

- Glass Processor Workstation
- FTAV4 Graphite Filament Assembly (Ø125 µm - Ø600 µm Cladding) Pre-Installed (Additional Filaments Sold Below)
- Computer with Monitor, Keyboard, and Mouse
- Software Interface with Example Splice Files
- Vacuum Pump for Bottom Fiber Inserts
- Power Supply (See *Specs* Tab for Details)
- Regulator for Argon Gas Tank with CGA-580 and DIN 477 Number 6 Connectors
- 1/8" PTFE Tube for Argon Gas
- USB A to B Communication Cable
- USB 3.0 A to Micro B Camera Cable
- Tool Kit with Hex Keys for Filament/Insert Replacement
- Liquid Cooling System (GPX3600 Only)

Required Purchases

- Fiber Holder Top Inserts (Two Required)
- Fiber Holder Bottom Inserts (Two Required for Single Fiber Processing)
- Transfer Clamp and Graphite V-Grooves (Required for Transfer Inserts)
- >99.999% Purity Argon Gas Tank (Not Available from Thorlabs)

Optional Purchases

- Multi-Fiber Holder Bottom Inserts (Two Required for Making Couplers or Combiners)
- Fluorine-Doped Capillary Tubes (For Making Specialty Couplers or Combiners)
- Additional Filament Assemblies
- Liquid Cooling System (Optional Add-On for GPX3400)
- Fiber Taper Software Add-On and Handling Fixtures
- Fiber Combiner Loading Fixture
- Ultrasonic Cleaner
- Mountable Gooseneck Light
- Replacement SS2SN013 Setscrews for Fiber Holding Blocks

Part Number	Description	Price	Availability
GPX3400	**Vytran Automated Glass Processor Workstation, Up to Ø1.25 mm Cladding**	**$0.00**	**Lead Time**
GPX3600	**Vytran Automated Glass Processor Workstation, Up to Ø1.7 mm Cladding**	**$0.00**	**Lead Time**

Hide Additional Filament Assemblies

Additional Filament Assemblies

- Filament Assemblies for Automated Glass Processors (One FTAV4 Graphite Filament Pre-Installed in System)
- Optimized for Splicing, Tapering, or Lensed Tip Applications (See Table to the Right for Details)
- Assembly Includes Filament Element and Protective Shroud

Filament assemblies contain a graphite, iridium, or tungsten omega-shaped resistive heater element encased within a protective shroud. The filaments sold here are compatible with the automated glass processors; those indicated in the table to the right as splice filaments are also compatible with the LFS4100 Splicing System.

Filaments for Splicing or Tapering
Graphite filaments are capable of achieving the high temperatures necessary for splicing or tapering large-diameter fibers while outgassing less than filaments made from other metals. Iridium filaments heat fibers at lower temperatures than graphite filaments, making these ideal for working with soft glass fibers. Tungsten filaments offer narrower heat zones and reach temperature very quickly, making them ideal for splicing highly doped fibers and structured fibers where long splice duration could cause significant diffusion or collapse. Although the heating time of a filament is approximately 40 minutes, this can vary depending on a number of factors including argon quality, splice/taper duration, and fiber glass quality.

Item #	Filament Material	Cladding Diameter (Min/Max)	Application[a]
FTAV2	Graphite	80 µm / 250 µm	Splice
FTAV4		125 µm / 600 µm	
FTAV5		250 µm / 1000 µm	
FTAV6		400 µm / 1300 µm	
FTAT3		250 µm / 1500 µm	Taper
FTAT4		400 µm / 1800 µm	
FRAV1	Iridium	≤200 µm	Splice
FRAV3		≤400 µm	
FRAV5		250 µm / 1050 µm	
FWAV1	Tungsten	≤200 µm	Splice[b]

a. This column indicates the optimized application for each filament assembly but is not restrictive; splice filaments can also be used for tapering.
b. When used with our glass processors, this filament is also ideal for lensed fiber tip manufacture, as well as creating steep tapers and long period gratings.

These filaments are optimized for splicing or tapering applications; this is not restrictive, however, as splice filaments can be used for tapering. Splice filaments have an opening in the top of the assembly body, while tapering filaments are closed off at the top to minimize exposure to contaminants.

Identification & Maintenance

One FTAV4 filament comes pre-installed in the system. Different filament bodies are distinguished by the version number (e.g., V4, V6, T3) engraved on the assembly body. Before a new filament can be used in a system, it must be burned in. During the burn-in process, the filament is cycled between its operating temperature and room temperature several times. This stabilizes the thermal properties of the filament so that it produces a more consistent power output and heating performance when current is passed through it. This procedure only needs to be performed once, after which the filament will only need regular normalization. Visit the *Tutorial Videos* tab above to see videos on how to perform filament maintenance and simple splices. If filament performance begins to degrade, filament refurbishments can be ordered by contacting Tech Support.

Part Number	Description	Price	Availability
FTAV2	Graphite Filament Assembly, Ø80 µm - Ø250 µm Cladding	$406.46	Today
FTAV4	Graphite Filament Assembly, Ø125 µm - Ø600 µm Cladding	$406.46	7-10 Days
FTAV5	Graphite Filament Assembly, Ø250 µm - Ø1000 µm Cladding	$406.46	7-10 Days
FTAV6	Graphite Filament Assembly, Ø400 µm - Ø1300 µm Cladding	$406.46	Today
FTAT3	Graphite Filament Assembly, Ø250 µm - Ø1500 µm Cladding	$406.46	Today
FTAT4	Graphite Filament Assembly, Ø400 µm - Ø1800 µm Cladding	$406.46	Today
FRAV1	Iridium Filament Assembly, ≤Ø200 µm Cladding	$679.48	Today
FRAV3	Iridium Filament Assembly, ≤Ø400 µm Cladding	$679.48	Today
FRAV5	Iridium Filament Assembly, Ø250 µm - Ø1050 µm Cladding	$679.48	Today
FWAV1	Tungsten Filament Assembly, ≤Ø200 µm Cladding	$803.25	Today

Hide Fiber Holder Top Inserts - Two Required

Fiber Holder Top Inserts - Two Required

Click to Enlarge

- Top Inserts for Fiber Holding Blocks
- Accepts Fiber Outer Diameter (Cladding/Coating) from 57 µm to 3.198 mm (See the *Fiber Holder Inserts* Tab for Information on Choosing Inserts)
- Single-Sided and Dual-Sided Inserts Available (See Table to the Right for Details)
- VHBxx End-View Illumination Insert Available for Automated Glass Processors and Splicing Systems
- Compatible with Automated Glass Processors, LDC401 Series Fiber Cleavers, FPS301 Stripping and Cleaning Station, and LFS4100 Splicing System

Item #	Side 1 Accepted Diameter (Min/Max)	Side 2 Accepted Diameter (Min/Max)
VHB00[a]	57 µm / 759 µm[b]	N/A
VHB05[a]	410 µm / 1008 µm	560 µm / 1269 µm
VHA00	57 µm / 759 µm[b]	275 µm / 970 µm
VHA05	410 µm / 1008 µm	560 µm / 1269 µm
VHA10	812 µm / 1515 µm	1036 µm / 1770 µm
VHA15	1288 µm / 2022 µm	1534 µm / 2268 µm
VHA20	1772 µm / 2505 µm	2032 µm / 2944 µm
VHA25	2278 µm / 3029 µm	N/A
VHA30	2609 µm / 3198 µm	N/A

a. These top inserts are equipped with an indent for LED illumination of the fiber end faces.
b. Side 1 of the VHA00 and VHB00 is flat to provide additional clamping force for fibers with very small diameters

Fiber Holder Inserts, which consist of one top insert and either a bottom or transfer insert, are placed in the fiber holding blocks of the optical glass processor to secure the fiber during splicing or tapering. The inserts clamp the cladding, buffer, or coating of the fiber and can accommodate outer diameters of up to 3.198 mm. The *Fiber Holder Inserts* tab above includes information to aid in selecting and installing the correct combinations of top and bottom inserts to accommodate different fiber diameters.

Two types of top inserts are compatible with the automated glass processors. The VHA standard top inserts come in single-sided and dual-sided versions. These standard inserts can also be used in the LDC401 Series of Fiber Cleavers, FPS301 Stripping and Cleaning Station, and LFS4100 Splicing System. The VHB00 and VHB05 top inserts (shown to the left) feature an indent for LED illumination from the automated glass processor workstations and are necessary for end-view imaging and alignment of the cores of polarization-maintaining and microstructured specialty fibers.

Part Number	Description	Price	Availability
VHB00	Fiber Holder Top Insert with LED Illumination Indent, Ø57 µm - Ø759 µm	$200.76	Today
VHB05	Dual-Sided Fiber Holder Top Insert with LED Illumination Indent, Ø410 µm - Ø1269 µm	$200.76	Today
VHA00	Dual-Sided Fiber Holder Top Insert, Ø57 µm - Ø970 µm	$188.88	Today
VHA05	Dual-Sided Fiber Holder Top Insert, Ø410 µm - Ø1269 µm	$188.88	Today
VHA10	Dual-Sided Fiber Holder Top Insert, Ø812 µm - Ø1770 µm	$188.88	Today
VHA15	Dual-Sided Fiber Holder Top Insert, Ø1288 µm - Ø2268 µm	$188.88	Today
VHA20	Dual-Sided Fiber Holder Top Insert, Ø1772 µm - Ø2944 µm	$188.88	Today
VHA25	Fiber Holder Top Insert, Ø2278 µm - Ø3029 µm	$188.88	Today
VHA30	Fiber Holder Top Insert, Ø2609 µm - Ø3198 µm	$188.88	Today

Hide Fiber Holder Bottom Inserts - Two Required for Single Fiber Processing

Fiber Holder Bottom Inserts - Two Required for Single Fiber Processing

- Bottom Fiber Inserts with V-Grooves for Fiber Holding Blocks
- Compatible with Cladding/Coating Diameters from 112 µm to 3.198 mm (See the *Fiber Holder Inserts* Tab for Information on Choosing Standard or Transfer Inserts)
- Transfer Inserts for Moving Fiber Between Vytran Systems
- Inserts with Vacuum Holes for

Item #	Type	Side 1 Accepted Diameter (Min/Max)	Side 2 Accepted Diameter (Min/Max)	Vacuum Holes
VHF160	Transfer	112 µm / 208 µm	N/A	Yes
VHF250		177 µm / 320 µm	N/A	Yes
VHF400		279 µm / 519 µm	N/A	Yes
VHF500		346 µm / 795 µm	N/A	Yes
VHF750		516 µm / 1047 µm	N/A	Yes
VHE10		773 µm / 1271 µm	1034 µm / 1523 µm	No
VHE15		1280 µm / 1769 µm	1534 µm / 2007 µm	No

Aligning Smaller Fibers (<Ø1047 µm) in V-Groove

VHE20	Standard	1787 µm / 2267 µm	2033 µm / 2513 µm	No
VHE25		2270 µm / 2844 µm	N/A	No
VHE30		2692 µm / 3198 µm	N/A	No

Fiber Holder Inserts, which consist of one top insert and a bottom insert, are placed in the fiber holding blocks of the optical glass processor to secure the fiber during splicing or tapering. Bottom inserts are magnetically held within the fiber holding blocks of the glass processors and other compatible systems. The V-groove machined into the bottom inserts ensures the fiber is centered within the fiber holder; inserts with different V-groove sizes are available. Vacuum holes at the bottom of the transfer inserts are used for holding and aligning small fibers within the V-groove. The *Fiber Holder Inserts* tab above includes information to aid in selecting and installing the correct combinations of top and bottom inserts to accommodate different fiber diameters.

Three types of bottom inserts are compatible with the glass processors: transfer bottom inserts, standard bottom inserts, and multi-fiber bottom inserts (sold further below). Transfer bottom inserts (indicated with item #s starting with VHF) allow for a single fiber to be transferred between the LDC401 Series of Fiber Cleavers, FPS301 Stripping and Cleaning Station, and LFS4100 Splicing System with minimal loss of alignment. For example, a fiber can be placed in a transfer insert and cleaved using the LDC401 cleaver, then the entire transfer insert can be placed in the LFS4100 Splicing System for splicing. This process works because the transfer inserts are precisely located within each Vytran system, and the VHT1 Magnetic Lid (sold directly below) prevents axial movement of the fiber during transport. Transfer inserts are equipped with vacuum holes that provide a small suction force to hold the fiber in place. All of these transfer inserts require the VHT1 Transfer Clamp (sold below); transfer inserts for fiber outer diameters ≤550 µm also require a Graphite V-Groove (sold below).

Standard Fiber Holder Bottom Inserts (indicated by item #s starting with VHE) can be used with large-diameter fibers. These inserts come in single-sided and dual-sided versions. The standard bottom inserts can also be used in the LDC401 Series of Fiber Cleavers, FPS301 Stripping and Cleaning Station, and LFS4100 Splicing System. Unlike transfer inserts, alignment of the fibers will not be maintained when these inserts are transferred between systems.

Part Number	Description	Price	Availability
VHF160	**Fiber Holder Transfer Bottom Insert, Ø112 µm - Ø208 µm**	**$351.63**	**Today**
VHF250	**Fiber Holder Transfer Bottom Insert, Ø177 µm - Ø320 µm**	**$351.63**	**Today**
VHF400	**Fiber Holder Transfer Bottom Insert, Ø279 µm - Ø519 µm**	**$351.63**	**Today**
VHF500	**Fiber Holder Transfer Bottom Insert, Ø346 µm - Ø795 µm**	**$351.63**	**Today**
VHF750	**Fiber Holder Transfer Bottom Insert, Ø516 µm - Ø1047 µm**	**$351.63**	**Today**
VHE10	**Dual-Sided Fiber Holder Bottom Insert, Ø773 µm - Ø1523 µm**	**$236.40**	**Today**
VHE15	**Dual-Sided Fiber Holder Bottom Insert, Ø1280 µm - Ø2007 µm**	**$236.40**	**Today**
VHE20	**Dual-Sided Fiber Holder Bottom Insert, Ø1787 µm - Ø2513 µm**	**$236.40**	**Today**
VHE25	**Fiber Holder Bottom Insert, Ø2270 µm - Ø2844 µm**	**$236.40**	**Today**
VHE30	**Fiber Holder Bottom Insert, Ø2692 µm - Ø3198 µm**	**$236.40**	**Today**

Hide Fiber Transfer Clamp and Graphite V-Grooves - Required for VHF Transfer Bottom Inserts

Fiber Transfer Clamp and Graphite V-Grooves - Required for VHF Transfer Bottom Inserts

- Clamp and Graphite V-Grooves Used with Transfer Bottom Inserts to Move Fiber Between Vytran Systems
- One VHT1 Transfer Clamp Required with Each Transfer Bottom Insert
- Transfer Clamps are Compatible with GPX Fiber Processors, LDC401 Series and LDC405B Fiber Cleavers, the FPS301 Fiber Preparation Station, and the LFS4100 Fusion Splicer
- Graphite V-Grooves for Supporting Fibers ≤Ø550 µm
- V-Grooves Accept Diameters from 80 µm to 550 µm

These Transfer Clamps and V-Grooves are used with the VHF Transfer Bottom Inserts sold directly above to move a single fiber between various Vytran systems with minimal loss of alignment. For example, a fiber can be placed in a transfer insert and cleaved using the LDC401 Fiber Cleaver. Then, the entire transfer insert and fiber can be moved to a glass processor for splicing.

The VHT1 clamp secures transfer inserts with a magnetic lid that prevents axial movement of the fiber and can be used to hold the insert during transport without touching the fiber itself. For fibers with diameters ≤550 µm, a graphite V-groove is available to support the fiber when splicing (please see the size table to the right for more information). To provide extended support along the length of the fiber and reduce the amount of overhang during processing, we also offer 0.594" long V-grooves (Item #'s VHG125L, VHG250L, and VHG500L). The graphite V-grooves are secured by tightening two setscrews on the transfer insert. For information on how to assemble transfer inserts, see the *Fiber Holder Inserts* tab.

Item #	Accepted Diameter[a] (Min / Max)	Groove Length
VHG125	80 µm / 125 µm	0.313"
VHG125L	80 µm / 125 µm	0.594"
VHG200	150 µm / 200 µm	0.313"
VHG250	200 µm / 250 µm	0.313"
VHG250L	200 µm / 250 µm	0.594"
VHG300	250 µm / 300 µm	0.313"
VHG350	300 µm / 350 µm	0.313"
VHG400	350 µm / 400 µm	0.313"
VHG450	400 µm / 450 µm	0.313"
VHG500	450 µm / 500 µm	0.313"
VHG500L	450 µm / 500 µm	0.594"
VHG550	500 µm / 550 µm	0.313"

a. Graphite V-grooves are not required for fibers with diameters larger than 550 µm.

Part Number	Description	Price	Availability
VHT1	**Transfer Clamp with Magnetic Lid for Fiber Holder Transfer Inserts**	**$273.23**	**Today**
VHG125	**Graphite V-Groove, Ø80 µm - Ø125 µm, 0.313" Length**	**$158.00**	**Today**
VHG125L	**Extended Graphite V-Groove, Ø80 µm - Ø125 µm, 0.594" Length**	**$169.88**	**Today**
VHG200	**Graphite V-Groove, Ø150 µm - Ø200 µm, 0.313" Length**	**$158.00**	**Today**
VHG250	**Graphite V-Groove, Ø200 µm - Ø250 µm, 0.313" Length**	**$158.00**	**Today**
VHG250L	**Customer Inspired! Extended Graphite V-Groove, Ø200 µm - Ø250 µm, 0.594" Length**	**$169.88**	**Today**
VHG300	**Graphite V-Groove, Ø250 µm - Ø300 µm, 0.313" Length**	**$158.00**	**Today**
VHG350	**Graphite V-Groove, Ø300 µm - Ø350 µm, 0.313" Length**	**$158.00**	**Today**
VHG400	**Graphite V-Groove, Ø350 µm - Ø400 µm, 0.313" Length**	**$158.00**	**Today**
VHG450	**Graphite V-Groove, Ø400 µm - Ø450 µm, 0.313" Length**	**$158.00**	**Today**
VHG500	**Graphite V-Groove, Ø450 µm - Ø500 µm, 0.313" Length**	**$158.00**	**Today**
VHG500L	**Customer Inspired! Extended Graphite V-Groove, Ø450 µm - Ø500 µm, 0.594" Length**	**$169.88**	**Today**
VHG550	**Graphite V-Groove, Ø500 µm - Ø550 µm, 0.313" Length**	**$158.00**	**Today**

Hide Multi-Fiber Holder Bottom Inserts - Two Required for Making Couplers/Combiners

Multi-Fiber Holder Bottom Inserts - Two Required for Making Couplers/Combiners

Click to Enlarge
The VHD320P features adjustment pins that are used to bring two fibers into very close proximity for splicing.

- Bottom Inserts with Grooves for Holding Multiple Fibers
- Used When Creating Fused Couplers or Combiners
- Vacuum Holes for Aligning Fibers in V-Grooves or Slots
- Multiple Insert Types Available (See Table for Options)

Multi-Fiber Inserts are designed for applications requiring two or three fibers to be tapered and fused together, such as when making wavelength division multiplexers, fused fiber couplers, or power combiners.

Side-by-side inserts have a U-shaped groove for holding two fibers tightly together in parallel. Double-V-slot inserts feature two parallel V-grooves on the same side of the insert that each hold a single fiber. The VHD320P insert additionally features offset adjustment pins that are used to bring the two fibers in close contact during splicing (see photo to the left). Triple-V-slot inserts have a V-groove in the middle and two V-grooves adjacent on both sides that allow a signal fiber to be fused with two pump fibers.

Item #	Type (Click for Drawing)	Accepted Diameters	Recommended Top Insert[a]
VHD125S	Side-by-Side	125 µm / 125 µm	VHA00
VHD250S	Side-by-Side	250 µm / 250 µm	
VHD320S	Side-by-Side	320 µm / 320 µm	
VHD250V	Double-V Slot	250 µm / 250 µm	
VHD320V	Double-V Slot	320 µm / 320 µm	
VHD320P	Double-V Slot w/ Pins	320 µm / 320 µm	
VHS250250	Triple-V Slot	250 µm / 250 µm / 250 µm	
VHS250400	Triple-V Slot	250 µm / 400 µm / 250 µm	
VHS250500	Triple-V Slot	250 µm / 500 µm / 250 µm	
VHS300350	Triple-V Slot	300 µm / 350 µm / 300 µm	
VHS320400	Triple-V Slot	300 µm / 400 µm / 300 µm	
VHS320550	Triple-V Slot	320 µm / 550 µm / 320 µm	VHA05

a. The VHB00 or VHB05 inserts can also be used with these illumination is not used when making couplers or combiners.

These bottom inserts are magnetically held within the fiber holding blocks of the glass processors and other compatible systems. The grooves machined into the inserts ensure the fiber is centered within the fiber holder. Vacuum holes at the bottom of the transfer inserts are used for holding and aligning small fibers within the V-groove. Recommended top inserts for each multi-fiber insert are indicated in the table to the right. Alignment of the fibers will not be maintained when these inserts are transferred between systems.

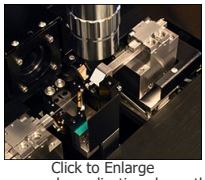
Part Number	Description	Price	Availability
VHD125S	Side-by-Side Fiber Holder Bottom Insert, Ø125 µm / Ø125 µm	$454.97	Lead Time
VHD250S	Side-by-Side Fiber Holder Bottom Insert, Ø250 µm / Ø250 µm	$454.97	Today
VHD320S	Side-by-Side Fiber Holder Bottom Insert, Ø320 µm / Ø320 µm	$454.97	Today
VHD250V	Double-V-Slot Fiber Holder Bottom Insert, Ø250 µm / Ø250 µm	$475.17	Today
VHD320V	Double-V-Slot Fiber Holder Bottom Insert, Ø320 µm / Ø320 µm	$475.17	Today
VHD320P	Double-V-Slot Fiber Holder Bottom Insert with Alignment Pins, Ø320 µm / Ø320 µm	$534.56	Today
VHS250250	Triple-V-Slot Fiber Holder Bottom Insert, Ø250 µm / Ø250 µm / Ø250 µm	$504.88	Today
VHS250400	Triple-V-Slot Fiber Holder Bottom Insert, Ø250 µm / Ø400 µm / Ø250 µm	$504.88	Today
VHS250500	Triple-V-Slot Fiber Holder Bottom Insert, Ø250 µm / Ø500 µm / Ø250 µm	$494.97	Today
VHS300350	Triple-V-Slot Fiber Holder Bottom Insert, Ø300 µm / Ø350 µm / Ø300 µm	$504.88	Lead Time
VHS320400	Triple-V-Slot Fiber Holder Bottom Insert, Ø320 µm / Ø400 µm / Ø320 µm	$504.88	Lead Time
VHS320550	Triple-V-Slot Fiber Holder Bottom Insert, Ø320 µm / Ø550 µm / Ø320 µm	$504.88	Today

Hide 45° Mirror Insert for Fiber Inspection and Alignment - Optional

45° Mirror Insert for Fiber Inspection and Alignment - Optional

- For Inspection of Fiber End Faces and Alignment of Fiber Components
- 10 mm Square 45° Inspection Mirror
- Compatible with the LFS4100 Splicer, the GLZ4001EC CO_2 Laser End-Cap Splicer Workstation, and GPX Series Fiber Processors.

The GPXM45 Insert with 45° Mirror provides an additional method for inspection of fiber end faces and alignment of fiber components. A fiber holding block on any of the compatible Vytran systems listed above secures the mirror insert in the same way as a fiber holder bottom insert. On the GPX series fiber processors and the LFS4100 splicer, which have smaller end-view mirrors, this insert provides a larger, 10 mm square mirror as an additional inspection option. Additionally, this mirror can be used outside the Vytran systems as a convenient inspection tool on an optical bench or a microscope.



Click to Enlarge
An example application shows the GPXM45 Insert being used in Top View to inspect the end face of an endcapped fiber on the GLZ4001EC CO_2 Laser End-Cap Splicer Workstation.

Part Number	Description	Price	Availability
GPXM45	GPX Insert with 45 Degree Mirror	$268.96	Today

Hide Fluorine-Doped Fused Silica Capillary Tubes

Fluorine-Doped Fused Silica Capillary Tubes

- Capillary Tube for Manufacturing Fiber Combiners
- Three Diameter Combinations Available, 170 mm Long
- Compatible with GPX3400, GPX3600, GPX3800, GPX3850, and GPX3900 Processors

Item #	Inner Diameter	Outer Diameter	Length
FTB02	750 ± 100 µm	1500 ± 100 µm	170.0 ± 3 mm
FTB03	800 ± 40 µm	1100 ± 55 µm	
FTB01	1200 ± 60 µm	1450 ± 75 µm	

Click to Enlarge
End-view image of 3:1 combiner made using a capillary tube.

Fluorine-doped silica capillary tubes are ideal for the manufacture of high-power fiber laser combiners and other specialty applications. During this process, the fibers that will be joined are inserted into the capillary tube, then the tube is fused and tapered down into a solid glass element. With a core consisting of the fused fibers and a cladding formed by the low-index capillary tube, the tapered element acts as a multimode waveguide, with the capillary tube serving to contain the light in the combiner.

Please make sure to use gloves when handling these fluorine-doped tubes.

Part Number	Description	Price	Availability
FTB02	Fluorine-Doped Fused Silica Capillary Tube, 750 µm ID, 1500 µm OD, 170 mm Long	$164.67	Today
FTB03	Fluorine-Doped Fused Silica Capillary Tube, 800 µm ID, 1100 µm OD, 170 mm Long	$109.78	Today
FTB01	Fluorine-Doped Fused Silica Capillary Tube, 1200 µm ID, 1450 µm OD, 170 mm Long	$109.78	Today

Hide Liquid Cooling System

Liquid Cooling System

- Included with GPX3600 Glass Processor Workstation
- Optional Add-On for GPX3400 Glass Processor Workstation
- Liquid Cooling System for Vytran Glass Processors and Splicing Systems
- Prevents Furnace Overheating During Extended Heating Operation (e.g., Tapering)
- Includes 700 mL (24 fl oz) of High-Performance Liquid Coolant

Liquid Cooling System Specifications	
Cooling Capacity	590 W[a]
Coolant Pump Flow Rate	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 also compatible with the LFS4100 Splicing System but is not necessary for standard splicing processes.

The GPXWCS has a 157 mL reservoir to cycle high-performance liquid coolant (700 mL bottle of coolant included) at flow rates of up to 4 L/min with a cooling capacity of 590 W at 25 °C ambient temperature; click here for a MSDS safety sheet. Tubing and fittings for connecting to a Vytran Glass Processor are included. The cooling system can be powered either through a 12 VDC Molex Connector (via the included computer slot adapter) or externally using the included 110/120 VAC power adapter.

Part Number	Description	Price	Availability
GPXWCS	Liquid Cooling System for Vytran Glass Processors	$2,186.95	Today

Hide Fused Taper Software Enhancement and Handling Fixtures - Optional

Fused Taper Software Enhancement and Handling Fixtures - Optional

- Software Enhancement Enabling Active Fused Biconic Taper (FBT) Processing
- Fixture with Adjustable Fiber Gripper for Transporting Fiber Tapers and Couplers to a Packaging Station
- Fixture with Removable Fiber Holder for *In Situ* Packaging of Fiber Tapers and Couplers
- Applications:
  - Microscale and Nanoscale Fiber Tapers
  - Fused Fiber Couplers and Wavelength Division Multiplexers (WDMs)
  - Tapered Fiber Coupling Microresonator and Whispering Gallery Mode Structures
  - Cavity Optomechanics
  - Biosensing and Microparticle Sensing

Click to Enlarge
Comparison of Adjustable Gripper (Left) and Removable Taper Holder (Right) Fixtures

Fused Taper Software and Handling Fixtures			
Item #	FBT Software	Adjustable Gripper	Removable Taper Holder
GPXFBT-SFT	✓	-	-
GPXFBT-FXTA	-	✓	-
GPXFBT-FXTB	-	-	✓
GPXFBT-KITA	✓	✓	-
GPXFBT-KITB	✓	-	✓

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

Two fixture add-ons are also available. The GPXFBT-FXTA Adjustable Taper Fiber Gripper fixture provides a stable base for your specific length component, allowing transfer to a packaging station. The fiber gripper can be adjusted to accommodate taper lengths from 0 - 3.15" (0 - 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. The stages included with these fixtures have an X-axis and Y-axis travel of 1" (25.4 mm) and a roll and yaw adjustment of ±2.5° and ±5°, respectively.

Part Number	Description	Price	Availability
GPXFBT-SFT	Fused Biconic Taper (FBT) Processing Add-On Software	$7,293.85	Lead Time
GPXFBT-FXTA	Fixture with Adjustable Gripper for Vytran Glass Processor	$6,688.01	Today
GPXFBT-FXTB	Fixture with Removable Taper Holder for Vytran Glass Processor	$6,688.01	Today
GPXFBT-KITA	Add-On Software and Adjustable Gripper Fixture Kit	$11,546.59	Lead Time
GPXFBT-KITB	Add-On Software and Removable Taper Holder Fixture Kit	$11,546.59	Lead Time

Hide Fiber Combiner Loading Fixture - Optional

Fiber Combiner Loading Fixture - Optional

- Supports the Positioning of Fiber Bundles for Combiner Fabrication
- Five Degrees of Freedom: X, Y, Z, Pitch, Yaw
- 300 mm Coarse Travel Along Fiber Feed Axis
- Working Platform Folds Up 90° for Fiber Bundle Grouping
- Required Bottom Insert Sold Separately
- Contact Tech Support for Right Side Mounting Variant

Click to Enlarge
The fiber holding block assembly translates along a rail for Y-axis positioning.

Combiner Fixture Specifications	
Degrees of Freedom	Five (X, Y, Z, Pitch, Yaw)
Y-Axis Travel (Coarse)	300 mm
X-Axis Travel[a]	0.44" (11.2 mm)
Z-Axis Travel[a]	0.20" (5.1 mm)
Platform Flatness	±0.005"
Platform Thickness	6 mm
Platform Material	Mic-6 Aluminum
Bottom Insert (One Required)	VHS, VHD, VHE, or VHF Series

a. Achieved using integrated T12XZ stage.

The GPXCFXL Fiber Combiner Loading Fixture is an optional add-on for our GPX3000 Series Glass Processors that provides support and five-axis positioning of fiber bundles during manufacture of fiber combiners. The multi-axis assembly enables direct insertion of fiber bundles into fragile tapered capillary tubes. This reduces the risk of tube breakage by allowing controlled bundle insertion while the capillary tube is still in the glass processing station.

The bundle is placed in the bottom insert (sold separately above), which is mounted in the assembly's fiber holding block. XZ translation is provided by the integrated T12XZ stage, while the support assembly is attached to a rail for travel in the fiber feed direction. To aid with bundle alignment, coarse pitch and yaw adjustments are achieved through a lockable ball pivot mechanism; note that this mechanism also allows off-axis roll that is coupled with translation. The stage's travel along the rail (Y-axis) is also lockable.

The fixture mounts to the left side of processors and supports a wide variety of inserts to suit individual needs. The working platform features a double hinge to ensure a gapless working surface and folds up 90° with an air spring support and a pin lock at the vertical and horizontal positions. Please contact Tech Support to request a variant for mounting on the right side of a processor.

Part Number	Description	Price	Availability
GPXCFXL	**Customer Inspired! Fiber Combiner Loading Fixture for Vytran Glass Processors, Left Side**	**$3,392.12**	**Today**

Hide Ultrasonic Cleaner - Optional

Ultrasonic Cleaner - Optional

Click to Enlarge
USC2 Ultrasonic Cleaner and USC2NVT Nest for Vytran Transfer Bottom Inserts

Click to Enlarge
The cleaning intensity and duration controls are located on the rear of the cleaner.

- Easy-to-Adjust Immersion Depth, Cleaning Duration, and Power Level
- Bare Fiber Nest with Magnetic Clamp Included
- Nest for Vytran Transfer Bottom Inserts Sold Separately (Item # USC2NVT)
- Compatible Solvents: Acetone or Isopropanol (Isopropyl Alcohol)
- Spout for Easy Fluid Disposal; Slotted Shield for Reduced Solvent Evaporation

Click for Details
[APPLIST]
The USC2NVT Nest adds support for Vytran transfer bottom inserts.

USC2 Ultrasonic Cleaner Specifications	
Supported Fiber Diameter[a]	125 - 600 µm
Tank Capacity	100 mL
Tank Dimensions	Ø1.7" x 2.8" Deep (Ø43 mm x 71 mm Deep)
Cleaning Duration (Max Setting)	>1 Minute
Peak Output Frequency	75.2 - 76.4 kHz
Transducer Power (Max)	6 W
Operating Power	36 W
Operating Current	1.5 A
Input Voltage[b]	100 - 240 VAC @ 47 - 63 Hz
Overall Dimensions[a]	6.95" x 4.78" x 4.13" (176.5 mm x 121.5 mm x 104.8 mm)
Mass	1.28 kg (2.82 lbs)

a. With Included Nest for Bare Fiber Installed
b. Location-Specific Power Cord Included

Thorlabs' Vytran® USC2 Ultrasonic Fiber Cleaner is designed for volume processing of bare fiber. Adjustment knobs for cleaning intensity and cleaning duration allow the user to easily set repeatable cleaning parameters. The dunking jig offers adjustable immersion depth and is compatible with interchangeable fiber holder nests (each sold separately). A red LED indicates when the cleaning cycle is active. The 100 mL solvent tank is only suitable for use with acetone or isopropyl alcohol.

Tilting the dunking jig submerges the fiber in the tank and initiates the ultrasonic cleaning process. The ultrasonic agitation ceases after the chosen cleaning duration. The height of the fiber holder above the solvent tank can be changed over a 0.5" (12.7 mm) range using the knurled adjuster on the side of the dunking jig, visible in the photo above.

The knurled adjuster can also be reversed to disengage the bare fiber nest and switch it out for another fiber holder nest. Each cleaner is shipped with a bare fiber nest installed in the dunking jig. The USC2NVT Nest (sold separately) is designed for use with Vytran transfer bottom inserts. Accessories are available for the Vytran fiber nest to support a wider range of usage scenarios, including a clamp for standard bottom inserts and spacers for recessing inserts farther from the solvent tank. We also offer nests for Fujikura® and Fitel® fiber holders (each sold separately). Please see the complete product presentation for more information.

Part Number	Description	Price	Availability
USC2	**Ultrasonic Fiber Cleaner with Bare Fiber Holder Nest**	**$2,323.44**	**Today**
USC2NVT	**Ultrasonic Cleaner Nest for Vytran Bottom Inserts**	**$227.10**	**Today**

Hide Mountable Gooseneck Light - Optional

Mountable Gooseneck Light - Optional

- Attaches to Either Side of Workstation
- Illuminate Fiber Ends or Light General Work Area
- 12 VDC Power Supply (Sold Separately) Includes Region-

GPXL1 Gooseneck Light Specifications	
Lamp Electrical Power	1 W
Color Rendering Index (CRI)	80
Lamp Lifetime	30 000 h
Lamp Luminous Flux	100 lm

Specific Power Cord

Click to Enlarge
The GPXL1 can be attached on either the right or left side of the glass processor workstation

Lamp Luminous Efficiency	80 lm/W
Operating Temperature	-25 to 45 °C
Light Color	Neutral White
Input Voltage	12 VDC

The GPXL1 Gooseneck Light is a lamp that can be used to couple light into a fiber combiner for end-view illumination or for general lighting of the workstation during alignment. The lamp features an on/off switch and a dimmer knob to control brightness. The flexible neck allows the lamp head to be easily positioned near a fiber or furnace.

Mount the GPXL1 on either side of the workstation using the mounting holes on the workstation (as seen in the image to the right). Two 10-32 mounting screws and a 5/32" hex key are included.

Users must also purchase a GPXL1PS 12 VDC Power Supply along with the GPXL1. The power supply includes a region-specific power cord which must be used with an 85 - 265 VAC, 47 - 63 Hz power source.

Part Number	Description	Price	Availability
GPXL1	**Mountable Gooseneck Light for GPX Glass Processors**	**$139.75**	**Today**
GPXL1PS	**Power Supply for GPXL1 Gooseneck Light, 12 VDC**	**$79.19**	**Today**

Visit the *Vytran® Automated Glass Processors* page for pricing and availability information:
https://www.thorlabs.com/newgrouppage9.cfm?objectgroup_id=9326