

**SPECIFICATIONS:
FIBER-OPTIC LASER BEAM DELIVERY SYSTEMS**

- Operating Wavelength¹: 458-647 nm
- Fiber Length: 2 m
- Fiber Protective Jacket: Stainless steel, 5-mm outside diameter
- Throughput Efficiency: >65%
- Polarization Extinction Ratio: ≥ 20 dB
- Polarization Alignment (FDS 100/200 series)²: ± 2 degrees
- Input Beam Diameter (1/e² points)³: 0.65 mm
- Output Beam Diameter (FDS/FDN 200 series)³: 0.65 mm ± 10%
- Output Beam Roundness: ≥95%
- M² Factor: ≤1.2
- Pointing Stability: ≤1 μrad/°C
- Operating Temperature: 10-40°C
- Operating Humidity: Noncondensing

¹ Fiber delivery systems are optimized for specific, discrete wavelengths. Contact your nearest Melles Griot sales office for information on custom wavelengths.

² Relative to alignment key.

³ 0.70 mm for 633-nm systems.

**Polarization-Maintaining
Fiber-Optic Laser Beam Delivery Systems**

Wavelength	Output Divergence (full angle)	Features	PRODUCT NUMBER
Collimated Output			
488 nm Only	~2 mrad	Low Back Reflections	05 FDS 201
458-514 nm ¹	~2 mrad	Low Back Reflections	05 FDS 203
488-647 nm ²	~2 mrad	Low Back Reflections	05 FDS 205
633 nm Only	~2 mrad	Low Back Reflections	05 FDS 207
FC Connector			
488 nm Only	~160 mrad	FC Keyed Connector	05 FDS 101
458-514 nm ¹	~160 mrad	FC Keyed Connector	05 FDS 103
488-647 nm ²	~160 mrad	FC Keyed Connector	05 FDS 105

¹ Specifications apply only at 458, 488, and 514 nm.

² Specifications apply only at 488, 568, and 647 nm.

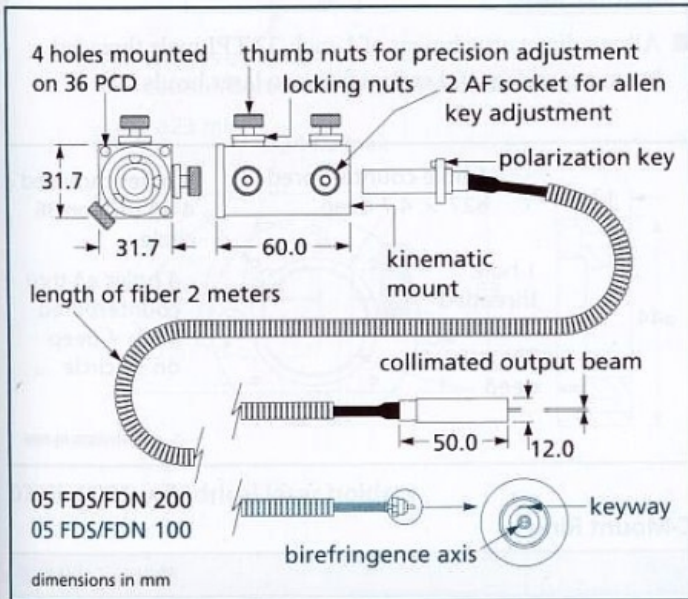
**Single-Mode
Fiber-Optic Laser Beam Delivery Systems**

Wavelength	Output Divergence (full angle)	Features	PRODUCT NUMBER
Collimated Output			
488 nm Only	~2 mrad	Low Back Reflections	05 FDN 201
458-514 nm ¹	~2 mrad	Low Back Reflections	05 FDN 203
488-647 nm ²	~2 mrad	Low Back Reflections	05 FDN 205
633 nm Only	~2 mrad	Low Back Reflections	05 FDN 207
FC Connector			
488 nm Only	~160 mrad	FC Keyed Connector	05 FDN 101
458-514 nm ¹	~160 mrad	FC Keyed Connector	05 FDN 103
488-647 nm ²	~160 mrad	FC Keyed Connector	05 FDN 105

¹ Specifications apply only at 458, 488, and 514 nm.

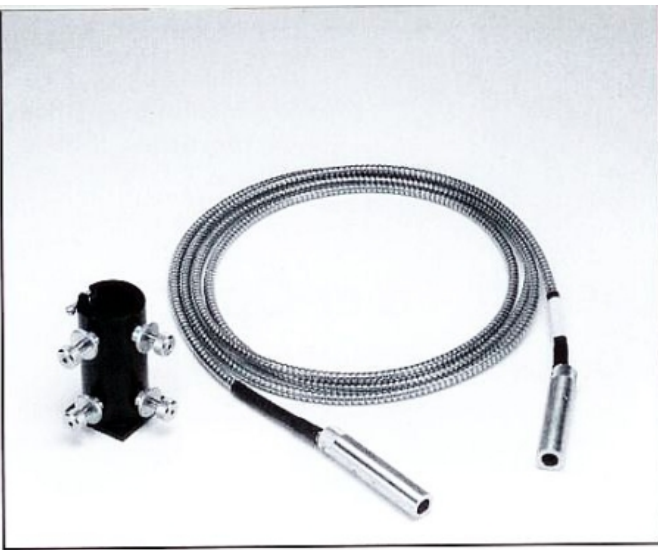
² Specifications apply only at 488, 568, and 647 nm.

Custom OEM laser beam delivery systems are available as integrated assemblies or components upon request. Contact your nearest Melles Griot office for assistance.



05 FDS/FDN series fiber-optic beam delivery system

Available in:
✓ Production Quantities
✓ Custom Sizes



Fiber-Optic Laser Beam Delivery Systems

Melles Griot 05 FDS and 05 FDN fiber-optic laser beam delivery systems are designed to meet the demanding needs of commercial laser applications. They set the standard in fiber-delivery efficiency, demonstrating our uncompromising commitment to optical performance.

- Highest coupling efficiency — greater than 70%
- Lowest back reflection — less than -45dB
- Multiwavelength operation
- Kinematic launch unit — quick setup and excellent long-term stability.

Melles Griot fiber-optic delivery systems are designed for a real industrial environment. Single-mode or polarization-preserving fiber is reinforced with a Kevlar and stainless-steel cable that is designed to protect the fiber from strain and crushing as well as to limit the bend radius to a safe value. The fiber is fitted with prefocused input and output optics, which efficiently collect and deliver the laser beam. The input optics consist of a focusing lens and a polished fiber face. The fiber-to-lens separation is set at the factory for optimum performance, with coupling efficiencies as high as 80%.

Unlike traditional fiber-optic coupling systems, which require five-axis positioning, prefocused optics only require two axes positioning. Tilt of the assembly becomes translation in the focal plane, and translation becomes tilt. Because the fiber has a relatively large acceptance angle, the system is insensitive to external translation, leaving only two required degrees of freedom.

BACK REFLECTIONS

Back-reflections are often a source of concern with fiber-optic systems because the reflections from the ends of a straight-cleaved fiber form a low-finesse Fabry-Perot cavity. When the fiber is used with a single-frequency laser, output from the fiber can vary as much as $\pm 10\%$ as thermal and mechanical perturbations change its length. There are several solutions to this problem. Applying an antireflection coating to the ends of the fiber reduce reflections from approximately 4% per surface to less than 1% per surface. For critical applications, where fluctuations must be at an absolute minimum, Melles Griot polishes the fiber at an angle and refracts the laser beam into the fiber axis. This method, illustrated in the diagram at the lower right, eliminates the index-matching fluids, cover glasses, and antireflection coatings and results in rejection ratios as high as -50 dB.

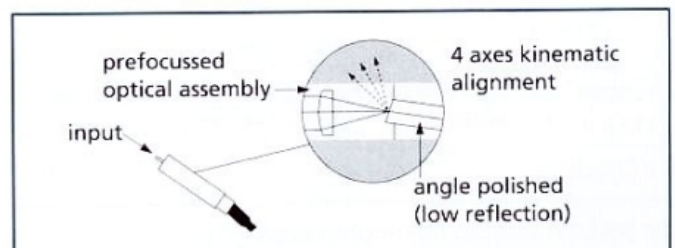
POLARIZATION-PRESERVING FIBERS

Melles Griot offers both single-mode and polarization-preserving fibers. Standard single-mode fibers have a circular, symmetrical cross-section. If the fiber is perfectly straight, polarization of the input beam can be preserved as the light travels through the fiber, but when the fiber is bent or coiled, stress in the fiber induces birefringence. The outcome is two modes of propagation that recombine with an uncontrollable phase relationship at the output. This results in polarization drift and fading.

Polarization-preserving fiber, on the other hand, is not optically symmetrical and exhibits a strong internal birefringence caused by stress-applying sectors engineered into the fiber. The internal birefringence caused by these sectors is much higher than any stress birefringence induced by bending, and as long as the polarization of the laser input is properly aligned with the optic axes of the fiber, polarization will be preserved. In addition to setting the focus, both input and output optics are centered so that the optical directionality is aligned to better than 0.5 mrad, making polarization adjustment easy — simply rotate the optics. There will not be any significant loss of transmission.

SYSTEM CONFIGURATION

All of these fiber-optic delivery systems include a detachable kinematic manipulator that attaches with 4-40 UNC screws to the standard 36-mm-diameter bolt circle found on Melles Griot helium neon, helium cadmium, and ion laser products, as well as laser products from other manufacturers. All fibers include an input collimating optical assembly that is integrated into the fiber. 05 FDS/FDN 200 series fiber-optic systems incorporate output re-collimating optics into the assembly. 05 FDS/FDN 100 series systems have a keyed FC connector at the output end, but the output is not collimated.



Angle-polished fiber input eliminates back-reflection