



LASER DIODE / LED TO FIBER DELIVERY SYSTEM QUESTIONNAIRE

Thank you for choosing OZ Optics. In order to help you choose the best components for your system, we would appreciate it if you could answer the following questions. If you do not know what to enter, write DON'T KNOW beside the question. We will then recommend an option. If you need assistance filling out the form, you are welcome to contact your nearest distributor or our sales office where a sales representative will be happy to assist.

To help you fully understand all the relevant issues involved in designing the ideal laser to fiber delivery system, we ask you to read our [Laser Diode to Fiber Source Couplers Application Notes](#) before completing this questionnaire.

Please note that if your source is a collimated output, such as a solid state laser, and not a laser diode or LED, then you need to instead fill out our [Laser to Fiber Delivery System Questionnaire](#).

Section 1 of 6: Personal Information

To process your information as quickly as possible, please ensure that the fields marked in *red italics* are completed before submitting your request. If this data is not entered we will be unable to respond to your request.

Name: _____

Position: _____

Company: _____

Address: _____

City: _____

State / Province: _____

Country: _____

Postal / Zip Code: _____

Telephone: _____

Fax: _____

Email: _____

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Section 2 of 6: Laser Diode Characteristics:

Complete this section to provide us information about the laser diode / LED you are using as completely as possible. Note that we can package a laser diode that you provide, or supply one of our own laser diodes for your application. If you prefer, you may fax or PDF us the laser diode manufacturer's specification sheet. This will answer the initial questions on the laser diode specifications. If you do not know the type of laser diode to use, please specify the wavelength and the power you need to come out of the fiber.

- 1) Who will provide the laser diode?:
 - OZ Optics,
 - Customer
- 2) Who will perform the alignment?:
 - OZ Optics,
 - Customer
- 3) Laser Diode/ LED Manufacturer: _____
- 4) Laser Diode/LED Model: _____
- 5) Wavelength, in nm: _____
- 6) My laser diode's output is: Pulsed, CW
- 7) Laser diode output power, in mW, (if CW): _____
- 8) Laser diode output power, in mJ (if pulsed): _____
- 9) Laser pulse duration, in nsec (if pulsed): _____
- 10) Laser repetition rate, in kHz (if pulsed): _____
- 11) Laser diode emitter dimensions (in microns): _____
- 12) Laser diode beam FWHM divergence angles ($\theta_{||}, \theta_{\perp}$), in degrees: _____

- 13) Laser diode package dimensions (See Figure 1):
 - D: _____ mm
 - E: _____ mm
 - WD: _____ mm

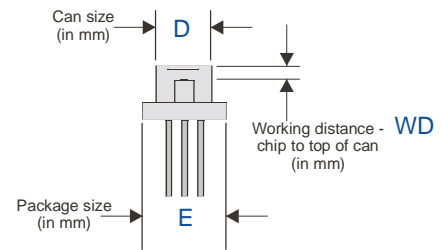


Figure 1: Laser Diode Package Dimensions

- 14) Is your laser diode sensitive to backreflection (*see note 1*):
 - Yes,
 - No,
 - Not Sure

Please enter below any additional information about your laser diode/LED that you believe is relevant:

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Section 3 of 6: Laser Diode to Fiber Coupler Characteristics:

Complete this section to better identify the best laser diode to fiber coupler (launcher) for your laser.

- 1) Which style of coupler would you prefer (choose one)?:
- Receptacle Style Coupler
 - Pigtail Style Coupler
 - No Preference / Please Recommend
- 2) What connector type do you prefer (choose one)? :
- I don't know / Please recommend
 - FC Connector
 - Adjustable FC Connector
 - ST Connector
 - SC Connector
 - LC Connector
 - MU Connector
 - E2000 Connector
 - SMA 905 Connector
 - SMA 906 Connector
 - Other (Specify) _____
- 3) What connector finish do you prefer (choose one)?:
- I don't know / Please recommend
 - Flat
 - Super PC
 - Ultra PC
 - Angled PC (APC)
 - Angled Flat (AFC)
 - Other (Specify) _____
- 4a) What is the minimum required coupling efficiency?:
- 20%
 - 30%
 - 45%
 - Other (Specify): _____
- 4b) Alternatively, what is the minimum required output power
- from the fiber, in mW?: _____
- 5) What is the largest acceptable outer diameter for the assembly?:
- 1.3 inches,
 - 0.79 inches,
 - 0.59 inches,
 - 0.50 inches,
 - Other (Specify): _____
- 6) Which of the following statements best describe your needs?:
- I need a cost effective device. Coupling efficiency is not as critical.
 - I need the best performance device. Cost is not as critical.
- 7) Identify which of the following accessories, if any, you would like added to your laser diode system (select all that apply):
- Laser diode driver circuit
 - Battery operated power supply
 - AC plug-in power supply
 - Thermoelectric (Peltier) cooler, without driver electronics
 - Thermoelectric (Peltier) cooler, with driver electronics
 - Manual variable attenuator
 - Motorized variable attenuator
 - Isolator
 - Inline optical tap/power monitor
 - Case enclosure
 - A complete OEM delivery system

Please enter below any additional information about your laser diode delivery system that you believe is relevant:

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Section 4 of 6: Fiber Patchcord Properties

Complete this section to better select the fiber patchcord to use in your system. (**Note:** Questions marked with a **red asterisk*** are also required to help select the correct type of laser diode to fiber coupler).

- 1) Who will provide the patchcord to be used in this system?:
 Customer,
 OZ Optics
- 2) * What type of fiber are you using in your system
([See Note 2 on Page 6](#))?:
 Singlemode,
 Multimode,
 Polarization Maintaining,
 Not sure / Recommend
- 3) * What are the core and cladding diameters in microns?
_____ / _____
- 4) * What is the numerical aperture of the fiber? _____
- 5) * (For multimode fiber only):
Are you using step index or graded index fiber?:
 Step Index
 Graded Index
 Not Sure
- 6) Who will provide the fiber?
 Customer,
 OZ Optics
- 7) Who will add the connectors?
 Customer,
 OZ Optics
- 8) What is the fiber length, in meters? _____
- 9) What type of cabling do you want on the fiber?
 0.25 mm Acrylate coating
 0.4 mm Acrylate coating
 0.9 mm OD tight buffer jacket
 0.9 mm OD loose tube hytrel tubing
 2 mm OD Kevlar reinforced cable
 3 mm OD Kevlar reinforced cable
 3 mm OD nylon coated armored cable
 3 mm OD all stainless steel armored cable
 5 mm OD nylon coated armored cable
 5 mm OD all stainless steel armored cable
 Not sure / Please recommend
- 10) What type of connectors do you want on the **input** end of the fibers (choose one)? :
 Not applicable (Attached to the coupler)
 I don't know / Please recommend
- FC Connector
 Adjustable FC Connector
 ST Connector
 SC Connector
 LC Connector
 MU Connector
 E2000 Connector
 SMA 905 Connector
 SMA 906 Connector
 Other (Specify) _____
- 11) What connector finish do you prefer (choose one)?:
 I don't know / Please recommend
 Flat
 Super PC
 Ultra PC
 Angled PC (APC)
 Angled Flat (AFC)
 Other (Specify) _____
- 12) What type of connectors do you want on the **output** end of the fibers (choose one)? :
 Collimator or Focuser (Please proceed to section 5)
 I don't know / Please recommend
 FC Connector
 Adjustable FC Connector
 ST Connector
 SC Connector
 LC Connector
 MU Connector
 E2000 Connector
 SMA 905 Connector
 High Power SMA 905 Connector
 SMA 906 Connector
 Bare Fiber
 Other (Specify) _____
- 13) What Connector Finish do you prefer (choose one)?:
 I don't know / Please recommend
 Flat
 Super PC
 Ultra PC
 Angled PC (APC)
 Angled Flat (AFC)
 Other (Specify) _____

Please enter below any additional information about the cable that you believe is relevant:

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Section 5 of 6: Output Optics

Complete this section to choose output optics for your system. To help understand the concepts and issues involved with fiber optic collimator and focuser assemblies, we ask you to read the [Collimators/Focusers Application Notes](#).

- 1) Do you need a collimator or focuser assembly for the output end of the system?
 Yes,
 No
- 2) Do you require a fiber optic:
 Collimator,
 Focuser?
- 3a) For fiber collimator users only:
 Desired Collimated Beam Diameter (mm): _____
 Desired Collimated Divergence Angle (mRad): _____
- 3b) For fiber focuser users only:
 Desired Spot Diameter (microns): _____
 Desired Working Distance (mm): _____
- 4) Do you prefer a:
 Pigtail style assembly,
 Connector receptacle style assembly
- 5) **(For Receptacle Style Assemblies Only)**
What is the desired flange size?:
 1.3 inch (33 mm)
 0.79 inch (20 mm)
 Other (Specify) _____
- 6a) **(For Pigtail Style Assemblies Only):**
What is the maximum acceptable collimator housing diameter?
 1.6 mm
 2.5 mm
 4.0 mm
 8.0 mm
 12.0 mm
 Other (please specify): _____
 No preference
- 6b) Do you need a removable flange?
 Yes,
 No
- 6c) If yes, what is the desired flange size:
 1.3 inch (33 mm)
 0.79 inch (20 mm)
 Other (Specify) _____

Please enter below any additional information about your collimator/ focuser assembly that you believe is relevant:

Section 6 of 6: Other Options

Use this section to provide any additional information that you feel can help us provide you with the system you require. For instance, you could provide a block diagram of your system needs. [See note 3](#) for some sample drawings. If you have any special requirements other than the ones listed (for example, a beam splitter, filter, or a wavelength division multiplexor to combine two sources), then please describe them in the space provided.

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NOTES

NOTE 1:

Backreflection often causes the laser diode intensity to fluctuate as well as change the laser frequency. It can also cause the monitor current to give higher than normal readings, which will affect your output power if you are running the diode in constant power mode. We recommend pigtail style couplers for low backreflection. For the very best protection from backreflection, consider using an isolator in the coupler system.

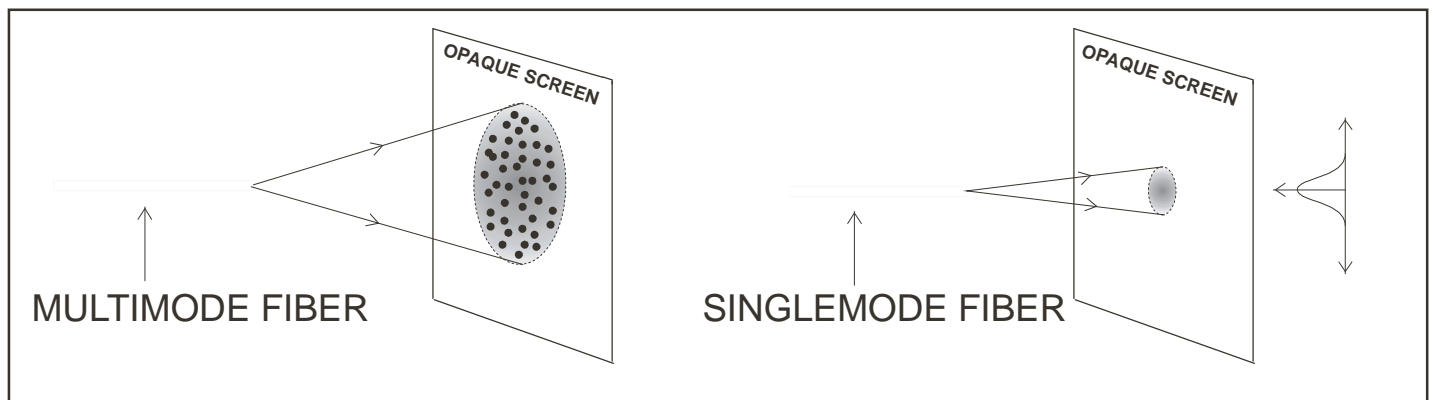
If you have to have a receptacle style laser diode to fiber coupler and backreflection is a concern, then we recommend using receptacle style laser diode to fiber couplers with angled-flat polished FC (FC/APC) connector fibers. Please note that we do not recommend standard angle point contact (APC) connectors. The problem with APC connectors is that the coupling efficiency into the fiber will change if you use the same coupler with a fiber with a different APC connector. This is because the position of the fiber with respect to the lens changes due to tolerances on the angle tip of the connector. For more information on this issue, please read our application note FC/APC Connectors Versus Flat Angled Finish FC Connectors, available on our website (<http://www.ozoptics.com/APC-vs-AFC.pdf>)

Receptacle style laser diode couplers are generally recommended for systems which are not sensitive to backreflection and where different fibers are often used. They are also recommended for high power applications where fiber ends could be burnt, in which case connectors could easily be repolished or reterminated. To minimize backreflection, both ends of the fiber should be angle polished and/or AR (antireflection) coated.

NOTE 2:

Sometimes the customer does not know what type of fiber he has or wants. In that case we need to know the customer's application to help him pick the proper fiber. The following information might help you select the fiber type.

First, a multimode fiber is not a multi-strand or bundle of fibers. A multimode fiber is a single fiber with a 25 to 1000 micron core diameter. When coherent laser light is coupled into multimode fiber, the output shows speckles as shown in the following figure. This speckle pattern changes when you bend the fiber. We can make the beam more uniform by adding a special diffuser plate at an additional cost. This will also reduce the coupling efficiency. The term multimode means there is more than one path for light to travel inside a **single** fiber. It does not mean the unit consists of multiple fibers in a bundle.



The output from a singlemode fiber (SM) shows a nice, smooth gaussian profile as shown. Singlemode fiber does not maintain polarization under stress such as bending; for that you need polarization maintaining (PM) fiber. PM fiber is also singlemode.

One can couple higher power into multimode fiber than into singlemode fiber. The smallest usable size of the multimode fiber for high power application depends on the laser power and wavelength. If you want to collimate or refocus the output from multimode fibers then, the larger the fiber core size is, the larger the divergence angle of the collimated beam will be.

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Note 3:

The following set of block diagrams are of the most common systems that people use. We can offer laser diode to fiber couplers with a splitter in the middle as shown. We also offer variable attenuators as an option for laser diode to fiber couplers as shown. This can reduce the cost of your overall system by combining two components into one and thus enhance your overall system efficiency.

