



## FUSED COUPLERS – FIBER OPTIC



Fused couplers are used to split optical signals between two fibers, or to combine optical signals from two fibers into one fiber. They are constructed by fusing and tapering two fibers together. This method provides a simple, rugged, and compact method of splitting and combining optical signals. Typical excess losses are as low as 0.2dB, while splitting ratios are accurate to within  $\pm 5$  percent at the design wavelength. The devices are bi-directional, and offer low backreflection. The technique is best suited to singlemode and multimode couplers.

Fused couplers do suffer from some disadvantages. Multimode fused couplers are mode dependent. Certain modes within one fiber are transferred to the second fiber, while other modes are not. As a result, the splitting ratio will depend on what modes are excited within the fiber. The couplers are optimized for a uniform distribution of modes within the fiber known as an equilibrium mode field distribution, (EMD).

### SPECIFICATIONS:

- Standard Wavelengths:** 488nm, 514nm, 633nm, 830nm, 1300-1350nm, and 1490-1550nm for single-mode fused couplers. Other wavelengths are available on request. Multimode couplers are broadband in nature. Their operating range is 400nm to 1600nm.
- Fiber Sizes:** Singlemode: 3.5/125 for 488nm and 514nm couplers, 4/125 for 633nm, 5/125 for 830nm, and 9/125 for 1300nm and 1550nm.  
Multimode: 50/125, 62.5/125 and 100/140 size fibers.
- Excess Loss:** <0.3dB for 1300nm and 1550nm couplers. <0.5dB for 830nm couplers. <1.0dB for wavelengths between 480nm and 700nm.
- Directivity:** 50dB or better.
- Splitting Ratio Accuracy:** Within  $\pm 3\%$  for 850nm, 1300nm, and 1550nm wavelengths. Within  $\pm 5\%$  for wavelengths between 480nm and 850nm.
- Temperature Range:** -40°C to +85°C

This condition is met by using an incoherent source, such as an LED, or by using a mode scrambler, to mix up the modes traveling through the fiber. It is also achieved by sending the signal through a long length of fiber, before it enters the coupler.

Singlemode fused couplers only transmit one mode, so they do not suffer from mode dependency. However, they are highly wavelength dependent. A difference in wavelength of only 10nm can cause a significant change in the splitting ratio. As a result it is important to specify the exact wavelength at which the fused coupler will be used. Finally, fused couplers made from polarization maintaining fiber do not maintain polarization well at the fusion point, making them sensitive to temperature or vibration. As a result they are not well suited for polarization applications. If any of the above problems are of concern to you, then you should instead consider using an OZ Optics Fiber Optic Beam Splitter/Combiner, which uses hybrid micro-optics. Refer to the data sheet entitled *Fiber Optic Beam Splitters/Combiners*.

OZ Optics fused couplers are available in a range of wavelengths, fiber sizes, and splitting ratios. The fiber ends can be terminated with a variety of fiber connectors. Standard configurations are One-by-Two and Two-by-Two couplers. N by M fused couplers, such as one by three, or one-by 4, etc., are also available on request.

## ORDERING INFORMATION:

### Part Number

### Description

**FUSED-12-W-a/b-S/R-XYZ-JD-L**

One-by-Two Fused Coupler

**FUSED-22-W-a/b-S/R-XYZI-JD-L**

Two-by-Two Fused Coupler

Where: X,Y,Z,I are the input and output male connector types (3 for NTT-FC compatible, 3S for Super FC/PC, 3A for Angled PC, 5 for SMA 905, 8 for AT&T-ST, SC for SC connectors, and X for unterminated fiber ends),  
W is the operating wavelength in nm (Standard wavelengths are 488nm, 514nm, 633nm, 830nm, 1300nm and 1550nm),  
a,b are the fiber core and cladding diameters respectively, in microns,  
S/R is the desired splitting ratio (50/50 splitting is standard),  
JD is the fiber jacket type (3 for 3mm OD loose tube kevlar reinforced PVC cable is standard.),  
L is the fiber length in meters. The standard fiber length is 0.5m per side. Contact OZ Optics for availability on other lengths.

**Example:** The customer requires a singlemode two-by-two 50/50 coupler for 633nm (fiber core size is 4/125 for 633nm singlemode fiber). All ends are to be 0.5 meters long, cabled, and terminated with FC style connectors. OZ Optics' part number: **FUSED-22-633-4/125-50/50-3333-3-0.5**

**Note:** OZ Optics reserves the right to substitute a two-by-two coupler for the equivalent one-by two splitter, depending on availability. This will not affect the couplers performance or pricing. The only difference will be an extra input fiber on the coupler.