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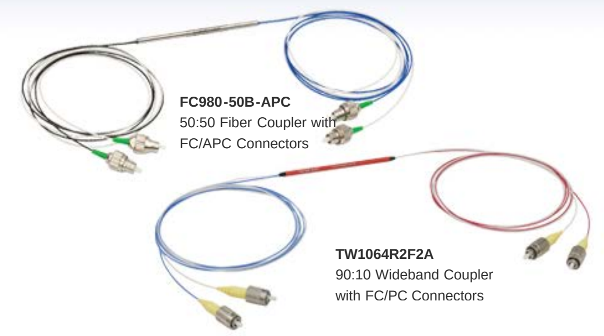
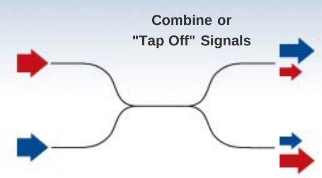
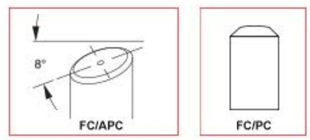
FC980-99B-APC - Nov. 16, 2016

Item # FC980-99B-APC was discontinued on Nov. 16, 2016. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

- ▶ Narrowband and Wideband Couplers for 980 nm
- ▶ 50:50, 75:25, 90:10, or 99:1 Coupling Ratio
- ▶ Polarization Insensitive





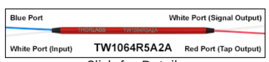


Hide Overview

OVERVIEW

Features

- Fused Fiber Optic Couplers for Use at 980 nm
- Three Wavelength Ranges Available
  - Narrowband: 980 ± 15 nm
  - Wideband: 930 ± 100 nm
  - Wideband: 1064 ± 100 nm with 0.14 NA or 0.22 NA Fiber
- 50:50, 75:25, 90:10, or 99:1 Split Ratios Available
- Bidirectional Coupling (Either End Can Be Used as an Input)
- Couplers Shipped with Individual Test Reports (See the *Coupler Verification* Tab for Details on Wideband Coupler Testing)
- Contact Us for Custom Wavelength, Coupling Ratio, and Connector Options



Click for Details
Each coupler is engraved with the Item #, serial number, and key specifications for easy identification. When the white port on the left is used as the input, the coupling ratios listed below correspond to the ratio of the measured output power from the white (signal output) port to the red (tap output) port.

Animated example of 90:10 splitting and 50:50 mixing.

2x2 SM Fiber Optic Coupler Selection Guide[a]	
Center Wavelength	Bandwidth
470 nm	±40 nm
488 nm	±15 nm
532 nm	±15 nm
560 nm	±50 nm
630 nm	±50 nm
670 nm	±75 nm
780 nm	±15 nm
805 nm	±75 nm
830 nm	±15 nm
850 nm	±100 nm
930 nm	±100 nm
980 nm	±15 nm
1064 nm	±100 nm
1300 nm	±100 nm
1430 nm	±100 nm
1550 nm	±100 nm
1650 nm	±100 nm
2000 nm	±200 nm
1310 nm/1550 nm	±40 nm

- Green shading denotes wideband couplers.

Thorlabs offers a wide range of narrowband and wideband single mode 2x2 fused fiber optic couplers, as highlighted in the table to the right. Couplers that can be used at 980 nm with coupling ratios of 50:50, 75:25, 90:10, or 99:1 are featured below.

980 nm narrowband couplers with a ±15 nm bandwidth offer low insertion loss performance at the center wavelength. Wideband couplers with a center wavelength of 930 nm or 1064 nm are also available. The 1064 nm wideband couplers are designed for a ±100 nm operating range with the option of 0.14 NA fiber (HI1060) or 0.22 NA fiber (HI1060 FLEX). All the couplers on this page are bidirectional, allowing any port to be used as an input (refer to the *2x2 Coupling Examples* tab above).

Thorlabs provides an individual test data sheet with each coupler. Our wideband couplers feature a detailed test report that includes coupling data and performance graphs that extend outside of the specified bandwidth, covering the wavelength range where the coupling ratio remains within the specified tolerance. Details of our wideband coupler testing procedures are provided on the *Coupler Verification* tab and sample data sheets for our 1064 nm (0.14 NA) and 1064 nm (0.22 NA) wideband couplers are available.

These couplers are all offered from stock with 2.0 mm narrow key FC/PC or FC/APC connectors. The narrowband couplers on this page are also available with no connectors. Fiber leads are jacketed in Ø900 µm Hytrel® tubing. If a custom connector configuration is needed, one-day turnaround is possible for small orders if the order is placed before 12 PM EST. Please contact Tech Support for inquiries.

Our complete selection of 2x2 SM couplers is outlined in the table to the right and on the *SM Coupler Guide* tab.

Alternative Fiber Coupler Options								
Double-Clad Couplers	Single Mode Couplers			Multimode Couplers		Polarization-Maintaining Couplers		Wavelength Division Multiplexers (WDM)
2x2	1x2	2x2	1x4	Graded-Index 1x2	Step-Index 2x2	1x2	2x2	

Hide 2x2 Coupler Tutorial

2X2 COUPLER TUTORIAL

Definition of 2x2 Fused Fiber Optic Coupler Specifications

This tab provides a brief explanation of how we determine several key specifications for our 2x2 couplers. The ports of the coupler are defined as shown in the coupler schematic below. In the sections below, the light is input into port 1. Ports 3 and port 4 would then be considered the signal and tap outputs, respectively.

Excess Loss

Excess loss in dB is determined by the ratio of the total input power to the total output power:

$$\text{Excess Loss}(dB) = 10\log\frac{P_{port1}(mW)}{P_{port3}(mW) + P_{port4}(mW)}$$

P_{port1} is the input power at port 1 and P_{port3}+P_{port4} is the total output power from Ports 3 and 4, assuming no input power at port 2. All powers are expressed in mW.

Optical Return Loss (ORL) / Directivity

The directivity refers to the fraction of input light that exits the coupler through an input port (i.e., light exiting at port 2) instead of the intended output port . It can be calculated in units of dB using the following equation:

$$\text{Directivity}(dB) = 10\log\frac{P_{port1}(mW)}{P_{port2}(mW)}$$

where P_{port1} and P_{port2} are the optical powers (in mW) in port 1 and port 2, respectively. This output is the result of back reflection at the junction of the legs of the coupler and represents a loss in the total light output at ports 3 and 4. For a 50:50 coupler, the directivity is equal to the optical return loss (ORL).

Insertion Loss

The insertion loss is defined as the ratio of the input power to the output power at one of the output legs of the coupler (signal or tap). Insertion loss is always specified in decibels (dB). It is generally defined using the equation below:

$$\text{Insertion Loss}(dB) = 10\log\frac{P_{in}(mW)}{P_{out}(mW)}$$

where P_{in} and P_{out} are the input and output powers (in mW). For our 2x2 couplers, the insertion loss specification is provided for both signal and tap outputs; our specifications always list insertion loss for the signal output first. To define the insertion loss for a specific output (port 3 or port 4), the equation is rewritten as:

$$\text{Insertion Loss}_{port1\rightarrow port3}(dB) = 10\log\frac{P_{port1}(mW)}{P_{port3}(mW)}$$

$$\text{Insertion Loss}_{port1\rightarrow port4}(dB) = 10\log\frac{P_{port1}(mW)}{P_{port4}(mW)}$$

A similar equation can be used to define the insertion loss at port 2 for input at port 1. However, as seen above, this is already defined as the directivity of the coupler.

Insertion loss inherently includes both coupling (e.g., light transferred to the other output leg) and excess loss (e.g., light lost from the coupler) effects.
The maximum allowed insertion loss for each output, signal and tap, are both specified. Because the insertion loss in each output is correlated to light coupled to the other output, no coupler will ever have the maximum insertion loss in both outputs simultaneously.

Calculating Insertion Loss using Power Expressed in dBm
Insertion loss can also be easily calculated with the power expressed in units of dBm. The equation below shows the relationship between power expressed in mW and dBm:

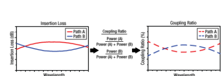
$$P(dBm) = 10\log P(mW)$$

Then, the insertion loss in dB can be calculated as follows:

$$\text{Insertion Loss}(dB) = P_{in}(dBm) - P_{out}(dBm)$$

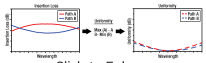
Coupling Ratio

Insertion loss (in dB) is the ratio of the input power to the output power from each leg of the coupler as a function of wavelength. It captures both the coupling ratio and the excess loss. The coupling ratio is calculated from the measured insertion loss. Coupling ratio (in %) is the ratio of the optical power from each output port (A and B) to the sum of the total power of both output ports as a function of wavelength. It is not impacted by spectral features such as the water absorption region because both output legs are affected equally. Persistence plots showing the coupling ratio of our wideband couplers can be viewed by clicking on the blue info icons below.


Click to Enlarge
A graphical representation of the coupling ratio calculation.

Uniformity

The uniformity is also calculated from the measured insertion loss. Uniformity is the variation (in dB) of the insertion loss over the bandwidth. It is a measure of how evenly the insertion loss is distributed over the spectral range. The uniformity of Path A is the difference between the value of highest insertion loss and the solid red insertion loss curve (in the Insertion Plot above). The uniformity of Path B is the difference between the solid blue insertion loss curve and the value of lowest insertion loss. Persistence plots showing the uniformity of our wideband couplers can be viewed by clicking on the blue info icons below.



Click to Enlarge
A graphical representation of the Uniformity calculation.

Hide 2x2 Coupling Examples

2X2 COUPLING EXAMPLES

General Coupling Examples

Animated example of 90:10 splitting and 50:50 mixing.

2x2 fused fiber optic couplers can split or mix light between two optical fibers with minimal loss and at a specified coupling ratio. Thorlabs' couplers are available from stock in one of four ratios: 50:50, 75:25, 90:10, or 99:1. All of our fused fiber optic couplers are bidirectional, meaning that all ports can be used as an input. The animation to the right shows several simple coupling examples.

The terms "Signal Output" and "Tap Output" refer to the higher and lower power outputs, respectively. To illustrate this, if light is input into the white port of the TW1064R1A2A coupler (99:1 coupling ratio), 99% of the transmitted light is coupled into the white port on the other side of the coupler while the other 1% is coupled into the red port. In this example, the second white port is referred to as the signal output port, and the red port is referred to as a tap output port. For a 50:50 coupler, the signal and tap ports would have the same power output.

In our wideband couplers, the signal always propagates from blue to red or white to white, while the tap always propagates from blue to white or white to red. For our narrowband couplers, please refer to the datasheet included with the coupler to determine signal and tap propagation paths.

Specific Coupling Examples

In the examples below, two 2x2 1300 nm Wideband Fiber Optic Couplers (50:50 and 90:10 coupling ratios) are used with input signals A and B. The table to the right lists typical insertion loss (signal and tap outputs) for each coupler. To calculate the power at any given output, subtract the insertion loss for the signal or tap output from the input power (in dBm).

Coupling Ratio	Insertion Loss (Signal)	Insertion Loss (Tap)
90:10	0.6 dB	10.1 dB
50:50	3.2 dB	3.2 dB

Example 1: Splitting Light from a Single Input

For this example, the couplers are used to split light from a single input into the signal and tap outputs as indicated in the diagrams below. In the table below, the output ports are highlighted in green.

	90:10 Coupling Ratio	50:50 Coupling Ratio
Port	**Signal A**	**Signal A**
1 (Input)	10 dBm (10 mW)	10 dBm (10 mW)
2 (Not Used)	-	-
3 (Signal Output)	9.4 dBm (8.7 mW)	6.8 dBm (4.8 mW)
4 (Tap Output)	-0.1 dBm (1.0 mW)	6.8 dBm (4.8 mW)
Click on the Diagram for Power Distributions at Each Port		

Example 2: Mixing Two Signals from Two Inputs

In this example, the couplers are used to mix light from two inputs, designated Signal A and Signal B. The outputs contain a mixed signal composed of both Signal A and Signal B in ratios depending on the coupling ratio. All ports are indicated in the diagrams below. In the table below, the output ports are highlighted in green.

	90:10 Coupling Ratio		50:50 Coupling Ratio	
Port	**Signal A**	**Signal B**	**Signal A**	**Signal B**
1 (Input A)	5 dBm (3.2 mW)	-	5 dBm (3.2 mW)	-
2 (Input B)	-	8 dBm (6.3 mW)	-	8 dBm (6.3 mW)
3 (Output)	4.4 dBm (2.8 mW)	-2.1 dBm (0.6 mW)	1.6 dBm (1.4 mW)	4.8 dBm (3.0 mW)
4 (Output)	-5.1 dBm (0.3 mW)	7.4 dBm (5.5 mW)	1.6 dBm (1.4 mW)	4.8 dBm (3.0 mW)
Click on the Diagram for Power Distributions at Each Port				

Example 3: Coupling a Return Signal with a Reflector on Port 4

Here, the couplers are used to split light from a single input, however, in this example there is a 100% reflector on port 4, as shown in the diagrams below. As a result, the light is reflected back into the coupler and split again. The ports are indicated in the diagrams below. In the table below, the output ports for the initial pass are highlighted in green.

	90:10 Coupling Ratio		50:50 Coupling Ratio	
Port	**Signal A**	**Reflected Signal A**	**Signal A**	**Reflected Signal A**
1 (Input)	6 dBm (4.0 mW)	-14.2 dBm (0.04 mW)	6 dBm (4.0 mW)	-0.4 dBm (0.9 mW)
2 (No Input)	-	-4.7 dBm (0.34 mW)	-	-0.4 dBm (0.9 mW)
3 (Signal Output)	5.4 dBm (3.5 mW)	-	2.8 dBm (1.9 mW)	-

4 (Reflected Output)	-4.1 dBm (0.39 mW) Reflected	-	2.8 dBm (1.9 mW) Reflected	-
Click on the Diagram for Power Distributions at Each Port				

Hide Coupler Verification

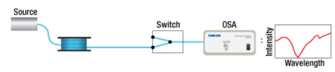
COUPLER VERIFICATION

Wideband Fiber Coupler Testing and Verification Procedure

During Thorlabs' coupling manufacturing process, the coupling ratio and bandwidth of each wideband coupler is monitored as the two branches are fused together. This ensures that each coupler meets the stated specifications over the bandwidth. Each wideband coupler is shipped with an individualized data sheet providing a summary of the results of these tests. Click for a sample data sheet for our 1064 nm (0.14 NA) or 1064 nm (0.22 NA) wideband couplers.

Step 1

The fiber to create the first branch (Path A) of the coupler is connected to a source on one side and a switch leading to an Optical Spectrum Analyzer (OSA) on the other.



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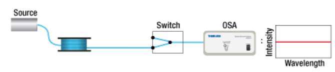
Step 2

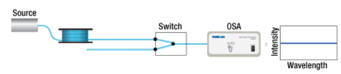
The spectrum of the source through the fiber and switch is measured using the OSA and zeroed.



Click to Enlarge

Step 3

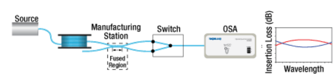
The fiber to form the second branch (Path B) of the coupler is connected to the source and to the second port of the switch leading to the OSA. The spectrum of the source through the fiber and switch is also measured and zeroed.



Click to Enlarge

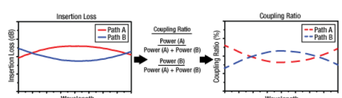
Step 4

The two fibers are fused on a manufacturing station to create the coupler structure. During the fusing process, the output from both legs of the coupler is monitored on the OSA. Coupler fusing stops once the coupler reaches the desired coupling ratio, excess loss, and insertion loss specifications.



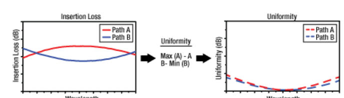
Click to Enlarge

For 1x2 couplers, one of the fiber ends is terminated within the coupler housing. The termination is done in a manner that minimizes back reflections from this output.



Click to Enlarge

Insertion loss (in dB) is the ratio of the input power to the output power from each leg of the coupler as a function of wavelength. It captures both the coupling ratio and the excess loss. The coupling ratio is calculated from the measured insertion loss. Coupling ratio (in %) is the ratio of the optical power from each output port (A and B) to the sum of the total power of both output ports as a function of wavelength. It is not impacted by spectral features such as the water absorption region because both output legs are affected equally. Persistence plots showing the coupling ratio of our wideband couplers can be viewed by clicking on the blue info icons below.



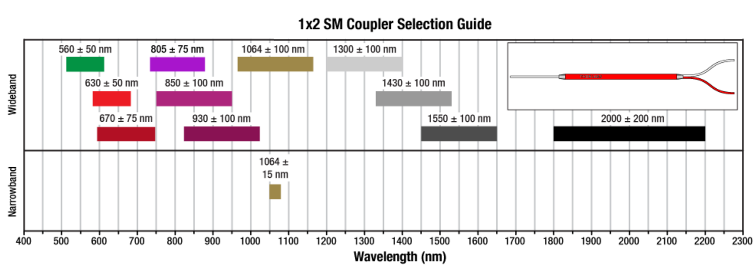
Click to Enlarge

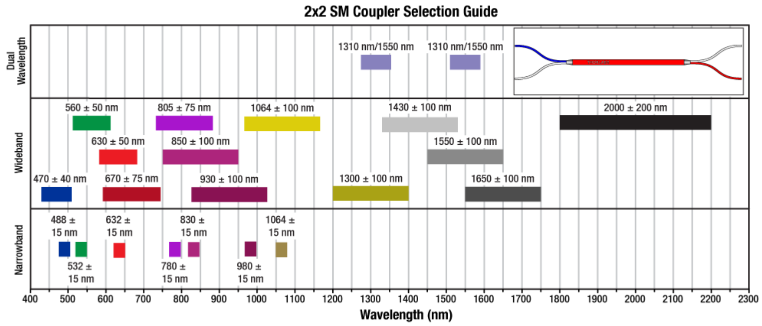
The uniformity is also calculated from the measured insertion loss. Uniformity is the variation (in dB) of the insertion loss over the bandwidth. It is a measure of how evenly the insertion loss is distributed over the spectral range. The uniformity of Path A is the difference between the value of highest insertion loss and the solid red insertion loss curve (in the Insertion Plot above). The uniformity of Path B is the difference between the solid blue insertion loss curve and the value of lowest insertion loss. Persistence plots showing the uniformity of our wideband couplers can be viewed by clicking on the blue info icons below.

Hide SM Coupler Guide

SM COUPLER GUIDE

Our 1x2 and 2x2 Single Mode Coupler offerings are outlined in the graphs below. Click on the colored bars to visit the web presentation for each coupler.





Hide 50:50 Fiber Optic Couplers

50:50 Fiber Optic Couplers

Thorlabs offers both narrowband and wideband fiber optic couplers. All specifications are measured without connectors during the manufacturing process. Additional information on the testing process for our wideband couplers can be found on the *Coupler Verification* tab above. Our wideband couplers are highlighted green in the table below.

Item #	Info	Center Wavelength	Bandwidth	Coupling Ratio[a]	Coupling Ratio Tolerance	Insertion Loss (dB)[a]	Excess Loss[a]	Uniformity[a]	Fiber Type[b]	Termination
TW930R5F2		930 nm	±100 nm	50:50 (Click for Plot)	±6.0%	≤3.9 dB / ≤3.9 dB	≤0.3 dB	≤1.0 dB (Click for Plot)	780HP	FC/PC
TW930R5A2										FC/APC
FC980-50B		980 nm	±15 nm	50:50	-	3.5 dB / 3.5 dB (Typ.)	0.12 dB (Typ.)	-	HI1060 FLEX (0.22 NA)	No Connectors, Scissor Cut
FC980-50B-FC										FC/PC
FC980-50B-APC										FC/APC
TW1064R5F2A[c,d]		1064 nm	±100 nm[d,e]	50:50 (Click for Plot)	±5.0%	≤3.7 dB / ≤3.7 dB	≤0.2 dB	≤0.5 dB (Click for Plot)	HI1060 (0.14 NA)	FC/PC
TW1064R5A2A[c,d]										FC/APC
TW1064R5F2B[c,d]		1064 nm	±100 nm[d,e]	50:50 (Click for Plot	±5.0%	≤3.7 dB / ≤3.7 dB	≤0.2 dB	≤0.5 dB (Click for Plot)	HI1060 FLEX (0.22 NA)	FC/PC
TW1064R5A2B[c,d]										FC/APC

- Please see the *2x2 Coupler Tutorial* tab for more information on these terms.
- Other fiber types may be available upon request. Please contact Tech Support with inquiries.
- All values are specified at room temperature over the bandwidth and measured using the white port as the input, as indicated in the diagram above; similar performance is achieved (≤0.05 dB difference) when the blue port is used as the input.
- Below the cut-off wavelength, single mode operation is not guaranteed (click on the blue info icon for more information).
- This value represents the minimum bandwidth over which the coupler is guaranteed to meet its specifications. Each wideband coupler is shipped with an individual item data sheet that provides information on coupler performance over the specified bandwidth range.

Part Number	Description	Price	Availability
TW930R5F2	**2x2 Wideband Fiber Optic Coupler, 930 ± 100 nm, 50:50 Split, FC/PC**	**$310.00**	**Today**
TW930R5A2	**2x2 Wideband Fiber Optic Coupler, 930 ± 100 nm, 50:50 Split, FC/APC**	**$350.00**	**Today**
FC980-50B	**2x2 Fiber Optic Coupler, 980 ± 15 nm, 50:50 Split, No Connectors**	**$135.00**	**3-5 Days**
FC980-50B-FC	**2x2 Fiber Optic Coupler, 980 ± 15 nm, 50:50 Split, FC/PC**	**$170.00**	**Today**
FC980-50B-APC	**2x2 Fiber Optic Coupler, 980 ± 15 nm, 50:50 Split, FC/APC**	**$210.00**	**Today**
TW1064R5F2A	**2x2 Wideband Fiber Optic Coupler, 1064 ± 100 nm, 0.14 NA, 50:50 Split, FC/PC**	**$310.00**	**Today**
TW1064R5A2A	**2x2 Wideband Fiber Optic Coupler, 1064 ± 100 nm, 0.14 NA, 50:50 Split, FC/APC**	**$350.00**	**Today**
TW1064R5F2B	**2x2 Wideband Fiber Optic Coupler, 1064 ± 100 nm, 0.22 NA, 50:50 Split, FC/PC**	**$310.00**	**Today**
TW1064R5A2B	**2x2 Wideband Fiber Optic Coupler, 1064 ± 100 nm, 0.22 NA, 50:50 Split, FC/APC**	**$350.00**	**Today**

Hide 75:25 Fiber Optic Couplers

75:25 Fiber Optic Couplers

All specifications are measured without connectors during the manufacturing process. Additional information on the testing process for our wideband couplers can be found on the *Coupler Verification* tab above. Our wideband couplers are highlighted green in the table below.

Item #	Info	Center Wavelength	Bandwidth	Coupling Ratio[a]	Coupling Ratio Tolerance	Insertion Loss[a]	Excess Loss[a]	Uniformity[a]	Fiber Type[b]	Termination
TW930R3F2		930 nm	±100 nm	75:25 (Click for Plot)	±3.75%	≤1.8 dB / ≤7.0 dB	≤0.3 dB	≤1.25 dB (Click for Plot)	780HP	FC/PC
TW930R3A2										FC/APC
TW1064R3F2A[c,d]		1064 nm	±100 nm[d,e]	75:25 (Click for Plot)	±3.5%	≤1.7 dB / ≤6.9 dB	≤0.2 dB	≤0.6 dB (Click for Plot)	HI1060 (0.14 NA)	FC/PC
TW1064R3A2A[c,d]										FC/APC
TW1064R3F2B[c,d]		1064 nm	±100 nm[d,e]	75:25 (Click for Plot)	±3.5%	≤1.7 dB / ≤6.9 dB	≤0.2 dB	≤0.6 dB (Click for Plot)	HI1060 FLEX (0.22 NA)	FC/PC
TW1064R3A2B[c,d]										FC/APC

- Please see the *2x2 Coupler Tutorial* tab for more information on these terms.
- Other fiber types may be available upon request. Please contact Tech Support with inquiries.
- All values are specified at room temperature over the bandwidth and measured using the white port as the input, as indicated in the diagram above; similar performance is achieved (≤0.05 dB difference) when the blue port is used as the input.
- Below the cut-off wavelength, single mode operation is not guaranteed (click on the blue info icon for more information).
- This value represents the minimum bandwidth over which the coupler is guaranteed to meet its specifications. Each wideband coupler is shipped with an individual item data sheet that provides information on coupler performance over the specified bandwidth range.

Part Number	Description	Price	Availability
TW930R3F2	**2x2 Wideband Fiber Optic Coupler, 930 ± 100 nm, 75:25 Split, FC/PC**	**$310.00**	**Today**
TW930R3A2	**2x2 Wideband Fiber Optic Coupler, 930 ± 100 nm, 75:25 Split, FC/APC**	**$350.00**	**Today**
TW1064R3F2A	**2x2 Wideband Fiber Optic Coupler, 1064 ± 100 nm, 0.14 NA, 75:25 Split, FC/PC**	**$310.00**	**Today**
TW1064R3A2A	**2x2 Wideband Fiber Optic Coupler, 1064 ± 100 nm, 0.14 NA, 75:25 Split, FC/APC**	**$350.00**	**Today**
TW1064R3F2B	**2x2 Wideband Fiber Optic Coupler, 1064 ± 100 nm, 0.22 NA, 75:25 Split, FC/PC**	**$310.00**	**Today**
TW1064R3A2B	**2x2 Wideband Fiber Optic Coupler, 1064 ± 100 nm, 0.22 NA, 75:25 Split, FC/APC**	**$350.00**	**Today**

Hide 90:10 Fiber Optic Couplers

90:10 Fiber Optic Couplers

Thorlabs offers both narrowband and wideband fiber optic couplers. All specifications are measured without connectors during the manufacturing process. Additional information on the testing process for our wideband couplers can be found on the *Coupler Verification* tab above. Our wideband couplers are highlighted green in the table below.

Item #	Info	Center Wavelength	Bandwidth	Coupling Ratio[a]	Coupling Ratio Tolerance	Insertion Loss (dB)[a]	Excess Loss[a]	Uniformity[a]	Fiber Type[b]	Termination
TW930R2F2		930 nm	±100 nm	90:10 (Click for Plot)	±3.0%	≤0.9 dB / ≤11.8 dB	≤0.3 dB	≤2.0 dB (Click for Plot)	780HP	FC/PC
TW930R2A2										FC/APC
FC980-90B		980 nm	±15 nm	90:10	-	0.7 dB / 10.5 dB (Typ.)	0.12 dB (Typ.)	-	HI1060 FLEX (0.22 NA)	No Connectors, Scissor Cut
FC980-90B-FC										FC/PC
FC980-90B-APC										FC/APC
TW1064R2F2A[c,d]		1064 nm	±100 nm[d,e]	90:10 (Click for Plot)	±2.5%	≤0.8 dB / ≤11.4 dB	≤0.2 dB	≤0.6 dB (Click for Plot)	HI1060 (0.14 NA)	FC/PC
TW1064R2A2A[c,d]										FC/APC
TW1064R2F2B[c,d]		1064 nm	±100 nm[d,e]	90:10 (Click for Plot)	±2.5%	≤0.8 dB / ≤11.4 dB	≤0.2 dB	≤0.7 dB (Click for Plot)	HI1060 FLEX (0.22 NA)	FC/PC
TW1064R2A2B[c,d]										FC/APC

- Please see the *2x2 Coupler Tutorial* tab for more information on these terms.
- Other fiber types may be available upon request. Please contact Tech Support with inquiries.
- All values are specified at room temperature over the bandwidth and measured using the white port as the input, as indicated in the diagram above; similar performance is achieved (≤0.05 dB difference) when the blue port is used as the input.
- Below the cut-off wavelength, single mode operation is not guaranteed (click on the blue info icon for more information).
- This value represents the minimum bandwidth over which the coupler is guaranteed to meet its specifications. Each wideband coupler is shipped with an individual item data sheet that provides information on coupler performance over the specified bandwidth range.

Part Number	Description	Price	Availability
TW930R2F2	**2x2 Wideband Fiber Optic Coupler, 930 ± 100 nm, 90:10 Split, FC/PC**	**$310.00**	**Today**
TW930R2A2	**2x2 Wideband Fiber Optic Coupler, 930 ± 100 nm, 90:10 Split, FC/APC**	**$350.00**	**Today**
FC980-90B	**2x2 Fiber Optic Coupler, 980 ± 15 nm, 90:10 Split, No Connectors**	**$135.00**	**Today**
FC980-90B-FC	**2x2 Fiber Optic Coupler, 980 ± 15 nm, 90:10 Split, FC/PC**	**$170.00**	**Today**
FC980-90B-APC	**2x2 Fiber Optic Coupler, 980 ± 15 nm, 90:10 Split, FC/APC**	**$210.00**	**Today**
TW1064R2F2A	**2x2 Wideband Fiber Optic Coupler, 1064 ± 100 nm, 0.14 NA, 90:10 Split, FC/PC**	**$310.00**	**Today**
TW1064R2A2A	**2x2 Wideband Fiber Optic Coupler, 1064 ± 100 nm, 0.14 NA, 90:10 Split, FC/APC**	**$350.00**	**Today**
TW1064R2F2B	**2x2 Wideband Fiber Optic Coupler, 1064 ± 100 nm, 0.22 NA, 90:10 Split, FC/PC**	**$310.00**	**Today**
TW1064R2A2B	**2x2 Wideband Fiber Optic Coupler, 1064 ± 100 nm, 0.22 NA, 90:10 Split, FC/APC**	**$350.00**	**Today**

Hide 99:1 Fiber Optic Couplers

99:1 Fiber Optic Couplers

Thorlabs offers both narrowband and wideband fiber optic couplers. All specifications are measured without connectors during the manufacturing process. Additional information on the testing process for our wideband couplers can be found on the *Coupler Verification* tab above. Our wideband couplers are highlighted green in the table below.

Item #	Info	Center Wavelength	Bandwidth	Coupling Ratio[a]	Coupling Ratio Tolerance	Insertion Loss (dB)[a]	Excess Loss[a]	Uniformity[a]	Fiber Type[b]	Termination
TW930R1F2		930 nm	±100 nm	50:50 (Click for Plot)	±0.6%	≤0.4 dB / ≤24.3 dB	≤0.3 dB	≤3.0 dB (Click for Plot)	780HP	FC/PC
TW930R1A2										FC/APC
FC980-99B		980 nm	±15 nm	99:1	-	0.35 dB / 22 dB (Typ.)	0.12 dB (Typ.)	-	HI1060 FLEX (0.22 NA)	No Connectors, Scissor Cut
FC980-99B-FC										FC/PC
FC980-99B-APC										FC/APC
TW1064R1F2A[c,d]		1064 nm	±100 nm[d,e]	99:1 (Click for Plot)	±0.6%	≤0.3 dB / ≤24.2 dB	≤0.2 dB	≤1.0 dB (Click for Plot)	HI1060 (0.14 NA)	FC/PC
TW1064R1A2A[c,d]										FC/APC
TW1064R1F2B[c,d]		1064 nm	±100 nm[d,e]	99:1 (Click for Plot)	±0.6%	≤0.3 dB / ≤24.2 dB	≤0.2 dB	≤1.0 dB (Click for Plot)	HI1060 FLEX (0.22 NA)	FC/PC
TW1064R1A2B[c,d]										FC/APC

- Please see the *2x2 Coupler Tutorial* tab for more information on these terms.
- Other fiber types may be available upon request. Please contact Tech Support with inquiries.
- All values are specified at room temperature over the bandwidth and measured using the white port as the input, as indicated in the diagram above; similar performance is achieved (≤0.05 dB difference) when the blue port is used as the input.
- Below the cut-off wavelength, single mode operation is not guaranteed (click on the blue info icon for more information).
- This value represents the minimum bandwidth over which the coupler is guaranteed to meet its specifications. Each wideband coupler is shipped with an individual item data sheet that provides information on coupler performance over the specified bandwidth range.

Part Number	Description	Price	Availability
TW930R2F2	2x2 Wideband Fiber Optic Coupler, 930 ± 100 nm, 90:10 Split, FC/PC	$310.00	Today
TW930R2A2	2x2 Wideband Fiber Optic Coupler, 930 ± 100 nm, 90:10 Split, FC/APC	$350.00	Today
FC980-99B	2x2 Fiber Optic Coupler, 980 ± 15 nm, 99:1 Split, No Connectors	$135.00	3-5 Days
FC980-99B-FC	2x2 Fiber Optic Coupler, 980 ± 15 nm, 99:1 Split, FC/PC	$170.00	Today
FC980-99B-APC	2x2 Fiber Optic Coupler, 980 ± 15 nm, 99:1 Split, FC/APC	$210.00	3-5 Days
TW1064R1F2A	2x2 Wideband Fiber Optic Coupler, 1064 ± 100 nm, 0.14 NA, 99:1 Split, FC/PC	$310.00	Today
TW1064R1A2A	2x2 Wideband Fiber Optic Coupler, 1064 ± 100 nm, 0.14 NA, 99:1 Split, FC/APC	$350.00	Today
TW1064R1F2B	2x2 Wideband Fiber Optic Coupler, 1064 ± 100 nm, 0.22 NA, 99:1 Split, FC/PC	$310.00	Today
TW1064R1A2B	2x2 Wideband Fiber Optic Coupler, 1064 ± 100 nm, 0.22 NA, 99:1 Split, FC/APC	$350.00	Today

FC980-99B-APC - 2x2 SM Coupler, 980 ± 15 nm, 99:1 Split, FC/APC

Specs

Specifications[a]	
Coupling Ratio	99:1
Center Wavelength	980 nm
Bandwidth	±15 nm
Insertion Loss	0.35 dB / 22 dB (Typ.)
Excess Loss	0.12 dB (Typ.)
Polarization-Dependent Loss (PDL)	<0.15 dB
Directivity	>55 dB
Fiber Type	HI1060FLEX
Port Configuration	2x2
Fiber Lead Length and Tolerance	0.8 m +0.075 m/-0 m
Termination	2.0 mm Narrow Key FC/APC
Package Size	Ø0.15" x 2.60" (Ø3.8 mm x 66.0 mm)
Jacket	Ø900 µm Loose Furcation Tubing
Operating Temperature	-40 to 85 °C

a. All specifications are measured without connectors during the manufacturing process.