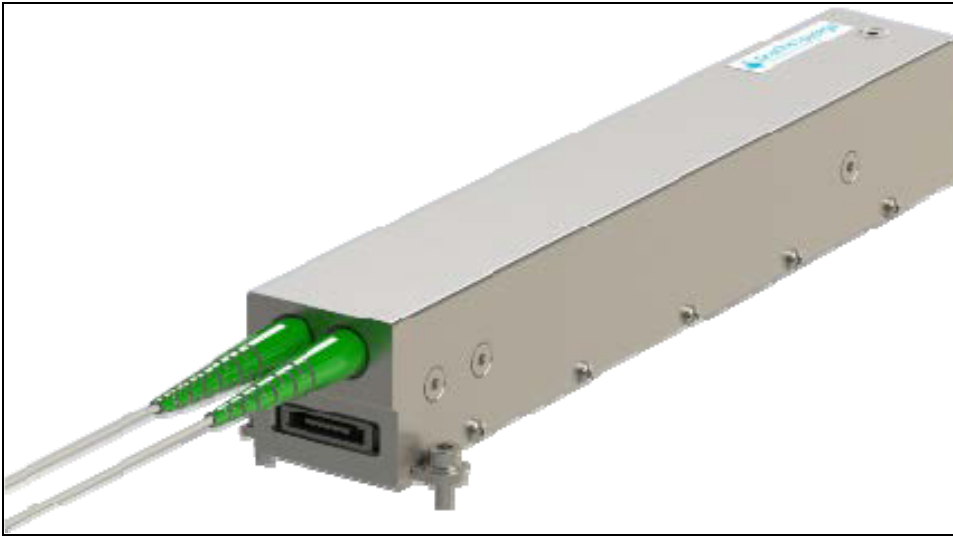


OCT VARIABLE OPTICAL DELAY LINE



Our Variable Optical Delay Line provides fast and accurate optical path length control in a compact housing. Based on a customisable chassis that can be adapted to incorporate additional optical components, the unit is designed to be easily incorporated into any modular optical coherence tomography (OCT) or similar interferometric system architecture.

Optical interface is through a single or dual fiber pigtailed which can be specified to length and terminated with all commonly used optical connectors. Internal optical sensors can be used as reference location and travel limit switches.

Please contact us for further details related to use of the delay line within interferometric applications.

Key Features

- Point-and-return or dual fiber architecture
- Extremely compact design
- Optical wavebands covered:
 - 850 nm
 - 1060 nm
 - 1310 nm
- Low insertion loss
- Simple system integration
- Highly customisable

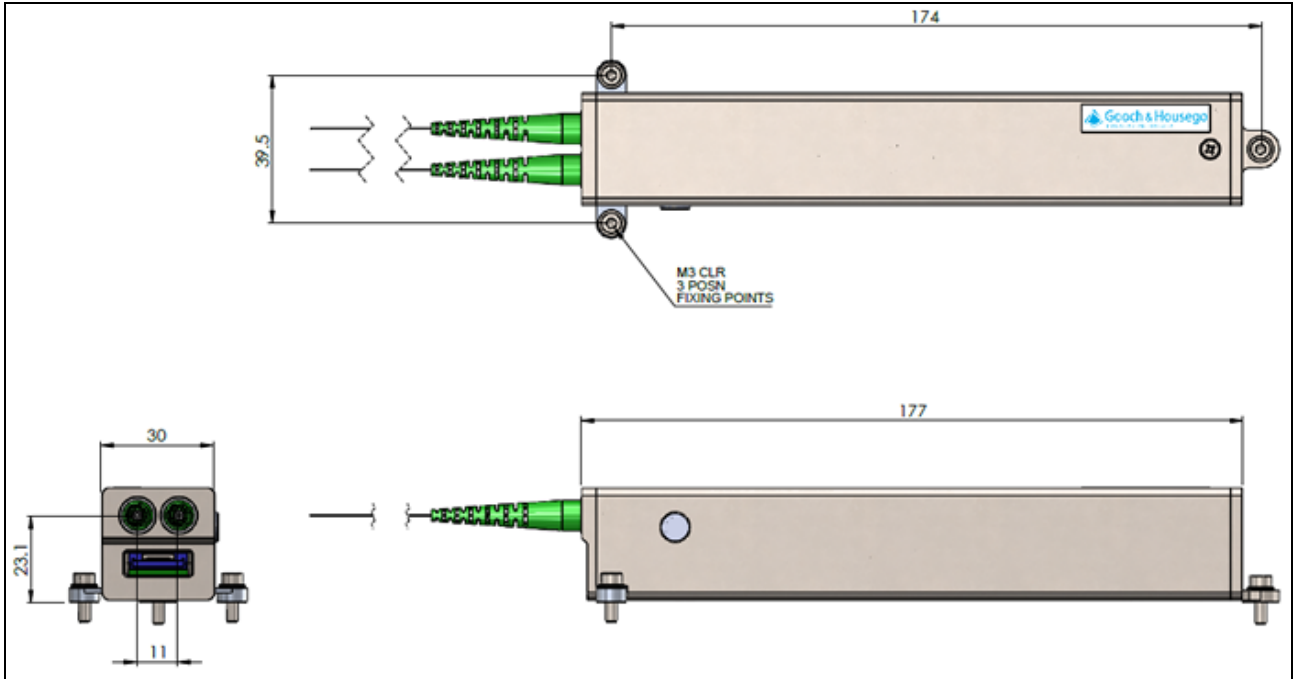
Specifications

Parameter	Value	Notes
Wavelength range	850, 1060 and 1310 nm	Typical spectral bandwidth ± 50 nm
Optical input power	<100 mW	Continuous exposure
Mechanical travel range	80 mm	Can be customized according to requirements
Optical delay range	1066 ps ¹ 533 ps ²	80 mm travel range
Travel speed	50 mm/s	Mechanical travel speed
Travel resolution	5 μ m	Can be customized according to requirements
Optical delay resolution	0.03 ps	Dual fiber version
Optical IL	≤ 1.6 dB	Excludes connector loss, waveband dependant
IL over travel range	≤ 0.5 dB	
WDL	≤ 0.6 dB	
Temperature dependent IL	≤ 0.6 dB	
Return loss	>55 dB	
Operating temperature range	+15°C to +55°C	Typical
Dimensions	177x30x30 mm	Excludes fixing tabs and fiber pigtailed

¹ For single fiber, point-and-return architecture

² For dual fiber architecture

Mechanical Outline



Order Code

Order codes are comprised of a standard device prefix (e.g. ODL) followed by code letters or numbers which correspond to available options.

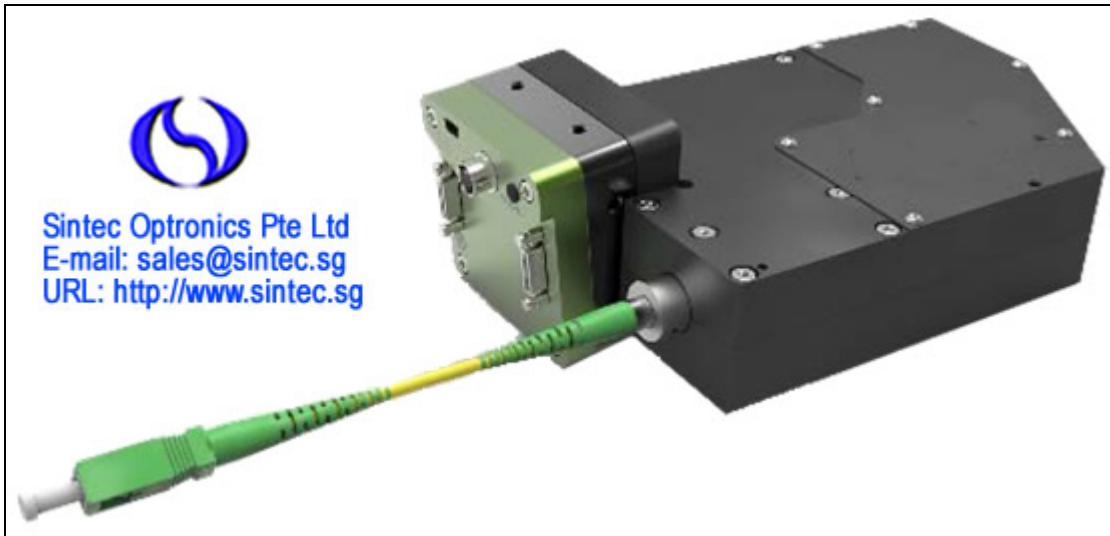
Sample: ODL-3AXXX1213 (SFF Delay Line, 1310 nm center wavelength, 50 mm/s travel speed, single fiber port configuration, 2 mm sleeving, 1 m pigtails, FC/APC connector).

Order Code				①	②	③	④	⑤	⑥	⑦	⑧	⑨
O	D	L	-		A	X	X	X				

①	Passband	850		1060 nm			1310					
	Code	8		0			3					
②	Travel speed	50 mm/s										
	Code	A										
③	Blank	X										
	Code	X										
④	Blank	X										
	Code	X										
⑤	Blank	X										
	Code	X										
⑥	Port configuration	Point and return (single fiber)					Dual fiber (input separate from output)					
	Code	1					2					
⑦	Fiber sleeving	Ø .9 mm					Ø2.0 mm					
	Code	1					2					
⑧	Pigtail length ¹	0.5 m					1 m					
	Code	0					1					
⑨	Connector ¹	None	FC/PC	FC/APC	SC/APC	FC/UPC	SC/UPC	LC				
	Code	0	1	3	5	9	A		B			

¹ Minimum pigtail length. Further pigtail lengths available on request. Where connectorized, pigtail length is to connector end face.

COMPACT OCT OPTICAL SPECTROMETER



Our Optical Spectrometer is a high resolution, flexible platform for spectral analysis of fiber coupled signals. Based on a high quality transmission diffraction grating, the spectrometer unit allows high resolution spectral analysis in a robust and reliable package.

Designed to be incorporated into any OEM modular system architecture with applications in optical coherence tomography (OCT), gas detection and many other industrial, medical or scientific applications.

The optical input is via a fiber optic pigtail which can be specified to length and terminated with all commonly used optical connectors. The line scan camera detection unit is selected to provide optimum performance for the chosen operating wavelength range and resolution or may be specified by the customer.

Key Features

- Optical waveband centred at 840 nm
- Resolution <0.1 nm/pixel
- Wide operating temperature range

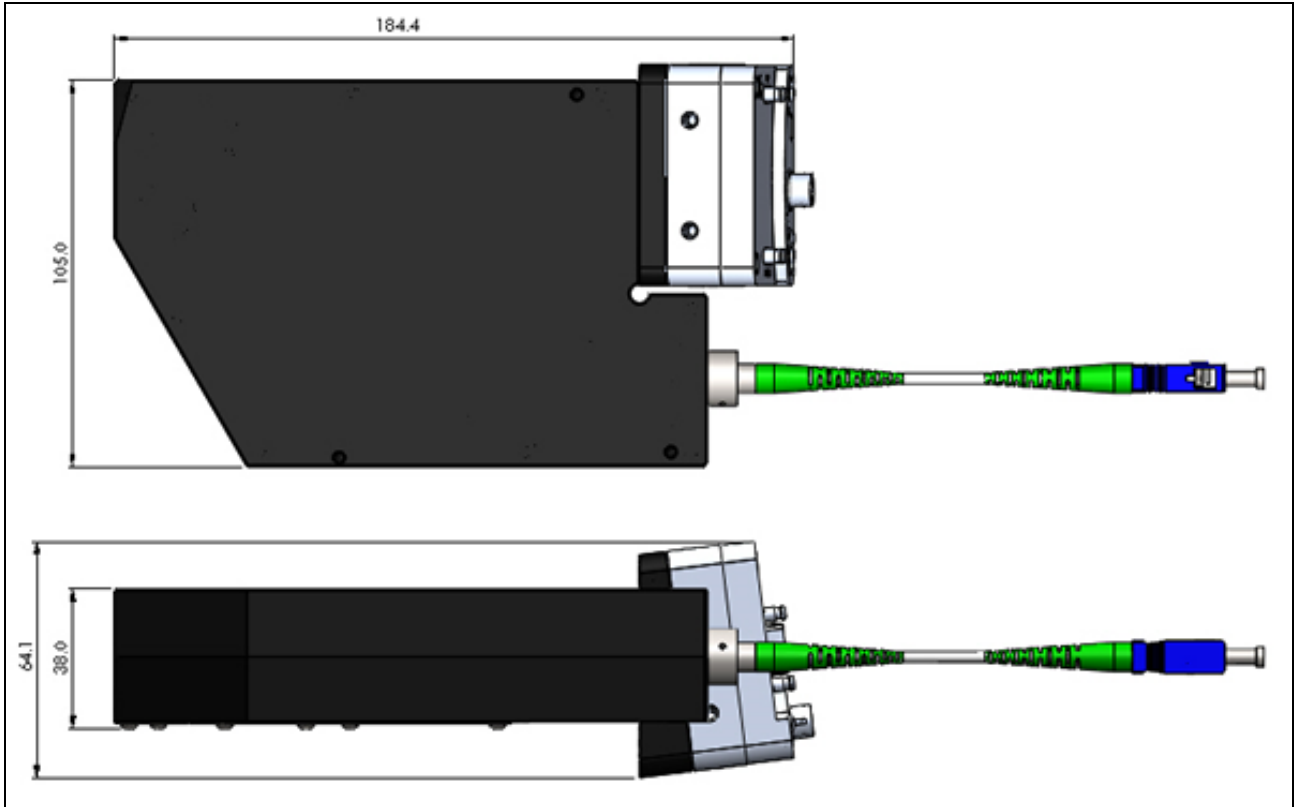
Key Benefits

- High resolution
- High optical efficiency
- Compact design
- Fiber coupled input

Specifications

Parameter	Value	Notes
Wavelength range	840 nm	Typical spectral bandwidth ± 50 nm Other wavelengths available on request
Optical input power	<10 mW	
Efficiency of optical train	>60%	
Wavelength resolution	<0.1 nm/pixel	Dependent on combination of dispersive element, imaging optics and camera
Optical fiber input	Single-mode fiber	
Number of pixels	512 / 1024 / 2048	Options available
Line rate	up to 250 kHz	Camera dependent
Operating temperature range	+10°C to +45°C	Typical
Dimensions	Refer to drawing	Overall dimensions depend on camera

Mechanical Outline



OCT FIBER COLLIMATOR



A range of non-contact style, single mode, fiber collimators incorporating achromatic lenses.

Anti-reflection coatings are employed to minimize back reflections. Our proprietary alignment and assembly processes produce a beam having low pointing error that is stable over a wide range of environmental conditions. Our OCT Fiber Collimators are manufactured to high opto-mechanical tolerances to enable simple incorporation into production line processes.

Key Features

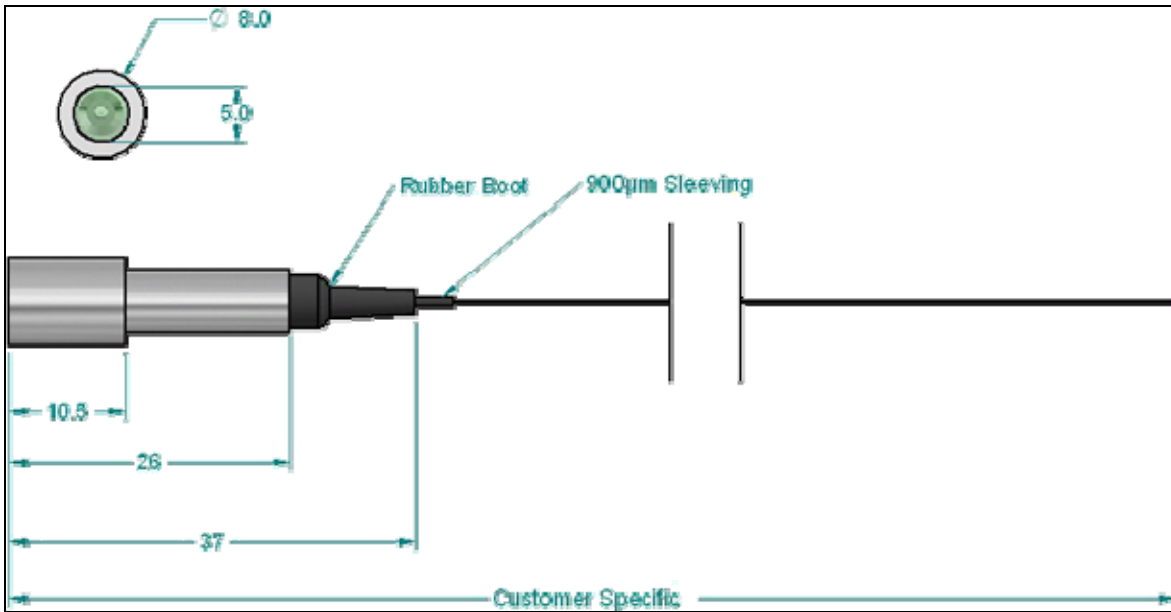
- Low pointing error
- Low back reflection
- Low divergence
- Custom configurations available
- High opto-mechanical tolerances
- Can be integrated with OCT couplers
- Also available at 1060nm and 1300nm

Example Optical Specifications 840 nm

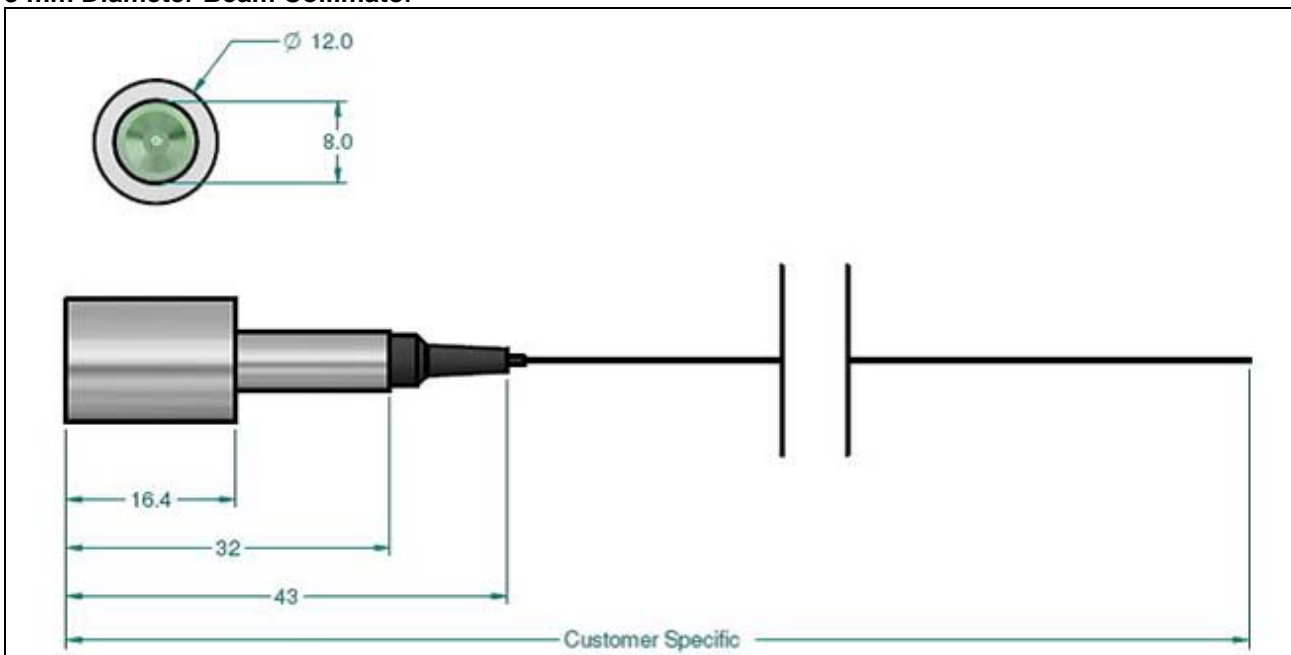
Parameter	Specification
2 mm Diameter Beam Collimator	
Lens focal	10.00 mm \pm 0.5%
Operating wavelength	840 nm nominal
Lens AR coating	<1% reflection at 800-900 nm
Lens diameter	5 mm
Beam diameter ($1/e^2$)	2.1 mm
Beam centering	<1 mrad
Beam focusing	>20 m
Mechanical OD	8 mm (-0.01 mm ~ -0.02 mm)
Fiber	Nufern 780-HP
3mm Diameter Beam Collimator	
Lens focal distance	16.38 mm \pm 0.5%
Operating wavelength	840 nm nominal
Lens AR coating	<1% reflection at 800-900 nm
Lens diameter	8 mm
Beam diameter ($1/e^2$)	3.2 mm
Beam centering	<1 mrad
Beam focusing	>20 m
Mechanical OD	12 mm (-0.01 mm ~ -0.02 mm)
Fiber	Nufern 780-HP

Mechanical Outline

2 mm Diameter Beam Collimator



3 mm Diameter Beam Collimator



OCT COUPLER 1060 NM WIDEBAND



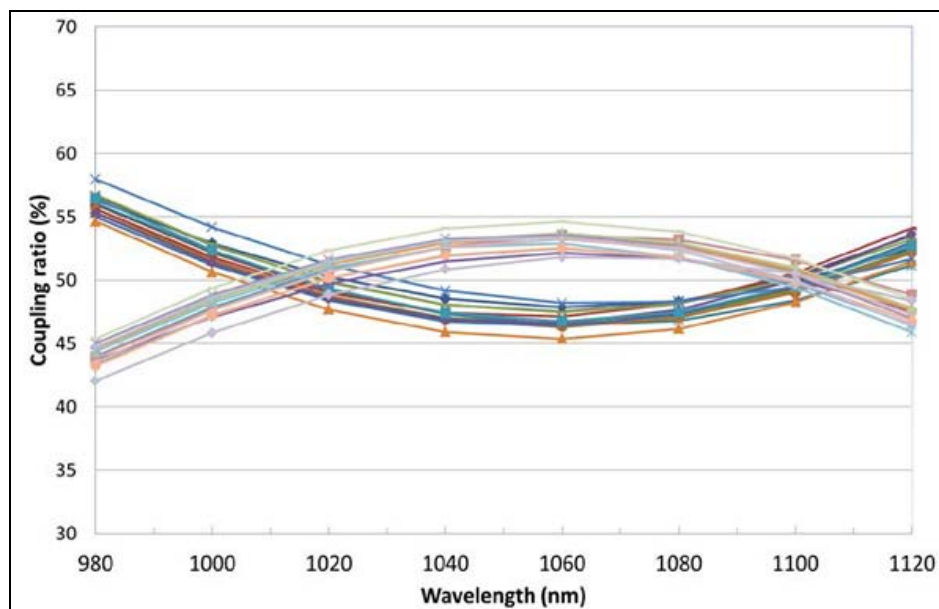
Fiber Optic couplers are used in the optical coherence tomography (OCT) light engine to form the interferometer that OCT systems use to generate depth information

A coupler with low wavelength dependence allows the system to operate over a wide wavelength range which increases depth resolution. The OCT wideband coupler splits over a wide bandwidth at the popular OCT wavelength band centered at 1060 nm. Designed for low loss and wide bandwidth operation, the coupler utilizes our proprietary fused fiber technology.

Key Features

- Very low light loss
- Any coupling ratio available
- Wide bandwidth operation
- Various fiber options available

Typical Optical Specifications



A sample of 10 50/50% couplers plotted in the wavelength range 980 nm to 1120 nm

Coupling Ratio ¹	Measured Bandwidth	1060 nm Band Excess Loss ^{2,3}	1060 nm Band Coupling Ratio Tolerance ²	Available Housing Option
1%	A=±20 nm	0.10 dB	±0.30%	3, 4, 5, 6
	B=±35 nm	0.10 dB	±0.40%	
	C=±50 nm	0.10 dB	±0.50%	
10%	A=±20 nm	0.10 dB	±1.5%	3, 4, 5, 6
	B=±35 nm	0.10 dB	±2.5%	
	C=±50 nm	0.10 dB	±3.5%	
20%	A=±20 nm	0.13 dB	±2%	3, 4, 5, 6
	B=±35 nm	0.13 dB	±3%	
	C=±50 nm	0.13 dB	±4%	
30%	A=±20 nm	0.13 dB	±2.5%	3, 4, 5, 6
	B=±35 nm	0.13 dB	±3.5%	
	C=±50 nm	0.13 dB	±4.5%	
50%	A=±20 nm	0.15 dB	±3.5%	3, 4, 5, 6
	B=±35 nm	0.15 dB	±5%	
	C=±50 nm	0.15 dB	±6.5%	

- Any coupling ratio available. Please contact sales office for details on coupling ratios not listed.
- Measured through P1 to P2 and P3

Parameter	Specification
Operating/storage temperature range ¹	-40 – +75°C/-40 – + 85°C
Pigtail tensile load	5 N
Fiber type ²	Speciality single mode fiber

- For connectorized component, operating temperature range is -5 – +75°C.
- Fiber type to be confirmed upon request.
- Excess loss dependent on fiber type.

Housing Option

Housing Code	Description	1x2, 2x2 Dimensions (mm)	Pigtail
3	Regular	3.0 (∅) x 50 (L)	Primary-coated fiber
4	∅0.9 mm slim	3.0 (∅) x 60 (L)	∅0.9 mm loose-tube
5	∅0.9 mm semi-ruggedized	5.0 (∅) x 75 (L)	∅0.9 mm loose-tube
6	∅3.0 mm fully-ruggedized	80 (L) x 10 (W) x 8 (H)	∅3.0 mm fan-out sleeving

Configuration



Order code

Order codes are comprised of a standard device prefix (e.g. OCT) followed by code letters or numbers which correspond to available options.

Sample: OCT-040K31A10 (OCT Wideband Coupler, 1040 nm center wavelength, 50/50 coupling ratio, regular housing, 1x2 port configuration, ± 20 nm measured bandwidth, 1 m pigtails, no connectors)

Order Code				①	②	③	④	⑤	⑥	⑦	⑧	⑨
O	C	T	-									

①	Passband ⁶	10XX nm										
	Code	0										
②	Last two digits of center wavelength	XX10nm			XX32nm			XX57nm				
③		Code			Code			Code				
		10			32			57				
④	Coupling ratio ²	5%	10%	20%	25%	30%						
	Code	5	A	C	D	E						
⑤	Housing ⁴	Regular $\varnothing 0.9$ mm		slim $\varnothing 0.9$ mm		semi-ruggedized		ø3.0 mm fully ruggedized				
		Code	3		4		5		6			
⑥	Port configuration	1x2					2x2					
		Code	1					2				
⑦	Measured Bandwidth	± 20 nm			± 35 nm			± 50 nm				
		Code	A			B			C			
⑧	Pigtail length ¹	0.5 m					1 m					
		Code	0					1				
⑨	Connector ^{1,3,4}	None	FC/PC	FC/APC	SC/APC	FC/UPC	SC/UPC	LC ³				
		Code	0	1	3	5	9	A	B			

1. Minimum pigtail length. Further pigtail lengths available on request. Where connectorized, pigtail length is to connector end face.
2. Any coupling ratio available. Please contact us for ordering codes of coupling ratios not listed.
3. LC connector not available for housing code 6, fully ruggedized housing.
4. Connectors may be fitted to housing types 4, 5 and 6. For connectorization of housing type 3 please contact the sales office.
5. Various fiber options available. Please contact sales office to discuss fiber choice.

OCT COUPLER 850 NM & 1030 NM WIDEBAND



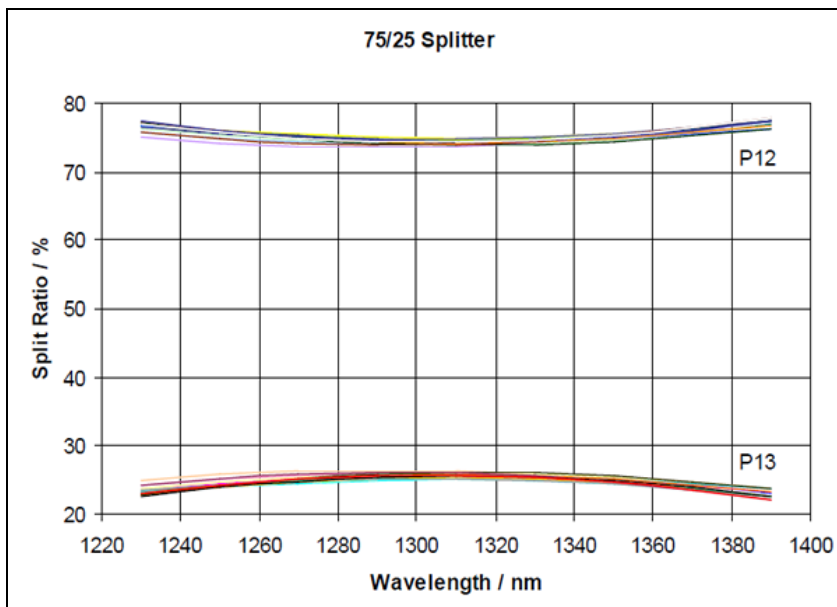
Fiber optic couplers are used in the optical coherent tomography (OCT) light engine to form the interferometer that OCT systems use to generate depth information.

A coupler with low wavelength dependence allows the system to operate over a wide wavelength range which increases depth resolution. The OCT wideband coupler splits over a wide bandwidth at the popular OCT wavelength band centered at 850 nm and 1030 nm. Designed for low loss and wide bandwidth operation, the coupler utilizes our proprietary fused fiber technology.

Key Features

- Very low light loss
- Any coupling ratio available
- Wide bandwidth operation
- Various fiber options available

Typical Optical Specifications



A sample of 75/25% couplers plotted in the wavelength range 1230 nm to 1390 nm

Coupling Ratio ¹	Measured Bandwidth	800 nm Band Excess Loss ²	1300 nm or 1500 nm Band Excess Loss ²	800 nm Band Coupling Ratio Tolerance ²	1030 nm and 1500 nm Band Coupling Ratio Tolerance ²	Available Housing Option
1%	A=±20 nm	0.10 dB	0.10 dB	±0.35%	±0.30%	3, 4, 5, 6
	B=±35 nm	0.10 dB	0.10 dB	±0.45%	±0.40%	
	C=±50 nm	0.10 dB	0.10 dB	±0.55%	±0.50%	
10%	A=±20 nm	0.13 dB	0.10 dB	±2.0%	±1.5%	3, 4, 5, 6
	B=±35 nm	0.13 dB	0.10 dB	±3.0%	±2.5%	
	C=±50 nm	0.13 dB	0.10 dB	±4.0%	±3.5%	
20%	A=±20 nm	0.15 dB	0.13 dB	±2.5%	±2%	3, 4, 5, 6
	B=±35 nm	0.15 dB	0.13 dB	±3.5%	±3%	
	C=±50 nm	0.15 dB	0.13 dB	±4.5%	±4%	
30%	A=±20 nm	0.20 dB	0.13 dB	±2.75%	±2.5%	3, 4, 5, 6
	B=±35 nm	0.20 dB	0.13 dB	±3.75%	±3.5%	
	C=±50 nm	0.20 dB	0.13 dB	±4.75%	±4.5%	
50%	A=±20 nm	0.25 dB	0.15 dB	±4.0%	±3.5%	3, 4, 5, 6
	B=±35 nm	0.25 dB	0.15 dB	±5.5%	±5%	
	C=±50 nm	0.25 dB	0.15 dB	±7.0%	±6.5%	

- Any coupling ratio available. Please contact sales office for details on coupling ratios not listed.
- Measured through P1 to P2 and P3

Parameter	Specification
Operating/storage temperature range ¹	-40 – +75°C/-40 – + 85°C
Pigtail tensile load	5 N
Fiber type ²	Speciality single mode fiber

- For connectorized component, operating temperature range is -5 – +75°C.
- Fiber type to be confirmed upon request.

Housing Option

Housing Code	Description	1x2, 2x2 Dimensions (mm)	Pigtail
3	Regular	3.0 (∅) x 50 (L)	Primary-coated fiber
4	∅0.9 mm slim	3.0 (∅) x 60 (L)	∅0.9 mm loose-tube
5	∅0.9 mm semi-ruggedized	5.0 (∅) x 75 (L)	∅0.9 mm loose-tube
6	∅3.0 mm fully-ruggedized	80 (L) x 10 (W) x 8 (H)	∅3.0 mm fan-out sleeving

Configuration



Order code

Order codes are comprised of a standard device prefix (e.g. OCT) followed by code letters or numbers which correspond to available options.

Sample: OCT-310D52C13 (OCT Wideband Coupler, 1310nm center wavelength, 75/25% coupling ratio, 0.9 mm loose tube semi-ruggedized housing, 2x2 port configuration, ± 50 nm measured bandwidth, 1 m pigtails, FC/APC connectors)

Order Code				①	②	③	④	⑤	⑥	⑦	⑧	⑨
O	C	T	-									

①	Passband ⁶	8XX nm			13XX nm			15XX nm				
	Code	8			3			5				
②	Last two digits of center wavelength	XX10nm			XX32nm			XX57nm				
③		Code			10			32			57	
④	Coupling ratio ²	10%	20%	25%	30%	33%	40%	50%				
	Code	A	C	D	E	F	H	K				
⑤	Housing ⁴	Regular $\varnothing 0.9$ mm		slim $\varnothing 0.9$ mm		semi-ruggedized		$\varnothing 3.0$ mm fully ruggedized				
	Code	3		4		5		6				
⑥	Port configuration	1x2					2x2					
	Code	1					2					
⑦	Measured Bandwidth	± 20 nm			± 35 nm			± 50 nm				
	Code	A			B			C				
⑧	Pigtail length ¹	0.5 m					1 m					
	Code	0					1					
⑨	Connector ^{1,3,4}	None	FC/PC	FC/APC	SC/APC	FC/UPC	SC/UPC	LC ³				
	Code	0	1	3	5	9	A	B				

1. Minimum pigtail length. Further pigtail lengths available on request. Where connectorized, pigtail length is to connector end face.
2. Any coupling ratio available. Please contact us for ordering codes of coupling ratios not listed.
3. LC connector not available for housing code 6, fully ruggedized housing.
4. Connectors may be fitted to housing types 4, 5 and 6. For connectorization of housing type 3 please contact the sales office.
5. Various fiber options available. Please contact sales office to discuss fiber choice.

OCT COUPLER 850 NM & 1030 NM WIDEBAND



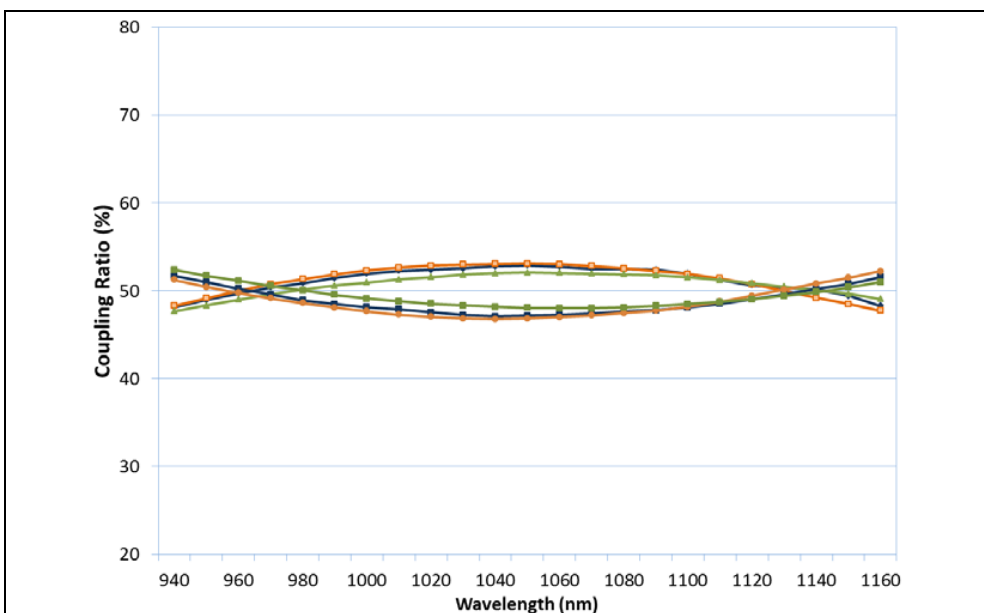
Fiber optic couplers are used in the optical coherence tomography (OCT) light engine to form the interferometer that OCT systems use to generate depth information.

Our EWOC has been developed to provide market leading performance for use in high resolution OCT imaging systems employing next generation wideband wavelength-swept sources. The EWOC splits over an extended bandwidth and can be ordered to operate at any of the popular OCT wavelength bands (850 nm, 1060 nm and 1310 nm). Designed for low loss and extended bandwidth operation, the coupler utilizes our proprietary fused fiber technology.

Key Features

- Extended bandwidth
- Any coupling ratio available
- Very low light loss
- Various fiber options available

Typical Optical Specifications⁶



Sample of 50/50% couplers plotted in the wavelength range 940 – 1160 nm.

Coupling Ratio ¹	Measured Bandwidth ⁴	800 nm Band Excess Loss ^{2,3}	1060 nm and 1310 nm Band Excess Loss ^{2,3,5}	850 nm Band Coupling Ratio Tolerance ^{2,3}	1060 nm and 1310 nm Band Coupling Ratio Tolerance ^{2,3}
90/10	100nm	0.50 (typ <0.30)	0.30 (typ <0.15)	±3.0%	±2.5%
80/20				±3.5%	±3.0%
75/25				±3.75%	±3.25%
70/30				±4.0%	±3.5%
67/33				±4.25%	±3.7%
60/40				±5.0%	±4.0%
50/50				±6.5%	±5.0%

1. Any coupling ratio available. Please contact sales office for details on coupling ratios not listed.
2. Measured through P1 input.
3. Performance through P4 input will closely match P1 – please contact sales office for details.
4. Performance over entire bandwidth may be limited by the single-mode fiber cut-off.
5. Excluding water peak band, centered around 1383 nm.
6. Data supplied at center wavelength.

Parameter	Specification
Operating/storage temperature range ¹	-40 – +75°C/-40 – + 85°C
Pigtail tensile load	5 N
Fiber type ²	850 nm: OFS/Furukawa CL 780 11 (CF04247-03)
	1060 nm: Nufern 1060-XP
	1310 nm: Corning SMF28

1. For connectorized component, operating temperature range is -5 – +75°C.
2. Alternative fiber types may be available upon request.

Housing Option

Housing Code	Description	1x2, 2x2 Dimensions (mm)	Pigtail
3	Regular	3.0 (Ø) x 50 (L)	Primary-coated fiber
4	Ø0.9 mm slim	3.0 (Ø) x 60 (L)	Ø0.9 mm loose-tube
5	Ø0.9 mm semi-ruggedized	5.0 (Ø) x 75 (L)	Ø0.9 mm loose-tube
6	Ø3.0 mm fully-ruggedized	80 (L) x 10 (W) x 8 (H)	Ø3.0 mm fan-out sleeving

Configuration



Order code

Order codes are comprised of a standard device prefix (e.g. OCT) followed by code letters or numbers which correspond to available options.

Sample: 060K31H10 (OCT Wideband Coupler, 1060 nm center wavelength, 50/50 coupling ratio, regular housing, 1x2 port configuration, ± 100 nm measured bandwidth, 1 m pigtails, no connectors).

Order Code				①	②	③	④	⑤	⑥	⑦	⑧	⑨
O	C	T	-									

①	Passband ⁶	8XX nm			13XX nm			15XX nm				
	Code	8			3			5				
②	Last two digits of center wavelength	XX10nm			XX32nm			XX57nm				
③		Code			10			32			57	
④	Coupling ratio ²	10%	20%	25%	30%	33%	40%	50%				
	Code	A	C	D	E	F	H	K				
⑤	Housing ⁴	Regular $\varnothing 0.9$ mm		slim $\varnothing 0.9$ mm		semi-ruggedized		ø3.0 mm fully ruggedized				
	Code	3		4		5		6				
⑥	Port configuration	1x2					2x2					
	Code	1					2					
⑦	Measured Bandwidth	± 100 nm										
	Code	H										
⑧	Pigtail length ¹	0.5 m					1 m					
	Code	0					1					
⑨	Connector ^{1,3,4}	None	FC/PC	FC/APC	SC/APC	FC/UPC	SC/UPC	LC ³				
	Code	0	1	3	5	9	A	B				

1. Minimum pigtail length. Further pigtail lengths available on request. Where connectorized, pigtail length is to connector end face.

2. Any coupling ratio available. Please contact G&H for ordering codes of coupling ratios not listed.

3. LC connector not available for housing code 6, fully ruggedized housing.

4. Connectors may be fitted to housing types 4, 5 and 6. For connectorization of housing type 3 please contact the sales office.