

# THORLABS

Ultrafast Optoelectronics



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*Mi-Light Meeting  
Traverse City  
10-8-16*

# THORLABS

Ultrafast Optoelectronics

110 Parkland Plaza  
Ann Arbor, MI

*Ultrafast Photonics  
Instrumentation &  
Components*

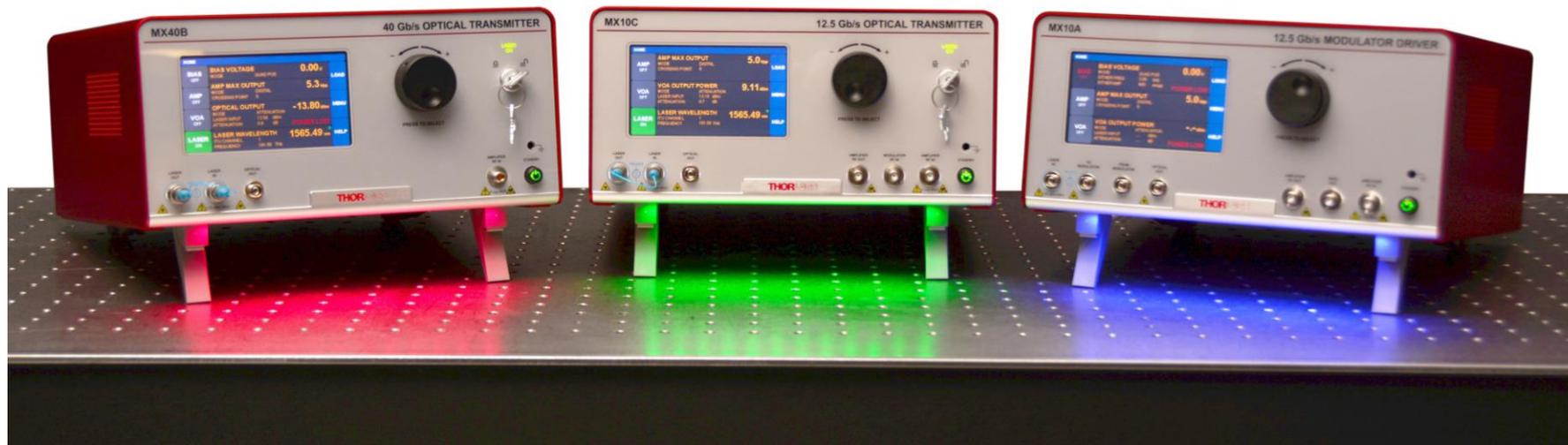
*All Sales Thru Thorlabs  
World-Wide Catalog  
[www.thorlabs.com](http://www.thorlabs.com)*

*Expanding to 4500sf  
& 10 Staff Members  
by end of 2016*



# MX Series of High-Speed Transmitters

*Full line of high-speed instruments for fiber-optic, lithium niobate modulators up to 70GHz. Touch-screen controlled. Affordable. Immediately available. Bias controllers. Drivers. E-O Converters. Transmitters.*



# Modulator Drivers

## Benchtop High-Speed LiNbO<sub>3</sub> Electro-Optic Modulator Drivers

- ▶ Digital Operation up to 12.5 Gb/s or 40 Gb/s
- ▶ Analog (Linear) Operation up to 7 GHz or 20 GHz
- ▶ Built-In RF Amplifier, Bias Control, and Variable Optical Attenuator
- ▶ Accepts External Laser Sources from 1250 to 1610 nm



**MX10A**  
Modulator Driver for  
Operation up to 12.5 Gb/s

HOME				
<b>BIAS</b> OFF	<b>BIAS VOLTAGE</b> MODE: DITHER/FREQ DITHER/RAMP	QUAD POS: 3.00 MHz 600 mVpp	<b>2.38 v</b>	<b>LOAD</b>
<b>AMP</b> ON	<b>AMP MAX OUTPUT</b> MODE: DIGITAL CROSSING POINT	0	<b>5.2 vpp</b>	<b>MENU</b>
<b>VOA</b> ON	<b>VOA OUTPUT POWER</b> MODE: LASER INPUT ATTENUATION	ATTENUATION: 13.35 dBm 1.1 dB	<b>7.10 dBm</b>	<b>HELP</b>

Touchscreen  
Interface

# Fully Integrated Transmitters

## High-Speed Optical Transmitters

- ▶ Analog Operation up to 20 GHz & Digital Operation up to 40 Gb/s
- ▶ Integrated RF Driver Amplifier, Modulator, and Automatic Bias Control
- ▶ Integrated C-Band Tunable Laser and Automatic Power Control
- ▶ Accepts External Lasers from 1250 to 1610 nm

HOME			
BIAS OFF	BIAS VOLTAGE MODE QUAD POS	2.30v	LOAD
AMP ON	AMP MAX OUTPUT MODE DIGITAL CROSSING POINT 0	5.2vpp	MENU
VOA ON	OPTICAL OUTPUT MODE ATTENUATION LASER INPUT 13.25 dBm ATTENUATION 1.1 dB	7.10dbm	HELP
LASER OFF	LASER WAVELENGTH ITU CHANNEL 1 FREQUENCY 191.50 THz	1565.49 nm	

Touch-Panel Interface for Device Control



**MX10C**  
Optical Transmitter with  
12.5 Gb/s Phase Modulator



**MX40B**  
Optical Transmitter with  
40 Gb/s Intensity Modulator

**LASER RADIATION**  
DO NOT VIEW DIRECTLY WITH  
OPTICAL INSTRUMENTS  
CLASS 1M LASER PRODUCT

# Bias Controllers

## Automated Bias Controller for Lithium Niobate (LiNbO<sub>3</sub>) Modulators

- ▶ Quadrature, Peak, and Null Automated Modes
- ▶ Ditherless and Constant Bias Modes
- ▶ Built-In VOA for Power Control
- ▶ Power Calibration Points at 1310 nm, 1550 nm, and 1590 nm



**MBX**  
Bias and Power Controller  
for External Modulators

HOME		
BIAS OFF	<b>BIAS VOLTAGE</b> <span style="float: right;">0.00<sub>v</sub></span>	LOAD
	MODE QUAD POS	
	DITHER FREQ 3.00 MHz	
DITHER AMP 600 mVpp		
VOA ON	<b>VOA OUTPUT POWER</b> <span style="float: right;">7.10<sub>dBm</sub></span>	MENU
	MODE ATTENUATION	
	LASER INPUT 13.35 dBm	
ATTENUATION 1.1 dB	HELP	

Touchscreen Interface

# Tunable Laser Sources

## Fiber-Coupled, Benchtop Tunable Laser Sources

- ▶ General Purpose Telecom Tunable Lasers for C-Band or L-Band
- ▶ +13 dBm Laser, 10 kHz Linewidth, Low Noise
- ▶ Built-In Variable Optical Attenuator for Power Control
- ▶ Dither Function Stabilizes Wavelength



TLX1  
Tunable Laser Source,  
C-Band

A screenshot of the TLX1 touchscreen interface. The screen is dark with green and blue accents. It displays two main sections: "LASER" and "VOA". The "LASER" section shows "LASER WAVELENGTH" at 1565.49 nm, "ITU CHANNEL" at 1, "FREQUENCY" at 191.50 THz, and "DITHER" at ON. The "VOA" section shows "VOA OUTPUT POWER" at 7.10 dBm, "MODE" at LASER INPUT, "ATTENUATION" at 1.1 dB, and "LASER INPUT" at 8.25 dBm. On the right side of the screen, there are four buttons: "LOAD", "MENU", and "HELP".

Section	Parameter	Value
LASER	LASER WAVELENGTH	1565.49 nm
	ITU CHANNEL	1
	FREQUENCY	191.50 THz
	DITHER	ON
VOA	VOA OUTPUT POWER	7.10 dBm
	MODE	LASER INPUT
	ATTENUATION	1.1 dB
	LASER INPUT	8.25 dBm

Touchscreen Interface

**LASER RADIATION**  
DO NOT VIEW DIRECTLY WITH  
OPTICAL INSTRUMENTS  
CLASS 1M LASER PRODUCT

# E-O Converters for VNA applications

- *Converts E-E Vector Network Analyzer to Optical VNA*
- *Integrated Tunable Laser*
- *26GHz, 40GHz, 70GHz Models*
- *S-parameters provided for de-embedding*
- *Enables VNA testing of high-speed optical components*

**Available Dec. 2016**



# Electronic VOAs

## Fiber-Coupled Variable Optical Attenuators (VOAs) with Power Lock

- ▶ Manual and Electronic Control of Optical Power in Fiber
- ▶ Modulation Input and Monitor Output with 1 kHz Bandwidth
- ▶ Power Lock Mode Stabilizes Output for Long-Term Measurements

- *Basic model is VOA only*
- *Modulation input to 1 kHz*
- *Available in 5 Bands from 450nm to 1610nm*

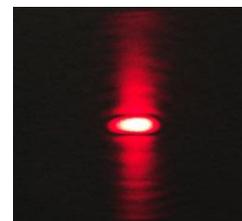
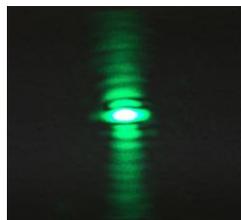


**Available 2017!**



EVOA1550F  
FC/PC Version

- Full family of wavelengths to be available
- Adjustable pulse width from 4ns to 34ns
- Adjustable rep. rate from 1MHz to 10MHz
- Output powers from 5mW to 100mW
- Remote interlock, and key-switch control
- SMA trigger input and output



# Fiber Optic Black Hole

## Fiber Optic Light Trap / Terminators

- ▶ Improves Return Loss to Better than 50 dB
- ▶ Index-Matched Gel Block for Temporary Use
- ▶ Light Traps with FC Connectors

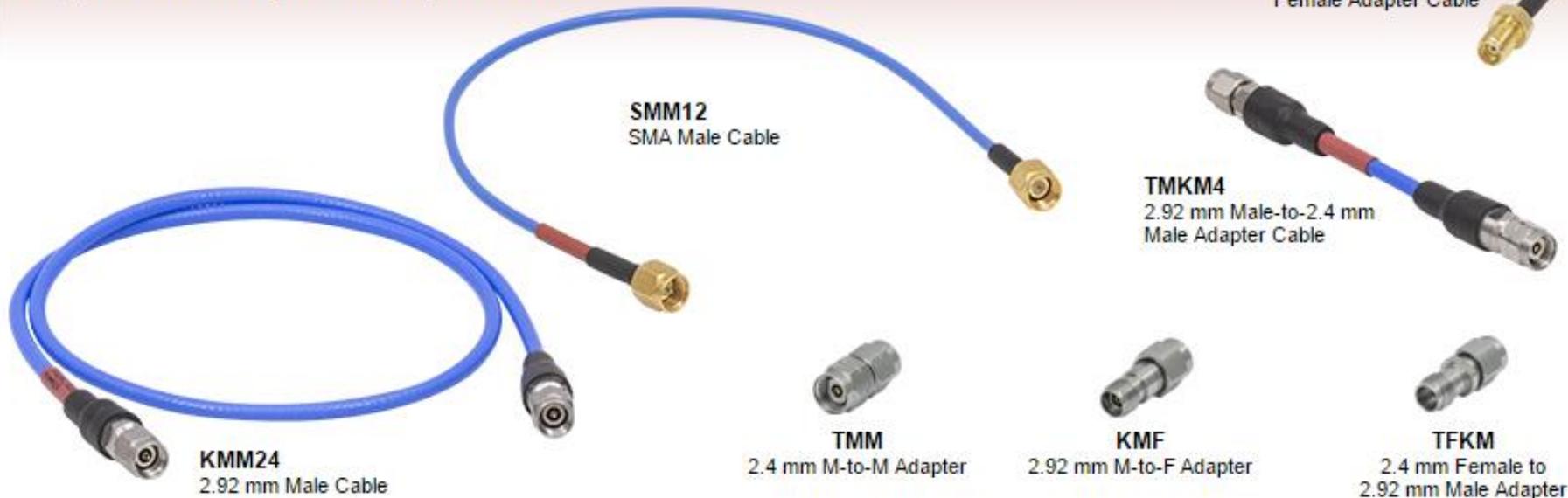


- *Used for calibration of fiber components*
- *Solid Silicone Gel with Index of 1.46*

# Accessory Products

## Premium Microwave Cables and Adapters

- ▶ Flexible, Low-Loss, High-Frequency Microwave Cables
- ▶ SMA, SMP, 2.92 mm, and 2.4 mm Cables and Adapters
- ▶ Options for Frequencies up to 50 GHz



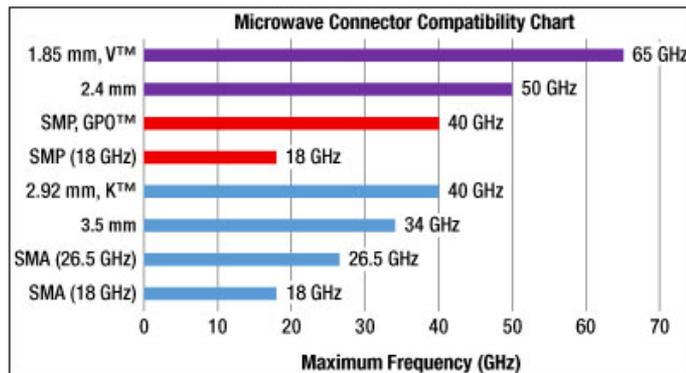
# Microwave Adapters

## Microwave Cable Adapters

These microwave cable adapters are designed to change the gender or connector type of microwave cables and connectors. They include in-series adapters (F-F, F-M, M-F) for 2.92 mm and 2.4 mm, as well as between-series adapters for all gender combinations of 2.92 mm and 2.4 mm cables.

For detailed specifications, including interconnector compatibility, please see the full web presentation for our [Microwave Cables](#).

[Calibrated torque wrenches](#) are available to ensure that the proper mating torque is supplied when using these adapters.



[Click for Details](#)

This chart summarizes the maximum frequency and cross-compatibility of the microwave cable connectors used by our adapters. Please refer to the *Compatibility* tab of our [full web presentation](#) for microwave cables for details.

Item #	TFKF	TFKM	TMKF	TMKM
Adapter Type	2.4 mm to 2.92 mm			
Click Image to Enlarge				
Description	2.4 mm Female to 2.92 mm Female	2.4 mm Female to 2.92 mm Male	2.4 mm Male to 2.92 mm Female	2.4 mm Male to 2.92 mm Male

Item #	KFF	KMF	KMM	TFF	TMF	TMM
Adapter Type	2.92 mm			2.4 mm		
Click Image to Enlarge						
Description	2.92 mm Female to 2.92 mm Female	2.92 mm Male to 2.92 mm Female	2.92 mm Male to 2.92 mm Male	2.4 mm Female to 2.4 mm Female	2.4 mm Male to 2.4 mm Female	2.4 mm Male to 2.4 mm Male

Based on your currency / country selection, your order will ship from Newton, New Jersey

# Torque Wrenches

## Calibrated Torque Wrenches for Coaxial Connectors

- ▶ 5/16" Hex for Use with Coaxial Connectors
- ▶ Preset Torque Value of 5 in-lbs or 8 in-lbs
- ▶ Engraved for Easy Identification



**TQW5A**  
5 in-lbs Torque Wrench,  
5/16" Hex

TQW8A 8 in-lbs Calibrated Torque Wrench being used to secure a 2.92 mm connector. The break-over design ensures that the proper mating torque is supplied.



- *Extends life of expensive connectors*
- *Ensures proper frequency response of connections*
- *Makes you look like a pro in the lab*