

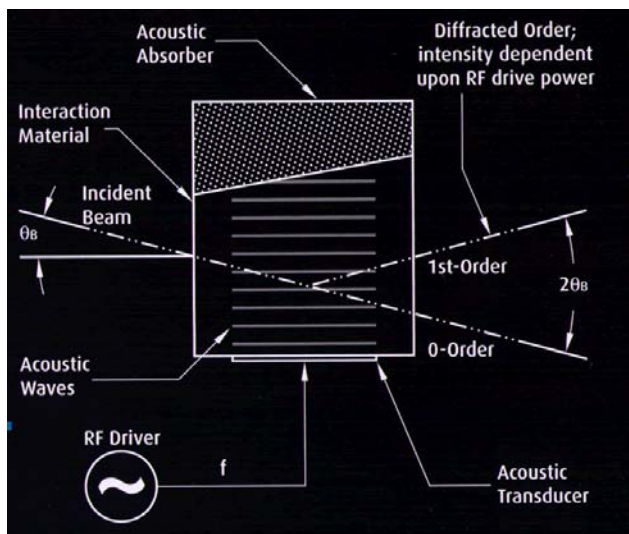
Acousto-Optic Modulators

By virtue of having no moving parts our acousto-optic devices are able to amplitude modulate a laser beam at very high speed. For example modulation bandwidths in excess of 50MHz are readily achievable. These Acousto-optic devices have different applications like beam deflection, frequency shifting of the input beam, modulation, pulse-picking, cavity dumping, Q-switching, Tunable filtering. All these devices essentially use the same physics as described below, and then optimised for their specific application.

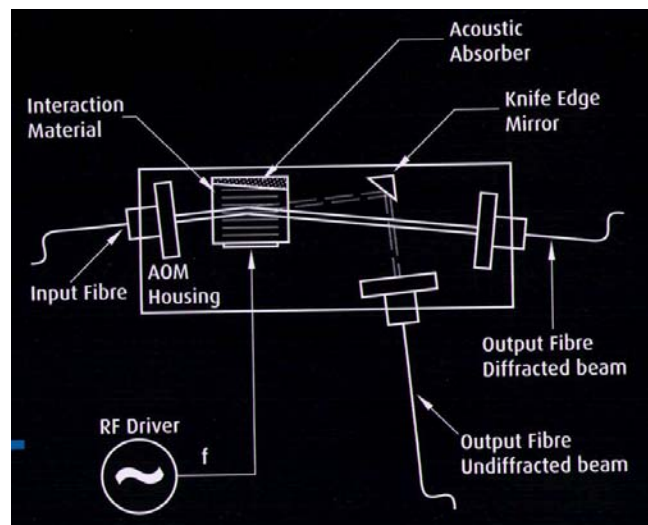
In an acousto-optic modulator (AOM) a laser beam is caused to interact with a high frequency ultrasonic sound wave inside an optically polished block of crystal or glass (the interaction medium). By carefully orientating the laser with respect to the sound waves the beam can be made to reflect off the acoustic wavefronts (Bragg diffraction). Therefore, when the sound field is present the beam is deflected and when it is absent the beam passes through undeviated. By switching the sound field on and off very rapidly the deflected beam appears and disappears in response (digital modulation). By varying the amplitude of the acoustic waves the intensity of the deflected beam can similarly be modulated (analogue modulation).

It is usual to choose the deflected beam as the one that is used in the optical system because it can be switched on and off with high extinction ratio (typically >40dB) and intensity can be varied from zero to more than 85% of the incident beam. The rate at which the beam can be modulated is governed by the time it takes the acoustic wavefronts to traverse the laser beam, which depends on the beam diameter and the acoustic velocity in the interaction medium.

The sound waves are generated by a transducer, usually a thin wafer of lithium niobate, that is bonded onto the interaction medium using a highly efficient cold-weld metallic bonding process. When a high frequency electrical signal is applied to the transducer it vibrates, generating the acoustic wave. The signal is derived from an RF driver, which generates a high frequency carrier that is itself modulated by an analogue or digital input signal.



AO Modulator Cell Schematic



Fiber-coupled AO Modulator Cell Schematic

Principal applications for AO modulators are pre-press (putting image and text data onto films or plates as part of the printing process), laser imaging and displays, switching in telecom fibres, instrumentation and research.

AOM, AOB, AOTF, PCAOM, QSW, FO:

Optional		optional		optional		optional		optional		optional		optional		optional	
	P					-									
	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
	Non-RoHS	Device			Aperture in mm	Material Code			Water Connection	RF Connector					FO Connector
Location		Frequency in MHz			Acoustic mode Code: C = Compressional S = Shear	Wavelength Code									
Location Code: I: Ilminster M: Melbourne N: Norderstedt T: Torquay	Device Code: CD: Cavity Dumper FS: Frequency Shifter ML: Mode Locker TF: Tunable Filter D: AO Beam Deflectors M: Modulator QS: Q-Switch OD: Integrated Q-Sw / Driver MS: Bragg Mount FA: Focusing Assembly Optics / Mount ZR: Zero order re-combiner	Material Code: 1 PbMoO ₄ 2 TeO ₂ 3 SF6 4 Fused Silica 5 SF10 6 SF57 7 SF2 8 Amtrir-1 9 SF8 10 Crystal Quartz 11 Germanium 12 Lithium Niobate 13 F2 14 Potassium Ytrium Tungstate 15 KDP 16 Si 17 GaP 18 GLS	Wavelength Code: A 442 nm B 488 nm C 532 nm D 543 nm E 633 nm F 800 nm G 1064 nm H 1319 nm J 1550 nm K 532 / 1064 nm L 1660 nm M 2130 nm N 488 - 633 nm P 2.5 μm - 3.5 μm Q 10.6 μm R Brewster S 930 nm T 355 nm U 244 nm V 405 nm W 780 nm X 850 nm Y 946 nm Z 1230 nm V1 1342 nm V2 1640 nm V3 1940 nm V4 1990 nm V5 2000 nm V6 2022 nm V7 2090 nm V8 2100 nm V9 1030 nm R1* 244-260nm R2* 300-550nm R3* * Brewster - Limited by Design	Water Connection Code: None Air Cooled (No Water Connection) B: Barbed Push on F: Festo CN-M-5-PK-4-59 J: Screw on with Jaco nylon nuts K: KOH 04-M5 SMC Push on L: Landwehr connector M: MS-5H-6 SMC N: 4mm OD Straight Legris 3106 04 00 P: 6mm OD Straight Legris 3106 04 06 Q: 4mm OD Right Angle Legris 3102 04 00 U: 6mm OD Right Angle Legris 3102 04 06 R: Right angle S: Swagelok Screw on T: Heater / Cooler (TE) W: 3.2 mm SMC Push in	RF Connector Code: 1: SMB Fm BH 2: SMC Fm BH 3: SMA Fm BH 4: SMA Fm Pig Tail 5: BNC Fm BH 6: Right Angle SMA Fm BH 7: Right Angle BNC Fm BH 8: SMA Male Pig Tail 9: BNC Male Pig Tail C: BNC Female Pig Tail Fm = Female BH = Bulk Head	Variant 1 Customer Code and a Number = xxn Variant 2 Fiber Coupled = F and a number (ports) followed by: S = Single Mode Fiber M = Multi- Mode Fiber P = Polarization maintaining Fiber H = High Power Option L = Large Area Single Mode Fiber	FO Connector Code: A: FC/APC B: FC/PC C: SC/PC D: SC/APC BS 1000 – 1500 nm BT 1064 – 1300 nm BU 1064 – 1550 nm BV 1064 – 2100 nm BW 1300 – 1600 nm BX 1800 – 2200 nm BY 1800 – 4000 nm BZ 1850 – 2500 nm B1 1900 – 2200 nm B2 2000 – 3000 nm B3 2400 – 2600 nm B4 2650 – 2900 nm B5 3000 – 4000 nm B6 B7 B8 B9 WA 400 / 800 nm WB 355 / 440 nm								

Table of Contents

1. Free-space Acousto-optical Modulators.....	4
STBR series free space AOM	9
STBR series free space Q-switch	11
2. “Fiber-Q” Fiber-coupled Modulators	12
STBR Series Fiber Coupled AOM	15
AOMM Series Fiber Coupled AOM.....	错误!未定义书签。
3. AOM RF Drivers	20
RF Drivers for STBR Series	21
4. Fiber-Q RF Driver	24
5. Beam Deflector	25
STBR series beam deflectors.....	25
6. Frequency Shifters	27
STBR series free space AO Frequency Shifters.....	27
7. Mode Lockers.....	29
STBR series free space Mode Lockers.....	30
8. Multi-channel Modulators	31
9. Pulse Pickers, Cavity Dumpers	32
STBR series free space Cavity dumpers/ Pulse Pickers	32
10. Tunable Filters.....	34
STBR series free space tunable filters	35
STBR series fiber coupled tunable filters	36
RF Drivers for STBR Series (free space or fiber coupled) tunable filter:	36

Detailed Specifications:

1. Free space AOMs – page 19
2. Fiber coupled AOMs – page 27

1. Free-space Acousto-optical Modulators

We offer a wide range of standard AO Modulators, for digital or analogue intensity modulation of laser beams.

Their main specifications are as follows:

- Wavelength Range: 240nm to 2100nm
- Drive Frequencies: 20MHz to 350MHz
- Optical Rise-Times: Down to 5ns
- Modulation Bandwidths: Up to 100MHz
- Interaction Materials: Tellurium Dioxide, Lead Molybdate, Fused Silica, Crystal Quartz, halcogenide Glass, Flint Glass.



An RF Driver provides the electronic signal operating the AO Modulator. With a digital driver, an external TTL signal enables rapid on and off switching of the optical beam. Alternatively an analogue driver enables a variable intensity output, typically from 0% to 85% of the input beam.

The maximum modulation bandwidth, or optical rise-time, is a function of the acoustic transit time across the optical beam. Therefore, for the highest speeds it is often necessary to focus the optical beam down to a small spot inside the modulator.

Our standard AOMs are listed below. *Updated 2016*

Model	Type	Wave length	Rise/ Fall time	Active Aperture	Operating Frequency	Optical Material	Driver
I-M110-4C19R19-3-GH93	UV	193-266nm	110ns/m	4mm	110MHz	ArF grade fused Silica	
AOMO 3200-1220	UV	257nm	10ns	0.25mm	200MHz	Crystalline Quartz	
I-M110-3C10BB-3-GH27	UV	300-400nm	113ns/m	3mm	110MHz	Crystalline Quartz	
I-M110-3C10T-3-GH72	UV	355nm	113ns/m	3mm	110MHz	Crystalline Quartz	
I-M80-6.5C10T-4-GH60	UV	355 nm	113 ns/mm	6.5 mm	80 MHz	Crystalline quartz	
I-M110-2C10B6-3-GH26	UV	400-540 nm	113 ns/mm	2 mm	110 MHz	Crystalline quartz	
AOMO 3200-121	Visible	442-488nm	153 ns/mm	0.32mm	200MHz	Tellurium Dioxide	
AOMO 3200-120	Visible	442-488nm	153 ns/mm	0.45mm	200MHz	Tellurium Dioxide	
AOMO 3110-121	Visible	442-488nm	153 ns/mm	0.6mm	110MHz	Tellurium Dioxide	
AOMO 3080-125	Visible	415-900nm	153 ns/mm	2mm	80MHz	Tellurium Dioxide	
AOMO 3100-125	Visible	440-850nm	153 ns/mm	1.5mm	100MHz	Tellurium Dioxide	
AOMO 3200-125	Visible	440-850nm	153 ns/mm	1.5mm	200MHz	Tellurium Dioxide	
AOMO 3350-125	Visible	440-850nm	153 ns/mm	1.5mm	350MHz	Tellurium Dioxide	
AOMO 3110-120	Visible	440-850nm	153 ns/mm	0.6mm	110MHz	Tellurium Dioxide	
AOMO 3080-120	Visible	440-850nm	153 ns/mm	1mm	80MHz	Tellurium Dioxide	
AOMO 3350-120	Visible	488-532nm	153 ns/mm	0.1mm	350MHz	Tellurium Dioxide	
AOMO 3350-111	Visible	488-650nm		2mm'L'x 0.15'H'	350MHz	Tellurium Dioxide	
I-M080-2C10B11-4-GH95	IR	700-1000 nm	113 ns/mm	2 mm	80 MHz	Crystalline quartz	
AOMO 3200-124	IR	780-	113	0.32mm	200MHz	Tellurium Dioxide	

		850nm	ns/mm				
AOMO 3080-122	IR	780-850nm	153 ns/mm	1mm	80MHz	Tellurium Dioxide	
AOMO 3200-1113	IR	870-1250nm	153 ns/mm	0.1mm	200MHz	Tellurium Dioxide	
I-M080-2C10G-4-AM3	IR	1030-1064nm	113ns/mm	2mm	80MHz	Crystalline Quartz	
I-M080-4C10G-4-GH60	IR	1030-1064 nm	113 ns/mm	4 mm	80 MHz	Crystalline quartz	
I-M068-5C10G-U5-GH100	IR	1030-1064 nm	113 ns/mm	5 mm	68 MHz	Crystalline quartz	
AOMO 3110-197	IR	1030-1090nm	153 ns/mm	1.25mm	110MHz	Tellurium Dioxide	
AOMO 3080-194	IR	1060 nm	153 ns/mm	1.75 mm	80 MHz	Tellurium dioxide	
AOMO/AOFS 3165-1		1300-1550 nm	153 ns/mm	0.6 mm	165 MHz	Tellurium dioxide	
I-M040-2C8J-3-GH84		1550 nm	260 ns/mm	2 mm	40 MHz	AMTIR	
I-M041-3C2V5-4-IS8		2000 nm	153 ns/mm	3 mm	40.68 MHz	Tellurium dioxide	
I-M041-1.4C10V5-4-GH49		1900-2100 nm	113 ns/mm	1.4 mm	40.68 MHz	Crystalline quartz	
I-M040-2C8B1-3-GH84		1900-2100 nm	260 ns/mm	2 mm	40 MHz	AMTIR	
I-M050-10C11V49-P5-GH77		5.5 μ m	120 ns/mm	7.0, 9.6 mm	50 MHz	Germanium	
I-M050-10C11V41-P3-GH75		9.4 μ m	120 ns/mm	9.6 mm	40/60 MHz	Germanium	
I-M041-xxC11xxx-P5-GH77		9.4/10.6 μ m	120 ns/mm	7.0, 9.6 mm	40.68 MHz	Germanium	

Our **old AOM models** are listed in the below table. These old models may or may not be in stock or obsolete and no longer produced. Please check with our sales regarding the availability of the below models.

Model	Description	Driver
I-FS040-1.5C2E-1-ME1 (FS040-2E-ME1)	630-690nm, 40MHz, 4x2mm aperture	Integrated RF driver
I-FS040-1.5S2E-1-ME1 (FS040-2E-ME1)	630-690nm, 40MHz, 4x2mm aperture	Integrated RF driver
I-FS040-2C2E-3-OL3 (FS040-2E-OL3)	633-680nm, 40MHz, 2x4mm aperture	
I-FS040-2S2E-1-GH38	630-67nm,40MHz, 2.0mm aperture, 15VDC power	Integrated RF driver
FS040-2C-AR1	532nm, 40MHz, 1.5mm aperture,	Integrated RF driver
FS040-2E-AR1	630-690nm, 40MHz, 1.5mm aperture,	Integrated RF driver
I-M041-2.5C10G-4-GH50	1030-1064nm, 40.68MHz, 113ns/mm rise time, 2.5mm aperture, RF<20W	
I-M041-7C11Q-P5-GH77	10.6um wavelength, 40.68MHz, 120ns/mm rise time, 7mm active aperture, transmission >96.5%, max RF power 100W	HP041-125ADG-A10
I-FS080-2C2G-3-LV1 (M080-2G-LV1)	High efficiency AO Modulator for lasers where fast modulation is not critical, RF 0.5W	A35080 N21080-1DM, N21080-1AM
I-FS080-3S2E-1-GH39	633nm, 80MHz up-shift, 3mm aperture	
I-M080-2.5C10G-4-GH25	400-540nm,110MHz, 113ns/mm rise time, 2.5mm aperture, RF<5W	A35080 N31080-5DM, N31080-5AM
I-FS110-2C2B8-3-GH2	480-800nm, 150ns risetime, 110MHz, 2mm aperture,	A35110,

(M110-2B/F-GH2)	RF<2W	N21110-2AM, N21110-2DM
I-M110-2C10B6-3-GH26 (M110-10UV-OR1)	351 to 364nm, 110MHz, 110ns rise-time, Crystal Quartz for high power handling, RF 3W	A35110 N31110-3DM, N31110-3AM
I-M110-2C10B6-3-GH26	400-540nm, 110MHz, 113ns/mm rise time, 2mm aperture, RF <5W	A35110 N31110-5DM, N31110-5AM
I-M110-2.5C10B6-3-GH26	400-540nm, 110MHz, 113ns/mm rise time, 2.5mm aperture, high damage threshold, RF<5W	A35110 N31110-5DM, N31110-5AM
I-M110-3C10B6-3-GH27	300-400nm, 110MHz, 113ns/mm rise time, 2.5mm aperture, high damage threshold, RF<3W	
I-M110-3C10B6-3-GH27 (M110-10C-TR7)	AO Modulator for wavelength 514 to 532nm, high damage threshold , RF 5W	A35110 N31110-5DM, N31110-5AM
I-M120-0.7C2G-GH42	1064nm, 120MHz, 153ns/mm rise time, 700um aperture, RF<3W	
I-M150-0.4C2G-GH42	1064nm, 150MHz, 153ns/mm rise time, 400um aperture, RF<2W	
I-M200-0.75C2G-3-SO8	1064nm, 200MHz, 153ns/mm rise time, 0.75mm aperture, RF<3W	
12038-3-BR-TE	SiO2, used for various wavelength, 38MHz, aperture 2mm, deflection 6.75mrad, RF 1W	11038-1ML
12038-3-TE	SiO2, 1064nm wavelength, 38MHz, aperture 3mm, deflection, 6.75mrad, RF 1W	11038-1ML
12041-3-BR-TE	SiO2, used for various wavelength, 41MHz, aperture 2mm, deflection 7.3mrad, RF 1W	11041-1ML
12041-3-TE	SiO2, 1064nm wavelength, 41MHz, aperture 3mm, deflection 7.3mrad, RF 1.2W	11041-1ML
12050-3-BR-TE	SiO2, used for various wavelength, 50MHz, aperture 2mm, deflection 8.9mrad, RF 1W	11050-1ML
12050-3-TE	SiO2, 1064nm wavelength, 50MHz, aperture 3mm, deflection 8.9mrad, RF 1.2W	11050-1ML
12080-3-BR-TE	SiO2, used for various wavelength, 80MHz, aperture 2mm, deflection 14.2mrad, RF 1W	11080-1ML
12080-3-TE	SiO2, 1064nm wavelength, 80MHz, aperture 3mm, deflection 14.2mrad, RF 1.2W	11080-1ML
13389-BR	SiO2, used for various wavelength, 389MHz, aperture 60um, deflection 41mrad, RF 0.5W	64389-SYN-9.5-X
15180-1.06-LTD-GAP	GaP, 1.06um wavelength, 180MHz, aperture 0.3mm, deflection 28.7mrad, RF 1.7W	
15210	TeO2, 440-850nm wavelength, 210MHz, aperture 0.2mm, deflection 31mrad, RF1W	21210-1xx
15210-FOA/71002	TeO2, 440-850nm wavelength, 210MHz, aperture 0.2mm, deflection 31mrad, RF1W	21210-1xx
15210-FOA	TeO2, 440-850nm wavelength, 210MHz, aperture 0.2mm, deflection 31mrad, RF1W	21210-1xx
15260	TeO2, 440-850nm wavelength, 260MHz, aperture 0.2mm, deflection 39mrad, RF0.7W	21260-.7xx
15260-FOA/71002	TeO2, 440-850nm wavelength, 260MHz, aperture 0.2mm, deflection 39mrad, RF1W	21260-1xx
15260-FOA	TeO2, 440-850nm wavelength, 260MHz, aperture 0.2mm, deflection 39mrad, RF1W	21260-1xx
17389-1.06-LTD-GaP	GaP, 1.06um wavelength, 389MHz, aperture 0.15mm, deflection 62mrad, RF 1W	11389-5AM, 64389.5-SYN-9.5-X
17389-.93	TeO2, 700-1064nm wavelength, 389MHz, aperture 70um, deflection 73mrad, RF 0.7W	11389-5AM, 64389.5-SYN-9.5-X
17389-.93-FOA	TeO2, 700-1064nm wavelength, 389MHz, aperture 70um, deflection 73mrad, RF 0.7W	11389-5AM, 64389.5-SYN-9.5-X

17440	TeO ₂ , 440-850nm wavelength, 440MHz, aperture 90um, deflection 65mrad, RF 0.8W	11440-.8Ax
17440-FOA	TeO ₂ , 440-850nm wavelength, 440MHz, aperture 90um, deflection 65mrad, RF 0.8W	11440-.8Ax
23080-1-LTD	TeO ₂ , 440-850nm wavelength, 80MHz, aperture 1mm, 150 ns / mm rise time, deflection 11.88mrad, RF 1W	21080-1xx
23080-1-.85-LTD	TeO ₂ , 700-1000nm wavelength, 80MHz, aperture 1mm, 150ns/mm rise time, deflection 16mrad, RF 1W	21080-1xx
23080-1-1.06-LTD	TeO ₂ , 1064nm wavelength, 80MHz, aperture 1mm, 150ns/mm rise time, deflection 20mrad, RF<1.25W	21080-1xx
23080-1-1.06/1.3-LTD	TeO ₂ , 1.06-1.3um wavelength, 80MHz, aperture 1mm, 155ns/mm rise time, deflection 24.4mrad @ 1.3um, 20mrad @ 1.06um, RF<2W @ 1.3um, <1.2W @ 1.06um	21080-1xx
23080-1-1.3-LTD	TeO ₂ , 1300nm wavelength, 80MHz, aperture 1mm, 150ns/mm rise time, deflection 25mrad, RF<1.25W	21080-1xx
23080-1-1.55-LTD	TeO ₂ , 1550nm wavelength, 80MHz, 1mm aperture, 150ns/mm rise time, deflection 29mrad, RF<2W	21080-2xx
23080-2-LTD	TeO ₂ , 440-850nm wavelength, 80MHz, aperture 2mm, 150ns/mm rise time, deflection 11.88mrad @ 633nm, RF 1W	21080-1xx
23080-2-.85-LTD	TeO ₂ , 700-1000nm wavelength, 80MHz, 2mm aperture, 150ns/mm rise time, deflection 15mrad @ 850nm, RF<2W	21080-2xx
23080-2-1.06-LTD	TeO ₂ , 1064nm wavelength, 80MHz, 2mm aperture, 150ns/mm rise time, deflection 20mrad, RF<2W	21080-2xx
23080-2-1.3-LTD	TeO ₂ , 1300nm wavelength, 80MHz, 2mm aperture, 150ns/mm rise time, deflection 24.4mrad, RF<3.2W	21080-3xx
23080-2-1.55-LTD	TeO ₂ , 1550nm wavelength, 80MHz, 2mm aperture, 150ns/mm rise time, deflection 29mrad @ 1550nm, RF<3.2W	21080-3xx
23080-3-LTD	TeO ₂ , 440-850nm wavelength, 80MHz, aperture 3mm, 150ns/mm risetime, deflection 11.88mrad @ 633nm, RF<1.2W	21080-1.2xx
23080-3-.85-LTD	TeO ₂ , 700-1000nm wavelength, 80MHz, 3mm aperture, 150ns/mm risetime, deflection 16mard @ 850nm, RF 2W	21080-2xx
23080-3-1.06-LTD	TeO ₂ , 1064nm wavelength, 80MHz, 3mm aperture, 150ns/mm risetime, deflection 20mard, RF<2W	21080-2xx
23080-3-1.3-LTD	TeO ₂ , 1300nm wavelength, 80MHz, 3mm aperture, 150ns/mm risetime, deflection 24.4mard, RF<4W	21080-4xx
23110-.5	TeO ₂ , 440-850nm wavelength, 110MHz, 0.5mm aperture, 150ns/mm risetime, deflection 16.3mard @ 633nm, RF<1W	21110-1xx
23110-1-LTD	TeO ₂ , 440-850nm wavelength, 110MHz, 1mm aperture, 150ns/mm risetime, deflection 16.34mard @ 633nm, RF<1W	21110-1xx
24080-1	SF ₆ , 440-850nm wavelength, 80MHz, 1mm aperture, 185ns/mm risetime, deflection 14.4mrad @ 633nm, RF<1W	21080-1xx
26035-2-1.55-LTD	AMTIR, 1300-1600nm wavelength, 35MHz, 2mm aperture, 260ns/mm risetime, deflection 20.6mard @ 1550nm, RF<0.5W	21035-0.5xx
26055-1-1.55-LTD	AMTIR, 1300-1600nm wavelength, 55MHz, 1mm aperture, 260ns/mm risetime, deflection 32.4mard @ 1550nm, RF<0.5W	21055-0.5xx
35085-.5	Fused Silica, 400-540nm wavelength, 85MHz, 0.5mm aperture, 110ns/mm risetime, deflection 5mrad @ 514nm, RF<6W	31085-6xx
35085-0.5-350	Fused silicon, 300-400nm wavelength, 85MHz, aperture 0.5mm, 110ns/mm risetime, deflection 5mrad@350nm, RF<6W	31085-6xx
35085-3	Fused silicon, 400-540nm wavelength, 85MHz, aperture 3mm, 110ns/mm risetime, deflection 5mrad @ 488nm, RF 6W	31085-6xx

35085-3-350	Fused silicon, 300-400nm wavelength, 85MHz, aperture 3mm, 110ns/mm risetime, deflection 5mrad @ 350nm, RF 3W	31085-6xx
35110-2-244	KrF grade fused silica, 244nm wavelength, 110MHz, aperture 2mm, deflection 4.5mrad, RF 2W	21110-2xx
35110-2-244-BR	KrF grade fused silica, 244-260nm wavelength, 110MHz, aperture 2mm, deflection 4.5mrad @ 244nm, RF 4W	31110-4xx
35110-3-244-BR-KRF	KrF grade fused silica, 244-260nm, Brewster window, 110MHz, aperture 2mm, deflection 4.5mrad @ 244nm, RF 4W	31110-4xx
35210-BR/71004	Fused silica, 300-700nm wavelength, 210MHz, aperture 0.13mm, deflection 17mrad, RF 6W	31210-6xx
35210-BR	Fused silica, 300-700nm wavelength, 210MHz, aperture 0.13mm, deflection 17mrad, RF 6W	31210-6xx
35250-.2-.53-XQ	Crystal quartz, 532nm wavelength, 250MHz, aperture 0.2mm, deflection 23mrad, RF 6W	31250-6xx
37027-3	Ge, 10.6um wavelength, 27.12MHz, aperture 3mm, deflection 52mrad, RF 30W	39027-30DSA05
37027-5	Ge, 10.6um wavelength, 27.12MHz, aperture 5mm, deflection 52mrad, RF 30W	39027-35DSA05
37027-8-10.6	Ge, 10.6um wavelength, 27.12MHz, aperture 8mm, deflection 52mrad, RF 50W	39027???
37040-5	Ge, 10.6um wavelength, 40MHz, aperture 5mm, deflection 78mrad, RF 35W	39040-35DSA05-A
37041-8-4.5	Ge, 4-5um wavelength, 40.68MHz, aperture 8mm, deflection 33mrad, RF 15W	39040-35DSA05-A???
47040-5-.7-RA	TeO ₂ , 655-850nm wavelength, 40MHz, aperture 5mm, deflection 47mrad, RF<0.6W	
48060-8/4-1.0-COL	TeO ₂ , 800-1200nm wavelength, 54-84MHz, aperture 8x2mm, deflection 23mrad, RF<100mW	
MFS030-3S2C-5-6.5DEG	TeO ₂ , 532nm, 30MHz, 3mm aperture, 1us/mm risetime, deflection 24mrad, RF<0.2W	MLP030-1DC MLP030-1AC-A1 (Former 21xxx-Yzz)
MFS030-3S2E-5-6.5DEG	TeO ₂ , 633nm, 30MHz, 3mm aperture, 1us/mm risetime, deflection 28mrad, RF<0.8W	MLP030-1DC MLP030-1AC-A1 (Former 21xxx-Yzz)
MFS040-35/13S2C-3	TeO ₂ , 532nm, 40MHz, 35x13mm aperture, 1us/mm risetime, deflection 34.4mrad, RF<1.2W	
MFS050-3S2C-5-6.5DEG	TeO ₂ , 532nm, 50MHz, 3mm aperture, 1us/mm risetime, deflection 40mrad, RF<0.5W	
MFS050-5S2E-5-6.5DEG	TeO ₂ , 633nm, 50MHz, 5mm aperture, 1us/mm risetime, deflection 48mrad, RF<1.5W	MLP050-1.5DC MLP050-1.5AC-A1 (Former 21xxx-Yzz)
MFS080-35/5S2C-3	TeO ₂ , 532nm, 80MHz, 35x5mm aperture, 1us/mm risetime, deflection 68.9mrad, RF<4W	
MFS100-2C4BB-5	Fused Silica, 300-400nm, 80-120MHz, 2mm aperture, deflection 2.4mrad @ 355nm, 6mrad @ 100MHz @ 355nm, RF<6W	
MFS150-.2C17J-3-F2P-A-GH		MLP150-2AC-A1 (Former 21xxx-Yzz)
MFS160-5/13S2C-3	TeO ₂ , 532nm, 160MHz, 5x13mm aperture, 1us/mm risetime, deflection 138mrad, RF<2W	
MFS400-.2C2V13-5	TeO ₂ , 650nm, 350-450MHz, 0.2mm aperture, deflection 15.2mrad, deflection 61mrad @ 400MHz, RF<1W	
MFS500-.2C2B26-5	TeO ₂ , 490-500nm, 450-550MHz, 0.2mm aperture, deflection 11.6mrad @ 495nm, deflection 58mrad @ 495nm @ 500MHz, RF<0.8W	
MM027-3C11B40-S5-30W		31027-6DM

MM040-5C11B38-5		31040-6DM
MM200-.2C17B34-5	GaP, 1.06-1.7um, 200MHz, 0.2mm aperture, deflection 31.8mrad @ 1.06um, 51mrad @ 1.7um @ 500MHz, RF<2W	
MPP389-.15C17G-C-FOA	GaP, 1.06um, 389MHz, 150um aperture, deflection 62mrad, RF<2.5W with duty cycle <20% & RF on duration <200nsec	
MTF096-2S2B43-3-1ST/-1ST	TeO2, 1.5-1.6um, 52.5-56.1MHz, 2mm aperture, deflection 7.4degree, RF<4W	
MTF096-2S2B43-3-1ST/-1ST-1.2	TeO2, 1.5-1.6um, 92.53-98.89MHz, 2mm aperture, resolution 2.5nm, deflection 7.4degree, RF<4W	
MTF096-2S2B43-3-1ST/-1ST-2.5	TeO2, 1.5-1.6um, 92.53-98.89MHz, 2mm aperture, resolution 2.5nm, deflection 7.4degree, RF<4W	
I-M041-xxC11xxx-P5-GH77	Germanium, 9.4um or 10.6um, 40.68MHz, up to 9.6mm aperture, RF power 120W	HP041-125ADG-A10
I-M041-10C11Q-P5-SY1	Monocrystalline Germanium, 10.6um, 40.68MHz, 6-8mm aperture, RF power 100W	A25041-x-5/600-s4k7u
I-M080-2C10G-4-AM3	Crystal Quartz, 1030-1064nm, 80MHz, 2mm aperture, Linear polarisation, Compressional, 85% diffraction efficiency, RF power 15W	
I-M080-2.5C10G-4-AM3	Crystal Quartz, 1030-1064nm, 80MHz, 2.5mm aperture, Linear polarisation, Compressional, 80% diffraction efficiency, RF power 15W	
I-M-060-XXC11B76-P5-GH105		

STBR Series Free Space AOM

The STBR series free space Acousto-Optic Modulator (AOM) with RF driver is used to vary and control laser beam intensity. It is electronically programmable using a microprocessor connected to the RF driver unit. The RF driver features all the necessary components to drive the modulator with analog or digital input control. Our free space AO products are housed in environmentally stable packages. They offer superior resistance to humidity and temperature, and are suitable for laboratory as well as various OEM applications and instrumentations



Model #	Spectral Range (nm)	Rise Time (ns)	Active Aperture (mm)	Modulation Bandwidth (MHz)	DE (%)
TEM-85-2	380-1600	280	2.0	2	80
TEM-85-10	380-1600	55	1.0	10	80
TEM-110-25	380-1600	22	0.5	25	80
TEM-200-50	380-1600	10	0.3	50	70
TEM-400-100	380-1600	5.5	0.075	100	50
TEM-800-200	380-1600	3	0.05	200	35
AMM-27-2	1000-2500	300	1	1.8	>80
AMM-80-4	1000-2500	160	1	4	>80
AMM-100-8	1000-2500	68	0.3	8	>80
FQM-80-2	200-1300	195	1.6	2.8	70
FQM-80-20	200-1300	30	1	18	70
FQM-200-40	200-1300	14	0.3	40	70
GEM-40-4	2000-11,000	125	1.5	5	70
GPM-200-50	600-1600	11	0.3	50	>75
GPM-400-100	600-1600	5.1	0.1	108	>65
GPM-800-200	600-1600	2.6	0.05	217	>40
GPM-1600-400	600-1600	1.4	0.025	400	>25

IPM-200-26	1000-1600	21	0.3	26	60
IPM-400-100	1000-1600	5	0.075	100	50

For the associated RF drivers, please refer to "RF Drivers for STBR series"

STBR Series Free Space Q-switch

STBR series Acousto-Optic Q-switching systems for industrial and laboratory applications. The STBR free space Q-switches are designed for the highest conversion efficiency of RF energy into acoustic energy by attaching the transducer to the crystal with an advanced vacuum metallized process. Q-switches are special modulators designed for use inside laser cavities. They are fabricated from high optical quality Fused Quartz, Flint Glass, and Tellurium Dioxide, or other acousto-optic materials with Brewster cut optical faces or durable hard oxide AR coatings for high optical power applications.



Model #	FSQ-24-2-BC	FSQ-27-5-BC	FSQ-80-5-BC	TEQ-27-4-BC	TEQ-80-20-BC
Substrate	SiO ₂	SiO ₂	SiO ₂	TeO ₂	TeO ₂
Brewster cut	yes	yes	yes	yes	yes
Laser Wavelength (nm)	1064	1064	1060	2940	800
Active Aperture (mm)	2	2	1	1.5	3
Center Frequency (MHz)	24	27	80	27	80
Digital Modulation Bandwidth (MHz)	2	5	6.5	4 (3dB Bandwidth)	20 (3dB Bandwidth)
Optical Transmission (%)	99.8	99.8	>99.5	>99.5	>99.5
Maximum Diffraction Efficiency (%)	30	30	25	>50	>65
Rise Time (nsec)	100	100	85	150/630	80/400
Acoustic Velocity (m/s)	5.96E+3	5.96E+3	5.96E+3	4.2E+3	4.2E+3
Wave Front Distortion	$\lambda/10$	$\lambda/10$	$\lambda/10$	$\lambda/10$	$\lambda/10$
Separation Angle	5 mrad @ 1064nm	5 mrad @ 1064nm	5 mrad @ 1064nm	1 deg @ 2940nm	0.9 deg @ 800nm
Input Impedance	50 ohms	50 ohms	50 ohms	50 ohms	50 ohms
Optical Polarization	Linear (perpendicular to acoustic wave)			Linear	Perpendicular to acoustic wave
VSWR	2.1:1				

For the associated RF drivers, please refer to "RF Drivers for STBR series"

2. “Fiber-Q” Fiber-coupled Modulators

2.1 STG Series Fiber-coupled AOMs

Our standard fibre-coupled AOMs (FCAOM) are listed below. If you would like to see a detailed technical data sheet just go on the relevant model number. If you do not see a device that meets your requirements please contact one of our engineers. We manufacture application-specific AOMs and would be pleased to design one that meets your needs.

The devices listed are aimed at fibre-optic telecommunications applications but we can also offer fibre-coupled versions of our standard AOMs, if required. If you are considering a non-standard device, or are just not sure which of the listed devices would suit you best, you may find it useful to email us with your questions.



We offer a wide range of standard fibre-coupled AOMs with the following characteristics: -

- Wavelengths: 1064nm, 1310nm or 1550nm
- Drive Frequencies: 40MHz, 80MHz or 100MHz, 110MHz, 150MHz, 200MHz
- Optical Rise-Times: as low as 10ns
- Materials: Tellurium Dioxide & Chalcogenide Glass
- Options: Single mode, polarisation maintaining and multimode, with or without connectors. Available in two, three or four fibre package configurations.

Description of Part Number:

T-M150-0.4C2G-3-F2S:

M = Modulator

150 = Drive frequency in MHz

2 = Tellurium Dioxide (interaction material)

F2 = 2 port fibre-coupled

S or P = Single Mode or Polarisation Maintaining.

Our standard FCAOMs are listed below. *Updated 2016*

Model	Description	Optical Power handling	Wave length	Rise/ Fall time	Operating Frequency
S200-0.4C2N-3-F2P	Non-hermetic, PM		450, 532, 633, 780 nm	25 ns	200 MHz
T-M150-0.5C2W-3-F2S	Non-hermetic, SM		780 nm	30 ns	150 MHz
T-M150-0.5C2W-3-F2P	Non-hermetic, PM		780 nm	30 ns	150 MHz
T-M150-0.4C2G-3-F2S	Hermetic,	5W average	1060nm	30ns	150MHz
T-M200-0.1C2G-3-F2S	Hermetic, SM,	1W average	1060nm	10ns	200MHz
T-M200-0.1C2G-3-F2P	Hermetic, PM,	1W average	1060nm	10ns	200MHz
S-M150-0.4C2G-3-F2S	Non-hermetic, SM, HI1060		1060 nm	30 ns	150 MHz
T-M260-0.1C2G-3-F2P	Hermetic, PM		1060 nm	6 ns	260 MHz
T-M200-0.1C2G-3-F2P	Hermetic PM		1060 nm	10 ns	200 MHz
T-M200-0.1C2G-3-F2S	Hermetic SM HI1060	1W average	1060nm	10ns	200MHz
T-M150-0.4C2G-3-F2P	Hermetic, Fujikura PM980 (SM98-PS-U25A)	5W average	1060nm	30ns	150MHz
T-M200-0.1C2J-3-F2P	Hermetic, Fujikura PM1550 (SM15-PS-U25A)	1W average	1550nm	10ns	200MHz
T-M200-0.1C2J-3-F2S	Hermetic, SMF28	1W average	1550nm	10ns	200MHz
T-M110-0.2C2J-3-F2S	Hermetic, SMF28	1W average	1550nm	25ns	110MHz
T-M110-0.2C2J-3-F2P	Hermetic, Fujikura PM1550 (SM15-PS-U25A)	1W average	1550nm	25ns	110MHz
T-M080-0.4C2J-3-F2S	Hermetic, SMF28	1W average	1550nm	35ns	80MHz
T-M080-0.4C2J-3-F2S	Hermetic, PM	1W average	1550nm	35ns	80MHz
T-M080-0.4C2J-3-F2P	Hermetic, Fujikura PM1550 (SM15-PS-U25A)	1W average	1550nm	35ns	80MHz
T-M040-0.5C8J-3-F2S	SMF28	1W average	1550nm	70-100ns	40MHz

T-M080-0.5C8J-3-F2S	Hermetic, Low power consumption	1W average	1550nm	70-100ns	80MHz
T-M080-0.5C8J-3-F2P	Hermetic, Polarisation Maintaining, Low power consumption	1W average	1550nm	70-100ns	80MHz
T-M040-0.5C8J-3-F2P	Polarisation Maintaining,	1W average	1550nm	70-100ns	40MHz
T-M080-0.3C2Z-3-F2S	Nufern SM1950	5W average	2000nm	70-100ns	80MHz
T-M080-0.3C2Z-3-F2P	Nufern PM1950	5W average	2000nm	70-100ns	80MHz

The drivers to be used in the above items are 1xxxAF-AINA-3.0 HCR and 1xxxAF-DINA-3.0 HCR

Our **old FCAOM models** are listed in the below table. These old models may or may not be in stock or obsolete and no longer produced. Please check with our sales regarding the availability of the below models.

Model	Description	Driver
T-M040-0.5C8H-3-F2S	1310nm (1285~1325nm), RF frequency 40MHz, average optical power handling $\leq 1W$, SMF (SingleMode Fibre)	MLP040-0.4DC MLP040-0.4AC-A1 MLP040-0.4DS2 MLP040-0.4AS2-A1
T-M040-0.5C8J-3-F2S	1550nm (1530~1565nm), RF frequency 40MHz, average optical power handling $\leq 1W$, SMF (SMF28)	MLP040-0.4DC MLP040-0.4AC-A1 MLP040-0.4DS2 MLP040-0.4AS2-A1
T-M040-0.5C8J-3-F2P	1550nm (1530~1565nm), RF frequency 40MHz, average optical power handling $\leq 1W$, PMF (Fujikura PM1550)	MLP040-0.4DC MLP040-0.4AC-A1 MLP040-0.4DS2 MLP040-0.4AS2-A1
T-M080-0.4C2J-3-F2P	1550nm, RF frequency 80MHz & RF power $\leq 3W$, average optical power handling 1W, fiber Fujikura PM1550 (SM15-PSU25A), no connector	1080AF-AINA-3.0 HCR 1080AF-DINA-3.0 HCR
T-M080-0.4C2J-3-F2S	1550nm, RF frequency 80MHz & RF power $\leq 3W$, average optical power handling 1W, fiber SMF28), no connector	1080AF-AINA-3.0 HCR 1080AF-DINA-3.0 HCR
T-M150-0.4C2G-3-F2P	1060nm, RF frequency 150MHz & RF power $\leq 2W$, average optical power handling 5W, fiber Fujikura PM980 (SM98-PS-U25A)), no connector	1150AF-AINA-3.0 HCR 1150AF-DINA-3.0 HCR
T-M150-0.4C2G-3-F2S	1060nm, RF frequency 150MHz & RF power $\leq 2W$, average optical power handling 5W, fiber HI1060), no connector	1200AF-AINA-3.0 HCR 1200AF-DINA-3.0 HCR
T-M200-0.1C2J-3-F2P	1550nm, RF frequency 200MHz & RF power $\leq 3W$, average optical power handling 1W, fiber Fujikura PM1550 (SM15-PSU25A)), no connector	1200AF-AINA-3.0 HCR 1200AF-DINA-3.0 HCR
T-M200-0.1C2J-3-F2S	1550nm, RF frequency 200MHz & RF power $\leq 3W$, average optical power handling 1W, fiber SMF-28), no connector	1200AF-AINA-3.0 HCR 1200AF-DINA-3.0 HCR
T-M200-0.1C2G-3-F2P	1060nm, RF frequency 200MHz & power 3W, average optical power handling 1W, fiber Fujikura PM980 (SM98-PS-U25A)), no connector	1200AF-AINA-3.0 HCR 1200AF-DINA-3.0 HCR
T-M200-0.1C2G-3-F2S	1060nm, RF frequency 200MHz & RF power $\leq 3W$, average optical power handling 1W, fiber SMF-28), no connector	1200AF-AINA-3.0 HCR 1200AF-DINA-3.0 HCR
I-FS060-2F-F2P	852nm, RF frequency 60MHz & RF power $\leq 1W$, PM fiber 2m	
MM065-1C2V5-5-F2XY-Z	TeO ₂ , 2um, 65MHz, random, rise time 75ns, RF $\leq 4W$, single mode fiber 9/125 or PM fiber 8/125	31065-4xx
MM065-1C2V12-5-F2XY-Z	TeO ₂ , 1.95um, 65MHz, random, rise time 100ns, RF $\leq 4W$, single mode fiber 9/125 or PM fiber 8/125	31065-4xx
MFS150-.2C17J-3-F2P-X-GH	GaP, 1.55um, 150MHz, 10ns risetime, RF $<2W$, PM fiber 8/125	
15200-.2-1.55-LTD-GaP-FO	Gap, 1.55um wavelength, linear polarisation, rise/fall time 10ns, 8/125 PM fiber, 200MHz, RF 2W	21200-2xx

15200-2-1.06-LTD-GaP-FO-GH	Gap, 1.06um wavelength, linear polarisation, rise/fall time 10ns, 6/125 PM fiber, 200MHz, RF 2W	21200-2xx
23050-1-1.95-LTD-FO-2HP-PM-CSF	TeO2, 1950nm wavelength, 50MHz, linear polarized, 100ns risetime, PM fiber GDF 10/130um, 0.15/0.46NA, RF<4W	
23080-1-.85-LTD-FO	TeO2, 850nm wavelength, 80MHz, random, 50ns risetime, single mode or PM fiber 5/125, RF<1W	
23080-1-1.06-LTD-FO	TeO2, 1060nm, 80MHz, random, risetime 50ns, single mode fiber 6/125 (PM 6/125 optional), <0.5W @ 1060nm, Used external to laser cavity, RF <1.25W	21080-1xx
23080-1-1.06-LTD-FO-HP	TeO2, 1060nm, 80MHz, random, risetime 50ns, single mode fiber 6/125 (PM 6/125 optional), <2W @ 1060nm, Used external to laser cavity, RF <1.25W	21080-1xx
23080-1-1.06-LTD-FO-2HP	TeO2, 1060nm, 80MHz, random, risetime 50ns, single mode fiber 6/125 (PM 6/125 optional), <2W @ 1060nm, may be used internal to laser cavity), RF <1.25W	21080-1xx
23080-1-1.3-LTD-FO	TeO2, 1300nm, 80MHz, random, risetime 50ns, single mode fiber 9/125 (PM 8/125 optional), RF <1.5W	21080-2xx
23080-1-1.55-LTD-FO	TeO2, 1520-1570nm, 80MHz, random, risetime 50ns, single mode fiber 9/125, RF <2W	21080-2xx
26035-2-1.3-LTD-FO	AMTIR, 1300nm, 35MHz, random, risetime 100ns, single mode fiber 9/125 (PM 8/125 optional), RF <0.5W	21035-0.4xx
26035-2-1.55-LTD-FO	AMTIR, 1520-1570nm (1570-1620nm optional), 35MHz, random, risetime 100ns, single mode fiber 9/125 (PM 8/125 optional), RF <0.5W	21035-0.4xx
26050-1-1.55-LTD-FO	AMTIR, 1520-1570nm (1570-1620nm optional), 50MHz, random, risetime 100ns, single mode fiber 9/125 (PM 8/125 optional), RF <0.5W	21050-0.4xx
26055-1-1.55-LTD-FO	AMTIR, 1520-1570nm (1570-1620nm optional), 55MHz, random, risetime 100ns, single mode fiber 9/125, 3 ports, RF <1W	21055-0.4xx
26055-1-1.55-LTD-3FO	AMTIR, 1550nm, 55MHz, random, risetime 100ns, single mode fiber 9/125, 3 ports, RF <1W	21055-0.4xx
26055-1-1.55-LTD-4FO	AMTIR, 1550nm, 55MHz, random, risetime 100ns, single mode fiber 9/125, 4 ports, RF <0.5W	21055-0.4xx
47040-2-.63-6.5DEG-LTD-FO-PM	TeO2, 633nm, 40MHz, linear polarized, 440ns risetime, PM fiber 4/125, 1 meter long, RF<0.5W	21040-0.4xx
54035-1.55-.5AS-FO	AMTIR, 1520-1570nm (1570-1620nm optional), 35MHz, random, risetime 100ns, single mode fiber 9/125, 1, 2, 3 or 4 channels	Driver integrated
54055-1.55-.5DS-3FO	AMTIR, 1550nm, 55MHz, random, risetime 100ns, single mode fiber 9/125, 3 ports	Driver integrated
54080-1.55-2DS	TeO2, 1520-1570nm (1570-1620nm optional), 80MHz, random, risetime 50ns, single mode fiber 9/125, 1, 2, 3 or 4 channels	Driver integrated

Remark:

- xx in the driver model (such as 21200-2xx) may be DM, AM, DS or AS
- Standard connector is FC/PC (not applicable for T-M080, T-M150 and T-M200 series). We also commonly supply the following options: FC/APC, SC/PC & SC/APC. (Remark: 1. FC = Named as "Frank Charlie", screw-in type metal plug connector; 2. SC = Named as "Sam Charlie", square type plastic connector. 3. PC = Polished Connector, usually with Return Loss (RL) > 40dB (min) [eg. FC/PC, SC/PC]; 4. APC = 8 deg Angled-Polished Connector, usually with RL > 50dB (min) [eg. FC/APC, SC/APC])

2.2 STBR Series Fiber Coupled AOM



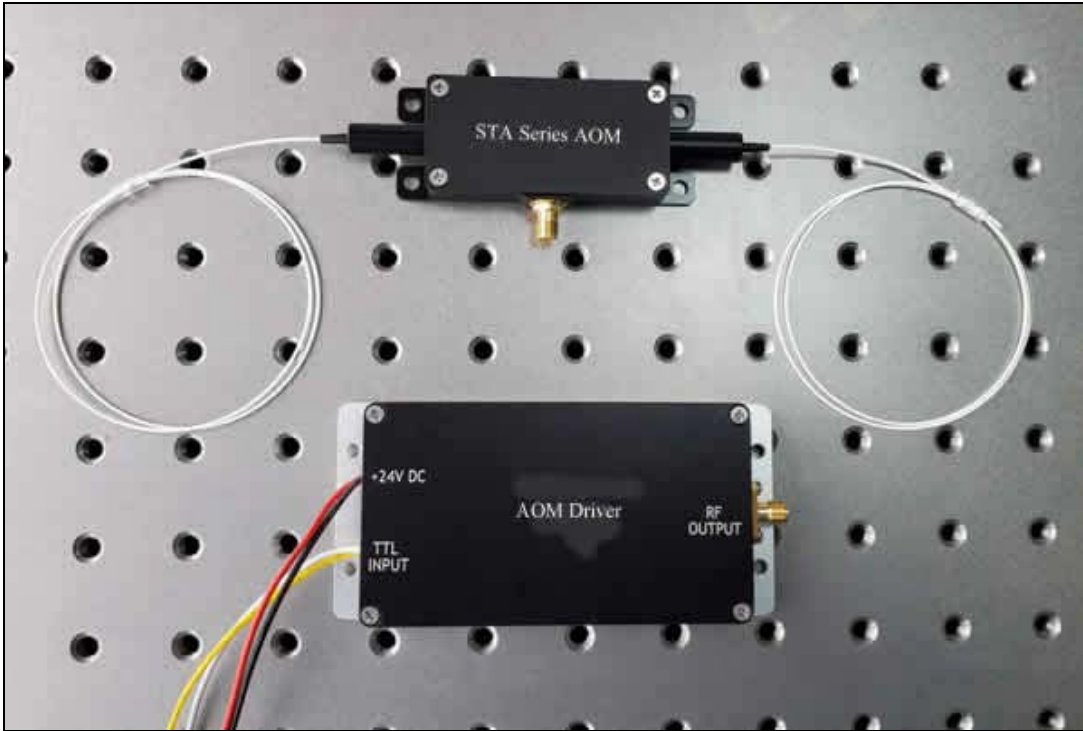
General specs

Switching time (nsec)	<100
ON/OFF Extinction (dB)	>50
Back Reflection (dB)	<-50
Insertion Loss (dB)	< 2.5
Wavelengths (nm)	380-2100nm
Low Electric Power Consumption (dBm)	<23
Operating Wavelength Range (nm)	>60

Model #	Wavelength (nm)	Center Frequency (MHz)	Rise Time (ns)	Modulation Bandwidth (MHz)	Fiber Type
STBR-TEM-110-10-55-2FP	380-1600	110	55	10	SM or PM
STBR-TEM-200-25-20-2FP	380-1600	200	20	25	
STBR-TEM-250-50-10-2FP	380-1600	250	10	50	
STBR-TEM-500-100-5-2FP	380-1600	500	5	100	
STBR-IPM-200-25-20-2FP	1000-2100	200	20	25	
STBR-IPM-500-100-5-2FP	1000-2100	500	5	100	
STBR-AMM-55-8-70-2FP	1000-2500	55	70	8	
STBR-AMM-100-20-25-2FP	1000-2500	100	25	20	

For associated RF drivers, please refer to "RF Drivers for STBR series"

2.3 STA Series Fiber-coupled AOMs

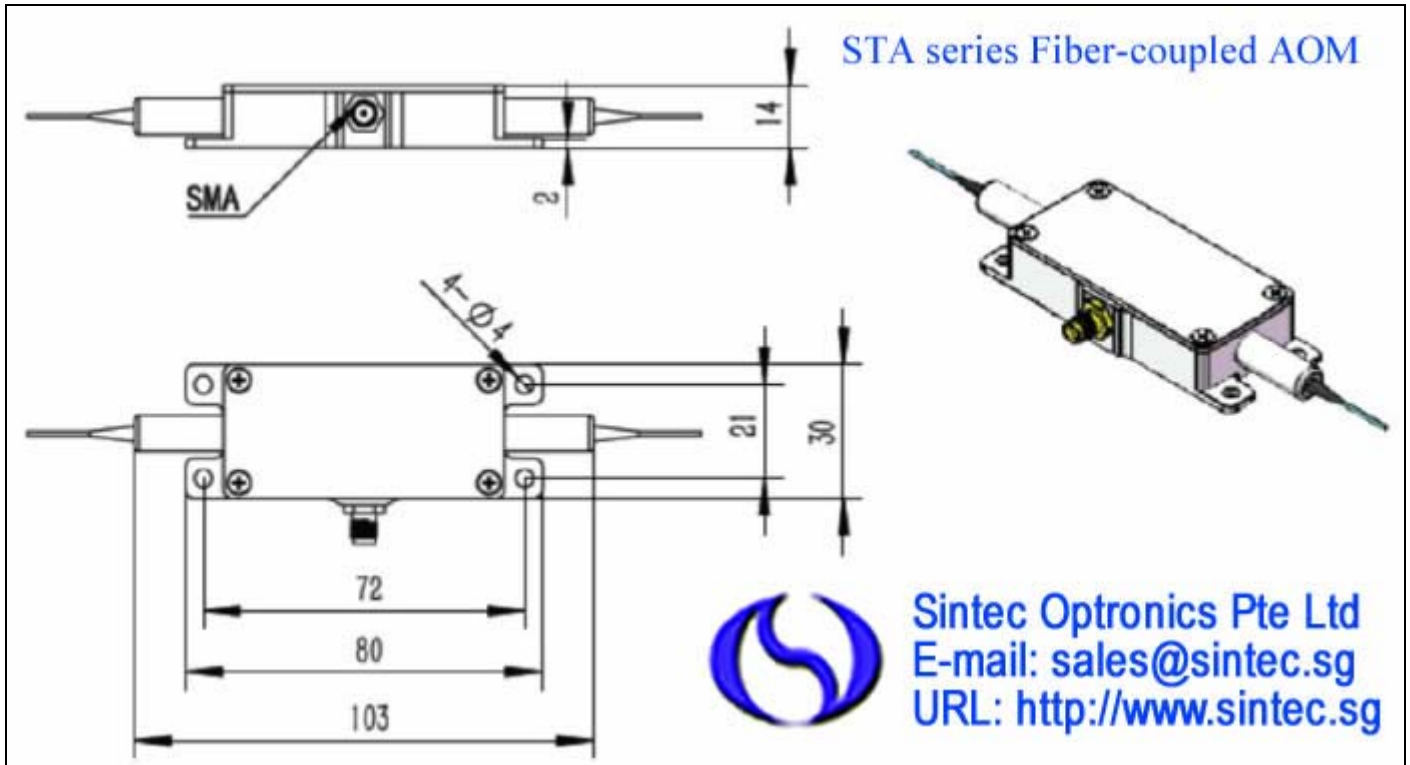


Parameter	Unit	
Wavelength	nm	1064
Frequency	MHz	100
Average optical power handling:	W	5
Diffraction efficiency (Free - space AOM)		≥85%
Coupling efficiency (Fiber - AOM)		≥75%
Insertion Loss	dB	< 1.2
Transmission		>99.0%
Return Loss	dB	> 45
Fiber type		NUFERN 10/125
Fiber length	cm	>60
Fiber termination		Bare fiber
VSWR @120MHz		<1.3:1
RF connectors		SMA
RF power	W	2.0
Storage temperature	°C	- 20 to +70
Dimension	mm	103x30x14

Ordering Information: STA-WWW-FFF-TTT-JJJ-LLL

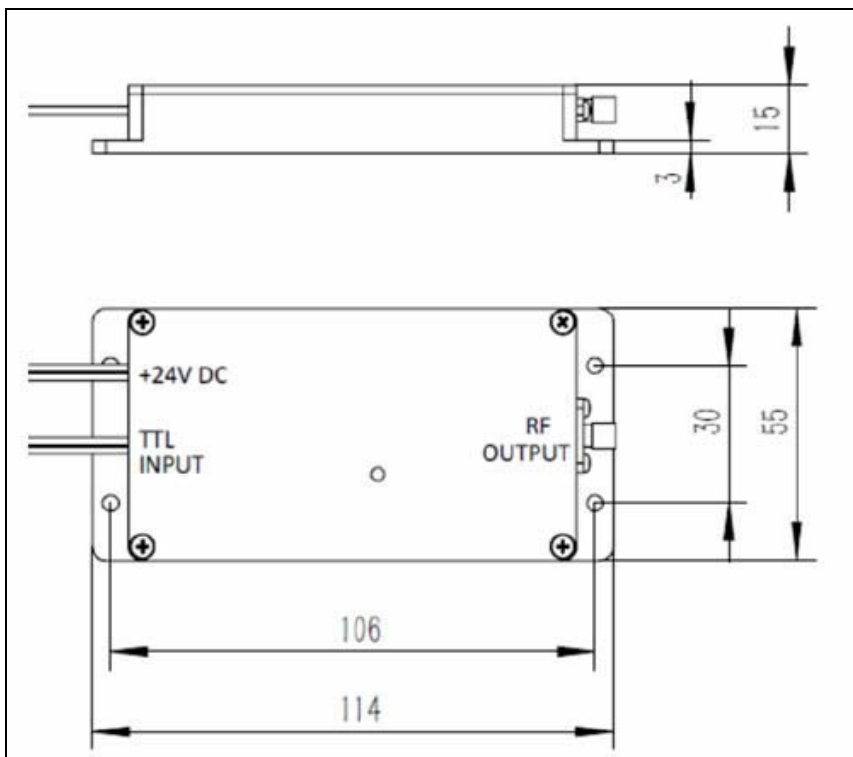
- STA means STA series fiber-coupled AOM;
- WWW means laser wavelength such as 1064nm, 1550nm, 2000nm etc;
- FFF means driving frequency such as 100, 120, 150, 200MHz etc;
- TTT means fiber types such as L06 (6/125 type), L09 (9/125 fiber), L10 (12/125 DCF fiber), L12 (12/125 DCF fiber), P06 (PM98 fiber), P10 (PM10/125 DCF fiber) etc;
- JJJ means fiber jacket type on IN/OUT such as B (bare fiber), L (900um loose fiber), C (3mm loose cable) etc; LLL means fiber length in meter.

Example: STA-1064-100-L10-B-1.



RF Driver for STA Series Fiber-coupled AOMs

Frequency	100 MHz
Operating voltage	24
Control signal mode	TTL
High - level output voltage	> 25V
High - level peak jumping voltage	< 1V
RF power	2.0 ± 0.2 W
Time delay range	60ns – 600ns
Rise - time adjustable range	50ns - 500ns
Dimension	114x55x15mm



2. 4 STZ Series Fiber-coupled AOMs

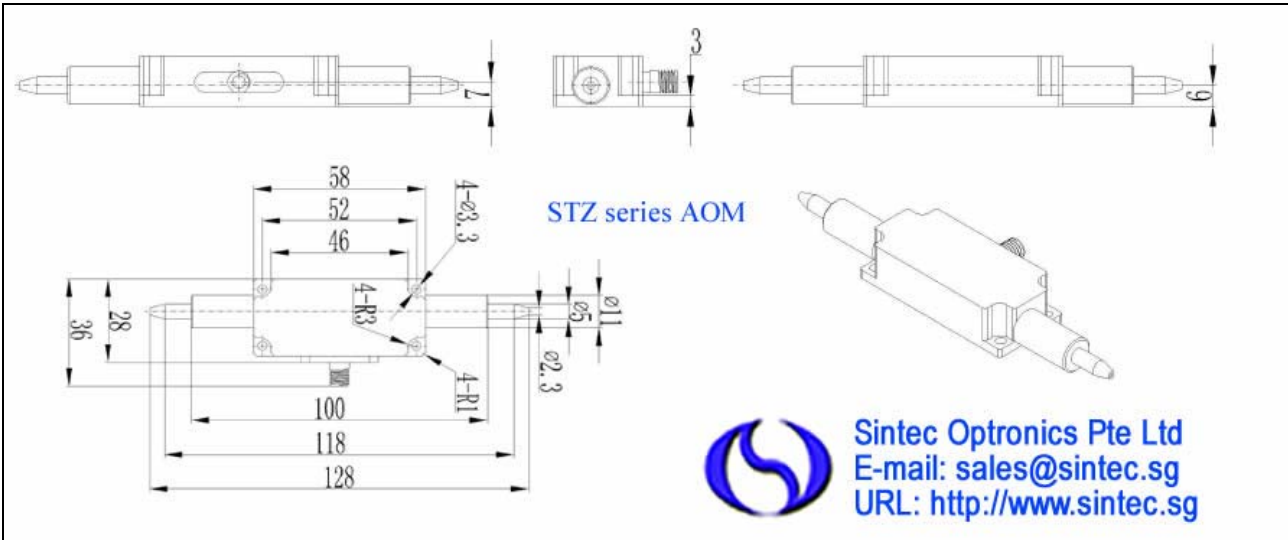


Parameter	Unit	
Wavelength	nm	1064
Frequency	MHz	100
Average optical power handling:	W	5
Diffraction efficiency (Free - space AOM)		≥85%
Coupling efficiency (Fiber - AOM)		≥85%
Insertion loss	dB	< 1.6
Transmission		>99.0%
Return loss	dB	> 45
Fiber type		NUFERN 10/125 GSF
Fiber length	cm	>60
Fiber termination		Bare fiber
VSWR @120MHz		<1.3:1
RF connectors		SMA
RF power	W	1.8
Storage temperature	°C	- 20 to +70
Dimension	mm	128x36x14

Ordering Information: STZ-WWW-FFF-TTT-JJJ-LLL

- STZ means STZ series fiber-coupled AOM;
- WWW means laser wavelength such as 1064nm, 1550nm, 2000nm etc;
- FFF means driving frequency such as 100, 120, 150, 200MHz etc; T
- TT means fiber types such as L06 (6/125 type), L09 (9/125 fiber, L10 (10/125 GSF fiber), L12 (12/125 DCF fiber), P06 (PM98 fiber), P10 (PM10/125 DCF fiber) etc;
- JJJ means fiber jacket type on IN/OUT such as B (bare fiber), L (900um loose fiber), C (3nm loose cable) etc;
- LLL means fiber length in meter.

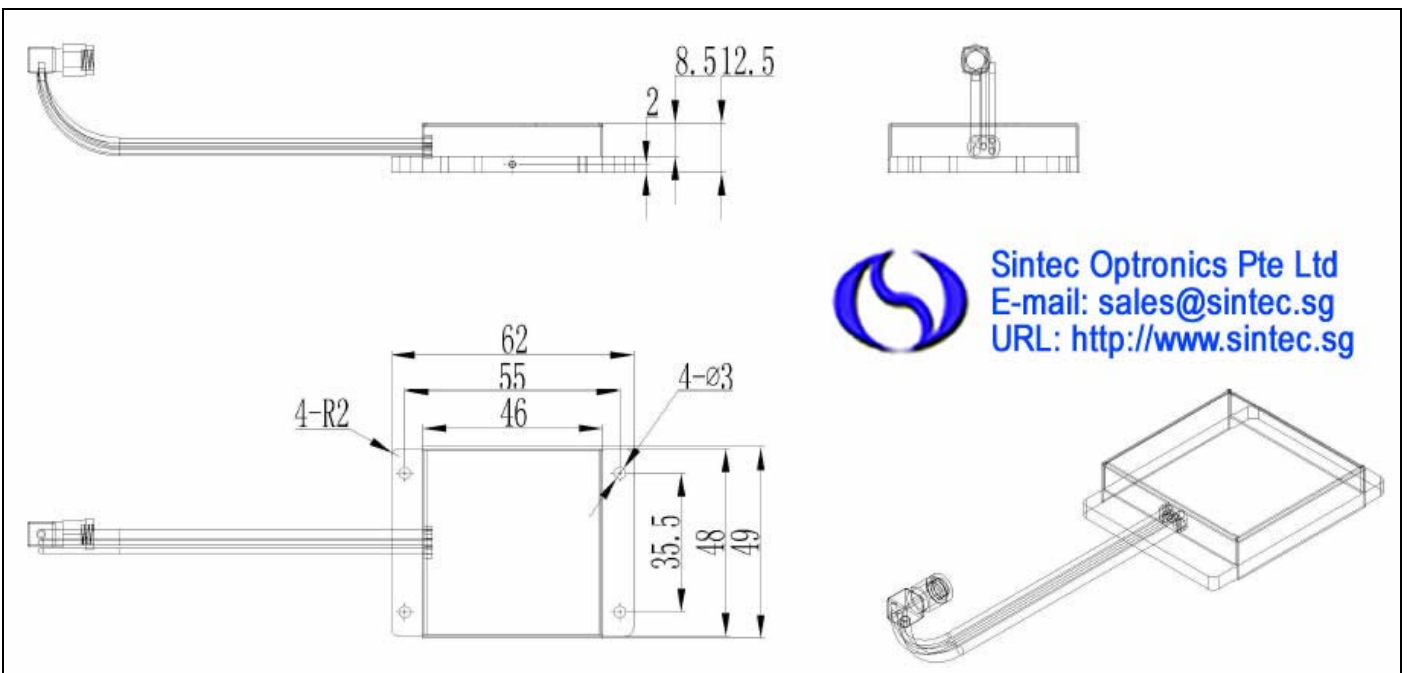
Example: STZ-1064-100-L10-B-1.



RF Driver for STZ Series Fiber-coupled AOMs

Frequency	100 MHz
Operating voltage	15V
Control signal mode	TTL
High - level output voltage	>3.3V
RF power	1.8 ± 0.1 W
Time delay range	60ns – 600ns
Rise - time adjustable range	250ns - 270ns
Dimension	62x49x12.5mm

Remark: other frequencies available upon request.



3. AOM RF Drivers

An RF driver generates a fixed or variable frequency signal supplied to the acousto-optic device's transducer. This in turn uses the piezoelectric effect to very precisely convert the RF signal to an acoustic wave that propagates within the acousto-optic device's crystal. The frequency and intensity of the applied signal will determine how much an optical beam is modulated, deflected, or tuned.



An acousto-optic device and its RF driver should be selected as a unit to optimize speed and stability for each application. Additional driver features include first pulse suppression, synchronization, pulse shaping, and multi-channel operation. We offer a wide variety of stable high frequency drivers with analog and digital modulation capability. Voltage controlled oscillators (VCOs) vary the oscillation frequency via the input voltage, and are a cost-effective solution for applications with less stringent frequency stability and linearity requirements.

Direct digital synthesizer (DDS) drivers offer higher stability, with fast switching time and high resolution. They can create random waveforms from a single, fixed-frequency reference clock, and thus are ideal for pulse shaping and special functions. They also allow frequency to be varied on the order of a few hundred nanoseconds, and are inherently very linear. DDS drivers are software driven, and can be run from a user-friendly interface (a GUI), or controlled directly via computer driver commands. Our high-performance multi-frequency DDS drivers generate up to 8 channels of RF frequencies simultaneously.

Our standard models are below:

Model	Compatible Devices	Operating Frequency	RF Power	Key Features
64020-250-1ADMDFS-A	Beam deflector, special AOM, tunable filter	20-250 MHz	1.0 W	Variable frequency; module
64020-200-2ADMDFS-A	Beam deflector, special AOM, tunable filter	20-200 MHz	2.0 W	Variable frequency; module
97-02925-32	Beam deflector, tunable filter	20- 160 MHz	0.4 W	Single channel DDS; module
97-03926-12	Beam deflector, tunable filter	20-160 MHz	3.2 W	8 channel DDS; module
SD020-200-5UC-	4x1 Tunable filter	20-200 MHz	5.0 W	DDS module, single or multichannel
A35xxx-S-1/50-p4k7u	Fiber-Q, modulator	40, 80, 110, 150, 200, 300 MHz	5.0 W	Analog/digital; module
MHPXXX-YYADM-A1	Fiber-Q, modulator	24-260 MHz	2-20 W	Analog/digital; module
1xxxAF-xIN0-x.xHCR	Fiber-Q, modulator, frequency shifter	80-350 MHz	0.5-4.0 W	Analog/digital; module
HP041-125ADG-A10	Modulator	40.68 MHz	125 W	Analog/digital; module
HP040-060-150ADG-A10-2X	Modulator	40/60 MHz	2x75 W	Dual frequency; analog/digital; module
MQH0XX-YYDM-ZZZ	Q-switch, modulator	24, 27.12, 40.68, 68, 80 MHz	25-100 W	Analog/digital; module
MQH0XX-YYDM-ZZZ-2S	Q-switch	24, 27.12, 40.68, 68, 80 MHz	25-50 W per channel	2 channel analog/digital; module
QC0XX-YYDC-ZZZ-AAV	Q-switch, modulator	24, 27.12, 40.68, 68, 80,	2-24 W	Analog/digital; module

		110 MHz		
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Old RF Driver models below:

	31xxx-yyAM 31xxx-yyDM	MLPxxx-yAC MLPxxx-yAS MLPxxx-yDC MLPxxx-yDS (21xxx-yAM 21xxx-yDM)	1xxxAF-AINA-y HCR 1xxxAF-DINA-y HCR (A35xxx-S-1/50-p4k7u)	A36xxx
RF power, W	2-20W	0.4, 1 or 2W	0~5W (Analogue)	2W
RF frequency, MHz	24-260	27-300	80, 100, 110, 150, 200, 250, 300, 350	
Max. modulation frequency, MHz			<1/3 carrier frequency and <50MHz	
Input modulation	Analogue or digital		Analogue and digital	

Description of N series drivers:

xxx = a fixed frequency of between 27 and 300 MHz crystal controlled.
y = 0.4, 1, or 2 Watts output (N21 series), 2-20W adjustable output (N31 series)
D = Digital Modulation or **A** = Analogue Modulation
M = OEM Module

Description of A35xxx and A36xxx series drivers:

- Low profile housing
- Various standard frequencies, other frequencies from 80 to 350 MHz available
- Analogue and digital modulation
- EMC-safe design, power stage and control circuits separately grounded, entirely shielded
- Supply voltage 24VDC

Type	RF Power [W]	Standard Frequencies [MHz]								RF on/off ratio guaranteed at any RF output level
		80	100	110	150	200	250	300	350	
		<i>080</i>	<i>100</i>	<i>110</i>	<i>150</i>	<i>200</i>	<i>250</i>	<i>300</i>	<i>350</i>	
A36 ___	2	✓	✓	✓	✓	✓	✓	✓	✓	TBD
A35 ___	5	✓	✓	✓	✓	✓	✓	✓	✓	≥ 65 dB

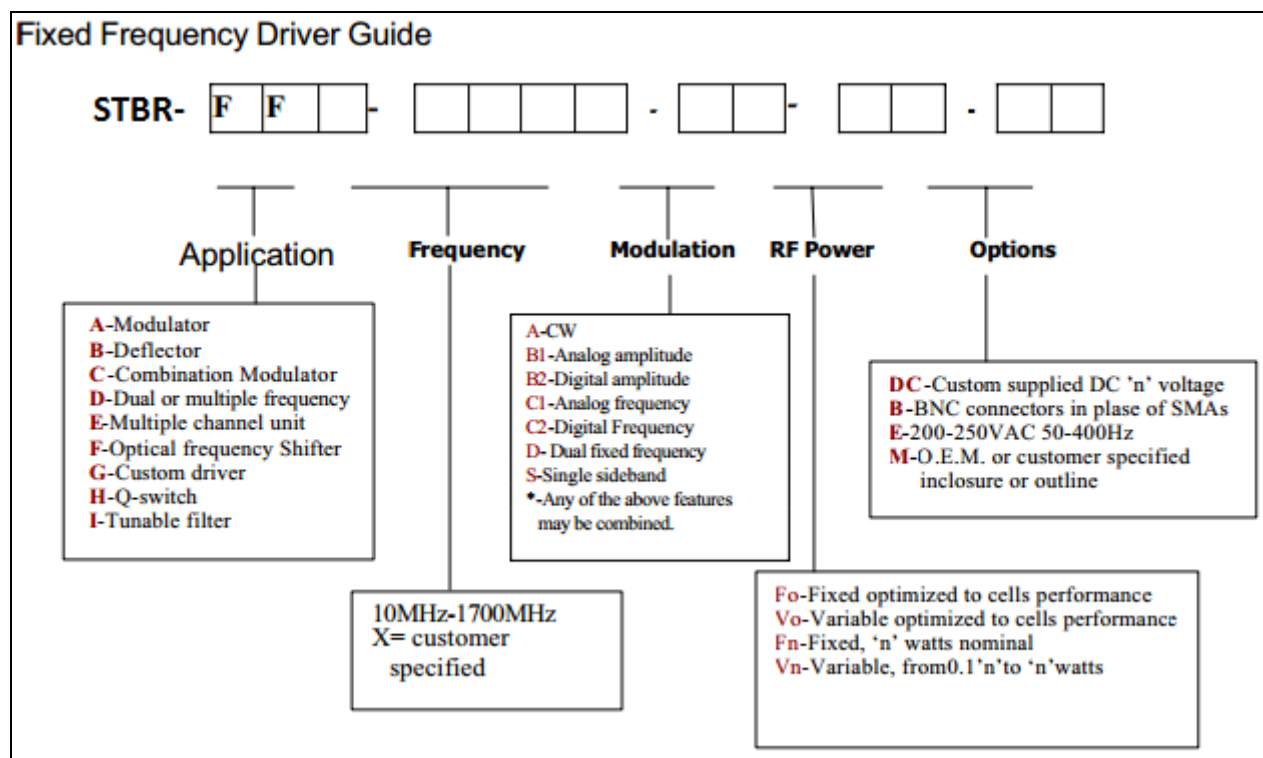
Connector cable for A35xxx and A36xxx AOM drivers.

This accessory provides the connection of the analogue and digital modulations interface as well as the power connection for the A35xxx and A36xxx AOM driver series. It comprises the fully shield plug and 1 meter pigtailed. The RF connecting cable between the RF driver and the AOM is not included. Ordering Code : 508A00169

RF Drivers for STBR Series

Typical fixed frequency RF drivers configurations:

Model	STBR-FF -XX-B1-FY	STBR-FF -XX-B2-FY	STBR-FF -XX-B3-FY
Output Frequency	XX MHz (compatible with the AO device		
Frequency control	Quartz crystal referenced phase locked loop		
Frequency Accuracy	0.015		
Harmonic Content (dBc)	<=-20		
Frequency Stability	0.0015% minimum after 15 minute warmup		
Output power	Power is optimised for peak efficiency with supplied AO device		
Output protection	Power amplifiers used will tolerate an infinite VSWR without damage. Rated power is available only when a proper RF load is connected		
Internal Pulse Generator	N/A		Pulse width: 100 to 500 nsec ± 10% adjustable, pulse generator with 5000 Hz to 100 KHz rep rate adjustable. Front panel switch for pulse/standby operation.
Rise/Fall Time	To match AOM requirements		
Modulation Type	Analog amplitude modulation	TTL compatible	Pulse modulation, pulse monitor output via front panel BNC connector
Modulation Rate	To match device requirements		
Modulation Input	50 ohm 0-1V	330ohm; 0-5V	Internal or external trigger
Operating Power	90-250 VAC, 50-60Hz, 55 W max		
Enclosure	The unit will be packaged in a 190mm (7.5inch) wide by 90mm (4inch) high by 220,, (8,75inch) deep instrument case. The rear panel heat sink increases the depth to 240mm(9.75inches) maximum. The size is exclusive of connectors		
Environmental	Nominal Lab conditions: Max temperature is +35 degC. The unit is not seals against moisture or condensing humidity		



Typical variable frequency RF drivers configurations:

Model	STBR-VFB-XX-YY-V-A-F2	STBR-VFE-XX—YY-V-A-F2
Output Frequency Range	Corresponding to AO Device	Matching the 2-D AOD controlled

4. Fiber-Q RF Driver

Each Fiber-Q acousto-optic modulator requires an RF driver to control the embedded acousto-optic crystal, as modulation of the beam depends upon the frequency and intensity of the applied RF signal.

The RF signal which generates the acousto-optic wave in the acousto-optic crystal can do so very precisely at a fixed or variable frequency, and is created using a transducer mated to the acousto-optic crystal and driven by the piezoelectric effect.



Analog, digital, and combined RF drivers are available for use with the Fiber-Q series. All are designed for dependable stability and high frequency operation, with compatible options for the full line of visible and NIR Fiber-Q products. The speed and stability of a modulator is limited by the stability and speed of the RF driver, and thus the two should be selected as a paired unit to optimize performance, features, and application-specific options.

The primary factors to consider when selecting an RF driver include the operating frequency, the required rise/fall time of the application, and whether analog or digital modulation is needed. RF power, duty cycle, stability, and variable vs fixed frequency are also relevant.

Drivers for the Fiber-Q series of modulators are designed for constant RF power output, fast modulation, and with conductive cooling via the baseplate. When tuned together with the modulator, they offer stable, dependable modulation to enable all-fiber laser systems.

Our standard models are below:

Model	Operating Frequency	RF Power	Key Features
97-09210-18	80 MHz	3.0 W	Analog
97-09210-19	80 MHz	3.0 W	Digital
A35080	80 MHz	3.0 W	Analog/digital
A35110	110 MHz	3.0 W	Analog/digital
97-09210-14	150 MHz	2.5 W	Analog
97-09210-15	150 MHz	2.5 W	Digital
A35150	150 MHz	2.5 W	Analog/digital
97-02910-04	200 MHz	2.5 W	Analog
97-02910-01	200 MHz	2.5 W	Digital
A35200	200 MHz	2.5 W	Analog/digital

5. Beam Deflector

Acousto-optic beam deflectors (AOBD) offer precise angular control of an optical beam using RF drive frequency tuning. Up to two thousand spots can be resolved over an angular range of a few degrees for 1D and 2D scanning as well as beam deflection through a fixed angle. The scan speed can be as fast as a few microseconds.

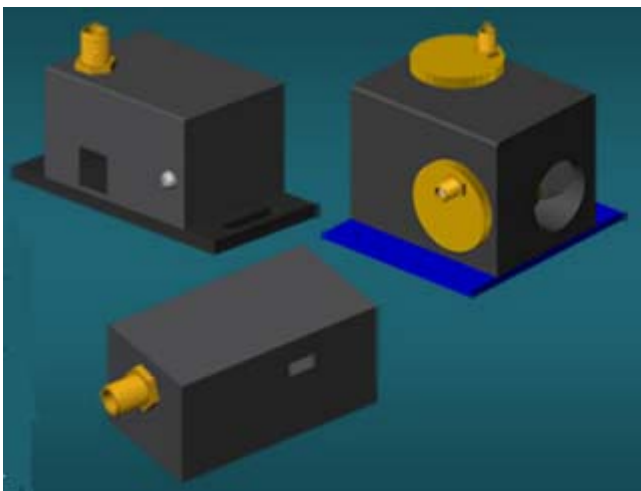


Beam deflectors offer highly uniform diffraction efficiency across the full scan angle, with consistent power throughput for scanning applications such as material processing and digital imaging. We manufacture devices based on tellurium dioxide crystals grown in-house for visible and near-infrared (NIR) wavelength applications. For optimal transmission in the ultraviolet (UV) we offer fused silica and crystal quartz products. For broad bandwidth applications, we use a longitudinal mode approach with a phased array of piezoelectric elements within the transducer. We achieve high efficiency with slow shear deflection using parallel tangents off-axis interaction.

Our standard models are below:

Model	Wavelength	Scan Angle	Active Aperture	Operating Frequency	Optical Material
AOBD 4200-UV	266 nm	10.3 mrad	1.0x60.0 mm	135-265 MHz	Fused silica
AOBD 4170	355 nm	4.9 mrad	7 mm	130-210 MHz	Crystalline quartz
AOBD 4100-UV	364 nm	29.5 mrad	4.0x14.0 mm	75-125 MHz	Tellurium dioxide
AOBD 4090-7	440-530 nm	44 mrad	8.5 mm	60-115 MHz	Tellurium dioxide
AOBD 4200-VI	442-488 nm	29.5 mrad	4.8 mm	150-250 MHz	Tellurium dioxide
AOBD 4100-VI	488 nm	39.5 mrad	4.0-14 mm	75-125 MHz	Tellurium dioxide
AOBD 4080-13	635 nm	8.2 mrad	2 mm	76-84 MHz	Tellurium dioxide
AOBD 4055-4	780-980 nm	44.3 mrad	3.5x14 mm	35-70 MHz	Tellurium dioxide
AOBD 4210-IR	830 nm	27.6 mrad	2.0-6.0 mm	140-280 MHz	Tellurium dioxide
AOBD 4090-6	1064 nm	56 mrad	2 mm	72.5-107.5 MHz	Tellurium dioxide
AOBD 4075-IR	1065-1100 nm	8.1 mrad	2.5 mm	59-91 MHz	Tellurium dioxide
AOBD 4070	9.4 μ m	60 mrad	9 mm	50-90 MHz	Germanium

STBR series beam deflectors



STBR series Acousto-Optic Deflectors (AODs) combined with RF drivers are specially designed for high-speed scanning applications such as laser recording, optical scanning, signal processing, etc. The AOD changes the diffraction angle of an input laser beam and its angular position is linearly proportional to the RF frequency, so that

the higher the frequency, the larger the diffracted angle.

Model #	Wavelength Range (nm)	Active Aperture (mm)	Time bandwidth Product	3dB Bandwidth (MHz)	Deflection angle (deg.)	DE (%)
TED-130-60	380-1600	1.0 x 4.2	60	60	0.44	70
TED-200-100	380-1600	1.0 x 4.2	100	100	0.8	70
TED-320-200	380-1600	0.5 x 9.0	400	200	1.69	60
TED-400-200	380-1600	0.5 x 5.0	200	200	1.69	50
TED10-100-60-.488	488	3.0 x 7.0	600	60	2.5	>75
TED20-100-60-.488	488	3.0 x 14.0	1200	60	2.5	>70
TED10-100-50-.532	532	3.0 x 7.0	500	50	3.0	>70
TED20-100-50-.532	532	3.0 x 14.0	1000	50	3.0	>70
TED10-75-50-.633	633	3.0 x 7.0	500	50	3.0	>75
TED20-75-50-.633	633	3.0 x 14.0	1000	50	3.0	>70
TED10-60-40-.800	800	3.0 x 7.0	400	40	2.0	>70
TED20-60-40-.800	800	3.0 x 14.0	800	40	2.0	>65
TED10-50-30-1.06	1060	3.0 x 7.0	300	30	2.7	>75
TED20-50-30-1.06	1060	3.0 x 14.0	600	30	2.7	>70
GPD-250-100	633	0.75 x 5.0	70	100	0.57	70
GPD2-250-100	633	0.75 x 13.0	200	100	0.57	40
GPD-350-200	633	0.75 x 5.0	140	200	1.15	40
GPD2-350-200	633	0.75 x 13.0	400	200	1.15	35
GPD-650-300	633	0.18 x 5.0	210	300	2.25	40
GPD-800-400-SC	600-1600	0.18 x 4.2	400	400	4.3	30
GPD2-800-400-SC	600-1600	0.18 x 8.4	800	400	4.3	25
GPD-800-500	600-1600	0.076 x 5.0	350	500	2.9	50
GPD-1500-1000	600-1600	0.075 x 6.3	250	1000	5.7	15-20
LND-2500-1000	630/830	0.075 x 3.4	1000	1000	10@630nm	10-15
IPD-200-50	1000-2100	0.75 x 6.0	50	50	0.65	40
IPD-400-150	1000-2100	0.75 x 6.0	150	150	1.95	35
IPD-600-200	1000-2100	0.18 x 6.0	200	200	2.6	30
2DS-100-45-532 *	532+/-25	10.0 x 10.0	675 x 675	45	2.3	>40

* 2-Dimensional AO Deflector is also available in the 400nm to 1600nm optical range.

For the associated RF drivers, please refer to "RF Drivers for STBR series". For AO Deflector, you should use the variable frequency drivers.

6. Frequency Shifters

Doppler-shifts the frequency of input light by an amount equal to the RF drive frequency, but is optimized specifically for this purpose. Typically our frequency shifters will use the anisotropic interaction of the slow shear mode in tellurium dioxide (TeO₂). Applications such as interference-based optical techniques require a high extinction ratio between the diffracted and undiffracted beam; this can be achieved with a high-quality optical finish to minimize optical scatter.



We offer standard products with frequency shifts of 40-350 MHz, many of which can be operated in double-pass configurations. In addition we can design for custom frequency shifts where required. Frequency shifters are fabricated using high quality TeO₂, grown and polished in-house, for lowest insertion loss and excellent power handling. Other acousto-optic materials are available and may be more appropriate for some applications.

TeO₂ based frequency shifters are highly efficient acousto-optic devices, requiring very low drive power to achieve the desired frequency shift. Our designs consume minimal power (generally <100 mW power draw), often allowing us to package the driver with the AOFS for a more compact and power-efficient solution.

Our standard models are below:

Model	Wavelength	Operating Frequency	Active Aperture	Integrated Driver	Optical Material
I-M110-3C10BB-3-GH27	300-400 nm	110 MHz	3.0 mm	No	Crystal quartz
AOMO 3080-125	415-900 nm	80 MHz	2 mm	No	Tellurium dioxide
AOMO 3100-125	440-850 nm	100 MHz	1.5 mm	No	Tellurium dioxide
AOMO 3200-125	470-690 nm	200 MHz	1.5 mm	No	Tellurium dioxide
I-FS040-1.5S2C-3-GH83	532 nm	40 MHz	1.5 mm	No	Tellurium dioxide
I-FS040-1.5S2C-1-GH66	532 nm	40 MHz	1.5 mm	Yes	Tellurium dioxide
I-FS080-3S2E-1-GH39	633 nm	80 MHz	3 mm	Yes	Tellurium dioxide
I-FS080-3S2E-3-LG5	633 nm	80 MHz	3 mm	No	Tellurium dioxide
I-FS040-2S2E-1-GH66	630-690 nm	40 MHz	2 mm	Yes	Tellurium dioxide
I-FS040-2S2E-3-OL3	630-690 nm	40 MHz	2 mm	No	Tellurium dioxide
AOFS 4040-191	633-1064 nm	40 MHz	2x6 mm	No	Tellurium dioxide
I-FS080-2S2G-3-LV1	1064 nm	80 MHz	2 mm	No	Tellurium dioxide
I-FS040-2S2J-3-GH53	1550 nm	40 MHz	2 mm	No	Tellurium dioxide
I-M040-2C8J-3-GH84	1550 nm	40 MHz	2 mm	No	AMTIR
I-M040-2C8B1-3-GH84	1900-2100 nm	40 MHz	2 mm	No	AMTIR

STBR series free space AO Frequency Shifters



The STBR Free Space Acousto-Optic Frequency Shifter (AOFS) with RF driver is used to modify the frequency of the optical beam. Due to a Doppler shift, the frequency of the diffracted first order optical beam in the AO modulator or AO frequency shifter is shifted in frequency (wavelength) by the acoustic carrier frequency (wavelength). If the

incident acoustic wave is introduced in the direction of the incident optical wave, the laser frequency shifts towards the higher side. If the incident acoustic wave is introduced in the opposite direction of the incident optical wave, the laser shifts toward the lower frequency side.

Model #	Spectral Range (nm)	DE up to (%)	Frequency Shift (MHz)	Active Aperture (mm)	Material
AMF-90-2-2.1	1000-2200	15	90	1.0	AM
AMF-55-1.3	1000-2200	80	55	2.0	AM
AMF-100-1.3	1000-2200	80	100	2.0	AM
GEF-40-10	2000-12000	75	40	2.0	Ge
GEF-60-1.5	2000-12000	75	60	1.5	Ge
GEF-80-20	2000-12000	70	80	1.0	Ge
GPF-250-100	590-1000	60	250	0.75	GaP
GPF-650-225	590-1000	50	650	0.18	GaP
GPF-1000-500	590-1000	40	1000	0.076	GaP
GPF-1500-1000	590-1000	10	1500	0.076	GaP
GPF-1700-500	590-1000	30	1700	0.076	GaP
IPF-200-50	1000-1600	40	200	0.75	InP
IPF-400-200	1000-1600	35	400	0.50	InP
IPF-600-200	1000-1600	30	600	0.18	InP
IPF-800-300	1000-1600	20	800	0.076	InP
IPF-1000-350	1000-1600	15	1000	0.076	InP
IPF-1300-400	1000-1600	10	1300	0.076	InP
LNF-2500-1000	400/830	20	2500	0.076	LiNBO3
LNF-3500-1000	400-630	5	3500	0.076	LiNBO3
QZF-80-20	200-4500	75	80	1.0	SiO2
QZF-150-30	200-4500	75	150	0.75	SiO2
QZF-210-40	200-4500	75	210	0.5	SiO2
TEF-200-50	400-1600	60	200	0.75	TEO2
TEF-270-100	400-1600	60	270	0.75	TEO2
TEF-540-200	400-1600	40	540	0.18	TEO2
TEF-600-400	400-1600	40	600	0.18	TEO2
TEF-1000-300	400-1600	40	1000	0.076	TEO2
TEF-1700-350	400-1600	15	1700	0.076	TEO2

For the associated RF drivers, please refer to "RF Drivers for STBR series"

7. Mode Lockers

An acousto-optic mode locker (AOML) modulates the loss within a laser cavity at its resonant frequency, effectively “locking” the phase of the longitudinal modes to generate very narrow laser pulses of high intensity. G&H standing wave mode lockers yield near-theoretical mode locked laser pulse widths, with industry-leading transmission performance. Available in antireflection (AR) coated and Brewster angle options, they can also be customized for demanding one-off scientific and OEM applications.



We combine extensive AO device design experience with strict manufacturing controls to deliver high-Q (very low loss) mode lockers with minimal extraneous modes, achieving picosecond and femtosecond length pulses at repetition rates of up to 200 MHz. To ensure high quality and reliability lockers use high quality fused silica, polished and fabricated in-house. Greater than 99% transmission at 1064 nm is achieved with a durable in-house antireflection V-coat. Transmission over a broader range of wavelengths (700-1100 nm) can be achieved using windows cut to the Brewster angle. Low scatter and tight quality controls ensure that every mode locker is capable of handling high peak laser power over the long term without damage.

RF driver selection impacts mode locking system performance, as active temperature control of the acoustic resonator can assist in controlling resonant frequency such that resonance at the precise frequency of the driver’s oscillator can be maintained. G&H can assist in choosing the right driver for your application, advising on how performance of each RF driver will influence mode locking efficiency and pulse width.

Our standard models are below:

Model	Wavelength	Operating Frequency	Active Aperture	Window Type	Optical Material
I-ML041-3C4G-3-GH101	1064 nm	41 MHz	3 mm	AR coated	Fused silica
I-ML080-3C4G-3-GH101	1064 nm	80 MHz	3 mm	AR coated	Fused silica
I-ML041-4.5C4R4-3-GH102	700-1100 nm	41 MHz	4.5 mm	Brewster	Fused silica
I-ML080-4.5C4R4-3-GH102	700-1100 nm	80 MHz	4.5 mm	Brewster	Fused silica

STBR series free space Mode Lockers

The STBR Free Space Acousto-Optic (AO) Standing Wave Mode Lockers, with corresponding RF Variable Frequency drivers, are designed so the frequency matches the customer's laser resonant cavity longitudinal mode frequencies. It is necessary to adjust the resonant laser cavity mode spacing frequency to be equal to twice the original acoustic wave frequency to achieve mode locking. The mode-locking technique is actually a phaselocking process, connecting the various longitudinal modes by fixing the relative phase differences among them.



Model #	FSML-40-20-BR-800	FSML-80-20-BR1064	FSML-125-30-BR800	FSML-125-30-BR1064
Substrate	Fused Silica	Fused Silica	Fused Silica (uncoated)	Fused Silica (uncoated)
Brewster cut	Brewster cut optimizes for horizontal polarization at:			
Laser Wavelength (nm)	800	1064	800	1064
Active Aperture (mm)	Up to 5 x 5 mm	Up to 5 x 5 mm	Up to 5 x 5 mm	Up to 5 x 5 mm
Carrier Frequency (MHz)	40	80	125	125
Modulation Rate (MHz)	80	160	250	250
3dB Bandwidth	+50	+10	+15	+15
Optical Transmission (%)	99.7%	99.7%	99.7%	99.7%
Resonant Modulation Depth	70%	60%	50%	30%
Acoustic Velocity (m/s)	5.96E+3	5.96E+3	5.96E+3	5.96E+3
Wave Front Distortion	$\lambda/10$	$\lambda/10$	$\lambda/10$	$\lambda/10$
Input Impedance	50 ohms	50 ohms	50 ohms	50 ohms
Maximum Electric Input Power	5-7 Watts	5-7 Watts	5-7 Watts	5-7 Watts
VSWR	N/A	N/A	N/A	N/A
Case Type	Water cooled	Water cooled	Water cooled	Water cooled

For the associated RF drivers, please refer to "RF Drivers for STBR series". For Q-switches, you can consider RF Driver model STBR-VFE-XX-YY-DSP1kHz-B2-F7-X. The VFE-XX-YY-DSP1kHz-B2-F7-X is a variable frequency driver operating from 40 MHz to 60 MHz. The frequency adjustment is done via front panel switches with a 1 KHz step size. The output RF power is ~7 Watts optimized for maximum performance of the AO device. A TTL-compatible modulation input is provided to turn "off" the mode-locking function. Also, using the "return voltage read-out" output can identify the resonant or non-resonant frequencies. At resonant frequency, most of the RF energy entering the crystal is absorbed and the minimal back reflection is monitored using this port.

8. Multi-channel Modulators

Acousto-optic multi-channel modulators (AOMC) allow multiple beams to be modulated or deflected independently by integrating an array of transducers with a single acousto-optic crystal. Our proprietary optical and electrical designs minimize crosstalk, allowing concurrent operation of up to 48 channels for modulation, and up to 8 channels for beam deflection. Our AOMCs are known for their reliable operation and high performance.



Multi-channel modulators have parallel beams as input, each beam independently controlled by a different transducer to modulate its intensity. Multi-channel modulators are most often used for high speed applications like micromachining and direct-write lithography, as each beam can be modulated independently.

These devices can also be used to increase throughput when writing large media by writing multiple beams at the same time. Our multi-channel modulators equal the performance available with our single channel modulators, and can be customized for large aperture applications as well as high speed, small aperture applications.

A multi-channel beam deflector however, generates multiple diffracted beams from a single input beam at specific locations by simultaneously applying multiple frequencies to a single transducer. Each individual channel is a deflector that can either scan the beam or produce multiple spots. This makes it possible to create a two-dimensional grid. For example, if a four channel beam deflector were configured so that each channel diffracted three spots, the result would be a 4x3 grid.

High laser damage threshold is achieved using low-scatter materials. These are inspected to rigorous quality standards. We grow our own tellurium dioxide and source high quality fused silica and crystalline quartz to ensure low insertion loss and excellent optical power handling.

Our standard models are below:

Model	Wavelength	Number of Channels	Rise/Fall Time	Active Aperture	Operating Frequency	Optical Material
AOMC 220-4	350-365 nm	4	16 ns	0.24 mm	190-250 MHz	Crystalline quartz
AOMC 125/24-3	350-365 nm	24	23 ns	0.5 mm	125 MHz	Crystalline quartz
AOMC 3160-8	364 nm	8	21 ns	0.18 mm	160 MHz	Fused silica
AOMC 300-5	413 nm	5	10 ns	0.2 mm	300 MHz	Crystalline quartz
AOMC 220-5	413 nm	5	16 ns	0.24 mm	220 MHz	Crystalline quartz
AOMC 3350-6	350-850 nm	6	30 ns	0.33 mm	350 MHz	Tellurium dioxide

9. Pulse Pickers, Cavity Dumpers

Pulse pickers and cavity dumpers are high speed acousto-optic modulators which separate and divert a single laser pulse within a pulse train to a new optical path. A cavity dumper is used inside the cavity of a mode locked laser, while a pulse picker describes the same function when used externally. Both use high speed acousto-optic crystal and specialized design techniques to keep rise time to a minimum while operating at a low duty cycle to select individual laser pulses with speed and synchronization.



Tight focusing of the beam within the device is required to achieve the desired speed (typically <math><0.1\text{ mm}</math>), resulting in very high input power density. Our rigorous manufacturing standards and high crystal quality minimize scatter and enable industry-leading optical power handling. Antireflection coatings minimize insertion loss.

By using a high RF carrier frequency and an optimized lens design, our pulse pickers and cavity dumpers provide large angular separation between the deflected and undeflected beams (up to 75 mrad). This makes it easy to separate the two beams in space and maintain a static contrast ratio of at least 500:1.

The choice of RF driver is particularly important to achieve accurate synchronization with the laser pulse train. Controls on the driver optimize the RF drive pulse shape and delay. The modulation signal is synchronized and optimized using a control loop to select the best time at which to pick off the pulse. Extinction ratio relative to adjacent and subsequent pulses can also be affected by the choice of driver, though >20 dB can be achieved.

Our standard models are below:

Model	Wavelength	Rise/Fall Time	Active Aperture	Operating Frequency	Optical Material
13389-BR AOCD/AOPP	350-850 nm	6 ns	60 μm	389 MHz	Fused silica
17389-.93-FOA AOPP	700-1064 nm	7 ns	70 μm	389 MHz	Tellurium dioxide
I-M080-2C10G-4-AM3	1030-1064 nm	113 ns/mm	2 mm	80 MHz	Crystalline quartz
I-M080-4C10G-4-GH60	1030-1064 nm	113 ns/mm	4 mm	80 MHz	Crystalline quartz
I-M150-0.5C10G-8-GH48	1064 nm	30 ns	0.5 mm	150 MHz	Crystalline quartz
I-M110-1C10G-8-GH48	1064 nm	60 ns	1 mm	110 MHz	Crystalline quartz

STBR series free space Cavity dumpers/ Pulse Pickers

The STBR series Free Space Cavity Dumper is typically used in a mode-locked laser cavity to separate a single optical pulse from the pulsed energy circulating. As a result, nearly all the laser energy is dumped out of the resonant cavity in the form of a single optical pulse. A cavity dumper offers high peak power and higher repetition frequencies. The STBR series high-speed Pulse Picker is used typically in high-speed optical pulse picking external to a laser cavity and is designed to extract single pulses from a fast train of laser pulses up to 100 MHz – few GHz pulse repetition rate, and re-direct the pulse into a different optical path. A cavity-dumped laser, a pulse picker is often called a cavity dumper, extracts the circulating pulse from the cavity in only every Nth round trip. The Pulse Picker is in most cases either an electro-optic modulator or an AO Modulator, combined with a suitable fast electronic driver.



CAVITY DUMPERS:

Model #	TECD-380-95-543	TECD-380-50-780	TECD-380-95-800	FSCD-250-54-BR-400	FSCD-380-92-BR-800

Substrate	TeO2	TeO2	TeO2	SiO2	SiO2
Laser Wavelength (nm)	543	780	800	250-450	800
Active Aperture (mm)	0.30	0.30	0.10	0.10	0.10
Center Frequency (MHz)	380	380	380	250	380
3dB Modulation Bandwidth (MHz)	95	50	95	54	92
Optical Transmission (%)	>95	>95	>98	>98	>98
Max Diffraction Efficiency (%)	70%@1W	40%@1W	60%@2W	70%@5W	30%@10W
Rise time (nsec)	10	20	5.8	10	6
Beam spot size (um)	31	62	29	72	42
Acoustic Velocity (m/s)	4.2E+3	4.2E+3	4.2E+3	5.96E+3	5.96E+3
Wave Front Distortion	$\lambda/10$	$\lambda/10$	$\lambda/10$	$\lambda/10$	$\lambda/10$
Bragg Angle	1.4mrad	2.0mrad	36mrad	9mrad@450nm	25mrad
Input Impedance	50 ohms	50 ohms	50 ohms	50 ohms	50 ohms
Optical Polarization	Linear	Linear	Linear	Linear (vertical)	Linear (vertical)
VSWR	2.1:1	2.1:1	2.1:1	2.1:1	2.1:1

For the associated RF drivers, please refer to “RF Drivers for STBR series”.

PULSE PICKERS:

Model #	TEPP-200-40-BR	FSP-380-76-BR
Substrate	TeO2	SiO2
Laser Wavelength (nm)	700 - 1200	700 - 1200
Active Aperture (mm)	0.10	0.10
Center Frequency (MHz)	200	380
Digital Modulation Bandwidth (MHz)	40	80
Optical Transmission (%)	> 99.8	> 99.8
Diffraction Efficiency (%)	~ 40-50	> 25
Rise time (nsec)	14	6
Acoustic Velocity (m/s)	4.2E+3	5.96E+3
RF Power Level (W)	2 (50% duty cycle max.)	10 (10% duty cycle max.)
Bragg Angle (mrad)	29	25
Separation Angle (mrad)	59	50
Wave Front Distortion	$\lambda/10$	$\lambda/10$
Input Impedance	50 ohms	50 ohms
Optical Polarization	Linear	Linear
VSWR	2:1	2:1
RF connector	SMA	SMA

Both case types allow for Brewster angle adjustment of the input optical beam. The device should operate only with pulsed RF power. The max CW RF power that can be used without damage is 1 Watt. For associated RF Drivers, please see “RF Drivers for STBR series”.

10. Tunable Filters

An acousto-optic tunable filter (AOTF) is a solid-state, electronically-addressable random-access optical pass-band filter. It may be used to rapidly and dynamically select a specific wavelength from a broadband or multi-line source. When specific matching conditions between the acoustic and optical beams are met, diffraction will occur. As a result it is possible to electronically control key filter parameters such as wavelength, modulation-depth and even bandwidth, thus providing rapid (typically μ s), dynamic, random access optical filtering.



Resolution bandwidths down to <0.1% are available with exceptional performance and with aperture sizes up to 25 mm and beyond. We have developed and patented techniques to allow us to offer options such as large-aperture imaging filtering, sideband suppression, and transmission of multiple discrete wavelengths.

We offer a range of AOTFs to suit a variety of applications. For scanning an entire image in wavelength at speeds sufficient for real-time video rate spectral imaging, high optical throughput is required. For this purpose devices with large aperture and/or field of view are recommended.

Our standard models are below:

Model	Wavelength	Active Aperture	Resolution
AOTF 2837-31	351-430 nm	2.5 mm	1.0 nm
AOTF 3151-01	400-650nm	2.5 mm	2.5 nm
TF525-250-6-3-GH19A	400-650 nm	3 mm	5 nm
TF525-250-4-6-GH57A	400-700 nm	6 mm	4 nm
TF560-280-1-5-NT2	420-700 nm	5 mm	0.3 nm
AOTF 2838-01	450-670 nm	2.5 mm	1.3 nm
AOTF 2885-02	450-670 nm	2.5 mm	2 nm
AOTF 2885-04	450-670 nm	2.5 mm	4 nm
TF625-350-2-11-BR1A	450-800 nm	11 mm	1.5 nm
TF850-500-1-3-PF3	600-1100 nm	3 mm	1.5 nm
TF850-500-10-6-GH58A	600-1100 nm	6 mm	10 nm
AOTF 2986-01	640-1100 nm	2.5 mm	5 nm
TF925-550-10-3-GH29A	650-1200 nm	3 mm	9 nm
TF950-500-1-2-GH96	700-1200 nm	2 mm	0.6 nm
TF950-500-0.3-3-GH98	700-1200 nm	3 mm	0.3 nm
TF950-500-1-5-NT2	700-1200 nm	5 mm	0.8 nm
TF1300-800-16-11-NO1A	900-1700 nm	11 mm	16 nm
TF2270-2560-5-5-GH65	990-3550 nm	5 mm	5 nm
AOTF 2996-01	1100-2000 nm	2.5 mm	12 nm
TF1650-1100-2-3-GH40	1100-2200 nm	3 mm	1.6 nm
TF1650-1100-9-3-GH30A	1100-2200 nm	3 mm	8 nm
TF1875-1250-10-6-GH59A	1250-2500 nm	6 mm	10 nm
TF1900-1100-6-11-GH54A	1300-2500 nm	11 mm	6 nm
TF1900-1100-6-25-GH87A	1350-2450 nm	25 mm	6 nm
TF2000-1000-2-6-GH78	1500-2500 nm	6 mm	1.2 nm
TF2250-1500-12-7-GH61A	1500-3000 nm	7 mm	12 nm
TF2900-2200-5-3-GH40	1800-4000 nm	3 mm	5 nm
TF3000-2000-3-7-GH78	2000-4000 nm	7 mm	2.6 nm
TF3300-2200-xxx	2200-4400 nm	Up to 15 mm	Varies

STBR series free space tunable filters

The STBR series Dynamic Tunable Bandpass Filter adjusts the center wavelength of a narrow band of light over a 100 - 200nm range. It offers very high resolution of ~1.5nm and either single or simultaneous multiple wavelength selection. It is able to precisely and rapidly adjust the wavelength and intensity of the diffracted/filtered light by varying the frequency (see graph) and RF power. We offer both free-space and fiber-coupled configurations. AOTFs are used widely in numerous optical systems and applications, especially in industrial or process control near-infrared (NIR) spectroscopy applications.



Model #	Spectral Range (nm)	Drive RF Frequency (MHz)	Optical Aperture (mm)	Spectral Resolution (nm)			Acceptance Angle (deg.)		DE (%)
				S	H	EH	S	H	
STBR-QZAF-.20-.40	200-400	90-250	2.0 x 10.0	1.2-7.0			4.4-7.2		20-30
STBR-TEAF_-.36-.52_	360-520	100-190	5.0 x 5.0 Available Standard Optical Apertures includes: 3.0x3.0 5.0x5.0 7.0x7.0 10.0x10.0 Other optical apertures are available upon request.	S	H		S	H	70
STBR-TEAF_-.40-.65_	400-650	220-110		0.8-4.0	0.5-2.2		4.18-4.36	2.85-3.4	70-90
STBR-TEAF_-.45-.70_	450-700	180-100		1.0-5.1	0.5-2.5		4.8-6.2	3.4-4.4	70-90
STBR-TEAF_-.55-1.0_	550-1000	155-70		1.7-6.2	0.8-3.2		5.2-6.5	3.6-5.0	70-90
STBR-TEAF_-.40-1.0-2CH*	400-1000	220-70		1.5-8.3	0.9-5.0		4.3-5.9	3.2-4.5	70-90
STBR-TEAF_-.80-1.6_	800-1600	130-60		1.2-8.3	0.7-5.0		3.8-5.9	2.8-4.6	50-60
STBR-TEAF_-1.2-2.0_	1200-2000	90-50		S	H	EH	S	H	70-90
STBR-TEAF_-1.5-3.0_	1500-3000	68-34		4-10	3-8	2-6	5.39-5.71	4.96-7.2	25-35
STBR-TEAF_-2.4-4.5_	2400-4500	40-20		6-16	6-12	4-9	6.78-8.56	5.3-7.5	30
STBR-TEAF_-0.8-1.6-UH	800-1600	190-90		9-37	8-29	6-22	7.4-9.26	6.6-7.95	40
STBR-TEAF_-1.2-1.7-UH	1200-1700	120-80	25-83	18-65	14-48	8.43-11.38	7.3-9.72	60	
STBR-TEAF_-1.5-2.4-UH	1500-2400	90-55	S	H		S	H	50	
STBR-TEAF_-2.4-3.2-UH	2400-3200	55-40	2-6	2.0-4.5		9.9-15.2	8.65-13.3	40	
STBR-TEAF_-3.2-4.5-UH	3200-4500	45-30	5-7	3.0-5.0		11.9-14.68	9.47-12.88	35	
			6-14	4.5-11.0		13.4-16.95	11.9-15.2	30	
			14-25	11.0-17.0		16.95-19.8	15.2-17.29		
			24-48	17.5-37.0		19.8-23.44	17.29-20.9		

* Available in low or standard resolution.

A crystal of Tellurium Dioxide (TeO₂) AOTF that operates in the NIR region in a so-called non-collinear configuration - the acoustic and optical waves propagate at quite different angles through the crystal.

Material:

TE – Tellurium Dioxide (350-5000 nm)

QZ – Quartz (SiO₂)

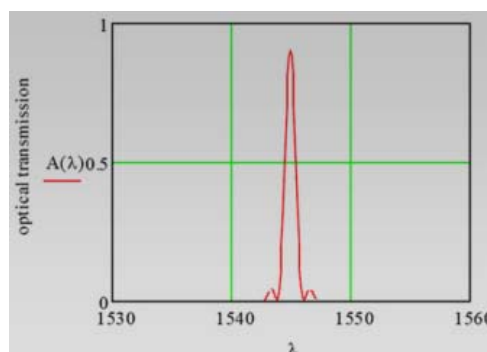
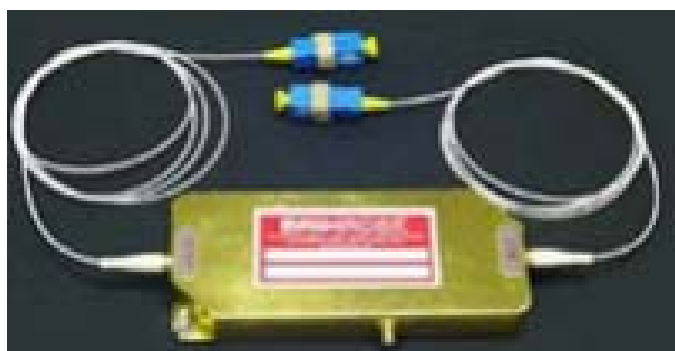
Options: S – Standard Resolution

H – High Resolution

EX – Extra high Resolution

UH – Ultra high Resolution

STBR series fiber coupled tunable filters



The STBR dynamic tunable bandpass filters are commonly used to dynamically select among different wavelength channels at the receiver end of dense WDM transmission systems. Other applications include tuning the center wavelength of broadband sources (such as white light sources or LEDs) in laboratory test and measurement systems. A typical band-pass shape of the selected light by AOTF filter is shown in the diagram above on the right

Model #	Wavelength Range (nm)	Spectral Resolution (MHz)	RF Frequency (MHz)	Insertion Loss (dB)
STBR-TEAF-0.40-0.60-2FP	400-600	1-5	59-100	3-5
STBR-TEAF-0.45-0.7-S-2FP	450-700	3-9	100-180	3-5
STBR-TEAF-0.9-1.2-UH-2FP	900-1200	1	130-160	4-5
STBR-TEAF-1.2-1.7-UH/EH-2FP	1200-1700	1.0-2.5	80-120	~5
STBR-TEAF-1.5-1.65-UH/EH-2FP	1500-1650	1.5-2.5	80-100	~5
STBR-TEAF-1.1-2.1-S-2FP	1100-2100	4.0-15.0	50-100	5-7

Fiber Type:

- Single-Mode (SM) fiber
- Single-Mode Polarization Maintaining (SM/PM) fiber
- Multimode (MM) fiber

Other fiber types are available on request.

Fiber Connectors:

FC, SC, LC, SMA, etc.

Other fiber connectors are available on request

Options:

S – Standard Resolution

H – High Resolution

EH – Extra-high Resolution

UH – Ultra-high Resolution

Other wavelengths are available upon request.

RF Drivers for STBR Series (free space or fiber coupled) tunable filter:

Model	STBR-VFI-XX-YY-SPS-A-C3	STBR-VFI-XX-YY-SPF-A-C3
Frequency range	XX MHz (matching the tunable filter requirements)	
Frequency Step Size	4 Hz	10 Hz
Frequency Stability	0.010% (100PPM); +15°C to +75°C	0.015% ; +15°C to +75°C
Frequency Switching Speed	15ms typ. (from f_{min} to f_{max})	8ns
Minimum Duration of Each step	N/A	32ns for sweeping mode 1ms for hopping mode (for <300 hops) 15ms for hopping mode (>300)

		hops)
Power output	Optimised for max performance of the tunable filter device	
Power control	N/A	12 bit attenuator with 25dB range (min.)
Modulation	None (TTL or Analog optional)	
Enclosure	The unit will be packaged in a 190 mm (7.5 inch) wide by 90 mm (3.5 inch) high by 220 mm (8.75 inch) deep instrument case. The rear panel heat sink increases the depth to 270 mm (10.5 inches) maximum. The size is exclusive of connectors. A detachable AC line cord and RF cable are provided.	
Environmental	Nominal Laboratory conditions: The maximum ambient temperature is +35° C. The unit is not sealed against moisture or condensing humidity.	
Output Impedance	50 ohms	
Output Connectors	SMA jack on front panel	

Detailed Specifications of AOMs

1. Free-space Acousto-Optic Modulators (AOMs)

1.1 AO Modulator M080-2G-LV1

- High efficiency (95% typical)
- Low drive power (0.3W typical)
- Compact
- Easy to align

Description

The M080-2G-LV1 is a compact AO Modulator specifically designed for extra-cavity modulation of Nd:YAG/Nd:YVO4 lasers where fast modulation is not critical.

Rise times down to 10 μ s are readily achievable, together with excellent efficiency, typically > 95% for a well-collimated laser beam.

The relatively wide field of view means that good efficiency is achieved for more divergent beams.

Specification

Interaction Material: TeO₂
Wavelength: 1064nm
Anti-Reflection Coating: < 0.3% per surface
Polarisation Alignment: $\pm 5^\circ$
Frequency: 80MHz
Input Impedance: 50 Ω
Acoustic Mode: Slow Shear
Active Aperture: 2.0 x 5.0mm
Clear Aperture: 4.0 x 5.0mm (min)
Recommended Beam Diameter: 1mm
Input Polarisation: Linear - vertical to base
Diffracted Beam Polarisation: Linear - rotated by 90° wrt input
Diffraction Efficiency: > 90%
RF Connector: SMA Female
RF Power: 0.5W
RF Driver Model No.: A36080, N21080-1DM or N21080-1AM



1.2 AO Modulator M111-10C-TR7

- 514 to 532 nm
- High damage threshold
- 111MHz drive frequency

Description

An acousto-optic modulator ideal for use with frequency doubled DPSS lasers. Manufactured in Crystal Quartz for improved thermal management and efficiency, this modulator combines high quality optical finishing with in house anti-reflection coatings to provide high extinction ratio and optimised throughput.

Alternative wavelengths, apertures or package designs are available.

Specification

Interaction Material: Crystal Quartz
Wavelength: 514 to 532nm



Anti-Reflection Coating: < 0.3% per surface
Transmission: > 99.5%
Polarisation: Linear, vertical to base
Extinction Ratio (1st order on / off) > 55dB
Damage Threshold: > 50KW/cm² (Average)
> 500MW/cm² (Peak)
Frequency: 111MHz
VSWR: < 1.2:1 (50Ω input impedance)
Active Aperture: 2.0mm
Diffraction Efficiency: > 85%
Rise-Time / Fall-Time: 110ns / mm
Separation Angle: 9.6mrad at 515nm
RF Power: < 5.0W
RF Driver Model No.: A35111, N31111-5DM, N31111-5AM

1.3 AO Modulator M080-2B/F-GH2

- 480 to 800nm
- 80MHz drive frequency
- Up to 2mm beam diameter

Description

A general purpose acousto-optic modulator for use is in the visible or near infra-red spectral regions. It's broadband anti-reflection coatings and large active aperture make it the ideal choice for cost-effective amplitude modulation of a wide range of low-power gas and diode lasers.

Available for the visible (B/E) and near infra-red (F), with active apertures of 2mm, laser beams with diameters ranging from 0.5 to 2mm may be modulated at moderate speed with high efficiency. For faster modulation, please refer to our extensive range of other AO modulators.

Specification

Interaction Material: Tellurium Dioxide
Wavelength: 480 to 800nm
Anti-Reflection Coating: < 0.5% per surface
Transmission: > 95%
Polarisation: Any
Frequency: 80MHz
VSWR: < 1.2:1 (50Ω input impedance)
Active Aperture: 2mm
Rise-Time / Fall-Time: 155ns/mm
Diffracted Beam Ellipticity: < 5% typical
Diffraction Efficiency: > 85% typical
RF Power: < 2W

Driver Selection:
A36080,
Digital Modulation: N21080-2DM
Analogue Modulation: N21080-2AM

1.4 AO Modulator M250-2x-xx

- 488, 532 and 633nm
- 250MHz drive frequency
- 10ns rise-time

Description

An acousto-optic modulator combining high efficiency and fast switching speed, is suitable for use with visible wavelength lasers. This AOM features excellent extinction ratio, superb diffraction efficiency even at maximum modulation rates and minimal optical beam quality distortion.



Options include a choice of mounting and pivot holes, RF connectors and aperture dimensions. Alternative models in lead molybdate or for other wavelengths are available.

Specification

Interaction Material: Tellurium Dioxide
Acoustic Mode: Isotropic, compressional
Wavelength M250-2B-P2: 488nm, < 20mW
M250-2C-ES1: 532nm, < 20mW
M250-2E-O2: 633nm
Anti-Reflection Coating: < 0.2% per surface
Transmission: > 97%
Polarisation: Linear, vertical to base
Frequency: 250MHz
VSWR: < 1.2:1 (50Ω input impedance)
Active Aperture: 0.4mm
Separation Angle: 28 to 37mrad, wavelength dependant
RF Power: < 1.5W

Performance with a 65μm diameter, linearly polarised beam:

Rise-Time / Fall-Time: 10ns
Modulation Bandwidth: 50MHz
Diffracted Beam Ellipticity: < 10%
Diffraction Efficiency: > 85%

Driver Selection

A36250, N21250-2AM, N21250-2DM

1.5 AO Modulator M350-2x

- 488nm, 532nm and 633nm
- 350MHz drive frequency
- 5ns rise-time

Description

A high bandwidth acousto-optic modulator is for use in the visible RGB spectral region. Using specially selected top-grade tellurium dioxide and with our renowned quality manufacturing processes, this modulator provides fast switching capability at low RF drive powers.

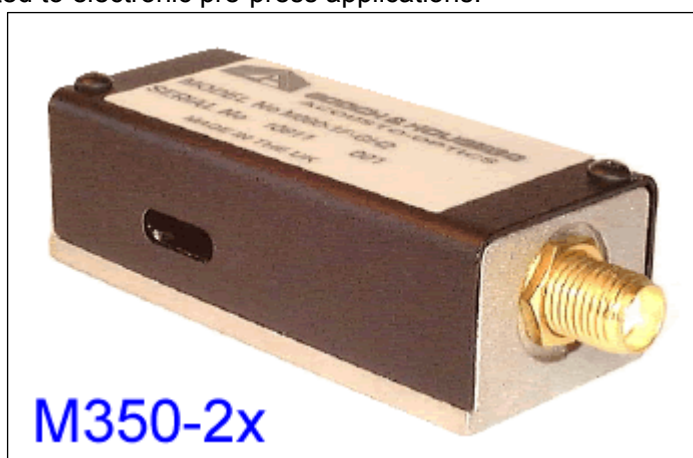
Available in three models, one each for red, green and blue, high efficiency coupled with excellent transmitted beam quality make it particularly suited to electronic pre-press applications.

Specification

Interaction Material: Tellurium Dioxide
Acoustic Mode: Isotropic, compressional
Wavelength M350-2B: 488nm, < 20mW
M350-2C: 532nm, < 20mW
M350-2E: 633nm
Anti-Reflection Coating: < 0.2% per surface
Transmission: > 97%
Polarisation: Linear, vertical to base
Frequency: 350MHz
VSWR: < 1.2:1 (50Ω input impedance)
Active Aperture: 0.15mm
Separation Angle: 40 to 52mrad, wavelength dependant
RF Power: < 2W

Performance with a 30μm diameter, linearly polarised beam:

Rise-Time / Fall-Time: 5ns
Modulation Bandwidth: 100MHz
Diffracted Beam Ellipticity: < 15%



Diffraction Efficiency: > 80%

Driver Selection: Analogue / Digital Modulation: A35350

1.6 AO Modulator M111-2J-AV1

- 1520 to 1630nm
- 111MHz drive frequency
- 60ns rise-time

Description

A free-space acousto-optic modulator appropriate for use either intra-cavity or extacavity, for example to Q-Switch or modulate erbium doped fibre lasers.

Broadband anti-reflection coatings, combined with top grade tellurium dioxide, guarantee excellent throughput and beam quality. Special design and high quality manufacturing processes result in superior efficiency with excellent extinction ratio.

Specification

Interaction Material: Tellurium Dioxide
Acoustic Mode: Isotropic, compressional
Wavelength: 1520nm to 1630nm
Transmission: > 97%
Damage Threshold: >10MW/cm² Pulsed, >50KW/cm² CW
Polarisation: Any
Frequency: 111MHz
VSWR: < 1.2:1 (50Ω Input Impedance)
Active Aperture: 0.65mm
Separation Angle: 39 to 43mrad, wavelength dependant
RF Power: 3.5W
Operating Temperature: +10 to +60°C
Storage Temperature: - 15 to +65°C



M111-2J-AV1

Performance with a 400µm diameter, linearly polarised beam:

Rise-Time / Fall-Time: 61ns
Modulation Bandwidth: 8.2MHz
Extinction Ratio: > 40dB
Diffracted Beam Ellipticity: < 20%
Diffraction Efficiency: > 85%

Driver Selection

A35111, N31111-3.5DM or N31111-3.5AM

1.7 AO Modulator M110-10UV-OR1

- 351, 355 & 364nm
- High damage threshold
- 110MHz drive frequency

Description

An acousto-optic modulator ideal for use with 355nm frequency tripled Nd:YAG and Nd:YVO₄ or 351nm / 364nm Argon lasers.



M110-10UV-OR1

Manufactured in Crystal Quartz for improved thermal management & efficiency. This modulator combines high quality optical finishing with in house anti-reflection coatings to provide high extinction ratio and optimised throughput.

Alternative wavelengths, apertures or package designs are available. Please don't hesitate to contact us with your specific requirements.

Specification

Interaction Material: Crystal Quartz
Wavelength: 351 to 364nm
Anti-Reflection Coating: < 0.3% per surface at 355nm
< 0.5% per surface at 351 to 364nm
Transmission: > 99% at 355nm
> 98.6% at 351 to 364nm
Polarisation: Linear, vertical to base
Extinction Ratio (1st order on / off) > 55dB
Damage Threshold: > 50KW/cm² (Average)
> 500MW/cm² (Peak)
Frequency: 110MHz
VSWR: < 1.2:1 (50Ω input impedance)
Active Aperture: 3.0mm
Diffraction Efficiency: > 85%
Rise-Time / Fall-Time: 110ns / mm
Separation Angle: 6.5mrad at 355nm
RF Power: < 3.0W

Driver Selection

A35111, N31111-3DM or N31111-3AM

1.8 AO Modulator M200-4A-GH11

- 380 to 430nm AO modulation
- 200MHz drive frequency
- 10ns rise-time

Description

An acousto-optic modulator suitable for use with frequency doubled Ti:Sapphire lasers.

Manufactured in fused silica and with our superior high damage threshold anti-reflection coatings this modulator provides extremely fast digital or analogue switching, coupled with an ultra-high extinction ratio and optimised throughput.

Specification

Interaction Material: Fused Silica
Acoustic Mode: Isotropic, compressional
Wavelength: 380 to 430nm
Polarisation: Linear, vertical to base
Anti-Reflection Coating: < 0.5% per surface
Transmission: > 98.5%
Extinction Ratio (1st order on/off): > 55dB
Frequency: 200MHz
Active Aperture: 0.20mm
Input Impedance: 50Ω
Maximum RF Power Requirement: 2.5W
Operating Temperature: +10 to +60°C
Storage Temperature: -15 to +70°C

Performance characteristics at 405nm:

Beam Diameter: 90μm
Rise-Time (10-90%): 10ns
Modulation Bandwidth (3dB): 50MHz
Diffracted Beam Ellipticity: < 15%
Separation Angle: 13.5mrad
Diffraction Efficiency: > 80%
RF Power: 2W

Driver Selection

M200-4A-GH11

1.9 AO Modulator M200-4B/E-LD5

- High intensity RGB modulation
- 200MHz drive frequency
- 10ns rise-time

Description

An acousto-optic modulator for use with high intensity RGB lasers, ideally suited for laser display and reprographic applications.

Manufactured in fused silica and with our superior high damage threshold anti-reflection coatings this modulator provides extremely fast digital or analogue switching in the RGB range, coupled with an ultra-high extinction ratio and optimised throughput.

Specification

Device: AO Modulator
 Interaction Medium: Fused Silica
 Acoustic Mode: Isotropic, compressional
 Operational Wavelength: RGB (446nm, 532nm, 628nm)
 Polarisation: Linear, vertical to base
 Laser Power Maximum: > 100W
 Optical Faces: 1deg wedged
 AR coating reflectivity: $\leq 0.5\%$ per surface
 Transmission: > 97%
 Extinction Ratio (1st order on/off) : > 55dB
 RF Drive Frequency: 200MHz
 Active Aperture: 0.2mm
 Diffraction Efficiency: > 70% (typically 75%) at 75um beam diameter
 Rise-Time: 10ns at 532nm, 90um beam diameter
 Input Impedance: 50 Ω
 Maximum RF Drive Power: 6W
 Operating Temperature: +10 to +60°C
 Storage Temperature: -15 to +70°C



M200-4B/E-LD5

Wavelength:	446nm	532nm	628nm
Beam Diameter:	90 μ m	90 μ m	120 μ m
Rise-Time (10-90%):	10ns	10ns	13.5ns
Modulation Bandwidth (3dB):	50MHz	50MHz	37MHz
Diffracted Beam Ellipticity:	16%	21%	17%
Separation Angle:	15mrad	18mrad	21mrad
Diffraction Efficiency:	> 80%	> 80%	> 80%
RF Power:	3W	4W	5.5W

Driver Selection

N31200-6DM, N31200-6AM

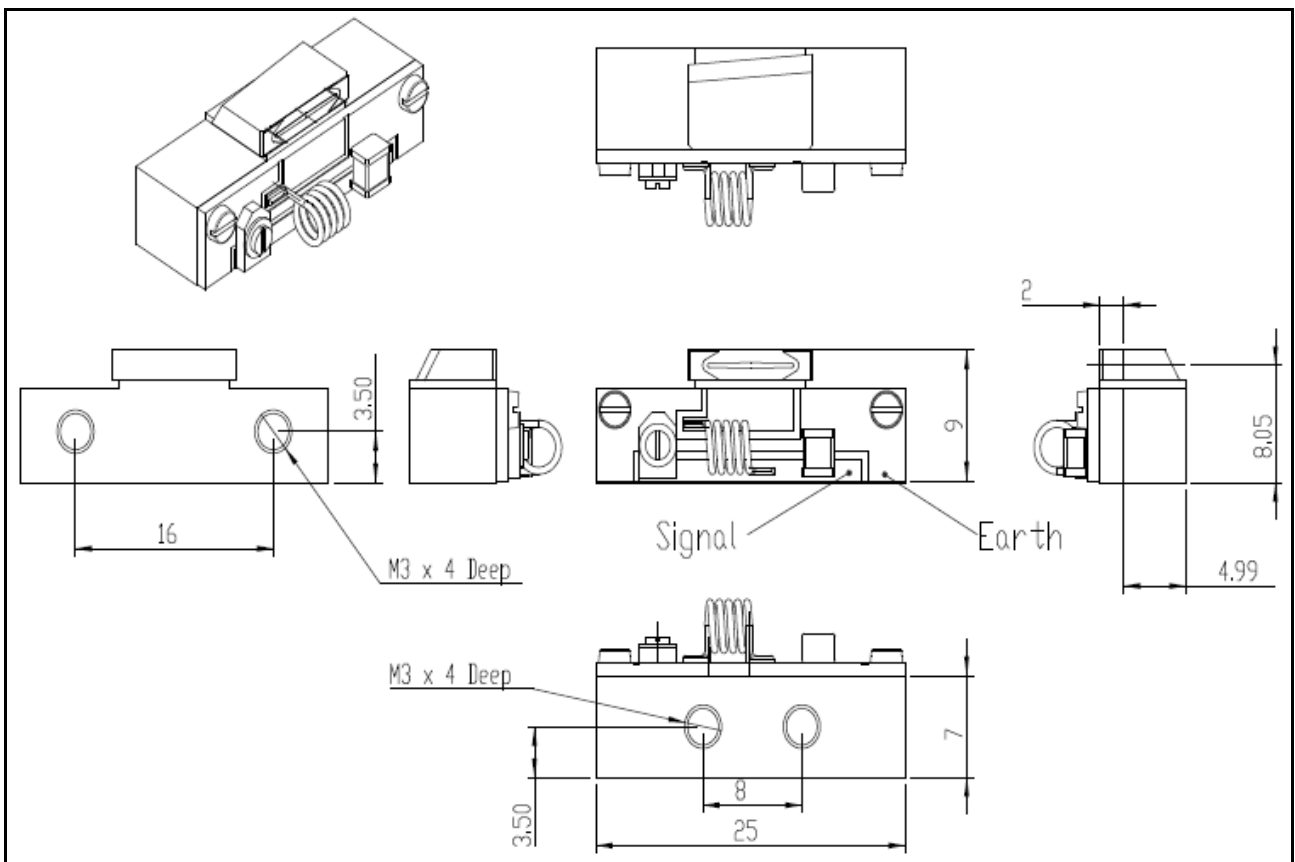
1.10 M080-2B/F-GH2

Device	AO Modulator
Interaction Material	Tellurium Dioxide
RF Frequency	80MHz
Wavelength	480 - 800nm
AR Coating Reflectivity	$\leq 0.5\%$ /surface
Transmission	$\geq 95\%$
Input Polarisation	Any
Active Aperture	2.0mm
Diffraction Efficiency	$\geq 85\%$
Risetime	155ns / mm
RF Input Impedance	50 Ω

RF Drive Power	< 2W (wavelength dependent)
RF Connector	SMA Female
Driver	N21080-2AM or N21080-2DM or A36080

1.11 I-M150-0.4C2G-GH42

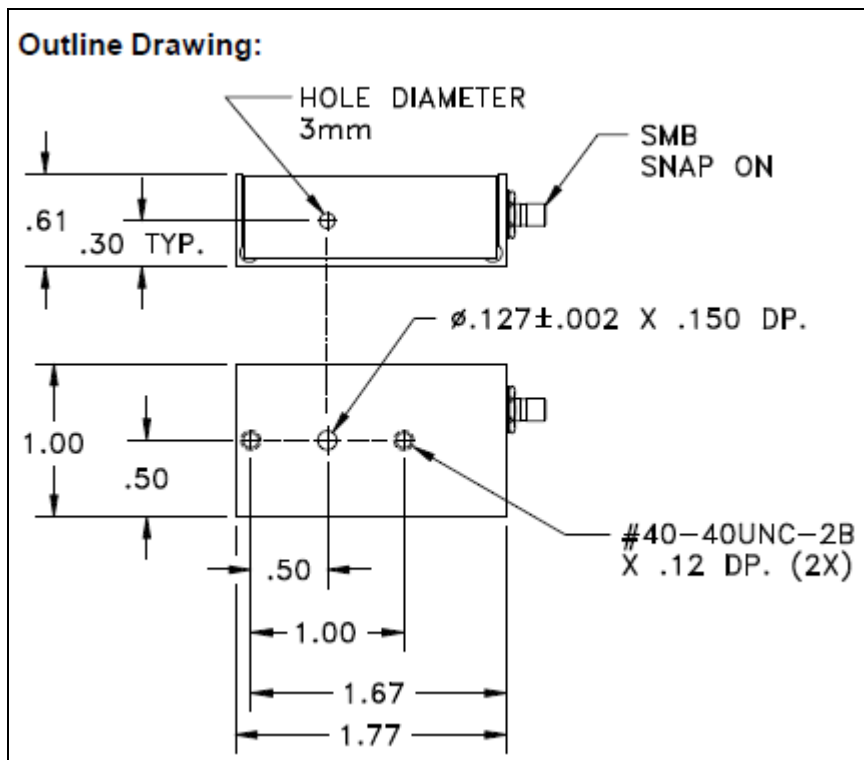
Device	AO Modulator
Interaction Material	Tellurium Dioxide
Wavelength	1064nm
Damage Threshold	> 50MW/cm ² (Pulsed)
RF Frequency	150MHz
AR Coating Reflectivity	≤ 0.2% /surface
Transmission	≥ 99.6%
Input Polarisation	Random
Active Aperture	0.4mm
Recommended Beam Diameter	0.2mm
Diffraction Efficiency	≥ 85%
Separation Angle	37.5mrad
Risetime (10% - 90%)	153ns / mm
RF Input Impedance	50Ω
Max. RF Drive Power	2W



AOMO 3350-111

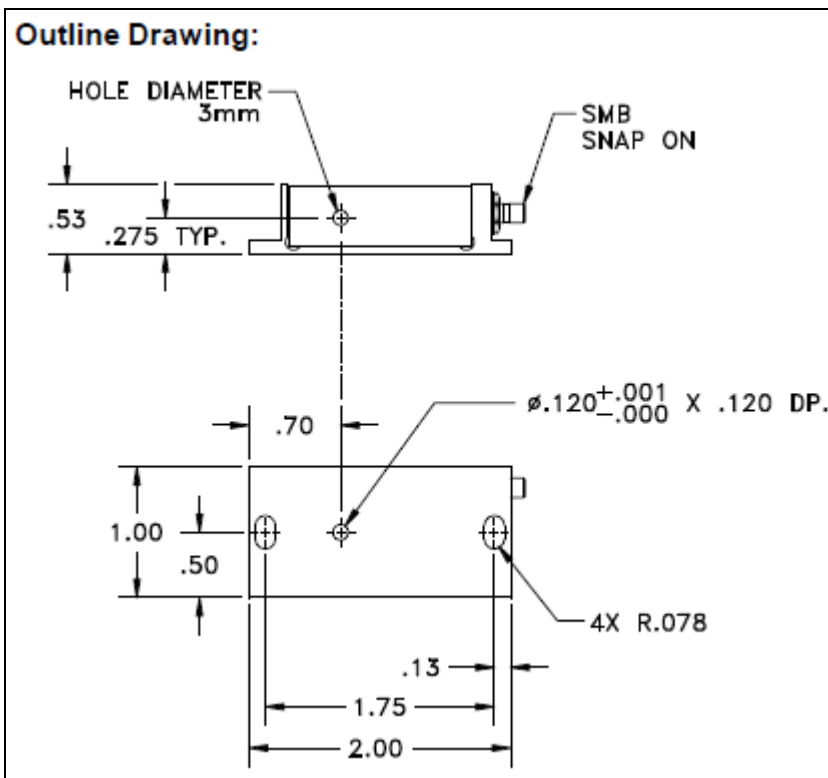
Device	AO Modulator
Interaction Material	Tellurium Dioxide
Acoustic Velocity	4.2mm/us
Active Aperture	2mm'L' X 0.15mm'H'
Center Frequency (Fc)	350MHz
RF Bandwidth	150MHz @ -10dB Return Loss
Input Impedance	50 Ohms Nominal
VSWR @ Fc	1.3:1 Max
Wavelength	440-650nm
Insertion Loss	4% Max
Reflectivity per Surface	1% Max
Anti-Reflection Coating	MIL-C-48497
Optical Power Density	<50W/mm ²
Contrast Ratio	1500:1 Min
Polarisation	Linear, 90deg to Mounting Plane
Damage Threshold	> 50MW/cm ² (Pulsed)
Operational RF power	1 W
Bragg Angle (mrad)	20.3 mrad (@488nm) 22.2mrad (@532nm) 26.4mrad (@633nm)
Beam Separation (mrad)	40.6mrad (@488nm) 44.4mrad (@532nm) 52.8mrad (@633nm)
Beam diameter	30um
Diffraction Efficiency %	70% (@488nm) 65% (@532nm) 45% (@633nm)
Rise Time (nsec)	7nsec

**The maximum optical power density should not exceed 1KW/cm² CW/ave for wavelengths <550nm. The optical power density should not exceed 100KW/cm² ave/CW for longer wavelengths.



AOMO 3350-120

Device	AO Modulator
Interaction Material	Tellurium Dioxide
Acoustic Velocity	4.2mm/us
Active Aperture	2mm'L' X 0.1mm'H'
Center Frequency (Fc)	350MHz
RF Bandwidth	150MHz @ -10dB Return Loss
Input Impedance	50 Ohms Nominal
VSWR @ Fc	1.3:1 Max
Wavelength	440-532nm
Insertion Loss	4% Max
Reflectivity per Surface	1% Max
Anti-Reflection Coating	MIL-C-48497
Optical Power Density	<50W/mm ²
Contrast Ratio	1500:1 Min
Polarisation	Linear, 90deg to Mounting Plane
Damage Threshold	> 50MW/cm ² (Pulsed)
Operational RF power	1 W
Bragg Angle (mrad)	20.3 mrad (@488nm) 22.2mrad (@532nm)
Beam Separation (mrad)	40.6mrad (@488nm) 44.4mrad (@532nm)
Beam diameter	30um
Diffraction Efficiency %	75% (@488nm) 70% (@532nm)
Rise Time (nsec)	6nsec



2. Fiber-coupled Acousto-Optic modulators (AOMs)

2.1 Fiber-Q

Gooch & Housego specialises in providing optical components for high power fibre laser and amplifier systems. In-house control of critical manufacturing processes, from crystalline material selection and orientation, cutting, polishing and AR coating through to fibre coupling, ensure our components are of the highest optical quality.

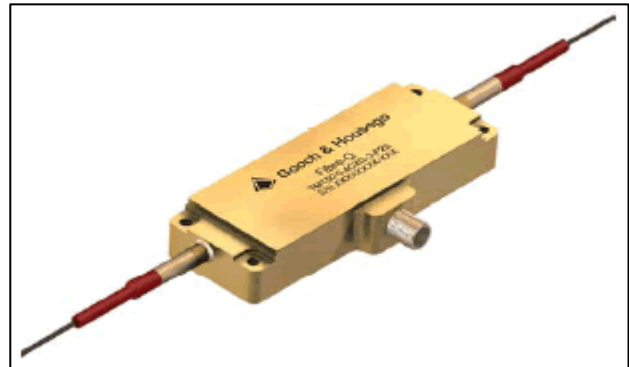
The 'Fibre-Q' Acousto-Optic Modulator is designed for use in pulsed fibre laser amplifier systems. In addition to the standard product shown, custom configurations are available for specialized applications.

Ordering Code:

Explanation: T-M150-0.4C2G-3-F2S (Modulator, 150MHz, 0.4mm active aperture, compressional mode, Tellurium Dioxide, 1064nm, SMA female bulk head connector, 2 fibre, single mode (Hi1060))

Key Features:

- _ Low insertion loss
- _ Compact, low profile package
- _ Rugged hermetic design
- _ Stable performance
- _ Custom configurations available



General Specifications:

Model	T-M040-0.5C8H-3-F2S	T-M040-0.5C8J-3-F2S
Interaction material:	Amtir-1	Amtir-1
Wavelength:	1310 (other wavelengths available on request)	1550 (other wavelengths available on request)
Average optical power handling:	1W	1W
Peak (pulse) optical power handling:	1kW typical (dependent on pulse width)	1kW typical (dependent on pulse width)
Insertion loss:	< 2.5dB	< 2.5dB
Return loss: Extinction ratio (1st order on / off)	> 40dB (>50dB version available on request) > 50dB	> 40dB (>50dB version available on request) > 50dB
Rise-time / fall-time:	70ns	70ns
Frequency:	40MHz	40MHz
VSWR:	< 1.3:1	< 1.3:1
Input impedance:	50Ω	50Ω
RF power:	< 0.4W	< 0.4W
Frequency shift:	40MHz (up-shift)	40MHz (up-shift)
Fibre type:	SMF28 (900µm black sleeving, 1.5m length)	SMF28 (900µm black sleeving, 1.5m length)
Fibre termination:	Bare fibre	Bare fibre
Application	Sensing (heterodyne interferometry) Intensity modulation	Sensing (heterodyne interferometry) Intensity modulation

Model	T-M040-0.5C8J-3-F2P	T-M080-0.4C2J-3-F2P
Interaction material:	Amtir-1	TeO2
Wavelength:	1550 (other wavelengths available on request)	1550 (other wavelengths available on request)
Average optical power handling:	1W	1W
Peak (pulse) optical power handling:	1kW	30kW typical (dependent on pulse width)
Insertion loss:	< 2.5dB	<3dB
Return loss: Extinction ratio (1st order on/off)	> 40dB (>50dB version available on request) > 50dB	> 40dB (>50dB version available on request) > 50dB

Rise-time / fall-time:	70ns	35ns
Frequency:	40MHz	80MHz
VSWR:	< 1.3:1	< 1.2:1
Input impedance:	50Ω	50Ω
RF power:	< 0.4W	< 3.0W
Frequency shift:	40MHz (up-shift)	80MHz (up-shift)
Fibre type:	PM1550(SM15-PS-U25A, 900um PVDF sleeving, 1.5m length)	PM1550(SM15-PS-U25A, 900um PVDF sleeving, 1.5m length)
Fibre termination:	FC/APC	Bare fibre
Application	Sensing (heterodyne interferometry) Intensity modulation	Sensing (heterodyne interferometry) Intensity modulation, Pulse picking

Model	T-M080-0.4C2J-3-F2S	T-M150-0.4C2G-3-F2S
Interaction material:	TeO ₂	TeO ₂
Wavelength:	1550nm (other wavelengths available on request)	1060nm (other wavelengths available on request)
Average optical power handling:	1W	5W
Peak (pulse) optical power handling:	30kW typical (dependent on pulse width)	30kW typical (dependent on pulse width)
Insertion loss:	<3dB	<2dB
Return loss: Extinction ratio (1st order on/off)	> 40dB (>50dB version available on request) > 50dB	> 40dB (>50dB version available on request) > 50dB
Rise-time / fall-time:	35ns	30ns
Frequency:	80MHz	150MHz
VSWR:	< 1.2:1	< 1.2:1
Input impedance:	50Ω	50Ω
RF power:	< 3.0W	<2W
Frequency shift:	80MHz (up-shift)	150MHz upshift
Fibre type:	SMF28(900um black sleeving, 1.5m length)	Nufern FUD 3583 10/125 NA 0.08, 900um black sleeving, 1.5m length
Fibre termination:	Bare fibre	Bare fibre
Application	Sensing (heterodyne interferometry) Intensity modulation, Pulse picking	Fibre laser, Fibre amplifier Pulse picker

Model	T-M150-0.4C2G-3-F2P	T-M200-0.1C2J-3-F2S
Interaction material:	TeO ₂	TeO ₂
Wavelength:	1060nm (other wavelengths available on request)	1550nm (other wavelengths available on request)
Average optical power handling:	5W	1W
Peak (pulse) optical power handling:	30kW typical (dependent on pulse width)	100uJ, based on 10ns pulse
Insertion loss:	<2.5dB	<6dB
Return loss: Extinction ratio (1st order on/off)	> 40dB (>50dB version available on request) > 50dB	> 40dB (>50dB version available on request) > 50dB
Rise-time / fall-time:	30ns	10ns
Frequency:	150MHz	200MHz
VSWR:	< 1.2:1	< 1.5:1
Input impedance:	50Ω	50Ω
RF power:	<2W	<3W
Frequency shift:	150MHz upshift	200MHz upshift
Fibre type:	Fujikura PM980 (SM98-PS-U25A) 900um black sleeving, 1.5m length	SMF28(900um black sleeving, 1.5m length)
Fibre termination:	Bare fibre	Bare fibre
Application	Fibre laser, Fibre amplifier, Pulse picker	Fibre laser, Pulse picker, Optical sensing

Model	T-M200-0.1C2J-3-F2P	T-M200-0.1C2G-3-F2S
Interaction material:	TeO ₂	TeO ₂
Wavelength:	1550nm (other wavelengths available on request)	1060nm (other wavelengths available on request)
Average optical power handling:	1W	1W
Peak (pulse) optical power handling:	100uJ, based on 10ns pulse	1kW typical (dependent on pulse width)
Insertion loss:	<6dB	<4dB
Return loss: Extinction ratio (1st order on/off)	> 40dB (>50dB version available on request) > 50dB	> 40dB (>50dB version available on request) > 50dB
Rise-time / fall-time:	10ns	10ns
Frequency:	200MHz	200MHz
VSWR:	< 1.5:1	< 1.5:1
Input impedance:	50Ω	50Ω
RF power:	<3W	<2.5W
Frequency shift:	200MHz upshift	200MHz upshift
Fibre type:	Fujikura PM1550 (SM15-PS-U25A) 900um black sleeving, 1.5m length	HI1060(900um PVDF sleeving, 1.5m length)
Fibre termination:	Bare fibre	Bare fibre
Application	Fibre laser, Pulse picker, Optical sensing	Fibre laser, Pulse picker, Optical sensing

Model	T-M200-0.1C2G-3-F2P	FS060-2F-F2P
Interaction material:	TeO ₂	TeO ₂
Wavelength:	1060nm (other wavelengths available on request)	852nm
Average optical power handling:	1W	>25mW
Peak (pulse) optical power handling:	1kW typical (dependent on pulse width)	
Insertion loss:	<4dB	<3dB
Return loss: Extinction ratio (1st order on/off)	> 40dB (>50dB version available on request) > 50dB	>40dB
Rise-time / fall-time:	10ns	
Frequency:	200MHz	60MHz
VSWR:	< 1.5:1	
Input impedance:	50Ω	50Ω
RF power:	<3W	<1W
Frequency shift:	200MHz upshift	
Fibre type:	Fujikura PM980 (SM98-PS-U25A) 900um black sleeving, 1.5m length	PM fiber 2m length
Fibre termination:	Bare fibre	SMA Female
Application	Fibre laser, Pulse picker, Optical sensing	

2.1 Fiber-coupled AOM

Model	MM065-1C2V5-5-F2XY-Z	MM065-1C2V12-5-F2XY-Z
Interaction material:	TeO ₂	TeO ₂
Acousto mode	Longitudinal	Longitudinal
Wavelength:	2um	1.95um
Window configuration	AR coated	AR coated
Insertion loss:	<3.5dB	<3.5dB
Contrast ratio	> 40dB	> 40dB
Rise-time / fall-time:	75ns	100ns
Frequency:	65MHz	65MHz
VSWR:	< 1.2:1	< 1.2:1
Input impedance:	50Ω	50Ω

RF power:	<4W	<4W
Fibre type:	9/125 single mode, 1meter long: X=S 8/125 polarization maintaining: X=P	9/125 single mode, 1meter long: X=S 8/125 polarization maintaining: X=P
Fibre termination:	FC/PC, SC/PC, FC/APC, SC/APC	FC/PC, SC/PC, FC/APC, SC/APC

Model	MFS150-.2C17J-3-F2P-X-GH	15200-.2-1.55-LTD-GaP-FO
Interaction material:	GaP	GaP
Acousto mode	Longitudinal	Longitudinal
Wavelength:	1.55um	1.55um
Window configuration	AR coated	AR coated
Insertion loss:	<3.5dB	<3.5dB
Contrast ratio	> 35dB	> 35dB
Rise-time / fall-time:	10ns	10ns
Frequency:	150MHz	200MHz
VSWR:	< 1.5:1	< 1.5:1
Input impedance:	50Ω	50Ω
RF power:	<2W	<2W
Fibre type:	8/125, polarization maintaining fiber, 1 meter long	8/125, polarization maintaining fiber, 1 meter long
Fibre termination:	FC/PC, SC/PC, FC/APC, SC/APC	FC/PC, SC/PC, FC/APC, SC/APC

Model	23050-1-1.95-LTD-FO-2HP-PM-CSF	
Interaction material:	TeO ₂	
Acousto mode	Longitudinal	
Wavelength:	1950um	
Window configuration	AR coated	
Optical power	<2W average/CW	
Back reflection	-30dB	
Insertion loss:	<3.5dB	
Contrast ratio	> 40dB	
Rise-time / fall-time:	100ns	
Frequency:	50MHz	
VSWR:	< 1.2:1	
Input impedance:	50Ω	
RF power:	<4W	
Fibre type:	Polarization Maintaining GDF, 10/130 um 0.15/0.46 NA	
Fibre termination:	FC/PC	

3 Free Space AOMs

Model	I-FS040-1.5C2E-1-ME1 (FS040-2E-ME1)	I-FS040-1.5S2E-1-ME1 (FS040-2E-ME1)
Interactive Material	TeO ₂	TeO ₂
Acoustic Mode	Anisotropic, slow shear	Anisotropic, slow shear
Operating Wavelength	630-690nm	630-690nm
AR coating reflectivity	<0.2% per surface	<0.2% per surface
Transmission	>95 %	>95 %
Frequency shift	40 MHz	40 MHz
Frequency drift /°C	<±10ppm	<±10ppm
Clear aperture	4x2 (horizontal x vertical)	4x2 (horizontal x vertical)
Active aperture	1.5 mm (vertical)	1.5 mm (vertical)
Input polarization	Linear, horizontal with respect to housing base	Linear, horizontal with respect to housing base
Output polarization(1st order diffracted)	Linear, vertical with respect to housing base	Linear, vertical with respect to housing base
0/1st order polarization extinction	>100:1	>100:1
0/1st order beam symmetry	Symmetry to the left and right of straight through direction ±0.5°	Symmetry to the left and right of straight through direction ±0.5°
Angle between 0/1st order	2.4° at 655nm	2.4° at 655nm
Supply voltage	15VDC (±10%)	15VDC (±10%)
Power consumption	<1.5W	<1.5W
VSWR	<1.2:1	<1.2:1
Max diffraction efficiency	>90%	>90%
Reference RF output	10MHz sine-wave voltage of 0.5 to 1V peak to peak	10MHz sine-wave voltage of 0.5 to 1V peak to peak
RF driver	Integrated	Integrated

Model	I-FS040-2C2E-3-OL3 (FS040-2E-OL3)	I-FS040-2S2E-1-GH38
Interactive Material	TeO ₂	TeO ₂
Acoustic Mode	Anisotropic, slow shear	
Operating Wavelength	630-680nm	630-670nm
AR coating reflectivity	<0.2% per surface	<0.2% per surface
Transmission	>99.5 %	>95 %
Frequency shift	40 MHz	40 MHz (up-shift)
Clear aperture	2.5x4mm (vertical x horizontal)	2x4mm (vertical x horizontal)
Active aperture	2x4 mm (vertical x horizontal)	2mm (vertical)
Input polarization	Linear, horizontal with respect to housing base	Linear and horizontal with respect housing
Output polarization(1st order diffracted)	Linear, vertical with respect to housing base	Linear and orthogonal to input and 0 order beams
0/1st order polarization extinction	>100:1	>100:1
Angle between 0/1st order	>2°	<2 mrad with respect to straight through direction
VSWR	<1.2:1	< 1.2:1
Max diffraction efficiency	>90%	>90%
RF power	100mW	Integrated driver

Model	FS040-2C-AR1	FS040-2E-AR1
Interactive Material	TeO ₂	TeO ₂
Acoustic Mode	Anisotropic, slow shear	Anisotropic, slow shear
Operating Wavelength	532nm	630-690nm
AR coating reflectivity	<0.2% per surface	<0.3% per surface
Transmission	>95% @ 532nm	>95 % @ 633nm
Frequency shift	40 MHz	40 MHz (up-shift)

Clear aperture	2x4mm (vertical x horizontal)	2x4mm (vertical x horizontal)
Active aperture	1.5mm (vertical)	1.5mm (vertical)
Input polarization	Linear and horizontal with respect housing	Linear and horizontal with respect housing
Output polarization(1st order diffracted)	Linear and orthogonal to input	Linear and orthogonal to input and 0 order beams
0/1st order polarization extinction	>100:1	>100:1
0/1st order beam symmetry	Symmetrical to the left and right of the straight through direction $\pm 0.5^\circ$	Symmetrical to the left and right of the straight through direction $\pm 0.5^\circ$
Vertical angle of deflection	<2mrad with respect to straight through	<2mrad with respect to straight through
Angle between input beam and housing	$90^\circ \pm 1^\circ$	$90^\circ \pm 1^\circ$
Max diffraction efficiency	>90% @ 532nm	>90% @ 635nm
Supply voltage	+5VDC ($\pm 10\%$)	+5VDC ($\pm 10\%$)
Power supply connection	Lead-through filter	Lead-through filter
RF input connector	SMB bulkhead jack	SMB bulkhead jack
RF input	40MHz sine-wave voltage of 0.5 to 1Vpp	40MHz sine-wave voltage of 0.5 to 1Vpp

Model	I-M041-2.5C10G-4-GH50	I-M041-8C10G-B5-PI23
Interactive Material	Crystal Quartz	Crystal Quartz
Operating Wavelength	1030-1064nm	1064nm
Damage threshold	>1GW/cm ²	> 1GW/cm ²
AR coating reflectivity	<0.3% per surface	< 0.2% per surface
Transmission	>99.4%	> 99.6%
Frequency shift	40.68 MHz	40.68MHz
Optical polarization	Linear, vertical to base	Linear, vertical to base
Active aperture	2.5mm	8.0mm
Acoustic mode	Compressional	Compressional
Separation angle	7.6mrad	
Rise-time (10-90%)	113ns/mm	113ns/mm
0/1st order beam symmetry	Symmetrical to the left and right of the straight through direction $\pm 0.5^\circ$	CW power handling: > 500KW/cm ²
Diffraction efficiency	>85%	> 75% @ ~45W RF power
Max RF power	20W	50W
Cooling	Conduction	Water (de-ionised)

Model	I-FS080-2C2G-3-LV1 (M080-2G-LV1)	I-FS080-3S2E-1-GH39
Interactive Material	TeO ₂	TeO ₂
Wavelength	1064nm	633nm
AR coating reflectivity	<0.2% per surface	<0.2%
Transmission	>99.5%	>95% @ 633nm
Frequency shift	80 MHz	80MHz (up-shift)
VSWR	<1.2:1	<1.2:1
Active aperture	2mm	3.0mm (vertical)
Clear aperture	4mm	4x3.0mm
Recommended beam diameter	1mm	-
Input polarization	Linear, vertical with respect to house base	Linear and horizontal with respect housing
Output polarization	Linear, horizontal (rotated by 90° to input)	Linear and orthogonal to input and zero beams
Angle between 0/1st order	6.45°	< 2 mrad with respect to straight through direction
Diffraction efficiency	>90% (typically >95%)	>90%
RF power	0.5W	≥90% (based on recommended beam diameter)

Model	I-M080-2.5C10G-4-GH25	I-FS110-2C2B8-3-GH2 (M110-2B/F-GH2)
Interactive Material	Crystal Quartz	TeO ₂
Wavelength	1064nm	480-800nm
AR coating reflectivity	<0.2% per surface	0.2% per surface
Transmission	>99.6%	>95%
Frequency shift	80 MHz	110MHz
Optical polarization	Linear, vertical to base	Any
Active aperture	2.5mm	2mm
Acoustic mode	Compressional	Compressional
Rise-time (10-90%)	113ns/mm	155ns/mm
Diffraction efficiency	≥80%	>85%
RF power	15W (max)	<2W (wavelength dependent)

Model	I-M110-2C10B6-3-GH26 (M110-10UV-GH27)	I-M110-2.5C10B6-3-GH26
Interactive Material	Crystal Quartz	Crystal Quartz
Wavelength	400-540nm	400-540nm
AR coating reflectivity	<0.5% per surface	0.5% per surface
Damage threshold	>500MW/cm ² (pulsed)	>500MW/cm ² (pulsed)
Transmission	>99.0%	>99.0%
Frequency shift	110 MHz	110MHz
Optical polarization	Linear, vertical to base	Linear, vertical to base
Active aperture	2.0mm	2.5mm
Acoustic mode	Compressional	Compressional
Rise-time (10-90%)	113ns/mm	113ns/mm
Diffraction efficiency	≥85%	>80%
RF power	<5W	<5W

Model	I-M110-3C10BB-3-GH27 (M110-10UV-GH27)	I-M110-3C10B6-3-GH26
Interactive Material	Crystal Quartz	Crystal Quartz
Wavelength	300-400nm	400-540nm
AR coating reflectivity	<0.5% per surface	0.5% per surface
Damage threshold	>500MW/cm ² (pulsed)	>500MW/cm ² (pulsed)
Transmission	>99.0%	>99.0%
Frequency shift	110 MHz	110MHz
Optical polarization	Linear, vertical to base	Linear, vertical to base
Active aperture	3.0mm	3.0mm
Acoustic mode	Compressional	Compressional
Rise-time (10-90%)	113ns/mm	113ns/mm
Separation angle	6.8mrad at 355nm	10.2mrad at 532nm
Diffraction efficiency	≥85%	>80%
RF power	<3W	<5W

Model	I-M120-0.7C2G-GH42	I-M150-0.4C2G-GH42	I-M200-0.75C2G-3-SO8
Interactive Material	TeO ₂	TeO ₂	TeO ₂
Wavelength	1064nm	1064nm	1064nm
AR coating reflectivity	<0.2% per surface	<0.2% per surface	<0.3% per surface
Damage threshold	>50MW/cm ² (pulsed)	>50MW/cm ² (pulsed)	>50MW/cm ² (pulsed)
Transmission	>99.5%	>99.6%	>99.4%
Frequency shift	120 MHz	150 MHz	200 MHz
Optical polarization	Random	Random	Linear, vertical with respect to base
Active aperture	700um	400um	750um
Recommended beam dia.	400um	200um	400um
Rise-time (10-90%)	153ns/mm	153ns/mm	153ns/mm

Separation angle	30mrad	37.5mrad	50mrad
Diffraction efficiency	≥85%	>85%	>85%
RF power	3W (at <50% duty cycle)	2W	3W

Model	3080-120				3080-122			
Interactive Material	TeO ₂				TeO ₂			
Acoustic Velocity	4.2mm/us				4.2mm/us			
Active Aperture	2.5mmLx1.0mmH				2.5mmLx1.0mmH			
Center Frequency	80MHz				80MHz			
RF Bandwidth	20MHz @ -10dB Return Loss				20MHz @ -10dB Return Loss			
Input Impedance	50 Ohms Nominal				50 Ohms Nominal			
VSWR @ Fc	1.3:1 Max				1.3:1 Max			
Wavelength	442-633nm				780-850nm			
Insertion Loss	4% Max				3% Max			
Reflectivity per Surface	1% Max				0.25% Max			
Anti-Reflection Coating	MIL-C-48497				MIL-C-48497			
Optical Power Density	250W/mm ²				250W/mm ²			
Contrast Ratio	1000:1 Min				1000:1 Min			
Polarization	90° to mounting plate				90° to mounting plate			
Performance vs wavelength								
Wavelength(nm)	442	488	515	633	830			
Saturation RF power (W)	0.27	0.33	0.36	0.55	1			
Bragg angle (mrad)	4.2	4.6	4.9	6	7.9			
Beam separation (mrad)	8.4	9.2	9.8	12	15.8			
Performance vs beam dia								
Beam diameter(um)	200	300	500		200	250	500	
At wavelength (nm)	633	633	633		830	830	830	
Diffraction efficiency (%)	80	83	85		70	80	85	
Rise time (nsec)	34	49	80		34	41	80	
Modulation bandwidth	15.9 10	10.6 5	6.3 1		15.9 15	12.65 10	6.3 1	

Model	3080-125				3100-125			
Interactive Material	TeO ₂				TeO ₂			
Acoustic Velocity	4.2mm/us				4.2mm/us			
Active Aperture	2.5mmLx2.0mmH				2.5mmLx1.5mmH			
Center Frequency	80MHz				100MHz			
RF Bandwidth	25MHz @ -9dB Return Loss				25MHz @ -10dB Return Loss			
Input Impedance	50 Ohms Nominal				50 Ohms Nominal			
VSWR @ Fc	1.3:1 Max				1.3:1 Max			
Wavelength	442-633nm				470-690nm			
Insertion Loss	5% Max				4% Max			
Reflectivity per Surface	1% Max				1% Max			
Anti-Reflection Coating	MIL-C-48497				MIL-C-48497			
Optical Power Density	250W/mm ²				250W/mm ²			
Contrast Ratio	1000:1 Min				1000:1 Min			
Polarization	90° to mounting plate				90° to mounting plate			
Performance vs wavelength								
Wavelength(nm)	515	633			470	532	633	690
Saturation RF power (W)	0.65	1.0			0.4	0.6	0.9	1.1
Bragg angle (mrad)	4.9	6			5.6	6.3	7.5	8.2
Beam separation (mrad)	9.8	12			11.2	12.6	15	16.4
Performance vs beam dia								
Beam diameter(um)	125	200	400		1000	1000	1000	1000
At wavelength (nm)	633	633	633		470	532	633	690
Diffraction efficiency (%)	65	80	90		85	85	85	85
Rise time (nsec)	23	34	65		159	159	159	159
Modulation bandwidth	20	12	6					

Model	3110-120				3110-121			
Interactive Material	TeO2				TeO2			
Acoustic Velocity	4.2mm/us				4.2mm/us			
Active Aperture	2.5mmLx0.6mmH				2.5mmLx0.6mmH			
Center Frequency	110MHz				110MHz			
RF Bandwidth	24MHz @ -10dB Return Loss				24MHz @ -10dB Return Loss			
Input Impedance	50 Ohms Nominal				50 Ohms Nominal			
VSWR @ Fc	1.3:1 Max				1.3:1 Max			
Wavelength	442-633nm				442-488nm			
Insertion Loss	4% Max				3% Max			
Reflectivity per Surface	1% Max				1% Max			
Anti-Reflection Coating	MIL-C-48497				MIL-C-48497			
Optical Power Density	250W/mm2				250W/mm2			
Contrast Ratio	1000:1 Min				1000:1 Min			
Polarization	90° to mounting plate				90° to mounting plate			
Performance vs wavelength								
Wavelength(nm)	442	488	515	633	488			
Saturation RF power (W)	0.29	0.39	0.43	0.65	0.4			
Bragg angle (mrad)	5.8	6.4	6.7	8.3	6.4			
Beam separation (mrad)	11.6	12.8	13.4	16.6	12.8			
Performance vs beam dia								
Beam diameter(um)	113	130	200	500	100	150	200	
At wavelength (nm)	633	633	633	633	488	488	488	
Diffraction efficiency (%)	70	75	80	83	70	75	80	
Rise time (nsec)	25	28	39	86	18	25	33	
Modulation bandwidth	28	24	15.8	6.3	28	24	15.8	
	20	10	5	1	20	9	5	

Model	3110-197				3120-120			
Interactive Material	TeO2				TeO2			
Acoustic Velocity	4.2mm/us				4.2mm/us			
Active Aperture	2.5mmLx1.25mmH				2.5mmLx0.6mmH			
Center Frequency	110MHz				120MHz			
RF Bandwidth	15MHz @ -10dB Return Loss				15MHz @ -10dB Return Loss			
Input Impedance	50 Ohms Nominal				50 Ohms Nominal			
VSWR @ Fc	1.3:1 Max				1.3:1 Max			
Wavelength	1047-1060nm				1064nm			
Insertion Loss	4% Max				2% Max			
Reflectivity per Surface	0.5% Max				0.5% Max			
Anti-Reflection Coating	MIL-C-48497				MIL-C-48497			
Optical Power Density	10MW/cm2				10MW/cm2			
Contrast Ratio	1000:1 Min				1000:1 Min			
Polarization	90° to mounting plate				Random			
Performance vs wavelength								
Wavelength(nm)	1060				1060			
Saturation RF power (W)	2.5				2.0			
Bragg angle (mrad)	13.9				15.2			
Beam separation (mrad)	27.8				30.4			
Performance vs beam dia								
Beam diameter(um)	1100				375			
At wavelength (nm)	1060				1064			
Diffraction efficiency (%)	90				80			
Rise time (nsec)	200				73			
Modulation bandwidth	3				4.5			
Beam ellipticity	NA				NA			

Model	3120-121	3200-120
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Interactive Material	TeO2	TeO2			
Acoustic Velocity	4.2mm/us	4.2mm/us			
Active Aperture	2.5mmLx0.6mmH	2.5mmLx0.45mmH			
Center Frequency	120MHz	200MHz			
RF Bandwidth	15MHz @ -10dB Return Loss	50MHz @ -10dB Return Loss			
Input Impedance	50 Ohms Nominal	50 Ohms Nominal			
VSWR @ Fc	1.3:1 Max	1.3:1 Max			
Wavelength	1064nm	442-488nm			
Insertion Loss	2% Max	5% Max			
Reflectivity per Surface	0.5% Max	1% Max			
Anti-Reflection Coating	MIL-C-48497	MIL-C-48497			
Optical Power Density	10MW/cm2	250W/mm2			
Contrast Ratio	1000:1 Min	1000:1 Min			
Polarization	Random	90° to mounting plate			
Performance vs wavelength					
Wavelength(nm)	1064	442	488		
Saturation RF power (W)	2.0	0.53	0.65		
Bragg angle (mrad)	15.2	10.5	11.6		
Beam separation (mrad)	30.4	21	23.2		
Performance vs beam dia					
Beam diameter(um)	375	60	80	100	120
At wavelength (nm)	1064	488	488	488	488
Diffraction efficiency (%)	80	70	75	80	80
Rise time (nsec)	73	13	16	19	23
Modulation bandwidth	4.5	52	40	31	26.5
Beam ellipticity	NA	15	8	4	2

Model	3200-121				3200-124			
Interactive Material	TeO2				TeO2			
Acoustic Velocity	4.2mm/us				4.2mm/us			
Active Aperture	2.5mmLx0.32mmH				2.5mmLx0.32mmH			
Center Frequency	200MHz				200MHz			
RF Bandwidth	50MHz @ -9dB Return Loss				50MHz @ -10dB Return Loss			
Input Impedance	50 Ohms Nominal				50 Ohms Nominal			
VSWR @ Fc	1.3:1 Max				1.3:1 Max			
Wavelength	515-633nm				780-850nm			
Insertion Loss	4% Max				3% Max			
Reflectivity per Surface	1% Max				1% Max			
Anti-Reflection Coating	MIL-C-48497				MIL-C-48497			
Optical Power Density	250W/mm2				250W/mm2			
Contrast Ratio	1000:1 Min				1000:1 Min			
Polarization	90° to mounting plate				90° to mounting plate			
Performance vs wavelength								
Wavelength(nm)	515	633			830			
Saturation RF power (W)	0.7	1.0			2.0			
Bragg angle (mrad)	12.3	15.1			19.8			
Beam separation (mrad)	24.6	30.2			39.6			
Performance vs beam dia								
Beam diameter(um)	60	80	100	120	150			
At wavelength (nm)	633	633	633	633	830			
Diffraction efficiency (%)	70	75	80	80	70			
Rise time (nsec)	14	17	20	23	29			
Modulation bandwidth	52	40	31	26.5	21.0			
	15	8	4	2				
Beam ellipticity	NA	NA	NA	NA	10			

Model	3200-125				3200-126			
Interactive Material	TeO2				TeO2			
Acoustic Velocity	4.2mm/us				4.2mm/us			

Active Aperture	2.5mmLx1.5mmH				2.5mmLx0.32mmH			
Center Frequency	200MHz				200MHz			
RF Bandwidth	50MHz @ -10dB Return Loss				50MHz @ -9dB Return Loss			
Input Impedance	50 Ohms Nominal				50 Ohms Nominal			
VSWR @ Fc	1.3:1 Max				1.3:1 Max			
Wavelength	470-690nm				532nm			
Insertion Loss	4% Max				4% Max			
Reflectivity per Surface	1% Max				1% Max			
Anti-Reflection Coating	MIL-C-48497				MIL-C-48497			
Optical Power Density	250W/mm2				250W/mm2			
Contrast Ratio	1000:1 Min				1000:1 Min			
Polarization	90° to mounting plate				90° to mounting plate			
Performance vs wavelength								
Wavelength(nm)	470	532	633	690	532			
Saturation RF power (W)	0.4	0.6	0.9	1.1	0.7			
Bragg angle (mrad)	11.2	12.7	15.1	16.4	12.7			
Beam separation (mrad)	22.4	25.4	30.2	32.8	25.4			
Performance vs beam dia								
Beam diameter(um)	1000	1000	1000	1000	60			
At wavelength (nm)	470	532	633	690	532			
Diffraction efficiency (%)	85	85	85	85	75			
Rise time (nsec)	159	159	159	159	13			

Model	3200-1113				3200-1220			
Interactive Material	TeO2				Crystalline quartz			
Acoustic Velocity	4.2mm/us				5.74mm/us			
Active Aperture	1mmLx0.1mmH				2.5mmLx0.25mmH			
Center Frequency	200MHz				200MHz			
RF Bandwidth	90MHz @ -10dB Return Loss				100MHz @ -5dB Return Loss			
Input Impedance	50 Ohms Nominal				50 Ohms Nominal			
VSWR @ Fc	1.3:1 Max				1.5:1 Max			
Wavelength	1047-1060nm				257nm			
Insertion Loss	4% Max				5% Max			
Reflectivity per Surface	0.5% Max				1% Max			
Anti-Reflection Coating	MIL-C-48497				MIL-C-48497			
Optical Power Density	50MW/cm2				NA			
Contrast Ratio	1000:1 Min				1000:1 Min			
Polarization	90° to mounting plate				90° to mounting plate			
Performance vs wavelength								
Wavelength(nm)	1060				257			
Saturation RF power (W)	2.5				1			
Bragg angle (mrad)	25.2				4.5			
Beam separation (mrad)	50.4				9			
Performance vs beam dia								
Beam diameter(um)	50	65			70			
At wavelength (nm)	1060	1060			257			
Diffraction efficiency (%)	75	80			75			
Rise time (nsec)	10	12			10			
Loss modulation	80%				NA			

Model	12038-3-TE	12038-3-BR-TE
Interactive Material	SiO2	SiO2
Acoustic Mode	Longitudinal	Longitudinal
Operating Wavelength	1.06 μm	Used for Various λ (Specifications shown for 1.06 μm)
Window Configuration	AR "V" Coated	Brewster
Static Transmission	>99 %	>99 %
Operating Frequency	38 MHz + 150 KHz	38 MHz + 182 KHz
Mode spacing	300 KHz Typical	364 KHz Typical

Mode Bandwidth -3dB	10 KHz approximate	10 KHz approximate
Average Loss Modulation	15 % minimum with Linear Polarized Light, Perpendicular to Acoustic Propagation	10 % minimum with Linear Polarization Light, Perpendicular to Acoustic Propagation
Acoustic Aperture Size (in air)	3 mm	2 mm
Deflection Angle	6.75 mrad	6.75 mrad @ 1.06 μ m
RF Power Level	<1.2 watt	<1 watt
Impedance	50 ohms @ Resonant Frequency	50 ohms @ Resonant Frequency
VSWR	<1.5:1 @ Resonant Frequency	<1.5:1 @ Resonant Frequency
Package:	53A2198	53A3890
Recommended Driver:	11038-1ML	11038-1ML

Model	12041-3-BR-TE	12041-3-TE
Interactive Material	SiO ₂	SiO ₂
Acoustic Mode	Longitudinal	Longitudinal
Operating Wavelength	Used for Various λ Specification shown for 1.06 μ m	1.06 μ m
Window Configuration	Brewster	AR "V" Coated
Static Transmission	>99 %	>99%
Operating Frequency	41 MHz + 182 KHz	41 MHz + 150 KHz
Mode spacing	364 KHz Typical	300 KHz Typical
Mode Bandwidth -3dB		10 KHz approximate
Average Loss Modulation	10 % minimum with Linear Polarized Light, Perpendicular to Acoustic Propagation	15 % minimum with Linear Polarized Light, Perpendicular to Acoustic Propagation
Acoustic Aperture Size (in air)	2 mm	3 mm
Deflection Angle	7.3 mrad @ 1.06 μ m	7.3 mrad
RF Power Level	<1 watt	<1.2 watt
Impedance	50 ohms @ Resonant Frequency	50 ohms @ Resonant Frequency
VSWR	<1.5:1 @ Resonant Frequency	<1.5:1 @ Resonant Frequency
Package:	53A3890	53A2198
Recommended Driver:	11041-1ML	11041-1ML

Model	12050-3-BR-TE	12050-3-TE
Interactive Material	SiO ₂	SiO ₂
Acoustic Mode	Longitudinal	Longitudinal
Operating Wavelength	Used for Various λ Specifications shown for 1.06 μ m	1.06 μ m
Window Configuration	Brewster	AR "V" Coated
Static Transmission	>99 %	>99%
Operating Frequency	50 MHz + 182 KHz	50 MHz + 150 KHz
Mode spacing	364 KHz Typical	300 KHz Typical
Mode Bandwidth -3dB	10 KHz approximate	10 KHz approximate
Average Loss Modulation	6.5 % minimum with Linear Polarized Light, Perpendicular to Acoustic Propagation	10 % minimum with Linear Polarized Light, Perpendicular to Acoustic Propagation
Acoustic Aperture Size (in air)	2 mm	3 mm
Deflection Angle	8.9 mrad @ 1.06 μ m	8.9 mrad
RF Power Level	<1 watt	<1.2 watt
Impedance	50 ohms @ Resonant Frequency	50 ohms @ Resonant Frequency
VSWR	<1.5:1 @ Resonant Frequency	<1.5:1 @ Resonant Frequency
Package:	53A3890	53A2198
Recommended Driver:	11050-1ML	11050-1ML

Model	12080-3-BR-TE	12080-3-TE
Interactive Material	SiO ₂	SiO ₂
Acoustic Mode	Longitudinal	Longitudinal
Operating Wavelength	Used for Various λ Specifications	1.06 μ m

	shown for 1.06 μm	
Window Configuration	Brewster	AR "V" Coated
Static Transmission	>99 %	>99 %
Operating Frequency	80 MHz + 182 KHz	80 MHz + 150 KHz
Mode spacing	364 KHz Typical	300 KHz Typical
Mode Bandwidth -3dB	10 KHz approximate	10 KHz approximate
Average Loss Modulation	6.5 % minimum with Linear Polarized Light, Perpendicular to Acoustic Propagation	10 % minimum with Linear Polarized Light, Perpendicular to Acoustic Propagation
Acoustic Aperture Size (in air)	2 mm	3 mm
Deflection Angle	14.2 mrad @ 1.06 μm	14.2 mrad
RF Power Level	<1 watt	<1.2 watt
Impedance	50 ohms @ Resonant Frequency	50 ohms @ Resonant Frequency
VSWR	<1.5:1 @ Resonant Frequency	<1.5:1 @ Resonant Frequency
Package:	53A3890	53A2198
Recommended Driver:	11080-1ML	11080-1ML

Model	13389-BR	15180-1.06-LTD-GAP
Interactive Material	SiO ₂	GaP
Acoustic Mode	longitudinal	Longitudinal
Operating Wavelength	Used for Various λ Specifications shown for 633 nm	1.06 μm
Window Configuration	Brewster, $\lambda/10$ over acoustic aperture	AR "V" coated
Static Transmission	>99 %	>90%
Operating Frequency	389 MHz	180 MHz
Diffraction Efficiency	>5.5 % @ 500 mW	>70%
Light Polarization	Linear, Perpendicular to Acoustic Propagation	Linear, horizontal
Acoustic Aperture Size	60 μm in air	300 μm
Rise Time	<6 ns	10 nsec*
Optical Waist Size to achieve Rise Time	44 μm	100 microns
Deflection Angle	41 mrad @ 633 nm	28.7 mrad
RF Power Level Average	500 mW	1.7 Watts
RF Power Level Peak	10 Watts peak, 5 % duty cycle with 10 ns pulse	
Impedance	50 Ohms	50 Ohms nominal
VSWR	<1.5:1 @ 389MHz, <6:1 @ 299, 479 MHz	<1.5:1 at 180 MHz
Package:	53A5314	53B0624
Recommended Drivers:	64389-SYN-9.5-X	

Model	15210	15210-FOA / 71002	15210-FOA
Interactive Material	TeO ₂	TeO ₂	TeO ₂
Acoustic Mode	Longitudinal	Longitudinal	Longitudinal
Operating Wavelength	440 – 850 nm	440 – 850 nm	440 – 850 nm
Window Configuration	AR Coated	AR Coated	AR Coated
Static Transmission	> 95 %	>95 %	>95 %
Operating Frequency	210 MHz	210 MHz	210 MHz
Diffraction Efficiency	> 70 % @ 633 nm with Linear, Polarization Perpendicular to Acoustic Propagation or with Random Polarization	>70 % @ 633 nm with Linear, Polarization Perpendicular to Acoustic Propagation or with Random Polarization	>70 % @ 633 nm with Linear, Polarization Perpendicular to Acoustic Propagation or with Random Polarization
Acoustic Aperture Size	0.2 mm	0.2 mm	0.2 mm

Rise Time	< 10 nsec	<10 nsec	< 10 nsec
Optical Waist Size to achieve Rise Time	55 μ m	55 μ m	55 μ m
Deflection Angle	31 mrad @ 633 nm	31 mrad @ 633 nm	31 mrad @ 633 nm
RF Power Level	< 1 Watt	< 1 Watt	< 1 Watt
Impedance	50 Ohms nominal	50 Ohms nominal	50 Ohms nominal
VSWR	< 1.5:1 @ 210 MHz	< 1.5:1 @ 210 MHz	<1.5:1 @ 210 MHz
Package:	53B0504	53D00314	53B0957
Recommended Drivers:	Analog Driver System: 21210-1AS Analog Driver Module: 21210-1AM Digital Driver System: 21210-1DS Digital Driver Module: 21210-1DM		

Model	15260	15260-FOA/71002	15260-FOA
Interactive Material	TeO ₂	TeO ₂	TeO ₂
Acoustic Mode	Longitudinal	Longitudinal	Longitudinal
Operating Wavelength	440 – 850 nm	440 – 850 nm	440 – 850 nm
Window Configuration	AR Coated	AR Coated	AR Coated
Static Transmission	>95 %	>95 %	>95 %
Operating Frequency	260 MHz	260 MHz	260 MHz
Diffraction Efficiency	>70 % @ 633nm with Linear, Polarization Perpendicular to Acoustic Propagation or with Random Polarization	>70 % @ 633 nm with Linear, Polarization Perpendicular to Acoustic Propagation or with Random Polarization	>70 % @ 633 nm with Linear, Polarization Perpendicular to Acoustic Propagation or with Random Polarization
Acoustic Aperture Size	0.2 mm	0.2 mm	0.2 mm
Rise Time	<10 ns	<10 nsec	<10 nsec
Optical Waist Size to achieve Rise Time	55 μ m	0.055 mm	55 μ m
Deflection Angle	39 mrad @ 633nm	39 mrad @ 633 nm	39 mrad @ 633 nm
RF Power Level	700 mW	< 1 Watt	< 1 Watt
Impedance	50 Ohms nominal	50 Ohms nominal	50 Ohms nominal
VSWR	1.5:1 @ 260MHz	1.5:1 @ 260 MHz	1.5:1 @ 260 MHz
Package:	53B0504	53D0314	
FOA Modulator Package:		53B0957	53B0957
Recommended Drivers:	21260-.7AS 21260-.7AM 21260-.7DS 21260-.7DM	Analog Driver System: 21260-1AS Analog Driver Module: 21260-1AM Digital Driver System: 21260-1DS Digital Driver Module: 21260-1DM	

Model	17389-1.06-LTD-GaP	17389-.93	17389-.93-FOA
Interaction Material	GaP	TeO ₂	TeO ₂
Acoustic Mode	Longitudinal	Longitudinal	Longitudinal
Operating Wavelength	1.06 μ m	700 –1064 nm	700 –1064 nm
Window Configuration	AR “V” coating	AR Coated	AR Coated
Static Transmission	>90%	>95 %	>95%
Operating Frequency	389 MHz	389 MHz	389 MHz
Diffraction Efficiency	56% minimum with linear polarized light parallel to acoustic propagation	>70 % @ 800 nm with Linear, Polarization Perpendicular to Acoustic Propagation. >60 % @ 800 nm with Random Polarization.	>70% @ 800 nm with Linear, Polarization Perpendicular to Acoustic Propagation >60% @ 800 nm with Random Polarization
Acoustic Aperture Size (in air)	150 μ m	70 μ m	70 μ m

Rise Time	4 nsec minimum	<7 nsec	<7 nsec
Extinction Ratio *	>20dB for neighboring pulses, >27dB for subsequent pulses @ <80MHz pulse rep rate	>20dB for neighboring pulses, >27dB for subsequent pulses @ <80MHz pulse rep rate	>20dB for neighboring pulses, >27dB for subsequent pulses @ <80MHz pulse rep rate
Optical Waist Size To Achieve Rise Time	40 μ m	35 μ m	35 μ m
Deflection Angle	62 mrad	73 mrad @ 800 nm	73mrad @ 800nm
RF Power Level	2.5 watts peak, <1 watt aver.	< 700 mW Average/ 5 Watts Peak 10 % max duty cycle with 10 nsec pulse.	< 700 mW Average/ 5 Watts Peak 10% max duty cycle with 10nsec pulse.
Impedance	50 Ohms nominal	50 Ohms nominal	50 Ohms nominal
VSWR	<1.5:1 @ 389 MHz	<1.5:1 @ 389 MHz	< 1.5:1 @ 389 MHz
Package	53B00624TO1	53B0504	53B0499
Recommended Drivers:	Non - Synchronous Driver: 11389-5AM Synchronous Driver: 64389.5-SYN-9.5-X		

Model	17440	17440-FOA
Interaction Material	TeO2	TeO2
Acoustic Mode	Longitudinal	Longitudinal
Operating Wavelength	440-850nm	440-850m
Window Configuration	AR coated	AR coated
Static Transmission	>95%	>95%
Operating Frequency	440 MHz	440 MHz
Diffraction Efficiency	>60 % @ 633 nm with Linear, Polarization Perpendicular to Acoustic Propagation. >50 % @ 633 nm with Random Polarization	>60 % @ 633 nm with Linear, Polarization Perpendicular to Acoustic Propagation. >50 % @ 633 nm with random polarization.
Acoustic Aperture Size (in air)	90 μ m	90 μ m
Rise Time	4 ns	4 ns
Optical Waist Size To Achieve Rise Time	19 μ m	19 μ m
Deflection Angle	65 mrad @ 633nm	65 mrad @ 633nm
RF Power Level	800mW nominal	800mW
Impedance	50 Ohms nominal	50 Ohms nominal
VSWR	<1.5:1 @ 440 MHz	<1.5:1 @ 440 MHz

Model	23080-1-LTD	23080-1-.85-LTD	23080-1-1.06-LTD
Interaction Material	TeO2	TeO2	TeO2
Acoustic Mode	Longitudinal	Longitudinal	Longitudinal
Operating Wavelength	440-850nm	700-1000nm	1064nm
Window Configuration	AR coated	AR coated	AR coated
Static Transmission	\geq 95%	>97%	>97%
Operating Frequency	80 MHz	80 MHz	80 MHz
Diffraction Efficiency	\geq 85 % @ 633 nm with linear polarization, perpendicular to acoustic propagation or random polarization	>60 % @ 633 nm with Linear, Polarization Perpendicular to Acoustic Propagation. >50 % @ 633 nm with random polarization.	>75 % With Linear Polarization, Perpendicular to Acoustic Propagation >70 % With Random Polarization
Acoustic Aperture Size	1mm	1mm	1mm
Rise Time	150ns/mm	150ns/mm	150ns/mm
Deflection Angle	11.89 mrad @ 633nm	16 mrad @ 850nm	20 mrad
RF Power Level	\leq 1W	1W	1.25W
Impedance	50 Ohms nominal	50 Ohms nominal	50 Ohms

VSWR	<1.2:1 @ 80 MHz	<1.2:1 @ 80 MHz	<1.2:1 @ 80 MHz
Model	23080-1-1.06/1.3-LTD	23080-1-1.3-LTD	23080-1-1.55-LTD
Interaction Material	TeO ₂	TeO ₂	TeO ₂
Acoustic Mode	Longitudinal	Longitudinal	Longitudinal
Operating Wavelength	1.06-1.3um	1300nm	1550nm
Window Configuration	AR coated	AR coated	AR coated
Static Transmission	≥97%	>97%	>97%
Operating Frequency	80 MHz	80 MHz	80 MHz
Diffraction Efficiency	>75% with linear polarization perpendicular to acoustic propagation >70% with random polarization	>75 % With Linear Polarization, Perpendicular to Acoustic Propagation >70 % With Random Polarization	>60 % with light Polarized Linear, Perpendicular to Acoustic Propagation >55 % with light Random Polarization
Acoustic Aperture Size	1mm	1mm	1mm
Rise Time	155ns/mm	150ns/mm	150ns/mm
Deflection Angle	24.44 mrad @ 1.3um 20mrad @ 1.06um	25 mrad	29 mrad
RF Power Level	<2W @ 1.3um <1.2W @ 1.06um	<1.25W	<2W
Impedance	50 Ohms nominal	50 Ohms nominal	50 Ohms
VSWR	<1.2:1 @ 80 MHz	<1.2:1 @ 80 MHz	<1.2:1 @ 80 MHz

Model	23080-2-LTD	23080-2-.85-LTD	23080-2-1.06-LTD
Interaction Material	TeO ₂	TeO ₂	TeO ₂
Acoustic Mode	Longitudinal	Longitudinal	Longitudinal
Operating Wavelength	440-850nm	1300nm	1064nm
Window Configuration	AR coated	AR coated	AR coated
Static Transmission	≥95%	>97%	>97%
Operating Frequency	80 MHz	80 MHz	80 MHz
Diffraction Efficiency	>85 % @ 633 nm, Linear polarization, perpendicular to acoustic propagation or random	>70 % With Linear Polarization, Perpendicular to Acoustic Propagation >65 % With Random Polarization	>75 % with light Polarized Linear, Perpendicular to Acoustic Propagation >70 % with light Random Polarization
Acoustic Aperture Size	2mm	2mm	2mm
Rise Time	150ns/mm	150ns/mm	150ns/mm
Deflection Angle	11.89mrad @ 633 nm	16 mrad @ 850nm	20 mrad
RF Power Level	<1W	<2W	<2W
Impedance	50 Ohms nominal	50 Ohms nominal	50 Ohms
VSWR	<1.2:1 @ 80 MHz	<1.2:1 @ 80 MHz	<1.2:1 @ 80 MHz

Model	23080-2-1.3-LTD	23080-2-1.55-LTD	23080-3-LTD
Interaction Material	TeO ₂	TeO ₂	TeO ₂
Acoustic Mode	Longitudinal	Longitudinal	Longitudinal
Operating Wavelength	1330nm	1550nm	440-850nm
Window Configuration	AR coated	AR coated	AR coated
Static Transmission	≥97%	>97%	>97%
Operating Frequency	80 MHz	80 MHz	80 MHz
Diffraction Efficiency	>75 % with linear polarization, perpendicular to acoustic propagation >70% with random polarization	>50% With light Polarization linear, Perpendicular to Acoustic Propagation >45 % With Random Polarization	>85 % @ 633 nm, Linear Polarization, Perpendicular to Acoustic Propagation or Random
Acoustic Aperture Size	2mm	2mm	3mm

Rise Time	150ns/mm	150ns/mm	150ns/mm
Deflection Angle	24.4 mrad	29 mrad	11.89 mrad @ 633nm
RF Power Level	<3.2W	<4W	<1.2W
Impedance	50 Ohms nominal	50 Ohms nominal	50 Ohms
VSWR	<1.2:1 @ 80 MHz	<1.2:1 @ 80 MHz	<1.2:1 @ 80 MHz

Model	23080-3-.85-LTD	23080-3-1.06-LTD	23080-3-1.3-LTD
Interaction Material	TeO2	TeO2	TeO2
Acoustic Mode	Longitudinal	Longitudinal	Longitudinal
Operating Wavelength	700-1000nm	1064nm	1330nm
Window Configuration	AR coated	AR coated	AR coated
Static Transmission	≥97%	>97%	>97%
Operating Frequency	80 MHz	80 MHz	80 MHz
Diffraction Efficiency	>70 % with linear polarization, perpendicular to acoustic propagation >65% with random polarization	>70% With linear Polarization, Perpendicular to Acoustic Propagation >65 % With Random Polarization	>75% With linear Polarization, Perpendicular to Acoustic Propagation >70 % With Random Polarization
Acoustic Aperture Size	3mm	3mm	3mm
Rise Time	150ns/mm	150ns/mm	150ns/mm
Deflection Angle	16 mrad @ 850nm	20 mrad	24.4 mrad
RF Power Level	<2W	<2W	<4W
Impedance	50 Ohms nominal	50 Ohms nominal	50 Ohms
VSWR	<1.2:1 @ 80 MHz	<1.2:1 @ 80 MHz	<1.2:1 @ 80 MHz

Model	23110-5	23110-1-LTD	24080-1
Interaction Material	TeO2	TeO2	SF6
Acoustic Mode	Longitudinal	Longitudinal	Longitudinal
Operating Wavelength	440-850nm	440-850nm	440-850nm
Window Configuration	AR coated	AR coated	AR coated
Static Transmission	≥95%	>95%	>97%
Operating Frequency	110 MHz	110 MHz	80 MHz
Diffraction Efficiency	>90% @ 633nm With linear Polarization, Perpendicular to Acoustic Propagation or with Random Polarization	>85% @ 633nm With linear Polarization, Perpendicular to Acoustic Propagation or Random	65% @ 633nm with random polarization
Acoustic Aperture Size	0.5mm	1mm	1mm
Rise Time	150ns/mm	150ns/mm	185ns/mm
Deflection Angle	16.3 mrad @ 633nm	16.34 mrad @ 633nm	14.4 mrad @ 633nm
RF Power Level	1W	1W	1W
Impedance	50 Ohms nominal	50 Ohms nominal	50 Ohms
VSWR	<1.2:1 @ 110 MHz	<1.2:1 @ 110 MHz	<1.2:1 @ 80 MHz

Model	26035-2-1.55-LTD	26055-1-1.55-LTD
Interaction Material	AMTIR	AMTIR
Acoustic Mode	Longitudinal	Longitudinal
Operating Wavelength	1300-1600nm	1300-1600nm
Window Configuration	AR coated	AR coated
Static Transmission	≥97%	≥97%
Operating Frequency	35 MHz	55 MHz
Diffraction Efficiency	>85%	>85%
Light polarization	Random	Random
Optical power density	<50kW/cm ²	<50kW/cm ²
Acoustic Aperture Size	2mm	1mm
Rise Time	260ns/mm	260ns/mm
Deflection Angle	20.6 mrad @ 1550nm	32.4 mrad @ 1550nm

RF Power Level	<0.5W	<0.5W
Impedance	50 Ohms nominal	50 Ohms nominal
VSWR	<1.2:1 @ 35 MHz	<1.2:1 @ 35 MHz
Recommended driver (Analog, Digital Module, System)	21035-0.5AS 21035-0.5AM 21035-0.5DS 21035-0.5DM	21055-0.5AS 21055-0.5AM 21055-0.5DS 21055-0.5DM

Model	35085-0.5-350	35085-3-350
Interactive Material	Fused Silica	Fused Silica
Acoustic Mode	Longitudinal	Longitudinal
Operating Wavelength	300 to 400 nm	300 to 400 nm
Window Configuration	AR Coated	AR Coated
Static Transmission	>99 %	>99 %
Operating Frequency	85 MHz	85 MHz
Diffraction Efficiency	>85 %	85 % @ 350 nm
Light Polarization	Linear, Perpendicular to acoustic propagation	Linear, Perpendicular to Acoustic Propagation
Acoustic Aperture	0.5 mm	3 mm
Rise Time	110 nsec/mm beam diameter	110 ns / mm Beam Diameter
Deflection Angle	5 mrad @ 350 nm	5 mrad @ 350 nm
RF Power Level	< 6 Watts	3 Watts
Impedance	50 Ohms	50 Ohms
VSWR	<1.2:1 @ 85 MHz	<1.2:1 @ 85 MHz
Package:	53B1428	53B1428
Recommended driver (Analog, Digital Module, System)	31085-6AS 31085-6AM 31085-6DS 31085-6DM	31085-6AS 31085-6AM 31085-6DS 31085-6DM

Model	35085-0.5	35085-3
Interactive Material	Fused Silica	Fused Silica
Acoustic Mode	Longitudinal	Longitudinal
Operating Wavelength	400 to 540 nm	400 to 540 nm
Window Configuration	AR Coated	AR Coated
Static Transmission	>99 %	>98 % @ 488 nm
Operating Frequency	85 MHz	85 MHz
Diffraction Efficiency	>85 % With Linear Polarized Light, Perpendicular to acoustic propagation	>85 % @ 488 nm With Light Polarized Linear, Perpendicular to Acoustic Propagation.
Acoustic Aperture Size	0.5 mm	3 mm
Rise Time	110 nsec/mm beam diameter	110 ns / mm Beam Diameter
Deflection Angle	5 mrad @ 514 nm	6.9 mrad @ 488 nm
RF Power Level	< 6 Watts	< 6 Watts @ 488 nm
Impedance	50 Ohms	50 Ohms
VSWR	<1.2:1 @ 85 MHz	<1.2:1 @ 85 MHz
Package:	53B1428	53B1428
Recommended driver (Analog, Digital Module, System)	31085-6AS 31085-6AM 31085-6DS 31085-6DM	31085-6AS 31085-6AM 31085-6DS 31085-6DM

Model	35110-2-244	35110-2-244-BR	35110-3-244-BR-KrF
Interactive Material	KrF Grade Fused Silica	KrF Grade Fused Silica	KrF Grade Fused Silica
Acoustic Mode	Longitudinal	Longitudinal	Longitudinal
Operating Wavelength	244 nm	244-260 nm	244-260 nm
Window Configuration	AR Coated	Brewster	Brewster
Static Transmission	>97 %	>99 %	>99 %
Operating Frequency	110 MHz	110 MHz	110 MHz

Diffraction Efficiency	>70% With Linear Polarized Light, Perpendicular to acoustic propagation	>70% With Linear Polarized Light, Perpendicular to acoustic propagation	>70% With Linear Polarized Light, Perpendicular to acoustic propagation
Acoustic Aperture Size	2 mm	2 mm	2 mm
Rise Time	110 nsec/mm	110 nsec/mm	110 nsec/mm
Deflection Angle	4.5 mrad	4.5 mrad @ 244nm	4.5 mrad @ 244nm
RF Power Level	< 2 Watts	< 4 Watts	< 4 Watts
Impedance	50 Ohms	50 Ohms	50 Ohms
VSWR	<1.2:1 @ 110 MHz	<1.2:1 @ 110 MHz	<1.5:1 @ 95-125 MHz
Package:	53B2921	53D1634	53D3926
Recommended driver (Analog, Digital Module, System)	21110-2AS 21110-2AM 21110-2DS 21110-2DM	31110-4AS 31110-4AM 31110-4DS 31110-4DM	31110-4AS 31110-4AM 31110-4DS 31110-4DM

Model	35210-BR / 71004	35210-BR
Interactive Material	Fused Silica	Fused Silica
Acoustic Mode	Longitudinal	Longitudinal
Operating Wavelength	300 to 700 nm	300 to 700 nm
Window Configuration	Brewster	Brewster
Static Transmission	>99 % @ 488 nm	98 % @ 488 nm
Operating Frequency	210 MHz	210 MHz
Diffraction Efficiency	>70 % @ 488 nm	>70 % @ 488 nm
Light Polarization	Linear, Perpendicular to acoustic propagation	Linear, Perpendicular to acoustic propagation
Acoustic Aperture Size (in air)	0.13 mm	0.13 mm
Rise Time	<15 ns	<15 ns
Optical Waist Size to achieve Rise Time	0.1 mm	0.1 mm
Deflection Angle	17 mrad @488 nm	17 mrad @ 488 nm
RF Power Level	6 Watts	6 Watts
Impedance	50 Ohms	50 Ohms
VSWR	<1.5:1 @ 210 MHz	<1.5:1 @ 210 MHz
Package Assembly: Mount, Optics and Modulator:	53D0307	
Package:	53B3408	53B3408
Recommended Driver:	Analog System Driver: 31210-6AS Analog Module Driver: 31210-6AM Digital System Driver: 31210-6DS Digital Module Driver: 31210-6DM	

Model	35110-2-244	35250-2-53-XQ
Interactive Material	KrF Grade Fused Silica	Crystal Quartz
Acoustic Mode	Longitudinal	Longitudinal
Operating Wavelength	244 nm	532 nm
Window Configuration	AR Coated	AR Coated
Static Transmission	>97 %	>99 %
Operating Frequency	110 MHz	250 MHz
Diffraction Efficiency	70 % With Linear Polarized Light Perpendicular to Acoustic Propagation	>70 %
Light Polarization		Linear, Perpendicular
Acoustic Aperture Size	2 mm	0.2 mm
Rise Time	110 ns / mm beam diameter	10 ns
Optical Waist Size to achieve Rise Time		0.09 mm
Deflection Angle	4.5 mrad	23 mrad
RF Power Level	<2 Watts	6 Watts
Impedance	50 Ohms	50 Ohms
VSWR	<1.2:1 @ 110 MHz	<1.5:1 - 170 to 330 MHz
Package:	53B2921	53B1354

Recommended Driver:	21110-2AS 21110-2AM 21110-2DS 21110-2DM	31250-6AS 31250-6AM 31250-6DS 31250-6DM
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Model	37027-3	37027-5	37027-8-10.6
Interactive Material	Ge	Ge	Ge
Acoustic Mode	Longitudinal	Longitudinal	Longitudinal
Operating Wavelength	10.6um	10.6um	10.6um
Optical power density	5Watt/mm ² max	5Watt/mm ² max	5Watt/mm ² max
Window Configuration	AR Coated	AR Coated	AR "V" Coated
Static Transmission	85 %	85 %	85 %
Operating Frequency	27.12 MHz	27.12 MHz	27.12 MHz
Diffraction Efficiency	>85%	>75%	>75%
Light Polarization	Linear, Parallel to acoustic propagation	Linear, Parallel to acoustic propagation	Linear, Parallel to acoustic propagation
Acoustic Aperture Size	3 mm	5 mm	8 mm
Rise Time	120 ns / mm	120 ns / mm	120 ns / mm
Deflection Angle	52 mrad @ 10.6um	52 mrad @ 10.6um	52 mrad @ 10.6um
RF Power Level	30 Watts	30 Watts	50 Watts
Impedance	50 Ohms	50 Ohms	50 Ohms
VSWR	<1.2:1 @ 27.12 MHz	<1.2:1 @ 27.12 MHz	<1.2:1 @ 27.12 MHz
Package:	53B2220	53B2220	53B2220
Recommended Driver:	39027-30-DSA05	39027-35-DSA05	39027-50-DSA05

Model	37040-5	37041-8-4.5
Interactive Material	Ge	Ge
Acoustic Mode	Longitudinal	Longitudinal
Operating Wavelength	10.6um	4-5um
Optical power density	5Watt/mm ² max	
Window Configuration	AR Coated	AR Coated
Static Transmission	85 %	85 %
Operating Frequency	40 MHz	40.68 MHz
Diffraction Efficiency	>85%	>80% with Linear polarized light, Parallel to acoustic propagation
Light Polarization	Linear, Parallel to acoustic propagation	
Acoustic Aperture Size	5 mm	8 mm
Rise Time	120 ns / mm	120 ns / mm
Deflection Angle	78 mrad @ 10.6um	33 mrad @ 4.5um
RF Power Level	35 Watts	15 Watts
Impedance	50 Ohms	50 Ohms
VSWR	<1.2:1 @ 40 MHz	<1.2:1 @ 40.68 MHz
Package:	53B2220	53B2220
Recommended Driver:	39027-35-DSA05	39027-30-DSA05

Model	47040-5-.7-RA	48060-8/4-1.0-COL
Interactive Material	TeO ₂	TeO ₂
Acoustic Mode	Shear	Shear
Operating Wavelength	655-850nm	800-1200nm
Window Configuration	AR Coated	AR Coated
Static Transmission	95 %	95 %
Operating Frequency	40 MHz	84MHz @ 800nm, 74MHz @ 900nm 65.7MHz @ 1000nm, 60MHz @ 1100nm, 54MHz @ 1200nm
Diffraction Efficiency	>50% with Linear polarized light, Parallel to acoustic propagation	>85% with Linear polarized light, perpendicular to acoustic propagation
Acoustic Aperture Size	5 mm	8x2 mm
Rise Time	1us / mm	

Resolution		<1nm (best offer)
Deflection Angle	47 mrad	23 mrad (with respect to incident beam)
RF Power Level	0.6 Watts	100 mWatts
Impedance	50 Ohms	50 Ohms
VSWR	<1.2:1	<1.5:1 over bandwidth
Package:	53B3570	53B00337

Model	MFS030-3S2C-5-6.5DEG	MFS030-3S2E-5-6.5DEG	MFS040-35/13S2C-3
Interactive Material	TeO2	TeO2	TeO2
Acoustic Mode	Shear	Shear	Shear
Operating Wavelength	532nm	633nm	532nm
Window Configuration	AR Coated	AR Coated	AR Coated
Static Transmission	95 %	95 %	95 %
Operating Frequency	30 MHz	30 MHz	40 MHz
Diffraction Efficiency	>85% with linear polarization, parallel to acoustic propagation	>85% with linear polarization, perpendicular to acoustic propagation for up shift and parallel to acoustic propagation for down shift	>85% with linear polarization, random
Acoustic Aperture Size	3 mm	3 mm	35mm(H)x13mm(along acoustic propagation direction)
Rise Time	1us / mm	1us / mm	1us / mm
Deflection Angle	24 mrad	28 mrad	34.4 mrad
RF Power Level	<0.2 Watts	<0.8 Watts	<1.2 Watts
Impedance	50 Ohms	50 Ohms	50 Ohms
VSWR	<1.2:1	<1.2:1	<1.2:1
Package:	53B2024	53B2024	53A3286T04

Model	MFS050-3S2C-5-6.5DEG	MFS050-5S2E-5-6.5DEG	MFS080-35/5S2C-3
Interactive Material	TeO2	TeO2	TeO2
Acoustic Mode	Shear	Shear	Shear
Operating Wavelength	532nm	633nm	532nm
Window Configuration	AR Coated	AR Coated	AR Coated
Static Transmission	95 %	95 %	95 %
Operating Frequency	50 MHz	50 MHz	80 MHz
Diffraction Efficiency	>85% with linear polarization, parallel to acoustic propagation	>85% with linear polarization, perpendicular to acoustic propagation for up shift and parallel to acoustic propagation for down shift	>50% with linear polarization, random
Acoustic Aperture Size	3 mm	5 mm	35mm(H)x5mm(along acoustic propagation direction)
Rise Time	1us / mm	1us / mm	1us / mm
Deflection Angle	40 mrad	48 mrad	68.9 mrad
RF Power Level	<0.5 Watts	<1.5 Watts	<4 Watts
Impedance	50 Ohms	50 Ohms	50 Ohms
VSWR	<1.2:1	<1.2:1	<1.2:1
Package:	53B2024	53B2024	53A3286T04

Model	MFS100-2C4BB-5	MFS160-5/13S2C-3	MFS400-.2C2V13-5
Interactive Material	Fused Silica	TeO2	TeO2
Acoustic Mode	Longitudinal	Shear	Longitudinal
Operating Wavelength	300-400nm	532nm	650nm

Window Configuration	AR Coated	AR Coated	AR Coated
Static Transmission	95 %	95 %	95 %
Operating Frequency	80-120 MHz	160 MHz	350-450 MHz
Intensity Variation	<1.5dB		
Diffraction Efficiency	>85%, midband with linear polarization, perpendicular to acoustic propagation	>50% with linear polarization, random	>50%, midband with linear polarization, perpendicular to acoustic propagation
Acoustic Aperture Size	2 mm	5mm(H)x13mm(along acoustic propagation direction)	0.2mm
Recommended beam diameter			100um
Deflection Angle	2.4mrad @ 355nm	1us / mm for rise-time	15.2mrad
Deflection Angle	6 mrad @ 100MHz @ 355nm	138mrad	61mrad @ 400MHz
RF Power Level	<6 Watts	<2 Watts	<1 Watts
Impedance	50 Ohms	50 Ohms	50 Ohms
VSWR	<1.2:1 across bandwidth	<1.2:1	<1.2:1 across bandwidth
Package:	53B1428	53A3286T04	53B0504

Model	MFS500-.2C2B26-5	MM200-.2C17B34-5	MPP389-.15C17G-C-FOA
Interactive Material	TeO2	GaP	GaP
Acoustic Mode	Longitudinal	Longitudinal	Longitudinal
Operating Wavelength	490-500nm	1.06-1.7um	1060nm
Window Configuration	AR Coated	AR Coated	AR Coated
Static Transmission	95 %	>75% @ 1.06um >80% @ 1.7um	75 %
Operating Frequency	450-550 MHz	200 MHz	389 MHz
Intensity Variation	<1.25dB		
Diffraction Efficiency	>65%, Midband with linear polarization, perpendicular to acoustic propagation	>55%@1.7um, >80% @ 1.06um with linear polarization, parallel to acoustic propagation	>56% @ 2.5W peak, >40% @ 1W CW with linear polarization, parallel to acoustic propagation
Acoustic Aperture Size	0.2 mm	0.2mm	0.15mm
Recommended beam diameter	100um		
Optical waist size to achieve rise time		100um to achieve 10ns rise-time	40um to achieve 4ns rise-time
Deflection Angle	11.6mrad @ 495nm		15.2mrad
Deflection Angle	58mrad @ 500MHz @ 495nm	138mrad @ 1.06um 51mrad @ 1.7um	62mrad @ 400MHz
RF Power Level	<0.8 Watts	<2 Watts	<2.5W with duty cycle limited to <20% with RF on duration <200ns <1 Watts average
Impedance	50 Ohms	50 Ohms	50 Ohms
VSWR	<2:1 across bandwidth	<1.5:1	<1.5:1
Package:	53B0504	53B0624T01	53B4475

Model	MTF096-2S2B43-3-1ST/-1ST	MTF096-2S2B43-3-1ST/-1ST-1.2	MTF096-2S2B43-3-1ST/-1ST-2.5
Interactive Material	TeO2	TeO2	TeO2
Acoustic Mode	Shear wave	Shear wave	Shear wave
Operating Wavelength	1.5-1.6um	1.5-1.6um	1.5-1.6um
Window Configuration	AR Coated	AR Coated	AR Coated

Static Transmission	95 %	95 %	95 %
Operating Frequency	70.7MHz @ 1.5um 65.0MHz @ 1.51um 60.2MHz @ 1.52um 56.1MHz @ 1.53um 52.5MHz @ 1.54um 49.3MHz @ 1.55um 46.5MHz @ 1.56um 44.0MHz @ 1.57um 41.8MHz @ 1.58um 39.7MHz @ 1.59um 37.9MHz @ 1.6um	98.89MHz @ 1.5um 98.21 MHz @ 1.51um 97.54MHz @ 1.52um 96.89MHz @ 1.53um 96.24MHz @ 1.54um 95.60MHz @ 1.55um 94.97MHz @ 1.56um 94.34MHz @ 1.57um 93.73MHz @ 1.58um 93.12MHz @ 1.59um 92.53MHz @ 1.6um	98.89MHz @ 1.5um 98.21 MHz @ 1.51um 97.54MHz @ 1.52um 96.89MHz @ 1.53um 96.24MHz @ 1.54um 95.60MHz @ 1.55um 94.97MHz @ 1.56um 94.34MHz @ 1.57um 93.73MHz @ 1.58um 93.12MHz @ 1.59um 92.53MHz @ 1.6um
Diffraction Efficiency	>80%(both order combined) with random polarization	>80%(both order combined) with random polarization	>40%(both order combined) with random polarization
Input beam divergence	<5 deg solid angle	<5 deg solid angle	<8 deg solid angle
Acoustic Aperture Size	2 mm	2 mm	2 mm
Resolution	<1.2nm	<1.2nm	<2.5nm
Deflection Angle(with respect to input beam)	7.4 degree nominal	7.4 degree nominal	7.4 degree nominal
Angular speed	<0.15degree	<0.15degree	<0.15degree
RF Power Level	<4 Watts	<4 Watts	<3 Watts
Impedance	50 Ohms	50 Ohms	50 Ohms
VSWR	<2:1 over bandwidth	<1.5:1	<1.5:1
Package:	53B2965	53B2965	53B2965

Model	I-M041-XXC11XX-P5-GH771	I-M041-10C11Q-P5-SY1	
Interactive Material	Germanium	Monocrystalline Germanium	
Operating Wavelength	9.4um or 10.6um	10.6um	
Damage threshold	>15W/mm ²	<=5W/mm ²	
AR coating reflectivity	<0.2% per surface	<=0.5% per surface	
Transmission	>96.5%	>=95%	
Acoustic Frequency	40.68MHz	40.68MHz	
Optical polarization	Linear, Horizontal (parallel to base)	Linear, horizontal (parallel to base)	
Active aperture	Up to 9.6mm	10mm	
Acoustic mode	Compressional		
Rise-time (10-90%)	120ns/mm		
Diffraction efficiency	>=90%	>=90%	
Max RF power	120W	100W	

Model	I-M080-2C10G-4-AM3	I-M080-2.5C10G-4-AM3	
Interactive Material	Crystal Quartz	Crystal Quartz	
Operating Wavelength	1030-1064nm	1030-1064nm	
Damage threshold	>1GW/cm ²	>1GW/cm ²	
AR coating reflectivity	<0.3% per surface	<0.3% per surface	
Transmission	>99.4%	>99.4%	
Acoustic Frequency	80MHz	80MHz	
VSWR	<1.2:1 at 0dBm	<1.2:1 at 0dBm	
Optical polarization	Linear (vertical to base)	Linear (vertical to base)	
Active aperture	2mm	2.5mm	
Acoustic mode	Compressional	Compressional	
Separation angle	14.9mrad	14.9mrad	
Rise-time (10-90%)	113ns/mm	113ns/mm	

Diffraction efficiency	>85% at 15W RF	>80% at 15W RF	
Max RF power	15W	15W	
Housing	Aluminium	Aluminium	
Cooling	Conduction	Conduction	

Acousto Optical Deflectors

An AO Deflector is a device that will scan an optical beam over a range of angles or accurately control the output angle of the beam. By altering the RF drive frequency to the Deflector, the deflection angle, i.e. the angle through which the diffracted beam is deviated, can be varied.

Effective AO Deflector design is complex, and involves choices of acousto-optic materials and the appropriate acoustic-mode depending upon the application. Commonly, resolution is the most important parameter for a deflector. However, high resolution generally comes at the expense of other parameters such as access time and efficiency. Thus it is important to effectively trade off the various performance requirements.

Gooch & Housego's strong team of scientists and engineers are available to assist you in selecting one of our standard products or providing a custom solution.

Typical applications include; Photolithography, laser tweezers, optical scanning, optical inspection and digital imaging.

Model	Brief Description	Recommended Driver
45035-3-6.5DEG-1.06	TeO ₂ , 1064nm wavelength, 25-45MHz, 3mm aperture, 32mrad deflection, 90 spots resolution, 2W RF	64020-200-2ADSDFS-A 64020-200-2ADMDFS-A 64025-45-2ASVCO-1 64025-45-2AMVCO
45035-3-6.5DEG-1.06-XY	TeO ₂ , 1064nm, 25-45MHz, 3mm aperture, 32mrad deflection, 90 spots resolution, 2W RF	64020-200-2ADSDFS-A-2 64020-200-2ADMDFS-A (2X) 64025-45-2ASVCO-2 64025-45-2AMVCO (2X)
45035-5-6.5DEG-1.06	TeO ₂ , 1064nm, 25-45MHz, 5mm aperture, 56mrad deflection, 150 spots resolution, 4W RF	64020-200-4ADSDFS-A 64020-200-4ADMDFS-A 64025-45-4ASVCO-1 64025-45-4AMVCO
45035-5-6.5DEG-1.06-XY	TeO ₂ , 1064nm, 25-45MHz, 5mm aperture, 56mrad deflection, 150 spots resolution, 4W RF	64020-200-4ADSDFS-A-2 64020-200-4ADMDFS-A (x2) 64025-45-4ASVCO-2 64025-45-4AMVCO (x2)
45050-5-6.5DEG-.8	TeO ₂ , 780-850nm, 35-65MHz, 5mm aperture, 65mrad deflection, 225 spots resolution, 2W RF	64020-200-2ADSDFS-A 64020-200-2ADMDFS-A 21035-65-2ASVCO-1 21035-65-2AMVCO
45050-5-6.5DEG-.8-XY	TeO ₂ , 780-850nm, 35-65MHz, 5mm aperture, 65mrad deflection, 225 spots resolution, 2W RF	64020-200-2ADSDFS-A-2 64020-200-2ADMDFS-A (x2) 21035-65-2ASVCO-2 21035-65-2AMVCO (x2)
45050-6-.83	TeO ₂ , 780-850nm, 35-65MHz, 6mm aperture, 68mrad deflection, 291 spots resolution, 2W RF	64020-200-2ADSDFS-A 64020-200-2ADMDFS-A 64035-65-2ASVCO-1 64035-65-2AMVCO
45070-5-6.5DEG-.63	TeO ₂ , 633nm, 50-90MHz, 5mm aperture, 67mrad deflection, 300 spots resolution, 2W RF	64020-200-2ADSDFS-A 64020-200-2ADMDFS-A 21050-90-2ASVCO 21050-90-2AMVCO
45070-5-6.5DEG-.63-XY	TeO ₂ , 633nm, 50-90MHz, 5mm aperture, 67mrad deflection, 300 spots resolution, 2W RF	64020-200-2ADSDFS-A-2 64020-200-2ADMDFS-A (2x) 64050-90-2ASVCO-2 64050-90-2AMVCO (2x)
45070-6	TeO ₂ , 633-850nm, 50-90MHz, 6mm aperture, 72mrad deflection, 388 spots resolution, 2W RF	64020-200-2ADSDFS-A 64020-200-2ADMDFS-A 64050-90-2ASVCO-1 64040-90-2AMVCO
45100-5-6.5DEG-.51	TeO ₂ , 440-530nm, 75-125MHz, 5mm	64020-200-2ADSDFS-A

	aperture, 78mrad deflection, 375 spots resolution, 2W RF	64020-200-2ADMDFS-A 64075-125-2ASVCO-1 64075-125-2AMVCO
45100-5-6.5DEG-.51-XY	TeO ₂ , 440-530nm, 75-125MHz, 5mm aperture, 78mrad deflection, 375 spots resolution, 2W RF	64020-200-2ADSDFS-A-2 64020-200-2ADMDFS-A (X2) 64075-125-2ASVCO-2 64075-125-2AMVCO (x2)
45100-6	TeO ₂ , 440-530nm, 75-125MHz, 6mm aperture, 87mrad deflection, 485 spots resolution, 2W RF	64020-200-2ADSDFS-A 64020-200-2ADMDFS-A 64075-125-2ASVCO-1 64075-125-2AMVCO
45125-2/10-.355	Crystal Quartz, 355nm, 100-150MHz, 2x10mm aperture, 7.7mrad deflection, 60 spots resolution, 4W RF	64090-150-7ASVCO 64090-150-7AMVCO
46080-1/4-LTD	TeO ₂ , 450-800nm, 60-100MHz, 1x4mm aperture, 14.6mrad deflection, 2W RF	64020-200-1ADSDFS-A 64020-200-1ADMDFS-A 21060-100-1ASVCO 21060-100-1AMVCO
46080-1-1.06-LTD	TeO ₂ , 1064nm, 70-90MHz, 1mm aperture, 20mrad deflection, 1.5W RF	64020-200-2ADSDFS-A 64020-200-2ADMDFS-A 21065-95-2ASVCO 21065-95-2AMVCO
46080-1-.85-LTD	TeO ₂ , 700-1100nm, 70-90MHz, 1mm aperture, 16mrad deflection, 1W RF	64020-200-2ADSDFS-A 64020-200-2ADMDFS-A 21065-95-1ASVCO 21065-95-1AMVCO
46080-1-LTD	TeO ₂ , 450-800nm, 60-100MHz, 1x4mm aperture, 14.6mrad deflection, 1W RF	64020-200-1ADSDFS-A 64020-200-1ADMDFS-A 21060-100-1ASVCO 21060-100-1AMVCO
46080-2-1.06-LTD	TeO ₂ , 1064nm, 70-90MHz, 2mm aperture, 20mrad deflection, 2W RF	64020-200-2ADSDFS-A 64020-200-2ADMDFS-A 21065-95-2ASVCO 21065-95-2AMVCO
46080-2-.85-LTD	TeO ₂ , 700-1100nm, 65-95MHz, 2mm aperture, 16mrad deflection, 2W RF	64020-200-2ADSDFS-A 64020-200-2ADMDFS-A 21065-95-1ASVCO 21065-95-1AMVCO
46080-2-LTD	TeO ₂ , 450-800nm, 60-100MHz, 2mm aperture, 14.6mrad deflection, 1.25W RF	64020-200-2ADSDFS-A 64020-200-2ADMDFS-A 21060-100-2ASVCO 21060-100-2AMVCO
46080-3-1.06-LTD	TeO ₂ , 1064nm, 60-90MHz, 3mm aperture, 20mrad deflection, 2W RF	64020-200-2ADSDFS-A 64020-200-2ADMDFS-A 21065-95-2ASVCO 21065-95-2AMVCO
46080-3-.85-LTD	TeO ₂ , 700-1100nm, 65-95MHz, 3mm aperture, 16mrad deflection, 2W RF	64020-200-2ADSDFS-A 64020-200-2ADMDFS-A 21065-95-2ASVCO 21065-95-2AMVCO
46080-3-LTD	TeO ₂ , 450-800nm, 60-100MHz, 3x4mm aperture, 14.6mrad deflection, 1.5W RF	64020-200-2ADSDFS-A 64020-200-2ADMDFS-A 21060-100-2ASVCO 21060-100-2AMVCO
46110-1-LTD	TeO ₂ , 470-850nm, 90-130MHz, 1mm aperture, 16.3mrad deflection, 2W RF	
46300-0.2/2-.36	Fused silica, 360nm, 225-375MHz, 0.2x2mm aperture, 18mrad deflection, 50 spots resolution, 3W RF	64200-380-5ASVCO 64200-380-5AMVCO
451000-GaP	GaP, 800-850nm, 750-1250MHz, 0.15x2mm aperture, 124mrad	

	deflection, 0.25W RF	
451000L	LiNbO ₃ , 820nm, 750-1250MHz, 0.1x2.6mm aperture, 200 spots resolution, 124mrad deflection, 0.5mW RF	
451500G	GaP, 820nm, 1500MHz, 0.07x1.33mm aperture, 112 spots resolution, 184mrad deflection, 100mW RF	
D040-2G-BG2	TeO ₂ , 1064nm, 30-50MHz, 2x5mm aperture, 3W RF	
D075-2EF-KW1	TeO ₂ , 630-780nm, 50-100MHz, 3x10mm aperture, 3W RF	
D225-1B-OI1	Lead Molybdate, 488nm, 150-300MHz, 0.5mm x 28mm aperture, 1160 spots resolution, 20mrad deflection, 1.5W RF	

Drivers for the Standard AO Deflection Systems / 1D and 2 D

Select the driver, which corresponds to the required frequency and RF drive power for the AO Deflector or Bragg Cell selected. Then select the method of control: VCO (Voltage Controlled Oscillator) or DFS (Digital frequency Synthesizer) and the type of package (Rack Mount System Box or OEM Module). The system box typically requires power of 100 to 240 Volts, 47 to 63 Hz AC. The OEM module requires you to supply DC power, + 15 Volts, and -5 Volts typically, at the required current to power the unit.

The new 64040-150-0.8ADSDFS-8X1 is an eight channel, frequency synthesized driver with the signals combined as one output for use with an Acousto-Optic Beam Deflector (AOBD). The Driver allows independent analog and digital (blanking) control of up to eight beams of light. The frequency and power for each channel can be selected from presets stored in internal memory or setup through the top panel keypad, the RS-232, or the USB. Internal memory contains a factory default setup and up to 16 user stored configurations.

45035-3-6.5DEG-1.06

Interactive Material	TeO ₂
Acoustic Mode	Shear Wave
Operating Wavelength	1064 nm
Window Configuration	AR Coated
Static Transmission	> 97 %
Operating Frequency	25 to 45 MHz
Intensity Variation	< 2 dB
Diffraction Efficiency	> 65 % Midband with Linear polarization, parallel to acoustic propagation
Acoustic Aperture Size	3 mm
Process Time	4.5 μ s
Resolution (T.BW product)	90 spots with no less than 50 μ s scan time and full illumination of the aperture
Δ Deflection Angle	32 mrad
Deflection Angle	56 mrad @ 35 MHz
RF Power Level	2 watts
Impedance	50 ohms
VSWR	< 2:1 across band
Package	53B2024
Recommended Drivers	Analog System Digital Frequency Synthesizer: 64020-200-2ADSDFS-A Analog Module Digital Frequency Synthesizer: 64020-200-2ADMDFS-A Analog System Voltage Controlled Oscillator: 64025-45-2ASVCO-1 Analog Module Voltage Controlled Oscillator: 64025-45-2AMVCO

45035-3-6.5DEG-1.06-XY

Interactive Material	TeO ₂
Acoustic Mode	Shear Wave
Operating Wavelength	1064 nm
Window Configuration	AR Coated

Static Transmission	> 97 %
Operating Frequency	25 to 45 MHz
Intensity Variation	< 2 dB
Diffraction Efficiency	> 65 % mid-band per device with linear polarization, parallel to acoustic propagation
Acoustic Aperture Size	3 mm
Process Time	4.5 μ s
Resolution (T.BW product)	90 spots with no less than 50 μ s scan time and full illumination of the aperture
Δ Deflection Angle	32 mrad
Deflection Angle	56 mrad @ 35 MHz
RF Power Level	< 2 watts
Impedance	50 ohms
VSWR	< 2:1 across band
Package 72003	53D1970
Recommended Drivers	Analog System Digital Frequency Synthesizer: 64020-200-2ADSDFS-A-2 Analog Module Digital Frequency Synthesizer: 64020-200-2ADMDFS-A (2X) Analog System Voltage Controlled Oscillator: 64025-45-2ASVCO-2 Analog Module Voltage Controlled Oscillator: 64025-45-2AMVCO (2X)

45035-5-6.5DEG-1.06

Interactive Material	TeO ₂
Acoustic Mode	Shear wave
Operating Wavelength	1064 nm
Window Configuration	AR Coated
Static Transmission	> 97 %
Operating Frequency	25-45 MHz
Intensity Variation	< 2 dB
Diffraction Efficiency	> 60 % Midband with linear polarization, parallel to acoustic propagation
Active Aperture	5 mm
Process Time	7.5 μ s
Resolution (T.BW product)	150 spots with no less than 60 μ s scan time and full illumination of the aperture
Δ Deflection Angle	32 mrad (25 - 45 MHz)
Deflection angle	56 mrad @ 35 MHz
RF power level	4 watts
Impedance	50 ohms nominal
VSWR	< 2:1 across band
Package	53B2024
Recommended Drivers	Analog System Digital Frequency Synthesizer: 64020-200-4ADSDFS-A Analog Module Digital Frequency Synthesizer: 64020-200-4ADMDFS-A Analog System Voltage Controlled Oscillator: 64025-45-4ASVCO-1 Analog Module Voltage Controlled Oscillator: 64025-45-4AMVCO

45035-5-6.5DEG-1.06-XY

Interaction Material	TeO ₂
Acoustic Mode	Shear
Operating Wavelength	1064 nm
Window Configuration	AR Coated
Static Transmission	> 98%
Operating Frequency	25-45 MHz
Intensity Variation	2 dB
Diffraction Efficiency	\geq 65 % mid-band per device with linear polarization, parallel to acoustic propagation
Acoustic Aperture Size	5 mm
Process Time	7.5 μ s
Resolution (T.BW product)	150 spots with no less than 60 μ s scan time and full illumination of the aperture
Acoustic Velocity	66 mm / μ s

Δ Deflection Angle	32 mrad
Deflection Angle	56 mrad @ 35 MHz
RF Power Level	4 watt max
Impedance	50 ohms
VSWR	< 2:1
Package	53D1970
Recommended Drivers	Analog synthesized driver system: 64020-200-4ADSDFS-A-2 Analog synthesized driver modules: 64020-200-4ADMDFS-A (x2) Analog System Voltage Controlled Oscillator: 64025-45-4ASVCO-2 Analog Module Voltage Controlled Oscillator: 64025-45-4AMVCO (x2)

45050-5-6.5DEG-.8

Interactive Material	TeO ₂
Acoustic Mode	Shear Wave
Operating Wavelength	780 to 850 nm
Window Configuration	AR Coated
Static Transmission	> 95 %
Operating Frequency	35 to 65 MHz.
Intensity Variation	2 dB
Diffraction Efficiency	> 70 % Midband with linear polarization, parallel to acoustic propagation
Acoustic Aperture Size	5mm
Process Time	7.5 μ s
Resolution (T.BW product)	225 spots with no less than 60 μ s scan time and full illumination of the aperture
Δ Deflection Angle	39 mrad @ 850 nm
Deflection Angle	65 mrad @ 50MHz, 850 nm
RF Power Level	2 watts maximum
Impedance	50 ohms
VSWR	< 2:1 across band
Package	53B2024
Recommended Driver	Analog System Digital Frequency Synthesizer: 64020-200-2ADSDFS-A Analog Module Digital Frequency Synthesizer: 64020-200-2ADMDFS-A Analog System Voltage Controlled Oscillator: 21035-65-2ASVCO-1 Analog Module Voltage Controlled Oscillator: 21035-65-2AMVCO

45050-5-6.5DEG-.8-XY

Interactive Material	TeO ₂
Acoustic Mode	Shear
Operating Wavelength	780 to 850 nm
Window Configuration	AR Coated
Static Transmission	> 95 %
Operating Frequency	35 to 65 MHz.
Intensity Variation	2 dB
Diffraction Efficiency	> 70 % mid-band per device with linear polarization, parallel to acoustic propagation
Acoustic Aperture Size	5 mm
Process Time	7.5 μ s
Resolution (T.BW product)	225 spots with no less than 60 μ s scan time and full illumination of the aperture
Acoustic Velocity	0.66 mm/ μ s
Δ Deflection Angle	39 mrad @ 850 nm
Deflection Angle	5 mrad @ 50 MHz, 850 nm
RF Power Level	2 watts max
Impedance	50 ohms
VSWR	< 2:1
Package	53D1970
Recommended Drivers	Analog synthesized driver system: 64020-200-2ADSDFS-A-2 Analog synthesized driver modules: 64020-200-2ADMDFS-A (x2) Analog System Voltage Controlled Oscillator: 21035-65-2ASVCO-2

	Analog Module Voltage Controlled Oscillator: 21035-65-2AMVCO (x2)
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45050-6-.83

Interactive Material	TeO ₂
Acoustic Mode	Shear Wave
Operating Wavelength	780 to 850 nm
Window Configuration	AR Coated
Static Transmission	> 95 %
Operating Frequency	35 to 65 MHz.
Diffraction Efficiency	> 60 % Midband with polarization circular or linear
Intensity Variation	< 2.5 dB
Acoustic Aperture Size	6 mm
Processing Time	9.7 μ s
Resolution (T.BW. product)	291 spots with no less than 70 μ s scan time and full illumination of the aperture
Δ Deflection Angle	41 mrad @ 850 nm
Deflection Angle	68 mrad @ 50MHz, 850 nm
RF Power Level	2 watts
Impedance	50 ohms
VSWR	<2.5:1 Across Bandwidth
Package:	53B2024
Recommended Drivers:	Analog System Digital Frequency Synthesizer: 64020-200-2ADSDFS-A Analog Module Digital Frequency Synthesizer: 64020-200-2ADMDFS-A Analog System Voltage Controlled Oscillator: 64035-65-2ASVCO-1 Analog Module Voltage Controlled Oscillator: 64035-65-2AMVCO

45070-5-6.5DEG-.63

Interactive Material	TeO ₂
Acoustic Mode	Shear Wave
Operating Wavelength	633 nm
Window Configuration	AR Coated
Static Transmission	> 95 %
Operating Frequency	50 to 90 MHz.
Diffraction Efficiency	> 70% Midband with polarization, parallel to acoustic propagation
Intensity Variation	< 2 dB
Acoustic Aperture Size	5mm
Processing Time	7.5 μ s
Resolution (T.BW. product)	300 spots with no less than 60 μ s scan time and full illumination of the aperture
Δ Deflection Angle	38mrad @ 633 nm
Deflection Angle	67mrad @ 633 nm
RF Power Level	2 watts
Impedance	50 ohms
VSWR	<2:1 Across Bandwidth
Package:	53B2024
Recommended Drivers:	Analog System Digital Frequency Synthesizer: 64020-200-2ADSDFS-A Analog Module Digital Frequency Synthesizer: 64020-200-2ADMDFS-A Analog System Voltage Controlled Oscillator: 21050-90-2ASVCO Analog Module Voltage Controlled Oscillator: 21050-90-2AMVCO

45070-5-6.5DEG-.63-XY

Interactive Material	TeO ₂
Acoustic Mode	Shear Wave
Operating Wavelength	633 nm
Window Configuration	AR Coated
Static Transmission	> 98 %
Operating Frequency	50 to 90 MHz.
Intensity Variation	2 dB
Diffraction Efficiency	> 55 % Midband per Device with linear polarization, parallel to acoustic

	propagation
Acoustic Aperture Size	5 mm
Process Time	7.5 μ s
Resolution (T.BW product)	300 spots with no less than 60 μ s scan time and full illumination of the aperture
Δ Deflection Angle	38 mrad @ 633 nm
Deflection Angle	67 mrad @ 633 nm
RF Power Level	2 watt maximum per Device
Impedance	50 ohms
VSWR	< 2:1 across band
Package:	53B2024
Recommended Driver:	Analog System Digital Frequency Synthesizer: 64020-200-2ADSDFS-A-2 Analog Module Digital Frequency Synthesizer: 64020-200-2ADMDFS-A (2x) Analog System Voltage Controlled Oscillator: 64050-90-2ASVCO-2 Analog Module Voltage Controlled Oscillator: 64050-90-2AMVCO (2x)

45070-6

Interactive Material	TeO ₂
Acoustic Mode	Shear Wave
Operating Wavelength	633 to 850 nm
Window Configuration	AR Coated
Static Transmission	> 95 %
Operating Frequency	50 to 90 MHz
Diffraction Efficiency	> 60 % Midband with polarization circular or linear
Intensity Variation	< 2.5 dB
Acoustic Aperture Size	6 mm
Processing Time	9.7 μ s
Resolution (T.BW. product)	388 spots with no less than 70 μ s scan time and full illumination of the aperture
Deflection Angle	72 mrad @ 633 nm
Δ Deflection Angle	41 mrad @ 633 nm
RF Power Level	2 watts
Impedance	50 ohms
VSWR	< 2.5:1 Across Bandwidth
Package:	53B2024
Recommended Drivers:	Analog System Digital Frequency Synthesizer: 64020-200-2ADSDFS-A Analog Module Digital Frequency Synthesizer: 64020-200-2ADMDFS-A Analog System Voltage Controlled Oscillator: 64050-90-2ASVCO-1 Analog Module Voltage Controlled Oscillator: 64040-90-2AMVCO

45100-5-6.5DEG-.51

Interactive Material	TeO ₂
Acoustic Mode	Shear Wave
Operating Wavelength	440 to 530 nm
Window Configuration	AR Coated
Static Transmission	> 95 %
Operating Frequency	75 to 125 MHz.
Intensity Variation	2 dB
Diffraction Efficiency	> 70 % Midband with linear polarization, parallel to acoustic propagation
Acoustic Aperture Size	5 mm
Process Time	7.5 μ s
Resolution (T.BW product)	375 spots with no less than 60 μ s scan time and full illumination of the aperture
Δ Deflection Angle	39 mrad @ 514 nm
Deflection Angle	78 mrad @ 100 MHz, 514 nm
RF Power Level	2 watt maximum
Impedance	50 ohms
VSWR	< 2:1 across band

Package:	53B2024
Recommended Driver:	Analog System Digital Frequency Synthesizer: 64020-200-2ADSDFS-A Analog Module Digital Frequency Synthesizer: 64020-200-2ADMDFS-A Analog System Voltage Controlled Oscillator: 64075-125-2ASVCO-1 Analog Module Voltage Controlled Oscillator: 64075-125-2AMVCO

45100-5-6.5DEG-.51-XY

Interactive Material	TeO ₂
Acoustic Mode	Shear Wave
Operating Wavelength	440 to 530 nm
Window Configuration	AR Coated
Static Transmission	> 95 %
Operating Frequency	75 to 125 MHz.
Intensity Variation	2 dB
Diffraction Efficiency	>70 % Midband per Device
Light Polarization	Linear, parallel to acoustic propagation
Acoustic Aperture Size	5 mm
Process Time	7.5 μ s
Resolution (T.BW product)	375 spots with no less than 60 μ s scan time and full illumination of the aperture
Δ Deflection Angle	39 mrad @ 514 nm
Deflection Angle	78 mrad @ 100 MHz, 514 nm
RF Power Level	2 watt maximum per Device
Impedance	50 ohms
VSWR	< 2:1 across band
Package:	53D1970
Recommended Driver:	Analog System Digital Frequency Synthesizer: 64020-200-2ADSDFS-A-2 Analog Module Digital Frequency Synthesizer: 64020-200-2ADMDFS-A (X2) Analog System Voltage Controlled Oscillator: 64075-125-2ASVCO-2 Analog Module Voltage Controlled Oscillator: 64075-125-2AMVCO (x2)

45100-6

Interactive Material	TeO ₂
Acoustic Mode	Shear Wave
Operating Wavelength	440 to 530 nm
Window Configuration	AR Coated
Static Transmission	> 95 %
Operating Frequency	75 to 125 MHz
Intensity Variation	3 dB
Diffraction Efficiency	> 60 % Midband with polarization circular or linear
Acoustic Aperture Size	6 mm
Processing Time	9.7 μ s
Resolution (T.BW. product)	485 spots with no less than 70 μ s scan time and full illumination of the aperture
Deflection Angle	87 mrad @ 530 nm, @ 100 MHz
Δ Deflection Angle	41 mrad @ 530 nm
RF Power Level	2 watts
Impedance	50 ohms
VSWR	< 2.5:1 Across Bandwidth
Package:	53B2024
Recommended Drivers:	Analog System Digital Frequency Synthesizer: 64020-200-2ADSDFS-A Analog Module Digital Frequency Synthesizer: 64020-200-2ADMDFS-A Analog System Voltage Controlled Oscillator: 64075-125-2ASVCO-1 Analog Module Voltage Controlled Oscillator: 64075-125-2AMVCO

45125-2/10-.355

Interactive Material	Crystal Quartz
Acoustic Mode	Longitudinal

Operating Wavelength	355nm
Window Configuration	AR Coated
Static Transmission	> 97 %
Operating Frequency	100 to 150 MHz
Intensity Variation	<1 dB
Diffraction Efficiency	> 75 %, midband
Light Polarization	Linear, perpendicular to acoustic propagation
Acoustic Aperture Size	2x10mm
Processing Time	1.25us with 7.2mm beam size in acoustic direction
Resolution (T.BW. product)	60 spots
Deflection Angle	7.7mrad @ 125MHz
Δ Deflection Angle	3mrad
RF Power Level	4 watts
Impedance	50 ohms
VSWR	< 1.5:1 Across Bandwidth
Package:	53B1289
Recommended Drivers:	Analog System Voltage Controlled Oscillator: 64090-150-7ASVCO Analog Module Voltage Controlled Oscillator: 64090-150-7AMVCO

46080-1/4-LTD

Interactive Material	TeO ₂
Acoustic Mode	Longitudinal
Operating Wavelength	450-800nm
Window Configuration	AR Coated
Static Transmission	> 95 %
Operating Frequency	60 to 100 MHz
Intensity Variation	<2 dB across the bandwidth
Diffraction Efficiency	>80%, midband with linear polarized light, perpendicular to acoustic propagation or with random polarized light
Acoustic Aperture Size	1mm high x 4mm in acoustic direction
Rise Time	150ns/mm beam dia
Δ Deflection Angle	7.3mrad @ 780nm, 4.5mrad @ 488nm
Deflection Angle	14.6 mrad @ 780nm @ 80MHz, 9.1mrad @ 488nm @ 80MHz
RF Power Level	<1 watts @ 780nm
Impedance	50 ohms
VSWR	< 2:1 Across Bandwidth
Package:	53B0624TO1
Recommended Drivers:	Analog System Digital Frequency Synthesizer: 64020-200-1ADSDFS-A Analog Module Digital Frequency Synthesizer: 64020-200-1ADMDFS-A Analog System Voltage Controlled Oscillator: 21060-100-1ASVCO Analog Module Voltage Controlled Oscillator: 21060-100-1AMVCO

46080-1-1.06-LTD

Interaction Material	TeO ₂
Acoustic Mode	Longitudinal
Operating Wavelength	1.06 μ m
Window Configuration	AR coated
Static Transmission	>97%
Operating Frequency	70-90 MHz
Intensity Variation	< 2.5 dB across bandwidth
Diffraction Efficiency (midband)	> 75 % midband with linear polarization, perpendicular to acoustic propagation, > 70 % midband with random polarization.
Acoustic Aperture Size	1.0 mm
Rise Time	150 nsec/mm beam diameter
Δ Deflection Angle	7.5 mrad
Deflection Angle	20 mrad @ 80 MHz
RF Power Level	< 1.5 watts
Impedance	50 ohms nominal

VSWR	< 1.5:1 across bandwidth
Package	53B0624 T01
Recommended Drivers:	Analog System Digital Frequency Synthesizer: 64020-200-2ADSDFS-A Analog Module Digital Frequency Synthesizer: 64020-200-2ADMDFS-A Analog System Voltage Controlled Oscillator: 21065-95-2ASVCO Analog Module Voltage Controlled Oscillator: 21065-95-2AMVCO

46080-1-.85-LTD

Interactive Material	TeO ₂
Acoustic Mode	Longitudinal
Operating Wavelength	700 to 1100 nm
Window Configuration	AR Coated
Static Transmission	>95 %
Operating Frequency	65–95 MHz
Intensity Variation	< 1.5 dB @ 780 nm
Diffraction Efficiency (midband)	> 70 % midband with linear polarization, perpendicular to acoustic propagation, > 65 % midband with random polarization.
Acoustic Aperture Size	1 mm
Rise Time	150 nsec/mm beam dia.
Δ Deflection Angle	4 mrad @
Deflection Angle	16 mrad @ 80 MHz and 850 nm
RF Power Level	< 1 watt @ 850 nm
Impedance	50 ohms nominal
VSWR	< 1.5:1 over bandwidth
Package	53B0624
Recommended Drivers:	Analog System Digital Frequency Synthesizer: 64020-200-2ADSDFS-A Analog Module Digital Frequency Synthesizer: 64020-200-2ADMDFS-A Analog System Voltage Controlled Oscillator: 21065-95-1ASVCO Analog Module Voltage Controlled Oscillator: 21065-95-1AMVCO

46080-1-LTD

Interaction Material	TeO ₂
Acoustic Mode	Longitudinal
Operating Wavelength	450-800 nm
Window Configuration	AR coated
Static Transmission	>95 %
Operating Frequency	60-100 MHz
Intensity Variation	< 2 dB
Diffraction Efficiency	>80 % midband with linear polarized light perpendicular to acoustic propagation or with random polarized light
Acoustic Aperture Size	1 x 4mm
Rise Time	150 ns / mm beam dia.
Δ Deflection Angle	7.3 mrad @ 780 nm; 4.5 mrad @ 488 nm
Deflection Angle	14.6 mrad @ 780 nm @ 80 MHz; 9.1 mrad @ 488 nm @ 80 MHz
RF Power Level	< 1 watt @ 780 nm
Impedance	50 Ω nominal
VSWR	<2:1 across bandwidth
Package	53B0624
Recommended Drivers:	Analog System Digital Frequency Synthesizer: 64020-200-1ADSDFS-A Analog Module Digital Frequency Synthesizer: 64020-200-1ADMDFS-A Analog System Voltage Controlled Oscillator: 21060-100-1ASVCO Analog Module Voltage Controlled Oscillator: 21060-100-1AMVCO

46080-2-1.06-LTD

Interaction Material	TeO ₂
Acoustic Mode	Longitudinal
Operating Wavelength	1064 nm
Static Transmission	> 97 %
Window Configuration	AR coated

Operating Frequency	70-90 MHz
Intensity Variation	< 2.5 dB across bandwidth
Diffraction Efficiency (midband)	> 75 % midband with linear polarization, perpendicular to acoustic propagation, > 70 % midband with random polarization.
Acoustic Aperture Size	2 mm
Rise Time	150 ns/mm beam dia.
Δ Deflection Angle	7.5 mrad
Deflection Angle	20 mrad
RF Power Level	< 2 watts
Impedance	50 ohms nominal
VSWR	<1.5:1 across bandwidth
Package	53B0624 TO2
Recommended Drivers:	Analog System Digital Frequency Synthesizer: 64020-200-2ADSDFS-A Analog Module Digital Frequency Synthesizer: 64020-200-2ADMDFS-A Analog System Voltage Controlled Oscillator: 21065-95-2ASVCO Analog Module Voltage Controlled Oscillator: 21065-95-2AMVCO

46080-2-.85-LTD

Interactive Material	TeO ₂
Acoustic Mode	Longitudinal
Operating Wavelength	700 to 1100 nm
Window Configuration	AR Coated
Static Transmission	> 95 %
Operating Frequency	65–95 MHz
Intensity Variation	< 1.5 dB @ 780 nm
Diffraction Efficiency (midband)	> 70 % midband with linear polarization, perpendicular to acoustic propagation, > 65 % midband with random polarization.
Acoustic Aperture Size	2 mm
Rise Time	150 nsec/mm beam dia.
Δ Deflection Angle	4 mrad @ 850 nm
Deflection Angle	16 mrad @ 80 MHz and 850 nm
RF Power Level	< 2 watts @ 850 nm
Impedance	50 ohms nominal
VSWR	< 1.5:1 over bandwidth
Package	53B0624
Recommended Drivers:	Analog System Digital Frequency Synthesizer: 64020-200-2ADSDFS-A Analog Module Digital Frequency Synthesizer: 64020-200-2ADMDFS-A Analog System Voltage Controlled Oscillator: 21065-95-1ASVCO Analog Module Voltage Controlled Oscillator: 21065-95-1AMVCO

46080-2-LTD

Interaction Material	TeO ₂
Acoustic Mode	Longitudinal
Operating Wavelength	450-800 nm
Window Configuration	AR coated
Static Transmission	>95 %
Operating Frequency	60-100 MHz
Intensity Variation	< 2 dB
Diffraction Efficiency	>80 % midband with linear polarized light perpendicular to acoustic propagation or with random polarized light
Acoustic Aperture Size	2 mm
Rise Time	150 ns / mm beam dia.
Δ Deflection Angle	7.3 mrad @ 780 nm; 4.5 mrad @ 488 nm
Deflection Angle	14.6 mrad @ 780 nm @ 80 MHz; 9.1 mrad @ 488 nm @ 80 MHz
RF Power Level	< 1.25 watt @ 780 nm
Impedance	50 Ω nominal
VSWR	<2:1 across bandwidth
Package	53B0624
Recommended Drivers:	Analog System Digital Frequency Synthesizer: 64020-200-2ADSDFS-A

	Analog Module Digital Frequency Synthesizer: 64020-200-2ADMDFS-A Analog System Voltage Controlled Oscillator: 21060-100-2ASVCO Analog Module Voltage Controlled Oscillator: 21060-100-2AMVCO
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46080-3-1.06-LTD

Interaction Material	TeO ₂
Acoustic Mode	Longitudinal
Operating Wavelength	1064nm
Window Configuration	AR coated
Static Transmission	>97%
Operating Frequency	60-90 MHz
Intensity Variation	< 2.5 dB across bandwidth
Diffraction Efficiency	>70 % midband with linear polarization, perpendicular to acoustic propagation, >65% midband with random polarization.
Acoustic Aperture Size	3 mm
Rise Time	150 ns / mm beam dia.
Δ Deflection Angle	7.5mrad
Deflection Angle	20mrad
RF Power Level	<2watts
Impedance	50 Ω nominal
VSWR	<1.5:1 across bandwidth
Package	53B0624 TO2
Recommended Drivers:	Analog System Digital Frequency Synthesizer: 64020-200-2ADSDFS-A Analog Module Digital Frequency Synthesizer: 64020-200-2ADMDFS-A Analog System Voltage Controlled Oscillator: 21065-95-2ASVCO Analog Module Voltage Controlled Oscillator: 21065-95-2AMVCO

46080-3-.85-LTD

Interactive Material	TeO ₂
Acoustic Mode	Longitudinal
Operating Wavelength	700 to 1100 nm
Window Configuration	AR Coated
Static Transmission	> 95 %
Operating Frequency	65–95 MHz
Intensity Variation	< 1.5 dB @ 780 nm
Diffraction Efficiency (midband)	> 70 % midband with linear polarization, perpendicular to acoustic propagation, > 65 % midband with random polarization.
Acoustic Aperture Size	3 mm
Rise Time	150 nsec/mm beam dia.
Δ Deflection Angle	4 mrad @ 850 nm
Deflection Angle	16 mrad @ 80 MHz and 850 nm
RF Power Level	2 watts @ 850 nm
Impedance	50 ohms nominal
VSWR	< 1.5:1 over bandwidth
Package	53B0624
Recommended Drivers:	Analog System Digital Frequency Synthesizer: 64020-200-2ADSDFS-A Analog Module Digital Frequency Synthesizer: 64020-200-2ADMDFS-A Analog System Voltage Controlled Oscillator: 21065-95-2ASVCO Analog Module Voltage Controlled Oscillator: 21065-95-2AMVCO

46080-3-LTD

Interaction Material	TeO ₂
Acoustic Mode	Longitudinal
Operating Wavelength	450-800 nm
Window Configuration	AR coated
Static Transmission	>95 %
Operating Frequency	60-100 MHz
Intensity Variation	< 2 dB
Diffraction Efficiency	>80 % midband with linear polarized light perpendicular to acoustic

	propagation or with random polarized light
Acoustic Aperture Size	3 x 4 mm
Rise Time	150 ns / mm beam dia.
Δ Deflection Angle	7.3 mrad @ 780 nm; 4.5 mrad @ 488 nm
Deflection Angle	14.6 mrad @ 780 nm @ 80 MHz; 9.1 mrad @ 488 nm @ 80 MHz
RF Power Level	< 1.5 watt @ 780 nm
Impedance	50 Ω nominal
VSWR	<2:1 across bandwidth
Package	53B0624
Recommended Drivers:	Analog System Digital Frequency Synthesizer: 64020-200-2ADSDFS-A Analog Module Digital Frequency Synthesizer: 64020-200-2ADMDFS-A Analog System Voltage Controlled Oscillator: 21060-100-2ASVCO Analog Module Voltage Controlled Oscillator: 21060-100-2AMVCO

46110-1-LTD

Interaction Material	TeO ₂
Acoustic Mode	Longitudinal
Operating Wavelength	470-850 nm
Window Configuration	AR coated
Operating Frequency	90-130 MHz
Intensity Variation	< 2 dB
Diffraction Efficiency	>85% midband with linear polarization perpendicular to acoustic propagation, >80% midband with random polarization
Acoustic Aperture Size	1mm
Rise Time	150 ns / mm beam dia.
Δ Deflection Angle	15.9 mrad @ 633nm
Deflection Angle	16.3 mrad @ 633nm
RF Power Level	< 1.25 watts
Impedance	50 Ω nominal
VSWR	<2:1 across bandwidth
Package	53B0624
Recommended Drivers:	Analog System Digital Frequency Synthesizer: 64020-200-2ADSDFS-A Analog Module Digital Frequency Synthesizer: 64020-200-2ADMDFS-A Analog System Voltage Controlled Oscillator: 21090-130-2ASVCO Analog Module Voltage Controlled Oscillator: 21090-130-2AMVCO

46300-0.2/2-.36

Interactive Material	Fused Silica
Acoustic Mode	Longitudinal
Operating Wavelength	360 nm
Window Configuration	AR coated
Static Transmission	>97%
Operating Frequency	225-375 MHz
Intensity Variation	<1 dB
Diffraction Efficiency	>70%, midband next to transducer, with linear polarized light perpendicular to acoustic propagation
Acoustic Aperture Size	0.2mm (H) x 2mm (near field distance along acoustic propagation direction)
Process Time	0.33 μ s with 2mm beam size in acoustic direction
Resolution (T.BW product)	50 spots
Δ Deflection Angle	9 mrad
Deflection Angle	18 mrad @ 300 MHz
RF Power Level	<3 watts
Impedance	50 ohms
VSWR	<2:1 across bandwidth
Package	53B1354
Recommended Drivers:	Analog System Voltage Controlled Oscillator: 64200-380-5ASVCO Analog Module Voltage Controlled Oscillator: 64200-380-5AMVCO

451000-GaP

Interaction Material	GaP
Acoustic Mode	Longitudinal
Operating Wavelength	800-850 nm
Window Configuration	AR coated
Static Transmission	80%
Operating Frequency	750-1250 MHz
Intensity Variation	3 dB
Diffraction Efficiency	5% per watt minimum midband with linear polarized light parallel to acoustic propagation
Acoustic Aperture Size	150 μ m x 2mm
Aperture Time	300 nsec
Optical Waist Height	80 μ m
Δ Deflection Angle	62 mrad @ 830 nm
Deflection Angle	124 mrad @ 830 nm
RF Power Level	<.25 Watts nominal can withstand 1 watt maximum
Impedance	50 Ohms nominal
VSWR	<3:1 across bandwidth
Package	53B0504

451000L

Interactive Material	LiNbO3
Acoustic Mode	Longitudinal
Operating Wavelength	820 nm
Window Configuration	AR Coated
Static Transmission	>95 %
Operating Frequency	750 to 1250 MHz
Diffraction Efficiency	1% / Watt minimum with light linear polarized, perpendicular to acoustic propagation.
Acoustic Aperture Size	100 μ m x 2.6 mm
Process Time	400 ns
Resolution (T.BW product)	200 spots
Deflection Angle	124 mrad @ 1000 MHz
Δ Deflection Angle	62 mrad
RF Power Level	< 0.5 mW average, 1 Watt peak with duty cycle of 5 % with pulse width , <1 ms.
Impedance	50 Ohms
VSWR	3:1 across band maximum
Package:	53B0504

451500G

Interactive Material	GaP
Acoustic Mode	Longitudinal
Operating Wavelength	820 nm
Window Configuration	AR Coated
Static Transmission	>95 %
Center Frequency	1500 MHz
Bandwidth	560 MHz
Diffraction Efficiency	5 % / Watt minimum with light polarized Linear parallel to acoustic propagation.
Acoustic Aperture Size	70 μ m X 1.33 mm
Process Time	0.2 us
Resolution (T.BW product)	112 spots
Δ Deflection Angle	69 mrad @ 820 nm
Deflection Angle	184 nm @ 820 nm
RF Power Level	<100 mW ave, 1 Watt peak @10 % duty < 1 ms pulse width.
Impedance	50 Ohms
VSWR	< 3 :1
Package:	53B0504

D040-2G-BG2

Interactive Material	TeO ₂
Operating Wavelength	1064 nm
Damage Threshold	100MW/cm ²
AR Coating Reflectivity	<0.2% per surface
Center RF Frequency (f ₀)	40MHz
Frequency Range	20 MHz
Acoustic Aperture	2mm X 5 mm
Length (optical direction)	32mm
Diffraction Efficiency	>80% @ f ₀ , >50% for 30MHz<f<50MHz
RF Power Level	~3W

D075-2EF-KW1

Interactive Material	TeO ₂
Acoustic Mode	Slow shear
Operating Wavelength	630-780 nm
RF Drive Frequency	50-100MHz
Optical Faces	AR Coated, R<0.5%
Acoustic Aperture	3.0m x 10 mm min (hxd)
Polarization	Linear, horizontal with respect to base
Resolution	750 resolvable spots (Rayleigh criterion)
Scan Angle range @630nm	~3° (2.9°-4.9°)
Access Time	16us
Diffraction Efficiency	>50%
Diffraction Efficiency Variation	<10% @ 633nm
RF Power Level	<3.0W

AO DeflectorD225-1B-OI1

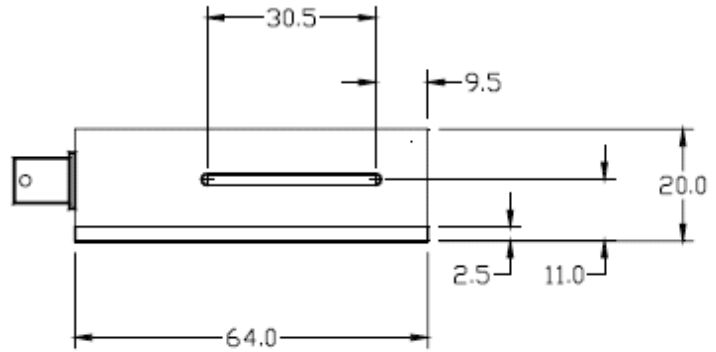
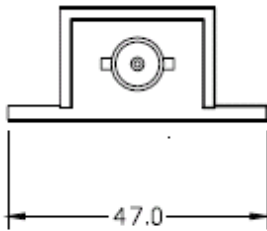
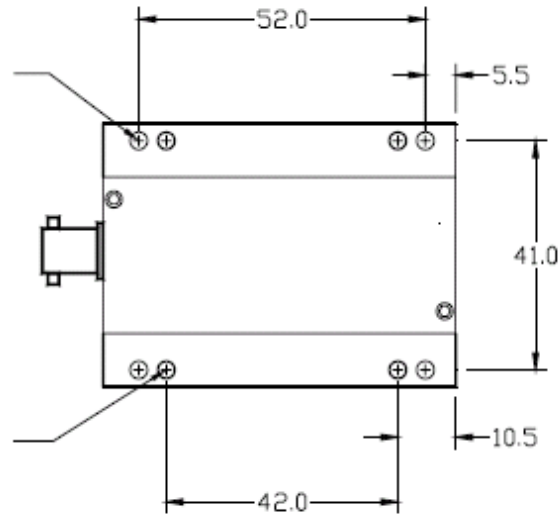
A high performance AO Deflector operating at 488nm, manufactured with superior flatness and parallelism of optical faces to yield minimal wavefront distortion. A scan angle of 20mrad with 1160 spots resolution (Rayleigh criteria) and 7.7μs access time make this device ideally suited for high resolution imaging and reprographic applications.

Interaction Material	Lead Molybdate
Acoustic Mode	Isotropic
Wavelength	488nm
Polarisation	Any
Anti-Reflection Coating	< 0.2% per surface
Transmission	> 93%
Frequency	150MHz to 300MHz
Active Aperture	0.5mm x 28mm
Scan Angle	20mrad
Access Time	7.7μs
Acoustic Velocity	3630m/s
Resolution (Rayleigh Criteria)	1160 spots
Diffraction Efficiency	> 50% (at centre of aperture)
RF Power	< 1.5W

D225-1B-011

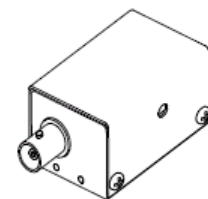
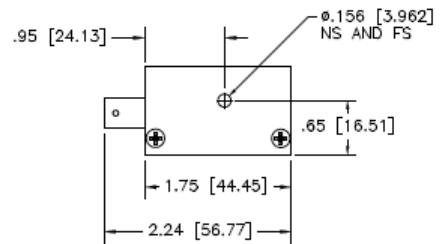
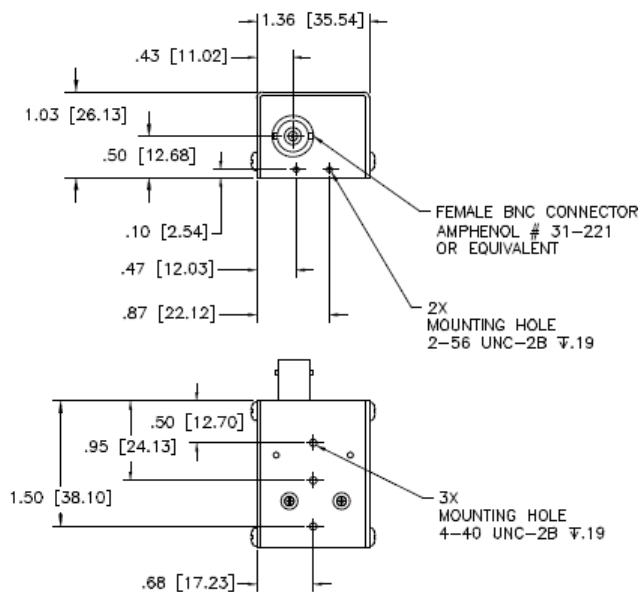
4 Mounting Holes
M3 clearance

4 Mounting Holes
M3 tapped



NOTES: UNLESS OTHERWISE SPECIFIED

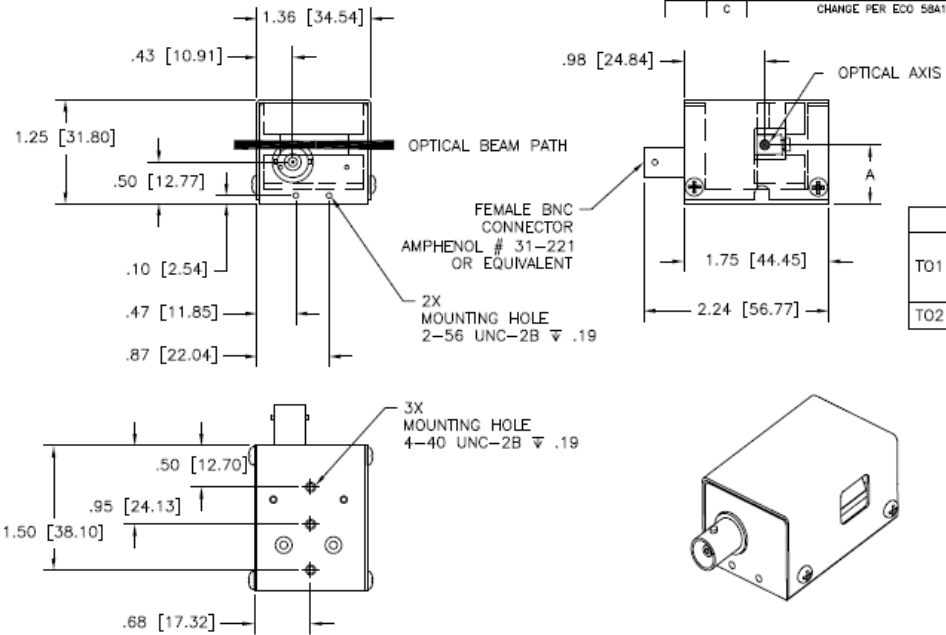
ZONE		REV.	DESCRIPTION	CHNG / DATE	APVD / DATE
	A		CHANGE PER ECO 58A15051	CR 2/04/03	PS 2/07/03



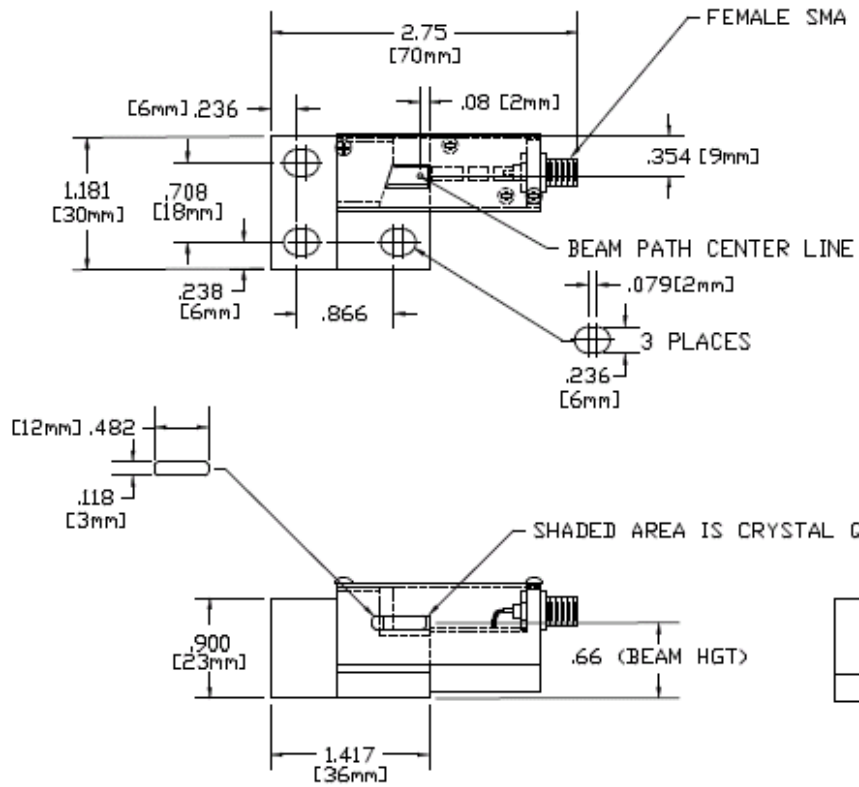
Package: 53B0504

NOTES: UNLESS OTHERWISE SPECIFIED

REVISIONS				
ZONE	REV.	DESCRIPTION	CHNG / DATE	APVD / DATE
	C	CHANGE PER ECO 58A15050	CR 2/05/03	PS 2/07/03



**Package:
53B0624**

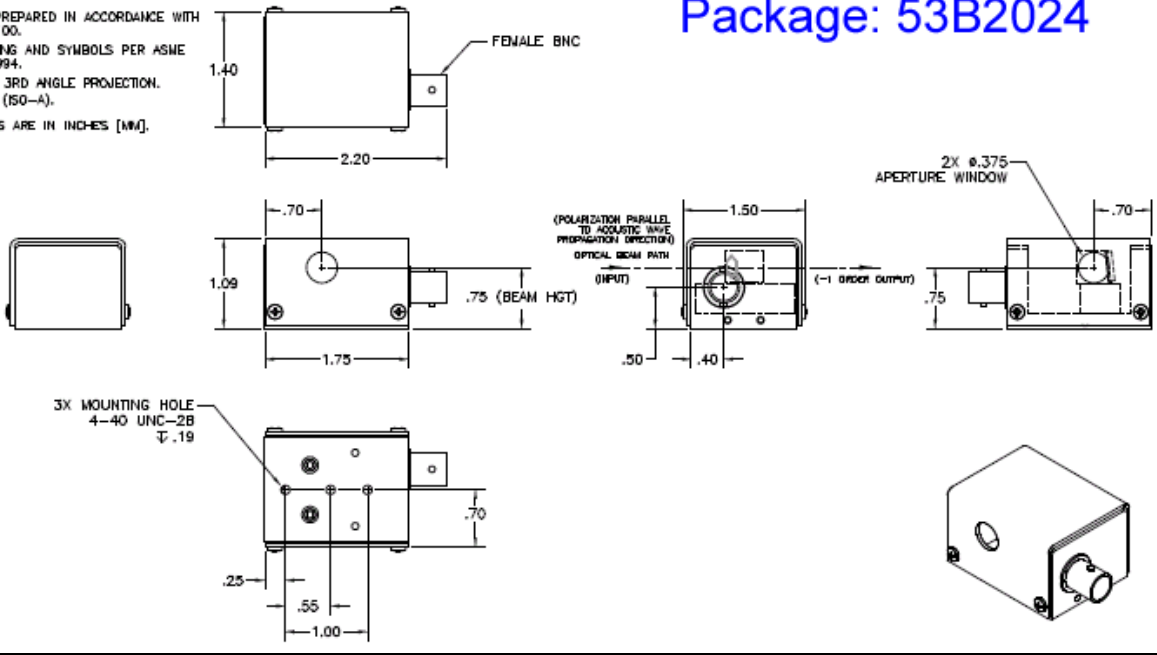


**Package:
53B1354**

NOTES: UNLESS OTHERWISE SPECIFIED

1. DRAWING PREPARED IN ACCORDANCE WITH MIL-STD-100.
2. DIMENSIONING AND SYMBOLS PER ASME Y14.5M-1994.
3. INTERPRET 3RD ANGLE PROJECTION.
4. DIMENSIONS ARE IN INCHES [MM].

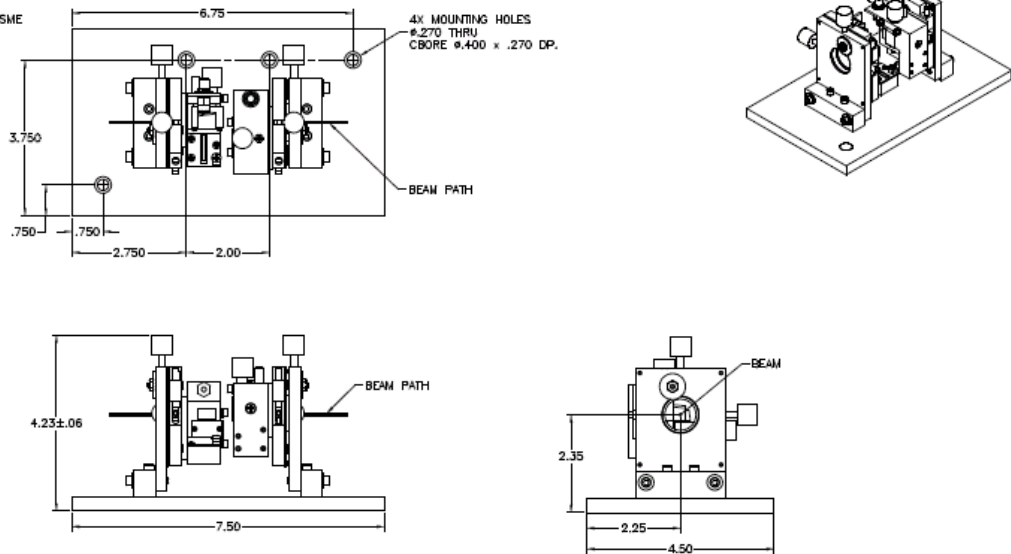
Package: 53B2024



NOTES: UNLESS OTHERWISE SPECIFIED

1. DRAWING PREPARED IN ACCORDANCE WITH MIL-STD-100.
2. INTERPRET 3RD ANGLE PROJECTION.
3. DIMENSIONING AND SYMBOLS PER ASME Y14.5M-1982.

Package 53D1970

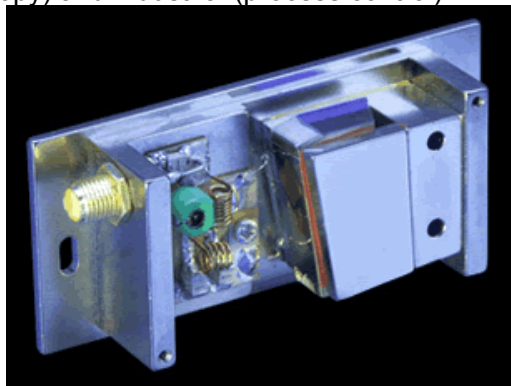


Tunable Filters

An acousto-optic tunable filter is a band-pass transmission filter, which exploits the acousto-optic interaction inside an anisotropic medium. AO Tunable Filters are generally fabricated in Tellurium Dioxide, operating within the visible to near/mid infra-red, and allows the user to select and transmit a single wavelength, or in some cases a selection of multiple discrete wavelengths from the incoming light. The centre of the pass-band may be selected simply by tuning the drive frequency.

Over a number of years we have maintained an ambitious development program which we believe has enabled us to enhance the general performance and increase the capabilities of AOTF technology. Our product range includes purpose designed solutions for illumination / excitation wavelength selection and multispectral / hyperspectral imaging, for which we also offer the latest DFS driver technology.

Typical applications include; Biomedical (confocal microscopy & hyperspectral imaging), Scientific (spectroscopy) and industrial (process control).



Model	Description	Driver
48032-4-3.5	TeO ₂ , 1.8-5um wavelength, aperture 4mm, deflection 2.7o, RF 5W	64020-200-5ADSDFS-A 64020-200-5ADMDFS-A
48055-2-1.7	TeO ₂ , 1.2-2.2um wavelength, aperture 2mm, deflection 2.71o, RF 1.5W	64020-200-2ADSDFS-A 64020-200-2ADMDFS-A
48058-1-.55	TeO ₂ , 442-676nm wavelength, aperture 1mm, deflection 1.4o, RF 0.8W	Eight Channel: 64048-80-.1-8CH-16 64048-80-.1-8CH-16M Four Channel: 64048-80-.1-4CH-5 64048-80-.1-4CH-5M
48058-1-.55-WP	TeO ₂ , 442-676nm wavelength, aperture 1mm, deflection 1.4o, RF 0.8W	Eight Channel: 64048-80-.1-8CH-16 64048-80-.1-8CH-16M Four Channel: 64048-80-.1-4CH-5 64048-80-.1-4CH-5M
48058-2.5-.55	TeO ₂ , 442-676nm wavelength, aperture 2.5mm, deflection 1.4o, RF 0.8W	Eight Channel: 64048-80-.1-8CH-16 64048-80-.1-8CH-16M Four Channel: 64048-80-.1-4CH-5 64048-80-.1-4CH-5M
48058-2.5-.55-WP	TeO ₂ , 442-676nm wavelength, aperture 2.5mm, deflection 1.4o, RF 0.8W	Eight Channel: 64048-80-.1-8CH-16 64048-80-.1-8CH-16M Four Channel: 64048-80-.1-4CH-5 64048-80-.1-4CH-5M
48058-5-.55	TeO ₂ , 442-676nm wavelength, aperture 5mm, deflection 1.4o, RF 0.8W	Eight Channel: 64048-80-.1-8CH-16 64048-80-.1-8CH-16M Four Channel:

		64048-80-.1-4CH-5 64048-80-.1-4CH-5M
48060-8-4-1.0-COL	TeO ₂ , 800-1200nm wavelength, aperture 8x2mm, deflection 23mrad, RF<100mW	
48062-1-.55	TeO ₂ , 442-676nm wavelength, aperture 1mm, deflection 1.3o, RF 0.8W	Eight Channel: 64040-75-.1-8CH-16B 64040-75-.1-8CH-16MB Four Channel: 64040-75-.1-4CH-5 64040-75-.1-4CH-5M
48062-1-.55-WP	TeO ₂ , 442-676nm wavelength, aperture 1mm, deflection 1.3o, RF 0.8W	Eight Channel: 64040-75-.1-8CH-16B 64040-75-.1-8CH-16MB Four Channel: 64040-75-.1-4CH-5 64040-75-.1-4CH-5M
48062-2.5-.55	TeO ₂ , 442-676nm wavelength, aperture 2.5mm, deflection 1.3o, RF 0.8W	Eight Channel: 64040-75-.1-8CH-16B 64040-75-.1-8CH-16MB Four Channel: 64040-75-.1-4CH-5 64040-75-.1-4CH-5M
48062-2.5-.55-WP	TeO ₂ , 442-676nm wavelength, aperture 2.5mm, deflection 1.3o, RF 0.8W	Eight Channel: 64040-75-.1-8CH-16B 64040-75-.1-8CH-16MB Four Channel: 64040-75-.1-4CH-5 64040-75-.1-4CH-5M
48062-4.5-.55	TeO ₂ , 442-676nm wavelength, aperture 4.5mm, deflection 1.3o, RF 0.8W	Eight Channel: 64040-75-.1-8CH-16B 64040-75-.1-8CH-16MB Four Channel: 64040-75-.1-4CH-5 64040-75-.1-4CH-5M
48062-4.5-.55-WP	TeO ₂ , 442-676nm wavelength, aperture 4.5mm, deflection 1.3o, RF 0.8W	Eight Channel: 64040-75-.1-8CH-16B 64040-75-.1-8CH-16MB Four Channel: 64040-75-.1-4CH-5 64040-75-.1-4CH-5M
TF515-230-4-5-VU1	TeO ₂ , 400-630nm wavelngth, aperture 5x5mm, beam separation 4 o, RF 2W	
TF525-250-6-3-GH19	TeO ₂ , 400-600nm wavelngth, aperture 3mm, beam separation 3 o	
TF525-250-6-6-GH57A	TeO ₂ , 400-650nm wavelngth, aperture 6mm, beam separation 3 o	64020-200-2ADMDFS-A 64020-200-2ADSDFS-A
TF527-245-6-3-GH18	TeO ₂ , 405-650nm wavelngth, aperture 3mm, beam separation 3 o	
TF527-245-6-3-GH19	TeO ₂ , 405-650nm wavelngth, aperture 3mm, beam separation 3 o	
TF600-300-6-3-GH19	TeO ₂ , 450-750nm wavelngth, aperture 3mm, beam separation 3 o	
TF640-325-2-12	TeO ₂ , 475-800nm wavelngth, aperture 12x12mm, RF 2W	
TF800-400-20-5-VU2	TeO ₂ , 600-1100nm wavelngth, aperture 6mm, RF ~2W	
TF850-500-8-6-GH58A	TeO ₂ , 475-800nm wavelngth, aperture 12x12mm, RF<1.5W	64020-200-2ADMDFS-A 64020-200-2ADSDFS-A
TF1450-500-2-F2S-SU6	TeO ₂ , 1.2-1.7um wavelngth, aperture 12x12mm, RF 2W	

TF1650-1100-9-3-GH30A	TeO ₂ , 1.1-2.2um wavelngth, aperture 3mm, RF 2.5W	
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Model	48055-2-1.7	48058-5-55
Interactive Material	TeO ₂	TeO ₂
Acoustic Mode	Shear wave	Shear wave
Operating Wavelength	1.2-2.2um	442-676nm
Operating Frequency	40-70MHz	50-85MHz
Window Configuration	AR Coated	AR Coated
Static Transmission	>95%	>95%
Diffraction Efficiency	>80% @ 1.2um, >70% @ 2.2um	>80% per wavelength
Input Polarization	Linear, perpendicular to acoustic propagation	Linear, Vertical (Perpendicular to acoustic propagation)
Input Beam Divergence	6 Deg @ 1.2 um Solid Angle 7 Deg @ 1.7 um 8 Deg @ 2.2 um	<30 mrad (solid angle)
Acoustic Aperture size	< 2 mm	<5mm
Resolution	6 nm @ 1.2 um 10 nm @ 1.7 um 17 nm @ 2.2 um	3nm @ 476 nm 7.5nm @ 676 nm
Deflection angle with respect to incident beam	2.71°	1.4 degrees (wavelength insensitive)
RF Drive Power	1.5 watts	0.8 watt maximum
Impedance	50 ohms nominal	50 ohms nominal
VSWR	< 3:1 over bandwidth	< 2:1 over bandwidth
Package	53B02965	53B1827
Driver	64020-200-2ADSDFS-A 64020-200-2ADMDFS-A	64048-80-.1-8CH-16(8 channel) 64048-80-.1-8CH-16M(8 channel) 64048-80-.1-4CH-5(4 channel) 64048-80-.1-4CH-5M(4 channel)

Model	48060-8/4-1.0-COL	TF1450-500-3-F2x
Interactive Material	TeO ₂	TeO ₂
Acoustic Mode	Shear wave	Anisotropic, slow shear
Operating Wavelength	800-1200nm	1.2µm to 1.7µm
Operating Frequency	55-85MHz	60 to 85MHz
Window Configuration	AR Coated	AR coated
Static Transmission	>95%	
Diffraction Efficiency	>85% with linear polarized light perpendicular to acoustic propagation	Insertion Loss: < 3.0dB (for linearly polarised light) < 6.0dB (for unpolarised light)
Acoustic Aperture Size	8mm x 2 mm	
Resolution	<1nm (best effort)	3nm at 1300nm, 4.5nm at 1550nm
Acceptance Angle(solid)	>0.75mrad	
Deflection angle with respect to incident beam	23mrad nominal	
RF Drive Power	<100mW	2W
Impedance	50 ohms nominal	
VSWR	< 1.5:1 over bandwidth	
Package	53B00337	
Fiber Type		Single mode(2m), or Polarisation maintaining(multimode)
Fiber Connectors		FC / PC Seiko-Geiken(SMF), or Pig-tails for splicing, FC/APC(PMF)

Model	TF515-230-4-5-VU1	TF525-250-6-6-GH57A
Interactive Material	TeO ₂	TeO ₂
Acoustic Mode	Shear wave	Anisotropic

Operating Wavelength	400-630nm	400 - 650nm
Operating Frequency	67-134MHz	58 – 116MHz
Input Polarization	Linear, parallel to base	Linear, vertical with respect to base
Field of view	$\geq 6^\circ$	$\pm 2^\circ$
Spectral Resolution	<4nm @ 500nm	< 6nm at 525nm
Diffraction Efficiency	>90%	> 90% (95% typical)
Beam Separation	$\geq 4^\circ$	> 3°
RF Drive Power	Wavelength dependent ~2W	< 200mW / channel
Input Impedance	50 ohms	50 ohms
Acoustic Aperture	5mm x 5mm	6mm
Clear Aperture	6mm x 8mm	
Temperature	0°C<T<40°C	Conduction through base
Optical Surfaces	Output surface compensated for maximum pointing-stability of diffracted beam	AR coated

Model	TF527-245-6-3-GH18	TF527-245-6-3-GH18
Interactive Material	TeO ₂	TeO ₂
Acoustic Mode	Anisotropic	Anisotropic
Operating Wavelength	405-650nm	405-650nm
Operating Frequency	60-120MHz	60-120MHz
Input Polarization	Linear – Vertical with to base	Linear – Vertical with to base
Spectral Resolution	< 6nm @ 525nm	< 6nm @ 525nm
Beam Separation	$\geq 3^\circ$	$\geq 3^\circ$
RF Drive Power	2W (16 Channels)	2W (16 Channels)
Input Impedance	50 ohms	50 ohms
Active Aperture	3 mm	3 mm
Polarisation of diffracted order	Linear – Orthogonal to input	Linear – Orthogonal to input
Pointing-Stability of diffracted order	< $\pm 0.01^\circ$	< $\pm 0.01^\circ$
Cooling	TEC active cooling	Conduction through housing base

Model	TF640-325-2-12	TF527-245-6-3-GH18
Interactive Material	TeO ₂	TeO ₂
Operating Wavelength	475-800nm	600nm - 1 μ m
Operating Frequency	65-130MHz	42 - 80MHz
Input Polarization	Linear – Vertical with to base	Linear: Parallel to base
Polarization of diffracted order	Linear – Orthogonal to input	
Spectral Resolution	< 2nm @ 650nm	< 10nm at 800nm
Diffraction Efficiency	>90%	> 90%
Field of View	>1.4%	$\geq 6^\circ$
Active Aperture	12 x12 mm	5 x 5mm
Clear Aperture	13 x13 mm	6 x 8mm
Optical Surfaces	Output face compensated for optimum pointing-stability of diffracted beam	Output face compensated for maximum pointing-stability of diffracted beam
RF Drive Power	2W	Wavelength dependent ~2W Max

Model	TF850-500-8-6-GH58A	TF1650-1100-9-3-GH30A
Interactive Material	TeO ₂	TeO ₂ (Anisotropic)
Operating Wavelength	600 - 1100nm	1100nm - 2200nm
Operating Frequency	49 – 98MHz	45 to 95MHz
Spectral Resolution	~ 8nm at 850nm	3nm at 1300nm, 4.5nm at 1550nm
Active Aperture	6 mm	3mm
Input Polarization	Linear, vertical with respect to base	Linear – Vertical wrt to base
Polarization of diffracted order	Linear, orthogonal to input (90° rotated)	Linear – Orthogonal to input

Pointing stability of diffracted order	< $\pm 0.01^\circ$ typical	< $\pm 0.01^\circ$
Field of View	$\geq 2^\circ$	
Beam Separation	$\geq 4^\circ$	> 6°
Transmission	>95%	
Diffraction Efficiency	>90%	
RF Impedance	50 ohms	50 Ω
RF Drive Power	<1.5W	2W
Cooling	Conduction through base	Conduction through base