G&H

ACOUSTO-OPTICS

PRODUCT & SOLUTIONS

GUIDE



G&H: A PHOTONICS SPECIALIST

G&H solves complex challenges for our customers by developing innovative photonics solutions that enhance performance, reliability, and efficiency. We are an award-winning name in the photonics industry with global reach and an established heritage dating back 75 years.

Emerging applications increasingly employ photonics as the enabler. Our customers require specialized, reliable and high-performance solutions. G&H pushes the boundaries in these key areas and provides differentiating product solutions. We maintain close and long-lasting relationships with our customers.

G&H is a photonics technology business headquartered in Ilminster Somerset, UK with operations in the USA and Europe.

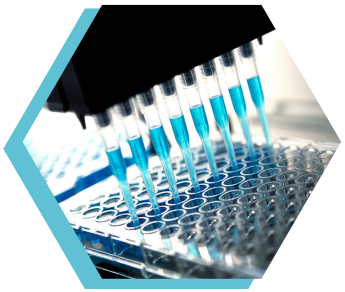
A BETTER WORLD WITH PHOTONICS.



Aerospace & Defense



Industrial & Telecom

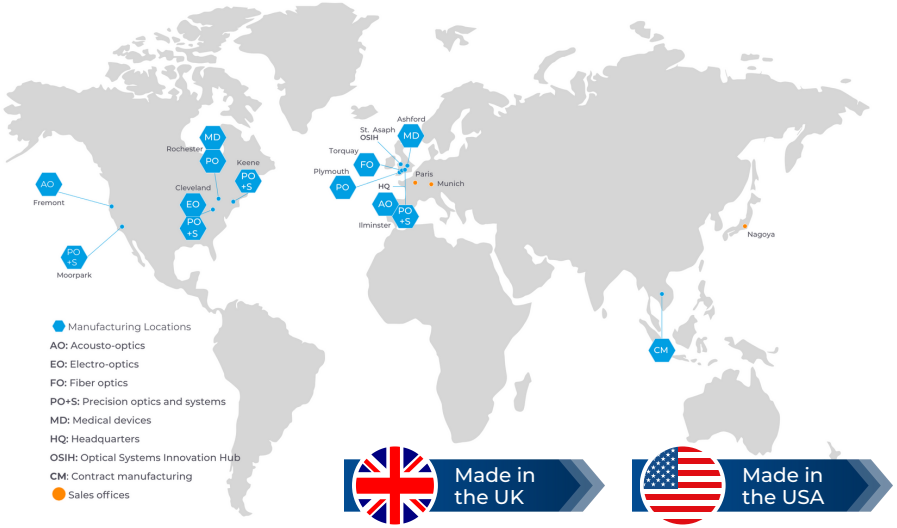


Life Sciences

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BROAD GLOBAL EXPERTISE





Ilminster, UK
49,679 ft²
4,615 m²



Fremont, USA
40,000 ft²
3,716 m²



Keene, USA
12,800 ft²
1,189 m²



Cleveland, USA
80,000 ft²
7,432 m²



Rochester, USA
43,226 ft²
4,015 m²



Moorpark, USA
50,000 ft²
4,645 m²



Plymouth, UK
22,000 ft²
2,043 m²



Torquay, UK
41,000 ft²
3,850 m²



St. Asaph, UK
9,149 ft²
850 m²



Ashford, UK
30,000 ft²
2,787 m²

G&H employs over 1,000 skilled employees across 10 manufacturing and design facilities. We also have 3 sales offices and a contract manufacturing partner in Thailand.

MANUFACTURING CAPABILITIES

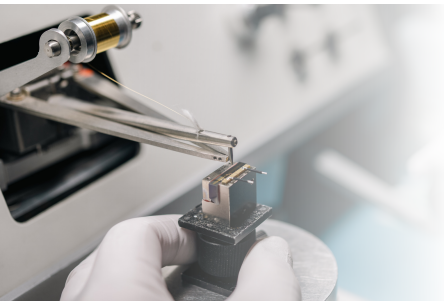


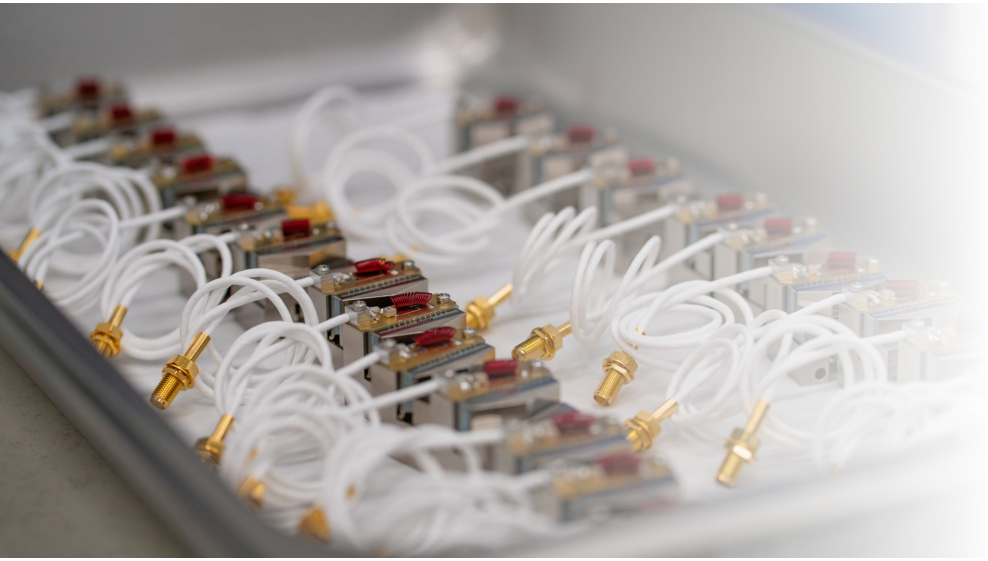
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G&H ACOUSTO-OPTICS

Since 1979, G&H has established itself as a frontrunner in the design and manufacturing of acousto-optic devices, driven by a team of exceptional minds and cutting-edge technologies. Notably, we excel in crystal production, cultivating some materials like TeO2 in-house and procuring others based on specific material and device requirements. Our extensive in-house coating capability ensures that our acousto-optic devices boast superior quality and unmatched reliability.

G&H takes pride in catering to diverse customer needs, offering customized devices designed to precise specifications. This dedication to tailored solutions has earned us a reputation for excellence and premier service. With a proven track record of high reliability and consistently superior quality products, G&H has established itself as one of the largest suppliers of acousto-optic devices, further bolstering their prominence in the industry.



DEFLECTORS

Acousto-optic deflectors (AODF) 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.

Uniform diffraction efficiency

G&H 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 (TeO2) 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.

	Wavelength	Scan angle (mrad)	Active aperture	Operating frequency	Optical material	Acoustic velocity	Polarization
AODF 4170	355nm	4.9	7mm	130-210MHz	Crystalline quartz	5.74mm/µs	Linear
AODF 4100-UV	364nm	29.5	4x14mm	75-125MHz	TeO_2	0.617mm/µs	Elliptical
AODF 4090-7	400-530nm	44	8.5mm	60-115MHz	TeO_2	0.656mm/µs	Linear
AODF 4200-VI	405-488nm	58	4.8mm	150-250MHz	TeO_2	0.710mm/µs	Linear
AODF 3085	633-1064nm	35.9	15mm	65-105MHz	TeO_2	0.705mm/µs	Linear
AODF 4055-4	780-980nm	44.3	3.5x14mm	35-70MHz	TeO_2	0.656mm/µs	Linear
AODF 4090-6	1064nm	56	2mm	72.5-107.5MHz	TeO_2	0.656mm/µs	Linear
AODF 4075-IR	1065-1100nm	8.1	2.5mm	59-91MHz	TeO_2	4.20mm/µs	Linear (random)
AODF 4070	9.4µm	60	9mm	50-90MHz	Ge	5.50mm/µs	Linear

APPLICATIONS

- Digital imaging
- Heterodyne interferometry
- Laser cooling & marking
- Material processing
- Semiconductor manufacturing
- Microscopy
- Photolithography



2D UV BEAM SCANNING

Our flexible functionality 6000 series RF drivers with phase synchronized outputs offer the optimum in RF driver control for 2D scanning. Our deflectors offer highly accurate, repeatable positioning as well as rapid, agile, random access control for higher throughput.

CUSTOM OR MULTI-CHANNEL

Contact us to discuss customized deflection solutions or multi-channel deflectors with high speed performance for your volume OEM applications.

FREQUENCY SHIFTERS

Like other acousto-optic devices, an acousto-optic frequency shifter (AOFS) 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 (TeO_2). Applications such as interference-based optical techniques require a high extinction ratio between the diffracted and undiffracted beam. G&H AOFS devices achieve this by using 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 to double the induced frequency shift. In addition we can design for custom frequency shifts where required. Frequency shifters are fabricated using high quality TeO_2, grown and polished in-house, for lowest insertion loss and excellent power handling. Other acousto-optic materials are available.

	Wavelength (nm)	Operating frequency (MHz)	Active aperture (mm)	Integrated driver	Optical material
AOMO 3080-125	440-850	80	2	No	TeO_2
AOMO 3100-125	440-850	100	1.5	No	TeO_2
AOMO 3200-1214	440-850	200	1.5	No	TeO_2
AOMO 3270-125	440-850	270	1.5	No	TeO_2
AOMO 3350-125	440-850	350	1.5	No	TeO_2
I-FS040-1.S2C-3-GH83	532	40	1.5	No	TeO_2
I-FS040-1.5S2C-1-GH66	532	40	1.5	Yes	TeO_2
I-FS080-3S2E-1-GH39	633	80	3	Yes	TeO_2
I-FS040-2S2E-1-GH66	630-690	40	2	Yes	TeO_2
I-FS040-2S2E-3-OL3	630-690	40	2	No	TeO_2
AOFS 4040-191	633-1064	40	2x6	No	TeO_2
I-FS080-2S2G-3-LV1	1064	80	2	No	TeO_2
I-FS040-23SJ-3-GH53	1550	40	2	No	TeO_2
I-M040-2C8J-3-GH84	1550	40	2	No	Chalcogenide

APPLICATIONS

- Interferometry
- Laser cooling
- Laser Doppler velocimetry and vibrometry (LDV)
- Lidar
- Quantum computing
- Optical heterodyne detection



HIGH EFFICIENCY

TeO_2 frequency shifters are highly efficient, requiring very low drive power to achieve the desired frequency shift. Our designs consume minimal power (generally <100 mW), allowing us to package the driver with the AOFS for a more compact, power-efficient solution.

CUSTOM FREQUENCY SHIFTERS

The products listed above illustrate a range of typical specifications. Our team routinely works with customers, applying our expertise to customize products to meet the demands of their specific applications.

MULTI-CHANNEL MODULATORS

Independent control of multiple beams or a sheet of collimated light

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 eight 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.

Multi-channel deflectors

A multi-channel 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 deflector were configured so that each channel diffracted three spots, the result would be a 4x3 grid.

	Wavelength (nm)	Number of channels	Rise/fall time (ns)	Active aperture (mm)	Operating frequency (MHz)	Optical material
AOMC 220-4	350-365	4	16	0.24	190-250	Crystal quartz
AOMC 300-5	413	5	10	0.2	300	Crystal quartz
AOMC 220-5	413	5	16	0.24	220	Crystal quartz
AOMC 3350-6	350-850	6	30	0.33	350	TeO_2

APPLICATIONS

- Heterodyne interferometry
- Intensity leveling and modulation
- Laser Doppler velocimetry and vibrometry (LDV)
- Lidar
- Lithography
- Marking, processing, printing, etc.



IN-HOUSE MATERIALS

High laser damage threshold is achieved using low-scatter materials, inspected to rigorous quality standards. We grow our own TeO_2 and source high quality fused silica and crystalline quartz to ensure low insertion loss and excellent optical power handling.

CUSTOM M-C MODULATORS

G&H engineers apply their extensive knowledge and experience to design custom products for our customers, to meet their unique needs. If you require a higher number of channels, or another custom parameter, please get in touch with us.

MODULATORS

Single frequency devices allowing intensity modulation of collimated light

Acousto-optic modulators (AOM) allow the intensity of light to be controlled and modulated at rates that far exceed mechanical shutters. AOMs can be used like a shutter (cycling light on and off at a set frequency), or as a variable attenuator (controlling the intensity of transmitted light dynamically). The laser modulation is effected by means of RF induced sound waves creating a periodic refractive-index perturbation in an acousto-optic crystal.

Modulator optimization

The most important factor in selecting a modulator is the required speed. This influences the choice of material, modulator design, and RF driver to be used. The speed of a modulator is described by the rise time, which determines how quickly the modulator can respond to the applied RF driver and limits the modulation rate. Rise time is proportional to the time required for the acoustic wave to traverse the optical beam and for this reason is influenced by the beam diameter within the AOM.

G&H acousto-optic modulators are optimized for low scatter and high laser damage threshold, and can be matched to the rise-time, modulation rate, beam diameter and power handling needs of each application.

Modulator frequency

Modulators fall into two general categories in regards to speed. Very fast modulators can provide frequencies up to 200 MHz and can have a rise time as low as 4 ns. This requires the input beam to be very tightly focused. Lower frequency modulators do not have this constraint, and can accept larger input beams. Their rise time is usually specified relative to the input beam diameter, in ns/mm.

Modulator extinction ratios

Our modulators typically achieve extinction ratios of >50 dB, usually with a deflected beam throughput of 85-90%. For applications such as intensity leveling where a lower contrast ratio of ~10 dB is acceptable, we offer modulators with >99% light throughput.

APPLICATIONS

- Heterodyne interferometry
- Intensity leveling and modulation
- Laser Doppler velocimetry and vibrometry (LDV)
- Lidar
- Lithography
- Marking, processing, printing, etc.



FIBER OPTIC AOMs

G&H has seamlessly integrated AOMs into an innovative fiber-only design, resulting in the award-winning FiberQ™ product line. For further detailed specifications, we invite you to explore the FiberQ™ section in our comprehensive Fiber Optics brochure.

CUSTOM MODULATORS

The standard products listed illustrate a range of typical G&H AOM specifications. Our team routinely works with customers, applying our expertise to customize products to meet the demands of their specific applications.





	Wavelength	Rise/fall time (ns/mm)	Active aperture (mm)	Operating frequency (MHz)	Optical material
I-M110-5C10R19-4-GH116	193-266nm	110	5	110	Crystal quartz
AOMO 3200-1220	257nm	113	0.25	200	Crystal quartz
I-M110-3C10BB-3-GH27	300-400nm	113	3	110	Crystal quartz
I-M110-6.5C10T-4-GH112	355nm	113	6.5	110	Crystal quartz
I-M110-2C10B6-3-GH26	400-540nm	113	2	110	Crystal quartz
AOMO 3200-121	442-488nm	153	0.32	200	TeO_2
AOMO 3200-120	442-488nm	153	0.45	200	TeO_2
AOMO 3110-121	442-488nm	153	0.6	110	TeO_2
AOMO/AOFS 3080-125	440-850nm	153	2	80	TeO_2
AOMO/AOFS 3100-125	440-850nm	153	1.5	100	TeO_2
AOMO/AOFS 3200-1214	440-850nm	153	1.5	200	TeO_2
AOMO/AOFS 3270-125	440-850nm	153	1.5	270	TeO_2
AOMO/AOFS 3350-125	440-850nm	153	1.5	350	TeO_2
AOMO 3110-120	440-850nm	153	0.6	110	TeO_2
AOMO 3080-120	440-850nm	153	1	80	TeO_2
AOMO 3350-120	488-532nm	153	0.1	350	TeO_2
I-M080-2C10B11-4-GH95	700-1000nm	113	2	80	Crystal quartz
AOMO 3200-124	780-850nm	153	0.32	200	TeO_2
AOMO 3080-122	780-850nm	153	1	80	TeO_2
AOMO 3200-1113	870-1250nm	153	0.1	200	TeO_2
I-M080-2C10G-4-AM3	1030-1064nm	113	2	80	Crystal quartz
I-M080-4C10G-4-GH60	1030-1046nm	113	4	80	Crystal quartz
AOMO 3110-197	1030-1090nm	153	1.25	110	TeO_2
AOMO 3080-194	1060nm	153	1.75	80	TeO_2
AOMO/AOFS 3165-1	1300-1550nm	153	0.6	165	TeO_2
I-M040-2C8J-3-GH84	1550nm	260	2	40	AMTIR
I-M041-3C2V5-4-IS8	2000nm	153	3	40.68	TeO_2
I-M041-1.4C10V5-4-GH49	1900-2100nm	113	1.4	40.68	Crystal quartz
I-M0xx-xxC11B76-P5-GH105	5.5µm	120	7.0, 9.6	40 / 60	Ge
I-M050-xxC11V41-P3-GH75	9.4µm	120	9.6, 11.6	40 / 60	Ge
I-M041-xxC11xxx-P5-GH77	9.4 / 10.6µm	120	3.5, 7.0, 9.6, 11.6	40.68	Ge

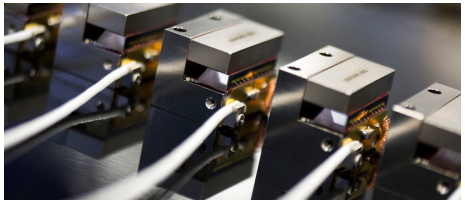
Q-SWITCHES

Our Q-switches (AOQS) are rugged and reliable, backed by millions of hours in the field. We offer low insertion loss, efficient Q-switches capable of handling very high peak power. We have COTS solutions for polarized or unpolarized lasers and can accommodate large lamp-pumped multi-mode laser beam diameters as well as small diameters. Specialized designs meet unique needs such as ultra-high single pass loss (up to 96%), high switching speeds, and premium pulse-to-pulse stability. All our q-switches offer very low loss in the "off" state to maximize output intensity and excellent transducer reliability to allow long-term use without upkeep.

	Wavelength (nm)	Active aperture (mm)	Operating frequency (MHz)	Optical material	Cooling
I-QS080-1C10G-8-GH28	1030-1064	1	80	Crystal quartz	Conduction
I-QS080-1C10G-4-OS13	1030-1064	1	80	Crystal quartz	Conduction
I-QS080-1.2C10G-4-GH64	1030-1064	1.2	80	Crystal quartz	Conduction
I-QS080-0.5C10G-8-GH48	1064	0.5	80	Crystal quartz	Conduction
I-QS041-1.8C10G-4-GH21	1064	1.8	40.68	Crystal quartz	Conduction
I-QS041-2.1C5G-4-GH88	1064	2.1	40.68	SF10 flint glass	Conduction
Industry standard q-switch	1064	3, 4, 5	24, 27.12, 40.68	Fused silica	Water
Stallion Q-Switch	1064	3, 4, 5	24, 27.12, 40.68	Fused silica	Water
Super Q-Switch	1064	3, 4, 5, 6.5	27.12	Crystal quartz	Water
VHE Q-Switch	1064	2.5, 4	68	Crystal quartz	Water
I-QS080-1C10H-4-OS14	1319-1342	1	80	Crystal quartz	Conduction
I-QS041-1.5C10V23-4-HC1	1535	1.5	40.68	Crystal quartz	Conduction
I-QS080-1C10J-8-GH28	1550	1	80	Crystal quartz	Conduction
I-QS041-1.8C10R3-8-SO7	1800-2200	1.8	40.68	Crystal quartz	Conduction
I-QS027-4C10R3-U5-IS6	1800-2200	4	27.12	Crystal quartz	Water
I-QS041-2C10V5-4-HC1	1900-2100	2	40.68	Crystal quartz	Conduction
I-QS027-3C10V5-U5-ST3	1900-2100	3	27.12	Crystal quartz	Water

APPLICATIONS

- Laser marking & lithography
- Material processing
- Medical surgery
- Micromachining



Q-SWITCH DRIVERS

We offer a full line of RF drivers designed specifically for Q-switching, with rapid fall times, tight synchronization, operation in either fixed or variable mode, and advanced capabilities like first pulse suppression or multi-channel operation.

CUSTOM Q-SWITCHES

The products listed above illustrate a range of typical G&H AOQS specifications. Products can be customized to meet the demands of specific applications.

For more, visit gandh.com/products/acousto-optics/q-switches

TUNABLE FILTERS

An acousto-optic tunable filter (AOTF) is a solid-state, electronically-addressable random-access optical passband filter. It may be used to rapidly, dynamically select a specific wavelength from a broadband or multi-line source. When specific matching conditions are met, diffraction will occur, making it possible to electronically control key filter parameters, thus providing rapid, 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. G&H AOTFs are based on our in-house grown high quality tellurium dioxide, polished and fabricated to rigorous standards. 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. When narrow resolution is required and the light source is well collimated, a "quasi-collinear" AOTF may be more appropriate.

	Wavelength (nm)	Active aperture (mm)	Resolution (nm)
AOTF 2837-31	351-430	2.5	1.0
AOTF 3151-01	400-650	2.5	2.5
TF525-250-6-3-GH19A	400-650	3	5
TF550-300-4-6-GH57A	400-700	6	4
TF560-280-1-5-NT2	420-700	5	0.3
AOTF 2838-01	450-670	2.5	1.3
TF625-350-2-11-BR1A	450-800	11	1.5
TF850-500-10-6-GH58A	600-1100	6	10
AOTF 2986-01	640-1100	2.5	5
TF950-500-1-2-GH96	700-1200	2	0.6
AOTF 2996-01	1100-2000	2.5	12
I-TF1650-1100-1-3-GH107	1100-2200	3	1.0
TF1875-1250-10-6-GH59A	1250-2500	6	10
I-TF2250-1500-2-3-GH107	1500-3000	3	2
I-TF3250-2500-3-3-GH107	2000-4500	3	3

APPLICATIONS

- Confocal microscopy
- Fluorescence & hyperspectral imaging
- Imaging spectroscopy
- Laser wavelength tuning & selection



RF DRIVERS

For best performance, we recommend a matched RF driver, including the latest digital frequency synthesizer (DFS) driver technology capable of random access wavelength control.

CUSTOM TUNABLE FILTERS

The table above shows a range of typical AOTF product specifications. G&H engineers apply their knowledge to design custom products for our customers, to meet their unique needs. Fiber-coupled AOTF devices are available upon request.

For more, visit www.gandh.com/products/acousto-optics/tunable-filters

RF DRIVERS

Reliable, versatile electronic control options for acousto-optic devices

An RF driver generates the fixed or variable frequency signal supplied to a device to induce the acousto-optic effect. The frequency and intensity of the signal will determine how much an optical beam is modulated, deflected, or tuned. An acousto-optic device and its RF driver should be paired to optimize speed and stability for each application.

G&H offers a wide variety of dependable high frequency drivers with analog and digital modulation capability, each matched to the device with application-specific features such as first pulse suppression, synchronization, pulse shaping, and multi-channel operation. OEM designs are optimized and streamlined for each customer's application, maximizing performance in the required cost effective form factor for production at high volume.

Choosing an RF driver

The needs of the AO device dictate the choice of RF driver, including but not limited to:

- RF power: ranges from <0.1 W to >150 W
- Modulation: digital or analog
- Frequency of operation: may be fixed, variable (linearly swept), or programmable
- Stability: influencing choice of VCO vs. DDS when frequency is not fixed
- Number of channels: number of output ports or output tones from a single port
- Special functions: pre-pulse-killing, synchronization, etc.

Modulation: digital vs. analog

The modulation mode determines how the applied RF power is varied, and thus the intensity of diffracted light. In digital modulation, the RF power is applied in an on/off state via an applied TTL signal, thus controlling whether the beam is diffracted or not. In analog modulation, the RF power is controlled through application of a voltage within a specified range, yielding control over the diffraction efficiency and allowing shaping of that waveform in time.

Fixed vs. variable frequency drivers

Fixed frequency drivers provide a single output frequency, controlled via analog or TTL input. These are used most often for modulation applications. Variable and programmable frequency drivers allow active control of output frequency. Voltage controlled oscillators (VCOs) provide a linearly swept drive frequency, and are flexible enough to be used for any AO device. Direct digital synthesizer (DDS) drivers offer programmable frequency via software. They can create arbitrary waveforms, and thus are ideal for pulse shaping and special functions.

Frequency agility and control

We manufacture DDS drivers that offer high stability and linearity, with fast switching time and high resolution. They are capable of creating arbitrary waveforms from a single, fixed-frequency reference clock, and thus are ideal for pulse shaping and special functions. DDS drivers can be run from a GUI or via driver commands in two modes: 1) random access of specific frequencies, and 2) chirped mode for continuous scanning.

APPLICATIONS

RF drivers play a key role in driving and controlling a diverse range of acousto-optic devices, including deflectors, cavity dumpers, frequency shifters, mode lockers, modulators (fiber-coupled, free-space), multi-channel, pulse pickers, Q-switches, and tunable filters.

CUSTOM RF DRIVERS

The products listed illustrate a range of typical G&H AO device driver specifications. Our technical support team is available to advise on selection and optimization of RF drivers for specific applications, as well as customization for OEM integration.

Flexible drivers: The Next Generation

Our unique new 6000 series drivers are designed with additional flexibility to adapt to the varied needs of deflectors, from dual channel to multiplexed, multi-tone, and phased array configurations. This unprecedented level of flexibility in configuration for control of AO deflectors, eliminates the need to design your own drive electronics and simplifying system development.

In addition to single channel operation, these drivers may be configured to control two RF channels independently (dual channel) or together (MUX). The dual channel option allows one driver to control two deflectors in an x-y configuration for 2D scanning with the same frequency, while the MUX configuration uses phase agility for enhanced scanning performance of phased array deflectors. Tunable filters may also be controlled in multi-tone operation. While not limited to this number, G&H has demonstrated 11 simultaneous frequencies facilitating multi-wavelength diffraction. All 6000 series drivers are available in a variety of bandwidths, and with optional water cooled, passive, or active forced air heat sink.

	Compatible AO devices	Operating frequency (MHz)	RF power (W)	Operation mode	Key features
6000 series	DF, TF	50-450	15-20	Flexible	Configurable
64020-250-1ADMDFS-A	DF, AOM, TF	20-250	1.0	Programmable frequency	Single channel DDS
64020-200-2ADMDFS-A	DF, AOM, TF	20-200	2.0	Programmable frequency	Single channel DDS
97-03926-12	DF, TF	20-160	3.2	Programmable frequency	8 channel DDS
97-02910-xx	Fiber-Q®	80, 150, 200	2.5-3.0	Fixed single frequency	Low power draw
MHPXXX-YYADM-A1	Fiber-Q®, AOM	24-260	2-20	Fixed single frequency	High frequency; moderate power
3910 series	Fiber-Q®, AOM, FS	80-350	0.5-8.0	Fixed single frequency	User configurable; USB programmable
HP041-125ADG-A10	AOM	40.68	125	Fixed single frequency	Ge AO devices
HP040-060-150ADG-A10-2X	AOM	40 / 60	2x75	Fixed dual frequency	Dual channel Ge AO devices
MQH0XX-YYDM-ZZZ	QS, AOM	24, 27.12, 40.68, 68, 80	25-100	Fixed single frequency	Fixed / variable pulse width
MQH0XX-YYDM-ZZZ-2S	QS	24, 27.12, 40.68, 68, 80	25-50 per channel	Fixed single frequency	2 channel; fixed / variable pulse width
QC0XX-YYDC-ZZZ-AAV	QS, AOM	24, 27.12, 40.68, 68, 80, 110	2-24	Fixed single frequency	Compact, low power; fixed/var. pulse w.
3307 series	Fiber-Q®, FS	80-350	1-4	Variable frequency	Analog & digital modulation





