

# Elliot Scientific

solution science for research and industry

## 2018 Product Overview

### LASERS and SYSTEMS

- Visible to Infrared Lasers & Protective Eyewear
- Narrow Linewidth & Single Frequency
- Fibre & Single Crystal Fibre Lasers



### OPTICS and FIBRE-OPTICS

- Optics, Waveplates, Adaptive Optics & Filters
- Speciality Fibre, Patchcords & Components
- Fibre-optic Test & Measurement, Safety Equipment



### PRECISION POSITIONING

- Nanopositioning & Auto-alignment Systems
- Flexure Stages, Micropositioners & Slides
- Piezo Actuators, Drives & Controllers



### MICROSCOPY and BIOPHOTONICS

- Optical Tweezers, AFM & Spatial Light Modulators
- Nanopositioning & Focusing Systems
- LED & Fibre-coupled Laser Light Sources



### SPECTROSCOPY

- Spectroradiometers & Spectrophotometers
- Light Sources & Filter Wheels
- Detectors & Monochromators



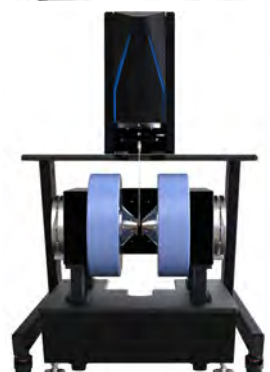
### SENSORS and INSTRUMENTATION

- Temperature & Magnetic Field Sensors
- Distributed Strain & Temperature Sensing
- Probes, Meters, Detectors & Receivers



### MATERIALS RESEARCH

- Cryogenic Characterisation Systems & Probe Stations
- Precision Measurement Instrumentation
- Hall Effect & VSM Systems



**CryoSpectra®**  
*Cryogenics is our passion.*



- Laser crystal cooling
- High power laser amplifiers
- CEP stabilised laser systems
- Ti:Sapphire amplifier systems
- Quantum Cascade lasers
- Cryopumping

**CryoSpectra** deliver the simplest way to bring cryogenic temperatures into a vacuum chamber through their uniquely designed cryorefrigeration systems. These high cooling capacity systems are easily the best way to cool laser crystals, via a very small cold head, to cryogenic temperatures.

The CryoSpectra K Series of low acoustic noise cryorefrigerators are especially designed for work in the lab. The closed-loop cooling system ensures a low maintenance operation, while the super-compact cold head guarantees an ultra-low vibration (0.5 nm peak to peak) chilled surface for inside the vacuum chambers of high power laser systems.

Over a dozen cryorefrigerator models deliver between 75 and 170 Kelvin, with each offering a particular cooling capacity dependent on compressor size and whether it is air or water-cooled.

Gold-plated and polished cold-heads are available in diameters of 38 or 50 mm with either CFF or KF flanges. A reduced chamber size is possible due to the unique design, thereby improving vacuum conditions and pump down times.

**High cooling capacity \* Cool-down time 20 mins \* Compact cold head \* Ultra-low vibration \* Quiet**

**fibercryst**



**Fibercryst** is the only manufacturer of powerful short pulse lasers and amplifiers utilising innovative Single Crystal Fibre technology (SCF). Originally developed from a series of University research programs, the SCF technology has been refined and brought to market by Fibercryst and patented jointly with the Institut d'Optique.

SCF offers significant performance advantages over existing technologies, and commercial products range from a full featured femtosecond micromachining laser, through a stand alone commercial amplifier, to individual Yb:YAG or Nd:YAG *Taranis* laser gain modules.



**IPG PHOTONICS**

**IPG Photonics** has an established range of high performance, reliable, direct diode-pumped lasers and amplifiers using doped optical fibres as the gain media. All models are compact, air-cooled and deliver continuous wave or pulsed light depending on model chosen.

**1.0 Micron Devices - Ytterbium-Doped Fibre Lasers & Amplifiers**

IPG's YLR series of single-mode continuous wave (CW) fibre laser systems offer a unique combination of high power (up to 200 W depending on model), ideal beam quality, and fibre delivery in the near infrared spectral range of between 1030 and 1090 nm.

A line of universal high power single mode fibre amplifiers, the YAR Series, complements the range and covers the spectral range from 1030 to 1070 nm with powers from one to one hundred Watts.

**1.5 Micron Devices - Erbium-Doped Fibre Lasers, Amplifiers & Broadband Sources**

The ELR series are single-mode CW fibre lasers with powers up to 50 W that provide diffraction limited output in the 1535 to 1605 nm spectral range. They offer turnkey operation from a compact unit, making them an ideal IR source for lab applications. Researchers can select from a wide range of options, including direct (up to 2 kHz) modulation, optical isolation at the output, pumping redundancy, termination and more.

Erbium single-mode fibre amplifiers are also offered that cover the spectral range from 1540 to 1605 nm with output powers up to 30 W. The amplifiers deliver high end parameters out of a convenient package with touchscreen, Ethernet and RS-232 interfaces.

**2.0 Micron Devices - Thulium-Doped Fibre Lasers**

IPG's thulium fibre lasers have been developed specifically to meet the demands of industrial, medical and R&D communities. They deliver high power from a compact, efficient, wavelength-selectable, single-mode CW source in the 1900 to 2050 nm spectral range.





**Micro Laser Systems (μLS)** manufactures high performance optical assemblies optimised to solve the unique requirements found in biomedical, military and industrial environments.



**Optical Assemblies**

- Collimators
- Beam expanders
- Fibre focusers
- Fibre receivers and collectors

μLS optical assemblies are used in lifescience, ophthalmology, interferometry, spectroscopy, inspection and metrology applications.



**OZ Optics** is a leading fibre-optic component supplier, with an outstanding reputation as a manufacturer of quality components for use in industrial, telecommunications, laboratory, medical and military fields.

Elliot Scientific offers the following standard components as well as custom solutions:

- |                                  |                          |
|----------------------------------|--------------------------|
| • Attenuators (fixed & variable) | • Polarisation analysers |
| • Beamsplitters                  | • Line generators        |
| • Combiners                      | • Polarisation rotators  |
| • Collimators                    | • PM connectors          |
| • Focusers                       | • Polarisers             |
| • Connectors                     | • Reflectors             |
| • Couplers                       | • Laser diode housings   |
| • Connector termination kits     | • Tuneable filters       |
| • Education kits                 | • U-bracket assemblies   |
| • Fibre-optic fault locators     | • Vacuum feedthroughs    |
| • Fibre pigtailed isolators      | • WDM accessories        |
| • Fused splitters                |                          |
| • Patchcords                     |                          |



**NoIR Laser** has been manufacturing laser safety eyewear for multiple applications since 1996, following its creation by parent company NoIR Medical Technologies.

All our NoIR products are CE-certified (EN207/208)

- |                        |                                   |
|------------------------|-----------------------------------|
| • Laser safety eyewear | ◆ UV-Visible filters              |
| • Reusable eyeshields  | ◆ IR filters                      |
| • Narrowband filters   | ◆ Visual alignment filters        |
| • Broadband filters    | ◆ Patient, Pilot & Low OD filters |



**Elliot Scientific recommends that you consult your laser safety officer, appropriate laser safety standards and laser system documentation to ensure correct choice of eyewear for safe laser use.**

## Optics

**Elliot Scientific** supplies the highest quality optics to researchers and OEMs. For over twenty-five years we have worked with a small number of specialist optic manufacturers to offer the best in choice and price.



**Elliot Scientific** offers a select range of superior quality laser optics in standard sizes from stock for next-day delivery in the UK, and low-cost high-quality Schott glass, ND and dichroic filters on a short lead time to customers around the globe.

- Dichroic colour filters
- Short, long and band pass filters
- ND filters, both reflective and absorptive
- High power laser mirrors and waveplates



**Lambda Research Optics** provide a comprehensive range of high quality standard and laser optics. Their catalogue offers over 300 pages of standard optics for fast delivery, with products that include mirrors, beamsplitters, lenses, prisms, filters, windows and more for 193 nm to 20  $\mu\text{m}$ .

- Catalogue and OEM optics
- Broad range of components
- 193 nm to 20  $\mu\text{m}$
- Laser optics



**OptiSource** has over a century of combined experience in all facets of optical manufacturing. The company offers an extensive range of high energy laser mirrors, beamsplitters, partial reflectors, antireflection and broadband antireflection coated windows and lenses from stock.

- Specialists in waveplates and polarisers
- Beamsplitters, lenses and mirrors
- Custom or OEM quantities
- Quality with competitive pricing



**CODIXX** develop and manufacture dichroic glass polarisers based on a unique *nanoparticle in glass* technology.

Their colorPol® range of high-quality polarisers for the ultraviolet, the visible and the infrared spectral ranges deliver high contrast ratios and transmittance.

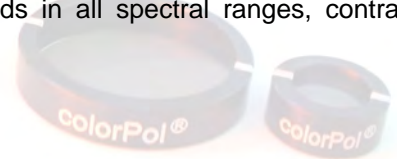
### colorPol® polarisers...

- are flat like foil polarisers
- can be processed like glass or silicon
- are UV and chemical resistant
- have large acceptance angles
- are temperature resistant up to 400 °C

The extraordinary flexibility of the colorPol®-technology enables production of custom polarisers that meet specific demands in all spectral ranges, contrast conditions and designs.

- UV range: 340 to 415 nm
- VIS and NIR range: 450 to 1200 nm
- IR range: 1.2 to 5  $\mu\text{m}$
- HT range for low insertion loss in the 1.2 to 1.7  $\mu\text{m}$  region

Standard dimensions range from 5 mm<sup>2</sup> up to 50 x 30 mm. Various thicknesses are available ranging from 0.2 to 2 mm raw, or laminated on a carrier glass. Other dimensions and shapes are available on request.





**HOLOEYE Photonics** manufacture optical wave manipulation systems and micro-structured optical components, specifically Spatial Light Modulators (SLMs) and diffractive optics.

HOLOEYE's SLM systems are built around liquid crystal microdisplays that can modulate light spatially in amplitude and phase. In effect, acting as a dynamic optical element.

**SLM Models**

- **Ultra HD**  
4094 x 2464 pixels
- **HDTV**  
1920 x 1080 pixels
- **WXGA**  
1280 x 768 pixels
- **XGA**  
1024 x 768 pixels

The most widely used PLUTO 2 SLM offers HDTV resolution and a wide range of interchangeable panel options. These include high retardance panels, dielectric reflective coated panels for high power handling, and standard panels AR/BBAR coated for different wavelength ranges covering 350 to 1700 nm.

Implementation of the different optical functions is straightforward due to easy addressing using HDMI or DVI signals directly from a PC graphics card.

**Applications**

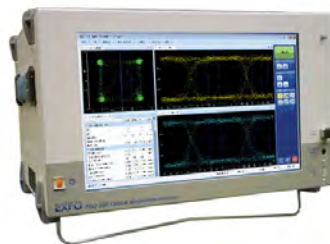
- Digital holography
- Optical tweezers
- Image projection
- Laser beam shaping
- Phase shifting
- Laser pulse modulation
- Beam splitting
- Wavefront modulation

HOLOEYE also offer the OptiXplorer educational kit for both introductory and advanced laboratory courses in optical physics. The main topics covered in the six experimental modules are polarisation effects, amplitude modulation, phase modulation and Fourier Optics.

The primary component of the OptiXplorer is an XGA resolution SLM transmissive twisted-nematic LC. Additionally, a laser module, two rotatable polarisers and some optomechanical components are included in the kit.



Optics & Fibre-optics



**EXFO** is a leading provider of test and measurement solutions for network service providers and equipment manufacturers in the global telecommunications industry.

Laboratory and manufacturing test solutions from EXFO include modular scalable platforms, turnkey systems, and powerful benchtop instruments optimised for the high-performance characterisation of today's and tomorrow's telecom devices.

**Optical Test and Measurement Instruments**

- Light sources
- Power meters
- Polarisation analysis
- OTDR instruments
- Variable attenuators
- Switch and utility modules





**Elliot Scientific** manufactures specialist opto-mechanical micropositioning and fibre alignment solutions.

Our UK-made positioners and flexure stages form the core of a comprehensive range of precision opto-mechanical systems and components engineered for research and industry.

The popular Elliot Gold™ series XYZ flexure stage is an evolution of the original device invented by Martock Design. As the most stable stage on the market, it is ideal for high precision device alignment due to its nanometre resolution. Fibre launch, waveguide and other alignment requirements are typical applications.

The stage can be supplied with a variety of adjusters, from simple or precision, through to piezo or stepper motor. It is available in right- or left-hand versions, and has an extensive range of complementary fibre-optic accessories that include v-grooves and clamps, vacuum or connectorised holders, fibre rotators and grippers.

The Elliot|Martock MDE123 and MDE125 piezo-equipped flexure stages can be driven by our new E1100 Piezo Controller. It is an open loop, three channel amplifier suitable for driving low voltage (up to 150 V) piezo actuators and stacks, and incorporates the latest technologies to combine low noise and outstanding stability with a high power output.

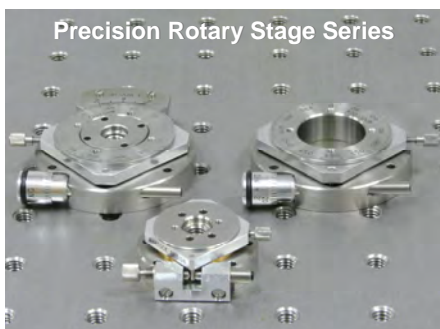
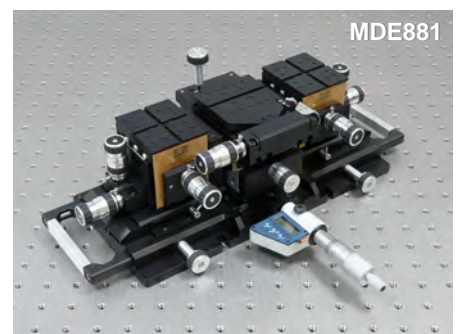
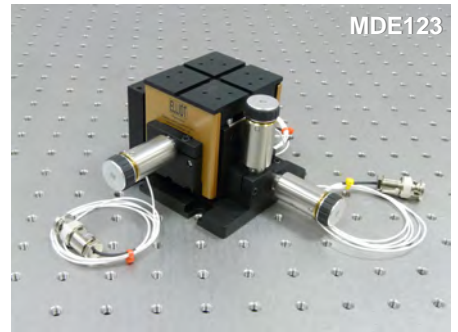
Such is the versatility of the Elliot Gold™ series XYZ flexure stage, it can also form the basis of much more complex manipulators, such as our MDE187 six-axis positioning stage for fibre, waveguide and device alignment.

Alignment of single mode fibres has never been an easy task, so the Elliot|Martock range was originally developed to address this challenge. With optical waveguide devices, alignment is more difficult as it is necessary to simultaneously align fibres or fibre arrays to the input and output of a device.

Elliot Scientific offers a broad range of solutions for alignment. The MDE881 Professional Workstation - a flexure based system designed specifically to address alignment problems - works well in both characterisation and pigtailed applications with a wide variety of devices and fibre types.

An automated solution is also available in our E-Wedge™ system. It includes roll axis optimisation and enables compensation for angled device facets. E-Wedge™ can also be configured as a dual-ended automatic waveguide or device alignment workstation, providing simultaneous alignment of input and output arrays.

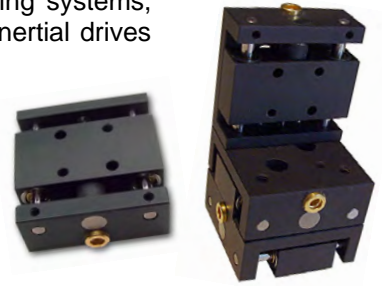
Our miniature, yet robust, dovetail slide series is offered in three different size ranges - *small*, *very-small*, and *ultra-small*; and in various configurations such as X, XY, XZ, YZ, and XYZ. We also manufacture precision rotary and tilt stages that can be used in conjunction with our slides to suit your application.





**mechOnics** specialises in piezo micropositioning systems, offering a complete range of stages with piezo inertial drives and controllers.

- Direct drive of the linear axis
- Zero backlash or rotation
- Up to 30 mm travel at up to 2 mm/s speed
- Vacuum and cryogenic compatible versions
- Numerous options and capabilities
- Open-ended and closed-loop controllers



Screw Pitches

- 0.05 mm (508 TPI)
- 0.10 mm (254 TPI)
- 0.20 mm (127 TPI)
- 0.25 mm (100 TPI)

**Kozak Micro Adjusters (KMA)** manufactures ultrafine metric and imperial micropositioning adjustment screw sets that deliver the highest precision and the smoothest movement by far for the most demanding of OEM applications.

Proprietary manufacturing using customised machine tools enables KMA to produce up to 0.05 mm (508 TPI) pitch adjusters that exceed industry quality standards.



**Mad City Labs** is a leading manufacturer of flexure-based nanopositioning systems that deliver sub-nanometre positioning resolution to researchers. The product line covers the entire spectrum of nanopositioning capabilities while maintaining a leadership role in multi-axis stages for high-speed optical microscopy imaging. Over forty different models are available to choose from.

**Nanopositioner applications**

- AFM, CARS, MEMS, MPE, PALM, SPM & STORM
- Precision alignment and Multi-axis positioning
- Nanolithography and Nanomanipulation
- Closed-loop and Auto-focus systems
- Scanning and High-speed imaging
- Confocal microscopy
- Surface analysis
- Optical trapping
- Particle tracking
- Spectroscopy
- Interferometry
- Lithography
- Metrology

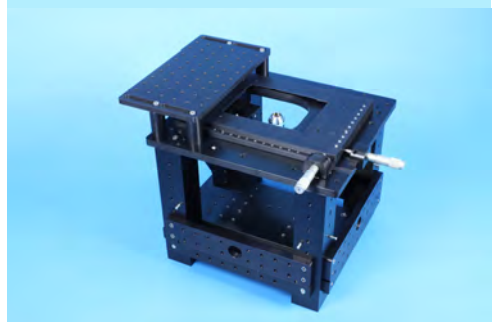
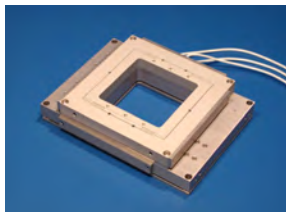
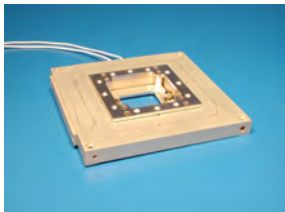


**Precision Microscope Platform**

The RM21™ is a precision aligned microscope platform designed by Mad City Labs for maximum accessibility; allowing microscopists the opportunity to develop flexible multi-configuration instruments with ease.

The rig is precision manufactured with all posts and fixing points referenced to a known datum. This makes alignment of optical and microscopy components within its 3D space very simple.

With a robust design, precision manufacturing and assembly, the RM21™ is the ideal platform for a range of microscopy applications such as fluorescence microscopy, super resolution (SR) microscopy, and total internal reflection fluorescence microscopy (TIRF).

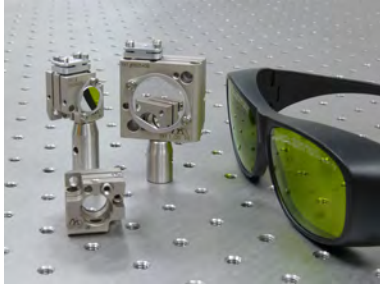
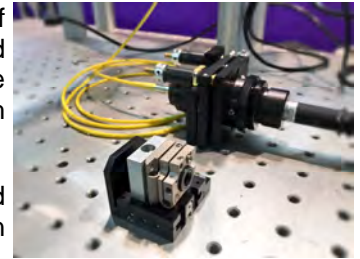
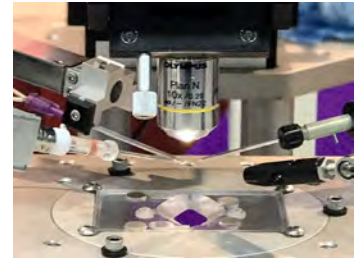


Precision Positioning



**Siskiyou Corporation** offers a diverse range of micromanipulators, microscope sample positioners, and modular opto-mechanical building blocks to life science and photonics researchers.

- Single-axis manipulators
- 4-axis manipulators
- Huxley-style manipulators
- Translation stages & slides
- Optogenetics positioner



The company has been a leading manufacturer of laboratory mechanicals, photonics components and precisioning position products for decades. From the beginning, these products have been produced with quality and flexibility in mind.

Siskiyou's superior engineering provides the end user with a product that fulfils the designed function and lasts far longer than the competition.



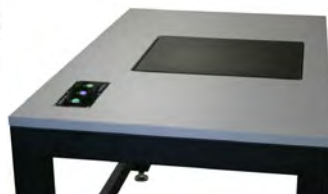
Precision Positioning



**Accurion** designs and manufactures the Halcyonics range of advanced vibration reduction systems for today's exacting nanotechnologies. Whether it's high-resolution measurement or a high-precision manufacturing process, effective anti-vibration solutions are required to achieve maximum performance.

Active vibration isolation overcomes the limits of passive damping systems, enabling the attenuation of vibrations caused by machinery, people, traffic, even sound waves, that would disturb delicate instruments.

- Vibration isolation workstations
- Anti-vibration supports
- Acoustic enclosures
- Custom design service



Microscopy & Biophotonics





**Elliot Scientific** designs and manufactures optical tweezers for use in research as complete single or multiple-trap turnkey systems requiring minimal laser or optics knowledge to set up. We also supply demonstration systems to undergrad laboratories, open designs for special applications, kit laser trapping systems and add-on units to upgrade existing commercial research microscopes.

Our state-of-the-art tweezing systems integrate seamlessly with most modern research microscopes, eliminating the need for scientists to build their own system from components.

**E3500 Multiple Spot System**

- Fully independent control of multiple optical traps
- Linear or circular trapping arrays with variable spacing and rotation
- Multiple independent arrays
- Attaches to microscope camera or epifluorescence port



**E3300 Optical Tweezer System**

- Cell manipulation by conjugate beam steering optics or XY stage
- Attaches to microscope camera or epifluorescence port
- Uses microscope camera and illumination
- Rotation of birefringent particles with optional polarisation optics

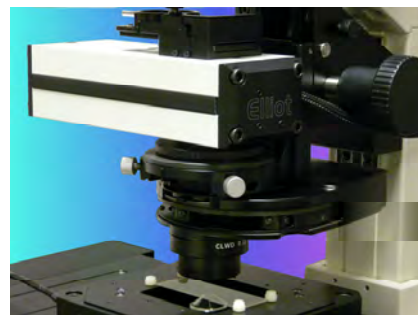


**E4100 QPD Force Measurement System**

- Quadrant Photodetector (QPD) for single particle force measurements
- Single / multiple beam
- Standalone or integrated system
- Optional multiple QPDs or auxiliary probe beam

**E4500 CPT Force Measurement System**

- Camera Particle Tracking (CPT) with calibration by thermal analysis
- Multiple particle / force measurements (within microfluidic channels)
- Standalone or integrated system
- Improved trap stiffness measurements
- Viscosity measurements at several points simultaneously



Precision Positioning



**Kinetic Systems** has been at the forefront of the vibration isolation and optical table market for over thirty years. They are among the world leaders in the development and construction of advanced low frequency vibration control systems that provide isolated work environments for sensitive equipment in applications as diverse as laser R&D, aerospace, medical research and semiconductor equipment.

- Optical tables
- Workstations
- Breadboards
- Isolation legs
- Benchtop systems



Microscopy & Biophotonics

# Prizmatix

**Prizmatix** is a technology-driven company specialising in ultra high-power LED illumination systems for microscopy, optogenetics, and other scientific or industrial applications.

Prizmatix systems incorporate the latest technologies in modular packages to offer maximum versatility in light delivery and light sensing for bioscience, physics neuroscience, neurobiology, biochemistry and more.

### In-vivo & In-vitro Optogenetics Products

Prizmatix offer a full range of modules for both in-vivo and in-vitro optogenetics. Starting from single wavelength plug-and-go Optogenetics-LED kits, to multi-wavelength systems for activation and silencing. From light sources to cannulae and everything in between, Prizmatix can provide all the components necessary for researchers working in these fields.

### Ultra High Power Collimated LED Light Sources from 365 to 730 nm

The Ultra High Power LED from Prizmatix provides almost ten times more power than regular high-power LED devices. The Ultra High Power LEDs are an effective replacement of mercury and xenon lamps as well as lasers in many power-demanding applications such as fluorescence microscopy, optogenetics, chemical reaction activation, uncaging and numerous others.

### Microscope LED Light Sources

The Prizmatix Modular Microscope-LED Light Source series deliver an affordable and expandable solution for fluorescence excitation in upright and inverted fluorescence microscopes. The system features powerful LED modules and beam combiners, and up to three Mic-series Microscope LEDs can be included in a system from a broad range of wavelengths.

### Modular Fibre-coupled LED Light Sources

The fibre-coupled Ultra High Power LED series also deliver more power than regular high-power LED devices. The Ultra High Power LEDs are an effective replacement of Hg and Xe lamps as well as lasers in many applications such as fluorescence microscopy, optogenetics, photocycle kinetics, chemical reaction activation, uncaging and numerous others that demand high power.

### Fixed Wavelength Benchtop Fibre-coupled LED Light Sources

The fibre-coupled high-power LED multi-wavelength light source modules are ideal for replacing lasers and lamps in many applications. These high-power LED plug-in modules can deliver continuous wave (CW) or pulsed light to selectable individual fibre outputs. Each system can contain two or more light sources chosen from a range that includes more than 30 colours plus white.

### Light Guide Coupled LED Light Sources up to 70 W

Prizmatix's UHP-F-LED series are light guide coupled Ultra High Power LED light sources designed for applications in life science instrumentation, machine vision, confocal microscopy and many others. With six wavelengths to choose from plus white, they include driver electronics and thermal management systems, making them an ideal self-contained light source.



Spectroscopy

Microscopy & Biophotonics



**Mountain Photonics** has engineered an easy to use high-brightness broadband tuneable light source by combining an Energetiq Technologies' EQ-99X plasma-based LDLS™ with a proprietary precision monochromator system.

- Tuneable light source
- Homogenous output distribution
- Broad tuning range: UV to NIR
- Fast optics: up to f/1.5
- Spectral power monitoring



LDLS™ = Laser Driven Light Source



**CRAIC Technologies** design and manufacture high-performance UV-Vis-NIR microanalysis instruments and accessories for science, law enforcement and industry. The product range includes:

**UV-Vis-NIR Microspectrophotometers and Photometers**

CRAIC microspectrophotometers offer new levels of sophistication in microanalysis with touch screen controls, sophisticated software, calibrated variable apertures and other innovative technologies.

Measurements across the UV-Vis-NIR range in transmission, absorbance, reflectance, polarisation, luminescence and fluorescence are possible on samples ranging from sub-micron to well over a 100 µm across in size.

And while microspectra are being acquired, samples may be simultaneously viewed in the deep UV and NIR with the high-resolution digital imaging system or in the visible through the research grade eyepiece optics.

**Raman Microspectrometers**

Fast and easy Raman spectroscopy of microscopic sampling areas is now possible with the CRAIC Artemis™ or Apollo II™ Raman Spectrometers - available as add-ons for modern research grade microscopes, or as an option for CRAIC's existing range of UV-Vis-NIR microspectrophotometers.

**UV Microscopes**

The UVM-1™ can image in transmission, reflectance, polarisation and even in fluorescence from the UV, colour visible, and NIR regions with high spatial resolution... all with the same microscope and without swapping components or optics.



CRAIC Technologies also offer instruments to measure thin film thickness and colourimetry on the microscopic scale, add-on units to equip existing microscopes with photometric capabilities, and a range of accessories for

Sensors & Instrumentation



**Tecella** supplies electrophysiology measurement systems that allow pharmaceutical researchers to rapidly screen drugs and medical compounds thereby accelerating and improving drug discovery.

Tecella offer a range of instruments for this fundamental technique; from the popular single channel Pico 2, to the 384-channel Apollo designed for high throughput screening (HTS) systems.

In addition to electrophysiology, researchers working in electrochemistry, MEMS and other biotech fields can benefit from Tecella's highly scalable patch clamp amplifier architectures and fully customisable software and hardware solutions.



Spectroscopy



**Rugged Monitoring** is a new company formed by veteran fibre optic engineers. This industry leading team has over 100 years of combined experience, and is committed to delivering customisable fibre optic based sensing solutions for challenging applications.

Rugged Monitoring offers several multi-channel instruments compatible with a wide range of fibre optic temperature sensors from both themselves and other companies.

The architecture is based on proven GaAs technology with inbuilt redundancy. It also does not require calibration and has been designed to offer simplicity of use with plug and play operation.

Rugged Monitoring fibre optic temperature sensors are highly responsive, intrinsically safe and immune to external influences such as electromagnetic fields, corrosion, and vibration.



Microscopy & Biophotonics

Used together, the right combination of sensor and instrument deliver Rugged Monitoring's promise of precision, reliability, and high performance.



**Gamma Scientific** designs and manufactures award-winning light measurement solutions and test systems for displays and LED characterisation. Their NIST-traceable products are ideal for both R&D and manufacturing environments.

Over fifty years of experience in optical metrology ensures Gamma Scientific's lab grade test equipment, integrating spheres, and light sources are among the best in the world. Their broad product range includes:

- Spectroradiometers
- Integrating spheres
- Light sources: Filament and LED
- Goniophotometers and Reflectometers
- Colourimeters and Spectrometers
- Photometers and Radiometers
- Photodetectors for UV, Vis and NIR



RadOMA™ spectroradiometers feature a proprietary optical design and back thinned CCD technology that provides exceptional low-light measurements, superior blue light sensitivity, and highly accurate measurements of wavelength, colour and power.

Integrating spheres are available sizes from 25 to 3000 mm in diameter, multiple port options, and a choice of PTFE, barium sulphate or gold internal coatings. The multi-purpose integrating spheres deliver unparalleled flexibility and can also be customised to meet your exact test requirements.

A choice of LED and filament light sources for calibration and metrology applications are available from Gamma Scientific, as well as photography, medical imaging, machine vision, sensor testing, and research in vision and colour science.

Gamma Scientific automated and semi-automated reflectometer systems are ideal for manufacturers who need to obtain fast and accurate reflectance measurements for flat panel display glass, anti-reflection coating inspection, touchscreen display glass, optical filters and lens coatings.

The UDT Instruments division of Gamma Scientific offer a broad selection of systems for measuring the intensity of light — photometry, and the measurement of its power — radiometry . These include both benchtop and handheld instruments, as well as an extensive range of photodetectors for a variety of light measurements.

Gamma Scientific also operate an ISO 17025 compliant, NVLAP accredited laboratory for calibration.



Sensors & Instrumentation

Spectroscopy



**Andeen-Hagerling** have been in business for over thirty years, manufacturing world-leading capacitance and capacitance/loss bridge test equipment for use in the lab and field. Their products enable measurements of pressure, cryogenic temperature and fluid levels; and are used in material characterisation, and displacement and strain testing.

The company offers a range of instrumentation and accessories including:

- High-precision Capacitance/Loss Bridges
- Automatic Capacitance Bridges
- Capacitance Standards
- Cabling and test rigs
- Accessories

**Multi-frequency Capacitance/Loss Bridge**

The Andeen-Hagerling AH 2700 series offers unparalleled stability, resolution, linearity and accuracy in a multi-frequency capacitance/loss bridge.



Its numerous state-of-the-art features make it an exceptionally user-friendly instrument, measuring capacitance and loss in medium and high impedance ranges, and thus allows using three-terminal rather than five-terminal connections to the DUT (Device Under Test).

**Capacitance and Loss Meter**

The Andeen-Hagerling AH 2550A measures capacitance and loss in medium and high impedance ranges. Both capacitance and loss ranges cover negative values to allow for unusual samples or 3-terminal networks, and 3-terminal BNC connections minimise connector costs and number of cables.



The unmatched precision is the result of a uniquely designed ratio transformer: the culmination of decades of Andeen-Hagerling bridge design and manufacture. Equally important is the unique temperature-controlled, fused silica capacitance standard which allows extremely high measurement stability and immunity to mechanical shock.

**Capacitance Standards**

The Andeen-Hagerling AH 1100 capacitance standard frame contains up to four AH 11A fused-silica capacitance standards, and provides reference capacitors of unexcelled stability.



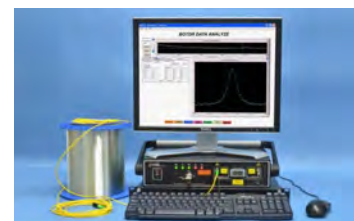
The frame provides the electrical power to operate the precision temperature-controlled oven that is part of each AH 11A. The frame also provides the metering circuits that monitor internal power voltages and temperatures. The built-in precision temperature controllers make it a simple and reliable system to use.

Sensors & Instrumentation



**OZ Optics** developed Foresight™, a sophisticated Distributed Strain and Temperature Sensor (DSTS) based on Brillouin scattering in a standard optical fibre, for numerous sensing applications.

- Live measurement of strain and temperature
- BOTDA with optional BOTDR
- Up to 100 km sensing range
- Multiple channel monitoring
- Real-time fault point detection
- High spatial strain and temperature resolution
- Uses standard telecom optical fibre



Foresight™ can measure subtle changes in both temperature and strain along the length of a fibre over time, or the rapid detection and location of a major disturbance within a second. DSTS is ideal for fire and security applications, and can monitor power lines, bridges, dams, buildings, oil or gas pipelines and wells for structural health, as well as corrosion or erosion effects.

**DEMCON | kryoz**

DEMCON | kryoz developed the CryoLab series to be a fully integrated desktop cryocooler system designed for rapid circuit or material characterisation measurements from ambient down to cryogenic temperatures in an automated manner.

**Features & Applications**

- Plug-and-play cooling platform
- Fast, controlled temperature cycling
- One system - various applications:
  - ◊ High temperature superconductors (HTS)
  - ◊ Thin films
  - ◊ Thermoelectrics - the Seebeck effect
  - ◊ Resistance & Hall coefficient measurements
  - ◊ Optical sensors
- No cryogenic fluids involved
- Integrated pump option



A guitar-shaped carrier holds the test sample (max size 10 x 10 mm), and up to 8 electrical connections can be made to it from the integrated bonding/solder pads (more on request). These are routed through the CryoLab for connection to a DAQ interface or CryoLab Breakout Box.



Although the Kryoz CryoLab can be fully operated as a stand-alone, the companion CryoVision software enables control of the system in more detail. All parameters can be seen at a glance, and switching between user-defined set-points and saved programs can be made. Data created can then be exported.

A smartphone app - the CryoVision Monitor - is also available for remote tracking of experiments.

**Lake Shore**  
ADVANCING SCIENCE™

Lake Shore Cryotronics leads the world in cryogenic temperature measurement.

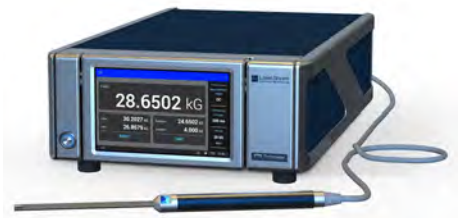
Backed by nearly fifty years of innovation and expertise and a three-year warranty, Lake Shore's equipment sets the standard for precision and accuracy across a wide range of applications.

**Cryogenic Instrumentation**

Lake Shore's cryogenic instrumentation and temperature sensors cover the range from 10 mK to 1543 K with unsurpassed accuracy, providing precision temperature measurement and/or control for cryogenic and higher temperature applications in research and industrial settings.

**Magnetic Instrumentation**

Likewise, Lake Shore's magnetic measurement systems deliver the most stable readings and the highest resolution of any gaussmeters on the market today. Combined with a selection of over a hundred standard transverse and axial Hall probes, Lake Shore magnetic instrumentation can deliver field strength, total flux, and flux density readings with ease.



**Temperature sensor range**

- Cernox™
- Thermocouple
- Platinum
- Germanium
- Ruthenium oxide
- Silicon diode
- GaAlAs diode
- Capacitance



**Lake Shore**  
ADVANCING SCIENCE™

**Lake Shore Cryotronics** design and build vibrating sample magnetometers, Hall Effect and THz measurement systems that set the standard for precision and accuracy in materials characterisation.

## Materials Characterisation Systems

Lake Shore offers a comprehensive range of fully integrated solutions for materials characterisation for measuring AC/DC Hall effect, magnetic and electronic properties.

### 8400 Series AC/DC Hall Measurement Systems

Lake Shore's 8400 series AC/DC Hall measurement system is the flagship of the range of Hall platforms, and includes a unique AC field option that enables users to characterise materials with Hall mobilities down to  $0.001 \text{ cm}^2/\text{Vs}$ , lower than is possible using traditional DC field Hall measurement techniques.

This feature allows for easier measurement of emerging semiconductor and electronic materials, enabling a significant breakthrough in research productivity. The AC field capability tops the list of an assortment of options that include variable temperature assemblies, high and low resistance, and optical access.

### 8425 Series Hybrid DC Hall/Probe Stations

Lake Shore's Model 8425 hybrid system is ideal for a number of applied physics, electrical engineering, materials research, and product R&D applications. It can determine electronic and magneto-transport properties of many novel materials such as: doped diamond, II-VI and III-V semiconductors, AlN-based devices, HEMTs, SOI, HBTs and FETs, and high-temperature superconductors. It can measure samples with resistance ranges of  $0.5 \text{ m}\Omega$  to  $100 \text{ G}\Omega$ , in DC fields of up to 2 T, and in temperatures from 10 to 400 K.

## Vibrating Sample Magnetometer Systems

### 8600 Series

Lake Shore's new 8600 Series Vibrating Sample Magnetometer (VSM) raises the bar for magnetometer performance and convenience by combining high sensitivity, rapid measurement speeds, and ease of operation for faster and more accurate measurements. It features a noise floor of  $0.15 \times 10^{-7} \text{ emu}$ , 10 ms/pt data acquisition rate, 10,000 Oe/s field ramp rate, and magnetic fields up to 3.26 T.

The entire 8600 Series system has been re-imagined with a focus on a clean, ergonomic design that simplifies the researcher's interaction with the system. For example, a motorised head brings the sample to a comfortable height for easy, one-handed exchange of the sample rods.

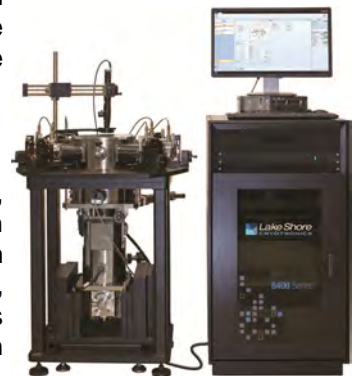
### 7400-S Series

Lake Shore's 7400-S series VSM features a noise floor of  $1 \times 10^{-7} \text{ emu}$  at 10 seconds per point sampling,  $4 \times 10^{-7} \text{ emu}$  at 1 second per point and  $7.5 \times 10^{-7} \text{ emu}$  at 0.1 of a second per point.

Both VSMs deliver a stability of 0.05% per day, surpassing that of any other commercial VSM.

## Warranty

All Lake Shore instruments and systems are backed by a comprehensive 3-year warranty for peace of mind.



**Lake Shore Cryotronics** offers a broad range of cryogenic/CCR-based and vacuum micro-manipulated probe stations.

**Cryogenic Probe Stations**

Designed for testing the electronic and magneto-transport properties of chips, wafers, and packaged devices, the systems feature variable temperature operation, from 1.6 to 675 K depending on model, and can accommodate 4" wafers with up to 6 probes, again depending on model chosen. The current range includes:

- Model PS-100                      Pre-configured Probe Station
- Model TTPX                        Table-top Probe Station
- Model CPX                         High Performance Probe Station
- Model CPX-VF                    Superconducting Magnet Vertical Field Probe Station
- Model CPX-HF                    Superconducting Magnet Horizontal Field Probe Station
- Model EMPX-H2                 Electromagnet Horizontal Field Probe Station
- Model FWPX                       Large Wafer Probe Station
- Model CRX-6.5K                 Affordable CCR-based Probe Station
- Model CRX-4K                    High Performance CCR-based Probe Station
- Model CRX-VF                    CCR-based Vertical Field Superconducting Magnet Probe Station
- Model CRX-EM-HF              CCR-based Horizontal Field Electromagnet Probe Station

Lake Shore's cryogenic probe stations provide precisely-controlled environments for the non-destructive measurement of the electrical properties of materials and early-stage electronic devices.

Probes are available for use with signals ranging from DC to 67 GHz, and a combination of both low and high frequency probes can be supplied with a single system. Additionally, these systems can be configured with horizontal or vertical field superconducting magnets, high-resolution microscopes, and CCD cameras for precision positioning of the probe tips on the wafer or device under test.

Probe stations are versatile and flexible research platforms that can be used in dedicated applications, or as multi-use community research assets.

Typical applications include sampling IV and CV curves over a wide range of temperatures, characterising magneto-transport properties in variable magnetic fields, measuring microwave and electro-optical responses, making Hall effect measurements to understand carrier mobility, and a variety of other material studies. Magnet equipped models enable the study of material responses in a horizontal or vertical magnetic field.

From general purpose units to specialised platforms, each carefully designed Lake Shore probe station ensures stable operation and dependable measurements from cryogenic temperatures all the way through the operating range.

CCR-based platforms provide the user with push-button convenience, while cryogen-based stations offer a lower initial cost for those who are comfortable working with liquid cryogenes.

**Power Supplies**

Lake Shore also offer a portfolio of power supplies for the laboratory. Ranging from small benchtop sources that deliver stable voltages and/or currents in a number of applications, to rack-mounted power supplies for small to medium sized superconducting magnets, and heavy-duty rack and floor-standing units for powering electromagnets.

- Current and Voltage Sources
- Superconducting Magnet PSUs
- Electromagnet Power Supplies



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