



# INNOVATION ECOSYSTEM 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.

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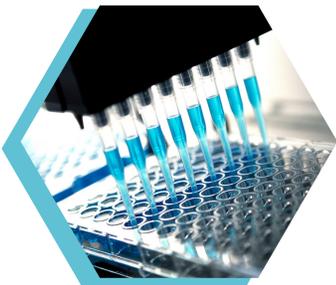
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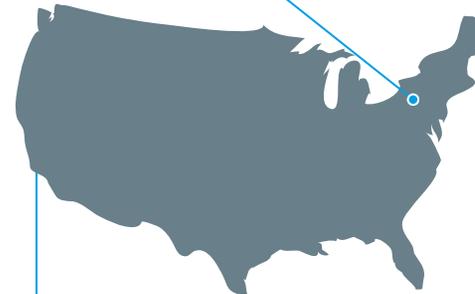


**LIFE  
SCIENCES**

# G&H INNOVATION ECOSYSTEM

Center of Excellence for North American Life Sciences (Rochester NY)

Optical Systems Innovation Hub (St. Asaph UK)



Center of Excellence for Life Sciences (Ashford UK)

Center of Excellence for Acousto-Optics (Fremont CA)

Center of Excellence for Optical Coatings (Plymouth UK)

Fiber Optics Innovation Hub (Torquay UK)



**Ilminster, UK**  
49,679 ft<sup>2</sup>  
4,615 m<sup>2</sup>



**Fremont, USA**  
40,000 ft<sup>2</sup>  
3,716 m<sup>2</sup>



**Keene, USA**  
12,800 ft<sup>2</sup>  
1,189 m<sup>2</sup>



**Cleveland, USA**  
80,000 ft<sup>2</sup>  
7,432 m<sup>2</sup>



**Rochester, USA**  
43,226 ft<sup>2</sup>  
4,015 m<sup>2</sup>



**Moorpark, USA**  
50,000 ft<sup>2</sup>  
4,645 m<sup>2</sup>



**Plymouth, UK**  
22,000 ft<sup>2</sup>  
2,043 m<sup>2</sup>



**Torquay, UK**  
41,000 ft<sup>2</sup>  
3,850 m<sup>2</sup>



**St. Asaph, UK**  
9,149 ft<sup>2</sup>  
850 m<sup>2</sup>



**Ashford, UK**  
30,000 ft<sup>2</sup>  
2,787 m<sup>2</sup>

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.

# CAPABILITIES



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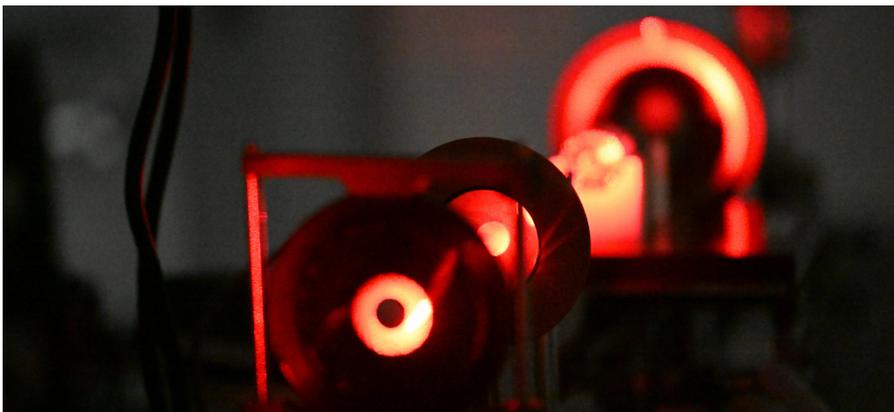
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## G&H INNOVATION

G&H is a world-leading specialist supplier of highly reliable photonics products and manufacturing solutions to customers around the world, relying on our enabling technologies on acousto-optics, crystal optics, electro-optics, fiber optics, optical systems, precision optics, and AFV vision systems.

Our commercial success is underpinned by our proven capability in performing cutting-edge product development and delivering technically-differentiated products that are engineered for each individual, high-valued customer.

As an OEM customer, whether you require customized variation of a standard product, or a dedicated component or subsystem for your application, G&H is well positioned to fulfill your product development needs. Our product development process has been refined over 40 years and relies on taking an idea from concept generation to full-scale production and aftersales support.



# PRODUCT DEVELOPMENT

## Application-specific engineering

Our axiom in R&D is to develop and commercialize products that address and solve problems specific to our customer end application. This is fundamental to our product development process and what makes our customers successful. Engineering application-specific components and sub-systems translates to unique differentiators in our customers' systems.

The key to success is early stage engagement that allows for concurrent engineering side by side with our customers. Talk to us about your new idea or next-generation products. We are here to help and make your project a commercial success.



## Our development process

Our R&D team expertise and specialist know-how combined with our robust AS9100 compliant development process gives our R&D projects portfolio focus, effectiveness and speed. Our new product development (NPD) process is based on well-thought and proven phase gates. It involves all functions of the business throughout the development lifecycle, making sure that that product under development is competitively positioned in the market, complies with the stringent customer- or market- driven requirements, is validated to the target operational environment and is designed for manufacture. Our process includes regular reviews on risks, regulatory compliance with a robust project management framework and interface with our customers. We work with each customer on an individual basis, and will comply with external or government development processes or formats if required.

With decades of experience, we know what will work and what won't. Moreover, as photonics continues to penetrate into new market and find new applications, our development engineers understand how to identify new failure mechanisms of the technology and provide effective and innovative solutions that ultimately lead to ground-breaking new products.

## VERTICAL INTEGRATION

Our ability to fabricate custom and application-specific photonic components coupled with our system design capabilities is the way we achieve technically-differentiated new products. A system is not just a collection of parts. Customized, better performing components that are optimally interconnected for the specific system under design gives a strong competitive edge our customers are looking for. Our system development teams and component specialists interact through a single global R&D team.

## COST-EFFECTIVE NEW PRODUCTS

As a high volume commercial supplier, we are aware that differentiation in cost as well as performance is required for a truly successful product. For every new product development project, G&H takes responsibility for meeting the initial target cost, as well as creating a detailed plan for ongoing cost reduction. As a vertically integrated business, we use internal content to achieve both technical and cost differentiators. Our global supply chain team makes sure that we remain competitive and continuously improve.

# TECHNOLOGY INNOVATION

## Breaking the boundaries of what is possible for our customers

We push the performance envelope of photonics to commercialize reliable new products through innovation and a robust new product development process.

Forward thinkers, we have a proven history of pioneering R&D and world-class product development in photonics technology, underpinning our product line by:

- Advancing material science, components technology and crystal optics
- Designing and developing novel sub-systems using our component base
- Creating components and systems for new applications where photonics can have a disruptive role

## Moving up the value chain with design-for-manufacture

We can design and manufacture solutions completely in-house, from materials all the way to a fully performing module. Our capabilities extend beyond component design and manufacturing to also include the creation and testing of sub-assemblies. As a fully integrated producer, we can add value to your solution by providing optics, electronics, software, and mechanics.



## THE G&H COMMITMENT

G&H is committed to being the reliable supplier of high performance photonic products that enable technology differentiators over the product lifetime. We achieve this by having a world-leading, multi-disciplinary team of engineers, efficient product development processes and well-controlled material supply to continually push the boundaries of what is possible.

# OUR TEAM OF EXPERTS

We focus our photonics expertise in designing, engineering and manufacturing to provide our OEM customers with the solutions they need. Whatever the application or environment, we can work with you to enable greater system efficiency and effectiveness.

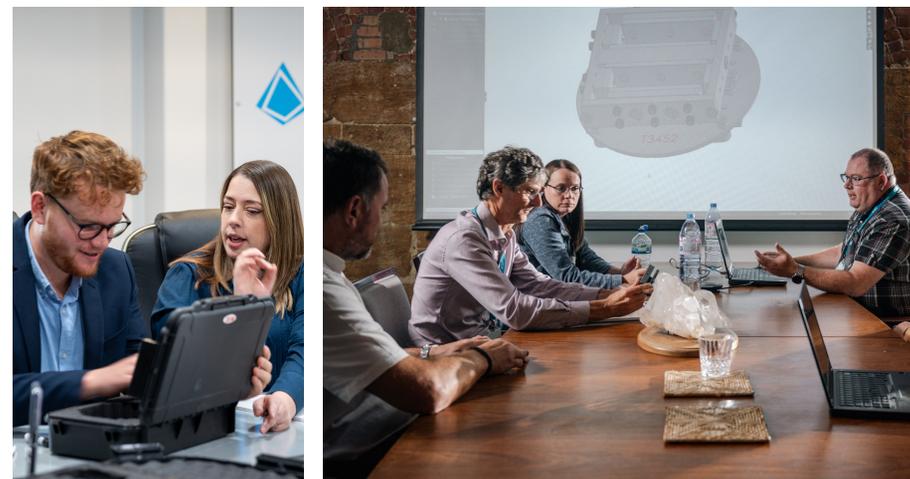
## Our team of experts

We currently employ over 1,000 people in our nine factories worldwide and we have a dedicated team of more than 150 engineers devoted to the development of photonics products and manufacturing solutions.

Experts in the fields of crystal growth and bonding, design, fiber handling, micro-assembly, optical testing and systems integration, precision optical polishing and coatings, our teams develop a wide range of photonics products comprising components, modules and subsystems based on:

- Acousto-optics
- Electro-optics
- Fiber optics
- Precision optical components and optical systems
- Specialty crystals

Our wealth of knowledge, expertise, skill and passion allows us to work collaboratively with all our customers across the globe, delivering first class solutions that are often unavailable anywhere else.



## OPTICAL SYSTEMS INNOVATION HUB

### Specialized engineering environment

At G&H, our commitment to translating innovation into action drives the creation of new environments that optimize our teams' ability to develop and commercialize new ideas, products and customer solutions. This is the strategy behind our Optical Systems Innovation Hub in St Asaph, UK.

The hub is the heart of new optical systems with differentiated performance, enabled by our state of the art component base in our manufacturing facilities in the UK and US. The specialized engineering environment, houses our growing development engineering team, comprising specialists in fields as diverse as optical design, opto-mechanical analysis, electronics development, system testing and integration. The hub is set to further our focus on application areas, including aerospace and defense, space, life sciences and more.

### ISO 5 Cleanroom

The Innovation Hub's cleanroom provides ample space for extensive system alignments in demanding applications, surpassing the capacity of commonly used laminar flow benches. The St. Asaph, UK cleanroom is a critical asset for the development of optical systems and assemblies, particularly applications like for Laser Directed Energy weapons and space, where precision and contamination control are paramount. With the cleanroom back in operation after thorough service and validation, the Hub is set to push the state of the art in high energy optical technology.



### EARLY CUSTOMER ENGAGEMENT

A standout feature of the Hub is its ability to engage with customers early in the development process. This collaboration in the conceptual phase proves pivotal in defining system requirements and conducting technology and component trade-off analyses. By involving customers from the outset, the Hub ensures a smoother journey from specification to final integration, with the added advantage of anticipating and addressing potential issues early on.

## FIBER OPTICS INNOVATION HUB

### World-class expertise in fiber optics

We are vertically integrated and offer fiber optic assemblies and custom sub-systems containing optoelectronics, driver circuitry, and firmware for biomedical, fiber sensing, and aerospace and defense. Some products are standard but most of our OEM customers have unique requirements and we are experienced in working with them to design and engineer the solution they need.

### Vertical integration for supply chain simplification

As a vertically integrated supplier, we offer supply chain simplification with a single source for design for manufacture and assembly (DFMA), engineering, test, manufacture, and integration. Even if we do not make all the subcomponents for your system, we are able to integrate third party components. All of our external suppliers have been through a rigorous qualification process with us, and we have confidence in our component suppliers. Thanks to our established buying power, design for manufacture focus, and continuous improvement, we can help customers overcome time to market and cost challenges.

### High performance, flexible designs

We understand our customers' need for high performance, as well as flexibility in design. We have the ability to look at a customer's schematic and know where the problems lay. We can help you to develop your system to get better image quality / resolution, speed, stability, smoothness, and reliability. For decades we have deployed integrated sub-systems, such as the critical fused fiber coupler, which was initially for the long-distance optical communications industry and is now available for OCT too. We have invested in R&D and listened to our customers' needs, developing key components such as the optical delay line, polarization diverse receiver (PDR), and collimator for OCT interferometers, as well as sub-systems and fully bespoke OCT systems.



## PHOTONIC DEVICE CENTER OF EXCELLENCE

### Center of excellence in acousto-optic device technology

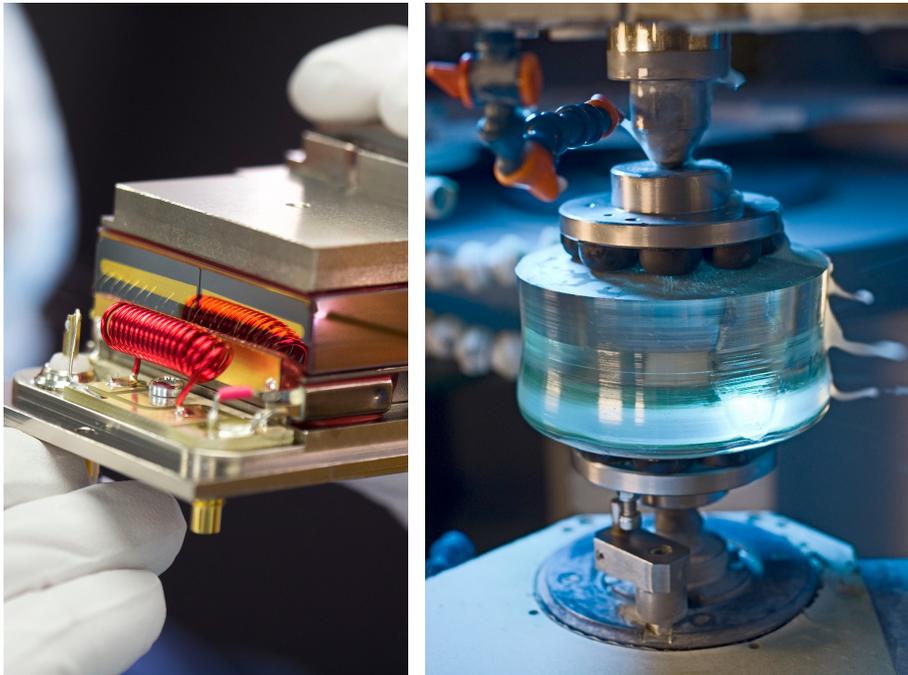
Photonic device technology is the backbone of G&H and our Center of Excellence situated at the heart of the Silicon Valley CA is a frontrunner in the design and manufacturing of photonic switching, deflecting and active filtering devices. We excel in processing diverse materials including Lithium Niobate, Tellurium Dioxide, Sapphire and Crystal Quartz. Our extensive in-house coating capability ensures that our material processing and acousto-optic device fabrication boast superior quality and unmatched reliability.

G&H works closely with customers to address diverse application needs, offering OEM devices designed to custom specifications. This dedication to tailored solutions has earned us a reputation for excellence and trusted partner having long standing relationships with our customers. 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 photonic devices, further bolstering their prominence in the industry.

### Expert crystal growing and processing

Our crystals are some of the world's best from a quality perspective, and they're also the market's most extensive range. Capable of higher specs and more stable performance in acousto-optic and electro-optic components than the alternatives, they are ideal for more challenging laser applications, from ultra-violet (UV) to deep infrared (MIR).

Our vertically integrated approach to product design leads to unique advantages on the system-level and shields our customers from the financial and operational risks of sourcing individual materials, substrates and components.



## OPTICAL COATING CENTER OF EXCELLENCE

### Center of excellence in optical coatings

Our center of excellence is a leading force in optical thin-film technology, with our products integrated into everyday items from mobile phones to anti-reflection optical coatings. This site is equipped with modern, purpose-built facilities and advanced production capabilities, including fully automated robot laser testing and high LIDT coatings from Ilminster.

### Testing and analysis

Leveraging an array of tools, including Interferometers, ETS Humidity, DSE Climatic, and Temperature, and Ascott Salt Fog test chambers, we conduct thorough evaluations across optical and environmental spectrums. These processes ensure the robustness of our products under diverse conditions. In-house test equipment, such as Digital microscopes and Dynascopes, enhances our inspection capabilities, while our Class 6 Assembly Cleanroom provides a controlled environment for precision manufacturing. Additionally, our Laser Test Facility employs Laser Induced Damage Threshold (LIDT) testing, assuring the endurance and resilience of our laser optics against potential damage, contributing to the overall reliability of our optical solutions.



### FACILITY

- 2,000 square meter (21,500 square feet) custom-built premises
- 1,500 square meter (16,100 square feet) environmentally controlled production laboratory
- Six main coating chambers
- Opto-mechanical assembly line
- State-of-the-art metrology laboratory
- Assembly cleanroom facility
- Bespoke head-up display combiner measurement system

### COATING EQUIPMENT

- 3 Leybold APS1104
- 2 Leybold Syrus LC3
  - All equipped with quartz crystal monitoring
  - E-beam guns
  - Advanced plasma source (APS)
  - IR plants have thermal sources
  - Optical monitoring
  - Bespoke grading mechanism for color selective combiner plates
- 1 bespoke DLC (diamond-like-carbon)

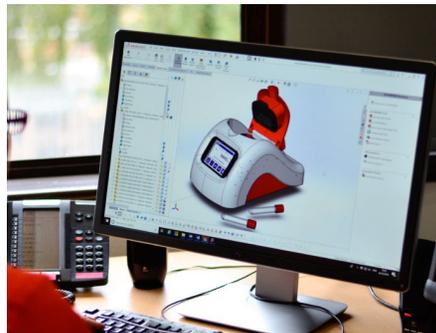
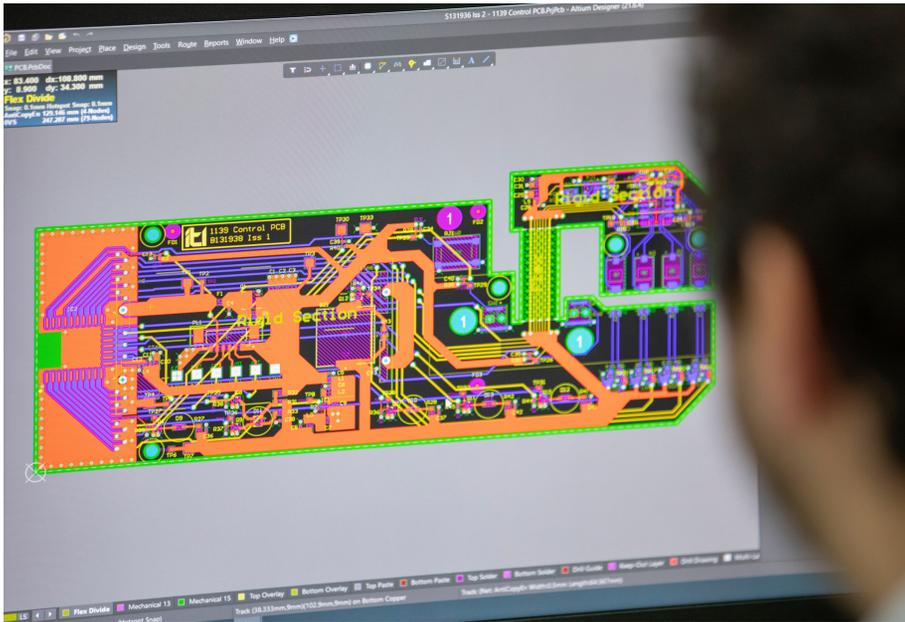
## LIFE SCIENCES & BIOPHOTONICS

### Center of excellence in North American life sciences

Our center of excellence in Rochester NY is a hub for dynamic, high-performing teams and cutting-edge research, development, and manufacturing of optics and photonics for life sciences.

Our Rochester team closely collaborates with our R&D center in Ashford UK under a common structure and leadership and excels in the custom design and manufacture of Life Sciences modules and equipment for medical diagnostics, analytics, cancer diagnosis and therapy.

The G&H engineering team has expertise in optical systems design, firmware and software development, mechanical design and assembly, all mobilized to deliver an exceptional customer experience during the Design & Development as well as transfer to Production phases,



## IN VITRO DIAGNOSTICS & MEDTECH

### Center of excellence in UK/EUR life sciences

Our center of excellence in Ashford UK has made a name for itself as a true end-to-end design and manufacturing provider, specializing in the startup and OEM development of life-saving medical technology, diagnostic devices, and scientific instruments for healthcare and life science industries.

From concept development to full-scale manufacturing, the Ashford team utilizes in-house tools, expertise, and state-of-the-art technology to streamline the process and speed up regulatory approvals of Class I, II, and III medical devices.

### MEDICAL DEVICE DEVELOPMENT

- Concept generation
- Feasibility studies
- CAD modeling
- UI / UX
- Rapid prototyping
- Design for manufacturing (DFM)
- Risk management
- Project management

### MEDICAL DEVICE DESIGN

- Systems engineering
- Mechanical engineering
- Electronics engineering
- Embedded software and firmware development
- Industrial design

### MEDICAL DEVICE MANUFACTURE

- Production engineering
- PCB, wiring, and cable loom manufacturing
- Medical device assembly
- Testing and inspection
- Procurement and supply chain management
- Aftermarket servicing and support

### MEDICAL DEVICE CONSULTING

- CE/UKCA mark certification
- FDA approval
- NMPA/CFDA submission
- NRTL accreditation
- Risk management
- Usability studies
- Safety and EMC testing
- Technical file audit and gap analysis

