

# Defence Modules



## Defence Modules



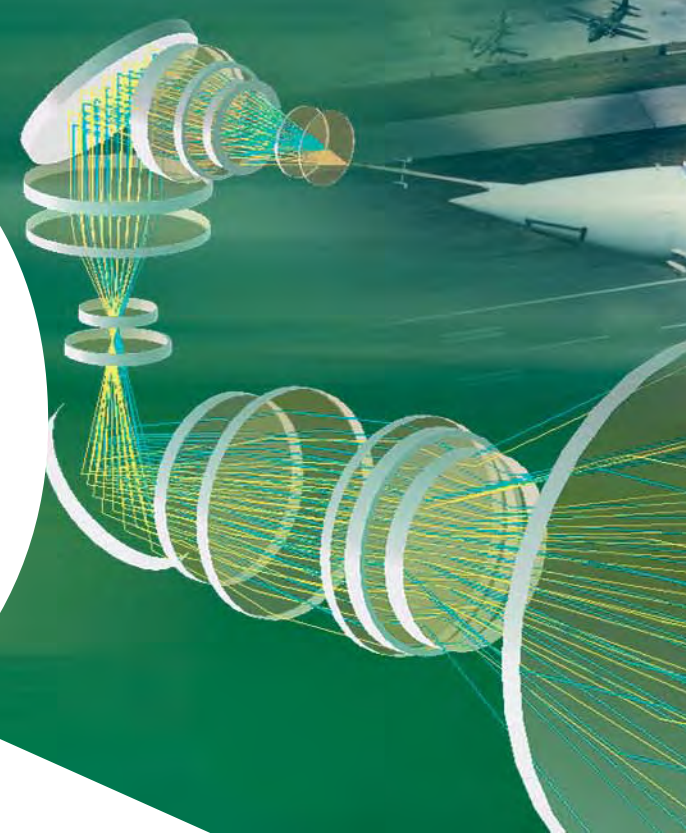


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# Defence Modules Design Capability



## Transforming customer requirements into reality

The Tactical Infra Red (TIR) design team is a highly skilled and motivated group of engineers who are customer focused. By discussing and understanding every aspect of a project's requirements with the customer, we can provide the optimum design solution that accomplishes all of the project objectives.

## Working with the customer at every step

- **Listen** to the customer's requirements and design constraints
- **Discuss** the design options based on expertise and experience
- **Create** innovative design solutions for review with the customer
- **Deliver** the optimum design solution, engineered for manufacture

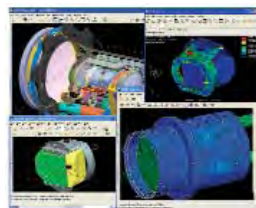
## Design through project teams

Projects are delivered by a team of designers and engineers. This approach ensures that the final design is both technically proficient, and suitable for volume production.

## Design expertise – Core competencies

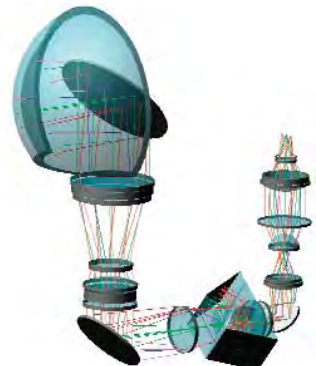
Project Team

Optical Design  
Mechanical Design  
Electronic Design  
Development Engineering  
Manufacturing Engineering  
Test Engineering



## Optical Design

- Design in all wavebands from visible to long wave IR
  - Multispectral optics
  - Objective lenses for uncooled sensors
  - Re-imaging objectives and telescopes for cooled sensors
  - Zoom optics, multiple FOV optics
  - Ultra wide-angle fisheye lenses
  - Visual optics
  - Aspheric and diffractive optics
  - Reflective & catadioptric systems
- Design for military environments
  - Athermalisation, thermal gradients, apressurisation
- Stray light analysis, narcissus analysis





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## Mechanical Design

- Design for hostile environments, low mass systems
- Complex packaging
- Novel mechanisms, precision mechanisms
- Finite element analysis
  - Mechanical fatigue analysis, stress analysis, shock
  - Thermal modelling
  - Line of sight, Jitter

## Electronic Design

- Closed loop servo control for accurate positioning of lens groups
- Embedded algorithms, athermalisation and focus laws
- Display drivers & man machine interface

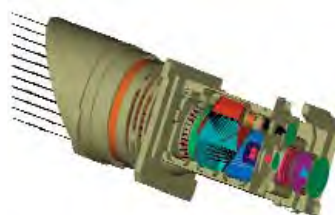
## Innovation

With world class capability in design, coupled with international award winning technical achievement, Qioptiq has demonstrated repeatedly an ability to convert technical innovation into producible cost-effective designs. Innovation has long been recognised to be the key attribute of the success of Qioptiq.

## Investment in new technology

Qioptiq recognises the need to develop new technology to continue to provide state of the art designs that meet increasingly demanding requirements.

- Wavefront coding
- High efficiency diffractive structures
- Material bonding techniques
- Conformal Optics
- Freeform surfaces
- Coatings







## Avionic Optical Displays and Laser Protection

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### Leading the way

Leading the world in technology and facilities, Qioptiq provides solutions to meet the individual requirements of civil and military customers for cockpit displays and laser protection.

Outstanding expertise in optical and mechanical design, optical coating and holography has earned the company a worldwide reputation for innovation and excellence.

It has a complete in-house capability to process the full range of optical materials and to design, fabricate, polish, coat and mount optical elements.

This manufacturing capability includes state-of-the-art, volume optical processing, vacuum deposition coatings, mechanical processing, assembly and test.

Qioptiq has the largest, most comprehensive and modern Ultra Precision Machining Cell (UPMC) facility in Europe.

We produce aspheric lenses and hybrid optics.

A key technology area within Qioptiq is the vacuum coating section where the next generation of coatings and dielectric combiners is already in production. Having delivered over 10,000 combiner elements, the company is a leader in holography and operates the most productive facility in the world for defence application holograms.

### Visible advantage

Qioptiq has a respected international reputation for the design and manufacture of optical modules for Head-Up, Head-Level, Head-Down and Helmet-Mounted displays.

We have been designing and manufacturing optical modules for Head-Up Displays (HUDs) for more than 30 years. Qioptiq now fulfils over 50% of the world's demand for HUD optical modules.

Systems are custom designed using in-house computer software for optical designs, including conformal, non-conformal or powered holographic optical elements (HOEs).

To meet the ever increasing demand for brighter, lighter and more compact display modules, Qioptiq has fully exploited the use of plastic technologies for both optical element and lens housing requirements and pilot display visor coatings.

The company offers a total capability in HUD optical modules from initial design through to volume production.

Qioptiq has designed and manufactured over 17,000 Head-Up and Head-Down Display optics for more than 30 aircraft types. In the military market these currently include the C130, C17, F16, F18, F22, Mirage, Rafale, Eurofighter Typhoon, Harrier, AV8B, Hawk and Tornado.

Qioptiq HUD optics modules are in service with regional airlines in Europe, the USA and executive jets worldwide.

For helmet-mounted applications, the company has designed and manufactured a variety of optical modules to satisfy the increasing demand for lightweight, compact displays. These advanced systems include airborne applications such as Tiger, for rotary wing and Eurofighter for fixed wing.



## Visible protection

Qioptiq is also recognised for its expertise in laser protection. Its capability extends from protection filters - optimised to integrate with sensors and sighting systems - through to the volume manufacture of spectacles, goggles and visors.

The company has led the field in the design, analysis, optimisation and manufacture of advanced, high transmission Electro Optic Protective Measures (EOPM) devices for 20 years and in the US defence market it is the leading supplier.

Protection can be provided over the full threat spectrum, from visible to far Infra Red, for both fixed, agile or broadband threats.

Hardware has been developed to meet a wide range of requirements, protecting systems and personnel, in both ground and airborne environments.

Designs for EOPM devices are optimised to suit the requirements of each individual application, drawing upon sophisticated modelling and the company's optical design and fabrication capabilities.

For all applications it is essential to balance the conflicting requirements of operational performance (such as transmission, haze, display visibility, colour perception, comfort) and laser protection (such as optical density and threat wavelengths).

The extensive experience of Qioptiq within this field enables it to maintain maximum operational ability while providing highly effective laser protection.

This expertise has won recognition with many key customers throughout the world. Volume manufacturing is proven, with over 15,000 high transmission, general-purpose laser goggles and 13,500 aircrew visors and spectacles produced to date. Qioptiq is also addressing an increasing number of demands for EOPM solutions in civil markets.

Solutions include; dielectric and holographic coatings, absorbing glasses, organic dyes and non-linear optical materials. All of these technologies have been applied to a variety of substrates or host materials including polycarbonate lenses and visors.

Designs have been fully tested with armoured vehicles, fixed wing aircraft and helicopters. They are available in a wide variety of frames and can be used with night vision goggles or fitted inside standard respirators.

## Customer support

A key feature of operations at Qioptiq has long been its outstanding after-sales service - particularly in terms of training, spares and test equipment availability.

Increasingly, customers around the world seek to become self sufficient in repair and maintenance - and the company is keen to provide the necessary expertise and resources to satisfy this requirement.

## Tactical Infra Red the Forefront of Optical Technology



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With a worldwide reputation for design innovation and manufacturing excellence, Qioptiq has been at the forefront of optical technology for more than three decades.

The Tactical Infra Red Group is dedicated exclusively to the design, development and supply of bespoke optical modules, providing leading edge optical solutions for the most demanding of defence and aerospace applications:

- Thermal Imaging Lens Modules
- Surveillance
- Navigation
- Target Acquisition
- Missile Tracking
- Missile and Laser Warner

A flexible approach during design is matched with an unparalleled capability across the visible to Infra Red wavebands, providing integrated optical solutions with any sensor technology currently available.

With a combination of dynamic engineering talent, manufacturing expertise, motivation and reputation, Qioptiq has the total capability to provide the most innovative and focused optical solutions to today's technological challenges. This strategic approach has made Qioptiq the preferred choice for a wide variety of prime contractors and military establishments around the world.

The full product range is supported by a complete in-house Integrated Logistic Support capability, embracing the company-wide target of total customer satisfaction.

The Qioptiq Tactical Infra Red Group has a truly world-class total capability providing the most cost effective and innovative solutions for the most complex of optical systems.

### A World of Experience

Producing more than a thousand different advanced optical modules for customers in more than 30 different countries each year, Qioptiq has demonstrated a dynamic presence in satisfying the widest range of technical and commercial challenges.

With optical solutions provided for use in either of the IR (3-5 or 8-12 micron), together with multi-spectral and visible wavebands, Qioptiq has designed some of the highest performing and sophisticated optics available today. These include optics for inter-satellite communications and ultra-precision targeting in extreme environments.

In addition, Qioptiq is a world leader in the design of compact zoom and multiple field-of-view Infra Red lenses. Advanced opto-mechanical and electronic designs utilise the latest micro-processing technology to ensure focus athermalisation and boresight retention can be maintained even in the harshest of environmental conditions. Qioptiq is the worlds' authority in the athermalisation of infrared optics.





## Key Products

The Qioptiq product range covers the complete spectrum of requirements for electro-optical modules and complex optical components for Airborne, Land, and Naval applications.

### Infra Red search and track

A very high performance multi role, electro-optical system designed to operate in unusually hostile environments in the far IR waveband. The smallest and most compact in its class.

### Multi-waveband missile and laser warners

Designed for a number of applications where the optical modules must be compact and lightweight, and where "Stray light" must be minimised.

## UAV's

Extensive short compact high performance range of continuous zoom telescopes such as Zulu, with a magnification range of x2.5 to x10.

### Gimbal mounted observation and weapon aiming for rotary and fixed wing platforms

Razor: Compact "folded" imaging optical modules operating in both the mid and long IR wavelengths. Capable of being configured for a large range of different detectors.

### Conformal and non-conformal complex windows and domes

Suitable for multiple applications such as navigational and target acquisition pods.

## Fire control and observation electro-optical modules for AFV's

A range of optical modules for a variety of AFV's. Designed to meet the tough environmental requirements of these platforms where very tight bore-sight retention under all conditions is essential.

### Primary missile guidance optical modules for both vehicle and shoulder launched missiles

Sole supplier to a major US programme where to date 1500+ IR telescopes have been delivered.

Qioptiq also provide the optics for a number of "Command line-of-sight units" (CLU's), and are the ONLY alternative manufacturer qualified to supply these items.



### **Missile seekers and domes for both ground launched and air-drop munitions**

Sole supplier to a number of major "Primes" both in the US and Europe. Our innovative approach to design and manufacture has meant that Qioptiq is able to offer unique solutions to these demanding requirements.

### **IR objectives for thermal weapon sights**

We provide a range of uncooled IR objectives for a number of major US and European programmes. Designed to be extremely cost competitive but retaining very high "Key" performance parameters. Qioptiq has the capability to produce in excess of 3000 per month.

### **Compact high performance eyepiece modules for TWS**

The smallest most compact and lightest eyepiece in its class, yet providing extremely high resolution.

### **Target acquisition and weapon aiming electro-optical modules for surface ships**

Very high performance large aperture long-wave electro-optical afocal telescope for a number of programmes including "Close-in weapon system" for fleet protection.

### **IR and visible telescopes and relays**

Complete range of electro-optical modules for the latest non-hull penetrating optronic masts. Designed and manufactured to withstand the exacting requirements of submarine applications.

We have an on-going investment programme in equipment, technology and processes to support our leading edge customers.

**Qioptiq is your partner for electro-optical solutions.**





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## About Qioptiq

Qioptiq designs and manufactures photonic products and solutions that serve a wide range of markets and applications in the areas of medical and life sciences, industrial manufacturing, defence and aerospace, research and development.

The company is known for its high-quality standard components, products and instruments, its custom modules and assemblies, its leading-edge innovation, its precision manufacturing and its responsive global resourcing.

Through a series of acquisitions, Qioptiq has an impressive history and pedigree, and benefits from having integrated the knowledge and experience of LINOS, Point Source, Spindler & Hoyer, Gsänger, Optem, Pilkingtons, and others.

Qioptiq has a worldwide presence with locations throughout Europe, Asia and the USA. For further information visit:  
[www.qioptiq.com](http://www.qioptiq.com)



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