

## Medical Photonics Solutions

Your Partner in Advanced Photonic  
Components, Assemblies and Systems

ILLUMINATION • OPTICS • DETECTION

Advancing Medicine through Photonic Innovation

**EXCELITAS**  
TECHNOLOGIES®



- ★ Headquarters
- ISO 9001:2008
- ISO 13485:2012
- FDB QSR (California)

## Global Photonic Manufacturing Facilities

At Excelitas Technologies, we share in your commitment to advancing medicine through innovation. We provide leading medical OEMs with broad expertise across all disciplines of photonic technology – emission, transmission, and detection.

### Engage. Enable. Excel.

Everything we do revolves around this simple and fully embraced principle.

At Excelitas, we **Engage** our customers in collaborative engineer-to-engineer relationships. Our engineers are involved early in product design cycles, helping our customers to accelerate their new product introductions.

With our broad applications expertise and innovative technology solutions, we **Enable** a diverse set of applications including endoscopy, surgical visualization, thermometry, radiography & molecular imaging, dental lighting & examination, medical device manufacturing, photo-therapy, patient monitoring, clinical diagnostics and more.

Our customized, market-driven solutions for each of our OEM customers’ unique system requirements – coupled with a focus on excellence in all aspects of product performance, quality, reliability, delivery and service – help our OEM customers to **Excel** in their end-markets and applications.

LynX® SiPM Low-Light-Level Detection Module

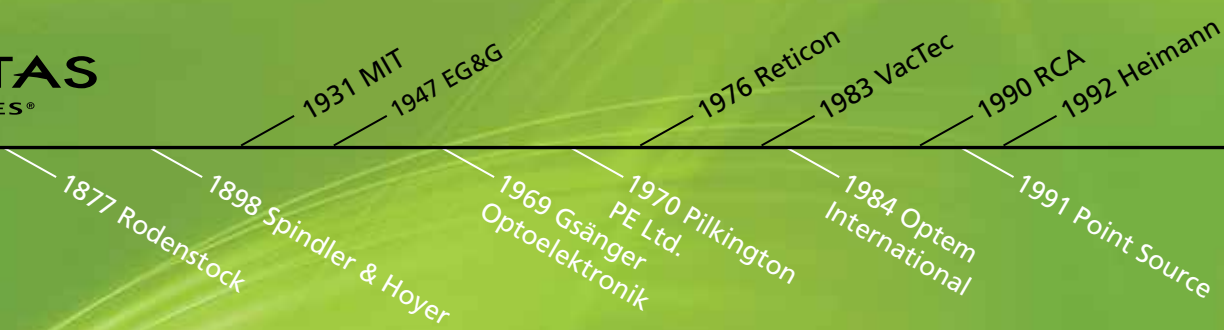


Custom Biomedical Imaging Optomechanical Assembly

# 140 Years of Photonic Innovation

**EXCELITAS**  
TECHNOLOGIES®

**QIOPTIQ**  
Photonics for Innovation



**Your One-Stop  
Medical Photonics Resource**

With the acquisition of Qioptiq in 2013, Excelitas now offers an expanded portfolio of lighting, optical, optomechanical and detection technologies to enable our customers to fully leverage the advantages of a single source partner. Engage our full photonics capabilities to better secure your competitive edge with expedited time to market and optimized medical system performance. With our extensive design, engineering and manufacturing capabilities, we can integrate a host of discrete components, assemblies and sub-systems for a wide array of medical applications.

**LIGHTING & ILLUMINATION**

- LED components & systems
- Cermax® Xenon lamps & modules
- Short-arc Xenon components & systems
- Fluorescence illuminators
- High-voltage power supplies
- Ultra-stable lasers & multi-wavelength laser Engines
- High-intensity flashlamps
- UV curing systems



ACULED® 4-Channel LED Chip-on-board Light Source



**OPTICS & IMAGING**

- Integrated endoscopic solutions
- Precision optics, coatings & mechanics
- Micro optics & assemblies
- X-Ray lens & camera systems
- Magneto- & electro-optic laser modules
- Stereo optics & cameras for 3D endoscopes, microscopes and navigation systems
- High-magnification optics
- Intra-oral camera solutions
- Light guides & fiber optic systems
- Laser optics & focusing lenses

**SENSING & DETECTION**

- InGaAs- & silicon-based photon detectors
- Indium phosphide & gallium arsenide emitters
- APD-based Single-Photon Counting Modules (SPCMs)
- Silicon-based low-light-level detection modules for high-performance
- IR Thermopile detectors
- Pyroelectric IR sensors

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# Your Partner in End-to-End Photonics

Turn to Excelitas for single-source innovation, reliability and expediency in all your medical system photonics requirements...  
From source to sensor, and everything in between.

## Illumination



## Core Competencies

Excelitas offers the most comprehensive range of photonic capabilities, technologies and expertise to meet the demands of your most challenging biomedical applications.

Our decades of interdisciplinary experience in critical photonics applications span a wide array of markets, enabling us to provide a portfolio of design, engineering and manufacturing capabilities tailored to meet your most specific requirements. We supply photonic solutions that will expedite your time to market, sharpen your competitive edge and advance your system optimization. Our teams of technology experts, solution engineers and manufacturing operations are strategically located across Europe, Asia and North America to provide our customers with the full advantage of global resourcing with the immediacy of regional access.

### Design & Development

- Grass-roots photonic system concept development
- Optical, coatings, mechanical, opto-electronic, & thermal design
- Discrete electronic component, driver & interface design
- Silicon & InGaAs PIN photodiode design
- Pulsed laser diode design, growth and processing
- FEM Analysis & thermal management
- Stray-light analysis & management
- Advanced tolerance analysis and yield simulation



### System Engineering

- System level design simulation
- Budget tolerance management
- Development of dedicated test procedures and equipment
- Implementation of multiple cross-linked beam paths
- Space conscious designs for streamlined integration
- Comprehensive understanding of customer's application from lighting to optics to detection
- Photonics Engine concept: integration of light sources, optics, motorized elements, sensors, data analysis, etc. to complete systems



### Assembly, Manufacture & System Integration

- Dedicated in-house processes to ensure precision assembly & reliable consistency
- Low to high-volume capacities from simple components to complex turnkey assemblies
- In-house Silicon and InGaAs wafer fab & processing
- Bonding, optical contacting and gluing procedures
- Fit mounting techniques & self-centering methods
- Clean-room and flow box assembly and manufacturing, (class 10,000 to 100)
- Nineteen state-of-the-art operations with a range of ISO 9001, ISO 13485 and ISO 14001 certifications
- Lean Six sigma culture delivers best-in-class on time delivery, product reliability, and customer service



# System Solutions

## Transmission

## Detection



### Lighting & Illumination

- Light engine development – Xenon, LED, solid-state laser & hybrid solutions
- Broad spectrum 200–1200nm
- Design to performance – High CRI, CCT matching, maximized output, energy efficiency
- Extensive modeling & computer simulation
- Custom LED die development, chip-on-board & system packaging
- Light delivery design – Optics, fiber & light-guide optimization for best transmission and delivery
- Thermal design & management for maximum stability and service life
- Power supplies, LED drivers and control interfaces
- Filter and polarization integration
- All-metal parabolic and elliptical reflectors with in-house machining and diamond turning



### Optical Fabrication

- CNC, MRF fluid jet polishing, ion beam polishing, diamond turning, aspheres & freeform capabilities
- Plano optics, spherical optics (1 – 350mm), singlets, doublets, triplets, achromats & cylindrical), aspheres, prisms, beam splitters, free form optics ( $\leq 300$ mm), toroids, polarizing optics, domes and custom fiber optics.
- Micro-optics fabrication & assembly down to  $\varnothing 0.3$ mm
- Ultra-precision optomechanics including, mounts, positioners, lens assemblies and complex subsystems.



### Optical Coatings

- From conventional deposition to ion-beam-sputtering
- Spectral range: DUV – VIS – IR
- Broad- & narrow-band coatings
- In-situ monitoring of deposition process
- Steep edges and high blocking notch, edge and band-pass filter coatings
- Polarizing and non-polarizing beam splitters
- High laser-induced damage thresholds
- Dielectric and metal mirror coatings



### Sensing & Detection

- Over four decades of optoelectronic components & module experience
- Full spectrum opto-electronic perception: Gamma – X-ray – UV – Visible – IR – FIR
- Module solutions for streamlined OEM system integration
- Standard TO-Can, SMD options and custom packaging
- Custom plastic molding design and integration
- Pulse laser diode driver electronics
- Discrete TIA (Trans-Impedance Amplifier) solutions
- High-volume, Asia-based manufacturing sites
- Automated assembly (pick & place, die mounting, wirebonding, encapsulation, testing)



# Medical Photonics Expertise



Excelitas is the right choice for all of your medical photonics solutions. Engage us at any point in your product development process.

We can manufacture "Built-to-Print", or develop a design specific to your unique requirements and optimized for manufacturing through a grass roots developmental partnership with you.



The key to our success and innovation is a detailed understanding of our customers' applications. We draw upon more than 140 years of intensive experience in integrating our lighting, optics and detection technologies across a broad array of medical requirements.



## Endoscopy

Excelitas is a leading solutions provider for highly customized endoscopic illumination, optics and imaging integration. Our Micro-Optics offering comprises compact micro objectives featuring diameters down to 0.8mm capable of delivering fields-of-view up to 170° to your application. to realize fields-of-view from 70° to 135°. Our Cermax® Xenon is the established industry standard for endoscopic illumination, providing perfect, bright-white light to distinguish the most subtle tissue distinctions in a field of interest. Our LED solutions can be configured to exacting CRI needs and can easily introduce selectable wavelengths for fluorescence and IR tissue excitation. Whether we are building to print, or partnering to design, engineer and manufacture an endoscopic system to your unique requirements, we are your partner of choice for highest-precision photonics solutions for endoscopy.

### Areas of Expertise

- Enteroscopy, arthroscopy, colonoscopy, otoscopy, colonoscopy, rhinoscopy, & bronchoscopy.
- Stereo Endoscopy & 3D visualization
- Endoscopic light engines



Cermax MX300  
Xenon Light  
Source

### Relevant Product Technologies

- Advanced endoscopic system integration
- Cermax Xenon light sources - lamps, modules & custom turnkey solutions
- Solid State LED chip-on-board & system solutions
- Micro-optic components, objectives & eyepieces
- Endoscopic camera couplers (sensor optimized)
- Light guides & polarization maintaining fiber optics
- Low-light-level detection modules for fluorescence



FALCON Series HD Micro-Objective  
optimized for 1/110" sensors



## Surgical Visualization

Excelitas brings the full range of our illumination, optical and detection technologies to bear in developing and delivering easily integrated turnkey photonic solutions for your surgical imaging and visualization systems. We offer a broad range of bulb-based and LED light sources for highly tuned CRI, intensity and color matching performance, as well as hybrid laser integration. Our optical capabilities and complex mechanical system integration is ideal for both exo- and endo-surgical field imaging systems. When faced with detecting minute tissue excitation, our photon detection modules offer exceptional sensitivity and precision.

### Areas of Expertise

- Surgical robotics, navigation & microscopy
- Diagnostic tissue evaluation & cancer detection
- Vascular surgery & laparoscopy
- Multi-wavelength and 3D imaging
- Cranial & neurosurgical systems
- Surgical suite & dental examination lighting
- Surgical headlamps



X-Cite Vitae™ FOI LED  
white-light source with  
variable coupling turret

### Relevant Product Technologies

- Solid State LED chip-on-board & integrated solutions
- Cermax Xenon light sources - lamps, modules & custom turnkey solutions
- Micro-optic components & assemblies
- High-magnification, high-resolution microscopy systems
  - Fixed & zoom optical lenses and imaging systems
  - Low-light-level detection modules



Custom LED Medical  
Headlamp Assembly

# Medical Photonics Expertise



## Ophthalmology

Excelitas is the right choice for your high-precision ophthalmic instrumentation with end-to-end expertise from light source to the patient's eye. We have many years expertise in the conceptualization, design and production of laser beam delivery systems for femtosecond laser refractive surgery in the cornea, as well as in the crystalline lens. If you seek solutions for high-precision ophthalmic measurement or a retinal diagnostic instrumentation, we are very familiar with various measurement principles including Placido projection, Scheimpflug cross-sectional imaging and optical low-coherence reflectometry. The key to our success is a detailed understanding of our customers' applications across the many and diverse ophthalmic disciplines.

### Areas of Expertise

- Femtosecond refractive surgery
- Ophthalmic measurement and geometry
- Retinal diagnostics and high-resolution fundus imaging
- OCT retinal scanning
- Ophthalmic lasers, fiber and optics



Silicon Avalanche Photodiodes (APDs)

### Relevant Product Technologies

- LINOS® electro-optic modules
- Axsun® Swept tunable laser engines
- iFLEX® Lasers and kineFLEX® fiber-optics
- Complex and highly stable optomechanics
- Precision optical fabrication and assemblies
- LED chip-on-board solutions and packaged sources
- Avalanche Photodiodes (APDs)
- APD- and SiPM- based Low-light-level detection modules



LINOS® KD\*P Brewster Pockels Cell, BPC 8



Axsun® Tunable Swept Laser Engines

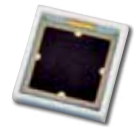


## Radiography & Molecular Imaging

Angiographic, surgical or lithotripsy applications require the highest image quality and a high dynamic range. We can meet your demands with high-aperture and fully motorized camera and lens units. Swing-in filters, automatic stop adjustment, integrated incident light reading and modular focus have been our innovation standard for many years. These range from standard optics and customized lenses to complete radiology cameras. Customized solutions with folded lens setup are also available for space efficiency.

### Areas of Expertise

- Radiographic C-arm imaging
- Fluoroscopy
- Cardiac and cerebral angiography
- Digital radiography
- CT, PET and MRI scanning



Large-Area, UV-Enhanced Silicon Avalanche Photodiode for molecular imaging

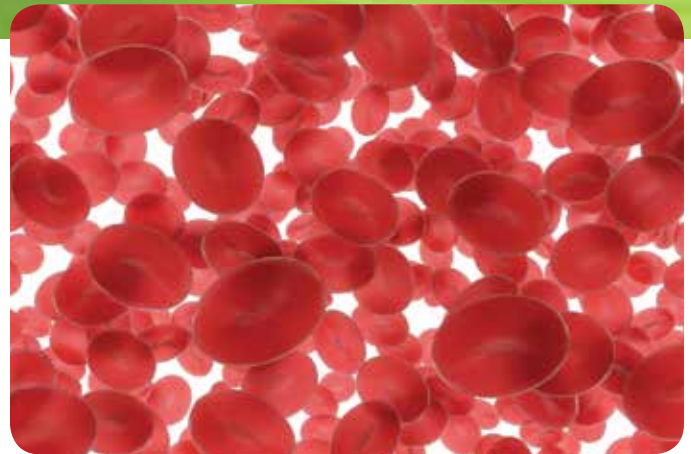
### Relevant Product Technologies

- SlimLine™ 1k<sup>2</sup> CMOS x-ray camera/lens system
- Luma X-System 1k<sup>2</sup> fluoroscopy camera
- HR Heliflex high-resolution CCD x-ray diagnostic camera
- XV Heligon 4k Lens for digital radiography
- Large area, UV-enhanced Si avalanche photodiodes
- Single-Photon Counting Modules (SPCMs)
- High-voltage power supplies and capacitors

SlimLine® 1Kx1K CMOS X-Ray Camera System







## Dentistry

For more than 20 years, Excelitas has applied its expertise in optical systems, lighting and integration to building partnerships with many of the world's leading dental equipment manufacturers. Initially serving as a precision components supplier, we have evolved into a turnkey value-added solutions supplier with highly integrated products. We deliver sophisticated solutions for intra-oral cameras with robust, waterproof, service-friendly housings and ergonomic designs for integration with dentistry chair systems. Our optical solutions for 3D dental cameras permit recording of 3D high-resolution digital impressions of single teeth or the full dental arch. Sophisticated projection and imaging are required for accurate 3D reconstruction of the dental topography in restorative dentistry CAD and CAM processes. Lastly, with our expertise in radiographic camera solutions, we offer highly customized dental X-ray solutions.

### Areas of Expertise

- Intra-oral cameras
- 3D Imaging and tooth mapping
- Dental radiography
- Examination lighting & dental headlamps



Custom LED Dental Exam Light

### Relevant Product Technologies

- Fully integrated opto-electronics
- Custom LED solutions
- Micro-optics
- Cermax Xenon lighting - lamps, modules & light guides
- Optical and mechanical design
- Image amplified radiographic systems

Auto-focusing Qioptiq Dental Camera



## Analytical & Clinical Diagnostics

Our full-spectrum lighting portfolio, high-resolution microscopy technologies, ultra-sensitive low-light-level detection (L3D) and advanced integration capabilities position Excelitas to serve the demanding stability and low-noise requirements of today's leading in vivo and in vitro diagnostic and analytical instrumentation. For a range of conditions from cancer to thyroid disorders, to anemia and cardiac disease, Excelitas illumination, optical and detection solutions combine to streamline development, improve accuracy, expedite diagnosis and ultimately reduce time to treatment and improve patient outcome.

### Areas of Expertise

- PCR & Genetic sequencing
- Hematology & Biofluidic Analysis
- Immunology & clinical pathology
- Fluorescence excitation & detection
- Optical coherence tomography (OCT)
- Microplate Readers, modular assays & Lab automation
- Flow Cytometry
- UV/Vis Spectroscopy
- Particle Characterization



X-Cite Vitae IR LED Biomedical light engine



Silicon InGaAs APDs in SMD and TO packages

### Relevant Product Technologies

- Short arc xenon, LED & laser Light Engines
- Low-light level detection modules
- Single-Photon Counting Modules (SPCMs)
- Coherent InGaAs PIN Balanced Receivers
- Time-resolved Fluorescence (TRF) sensors
- Photodiode arrays & low-noise APDs
- High-Speed, Low Voltage Avalanche Photodiodes
- High-magnification/high-resolution Optics
- Precision optical components and assemblies
- High-resolution, broadfield microscopy systems



Helix® SiAPD Low-Light-Level Detection Module

# Medical Photonics Expertise



## Wearables & Patient Monitoring

Excelitas offers extensive light emission and detection expertise for non-contact patient monitoring devices. We are a leading-edge innovator in developing compact, low-power emitters, sensors and detectors for high-accuracy UV-Vis-IR performance in a variety of non-contact and wearable devices for both clinical and personal health monitoring.

### Areas of Expertise

- Forehead & ear thermometry
- Pulse oximetry
- Wearables & personal health monitors

### Relevant Product Technologies

- Digital thermopiles
- VTP Fast Response Silicon Photodiodes
- Avalanche Photodiodes
- Pulsed laser diodes & emitters



VTD Silicon Photodiodes for Pulse Oximetry



ISOthermal and IRA type Thermopile Detectors for non-contact thermometry

## Other Medical Applications

As leading innovators through our many years of addressing the photonic requirements of mainstream medical OEMs, we have engaged a wide variety of specialized, niche medical applications. Engage our expertise to address your most unique and specialized medical, biomedical and life science photonic challenges.

### Areas of Expertise

- Intense pulsed light and photo dynamic therapy
- Skin rejuvenation & hair removal
- Tattoo and scar remediation
- Pre-operative incision targeting
- Medical laser pumping
- Laser therapy
- UV sterilization



Our SSPMs are utilized in point-of-care diagnostics and analytical systems for fluorescence detection monitoring

### Relevant Product Technologies

- Electro-optic & magneto optics modules
- iFLEX Lasers & fiber delivery systems
- High-voltage power supplies
- Light emitting diodes - Chip-on-board & integrated solutions
- Flashlamps



Custom LED light engine for a Bilirubin Blanket



## Inspection & Laser Processing

Excelitas inspection and machine vision optics are ideal for the high-resolution automated optical imaging and quality control requirements of today's medical device manufacturing. We offer area and linescan, fixed and zoom optical lenses, all of which can be optimally paired with your camera requirements. We offer stroboscopic light sources and LED illuminators for high-speed inspection and sorting applications. Excelitas is also a leading innovator and supplier of highest quality laser focusing optics to scan head and laser system OEMs.

### Areas of Expertise

- Machine vision & automated optical inspection
- High-magnification imaging & quality control
- Laser material processing - cutting, drilling, etching
- Laser welding & 3D printing
- Laser marking

### Relevant Product Technologies

- LINOS<sup>®</sup> machine vision lenses
- Optem<sup>®</sup> high-magnification inspection lenses
- Pulsed arc Xenon light sources
- Solid state LED light sources
- Mag.X<sup>®</sup> high-resolution, broadfield microscope systems
- LINOS F-Theta and Focus Ronar lenses
- LINOS beam expanders



LINOS F-Theta-Ronar Lens  
for Laser



Custom 3CCD  
Inspection Camera

## UV Curing for Medical Devices

The use of UV curing systems and adhesives is an important assembly technique for medical device manufacturing due to their rapid processing, cure on demand nature, ease of automation, low temperature and lower energy requirements. OmniCure<sup>®</sup> UV curing systems are ideal for assembling a variety of plastics, glass, stainless steel, rubber and joining similar or dissimilar substrates as part of a controlled UV assembly process.

### Areas of Expertise

- Canula assemblies & blood oxygenators
- Endoscopes, optics & fiber optics
- Catheters, stents & syringes
- Anesthesia & respiratory masks
- Endotracheal tubing & connectors
- Drainage devices and tubing
- Transdermic patches & hydrogels
- Medical coatings & filters
- Hearing aids & insulin pens
- Arterial locators
- Atraumatic guidewire tips



OmniCure<sup>®</sup> LX500  
LED Spot Curing System

### Relevant Product Technologies

- OmniCure UV curing systems
- Lamp- & LED-based UV sources
- Compact & powerful spot curing systems
- Small- to large-area curing systems
- Radiometers, light guides and accessories

OmniCure<sup>®</sup> AC9 Series  
LED Area-Curing Systems





## About Excelitas Technologies

Excelitas Technologies® Corp. is a photonics technology leader focused on delivering innovative, high-performance, market-driven solutions to meet the lighting, optronics, detection and optical technology needs of our OEM customers. Serving a vast array of applications across biomedical, scientific, safety, security, consumer products, semiconductor, industrial manufacturing, defense and aerospace sectors, Excelitas stands committed to enabling our customers' success in their end-markets. Our photonics team consists of 6,700 professionals across North America, Europe and Asia, serving customers worldwide.



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For a complete listing of our global offices, visit [www.excelitas.com/locations](http://www.excelitas.com/locations)

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