

IMAGING OPTICS

NEW Advanced Design and
Opto-Electronic Assembly

▼ 21,225 sq. ft of high-volume advanced assembly space,
with high precision optical metrology and environmental testing
| TUCSON, ARIZONA |

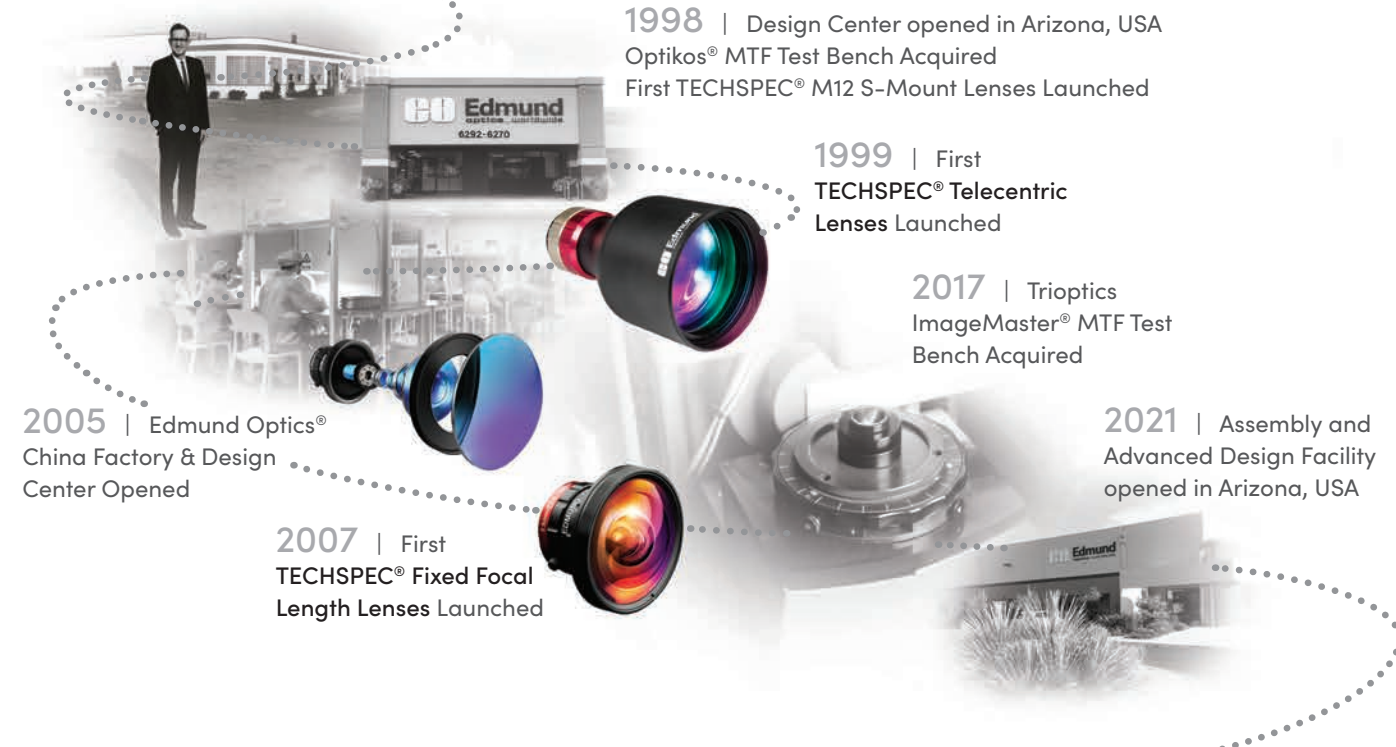


For more information on this facility,
see page 8 ▶

Imaging Optics® – Your Imaging Solutions Provider

Who We Are

Our Evolution



From product design to full-scale volume production, Edmund Optics® Imaging supports customers at each step of your project journey

1250+ Employees

290+ Engineers

30+ A3 Certified Vision Professionals

4 Imaging Design Centers
Arizona, New Jersey, China & Germany

6 Warehouses
US (New Jersey), China, Korea, UK, Singapore, & Japan

8 Factories
US: New Jersey, Arizona & Florida, Germany, Japan, China, Singapore & Malaysia

NEW 24/7 Application Support

>1.7 Million Imaging Lenses Sold

170,000+ Imaging Lenses produced per year

Recent Award Winning **TECHSPEC®** Lenses

Edmund Optics® Designed, Manufactured & Guaranteed

2021 | Vision Systems Design Innovators Award, Bronze
TECHSPEC® Cw Series Lenses

2021 | Vision Systems Design Innovators Award, Gold and Inspect Award Winner
Vision Category, 3rd place
TECHSPEC® LT Series Lenses

2022 | Vision Systems Design Innovators Award, Silver
TECHSPEC® Athermal Imaging Lenses

2022 | Inspect Award Winner
Vision Category, 1st place
TECHSPEC® Athermal Imaging Lenses

2023 | Vision Systems Design Innovators Award, Bronze
TECHSPEC® 120i Infinity Corrected Lenses

“Edmund Optics' robust offering of imaging lenses and broad application knowledge uniquely positions us to **solve any application that needs imaging** and to service our customers with around the clock support. Our vast availability of in-stock optics means our customers can get what they need when they need it, and our ability to design custom optics ensures that no goal is unreachable.”



Nicholas Sischka
Director of Imaging



Where We Are



We have locations in **12 countries**, **8 factories**, **6 global warehouses**, and **4 world class imaging design centers**. With global locations, local support, and product availability, Edmund Optics® is here to help. We also have **7 imaging optics labs**, where we provide **highly experienced application support** by working directly with customers to find imaging solutions for their unique parts and projects. **Contact one of our in-region imaging specialists (below)**, who have a wide range of customer and application experience to solve your unique application needs. If one of our off-the-shelf TECHSPEC® imaging lenses does not meet your needs, we can design a customized solution. Leverage our expertise for your next project. Our team is passionate, dedicated, and committed to helping solve customer challenges. At Edmund Optics®, **we do what is best for the customer**.

Meet our other Experts

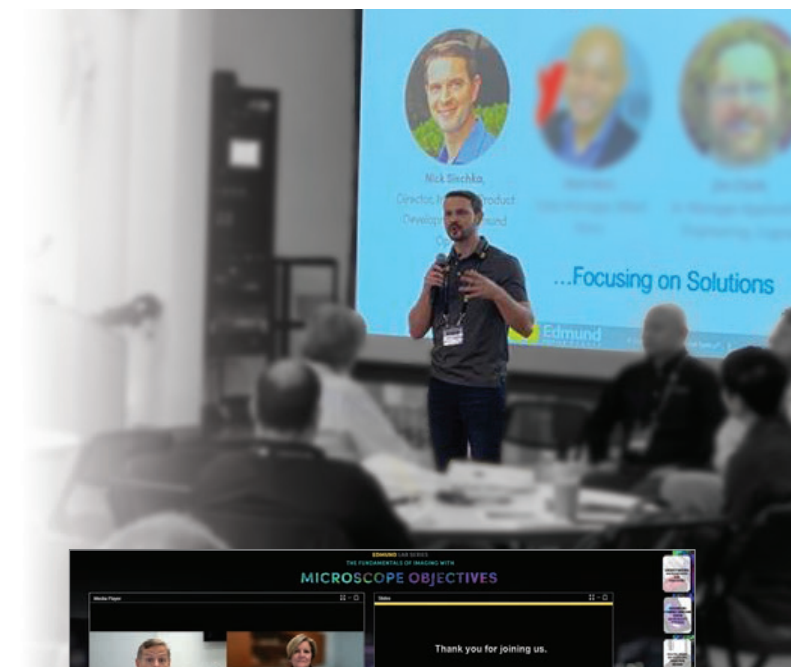
					
Nitin Sampat Senior Imaging Engineer, Silicon Valley nsampat@edmundoptics.com	Jaylond Martin Senior Imaging Engineer, Americas jcotten-martin@edmundoptics.com	Thomas-Armspach Young Imaging Engineer, UK thomasa@edmundoptics.co.uk	Boris Lange Imaging Manager, Europe blange@edmundoptics.de	Brightstate Chen Imaging Engineer, Asia lchen@edmundoptics.com.tw	Ghee Hou SOH Imaging Engineer, Asia ghsoh@edmundoptics.com.sg

Our Imaging Labs

Woodcrest, New Jersey 	Cupertino, California 	Mainz, Germany 	Akita, Japan 	Taichung City, Taiwan 	Singapore, Singapore 	York, United Kingdom 
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Troubleshoot, Collaborate, and Learn

Machine vision design can be challenging, but Edmund Optics® has you covered. Visit one of our 7 imaging labs around the world to learn from and collaborate with our team of expert engineers and vision professionals. Develop vision systems solutions and explore our products, hands-on. Participate in online discussion about machine vision applications during our live imaging lab webinars or check out our extensive library of on-demand webinars, application notes, technical tools, and many other forms of technical content.



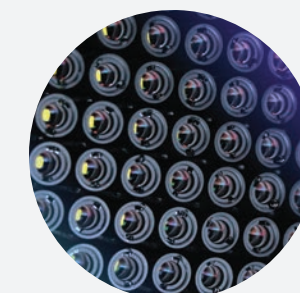
Unable to visit one of our labs?

Register online for our **Imaging Lab webinar series** and engage with experts across different companies and industries on machine vision topics and applications.

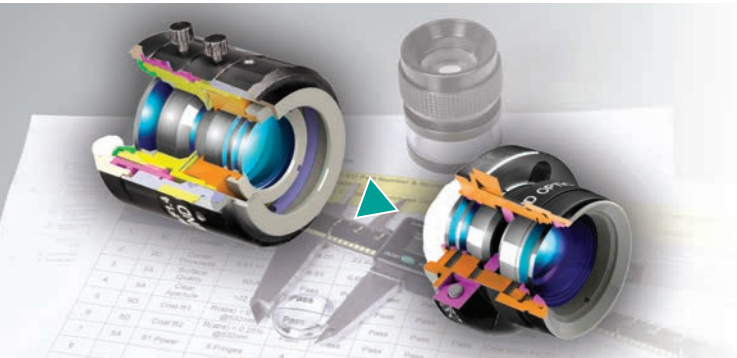


“ Edmund has made it possible for us to **push the limits of optical microscopy**, and without them it's difficult to imagine getting to where we are today. Their support from workshoping early design concepts to high volume production of productized lenses has been invaluable to our development process. As we continue to expand our product line and explore new imaging strategies, we have great deal of confidence that our optics will be reliable and of the highest quality. ”

Paul Reamey, Ramona Optics



Engineering and Design Capabilities



Zemax

CODE V

COMSOL

SolidWorks

SIMULIA ABAQUS

FRED Optimum

MathWorks

Design for Manufacturability

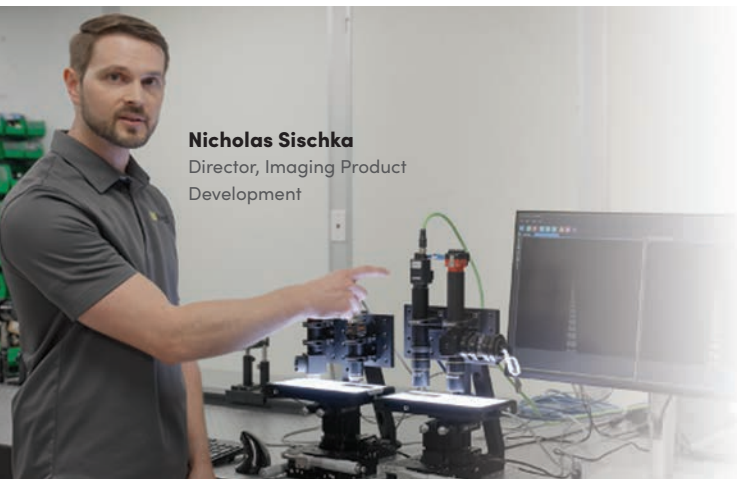
- Advanced design, simulation, and analysis for optical and optomechanical manufacturability, sensitivity, and tolerancing
- Multiphysics modeling, finite element analysis, and other software tools expedite the design process
- Production manufacturing from first articles to high volumes and every stage of development in between
- Cost conscious geometric dimensioning and tolerancing

Ruggedization for Harsh Environments

- Streamlined instrumentation designs for OEM
- Stability to combat damage from shock and vibration
- Ingress protection for immersion and washdown
- Athermalization for shifting temperatures

Product Design Expertise

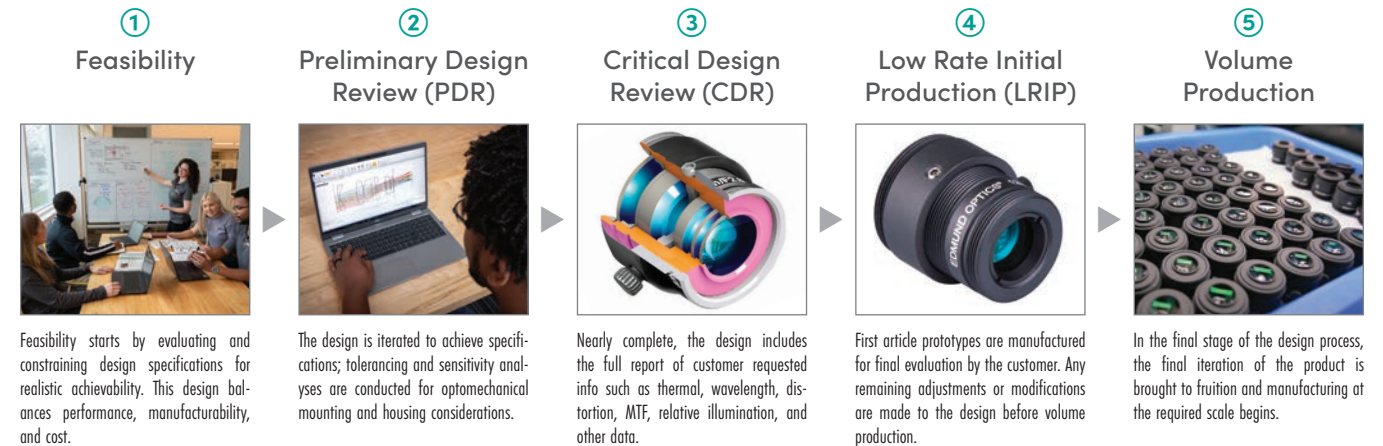
- High-quality, high-resolution designs include fixed focal length, fixed magnification, telecentric, M12, high magnification objectives, line scan lenses, and many more
- Common modifications include in-line illumination, focusable telecentrics, focus-tunable liquid lenses, and wavelength compatibility for VIS, VIS-NIR, SWIR, and UV
- Full vision system design including illumination, camera integration, filters, and other supporting accessories
- Quick modification to over 700 stock imaging lens designs
- 145 combined years of trusted and industry-tested design experience



Nicholas Sischka
Director, Imaging Product Development

Production Design and Metrology

The Design Process



State-of-the-Art Metrology and Testing

- MTF (reverse projection, slanted edge, camera-type), CTF, camera, stray light, telecentricity, wavefront distortion, and more
- Environmental testing capabilities
- Application specific testbed development
- Test reports, documentation, and serialization
- Correlation studies and error analysis



“By partnering with Edmund Optics® for all of our machine vision lenses we are able to **consistently deliver high quality images** that meet the wide variety of applications our customers bring to us. The quality of their products and expert support takes the guess work out of specifying components. By standardizing on high quality lenses we are free to focus on other things knowing that we have the best possible optics for our projects.”



Adam Mull
Vice President of Business Development, Flexible Vision



Our Factories

NEW Edmund Optics® Tucson Advanced Assembly and Design Facility

- Advanced Design and High-Volume Manufacturing Services
- Commercial and ITAR-Compliant Facility
- ISO 6 Cleanroom Assembly and Advanced Testing for MTF, Stray Light, Thermal Cycling, Shock and Vibration, and More
- Advanced Assemblies Requiring Active Alignment, Electronics Integration, and/or Environmental Ruggedization
- Officially AS 9100 and ISO 9001 Certified

Edmund Optics® now operates a brand new facility in Tucson, Arizona. This location offers assembly and advanced design services. Our skilled team of optical assembly technicians has extensive experience with high-performance systems in cleanroom facilities and customers now have access to more sophisticated commercial and ITAR compliant offerings at a new location on the US West Coast.

- | | |
|--------------------------------------|--|
| - Active Alignment | - Electronics Integration |
| - Thermal Cycling | - Environmental Factors |
| - Shock and Vibration | - High-Precision Mechanical Tolerances |
| - Modulation Transfer Function (MTF) | - Stray Light |
| - Wavefront and Distortion | - Application-Specific Development |

With this new facility, Edmund Optics® strengthens a globally diversified supply chain that lowers risk for customers and enables advanced optical, opto-mechanical, and opto-electronic assembly design and manufacturing.

Edmund Optics® Asia Volume Production Facilities

- High-Volume Imaging and Opto-mechanical Assembly
- On-Site Interferometry, Alignment and Centering, Spectrophotometry, Focometry and More
- MTF, Rear Projection, Ingress Protection, Thermal Cycling, Shock and Vibration Testing, Custom Metrology and More
- Class 1,000 Cleanrooms
- Class 100 Laminar Flow Booths
- ESD Assembly Room
- ISO 9001 and AS 9100 Certified

The Edmund Optics® Asia design and manufacturing facilities focuses on cost-effective and mid-to-high volume production from ideation to metrology of the final product. These ISO 9001 and AS 9100 facilities are equipped for shock and vibration, ingress protection (IP), stray light, MTF testing, and much more.



Arizona, USA
Design & Manufacturing Center



21,225 sq. ft (1,972 m²) facility for advanced, high-volume opto-electronic assembly, imaging optics design, and optical assembly metrology.

Florida, USA
Laser Optics Center



34,000 sq. ft (3,159 m²) dedicated to manufacturing high laser damage coatings, laser crystals, and other high-precision optics.

New Jersey, USA
Corporate Headquarters



120,000 sq. ft (11,150 m²); 20,000 sq. ft (1,860 m²) of dedicated manufacturing space. High-precision fabrication, coating, assembly, and testing cells.

Germany
Design & Manufacturing Center



7,060 sq. ft. (600 m²) European manufacturing base for polarizers and colored filter glass and home for European Optical Design services.

China



16,140 sq. ft (1,500 m²) of manufacturing space. On-site design, assembly, and testing of high volume optomechanical and imaging assemblies.

Malaysia



19,000 sq. ft (1,765 m²) of manufacturing space. Supports Singapore facility in volume production of spherical lenses and prisms.

Japan



80,000 sq. ft (7,430 m²) of manufacturing space. High-precision spherical lenses, prisms, and other coated optics with over 50 years of experience.

Singapore



77,000 sq. ft (7,150 m²) of manufacturing space. Highly vertically-integrated facility for volume production of components and mounted optics.



Industry-Leading Supply Chain

Inventory



Manufacturing

- Robust, redundant, and global AS 9001 and ISO 9001 certified manufacturing capabilities
- Engineering, design, and manufacturing all collocated globally
- Manufacturing and design support for prototyping and product design
- Volume manufacturing for OEM application integration
- Electronics integration and advanced optical manufacturing capabilities

Off-the-Shelf Inventory

- Over 45 unique lens families and thousands of unique stock numbers in global inventory
- Expedited delivery with quick-modified stock program
- Industry-leading turnaround and delivery times
- Global warehouse inventory in 6 locations
 - United States
 - United Kingdom
 - China
 - Japan
 - South Korea
 - Singapore

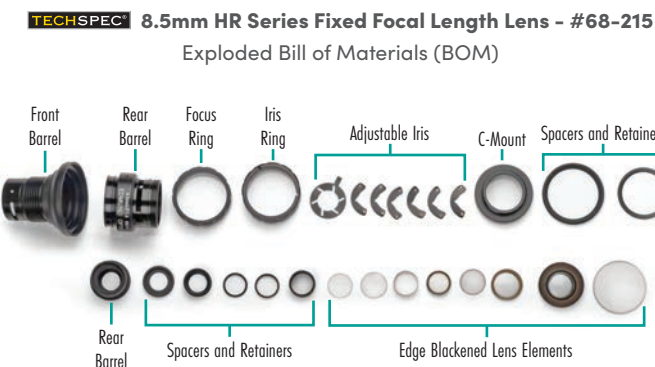


Supplier Quality Team

- Upholds rigorous quality control measures to ensure products are reliable and consistent
- Collaborates closely with vendors to develop customized solutions to offer flexibility in tailoring to customer needs
- Anticipates potential supply chain issues proactively, addressing challenges before they arise, reducing disruptions to provide seamless customer experience

Materials

- On-hand access to raw materials at all manufacturing facilities globally
- Stable and local material supply chains at each manufacturing location
- High-quality material supplies from SCHOTT, Ohara, Corning, CDGM, and additional suppliers
- Committed to proactively meeting all current and future global environmental and electronics compliance regulations (i.e. RoHS 3 [2015], REACH 235, etc.)



Ciaran Hennessey
Manager Supplier Quality



Andrew Vernot
Supplier Quality Engineer



Estefania Cervantes
Global Sustainability Manager

“ **Edmund Optics® is serious about our commitment to sustainability.** This includes being environmentally responsible to the world, socially responsible to stakeholders, and financially responsible to allow the company to continue to thrive and grow. This means using the best frameworks of lean six-sigma to change the way we do business, improving service to customers and ensuring the wellbeing of our work force while respecting the environment to create business that will last into the future. ”

“ As a customer focused and service orientated company, Edmund Optics® has a long history of heavily investing in inventory to not only meet our customers' current needs, but to exceed their future predicted demands. We view inventory as one of our greatest assets as we strive to **provide the products needed, when they are needed, in the quantity that they are needed.** We achieve this by having a strong and experienced supply chain team, a robust network of factories and suppliers to source from, and a dual-sourcing policy to ensure that our supply chain remains uninterrupted, from raw materials to finished goods. ”



Julianne Wagner
Vice President of Supply Chain



Key Markets

Factory automation is the continuously increasing manufacturing trend of using computerized control systems, programming, and sensors to perform repetitive tasks with reduced human oversight. Machine vision systems collect and feedback information about objects of interest and the environment the objects are situated within, much like how humans use eyes.

Ruggedized lenses are designed to withstand the harsh environments of the many demanding applications and are available in four types: Industrial, Ingress Protected, Stability, and Athermal Ruggedization.

FACTORY AUTOMATION



Automotive Manufacturing

Automated articulating arms assemble products by using fixed focal length lenses to detect components within a manufacturing environment.



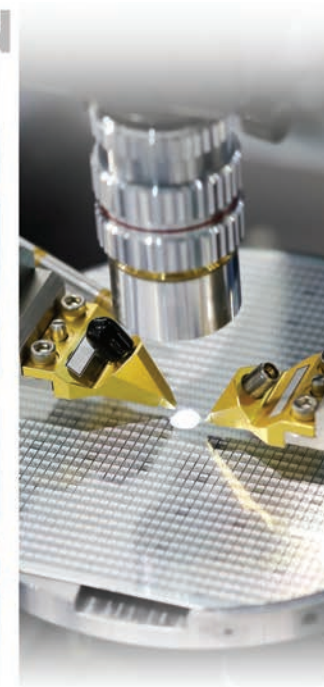
Warehouse Automation and Logistics

Vision guided autonomous mobile robots (AMRs) use M12 lenses to detect, replenish, and sort product inventory.



Pharmaceutical Manufacturing

Fixed focal length lenses are used in pharmaceutical manufacturing settings to read data from 2-dimensional barcodes to identify contents.



Electronics and Semiconductor Inspection

Automated optical inspection (AOI) systems use microscope objectives and telecentric lenses to inspect for wafer alignment, dicing, and placement defects.

HARSH ENVIRONMENTS



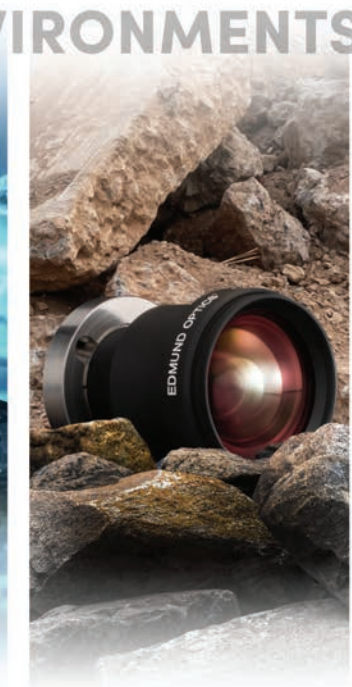
Industrial Ruggedization

- Streamlined and simplified mechanics prevent focus or f/# change
- Made to "set and forget"
- More cost-effective than traditional fixed focal length lenses



Ingress Protected Ruggedization

- Sealed in a weatherproof assembly
- Waterproof to IPX7 and IPX9K ratings
- Hermetically sealable to a camera



Stability Ruggedization

- Minimize pixel shift from shock and vibration
- Robust mechanics with simplified focus mechanics
- Elements glued in place to maintain optical pointing stability



Athermal Ruggedization

- Passive compensation for thermal expansion
- Eliminate the need for refocusing due to temperature change
- Ideal for aerial & aerospace applications

Automation systems enable connected systems and operators to make process adjustments as needed. These same functional principles are what enable other autonomous applications including self-driving cars, agriculture equipment, and aerial drones.



Industrial ruggedized lenses will survive shock and vibration. Ingress protection ruggedization seals assemblies from moisture. Stability ruggedization not only protects from shock and vibration damage, but also maintains the position accuracy and repeatability of the optical pointing stability. Athermalization eliminates performance changes due to swings in the operational temperature of the application environment.



For a selection of **factory automation lenses**, visit www.edmundoptics.com/factory-automation-lenses

To learn more about **ruggedized imaging lenses**, visit www.edmundoptics.com/ruggedization

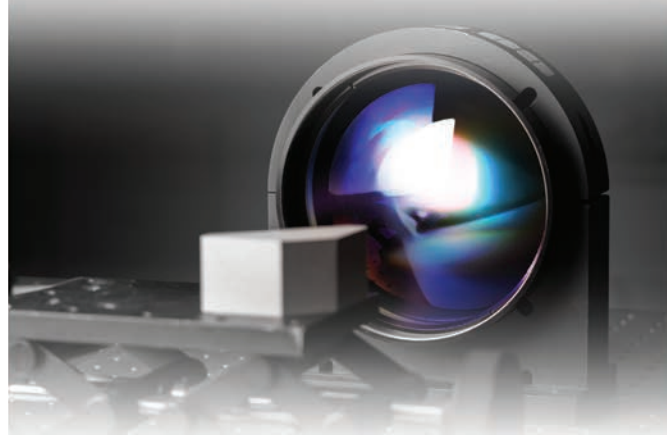


Key Markets

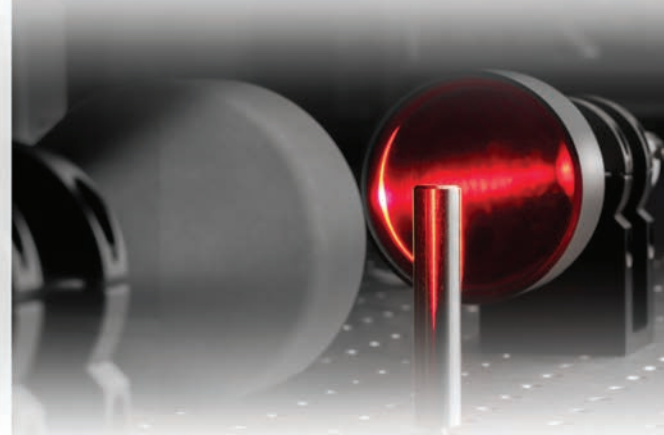
Many **machine vision systems** are simply used to detect the presence of defects or successful installation of components, but others require high-precision, high-accuracy measurements systems for critical dimensional information.

From advanced in vitro, in vivo, and in situ **diagnostic platforms** to machine vision inspection for pharmaceutical packaging, imaging systems are used in a wide range of **life science applications**. Some imaging applications include microscopy (fluorescence, brightfield, darkfield, etc.), polymerase chain reaction (PCR), flow cytometry, microfluidics, surgical robots, and so many more.

MEASUREMENT, METROLOGY and GAUGING

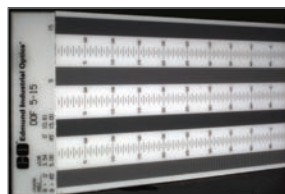


Imaging a depth of field target using a telecentric lens



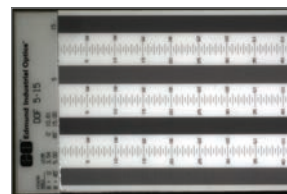
Imaging a mounting post being backlit with telecentric illumination and using a telecentric lens

Fixed focal length lens and conventional backlight

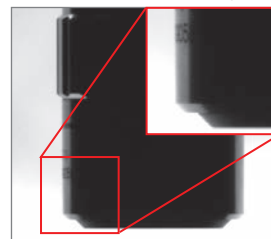


Telecentric lenses produce images free of parallax or perspective error (right) as opposed to fixed focal length lenses (left).

Telecentric lens and backlight

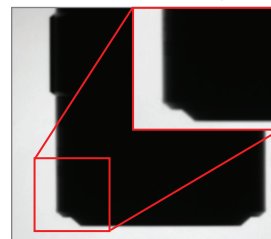


Conventional backlight



Telecentric lenses used with telecentric illumination produce images with sharp contrast at edges (right) as opposed to fixed focal length lenses (left).

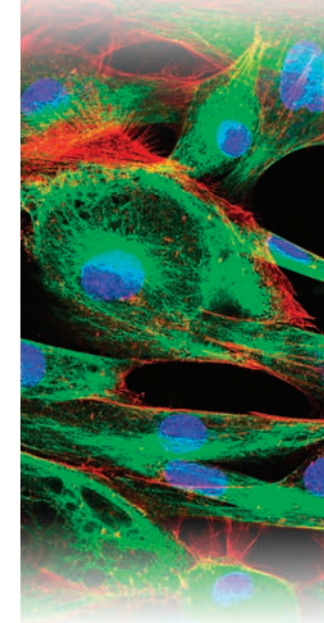
Telecentric backlight



For measurement, **conventional fixed focal length** or **factory automation (FA) lenses** introduce too much parallax or perspective error. **Telecentric lenses** functionally eliminate image parallax and their use with collimated backlights or better, telecentric illumination, yields deep contrast, minimal blur, and sharp edges, as well as highly accurate dimensional measurements.



LIFE SCIENCES and DIAGNOSTICS



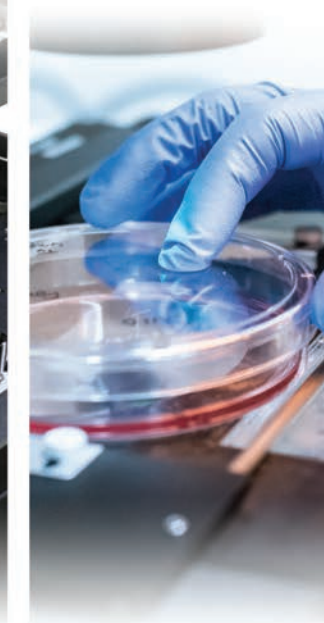
Microscopy

Image of fibroblast cells labeled with multiple fluorophores to analyze their cellular structures.



PCR

Loading a 96-well plate with DNA samples for amplification.



High-Throughput Microscopy

Multi-camera microscopes allow for high-throughput screening of well-plates.



Vision-Guided Surgical Robots

Surgical robots used to provide enhanced visualization in situ during surgery to help avoid complications.

With **partnerships from trusted brands** including Mitutoyo, Olympus, Nikon, Coherent, and Zeiss, **Edmund Optics® 200+ engineers** are ready to assist with product selection, application support, or even custom design and manufacturing. Our manufacturing facilities are ISO 13485:2016 certified and have extensive experience with lot control, change control, serialization, traceability, and many other critical FDA requirements.



For **measurement, metrology, and gauging lenses**, visit www.edmundoptics.com/measurement-lenses

For a selection of **lenses for life sciences and diagnostics**, visit www.edmundoptics.com/life-sciences

◆ REFERENCE
NUMBER

◆ CUSTOMER
NUMBER

The **Future** Depends on Optics®

Custom Product Development

- **Fully custom lens designs** utilizing the newest tech trends such as liquid lens and electronics integration, and environmental ruggedization
- **Extensive expertise** in Fixed Focal Length, Telecentric, M12, Microscope objective design, and more to develop the best lens to solve your unique application
- **Designs optimized** for cost-effective volume production to ensure your long-term success

For more details on the design process,
see page 7 ▶

