



Precision Under Pressure: Ruggedized Optics for High-Resolution Sensors

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*Please turn off your video, open your chat,
and ask any questions in the chat. Thank you!*

Meet the Speaker

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Jonathan Hackney

Director of Sales for
the West Region

Jonathan is an experienced Application Engineer with a demonstrated history of more than 17 years in the industrial automation industry.

He holds a Bachelor of Science degree in industrial engineering from Texas Tech University.

For more than 40 years, Computar Optics, part of the CBC Group global conglomerate, has been a leader in developing innovative lenses worldwide.

With its technical expertise, Computar Optics consistently engineers superior optics and custom lenses.

The world
standard for lenses.

Why Ruggedization Matters

- **The Challenge:** How shock and vibration degrade image quality.
- **The Solution:** How ruggedized designs maintain performance.
- **Key Metrics:**
 - MTF (Modulation Transfer Function): Preserving image sharpness.
 - Contrast: Ensuring clear differentiation between features.
 - Edge-to-Edge Sharpness: Maintaining clarity across the entire sensor.

The Ruggedized Machine Vision Lens

High Optical Performance

- **Longevity:** Longer operational life reduces the need for replacements and downtime.
- **Precision Engineering:** High optical standards for sharp and accurate imaging.

Adaptability & Versatility



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- Wide Range of Applications
- Compatibility

Durability and Reliability

- Chemical and Dust Protection
- Shock and Vibration Resistance

Optimizing the Sensor–Lens Pairing^{computar}

The Three Pillars of Pairing:

- **Focal Length:** Matching the lens to the desired field of view.
- **Image Circle:** Ensuring the lens covers the entire sensor area.
- **Pixel Size:** Aligning lens resolution with sensor capabilities.

Optimizing the Sensor–Lens Pairing

Demystifying the Trade-offs:

- F-Number vs. Light
- Depth of Field (DOF) vs. Focus
- Working Distance vs. Magnification

Real-World Impact & ROI: Case Studies

Automated Optical Inspection (AOI):

- Measurable improvements in defect detection and yield.

Robotics:

- Enhanced guidance precision and operational uptime.

Intelligent Transportation Systems (ITS):

- Reliable performance in harsh outdoor environments.

Calculating Your Return on Investment

Framework:

- A simple model for calculating Total Cost of Ownership (TCO).

Justify the Investment:

- Reduced downtime and maintenance.
- Increased yield and throughput.
- Improved product quality and reliability.

Industry Benefits

- **Engineers & Integrators:** Designing and building robust vision systems.
- **Manufacturing & Quality Managers:** Improving uptime and yield.
- **Product & Hardware Architects:** Developing reliable platforms.
- **R&D and Optical Engineers:** Evaluating performance limits.
- **Maintenance & Reliability Teams:** Minimizing recalibration.
- **Procurement & Program Managers:** Making sound long-term investments.

Industries Benefitting from Ruggedization

Automotive

Inspecting parts, robotic guidance, and quality control.

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Pharmaceuticals

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Pill inspection, packaging verification, and compliance with safety regulations.

Food and Beverage

Automated food inspection processes for quality standards.

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Aerospace

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Maintain the highest quality, minimize errors, and maximize efficiency.

Regular inspections and rigorous testing

Other Industries

Manufacturing: Logistics Automation

Oil & Gas: Inspection with robots & drones
and more...

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How to Choose a Ruggedized Machine Vision Lens

- Application Requirements
- Sensor Compatibility
- Field of View (FOV) and depth of field
- Cost vs. Performance

Engineering the Durable Lens Stack

- **Inside the Lens:** Understanding the internal mechanics.
- **Key Features for Stability:**
 - **Mechanical Retention:** Securing optical elements against movement.
 - **Floating Elements:** Maintaining focus and alignment during changes.
 - **Wide Focus Rotation:** Preventing focus drift and pixel blur for repeatable precision.

The MPX Series

16MP Ruggedized Machine Vision Lens Series



 **RUGGEDIZED**
FOR MACHINE VISION

2/3" mechanical design minimizes image aberrations.

Mechanical Design

Floating design for excellent image quality from MOD to infinity

Standard Lens

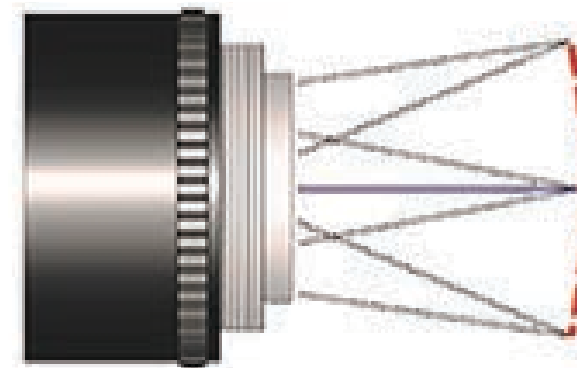
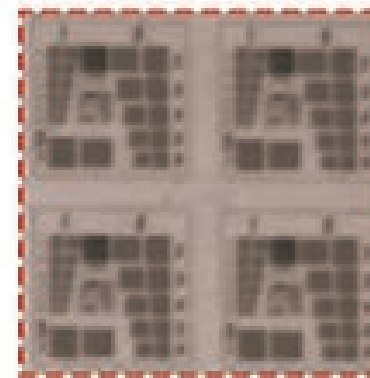


Image peripheral image quality (Standard Lens)



Floating Lens

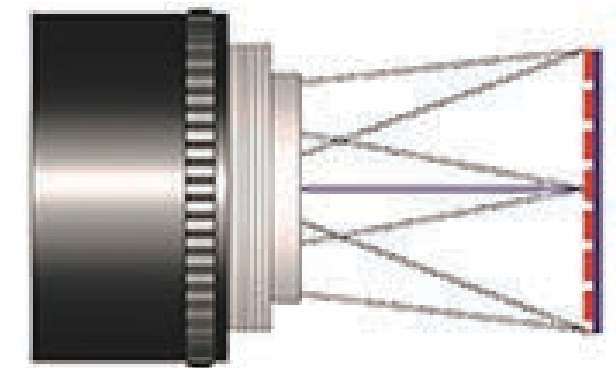
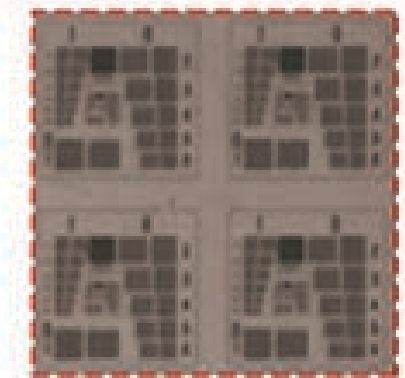


Image peripheral image quality (Floating Lens)

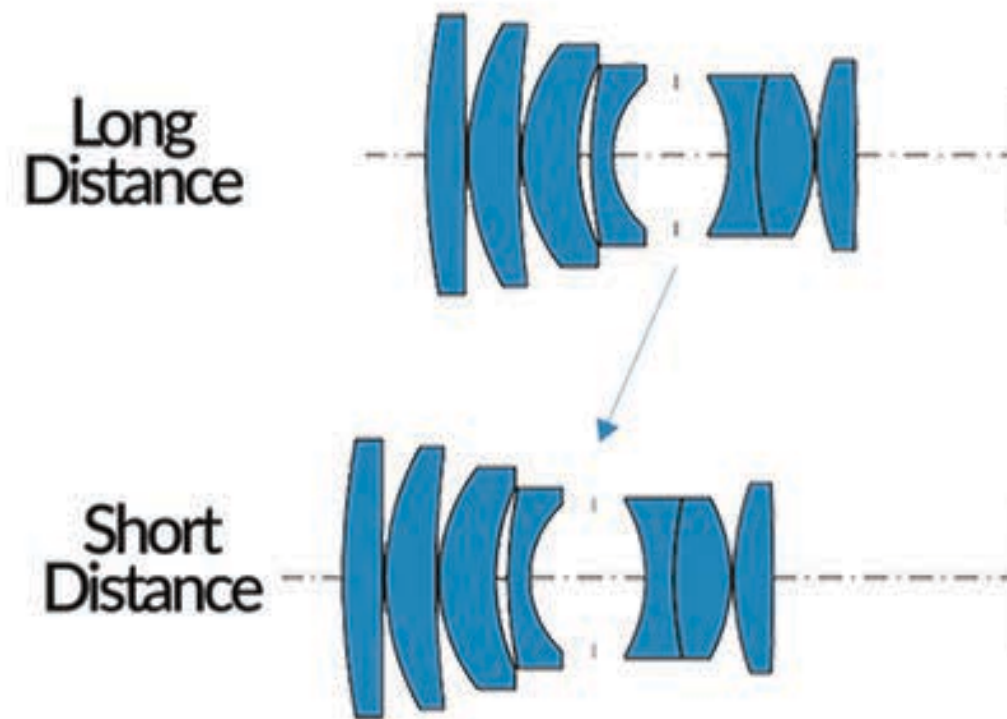


— Image plane at optimal design distance
- - - Image plane when used at a shooting distance that is significantly different from the optical design distance

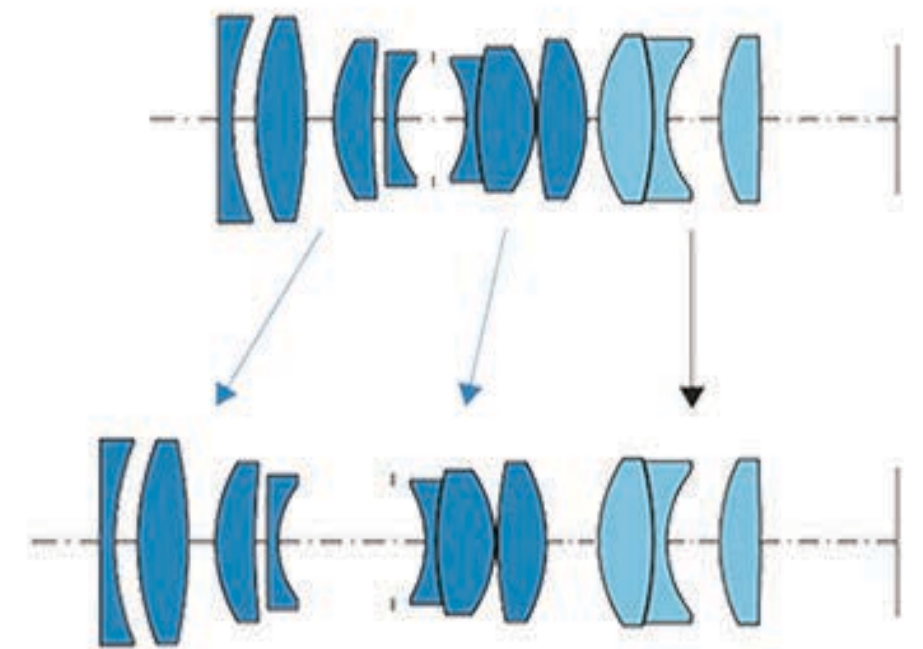
Mechanical Design

Floating design for excellent image quality from MOD to infinity

Standard Lens



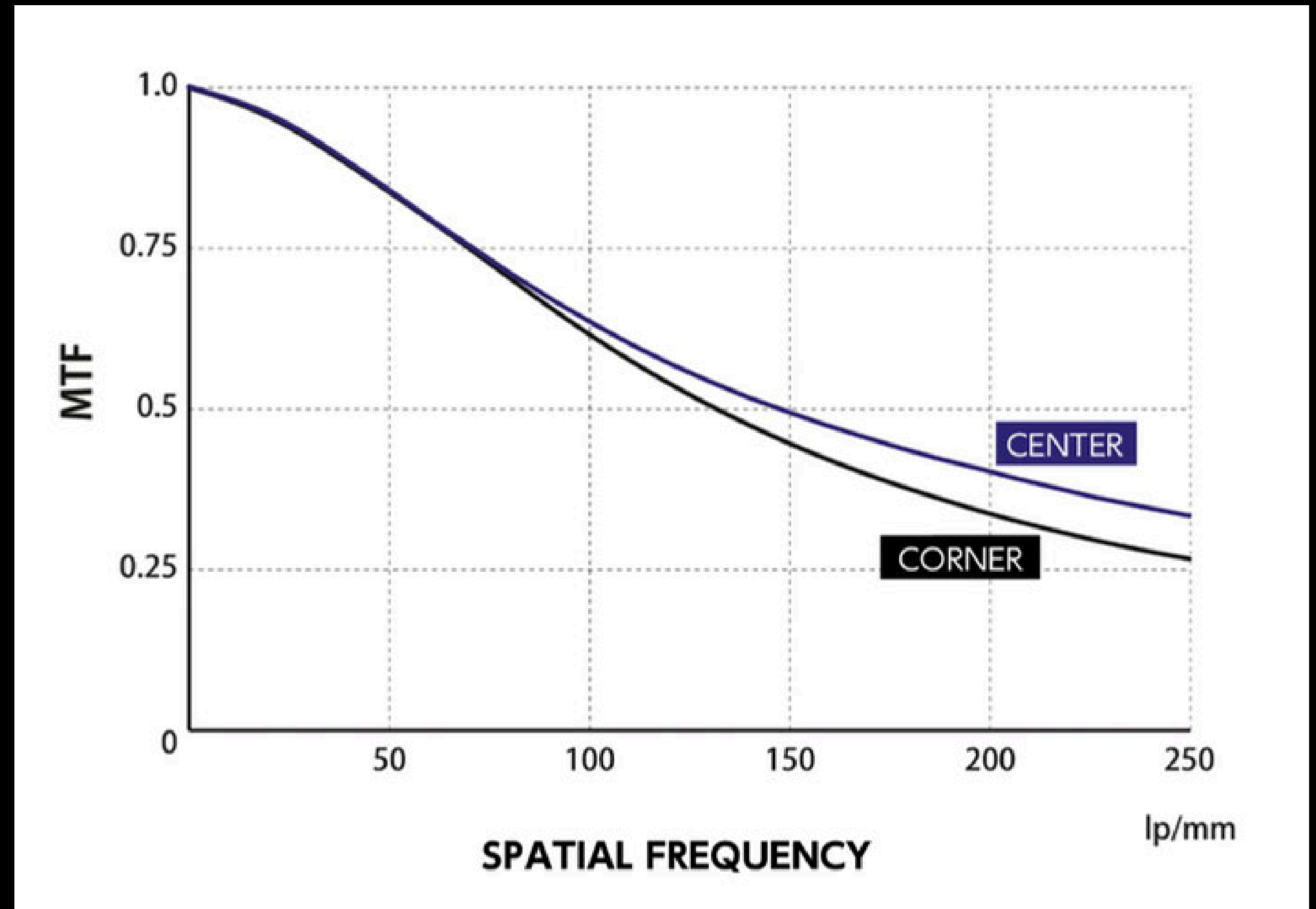
Floating Lens



Lens Capabilities

Spatial Frequency

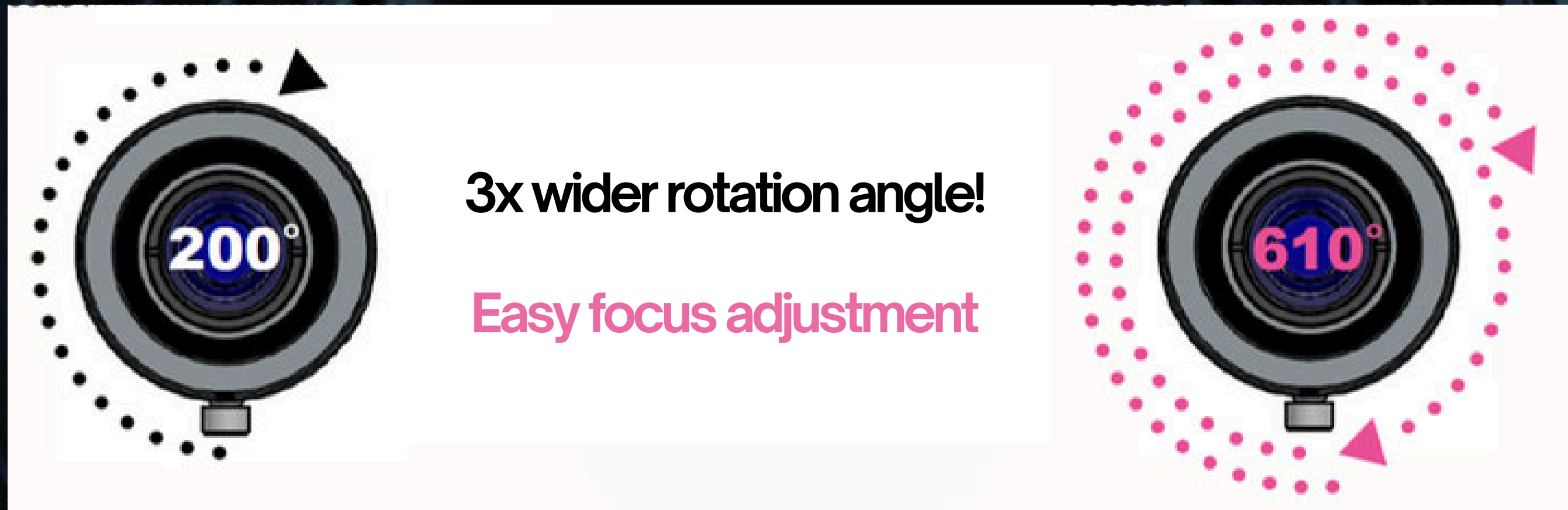
- High-resolution supports pixel size of 2um or less



Precise Focus

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A focus rotation angle three times that of conventional models for precise focus adjustment



Standard Lens
Focus ring rotation angle: 200 degrees

MPX
Focus ring rotation angle: 610 degrees

Compatibility and Iris Control

2/3" format

Manual iris control
for precise light
adjustments

Optimized for

- IMX536 (546/566)
- IMX537 (547/566)
- IMX676/IMX266/IMX17
- Sony 4th Generation Pregius S sensors.

MPX Ruggedized Lineup

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16MP , 2/3" Format



RUGGEDIZED
FOR MACHINE VISION

Model	Focal Length	F-Stop
M0828-MPX	8mm	F2.8 - F16.0
M1228-MPX	12mm	F2.8 - F16.0
M1628-MPX	16mm	F2.8 - F16.0
M2528-MPX	25mm	F2.8 - F16.0
M3528-MPX	35mm	F2.8 - F16.0
M5028-MPX	50mm	F2.8 - F16.0
M7538-MPX	75mm	F3.8 - F16.0

The MPZ-R Series

20MP, 1" Format Ruggedized Machine Vision Lens Series



- 8mm, 12mm, 16mm, 25mm, 35mm, 50mm, and 75mm models
- Designed for harsh environments with vibration resistance (10G) and shock resistance (15G)
- Customizable to your desired F-number
- High-resolution lens over 20MP (custom-made to order)
- Floating structure ensures high performance from close-up to long-distance
- Close-focus design with a minimum distance of 0.1m
- Compact and lightweight design

The Future

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The manufacturing sector's increasing demand, driven by automation, AI, and the Internet of Things (IoT), necessitates innovative, adaptable, and durable lenses to meet the constantly evolving needs for automated inspection.

More robust and intelligent lenses will increase efficiency and reliability in the industrial sector.

Q&A

Thank you!

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