Guide to Machine Vision in Harsh Environments

In the world of machine vision, not all environments are created equal.

Dust, moisture, oil, vibration, and temperature extremes can challenge even the most advanced optical systems. Whether it's a CNC machine tool surrounded by flying debris, or an automated robotics arm operating in a high-vibration factory floor - reliable imaging is non-negotiable.

Kowa Vision meets these challenges head-on. With over seven decades of optical expertise, we deliver high-performance lenses, cameras, and vision systems specifically engineered for reliability and precision in the toughest conditions. This guide presents the key elements of our harsh environment portfolio - designed to empower automation, inspection, and manufacturing with uncompromising clarity and durability.

Ruggedized Lenses: Engineered for Reliability

Conventional lenses are not built for extremes. A slight vibration can throw off focus, and moisture ingress or impact can render a system unusable. That's why Kowa has engineered a comprehensive line of ruggedized lenses that go beyond optical quality to offer structural endurance and application-specific resilience.

A two-way reversible nut is used instead of thumb screws to securely lock the focus adjustment ring, eliminating the risk of dropped screws contaminating production lines.

Rather than delicate mechanical iris diaphragms, Kowa ruggedized lenses use durable interchangeable iris plates allowing you to change the aperture/F-stop by simply inserting the desired plate.

All internal glass elements are glued to the inside housing to further improve stability and ruggedized performance.

JCM-V

2/3" | 2 MP | 4.5µm

Our JCM-V Series lenses are trusted for their robustness in manufacturing, automation, and robotic applications. Supporting a 2/3" sensor format with 2-megapixel resolution, these lenses maintain sharpness and contrast in environments subject to shock and vibration. But what sets them apart isn't only their optical performance, it's their sophisticated mechanical design. Each lens features interchangeable iris plates and a two-way reversible nut, allowing for precise manual adjustment. The use of high-adhesion bonding between the barrel and optical components ensures that once calibrated, these lenses remain stable and locked in place even during long periods of mechanical stress or transport.

5 mm | 8.5 mm | 12 mm | 16 mm | 25 mm | 35 mm | 50 mm

HC-V

1” | 5 MP | 5.0µm

Moving up in performance, the HC-V Series supports a 1” 5-megapixel format. These lenses are ideal for more detailed applications such as high-resolution inspection systems. Their construction mirrors the JCM-V approach. Here as well, the lenses come with interchangeable iris plates and a two-way reversible nut for precise focus adjustment

6 mm | 8 mm | 12 mm | 16 mm | 25 mm | 35 mm | 50 mm

JCM-WP

2/3” | 2 MP | 4.5µm

WATERPROOF
IP67

When moisture and water spray are part of the environment, the JCM-WP Series demonstrates its true strength. These lenses combine the mechanical resilience of the JCM-V with added environmental protection. O-ring seals safeguard threaded connections against fluid ingress, while the front lens is coated with a specialized water-repellent treatment. When used with a compatible IP67-rated camera, the entire assembly becomes dust-tight and waterproof. The series also includes a 3.5mm wide-angle model supporting 1/1.8” image circles, giving integrators more flexibility without sacrificing ruggedization.

These ruggedized lenses are purpose-built, opto-mechanical tools that perform with unwavering stability in conditions where other lenses fail. They represent the foundation of a Kowa system engineered for endurance and clarity.

3.5 mm | 5 mm | 8.5 mm | 12 mm | 16 mm | 25 mm | 35 mm | 50 mm

Harsh Environment Cameras: **Imaging with Confidence**

Your camera is the heart of your vision system and in rugged settings, protection and performance must go hand-in-hand. **Kowa's industrial cameras are built for real-world environments where conditions are extreme.** In a harsh environment, your camera is more than just an image capture device, it's the nerve center of your vision system. If it fails, your entire application can grind to a halt. That's why Kowa's line of industrial GigE Vision cameras is designed not just to deliver stunning image quality, but to endure in the most challenging environments imaginable.

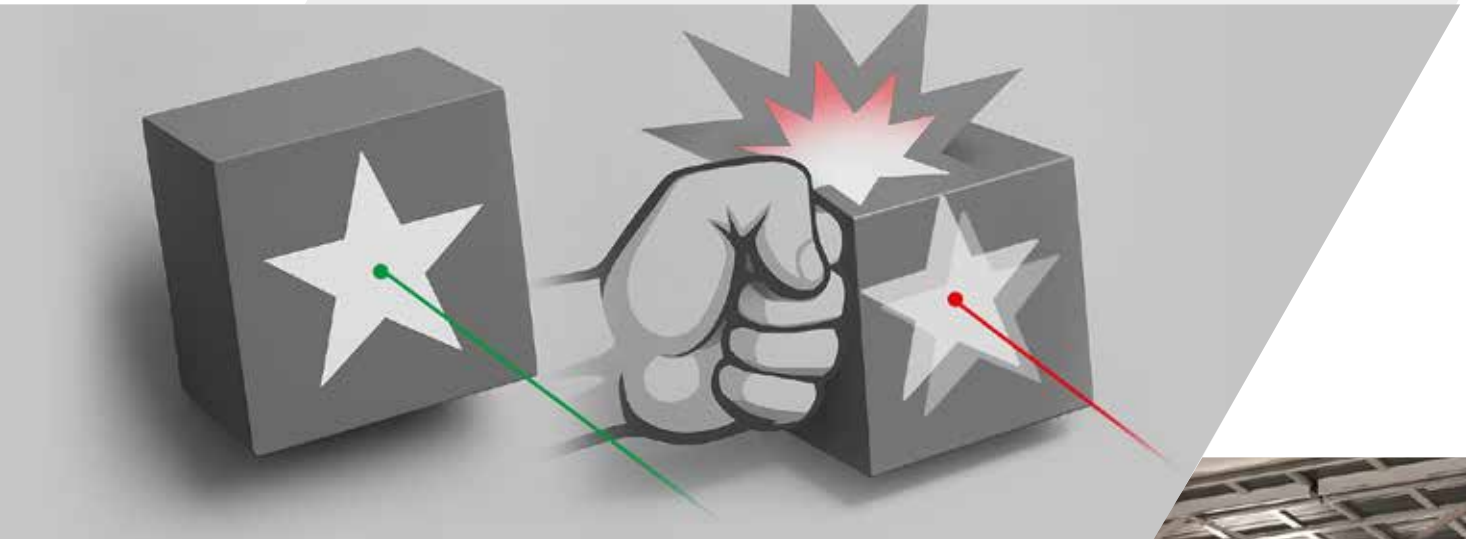
Our portfolio spans resolutions from 1.3 megapixels to 24 megapixels, encompassing 16 different models that suit a wide array of applications—from simple presence detection to detailed defect analysis.

But what truly makes these cameras exceptional is their mechanical construction. Unlike standard cameras that rely on protective enclosures or external housing to survive industrial conditions, Kowa cameras are rugged from the inside out.

The housing is precision-machined and sealed to protect against oil, dust, and moisture. Coupled with our IP67-rated ruggedized lenses, these cameras create a completely sealed system that requires no additional housing, saving both space and installation effort.

Vibration and shock resistance are engineered into the camera's core.

Secure mounting options and internal damping elements ensure consistent image acquisition even on vibrating equipment such as CNC machines or moving platforms. This intrinsic resilience makes them particularly suitable for mobile robotics, automated warehouses, and heavy industrial equipment.



All Kowa ruggedized machine vision cameras undergo rigorous testing to ensure their durability and reliable performance in harsh environments.

Furthermore, these cameras are designed with ease of integration in mind. Featuring standard GigE Vision interfaces and compatible with a wide range of machine vision software, they deliver high-speed, low-latency image transmission over long distances. And when paired with a Kowa lens, the optical and mechanical alignment is guaranteed.

By combining imaging performance with industrial survivability, Kowa's camera solutions form a cornerstone of vision systems in the most demanding sectors, from precision manufacturing to outdoor automation.

Key Benefits

- Resolution range: 1.3MP to 24MP (16 models available)
- All-in-one protection: Vibration, impact, dust, water, and oil resistance
- IP67 protection without requiring external housing
- Perfect pairing: Fully compatible with Kowa's waterproof and ruggedized lenses

*1: Complies with IEC 60068-2-6 (JIS C 60068-2-6).

* 2: Complies with MIL-STD-810H.

Rotary Wiper Vision System: **Clarity Without Compromise**

Machine tool environments, particularly CNC milling and turning machines, present a unique challenge for vision systems. Inside these enclosures, oil mist, metal shavings, and residue are constantly in motion - frequently obscuring lenses and rendering conventional cameras ineffective. Stopping the machine to clean a lens or check progress interrupts workflow and lowers production efficiency.

Kowa's Rotary Wiper Vision System was developed to solve this exact problem. It's not just a camera with a wiper: it's a fully integrated vision solution designed for seamless installation in CNC environments. The system combines an industrial-grade lens, camera, and software interface within a compact, shielded housing. At its heart is a sapphire-coated viewing window, resistant to scratches and corrosion, featuring Kowa's proprietary hydrophobic coating to repel oil and residue.

A rotary wiper - powered by high-speed air rotation - continuously clears the lens of debris. Complementing this is an air injection system that directs compressed air across the lens surface, preventing buildup of coolant mist and micro-particles. The result is a continuously clear line of sight into the machine's internal operations, allowing live monitoring, real-time defect detection, and in some models, continuous video recording for traceability and quality assurance.

This solution drastically reduces the need to interrupt the manufacturing cycle for manual inspections. Operators can assess chip accumulation, verify tool function, and catch malfunctions before they escalate, without ever stopping the machine. The compact form factor allows retrofitting into tight CNC spaces, and installation requires minimal downtime.

PROTECTIVE LENS COATING
Sapphire glass with Kowa's special water repellent coating resists scratches and repels moisture, oil, and residue.

HIGH SPEED ROTATION
Air-powered rotary wiper clears residue and materials for a consistently clear view.

AIR INJECTION
High-pressure air not only rotates the wiper but also assists in removing moisture and oil.

Designed for seamless installation in CNC environments.

Uncertain if a Kowa Lens or Camera is the Perfect Fit for Your Application?

We understand that every machine vision project is unique — and getting the right components is critical for success. With Kowa's rental service, you can test any of our lenses, cameras, or compatible accessories in your own system and environment before making a purchase decision. Experience the performance firsthand and make your choice with confidence.

Find out more about how to get started here:
https://www.kowa-lenses.com/Service/Kowa-rental-service/

Step 1: Browse & Choose

Step 2: Review & Contact

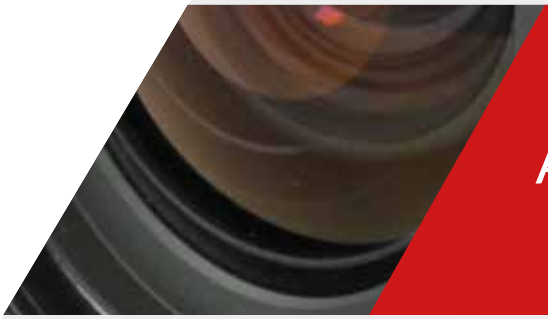
Step 3: Test & Confirm

Kowa is the Partner You Can Trust

With over 70 years of optical expertise, Kowa is the trusted partner for industrial imaging in harsh environments. Our extensive product range - from ruggedized lenses and IP67-rated cameras to integrated solutions like the Rotary Wiper System - ensures reliable performance under extreme conditions including vibration, moisture, dust, and heat.

All of our harsh environment products are proudly made in Japan, ensuring the highest level of manufacturing precision, reliability, and quality control. What sets us apart is **our focus on durability, application-specific design, and the ability to customize optics** to your unique needs.

Our global presence, bolstered by local support from Kowa Optimed Deutschland GmbH, means you always have expert guidance within reach. Whether you're seeking precision, resilience, or tailored integration, Kowa delivers imaging solutions you can trust — frame after frame.



About Kowa

Kowa is a Japanese company that specializes in creating top-notch optical products specifically designed for machine vision purposes. We have a wide selection of lenses and cameras tailored for machine vision, all meticulously crafted and manufactured in Japan.

To cater to our European customers, Kowa has a sales and R&D office in Germany. This office serves as a hub for sales and technical support within the European market. Our German team works closely with the technical experts in Japan to provide exceptional service. We understand the value of having local expertise and leverage the expertise of our dedicated in-house optical designers within our German team to provide semi-customized and fully customized designs. You can expect prompt communication and a thorough understanding of your specific application needs to develop the ideal solution.

Kowa's machine vision lenses are highly sought after in various industries, such as automotive, pharmaceutical, and electronics. They have earned a stellar reputation for their unparalleled precision, reliability, and durability. When it comes to availability, Kowa lenses are readily stocked and can be shipped to any location in Europe within a matter of days. Our unwavering commitment to maintaining high quality standards and fostering innovation has positioned us as a leading brand in the machine vision market.

manufactured in Japan

Here to help

If you have any enquires or need help with your next machine vision project, then please do not hesitate to contact one of our optical experts.

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