



HRI
Optical
Design

4D
High
Resolution

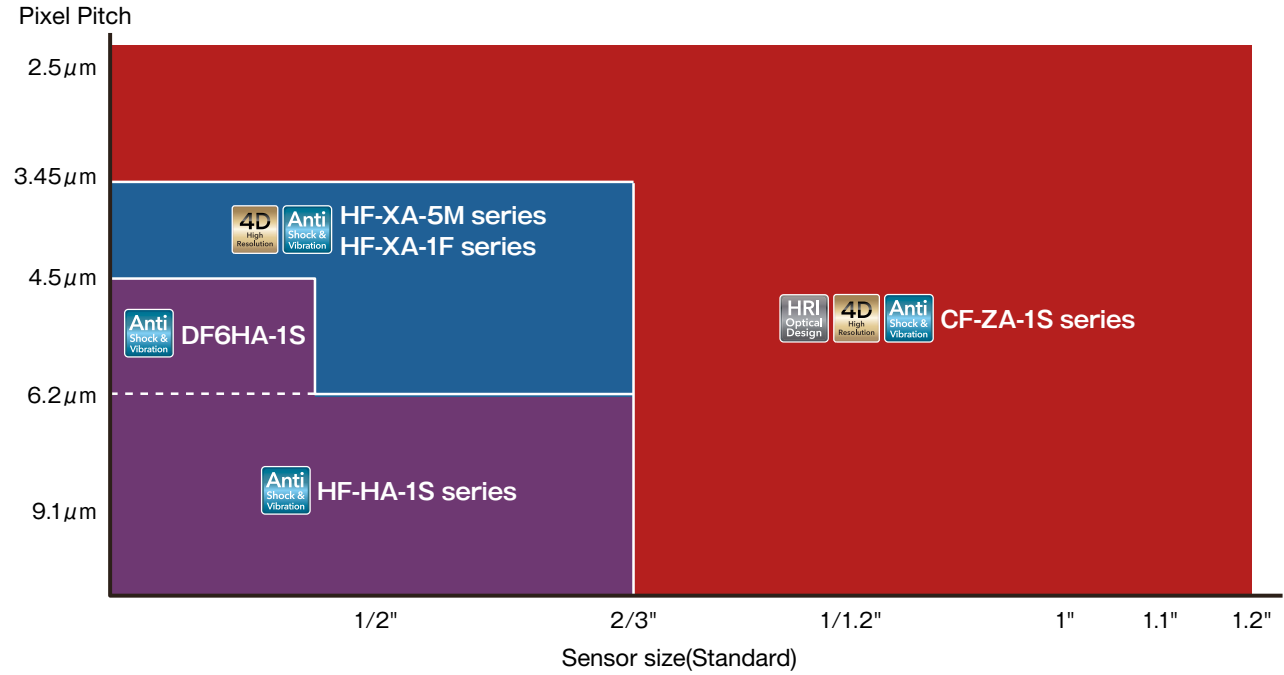
Anti
Shock &
Vibration

FUJINON

Machine Vision Lenses



Product Line-up



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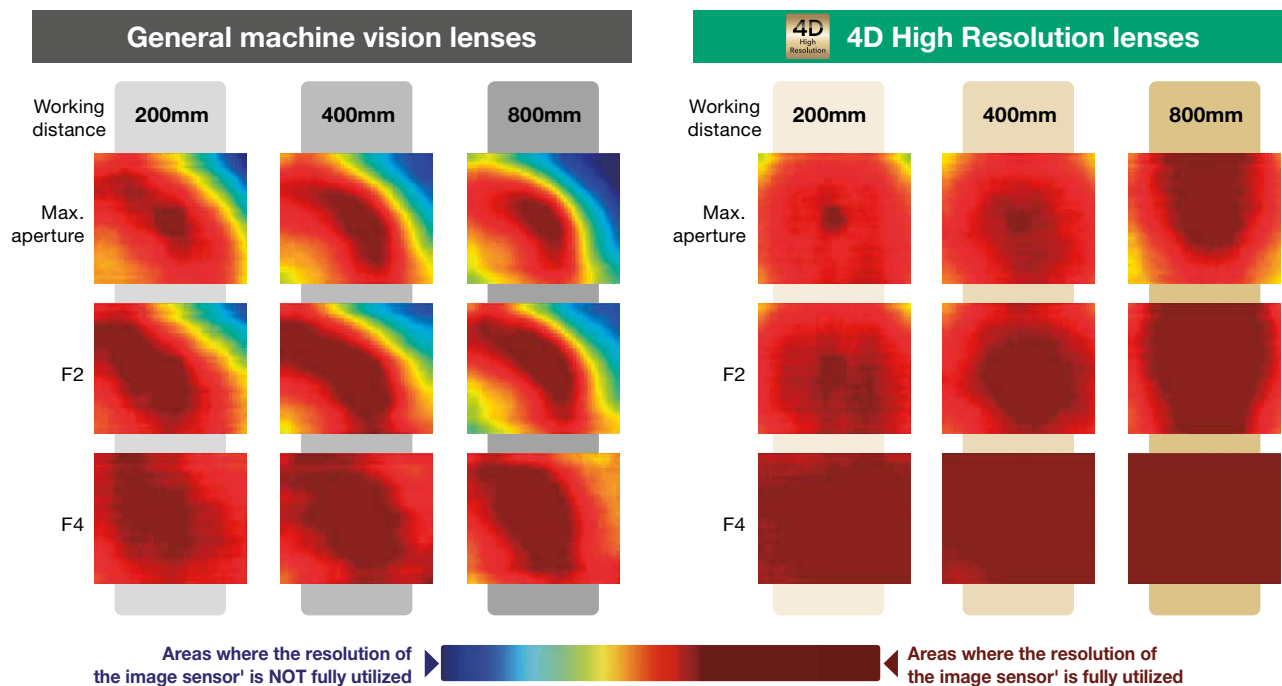
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Technologies supporting FUJINON lenses



FUJINON's Proprietary High-Resolution Performance: "4D High Resolution"

- 4D High Resolution is FUJINON's proprietary high-resolution optical performance technology. It maintains outstanding resolution from the center to the edges of the image, while also minimizing resolution degradation caused by changes in working distance and aperture settings. As a result, consistently high-resolution images can be achieved across a wide range of installation environments and operating conditions.



Anti Shock & Vibration

FUJINON Shock Resistance Limits Optical-Axis Shift (Image Displacement) to 10 μm or Less

- In the case of ordinary machine vision lenses, the optical axis shifts occur when the lens elements move from their initial position due to shocks. This affects the precise measurement performance of the lens. FUJINON's original¹ Anti-Shock design suppresses the optical axis shifts to less than 10μm even when given shocks up to 10G².

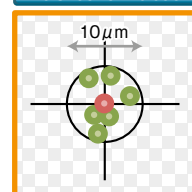
FUJINON Vibration Resistance for Harsh Vibration Environments

- Conventional machine vision lenses often face challenges in maintaining robustness when installed in environments subject to vibration. FUJINON's "Anti-Vibration" performance has successfully passed rigorous vibration testing in compliance with JIS C 60068-2-6 and provides exceptional durability while maintaining high optical resolution.

Designed to Minimize Age-Related Deterioration and Improve Installation Workability

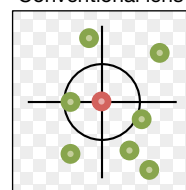
- A proprietary mechanical design minimizes the use of adhesives, making the lens less susceptible to deterioration caused by humidity and heat.

Anti Shock & Vibration



Axis shift when given repeated shock

Conventional lens



[Compliant with IEC60068-2-6]
 • Vibration frequency of 10-60Hz (amplitude of 0.75mm), 60-500Hz (acceleration of 100m/S²)
 • Sweep frequency of 50 cycles

* 1 : Patent applied for
 * 2 : Maximum impact tolerance varies by model
 * 3 : Based on FUJINON's internal test results

Thorough Quality Control at the Individual-Lens Level

- A proprietary inspection and measurement system quantitatively captures lens performance data. Each lens is assigned a serial number for individual quality management.



CF-ZA-1S series

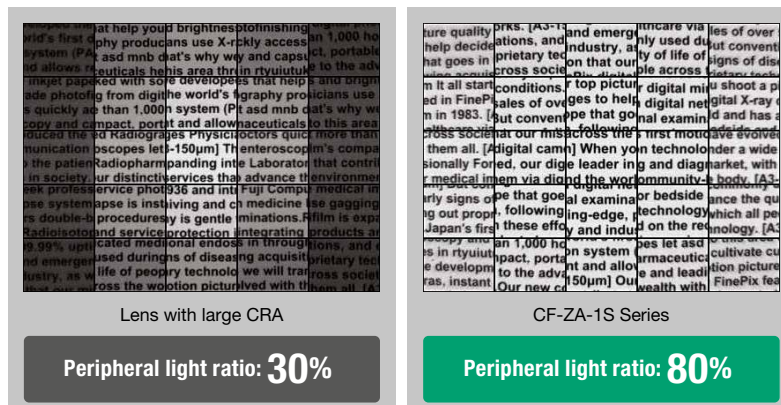
Supports 1.1-inch to 4/3-inch image sensors and 2.74 μm pixel pitch (equivalent to up to 24 megapixels).

Maximum compatible sensor size: 8/12/16mm $\approx$ 1.2", 25/35/50mm $\approx$ 4/3"



Achieves Relative Illumination of 90% or Higher

- In general, the brightness at the edge of an image is determined by a lens's relative peripheral illumination and Chief Ray Angle (CRA). The CF-ZA-1S Series incorporates FUJIFILM's proprietary optical design to achieve more than 90% relative peripheral illumination^{*2} (lens only), while keeping the CRA below 5° despite supporting large 1.2-inch image sensors. By combining these two features, the series delivers bright, uniform images all the way to the image periphery.
- In general, even when image processing is used to compensate for brightness variations between the center and the edges of an image, noise is often amplified, making it difficult to achieve high-quality imaging. In contrast, the CF-ZA-1S Series provides highly uniform illumination across the entire image field, including the periphery, without requiring shading correction, enabling the capture of high-quality, low-noise images that are ideal for inspection applications requiring a high level of reliability.



"4D High Resolution" – FUJINON's Proprietary High-Resolution Optical Technology

- "4D High Resolution" is FUJINON's proprietary high-resolution optical technology that maintains uniformly high resolution from the center to the edges of the image while minimizing degradation caused by variations in working distance and aperture settings. This enables consistently high-resolution imaging across a wide range of installation environments and shooting conditions.
- The lens fully utilizes the performance of 1.2-inch image sensors with a 2.74 μm pixel size (equivalent to approximately 24 megapixels) across the entire image field. It is particularly well suited for Sony's IMX253 (1.1-inch sensor) and IMX255 (1-inch sensor), delivering outstanding imaging performance and resolution.
- Ready for next-generation image sensors with increasingly smaller pixel sizes, these lenses provide exceptional performance across the entire image field and support 1.2-inch sensors with a 2.74 μm pixel size (equivalent to approximately 24 megapixels).
- High-precision assembly technology and proprietary inspection systems minimize image tilt and unit-to-unit variation, ensuring consistently high optical performance.

Compact 39 mm Outer Diameter Despite Support for Large Sensors

- Compact design with an outer diameter of $\phi 39$ mm ($\phi 54$ mm for the CF8ZA-1S), enabling space-saving installation.



CF-ZA Series lenses mounted on a machine vision camera compatible with large-format image sensors.



Vibration- and Shock-Resistant Design Using FUJIFILM's Proprietary Mechanical Structure

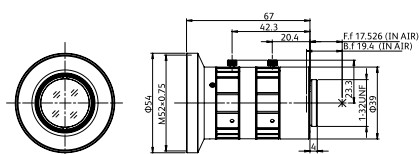
- Maintains high resolution before and after rigorous vibration testing in compliance with JIS C 60068-2-6^{*3}.
- For shock-prone applications such as robot vision and 3D scanning, the lens minimizes optical axis shift (image displacement) to less than 10 μm even under shocks of up to 10G^{*4}, ensuring stable and reliable imaging performance.
- Features a proprietary mechanical design^{*5} with minimal use of adhesives, providing excellent resistance to long-term degradation caused by heat and humidity.
- Achieves both vibration and shock resistance with a variable iris design, ensuring easy installation and operational flexibility.

High Usability and Reliability

- A mechanical structure is used that keeps the overall lens length unchanged during focusing.
- The lens barrel has three locking holes each for the iris and focus, allowing the most suitable position to be selected for the installation conditions.
- By incorporating an indicator that confirms focus at a subject distance of 50 cm, flange back misalignment in the camera can be detected efficiently.
- The iris and focus lock screws feature a captive-screw design, preventing screw loss even in high-vibration environments.
- Factory optical-performance results are managed for each individual lens, and a two-dimensional code is printed on every lens-barrel label.



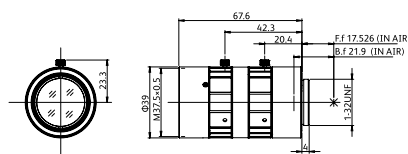
^{*1}: The maximum compatible sensor size varies depending on the lens model, and users should confirm peripheral illumination and resolution performance to ensure suitability for their specific application; ^{*2}: Data based on an aperture setting of F4, which is commonly used by customers; ^{*3}: Compliant with JIS C 60068-2-6 vibration testing requirements, including frequencies of 10 to 60 Hz (amplitude: 0.75 mm) and 60 to 500 Hz (acceleration: 100 m/s²), with 50 sweep cycles; ^{*4}: The applicable shock resistance (G-force) rating varies depending on the lens model; ^{*5}: FUJIFILM proprietary technology with patent applications filed.



Anti Shock & Vibration

CF8ZA-1S

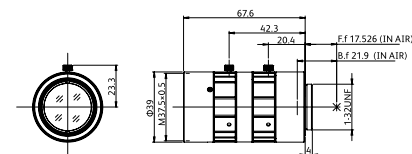
Focal length [mm]	8
Iris range [F. no]	F1.8-F16
Angle of view	85.7°×67.5°
Working Distance*1 [mm]	∞-100
Operation of focus	Manual
Operation of iris	Manual
Filter thread [mm]	M52×0.75
Mount	C-mount
Weight (approx.) [g]	180
Sensor size (std.)*2	1.1" (2.5μm) 1.2" (2.74μm)
CRA (Chief Ray Angle)	4.5
TV distortion [%]	-4.81
Dimension [mm]	Ø54×67



Anti Shock & Vibration

CF12ZA-1S

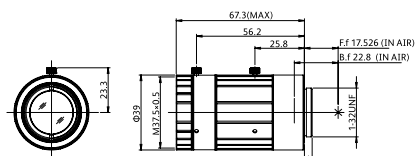
Focal length [mm]	12
Iris range [F. no]	F1.8-F16
Angle of view	62.5°×47.8°
Working Distance*1 [mm]	∞-100
Operation of focus	Manual
Operation of iris	Manual
Filter thread [mm]	M37.5×0.5
Mount	C-mount
Weight (approx.) [g]	180
Sensor size (std.)*2	1.1" (2.5μm) 1.2" (2.74μm)
CRA (Chief Ray Angle)	4.5
TV distortion [%]	-2.82
Dimension [mm]	Ø39×67.6



Anti Shock & Vibration

CF16ZA-1S

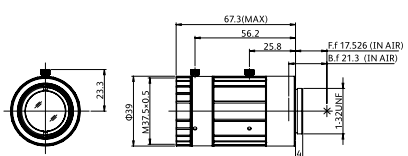
Focal length [mm]	16
Iris range [F. no]	F1.8-F16
Angle of view	47.3°×36.1°
Working Distance*1 [mm]	∞-100
Operation of focus	Manual
Operation of iris	Manual
Filter thread [mm]	M37.5×0.5
Mount	C-mount
Weight (approx.) [g]	180
Sensor size (std.)*2	1.1" (2.5μm) 1.2" (2.74μm)
CRA (Chief Ray Angle)	4.9
TV distortion [%]	-0.80
Dimension [mm]	Ø39×67.6



Anti Shock & Vibration

CF25ZA-1S

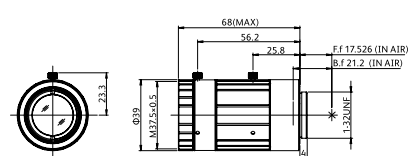
Focal length [mm]	25
Iris range [F. no]	F1.8-F16
Angle of view	32.9°×24.8°
Working Distance*1 [mm]	∞-100
Operation of focus	Manual
Operation of iris	Manual
Filter thread [mm]	M37.5×0.5
Mount	C-mount
Weight (approx.) [g]	170
Sensor size (std.)*2	1.1" (2.5μm) 1.2" (2.74μm)
Sensor size (max.)*3	4/3" (3.45μm)
CRA (Chief Ray Angle)	2.7
TV distortion [%]	-0.83
Dimension [mm]	Ø39×67.3



Anti Shock & Vibration

CF35ZA-1S

Focal length [mm]	35
Iris range [F. no]	F1.8-F16
Angle of view	23.0°×17.3°
Working Distance*1 [mm]	∞-200
Operation of focus	Manual
Operation of iris	Manual
Filter thread [mm]	M37.5×0.5
Mount	C-mount
Weight (approx.) [g]	165
Sensor size (std.)*2	1.1" (2.5μm) 1.2" (2.74μm)
Sensor size (max.)*3	4/3" (3.45μm)
CRA (Chief Ray Angle)	4.5
TV distortion [%]	-0.32
Dimension [mm]	Ø39×67.3



Anti Shock & Vibration

CF50ZA-1S

Focal length [mm]	50
Iris range [F. no]	F2.4-F16
Angle of view	16.6°×12.5°
Working Distance*1 [mm]	∞-200
Operation of focus	Manual
Operation of iris	Manual
Filter thread [mm]	M37.5×0.5
Mount	C-mount
Weight (approx.) [g]	155
Sensor size (std.)*2	1.1" (2.5μm) 1.2" (2.74μm)
Sensor size (max.)*3	4/3" (3.45μm)
CRA (Chief Ray Angle)	4.8
TV distortion [%]	-0.17
Dimension [mm]	Ø39×68

*1: Measured from the front edge of the lens barrel. *2: Standard Compatible Sensor Size indicates the sensor size for which the lens can deliver maximum imaging performance.

*3: Maximum Compatible Sensor Size varies depending on the lens model, and users should verify peripheral illumination and resolution performance to determine suitability for their specific application.

CF-ZA-1S series

Supports image sensors ranging from 1.1-inch to 4/3-inch[†] and pixel sizes down to 2.74 μm (equivalent to up to 24 megapixels).

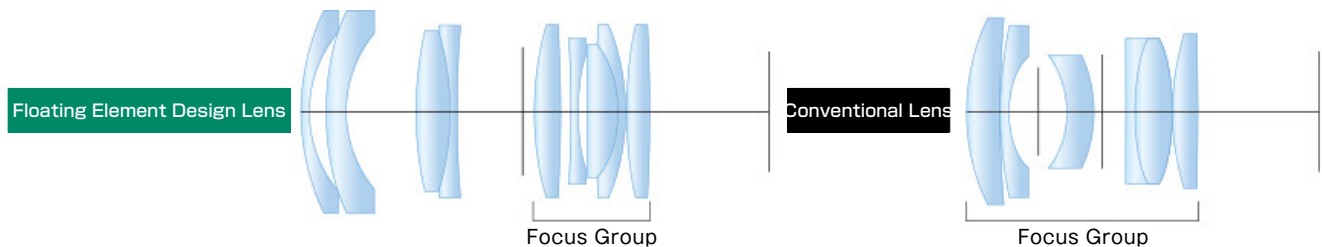
Maximum compatible sensor size: up to 1.2-inch for the 8 mm, 12 mm, and 16 mm models, and up to 4/3-inch for the 25 mm, 35 mm, and 50 mm models.



1. Floating Element Design Technology

Minimizes Resolution Degradation When Working Distance Changes

- In lens design, one or two working distances within the most commonly used imaging range are selected as the design reference distance(s), and the lens configuration is optimized to deliver the best resolution at those distances by carefully balancing the correction of optical aberrations such as chromatic aberration, peripheral blur, and distortion.
- With conventional lens design technologies, aberrations may be ideally corrected at the reference working distance, but resolution can degrade at other working distances as aberrations reappear. This issue is particularly pronounced in wide-angle lenses, which are inherently more susceptible to field curvature aberration, resulting in peripheral image blur.
- The FUJINON CF-ZA-1S Series incorporates a floating element design that suppresses aberrations across the entire working distance range. The lens elements are divided into front and rear groups, with focusing performed by moving only the rear group. This movement changes the spacing between the lens groups according to the working distance, and the optical design is optimized in advance to account for these changes and provide a floating effect. As a result, maximum resolution performance is maintained even when the working distance changes.

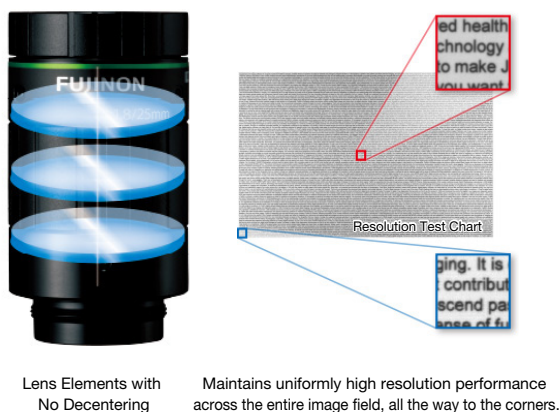


2. High-Precision Assembly Technology

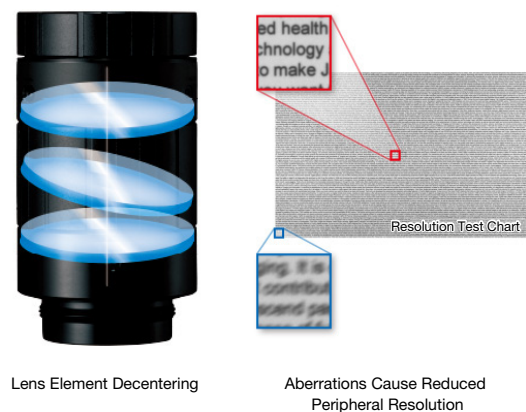
Maintains high and uniform resolution performance across the entire image field, including the corners.

- In the lens manufacturing process, if the optical centers of the lens elements are misaligned, the lens cannot deliver its intended performance. Therefore, it is essential to align the optical axes of the lens elements with micron-level precision throughout the assembly process.
- The FUJINON CF-ZA-1S Series utilizes proprietary inspection equipment that incorporates FUJIFILM's advanced lens manufacturing technologies to detect decentering of lens elements in every lens during assembly. By achieving micron-level alignment precision, the series delivers uniformly high-resolution performance across the entire image field, including the image periphery.

4D High Resolution-Enabled Lens



Conventional Machine Vision Lens



- This achievement is made possible by FUJIFILM's proprietary manufacturing expertise, which integrates the high-precision technologies developed for broadcast lenses, where exceptionally high and uniform image quality is required, into the production of compact lenses such as those used in camera modules.

3. Glass Material Matching Technology (Powered by our proprietary optical design software, "FOCUS")

Minimizes Loss of Resolving Power Caused by Aperture Changes

- One of the primary causes of resolution degradation when changing the aperture setting is lateral chromatic aberration (color fringing). Because the refractive index of light varies by wavelength (color), the image position shifts slightly for different colors, resulting in color misalignment, particularly at the image periphery. To suppress this effect, the combination of optical glass materials is critical. While conventional optical glass can typically correct only two of the three primary colors of light (RGB: red, green, and blue), the use of special glass materials with high anomalous dispersion properties enables precise correction and control of all colors, significantly reducing chromatic aberration and maintaining high resolution across the entire image.
- The FUJINON CF-ZA-1S Series utilizes special optical glass materials with high anomalous dispersion properties to suppress chromatic aberration (color fringing), enabling outstanding resolution performance even when the aperture setting is changed.
- FUJIFILM's lens design process utilizes its proprietary optical design software, FOCUS (Fujifilm Optical Class Library and Utilities System), to simulate countless combinations of optical glass materials and determine the optimal glass composition for each lens design.

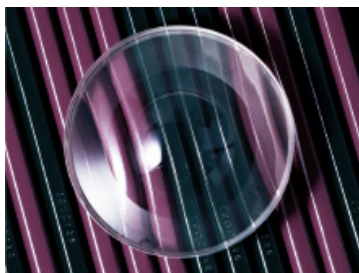


* Images shown are for illustrative purposes only.

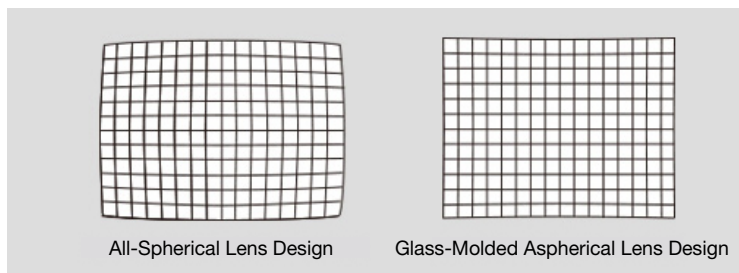
4. Glass-Molded Aspherical Lens Technology

Achieving Both Compact Design and Low Distortion

- To achieve a compact lens design, it is necessary to reduce the number of lens elements and bend incoming light more sharply to form an image. However, with a lens configuration consisting only of conventional spherical lenses, it is difficult to adequately suppress distortion aberration. Aspherical lenses, on the other hand, can perform the function of multiple spherical lenses, making it possible to reduce distortion while maintaining a compact design with fewer lens elements.
- Aspherical lenses require extremely high manufacturing precision. FUJIFILM is capable of designing and manufacturing aspherical lenses within the group and achieves the high level of precision demanded at the design stage through advanced precision mold fabrication technology, enabling stable mass production of high-performance aspherical lenses.
- The FUJINON CF-ZA-1S Series employs high-precision glass-molded aspherical lenses, successfully achieving both a compact lens design and low distortion performance.



Aspherical Optical Lens



* Images shown are for illustrative purposes only.

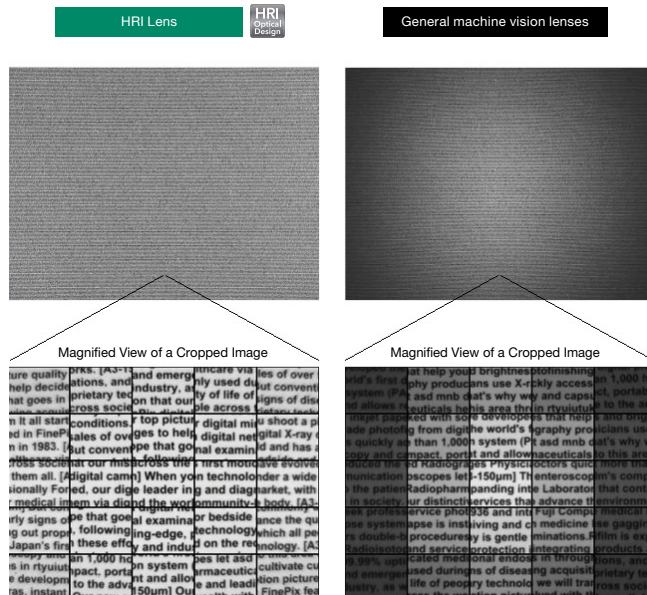
CF-ZA-1S series

Supports image sensors ranging from 1.1-inch to 4/3-inch¹ and pixel sizes down to 2.74 μm (equivalent to up to 24 megapixels).

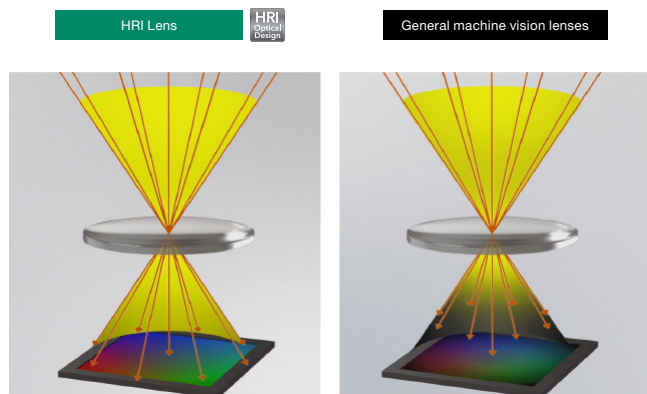
Maximum compatible sensor size: up to 1.2-inch for the 8 mm, 12 mm, and 16 mm models, and up to 4/3-inch for the 25 mm, 35 mm, and 50 mm models.



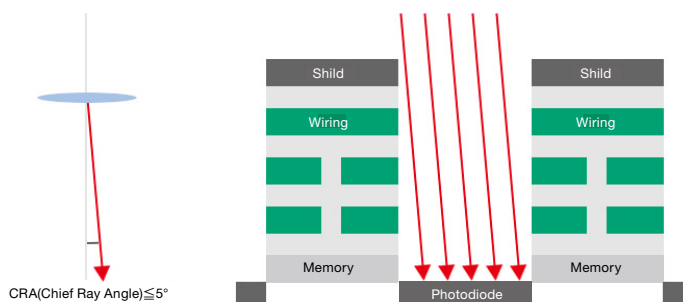
FUJINON's Proprietary High Relative Illumination Design, "HRI"



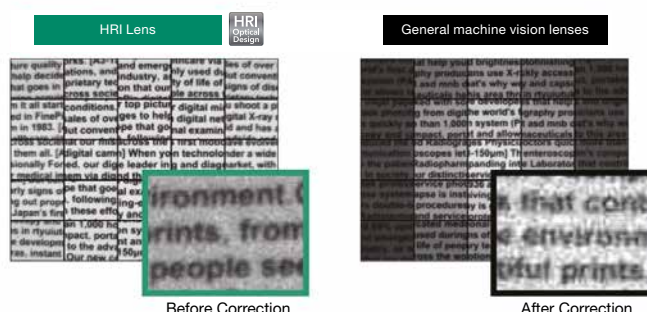
"HRI (High Relative Illumination)" is FUJINON's proprietary high-relative-illumination design technology.



While light transmitted through a lens naturally tends to diminish toward the image periphery, FUJINON's proprietary HRI optical design delivers exceptionally high illumination from the center to the edges of the image sensor, ensuring bright and uniform imaging across the entire field of view.



Conventional global shutter CMOS sensors typically incorporate both a photodiode for light reception and a memory element for signal storage within each pixel, resulting in a relatively small light-receiving area that makes it difficult for oblique light rays to reach the photodiode; however, FUJINON HRI lenses are designed with a Chief Ray Angle (CRA) of 5° or less, enabling bright and uniform illumination across the entire image, including the corners.



Even when image processing correction is applied to reduce brightness variations between the center and the periphery of an image, the signal-to-noise ratio (SNR) remains unchanged, which can amplify noise and make it difficult to obtain high-quality images. In contrast, FUJINON HRI lenses provide highly uniform illumination across the entire image field, including the periphery, without the need for illumination correction, enabling the capture of high-quality, low-noise images that are ideal for inspection applications requiring a high level of reliability.

Distortion Correction

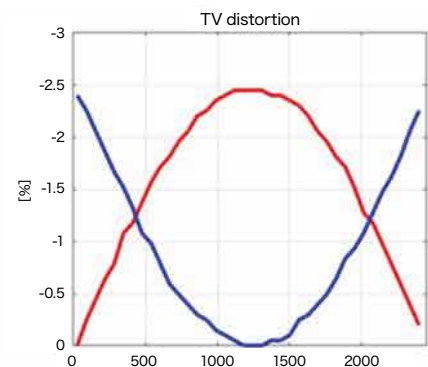
Excessive distortion can negatively impact inspection accuracy, particularly at the image periphery. To support the latest inspection systems that digitally correct lens distortion through image processing, FUJINON lenses feature an optical design with smooth and natural distortion characteristics that are easy to compensate for. Distortion correction data for each lens model can be downloaded from our website at any time.

Before Correction

Cropped Image

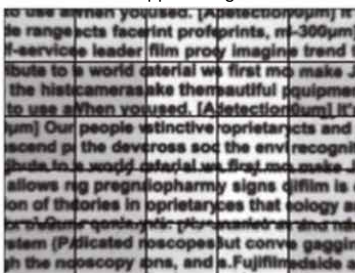


Distortion Map

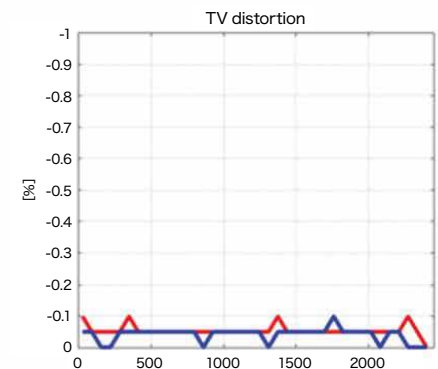


After Correction

Cropped Image



Distortion Map



Distortion can be easily corrected, reducing it from -2.5% to -0.1%.

HF-XA-5M series

Supports 2/3-inch to 1.1-inch^{*3} image sensors and 3.45 μm pixel pitch (equivalent to up to 5 megapixels).

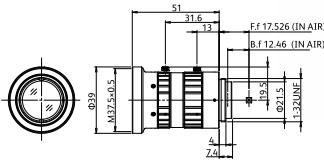
Maximum sensor size: 6mm/8mm=2/3", 12mm/16mm/25mm/35mm=1/1.2", 50mm=1.1"



- “4D High Resolution” minimizes resolution degradation when working distance or aperture settings change.
- Vibration- and shock-resistant design
- Compact design



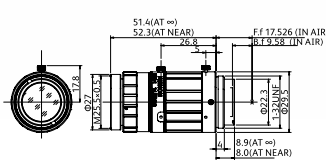
* Applicable to HF6XA-5M and HF50XA-5M only.



Anti Shock & Vibration

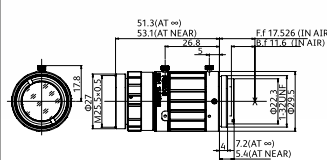
HF6XA-5M

Focal length [mm]	6
Iris range [F. no]	F1.9-F16
Angle of view : 2/3"	74.7°×58.1°
Working Distance ^{*1} [mm]	∞-100
Operation of focus	Manual
Operation of iris	Manual
Filter thread [mm]	M37.5×0.5
Mount	C-mount
Weight (approx.) [g]	100
Sensor size (std.) ^{*2}	2/3" (3.45μm)
Sensor size (max.) ^{*3}	2/3" (3.45μm)
TV distortion [%]	-2.88
Dimension [mm]	ø39×51



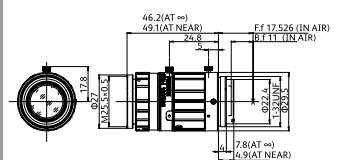
HF8XA-5M

Focal length [mm]	8
Iris range [F. no]	F1.6-F16
Angle of view : 2/3"	58.4°×44.6°
Working Distance ^{*1} [mm]	∞-100
Operation of focus	Manual
Operation of iris	Manual
Filter thread [mm]	M25.5×0.5
Mount	C-mount
Weight (approx.) [g]	79
Sensor size (std.) ^{*2}	2/3" (3.45μm)
Sensor size (max.) ^{*3}	2/3" (3.45μm)
TV distortion [%]	-1.99
Dimension [mm]	ø29.5×51.5



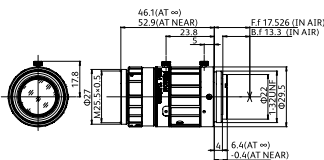
HF12XA-5M

Focal length [mm]	12
Iris range [F. no]	F1.6-F16
Angle of view : 2/3"	40.1°×30.3°
Working Distance ^{*1} [mm]	∞-100
Operation of focus	Manual
Operation of iris	Manual
Filter thread [mm]	M25.5×0.5
Mount	C-mount
Weight (approx.) [g]	79
Sensor size (std.) ^{*2}	2/3" (3.45μm)
Sensor size (max.) ^{*3}	1/1.2" (4.5μm)
TV distortion [%]	-1.26
Dimension [mm]	ø29.5×51.5



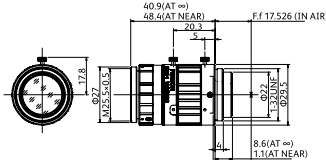
HF16XA-5M

Focal length [mm]	16
Iris range [F. no]	F1.6-F16
Angle of view : 2/3"	31.4°×23.7°
Working Distance ^{*1} [mm]	∞-100
Operation of focus	Manual
Operation of iris	Manual
Filter thread [mm]	M25.5×0.5
Mount	C-mount
Weight (approx.) [g]	71
Sensor size (std.) ^{*2}	2/3" (3.45μm)
Sensor size (max.) ^{*3}	1/1.2" (4.5μm)
TV distortion [%]	-0.60
Dimension [mm]	ø29.5×46



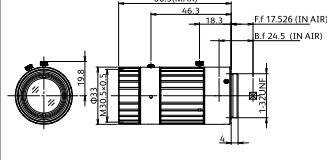
HF25XA-5M

Focal length [mm]	25
Iris range [F. no]	F1.6-F16
Angle of view : 2/3"	20.0°×15.0°
Working Distance ^{*1} [mm]	∞-100
Operation of focus	Manual
Operation of iris	Manual
Filter thread [mm]	M25.5×0.5
Mount	C-mount
Weight (approx.) [g]	72
Sensor size (std.) ^{*2}	2/3" (3.45μm)
Sensor size (max.) ^{*3}	1/1.2" (4.5μm)
TV distortion [%]	-0.07
Dimension [mm]	ø29.5×46.5



HF35XA-5M

Focal length [mm]	35
Iris range [F. no]	F1.9-F16
Angle of view : 2/3"	14.2°×10.7°
Working Distance ^{*1} [mm]	∞-200
Operation of focus	Manual
Operation of iris	Manual
Filter thread [mm]	M25.5×0.5
Mount	C-mount
Weight (approx.) [g]	60
Sensor size (std.) ^{*2}	2/3" (3.45μm)
Sensor size (max.) ^{*3}	1/1.2" (4.5μm)
TV distortion [%]	0.10
Dimension [mm]	ø29.5×41.5



Anti Shock & Vibration

HF50XA-5M

Focal length [mm]	50
Iris range [F. no]	F2.4-F16
Angle of view : 2/3"	10.4°×7.8°
Working Distance ^{*1} [mm]	∞-200
Operation of focus	Manual
Operation of iris	Manual
Filter thread [mm]	M30.5×0.5
Mount	C-mount
Weight (approx.) [g]	95
Sensor size (std.) ^{*2}	2/3" (3.45μm)
Sensor size (max.) ^{*3}	1.1" (4.5μm)
TV distortion [%]	0.01
Dimension [mm]	ø33×66.5

^{*1}: Measured from the front edge of the lens barrel. ^{*2}: Standard Compatible Sensor Size indicates the sensor size for which the lens can deliver maximum imaging performance.

^{*3}: Maximum Compatible Sensor Size varies depending on the lens model, and users should verify peripheral illumination and resolution performance to determine suitability for their specific application.

HF-HA-1S series

Supports 2/3-inch image sensors and 6.2 μ m pixel pitch (equivalent to 1.5 megapixels).

* Only the DF6HA-1S supports a 1/2" image sensor.

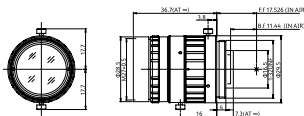


- Anti-Vibration and Shock-Resistant Design
- Broad lineup of eight models
- Compact 29.5 mm outer-diameter design^{*1}
- Fast F-number
- Near-infrared transmittance of 70% or higher at 850 nm, supporting IR systems^{*2}.



^{*1} HF75HA-1S not included.

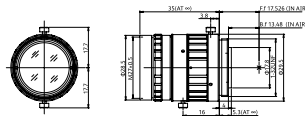
^{*2} Cannot be used in systems utilizing both visible and IR light.



Anti Shock & Vibration

DF6HA-1S

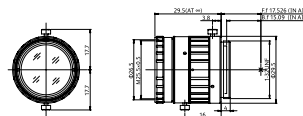
Focal length [mm]	6
Iris range [F. no]	F1.2-F16
Angle of view	57.3°x43.8° (1/2")
Working Distance ^{*1} [mm]	∞-10
Operation of focus	Manual
Operation of iris	Manual
Filter thread [mm]	M27×0.5
Mount	C-mount
Weight (approx.) [g]	50
Sensor size (std.) ^{*2}	1/2"(4.5μm)
Sensor size (max.) ^{*3}	1/2"(4.5μm)
TV distortion [%]	-1.84
Dimension [mm]	ø29.5x36.7



Anti Shock & Vibration

HF9HA-1S

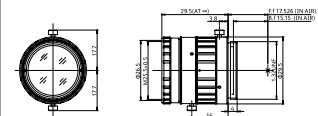
Focal length [mm]	9
Iris range [F. no]	F1.4-F16
Angle of view	53.3°x40.5° (2/3")
Working Distance ^{*1} [mm]	∞-40
Operation of focus	Manual
Operation of iris	Manual
Filter thread [mm]	M27×0.5
Mount	C-mount
Weight (approx.) [g]	50
Sensor size (std.) ^{*2}	2/3"(6.2μm)
Sensor size (max.) ^{*3}	2/3"(6.2μm)
TV distortion [%]	-2.00
Dimension [mm]	ø29.5x35



Anti Shock & Vibration

HF12.5HA-1S

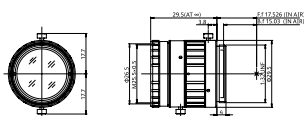
Focal length [mm]	12.5
Iris range [F. no]	F1.4-F16
Angle of view	39.2°x29.4° (2/3")
Working Distance ^{*1} [mm]	∞-20
Operation of focus	Manual
Operation of iris	Manual
Filter thread [mm]	M25.5×0.5
Mount	C-mount
Weight (approx.) [g]	40
Sensor size (std.) ^{*2}	2/3"(6.2μm)
Sensor size (max.) ^{*3}	2/3"(6.2μm)
TV distortion [%]	-1.95
Dimension [mm]	ø29.5x29.5



Anti Shock & Vibration

HF16HA-1S

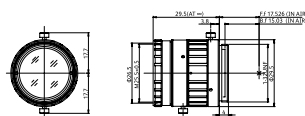
Focal length [mm]	16
Iris range [F. no]	F1.4-F16
Angle of view	30.5°x22.9° (2/3")
Working Distance ^{*1} [mm]	∞-40
Operation of focus	Manual
Operation of iris	Manual
Filter thread [mm]	M25.5×0.5
Mount	C-mount
Weight (approx.) [g]	40
Sensor size (std.) ^{*2}	2/3"(6.2μm)
Sensor size (max.) ^{*3}	2/3"(6.2μm)
TV distortion [%]	-0.87
Dimension [mm]	ø29.5x29.5



Anti Shock & Vibration

HF25HA-1S

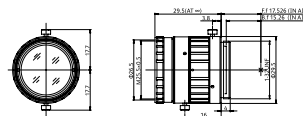
Focal length [mm]	25
Iris range [F. no]	F1.4-F16
Angle of view	19.4°x14.6° (2/3")
Working Distance ^{*1} [mm]	∞-120
Operation of focus	Manual
Operation of iris	Manual
Filter thread [mm]	M25.5×0.5
Mount	C-mount
Weight (approx.) [g]	40
Sensor size (std.) ^{*2}	2/3"(6.2μm)
Sensor size (max.) ^{*3}	2/3"(6.2μm)
TV distortion [%]	-0.19
Dimension [mm]	ø29.5x29.5



Anti Shock & Vibration

HF35HA-1S

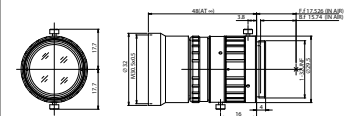
Focal length [mm]	35
Iris range [F. no]	F1.6-F22
Angle of view	14.3°x10.8° (2/3")
Working Distance ^{*1} [mm]	∞-230
Operation of focus	Manual
Operation of iris	Manual
Filter thread [mm]	M25.5×0.5
Mount	C-mount
Weight (approx.) [g]	40
Sensor size (std.) ^{*2}	2/3"(6.2μm)
Sensor size (max.) ^{*3}	2/3"(6.2μm)
TV distortion [%]	0.10
Dimension [mm]	ø29.5x29.5



Anti Shock & Vibration

HF50HA-1S

Focal length [mm]	50
Iris range [F. no]	F2.3-F22
Angle of view	10.1°x7.6° (2/3")
Working Distance ^{*1} [mm]	∞-500
Operation of focus	Manual
Operation of iris	Manual
Filter thread [mm]	M25.5×0.5
Mount	C-mount
Weight (approx.) [g]	40
Sensor size (std.) ^{*2}	2/3"(6.2μm)
Sensor size (max.) ^{*3}	2/3"(6.2μm)
TV distortion [%]	0.06
Dimension [mm]	ø29.5x29.5



Anti Shock & Vibration

HF75HA-1S

Focal length [mm]	75
Iris range [F. no]	F2.8-F22
Angle of view	6.7°x5.0° (2/3")
Working Distance ^{*1} [mm]	∞-1,100
Operation of focus	Manual
Operation of iris	Manual
Filter thread [mm]	M30.5×0.5
Mount	C-mount
Weight (approx.) [g]	50
Sensor size (std.) ^{*2}	2/3"(6.2μm)
Sensor size (max.) ^{*3}	2/3"(6.2μm)
TV distortion [%]	0.36
Dimension [mm]	ø31.5x48

^{*1}: Measured from the front edge of the lens barrel. ^{*2}: Standard Compatible Sensor Size indicates the sensor size for which the lens can deliver maximum imaging performance.

^{*3}: Maximum Compatible Sensor Size varies depending on the lens model, and users should verify peripheral illumination and resolution performance to determine suitability for their specific application.

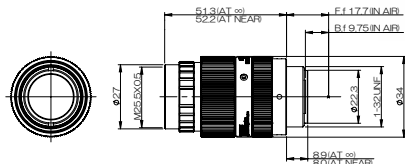
HF-XA-1F series

Supports 2/3-inch to 1/1.2-inch³ image sensors and 3.45 μm pixel pitch (equivalent to 5 megapixels).

Maximum Sensor Size: 8 mm (up to 2/3"), 12 mm / 16 mm / 25 mm / 35 mm (up to 1 1/2")



- **4D High Resolution: Maintaining High Resolution Performance Across Changes in Working Distance and Aperture Settings**
 - **Anti-Vibration and Shock-Resistant Design**
 - **Compact Design**
- 

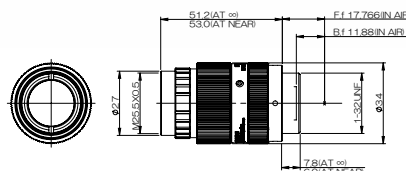


Anti Shock & Vibration

HF8XA-1F

Focal length [mm]	8
Iris range [F. no]	F1.6, F4, F8 (Selection)
Angle of view : 2/3"	58.4°x44.6°
Working Distance ⁻¹ [mm]	∞-100
Operation of focus	Fixed
Operation of iris	Fixed
Filter thread [mm]	M25.5 x 0.5
Mount	C-mount
Weight (approx.) [g]	97
Sensor size (std.) ⁻²	2/3"(3.45μm)
Sensor size (max.) ⁻³	2/3"(3.45μm)
TV distortion [%]	-1.99
Dimension [mm]	ø34x60.2

Required maximum screw-in length*4 [mm]	8.9
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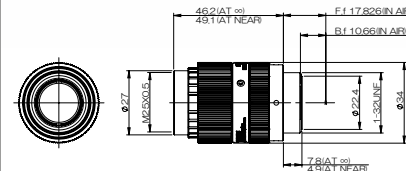


Anti Shock & Vibration

HF12XA-1F

Focal length [mm]	12
Iris range [F. no]	F1.6, F4, F8 (Selection)
Angle of view : 2/3"	40.1°x30.3°
Working Distance ^{*1} [mm]	∞-100
Operation of focus	Fixed
Operation of iris	Fixed
Filter thread [mm]	M25.5 x 0.5
Mount	C-mount
Weight (approx.) [g]	99
Sensor size (std.) ^{*2}	2/3"(3.45μm)
Sensor size (max.) ^{*3}	1/1.2"(4.5μm)
TV distortion [%]	-1.26
Dimension [mm]	ø34x58.7

Required maximum screw-in length*4 [mm]	78
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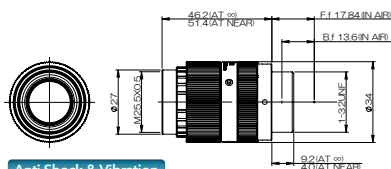


Anti Shock & Vibration

HF16XA-1F

Focal length [mm]	16
Iris range [F. no]	F1.6, F4, F8 (Selection)
Angle of view : 2/3"	31.4°×23.7°
Working Distance ¹ [mm]	∞-100
Operation of focus	Fixed
Operation of iris	Fixed
Filter thread [mm]	M25.5 x 0.5
Mount	C-mount
Weight (approx.) [g]	94
Sensor size (std.) ²	2/3" (3.45μm)
Sensor size (max.) ³	1/1.2" (4.5μm)
TV distortion [%]	-0.60
Dimension [mm]	ø34×54.0

Required maximum screw-in length*4 [mm]	78
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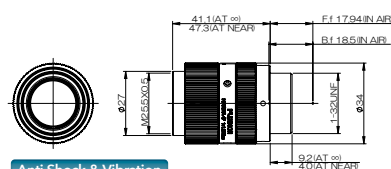


Anti Shock & Vibration

HF25XA-1F

Focal length [mm]	25
Iris range [F. no]	F1.6, F4.6, F9.2 (Selection)
Angle of view : 2/3"	20.0°×15.0°
Working Distance ¹ [mm]	∞-150
Operation of focus	Fixed
Operation of iris	Fixed
Filter thread [mm]	M25.5 x 0.5
Mount	C-mount
Weight (approx.) [g]	87
Sensor size (std.) ²	2/3"(3.45μm)
Sensor size (max.) ³	1/1.2"(4.5μm)
TV distortion [%]	-0.07
Dimension [mm]	ø34×55.4

Required maximum screw-in length*4 [mm]	9.2
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Anti Shock & Vibration

HF35XA-1F

Focal length [mm]	35
Iris range [F. no]	F1.9, F5.2, F10.4 (Selection)
Angle of view : 2/3"	14.2°×10.7°
Working Distance ^{*1} [mm]	∞-300
Operation of focus	Fixed
Operation of iris	Fixed
Filter thread [mm]	M25.5 x 0.5
Mount	C-mount
Weight (approx.) [g]	75
Sensor size (std.) ^{*2}	2/3"(3.45μm)
Sensor size (max.) ^{*3}	1/1.2"(4.5μm)
TV distortion [%]	0.10
Dimension [mm]	ø34×50.3

Required maximum screw-in length*4 [mm]	9.2
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*1: Measured from the front edge of the lens barrel. *2: Standard Compatible Sensor Size indicates the sensor size for which the lens can deliver maximum imaging performance.

*3: Maximum Compatible Sensor Size varies depending on the lens model, and users should verify peripheral illumination and resolution performance to determine suitability for their specific application.

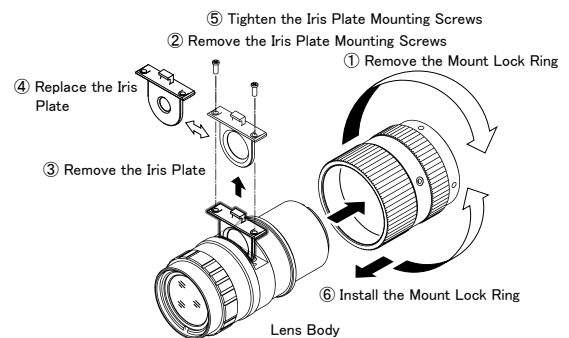
*4: This is the maximum screw-in length required when the object distance is used with INF. Be sure to check this lens can be attached to your camera before purchase.

New Mechanical Design with Improved Shock and Vibration Resistance

- A proprietary mechanical design eliminates moving parts in the iris and focus mechanisms to provide shock and vibration resistance.
- The set screw-free design ensures reliable operation even in high-vibration environments.



- Iris plates with different apertures are included, allowing light levels to be adjusted according to the installation environment and application.
- The iris plate is screw-secured and installed within the internal mechanical structure, ensuring stable illumination even in high-vibration environments.

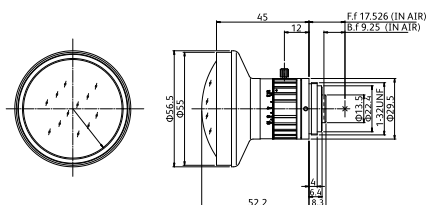


- The three M2.0 screw holes allow the mount locking ring to be secured more firmly, ensuring excellent reliability in harsh operating environments subject to intense vibration and shock.



FE185 Series: Ultra-Wide-Angle 185° Omnidirectional Fisheye Lenses

- Two lens models available
- Supports 5-megapixel sensors
- Durable, high-precision metal C mount
- Manually operated iris
- Made in Japan



FE185C086HA-1

Focal length [mm]	2.7
Iris range [F. no]	F1.8-F16
Angle of view : 1"	185.0°×185.0°(ø8.6mm)
Angle of view : 2/3"	185.0°×140.6°
Angle of view : 1/2"	136.3°×102.3°
Working Distance*1 [mm]	∞-200
Operation of focus	Fixed
Operation of iris	Manual
Mount	C-mount
Weight (approx.) [g]	160
Sensor size (std.)*2	-
Sensor size (max.)*3	1"(5μm)
Dimension [mm]	ø56.5×60.5

Fisheye Image

- Models for 1-Inch Cameras



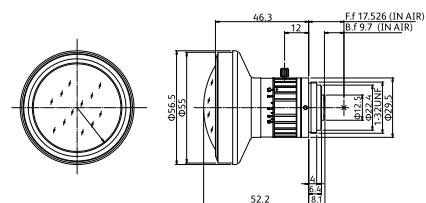
1-Inch



2/3-Inch



1/2-Inch



FE185C057HA-1

Focal length [mm]	1.8
Iris range [F. no]	F1.4-F16
Angle of view : 1"	185.0°×185.0°(ø5.7mm)
Angle of view : 2/3"	185.0°×154.1°
Angle of view : 1/2"	154.1°×115.4°
Working Distance*1 [mm]	∞-100
Operation of focus	Fixed
Operation of iris	Manual
Mount	C-mount
Weight (approx.) [g]	135
Sensor size (std.)*2	-
Sensor size (max.)*3	2/3"(3.45μm)
Dimension [mm]	ø56.5×60.3

Fisheye Image

- Models for 2/3-Inch Cameras



2/3-Inch



1/2-Inch



1/3-Inch

*1 Measured from the front vertex of the lens.

*2 Maximum compatible sensor size. The supported sensor size may vary depending on the lens model. Please verify peripheral illumination and resolution performance to determine suitability for your application.

FUJINON Lens Shooting Range Chart

CF-ZA-1S series

CF8ZA-1S

Working Distance	Optical Magnification	Extension Tube	Field of View [mm]							
			1.2"		1.1"		1"		2/3"	
			[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
1000	0.008x	-	2106.6	1499.9	1885.2	1355.9	1684.7	1221.8	1112.6	822.2
950	0.009x	-	2002.9	1426	1792.4	1289.1	1601.8	1161.6	1057.8	781.7
900	0.009x	-	1899.2	1352.2	1699.6	1222.3	1518.8	1101.4	1003	741.2
850	0.010x	-	1795.5	1278.3	1606.8	1155.5	1435.9	1041.2	948.2	700.7
800	0.010x	-	1691.8	1204.4	1514	1088.7	1352.9	981	893.4	660.2
750	0.011x	-	1588.2	1130.6	1421.2	1021.9	1269.9	920.9	838.6	619.7
700	0.012x	-	1484.5	1056.7	1328.4	955.2	1187	860.7	783.7	579.1
650	0.013x	-	1380.8	982.8	1235.6	888.4	1104	800.5	728.9	538.6
600	0.014x	-	1277.1	909	1142.7	821.6	1021.1	740.3	674.1	498.1
550	0.015x	-	1173.4	835.1	1049.9	754.8	938.1	680.1	619.3	457.6
500	0.016x	-	1069.7	761.2	957.1	688	855.2	619.9	564.5	417.1
450	0.018x	-	966	687.4	864.3	621.3	772.2	559.8	509.7	376.6
400	0.020x	-	862.3	613.5	771.5	554.5	689.2	499.6	454.9	336.1
350	0.023x	-	758.6	539.6	678.6	480.7	606.3	439.4	400.1	295.6
300	0.026x	-	654.9	465.7	585.8	420.9	523.3	379.2	345.2	255
250	0.031x	-	551.2	391.8	493	354.1	440.3	319	290.4	214.5
200	0.039x	-	447.5	318	400.2	287.3	357.3	258.8	235.6	174
150	0.050x	-	343.8	244.1	307.3	220.5	274.4	198.6	180.8	133.5
100	0.073x	-	240	170.1	214.4	153.7	191.3	138.4	125.9	92.9

CF12ZA-1S

Working Distance	Optical Magnification	Extension Tube	Field of View [mm]							
			1.2"		1.1"		1"		2/3"	
			[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
1000	0.012x	-	1369.9	995.1	1236.5	902.4	1112.2	815.2	743.6	551.4
950	0.013x	-	1302.7	946.2	1175.8	858.1	1057.6	775.1	707.1	524.3
900	0.013x	-	1235.5	897.4	1115.2	813.8	1003	735.1	670.6	497.2
850	0.014x	-	1168.3	848.5	1054.5	769.4	948.4	695.1	634.1	470.2
800	0.015x	-	1101.1	799.7	993.8	725.1	893.8	655	597.5	443.1
750	0.016x	-	1033.9	750.8	933.1	680.8	839.3	615	561	416
700	0.017x	-	966.7	702	872.5	636.5	784.7	575	524.5	388.9
650	0.019x	-	899.5	653.1	811.8	592.2	730.1	535	488	361.8
600	0.020x	-	832.3	604.3	751.1	547.9	675.5	494.9	451.5	334.7
550	0.022x	-	765.1	555.4	690.4	503.6	620.9	454.9	414.9	307.6
500	0.024x	-	697.9	506.6	629.7	459.3	566.3	414.9	378.4	280.6
450	0.026x	-	630.7	457.7	569.1	415	511.7	374.8	341.9	253.5
400	0.030x	-	563.5	408.8	508.4	370.7	457.1	334.8	305.4	226.4
350	0.034x	-	496.2	360	447.7	326.3	402.5	294.7	268.8	199.3
300	0.039x	-	429	311.1	387	282	347.9	254.7	232.3	172.2
250	0.046x	-	361.7	262.2	326.2	237.7	293.2	214.6	195.7	145.1
200	0.057x	-	294.5	213.3	265.5	193.3	238.6	174.6	159.2	118
150	0.074x	-	227.1	164.4	204.7	148.9	183.9	134.5	122.6	90.8
100	0.105x	-	159.7	115.3	143.8	104.5	129.1	94.3	86	63.7

CF16ZA-1S

Working Distance	Optical Magnification	Extension Tube	Field of View [mm]							
			1.2"		1.1"		1"		2/3"	
			[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
1000	0.016x	-	983.5	730.2	895.1	665.3	811	603.4	552.2	412.4
950	0.017x	-	935.4	694.5	851.3	632.7	771.3	573.9	525.1	392.2
900	0.018x	-	887.3	658.7	807.5	600.1	731.6	544.3	498.1	372
850	0.019x	-	839.2	622.9	763.7	567.5	691.9	514.8	471	351.8
800	0.020x	-	791.1	587.2	719.9	535	652.2	485.2	444	331.6
750	0.021x	-	743	551.4	676.1	502.4	612.5	455.7	416.9	311.4
700	0.023x	-	694.9	515.7	632.3	469.8	572.8	426.1	389.9	291.2
650	0.025x	-	646.8	479.9	588.5	437.2	533.1	396.5	362.8	271
600	0.026x	-	598.6	444.2	544.7	404.6	493.4	367	335.8	250.7
550	0.029x	-	550.5	408.4	500.9	372	453.7	337.4	308.7	230.5
500	0.032x	-	502.4	372.6	457	339.4	414	307.8	281.7	210.3
450	0.035x	-	454.2	336.9	413.2	306.8	374.2	278.3	254.6	190.1
400	0.039x	-	406.1	301.1	369.4	274.2	334.5	248.7	227.5	169.9
350	0.044x	-	357.9	265.3	325.5	241.6	294.8	219.1	200.5	149.6
300	0.051x	-	309.7	229.5	281.7	209	255	189.5	173.4	129.4
250	0.061x	-	261.5	193.7	237.8	176.4	215.2	159.9	146.3	109.2
200	0.075x	-	213.2	157.8	193.8	143.7	175.4	130.2	119.1	88.9
150	0.097x	-	164.9	121.9	149.8	110.9	135.5	100.6	92	68.6
100	0.138x	-	116.3	85.8	105.6	78.1	95.4	70.7	64.7	48.2

CF25ZA-1S

Working Distance	Optical Magnification	Extension Tube	Field of View [mm]							
			4/3"		1.2"		1.1"		1"	
			[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
1000	0.024x	-	780.1	577.8	663.1	492.7	603.5	449	546.9	407.5
950	0.025x	-	742	549.5	630.7	468.5	574	427	520.1	387.5
900	0.026x	-	703.8	521.2	598.2	444.4	544.4	405	493.4	367.6
850	0.028x	-	665.6	492.9	565.7	420.3	514.9	383.1	466.6	347.6
800	0.030x	-	627.5	464.6	533.3	396.1	485.3	361.1	439.8	327.6
750	0.031x	-	589.3	436.3	500.8	372	455.8	339.1	413	307.7
700	0.034x	-	551.1	408	468.3	347.9	426.2	317.1	386.2	287.7
650	0.036x	-	512.9	379.7	435.9	323.7	396.6	295.1	359.4	267.7
600	0.039x	-	474.7	351.4	403.4	299.6	367.1	273	332.6	247.8
550	0.043x	-	436.5	323.1	370.9	275.4	337.5	251	305.8	227.8
500	0.047x	-	398.3	294.8	338.4	251.3	307.9	229	279	207.8
450	0.052x	-	360.1	266.4	305.9	227.1	278.3	207	252.2	187.8
400	0.058x	-	321.8	238.1	273.4	202.9	248.7	184.9	225.3	167.8
350	0.066x	-	283.6	209.7	240.8	178.7	219.1	162.9	198.5	147.8
300	0.076x	-	245.2	181.3	208.2	154.5	189.4	140.8	171.6	127.7
250	0.090x	-	206.8	152.8	175.5	130.2	159.7	118.6	144.6	107.6
200	0.111x	-	168.3	124.3	142.8	105.9	129.8	96.4	117.6	87.5
150	0.144x	-	129.5	95.5	109.8	81.3	99.8	74.1	90.4	67.2
100	0.208x	-	90.2	66.4	76.3	56.5	69.4	51.4	62.8	46.6

CF35ZA-1S

Working Distance	Optical Magnification	Extension Tube	Field of View [mm]							
			4/3"		1.2"		1.1"		1"	
			[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
1000	0.034x	-	541.2	403.7	462	345	421.3	314.9	382.5	286
950	0.036x	-	515	384.1	439.6	328.3	400.9	299.6	363.9	272.1
900	0.038x	-	488.8	364.6	417.2	311.6	380.5	284.3	345.4	258.3
850	0.040x	-	462.6	345	394.8	294.9	360.1	269.1	326.9	244.4
800	0.042x	-	436.4	325.4	372.5	278.1	339.6	253.8	308.3	230.5
750	0.045x	-	410.2	305.9	350.1	261.4	319.2	238.5	289.8	216.7
700	0.048x	-	384	286.3	327.7	244.7	298.8	223.3	271.2	202.8
650	0.051x	-	357.7	266.7	305.3	227.9	278.4	208	252.7	188.9
600	0.056x	-	331.5	247.1	282.9	211.2	257.9	192.7	234.1	175
550	0.060x	-	305.3	227.5	260.5	194.4	237.5	177.4	215.5	161.1
500	0.066x	-	279	207.9	238	177.7	217	162.1	197	147.2
450	0.073x	-	252.7	188.3	215.6	160.9	196.5	146.8	178.4	133.3
400	0.082x	-	226.4	168.6	193.1	144.1	176	131.4	159.7	119.4
350	0.093x	-	200	148.9	170.6	127.2	155.5	116.1	141.1	105.4
300	0.107x	-	173.6	129.2	148	110.4	134.9	100.7	122.4	91.4
250	0.127x	-	147.1	109.4	125.3	93.4	114.2	85.2	103.6	77.4
200	0.156x	-	120.4	89.5	102.5	76.4	93.4	69.7	84.8	63.3
150	0.201x	1.5	93.3	69.3	79.5	59.2	72.4	54	65.7	49
100	0.282x	5	65.6	48.6	55.8	41.5	50.8	37.8	46	34.3

CF50ZA-1S

Working Distance	Optical Magnification
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HF-XA-5M / HF-XA-1F series

HF6XA-5M

Working Distance [mm]	Optical Magnification	Extension Tube [mm]	Field of View [mm]					
			2/3"		1/2"		1/3"	
			H	V	H	V	H	V
1000	0.006x	-	1548.2	1126.4	1089.5	802.1	802.1	594.9
950	0.006x	-	1471.8	1070.9	1035.7	762.5	762.5	565.6
900	0.007x	-	1395.5	1015.3	982.0	722.9	722.9	536.3
850	0.007x	-	1319.1	959.8	928.3	683.4	683.4	506.9
800	0.008x	-	1242.8	904.2	874.6	643.8	643.8	477.6
750	0.008x	-	1166.5	848.7	820.8	604.3	604.3	448.2
700	0.009x	-	1090.1	793.1	767.1	564.7	564.7	418.9
650	0.009x	-	1013.8	737.6	713.4	525.2	525.2	389.6
600	0.010x	-	937.4	682.0	659.6	485.6	485.6	360.2
550	0.011x	-	861.1	626.5	605.9	446.1	446.1	330.9
500	0.012x	-	784.8	570.9	552.2	406.5	406.5	301.5
450	0.013x	-	708.4	515.4	498.5	367.0	367.0	272.2
400	0.015x	-	632.1	459.8	444.7	327.4	327.4	242.9
350	0.017x	-	555.7	404.3	391.0	287.8	287.8	213.5
300	0.020x	-	479.4	348.7	337.3	248.3	248.3	184.2
250	0.024x	-	403.0	293.2	283.5	208.7	208.7	154.8
200	0.029x	-	326.7	237.6	229.8	169.2	169.2	125.5
150	0.038x	-	250.4	182.1	176.1	129.6	129.6	96.2
100	0.055x	-	174.0	126.5	122.4	90.1	90.1	66.8

HF8XA-5M / HF8XA-1F

Working Distance [mm]	Optical Magnification	Extension Tube [mm]	Field of View [mm]					
			2/3"		1/2"		1/3"	
			H	V	H	V	H	V
1000	0.008x	-	1130.4	830.5	803.9	595.5	595.5	443.3
950	0.009x	-	1074.6	789.5	764.2	566.1	566.1	421.4
900	0.009x	-	1018.8	748.5	724.5	536.6	536.6	399.5
850	0.010x	-	962.9	707.4	684.8	507.2	507.2	377.6
800	0.010x	-	907.1	666.4	645.1	477.8	477.8	355.7
750	0.011x	-	851.2	625.4	605.4	448.4	448.4	333.8
700	0.012x	-	795.4	584.3	565.7	419.0	419.0	311.9
650	0.013x	-	739.6	543.3	525.9	389.6	389.6	290.0
600	0.014x	-	683.7	502.3	486.2	360.1	360.1	268.1
550	0.015x	-	627.9	461.3	446.5	330.7	330.7	246.2
500	0.016x	-	572.0	420.2	406.8	301.3	301.3	224.3
450	0.018x	-	516.2	379.2	367.1	271.9	271.9	202.4
400	0.020x	-	460.3	338.2	327.4	242.5	242.5	180.5
350	0.023x	-	404.5	297.1	287.6	213.0	213.0	158.6
300	0.027x	-	348.7	256.1	247.9	183.6	183.6	136.7
250	0.032x	-	292.8	215.1	208.2	154.2	154.2	114.8
200	0.039x	-	237.0	174.1	168.5	124.8	124.8	92.9
150	0.051x	-	181.1	133.0	128.8	95.4	95.4	71.0
100	0.074x	-	125.3	92.0	89.1	66.0	66.0	49.1

HF12XA-5M / HF12XA-1F

Working Distance [mm]	Optical Magnification	Extension Tube [mm]	Field of View [mm]					
			1/1.2"		2/3"		1/2"	
			H	V	H	V	H	V
1000	0.012x	-	913.0	673.6	740.5	548.9	531.8	396.2
950	0.013x	-	868.0	640.4	704.0	521.9	505.6	376.7
900	0.014x	-	823.0	607.2	667.5	494.8	479.4	357.2
850	0.014x	-	778.0	574.0	631.0	467.8	453.2	337.7
800	0.015x	-	733.0	540.8	594.5	440.7	427.0	318.1
750	0.016x	-	688.0	507.6	558.0	413.7	400.8	298.6
700	0.017x	-	643.1	474.5	521.6	386.6	374.6	279.1
650	0.019x	-	598.1	441.3	485.1	359.6	348.3	259.6
600	0.020x	-	553.1	408.1	448.6	332.5	322.1	240.0
550	0.022x	-	508.1	374.9	412.1	305.5	295.9	220.5
500	0.024x	-	463.1	341.7	375.6	278.4	269.7	201.0
450	0.027x	-	418.2	308.5	339.1	251.4	243.5	181.5
400	0.030x	-	373.2	275.3	302.6	224.3	217.3	161.9
350	0.034x	-	328.2	242.1	266.2	197.3	191.1	142.4
300	0.039x	-	283.2	208.9	229.7	170.2	164.9	122.9
250	0.047x	-	238.2	175.7	193.2	143.2	138.7	103.4
200	0.058x	-	193.2	142.5	156.7	116.1	112.5	83.8
150	0.075x	-	148.3	109.3	120.2	89.1	86.3	64.3
100	0.108x	-	103.3	76.1	83.7	62.0	60.1	44.8

HF16XA-5M / HF16XA-1F

Working Distance [mm]	Optical Magnification	Extension Tube [mm]	Field of View [mm]					
			1/1.2"		2/3"		1/2"	
			H	V	H	V	H	V
1000	0.016x	-	701.9	522.1	572.8	427.0	413.9	309.3
950	0.016x	-	667.5	496.5	544.7	406.0	393.6	294.2
900	0.017x	-	633.1	470.9	516.6	385.1	373.2	279.0
850	0.018x	-	598.7	445.3	488.4	364.1	352.9	263.8
800	0.019x	-	564.2	419.7	460.3	343.2	332.6	248.6
750	0.021x	-	529.8	394.0	432.2	322.2	312.3	233.4
700	0.022x	-	495.4	368.4	404.1	301.3	292.0	218.2
650	0.024x	-	461.0	342.8	376.0	280.3	271.7	203.0
600	0.026x	-	426.5	317.2	347.9	259.3	251.4	187.9
550	0.028x	-	392.1	291.5	319.8	238.4	231.0	172.7
500	0.031x	-	357.7	265.9	291.7	217.4	210.7	157.5
450	0.034x	-	323.3	240.3	263.6	196.5	190.4	142.3
400	0.038x	-	288.8	214.7	235.5	175.5	170.1	127.1
350	0.043x	-	254.4	189.1	207.4	154.6	149.8	111.9
300	0.050x	-	220.0	163.4	179.3	133.6	129.5	96.7
250	0.059x	-	185.6	137.8	151.2	112.6	109.2	81.6
200	0.073x	-	151.1	112.2	123.1	91.7	88.9	66.4
150	0.094x	-	116.7	86.6	95.0	70.7	68.5	51.2
100	0.134x	-	82.3	60.9	66.9	49.8	48.2	36.0

HF25XA-5M / HF25XA-1F

Working Distance [mm]	Optical Magnification	Extension Tube [mm]	Field of View [mm]					
			1/1.2"		2/3"		1/2"	
			H	V	H	V	H	V
1000	0.025x	-	435.9	326.5	357.4	267.8	259.7	194.6
950	0.026x	-	414.4	310.4	339.9	254.6	246.9	185.1
900	0.027x	-	393.0	294.3	322.3	241.5	234.1	175.5
850	0.029x	-	371.5	278.3	304.7	228.3	221.3	165.9
800	0.031x	-	350.1	262.2	287.1	215.1	208.6	156.3
750	0.033x	-	328.7	246.1	269.5	201.9	195.8	146.7
700	0.035x	-	307.2	230.1	251.9	188.7	183.0	137.2
650	0.038x	-	285.8	214.0	234.3	175.6	170.2	127.6
600	0.041x	-	264.4	198.0	216.8	162.4	157.4	118.0
550	0.044x	-	242.9	181.9	199.2	149.2	144.7	108.4
500	0.049x	-	221.5	165.8	181.6	136.0	131.9	98.8
450	0.054x	-	200.1	149.8	164.0	122.8	119.1	89.3
400	0.060x	-	178.6	133.7	146.4	109.7	106.3	79.7
350	0.069x	-	157.2	117.6	128.8	96.5	93.5	70.1
300	0.079x	-	135.7	101.6	111.2	83.3	80.8	60.5
250	0.094x	-	114.3	85.5	93.7	70.1	68.0	50.9
200	0.116x	-	92.9	69.4	76.1	56.9	55.2	41.4
150	0.151x	-	71.4	53.4	58.5	43.7	42.4	31.8
100	0.217x	- / 1.5	49.9	37.3	40.9	30.6	29.6	22.2

HF35XA-5M / HF35XA-1F

Working Distance [mm]	Optical Magnification	Extension Tube [mm]	Field of View [mm]					
			1/1.2"		2/3"		1/2"	
			H	V	H	V	H	V
1000	0.035x	-	307.4	230.7	252.4	189.4	183.7	137.8
950	0.037x	-	292.1	219.3	240.0	180.0	174.6	131.0
900	0.039x	-	276.9	207.8	227.5	170.7	165.5	124.1
850	0.041x	-	261.7	196.4	215.0	161.3	156.4	117.3
800	0.044x	-	246.5	185.0	202.5	151.9	147.3	110.5
750	0.047x	-	231.3	173.6	190.0	142.5	138.2	103.7
700	0.050x	-	216.1	162.2	177.5	133.1	129.1	96.8
650	0.054x	-	200.9	150.8	165.0	123.8	120.0	90.0
600	0.059x	-	185.7	139.3	152.5	114.4	110.9	83.2
550	0.064x	-	170.5	127.9	140.0	105.0	101.8	76.4
500	0.070x	-	155.3	116.5	127.5	95.6	92.7	69.6
450	0.078x	-	140.1	105.1	115.0	86.3	83.6	62.7
400	0.088x	-	124.9	93.7	102.5	76.9	74.6	55.9
350	0.101x	-	109.7	82.2	90.0	67.5	65.5	49.1
300	0.117x	-	94.5	70.8	77.5	58.1	56.4	42.3
250	0.141x	- / 0.5	79.3	59.4	65.0	48.8	47.3	35.5
200	0.176x	- / 2	64.1	48.0	52.6	39.4	38.2	28.6
150	0.235x	2 / 5	48.3	36.2	39.6	29.7	28.8	21.6
100	0.354x	10 / 10	30.4	22.8	25.0	18.7	18.1	13.6

HF-HA-1S series

DF6HA-1S

Working Distance [mm]	Optical Magnification	Extension Tube [mm]	Field of View [mm]					
			2/3"		1/2"		1/3"	
			H	V	H	V	H	V
1000	0.006x	-	-	-	1109.3	816.0	816.0	604.3
950	0.006x	-	-	-	1054.7	775.8	775.8	574.6
900	0.007x	-	-	-	1000.1	735.6	735.6	544.8
850	0.007x	-	-	-	945.4	695.3	695.3	515.0
800	0.008x	-	-	-	890.8	655.1	655.1	485.2
750	0.008x	-	-	-	836.2	614.9	614.9	455.4
700	0.009x	-	-	-	781.6	574.7	574.7	425.6
650	0.009x	-	-	-	726.9	534.5	534.5	395.8
600	0.010x	-	-	-	672.3	494.3	494.3	366.1
550	0.011x	-	-	-	617.7	454.1	454.1	336.3
500	0.012x	-	-	-	563.1	413.9	413.9	306.5
450	0.013x	-	-	-	508.4	373.7	373.7	276.7
400	0.015x	-	-	-	453.8	333.5	333.5	246.9
350	0.017x	-	-	-	399.2	293.3	293.3	217.1
300	0.020x	-	-	-	344.6	253.1	253.1	187.3
250	0.023x	-	-	-	289.9	212.9	212.9	157.5
200	0.029x	-	-	-	235.3	172.7	172.7	127.8
150	0.037x	-	-	-	180.7	132.5	132.5	98.0
100	0.054x	-	-	-	126.0	92.3	92.3	68.2

HF12.5HA-1S

Working Distance [mm]	Optical Magnification	Extension Tube [mm]	Field of View [mm]					
			2/3"		1/2"		1/3"	
			H	V	H	V	H	V
1000	0.013x	-	723.3	532.3	515.4	382.7	382.7	285.4
950	0.013x	-	687.6	506.1	490.0	363.8	363.8	271.3
900	0.014x	-	652.0	479.8	464.6	344.9	344.9	257.2
850	0.015x	-	616.3	453.6	439.2	326.1	326.1	243.2
800	0.016x	-	580.7	427.3	413.8	307.2	307.2	229.1
750	0.017x	-	545.0	401.1	388.4	288.3	288.3	215.0
700	0.018x	-	509.4	374.8	363.0	269.5	269.5	200.9
650	0.019x	-	473.7	348.6	337.5	250.6	250.6	186.9
600	0.021x	-	438.1	322.4	312.1	231.7	231.7	172.8
550	0.023x	-	402.4	296.1	286.7	212.8	212.8	158.7
500	0.025x	-	366.8	269.9	261.3	194.0	194.0	144.6
450	0.028x	-	331.1	243.6	235.9	175.1	175.1	130.6
400	0.031x	-	295.5	217.4	210.5	156.2	156.2	116.5
350	0.035x	-	259.8	191.1	185.0	137.3	137.3	102.4
300	0.041x	-	224.2	164.9	159.6	118.5	118.5	88.3
250	0.049x	-	188.5	138.6	134.2	99.6	99.6	74.3
200	0.060x	-	152.9	112.4	108.8	80.7	80.7	60.2
150	0.079x	-	117.2	86.1	83.4	61.9	61.9	46.1
100	0.113x	-	81.5	59.8	57.9	43.0	43.0	32.0

HF25HA-1S

Working Distance [mm]	Optical Magnification	Extension Tube [mm]	Field of View [mm]					
			2/3"		1/2"		1/3"	
			H	V	H	V	H	V
1000	0.026x	-	344.7	257.9	250.1	187.3	187.3	140.4
950	0.027x	-	327.6	245.1	237.6	178.0	178.0	133.4
900	0.029x	-	310.5	232.3	225.2	168.7	168.7	126.4
850	0.030x	-	293.4	219.5	212.8	159.4	159.4	119.4
800	0.032x	-	276.3	206.7	200.4	150.1	150.1	112.5
750	0.034x	-	259.1	193.8	187.9	140.8	140.8	105.5
700	0.037x	-	242.0	181.0	175.5	131.4	131.4	98.5
650	0.039x	-	224.9	168.2	163.1	122.1	122.1	91.5
600	0.043x	-	207.8	155.4	150.6	112.8	112.8	84.5
550	0.046x	-	190.6	142.6	138.2	103.5	103.5	77.6
500	0.051x	-	173.5	129.8	125.8	94.2	94.2	70.6
450	0.057x	-	156.4	116.9	113.4	84.9	84.9	63.6
400	0.064x	-	139.3	104.1	100.9	75.6	75.6	56.6
350	0.073x	-	122.1	91.3	88.5	66.3	66.3	49.6
300	0.084x	-	105.0	78.5	76.1	56.9	56.9	42.7
250	0.101x	-	87.9	65.6	63.6	47.6	47.6	35.7
200	0.126x	-	70.7	52.8	51.2	38.3	38.3	28.7
150	0.166x	-	53.6	40.0	38.8	29.0	29.0	21.7
100	0.245x	5	36.4	27.2	26.3	19.7	19.7	14.7

HF50HA-1S

Working Distance [mm]	Optical Magnification	Extension Tube [mm]	Field of View [mm]					
			2/3"		1/2"		1/3"	
			H	V	H	V	H	V
1500	0.034x	-	254.8	191.2	185.4	139.1	139.1	104.4
1450	0.036x	-	245.9	184.5	179.0	134.3	134.3	100.7
1400	0.037x	-	237.1	177.9	172.5	129.4	129.4	97.1
1350	0.039x	-	228.2	171.2	166.1	124.6	124.6	93.5
1300	0.040x	-	219.4	164.6	159.6	119.8	119.8	89.8
1250	0.042x	-	210.5	157.9	153.2	114.9	114.9	86.2
1200	0.044x	-	201.7	151.3	146.7	110.1	110.1	82.6
1150	0.046x	-	192.8	144.7	140.3	105.2	105.2	78.9
1100	0.048x	-	183.9	138.0	133.8	100.4	100.4	75.3
1050	0.050x	-	175.1	131.4	127.4	95.6	95.6	71.7
1000	0.053x	-	166.2	124.7	120.9	90.7	90.7	68.1
950	0.056x	-	157.4	118.1	114.5	85.9	85.9	64.4
900	0.059x	-	148.5	111.4	108.0	81.0	81.0	60.8
850	0.063x	-	139.6	104.8	101.6	76.2	76.2	57.2
800	0.067x	-	130.8	98.1	95.1	71.4	71.4	53.5
750	0.072x	-	121.9	91.5	88.7	66.5	66.5	49.9
700	0.078x	-	113.1	84.8	82.2	61.7	61.7	46.3
650	0.084x	-	104.2	78.2	75.8	56.9	56.9	42.6
600	0.092x	-	95.3	71.5	69.3	52.0	52.0	39.0
550	0.102x	-	86.5	64.9	62.9	47.2	47.2	35.4
500	0.113x	-	77.6	58.2	56.4	42.3	42.3	31.8
450	0.128x	1	68.7	51.6	50.0	37.5	37.5	28.1
400	0.147x	2	59.9	44.9	43.5	32.7	32.7	24.5
350	0.173x	5	51.0	38.2	37.1	27.8	27.8	20.9
300	0.209x	5	42.1	31.6	30.6	23.0	23.0	17.2
250	0.265x	10	33.3	24.9	24.2	18.1	18.1	13.6
200	0.361x	15	24.4	18.3	17.7	13.3	13.3	10.0
150	0.568x	25	15.5	11.6	11.3	8.5	8.5	6.3
100	1.330x	65	6.6	5.0	4.8	3.6	3.6	2.7

<Sensor size>

1.1"	14.1X10.6
1"	12.8X9.6
1/1.2"	10.7X8.0
2/3"	8.8X6.6
1/2"	6.4X4.8
1/3"	4.8X3.6

[mm]

* This data shows simulation value.

* When attached with an extension tube, the optical performance of the lenses is not covered under warranty.

* The extension tubes of 5mm to 9mm cannot be attached to the HF-12M series.

HF9HA-1S

Working Distance [mm]	Optical Magnification	Extension Tube [mm]	Field of View [mm]					
			2/3"		1/2"		1/3"	
			H	V	H	V	H	V
1000	0.009x	-	1018.3	747.5	723.6	535.9	535.9	399.0
950	0.010x	-	968.1	710.6	687.9	509.4	509.4	379.3
900	0.010x	-	917.9	673.8	652.2	483.0	483.0	359.6
850	0.011x	-	867.7	636.9	616.5	456.5	456.5	339.9
800	0.011x	-	817.4	600.0	580.8	430.1	430.1	320.2
750	0.012x	-	767.2	563.1	545.1	403.6	403.6	300.5
700	0.013x	-	717.0	526.2	509.4	377.2	377.2	280.8
650	0.014x	-	666.8	489.3	473.7	350.8	350.8	261.1
600	0.015x	-	616.6	452.5	438.0	324.3	324.3	241.4
550	0.016x	-	566.4	415.6	402.2	297.9	297.9	221.7
500	0.018x	-	516.2	378.7	366.5	271.4	271.4	202.0
450	0.020x	-	465.9	341.8	330.8	245.0	245.0	182.3
400	0.022x	-	415.7	304.9	295.1	218.5	218.5	162.7
350	0.025x	-	365.5	268.0	259.4	192.1	192.1	143.0
300	0.029x	-	315.3	231.1	223.7	165.6	165.6	123.3
250	0.035x	-	265.1	194.3	188.0	139.2	139.2	103.6
200	0.043x	-	214.8	157.4	152.3	112.7	112.7	83.9
150	0.057x	-	164.6	120.5	116.6	86.3	86.3	64.2
100	0.082x	-	114.4	83.6	80.9	59.8	59.8	44.5

HF16HA-1S

Working Distance [mm]	Optical Magnification	Extension Tube [mm]	Field of View [mm]					
			2/3"		1/2"		1/3"	
			H	V	H	V	H	V
1000	0.016x	-	555.0	412.2	399.4	297.9	297.9	222.7
950	0.017x	-	527.7	391.9	379.8	283.2	283.2	211.7
900	0.018x	-	500.4	371.7	360.1	268.6	268.6	200.8
850	0.019x	-	473.1	351.4	340.5	253.9	253.9	189.8
800	0.020x	-	445.8	331.1	320.8	239.3	239.3	178.9
750	0.022x	-	418.6	310.8	301.2	224.6	224.6	167.9
700	0.023x	-	391.3	290.6	281.5	209.9	209.9	156.9
650	0.025x	-	364.0	270.3	261.9	195.3	195.3	146.0
600	0.027x	-	336.7	250.0	242.2	180.6	180.6	135.0
550	0.029x	-	309.4	229.7	222.6	166.0	166.0	124.1
500	0.032x	-	282.1	209.4	202.9	151.3	151.3	113.1
450	0.035x	-	254.8	189.2	183.3	136.7	136.7	102.2
400	0.040x	-	227.6	168.9	163.6	122.0	122.0	91.2
350	0.045x	-	200.3	148.6	144.0	107.4	107.4	80.2
300	0.052x	-	173.0	128.3	124.3	92.7	92.7	69.3
250	0.062x	-	145.7	108.1	104.7	78.0	78.0	58.3
200	0.076x	-	118.4	87.8	85.0	63.4	63.4	47.4
150	0.099x	-	91.1	67.5	65.4	48.7	48.7	36.4
100	0.142x	-	63.8	47.2	45.7	34.1	34.1	25.5

Automotive-Related Manufacturer, Company A

Large Workpieces, Multiple Vision Systems, and Inconsistent Inspection Accuracy. What Is the Solution?

Company A supplies components to leading automotive manufacturers and has extensive experience, particularly in the production of large-sized parts. In recent years, as quality standards have become more stringent and lead times have shortened, the company began considering the implementation of a visual inspection system capable of delivering higher accuracy and greater efficiency than ever before. However, the large size of the workpieces presented a unique set of challenges.

Challenges	After Introducing “4D High Resolution” Lenses
■ System-to-system variations can affect inspection consistency when multiple vision systems are controlled simultaneously. ■ The large number of vision systems required increases overall system costs.	■ The adoption of lenses with minimized unit-to-unit variation helped reduce overall system variation. ■ Lenses offering a wide field of view and uniform resolution performance enabled a reduction in the number of cameras required, helping to lower system costs.

Problem 1: Capture uniform images using more than 20 vision systems.

Lens-to-Lens Performance Variations and Calibration Workload

Company A manufactures large components that are installed in various parts of automobiles. The size and shape of these components vary depending on the installation location and vehicle model. To improve the efficiency of visual inspection, the company considered a method in which the entire workpiece would be captured simultaneously by multiple vision systems from above, below, left, right, and in some cases from various angles. Because of the large size of the workpieces, the inspection system required more than 20 vision systems. However, the lenses previously used exhibited performance variations from unit to unit, resulting in inconsistencies in image inspection results. Although extensive time was spent repeatedly adjusting the systems to achieve uniform defect detection performance, the desired results could not be achieved.

Problem 2: The Need to Reduce the Number of Vision Systems and Lower Overall System Costs

When the Field of View Is Expanded, Maintaining Uniform Image Quality Across the Entire Image Becomes Difficult

As part of building the new inspection system, Company A aimed not only to minimize performance variations among individual vision systems, but also to reduce management effort and overall costs by decreasing the number of vision systems required. However, inspecting large workpieces with fewer vision systems while maintaining the same level of coverage posed a significant challenge. It required not only wide-angle lenses to expand the field of view, but also high-performance lenses capable of reliably detecting even the smallest defects appearing at the corners of the image.

The Keys to Solving the Challenges: Elimination of Lens-to-Lens Resolution Variations and Expansion of the Field of View

Solution: Adopting Lenses That Maximize Camera Performance

To address the challenges of eliminating variations in image inspection results and reducing the number of cameras required, Company A decided to introduce the latest high-resolution cameras. Recognizing that lens selection would be critical to the success of the project, the company consulted the camera manufacturer it planned to adopt. The manufacturer recommended Fujifilm's "4D High Resolution" machine vision lenses, stating, "These lenses are designed to bring out the full potential of your cameras."

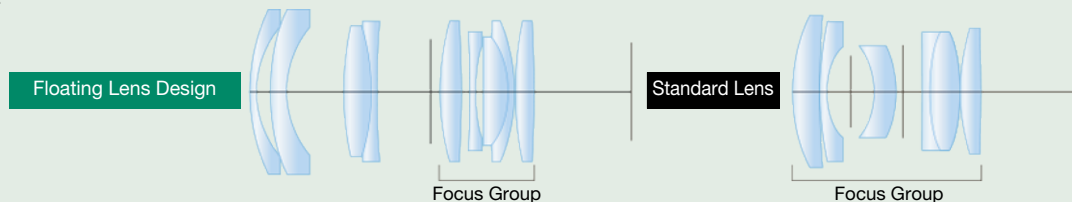


Solution to Problem 1: Eliminating System Variations by Using Lenses with Consistent Performance

When multiple vision systems are used for inspection, all systems must deliver equivalent performance to ensure consistent inspection results. Lens quality is particularly critical, as variations in lens performance can easily affect overall system accuracy. Company A strongly emphasized its requirement for lenses with reliable and consistent performance, stating, "We need lenses with virtually no performance variation from unit to unit." To minimize lens-to-lens variations, every FUJIFILM "4D High Resolution" machine vision lens undergoes rigorous inspection using proprietary measurement equipment. In addition, each lens is assigned a serial number, enabling thorough individual quality control and traceability. These lenses are designed to suppress resolution degradation caused by changes in working distance or aperture settings. As a result, even in Company A's inspection system, where cameras are installed at multiple locations under different operating conditions, variations in image inspection results were significantly reduced. Because lens performance remained consistent across all systems, the time required for system calibration was also shortened, reducing the workload on inspection personnel.

Solution to Problem 2: Adopting Wide-Angle Lenses with High Resolution Performance

In general, lenses are designed for a specific reference working distance, with optical performance optimized to deliver maximum resolution at that distance. As a result, when the working distance changes, image quality at the corners of the image may degrade. This tendency is particularly pronounced in wide-angle lenses due to their optical characteristics. FUJIFILM's "4D High Resolution" lenses are designed to suppress resolution degradation caused by changes in working distance. This is achieved through advanced optical technologies, including a floating focus design in which only the rear lens group moves to maintain focus. In addition, the lenses are assembled with micron-level precision, minimizing optical axis misalignment and ensuring consistent performance. Because FUJIFILM lenses maintain high resolution performance all the way to the image edges, each lens can cover a wider inspection area. As a result, Company A was able to significantly reduce the number of vision systems required, while maintaining the inspection accuracy needed for large workpieces.



Machine Vision Lenses That Helped Solve the Challenges

"4D High Resolution" Compatible Lens **HF6XA-5M**

Although it is a wide-angle lens with a focal length of just 6 mm, the "HF6XA-5M," a member of the FUJIFILM "4D High Resolution" lens lineup, delivers exceptionally high resolution performance from the center of the image all the way to the edges, making it ideal for the inspection of large workpieces such as those handled by Company A. In Company A's case, some vision systems had to be installed at a considerable distance from the inspection target. Therefore, the ability to secure a wide field of view while maintaining high resolution performance across the entire image, including the corners, was a key factor in the decision to adopt the lens. The lens also earned the company's trust through its rigorous quality inspection process and comprehensive serial number-based traceability and quality control system.



Consumer Products Manufacturer, Company B

Inspection Targets Vary Widely in Size and Shape!

What Does It Take to Build an Inspection System That Covers a Wide Range of Conditions?

Company B, a leading manufacturer and supplier of everyday consumer products, produces a wide variety of items that are essential to daily life. With such a diverse product lineup, container sizes and shapes vary significantly, and new products are introduced on a regular basis. As a result, considerable time and effort were required to evaluate and optimize the inspection system for detecting surface defects and printing misalignment on containers each time a new product was introduced. In addition, the company was experiencing difficulties with a new inspection system under evaluation, as the rate of false detections remained higher than expected.

Challenges	After Introducing “4D High Resolution” Lenses
■ Detection consistency can vary when multiple workpieces are inspected simultaneously. ■ The selection, evaluation, and optimization of equipment for vision system implementation require considerable engineering effort and time.	■ Uniform resolution performance across the entire image, from center to edge, minimizes recognition errors and improves inspection consistency. ■ Delivers high-resolution imaging under virtually any operating condition, shortening the time required for vision system selection, setup, and adjustment.

Problem 1: Achieving Uniform Resolution Performance Across the Entire Image, from Center to Edge

Partial Image Blur and Lens-to-Lens Variations

Company B inspects pouch-type containers used for products such as shampoo and detergent. Two large pouches, each approximately the size of an A4 sheet of paper, were placed side by side at an inspection station and captured using a single camera. However, one of the two pouches would consistently appear blurred in the image.

The company repeatedly experimented with different lighting configurations and vision system installation methods in an attempt to solve the problem. Despite extensive trial and error, they were unable to achieve satisfactory results.



Problem 2: Improved Selection Efficiency

Lens selection must be optimized for each inspection task and imaging condition, reducing operational efficiency.

Company B handles a wide variety of products, each requiring different image inspection criteria and inspection methods. Because product sizes and shapes vary significantly, the company selected cameras and lenses that appeared best suited for each inspection task, while optimizing product positioning and lighting conditions on a case-by-case basis.

However, this approach meant that every time a new product was introduced, the company had to re-evaluate and select equipment that matched the new inspection requirements. As a result, considerable time and effort were devoted to configuring the inspection system for each product.

A representative from Company B expressed frustration, saying, “Our primary objective is to improve inspection accuracy and production efficiency, yet too much of our time is being spent selecting and tuning vision system equipment.”

The Keys to Solving the Challenges: A Lens with No Partial Blur and Consistently High Resolution Performance Across All Imaging Conditions



Solution: Following the Suggestion That “The Lens May Be the Problem,” the Lens Was Replaced

Company B believed that the image blur affecting one side of the inspection image could be eliminated by optimizing the lighting setup and the installation of the vision system. However, despite trying various approaches, satisfactory results could not be achieved.

In search of a solution, the company consulted its dealer, a trusted business partner. The dealer suggested that the root cause might lie in the lens itself and proposed re-evaluating the system using FUJIFILM's “4D High Resolution” lenses.



Solution to Problem 1: Achieving Uniform Resolution Performance Across the Entire Image

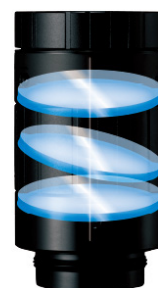
The dealer representative, after hearing about Company B's challenges, suspected that the issue was caused by lens decentering. Lens decentering occurs when the optical elements within a lens are not perfectly aligned, causing the optical axes of the lens elements to shift from their intended positions. As a result, the lens cannot deliver its designed optical performance, leading to a noticeable degradation in image quality on one side of the image.

FUJIFILM's “4D High Resolution” machine vision lenses are manufactured using proprietary inspection equipment that detects even minute optical axis misalignment of lens elements. Each lens is then assembled with micron-level precision to ensure accurate optical alignment. In addition, every lens is assigned a serial number, enabling strict individual quality control and complete traceability.

As a result, resolution performance is virtually uniform across the entire image. Even when two products are captured simultaneously with a single camera, the issue of one product appearing blurred has been eliminated.



No Lens Decentering



Lens Decentering Present

Solution to Problem 2: Adopting Lenses That Deliver Consistent High Performance Regardless of Imaging Conditions

In general, lenses are designed to deliver maximum optical performance at a specific working distance and aperture setting. When used under different imaging conditions, resolution performance often degrades. FUJIFILM's “4D High Resolution” lenses leverage the company's extensive expertise as a comprehensive lens manufacturer to minimize resolution degradation caused by changes in working distance or aperture settings, achieving exceptional performance across a wide range of conditions.

Because of their high versatility and ability to maintain performance under diverse imaging conditions, Company B found that “4D High Resolution” lenses could be used for image inspection of nearly all of its products, despite the wide variety of container shapes and sizes.

A representative from Company B commented, “The time required for lens selection has been significantly reduced, which has had a positive impact on other areas of our work as well. In addition, our onsite engineers were pleased to find that installation and adjustment time was cut to about half of what it used to be.”

Machine Vision Lenses That Helped Solve the Challenges

“4D High Resolution” Compatible Lens **HF16XA-5M/HF25XA-5M**

The exceptional quality of FUJIFILM's “4D High Resolution” lenses, which are designed to virtually eliminate the risk of image degradation caused by lens decentering, was highly valued by Company B and ultimately led to their adoption. In addition, the lenses' high versatility and ability to maintain performance across a wide range of imaging conditions helped address the challenges associated with inspecting containers of various shapes and sizes.

As a result, Company B commented, “Going forward, regardless of the camera or image processing system being used, we plan to use 4D High Resolution lenses.”



Packaging Manufacturer, Company C

Product Inspection Takes Too Much Time. What Was the Key Component That Unlocked Greater Efficiency?

Company C manufactures a wide range of containers, including PET bottles. To ensure the highest level of product quality, the company sought to further improve the accuracy of its inspection systems. At the same time, the wide variety of container types and the high production volumes being handled created another challenge: inspections were taking too much time. As a result, developing an inspection system that could perform inspections more accurately and efficiently became an urgent priority.

Challenges	After Introducing “4D High Resolution” Lenses
■ When inspecting multiple identical workpieces simultaneously, variations in detection results can occur between individual units. ■ Significant time and effort are required for equipment selection, evaluation, and adjustment when implementing a vision system.	■ Uniform resolution performance from the center to the corners of the image suppresses recognition errors between individual objects. ■ Delivers consistently high resolution across a wide range of imaging conditions, helping reduce the time and effort required for machine vision system selection, installation, and fine-tuning.

Problem 1: Achieving Uniform Resolution Performance Across the Entire Image, from Center to Edge

Image Blur Occurs at the Edges of the Image

Company C initially believed that inspection efficiency could be improved by capturing as many products as possible in a single image. To achieve this, the company arranged multiple containers within the camera’s field of view and inspected them simultaneously.

However, products positioned near the edges of the image did not appear clearly, making accurate inspection difficult. The company tried various countermeasures, including adjusting the camera position and optimizing the lighting setup, but none of these approaches produced satisfactory results.



Problem 2: Improved Selection Efficiency

Lens selection must be optimized for each inspection task and imaging condition, reducing operational efficiency.

Company C manufactures a wide variety of containers in different sizes and designs. As a result, imaging conditions such as working distance and aperture settings vary from product to product. Whenever a container size changed or a new product was introduced, the inspection conditions had to be reviewed and optimized.

However, changes in working distance or aperture settings often resulted in variations in inspection performance, making it difficult to maintain consistent inspection results. As a result, the engineers responsible for the system spent a significant amount of time identifying the causes of these inconsistencies whenever inspection conditions were modified.

The Keys to Solving the Challenges: Uniform Image-Wide Resolution and Consistent High Performance Across Diverse Imaging Conditions



Solution: Replacing the Lens with One That Delivers Uniform Resolution Across the Entire Image

To achieve highly accurate and efficient quality inspections, Company C needed to address two key challenges: increasing the number of containers that could be inspected in a single inspection cycle and reducing the effort required to select the right lenses. To find a solution, the company consulted a system integrator. After considering the unique challenges faced by packaging container manufacturers, including the large number of inspection targets and the wide variety of container shapes, the integrator recommended FUJIFILM's "4D High Resolution" lenses, stating that they would be the ideal choice for the application.



Solution to Problem 1: Adopting Lenses That Deliver Uniform Resolution Performance Across the Entire Image

"We'd like to inspect as many products as possible in a single inspection cycle, but we just can't seem to make it work," explained Company C's representative.

This challenge can be solved by using a lens that delivers uniform resolution performance from the center of the image all the way to the edges. Conventional lenses are typically designed to maximize resolution at a specific reference working distance. As a result, when the working distance changes, image quality at the edges of the image can deteriorate, making it difficult to accurately inspect products located near the image boundaries.

FUJIFILM's "4D High Resolution" machine vision lenses address this issue through advanced optical technologies, including a floating focus design that separates the optical system into front and rear lens groups and achieves focusing by moving only the rear group. This design suppresses resolution degradation caused by changes in working distance.

In addition, the lenses are assembled with micron-level precision, minimizing optical misalignment and virtually eliminating image degradation caused by lens decentering. As a result, even when the maximum number of containers is arranged within the lens's field of view and inspected simultaneously, products located at the image edges remain sharp and clearly visible. This has enabled Company C to perform inspections much more efficiently while maintaining high inspection accuracy.

Solution to Problem 2: Adopting Lenses That Deliver Consistent High Performance Regardless of Imaging Conditions

When vision systems are used for inspection, changes in imaging conditions, such as working distance and aperture settings, can sometimes result in reduced resolution performance. This occurs because conventional lenses are typically designed to deliver their maximum performance under specific imaging conditions. For Company C, which manufactures products in a wide range of sizes and designs, simply determining which lens was best suited for each container was already a significant challenge.

Drawing on its extensive design and manufacturing expertise as a comprehensive lens manufacturer, FUJIFILM developed its "4D High Resolution" lenses to maintain uniform resolution performance from the center of the image to the edges, even when imaging conditions change. This innovation has successfully eliminated much of the complexity associated with lens selection.

Because a single lens can accommodate inspections of a wide variety of container types, Company C no longer needs to spend valuable time worrying about lens selection. In addition, the lenses deliver reliable performance regardless of whether the camera is installed above, below, to the side, or at an angle, helping to reduce system installation and adjustment time as well.

Machine Vision Lenses That Helped Solve the Challenges

"4D High Resolution" Compatible Lens HF-XA-5M series

FUJIFILM's "4D High Resolution" lenses, which deliver outstanding resolution performance from the center of the image all the way to the edges, proved to be exactly what Company C was looking for: a lens that would remain sharp across the entire image without blurring at the corners. As a result, the company quickly decided to adopt the lenses. Another key advantage was their versatility. Because a single lens can maintain high performance under a wide range of imaging conditions, the lenses were particularly well suited to a packaging container manufacturer such as Company C, which produces containers of many different sizes and designs.

A representative from Company C commented, "The time required for inspections has been reduced by 20%, allowing us to devote more time to designing new equipment and improving existing systems." Pleased with the results, Company C now uses "4D High Resolution" lenses across its entire range of focal lengths.



3D Measurement Equipment Manufacturer, Company D

Lens Optical Axis Misalignment: A Hidden Cause of Inspection Errors. What Earned the Trust of a Manufacturer Demanding the Highest Precision?

Company D supplies 3D measurement systems to customers across a wide range of industries. To ensure the highest level of accuracy, every lens used in its systems is individually inspected and precisely calibrated before delivery. However, after installation and operation, shocks and vibrations can sometimes cause the optical axis of a lens to shift. When this occurs, accurate measurement and inspection can no longer be guaranteed. As a result, the company faced challenges in selecting lenses that could maintain their performance even under the shocks and vibrations encountered during actual operation.

Challenges

- To ensure inspection accuracy, we require lenses that are highly resistant to shock and vibration and capable of minimizing optical axis misalignment.
- We need objective and verifiable proof of a lens’s shock and vibration resistance.

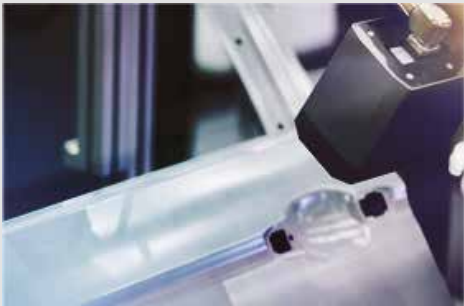
Results After Adopting FUJINON Shock - and Vibration-Resistant Lenses

- Inspection accuracy was improved through the adoption of shock- and vibration-resistant lenses featuring FUJIFILM’s proprietary high-precision mechanical design, which minimizes optical axis misalignment.
- The use of lenses that have passed international vibration standards and are proven to suppress optical axis misalignment provides customers with greater confidence in system reliability.

? Problem 1: Eliminating Inspection Errors Caused by Lens Optical Axis Misalignment

Shock and vibration can cause optical axis misalignment in conventional lenses.

When the optical axis of a lens shifts, measurement and inspection errors can occur. In recent years, advances in image sensor technology have enabled increasingly precise inspection and measurement, leading to growing customer expectations for higher lens quality. However, even when using high-specification lenses, unexpected shocks during operation and long-term exposure to vibration can cause lens elements to shift slightly, resulting in optical axis misalignment. When this happens, the accuracy of 3D measurement systems can be compromised. Addressing this issue had become a major concern for Company D.



? Problem 2: Selecting a Lens with Proven Shock and Vibration Resistance

Although many lenses claim to be shock- and vibration-resistant, few provide clear evidence to support those claims.

Company D was looking for lenses backed by reliable, objective evidence of their resistance to shock and vibration, so that it could confidently deliver its 3D measurement systems to customers. While several lens manufacturers in the market offered products promoted as shock- and vibration-resistant, few provided clearly defined test standards or guaranteed performance values. As a result, finding the best lens for the application was far from straightforward.

The Keys to Solving the Challenges: Reliable Shock and Vibration Resistance and Internationally Recognized Testing Standards

Solution: FUJIFILM's Proprietary Shock and Vibration Resistance

Company D works with a number of lens distributors. One of these distributors shared a case study in which an equipment manufacturer adopted FUJINON shock- and vibration-resistant machine vision lenses and found that optical axis misalignment caused by shock and vibration was virtually eliminated, resulting in improved inspection accuracy. Based on this successful example, the distributor introduced Company D to FUJIFILM and its lens solutions.

Solution to Problem 1: Adopting lenses with a mechanical design that minimizes lens element displacement due to shock and vibration.

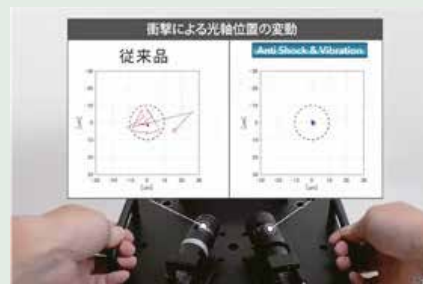
3D measurement systems are used across a wide range of industries and operating environments. Many are integrated into robotic systems, where unexpected shocks and long-term vibration can cause lens elements to shift by just a few microns, resulting in optical axis misalignment and reduced measurement accuracy.

FUJINON shock- and vibration-resistant machine vision lenses feature a proprietary mechanical design that suppresses lens element movement over long periods of operation. While some lenses rely heavily on adhesives to secure optical elements, adhesive-based structures can be affected by changes in temperature and humidity, potentially impacting optical performance. In addition, from an environmental standpoint, extensive use of adhesives is not always the most desirable solution.

To address these issues, FUJIFILM employs its own high-precision mechanical design to secure the lens elements, minimizing the use of adhesives while creating a lens structure that remains unaffected by changes in temperature and humidity. This robust design enables 3D measurement systems to maintain accurate and stable inspection performance in a variety of operating environments.

Based on these advantages, Company D decided to adopt FUJINON shock- and vibration-resistant lenses.

The company later commented, "FUJIFILM is the best partner for maximizing the performance of our own products."



Solution to Problem 2: Internationally Recognized Testing Standards and Clearly Defined Optical Axis Misalignment Criteria Provide Customers with Confidence

Among shock- and vibration-resistant lenses available on the market, some products do not clearly disclose their testing methods. In some cases, shock and vibration resistance is defined simply in terms of preventing screws from loosening, without specifying any quantitative criteria for optical axis misalignment.

FUJINON shock- and vibration-resistant lenses have passed vibration testing in accordance with the international standard JIS C 60068-2-6. In addition, they are designed to suppress optical axis misalignment to 10 μm or less even when subjected to shocks of up to 10 G*1. The testing process itself has also been made available through demonstration videos.

Company D conducts its own vibration and shock tests on 3D measurement systems and confirmed that FUJINON shock- and vibration-resistant lenses met their guaranteed specifications, with no measurable optical axis misalignment observed under the specified conditions. Furthermore, because clear acceptance criteria for optical axis misalignment are defined and documented, Company D has been able to adopt the lenses with confidence and peace of mind.

*1 The applicable shock resistance value (G) varies by lens model.

Machine Vision Lenses That Helped Solve the Challenges

FUJINON Shock and Vibration Resistant Lens CF-ZA-1S series

For Company D, which sought to prevent inspection accuracy degradation caused by lens optical axis misalignment, FUJIFILM's proprietary shock- and vibration-resistant technology provided a clear and credible basis for confidence that could also be communicated directly to customers.

For this project, Company D adopted the FUJINON "CF-ZA-1S" series of shock- and vibration-resistant machine vision lenses. A representative from Company D commented, "Since adopting the CF-ZA-1S lenses, we have not experienced any lens-related issues at customer sites where our systems have been installed, and our customers have been able to enjoy stable and reliable performance."



System Integrator, Company S

Lenses Chosen for High-Precision Semiconductor Inspection. What Convinced the Semiconductor Manufacturer to Make Its Decision?

"We are developing a new semiconductor inspection system and would like you to recommend a lens that we can use with confidence." System integrator Company S received this request from a semiconductor inspection equipment manufacturer and began evaluating the most suitable lens solution. However, selecting a lens with the quality and performance required for high-precision semiconductor inspection, where even micron-level errors are unacceptable, proved to be a significant challenge. Company S struggled to determine how to accurately evaluate and verify the performance of candidate lenses.

Challenges	After Implementing FUJINON Lenses with Full Performance Traceability
■ We would like to deliver lenses with guaranteed consistency in quality and performance. ■ We would like to reduce the time and effort required to handle potential customer complaints and troubleshooting issues.	■ By delivering lenses whose performance is guaranteed through 100% inspection at FUJIFILM's own manufacturing facilities, Company S gained its customers' trust. ■ Serial number-based traceability enables verification of lens performance prior to factory shipment.

? Problem 1: Confidently Recommending Lenses for High-Precision Inspection

Many lenses exhibit unit-to-unit variations in resolution performance, even within the same product model.

Semiconductor inspection systems are extremely expensive and are expected to operate continuously after installation. The machine vision lenses incorporated into these systems must therefore offer exceptional reliability in terms of quality, performance, and durability. However, because lenses are assembled through manufacturing processes that can introduce slight variations, even identical products from the same manufacturer may exhibit differences in resolution performance from one unit to another. For this reason, Company S required every lens it delivered to provide consistent and uniform performance.

No Lens Decentering Lens Decentering Present

4D High Resolution Compatible Lens Standard Machine Vision Lens

? Problem 2: Reducing the Time and Effort Spent Investigating Customer Complaints

There Is No Fast and Reliable Way to Rule Out the Lens as the Cause of a Problem

When a problem occurs in a machine vision system, inquiries are often directed to Company S, which selected and supplied the lens. Even if the lens is ultimately not the cause of the issue, significant time and effort may be required to identify the root cause, impacting other business activities. For this reason, Company S wanted to accelerate troubleshooting by selecting lenses backed by reliable quality assurance, enabling customer inquiries to be resolved more quickly and efficiently.

The Keys to Solving the Challenges: Reliable Evaluation Standards and Quality Assurance Through In-House Manufacturing and Inspection

Solution: Proposing Lenses with Rigorous Individual Quality Control

Company S compared several lenses based on their catalog specifications, but found little difference in the published performance figures. Having previously experienced cases where lenses with identical specifications exhibited noticeable performance variations in actual use, the company found the selection process difficult.

At that time, Company S received information from a business partner specializing in image processing software that FUJINON “4D High Resolution” machine vision lenses undergo 100% inspection. Intrigued by this commitment to quality assurance, Company S decided to consult with FUJIFILM to learn more about the lenses and their performance management process.

Solution to Problem 1: Recommending Lenses with Rigorous Unit-by-Unit Quality Control

Machine vision systems are used across a wide range of industries and inspection applications. To meet diverse customer requirements, lens manufacturers typically offer extensive product lineups covering a broad range of focal lengths. As a result, production volumes are often distributed across multiple facilities, and in some cases, lenses within the same product series may be manufactured at different factories to accommodate demand fluctuations or specific models. While this approach improves manufacturing flexibility, it can also raise concerns regarding the consistency of production quality. To ensure the highest level of quality assurance, FUJIFILM manufactures all of its “4D High Resolution” lenses at its own facilities. To minimize unit-to-unit variations in quality and performance, the company applies rigorous acceptance standards and evaluates every lens using proprietary inspection and measurement equipment. Only lenses that pass these stringent tests are shipped.

Furthermore, every lens is assigned a unique serial number, and performance data is recorded for each individual unit that meets the established standards. This comprehensive traceability system enables strict unit-by-unit quality management and performance verification. Because FUJIFILM supplies only lenses whose quality and performance have been thoroughly verified, system integrators can confidently recommend them for demanding machine vision applications such as semiconductor inspection systems, where equipment is highly expensive, operates continuously, and requires exceptional precision and reliability. Company S was particularly reassured by this commitment to quality assurance, commenting, “With FUJINON ‘4D High Resolution’ machine vision lenses, our customers can feel confident and secure.”



Solution to Problem 2: Quick Access to Lens Performance Data Helps Prevent Customer Complaints

Time and effort spent responding to system issues can be substantial. For system integrators, the ideal situation is to avoid problems with the products they supply altogether. However, issues may occasionally arise after a system has been deployed.

As mentioned earlier, FUJINON “4D High Resolution” machine vision lenses undergo 100% inspection, are assigned individual serial numbers, and have their performance data recorded prior to shipment. This level of quality assurance is virtually unmatched in the industry. Even if an issue occurs in a machine vision system, the serial number allows the lens's factory-shipment performance data to be retrieved immediately, making it possible to quickly verify whether the lens is involved and rule it out as the source of the problem when appropriate.

A representative from Company S commented, “In the past, we spent a great deal of time isolating the cause of system issues. With this approach, we can quickly rule out the lens and focus on the actual source of the problem, avoiding unnecessary time and effort.”

Machine Vision Lenses That Helped Solve the Challenges

FUJINON “4D High Resolution” Machine Vision Lenses with 100% Performance Verification

CF-ZA-1S series / HF-XA-5M series

FUJIFILM's decision to manufacture all “4D High Resolution” machine vision lenses in its own facilities, combined with 100% inspection and individual serial number traceability, ensures consistent lens quality and performance. As a result, system integrator Company S has been able to further strengthen the trust it has built with its customers.

A representative from Company S commented, “With FUJINON ‘4D High Resolution’ machine vision lenses, we rarely receive inquiries related to lens performance issues, which has been a tremendous help to us.”

Impressed by the reliability and quality assurance provided by the lenses, Company S has continued to actively recommend FUJIFILM lenses to a wide range of customers ever since.



Beverage Manufacturer, Company E

Beverage Inspection Using Expensive IR-Compatible Lenses What Enabled a Significant Reduction in Cost?

Company E manufactures bottled beverages and ships them only after filling the bottles, automatically inspecting the liquid level and checking for foreign matter contamination. Because the inspection process requires suppression of visible-light reflections and transmission through plastic labels, IR (infrared) illumination has traditionally been used. When reviewing its automatic inspection system as part of a production line expansion project, the company began exploring opportunities to reduce overall system costs.

Challenges

- We would like to reduce the cost of our IR-based automated inspection system.
- IR-compatible lenses are significantly more expensive than standard lenses.

Results After Adopting IR (Infrared)-Compatible Lenses

- It was found that IR-compatible lenses were not necessary as long as the lenses provided sufficiently high transmission at the IR wavelength being used.
- By adopting FUJIFILM machine vision lenses with high IR transmittance, the company was able to reduce overall system costs.

? Problem 1: Cost Reduction for IR-Based Automated Inspection Systems.

IR-Compatible Lenses Are Expensive.

Company E regularly updates its automated inspection systems to support new product launches and the addition of new flavor variations. Because the inspection process requires plastic labels to be transparent to the imaging system, the company had been using IR-compatible lenses. In recent years, as part of its cost-reduction initiatives, Company E began internally reviewing and re-evaluating the use of these relatively expensive IR-compatible lenses.



? Problem 2: Evaluating and Comparing IR-Compatible Lens Options

Limited Availability of IR-Compatible Lenses in the Market

Company E wanted to evaluate and compare a variety of lens options. However, the number of lenses specifically designed and marketed for IR applications was limited, and depending on the sensor size, there were sometimes no alternative products to choose from. With little opportunity for meaningful comparison, Company E often had no choice but to adopt expensive IR-compatible lenses despite the associated cost.

The Keys to Solving the Challenges: Reducing Lens Costs and Discovering New Options



Solution: Adopting Cost-Effective Machine Vision Lenses

To reduce the cost of IR-compatible lenses, Company E consulted one of its lens distributors and attended an exhibition focused on cameras and lens-related technologies. At the event, the company saw a demonstration of an IR inspection system using FUJIFILM machine vision lenses at the booth of a camera manufacturer. When Company E checked the pricing, it discovered that the lenses were surprisingly cost-effective.

Solution to Problem 1: Adopting Cost-Effective Machine Vision Lenses

After the exhibition, Company E contacted FUJIFILM through its lens distributor and discussed its inspection requirements and installation environment. Because the company used only a specific 850 nm IR wavelength, FUJIFILM proposed the “HF-HA-1S Series,” a machine vision lens offering a high IR transmittance of more than 70%.

Since the HF-HA-1S Series was significantly more cost-effective than the IR-compatible lenses previously used, Company E immediately conducted evaluation tests. The results showed that the lenses delivered resolution performance comparable to that of the existing IR-compatible lenses, leading the company to adopt them.

Company E uses multiple cameras to inspect different areas of each bottle, including the top, middle, and bottom sections. As a result, a large number of lenses are required throughout the inspection system. The HF-HA-1S Series, with its excellent cost performance, proved to be exactly the solution the company had been seeking.

A representative from Company E commented, “Because our inspection system required multiple IR-compatible lenses, adopting these lenses allowed us to reduce our initial investment costs significantly.”

Solution to Problem 2: FUJIFILM Lenses Expanded the Range of Available Options

Machine vision lenses specifically marketed as “IR-compatible” have traditionally been limited in number and availability. In industries such as beverages, food, consumer goods, and cosmetics, IR-based inspection is widely used, leading many users to request a broader range of lens options.

When both visible light and IR light are used in the same system, an IR-compatible lens is required to maintain focus across both wavelength ranges. However, in many inspection applications, only a single IR wavelength is used. In such cases, a lens does not necessarily need to be “IR-compatible” (capable of maintaining focus in both visible and IR light). A lens with high IR transmittance can often serve as a fully effective alternative.

By offering lenses with high IR transmittance, FUJIFILM helps expand the available choices for users designing IR inspection systems, providing greater flexibility in balancing performance and cost.

Looking ahead, FUJIFILM will continue to strengthen its machine vision lens business, supporting a growing range of applications, including environmental monitoring and other emerging industrial fields where machine vision technologies are expected to play an increasingly important role.

Machine Vision Lenses That Helped Solve the Challenges

High IR Transmittance Lens **HF-HA-1S series**

HF-HA-1S Series lenses are machine vision lenses with high infrared (IR) transmittance. In addition to being cost-effective and easy to use, their compact design with an outer diameter of just 29.5 mm made them an excellent fit for Company E’s automated inspection system, leading to their adoption.

A representative from Company E commented, “FUJIFILM’s machine vision lens lineup greatly expands our range of lens options, which is extremely valuable to us. We look forward to continuing our partnership.”

Not for use in systems that employ both visible light and IR illumination.



Why FUJINON Lenses Are Chosen



Broad Product Categories

Fujifilm is a truly unique comprehensive lens manufacturer, offering an extensive lineup ranging from large-aperture lenses to ultra-compact lenses, covering a wide variety of sizes, materials, and designs. Its portfolio includes high-resolution broadcast lenses for 8K and 4K television production, interchangeable lenses and cinema lenses trusted by professional photographers and creators worldwide, high-brightness lenses for digital cinema projectors, and compact, highly durable lenses for automotive cameras designed to perform in harsh environments.

Every FUJINON lens is renowned for the exceptional performance and quality demanded by professionals. The FUJINON brand has earned global recognition for its technological excellence and uncompromising quality, receiving numerous prestigious awards over the years, including the Technology & Engineering Emmy® Award, one of the most distinguished honors in the broadcast industry alongside the Academy Awards. Backed by advanced optical technology and manufacturing expertise, FUJINON lenses continue to be highly acclaimed around the world.



Advanced Technology Accumulated Over More Than 80 Years

Fujifilm's history of lens manufacturing began in 1940, when the company successfully melted and produced 12 types of optical glass. The production of high-precision lenses requires exceptional craftsmanship and expertise. Through nearly 80 years of experience, Fujifilm has accumulated advanced optical technologies and manufacturing know-how.

By leveraging its expertise in manufacturing, precision processing, and assembly technologies, Fujifilm continues to develop and deliver a wide range of world-leading optical products. This long-standing commitment to innovation and quality has enabled the company to remain at the forefront of the global optics industry.



Global Network

Fujifilm has established sales and production bases in more than 30 countries worldwide, enabling the company to deploy global logistics and marketing strategies on a worldwide scale. At the same time, each regional location provides prompt, attentive, and localized customer support, ensuring that customers receive responsive service tailored to their specific needs and market requirements.



Cumulative Production of More Than Two Million Machine Vision Lenses

FUJINON machine vision lenses have achieved a cumulative production volume exceeding 2 million units, continuously evolving alongside advances in imaging technology. Incorporating Fujifilm's cutting-edge optical expertise, these lenses are widely used in manufacturing and quality inspection applications around the world.

With a comprehensive lineup designed to deliver consistently high-resolution performance across a wide range of installation environments and operating conditions, FUJINON machine vision lenses continue to meet the diverse and demanding needs of customers globally.

FUJINON

Machine Vision Lenses

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9-7-3, AKASAKA, MINATO-KU, TOKYO 107-0052, JAPAN
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