



RICOH Industrial Solutions Inc.

Machine Vision

- Lenses
- Accessories
- Technical Information

RICOH
imagine. change.

MACHINE VISION LENSES

Keen eyes for manufacturing

On the production floor, companies continue to seek ever greater safety, security, and product quality. RICOH's latest "keen eyes" were created to support such advances in reliable manufacturing.

These series of high-quality factory automation (FA) lenses bring together all the advanced optical design and technology that RICOH has developed over many years.

Moving forward, we will support even higher production-line efficiency and reliability by continuing to develop the best high quality lenses optimised for FA cameras and by combining an extensive range of lenses in a way that ensures a dependable image solution.



MACHINE VISION LENSES**4**

Ricoh's Advantage.....	5
VGA Lenses, Fixed Focal Length, Manual Iris	6
2 Megapixel Lenses, 1/2" and 2/3", Fixed Focal Length, Manual Iris	8
2 Megapixel Lenses, all 2/3", Fixed Focal Length, Manual Iris	10
5 Megapixel Lenses, Fixed Focal Length, Manual Iris.....	12
Exceeding 5 Megapixel Lenses, Fixed Focal Length, Manual Iris.....	14
9 Megapixel Lenses (1") / 12 Megapixel Lenses (1.1"), Fixed Focal Length, Manual Iris.....	16
Line-Scan Lenses, Format 45 mm.....	18
6X Zoom Lenses, Manual	18
High Performance UV Lenses.....	19
Focal Length Extender, Adaptor, Tools	20
For close-up applications: Macro Reversing Ring, Macro Focus Mount	20
For close-up applications: Extension Tubes.....	21

TECHNICAL INFORMATION**22**

Conversion Table For Horizontal Angle Of View	22
Optical Calculations for Close-Up Applications	23

Machine Vision Lenses

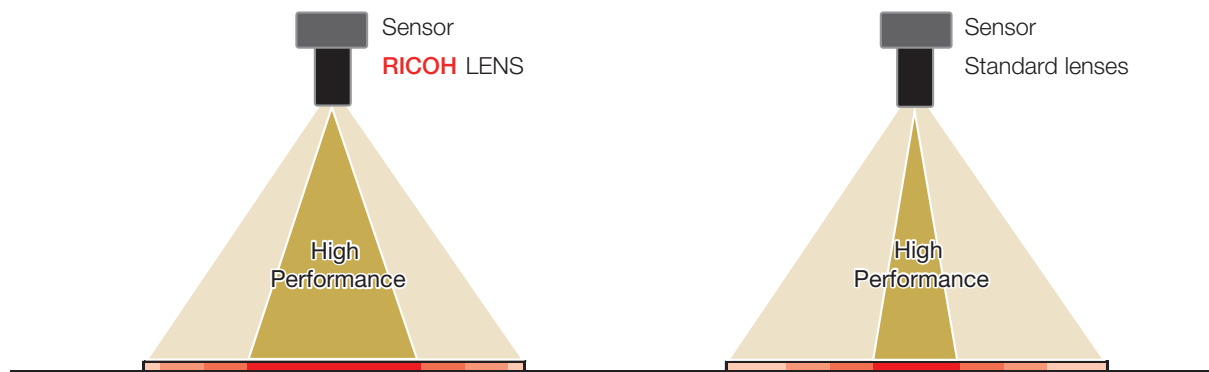


Pictures not true to scale

- VGA Lenses
- 2 Megapixel Lenses
- 5 Megapixel Lenses
- 9 Megapixel Lenses
- Line-scan Lenses
- UV Cameras Lenses

RICOH'S ADVANTAGE

RICOH technology has developed excellent optical characteristics even at the periphery, despite the problems with resolution, contrast, distortion and vignetting that competitor's lenses suffer from.

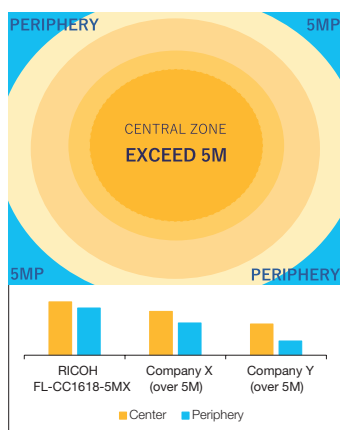


- You can obtain high quality images over a wider viewing area.
- Inspection systems have improved performance due to RICOH lenses high performing peripheral imagery.

REPORT 1 : RICOH'S OPTICAL DESIGN, BASED ON MACHINE VISION'S DEMAND.

Clear images to the periphery

2/3" format 5 Mega-pixel lens



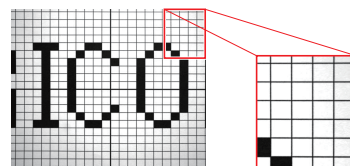
- 5MP at all distances, maintains 5MP even at the periphery.

WD : 250 mm
investigated by RICOH

- The quality is better than competitor's higher resolution lenses.

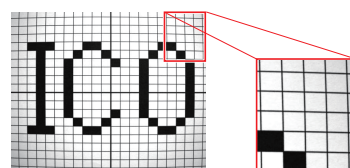
[Extremely low distortion]

FL-CC1218-5MX (w.d.100 f1.8)



- Low distortion achieves low image degradation at the corners.

Sensor Standard lenses (w.d.100 f1.8)



- Larger distortion at the corner.

REPORT 2: PROVIDING THE MARKET WITH HIGH PERFORMANCE LENSES

1. Optical simulation technology supported by actual results

To realise this product, we shared information on our vital optical design technology with other products in the Ricoh Group and are always introducing new technology. We introduced Ricoh original algorithms for resolution and ghost analysis, and in post-design trials, we confirmed the characteristics on actual equipment were the same as in our simulations. These results are fed back into the simulations, which in turn helps us improve our technology to ensure performance and build on pre-existing technology.

2. Tolerance accumulating technology with due attention to variations during mass production

Ricoh has created a parts tolerance accumulation system that is replete with our inherent knowledge of optical units, maintaining part processing precision and yield. We establish the required precision at part level in accordance with Ricoh's original algorithms and verify them.

3. Precision adjustment technology during mass production

We have introduced adjustment technology to precision lens processing and assembly to our production process, concentrating the precision adjustment technology created by the Ricoh Group to produce lenses that are even more advanced.

VGA LENSES MANUAL IRIS

An extensive line of general-use lenses boasting high-performance lens technology featuring vibration-control measures, these lenses are a superior choice for installation in machine vision systems.

Built for a wide variety of uses, including pattern matching, component positioning, missing-part inspection, board mounting and inspection of pharmaceuticals, produce, and grains.

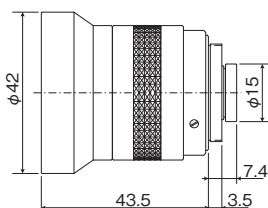
- Standard lenses for machine vision use
- Compatible with VGA-class cameras
- Production line handling cameras from 1/2" to 1" formats
- Lock screws as standard vibration-control measures

VGA LENSES, FIXED FOCAL LENGTH Manual Iris, with Locking Screws

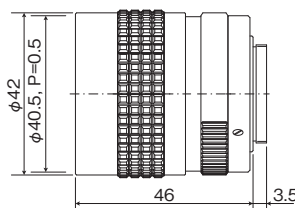
Part No.	Format size	Mount	Focal length (mm)	Iris range	Min. Pixel Pitch (μm)*	M. O. D. (m)	Horizontal angle of view	Filter size (mm)	Dimensions (mm)
① FL-HC0416X-VG	1/2"	C	4.2	1.6 - C	8.75	0.2	86.8°	-	Ø42.0 × 43.5
FL-HC0612A-VG	1/2"	C	6.0	1.2 - C	8.75	0.2	56.9°	40.5	Ø42.0 × 46.0
FL-HC1212B-VG	1/2"	C	12.0	1.2 - 22	8.75	0.2	30.2°	27.0	Ø30.0 × 35.5
① FL-CC0418DX-VG	2/3"	C	4.8	1.8 - C	11.67	0.3	96.4°	-	Ø40.5 × 35.5
FL-CC0815B-VG	2/3"	C	8.5	1.5 - C	11.67	0.2	56.5°	40.5	Ø42.0 × 40.0
FL-CC1614A-VG	2/3"	C	16.0	1.4 - 22	11.67	0.3	30.7°	27.0	Ø30.0 × 33.0
FL-BC1214D-VG	1"	C	12.5	1.4 - C	17.50	0.3	54.0°	40.5	Ø42.0 × 50.0
FL-BC1218A-VG	1"	C	12.5	1.8 - C	17.50	0.3	55.5°	40.5	Ø42.0 × 40.0
FL-BC2514D-VG	1"	C	25.0	1.4 - 22	17.50	0.3	30.0°	27.0	Ø30.0 × 37.3
FL-BC2518-VG	1"	C	25.0	1.8 - C	17.50	0.6	28.2°	40.5	Ø42.0 × 40.0
FL-BC5014A-VG	1"	C	50.0	1.4 - C	17.50	1.0	14.4°	46.0	Ø48.0 × 48.0

* Min. Pixel Pitch at 30% contrast (measuring on the edge of the Optic), ① fixed focus

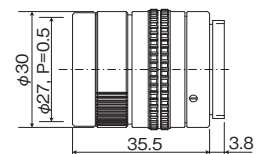
Unit: mm



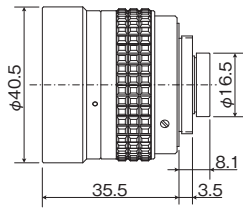
FL-HC0416X-VG



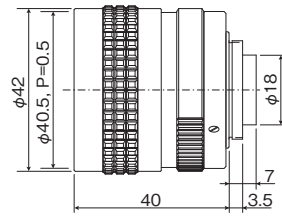
FL-HC0612A-VG



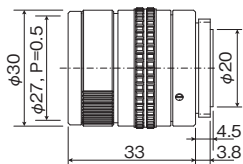
FL-HC1212B-VG



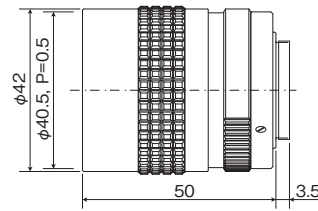
FL-CC0418DX-VG



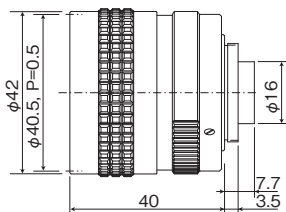
FL-CC0815B-VG



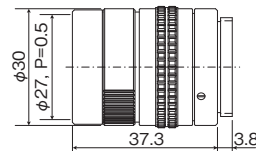
FL-CC1614A-VG



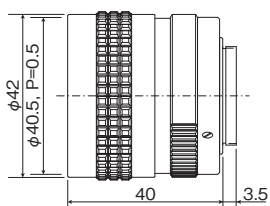
FL-BC1214D-VG



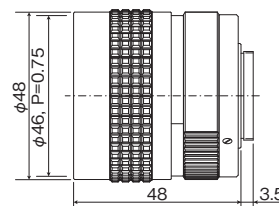
FL-BC1218A-VG



FL-BC2514D-VG



FL-BC2518-VG



FL-BC5014A-VG

2 MEGA PIXEL LENSES

1/2" AND 2/3"

2 megapixel type lenses for a wide range of applications: Select the optimum lens for your focal length and format size requirements.

These manual-iris lenses are an optimal choice for image processing data capture at 2 megapixels. With their compact size and high performance, they deliver great results for high-precision manufacturing inspection (chip mounters, wafers, electronic substrates, etc.).

- High-performance lenses for close-up imaging with 2 megapixel CCD and CMOS sensors
- Sharp high resolution, high contrast images, that limit resolution loss from the center to periphery
- With compact size, light weight, and durability, these are excellent lenses for FA and machine vision use
- They greatly reduce distortion that causes problems in image measurement and recognition
- Built to handle environments with vibration, etc.
- Easy to use, reliable focus and iris locking mechanisms as standard features

2 MEGA PIXEL LENSES, FIXED FOCAL LENGTH

Manual Iris, with Locking Screws

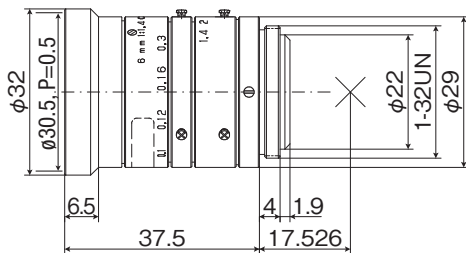
Part No.	Format size	Mount	Focal length (mm)	Iris range	Min. Pixel Pitch (μm)*	M. O. D. (m)	Horizontal angle of view	Filter size (mm)	Dimensions (mm)
----------	-------------	-------	-------------------	------------	------------------------	--------------	--------------------------	------------------	-----------------

HIGH-RESOLUTION, FOR STANDARD, IP AND MEGA PIXEL CAMERAS

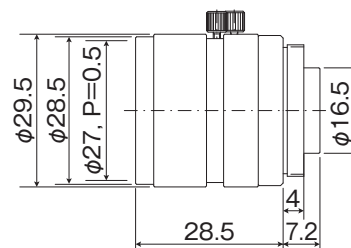
FL-HC0614-2M	1/2"	C	6	1.4 - 16	5.39	0.10	57.4°	30.5	Ø32.0 × 37.5
FL-HC1214-2M	1/2"	C	12	1.4 - 16	5.39	0.25	28.9°	27.0	Ø29.5 × 28.5
FL-CC1614-2M	2/3"	C	16	1.4 - 16	5.39	0.25	31.0°	27.0	Ø29.5 × 33.2
FL-CC2514-2M	2/3"	C	25	1.4 - 16	5.39	0.25	20.0°	27.0	Ø29.5 × 32.0
FL-CC3516-2M	2/3"	C	35	1.6 - 16	5.39	0.40	14.8°	27.0	Ø29.5 × 35.4
FL-CC5028-2M	2/3"	C	50	2.8 - 22	5.39	0.90	10.1°	27.0	Ø29.5 × 34.0
FL-CC7528-2M	2/3"	C	75	2.8 - 32	5.39	0.70	6.9°	30.5	Ø34.0 × 59.6

* Min. Pixel Pitch at 30% contrast (measuring on the edge of the Optic)

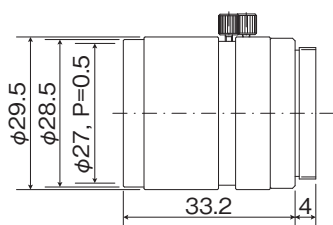
Unit: mm



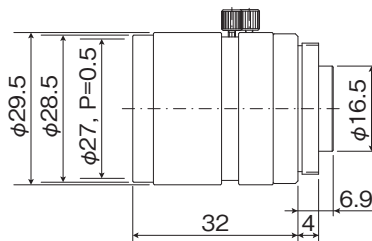
FL-HC0614-2M



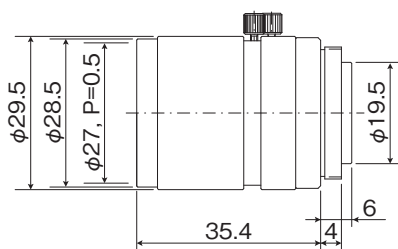
FL-HC1214-2M



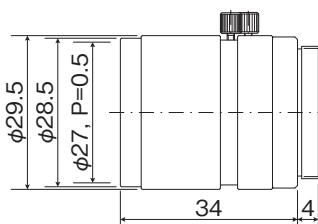
FL-CC1614-2M



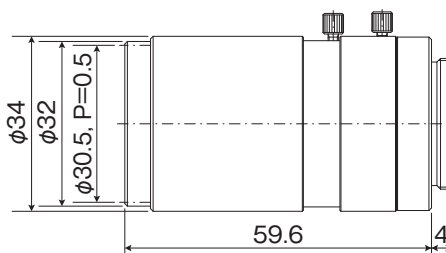
FL-CC2514-2M



FL-CC3516-2M



FL-CC5028-2M



FL-CC7528-2M

2 MEGAPIXEL LENSES

ALL 2/3"

The new lenses following customer's requests now consistently have a 2/3" format, expanding the line-up next to the existing and very successful 2 Megapixel series. With the new lens design, all values are again improved, so the lenses are ideal for a wide range of applications.

- **Bright images from the center to the edges:**
Degradation of light transmission at the periphery has been kept to an absolute minimum enabling the new lenses to reproduce bright, high resolution images from the center to the periphery.

- **High Resolution and High Contrast even at the periphery:** Minimal degradation of resolution and contrast right through to the periphery. Therefore, even images right on the periphery are suitable for measurement and inspections.
- **Shortened MOD (Minimum Objective Distance):** Thanks to the newly developed optics, MODs have been shortened to 0.1m (except FL-CC5024A-2M), enabling further close-up imaging without the need for distance rings.
- **Low distortion:** Troublesome distortion for measurement and recognition applications has been reduced (0.02% to max. 0.56%).

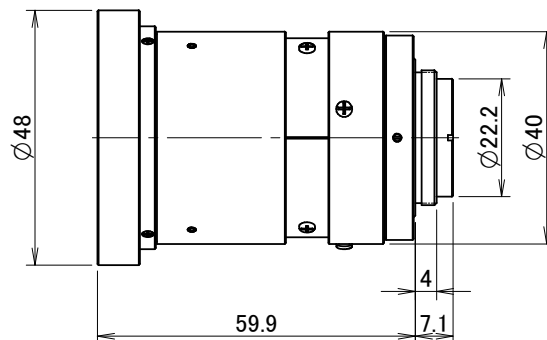
2 MEGAPIXEL LENSES, FIXED FOCAL LENGTH

Manual Iris, with Locking Screws

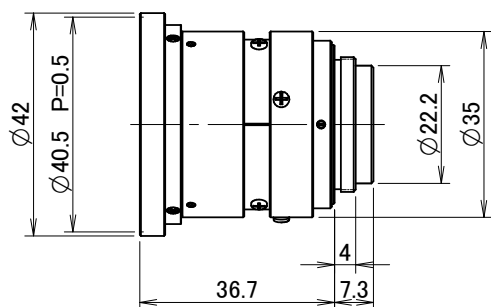
Part No.	Format size	Mount	Focal length (mm)	Iris Range	Min. Pixel Pitch (µm)*	M. O. D. (m)	Horizontal angle of view	Filter size (mm)	Dimensions (mm)
HIGH-RESOLUTION, FOR STANDARD, IP AND MEGAPIXEL CAMERAS									
FL-CC0614A-2M	2/3"	C	6	1.4-16	5.39	0.1	71.2°	-	Ø 48.0 x 59.9
FL-CC0814A-2M	2/3"	C	8	1.4-16	5.39	0.1	56.3°	40.5 P=0.5	Ø 42.0 x 36.7
FL-CC1214A-2M	2/3"	C	12	1.4-16	5.39	0.1	39.4°	27.0 P=0.5	Ø 29.5 x 45.7
FL-CC1614A-2M	2/3"	C	16	1.4-16	5.39	0.1	30.7°	27.0 P=0.5	Ø 29.5 x 32.2
FL-CC2514A-2M	2/3"	C	25	1.4-16	5.39	0.1	19.5°	30.5 P=0.5	Ø 32.0 x 38.0
FL-CC5024A-2M	2/3"	C	50	2.4-22	5.39	0.3	10.3°	30.5 P=0.5	Ø 32.0 x 46.5

* Min. Pixel Pitch at 30% contrast (measuring on the edge of the Optic)

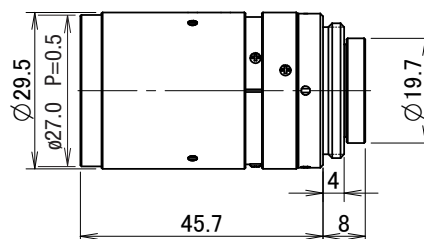
Unit: mm



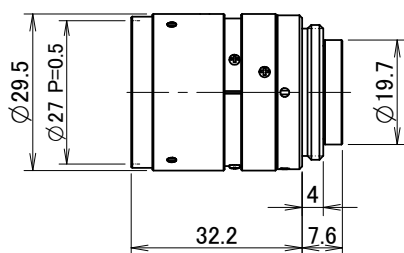
FL-CC0614A-2M



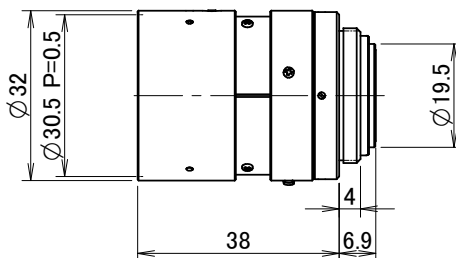
FL-CC0814A-2M



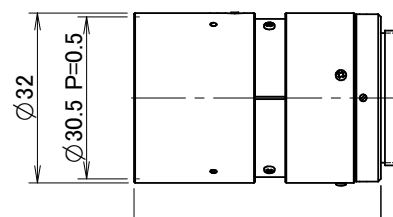
FL-CC1214A-2M



FL-CC1614A-2M



FL-CC2514A-2M



FL-CC5024A-2M

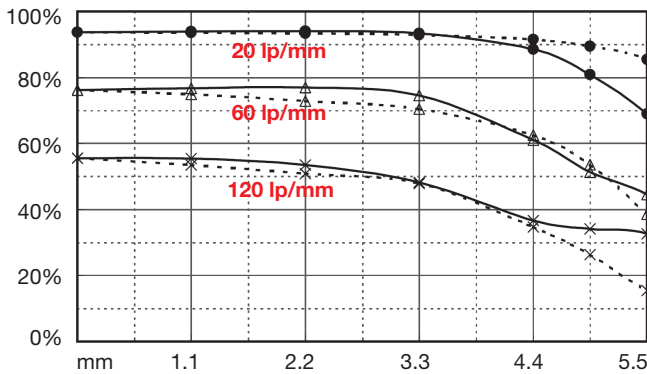
5 MEGAPIXEL LENSES

This series of high-res lenses are designed to match the requirements of highly developed machine vision systems. The lens isn't only optimized for highest image quality, but also for heavy duty industrial operation.

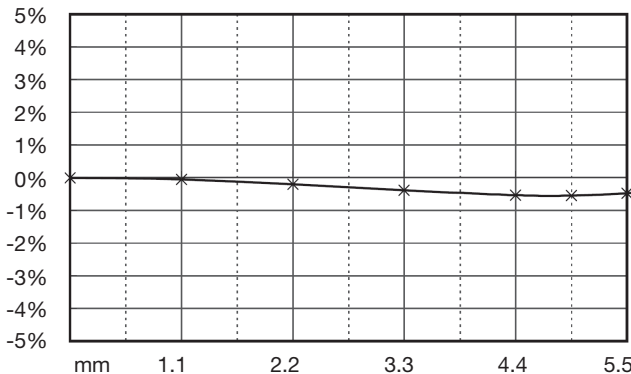
They are perfect for inspection, pattern matching, and alignment uses in which images with high definition from edge to edge definition are needed for large subjects such as wafers, chip mounters, board mounting, etc.

- Compatible with pixel size 3.45µm, 5 megapixel on 2/3" cameras
- High resolving power of 140 lp/mm from centre to corners of the image
- FL-CC1614-5M, FL-C2514-5M: 1% or less distortion, suitable for image measurement
- 40% increased light distribution
- Fast aperture F1.4
- Ideal for integration in highly developed machine vision systems
- Stable design, robust and durable
- With locking and thumb screws

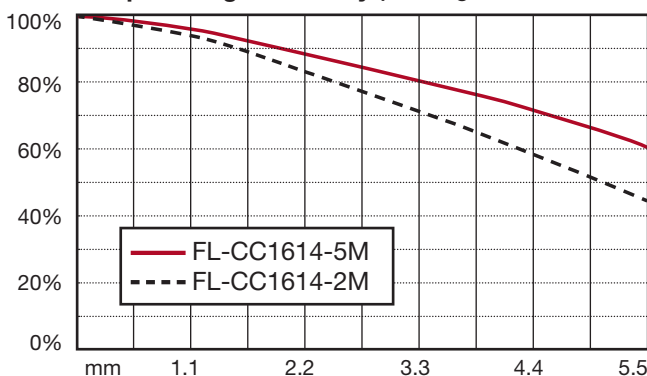
FL-CC1614-5M Optical transfer function



FL-CC1614-5M Distortion



Peripheral light intensity (Working distance 250 mm)



High resolution and high contrast

Supports 2/3" format, 5 megapixel CCD camera with 3.45µm pixel pitch. Achieves 140 lp/mm high resolution from center to periphery. Produces sharp, high-clarity images with high-contrast and low resolution loss all the way to the edge.

Ø 43 mm / 60 mm compact design

Consistent with the 44 mm-square cases used by many 5 megapixel cameras, we have achieved a size reduction to 43 mm for the outer diameter. These lenses are an excellent choice for installation on high-performance devices..

Extremely small level of optical distortion

For both the FL-CC2514-5M and the FL-CC1614-5M, optical distortion on the diagonals is less than 1%. TV distortion is held to less than 0.2%. The resulting extremely low-distortion images are also excellent for use in the image measurement field.

Bright to the periphery

Despite the F43 mm diameter, the optics accommodate 5 megapixels with F1.4 brightness. With peripheral-light-intensity falloff held to an absolute minimum, it is possible to obtain bright and high-resolution images. Although they are wide-angle lenses, with the iris open we were able to raise the peripheral light level to 70% (diagonals) and thereby achieve images that are bright and clear all the way to the periphery.

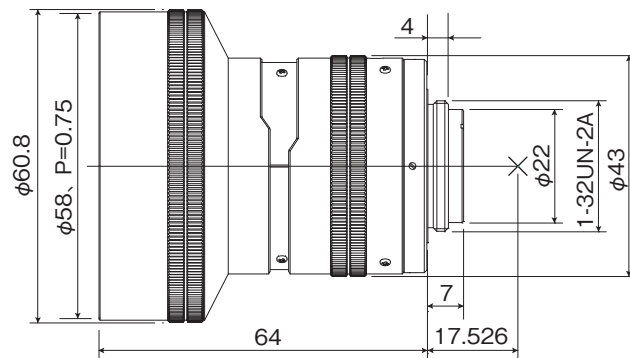
5 MEGA PIXEL LENSES, FIXED FOCAL LENGTH

Manual Iris, with Locking Screws

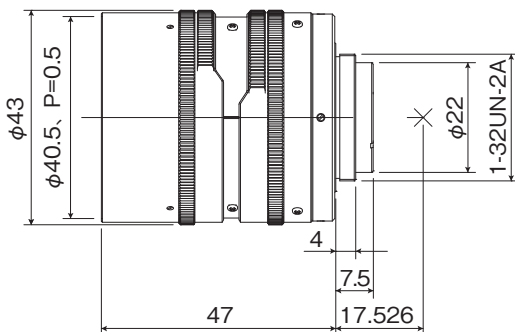
Part No.	Format size	Mount	Focal length (mm)	Iris range	Min. Pixel Pitch (μm)*	M. O. D. (m)	Horizontal angle of view	Filter size (mm)	Dimensions (mm)
HIGH-RESOLUTION, FOR STANDARD, IP AND MEGA PIXEL CAMERAS									
FL-CC0814-5M	2/3"	C	8	1.4 - 16	3.45	0.1	57.8°	58.0	$\varnothing 60.8 \times 64.0$
FL-CC1614-5M	2/3"	C	16	1.4 - 16	3.45	0.1	30.8°	40.5	$\varnothing 43.0 \times 47.0$
FL-CC2514-5M	2/3"	C	25	1.4 - 16	3.45	0.1	19.9°	40.5	$\varnothing 43.0 \times 44.0$

* Min. Pixel Pitch at 30% contrast (measuring on the edge of the Optic)

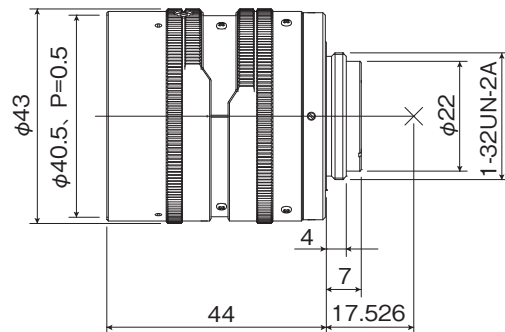
Unit: mm



FL-CC0814-5M



FL-CC1614-5M



FL-CC2514-5M

EXCEEDING 5 MEGAPIXEL LENSES

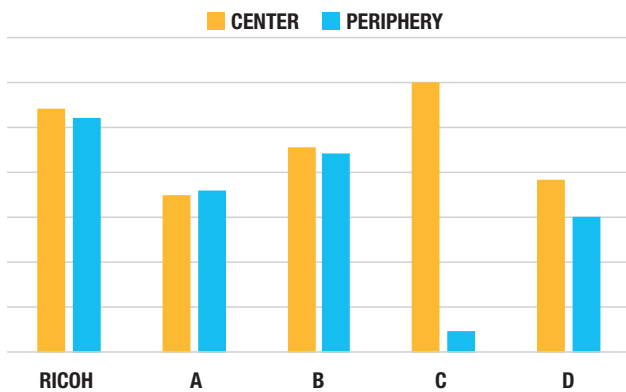
This series of 5 megapixel lenses are developed to be used with 2/3" format cameras and are not only optimised for high image quality, but also for use in harsh environments and durable industrial systems.

The lens's focusing uses a floating mechanism design, reducing aberrations from an infinite to close working distance. Therefore, the lenses can also be used at distance in intelligent traffic technology.

A floating focusing mechanism focuses whilst changing the spacing of some of its optical systems in order to minimize changes in aberrations due to object distance. The lens's construction is divided into a focus group that moves when focusing and a fixed group that remains stationary.

NEW 5 MEGAPIXEL LENSES

- Focal Length 12 mm, 16 mm, 25mm
- Pixel Pitch 3.45 μm
- \varnothing 33mm compact design, robust and durable with locking screws
- JIA S-Rank^{*1} Performance, 147 lp/mm from center to corners
- Even light distribution, bright and clear to the periphery
- Floating Focusing Mechanism produces high resolution images at all working distances
- Distortion less than 0.1%



FL-CC1218-5MX f12 MTF Comparison

- [A] Competitor's 5 MP Lens:
Large distortion caused lower MTF result
- [B] Competitor's 12 MP Lens
- [C] Competitor's 5 MP Lens:
High central MTF, very low peripheral MTF
- [D] Competitor's 10 MP Lens

Extremely low distortion

The optical distortion of this series is < 0.1%. The resulting extremely low distortion images are excellent for use in the image measurement field.

Compact design, \varnothing 33 mm

These lenses have a 33 mm compact design, ideal for installation with high performance equipment.

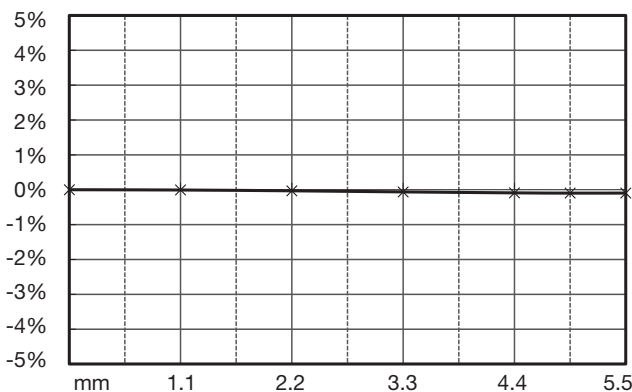
Bright and clear to the periphery

Despite the small diameter of 33 mm, the vignetting has been reduced to the minimum. Combined with the 5 megapixel resolution, bright, high contrast images are achieved all the way to the edges.

High resolution and high contrast

Supports 2/3" format, 3.45 μm pixel pitch cameras, producing sharp 147 lp/mm high resolution, high contrast images from the center to the periphery.

FL-CC2518-5MX Distortion



*1 JIA Technical Report LER-007:Recommended specifications for high definition camera lenses

- Applications (S-Rank): For applications requiring higher resolution over the entire image
- Evaluation Criteria (S-Rank): Resolving spatial frequency corresponding to the Nyquist frequency over the entire image

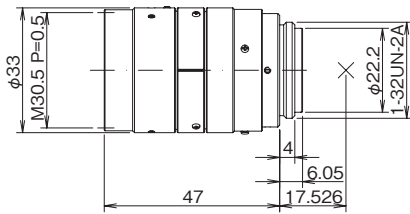
EXCEEDING 5 MEGA PIXEL LENSES, FIXED FOCAL LENGTH

Manual Iris, with Locking Screws

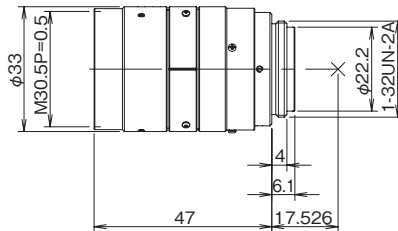
Part No.	Format size	Mount	Focal length (mm)	Iris range	Min. Pixel Pitch (μm)*	M. O. D. (m)	Horizontal angle of view	Filter size (mm)	Dimensions (mm)
HIGH-RESOLUTION, FOR STANDARD, IP AND MEGA PIXEL CAMERAS									
FL-CC1218-5MX	2/3"	C	12	1.8 - 16	3.45	0.1	40.5°	30.5	$\varnothing 33.0 \times 47.0$
FL-CC1618-5MX	2/3"	C	16	1.8 - 16	3.45	0.1	30.9°	30.5	$\varnothing 33.0 \times 47.0$
FL-CC2518-5MX	2/3"	C	25	1.8 - 16	3.45	0.1	20.0°	30.5	$\varnothing 33.0 \times 50.0$

* Min. Pixel Pitch at 30% contrast (measuring on the edge of the Optic)

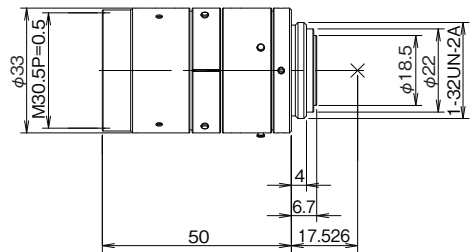
Unit: mm



FL-CC1218-5MX



FL-CC1618-5MX

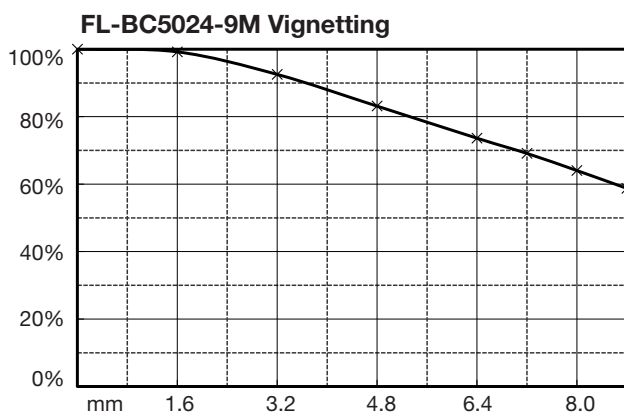
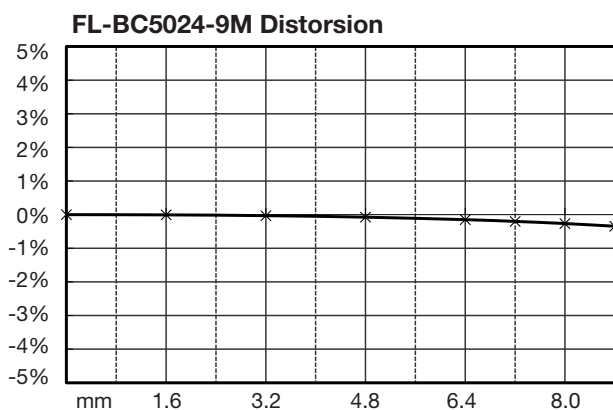
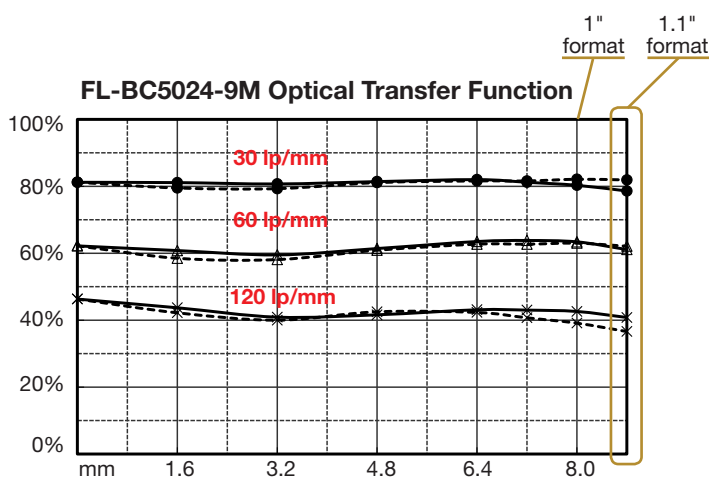


FL-CC2518-5MX

9 MEGAPIXEL LENSES (1") / 12 MEGAPIXEL LENSES (1.1")

This series of high resolution lenses are developed to be installed in machine vision systems with cameras with sensors up to 9 megapixel for 1 inch format / 12 megapixel for 1.1 inch format.

- Focal Lengths 12 mm, 16 mm, 25 mm, 35 mm, 50 mm, 75 mm
- Pixel pitch 3.45 μm
- 147 lp/mm from center to corners of image
- Extremely low distortion, suitable for image measurement
- Even light distribution
- Locking Screws
- Ideal for integration in systems with large sensors
- Compact design, robust and durable



High resolution and high contrast

Supports 1" format, 9 megapixel / 1.1" format, 12 megapixel cameras. Achieves 147 lp/mm high resolution from center to periphery.

Compact design, \varnothing 42 mm

To suit 44 mm housings used for most 12 megapixel cameras, these lenses have a 42 mm compact design ideal for installation with high performance equipment.

Extremely low distorsion

The optical distorsion of this series is generally ~ 2%, (wide angle lens FL-BC1220-9M) or less, partially even < 0.1 %. The resulting extremely low-distorsion images are excellent for use in the image measurement field.

Bright and clear to the periphery

Despite the small diameter of 42 mm, the vignetting has been reduced to the minimum. Combined with the 12 megapixel resolution, bright, high contrast images are achieved all the way to the edges.

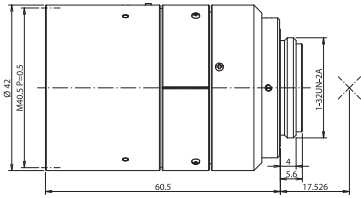
9 MEGA PIXEL LENSES, FIXED FOCAL LENGTH

Manual Iris, with Locking Screws

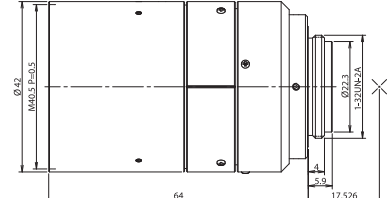
Part No.	Format size	Mount	Focal length (mm)	Iris range	Min. Pixel Pitch (μm)*	M. O. D. (m)	Horizontal angle of view	Filter size (mm)	Dimensions (mm)
HIGH-RESOLUTION, FOR STANDARD, IP AND MEGA PIXEL CAMERAS									
FL-BC1220-9M	1" (1.1")	C	12	2.0 - 16	3.45	0.08	57.0°/ 61.8°	40.5	$\text{Ø}42.0 \times 60.5$
FL-BC1618-9M	1" (1.1")	C	16	1.8 - 16	3.45	0.08	43.8°/ 47.7°	40.5	$\text{Ø}42.0 \times 64.0$
FL-BC2518-9M	1" (1.1")	C	25	1.8 - 16	3.45	0.1	28.8°/ 31.5°	40.5	$\text{Ø}42.0 \times 57.5$
FL-BC3518-9M	1" (1.1")	C	35	1.8 - 22	3.45	0.15	20.7°/ 22.7°	40.5	$\text{Ø}42.0 \times 60.0$
FL-BC5024-9M	1" (1.1")	C	50	2.4 - 22	3.45	0.2	14.6°/ 16.0°	40.5	$\text{Ø}42.0 \times 69.0$
FL-BC7528-9M	1" (1.1")	C	75	2.8 - 32	3.45	0.25	9.8°/ 10.7°	40.5	$\text{Ø}42.0 \times 81.0$

* Min. Pixel Pitch at 30% contrast (measuring on the edge of the Optic)

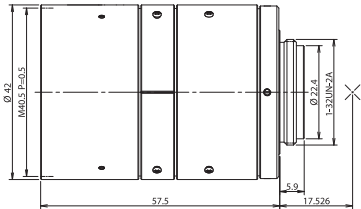
Unit: mm



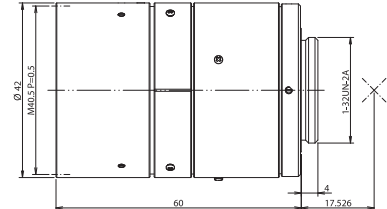
FL-BC1220-9M



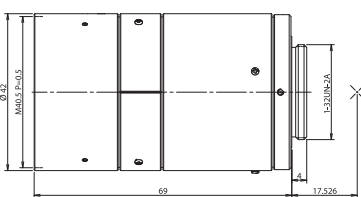
FL-BC1618-9M



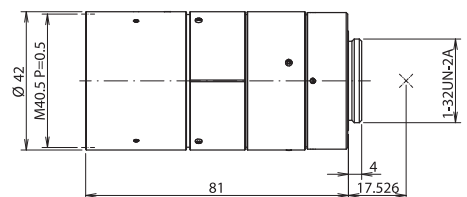
FL-BC2518-9M



FL-BC3518-9M



FL-BC5024-9M



FL-BC7528-9M

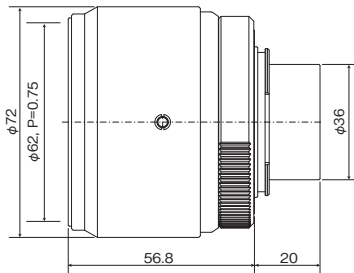
LINE-SCAN LENSES

Format 45 mm, Locking Screw for Focus

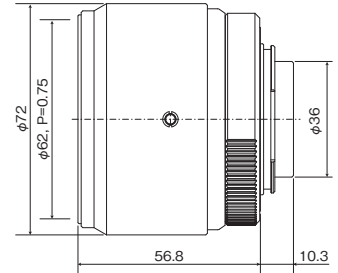
Part No.	Format size	Mount	Focal length (mm)	Iris range	Min. Pixel Pitch (μm)*	Working distance (m)	Horizontal angle of view	Filter size (mm)	Dimensions (mm)
FL-YFL3528	45mm	F	35	2.8 - 22	5.83	0.19 - ∞	64.40°	62	$\varnothing 72.0 \times 56.8$
FL-YFL5028	45mm	F	50	2.8 - 22	5.83	0.25 - ∞	47.60°	62	$\varnothing 72.0 \times 57.8$
FL-YKL3528	45mm	K	35	2.8 - 22	5.83	0.19 - ∞	64.40°	62	$\varnothing 72.0 \times 56.8$
FL-YKL5028	45mm	K	50	2.8 - 22	5.83	0.25 - ∞	47.60°	62	$\varnothing 72.0 \times 57.8$

* Min. Pixel Pitch at 30% contrast (measuring on the edge of the Optic)

Unit: mm



FL-YFL3528 | FL-YKL3528



FL-YFL5028 | FL-YKL5028

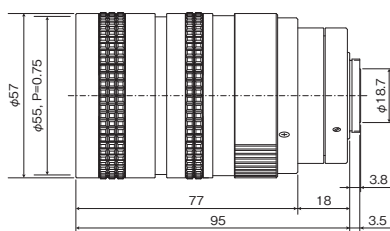
6X ZOOM LENSES MANUAL

Manual zoom

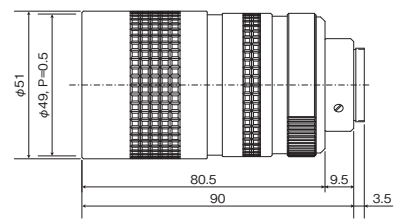
Part No.	Format size	Mount	Focal length (mm)	Iris range	Min. Pixel Pitch (μm)*	M. O. D. (m)	Horizontal angle of view	Filter size (mm)	Dimensions (mm)
① FL-HC6Z0810-VG	1/2"	C	8.0 - 48	1.0 - 22	11.67	0.75	43.3° - 7.7°	55	$\varnothing 57 \times 95$
FL-CC6Z1218-VG	2/3"	C	12.5 - 75	1.8 - 22	12.25	1.00	38.8° - 6.7°	49	$\varnothing 51 \times 90$
① FL-CC6Z1218A-VG	2/3"	C	12.5 - 75	1.8 - 22	12.25	1.00	38.8° - 6.7°	49	$\varnothing 51 \times 90$

* Min. Pixel Pitch at 30% contrast (measuring on the edge of the Optic), ① Locking Screws

Unit: mm



FL-HC6Z0810-VG



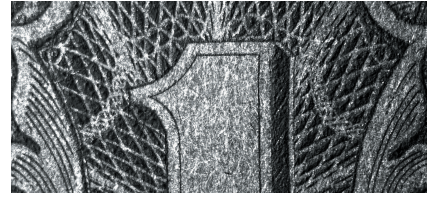
FL-CC6Z1218-VG

FL-CC6Z1218A-VG

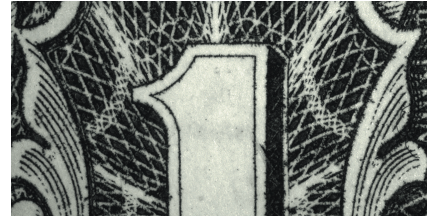
HIGH PERFORMANCE UV LENSES

An optical system that employs optical-grade quartz glass for imaging in the near-ultraviolet region. This lens is optimized for application in the inspection of minute surfaces. Used for detection of counterfeit banknotes; falsified documents and credit cards, surface inspection of circuit boards for soldering defects.

- High performance quartz glass, enabling the capture of sharp images in the near-ultraviolet region
- Extended wavelength range (230 nm to 800 nm), with peak performance at 365 nm
- Compact design, ideal for integration into machine vision systems
- Optimised for use with band pass filters and UV illumination to provide falsified documents detection



UV Lens with near UV light. The texture of material and unevenness of ink can be recognized

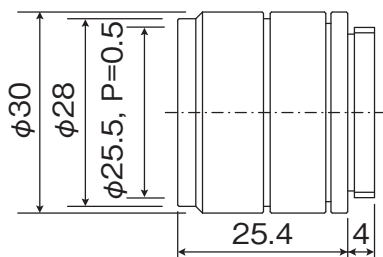


Ordinary Lens with visible light

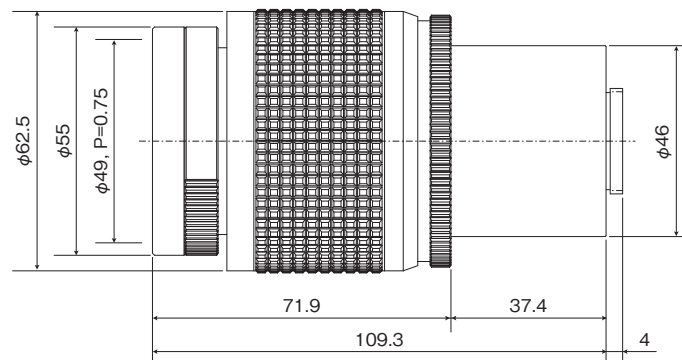
Part No.	Format size	Mount	Focal length (mm)	Iris range	Min. Pixel Pitch (μm)*	M. O. D. (m)	Horizontal angle of view	Filter size (mm)	Dimensions (mm)
FL-BC2528-VGUV	1"	C	25	2.8 - 16	35.00	0.23	29.7°	25.5	Ø30.0 × 25.4
FL-BC7838-VGUV	1"	C	78	3.8 - 16	17.50	0.44	9.5°	49.0	Ø62.5 × 109.3

* Min. Pixel Pitch at 30% contrast (measuring on the edge of the Optic)

Unit: mm



FL-BC2528-VGUV



FL-BC7838-VGUV

ACCESSORIES

Focal Length Extender, Adaptors, Tools

Part No.	Description	Specials
FOCAL LENGTH EXTENDER		
FP-EX2	2x, for C-Mount lenses ϕ 30.5 mm	compact

for close-up applications

Part No.	Description	Filter size (mm)	Specials
MACRO REVERSING RING			
FP-RR27	Macro reversing ring	27.0	



FP-EX2



FP-RR27

Part No.	Description	Specials
MACRO FOCUS MOUNT		
FP-MUVG	Macro Focus Mount - 2mm for FL-HC1212B-VG, FL-CC1614A-VG, FL-BC2514D-VG	
FP-MU2M	Macro Focus Mount - 2mm for FL-HC1214-2M, FL-CC1614-2M, FL-CC2514-2M, FL-CC3516-2M, FL-CC5028-2M	

The Macro Focus Mount is a special camera mount with a 2 mm tube extension. The C-Mount flange focal distance will then be extended by 2 mm to 19.526 mm which will in turn reduce the lenses minimum object distance (M.O.D.).

In order to use our Macro Focus Mount, remove the standard C-mount on the lens and replace them with the appropriate mount above.

Please ensure you use the correct mount to lens as per the above chart. The FP-MU2M is designed for all the machine vision lenses except the FL-HC0614-2M and FL-CC7528-2M. In order to achieve even higher magnifications you can also use the close up adaptors and extension tubes.



FP-MUVG



FP-MU2M

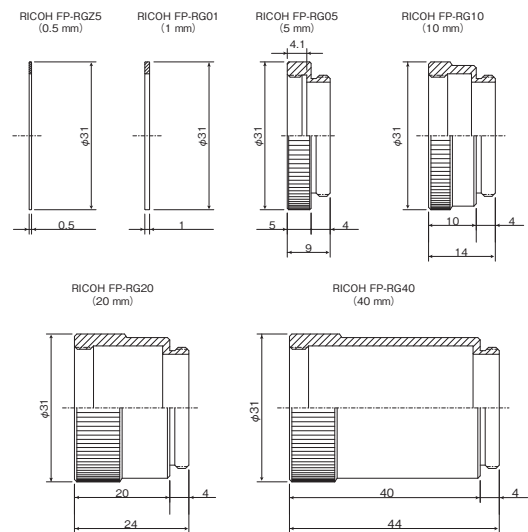
ACCESSORIES

for close-up applications

Part No.	Description	Specials		
EXTENSION TUBES				
FP-RGZ5	Extension tube Min. order quantity = 10 pcs	0.5 mm	matt black (antireflex)	Price per Item
FP-RG01	Extension tube Min. order quantity = 10 pcs	1.0 mm	matt black (antireflex)	Price per Item
FP-MA	Extension tube	5.0 mm		
FP-RG05	Extension tube	5.0 mm	matt black (antireflex)	
FP-RG10	Extension tube	10.0 mm	matt black (antireflex)	
FP-RG20	Extension tube	20.0 mm	matt black (antireflex)	
FP-RG40	Extension tube	40.0 mm	matt black (antireflex)	
FP-RGST	Extension tube set (6 pieces) Contents: 0.5 mm / 1.0 mm / 5.0 mm / 10.0 mm / 20.0 mm / 40.0 mm			



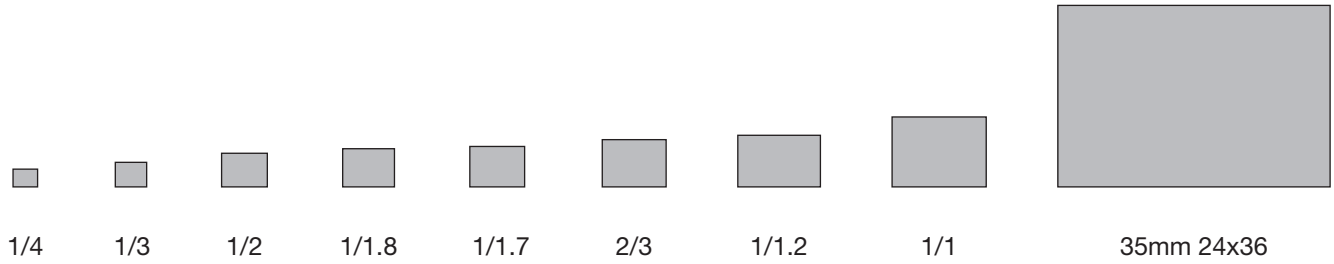
FP-RGST



TECHNICAL INFORMATION

CONVERSION TABLE FOR HORIZONTAL ANGLE OF VIEW

Lenses can be used on cameras with a smaller sensor, but not vice versa. By doing this, the viewing angle will change according to the table below.



Horizontal Angle Of View

Format	1/4	1/3	1/2	1/1.8	1/1.7	2/3	1/1.2	1/1	35mm 24x36
--------	-----	-----	-----	-------	-------	-----	-------	-----	------------

Sensor (mm)

horizontal	3.6	4.8	6.4	7.2	7.6	8.8	11.3	12.8	36.0
vertical	2.7	3.6	4.8	5.4	5.7	6.6	7.1	9.6	24.0
diagonal	4.5	6.0	8.0	9.0	9.5	11.0	13.4	16.0	43.3

Focal Length (mm)

2.2	78.6 °								
2.6	69.4 °	81.7 °							
2.8	65.5 °	77.6 °							
2.9	63.7 °	75.6 °							
3.0	61.9 °	73.7 °							
3.5	54.4 °	65.5 °	84.9 °						
3.7	51.9 °	62.6 °	81.7 °	88.4 °	91.5 °				
4.0	48.5 °	58.7 °	77.3 °	84.0 °	87.1 °				
4.2	46.4 °	56.4 °	74.6 °	81.2 °	84.3 °	92.7 °			
4.8	41.1 °	50.2 °	67.4 °	73.7 °	76.7 °	85.0 °	99.3 °	106.3 °	
5.8	34.5 °	42.4 °	57.8 °	63.7 °	66.5 °	74.4 °	88.5 °	95.6 °	
6.0	33.4 °	41.1 °	56.1 °	61.9 °	64.7 °	72.5 °	86.6 °	93.7 °	
6.2	32.4 °	39.9 °	54.6 °	60.3 °	63.0 °	70.7 °	84.7 °	91.8 °	
6.5	31.0 °	38.2 °	52.4 °	58.0 °	60.6 °	68.2 °	82.0 °	89.1 °	
7.5	27.0 °	33.4 °	46.2 °	51.3 °	53.7 °	60.8 °	74.0 °	81.0 °	134.8 °
8.0	25.4 °	31.4 °	43.6 °	48.5 °	50.8 °	57.6 °	70.5 °	77.3 °	132.1 °
8.5	23.9 °	29.7 °	41.3 °	45.9 °	48.2 °	54.7 °	67.2 °	74.0 °	129.4 °
9.0	22.6 °	28.1 °	39.1 °	43.6 °	45.8 °	52.1 °	64.2 °	70.8 °	126.9 °
10.0	20.4 °	25.4 °	35.5 °	39.6 °	41.6 °	47.5 °	58.9 °	65.2 °	121.9 °
10.5	19.5 °	24.2 °	33.9 °	37.8 °	39.8 °	45.5 °	56.6 °	62.7 °	119.5 °
12.0	17.1 °	21.2 °	29.9 °	33.4 °	35.1 °	40.3 °	50.4 °	56.1 °	112.6 °
12.5	16.4 °	20.4 °	28.7 °	32.1 °	33.8 °	38.8 °	48.6 °	54.2 °	110.4 °
16.0	12.8 °	16.0 °	22.6 °	25.4 °	26.7 °	30.8 °	38.9 °	43.6 °	96.7 °
25.0	8.2 °	10.3 °	14.6 °	16.4 °	17.3 °	20.0 °	25.5 °	28.7 °	71.5 °
35.0	5.9 °	7.4 °	10.4 °	11.7 °	12.4 °	14.3 °	18.3 °	20.7 °	54.4 °
38.0	5.4 °	6.8 °	9.6 °	10.8 °	11.4 °	13.2 °	16.9 °	19.1 °	50.7 °
40.0	5.2 °	6.4 °	9.1 °	10.3 °	10.9 °	12.6 °	16.1 °	18.2 °	48.5 °
48.0	4.3 °	5.4 °	7.6 °	8.6 °	9.1 °	10.5 °	13.4 °	15.2 °	41.1 °
50.0	4.1 °	5.2 °	7.3 °	8.2 °	8.7 °	10.1 °	12.9 °	14.6 °	39.6 °
58.0	3.6 °	4.4 °	6.3 °	7.1 °	7.5 °	8.7 °	11.1 °	12.6 °	34.5 °
75.0	2.7 °	3.4 °	4.9 °	5.5 °	5.8 °	6.7 °	8.6 °	9.8 °	27.0 °

Angles of view in this table are calculated. Individual lens angles of view may vary according to optical design.

2 MEGAPIXEL LENS + MACRO RING – 2/3" FORMAT

W.D. (Working Distance): Object-L1 vertex

V: 6.6 H: 8.8	2/3" FORMAT	FL-CC0614A-2M			FL-CC0814A-2M			FL-CC1214A-2M			FL-CC1614A-2M			FL-CC1614A-2M			FL-CC2514-2M									
		f=6mm F1.4			f=8mm F1.4			f=12mm F1.4			f=16mm F1.4			f=16mm F1.4			f=25mm F1.4									
		Position of Focus Ring	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.								
0.5mm	maximum	81.8 x 109.1	61	108.8 x 145.1	123	162.3 x 216.4	288	211.2 x 281.6	499	211.3 x 281.7	501	330.0 x 440.1	1250	minimum	49.2 x 65.6	30	49.4 x 65.8	49	44.5 x 59.3	69	71.6 x 95.5	161	37.7 x 50.2	80	55.0 x 73.3	208
	maximum	40.9 x 54.5	22	54.4 x 72.5	55	81.1 x 108.2	137	105.6 x 140.8	243	105.6 x 140.9	245	165.0 x 220.0	625	minimum	30.7 x 41.0	13	34.0 x 45.3	29	34.9 x 46.5	51	53.5 x 71.3	117	32.0 x 42.6	66	47.1 x 62.9	179
1.5mm (1+0.5)	maximum	X	-	36.3 x 48.4	32	54.1 x 72.1	87	70.4 x 93.9	158	70.4 x 93.9	160	110.0 x 146.7	417	minimum	X	-	25.9 x 34.5	19	28.7 x 38.3	39	42.7 x 56.9	91	27.8 x 37.0	56	41.2 x 55.0	156
	maximum	X	-	X	-	16.2 x 21.6	16	21.1 x 28.2	39	21.1 x 28.2	40	33.0 x 44.0	125	minimum	X	-	X	-	12.8 x 17.1	10	17.7 x 23.6	30	14.5 x 19.3	24	22.0 x 29.3	83
5mm	maximum	X	-	X	-	X	-	10.6 x 14.1	13	10.6 x 14.1	14	16.5 x 22.0	63	minimum	X	-	X	-	X	-	9.6 x 12.8	11	8.6 x 11.4	10	13.2 x 17.6	50
	maximum	X	-	X	-	X	-	X	-	X	-	11.0 x 14.7	42	minimum	X	-	X	-	X	-	X	-	X	-	9.4 x 12.6	36
10mm	maximum	X	-	X	-	X	-	X	-	X	-	8.3 x 11.0	31	minimum	X	-	X	-	X	-	X	-	X	-	7.3 x 9.8	28
	maximum	X	-	X	-	X	-	X	-	X	-	6.6 x 8.8	25	minimum	X	-	X	-	X	-	X	-	X	-	6.0 x 8.0	23
15mm (10+5)	maximum	X	-	X	-	X	-	X	-	X	-	5.5 x 7.3	21	minimum	X	-	X	-	X	-	X	-	X	-	5.1 x 6.8	19
	maximum	X	-	X	-	X	-	X	-	X	-	4.7 x 6.3	18	minimum	X	-	X	-	X	-	X	-	X	-	4.4 x 5.9	17
20mm	maximum	X	-	X	-	X	-	X	-	X	-	4.1 x 5.5	16	minimum	X	-	X	-	X	-	X	-	X	-	3.9 x 5.2	15
	maximum	X	-	X	-	X	-	X	-	X	-	3.7 x 4.9	14	minimum	X	-	X	-	X	-	X	-	X	-	3.5 x 4.6	13
25mm (20+5)	maximum	X	-	X	-	X	-	X	-	X	-	3.3 x 4.4	13	minimum	X	-	X	-	X	-	X	-	X	-	3.1 x 4.2	12
	maximum	X	-	X	-	X	-	X	-	X	-	3.1 x 4.2	12	minimum	X	-	X	-	X	-	X	-	X	-	3.1 x 4.2	12

Extension Tube Set (Macro Ring) EX-C6
(0.5mm, 1mm, 5mm, 10mm, 20mm and 40mm)

2 MEGAPIXEL LENS + MACRO RING – 2/3" FORMAT

W.D. (Working Distance): Object→L1 vertex

		f=25mm F1.4		f=35mm F1.6		f=50mm F2.8		f=50mm F2.4		f=75mm F2.8	
2/3" FORMAT		FL-CC2514A-2M		FL-CC3516-2M		FL-CC5028-2M		FL-CC5024A-2M		FL-CC7528-2M	
V: 6.6 H: 8.8	Position of Focus Ring	V x H (mm)		V x H (mm)		V x H (mm)		V x H (mm)		V x H (mm)	
		W.D.	W.D.	W.D.	W.D.	W.D.	W.D.	W.D.	W.D.	W.D.	W.D.
0.5mm	maximum	338.2 x 451.0	1312	448.1 x 597.5	2303	659.8 x 879.7	5048	643.5 x 858.0	4790	960.8 x 1281.0	10652
	minimum	24.2 x 32.3	93	66.6 x 88.8	340	95.8 x 127.8	777	33.8 x 45.1	286	54.9 x 73.3	663
1.0mm	maximum	169.1 x 225.5	655	224.1 x 298.8	1150	329.9 x 439.9	2549	321.8 x 429.0	2413	480.4 x 640.5	5355
	minimum	22.6 x 30.1	86	58.0 x 77.3	296	83.7 x 111.6	685	32.1 x 42.8	274	52.0 x 69.3	630
1.5mm (1+0.5)	maximum	112.7 x 150.3	436	149.4 x 199.2	766	219.9 x 293.2	1716	214.5 x 286.0	1621	320.3 x 427.0	3589
	minimum	21.2 x 28.3	81	51.3 x 68.4	262	74.3 x 99.0	613	30.6 x 40.8	262	49.3 x 65.7	601
5mm	maximum	33.8 x 45.1	130	44.8 x 59.8	228	66.0 x 88.0	551	64.4 x 85.8	512	96.1 x 128.1	1117
	minimum	14.7 x 19.6	56	28.5 x 38.0	144	41.5 x 55.4	365	23.0 x 30.6	206	36.3 x 48.4	457
10mm	maximum	16.9 x 22.5	64	22.4 x 29.9	113	33.0 x 44.0	301	32.2 x 42.9	274	48.0 x 64.1	587
	minimum	10.3 x 13.7	39	17.4 x 23.2	87	25.5 x 34.0	244	16.9 x 22.6	161	26.3 x 35.1	348
15mm (10+5)	maximum	11.3 x 15.0	42	14.9 x 19.9	75	22.0 x 29.3	217	21.5 x 28.6	195	32.0 x 42.7	411
	minimum	7.9 x 10.5	29	12.5 x 16.7	62	18.4 x 24.5	190	13.4 x 17.9	135	20.7 x 27.6	285
20mm	maximum	8.5 x 11.3	32	11.2 x 14.9	55	16.5 x 22.0	176	16.1 x 21.5	155	24.0 x 32.0	322
	minimum	6.4 x 8.5	23	9.8 x 13.1	48	14.4 x 19.2	160	11.1 x 14.8	118	17.0 x 22.7	245
25mm (20+5)	maximum	6.8 x 9.0	25	9.0 x 12.0	44	13.2 x 17.6	151	12.9 x 17.2	132	19.2 x 25.6	269
	minimum	5.4 x 7.2	20	8.0 x 10.7	39	11.8 x 15.7	140	9.5 x 12.6	106	14.5 x 19.3	217
30mm (20+10)	maximum	5.6 x 7.5	21	7.5 x 10.0	36	11.0 x 14.7	134	10.7 x 14.3	116	16.0 x 21.4	234
	minimum	4.6 x 6.2	17	6.8 x 9.1	33	10.0 x 13.4	127	8.2 x 11.0	97	12.6 x 16.7	196
35mm (20+10+5)	maximum	4.8 x 6.4	17	6.4 x 8.5	31	9.4 x 12.6	122	9.2 x 12.3	104	13.7 x 18.3	209
	minimum	4.1 x 5.4	15	5.9 x 7.9	28	8.7 x 11.6	117	7.3 x 9.7	90	11.1 x 14.8	180
40mm	maximum	4.2 x 5.6	15	5.6 x 7.5	27	8.2 x 11.0	113	8.0 x 10.7	96	12.0 x 16.0	190
	minimum	3.6 x 4.9	13	5.2 x 7.0	25	7.7 x 10.2	109	6.6 x 8.8	85	10.0 x 13.3	167
45mm (40+5)	maximum	3.8 x 5.0	13	5.0 x 6.6	23	7.3 x 9.8	106	7.2 x 9.5	89	10.7 x 14.2	175
	minimum	3.3 x 4.4	11	4.7 x 6.2	22	6.9 x 9.2	103	6.0 x 7.9	80	9.0 x 12.0	157
50mm (40+10)	maximum	3.4 x 4.5	12	4.5 x 6.0	21	6.6 x 8.8	101	6.4 x 8.6	84	9.6 x 12.8	163
	minimum	3.0 x 4.0	10	4.2 x 5.7	20	6.2 x 8.3	98	5.5 x 7.3	77	8.2 x 11.0	148

Extension Tube Set (Macro Ring) EX-C6
(0.5mm, 1mm, 5mm, 10mm, 20mm and 40mm)

2 MEGAPIXEL LENS + MACRO RING – 1/1.8" FORMAT

W.D. (Working Distance): Object~L1 vertex

1/1.8" FORMAT		FL-CC0614A-2M			FL-CC0814A-2M			FL-CC1214A-2M			FL-CC1614A-2M			FL-CC1614A-2M			FL-CC2514-2M		
		f=6mm F1.4			f=8mm F1.4			f=12mm F1.4			f=16mm F1.4			f=16mm F1.4			f=25mm F1.4		
V: 5.4 H: 7.2	Position of Focus Ring	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.		
		0.5mm	maximum	66.9 x 89.3	61	89.0 x 118.7	123	132.8 x 177.0	288	172.8 x 230.4	499	172.9 x 230.5	501	270.0 x 360.0	1250				
minimum	40.3 x 53.7		30	40.4 x 53.9	49	36.4 x 48.5	69	58.6 x 78.1	161	30.8 x 41.1	80	45.0 x 60.0	208						
1.0mm	maximum	33.5 x 44.6	22	44.5 x 59.3	55	66.4 x 88.5	137	86.4 x 115.2	243	86.4 x 115.3	245	135.0 x 180.0	625						
	minimum	25.1 x 33.5	13	27.8 x 37.1	29	28.6 x 38.1	51	43.8 x 58.3	117	26.1 x 34.9	66	38.6 x 51.4	179						
1.5mm (1+0.5)	maximum	X	-	29.7 x 39.6	32	44.3 x 59.0	87	57.6 x 76.8	158	57.6 x 76.8	160	90.0 x 120.0	417						
	minimum	X	-	21.2 x 28.2	19	23.5 x 31.3	39	34.9 x 46.5	91	22.7 x 30.3	56	33.7 x 45.0	156						
5mm	maximum	X	-	X	-	13.3 x 17.7	16	17.3 x 23.0	39	17.3 x 23.1	40	27.0 x 36.0	125						
	minimum	X	-	X	-	10.5 x 14.0	10	14.5 x 19.3	30	11.8 x 15.8	24	18.0 x 24.0	83						
10mm	maximum	X	-	X	-	X	-	8.6 x 11.5	13	8.6 x 11.5	14	13.5 x 18.0	63						
	minimum	X	-	X	-	X	-	7.9 x 10.5	11	7.0 x 9.4	10	10.8 x 14.4	50						
15mm (10+5)	maximum	X	-	X	-	X	-	X	-	X	-	9.0 x 12.0	42						
	minimum	X	-	X	-	X	-	X	-	X	-	7.7 x 10.3	36						
20mm	maximum	X	-	X	-	X	-	X	-	X	-	6.8 x 9.0	31						
	minimum	X	-	X	-	X	-	X	-	X	-	6.0 x 8.0	28						
25mm (20+5)	maximum	X	-	X	-	X	-	X	-	X	-	5.4 x 7.2	25						
	minimum	X	-	X	-	X	-	X	-	X	-	4.9 x 6.5	23						
30mm (20+10)	maximum	X	-	X	-	X	-	X	-	X	-	4.5 x 6.0	21						
	minimum	X	-	X	-	X	-	X	-	X	-	4.2 x 5.5	19						
35mm (20+10+5)	maximum	X	-	X	-	X	-	X	-	X	-	3.9 x 5.1	18						
	minimum	X	-	X	-	X	-	X	-	X	-	3.6 x 4.8	17						
40mm	maximum	X	-	X	-	X	-	X	-	X	-	3.4 x 4.5	16						
	minimum	X	-	X	-	X	-	X	-	X	-	3.2 x 4.2	15						
45mm (40+5)	maximum	X	-	X	-	X	-	X	-	X	-	3.0 x 4.0	14						
	minimum	X	-	X	-	X	-	X	-	X	-	2.8 x 3.8	13						
50mm (40+10)	maximum	X	-	X	-	X	-	X	-	X	-	2.7 x 3.6	13						
	minimum	X	-	X	-	X	-	X	-	X	-	2.6 x 3.4	12						

Extension Tube Set (Macro Ring) EX-C6
(0.5mm, 1mm, 5mm, 10mm, 20mm and 40mm)

2 MEGAPIXEL LENS + MACRO RING – 1/1.8" FORMAT

W.D. (Working Distance): Object-L1 vertex

1/1.8" FORMAT		FL-CC2514A-2M		FL-CC3516-2M		FL-CC5028-2M		FL-CC5024A-2M		FL-CC7528-2M	
V: 5.4 H: 7.2	Position of Focus Ring	f=25mm F1.4		f=35mm F1.6		f=50mm F2.8		f=50mm F2.4		f=75mm F2.8	
		V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.
0.5mm	maximum	276.7 x 369.0	1312	366.7 x 488.9	2303	539.8 x 719.8	5048	526.5 x 702.0	4790	786.1 x 1048.1	10652
	minimum	19.8 x 26.4	93	54.5 x 72.6	340	78.4 x 104.6	777	27.7 x 36.9	286	45.0 x 59.9	663
1.0mm	maximum	138.4 x 184.5	655	183.3 x 244.4	1150	269.9 x 359.9	2549	263.3 x 351.0	2413	393.0 x 524.0	5355
	minimum	18.5 x 24.7	86	47.4 x 63.2	296	68.5 x 91.3	685	26.3 x 35.0	274	42.5 x 56.7	630
1.5mm (1+0.5)	maximum	92.2 x 123.0	436	122.2 x 163.0	766	179.9 x 239.9	1716	175.5 x 234.0	1621	262.0 x 349.4	3589
	minimum	17.3 x 23.1	81	42.0 x 56.0	262	60.8 x 81.0	613	25.0 x 33.4	262	40.3 x 53.8	601
5mm	maximum	27.7 x 36.9	130	36.7 x 48.9	228	54.0 x 72.0	551	52.7 x 70.2	512	78.6 x 104.8	1117
	minimum	12.1 x 16.1	56	23.3 x 31.1	144	34.0 x 45.3	365	18.8 x 25.0	206	29.7 x 39.6	457
10mm	maximum	13.8 x 18.4	64	18.3 x 24.4	113	27.0 x 36.0	301	26.3 x 35.1	274	39.3 x 52.4	587
	minimum	8.4 x 11.2	39	14.2 x 19.0	87	20.9 x 27.8	244	13.8 x 18.5	161	21.5 x 28.7	348
15mm (10+5)	maximum	9.2 x 12.3	42	12.2 x 16.3	75	18.0 x 24.0	217	17.6 x 23.4	195	26.2 x 34.9	411
	minimum	6.4 x 8.6	29	10.3 x 13.7	62	15.0 x 20.1	190	11.0 x 14.6	135	16.9 x 22.5	285
20mm	maximum	6.9 x 9.2	32	9.2 x 12.2	55	13.5 x 18.0	176	13.2 x 17.6	155	19.7 x 26.2	322
	minimum	5.2 x 7.0	23	8.0 x 10.7	48	11.8 x 15.7	160	9.1 x 12.1	118	13.9 x 18.6	245
25mm (20+5)	maximum	5.5 x 7.4	25	7.3 x 9.8	44	10.8 x 14.4	151	10.5 x 14.0	132	15.7 x 21.0	269
	minimum	4.4 x 5.9	20	6.6 x 8.8	39	9.7 x 12.9	140	7.7 x 10.3	106	11.8 x 15.8	217
30mm (20+10)	maximum	4.6 x 6.1	21	6.1 x 8.1	36	9.0 x 12.0	134	8.8 x 11.7	116	13.1 x 17.5	234
	minimum	3.8 x 5.1	17	5.6 x 7.4	33	8.2 x 10.9	127	6.7 x 9.0	97	10.3 x 13.7	196
35mm (20+10+5)	maximum	4.0 x 5.3	17	5.2 x 7.0	31	7.7 x 10.3	122	7.5 x 10.0	104	11.2 x 15.0	209
	minimum	3.3 x 4.4	15	4.8 x 6.5	28	7.1 x 9.5	117	6.0 x 8.0	90	9.1 x 12.1	180
40mm	maximum	3.5 x 4.6	15	4.6 x 6.1	27	6.7 x 9.0	113	6.6 x 8.8	96	9.8 x 13.1	190
	minimum	3.0 x 4.0	13	4.3 x 5.7	25	6.3 x 8.4	109	5.4 x 7.2	85	8.1 x 10.9	167
45mm (40+5)	maximum	3.1 x 4.1	13	4.1 x 5.4	23	6.0 x 8.0	106	5.9 x 7.8	89	8.7 x 11.6	175
	minimum	2.7 x 3.6	11	3.8 x 5.1	22	5.6 x 7.5	103	4.9 x 6.5	80	7.4 x 9.8	157
50mm (40+10)	maximum	2.8 x 3.7	12	3.7 x 4.9	21	5.4 x 7.2	101	5.3 x 7.0	84	7.9 x 10.5	163
	minimum	2.4 x 3.3	10	3.5 x 4.6	20	5.1 x 6.8	98	4.5 x 5.9	77	6.7 x 9.0	148

(0.5mm, 1mm, 5mm, 10mm, 20mm and 40mm)
Extension Tube Set (Macro Ring) EX-C6

2 MEGAPIXEL LENS + MACRO RING – 1/2" FORMAT

W.D. (Working Distance): Object-L1 vertex

V: 4.8 H: 6.4	1/2" FORMAT	FL-CC0614A-2M			FL-CC0814A-2M			FL-CC1214A-2M			FL-CC1614A-2M			FL-CC1614A-2M			FL-CC2514-2M									
		f=6mm F1.4			f=8mm F1.4			f=12mm F1.4			f=16mm F1.4			f=16mm F1.4			f=25mm F1.4									
		Position of Focus Ring	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.						
0.5mm	maximum	59.5 x 79.3	61	79.1 x 105.5	123	118.0 x 157.4	288	153.6 x 204.8	499	153.7 x 204.9	501	240.0 x 320.0	1250	minimum	35.8 x 47.7	30	35.9 x 47.9	49	32.3 x 43.1	69	52.1 x 69.4	161	27.4 x 36.5	80	40.0 x 53.3	208
	maximum	29.8 x 39.7	22	39.6 x 52.7	55	59.0 x 78.7	137	76.8 x 102.4	243	76.8 x 102.4	245	120.0 x 160.0	625	minimum	22.4 x 29.8	13	24.7 x 32.9	29	25.4 x 33.8	51	38.9 x 51.9	117	23.2 x 31.0	66	34.3 x 45.7	179
1.5mm (1+0.5)	maximum	X	-	26.4 x 35.2	32	39.3 x 52.5	87	51.2 x 68.3	158	51.2 x 68.3	160	80.0 x 106.7	417	minimum	X	-	18.8 x 25.1	19	20.9 x 27.9	39	31.0 x 41.4	91	20.2 x 26.9	56	30.0 x 40.0	156
	maximum	X	-	X	-	11.8 x 15.7	16	15.4 x 20.5	39	15.4 x 20.5	40	24.0 x 32.0	125	minimum	X	-	X	-	9.3 x 12.4	10	12.9 x 17.1	30	10.5 x 14.0	24	16.0 x 21.3	83
5mm	maximum	X	-	X	-	X	-	7.7 x 10.2	13	7.7 x 10.2	14	12.0 x 16.0	63	minimum	X	-	X	-	X	-	7.0 x 9.3	11	6.2 x 8.3	10	9.6 x 12.8	50
	maximum	X	-	X	-	X	-	X	-	X	-	8.0 x 10.7	42	minimum	X	-	X	-	X	-	X	-	X	-	6.9 x 9.1	36
15mm (10+5)	maximum	X	-	X	-	X	-	X	-	X	-	6.0 x 8.0	31	minimum	X	-	X	-	X	-	X	-	X	-	5.3 x 7.1	28
	maximum	X	-	X	-	X	-	X	-	X	-	4.8 x 6.4	25	minimum	X	-	X	-	X	-	X	-	X	-	4.4 x 5.8	23
20mm	maximum	X	-	X	-	X	-	X	-	X	-	4.0 x 5.3	21	minimum	X	-	X	-	X	-	X	-	X	-	3.7 x 4.9	19
	maximum	X	-	X	-	X	-	X	-	X	-	3.4 x 4.6	18	minimum	X	-	X	-	X	-	X	-	X	-	3.2 x 4.3	17
25mm (20+5)	maximum	X	-	X	-	X	-	X	-	X	-	3.0 x 4.0	16	minimum	X	-	X	-	X	-	X	-	X	-	2.8 x 3.8	15
	maximum	X	-	X	-	X	-	X	-	X	-	2.7 x 3.6	14	minimum	X	-	X	-	X	-	X	-	X	-	2.5 x 3.4	13
30mm (20+10)	maximum	X	-	X	-	X	-	X	-	X	-	2.4 x 3.2	13	minimum	X	-	X	-	X	-	X	-	X	-	2.4 x 3.2	13
	maximum	X	-	X	-	X	-	X	-	X	-	2.3 x 3.0	12	minimum	X	-	X	-	X	-	X	-	X	-	2.3 x 3.0	12
35mm (20+10+5)	maximum	X	-	X	-	X	-	X	-	X	-	2.3 x 3.0	12	minimum	X	-	X	-	X	-	X	-	X	-	2.3 x 3.0	12
	maximum	X	-	X	-	X	-	X	-	X	-	2.3 x 3.0	12	minimum	X	-	X	-	X	-	X	-	X	-	2.3 x 3.0	12
40mm	maximum	X	-	X	-	X	-	X	-	X	-	2.3 x 3.0	12	minimum	X	-	X	-	X	-	X	-	X	-	2.3 x 3.0	12
	maximum	X	-	X	-	X	-	X	-	X	-	2.3 x 3.0	12	minimum	X	-	X	-	X	-	X	-	X	-	2.3 x 3.0	12
45mm (40+5)	maximum	X	-	X	-	X	-	X	-	X	-	2.3 x 3.0	12	minimum	X	-	X	-	X	-	X	-	X	-	2.3 x 3.0	12
	maximum	X	-	X	-	X	-	X	-	X	-	2.3 x 3.0	12	minimum	X	-	X	-	X	-	X	-	X	-	2.3 x 3.0	12
50mm (40+10)	maximum	X	-	X	-	X	-	X	-	X	-	2.3 x 3.0	12	minimum	X	-	X	-	X	-	X	-	X	-	2.3 x 3.0	12
	maximum	X	-	X	-	X	-	X	-	X	-	2.3 x 3.0	12	minimum	X	-	X	-	X	-	X	-	X	-	2.3 x 3.0	12

Extension Tube Set (Macro Ring) EX-C6
(0.5mm, 1mm, 5mm, 10mm, 20mm and 40mm)

2 MEGAPIXEL LENS + MACRO RING – 1/2" FORMAT

W.D. (Working Distance): Object-L1 vertex

1/2" FORMAT		FL-CC2514A-2M	FL-CC3516-2M	FL-CC5028-2M	FL-CC5024A-2M	FL-CC7528-2M					
V: 4.8 H: 6.4	Position of Focus Ring	f=25mm F1.4		f=50mm F2.8		f=75mm F2.8					
		V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.				
0.5mm	maximum	246.0 x 328.0	1312	325.9 x 434.6	2303	479.8 x 639.8	5048	468.0 x 624.0	4790	698.7 x 931.6	10652
	minimum	17.6 x 23.5	93	48.4 x 64.5	340	69.7 x 92.9	777	24.6 x 32.8	286	40.0 x 53.3	663
1.0mm	maximum	123.0 x 164.0	655	163.0 x 217.3	1150	239.9 x 319.9	2549	234.0 x 312.0	2413	349.4 x 465.8	5355
	minimum	16.4 x 21.9	86	42.2 x 56.2	296	60.9 x 81.1	685	23.4 x 31.1	274	37.8 x 50.4	630
1.5mm (1+0.5)	maximum	82.0 x 109.3	436	108.6 x 144.9	766	159.9 x 213.3	1716	156.0 x 208.0	1621	232.9 x 310.5	3589
	minimum	15.4 x 20.5	81	37.3 x 49.8	262	54.0 x 72.0	613	22.2 x 29.7	262	35.9 x 47.8	601
5mm	maximum	24.6 x 32.8	130	32.6 x 43.5	228	48.0 x 64.0	551	46.8 x 62.4	512	69.9 x 93.2	1117
	minimum	10.7 x 14.3	56	20.7 x 27.6	144	30.2 x 40.3	365	16.7 x 22.3	206	26.4 x 35.2	457
10mm	maximum	12.3 x 16.4	64	16.3 x 21.7	113	24.0 x 32.0	301	23.4 x 31.2	274	34.9 x 46.6	587
	minimum	7.5 x 10.0	39	12.7 x 16.9	87	18.5 x 24.7	244	12.3 x 16.4	161	19.2 x 25.5	348
15mm (10+5)	maximum	8.2 x 10.9	42	10.9 x 14.5	75	16.0 x 21.3	217	15.6 x 20.8	195	23.3 x 31.1	411
	minimum	5.7 x 7.6	29	9.1 x 12.2	62	13.4 x 17.8	190	9.7 x 13.0	135	15.0 x 20.0	285
20mm	maximum	6.1 x 8.2	32	8.1 x 10.9	55	12.0 x 16.0	176	11.7 x 15.6	155	17.5 x 23.3	322
	minimum	4.6 x 6.2	23	7.1 x 9.5	48	10.5 x 13.9	160	8.1 x 10.8	118	12.4 x 16.5	245
25mm (20+5)	maximum	4.9 x 6.6	25	6.5 x 8.7	44	9.6 x 12.8	151	9.4 x 12.5	132	14.0 x 18.6	269
	minimum	3.9 x 5.2	20	5.8 x 7.8	39	8.6 x 11.4	140	6.9 x 9.2	106	10.5 x 14.0	217
30mm (20+10)	maximum	4.1 x 5.5	21	5.4 x 7.2	36	8.0 x 10.7	134	7.8 x 10.4	116	11.6 x 15.5	234
	minimum	3.4 x 4.5	17	5.0 x 6.6	33	7.3 x 9.7	127	6.0 x 8.0	97	9.1 x 12.2	196
35mm (20+10+5)	maximum	3.5 x 4.7	17	4.7 x 6.2	31	6.9 x 9.1	122	6.7 x 8.9	104	10.0 x 13.3	209
	minimum	3.0 x 4.0	15	4.3 x 5.7	28	6.3 x 8.4	117	5.3 x 7.1	90	8.1 x 10.8	180
40mm	maximum	3.1 x 4.1	15	4.1 x 5.4	27	6.0 x 8.0	113	5.9 x 7.8	96	8.7 x 11.6	190
	minimum	2.6 x 3.5	13	3.8 x 5.1	25	5.6 x 7.4	109	4.8 x 6.4	85	7.2 x 9.7	167
45mm (40+5)	maximum	2.7 x 3.6	13	3.6 x 4.8	23	5.3 x 7.1	106	5.2 x 6.9	89	7.8 x 10.4	175
	minimum	2.4 x 3.2	11	3.4 x 4.5	22	5.0 x 6.7	103	4.3 x 5.8	80	6.6 x 8.7	157
50mm (40+10)	maximum	2.5 x 3.3	12	3.3 x 4.3	21	4.8 x 6.4	101	4.7 x 6.2	84	7.0 x 9.3	163
	minimum	2.2 x 2.9	10	3.1 x 4.1	20	4.5 x 6.0	98	4.0 x 5.3	77	6.0 x 8.0	148

Extension Tube Set (Macro Ring) EX-C6
(0.5mm, 1mm, 5mm, 10mm, 20mm and 40mm)

5 MEGAPIXEL LENS + MACRO RING – 2/3" FORMAT

W.D. (Working Distance): Object-L1 vertex

2/3" FORMAT		FL-CC0814-5M			FL-CC1614-5M			FL-CC2514-5M			FL-CC1218-5MX			FL-CC1618-5MX			FL-CC2518-5MX								
V: 6.6 H: 8.8	Position of Focus Ring	f=8mm F1.4			f=16mm F1.4			f=25mm F1.4			f=12mm F1.8			f=16mm F1.8			f=25mm F1.8								
		V x H (mm)	W.D.		V x H (mm)	W.D.		V x H (mm)	W.D.		V x H (mm)	W.D.		V x H (mm)	W.D.		V x H (mm)	W.D.							
0.5mm	maximum	108.8	x	145.0	116	211.1	x	281.4	498	330.0	x	440.0	1237	158.3	x	211.1	276	211.1	x	281.5	497	330.0	x	440.0	1254
	minimum	50.9	x	67.9	44	38.3	x	51.1	79	27.3	x	36.4	91	44.0	x	58.7	69	38.5	x	51.3	79	22.4	x	29.9	94
1.0mm	maximum	54.4	x	72.5	48	105.5	x	140.7	242	165.0	x	220.0	612	79.2	x	105.5	132	105.5	x	140.7	241	165.0	x	220.0	629
	minimum	34.7	x	46.2	24	32.4	x	43.2	65	25.2	x	33.6	83	34.5	x	46.0	52	32.5	x	43.3	65	21.1	x	28.1	88
1.5mm (1+0.5)	maximum	36.3	x	48.3	26	70.4	x	93.8	157	110.0	x	146.7	404	52.8	x	70.4	84	70.4	x	93.8	156	110.0	x	146.7	420
	minimum	26.3	x	35.1	13	28.1	x	37.5	55	23.4	x	31.2	76	28.3	x	37.8	41	28.1	x	37.4	54	19.9	x	26.5	84
5mm	maximum		x		-	21.1	x	28.1	38	33.0	x	44.0	112	15.8	x	21.1	17	21.1	x	28.1	37	33.0	x	44.0	129
	minimum		x		-	14.5	x	19.4	22	15.7	x	20.9	46	12.6	x	16.8	12	14.4	x	19.2	22	14.2	x	19.0	61
10mm	maximum		x		-	10.6	x	14.1	12	16.5	x	22.0	50		x		-	10.6	x	14.1	11	16.5	x	22.0	66
	minimum		x		-	8.6	x	11.5	8	10.6	x	14.2	27		x		-	8.5	x	11.3	8	10.1	x	13.5	44
15mm (10+5)	maximum		x		-		x		-	11.0	x	14.7	29		x		-		x		-	11.0	x	14.7	46
	minimum		x		-		x		-	8.0	x	10.7	18		x		-		x		-	7.9	x	10.5	35
20mm	maximum		x		-		x		-	8.3	x	11.0	18		x		-		x		-	8.2	x	11.0	35
	minimum		x		-		x		-	6.5	x	8.6	12		x		-		x		-	6.4	x	8.6	29
25mm (20+5)	maximum		x		-		x		-	6.6	x	8.8	12		x		-		x		-	6.6	x	8.8	29
	minimum		x		-		x		-	5.4	x	7.2	8		x		-		x		-	5.4	x	7.2	25
30mm (20+10)	maximum		x		-		x		-		x		-		x		-		x		-		x		-
	minimum		x		-		x		-		x		-		x		-		x		-		x		-
35mm (20+10+5)	maximum		x		-		x		-		x		-		x		-		x		-		x		-
	minimum		x		-		x		-		x		-		x		-		x		-		x		-
40mm	maximum		x		-		x		-		x		-		x		-		x		-		x		-
	minimum		x		-		x		-		x		-		x		-		x		-		x		-
45mm (40+5)	maximum		x		-		x		-		x		-		x		-		x		-		x		-
	minimum		x		-		x		-		x		-		x		-		x		-		x		-
50mm (40+10)	maximum		x		-		x		-		x		-		x		-		x		-		x		-
	minimum		x		-		x		-		x		-		x		-		x		-		x		-

Extension Tube Set (Macro Ring) FP-RGST
(0.5mm, 1mm, 5mm, 10mm, 20mm and 40mm)

5 MEGAPIXEL LENS + MACRO RING – 1/1.8" FORMAT

W.D. (Working Distance): Object-L1 vertex

1/1.8" FORMAT		FL-CC0814-5M		FL-CC1614-5M		FL-CC2514-5M		FL-CC1218-5MX		FL-CC1618-5MX		FL-CC2518-5MX							
V: 5.4 H: 7.2	Position of Focus Ring	f=8mm F1.4		f=16mm F1.4		f=25mm F1.4		f=12mm F1.8		f=16mm F1.8		f=25mm F1.8							
		V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.						
0.5mm	maximum	89.0	x 118.6	116	172.7	x 230.2	498	270.0	x 360.0	1237	129.5	x 172.7	276	172.7	x 230.3	497	270.0	x 360.0	1254
	minimum	41.7	x 55.5	44	31.3	x 41.8	79	22.3	x 29.8	91	36.0	x 48.0	69	31.5	x 42.0	79	18.3	x 24.5	94
1.0mm	maximum	44.5	x 59.3	48	86.3	x 115.1	242	135.0	x 180.0	612	64.8	x 86.4	132	86.4	x 115.1	241	135.0	x 180.0	629
	minimum	28.4	x 37.8	24	26.5	x 35.4	65	20.6	x 27.5	83	28.2	x 37.6	52	26.6	x 35.4	65	17.2	x 23.0	88
1.5mm (1+0.5)	maximum	29.7	x 39.5	26	57.6	x 76.7	157	90.0	x 120.0	404	43.2	x 57.6	84	57.6	x 76.8	156	90.0	x 120.0	420
	minimum	21.5	x 28.7	13	23.0	x 30.7	55	19.2	x 25.6	76	23.2	x 30.9	41	23.0	x 30.6	54	16.3	x 21.7	84
5mm	maximum	x	-	-	17.3	x 23.0	38	27.0	x 36.0	112	13.0	x 17.3	17	17.3	x 23.0	37	27.0	x 36.0	129
	minimum	x	-	-	11.9	x 15.9	22	12.8	x 17.1	46	10.3	x 13.8	12	11.8	x 15.7	22	11.6	x 15.5	61
10mm	maximum	x	-	-	8.6	x 11.5	12	13.5	x 18.0	50	x	x	-	8.6	x 11.5	11	13.5	x 18.0	66
	minimum	x	-	-	7.0	x 9.4	8	8.7	x 11.6	27	x	x	-	7.0	x 9.3	8	8.3	x 11.0	44
15mm (10+5)	maximum	x	-	-	x	x	-	9.0	x 12.0	29	x	x	-	x	x	-	9.0	x 12.0	46
	minimum	x	-	-	x	x	-	6.6	x 8.8	18	x	x	-	x	x	-	6.4	x 8.6	35
20mm	maximum	x	-	-	x	x	-	6.8	x 9.0	18	x	x	-	x	x	-	6.7	x 9.0	35
	minimum	x	-	-	x	x	-	5.3	x 7.0	12	x	x	-	x	x	-	5.3	x 7.0	29
25mm (20+5)	maximum	x	-	-	x	x	-	5.4	x 7.2	12	x	x	-	x	x	-	5.4	x 7.2	29
	minimum	x	-	-	x	x	-	4.4	x 5.9	8	x	x	-	x	x	-	4.4	x 5.9	25
30mm (20+10)	maximum	x	-	-	x	x	-	x	x	-	x	x	-	x	x	-	x	x	-
	minimum	x	-	-	x	x	-	x	x	-	x	x	-	x	x	-	x	x	-
35mm (20+10+5)	maximum	x	-	-	x	x	-	x	x	-	x	x	-	x	x	-	x	x	-
	minimum	x	-	-	x	x	-	x	x	-	x	x	-	x	x	-	x	x	-
40mm	maximum	x	-	-	x	x	-	x	x	-	x	x	-	x	x	-	x	x	-
	minimum	x	-	-	x	x	-	x	x	-	x	x	-	x	x	-	x	x	-
45mm (40+5)	maximum	x	-	-	x	x	-	x	x	-	x	x	-	x	x	-	x	x	-
	minimum	x	-	-	x	x	-	x	x	-	x	x	-	x	x	-	x	x	-
50mm (40+10)	maximum	x	-	-	x	x	-	x	x	-	x	x	-	x	x	-	x	x	-
	minimum	x	-	-	x	x	-	x	x	-	x	x	-	x	x	-	x	x	-

(0,5mm, 1mm, 5mm, 10mm, 20mm and 40mm)
Extension Tube Set (Macro Ring) FP-RGST

5 MEGAPIXEL LENS + MACRO RING – 1/2" FORMAT

W.D. (Working Distance): Object-L1 vertex

1/2" FORMAT		FL-CC0814-5M			FL-CC1614-5M			FL-CC2514-5M			FL-CC1218-5MX			FL-CC1618-5MX			FL-CC2518-5MX								
V: 4.8 H: 6.4	Position of Focus Ring	f=8mm F1.4			f=16mm F1.4			f=25mm F1.4			f=12mm F1.8			f=16mm F1.8			f=25mm F1.8								
		V x H (mm)	W.D.		V x H (mm)	W.D.		V x H (mm)	W.D.		V x H (mm)	W.D.		V x H (mm)	W.D.		V x H (mm)	W.D.							
0.5mm	maximum	79.1	x	105.5	116	153.5	x	204.7	498	240.0	x	320.0	1237	115.1	x	153.5	276	153.5	x	204.7	497	240.0	x	320.0	1254
	minimum	37.0	x	49.4	44	27.9	x	37.1	79	19.9	x	26.5	91	32.0	x	42.7	69	28.0	x	37.3	79	16.3	x	21.7	94
1.0mm	maximum	39.5	x	52.7	48	76.7	x	102.3	242	120.0	x	160.0	612	57.6	x	76.8	132	76.8	x	102.4	241	120.0	x	160.0	629
	minimum	25.2	x	33.6	24	23.6	x	31.4	65	18.3	x	24.5	83	25.1	x	33.4	52	23.6	x	31.5	65	15.3	x	20.4	88
1.5mm (1+0.5)	maximum	26.4	x	35.2	26	51.2	x	68.2	157	80.0	x	106.7	404	38.4	x	51.2	84	51.2	x	68.2	156	80.0	x	106.7	420
	minimum	19.1	x	25.5	13	20.4	x	27.2	55	17.0	x	22.7	76	20.6	x	27.5	41	20.4	x	27.2	54	14.5	x	19.3	84
5mm	maximum		x		-	15.3	x	20.5	38	24.0	x	32.0	112	11.5	x	15.4	17	15.4	x	20.5	37	24.0	x	32.0	129
	minimum		x		-	10.6	x	14.1	22	11.4	x	15.2	46	9.2	x	12.2	12	10.5	x	14.0	22	10.4	x	13.8	61
10mm	maximum		x		-	7.7	x	10.2	12	12.0	x	16.0	50		x		-	7.7	x	10.2	11	12.0	x	16.0	66
	minimum		x		-	6.3	x	8.3	8	7.7	x	10.3	27		x		-	6.2	x	8.3	8	7.4	x	9.8	44
15mm (10+5)	maximum		x		-		x		-	8.0	x	10.7	29		x		-		x		-	8.0	x	10.7	46
	minimum		x		-		x		-	5.8	x	7.8	18		x		-		x		-	5.7	x	7.6	35
20mm	maximum		x		-		x		-	6.0	x	8.0	18		x		-		x		-	6.0	x	8.0	35
	minimum		x		-		x		-	4.7	x	6.3	12		x		-		x		-	4.7	x	6.2	29
25mm (20+5)	maximum		x		-		x		-	4.8	x	6.4	12		x		-		x		-	4.8	x	6.4	29
	minimum		x		-		x		-	3.9	x	5.2	8		x		-		x		-	3.9	x	5.3	25
30mm (20+10)	maximum		x		-		x		-		x		-		x		-		x		-		x		-
	minimum		x		-		x		-		x		-		x		-		x		-		x		-
35mm (20+10+5)	maximum		x		-		x		-		x		-		x		-		x		-		x		-
	minimum		x		-		x		-		x		-		x		-		x		-		x		-
40mm	maximum		x		-		x		-		x		-		x		-		x		-		x		-
	minimum		x		-		x		-		x		-		x		-		x		-		x		-
45mm (40+5)	maximum		x		-		x		-		x		-		x		-		x		-		x		-
	minimum		x		-		x		-		x		-		x		-		x		-		x		-
50mm (40+10)	maximum		x		-		x		-		x		-		x		-		x		-		x		-
	minimum		x		-		x		-		x		-		x		-		x		-		x		-

Extension Tube Set (Macro Ring) FP-RGST
(0.5mm, 1mm, 5mm, 10mm, 20mm and 40mm)

9 MEGAPIXEL LENS + MACRO RING – 1" FORMAT

W.D. (Working Distance): Object-L1 vertex

V: 9.6 H: 12.8	1" FORMAT					FL-BC1220-9M					FL-BC1618-9M					FL-BC2518-9M					FL-BC3518-9M					FL-BC5024-9M					FL-BC7528-9M				
	Position of Focus Ring	f=12mm F2.0					f=16mm F1.8					f=25mm F1.8					f=35mm F1.8					f=50mm F2.4					f=75mm F2.8								
		V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.						
0.5mm	∞	230.9 x 307.9	276	307.4 x 409.8	497	479.8 x 639.8	1244	671.9 x 895.8	2455	959.9 x 1279.9	5015	1439.9 x 1919.9	11288	minimum	55.5 x 74.0	58	47.8 x 63.7	65	36.2 x 48.3	92	36.3 x 48.5	142	35.1 x 46.8	193	26.0 x 34.7	246									
1.0mm	∞	115.5 x 153.9	131	153.7 x 204.9	241	239.9 x 319.9	620	335.9 x 447.9	1231	479.9 x 639.9	2515	720.0 x 959.9	5664	minimum	44.9 x 59.9	45	41.3 x 55.1	55	33.8 x 45.0	86	34.5 x 46.0	136	33.8 x 45.1	187	25.5 x 34.0	243									
1.5mm (1+0.5)	∞	77.0 x 102.6	83	102.5 x 136.6	156	159.9 x 213.3	412	224.0 x 298.6	823	320.0 x 426.6	1682	480.0 x 640.0	3789	minimum	37.7 x 50.3	35	36.4 x 48.6	46	31.6 x 42.1	80	32.9 x 43.8	129	32.6 x 43.5	181	25.1 x 33.5	239									
5mm	∞	23.1 x 30.8	15	30.7 x 41.0	36	48.0 x 64.0	120	67.2 x 89.6	251	96.0 x 128.0	516	144.0 x 192.0	1165	minimum	17.8 x 23.7	10	19.9 x 26.5	19	21.8 x 29.1	54	24.7 x 32.9	99	26.2 x 34.9	148	22.4 x 29.9	218									
10mm	∞	x	-	15.4 x 20.5	10	24.0 x 32.0	58	33.6 x 44.8	129	48.0 x 64.0	266	72.0 x 96.0	602	minimum	x	-	12.1 x 16.1	6	15.1 x 20.2	36	18.2 x 24.2	74	20.5 x 27.3	119	19.4 x 25.9	194									
15mm (10+5)	∞	x	-	x	-	16.0 x 21.3	37	22.4 x 29.9	88	32.0 x 42.7	182	48.0 x 64.0	415	minimum	x	-	x	-	11.6 x 15.4	26	14.4 x 19.2	60	16.8 x 22.4	100	17.2 x 22.9	176									
20mm	∞	x	-	x	-	12.0 x 16.0	27	16.8 x 22.4	68	24.0 x 32.0	141	36.0 x 48.0	321	minimum	x	-	x	-	9.4 x 12.5	20	11.9 x 15.9	51	14.2 x 19.0	88	15.4 x 20.5	162									
25mm (20+5)	∞	x	-	x	-	9.6 x 12.8	20	13.4 x 17.9	55	19.2 x 25.6	116	28.8 x 38.4	265	minimum	x	-	x	-	7.9 x 10.5	16	10.2 x 13.5	44	12.3 x 16.5	78	13.9 x 18.5	150									
30mm (20+10)	∞	x	-	x	-	8.0 x 10.7	16	11.2 x 14.9	47	16.0 x 21.3	99	24.0 x 32.0	227	minimum	x	-	x	-	6.8 x 9.1	14	8.9 x 11.8	39	10.9 x 14.5	71	12.7 x 16.9	141									
35mm (20+10+5)	∞	x	-	x	-	6.9 x 9.1	13	9.6 x 12.8	41	13.7 x 18.3	87	20.6 x 27.4	200	minimum	x	-	x	-	6.0 x 8.0	11	7.9 x 10.5	36	9.8 x 13.0	65	11.7 x 15.6	133									
40mm	∞	x	-	x	-	6.0 x 8.0	11	8.4 x 11.2	37	12.0 x 16.0	78	18.0 x 24.0	180	minimum	x	-	x	-	5.3 x 7.1	10	7.1 x 9.4	33	8.8 x 11.8	60	10.8 x 14.4	126									
45mm (40+5)	∞	x	-	x	-	5.3 x 7.1	9	7.5 x 10.0	34	10.7 x 14.2	71	16.0 x 21.3	165	minimum	x	-	x	-	4.8 x 6.4	8	6.4 x 8.5	30	8.1 x 10.8	56	10.1 x 13.4	120									
50mm (40+10)	∞	x	-	x	-	4.8 x 6.4	8	6.7 x 9.0	31	9.6 x 12.8	66	14.4 x 19.2	152	minimum	x	-	x	-	4.4 x 5.8	7	5.9 x 7.8	28	7.4 x 9.9	53	9.4 x 12.6	115									

Extension Tube Set (Macro Ring) EX-C6
(0.5mm, 1mm, 5mm, 10mm, 20mm and 40mm)

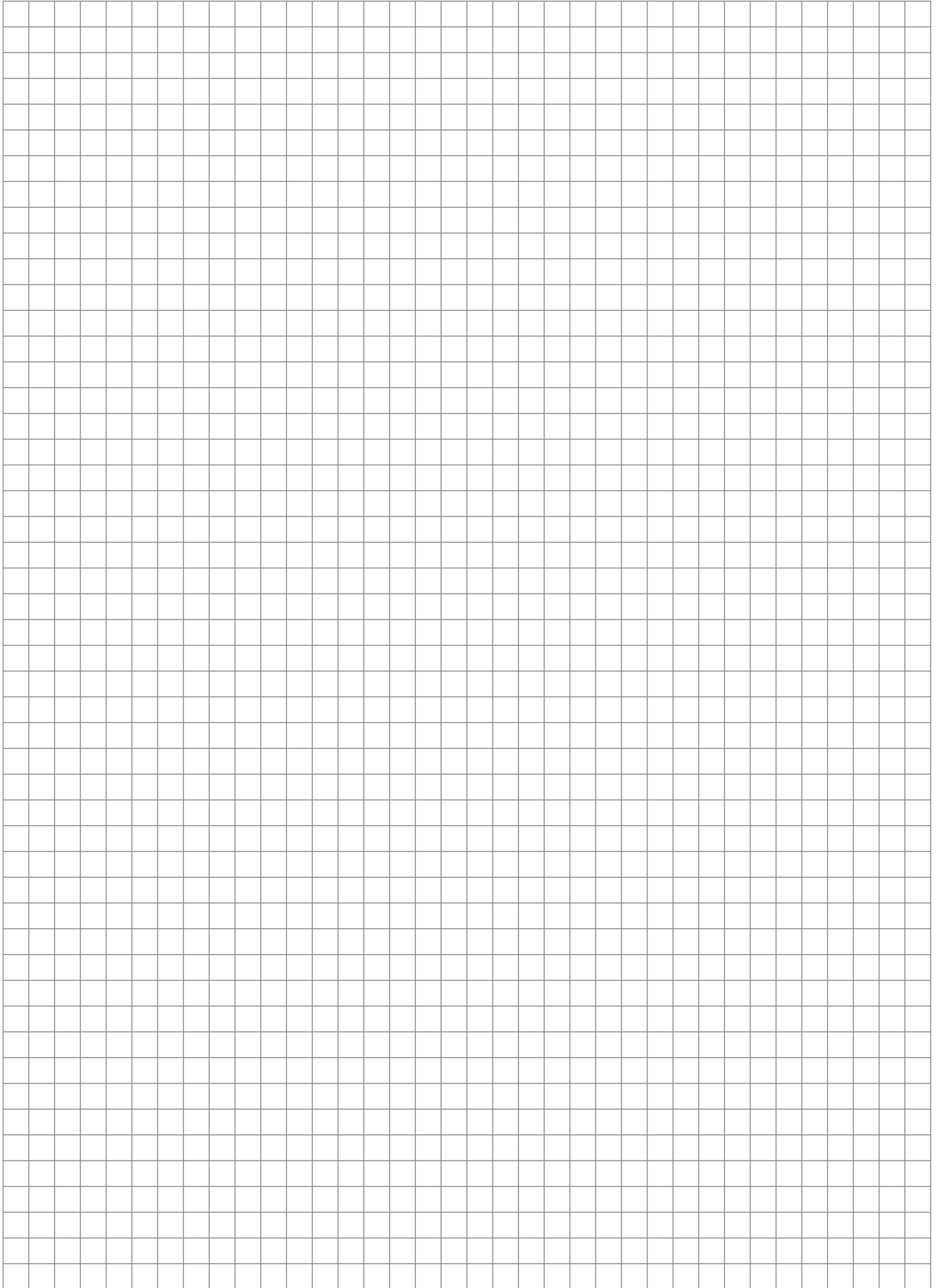
9 MEGAPIXEL(1") / 12 MEGAPIXEL (1.1") LENS + MACRO RING 1.1" FORMAT

W.D. (Working Distance): Object-L1 vertex

1.1" FORMAT		FL-BC1220-9M	FL-BC1618-9M	FL-BC2518-9M	FL-BC3518-9M	FL-BC5024-9M	FL-BC7528-9M						
V: 10.37 H: 14.16	Position of Focus Ring	f=12mm F2.0		f=16mm F1.8		f=25mm F1.8		f=35mm F1.8		f=50mm F2.4		f=75mm F2.8	
		V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.	V x H (mm)	W.D.
0.5mm	∞	249.5 x 340.6	276	332.1 x 453.3	497	518.3 x 707.7	1244	725.8 x 990.9	2455	1037.0 x 1415.7	5015	1555.5 x 2123.7	11288
	minimum	59.9 x 81.8	58	51.6 x 70.4	65	39.2 x 53.5	92	39.3 x 53.6	142	37.9 x 51.7	193	28.1 x 38.3	246
1.0mm	∞	124.7 x 170.3	131	166.0 x 226.7	241	259.2 x 353.8	620	362.9 x 495.5	1231	518.5 x 707.9	2515	777.8 x 1061.8	5664
	minimum	48.5 x 66.2	45	44.6 x 61.0	55	36.5 x 49.8	86	37.3 x 50.9	136	36.5 x 49.9	187	27.6 x 37.7	243
1.5mm (1+0.5)	∞	83.2 x 113.5	83	110.7 x 151.1	156	172.8 x 235.9	412	241.9 x 330.3	823	345.7 x 471.9	1682	518.5 x 707.9	3789
	minimum	40.7 x 55.6	35	39.4 x 53.7	46	34.1 x 46.6	80	35.5 x 48.5	129	35.2 x 48.1	181	27.1 x 37.0	239
5mm	∞	24.9 x 34.1	15	33.2 x 45.3	36	51.8 x 70.8	120	72.6 x 99.1	251	103.7 x 141.6	516	155.6 x 212.4	1165
	minimum	19.2 x 26.2	10	21.5 x 29.4	19	23.6 x 32.2	54	26.6 x 36.4	99	28.3 x 38.7	148	24.2 x 33.1	218
10mm	∞	x	-	16.6 x 22.7	10	25.9 x 35.4	58	36.3 x 49.5	129	51.8 x 70.8	266	77.8 x 106.2	602
	minimum	x	-	13.0 x 17.8	6	16.3 x 22.3	36	19.6 x 26.8	74	22.1 x 30.2	119	21.0 x 28.7	194
15mm (10+5)	∞	x	-	x	-	17.3 x 23.6	37	24.2 x 33.0	88	34.6 x 47.2	182	51.9 x 70.8	415
	minimum	x	-	x	-	12.5 x 17.1	26	15.5 x 21.2	60	18.1 x 24.7	100	18.5 x 25.3	176
20mm	∞	x	-	x	-	13.0 x 17.7	27	18.1 x 24.8	68	25.9 x 35.4	141	38.9 x 53.1	321
	minimum	x	-	x	-	10.1 x 13.8	20	12.9 x 17.6	51	15.4 x 21.0	88	16.6 x 22.7	162
25mm (20+5)	∞	x	-	x	-	10.4 x 14.2	20	14.5 x 19.8	55	20.7 x 28.3	116	31.1 x 42.5	265
	minimum	x	-	x	-	8.5 x 11.6	16	11.0 x 15.0	44	13.3 x 18.2	78	15.0 x 20.5	150
30mm (20+10)	∞	x	-	x	-	8.6 x 11.8	16	12.1 x 16.5	47	17.3 x 23.6	99	25.9 x 35.4	227
	minimum	x	-	x	-	7.3 x 10.0	14	9.6 x 13.1	39	11.8 x 16.1	71	13.7 x 18.7	141
35mm (20+10+5)	∞	x	-	x	-	7.4 x 10.1	13	10.4 x 14.2	41	14.8 x 20.2	87	22.2 x 30.3	200
	minimum	x	-	x	-	6.4 x 8.8	11	8.5 x 11.6	36	10.5 x 14.4	65	12.6 x 17.2	133
40mm	∞	x	-	x	-	6.5 x 8.8	11	9.1 x 12.4	37	13.0 x 17.7	78	19.4 x 26.5	180
	minimum	x	-	x	-	5.7 x 7.8	10	7.6 x 10.4	33	9.5 x 13.0	60	11.7 x 16.0	126
45mm (40+5)	∞	x	-	x	-	5.8 x 7.9	9	8.1 x 11.0	34	11.5 x 15.7	71	17.3 x 23.6	165
	minimum	x	-	x	-	5.2 x 7.1	8	6.9 x 9.4	30	8.7 x 11.9	56	10.9 x 14.9	120
50mm (40+10)	∞	x	-	x	-	5.2 x 7.1	8	7.3 x 9.9	31	10.4 x 14.2	66	15.6 x 21.2	152
	minimum	x	-	x	-	4.7 x 6.5	7	6.3 x 8.6	28	8.0 x 11.0	53	10.2 x 13.9	115

Extension Tube Set (Macro Ring) FP-RGST (0.5mm, 1mm, 5mm, 10mm, 20mm and 40mm)

NOTES





RICOH Industrial Solutions Inc.

3-2-3, Shin-yokohama Kohoku-ku
Yokohama-shi 222-0033, Kanagawa, Japan

Tel: +81-45-477-1551

Email: sales@rins.ricoh.co.jp

Web: <http://www.rins.ricoh.co.jp/en/>

RICOH
imagine. change.

