MML Fixed Magnification Series

MML-High Resolution 5M Series

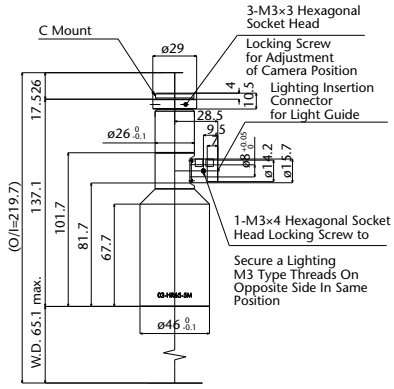
High-resolution models that possess the best contrast and NA of all MML Series. Image acquisition with even higher image quality is realized by combining these lenses with cameras with a high number of pixels, especially emerging 5 megapixel sensors.

- Highest image quality model of the MMLs Series.
- Supports 5 million pixels (3.34μm/pixel)
  * Except for MML4-HR65DVI-5M
- Use of internal reflection light-scattering design and noise reduction filter for hot spot reduction
- Variable iris available for most models
- Very low distortion

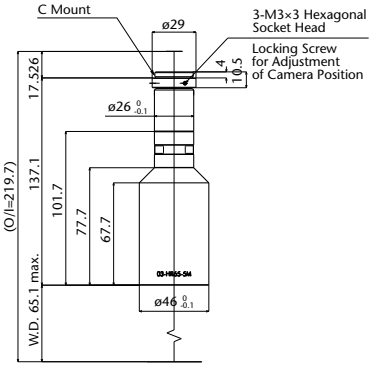
Model	Magnification	WD	Resolution	Depth Of Field	NA	Effective F No	TV Distortion	Largest Compatible CCD	Weight (g)	Mount	Product Code
MML03-HR65D-5M	0.3x	65.1mm	15.7μm	6.2mm	0.021	7	0.002%	2/3"	202	C Mount	A-3133
MML03-HR65-5M	0.3x	65.1mm	15.7μm	6.2mm	0.021	7	0.002%	2/3"	198	C Mount	A-3134
MML05-HR65DVI-5M	0.5x	65.3mm	9.3μm~41μm	2.2mm~9.8mm	0.036~0.008	7~30.6	0.01%	2/3"	210	C Mount	A-3137
MML05-HR65VI-5M	0.5x	65.3mm	9.3μm~41μm	2.2mm~9.8mm	0.036~0.008	7~30.6	0.01%	2/3"	210	C Mount	A-3140
MML1-HR65DVI-5M	1x	65mm	4.7μm~19μm	0.56mm~2.2mm	0.071~0.018	7~28	0.09%	2/3"	140	C Mount	A-3138
MML1-HR65VI-5M	1x	65mm	4.7μm~19μm	0.56mm~2.2mm	0.071~0.018	7~28	0.09%	2/3"	135	C Mount	A-3141
MML2-HR65DVI-5M	2x	65mm	2.4μm~15μm	0.14mm~0.9mm	0.139~0.022	7~45	0.006%	2/3"	200	C Mount	A-3139
MML2-HR65VI-5M	2x	65mm	2.4μm~15μm	0.14mm~0.9mm	0.139~0.022	7~45	0.006%	2/3"	190	C Mount	A-3142
MML3-HR65DVI-5M	3x	65mm	2.1μm~10.5μm	0.085mm~0.42mm	0.157~0.032	9.6~47.5	0.004%	2/3"	280	C Mount	A-3156
MML3-HR65VI-5M	3x	65mm	2.1μm~10.5μm	0.085mm~0.42mm	0.157~0.032	9.6~47.5	0.004%	2/3"	275	C Mount	A-3158
MML4-HR65DVI-5M	4x	65mm	2μm~8.2μm	0.06mm~0.24mm	0.167~0.041	12.1~48.6	0.007%	2/3"	290	C Mount	A-3157
MML4-HR65VI-5M	4x	65mm	2μm~8.2μm	0.06mm~0.24mm	0.167~0.041	12.1~48.6	0.007%	2/3"	285	C Mount	A-3159
MML014-HR110D-5M	0.14x	110mm	19.2μm	16.4mm	0.018	4	0.001%	2/3"		C Mount	A-3165
MML03-HR110D-5M	0.3x	110mm	15.7μm	6.2mm	0.021	7	0.003%	2/3"	212	C Mount	A-3135
MML03-HR110-5M	0.3x	110mm	15.7μm	6.2mm	0.021	7	0.003%	2/3"	209	C Mount	A-3136

*Information in this catalog is given for condition when the aperture is open

MML03-HR65D-5M



MML03-HR65-5M



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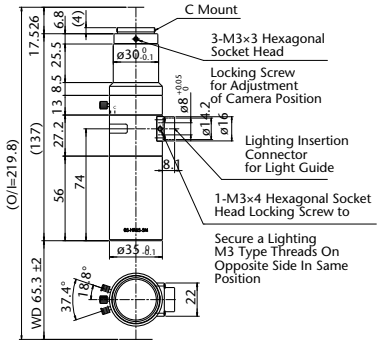

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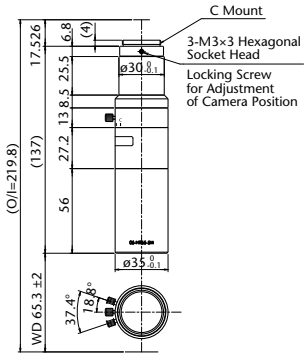

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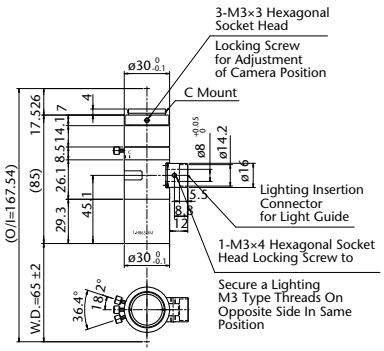

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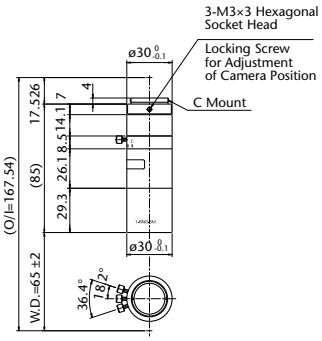

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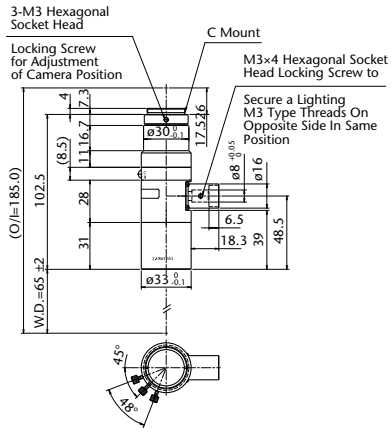

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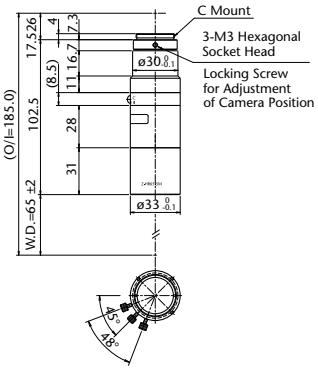

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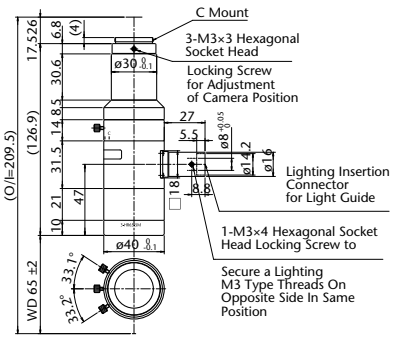

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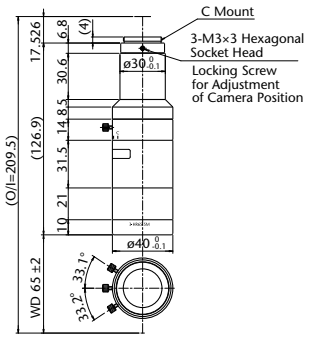

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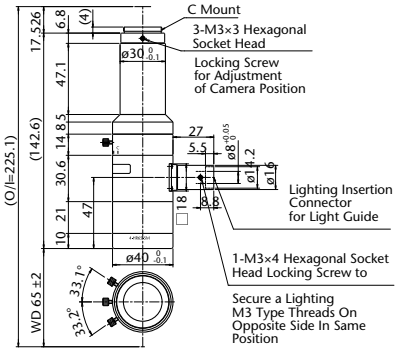

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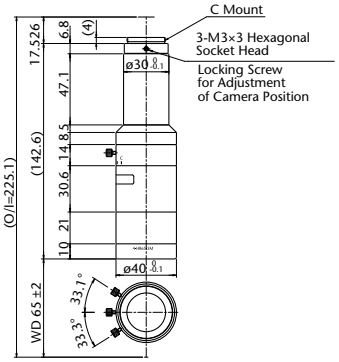
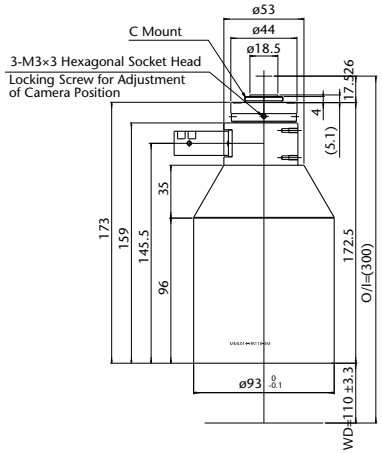
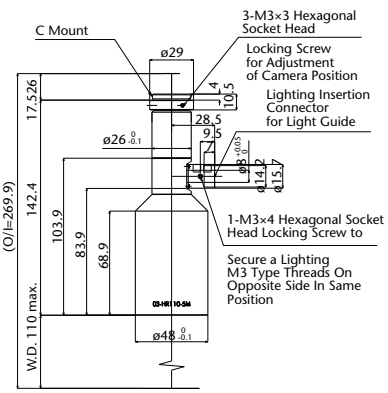


MML014-HR110D-5M



MML03-HR110D-5M



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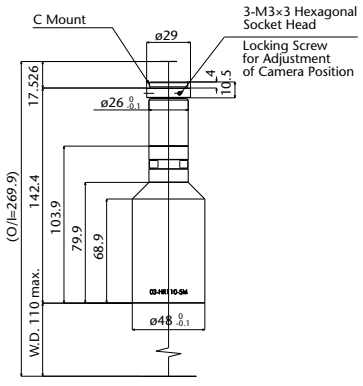
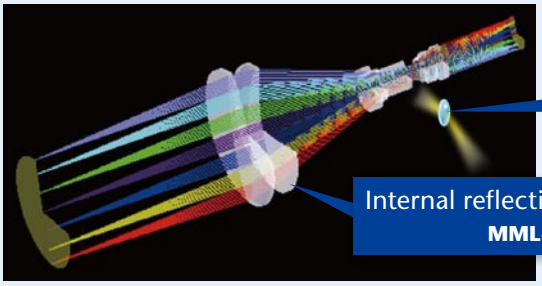


Provisions made for coaxial illumination hot spots seen with low magnification

patent pending



Equipped with a noise reduction filter
Cuts long wavelengths
MML03-HR65D 5M / MML03-HR110D 5M

Internal reflection light-scattering design
MML-HR 5M (All models)

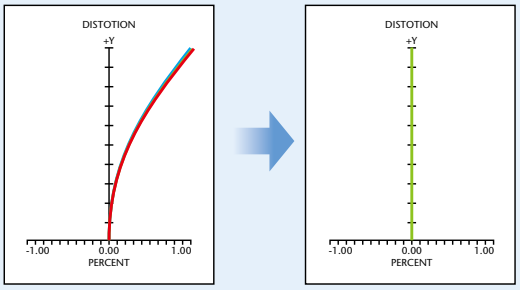
Conventional Design Lens

MML-HR 5M Series

Please note that although the lens is structured to suppress hot spots, hot spots will occur for mat surface work.

Extremely Low Distortion

The pursuit of high resolution with no aberration has resulted in the elimination of image bending. This means that it is no longer necessary to consider distortion offsets.

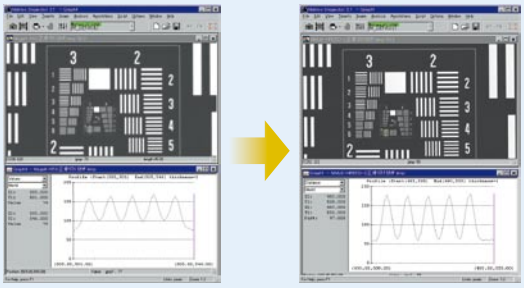


Conventional MML

MML-HR & MML-ST

High Contrast

Contrast improvement has enabled image recognition with greater emphasis on the black and white shading. By converting the resolution chart image to binary form and then graphing and comparing the brightness levels, the MML-HR greatly emphasizes the difference in brightness between black and white object features when compared to our prior Mega MML.



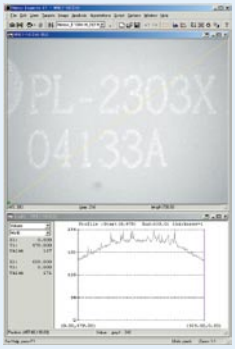
Conventional MML

MML-HR & MML-ST

Illumination Uniformity

For object recognition on a matte surface with coaxial illumination, only a small amount of light is reflected from the surface requiring the coaxial light intensity to be increased. When this is done, however, the brightness in the center of the image increases due to reflection in the coaxial illumination lensing. The ST and HR Series solve this problem through a hot spot reduction technique that vastly reduces the reflection from the lens. This improves the uniformity of coaxial illumination for even matte surfaces.

Below, OCR using coaxial illumination was performed on a rough, microcomputer chip surface. The MML-ST/HR brightness graph shows a reduction in the variation between the brightness in the center and periphery of the FOV which can also be seen in the sample images.



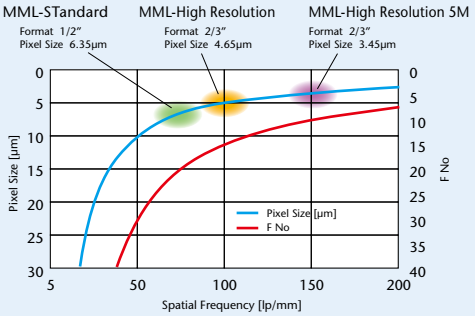
Conventional MML

MML-HR & MML-ST

Design Concept

Pixel size, resolution limitation frequency, F No relation

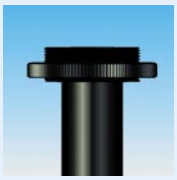
The MML HR/ST Series consist of two types of optical design focuses as well as for CCD camera compatibility.



C Mount

3 Different Mount Types

ø34 Ring Type
MML



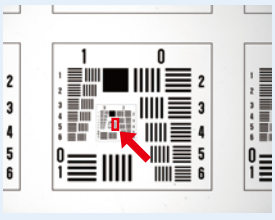
ø30 Ring Type
MML-ST / HR

Set Screw Type
MML-ST

MORITEX provides customized responses to requests for modifications of mounts and special mounts.

Image Comparison for MML Series

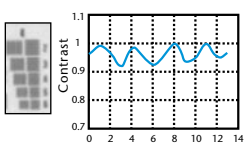
- CCD Camera: 5 million pixels, 3.45µm/pixel
- Lens: Optical magnification 2x WD65 mm
- Test Chart : Resolution 5.563µm (resolving power 179.6 lp/mm)



Field of view 4.4mm

MML-ST Series

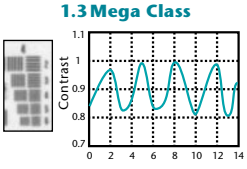
VGA Class



MML2-ST65D

MML-HR Series

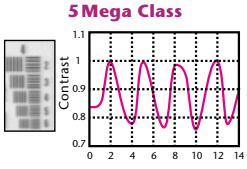
1.3 Mega Class



MML2-HR65D

MML-HR 5M Series

5 Mega Class



MML2-HR65D-5M