

MORITEX high quality telecentric lenses have become the industry standard for semiconductor, FPD, and other electronics manufacturing applications that require machine vision for recognition, mounting, alignment, or inspection. Our lenses enable high contrast, high resolution and low distortion imaging with optional integrated coaxial illumination that utilizes our proprietary hot spot reduction techniques. Catalog specifications alone cannot convey the high level of MORITEX lens quality.



SOD-X Series

SOD-X Series

High Magnification Machine Micro Lens
SOD-10X / 20X-VI

The cutting-edge SOD-X Series consists of a unique set of multifunctional telecentric lenses designed with high NA, high magnification, and integrated coaxial illumination while providing a long working distance. They allow for high resolution imaging never seen before in a machine vision lens.



MML-High Resolution 5M
MML-HR 5M Series

MML Series

Fixed Magnification Series
MML-High Resolution 5M Series
MML-High Resolution Series
MML-Standard Series
MML Series

For Use with Compact Camera
MML-ST-CM Series

For Use with Near-Infrared
MML-NIR Series



MML-High Resolution
MML-HR Series



MML-Standard
MML-ST Series

Essential in alignment, gauging, and inspection applications, the Machine Micro Lens (MML) Series are the highest quality fixed magnification, compact telecentric lenses available. The Standard (ST), High Resolution (HR), and 5 Megapixel (HR 5M) Series offer solutions for a wide-range of machine vision systems including the NIR light range.



MML-Zoom Lens Series

MML-Zoom Lens Series

High-Performance Low Magnification Zoom Lens

ML-Z0220D

Manual Click Zoom Lens

ML-Z0315D

High Resolution Zoom Lens

ML-Z07545HR Series

Standard Zoom Lens

ML-Z07545 Series

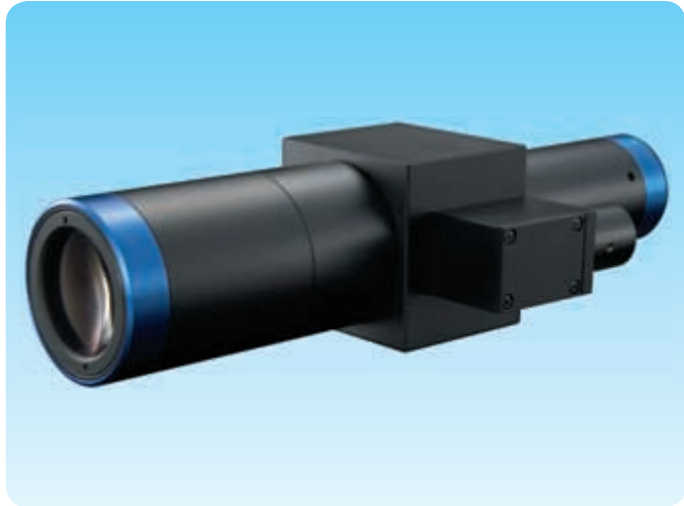
This telecentric zoom lens series is used for high performance inspection and object recognition when a wide range of FOV and long WD are required. The ML-Z and ML-Z HR Series offer integrated coaxial illumination, adapter lenses, and motorized zoom function options.

High Magnification Machine Micro Lens

Super Optical Device — SOD-10X

The SOD-10X is the first telecentric machine vision lens that we introduced with the resolution to rival microscope objectives. The long WD and high NA have made it indispensable for high magnification alignment & inspection applications of 10x or greater.

High performance rear converters allow for magnifications of 15x & 20x to be achieved without changing the working distance allowing microscope type performance in a relatively compact package.



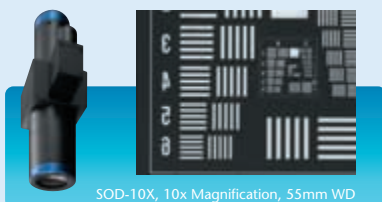
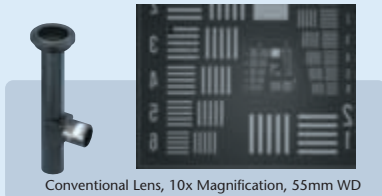
- 10x optical magnification
- Capable of 15x and 20x with rear converter lenses
- High NA of 0.23
- High resolution, 1.5 μ m
- Compact, integrated design

1

Even Better Images

High Resolution and NA

Achievement of high resolution that is beyond comparison with conventional machine vision lenses.

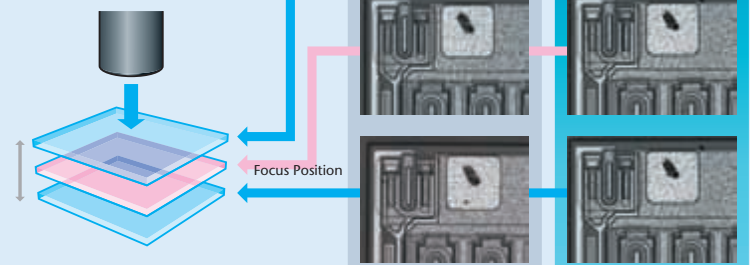


2

Wide Focus Range

Deep Depth of Field Telecentric Optical System

A high resolution equivalent to an objective lens with even longer depth of field has been sought after and now there is a telecentric optical system that has been implemented to widen the range of focus when viewing objects with a CCD camera.



NEW High Magnification Machine Micro Lens

Super Optical Device—SOD-20X-VI

This revolutionary 20x magnification SOD series model has a high NA & resolution that put it in the microscope objective lens class. In addition, it boasts a long WD of 37.5 mm that provides you with additional space to install Illumination and motion, handling, & transfer systems. The all-in-one machine vision lens has a compact body with an integrated coaxial epi-illumination also saving space & improving on-axis light quality.

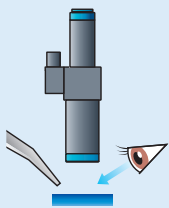


- 20x optical magnification
- Capable of 30x and 40x with rear converter lenses
- High NA of 0.35
- High resolution, 1µm
- Variable iris

3 Ease of Use **Long WD**

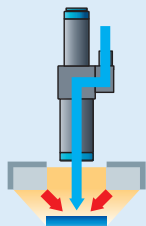
Improved ease of use through longer WD (working distance) while maintaining high resolution.

Sufficient space for tooling and pick-up tools has been provided allowing the performance of operations thought to be impossible with conventional lenses. Operating position and work status can be confirmed by eye resulting in a reduction of operating errors.



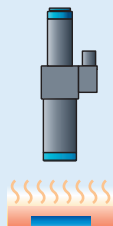
Establishment of operating space
Confirmation of operation status and position possible by eye

Opens the possibility of using not only coaxial but ring and various other types of illumination. This increase in lighting options allows for the imaging of objects previously difficult to view and resolve.



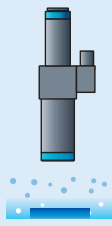
Oblique illumination is possible

Recognition is possible at a location with necessary separation from heat sources. Alignment and inspection are also possible during thermo compression bonding.



Separation from heat source

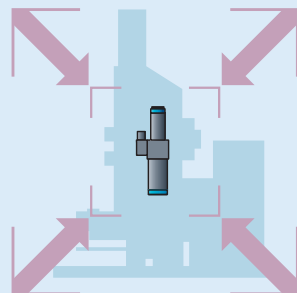
Observation can be performed without any effects from water, oil, and foreign objects generated or moved during processing.



Use in environments where substances such as water & oil are disturbed

4 Compact

Compact design makes it possible to downsize peripheral parts and machinery.



MML Series

Essential in alignment, gauging, and inspection applications, the Machine Micro Lens (MML) Series are the highest quality fixed magnification, compact telecentric lenses available. The Standard (ST), High Resolution (HR), and 5 Megapixel (HR 5M) Series offer solutions for a wide-range of machine vision systems including the NIR light range.

MML-High Resolution 5M MML-HR 5M Series

Top quality product types that boast the best contrast and NA among the entire MML Series. The highest possible image quality can be obtained in combination with high pixel count cameras such as the increasingly popular 5 mega pixel sensors. Various models also include iris control.



MML-High Resolution MML-HR Series

High performance MML Series models designed for cameras with 1.3 million pixels and up (i.e. ~4.65 microns/pixel) with relatively small barrel diameters.



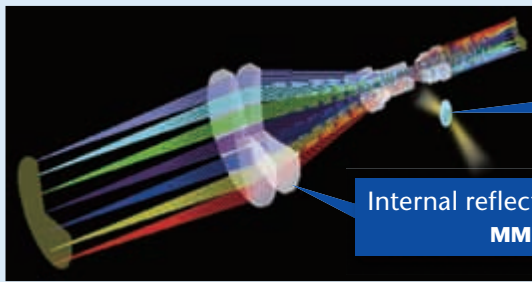
MML-Standard MML-ST Series

This series offers the highest level of optical performance when coupled with 410 thousand pixel cameras. Compact (\varnothing 16mm) standard models with long DOF (Depth of Field) design.



Provisions made to reduce coaxial illumination hot spots seen in low magnification lenses

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



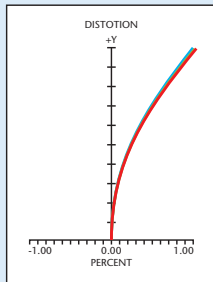
MML-HR 5M Series



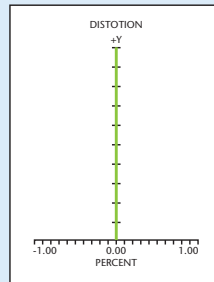
Please note that although the lens is structured to suppress hot spots, hot spots will occur for mat surface work.

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.



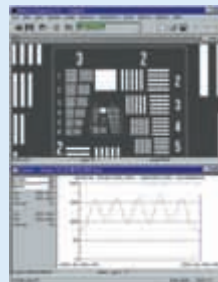
Conventional MML



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

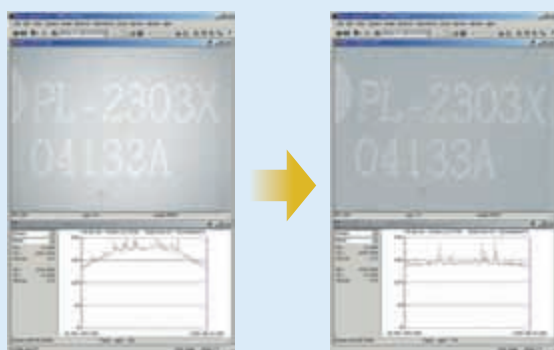


MML-HR & MML-ST

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.



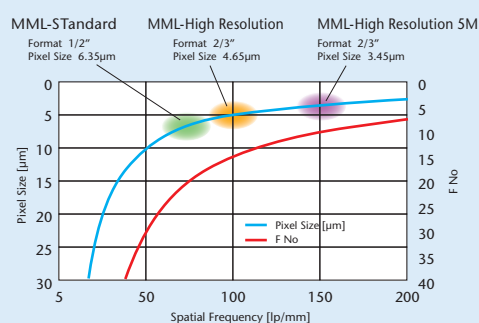
Conventional MML

MML-HR & MML-ST

Design Concept

Pixel size, resolution limitation frequency, F No relation

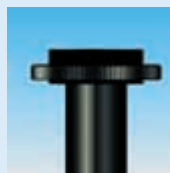
The MML HR/ST Series consist of three types of optical design focuses as well as for CCD camera compatibility.



C Mount

3 Different Mount Types

ø34 Ring Type
MML



ø30 Ring Type
MML-ST / HR



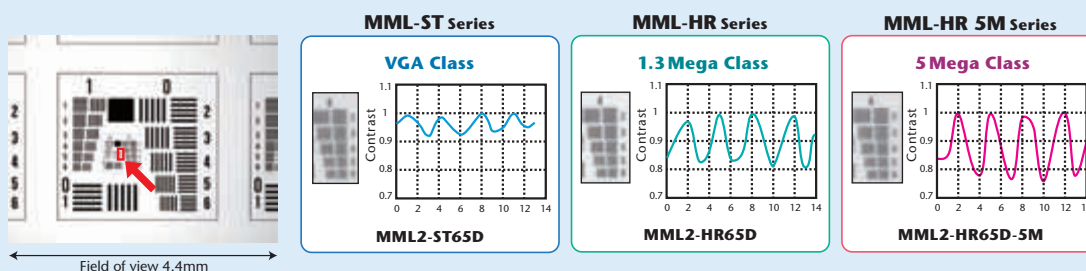
Set Screw Type
MML-ST / HR



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)



MML Fixed Magnification Series

MML-High Resolution 5M Series

MML Fixed Magnification Series

MML-HR 5M

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.

**NEW MML014-HR110D-5M**

- Highest image quality model of the MMLs Series.
- Supports 5 million pixels (3.34 μ m/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	Optical Distortion	Largest Compatible CCD	Weight (g)	Mount	Product Code
MML03-HR65D-5M	0.3x	65.1mm	15.7 μ m	6.2mm	0.021	7	0.002%	2/3"	202	C Mount	A-3133
MML03-HR65-5M	0.3x	65.1mm	15.7 μ m	6.2mm	0.021	7	0.002%	2/3"	198	C Mount	A-3134
MML05-HR65DVI-5M	0.5x	65.3mm	9.3 μ m~41 μ m	2.2mm~9.8mm	0.036~0.008	7~30.6	0.006%	2/3"	210	C Mount	A-3137
MML05-HR65VI-5M	0.5x	65.3mm	9.3 μ m~41 μ m	2.2mm~9.8mm	0.036~0.008	7~30.6	0.006%	2/3"	210	C Mount	A-3140
MML1-HR65DVI-5M	1x	65mm	4.7 μ m~19 μ m	0.56mm~2.2mm	0.071~0.018	7~28	0.028%	2/3"	140	C Mount	A-3138
MML1-HR65VI-5M	1x	65mm	4.7 μ m~19 μ m	0.56mm~2.2mm	0.071~0.018	7~28	0.028%	2/3"	135	C Mount	A-3141
MML2-HR65DVI-5M	2x	65mm	2.422 μ m~15.25 μ m	0.145mm~0.898mm	0.139~0.022	7.25~44.92	0.035%	2/3"	200	C Mount	A-3139
MML2-HR65VI-5M	2x	65mm	2.422 μ m~15.25 μ m	0.145mm~0.898mm	0.139~0.022	7.25~44.92	0.035%	2/3"	190	C Mount	A-3142
MML3-HR65DVI-5M	3x	65mm	2.1 μ m~10.5 μ m	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	2.1 μ m~10.5 μ m	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	2 μ m~8.2 μ m	0.06mm~0.24mm	0.167~0.041	12.1~48.6	-0.021%	2/3"	290	C Mount	A-3157
MML4-HR65VI-5M	4x	65mm	2 μ m~8.2 μ m	0.06mm~0.24mm	0.167~0.041	12.1~48.6	-0.021%	2/3"	285	C Mount	A-3159
MML014-HR110D-5M	0.14x	110mm	19.2 μ m	16.4mm	0.018	4	0.001%	2/3"	730	C Mount	A-3165
MML03-HR110D-5M	0.3x	110mm	15.7 μ m	6.2mm	0.021	7	0.012%	2/3"	212	C Mount	A-3135
MML03-HR110-5M	0.3x	110mm	15.7 μ m	6.2mm	0.021	7	0.012%	2/3"	209	C Mount	A-3136



MML-High Resolution

MML-HR Series

MML Fixed Magnification Series

MML-HR

The MML-HR Series consists of highly versatile models that support mega pixel cameras with 1.3 million pixels or more (4.65 μ m/pixel).

The entire lineup features a high resolution and contrast design that realizes amazingly high image quality which cannot be shown by numbers alone. This series provides true imaging power in high end inspections and alignment applications.



- Supports mega pixel CCDs, 1.3 million pixels or greater
- High resolution throughout the entire field of view
- High NA and contrast
- Most models compatible with 2/3" or smaller CCD elements

WD65mm

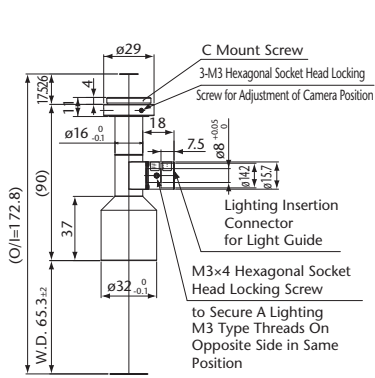


Model	Magnification	WD	Resolution	Depth of Field	NA	Effective F No	Optical Distortion	Largest Compatible CCD	Weight	Mount	Product Code
MML05-HR65D	0.5x	65mm	12.8 μ m	3.04mm	0.026	9.5	-0.001% or less	2/3"	75g	C Mount	A-3029
MML08-HR65D	0.8x	65mm	8.4 μ m	1.2mm	0.04	9.9	0.029%	2/3"	64g	C Mount	A-3128
MML1-HR65D	1.0x	65mm	7.5 μ m	0.88mm	0.045	11	0.043%	2/3"	58g	C Mount	A-3031
MML1.5-HR65D	1.5x	65mm	5.4 μ m	0.42mm	0.063	12	-0.003%	1/2"	53g	C Mount	A-3032
MML2-HR65D	2.0x	65mm	4.5 μ m	0.27mm	0.074	13.5	0.013%	2/3"	52g	C Mount	A-3033
MML4-HR65D	4.0x	65mm	3 μ m	0.09mm	0.112	17.9	-0.060%	2/3"	94g	C Mount	A-3034
MML6-HR65D	6.0x	65mm	3 μ m	0.06mm	0.112	26.7	-0.110%	2/3"	102g	C Mount	A-3035
MML4-HR65DVI	4.0x	65mm	3-13.3 μ m	0.09- 0.53mm	0.112	17.9-79.2	0.053%	2/3"	95g	C Mount	A-3094
MML6-HR65DVI	6.0x	65mm	3-13.9 μ m	0.06- 0.58mm	0.112	26.7-124	0.005%	2/3"	102g	C Mount	A-3095

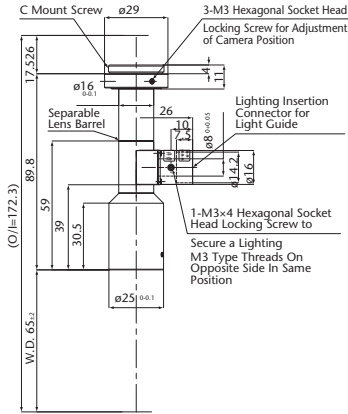
* Resolution values indicate the theoretical resolution at a wavelength of 550nm.

* Depth of field is calculated assuming a horizontal 240TV resolution using a 1/2" CCD camera. (Permissible circle of confusion on the image-formation side: 40 μ m)

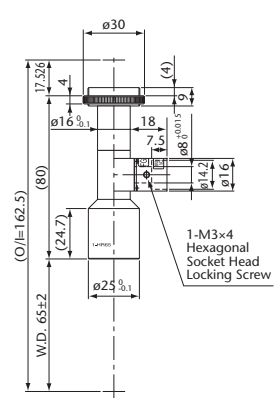
MML05-HR65D



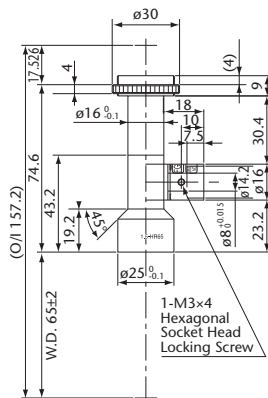
MML08-HR65D



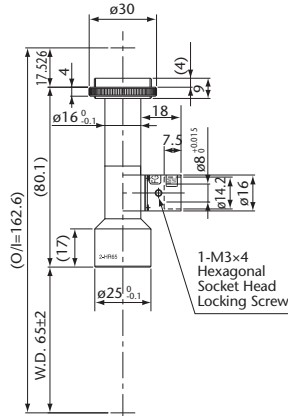
MML1-HR65D



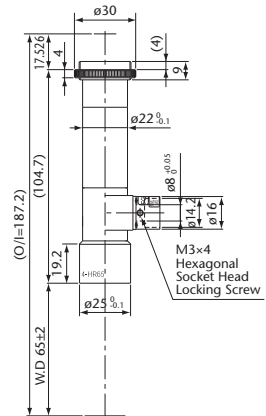
MML1.5-HR65D



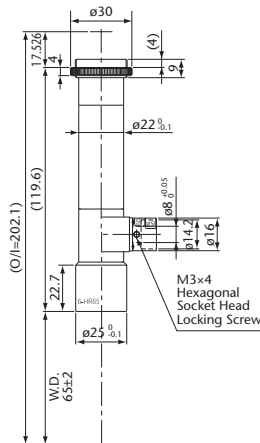
MML2-HR65D



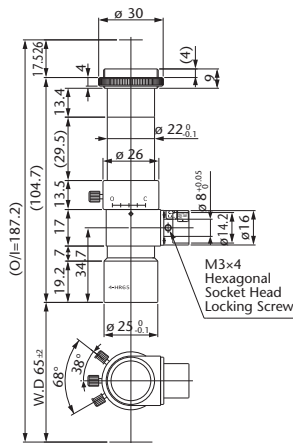
MML4-HR65D



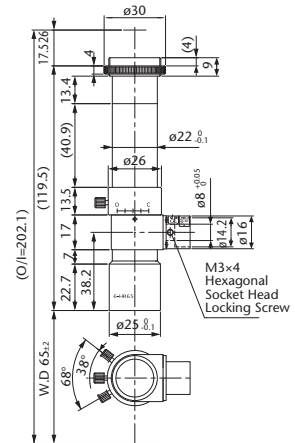
MML6-HR65D



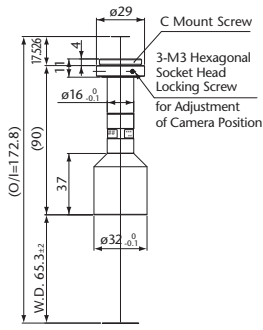
MML4-HR65DVI



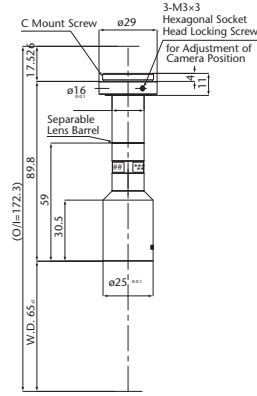
MML6-HR65DVI



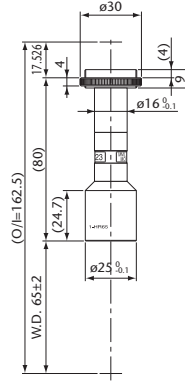
MML05-HR65



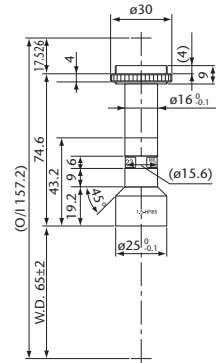
MML08-HR65



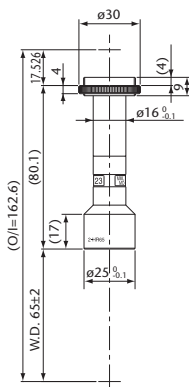
MML1-HR65



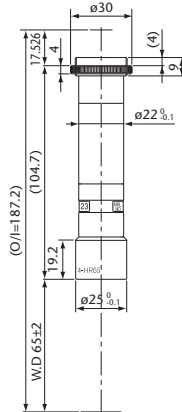
MML1.5-HR65



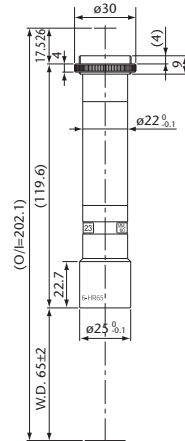
MML2-HR65



MML4-HR65



MML6-HR65



Model	Magnification	WD	Resolution	Depth of Field	NA	Effective F No	Optical Distortion	Largest Compatible CCD	Weight	Mount	Product Code
MML05-HR65	0.5x	65mm	12.8µm	3.04mm	0.026	9.5	-0.001%	2/3"	70g	C Mount	A-3044
MML08-HR65	0.8x	65mm	8.4µm	1.2mm	0.04	9.9	0.029%	2/3"	60g	C Mount	A-3129
MML1-HR65	1.0x	65mm	7.5µm	0.88mm	0.045	11	0.043%	2/3"	50g	C Mount	A-3045
MML1.5-HR65	1.5x	65mm	5.4µm	0.42mm	0.063	12	-0.003%	1/2"	46g	C Mount	A-3046
MML2-HR65	2.0x	65mm	4.5µm	0.27mm	0.074	13.5	0.013%	2/3"	46g	C Mount	A-3047
MML4-HR65	4.0x	65mm	3µm	0.09mm	0.112	17.9	-0.060%	2/3"	86g	C Mount	A-3048
MML6-HR65	6.0x	65mm	3µm	0.06mm	0.112	26.7	-0.110%	2/3"	94g	C Mount	A-3049

* Resolution values indicate the theoretical resolution at a wavelength of 550nm.

* Depth of field is calculated assuming a horizontal 240TV resolution using a 1/2" CCD camera. (Permissible circle of confusion on the image-formation side: 40µm)



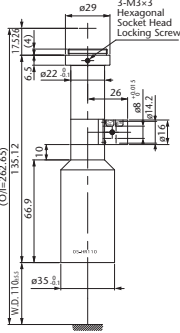
MML-PL25HR

- Dedicated 90° prism for MML-HR. See page L-40 for details.

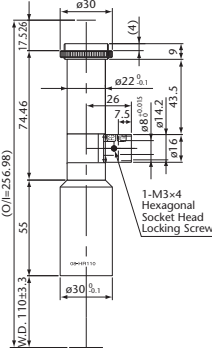


WD110mm

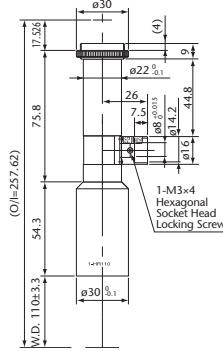
MML05-HR110D



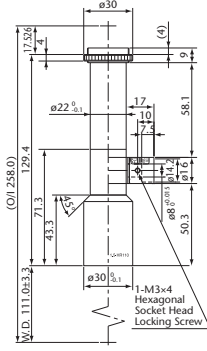
MML08-HR110D



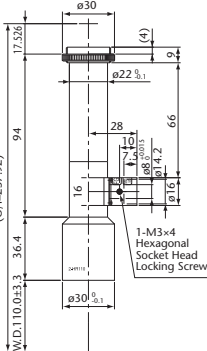
MML1-HR110D



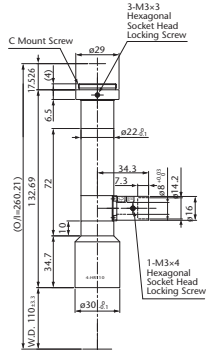
MML1.5-HR110D



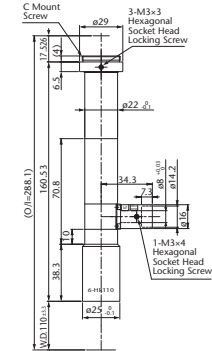
MML2-HR110D



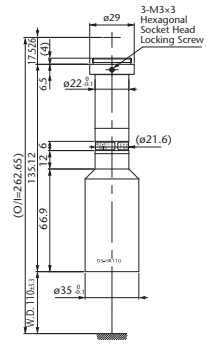
MML4-HR110D



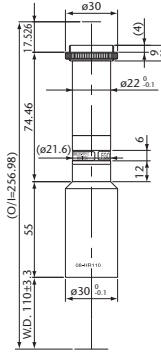
MML6-HR110D



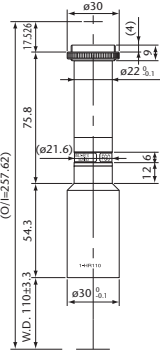
MML05-HR110



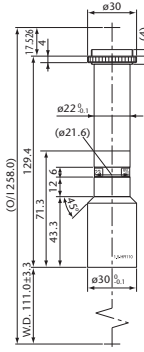
MML08-HR110



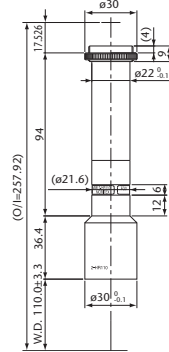
MML1-HR110



MML1.5-HR110



MML2-HR110



Model	Magnification	WD	Resolution	Depth of Field	NA	Effective F No	Optical Distortion	Largest Compatible CCD	Weight	Mount	Product Code
MML05-HR110D	0.5x	110.0mm	12.8µm	3.0mm	0.026	9.5	-0.016%	2/3"	142g	C Mount	A-3037
MML08-HR110D	0.8x	110.0mm	9.3µm	1.4mm	0.036	11	0.005%	2/3"	112g	C Mount	A-3038
MML1-HR110D	1.0x	110.0mm	7.4µm	0.88mm	0.045	11	-0.016%	2/3"	120g	C Mount	A-3039
MML1.5-HR110D	1.5x	111.0mm	5.4µm	0.42mm	0.063	12	0.025%	2/3"	110g	C Mount	A-3040
MML2-HR110D	2.0x	110.0mm	4.5µm	0.27mm	0.074	13.5	0.028%	2/3"	110g	C Mount	A-3041
MML4-HR110D	4.0x	110.0mm	3.7µm	0.11mm	0.09	22.2	-0.025%	2/3"	125g	C Mount	A-3042
MML6-HR110D	6.0x	110.0mm	4.5µm	0.088mm	0.075	39.9	0.011%	2/3"	140g	C Mount	A-3043
MML05-HR110	0.5x	110.0mm	12.8µm	3.0mm	0.026	9.5	-0.016%	2/3"	137g	C Mount	A-3051
MML08-HR110	0.8x	110.0mm	9.3µm	1.4mm	0.036	11	0.005%	2/3"	109g	C Mount	A-3052
MML1-HR110	1.0x	110.0mm	7.4µm	0.88mm	0.045	11	-0.016%	2/3"	116g	C Mount	A-3053
MML1.5-HR110	1.5x	111.0mm	5.4µm	0.42mm	0.063	12	0.025%	2/3"	98g	C Mount	A-3054
MML2-HR110	2.0x	110.0mm	4.5µm	0.27mm	0.074	13.5	0.028%	2/3"	100g	C Mount	A-3055

* Resolution values indicate the theoretical resolution at a wavelength of 550nm.
 * Depth of field is calculated assuming a horizontal 240TV resolution using a 1/2" CCD camera. (Permissible circle of confusion on the image-formation side: 40µm)

MML-Standard

MML-ST Series

Through combination with 410 thousand pixel or greater cameras, the renewed design of the MML-ST Series realizes high level optical performance. These compact models with a diameter of 16mm feature a long depth of field making them ideal for installation in manufacturing equipment.



- Compact design with a lens barrel diameter of $\varnothing 16\sim$
- Long Depth of Field
- Number of pixels: 410 thousand or higher
- CCD Element Size: 1/2" or less in most cases

WD40mm

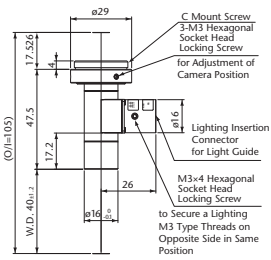
Model	Magnification	WD	Resolution	Depth of Field	NA	Effective F No	Optical Distortion	Largest Compatible CCD	Weight	Mount	Product Code
MML1-ST40D	1.0x	40.0mm	7.2 μ m	0.88mm	0.046	11.0	0.076 or less	1/2"	31g	C Mount	A-3086
MML1.5-ST40D	1.5x	40.1mm	5.6 μ m	0.44mm	0.060	12.5	-0.039 or less	1/2"	31g	C Mount	A-3088
MML2-ST40D	2.0x	40.1mm	4.8 μ m	0.29mm	0.070	14.3	0.003 or less	1/2"	34g	C Mount	A-3090
MML3-ST40D	3.0x	37.9mm	4.8 μ m	0.19mm	0.070	21.3	0.064 or less	1/2"	33g	C Mount	A-3092
MML4-ST40D	4.0x	40.9mm	4.8 μ m	0.14mm	0.070	28.5	-0.038 or less	1/2"	36g	C Mount	A-3077
MML6-ST40D	6.0x	40.3mm	4.8 μ m	0.10mm	0.070	42.8	0.035 or less	1/2"	39g	C Mount	A-3079
MML8-ST40D	8.0x	40.0mm	4.8 μ m	0.07mm	0.070	57.0	0.032 or less	1/2"	42g	C Mount	A-3081
MML1-ST40	1.0x	40.0mm	7.2 μ m	0.88mm	0.046	11.0	0.076 or less	1/2"	26g	C Mount	A-3087
MML1.5-ST40	1.5x	40.1mm	5.6 μ m	0.44mm	0.060	12.5	-0.039 or less	1/2"	26g	C Mount	A-3089
MML2-ST40	2.0x	40.1mm	4.8 μ m	0.29mm	0.070	14.3	0.003 or less	1/2"	29g	C Mount	A-3091
MML3-ST40	3.0x	37.9mm	4.8 μ m	0.19mm	0.070	21.3	0.064 or less	1/2"	28g	C Mount	A-3093
MML4-ST40	4.0x	40.9mm	4.8 μ m	0.14mm	0.070	28.5	-0.038 or less	1/2"	31g	C Mount	A-3078
MML6-ST40	6.0x	40.3mm	4.8 μ m	0.10mm	0.070	42.8	0.035 or less	1/2"	35g	C Mount	A-3080
MML8-ST40	8.0x	40.0mm	4.8 μ m	0.07mm	0.070	57.0	0.032 or less	1/2"	37g	C Mount	A-3082

*Depth of field is calculated assuming a horizontal 240TV resolution using a 1/2" CCD camera. (Permissible circle of confusion on the image-formation side: 40 μ m)

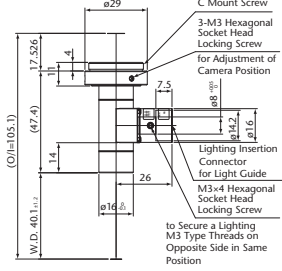
*Resolution values indicate the theoretical resolution at a wavelength of 550nm.

Caution: The WD 40mm series cannot be used with all prism adapter options.

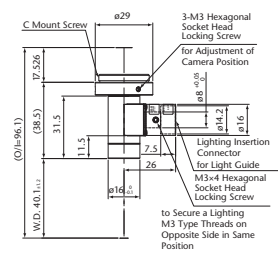
MML1-ST40D



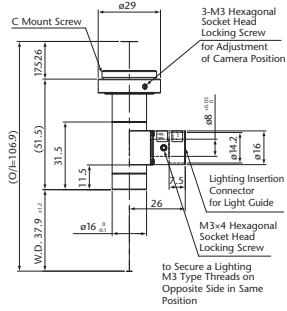
MML1.5-ST40D



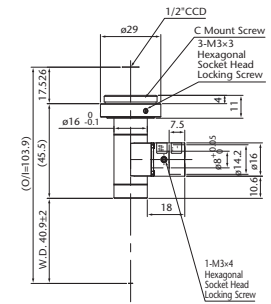
MML2-ST40D



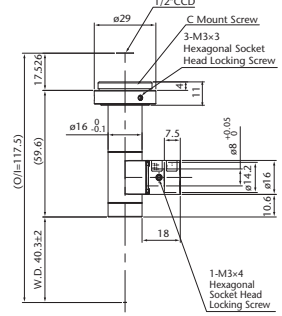
MML3-ST40D



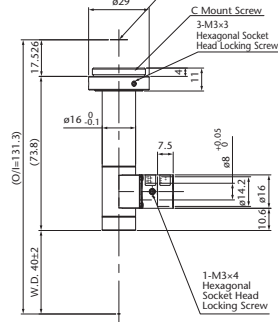
MML4-ST40D



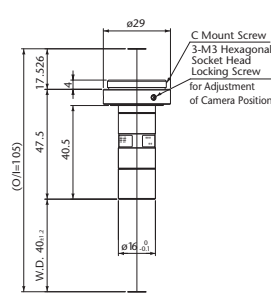
MML6-ST40D



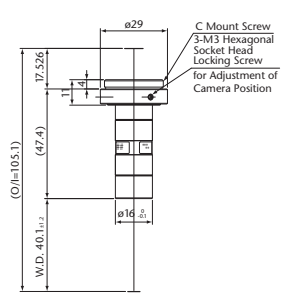
MML8-ST40D



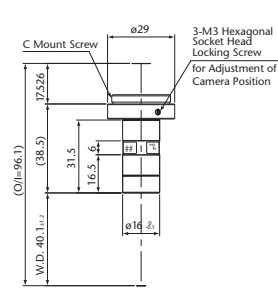
MML1-ST40



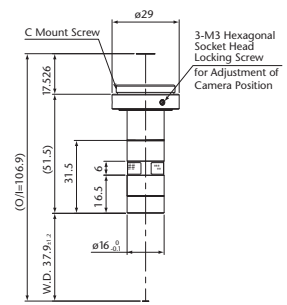
MML1.5-ST40



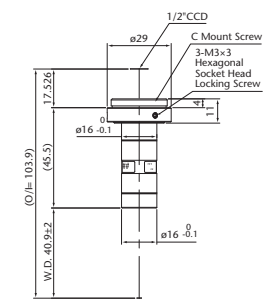
MML2-ST40



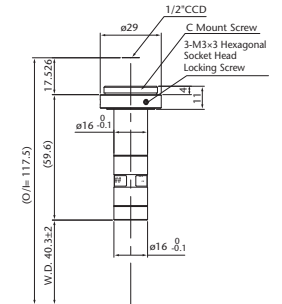
MML3-ST40



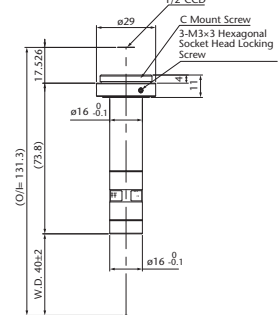
MML4-ST40



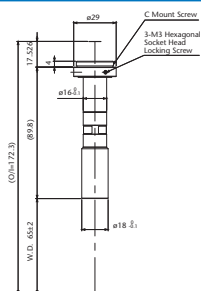
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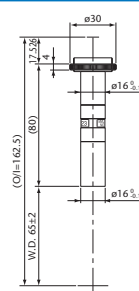
MML8-ST40



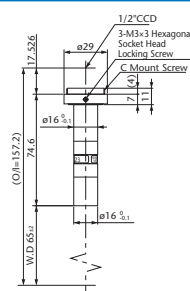
MML08-ST65



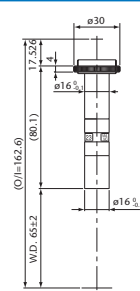
MML1-ST65



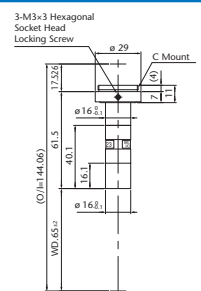
MML1.5-ST65



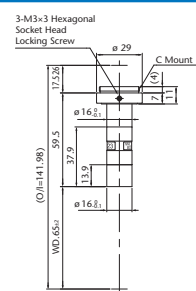
MML2-ST65



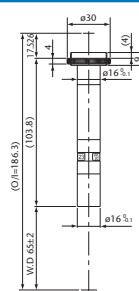
MML2-ST65S



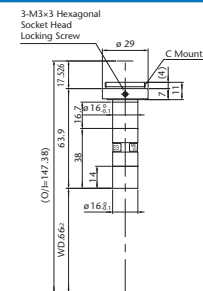
MML3-ST65S



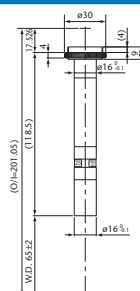
MML4-ST65



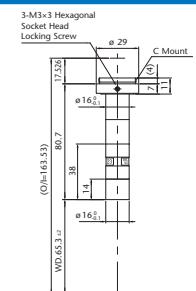
MML4-ST65S



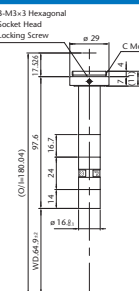
MML6-ST65



MML6-ST65S



MML8-ST65S



Model	Magnification	WD	Resolution	Depth of Field	NA	Effective F No	Optical Distortion	Largest Compatible CCD	Weight	Mount	Product Code
MML08-ST65	x0.8	65mm	12.4µm	1.86mm	0.027	14.9	0.0003%	1/2"	44g	C Mount	A-3085
MML1-ST65	x1	65mm	12.5µm	1.49mm	0.027	18.6	-0.147%	1/2"	38g	C Mount	A-3025
MML1.5-ST65	x1.5	65mm	7µm	0.56mm	0.048	15.5	0.035%	1/2"	36g	C Mount	A-3063
MML2-ST65	x2	65mm	5.8µm	0.35mm	0.057	17.3	-0.037%	1/2"	38g	C Mount	A-3026
MML2-ST65S	x2	65mm	5.6µm	0.35mm	0.06	17.3	0.004%	1/2"	32g	C Mount	A-3105
MML3-ST65S	x3	65mm	4.7µm	0.19mm	0.069	21.9	-0.034%	1/2"	30g	C Mount	A-3106
MML4-ST65	x4	65mm	4.6µm	0.135mm	0.073	27	0.003%	1/2"	50g	C Mount	A-3056
MML4-ST65S	x4	66mm	4.4µm	0.13mm	0.076	25.9	0.006%	1/2"	36g	C Mount	A-3107
MML6-ST65	x6	65mm	4.6µm	0.091mm	0.073	40.9	-0.109%	1/2"	55g	C Mount	A-3057
MML6-ST65S	x6	65.3mm	4.4µm	0.09mm	0.076	39.3	0.003%	1/2"	38g	C Mount	A-3108
MML8-ST65S	x8	64.9mm	4.4µm	0.07mm	0.076	50	0.012%	1/2"	42g	C Mount	A-3081

* Depth of field is calculated assuming a horizontal 240TV resolution using a 1/2" CCD camera. (Permissible circle of confusion on the image-formation side: 40µm)
 * Resolution values indicate the theoretical resolution at a wavelength of 550nm.

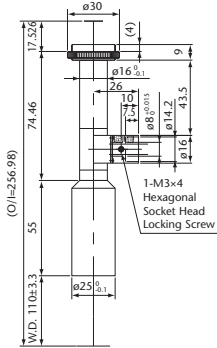
Optical Specifications for Recommended Combinations of MML Models and Rear Converter Lenses

Model	Converter Lenses	Magnification	Resolution	Depth of Field	Effective F No
MML1-ST65D/65	SOD-1.5X	1.5 X	12.5µm	0.99mm	27.9
	SOD-2X	2.0 X	12.5µm	0.74mm	37.2
MML1.5-ST65D/65	SOD-1.5X	2.25X	7µm	0.37mm	23.4
	SOD-2X	3X	7µm	0.28mm	31.3
MML2-ST65D/65	SOD-1.5X	3 X	5.8µm	0.23mm	26
	SOD-2X	4 X	5.8µm	0.17mm	34.6

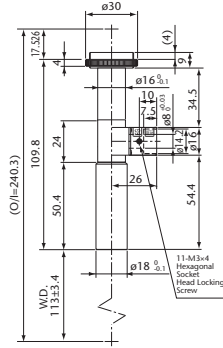
Caution: If combinations other than those recommended are used, dirt and scratches on the rear converter may be noticeable in the resulting images. For this reason, we do not recommend the use in any other setup for optimal performance.

WD110mm

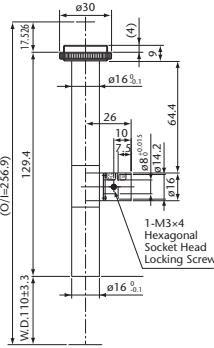
MML08-ST110D



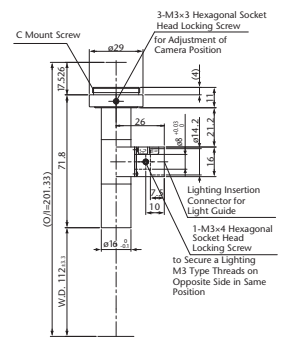
MML1-ST110D



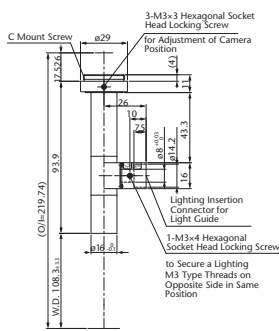
MML2-ST110D



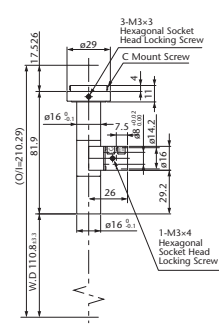
MML2-ST110DS



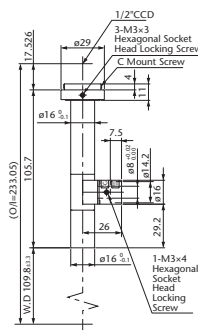
MML3-ST110DS



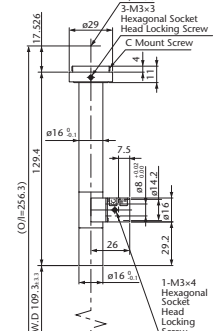
MML4-ST110D



MML6-ST110D



MML8-ST110D

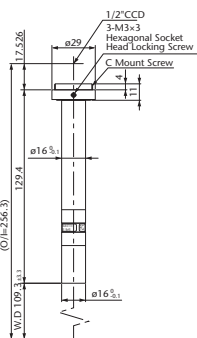


MML Fixed Magnification Series

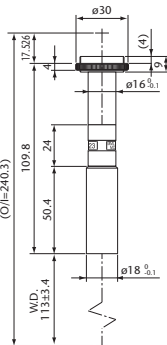
MML-ST

Model	Magnification	WD	Resolution	Depth of Field	NA	Effective F No	Optical Distortion	Largest Compatible CCD	Weight	Mount	Product Code
MML08-ST110D	0.8x	110.0mm	13.5µm	2.00mm	0.024	16.1	0.016%	1/2"	85g	C Mount	A-3002
MML1-ST110D	1x	113.0mm	14µm	1.68mm	0.024	20.9	0.005%	1/2"	58g	C Mount	A-3003
MML2-ST110D	2x	110.0mm	11µm	0.66mm	0.03	33.2	0.031%	1/2"	55g	C Mount	A-3004
MML2-ST110DS	2x	112.0mm	11.2µm	0.66mm	0.03	33.2	0.008%	2/3"	39g	C Mount	A-3109
MML3-ST110DS	3x	108.3mm	11.2µm	0.44mm	0.03	49.7	0.008%	2/3"	43g	C Mount	A-3110
MML4-ST110D	4x	110.8mm	7µm	0.164mm	0.045	44.4	-0.006%	1/2"	43g	C Mount	A-3005
MML6-ST110D	6x	109.8mm	7µm	0.164mm	0.045	66.4	-0.008%	1/2"	48g	C Mount	A-3006
MML8-ST110D	8x	109.3mm	7µm	0.17mm	0.045	88.4	-0.007%	1/2"	54g	C Mount	A-3007

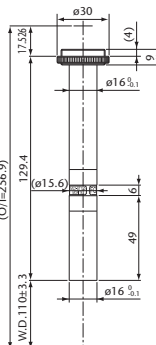
MML08-ST110



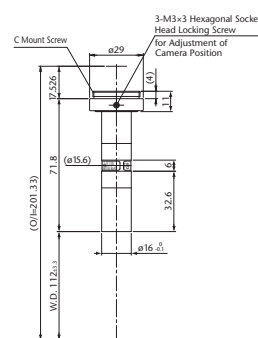
MML1-ST110



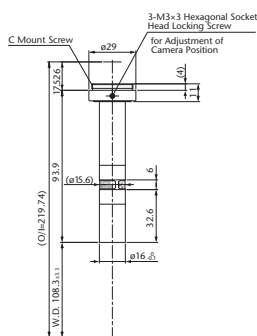
MML2-ST110



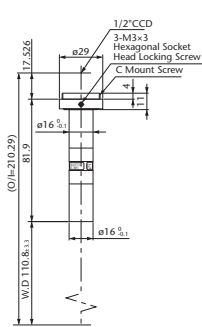
MML2-ST110S



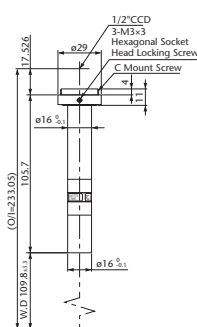
MML3-ST110S



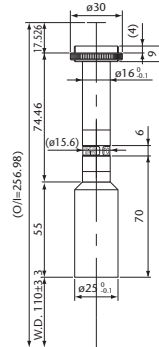
MML4-ST110



MML6-ST110



MML8-ST110



Model	Magnification	WD	Resolution	Depth of Field	NA	Effective F No	Optical Distortion	Largest Compatible CCD	Weight	Mount	Product Code
MML08-ST110	0.8x	110.0mm	13.5μm	2.00mm	0.024	16.1	0.016%	1/2"	78.5g	C Mount	A-3019
MML1-ST110	1x	113.0mm	14μm	1.68mm	0.024	20.9	0.005%	1/2"	50g	C Mount	A-3020
MML2-ST110	2x	110.0mm	11μm	0.66mm	0.03	33.2	0.031%	1/2"	50g	C Mount	A-3021
MML2-ST110S	2x	112.0mm	11.2μm	0.66mm	0.03	33.2	0.008%	2/3"	34g	C Mount	A-3111
MML3-ST110S	3x	108.3mm	11.2μm	0.44mm	0.03	49.7	0.008%	2/3"	37g	C Mount	A-3112
MML4-ST110	4x	110.8mm	7μm	0.164mm	0.045	44.4	-0.006%	1/2"	38g	C Mount	A-3064
MML6-ST110	6x	109.8mm	7μm	0.164mm	0.045	66.4	-0.008%	1/2"	43g	C Mount	A-3065
MML8-ST110	8x	109.3mm	7μm	0.17mm	0.045	88.4	-0.007%	1/2"	49g	C Mount	A-3066

Optical Specifications for Machine Types Recommended for Combination with the Rear Converter

Model	Converter Lenses	Magnification	Resolution	Depth of Field	Effective F No
MML08-ST110D/110	SOD-1.5X	1.2 x	13.5μm	1.34mm	24.2
	SOD-2X	1.6 x	13.5μm	1.00mm	32.2
MML1-ST110D/110	SOD-1.5X	1.5 x	14μm	1.11mm	31.4
	SOD-2X	2.0 x	14μm	0.84mm	41.8
MML2-ST110D/110	SOD-1.5X	3 x	11μm	0.44mm	49.8

* Depth of field is calculated assuming a horizontal 240TV resolution using a 1/2" CCD camera. (Permissible circle of confusion on the image-formation side: 40μm)
 * Resolution values indicate the theoretical resolution at a wavelength of 550nm.

Caution: If combinations other than those recommended are used, dirt and scratches on the rear converter may be noticeable in the resulting images. For this reason, we do not recommend the use in any other setup for optimal performance.

WD300mm

Lenses with a very long working distance of 300mm for are available with optical magnifications of 0.5X, 1X, 3X, & 4X for long stand-off applications. Improved flexibility and ease-of-use is achieved with variable iris control.

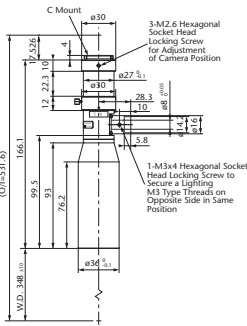
- Magnifications: 0.5x, 1x, 3x, & 4x
- WD=300 mm
- With variable iris of 22.7-C32
- Slim body with external diameter of ø27.



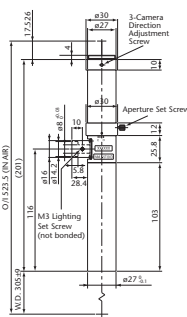
NEW MML05-ST300DVI

NEW

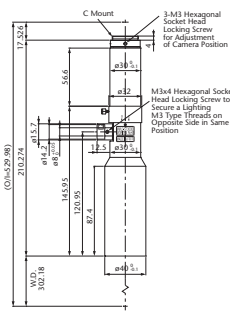
MML05-ST300DVI



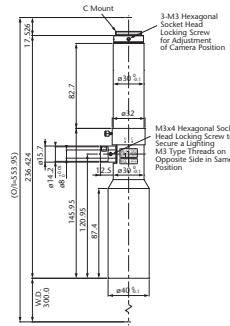
MML1-ST300D



MML3-ST300DVI



MML4-ST300DVI



Model	Magnification	WD	Resolution	Depth Of Field	NA	Effective F No	Optical Distortion	Largest Compatible CCD	Weight	Mount	Product Code
MML05-ST300DVI	0.5x	344.5mm	15.3µm~24.0µm	3.6mm ~ 5.7mm	0.022 ~ 0.014	11.4~17.9	0.06%	1/2"	200g	C Mount	A-3179
MML1-ST300D	1x	305mm	16.6µm~21.5µm	1.98mm ~ 2.56mm	0.020 ~ 0.016	24.72~32	-0.019%	1/2"	150g	C Mount	A-3061
MML3-ST300DVI	3x	302mm	7.5 µm~15 µm	0.3mm ~ 0.65mm	0.045 ~ 0.023	33~66	0.015%	1/2"	310g	C Mount	A-3166
MML4-ST300DVI	4x	300mm	7.5 µm~15 µm	0.3mm ~ 0.65mm	0.045 ~ 0.023	44~88	0.01%	1/2"	320g	C Mount	A-3167

* Resolution values indicate the theoretical resolution at a wavelength of 550nm.

* Depth of field is calculated assuming a horizontal 240TV resolution using a 1/2" CCD camera. (Permissible circle of confusion on the image-formation side: 40µm)

Optical Specifications for Recommended Combinations of MML Models & Rear Converters

Model	Converter Lenses	Magnification	Resolution	Depth of Field	Effective F No
MML1-ST300D	SOD-1.5X	1.5x	15µm	1.21mm	341
	SOD-2X	2.0x	15µm	0.91mm	45.4

Caution: If combinations other than those recommended are used, dirt and scratches on the rear converter may be noticeable in the resulting images. For this reason, we do not recommend the use in any other setup for optimal performance.

For Micro-head Cameras (ø17mm) MML-ST-CM Series

Made-to-order



The MML-ST-CM Series consists of small diameter, lightweight models which save space and achieve a fine pitch when used with micro-head cameras with smaller mounts.

MML

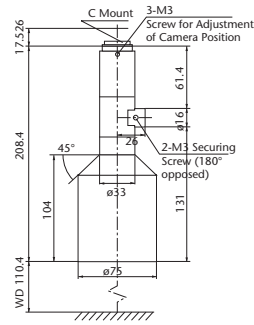
MML Series

MML Fixed Magnification Series

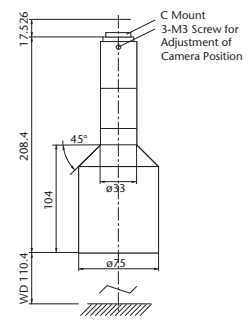
MML

WD110mm

MML018-110D



MML018-110

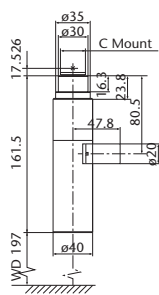


Model	Magnification	WD	Resolution	Depth of Field	NA	Effective F No	Optical Distortion	Largest Compatible CCD	Weight	Mount	Product Code
MML018-110D	0.18x	110.4mm	24µm	15.73mm	0.014	6.4	0.024% or less	2/3"	700g	C Mount	A-0041
MML018-110	0.18x	110.4mm	24µm	15.73mm	0.014	6.4	0.024% or less	2/3"	700g	C Mount	A-0040

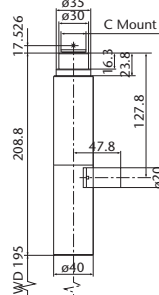
* Depth of field is calculated assuming a horizontal 240TV resolution using a 1/2" CCD camera. (Permissible circle of confusion on the image-formation side: 40µm)
 * Resolution values indicate the theoretical resolution at a wavelength of 550nm.

WD195mm

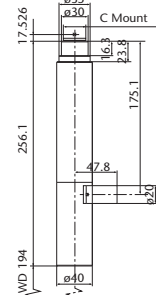
MML4-195D



MML6-195D



MML8-195D



Model	Magnification	WD	Resolution	Depth of Field	NA	Effective F No	Optical Distortion	Largest Compatible CCD	Weight	Mount	Product Code
MML4-195D	4x	197mm	3.97µm	0.12mm	0.084	23.976	0.062 or less	2/3"	480g	C Mount	A-0061
MML6-195D	6x	195mm	3.94µm	0.08mm	0.085	35.736	-0.016 or less	2/3"	490g	C Mount	A-0062
MML8-195D	8x	194mm	3.92µm	0.06mm	0.086	47.431	-0.021 or less	2/3"	500g	C Mount	A-0063

* Resolution values indicate the theoretical resolution at a wavelength of 550nm.
 * Depth of field is calculated assuming a horizontal 240TV resolution using a 1/2" CCD camera. (Permissible circle of confusion on the image-formation side: 40µm)

High-Performance Low Magnification Zoom Lens

ML-Z0220D

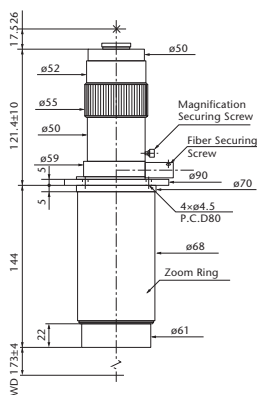
Manual Type

With the largest zoom ratio of any standard telecentric zoom lens, this manual zoom type model covers a wide range of FOVs (Field of Views). It also offers integrated coaxial lighting & filters.



- Magnification range: 0.2x~2x (zoom ratio of 10:1)
- WD=173mm
- Includes a uniform coaxial illumination function that covers the entire view.
- Dedicated, integrated coaxial light guide (super random type), L = 800mm, & color filters are attached (red & green).

ML-Z0220D



Model	Magnification Range	WD	Motor Option	Magnification	Effective F No	Depth of Field	Resolution	Optical Distortion	NA	Largest Compatible CCD	Weight	Mount	Product Code
ML-Z0220D	0.2x~2x (Zoom Ratio of 10:1)	173mm ±4	None Available (Manual Zoom)	at 0.2x at 1x at 2x	3.6 11.5 20	7mm 0.9mm 0.4mm	12μm 7.8μm 7μm	0.03% or less 0.15% or less 0.13% or less	0.03 0.04 0.05	1/2"	1100g	C Mount	A-0110

* Depth of field is calculated assuming a horizontal 240TV resolution using a 1/2" CCD camera. (Permissible circle of confusion on the image-formation side: 40μm)

* Resolution values indicate the theoretical resolution at a wavelength of 550nm.

Manual Click Zoom Lens

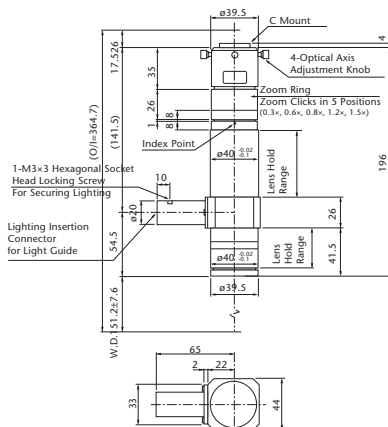
ML-Z0315D



By employing a manual click (detent) feature in the zoom system, a $\pm 0.5\%$ magnification reproducibility is realized. Magnification can be adjusted between five different levels.

- Magnification range: 0.3x~1.5x (in 5 clicks)
- WD=151.2mm
- Includes a uniform coaxial illumination system that covers the entire view

ML-Z0315D



Model	Magnification Range	WD	With/Without Motor	Magnification	Effective F No	Depth of Field	Resolution	Optical Distortion	NA	Largest Compatible CCD	Weight	Mount	Product Code
ML-Z0315D	0.3x~1.5x (Zoom Ratio of 5:1)	151.2mm ±7.6	Without (Manual Click Zoom)	at 0.3x	9.3	8.2mm	20.8μm	-0.09%	0.02	1/2"	520g	C Mount	A-0112
				at 0.6x	11.1	2.4mm	12.4μm	-0.05%	0.03				
				at 0.8x	12.4	1.5mm	10.4μm	-0.02%	0.03				
				at 1.2x	14.7	0.8mm	8.2μm	0.03%	0.04				
				at 1.5x	16.5	0.6mm	7.4μm	0.06%	0.05				

* Depth of field is calculated assuming a horizontal 240TV resolution using a 1/2" CCD camera. (Permissible circle of confusion on the image-formation side: 40μm)
 * Resolution values indicate the theoretical resolution at a wavelength of 550nm.

High Resolution Zoom Lens

ML-Z07545HR Series

High Resolution Zoom Lens

ML-Z07545HR

To exploit the full potential of high pixel count cameras, this unique high NA, high resolution telecentric zoom lens series has a long working distance and wide zoom ratio as well as adjustable iris & focus. Available with an integrated coaxial illumination system as well as other options, this lens series is versatile and ideal for extremely accurate gauging and inspection applications at various field of views (FOVs).



- Zoom Ratio 6:1 0.75x – 4.5x
- Effective F No 8.4 – Variable Aperture
- Focus Range +/- 3mm
- NA 0.12 (4.5x)
- Working Distance = 70.9 mm

Lineup : 3 Models



ML-Z07545HR

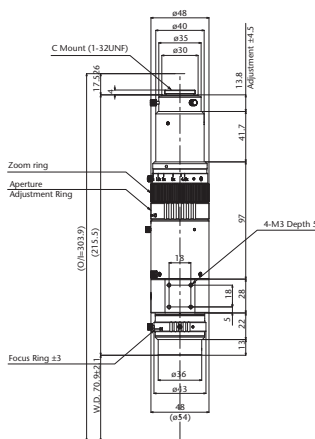


Coaxial Illumination Model D

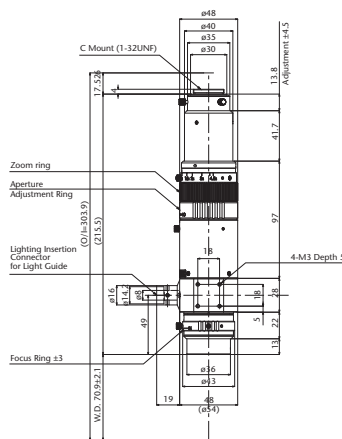


90°, Side View Model-L

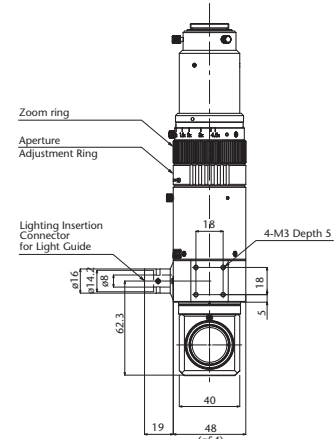
ML-Z07545HR



ML-Z07545HRD



ML-Z07545HRD-L



Model	Magnification Range	WD	Focus Position	Magnification	Effective F No	Depth of Field	Resolution	Optical Distortion	NA	Weight	Largest Compatible CCD	Mount	Product Code
ML-Z07545HR	0.75x ~ 4.5x	70.9mm ±2.1	±3mm	at 0.75x	8.4	1.2mm	7.5µm	-0.02%	0.04	Approx. 650g	1/2"	C Mount	A-3143
ML-Z07545HRD				at 2x	12	0.2mm	4.0µm	0.01%	0.08				A-3144
ML-Z07545HRD-L				at 4.5x	19	0.07mm	2.8µm	0.02%	0.12				A-3145

* Effective F No indicates designed value when iris is open
 * Calculated based on permissible circle of confusion on the image-formation side:40µm

Converter Lens (Optional)

Attach to the end of the lens to change magnification and WD.

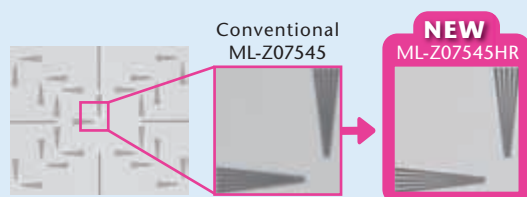


Model	Focus Position	Magnification Range		WD	Product Code
		Low	High		
None	Near	0.75x	~ 4.53x	74mm	—
	Middle	0.75x	~ 4.53x	77mm	
	Far	0.75x	~ 4.53x	80mm	
ML-Z025HR	Near	0.21x	~ 1.30x	201.5mm	A-3146
	Middle	0.19x	~ 1.14x	243mm	
	Far	0.16x	~ 0.97x	299mm	
ML-Z03HR	Near	0.25x	~ 1.52x	170mm	A-3147
	Middle	0.23x	~ 1.36x	200mm	
	Far	0.20x	~ 1.21x	237mm	
ML-Z05HR	Near	0.39x	~ 2.38x	107mm	A-3148
	Middle	0.38x	~ 2.27x	118mm	
	Far	0.36x	~ 2.16x	131mm	
ML-Z075HR	Near	0.57x	~ 3.46x	76.4mm	A-3149
	Middle	0.56x	~ 3.40x	81.7mm	
	Far	0.55x	~ 3.35x	87.1mm	
ML-Z135HR	Near	1.00x	~ 6.05x	37mm	A-3150
	Middle	1.01x	~ 6.12x	38.6mm	
	Far	1.02x	~ 6.17x	40mm	
ML-Z20HR	Near	1.45x	~ 8.80x	17mm	A-3151
	Middle	1.49x	~ 9.02x	18mm	
	Far	1.53x	~ 9.25x	18.8mm	

* Indicated values are based on calculation and not guaranteed values.

* When you used ML-Z025HR,ML-Z03HR,ML-Z05HR,ML-Z075HR,coaxial illumination does not cover entire view.

HR Series Improves Resolution



Standard Zoom Lens

ML-Z07545 Series

Standard Zoom Lens

ML-Z07545

Standard model zoom lens with outstanding functionality. Adjustment of magnification and working distance is possible through combination with optional optics.

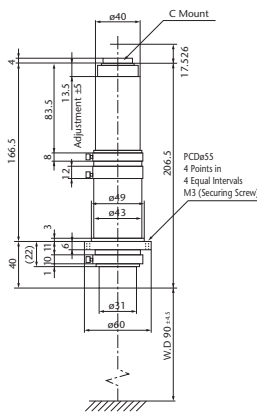


* Motorized zoom solution available.

- Magnification range : 0.75x~4.5x (zoom ratio of 6:1)
- WD=90mm
- Includes a uniform coaxial illumination function that covers the entire view.
- Equipped with built-in focus adjustment function (WD can be adjusted to -6 mm)

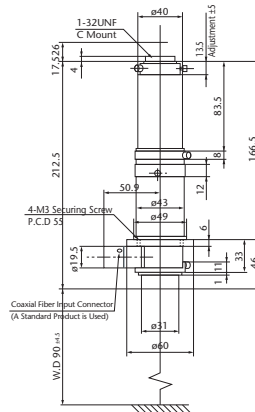
Manual Zoom

ML-Z07545



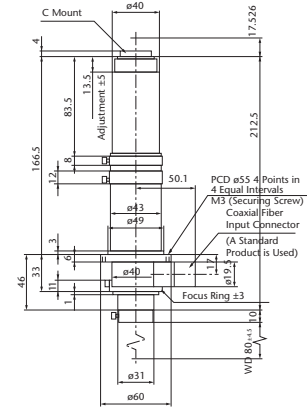
Zoom with Coaxial Illumination

ML-Z07545D



Zoom with Coaxial Illumination & Deflection Function

ML-Z07545D-PL



All models equipped with focus, aperture, and zoom.

Model	Magnification Range	WD (mm)	Focus Position	Motor Option	Magnification	Effective F No	Depth of Field	Resolution	Optical Distortion	NA	Operation Function	Weight	Largest Compatible CCD	Mount	Product Code
ML-Z07545	0.75x~4.5x (Zoom Ratio of 6:1)	90±4.5	0~-6mm	None Available (Manual Zoom)	0.75x time	11	1.6mm	9.9µm	0.02% or less	0.03	All models equipped with focus, aperture, and zoom.	Approx. 440g	1/2"	C Mount	A-0118
ML-Z07545D					2x time	16	0.3mm	5.4µm	0.01% or less	0.06		Approx. 470g			A-0119
ML-Z07545D-PL		80±4.5			4.5x time	28	0.1mm	4.2µm	-0.02% or less	0.08		Approx. 490g			A-0120

* Depth of field is calculated assuming a horizontal 240 TV resolution using a 1/2" CCD camera. (Permissible circle of confusion on the image-formation side: 40µm)
 * Resolution values indicate the theoretical resolution at a wavelength of 550nm.
 * Effective F No indicates a value when the iris is open.

Standard Zoom Lens

Options

Front Converter Lens

ML-Z Series

Attach to end of lens to change magnification and working distance.



Model	Product Code
ML-Z03	A-8025
ML-Z04	A-8026
ML-Z05	A-8027
ML-Z07	A-8028
ML-Z14	A-8029
ML-Z20	A-8030

Model	Focus Position	ML-Z07545			Matching Chart	ML-Z07545D			Matching Chart
		Magnification Range		WD		Magnification Range		WD	
		MIN	MAX						
ML-Z03	Near	0.24x	~ 1.43x	255mm	○	0.23x	~ 1.4x	263mm	▲ Coaxial Illumination Cannot Cover the Entire View
	Middle	0.23x	~ 1.36x	283mm		0.22x	~ 1.33x	292mm	
	Far	0.21x	~ 1.28x	315mm		0.21x	~ 1.25x	325mm	
ML-Z04	Near	0.31x	~ 1.87x	195mm	○	0.31x	~ 1.84x	200mm	▲ Coaxial Illumination Cannot Cover the Entire View
	Middle	0.3x	~ 1.81x	211mm		0.3x	~ 1.81x	216mm	
	Far	0.29x	~ 1.72x	229mm		0.29x	~ 1.72x	234mm	
ML-Z05	Near	0.38x	~ 2.27x	160mm	○	0.37x	~ 2.25x	163mm	▲ Coaxial Illumination Cannot Cover the Entire View
	Middle	0.37x	~ 2.24x	170mm		0.37x	~ 2.21x	174mm	
	Far	0.36x	~ 2.2x	181mm		0.36x	~ 2.17x	185mm	
ML-Z07	Near	0.52x	~ 3.17x	114mm	○	0.52x	~ 3.16x	115mm	▲ Coaxial Illumination Cannot Cover the Entire View
	Middle	0.53x	~ 3.16x	119mm		0.52x	~ 3.16x	121mm	
	Far	0.53x	~ 3.17x	125mm		0.52x	~ 3.16x	126mm	
ML-Z14	Near	1.03x	~ 6.21x	53.4mm	○	1.03x	~ 6.21x	53.8mm	○
	Middle	1.05x	~ 6.33x	54.7mm		1.06x	~ 6.37x	55.1mm	
	Far	1.08x	~ 6.49x	56.1mm		1.08x	~ 6.49x	56.5mm	
ML-Z20	Near	1.45x	~ 8.77x	32.1mm	○	1.46x	~ 8.77x	32.3mm	○
	Middle	1.49x	~ 9.01x	32.7mm		1.5x	~ 9.09x	32.9mm	
	Far	1.54x	~ 9.26x	33.4mm		1.54x	~ 9.35x	33.6mm	

*Magnification and working distance can be altered slightly by turning the focus adjustment ring (N⇔F) Indicated values are based on calculation formulas. Actual measurement may differ depending on tolerance. Cannot be mounted on ML-Z07545D-PL.

Rear Converter Lens

ML-Z2X

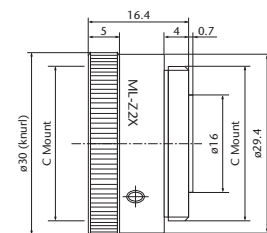
Specially designed 2x rear converter. Mounting this between a lens and CCD camera can double the magnification easily without changing working distance.

*May decrease the resolution.

Model	Product Code
ML-Z2X	A-8036



ML-Z2X

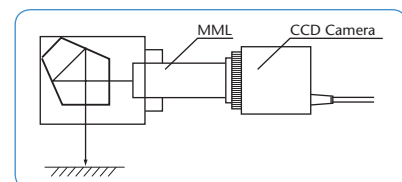
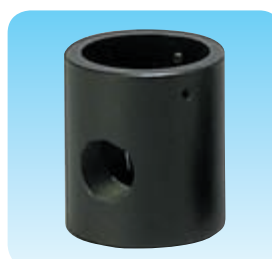


Prism Adapter

MML-P5

90° side view pentaprism type adapter. Monitor images are shown in an upright, normal position by the pentaprism.

Model	Product Code
MML-P5	A-8009



Prism Adapters

Prism adapters make it possible to bend the optical axis at a right angle of 90°, and to perform mark recognition for microscopic objects by modifying the pitch between 2 MML lenses to a fine pitch.

90° Side View Mirror Type Prism

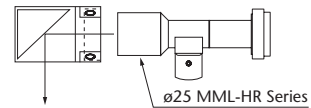
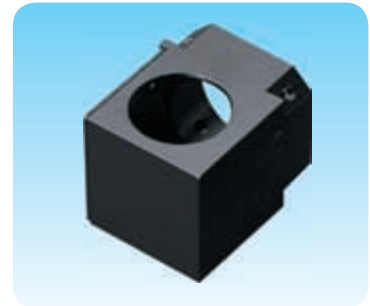
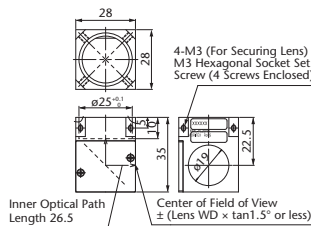
MML-PL25HR / MML-PL

90° Side View Mirror Type Prism for MML-HR MML-PL25HR

When used in optical systems, images may blur or bend due to the strong effects of profile irregularity of prisms. A clear image can be acquired, however, even for HR type lenses with large NA by sorting and removing prisms with high profile irregularity during the QC process.

- Exclusive MML-High Resolution
- Lens barrel diameter $\varnothing 25$
- Length of inner optical path length 26.5mm

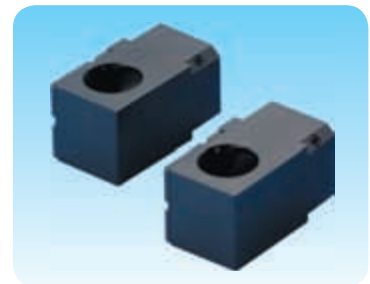
MML-PL25HR



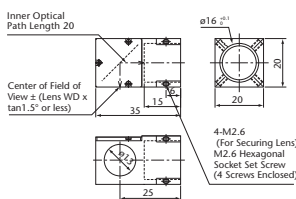
Model	MML-PL25HR
Specifications	90° Side View Mirror for HR For $\varnothing 25$
Product Code	A-8013

90° Side View Mirror Type Prism MML-PL Series

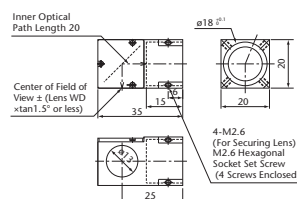
Using these prisms, the optical axis can be bent at a 90° right angle which is useful when space is limited. Resulting images become mirror images.



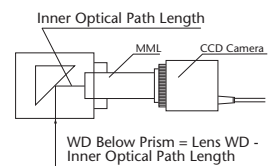
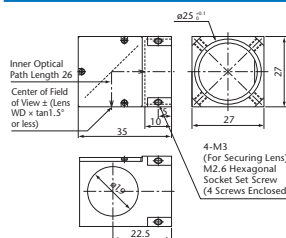
MML-PL16



MML-PL18



MML-PL25

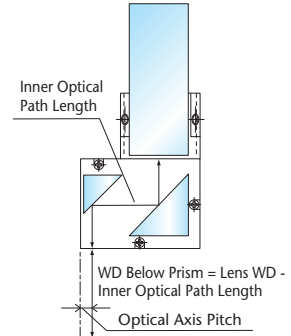
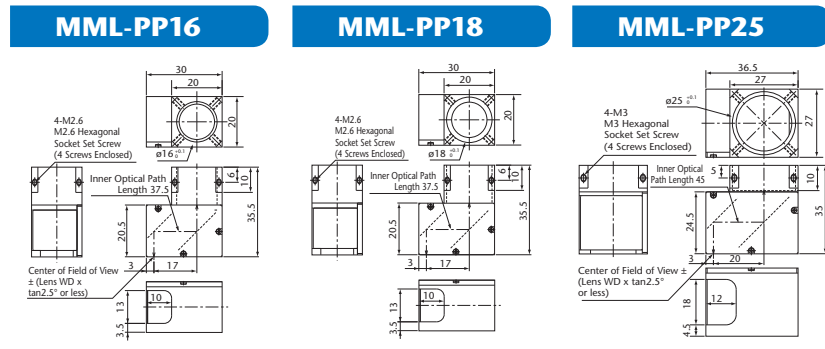


Cover Glass



Model	Compatible Sizes	Inner Optical Path Length	Product Code
MML-PL16	For $\varnothing 16$ Lens	20mm	A-8004
MML-PL18	For $\varnothing 18$ Lens	20mm	A-8005
MML-PL25	For $\varnothing 25$ Lens	26mm	A-8006
MML-GA20	Cover Glass $\varnothing 20$ t=1mm		A-8062

Variable Optical Axis Pitch Type (Pitch 3mm) MML-PP Series



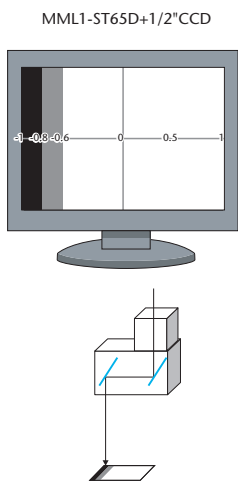
Model	Specification	Inner Optical Path Length	Optical Axis Pitch	Product Code
MML-PP16	For ø16 Lens	37.5mm	3mm	A-8020
MML-PP18	For ø18 Lens	37.5mm	3mm	A-8021
MML-PP25	For ø25 Lens	45mm	3mm	A-8022
MML-GA1411		Cover Glass 14 x 11 t=1mm		A-8063
MML-GA1913		Cover Glass 19 x 13 t=1mm		A-8064



Variable Optical Axis Prism MML-PP Series Field of View Vignetting Chart

Because of its narrow-pitch design, the MML-PP Series is subject to vignetting. Since vignetting varies depending on the object, illumination etc., in the environment that the customer uses, the prism must be tested in the actual machine.
*This is a calculated value only and is not guaranteed. For reference only.

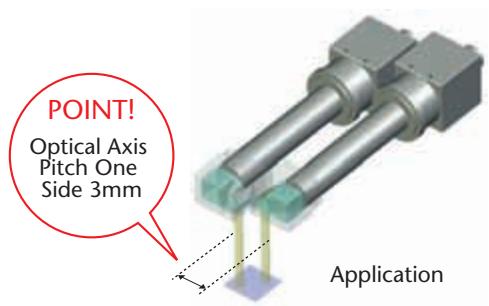
Model	Field of View (Horizontal Field of View Divided into 20 Equal Sections)																						
	CCD	-1	-0.9	-0.8	-0.7	-0.6	-0.5	-0.4	-0.3	-0.2	-0.1	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	
MML08-ST65D/65	1/2"	-100	-100	-100	-100	-82	-50	-18															
	1/3"	-100	-99	-82	-58	-33	-11																
MML1-ST65D/65	1/2"	-100	-100	-92	-70	-43	-18	-1															
	1/3"	-100	-100	-43	-24	-8																	
MML2-ST65D/65	1/2"	-34	-28	-22	-17	-12	-7	-3	-1														
	1/3"	-19	-15	-12	-8	-5	-3	-1															
MML4-ST65D/65	1/2"	-15	-13	-11	-9	-7	-6	-4	-3	-2	-1												
	1/3"	-10	-9	-7	-6	-5	-4	-3	-2	-1	-1												
MML6-ST65D/65	1/2"	-9	-7	-6	-5	-4	-3	-3	-2	-1	-1												
	1/3"	-6	-5	-4	-4	-3	-2	-2	-1	-1													
MML08-ST110D/110	1/2"	-100	-100	-96	-83	-67	-50	-33	-17	-4													
	1/3"	-90	-80	-67	-54	-41	-28	-17	-7														
MML1-ST110D/110	1/2"	-93	-83	-72	-60	-47	-34	-22	-12	-3													
	1/3"	-66	-56	-47	-37	-28	-19	-12	-5	-1													
MML2-ST110D/110	1/2"	-37	-32	-27	-22	-17	-13	-9	-6	-3	-1												
	1/3"	-24	-21	-17	-14	-11	-8	-6	-3	-1													
MML4-ST110D	1/2"	-25	-24	-22	-21	-19	-18	-16	-15	-14	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-2	-1
	1/3"	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-4	-4	-3	
MML6-ST110D	1/2"	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-11	-10	-9	-8	-7	-7	-6	-5	-4	-4	-3	
	1/3"	-17	-17	-16	-15	-15	-14	-13	-13	-12	-11	-11	-10	-9	-9	-8	-8	-7	-6	-6	-5	-5	
MML8-ST110D	1/2"	-17	-16	-16	-15	-14	-14	-13	-12	-12	-11	-10	-10	-9	-9	-8	-7	-7	-6	-6	-5	-5	
	1/3"	-15	-15	-14	-14	-13	-13	-12	-12	-11	-11	-10	-10	-9	-9	-8	-8	-7	-7	-6	-6	-5	
MML1-ST150D/150	1/2"	-70	-65	-60	-54	-49	-43	-38	-32	-27	-22	-17	-13	-9	-5	-2							
	1/3"	-57	-53	-49	-44	-40	-36	-32	-28	-25	-21	-17	-14	-11	-8	-5	-3	-1					
MML08-ST170D/170	1/2"	-88	-81	-74	-66	-58	-50	-42	-34	-26	-19	-12	-6	-2									
	1/3"	-70	-64	-58	-52	-46	-40	-34	-28	-22	-17	-12	-8	-4	-1								



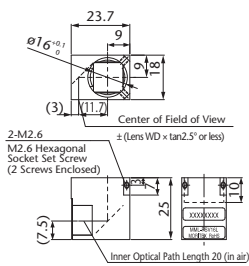
Variable Pitch Side View Prism MML-PSV16L/R

Fine pitch and small space observation at a 90° angle are possible for alignment marks. Because of the prism's compact design, 40mm working distance lenses can also be used.

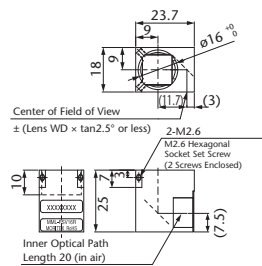
- MML-Standard for $\phi 16$
- Optical axis pitch 3mm
- Length of inner optical path length: 20mm
- WD=40mm lens can also be attached



MML-PSV16L



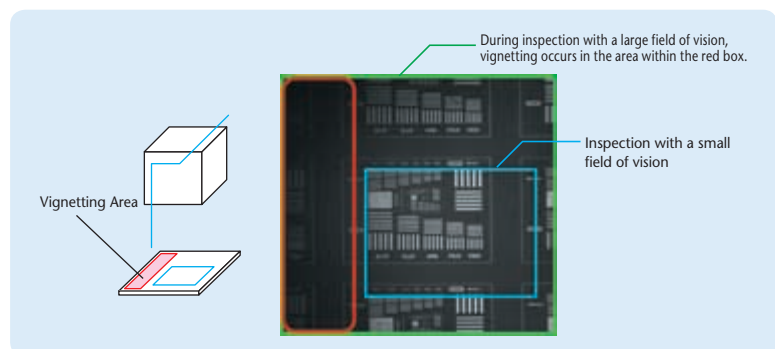
MML-PSV16R



Model	Specifications	Optical Axis Pitch	Product Code
MML-PSV16R	Side View Prism for ST Series (Right Side)	One Side 3mm	A-8007
MML-PSV16L	Side View Prism for ST Series (Left Side)	One Side 3mm	A-8008

MML-PSV 16L/R Vignetting Reference Data

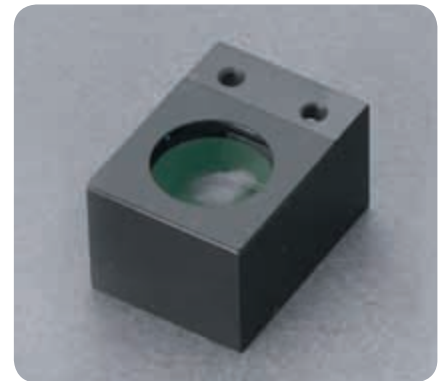
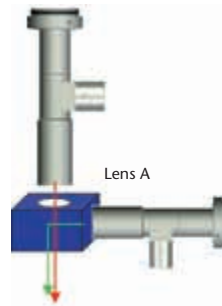
Note that the MML-PSV16 is designed for fine pitch which may cause vignetting in a portion of the screen when observation is performed with a wide field of view. (Differences exist depending on the kind of lens or camera being used.)



Dual Field of View Prism MML-P2S16

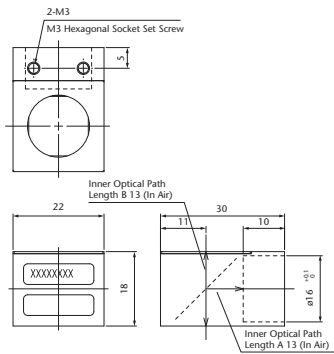
2 different fields of view type for ML-PL Series. This half-mirror prism can be used to view two different field of views (FOV) on the same optical access.

- Same object with two fields of view, same field of view at different working distances, etc.
- Lens A should have a diameter of 16mm

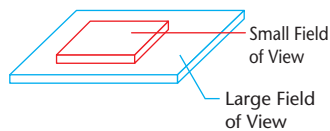


Model	Specifications	Product Code
MML-P2S16	ST Series, 2 field of views (FOV) prism for ø16mm	A-8012

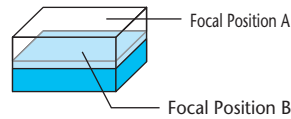
MML-P2S16



Low Magnification · High Magnification Alignment



Two Focus Point Alignment



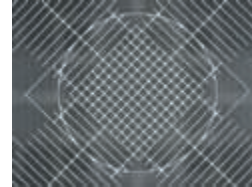
Large Field of View Rough Alignment



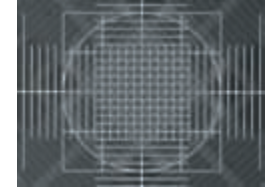
Small Field of View Fine Alignment



Focal Position A



Focal Position B



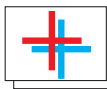
High Accuracy Two Fields of View Optical Unit ML-2PLBOX

Made-to-order

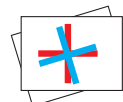
Two field of views and two focus points can be observed using two lenses & cameras. MORITEX adjusts CCD cameras and optical units to positions desired by customers to provide support to meet specific customer requirements for lenses and illumination, condition of optical units, etc. These adjustments and quality inspection ensure high accuracy of mounted components and the resulting images.



MORITEX performs adjustment and inspection to ensure high accuracy CCDs, prisms and lenses.



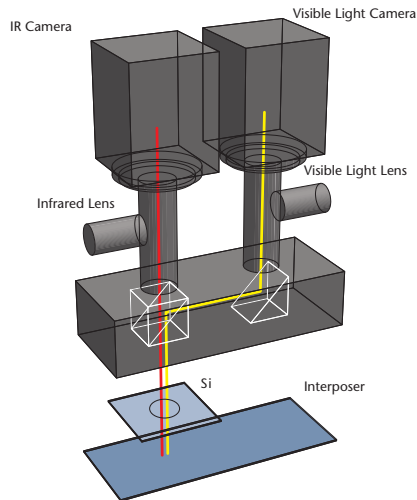
Center Position Accuracy
 $\pm(\text{Lens WD} \times \tan 1.5^\circ)$



Rotation Alignment Accuracy
Relative Position Within $\pm 0.5^\circ$

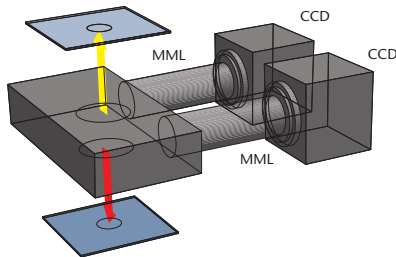
Total Optical Illumination System

Infrared & Visible Ray Transmission System



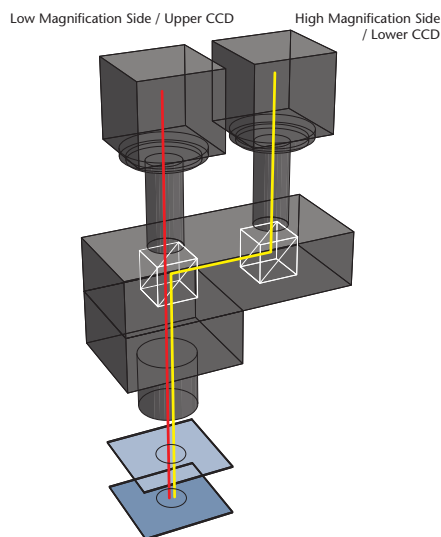
A complete lens and lighting system which uses infrared rays to transmit through a Si, GaAs, or Ge substrate to recognize IR penetration patterns.

Top and Bottom Dual Field Optical System (2CCD Type)



A space-saving optical system for attaching 2 opposite-facing objects with accuracy.

Twin-View, Dual Magnification/Twin-View, Dual Focal Optical System



A space-saving optical system that is used to simultaneously observe an object at two focus distances, and two magnifications on one optical path utilizing a specific prism structure.