

# Fixed Magnification Telecentric Lens

## 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 from  $\varnothing 16$
- Long Depth of Field
- Number of pixels: 410 thousand or higher
- Camera Size: 1/2" or less in most cases



### WD40mm

Model	Magnification	O/I	WD	Resolution	Depth of Field	NA	Effective F No	TV Distortion	Largest Compatible Camera	Weight
MML1-ST40D	×1	105mm	40mm	7.2 $\mu$ m	0.88mm	0.046	11	-0.02% or less	1/2"	31g
MML1.5-ST40D	×1.5	105.1mm	40.1mm	5.6 $\mu$ m	0.44mm	0.06	12.5	0.02% or less	1/2"	31g
MML2-ST40D	×2	96.1mm	40.1mm	4.8 $\mu$ m	0.29mm	0.07	14.3	0.01% or less	1/2"	34g
★ MML3-ST40D	×3	106.9mm	37.9mm	4.8 $\mu$ m	0.19mm	0.07	21.3	-0.05% or less	1/2"	33g
MML4-ST40D	×4	103.9mm	40.9mm	4.8 $\mu$ m	0.14mm	0.07	28.5	0.01% or less	1/2"	36g
MML6-ST40D	×6	117.5mm	40.3mm	4.8 $\mu$ m	0.1mm	0.07	42.8	-0.02% or less	1/2"	39g
MML8-ST40D	×8	131.3mm	40mm	4.8 $\mu$ m	0.07mm	0.07	57	-0.02% or less	1/2"	42g
MML1-ST40	×1	105mm	40mm	7.2 $\mu$ m	0.88mm	0.046	11	-0.02% or less	1/2"	26g
MML1.5-ST40	×1.5	105.1mm	40.1mm	5.6 $\mu$ m	0.44mm	0.06	12.5	0.02% or less	1/2"	26g
MML2-ST40	×2	96.1mm	40.1mm	4.8 $\mu$ m	0.29mm	0.07	14.3	0.01% or less	1/2"	29g
★ MML3-ST40	×3	106.9mm	37.9mm	4.8 $\mu$ m	0.19mm	0.07	21.3	-0.05% or less	1/2"	28g
MML4-ST40	×4	103.9mm	40.9mm	4.8 $\mu$ m	0.14mm	0.07	28.5	0.01% or less	1/2"	31g
MML6-ST40	×6	117.5mm	40.3mm	4.8 $\mu$ m	0.1mm	0.07	42.8	-0.02% or less	1/2"	35g
★ MML8-ST40	×8	131.3mm	40mm	4.8 $\mu$ m	0.07mm	0.07	57	-0.02% or less	1/2"	37g

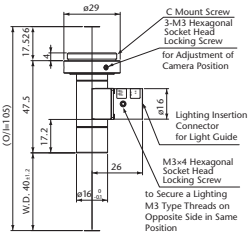
\*Depth of field is calculated assuming a horizontal 240TV resolution using a 1/2" CCD camera. (Permissible circle of confusion on the image-formation side: 40 $\mu$ m)

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

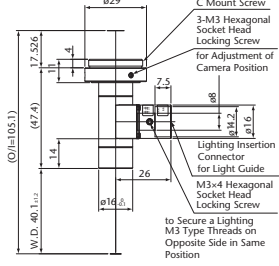
Caution: The WD 40mm series cannot be used with all prism adapter options.

★Made-to-order products.

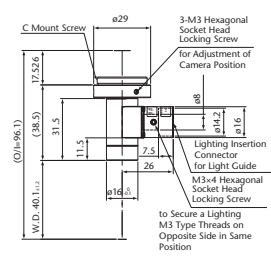
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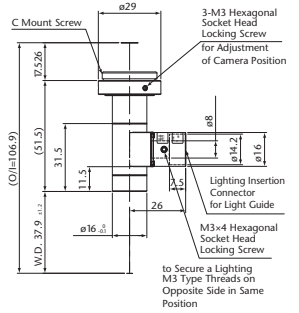
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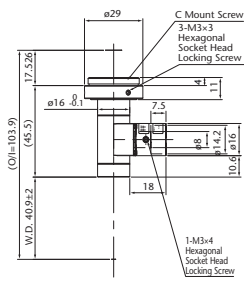
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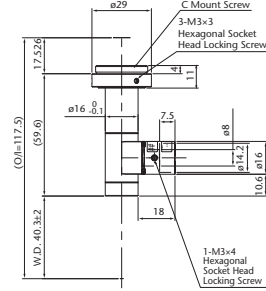
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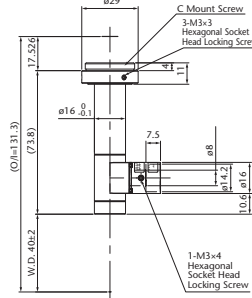
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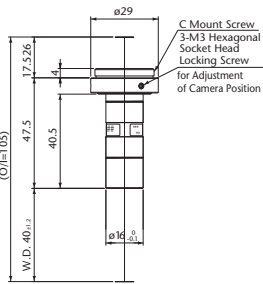
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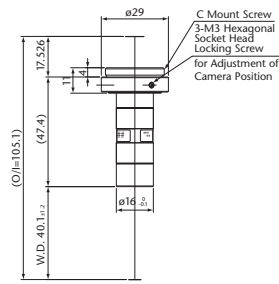
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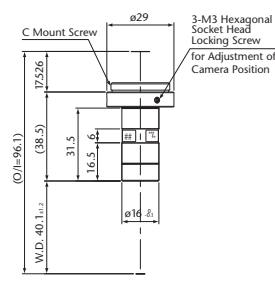
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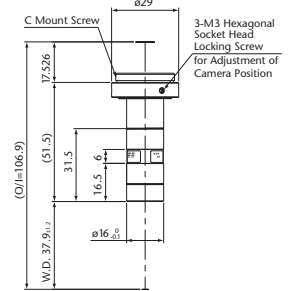
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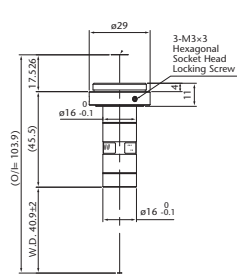
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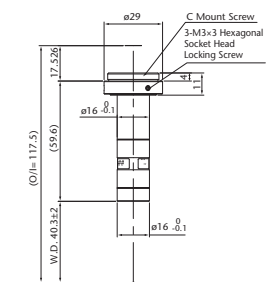
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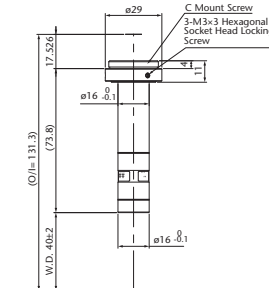
MML4-ST40



MML6-ST40

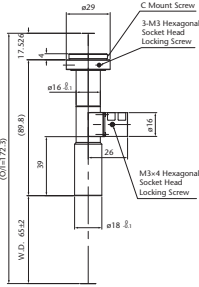


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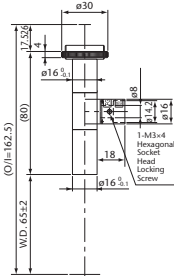


WD65mm

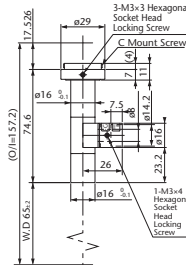
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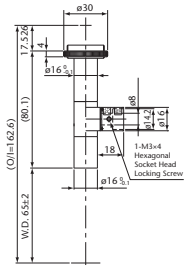
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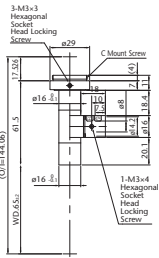
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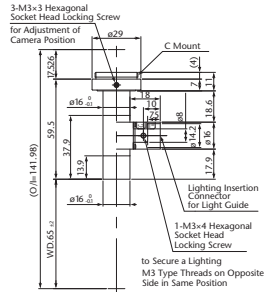
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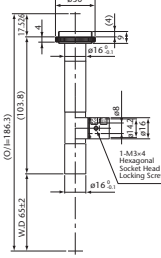
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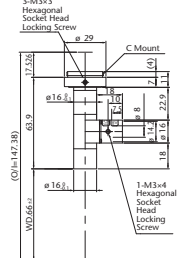
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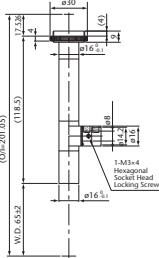
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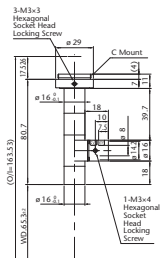
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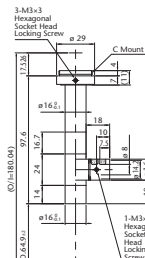
MML6-ST65D



MML6-ST65DS



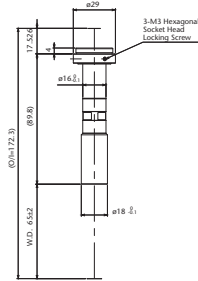
MML8-ST65DS



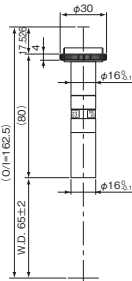
Model	Magnification	O/I	WD	Resolution	Depth of Field	NA	Effective FNo	TV Distortion	Largest Compatible Camera	Weight
MML08-ST65D	×0.8	172.3mm	65mm	12.4μm	1.9mm	0.027	14.9	0.01% or less	1/2"	49g
MML1-ST65D	×1	162.5mm	65mm	12.5μm	1.49mm	0.027	18.6	0.01% or less	1/2"	44g
MML1.5-ST65D	×1.5	157.2mm	65mm	7μm	0.56mm	0.048	15.5	-0.04% or less	1/2"	43g
MML2-ST65D	×2	162.6mm	65mm	5.8μm	0.35mm	0.057	17.3	0.02% or less	1/2"	44g
MML2-ST65DS	×2	144.1mm	65mm	5.6μm	0.35mm	0.057	17.3	0.01% or less	1/2"	37g
MML3-ST65DS	×3	142mm	65mm	4.7μm	0.19mm	0.07	21.9	0.01% or less	1/2"	35g
MML4-ST65D	×4	186.3mm	65mm	4.6μm	0.14mm	0.073	27	0.01% or less	1/2"	55g
MML4-ST65DS	×4	147.4mm	66mm	4.4μm	0.13mm	0.076	25.9	0.02% or less	1/2"	41g
MML6-ST65D	×6	201.1mm	65mm	4.6μm	0.091mm	0.073	40.9	0.01% or less	1/2"	60g
MML6-ST65DS	×6	163.5mm	65.3mm	4.4μm	0.09mm	0.076	39.3	0.01% or less	1/2"	43g
MML8-ST65DS	×8	180mm	64.9mm	4.4μm	0.07mm	0.076	52.3	-0.01% or less	1/2"	46g

\* 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.

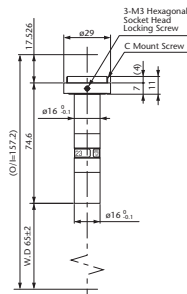
MML08-ST65



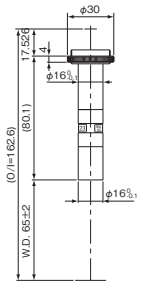
MML1-ST65



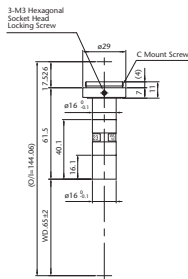
MML1.5-ST65



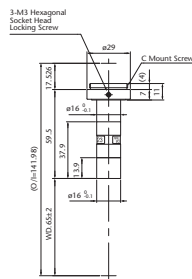
MML2-ST65



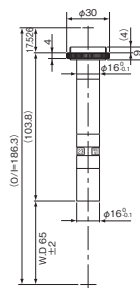
MML2-ST65S



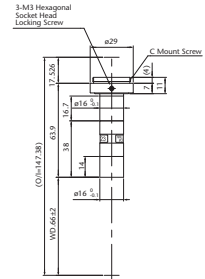
MML3-ST65S



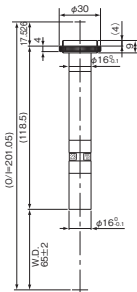
MML4-ST65



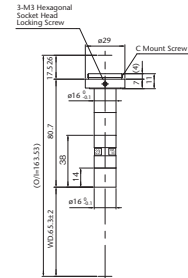
MML4-ST65S



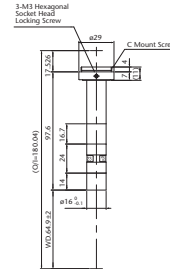
MML6-ST65



MML6-ST65S



MML8-ST65S



Model	Magnification	O/I	WD	Resolution	Depth of Field	NA	Effective FNo	TV Distortion	Largest Compatible Camera	Weight
MML08-ST65	×0.8	172.3mm	65mm	12.4µm	1.9mm	0.027	14.9	0.01% or less	1/2"	44g
MML1-ST65	×1	162.5mm	65mm	12.5µm	1.49mm	0.027	18.6	0.01% or less	1/2"	38g
MML1.5-ST65	×1.5	157.2mm	65mm	7µm	0.56mm	0.048	15.5	-0.04% or less	1/2"	36g
MML2-ST65	×2	162.6mm	65mm	5.8µm	0.35mm	0.057	17.3	0.02% or less	1/2"	38g
MML2-ST65S	×2	144.1mm	65mm	5.6µm	0.35mm	0.057	17.3	0.01% or less	1/2"	32g
MML3-ST65S	×3	142mm	65mm	4.7µm	0.19mm	0.07	21.9	0.01% or less	1/2"	30g
MML4-ST65	×4	186.3mm	65mm	4.6µm	0.14mm	0.073	27	0.01% or less	1/2"	50g
MML4-ST65S	×4	147.4mm	66mm	4.4µm	0.13mm	0.076	25.9	0.02% or less	1/2"	36g
★ MML6-ST65	×6	201.1mm	65mm	4.6µm	0.091mm	0.073	40.9	0.01% or less	1/2"	55g
MML6-ST65S	×6	163.5mm	65.3mm	4.4µm	0.09mm	0.076	39.3	0.01% or less	1/2"	38g
MML8-ST65S	×8	180mm	64.9mm	4.4µm	0.07mm	0.076	52.3	-0.01% or less	1/2"	42g

\* 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.

★ Made-to-order products.

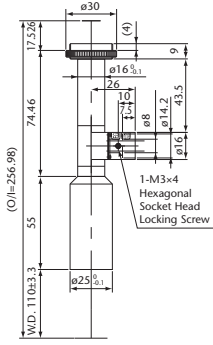
Optical Specifications for Recommended Combinations of MML Models and Rear Converter Lenses

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

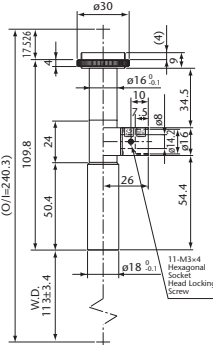
Caution: If combinations other than those recommended are used, dirt and scratches on the rear converter may be noticeable in the resulting images. For this reason, we do not recommend the use in any other setup for optimal performance.

WD110mm

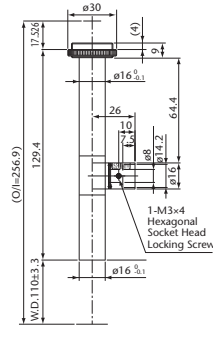
MML08-ST110D



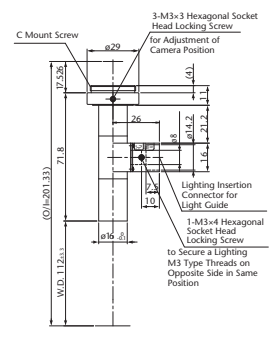
MML1-ST110D



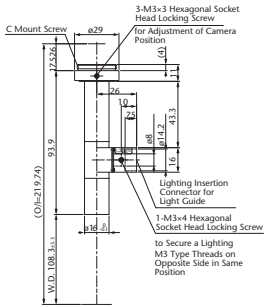
MML2-ST110D



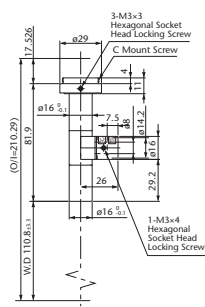
MML2-ST110DS



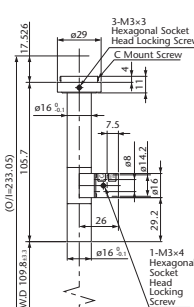
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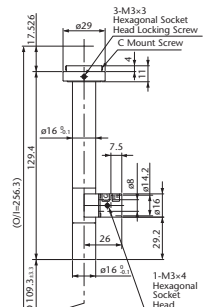
MML4-ST110D



MML6-ST110D

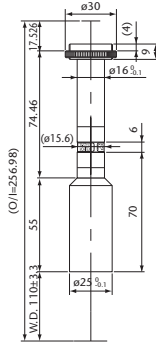


MML8-ST110D

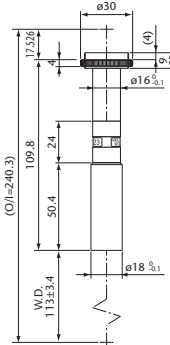


Model	Magnification	O/I	WD	Resolution	Depth of Field	NA	Effective FNo	TV Distortion	Largest Compatible Camera	Weight
MML08-ST110D	×0.8	257mm	110mm	13.5µm	2mm	0.024	16.1	0.01% or less	1/2"	85g
MML1-ST110D	×1	240.3mm	113mm	14µm	1.67mm	0.024	20.9	0.05% or less	1/2"	58g
MML2-ST110D	×2	256.9mm	110mm	11µm	0.66mm	0.03	33.2	0.01% or less	1/2"	55g
MML2-ST110DS	×2	201.3mm	112mm	11.2µm	0.66mm	0.03	33.2	0.01% or less	1/2"	39g
MML3-ST110DS	×3	219.7mm	108.3mm	11.2µm	0.44mm	0.03	49.7	0.01% or less	1/2"	43g
MML4-ST110D	×4	210.3mm	110.8mm	7.5µm	0.22mm	0.045	44.4	0.03% or less	1/2"	43g
MML6-ST110D	×6	233.1mm	109.8mm	7.5µm	0.17mm	0.045	66.4	-0.01% or less	1/2"	48g
MML8-ST110D	×8	256.3mm	109.3mm	7.5µm	0.17mm	0.045	88.4	-0.01% or less	1/2"	54g

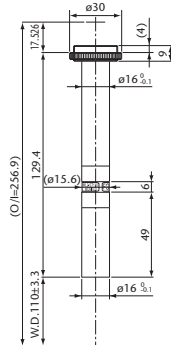
MML08-ST110



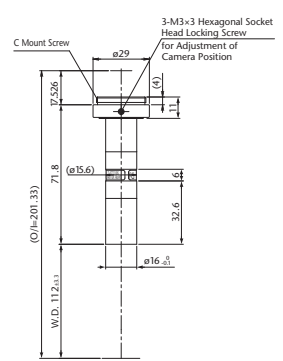
MML1-ST110



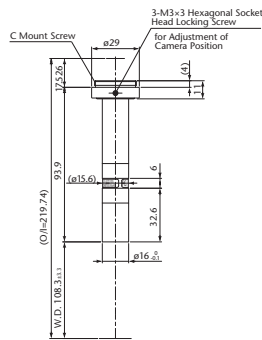
MML2-ST110



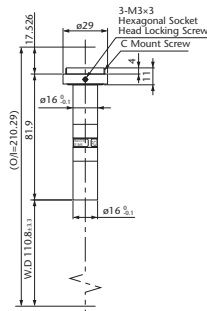
MML2-ST110S



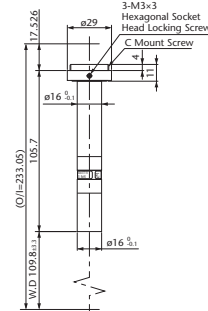
MML3-ST110S



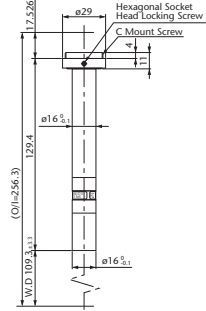
MML4-ST110



MML6-ST110



MML8-ST110



Model	Magnification	O/I	WD	Resolution	Depth of Field	NA	Effective F No	TV Distortion	Largest Compatible Camera	Weight
MML08-ST110	×0.8	257mm	110mm	13.5µm	2mm	0.024	16.1	0.01% or less	1/2"	79g
MML1-ST110	×1	240.3mm	113mm	14µm	1.67mm	0.024	20.9	0.05% or less	1/2"	50g
MML2-ST110	×2	256.9mm	110mm	11µm	0.66mm	0.03	33.2	0.01% or less	1/2"	50g
MML2-ST110S	×2	201.3mm	112mm	11.2µm	0.66mm	0.03	33.2	0.01% or less	1/2"	34g
MML3-ST110S	×3	219.7mm	108.3mm	11.2µm	0.44mm	0.03	49.7	0.01% or less	1/2"	37g
MML4-ST110	×4	210.3mm	110.8mm	7.5µm	0.22mm	0.045	44.4	0.03% or less	1/2"	38g
MML6-ST110	×6	233.1mm	109.8mm	7.5µm	0.17mm	0.045	66.4	-0.01% or less	1/2"	43g
MML8-ST110	×8	256.3mm	109.3mm	7.5µm	0.17mm	0.045	88.4	-0.01% or less	1/2"	49g

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

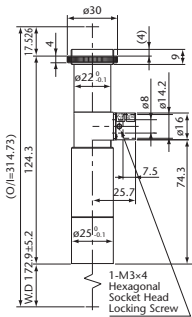
\* Depth of field is calculated assuming a horizontal 240TV resolution using a 1/2" CCD camera. (Permissible circle of confusion on the image-formation side: 40µm)

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

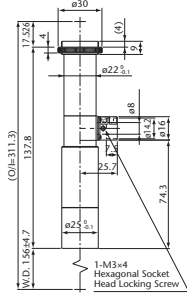
Caution: If combinations other than those recommended are used, dirt and scratches on the rear converter may be noticeable in the resulting images. For this reason, we do not recommend the use in any other setup for optimal performance

WD150mm

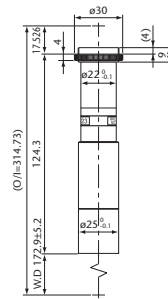
MML08-ST170D



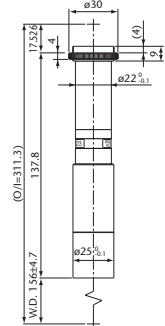
MML1-ST150D



MML08-ST170



MML1-ST150



Model	Magnification	O/I	WD	Resolution	Depth of Field	NA	Effective F No	TV Distortion	Largest Compatible Camera	Weight
MML08-ST170D	×0.8	314.7mm	172.9mm	12µm	1.8mm	0.028	14	0.03% or less	1/2"	80g
MML1-ST150D	×1	311.3mm	156mm	8.8µm	1.1mm	0.038	13	0.03% or less	1/2"	90g
MML08-ST170	×0.8	314.7mm	172.9mm	12µm	1.8mm	0.028	14	0.03% or less	1/2"	76g
MML1-ST150	×1	311.3mm	156mm	8.8µm	1.1mm	0.038	13	0.03% or less	1/2"	84g

\* 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 Machine Types Recommended for Combination with Rear Converter

Model	Converter Lenses	Magnification	Resolution	Depth of Field	Effective F No
MML08-ST170D/170	SOD-1.5X	1.2x	12µm	1.17mm	21
	SOD-2X	1.6x	12µm	0.88mm	28
MML1-ST150D/150	SOD-1.5X	1.5x	8.8µm	0.69mm	19.5
	SOD-2X	2.0x	8.8µm	0.52mm	26

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.

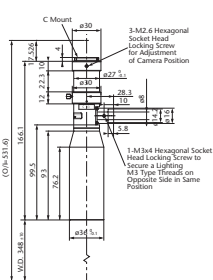
## WD300mm

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

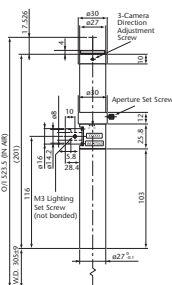
- Magnifications: 0.5 $\times$ , 1 $\times$ , 3 $\times$ , & 4 $\times$
- WD=300 mm
- With variable iris of 22.7-C32



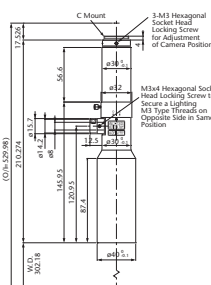
### MML05-ST300DVI



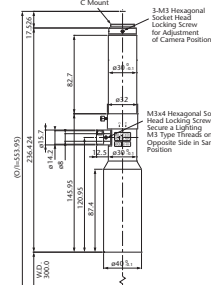
### MML1-ST300D



### MML3-ST300DVI



### MML4-ST300DVI



Model	Magnification	O/I	WD	Resolution	Depth of Field	NA	Effective FNo	TV Distortion	Largest Compatible Camera	Weight
MML05-ST300DVI	$\times 0.5$	531.6mm	348mm	15.3 $\mu\text{m}$ ~ 37.3 $\mu\text{m}$	3.6mm ~ 8.9mm	0.022 ~ 0.009	11.4 ~ 27.8	0.06% or less	1/2"	200g
MML1-ST300D	$\times 1$	523.5mm	305mm	15 $\mu\text{m}$ ~ 27 $\mu\text{m}$	1.8mm ~ 2.6mm	0.022 ~ 0.016	22.7 ~ 32	0.05% or less	1/2"	150g
MML3-ST300DVI	$\times 3$	530mm	302.2mm	7.5 $\mu\text{m}$ ~ 14.8 $\mu\text{m}$	0.29mm ~ 0.59mm	0.045 ~ 0.023	33.1 ~ 66.1	0.02% or less	1/2"	310g
MML4-ST300DVI	$\times 4$	554mm	300mm	7.5 $\mu\text{m}$ ~ 14.8 $\mu\text{m}$	0.22mm ~ 0.44mm	0.045 ~ 0.023	44.2 ~ 88.5	0.01% or less	1/2"	320g

\* 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 $\mu\text{m}$ )

### 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	1.5 $\times$	15 $\mu\text{m}$	1.21mm	34.1
	SOD-2X	2.0 $\times$	15 $\mu\text{m}$	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.