



MACHINE VISION

LENS • LIGHTING • OPTICAL ACCESSORIES

2017 ▶ 2018
General Catalog

PHILOSOPHY

Pursue further improvement of our own technology and create unique products for the market development

GREETING

Nowadays demand of vision in the market has been increasing not only for TV, also for cell-phone and information technology, and requirement of vision has been developing for ultra HD.
Requirement of vision has been developing for ultra HD.
We focus on this market trend and strive to create next-generation technology for machine vision, security, and broadcast.

COMPANY PROFILE

Company Name Myutron Inc.

Address <Head Office>
3-31-14, Nishikoiwa, Edogawa-ku, Tokyo, 133-0057, Japan
<Ichikawa Office>
4-1919-1, Bokke-Cho, Ichikawa City, Chiba, 272-0811, Japan

Establishment April, 1, 2001

Representative Keiji Watanabe

Business

- Design, manufacture, and supply lenses for machine vision
- Design, manufacture, and supply optical systems for machine vision
- Design, manufacture, and supply lenses for surveillance
- Design, manufacture, and supply for OEM

Total Solution of Optics for Various Applications

Line-up of Myutron Lens Series

Large FOV

Lenses for photography and surveillance were used for inspection of large objects such as metal, paper, PCB, and others. Due to the improvement of systems, quality of these lenses are not enough for machine vision applications. Myutron lens is designed for very low distortion and high resolution, suitable for machine vision applications. [XLS01/02 (P12-13)], [WF5045 (P18-19)], [FV-W Series (P27)] are suitable for line scan, [HS-V Series (P60-61)], [HF Series (P58-59)], [HS-J Series (P62-63)] are suitable for are scan applications.



Line Scan Lens

- FV-W Series



CCTV Lens for 5 Mega Pixel

- HF Series

Small FOV

Suitable for inspection of IC, silicon wafer, and color filter. [HMZ Series (P54-55)] are suitable for inspection of different size of objects. High magnification of telecentric lens with co-axial, [FT High Magnification Series (P40-43)] are suitable for inspection of reflective objects, required for higher resolution.

Middle FOV

Suitable for inspection of electronic component and fine pitch, wire bonder, and alignment. [FT Series (P40-43)], [TL Series (P44-53)] are suitable for alignment, required for high accuracy [LSP (P7)] and [SP Series (P8-9)] are compatible with 8K and 12K line scan camera and high speed and accurate inspection. [XLS Series (P10-13)], [LS Series (P14-15)], [FV-L Series (P26)] are suitable for line scan, [MGLT-VM Series (P34-37)] are suitable for are scan applications.



Super High Resolution Lens for Line Scan

- LSP350
- SP Series
- XLS Series



Telecentric Lens

- MGLT-VM Series
- MGLT-V Series
- MGLT Series
- FT Series
- TL Series



Macro Zoom Lens

- HMZ Series

Propose to Various Systems Together with Imaging Lens



*This combination is example.

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LENS
SERIES



LINE SENSOR LENS / LARGE AREA SENSOR LENS

WD and Magnification Chart for Line Scan Lens / Large Area Sensor Lens

Model No.	Image Circle	∞	0.3x	0.4x	0.5x	0.6x	0.7x	0.8x	0.9x	1x	1.5x	2x	3.5x	Page
LS05	φ36				188mm (0.5x)									P14
LS07	φ36						151mm (0.7x)							P14
LS10	φ36									123mm (1.0x)				P14
LS15	φ36										102mm (1.5x)			P14
LSTL10H-F	φ44									113mm (1.0x)				P16
LSTL15H-F	φ44										109mm (1.5x)			P16
LSTL20H-F	φ44											109mm (2.0x)		P16
SP05	φ62				276mm (0.5x)									P8
SP07	φ62						211mm (0.7x)							P8
SP10	φ62									165mm (1.0x)				P8
SP14	φ86										112mm (1.4x)			P8
SP20	φ100											90mm (2.0x)		P8
LSP350	φ62												100mm (3.5x)	P7
XLS03	φ90	680mm (0.2x)	477mm (0.3x)	376mm (0.4x)										P10
XLS05	φ90			386mm (0.4x)	324mm (0.5x)	274mm (0.625x)								P10
XLS075	φ90					279mm (0.625x)	246mm (0.75x)	222mm (0.875x)						P10
XLS10	φ90							215mm (0.875x)		197mm (1.0x)	177mm (1.2x)			P10
XLS14	φ90									185mm (1.2x)	170mm (1.4x)	154mm (1.7x)		P10
XLS20	φ90										157mm (1.7x)	146mm (2.0x)	133mm (2.5x)	P10

Display : WD (Magnification)

Model No.	Image Circle	∞	0.05x	0.1x	0.15x	0.2x	0.25x	0.3x	0.35x	0.4x	0.45x	0.5x	Page
LSF2528	φ44	1,000mm (0.025x)			142mm (0.15x)								P20
LSF3528	φ44	1,413mm (0.025x)			223mm (0.15x)								P20
LSF5028	φ44	2,064mm (0.025x)						163mm (0.3x)					P20
MS1828	φ30.7				100mm (0.15x)								P22
MS2524	φ30.7	999mm (0.025x)				120mm (0.2x)							P22
MS3520	φ30.7	1,429mm (0.025x)								100mm (0.39x)			P22
FV3526L	φ36		507mm (0.07x)			178mm (0.2x)							P26
FV5026W	φ45	2,063mm (0.025x)				297mm (0.18x)							P27
FV5026L	φ45			521mm (0.1x)		250mm (0.22x)							P26
HB5014	φ45	2,058mm (0.025x)				266mm (0.2x)							P27
WF5045	φ62	2,070mm (0.025x)				276mm (0.2x)							P18
FV8528W	φ62	3,423mm (0.025x)				463mm (0.2x)							P27
FV8528L	φ62					450mm (0.2x)				250mm (0.4x)			P26

LSP350

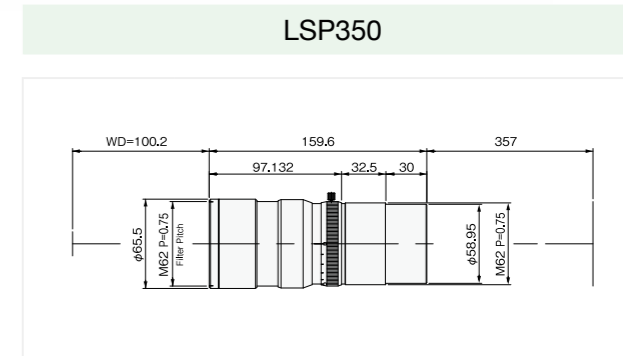


Super High Resolution of 3.5x Lens for 8K/12K Line Scan Camera

Suitable for the inspection in high accuracy such as LCD, TFT, and wafer



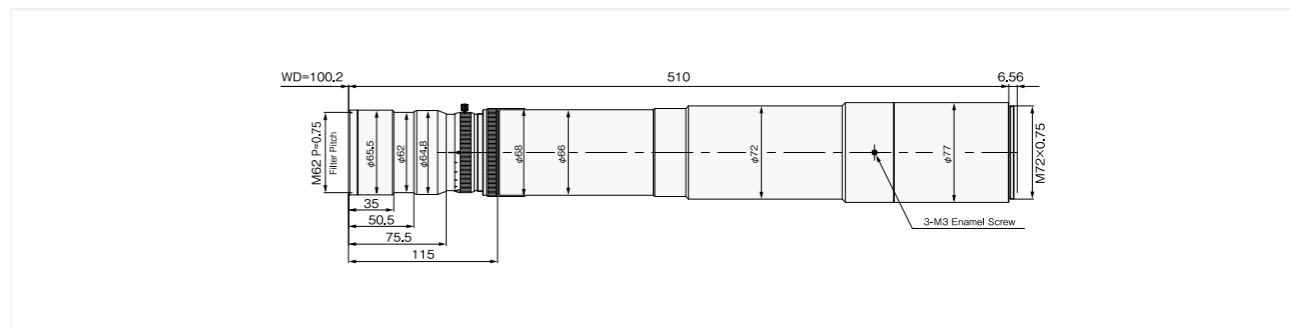
- Compatible with 8K and 12K line scan camera
- Maximum compatible sensor is 62mm
- Long working distance, WD100mm
- Reduce relative illumination and excellent uniformity
- Very low distortion
- Excellent brightness, suitable for high speed applications
- Customized mount is available



Magnification	3.5x	OI	616mm
F No.	11	Maximum Compatible sensor	φ 62mm
WD	100mm		

※Indicated specifications are design values.

Dimension of LSP350 + Dalsa HS Mount



* Please ask for customized mount.

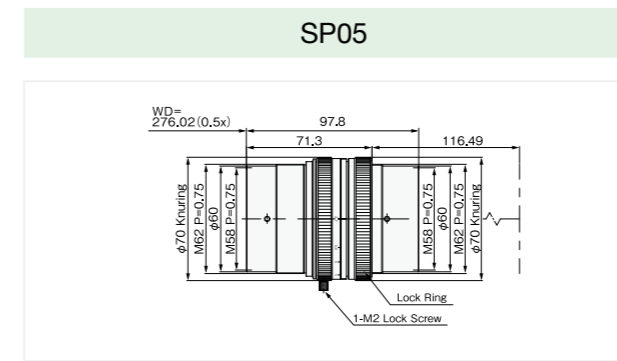
SP Series



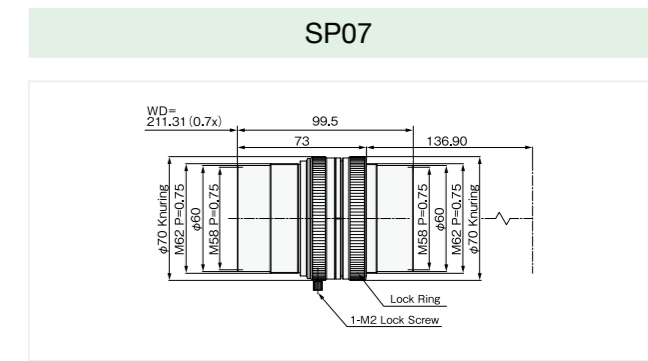
Super High Resolution Lens for 8K/12K Line Scan Camera

Suitable for high speed and high-end applications

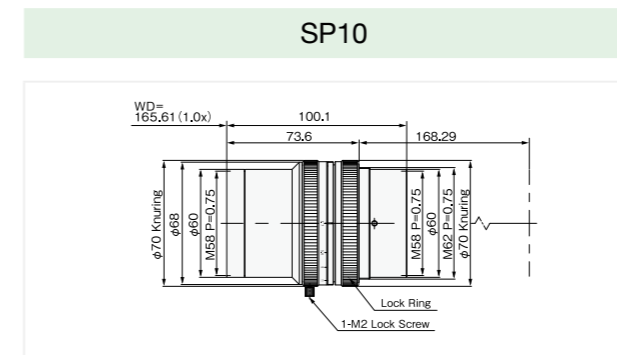
- Compatible with 8K and 12K and 16K, ϕ 62mm sensor
- Magnification can be changed by reversing a lens
- Reduce relative illumination and excellent uniformity
- Very low distortion
- Excellent brightness, ∞ F No. 2.7
- Customized mount is available



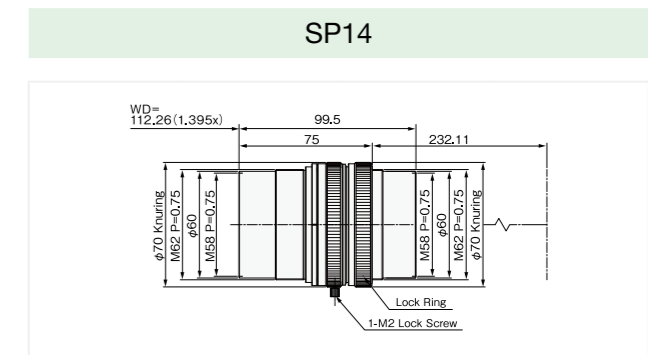
Magnification	0.5x	OI	463mm
F No.	4.3	Maximum	
WD	276mm	Compatible sensor	ϕ 62mm



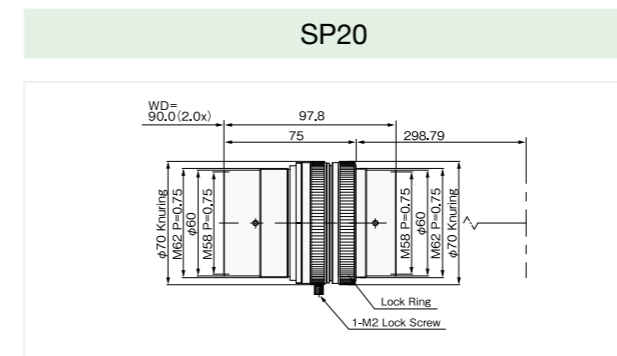
Magnification	0.7x	OI	421mm
F No.	5	Maximum	
WD	211mm	Compatible sensor	ϕ 62mm



Magnification	1.0x	OI	407mm
F No.	5.8	Maximum	
WD	165mm	Compatible sensor	ϕ 62mm



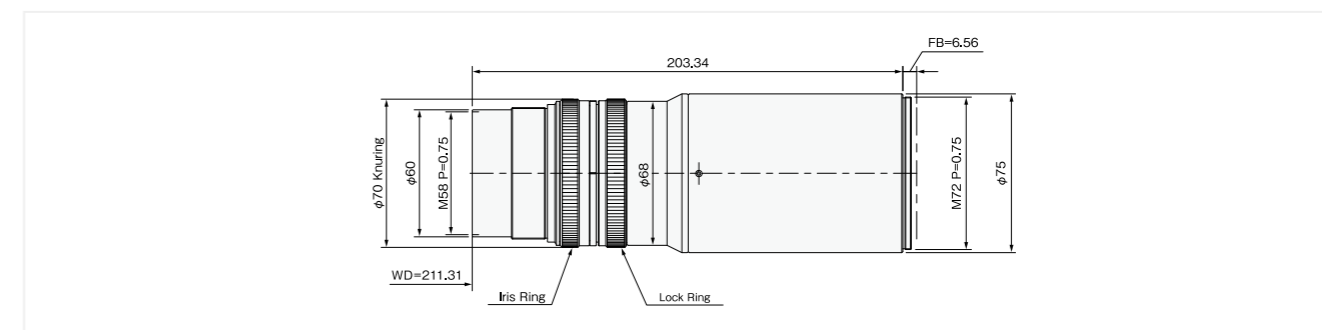
Magnification	1.4x	OI	419mm
F No.	6.8	Maximum	
WD	112mm	Compatible sensor	ϕ 86mm



Magnification	2.0x	OI	463mm
F No.	8.6	Maximum	
WD	90mm	Compatible sensor	ϕ 100mm

* Indicated specifications are design values.

Dimension of SP07 + Dalsa HS Mount



* Please ask for customized mount.

XLS Series



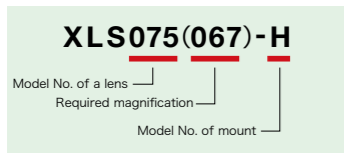
Line Scan Lens for Large Image Circle, φ90mm

Compatible with large image circle, up to φ90mm sensor

- Suitable for large sensor such as 「5μ x 12288 bit」, 「3.5μ x 16384 bit」, 「5μ x 16384bit」, etc...
- Suitable for large area sensor of high resolution such as 20 Mega Pixel, 25 Mega Pixel, and 29 Mega Pixel
- Reduce color aberration, suitable for 3 line sensor
- Excellent uniformity of brightness and resolution
- Possible to adjust ±0.05x from the original magnification by using the optional mount
- Customized mount is available
- 「SP Series (Page 8)」 is suitable if brightness is essential for the application

How to request if magnification is other than standard.

Ex.) 0.67x for Dalsa P3-12K



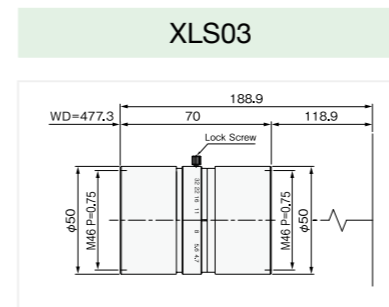
* If a lens is not used at the standard magnification, adjustable range is not ±0.05x.
* Please select one of XLS series which magnification is the closest from required magnification.



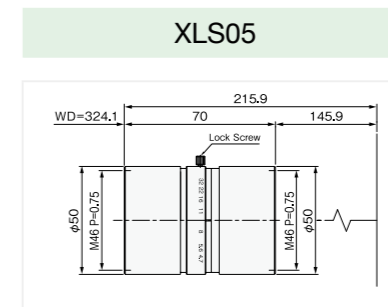
Model No. of Mount

Model	Compatible Camera	Screw Pitch	Back Focal Distance
XLS□□□-F	F Mount Camera	F Mount	46.5mm
XLS□□□-Q	NED : 3 Line Camera NUCli7300	M84.5 (P=0.5)	41mm
XLS□□□-N	NED : CLISBee 8k	M72 (P=0.75)	31.8mm
XLS□□□-M	DALSA : Piranha2 8k / TAKEX : TL-16000CL	M72 (P=0.75)	19.55mm
XLS□□□-D	DALSA : Piranha4 8k Piranha HS 3 16k	M72 (P=0.75)	12mm
XLS□□□-DX	DALSA : Piranha XL16K	M90 (P=1)	12mm
XLS□□□-E	e2V : ELiixA+ Colour 16K	M95 (P=1)	9.4mm
XLS□□□-H	DALSA : Piranha3 12k Piranha HS 8k 12k Piranha ES 8k	M72 (P=0.75)	6.56mm

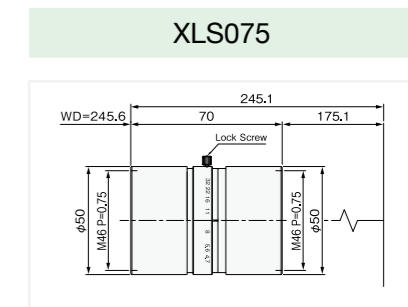
* ±0.05x can be adjusted from the standard magnification by using the mount mentioned above.
* Customized mount is also available. Please contact us for further information.



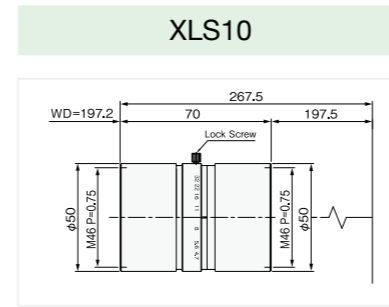
Magnification	0.3x
∞F No.	4.7
F No.	6.0
WD	477mm
OI	666mm
Maximum Compatible sensor	φ 90mm



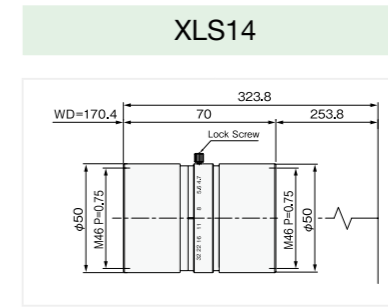
Magnification	0.5x
∞F No.	4.7
F No.	7.0
WD	324mm
OI	540mm
Maximum Compatible sensor	φ 90mm



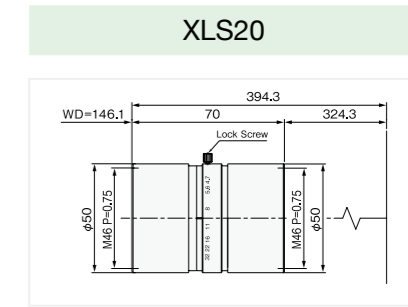
Magnification	0.75x
∞F No.	4.7
F No.	8.1
WD	246mm
OI	491mm
Maximum Compatible sensor	φ 90mm



Magnification	1.0x
∞F No.	4.7
F No.	9.0
WD	197mm
OI	465mm
Maximum Compatible sensor	φ 90mm

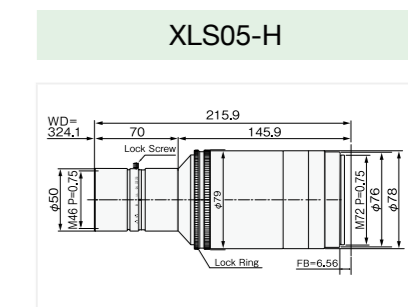
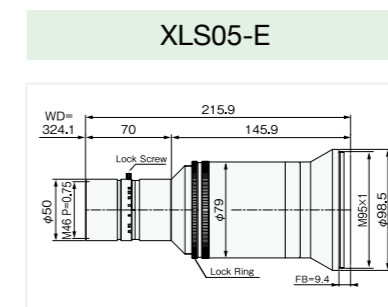
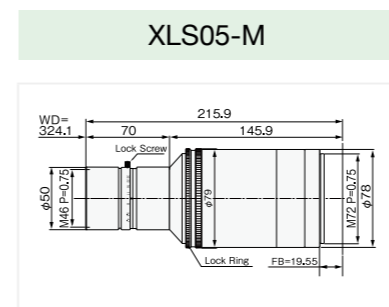
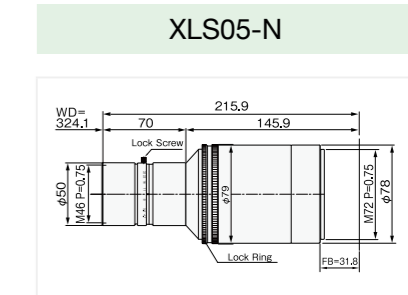
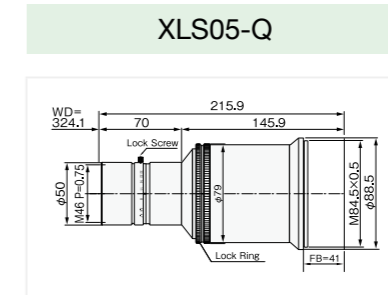
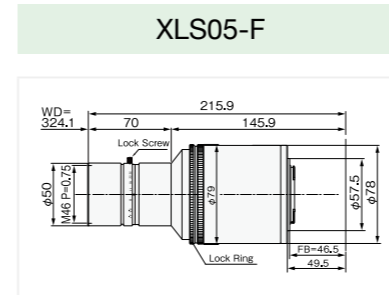


Magnification	1.4x
∞F No.	4.7
F No.	11.4
WD	170mm
OI	494mm
Maximum Compatible sensor	φ 90mm



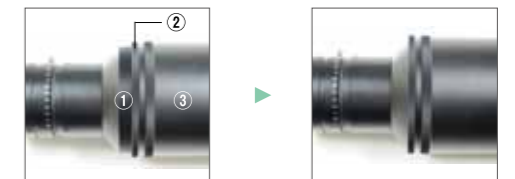
Magnification	2.0x
∞F No.	4.7
F No.	14.5
WD	146mm
OI	540mm
Maximum Compatible sensor	φ 90mm

Example of a lens with mount (XLS05)



How to adjust magnification

- Mount tube is composed by three mechanical parts ①, ②, and ③.
- Magnification increases by extending the mount and decreases by shortening.



* Indicated specifications are design values.

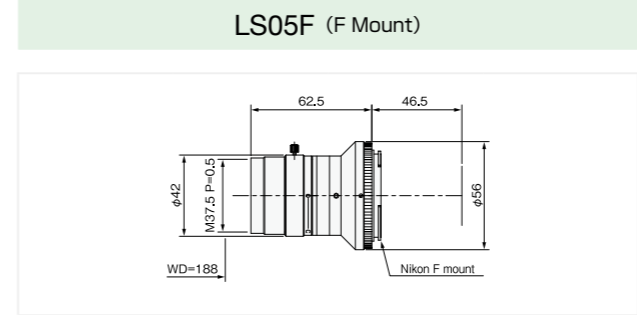
LS Series



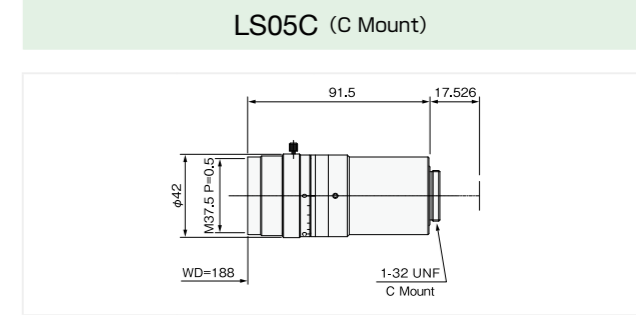
Fixed Magnification Lens for F Mount

High Resolution and high contrast
Suitable for LCD, film, and PCB inspection

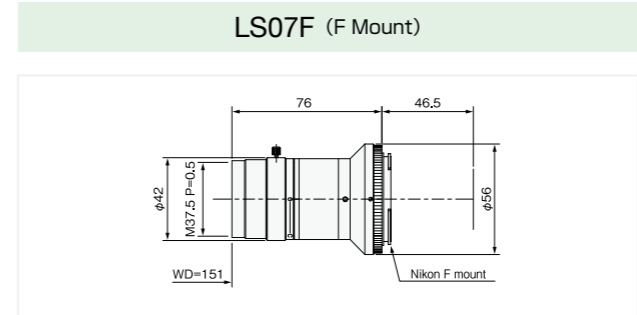
- ▶ Excellent uniformity
- ▶ High resolution from the center to the edge of image
- ▶ Compact design
- ▶ High durability
- ▶ Optical distortion less than 0.1%
- ▶ Suitable for area sensor, over 1 inch
- ▶ TFL- II mount is available



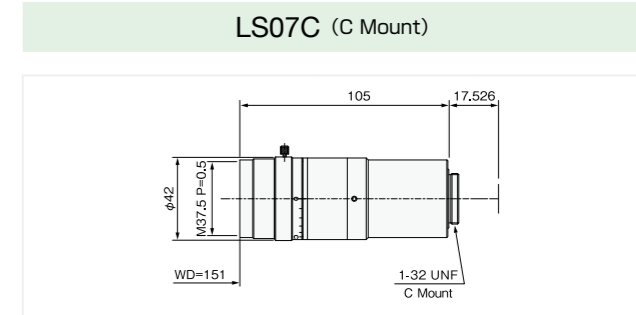
Magnification	0.5x	Resolution	11 μ
WD	188mm	Optical distortion	-0.01%
Depth of field	0.94mm	Maximum Compatible sensor	φ 36mm
F No.	5.1	Mount	F



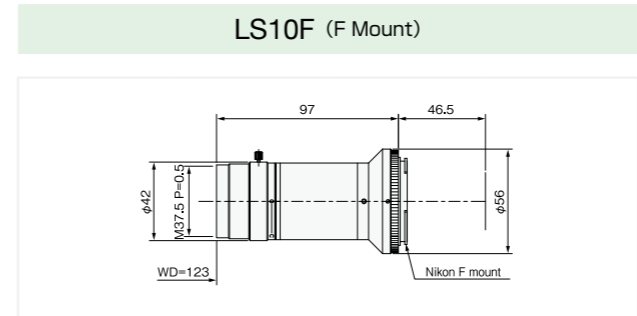
Magnification	0.5x	Resolution	11 μ
WD	188mm	Optical distortion	-0.01%
Depth of field	0.94mm	Maximum Compatible sensor	4/3 (φ 22.6mm)
F No.	5.1	Mount	C



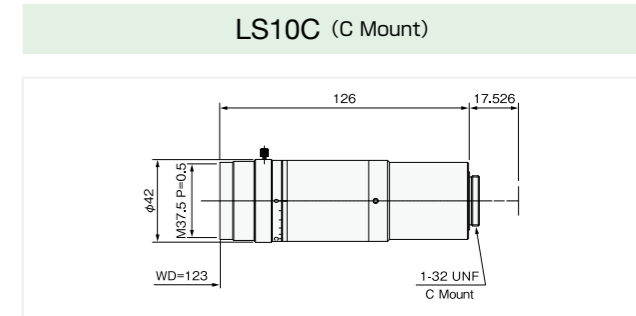
Magnification	0.7x	Resolution	10 μ
WD	151mm	Optical distortion	-0.07%
Depth of field	0.54mm	Maximum Compatible sensor	φ 36mm
F No.	6	Mount	F



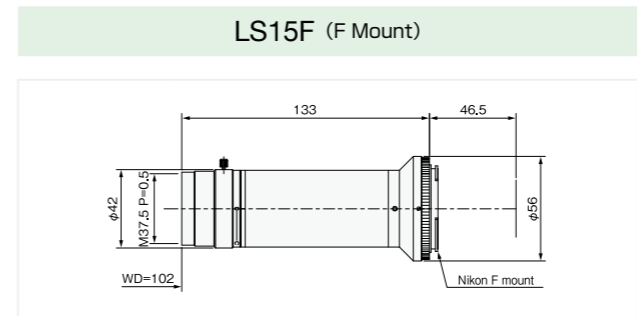
Magnification	0.7x	Resolution	10 μ
WD	151mm	Optical distortion	-0.07%
Depth of field	0.54mm	Maximum Compatible sensor	4/3 (φ 22.6mm)
F No.	6	Mount	C



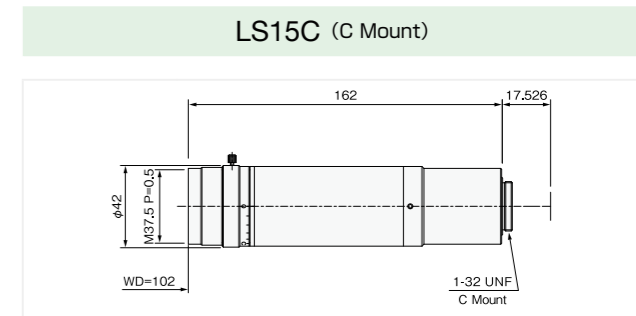
Magnification	1.0x	Resolution	8 μ
WD	123mm	Optical distortion	-0.01%
Depth of field	0.31mm	Maximum Compatible sensor	φ 36mm
F No.	7.5	Mount	F



Magnification	1.0x	Resolution	8 μ
WD	123mm	Optical distortion	-0.01%
Depth of field	0.31mm	Maximum Compatible sensor	4/3 (φ 22.6mm)
F No.	7.5	Mount	C



Magnification	1.5x	Resolution	7 μ
WD	102mm	Optical distortion	0.26%
Depth of field	0.17mm	Maximum Compatible sensor	φ 36mm
F No.	9.9	Mount	F



Magnification	1.5x	Resolution	7 μ
WD	102mm	Optical distortion	0.26%
Depth of field	0.17mm	Maximum Compatible sensor	4/3 (φ 22.6mm)
F No.	9.9	Mount	C

* Indicated specifications are design values. * Resolution is calculated based on MTF. * Resolution indicates a theoretical resolution at wavelength of 550nm.
* Depth of field is calculated assuming F No. (∞) 5.6 and resolution of 14 μ camera.

LSTL-H Series



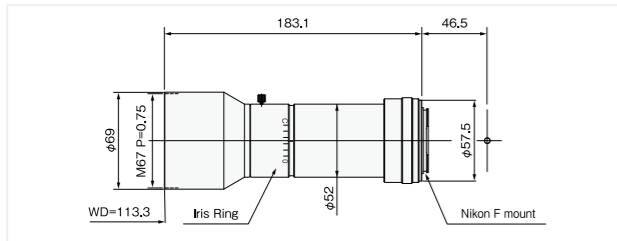
High Resolution Telecentric Lens for φ44mm Sensor

The highest NA in the optical industry

- Telecentric lens for large format, φ44mm
- Suitable for large area sensor of high resolution, 20 Mega Pixel, 25 Mega Pixel, and 29 Mega Pixel
- Design for large aperture
- Excellent uniformity of brightness and resolution
- Suitable for high speed and precise measurement
- Adjustable iris, possible to adjust depth of field
- M58 and M42 mount are also available

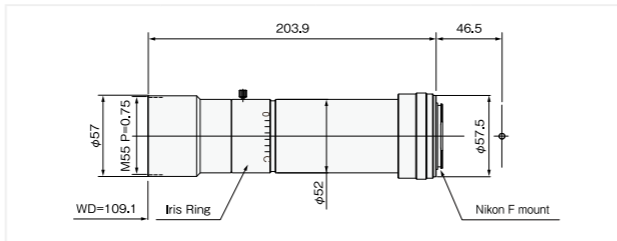


LSTL10H-F



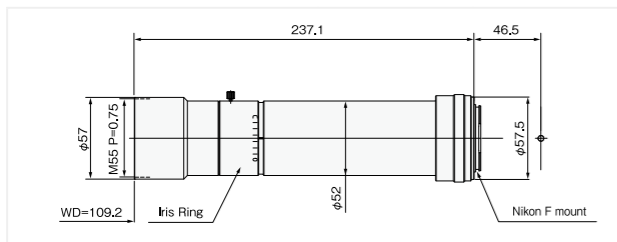
Magnification	1.0x	Resolution	4.3 μ
WD	113mm	Optical distortion	0.01%
Depth of field	0.31mm	Maximum Compatible sensor	φ 44mm
F No.	6.4	Mount	F

LSTL15H-F



Magnification	1.5x	Resolution	3.5 μ
WD	109mm	Optical distortion	0.02%
Depth of field	0.17mm	Maximum Compatible sensor	φ 44mm
F No.	7.8	Mount	F

LSTL20H-F



Magnification	2.0x	Resolution	2.9 μ
WD	109mm	Optical distortion	-0.02%
Depth of field	0.12mm	Maximum Compatible sensor	φ 44mm
F No.	8.7	Mount	F

Model No. for Different Mount

Model	Compatible Camera	Screw Pitch	Back Focal Distance
LSTL□□H-V58	SVS: SVCam-HR	M58 (P = 0.75)	11.48mm
LSTL□□H-B42	Basler	M42 (P = 1)	16mm
LSTL□□H-B42/2	Basler	M42 (P = 0.75)	16mm
LSTL□□H-V42	SVS	M42 (P = 1)	11.48mm
LSTL□□H-S42	Sentech	M42 (P = 1)	10mm
LSTL□□H-D42	Dalsa: Spyder 3	M42 (P = 1)	6.56mm

* Customized mount is also available. Please contact us for further information.

* Indicated specifications are design values. * Resolution indicates the theoretical resolution at wavelength of 550nm.
* Depth of field is calculated assuming F No.(∞) 5.6 and resolution of 14μ camera. * Drawing is for F mount.

LSTL-TW Series

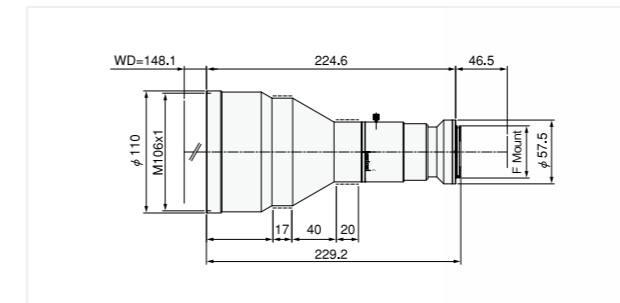


Telecentric Lens for Large Format

Suitable for middle-sized line and large area sensor

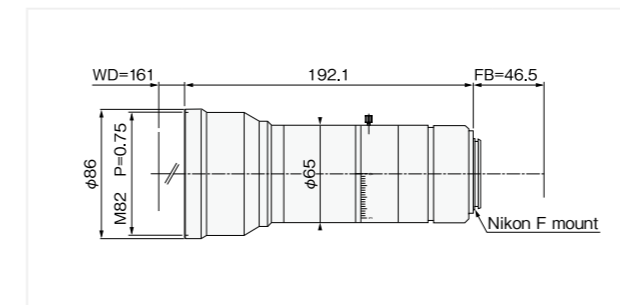
- Low magnification telecentric lens series for large format
- Suitable for 12 Mega Pixel sensor
- LSTL078TW-F is suitable for visible – NIR
- LSTL055TW-F is designed for high NA with long working distance, 160mm
- LSTL03TW-F is designed for long working distance, 150mm that can secure enough space to set up an illumination
- Adjustable iris, possible to adjust depth of field
- Customized mount is available

LSTL03TW-F



Magnification	0.3x	Depth of field	8.6mm
F No.	9.7	Resolution	22.4 μ
Object side NA	0.015	TV distortion	0.01%
WD	148.1mm	Maximum Compatible sensor	φ 28.2mm
OI	419.2mm	Mount	F

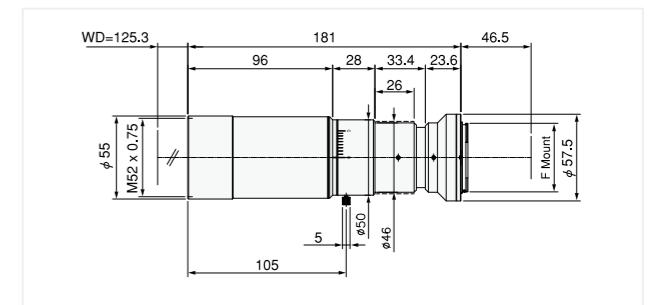
LSTL055TW-F



Magnification	0.55x	Depth of field	1.37mm
F No.	5.17	Resolution	6.33 μ
Object side NA	0.053	TV distortion	0.021%
WD	161.0mm	Maximum Compatible sensor	φ 30.8mm
OI	399.6mm	Mount	F

* Indicated specifications are design values. * Resolution indicates a theoretical resolution at a wavelength of 550nm.
* Depth of field is calculating assuming a horizontal 320 TV resolution using 1/2 inch camera (permissible circle of confusion 40μ).

LSTL078TW-F



Magnification	0.78x	Depth of field	1.3mm
F No.	9.8	Resolution	8.4 μ
Object side NA	0.04	TV distortion	0.00%
WD	125.3mm	Maximum Compatible sensor	φ 28.2mm
OI	352.8mm	Mount	F



WF Series



High Resolution and Wide Angle Lens for Large Image Circle, $\phi 62\text{mm}$

Suitable for large field of view in limited space

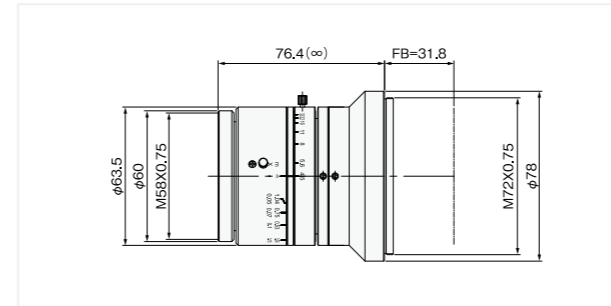
- ▶ The widest angle for $\phi 62\text{mm}$ in machine vision industry
- ▶ Suitable for 16K x 3.5 μ , 12K x 5 μ , 8K x 7 μ , etc..
- ▶ Possible to capture the large field of view by one camera in limited space

WF5045- □

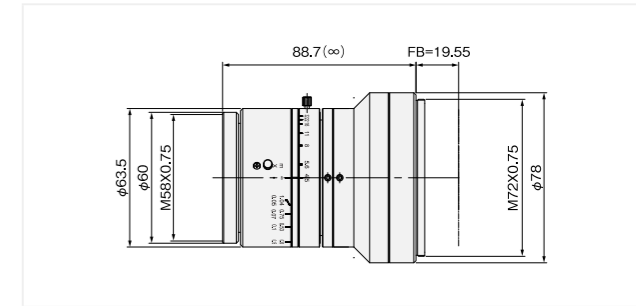
Focal length	50mm	Optical distortion	-0.01%
∞ F No.	4.5	Maximum Compatible sensor	$\phi 62.5\text{mm}$
Range of WD	276mm - ∞	Mount	M72 or F
Magnification at MOD	0.2x		



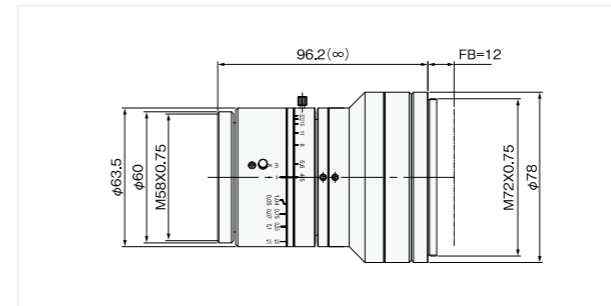
WF5045-N (FB=31.8mm)



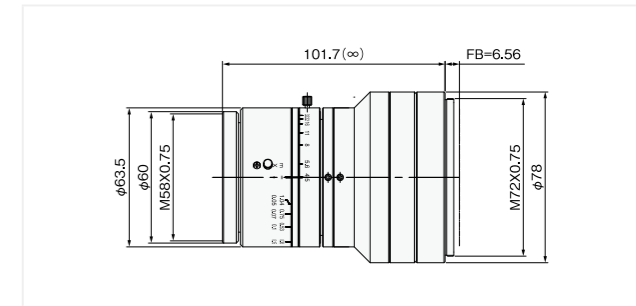
WF5045-M (FB=19.55mm)



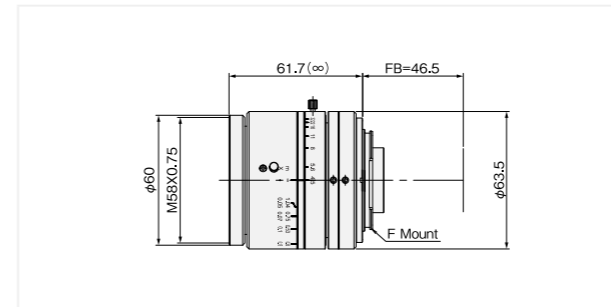
WF5045-D (FB=12mm)



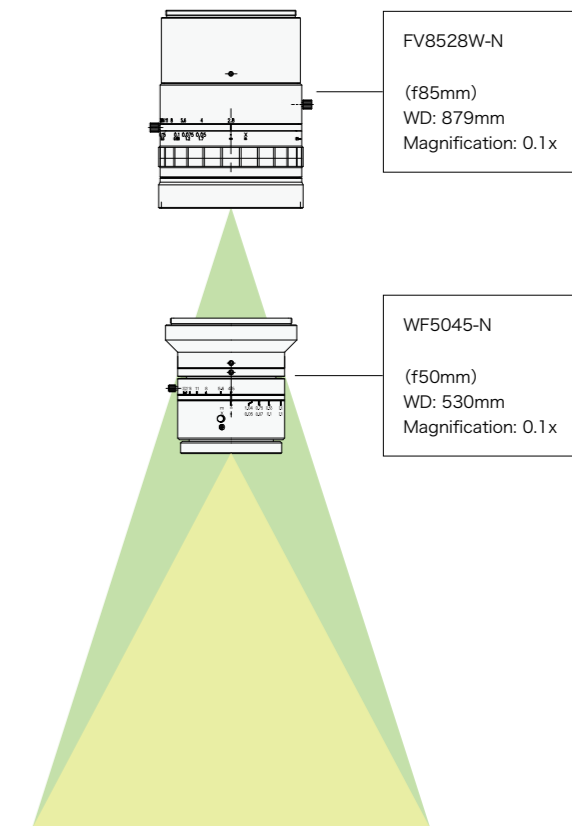
WF5045-H (FB=6.56mm)



WF5045-F (FB=46.5mm)



Conceptual Drawing



LSF Series

LARGE FORMAT $\phi 44$

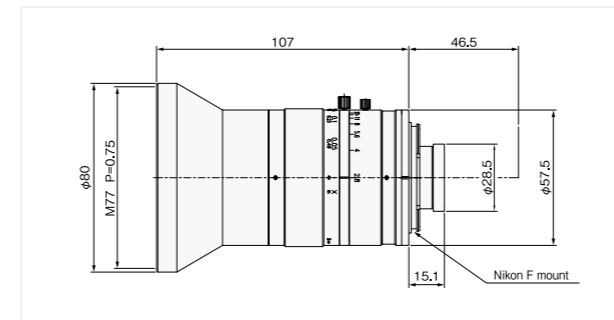
High Resolution and Wide Angle Lens for Area and Line Scan Camera

Excellent relative illumination High resolution at whole working distance

- Design for high resolution and low distortion, stable performance at whole working distance
- Possible to use for small pixel size, 3.5 μ line scan camera
- Very low color aberration, compatible with 3-line camera
- 「LSF5028-F」 is possible to use at 0.3x without extension ring
- Wide angle, f25mm is available
- Suitable for large area sensor, 20 Mega Pixel, 25 Mega Pixel, and 29 Mega Pixel

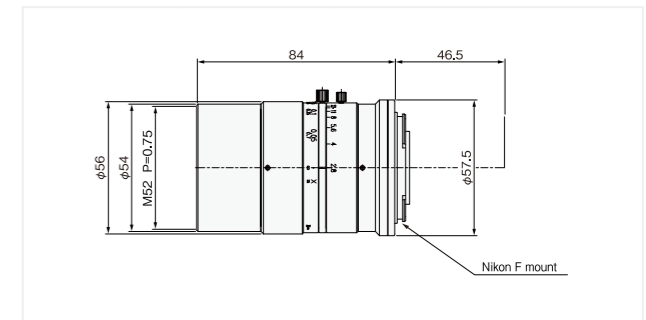


LSF2528-F



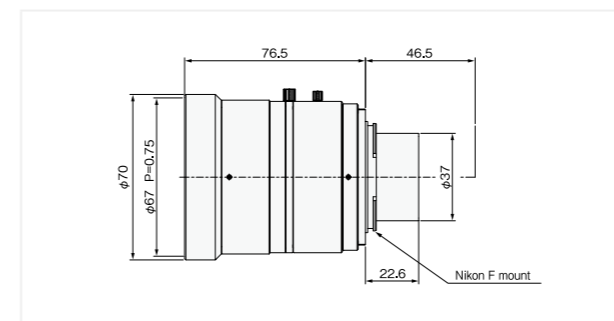
Focal length	25mm	Optical distortion	0.66%
∞ F No.	2.8	Maximum Compatible sensor	$\phi 44$ mm
Range of WD	140mm - ∞	Mount	F
Magnification at MOD	0.15x		

LSF3528-F



Focal length	35mm	Optical distortion	-0.31%
∞ F No.	2.8	Maximum Compatible sensor	$\phi 44$ mm
Range of WD	230mm - ∞	Mount	F
Magnification at MOD	0.15x		

LSF5028-F



Focal length	50mm	Optical distortion	-0.40%
∞ F No.	2.8	Maximum Compatible sensor	$\phi 44$ mm
Range of WD	190mm - ∞	Mount	F
Magnification at MOD	0.3x		

* Indicated specifications are design value.

Model No. for Different Mount

Model	Compatible Camera	Screw Pitch	Back Focal Distance
LSF □□□□-V58	SVS: SVCam-HR	M58 (P = 0.75)	11.48mm
LSF □□□□-U58	Baumer	M58 (P = 0.75)	12mm
LSF □□□□-B42	Basler	M42 (P = 1)	16mm
LSF □□□□-B42/2	Basler	M42 (P = 0.75)	16mm
LSF □□□□-V42	SVS	M42 (P = 1)	11.48mm
LSF □□□□-S42	Sentech, Baumer	M42 (P = 1)	10mm
LSF □□□□-D42	Dalsa: Spyder 3	M42 (P = 1)	6.56mm

* Customized mount is also available. Please contact us for further information.

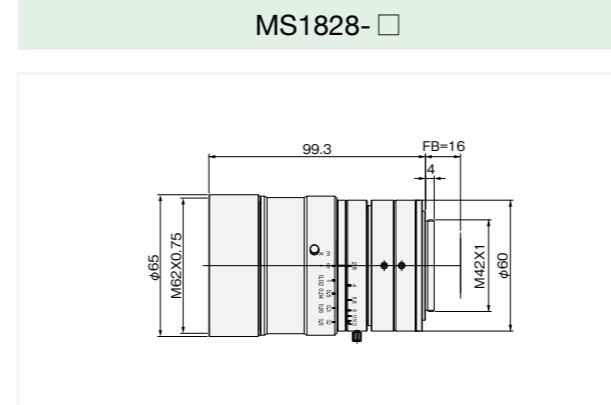
MS Series



12 Mega Pixel Lens for Large format, φ30mm

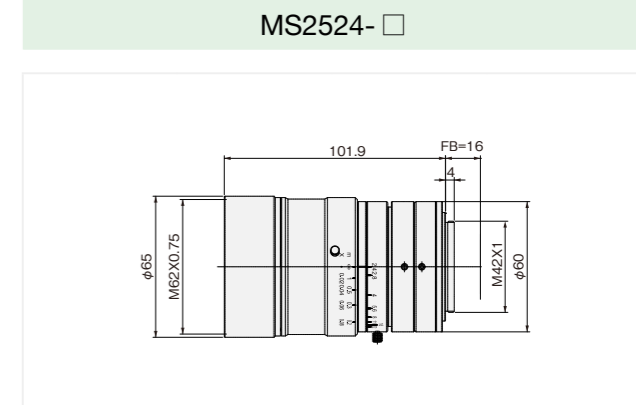
High resolution lens for 4/3 inch 8 Mega Pixel and 12 Mega Pixel

- Suitable for large format, 12 Mega Pixel (φ 30mm) and line scan, 8192 x 3.5 μ
- Standard mount is M42
- Adopt screw mount, stable mount mechanism without rattling
- Achieve low distortion and wide angle for large format, φ 30mm
- Stable performance at different working distance by floating design



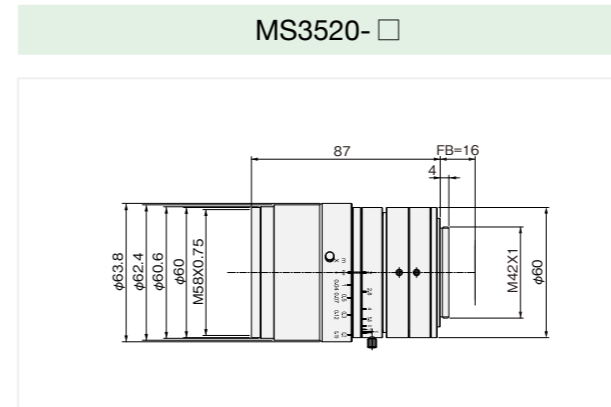
Focal length	18mm	Magnification at MOD	0.15x
∞F No.	2.8	TV distortion	0.52%
Range of WD	100mm - ∞	Maximum Compatible sensor	φ 30.7
Mount	M42, TFL- II, or C		

* Drawing is for B42 mount (M42 x 1, FB16.1mm)



Focal length	25mm	Magnification at MOD	0.2x
∞F No.	2.4	TV distortion	-0.27%
Range of WD	120mm - ∞	Maximum Compatible sensor	φ 30.7
Mount	M42, TFL- II, or C		

* Drawing is for B42 mount (M42 x 1, FB16.1mm)



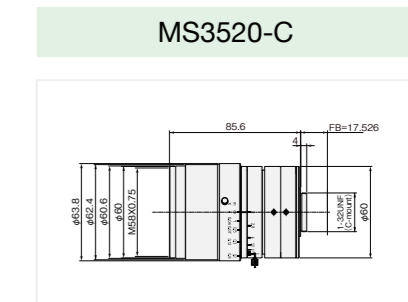
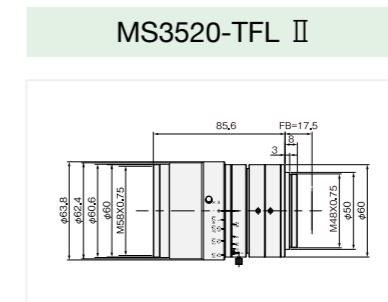
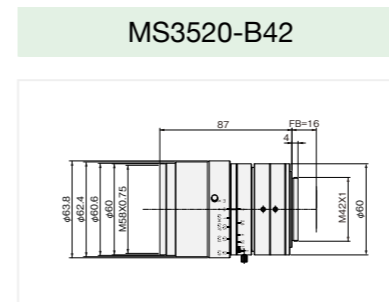
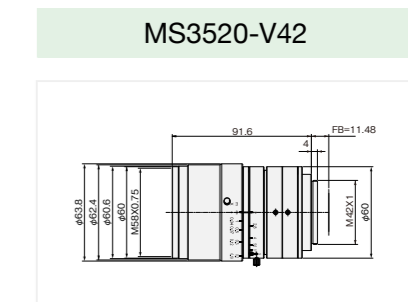
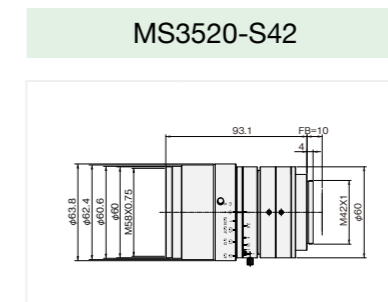
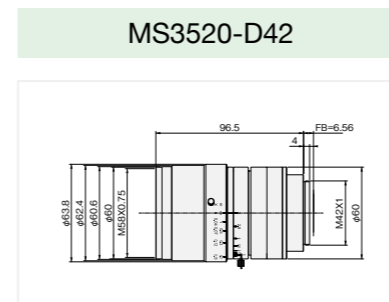
Focal length	35mm	Magnification at MOD	0.39x
∞F No.	2.0	TV distortion	-0.11%
Range of WD	100mm - ∞	Maximum Compatible sensor	φ 30.7
Mount	M42, TFL- II, or C		

* Drawing is for B42 mount (M42 x 1, FB16.1mm)

Model No. of Mount		
D42	6.56mm	(M42 P=1mm)
V42	11.48mm	(M42 P=1mm)
S42	10mm	(M42 P=1mm)
B42	16mm	(M42 P=1mm)
TFL II	17.5mm	(M48 P=0.75mm)
C	C Mount	

* □ = Mount
* Please ask for customized mount for different back focal distance.

Standard Mount (MS3520- □)



TFL II Series



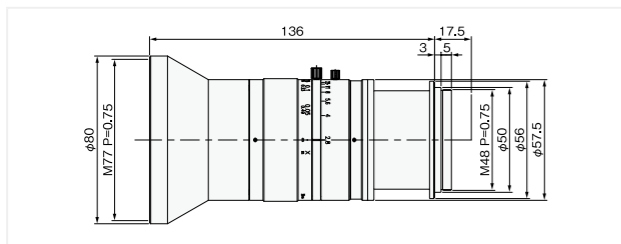
Large Format Lens for TFL-II Mount

Design for TFL-II mount, improve accuracy of inspection

- Improve accuracy and durability, more stable than F mount
- Suitable for high resolution and large format sensor
- 「LSF series」 is designed for high resolution and low distortion at the whole range of working distance, from macro to infinity
- 「LS series」 and 「LSTL series」 are suitable for macro imaging

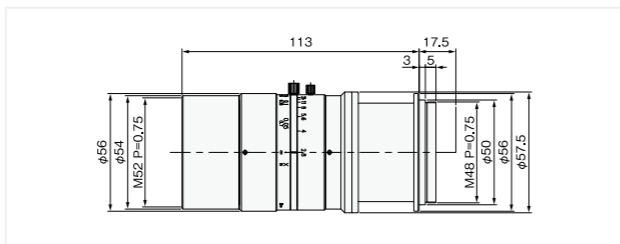


LSF2528-TFL II (for wide field of view)



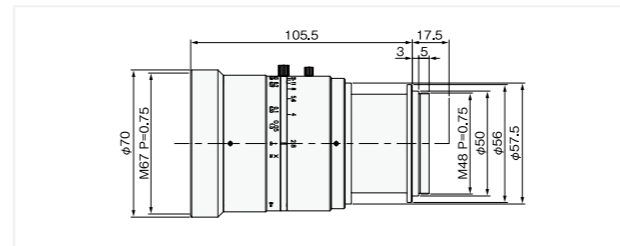
Focal length	25mm	TV distortion	-0.11%
∞F No.	2.8	Maximum Compatible sensor	φ 44mm
Range of WD	140mm~∞	Mount	TFL-II
Maximum Magnification	0.15x		

LSF3528-TFL II (for wide field of view)



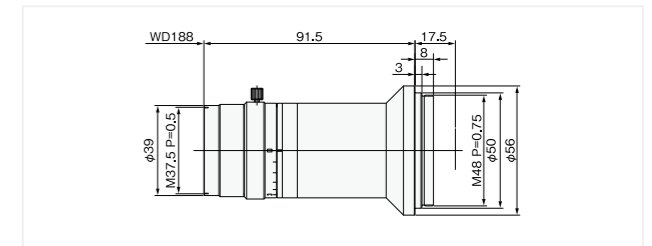
Focal length	35mm	TV distortion	-0.20%
∞F No.	2.8	Maximum Compatible sensor	φ 44mm
Range of WD	230mm~∞	Mount	TFL-II
Maximum Magnification	0.15x		

LSF5028-TFL II (for wide field of view)



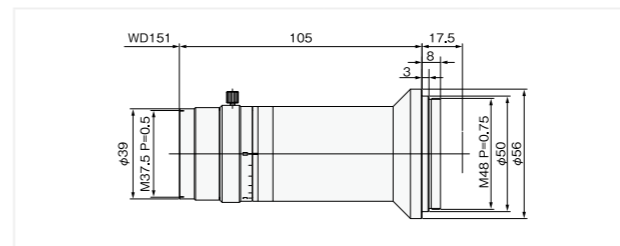
Focal length	50mm	TV distortion	-0.07%
∞F No.	2.8	Maximum Compatible sensor	φ 44mm
Range of WD	190mm~∞	Mount	TFL-II
Maximum Magnification	0.3x		

LS05-TFL II (for macro)



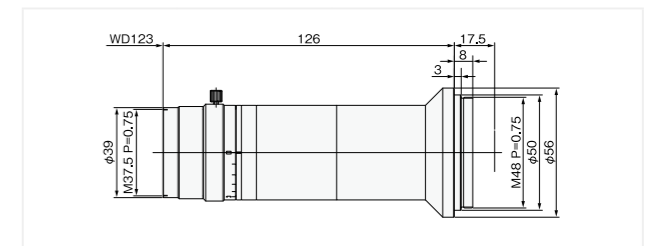
WD	188mm	TV distortion	-0.02%
Depth of field	0.94mm	Maximum Compatible sensor	φ 36mm
F No.	5.1	Mount	TFL-II
Resolution	11 μ		

LS07-TFL II (for macro)



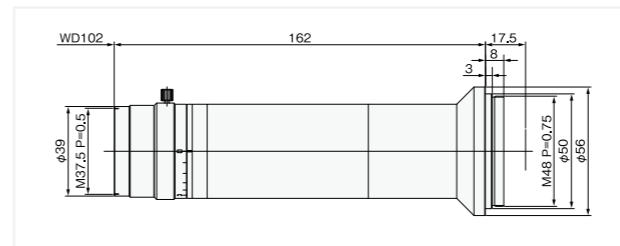
WD	151mm	TV distortion	-0.02%
Depth of field	0.54mm	Maximum Compatible sensor	φ 36mm
F No.	6	Mount	TFL-II
Resolution	10 μ		

LS10-TFL II (for macro)



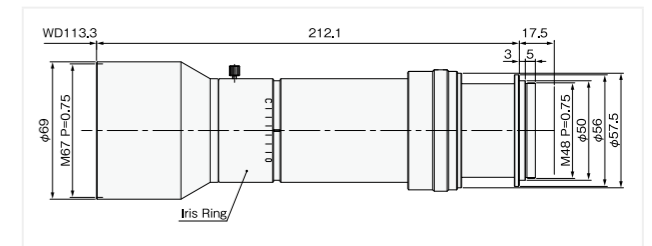
WD	123mm	TV distortion	0.00%
Depth of field	0.31mm	Maximum Compatible sensor	φ 36mm
F No.	7.5	Mount	TFL-II
Resolution	8 μ		

LS15-TFL II (for macro)



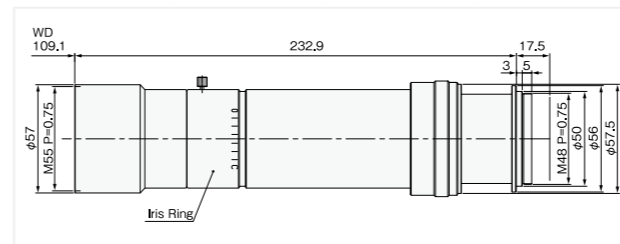
WD	102mm	TV distortion	0.06%
Depth of field	0.17mm	Maximum Compatible sensor	φ 36mm
F No.	9.9	Mount	TFL-II
Resolution	7 μ		

LSTL10H-TFL II (Telecentric type)



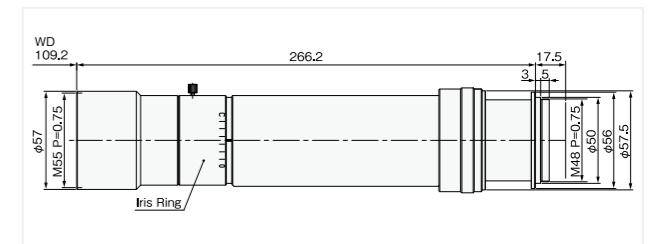
WD	113mm	TV distortion	0.00%
Depth of field	0.31mm	Maximum Compatible sensor	φ 44mm
F No.	6.4	Mount	TFL-II
Resolution	2.9 μ		

LSTL15H-TFL II (Telecentric type)



WD	109mm	TV distortion	0.00%
Depth of field	0.17mm	Maximum Compatible sensor	φ 44mm
F No.	7.8	Mount	TFL-II
Resolution	3.5 μ		

LSTL20H-TFL II (Telecentric type)



WD	109mm	TV distortion	0.00%
Depth of field	0.12mm	Maximum Compatible sensor	φ 44mm
F No.	8.7	Mount	TFL-II
Resolution	2.9 μ		

* TV distortion indicates the value for φ 30mm sensor.

* TV distortion indicates the value for φ 30mm sensor.

FV-L Series

LARGE
FORMAT

φ21.4-62

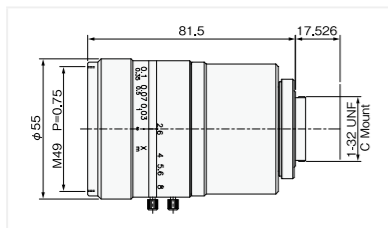
Macro Lens for Area and Line Scan Camera

Design for macro imaging, suitable for large area and line scan camera

- Adjustable focus and iris
- Design for macro imaging, suitable for machine vision application
- Suitable for inspection of wafer, PCB, electronic parts, etc..., required for high resolution at short working distance
- FV8528L-M is compatible with M72 mount
- Compatible with large image format of high resolution area camera

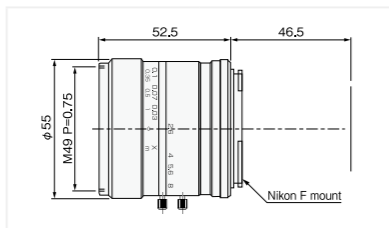


FV3526L-C



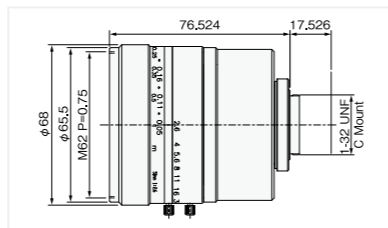
Focal length	35mm
∞ F No.	2.6
Range of WD	0.18m - ∞
Magnification at MOD	0.2x
Optical distortion	-0.05%
Maximum Compatible sensor	1.2 inch (φ 21.4mm)
Mount	C

FV3526L-F



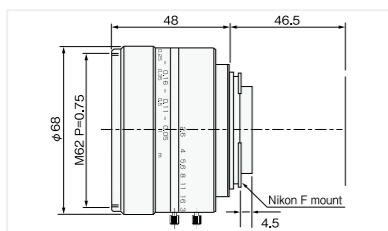
Focal length	35mm
∞ F No.	2.6
Range of WD	0.18m - ∞
Magnification at MOD	0.2x
Optical distortion	-0.42%
Maximum Compatible sensor	φ 36mm
Mount	F

FV5026L-C



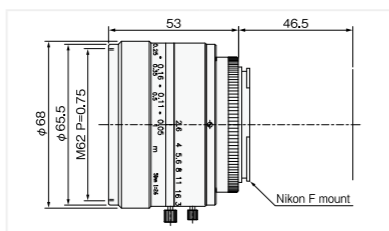
Focal length	50mm
∞ F No.	2.6
Range of WD	0.25m - 1m
Magnification at MOD	0.22x
Optical distortion	-0.01%
Maximum Compatible sensor	1.2 inch (φ 21.4mm)
Mount	C

FV5026L-F



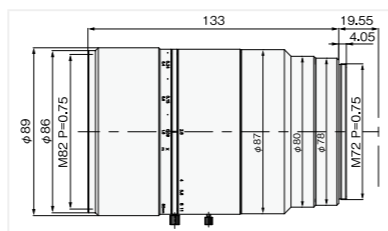
Focal length	50mm
∞ F No.	2.6
Range of WD	0.25 - 1m
Magnification at MOD	0.22x
Optical distortion	-0.24%
Maximum Compatible sensor	φ 45mm
Mount	F

FV5026L II -F



Focal length	50mm
∞ F No.	2.6
Range of WD	0.17m - 0.35m
Magnification at MOD	0.32x
Optical distortion	-0.80%
Maximum Compatible sensor	φ 45mm
Mount	F

FV8528L- □



* Drawing is for FV8528L-M (Dalsa P2, FB19.55mm).	
Focal length	85mm
∞ F No.	2.8
Range of WD	0.25m - 0.45m
Magnification at MOD	0.4x
Optical distortion	-0.18%
Maximum Compatible sensor	φ 62mm
Mount	F or M72

* Indicated specifications are design value. □ = Mount: F = Nikon F Mount, M = Dalsa P2 (FB19.55mm), H = Dalsa P2-HS and P3 (FB6.56mm), N = NED ClisBee (FB31.8mm)

FV-W Series

LARGE
FORMAT

φ45-62

Area and Line Scan Lens for Wide Field of View

Machine vision lens for large field of view

- Adjustable focus and iris
- Design for infinite distance (∞), suitable for wide field of view
- Design for machine vision application



HB5014-F

LARGE
FORMAT

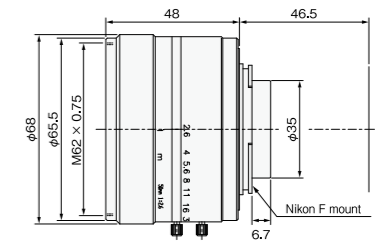
φ45

Line Scan Lens for Large Aperture

Large aperture and design for machine vision

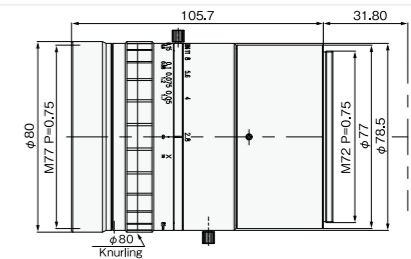
- Excellent brightness, F No. 1.4
- Suitable for high speed applications such as printing, food inspection, etc..
- Metal design, avoid aged deterioration of plastic and gum, concerned about photographic lenses
- Suitable for large image circle and high speed camera

FV5026W-F



Focal length	50mm	Optical distortion	0.23%
∞ F No.	2.6	Maximum Compatible sensor	φ 45mm
Range of WD	0.32m - ∞	Mount	F
Magnification at MOD	0.18x		

FV8528W- □

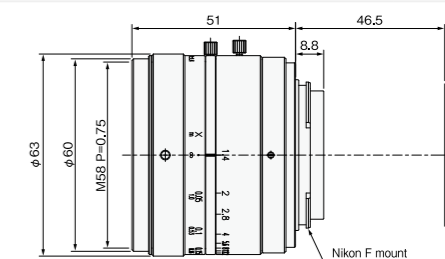


Focal length	85 mm	Optical distortion	0.04%
∞ F No.	2.8	Maximum Compatible sensor	φ 62mm
Range of WD	0.46m - ∞	Mount	F or M72
Magnification at MOD	0.2x		

* Indicated specifications are design value. □ = Mount: F = Nikon F Mount, M = Dalsa P2 (FB19.55mm), H = Dalsa P2-HS and P3 (FB6.56mm), N = NED ClisBee (FB31.8mm)



HB5014-F



Focal length	50mm	Optical distortion	0.17%
∞ F No.	1.4	Maximum Compatible sensor	φ 45mm
Range of WD	0.27m - ∞	Mount	F
Magnification at MOD	0.2x		

* Indicated specifications are design values.

TELECENTRIC LENS

Magnification chart of Telecentric lens for C mount

Magnification	compatible sensor									
	1/2	page	1/1.8	page	2/3	page	1	page	1.1	page
0.14x	MGTL014	P39	-	-	MGTL014VM	P35	-	-	-	-
0.17x	-	-	-	-	MGTL014VM-180	P35	-	-	-	-
0.19x	-	-	-	-	MGTL017VM	P35	-	-	-	-
0.22x	-	-	-	-	MGTL019	P39	-	-	-	-
0.23x	-	-	-	-	MGTL022VM	P35	-	-	-	-
0.275x	-	-	-	-	MGTL023	P39	-	-	-	-
0.3x	-	-	-	-	MGTL023H	P36	-	-	-	-
0.345x	-	-	-	-	MGTL0275-2	P39	MGTL0275V	P33	-	-
0.37x	-	-	-	-	MGTL03	P39	-	-	MGTL03V	P32
0.4x	-	-	-	-	MGTL03VM	P36	-	-	MGTL03VC	P32
0.4x	-	-	-	-	MGTL03VMC	P37	-	-	-	-
0.4x	-	-	-	-	MGTL0345VM	P36	-	-	-	-
0.4x	-	-	-	-	MGTL0345VMC	P37	-	-	-	-
0.5x	-	-	TL05C-220	P50	-	-	MGTL037V	P33	-	-
0.5x	-	-	-	-	MGTL04	P39	-	-	-	-
0.5x	-	-	-	-	MGTL04VM	P36	-	-	-	-
0.5x	-	-	-	-	MGTL04VMC	P37	-	-	-	-
0.5x	-	-	-	-	FT05-65	P40	-	-	MGTL05-1.1	P39
0.5x	-	-	-	-	FT05C-65	P41	-	-	-	-
0.5x	-	-	-	-	FT05-110	P42	-	-	-	-
0.5x	-	-	-	-	FT05C-110	P43	-	-	-	-
0.5x	-	-	-	-	MGTL05VM	P37	-	-	-	-
0.5x	-	-	-	-	MGTL05VMC	P37	-	-	-	-
0.5x	-	-	-	-	MGTL069VM	P37	-	-	-	-
0.5x	-	-	-	-	MGTL069VMC	P37	-	-	-	-
0.69x	-	-	-	-	-	-	-	-	-	-
0.7x	-	-	TL07C-220	P50	-	-	-	-	-	-
0.7x	-	-	TL07C-340	P52	-	-	-	-	-	-
0.8x	-	-	TL08-65R	P46	-	-	-	-	-	-
0.8x	-	-	TL08C-65R	P47	-	-	-	-	-	-
0.8x	-	-	TL08-110R	P48	-	-	-	-	-	-
0.8x	-	-	TL08C-110R	P49	-	-	-	-	-	-
0.8x	-	-	-	-	FT08-110	P42	-	-	-	-
0.8x	-	-	-	-	FT08C-110	P43	-	-	-	-
1.0x	-	-	TL10-65R	P46	FT10-65	P40	-	-	MGTL10V	P37
1.0x	-	-	TL10C-65R	P47	FT10C-65	P41	-	-	MGTL10VC	P37
1.0x	-	-	TL10-110R	P48	FT10-110	P42	-	-	-	-
1.0x	-	-	TL10C-110R	P49	FT10C-110	P43	-	-	-	-
1.0x	-	-	TL10C-220	P50	TL10C-310	P52	-	-	-	-
1.5x	-	-	TL15-65R	P46	FT15-65	P40	-	-	-	-
1.5x	-	-	TL15C-65R	P47	FT15C-65	P41	-	-	-	-
1.5x	-	-	-	-	FT15-110	P42	-	-	-	-
1.5x	-	-	-	-	FT15C-110	P43	-	-	-	-
2.0x	TL20-40	P44	TL20C-220	P50	FT20-65	P40	-	-	-	-
2.0x	TL20C-40	P45	-	-	FT20C-65	P41	-	-	-	-
2.0x	TL20-65R	P46	-	-	FT20-110	P43	-	-	-	-
2.0x	TL20C-65R	P47	-	-	FT20C-110	P43	-	-	-	-
2.0x	TL20-110R	P49	-	-	-	-	-	-	-	-
2.0x	TL20C-110R	P49	-	-	-	-	-	-	-	-
3.0x	-	-	-	-	FT30-110R	P43	-	-	-	-
3.0x	-	-	-	-	FT30C-110R	P43	-	-	-	-
3.0x	-	-	-	-	TL30C-65	P47	-	-	-	-
4.0x	TL40-40	P44	TL40-65	P47	TL40-65	P47	-	-	-	-
4.0x	TL40C-40	P45	TL40C-65	P47	TL40C-65	P47	-	-	-	-
4.0x	-	-	TL40C-110R	P49	FT40-65	P41	-	-	-	-
4.0x	-	-	-	-	FT40C-65	P41	-	-	-	-
4.0x	-	-	-	-	FT40-110R	P43	-	-	-	-
4.0x	-	-	-	-	FT40C-110R	P43	-	-	-	-
4.0x	-	-	-	-	TL40C-240	P51	-	-	-	-
6.0x	TL60-40	P45	-	-	FT60-110R	P43	-	-	-	-
6.0x	TL60C-40	P45	-	-	FT60C-110R	P43	-	-	-	-
6.0x	-	-	-	-	TL60-65	P47	-	-	-	-
6.0x	-	-	-	-	TL60C-65	P47	-	-	-	-
6.0x	-	-	TL60C-110R	P49	-	-	-	-	-	-
6.0x	-	-	-	-	TL60C-240	P51	-	-	-	-
8.0x	-	-	-	-	TL80-65	P47	-	-	-	-
8.0x	-	-	-	-	TL80C-65	P47	-	-	-	-
8.0x	-	-	TL80C-110R	P49	-	-	-	-	-	-
8.0x	-	-	-	-	TL80C-240	P51	-	-	-	-
10x	-	-	TL100C-55	P53	TL100C-240	P51	-	-	-	-

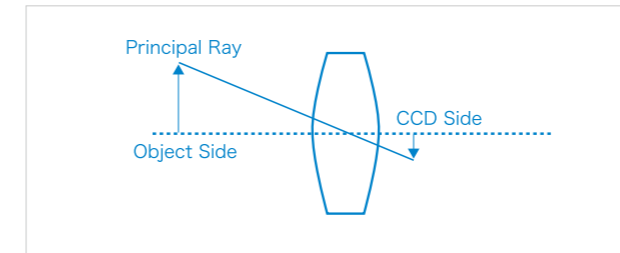
Coaxial type is 'C' included on the model name

Telecentric Lens for Image Processing

The most suitable optical system for measurement in high accuracy

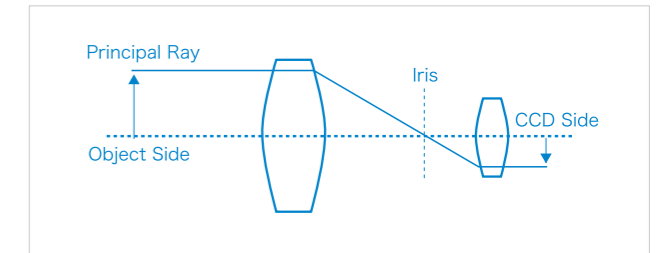
Telecentric optical system is an optical design that where the principal ray in parallel to the optical axis. It eliminates distortion problems by collimating the light entering the lens and suitable for imaging 3D objects. Co-axial illumination is suitable for recognizing object with high reflectance such as wafer, glass, and metal.

Non-telecentric lens



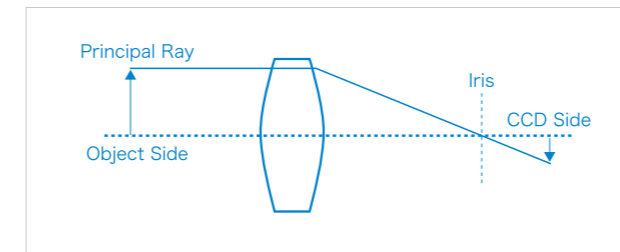
- Smaller size
- The number of lenses is fewer.
- Object size changes as the object goes up and down.

Double side telecentric lens



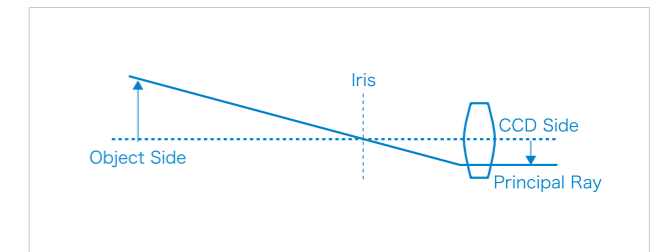
- Primary lays of object and image side are parallel to optical axis.
- Object size does not change when object goes up and down.
- Large size and high cost

Object side telecentric lens

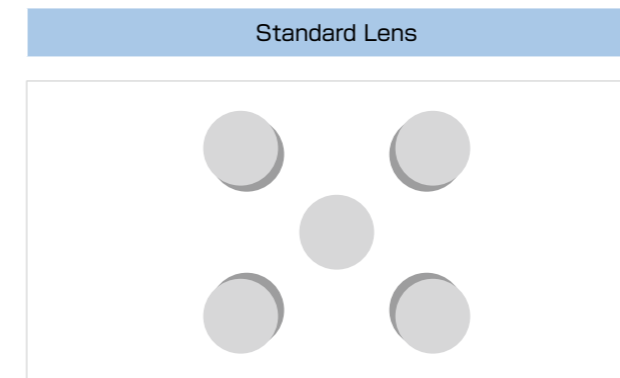


- Principal ray of object side is parallel to optical axis.
- Required for co-axial illumination
- Object size does not change when object goes up and down.
- Small size, compared to double side telecentric lens

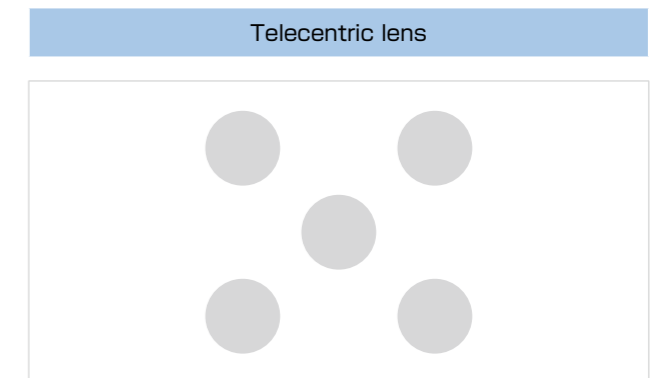
Image side telecentric lens



- Principal ray of image side is parallel to optical axis.
- Object size changes when object size goes up and down.
- A lens for video camera should be this optical system to correct color aberration.



Size of 3D object changes when it goes up and down when non-telecentric lens is used. Telecentric lens is suitable for accurate measurement of 3D object.



VTL Series

12 Mega Pixel Vari Focal Telecentric lens for 1.1 inch

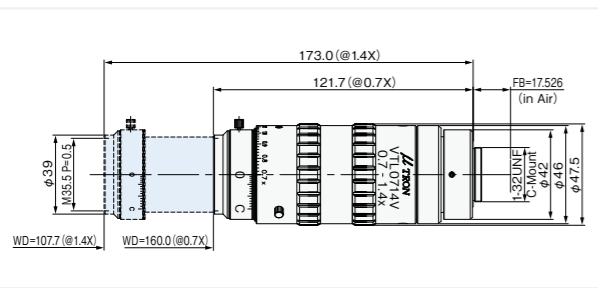


Vari Focal Telecentric Lens at 0.7x - 1.4x
Possible to change magnification range by using front converter

- ▣ Suitable for 12 Mega Pixel (1.1 inch, 3.45 μ m)
- ▣ Super high resolution
- ▣ Adjustable the depth of field and the Contrast
- ▣ Magnification can be converted from 0.35 x to 0.7 x by using front converter

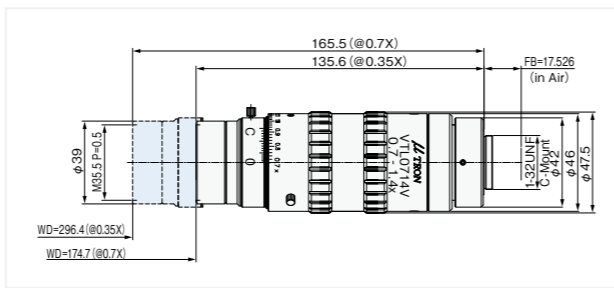


VTL0714V



Magnification	0.7x - 1.4x
WD	160mm - 108mm
Maximum Compatible sensor	φ 17.6mm (1.1 inch)
Mount	C

VTL0714V + VTL05FCV



Magnification	0.35x - 0.7x
WD	296mm - 175mm
Application	For VTL0714V

* Indicated specifications are design values. * Resolution indicates a theoretical resolution at a wavelength of 550nm.
*Depth of field is calculating assuming a horizontal 320 TV resolution using 1/2 inch camera (permissible circle of confusion 40 μ).

VTL Series

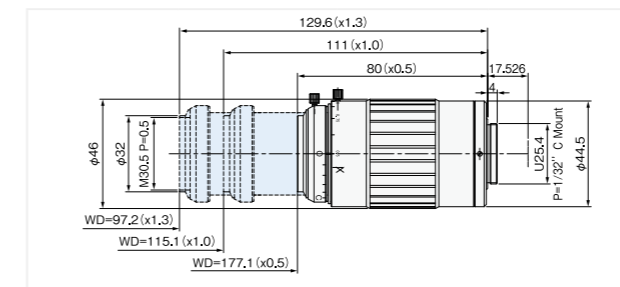
Vari Focal Telecentric Lens

Vari Focal Telecentric Lens at 0.5x - 1.3x
Possible to change magnification range by using front converter

- ▣ Telecentric lens at the whole range of magnification
- ▣ Suitable for 5 Mega Pixel
- ▣ Magnification of VTL0513 can be converted from 0.25x - 2.6x by using front converter
- ▣ Reduce relative illumination
- ▣ TV distortion less than 0.01%
- ▣ VTL0513 is suitable for large format, up to 1.1 inch even though original optical design is for 2/3 inch

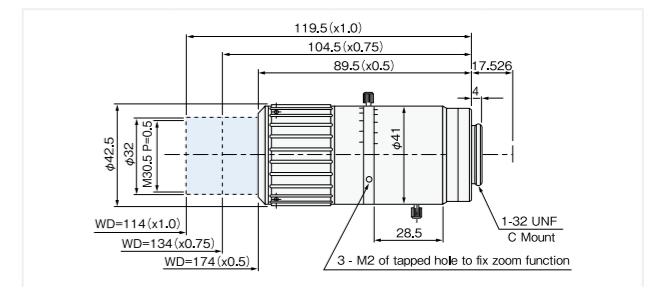


VTL0513



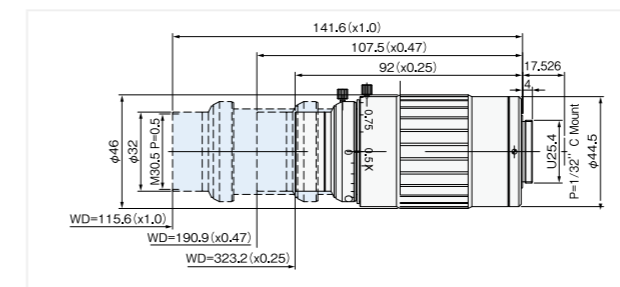
Magnification	0.5x - 1.3x	Depth of field	1.68mm - 0.47mm
F No.	5.26 - 10	Resolution	4.2 μ - 2.9 μ
Object side NA	0.048 - 0.065	TV distortion	0.01%
WD	173mm - 97mm	Maximum Compatible sensor	2/3
OI	271mm - 244mm	Mount	C

VTL0510



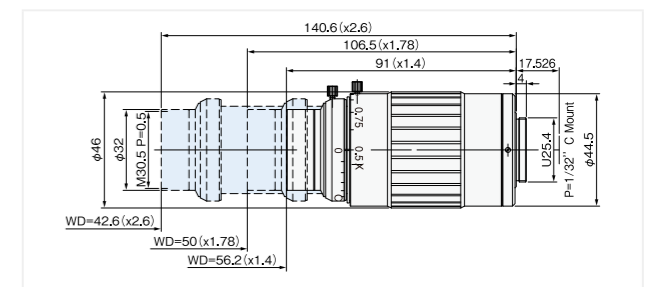
Magnification	0.5x - 1.0x	Depth of field	1.20mm - 0.47mm
F No.	3.76 - 5.89	Resolution	7.4 μ - 5 μ
Object side NA	0.066 - 0.085	TV distortion	0.01%
WD	174mm - 114mm	Maximum Compatible sensor	1/1.8
OI	281mm - 251mm	Mount	C

VTL0513 + VTL05FC



Magnification	0.25x - 1.0x
WD	323.2mm - 115.6mm
Application	For VTL0513

VTL0513 + VTL20FC



Magnification	1.4x - 2.6x
WD	56.2mm - 42.6mm
Application	For VTL0513

* Indicated specifications are design values. * Resolution indicates a theoretical resolution at a wavelength of 550nm.
*Depth of field is calculating assuming a horizontal 320 TV resolution using 1/2 inch camera (permissible circle of confusion 40 μ).

MGTL-V Series

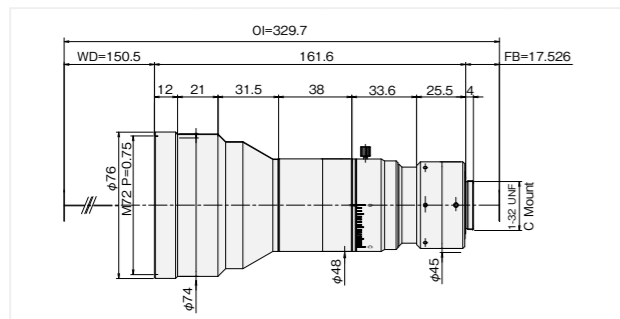
12 Mega Pixel Telecentric Lens for 1.1 inch

Suitable for 6.5 Mega Pixel – 12 Mega Pixel sensor

- 0.3x Bi-telecentric lens for 12 Mega Pixel (1.1 inch , 3.1 μ)
- Super high resolution, suitable 3.1 μ or smaller pixel
- Long working distance, 150mm with excellent brightness
- Variable iris, possible to adjust DOF
- Suitable for measurement and inspection, required for high accuracy
- Co-axial type is also available



MGTL03V

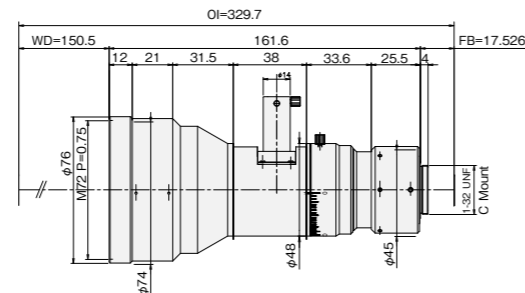


Magnification	0.3x	Depth of field	4.26mm
F No.	4.8	Resolution	10.8 μ
Object side NA	0.031	TV distortion	0.00%
WD	151mm	Maximum Compatible sensor	1.1
OI	330mm	Mount	C

* Indicated specifications are design values. * Resolution indicates a theoretical resolution at a wavelength of 550nm.

*Depth of field is calculating assuming a horizontal 320 TV resolution using 1/2 inch camera (permissible circle of confusion 40 μ).

MGTL03VC



Magnification	0.3x	Depth of field	4.26mm
F No.	4.8	Resolution	10.8 μ
Object side NA	0.031	TV distortion	0.00%
WD	151mm	Maximum Compatible sensor	1.1
OI	330mm	Mount	C

MGTL-V Series

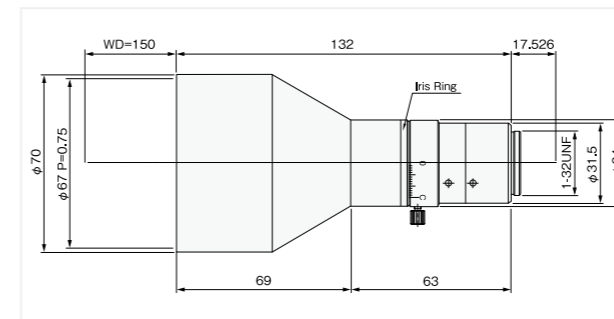
Telecentric Lens for 1 inch

Design for 1 inch High resolution and suitable for large field of view

- Over 4 Mega Pixel telecentric lens series for 1 inch
- 0.275x and 0.37x are available
- MGTL0275V is designed for long working distance, 150mm
- Excellent relative illumination
- Adjustable iris, possible to adjust depth of field



MGTL0275V

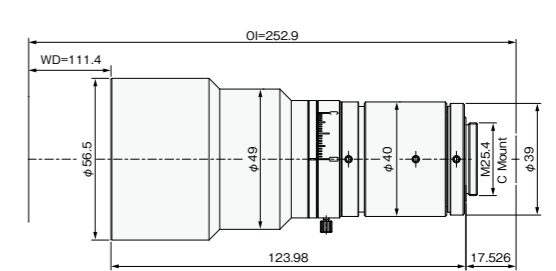


Magnification	0.275x	Depth of field	7.2mm
F No.	6.8	Resolution	16.8 μ
Object side NA	0.02	TV distortion	0.01%
WD	150mm	Maximum Compatible sensor	1
OI	298mm	Mount	C

* Indicated specifications are design values. * Resolution indicates a theoretical resolution at a wavelength of 550nm.

*Depth of field is calculating assuming a horizontal 320 TV resolution using 1/2 inch camera (permissible circle of confusion 40 μ).

MGTL037V



Magnification	0.37x	Depth of field	4.7mm
F No.	8	Resolution	14.6 μ
Object side NA	0.023	TV distortion	0.01%
WD	111mm	Maximum Compatible sensor	1
OI	253mm	Mount	C

MGTL-VM Series

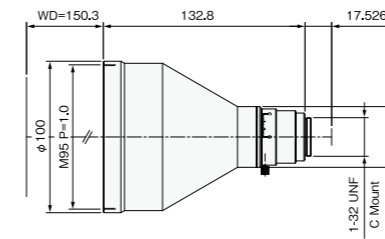
Low Magnification Telecentric Lens for 5 Mega Pixel

Possible to capture large field of view with high resolution

- Bring out the best quality in 5 Mega Pixel (3.45 μ of 2/3 inch)
- Suitable for 3.45 μ or smaller pixel size
- 0.14x, 0.17x, 0.22x are available
- Long working distance, WD150mm
- WD180mm type is available for 0.14x
- Compact design with low magnification
- Adjustable iris, possible to adjust depth of field

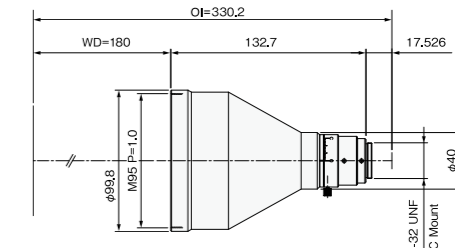


MGTL014VM



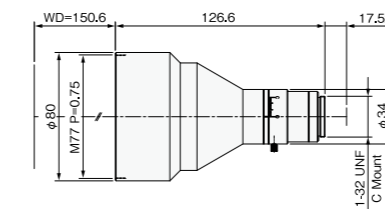
Magnification	0.14x	Depth of field	17.5mm
F No.	4.3	Resolution	20.5 μ
Object side NA	0.016	TV distortion	0.01%
WD	150.3mm	Maximum Compatible sensor	2/3
OI	300.6mm	Mount	C

MGTL014VM-180



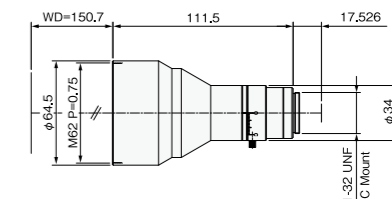
Magnification	0.14x	Depth of field	18mm
F No.	4.4	Resolution	21 μ
Object side NA	0.016	TV distortion	-0.01%
WD	180mm	Maximum Compatible sensor	2/3
OI	330.2mm	Mount	C

MGTL017VM



Magnification	0.17x	Depth of field	14.4mm
F No.	5.2	Resolution	20.5 μ
Object side NA	0.016	TV distortion	0.00%
WD	150.6mm	Maximum Compatible sensor	2/3
OI	294.7mm	Mount	C

MGTL022VM



Magnification	0.22x	Depth of field	8.5mm
F No.	5.2	Resolution	15.8 μ
Object side NA	0.021	TV distortion	0.00%
WD	150.7mm	Maximum Compatible sensor	2/3
OI	279.7mm	Mount	C

* Indicated specifications are design values. * Resolution indicates a theoretical resolution at a wavelength of 550nm.
*Depth of field is calculating assuming a horizontal 320 TV resolution using 1/2 inch camera (permissible circle of confusion 40 μ).

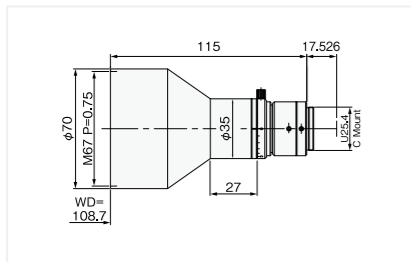
MGTL-VM Series

Telecentric Lens for 5 Mega Pixel

Suitable for the inspection in ultra high accuracy

- Bring out the best quality in 5 Mega Pixel (3.45 μ of 2/3 inch)
- Suitable for 3.45 μ or smaller pixel size
- Excellent brightness, compared to Mega Pixel telecentric lenses
- Adjustable iris, possible to adjust depth of field
- 1.0x is compatible with 1.1 inch sensor
- Compact design
- Reduce hot spots of co-axial illumination

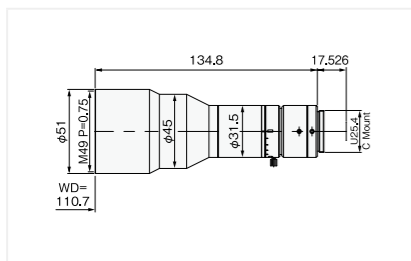
MGTL023H



Magnification	0.23x
F No.	5.2
Object side NA	0.022
WD	109mm
OI	241mm
Depth of field	7.9mm
Resolution	8.7 μ
TV distortion	0.00%
Maximum Compatible sensor	2/3
Mount	C

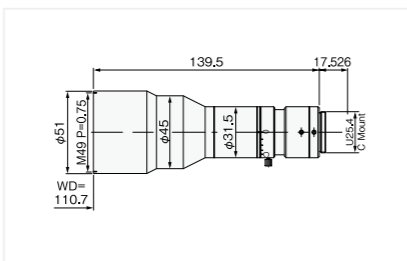


MGTL03VM



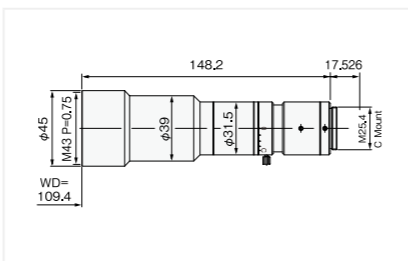
Magnification	0.3x
F No.	5.0
Object side NA	0.03
WD	111mm
OI	263mm
Depth of field	4.4mm
Resolution	6.6 μ
TV distortion	-0.04%
Maximum Compatible sensor	2/3
Mount	C

MGTL0345VM



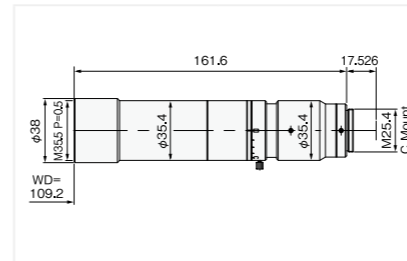
Magnification	0.345x
F No.	4.9
Object side NA	0.035
WD	111mm
OI	267mm
Depth of field	3.3mm
Resolution	5.5 μ
TV distortion	0.00%
Maximum Compatible sensor	2/3
Mount	C

MGTL04VM



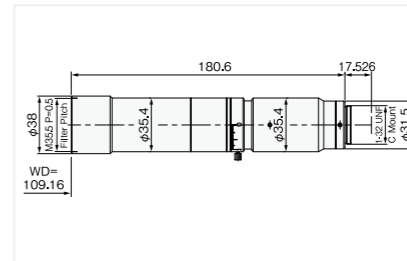
Magnification	0.4x
F No.	5.0
Object side NA	0.04
WD	109mm
OI	275mm
Depth of field	2.5mm
Resolution	4.9 μ
TV distortion	0.00%
Maximum Compatible sensor	2/3
Mount	C

MGTL05VM



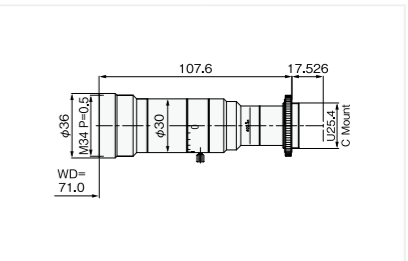
Magnification	0.5x
F No.	4.7
Object side NA	0.05
WD	109mm
OI	288mm
Depth of field	1.5mm
Resolution	3.8 μ
TV distortion	-0.03%
Maximum Compatible sensor	2/3
Mount	C

MGTL069VM



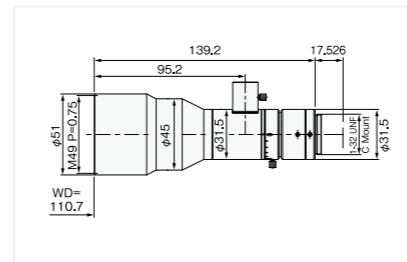
Magnification	0.69x
F No.	6.6
Object side NA	0.052
WD	109mm
OI	307mm
Depth of field	1.1mm
Resolution	3.9 μ
TV distortion	-0.04%
Maximum Compatible sensor	2/3
Mount	C

MGTL10V



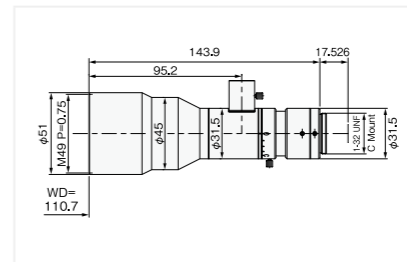
Magnification	1.0x
F No.	5.4
Object side NA	0.093
WD	71mm
OI	196mm
Depth of field	0.43mm
Resolution	2.5 μ
TV distortion	0.00%
Maximum Compatible sensor	1.1
Mount	C

MGTL03VMC



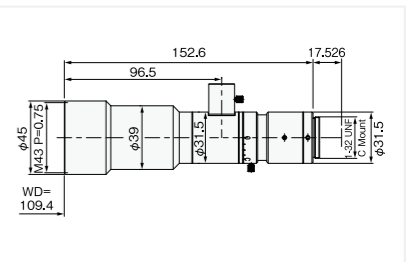
Magnification	0.3x
F No.	5.0
Object side NA	0.03
WD	111mm
OI	267mm
Depth of field	4.4mm
Resolution	6.6 μ
TV distortion	-0.04
Maximum Compatible sensor	2/3
Mount	C

MGTL0345VMC



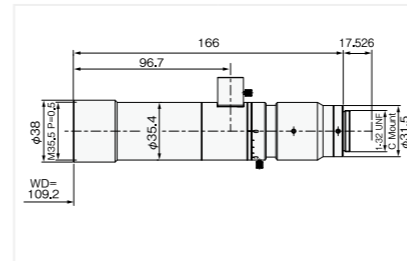
Magnification	0.345x
F No.	4.9
Object side NA	0.035
WD	111mm
OI	272mm
Depth of field	3.3mm
Resolution	5.5 μ
TV distortion	0.00%
Maximum Compatible sensor	2/3
Mount	C

MGTL04VMC



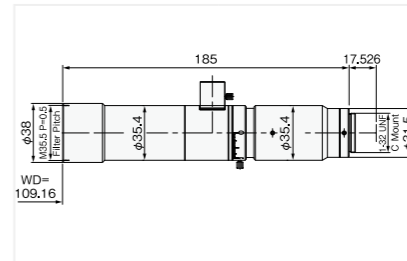
Magnification	0.4x
F No.	5.0
Object side NA	0.04
WD	109mm
OI	280mm
Depth of field	2.5mm
Resolution	4.9 μ
TV distortion	0.00%
Maximum Compatible sensor	2/3
Mount	C

MGTL05VMC



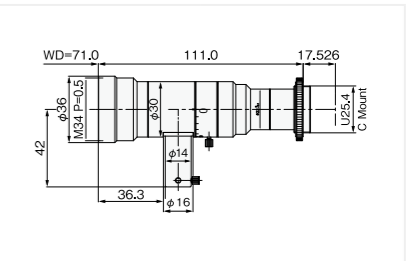
Magnification	0.5x
F No.	4.7
Object side NA	0.05
WD	109mm
OI	293mm
Depth of field	2.3mm
Resolution	3.8 μ
TV distortion	-0.03%
Maximum Compatible sensor	2/3
Mount	C

MGTL069VMC



Magnification	0.69x
F No.	6.6
Object side NA	0.052
WD	109mm
OI	312mm
Depth of field	1.1mm
Resolution	3.9 μ
TV distortion	-0.04%
Maximum Compatible sensor	2/3
Mount	C

MGTL10VC



Magnification	1.0x
F No.	5.4
Object side NA	0.093
WD	71mm
OI	200mm
Depth of field	0.43mm
Resolution	2.5 μ
TV distortion	0.00%
Maximum Compatible sensor	1.1
Mount	C

* Indicated specifications are design values. * Resolution indicates a theoretical resolution at a wavelength of 550nm.
*Depth of field is calculating assuming a horizontal 320 TV resolution using 1/2 inch camera (permissible circle of confusion 40 μ).

MGTL Series

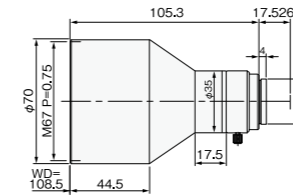
Mega Pixel Telecentric Lens

Suitable for Mega Pixel Sensor

- High resolution, compatible with Mega Pixel camera
- Compact design, suitable for small device
- MGTL05-1.1 is compatible with 1.1 inch
- MGTL0275 is compatible with ϕ 12.8mm sensor
- Adjustable iris, possible to adjust depth of field
- TV distortion less than 0.05%

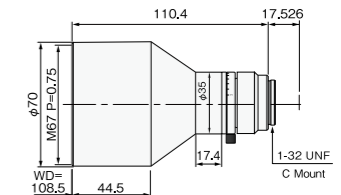


MGTL014



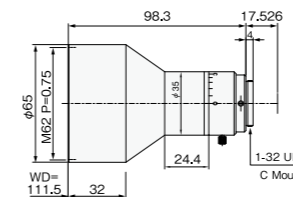
Magnification	0.14x	Depth of field	32.7mm
F No.	4.0	Resolution	19.7 μ
Object side NA	0.017	TV distortion	0.02%
WD	108mm	Maximum Compatible sensor	1/2
OI	231mm	Mount	C

MGTL019



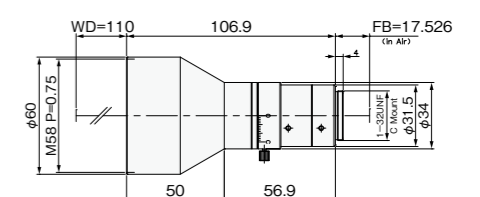
Magnification	0.19x	Depth of field	17.7mm
F No.	4.0	Resolution	14.0 μ
Object side NA	0.024	TV distortion	0.01%
WD	108mm	Maximum Compatible sensor	2/3
OI	236mm	Mount	C

MGTL023



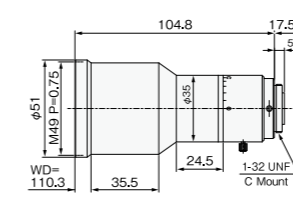
Magnification	0.23x	Depth of field	12mm
F No.	5.5	Resolution	16.0 μ
Object side NA	0.021	TV distortion	0.01%
WD	111mm	Maximum Compatible sensor	2/3
OI	227mm	Mount	C

MGTL0275-2



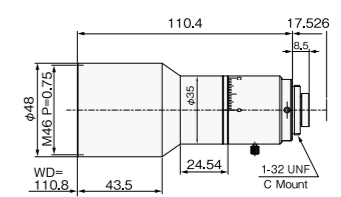
Magnification	0.275x	Depth of field	8.1mm
F No.	7.6	Resolution	18.6 μ
Object side NA	0.018	TV distortion	0.00%
WD	110mm	Maximum Compatible sensor	2/3
OI	234mm	Mount	C

MGTL03



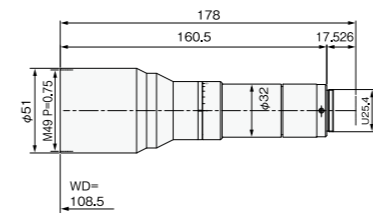
Magnification	0.3x	Depth of field	6.2mm
F No.	7.0	Resolution	16.0 μ
Object side NA	0.021	TV distortion	0.05%
WD	110mm	Maximum Compatible sensor	2/3
OI	233mm	Mount	C

MGTL04



Magnification	0.4x	Depth of field	4.6mm
F No.	9.2	Resolution	15.2 μ
Object side NA	0.022	TV distortion	0.00%
WD	110mm	Maximum Compatible sensor	2/3
OI	239mm	Mount	C

MGTL05-1.1



Magnification	0.5x	Depth of field	2mm
F No.	6.37	Resolution	8.6 μ
Object side NA	0.039	TV distortion	0.00%
WD	108mm	Maximum Compatible sensor	1.1
OI	286mm	Mount	C

* Indicated specifications are design values. *Resolution indicates a theoretical resolution at a wavelength of 550nm.
 *Depth of field is calculating assuming a horizontal 320 TV resolution using 1/2 inch camera (permissible circle of confusion 40 μ).
 *Depth of field of MGTL014, 019, and 023 indicate values at effective F No. 8

FT Series

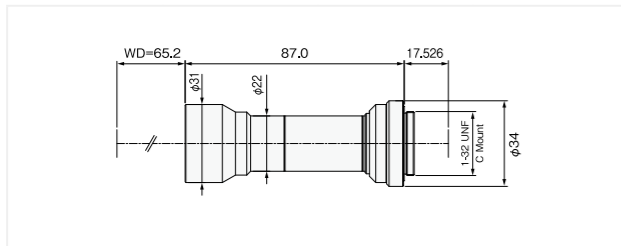
WD65 High NA Mega Pixel Telecentric Lens

Design for Mega Pixel Compact and high durability

- Mega Pixel telecentric lens for 2/3 inch
- Suitable for 2 Mega Pixel - 5 Mega Pixel camera
- High contrast with co-axial illumination
- TV distortion less than 0.01%

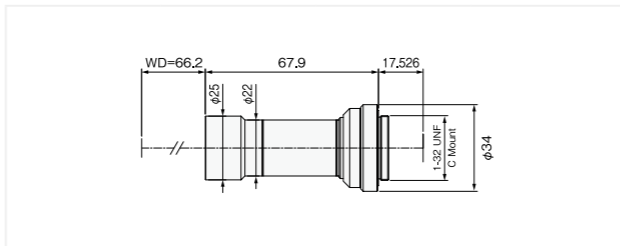


FT05-65



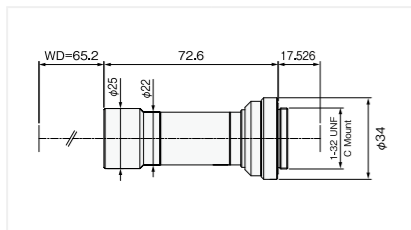
Magnification	0.5x	Depth of field	3.1mm
F No.	9.6	Resolution	12.9 μ
Object side NA	0.026	TV distortion	0.00%
WD	65mm	Maximum Compatible sensor	2/3
OI	170mm	Mount	C

FT08-65



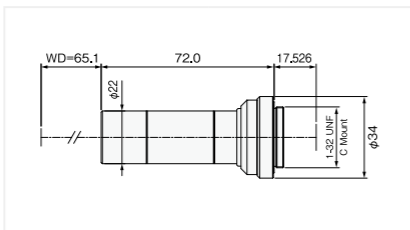
Magnification	0.8x	Depth of field	1.3mm
F No.	10	Resolution	8.4 μ
Object side NA	0.04	TV distortion	0.00%
WD	66mm	Maximum Compatible sensor	2/3
OI	152mm	Mount	C

FT10-65



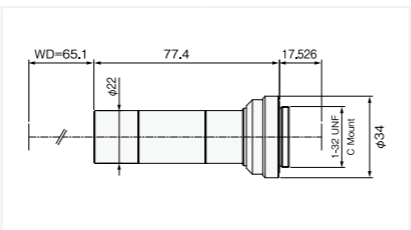
Magnification	1.0x	Depth of field	0.9mm
F No.	11.1	Resolution	7.5 μ
Object side NA	0.045	TV distortion	0.00%
WD	65mm	Maximum Compatible sensor	2/3
OI	155mm	Mount	C

FT15-65



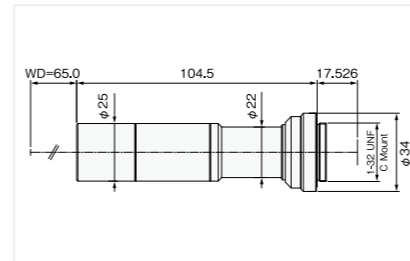
Magnification	1.5x	Depth of field	0.4mm
F No.	11.9	Resolution	5.3 μ
Object side NA	0.063	TV distortion	0.01%
WD	65mm	Maximum Compatible sensor	2/3
OI	155mm	Mount	C

FT20-65



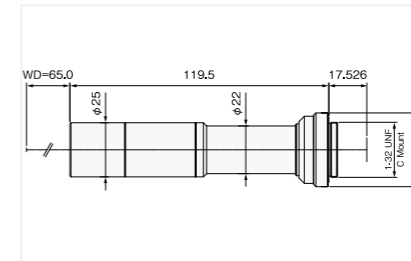
Magnification	2.0x	Depth of field	0.3mm
F No.	13.5	Resolution	4.5 μ
Object side NA	0.074	TV distortion	0.00%
WD	65mm	Maximum Compatible sensor	2/3
OI	160mm	Mount	C

FT40-65



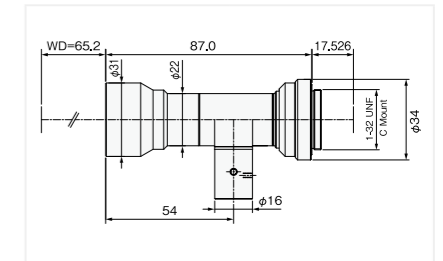
Magnification	4.0x	Depth of field	0.09mm
F No.	17.8	Resolution	3.0 μ
Object side NA	0.11	TV distortion	0.00%
WD	65mm	Maximum Compatible sensor	2/3
OI	187mm	Mount	C

FT60-65



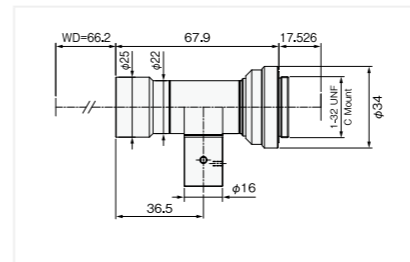
Magnification	6.0x	Depth of field	0.06mm
F No.	26.8	Resolution	3.0 μ
Object side NA	0.11	TV distortion	0.00%
WD	65mm	Maximum Compatible sensor	2/3
OI	202mm	Mount	C

FT05C-65



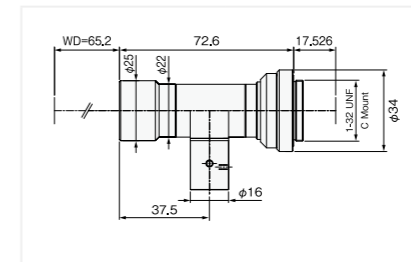
Magnification	0.5x	Depth of field	3.1mm
F No.	9.6	Resolution	12.9 μ
Object side NA	0.026	TV distortion	0.00%
WD	65mm	Maximum Compatible sensor	2/3
OI	170mm	Mount	C

FT08C-65



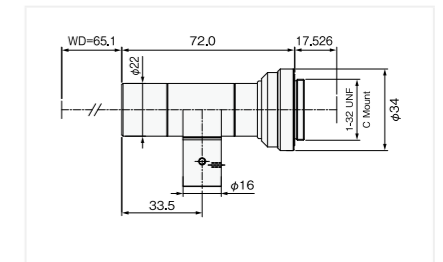
Magnification	0.8x	Depth of field	1.3mm
F No.	10	Resolution	8.4 μ
Object side NA	0.04	TV distortion	0.00%
WD	66mm	Maximum Compatible sensor	2/3
OI	152mm	Mount	C

FT10C-65



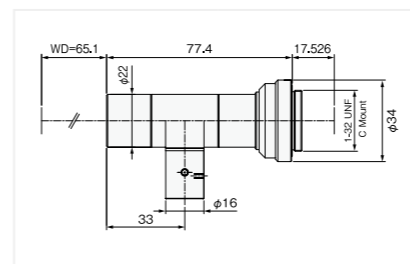
Magnification	1.0x	Depth of field	0.9mm
F No.	11.1	Resolution	7.5 μ
Object side NA	0.045	TV distortion	0.00%
WD	65mm	Maximum Compatible sensor	2/3
OI	155mm	Mount	C

FT15C-65



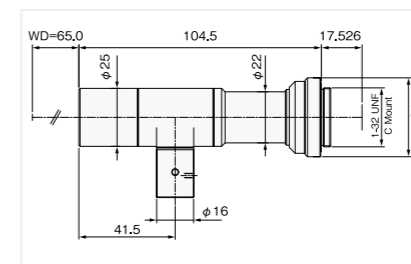
Magnification	1.5x	Depth of field	0.4mm
F No.	11.9	Resolution	5.3 μ
Object side NA	0.063	TV distortion	0.01%
WD	65mm	Maximum Compatible sensor	2/3
OI	155mm	Mount	C

FT20C-65



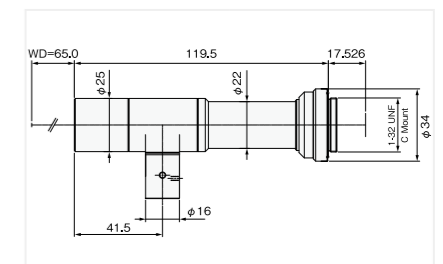
Magnification	2.0x	Depth of field	0.3mm
F No.	13.5	Resolution	4.5 μ
Object side NA	0.074	TV distortion	0.00%
WD	65mm	Maximum Compatible sensor	2/3
OI	160mm	Mount	C

FT40C-65



Magnification	4.0x	Depth of field	0.09mm
F No.	17.8	Resolution	3.0 μ
Object side NA	0.11	TV distortion	0.00%
WD	65mm	Maximum Compatible sensor	2/3
OI	187mm	Mount	C

FT60C-65



Magnification	6.0x	Depth of field	0.06mm
F No.	26.8	Resolution	3.0 μ
Object side NA	0.11	TV distortion	0.00%
WD	65mm	Maximum Compatible sensor	2/3
OI	202mm	Mount	C

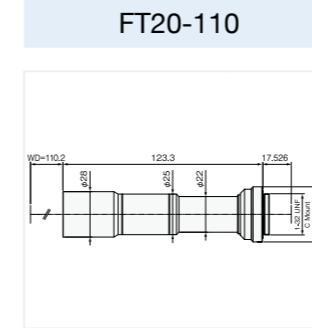
* Indicated specifications are design values. * Resolution indicates a theoretical resolution at a wavelength of 550nm.
*Depth of field is calculating assuming a horizontal 320 TV resolution using 1/2 inch camera (permissible circle of confusion 40 μ).

FT Series

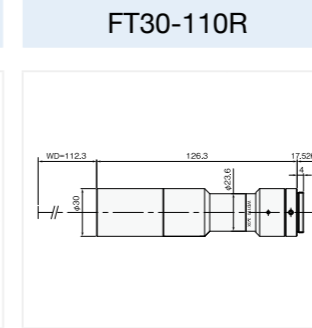
WD110 High NA Mega Pixel Telecentric Lens

Design for Mega Pixel Compact and high durability

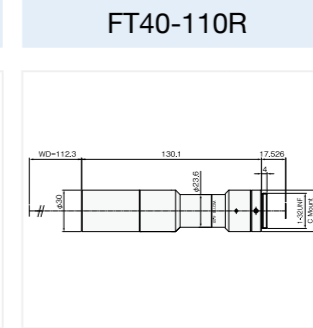
- ▶ Mega Pixel telecentric lens for 2/3 inch
- ▶ Suitable for 2 Mega Pixel - 5 Mega Pixel camera
- ▶ High contrast with co-axial illumination
- ▶ TV distortion less than 0.01%



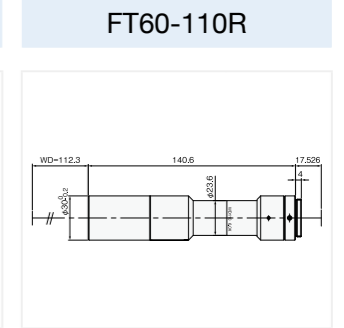
Magnification	2.0x
F No.	13.5
Object side NA	0.074
WD	110mm
OI	251mm
Depth of field	0.3mm
Resolution	4.5 μ
TV distortion	0.00%
Maximum Compatible sensor	2/3
Mount	C



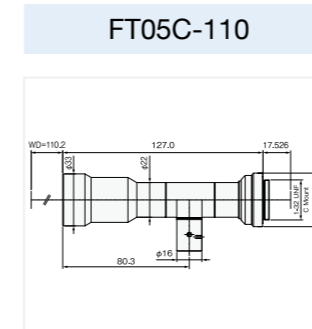
Magnification	3.0x
F No.	17.2
Object side NA	0.087
WD	112mm
OI	256mm
Depth of field	0.15mm
Resolution	3.9 μ
TV distortion	0.00%
Maximum Compatible sensor	2/3
Mount	C



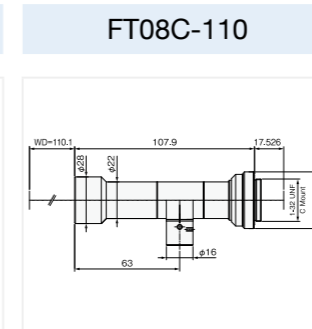
Magnification	4.0x
F No.	22.0
Object side NA	0.091
WD	112mm
OI	260mm
Depth of field	0.11mm
Resolution	3.7 μ
TV distortion	0.00%
Maximum Compatible sensor	2/3
Mount	C



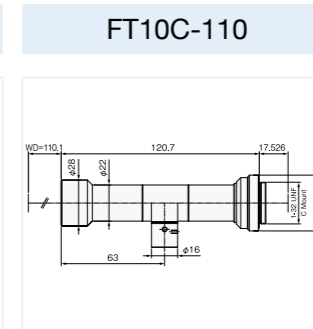
Magnification	6.0x
F No.	33.0
Object side NA	0.091
WD	112mm
OI	270mm
Depth of field	0.07mm
Resolution	3.7 μ
TV distortion	0.00%
Maximum Compatible sensor	2/3
Mount	C



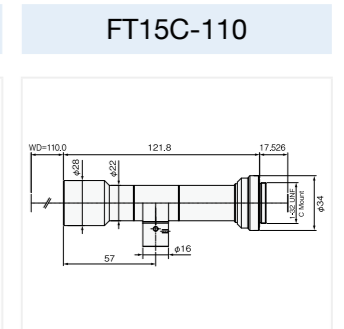
Magnification	0.5x
F No.	9.6
Object side NA	0.026
WD	110mm
OI	255mm
Depth of field	3.1mm
Resolution	12.9 μ
TV distortion	0.00%
Maximum Compatible sensor	2/3
Mount	C



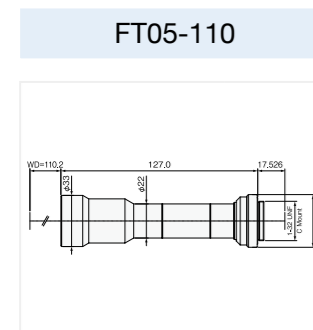
Magnification	0.8x
F No.	11.1
Object side NA	0.036
WD	110mm
OI	236mm
Depth of field	1.4mm
Resolution	9.3 μ
TV distortion	0.01%
Maximum Compatible sensor	2/3
Mount	C



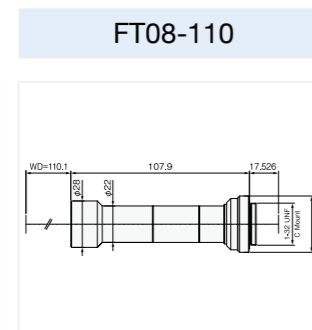
Magnification	1.0x
F No.	11.1
Object side NA	0.045
WD	110mm
OI	248mm
Depth of field	0.9mm
Resolution	7.5 μ
TV distortion	0.00%
Maximum Compatible sensor	2/3
Mount	C



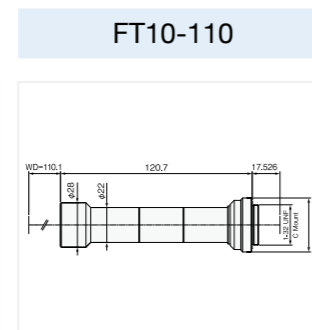
Magnification	1.5x
F No.	11.9
Object side NA	0.063
WD	110mm
OI	249mm
Depth of field	0.4mm
Resolution	5.3 μ
TV distortion	0.00%
Maximum Compatible sensor	2/3
Mount	C



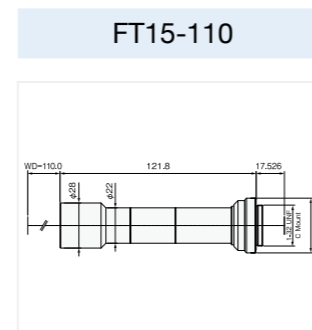
Magnification	0.5x
F No.	9.6
Object side NA	0.026
WD	110mm
OI	255mm
Depth of field	3.1mm
Resolution	12.9 μ
TV distortion	0.00%
Maximum Compatible sensor	2/3
Mount	C



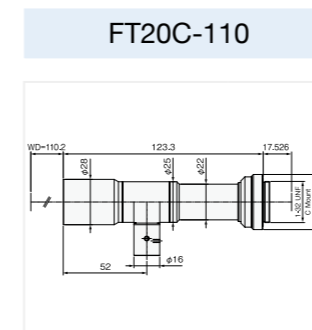
Magnification	0.8x
F No.	11.1
Object side NA	0.036
WD	110mm
OI	236mm
Depth of field	1.4mm
Resolution	9.3 μ
TV distortion	0.01%
Maximum Compatible sensor	2/3
Mount	C



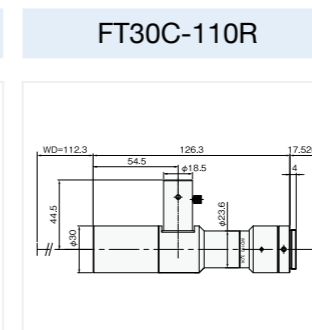
Magnification	1.0x
F No.	11.1
Object side NA	0.045
WD	110mm
OI	248mm
Depth of field	0.9mm
Resolution	7.5 μ
TV distortion	0.00%
Maximum Compatible sensor	2/3
Mount	C



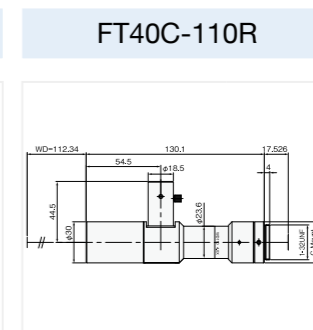
Magnification	1.5x
F No.	11.9
Object side NA	0.063
WD	110mm
OI	249mm
Depth of field	0.4mm
Resolution	5.3 μ
TV distortion	0.00%
Maximum Compatible sensor	2/3
Mount	C



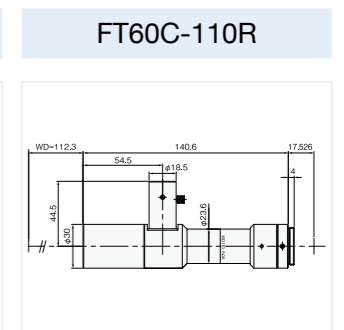
Magnification	2.0x
F No.	13.5
Object side NA	0.074
WD	110mm
OI	251mm
Depth of field	0.3mm
Resolution	4.5 μ
TV distortion	0.00%
Maximum Compatible sensor	2/3
Mount	C



Magnification	3.0x
F No.	17.2
Object side NA	0.087
WD	112mm
OI	256mm
Depth of field	0.15mm
Resolution	3.9 μ
TV distortion	0.00%
Maximum Compatible sensor	2/3
Mount	C



Magnification	4.0x
F No.	22.0
Object side NA	0.091
WD	112mm
OI	260mm
Depth of field	0.11mm
Resolution	3.7 μ
TV distortion	0.00%
Maximum Compatible sensor	2/3
Mount	C



Magnification	6.0x
F No.	33.0
Object side NA	0.091
WD	112mm
OI	270mm
Depth of field	0.07mm
Resolution	3.7 μ
TV distortion	0.00%
Maximum Compatible sensor	2/3
Mount	C

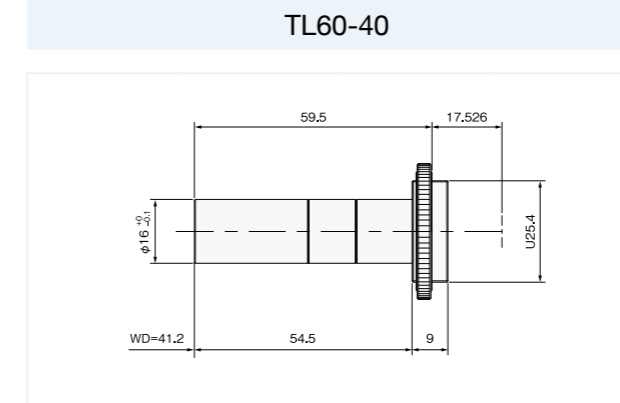
* Indicated specifications are design values. * Resolution indicates a theoretical resolution at a wavelength of 550nm.
*Depth of field is calculating assuming a horizontal 320 TV resolution using 1/2 inch camera (permissible circle of confusion 40 μ).

TL Series

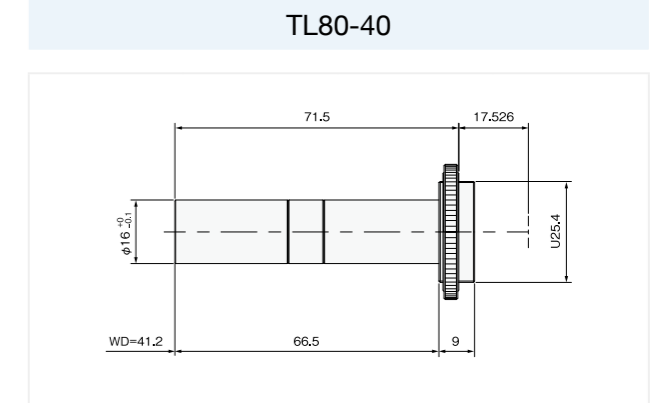
WD40 Built-in type Telecentric Lens Series

Short WD: WD40mm Suitable for small device and limited space

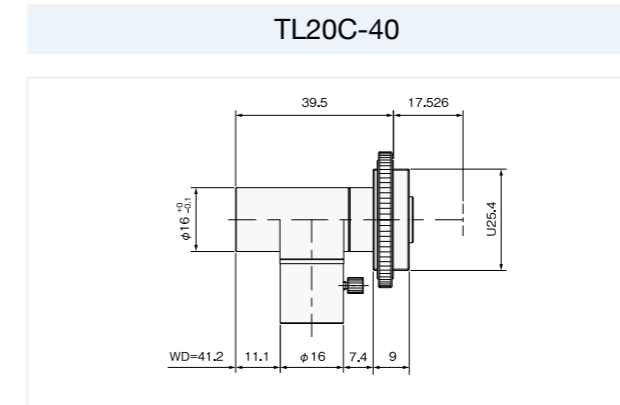
- φ 16mm telecentric lens
- Suitable for bonding, chip mounter, etc..



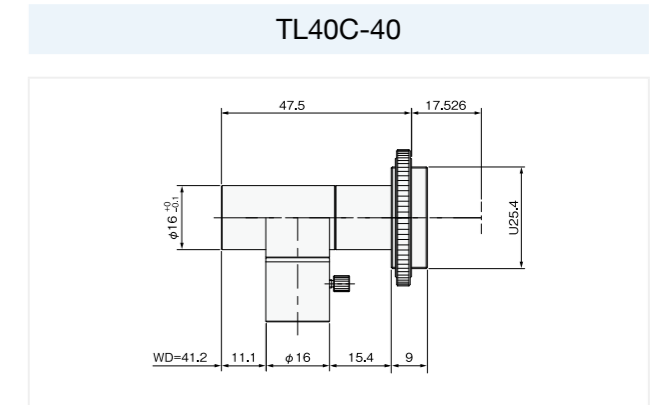
Magnification	6x	Depth of field	0.09mm
F No.	41.6	Resolution	4.7 μ
Object side NA	0.072	TV distortion	-0.10%
WD	40mm	Maximum Compatible sensor	1/2
OI	118mm	Mount	C



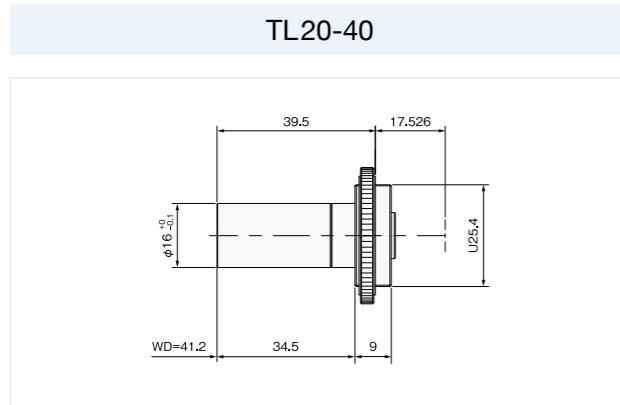
Magnification	8x	Depth of field	0.07mm
F No.	54.8	Resolution	4.6 μ
Object side NA	0.073	TV distortion	0.11%
WD	40mm	Maximum Compatible sensor	1/2
OI	130mm	Mount	C



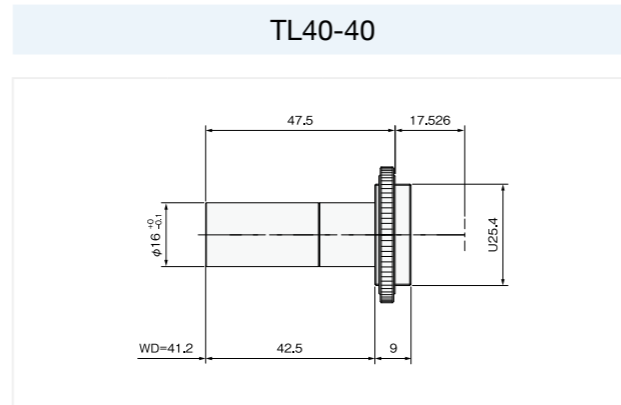
Magnification	2x	Depth of field	0.28mm
F No.	14.1	Resolution	4.7 μ
Object side NA	0.071	TV distortion	0.13%
WD	40mm	Maximum Compatible sensor	1/2
OI	98mm	Mount	C



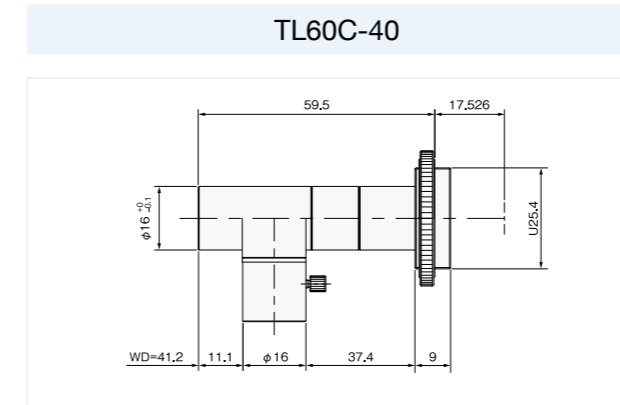
Magnification	4x	Depth of field	0.14mm
F No.	28.2	Resolution	4.7 μ
Object side NA	0.071	TV distortion	-0.19%
WD	40mm	Maximum Compatible sensor	1/2
OI	106mm	Mount	C



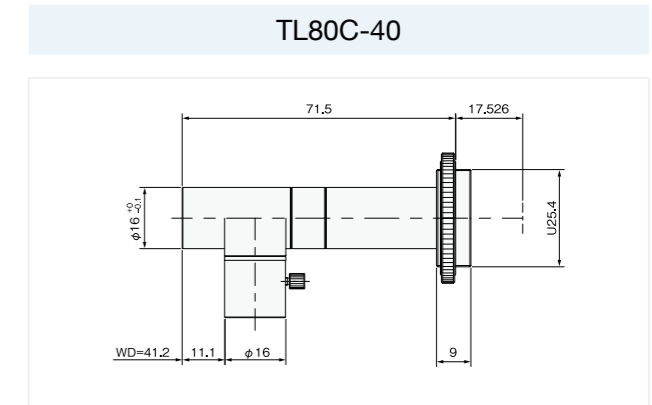
Magnification	2x	Depth of field	0.28mm
F No.	14.1	Resolution	4.7 μ
Object side NA	0.071	TV distortion	0.13%
WD	40mm	Maximum Compatible sensor	1/2
OI	98mm	Mount	C



Magnification	4x	Depth of field	0.14mm
F No.	28.2	Resolution	4.7 μ
Object side NA	0.071	TV distortion	-0.19%
WD	40mm	Maximum Compatible sensor	1/2
OI	106mm	Mount	C



Magnification	6x	Depth of field	0.09mm
F No.	41.6	Resolution	4.7 μ
Object side NA	0.072	TV distortion	-0.10%
WD	40mm	Maximum Compatible sensor	1/2
OI	118mm	Mount	C



Magnification	8x	Depth of field	0.07mm
F No.	54.8	Resolution	4.6 μ
Object side NA	0.073	TV distortion	0.11%
WD	40mm	Maximum Compatible sensor	1/2
OI	130mm	Mount	C

* Indicated specifications are design values. * Resolution indicates a theoretical resolution at a wavelength of 550nm.
*Depth of field is calculating assuming a horizontal 320 TV resolution using 1/2 inch camera (permissible circle of confusion 40 μ).

TL Series

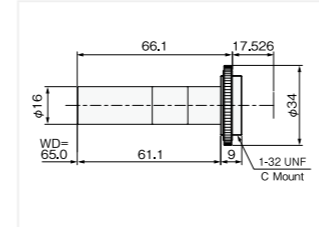
WD65 Built-in type Telecentric Lens Series

Middle WD: WD65mm Short OI and High NA

- φ 16mm telecentric lens
- TL-***"R" type is improved contrast and relative illumination.

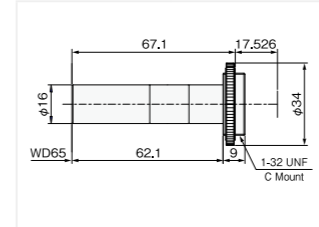


TL30-65



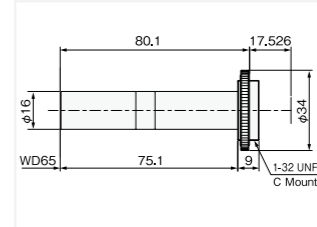
Magnification	3x
F No.	19.9
Object side NA	0.075
WD	65mm
OI	149mm
Depth of field	0.18mm
Resolution	4.47 μ
TV distortion	0.15%
Maximum Compatible sensor	2/3
Mount	C

TL40-65



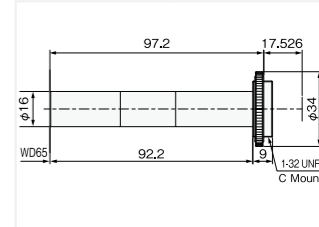
Magnification	4x
F No.	26.0
Object side NA	0.077
WD	65mm
OI	150mm
Depth of field	0.13mm
Resolution	4.36 μ
TV distortion	0.30%
Maximum Compatible sensor	2/3
Mount	C

TL60-65



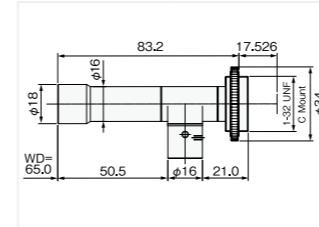
Magnification	6x
F No.	39.0
Object side NA	0.077
WD	65mm
OI	163mm
Depth of field	0.09mm
Resolution	4.36 μ
TV distortion	0.33%
Maximum Compatible sensor	2/3
Mount	C

TL80-65



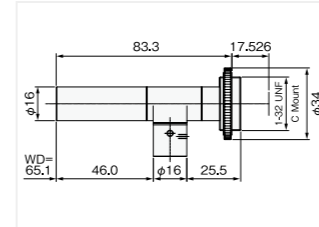
Magnification	8x
F No.	52.0
Object side NA	0.077
WD	65mm
OI	180mm
Depth of field	0.07mm
Resolution	4.36 μ
TV distortion	0.20%
Maximum Compatible sensor	2/3
Mount	C

TL08C-65R



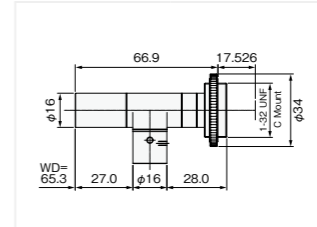
Magnification	0.8x
F No.	14.8
Object side NA	0.027
WD	65mm
OI	166mm
Depth of field	1.85mm
Resolution	12.3 μ
TV distortion	0.00%
Maximum Compatible sensor	1/1.8
Mount	C

TL10C-65R



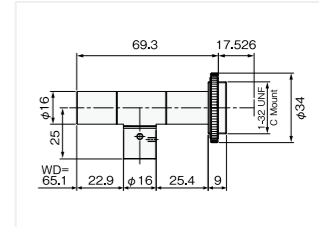
Magnification	1x
F No.	18.5
Object side NA	0.027
WD	65mm
OI	166mm
Depth of field	1.48mm
Resolution	12.4 μ
TV distortion	0.00%
Maximum Compatible sensor	1/1.8
Mount	C

TL15C-65R



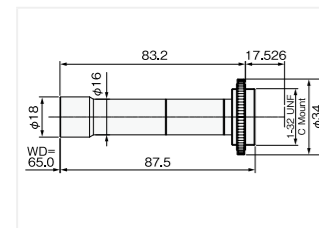
Magnification	1.5x
F No.	16.0
Object side NA	0.047
WD	65mm
OI	150mm
Depth of field	0.57mm
Resolution	7.22 μ
TV distortion	0.00%
Maximum Compatible sensor	1/1.8
Mount	C

TL20C-65R



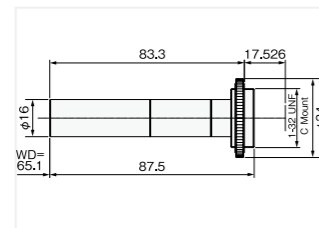
Magnification	2x
F No.	16.7
Object side NA	0.06
WD	65mm
OI	152mm
Depth of field	0.33mm
Resolution	5.6 μ
TV distortion	-0.01%
Maximum Compatible sensor	1/2
Mount	C

TL08-65R



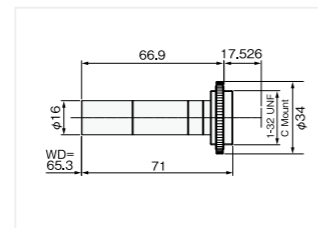
Magnification	0.8x
F No.	14.8
Object side NA	0.027
WD	65mm
OI	166mm
Depth of field	1.85mm
Resolution	12.3 μ
TV distortion	0.00%
Maximum Compatible sensor	1/1.8
Mount	C

TL10-65R



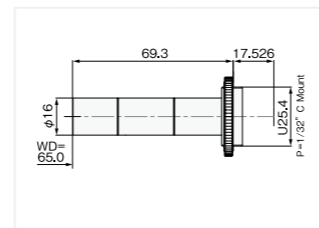
Magnification	1x
F No.	18.5
Object side NA	0.027
WD	65mm
OI	166mm
Depth of field	1.48mm
Resolution	12.4 μ
TV distortion	0.00%
Maximum Compatible sensor	1/1.8
Mount	C

TL15-65R



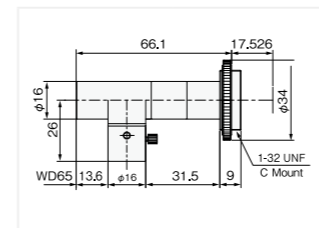
Magnification	1.5x
F No.	16.0
Object side NA	0.047
WD	65mm
OI	150mm
Depth of field	0.57mm
Resolution	7.22 μ
TV distortion	0.00%
Maximum Compatible sensor	1/1.8
Mount	C

TL20-65R



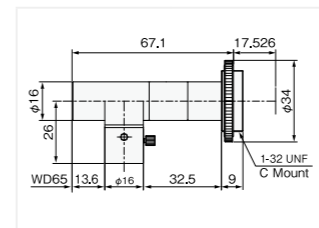
Magnification	2x
F No.	16.7
Object side NA	0.06
WD	65mm
OI	152mm
Depth of field	0.33mm
Resolution	5.6 μ
TV distortion	-0.01%
Maximum Compatible sensor	1/2
Mount	C

TL30C-65



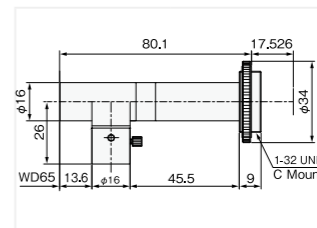
Magnification	3x
F No.	19.9
Object side NA	0.075
WD	65mm
OI	149mm
Depth of field	0.18mm
Resolution	4.47 μ
TV distortion	0.15%
Maximum Compatible sensor	2/3
Mount	C

TL40C-65



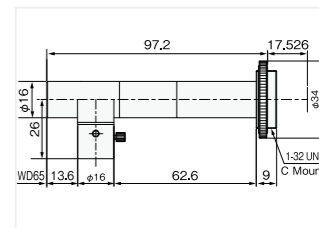
Magnification	4x
F No.	26.0
Object side NA	0.077
WD	65mm
OI	150mm
Depth of field	0.13mm
Resolution	4.36 μ
TV distortion	0.30%
Maximum Compatible sensor	2/3
Mount	C

TL60C-65



Magnification	6x
F No.	39.0
Object side NA	0.077
WD	65mm
OI	163mm
Depth of field	0.09mm
Resolution	4.36 μ
TV distortion	0.33%
Maximum Compatible sensor	2/3
Mount	C

TL80C-65



Magnification	8x
F No.	52.0
Object side NA	0.077
WD	65mm
OI	180mm
Depth of field	0.07mm
Resolution	4.36 μ
TV distortion	0.20%
Maximum Compatible sensor	2/3
Mount	C

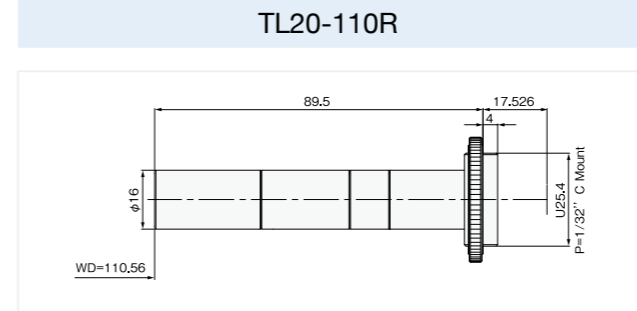
* Indicated specifications are design values. * Resolution is calculated based on MTF. *Depth of field is calculating assuming a horizontal 320 TV resolution using 1/2 inch camera (permissible circle of confusion 40 μ).

TL Series

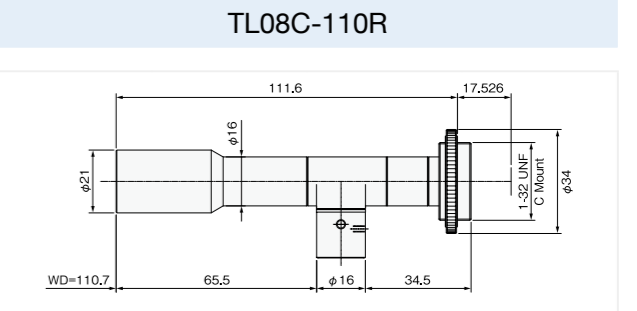
WD110 Built-in type Telecentric Lens Series

Long WD: 110mm Compact and suitable for customized optical systems

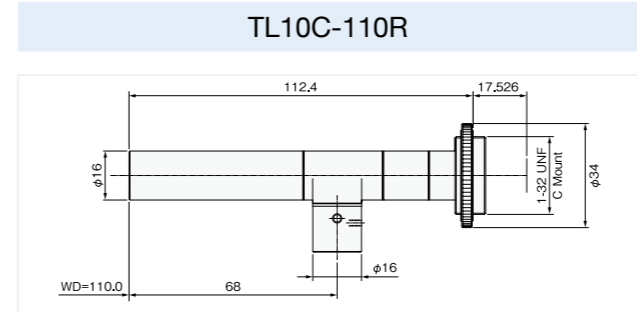
- φ 16mm telecentric lens
- TL-**"R" type is improved contrast and relative illumination.



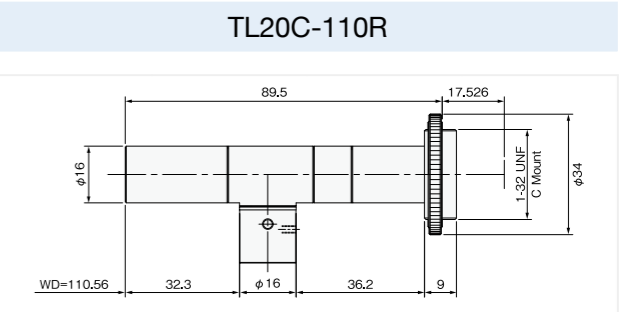
Magnification	2x	Depth of field	0.67mm
F No.	33.45	Resolution	11.2 μ
Object side NA	0.03	TV distortion	-0.03%
WD	110mm	Maximum Compatible sensor	1/2
OI	218mm	Mount	C



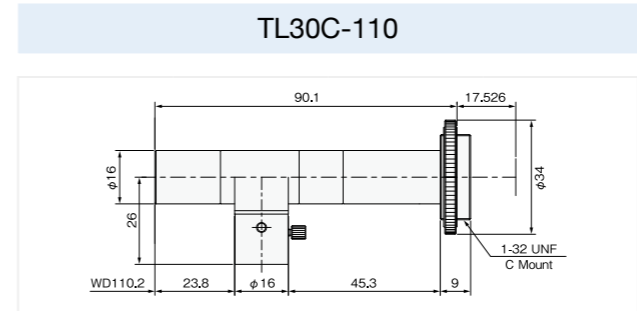
Magnification	0.8x	Depth of field	2.09mm
F No.	16.7	Resolution	14 μ
Object side NA	0.024	TV distortion	0.00%
WD	111mm	Maximum Compatible sensor	1/1.8
OI	240mm	Mount	C



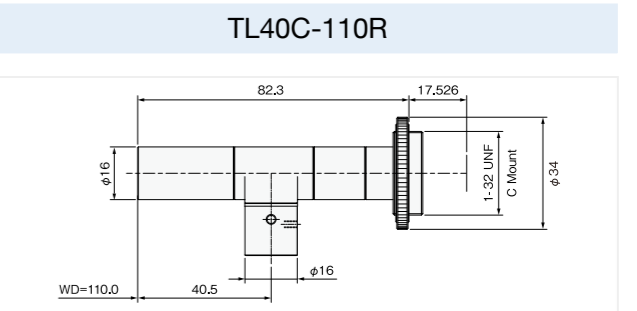
Magnification	1x	Depth of field	1.67mm
F No.	20.9	Resolution	14 μ
Object side NA	0.024	TV distortion	0.00%
WD	110mm	Maximum Compatible sensor	1/1.8
OI	240mm	Mount	C



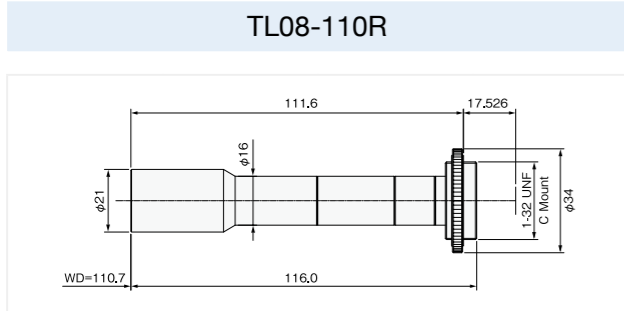
Magnification	2x	Depth of field	0.67mm
F No.	33.45	Resolution	11.2 μ
Object side NA	0.03	TV distortion	-0.03%
WD	110mm	Maximum Compatible sensor	1/2
OI	218mm	Mount	C



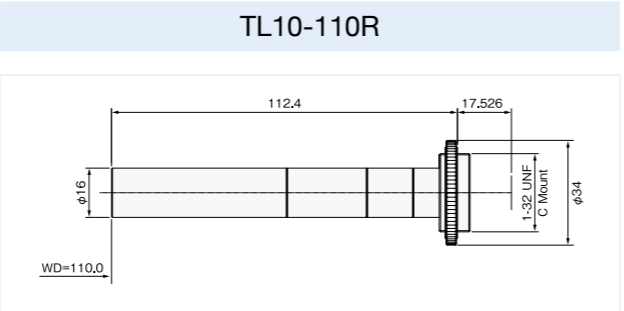
Magnification	3x	Depth of field	0.27mm
F No.	30.4	Resolution	6.8 μ
Object side NA	0.049	TV distortion	0.06%
WD	110mm	Maximum Compatible sensor	2/3
OI	218mm	Mount	C



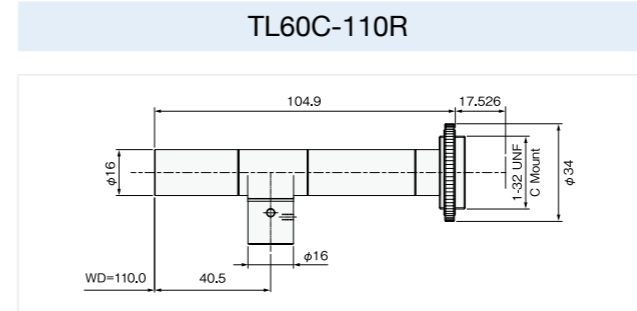
Magnification	4x	Depth of field	0.22mm
F No.	44.4	Resolution	7.5 μ
Object side NA	0.045	TV distortion	0.00%
WD	110mm	Maximum Compatible sensor	1/1.8
OI	210mm	Mount	C



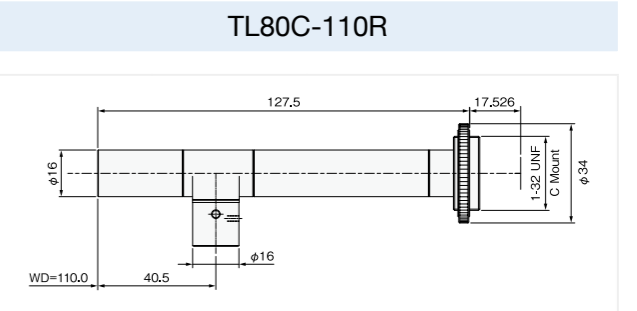
Magnification	0.8x	Depth of field	2.09mm
F No.	16.7	Resolution	14 μ
Object side NA	0.024	TV distortion	0.00%
WD	111mm	Maximum Compatible sensor	1/1.8
OI	240mm	Mount	C



Magnification	1x	Depth of field	1.67mm
F No.	20.9	Resolution	14 μ
Object side NA	0.024	TV distortion	0.00%
WD	110mm	Maximum Compatible sensor	1/1.8
OI	240mm	Mount	C



Magnification	6x	Depth of field	0.15mm
F No.	66.7	Resolution	7.5 μ
Object side NA	0.045	TV distortion	0.00%
WD	110mm	Maximum Compatible sensor	1/1.8
OI	232mm	Mount	C



Magnification	8x	Depth of field	0.11mm
F No.	88.9	Resolution	7.5 μ
Object side NA	0.045	TV distortion	0.00%
WD	110mm	Maximum Compatible sensor	1/1.8
OI	255mm	Mount	C

* Indicated specifications are design values. * Resolution indicates a theoretical resolution at a wavelength of 550nm.
*Depth of field is calculating assuming a horizontal 320 TV resolution using 1/2 inch camera (permissible circle of confusion 40 μ).

TL Series

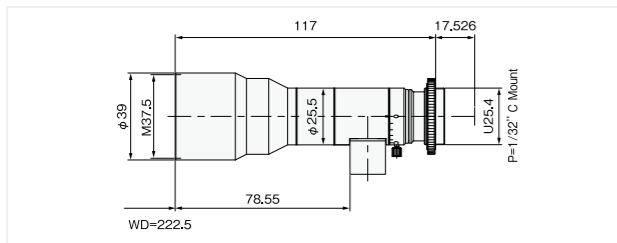
WD220 Built-in type Telecentric Lens Series

Long WD: 220mm High resolution and compact design

- Suitable for various applications, alignment, inspection, measurement, etc..
- Adjustable iris for 0.5x and 0.7x
- Compatible with 2 Mega Pixel of 1/1.8 inch

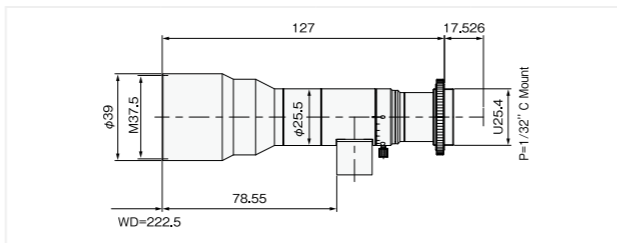


TL05C-220



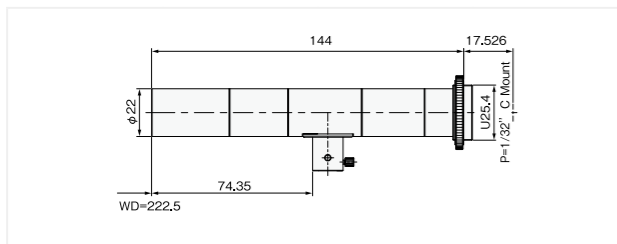
Magnification	0.5x	Depth of field	2.17mm
F No.	6.79	Resolution	9.1 μ
Object side NA	0.037	TV distortion	0.02%
WD	222mm	Maximum Compatible sensor	1/1.8
OI	357mm	Mount	C

TL07C-220



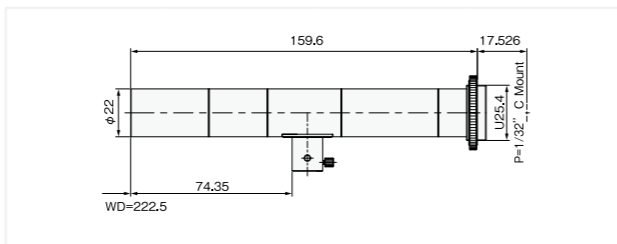
Magnification	0.7x	Depth of field	1.55mm
F No.	9.50	Resolution	9.1 μ
Object side NA	0.037	TV distortion	0.02%
WD	222mm	Maximum Compatible sensor	1/1.8
OI	367mm	Mount	C

TL10C-220



Magnification	1x	Depth of field	1.07mm
F No.	13.35	Resolution	9.0 μ
Object side NA	0.037	TV distortion	0.00%
WD	222mm	Maximum Compatible sensor	1/1.8
OI	384mm	Mount	C

TL20C-220



Magnification	2x	Depth of field	0.53mm
F No.	26.42	Resolution	8.8 μ
Object side NA	0.038	TV distortion	0.04%
WD	222mm	Maximum Compatible sensor	1/1.8
OI	400mm	Mount	C

* Indicated specifications are design values. * Resolution indicates a theoretical resolution at a wavelength of 550nm. *Depth of field is calculating assuming a horizontal 320 TV resolution using 1/2 inch camera (permissible circle of confusion 40 μ).

TL Series

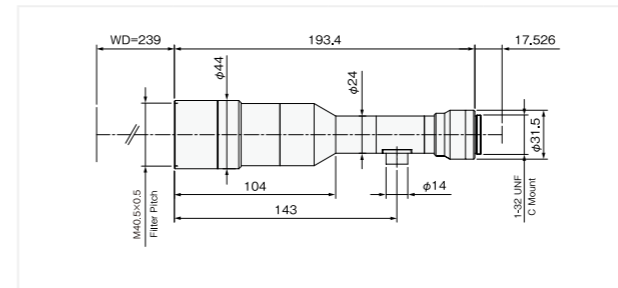
WD240 High Magnification Telecentric Lens for Long WD

Suitable for vacuum chamber, working environment in high temperature, etc., required for long WD

- Suitable for alignment, inspection, and other various applications
- 4, 6, 8, and 10x are available
- All models are designed for co-axial illumination

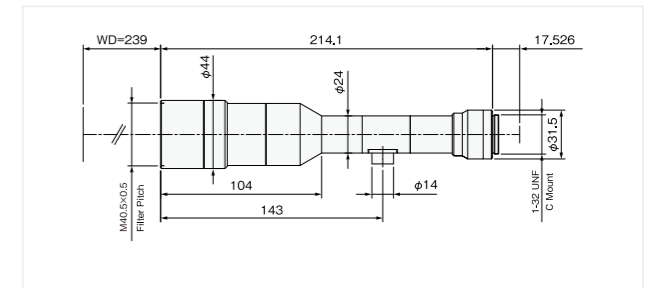


TL40C-240



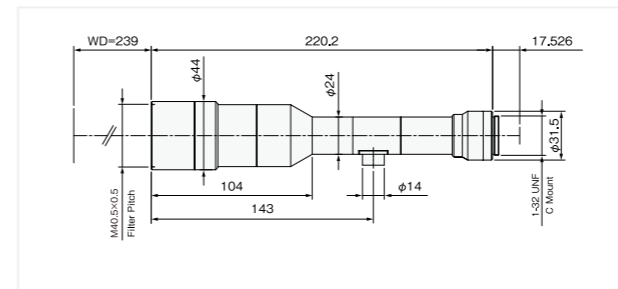
Magnification	4x	Depth of field	0.14mm
F No.	28.6	Resolution	4.8 μ
Object side NA	0.07	TV distortion	0.22%
WD	239mm	Maximum Compatible sensor	2/3
OI	450.0mm	Mount	C

TL60C-240



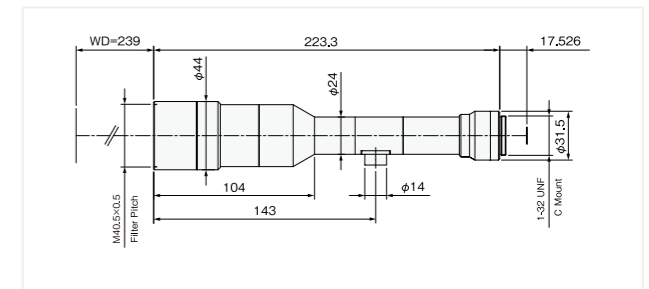
Magnification	6x	Depth of field	0.1mm
F No.	42.9	Resolution	4.8 μ
Object side NA	0.07	TV distortion	0.0%
WD	239mm	Maximum Compatible sensor	2/3
OI	470.6mm	Mount	C

TL80C-240



Magnification	8x	Depth of field	0.07mm
F No.	57.1	Resolution	4.8 μ
Object side NA	0.07	TV distortion	0.03%
WD	239mm	Maximum Compatible sensor	2/3
OI	476.7mm	Mount	C

TL100C-240



Magnification	10x	Depth of field	0.06mm
F No.	71.4	Resolution	4.8 μ
Object side NA	0.07	TV distortion	0.32%
WD	239mm	Maximum Compatible sensor	2/3
OI	479.8mm	Mount	C

* Indicated specifications are design values. * Resolution indicates a theoretical resolution at a wavelength of 550nm. *Depth of field is calculating assuming a horizontal 320 TV resolution using 1/2 inch camera (permissible circle of confusion 40 μ).

TL Series

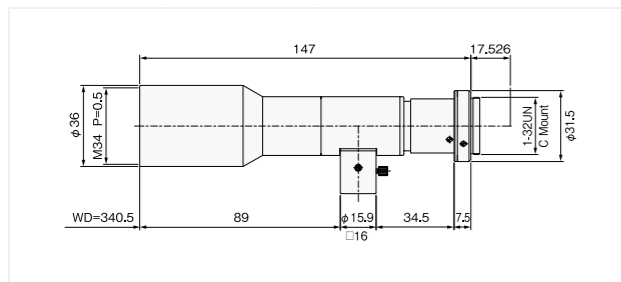
WD300 Telecentric Lens for Long WD

Suitable for applications required for long WD

- ▶ LONG WD, over 300mm
- ▶ TL10C-310 is compatible with 2/3 inch
- ▶ TV distortion is less than 0.00%

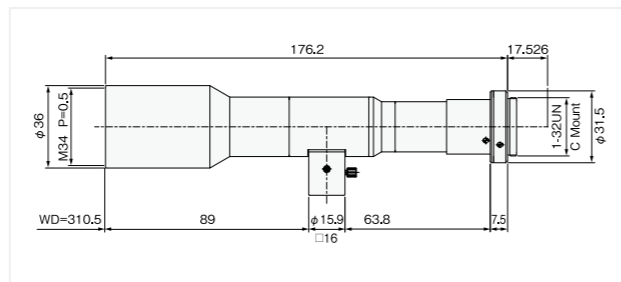


TL07C-340



Magnification	0.7x	Depth of field	1.9mm
F No.	11.6	Resolution	11.2 μ
Object side NA	0.03	TV distortion	0.00%
WD	341mm	Maximum Compatible sensor	1/1.8
OI	506mm	Mount	C

TL10C-310



Magnification	1.0x	Depth of field	1.2mm
F No.	15.5	Resolution	10.5 μ
Object side NA	0.032	TV distortion	0.00%
WD	311mm	Maximum Compatible sensor	2/3
OI	505mm	Mount	C

* Indicated specifications are design values. * Resolution indicates a theoretical resolution at a wavelength of 550nm.
*Depth of field is calculating assuming a horizontal 320 TV resolution using 1/2 inch camera (permissible circle of confusion 40 μ).

TL Series

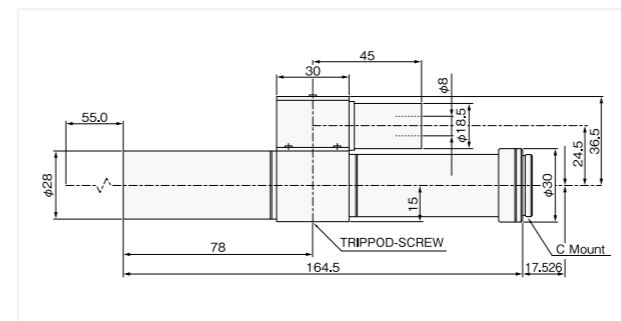
10x Telecentric Lens

High resolution, possible to use in limited space

- ▶ Magnification of 10x, similar to microscopic range for machine vision applications
- ▶ Compact design with high resolution



TL100C-55



Magnification	10x	Depth of field	0.023mm
F No.	29.7	Resolution	2 μ
Object side NA	0.17	TV distortion	0.02%
WD	55mm	Maximum Compatible sensor	1/1.8
OI	237mm	Mount	C

* Indicated specifications are design values. * Resolution indicates a theoretical resolution at a wavelength of 550nm.
*Depth of field is calculating assuming a horizontal 320 TV resolution using 1/2 inch camera (permissible circle of confusion 40 μ).

HMZ Series

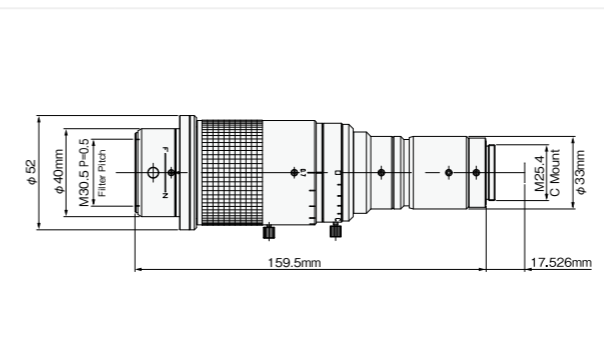
High Resolution Macro Zoom Lens

High resolution and compact design

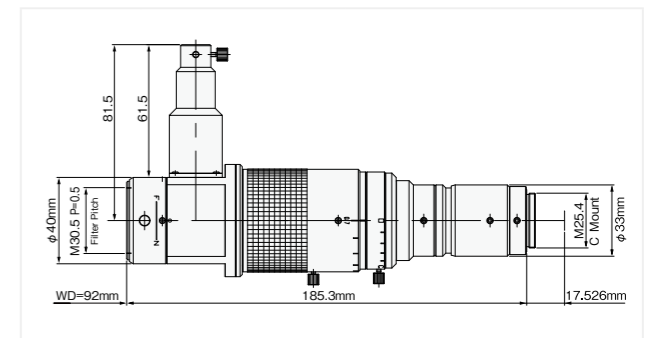
- Compatible with 1/1.8 inch of Mega Pixel camera
- High resolution and compact design
- High contrast and low distortion
- Improve uniformity of brightness for co-axial illumination
- Magnification and working distance can be converted to 0.21x - 18x, WD40 - 332mm by using converters



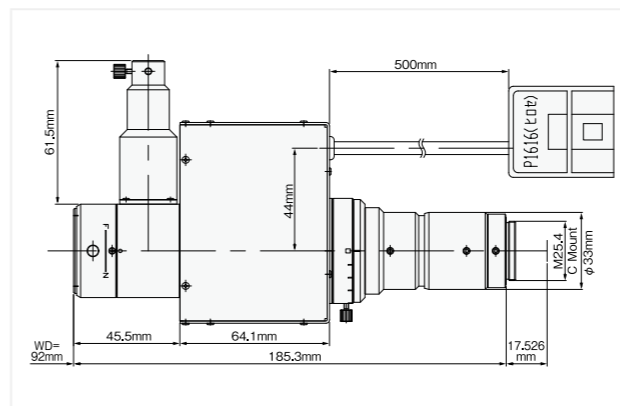
HMZ0745 (Manual Zoom/Straight type)



HMZ0745C (Manual Zoom/Co-axial type)



HMZ0745C-SM (Motorized Zoom/Co-axial type)



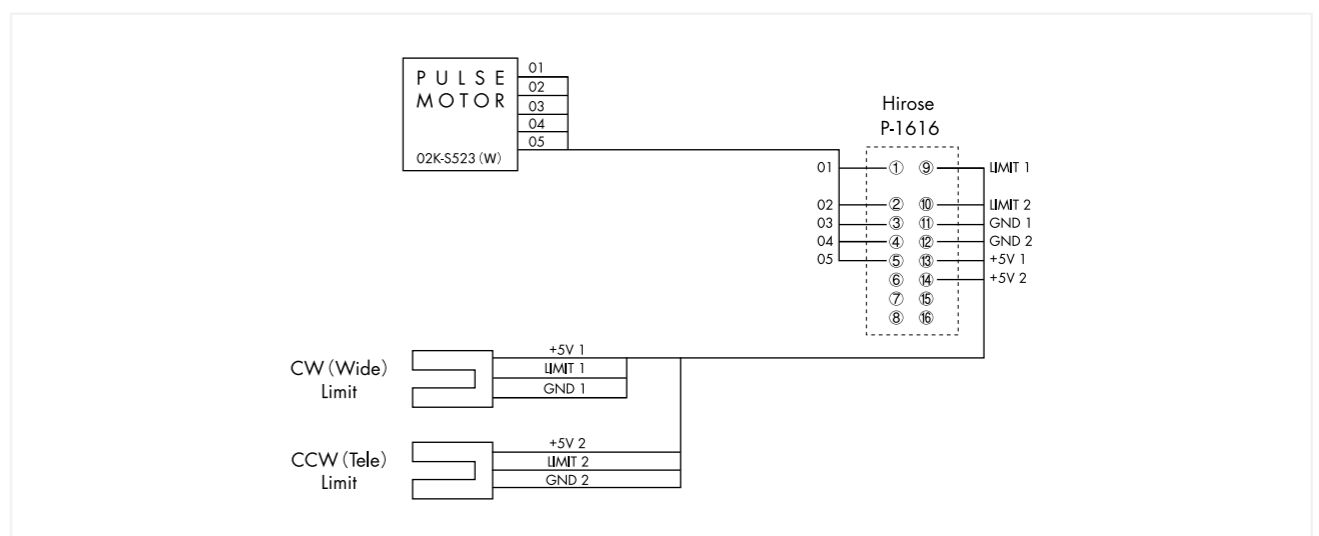
Lens			
Model	HMZ0745 / HMZ0745C / HMZ0745C-SM		
Magnification	0.7x - 4.5x	Depth of field	2mm - 0.08mm
WD	92mm	TV distortion	0.05% - 0.08%
Resolution	11.5 μ - 2.87 μ	Maximum Compatible sensor	1/1.8
Object side NA	0.03 - 0.12		

* Indicated specifications are design values.
 *Resolution indicates a theoretical resolution at a wavelength of 550nm.
 *Depth of field is calculating assuming a horizontal 320 TV resolution using 1/2 inch camera (permissible circle of confusion 40μ).

Front Converter		
Model	Magnification	WD with converter
HMZ-FC03	0.3x	329mm
HMZ-FC04	0.4x	235mm
HMZ-FC05	0.5x	182mm
HMZ-FC067	0.67x	118mm
HMZ-FC20	2.0x	37mm

Rear Converter	
Model	Magnification
HMZ-RC20	2.0x

(Wiring Diagram) HMZ0745C-SM



TLZ Series

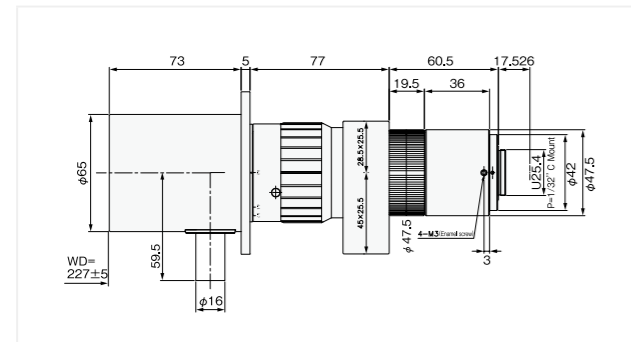
Low Magnification Zoom Lens with Co-axial Illumination

Built-in co-axial illumination
 Suitable for various applications, inspection of wafer, IC chip, etc...

- 10x Zoom (0.2x - 2.0x)
- Compact design of 10x zoom ratio
- Reduce relative illumination
- High resolution at the whole magnification
- Motorized zoom type is available
- Long WD, 227mm



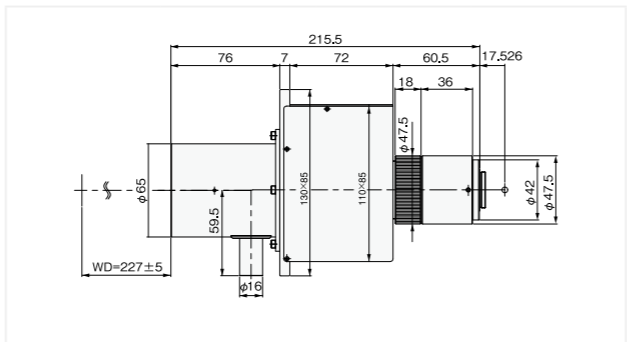
TLZ0220C (Manual Zoom)



Magnification	0.2x-2.0x	Depth of field	13.1mm - 0.45mm
WD	227mm	TV distortion	-0.16% - 0.16%
Resolution	22.4μ - 7.6μ	Maximum Compatible sensor	1/1.8
Object side NA	0.015 - 0.044		

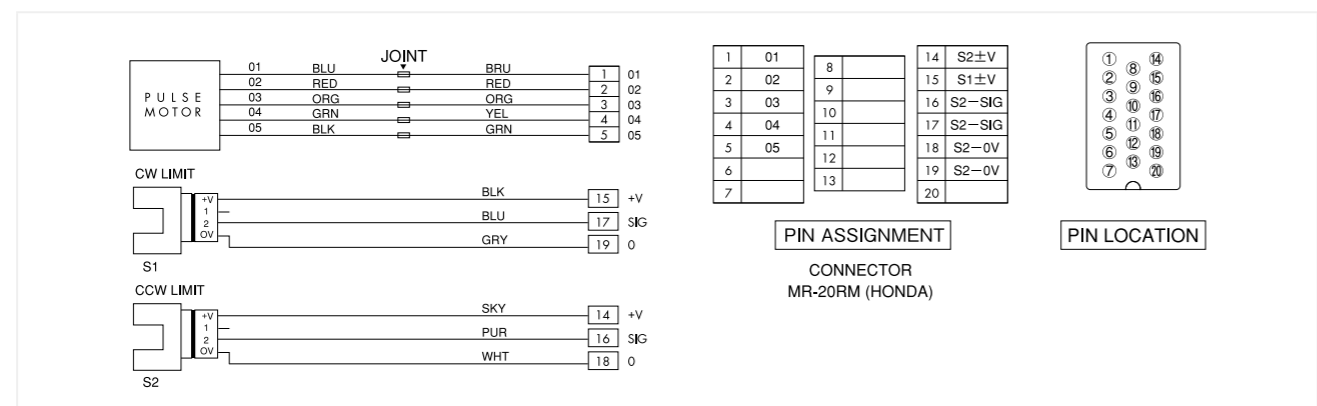
* Indicated specifications are design values. *Resolution indicates a theoretical resolution at a wavelength of 550nm.
 *Depth of field is calculating assuming a horizontal 320 TV resolution using 1/2 inch camera (permissible circle of confusion 40μ).

TLZ0220C-SM (Motorized Zoom)



Magnification	0.2x - 2.0x	Depth of field	13.1mm - 0.45mm
WD	227mm	TV distortion	-0.16% - 0.16%
Resolution	22.4μ - 7.6μ	Maximum Compatible sensor	1/1.8
Object side NA	0.015 - 0.044		

(Wiring Diagram) TLZ0220C-SM



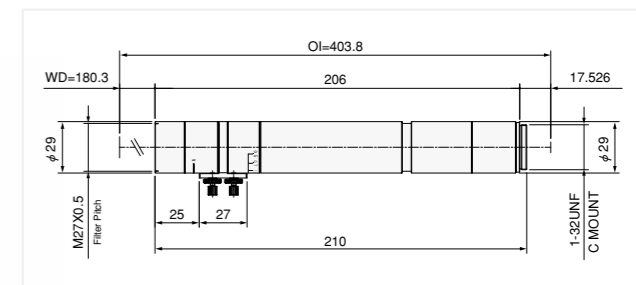
8.0x Compact Macro Zoom Lens

Compact and wide zoom ratio, suitable for inspection of various objects

- Long WD, 180mm
- Focus function is available
- φ29mm, suitable for small and limited spaces



CMZ0540-2



Magnification	0.5x~4.0x	Depth of field	3.3~0.19mm
WD	180.3mm	TV distortion	0.02%
Resolution	14μ~6.3μ	Maximum Compatible sensor	1/3
Object side NA	0.024~0.053		

* Indicated specifications are design values.
 *Resolution indicates a theoretical resolution at a wavelength of 550nm.
 *Depth of field is calculating assuming a horizontal 320 TV resolution using 1/2 inch camera (permissible circle of confusion 40μ).

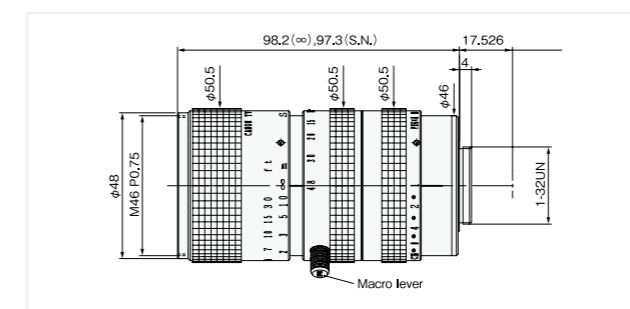
6.0x Zoom Lens

Suitable for high speed applications

- WD500mm - ∞
- *Macro photography: Possible to use at WD10mm by pulling a macro lever
- Large aperture, suitable for high speed camera



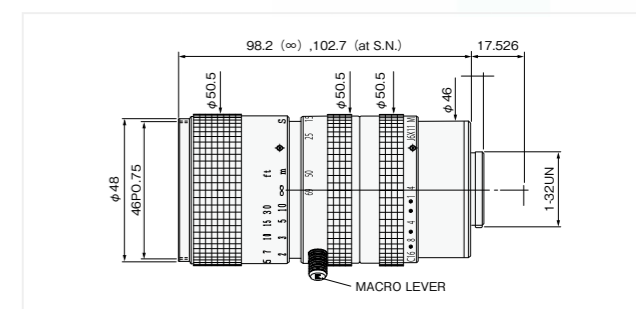
PH6 x 8Macro



Model Focal length (Zoom Ratio)	8 - 48mm (6.0x)	Magnification at WD500mm	0.017 - 0.1
∞F No.	1.0	Filter Pitch	M46 P=75
WD	500mm - ∞	Maximum Compatible sensor	1/2

* Indicated specifications are design values.

J6 x 11Macro



Model Focal length (Zoom Ratio)	11.5 - 69mm (6.0x)	Magnification at WD500mm	0.024 - 0.14
∞F No.	1.4	Filter Pitch	M46 P=75
WD	500mm - ∞	Maximum Compatible sensor	2/3

HF Series

High Resolution Fixed Focal Lens for 5 Mega Pixel - 12 Mega Pixel

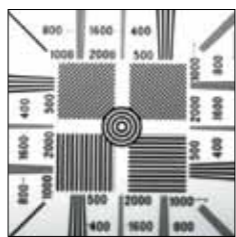
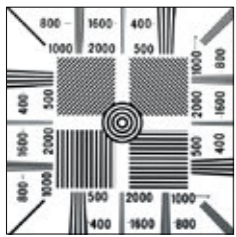
Suitable for inspection and alignment , required for high accuracy

- 5 Mega Pixel – 12 Mega Pixel sensor
- f16mm – f75mm are compatible with 1.1 inch – 1.2 inch
- Suitable for different types of sensor
- Excellent performance at macro imaging, compared with conventional Mega Pixel Fixed Focal lens
- Stable performance at different working distance by floating design
- Large aperture
- Robust design, suitable for machine vision applications

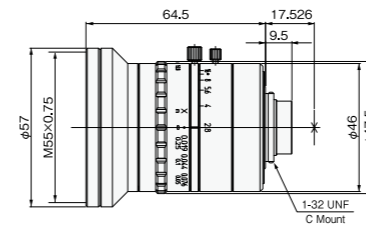
Comparison of resolution

5-12 Mega Pixel Lens

Mega Pixel Lens

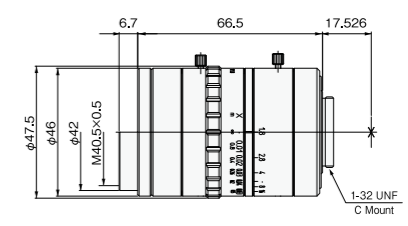


HF0528J-2



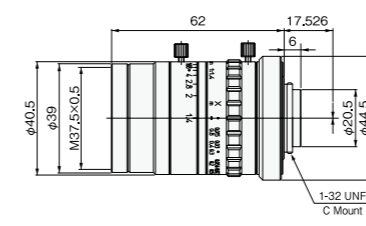
Focal length	5mm	TV distortion	0.29%
∞F No.	2.8	Filter pitch	M55 P=0.75
Range of WD	50mm - ∞	Maximum Compatible sensor	2/3
Maximum Magnification	0.076x		

HF0818J-2



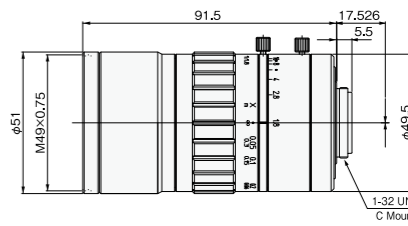
Focal length	8mm	TV distortion	0.31%
∞F No.	1.8	Filter pitch	M40.5 P=0.75
Range of WD	100mm - ∞	Maximum Compatible sensor	2/3
Maximum Magnification	0.078x		

HF1214J-2



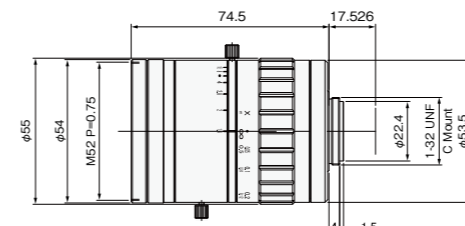
Focal length	12mm	TV distortion	-0.31%
∞F No.	1.4	Filter pitch	M37.5 P=0.5
Range of WD	100mm - ∞	Maximum Compatible sensor	2/3
Maximum Magnification	0.1x		

HF1618V-2



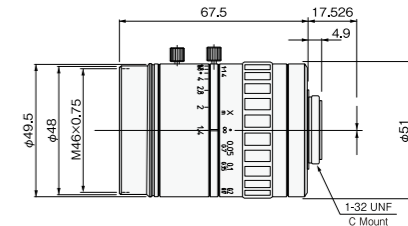
Focal length	16mm	TV distortion	-0.28%
∞F No.	1.8	Filter pitch	M49 P=0.75
Range of WD	33mm - ∞	Maximum Compatible sensor	1.1
Maximum Magnification	0.3x		

HF2514V-2



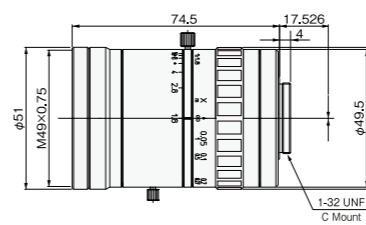
Focal length	25mm	TV distortion	-0.09%
∞F No.	1.4	Filter pitch	M52 P=0.75
Range of WD	80mm - ∞	Maximum Compatible sensor	1.1
Maximum Magnification	0.3x		

HF3514V-2



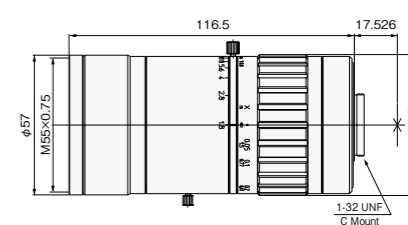
Focal length	35mm	TV distortion	-0.027%
∞F No.	1.4	Filter pitch	M46 P=0.75
Range of WD	110mm - ∞	Maximum Compatible sensor	1.1
Maximum Magnification	0.3x		

HF5018V-2



Focal length	50mm	TV distortion	-0.01%
∞F No.	1.8	Filter pitch	M49 P=0.75
Range of WD	192mm - ∞	Maximum Compatible sensor	1.2
Maximum Magnification	0.3x		

HF7518V-2



Focal length	75mm	TV distortion	0.00%
∞F No.	1.8	Filter pitch	M55 P=0.75
Range of WD	290mm - ∞	Maximum Compatible sensor	1.2
Maximum Magnification	0.3x		

* Indicated specifications are design values. *TV distortion indicates a value for 2/3 inch at minimum working distance.

HS-V Series

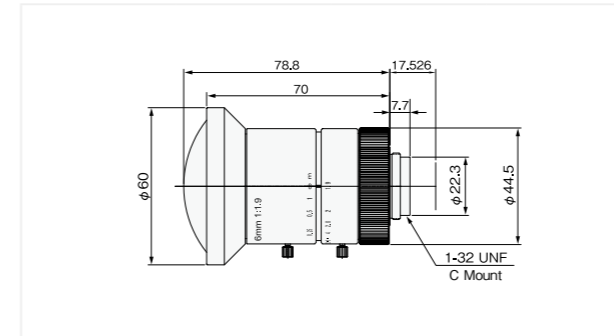
5 Mega Pixel - 9 Mega Pixel Fixed Focal Lens for 1 inch

5 Mega Pixel - 9 Mega Pixel sensor



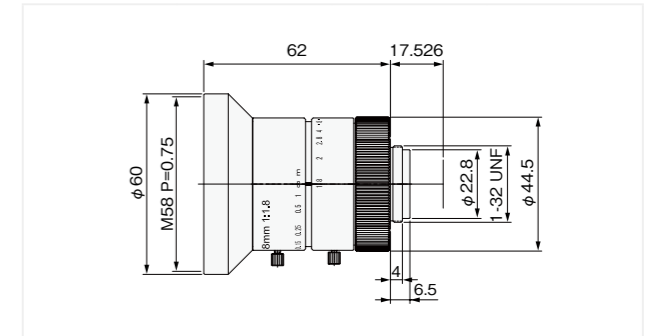
- ▶ Suitable for 5 Mega Pixel - 9 Mega Pixel sensor
- ▶ Design for 1 inch
- ▶ Stable performance at different working distance, from macro to infinity by floating design
- ▶ Robust design

HS0619V



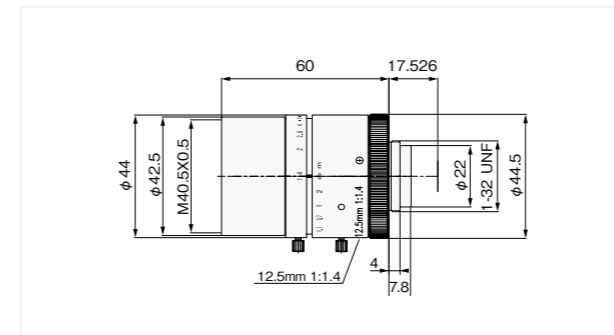
Focal length	6mm	TV distortion	0.83%
∞F No.	1.9	Angle of view(VxH)	94.7°x78.1°
Range of WD	100mm~∞	Maximum Compatible sensor	1

HS0818V



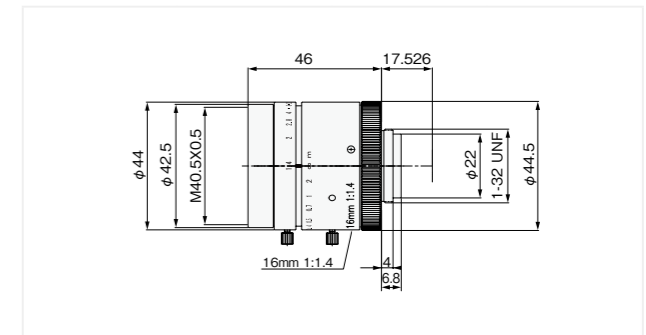
Focal length	8mm	Angle of view(VxH)	78.1°x62.1°
∞F No.	1.8	Filter pitch	M58 P=0.75
Range of WD	100mm~∞	Maximum Compatible sensor	1
TV distortion	-0.17%		

HS1214V



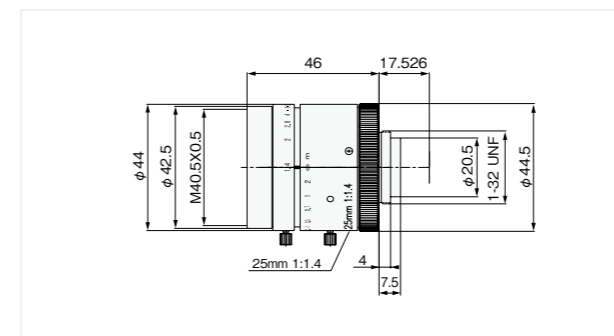
Focal length	12.5mm	Angle of view(VxH)	54.9°x42.2°
∞F No.	1.4	Filter pitch	M40.5 P=0.5
Range of WD	300mm~∞	Maximum Compatible sensor	1
TV distortion	-0.69%		

HS1614V



Focal length	16mm	Angle of view(VxH)	44.2°x33.5°
∞F No.	1.4	Filter pitch	M40.5 P=0.5
Range of WD	300mm~∞	Maximum Compatible sensor	1
TV distortion	-0.85%		

HS2514V



Focal length	25mm	Angle of view(VxH)	28.6°x21.6°
∞F No.	1.4	Filter pitch	M40.5 P=0.5
Range of WD	300mm~∞	Maximum Compatible sensor	1
TV distortion	-0.02%		

HS-J Series

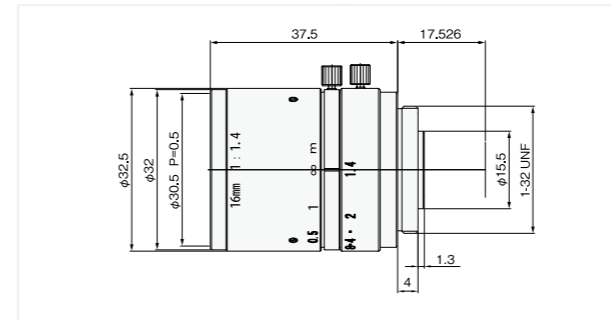
2 Mega Pixel Fixed Focal Lens

High resolution and large aperture, F No. 1.4 Suitable for various applications

- ▶ Excellent brightness, F No. 1.4, suitable for high speed application
- ▶ Design for 2 Mega Pixel sensor
- ▶ Stable performance from macro to infinity (∞)
- ▶ Robust design

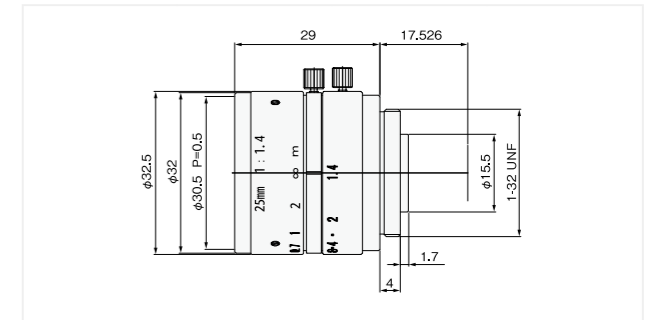


HS1614J



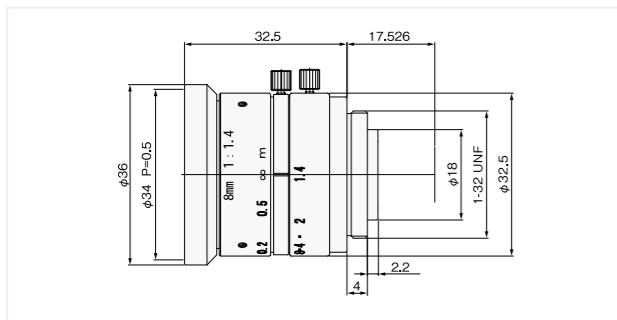
Focal length	16mm	Angle of view(VxH)	23°×30°
∞F No.	1.4	Filter pitch	M30.5 P=0.5
Range of WD	200mm - ∞	Maximum Compatible sensor	2/3
TV distortion	-0.14%		

HS2514J



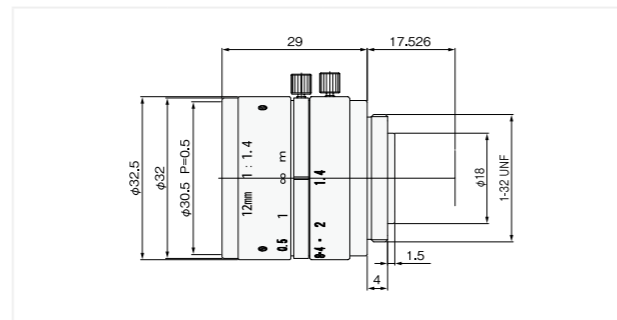
Focal length	25mm	Angle of view(VxH)	15°×19°
∞F No.	1.4	Filter pitch	M30.5 P=0.5
Range of WD	300mm - ∞	Maximum Compatible sensor	2/3
TV distortion	-0.12%		

HS0814J



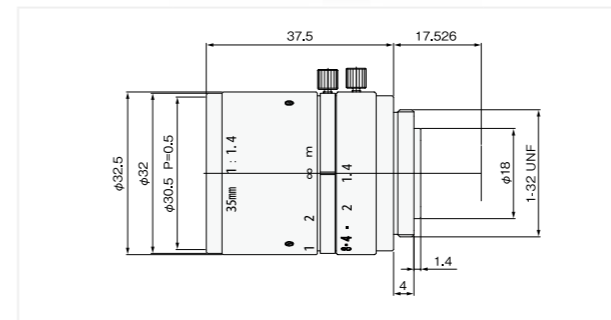
Focal length	8mm	Angle of view(VxH)	44°×56°
∞F No.	1.4	Filter pitch	M34 P=0.5
Range of WD	100mm - ∞	Maximum Compatible sensor	2/3
TV distortion	0.83%		

HS1214J



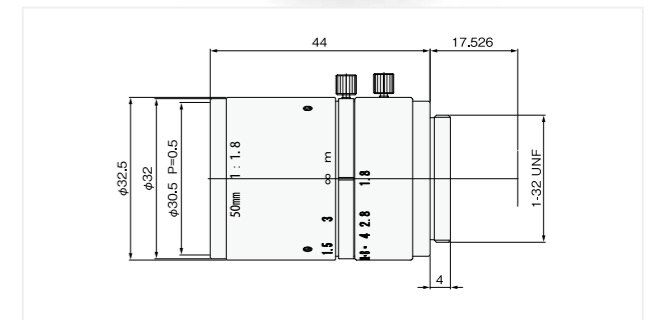
Focal length	12mm	Angle of view(VxH)	30°×39°
∞F No.	1.4	Filter pitch	M30.5 P=0.5
Range of WD	150mm - ∞	Maximum Compatible sensor	2/3
TV distortion	-0.12%		

HS3514J



Focal length	35mm	Angle of view(VxH)	11°×14°
∞F No.	1.4	Filter pitch	M30.5 P=0.5
Range of WD	300mm - ∞	Maximum Compatible sensor	2/3
TV distortion	-0.06%		

HS5018J



Focal length	50mm	Angle of view(VxH)	7.7°×10°
∞F No.	1.8	Filter pitch	M30.5 P=0.5
Range of WD	500mm - ∞	Maximum Compatible sensor	2/3
TV distortion	0.07%		

* Indicated specifications are design values. * TV distortion indicates a value for minimum working distance. * Angle of view indicates a value for maximum compatible sensor.

* Indicated specifications are design values. * TV distortion indicates a value for minimum working distance. * Angle of view indicates a value for maximum compatible sensor.

FV Series

Mega Pixel Low Distortion Fixed Focal Lens

Design for low distortion

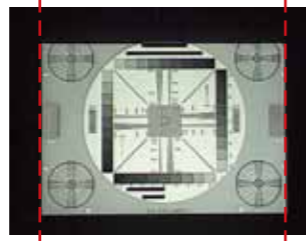
- ▶ Mega Pixel sensor
- ▶ Design for machine vision application, excellent performance at short WD, less than 500mm
- ▶ Reduce color aberration, compared with Conventional Fixed Focal Lens
- ▶ TV distortion less than 0.1% (except for f4mm)
- ▶ Possible to use for macro imaging without extension ring



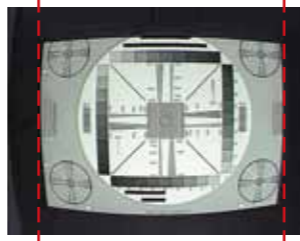
Comparison of Distortion

- ▶ FV0420 0.9%
- ▶ Conventional f4mm lens Approx. 18%

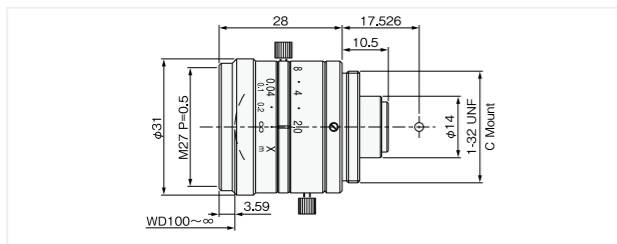
FV low distortion lens



Conventional Fixed Focal lens

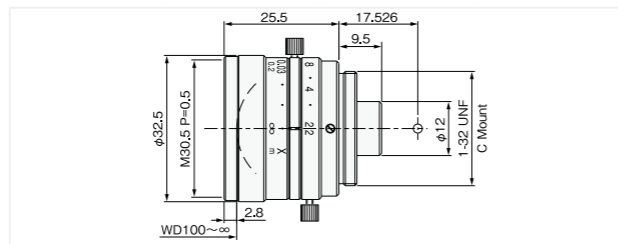


FV0420



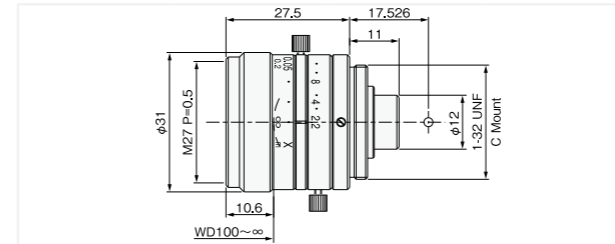
Focal length	4mm	Angle of view(VxH)	59.96°x75.14°
∞ F No.	2.0	Filter pitch	M27 P=0.5
Range of WD	0.1m - ∞	Maximum Compatible sensor	1/2
TV distortion	0.91%		

FV0622



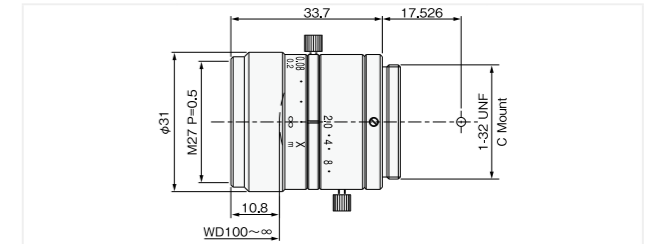
Focal length	6.5mm	Angle of view(VxH)	40.47°x52.35°
∞ F No.	2.2	Filter pitch	M30.5 P=0.5
Range of WD	0.1m - ∞	Maximum Compatible sensor	1/2
TV distortion	-0.01%		

FV1022



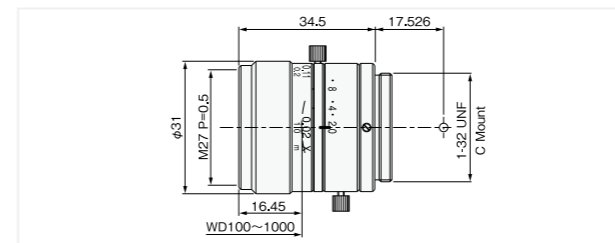
Focal length	10mm	Angle of view(VxH)	26.31°x34.61°
∞ F No.	2.2	Filter pitch	M27 P=0.5
Range of WD	0.1m - ∞	Maximum Compatible sensor	1/2
TV distortion	-0.08%		

FV1520



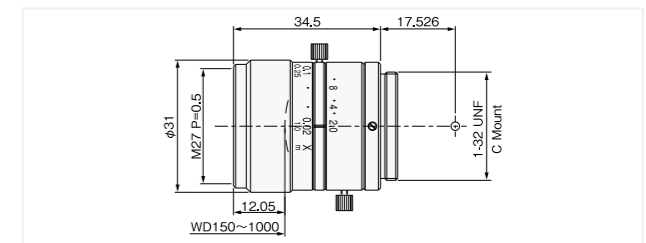
Focal length	15mm	Angle of view(VxH)	24.11°x31.79°
∞ F No.	2.0	Filter pitch	M27 P=0.5
Range of WD	0.1m - ∞	Maximum Compatible sensor	2/3
TV distortion	-0.09%		

FV2020



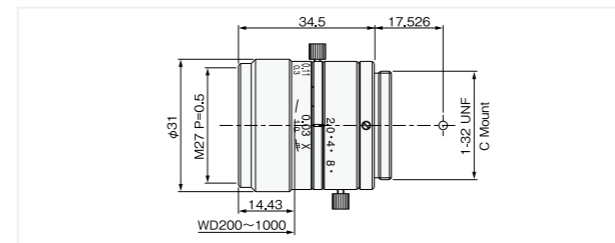
Focal length	20mm	Angle of view(VxH)	18.2°x24.11°
∞ F No.	2.0	Filter pitch	M27 P=0.5
Range of WD	0.1m - 1m	Maximum Compatible sensor	2/3
TV distortion	-0.10%		

FV2520



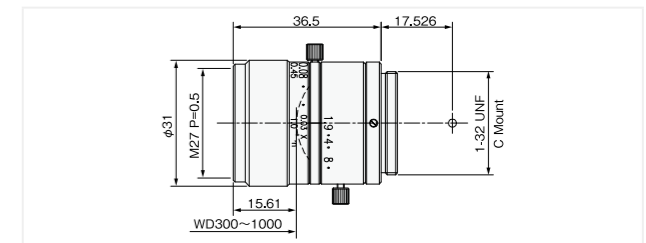
Focal length	25mm	Angle of view(VxH)	14.75°x19.58°
∞ F No.	2.0	Filter pitch	M27 P=0.5
Range of WD	0.15m - 1m	Maximum Compatible sensor	2/3
TV distortion	-0.01%		

FV3020



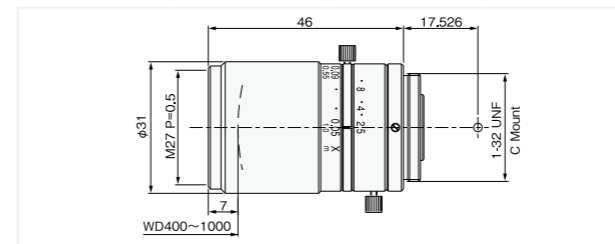
Focal length	30mm	Angle of view(VxH)	12.55°x16.69°
∞ F No.	2.0	Filter pitch	M27 P=0.5
Range of WD	0.2m - 1m	Maximum Compatible sensor	2/3
TV distortion	-0.02%		

FV3519



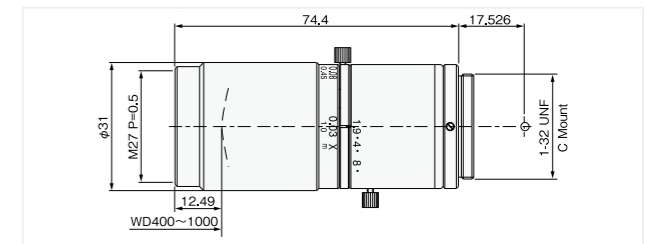
Focal length	35mm	Angle of view(VxH)	10.77°x14.32°
∞ F No.	1.9	Filter pitch	M27 P=0.5
Range of WD	0.3m - 1m	Maximum Compatible sensor	2/3
TV distortion	-0.03%		

FV5025



Focal length	50mm	Angle of view(VxH)	7.82°x10.38°
∞ F No.	2.5	Filter pitch	M27 P=0.5
Range of WD	0.4m - 1m	Maximum Compatible sensor	2/3
TV distortion	0.03%		

FV7538



Focal length	75mm	Angle of view(VxH)	5.11°x6.81°
∞ F No.	3.8	Filter pitch	M27 P=0.5
Range of WD	0.4m - 1m	Maximum Compatible sensor	2/3
TV distortion	-0.01%		

* Indicated specifications are design values. * Angle of view indicates a value for maximum compatible sensor.
* TV distortion indicates a value for minimum working distance.

* Indicated specifications are design values. * Angle of view indicates a value for maximum compatible sensor.
* TV distortion indicates a value for the minimum working distance.

MV Series

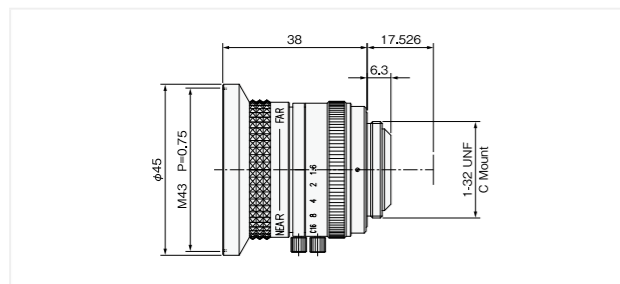
VGA Fixed Focal Lens

Wide range of focal length is available Suitable for various applications

- ▶ Focal length f3.5mm - f100mm, 10 models are available
- ▶ Available for focus and iris lock screws
- ▶ Suitable for various applications

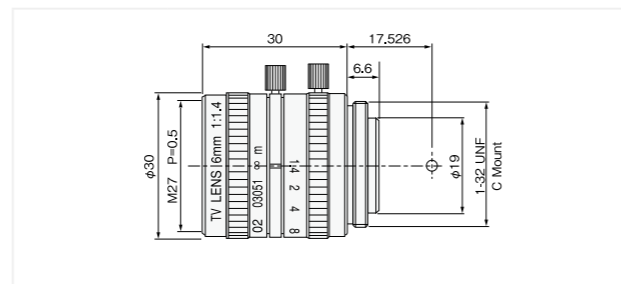


MV0316



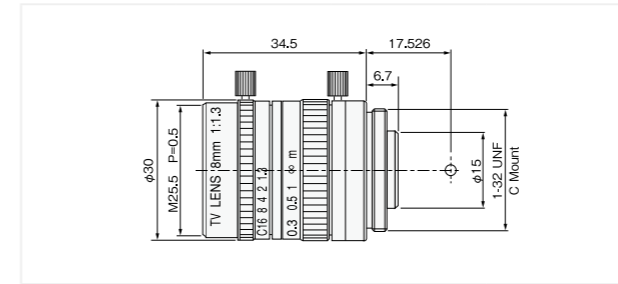
Focal length	3.5mm	Angle of view(VxH)	68.9°×84.9°
∞F No.	1.6	Filter pitch	M43 P=0.75
Range of WD	0.1m - ∞	Maximum Compatible sensor	1/2

MV0614



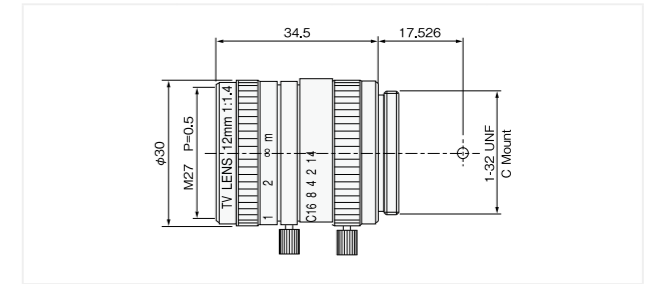
Focal length	6.0mm	Angle of view(VxH)	42.3°×54.6°
∞F No.	1.4	Filter pitch	M27 P=0.5
Range of WD	0.2m - ∞	Maximum Compatible sensor	1/2

MV0813



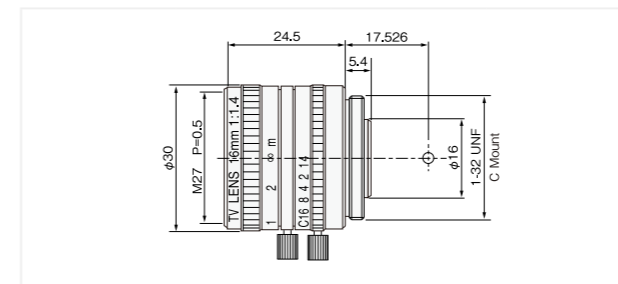
Focal length	8.0mm	Angle of view(VxH)	45°×57.8°
∞F No.	1.3	Filter pitch	M25.5 P=0.5
Range of WD	0.2m - ∞	Maximum Compatible sensor	2/3

MV1214



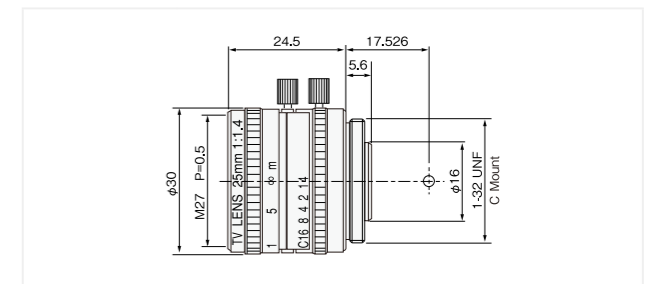
Focal length	12mm	Angle of view(VxH)	21.9°×29°
∞F No.	1.4	Filter pitch	M27 P=0.5
Range of WD	0.3m - ∞	Maximum Compatible sensor	1/2

MV1614



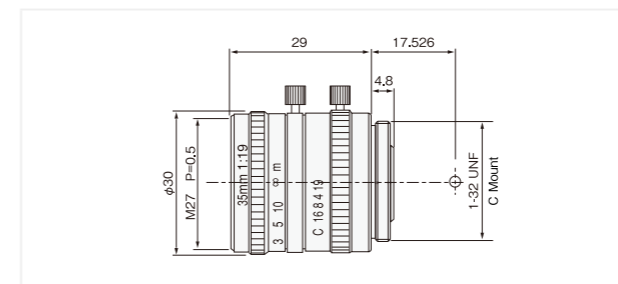
Focal length	16mm	Angle of view(VxH)	23°×30.4°
∞F No.	1.4	Filter pitch	M27 P=0.5
Range of WD	0.4m - ∞	Maximum Compatible sensor	2/3

MV2514



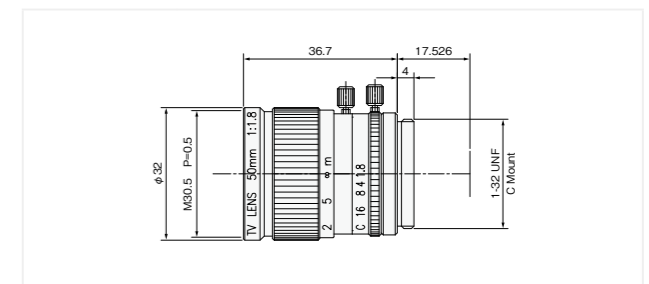
Focal length	25mm	Angle of view(VxH)	21.6°×28.5°
∞F No.	1.4	Filter pitch	M27 P=0.5
Range of WD	0.5m - ∞	Maximum Compatible sensor	2/3

MV3519



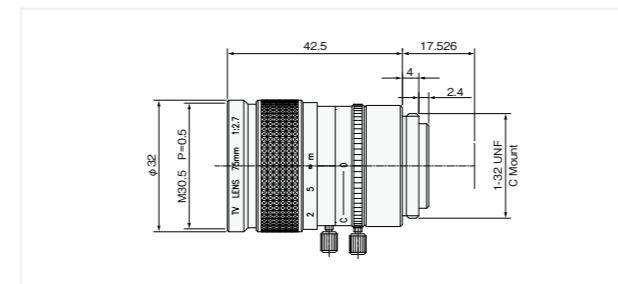
Focal length	35mm	Angle of view(VxH)	10.8°×14.4°
∞F No.	1.9	Filter pitch	M27 P=0.5
Range of WD	0.5m - ∞	Maximum Compatible sensor	2/3

MV5018



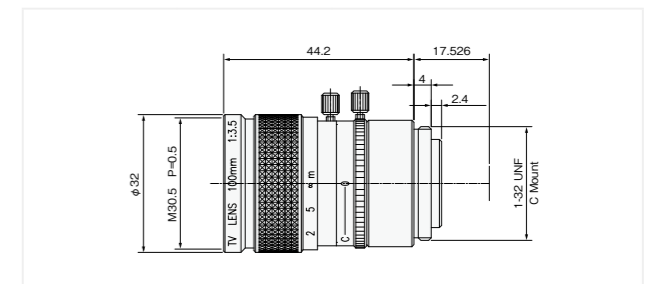
Focal length	50mm	Angle of view(VxH)	7.9°×10.5°
∞F No.	1.8	Filter pitch	M30.5 P=0.5
Range of WD	1m - ∞	Maximum Compatible sensor	2/3

MV7527



Focal length	75mm	Angle of view(VxH)	4.9°×6.5°
∞F No.	2.7	Filter pitch	M30.5 P=0.5
Range of WD	1m - ∞	Maximum Compatible sensor	2/3

MV10035



Focal length	100mm	Angle of view(VxH)	3.8°×5.1°
∞F No.	3.5	Filter pitch	M30.5 P=0.5
Range of WD	1m - ∞	Maximum Compatible sensor	2/3

* Indicated specifications are design values. * Angle of view indicates a value for maximum compatible sensor.

* Indicated specifications are design values. * Angle of view indicates a value for maximum compatible sensor.

ACCESSORIES



Extension Ring

Fixed Focal lens can be changed into macro lens with extension rings

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



Model	Specification
SR-02	0.2mm
SR-05	0.5mm
SR-1	1mm
SR-2	2mm
SR-5	5mm
SR-10	10mm
SR-15	15mm
SR-20	20mm
SR-30	30mm
SR-40	40mm
SR-50	50mm
SR-100	100mm
SR-SET	0.5mm, 1mm, 2mm, 5mm, 10mm, 20mm, 40mm

Magnification, WD and FOV Chart for Extension Ring Fixed Focal Lens (MV Series)

Extension Ring (mm)	MV0316				MV0614				MV0813				MV1214				MV1614			
	1/2 CCD	1/3 CCD	WD (mm)	magnification	1/2 CCD	1/3 CCD	WD (mm)	magnification	1/2 CCD	1/3 CCD	WD (mm)	magnification	1/2 CCD	1/3 CCD	WD (mm)	magnification	1/2 CCD	1/3 CCD	WD (mm)	magnification
0	147x196	110x147	100	0.03	165x221	124x165	200	0.03	96x128	72x96	148	0.05	103x137	77x103	248	0.05	109x145	82x109	358	0.04
0.5	28x37	21x28	10	0.17	44x58	33x44	43	0.11	43x57	32x43	59	0.11	55x73	41x55	125	0.09	64x86	48x64	206	0.07
1	35x46	26x35	14	0.14	60x79	45x60	63	0.08	77x102	57x77	115	0.06	119x159	89x119	289	0.04	156x208	117x156	515	0.03
1.5					25x34	19x25	19	0.19	27x37	21x27	34	0.18	38x50	28x38	80	0.13	45x61	34x45	143	0.11
2					30x40	22x30	25	0.16	38x51	29x38	52	0.13	59x79	45x59	136	0.08	78x104	58x78	252	0.06
5									20x27	15x20	22	0.24	29x38	21x29	57	0.17	35x47	26x35	108	0.14
10									26x34	19x26	31	0.19	40x53	30x40	85	0.12	52x69	39x52	164	0.09
													23x31	17x23	42	0.21	29x38	22x29	86	0.17
													30x40	22x30	59	0.16	39x52	29x39	120	0.12
																	14x18	10x14	35	0.35
																	16x21	12x16	42	0.31
																	7.3x9.7	5.4x7.3	14	0.66
																	7.8x10	5.8x7.8	15	0.62

Extension Ring (mm)	MV2514				MV3519				MV5018				MV7527				MV10035			
	1/2 CCD	1/3 CCD	WD (mm)	magnification	1/2 CCD	1/3 CCD	WD (mm)	magnification	1/2 CCD	1/3 CCD	WD (mm)	magnification	1/2 CCD	1/3 CCD	WD (mm)	magnification	1/2 CCD	1/3 CCD	WD (mm)	magnification
0	87x115	65x87	458	0.06	66x87	49x66	500	0.07	90x120	68x90	943	0.05	60x80	45x60	1000	0.08	46x62	35x46	1000	0.1
0.5	64x85	48x64	338	0.08	55x73	41x55	422	0.09												
1	242x322	181x242	1270	0.02	335x447	251x335	2459	0.01												
1.5	50x67	38x50	269	0.1	47x63	35x47	366	0.1												
2	121x161	91x121	637	0.04	168x223	126x168	1240	0.03												
5	42x56	31x42	223	0.12	41x55	31x41	324	0.12												
10	81x107	60x81	425	0.06	112x149	84x112	834	0.04	154x205	115x154	1577	0.03								
15	36x47	27x36	191	0.13	37x49	28x37	291	0.13	51x67	38x51	548	0.1	43x57	32x43	776	0.11				
20	60x81	45x60	320	0.08	84x112	63x84	631	0.06	115x154	86x115	1193	0.04	184x246	138x184	3189	0.03				
25	19x25	14x19	103	0.25	22x30	17x22	185	0.22	31x41	23x31	347	0.16	30x40	23x30	607	0.16	27x37	21x27	724	0.18
30	24x32	18x24	130	0.2	34x45	25x34	265	0.14	46x61	35x46	503	0.1	74x98	55x74	1422	0.07	95x127	71x95	2413	0.05
35	11x14	8.0x11	60	0.45	13x18	10x13	121	0.36	18x25	14x18	226	0.26	20x27	15x20	475	0.24	19x26	15x19	609	0.25
40	12x16	9.1x12	66	0.4	17x22	13x17	143	0.29	23x31	17x23	273	0.21	37x49	28x37	833	0.13	48x63	36x48	1432	0.1
45	7.4x9.8	5.5x7.4	43	0.65	9.5x13	7.2x9.5	93	0.5	13x18	10x13	174	0.37	15x20	11x15	408	0.32	15x20	11x15	546	0.32
50	8.1x11	6.0x8.1	45	0.6	11x15	8.4x11	103	0.43	15x21	12x15	196	0.31	25x33	18x25	636	0.2	32x42	24x32	1105	0.15
	5.6x7.5	4.2x5.6	34	0.85	7.4x9.9	5.6x7.4	78	0.65	10x14	7.7x10	145	0.47	12x16	9x12	369	0.4	12x16	9x12	505	0.39
	6.0x8.1	4.5x6.0	35	0.79	8.4x11	6.3x8.4	82	0.57	12x15	8.6x12	158	0.42	18x25	14x18	538	0.26	24x32	18x24	941	0.2
					6.1x8.1	4.6x6.1	68	0.79	8.4x11	6.3x8.4	126	0.57	10x14	7.6x10	342	0.47	10x14	8x10	478	0.46
					9.2x12	6.9x9.2	134	0.52	15x20	11x15	479	0.33	19x25	14x19	843	0.25				
					7.1x9.4	5.3x7.1	113	0.68	8.7x12	6.5x8.7	323	0.55	9.0x12	6.7x9.0	458	0.54				
					7.7x10	5.8x7.7	119	0.63	12x16	9.2x12	440	0.39	16x21	12x16	778	0.3				
					6.1x8.2	4.6x6.1	104	0.78	7.6x10	5.7x7.6	309	0.63	7.9x11	5.9x7.9	443	0.61				
					6.6x8.8	4.9x6.6	108	0.73	11x14	7.9x11	412	0.46	14x18	10x14	731	0.35				
					5.4x7.2	4.1x5.4	97	0.89	6.7x9.0	5.1x6.7	297	0.71	7.1x9.4	5.3x7.1	430	0.68				
					5.8x7.7	4.3x5.8	100	0.83	9.2x12	6.9x9.2	391	0.52	12x16	8.9x12	696	0.4				
									6.1x8.1	4.6x6.1	289	0.79	6.4x8.5	4.8x6.4	421	0.75				
									8.2x11	6.1x8.2	375	0.59	11x14	7.9x11	669	0.45				
									5.5x7.4	4.1x5.5	281	0.87	5.8x7.8	4.4x5.8	412	0.82				
									7.4x9.8	5.5x7.4	361	0.65	9.5x13	7.1x9.5	647	0.5				

Magnification, WD and FOV Chart for Extension Ring Mega Pixel Low Distortion Fixed Focal Lens (FV Series)

Extension Ring (mm)	FV0420				FV0622				FV1022				FV1520			
	1/2 CCD	1/3 CCD	WD (mm)	magnification	1/2 CCD	1/3 CCD	WD (mm)	magnification	1/2 CCD	1/3 CCD	WD (mm)	magnification	1/2 CCD	1/3 CCD	WD (mm)	magnification
0	126x168	95x126	97	0.038	86x114	64x86	97	0.056	49x65	37x49	91	0.098	33x44	24x33	92	0.147
0.5	30x41	23x30	14	0.158	36x48	27x36	30	0.132	33x44	25x33	56	0.146	27x36	20x27	73	0.179
1	40x53	30x40	23	0.120	62x83	47x62	65	0.077	98x131	73x98	196	0.049	150x200	113x150	462	0.032
1.5	17x23	13x17	3	0.279	23x31	17x23	12	0.209	25x33	18x25	38	0.195	23x30	17x23	60	0.212
2	20x27	15x20	6	0.240	31x42	23x31	23	0.154	49x66	37x49	90	0.097	74x98	55x74	223	0.065
5					17x22	13x17	4	0.286	20x26	15x20	28	0.244	20x26	15x20	50	0.244
10					21x28	16x21	9	0.230	33x44	25x33	55	0.146	49x66	37x49	144	0.097
									16x22	12x16	21	0.292	17x23	13x17	43	0.276
									25x33	18x25	38	0.195	37x50	28x37	104	0.129
									8.2x11	6.2x8.2	3	0.585	10x14	7.7x10	20	0.470
									9.9x13	7.4x9.9	6	0.487	15x20	11x15	32	0.324
													6.0x8.1	4.5x6.0	6	0.794
													7.4x9.9	5.6x7.4	8	0.647

Extension Ring (mm)	FV2020				FV2520				FV3020				FV3519			
	1/2 CCD	1/3 CCD	WD (mm)	magnification	1/2 CCD	1/3 CCD	WD (mm)	magnification	1/2 CCD	1/3 CCD	WD (mm)	magnification	1/2 CCD	1/3 CCD	WD (mm)	magnification
0	22x29	17x22	88	0.217	27x35	20x27	142	0.181	29x39	22x29	190	0.164	37x49	27x37	288	0.131
0.5	229x305	171x229	984	0.021	185x246	138x185	988	0.026	155x206	116x155	986	0.031	133x178	100x133	985	0.036
1	20x27	15x20	79	0.241	24x32	18x24	128	0.200	27x35	20x27	173	0.181	33x44	25x33	262	0.145
1.5	107x142	80x														

WD and FOV Chart for Extension Ring 2 Mega Pixel Fixed Focal Lens (HS Series)

Extension Ring (mm)	HS0814J				HS1214J				HS1614J			
	FOV (V x H)		WD (mm)	Magnification	FOV (V x H)		WD (mm)	Magnification	FOV (V x H)		WD (mm)	Magnification
	1/2 CCD	1/3 CCD			1/2 CCD	1/3 CCD			1/2 CCD	1/3 CCD		
0	65x86	49x65	90	0.074	61x81	46x61	145	0.079	60x80	45x60	197	0.08
	600x800	450x600	989	0.008	400x533	300x400	994	0.012	300x400	225x300	996	0.016
0.5	36x47	27x36	40	0.135	40x54	30x40	92	0.119	44x58	33x44	141	0.11
	70x93	52x70	98	0.069	91x121	68x91	223	0.053	102x136	77x102	343	0.047
1	24x33	18x24	21	0.196	30x40	23x30	65	0.16	34x45	26x34	108	0.141
	37x49	28x37	42	0.13	52x69	39x52	120	0.093	62x83	47x62	204	0.077
1.5	19x25	14x19	11	0.256	24x32	18x24	50	0.2	28x37	21x28	87	0.171
	25x34	19x25	21	0.19	36x48	27x36	80	0.133	45x60	34x45	144	0.107
2	15x20	11x15	5	0.317	20x27	15x20	39	0.24	24x32	18x24	73	0.201
	19x25	14x19	11	0.251	28x37	21x28	58	0.173	35x46	26x35	110	0.138
5					10x13	7.5x10	13	0.482	13x17	9.4x13	34	0.383
					12x15	8.7x12	17	0.415	15x20	11x15	42	0.32
10					5.4x7.2	4.1x5.4	2	0.885	7x9.3	5.2x7	15	0.686
					5.9x7.8	4.4x5.9	2	0.818	7.7x10	5.8x7.7	16	0.623

Extension Ring (mm)	HS2514J				HS3514J				HS5018J			
	FOV (V x H)		WD (mm)	Magnification	FOV (V x H)		WD (mm)	Magnification	FOV (V x H)		WD (mm)	Magnification
	1/2 CCD	1/3 CCD			1/2 CCD	1/3 CCD			1/2 CCD	1/3 CCD		
0	55x74	41x55	291	0.087	47x63	35x47	337	0.102	43x58	32x43	438	0.111
	185x246	138x185	988	0.026	98x131	73x98	701	0.049	80x107	60x80	813	0.06
0.5	45x60	34x45	236	0.107	41x55	31x41	295	0.116	40x53	30x40	402	0.121
	107x142	80x107	560	0.045	75x100	56x75	542	0.064	69x91	51x69	693	0.07
1	38x51	29x38	200	0.126	37x49	28x37	263	0.13	37x49	27x37	371	0.131
	74x98	55x74	390	0.065	62x82	46x62	441	0.078	60x80	45x60	604	0.08
1.5	33x44	25x33	172	0.146	33x44	25x33	235	0.145	34x45	26x34	345	0.141
	57x76	43x57	298	0.084	52x70	39x52	371	0.092	53x70	40x53	536	0.091
2	29x39	22x29	151	0.166	21x28	16x21	145	0.231	24x32	18x24	239	0.203
	46x62	35x46	241	0.104	27x36	20x27	188	0.178	32x42	24x32	317	0.152
5	17x23	13x17	87	0.283	13x17	10x13	87	0.374	16x21	12x16	159	0.305
	22x29	16x22	111	0.221	15x20	11x15	101	0.321	19x25	14x19	188	0.254
10	10x13	7.5x10	50	0.479	9.3x12	7x9.3	62	0.517	12x16	9x12	118	0.408
	12x15	8.6x12	57	0.417	10x14	7.8x10	67	0.464	13x18	10x13	133	0.357
15	7.1x9.5	5.3x7.1	35	0.674	7.3x10	5.5x7.3	47	0.66	9x13	7.1x9.4	95	0.51
	7.8x10	5.9x7.8	37	0.613	7.9x11	5.9x7.9	50	0.607	10x14	7.8x10	103	0.459
20	5.5x7.4	4.1x5.5	26	0.87	6x8	4.5x6	37	0.803	7.8x10.4	5.9x7.8	78	0.613
	5.9x7.9	4.5x5.9	27	0.808	6.4x8.5	4.8x6.4	39	0.75	8.5x11.4	6.4x8.5	83	0.562
30									6.7x9	5x6.7	67	0.715
									7.2x9.6	5.4x7.2	70	0.664
35									5.9x7.8	4.4x5.9	59	0.818
									6.3x8.3	4.7x6.3	60	0.767

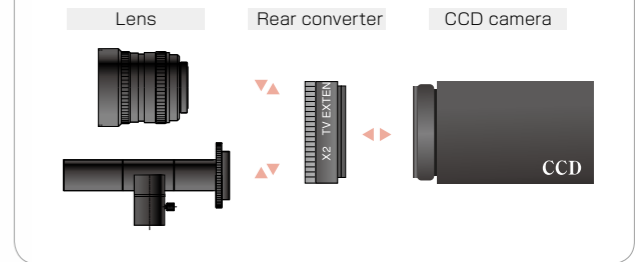
Rear Converter

Rear converter for C mount

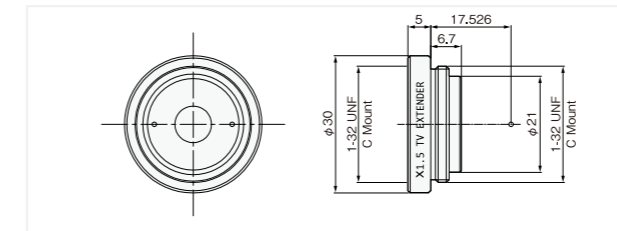
- Easy to convert magnification without changing the working distance
- * Using rear converter is deteriorated resolution and F No.



Configuration

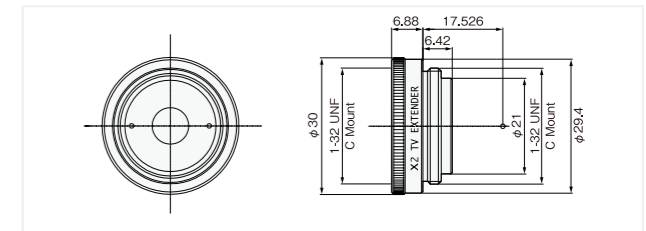


RC15



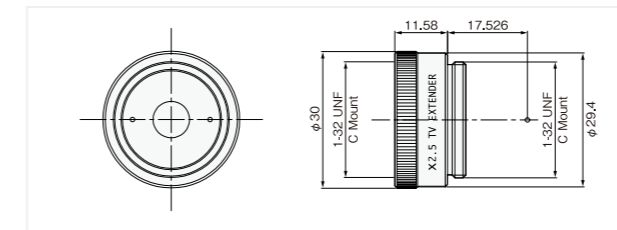
Magnification 1.5x

RC20



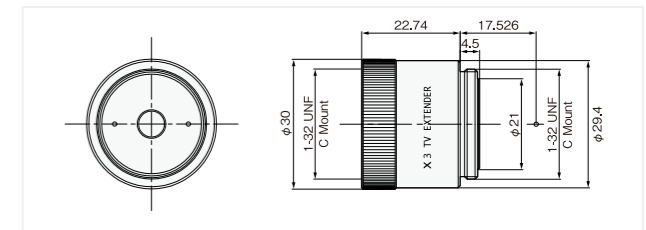
Magnification 2.0x

RC25



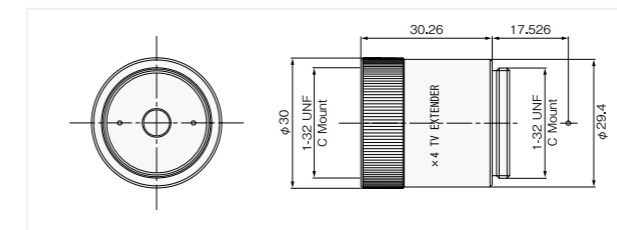
Magnification 2.5x

RC30



Magnification 3.0x

RC40



Magnification 4.0x

Filter

Customization is available

Attach to the tip of lenses and use for adjustment of wavelength and brightness

*Please contact us for different filters, not listed on the catalog.



UV Cut Fiter (Protection cover filter)

Model	Filter	Screw Pitch
UV225	UV-CUT	M22.5 P=0.5
UV255	UV-CUT	M25.5 P=0.5
UV270	UV-CUT	M27.0 P=0.5
UV305	UV-CUT	M30.5 P=0.5



IR Cut Fiter

Model	Filter	Screw Pitch
IR225	IR-CUT	M22.5 P=0.5
IR255	IR-CUT	M25.5 P=0.5
IR270	IR-CUT	M27.0 P=0.5
IR305	IR-CUT	M30.5 P=0.5



ND Fiter

Model	Filter	Screw Pitch
ND2225	ND 2 (50%)	M22.5 P=0.5
ND2255	ND 2 (50%)	M25.5 P=0.5
ND2270	ND 2 (50%)	M27.0 P=0.5
ND2305	ND 2 (50%)	M30.5 P=0.5
ND2405	ND 2 (50%)	M40.5 P=0.5
ND4225	ND 4 (25%)	M22.5 P=0.5
ND4255	ND4(25%)	M25.5 P=0.5
ND4270	ND4(25%)	M27.0 P=0.5
ND4305	ND4(25%)	M30.5 P=0.5
ND4405	ND4(25%)	M40.5 P=0.5
ND8270	ND8(12.5%)	M27.0 P=0.5
ND8305	ND8(12.5%)	M30.5 P=0.5



Polarized Fiter

Model	Filter	Screw Pitch
PL255R	PL255 Rotation type	M25.5 P=0.5
PL270R	PL270 Rotation type	M27.0 P=0.5
PL305R	PL305 Rotation type	M30.5 P=0.5
PL340R	PL340R Rotation type	M34.0 P=0.5
PL355R	PL355R Rotation type	M35.5 P=0.5
PL375R	PL375R Rotation type	M37.5 P=0.5
PL405R	PL405R Rotation type	M40.5 P=0.5
PL430R	PL430R Rotation type	M43.0 P=0.75
PL460R	PL460R Rotation type	M46.0 P=0.75
PL490R	PL490R Rotation type	M49.0 P=0.75
PL520R	PL520R Rotation type	M52.0 P=0.75
PL550R	PL550R Rotation type	M55.0 P=0.75
PL580R	PL580R Rotation type	M58.0 P=0.75
PL620R	PL620R Rotation type	M62.0 P=0.75
PL670R	PL670R Rotation type	M67.0 P=0.75
PL720R	PL720R Rotation type	M72.0 P=0.75
PL770R	PL770R Rotation type	M77.0 P=0.75
PL820R	PL820R Rotation type	M82.0 P=0.75
PL950R	PL950R Rotation type	M95.0 P=0.75
PL106R	PL106R Rotation type	M106.0 P=1.0



Color Fiter

Model	Filter	Screw Pitch
B225	Blue	M22.5 P=0.5
B255	Blue	M25.5 P=0.5
B270	Blue	M27.0 P=0.5
B305	Blue	M30.5 P=0.5
G225	Green	M22.5 P=0.5
G255	Green	M25.5 P=0.5
G270	Green	M27.0 P=0.5
G305	Green	M30.5 P=0.5
Y225	Yellow	M22.5 P=0.5
Y255	Yellow	M25.5 P=0.5
Y270	Yellow	M27.0 P=0.5
Y305	Yellow	M30.5 P=0.5
R225	Red	M22.5 P=0.5
R255	Red	M25.5 P=0.5
R270	Red	M27.0 P=0.5
R305	Red	M30.5 P=0.5
R405	Red	M40.5 P=0.5

CHART

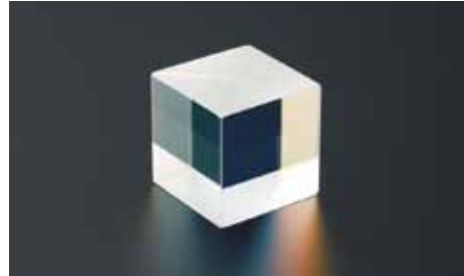
Screw Pitch	Model Name			
	LINE/LARGE AREA SENSOR LENS	TELECENTRIC LENS	MACRO ZOOM LENS	FIXED FOCAL LENS
M25.5 P=0.5				MV0813
M27.0 P=0.5			CMZ0540-2	FV0420, FV1022, FV1520, FV2020, FV2520, FV5025, FV7538, MV0614, MV1214, MV1614, MV2514, MV3519
M30.5 P=0.5		VTL0513	HMZ0745, HMZ0745C	HS1214J, HS1614J, HS2514J, HS3514J, HS5018J, FV0622, MV5018, MV7527, MV10035
M34 P=0.75		MGTL10V, MGTL10VC		HS0814J
M35.5 P=0.5		VTL0714, MGTL05VM, MGTL05VMC, MGTL069VM, MGTL069VMC		
M37.5 P=0.5	LS05, LS07, LS10, LS15			HF1214J-2
M40.5 P=0.5		MGTL03, MGTL03VM, MGTL03VMC, MGTL0345VM, MGTL0345VMC		HF0818J-2, HS1214V, HS1614V, HS2514V
M43 P=0.75		MGTL04VM, MGTL04VMC		
M46 P=0.75	XLS03, XLS05, XLS075, XLS10, XLS14, XLS20	MGTL04		HF3514V-2
M49 P=0.75	FV3526L	MGTL03, MGTL03VM, MGTL03VMC, MGTL0345VM, MGTL0345VMC		HF1618V-2, HF5018V-2
M52 P=0.75	LSTL078TW, LSF3528			HF2514V-2
M55 P=0.75	LS15H, LS20H			HF0528J-2, HF7518V-2
M58 P=0.75	SP10, SP20, XLS01, XLS02, WF5045, MS1828, MS3520, HB5014	MGTL0275-2		HS0818V
M62 P=0.75	MS2524, LSP350, SP05, SP07, SP14, FV5026L, FV5026W	MGTL023, MGTL022VM		
M67 P=0.75	LS10H, LSF5028	MGTL014, MGTL019, MGTL023H, MGTL0275V		
M72 P=0.75		MGTL03V, MGTL03VC		
M77 P=0.75	LSF2528, FV8528W	MGTL017VM		
M82 P=0.75	LSTL055TW, FV8528L			
M95 P=1.0		MGTL014VM, MGTL014VM-180		
M106 P=1.0	LSTL03TW			

Optical Lens Parts

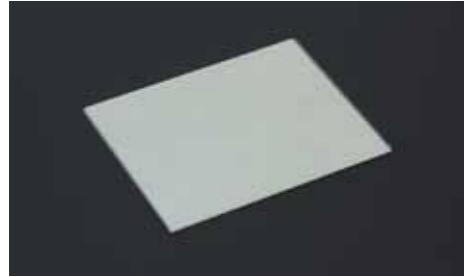
Customization is available



Beam splitter			
Wavelength	400nm-700nm	Model	Dimension(mm)
Coating	Slope: Dielectric multilayer coating Side: AR multi-coated	BS-10	10×10×10
Spectral ratio	T : R = 50 : 50	BS-15	15×15×15
Surface tolerance	$\lambda / 4$	BS-20	20×20×20
Angle	$\pm 3^\circ$	BS-25	25×25×25
Size tolerance	+0.1 / -0.3mm		
Material	BK-7		



Polarized beam splitter			
Wavelength	450nm-650nm	Model	Dimension(mm)
Coating	Slope: Dielectric multilayer coating Side: AR multi-coated	BSP-03	3×3×3
Spectral ratio	Tp > 95 Rs > 95	BSP-05	5×5×5
Surface tolerance	$\lambda / 4$	BSP-08	8×8×8
Angle	$\pm 3^\circ$	BSP-10	10×10×10
Size tolerance	+0.1 / -0.3mm		
Material	BK-7		



Half mirror				
Coating	Surface: Dielectric multilayer coating Rear surface : AR multi-coated	Model	Dimension(mm)	Thickness(mm)
Spectral ratio	T : R = 50 : 50	HM-30-1	30×30	1
Surface tolerance	$\lambda - 3\lambda$	HM-50-1	50×50	1
Parallelism	Within 1°	HM-100-1	100×100	1
Angle of incidence	45°	HM-30-2	30×30	2
Material	Crown	HM-50-2	50×50	2
		HM-100-2	100×100	2



Aluminized surface mirror				
Coating	Aluminum + Sio	Model	Dimension(mm)	Thickness(mm)
Surface tolerance	λ	AM-5	5×5	1
Size tolerance	+0 / -0.2mm	AM-10	10×10	1
Material	Crown	AM-30	30×30	2
		AM-50	50×50	3
		AM-100	100×100	3



Right angle prism			
Coating	Slope: Aluminum coated Vertical plane: AR multi-coated	Model	Dimension(mm)
Surface tolerance	$\lambda / 2$	TP-5	5×5×5
Angle	$\pm 3^\circ$	TP-10	10×10×10
Size tolerance	+0 / -0.2mm	TP-15	15×15×15
Material	BK-7	TP-20	20×20×20
		TP-25	25×25×25
		TP-30	30×30×30
		TP-40	40×40×40
		TP-50	50×50×50



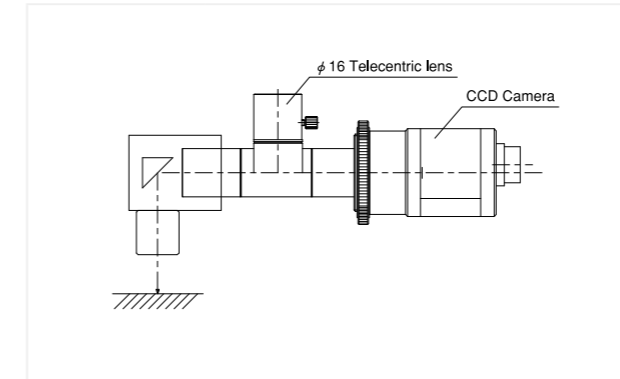
Penta prism			
Coating	Two sided: AR multi-coated Two sided: black coated aluminum	Model	Dimension(mm)
Surface tolerance	$\lambda / 2$	PP-5	5×5×5
Angle	$\pm 3^\circ$	PP-10	10×10×10
Size tolerance	$\pm 0.2\text{mm}$	PP-15	15×15×15
Material	BK-7	PP-20	20×20×20
		PP-25	25×25×25
		PP-30	30×30×30

Prism Adapter

Prism adapters for telecentric lenses

➤ Bend the optical axis at 90° and suitable for mark recognition

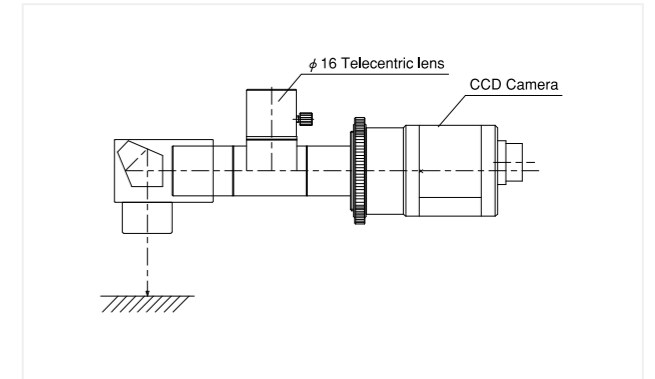
90° slide-looking rectangular mirror type



Optical axis can be bent 90°degrees. Effective when there is no space above the object. Monitored image is a mirror image.

Model	Compatible model
TL-PM16-1	φ 16 Telecentric Series
TL-PM22-1	WD220 Telecentric φ 22
TL-PM39-1	WD220 Telecentric φ 39

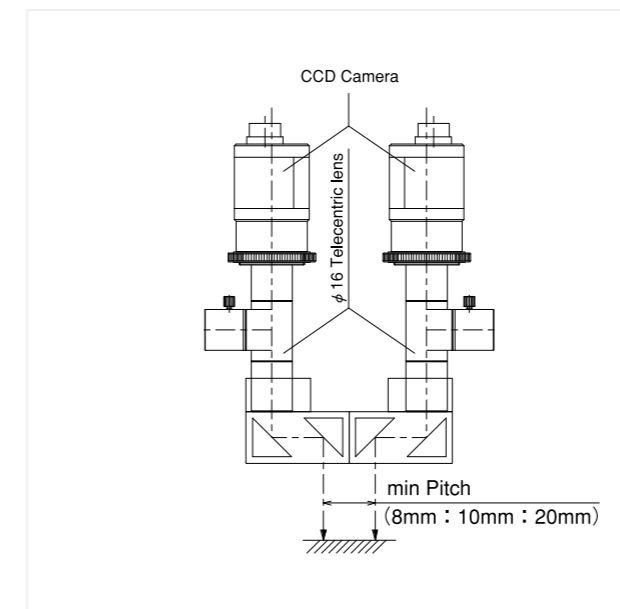
90° slide-looking pentaprism type



Optical axis can be bent 90°degrees. Effective when there is no space above the object. Monitored image is an erecting image.

Model	Compatible model
TL-PP16-1	φ 16 Telecentric Series
TL-PP22-1	WD220 Telecentric φ 22
TL-PP39-1	WD220 Telecentric φ 39

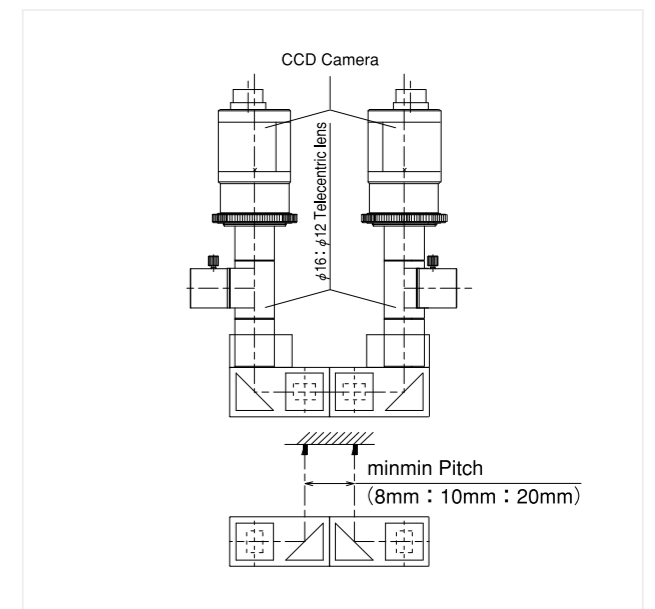
Optical axis pitch conversion type



Narrow pitch marks between two points can be recognized.

Model	Compatible model
TL-PT16-1	φ 16 Telecentric (Pitch 8mm/One side 4mm)
TL-PT16-2	φ 16 Telecentric (Pitch 10mm/One side 5mm)
TL-PT16-3	φ 16 Telecentric (Pitch 20mm/One side 10mm)

Optical axis pitch 90° conversion type



Narrow pitch marks between two points can be recognized. Effective when there is no space above the object.

Model	Compatible model
TL-PTV16-1	φ 16 Telecentric (Pitch 8mm/One side 4mm)
TL-PTV16-2	φ 16 Telecentric (Pitch 10mm/One side 5mm)
TL-PTV16-3	φ 16 Telecentric (Pitch 20mm/One side 10mm)

LIGHTING
SERIES

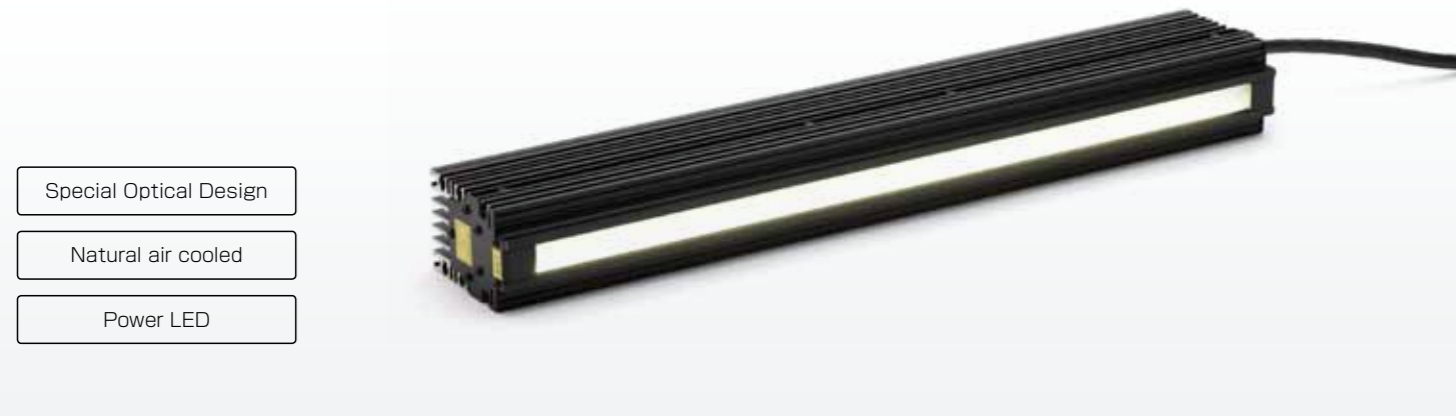


MDBB-LSRH Series LED LIGHTING

1 million lx very bright lighting product line

Natural air-cooled, industrys' highest class

Use PC to adjust light strength each 100mm.

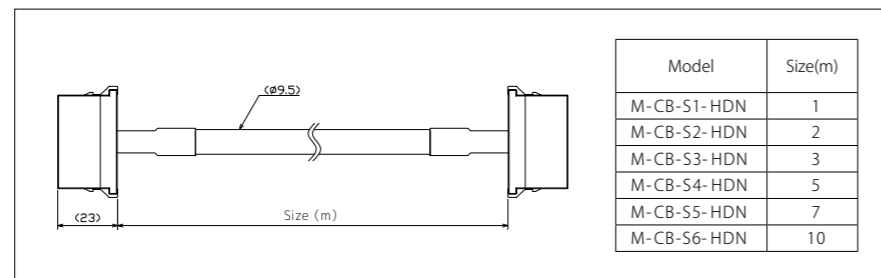


- Special Optical Design
- Natural air cooled
- Power LED

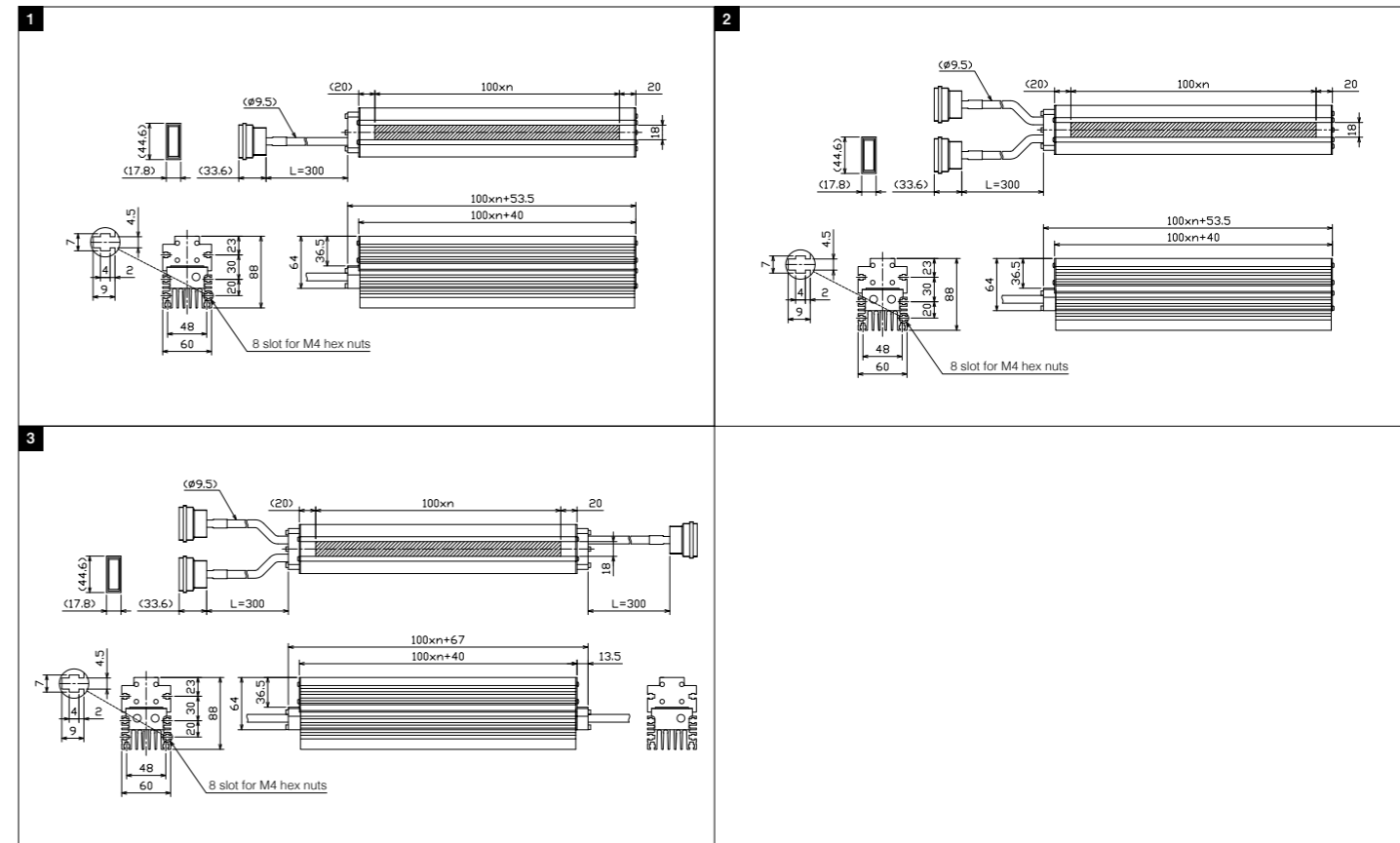
- Achieves natural air-cooled 1 million lx (WD 50mm).
- Can use special power app to control by PC individually each 100mm.
- Our product line emits light from 100 to 3000 mm, in 100mm units.
- Models ending in -S can be used very uniformly.

Model	Color	Power Consumption (W)	Channels	Dimension
MDBB-LSRH100W	W	30	1CH	1
MDBB-LSRH200W	W	60	2CH	
MDBB-LSRH300W	W	90	3CH	
MDBB-LSRH400W	W	120	4CH	
MDBB-LSRH500W	W	150	5CH	
MDBB-LSRH600W	W	180	6CH	
MDBB-LSRH700W	W	210	7CH	
MDBB-LSRH800W	W	240	8CH	
MDBB-LSRH900W	W	270	9CH	
MDBB-LSRH1000W	W	300	10CH	
MDBB-LSRH1100W	W	330	11CH	
MDBB-LSRH1200W	W	360	12CH	2
MDBB-LSRH1300W	W	390	13CH	
MDBB-LSRH1400W	W	420	14CH	
MDBB-LSRH1500W	W	450	15CH	
MDBB-LSRH1600W	W	480	16CH	
MDBB-LSRH1700W	W	510	17CH	
MDBB-LSRH1800W	W	540	18CH	
MDBB-LSRH1900W	W	570	19CH	
MDBB-LSRH2000W	W	600	20CH	
MDBB-LSRH2100W	W	630	21CH	
MDBB-LSRH2200W	W	660	22CH	3
MDBB-LSRH2300W	W	690	23CH	
MDBB-LSRH2400W	W	720	24CH	
MDBB-LSRH2500W	W	750	25CH	
MDBB-LSRH2600W	W	780	26CH	
MDBB-LSRH2700W	W	810	27CH	
MDBB-LSRH2800W	W	840	28CH	
MDBB-LSRH2900W	W	870	29CH	
MDBB-LSRH3000W	W	900	30CH	

MDBB-LSRH Dedicated extension cable



• Condenser lens MLBBH-□, diffusion plate MKBB-LSRH□. Replace the □ with its size, in 100mm units. Product line from 100 to 1000 mm. Please tell us whether you want a condenser lens or diffusion plate attached. Diffusion plates are 30%, 60%, 80% or 90%.



Power Supply application

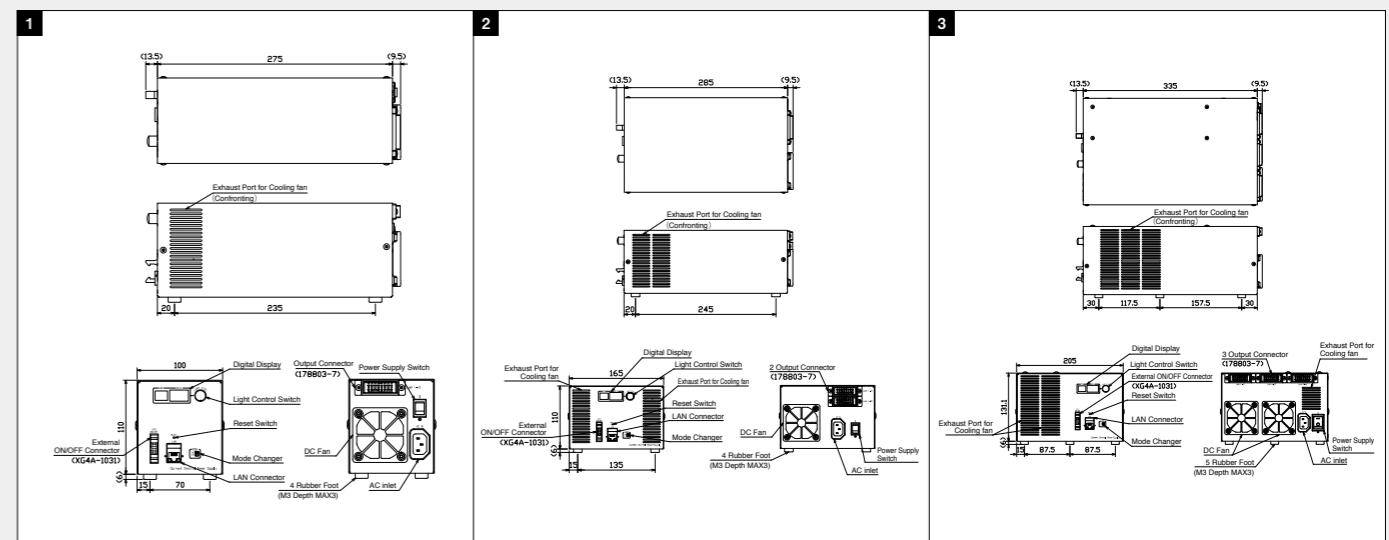
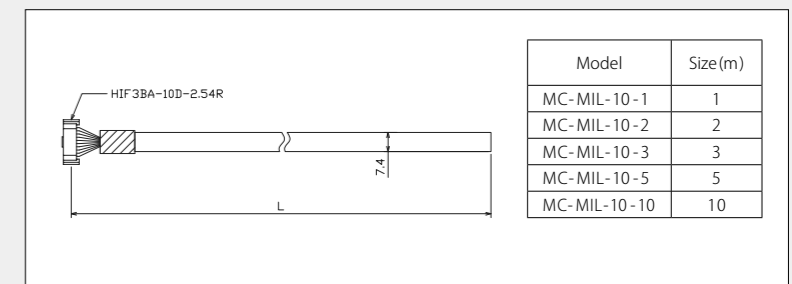
Power Supply for MDBB-LSRH

Available in size from 100 to 1,000 mm



Model	MMC-300M10-TP	MMC-600M20-TP	MMC-1000M30-TP
Input Voltage	AC100~240V		
Operating frequency	50/60Hz		
Capacity	30W/CH		
Channels	10CH	20CH	30CH
Dimming method	Method to vary output current		
External control	LAN外部ON/OFF		
対応サイズ	100~1000	1100~2000	2100~3000
Dimension	1	2	3

External control cable



MDBB-LSR Series LED LIGHTING

600,000 lx very bright lighting product line

Great variety of sizes

Extendable from 100mm to max 3000mm

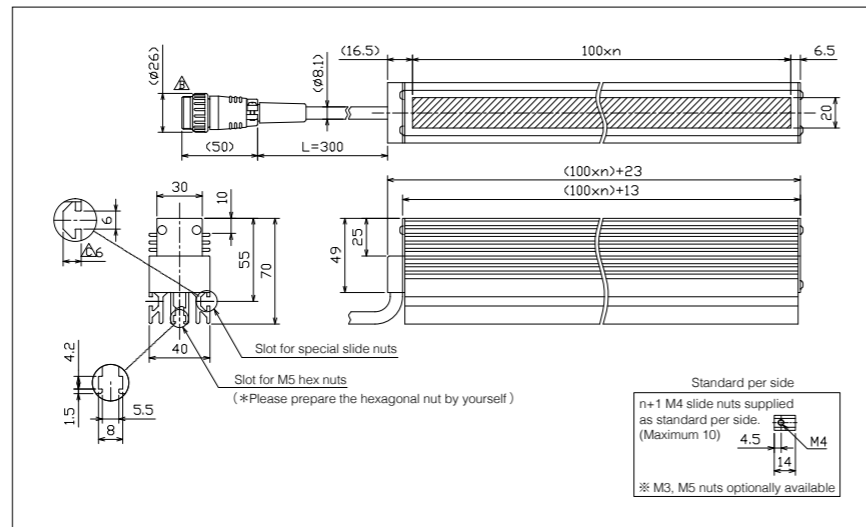
- Special Optical Design
- Natural air cooled
- DC24V
- Power LED



• Models ending in -S can be used very uniformly.

Model	Color	Power Consumption (W)	Dimension
MDBB-LSR100R	R	13	n=1
MDBB-LSR100□	W B	20	
MDBB-LSR200R	R	26	n=2
MDBB-LSR200□	W B	40	
MDBB-LSR300R	R	39	n=3
MDBB-LSR300□	W B	60	
MDBB-LSR400R	R	52	n=4
MDBB-LSR400□	W B	80	
MDBB-LSR600R	R	78	n=6
MDBB-LSR600□	W B	120	
MDBB-LSR1000R	R	130	n=10
MDBB-LSR1000□	W B	200	

- R= Red, W = White, B = Blue, in □.
- Input voltage is DC24V.
- Condenser lens MLBBH-□ and diffusion plate MKBB-LSR□ (optional) can be attached. Replace the □ with its size, in 100mm units. Product line from 100 to 1000 mm. Please tell us whether you want a condenser lens or diffusion plate attached. Diffusion plates are 30%, 60%, 80% or 90%.

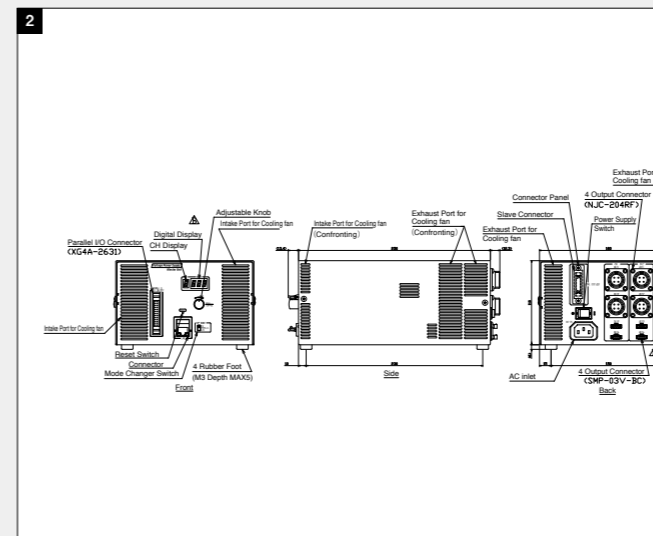


High function Voltage Light Control Power Supply

Voltage light control power supply capable of 1,000 - level light control

- As it is capable of varying output voltage, this series is suitable for Line Scan Camera and High Speed Camera
- This series is capable of supporting large 24 V DC lights with power consumption of 300 W and makes it possible to select an optimal light control range by setting a low-voltage output limit.
- It is possible to switch between LAN and parallel communication for external light control.

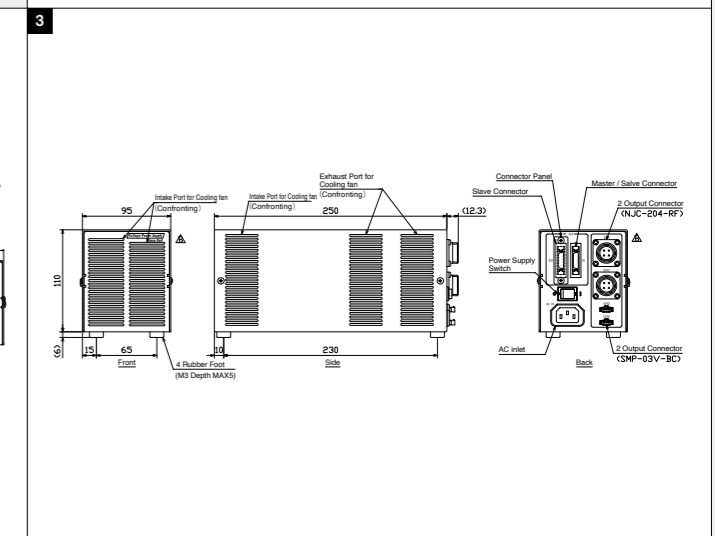
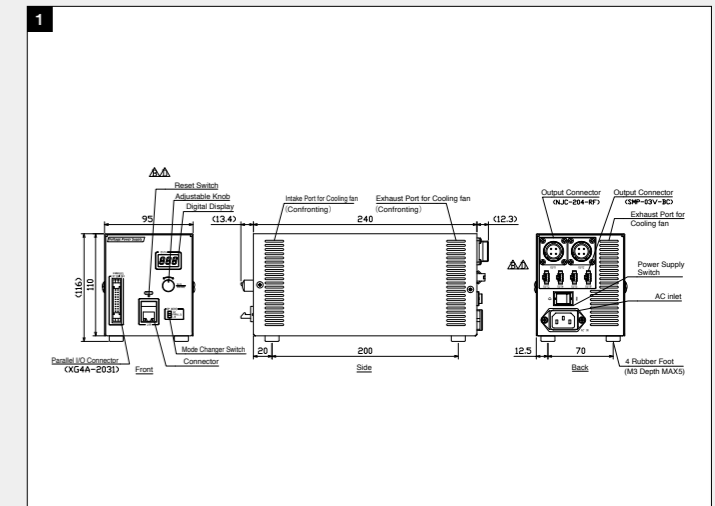
Model	MWDV-300S-24	MWDV-600M2-24	MWDV-300M1-24
Input Voltage	AC100~240V		
Operating frequency	50/60Hz		
Rated output	DC24V		
Capacity	300W	Total 600W (300W/CH)	300W
Channels	Single split - channel output connectors (metal connectors ×2 +SM connectors ×4)	2CH 4 connectors ×2 +SM connectors ×4)	1CH 4 connectors / CH (metal connectors ×2 +SM connectors ×2)
Dimming method	Method to vary output current		
External control	External ON/OFF. External light control (10 bit parallel communication / LAN communication)	External ON/OFF. External light control (10 bit parallel communication / LAN communication)	
Dimension	1	2	3



- 10bit
- LAN
- CE MARK TYPE

Dedicated extension cable

Model	Size(m)
M-CB-S1R-MCB	1
M-CB-S2R-MCB	2
M-CB-S3R-MCB	3
M-CB-S5R-MCB	5
M-CB-S10R-MCB	10



* For details on the external control cable, refer to MC-MIL-series on page 113.

MV & MHV Series Coaxial Light

Ultra-high brightness coaxial spot lighting

Telecentric light source

Ideal for mirror work such as a wafers

We also have UV & IR types

MHVC-21A is the industrys' highest class of brightness

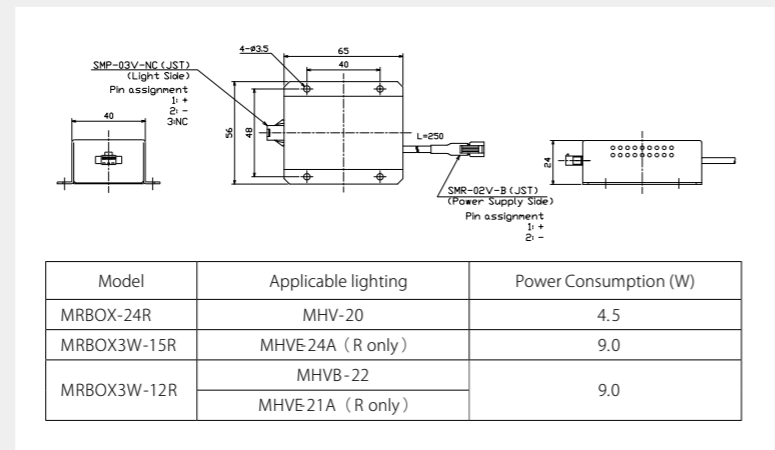


Power LED

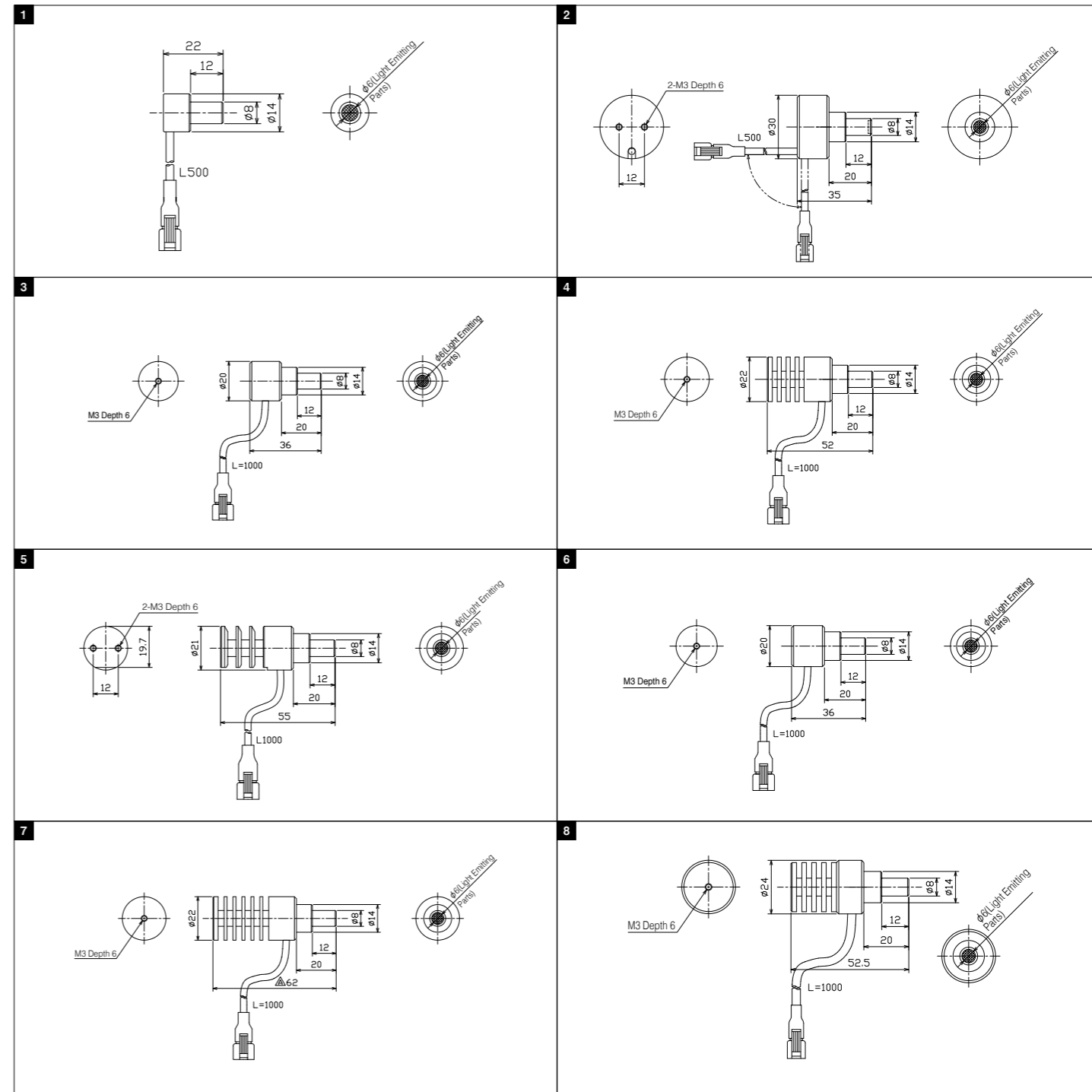
Model	Color	Power Consumption (W)	Applicable Current	Dimension
MV-14A□	R	1.0	DC12V	1
	W			
	G			
	B			
MV-30A□	R	1.5	DC12V	2
	W			
	G			
	B			
MHV-20□	R	-	MLC-350M2-VI	3
	W			
	G			
	B			
MHVB-22□	R	-	MLC-700M2-VI	4
	W			
	G			
	B			
MHVE-21A□	R	-	MLC-700M2-VI	5
	W			
	G			
	B			
MHV-20UV-400	UV	-	MLC-350M2-VI	6
MHVB-22UV-365	UV	-	MLC-700M2-VI	7
MHVB-24IR-850	IR	-	MLC-700M2-VI	8
MHVB-24IR-940	IR	-	MLC-700M2-VI	

Resistance Box / MRBOX (Required when using 12V DC output power supply)

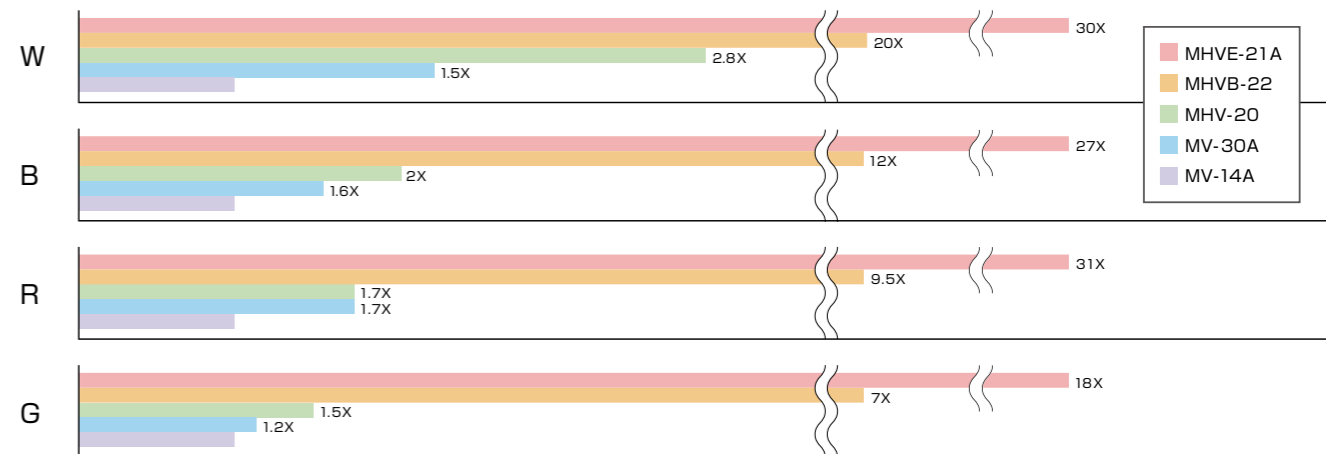
MRBOX-24R / MRBOX3W-15R / MRBOX3W-12R



- R= Red, W = White, B = Blue, G = Green, in □ .
- MHV/MHVB series
- Use a resistance box to enable connection to power supplies other than MLC.
- LEDs have individual differences in peak wavelengths, so their hues can vary, even if the same model product.



Luminance Comparison (Reference Values) Relative brightness (MV-14A standard)



MMAR Series Ring Light

Multi-angle ring lighting

From low angles to high angles
Applicable to wide range of uses



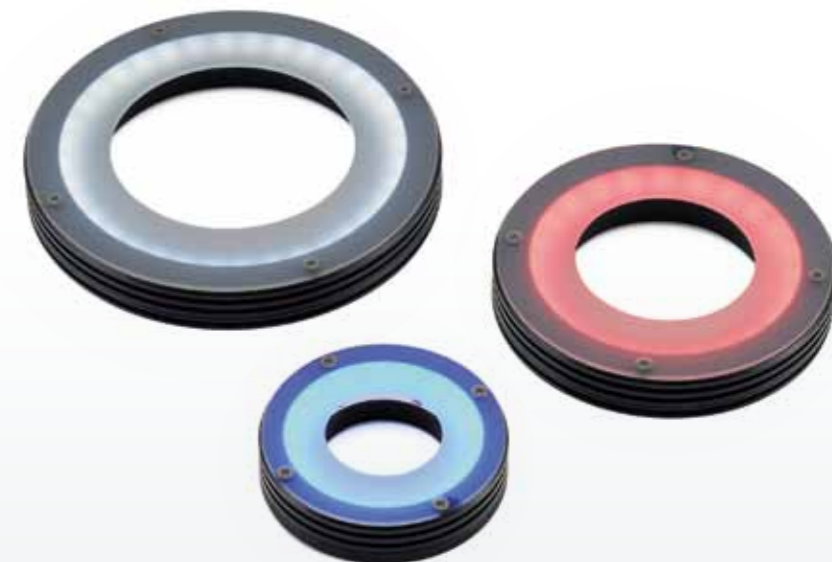
24 V DC Models Available

Power LED

MHRA Series Ring Light

High Power Flat Ring Light

φ66 to φ353
7 types in product line



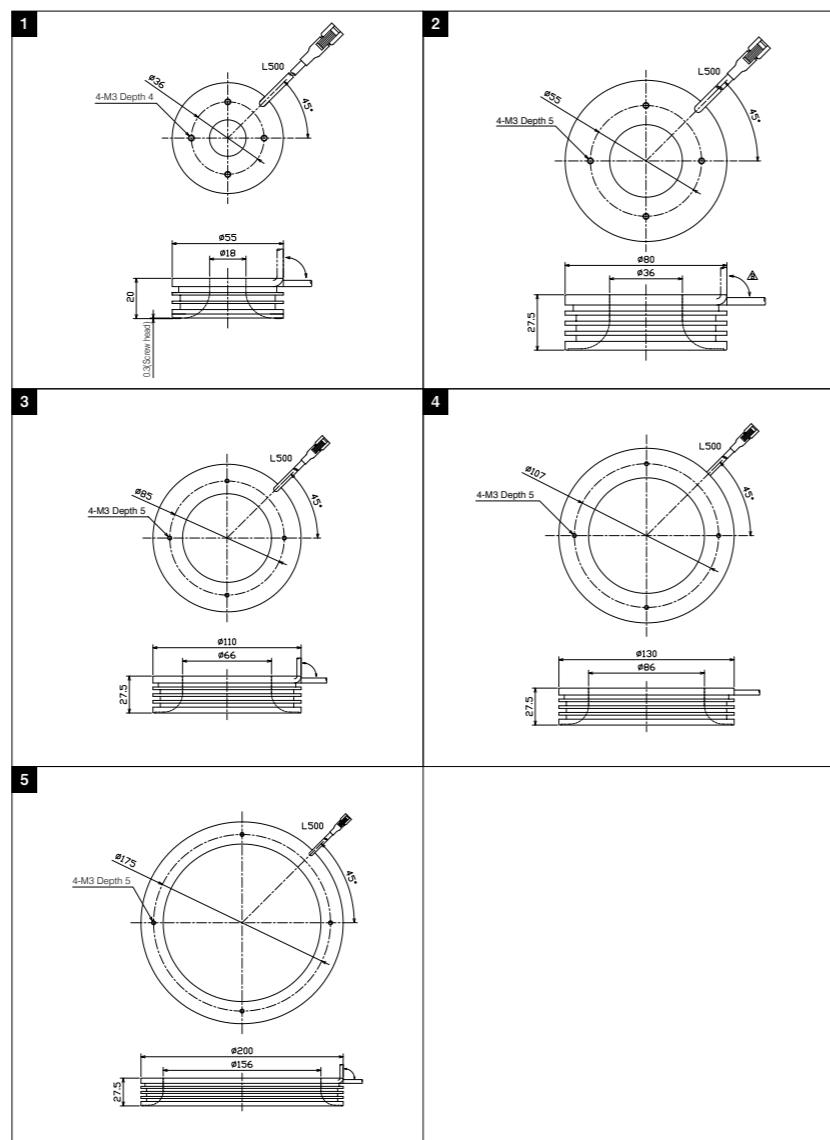
Power LED

Model	Color	Power Consumption (W)	SAG*	Dimension
MMAR-55□	AR	4.5	D6	1
	W		C2	
	B		C5	
MMAR-80□	AR	8.5	CA	2
	W	8	AC	
	B	8	AE	
MMAR-110□	AR	12	CA	3
	W	14.5	AC	
	B	14.5	AE	
MMAR-130□	AR	14.5	B8	4
	W	16	A6	
	B	16	A9	
MMAR-200□	AR	24	AF	5
	W		AA	
	B		B2	

• AR= Red, W = White, B = Blue, in □.

• Input voltage is DC12V, but we can also make DC24V products.

* SAG is the maximum voltage setting for a SAG power supply. See details P.108.



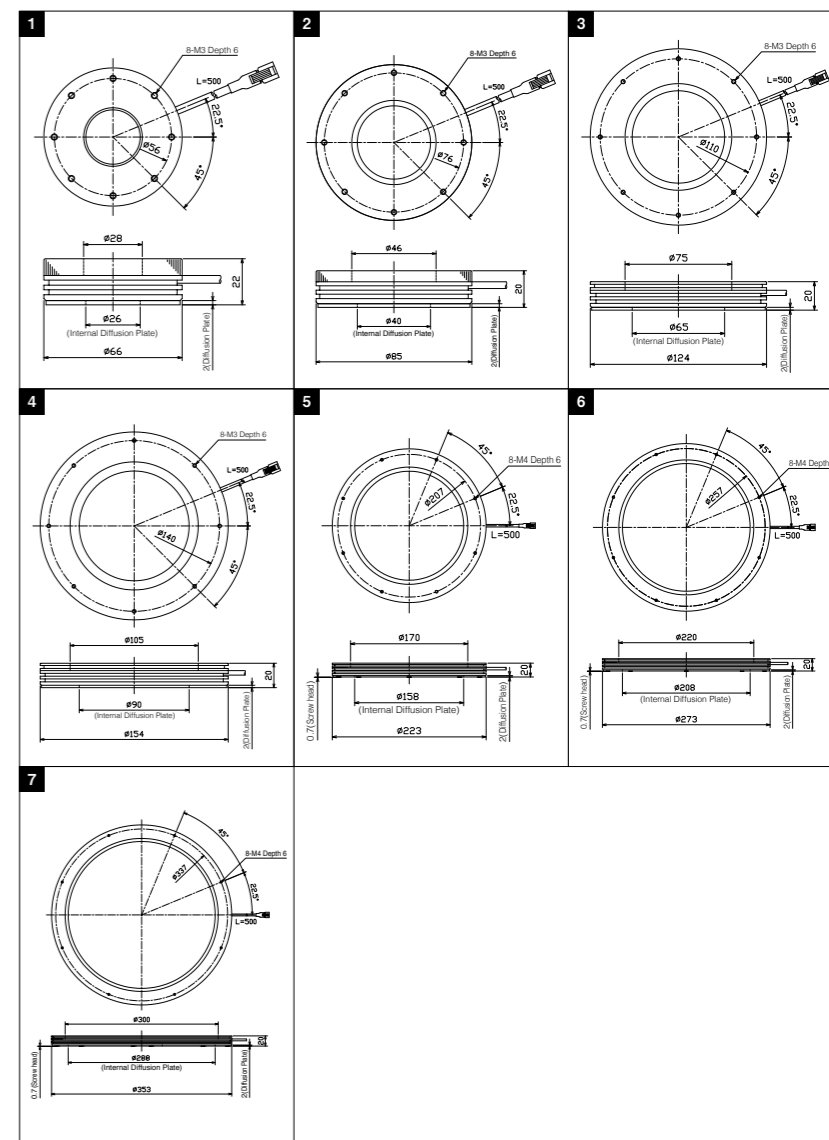
Model	Color	Power Consumption (W)	Input Voltage (V)	SAG*	Dimension
MHRA-60□S	R	6.5	12	FF	1
	AW				
	B				
MHRA-80□S	R	9	12	FF	2
	AW				
	B				
MHRA-120□S	R	13.5	12	FF	3
	AW				
	B				
MHRA-150□S	R	18	12	FF	4
	AW				
	B				
MHRA-220□S	R	28.5	12	FF	5
	AW				
	B				
MHRA-270□HVS	R	34	24	-	6
	AW				
	B				
MHRA-350□HVS	R	44	24	-	7
	AW				
	B				

• R= Red, AW = White, B = Blue, in □.

• Diffusion plate is removable. Can add a polarization plate (optional).

• MHRA-270 □ HVS and higher models are DC24V spec.

* SAG is the maximum voltage setting for a SAG power supply. See details P.108.



MDR Series Ring Light

Direct Ring Light

General purpose ring LED applicable in a wide angle of uses



24 V DC Models Available

MDR-LA Series Ring Light

Low Angle Direct Light

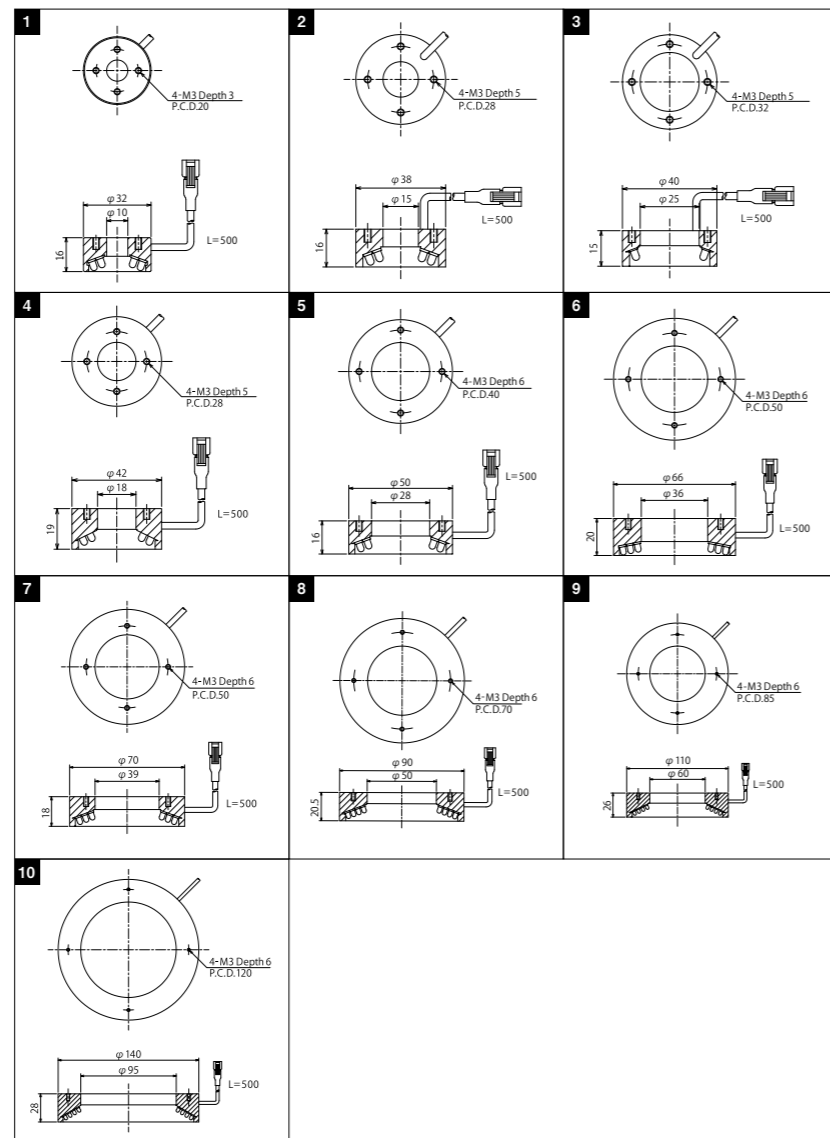
Great for detecting minute scratches and edges



24 V DC Models Available

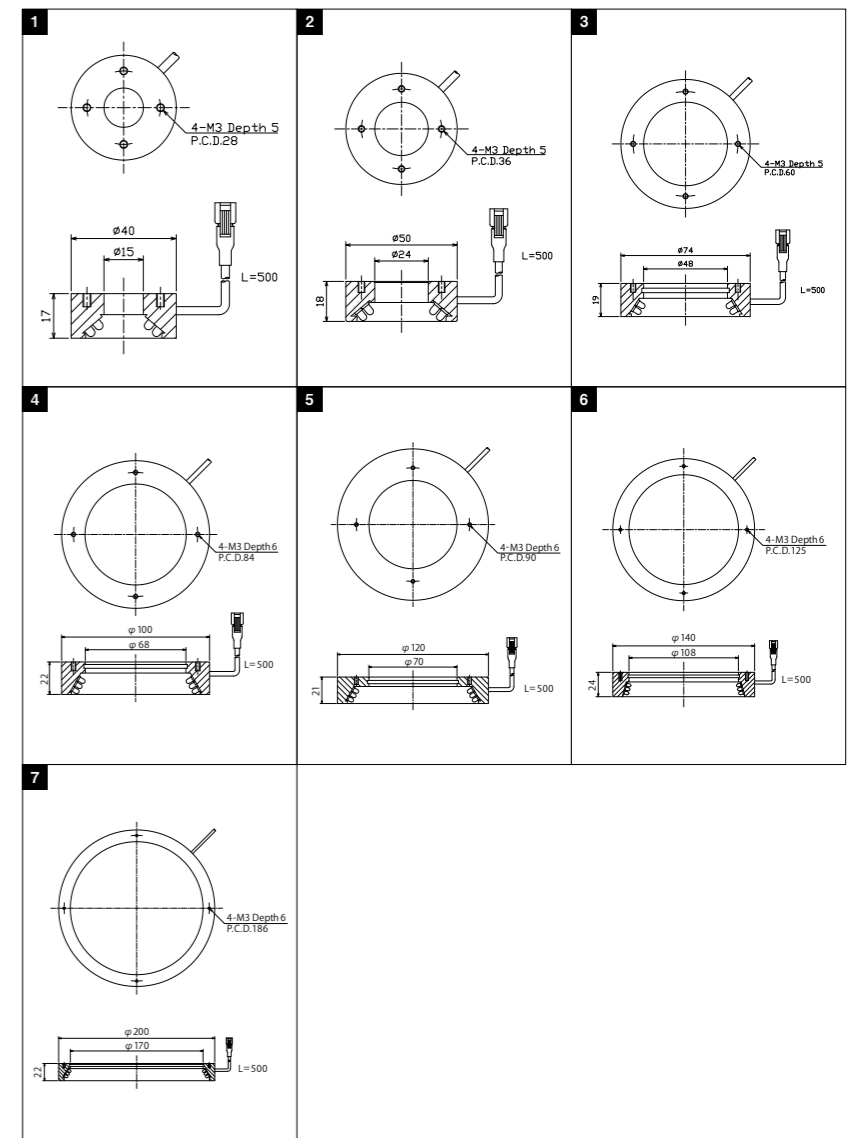
Model	Color	Power Consumption (W)	WD	SAG*	Dimension
MDR-32/10R	R	1.2	20-35	6E	1
MDR-32/10□	DW B G	1.8	20-35	FF	
MDR-38/15R	R	1.5	20-35	6E	2
MDR-38/15□	DW B G	2.2	20-35	FF	
MDR-40/25R	R	1	25-45	6E	3
MDR-40/25□	DW B G	1.5	25-45	FF	
MDR-42/18R	R	1.7	25-45	6E	4
MDR-42/18□	DW B G	2.6	25-45	FF	
MDR-50/28R	R	2.2	30-50	6E	5
MDR-50/28□	DW B G	2.7	30-50	FF	
MDR-66/36R	R	4.6	40-70	70	6
MDR-66/36□	DW B G	5.4	40-70	FF	
MDR-70/39R	R	4.8	20-60	71	7
MDR-70/39□	DW B G	5.8	20-60	FF	
MDR-90/50R	R	8.7	40-90	73	8
MDR-90/50□	DW B G	6.5	40-90	FF	
MDR-110/60R	R	10.1	35-90	75	9
MDR-110/60□	DW B G	9.6	35-90	FF	
MDR-140/95R	R	14.4	50-110	78	10
MDR-140/95□	DW B G	10.8	50-110	FF	

- DW = White, B = Blue, G= Green, in □.
 - Can attach a diffusion plate and polarization plate (optional).
 - Input voltage is DC12V, but we can also make DC24V products.
 - We can also make other sizes.
 - DC24V models have HV at end of the model number.
- * SAG is the maximum voltage setting for a SAG power supply. See details P.108.



Model	Color	Power Consumption(W)	WD	SAG*	Dimension
MDR-LA40/15R-2	R	1.5	5-10	6E	1
MDR-LA40/15□-2	DW B G	2.2	5-10	FF	
MDR-LA50/24R-2-C01	R	2	10-20	6E	2
MDR-LA50/24□-2-C01	DW B G	2.9	10-20	FF	
MDR-LA74/48R	R	3.6	15-30	70	3
MDR-LA74/48□	DW B G	5.4	15-30	FF	
MDR-LA100/68R-3	R	7.2	20-40	72	4
MDR-LA100/68□-3	DW B G	5.4	20-40	FF	
MDR-LA120/70R-3	R	9.2	20-40	74	5
MDR-LA120/70□-3	DW B G	6.9	20-40	FF	
MDR-LA140/108R-3	R	10.6	15-40	75	6
MDR-LA140/108□-3	DW B G	8	15-40	FF	
MDR-LA200/170R-3	R	15.9	40-45	79	7
MDR-LA200/170□-3	DW B G	18.9	40-45	FF	

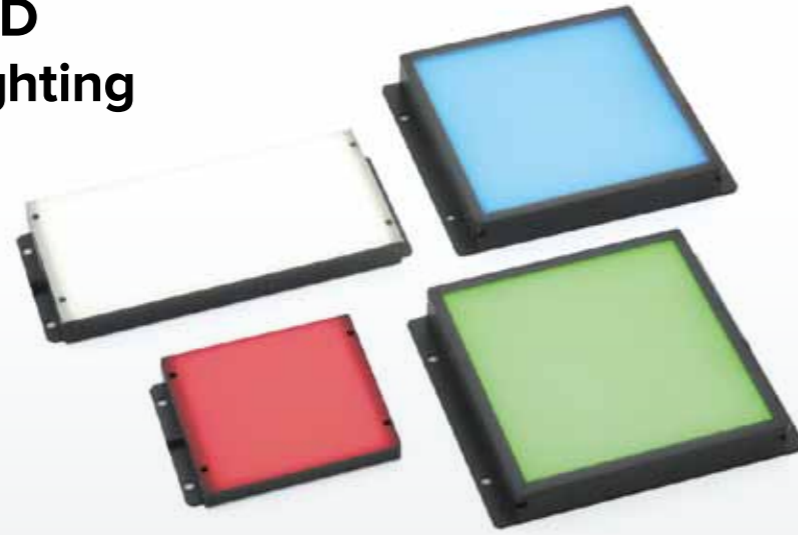
- DW = White, B = Blue, G= Green, in □.
 - Can attach a diffusion plate and polarization plate (optional). * Excludes LA40/15.
 - Input voltage is DC12V, but we can also make DC24V products.
 - We can also make other sizes.
 - DC24V models have HV at end of the model number.
- * SAG is the maximum voltage setting for a SAG power supply. See details P.108.



MDHM Series Transparent lighting

Very bright chip LED surface-emitting lighting

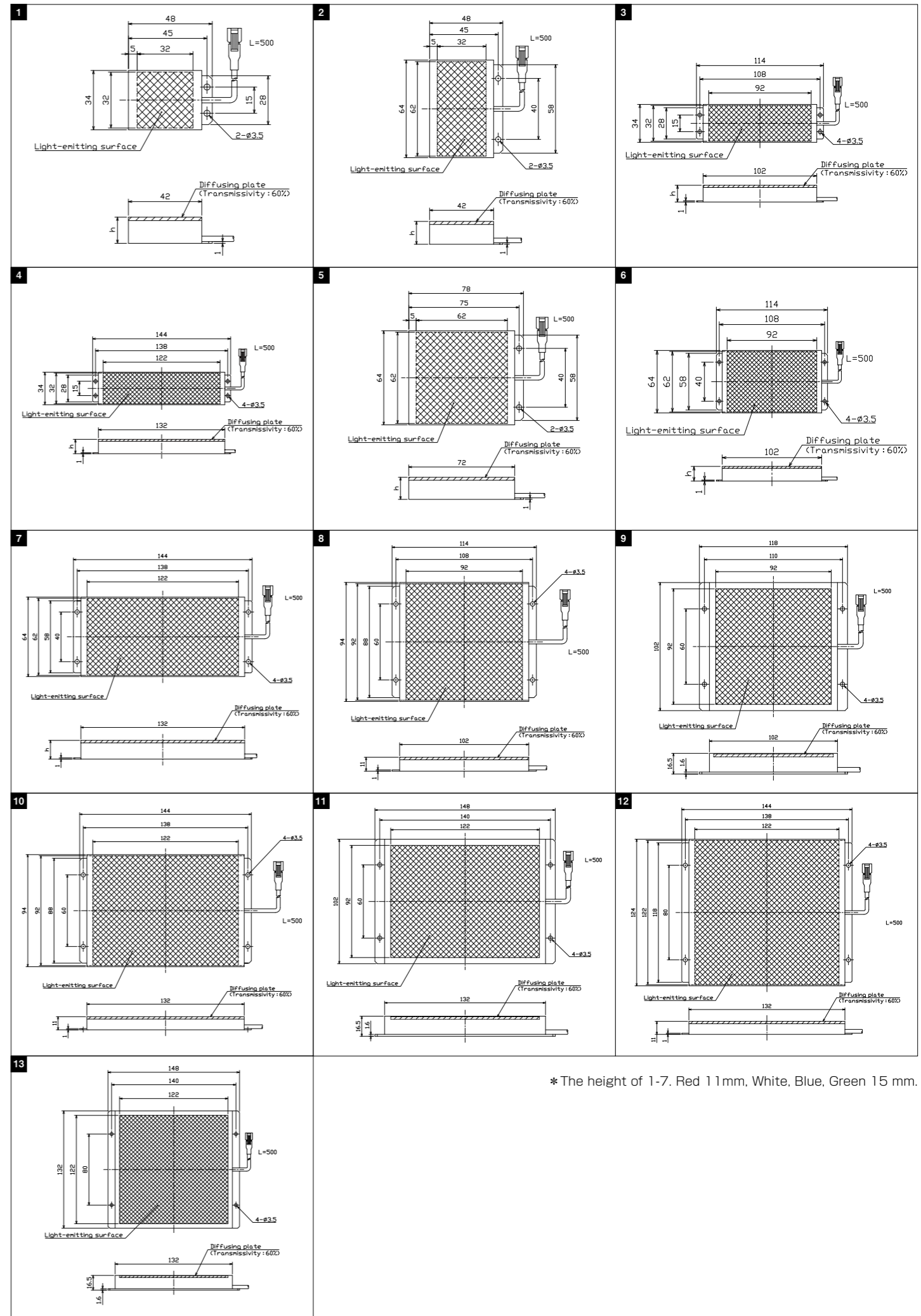
Very bright & uniform thin flat surface-emitting lighting.
We can make these in sizes that are multiples of 30mm square.



24 V DC Models Available

Model	Color	Power Consumption (W)	SAG*	Dimension	Model	Color	Power Consumption (W)	SAG*	Dimension
MDHM-32/32HRT	R	1.5	74	1	MDHM-62/92HRT	R	8.7	76	6
MDHM-32/32DWT	W	1.8	FF		MDHM-62/92DWT	W	10.8	FF	
MDHM-32/32□T	B G	1.8	DC		MDHM-62/92□T	B G	10.8	E8	
MDHM-32/62HRT	R	2.9	75	2	MDHM-62/122HRT	R	11.6	77	7
MDHM-32/62DWT	W	3.6	FF		MDHM-62/122DWT	W	14.4	FF	
MDHM-32/62□T	B G	3.6	DD		MDHM-62/122□T	B G	14.4	E0	
MDHM-32/92HRT	R	4.4	75	3	MDHM-92/92HRT	R	13	78	8
MDHM-32/92DWT	W	5.4	FF		MDHM-92/92DWT	W	16.2	FF	
MDHM-32/92□T	B G	5.4	E0		MDHM-92/92□T	B G	16.2	E6	
MDHM-32/122HRT	R	5.8	76	4	MDHM-92/122HRT	R	17.3	79	10
MDHM-32/122DWT	W	7.2	FF		MDHM-92/122DWT	W	21.6	FF	
MDHM-32/122□T	B G	7.2	DF		MDHM-92/122□T	B G	21.6	ED	
MDHM-62/62HRT	R	5.8	76	5	MDHM-122/122HRT	R	23.1	7B	12
MDHM-62/62DWT	W	7.2	FF		MDHM-122/122DWT	W	28.8	FF	
MDHM-62/62□T	B G	7.2	E3		MDHM-122/122□T	B G	28.8	F3	

- B = Blue, G= Green, in □.
- Input voltage is DC12V, but we can also make DC24V products.
- DC24V models have HV at end of the model number.
- * SAG is the maximum voltage setting for a SAG power supply. See details P.10B.

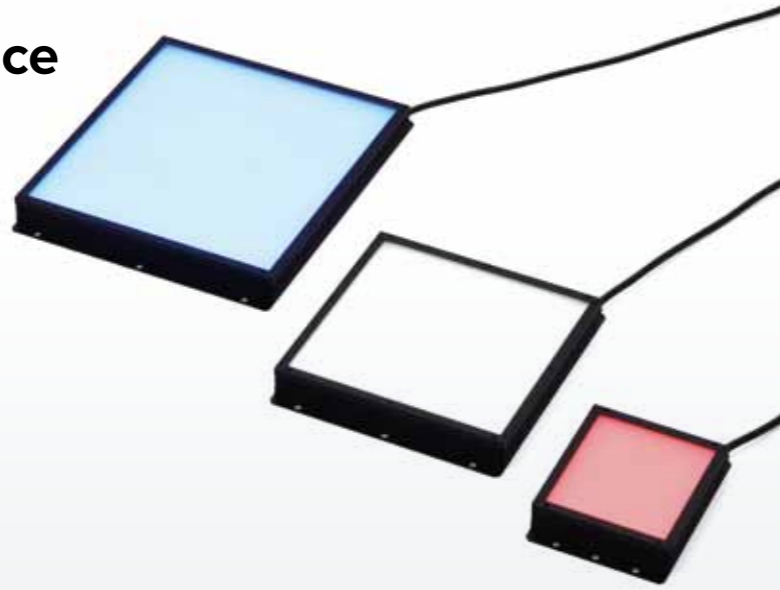


* The height of 1-7. Red 11 mm, White, Blue, Green 15 mm.

MHM Series Transparent lighting

Very bright chip LED surface illumination lighting

High output, light weight chip type transparent lighting
 IR:850nm is also in our product line.



24 V DC Models Available

MFV-C Series Coaxial Light

Pseudo coaxial epi-illumination

Achieves coaxial incident on a lens that is not telecentric.
 Uniformly gets a positive reflection in a wide field of view.

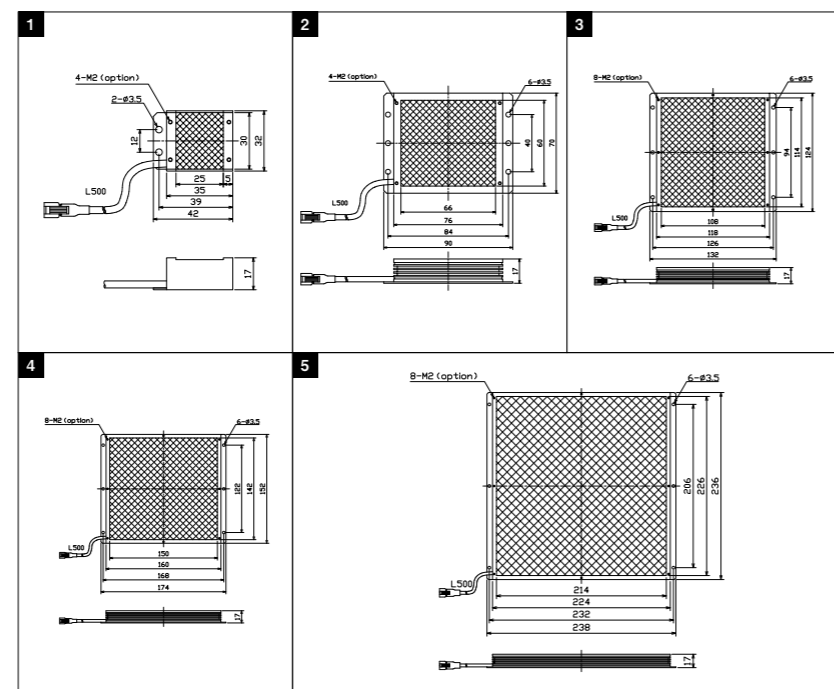
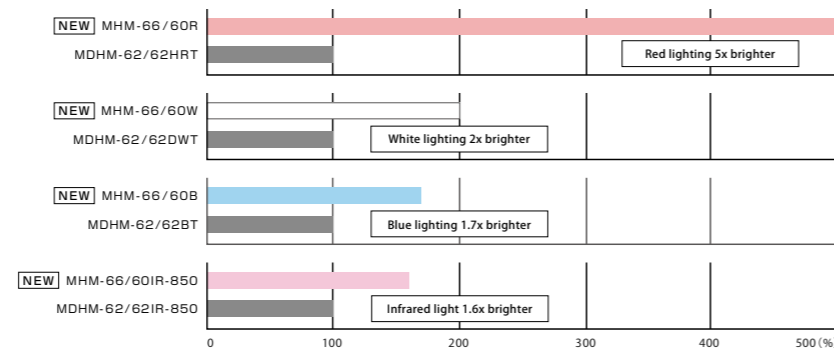


24 V DC Models Available

Model	Color	Power Consumption(W)	Input Voltage (V)	SAG*	Dimension
MHM-25/30□	R	2	12	9A	1
	AW			F9	
	B			98	
	IR (850)			E3	
MHM-66/60□	R	7.5	12	F5	2
	AW			FF	
	B			B3	
	IR (850)			FF	
MHM-108/114□	R	14.7	12	FF	3
	AW			FF	
	B				
	IR (850)				
MHM-150/142□	R	24	12	FF	4
	AW			CF	
	B			D0	
	IR (850)			E5	
MHM-214/226□HV	R	47	24	-	5
	AW				
	B				
	IR (850)				

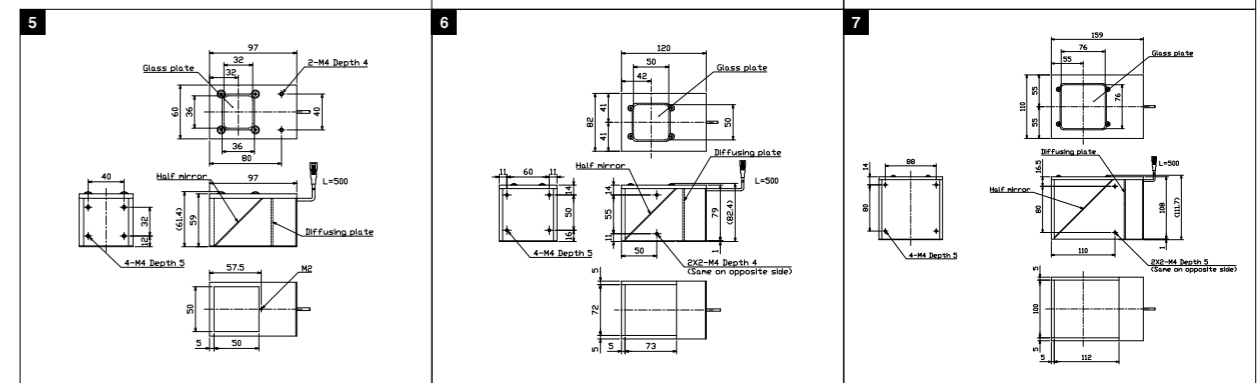
- R = Red, AW = White, B = Blue, IR (850) = Infrared, in □.
- Can attach a polarization plate and light control (optional).
- The AW series has a color temperature about 500K lower than conventional W. But this can vary by type and size.
- MHM-214/226 □ HV is DC24V.
- SAG is the maximum voltage setting for a SAG power supply. See details P.108.

Drastically Increased Brightness



Model	Color	Power Consumption (W)	SAG*	Dimension
MFV-C13R-HM	R	0.8	6D	1
MFV-C13□-HM	DW B G	0.6	FF	
MFV-C20R	R	1.2	6D	2
MFV-C20□	DW B G	1.7	FF	
MFV-C32R	R	1.7	6F	3
MFV-C32□	DW B G	2.6	FF	
MFV-C40R	R	2.7	6F	4
MFV-C40□	DW B G	3.1	FF	
MFV-C50R	R	4.8	71	5
MFV-C50□	DW B G	4.9	FF	
MFV-C70R	R	6.8	72	6
MFV-C70□	DW B G	10.1	FF	
MFV-C100R	R	13	77	7
MFV-C100□	DW B G	19.5	FF	

- DW = White, B = Blue, G = Green, in □.
- Input voltage is DC12V, but we can also make DC24V products.
- We can also make other sizes.
- SAG is the maximum voltage setting for a SAG power supply. See details P.108.



MDBA-LE Series Bar Light

High Power Bar Light

Achieves illumination in wide field of vision at long distances.

7 colors: white, red, blue, green, yellow, infrared, ultraviolet, in product line



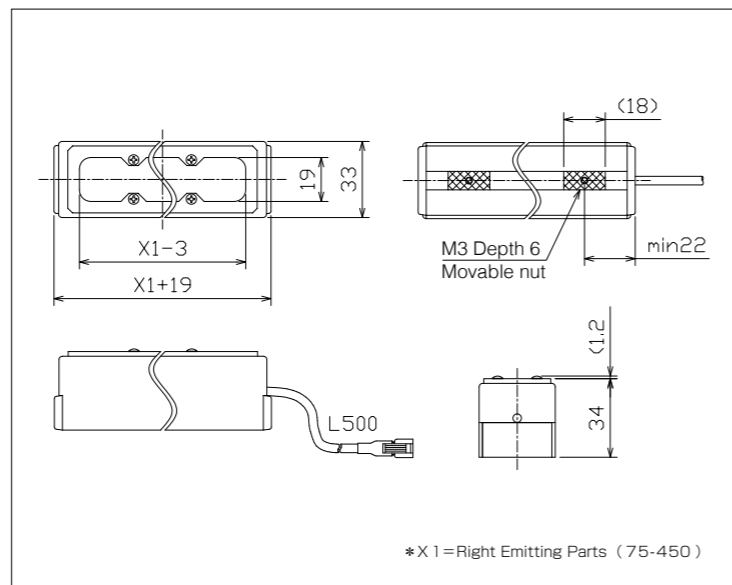
- Power LED
- reasonable price

Model	Color							Power Consumption (W)	Input Voltage(V)
MDBA-LE75□-■	R	W	B	G	Y	IR	UV	4.5	12
MDBA-LE150□-■	R	W	B	G	Y	IR	UV	9.0	
MDBA-LE225□-■	R	W	B	G	Y	IR	UV	13.5	
MDBA-LE300□-■	R	W	B	G	Y	IR	UV	18.0	
MDBA-LE375□-■	R	W	B	G	Y	IR	UV	22.5	
MDBA-LE450□-■	R	W	B	G	Y	IR	UV	27.0	24
MDBA-LE600□-■HV	R	W	B	G	Y	IR	UV	36.0	
MDBA-LE750□-■HV	R	W	B	G	Y	IR	UV	45.0	
MDBA-LE900□-■HV	R	W	B	G	Y	IR	UV	54.0	
MDBA-LE1050□-■HV	R	W	B	G	Y	IR	UV	63.0	
MDBA-LE1200□-■HV	R	W	B	G	Y	IR	UV	72.0	

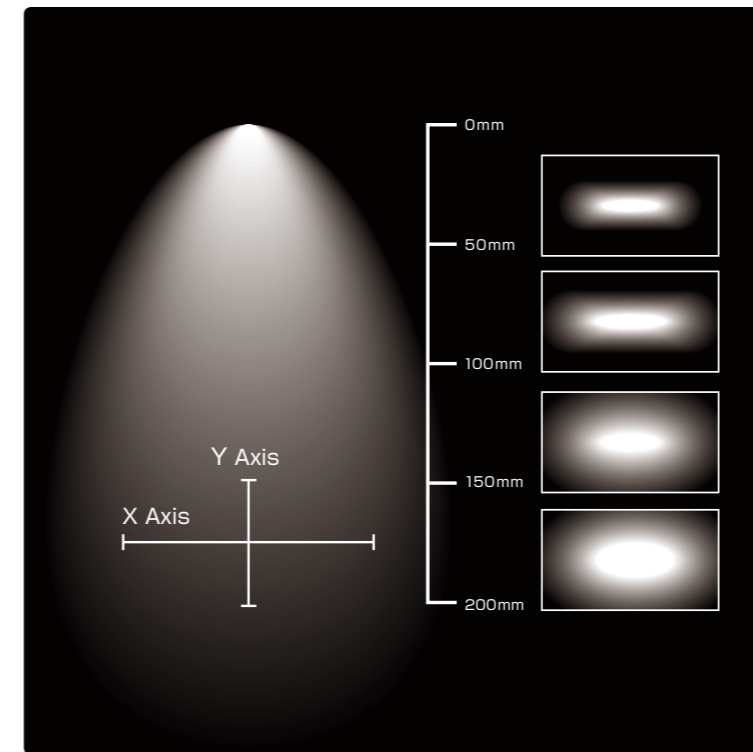
- S = wide angle light distribution type, L = narrow-angle light distribution type, in □ of the model number.
- Color is in ■ of model number (R = Red, W = White, B = Blue, G = Green, Y = Yellow, IR-850 = Infrared, UV-400 = Ultraviolet).
- The standard diffusion plate included is 90%. 80% or 60% can be attached as options.
- Can also attach a polarization plate.
- * SAG is the maximum voltage setting for a SAG power supply. See details P.10B.

SAG Settings Values

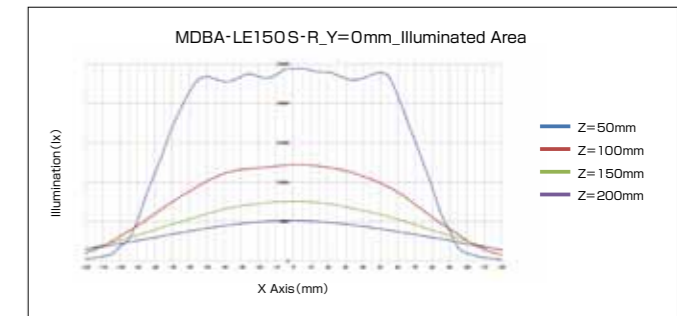
Model	R	W	G	B	Y	IR	UV
MDBA-LE75□-■	C7	8B	9B	90	8E	CB	7F
MDBA-LE150□-■	C9	8D	9D	92	8F	CD	80
MDBA-LE225□-■	CA	8E	9E	94	90	CE	82
MDBA-LE300□-■	CC	90	A0	95	92	D0	83
MDBA-LE375□-■	CD	91	A1	97	93	D1	85
MDBA-LE450□-■	CF	93	A3	98	94	D3	87



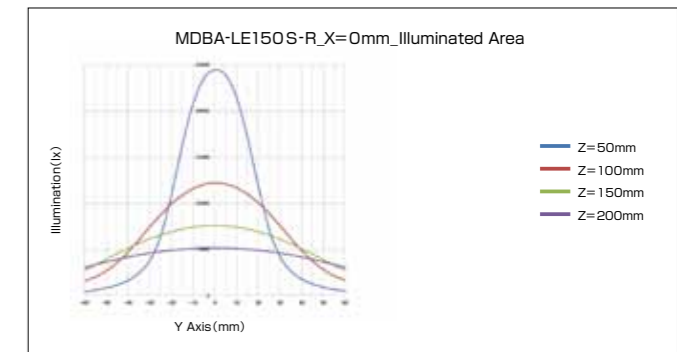
S type wide distribution model - illuminates a wide area at close distances (Reference Values)



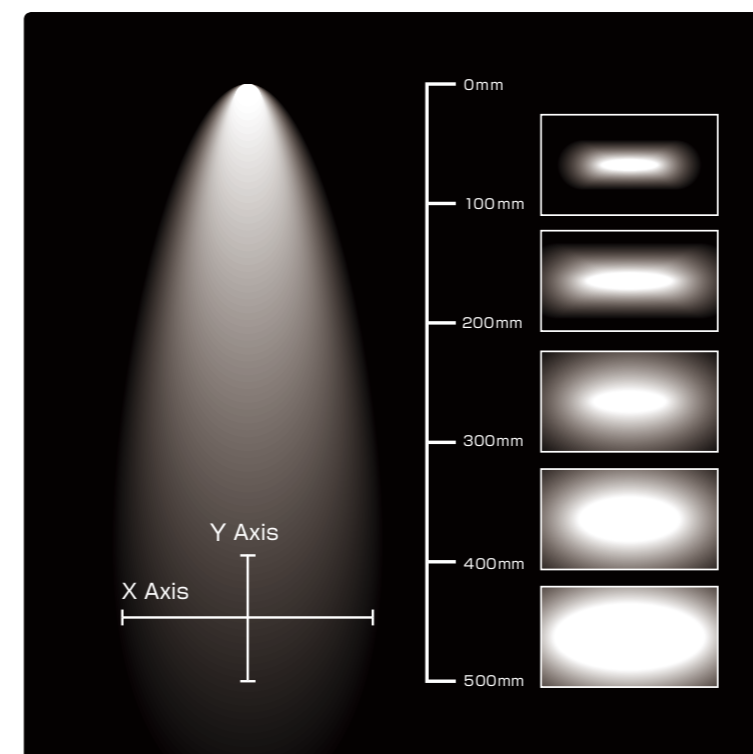
X Axis Graph



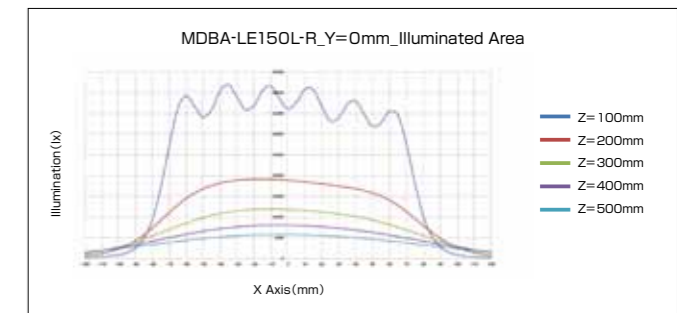
Y Axis Graph



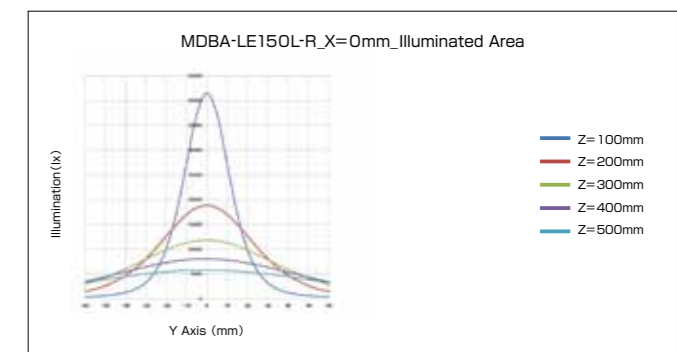
L type narrow distribution model - provides bright illumination at long distances (Reference Values)



X Axis Graph



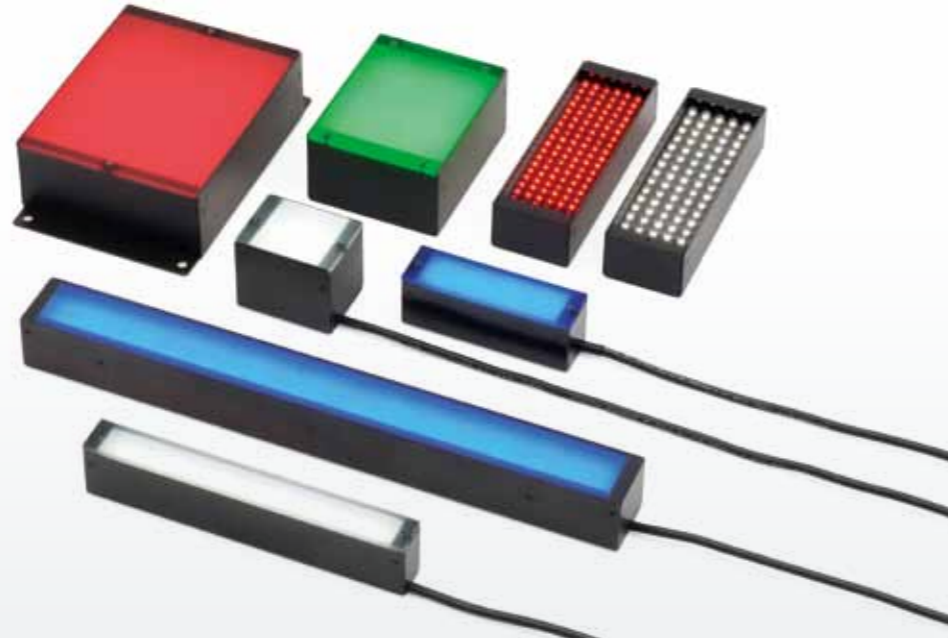
Y Axis Graph



MDBA-C Series Bar Light

Bar Light

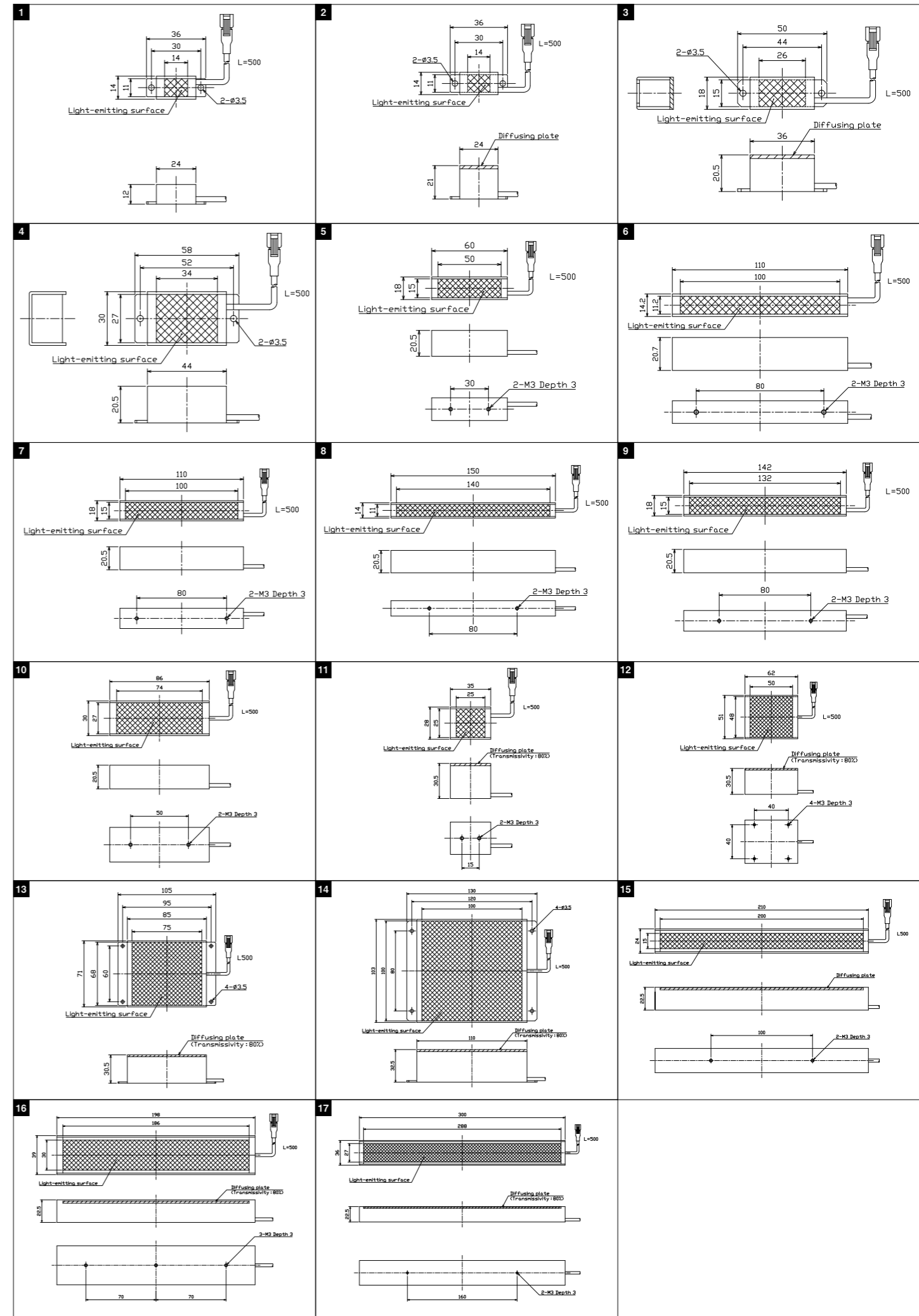
Wide range of uses, as oblique lighting and backlight for various work



24 V DC Models Available

Model	Color	Power Consumption (W)	SAG*	Dimension	Model	Color	Power Consumption (W)	SAG*	Dimension
MDBA-C11/14R	R	0.3	6D	1	MDBA-C72/24R	R	4.4	73	10
MDBA-C11/14□	DW B G	0.4	FF		MDBA-C72/24□	DW B G	4.4	FF	
MDBA-C11/14RS-H21	R	0.3	6D	2	MDBA-C25/25RS	R	1.5	6E	11
MDBA-C11/14□S-H21	DW B G	0.4	FF		MDBA-C25/25□S	DW B G	2.2	FF	
MDBA-C15/26RS	R	0.8	6D	3	MDBA-C50/50RS	R	5.8	71	12
MDBA-C15/26□S	DW B G	1.1	FF		MDBA-C50/50□S	DW B G	5.4	FF	
MDBA-C27/34R	R	2.0	6E	4	MDBA-C70/75RS	R	6.8	72	13
MDBA-C27/34□	DW B G	2.9	FF		MDBA-C70/75□S	DW B G	10.1	FF	
MDBA-C50/15R	R	1.5	6E	5	MDBA-C100/100RS	R	13.7	77	14
MDBA-C50/15□	DW B G	2.2	FF		MDBA-C100/100□S	DW B G	20.6	FF	
MDBA-C100/11R	R	2.0	6E	6	MDBA-C15/200RS	R	6.0	71	15
MDBA-C100/11□	DW B G	2.9	FF		MDBA-C15/200□S	DW B G	8.9	FF	
MDBA-C100/15R	R	2.9	6F	7	MDBA-C185/30RS	R	8.7	73	16
MDBA-C100/15□	DW B G	4.4	FF		MDBA-C185/30□S	DW B G	13.0	FF	
MDBA-C140/11R	R	2.9	6F	8	MDBA-C300/24RS	R	17.1	7A	17
MDBA-C140/11□	DW B G	4.4	FF		MDBA-C300/24□S	DW B G	25.6	DC	
MDBA-C132/15R	R	3.9	70	9					
MDBA-C132/15□	DW B G	5.8	FF						

- DW = White, B = Blue, G = Green in □.
- Input voltage is DC12V, but we can also make DC24V products.
- We can also make other sizes.
- * SAG is the maximum voltage setting for a SAG power supply. See details P. 10B.



MDDA-KH Series Dome Light

High Power Dome Light

Illuminates objects with glossy surfaces or curved shapes, without irregularities

6 types in product line, from φ85 to φ353



Power LED

UV Series UV LED

Ultraviolet lighting

Long type and short type radiation distances in product line.

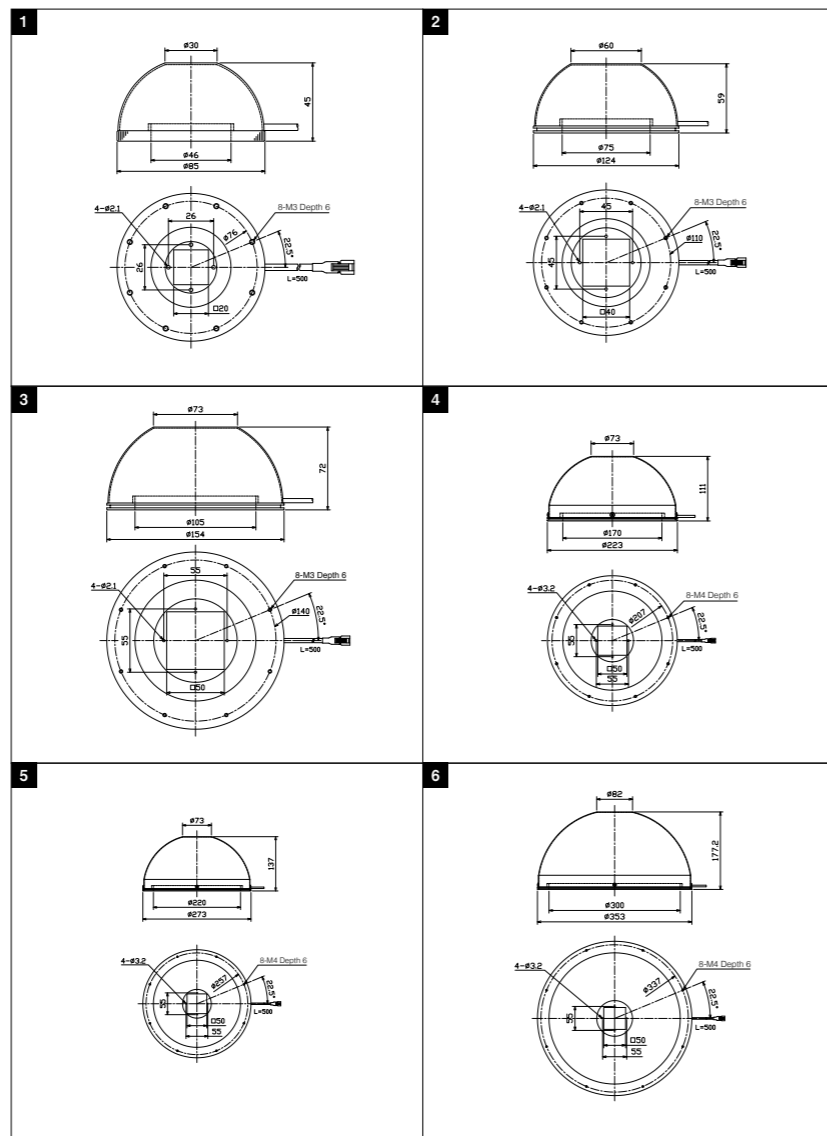
High output UV LED included



24 V DC Models Available

Model	Color	Power Consumption (W)	Input Voltage (V)	SAG*	Dimension
MDDA-KH80□	R	9	12	FF	1
	AW				
	W				
MDDA-KH120□	R	13.5	12	FF	2
	AW				
	W				
MDDA-KH150□	R	18	12	FF	3
	AW				
	W				
MDDA-KH220□	R	28.5	24	FF	4
	AW				
	W				
MDDA-KH270□HV	R	34	24	-	5
	AW				
	W				
MDDA-KH350□HV	R	44	24	-	6
	AW				
	W				

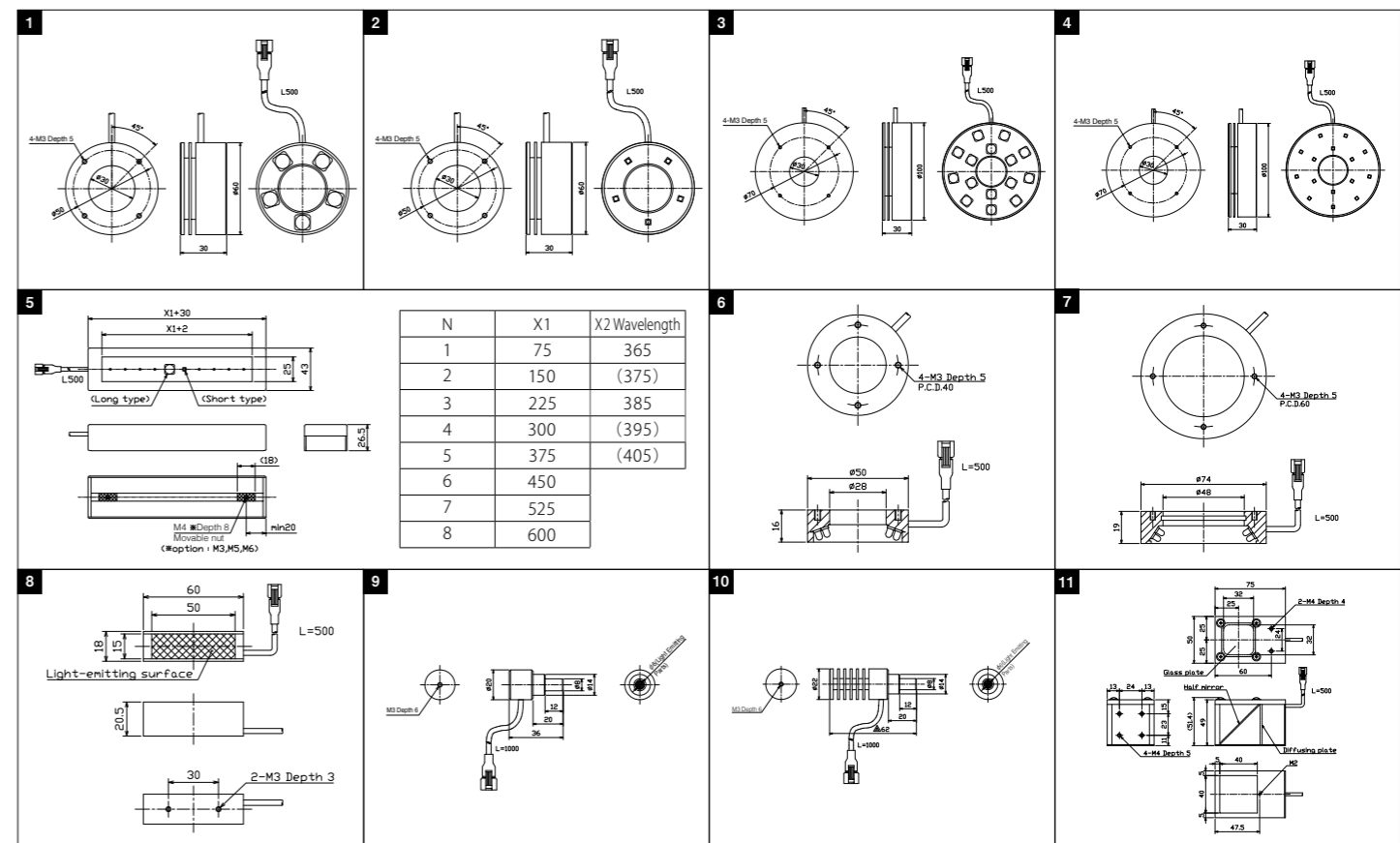
- R = Red, AW = White, W = White, B = Blue in □.
- MDDA-KH270 □ HV and higher models are DC24V.
- The AW series has a color temperature about 500K lower than conventional W. But this can vary by type and size.
- SAG is the maximum voltage setting for a SAG power supply. See details P.108.



Model	Color	Power Consumption (W)	Input Voltage (V)	Wavelength (mm)	Dimension
MDHR-60L-UV-(X2)	UV	8	24	365	1
MDHR-60S-UV-(X2)	UV			(375)	2
MDHR-100L-UV-(X2)	UV	15.4	24	385	3
MDHR-100S-UV-(X2)	UV			(395)	4
MDBA-CH(X1)L-UV-(X2)	UV	8 x N	24	(405)	5
MDBA-CH(X1)S-UV-(X2)	UV				

Model	Color	Power Consumption (W)	Input Voltage (V)	SAG*	Wavelength (mm)	Dimension
MDR-50/28UV-405	UV	3.6	12	A7	405	6
MDR-LA74/48UV-405	UV	7.2		A9	7	
MDBA-C50/15UV-405	UV	2.9	12	A7	405	8
MHV-20UV-400	UV	-		-	400	9
MHVB-22UV-365	UV	-	12	-	365	10
MFV-C40UV-405	UV	4.1		A7	405	11

- Ask us about other shapes.
- Input voltage is DC12V, but we can also make DC24V products.
- SAG is the maximum voltage setting for a SAG power supply. See details P.108.



IR Series IR LED

Infrared illumination

Ideal for permeation testing: liquids, packages, etc.

850nm and others (780/810/890/940nm) also in product line



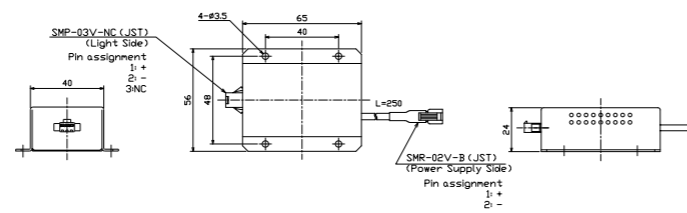
24 V DC Models Available

Model	Color	Power Consumption (W)	SAG*	Dimension
MMAR-80IR-850	IR	7	BC	1
MDR-50/28IR-850	IR	2.2	DC	2
MDR-90/50IR-850	IR	4.4	DD	3
MDHM-32/32IR-850T	IR	1.0	FF	4
MDHM-62/62IR-850T	IR	3.9	FF	5
MIDHM-122/122IR-850T	IR	15.4	FF	6
MHVB-24IR-850	IR	-	-	7
MHVB-24IR-940	IR	-	-	
MFV-C40IR-850	IR	1.7	97	8
MDBA-C50/15IR-850	IR	1.5	DC	9
MDBA-C72/24IR-850	IR	2.4	98	10
MDBA-C132/15IR-850	IR	3.9	DD	11

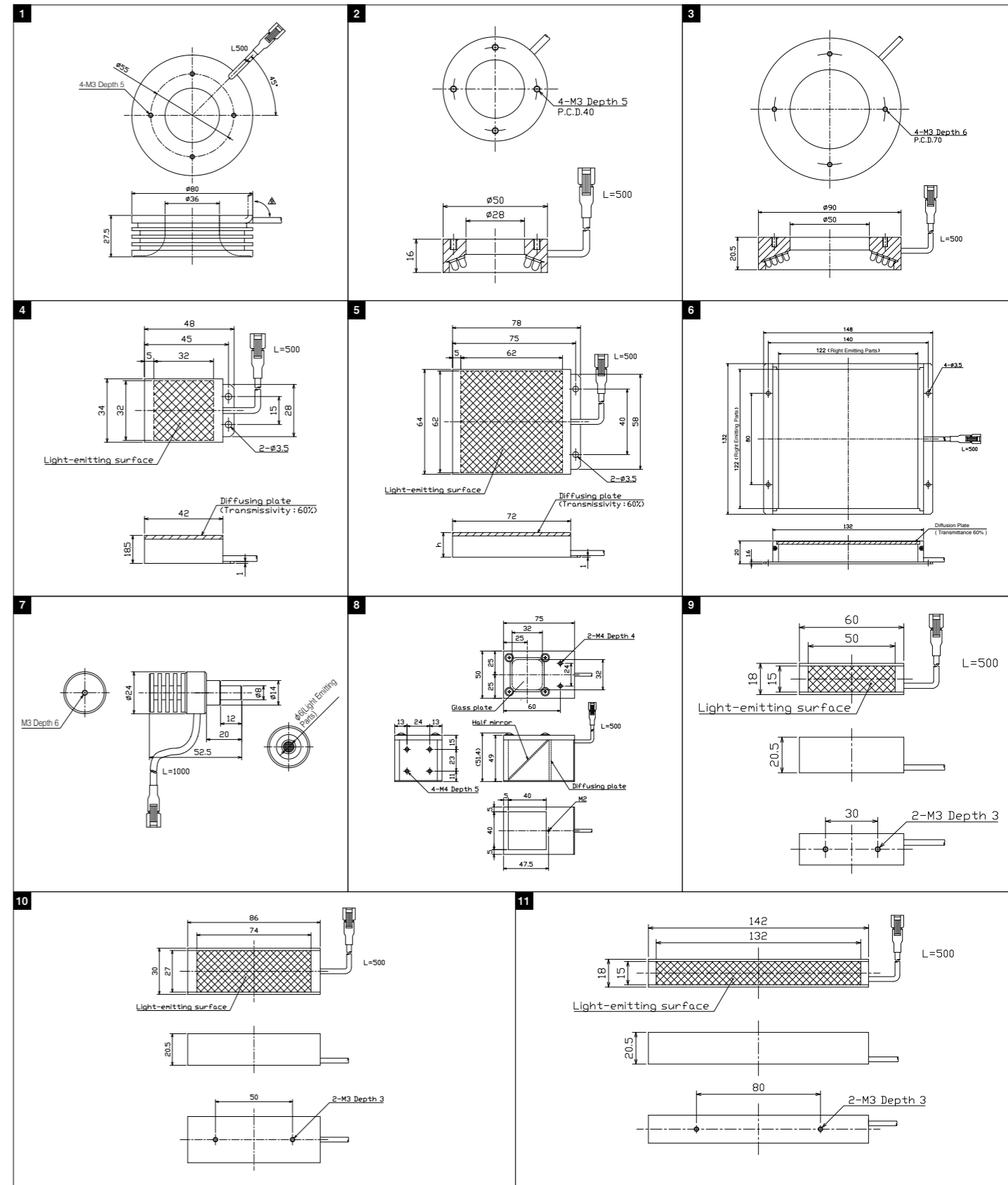
- We can also make shapes that are same as for visible light illumination, in addition to the above.
- Input voltage is DC12V, but we can also make DC24V products.
- SAG is the maximum voltage setting for a SAG power supply. See details P.108.

Resistance Box / MRBOX (Input voltage is 12 V DC.)

MRBOX3W-15R



Model	Applicable lighting	Power Consumption (W)
MRBOX3W-15R	MHVB-24IR-850	9.0
	MHVB-24IR-940	



MDGB Series Digital power supply

Digital path dimmer power supply

Multi-function power supply with freely selectable interface



Total Diverse Line up of 63 Models

Model	Input Voltage (V)	Output voltage	Capacity (W)	Channels	Mass (g)	Dimension	
MDGB-30M2-*****	AC100-240V	DC12V	30	2CH	700	1	
MDGB-30M4-*****				4CH	1000	2	
MDGB-30M8-*****				8CH	1000	2	
MDGB-50M2-*****			50	2CH	1200	3	
MDGB-50M4-*****				4CH	1200	3	
MDGB-50M8-*****				8CH	1200	3	
MDGB-100M2-*****		100	DC24V	2CH	1300	4	
MDGB-100M4-*****				4CH			
MDGB-100M8-*****				8CH			
MDGB-30M2-24-*****		DC24V	30	30	2CH	700	1
MDGB-30M4-24-*****					4CH	1000	2
MDGB-30M8-24-*****					8CH	1000	2
MDGB-50M2-24-*****				50	2CH	1200	3
MDGB-50M4-24-*****					4CH	1200	3
MDGB-50M8-24-*****					8CH	1200	3
MDGB-100M2-24-*****			100	2CH	1300	4	
MDGB-100M4-24-*****	4CH						
MDGB-100M8-24-*****	8CH						
MDGB-50M2-24-*****-T	DC24V		144	144	2CH	700	5
MDGB-150M4-24-*****-T		4CH			1000	6	
MDGB-150M8-24-*****-T		8CH			1000	6	

Common Specifications

Dimmer method	Approx. 125kHz PWM control
External control	External ON/OFF, external dimmer
Protective function	Overcurrent protection, fan abnormal

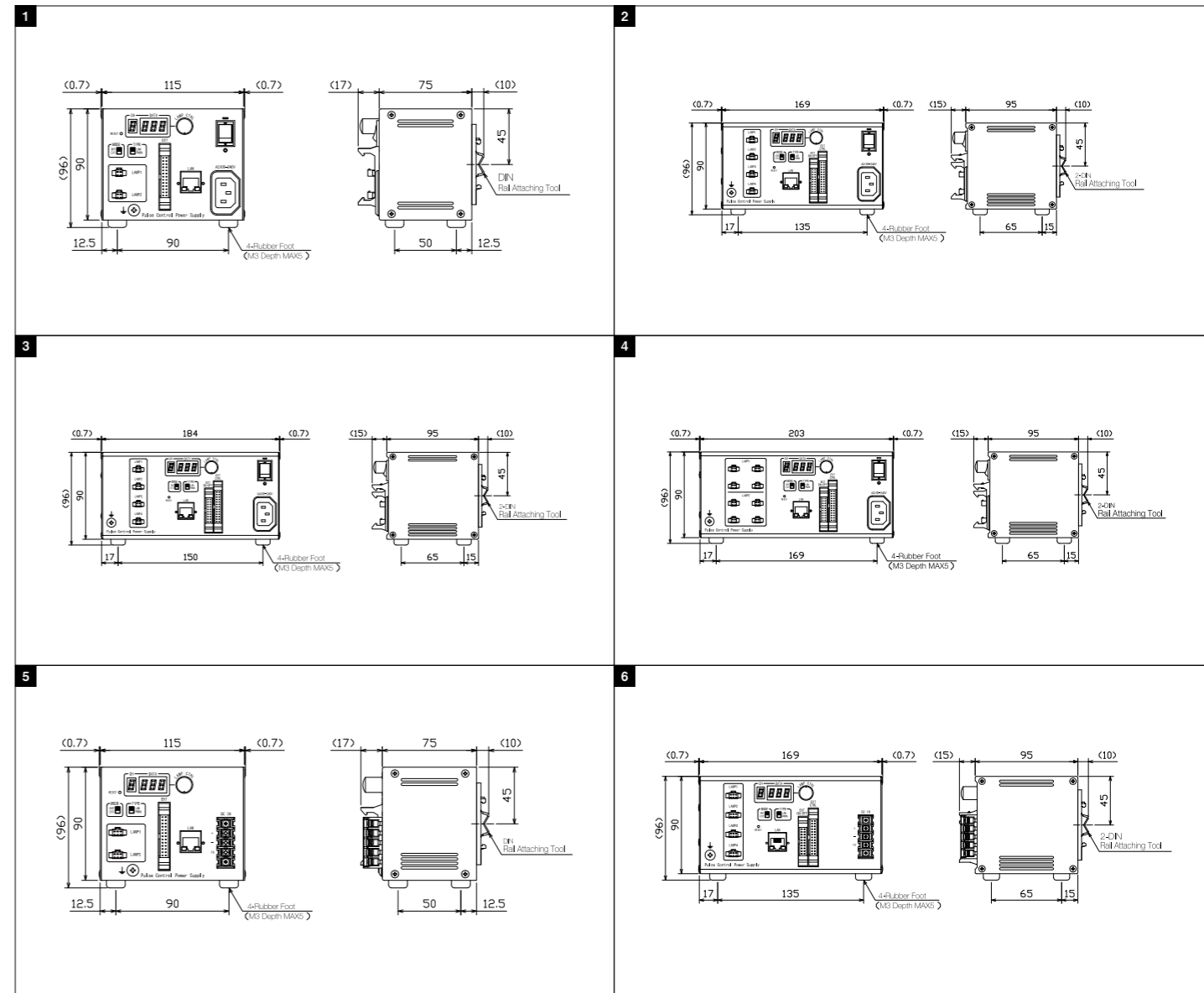
Communication Specifications (LAN)

Communication protocol	TCP/IP
Compliance	IEEE802.3(10BASE-T)、IEEE802.3u(100BASE-TX)
Transmission speed	10Mbps(10BASE-T)、100Mbps(100BASE-TX)
Connection ports	4 ports
Functions	Auto MDI/MDIX、Auto Negotiation

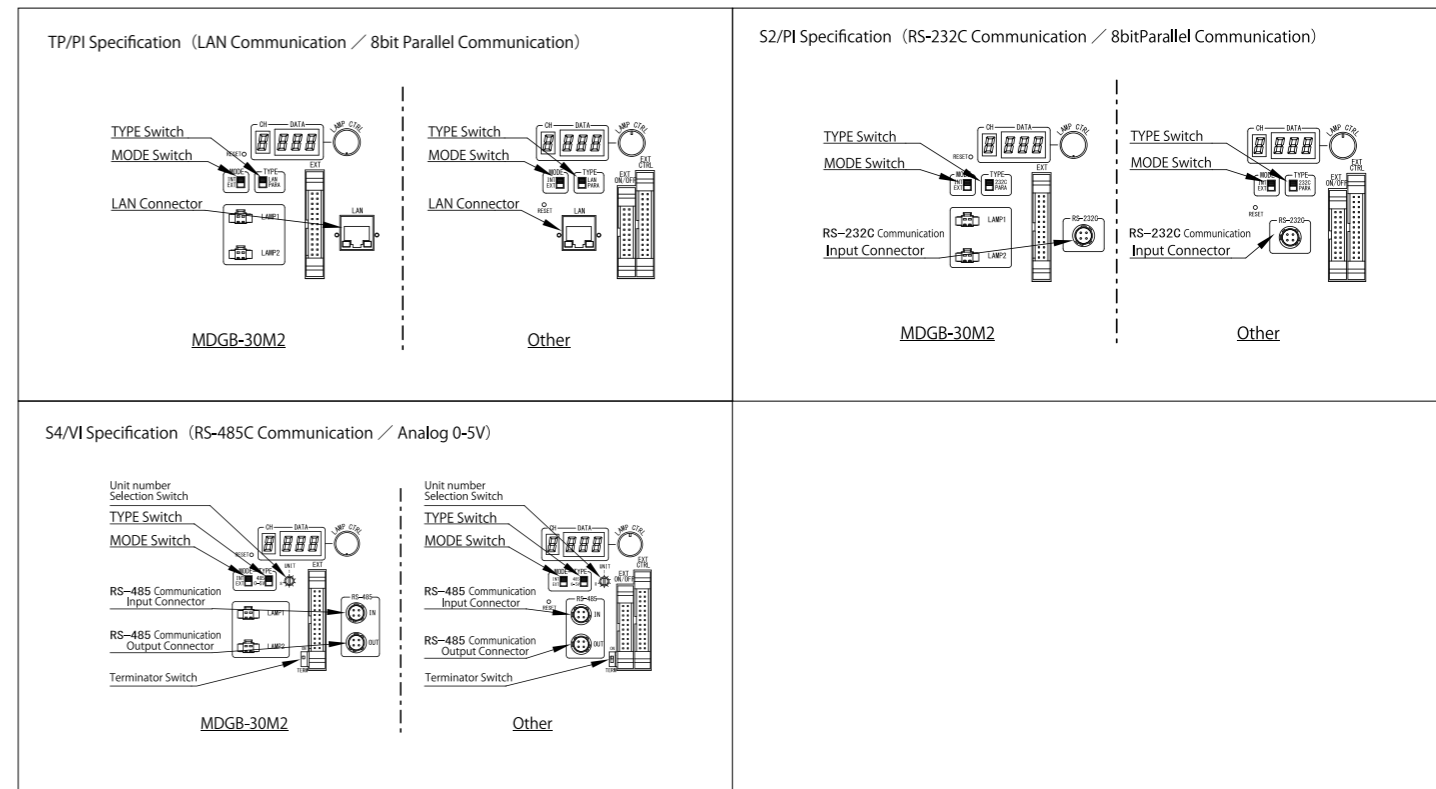
Communication Specifications (RS-232C/RS-485)

Communication protocols	RS-232C/RS-485
Baud rate	19200bps
Data	8bit
Parity bit	Even parity
Stop bit	1bit

- ***** in model number is for the external control type code.
- TP/PI: LAN communication / 8 bit parallel communication switch type
- S2/PI: RS-232C communication / 8 bit parallel communication switch type
- S4/VI: RS-485 communication / Analog 0-5V switch type
- Depending on number of channels, dimensions and number of lighting connectors will vary.
- DC24V output specification has different dimensions and connector shape.
- For the external control cable, refer to P.113.

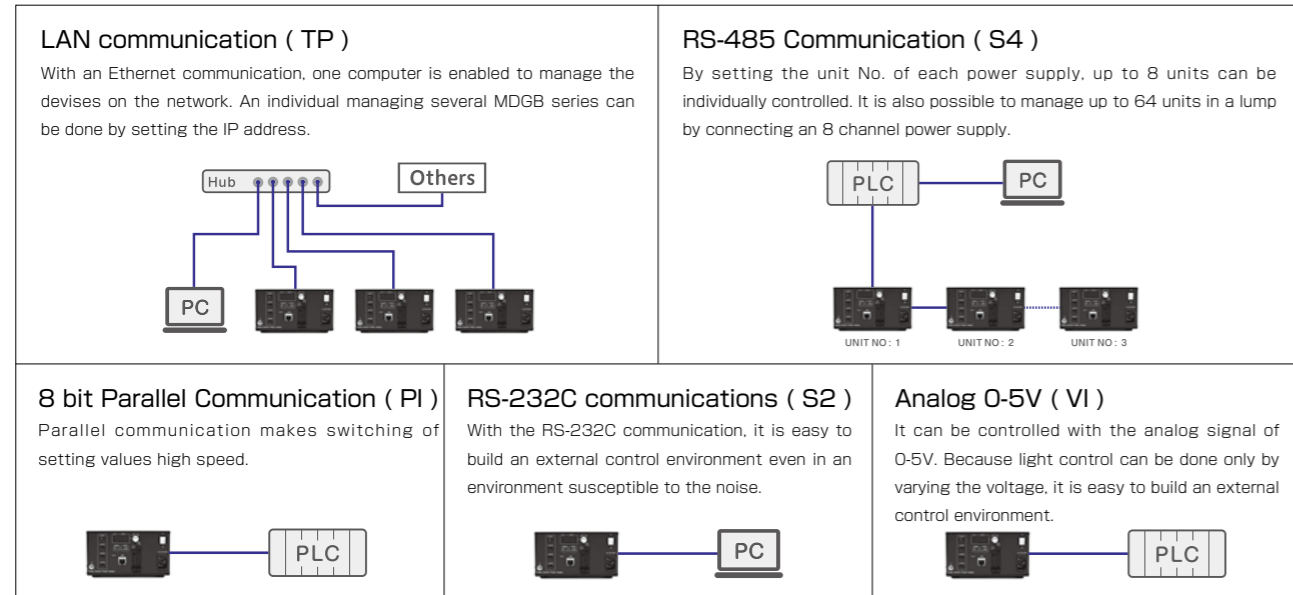


The layout of control part on the front panel



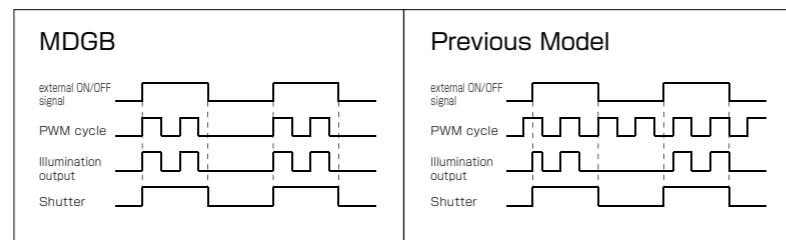
Fully External control Facility

Some type of external controls are available for your network environment the lineup of LAN communication / 8 bit parallel communication * switch, * RS-232C communication / 8 bit parallel communication * switch, and * RS-485 communication / Analog 0-5 V * switch.



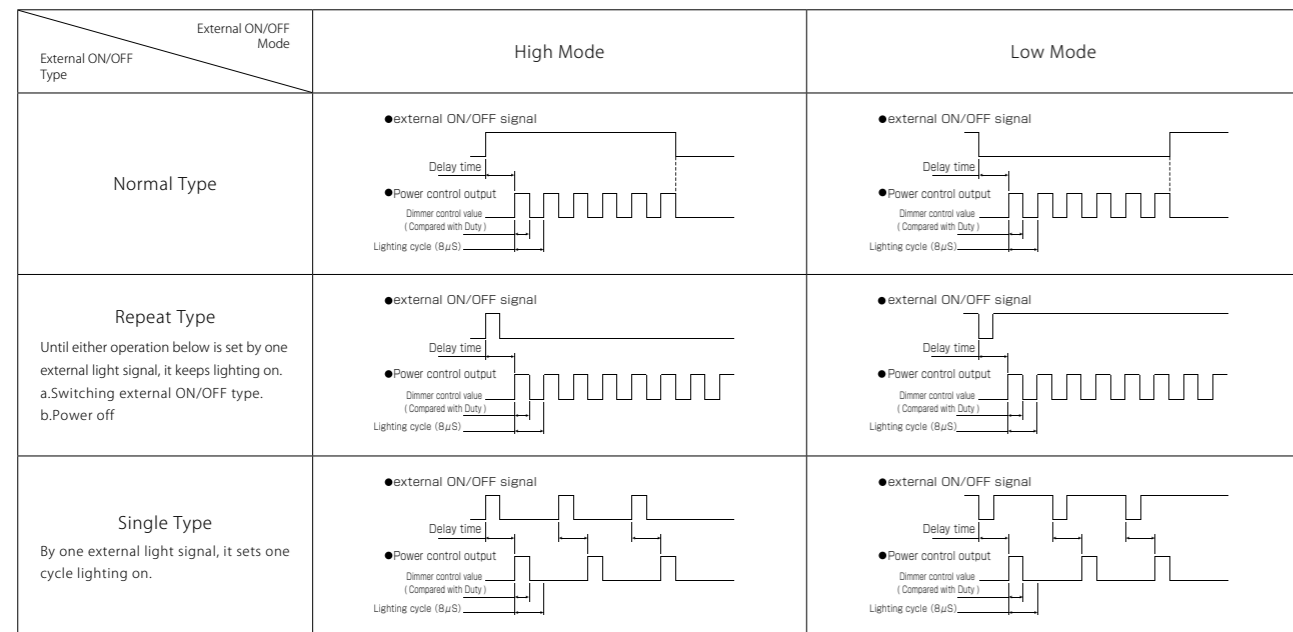
Fully synchronizes the lighting output and external ON/OFF signal

The conventional products had a lighting function due to an asynchronism in the external ON/OFF signal and inner PWM cycle. However, the PWM cycle of these products synchronizes with the external ON/OFF signal so it has no lighting fluctuation.



Various External ON/OFF Functions

Regarding the external ON/OFF mode, the "High Mode" which the lighting turns off with the signal and the "Low Mode" which the lighting turns on with one trigger, and "Single type" which turns the light on for one cycle with one trigger.



MLC Series Constant-current power supply

Small constant current controller

Constant-current power supply with external 0 to 5V control function. Can be connected to MHV, MHVB, MHVC and MBF series.

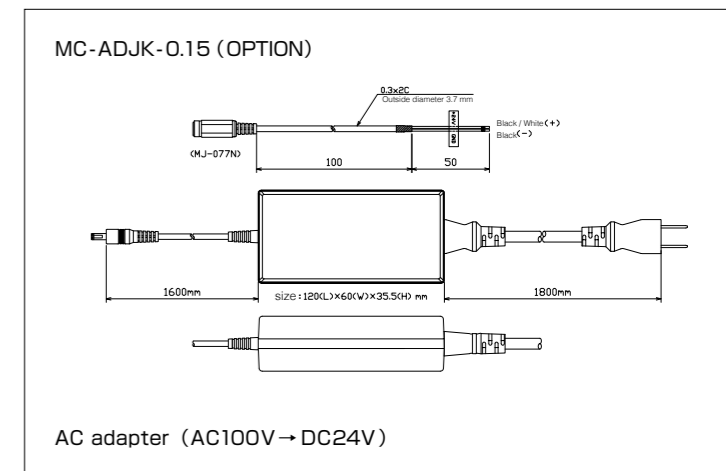
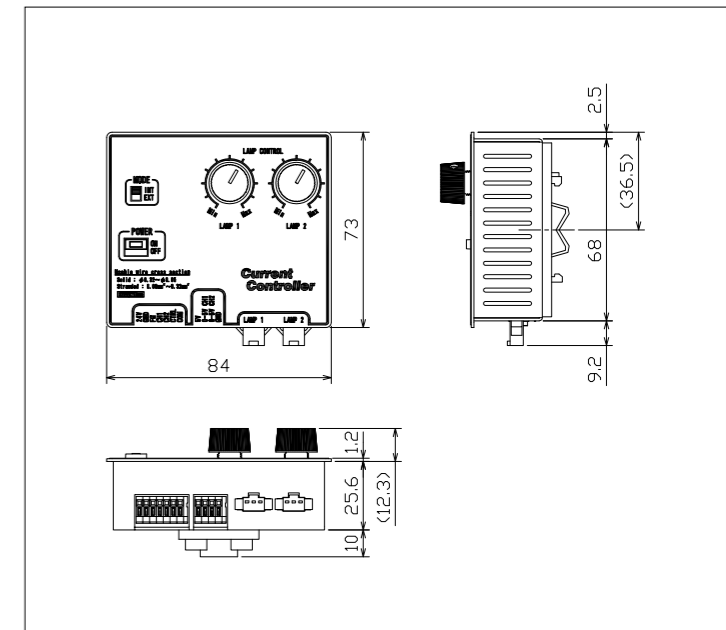
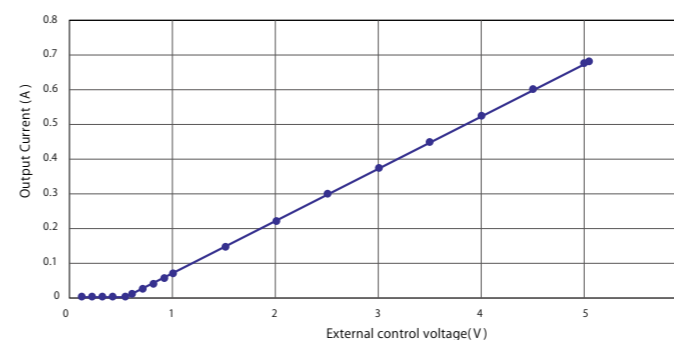


Model	MLC-700M2-VI	MLC-350M2-VI
Input Voltage (V)	DC24V±10%	
Input current	0.3A	0.15A
Operating frequency	-	
Rated output	700mA/CH	350mA/CH
Channels	2CH	
Dimming method	Method to vary output current	
External control	0-5V input, external On/Off	
Can be connected to lighting	MHVB・MHVC・MBF・LX (except for UV)	MHV・MBF (UV-400)

* Available for MHA-IL (option).refer to P.106.



External 0 to 5 V light control output linearity



MLP Series

Digital power supply

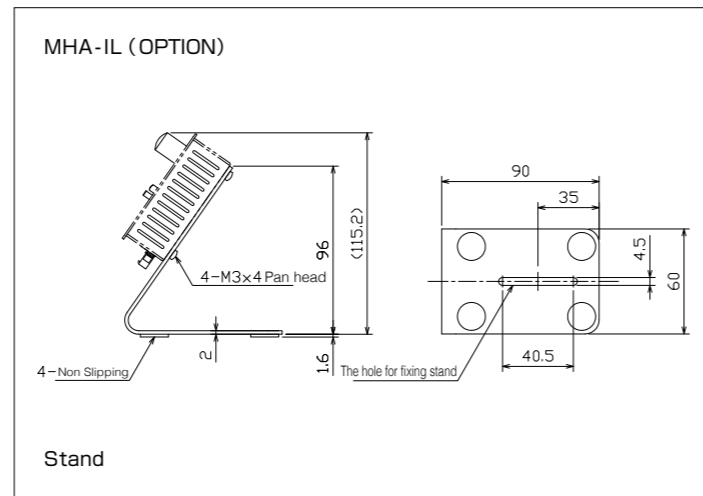
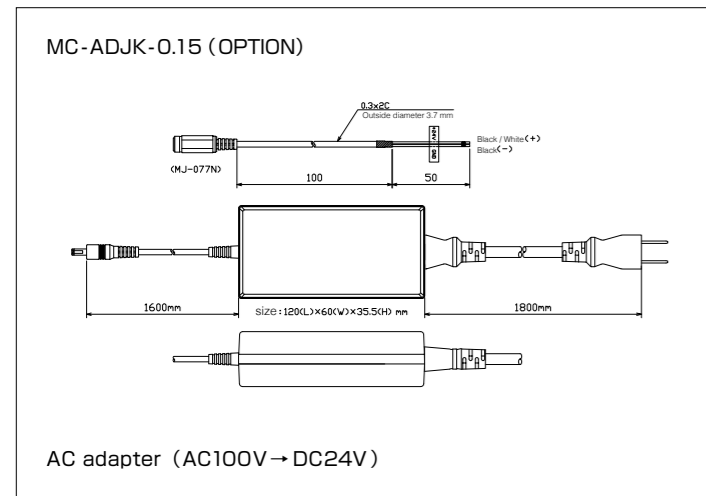
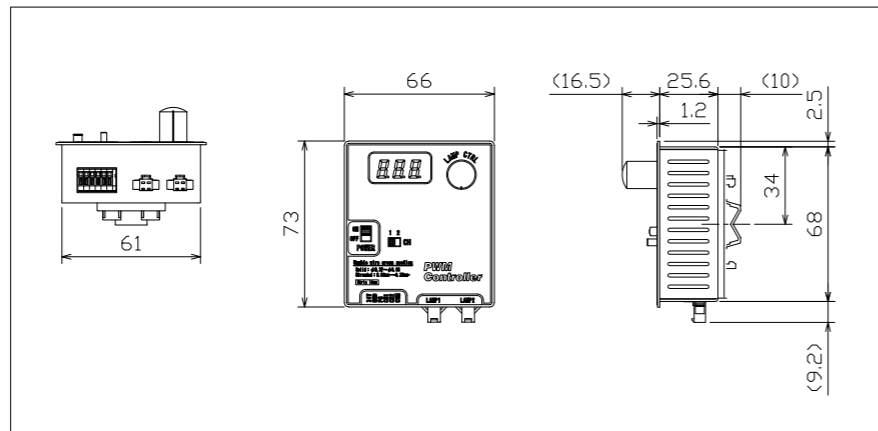
1000 gradations digital controller

Small, low price digital power supply

reasonable price

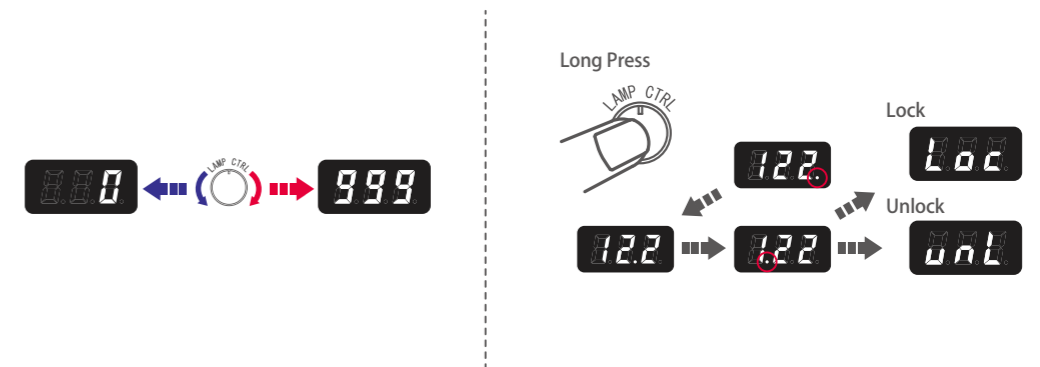


Model	MLP-30M2	MLP-60M2-24
Input Voltage (V)	DC24V±10%	
Input current	1.5A (Max)	3.0A (Max)
Output voltage	DC12V	DC24V
Channels	2CH	
Capacity	30W (2 channels total)	60W (2 channels total)
Dimming method	Approximate 80kHz PWM control (1000 gradations)	
Response speed	OFF→ON: Within 70 μS, ON→OFF: Within 20 μS	

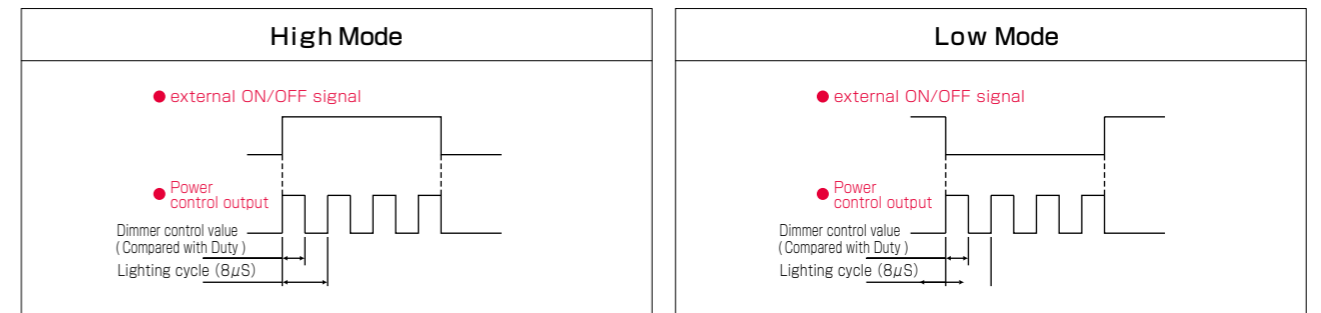
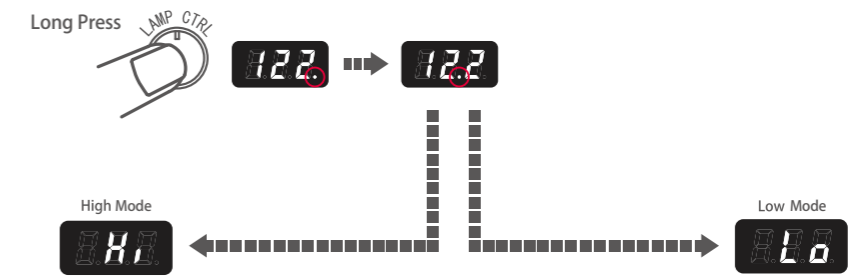


Easy to check the set value with the good visibility display.

1000 level digital controller with good visibility display. Since the variable speed of the light control is changed according to the speed of rotating the dimmer switch, the dimming value will be quickly set. Further, by pressing and holding the dimmer switch, you can lock each channel.

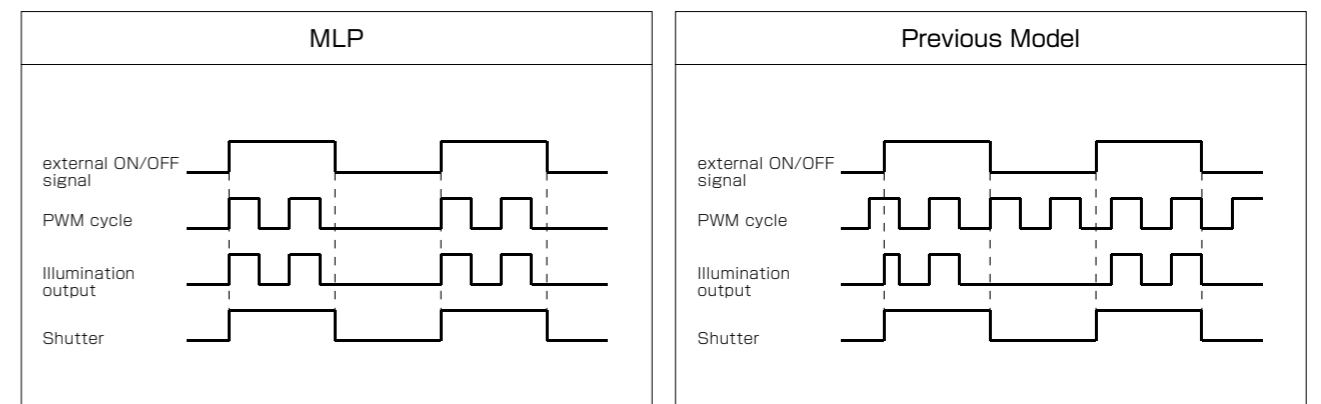


The external ON/OFF signal and inverting function of lighting output



Fully synchronizes the lighting output and external ON/OFF signal

The conventional products had a lighting function due to an asynchronism in the external ON/OFF signal and inner PWM cycle. However, the PWM cycle of these products synchronizes with the external ON/OFF signal so it has no lighting fluctuation.



MJS Series

Strobe power supply

Small multi-channel strobe power supply for LAN

30W capacity, 2 to 6 channels, enables strobe light.

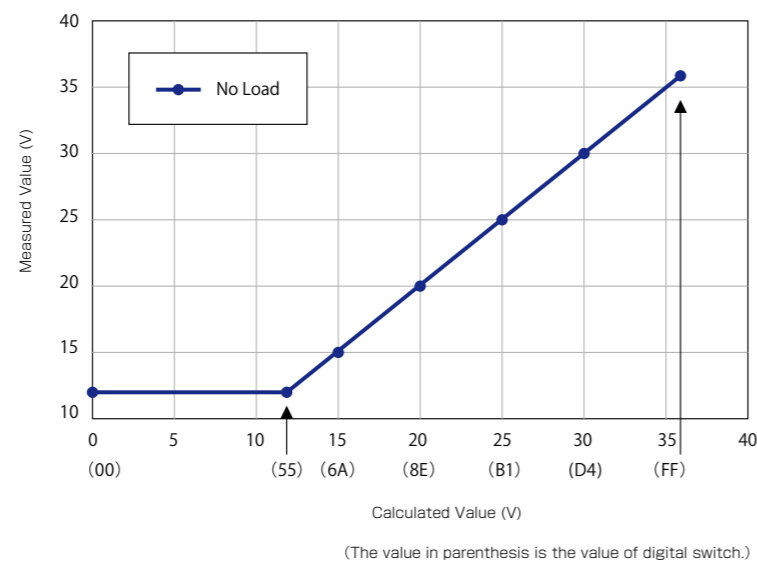


- Momentarily sends current that is larger than normal. Can be used for up four times normal current or higher.
- More compact than conventional SAG power supplies.
- Adjustable in 256 gradients, from 12V to the SAG value set.
- 4 connection ports. Can control from 4 PCs.
- Multi-channel has same chassis size.

Model	Channels	Connection lighting capacity (power consumption)	Dimension
MJS-30M2-TP	2CH	15W x 2: Total 30W	1
MJS-30M3-TP	3CH	15W x 3: Total 30W	2
MJS-30M4-TP	4CH	10W x 2, 5W x 2: Total 30W	3
MJS-30M6-TP	6CH	5W x 6: Total 30W	4

Input Voltage (V)	AC 100 to 240V
Operating frequency	50/60Hz
Output voltage	DC12 to 36V (256 gradient variable output voltage)
Pulse width setting	10 μ sec to 990 μ sec
Trigger signal	Synchronous lighting function (internal/external switching)
Trigger response speed	Approximately 1 μ S
Internal lighting	50Hz fixed
External dimming function	LAN communication
Variable delay	0 to 5,000 μ S range in 1 μ S intervals (external control mode only)
Other	Interlock function, Overcurrent protection function

Voltage Characteristic



Light Control

Light control method

Strobe luminescence by external trigger signal
The duty ratio of luminescence frequency should be 1/20 or less.

* Please use our LED lightings within the maximum SAG setting value specified in the catalogue.

Light Control Method

DC12-36V (For the relationship between the digital switch hexadecimal values and voltage, see Page 108)

* Digital switch controls DC12V - 36V at 256 steps.

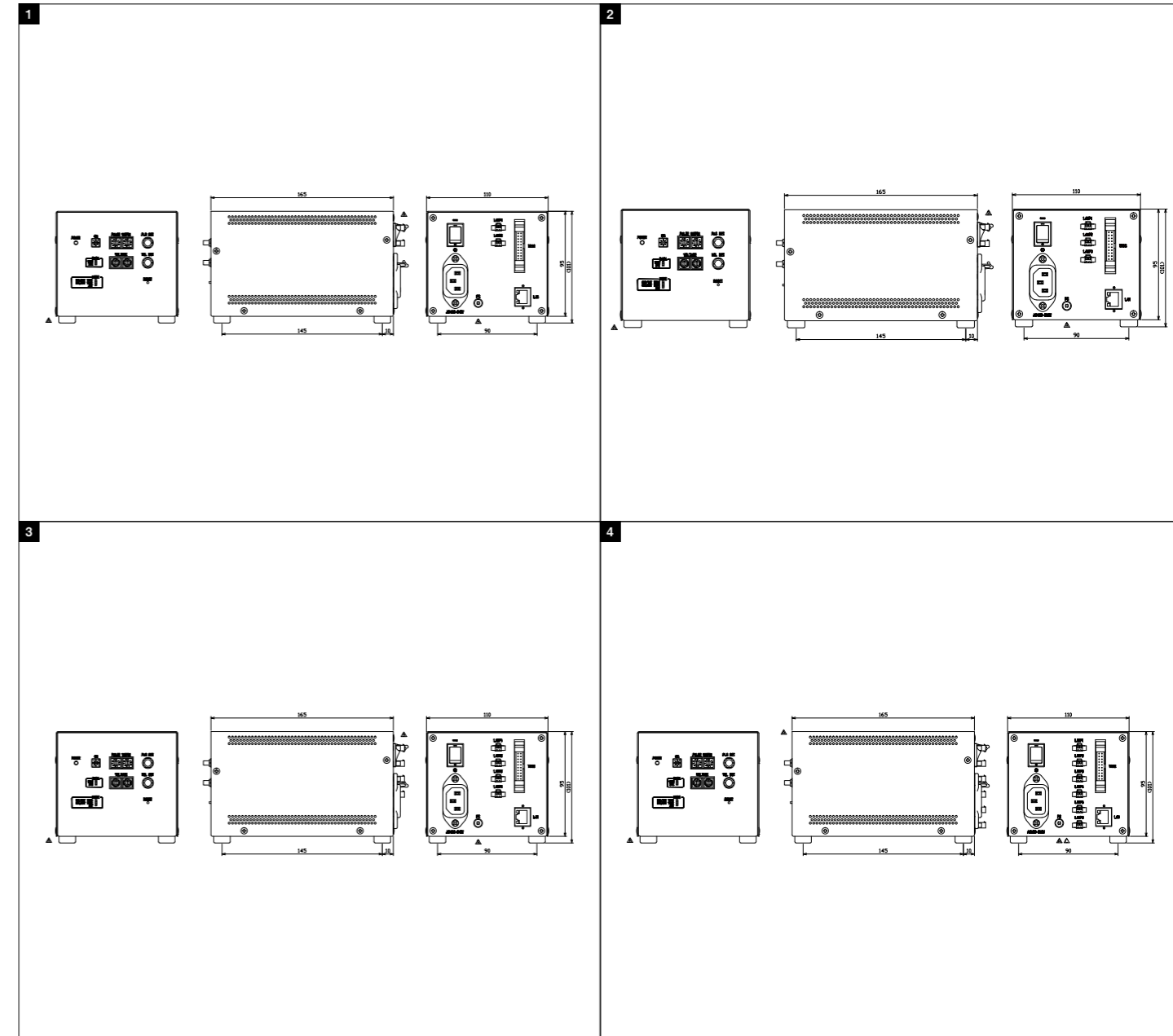
Range of 00 → 55 outputs DC12V constantly.
Please refer to the catalogue of SAG setting value and be sure not to apply excess current to LED.

Range of Voltage

① Luminescence time is adjusted by pulth width.
(Approx. 10 μ SEC - 1mSEC)
(Switch INTI/EXT by PLS Select)

EXT:Adjust by pulth width of external trigger
INT:Control light by volume setting of pulth width
(Variable range: 10 μ s - 990 μ s)

②Luminescence intensity is adjusted by variable voltage of VOLTAGE SELECT.



Options

Diffusion plate for ring lighting / MKR & MKR-F

- Diffusion plate for ring lighting. Attach to diffuse light and reduce reflection from work.
- Can control transmittance (diffusion index). Standard 80% transmittance. We also have 90%, 60% or 30% transmittance in same thickness and price. Special order sizes also possible.
- Easy to attach and detach later with screws.

Model	Applicable lighting	Model	Applicable lighting
MKR-32/10-80	MDR-32/10	MKR-66/32-80	MDR-66/36
MKR-38/15-80	MDR-38/15	MKR-70/39-80	MDR-70/39
MKR-38/12-80	MDR-38/15	MKR-70/35-80	MDR-70/39
MKR-40/25-80	MDR-40/25	MKR-90/50-80	MDR-90/50
MKR-40/21-80	MDR-40/25	MKR-90/46-80	MDR-90/50
MKR-42/18-80	MDR-42/18	MKR-110/60-80	MDR-110/60
MKR-50/28-80	MDR-50/28	MKR-110/56-80	MDR-110/60
MKR-50/24-80	MDR-50/28	MKR-140/95-80	MDR-140/95
MKR-66/36-80	MDR-66/36	MKR-140/91-80	MDR-140/95

* The above models have 80% transmittance. 90% transmittance has -90 at the end of the model number. -60 for 60%, -30 for 30%.

Diffusion plate for bar lighting / MKBA

- Diffusion plate for bar lighting. Attach to diffuse light and reduce reflection from work.
- Can control transmittance (diffusion index). Standard 80% transmittance. We also have 90%, 60% or 30% transmittance in same thickness and price. Special order sizes also possible.
- Bar light manufacturing methods vary depending on whether there is a diffusion plate, so please tell us whether you want a diffusion plate when you order a light.

Model	Applicable lighting	Model	Applicable lighting	Model	Applicable lighting
MKBA-11/14-80	MDBA-C11/14	MKBA-100/15-80	MDBA-C100/15	MKBA-100/100-80	MDBA-C100/100
MKBA-15/26-80	MDBA-C15/26	MKBA-140/11-80	MDBA-C140/11	MKBA-15/200-80	MDBA-C15/200
MKBA-25/25-80	MDBA-C25/25	MKBA-132/15-80	MDBA-C132/15	MKBA-185/30-80	MDBA-C185/30
MKBA-50/15-80	MDBA-C50/15	MKBA-72/24-80	MDBA-C72/24	MKBA-300/24-80	MDBA-C300/24
MKBA-27/34-80	MDBA-C27/34	MKBA-50/50-80	MDBA-C50/50		
MKBA-100/11-80	MDBA-C100/11	MKBA-70/75-80	MDBA-C70/75		

* The above models have 80% transmittance. 90% transmittance has -90 at the end of the model number. -60 for 60%, -30 for 30%.

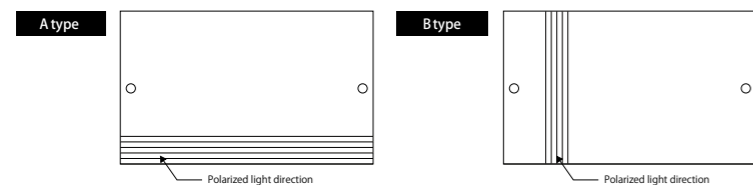
Polarization plate (PL plate) / MKBA-PL & MKR-PL & MKR-F PL

- You can eliminate glare and surface reflection from work by installing a PL plate or PL filter on light or camera lens.
- Can screw on, like the diffusion plate.
- For the bar lighting polarization plate, the polarizer's direction determines whether it is A type or B type.
- There is risk of deformation and discoloration due to heat, depending on your environment. Do heat dissipation countermeasures, and use within a range that does not exceed the heat resistance temperature (74°C). The original effect will no longer be obtained, so check by periodic inspections.

For ring lighting / MKR-PL, MKR-PL, MKR-F PL

Model	Applicable lighting	Model	Applicable lighting	Model	Applicable lighting
MKR-32/10-PL	MDR-32/10	MKR-140/91-PL	MDR-140/95	MKR-66/32-PL	MDR-66/36
MKR-38/15-PL	MDR-38/15	MKHR-60-PL	MDR-66/36	MKR-70/39-PL	MDR-70/39
MKR-38/12-PL	MDR-38/15	MKHR-80-PL	MDR-70/39	MKR-70/35-PL	MDR-70/39
MKR-40/25-PL	MDR-40/25	MKHR-120-PL	MDR-70/39	MKR-90/50-PL	MDR-90/50
MKR-40/21-PL	MDR-40/25	MKHR-150-PL	MDR-90/50	MKR-90/46-PL	MDR-90/50
MKR-50/28-PL	MDR-50/28	MKHR-220-PL	MDR-90/50	MKR-110/60-PL	MDR-110/60
MKR-50/24-PL	MDR-50/28	MKHR-270-PL	MDR-110/60	MKR-110/56-PL	MDR-110/60
MKR-66/36-PL	MDR-66/36	MKHR-350-PL	MDR-110/60	MKR-140/95-PL	MDR-140/95

Polarized light direction



For bar lighting / MKBA-PL

Model	Applicable lighting	
MKBA-11/14-A-PL	MKBA-11/14-B-PL	MDBA-C11/14
MKBA-15/26-A-PL	MKBA-15/26-B-PL	MDBA-C15/26
MKBA-25/25-A-PL	MKBA-25/25-B-PL	MDBA-C25/25
MKBA-50/15-A-PL	MKBA-50/15-B-PL	MDBA-C50/15
MKBA-27/34-A-PL	MKBA-27/34-B-PL	MDBA-C27/34
MKBA-100/11-A-PL	MKBA-100/11-B-PL	MDBA-C100/11
MKBA-100/15-A-PL	MKBA-100/15-B-PL	MDBA-C100/15
MKBA-132/15-A-PL	MKBA-132/15-B-PL	MDBA-C132/15
MKBA-72/24-A-PL	MKBA-72/24-B-PL	MDBA-C72/24
MKBA-50/50-A-PL	MKBA-50/50-B-PL	MDBA-C50/50
MKBA-70/75-A-PL	MKBA-70/75-B-PL	MDBA-C70/75
MKBA-100/100-A-PL	MKBA-100/100-B-PL	MDBA-C100/100
MKBA-15/200-A-PL	MKBA-15/200-B-PL	MDBA-C15/200
MKBA-185/30-A-PL	MKBA-185/30-B-PL	MDBA-C185/30
MKBA-300/24-A-PL	MKBA-300/24-B-PL	MDBA-C300/24
MKBA-LE75-A-PL	MKBA-LE75-B-PL	MKBA-LE75□-■
MKBA-LE150-A-PL	MKBA-LE150-B-PL	MKBA-LE150□-■
MKBA-LE225-A-PL	MKBA-LE225-B-PL	MKBA-LE225□-■
MKBA-LE300-A-PL	MKBA-LE300-B-PL	MKBA-LE300□-■
MKBA-LE375-A-PL	MKBA-LE375-B-PL	MKBA-LE375□-■
-	MKBA-LE450-B-PL	MKBA-LE450□-■

Extension cable for LED lighting

1ch Cable

Model	Size (m)
M-CB-S1	1
M-CB-S2	2
M-CB-S3	3
M-CB-S4	4
M-CB-S5	5
M-CB-S10	10

2ch Cable

Model	Size (m)
M-CB-D1	1
M-CB-D2	2
M-CB-D3	3
M-CB-D4	4
M-CB-D5	5
M-CB-D10	10

3ch Cable

Model	Size (m)
M-CB-T1	1
M-CB-T2	2
M-CB-T3	3
M-CB-T4	4
M-CB-T5	5
M-CB-T10	10

Extension robot cable for LED lighting

1ch Robot Cable

Model	Size (m)
M-CB-S1R-C02	1
M-CB-S2R-C02	2
M-CB-S3R-C02	3
M-CB-S4R-C02	4
M-CB-S5R-C02	5
M-CB-S10R-C02	10

2ch Robot Cable

Model	Size (m)
M-CB-D1R-C02	1
M-CB-D2R-C02	2
M-CB-D3R-C02	3
M-CB-D4R-C02	4
M-CB-D5R-C02	5
M-CB-D10R-C02	10

3ch Robot Cable

Model	Size (m)
M-CB-T1R-C02	1
M-CB-T2R-C02	2
M-CB-T3R-C02	3
M-CB-T4R-C02	4
M-CB-T5R-C02	5
M-CB-T10R-C02	10

Extension cable for very bright coaxial & spot lighting MHV, MHVB & MHVC

For MHV

Model	Size (m)
M-CB-S1-HV	1
M-CB-S2-HV	2
M-CB-S3-HV	3
M-CB-S4-HV	4
M-CB-S5-HV	5

For MHVB & MHVC

Model	Size (m)
M-CB-S1-HV3W	1
M-CB-S2-HV3W	2
M-CB-S3-HV3W	3
M-CB-S4-HV3W	4
M-CB-S5-HV3W	5

Extension branch cable for LED lighting

Two branches Cable

Model	Size (m)
M-2M-1-100	1
M-2M-2-100	2
M-2M-3-100	3
M-2M-4-100	4
M-2M-5-100	5
M-2M-10-100	10

Three branches Cable

Model	Size (m)
M-3M-1-100	1
M-3M-2-100	2
M-3M-3-100	3
M-3M-4-100	4
M-3M-5-100	5
M-3M-10-100	10

Four branches Cable

Model	Size (m)
M-4M-1-100	1
M-4M-2-100	2
M-4M-3-100	3
M-4M-4-100	4
M-4M-5-100	5
M-4M-10-100	10

External control cable

ON/OFF cable, Dimmer cable / MC-MIL-20 series

Compatible power supplies (external ON/OFF): MWDV-300S-24 / MDGB series (except MDGB-30M2) / MJS series
(external dimmer): MWDV-300S-24

Pin No.	MDGB (4CH)	MDGB (8CH)	MWDV-300S-24
1	EXT 0~24V IN	EXT 0~24V IN	EXTCOM
2	EXT 0~24V IN	EXT 0~24V IN	NC
3	EXT ON/OFF CH1	EXT ON/OFF CH1	B0 (LSB)
4	EXT ON/OFF CH2	EXT ON/OFF CH2	B1
5	EXT ON/OFF CH3	EXT ON/OFF CH3	B2
6	EXT ON/OFF CH4	EXT ON/OFF CH4	B3
7	RESERVED	EXT ON/OFF CH5	B4
8	RESERVED	EXT ON/OFF CH6	B5
9	RESERVED	EXT ON/OFF CH7	B6
10	RESERVED	EXT ON/OFF CH8	B7
11	Error Reset	Error Reset	B8
12	STATUS CH1	STATUS CH1	B9 (MSB)
13	STATUS CH2	STATUS CH2	ON/OFF信号入力
14	STATUS CH3	STATUS CH3	NC
15	STATUS CH4	STATUS CH4	Status
16	RESERVED	STATUS CH5	COM
17	RESERVED	STATUS CH6	NC
18	RESERVED	STATUS CH7	NC
19	RESERVED	STATUS CH8	NC
20	STATUS COM	STATUS COM	NC

Model	Size (m)
MC-MIL-20-1	1
MC-MIL-20-2	2
MC-MIL-20-3	3
MC-MIL-20-5	5
MC-MIL-20-10	10

Pin No.	Cable Color	Dot Mark	Dot Color	Pin No.	Cable Color	Dot Mark	Dot Color
1	Orange	■	Black	1	Orange	■■■	Black
2	Orange	■	Red	2	Orange	■■■	Red
3	Yellow	■	Black	3	Yellow	■■■	Black
4	Yellow	■	Red	4	Yellow	■■■	Red
5	Light green	■	Black	5	Light green	■■■	Black
6	Light green	■	Red	6	Light green	■■■	Red
7	Gray	■	Black	7	Gray	■■■	Black
8	Gray	■	Red	8	Gray	■■■	Red
9	White	■	Black	9	White	■■■	Black
10	White	■	Red	10	White	■■■	Red

Core Wire image

Dimmer cable (for VI/PI) / MC-MIL-26 series

Compatible power supplies (external ON/OFF): MWDV-600M2-24 / MDGB-30M2
(external dimmer): MWDV-600M2-24 / MDGB series

Model	Size (m)
MC-MIL-26-1	1
MC-MIL-26-2	2
MC-MIL-26-3	3
MC-MIL-26-5	5
MC-MIL-26-10	10

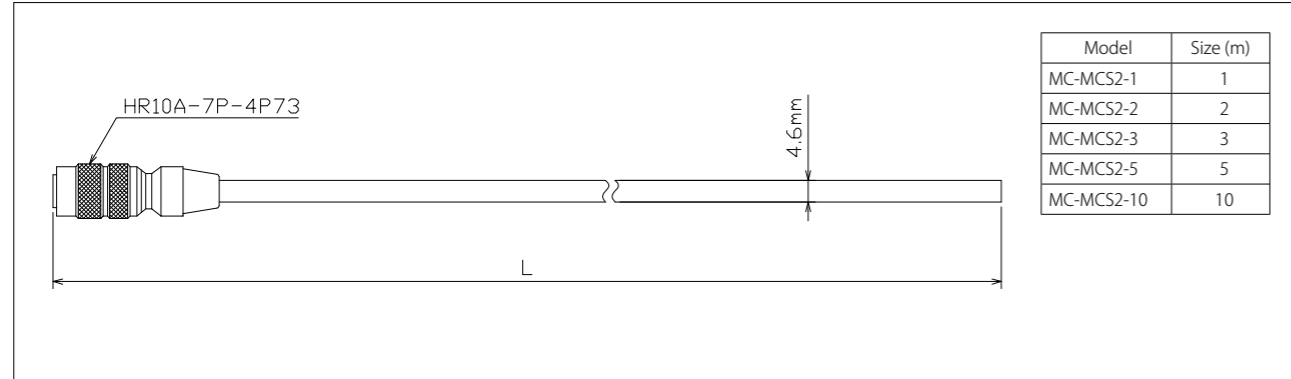
Pin No.	Cable Color	Dot Mark	Dot Color	Pin No.	Cable Color	Dot Mark	Dot Color	Pin No.	Cable Color	Dot Mark	Dot Color
1	Orange	■	Black	11	Orange	■■■	Black	21	Orange	■■■	Black
2	Orange	■	Red	12	Orange	■■■	Red	22	Orange	■■■	Red
3	Yellow	■	Black	13	Yellow	■■■	Black	23	Yellow	■■■	Black
4	Yellow	■	Red	14	Yellow	■■■	Red	24	Yellow	■■■	Red
5	Light green	■	Black	15	Light green	■■■	Black	25	Light green	■■■	Black
6	Light green	■	Red	16	Light green	■■■	Red	26	Light green	■■■	Red
7	Gray	■	Black	17	Gray	■■■	Black	Core Wire image 			
8	Gray	■	Red	18	Gray	■■■	Red				
9	White	■	Black	19	White	■■■	Black				
10	White	■	Red	20	White	■■■	Red				

Core Wire image

External control cable

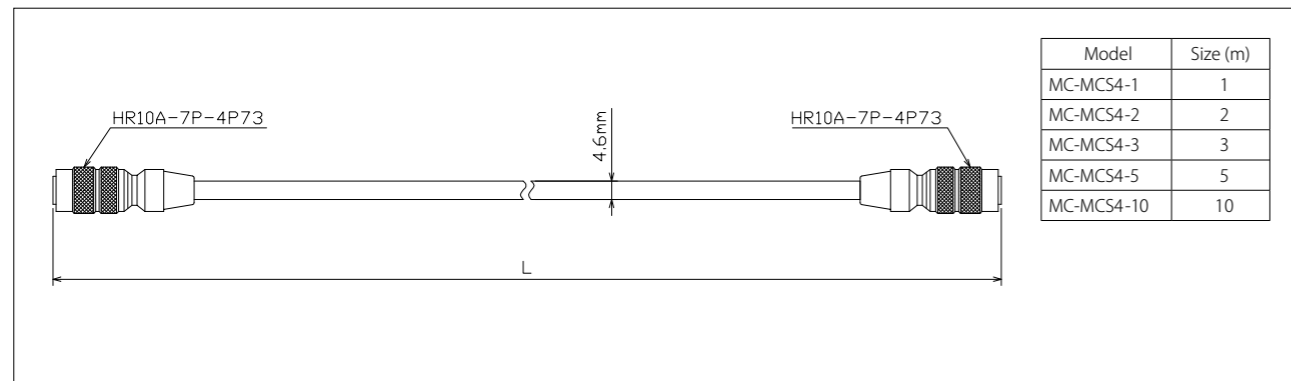
Dimmer cable (for S2/S4) / MC-MCS2 series

Compatible power supplies: MDGB series (-S2/PI, -S4/VI)



Communication transition cable (for S4) / MC-MCS4 series

Compatible power supplies: MDGB series (-S2/PI, -S4/VI)



LED lighting for image processing

Long life and low power consumption

Features

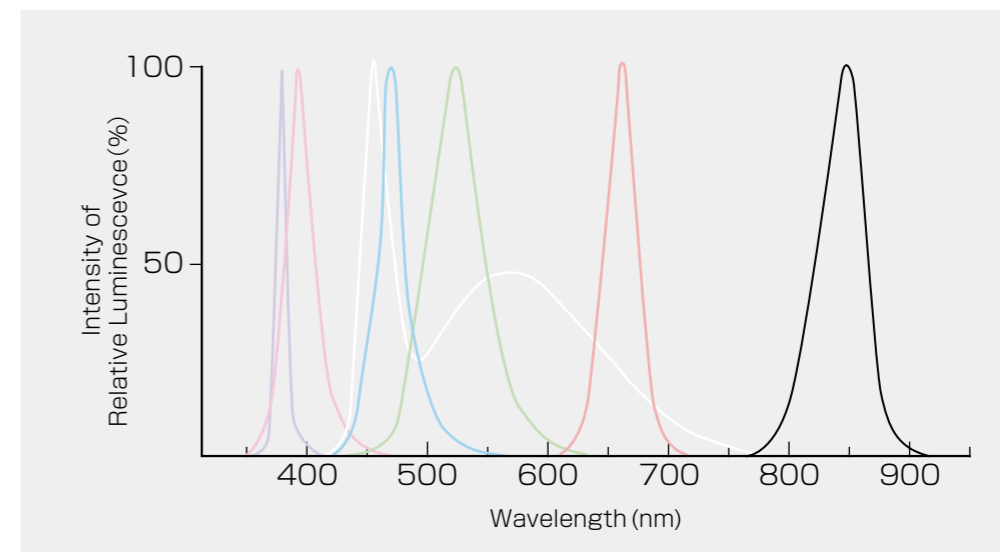
- ✓ Low power consumption
- ✓ Ten times longer life compare to halogen lamp and fluorescent light
- ✓ Greater flexibility in dimensions
- ✓ Suitable for narrow space or small device
- ✓ Excellent switch characteristics
- ✓ UV and IR lighting are also available

Comparison of characteristic of wave length

	Max. Wavelength	Main Uses of Inspection	Dispersion Rate
White	-	Color treating, etc	-
Ultraviolet	375nm	Inspection for fine scratches, etc.	Approx. 9times
	405nm		Approx. 8times
Blue	470nm	Inspection for scratches, etc.	Approx. 4times
Green	525nm	Visual Inspection, etc	Approx. 2.5times
Red	660nm	Use for backlight, etc	1
Infrared	850nm	Penetrating illumination	Approx. 0.4times

- As the wavelength is shorter, dispersion rate is increased, and it is suitable for surface inspection of fine scratch.
- If the object and LED are same color, it lowers the contrast.

Wavelength graph



CUSTOMIZATION



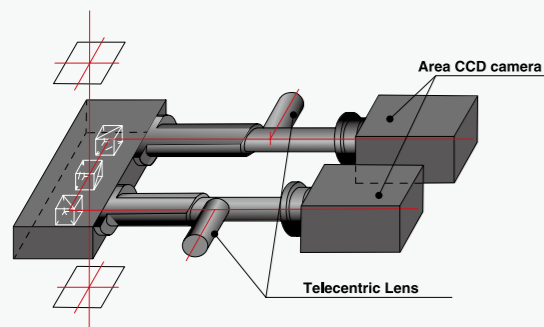
Customization

Customization Optical System

We can customize for your request. Semi-customized, fully customized, and OEM.

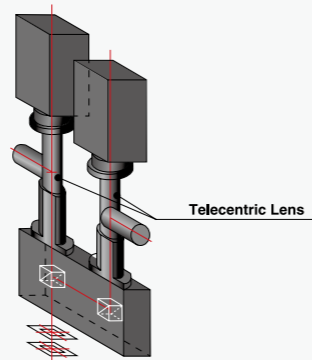
Production example

Top and bottom double field / Two magnification



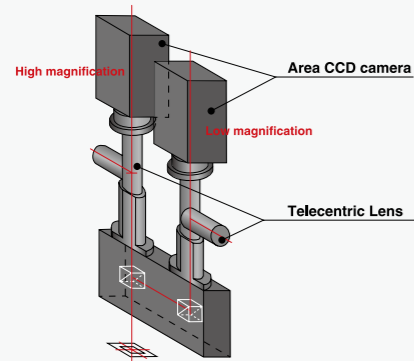
Optical system to stick together two objects that are matching each other

Twin lens two focuses system



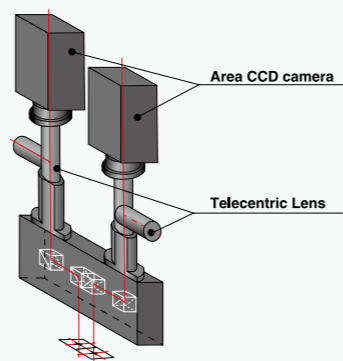
Optical system to check at two focuses and two different magnification

Twin lens, two magnification system



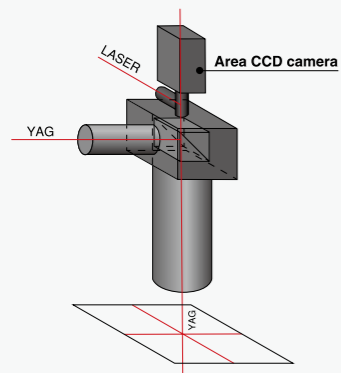
Optical system to check an object at two different magnification

Optical system for inspection between two points

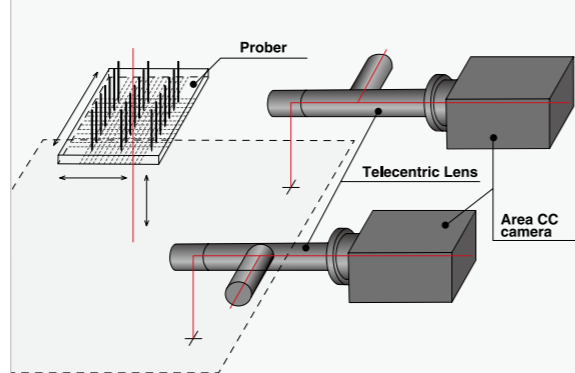


Optical system to check narrow pitch marks between two points

YAG laser optical system

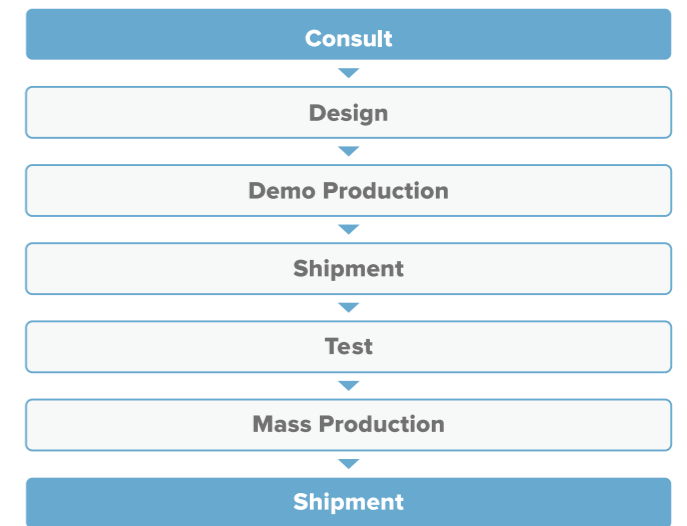


Prober alignment



Work Flow

When you request the Customization products, please consult with the sales staff. We will discuss the specification each other, and then start to design by our engineer. After confirming the designed drawing, specification, Demo, and mass production will be started.



Design / Development

Customization

Propose optical design for a special request
Customize lens mount and mechanical design

Optical unit

Propose optical system, including a lens, camera and illumination as a unit

SUPPORT

CUSTOMER SUPPORT

We will support both before and after sales service to each customers. We deal with any products except the catalogue products. Also, the custom and the semicustom production are available.

This Home page is written in not only, Japanese, but also English, Chinese and Korean.

We have the staff who can speak each foreign language. Kindly contact with us for each inquiry.

Before sales service

Demo products is available at free of charge.

- Download of the specifications and the drawings
You can download it from sign-in form page.
If you have more inquiries, please don't hesitate to contact us.

Consultation

The sales staff in charge will consult with you to choose the most suitable products.

After sales service

- Download of the specifications and the drawings
You can download it from sign-in form page.
If you have more inquiries, please don't hesitate to contact us.

MATERIAL



Glossary

Resolution(μ m)

Resolution indicates the ability to recognize two points that are close together.
Resolution values in this catalogue are theoretical resolution at 550nm.
Resolution = $0.61 \times \lambda / NA$

Resolving power(line/mm)

Resolving power indicates the number of black and white lines distinguished within 1mm in an image through a black and white grid-like chart lens. It is expressed by line/mm.
For example, 100 line/mm means that black and white pitch 1/100mm(10 μ) can be distinguished. The width of both the black and white lines is 1/200mm(5 μ).

Horizontal TV resolution

The total number of black and white horizontal stripes on a TV monitor screen.
It is expressed in TV lines. For resolving power, a pair of black and white lines is counted as one line.
However, for TV lines, one pair is counted as 2 TV lines. For example, if 470 horizontal TV lines of 1/2 CCD (H = 6.4mm) is used, required resolving power is $1\text{mm}/(6.4\text{mm}/(470/2)) = 36.72/\text{mm}$.

Aperture efficiency/Relative illumination (%)

Aperture efficiency indicates the brightness difference between the optical axis of the image formation plane and its surrounding area when an evenly bright object is captured with a lens. It is expressed by percent(%) assuming that the center brightness is 100. It is one of a lens's optical characteristics.

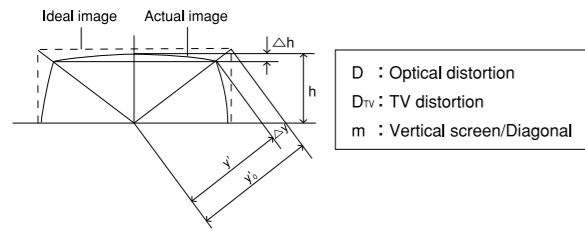
Shading

Shading is the brightness difference between TV monitor's center and its edges when an evenly bright object is captured with a lens. Shading indicates comprehensive performance of a lens and TV camera.

Chromatic aberration

In lenses' optional systems, positions where images are formed and image magnification differ according to light's wavelength. Rays with different wavelengths have different colors. This is called chromatic aberration. Aberration on the optical axis is called chromatic aberration on the axis and magnification difference is called magnification chromatic aberration.

Distortion



Optical distortion
Lens's aberration where a straight object outside of the optical axis appears curved.

$$D = \frac{y' - y'_0}{y'_0} \times 100\%$$

Positive distortion of a straight line is called pincushion distortion. Negative distortion is called barrel distortion.

TV distortion
Image distortion on a TV monitor. The closer to zero, the better the performance.

$$D_{TV} = \frac{\Delta h}{2h} \times 100\%$$

Object	Pincushion distortion	Barrel distortion

F Number (F No)

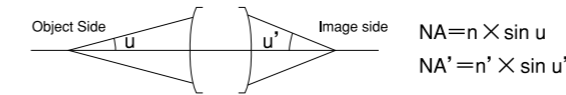
The brightness of a lens at infinity. It is calculated by dividing the focal length by the diameter of entrance pupil (D) (effective aperture)).
F No. = f/D

Effective F No

The brightness of a lens at a certain magnification.
Effective F No. = $(1 + M) \times F \text{ No.}$

NA

The higher the NA, the greater the resolution and brightness are. When the half angle that an image makes on exit pupil is u' and refractive index is n', n' x sin u' is called image side numerical aperture, NA'.
NA in this catalogue indicates object side numerical aperture.



$NA = M/2xF$, $NA' = 1/2xF$.
Relation of NA and NA' is $NA = NA' \times \text{Optical magnification}$ or $NA' = NA / \text{optical magnification}$.

MTF

It provides a graph analyzing a lens' ability to resolve sharp details in very fine sets of parallel lines, and a lens' contrast or ability to provide a sharp transfer between light and dark areas in sets of thicker parallel lines.

Depth of field

Images through lenses theoretically form as points. Acceptable blur on an acceptably clear image is called the permissible circle of confusion. Depth is the distance between the nearest and farthest points that appear in acceptably sharp focus when an object is shifted back and forth from the best focal point. Depth range of the object side is called depth of field.
Depth of field = $2(\text{Permissible circle of confusion} \times \text{Effective F No.} / \text{Magnification}^2)$

Depth of focus

Depth is the distance between the nearest and farthest points that appear in acceptably sharp focus when a CCD is shifted back and forth from the best focal point. Depth range of the image side is called depth of focus.

Angle of view

The angle formed by imaginary lines connecting the lens second principal point with both ends of the image diagonal. Angle of view is directly associated with lens focal length. As the focal length is longer, the angle of view is narrower.
Angle of view = $2 \times \tan^{-1}(\text{Image size} / 2f)$ (Focal length)

WD

Distance from the object to the front lens.

OI

Distance from the object to the image sensor.

Focal length

Focal length is the distance from the optical system's principle point to the focal point. Distance from the vertex of the last lens to the back focal point is called back length. Distance from the vertex of the first lens to the front focal point is called front focal length.

Image size

The diameter of the sharp image circle formed by a lens. Area sensor is expressed by inch, and diameter of image circle is equal to diagonal of sensor. Image circle of diameter for line sensor is equal to the maximum sensor size. It is expressed by pixel size x resolution.

Optical Data

How to calculate optical magnification

Most of lenses in this catalogue are designed for finite distance. Image format (sensor size) divided by object size equal to optical magnification. It is the most important to select a lens.

Image Format

Area Sensor

Examples of area sensor used for machine vision. Different size of sensor will be expected to be available for various applications.

Image Size (inch)	1/3	1/2.5	1/2	1/1.8	2/3 (5MP)	1 (5MP)	4/3	1.1 (12MP)
Vertical (mm)	3.6	4.27	4.8	5.35	7.1	10.2	13	12.2
Horizontal (mm)	4.8	5.7	6.4	7.14	8.47	12.8	17.3	12
Diagonal (mm)	6	7.12	8	8.93	11	16.4	23.5	17.4

Line Sensor

Length of line sensor is formed, depended on pixel size and resolution. As the sensor size is larger, design and manufacture of a lens for line sensor are more difficult and complicated.

Sensor Size (mm)	10.24	14.34	20.48	28.67	28.67	35	36	57.34	57.34	61.44	81.92
Pixel size (μm)	10	14	10	14	7	4.7	7	7	3.5	5	5
Resolution (pixel)	1024	1024	2048	2048	4096	7450	5150	8192	16384	12288	16384

Formula of optical magnification

Field of View (FOV)

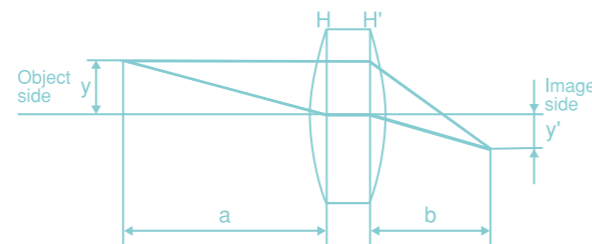
The actual size of a viewed object that can be taken when a lens is mounted to a camera. Ex). Magnification: 0.5x Image format: 1/2

Vertical FOV = $4.8 \div 0.5 = 9.6\text{mm}$ Horizontal FOV = $6.4 \div 0.5 = 12.8\text{mm}$

Magnification

Magnification (M) = Image format/FOV

$$M = y'/y = b/a$$



Electronic magnification and monitor magnification

Electronic magnification

Magnification of an image on a CCD camera when it is displayed on a monitor screen.

Monitor magnification

Magnification of an object displayed on a monitor screen through a lens.

Ex). Magnification: 0.5x Image format: 1/2 Monitor size: 15 inch (1 inch = 25.4mm)

Electronic magnification $15 \times 25.4 \div 8 = 47.6x$ Monitor magnification $0.5 \times 47.65 = 23.8x$

How to calculate focal length and photographic range

Formula of photographic range

$$X = \frac{\text{(Distance from lens to object)} \times \text{(Image size)}}{\text{Focal length}}$$

Ex. Object distance: 100m Focal length: 50mm CCD: 2/3



$$X = \frac{100,000 \times 6.6}{50} = 13,200 \text{ (mm)} \quad \text{Height: 13.2m}$$

Formula of Focal length

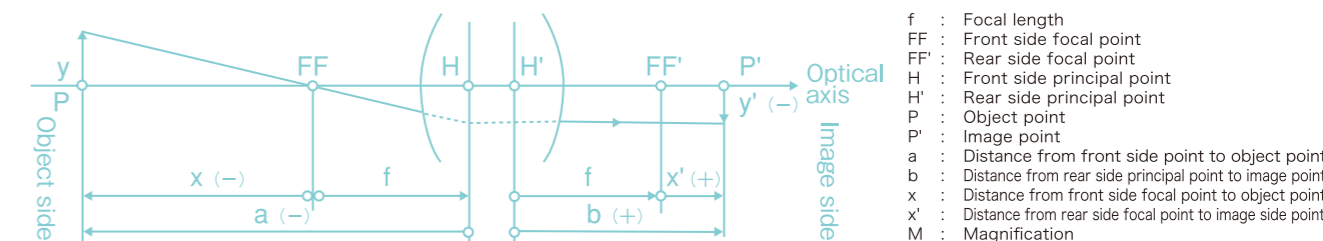
$$f = \frac{\text{(Distance from lens to object)} \times \text{(Image size)}}{\text{Height}}$$

Ex. Object distance: 20m Height: 6.6m CCD: 2/3



$$f = \frac{20,000 \times 6.6}{2,000} = 66 \text{ (mm)} \quad \text{Focal length: 66mm}$$

Formula of conjugation relationship



- f : Focal length
- FF : Front side focal point
- FF' : Rear side focal point
- H : Front side principal point
- H' : Rear side principal point
- P : Object point
- P' : Image point
- a : Distance from front side point to object point
- b : Distance from rear side principal point to image point
- x : Distance from front side focal point to object point
- x' : Distance from rear side focal point to image side point
- M : Magnification

Basics formula	Horizontal magnification	Object point distance	Image point distance
$-\frac{1}{a} + \frac{1}{b} = \frac{1}{f}$	$M = \frac{y'}{y} = \frac{b}{a}$	$-a = (1 - \frac{1}{M}) \times f$	$b = (1 - M) \times f$

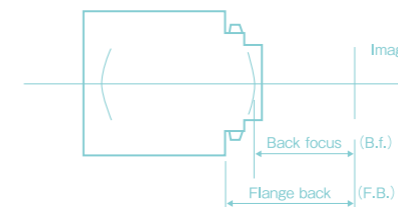
F No./NA Formula

Relationship of object side NA and image side NA (NA')	Relationship of F No. and Effective F no.(Fe)	Relationship of NA and Effective F No.
$NA' = \frac{NA}{M}$	$Fe = (1 + M) F$	$NA' = \frac{1}{2Fe}$ $NA' = \frac{1}{2(1+M)F}$ $NA = \frac{M}{2Fe}$ $NA = \frac{M}{2(1+M)F}$

Camera mount and flange back

Back focus Distance from the vertex of the last lens to the image plane

Flange back Distance from the surface of lens mount to the image plane



Name	Flange back	Screw size
C Mount	17.526mm	25.4mm 32tpi thread
CS Mount	12.5mm	25.4mm 32tpi thread
F Mount	46.5mm	Bayonet
K Mount	45.5mm	Bayonet

MYUTRON Inc.

<http://www.myutron.com>

3-31-14, Nishikoiwa, Edogawa-ku, Tokyo,
133-0057, Japan

TEL +81-3-5612-1884

FAX +81-3-5612-1890

E-mail opt@myutron.com