MACRO LENSES

A complete array of products dedicated to close-range inspection.

Macro lenses are the Opto Engineering® answer to the need for accurate close-up imaging.

These lenses can perform close–range inspection tasks very effectively with impressive optical performance in terms of resolution and distortion.

Like all our products, these optics are built to be deployed in industrial environments: their compact form factor, optical capabilities and excellent value make the Opto Engineering® macro lenses the ideal solution for a wide range of machine vision systems.

Refer to specific datasheets available at www.opto
for product compliancy with regulations, certificati

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MC series

Zero distortion macro lenses

KEY ADVANTAGES

Zero distortion
MC series are suitable for any measurement application where telecentricity is not required.

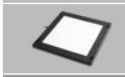
High resolution
MC series has been specifically designed to work in macro configuration.

Compactness
Small outer diameter (15 mm), fitting applications with limited space for optical components.

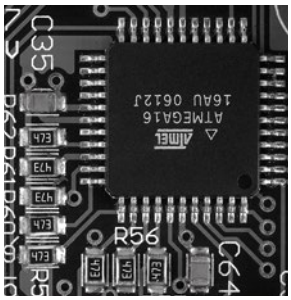
MC series macro lenses are designed to capture images of small objects when both very good resolution and nearly zero distortion are needed. Small object fields of view are often observed by means of long focal length lenses equipped with an additional spacer, used to adjust the working distance.

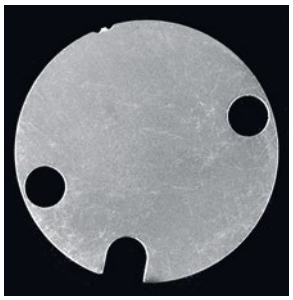
Unfortunately, this approach leads to several problems like high image distortion, resolution loss (especially at the corners), poor depth of field and chromatic effects, thus making this method not suitable for good imaging neither compatible with accurate measurement requirements.

All of these problems can be overcome by using MC series, specifically designed for macro imaging. MC series lenses are compact and cost-effective optics providing very high image resolution. A very low optical distortion makes these lenses perfectly suitable for precise dimensional measurement applications.

FOR HIGHER MAGNIFICATION TELECENTRIC LENSES SEE ALSO		
	TCHM series	p. 46
FULL RANGE OF COMPATIBLE ILLUMINATORS		
	Ringlights LTLA, LTRNST, LTRNOB series	p. 146-151
	Backlights LT2BC, LTBP, LTBC, LTBFC series	p. 162-170
FULL RANGE OF COMPATIBLE CAMERAS		
	Area scan cameras	p. 196-205

Application examples





			Detector type					Optical specifications						Mechanical specifications			
			1/3"	1/2.5"	1/2"	1/1.8"	2/3" - 5 Mpx										
			6.0 mm diag	7.1 mm diag	8.0 mm diag	8.9 mm diag	11.1 mm diag										
Part number	Mag.	Image circle	w x h 4.80 x 3.60	w x h 5.70 x 4.28	w x h 6.40 x 4.80	w x h 7.13 x 5.33	w x h 8.50 x 7.09	WD	Focal length	F/# (wF/#)	Distortion	Field depth	CTF @ 30 lp/mm	Mount	Length	Height	Diam.
	(x)	Ø (mm)	(mm x mm)	(mm x mm)	(mm x mm)	(mm x mm)	(mm x mm)	(mm) 1	(mm) 1	2	(%)	(mm) 3	(mm)		(mm) 4	(mm)	(mm)
			Object field of view (mm x mm)														
MC 300X	3.00	11.0	1.6 x 1.2	1.9 x 1.4	2.1 x 1.6	2.4 x 1.8	2.8 x 2.4	29	28.2	5.0 (20)	< 0.01	0.1	> 20	C	106.5	30.0	15
MC 200X	2.00	11.0	2.4 x 1.8	2.9 x 2.1	3.2 x 2.4	3.6 x 2.7	4.3 x 3.5	33	28.2	5.3 (16)	< 0.01	0.2	> 35	C	78.1	30.0	15
MC 150X	1.50	11.0	3.2 x 2.4	3.8 x 2.9	4.3 x 3.2	4.8 x 3.6	5.7 x 4.7	38	28.2	5.2 (13)	< 0.01	0.3	> 45	C	63.9	30.0	15
MC 100X	1.00	11.0	4.8 x 3.6	5.7 x 4.3	6.4 x 4.8	7.1 x 5.3	8.5 x 7.1	47	28.2	5.0 (10)	< 0.01	0.5	>50	C	49.9	30.0	15
MC 075X	0.75	11.0	6.4 x 4.8	7.6 x 5.7	8.5 x 6.4	9.5 x 7.1	11.3 x 9.5	58	28.2	5.1 (9)	< 0.02	0.8	>55	C	42.8	30.0	15
MC 050X	0.50	11.0	9.6 x 7.2	11.4 x 8.6	12.8 x 9.6	14.3 x 10.7	17.0 x 14.2	75	28.2	5.3 (8)	< 0.02	1.7	> 55	C	35.7	30.0	15
MC 033X	0.33	11.0	14.4 x 10.8	17.1 x 12.9	19.2 x 14.4	21.4 x 16.0	25.5 x 21.3	102	28.2	5.3 (7)	< 0.05	3.3	> 55	C	31.0	30.0	15

1 Working distance: distance between the front end of the mechanics and the object. Set this distance within +/- 3% of the nominal value for maximum resolution and minimum distortion.

2 F/# = F-number, wF/# = working F-number, the real F-number of a lens when used as a macro.

3 At the borders of the field depth the image can be still used for measurement but, to get a perfectly sharp image, only half of the nominal field depth should be considered. Pixel size used for calculation is 3.45 µm.

4 Measured from the front end of the mechanics to the camera flange.

MC3-03X macro

Zero distortion multi-configuration macro lens

KEY ADVANTAGES

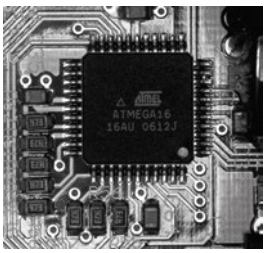
Wide range of magnifications
MC3-03X is suitable for the inspection of many different object sizes with different detector options.

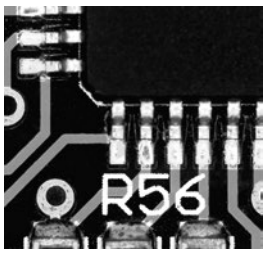
Nearly zero distortion
Less than 0.05% distortion, at any magnification, makes this lens the perfect choice for measurement applications.

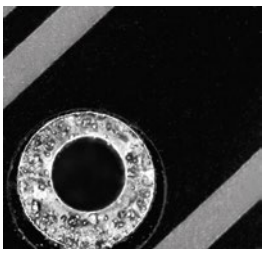
Perfect optical parameters mix
Changing the magnification also changes the lens working F-number in such a way that resolution and distortion are always optimized.

MC3-03X is a multi-configuration macro lens suitable for the inspection of objects whose size varies from a few millimeters to some centimeters. Magnification and focus can be tuned by adjusting a lockable rotating knob.
The lens magnification range can be selected by means of a set of extension tubes, included in the product package; this feature makes this component ideal for prototyping purposes and for machine vision applications requiring flexibility. Since the working F-number increases with magnification, the optimum combination of field depth, image resolution and brightness is maintained in any lens configuration.
Moreover, the optical distortion approaches zero at any magnification, making this lens perfectly suitable for measurement applications.

Application examples







FOR HIGHER MAGNIFICATION TELECENTRIC LENSES SEE ALSO

TCHM series p. 46

FULL RANGE OF COMPATIBLE ILLUMINATORS

Ringlights LTLA, LTRNST, LTRNOB series p. 146-151

Backlights LT2BC, LTBP, LTBC, LTBFC series p. 162-170

FULL RANGE OF COMPATIBLE CAMERAS

Area scan cameras p. 196-205

MC3-03X macro FOV and WD selection chart

					Detector type					Dimensions		
Number of spacers	**Mag.**	**WD**	**F/# (wF/#)**	**Field depth**	**1/3'' 6.0 mm diag w x h** 4.80 x 3.60 (mm x mm)	**1/2.5'' 7.1 mm diag w x h** 5.70 x 4.28 (mm x mm)	**1/2'' 8.0 mm diag w x h** 6.40 x 4.80 (mm x mm)	**1/1.8'' 8.9 mm diag w x h** 7.13 x 5.33 (mm x mm)	**2/3'' - 5 Mpx 11.1 mm diag w x h** 8.50 x 7.09 (mm x mm)	**Mount**	**Length**	**Diam.**
	(x)	(mm) 1	2	(mm) 3	Object field of view (mm x mm)						(mm)	(mm)
0	0.1	275.0	5.5 (6)	23.8	48.0 x 36.0	57.0 x 42.8	64.0 x 48.0	71.3 x 53.3	85.0 x 70.9	C	50.5	28
	0.2	136.0	5.0 (6)	5.95	24.0 x 18.0	28.5 x 21.4	32.0 x 24.0	35.7 x 26.7	42.5 x 35.5			
	0.3	92.0	5.4 (7)	3.09	16.0 x 12.0	19.0 x 14.3	21.3 x 16.0	23.8 x 17.8	28.3 x 23.6			
	0.4	71.0	5.0 (7)	1.74	12.0 x 9.0	14.3 x 10.7	16.0 x 12.0	17.8 x 13.3	21.3 x 17.7			
	0.5	60.0	5.3 (8)	1.27	9.6 x 7.2	11.4 x 8.6	12.8 x 9.6	14.3 x 10.7	17.0 x 14.2			
	0.6	54.0	5.6 (9)	0.99	8.0 x 6.0	9.5 x 7.1	10.7 x 8.0	11.9 x 8.9	14.2 x 11.8			
	0.7	50.0	5.3 (9)	0.73	6.9 x 5.1	8.1 x 6.1	9.1 x 6.9	10.2 x 7.6	12.1 x 10.1			
	0.8	47.0	5.6 (10)	0.62	6.0 x 4.5	7.1 x 5.4	8.0 x 6.0	8.9 x 6.7	10.6 x 8.9			
	0.9	46.0	5.3 (10)	0.49	5.3 x 4.0	6.3 x 4.8	7.1 x 5.3	7.9 x 5.9	9.4 x 7.9			
	1.0	46.0	5.5 (11)	0.44	4.8 x 3.6	5.7 x 4.3	6.4 x 4.8	7.1 x 5.3	8.5 x 7.1			
1	0.7	31.0	5.3 (9)	0.73	6.9 x 5.1	8.1 x 6.1	9.1 x 6.9	10.2 x 7.6	12.1 x 10.1	C	69.0	28
	0.8	29.0	5.6 (10)	0.62	6.0 x 4.5	7.1 x 5.4	8.0 x 6.0	8.9 x 6.7	10.6 x 8.9			
	0.9	28.0	5.3 (10)	0.49	5.3 x 4.0	6.3 x 4.8	7.1 x 5.3	7.9 x 5.9	9.4 x 7.9			
	1.0	27.0	5.5 (11)	0.44	4.8 x 3.6	5.7 x 4.3	6.4 x 4.8	7.1 x 5.3	8.5 x 7.1			
	1.1	28.0	5.2 (11)	0.36	4.4 x 3.3	5.2 x 3.9	5.8 x 4.4	6.5 x 4.8	7.7 x 6.4			
	1.2	28.0	5.5 (12)	0.33	4.0 x 3.0	4.8 x 3.6	5.3 x 4.0	5.9 x 4.4	7.1 x 5.9			
	1.3	29.0	5.2 (12)	0.28	3.7 x 2.8	4.4 x 3.3	4.9 x 3.7	5.5 x 4.1	6.5 x 5.5			
	1.4	31.0	5.4 (13)	0.26	3.4 x 2.6	4.1 x 3.1	4.6 x 3.4	5.1 x 3.8	6.1 x 5.1			
	1.5	32.0	5.2 (13)	0.23	3.2 x 2.4	3.8 x 2.9	4.3 x 3.2	4.8 x 3.6	5.7 x 4.7			
	1.6	34.0	5.4 (14)	0.22	3.0 x 2.3	3.6 x 2.7	4.0 x 3.0	4.5 x 3.3	5.3 x 4.4			
2	1.4	12.0	5.4 (13)	0.26	3.4 x 2.6	4.1 x 3.1	4.6 x 3.4	5.1 x 3.8	6.1 x 5.1	C	87.5	28
	1.5	14.0	5.2 (13)	0.23	3.2 x 2.4	3.8 x 2.9	4.3 x 3.2	4.8 x 3.6	5.7 x 4.7			
	1.6	15.0	5.4 (14)	0.22	3.0 x 2.3	3.6 x 2.7	4.0 x 3.0	4.5 x 3.3	5.3 x 4.4			
	1.7	17.0	5.2 (14)	0.19	2.8 x 2.1	3.4 x 2.5	3.8 x 2.8	4.2 x 3.1	5.0 x 4.2			
	1.8	19.0	5.4 (15)	0.18	2.7 x 2.0	3.2 x 2.4	3.6 x 2.7	4.0 x 3.0	4.7 x 3.9			
	1.9	21.0	5.2 (15)	0.16	2.5 x 1.9	3.0 x 2.3	3.4 x 2.5	3.8 x 2.8	4.5 x 3.7			
	2.0	23.0	5.3 (16)	0.16	2.4 x 1.8	2.9 x 2.1	3.2 x 2.4	3.6 x 2.7	4.3 x 3.5			
	2.1	25.0	5.2 (16)	0.14	2.3 x 1.7	2.7 x 2.0	3.0 x 2.3	3.4 x 2.5	4.0 x 3.4			
	2.2	27.0	5.3 (17)	0.14	2.2 x 1.6	2.6 x 1.9	2.9 x 2.2	3.2 x 2.4	3.9 x 3.2			
	2.3	30.0	5.5 (18)	0.14	2.1 x 1.6	2.5 x 1.9	2.8 x 2.1	3.1 x 2.3	3.7 x 3.1			
3	2.1	7.0	5.2 (16)	0.14	2.3 x 1.7	2.7 x 2.0	3.0 x 2.3	3.4 x 2.5	4.0 x 3.4	C	106.0	28
	2.2	9.0	5.3 (17)	0.14	2.2 x 1.6	2.6 x 1.9	2.9 x 2.2	3.2 x 2.4	3.9 x 3.2			
	2.3	11.0	5.5 (18)	0.14	2.1 x 1.6	2.5 x 1.9	2.8 x 2.1	3.1 x 2.3	3.7 x 3.1			
	2.4	14.0	5.3 (18)	0.12	2.0 x 1.5	2.4 x 1.8	2.7 x 2.0	3.0 x 2.2	3.5 x 3.0			
	2.5	16.0	5.4 (19)	0.12	1.9 x 1.4	2.3 x 1.7	2.6 x 1.9	2.9 x 2.1	3.4 x 2.8			
	2.6	18.0	5.3 (19)	0.11	1.8 x 1.4	2.2 x 1.6	2.5 x 1.8	2.7 x 2.1	3.3 x 2.7			
	2.7	21.0	5.4 (20)	0.11	1.8 x 1.3	2.1 x 1.6	2.4 x 1.8	2.6 x 2.0	3.1 x 2.6			
	2.8	23.0	5.3 (20)	0.10	1.7 x 1.3	2.0 x 1.5	2.3 x 1.7	2.5 x 1.9	3.0 x 2.5			
	2.9	26	5.4 (21)	0.10	1.7 x 1.2	2.0 x 1.5	2.2 x 1.7	2.5 x 1.8	2.9 x 2.4			
	3.0	28	5.3 (21)	0.09	1.6 x 1.2	1.9 x 1.4	2.1 x 1.6	2.4 x 1.8	2.8 x 2.4			

1 Working distance: distance between the front end of the mechanics and the object. Set this distance within +/- 3% of the nominal value for maximum resolution and minimum distortion.

2 F/# = F-number, wF/# = working F-number, the real F-number of a lens when used as a macro.

3 At the borders of the field depth the image can be still used for measurement but, to get a perfectly sharp image, only half of the nominal field depth should be considered. Pixel size used for calculation is 3.45 µm.

MCSM1-01X

Variable macro lens with Scheimpflug adjustment

KEY ADVANTAGES

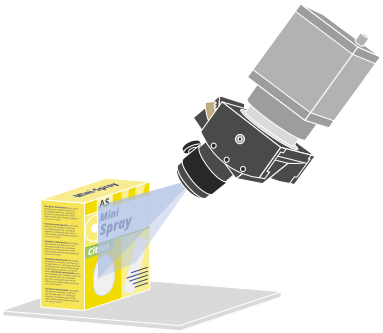
Precision Scheimpflug mount
Image focus is maintained across any tilted plane.

Compatible with any C-mount camera
The back focal length meets the C-mount standard.

Application flexibility
Supports a wide range of magnification factors and viewing angles.

MCSM1-01X is a variable macro lens expressly designed for 3D measurement and imaging applications where the object plane is not perpendicular to the optical axis. A precise built-in adjustment mechanism allows the lens to accurately meet the Scheimpflug condition and to image tilted planes in perfect focus. This lens offers a wide range of magnifications and view angles. It can be interface with any structured light source to build up extremely accurate 3D imaging systems. Image sharpness is maintained even when the lens is tilted by a wide angle, since the Scheimpflug adjustment tilts around the horizontal axis of the detector plane. The tiltable mount is compatible with any C-mount camera.

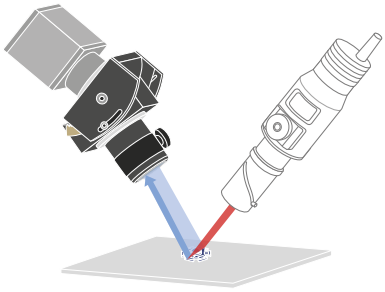
Examples of 3D imaging configuration



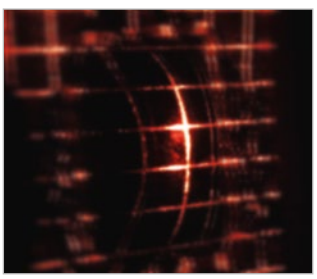
MCSM1-01X imaging a sample from an angled point of view.

Without tilt adjustment, the object is not homogeneously focused.

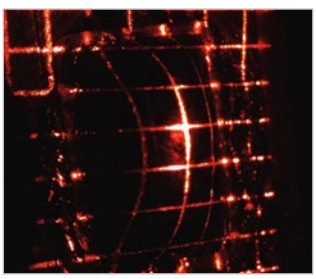
At the Scheimpflug angle, the image becomes sharp.



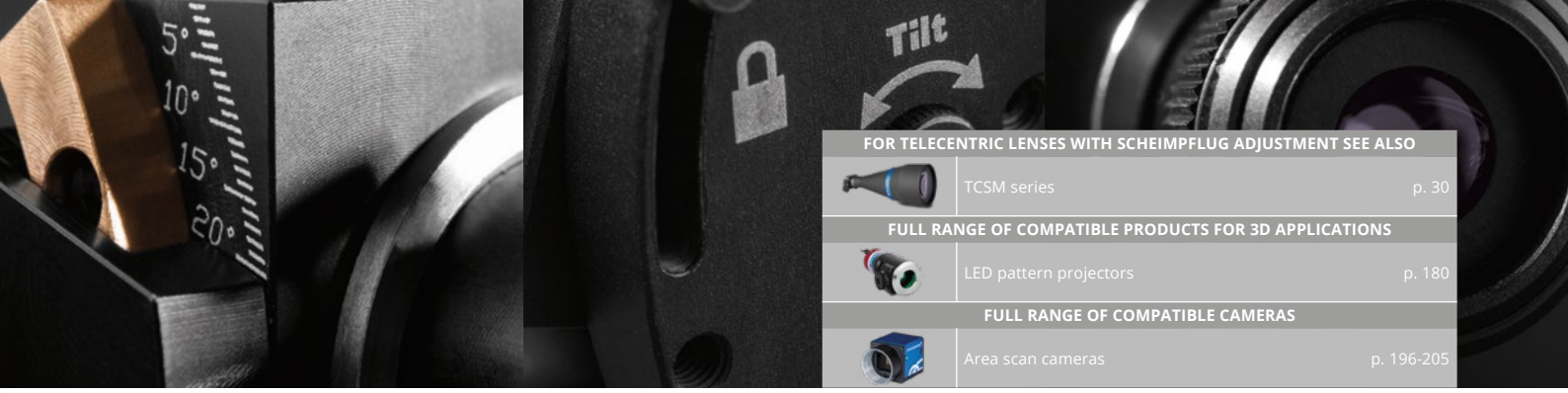
MCSM1-01X combined with a LTPRSMHP3W-R Scheimplfug pattern projector at 90°.



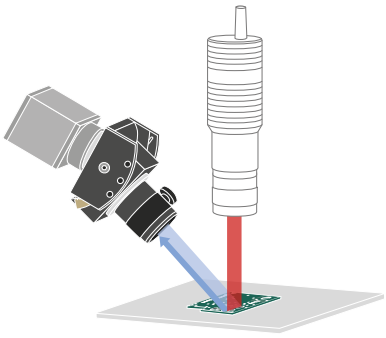
Without tilt adjustment, the image of the surface is not homogeneously focused.



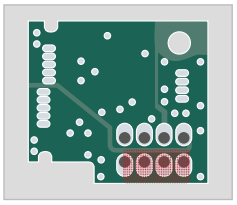
At the Scheimplflug angle, the image is sharp over the entire surface where the paste has been deposited.



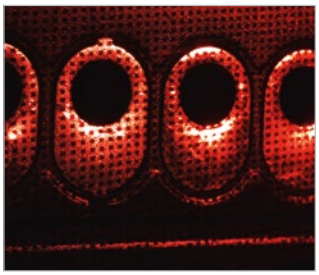
FOR TELECENTRIC LENSES WITH SCHEIMPFLUG ADJUSTMENT SEE ALSO
TCSM series p. 30
FULL RANGE OF COMPATIBLE PRODUCTS FOR 3D APPLICATIONS
LED pattern projectors p. 180
FULL RANGE OF COMPATIBLE CAMERAS
Area scan cameras p. 196-205



MCSM1-01X combined with LTPRHP3W-R.

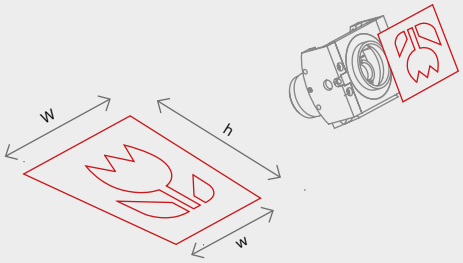
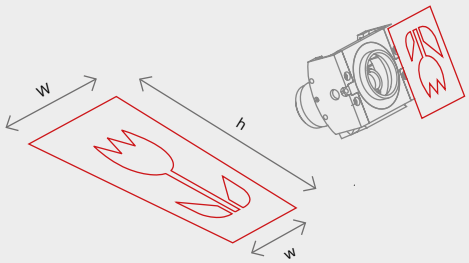


Without tilt adjustment, the image is out of focus.



At the Scheimplflug angle, the entire surface becomes focused.

FOV and WD selection chart

Mag. (x)	Object tilt (deg)	Mount tilt (deg)	WD (mm) 1	F/# (wF/#) 2	Long detector side horizontal: 1/3" 6.0 mm diag w x h 4.80 x 3.60 (mm x mm)	Long detector side horizontal: 1/2" 8.0 mm diag w x h 6.40 x 4.80 (mm x mm)	Long detector side horizontal: 2/3" 11.1 mm diag w x h 8.50 x 7.09 (mm x mm)	Long detector side vertical: 1/3" 6.0 mm diag w x h 3.60 x 4.80 (mm x mm)	Long detector side vertical: 1/2" 8.0 mm diag w x h 4.80 x 6.40 (mm x mm)	Long detector side vertical: 2/3" 11.1 mm diag w x h 7.09 x 8.50 (mm x mm)
					Field of view - w (W) x h - (mm x mm)			Field of view - w (W) x h - (mm x mm)		
										
1	0.0	0.0	43.0	6.3 (12.5)	4.80 (4.80) x 3.60	6.40 (6.40) x 4.80	8.50 (8.50) x 7.09	3.60(3.60) x 4.80	4.80 (4.80) x 6.4	7.09 (7.09) x 8.50
	5.0	5.0			4.75 (4.85) x 3.61	6.33 (6.47) x 4.81	8.41 (8.59) x 7.10	3.55(3.65) x 4.81	4.73 (4.87) x 6.4	6.99 (7.19) x 8.51
	10.0	10.0			4.70 (4.90) x 3.61	6.27 (6.53) x 4.81	8.33 (8.67) x 7.10	3.51(3.70) x 4.81	4.68 (4.93) x 6.4	6.91 (7.28) x 8.51
	15.0	15.0			4.64 (4.95) x 3.61	6.18 (6.60) x 4.81	8.21 (8.77) x 7.10	3.46(3.75) x 4.81	4.61 (5.00) x 6.4	6.81 (7.39) x 8.51
0.75	0.0	0.0	47.8	6.2 (10.9)	6.43 (6.43) x 4.82	8.57 (8.57) x 6.42	11.4 (11.4) x 9.49	4.82(4.82) x 6.43	6.42 (6.42) x 8.6	9.49 (7.62) x 11.4
	7.5	5.7			6.33 (6.52) x 4.84	8.44 (8.70) x 6.45	11.2 (11.6) x 9.53	4.72(4.92) x 6.45	6.29 (6.56) x 8.6	9.29 (9.69) x 11.4
	15.0	11.4			6.23 (6.63) x 4.89	8.31 (8.84) x 6.52	11.0 (11.8) x 9.64	4.63(5.02) x 6.53	6.17 (6.70) x 8.7	9.50 (9.89) x 11.6
	20.0	15.3			6.17 (6.70) x 4.95	8.23 (8.9) x 6.60	10.9 (11.9) x 9.75	4.57(5.10) x 6.61	6.09 (6.80) x 8.8	9.0 (10.0) x 11.7
0.5	0.0	0.0	59.6	6.3 (9.4)	9.63 (9.63) x 7.23	12.8 (12.8) x 9.64	17.1 (17.1) x 14.3	7.23(7.23) x 9.63	9.64 (9.64) x 13.0	14.3 (14.3) x 17.1
	10.0	5.0			9.44 (9.83) x 7.31	12.6 (13.1) x 9.75	16.7 (17.4) x 14.4	7.03(7.43) x 9.74	9.37 (9.91) x 13.0	13.9 (14.6) x 17.3
	20.0	10.4			9.25 (10.1) x 7.58	12.3 (13.4) x 10.1	16.4 (17.8) x 14.9	6.84(7.65) x 10.1	9.12 (10.2) x 13.0	13.5 (15.0) x 18.0
	30.0	16.1			9.04 (10.3) x 8.05	12.1 (13.7) x 10.7	16.0 (18.3) x 15.9	6.65(7.91) x 10.8	8.87 (10.5) x 14.0	13.1 (15.6) x 19.0
0.33	0.0	0.0	83.8	6.2 (8.3)	14.6 (14.6) x 10.9	19.4 (19.4) x 14.6	25.8 (25.8) x 20.1	10.9(10.9) x 14.5	14.6 (14.6) x 19.0	21.6 (21.6) x 25.7
	15.0	5.1			14.1 (14.9) x 11.3	18.9 (19.9) x 15.1	25.0 (26.5) x 22.2	10.5(11.4) x 15.1	14.0 (15.2) x 20.0	20.7 (22.5) x 26.7
	30.0	10.8			13.7 (15.6) x 12.5	18.2 (20.8) x 16.6	24.2 (27.6) x 24.5	10.0(12.0) x 16.7	13.4 (16.0) x 22.0	19.8 (23.6) x 29.6
	45.0	18.3			13.1 (16.4) x 14.9	17.5 (21.9) x 19.8	23.3 (29.1) x 29.3	9.52(12.9) x 20.0	12.7 (17.1) x 27.0	18.8 (25.4) x 35.4
0.2	0.0	0.0	135.3	6.3 (7.5)	24.0 (24.0) x 18.0	32.0 (32.0) x 24.0	42.5 (42.5) x 35.5	18.0(18.0) x 24.0	24.0 (24.0) x 32.0	35.5 (35.5) x 42.5
	15.0	3.0			23.3 (24.8) x 18.6	31.0 (33.0) x 24.8	41.2 (43.9) x 40.8	17.3(18.8) x 24.9	23.0 (25.1) x 33.0	34.1 (37.1) x 44.0
	30.0	6.7			22.5 (25.7) x 20.7	30.0 (34.3) x 27.7	39.8 (45.6) x 49.8	16.5(19.8) x 27.8	22.0 (26.4) x 37.0	32.5 (39.0) x 49.2
	45.0	11.4			21.5 (27.1) x 25.3	28.7 (36.2) x 33.7	38.2 (48.0) x 29.3	15.6(21.3) x 34.1	20.8 (28.4) x 45.0	30.7 (41.9) x 60.4
0.1	0.0	0.0	271.0	6.3 (6.9)	47.6 (47.6) x 35.7	63.5 (63.5) x 47.6	84.3 (84.3) x 70.4	35.7(35.7) x 47.7	47.6 (47.6) x 64.0	70.4 (70.4) x 84.4
	15.0	1.6			46.2 (49.2) x 37.0	61.6 (65.6) x 49.4	81.8 (87.1) x 72.9	34.3(37.3) x 49.4	45.7 (49.7) x 66.0	712.1 (73.5) x 87.5
	30.0	3.4			44.6 (51.1) x 41.4	59.5 (68.1) x 55.2	79.0 (90.5) x 81.4	32.8(39.3) x 55.4	43.7 (52.4) x 74.0	64.6 (77.3) x 98.0
	45.0	5.8			42.7 (53.9) x 51.0	56.9 (71.9) x 68.0	75.5 (95.5) x 100.3	30.9(42.3) x 68.7	41.2 (56.4) x 92.0	60.9 (83.4) x 121.6

1 Working distance: distance between the front end of the mechanics and the object. Set this distance within +/- 3% of the nominal value for maximum resolution and minimum distortion.

2 F/# = F-number, wF/# = working F-number, the real F-number of a lens when used as a macro.

MZMT12X series

12X continuous macro zoom lenses with motorized control

KEY ADVANTAGES

Independent motorized zoom and focus control.

Compact and robust design.

High resolution macro imaging.

Compatible MTDV controller.

MZMT12X motorized macro zoom lenses for 2/3" cameras deliver superb optical performance in a compact and robust housing. The Opto Engineering® motorized design features two bipolar stepper motors that respectively control zoom and focus with fine increments, ensuring extremely accurate and repeatable results throughout the entire 12x zoom range.

MZMT12X lenses are available with or without coaxial illumination and are complemented by the MTDV motion controller, available separately. All of these features make MCMT12X lenses perfect for close-up imaging applications requiring high quality images and flexible zoom capabilities.

DEDICATED COMPATIBLE RINGLIGHT		
	LTRN024NW	p. 148
COMPATIBLE STEPPER MOTOR CONTROLLER		
	MTDV	p. 262
FULL RANGE OF COMPATIBLE CAMERAS		
	Area scan cameras	p. 196-205

Product combinations*

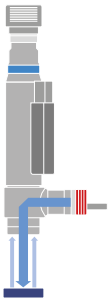
MZMTCX23A12X-C-x
with coaxial illumination.

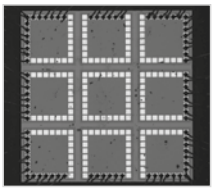
MZMT23A12X-C
without coaxial illumination.

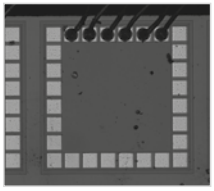
CBMT001 cable + MTDV controller.

* To be ordered separately.

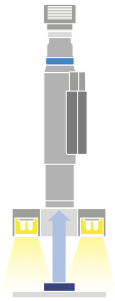
Application examples



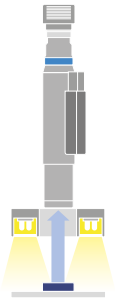


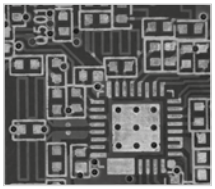


MZMTCX23A12X-C-W lens with white coaxial illumination inspecting integrated circuits assemblies.



MZMT23A12X-C lens in combination with LTRN024NW ring illuminator inspecting precision gears.





MZMT23A12X-C lens in combination with LTRN024N ring illuminator inspecting PCBs.

				Detector type					Optical specifications					Electrical specs	Mechanical specs			
Part number		Mag.	Image circle	1/3" 6.0 mm diag w x h	1/2.5" 7.1 mm diag w x h	1/2" 8.0 mm diag w x h	1/1.8" 8.9 mm diag w x h	2/3" - 5 Mpx 11.1 mm diag w x h	WD	wF/#	Dist.	Field depth	CTF	Coaxial light	Mount	Length	Width	Height
				4.80 x 3.60	5.70 x 4.28	6.40 x 4.80	7.13 x 5.33	8.50 x 7.09			typ (max)	min						
			Ø (mm)	(mm x mm)	(mm x mm)	(mm x mm)	(mm x mm)	(mm x mm)	(mm)		(%)	(mm)	(%)			(mm)		(mm)
				Object field of view (mm x mm)					1	2	5	3				4		
	max	7.2	11	0.7 x 0.5	0.8 x 0.6	0.9 x 0.7	1.0 x 0.7	1.2 x 1.0		31	< 0.25 (0.3)	0.03	> 25% @ 20lp/mm					
MZMT 23A12X-C	mid	2.5	11	1.9 x 1.4	2.3 x 1.7	2.6 x 1.9	2.9 x 2.1	3.4 x 2.8	83.0	17.6	< 0.05 (0.1)	0.15	> 40% @ 50lp/mm	no	C	300	70	73
	min	0.6	11	8.0 x 6.0	9.5 x 7.1	10.7 x 8.0	11.9 x 8.9	14.2 x 11.8		12	< 0.2 (0.25)	1.73	> 30% @ 50lp/mm					
	max	7.2	11	0.7 x 0.5	0.8 x 0.6	0.9 x 0.7	1.0 x 0.7	1.2 x 1.0		31	< 0.25 (0.3)	0.03	> 25% @ 20lp/mm					
MZMT CX23A12X-C-G	mid	2.5	11	1.9 x 1.4	2.3 x 1.7	2.6 x 1.9	2.9 x 2.1	3.4 x 2.8	83.0	17.6	< 0.05 (0.1)	0.15	> 40% @ 50lp/mm	green, 520 nm	C	300	70	171
	min	0.6	11	8.0 x 6.0	9.5 x 7.1	10.7 x 8.0	11.9 x 8.9	14.2 x 11.8		12	< 0.2 (0.25)	1.73	> 30% @ 50lp/mm					
	max	7.2	11	0.7 x 0.5	0.8 x 0.6	0.9 x 0.7	1.0 x 0.7	1.2 x 1.0		31	< 0.25 (0.3)	0.03	> 25% @ 20lp/mm					
MZMT CX23A12X-C-W	mid	2.5	11	1.9 x 1.4	2.3 x 1.7	2.6 x 1.9	2.9 x 2.1	3.4 x 2.8	83.0	17.6	< 0.05 (0.1)	0.15	> 40% @ 50lp/mm	white	C	300	70	171
	min	0.6	11	8.0 x 6.0	9.5 x 7.1	10.7 x 8.0	11.9 x 8.9	14.2 x 11.8		12	< 0.2 (0.25)	1.73	> 30% @ 50lp/mm					

1 Working distance: distance between the front end of the mechanics and the object. Set this distance within +/- 3% of the nominal value for maximum resolution and minimum distortion.
2 F/# = F-number, wF/# = working F-number, the real F-number of a lens when used as a macro..
3 At the borders of the field depth the image can be still used for measurement but, to get a perfectly sharp image, only half of the nominal field depth should be considered. Pixel size used for calculation is 3.45 µm.
4 Measured from the front end of the mechanics to the camera flange.
5 Percent deviation of the real image compared to an ideal, undistorted image: typical (average production) values and maximum (guaranteed) values are listed.

MZMT12X series

12X continuous macro zoom lenses with motorized control

Electrical specifications		
Coaxial light		Optional
Iris		Fixed 1
Focusing		Motorized
Zoom		
Connector		Circular standard DIN 12Pos Male
Motor		
Number		2
Type		Stepper - bipolar
Supply voltage	(V, DC)	3,9
Amps/phase	(A)	0,6
Resistance/phase 2	(Ω)	6.5 ± 15%
Inductance/phase 3	(mH)	1.7 ± 20%
Holding Torque	(N·m)	0,018
Ratio		1:1
Step angle	(°)	1,8
Step accuracy		± 5%
Rotor inertia	(Kg/m^2)	2.0 x 10-7
Temperature rise	(°C)	80
Ambient temperature	(°C)	-10 ÷ 50
Insulation resistance	(MΩ)	100
Insulation class		B - 130 °C
Dielectric strength 4	(V AC)	500
Ambient humidity		max 85% (no condensation)
Compatibility 5		
Stepper motors controller		MTDV3CH-00A1
Cable 6		CBMT001 (circular standard DIN 12Pos Female to DB15M connector cable, 2 m)
LED illuminators		LTRN024xx

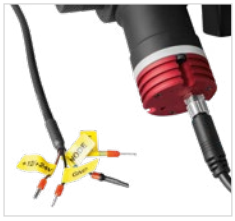
1 Fixed value at a specific magnification.
F/# changes when magnification is changed.
2 At 25 °C.
3 At 1 KHz.
4 For 1 min between the motor coils and the motor case.
5 All compatible products must be ordered separately.
6 Cable is required to connect MZMT12X series to MTDV3CH-00A1 controller and must be ordered separately.

Precise light intensity tuning

Easily and precisely tune the light intensity level thanks to the leadscrew multi-turn trimmer positioned in the back.

Direct LED control

The built-in electronics can be bypassed in order to drive the LED directly for use in continuous or pulsed mode.
When bypassed, the built-in electronics behaves as an open circuit allowing direct control of the LED source.



Electrical specifications

	Light	Device power ratings				LED power ratings		
Part number	**Light color, wavelength peak**	**DC voltage**		**Power consumption**	**Max LED fwd current**	**Forward voltage**		**Max pulse current**
		min	max			typ.	max	
		(V)	(V)	(W)	(mA)	(V)	(V)	(mA)
		1			2	3		4
MZMTCX23A12X-C-G	green, 520 nm	12	24	< 2.5	350	3.3	4.00	2000
MZMTCX23A12X-C-W	white	12	24	< 2.5	350	2.78	n.a.	2000

1 Tolerance ± 10%.
2 Used in continuous (not pulsed) mode.
3 At max forward current. Tolerance is ±0.06V on forward voltage measurements.
4 At pulse width <= 10 ms, duty cycle <= 10% condition.
Built-in electronics board must be bypassed (see tech info online).

MCZM series

Macro zoom lenses

*RT

	Optical specifications							Dimensions		
Part number	**Focal length** (mm)	**Magnification**	**Image circle** (mm)	**WD** (mm)	**f/#**	**Back focal length** (mm)	**Distortion** (%)	**Length** (mm)	**Diam.** (mm)	**Mass** (g)
RT-MLM-3XMP	-	0.3 - 1.0	11	89.9	4.5	20.4	1.8	36.5	79.5	150
RT-MLH-10X-C	-	0.084 - 0.84	8	152 - 457	5.6	23.3	-	48.0	98.5	260
RT-TEC-M55	55	0.486 - 0.011	11	140 - 5000	2.8	29.8	0.6	53.0	92.9	320

FULL RANGE OF COMPATIBLE ILLUMINATORS		
	Backlights LT2BC, LTBP, LTBC, LTBFC series	p. 162-170
	Dome lights LTDMC, LTDM series	p. 142-144
FULL RANGE OF COMPATIBLE CAMERAS		
	Area scan cameras	p. 196-205

MC4K series

Macro lenses for 4 k pixel linescan cameras

KEY ADVANTAGES

Macro design
Achieve unmatched resolution in critical applications: these lenses consistently deliver superior image quality than standard fixed focal length lenses used with extension tubes.

Exceptional low distortion
Perform measurement tasks with a high degree of accuracy and reliability.

Optimized aperture
For each magnification, the F/# is optimized to ensure the best field depth and image resolution.

Easy front filter insertion
Thanks to the front M30.5x0.5 thread.

MC4K series is a collection of macro lenses fitting both 4 K linescan cameras and matrix detector cameras over 4/3".
These lenses are specifically designed for macro imaging, as opposed to infinite conjugate lenses with added spacers, a common alternative unable to deliver the same optical performance.
MC4K lenses feature fixed aperture to ensure optimal field depth, image resolution and brightness for each magnification range, while meeting the typical needs of machine vision applications.
The absence of an iris adjustment mechanism leads to more robust build quality, granting extra durability and precision.

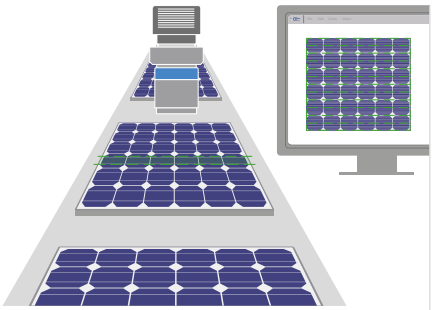
Machine integration is made easy thanks to the precise focusing mechanism and the possibility to choose from an F or M42x1 mount (-N). MC4K series additionally features a front M30.5x0.5 thread for the insertion of an optional filter as well as easy phase adjustment.

Mount F

Mount N = M42x1

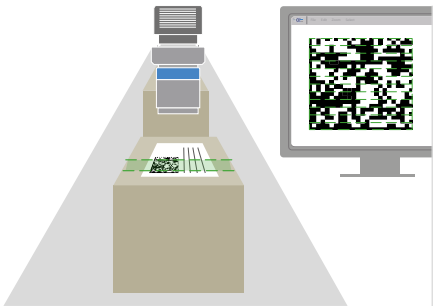
FULL RANGE OF COMPATIBLE ILLUMINATORS		
	Line lights, LTLNC, LTLNM, LTLNE series	p. 172-177
	Bar lights LTBRDC series	p. 171
	Backlights LT2BC, LTBP, LTBC, LTBFC series	p. 162-170
FULL RANGE OF COMPATIBLE CAMERAS		
	Area scan cameras	p. 196-205

Application examples



Solar cell inspection

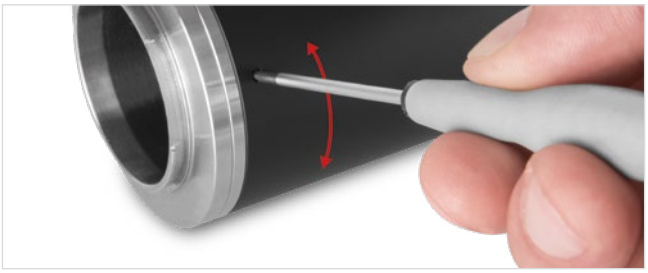
Print and web inspection



Identification: data-matrix and barcode reading

Phase adjustment

Adjusting the phase of the camera mounted on MC4K macro lenses is easy: simply loosen the three set screws and rotate the camera mount until you achieve the desired angular alignment.



				Detector type					Optical specifications									Mechanical specification			
Part number	Focusing	Mag.	Image cirlce	1" IMX255/ IMX267 16.1 mm diag w x h 14.19 x 7.51 (mm x mm)	1.1" IMX253/ IMX304 17.6 mm diag w x h 14.2 x 10.4 (mm x mm)	Line 2k 2k x 10 µm w 20.5 (mm)	4/3" KAI-08050 22.6 mm diag w x h 18.1 x 13.6 (mm x mm)	Line 4k 4k x 7 µm w 28.7 (mm)	WD	Focal length	F/# (wF/#)	Distortion typical (max)	Field depth	CTF @50 lp/mm	Image side NA	Object side NA	Mount	Phase adj.	Length	Diam.
	1	(x)	Ø (mm)	Object field of view (mm x mm)					(mm) 2	(mm)	3	(%) 4	(mm) 5	(%)			6	(mm) 7	(mm)
	near	0.295		48.10 x 25.46	48.14	69.49	61.36	97.29	298.5				7.72						
MC4K 025X-F	nominal	0.250	28.7	56.76 x 30.04	56.80	82.00	72.40	114.80	346.1	88.0	6.4 (8)	< 0.08 (0.10)	10.8	> 60	0.063	0.018	F	Yes	80.0	64
	far	0.205		69.22 x 36.63	69.27	100.00	88.29	140.00	414.3				16.0						
	near	0.295		48.10 x 25.46	48.14	69.49	61.36	97.29	298.5				7.72						
MC4K 025X-N	nominal	0.250	28.7	56.76 x 30.04	56.80	82.00	72.40	114.80	346.1	88.0	6.4 (8)	< 0.08 (0.10)	10.8	> 60	0.063	0.018	M42x1 FD 10.56	Yes	115.9	52
	far	0.205		69.22 x 36.63	69.27	100.00	88.29	140.00	414.3				16.0						
	near	0.545		26.04 x 13.78	26.06	37.61	33.21	52.66	177.0				2.37						
MC4K 050X-F	nominal	0.500	28.7	28.38 x 15.02	28.40	41.00	36.20	57.40	189.9	88.0	6.7 (10)	< 0.04 (0.08)	2.81	> 50	0.05	0.027	F	Yes	99.5	64
	far	0.455		31.19 x 16.51	31.21	45.05	39.78	63.08	205.2				3.40						
	near	0.545		26.04 x 13.78	26.06	37.61	33.21	52.66	177.0				2.37						
MC4K 050X-N	nominal	0.500	28.7	28.38 x 15.02	28.40	41.00	36.20	57.40	189.9	88.1	6.7 (10)	< 0.04 (0.08)	2.81	> 50	0.05	0.027	M42x1 FD 10.56	Yes	135.4	52
	far	0.455		31.19 x 16.51	31.21	45.05	39.78	63.08	205.2				3.40						
	near	0.795		17.85 x 9.45	17.86	25.79	22.77	36.10	131.4				1.05						
MC4K 075X-F	nominal	0.750	28.7	18.92 x 10.01	18.93	27.33	24.13	38.27	137.3	77.1	6.3 (11)	< 0.04 (0.08)	1.18	> 50	0.045	0.036	F	Yes	113.6	64
	far	0.704		20.16 x 10.67	20.17	29.12	25.71	40.77	143.9				1.33						
	near	0.795		17.85 x 9.45	17.86	25.79	22.77	36.10	131.4				1.05						
MC4K 075X-N	nominal	0.750	28.7	18.92 x 10.01	18.93	27.33	24.13	38.27	137.3	77.1	6.3 (11)	< 0.04 (0.08)	1.18	> 50	0.045	0.036	M42x1 FD 10.56	Yes	149.5	52
	far	0.704		20.16 x 10.67	20.17	29.12	25.71	40.77	143.9				1.33						
	near	1.045		13.58 x 7.19	13.59	19.62	17.32	27.46	108.2				0.62						
MC4K 100X-F	nominal	1.000	28.7	14.19 x 7.51	14.20	20.50	18.10	28.70	111.6	77.1	6.5 (13)	< 0.01 (0.03)	0.68	> 50	0.038	0.04	F	Yes	132.9	64
	far	0.954		14.87 x 7.87	14.88	21.49	18.97	30.08	115.2				0.75						
	near	1.045		13.58 x 7.19	13.59	19.62	17.32	27.46	108.2				0.62						
MC4K 100X-N	nominal	1.000	28.7	14.19 x 7.51	14.20	20.50	18.10	28.70	111.6	77.1	6.5 (13)	< 0.01 (0.03)	0.68	> 50	0.038	0.04	M42x1 FD 10.56	Yes	168.8	52
	far	0.954		14.87 x 7.87	14.88	21.49	18.97	30.08	115.2				0.75						
	near	1.295		10.96 x 5.80	10.97	15.83	13.98	22.16	94.0				0.42						
MC4K 125X-F	nominal	1.250	28.7	11.35 x 6.01	11.36	16.40	14.48	22.96	96.1	77.1	6.7 (15)	< 0.01 (0.03)	0.45	> 40	0.033	0.043	F	Yes	152.2	64
	far	1.204		11.79 x 6.24	11.79	17.03	15.03	23.84	98.5				0.49						
	near	1.295		10.96 x 5.80	10.97	15.83	13.98	22.16	94.0				0.42						
MC4K125X-N	nominal	1.250	28.7	11.35 x 6.01	11.36	16.40	14.48	22.96	96.1	77.2	6.7 (15)	< 0.01 (0.03)	0.45	> 40	0.033	0.043	M42x1 FD 10.56	Yes	188.1	52
	far	1.204		11.79 x 6.24	11.79	17.03	15.03	23.84	98.5				0.49						
	near	1.543		9.20 x 4.87	9.20	13.29	11.73	18.60	89.9				0.30						
MC4K 150X-F	nominal	1.500	28.7	9.46 x 5.01	9.47	13.67	12.07	19.13	91.4	79.8	6.8 (17)	< 0.01 (0.03)	0.32	> 35	0.029	0.045	F	Yes	178.6	64
	far	1.455		9.75 x 5.16	9.76	14.09	12.44	19.73	93.0				0.34						
	near	1.543		9.20 x 4.87	9.20	13.29	11.73	18.60	89.9				0.30						
MC4K 150X-N	nominal	1.500	28.7	9.46 x 5.01	9.47	13.67	12.07	19.13	91.4	79.8	6.8 (17)	< 0.01 (0.03)	0.32	> 35	0.029	0.045	M42x1 FD 10.56	Yes	214.5	52
	far	1.455		9.75 x 5.16	9.76	14.09	12.44	19.73	93.0				0.34						
	near	1.793		7.91 x 4.19	7.92	11.43	10.09	16.01	82.7				0.21						
MC4K 175X-F	nominal	1.750	28.7	8.11 x 4.29	8.11	11.71	10.34	16.40	83.8	79.8	6.5 (18)	< 0.01 (0.03)	0.22	> 35	0.028	0.05	F	Yes	198.5	64
	far	1.705		8.32 x 4.40	8.33	12.02	10.62	16.83	85.0				0.23						
	near	1.793		7.91 x 4.19	7.92	11.43	10.09	16.01	82.7				0.21						
MC4K 175X-N	nominal	1.75	28.7	8.11 x 4.29	8.11	11.71	10.34	16.40	83.8	79.8	6.5 (18)	< 0.01 (0.03)	0.22	> 35	0.028	0.05	M42x1 FD 10.56	Yes	234.5	52
	far	1.705		8.32 x 4.40	8.33	12.02	10.62	16.83	85.0				0.23						
	near	2.042		6.95 x 3.68	6.95	10.04	8.86	14.05	77.3				0.17						
MC4K 200X-F	nominal	2.000	28.7	7.10 x 3.76	7.10	10.25	9.05	14.35	78.1	79.8	6.7 (20)	< 0.01 (0.03)	0.18	> 30	0.025	0.051	F	Yes	218.5	64
	far	1.955		7.26 x 3.84	7.26	10.49	9.26	14.68	79.0				0.18						
	near	2.042		6.95 x 3.68	6.95	10.04	8.86	14.05	77.3				0.17						
MC4K 200X-N	nominal	2.000	28.7	7.10 x 3.76	7.10	10.25	9.05	14.35	78.1	79.9	6.7 (20)	< 0.01 (0.03)	0.18	> 30	0.025	0.051	M42x1 FD 10.56	Yes	254.5	52
	far	1.955		7.26 x 3.84	7.26	10.49	9.26	14.68	79.0				0.18						

1 Maximum and minimum magnification changes when focusing.
2 Working distance: distance between the front end of the mechanics and the object. Set this distance within +/- 3% of the nominal value for maximum resolution and minimum distortion.
3 Working F-number (wF/#): the real F-number of a lens when used as a macro. Lenses with smaller apertures can be supplied on request.
4 Percent deviation of the real image compared to an ideal, undistorted image: typical (average production) values and maximum (guaranteed) values are listed.
5 At the borders of the field depth the image can be still used for measurement but, to get a perfectly sharp image, only half of the nominal field depth should be considered. Pixel size used for calculation is 7 µm.
6 Indicates the availability of an integrated camera phase adjustment feature.
7 Measured from the front end of the mechanics to the camera flange.

Ordering information

It's easy to select the right lens for your application: our part numbers are coded as **MC4K yyyX -x** where **yyy** refers to the magnification and **-x** refers to the mount option:
- **F** for F-mount
- **N** for M42x1 mount (flange distance FD 10.56 mm).

E.g. MC4K100X-N for a MC4K100X with M42x1 mount.

MC12K series

Macro lenses for 12 k and 16 k pixel linescan cameras

KEY ADVANTAGES

Exceptional low distortion
Perform measurement tasks with a high degree of accuracy and reliability.

Optimized for high resolution linescan cameras
MC12K feature a large image circle ensuring wide compatibility with line scan sensors (up to 62.4 mm).

Color correction
MC12K can distinguish the finest tonal gradations and are the ideal solution for demanding applications where color consistency is required.

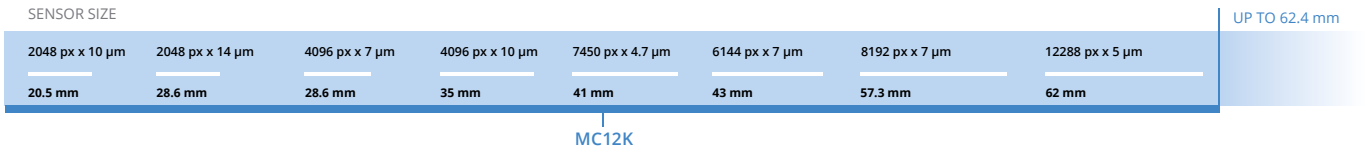
Industrial design for factory automation
MC12K feature precise manual focusing mechanism to achieve the best possible image sharpness.

MC12K series are macro lenses specifically optimized to work with high resolution line scan cameras with sensor size up to 62 mm.
Infinite conjugate lenses, like photographic optics, will offer poor performance when used to observe objects from up close: MC12K series are macro by design, enabling unmatched and uniform optical performance at short working distances.

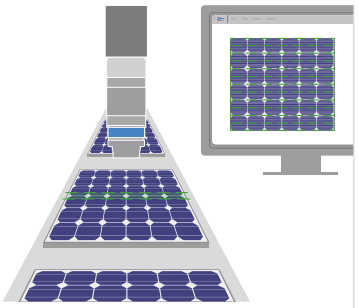
MC12K series lenses are the ideal choice for industrial applications where maximum image resolution is required: solar cells and printed sheets inspection, web inspection or high speed product sorting are just a few examples.
In addition to the standard M72x0.75 mount, MC12K lenses can be easily equipped with any camera mount at no additional cost ensuring wide compatibility with most common linescan cameras.

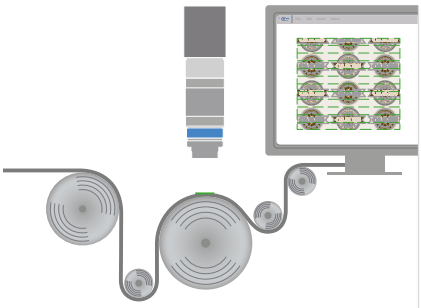
FULL RANGE OF COMPATIBLE ILLUMINATORS		
	Line lights, LTLNC, LTLNM, LTLNE series	p. 172-177
	Bar lights LTBRDC series	p. 171
	Backlights LT2BC, LTBP, LTBC, LTBFC series	p. 162-170
FULL RANGE OF COMPATIBLE CLAMPING MECHANICS		
	CMHOMC12Kxxx	p. 228
FULL RANGE OF COMPATIBLE CAMERAS		
	HR Area scan cameras, HR Line scan cameas	p. 206-211

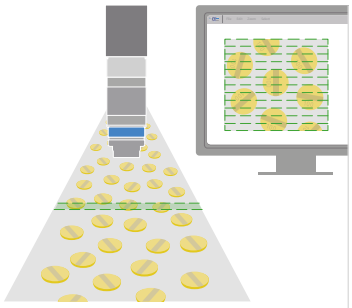
Wide image circle
MC12K is optimized to cover the line scan sensor sizes up to 62.4 mm.



Application examples


Solar cell inspection


Print and web inspection


High speed sorting of tablets

				Detector type					Optical specifications								Mechanical specification			
Part number	Focusing	Mag.	Image cirlce	KAI-47051 56.7 mm diag w x h	Line - 16k 16k x 3.5 µm w x h	Line - 8k 8k x 7.5 µm w	Line - 12k 12k x 5µm w x h	Line - 12k 12k x 5.2µm w	WD	Focal length	F/# (wF/#)	Distortion typical (max)	Field depth	CTF @50 lp/mm	Image side NA	Object side NA	Mount	Phase adj.	Length	Diam.
				48.71 x 29.04	57.30	61.40	61.40	62.40												
	1	(x)	Ø (mm)	(mm x mm)	(mm)	(mm)	(mm x mm)	(mm x mm)	(mm) 2	(mm)	3	(%) 4	(mm) 5	(%)				6	(mm) 7	(mm)
				Object field of view (mm x mm)																
	near	2.017		24.15 x 14.40	28.41	30.44	30.44	30.94	93.6				0.15							
MC12K 200X-F	nominal	2.000	62.4	24.35 x 14.52	28.65	30.70	30.70	31.20	94.0	88.2	6.0 (18)	< 0.01 (0.02)	0.2	> 30	0.028	0.056	F	Yes	242.2	76
	far	1.983		24.56 x 14.64	28.90	30.96	30.96	31.47	94.4				0.2							
	near	2.017		24.15 x 14.40	28.41	30.44	30.44	30.94	93.6				0.15							
MC12K 200X-I	nominal	2.000	62.4	24.35 x 14.52	28.65	30.70	30.70	31.20	94.0	88.2	6.0 (18)	< 0.01 (0.02)	0.2	> 30	0.028	0.056	M58x0.75 FD 11.48	Yes	276.7	76
	far	1.983		24.56 x 14.64	28.90	30.96	30.96	31.47	94.4				0.2							
	near	2.017		24.15 x 14.40	28.41	30.44	30.44	30.94	93.6				0.15							
MC12K 200X-R	nominal	2.000	62.4	24.35 x 14.52	28.65	30.70	30.70	31.20	94.0	88.2	6.0 (18)	< 0.01 (0.02)	0.16	> 30	0.028	0.056	M72x0.75 FD 6.56	Yes	281.8	76
	far	1.983		24.56 x 14.64	28.90	30.96	30.96	31.47	94.4				0.16							
	near	2.017		24.15 x 14.40	28.41	30.44	30.44	30.94	93.6				0.15							
MC12K 200X-K	nominal	2.000	62.4	24.35 x 14.52	28.65	30.70	30.70	31.20	94.0	88.2	6.0 (18)	< 0.01 (0.02)	0.16	> 30	0.028	0.056	M58x0.75 FD 12.96	Yes	271.4	76
	far	1.983		24.56 x 14.64	28.90	30.96	30.96	31.47	94.4				0.16							
	near	1.517		32.11 x 19.14	37.77	40.47	40.47	41.13	109.3				0.27							
MC12K 150X-F	nominal	1.500	62.4	32.47 x 19.36	38.20	40.93	40.93	41.60	110.0	89.9	6.0 (15)	< 0.01 (0.02)	0.28	> 40	0.033	0.05	F	Yes	202.8	76
	far	1.484		32.82 x 19.57	38.61	41.37	41.37	42.05	110.7				0.29							
	near	1.517		32.11 x 19.14	37.77	40.47	40.47	41.13	109.3				0.27							
MC12K 150X-I	nominal	1.500	62.4	32.47 x 19.36	38.20	40.93	40.93	41.60	110.0	89.9	6.0 (15)	< 0.01 (0.02)	0.28	> 40	0.033	0.05	M58x0.75 FD 11.48	Yes	237.4	76
	far	1.484		32.82 x 19.57	38.61	41.37	41.37	42.05	110.7				0.29							
	near	1.517		32.11 x 19.14	37.77	40.47	40.47	41.13	109.3				0.27							
MC12K 150X-R	nominal	1.500	62.4	32.47 x 19.36	38.20	40.93	40.93	41.60	110.0	89.9	6.0 (15)	< 0.01 (0.02)	0.28	> 40	0.033	0.05	M72x0.75 FD 6.56	Yes	242.5	76
	far	1.484		32.82 x 19.57	38.61	41.37	41.37	42.05	110.7				0.29							
	near	1.517		32.11 x 19.14	37.77	40.47	40.47	41.13	109.3				0.27							
MC12K 150X-K	nominal	1.500	62.4	32.47 x 19.36	38.20	40.93	40.93	41.60	110.0	89.9	6.0 (15)	< 0.01 (0.02)	0.28	> 40	0.033	0.05	M58x0.75 FD 12.96	Yes	232.1	76
	far	1.484		32.82 x 19.57	38.61	41.37	41.37	42.05	110.7				0.29							
	near	1.018		47.85 x 28.53	56.29	60.31	60.31	61.30	134.0				0.61							
MC12K 100X-F	nominal	1.000	62.4	48.71 x 29.04	57.30	61.40	61.40	62.40	135.5	88.3	6.0 (12)	< 0.01 (0.02)	0.63	> 50	0.042	0.042	F	Yes	155.4	76
	far	0.984		49.50 x 29.51	58.23	62.40	62.40	63.41	137.0				0.65							
	near	1.018		47.85 x 28.53	56.29	60.31	60.31	61.30	134.0				0.61							
MC12K 100X-I	nominal	1.000	62.4	48.71 x 29.04	57.30	61.40	61.40	62.40	135.5	88.3	6.0 (12)	< 0.01 (0.02)	0.63	> 50	0.042	0.042	M58x0.75 FD 11.48	Yes	189.9	76
	far	0.984		49.50 x 29.51	58.23	62.40	62.40	63.41	137.0				0.65							
	near	1.018		47.85 x 28.53	56.29	60.31	60.31	61.30	134.0				0.61							
MC12K 100X-R	nominal	1.000	62.4	48.71 x 29.04	57.30	61.40	61.40	62.40	135.5	88.3	6.0 (12)	< 0.01 (0.02)	0.63	> 50	0.042	0.042	M72x0.75 FD 6.56	Yes	195.0	76
	far	0.984		49.50 x 29.51	58.23	62.40	62.40	63.41	137.0				0.65							
	near	1.018		47.85 x 28.53	56.29	60.31	60.31	61.30	134.0				0.61							
MC12K 100X-K	nominal	1.000	62.4	48.71 x 29.04	57.30	61.40	61.40	62.40	135.5	88.3	6.0 (12)	< 0.01 (0.02)	0.63	> 50	0.042	0.042	M58x0.75 FD 12.96	Yes	184.6	76
	far	0.984		49.50 x 29.51	58.23	62.40	62.40	63.41	137.0				0.65							
	near	0.684		71.21 x 42.46	83.77	89.77	89.77	91.23	179.7				1.35							
MC12K 067X-F	nominal	0.667	62.4	73.03 x 43.54	85.91	92.05	92.05	93.55	183.0	89.9	6.0 (10)	< 0.01 (0.02)	1.42	> 60	0.05	0.033	F	Yes	130.0	76
	far	0.650		74.94 x 44.68	88.15	94.46	94.46	96.00	186.4				1.49							
	near	0.684		71.21 x 42.46	83.77	89.77	89.77	91.23	179.7				1.35							
MC12K 067X-I	nominal	0.667	62.4	73.03 x 43.54	85.91	92.05	92.05	93.55	183.0	89.9	6.0 (10)	< 0.01 (0.02)	1.42	> 60	0.05	0.033	M58x0.75 FD 11.48	Yes	164.5	76
	far	0.650		74.94 x 44.68	88.15	94.46	94.46	96.00	186.4				1.49							
	near	0.684		71.21 x 42.46	83.77	89.77	89.77	91.23	179.7				1.35							
MC12K 067X-R	nominal	0.667	62.4	73.03 x 43.54	85.91	92.05	92.05	93.55	183.0	89.9	6.0 (10)	< 0.01 (0.02)	1.42	> 60	0.05	0.033	M72x0.75 FD 6.56	Yes	169.6	76
	far	0.650		74.94 x 44.68	88.15	94.46	94.46	96.00	186.4				1.49							
	near	0.684		71.21 x 42.46	83.77	89.77	89.77	91.23	179.7				1.35							
MC12K 067X-K	nominal	0.667	62.4	73.03 x 43.54	85.91	92.05	92.05	93.55	183.0	89.9	6.0 (10)	< 0.01 (0.02)	1.42	> 60	0.05	0.033	M58x0.75 FD 12.96	Yes	159,2	76
	far	0.650		74.94 x 44.68	88.15	94.46	94.46	96.00	186.4				1.49							
	near	0.517		94.21 x 56.17	110.83	118.76	118.76	120.70	217.1				2.36							
MC12K 050X-F	nominal	0.500	62.4	97.42 x 58.08	114.60	122.80	122.80	124.80	223.0	88.2	6.0 (9)	< 0.01 (0.02)	2.52	> 50	0.056	0.028	F	Yes	113.6	76
	far	0.483		100.84 x 60.12	118.63	127.12	127.12	129.19	229.1				2.70							
	near	0.517		94.21 x 56.17	110.83	118.76	118.76	120.70	217.1				2.36							
MC12K 050X-I	nominal	0.500	62.4	97.42 x 58.08	114.60	122.80	122.80	124.80	223.0	88.2	6.0 (9)	< 0.01 (0.02)	2.52	> 50	0.056	0.028	M58x0.75 FD 11.48	Yes	148.2	76
	far	0.483		100.84 x 60.12	118.63	127.12	127.12	129.19	229.1				2.70							
	near	0.517		94.21 x 56.17	110.83	118.76	118.76	120.70	217.1				2.36							
MC12K 050X-R	nominal	0.500	62.4	97.42 x 58.08	114.60	122.80	122.80	124.80	223.0	88.2	6.0 (9)	< 0.01 (0.02)	2.52	> 50	0.056	0.028	M72x0.75 FD 6.56	Yes	153.3	76
	far	0.483		100.84 x 60.12	118.63	127.12	127.12	129.19	229.1				2.70							
	near	0.517		94.21 x 56.17	110.83	118.76	118.76	120.70	217.1				2.36							
MC12K 050X-K	nominal	0.500	62.4	97.42 x 58.08	114.60	122.80	122.80	124.80	223.0	88.2	6.0 (9)	< 0.01 (0.02)	2.52	> 50	0.056	0.028	M58x0.75 FD 12.96	Yes	142.8	76
	far	0.483		100.84 x 60.12	118.63	127.12	127.12	129.19	229.1				2.70							
	near	0.266		183.11 x 109.17	215.41	230.83	230.83	234.59	393.6				9.50							
MC12K 025X-F	nominal	0.250	62.4	194.83 x 116.16	229.20	245.60	245.60	249.60	415.5	92.1	6.4 (8)	< 0.05 (0.1)	10.75	> 50	0.063	0.016	F	Yes	99.3	76
	far	0.234		208.15 x 124.10	244.87	262.39	262.39	266.67	441.8				12.27							
	near	0.266		183.11 x 109.17	215.41	230.83	230.83	234.59	393.6				9.50							
MC12K 025X-I	nominal	0.250	62.4	194.83 x 116.16	229.20	245.60	245.60	249.60	415.5	92.1	6.4 (8)	< 0.05 (0.1)	10.75	> 50	0.063	0.016	M58x0.75 FD 11.48	Yes	133.8	76
	far	0.234		208.15 x 124.10	244.87	262.39	262.39	266.67	441.8				12.27							
	near	0.266		183.11 x 109.17	215.41	230.83	230.83	234.59	393.6				9.50							
MC12K 025X-R	nominal	0.250	62.4	194.83 x 116.16	229.20	245.60	245.60	249.60	415.5	92.1	6.4 (8)	< 0.05 (0.1)	10.75	> 50	0.063	0.016	M72x0.75 FD 6.56	Yes	138.9	76
	far	0.234		208.15 x 124.10	244.87	262.39	262.39	266.67	441.8				12.27							
	near	0.266		183.11 x 109.17	215.41	230.83	230.83	234.59	393.6				9.50							
MC12K 025X-K	nominal	0.250	62.4	194.83 x 116.16	229.20	245.60	245.60	249.60	415.5	92.1	6.4 (8)	< 0.05 (0.1)	10.75	> 50	0.063	0.016	M58x0.75 FD 12.96	Yes	128.5	76
	far	0.234		208.15 x 124.10	244.87	262.39	262.39	266.67	441.8				12.27							
	near	0.142		343.01 x 204.51	403.52	432.39	432.39	439.44	678.5				32.29							
MC12K 012X-I	nominal	0.125	62.4	389.66 x 232.32	458.40	491.20	491.20	499.20	762.0	89.8	6.2 (7)	< 0.05 (0.1)	41.66	> 50	0.071	0.009	M58x0.75 FD 11.48	Yes	120.2	76
	far	0.108		451.00 x 268.89	530.56	568.52	568.52	577.78	873.2				55.81							
	near	0.142		343.01 x 204.51	403.52	432.39	432.39	439.44	678.5				32.29							
MC12K 012X-R	nominal	0.125	62.4	389.66 x 232.32	458.40	491.20	491.20	499.20	762.0	89.8	6.2 (7)	< 0.05 (0.1)	41.66	> 50	0.071	0.009	M72x0.75 FD 6.56	Yes	125.3	76
	far	0.108		451.00 x 268.89	530.56	568.52	568.52	577.78	873.2				55.81							
	near	0.142		343.01 x 204.51	403.52	432.39	432.39	439.44	678.5				32.29							
MC12K 012X-K	nominal	0.125	62.4	389.66 x 232.32	458.40	491.20	491.20	499.20	762.0	89.8	6.2 (7)	< 0.05 (0.1)	41.66	> 50	0.071	0.009	M58x0.75 FD 12.96	Yes	114.9	76
	far	0.108		451.00 x 268.89	530.56	568.52	568.52	577.78	873.2				55.81							
	near	0.100		487.08 x 290.40	573.00	614.00	614.00	624.00	924.1				68.25							
MC12K 008X-I	nominal	0.083	62.4	586.84 x 349.88	690.36	739.76	739.76	751.81	1102.5	88.5	6.5 (7)	< 0.05 (0.1)	99.07	> 50	0.071	0.006	M58x0.75 FD 11.48	Yes	115.9	76
	far	0.067		726.99 x 433.43	855.22	916.42	916.42	931.34	1370.9				152.04							
	near	0.100		487.08 x 290.40	573.00	614.00	614.00	624.00	924.1				68.25							
MC12K 008X-R	nominal	0.083	62.4	586.84 x 349.88	690.36	739.76	739.76	751.81	1102.5	88.5	6.5 (7)	< 0.05 (0.1)	99.07	> 50	0.071	0.006	M72x0.75 FD 6.56	Yes	121.0	76
	far	0.067		726.99 x 433.43	855.22	916.42	916.42	931.34	1370.9				152.04							
	near	0.100		487.08 x 290.40	573.00	614.00	614.00	624.00	924.1				68.25							
MC12K 008X-K	nominal	0.083	62.4	586.84 x 349.88	690.36	739.76	739.76	751.81	1102.5	88.5	6.5 (7)	< 0.05 (0.1)	99.07	> 50	0.071	0.006	M58x0.75 FD 12.96	Yes	110.6	76
	far	0.067		726.99 x 433.43	855.22	916.42	916.42	931.34	1370.9				152.04							

1 Maximum and minimum magnification changes when focusing.
2 Working distance: distance between the front end of the mechanics and the object. Set this distance within +/- 3% of the nominal value for maximum resolution and minimum distortion.
3 Working F-number (wF/#): the real F-number of a lens when used as a macro. Lenses with smaller apertures can be supplied on request.
4 Percent deviation of the real image compared to an ideal, undistorted image: typical (average production) values and maximum (guaranteed) values are listed.
5 At the borders of the field depth the image can be still used for measurement but, to get a perfectly sharp image, only half of the nominal field depth should be considered. Pixel size used for calculation is 7 µm.
6 Indicates the availability of an integrated camera phase adjustment feature.
7 Measured from the front end of the mechanics to the camera flange.

Ordering information

It's easy to select the right lens for your application: our part numbers are coded as **MC12K yyyX-x** where **yyy** refers to the magnification and **-x** refers to the mount option:
- **R** for M72x0.75 mount (flange distance FD 6.56 mm)
- **F** for F-mount
- **I** for M58x0.75 mount (flange distance FD 11.48 mm).

E.g. MC12K100X-I for a MC12K100X with M58x0.75 mount.

MC16K series

Macro lenses for up to 82 mm line detectors

*RT

			Detector type					Optical specifications					Mechanical specification		
Part number	Mag.	Image cirlce	KAI-47051 56.7 mm diag w x h 48.71 x 29.04 (mm x mm)	Line - 16k 16k x 3.5 µm w x h 57.30 (mm)	Line - 12k 12k x 5.2 µm w 61.40 (mm)	Line - 8k 8k x 10 µm w x h 81.90 (mm)	Line - 16k 16k x 5.2 µm w 81.90 (mm)	WD	Focal length	F/#	Back focal length	Distortion	Mount	Length	Diam.
	(x)	Ø (mm)	Object field of view (mm x mm)					(mm)	(mm)		(mm)	(%)		(mm)	(mm)
RT-OPKE16-050M95	0.5	82	97.4 x 58.1	114.6	124.8	163.8	163.8	296 ±5	116	3.8	10	0.01	M95X1 FD 10	496 ±9	47
RT-OPKE16-070M95	0.7	82	69.6 x 41.5	81.9	89.1	117.0	117.0	221.9 ±5	116	3.8	10	0.01	M95X1 FD 10	447.9 ±9	47
RT-OPKE16-100M95	1.0	82	48.7 x 29.0	57.3	62.4	81.9	81.9	182.9 ±5	116	3.8	10	0.01	M95X0.75 FD 10	439.4 ±9	47
RT-OPKE16-150M95	1.5	82	32.5 x 19.4	38.2	41.6	54.6	54.6	143.9 ±5	116	3.8	10	0.01	M95X1 FD 10	453.7 ±9	47
RT-OPKE16-200M95	2.0	82	24.4 x 14.5	28.7	31.2	41.0	41.0	127.1 ±5	116	3.8	10	0.01	M95X1 FD 10	496 ±9	47
RT-OPKE16-300M95	3.0	82	16.2 x 9.70	19.1	20.8	27.3	27.3	111.4 ±5	116	4.2	10	0.01	M95X1 FD10	591.4 ±8	47

FULL RANGE OF COMPATIBLE ILLUMINATORS

Line lights, LTLNC, LTLNM, LTLNE series p. 172-177

Bar lights LTBRDC series p. 171

Backlights LT2BC, LTBP, LTBC, LTBFC series p. 162-170