

MACRO LENSES

70 - 81	1/3" TO 2/3" SENSORS
82 - 83	UP TO 4/3" SENSORS
84 - 88	VERY LARGE & LINESCAN SENSORS

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-engineering.com
for product compliancy with regulations, certifications and safety labels.



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

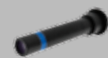
Small outer diameter (15 mm), fitting applications with limited space for optical components.

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. 30

FULL RANGE OF COMPATIBLE ILLUMINATORS



Ringlights LTLA, LTRNST, LTRNOB series

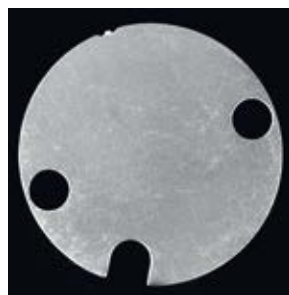
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Backlights LTBP, LTBC, LTBFC series

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Application examples





			Detector type					Optical specifications					Mechanical specifications			
Part number	Mag.	Image circle	1/3"	1/2.5"	1/2"	1/1.8"	2/3" - 5 Mpx	WD	Focal length	F/#	Distortion	Field depth	Mount	Length	Height	Diam.
			w x h	w x h	w x h	w x h	w x h									
	(x)	Ø (mm)	4.80 x 3.60	5.70 x 4.28	6.40 x 4.80	7.13 x 5.37	8.45 x 7.07	(mm)	(mm)	(wF/#)	(%)	(mm)	(mm)	(mm)	(mm)	
Object field of view (mm x mm)																
MC 300X	3.00	11.0	1.60 x 1.20	1.90 x 1.43	2.13 x 1.60	2.38 x 1.79	2.82 x 2.36	29	28.2	5.0 (20)	< 0.01	0.09	C	106.5	30.0	15
MC 200X	2.00	11.0	2.40 x 1.80	2.85 x 2.14	3.20 x 2.40	3.56 x 2.68	4.22 x 3.53	33	28.2	5.3 (16)	< 0.01	0.16	C	78.1	30.0	15
MC 150X	1.50	11.0	3.20 x 2.40	3.80 x 2.85	4.27 x 3.20	4.75 x 3.58	5.63 x 4.71	38	28.2	5.2 (13)	< 0.01	0.23	C	63.9	30.0	15
MC 100X	1.00	11.0	4.80 x 3.60	5.70 x 4.28	6.40 x 4.80	7.13 x 5.37	8.45 x 7.07	47	28.2	5.0 (10)	< 0.01	0.40	C	49.9	30.0	15
MC 075X	0.75	11.0	6.40 x 4.80	7.60 x 5.70	8.53 x 6.40	9.50 x 7.16	11.3 x 9.42	58	28.2	5.1 (9)	< 0.02	0.63	C	42.8	30.0	15
MC 050X	0.50	11.0	9.60 x 7.20	11.4 x 8.55	12.8 x 9.60	14.3 x 10.7	16.9 x 14.1	75	28.2	5.3 (8)	< 0.02	1.27	C	35.7	30.0	15
MC 033X	0.33	11.0	14.4 x 10.8	17.1 x 12.8	19.2 x 14.4	21.4 x 16.1	25.4 x 21.2	102	28.2	5.3 (7)	< 0.05	2.50	C	31.0	30.0	15

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

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

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

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.

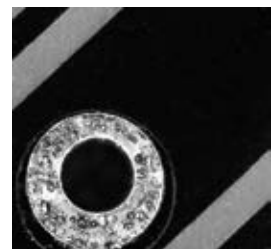
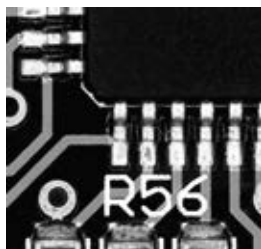
MC3-03X is a multi-configuration macro lens suitable for the inspection of objects whose size varies from a few millimeters to some centimeters. Magnification and focus can be tuned by adjusting a lockable rotating knob.

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.

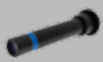
Moreover, the optical distortion approaches zero at any magnification, making this lens perfectly suitable for measurement applications.

Application examples





FOR HIGHER MAGNIFICATION TELECENTRIC LENSES SEE ALSO



TCHM series

p. 30

FULL RANGE OF COMPATIBLE ILLUMINATORS



Ringlights LTLA, LTRNST, LTRNOB series

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Backlights LTBP, LTBC, LTBFC series

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MC3-03X macro FOV and WD selection chart

Number of spacers	Mag.	Image circle	WD	F/# (wF/#)	Field depth	Detector type					Dimensions		
						1/3"	1/2.5"	1/2"	1/1.8"	2/3" - 5 Mpx	Mount	Length	Diam.
	(x)	Ø (mm)	(mm)		(mm)	w x h 4.80 x 3.60 (mm x mm)	w x h 5.70 x 4.28 (mm x mm)	w x h 6.40 x 4.80 (mm x mm)	w x h 7.13 x 5.37 (mm x mm)	w x h 8.45 x 7.07 (mm x mm)		(mm)	(mm)
Object field of view (mm x mm)													
0	0.1	11.0	275	5.5 (6)	23.8	48.0 x 36.0	57.0 x 42.8	64.0 x 48.0	71.3 x 53.7	84.5 x 70.7	C	50.5	28
	0.2	11.0	136	5.0 (6)	5.95	24.0 x 18.0	28.5 x 21.4	32.0 x 24.0	35.6 x 26.8	42.2 x 35.3			
	0.3	11.0	92	5.4 (7)	3.09	16.0 x 12.0	19.0 x 14.3	21.3 x 16.0	23.8 x 17.9	28.2 x 23.6			
	0.4	11.0	71	5.0 (7)	1.74	12.0 x 9.00	14.3 x 10.7	16.0 x 12.0	17.8 x 13.4	21.1 x 17.7			
	0.5	11.0	60	5.3 (8)	1.27	9.60 x 7.20	11.4 x 8.56	12.8 x 9.60	14.3 x 10.7	16.9 x 14.1			
	0.6	11.0	54	5.6 (9)	0.99	8.00 x 6.00	9.50 x 7.13	10.7 x 8.00	11.9 x 8.95	14.1 x 11.8			
	0.7	11.0	50	5.3 (9)	0.73	6.86 x 5.14	8.14 x 6.11	9.14 x 6.86	10.2 x 7.67	12.1 x 10.1			
	0.8	11.0	47	5.6 (10)	0.62	6.00 x 4.50	7.13 x 5.35	8.00 x 6.00	8.91 x 6.71	10.6 x 8.83			
	0.9	11.0	46	5.3 (10)	0.49	5.33 x 4.00	6.33 x 4.76	7.11 x 5.33	7.92 x 5.96	9.38 x 7.85			
	1.0	11.0	46	5.5 (11)	0.44	4.80 x 3.60	5.70 x 4.28	6.40 x 4.80	7.13 x 5.37	8.45 x 7.07			
1	0.7	11.0	31	5.3 (9)	0.73	6.86 x 5.14	8.14 x 6.11	9.14 x 6.86	10.2 x 7.67	12.1 x 10.1	C	69.0	28
	0.8	11.0	29	5.6 (10)	0.62	6.00 x 4.50	7.13 x 5.35	8.00 x 6.00	8.91 x 6.71	10.6 x 8.83			
	0.9	11.0	28	5.3 (10)	0.49	5.33 x 4.00	6.33 x 4.76	7.11 x 5.33	7.92 x 5.96	9.38 x 7.85			
	1.0	11.0	27	5.5 (11)	0.44	4.80 x 3.60	5.70 x 4.28	6.40 x 4.80	7.13 x 5.37	8.45 x 7.07			
	1.1	11.0	28	5.2 (11)	0.36	4.36 x 3.27	5.18 x 3.89	5.82 x 4.36	6.48 x 4.88	7.68 x 6.42			
	1.2	11.0	28	5.5 (12)	0.33	4.00 x 3.00	4.75 x 3.57	5.33 x 4.00	5.94 x 4.47	7.04 x 5.89			
	1.3	11.0	29	5.2 (12)	0.28	3.69 x 2.77	4.38 x 3.29	4.92 x 3.69	5.48 x 4.13	6.50 x 5.44			
	1.4	11.0	31	5.4 (13)	0.26	3.43 x 2.57	4.07 x 3.06	4.57 x 3.43	5.09 x 3.83	6.03 x 5.05			
	1.5	11.0	32	5.2 (13)	0.23	3.20 x 2.40	3.80 x 2.85	4.27 x 3.20	4.75 x 3.58	5.63 x 4.71			
	1.6	11.0	34	5.4 (14)	0.22	3.00 x 2.25	3.56 x 2.68	4.00 x 3.00	4.46 x 3.36	5.28 x 4.42			
2	1.4	11.0	12	5.4 (13)	0.26	3.43 x 2.57	4.07 x 3.06	4.57 x 3.43	5.09 x 3.83	6.03 x 5.05	C	87.5	28
	1.5	11.0	14	5.2 (13)	0.23	3.20 x 2.40	3.80 x 2.85	4.27 x 3.20	4.75 x 3.58	5.63 x 4.71			
	1.6	11.0	15	5.4 (14)	0.22	3.00 x 2.25	3.56 x 2.68	4.00 x 3.00	4.46 x 3.36	5.28 x 4.42			
	1.7	11.0	17	5.2 (14)	0.19	2.82 x 2.12	3.35 x 2.52	3.76 x 2.82	4.19 x 3.16	4.97 x 4.16			
	1.8	11.0	19	5.4 (15)	0.18	2.67 x 2.00	3.17 x 2.38	3.56 x 2.67	3.96 x 2.98	4.69 x 3.93			
	1.9	11.0	21	5.2 (15)	0.16	2.53 x 1.89	3.00 x 2.25	3.37 x 2.53	3.75 x 2.83	4.45 x 3.72			
	2.0	11.0	23	5.3 (16)	0.16	2.40 x 1.80	2.85 x 2.14	3.20 x 2.40	3.56 x 2.68	4.22 x 3.53			
	2.1	11.0	25	5.2 (16)	0.14	2.29 x 1.71	2.71 x 2.04	3.05 x 2.29	3.39 x 2.56	4.02 x 3.36			
	2.2	11.0	27	5.3 (17)	0.14	2.18 x 1.64	2.59 x 1.95	2.91 x 2.18	3.24 x 2.44	3.84 x 3.21			
	2.3	11.0	30	5.5 (18)	0.14	2.09 x 1.57	2.48 x 1.86	2.78 x 2.09	3.10 x 2.33	3.67 x 3.07			
3	2.1	11.0	7	5.2 (16)	0.14	2.29 x 1.71	2.71 x 2.04	3.05 x 2.29	3.39 x 2.56	4.02 x 3.36	C	106.0	28
	2.2	11.0	9	5.3 (17)	0.14	2.18 x 1.64	2.59 x 1.95	2.91 x 2.18	3.24 x 2.44	3.84 x 3.21			
	2.3	11.0	11	5.5 (18)	0.14	2.09 x 1.57	2.48 x 1.86	2.78 x 2.09	3.10 x 2.33	3.67 x 3.07			
	2.4	11.0	14	5.3 (18)	0.12	2.00 x 1.50	2.38 x 1.78	2.67 x 2.00	2.97 x 2.24	3.52 x 2.94			
	2.5	11.0	16	5.4 (19)	0.12	1.92 x 1.44	2.28 x 1.71	2.56 x 1.92	2.85 x 2.15	3.38 x 2.83			
	2.6	11.0	18	5.3 (19)	0.11	1.85 x 1.38	2.19 x 1.65	2.46 x 1.85	2.74 x 2.06	3.25 x 2.72			
	2.7	11.0	21	5.4 (20)	0.11	1.78 x 1.33	2.11 x 1.59	2.37 x 1.78	2.64 x 1.99	3.13 x 2.62			
	2.8	11.0	23	5.3 (20)	0.10	1.71 x 1.29	2.04 x 1.53	2.29 x 1.71	2.55 x 1.92	3.02 x 2.52			
	2.9	11.0	26	5.4 (21)	0.10	1.66 x 1.24	1.97 x 1.48	2.21 x 1.66	2.46 x 1.85	2.91 x 2.44			
	3.0	11.0	28	5.3 (21)	0.09	1.60 x 1.20	1.90 x 1.43	2.13 x 1.60	2.38 x 1.79	2.82 x 2.36			

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

2 At the borders of the field depth the image can be still used for measurement but, to get a very 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.

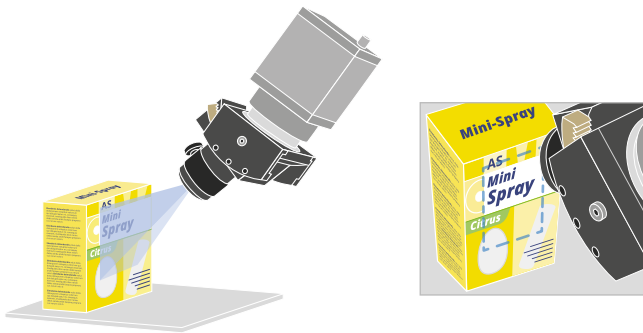
Application flexibility

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.

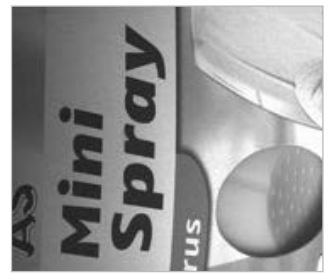
Examples of 3D imaging configuration



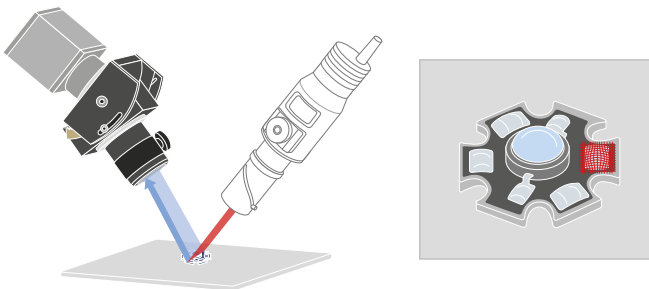
MCSM1-01X imaging a sample from an angled point of view.



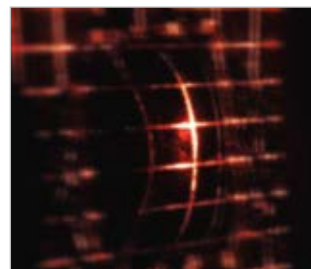
Without tilt adjustment, the object is not homogeneously focused.



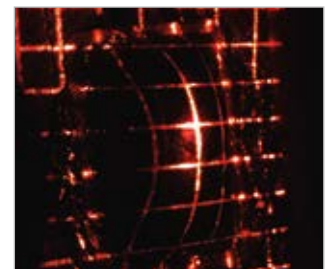
At the Scheimpflug angle, the image becomes sharp.



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



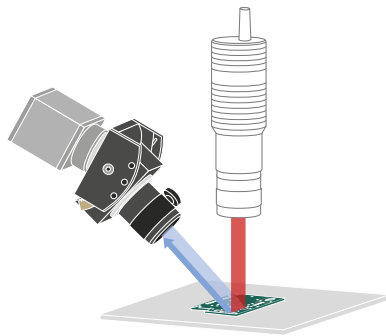
Without tilt adjustment, the image of the surface is not homogeneously focused.



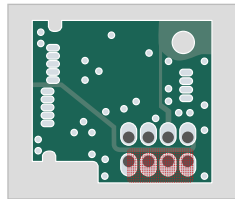
At the Scheimpflug angle, the image is sharp over the entire surface where the paste has been deposited.



FOR TELECENTRIC LENSES WITH SCHEIMPLUG ADJUSTMENT SEE ALSO		
	TCSM series	p. 16
FULL RANGE OF COMPATIBLE PRODUCTS FOR 3D APPLICATIONS		
	LED pattern projectors	p. 146
FULL RANGE OF COMPATIBLE CAMERAS		
	Area scan cameras	p. 180-185



MCSM1-01X combined with LTRHP3W-R.

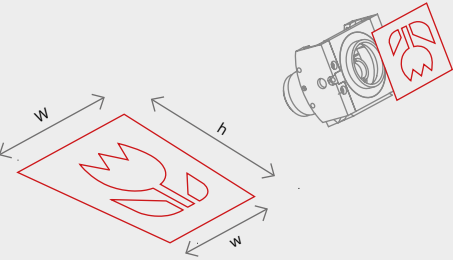
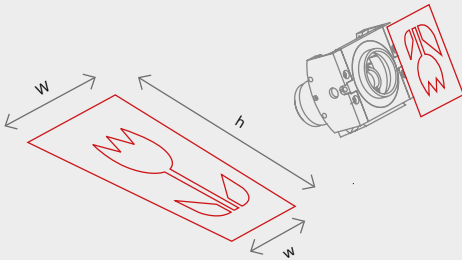


Without tilt adjustment, the image is out of focus.



At the Scheimpflug angle, the entire surface becomes focused.

FOV and WD selection chart

					Long detector side horizontal			Long detector side vertical		
Mag.	F/# (wF/#)	Object tilt	Mount tilt	WD	1/3" w x h	1/2" w x h	2/3" w x h	1/3" w x h	1/2" w x h	2/3" w x h
(x)	1	(deg)	(deg)	(mm)	4.80 x 3.60 (mm x mm)	6.40 x 4.80 (mm x mm)	8.80 x 6.60 (mm x mm)	3.60 x 4.80 (mm x mm)	4.80 x 6.40 (mm x mm)	6.60 x 8.80 (mm x mm)
					Field of view - w (W) x h - (mm x mm)			Field of view - w (W) x h - (mm x mm)		
										
1	6.3 (12.5)	0.0	0.0	46.0	4.80 (4.80) x 3.60	6.40 (6.40) x 4.80	8.80 (8.80) x 6.60	3.60 (3.60) x 4.80	4.80 (4.80) x 6.40	6.60 (6.60) x 8.80
		5.0	5.0	46.0	4.75 (4.85) x 3.61	6.33 (6.47) x 4.81	8.71 (8.89) x 6.61	3.55 (3.65) x 4.81	4.73 (4.87) x 6.41	6.51 (6.69) x 8.81
		10.0	10.0	46.0	4.70 (4.90) x 3.60	6.27 (6.53) x 4.80	8.62 (8.98) x 6.60	3.51 (3.70) x 4.81	4.68 (4.93) x 6.41	6.43 (6.78) x 8.81
		15.0	15.0	46.0	4.64 (4.95) x 3.61	6.18 (6.60) x 4.81	8.50 (9.08) x 6.61	3.46 (3.75) x 4.81	4.61 (5.00) x 6.41	6.34 (6.88) x 8.81
0.75	6.2 (10.9)	0.0	0.0	47.8	6.43 (6.43) x 4.82	8.57 (8.57) x 6.42	11.8 (11.8) x 8.83	4.82 (4.82) x 6.43	6.42 (6.42) x 8.57	8.83 (8.83) x 11.8
		7.5	5.7	47.8	6.33 (6.52) x 4.84	8.44 (8.70) x 6.45	11.6 (12.0) x 8.87	4.72 (4.92) x 6.45	6.29 (6.56) x 8.60	8.65 (9.02) x 11.8
		15.0	11.4	47.8	6.23 (6.63) x 4.89	8.31 (8.84) x 6.52	11.4 (12.2) x 8.97	4.63 (5.02) x 6.53	6.17 (6.70) x 8.71	8.48 (9.21) x 12.0
		20.0	15.3	47.8	6.17 (6.70) x 4.95	8.23 (8.93) x 6.60	11.3 (12.3) x 9.08	4.57 (1.83) x 6.61	6.09 (2.44) x 8.81	8.37 (3.35) x 12.1
0.5	6.3 (9.4)	0.0	0.0	59.6	9.63 (9.63) x 7.23	12.8 (12.8) x 9.64	17.7 (17.7) x 13.3	7.23 (7.23) x 9.63	9.64 (9.64) x 12.8	13.3 (13.3) x 17.7
		10.0	5.0	59.6	9.44 (9.83) x 7.31	12.6 (13.1) x 9.75	17.3 (18.0) x 13.4	7.03 (7.43) x 9.74	9.37 (9.91) x 13.0	12.9 (13.6) x 17.9
		20.0	10.4	59.6	9.25 (10.1) x 7.58	12.3 (13.4) x 10.1	17.0 (18.4) x 13.9	6.84 (7.65) x 10.1	9.12 (10.2) x 13.5	12.6 (14.0) x 18.6
		30.0	16.1	59.6	9.04 (10.3) x 8.05	12.1 (13.7) x 10.7	16.6 (18.9) x 14.8	6.65 (7.91) x 10.8	8.87 (10.5) x 14.4	12.2 (14.5) x 19.7
0.33	6.2 (8.3)	0.0	0.0	83.8	14.6 (14.6) x 10.9	19.4 (19.4) x 14.6	26.7 (26.7) x 20.1	10.9 (10.9) x 14.5	14.6 (14.6) x 19.4	20.1 (20.1) x 26.6
		15.0	5.1	83.8	14.1 (14.9) x 11.3	18.9 (19.9) x 15.1	25.9 (27.4) x 20.7	10.5 (11.4) x 15.1	14.0 (15.2) x 20.1	19.3 (20.9) x 27.6
		30.0	10.8	83.8	13.7 (15.6) x 12.5	18.2 (20.8) x 16.6	25.1 (28.6) x 22.8	10.0 (12.0) x 16.7	13.4 (16.0) x 22.2	18.4 (22.0) x 30.6
		45.0	18.3	83.8	13.1 (16.4) x 14.9	17.5 (21.9) x 19.8	24.1 (30.1) x 27.3	9.52 (12.9) x 20.0	12.7 (17.1) x 26.7	17.5 (23.6) x 36.7
0.2	6.3 (7.5)	0.0	0.0	135.3	24.0 (24.0) x 18.0	32.0 (32.0) x 24.0	44.0 (44.0) x 33.0	18.0 (18.0) x 24.0	24.0 (24.0) x 32.0	33.0 (33.0) x 44.0
		15.0	3.1	135.3	23.3 (24.8) x 18.6	31.0 (33.0) x 24.8	42.7 (45.4) x 34.2	17.3 (18.8) x 24.9	23.0 (25.1) x 33.1	31.7 (34.5) x 45.6
		30.0	6.6	135.3	22.5 (25.7) x 20.7	30.0 (34.3) x 27.7	41.2 (47.2) x 38.0	16.5 (19.8) x 27.8	22.0 (26.4) x 37.0	30.3 (36.3) x 50.9
		45.0	11.4	135.3	21.5 (27.1) x 25.3	28.7 (36.2) x 33.7	39.5 (49.7) x 46.4	15.6 (21.3) x 34.1	20.8 (28.4) x 45.4	28.6 (39.0) x 62.5
0.1	6.3 (6.9)	0.0	0.0	271.0	47.6 (47.6) x 35.7	63.5 (63.5) x 47.6	87.3 (87.3) x 65.5	35.7 (35.7) x 47.7	47.6 (47.6) x 63.6	65.5 (65.5) x 87.4
		15.0	1.6	271.0	46.2 (49.2) x 37.0	61.6 (65.6) x 49.4	84.7 (90.2) x 67.9	34.3 (37.3) x 49.4	45.7 (49.7) x 65.9	62.9 (68.4) x 90.6
		30.0	3.4	271.0	44.6 (51.1) x 41.4	59.5 (68.1) x 55.2	81.8 (93.7) x 75.8	32.8 (39.3) x 55.4	43.7 (52.4) x 73.8	60.1 (72.0) x 101.5
		45.0	5.8	271.0	42.7 (53.9) x 51.0	56.9 (71.9) x 68.0	78.2 (98.9) x 93.4	30.9 (42.3) x 68.7	41.2 (56.4) x 91.6	56.7 (77.6) x 125.9

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

MCZR series

4x macro revolver with motorized control



KEY ADVANTAGES

Perfect magnification costancy

No need of re-calibration after zooming.

Perfect parfocality

No need of refocusing when changing magnification.

Excellent image center stability

Each magnification maintains its FOV center.

Full motorized control

Zoom magnification can be set either manually or via software.

MANUAL AND SETUP

Please refer to our website for the updated MCZR manual and for a complete technical documentation of the setup process.

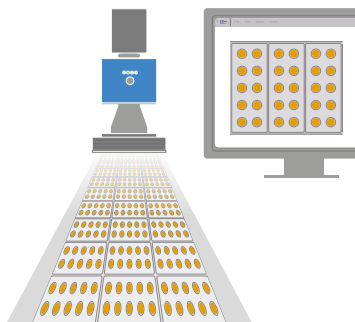
www.opto-engineering.com

MCZR series are multiple-magnification optical systems which combine high resolution imaging with the flexibility of having multiple fields of view available in one lens. Unlike conventional zoom systems, MCZR have been specifically designed to work as **macro** lenses, while the optical system ensures the same optical performance of very high-resolution fixed focal lenses.

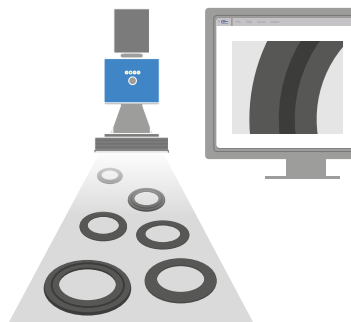
The device can be both automatically and manually set to one of the four available magnifications; this optomechanical solution ensures that both magnification and image centering are maintained when returning to a specific configuration.

All of these features make these optical products perfect for all those on-line applications requiring frequent changes of format and high quality images all in one lens.

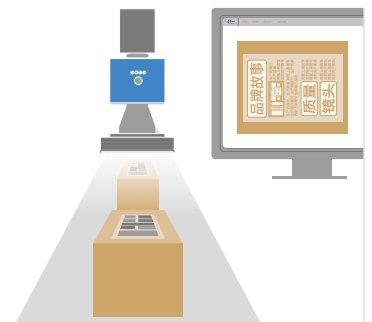
Application examples



Quality inspection of different sized objects



Quality inspection o-ring/gaskets



Package inspection



FOR TELECENTRIC MULTI-MAGNIFICATION OPTICS SEE ALSO		
	TCZR series	p. 24
DEDICATED COMPATIBLE RINGLIGHT		
	LTRN 036xx	p. 122
FULL RANGE OF COMPATIBLE CAMERAS		
	Area scan cameras	p. 180-185



Envelope barcode identification.



Gasket inspection.

			Detector type					Optical specifications					Dimensions		
Part number	Mag.	Image circle	1/3"	1/2.5"	1/2"	1/1.8"	2/3" - 5 Mpx	WD	F/# (wF/#)	Distortion	Field	CTF	Mount	Length	Width
			w x h	w x h	w x h	w x h	w x h				depth				
	(x)	Ø (mm)	4.80 x 3.60	5.70 x 4.28	6.40 x 4.80	7.13 x 5.37	8.45 x 7.07	(mm)		(%)	(mm)	(%)	(mm)	(mm x mm)	
Object field of view (mm x mm)							1		2		3				
MCZR 033-008	0.083	11.0	57.7 x 43.3	68.6 x 51.4	77.0 x 57.7	85.7 x 64.6	101.6 x 85.0	208.4	4.6 (5)	< 0.2	18	> 40	C	146.4	98.1 x 91.9
	0.167		28.8 x 21.6	34.2 x 25.7	38.4 x 28.8	42.8 x 32.2	50.7 x 42.4		4.3 (5)	< 0.1	4.5	> 50			
	0.250		19.2 x 14.4	22.8 x 17.1	25.6 x 19.2	28.5 x 21.5	33.8 x 28.3		4.0 (5)	< 0.05	2	> 60			
	0.333		14.4 x 10.8	17.1 x 12.8	19.2 x 14.4	21.4 x 16.1	25.4 x 21.2		3.8 (5)	< 0.05	1.1	> 60			
MCZR 025-006	0.063	10.0	76.7 x 57.5	91.1 x 68.3	102.3 x 76.7	113.9 x 85.8	134.9 x 112.9	275.9	4.7 (5)	< 0.2	30	> 50	C	149.9	98.1 x 91.9
	0.125		38.3 x 28.7	45.5 x 34.1	51.0 x 38.3	56.8 x 42.8	67.3 x 56.3		4.4 (5)	< 0.1	8	> 50			
	0.188		25.5 x 19.2	30.3 x 22.8	34.1 x 25.5	37.9 x 28.6	44.9 x 37.6		4.2 (5)	< 0.05	3.5	> 60			
	0.251		19.1 x 14.4	22.7 x 17.1	25.5 x 19.1	28.4 x 21.4	33.7 x 28.2		4.0 (5)	< 0.05	1.9	> 50			
MCZR 018-004	0.047	10.0	102.3 x 76.7	121.5 x 91.1	136.4 x 102.3	151.9 x 114.4	179.9 x 150.5	384.8	4.8 (5)	< 1	55	> 40	C	154.5	98.1 x 91.9
	0.094		51.0 x 38.3	60.6 x 45.5	68.1 x 51.0	75.8 x 57.1	89.8 x 75.1		4.6 (5)	< 0.2	14	> 40			
	0.141		34.1 x 25.5	40.5 x 30.3	45.4 x 34.1	50.6 x 38.1	59.9 x 50.1		4.4 (5)	< 0.1	6	> 60			
	0.188		25.5 x 19.1	30.3 x 22.7	34.0 x 25.5	37.9 x 28.6	44.9 x 37.6		4.2 (5)	< 0.05	3.5	> 60			
MCZR 014-003	0.035	10.0	137.5 x 103.1	163.4 x 122.5	183.4 x 137.5	204.2 x 153.8	242.0 x 202.4	532.3	4.8 (5)	< 1	100	> 40	C	154.7	98.1 x 91.9
	0.070		68.6 x 51.5	81.5 x 61.2	91.5 x 68.6	101.9 x 76.8	120.8 x 101.0		4.7 (5)	< 0.2	25	> 40			
	0.105		45.8 x 34.4	54.4 x 40.8	61.1 x 45.8	68.0 x 51.2	80.6 x 67.4		4.5 (5)	< 0.1	11	> 60			
	0.140		34.3 x 25.8	40.8 x 30.6	45.8 x 34.3	51.0 x 38.4	60.4 x 50.5		4.4 (5)	< 0.05	6	> 60			

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

2 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.

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

MZMT12X series

12X continuous macro zoom lenses with motorized control

NEW



KEY ADVANTAGES

Independent motorized zoom and focus control.

Compact and robust design.

High resolution macro imaging.

Compatible MTDV controller

designed to drive MZMT12X stepper motors via Modbus RTU/USB or manual interface.

DEDICATED COMPATIBLE RINGLIGHT



LTRN024NW

p. 122

COMPATIBLE STEPPER MOTOR CONTROLLER



MTDV

p. 224

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.

Product combinations*



MZMT23A12X-C-x
with coaxial illumination.



MZMT23A12X-C
without coaxial illumination.



CBMT001 cable + MTDV controller.

* To be ordered separately.

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/m²)	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.

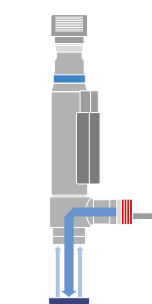
3 At 1 KHz.

4 For 1 min between the motor coils and the motor case.

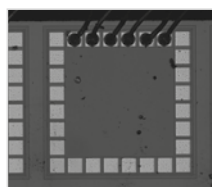
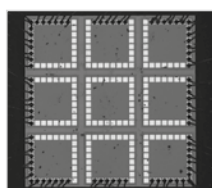
5 All compatible products must be ordered separately.

6 Cable is required to connect MZMT12X series to MTDV3CH-00A1 controller and must be ordered separately.

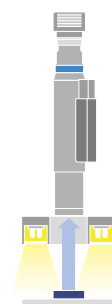
Application examples



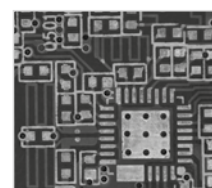
MZMTCX23A12X-C-W lens with white coaxial illumination inspecting integrated circuits assemblies.



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



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



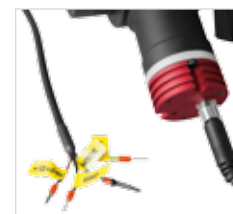
Precise light intensity tuning

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

Part number	Light color, wavelength peak	Device power ratings				LED power ratings		
		DC voltage		Power consumption	Max LED fwd current	Forward voltage		Max pulse current
		min (V)	max (V)			typ. (V)	max (V)	
		1		(W)	(mA)	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 $\pm 10\%$.

2 Used in continuous (not pulsed) mode.

3 At max forward current. Tolerance is $\pm 0.06V$ on forward voltage measurements.

4 At pulse width ≤ 10 ms, duty cycle $\leq 10\%$ condition.

Built-in electronics board must be bypassed (see tech info online).

Part number	Mag. Image circle		Detector type					Optical specifications					Electrical specs		Mechanical specs			
			1/3"	1/2.5"	1/2"	1/1.8"	2/3" - 5 Mpx	WD	wF/#	Dist.	Field depth	CTF	Coaxial light		Mount	Length	Width	Height
			w x h	w x h	w x h	w x h	w x h	(mm)		(%)	(mm)	(%)				(mm)		(mm)
			4.80 x 3.60	5.70 x 4.28	6.40 x 4.80	7.13 x 5.37	8.47 x 7.07			typ (max)	min							
			(mm x mm)	(mm x mm)	(mm x mm)	(mm x mm)	(mm x mm)			(%)	(mm)	(%)						
			Object field of view (mm x mm) 1					2	3	4	5				6			
MZMT 23A12X-C	max	7.3	11.0	0.70 x 0.50	0.80 x 0.60	0.90 x 0.70	1.00 x 0.70	1.20 x 1.00	31	< 0.25 (0.3)	0.02	> 25% @20lp/mm	no		C	300	70	73.6
	mid	1.1	11.0	4.50 x 3.30	5.30 x 4.00	5.90 x 4.50	6.60 x 5.00	7.90 x 6.60	81.2	< 0.05 (0.1)	0.44	> 40% @50lp/mm						
	min	0.6	11.0	8.00 x 6.00	9.50 x 7.10	10.7 x 8.00	11.9 x 9.00	14.1 x 11.8	12	< 0.2 (0.25)	1.30	> 30% @50lp/mm						
MZMTCX 23A12X-C-W	max	7.3	11.0	0.70 x 0.50	0.80 x 0.60	0.90 x 0.70	1.00 x 0.70	1.20 x 1.00	31	< 0.25 (0.3)	0.02	> 25% @20lp/mm	white		C	300	70	124.1
	mid	1.1	11.0	4.50 x 3.30	5.30 x 4.00	5.90 x 4.50	6.60 x 5.00	7.90 x 6.60	81.2	< 0.05 (0.1)	0.44	> 40% @50lp/mm						
	min	0.6	11.0	8.00 x 6.00	9.50 x 7.10	10.7 x 8.00	11.9 x 9.00	14.1 x 11.8	12	< 0.2 (0.25)	1.30	> 30% @50lp/mm						
MZMTCX 23A12X-C-G	max	7.3	11.0	0.70 x 0.50	0.80 x 0.60	0.90 x 0.70	1.00 x 0.70	1.20 x 1.00	31	< 0.25 (0.3)	0.02	> 25% @20lp/mm	green, 520 nm		C	300	70	124.1
	mid	1.1	11.0	4.50 x 3.30	5.30 x 4.00	5.90 x 4.50	6.60 x 5.00	7.90 x 6.60	81.2	< 0.05 (0.1)	0.44	> 40% @50lp/mm						
	min	0.6	11.0	8.00 x 6.00	9.50 x 7.10	10.7 x 8.00	11.9 x 9.00	14.1 x 11.8	12	< 0.2 (0.25)	1.30	> 30% @50lp/mm						

1 For the fields with the indication "Ø =", the image of a circular object of such diameter is fully inscribed into the detector.

2 Working distance: distance between the front end of the mechanics and the object. Set this distance within $\pm 3\%$ 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. wF/# is fixed at a specific magnification. wF/# changes when magnification is changed.

4 Percent deviation of the real image compared to an ideal, undistorted image. Absolute values are listed.

5 At the borders of the field depth the image can be still used for measurement but, to get a very sharp image, only half of the nominal field depth should be considered. Pixel size used for calculation is $5.5 \mu m$.

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



MCZM series

Macro zoom lenses



Part number	Optical specifications							Dimensions		
	Focal length	Magnification	Image circle	WD	f/#	Back focal length	Distortion	Length	Diam.	Mass
	(mm)		(mm)	(mm)		(mm)	(%)	(mm)	(mm)	(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 LTBP, LTBC, LTBFC series

p. 134-140



Dome lights LTDM series

p. 116

FULL RANGE OF COMPATIBLE CAMERAS



Area scan cameras

p. 180-185

MZMT5X series

5X continuous macro zoom lenses with motorized control



KEY ADVANTAGES

Motorized zoom, focus and aperture.

Compact and robust design.

High resolution macro imaging.

Compatible MTDV controller

designed to drive MZMT5X stepper motors via Modbus RTU / USB or manual interface.

Suitable for high speed applications.

MZMT10 and **MZMT43** motorized macro zoom lenses have been designed for inline and offline applications where items of various sizes must be inspected with high resolution macro imaging.

Unlike many zoom lenses, MZMT10/43 working f-number is constant when magnification is changed, thus ensuring high optical throughput even at high magnifications. MZMT10/43 models feature a total continuous magnification range of 5x and fit detectors up 4/3", making them a very flexible solution to be used in many diverse applications.

The Opto Engineering® motorized design features three bipolar stepper motors that respectively control zoom, focus and iris with fine increments, ensuring extremely accurate and repeatable results throughout the entire 5x zoom range.

MZMT5X moving parts are conveniently shielded and integrated within the lens barrel providing a zoom system that is both compact and robust. MZMT5X macro zoom lenses are complemented by dedicated stepper motor controller MTDV to be purchased separately.

All of these features make these zoom lenses perfect for all those on-line applications requiring changes of format and high quality images.

Electrical specifications

Iris	motorized
Focusing	
Zoom	
Connector	circular standard DIN 12Pos Male
Motor	
Number	3
Type	Stepper - bipolar
Supply voltage (V, DC)	5 - 24
Amps/phase (A)	0.5
Resistance/phase ¹ (Ω)	10 ± 7%
Inductance/phase ² (mH)	2.3 ± 20%
Holding Torque (N·m)	0.135
Ratio	1:50
Step angle (°)	18/50
Step accuracy	± 7%
Rotor inertia (Kg/m²)	1,0 x 10 ⁻⁷
Temperature rise (°C)	80
Ambient temperature (°C)	0 ÷ 50
Insulation resistance (MΩ)	100
Insulation class	E - 120 °C
Dielectric strength ³ (V AC)	500
Ambient humidity	max 85% (no condensation)
Compatibility ⁴	
Stepper motors controller	MTDV3CH-00A1
Cable ⁵	CBMT001 (circular standard DIN 12Pos Female to DB15M connector cable, 2 m)

¹ At 25 °C.

² At 1 KHz.

³ For 1 min between the motor coils and the motor case.

⁴ All compatible products must be ordered separately.

⁵ Cable is required to connect MZMT5X series to MTDV3CH-00A1 controller and must be ordered separately.

Product combinations*



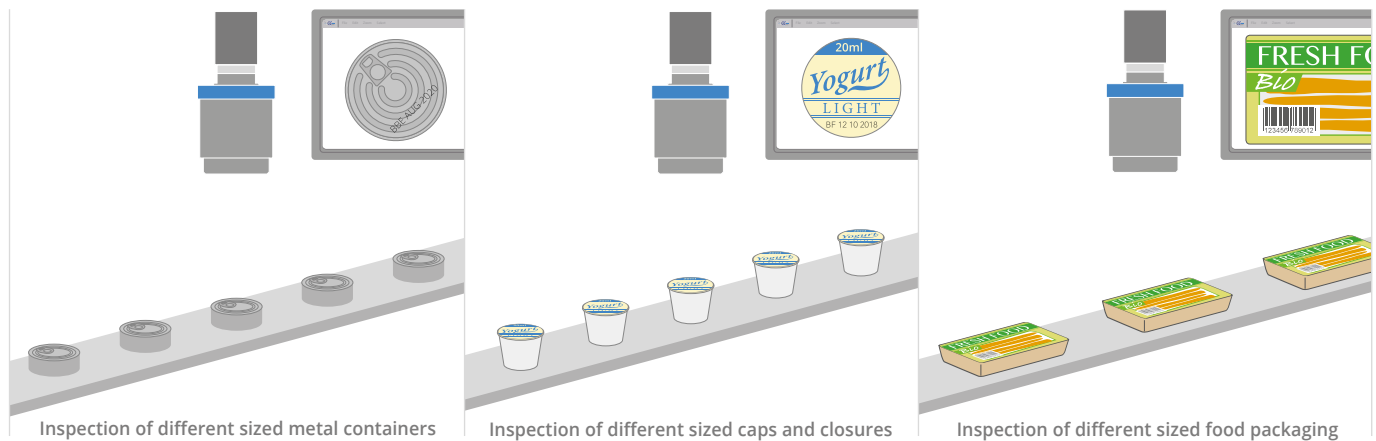
MZMT5X lens + CBMT001 cable + MTDV controller.

* To be ordered separately.



DEDICATED COMPATIBLE RINGLIGHTS		
	LTRN 064 xx	p. 122
COMPATIBLE STEPPER MOTOR CONTROLLER		
	MTDV	p. 224
FULL RANGE OF COMPATIBLE CAMERAS		
	Area scan cameras	p. 180-185

Application examples



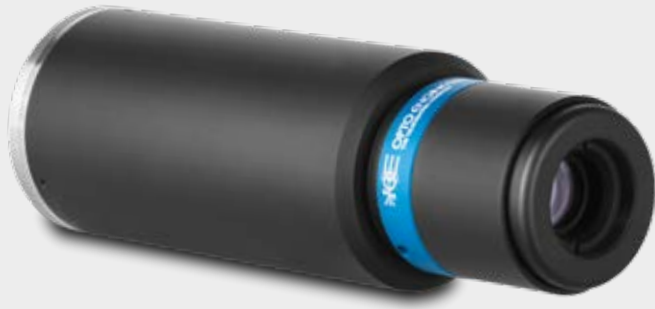
Part number	Mag.	Image circle Ø (mm)	Detector type										Optical specifications					Mechanical specs		
			1/3"	1/2.5"	1/2"	1/1.8"	2/3" - 5 Mpx	1"	1.2"	4/3"	WD	wF/#		Dist.	Field depth		CTF	Mount	Length	Diam.
			w x h	w x h	w x h	w x h	w x h	w x h	w x h	w x h		min	max	(%)	min	max	@50lp/mm			
			4.80 x 3.60	5.70 x 4.28	6.40 x 4.80	7.13 x 5.37	8.47 x 7.07	12.80 x 9.60	15.20 x 15.20	18.10 x 13.60										
			(mm x mm)	(mm x mm)	(mm x mm)	(mm x mm)	(mm x mm)	(mm x mm)	(mm x mm)	(mm x mm)	(mm)						(%)	(mm)	(mm)	(mm)
											2	3	4	5				6		
Object field of view (mm x mm) 1																				
MZMT 10A5X-C	max	0.327	16.0	14.7 x 11.0	17.4 x 13.1	19.6 x 14.7	21.8 x 16.4	25.9 x 21.6	39.2 x 29.4	Ø = 49.0				< 2.0	1.8	13.2	50 @wF/# 5.6	C	175	124
	0.147	16.0		32.7 x 24.5	38.9 x 29.2	43.6 x 32.7	48.6 x 36.6	57.8 x 48.2	87.3 x 65.5	Ø = 109.1				< 2.5	8.8	65.5	50 @wF/# 5.6			
	min	0.069	16.0	69.9 x 52.4	83.0 x 62.3	93.2 x 69.9	103.8 x 78.2	123.3 x 103.0	186.4 x 139.8	Ø = 233.0				< 3.5	32.8	298.6	65 @wF/# 5.6			
MZMT 43A5X-C	max	0.463	22.7	10.4 x 7.8	12.3 x 9.3	13.8 x 10.4	15.4 x 11.6	18.3 x 15.3	27.7 x 20.8	32.9 x 32.9	39.1 x 29.4			< 2.0	1.6	6.6	50 @wF/# 8	C	188	124
	0.310	22.7		15.5 x 11.6	18.4 x 13.8	20.7 x 15.5	23.0 x 17.3	27.3 x 22.8	41.3 x 31.0	49.1 x 49.1	58.4 x 43.9			< 2.0	3.7	14.7	60 @wF/# 8			
	min	0.097	22.7	49.4 x 37.0	58.6 x 44.0	65.8 x 49.4	73.4 x 55.2	87.1 x 72.7	131.7 x 98.8	156.4 x 156.4	186.2 x 139.9			< 3.5	37.3	121.9	40 @wF/# 8			
MZMT 43A5X-F	max	0.463	22.7	10.4 x 7.8	12.3 x 9.3	13.8 x 10.4	15.4 x 11.6	18.3 x 15.3	27.7 x 20.8	32.9 x 32.9	39.1 x 29.4			< 2.0	1.3	6.6	50 @wF/# 8	F	182	124
	0.310	22.7		15.5 x 11.6	18.4 x 13.8	20.7 x 15.5	23.0 x 17.3	27.3 x 22.8	41.3 x 31.0	49.1 x 49.1	58.4 x 43.9			< 2.0	3.7	14.7	60 @wF/# 8			
	min	0.097	22.7	49.4 x 37.0	58.6 x 44.0	65.8 x 49.4	73.4 x 55.2	87.1 x 72.7	131.7 x 98.8	156.4 x 156.4	186.2 x 139.9			< 3.5	37.3	149.0	40 @wF/# 8			
MZMT 43A5X-J	max	0.463	22.7	10.4 x 7.8	12.3 x 9.3	13.8 x 10.4	15.4 x 11.6	18.3 x 15.3	27.7 x 20.8	32.9 x 32.9	39.1 x 29.4			< 2.0	1.6	6.6	50 @wF/# 8	M42x1 FD12	193	124
	0.310	22.7		15.5 x 11.6	18.4 x 13.8	20.7 x 15.5	23.0 x 17.3	27.3 x 22.8	41.3 x 31.0	49.1 x 49.1	58.4 x 43.9			< 2.0	3.7	14.7	60 @wF/# 8			
	min	0.097	22.7	49.4 x 37.0	58.6 x 44.0	65.8 x 49.4	73.4 x 55.2	87.1 x 72.7	131.7 x 98.8	156.4 x 156.4	186.2 x 139.9			< 3.5	37.3	149.0	40 @wF/# 8			

- For the fields with the indication "Ø =", the image of a circular object of such diameter is fully inscribed into the detector.
- 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.
- Working F-number (wF/#): the real F-number of a lens when used as a macro.

- Percent deviation of the real image compared to an ideal, undistorted image. Absolute values are listed.
- At the borders of the field depth the image can be still used for measurement but, to get a very sharp image, only half of the nominal field depth should be considered. Pixel size used for calculation is 5.5 µm.
- Measured from the front end of the mechanics to the camera flange.

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 4K 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

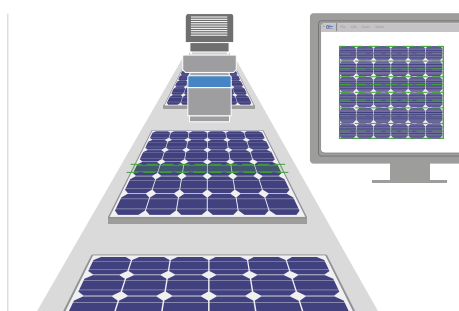


Mount N = M42x1

FULL RANGE OF COMPATIBLE ILLUMINATORS

	Line lights, LTLNC series	p. 142
	Bar lights LTBRC series	p. 141
	Backlights LTBP, LTBC, LTBFC series	p. 134-140

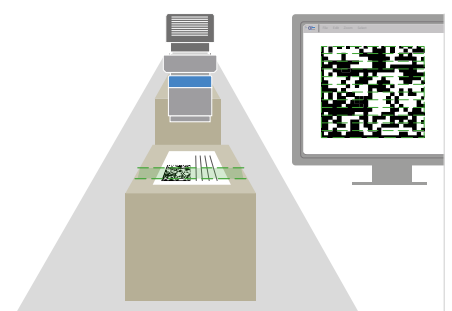
Application examples



Solar cell inspection



Print and web inspection

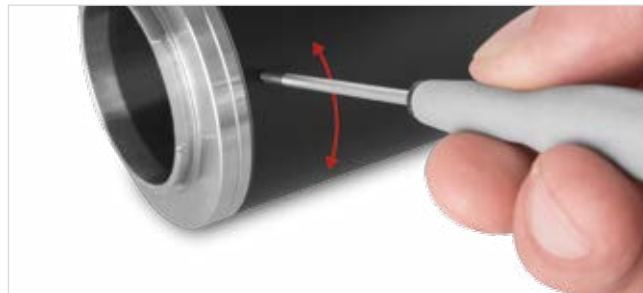


Identification: data-matrix and barcode reading



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								Dimensions			
Part number	Focusing	Mag.	KAI-04050	line 2 k	KAI4022/4021	KAI-08050	APS-C	line 4 k												
			16 mm diag		21.5 mm diag	22.6 mm diag	28.35 mm													
			w x h	2k x 10 µm	w x h	w x h	w x h	4k x 7 µm	WD	Focal	F/#	Distortion	Field	CTF	Image	Object	Length	Diam.		
			(mm x mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(W F/#)	typical (max)	depth	@50lp/mm	side NA	side NA	(mm)	(mm)	
1									234								5			
			Object field of view (mm x mm)														F N F N			
MC4K 025X-x	near	0.295	43.4 x 32.5	69.4	51.5 x 51.5	61.4 x 46.1	80.0 x 53.2	97.2	298.5											
	nominal	0.250	51.2 x 38.4	81.9	60.8 x 60.8	72.4 x 54.4	94.4 x 62.8	114.7	346.1	88.0	6.4 (8)	< 0.08 (0.1)	6.8	>60	0.063	0.018	80.0	115.9	64.0 52.0	
MC4K 050X-x	far	0.205	62.4 x 46.8	99.9	74.1 x 74.1	88.3 x 66.3	115.1 x 64.9	139.9	414.3											
	near	0.545	23.5 x 17.6	37.6	27.9 x 27.9	33.2 x 25.0	43.3 x 28.8	52.6	177.0											
MC4K 050X-x	nominal	0.500	25.6 x 19.2	41.0	30.4 x 30.4	36.2 x 27.2	47.2 x 31.4	57.3	189.9	88.0	6.7 (10)	< 0.04 (0.08)	2.5	> 50	0.050	0.027	99.5	135.4	64.0 52.0	
	far	0.455	28.1 x 21.1	45.0	33.4 x 33.4	39.8 x 29.9	51.9 x 31.6	63.0	205.2											
MC4K 075X-x	near	0.795	16.1 x 12.1	25.8	19.1 x 19.1	22.8 x 17.1	29.7 x 19.7	36.1	131.4											
	nominal	0.750	17.1 x 12.8	27.3	20.3 x 20.3	24.1 x 18.1	31.5 x 20.9	38.2	137.3	77.1	6.3 (11)	< 0.04 (0.08)	1.3	> 50	0.045	0.036	113.6	149.5	64.0 52.0	
MC4K 100X-x	far	0.704	18.2 x 13.6	29.1	21.6 x 21.6	25.7 x 19.3	33.5 x 21.0	40.7	143.9											
	near	1.045	12.2 x 9.19	19.6	14.5 x 14.5	17.3 x 13.0	22.5 x 15.0	27.4	108.2											
MC4K 100X-x	nominal	1.000	12.8 x 9.60	20.5	15.2 x 15.2	18.1 x 13.6	23.6 x 15.7	28.7	111.6	77.1	6.5 (13)	< 0.01 (0.03)	0.9	> 50	0.038	0.040	132.9	168.8	64.0 52.0	
	far	0.954	13.4 x 10.1	21.5	15.9 x 15.9	19.0 x 14.3	24.7 x 15.7	30.1	115.2											
MC4K 125X-x	near	1.295	9.88 x 7.41	15.8	11.7 x 11.7	14.0 x 10.5	18.2 x 12.2	22.1	94.0											
	nominal	1.250	10.2 x 7.68	16.4	12.2 x 12.2	14.5 x 10.9	18.9 x 12.6	22.9	96.1	77.1	6.7 (15)	< 0.01 (0.03)	0.7	> 40	0.033	0.043	152.2	188.1	64.0 52.0	
MC4K 150X-x	far	1.204	10.6 x 7.97	17.0	12.6 x 12.6	15.0 x 11.3	19.5 x 12.6	23.8	98.5											
	near	1.543	8.30 x 6.22	13.3	9.85 x 9.85	11.7 x 8.81	15.3 x 10.2	18.6	89.9											
MC4K 150X-x	nominal	1.500	8.53 x 6.40	13.7	10.1 x 10.1	12.1 x 9.07	15.7 x 10.5	19.1	91.4	79.8	6.8 (17)	< 0.01 (0.03)	0.5	> 35	0.029	0.045	178.6	214.5	64.0 52.0	
	far	1.455	8.80 x 6.60	14.1	10.4 x 10.4	12.4 x 9.35	16.2 x 10.6	19.7	93.0											
MC4K 175X-x	near	1.793	7.14 x 5.35	11.4	8.48 x 8.48	10.1 x 7.59	13.2 x 8.8	16.0	82.7											
	nominal	1.750	7.31 x 5.49	11.7	8.69 x 8.69	10.3 x 7.77	13.5 x 9.0	16.4	83.8	79.8	6.5 (18)	< 0.01 (0.03)	0.4	> 35	0.028	0.049	198.5	234.4	64.0 52.0	
MC4K 200X-x	far	1.705	7.51 x 5.63	12.0	8.91 x 8.91	10.6 x 7.98	13.8 x 9.0	16.8	85.0											
	near	2.042	6.27 x 4.70	10.0	7.44 x 7.44	8.86 x 6.66	11.6 x 7.7	14.0	77.3											
MC4K 200X-x	nominal	2.000	6.40 x 4.80	10.2	7.60 x 7.60	9.05 x 6.80	11.8 x 7.9	14.3	78.1	79.8	6.7 (20)	< 0.01 (0.03)	0.4	> 30	0.025	0.050	218.4	254.4	64.0 52.0	
	far	1.955	6.55 x 4.91	10.5	7.77 x 7.77	9.26 x 6.96	12.1 x 7.9	14.7	79.0											

- Maximum and minimum magnification changes when focusing.
- F/# = F-number, wF/# = Working F-number, the real F-number of a lens when used as a macro.
- Percent deviation of the real image compared to an ideal, undistorted image: typical (average production) values and maximum (guaranteed) values are listed.

- 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 taken into account.
- Measured from the front end of the mechanics to the camera flange; take into account a +/- 2.5 mm tolerance due to the focussing mechanism.

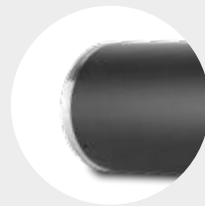
Ordering information

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:

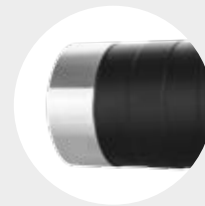
- **F** for F-mount
 - **N** for M42x1 mount (flange distance FD 10.56 mm).
- E.g. MC4K100X-N for a MC4K100X with M42x1 mount.

MC12K series

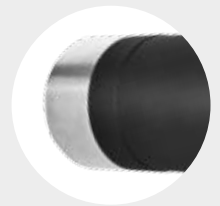
Macro lenses for 12 k and 16 k pixel linescan cameras



Mount F



Mount I = M58x0.75



Mount R = M72x0.75

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.

KEY ADVANTAGES

Macro design

Achieve unmatched resolution in critical applications.

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.

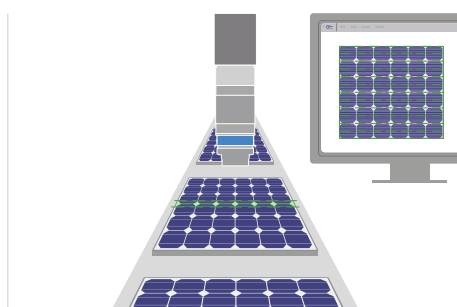
Wide image circle

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

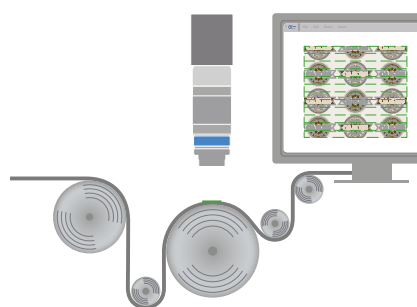
SENSOR SIZE								UP TO 62.4 mm
2048 px x 10 μ m	2048 px x 14 μ m	4096 px x 7 μ m	4096 px x 10 μ m	7450 px x 4.7 μ m	6144 px x 7 μ m	8192 px x 7 μ m	12288 px x 5 μ m	
20.5 mm	28.6 mm	28.6 mm	35 mm	41 mm	43 mm	57.3 mm	62 mm	

MC12K

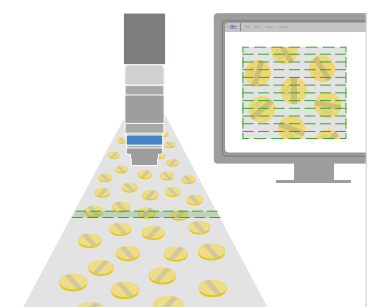
Application examples



Solar cell inspection



Print and web inspection



High speed sorting of tablets

			Detector type				Optical specifications									Dimensions				
Part number	Focusing	Mag. (x)	Full frame 35 mm w x h 36.0 x 24.0 (mm x mm)	Line 16 kpx 16 k x 3.5 µm 57.3 (mm)	Line 2 kpx 12 k x 5 µm 61.4 (mm)	Line 12 kpx 12 k x 5.2 µm 62.4 (mm)	WD (mm)	Focal length (mm)	F/# (wF/#)	Distortion typical (max) (%)	Field depth (mm)	CTF @50lp/mm (%)	Image side NA	Object side NA	Mount	Length (mm)	Diam. (mm)			
			Object field of view (mm x mm)															6	5	
MC12K 200X-F	near	2.017	17.8 x 11.9	n.a.	n.a.	n.a.	93.6								F					
	nominal	2.000	18.0 x 12.0	n.a.	n.a.	n.a.	94.0	88.2	6.0 (18)	< 0.01 (0.02)	0.15	> 30	0.028	0.056		242.2	76			
	far	1.983	18.2 x 12.1	n.a.	n.a.	n.a.	94.4													
MC12K 200X-I	near	2.017	17.8 x 11.9	28.7	n.a.	n.a.	93.6								M58 x 0.75					
	nominal	2.000	18.0 x 12.0	28.7	n.a.	n.a.	94.0	88.2	6.0 (18)	< 0.01 (0.02)	0.15	> 30	0.028	0.056	FD 11.48	276.7	76			
	far	1.983	18.2 x 12.1	29.2	n.a.	n.a.	94.4													
MC12K 200X-R	near	2.017	17.8 x 11.9	28.7	30.5	30.7	93.6								M72 x 0.75					
	nominal	2.000	18.0 x 12.0	28.7	30.7	31.2	94.0	88.2	6.0 (18)	< 0.01 (0.02)	0.15	> 30	0.028	0.056	FD 6.56	281.8	76			
	far	1.983	18.2 x 12.1	29.2	31.0	31.3	94.4													
MC12K 150X-F	near	1.517	23.7 x 15.8	38.2	n.a.	n.a.	109.3								F					
	nominal	1.500	24.0 x 16.0	38.2	n.a.	n.a.	110.0	89.9	6.0 (15)	< 0.01 (0.02)	0.2	> 40	0.033	0.05		202.8	76			
	far	1.484	24.3 x 16.2	39.0	n.a.	n.a.	110.7													
MC12K 150X-I	near	1.517	23.7 x 15.8	38.2	n.a.	n.a.	109.3								M58 x 0.75					
	nominal	1.500	24.0 x 16.0	38.2	n.a.	n.a.	110.0	89.9	6.0 (15)	< 0.01 (0.02)	0.2	> 40	0.033	0.05	FD 11.48	237.4	76			
	far	1.484	24.3 x 16.2	39.0	n.a.	n.a.	110.7													
MC12K 150X-R	near	1.517	23.7 x 15.8	38.2	40.5	40.9	109.3								M72 x 0.75					
	nominal	1.500	24.0 x 16.0	38.2	41.0	41.6	110.0	89.9	6.0 (15)	< 0.01 (0.02)	0.2	> 40	0.033	0.05	FD 6.56	242.5	76			
	far	1.484	24.3 x 16.2	39.0	41.4	41.8	110.7													
MC12K 100X-F	near	1.018	35.4 x 23.6	56.9	n.a.	n.a.	134.0								F					
	nominal	1.000	36.0 x 24.0	57.3	n.a.	n.a.	135.5	88.3	6.0 (12)	< 0.01 (0.02)	0.3	> 50	0.042	0.042		155.4	76			
	far	0.984	36.6 x 24.4	58.9	n.a.	n.a.	137.0													
MC12K 100X-I	near	1.018	35.4 x 23.6	56.9	n.a.	n.a.	134.0								M58 x 0.75					
	nominal	1.000	36.0 x 24.0	57.3	n.a.	n.a.	135.5	88.3	6.0 (12)	< 0.01 (0.02)	0.3	> 50	0.042	0.042	FD 11.48	189.9	76			
	far	0.984	36.6 x 24.4	58.9	n.a.	n.a.	137.0													
MC12K 100X-R	near	1.018	35.4 x 23.6	56.9	60.4	61.0	134.0								M72 x 0.75					
	nominal	1.000	36.0 x 24.0	57.3	61.4	62.4	135.5	88.3	6.0 (12)	< 0.01 (0.02)	0.3	> 50	0.042	0.042	FD 6.56	195.0	76			
	far	0.984	36.6 x 24.4	58.9	62.5	63.1	137.0													
MC12K 067X-F	near	0.684	52.7 x 35.1	84.7	n.a.	n.a.	179.7								F					
	nominal	0.667	54.0 x 36.0	86.0	n.a.	n.a.	183.0	89.9	6.0 (10)	< 0.01 (0.02)	0.6	> 60	0.050	0.033		130.0	76			
	far	0.650	55.4 x 36.9	88.2	n.a.	n.a.	186.4													
MC12K 067X-I	near	0.684	52.7 x 35.1	84.7	n.a.	n.a.	179.7								M58 x 0.75					
	nominal	0.667	54.0 x 36.0	86.0	n.a.	n.a.	183.0	89.9	6.0 (10)	< 0.01 (0.02)	0.6	> 60	0.050	0.033	FD 11.48	164.5	76			
	far	0.650	55.4 x 36.9	88.2	n.a.	n.a.	186.4													
MC12K 067X-R	near	0.684	52.7 x 35.1	84.7	89.9	90.7	179.7								M72 x 0.75					
	nominal	0.667	54.0 x 36.0	86.0	92.2	93.6	183.0	89.9	6.0 (10)	< 0.01 (0.02)	0.6	> 60	0.050	0.033	FD 6.56	169.6	76			
	far	0.650	55.4 x 36.9	88.2	94.5	96.0	186.4													
MC12K 050X-F	near	0.517	69.6 x 46.4	111.9	n.a.	n.a.	217.1								F					
	nominal	0.500	72.0 x 48.0	114.7	n.a.	n.a.	223.0	88.2	6.0 (9)	< 0.01 (0.02)	0.9	> 50	0.056	0.028		113.6	76			
	far	0.483	74.5 x 49.6	119.7	n.a.	n.a.	229.1													
MC12K 050X-I	near	0.517	69.6 x 46.4	111.9	n.a.	n.a.	217.1								M58 x 0.75					
	nominal	0.500	72.0 x 48.0	114.7	n.a.	n.a.	223.0	88.2	6.0 (9)	< 0.01 (0.02)	0.9	> 50	0.056	0.028	FD 11.48	148.2	76			
	far	0.483	74.5 x 49.6	119.7	n.a.	n.a.	229.1													
MC12K 050X-R	near	0.517	69.6 x 46.4	111.9	118.8	119.9	217.1								M72 x 0.75					
	nominal	0.500	72.0 x 48.0	114.7	122.9	124.8	223.0	88.2	6.0 (9)	< 0.01 (0.02)	0.9	> 50	0.056	0.028	FD 6.56	153.3	76			
	far	0.483	74.5 x 49.6	119.7	127.1	128.3	229.1													
MC12K 025X-F	near	0.266	135.3 x 90.2	217.6	n.a.	n.a.	393.6								F					
	nominal	0.250	144.0 x 96.0	229.4	n.a.	n.a.	415.5	92.1	6.4 (8)	< 0.05 (0.1)	3.2	> 50	0.063	0.016		99.3	76			
	far	0.234	154.2 x 102.8	247.9	n.a.	n.a.	393.6													
MC12K 025X-I	near	0.266	135.3 x 90.2	217.6	n.a.	n.a.	393.6								M58 x 0.75					
	nominal	0.250	144.0 x 96.0	229.4	n.a.	n.a.	415.5	92.1	6.4 (8)	< 0.05 (0.1)	3.2	> 50	0.063	0.016	FD 11.48	133.8	76			
	far	0.234	154.2 x 102.8	247.9	n.a.	n.a.	393.6													
MC12K 025X-R	near	0.266	135.3 x 90.2	217.6	231.1	233.2	393.6								M72 x 0.75					
	nominal	0.250	144.0 x 96.0	229.4	245.8	249.6	415.5	92.1	6.4 (8)	< 0.05 (0.1)	3.2	> 50	0.063	0.016	FD 6.56	138.9	76			
	far	0.234	154.2 x 102.8	247.9	263.2	265.6	393.6													
MC12K 012X-I	near	0.142	254.4 x 169.6	409.1	n.a.	n.a.	678.5								M58 x 0.75					
	nominal	0.125	287.0 x 192.0	458.4	n.a.	n.a.	762.0	89.8	6.2 (7)	< 0.05 (0.1)	11	> 50	0.071	0.009	FD 11.48	120.2	76			
	far	0.108	332.5 x 221.7	534.5	n.a.	n.a.	873.2													
MC12K 012X-R	near	0.142	254.4 x 169.6	409.1	434.4	438.3	678.5								M72 x 0.75					
	nominal	0.125	287.0 x 192.0	458.4	491.1	498.8	762.0	89.8	6.2 (7)	< 0.05 (0.1)	11	> 50	0.071	0.009	FD 6.56	125.3	76			
	far	0.108	332.5 x 221.7	534.5	567.5	572.6	873.2													
MC12K 008X-I	near	0.100	359.2 x 239.5	577.7	n.a.	n.a.	924.1								M58 x 0.75					
	nominal	0.083	432.0 x 288.0	687.3	n.a.	n.a.	1102.5	88.5	6.5 (7)	< 0.05 (0.1)	15	> 50	0.071	0.006	FD 11.48	115.9	76			
	far	0.067	541.1 x 360.7	869.9	n.a.	n.a.	1370.9													
MC12K 008X-R	near	0.100	359.2 x 239.5	577.7	613.5	619.1	924.1								M72 x 0.75					
	nominal	0.083	432.0 x 288.0	687.3	736.4	747.9	1102.5	88.5	6.5 (7)	< 0.05 (0.1)	15	> 50	0.071	0.006	FD 6.56	121.0	76			
	far	0.067	541.1 x 360.7	869.9	923.6	932.0	1370.9													

- 1 Maximum and minimum magnification changes when focusing.
- 2 F/# = F-number, wF/# = Working F-number, the real F-number of a lens when used as a macro.
- 3 Percent deviation of the real image compared to an ideal, undistorted image: typical (average production) values and maximum (guaranteed) values are listed.
- 4 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 taken into account.
- 5 Measured from the front end of the mechanics to the camera flange; take into account a +/- 2.5 mm tolerance due to the focussing mechanism.

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.

- 6 FD stands for Flange Distance (in mm), defined as the distance from the mounting flange (the "metal ring" in rear part of the lens) to the camera detector plane.
F Mount (-F) may cause vignetting with sensor diagonal > 50 mm.
For such sensor size we suggest mount M72x0.75, FD 6.56 (-R).
Mount M58x0.75 (-I) may cause vignetting with sensor diagonal > 52 mm.
For such sensor size we suggest mount M72x0.75, FD 6.56 (-R).

FULL RANGE OF COMPATIBLE ILLUMINATORS		
	Line lights, LTLNC series	p. 142
	Bar lights LTBRDC series	p. 141
	Backlights LTBP, LTBC, LTBC series	p. 134-140

FULL RANGE OF COMPATIBLE CLAMPING MECHANISMS		
	CMHOMC12Kxxx	p. 200

MC16K series

Macro Lenses for up to 82 mm line detectors



Part number	Focal length	Mag.	Image circle	Detector type						Optical specifications				Dimension		
				35 mm	Line - 8k	Line - 16k	Line - 12k	Line - 12k	Line - 16k	WD	wF/#	Back focal length	Distort.	Mount	Length	Diam.
				w x h	8k x 7µm	16k x 3.5µm	12k x 5µm	12k x 5.2µm	16k x 5µm							
				36.0 x 24.0	57.3	57.3	61.4	62.4	81.9							
				(mm)	Ø (mm)	(mm x mm)	(mm x mm)	(mm x mm)	(mm x mm)	(mm)	(mm)	(%)	(mm)	(mm)		
Object field of view																
RT-OPKE16-050M95	116	0.5	82	70.0	114.7	114.7	122.9	124.8	162.6	296 ± 5	3.8	10	0.01	M95X1	496 ± 9	47
RT-OPKE16-070M95	116	0.7	82	50.0	81.9	81.9	87.8	89.1	116.1	221.9 ± 5	3.8	10	0.01	M95X1	447.9 ± 9	47
RT-OPKE16-100M95	116	1	82	35.0	57.3	57.3	61.4	62.4	81.3	182.9 ± 5	3.8	10	0.01	M95X1	439.4 ± 8	47
RT-OPKE16-150M95	116	1.5	82	23.3	38.2	38.2	41.0	41.6	54.2	143.9 ± 5	3.8	10	0.01	M95X1	453.7 ± 9	47
RT-OPKE16-200M95	116	2	82	17.5	28.7	28.7	30.7	31.2	40.6	127.1 ± 5	3.8	10	0.01	M95X1	496 ± 9	47
RT-OPKE16-300M95	116	3	82	11.7	19.1	19.1	20.5	20.8	27.1	111.4 ± 3	4.2	10	0.01	M95X1	591.4 ± 8	47

FULL RANGE OF COMPATIBLE ILLUMINATORS

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	Bar lights LTBRDC series	p. 141
	Backlights LTBP, LTBC, LTBC series	p. 134-140