

# TC2MHR096-F

High resolution telecentric lens for 1" detectors, magnification 0.137x, F-mount

## SPECIFICATIONS

Magnification	(x)	0.137
Image circle Ø	(mm)	16.9
<b>Object field of view<sup>8</sup></b>		
	(mm x mm or Ø)	
with IMX174/IMX249 13.3 mm diag w x h 11.35 x 7.13		82.81 x 52.01
with IMX255/IMX267 16.1 mm diag w x h 14.19 x 7.51		103.58 x 54.82
with IMX253/IMX304 17.6 mm diag w x h 14.16 x 10.37		Ø = 75.70
with KAI-4022/4021 21.5 mm diagonal w x h 15.2 x 15.2		Ø = 110.62
with KAI-08050 22.6 mm diagonal w x h 18.1 x 13.6 <sup>(7)</sup>		Ø = 99.24

## Optical specifications

Working distance <sup>(1)</sup>	(mm)	278.6
wF/# <sup>(2)</sup>		16
Telecentricity typical (max) <sup>(3)</sup>	(deg)	<0.05 (0.10)
Distortion typical (max) <sup>(4)</sup>	(%)	<0.07 (0.10)
Field depth <sup>(5)</sup>	(mm)	63.9
CTF@ 50 lp/mm	(%)	> 40

## Mechanical specifications

Mount		F
Phase adjustment <sup>(9)</sup>		Yes
Length <sup>(6)</sup>	(mm)	340.4
Diameter	(mm)	143
Mass	(g)	2464

Last update: 2018-06-12

## NOTES

- 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. Lenses with smaller apertures can be supplied on request.
- Maximum slope of chief rays inside the lens: when converted to milliradians, it gives the maximum measurement error for any millimeter of object displacement. Typical (average production) values and maximum (guaranteed) values are listed.
- 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 considered. Pixel size used for calculation is 5 µm.
- Measured from the front end of the mechanics to the camera flange.
- With KAI-08050 (22.6 mm diagonal) detectors, the FOV of TC4MHRyyy-x lenses may show some vignetting at the image corners.
- For the fields with the indication "Ø =", the image of a circular object of such diameter is fully inscribed into the detector.

## COMPATIBLE PRODUCTS

Despite the efforts made to generate an error-free compatibility list, we always recommend to consult the Opto Engineering® technical support department before purchasing a compatible product. Opto Engineering® shall not be liable for any damage or malfunctioning caused by the incorrect selection of a compatible product.



LTCLHP series

High-performance telecentric illuminators

LTCLHP096-G	Telecentric HP illuminator, beam diameter 120 mm, green
LTCLHP096-R	Telecentric HP illuminator, beam diameter 120 mm, red



All product specifications and data are subject to change without notice to improve reliability, functionality, design or other. Photos and pictures are for illustration purposes only.

LTCLHP096-B	Telecentric HP illuminator, beam diameter 120 mm, blue
LTCLHP096-W	Telecentric HP illuminator, beam diameter 120 mm, white



LTCLHP CORE series  
Ultra compact telecentric illuminators

LTCLCR096-R	Telecentric CORE illuminator, beam dimensions $\varnothing = 120$ ; x = 99, red
LTCLCR096-G	Telecentric CORE illuminator, beam dimensions $\varnothing = 120$ ; x = 99, green
LTCLCR096-W	Telecentric CORE illuminator, beam dimensions $\varnothing = 120$ ; x = 99, white



LTLADC series  
Continuous LED low angle direct ringlights

LTZZO170-75-3-W24V	LED low angle ringlight, 3 LED rows, outer diameter 175 mm, 75°, white, 24V
LTZZO170-75-3-R-24V	LED low angle ringlight, 3 LED rows, outer diameter 175 mm, 75°, red, 24V
LTZZO170-75-3-G-24V	LED low angle ringlight, 3 LED rows, outer diameter 175 mm, 75°, green, 24V
LTZZO170-75-3-B-24V	LED low angle ringlight, 3 LED rows, outer diameter 175 mm, 75°, blue, 24V



LTRNST series  
LED ring illuminators - straight type

LTRN096RD	Ring LED illuminator, inner diameter 143 mm, straight type, red 630 nm
LTRN096GR	Ring LED illuminator, inner diameter 143 mm, straight type, green 525 nm
LTRN096BL	Ring LED illuminator, inner diameter 143 mm, straight type, blue 470 nm
LTRN096NW	Ring LED illuminator, inner diameter 143 mm, straight type, white



LTBC series  
Continuous LED backlight

LTBC174174-W	Continuous LED backlight, 174x174 illumination area, white
LTBC174174-G	Continuous LED backlight, 174x174 illumination area, green



LTBRDC series  
Continuous LED bar lights

LTZPFL160-00-6-W-24V	LED bar light, 6 LED rows, 160X26.3 illumination area, white, 24V
LTZPFL160-00-6-R-24V	LED bar light, 6 LED rows, 160X26.3 illumination area, red, 24V
LTZPFL160-00-6-G-24V	LED bar light, 6 LED rows, 160X26.3 illumination area, green, 24V
LTZPFL160-00-6-B-24V	LED bar light, 6 LED rows, 160X26.3 illumination area, blue, 24V



CMMR series  
45° first surface mirrors

CMMR096	45° first surface mirror for 143 mm clamping diameter optics
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WI series  
Protective windows

WI096	Protective window for 143 mm clamping diameter optics
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CMHO series  
Clamping mechanics

CMHO096	Clamping mechanics for TCxx085, TCxx096 lenses and LTCLHP096-X illuminators
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CMT series  
Precision alignment mechanics

CMTH096	Precision alignment mechanics for telecentric optics 096
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### USB3 vision camera with Sony Pregius CMOS sensors

<a href="#">RT-mvBF3-2024a</a>	USB3 Vision camera with Sony Pregius CMOS sensor IMX249
<a href="#">RT-mvBF3-2024</a>	USB3 Vision camera with Sony Pregius CMOS sensor IMX174
<a href="#">RT-mvBF3-2089a</a>	USB3 Vision camera with Sony Pregius CMOS sensor IMX267
<a href="#">RT-mvBF3-2089</a>	USB3 Vision camera with Sony Pregius CMOS sensor IMX255



### mvBlueCOUGAR series

GigE & Dual GigE Vision cameras

<a href="#">RT-mvBC-X104f</a>	Camera with interface GigE (1GB/s), sensor size 1/1.2", mpixel 2.35, resolution 1936 x 1216, sensor name IMX249, sensor type CMOS
<a href="#">RT-mvBC-XD104d</a>	Camera with interface Dual GigE (2GB/s), sensor size 1/1.2", mpixel 2.35, resolution 1936 x 1214, sensor name IMX174, sensor type CMOS
<a href="#">RT-mvBC-X109b</a>	Camera with interface GigE (1GB/s), sensor size 1", mpixel 8.95, resolution 4112 x 2176, sensor name IMX267, sensor type CMOS
<a href="#">RT-mvBC-XD109b</a>	Camera with interface Dual GigE (2GB/s), sensor size 1", mpixel 8.95, resolution 4112 X 2176, sensor name IMX267, sensor type CMOS



### COE HR AS-X series

20MP, 26MP and 29MP area scan cameras for high-speed applications

<a href="#">COE-200-M-POE-070-IR-C</a>	HR Area Scan camera IMX183, CMOS, Rolling shutter, 5472 × 3648, 20.4 MP, 2.4 pix, 1", Gray, GigE, 6 fps, POE, C - mount, Glass filter
<a href="#">COE-200-C-POE-070-IR-C</a>	HR Area Scan camera IMX183, CMOS, Rolling shutter, 5472 × 3648, 20.4 MP, 2.4 pix, 1", Color, GigE, 6 fps, POE, C - mount, Infrared cut filter
<a href="#">COE-200-M-USB-070-IR-C</a>	HR Area Scan camera IMX183, CMOS, Rolling shutter, 5472 × 3648, 20.4 MP, 2.4 pix, 1", Gray, 14 fps, C - mount, Glass filter
<a href="#">COE-200-C-USB-070-IR-C</a>	HR Area Scan camera IMX183, CMOS, Rolling shutter, 5472 × 3648, 20.4 MP, 2.4 pix, 1", Color, 14 fps, C - mount, Infrared cut filter