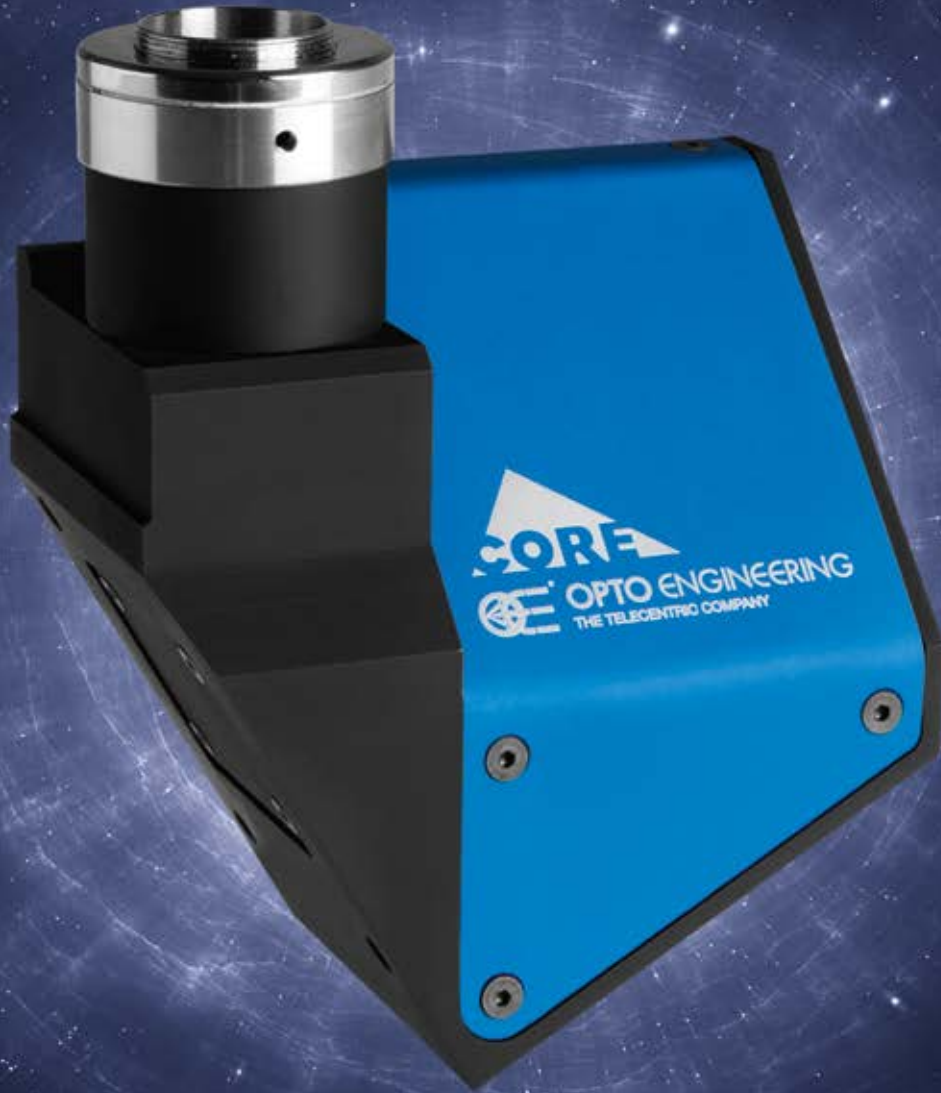




OPTO ENGINEERING



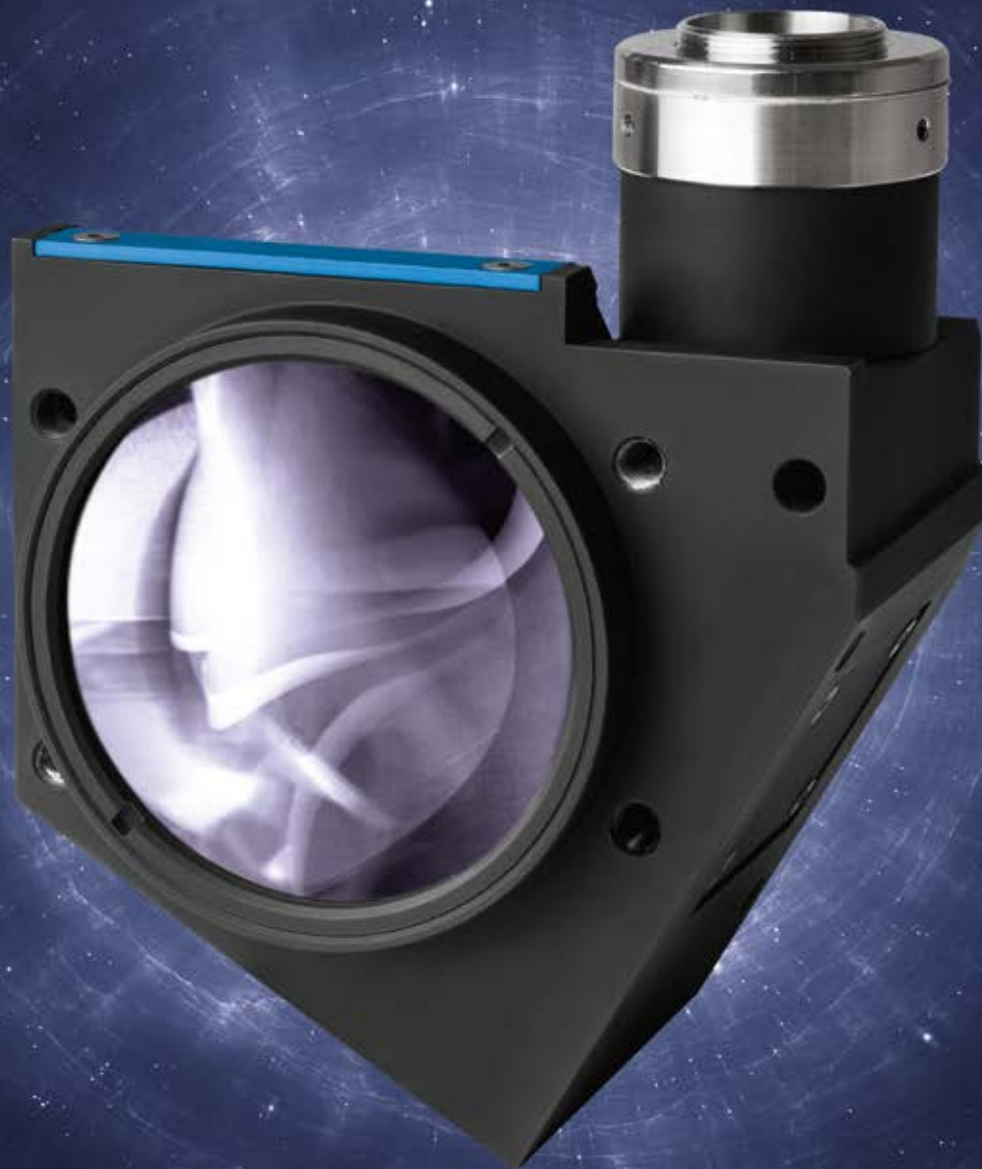
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**CORE**  
FAMILY

[www.opto-engineering.com](http://www.opto-engineering.com)

# *The new era of telecentric lenses*



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Refer to specific datasheets available at [www.opto-engineering.com](http://www.opto-engineering.com)  
for product compliancy with regulations, certifications and safety labels.

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# TC CORE series

Ultra compact bi-telecentric lenses up to 2/3"



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## KEY ADVANTAGES

### Excellent optical performances

TC CORE bi-telecentric lenses deliver excellent optical performances as other comparable Opto Engineering bi-telecentric lenses.

### Extremely compact

TC CORE lenses are up to 70% smaller than other telecentric lenses on the market.

### Designed for flexibility and smart integration

TC CORE lenses integrate a camera phase adjustment and can be mounted on multiple sides with or without clamps, allowing to cut the costs.

### Save you money

Systems integrating TC CORE lenses take much less space, resulting in lower manufacturing, shipping and storage costs.

### Boost your sales

A smaller vision system or measurement machine is the solution preferred by the industry.

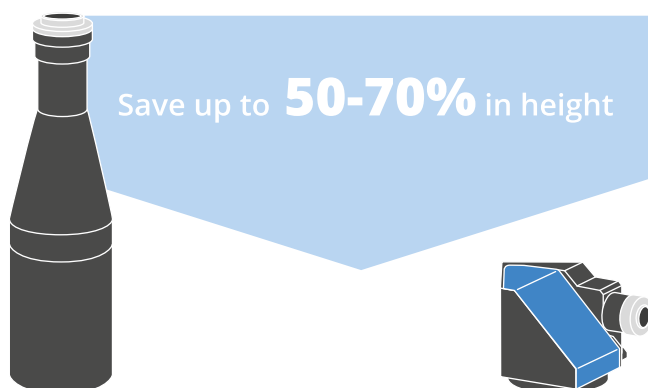
**TC CORE** bi-telecentric lenses for sensors up to 2/3" feature a truly revolutionary ultra compact opto-mechanical design.

These lenses deliver high-end optical performances and at the same time are up to 70% smaller than other double-sided telecentric lenses on the market, thus allowing to significantly downsize a vision system.

The unique shape has been expressly developed for maximum mounting flexibility.

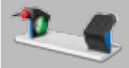


TC CORE lenses can be mounted in different directions using any of the 4 sides even without clamps, allowing to cut the system's cost, and can be easily fitted or retrofitted even into very compact machines.

TC CORE bi-telecentric lenses can also be coupled with the new ultra compact LTCLHP CORE series telecentric illuminators to build super small yet extremely accurate measurement systems.



Comparison of a "classic" telecentric lens present on the market and a TC CORE bi-telecentric lens: TC CORE lens delivers best optical performances and is extremely compact.

## SEE ALSO

	TCBENCH CORE series	p. 27
FULL RANGE OF COMPATIBLE ILLUMINATORS		
	LTCLHP CORE series	p. 108
FULL RANGE OF COMPATIBLE ACCESSORIES		
	Mounting mechanics CMHOCR and CMPTCR series	p. 165

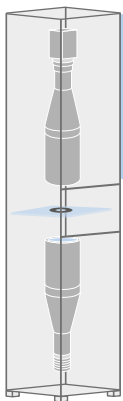


Multiple lens surfaces can be used for mounting thanks to the M6 threaded holes located on 4 sides. Mounting is direct without clamps, allowing to cut the costs.

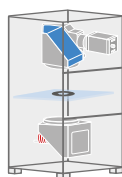
Front CMHOCR clamp available for added mounting flexibility.

Built-in phase adjustment allows to easily align the camera sensor.

**Off-line precision measurement systems:**



Save up to  
**50-70%**  
in height



Integrates a classic telecentric lens and a classic telecentric illuminator present on the market.

Integrates a TC CORE bi-telecentric lens and LTCLHP CORE telecentric illuminator.

**ADVANTAGES**



**Save more**

- Lower manufacturing cost due to less material employed
- Less space required for storage and use
- Lower shipment expenses due to smaller size
- Lower transportation risks

**Sell more**

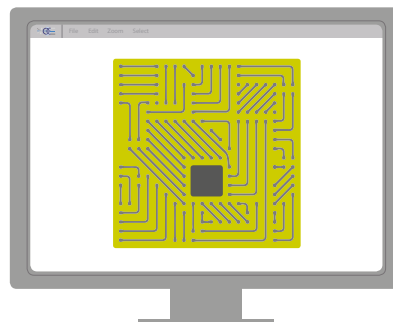
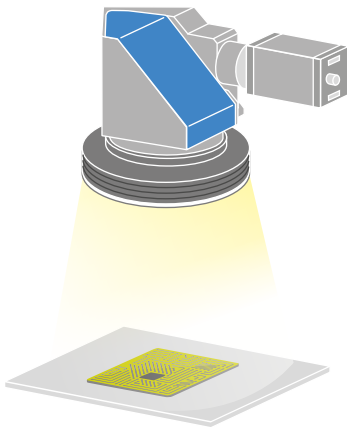
- A smaller vision system or measurement machine is preferred by the industry

# TC CORE series

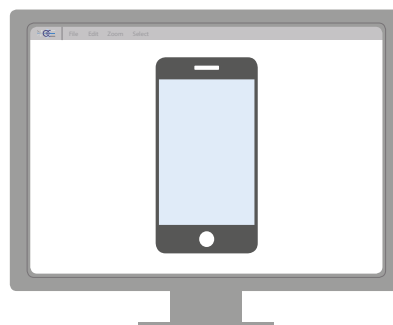
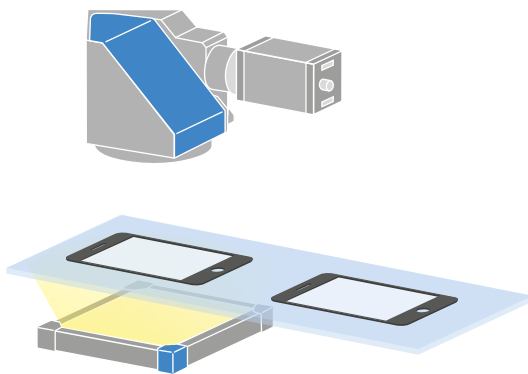
Ultra compact bi-telecentric lenses up to 2/3"

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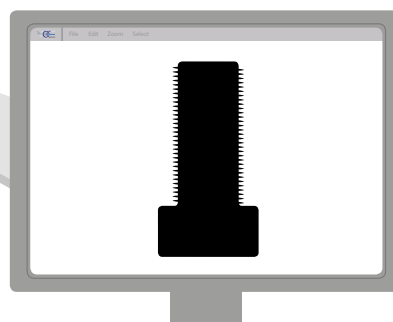
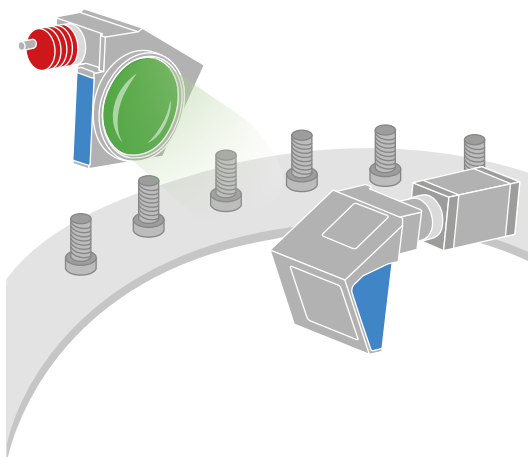
## Application examples



Electronic board inspection:  
TC CORE with top ringlight.



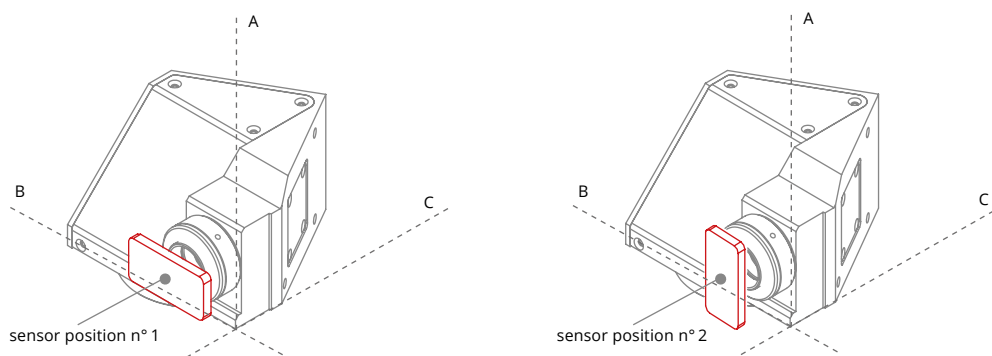
Smartphone glass inspection:  
TC CORE mounted directly  
on a plate and a flat backlight.



Screw measurement on a rotary  
glass table: TC CORE lens  
and LTCLHP CORE illuminator.



**TC CORE lens dimensions (A, B, C) and correct position of the sensor in relation to the lens:**



The long side of sensor has to be aligned along axis B (position n°1) or axis A (position n°2).

Part number	Mag.	Image circle Ø (x) (mm)	Detector type					Optical specifications					Dimensions				
			1/3" w x h (mm x mm)	1/2.5" w x h (mm x mm)	1/2" w x h (mm x mm)	1/1.8" w x h (mm x mm)	2/3" - 5 MP w x h (mm x mm)	WD (mm)	wF/#	Telecentricity typical (max) (deg)	Distortion typical (max) (%)	Field depth (mm)	CTF @70 lp/mm (%)	Mount	A (mm)	B (mm)	C (mm)
Object field of view (mm x mm) 6																	
TCCR 12 048	0.134	8.0	35.9 x 26.9	42.5 x 31.9	47.8 x 35.9	53.3 x 40.1	Ø = 52.8	132.9	8	< 0.07 (0.10)	< 0.06 (0.10)	37	> 40	C	77	106	115
TCCR 23 048	0.184	11.0	26.1 x 19.6	31.0 x 23.3	34.8 x 26.1	38.8 x 29.2	46.0 x 38.4	132.9	8	< 0.08 (0.10)	< 0.05 (0.10)	20	> 40	C	77	106	135
TCCR 12 056	0.114	8.0	42.0 x 31.5	49.9 x 37.4	56.0 x 42.0	62.3 x 46.9	Ø = 61.8	157.8	8	< 0.04 (0.08)	< 0.04 (0.10)	51	> 50	C	94	110	125
TCCR 23 056	0.157	11.0	30.6 x 22.9	36.3 x 27.2	40.7 x 30.6	45.4 x 34.2	53.8 x 45.0	157.8	8	< 0.05 (0.08)	< 0.03 (0.10)	27	> 45	C	94	110	145
TCCR 12 064	0.100	8.0	48.0 x 36.0	57.0 x 42.7	64.0 x 48.0	71.2 x 53.6	Ø = 70.6	181.8	8	< 0.05 (0.08)	< 0.04 (0.10)	67	> 50	C	101	122	133
TCCR 23 064	0.138	11.0	34.9 x 26.2	41.5 x 31.1	46.6 x 34.9	51.9 x 39.0	61.4 x 51.4	181.8	8	< 0.05 (0.08)	< 0.03 (0.10)	35	> 50	C	101	122	153
TCCR 12 080	0.080	8.0	59.8 x 44.8	71.0 x 53.2	79.7 x 59.8	88.7 x 66.8	Ø = 88.0	226.7	8	< 0.03 (0.08)	< 0.04 (0.10)	104	> 50	C	119	145	159
TCCR 23 080	0.110	11.0	43.5 x 32.6	51.7 x 38.8	58.0 x 43.5	64.6 x 48.7	76.5 x 64.0	226.7	8	< 0.04 (0.08)	< 0.02 (0.10)	55	> 50	C	119	145	172
TCCR 12 096	0.068	8.0	70.6 x 52.9	83.8 x 62.9	94.1 x 70.6	104.8 x 78.9	Ø = 103.9	278.6	8	< 0.06 (0.08)	< 0.03 (0.10)	145	> 45	C	139	172	183
TCCR 23 096	0.093	11.0	51.4 x 38.5	61.0 x 45.8	68.5 x 51.4	76.3 x 57.5	90.4 x 75.6	278.6	8	< 0.06 (0.08)	< 0.04 (0.10)	77	> 40	C	139	172	197

- 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 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.
- 3 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.

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

# TC2MHR - TC4MHR CORE series

Ultra compact high-resolution telecentric lenses up to 4/3"



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## KEY ADVANTAGES

### Excellent optical performances

TC2MHR - TC4MHR CORE telecentric lenses deliver excellent optical performances as other comparable Opto Engineering telecentric lenses.

### Extremely compact

TC2MHR - TC4MHR CORE lenses are up to 70% smaller than other telecentric lenses on the market.

### Designed for flexibility and smart integration

TC2MHR CORE - TC4MHR CORE lenses integrate a camera phase adjustment and can be mounted on multiple sides with or without clamps, allowing to cut the costs.

### Save you money

Systems integrating TC2MHR - TC4MHR CORE lenses take much less space, resulting in lower manufacturing, shipping and storage costs.

### Boost your sales

A smaller vision system or measurement machine is the solution preferred by the industry.

**TC2MHR CORE and TC4MHR CORE series** are ultra compact telecentric lenses tailored for high-resolution sensors up to 4/3".

TC2MHR CORE and TC4MHR CORE lenses deliver excellent optical performances in a super compact shape. Thanks to the unique opto-mechanical design, these lenses offer very high resolution, nearly zero distortion and high field depth while saving up to 70% in length compared to similar FOV lenses on the market.

TC2MHR CORE and TC4MHR CORE lenses ensure hassle-free integration in a measurement system. The rear phase adjustment allows the user to easily align the camera sensor to the sample.

These lenses can be mounted in several orientations thanks to the M6 threads located on multiple sides, even without clamps. For maximum flexibility, a special front mounting clamp is also available.



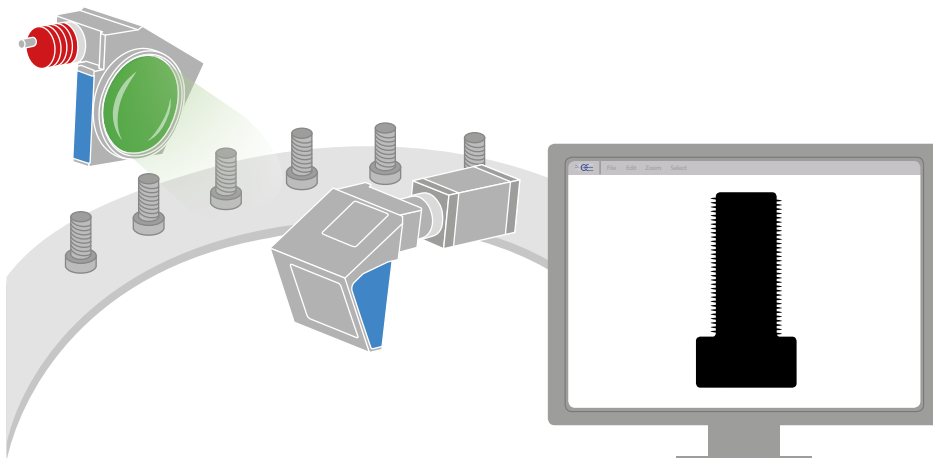
Comparison of a "classic" telecentric lens and a TC CORE telecentric lens: TC CORE lens delivers best optical performances and is extremely compact.

FULL RANGE OF COMPATIBLE ILLUMINATORS		
	LTCLHP CORE series	p. 108
FULL RANGE OF COMPATIBLE ACCESSORIES		
	CMHOCR series	p. 165





### Application example



Standard solution with a 4/3" camera, TC4MHR CORE lens and a LTCLHP CORE illuminator.

# TC2MHR - TC4MHR CORE series

Ultra compact high-resolution telecentric lenses up to 4/3"

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TCCR2M080-C  
with Mount C



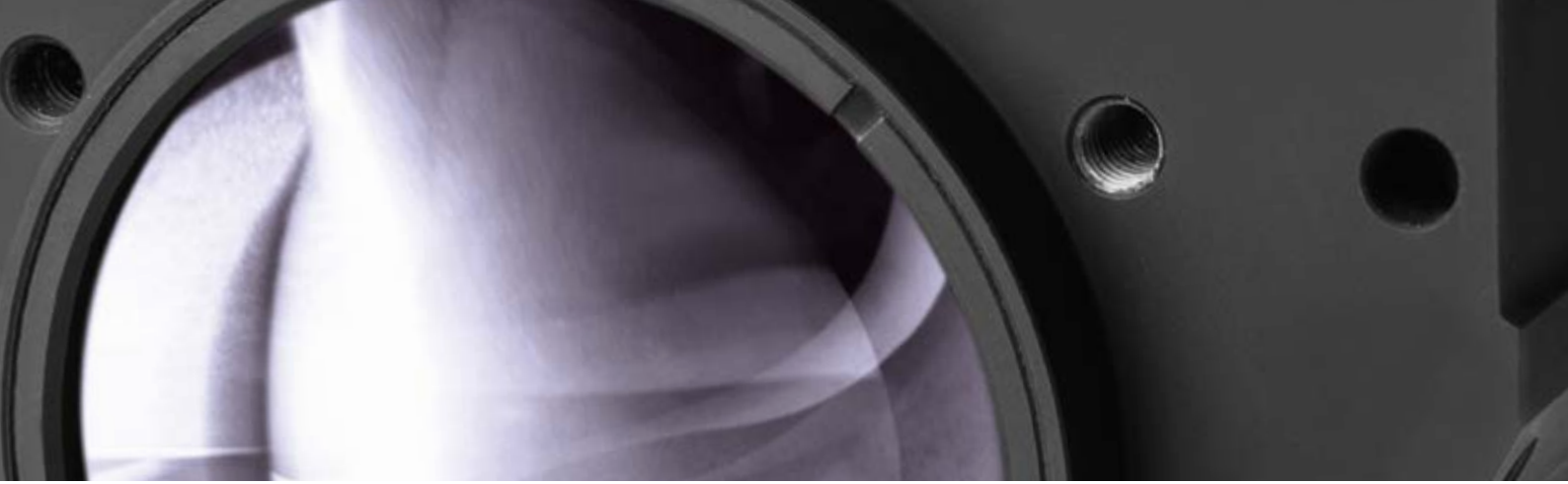
TCCR4M096-E  
with Mount E (M42x1)



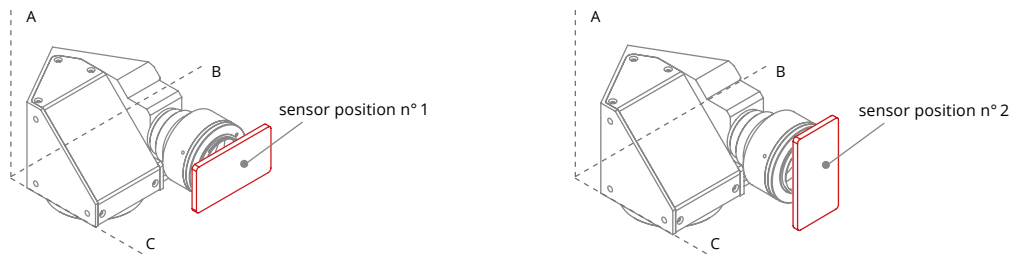
TCCR4M056-F  
with Mount F



Built-in phase adjustment allows to easily align the camera sensor.



**TC2MHR - TC4MHR CORE lens dimensions (A, B, C) and correct position of the sensor in relation to the lens:**



The long side of sensor has to be aligned along axis B (position n°1) or axis A (position n°2).

Part number	Mag. (x)	Image circle Ø (mm)	Detector type				Optical specifications						Dimensions			
			KAI 2020 14.8 mm diag.	KAI-04050 16 mm diag.	KAI-4022/4021 21.5 mm diag.	KAI-08050 22.6 mm diag.	WD	wF/#	Telecentricity	Distortion	Field depth	CTF	Mount	A	B	C
			w x h (mm x mm)	w x h (mm x mm)	w x h (mm x mm)	w x h (mm x mm)	(mm)	(deg)	typical (max)	typical (max)	(mm)	@50lp/mm (%)	(mm)	(mm)	(mm)	
			<b>Object field of view (mm x mm) 7</b>				<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>				
TC2R2MHR																
TC2R2M 048-C	0.268	16.9	44.2 x 33.1	47.8 x 35.8	Ø=56.7	Ø=50.7	133.41	16	< 0.08 (0.10)	< 0.08 (0.10)	17	> 30	C	77	109	168
TC2R2M 048-E	0.268	16.9	44.2 x 33.1	47.8 x 35.8	Ø=56.7	Ø=50.7	133.41	16	< 0.08 (0.10)	< 0.08 (0.10)	17	> 30	M42x1 FD 16	77	112	170
TC2R2M 056-C	0.228	16.8	51.9 x 38.9	56.1 x 42.1	Ø=66.7	Ø=59.6	157.79	16	< 0.04 (0.08)	< 0.05(0.10)	23	> 40	C	94	112	178
TC2R2M 056-E	0.228	16.8	51.9 x 38.9	56.1 x 42.1	Ø=66.7	Ø=59.6	157.79	16	< 0.04 (0.08)	< 0.05(0.10)	23	> 40	M42x1 FD 16	94	114	178
TC2R2M 064-C	0.200	16.8	59.3 x 44.5	64.1 x 48.1	Ø=76.1	Ø=68.1	181.86	16	< 0.04 (0.08)	< 0.05 (0.10)	30	> 40	C	101	125	185
TC2R2M 064-E	0.200	16.8	59.3 x 44.5	64.1 x 48.1	Ø=76.1	Ø=68.1	181.86	16	< 0.04 (0.08)	< 0.05 (0.10)	30	> 40	M42x1 FD 16	101	127	187
TC2R2M 080-C	0.160	16.9	74.0 x 55.5	80.0 x 60.0	Ø=95.0	Ø=85.0	226.76	16	< 0.04 (0.08)	< 0.05 (0.10)	46	> 40	C	119	145	205
TC2R2M 080-E	0.160	16.9	74.0 x 55.5	80.0 x 60.0	Ø=95.0	Ø=85.0	226.76	16	< 0.04 (0.08)	< 0.05 (0.10)	46	> 40	M42x1 FD 16	119	149	207
TC2R2M 096-C	0.137	16.9	86.6 x 65.0	93.6 x 70.2	Ø=111.2	Ø=99.5	278.62	16	< 0.05 (0.10)	< 0.07 (0.10)	64	> 40	C	139	172	230
TC2R2M 096-E	0.137	16.9	86.6 x 65.0	93.6 x 70.2	Ø=111.2	Ø=99.5	278.62	16	< 0.05 (0.10)	< 0.07 (0.10)	64	> 40	M42x1 FD 16	139	172	232
TC4R4MHR																
TC4R4M 048-C	0.369	21.7	32.1 x 24.1	34.7 x 26.0	41.2 x 41.2	49.1 x 36.9	133.41	16	< 0.08 (0.10)	< 0.08 (0.10)	8.7	> 40	C	77	109	193
TC4R4M 048-F	0.369	21.7	32.1 x 24.1	34.7 x 26.0	41.2 x 41.2	49.1 x 36.9	133.41	16	< 0.08 (0.10)	< 0.08 (0.10)	8.7	> 40	F	77	118	163
TC4R4M 048-E	0.369	21.7	32.1 x 24.1	34.7 x 26.0	41.2 x 41.2	49.1 x 36.9	133.41	16	< 0.08 (0.10)	< 0.08 (0.10)	8.7	> 40	M42x1 FD 16	77	112	195
TC4R4M 056-C	0.314	21.6	37.7 x 28.3	40.8 x 30.6	48.4 x 48.4	57.6 x 43.3	157.80	16	< 0.05 (0.10)	< 0.04 (0.10)	12.0	> 40	C	94	112	202
TC4R4M 056-F	0.314	21.6	37.7 x 28.3	40.8 x 30.6	48.4 x 48.4	57.6 x 43.3	157.80	16	< 0.05 (0.10)	< 0.04 (0.10)	12.0	> 40	F	94	119	173
TC4R4M 056-E	0.314	21.6	37.7 x 28.3	40.8 x 30.6	48.4 x 48.4	57.6 x 43.3	157.80	16	< 0.05 (0.10)	< 0.04 (0.10)	12.0	> 40	M42x1 FD 16	94	115	204
TC4R4M 064-C	0.275	21.6	43.1 x 32.3	46.6 x 34.9	55.3 x 55.3	65.8 x 49.5	181.86	16	< 0.05 (0.10)	< 0.04 (0.10)	15.7	> 40	C	101	124	208
TC4R4M 064-F	0.275	21.6	43.1 x 32.3	46.6 x 34.9	55.3 x 55.3	65.8 x 49.5	181.86	16	< 0.05 (0.10)	< 0.04 (0.10)	15.7	> 40	F	101	129	180
TC4R4M 064-E	0.275	21.6	43.1 x 32.3	46.6 x 34.9	55.3 x 55.3	65.8 x 49.5	181.86	16	< 0.05 (0.10)	< 0.04 (0.10)	15.7	> 40	M42x1 FD 16	101	127	211
TC4R4M 080-C	0.221	21.7	53.7 x 40.3	58.0 x 43.5	68.9 x 68.9	82.0 x 61.7	226.76	16	< 0.05 (0.10)	< 0.04 (0.10)	24.4	> 40	C	119	146	228
TC4R4M 080-F	0.221	21.7	53.7 x 40.3	58.0 x 43.5	68.9 x 68.9	82.0 x 61.7	226.76	16	< 0.05 (0.10)	< 0.04 (0.10)	24.4	> 40	F	119	152	199
TC4R4M 080-E	0.221	21.7	53.7 x 40.3	58.0 x 43.5	68.9 x 68.9	82.0 x 61.7	226.76	16	< 0.05 (0.10)	< 0.04 (0.10)	24.4	> 40	M42x1 FD 16	119	148	231
TC4R4M 096-C	0.186	21.6	63.5 x 47.6	68.7 x 51.5	81.6 x 81.6	97.1 x 73.0	278.62	16	< 0.05 (0.10)	< 0.04 (0.10)	34.2	> 35	C	139	172	254
TC4R4M 096-F	0.186	21.6	63.5 x 47.6	68.7 x 51.5	81.6 x 81.6	97.1 x 73.0	278.62	16	< 0.05 (0.10)	< 0.04 (0.10)	34.2	> 35	F	139	175	225
TC4R4M 096-E	0.186	21.6	63.5 x 47.6	68.7 x 51.5	81.6 x 81.6	97.1 x 73.0	278.62	16	< 0.05 (0.10)	< 0.04 (0.10)	34.2	> 35	M42x1 FD 16	139	173	256

- 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.
- M42x1 mount has a flange distance of 16 mm.
- For the fields with the indication "Ø =", the image of a circular object of such diameter is fully inscribed into the detector.

# LTCLHP CORE series

Ultra compact telecentric illuminators

## KEY ADVANTAGES

### Deliver excellent performances

LTCLHP CORE telecentric illuminators deliver exactly the same excellent optical performances as other Opto Engineering telecentric illuminators.

### Downsize your vision system

LTCLHP CORE telecentric illuminators are up to 60% smaller than other telecentric illuminators on the market.

### Easily fit into existing systems

LTCLHP CORE illuminators can be mounted in different directions in your machine.

### Improve your system performances

LTCLHP CORE illuminators may be used instead of flat backlights to improve your system.

### Help to spare and sell

A smaller system means less expenses and less space and is preferred by the industry.



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**LTCLHP CORE Series** are ultra compact telecentric illuminators. They are up to 60% more compact than other collimated illuminators on the market.

The ultra compact size allows to greatly reduce the size of your machine and to easily integrate true collimated illumination instead of common flat backlights, thus improving your system's performance.

The smart design also makes them easy to retrofit into existing systems. They can easily be mounted in different directions using any of their 4 sides, with or without clamps.




A smaller system means lower manufacturing, shipping and storage costs, as well as less use of factory space and is the solution preferred by the industry.

LTCLHP CORE illuminators can be used both with classic telecentric lenses and with ultra compact telecentric lenses from CORE family like TC CORE, TC2MHR CORE and TC4MHR CORE series.



LTCLHP CORE telecentric illuminators are up to 60% shorter than other telecentric illuminators on the market.

## SEE ALSO

	TCBENCH CORE series	p. 27
<b>FULL RANGE OF COMPATIBLE ACCESSORIES</b>		
	Mounting mechanics CMHO CR and CMPT CR series	p. 165
	LTDV1CH-17V strobe controller	p. 182



### 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, built-in electronics behave as an open circuit allowing direct control of the LED source.



Part number	Light	Device power ratings			LED power ratings			
		DC voltage		Power consumption	Max LED fwd current	Forward voltage		Max pulse current
	Light color, wavelength peak	min (V)	max (V)	(W)	(mA)	typical (V)	max (V)	(mA)
LTCLCR xxx-R	red, 630 nm	12	24	< 2.5	350	2.4	3.00	2000
LTCLCR xxx-G	green, 520 nm	12	24	< 2.5	350	3.3	4.00	2000
LTCLCR xxx-W	white	12	24	< 2.5	350	2.78	n.a.	2000

<sup>1</sup> Tolerance ± 10%.

<sup>2</sup> Used in continuous (not pulsed) mode.

<sup>3</sup> At max forward current. Tolerance is ±0.06V on forward voltage measurements.

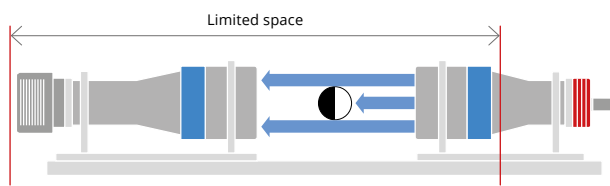
<sup>4</sup> At pulse width ≤ 10 ms, duty cycle ≤ 10% condition.

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

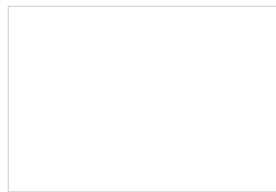
# LTCLHP CORE series

Ultra compact telecentric illuminators

## LTCLHP CORE - True collimated illumination in very limited space



Telecentric lens and collimated illuminator.



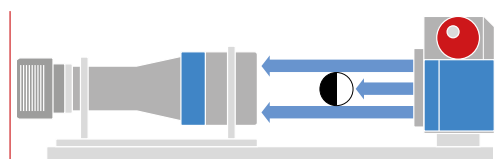
A standard collimated illuminator is impossible to use due to lack of space.



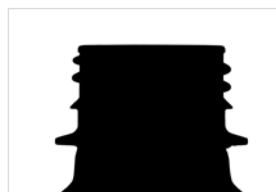
"Classic" telecentric lens and flat backlight.



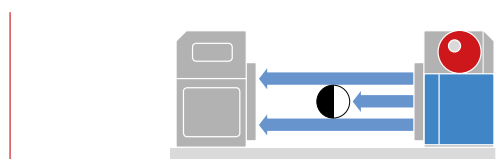
Classic solution with diffuse backlight: less precise measurements due to surface reflections and uncertain edge position.



"Classic" telecentric lens and LTCLHP CORE collimated illuminator.



Smart solution with LTCLHP CORE telecentric illuminator: no edge uncertainty for excellent measurement results.



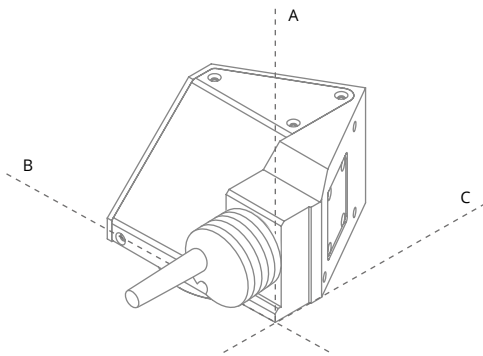
TC CORE telecentric lens and LTCLHP CORE collimated illuminator.



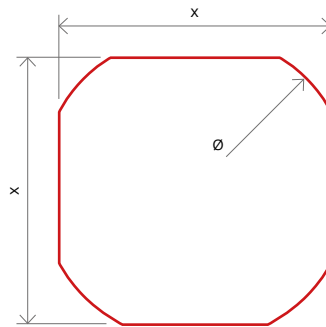
The smartest solution with TC CORE telecentric lens and LTCLHP CORE telecentric illuminator: excellent measurement results in a super compact space.



**LTCLHP CORE illuminator dimensions (A, B, C):**



**Minimum beam shape dimensions:**



Part number	Optical specifications			Dimensions			Compatibility
	Light color, wavelength peak <sup>1</sup>	Minimum beam shape dimensions (mm)	Working distance range (mm)	A	B	C <sup>2</sup>	
LTCLCR 048-R	red, 630 nm	Ø = 56; x = 50	90 - 180	77	106	162	TCCRxx048, CMHOCR048, CMPTCR048, TCCR2M048-x, TCCR4M048-x, TCxx048, TCxMHR048-x, TC16M048, TC16M048-Q
LTCLCR 048-G	green, 520 nm	Ø = 56; x = 50	90 - 180	77	106	162	
LTCLCR 048-W	white	Ø = 56; x = 50	90 - 180	77	106	162	
LTCLCR 056-R	red, 630 nm	Ø = 74; x = 66	100 - 200	94	110	172	TCCRxx056, CMHOCR056, CMPTCR056, TCCR2M056-x, TCCR4M056-x, TCxx056, TCxMHR056-x, TC16M056, TC16M056-Q
LTCLCR 056-G	green, 520 nm	Ø = 74; x = 66	100 - 200	94	110	172	
LTCLCR 056-W	white	Ø = 74; x = 66	100 - 200	94	110	172	
LTCLCR 064-R	red, 630 nm	Ø = 86; x = 67	120 - 240	101	122	179	TCCRxx064, CMHOCR064, CMPTCR064, TCCR2M064-x, TCCR4M064-x, TCxx064, TCxMHR064-x, TC16M064, TC16M064-Q, TC12K064
LTCLCR 064-G	green, 520 nm	Ø = 86; x = 67	120 - 240	101	122	179	
LTCLCR 064-W	white	Ø = 86; x = 67	120 - 240	101	122	179	
LTCLCR 080-R	red, 630 nm	Ø = 98; x = 90	150 - 300	119	145	198	TCCRxx080, CMHOCR080, CMPTCR080, TCCR2M080-x, TCCR4M080-x, TCxx080, TCxMHR080x, TC16M080, TC16M080-Q, TC12K080, TCZR072
LTCLCR 080-G	green, 520 nm	Ø = 98; x = 90	150 - 300	119	145	198	
LTCLCR 080-W	white	Ø = 98; x = 90	150 - 300	119	145	198	
LTCLCR 096-G	green, 520 nm	Ø = 120; x = 99	200 - 350	139	172	223	TCCRxx096, CMHOCR096, CMPTCR096, TCCR2M096-x, TCCR4M096-x, TCxx096, TCxMHR096x, TC16M096, TC16M096-Q, TC12K096
LTCLCR 096-R	red, 630 nm	Ø = 120; x = 99	200 - 350	139	172	223	
LTCLCR 096-W	white	Ø = 120; x = 99	200 - 350	139	172	223	

<sup>1</sup> Opto Engineering recommends green light for high precision measurement applications.

<sup>2</sup> Nominal value, with no spacers in place.

# TCBENCH CORE series

Ultra compact TCCORE optical bench for precision measurements



INTERNATIONAL  
**PATENT**  
PENDING

**TCBENCH CORE series** are complete optical systems offering superior performances needed for highly demanding measurement applications in a super compact assembly.

The benches come pre-mounted and pre-aligned, ensuring the best accuracy that a telecentric measurement system can deliver.

**Each TCBENCH CORE integrates:**

- 1 TC CORE bi-telecentric lens for 2/3" sensors
- 1 LTCLHP CORE telecentric illuminator (green)
- 1 CMPTCR base plate

TCBENCH CORE systems deliver the same optical performances as our TCBENCH systems in a very reduced space.

**KEY ADVANTAGES**

**Multi-level cost cutting**

Saves money on manufacturing and transportation costs.

**Downsized vision system**

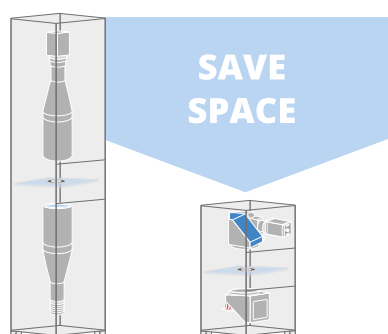
Allows to reduce the length of your measurement system.

**Pre-assembled setup**

Just add a camera and a measurement software and you're ready to go.

**Best optical performances in a super tight space**

A complete optical system designed for hassle free development of demanding precision measurement applications.



Example of off-line measurement systems with "classic" telecentric lens and illuminator (left) and TCBENCH CORE (right).

**Non-contact measurement machine example**

Technical specs	Standard components	TCBENCH CORE	Comparison
Camera sensor (mm)	8.45 x 7.07	8.45 x 7.07	
FOV (mm)	90.4 x 75.6	90.4 x 75.6	High-end performances of both systems
Field depth (mm)	94	94	
CTF 70 lp/mm (%)	> 50	> 50	
Height (m)	1.65	0.77	
Length (m)	0.45	0.45	
Width (m)	0.41	0.41	54% volume difference
Volume (m³)	0.30	0.14	





FULL RANGE OF COMPATIBLE ACCESSORIES



Optical filters

Part number	Mag. (x)	Image circle Ø (mm)	Detector type					Optical specs			Dimensions				
			1/3" w x h (mm x mm)	1/2.5" w x h (mm x mm)	1/2" w x h (mm x mm)	1/1.8" w x h (mm x mm)	2/3" - 5 Mpx w x h (mm x mm)	WD (mm)	Field Depth (mm)	CTF @70lp/mm (%)	Mount	Length (mm)	Width (mm)	Height (mm)	Weight (g)
Field of view (mm x mm)															
TCCRBENCH 048	0.184	11.0	26.1 x 19.6	31.0 x 23.3	34.8 x 26.1	38.8 x 29.2	46.0 x 38.4	132.9	24	> 50	C	352	134	118	3849
TCCRBENCH 056	0.157	11.0	30.6 x 22.9	36.3 x 27.2	40.7 x 30.6	45.4 x 34.2	53.8 x 45.0	157.8	33	> 55	C	424	144	122	5392
TCCRBENCH 064	0.138	11.0	34.9 x 26.2	41.5 x 31.1	46.6 x 34.9	51.9 x 39.1	61.4 x 51.4	181.8	43	> 65	C	474	152	134	6260
TCCRBENCH 080	0.110	11.0	43.5 x 32.6	51.7 x 38.8	58.0 x 43.5	64.6 x 48.7	76.5 x 64.0	226.7	67	> 55	C	578	182	162	10965
TCCRBENCH 096	0.093	11.0	51.4 x 38.5	61.0 x 45.8	68.5 x 51.4	76.3 x 57.5	90.4 x 75.6	278.6	94	> 50	C	696	200	189	15207

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

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. Pixel size used for calculation is 5.5 µm.

# CMHOCR series

## Clamping mechanics CORE series



**CMHOCR series** are special mounting clamps for CORE telecentric lenses and illuminators. CMHOCR mounting clamps have been designed to give even more flexibility for integration of CORE lenses and illuminators.

Part number	Compatibility	Mechanical specifications				
	Opto Engineering optics	Compatible Illuminator	Depth (mm)	Width (mm)	Height (mm)	Optical axis height (mm)
<b>CMHOCR 048</b>	TCCR12048, TCCR23048, TCCR2M048-x, TCCR4M048-x, LTCLCR048-x	LTRN048-x	80	130.0	195.0	130.0
<b>CMHOCR 056</b>	TCCR12056, TCCR23056, TCCR2M056-x, TCCR4M056-x, LTCLCR056-x	LTRN056-x	80	130.0	180.0	115.0
<b>CMHOCR 064</b>	TCCR12064, TCCR23064, TCCR2M064-x, TCCR4M064-x, LTCLCR064-x	LTRN064-x	80	150.0	200.0	125.0
<b>CMHOCR 080</b>	TCCR12080, TCCR23080, TCCR2M080-x, TCCR4M080-x, LTCLCR080-x	LTRN080-x	80	160.0	210.0	130.0
<b>CMHOCR 096</b>	TCCR12096, TCCR23096, TCCR2M096-x, TCCR4M096-x, LTCLCR096-x	LTRN096-x	84	200.0	240.0	140.0

# CMPTCR series

## Mounting plates CORE series



**CMPTCR series** are mechanical components designed for CORE Series telecentric lenses and illuminators. These precision mounting plates have a special design to integrate telecentric lenses and telecentric illuminators from CORE Series directly without any need of mounting clamps.

Part number	Compatible products	Mechanical specifications			
	Clamping mechanics CMHO	Length (mm)	Width (mm)	Thickness (mm)	Weight (g)
<b>CMPTCR 048</b>	TCCR12048, TCCR23048, TCCR2M048-x, TCCR4M048-x, LTCLCR048-x	352.0	130.0	15.0	1722
<b>CMPTCR 056</b>	TCCR12056, TCCR23056, TCCR2M056-x, TCCR4M056-x, LTCLCR056-x	424.0	135.0	15.0	2156
<b>CMPTCR 064</b>	TCCR12064, TCCR23064, TCCR2M064-x, TCCR4M064-x, LTCLCR064-x	474.0	140.0	15.0	2485
<b>CMPTCR 080</b>	TCCR12080, TCCR23080, TCCR2M080-x, TCCR4M080-x, LTCLCR080-x	578.0	170.0	20.0	5017
<b>CMPTCR 096</b>	TCCR12096, TCCR23096, TCCR2M096-x, TCCR4M096-x, LTCLCR096-x	696.0	190.0	20.0	6735

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.

If the buyer does not require formally, in writing, that the products conform to specifications of the country of purchase, we feel relieved from having to comply with these requirements. Opto Engineering ensures the compliance of its products to the European Community regulations.



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