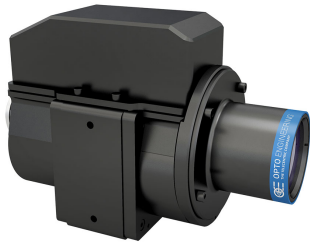




TCZR036S | DATASHEET

Bi-telecentric zoom with motorized controls, mag. 0.250x to 2.000x, for sensors up to 2/3"



KEY ADVANTAGES

Perfect magnification constancy and parfocality

No need to re-calibrate or refocus after zooming thanks to an extremely precise positioning system

Bi-telecentricity

For very accurate measurement

Excellent image centre stability

Image centring is maintained at every magnification

Full motorization control

Zoom magnification is set via software

Fast and silent operations

Max 2 seconds to softly switch from one mag to another

Detailed test report with measured optical parameters

TCZR series is a leading edge optical solution for imaging and measurement applications requiring both the flexibility of zoom lenses and the accuracy of fixed optics.

SPECIFICATIONS

Optical specifications

Magnifications		0.250 - 0.500 - 1.000 - 2.000
Image circle	(mm)	11
Max sensor size		2/3"
Working distance ¹	(mm)	74
wf/N^2		16
Max image displacement between mag changes ⁸	(μ m)	350

Motor Parameters

Connector		DB15HD male
Number of motors		1
Type		Bipolar stepper
RMS winding current	(mA)	600
Winding voltage	(V)	24
Steps per revolution		200
Min time for mag change ⁹	(s)	1.5
Max time for mag change ¹⁰	(s)	2

Environment

Operating temperature	(°C)	0-40
Storage temperature	(°C)	0-50
Operating relative Humidity	(%)	10-85 non condensing
IP rating		IP20
Installation		Indoor use only

Encoder parameters

Number of encoders		1
Supply voltage	(V)	24
Maximum supply current	(mA)	30
Type		Magnetic rotary, incremental with reference
Output signals		A, B, Z (index)
Interfaces		RS422
Number of magnetic poles		120
Poles pitch	(mm)	2
Interpolation		500
Pulses per revolution		60000
Motor to encoder ratio ¹¹		2.56

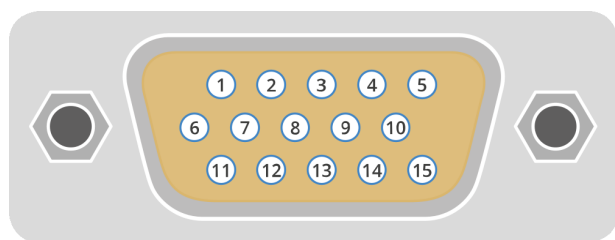
Mechanical specifications

Mount		C
Phase adjustment ¹²		Yes
Length	(mm)	211.5
Height	(mm)	142.0
Width	(mm)	103.0
Front diameter	(mm)	58.0
Mass	(g)	2359

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- ¹ 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.
- ² Working f/N : the real f/N of a lens in operating conditions.
- ³ Maximum angle between chief rays and optical axis on the object side. 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 very sharp image, only half of the nominal field depth should be considered. Pixel size used for calculation is $3.45 \mu\text{m}$.
- ⁶ Object side, calculated with the Rayleigh criterion with $\lambda = 520 \text{ nm}$
- ⁷ Image side, at 1σ standard deviation
- ⁸ Image side
- ⁹ One magnification step
- ¹⁰ Two magnification steps
- ¹¹ 1 encoder pulse = 2.56 motor μsteps (with a 256 microstepping control)
- ¹² Indicates the availability of an integrated camera phase adjustment feature.

CONNECTION



COMPATIBLE CONTROLLER

The TCZRS lens must be controlled by a suitable motion controller for bipolar stepper motors. Cable and controller are sold separately. The following part numbers are fully compatible with the TCZRS series:

CBMT002, 15 wires cable, DB15HD Male to DB15HD Female connector, 2 m.

MTDV1CH-22A2, Motion controller for bipolar stepper motors with additional encoder input. Multi-channel versions are compatible as well.

COMPATIBLE PRODUCTS

Full list of compatible products available [here](#).



A wide selection of innovative machine vision components.

Pin	Name	Description
1	5V	5V encoder power supply
2	GND	0V encoder reference ground
3	ENC_A+	Encoder quadrature signal – A +
4	ENC_B+	Encoder quadrature signal – B +
5	ENC_Z+	Encoder quadrature signal – Z +
6	MOT_A+	Motor – Phase A +
7	MOT_B+	Motor – Phase B +
8	ENC_A-	Encoder quadrature signal – A -
9	ENC_B-	Encoder quadrature signal – B -
10	ENC_Z-	Encoder quadrature signal – Z -
11	MOT_A-	Motor – Phase A -
12	MOT_B-	Motor – Phase B -
13	N.C.	-
14	N.C.	-
15	N.C.	-

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MAGNIFICATION: 0.250X

SPECIFICATION

Optical specifications

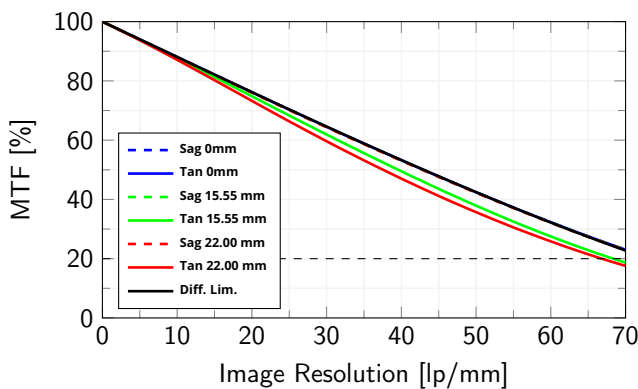
Telecentricity typical (max) ³	(°)	< 0.05 (0.10)
Distortion typical (max) ⁴	(%)	< 0.05 (0.08)
Field depth ⁵	(mm)	13.25
Resolution (max) ⁶	(μm)	41
Reference point repeatability ⁷	(μm)	< 6

FIELD OF VIEW

Sensors

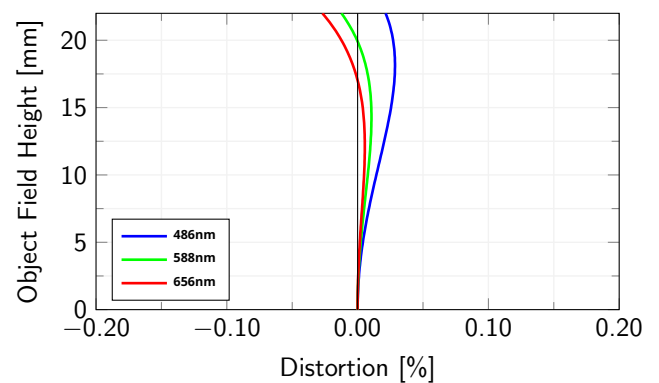
	(mm x mm)
1/3" (4.8 x 3.6 mm x mm)	19.20 x 14.40
1/2.5" (5.70 x 4.28 mm x mm)	22.80 x 17.12
1/2" (6.4 x 4.8 mm x mm)	25.60 x 19.20
1/1.8" (7.13 x 5.33 mm x mm)	28.52 x 21.32
2/3" (8.50 x 7.09 mm x mm)	34.00 x 28.36

Image Resolution



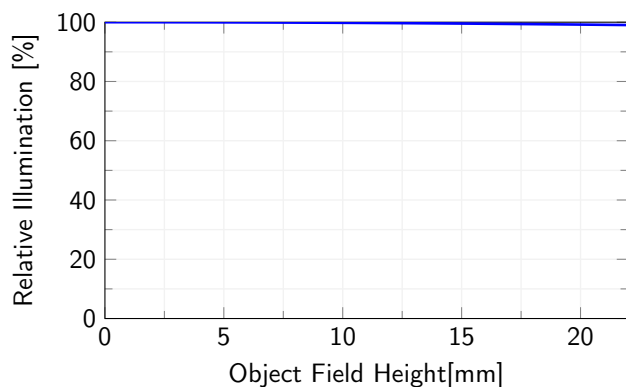
Modulation Transfer Function (MTF) vs. Image Resolution, wavelength range 486 nm - 656 nm

Distortion



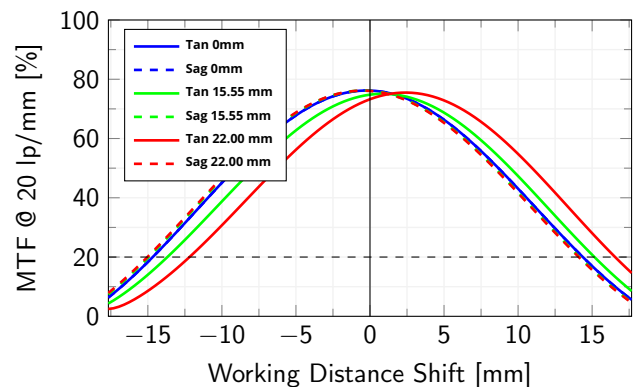
Object Field Height vs. Distortion, from the optical axis to the corner of the field of view

Relative Illumination



Relative illumination vs. Object Field Height, from the optical axis to the corner of the field of view

Depth of Field



Modulation Transfer Function (MTF) @ 20 lp/mm vs. Working Distance Shift from the best focus Working Distance, wavelength range 486 nm - 656 nm

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MAGNIFICATION: 0.500X

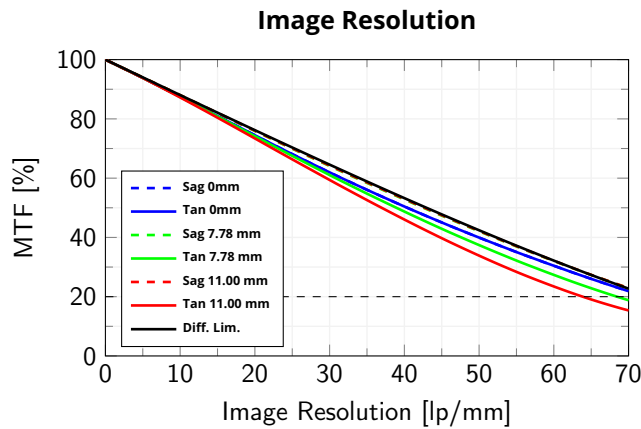
SPECIFICATION

Optical specifications

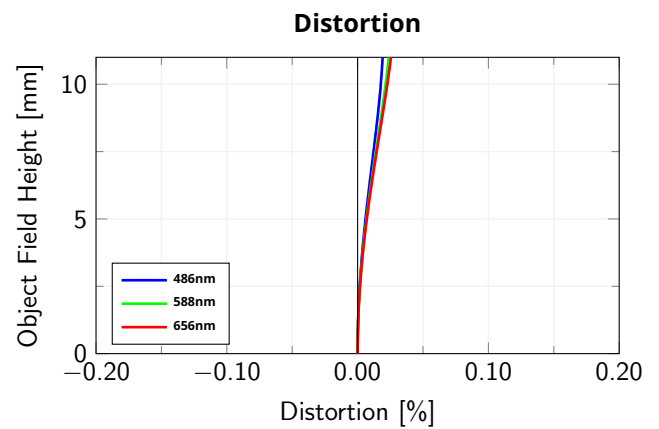
Telecentricity typical (max) ³	(°)	< 0.05 (0.10)
Distortion typical (max) ⁴	(%)	< 0.04 (0.08)
Field depth ⁵	(mm)	3.31
Resolution (max) ⁶	(μm)	20
Reference point repeatability ⁷	(μm)	< 5

FIELD OF VIEW

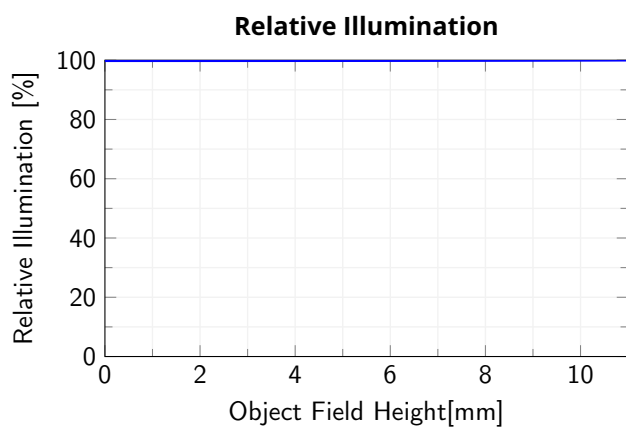
Sensors	(mm x mm)
1/3" (4.8 x 3.6 mm x mm)	9.60 x 7.20
1/2.5" (5.70 x 4.28 mm x mm)	11.40 x 8.56
1/2" (6.4 x 4.8 mm x mm)	12.80 x 9.60
1/1.8" (7.13 x 5.33 mm x mm)	14.26 x 10.66
2/3" (8.50 x 7.09 mm x mm)	17.00 x 14.18



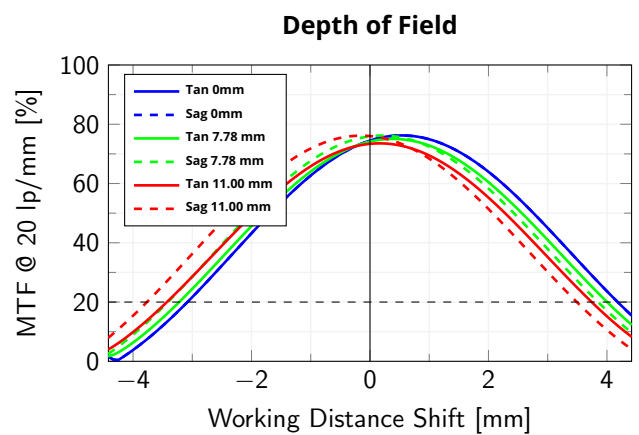
Modulation Transfer Function (MTF) vs. Image Resolution, wavelength range 486 nm - 656 nm



Object Field Height vs. Distortion, from the optical axis to the corner of the field of view



Relative illumination vs. Object Field Height, from the optical axis to the corner of the field of view



Modulation Transfer Function (MTF) @ 20 lp/mm vs. Working Distance Shift from the best focus Working Distance, wavelength range 486 nm - 656 nm

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MAGNIFICATION: 1.000X

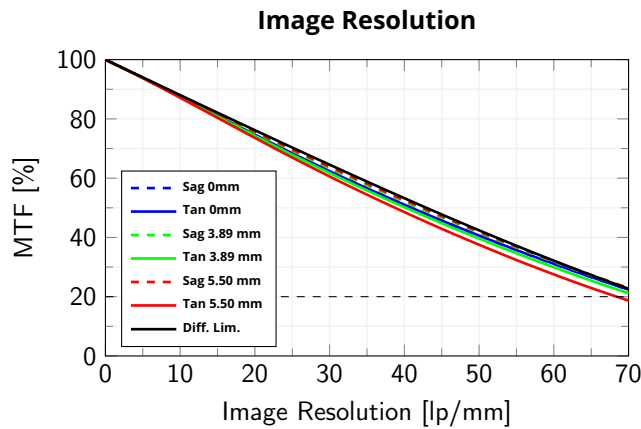
SPECIFICATION

Optical specifications

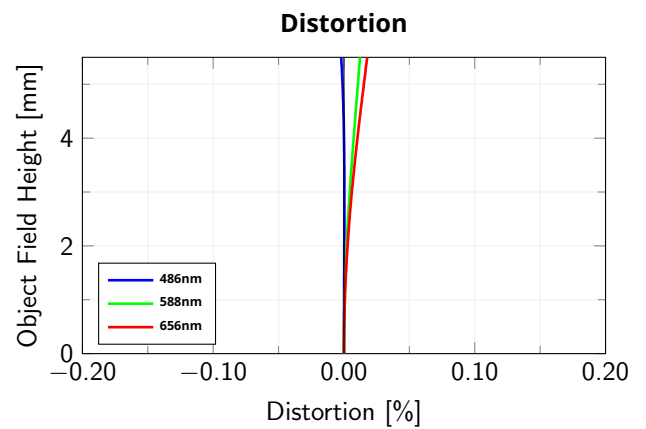
Telecentricity typical (max) ³	(°)	< 0.05 (0.10)
Distortion typical (max) ⁴	(%)	< 0.04 (0.08)
Field depth ⁵	(mm)	0.83
Resolution (max) ⁶	(μm)	10
Reference point repeatability ⁷	(μm)	< 2

FIELD OF VIEW

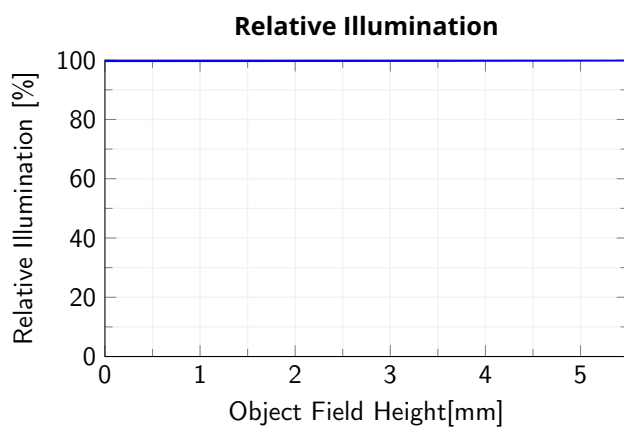
Sensors	(mm x mm)
1/3" (4.8 x 3.6 mm x mm)	4.80 x 3.60
1/2.5" (5.70 x 4.28 mm x mm)	5.70 x 4.28
1/2" (6.4 x 4.8 mm x mm)	6.40 x 4.80
1/1.8" (7.13 x 5.33 mm x mm)	7.13 x 5.33
2/3" (8.50 x 7.09 mm x mm)	8.50 x 7.09



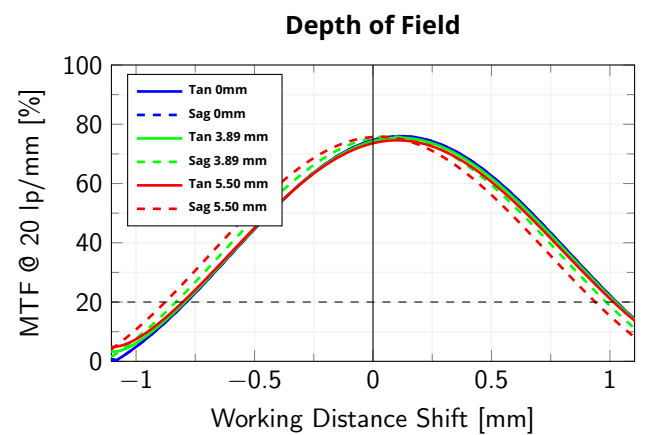
Modulation Transfer Function (MTF) vs. Image Resolution, wavelength range 486 nm - 656 nm



Object Field Height vs. Distortion, from the optical axis to the corner of the field of view



Relative illumination vs. Object Field Height, from the optical axis to the corner of the field of view



Modulation Transfer Function (MTF) @ 20 lp/mm vs. Working Distance Shift from the best focus Working Distance, wavelength range 486 nm - 656 nm

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MAGNIFICATION: 2.000X

SPECIFICATION

Optical specifications

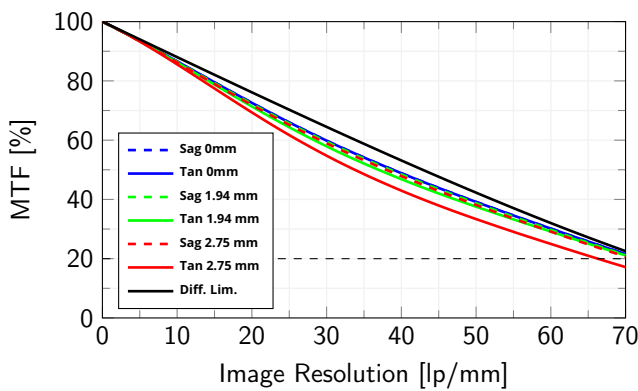
Telecentricity typical (max) ³	(°)	< 0.05 (0.10)
Distortion typical (max) ⁴	(%)	< 0.08 (0.10)
Field depth ⁵	(mm)	0.21
Resolution (max) ⁶	(μm)	5
Reference point repeatability ⁷	(μm)	< 4

FIELD OF VIEW

Sensors

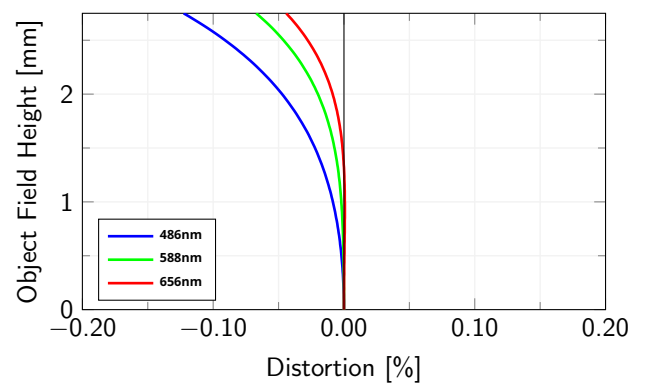
	(mm x mm)
1/3" (4.8 x 3.6 mm x mm)	2.40 x 1.80
1/2.5" (5.70 x 4.28 mm x mm)	2.85 x 2.14
1/2" (6.4 x 4.8 mm x mm)	3.20 x 2.40
1/1.8" (7.13 x 5.33 mm x mm)	3.56 x 2.67
2/3" (8.50 x 7.09 mm x mm)	4.25 x 3.54

Image Resolution



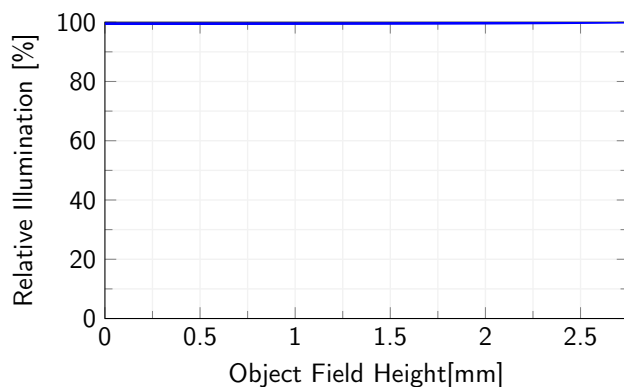
Modulation Transfer Function (MTF) vs. Image Resolution, wavelength range 486 nm - 656 nm

Distortion



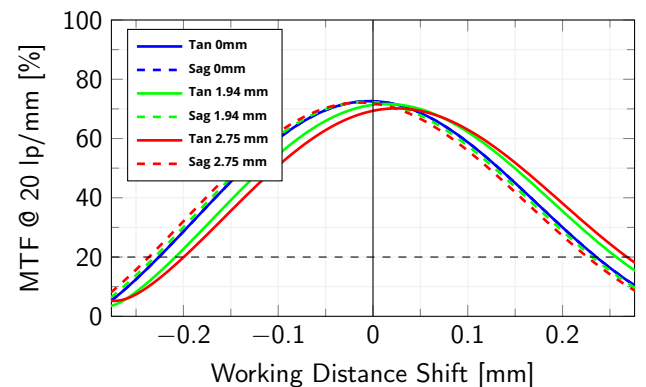
Object Field Height vs. Distortion, from the optical axis to the corner of the field of view

Relative Illumination



Relative illumination vs. Object Field Height, from the optical axis to the corner of the field of view

Depth of Field



Modulation Transfer Function (MTF) @ 20 lp/mm vs. Working Distance Shift from the best focus Working Distance, wavelength range 486 nm - 656 nm

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