

CATALOG

S-MOUNT
C-MOUNT
MACRO
TELECENTRIC
LINE SCAN
OPTICAL DESIGN
ACCESSOIRES

LENSATION
smart lenses. smart solutions.





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We speak English, German, Korean, and Chinese.

Are you looking for a product that you haven't been able to locate? Ask us! We will source what we are unable to provide you right now. Name the product specifications and the target volume price - we can generally deliver the needed goods. And if 'your' product isn't already available, we'll design it for you!

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We prioritize your unique requirements, such as product specs, excellent quality, and affordable pricing.



Our mission is to keep our customers excited.

With this goal in mind, we provide:

- Free consultancy
- Exceptionally good value for money
- Best performance
- OEM design and development
- Unique solutions
- Products tailored especially according to your demands

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VGA AND BELOW MEGAPIXEL HIGH RESOLUTION LENSES

- Perfect for standard image applications
- Entry level pricing
- Suited for standard resolution cameras
- Pixel size class down to 4µm



	Focal length (mm)	Aperture (f-number)	Image format	MOD (m)	BFL (mm)	FOV (diag.)	Weight (g)	Mega Pixel	IR cut filter or option
BK1220	1.2	2.0	1/4"	0.2	3.4	192°	5.2	0.3	BK1220C
BHR2125	2.1	2.5	1/3"	0.2	4.25	165.7°	6.1	0.7	
BHR2525	2.5	2.5	1/3"	0.2	5.04	142.7°	6.8	0.7	
BHR3020	3.0	2.0	1/3"	0.2	5.67	126.0°	5.9	0.7	
BHR4318	4.3	1.8	1/3"	0.2	6.16	83.1°	4.0	0.7	
BHR5620	5.6	2.0	1/3"	0.2	8.07	65.3°	4.0	0.7	
BT8020N	8.0	2.0	1/3"	0.2	8.25	44°	3.5	0.3	BT8020NC
BHR8020	8.0	2.0	1/3"	0.2	7.6	43.0°	6.0	0.7	
BHR12020	12.0	2.0	1/3"	0.2	6.7	28.0°	4.5	0.7	
BHR16012S12	16.0	1.2	1/2"	0.3	7.2	21.8°	11.0	0.7	

BOARD LENSES UP TO 1 MEGAPIXEL

- For cameras up to 1024x768 (4:3) and 1280x720 (16:9) resolution
- Pixel size class down to 3µm

	Focal length (mm)	Aperture (f-number)	Image format	MOD (m)	BFL (mm)	FOV (diag.)	Weight (g)	Mega Pixel	IR cut filter or option
BK1820	1.8	2.0	1/4"	0.2	3.65	160°	5.5	1	BK1820C
BT1922	1.9	2.2	1/4"	0.05	4.7	156°	3.5	1	BT1922C
BT2120	2.1	2.0	1/3"	0.2	4.92	151°	6.5	1	BT2120C
BT2520	2.5	2.0	1/3"	0.2	5.18	140°	5.3	1	BT2520C
BT2920	2.9	2.0	1/3"	0.2	5.02	138°	4.5	1	BT2920C
BT3020	3.0	2.0	1/3"	0.2	5.35	124°	3.5	1	BT3020C
BT3620	3.6	2.0	1/3"	0.2	5.00	100°	4.1	1	BT3620C
BT6020V2	6.1	2.0	1/3"	0.2	8.03	62°	6.5	1	BT6020V2C
BT12020	12.0	2.0	1/3"	0.4	8.97	29°	3.2	1	BT12020C
B16020S12	16.0	2.0	1/2"	0.2	12.3	27.8°	4.2	1	
B25020S12	25.0	2.0	1/2"	0.2	11.8	18.2°	17.6	1	
B35020S12	35.0	2.0	1/2"	0.2	18.9	13.0°	15.4	1	
B50020S12	50.0	2.0	1/2"	0.4	33.9	9.2°	27.1	1	

S-MOUNT LENSES (M12X0.5)

1-2 MEGAPIXEL BOARD LENSES

Broad portfolio for cameras in the 1.2 / 1.3 and 2.0 Megapixel class.

For common resolutions like

- 1280x 960
- 1280x1024
- 1600x1200
- 1920x1080
- 1920x1200

For Sony Starvis / Pregius image sensors. Also for Teledyne Ruby / Sapphire and Snappy image sensors. Perfect for a pixel size down to 3µm.



	Focal length (mm)	Aperture (f-number)	Image format	MOD (m)	BFL (mm)	FOV (diag.)	Distortion TV (%)	Weight (g)	Mega Pixel	IR corr.	IR cut filter / option
BMK2119C	2.1	1.9	1/3"	0.2	2.2	160°	-73	2.8	1		SLAR coating 550nm
BM2118V2	2.1	2.2	1/3"	0.2	6.3	170°	-88.1	6.5	1	•	BM2118V2C
BMK2320C	2.3	2.0	1/3"	0.16	2.3	140°	-	2.8	1		SLAR coating 550nm
BM2420	2.4	2.0	1/3"	0.15	4.56	132°	-25	6.0	1	•	BM2420C
BM2820	2.8	2.0	1/3"	0.2	5.29	122°	-40	6.0	1	•	BM2820C
BM3618	3.6	1.8	1/3"	0.2	6.59	100°	34.1	6.0	1	•	BM3618C
B2M3814	3.85	1.4	1/2.5"	0.2	6.76	122°	-	9.0	2		B2M3814C
BM4218	4.2	1.8	1/3"	0.2	7.21	89°	-29	7.0	1	•	BM4218C
BM4518S118ND-810	4.5	1.8	1/1.8"	0.1	6.4	90°	<2.8	14.0	1	•	810nm Coating
BM4525S118ND	4.5	2.5	1/1.8"	0.1	6.4	90°	-2.8	15.0	1		
BM4620DN	4.6	2.0	1/3"	0.2	5.63	80°	-22	6.0	1	•	BM4620DNC
BM6018	6.0	1.8	1/3"	0.2	9.33	60°	-17	6.0	1	•	BM6018C
BSM6016S12	6.0	1.8	1/2"	0.2	8.73	88°	-32	4.5	2	•	
BM8021S118ND	7.84	2.1	1/1.8"	0.5	7.8	60°	-2.9 (opt.)	14.3	1	•	BM8021S118NDC
BM8018	8.0	1.8	1/3"	0.2	5.4	45°	-8.3	6.0	1	•	BM8018C
BSM8016S12	8.0	1.9	1/2"	0.2	5.4	62°	-12	6.0	2	•	
BM9040	9.0	4.0	1/3"	0.1	8.0	34°	-	3.9	1.3	•	
BM9050	9.0	5.0	1/3"	0.1	8.0	34°	1.0	3.9	1.3	•	
BM10028S12	10.0	2.8	1/2"	0.4	8.0	44°	1.0	6.0	1.2		BM10028S12C
BSM12016S12	12.0	2.0	1/2"	0.2	6.54	39°	-	6.0	2	•	
BM16018	16.0	1.8	1/3"	0.2	6.59	21°	3.4	6.0	1	•	BM16018C
BT25020S12	25.0	2.0	1/2"	0.2	8.29	18.6°	-	7.0	1-2		BT25020S12C

3 MEGAPIXEL BOARD LENSES

High resolution lenses for the popular Full HD resolution of 1920x1080 or 1920x1200 pixels

Also perfect for the classic 2048x1536 format.

Supports a pixel size down to the 2.5µm class.



	Focal length (mm)	Aperture (f-number)	Image format	MOD (m)	BFL (mm)	FOV (diag.)	Distortion (%)	Weight (g)	Mega Pixel	IR corr.	IR cut filter / option
B3M21835ND	2.18	3.5	1/4"	0.1	1.30	94°	<0.6	4.0	3		B3M21835NDC
B3M2818	2.8	2.2	1/2.5"	0.3	6.2	147°	< 1.9	5.0	3	•	
BM3516ND	3.5	1.6	1/3"	0.2	5.97	81°	< 1.9	10.0	3	•	BM3516NDC
BM3518S125ND	3.5	1.8	1/2.5"	0.2	5.97	90°	< 1.9	12.0	3	•	BM3518S125NDC
BM3524S12ND	3.5	2.4	1/2"	0.1	6.09	97°	<-3.1	21.8	3	•	BM3524S12NDC
B3M4016	4.0	2.2	1/2.5"	0.2	7.28	112°	-12	5.4	3	•	
BM4018S118	4.0	1.8	1/1.8"	0.2	8.0	126°	-45	10.0	3	•	BM4018S118C
BM4518S125ND	4.5	1.8	1/2.5"	0.2	6.14	76.4°	< 1.9	13.0	3	•	BM4518S125NDC
BM5518S12ND *	5.5	1.8	1/1.8"	0.2	6.87	76°	< 1.9	10.0	2	•	BM5518S12NDC
BM5822S118ND	5.8	2.2	1/1.8"	0.3	6.5	76.2°	-2.4	12.15	2		BM5822S118ND
BM6020ND	6.0	2.0	1/3"	0.2	6.27	57°	<-2.6	5.9	3	•	BM6020NDC
B3M6016	6.0	2.2	1/2.5"	0.3	6.8	72°	-19	5.8	3	•	
B3M6020S12	6.0	2.0	1/2"	0.5	8.3	81°	-	9.9	3		
B3M8016	8.0	2.2	1/2.5"	0.4	8.0	54°	-3.8	5.0	3		
B3M8018S12	8.0	1.8	1/2"	0.5	7.9	57.7°	-	10.7	3		
B3M8556S118ND	8.5	5.6	1/1.8"	0.1	2.9	54.3°	-1.15	6.6	3		B3M8556S118NDC
B3M12016	12.0	2.3	1/2.5"	0.3	6.44	35°	-6	5.0	3	•	
B3M16018V2	16.3	1.83	1/2"	0.5	7.35	28.8°	-0.72	-	3	•	
B3M25024	25.0	2.4	1/2"	0.4	10.26	18°	3.3	7.1	3	•	B3M25024C
B3M35025V2	35.0	2.8	1/1.7"	0.5	14.42	15.5°	0.1	15.5	3	•	B3M35025CV2

* Limited

S-MOUNT LENSES (M12X0.5)

4 MEGAPIXEL BOARD LENSES

Our f=1.93mm offers the widest low distortion Field Of View of all M12 lenses. The unique 50mm M12 lens is perfect for 2k x 2k cameras.



	Focal length (mm)	Aperture (f-number)	Image format	MOD (m)	BFL (mm)	FOV (diag.)	Distortion (%)	Weight (g)	Mega Pixel	IR corr.	IR cut filter / option
B4M1920NDC	1.93	2.0	1/2.9"	-	1.137	117°	-5 (opt.)	5.7	4		•
B4M3516S12	3.5	1.6	1/2"	0.85	4.8	160°	-13.9 (TV)	7.7	4		B4M3516S12C
B4M50028S117	50	2.8	1/1.7"	1.0	18.7	18.7°	-0.1 (opt.)	34.3	4		B4M50028S117C

5 MEGAPIXEL BOARD LENSES

Our broad portfolio of high resolution lenses.

Perfect for the new Sony Starvis, the On Semi AR series or the Omnivision image sensors.

Supporting pixel sizes down to 2.2µm.



	Focal length (mm)	Aperture (f-number)	Image format	MOD (m)	BFL (mm)	FOV (diag.)	Distortion (%)	Weight (g)	Mega Pixel	IR corr.	IR cut filter or option
B5M2524	2.5	2.4	1/2.5"	0.1	4.98	166°	-83	6.1	5		B5M2524C
B5M2916	2.9	2.0	1/2.5"	0.1	4.47	152°	-63	7.2	5	•	B5M2916C
B5M2920S118	2.95	2.8	1/1.8"	0.3	6.81	180°	-4.3	15.6	5	•	B5M2920S118C
B5M29740ND	2.97	4.0	1/2.5"	0.2	2.97	102°	< 1	3.5	5		B5M29740NDC
B5M3428S123	3.4	2.8	1/2.3"	0.1	6.3	150°	-12	8.2	5		B5M3428S123C
B5M3618	3.6	1.8	1/2.5"	0.2	7.25	128°	-0.5	5.0	5		B5M3618C
BK5M3920 (MOQ)	3.9	2.0	1/2"	0.8	6.1	127°	-	11.0	5	•	
B5M4018	4.0	1.8	1/2.5"	0.2	7.72	112°	-41.5	5.0	5		B5M4018C
B5M4020	4.0	2.0	1/2.5"	0.3	6.7	114°	-62.9	5.0	5		B5M4020C

	Focal length (mm)	Aperture (f-number)	Image format	MOD (m)	BFL (mm)	FOV (diag.)	Distortion (%)	Weight (g)	Mega Pixel	IR corr.	IR cut filter or option
B5M41430ND	4.14	3.0	1/2.5"	0.2	5.25	82°	< 0.2	8.3	5		B5M41430NDC
B5M6018	6.0	1.8	1/2.5"	0.2	9.58	75°	-21.4	6.5	5		B5M6018C
B5M6020	6.0	2.0	1/2.5"	0.3	7.3	67°	-19.6	6.0	5		B5M6020C
B5M6532S123ND	6.0	3.2	1/2.3"	0.3	7.55	62°	0.8	3.1	5		B5M6532S123NDC
B5M7630	7.6	3.0	1/1.8"	0.2	5.38	58°	1.9	6.0	5		B5M7630C
B5M8018	8.0	1.8	1/2"	0.2	7.8	56°	-14.4	6.5	5		B5M8018C
B5M8020	8.0	2.0	1/2.5"	0.3	8.0	50°	-7.7	5.0	5		B5M8020C
B5M12020	12.0	2.0	1/2.5"	0.3	7.6	35°	-4.4	5.0	5	•	B5M12020C
B5M12028	12.0	2.8	1/1.8"	0.1	8.57	41°	-1.75	7.0	5		B5M12028C
B5M12056	12.0	5.6	1/1.8"	0.1	8.57	41°	-1.75	7.0	5		B5M12056C
B5M16020V2	16.0	2.0	1/2.5"	0.3	7.1	28°	0.24	5.0	5	•	B5M16020V2C
B5M25020S23ND	25.0	2.0	2/3"	0.25	5.2	25°	0.05	8.4	5		
B5M25024V2	25.0	2.4	1/2"	0.3	11.98	18.8°	1.13	5.0	5	•	B5M25020V2C
B5M35020S23ND	35.0	2.0	2/3"	0.35	5.5	21.3°	0.05	14.5	5		

8/10/14 MEGAPIXEL BOARD LENSES

For 4k cinema resolution cameras.

Supports sensors like

- ON MT9J00x/MT9F00x/AR133x/AR1820
- Perfect for Sony IMX213/286/374/377/486/663/708
- Also suits for the Omnivision OV128xx/OV138xx series

Crystal clear images with pixel sizes down to the 1.25µm class.



B14M28620S123C

B10M45545ND

B10M5425

B10M7224V2

	Focal length (mm)	Aperture (f-number)	Image format	MOD (m)	BFL (mm)	FOV (diag.)	Distortion (%)	Weight (g)	Mega Pixel	IR corr.	IR cut filter / option
B8M2624S125ND	2.6	2.4	1/2.5"	0.2	2.52	106°	-0.12	-	8	•	B8M2624S125NDC
B14M28620S123	2.86	2.0	1/2.3"	0.1	5.71	170°	-25	15.0	14		B14M28620S123C
B8M3025S125ND	3.0	2.5	1/2.5"	0.2	3.74	97°	2	-	8	•	B8M3025S125NDC
B8M4028S118ND	4.0	2.8	1/1.8"	0.25	5.7	92.4°	-3	16	8		B8M4028S118NDC
B8M4418S23	4.41	1.8	2/3"	0.1	7.33	139.6	-18	8.0	8		B8M4418S23C
B10M45545ND	4.55	4.5	1/2.3"	0.1	3.44	81.7°	<0.5	8.2	10		B10M45545NDC
B10M5425	5.4	2.5	1/2.3"	0.2	6.6	70°	-2	6.0	10	•	B10M5425C
B10M7224V2	7.2	2.4	1/2.3"	0.3	7.23	57°	-1.8	12.6	10	•	B10M7224V2C
B8M8020S118ND	8.0	2.0	1/1.7"	0.1	6.06	60.8	-2	-	8		B8M8020S118NDC
B8M12020S118ND	12.0	2.0	1/1.8"	0.15	5.64	44.9	-2	-	8		B8M12020S118NDC

S-MOUNT LENSES (M12X0.5)

PINHOLE BOARD LENSES

- Suited for standard resolution cameras
- Easy to clean
- Wide field-of-view
- Perfect for LED Illumination with a ring light



BP2824S13



BPM3725C



BP3M3728S127

	Focal length (mm)	Aperture (f-number)	Image format	MOD (m)	BFL (mm)	FOV (diag.)	Weight (g)	Mega Pixel	IR cut filter or option
BP2824S13	2.8	2.4	1/3"	0.1	3.1	125°	1.5		BP2824S13C
BPM3725C	3.7	2.5	1/3"	0.2	3.64	106°	1.7	1	•
BP3M3728S127	3.7	2.8	1/2.7"	0.3	3.7	108.4°	1.8	3	BP3M3728S127C

TIME-OF-FLIGHT BOARD LENSES

- Light sensitive lenses including a special bandpass filter for Time-of-Flight 3D Cameras
- Ideal for factory automation, robotics and logistics



BTOF2512-850



BTOF2512-940



BTOF2512-850



BTOF2512-940



	Focal length (mm)	Aperture (f-number)	Image format	MOD (m)	BFL (mm)	FOV (diag.)	Chief ray	Optical Distortion %	bandpass filter
BTOF2512-850	2.5	2.0	1/3"	0.2	5.18	140°	13.07°	-53	850nm
BTOF2512-940	2.5	2.0	1/3"	0.2	5.18	140°	13.07°	-53	940nm
BTOF1114S12-850	11.3	1.4	1/2"	0.1	5.96	38.1°	12.6°	2.1	850nm
BTOF1114S12-940	11.3	1.4	1/2"	0.1	5.96	38.1°	12.6°	2.1	940nm

M16 CCTV LENSES

- Light sensitive lenses with 16mm thread
- Applications are inspection of bottles, caps and tubes
- Up to 4 times more light sensitive compared to a conventional M12 lens
- All lenses including a 2-hole mount M16 lens holder



M16B6M4010S125



M16B4M5009S118C



M16B8M54310S118



	Focal length (mm)	Aperture (f-number)	Image format	MOD (m)	BFL (mm)	FOV (diag.)	Weight (g)	Mega Pixel	IR cut filter or option
M16B6M4010S125	4.0	1.0	1/2.5"	1.0	5.36	106°	9	6	
M16B4M5009S118C	5.0	0.9	1/1.8"	0.5	6.48	118°	-	4	• (inside holder)
M16B8M54310S118	5.43	1.0	1/1.8"	1.0	5.98	105°	10	8	

WATERPROOF AUTOMOTIVE BOARD LENSES

Protected against dust and humidity.
Compact size, wide FOV.

- Waterproof with IP54 classification
- Hard-coating against oil, fog and pollution



	Focal length (mm)	Aperture (f-number)	Image format	MOD (m)	BFL (mm)	FOV (diag.)	Weight (g)	Megapixel	IR cut filter
BA1520WPC	1.5	2.0	1/4"	0.2	2.2	163.0°	5.5	<1	•
BA1825WPC	1.8	2.5	1/4"	0.2	2.2	160.0°	5.5	<1	•
BA2325WPC	2.3	2.5	1/3"	0.2	2.7	163.0°	6.0	<1	•

FISHEYE BOARD LENSES

Lenses for a wide field-of-view.

For image sensors up to 16 Megapixels. Typical applications are surround view, inspection of tubes and pipes. We also offer software for unwarped images or to simulate rectified PTZ Cameras.

Important: The image circle diameter you need depends on your application. Choose the image circle larger than the equivalent sensor dimension (h/v/d) (see table on page 42).



	Image Circle	Focal length (mm)	Aperture (f-number)	Image format	MOD (m)	BFL (mm)	FOV (diag.)	Weight (g)	Megapixel	IR corr.	IR cut filter or option
BF5M12721	2.8	1.27	2.1	1/4.0"	0.1	4.18	185°	4.7	5	•	BF5M12721C
BF13M0922S13C	2.9	0.9	2.2	1/3.2"	0.1	2.01	200°	5.6	13		•
BF5M11920	3.24	1.19	2.0	1/3.2"	0.2	6.44	180°	14.7	5	•	BF5M11920C
BF10M10526S132	3.5	1.05	2.6	1/3.2"	0.1	3.2	200°	13.7	10	•	BF10M10526S132C
BFM1220C	3.84	1.2	2.0	1/3.0"	0.2	2.91	190°	7.5	1.3		•
BF5M15828S125	4.1	1.58	2.8	1/2.5"	0.1	5.75	180°	10.9	5	•	BF5M15828S125C
BF16M220DV2	4.2	1.2	2.5	1/2.3"	0.1	2.94	220°	26	16		BF16M220DV2C
BF9M1422	4.5	1.41	2.2	1/2.3"	0.1	3.69	183°	24.0	9	•	BF9M1422C
BF10M14522S18	4.6	1.45	2.2	1/1.8"	0.1	4.62	190°	14.0	10	•	BF10M14522S18C
BFM1524S125	4.7	1.49	2.4	1/2.5"	0.06	2.94	183°	4.0	1.3		BFM1524S125C
BF3M2122S13	4.8	2.1	2.2	1/3.0"	0.1	3.67	184°	3.9	3	•	BF3M2122S13C
BF5M19622	5.6	1.96	2.2	1/2.5"	0.1	2.77	180°	2.3	5	•	BF5M19622C
BF10M19828S118	5.6	1.98	2.8	1/1.8"	0.1	6.32	180°	15.6	10	•	BF10M19828S118C
BF5M2223S129	6.2	2.2	2.3	1/2.9"	0.1	4.71	195°	4.8	5	•	BF5M2223S129C
BF5M2023S23	6.6	2.0	2.3	2/3	0.1	6.11	195°	18.8	5	•	BF5M2023S23C
BF10M2628S123	8.0	2.6	2.8	1/2.3"	0.1	3.67	150°	6.8	10		BF10M2628S123C

C-MOUNT LENSES

ABOUT C-MOUNT LENSES

These days this is still the most common type in industrial image processing, esp. in factory automation. Mostly they are used with digital cameras like USB, Fire_Wire, Gig-E and Smart Cameras.

All C-Mount lenses have three things in common:

- Outer diameter thread of 1" (about 2.54 cm)
- 32 threads per inch thread pitch
- A back flange length of **17.526mm**

CS-Mount Lenses

This is the most common type of lens in the surveillance industry. CS-Mount lenses are more popular than C-Mount lenses for extreme wide angle lenses. CS-Mount lenses are still often used with analog film cameras. All CS-Mount lenses have three characteristics in common:

- Outer diameter thread of 1" (about 2.54 cm)
- 32 threads per inch thread pitch
- A back flange length of **12.5mm**

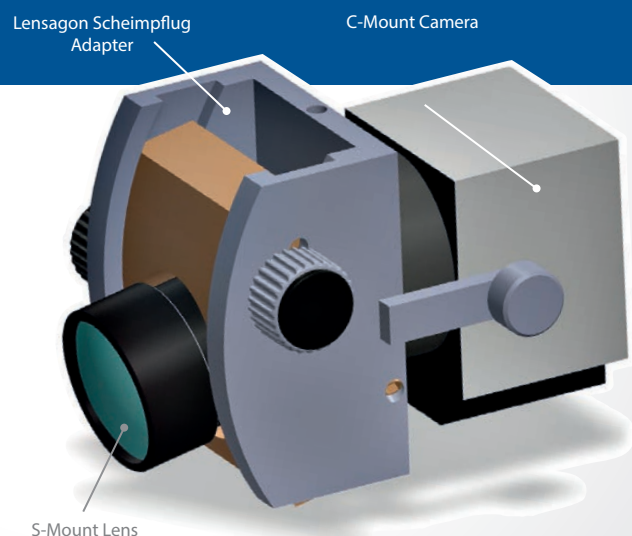
Not sure which is which?

C-Mount CS-Mount lenses on first glance look very similar .. even the thread fits well. Because only the back focal length is different things can be tricky. Please visit www.optowiki.com and check the FAQ "How to distinguish C- and CS-Mount with a quick test?" if you're not sure to have the right lens.

S-MOUNT TO C-MOUNT SCHEIMPFLUG ADAPTER

The tilt mechanism allows overall image sharpness to be controlled in a different way than conventional lenses. Used in conjunction with aperture, the tilt feature of these lenses allows objects or features within an image plane to be kept in focus. This is helpful when imaging objects at oblique angles.

If absolute sharpness in the foreground and background is required, it is necessary to first focus on the closest foreground object and then tilt the lens until the background object is focus. After selecting the correct aperture, both objects will be sharp. Using such tilt mechanisms provides an additional means of controlling depth of field and allows greater freedom over the aperture and shutter speed combinations.



<http://www.optowiki.info/glossary/scheimpflug-principle/>

(CAD image)

HIGH QUALITY C-MOUNT LENSES

Features

- Cover a wide range of uses from inspection to factory automation
- Vibration-resistant focus and iris locks available
- Compatible with 1/3", 1/2", 2/3", 1" 400,000 pixel cameras



1/2" format

	Focal length (mm)	Aperture (f-number)	MOD (m)	Angle of view (Horiz. x Vert.)	Filter screw	Sensor Format
CY0316	3.5	1.6	0.1	69.0° x 85.0°	M43 P=0.75	1/2"
CY0614	6	1.4	0.2	42.0° x 54.5°	M27 P=0.5	1/2"
CY1214	12	1.4	0.3	22.0° x 29.0°	M27 P=0.5	1/2"

2/3" format

	Focal length (mm)	Aperture (f-number)	MOD (m)	Angle of view (Horiz. x Vert.)	Filter screw	Sensor Format
CY0614S23	6	1.4	0.2	81.9° x 61.2°	no filter thread	2/3"
CY0813	8	1.3	0.2	45.0° x 57.8°	M25.5 P=0.5	2/3"
CY1614	16	1.4	0.4	23.2° x 30.7°	M27 P=0.5	2/3"
CY2514	25	1.4	0.5	21.6° x 28.5°	M27 P=0.5	2/3"
CY3519	35	1.9	0.5	10.8° x 14.4°	M27 P=0.5	2/3"
CY5018	50	1.8	1	7.9° x 10.5°	M30.5 P=0.5	2/3"
CY7527	75	2.7	1	4.9° x 6.6°	M30.5 P=0.5	2/3"
CY10035	100	3.5	1	3.8° x 5.1°	M30.5 P=0.5	2/3"

MEGAPIXEL HIGH RESOLUTION
1" C-MOUNT LENSES

	Focal length (mm)	Aperture (f-number)	MOD (m)	Angle of view (Horiz. x Vert.)	Filter screw	Sensor Format
CM0618GS	6	1.8	0.1	96.8° x 79.4°	no filter thread	1"
CM0814GS	8	1.4	0.1	79.7° x 63.0°	M55 P=0.75	1"
CM1214GS	12	1.4	0.3	55.6° x 42.5°	M27 P=0.5	1"
CM1614GS	16	1.4	0.3	44.3° x 33.6°	M35.5 P=0.5	1"
CM2514GS	25	1.4	0.3	29.3° x 22.0°	M35.5 P=0.5	1"
CM3514GS	35	1.4	0.3	20.9° x 15.8°	M35.5 P=0.5	1"
CM5014GS	50	1.4	0.5	14.5° x 10.8°	M40.5 P=0.5	1"
CM7518GS	75	1.8	1.0	9.7° x 7.3°	M46.5 P=0.75	1"

C-MOUNT LENSES

HIGH SPEED F0.95 C-MOUNT LENSES

These light-sensitive lenses are optimized for high-speed cameras. Our C-mount lenses in 1" format are designed for focal lengths of 17, 25 and 50 mm and are well suited for low-light applications.

Common applications include:

- Digital microscopy
- Motion analysis
- Transportation inspection
- Measurement systems
- Holographic imaging
- High-speed bottle inspection



	Focal length (mm)	Aperture (f-number)	MOD (m)	Angle of view (Horiz. x Vert.)	Filter screw	Sensor Format
CHS17095	17	0.95	0.5	22.0° x 29.0°	M40.5 P=0.5	2/3"
CHS25095	25	0.95	0.5	21.7° x 28.7°	M40.5 P=0.5	1"
CHS50095	50	0.95	0.7	11.0° x 14.6°	M62.0 P=0.75	1"

MEGAPIXEL LOW DISTORTION VARIFOCAL C-MOUNT LENSES

The CVM series maintains straight lines in wide angle images!

Utilising advanced lens technology to XD (extra low Dispersion) glass and an aspherical lens, this new multi-megapixel lens will pave the way for more possibilities in applications such as high end surveillance.

Features

- High resolution, compatible with sensors of over 1 megapixel
- Compact design and low distortion: Where "normal" 4.5mm lenses for 1/2" have a distortion of between 20% and 30%, this brand new aspherical lenses have a distortion of below 0.5% (T) on a 1/2" sensor.



	Focal length (mm)	Aperture (max.)	MOD (m)	TV Distortion	Angle of View (H x V)		Sensor Format
					Wide	Tele	
CVM0411ND	4.4 - 11	1.6	0.3	W: -0.2% T: 0.35%	76.6° x 61.2°	36.7° x 28.0°	1/1.8"
CVM1040ND	10 - 40	1.6	0.5	W: -0.17% T: 0.1%	39.5° x 48.3°	10.5° x 13.1°	1/1.8"
CVM1664NDGS	16 - 64	1.8	1.0	W: -3.4% T: 0.2%	45.9° x 34.2°	11.7° x 8.8°	1"

MEGAPIXEL LOW DISTORTION CCTV LENSES (ND SERIES)

Features

- High resolution, compatible with sensors of over 1 megapixel
- High performance at less than WD500 mm
- Low color aberration and low TV distortion
- Micro-photography without extension ring



	Focal length (mm)	Aperture (f-number)	MOD (m)	TV Distortion	Angle of view (Horiz. x Vert.)	Filter screw	Sensor Format
CMFA0420ND	4 mm	2.0	0.1	0.91%	60° x 75.1°	M27 P=0.5	1/2"
CMFA0622ND	6 mm	2.2	0.1	-0.01%	40.5° x 52.3°	M30.5 P=0.5	1/2"
CMFA1022ND	10 mm	2.2	0.1	-0.08%	26.3° x 34.6°	M27 P=0.5	1/2"
CMFA1520ND	15 mm	2.0	0.1m~∞	-0.09%	24.1° x 31.8°	M27 P=0.5	2/3"
CMFA2020ND	20 mm	2.0	0.1m~1m	-0.10%	18.2° x 24.1°	M27 P=0.5	2/3"
CMFA2520ND	25 mm	2.0	0.15m~1m	-0.01%	14.8° x 19.6°	M27 P=0.5	2/3"
CMFA3020ND	30 mm	2.0	0.2m~1m	-0.02%	12.6° x 16.7°	M27 P=0.5	2/3"
CMFA3519ND	35 mm	1.9	0.3m~1m	-0.03%	10.8° x 14.3°	M27 P=0.5	2/3"
CMFA5025ND	50 mm	2.5	0.4m~1m	-0.03%	7.8° x 10.4°	M27 P=0.5	2/3"
CMFA7538ND	75 mm	3.8	0.4m~1m	-0.01%	5.1° x 6.8°	M27 P=0.5	2/3"

3 MEGAPIXEL C-MOUNT LENSES (C3M SERIES)

Features:

- Compatible with over 3 megapixel sensors
- Low optical distortion
- High performance and excellent value for money
- Focal length 4 mm coming soon!
- Lock screws for manual iris and manual focus.



	Focal length (mm)	Aperture (f-number)	MOD (m)	Angle of view (Horiz. x Vert.)	Weight (g)	Sensor Format
C3M0616V2	6 mm	1.6	0.15	45.1° x 71.1°	91.1	1/1.8"
C3M0814V2	8 mm	1.4	0.20	48.3° x 36.4°	64.8	1/1.8"
C3M1216V2	12 mm	1.6	0.15	40.2° x 30.5°	68.2	2/3"
C3M1616V2	16 mm	1.6	0.30	29.5° x 22.6°	89	2/3"
C3M2518V2	25 mm	1.8	0.30	19.6° x 15.2°	55	2/3"
C3M3520V2	35 mm	2.0	0.40	14.2° x 10.5°	56	2/3"
C3M5025V2	50 mm	2.5	0.50	10.3° x 7.3°	79	2/3"
C3M7528V2	75 mm	2.8	1.20	9.2° x 6.9°	167.5	1"

C-MOUNT LENSES

5 MEGAPIXEL HIGH RESOLUTION MACHINE VISION LENSES

Suitable for inspection and alignment, high accuracy

- Suitable for 5 mega upto 10 megapixel sensors
- Focal length longer than f=16mm is compatible with 1.1 sensor
- High resolution at whole range of WD and excellent brightness
- Robust design, suitable for machine vision applications
- Two different mount types available : slip mount for all lenses, fix mount for 25 mm, 50 mm, 75 mm



	Focal length (mm)	Aperture (f-number)	MOD (m)	TV Distortion	max. Magnification	Filter size	Sensor Format
C5M0528V2	5	2.8	0.05	0.29%	0.044x	M55 P=0.75	2/3"
C5M0818V2	8	1.8	0.1	0.31%	0.078x	M40.5 P=0.75	2/3"
C5M1214V2	12	1.4	0.1	-0.31%	0.1x	M37.5 P=0.5	2/3"
C5M1618GSV2	16	1.8	0.033	-0.28%	0.3x	M49 P=0.75	1.1"
C5M2514GSV2	25	1.4	0.08	-0.09%	0.3x	M52 P=0.75	1.1"
C5M3514GSV2	35	1.4	0.11	0.07%	0.3x	M46 P=0.75	1.1"
C5M5018GSV2	50	1.8	0.192	-0.01%	0.3x	M49 P=0.75	1.1"
C5M7518GSV2	75	1.8	0.29	0.001%	0.3x	M55 P=0.75	1.1"

* TV distortion indicates a value for the closest working distance with 2/3 sensor

6/8 MEGAPIXEL COMPACT MACHINE VISION LENSES

Compact designed models

- from f6~f75 mm for 2/3" or 1/1.8" sensors
- High resolution for high megapixel cameras
- Lock screws for iris and focus for all models



	Focal length (mm)	Aperture (f-number)	MOD (m)	Optical Distortion	Angle of view (Horiz. x Vert.)	Weight (g)	Sensor Format
CK8M0828S23	8	2.8	0.1	-1.51%	47.06° x 54.97°	80.7	2/3"
CK8M1628S23	16	2.8	0.1	-0.2%	24.38° x 28.94°	57.1	2/3"

	Focal length (mm)	Aperture (f-number)	MOD (m)	Distortion	Angle of view (Horiz. x Vert.)	Filter size	Sensor Format
CK6M0628S118	6	2.0	0.035	-1.5% opt.	44.8° x 63.5°	-	1/1.8"
CK6M0828S118	8	2.0	0.1	-0.03% TV	34° x 49.3°	M27 P=0.5	1/1.8"
CK6M1228S118	12	2.0	0.1	-0.12% TV	23.4° x 34.4°	M27 P=0.5	1/1.8"
CK6M1628S118	16	2.0	0.1	-0.08% TV	17.5° x 25.7°	M27 P=0.5	1/1.8"
CK6M2528S118	25	2.0	0.1	-0.02% TV	11° x 16.3°	M25 P=0.5	1/1.8"
CK6M3528S118	35	2.0	0.15	-0.02% TV	7.6° x 11.3°	M27 P=0.5	1/1.8"
CK6M5028S118	50	2.0	0.3	0.11% opt.	5.4° x 8°	M25.5 P=0.5	1/1.8"

10 MEGAPIXEL C-MOUNT LENSES

Designed for 4/3" sensors (Ø 23 mm format)

Features

- Large image format of Ø 23 mm
- High defined picture throughout the entire image format
- Filters are available for all models



	Focal length (mm)	Aperture (f-number)	MOD (m)	Optical Distortion	Angle of view (Horiz. x Vert.)	Filter size	Image Format
CK10M1220S43	12	2.0	0.15	-2.4%	61.1° x 75.5°	M77 P=0.75	4/3"
CK10M1620S43	16	2.0	0.1	-2.81%	47.3° x 60.9°	M58 P=0.75	4/3"
CK10M2520S43	25	2.0	0.15	-0.66%	31° x 40.6°	M46 P=0.75	4/3"
CK10M3520S43	35	2.0	0.2	-0.56%	22.4° x 29.6°	M40.5 P=0.5	4/3"
CK10M5020S43	50	2.0	0.3	-0.14%	15.7° x 20.9°	M40.5 P=0.5	4/3"
CK10M8520S43	85	2.0	1.2	-0.04%	9.3° x 12.1°	M77 P=0.75	4/3"

12 MEGAPIXEL C-MOUNT LENSES

Designed for 12 Megapixel sensors

Features

- High performance from macro distance range to infinity
- Suited fine for factory automation and also high end surveillance



	Focal length (mm)	Aperture (f-number)	MOD (m)	Optical Distortion	Angle of view (Horiz. x Vert.)	Filter size	Image Format
CK12M1628S11	16	2.8	0.08	-1.3%	44.9° x 33.9°	M35.5 P=0.5	1.1"
CK12M2528S11	25	2.8	0.12	0.4%	29.6° x 22.1°	M35.5 P=0.5	1.1"
CK12M3528S11	35	2.8	0.18	-0.21%	21.4° x 15.9°	M35.5 P=0.5	1.1"
CK12M5028S11	50	2.8	0.275	-0.05%	11.2° x 15.1°	M35.5 P=0.5	1.1"

KNOWLEDGE BASE

Do you already know
optowiki.info?

You will find many interesting
questions about optics

...and surprising answers!

**Q: CAN S-MOUNT LENSES BE AS
GOOD AS C-MOUNT LENSES?**

A: EVEN BETTER!

ALTHOUGH THERE IS A NATURAL
LIMIT ON THE QUALITY OF
S-MOUNT LENSES, SOME OF
THEM PROVIDE A QUALITY NOT
FOUND IN THE C-MOUNT AREA,
OR ONLY FOR DRAMATICALLY
HIGHER PRICES.

Q: WHY IS THE CAMERA IMAGE TOTALLY BLURRED!?

**A: ...NOT JUST 'A LITTLE' OUT OF FOCUS!
IT COULD BE THAT YOU ARE USING A CS-MOUNT
LENS ON A C-MOUNT CAMERA.
AT CS-MOUNT CAMERAS IT IS ABOUT 5MM LESS
FROM THE LEADING EDGE OF THE MECHANICS
TO THE SENSOR.**



- Interactive graphics
- Online calculators
- Optics glossary
- Trouble shooting

S-MOUNT (M12X0.5)



ST05

M12 Extension ring 5mm

Material: Aluminium, Height: 5 mm



ST10

M12 Extension ring 10mm

Material: Aluminium, Height: 10 mm

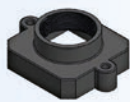


M12TM14

M12 to M14 Adapter

Material: Aluminium. For using M12x0.5 lenses in M14x0.5 mounts

NEW



SH04F85

S-mount lens holder 8.5mm

Material: Plastic, mounting hole distance 22mm, Height: 8.9 mm, Base width: 19.8 mm



SH02M13V3

S-mount lens holder 13mm

Material: Plastic, mounting hole distance 22mm, Height: 13 mm, Width: 20.3 mm



SH03H16V4

S-mount lens holder 16mm

Material: Plastic, mounting hole distance 22mm, side hole for lock screw. Inner height 5mm



LRM12V2

M12 x 0.5 Lock Ring

Material: Aluminium, Black anodized, Height: 2 mm, Diameter: 15.8 mm



FAM12D14H08

Iris/Filter adapter for M12x0.5

allows to add a filter to standard S-Mount (M12x0.5) Lenses or to modify the F-Number.

NEW



SHM16

M16 to S-Mount Lens Holder

Material: Plastic

NEW



DC-D27H11 / DC-D46H27

Scratch Resistant Dome Cover

Hard coating 1.2 or 2 inch dome with plating, 3.5/7.6cm, PE film

C-MOUNT



ADCTS

C-Mount to CS-Mount Adapter

with male and female thread, 5mm effective height, for use of c-mount lenses with cs-mount cameras



CT40

Extension Tube 40mmMaterial: Aluminium, Height: 40 mm
40mm extension tube for C-Mount lenses.

AD02F

S-Mount to C-Mount Adapter Flat

Male c-mount thread and female M12x0.5 thread, for use of s-mount lenses in c-mount cameras.



AD03H

S-Mount to C-Mount Adapter High

Male c-mount thread and female M12x0.5 thread, for use of s-mount lenses in c-mount cameras.



AD01S

S-Mount to C-Mount Adapter Standard

Male c-mount thread and female M12x0.5 thread, for use of s-mount lenses in c-mount cameras.



AD04M

S-Mount to C-Mount Adapter Medium

Male c-mount thread and female M12x0.5 thread, H: 6mm, for s-mount lenses in c-mount cameras.



LRICM / LROCM

C-Mount Lock RingsOutside thread: Dia.: 20mm, H: 2.5mm
Inside thread: Dia.: 31mm, Height 2mm

ADM16TCF / ADM16TCM

M16 to C-Mount AdaptersOutside thread: C-Mount (1-32 UN 2A)
Inside thread: M16x0.5mm

S-Mount

C-Mount

Accessories

Telecentric

Line Scan

Macro

Sensors

TELECENTRIC LENSES

DOUBLE SIDE TELECENTRIC LENSES

These lenses are the best choice for accurate dimensional measurement of large part samples.

Despite the fact that we display a wide range of catalog lenses here, we offer significantly more customized lens designs.

For example, lenses having folded optical paths, non-circular geometry, ultra-short working distances, and, to our knowledge, the world's smallest telecentric lens. No perspective error over the whole FOV

- IRIS diaphragm for adjusting DOF
- Well suited for High Megapixel sensors like 5M, 4M, 16M, 29M (Diagonal length from 11mm to 43mm)
- Good for engine parts, metal parts, molding and casting semiconductor parts application
- Optional mounts : M58, C, F, customized



T29M SERIES

	Magnification	WD (mm)	Res. Obj. (μm)	NA (obj.)	Aperture (wF#)	DOF (μm)	Telecentricity (<degree)	Optical Distort. (%)	Sensor size (max.)	Standard mount
T29M-015-545	0.15X	545	34.41	0.0097	7.7	15050	0.05	0.03	36 x 24 mm	M58
T29M-024-400I	0.24X	400	28	0.012	10	7640	0.05	0.03	43mm	M58
T29M-038-265I	0.38X	265	17.6	0.019	10	3050	0.04	0.03	43mm	M58
T29M-0563-160I	0.563X	160	12	0.028	10	1270	0.05	0.04	43mm	M58
T29M-0664-181I	0.664X	181	8.4	0.04	8.3	1110	0.05	0.05	43mm	M58

T4M SERIES

	Magnification	WD (mm)	Res. Obj. (μm)	NA (obj.)	Aperture (wF#)	DOF (mm)	Telecentricity (<degree)	Optical Distort. (%)	Sensor size (max.)	Standard mount
T4M-01-470I	0.1X	470	51.6	0.0065	7.7	61.6	0.05	0.026	1.2"	F

TDC SERIES

	Magnification	WD (mm)	Res. Obj. (μm)	NA (obj.)	Aperture (wF#)	DOF (mm)	Telecentricity (<degree)	Optical Distort. (%)	Sensor size (max.)	Standard mount
TDC-0044-398	0.044X	398	116	0.0029	7.5	310	0.05	0.03	1/2" (8mm)	C
TDC-0061-398	0.061X	398	78	0.0043	7	150	0.05	0.03	2/3" (11mm)	C
TDC-012-230	0.12X	230	40.91	0.0082	7.3	40.5	0.04	0.03	2/3" (11mm)	C
TDC-0138-184	0.138X	184	38.563	0.0095	7.5	30.7	0.05	0.03	2/3" (11mm)	C
TDC-0157-160	0.157X	160	32.259	0.0104	7.5	24.3	0.05	0.03	2/3" (11mm)	C
TDC-0184-135	0.184X	135	27.5	0.0122	7.5	17.7	0.04	0.05	2/3" (11mm)	C
TDC-024-108	0.24X	108	20.96	0.016	7.5	10.4	0.04	0.04	2/3" (11mm)	C
TDC-0255-70	0.255X	70	20.97	0.016	8	9.8	0.04	0.04	2/3" (11mm)	C
TDC-035-72	0.35X	72	14.399	0.0233	7.5	4.9	0.05	0.04	2/3" (11mm)	C

I = Manual Iris, C = Coaxial, IC = Both

OBJECT SIDE TELECENTRIC LENSES

T47M SERIES

- This lens can be applied for 47MP sensor cameras which have 56.7mm diagonal length
- Good for various inspections like Flat Panel Display applications & automobile components
- High resolution and good telecentricity regarding of all series
- Iris diaphragm adapted for adjusting DOF



	Magnification	WD (mm)	Res. Obj. (μm)	NA (obj.)	Aperture (wF#)	DOF (mm)	Telecentricity (<degree)	Optical Distort. (%)	Sensor size (max.)	Standard mount
TD47M-02-542	0.2X	542	26	0.013	7.7	8.4	0.03	0.04	47M (56.7mm)	M72
T47M-04-208I	0.4X	208.3	14	0.024	8.3	2.3	0.04	0.04	47M (56.7mm)	M72
T47M-07-117I	0.7X	117	7.7	0.0437	8	718μm	0.04	0.07	47M (56.7mm)	M72
T47M-064-170I	0.64X	170	8.4	0.04	8	860μm	0.04	0.06	47M (56.7mm)	M72
T47M-087-137I	0.87X	137	6.4	0.052	8.3	482μm	0.04	0.07	47M (56.7mm)	M72
T47M-10-122C	1.0X	122	6.7	0.05	10	440μm	0.04	0.02	47M (56.7mm)	M72
T47M-13-105C	1.3X	105	5.6	0.06	10.8	281μm	0.03	0.03	47M (56.7mm)	M72
T47M-10-122	1.0X	122	6.7	0.05	10	440μm	0.04	0.02	47M (56.7mm)	M72
T47M-13-105	1.3X	105	5.6	0.06	10.8	281μm	0.03	0.03	47M (56.7mm)	M72

I = Manual Iris, C = Coaxial, IC = Both / DOF Calculation: Permissible of circle of confusion : 22μm

T25M SERIES

- This telecentric lens supports up to 25 megapixel sensor cameras with 32mm diagonal length.
- It is compatible with 12M sensor camera according to the customer requirement
- High resolution lens & No perspective error over the whole FOV
- Iris diaphragm adapted for adjusting DOF
- Possible to change M48-Mount / F-Mount.



	Magnification	WD (mm)	Res. Obj. (μm)	NA (obj.)	Aperture (wF#)	DOF (μm)	Telecentricity (<degree)	Optical Distort. (%)	Sensor size (max.)	Standard mount
T25M-033-347I	0.33X	347	16.8	0.0124	8	2940	0.03	0.02	25M (32mm)	M48
T25M-035-213I	0.35X	213	14.39	0.0233	7.5	2200	0.03	0.08	25M (32mm)	M48
T25M-045-270I	0.45X	270	9.31	0.036	6.25	1110	0.03	0.08	25M (32mm)	F
T25M-046-150I	0.46X	150	10.2	0.033	7	1200	0.03	0.04	25M (32mm)	M48
T25M-05-237I	0.5X	237	8.4	0.04	6.25	900	0.03	0.08	25M (32mm)	M48
T25M-06-132I	0.6X	132	7	0.048	6.3	630	0.03	0.04	25M (32mm)	M48
T25M-08-240I	0.8X	240	6.3	0.0533	7.5	421	0.03	0.04	25M (32mm)	F
T25M-082-270I	0.82X	270	6.1	0.0546	7.5	401	0.03	0.04	25M (32mm)	F
T25M-092-170I	0.92X	170	5.2	0.064	7.14	303	0.04	0.03	25M (32mm)	M48
T25M-12-155I	1.2X	155	4.2	0.08	7.5	187	0.03	0.03	25M (32mm)	F
T25M-135-110I	1.35X	110	4.5	0.075	9	178	0.03	0.01	25M (32mm)	F
T25M-15-100I	1.5X	100	4.47	0.075	10	160	0.03	0.03	25M (32mm)	F
T25M-30-78/C	3.0X	78	3.4	0.1	15	60	0.04	0.09	25M (32mm)	F

I = Manual Iris, C = Coaxial, IC = Both / DOF Calculation: Permissible of circle of confusion : 18μm

TELECENTRIC LENSES

T12M SERIES

- High resolution lens, no perspective error
- Compatible with 12M sensors Ø28mm
- Manual iris to adjust DOF vs. resolution



	Magnification	WD (mm)	Res. Obj. (µm)	NA (obj.)	Aperture (wF#)	DOF (µm)	Telecentricity (<degree)	Optical Distort. (%)	Sensor size (max.)	Standard mount
T12M-055-271/C	0.55X	271	9.1	0.037	7.4	1000	0.03	0.01	12M (28mm)	M48
T12M-0785-275/C	0.785X	275	6.3	0.053	7.4	528	0.03	0.01	12M (28mm)	M48

I = Manual Iris, C = Coaxial, IC = Both / DOF Calculation: Permissible of circle of confusion : 22µm

TF8M SERIES

- High telecentricity: no perspective error.
- Telecentric lenses for large detectors 4M (15.2mm x 15.2mm) and 1.2"
- Manual iris to adjust DOF vs. resolution
- Wide magnification range from 0.315X to 2.0X
- Great for semiconductor & SMT & PCB components measurement



	Magnification	WD (mm)	Res. Obj. (µm)	NA (obj.)	Aperture (wF#)	DOF (µm)	Telecentricity (<degree)	Optical Distort. (%)	Sensor size (max.)	Standard mount
TF8MHR-0315-130I	0.315X	130	13.3	0.0252	6.25	2780	0.03	0.03	8M (23mm)	F
TF8MHR-0318-265I	0.318X	265	10.6	0.0318	5	2180	0.03	0.08	8M (23mm)	F
TF8MHR-0348-130I	0.348X	130	12.1	0.0278	6.25	2300	0.03	0.04	8M (23mm)	F
TF8MHR-0348-200I	0.348X	200	12	0.0289	6	2180	0.03	0.02	8M (23mm)	F
TF8MHR-0385-130I	0.385X	130	12.4	0.027	7.1	2100	0.015	0.03	8M (23mm)	F
TF8MHR-042-132I	0.42X	132	5.4	0.0627	3.35	835.6	0.03	0.03	8M (23mm)	F
TF8M-042-130I	0.42X	130	16	0.021	10	2500	0.023	0.1	8M (23mm)	F
TF8MHR-049-132I	0.49X	132	7.5	0.0446	5.5	1010	0.03	0.05	8M (23mm)	F
TF8MHR-05-130I	0.5X	130	9.4	0.0357	7	1230	0.03	0.05	8M (23mm)	F
TF8M-056-130I	0.56X	130	12.7	0.028	10	1400	0.03	0.06	8M (23mm)	F
TF8MHR-058-254I	0.58X	254	5.8	0.058	5	653.9	0.03	0.08	8M (23mm)	F
TF8MHR-06-130I	0.6X	130	6.2	0.054	5.6	684.4	0.03	0.06	8M (23mm)	F
TF8M-06-130I	0.6X	130	11.6	0.029	10.4	1300	0.23	0.1	8M (23mm)	F
TF8MHR-06-258I	0.6X	258	5.6	0.06	5	611.1	0.03	0.03	8M (23mm)	F
TF8MHR-064-130I	0.64X	130	5.8	0.0576	5.56	597.3	0.02	0.06	8M (23mm)	F
TF8MHR-06-310I	0.6X	310	7	0.048	6.25	671.4	0.03	0.08	8M (23mm)	F
TF8MHR-07-130I	0.7X	130	5.1	0.066	5.3	476	0.03	0.05	8M (23mm)	F
TF8MHR-10-157I	1.0X	157	4.7	0.071	7	308	0.03	0.06	8M (23mm)	F
TF8MHR-20-50/C	2.0X	50	3	0.112	8.93	98.2	0.03	0.04	8M (23mm)	F

Possible to change mount. For Robot guidance applications we recommend metrical threads (and not bajonett F-mount) due to the higher mechanical stability.

TC4M SERIES

- High telecentricity: no perspective error.
- Telecentric lenses for large detectors 4M (Ø16mm) and 1.2"
- Manual iris to adjust DOF vs. resolution
- Wide magnification range from 0.15X to 3X
- Great for semiconductor & SMT & PCB components measurement



	Magnification	WD (mm)	Res. Obj. (μm)	NA (obj.)	Aperture (wF#)	DOF (μm)	Telecentricity (<degree)	Optical Distort. (%)	Sensor size (max.)	Standard mount
TC4MHR-015-255I	0.15X	255	31.4	0.0107	7	13.68mm	0.023	0.01	1" (16mm)	C
TC4MHR-016-240I	0.16X	240	30.5	0.011	7	12.03mm	0.03	0.01	1" (16mm)	C
TC4MHR-0215-163I	0.215X	163	17.65	0.019	5.6	5300	0.03	0.03	1" (16mm)	C
TC4MHR-0234-130I	0.234X	130	15.97	0.021	5.6	4500	0.03	0.031	1" (16mm)	C
TC4MHR-0234-200I	0.234X	200	16	0.021	5.6	4500	0.03	0.03	1" (16mm)	C
TC4MHR-026-130I	0.26X	130	14.3	0.0234	5.6	3644	0.03	0.031	1" (16mm)	C
TC4MHR-026-200I	0.26X	200	14.3	0.0234	5.6	3644	0.03	0.031	1" (16mm)	C
TC4MHR-0275-240I	0.275X	240	16.8	0.02	6.87	4000	0.025	0.04	1" (16mm)	C
TC4MHR-0312-130I	0.312X	130	7.21	0.0465	3.35	1514	0.03	0.031	1" (16mm)	C
TC4MHR-0312-200I	0.312X	200	9.7	0.0346	4.5	2000	0.03	0.03	1" (16mm)	C
TC4MHR-037-240I	0.37X	240	12.1	0.0277	6.66	2100	0.03	0.01	1" (16mm)	C
TC4MHR-0445-130I	0.445X	130	10.583	0.037	7	1560	0.023	0.065	1" (16mm)	C
TC4MHR-07-65/C	0.7X	65	6.57	0.051	6.8	610	0.03	0.03	1" (16mm)	C
TC4MHR-08-130C	0.8X	130	8.38	0.04	10	687	0.03	0.03	1" (16mm)	C
TC4MHR-10-65/C	1.0X	65	5.41	0.062	8	352	0.03	0.03	1" (16mm)	C
TC4M-10-110/C	1.0X	110	5.41	0.062	8	352	0.03	0.03	1" (16mm)	C
TC4MHR-22-40/C	2.2X	40	2.72	0.123	8.9	80.9	0.03	0.02	1" (16mm)	C
TC4MHR-30-40/C	3.0X	40	2.4	0.14	10.7	52.3	0.03	0.03	1" (16mm)	C

I = Manual Iris, C = Coaxial, IC = Both / DOF Calculation: Permissible of circle of confusion : 22μm

TELECENTRIC LENSES

TC5M SERIES ULTRA HIGH RESOLUTION

In combination with Megapixel cameras (up to 2/3" sensor), you can get high-quality images.

- Designed for 5M sensor cameras (3.45m/pixel)
- Ultra High resolution and contrast with high NA.
- Very low distortion in whole field.
- Compact design with optional coaxial illumination.
- High telecentricity, No perspective error



TC5M SERIES (WD: 65MM)

	Magnification	WD (mm)	Res. Obj. (μm)	NA (obj.)	Aperture (wF#)	DOF (μm)	Telecentricity (<degree)	Optical Distort. (%)	Sensor size (max.)	Standard mount
TC5M-05-65/C	0.5X	65	8.4	0.04	6.25	1000	0.02	0.17	2/3"	C
TC5M-08-65/C	0.8X	65	5.25	0.064	6.25	390.6	0.02	0.13	2/3"	C
TC5M-10-65/C	1.0X	65	4.8	0.07	7.14	285.6	0.022	0.16	2/3"	C
TC5M-10-65I/IC	1.0X	65	4.8	0.07	7.14	285.6	0.022	0.16	2/3"	C
TC5M-20-65/C	2.0X	65	2.8	0.12	8.3	83	0.03	0.02	2/3"	C
TC5M-20-65I/IC	2.0X	65	2.8	0.12	8.3	83	0.03	0.02	2/3"	C
TC5M-30-65/C	3.0X	65	2.15	0.156	9.6	42.7	0.02	0.05	2/3"	C
TC5M-30-65I/IC	3.0X	65	2.15	0.156	9.6	42.7	0.02	0.05	2/3"	C
TC5M-40-65/C	4.0X	65	2.09	0.16	12.5	31.3	0.02	0.03	2/3"	C
TC5M-40-65I/IC	4.0X	65	2.09	0.16	12.5	31.3	0.02	0.03	2/3"	C

I = Manual Iris, C = Coaxial, IC = Both / DOF Calculation: Permissible of circle of confusion : 20μm

TC5M SERIES (WD: 110MM)

	Magnification	WD (mm)	Res. Obj. (μm)	NA (obj.)	Aperture (wF#)	DOF (μm)	Telecentricity (<degree)	Optical Distort. (%)	Sensor size (max.)	Standard mount
TC5M-03-110/C	0.3X	110	15.3	0.0219	6.9	3040	0.04	0.02	2/3"	C
TC5M-05-110/C	0.5X	110	7.2	0.0465	5.38	861	0.02	0.02	2/3"	C
TC5M-05-110I/IC	0.5X	110	7.2	0.0465	5.38	861	0.02	0.02	2/3"	C
TC5M-07-110/C	0.7X	110	5.15	0.0651	5.38	439	0.02	0.02	2/3"	C
TC5M-07-110I/IC	0.7X	110	5.15	0.0651	5.38	439	0.02	0.012	2/3"	C
TC5M-09-110/C	0.9X	110	4.473	0.075	6	296	0.025	0.01	2/3"	C
TC5M-10-110/C	1.0X	110	4.36	0.077	6.5	260	0.03	0.03	2/3"	C
TC5M-10-110I/IC	1.0X	110	4.36	0.077	6.5	260	0.03	0.03	2/3"	C
TC5M-18-110/C	1.8X	110	4.14	0.081	11	95	0.03	0.03	2/3"	C
TC5M-20-110/C	2.0X	110	3.7	0.09	11	110	0.05	0.03	2/3"	C
TC5M-20-110I/IC	2.0X	110	3.7	0.09	11	110	0.05	0.03	2/3"	C

I = Manual Iris, C = Coaxial, IC = Both / DOF Calculation: Permissible of circle of confusion : 20μm



TC5M SERIES (WD: 130-170MM)

	Magnification	WD (mm)	Res. Obj. (μm)	NA (obj.)	Aperture (wF#)	DOF (μm)	Telecentricity (<degree)	Optical Distort. (%)	Sensor size (max.)	Standard mount
TC5M-0315-130I	0.315X	130	13.3	0.0252	6.25	2052	0.03	0.03	2/3"	C
TC5M-0348-130I	0.348X	130	12.1	0.0278	6.25	2060	0.03	0.04	2/3"	C
TC5M-042-130I	0.42X	130	5.4	0.0627	3.35	759	0.03	0.03	2/3"	C
TC5M-07-130I	0.7X	130	5.33	0.063	5.5	449	0.03	0.05	2/3"	C
TC5M-026-150I	0.26X	150	13.7	0.0245	5.3	3100	0.03	0.08	2/3"	C
TC5M-017-170I	0.17X	170	9.73	0.058	5	4775	0.03	0.06	2/3"	C
TC5M-03-170I	0.3X	170	17.94	0.0187	8	3550	0.03	0.01	2/3"	C
TC5M-065-170/C	0.65X	170	5.78	0.058	5.6	530	0.02	0.06	2/3"	C

I = Manual Iris, C = Coaxial, IC = Both / DOF Calculation: Permissible of circle of confusion : 20μm

TELECENTRIC LENSES

TCHR SERIES OF TELECENTRIC LENSES

- Designed for mega-pixel sensor cameras (4.65µm/pixel)
- High Resolution and contrast design in FOV
- WD Lineup of 65, 110, 130mm
- Support up to 2/3" cameras
- Various magnification with low-distortion design
- Uniform coaxial illumination over the whole FOV
- Coaxial versions are partly non-rotatable



TCHR SERIES (WD: 65MM)

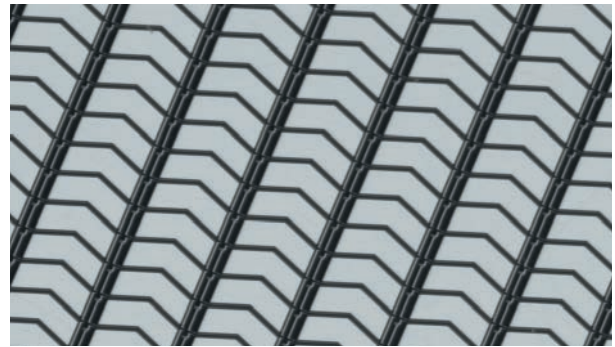
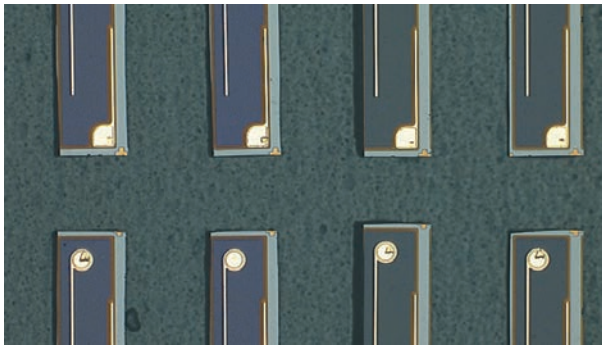
	Magnification	WD (mm)	Res. Obj. (µm)	NA (obj.)	Aperture (wF#)	DOF (µm)	Telecentricity (<degree)	Optical Distort. (%)	Sensor size (max.)	Standard mount
TCHR-013-60I	0.13X	60	34.6	0.0097	6.7	31.7mm	0.03	0.08	1/2" (8mm)	C
TCHR-05-65/C	0.5X	65	11.2	0.03	8.3	2600	0.02	0.17	2/3" (11mm)	C
TCHR-05-65I	0.5X	65	11.2	0.03	8.3	2600	0.02	0.17	2/3" (11mm)	C
TCHR-08-65/C	0.8X	65	6.7	0.05	8	1000	0.02	0.134	2/3" (11mm)	C
TCHR-10-65/C	1.0X	65	6.7	0.05	10	800	0.022	0.16	2/3" (11mm)	C
TCHR-15-65/C	1.5X	65	4.8	0.07	10.7	380	0.022	0.07	1/2" (8mm)	C
TCHR-20-65/C	2.0X	65	4.5	0.074	13.4	268	0.05	0.03	2/3" (11mm)	C
TCHR-24-65/C	2.4X	63.6	4.8	0.07	17.2	239	0.015	0.1	2/3" (11mm)	C
TCHR-30-65/C	3.0X	65	4.04	0.083	18	120	0.02	0.14	1/2" (8mm)	C
TCHR-40-65/C	4.0X	65	3	0.11	18.18	90	0.05	0.03	2/3" (11mm)	C
TCHR-60-65/C	6.0X	65	3	0.11	27.2	61	0.05	0.03	2/3" (11mm)	C
TCHR-100-65/C	10.0X	65	2.2	0.15	33.3	27	0.01	0.14	1/2" (8mm)	C
TCHR-120-65/C	12.0X	65	2.1	0.161	37.3	21	0.004	0.1	1/2" (8mm)	C

I = Manual Iris, C = Coaxial, IC = Both / DOF Calculation: Permissible of circle of confusion : 40µm

TCHR SERIES (WD: 110MM)

	Magnification	WD (mm)	Res. Obj. (μm)	NA (obj.)	Aperture (wF#)	DOF (μm)	Telecentricity (<degree)	Optical Distort. (%)	Sensor size (max.)	Standard mount
TCHR-035-110-S12/C	0.35X	110	21.1	0.016	11	4500	0.03	0.05	1/2" (8mm)	C
TCHR-05-110-S13/C	0.5X	110	11.2	0.03	8.3	2600	0.03	0.02	1/3" (6mm)	C
TCHR-05-110/C	0.5X	110	14.9	0.0225	11.1	3500	0.02	0.15	2/3" (11mm)	C
TCHR-08-110/C	0.8X	110	11.2	0.03	13.2	1650	0.017	0.15	2/3" (11mm)	C
TCHR-10-110/C	1.0X	110	6.7	0.05	10	800	0.03	0.15	2/3" (11mm)	C
TCHR-15-110/C	1.5X	110	7.0	0.048	15.6	555	0.01	0.15	2/3" (11mm)	C
TCHR-15-110-S12/C	1.5X	110	5.6	0.06	12.5	444	0.02	0.06	1/2" (8mm)	C
TCHR-20-110/C	2.0X	110	4.4	0.077	13	260	0.02	0.03	2/3" (11mm)	C
TCHR-30-110/C	3.0X	110	3.7	0.09	10.6	148	0.02	0.11	2/3" (11mm)	C
TCHR-40-110/C	4.0X	110	3.72	0.09	22.2	111	0.05	0.03	2/3" (11mm)	C
TCHR-40-110I	4.0X	110	3.72	0.09	22.2	111	0.05	0.03	2/3" (11mm)	C
TCHR-60-110/C	6.0X	110	3.72	0.09	33.4	74	0.05	0.03	2/3" (11mm)	C
TCHR-80-110/C	8.0X	110	3.72	0.09	44.4	56	0.05	0.19	2/3" (11mm)	C

I = Manual Iris, C = Coaxial, IC = Both / DOF Calculation: Permissible of circle of confusion : 40μm



TCHR SERIES (WD: 130MM-190MM)

	Magnification	WD (mm)	Res. Obj. (μm)	NA (obj.)	Aperture (wF#)	DOF (μm)	Telecentricity (<degree)	Optical Distort. (%)	Sensor size (max.)	Standard mount
TCHR-01-150I	0.1X	150	40.4	0.0083	6.0	48.0mm	0.04	0.05	1/2" (8mm)	C
TCHR-0165-130I	0.165X	130	28.2	0.012	7.1	20.8mm	0.017	0.13	1/2" (8mm)	C
TCHR-023-130I	0.23X	130	20	0.016	7.1	10.7mm	0.01	0.13	2/3" (11mm)	C
TCHR-03-130I	0.3X	130	17.6	0.019	7.9	7000	0.04	0.08	2/3" (11mm)	C
TCHR-035-130I	0.35X	130	14.1	0.0238	7.3	4800	0.035	0.08	1/2" (8mm)	C
TCHR-10-190I	1.0X	190	6.7	0.05	10	360	0.035	0.08	1/2" (8mm)	C

I = Manual Iris, C = Coaxial, IC = Both / DOF Calculation: Permissible of circle of confusion : 40μm

TELECENTRIC LENSES

TCST SERIES

Telecentric lenses are useful for measuring without changing magnification across the DOF and coaxial illumination for even illumination (telecentric lighting). As shown below, we have a range of telecentric lenses with varying working distances, magnification, sensor sizes, and high or standard resolution.

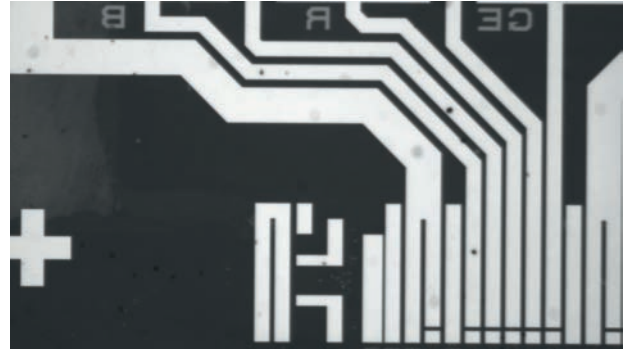
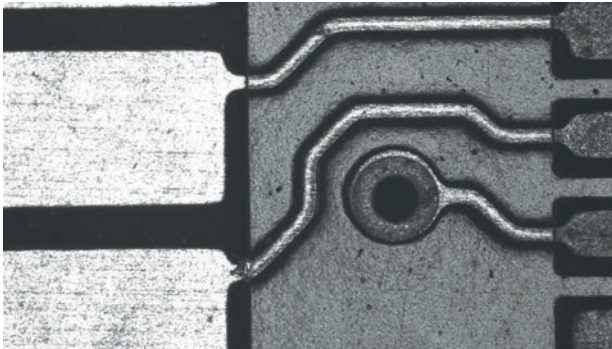
- Fixed magnification lens
- Low optical distortion & excellent telecentricity
- High resolution and high contrast design
- Various WD & magnifications
- Even coaxial illumination types
- **Remark:** To keep the prices low, some Coaxial versions are not fully rotatable



TCST SERIES (WD: 40MM)

	Magnification	WD (mm)	Res. Obj. (μm)	NA (obj.)	Aperture (wF#)	DOF (μm)	Telecentricity (<degree)	Optical Distort. (%)	Sensor size (max.)	Standard mount
TCST-05-40/C	0.5X	43	11.2	0.03	8.3	2600	0.03	0.08	1/2" (8mm)	C
TCST-10-40/C	1.0X	40	6.21	0.054	9.26	740	0.03	0.08	1/2" (8mm)	C
TCST-15-40/C	1.5X	40	5.32	0.063	11.9	423	0.03	0.25	1/2" (8mm)	C
TCST-20-40/C	2.0X	40	4.8	0.07	14.28	286	0.03	0.03	1/2" (8mm)	C
TCST-30-40/C	3.0X	40	4.8	0.07	21.5	191	0.02	0.26	1/2" (8mm)	C
TCST-40-40/C	4.0X	40	4.8	0.07	28.6	143	0.02	0.2	1/2" (8mm)	C
TCST-50-40/C	5.0X	40	4.2	0.08	31.25	100	0.02	0.05	1/2" (8mm)	C
TCST-60-40/C	6.0X	40	4.2	0.08	37.4	83	0.02	0.02	1/2" (8mm)	C
TCST-80-40/C	8.0X	40	4.2	0.08	50	63	0.01	0.03	1/2" (8mm)	C

I = Manual Iris, C = Coaxial, IC = Both / DOF Calculation: Permissible of circle of confusion : 40μm



TCST SERIES (WD: 65MM)

	Magnification	WD (mm)	Res. Obj. (μm)	NA (obj.)	Aperture (wF#)	DOF (μm)	Telecentricity (<degree)	Optical Distort. (%)	Sensor size (max.)	Standard mount
TCST-05-65/C	0.5X	65	20.2	0.017	15.0	4800	0.03	0.04	1/2" (8mm)	C
TCST-08-65/C	0.8X	65	12.4	0.027	14.8	1850	0.03	0.03	1/2" (8mm)	C
TCST-10-65/C	1.0X	65	12.4	0.027	18.5	1450	0.03	0.03	1/2" (8mm)	C
TCST-15-65/C	1.5X	65	7	0.048	15.6	554	0.05	0.06	1/2" (8mm)	C
TCST-20-65/C	2.0X	65	5.2	0.065	15.4	308	0.02	0.03	1/2" (8mm)	C
TCST-30-65/C	3.0X	65	4.8	0.07	21.5	191	0.02	0.16	1/2" (8mm)	C
TCST-40-65/C	4.0X	66	4.4	0.076	26.3	132	0.04	0.03	1/2" (8mm)	C
TCST-50-65/C	5.0X	65.5	4.4	0.076	32.9	105	0.04	0.05	1/2" (8mm)	C
TCST-60-65/C	6.0X	65.3	4.4	0.076	39.5	88	0.04	0.06	1/2" (8mm)	C
TCST-80-65/C	8.0X	64.9	4.4	0.076	52.6	66	0.05	0.05	1/2" (8mm)	C

I = Manual Iris, C = Coaxial, IC = Both / DOF Calculation: Permissible of circle of confusion : 40μm

TCST SERIES (WD: 110MM)

	Magnification	WD (mm)	Res. Obj. (μm)	NA (obj.)	Aperture (wF#)	DOF (μm)	Telecentricity (<degree)	Optical Distort. (%)	Sensor size (max.)	Standard mount
TCST-05-110/C	0.5X	110	20.21	0.0166	15	4800	0.05	0.05	1/2" (8mm)	C
TCST-08-110/C	0.8X	110	12.4	0.027	14.8	1850	0.05	0.05	1/2" (8mm)	C
TCST-08-110I	0.8X	110	12.4	0.027	14.8	1850	0.05	0.05	1/2" (8mm)	C
TCST-10-113/C	1.0X	113	14	0.024	20.8	1660	0.02	0.023	1/2" (8mm)	C
TCST-12-110-S13/C	1.0X	110	10.16	0.033	18	1000	0.03	0.03	1/3" (6mm)	C
TCST-20-110/C	2.0X	110	7.4	0.045	22.2	444	0.02	0.02	1/2" (8mm)	C
TCST-24-110/C	2.4X	107	7.4	0.045	26.7	370	0.02	0.07	1/2" (8mm)	C
TCST-30-110/C	3.0X	110	6.1	0.055	27.3	243	0.01	0.14	1/2" (8mm)	C
TCST-40-110/C	4.0X	110	5.6	0.06	33.45	167	0.01	0.16	1/2" (8mm)	C
TCST-50-110/C	5.0X	110	5.6	0.06	41.77	134	0.01	0.14	1/2" (8mm)	C
TCST-60-110/C	6.0X	110	5.6	0.06	50	111	0.01	0.1	1/2" (8mm)	C
TCST-80-110/C	8.0X	110	5.6	0.06	66.7	85	0.015	0.25	1/2" (8mm)	C

I = Manual Iris, C = Coaxial, IC = Both / DOF Calculation: Permissible of circle of confusion : 40μm

TCST LONG WD SERIES

- Long working distance telecentric lenses. (up to 400mm)
- Good for the alignment application where long WD is requested
- 4 types of WD (150, 200, 300, 400mm)
- Homogeneous illumination on the whole area
- High Resolution & low distortion



TCST SERIES (WD: 150-170MM)

	Magnification	WD (mm)	Res. Obj. (μm)	NA (obj.)	Aperture (wF#)	DOF (μm)	Telecentricity (<degree)	Optical Distort. (%)	Sensor size (max.)	Standard mount
TCST-08-173/C	0.8X	173	11.2	0.03	13.3	1660	0.04	0.07	1/2" (8mm)	C
TCST-10-156/C	1.0X	156	8.8	0.038	13.1	1000	0.04	0.07	1/2" (8mm)	C
TCST-12-173/C	1.2X	173	11.2	0.03	20	1110	0.04	0.13	1/2" (8mm)	C
TCST-15-156/C	1.5X	156	8.83	0.038	19.7	700	0.04	0.16	1/2" (8mm)	C
TCST-16-173/C	1.6X	173	11.2	0.03	26.7	834	0.04	0.18	1/2" (8mm)	C
TCST-20-156/C	2.0X	156	8.83	0.038	26.3	526	0.04	0.19	1/2" (8mm)	C

I = Manual Iris, C = Coaxial, IC = Both / DOF Calculation: Permissible of circle of confusion : 40μm

TCST SERIES (WD: 200-250MM)

	Magnification	WD (mm)	Res. Obj. (μm)	NA (obj.)	Aperture (wF#)	DOF (μm)	Telecentricity (<degree)	Optical Distort. (%)	Sensor size (max.)	Standard mount
TCST-075-220/C	0.75X	220	8.9	0.0375	10	1400	0.03	0.08	1/2" (8mm)	C
TCST-075-220-S23/C	0.75X	220	9.1	0.037	10	1400	0.03	0.02	2/3" (11mm)	C
TCST-10-220/C	1.0X	220	7.4	0.045	11	880	0.03	0.01	2/3" (11mm)	C
TCST-10-250-S118/C	1.0X	250	7.45	0.045	11	484	0.03	0.081	1/1.8" (9mm)	C
TCST-15-220-S12/C	1.5X	220	7.45	0.045	16.6	590	0.03	0.13	1/2" (8mm)	C
TCST-15-200/C	1.5X	200	5	0.067	11.2	398	0.03	0.08	2/3" (11mm)	C
TCST-20-200/C	2.0X	200	4.2	0.08	12.5	250	0.03	0.02	1/2" (8mm)	C
TCST-30-200/C	3.0X	200	4.2	0.08	18.7	166	0.02	0.1	1/2" (8mm)	C
TCST-40-200/C	4.0X	200	4.19	0.08	25	125	0.015	0.13	1/2" (8mm)	C

I = Manual Iris, C = Coaxial, IC = Both / DOF Calculation: Permissible of circle of confusion : 40μm



TCST SERIES (WD: 300MM)

	Magnification	WD (mm)	Res. Obj. (μm)	NA (obj.)	Aperture (wF#)	DOF (μm)	Telecentricity (<degree)	Optical Distort. (%)	Sensor size (max.)	Standard mount
TCST-08-320/C	0.8X	320	11.98	0.028	14.0	1750	0.03	0.03	1/2" (8mm)	C
TCST-10-300/C	1.0X	300	9.6	0.035	14.2	1100	0.02	0.03	1/2" (8mm)	C
TCST-10-340/C	1.0X	340	38.56	0.04	12.5	1000	0.03	0.04	1/2" (8mm)	C
TCST-15-300/C	1.5X	300	9.6	0.035	21.4	762	0.02	0.13	1/2" (8mm)	C
TCST-20-300/C	2.0X	300	9.6	0.035	28.5	571	0.01	0.17	1/2" (8mm)	C

I = Manual Iris, C = Coaxial, IC = Both / DOF Calculation: Permissible of circle of confusion : 40μm

TCST SERIES (WD: 400MM)

	Magnification	WD (mm)	Res. Obj. (μm)	NA (obj.)	Aperture (wF#)	DOF (μm)	Telecentricity (<degree)	Optical Distort. (%)	Sensor size (max.)	Standard mount
TCST-05-400/C	0.5X	402	12.9	0.026	9.6	3.07mm	0.03	0.05	1/2" (8mm)	C

I = Manual Iris, C = Coaxial, IC = Both / DOF Calculation: Permissible of circle of confusion : 40μm



TELECENTRIC LENSES

TELECENTRIC ZOOM LENSES

Features

- Telecentricity at any magnification
- Suitable for high resolution megapixel cameras
- Magnification can be converted from 0.25x to 2.6x by using front converters
- Less shading, uniformity of intensity
- TV distortion less than 0.01%

Magnification changes with WD.
Telecentricity around this WD.



	Magnification	WD (mm)	Depth of Field	Resolution Obj. (μm)	NA (obj.)	Sensor size (max.)	Standard mount
TZ0510	0.5× - 1.0×	174 - 114	1.20 - 0.47	12.5 - 9.8	0.066 - 0.085	2/3" (8mm)	C
TZ0513	0.5× - 1.3×	173 - 97	1.84 - 0.52	8 - 6.4	0.044 - 0.059	2/3" (8mm)	C

Values when the converter is attached to TZ0513:

	Magnification	WD (mm)	Application
FC02510	0.25× - 1.0×	323.2 - 115.6	Front converter for TZ0513
FC1426	1.4× - 2.6×	56.2 - 42.6	Front converter for TZ0513

Depth of field is calculated assuming a horizontal 320 TV resolution using 1/2" (8mm) sensor cameras (permissible circle of confusion 40μ)

TL4K SERIES 4K LINE SENSORS TELECENTRIC LENSES

We offer several telecentric lenses for 4K line sensor cameras (7µm/Pixel)

- High accuracy lens for 4K line sensor camera
- Very good telecentricity and high contrast image
- Low distortion over the whole field of view
- Manual iris for adjusting DOF vs. resolution
- Object-side telecentric lens



	Magnification	WD (mm)	Res. Obj. (µm)	NA (obj.)	Aperture (wF#)	DOF (µm)	Telecentricity (<degree)	Optical Distort. (%)	Sensor size (max.)	Standard mount
TL4K-05-237I	0.5X	237	8.4	0.04	6.25	700	0.02	0.08	4K(7µm) 28mm	F
TL4K-07-130I	0.7X	130	5.1	0.066	5.3	303	0.04	0.05	4K(7µm) 28mm	F
TL4K-077-140I	0.77X	140	7	0.0477	8	544	0.03	0.06	4K(10µm) 40mm	M72
TL4K-092-170I	0.92X	170	5.2	0.064	7.14	250	0.01	0.03	4K(7µm) 28mm	F
TL4K-10-138I	1.0X	138	6.1	0.055	9.1	364	0.04	0.02	4K(10µm) 40mm	F
TL4K-20-102	2.0X	102	3.7	0.09	11.1	111	0.03	0.07	4K(10µm) 40mm	F

I = Manual Iris, C = Coaxial, IC = Both / Possible to change mount

For Robot guidance applications we recommend metrical threads (and not bajonett F-mount) due to the higher mechanical stability.

TELECENTRIC LINE SCAN LENSES

TL8K SERIES 8K LINE SENSORS TELECENTRIC LENS

- High accuracy lens for 8K line sensor camera
- Very good telecentricity and high contrast image
- Low distortion over the whole field of view
- Uniform coaxial illumination with LED coaxial guide
 - Provides easy alignment with sensor camera and illumination
 - **Inner** coaxial illumination, not external coaxial illumination
- Good for 8K TDI & general line scan cameras



	Magnification	WD (mm)	Res. Obj. (μm)	NA (obj.)	Aperture (wF#)	DOF (μm)	Telecentricity (<degree)	Optical Distort. (%)	Sensor size (max.)	Standard mount
TL8K-0467-278/C	0.467X	278	12	0.028	8	1000	0.04	0.03	8K(7μm) 56mm	M72

TL12K SERIES 12K LINE SENSORS TELECENTRIC LENSES



- High resolution & High contrast optical design
- Can be used for 8K to 12K line sensor
- Almost perfect telecentric design. (telecentricity: < 0.04 degree)
- Low distortion over the whole field of view
- Support upto 5μm/pixel (12K Line sensor)
- Uniform coaxial illumination with LED coaxial guide
 - Provides easy alignment with sensor camera and illumination
 - **Inner** coaxial illumination, not an external coaxial illumination

	Magnification	WD (mm)	Res. Obj. (μm)	NA (obj.)	Aperture (wF#)	DOF (μm)	Telecentricity (<degree)	Optical Distort. (%)	Sensor size (max.)	Standard mount
TL12K-064-170I	0.64X	170	8.4	0.04	8	390	0.04	0.06	12K(5μm) 60mm	M72
TL12K-07-117I	0.7X	117	7.7	0.044	8	326	0.04	0.07	12K(5μm) 60mm	M72
TL12K-07-145/C	0.7X	145	10.16	0.033	10.6	450	0.04	0.03	12K(5μm) 60mm	M72
TL12K-087-137I	0.87X	137	6.5	0.052	8.3	219	0.04	0.07	12K(5μm) 60mm	M72
TL12K-10-122/C	1.0X	122	6.7	0.05	10	200	0.04	0.02	12K(5μm) 60mm	M72
TL12K-20-107I	2.0X	107	3.9	0.085	11.8	59	0.04	0.03	12K(5μm) 60mm	M72
TL12K-35-78/C	3.5X	78	3.05	0.11	15.9	25.9	0.04	0.05	12K(5μm) 60mm	M72
TL12K-50-78/C	5.0X	78	2.58	0.13	19.2	15.2	0.04	0.08	12K(5μm) 60mm	M72
TL12K-70-15/C	7.0X	15	1.5	0.23	15.2	62	0.03	0.32	12K(5μm) 60mm	M72
TL12K-100-13/C	10.0X	13.5	1.68	0.2	25	5	0.04	0.02	12K(5μm) 60mm	M72

ENTOCENTRIC LINE SCAN LENSES FOR WIDE FIELD OF VIEW

Our large format lens series has been specifically designed for the line-scan and large area sensor market. Covering sensors up to 62mm diag., these low distortion lenses are ready for challenging applications.

Features:

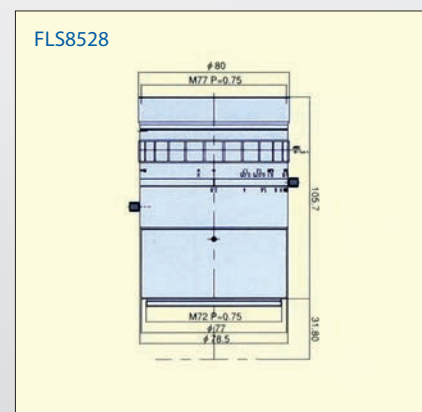
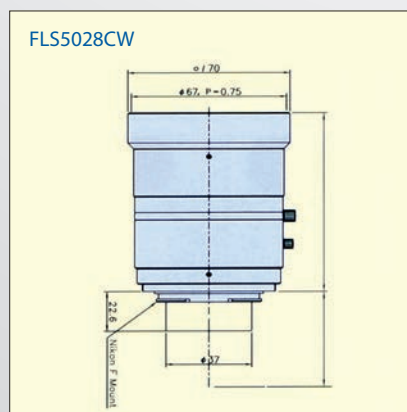
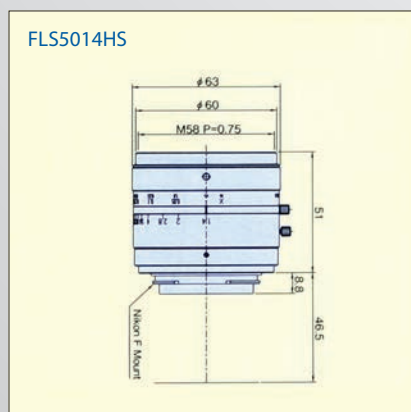
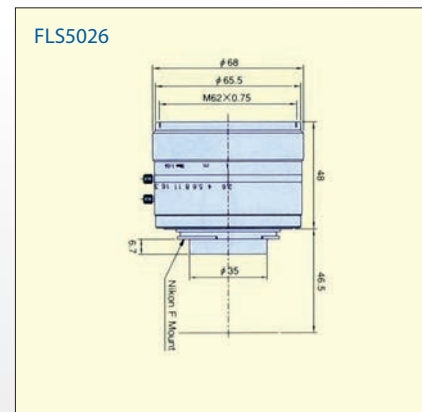
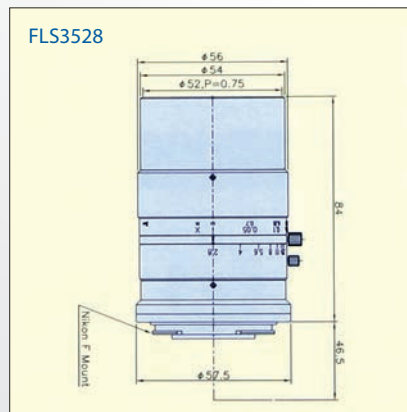
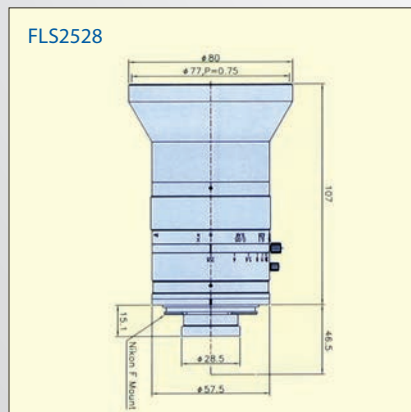
- Working distance and magnification are adjustable
- Suitable for long working distance
- Designed for machine vision applications
- FLS8528 is compatible with M72 mount (option)
- Suitable for various applications such as printing, PC, glass, textile etc..



	F No.	Focal length	Range of WD	Magnification	Distortion	Max. comp. sensor	Mount
FLS2528	2.8	25 mm	140 mm	0.15x	0.66%	Ø 44 mm	F
FLS3528	2.8	35 mm	230 mm	0.15x	-0.31%	Ø 44 mm	F
FLS5026	2.6	50 mm	0.32m	0.18x	0.23%	Ø 45 mm	F
FLS5014HS	1.4	50 mm	0.27m	0.2x	0.17%	Ø 45 mm	F
FLS5028CW	2.8	50 mm	190 mm	0.3x	-0.40%	Ø 44 mm	F
FLS8528	2.8	85 mm	0.46m	0.2x	0.04%	Ø 62 mm	F or M72

Indicated specifications are design values.

For Robot guidance applications we recommend metrical threads (and not bajonett F-mount) due to the higher mechanical stability.



LINE SCAN LENSES

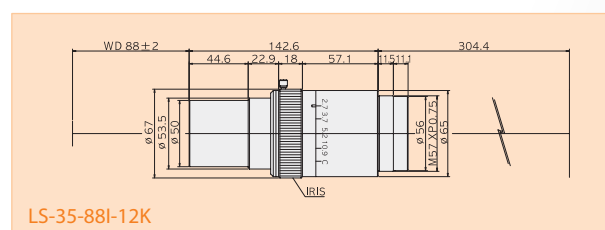
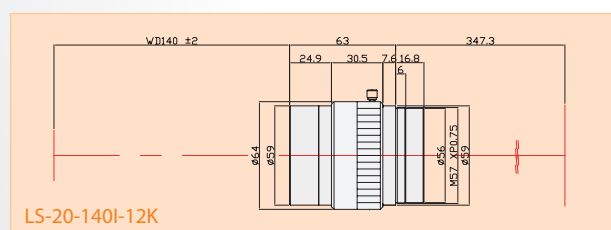
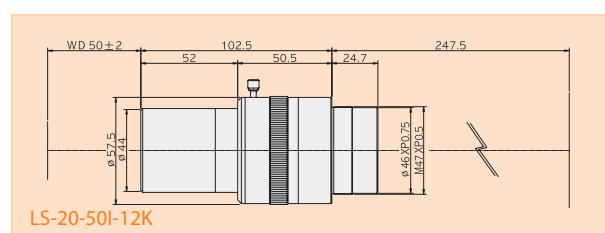
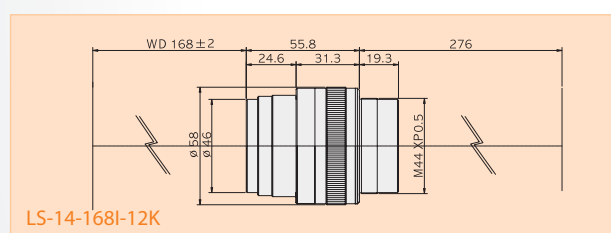
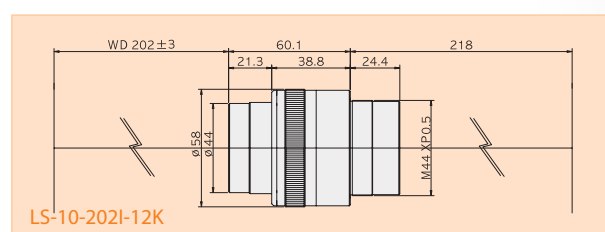
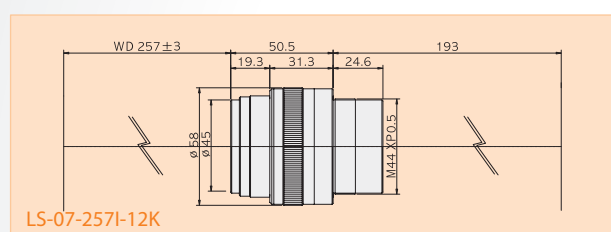
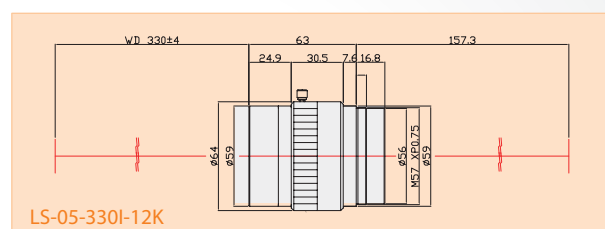
ENTOCENTRIC LS-12K SERIES: LINE SCAN LENSES FOR 8K TO 12K SENSORS

WD 50 - 320

	Magnification	WD (mm)	DOF (μm)	Res. (Obj.)	NA (obj.)	Sensor size	Aperture (wF#)	Optical Distortion (%)	Mount
LS-05-330I-12K	0.5X	330	512	8.6 μm	0.039	12k (5u) 60mm	6.4	0.08	M57
LS-07-257I-12K	0.7X	257	408	9.6 μm	0.035	12k (5u) 60mm	10	0.01	M47
LS-10-202I-12K	1.0X	202	100	6.7 μm	0.05	12k (5u) 60mm	10	0.04	M47
LS-14-168I-12K	1.4X	168	113	5.4 μm	0.063	12k (5u) 60mm	11.1	0.02	M47
LS-20-50I-12K	2.0X	50	45	3.1 μm	0.11	12k (5u) 60mm	9.1	0.03	M47
LS-20-140I-12K	2.0X	140	64	4.3 μm	0.078	12k (5u) 60mm	12.8	0.03	M57
LS-35-88I-12K	3.5X	88	41	2.4 μm	0.14	12k (5u) 60mm	12.5	0.05	M47

Possible to change mount

- High resolution & high contrast optical design
- Can be applied from 8K to 12K line scan cameras
- Low distortion for excellent image quality
- Large image circle up to 61.4 (12K @ 5μm)
- Magnifications from 0.5X to 3.5X



HIGH RESOLUTION LINE SCAN LENSES FOR 8K/16K SENSORS

EFL 41 - 116



Discover our range of line scan lenses with up to 16K resolution,
for a variety of industrial applications.

	Central Magnification	EFL/mm	Magnification Range	Image format	Pixel Size	Aperture	Mount
16K APO Series	4.38	116.4mm	3.80 - 4.80	φ88mm	3.5um	F1.6 - F16	M90, M95
apochromatic lens	6.20	117mm	5.60 - 6.90	φ88mm	3.5um	F1.6 - F16	M90, M95
	0.30	115mm	0.29 - 0.34	φ62mm	3.5um	F3.78 - F16	M58, M72, M90
	0.50	113mm	0.46 - 0.54	φ70mm	3.5um	F3.65 - F16	M58, M72, M90
	0.70	112mm	0.65 - 0.76	φ80mm	3.5um	F3.6 - F16	M58, M72, M90
	Central Magnification	EFL/mm	Magnification Range	Image format	Pixel Size	Aperture	Mount
8K APO Series	0.14	78mm	0.04 - 0.33	φ60mm	5um	F5.6 - F22	M58, M72, M90
apochromatic lens	0.21	78mm	0.04 - 0.33	φ64mm	5um	F4.0 - F22	M42, M58, M72
	Central Magnification	EFL/mm	Magnification Range	Image format	Pixel Size	Aperture	Mount
8K Series	0.1	41	0.04 - 0.33	φ44mm	5um	F2.8 - 11	M42, M58, M72
	0.17	41	0.04 - 0.33	φ60mm	5um	F5.6 - 22	M58, M72, M90
	0.167	60	0.04 - 0.33	φ64mm	5.5um	F4 - 22	M42, M58, M72
	0.17	61	0.04 - 0.33	φ82mm	5.5um	F5.6 - 22	M58, M72, M90
	0.3	80	0.2 - 0.4	φ64mm	5um	F5.6 - 22	M58, M72, M90
	0.2	90	0.15 - 0.3	φ86mm	5um	F5.6 - 22	M58, M72, M90
	0.17	100mm	0.08 - 0.33	φ108mm	5um	F5.6 - F16	M72, M90, M95
	0.50	120mm	0.37 - 0.65	φ86mm	5um	F5.6 - F16	M72, M90, M95

- High resolution & high contrast optical design
- Can be applied from 8K to 16K line scan cameras
- Low distortion for excellent image quality

apochromatic lens = better correction of chromatic and spherical aberration

MACRO LENSES

MACRO LENSES

These series are entocentric lenses for machine vision applications like factory automation.

For many types of sensor cameras like 1/2", 2/3", 2M, 4M, 5M, 8M, 12M & 15M, with high resolution and low distortion quality.

Features:

- Various working distance and magnification
- Fixed magnification (can be modified to another magnification)
- Mount: C-mount, F-mount & M48-P0.75
- Some models provide a manual iris adjustment



Standard

	Magnification	WD (mm)	Res. Obj. (μm)	NA (obj.)	Aperture (wF#)	DOF (μm)	Optical Distort. (%)	Sensor size (max.)	Standard mount
MCST-034-120	0.34X	120	15.80	0.0212	8.00	5500	0.07	1/2" (8mm)	C
MCST-053-110	0.53X	110	11.18	0.0300	9.00	2560	0.06	1/2" (8mm)	C
MCST-06-117	0.6X	117	9.30	0.0360	8.30	1800	0.02	1/2" (8mm)	C
MCST-06-120	0.6X	120	9.30	0.0360	8.30	1800	0.04	1/2" (8mm)	C
MCST-08-100	0.8X	100	8.20	0.0410	9.70	1200	0.03	1/2" (8mm)	C
MCST-12-100	1.2X	100	7.80	0.0430	13.90	772	0.03	1/2" (8mm)	C
MCST-20-100	2.0X	100	7.10	0.0470	21.20	424	0.04	1/2" (8mm)	C
MCST-40-92	4.0X	92	6.10	0.0550	36.40	180	0.01	1/2" (8mm)	C
MCHR-019-240	0.19X	240	28.00	0.0120	7.77	17 mm	0.13	2/3" (11mm)	C
MCHR-03-240	0.3X	240	17.66	0.0190	7.80	6900	0.135	2/3" (11mm)	C
MCHR-057-200	0.57X	200	11.57	0.0290	10.00	2460	0.04	2/3" (11mm)	C

2 Megapixel

	Magnification	WD (mm)	Res. Obj. (μm)	NA (obj.)	Aperture (wF#)	DOF (μm)	Optical Distort. (%)	Sensor size (max.)	Standard mount
MCHR-0198-185	0.198X	185	21.20	0.0158	6.25	9570	0.06	1/1.8"	C
MC2M-025-194I	0.25X	194	8.50	0.0395	3.16	3030	0.01	2M	C
MC2M-047-176	0.47X	176	10.17	0.0330	7.14	1900	0.28	2M	C
MC2M-055-164	0.55X	164	9.80	0.0342	8.10	2100	0.06	2M	C
MC2M-05-253	0.5X	253	11.18	0.0300	8.33	2000	0.06	2M	C
MC2M-075-164	0.75X	164	8.90	0.0376	10.00	1070	0.06	2M	C

DOF Calculation: Permissible of circle of confusion : 30μm



4 Megapixel

	Magnification	WD (mm)	Res. Obj. (μm)	NA (obj.)	Aperture (wF#)	DOF (μm)	Optical Distort. (%)	Sensor size (max.)	Standard mount
MC4M-0185-225I	0.185X	225	18.10	0.0185	5.00	8770	0.01	4M	C
MC4M-0215-226I	0.215X	226	20.00	0.0170	6.25	8120	0.01	4M	C
MF4M-0247-267	0.247X	267	13.60	0.0247	5.00	4900	0.01	4M	F
MC4M-025-194I	0.25X	194	14.80	0.0230	5.50	5280	0.01	4M	C
MF4M-037-261	0.37X	261	9.10	0.0370	5.00	2190	0.01	4M	F
MF4M-055-210	0.55X	210	10.20	0.0330	8.30	1650	0.04	4M	F
MF4M-075-193	0.75X	193	8.90	0.0376	10.00	1060	0.06	4M	F
MC4M-015-255I	0.15X	255	29.8	0.01125	6.7	17.87mm	0.08	4M	C
MF4M-0296-267	0.296X	267	12	0.028	5.3	3600	0.01	4M	F
MC4M-03-170I	0.3X	170	17.2	0.02	7.7	5130	0.06	4M	C
MF4M-043-261	0.43X	261	7.8	0.043	5	1620	0.01	4M	F
MF4M-063-310I	0.63X	310	6.9	0.0485	6.5	983	0.08	4M	F
MF4M-074-247	0.74X	247	6.5	0.0518	7.1	778	0.06	4M	F

5 Megapixel

	Mag.	WD (mm)	Res. Obj. (μm)	NA (obj.)	wF#	DOF (μm)	Opt. Distort. (%)	Sensor (max.)	Mount
MC5M-019-240	0.19X	240	17.70	0.0190	5.00	5500	0.03	2/3"	C
MC5M-0257-185	0.257X	185	16.80	0.0200	6.25	3800	0.01	2/3"	C

8 Megapixel

	Mag.	WD (mm)	Res. Obj. (μm)	NA (obj.)	wF#	DOF (μm)	Opt. Distort. (%)	Sensor (max.)	Mount
MF8M-0247-267	0.247X	267	13.6	0.0247	5.0	3600	0.01	8M (23mm)	F
MF8M-0296-267	0.296X	267	12	0.028	5.3	2700	0.01	8M (23mm)	F
MF8M-035-300	0.35X	300	9.6	0.035	5.0	1800	0.08	8M (23mm)	F
MF8M-037-261	0.37X	261	9.1	0.037	5.0	1600	0.01	8M (23mm)	F
MF8M-043-261	0.43X	261	7.8	0.043	5.0	1200	0.01	8M (23mm)	F
MF8M-05-300	0.5X	300	6.7	0.05	5.0	880	0.08	8M (23mm)	F
MF8M-055-210	0.55X	210	10.2	0.033	8.3	1200	0.04	8M (23mm)	F
MF8M-063-310I	0.63X	310	6.9	0.0485	6.5	720	0.08	8M (23mm)	F
MF8M-074-247	0.74X	247	6.5	0.0518	7.1	574	0.06	8M (23mm)	F
MF8M-075-193	0.75X	193	8.9	0.0376	10	780	0.005	8M (23mm)	F
MF8M-08-260	0.8X	260	5.9	0.0568	7.0	484	0.05	8M (23mm)	F

12 Megapixel

	Mag.	WD (mm)	Res. Obj. (μm)	NA (obj.)	wF#	DOF (μm)	Opt. Distort. (%)	Sensor (max.)	Mount
MD12M-054-235I	0.54X	235	7.80	0.0430	6.25	1280	0.05	12M	M48

15 Megapixel

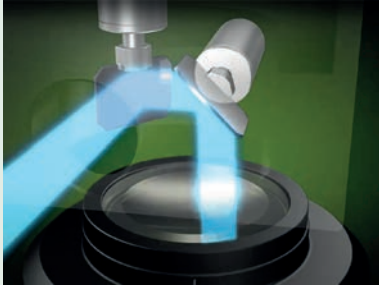
	Mag.	WD (mm)	Res. Obj. (μm)	NA (obj.)	wF#	DOF (μm)	Opt. Distort. (%)	Sensor (max.)	Mount
MF15M-042-300	0.42X	300	8.6	0.039	5.37	1200	0.08	15M	F
MF15M-0789-260	0.789X	260	5.95	0.056	7	674	0.06	15M	F

DOF Calculation: Permissible of circle of confusion : 20μm

For Robot guidance applications we recommend metrical threads (and not bajonett F-mount) due to the higher mechanical stability.

F-THETA SCAN LENSES

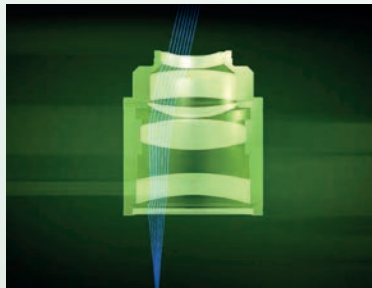
Together with high speed Galvo-Mirrors, F-theta lenses enable laser cutting and writing, soldering and even welding.



While laser pointers with a mere 0.3mW power, industrial lasers can have for example 30W, but some High Power Lasers work with for example 6000W.

For the laser not to immediately destroy the lens, high end surface coatings are mandatory and the laser beam must be expanded before it enters the lens.

Here you get optical components: Mirrors, mirror holders, beam expanders and F-Thetas for the various wavelengths and laser powers. We offer a set of standard types designed and patented by our workshop.



However we can show our real strength by customised designs.
For further information please contact our sales department



[https://www.lensation.de/
product-category/f-theta-lenses](https://www.lensation.de/product-category/f-theta-lenses)

LENSATION SENSOR DATABASE



Not sure what size your sensor is?
Here you can find all relevant information
like resolution, optical diagonal and sensor area.

Your sensor is not listed?
www.lensation.de/sensor-db/ 

Manufacturer	Sensor	Megapixel	Pixelsize	Resolution Horiz. (X)	Resolution Vert. (Y)	Width (mm)	Height (mm)	Diag (mm)	Exact opt. Diag
AMS (CMOSIS)	CMV2000	2.228	5.50	2048	1088	11.26	5.98	12.75	1/1.25"
AMS (CMOSIS)	CMV4000	4.194	5.50	2048	2048	11.26	11.26	15.93	1/1.0"
AMS (CMOSIS)	CMV8000	8.387	5.50	3360	2496	18.48	13.73	23.02	1.44"
AMS (CMOSIS)	CMV12000	12.583	5.50	4096	3072	22.53	16.90	28.16	1.76"
AMS (CMOSIS)	CMV20000	19.661	6.40	5120	3840	32.77	24.58	40.96	2.56"
AMS (CMOSIS)	CMV50000	47.552	4.60	7920	6004	36.43	27.62	45.72	2.86"
Gpixel	GCINE4349	49.152	4.30	8192	6000	35.23	25.80	43.66	2.73"
Gpixel	GL0204-0467		4.67	6300	4	29.42	0.02	29.42	1.84"
Gpixel	GL0402		7.00	4096	2	28.67	0.01	28.67	1.79"
Gpixel	GL0816		5.00	8322	16	41.61	0.08	41.61	2.6"
Gpixel	GL1608		5.00	16384	8	81.92	0.04	81.92	5.12"
Gpixel	GLT5009BSI		5.00	9072	288	45.36	1.44	45.38	2.84"
Gpixel	GMAX0505	26.214	2.50	5120	5120	12.80	12.80	18.10	1.13"
Gpixel	GMAX2505	5.530	2.50	2560	2160	6.40	5.40	8.37	1/1.91"
Gpixel	GMAX2509	9.072	2.50	4200	2160	10.50	5.40	11.81	1/1.36"
Gpixel	GMAX2518	18.474	2.50	4508	4098	11.27	10.25	15.23	1/1.05"
Gpixel	GMAX32103	103.739	3.20	11276	9200	36.08	29.44	46.57	2.91"
Gpixel	GMAX32152	152.315	3.20	16556	9200	52.98	29.44	60.61	3.79"
Gpixel	GMAX3265	65.408	3.20	9344	7000	29.90	22.40	37.36	2.34"
Gpixel	GMAX4651	50.814	4.60	8424	6032	38.75	27.75	47.66	2.98"
Gpixel	GSENSE2020BSI	4.194	6.50	2048	2048	13.31	13.31	18.83	1.18"
Gpixel	GSENSE400	4.194	11.00	2048	2048	22.53	22.53	31.86	1.99"
Gpixel	GSENSE4040BSI	16.777	9.00	4096	4096	36.86	36.86	52.13	3.26"
Gpixel	GSENSE6060	37.749	10.00	6144	6144	61.44	61.44	86.89	5.43"
Gpixel	GSPRINT4521	20.972	4.50	5120	4096	23.04	18.43	29.51	1.84"
On Semi (Aptina)	AR0521	5.039	2.20	2592	1944	5.70	4.28	7.13	1/2.53"
On Semi (Aptina)	AR0820	8.294	2.10	3840	2160	8.06	4.54	9.25	1/1.73"
On Semi (Aptina)	AR1820	18.096	1.25	4912	3684	6.14	4.61	7.68	1/2.35"
On Semi (Cypress)	PYTHON 1300	1.311	4.80	1280	1024	6.14	4.92	7.87	1/2.29"
On Semi (Cypress)	PYTHON 2000	2.304	4.80	1920	1200	9.22	5.76	10.87	1/1.47"
On Semi (Cypress)	PYTHON 5000	5.308	4.80	2592	2048	12.44	9.83	15.86	1/1.01"
On Semi (Cypress)	PYTHON 12K	12.583	4.50	4096	3072	18.43	13.82	23.04	1.44"
On Semi (Cypress)	PYTHON 16K	16.777	4.50	4096	4096	18.43	18.43	26.07	1.63"
On Semi (Cypress)	PYTHON 25K	26.214	4.50	5120	5120	23.04	23.04	32.58	2.04"
On Semi (Micron)	MT9V032 034	0.361	6.00	752	480	4.51	2.88	5.35	1/3.36"
On Semi (Micron)	MT9P006 031	5.039	2.20	2592	1944	5.70	4.28	7.13	1/2.53"
On Semi (Micron)	MT9J003	10.658	1.67	3856	2764	6.44	4.62	7.92	1/2.27"
On Semi (Micron)	MT9F002	15.151	1.40	4608	3288	6.45	4.60	7.93	1/2.27"
On Semi	XGS 2000 (1. Gen)	2.304	3.20	1920	1200	6.14	3.84	7.25	1/2.48"

Manufacturer	Sensor	Megapixel	Pixelsize	Resolution Horiz. (X)	Resolution Vert. (Y)	Width (mm)	Height (mm)	Diag (mm)	Exact opt. Diag
On Semi	XGS 5000 (2. Gen)	5.308	3.20	2592	2048	8.29	6.55	10.57	1/1.51"
On Semi	XGS 8000 (2. Gen)	8.847	3.20	4096	2160	13.11	6.91	14.82	1/1.08"
On Semi	XGS 12000 (2. Gen)	12.583	3.20	4096	3072	13.11	9.83	16.38	1.02"
On Semi	XGS 20000 (1. Gen)	20.250	3.20	4500	4500	14.40	14.40	20.36	1.27"
On Semi	XGS 32000 (1. Gen)	32.472	3.20	6580	4935	21.06	15.79	26.32	1.65"
On Semi	XGS 45000 (1. Gen)	44.728	3.20	8192	5460	26.21	17.47	31.50	1.97"
Teledyne e2v	Emerald 2M Snappy 2M	2.074	2.80	1920	1080	5.38	3.02	6.17	1/2.92"
Teledyne e2v	Emerald 5M Snappy 5M	4.956	2.80	2560	1936	7.17	5.42	8.99	1/1.78"
Teledyne e2v	Emerald 16M	17.040	2.80	4128	4128	11.56	11.56	16.35	1.02"
Teledyne e2v	Emerald 36M	37.749	2.50	6144	6144	15.36	15.36	21.72	1.36"
Teledyne e2v	Emerald 67M	67.897	2.50	8256	8224	20.64	20.56	29.13	1.82"
Teledyne e2v	ev76C560 660 661	1.311	5.30	1280	1024	6.78	5.43	8.69	1/1.84"
Teledyne e2v	ev76C570 571	1.920	4.50	1600	1200	7.20	5.40	9.00	1/1.78"
Sony	IMX178 (Starvis 1. Gen)	6.440	2.40	3096	2080	7.43	4.99	8.95	1/1.79"
Sony	IMX183 (Starvis 1. Gen)	20.480	2.40	5544	3694	13.31	8.87	15.99	1/1.0"
Sony	IMX226 (Starvis 1. Gen)	12.403	1.85	4072	3046	7.53	5.64	9.41	1/1.7"
Sony	IMX250 264 (Pregius 2. Gen)	5.066	3.45	2464	2056	8.50	7.09	11.07	1/1.45"
Sony	IMX252 265 (Pregius 2. Gen)	3.187	3.45	2064	1544	7.12	5.33	8.89	1/1.8"
Sony	IMX253 304 (Pregius 2. Gen)	12.369	3.45	4112	3008	14.19	10.38	17.58	1.1"
Sony	IMX255 267 305 (Pregius 2. Gen)	8.948	3.45	4112	2176	14.19	7.51	16.05	1.0"
Sony	IMX273 296 (Pregius 2. Gen)	1.584	3.45	1456	1088	5.02	3.75	6.27	1/2.87"
Sony	IMX287 297 (Pregius 2. Gen)	0.396	6.90	728	544	5.02	3.75	6.27	1/2.87"
Sony	IMX290 291 (Starvis 1. Gen)	2.134	2.90	1945	1097	5.64	3.18	6.48	1/2.78"
Sony	IMX334 (Starvis 2. Gen)	8.424	2.00	3864	2180	7.73	4.36	8.87	1/1.8"
Sony	IMX335 (Starvis 2. Gen)	5.138	2.00	2616	1964	5.23	3.93	6.54	1/2.75"
Sony	IMX342 (Pregius 2. Gen)	31.493	3.45	6480	4860	22.36	16.77	27.95	1.75"
Sony	IMX367 (Pregius 2. Gen)	19.660	3.45	4432	4436	15.29	15.30	21.63	1.35"
Sony	IMX387 (Pregius 2. Gen)	16.876	3.45	5472	3084	18.88	10.64	21.67	1.35"
Sony	IMX390 (Automotive)	2.455	3.00	2017	1217	6.05	3.65	7.07	1/2.55"
Sony	IMX392 (Pregius 2. Gen)	2.354	3.45	1936	1216	6.68	4.20	7.89	1/2.28"
Sony	IMX397 (Pregius 2. Gen)	0.326	3.45	658	496	2.27	1.71	2.84	1/6.33"
Sony	IMX411	151.003	3.76	14192	10640	53.36	40.01	66.69	4.17"
Sony	IMX412 (Starvis 1. Gen)	12.330	1.55	4056	3040	6.29	4.71	7.86	1/2.29"
Sony	IMX420 428 (Pregius 3. Gen)	7.101	4.50	3216	2208	14.47	9.94	17.55	1.1"
Sony	IMX421 429 437 (Pregius 3. Gen)	2.862	4.50	1944	1472	8.75	6.62	10.97	1/1.46"
Sony	IMX422 430 (Pregius 3. Gen)	2.037	4.50	1632	1248	7.34	5.62	9.25	1/1.73"
Sony	IMX425 432 (Pregius 3. Gen)	1.775	9.00	1608	1104	14.47	9.94	17.55	1.1"
Sony	IMX426 433 (Pregius 3. Gen)	0.509	9.00	816	624	7.34	5.62	9.25	1/1.73"
Sony	IMX455 (Starvis 1. Gen)	61.171	3.76	9576	6388	36.01	24.02	43.28	2.71"
Sony	IMX461	101.897	3.76	11656	8742	43.83	32.87	54.78	3.42"
Sony	IMX485 (Starvis 1. Gen) IMX585 (2. Gen)	8.391	2.90	3856	2176	11.18	6.31	12.84	1/1.25"
Sony	IMX490 (Automotive)	5.433	3.00	2896	1876	8.69	5.63	10.35	1/1.55"
Sony	IMX492 (Starvis 1. Gen)	47.082	2.32	8336	5648	19.30	13.08	23.31	1.46"
Sony	IMX500 (Vision Sensor)	12.330	1.55	4056	3040	6.29	4.71	7.86	1/2.29"
Sony	IMX530 540 (Pregius S 4. Gen)	24.551	2.74	5328	4608	14.60	12.63	19.30	1.21"
Sony	IMX531 541 (Pregius S 4. Gen)	20.358	2.74	4512	4512	12.36	12.36	17.48	1.09"
Sony	IMX532 542 (Pregius S 4. Gen)	16.197	2.74	5328	3040	14.60	8.33	16.81	1.05"
Sony	IMX533 (Starvis 1. Gen)	9.066	3.76	3011	3011	11.32	11.32	16.01	1.0"
Sony	IMX535 545 565 (Pregius S 4. Gen)	12.417	2.74	4128	3008	11.31	8.24	14.00	1/1.14"
Sony	IMX536 546 566 (Pregius S 4. Gen)	8.134	2.74	2856	2848	7.83	7.80	11.05	1/1.45"
Sony	IMX537 547 548 567 568 (Pregius S 4. Gen)	5.102	2.74	2472	2064	6.77	5.66	8.82	1/1.81"
Sony	IMX556 (ToF)	0.311	10.00	642	484	6.42	4.84	8.04	1/1.99"
Sony	IMX570 (ToF)	0.316	5.00	648	488	3.24	2.44	4.06	1/4.44"
Sony	IMX571 (Starvis 1. Gen)	26.108	3.76	6252	4176	23.51	15.70	28.27	1.77"
Sony	IMX577	12.477	1.55	4072	3064	6.31	4.75	7.90	1/2.28"
Sony	IMX661 (Pregius 4. Gen)	127.675	3.45	13400	9528	46.23	32.87	56.73	3.55"
Sony	IMX662 (Starvis 2. Gen)	2.125	2.90	1937	1097	5.62	3.18	6.46	1/2.79"
Sony	IMX677	23.915	1.12	5663	4223	6.34	4.73	7.91	1/2.28"
Sony	IMX678 (Starvis 2. Gen)	8.391	2.00	3856	2176	7.71	4.35	8.86	1/1.81"
Sony	IMX990 (SenSWIR)	1.337	5.00	1296	1032	6.48	5.16	8.28	1/1.93"
Sony	IMX991 (SenSWIR)	0.341	5.00	656	520	3.28	2.60	4.19	1/4.3"

S-Mount

C-Mount

Accessories

Telecentric

Line Scan

Macro

Sensors

We like to move it!



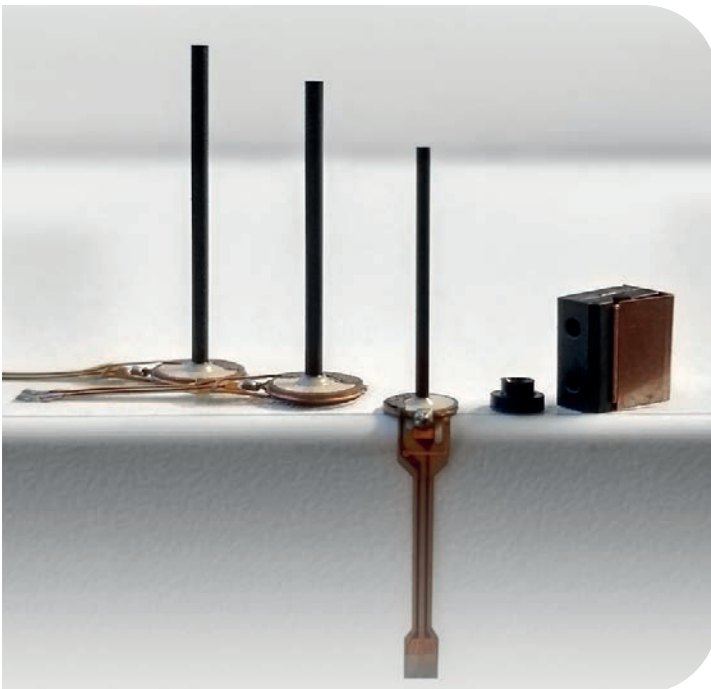
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You can find with ease your motion solutions with our piezoelectric linear drives. They are quick-responsive, highly accurate and very simple to control.

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A compact one-chip focus module for M12 lenses, driven by piezoelectric ultrasonic linear motor. Precise, quick-responsive and simple to integrate.



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Resolution(μm)

Resolution is a measure of how closely spaced two points may be before they cannot be distinguished. For example, 1μm resolution means that two points that are 1μm away from each other can be distinguished. Resolution values in this catalog are lenses' theoretical resolutions. The following is a formula to calculate theoretical resolution based on an aplanatic lens's ray diffraction. (Rayleigh formula) $\text{Wavelength } 0.61 \times \text{NA}$

Resolving power(line/mm)

Resolving power indicates the number of black and white lines distinguished within 1mm in an image through a black and white grid-like chart lens. It is expressed by line/mm.

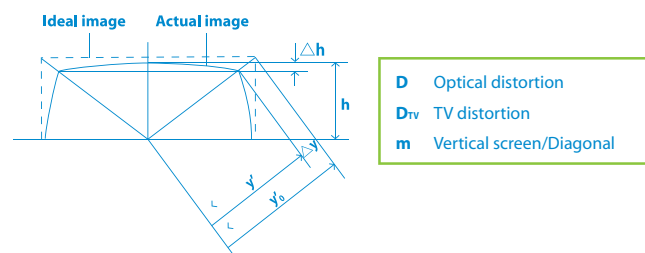
For example, 100 line/mm means that black and white pitch 1/100mm(10μ) can be distinguished. The width of both the black and white lines is 1/200mm(5μ).

Horizontal TV resolution

The total number of black and white horizontal stripes on a TV monitor screen. It is expressed in TV lines.

For example, 200TV lines of horizontal TV resolution means that 100 white horizontal lines is counted as one line. However, for TV lines, one pair is counted as 2 TV lines. For example, if a 1/2-inch CCD camera is used with a lens of 50 lines/mm resolving power, horizontal TV resolution on a TV monitor screen is calculated as follows; $50 \times 6.4(\text{CCD width}) \times 2 = 640\text{TV}$

Distortion



Optical distortion

Lens's aberration where a straight object outside of the optical axis appears curved.

$$\frac{y' - y'_0}{y'_0} \times 100\%$$

Positive distortion of a straight line is called pincushion distortion. Negative distortion is called barrel distortion.

TV distortion

Image distortion on a TV monitor. The closer to zero, the better the performance.

$$D_{TV} = \frac{\Delta h}{2h} \times 100\% \quad D_{TV} = \frac{1}{2} (1 - m^2) D \quad m = 0.6 \quad D_{TV} = 0.32D$$

Object	Pincushion distortion	Barrel distortion

Aperture efficiency / Marginal light quantity (%)

Aperture efficiency indicates the brightness difference between the optical axis of the image formation plane and its surrounding area when an evenly bright object is captured with a lens. It is expressed by percent(%) assuming that the center brightness is 100. It is one of a lens's optical characteristics.

Shading

Shading is the brightness difference between TV monitor's center and its edges when an evenly bright object is captured with a lens and CCD-TV camera. Shading indicates comprehensive performance of a lens and TV camera.

Chromatic aberration

In lenses' optional systems, positions where images are formed and image magnification differ according to light's wavelength. Rays with different wavelengths have different colors. This is called chromatic aberration. Aberration on the optical axis is called chromatic aberration on the axis and magnification difference is called magnification chromatic aberration.

F Number (F No)

The value indicates a lens's brightness. It is calculated by dividing the lens's focal length by the lens's effective diameter (entrance pupil D mm) looking from object side. It can be also calculated by NA and lens's optical magnification(). The smaller the number, the brighter the lens is. $F \text{ No} = f/D$

Effective F No

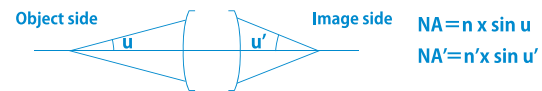
The value indicates a lens's brightness. It is calculated by dividing the lens's focal length by the lens's effective diameter (entrance pupil D mm) looking from object side. It can be also calculated by NA and lens's optical magnification(). The smaller the number, the brighter the lens is. $\text{Effective F No} = (1 + M) \times F \text{ No}$

Numerical aperture

The higher the NA, the greater the resolution and brightness are.

When the half angle that an image makes on exit pupil is u' and refractive index is n' , $n' \times \sin u'$ is called image side numerical aperture, NA' .

NAs in this catalog indicate object side numerical apertures.



$$NA = M/2xF, NA' = 1/2xF.$$

Relation of NA and NA' is $NA = NA' \times \text{Optical magnification}$ or $NA' = NA / \text{optical magnification}$.

MTF

It provides a graph analyzing a lens's ability to resolve sharp details in very fine sets of parallel lines, and a lens's contrast or ability to provide a sharp transfer between light and dark areas in sets of thicker parallel lines.

Depth of field

Images through lenses theoretically form as points. Acceptable blur on an acceptably clear image is called the permissible circle of confusion.

Depth is the distance between the nearest and farthest points that appear in acceptably sharp focus when an object is shifted back and forth from the best focal point. Depth range of the object side is called depth of field.

$$\text{Depth of field} = 2(\text{Permissible circle of confusion} \times \text{Effective F No} / \text{Magnification}^2)$$

Depth of focus

Depth is the distance between the nearest and farthest points that appear in acceptably sharp focus when a CCD is shifted back and forth from the best focal point. Depth range of the image side is called depth of focus.

Angle of view

The angle formed by imaginary lines connecting the lens second principal point with both ends of the image diagonal. Angle of view is directly associated with lens focal length. As the focal length is longer, the angle of view is narrower.

$$\text{Angle of view } 2 \times \tan^{-1} D / \text{Image size } 2f / \text{Focal length}$$

WD

Distance from the front end of a lens system to the object under inspection.

OI

Distance from the object to the image sensor.

Focal length

Focal length is the distance from the optical system's principle point to the focal point. Distance from the vertex of the last lens to the back focal point is called back length. Distance from the vertex of the first lens to the front focal point is called front focal length.

Image size

The diameter of the sharp image circle formed by a lens. Area sensor is expressed by inch and diameter of image circle is equal to diagonal of sensor. Image circle of diameter for line sensor is equal to the maximum sensor size. It is expressed by pixel size x resolution.

How to calculate optical magnification

Most of Lensagon lens series are designed at finite distance. Optical magnification is the image size (CCD) ratio against the object size (FOV) and the most important for selection of a lens.

Sensor size

Area Sensor

Examples of area sensor used for machine vision.
It is expected that various sensors will be available for next generation.

Image Size inch	1/4	1/3	1/2	1/1.8	2/3	1	1.1
Vertical mm	2.7	3.6	4.8	5.35	6.6	9.6	12
Horizontal mm	3.6	4.8	6.4	7.14	8.8	12.8	12
Diagonal mm	4.5	6	8	8.93	11	16	17

Line Sensor

Length of line sensor is formed, depended on pixel size and resolution. As the line sensor is larger, the dimension of a lens becomes larger. Design and manufacture of lenses for the large line sensors are required for high specification.

Image Size mm	10.24	14.34	20.48	28.67	28.67	35	36	57.34	61.44
Pixel size μm	10	14	10	14	7	4.7	7	7	5
Resolution pixel	1024	1024	2048	2048	4096	7450	5150	8192	12288

Formula of optical magnification

FOV

Field of view (FOV) The actual size of a viewed object that can be taken when the lens is attached to the camera.
Ex. Optical magnification: 0.5x Sensor: 1/2"

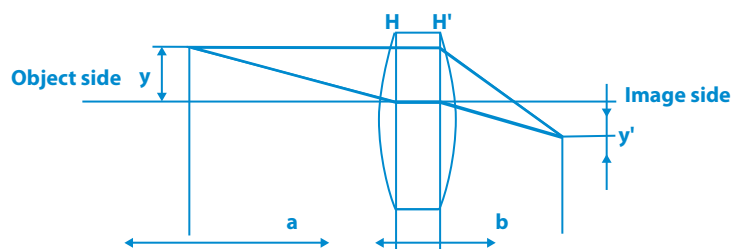
Vertical FOV $4.8 \div 0.5$ 9.6mm Horizontal FOV $6.4 \div 0.5$ 12.8mm

Magnification

Optical magnification (M) = Sensor size/FOV

$$M = y' / y$$

$$= b / a$$



Electronic magnification and monitor magnification

Electronic magnification

Magnification of an image on a sensor when it is displayed on a monitor screen.

Monitor magnification

Magnification of an object displayed on a monitor screen through a lens.

Ex. Optical magnification: 0.5x Sensor: 1/2 Monitor size: 15 inch (1 inch = 25.4mm)

Electronic magnification $15 \times 25.4 \div 8$ 47.6x

Monitor magnification 0.5×47.65 23.8x

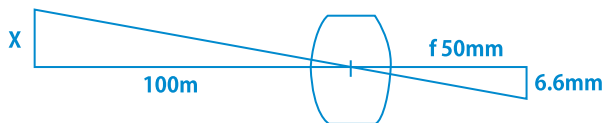


How to calculate focal length and photographic range

Formula of photographic range

$$X = \frac{\text{Distance from lens to object} \times \text{Image size}}{\text{Focal length}}$$

Ex. Object distance: 100mm Focal length: 50mm CCD: 2/3



$$X = \frac{100,000 \times 6.6}{50} = 13,200 \text{ (mm)} \quad \text{Height: 13.2m}$$

Formula of Focal length

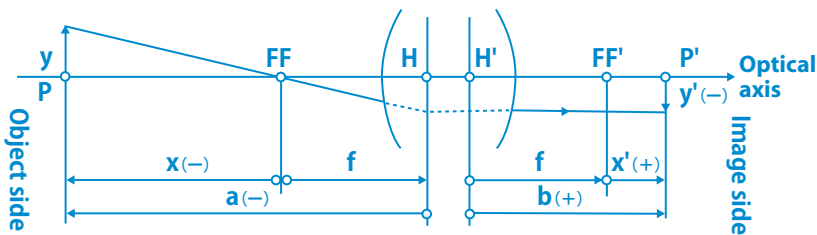
$$f = \frac{\text{Distance from lens to object} \times \text{Image size}}{\text{Height}}$$

Ex. Object distance: 20m Height: 6.6m CCD: 2/3



$$f = \frac{20,000 \times 6.6}{2,000} = 66 \text{ (mm)} \quad \text{Focal length: 66mm}$$

Formula of conjugation relationship



Basics formula

$$-\frac{1}{a} + \frac{1}{b} = \frac{1}{f}$$

Object point distance

$$-a = \left(1 - \frac{1}{M}\right) \times f$$

Horizontal magnification

$$M = \frac{y'}{y} = -\frac{b}{a}$$

Image point distance

$$b = (1 - M) \times f$$

f : Focal length

FF : Front side focal point

FF' : Rear side focal point

H : Front side principal point

H' : Rear side principal point

P : Object point

P' : Image point

a : Distance from front side point to object point

b : Distance from rear side principal point to image point

x : Distance from front side focal point to object point

x' : Distance from rear side focal point to image side point

M : Magnification

F No./NA Formula

Relationship of object side NA and image side NA (NA')

$$NA' = \frac{NA}{M}$$

Relationship of F No. and Effective F no.(Ef)

$$Fe = (1 - M) F$$

Relationship of NA and Effective F No.

$$NA' = \frac{1}{2Fe}$$

$$NA' = \frac{1}{2(1-M)F}$$

$$NA = \frac{M}{2Fe}$$

$$NA = \frac{M}{2(1-M)F}$$

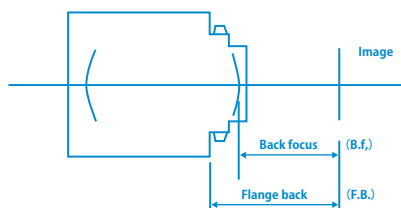
Camera mount and flange back

Back focus

Distance from the vertex of the last lens to the back focal point.

Flange back

Distance from the camera's lens mount reference surface to the focal plane.



Name	Flange back	Screw size
C Mount	17.526mm	25.4mm 32tpi thread
CS Mount	12.5mm	25.4mm 32tpi thread
F Mount	46.5mm	Bayonet
K Mount	45.5mm	Bayonet

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