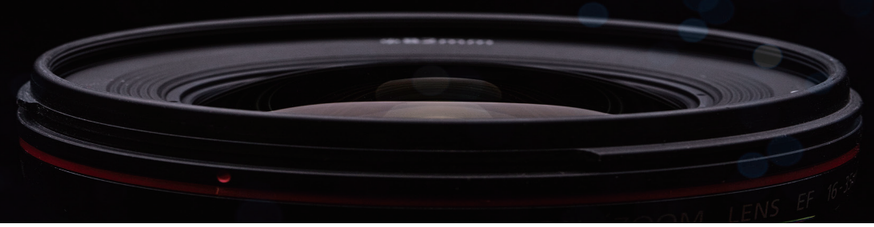
LENS

FA product series, low distortion



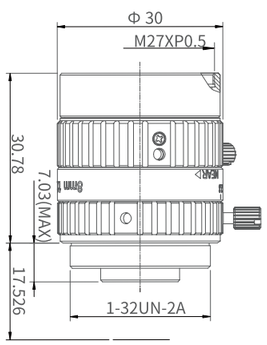
A9-6MP SERIES (1/1.8''6MP)

- Supports image sensor size up to 1/1.8 Inches
- The whole series has 6 focal length types, including 8-50
- High resolution, full field of view 6MP resolution, matching 2.4μm pixel
- Low distortion design, optimized chromatic aberration design

Specifications

Model	Focal Length	Image Circle	F#	Angle Of View		Minimum Of WD	TV Distortion	Mount	Dimensions	Filter Thread	Weight	Working Temperature	Label
				1/1.8''	1/2''								
A9-0828-6MP	8	1/1.8''(Φ9.4mm)	F2.8 - F16	58.9° *50.4° *34.8°	54.1° *44.4° *34.0°	100	-0.28%	C	35.4 * Φ30	M27*P0.5	45 g	-20° C~50° C	A
A9-1228-6MP	12	1/1.8''(Φ9.4mm)	F2.8 - F16	42.9° *35.5° *23.7°	37.1° *30.1° *22.8°	100	-0.10%	C	30 * Φ30	M27*P0.5	48 g	-20° C~50° C	B
A9-1628-6MP	16	1/1.8''(Φ9.4mm)	F2.8 - F16	31.3° *25.9° *17.2°	28.1° *22.6° *17.1°	100	-0.08%	C	36.9 * Φ30	M27*P0.5	56 g	-20° C~50° C	C
A9-2528-6MP	25	1/1.8''(Φ9.4mm)	F2.8 - F16	20.7° *17.3° *11.6°	18.7° *15.0° *11.3°	150	-0.02%	C	33.5 * Φ30	M27*P0.5	47 g	-20° C~50° C	D
A9-3528-6MP	35	1/1.8''(Φ9.4mm)	F2.8 - F16	15.2° *12.6° *8.3°	13.5° *10.8° *8.1°	200	-0.10%	C	39.8 * Φ30	M27*P0.5	60 g	-20° C~50° C	E
A9-5028-6MP	50	1/1.8''(Φ9.4mm)	F2.8 - F16	10.1° *8.4° *5.6°	9.1° *7.3° *5.5°	250	0.12%	C	48 * Φ30	M27*P0.5	67 g	-20° C~50° C	F

Dimensions



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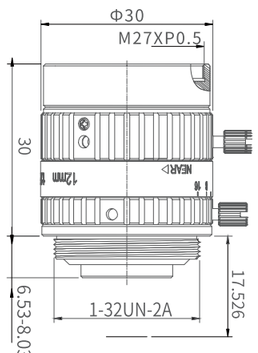

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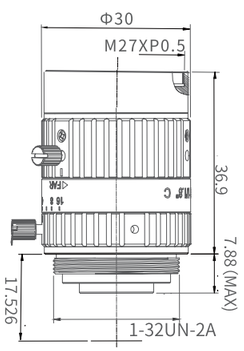

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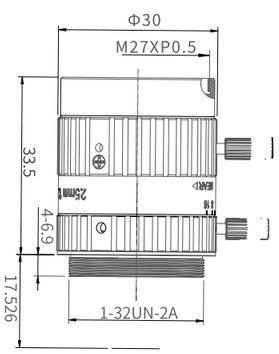

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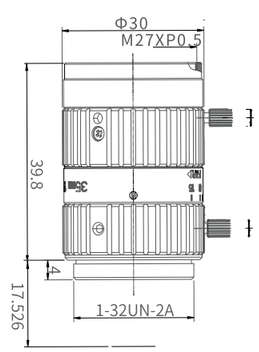

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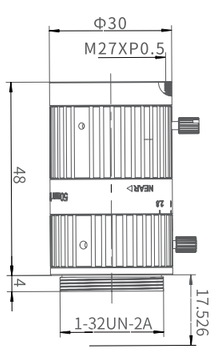


F

MACHINE VISION

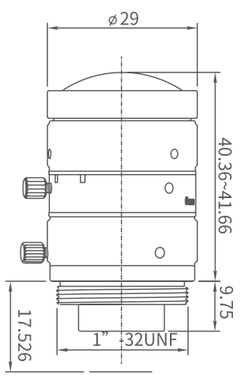
MH-SP SERIES (1/1.8'' 6MP)

- Supports image sensor size up to 1/1.8 Inches
- Resolution up to 200lp/mm, suitable for 2.4μm pixels
- Full field definition and brightness consistency high
- Small dimension, easy to integrate and install

Specifications

Model	Focal Length	Image Circle	F#	Angle Of View		Minimum Of WD	TV Distortion	Mount	Dimensions (mm*mm*mm)	Filter Thread	Weight	Working Temperature	Label
				1/1.8''	1/2''								
MH0628SP	6	1/1.8''(Φ9.4mm)	F2.8 - F16	74.8° *63.5° *44.8°	68.0° *56.6° *43.8°	80	-0.04%	C	40.36*Φ29	No	67 g	-10° C~50° C	A
MH0828SP	8	1/1.8''(Φ9.4mm)	F2.8 - F16	58.5° *49.3° *34.0°	53.4° *43.5° *33.2°	100	-0.55%	C	34.74*Φ29	M27*P0.5	56 g	-10° C~50° C	B
MH1228SP	12	1/1.8''(Φ9.4mm)	F2.8 - F16	41.2° *34.4° *23.4°	37.2° *30.2° *22.8°	100	-0.04%	C	35.36*Φ29	M27*P0.5	54 g	-10° C~50° C	C
MH1628SP	16	1/1.8''(Φ9.4mm)	F2.8 - F16	31.0° *25.7° *17.5°	28.0° *22.3° *16.9°	100	-0.08%	C	33.12*Φ29	M27*P0.5	46 g	-10° C~50° C	D
MH2528SP	25	1/1.8''(Φ9.4mm)	F2.8 - F16	19.8° *16.4° *11.0°	17.7° *14.2° *10.7°	100	-0.02%	C	34.34*Φ29	M25.5*P0.5	48 g	-10° C~50° C	E
MH3528SP	35	1/1.8''(Φ9.4mm)	F2.8 - F16	13.8° *11.3° *7.6°	12.3° *9.8° *7.4°	150	-0.02%	C	42.62*Φ29	M27*P0.5	58 g	-10° C~50° C	F
MH5028SP	50	1/1.8''(Φ9.4mm)	F2.8 - F16	9.7° *8.0° *5.4°	8.7° *7.0° *5.2°	300	0.11%	C	43.89*Φ29.4	M25.5*P0.5	56 g	-10° C~50° C	G

Dimensions



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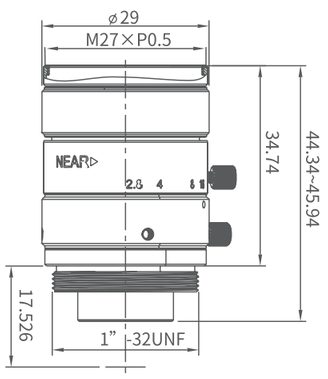

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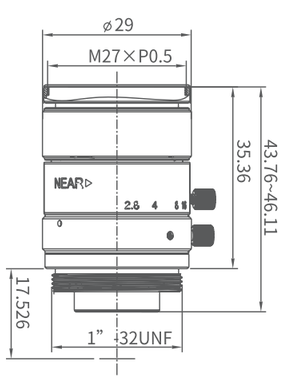

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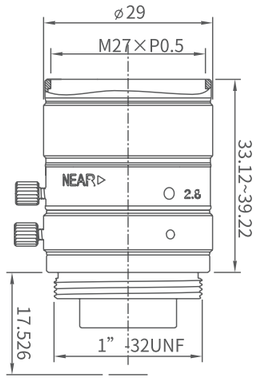

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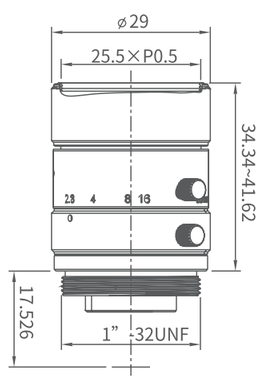

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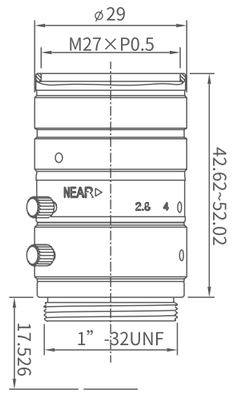

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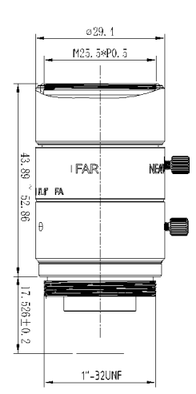


G

MACHINE VISION

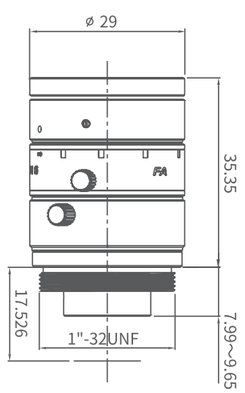
MH-M SERIES (2/3'' 8MP)

- Supports image sensor size up to 2/3 inches
- Low distortion design
- Resolution up to 200lp/mm, suitable for 2.4μm pixel
- Small dimension, easy to integrate and install
- Full field definition consistency high

Specifications

Model	Focal Length	Image Circle	F#	Angle Of View		Minimum Of WD	TV Distortion	Mount	Dimensions (mm*mm*mm)	Filter Thread	Weight	Working Temperature	label
				2/3"	1/1.8"								
MHR0828M	8	2/3''(Φ11.4mm)	F2.8 - F16	67.2° *53.2° *46.0°	56.5° *47.7° *34.1°	100	-0.77%	C	35.35*Φ29	- -	68 g	-20° C~50° C	A
MHR1220M	12	2/3''(Φ11.4mm)	F2.0 - F16	48.8° *38.4° *32.5°	39.9° *33.6° *22.8°	150	-0.01%	C	37.65*Φ29	M27*P0.5	61 g	-20° C~50° C	B
MHR2520M	25	2/3''(Φ11.4mm)	F2.0 - F16	23.9° *18.3° *15.4°	19.4° *15.8° *10.7°	200	-0.04%	C	36.25*Φ29	M25.5*P0.5	58 g	-20° C~50° C	C
MHR3520M	35	2/3''(Φ11.4mm)	F2.0 - F16	16.5° *12.8° *10.7°	13.5° *11.7° *7.4°	200	-0.01%	C	52.82*Φ29.4	M25.5*P0.5	62 g	-20° C~50° C	D
MH7532M	75	2/3''(Φ11.4mm)	F3.2 - F16	8.5° *6.5° *5.4°	4.0° *3.1° *2.6°	150	0.07%	C	82.1*Φ32	M27*P0.5	120 g	-20° C~50° C	E

Dimensions



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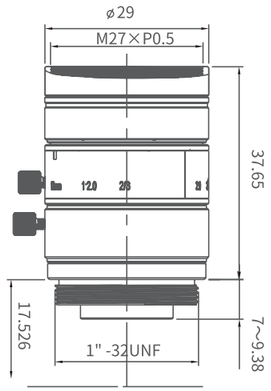

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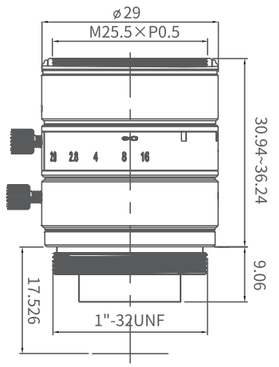

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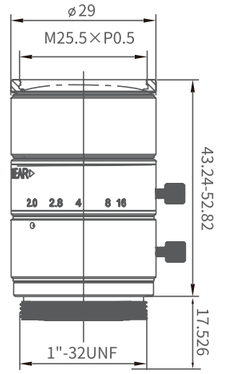

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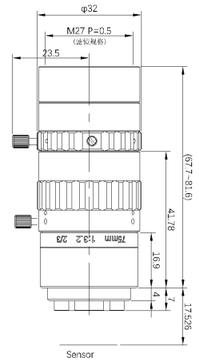


E

MACHINE VISION

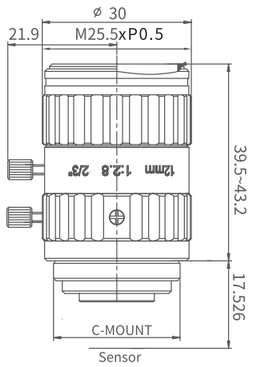
MK-M SERIES (2/3'' 10MP)

- Supports image sensor size up to 2/3 inches
- Resolution up to 250lp/mm, suitable for 2μm pixels
- Full field definition and brightness consistency high
- Small dimension, easy to integrate and install

Specifications

Model	Focal Length	Image Circle	F#	Angle Of View		Working Distance	TV Distortion	Mount	Dimensions (mm*mm*mm)	Filter Thread	Weight	Working Temperature	label
				2/3''(Φ9.4)	1/1.8''(Φ11)								
MK1228M	12	2/3''(Φ11.4)	F2.8 - F16	36.9°*29.9°*22.6°	36.9°*29.9°*22.6°	0.1m to inf	-0.20%	C	43.2*Φ30	M25.5*P0.5	70g	-20° C~50° C	A
MK1628M	16	2/3''(Φ11.4)	F2.8 - F16	31.2°*25.3°*18.9°	31.2°*25.3°*18.9°	0.1m to inf	-0.20%	C	40*Φ30	M25.5*P0.5	58g	-20° C~50° C	B
MK2528M	25	2/3''(Φ11.4)	F2.8 - F16	18.2°*14.6°*11.0°	18.2°*14.6°*11.0°	0.15m to inf	-0.30%	C	46.7*Φ30	M25.5*P0.5	66g	-20° C~50° C	C
MK3528M	35	2/3''(Φ11.4)	F2.8 - F16	13.0°*10.4°*7.8°	13.0°*10.4°*7.8°	0.2m to inf	-0.07%	C	49.2*Φ30	M25.5*P0.5	99g	-20° C~50° C	D
MK5028M	50	2/3''(Φ11.4)	F2.8 - F16	9.1°*5.5°*4.3°	9.1°*5.5°*4.3°	0.2m to inf	-0.01%	C	58.1*Φ30	M25.5*P0.5	86.5g	-20° C~50° C	E

Dimensions



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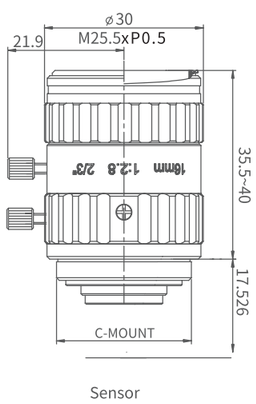

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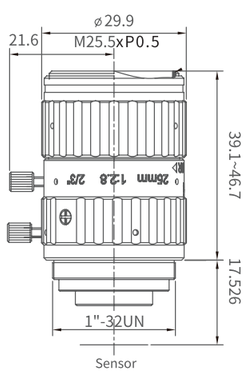

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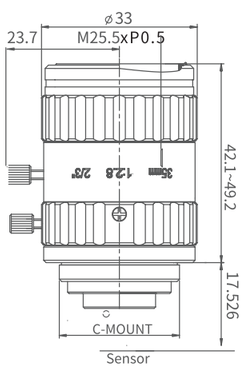

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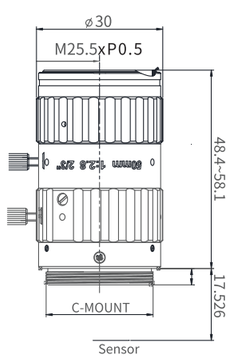


E

MACHINE VISION

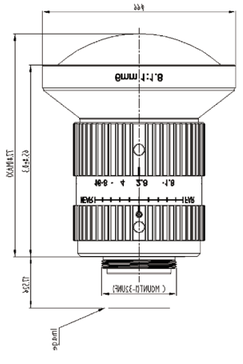
MH-X SERIES (1.1'' 12MP)

- Supports image sensor size up to 1.1 Inches (Φ17.6mm)
- Resolution up to 145lp/mm, suitable for 3.45μm pixels
- Full field definition consistency high
- Low distortion design, TV distortion less than 0.5%

Specifications

Model	Focal Length	Image Circle	F#	Angle Of View		Minimum Of WD	TV Distortion	Mount	Dimensions (mm*mm*mm)	Filter Thread	Weight	Working Temperature	Label
				1.1"	1"								
MH0618X	6	1.1''(Φ17.6mm)	F1.8 - F16	118.2°x104.9°x86.2°	107.5°x95.1°x78.4°	100	2.50%	C	77.8 × Φ66	No	353 g	-10° C~50° C	A
MH0814X	8	1.1''(Φ17.6mm)	F1.4 - F16	98.4°x84.8°x68°	89.5°x77.1°x61.8°	100	5.50%	C	77.8mmxΦ60	M58xP0.75	371 g	-10° C~50° C	B
MH1228X	12	1.1''(Φ17.6mm)	F2.8 - F16	70.5° *59.8° *46.3°	65.7° *53.5° *43.3°	100	-0.22%	C	56.99*Φ47	No	186 g	-20° C~50° C	C
MH1628X	16	1.1''(Φ17.6mm)	F2.8 - F16	57.8° *47.6° *36.5°	52.8° *42.5° *34.1°	100	-0.18%	C	51.78*Φ38.59	M35.5*P0.5	180 g	-20° C~50° C	D
MH2528X	25	1.1''(Φ17.6mm)	F2.8 - F16	37.3° *30.4° *23°	33.9° *26.9° *21.4°	150	-0.20%	C	49.81*Φ38.6	M35.5*P0.5	133 g	-20° C~50° C	E
MH3528X	35	1.1''(Φ17.6mm)	F2.8 - F16	26.7° *21.4° *15.9°	24.1° *18.9° *15.1°	200	-0.02%	C	53.61*Φ38.6	M35.5*P0.5	136 g	-20° C~50° C	F
MH5028X	50	1.1''(Φ17.6mm)	F2.8 - F16	18.4° *14.8° *11.2°	16.7° *13.2° *10.5°	300	-0.02%	C	56.82*Φ38.6	M35.5*P0.5	134 g	-20° C~50° C	G

Dimensions



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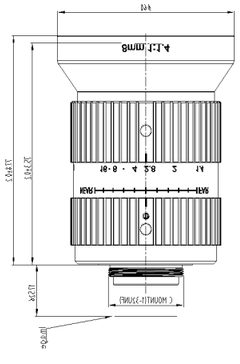

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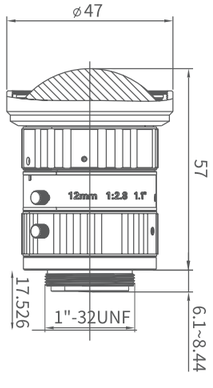

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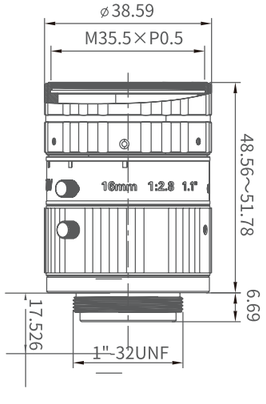

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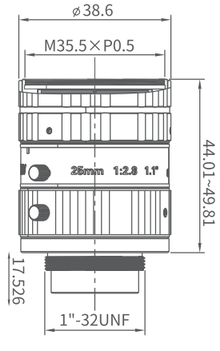

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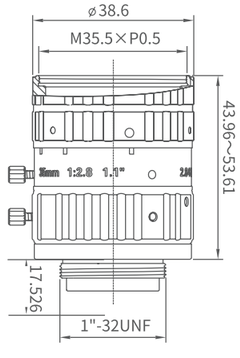

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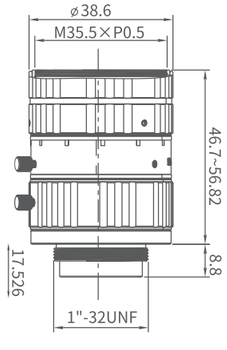


G

MACHINE VISION

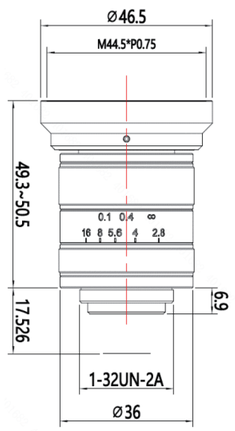
MT-X SERIES (1.1'' 25MP)

- Supports image sensor size up to 1.1 Inches (Φ17.6mm)
- Resolution up to 200lp/mm, suitable for 2.4μm pixels
- Full field definition consistency high
- Low distortion design, TV distortion is less than 0.1%

Specifications

Model	Focal Length	Image Circle	F#	Angle Of View		Minimum Of WD	TV Distortion	Mount	Dimensions	Filter Thread	Weight	Working Temperature	Label
				1.1"	1"								
MT1228X	12	1.1''(Φ17.6mm)	F2.8-F16	73.4° x55.6° x55.6°	66.8° x56.8° x39.7°	100	-0.60%	C	50.5*Φ46.5	M44.5*P0.75	130 g	-20° C~50° C	A
MT1628X	16	1.1''(Φ17.6mm)	F2.8-F16	56.7° x47.1° x35.4°	51.9° x44.1° x30.2°	150	-0.20%	C	49.9*Φ39	M35.5*P0.5	132 g	-20° C~50° C	B
MT2528X	25	1.1''(Φ17.6mm)	F2.8 - F16	38.8° *34.7° *23.5°	35.5° *28.7° *21.7°	150	-0.02%	C	47.5*Φ39	M35.5*P0.5	124 g	-20° C~50° C	C
MT3528X	35	1.1''(Φ17.6mm)	F2.8 - 16	28.2° *22.9° *16.9°	25.8° *20.7° *15.6°	200	-0.07%	C	52.7*Φ39	M35.5*P0.5	125 g	-20° C~50° C	D
MT5028X	50	1.1''(Φ17.6mm)	F2.8 - F16	20.0° *16.2° *11.9°	18.2° *14.6° *11.0°	250	0.07%	C	52.7*Φ39	M35.5*P0.5	117 g	-20° C~50° C	E

Dimensions



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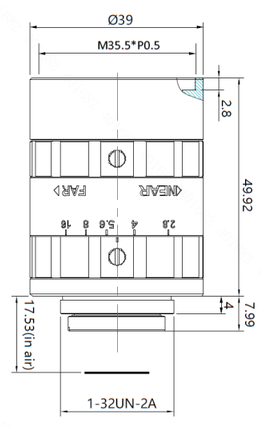

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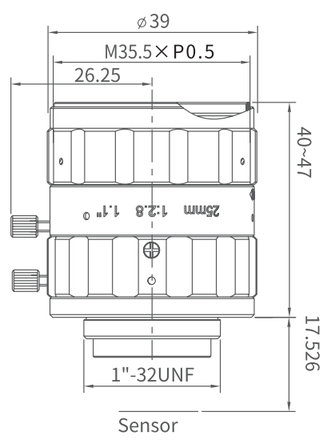

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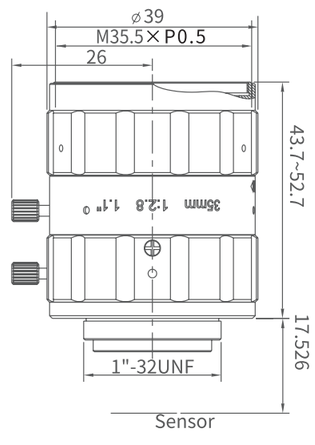

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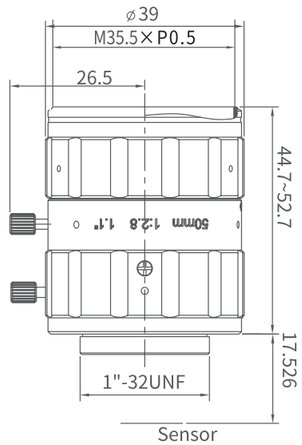


E

MACHINE VISION

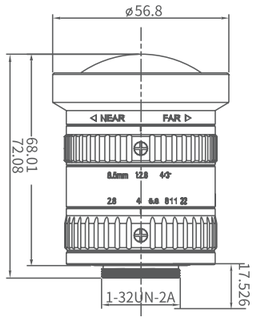
MH-K SERIES(4/3'' 10MP)

- Supports image sensor size up to 4/3 inches (Φ23mm)
- The whole series has 6 focal length types, including 8.5-50
- High resolution, full field of view 10MP resolution, adapted to 4.5μm pixels
- Low distortion design, F2.0Large aperture design

Specifications

Model	Focal Length	Image Circle	F#	Angle Of View		Minimum Of WD	TV Distortion	Mount	Dimensions	Filter Thread	Weight	Working Temperature	Label
				4/3''	1''								
MH08528K	8.5	4/3''(Φ23mm)	F2.8 - F22	107.4° *94.9° *80.1°	86.6° *73.6° *58.1°	500	-0.94%	C	72.1*Φ56.8	No	317 g	-20° C~50° C	A
MH1220K	12	4/3''(Φ23mm)	F2.0 - F22	89.0° *75.5° *61.1°	68.9° *57.3° *44.2°	150	0.04%	C	84.4*Φ80	M77*P0.75	447 g	-20° C~50° C	B
MH1620K	16	4/3''(Φ23mm)	F2.0 - F22	72.9° *60.9° *47.3°	54.0° *44.2° *33.6°	100	-1.27%	C	85.9*Φ60	M58*P0.75	338 g	-20° C~50° C	C
MH2520K	25	4/3''(Φ23mm)	F2.0 - F22	49.7° *40.6° *31.0°	35.7° *28.8° *21.8°	150	-0.25%	C	82.7*Φ47.5	M46*P0.75	251 g	-20° C~50° C	D
MH3520K	35	4/3''(Φ23mm)	F2.0 - F22	36.6° *29.6° *22.4°	25.9° *20.8° *15.7°	200	-0.22%	C	64.3*Φ44.6	M40.5*P0.5	173 g	-20° C~50° C	E
MH5020K	50	4/3''(Φ23mm)	F2.0 - F22	25.9° *20.9° *15.7°	18.2° *14.6° *11.0°	300	-0.11%	C	60.9*Φ42.6	M40.5*P0.5	170 g	-20° C~50° C	F

Dimensions



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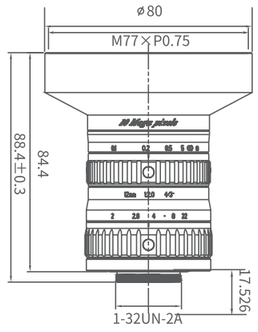

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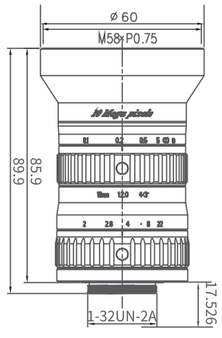

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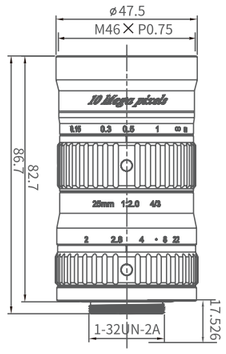

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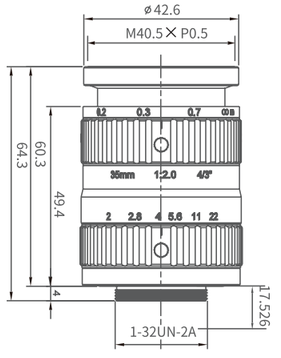

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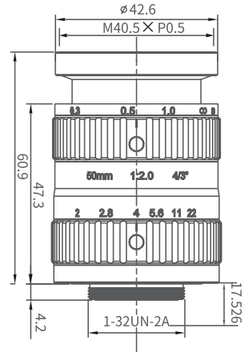


F

MACHINE VISION

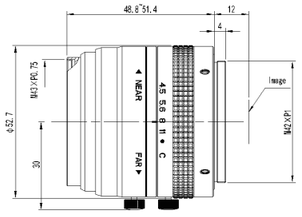
Line Scan & Large Target Surface Lens

- Image sensor size covers Φ30mm~Φ60mm
- High definition, image resolution 100~160lp/mm
- Low distortion, distortion <0.2%

Specifications

Series	Model	Focal Length	Image Circle	F#	Resolution	TV Distortion	Relative Illumination	Minimum Of WD	Magnification Range	Mount	Dimensions (mm*mm*mm)	Filter Thread	Weight	Working Temperature	Label
4K7u	F30-2045-M42	20	Φ30	F4.5-C	MTF>0.35 @100lp/mm	0.50%	55%	200	0.02~0.1x	M42*P1	51.4*Φ52	M43*P0.75	234.2	-20° C~50° C	A
	F30-2528-M42	25	Φ30	F2.8-16	MTF>0.3 @100lp/mm	0.94%	80%	115	0.03~0.2x	M42*P1	63.4*Φ53	M49*P0.75	265.4	-20° C~50° C	B
	F30-2840-M42	28	Φ30	F4.0-C	MTF>0.4 @100lp/mm	0.18%	63%	100	0.05~0.3x	M42*P1	54.85*Φ48	M35xP0.5	161.4	-20° C~50° C	C
	F30-3528-M42	35	Φ30	F2.8-F11	MTF>0.35 @100lp/mm	-0.2%	77%	200	0.01-0.157x	M42*P1	107*ϕ55	M52*P0.75	350.5	-20° C~50° C	D
	F43-4028-M42	40	Φ43	F2.8-F11	MTF>0.3 @100lp/mm	0.62%	51%	140	0.04-0.33x	M42*P1	62.7*ϕ47.6	M37×P0.75	110	-20° C~50° C	E
	F30-5028-M42	50	Φ30	F2.8 - 16	MTF>0.3 @100lp/mm	0.06%	80%	200	0-0.267x	M42*P1	77.21*ϕ50	M46*P0.75	406.5	-20° C~50° C	F
	F30-8028-M42	80	Φ30	F2.8 - F16	MTF>0.3 @100lp/mm	-0.20%	74%	220	0.02-0.46X	M 4 2 × P 1	108*ϕ62	M58×P0.75	546	-20° C~50° C	G
8K7u	F60-4040A-M72	40	Φ60	F4.0-22	MTF>0.4 @100lp/mm	0.20%	58%	250	0.02~0.16x	M72*P0.75	118.75*Φ75	M72*P0.75	659.4	-20° C~50° C	H
	F60-4040B-M72	40	Φ60	F4.0 - F16	MTF>0.3 @100lp/mm	0.09%	62%	150	0.05-0.262x	M72*P0.75	140.7*Φ74	NA	692	-20° C~50° C	I
	F60-6040A-M72	60	Φ60	F4.0 - F16	MTF>0.4 @100lp/mm	-0.20%	62%	340	0.04-0.18x	M72*P0.75	114.8*Φ78	M58*P0.75	680.5	-20° C~50° C	J
	F60-6040B-M72	60	Φ60	F4.0 - F16	MTF>0.4 @100lp/mm	-0.20%	62%	200	0.15-0.33x	M72*P0.75	114.8*Φ78	M58*P0.75	680.5	-20° C~50° C	K
	F80-8040-02X-M72-D76	80	Φ80	F4.0-22	MTF>0.4 @100lp/mm	0.02%	80%	303	0.04~0.33x	M72*P0.75	111.7*Φ76	NA	260	-20° C~50° C	L
16K3.5u	F64-9040-M72	90	Φ64	F4.0-16	MTF>0.35 @125lp/mm	0.15%	84%	722	0.08~0.14x	M72*P0.75	127.3*Φ83	M58*P0.75	402.9	-20° C~50° C	M
	F62-9540-005X-M72	95	Φ62	F4.0-16	MTF>0.3 @125lp/mm	0.01%	83%	1253	0.03~0.08x	M72*P0.75	129.9*Φ83	M58*P0.75	456.7	-20° C~50° C	N
65MP	F46-6035-M58	60	Φ46	F3.5 - F16	MTF>0.4 @160lp/mm	-0.20%	62%	350	0-0.16x	M58*P0.75	101.3*Φ61	NA	503.5	-20° C~50° C	O
151MP	F67-5545-M72	55	Φ67	F4.5-22	MTF>0.3 @140lp/mm	0.09%	85%	98	0.01~0.5x	M72*P0.75	132.3*Φ79.2	NA	1600	-20° C~50° C	P

Dimensions



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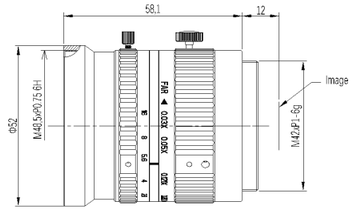

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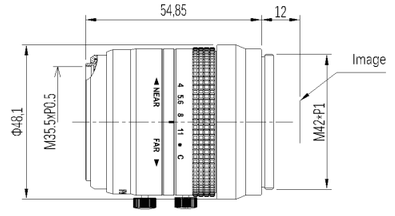

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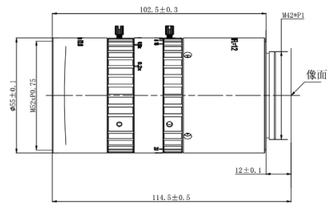

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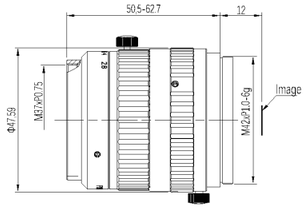

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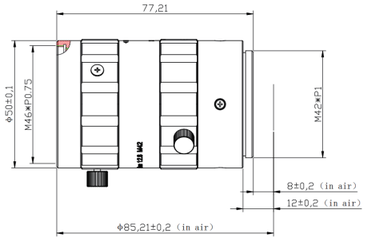

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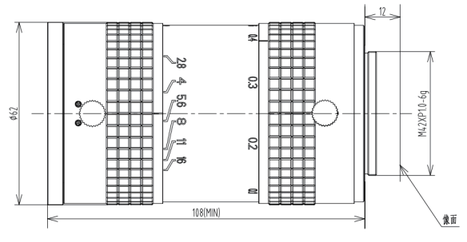

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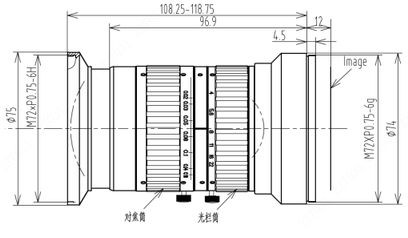

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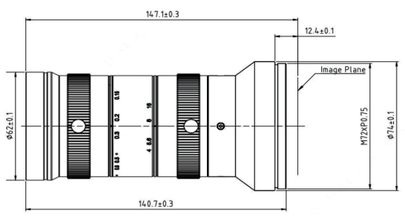

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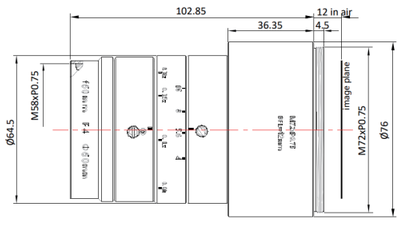

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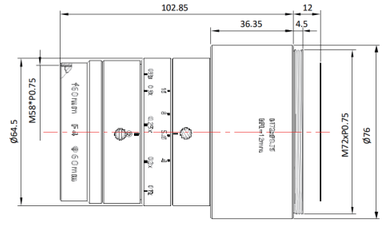

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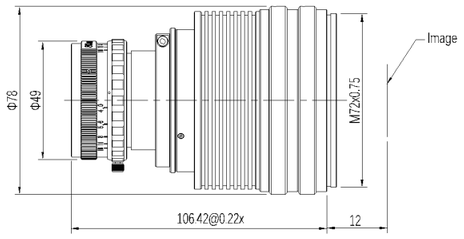

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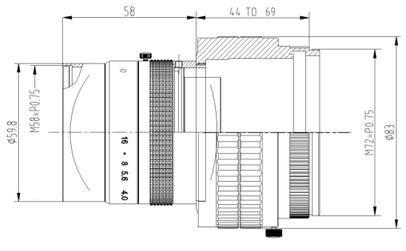

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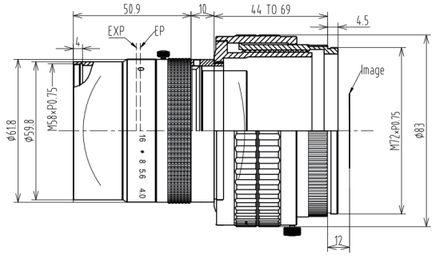

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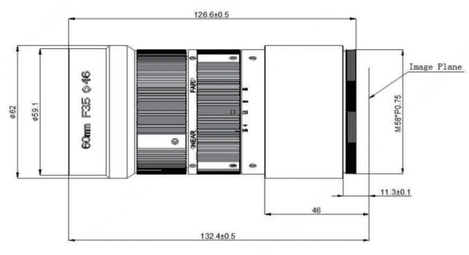

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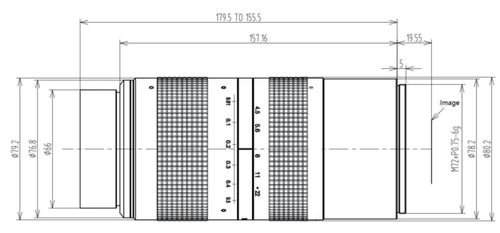


P

MACHINE VISION

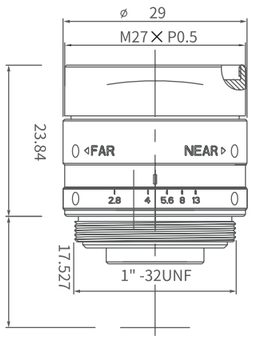
Industry Lens

- Customized lens for code reading and other recognition scenarios, high cost performance
- Maximum image area 1 inch, compatible with 20MP and 25MP code readers
- High resolution, up to 1.85μm pixel
- Low distortion design, TV distortion is less than 1%
- Small dimension, easy to integrate and install

Specifications

Model	Focal Length	Image Circle	F#	Angle Of View		Minimum Of WD	TV Distortion	Mount	Dimensions (mm*mm*mm)	Filter Thread	Weight	Working Temperature	Label
				1/1.7''(Φ9.4)	2/3''(Φ11)								
MH1228R	12	1/1.7''(Φ9.4mm)	F2.8 - F13	42.2° *34.2° *26.0°	/	0.2m to inf	-0.34%	C-Mount	23.8*Φ29	M27*P0.5	38g	-20° C~50° C	A
MH1628R	16	1/1.7''(Φ9.4mm)	F2.8 - F11	33.2° *26.8° *20.3°	/	0.15m to inf	-0.30%	C-Mount	19.5*Φ29	M27*P0.5	35g	-20° C~50° C	B
MH1656XR	16	1''(Φ16mm)	F5.6 - F11	32.7° *26.4° *19.9°	38.5°*30.0°*25.2°	0.3m to inf	-0.80%	C-Mount	39.8*Φ32	M27*P0.5	72g	-20° C~50° C	C
MH2056XR	20	1''(Φ16mm)	F5.6 - F11	26.4° *21.2° *15.9°	31.2°*24.0°*20.0°	0.5m to inf	-0.80%	C-Mount	30.96*Φ31.2	M27*P0.5	70g	-20° C~50° C	D
MH2556XR	25	1''(Φ16mm)	F5.6 - F11	21.3° *17.1° *12.8°	24.9°*19.2°*16.1°	0.5m to inf	-0.80%	C-Mount	35.7*Φ31	M27*P0.5	57g	-20° C~50° C	E

Dimensions



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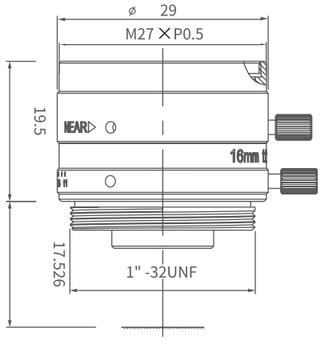

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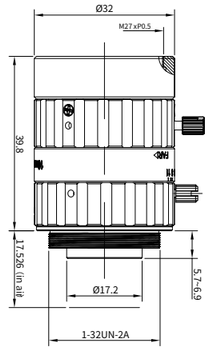

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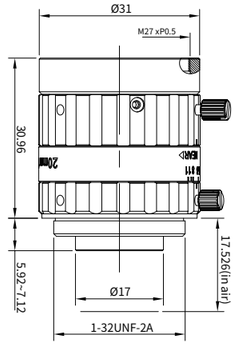

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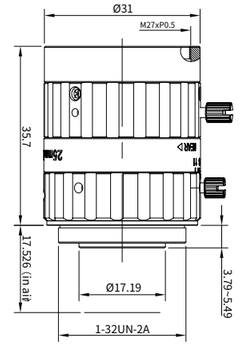


E

Lens Accessories

Polarizing filter

❶ Polarizing filter

Polarization filters can selectively filter light with a specific polarization direction.

Model	Thread Parameters	Transmittance	Working Band	Extinction Ratio
PZ-M25.5P0.5	M25.5×P0.5mm	Tave>40%	380-780mm	>1000
PZ- M27P0.5	M27×P0.5mm	Tave>40%	380~780mm	>1000
PZ-M30.5P0.5	M30.5×P0.5mm	Tave>40%	380~780mm	>1000
PZ-M35.5P0.5	M35.5×P0.5mm	Tave>40%	380~780mm	>1000

Description: Supports polarizer customization specification
Description rules: Example: PZ-M25P0.5
PZ: polarization filter
M25P0.5: Thread specification

Extension ring Adapter ring

When the lens working distance is smaller than its normal focusing range, you need to use an extension ring to increase the lens rear focus.

Model	Camera Interface	Lens Mount	Thread Specification	Rear Focus Length
EXR-C-E0.5	C	C	C	0.5
EXR-C-E1	C	C	C	1
EXR-C-E5	C	C	C	5
EXR-C-E10	C	C	C	10
EXR-C-E15	C	C	C	15
ADR-F-M42-E34.5	M42×P1.0	F	M42×P1	34.5
ADR-F-M58-E10.2	M58×P0.75	F	M58×P0.75	10.2
ADR-F-M72-E35.4	M72×P0.75	F	M72×P0.75	35.4
ADR-C-M12-E5	C	M12	C /M12	5
ADR-C-M42-E5.526	M42×P1.0	C	M42×P1/C	5.526
ADR-C-M58-E5.526	M58×P0.75	C	M58×P0.75/C	5.526

Lens Working Distance And Magnification

◎ Table I：A9-6MP Series

WD/mm	A9-0828-6MP	A9-1228-6MP	A9-1628-6MP	A9-2528-6MP	A9-3528-6MP	A9-5028-6MP	
	Mag.	Mag.	Mag.	Mag.	Mag.	Mag.	Ext.
K	5.0211	8.1802	13.476	14.666	24.19	115.09	115.09
α	-0.926	-0.943	-0.971	-0.918	-0.945	-1.127	-1.127
800	0.010	0.015	0.020	0.032	0.044	0.062	0
750	0.011	0.016	0.022	0.034	0.046	0.066	0
700	0.012	0.017	0.023	0.036	0.050	0.072	0
650	0.012	0.018	0.025	0.038	0.053	0.078	0
600	0.013	0.020	0.027	0.041	0.057	0.085	0
550	0.015	0.021	0.029	0.045	0.062	0.094	0
500	0.016	0.023	0.032	0.049	0.068	0.104	0
450	0.018	0.026	0.036	0.054	0.075	0.117	0
400	0.020	0.029	0.040	0.060	0.084	0.133	0
350	0.022	0.033	0.046	0.068	0.095	0.156	0
300	0.025	0.038	0.053	0.078	0.110	0.186	0
250	0.030	0.045	0.064	0.092	0.131	0.232	0
200	0.038	0.055	0.079	0.113	0.162	0.295	5
150	0.049	0.073	0.104	0.147	--	--	--
100	0.070	0.106	0.152	--	--	--	--

Remarks: "/" indicates that the lens needs an extension ring to ensure near field focus

◎ Table 2：MH-SP Series

WD/mm	MH0628SP	MH0828SP	MH1228SP	MH1628SP	MH2528SP	MH3528SP		MH5028SP	
	Mag.	Mag.	Mag.	Mag.	Mag.	Mag.	Ext.	Mag.	Ext.
1000	0.006	0.008	0.012	0.015	0.024	0.034	0	0.048	0
900	0.007	0.009	0.013	0.017	0.027	0.038	0	0.053	0
800	0.008	0.010	0.015	0.019	0.031	0.043	0	0.060	0
700	0.009	0.011	0.017	0.022	0.035	0.049	0	0.069	0
600	0.010	0.013	0.019	0.025	0.041	0.057	0	0.082	0
500	0.012	0.016	0.023	0.030	0.049	0.069	0	0.100	0
400	0.015	0.019	0.028	0.038	0.060	0.086	0	0.127	0
300	0.020	0.025	0.037	0.050	0.080	0.116	0	0.176	0
200	0.029	0.037	0.055	0.072	0.119	0.176	0	0.263	4
100	0.054	0.067	0.102	0.134	0.224	0.346	6	0.500	17

Remarks: "/" indicates that the lens needs an extension ring to ensure near field focus

Table 3：MH-M Series

WD/mm	MHR0828M	MHR1220M	MHR2520M		MHR3520M	
	Mag.	Mag.	Mag.	Ext.	Mag.	Ext.
1000	0.008	0.012	0.025	0	0.035	0
900	0.009	0.013	0.027	0	0.039	0
800	0.010	0.015	0.031	0	0.044	0
700	0.012	0.017	0.035	0	0.051	0
600	0.014	0.019	0.040	0	0.060	0
500	0.016	0.023	0.049	0	0.072	0
400	0.020	0.029	0.061	0	0.092	0
300	0.027	0.038	0.081	0	0.125	0
200	0.039	0.056	0.121	0	0.196	1
100	0.073	0.106	0.224	3	0.355	5

Table 4：MK-M Series

WD/mm	MK1228M	MK1628M	MK2528M	MK3528M		MK5028M	MK7532M
	Mag.	Mag.	Mag.	Mag.	Ext.	Mag.	--
1000	0.012	0.016	0.025	0.035	0	0.051	--
900	0.013	0.018	0.028	0.039	0	0.057	--
800	0.015	0.020	0.032	0.044	0	0.064	--
700	0.017	0.023	0.036	0.051	0	0.073	--
600	0.020	0.026	0.042	0.059	0	0.086	--
500	0.024	0.031	0.051	0.071	0	0.104	0.104
400	0.029	0.039	0.063	0.087	0	0.131	0.131
300	0.039	0.052	0.084	0.119	0	0.176	0.176
200	0.057	0.076	0.126	0.182	0	0.271	0.271
100	0.108	0.145	0.243	0.401	8	--	--

Remarks: "/" indicates that the lens needs an extension ring to ensure near field focus

Table 5：MH7532M Macro lens

Magnification	Working Distance/mm	Viewable Range/mm(29.9× 22.4mm)		Ext.Ring
		H	V	
0.16	521.1	49.65	41.53	0
0.2	454.8	42.20	35.30	
0.227	405.9	36.70	30.70	
0.26	368.3	32.46	27.15	
0.29	338.4	29.10	24.34	
0.32	314.2	26.38	22.06	
0.357	300	24.11	20.17	
0.38	277.8	22.21	18.58	
0.41	265.1	20.59	17.22	5
0.44	252.5	19.18	16.05	
0.47	243.4	17.96	15.02	10
0.5	233.6	16.88	14.12	
0.53	226.6	15.92	13.32	15
0.56	218.8	15.07	12.61	
0.59	211.9	14.31	11.97	
0.62	206.9	13.61	11.39	20
0.65	201.1	12.98	10.86	
0.68	197.1	12.41	10.38	25
0.71	192.4	11.89	9.94	
0.74	189	11.41	9.54	30
0.77	184.8	10.96	9.17	
0.8	180.9	10.55	8.83	
0.83	178.3	10.17	8.51	35
0.86	174.9	9.81	8.21	
0.89	172.6	9.48	7.93	40
0.92	169.7	9.17	7.67	
0.95	167.7	8.88	7.43	45
0.98	165.1	8.61	7.20	
1.01	162.7	8.36	6.99	

Remarks: "/" indicates that the lens needs an extension ring to ensure near field focus

Table 6：MH-X Series

WD/mm	MH1228X	MH1628X	MH2528X		MH3528X		MH5028X	
	Mag.	Mag.	Mag.	Ext.	Mag.	Ext.	Mag.	Ext.
1000	0.012	0.016	0.025	0	0.034	0	0.049	0
900	0.014	0.017	0.027	0	0.037	0	0.055	0
800	0.015	0.019	0.031	0	0.042	0	0.061	0
700	0.017	0.022	0.035	0	0.048	0	0.071	0
600	0.020	0.026	0.040	0	0.056	0	0.083	0
500	0.024	0.031	0.048	0	0.068	0	0.100	0
400	0.029	0.038	0.060	0	0.085	0	0.126	0
300	0.039	0.050	0.078	0	0.114	0	0.171	0
200	0.056	0.073	0.114	0	0.171	0	0.257	5
100	0.103	0.137	0.211	2	0.333	5	0.530	18

Table 7：MT-X Series

WD/mm	MT2528X		MT3528X		MT5028X	
	Mag.	Ext.	Mag.	Ext.	Mag.	Ext.
1000	0.025	0	0.036	0	0.051	0
900	0.028	0	0.040	0	0.057	0
800	0.031	0	0.044	0	0.064	0
700	0.036	0	0.051	0	0.074	0
600	0.042	0	0.059	0	0.087	0
500	0.050	0	0.072	0	0.105	0
400	0.062	0	0.090	0	0.133	0
300	0.083	0	0.121	0	0.182	0
200	0.124	0	0.184	0	0.283	5
100	0.235	5	0.360	7	0.634	20

Table 8：MH-K Series

WD/mm	MH1220K	MH1620K	MH2520K	MH3520K	MH5020K
	Mag.	Mag.	Mag.	Mag.	Mag.
1000	0.012	0.016	0.026	0.036	0.050
900	0.013	0.019	0.029	0.041	0.055
800	0.015	0.022	0.032	0.047	0.062
700	0.016	0.023	0.036	0.053	0.071
600	0.020	0.027	0.042	0.062	0.083
500	0.023	0.032	0.051	0.074	0.100
400	0.028	0.039	0.063	0.096	0.125
300	0.039	0.051	0.081	0.123	0.168
200	0.057	0.079	0.117	0.210	--
150	0.096	0.107	0.145	--	--
100	0.12	0.139	--	--	--

Remarks: "/" indicates that the lens needs an extension ring to ensure near field focus

Table 9：F46-6035-M58

Magnification	Working Distance/mm	Viewable Range/mm(29.9× 22.4mm)	
		H	V
0.177	320.1	168.93	126.55
0.160	354.8	186.88	140.00
0.150	378.9	199.33	149.33
0.140	406.5	213.57	160.00
0.130	438.4	230.00	172.31
0.120	475.7	249.17	186.67
0.110	519.8	271.82	203.64
0.100	572.8	299.00	224.00
0.090	637.7	332.22	248.89
0.080	719.1	373.75	280.00
0.070	823.9	427.14	320.00
0.060	964.0	498.33	373.33
0.050	1160.8	598.00	448.00
0.040	1457.2	747.50	560.00
0.030	1953.6	996.67	746.67
0.020	2953.0	1495.00	1120.00
0.100	574.8	299.99	224.74

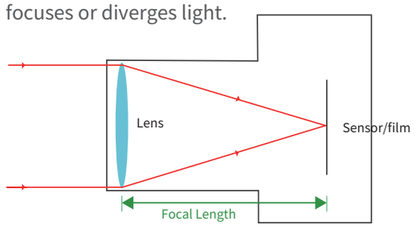
Remarks: "/" indicates that the lens needs an extension ring to ensure near field focus

Basic Knowledge And Selection Methods Of Lens

Lens Technical Specifications

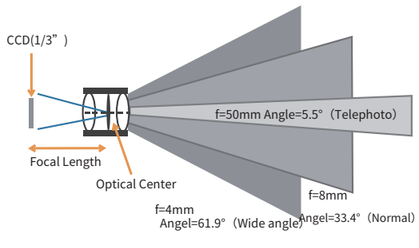
❶ Focal Length

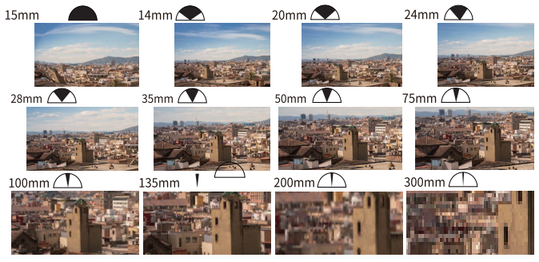
When the incident light is incident parallel to the lens optical axis, the distance from the principal point behind the lens to the imaging surface is called focal length, which measures the degree to which the optical system focuses or diverges light.



❷ Field Of View (FoV)

Field of view (FOV) refers to the angle of the lens relative to the imaging surface. Field of view (FOV) is determined by the focal length of the lens and the size of the image sensor. The larger the focal length, the smaller the field of view (FOV), and the shorter the focal length, the larger the field of view (FOV). If Y is the dimension of the short side of the sensor, then the short side field of view (FOV) 2θ=2xarctan(y/2/f)



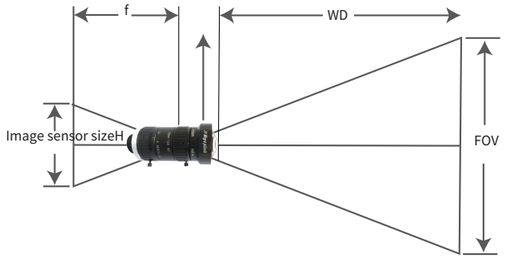


❸ Working Distance

When the lens is focused clearly, the distance between the measured surface and the front end of the lens is called the working distance of the lens.

❹ Field Of View

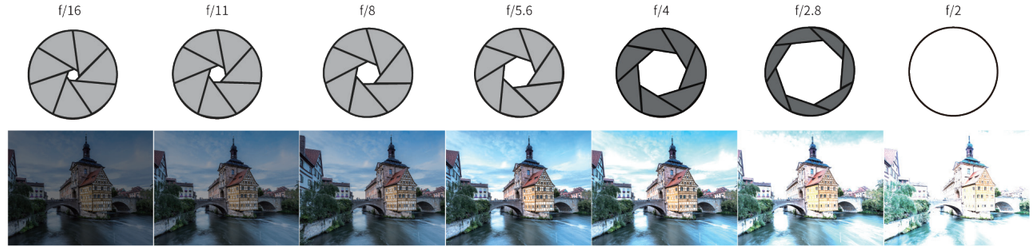
The field of view refers to the actual range of objects that are imaged.



$$\text{Magnification} = \frac{H}{FOV} = \frac{f}{WD}$$

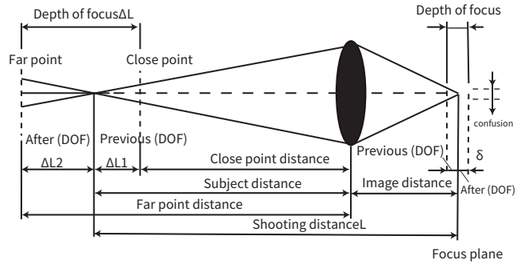
❺ Aperture

The aperture number, also known as the F number, is the ratio of the image side focal length to the lens entrance pupil diameter. The larger the aperture number, the smaller the relative aperture of the lens, the less light enters, the darker the image brightness, and the greater the depth of field (DOF).



❻ Depth Of Field (DOF)

The distance range before and after the subject can be clearly imaged. Without refocusing, the image can still be clear within a certain working distance. This distance at which the image is clear is the depth of field (DOF).



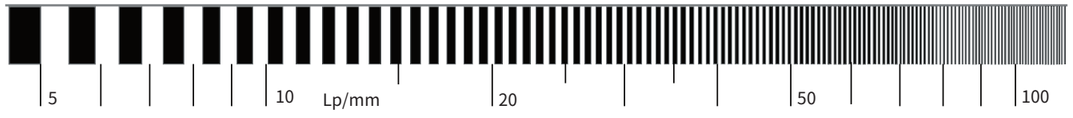
Previous (DOF) $\Delta L1 = F\delta L^2 / (f^2 + F\delta L)$
After (DOF) $\Delta L2 = F\delta L^2 / (f^2 - F\delta L)$
(DOF) $\Delta L = 2f^2 F\delta L^2 / (f^4 - F^2\delta^2 L^2)$
δ——Allowable diffusion circle diameter f——Lens focal length
F——The aperture value of the lens L——Focal length
ΔL1—— Previous (DOF) ΔL2——After (DOF) ΔL——(DOF)

From the depth of field (DOF) calculation formula we can get

(1) The larger the lens aperture, the smaller the depth of field (DOF)
(2) The longer the lens focal length, the smaller the depth of field (DOF)
(3) The closer the lens is to the focal length, the smaller the depth of field (DOF)
(4) The rear depth of field (DOF) is greater than the front depth of field (DOF)

❼ Resolution

The image space resolution is generally used to describe the resolution of the lens, and the unit is the number of black & white line pairs per mm (1p/mm). When used with a camera, the width of the black & white line pairs that t he lens can distinguish should be less than or equal to the dimension of two adjacent pixels. In actual applications, it is recommended that the resolution of the lens be higher than the resolution of the camera. Camera resolution = 1mm/(2*pixel dimension).

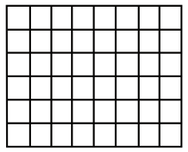


⑧ Distortion

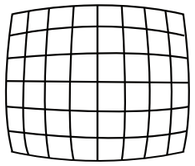
Distortion represents the degree of distortion between the image of an object captured by the lens and its actual shape. Common types include barrel distortion and pincushion distortion.

(1) The size of lens distortion is related to the field of view (FoV) and has nothing to do with the lens aperture;

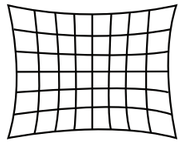
(2) Distortion helps achieve a large field of view (FoV), but it is not conducive to detection due to high distortion.



No distorted image



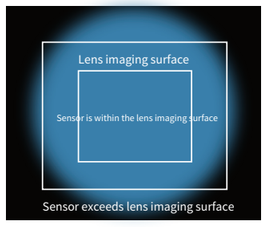
Barrel distortion

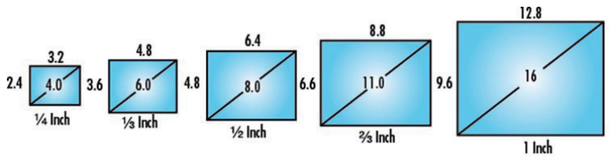


Pincushion distortion

⑨ Target Surface Size

The maximum imaging surface of the lens refers to the maximum range of the image after passing through the lens. When it is smaller than the image sensor dimension, vignetting or black edges will appear.



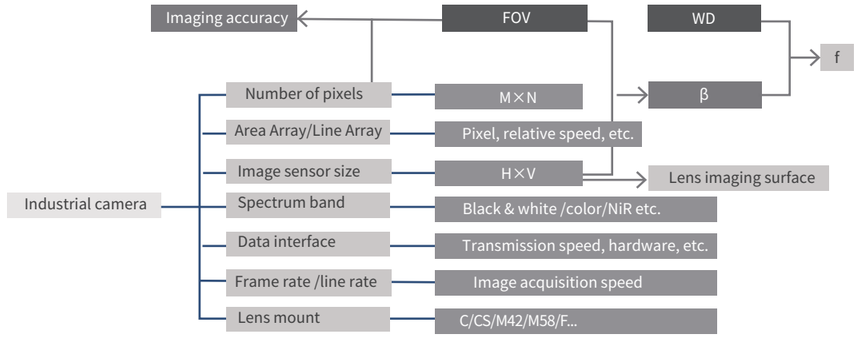


⑩ Camera Interface

The camera interface is the connection mode between the camera and the lens, ensuring that the lens is installed firmly and does not loosen and that the lens has the required rear focus. The lens flange, i.E. The distance between the lens mounting support surface and the imaging surface, is called the flange rear focus. The flange rear focus of different lenses is different, which affects the focal length and definition of the lens.

Category	Port type	Flange rear focus	Common lenses
Threaded mouth	C-Mount	17.526mm	Less than 4/3 inch
	CS-Mount	12.5mm	2/3 Inch or less
	S-Mount(M12)	--	1/1.8 Inches or less
	M42×1/M42×0.75	--	4K 7μm line scan lens
	M58×0.75mm	--	Large rake surface and 4K 7μm line scan lens
	M72×0.75mm	--	8K 7μm line scan lens
Checkpoint	F-Mount	46.5mm	Large target surface lens
Other	V-Mount	--	Line scan lens

Lens Selection Process



Lens Selection Case

◎ Calculate lens focal length

For example: If you choose an A7500MG20 camera with a pixel count of 2448×2048 and a pixel size of 3.45Mm, and require a working distance within 400mm and a detection range of 120×100mm, what is the focal length of the lens?

Image size: 2448×3.45μm=8.45mm

Use

$$\text{Magnification} = \frac{H}{FOV} = \frac{f}{WD} = \frac{8.45}{120} = 0.07 \qquad f = \frac{H \times WD}{FOV} = \frac{8.45 \times 400}{120} = 28\text{mm}$$

According to the focal length calculation result, an optional lens with a focal length of 25mm is used. Choosing a focal length smaller than the calculated result can better cover the detection range.

◎ Calculate the lens image plane

According to the selected camera A7500MG20, the target surface size is 2/3 inches, and the image surface of the lens should be larger than or equal to the target surface of the camera, so the lens needs to have an image surface larger than 2/3 inches. Preliminary selection of lens model MH2520M/MK2528M

◎ Calculate the camera field of view and lens field of view (FoV)

Example: Using an A7500MG20 camera with 2448×2048 pixels, 3.45Mm pixel size, 25mm lens focal length, and 400mm working distance, calculate the camera’ s field of view and lens field of view (FoV)?

Image size：H=2448×3.45μm=8.4456mm，V=2448×3.45μm=7.0656mm

Use

$$\text{Magnification} = \frac{H}{FOV} = \frac{f}{WD}$$

Calculate the camera's field of view：

X=8.4456×400/25=135.1296mm；Y=7.0656×400/6=113.0496mm

Calculate the lens field of view (FoV)：

Use：2θ=2×arctan (y/2/f)

2θx=2×arctan (8.4456/2/25)=19°；2θy=2 x arctan (7.0656/2/25)=16°

Note: When the working distance is close, there will be a certain variance between the calculated results and the measured results. The calculated data can only be used for reference, and the actual measurement is the main consideration.