

WVGA Lens Charts

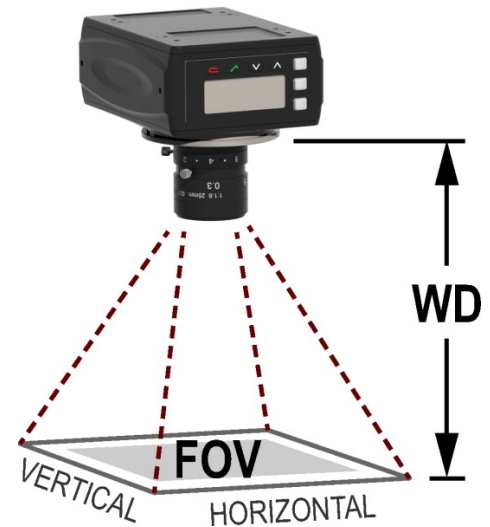
This paper offers information useful for selecting a C-mount lens for the VE Series WVGA smart camera.

Working Distance and Field of View

The two main variables involved when discussing a camera's lens choice are the **Working Distance** and the **Field of View** size. The Working Distance, or WD, is the distance from the camera to the target object. In the case of this collection of lens charts, the Working Distance is measured from the front surface of the threaded lens cover mount. The distance is not measured from the end of the lens because different lenses from different manufacturers, even with the same focal length, can vary in length.

The Field of View, or FOV, is the real world size of the picture the camera takes. This can also be broken down into a horizontal FOV size and a vertical FOV size. Note that the picture taken by a VE Series vision sensor is not square. The imager used in the WVGA VE sensor is 752×480 pixels, making a rectangular image where the vertical FOV is about 64% the size of the horizontal FOV.

The Working Distance and Field of View sizes are related by linear equations determined by the focal length of the lens. Choosing the correct lens for a given application might be a matter of selecting the desired size of the FOV, then seeing which of the options for focal length result in a good fit for camera Working Distance. The situation might also be reversed, where the desired mounting location of the camera is known (and thus the Working Distance is fixed) and the various focal length lenses give a range of FOV sizes to choose from. In all cases, only one of these two variables may be freely selected. The second variable then becomes a function of the first. This is the reason why we offer a broad range of lens focal lengths—to provide as many options as possible to suit different WD/FOV size requirements.



Multiple Manufacturers and Format Size

Banner does not manufacture any C-mount lenses used by our vision sensors. Instead we offer a range of lenses from different suppliers.

Imager Resolution: 752 px (H) \times 480 px (V)
Pixel Size: 5.3 μm \times 5.3 μm
Image Size: 4.1 mm (H) \times 2.6 mm (V), 4.9 mm (diagonal)

Off the Charts

In the pages that follow, graphical views of the Working Distance versus Horizontal FOV relationships are shown, out to a maximum working distance of 1 meter. These graphs offer a quick and easy way to estimate the FOV size for a given Working Distance and lens focal length. Also provided are two tables with entries out to 1.5 meters. The first shows FOV size as a function of Working Distance and the

second shows Working Distance as a function of FOV size. The mathematical equations that describe the relationship between these two variables are also provided, allowing for calculations beyond what the chart and tables offer.

Each lens has a natural minimum Working Distance. If a camera using this lens were to move closer to the target than this minimum distance, the image would be out of focus and the lens alone would not be able to fix it. This is where extension tubes and shims are used. Extension tubes allow a lens to come into focus at a Working Distance closer than the minimum. The relationship between Working Distance and FOV size remains in effect as extension tubes are added, and so extension tubes are usually used to generate very small FOVs. A microscope is basically a high focal length lens with a large amount of extension tubes applied.

Standard Resolution C-mount Lenses on WVGA VE Series



Standard C-mount Lenses on WVGA VE Series, FOV as a function of WD Chart

WD (mm)	FOV (mm)																	
	4mm			8mm			12mm			25mm			50mm			75mm		
Minimum	61	x	39	16	x	10	11	x	7	85	x	54	51	x	33	37	x	24
	@ 60mm			@ 44mm			@ 47mm			@ 573mm			@ 722mm			@ 809mm		
20																		
40																		
60	63	x	40	25	x	16	16	x	10									
80	85	x	54	35	x	22	23	x	15									
100	107	x	68	46	x	29	30	x	19									
120	129	x	82	56	x	36	36	x	23									
140	151	x	96	66	x	42	43	x	27									
160	173	x	110	76	x	49	50	x	32									
180	195	x	124	87	x	55	56	x	36									
200	217	x	138	97	x	62	63	x	40									
220	239	x	152	107	x	68	70	x	45									
240	261	x	167	118	x	75	77	x	49									
260	283	x	181	128	x	82	83	x	53									
280	305	x	195	138	x	88	90	x	57									
300	327	x	209	148	x	95	97	x	62									
320	349	x	223	159	x	101	103	x	66									
340	371	x	237	169	x	108	110	x	70									
360	393	x	251	179	x	115	117	x	75									
380	415	x	265	190	x	121	124	x	79									
400	437	x	279	200	x	128	130	x	83									
420	459	x	293	210	x	134	137	x	87									
440	481	x	307	221	x	141	144	x	92									
460	503	x	321	231	x	147	151	x	96									
480	525	x	335	241	x	154	157	x	100									
500	547	x	349	251	x	161	164	x	105									
520	569	x	363	262	x	167	171	x	109									
540	591	x	377	272	x	174	177	x	113									
560	613	x	391	282	x	180	184	x	118									
580	635	x	405	293	x	187	191	x	122	87	x	55						
600	657	x	419	303	x	193	198	x	126	90	x	57						
620	679	x	433	313	x	200	204	x	130	93	x	59						
640	701	x	447	324	x	207	211	x	135	96	x	61						
660	723	x	461	334	x	213	218	x	139	99	x	63						
680	745	x	475	344	x	220	224	x	143	102	x	65						
700	767	x	489	354	x	226	231	x	148	105	x	67						
720	789	x	503	365	x	233	238	x	152	109	x	69						
740	811	x	517	375	x	239	245	x	156	112	x	71	52	x	33			
760	833	x	531	385	x	246	251	x	160	115	x	73	54	x	34			
780	855	x	545	396	x	253	258	x	165	118	x	75	55	x	35			
800	877	x	559	406	x	259	265	x	169	121	x	77	57	x	36			
820	899	x	574	416	x	266	271	x	173	124	x	79	59	x	37	38	x	24
840	920	x	588	427	x	272	278	x	178	127	x	81	60	x	38	39	x	25
860	942	x	602	437	x	279	285	x	182	130	x	83	62	x	39	40	x	26
880	964	x	616	447	x	285	292	x	186	133	x	85	63	x	40	41	x	26
900	986	x	630	457	x	292	298	x	190	136	x	87	65	x	41	42	x	27
920	1008	x	644	468	x	299	305	x	195	140	x	89	66	x	42	43	x	28
940	1030	x	658	478	x	305	312	x	199	143	x	91	68	x	43	45	x	28
960	1052	x	672	488	x	312	319	x	203	146	x	93	69	x	44	46	x	29
980	1074	x	686	499	x	318	325	x	208	149	x	95	71	x	45	47	x	30
1000	1096	x	700	509	x	325	332	x	212	152	x	97	73	x	46	48	x	31
1020	1118	x	714	519	x	331	339	x	216	155	x	99	74	x	47	49	x	31
1040	1140	x	728	530	x	338	345	x	220	158	x	101	76	x	48	50	x	32
1060	1162	x	742	540	x	345	352	x	225	161	x	103	77	x	49	51	x	33
1080	1184	x	756	550	x	351	359	x	229	164	x	105	79	x	50	52	x	33
1100	1206	x	770	560	x	358	366	x	233	167	x	107	80	x	51	53	x	34
1120	1228	x	784	571	x	364	372	x	238	171	x	109	82	x	52	54	x	35
1140	1250	x	798	581	x	371	379	x	242	174	x	111	84	x	53	56	x	35
1160	1272	x	812	591	x	377	386	x	246	177	x	113	85	x	54	57	x	36
1180	1294	x	826	602	x	384	392	x	250	180	x	115	87	x	55	58	x	37
1200	1316	x	840	612	x	391	399	x	255	183	x	117	88	x	56	59	x	38
1220	1338	x	854	622	x	397	406	x	259	186	x	119	90	x	57	60	x	38
1240	1360	x	868	633	x	404	413	x	263	189	x	121	91	x	58	61	x	39
1260	1382	x	882	643	x	410	419	x	268	192	x	123	93	x	59	62	x	40
1280	1404	x	896	653	x	417	426	x	272	195	x	125	95	x	60	63	x	40
1300	1426	x	910	663	x	423	433	x	276	198	x	127	96	x	61	64	x	41
1320	1448	x	924	674	x	430	439	x	281	202	x	129	98	x	62	66	x	42
1340	1470	x	938	684	x	437	446	x	285	205	x	131	99	x	63	67	x	43
1360	1492	x	952	694	x	443	453	x	289	208	x	133	101	x	64	68	x	43
1380	1514	x	966	705	x	450	460	x	293	211	x	135	102	x	65	69	x	44
1400	1536	x	981	715	x	456	466	x	298	214	x	137	104	x	66	70	x	45
1420	1558	x	995	725	x	463	473	x	302	217	x	139	105	x	67	71	x	45
1440	1580	x	1009	735	x	469	480	x	306	220	x	141	107	x	68	72	x	46
1460	1602	x	1023	746	x	476	487	x	311	223	x	143	109	x	69	73	x	47
1480	1624	x	1037	756	x	483	493	x	315	226	x	145	110	x	70	74	x	47
1500	1646	x	1051	766	x	489	500	x	319	229	x	146	112	x	71	75	x	48

Standard C-mount Lenses on WVGA VE Series, WD as a function of FOV Chart

FOV (mm)			WD (mm)													
			4mm		8mm		12mm		25mm		50mm		75mm			
Minimum			61 x 39 @ 60mm	16 x 10 @ 44mm	11 x 7 @ 47mm	85 x 54 @ 573mm	51 x 33 @ 722mm	37 x 24 @ 809mm								
20	x	13			50		72									
40	x	26			89		131									
60	x	38			128		191					839				858
80	x	51		75	167		250				1094					1220
100	x	64		94	206		310		665		1350					1582
120	x	77		112	245		369		794		1605					1943
140	x	89		130	283		429		923		1861					2305
160	x	102		148	322		488		1052		2116					2667
180	x	115		166	361		548		1181		2372					3028
200	x	128		185	400		607		1310		2627					3390
220	x	140		203	439		667		1439		2882					3752
240	x	153		221	478		726		1568		3138					4113
260	x	166		239	517		786		1697		3393					4475
280	x	179		257	555		845		1826		3649					4837
300	x	191		276	594		905		1955		3904					5198
320	x	204		294	633		964		2084		4160					5560
340	x	217		312	672		1024		2213		4415					5922
360	x	230		330	711		1083		2342		4670					6283
380	x	243		348	750		1143		2471		4926					6645
400	x	255		367	788		1202		2600		5181					7007
420	x	268		385	827		1262		2729		5437					7368
440	x	281		403	866		1322		2858		5692					7730
460	x	294		421	905		1381		2987		5948					8092
480	x	306		439	944		1441		3116		6203					8453
500	x	319		458	983		1500		3245		6458					8815
520	x	332		476	1022		1560		3374		6714					9177
540	x	345		494	1060		1619		3503		6969					9538
560	x	357		512	1099		1679		3632		7225					9900
580	x	370		530	1138		1738		3761		7480					10262
600	x	383		548	1177		1798		3890		7736					10623
620	x	396		567	1216		1857		4019		7991					10985
640	x	409		585	1255		1917		4148		8246					11347
660	x	421		603	1293		1976		4277		8502					11708
680	x	434		621	1332		2036		4406		8757					12070
700	x	447		639	1371		2095		4536		9013					12432
720	x	460		658	1410		2155		4665		9268					12793
740	x	472		676	1449		2214		4794		9524					13155
760	x	485		694	1488		2274		4923		9779					13517
780	x	498		712	1526		2333		5052		10034					13878
800	x	511		730	1565		2393		5181		10290					14240
820	x	523		749	1604		2452		5310		10545					14602
840	x	536		767	1643		2512		5439		10801					14963
860	x	549		785	1682		2572		5568		11056					15325
880	x	562		803	1721		2631		5697		11312					15687
900	x	574		821	1760		2691		5826		11567					16048
920	x	587		840	1798		2750		5955		11822					16410
940	x	600		858	1837		2810		6084		12078					16772
960	x	613		876	1876		2869		6213		12333					17133
980	x	626		894	1915		2929		6342		12589					17495
1000	x	638		912	1954		2988		6471		12844					17857
1020	x	651		931	1993		3048		6600		13100					18218
1040	x	664		949	2031		3107		6729		13355					18580
1060	x	677		967	2070		3167		6858		13610					18942
1080	x	689		985	2109		3226		6987		13866					19303
1100	x	702		1003	2148		3286		7116		14121					19665
1120	x	715		1021	2187		3345		7245		14377					20026
1140	x	728		1040	2226		3405		7374		14632					20388
1160	x	740		1058	2264		3464		7503		14888					20750
1180	x	753		1076	2303		3524		7632		15143					21111
1200	x	766		1094	2342		3583		7761		15398					21473
1220	x	779		1112	2381		3643		7890		15654					21835
1240	x	791		1131	2420		3702		8019		15909					22196
1260	x	804		1149	2459		3762		8148		16165					22558
1280	x	817		1167	2498		3822		8277		16420					22920
1300	x	830		1185	2536		3881		8406		16676					23281
1320	x	843		1203	2575		3941		8536		16931					23643
1340	x	855		1222	2614		4000		8665		17186					24005
1360	x	868		1240	2653		4060		8794		17442					24366
1380	x	881		1258	2692		4119		8923		17697					24728
1400	x	894		1276	2731		4179		9052		17953					25090
1420	x	906		1294	2769		4238		9181		18208					25451
1440	x	919		1313	2808		4298		9310		18464					25813
1460	x	932		1331	2847		4357		9439		18719					26175
1480	x	945		1349	2886		4417		9568		18974					26536
1500	x	957		1367	2925		4476		9697		19230					26898
																27260

Standard C-mount Lens equations for VE Series WVGA

H = horizontal FOV size, W = working distance



4 mm lens

Banner model: LCF04 (p/n 68884)

Marshall Electronics model: V-4504ML

1/3-inch format, no filter, fixed iris f/2.5, fits with either the VELC60 or VELC85 lens cover

H(W), mm

$H = 1.099 \times W - 3$ (minimum W ~ 60 mm)

W(H), mm

$W = (H + 3)/1.099$ (minimum H ~ 61 mm)

NOTE: Banner recommends using a 0.25 mm spacer (LEKS)



8 mm lens

Banner model: LCF08 (p/n 57298)

Azure Photonics model: AZURE-0813F

1/2-inch format, no filter, fixed iris f/1.3, fits with either the VELC60 or VELC85 lens cover

H(W), mm

$H = 0.515 \times W - 5.97$ (minimum W ~ 44 mm)

W(H), mm

$W = (H + 5.97)/0.515$ (minimum H ~ 16 mm)



12 mm lens

Banner model: LCF12 (p/n 57299)

Marshall Electronics model: V-4512

1/3-inch format, no filter, fixed iris f/2.0, fits with either the VELC60 or VELC85 lens cover

H(W), mm

$H = 0.336 \times W - 4.04$ (minimum W ~ 47 mm)

W(H), mm

$W = (H + 4.04)/0.336$ (minimum H ~ 11 mm)



25mm lens

Banner model: LCF25R (p/n 68885)

Goyo Optical model: GMG42514C

1-inch format, 37.5 mm filter, min f/1.4, fits with either the VELC60 or VELC85 lens cover

H(W), mm

$H = 0.155 \times W - 3$ (minimum W ~ 573 mm)

W(H), mm

$W = (H + 3)/0.155$ (minimum H ~ 85 mm)



50mm lens

Banner model: LCF50L2R (p/n 68888)

Goyo Optical model: GMG45018MCN

1-inch format, 40.5 mm filter, min f/1.8, requires LHWK-1 set screws

H(W), mm

$H = 0.0783 \times W - 5.693$ (minimum $W \sim 722$ mm)

W(H), mm

$W = (H + 5.693)/0.0783$ (minimum $H \sim 51$ mm)



75mm lens

Banner model: LCF75LR (p/n 70545)

Goyo Optical model: GMG47518MCN

1-inch format, 46 mm filter, min f/1.8, does not fit with a sealed lens cover

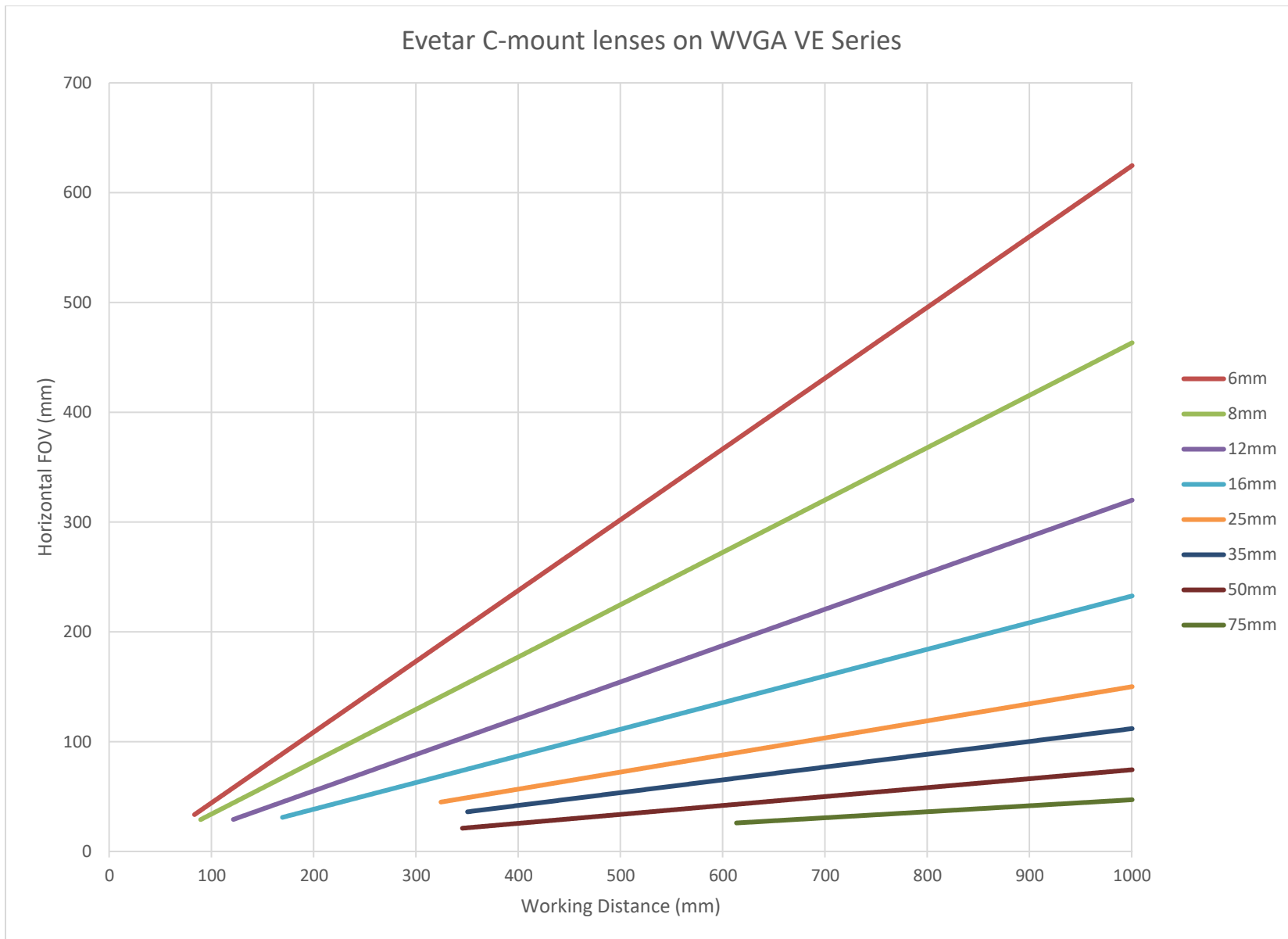
H(W), mm

$H = 0.055 \times W - 7.47$ (minimum $W \sim 809$ mm)

W(H), mm

$W = (H + 7.47)/0.055$ (minimum $H \sim 37$ mm)

Evetar C-mount Lenses on WVGA VE Series



Evetar C-mount Lenses on WVGA VE Series, FOV as a function of WD Chart

WD (mm)	FOV (mm)							
	6mm	8mm	12mm	16mm	25mm	35mm	50mm	75mm
Minimum	34 x 22 @ 83mm	29 x 19 @ 89mm	30 x 19 @ 121mm	31 x 20 @ 169mm	45 x 29 @ 324mm	36 x 23 @ 350mm	21 x 13 @ 345mm	26 x 17 @ 613mm
20								
40								
60								
80	32 x 20							
100	45 x 28	34 x 22						
120	57 x 37	44 x 28	29 x 18					
140	70 x 45	53 x 34	35 x 23					
160	83 x 53	63 x 40	42 x 27					
180	96 x 61	72 x 46	49 x 31	34 x 22				
200	109 x 70	82 x 52	55 x 35	39 x 25				
220	122 x 78	91 x 58	62 x 40	43 x 28				
240	135 x 86	101 x 64	69 x 44	48 x 31				
260	148 x 94	111 x 71	75 x 48	53 x 34				
280	161 x 102	120 x 77	82 x 52	58 x 37				
300	173 x 111	130 x 83	88 x 56	63 x 40				
320	186 x 119	139 x 89	95 x 61	68 x 43				
340	199 x 127	149 x 95	102 x 65	73 x 46	47 x 30			
360	212 x 135	158 x 101	108 x 69	77 x 49	51 x 32	37 x 24	22 x 14	
380	225 x 144	168 x 107	115 x 73	82 x 53	54 x 34	40 x 25	24 x 15	
400	238 x 152	177 x 113	121 x 78	87 x 56	57 x 36	42 x 27	26 x 16	
420	251 x 160	187 x 119	128 x 82	92 x 59	60 x 38	44 x 28	27 x 17	
440	264 x 168	196 x 125	135 x 86	97 x 62	63 x 40	47 x 30	29 x 18	
460	277 x 177	206 x 131	141 x 90	102 x 65	66 x 42	49 x 31	31 x 19	
480	289 x 185	215 x 137	148 x 94	107 x 68	69 x 44	51 x 33	32 x 21	
500	302 x 193	225 x 144	155 x 99	111 x 71	72 x 46	54 x 34	34 x 22	
520	315 x 201	234 x 150	161 x 103	116 x 74	75 x 48	56 x 36	35 x 23	
540	328 x 209	244 x 156	168 x 107	121 x 77	79 x 50	58 x 37	37 x 24	
560	341 x 218	254 x 162	174 x 111	126 x 80	82 x 52	61 x 39	39 x 25	
580	354 x 226	263 x 168	181 x 116	131 x 83	85 x 54	63 x 40	40 x 26	
600	367 x 234	273 x 174	188 x 120	136 x 87	88 x 56	65 x 42	42 x 27	
620	380 x 242	282 x 180	194 x 124	140 x 90	91 x 58	68 x 43	44 x 28	26 x 17
640	393 x 251	292 x 186	201 x 128	145 x 93	94 x 60	70 x 45	45 x 29	27 x 18
660	405 x 259	301 x 192	207 x 132	150 x 96	97 x 62	72 x 46	47 x 30	29 x 18
680	418 x 267	311 x 198	214 x 137	155 x 99	100 x 64	75 x 48	48 x 31	30 x 19
700	431 x 275	320 x 204	221 x 141	160 x 102	103 x 66	77 x 49	50 x 32	31 x 20
720	444 x 284	330 x 211	227 x 145	165 x 105	107 x 68	79 x 51	52 x 33	32 x 20
740	457 x 292	339 x 217	234 x 149	170 x 108	110 x 70	82 x 52	53 x 34	33 x 21
760	470 x 300	349 x 223	241 x 154	174 x 111	113 x 72	84 x 54	55 x 35	34 x 22
780	483 x 308	358 x 229	247 x 158	179 x 114	116 x 74	86 x 55	57 x 36	35 x 22
800	496 x 316	368 x 235	254 x 162	184 x 118	119 x 76	89 x 57	58 x 37	36 x 23
820	509 x 325	377 x 241	260 x 166	189 x 121	122 x 78	91 x 58	60 x 38	37 x 24
840	522 x 333	387 x 247	267 x 170	194 x 124	125 x 80	93 x 60	61 x 39	38 x 24
860	534 x 341	397 x 253	274 x 175	199 x 127	128 x 82	96 x 61	63 x 40	39 x 25
880	547 x 349	406 x 259	280 x 179	204 x 130	131 x 84	98 x 62	65 x 41	41 x 26
900	560 x 358	416 x 265	287 x 183	208 x 133	135 x 86	100 x 64	66 x 42	42 x 27
920	573 x 366	425 x 271	293 x 187	213 x 136	138 x 88	103 x 65	68 x 43	43 x 27
940	586 x 374	435 x 277	300 x 192	218 x 139	141 x 90	105 x 67	70 x 44	44 x 28
960	599 x 382	444 x 284	307 x 196	223 x 142	144 x 92	107 x 68	71 x 45	45 x 29
980	612 x 390	454 x 290	313 x 200	228 x 145	147 x 94	110 x 70	73 x 46	46 x 29
1000	625 x 399	463 x 296	320 x 204	233 x 149	150 x 96	112 x 71	74 x 47	47 x 30
1020	638 x 407	473 x 302	327 x 208	238 x 152	153 x 98	114 x 73	76 x 49	48 x 31
1040	650 x 415	482 x 308	333 x 213	242 x 155	156 x 100	117 x 74	78 x 50	49 x 31
1060	663 x 423	492 x 314	340 x 217	247 x 158	159 x 102	119 x 76	79 x 51	50 x 32
1080	676 x 432	501 x 320	346 x 221	252 x 161	163 x 104	121 x 77	81 x 52	51 x 33
1100	689 x 440	511 x 326	353 x 225	257 x 164	166 x 106	124 x 79	83 x 53	53 x 34
1120	702 x 448	520 x 332	360 x 230	262 x 167	169 x 108	126 x 80	84 x 54	54 x 34
1140	715 x 456	530 x 338	366 x 234	267 x 170	172 x 110	128 x 82	86 x 55	55 x 35
1160	728 x 465	540 x 344	373 x 238	272 x 173	175 x 112	131 x 83	87 x 56	56 x 36
1180	741 x 473	549 x 350	379 x 242	276 x 176	178 x 114	133 x 85	89 x 57	57 x 36
1200	754 x 481	559 x 357	386 x 246	281 x 180	181 x 116	135 x 86	91 x 58	58 x 37
1220	766 x 489	568 x 363	393 x 251	286 x 183	184 x 118	138 x 88	92 x 59	59 x 38
1240	779 x 497	578 x 369	399 x 255	291 x 186	187 x 120	140 x 89	94 x 60	60 x 38
1260	792 x 506	587 x 375	406 x 259	296 x 189	191 x 122	142 x 91	96 x 61	61 x 39
1280	805 x 514	597 x 381	413 x 263	301 x 192	194 x 124	145 x 92	97 x 62	62 x 40
1300	818 x 522	606 x 387	419 x 268	306 x 195	197 x 126	147 x 94	99 x 63	64 x 41
1320	831 x 530	616 x 393	426 x 272	310 x 198	200 x 128	149 x 95	100 x 64	65 x 41
1340	844 x 539	625 x 399	432 x 276	315 x 201	203 x 130	152 x 97	102 x 65	66 x 42
1360	857 x 547	635 x 405	439 x 280	320 x 204	206 x 132	154 x 98	104 x 66	67 x 43
1380	870 x 555	644 x 411	446 x 284	325 x 207	209 x 134	156 x 100	105 x 67	68 x 43
1400	882 x 563	654 x 417	452 x 289	330 x 211	212 x 136	159 x 101	107 x 68	69 x 44
1420	895 x 572	663 x 424	459 x 293	335 x 214	215 x 137	161 x 103	109 x 69	70 x 45
1440	908 x 580	673 x 430	465 x 297	340 x 217	219 x 139	163 x 104	110 x 70	71 x 45
1460	921 x 588	683 x 436	472 x 301	344 x 220	222 x 141	166 x 106	112 x 71	72 x 46
1480	934 x 596	692 x 442	479 x 306	349 x 223	225 x 143	168 x 107	113 x 72	73 x 47
1500	947 x 604	702 x 448	485 x 310	354 x 226	228 x 145	170 x 109	115 x 73	74 x 48

Evetar C-mount Lenses on WVGA VE Series, WD as a function of FOV Chart

FOV (mm)	WD (mm)																	
	6mm		8mm		12mm		16mm		25mm		35mm		50mm		75mm			
	34 x 22	29 x 19	30 x 19	31 x 20	45 x 29	36 x 23	21 x 13	26 x 17										
	Minimum	@ 83mm	@ 89mm	@ 121mm	@ 160mm	@ 324mm	@ 350mm	@ 345mm	@ 613mm									
20 x 13																		
40 x 26		93	112	154	206			383		577						870		
60 x 38		124	154	214	288			555		823						1235		
80 x 51		155	196	275	371			726		1069						1601		
100 x 64		186	238	335	453			898		1315						1967		
120 x 77		217	280	396	536			1069		1561						2332		
140 x 89		248	322	456	618			1241		1807						2698		
160 x 102		279	364	516	700			1413		2053						3064		
180 x 115		310	406	577	783			1584		2299						3429		
200 x 128		341	448	637	865			1756		2545						3795		
220 x 140		372	490	698	948			1927		2791						4161		
240 x 153		403	532	758	1030			2099		3037						4526		
260 x 166		434	574	819	1112			2270		3283						4892		
280 x 179		465	616	879	1195			2442		3529						5257		
300 x 191		496	657	940	1277			2613		3775						5623		
320 x 204		527	699	1000	1360			2785		4021						5989		
340 x 217		558	741	1061	1442			2956		4267						6354		
360 x 230		589	783	1121	1524			3128		4513						6720		
380 x 243		620	825	1182	1607			3299		4759						7086		
400 x 255		651	867	1242	1689			3471		5005						7451		
420 x 268		683	909	1302	1772			3642		5251						7817		
440 x 281		714	951	1363	1854			3814		5497						8182		
460 x 294		745	993	1423	1936			3985		5743						8548		
480 x 306		776	1035	1484	2019			4157		5989						8914		
500 x 319		807	1077	1544	2101			4328		6235						9279		
520 x 332		838	1119	1605	2184			4500		6481						9645		
540 x 345		869	1161	1665	2266			4672		6727						10011		
560 x 357		900	1203	1726	2348			4843		6973						10376		
580 x 370		931	1245	1786	2431			5015		7219						10742		
600 x 383		962	1287	1847	2513			5186		7465						11108		
620 x 396		993	1329	1907	2596			5358		7711						11473		
640 x 409		1024	1371	1968	2678			5529		7957						11839		
660 x 421		1055	1413	2028	2761			5701		8203						12204		
680 x 434		1086	1455	2088	2843			5872		8449						12570		
700 x 447		1117	1497	2149	2925			6044		8695						12936		
720 x 460		1148	1539	2209	3008			6215		8941						13301		
740 x 472		1179	1580	2270	3090			6387		9187						13667		
760 x 485		1210	1622	2330	3173			6558		9433						14033		
780 x 498		1241	1664	2391	3255			6730		9679						14398		
800 x 511		1272	1706	2451	3337			6901		9925						14764		
820 x 523		1303	1748	2512	3420			7073		10171						15129		
840 x 536		1334	1790	2572	3502			7244		10417						15495		
860 x 549		1365	1832	2633	3585			7416		10663						15861		
880 x 562		1396	1874	2693	3667			7587		10909						16226		
900 x 574		1427	1916	2754	3749			7759		11155						16592		
920 x 587		1458	1958	2814	3832			7931		11401						16958		
940 x 600		1489	2000	2874	3914			8102		11647						17323		
960 x 613		1520	2042	2935	3997			8274		11893						17689		
980 x 626		1551	2084	2995	4079			8445		12139						18054		
1000 x 638		1582	2126	3056	4161			8617		12385						18420		
1020 x 651		1613	2168	3116	4244			8788		12631						18786		
1040 x 664		1644	2210	3177	4326			8960		12877						19151		
1060 x 677		1675	2252	3237	4409			9131		13123						19517		
1080 x 689		1706	2294	3298	4491			9303		13369						19883		
1100 x 702		1737	2336	3358	4573			9474		13615						20248		
1120 x 715		1768	2378	3419	4656			9646		13861						20614		
1140 x 728		1799	2420	3479	4738			9817		14107						20980		
1160 x 740		1831	2462	3539	4821			9989		14353						21345		
1180 x 753		1862	2504	3600	4903			10160		14599						21711		
1200 x 766		1893	2545	3660	4985			10332		14845						22076		
1220 x 779		1924	2587	3721	5068			10503		15091						22442		
1240 x 791		1955	2629	3781	5150			10675		15337						22808		
1260 x 804		1986	2671	3842	5233			10846		15583						23173		
1280 x 817		2017	2713	3902	5315			11018		15829						23539		
1300 x 830		2048	2755	3963	5398			11190		16075						23905		
1320 x 843		2079	2797	4023	5480			11362		16321						24270		
1340 x 855		2110	2839	4084	5562			11533		16567						24636		
1360 x 868		2141	2881	4144	5645			11704		16813						25001		
1380 x 881		2172	2923	4205	5727			11876		17059						25367		
1400 x 894		2203	2965	4265	5810			12047		17305						25733		
1420 x 906		2234	3007	4325	5892			12219		17551						26098		
1440 x 919		2265	3049	4386	5974			12390		17797						26464		
1460 x 932		2296	3091	4446	6057			12562		18043						26830		
1480 x 945		2327	3133	4507	6139			12733		18289						27195		
1500 x 957		2358	3175	4567	6222			12905		18535						27561		

Evetar C-mount Lens equations for VE Series WVGA

H = horizontal FOV size, W = working distance



6mm Megapixel lens

Banner model: LCF06LEVMP (p/n 97345)

Evetar model: MV118FM06C

1/1.8-inch format, 34 mm filter, min f/1.6, fits with either the VELC60 or VELC85 lens cover

H(W), mm

$$H = 0.645 \times W - 19.947 \text{ (minimum } W \sim 83 \text{ mm)}$$

W(H), mm

$$W = (H + 19.947)/0.645 \text{ (minimum } H \sim 34 \text{ mm)}$$



8mm Megapixel lens

Banner model: LCF08LEVMP (p/n 97346)

Evetar model: MV118FM08C

1/1.8-inch format, 27 mm filter, min f/1.4, fits with either the VELC60 or VELC85 lens cover

H(W), mm

$$H = 0.477 \times W - 13.42 \text{ (minimum } W \sim 89 \text{ mm)}$$

W(H), mm

$$W = (H + 13.42)/0.477 \text{ (minimum } H \sim 29 \text{ mm)}$$



12mm Megapixel lens

Banner model: LCF12LEVMP (p/n 97347)

Evetar model: MV23FM12C

2/3-inch format, 27 mm filter, min f/1.6, fits with either the VELC60 or VELC85 lens cover

H(W), mm

$$H = 0.331 \times W - 10.86 \text{ (minimum } W \sim 121 \text{ mm)}$$

W(H), mm

$$W = (H + 10.86)/0.331 \text{ (minimum } H \sim 30 \text{ mm)}$$



16mm Megapixel lens

Banner model: LCF16LEVMP (p/n 97348)

Evetar model: MV23FM16CR1

2/3-inch format, 27 mm filter, min f/1.6, fits with either the VELC60 or VELC85 lens cover

H(W), mm

$$H = 0.243 \times W - 9.98 \text{ (minimum } W \sim 169 \text{ mm)}$$

W(H), mm

$$W = (H + 9.98)/0.243 \text{ (minimum } H \sim 31 \text{ mm)}$$



25mm Megapixel lens

Banner model: LCF25LEVMP (p/n 97349)

Evetar model: MV23FM25C

2/3-inch format, 27 mm filter, min f/1.8, fits with either the VELC60 or VELC85 lens cover

H(W), mm

$H = 0.156 \times W - 5.41$ (minimum $W \sim 324$ mm)

W(H), mm

$W = (H + 5.41)/0.156$ (minimum $H \sim 45$ mm)



35mm Megapixel lens

Banner model: LCF35LEVMP (p/n 97350)

Evetar model: MV23FM35C

2/3-inch format, 27 mm filter, min f/2.0, fits with either the VELC60 or VELC85 lens cover

H(W), mm

$H = 0.117 \times W - 4.7$ (minimum $W \sim 350$ mm)

W(H), mm

$W = (H + 4.7)/0.117$ (minimum $H \sim 36$ mm)



50mm Megapixel lens

Banner model: LCF50LEVMP (p/n 97351)

Evetar model: MV23FM50C

2/3-inch format, 30.5 mm filter, min f/2.6, fits with VELC85 lens cover

H(W), mm

$H = 0.081 \times W - 6.88$ (minimum $W \sim 345$ mm)

W(H), mm

$W = (H + 6.88)/0.081$ (minimum $H \sim 21$ mm)



75mm Megapixel lens

Banner model: LCF75LEVMP (p/n 97352)

Evetar model: MV11FM75C

1-inch format, 34 mm filter, min f/2.8, does not fit with a sealed lens cover

H(W), mm

$H = 0.055 \times W - 7.58$ (minimum $W \sim 613$ mm)

W(H), mm

$W = (H + 7.58)/0.055$ (minimum $H \sim 26$ mm)