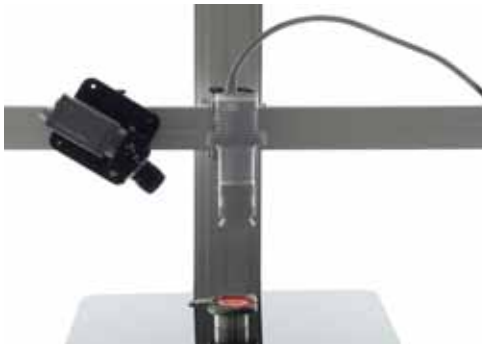
OPTO ENGINEERING
THE TELECENTRIC COMPANY

MCSM1-01X

3D MACRO lens with Scheimpflug adjustment

MCSM1-01X is a MACRO lens expressly designed for 3D measurement and imaging applications where the object plane is not perpendicular to the optical axis. A precise built-in adjustment mechanism allows to accurately meet the Scheimpflug condition and to image tilted planes in perfect focus. This lens offers a wide range of magnifications and view angles. It can be interface with any structured light source to build up extremely accurate 3D imaging systems. The tiltable mount is compatible with any C-mount camera since it respects the 17.52 mm back focal length. Image sharpness is maintained even when the lens is tilted by a wide angle, since the Scheimpflug adjustment is pivoted around the detector plane.

Examples of 3D imaging configurations:



MCSM1-0.1x working at 45° with a pattern projector for 3D shaping

MCSM1-0.1x combined with a Scheimpflug projector at 90°

MCSM1-0.1x imaging a sample from an angled point of view

KEY ADVANTAGES

1. **Precision Scheimpflug mount**
   image focus is retained across any tilted plane
2. **Compatible with any C-mount cameras**
   the back focal length meets the C-mount standard
3. **Tilt-mount is pivoted around the detector plane**
   the image remains in focus at any angle

Without tilt adjustment the object is not homogeneously focused

At the Scheimpflug angle the entire image becomes sharp

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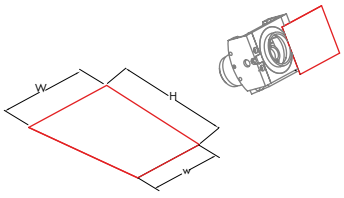
Setting-up the Scheimpflug mount is easy. First screw the lens into the camera C-mount, just like with any common lens. Loosen the lens C-mount adaptor by unscrewing the set-screws. Tune the lens phase to the right position, then tighten the set-screws.

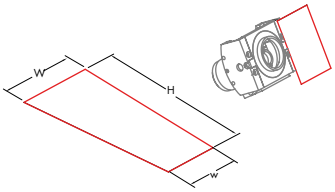
Mount the lens to a secure fixture by means of the threaded holes. Once the lens is mounted, adjust the focus until the image at the center of the detector is sharp; you don't need to tilt the detector yet.

With the lens mounted and well focused, adjust the tilt control on the side of the Scheimpflug mount by means of a screwdriver. It might be required to perform a second fine focusing of the lens to achieve the perfect setting. Once the Scheimfplug angle is set, lock the mount in place by tightening the lateral set-screws.

				long side of the detector set horizontal			long side of the detector set vertical		
	object tilt (deg)	mount tilt (deg)	working distance (mm)	1/3" 4,8 x 3,6 (mm x mm)	1/2" 6,4 x 4,8 (mm x mm)	2/3" 8,8 x 6,6 (mm x mm)	1/3" 3,6 x 4,8 (mm x mm)	1/2" 4,8 x 6,4 (mm x mm)	2/3" 6,6 x 8,8 (mm x mm)
				field of view - w (W) x H (mm x mm)			field of view - w (W) x H (mm x mm)		
1 x	0,0°	0,0°	46,0	4,8 (4,8) x 3,6	6,4 (6,4) x 4,8	8,8 (8,8) x 6,6	3,6 (3,6) x 4,8	4,8 (4,8) x 6,4	6,6 (6,6) x 8,8
	5,0°	5,0°	46,0	4,8 (4,8) x 3,6	6,3 (6,5) x 4,8	8,7 (8,9) x 6,6	3,6 (3,6) x 4,8	4,7 (4,9) x 6,4	6,5 (6,7) x 8,8
	10,0°	10,0°	46,0	4,7 (4,9) x 3,6	6,3 (6,5) x 4,8	8,6 (9,0) x 6,6	3,5 (3,7) x 4,8	4,7 (4,9) x 6,4	6,4 (6,8) x 8,8
	15,0°	15,0°	46,0	4,6 (5,0) x 3,6	6,2 (6,6) x 4,8	8,5 (9,1) x 6,6	3,5 (3,8) x 4,8	4,6 (5,0) x 6,4	6,3 (6,9) x 8,8
0,75 x	0,0°	0,0°	47,8	6,4 (6,4) x 4,8	8,6 (8,6) x 6,4	11,8 (11,8) x 8,8	4,8 (4,8) x 6,4	6,4 (6,4) x 8,6	8,8 (8,8) x 11,8
	7,5°	5,7°	47,8	6,3 (6,5) x 4,8	8,4 (8,7) x 6,5	11,6 (12,0) x 8,9	4,7 (4,9) x 6,4	6,3 (6,6) x 8,6	8,7 (9,0) x 11,8
	15,0°	11,4°	47,8	6,2 (6,6) x 4,9	8,3 (8,8) x 6,5	11,4 (12,2) x 9,0	4,6 (5,0) x 6,5	6,2 (6,7) x 8,7	8,5 (9,2) x 12,0
	20,0°	15,3°	47,8	6,2 (6,7) x 5,0	8,2 (8,9) x 6,6	11,3 (12,3) x 9,1	4,6 (1,8) x 6,6	6,1 (2,4) x 8,8	8,4 (3,4) x 12,1
0,5 x	0,0°	0,0°	59,6	9,6 (9,6) x 7,2	12,8 (12,8) x 9,6	17,7 (17,7) x 13,3	7,2 (7,2) x 9,6	9,6 (9,6) x 12,8	13,3 (13,3) x 17,7
	10,0°	5,0°	59,6	9,4 (9,8) x 7,3	12,6 (13,1) x 9,7	17,3 (18,0) x 13,4	7,0 (7,4) x 9,7	9,4 (9,9) x 13,0	12,9 (13,6) x 17,9
	20,0°	10,4°	59,6	9,2 (10,1) x 7,6	12,3 (13,4) x 10,1	17,0 (18,4) x 13,9	6,8 (7,7) x 10,1	9,1 (10,2) x 13,5	12,5 (14,0) x 18,6
	30,0°	16,1°	59,6	9,0 (10,3) x 8,0	12,1 (13,7) x 10,7	16,6 (18,9) x 14,8	6,6 (7,9) x 10,8	8,9 (10,5) x 14,3	12,2 (14,5) x 19,7
0,33 x	0,0°	0,0°	83,8	14,6 (14,6) x 10,9	19,4 (19,4) x 14,6	26,7 (26,7) x 20,1	10,9 (10,9) x 14,5	14,6 (14,6) x 19,4	20,1 (20,1) x 26,6
	15,0°	5,1°	83,8	14,1 (14,9) x 11,3	18,9 (19,9) x 15,1	25,9 (27,4) x 20,7	10,5 (11,4) x 15,1	14,0 (15,2) x 20,1	19,3 (20,9) x 27,6
	30,0°	10,8°	83,8	13,7 (15,6) x 12,5	18,2 (20,8) x 16,6	25,1 (28,6) x 22,8	10,0 (12,0) x 16,7	13,4 (16,0) x 22,2	18,4 (22,0) x 30,6
	45,0°	18,3°	83,8	13,1 (16,4) x 14,9	17,5 (21,9) x 19,8	24,1 (30,1) x 27,3	9,5 (12,9) x 20,0	12,7 (17,1) x 26,7	17,5 (23,6) x 36,7
0,2 x	0,0°	0,0°	135,3	24,0 (24,0) x 18,0	32,0 (32,0) x 24,0	44,0 (44,0) x 33,0	18,0 (18,0) x 24,0	24,0 (24,0) x 32,0	33,0 (33,0) x 44,0
	15,0°	3,1°	135,3	23,3 (24,8) x 18,6	31,0 (33,0) x 24,8	42,7 (45,4) x 34,2	17,3 (18,8) x 24,9	23,0 (25,1) x 33,1	31,7 (34,5) x 45,6
	30,0°	6,6°	135,3	22,5 (25,7) x 20,7	30,0 (34,3) x 27,7	41,2 (47,2) x 38,0	16,5 (19,8) x 27,8	22,0 (26,4) x 37,0	30,3 (36,3) x 50,9
	45,0°	11,4°	135,3	21,5 (27,1) x 25,3	28,7 (36,2) x 33,7	39,5 (49,7) x 46,4	15,6 (21,3) x 34,1	20,8 (28,4) x 45,4	28,6 (39,0) x 62,5
0,1 x	0,0°	0,0°	271,0	47,6 (47,6) x 35,7	63,5 (63,5) x 47,6	87,3 (87,3) x 65,5	35,7 (35,7) x 47,7	47,6 (47,6) x 63,6	65,5 (65,5) x 87,4
	15,0°	1,6°	271,0	46,2 (49,2) x 37,0	61,6 (65,6) x 49,4	84,7 (90,2) x 67,9	34,3 (37,3) x 49,4	45,7 (49,7) x 65,9	62,9 (68,4) x 90,6
	30,0°	3,4°	271,0	44,6 (51,1) x 41,4	59,5 (68,1) x 55,2	81,8 (93,7) x 75,8	32,8 (39,3) x 55,4	43,7 (52,4) x 73,8	60,1 (72,0) x 101,5
	45,0°	5,8°	271,0	42,7 (53,9) x 51,0	56,9 (71,9) x 68,0	78,2 (98,9) x 93,4	30,9 (42,3) x 68,7	41,2 (56,4) x 91,6	56,7 (77,6) x 125,9



Field of View with detector's long side set horizontal



Field of View with detector's long side set vertical