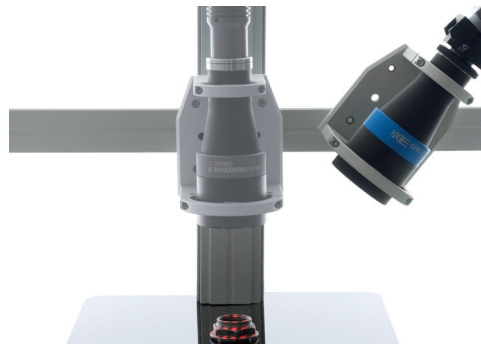


TCSM SERIES

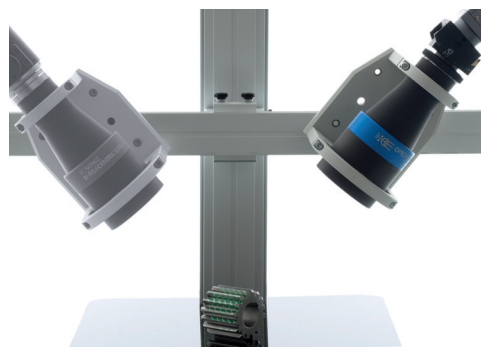
TCSM Series is a unique family of bi-telecentric lenses for extremely accurate 3D dimensional measurement systems. All TCSM lenses are equipped with a high-precision Scheimpflug adjustment mechanism that suits any type of C-mount camera. Besides achieving very good focus at wide tilt angles, bi-telecentricity also yields incredibly low distortion. Images are linearly compressed only in one direction, thus making 3D-reconstruction very easy and exceptionally accurate. The available magnifications range from 0.5x to 0.1x while the angle of view reaches 30° - 45° to meet the measurement needs of triangulation-based techniques. The Scheimpflug mount is pivoted around the detector plane to ensure excellent pointing stability and ease of focus.

High-end 3D measurements with TCSM

3D Bi-Telecentric lenses with Scheimpflug adjustment



A TCSM Series lens for straight telecentric pattern projection



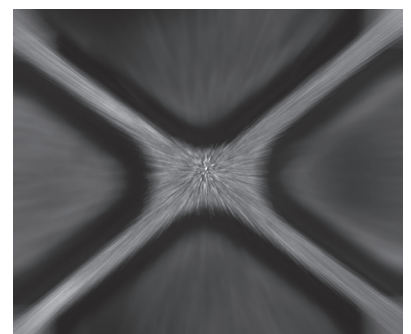
Scheimpflug telecentric optics for both projecting and imaging at 90°



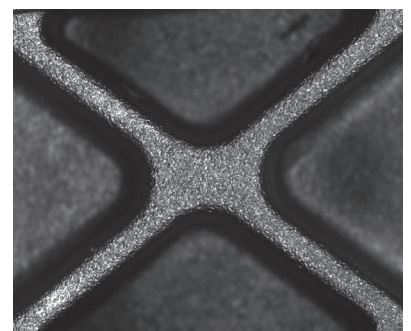
TCSM imaging and measuring sloped objects

KEY ADVANTAGES

- 1 **Unique Scheimpflug adjustment**
no other lens can perform oblique measurements
- 2 **The image is radially undistorted**
linear extension can be perfectly calibrated
- 3 **Compatible with any C-mount cameras**
and compliant to the C-mount standard

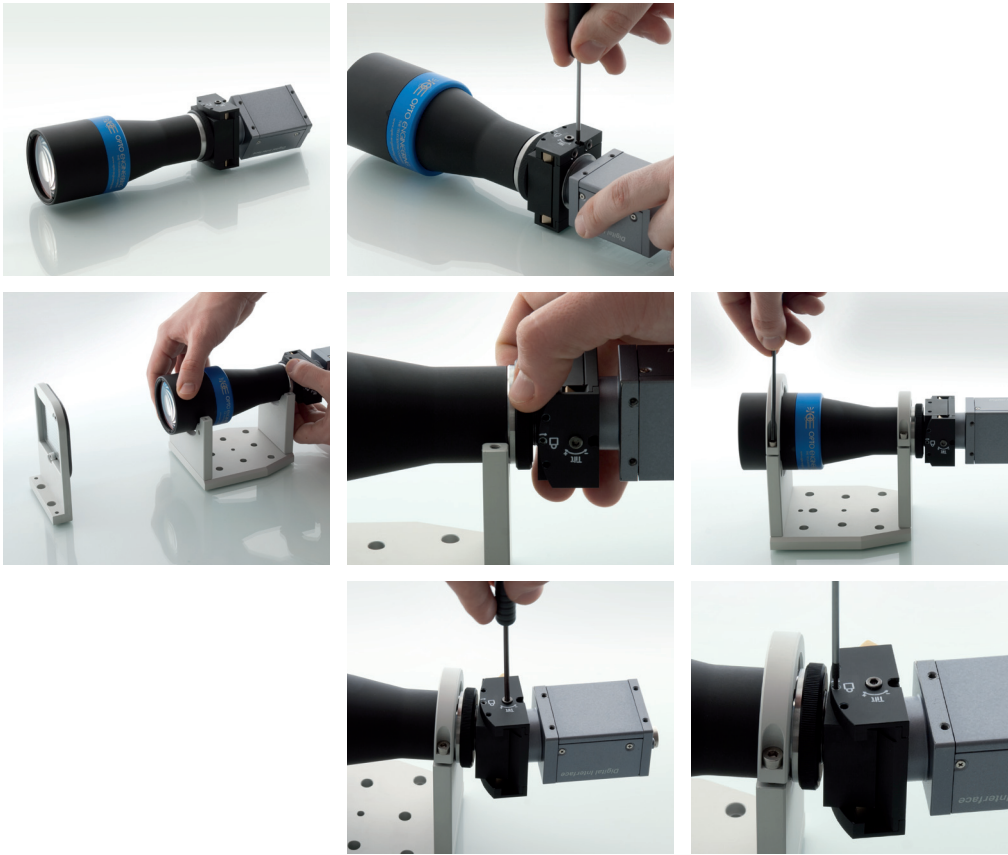


Without tilt adjustment, the object is not homogeneously focused



At the Scheimpflug angle, the image becomes homogeneously sharp

TCSM SERIES



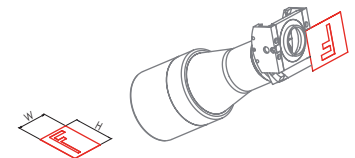
Setting-up the Scheimpflug mount is easy. First, screw the lens into the camera C-mount just like with any common lens. Then loosen the lens C-mount adaptor by unscrewing the set-screws and tune the lens phase to the proper position; tighten the set-screws to secure the setting.

Use the Opto Engineering's CMHO series mounts to clamp the lens. Once the lens is mounted, adjust the focus until the image at the center of the detector is sharp and lock the focus adjustment with the counter-flange.

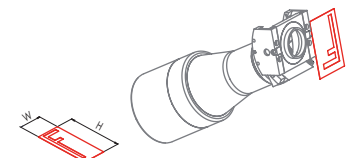
With the lens mounted and well focused, adjust the tilt control on the side of the Scheimpflug mount by means of a screwdriver. It might be required to perform a second fine focusing of the lens in order to obtain the best configuration. When the tilt angle is set, lock the mount in place by screwing the set-screws.

object tilt (deg)	mount tilt (deg)	working distance (mm)	long side of the detector set horizontal		long side of the detector set vertical					
			horizontal mag (x)	vertical mag (x)	1/3"	1/2"	2/3"			
					4,8 x 3,6 (mm x mm)	6,4 x 4,8 (mm x mm)	8,8 x 6,6 (mm x mm)	3,6 x 6,4 (mm x mm)	4,8 x 6,4 (mm x mm)	6,6 x 8,8 (mm x mm)

TCSM	field of view W x H (mm x mm)					field of view W x H (mm x mm)					
	0,0°	10,0°	20,0°	30,0°	45,0°	1/3"	1/2"	2/3"	1/3"	1/2"	2/3"
TCSM016	0,0°	0,0°	45,3	0,528	0,528	9,1 x 6,8	12,1 x 9,1	16,7 x 12,5	6,8 x 9,1	9,1 x 12,1	12,5 x 16,7
	5,3°	5,3°		0,528	0,522	9,1 x 6,9	12,1 x 9,2	16,7 x 12,6	6,8 x 9,2	9,1 x 12,3	12,5 x 16,9
	10,0°	10,9°		0,528	0,506	9,1 x 7,1	12,1 x 9,5	16,7 x 13,1	6,8 x 9,5	9,1 x 12,7	12,5 x 17,4
	30,0°	17,0°		0,528	0,478	9,1 x 7,5	12,1 x 10,1	16,7 x 13,8	6,8 x 10,0	9,1 x 13,4	12,5 x 18,4
TCSM024	0,0°	0,0°	69,2	0,350	0,350	13,7 x 10,3	18,3 x 13,7	25,1 x 18,9	10,3 x 13,7	13,7 x 18,3	18,9 x 25,1
	15,0°	5,4°		0,350	0,338	13,7 x 10,6	18,3 x 14,2	25,1 x 19,5	10,3 x 14,2	13,7 x 18,9	18,9 x 26,0
	30,0°	11,4°		0,350	0,308	13,7 x 11,7	18,3 x 15,6	25,1 x 21,4	10,3 x 15,6	13,7 x 20,8	18,9 x 28,5
	45,0°	19,3°		0,350	0,262	13,7 x 13,7	18,3 x 18,3	25,1 x 25,2	10,3 x 18,3	13,7 x 24,4	18,9 x 33,6
TCSM036	0,0°	0,0°	103,5	0,243	0,243	19,7 x 14,8	26,3 x 19,7	36,2 x 27,1	14,8 x 19,7	19,7 x 26,3	27,1 x 36,2
	15,0°	3,7°		0,243	0,235	19,7 x 15,3	26,3 x 20,4	36,2 x 28,1	14,8 x 20,4	19,7 x 27,2	27,1 x 37,4
	30,0°	8,0°		0,243	0,213	19,7 x 17,0	26,3 x 22,6	36,2 x 31,1	14,8 x 22,6	19,7 x 30,1	27,1 x 41,4
	45,0°	13,6°		0,243	0,177	19,7 x 20,4	26,3 x 27,2	36,2 x 37,4	14,8 x 27,1	19,7 x 36,2	27,1 x 49,7
TCSM048	0,0°	0,0°	134,6	0,185	0,185	26,0 x 19,5	34,7 x 26,0	47,7 x 35,7	19,5 x 26,0	26,0 x 34,7	35,7 x 47,7
	15,0°	2,8°		0,185	0,181	26,0 x 20,1	34,7 x 26,8	47,7 x 36,9	19,5 x 26,5	26,0 x 35,3	35,7 x 48,6
	30,0°	6,1°		0,185	0,161	26,0 x 22,4	34,7 x 29,9	47,7 x 41,1	19,5 x 29,8	26,0 x 39,8	35,7 x 54,7
	45,0°	10,5°		0,185	0,133	26,0 x 27,1	34,7 x 36,2	47,7 x 49,8	19,5 x 36,1	26,0 x 48,2	35,7 x 66,2
TCSM056	0,0°	0,0°	159,3	0,157	0,157	30,6 x 22,9	40,8 x 30,6	56,1 x 42,0	22,9 x 30,6	30,6 x 40,8	42,0 x 56,1
	15,0°	2,4°		0,157	0,152	30,6 x 23,7	40,8 x 31,7	56,1 x 43,5	22,9 x 31,6	30,6 x 42,2	42,0 x 58,0
	30,0°	5,1°		0,157	0,136	30,6 x 26,4	40,8 x 35,2	56,1 x 48,4	22,9 x 35,2	30,6 x 46,9	42,0 x 64,5
	45,0°	8,8°		0,157	0,112	30,6 x 32,1	40,8 x 42,8	56,1 x 58,8	22,9 x 42,8	30,6 x 57,0	42,0 x 78,4
TCSM064	0,0°	0,0°	182,0	0,137	0,137	34,9 x 26,2	46,6 x 34,9	64,0 x 48,0	26,2 x 34,9	34,9 x 46,6	48,0 x 64,0
	15,0°	2,1°		0,137	0,133	34,9 x 27,1	46,6 x 36,2	64,0 x 49,8	26,2 x 36,1	34,9 x 48,2	48,0 x 66,3
	30,0°	4,5°		0,137	0,119	34,9 x 30,2	46,6 x 40,3	64,0 x 55,4	26,2 x 40,2	34,9 x 53,6	48,0 x 73,7
	45,0°	7,8°		0,137	0,098	34,9 x 36,8	46,6 x 49,0	64,0 x 67,4	26,2 x 49,0	34,9 x 65,3	48,0 x 89,8
TCSM080	0,0°	0,0°	227,0	0,110	0,110	43,6 x 32,7	58,2 x 43,6	80,0 x 60,0	32,7 x 43,6	43,6 x 58,2	60,0 x 80,0
	15,0°	1,7°		0,110	0,107	43,6 x 33,8	58,2 x 45,0	80,0 x 61,9	32,7 x 45,0	43,6 x 60,0	60,0 x 82,5
	30,0°	3,6°		0,110	0,096	43,6 x 37,6	58,2 x 50,2	80,0 x 69,0	32,7 x 50,2	43,6 x 67,0	60,0 x 92,1
	45,0°	6,3°		0,110	0,078	43,6 x 45,9	58,2 x 61,2	80,0 x 84,2	32,7 x 61,2	43,6 x 81,7	60,0 x 112,3
TCSM096	0,0°	0,0°	279,0	0,093	0,093	51,4 x 38,5	68,5 x 51,4	94,2 x 70,7	38,5 x 51,4	51,4 x 68,5	70,7 x 94,2
	15,0°	1,4°		0,093	0,090	51,4 x 39,9	68,5 x 53,2	94,2 x 73,1	38,5 x 53,2	51,4 x 70,9	70,7 x 97,5
	30,0°	3,1°		0,093	0,081	51,4 x 44,4	68,5 x 59,2	94,2 x 81,5	38,5 x 59,2	51,4 x 79,0	70,7 x 108,6
	45,0°	5,3°		0,093	0,066	51,4 x 54,4	68,5 x 72,5	94,2 x 99,7	38,5 x 72,4	51,4 x 96,6	70,7 x 132,8



Field of View with detector's long side set horizontal



Field of View with detector's long side set vertical