Accessories / spare parts

2014

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Index
Accessories / spare parts

No product is an island.
We are fully aware that Opto Engineering products
live in complex ecosystems where optics must be
mechanically supported, calibrated and serviced:
we strive to provide complete solutions
for easy deployment of our optical products,
ranging from clamping supports to a wide array
of light sources, filters and patterns.

Of course, optical and electrical replacement parts
are provided, as well as the online documentation
needed for the most common service tasks.

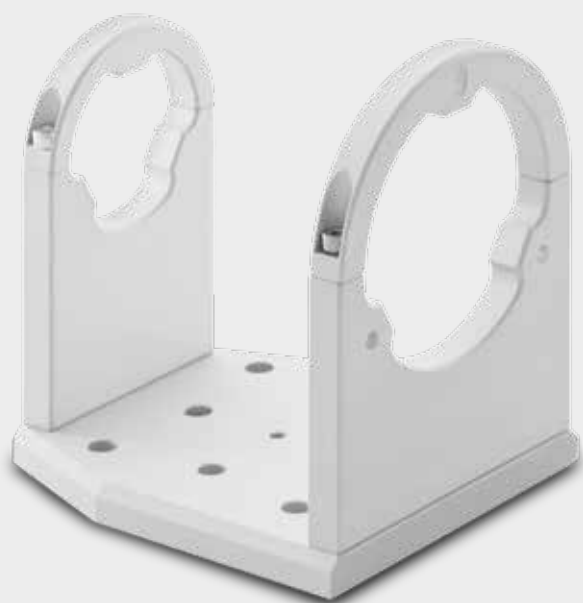Please refer to our website www.opto-engineering.com to browse our complete product range.

CMHO series

Clamping mechanics

The accurate alignment of optical components is crucial when designing measurement systems. Besides optical components stability, the mechanical system layout should assure that the optical axis is orthonormal to the measurement plane.

For this purpose, Opto Engineering supplies **CMHO series** clamping mechanics, suitable for most Opto Engineering telecentric lenses and collimated illuminators.

Three-point mounting grants a very precise and stable alignment of the optical components, also making the assembling procedure quick and simple.
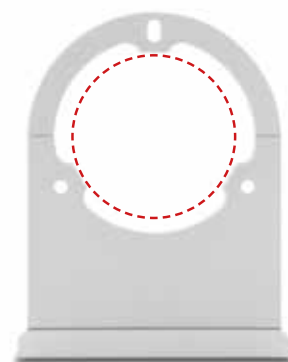
Assembling a telecentric lens on a CMHO clamping support

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| Part number	Compatibility		Mechanical specifications			
	Opto Engineering optics	Teleplates CMPT	Length	Width	Height	Optical axis height
			(mm)	(mm)	(mm)	(mm)
CMHO 023	TC 23 004, TC 23 007, TC 23 009, TC 23 012, TC4M 004, TC4M 007, TC4M 009, LTCL 023-X	004-009	20.0	53.0	66.5	40.0
CMHO 016	TC 12 016, TC 23 016, TC4M 016, TC2M 016, LTCL 016-X	016-024	20.0	62.5	71.2	40.0
CMHO 024	TC 12 024, TC 23 024, TC4M 024, TC2M 024, LTCL 024-X	016-024	20.0	62.5	71.2	40.0
CMHO 036	TC 13 036, TC 12 036, TC 23 036, TC4M 036, TC2M 036, TC16M 036, LTCL 036-X	036	110.0	97.0	125.5	80.0
CMHO 048	TC 12 048, TC 23 048, TC4M 048, TC2M 048, TC16M 048, LTCL 048-X	048	140.0	111.0	132.5	80.0
CMHO 056	TC 12 056, TC 23 056, TC4M 056, TC2M 056, TC16M 056, LTCL 056-X	056	162.0	116.0	135.0	80.0
CMHO 064	TC 13 064, TC 12 064, TC 23 064, TC4M 064, TC2M 064, TC16M 064, LTCL 064-X	064	175.0	137.0	145.0	80.0
CMHO 080	TC 23 072, TC 13 080, TC 12 080, TC 23 080, TC4M 072, TC4M 080, TC2M 080, TC16M 080, LTCL 080-X, PC xx030XS	080	230.0	153.0	152.0	80.0
CMHO 096	TC 23 085, TC 13 096, TC 12 096, TC 23 096, TC4M 085, TC4M 096, TC2M 096, TC16M 096, LTCL 096-X	096	265.0	179.0	186.5	100.0
CMHO 120	TC 23 110, TC 12 120, TC 23 120, TC4M 110, TC4M 120, TC2M 120, TC16M 120, LTCL 120-X	-	204.0	220.0	240.0	130.0
CMHO 144	TC 23 130, TC 12 144, TC 23 144, TC4M 130, TC2M 144, TC4M 144, TC16M 144, LTCL 144-X	-	204.0	232.0	247.0	130.0
	TC12K					
CMHO TC12K 064	TC12K 064	-	486.0	152.0	150.0	85.0
CMHO TC12K 080	TC12K 080	-	486.0	152.0	158.0	85.0
	TC16M					
CMHO TC16M 009	TC16M 009	-	143.0	66.5	81.3	50.0
CMHO TC16M 012	TC16M 012	-	143.0	66.5	81.3	50.0
CMHO TC16M 018	TC16M 018	-	143.0	66.5	81.3	50.0
	MC12K					
CMHO MC12K 025	MC12K 008-025	-	140.0	111.0	132.5	80.0
CMHO MC12K 067	MC12K 050-067	-	140.0	111.0	132.5	80.0
CMHO MC12K 200	MC12K 100-200	-	140.0	111.0	132.5	80.0
	TCZR					
CMHO TCZR	TCZR 036, TCZR 072	-	138.0	93.6.0	113.3	66.5
	PCCD					
CMHO PCCD	PCCD xxx	-	-	-	20.0	92.0

CMPT series

Mounting plates

CMPT plates are mechanical components designed to build up dimensional measurement optical benches. Most Opto Engineering telecentric lenses and collimated illuminators can be mounted on these plates by means of the compatible CMHO clamps.

For very accurate measurement applications, calibration patterns can be precisely positioned in front of the lens with the CMPH pattern holders, allowing for perfect optical system calibration.

| Part number	Compatibility		Mechanical specifications			
	Clamping mechanics CMHO	Pattern holders CMPH	Length	Width	Thickness	Weight
			(mm)	(mm)	(mm)	(g)
CMPT 004-009	023	004-024	199.6	56.0	10.0	286
CMPT 016-024	016, 024	004-024	226.8	66.5	10.0	385
CMPT 036	036	036-056	477.0	103.0	15.0	1950
CMPT 048	048	036-056	596.0	117.0	15.0	2770
CMPT 056	056	036-056	631.0	122.0	15.0	3060
CMPT 064	064	064-096	783.0	143.0	15.0	4460
CMPT 080	080	064-096	868.0	158.0	15.0	5470
CMPT 096	096	064-096	1005.0	185.0	20.0	9940
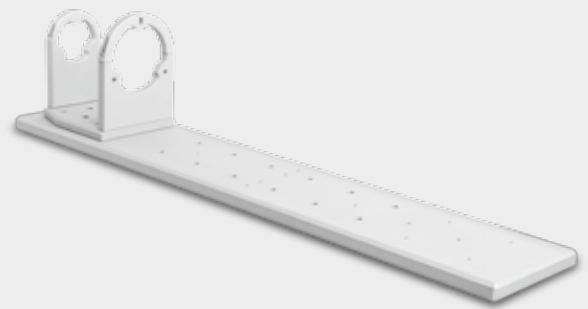
CMPH series

Pattern holders

Software calibration is accurate if pattern placement is accurate too. To do so, Opto Engineering offers specific pattern holders to easily and precisely mount each calibration pattern on its specific holding mechanics.

The pattern is assembled on a frame held by three magnets: this floating system allows for the adjustment of the pattern phase and for proper centering.

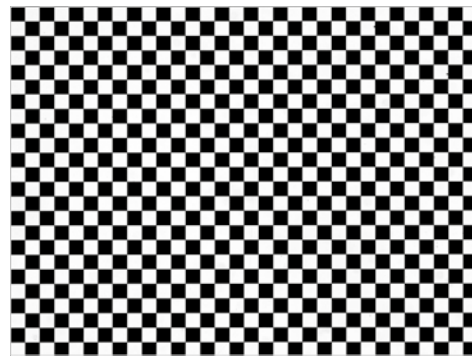| Part number	Compatibility	Mechanical specifications			
	Patterns PT	Width	Height	Thickness	Weight
		(mm)	(mm)	(mm)	(g)
CMPH 004-024	004-009, 016-024	45.0	68.5	18.0	78
CMPH 036-056	036-056	81.0	123.1	22.5	257
CMPH 064-096	064-096	129.0	145.5	25.0	611
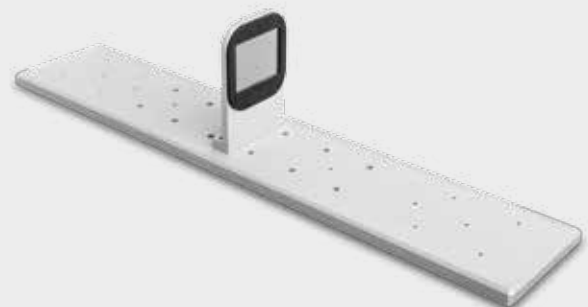
PT series patterns

Calibration patterns
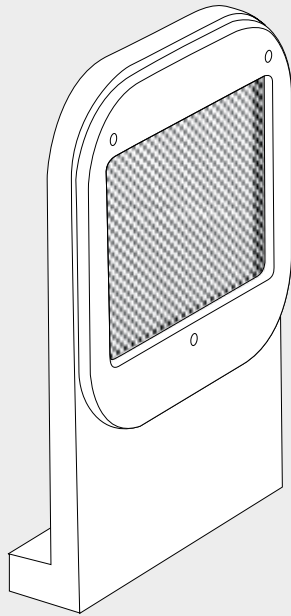
Any machine vision lens (either telecentric or not) shows some amount of distortion. In addition to *barrel* or *pincushion* distortion, changes in the view angle or misaligned components will affect the image symmetry and generate the so called *thin prism* or *keystone* effect.
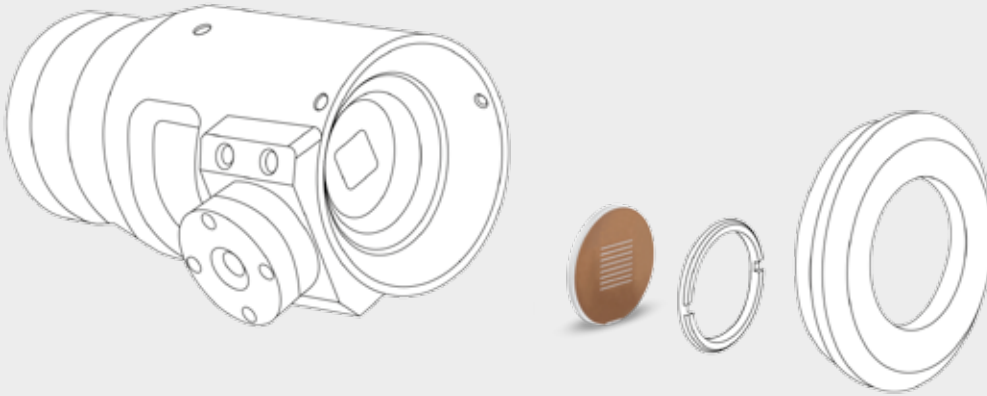
Imaging and metrology applications often require to minimize distortion, which can be software-corrected by analyzing the image of a precision pattern whose geometrical features are well known.

For this reason Opto Engineering offers chrome-on-glass patterns optimized for software calibration, featuring extremely high geometrical accuracy thanks to photolithography techniques.

The range of available chessboard patterns is compatible with most Opto Engineering telecentric lenses.

Part number	Compatibility		Mechanical specifications				
	Telecentric lenses	Pattern mounts CMPH	Dimensions width x height	Thickness	Active area width x height	Squares width & spacing	Dimensional accuracy
	(Part numbers ending in)		(mm x mm)	(mm)	(mm x mm)	(mm)	(µm)
PT 004-009	004, 007, 009	004-024	33.0 x 26.0	3.0	15.0 x 13.0	0.20	1.3
PT 016-024	016, 024	004-024	33.0 x 26.0	3.0	31.0 x 24.0	0.60	1.5
PT 036-056	036, 048, 056	036-056	66.0 x 52.0	3.0	64.0 x 51.0	1.35	1.9
PT 064-096	064, 072, 080, 085, 096	064-096	107.0 x 83.0	3.0	105.0 x 79.0	2.20	2.4
PT 120-240	110, 120, 130, 144, 172, 192, 200, 240	n.a.	229.0 x 229.0	3.0	208.0 x 208.0	4.00	3.7

PT series patterns

Patterns for LTPRSM series

Stripe patterns

PT 0000 0300 P:
8 lines in projection area

line gap 0.95 mm | line thickness 0.05 mm
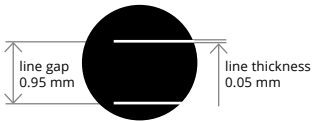
PTST 050 450 P:
16 lines in projection area

line gap 0.45 mm | line thickness 0.05 mm

PTST 050 200 P:
32 lines in projection area

line gap 0.2 mm | line thickness 0.05 mm

PTST 050 100 P:
53 lines in projection area

line gap 0.1 mm | line thickness 0.05 mm

PTST 050 050 P:
80 lines in projection area

line gap 0.05 mm | line thickness 0.05 mm

Grid patterns

PT 0000 0400 P:
8x8 lines in projection area

line gap 0.95 mm | line thickness 0.05 mm
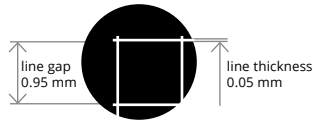
PRGR 050 450 P:
16x16 lines in projection area

line gap 0.45 mm | line thickness 0.05 mm

PTGR 050 200 P:
32x32 lines in projection area

line gap 0.2 mm | line thickness 0.05 mm

PTGR 050 100 P:
53x53 lines in projection area

line gap 0.1 mm | line thickness 0.05 mm

PTGR 050 050 P:
80x80 lines in projection area

line gap 0.05 mm | line thickness 0.05 mm

Projection patterns for machine vision

active area

8 mm

8 mm
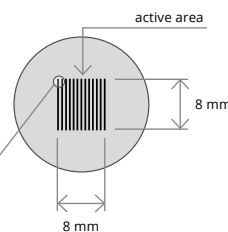
Pattern specifications

Photolithography patterns	
Substrate	Soda lime glass
Coating	Chrome
Geometrical accuracy	2 µm
Edge sharpness	1.4 µm

PT series patterns
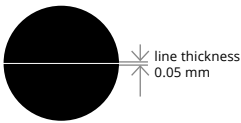
Patterns for LTPR series
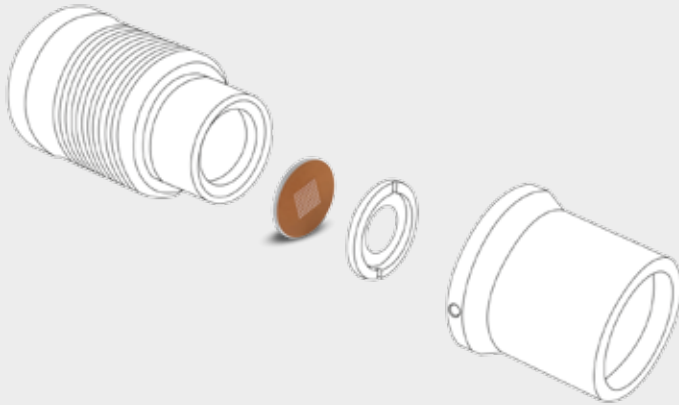
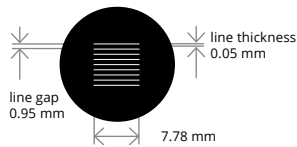Photolitography pattern   Laser engraved pattern

Photolithography patterns

P/N: PT 0000 0100 P - Line pattern

line thickness
0.05 mm

P/N: PT 0000 0200 P - Cross pattern

line thickness
0.05 mm

0.05 mm
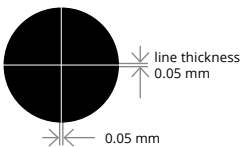
P/N: PT 0000 0300 P - Stripe pattern

line thickness
0.05 mm

line gap
0.95 mm

7.78 mm

P/N: PT 0000 0400 P - Grid pattern

line thickness
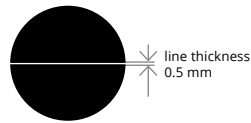0.05 mm

line gap
0.95 mm

7.78 mm
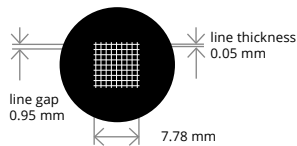
P/N: PT 0000 0500 P - Edge pattern
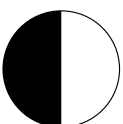
Laser engraved patterns

P/N: PT 0000 0100 L - Line pattern

line thickness
0.5 mm

P/N: PT 0000 0200 L - Cross pattern

line thickness
0.5 mm

0.5 mm
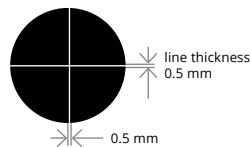
P/N: PT 0000 0300 L - Stripe pattern

line thickness
0.5 mm

line gap
0.5 mm

7.78 mm
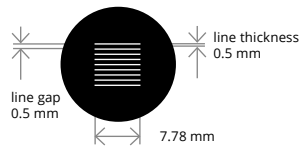
P/N: PT 0000 0400 L - Grid pattern

line thickness
0.2 mm

line gap
0.8 mm

7.78 mm
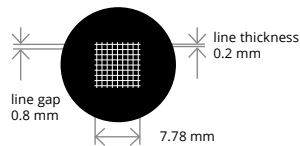
P/N: PT 0000 0500 L - Edge pattern
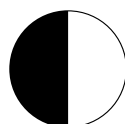
Projection patterns for machine vision

Pattern specifications

Photolithography patterns	
Substrate	Soda lime grass
Coating	Chrome
Geometrical accuracy	2 µm
Edge sharpness	1.4 µm

Laser engraved patterns	
Substrate	Borofloat glass
Coating	Dichroic mirror
Geometrical accuracy	50 µm
Edge sharpness	50 µm

Telecentric filter kit

Telecentric lens filters and plug-in filter holder

Light filtering is a typical need in machine vision measurement applications. For instance, you may need to avoid possible interactions between your LED illuminator and other light sources in an industrial environment.

Moreover, sunlight is a cause of frequent errors in imaging systems due to unexpected reflections from the surface of the parts being measured. In these cases, a band-pass or long-pass filter matching the emission wavelength of the illuminator is usually integrated in front of the objective: this way, only the light coming from the illuminator is collected while the rest of the spectrum is cut out.

Furthermore, many machine vision applications require monochromatic illumination in order to enhance or suppress particular object features: under these conditions, only the features with a certain color are imaged and can be measured.

Putting a filter in front of a telecentric lens can be very inconvenient when the size of the lens is very big. The filter should be as large as the front element of the lens, thus becoming very expensive.

To overcome size and cost issues, Opto Engineering designed a smart filter adaptor that can be easily plugged into the rear part of the lenses. This simple and cost-effective accessory is compatible with all TC 12 yyy and TC 23 yyy bi-telecentric lenses and with the C-mount versions of TC4M and TC2M series bi-telecentric lenses.

The bi-telecentricity of the Opto Engineering lenses makes this solution very efficient, since the rays remain parallel when passing through the filter. This allows for the optical bandpass to be maintained across the entire image surface.

Since inserting the filter will increase the back focal length of the lens, spacers (included in the TC lens package) must be added to the C-mount in order to set the lens back to its nominal working distance; the overall thickness of the spacers is usually equal to 1/3 of the filter thickness. The supported filter diameter is 17.50 mm and the maximum recommended filter thickness is 4.00 mm.

Opto Engineering also offers a selection of standard filters fitting Telecentric lenses and LTCL series collimated illuminators.

Part number	Description	Matching products		
Filter mount		**Telecentric lenses**		
TCFILTER	Filter mount for telecentric lenses	TC 12 yyy, TC 23 yyy, TC2M, TC4M		
		1	**2**	**2**
Filters		**Collimated illuminators**		
COBP470D17.5	Blue (470 nm) bandpass filter, 17.5 mm diameter	B LED sources		
COBP525D17.5	Green (525 nm) bandpass filter, 17.5 mm diameter	G LED sources		
COBP635D17.5	Red (635 nm) bandpass filter, 17.5 mm diameter	R LED sources		
COBP850D17.5	IR (850 nm) bandpass filter, 17.5 mm diameter	-		
COBP880D17.5	IR (880 nm) bandpass filter, 17.5 mm diameter	-		
COLP920D17.5	IR (920 nm) longpass filter, 17.5 mm diameter	-		
COPR032D17.5	Polarizer, 17.5 mm diameter	-		

1   Except TC 23 004, TC 23 007, TC 23 009, TC 23 012
2   C-mount versions only

TCKIT case

Telecentric optics selection for machine vision labs

The **Opto Engineering TCKIT case** includes a selection of some of the most commonly used telecentric optics in measurement applications.

A kit of four C-mount telecentric lenses covers FOVs ranging from 9 mm to 64 mm, offering good coverage of many measurement applications. These lenses are suitable for detectors up to 2/3", so that most cameras can be used in combination with this set of optics. In addition, a LTCL 036-G collimated light source (green color) is included in the box; this illuminator can be coupled with the three smaller telecentric lenses in order to demonstrate the several benefits of collimated illumination.

The telecentric kit case is a very helpful tool for system integrators and research centers that are frequently dealing with new machine vision applications.

The TCKIT case also benefits from our special educational price: you should seriously consider to buy this kit for your laboratory and discover the advantages of bi-telecentric optics!

Part number	Products included	Description
	TC 23 064	Bi-telecentric lens for 2/3", 64 x 48 mm FOV
	TC 23 036	Bi-telecentric lens for 2/3", 36 x 27 mm FOV
TCKIT	**TC 23 016**	Bi-telecentric lens for 2/3", 16 x 12 mm FOV
	TC 23 009	Bi-telecentric lens for 2/3", 8.8 x 6.6 mm FOV
	LTCL 036-G	Collimated LED Illuminator, green

IDEAL FOR

- prototyping
- feasibility studies
- demo system set-up
- educational purposes

LTRN series

LED ring illuminators for Opto Engineering optics


KEY ADVANTAGES

Mechanically fitting Opto Engineering optics
Each lens integrates specific mechanical interfaces.

Specific illumination geometry
Illumination path matches Opto Engineering lenses viewing angle and numerical aperture.

High performance to price ratio
Cost-effective, without quality compromises.

LTRN series are LED ring illuminators specifically designed to fit Opto Engineering optics.

Every illuminator is equipped with a specific mechanical interface which makes it very easy to mount it on different types of Opto Engineering lenses. These products enable the optimal illumination geometry for the most common applications of their matching lens.
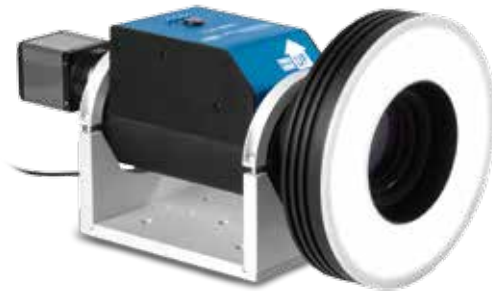
LTRN illuminator coupled with TCZR Series.

| Part number | Compatibility | Light | Dimensions | | | Power ratings | |
	Opto Engineering optics	Colour, peak wavelength	Outer diameter (mm)	Inner diameter (mm)	Height (mm)	Voltage (V, DC)	Power (W)
	Straight illumination						
LTRN 023 NW	TC 23 00x, TC 23 012, TC4M 00x, TC16M 009, MC3-03X	white, 6300K	104.0	28.0	40.0	24	12
LTRN 016 NW	TC xx 016, TCxM 016, TC16M 012, TC16M 016, TCSM 016	white, 6300K	120.6	37.7	40.0	24	15
LTRN 024 NW	TC xx 024, TCxM 024, TCSM 024	white, 6300K	120.6	44.0	40.0	24	15
LTRN 036 NW	TC xx 036, TCxM 036, TC16M 036, TCSM 036, MCZR xxx-yyy	white, 6300K	157.0	61.0	40.0	24	25
LTRN 048 NW	TC xx 048, TCxM 048, TC16M 048, TCSM 048	white, 6300K	157.0	75.0	40.0	24	25
LTRN 056 NW	TC xx 056, TCxM 056, TC16M 056, TCSM 056, TCZR 036	white, 6300K	157.0	80.0	40.0	24	25
LTRN 064 NW	TC xx 064, TCxM 064, TC16M 064, TC12K 064, TCSM 064	white, 6300K	192.0	100.0	40.0	24	38
LTRN 080 NW	TC xx 080, TC 23 072, TCxM 080, TC4M 072, TC16M 080, TC12K 080, TCSM 080, TCZR 072	white, 6300K	192.0	116.0	40.0	24	38
LTRN 096 NW	TC xx 096, TC 23 085, TCxM 096, TC4M 085, TC16M 096, TCSM 096	white, 6300K	221.0	143.0	40.0	24	38
LTRN 120 NW	TC xx 120, TC 23 110, TCxM 120, TC4M 110, TC16M 120, TC12K 120	white, 6300K	290.0	180.0	40.0	24	45
LTRN 144 NW	TC xx 144, TC 23 130, TCxM 144, TC4M 130, TC16M 144, TC12K 144	white, 6300K	290.0	200.0	40.0	24	45
	Oblique illumination						
LTRN 050 W45	PCPW 0xx, MCxxxX, TCCAGE xx048	white, 6300K	53.5	15.2	22.0	24	2.5
LTRN 075 W45	TC 23 00x, TC 23 012, TC4M 00x, PCHI 0xx, MC3-03X, TCCAGE xx096	white, 6300K	75.4	28.0	32.0	24	3
LTRN 165 W45	PCCD 0xx	white, 6300K	175.0	136.0	36.5	24	18
LTRN 210 W20	PCxx030XS	white, 6300K	210.0	116.5	40.0	24	38
LTRN 245 W25	PC 1x030HP	white, 6300K	245.0	157.0	48.0	24	30
LTRN 245 W35	PCCD 0xx	white, 6300K	245.0	143.0	48.0	24	30
LTRN 245 W45	PCPW 0xx	white, 6300K	245.0	158.0	48.0	24	30

Other products

Part number	Description	Matching Products
Optics		
PCBPTIP	Replacement tip for boroscopic probes, PCBP series	PCBP series
PCCDLFAT	Interchangeable attachment for extra-wide PCCD field of view	PCCD series
OEPL 18	18° projection lens, focal length 35 mm, for LTPR series pattern projectors	
OEPL 25	25° projection lens, focal length 25 mm, for LTPR series pattern projectors	LTPR series
OEPL 38	38° projection lens, focal length 16 mm, for LTPR series pattern projectors	
OEPL 50	50° projection lens, focal length 12 mm, for LTPR series pattern projectors	
Cables		
COCB243P0600	Sheated cable with 3 different elements; length 600 mm; nominal section 2x0.35 mm^2 22 AWG; max rated voltage AC:49 V; operative temperature -15/+70 °C	TCZR series, MCZR series
COCBUSB20	USB 2.0 cable; fully rated cable 80°C 30 V; length 2 m; standard A plug/mini-B plug	TCZR series, MCZR series
Illumination		
LTSC 1W-R	LED source, **1W RED**, for LTPR and LTCL series products	LTPR 36-X, LTCL series
LTSC 1W-G	LED source, **1W GREEN**, for LTPR and LTCL series products	LTPR 36-X, LTCL series
LTSC 1W-B	LED source, **1W BLUE**, for LTPR and LTCL series products	LTPR 36-X, LTCL series
LTSC 1W-W	LED source, **1W WHITE**, for LTPR and LTCL series products	LTPR 36-X, LTCL series
LTSC 3W-R	LED source, **3W RED**, for LTPR and LTPRSM series products	LTPR 3W-X, LTPRSM series
LTSC 3W-G	LED source, **3W GREEN**, for LTPR and LTPRSM series products	LTPR 3W-X, LTPRSM series
LTSC 3W-B	LED source, **3W BLUE**, for LTPR and LTPRSM series products	LTPR 3W-X, LTPRSM series
LTSC 3W-W	LED source, **3W WHITE**, for LTPR and LTPRSM series products	LTPR 3W-X, LTPRSM series
LTSCHP 1W-R	LED source high stability at low light, **1W RED**, for LTPR and LTCL series products	LTPR 36-X, LTCL series
LTSCHP 1W-G	LED source high stability at low light, **1W GREEN** for LTPR and LTCL series products	LTPR 36-X, LTCL series
LTSCHP 1W-B	LED source high stability at low light, **1W RED**, for LTPR and LTCL series products	LTPR 36-X, LTCL series
LTSCHP 1W-W	LED source high stability at low light, **1W WHITE**, for LTPR and LTCL series products	LTPR 36-X, LTCL series
Power supplies		
PS1CH24V	TMS Power supply 1 channel 24 V	TCCAGE series
PS1CH24VDIN	TMS Power supply 2 channel 24 V	TCCAGE (ringlight OR backlight), LTRN xxx NW
PS2CH24V	TMS Power supply 1 channel 24 V DIN guide	TCCAGE (ringlight AND backlight)
Software		
CVTOOLS	Calibration SW library for telecentric lenses	TC series

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