

## TL1250 family 4K Resolution Day/Night lenses for 1/1.7" sensors

- ✓ **Ultra high resolution for 4K cameras**, up to 12.4 megapixel
- ✓ Available in DC **autoiris**, **P-iris**, and **manual iris** versions
- ✓ **Fully motorized versions**, or combinations with zoom, focus, iris, IR cut, limit switch; non-motorized versions also available
- ✓ IR corrected for true **Day/Night** cameras
- ✓ **Compact design** to fit into domes as small as 4" mini-dome size
- ✓ **CS-mount** and smooth **D25 board mount** options
- ✓ Used for sensor sizes 1/2.5", 1/2.3", 1/2" 1/1.8", and **up to 1/1.7"** (Sony IMX178, Sony IMX226 for example)

### TL1250 lens family specifications

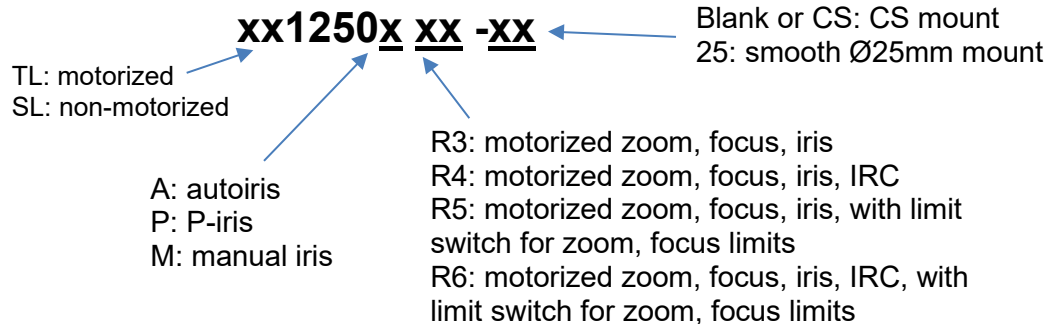
Focal length	12-50mm
Image circle	Up to Ø9.4mm
Resolution	12.4 megapixel
F/#	F/1.8 @ 12mm - F/2.4 @ 50mm to close
IR Correction	Day/Night
Focus Range	2.0m - infinity
Lens length	< 64mm TTL
Back focal length	BFL 8.2mm (in air)
CRA	< 7°
Distortion	< 10% at 12mm, < 2% at 50mm
Relative illumination	>40%
Lens transmission	>80%
Weight	TBD
Operating temperature	-20C to 60C (<70% humidity, non-condensing)
Storage temperature	-30C to 70C (<90% humidity, non-condensing)

### Field of view for sensor sizes

Sensor size	1/1.7"	1/1.8"	1/1.8" 4K*	1/2"	1/2.3"	1/2.5"
Horizontal	36° - 8.6°	36° - 8.6°	35° - 8.5°	30° - 7.4°	30° - 7.2°	27° - 6.7°
Vertical	26° - 6.5°	23° - 5.8°	17° - 4.3°	23° - 5.6°	22° - 5.5°	20° - 5.0°
Diagonal	46° - 11°	44° - 10°	40° - 9.5°	39° - 9.2°	38° - 9°	34° - 8.3°

\*4K format = 4000 x 2000 pixels

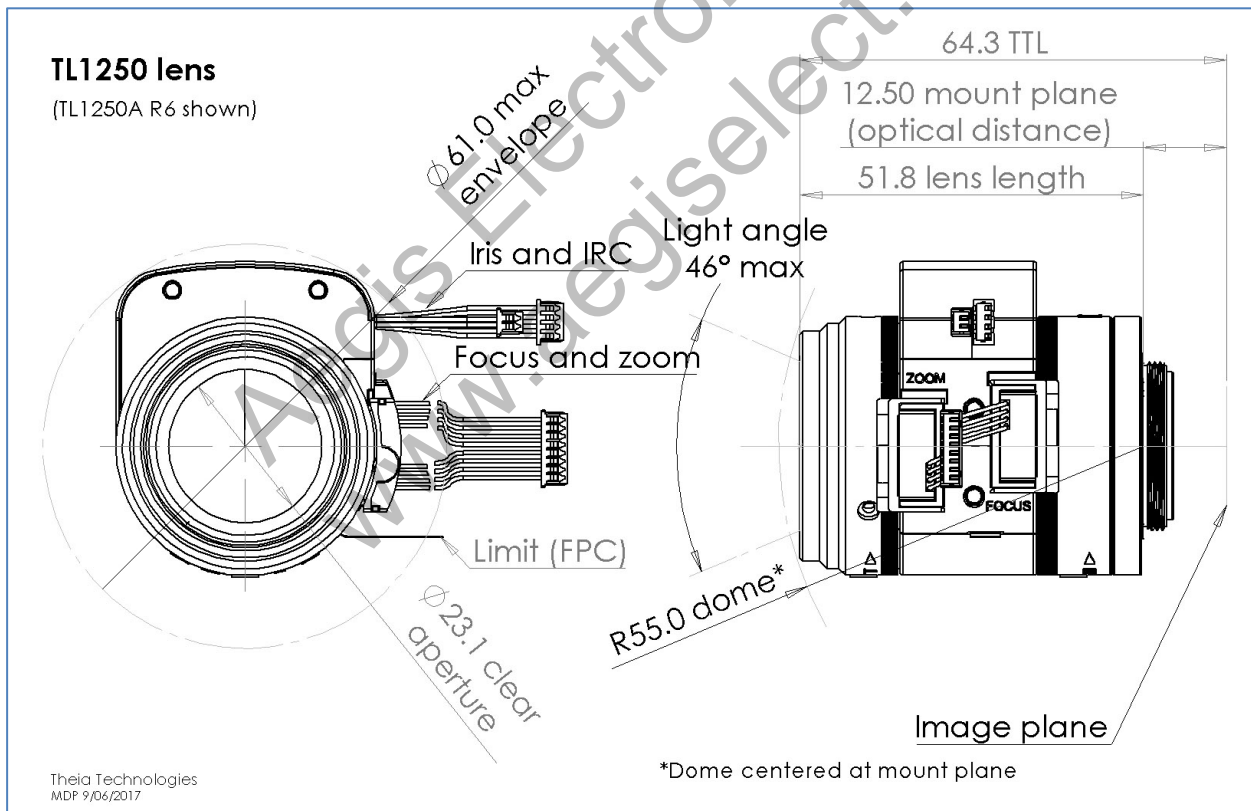
## Lens designation



**Production versions:** (call for other versions)  
 SL1250M (manual lens, manual iris, CS mount)  
 SL1250A (manual lens, DC autoiris, CS mount)  
 SL1250P (manual lens, P-iris, CS mount)  
 TL1250AR6-CS (fully motorized, DC autoiris lens)  
 TL1250PR6-CS (fully motorized, P-iris lens)  
 TL1250PR6-25 (fully motorized, P-iris lens, D25 mount)

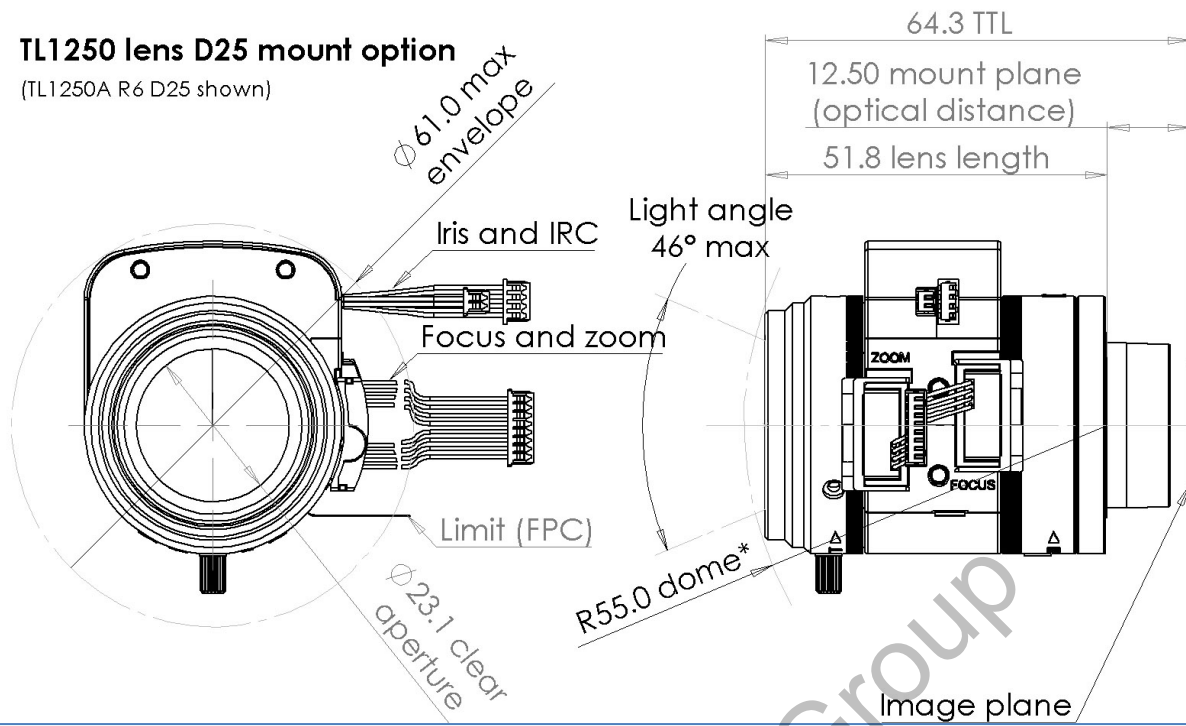
Other versions are available by special request and may be added to regular production

## Representative lens drawings



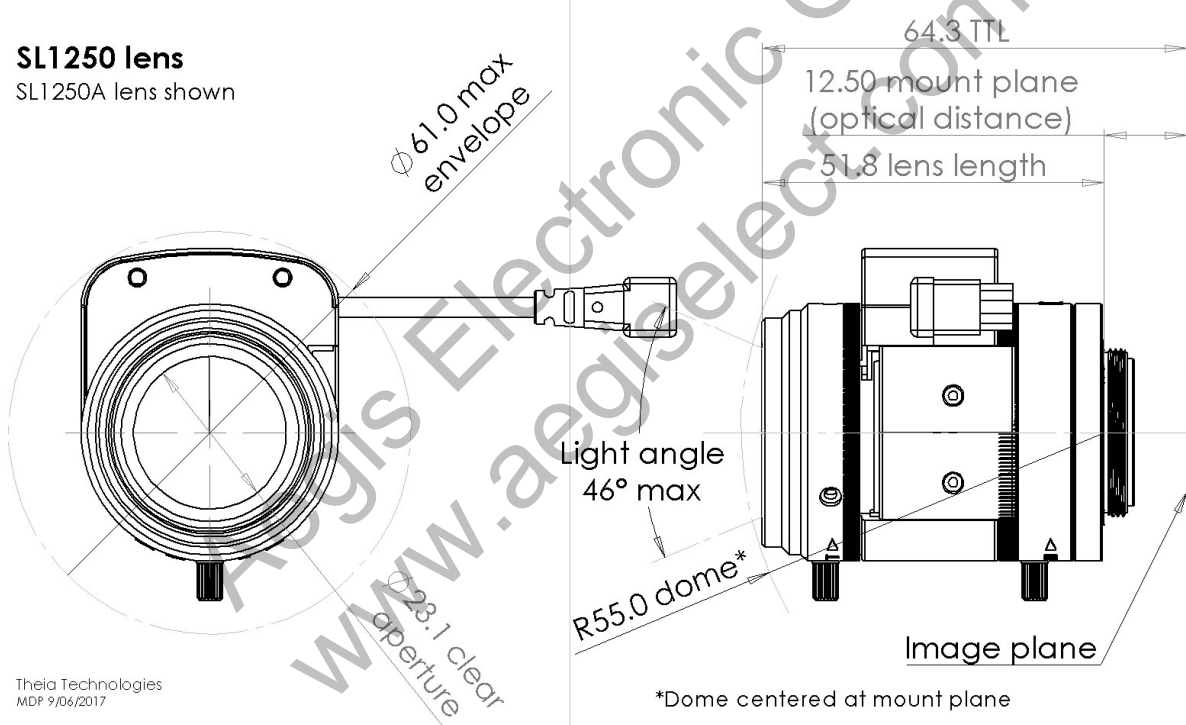
### TL1250 lens D25 mount option

(TL1250A R6 D25 shown)



### SL1250 lens

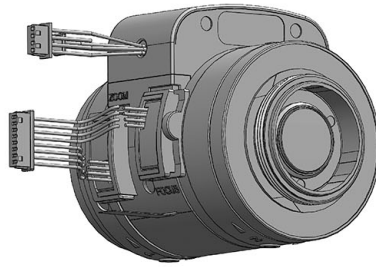
SL1250A lens shown



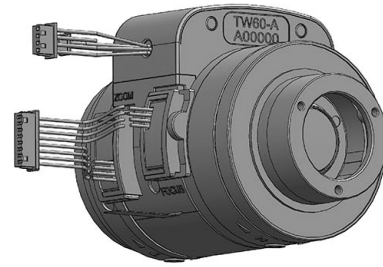
Theia Technologies  
MDP 9/06/2017

Pictures of some of the versions

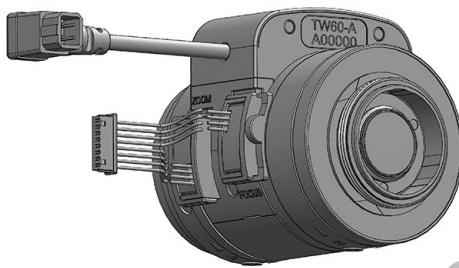
TL1250x R6



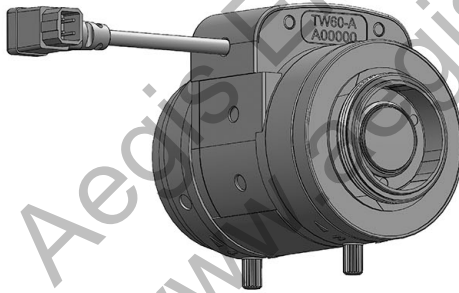
TL1250x R6 D25



TL1250x R3



SL1250x



SL1250M



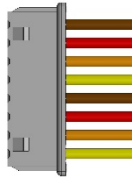
## Zoom/Focus motor specifications

Applicable models: **TL1250Axx**, **TL1250Pxx**

Drive	Stepper motor 2 phase bipolar drive			
Operation voltage	3.3V (operating range 2.6~4.8V)			
Maximum continuous operation time (seconds) for operation voltage and ambient temperature*		3.3V	4.0V	4.8V
	20C	60s	12s	6s
	40C	35s	9s	5s
	60C	20s	6s	4s
Coil resistance	28.5Ω (±7%)			
Gear ratio	1:1954			
Zoom number of steps	3256 steps between hard stops			
Zoom speed range	600pps to 1000pps*			
Zoom cam rotation	75°			
Focus number of steps	8467 steps between hard stops			
Focus speed range	600pps to 1000pps*			
Focus cam rotation	195°			
Focus/zoom connectors	Housing: Molex 51021-0800 Terminal: Molex 50058-8000			
Cable length	150mm			

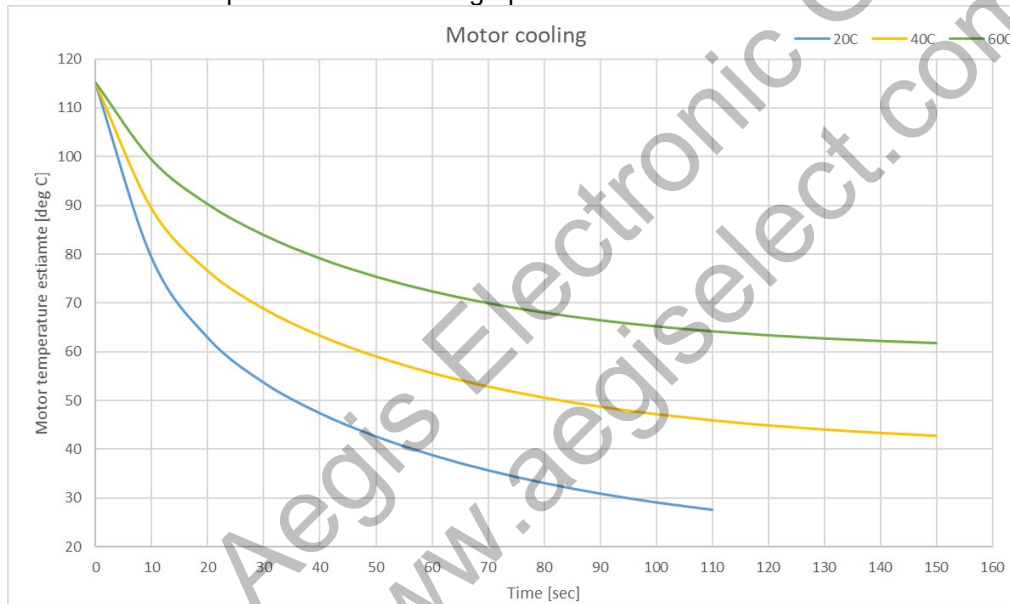
Zoom: Wide -> Tele				
Focus: Near -> ∞				
Step	A+	A-	B+	B-
0	H	L	H	L
1	L	H	H	L
2	L	H	L	H
3	H	L	L	H

Pin	Color	Function	Motor
1	Brown	A+	Focus
2	Red	A-	Focus
3	Orange	B+	Focus
4	Yellow	B-	Focus
5	Brown	A+	Zoom
6	Red	A-	Zoom
7	Orange	B+	Zoom
8	Yellow	B-	Zoom



\*Do not let motor temperature exceed 115°C

Measuring motor temperature is difficult due to the degree of motor integration. Temperature can be estimated based on the maximum operation times. The graph below shows the time for motors to cool to ambient temperature.

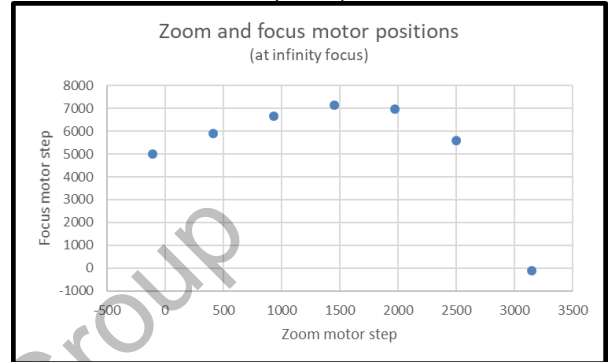


Zoom/Focus motor step map (at infinite focus position)

Zoom motor			Focus motor		
Note	Step (-R5, -R6)	Step (-R3, -R4)	Note	Step (-R5, -R6)	Step (-R3, -R4)
Hard stop (wide)	-109	0	Hard stop (far)	8031	8466
Wide design position	-109	0	Far focus design	7705	8140
PI position	0	NA	PI position	0	NA
Tele design position	3147	3256	Near focus design	-109	326
Hard stop (tele)	3147	3256	Hard stop (near)	-435	0

Zoom/Focus synchronizing map (step numbers based on -R5, -R6 lenses, observe min/max motor speeds)

Focal length	Zoom motor note	Zoom motor step number	Focus motor note	Focus motor step number
[mm]		[#]		[#]
12.36	Wide end	-109		4995
14.83		412		5898
18.05		933		6667
22.28		1454	Far focus	7132
27.86		1975		6971
35.20		2496		5578
49.00	Tele end	3147	Near focus	-109



Notes:

1. Zoom and focus **motor positions may be affected** by backlash and lost steps during movement. Zoom motor lost steps are tested to <40 over the full 3147 step range. Focus motor lost steps are tested to <45 over the full 7705 step range.

2. These motorized lenses are intended for integration into cameras and require motor drivers and controllers. Typically, Theia works with the camera manufacturer to ensure that the camera motor controller matches the lens. It is possible to supply your own motor controller, but Theia cannot guarantee that your motor controller will not damage the lens. Theia does not offer any warranty on the suitability of these motorized lenses for any particular camera. These motorized lenses are **not intended for continuous use** of the motors as in PTZ applications. Theia offers motor control boards that are suitable to control motorized lenses with P-iris.

## DC autoiris motor specifications

Applicable models: SL1250A, TL1250Axx

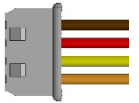
Drive	DC
Operation voltage	3V (2.5~5.0V)
Max current consumption	22mA
Drive coil resistance	190Ω
Damper coil resistance	855Ω

Connector type 1 (Molex)

Applicable models TL1250A R4, TL1250A R6

Connector type	Housing: Molex 51021-0400 Terminal: Molex 50058-8000
Cable length	150mm

Pin	Color	Function
1	Brown	Control -
2	Red	Control +
3	Yellow	Drive +
4	Orange	Drive -

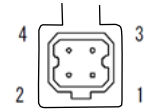


Connector type 2 (CCTV)

Applicable models SL1250A, TL1250A R3, TL1250A R5

Connector type	Housing: EYC 221
Cable length	300mm

Pin	Function
1	Control -
2	Control +
3	Drive +
4	Drive -



## P-iris motor specifications

Applicable models: SL1250P, TL1250Pxx

Drive	Stepper motor 2 phase bipolar drive
Operating voltage	4V (+/-1)
Number of steps	75 (open to closed)
Basic step angle	18°
Maximum response freq.	200pps
Coil resistance	30Ω

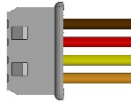
P-iris: open->close				
Step	A+	A-	B+	B-
0	H	L	H	L
1	L	H	H	L
2	L	H	L	H
3	H	L	L	H

Connector type 1 (Molex)

Applicable models TL1250P R4, TL1250P R6

Connector type	Housing: Molex 51021-0400 Terminal: Molex 50058-8000
Cable length	150mm

Pin	Color	Function
1	Brown	B+
2	Red	B-
3	Yellow	A+
4	Orange	A-

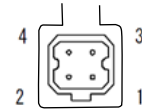


Connector type 2 (CCTV)

Applicable models SL1250P, TL1250P R3, TL1250P R5

Connector type	Housing: EYC 221
Cable length	300mm

Pin	Function
1	B+
2	A+
3	A-
4	B-



## P-iris motor map

Step	Aperture Size [mm <sup>2</sup> ]	F/#
1	95.0	1.84
5	90.8	1.88
10	82.1	1.98
15	72.8	2.10
20	63.4	2.25
25	54.0	2.43
30	44.9	2.67
35	36.0	2.98

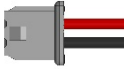
Step	Aperture Size [mm <sup>2</sup> ]	F/#
40	27.7	3.39
45	20.0	3.98
50	13.2	4.90
55	7.5	6.52
60	3.1	10.10
65	0.8	19.34
70	0.1	69.29
72	0.0	Closed
75	0.0	Closed

### IR Cut specifications

Applicable models: TL1250A R4, TL1250P R4, TL1250A R6, TL1250P R6

Electrical specifications	
Drive	DC
Operating voltage	4.0V
Drive coil resistance	130Ω
Connector type	Housing: Molex 51021-0200 Terminal: Molex 50058-8000
Cable length	150mm
Optical specifications for IR filter (Day)	
Cut-on wavelength	405nm ±10nm
Visible transmission	430-610nm
Cut-off wavelength	650nm ±10nm
IR transmission	<5% max 700-1000nm <10% ave 1000-1100nm
Optical specifications for clear filter (Night)	
Visible transmission	400-1050nm

Mode	Pin 1	Pin 2
Day (IR filter)	L	H
Night (clear filter)	H	L
Wire color	Red	Black

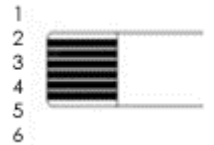


### Zoom/Focus limit switch

Applicable models: TL1250A R5, TL1250P R5, TL1250A R6, TL1250P R6

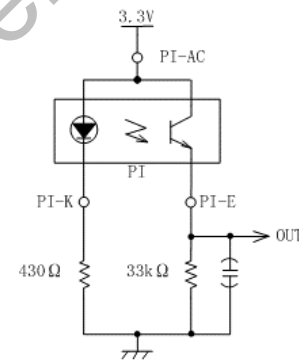
Type	Photo interrupter phototransistor
Part model	Sharp GP1S396HCPSF
Operating voltage	3.3V
Output level	>2.2V HIGH <0.6V LOW
Connector type	FPC cable
Board-side mating connector type (not supplied)	Molex 52746-0671 Molex 52745-0697 Molex 52559-0652
Cable length	150mm

Pin*	Function	Motor
1	Emitter	Focus
2	Anode/Collector	Focus
3	Cathode	Focus
4	Emitter	Zoom
5	Anode/Collector	Zoom
6	Cathode	Zoom



\*cable side pin designation matches Molex 52746-0671 bottom side contacts connector

Recommended circuit for each photo interrupter



For more information contact

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**Revisions**

<b>Version</b>	<b>Change</b>	<b>Reason</b>
160113	Added motor energizing time maximums	Clarification to prevent focus/zoom motor overheating
	Updated temperature spec	Consistent with motor supplier specification
	Changed minimum focus range to 2.0	Updated specification
	Changed p-iris steps to 75	Corrected from 72
	Updated IR filter transmission specs	
161107	Added applicable model numbers to iris section	Reduced confusion about which lenses came with which connectors
170109	Changed PI FPC pin-out	To match bottom side contacts connector; top side contacts connector may be discontinued
170905	Changed focus ring rotation angle	Old rotation ring amount.
	Added drawings and pictures for various versions	
180117	Corrected pinout for FPC	Pinout numbering was reversed
181206	Updated motor speed specs	Focus/zoom recommended speed unspecified, P-iris speed too high
	Added QR code	Directed to TL1250 webpage
190924	Zoom/focus map	Changed the map to be more clear
200106	Added page number and revision	Revision control
200306	Added Z/F motor step note	Motor position accuracy not previously specified
	Updated motor speed specs	Focus/zoom recommended speed too high, adjusted to tested range
200327	Added motor cool down graph	New information
	Highlighted applicable models for each section	Clarification of applicable lens sections for each family member