



LASER DELIVERY OPTICS

Thermal Lensing Compensation(TLC) Optics

Patent 8274743

The TLC (Thermal Lensing Compensation) optic design passively compensates thermal lensing for high power collimators and focusing lenses. Through the use of special optical materials and optic design, thermal lensing for lasers with powers in excess of 1KW is reduced to less than the Rayleigh range of the lens design. Figure 1 TLC Optics™ uses focusing objectives.



The **Haas Laser Technologies TLC Optics™** incorporate a balancing of the dn/dT between two high power laser optical materials, the thicknesses, air spacing and curvatures to minimize the thermal lensing between 20°C and 250°C using a proprietary optical design merit function. This means your application will be in focus from the moment the laser is first turned on to when it is turned off.

Thermal management of the lens mechanics is about the only means to mitigate thermal lensing but as optical glass, in general, is not a great thermal conductor there can be large temperature gradients across the lens that impacts its performance that even thermal management cannot handle. This means that most high power fiber laser applications require several minutes for the optical system to thermally stabilize before the shift in focus stays within the lasers focusing lens Rayleigh range(depth of focus).

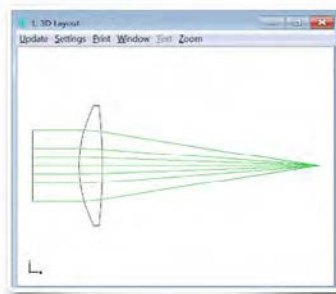


FIGURE 1

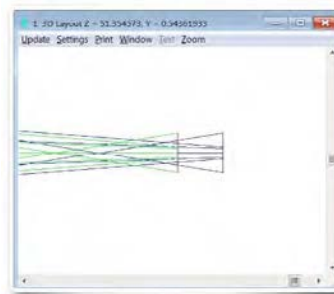


FIGURE 2

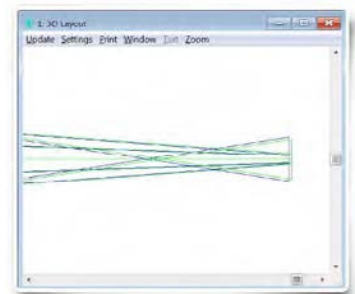


FIGURE 3

Figure 1 & 2 shows a simple fused silica best form singlet with an overlay of the same lens that has a 230°C temperature gradient applied. The blue rays are light focused at ambient temperature and the green rays represent the focus at the elevated temperature.

Figure 3 shows the close up the Haas TLC Optics™ in figure 1 with the same focal length and temperature gradient.



TLC COLLIMATING OPTIC SETS



TLCT-27034-050-900-1080

TLC-50-WA

PRODUCT FEATURES

- For use up to 20KW.
- Available in 25mm, 38mm and 50mm diameter optic sets.
- No thermal stabilization time needed.
- Custom configurations available. quality metrics.

Below is a list of TLC Optics. Please call (973) 598-1150 for pricing and availability.

HAAS PART #	SERIES	TLC DESCRIPTION
TLCT-27034-050-1064/532/355	25mm	50mm F.L. x 27.0mm clear aperture TLC Optic Set
TLCT-27034-060-1064/532/355	25mm	60mm F.L. x 27.0mm clear aperture TLC Optic Set
TLCT-27034-080-1064/532/355	25mm	80mm F.L. x 27.0mm clear aperture TLC Optic Set
TLCT-27034-100-1064/532/355	25mm	100mm F.L. x 27.0mm clear aperture TLC Optic Set
TLCYD-27034-120-1064/532/355	25mm	120mm F.L. x 27.0mm clear aperture TLC Optic Set
TLCYD-27034-150-1064/532/355	25mm	150mm F.L. x 27.0mm clear aperture TLC Optic Set
TLCT-27034-050-900-1080	25mm	50mm F.L. x 27.0mm clear aperture TLC Optic Set
TLCT-27034-060-900-1080	25mm	60mm F.L. x 27.0mm clear aperture TLC Optic Set
TLCT-27034-080-900-1080	25mm	80mm F.L. x 27.0mm clear aperture TLC Optic Set
TLCT-27034-100-900-1080	25mm	100mm F.L. x 27.0mm clear aperture TLC Optic Set
TLCT-27034-120-900-1080	25mm	120mm F.L. x 27.0mm clear aperture TLC Optic Set
TLCT-27034-150-900-1080	25mm	150mm F.L. x 27.0mm clear aperture TLC Optic Set
TLCYD-50047-120-1070	50mm	120mm F.L. x 47.0mm clear aperture TLC Optic Set
TLCYD-50047-160-1070	50mm	160mm F.L. x 47.0mm clear aperture TLC Optic Set
TLCYD-50047-180-1070	50mm	180mm F.L. x 47.0mm clear aperture TLC Optic Set
TLCYD-50047-200-1070	50mm	200mm F.L. x 47.0mm clear aperture TLC Optic Set
TLCYD-50047-250-1070	50mm	250mm F.L. x 47.0mm clear aperture TLC Optic Set
TLCYD-50047-300-1070	50mm	300mm F.L. x 47.0mm clear aperture TLC Optic Set
TLCYD-50047-500-1070	50mm	500mm F.L. x 47.0mm clear aperture TLC Optic Set
TLCYD-50047-120-900-1080	50mm	120mm F.L. x 47.0mm clear aperture TLC Optic Set
TLCYD-50047-120-900-1080	50mm	160mm F.L. x 47.0mm clear aperture TLC Optic Set
TLCYD-50047-120-900-1080	50mm	180mm F.L. x 47.0mm clear aperture TLC Optic Set
TLCYD-50047-120-900-1080	50mm	200mm F.L. x 47.0mm clear aperture TLC Optic Set
TLCYD-50047-120-900-1080	50mm	250mm F.L. x 47.0mm clear aperture TLC Optic Set
TLCYD-50047-120-900-1080	50mm	300mm F.L. x 47.0mm clear aperture TLC Optic Set
TLCYD-50047-120-900-1080	50mm	500mm F.L. x 47.0mm clear aperture TLC Optic Set

Specifications subject to change without notice.