

Laser Damage Threshold

Cambridge Technology has not sent any samples of its polygonal mirrors out for laser damage testing. We also do not warrant the mirrors for damage resistance at high powers. In an effort to inform users of the durability of our coatings we will share what limited information we do have on the subject.

The following test was performed with a CO2 laser at 10.6 microns. The coating was bare evaporated gold. The power density and run conditions were as follows:

Laser Power	Spot size	Power Density	Polygon State	Result
100 Watts	1mm	127 W/mm ²	static, rotating	no damage
100 Watts	0.2 mm	3183 W/mm ²	rotating	no damage
100 Watts	0.1 mm	12,732 W/mm ²	static	damage

These tests were performed with a freshly cleaned optic. Debris on the surface will cause local heating and may lead to catastrophic failure at much lower power densities. As the power is increased it is recommended that the polygon remain rotating and an interlock be used to interrupt the laser if the polygon falls out of sync.

The above tests were performed with a cw laser. The damage threshold will not change significantly with wavelength in the infrared but will decrease as absorption increases in the visible. The damage mechanism with the cw lasers is thermal runaway. Pulsed lasers cause damage by different mechanisms depending on the pulse width. We have one data point for pulsed lasers. The damage threshold for a static mirror with a laser of 530 nm, 10 picosecond pulse width, 70 KHz rep rate is 0.074 J/cm².