Dry Damping

TMC's constant development and refining process has yielded a new level in performance for optical tops.

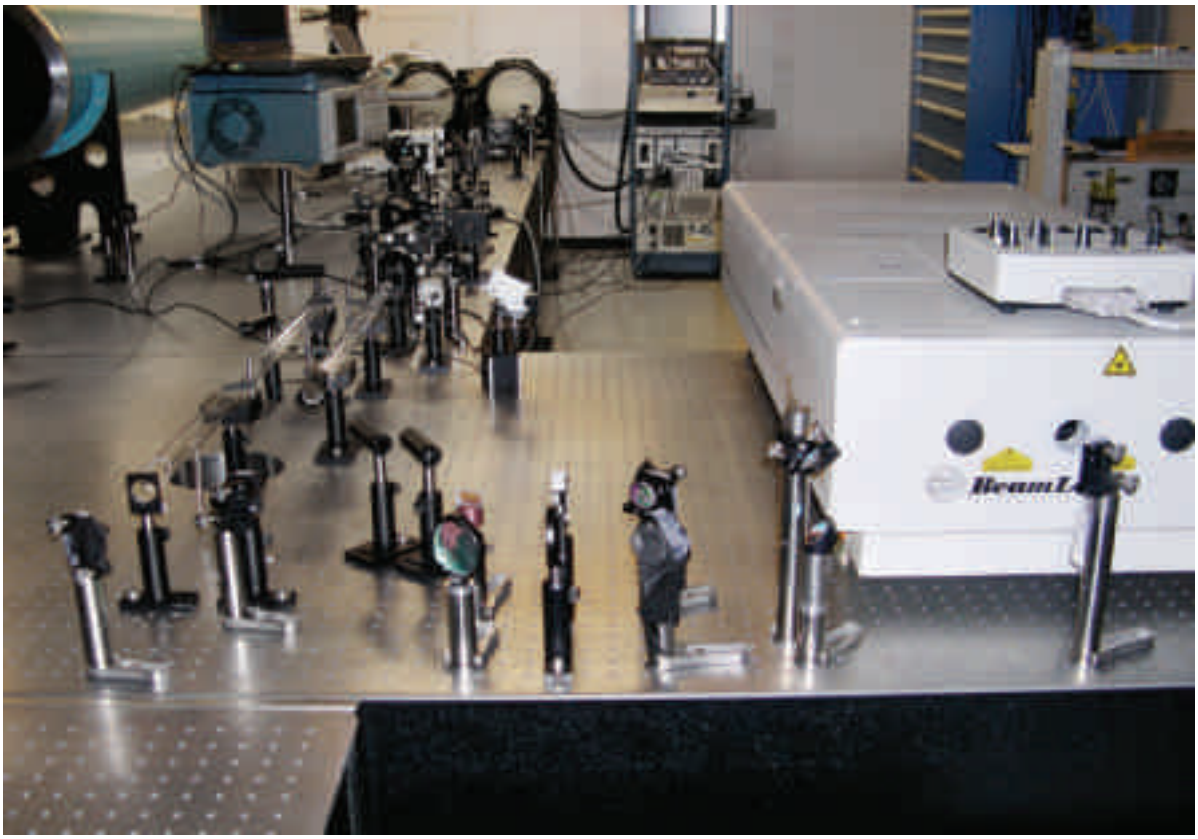
TMC has long adhered to the philosophy that dry damping of an optical top is preferable to oil-based dampers. Oil's characteristics can change over time and hidden oil reservoirs are always in danger of being pierced by an end-user customizing his system.

Our approach to damping of structural resonances has consistently been based on a "broadband damping" approach. "Tuned damping," or using a tuned xmass-damper to resonate out-of-phase with a top's bending mode, is a risky approach. First, it assumes the damper can be set to exactly coincide with the resonant frequency of the top. An optical top's resonant frequency will vary based on load, distribution of load, temperature, and even the presence of the dampers themselves. Therefore, in practice, it is difficult to tune the dampers to the top's resonance. Furthermore, it assumes that only the lowest resonant frequency requires damping when many secondary bending and twisting modes require attention.

More importantly, the notion of incorporating a tuned-mass-damper to suppress a structural resonance is a flawed one. Tuned damping is only effective in damping discrete resonances and is misapplied when used to damp a broadband structural resonance. In simple terms, a tuned damper "splits" a structural resonance into two resonances by creating a coupled mass system.

TMC's proprietary broadband damping techniques are the most effective way to damp an optical top. This approach works over the entire frequency range of interest, dissipating energy at the top's primary, secondary, and higher resonant frequencies. In addition, performance will not be compromised by adding weight to the top.

Our new, improved damping incorporates our broadband approach along with the latest improvements in materials and new proprietary techniques from TMC.



Multiple CleanTop® Optical Tables rigidly coupled in a "T" shaped configuration. This table system is part of the Texas Petawatt Laser at the University of Texas Austin (photo courtesy of the Texas Center for High Intensity Laser Science).

Dry Damping Performance Summary

TMC optical tops have guaranteed performance levels which are unsurpassed. In addition, with three levels of broadband damping, two skin thicknesses, and three environmental choices, TMC offers the most flexibility in choosing a performance level.

Guaranteed maximum compliance levels for the maximum damping level are tabulated in the chart below. The standard damping level offers compliance levels a factor of four times higher than those tabulated. The minimum damping level is only recommended for non-sensitive applications.

The charts summarize the guaranteed performance levels of TMC optical tops. In addition, table top corner compliance data are presented for the three damping levels available. Data were acquired by impact testing, using a one-pound calibrated hammer, accelerometer, and dual-channel spectrum analyzer. As these examples demonstrate, actual, measured performance is often considerably better than our guaranteed performance. For a more complete discussion of optical top performance, see pages 101-105.

Corner Compliance Data – 4 ft x 8 ft x 12 in. (1.2 m x 2.4 m x 300 mm) Tops

To convert from in./lb to mm/N, multiply by a factor of 5.7.

Example:

10^{-6} in./lb x 5.7 = 5.7 x 10^{-6} mm/N

Guaranteed Maximum Compliance Levels – Tops with Maximum Fixed Damping Level (micro-in./lb force input)

Top Thickness	Top Length					
	6' (1.8 m)	8' (2.4 m)	10' (3.0 m)	12' (3.6 m)	14' (4.2 m)	16' (4.8 m)
8 in. (200 mm)	3.0	5.5	10.0	15.0	20.0	30.0
12 in. (300 mm)	1.5	2.5	4.5	6.5	10.0	13.0
18 in. (450 mm)	0.7	1.5	2.5	3.5	5.0	7.0
24 in. (600 mm)	0.3	0.7	1.5	2.0	2.5	3.5

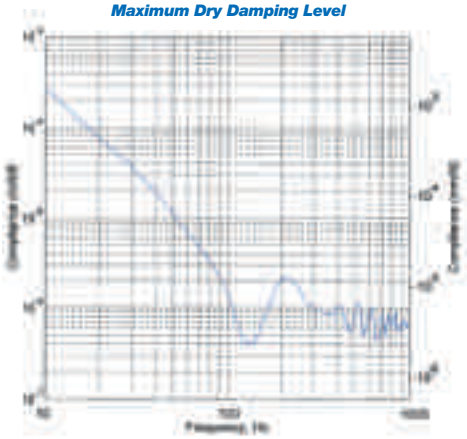
Guaranteed Minimum Resonant Frequency (Hz) – All Series of TMC Tops

Top Thickness	Top Length					
	6' (1.8 m)	8' (2.4 m)	10' (3.0 m)	12' (3.6 m)	14' (4.2 m)	16' (4.8 m)
8 in. (200 mm)	160	135	110	85	65	55
12 in. (300 mm)	200	170	135	110	85	70
18 in. (450 mm)	230	200	165	130	100	80
24 in. (600 mm)	250	230	185	150	120	90

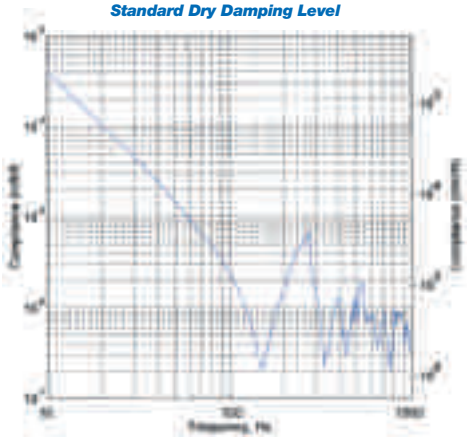
Guaranteed Maximum Static Deflection – All Series of TMC Tops with 3/16 in. (5 mm) Skins (micro-in./lb force)

Top Thickness	Top Length					
	6' (1.8 m)	8' (2.4 m)	10' (3.0 m)	12' (3.6 m)	14' (4.2 m)	16' (4.8 m)
8 in. (200 mm)	0.3	0.6	1.0	1.5	2.0	3.0
12 in. (300 mm)	0.12	0.2	0.35	0.6	0.8	1.0
18 in. (450 mm)	0.06	0.1	0.15	0.25	0.3	0.4
24 in. (600 mm)	0.05	0.07	0.1	0.15	0.2	0.25

Maximum Dry Damping Level



Standard Dry Damping Level



Nominal Dry Damping Level