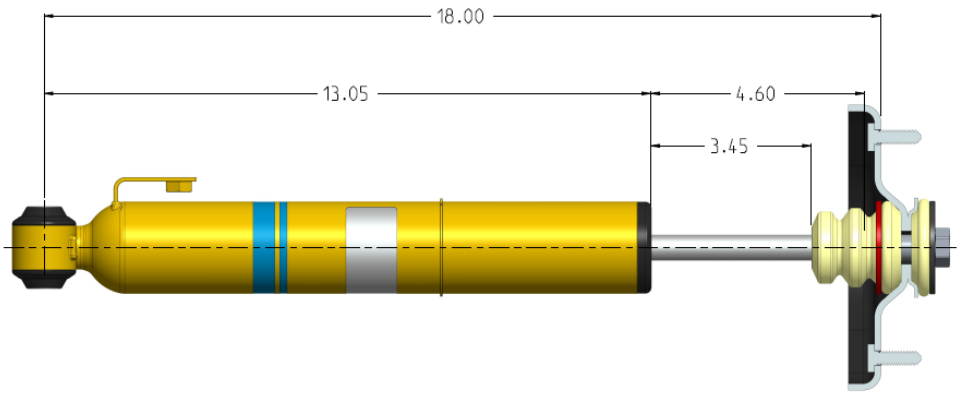
Spec Miata Dimensional Explanation

Penske Racing Shocks was asked to clarify the differences in the new spec series shock versus the previous set-up. The goal of this new spec was to provide a proper race shock by introducing equality, tech-ability and repeatability, all while increasing overall performance across all track conditions; the goal was not to increase travel of the shock, though this was achieved. Additionally, the goal was to eliminate continuous riding on the bump stop to relieve stress in other components, increasing longevity of parts.

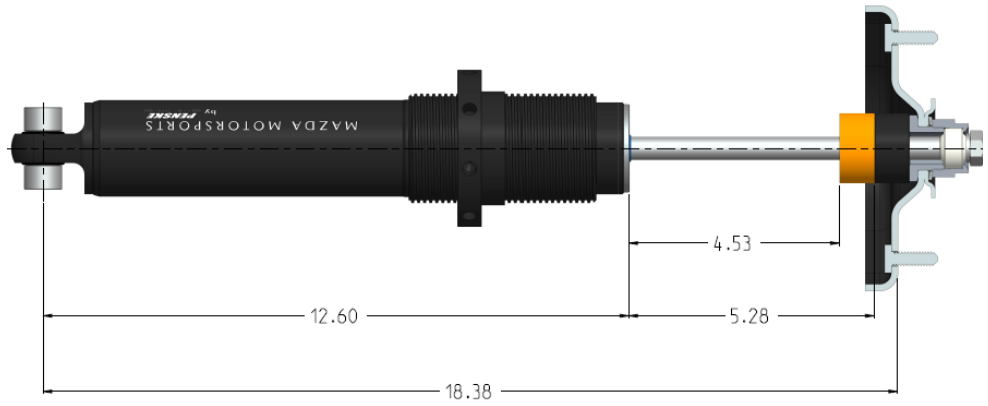
There are some misconceptions that the new Penske offering provides less travel than the Bilstein set-up and that a redesign of the upper mount would allow for more travel. While overall lengths are similar from the Bilstein spec to new Penske spec, the Penske's achieved more travel to the bump stop when measured at ride height by more than one inch in both front and rear. Thus, the statement that the cars must run higher with new set-up vs. original set-up is inaccurate. In theory, a raised upper mount could allow for more travel, but the physical limitations of the chassis could marginalize actual travel gains – validated by the Penske pulldown rig. The reason a raised upper mount was not developed to increase rear suspension travel is because the rear upper control arm would have metal-to-metal contact with the rear subframe. Then, the tire would begin to contact the wheel well, limiting travel gains, but more importantly, causing damage to the tire.

Below are detailed drawings that outline shock body lengths, dimensions, stroke limitations, and more.

Front - **Ride Height of 15" is just for comparison and not actual RH value recommended.



BILSTEIN	
OAL	RH
18	15
Stroke/Metal to Metal	Travel to Bump Stop
1.6	0.45

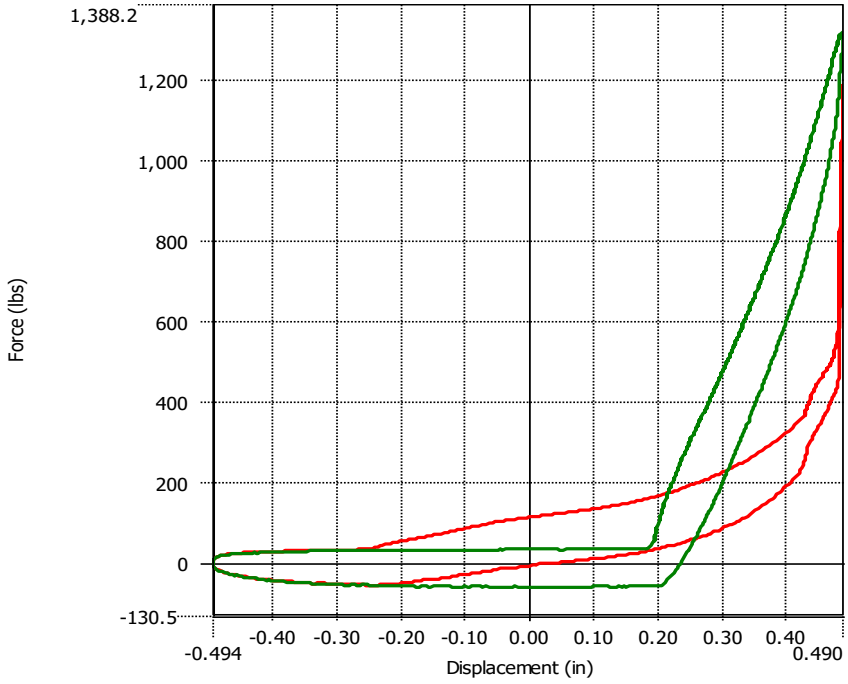


PENSKE	
OAL	RH
18.38	15
Stroke/Metal to Metal	Travel to Bump Stop
1.9	1.15

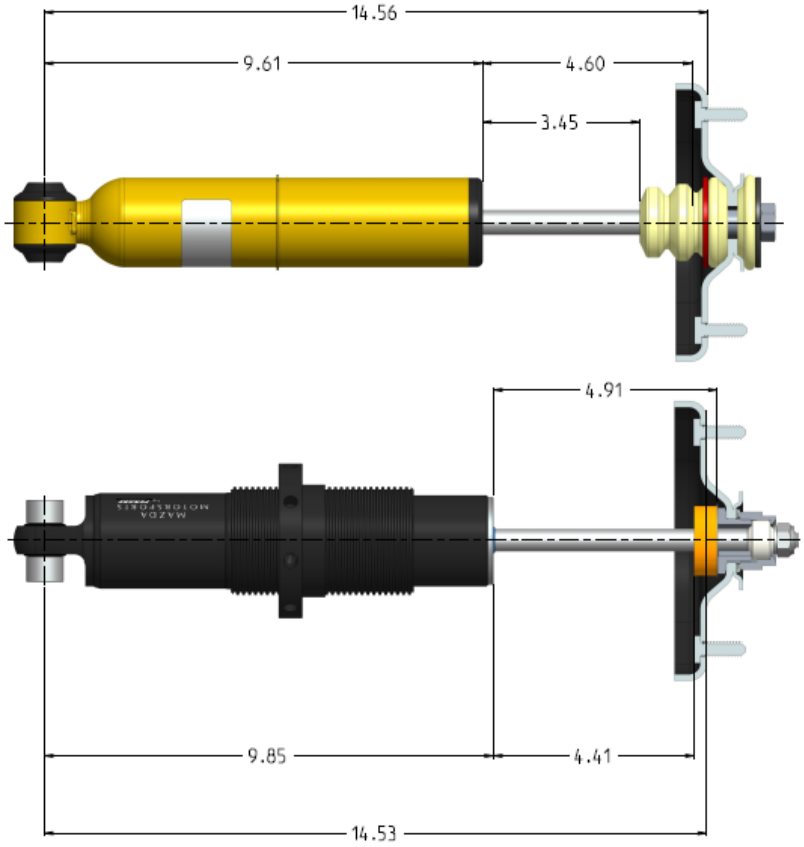
Bump Stop Performance - The Penske set-up uses a 70-durometer rated .750" thick stop; the Bilstein uses foam 1.5" (Est) stop. The Bilstein is a softer stop and will displace more while having less rate.

Graph below shows displacement vs. force values. Bilstein foam was displaced .750" (i.e. 50%). The Penske stop was displaced roughly .300" (i.e. 35%). You can see the ending rate is similar although the Bilstein rubber goes almost solid after .750" displacement. The Penske rubber still has rate and some displacement available before going solid.

Bilstein spec 750 displacement
Penske front 300 displacement



Rear - **Ride Height of 12" is just for comparison and not actual RH value recommended.

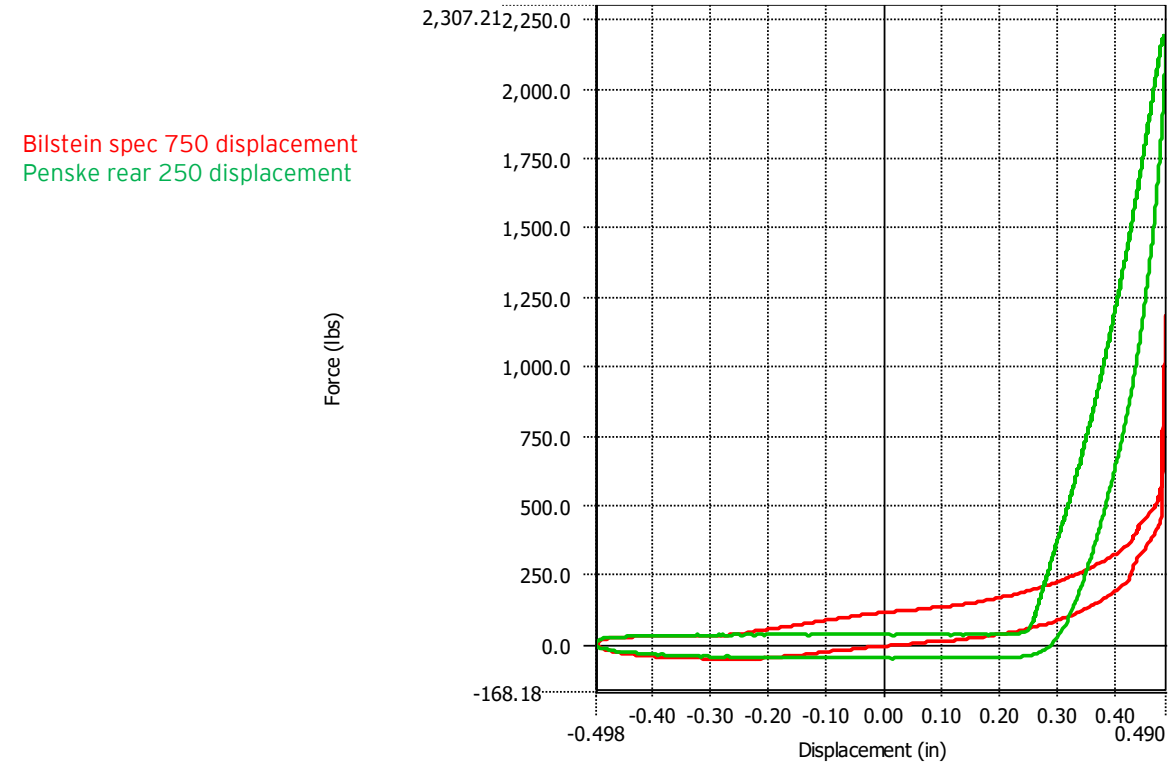


Bilstein	
OAL	RH
14.56	12
Stroke/Metal to Metal	Travel to Bump Stop
2.04	0.89

Penske	
OAL	RH
14.53	12
Stroke/Metal to Metal	Travel to Bump Stop
2.38	1.88

Bump Stop Performance - The Penske set-up uses a 70-durometer rated .500" thick stop; the Bilstein uses foam 1.5" (Est) stop. The Bilstein is a softer stop and will displace more while having less rate.

Graph below shows displacement vs. force values. Bilstein foam was displaced .750" (i.e. 50%). The Penske stop was displaced approximately .250" (i.e. 50%). You can see the ending rate is similar although the Bilstein rubber goes almost solid after .750" displacement. The Penske rubber still has rate and some displacement available before going solid.



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