

**Torsion bars**

By Wil Ferch – 1/22/2000

Listers:

Every once in a while, questions come up on torsion bar sizes , and of the suitability of certain size bars. I've compiled the following information that can be used for all pre-G50 911's.

Torsion bar spring rates can be determined by the formula:

$$K = 1,178,000 (d)^4 / (L) (A)^2$$

-d is to the fourth power, and A is to the second power.

-d is diameter of torsion bar

-L is torsion bar length

-A is the lever arm length

A fellow Rennlister, Joe Winn, measured torsion bars he had for sale, and the following is for the FRONT bar:

-length of 611 mm (or ~24")

-spline length at each end of about 1".....this makes for an "effective" length of 22" , assuming full length spline engagement as installed. Also, I'm using a lever arm measurement of 12"...the distance from the torsion bar centerline, to the brake caliper centerline. With this , I come up with:

SIZE (mm) SPRING RATE (Lb/in)

18.8	110
21	173
22	210
23	250
24	296
25	350

Using the same principle for the REAR bars, we have:

- bar length of 626 mm (24.65 ")

- spline length at one end of 19 mm, or 0.75"

- spline length at other end of 26 mm, or 1"

- "effective" bar length of 22.9", assuming full spline engagement

- lever arm of 18.5"...centerline of torsion bar to centerline of rear wheel.

With these, I get:

SIZE (mm) SPRING RATE (lb/in)

23	100
24	120
25	140
26	165
27	191
28	221
29	254
30	294
31	332
32	377
33	427

There are a few interesting observations about this. First, notice how powerful that "4th power" influence has on spring rates. Also, look how cars get delivered by Porsche. Let's use my car, a stock 85 Carrera, as an example. It uses an 18.8 / 24.1 combo. This results in about equal front/rear spring rates (110 / 120). The popular upgrades to 21/27 (yielding 173 /191) , and 22/28 (yielding 210 / 221) , although stiffer, maintain about the same front and rear balance. Keeping in mind that Porsche probably came up with spring rates to fight inherent oversteering characteristics (in other words, purposely dialing in understeer), I would think that a more reasonable upgrade for most cars would be 21/28 (173/ 221).....or 22/29 (210/254), to reduce some of that dialed-in understeer. Caution: going too far in that direction may make for a more neutral handling car at low speeds, but all settings will tend to more oversteer at high speeds ! ...so let's not over-do this. High speed oversteer is something you definitely don't want.....it's hard to catch and very user unfriendly.. Once the basic balance is set, you can still fine tune the front / rear cornering balance with anti -roll bars. Also, too stiff of a rear bar won't allow the car to squat and "hook-up", you may even get a skittering effect by not being able to put the power down. You need a little bit of suspension deflection. Hope some of this helps.

Regards,
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