
Limited Slip Unit for E46 3 Series (99-05, Not M3)

BMW stopped putting limited slip differentials in all cars – except for “M” cars – in 1995. So, if it's not an M3 or M5 your car does not have power going to BOTH wheels at the same time. In other words, it is “one wheel drive.” This is not good for any type of performance car and if you have taken your car to the track or have auto crossed it you can see why.

TMS has a cost effective solution to “one wheel drive”.... Manufactured exclusively for TMS, our limited slip unit for the E46 323i, 325i, 328i, 330i, and Z4 (Not M3) is a complete assembly (or chunk) that replaces the “open” differential chunk in your cars current differential. It is machined from billet heat treated 4340 chromoly steel for strength and offers added benefit to racers because it is completely adjustable by varying the amount of pre-load and the ramp angles. The ramps are asymmetrical which allows specific tuning for the racing customer. The unit is completely re-buildable, and all parts are replaceable. The TMS limited slip uses the factory bearings, fits into the factory differential housing with no modifications, and all critical dimensions are identical to the factory unit. This makes installation quick and easy, requiring minimal ring and pinion setup time and shimming. Professional installation is recommended, however. See the technical information below for more.

Why you should buy a TMS E46 limited slip differential?

Limited-slip differentials provide lock-up on both acceleration and deceleration. The amount of lock-up on accel and decel can be adjusted by selection of the internal plate sequence. Lock-up on deceleration allows aggressive entry into a turn and late braking, reasons why all professional race teams (that we are aware of) utilize limited slip differentials rather than torque biasing differentials.

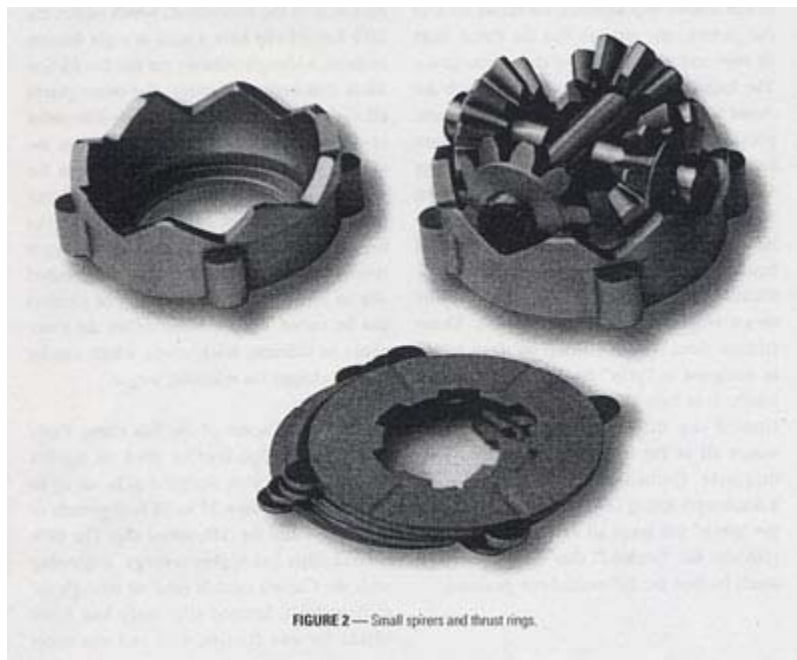
A plain "open" differential is pretty much what all current street BMW's are supplied with from the factory. BMW has decided that traction control will take care of any wheel spin that normal BMWs 99% of a car's life. This open differential has a set of gears that allows the outer tire in a corner (which follows a larger arc) to travel that extra distance without any hindrance or help from the inside tire. If the inside tire needs to travel twenty feet and the outside tire needs to travel thirty feet, this is not a problem, and occurs without much extra effort inside the differential. Minimal heat and friction are incurred as a result of this effort. Unfortunately, this effortless, minimal friction has a downside. If you were to jack up one rear corner of a vehicle that had this open differential, start the engine, and attempt to move this vehicle, the tire off the ground would simply spin, and there would be no force transferred to the other rear tire still on the ground. This same effect would occur on track. The unloaded inner rear tire would have a severe tendency to spin, and the power would not be used to move the car down the track. This obviously slows the vehicle down, resulting in slower lap times.

The TMS limited slip differential is a much better choice for performance-oriented drivers and a must for racing drivers. The TMS differential still has the gears that allow the tires to move different distances through a corner, but these gears are kept from spinning freely by a series of friction plates which are loaded differently whether you are accelerating, decelerating, or at steady state throttle. With our differential, as the car goes through the corner, the inside tire no

longer moves without being influenced by the distance that the outside tire travels. The friction action attempts to keep these tires moving the same distance until the friction force is overcome.

The internal ramping of the differential is such that as you accelerate harder you get increased differential lock. The reason for this is so that an understeer condition will not be induced at part throttle or steady state throttle conditions. Basically, you only get the amount of lock that you need at the time (more throttle=more lock). Our differential also allows for locking under deceleration. The reason for this is that you can now brake really deep in a corner while turning and not have the rear of the car want to rotate. This is very desirable at most tracks and on the street. The ramp angles on the thrust rings are adjustable in the TMS differential. The thrust rings come with two sets of ramps machined – 30/45 degrees and 40/45 degrees. The shallower the ramp angle, the easier it is for the differential to exert pressure on the friction discs. In addition, thrust rings can be swapped from side to side to change the characteristics on accel/decel (e.g. 30/45 can be changed to 45/30).

This style differential, because it depends upon friction to function, creates heat inside the differential. Depending upon the vehicle and the heat generated, this can become a serious issue, and may require that the oil be cooled. This is why we recommend the use of the TMS finned differential cover, and for competition we recommend a differential oil cooler. One also needs to remember that any friction that occurs before the power reaches the ground is a loss of acceleration. This is why the TMS differential comes with zero preload.



Internals of the TMS differential
(Top left thrust ring with different rampings, top right thrust ring with spur gears and axles, bottom friction discs and steel plates)