

Tire Pressures for Off Road Driving

The most common question we here on 4x4 runs, at overlanding events and at our classes is "what tire pressure should I run off road"? The question is not one easily answered. Many factors come into play including:

- *Weight resting on each tire*
- *Height of the tire sidewall*
- *Stiffness of the tire sidewall*
- *Type of wheel being used*

Optimum tire pressures for off roading are considerably lower than for highway driving. The process is called "AIRING DOWN". Tires are aired down for four important reasons:

- Increased tire traction by allowing the tire contact to grow as much as double over highway tire pressure contact patches. Some growth is lateral while most of the size increase is longitudinal.
- Improved ride quality created by a reduction of the tire sidewall spring rate (or an increase in sidewall flex). Suspension springs can never be soft enough to allow for improved ride comfort on bumpy, rocky surfaces off road.
- Less chance of a tire puncture. With the tire tread and sidewall more compliant, the tire can give more before a puncture can occur.
- Less damage to the road surface. With the increased tire contact area, the load on the tire is spread out over a greater area. This increases traction as well as reducing the load on each square inch of tire contact. Wheelspin reduces and less erosion occurs.

The one downside to airing down tires is reduction of ground clearance.

Tire pressures for off road are nearly always set too high to work effectively. The lack understanding for newcomers (and many experienced off roaders) leads to running tire pressures too high for effective off road driving. Many off roaders feel that lower tire pressures are too low. In reality, modern tires are constructed to close tolerances. Tires unseating from the wheel bead occurs only in exceptional circumstances with tire pressures over 10 PSI. For most overlanding rigs, with the exception of very heavy van conversions, tire pressure can be much lower than most believe to be safe. We generally recommend tire pressures within a range from 16 PSI down to 11 or 12 PSI depending on the tire. Some stiff sidewall tires need to run at lower pressures compared to softer sidewall tires. The softer sidewall allow more flex and will achieve adequate sidewall flex to achieve good contact spread at the higher pressure. Tire pressures below 10-11 PSI require the use of beadlock wheels to assure the tire bead remains seated on the wheel rim. More on beadlocks in the wheel section later in this chapter.

An example comparing two tires on the same vehicle may help illustrate the difference in the affect of sidewall stiffness. As mentioned earlier, we have tested many tires. We have found that the sidewall height from the ground to the bottom of the wheel rim is a good indication of tire contact spread. This has proven to be true by actually measuring the tire contact patch areas of different tires at a variety of tire pressures.

Two of our favorite tires are the Nexen Roadian MTX and the Falken WildPeak M/T. Both mud terrain tires work exceptionally well off road. However there are significant differences between these tires. When setting the tire pressures so that the measurements from the ground to the bottom of the wheel rim are the same, the Falken is at 10 PSI while the Nexen comes in at 14 PSI. The difference is in sidewall flex. The Falken is very close to needing a beadlock wheel for safe operation off road while the Nexen has a wide safety margin and does not need to use beadlock wheels. The comparison was done on 37-12.50x17 tires. Overall diameter was very close to identical. Later the measuring techniques will be covered.

Wheel and tire size are critical to determining proper tire pressure. Tall wheels and short tire sidewalls are not conducive to good off road performance. Here is an example. The Jeep Wrangler Sahara 4Xe comes with 275/55 R 20 tires. This tire is about 32 inches tall as are many OE off road capable vehicles. If we deduct the wheel diameter from the tire diameter a sidewall height of 12 inches remains. Dividing the sidewall total by two (top and bottom are each about half the total sidewall height), we are left with 6 inches of sidewall which given the loading on the tire the sidewall height is closer to about 5.5 inches. Five and half inches is not much sidewall to work with. Airing down this tire more than about 5 PSI risks the tire getting pinched between hard obstacles like rocks and the wheel rim. The bottom line means that a short sidewall is far from optimum for off road driving. Most modern 4x4 trucks, crossovers and SUVs are equipped with 17 inch wheels or taller. Brake clearance is one

of the reasons manufacturers use taller wheels. Reducing the ability to lower tire pressure to an optimum range due to short tire sidewall is detrimental to off road traction and comfort.