

3-Shoe KTM Clutch Basics

Three shoe clutches seem to remain a mystery to many folks in our industry. They are indeed confusing and frustrating at times. The following is some basic advice I give on a daily basis that may help get a beginner or even novice mini mechanic going in the right direction.

Vocabulary:

Blipping- Chopping the throttle excessively.

Clutch springs/washers: The beveled washers located on your clutch shoes.

Clutch Shoes: The parts that have a rubber pad on the outer edge that engage the rear wheel.

Stack height: The combined height of all the washers. **See Figure 1**

Stall Speeds: The maximum RPM attained prior to clutch lock up.

Centrifugal Clutch Operational Scope:

If you put three balls on the end of three strings and spun them in a circle. The effect of the balls floating/spreading outward is called centrifugal motion. This physical property is the essential operational aspect of your KTM 50's clutch. The three clutch shoes centrifugally actuate the clutch drum which rotates and actuates the primary gear attached to the input/output shaft connected to the counter sprocket. Simple stuff!! The more spring tension, the higher the RPM necessary to engage the drum. The higher the RPM the more torque output and rotational speed on the input/output shaft. The more bottom end hit!

The Myths-

First, let me dispel some real counter productive myths in 3-shoe clutching.

- a) Due to the open manufacturing tolerances found on all the components in the clutch assembly i.e., inner hub, shoes, crankshaft, etc, the entire system is never better than .004-.005". Why? 1. The crankshaft that the inner hub rotates on is NEVER better than .001 in indicated rotation. Even if trued better, every good motor builder knows it will NEVER stay that way long unless major \$\$ are dispensed.. The entire assembly therefore is wavering .001" within the drum. After several measurements (20+) of inner hubs, the tangent point (place where the shoes rest on the inner hub) to the exact center of the hub has been out, different from one to the next, an average of .003". Finally, the center of the radius on the shoe itself to the flat on the shoe which touches the inner hub has been out from one to the next an average of .002". If you stack these tolerances you never have a shoe closer than .0045" from one to the next while in operation. TRANSLATION YOUR CLUTCH WASHER STACKS FROM ONE TO THE NEXT DO NOT NEED TO BE CLOSER THAN .003"!!! YOUR ASSEMBLY ITSELF IS NOT CAPABLE OF .004-.005". Don't kill yourself getting them to be perfectly even. Math proves it doesn't matter closer than .003".
- b) The idea that you need a "winter vs. summer" stack humors me even on my worst days. The truth is, even in cooler weather, your clutch will basically operate at the same temperature. Heat is generated by contact between the clutch pad and the inner drum. Oil is used to cool the clutch. Without going into too much science, the amount of cooling effect the inner walls of the crank/clutch case have on this oil is minimal. The outside temperature deviations by as much as 50 degrees will only cool that about 10-15 degrees max. Why? Because of the speed and the amount of heat that is generated, and the amount and time the oil makes contact with the inner walls of the clutch cover and crank case. 10-15 degree changes in oil will not effect washer physical properties that much to make a differenc when your oil is running 275-400 deg. F.. Keep your set ups during all temp conditions unless your operational range exceeds 105 deg. F.

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Setting up for the first time:

See Figure 1 for a picture of how to measure your clutch washer stack.

If you bought your bike new, it will come with a set up between .630-.640. No one is certain as only the assembly folks at KTM will know because the springs will collapse when tightened. What we measure after that is the residual height of the initial stack up. .630 is a good starting point for most children learning to effectively use the single speed 50 cc bike Jr. or Sr.

Here are some basic steps for a new family-

Start at .630. Let your rider ride a day or two on that set up. Then move it up to .640. See if he notices the difference. Watch his throttle usage and techniques. Did it change? Is he blipping it more? No –good. Yes –Bad. Blipping means he’s a little concerned about what happens next after turning the throttle. If he’s blipping let him run a full day or two to see if it settles down before making changes.

Practice some starts. Does the bike pull OK? A .640 stack should pull a 55# rider ok without sacrificing gear. What does that mean? Optimal gearing is selected for each track. Ask around, your neighbors will have some consensus. If you have to increase the rear sprocket tooth to help your starts, we made need to adjust your stall speed higher to get-into-the power of your bike more. **TREAT GEARING AND CLUTCH TUNING INDEPENDANTLY TO AVOID THE PIT FALLS OF MAKING GEARING ERRORS.**

Nationally, and including myself, many racers run a .650-.675 clutch washer stack. It takes an experienced and comfortable child to run at that stack height as the hit is hard.

Washer Maintenance:

The washers will collapse after use and even being compressed as the shoes are assembled to the inner hub. This collapsing event will shorten the height and consequently reduce the compressive force necessary to throw out the shoes, thus causing pre-mature hook up. The amount of which is different from washer to washer. In addition, every time a washer sees a heat history, it will reduce the washers refractive force capacity. In other words, it gets a little weaker each time you use them. Makes sense right?

Clean your washers as often as possible. The crud that gets in between them and in between the bolt head and the washers reduces the washers effectiveness. Change the washers every 4-6 hours of use or sooner if measurements and performance dictate.

Run Two 2 cool oil additive. It works!

Run Maxima 75 wt. It is much better than the ATF trust me! You will never do as much testing on these things as I have, Maxima oil is a much better clutch oil than ATF because it absorbs the heat while ATF wants to conduct it. You do not have an intercooler on your KTM...Use maxima.

Stainless Vs. Steel washers. What can I say I started a war. Not all stainless washers are the same!! Some have been developed with more sulfer to handle higher heat loads. The Manga XL’s optimize heat loads and maintane compressive resistance well into the upper 290’s and low 300’s. Far superior to standard steel washers!! They do not fade late in the game folks and they last longer because of it.

Why do some bikes have problems running these washers?

- a) You can’t use a triple stack with all bikes. (())(())(())(())(()). Use this: (())(())(())(())((). Why? Believe it or not, if you are down on power at all, the above triple double configuration will let you know! The yield strength on the SS washers does not diminish nearly as much as the standard washers. The SS’s keep their compressive force nearly ALL the way through their collapse stroke!
- b) You will NOT break more drums as a result of using these washers unless you are not getting good, solid, pad lock up. In that case, you are heating the drum up to a point where everything is stressed. Make sure, by listening, you get good lock up. We have used SS washers for two

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years and are not using any more drums than usual. There are hundreds in the US doing the same thing with the same results. Stats. Do not lie.

Assembly Techniques:

- a) Use blue Lock tight on the assembly screws. You do not need to put any in the inner hub holes. That has cracked more inner hubs than any other activity! **See Figure 2**
- b) Tighten the assembly screws to 7 ft-lbs.
- c) Use Blue lock tight on the clutch nut. Assemble to 25 ft-lbs. Do not go over!!!
- d) Use the washer between the nut and the inner clutch hub.

Figure 1



Figure 2



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Basic Configurations –All on SS Washers

(O)(O)(O)(O) .650

(O)(O)(O)(O) .680

(O)(O)(O)(O/ .020 flat =.655 .040 =.675

(O)(O)(O)(O) .667 Good for beginner Novice. Not good for faster kids as it will fade in 10 minutes of riding.

All of these stacks will work fine on Stock and Mod bikes. Good luck.

AWM