FZ SHIFTER Maintenance + User Manual

Thank you for choosing to support Factory Karts in our mission to bring American-Made chassis and affordable, high-performance engines back into the karting industry. This maintenance guide and user manual will serve as your reference for recommended service intervals, as well as general set up and running parameters for our new line of FZ engines. If you have any questions, or need help troubleshooting any specific problems that aren't covered here, feel free to reach out to our experts anytime at: info@factorykarts.com

1. General Running Parameters

1.1. Fuel: We strongly recommend only the following fuels for competitive use:

1.1.1. VP C12, VP110, or VP MS98L

1.1.2. Sunoco Supreme 112

1.2. 2-Stroke Oil: We strongly recommend only the following 2 full synthetic mixing oils:

1.2.1. Motul Kart GP 2T

1.2.2. Elf HTX909

1.2.3. XPS 2T

1.3. Mixing Ratio: Recommended mixing ratio is 20:1

Note: The slightly higher mixing ratio (more oil per volume) is due to the sustained high-rpm's that the engines will see on kart tracks; the increase in oil helps the upper & lower rod bearings see longer hours before service is needed.

1.4. Engine Operating Temperatures

1.4.1. Before going on track, it is recommended to warm the engine up in the pits until the water temperature is above 100 F

1.4.2. Warm up laps; we recommend 1-2 moderate warm up laps before pushing the engine to maximum rpm's. This lets the water and engine temperatures stabilize (as well as gets the tires up to temperature for better traction).

1.4.3. On-track water temperature should be between 120-140 degrees at all times when pushing to maximum load and rpm's.

1.4.3.1. If engine temperatures remain too cold after several warm up laps, it is recommended to install tape or a curtain onto the radiator to reduce air flow and increase temperatures more quickly. Be sure to monitor the engine temperatures while you are driving to ensure the engine does not over-heat; i.e. pull the tape off or lower the curtain to increase air flow once temperatures approach 140 F.

1.4.3.2. If engine temperatures exceed 140 F, make sure the radiator is properly filled with water (or Maxima Cool-Aide / other non-glycol additive) and any air is bled out of the system. If water and radiator are working as intended, but engine temperature exceeds 140 F, this can be due to 2 reasons:

1.4.3.2.1. Extremely hot ambient temperature; If everything is working normally but the temperatures are stabilizing in the 140's – 150's, this can be simply due to excessive ambient temperatures. If this is the case, try to position the radiator as vertical as possible to allow maximum air flow. As a rule of thumb,

120-140 F is for maximum performance, but 140-160 is acceptable without worrying about engine damage. If you start to see temperatures exceed 160 or even 170, it is recommended to stop driving and inspect the cooling system for leaks (or the temperature leads for possible failures).

1.4.3.2.2. The 2nd reason for excessive engine temperatures (when the ambient air is not exceedingly hot) would be a failure in the cooling system; Inspect the radiator cores for any damage or leaks from debris, inspect the radiator hoses and hose clamps to ensure a closed system, inspect the water pump impeller & gasket (sometimes they can fail to operate correctly if the engine has been sitting with water in it for a long time), and inspect the cylinder head for any leaks or o-ring failures.

1.5. RPM's

1.5.1. The FZ engines have been tuned with both racing and ease-of-use in mind. As such, the RPM range for each engine is recommended to be from 7,000 – 13,000, with peak horsepower occurring right around 11,500-12,000. Shift points are recommended to be just after reaching peak horsepower, around 12,000-12,500.

1.5.1.1. **Shifting Pro-Tip:** When starting out, it's easier to shift slightly earlier in the RPM's and while letting off throttle to around 50% to unload the transmission. As your skill improves and you get quicker on the shifts, you can increase your shift point and reduce the amount of throttle you need to lift to as little as 10%. This will maximize the amount of time at full throttle and decrease the drop in RPM between shifts, thus resulting in faster acceleration and quicker lap times!

1.5.1.2. **Down-Shifting**: It's also recommended not to blitz the downshifts too aggressively on corner-entry (i.e. don't try to go from 6th gear to 1st gear in 10 feet). While you can use the gearbox to help slow the kart down into the corners, for maximum traction (and lap time!) you want space your downshifts out around half-a-second each to let the chassis roll into the corner; if you downshift too aggressively, not only can it cause damage to the engine, but it will also begin to lock the rear wheels and cause the back of the chassis to remain flat, which will hurt your roll speed through the corner.

1.5.2. **Peak RPM & Gearing**: We recommend not going past 13,000rpm, as the power falls off very steeply after this point, but also to help preserve the life of the engine. If you can gear it so the engine is only around 12,500-12,800 at the very end of the longest straight, that is ideal, as the sustained high-rpm's are one of the highest points of wear on the piston and bearings inside the engine.

1.5.2.1. **Gearing Pro-Tip**: You don't always have to gear the engine to be at max rpm at the end of the straight; on many tracks, a faster lap time can be produced by instead gearing the engine around the tight corners to make sure 2nd or 3rd gear is at the right rpms and offers smoother acceleration.

2. Service Intervals

2.1. Transmission Oil: Maxima MTL-75

2.1.1. Recommend changing the transmission oil every 5 hours of use (or before each race).

Note: If you are racing at a competitive level, we recommend changing the oil before every race.

2.1.2. The oil drain plug is located on the side of the case under the clutch cover.

2.1.3. Transmission oil amounts:

2.1.3.1. **FZ65**: 4500mL

2.1.3.2. **FZ85**: 450mL

2.1.3.3. **FZ125**: 550mL

2.1.3.4. **FZ250**: 750mL

2.2. Top End:

2.2.1. Piston Life

2.2.1.1. **FZ65:** 25 Hours or when piston skirt measures less than **43.38mm**

2.2.1.1.1. Recommended to inspect & measure piston every 5-6 hours.

2.2.1.2. **FZ85:** 15 Hours or when piston skirt measures less than **47.38mm**

2.2.1.2.1. Recommended to inspect & measure piston every 4-5 hours.

2.2.1.3. **FZ125:** 20 Hours or when piston skirt measures less than **53.84mm**

2.2.1.3.1. Recommended to inspect & measure piston every 5-6 hours.

2.2.1.4. **FZ250:** 30 Hours or when piston skirt measures less than **66.25mm**

2.2.1.4.1. Recommended to inspect & measure piston every 6-8 hours.

2.2.1.5. **NOTE:** When replacing the piston, you should always replace the ring, both circlips, the piston pin, and the upper rod bearing (piston pin bearing), as well as the base gasket and cylinder head O-rings.

2.3. Crank & Bottom-End Bearings

2.3.1. FZ65: 40 Hours

2.3.2. FZ85: 40 Hours

2.3.3. FZ125: 40 Hours

2.3.4. FZ250: 50 Hours

2.3.4.1. NOTE: It's recommended to install a new crank with new bottom end bearings (both main bearings + all transmission bearings) typically at the start of each racing season or before your largest race of the year, depending on how much time you put on the engine and how hard it is driven. The tracks you drive on, as well as ambient weather conditions & your jetting, will all affect how long the Top end & Bottom end parts last before needing replacement.

3. ENGINE BREAK-IN

3.1. When preparing your kart, Factory Karts will always try to set the carburetors to run rich as to be safe. Atmospheric conditions vary greatly across the country, so being rich in one location could be too lean in another. We will always try to communicate with the end user to get a feel for their local weather conditions and adjusted elevation information so we can set the jetting accordingly. If your engine has not been broken-in beforehand, then it is up to you to properly break in the engine according to the following guidelines:

3.2. Please give the engine at least 1 full heat cycle before putting it on track. This means just letting it warm up gently on the stand until it gets to 130 degrees F, then letting it cool back down.

3.3. Before taking it on track, be sure to let it warm up to 125 degrees on the stand or in grid.

3.4. Once on track, be sure the radiator is covered enough that the temperature does not decrease. If the temperature falls below 120 when under load this could severely damage the piston and engine. If you notice temperature dropping too low, keep the rpm's low and get off the track to add more tape / cover the radiator.

3.5. The break –in is best done between 130-140 degrees while on track.

3.6. The first 10 laps are the most important, so be sure to keep the engine below 80% of maximum rpm (about 10,500rpm)

3.7. Continue driving another 15 laps (10-12 minutes) keeping the rpm below 85% of maximum (about 11,000rpm). It is best to use full throttle and tall gears to accomplish this. The jetting may be rich and the engine may cough or stutter, this is normal during the break in.

3.8. After approximately 25 laps (15-20 minutes) of run time, do 1 more session of 5 laps while bringing the rpm up to 90% of maximum (about 12,000rpm), then the next 5 bringing it up to 95% of maximum (12,500rpm). It is important during this phase not to hold the engine at a high rpm for very long; the intention is to increase & decrease the rpm as much as possible.

3.9. As the last stage of break-in, you can now push the engine to full rpm and shift at the recommended shift points while keeping the rich jetting. It is recommended to put a taller gear on the kart if possible or lift early down the straight once the engine has peaked; the vast majority of piston seizures occur when the driver holds a high rpm for too long at the end of a straight. This stage of the break in helps loosen the piston/cylinder clearance before we lean on the jetting.

3.10. Once break in is complete, we can now bring the jetting down to our baseline practice settings (it's always best to practice with the carb set a little rich so as to help preserve the life of the motor, then lean it down to perfection when it really matters at the race)

3.11. If you need any specific advice about the break in or race jetting for your location, please feel free to contact us any time and we'll be happy to help.

Thank you,