TKM K4S 4-Stroke

Engine Running Instructions

Please Read Carefully Before You Install or Use Your Engine

Introduction

Thank you for buying the TKM K4S 4-stroke engine. A new development for karting with the combination of F1 technology, high performance and low weight to bring great racing at a budget cost.

As with any high performance engine it is vital that you look after the engine to ensure it is running correctly. Look after the engine well, run it correctly and you'll have many hours of trouble-free driving.

Please be very careful to study this guide before you start the engine to ensure it is being operated correctly. And also make sure that you keep within the service periods recommended within the guide. We wish you great racing.

Before You Start

Kart Installation

If you have bought an engine to install yourself onto a kart then please make sure that you have read our authorised installation guide. This gives you all the key factors which must be observed, and for those of you buying a ready to use outfit prepared by Tal-Ko please take note of the following.

Water Coolant

The engine must be filled with coolant mixed with anti-freeze or a similar inhibitor before being started. Make sure the inhibitor is suitable for aluminium engines and use either products at min 50% strength. When filling ensure that the radiator top core is just covered and that the water has no airlocks in the system (see later note). Replace pressurised radiator cap.

Oil Lubrication

Lubrication is absolutely vital to the continued life of your engine. If you run low on oil then extensive damage can be caused in a matter of moments.

NOTE: The oil capacity of this engine is very small to aid compactness and high performance. It is therefore important that you check the level regularly.

Sight Glass

The sight glass which is located at the rear of the engine has been provided to check the oil level, so do so regularly. Just above top of sight glass is correct level. The kart must be level when checking the sight glass oil level and a small torch may be useful to get a clear sight. Always allow time for oil to find correct level (30 secs) as you can easily overfill.

Oil Change

We recommend draining the oil and changing for fresh after every 90 mins. Some drivers may choose to change the oil after every race meeting. This is simply done by cutting the lock wire on the black coloured aluminium sump plug located on the very bottom of the engine. This can be carried out while engine is still fitted to the kart. You will require a 17mm socket and a catch tray for the old oil. The sump nut has a magnetic internal column to collect unwanted material and must be cleaned off before refitting. Allow engine, if possible, a good 5 minutes to drain before replacing sump nut and its sealing washer at 12 lbs/ft. WARNING DO NOT OVER TIGHTEN THIS NUT AS IT IS MADE FROM ALUMINIUM. Remember to safety lock wire. The best way to top up the oil is to remove the large bore plastic breather pipe which runs from the engine up to the Condenser Pot located on the seat bracket then simply pour in the oil, using a small funnel, down this pipe and into the engine – making sure to replace the breather pipe and cable tie. **Oil capacity is 250 ml**

Oil Filter

After the running in period and every 10 hours remove the oil filter and clean. This is located on the side of the engine next to the clutch. First cut the lock wire and undo its large brass hex head nut with a 25 mm socket. Remove the filter complete with its fibre seal washer and clean with airline of other method. Unwanted material will collect in central core of filter and must be removed carefully before refitting at 16 lbs/ft. Remember to safety lock wire. You should clean around both the sump nut and filter nut before attempting to undo to avoid debris entering engine.

Oil Type

For initial running in we recommend use of Castrol GTX Magnatec 10w40 for Advanced Modern Engines, and a one litre bottle is supplied with every new engine. It is

recommended that you fully drain engine oil and refill after 90 mins & 180 mins of running using this oil to complete the running in process and maybe first couple of races. **After the running in period, for racing the use of Castrol EDGE Sport 0W-40** or other equivalent high specification synthetic oils is recommended. Do NOT use motor cycle oils.

Oil Capacity

You MUST ensure the engine is filled with oil to the maximum level before starting. From empty new engines will need **250ml** of oil to bring the level to just above the top of the sight-glass. When carrying out regular oil changes, always add **250ml** which should bring oil to correct levels. We do not recommend the use of fully synthetic oils for running in but do recommend after approx 4 hours of total running that you fully drain the engine oil and change to Castrol Edge Sport 0W-40 Fully Synthetic.

Oil Condenser & Breather Assembly

Always mount this assembly as high as possible on the rear seat in an upright position.

This assembly allows oil in the engine to breathe via the large hose connected to rear of engine whilst running which then collects in the aluminium condenser pot and returns back via a small plastic pipe into the engine. This small pipe should always have a fall along its entire route to allow gravity to return oil back into the engine. Please note that the plastic oil catch bottle is screwed on and should be emptied and cleaned after each days racing. DO NOT pour any oil that is in this bottle back into engine as it is contaminated and may cause engine damage. This catch bottle can be drilled and a safety cable tie used to prevent bottle loss. On some tracks and conditions to prevent excessive oil loss in plastic oil catch bottle it is advised to use the alternative Enduro breather system.

Fuel System

Note that the fuel system has a supply pipe from the fuel tank together with a fuel return pipe system to take off excess fuel back to the tank.

Fuel Pulse Pump

The pulse pump mounted on the rear of the seat has arrows showing the direction of the fuel flow and must be connected correctly. The fuel return pipe is connected to the plastic “Y” piece and has a size 70 restrictor fuel return jet fitted. This jet must not be removed. We recommend that an in line fuel filter is used in the fuel supply pipe to pulse pump.

Carburettor

At the factory the carburettor will have been set to give an approximate setting for first starting & running. However it will probably need the tickover speed fine tuning once first started.

On the top of the carb is the small black plastic choke lever which can be pulled upright to give full choke. This should be used in the full choke position to first start the engine from cold. Do not depress the throttle when starting on choke as it may cause fuel flooding of the engine. Please note that the small black coloured overflow looped pipe on carb has a small cut split in its highest point which allows carb to vent. It must not be covered or blocked off.

Carb Jetting

As supplied the engine comes with a 122 main jet for Senior & 124 for Junior which is what we recommend for running in and most running/racing. However you may find that by changing to a slightly smaller or bigger jet it will give greater performance and crisper response, but this will depend on track and conditions. Only go down or up in main jet sizes a small amount at a time, ie from 124 to say 122 and so on. You can feel if you have gone too small on main jet by the engine holding back in a certain area of the rev range. If engine feels like it is holding back on standard jets try jetting up. For best carburation & running results we recommend that engine is raced at around a running temp of 70 - 80C on standard radiator and 60 – 65 C on Enduro radiator.

To change the jet simply undo the large 14mm brass nut at very bottom of carb. Place a fuel catch pot just under this nut so the fuel in the float bowl is safely collected. Let engine exhaust pipe cool before you attempt this for safety.

Remove the brass nut assembly into which is screwed the main jet. Hold brass nut in 14mm spanner and unscrew jet and replace with different jet. Then refit assembly into bottom of carb. Do not overtighten, just nip. A variety of jet sizes from 116 – 134 are available from Tal-Ko.

As you fine tune the carb setting you may need to slightly alter the tickover speed. Note that temperature and atmospheric pressure may effect the best jet setting to a small degree.

Fuel

Use normal unleaded fuel. You may of course use Super unleaded. Remember this engine is a 4-stroke and does **not** require oil mixed in with the fuel like a 2-stroke.

Starting the Engine for the First Time

Before you even attempt to turn over the engine or start you MUST ensure that it has been filled with the correct level of oil lubricant and water.

WARNING

First, with the driver sitting in the kart, ensure that the **ignition switch is off.** Then engage the starter shaft firmly on the crank nut and hold the starter firmly. With the ignition in the **off** position, you should then spin the starter for three or four short 2 second bursts just to ensure that the oil has been pumped around the engine. **THIS OIL CIRCULATION PROCEDURE SHOULD BE CARRIED OUT EACH TIME THE ENGINE IS STARTED FROM COLD OR LEFT STANDING FOR MORE THAN 2 HOURS**

Then switch on the ignition, put the choke to the full on upright position and spin over on the starter without depressing throttle. As soon as the engine starts remove the starter unit.

If you are experiencing problems with starting, let the engine run for a few seconds without being revved. You will find that with the choke on, it will run a little faster but also quite roughly. Once it has been running for a minute or so and heated up to around 28 C try pushing the choke lever down. You will find that the engine falters slightly and should then pick up speed. What you are looking for is a tickover speed of about 2250/2325rpm. This can be adjusted with the silver coloured large slide screw on the side of the carb in line with the throttle cable & carb slide. Do not confuse this screw with the smaller one nearer the engine (this smaller screw should be set at around 1.5 turns out from closed on normal jetting and needle clip position). This smaller screw may have to be adjusted either outwards or inwards if engine keeps stopping of faltering on correct rpm tick over. If setting of this screw exceeds 2.5 turns out then a larger than standard 45 pilot jet should be fitted.

As the engine warms use the slide screw to set tickover speed. You must ensure that it is not ticking over too fast or the clutch will start to drag which will cause excessive wear.

Once the engine temp gauge shows around 50C switch the engine off and carry out two important checks. Leave for 5 minutes, then with the kart level, make sure that the oil level is at the top of the sump sight glass, topping up if necessary. If you overfill with oil, the condenser overflow plastic bottle will quickly fill so only run engine with correct levels. Second carefully remove the radiator cap when cool and make sure that the water level is still just above the top radiator core. Replace the cap. You may now start the engine and take the kart out onto the track to follow the running in process.

Running In

This must be carried out on a track and not stationary as engine will overheat!

This is an important process which takes at least 1¼ hours of track time. This is vital to ensure the long term condition of the engine. You should divide your running in into five periods of 15 minutes.

0-15 minutes Use minimal throttle starting at first around 4000rpm and do not exceed 5000rpm. Use the throttle to power on and off during all of the running in periods. Do not hold engine at constant speed, but vary up and down. Keep a careful eye on the temperature gauge. It is a good idea to put one or two pieces of tank tape at the top across the full width of the radiator. If the gauge goes above 80C while running then remove some tape immediately and make sure that the temperature then goes down. 65C – 70C is ideal for the first three 15 mins periods.

At the end of this period check the kart and engine thoroughly. Ensure the engine has no leaks and check the oil level – oil must always be showing in the sight glass.

15-30 minutes Build the revs up over this next 15 mins to a maximum of 7000rpm again keeping an eye on engine temp. Check engine and tickover.

30-45 minutes Build the revs up over this next 15 mins to a maximum of 9000rpm using more throttle by taking the power on and off & again keeping an eye on engine temp Check engine and tickover.

45-60 minutes Build the revs up over this next 15 mins to a maximum of 10500rpm and use larger amounts of throttle. By now you will almost certainly have dispensed with some tank tape and have the engine running at around 75C – 80C. Check engine and tickover.

At this point carry out another thorough check to ensure oil level, water level, and to ensure that the kart is fully ready for high speed use, including the tension of the chain which will have stretched with initial use. (12mm up & down movement of chain is about correct tension)

60-75 minutes Build the revs up over this next 15 mins to a maximum of 11500rpm and use full throttle and higher revs, though we recommend that you do not use extended high revs until the engine has done at least a total of 1.5 hours running.

Getting The Best From Your Engine

Spark Plug

The plug fitted to your engine should be capable of very long life. It is a high performance **NGK** CR10EIX plug for normal weather conditions. The other plugs that can be used in this engine are CR8EIX (very cold condition) & CR9EIX (cold to normal condition) & DENSO U34ES-NZU for very hot conditions. All use a gap of 0.026" Only use fingers to re-enter plug back into its thread to avoid cross threading and damage and then tighten with plug spanner.

Coolant/Temperature

It is important to ensure that your engine is always up to a working temperature before being driven hard. We recommend that it should be at a minimum of 50c before hard usage and ideally 60c. You should not normally run the engine past 85c, using tank tape on the radiator or an adjustable blind to achieve correct monitoring of the temperature on the track. If the engine temp goes to 95c on the track you should pull off and investigate the cause.

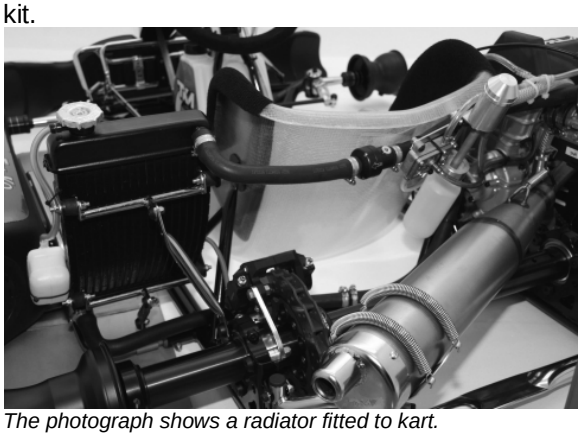
Please note that in extreme hot weather we advise that you only warm engine to 40C before racing with no tape on radiator. Also a summer coolant is recommended and the use of a colder spark plug DENSO U34ES-NZU.

Note that above approximately 85c it is likely that small quantities of fluid may be sent out into the radiator catch-tank. These can be poured back in afterwards. Always ensure that the fluid level is just above the radiator core. Note that if the level is low you may well get sudden large up and down changes in temperature showing on your temp gauge. You will need to refill the radiator just past the top core immediately.

When starting the engine from cold the best and quickest way to warm it up is to start the engine and leave it ticking over. Keep a close eye on the temperature gauge and switch off or drive as soon as it reaches 50C – 60C. **In extreme hot weather the use of the optional Enduro style radiator can be used if unable to keep temp below 90C.**

Enduro Radiator

In very hot weather or warm climate countries we advise use of the Enduro style radiator system. This comprises of a larger radiator fitted to the brake side of kart. Tal-Ko supplies the full kit which includes radiator, pipes and mounting brackets. The use of an inline thermostat is also advised with this radiator. This is an extra to the kit.



The photograph shows a radiator fitted to kart.

Noise Box & Air Filters

The noise box must always be in place. From time to time you should unclip the two air inlet filters and wash through in petrol or similar before drying and refitting. These filters must always be in place and will upset the carburation if not fitted. The fitting of cable ties around the O/D diameter of the filters is recommended.

Gearing

Although the engine has an absolute rev limit of 11950rpm you will probably find that for best power you do not need to go much above 11450rpm. The engine has large amounts of torque and power right through the rev range from the point where the clutch bites so do not waste this excellent feature of the engine. You may find that by taking teeth off you will actually go quicker and reduce your lap times. The engine is fitted as standard with a 12 tooth clutch sprocket. A good starting point for gearing is 12 : 68.

Rev Limiter

This is set to operate at 11950rpm but is a 'soft' limiter so you may not even realise that it is working. All that happens is that the engine will not rev above 11950rpm but it does not cut out. We advise you not to run for any length of time with the limiter operating. Always start with small axle sprockets to establish correct RPMs and then increase or decrease as required. For

tracks with long straights we advise the use of a 13 tooth clutch sprocket.

Clutch

This specially designed unit has been made with long life in mind. It will give many hours of reliable use so long as it is not ill-treated. The most common cause of premature clutch failure is adjustment of the tickover so that the clutch is engaged when at standstill. Also revving the engine while the rear wheels of the kart are on the ground with the kart stationery and the brake on. It is possible to change the drive sprocket fitted to the clutch drum. Available in 12 Tooth or 13 Tooth. Special tools are available for the changing of clutch sprocket. It is recommended that every 15 hours of use that a **small** amount of grease (not copper grease) is put on the sprocket roller cage.

Cold Starting

Whenever starting the engine from cold after it has been left standing for a day or more we strongly recommend that you spin it over 2 or 3 short 2 second periods with the ignition off so that the oil system is fully primed. This will help prevent cold start wear – the most common cause of engine wear. Always use the choke out fully for initial cold starting.

Engine Seal

Your engine is fitted with a unique TKM seal. This seal must only be removed by Tal-Ko. If at any time the seal is broken you will not be allowed to race and the engine must be returned to Tal-Ko for checking and re-sealing at your cost. MSA scrutineers are NOT permitted to break the seal or re-seal an engine. Any engine which in the opinion of a scrutineer needs checking must be sealed by the scrutineer and taken to the Tal-Ko factory for checking.

Servicing

Between 5-10 hours you may return your engine to TKM for a first inspection service which is carried out free of charge (other than any courier costs and consumable parts)

At 80 -100 hours it is recommended that the engine has a full strip and rebuild. This must be carried out by the Tal-Ko factory.

Naturally, you may if you wish, have your engine serviced at more frequent intervals. All services must be carried out by Tal-Ko and will be recorded.
In between factory servicing you are recommended to change the oil every two hours and to regularly check oil and coolant levels. The oil filter should also be regularly checked and cleaned every 10 hours.

It is permitted for others to carry out operations which do not require removal of the seal, such as clutch checking, replacement of the drive clutch sprocket and minor alterations to the carb settings within regulations.

What You Must Not Do

Start the engine without circulating the oil first with ignition turned off if engine has been left standing for more than 2 hours.

Leave the engine ticking over with the choke out for long periods – it will cause piston and bore wear.

Rev the engine while standing still – premature clutch wear and overheating will result.

Run the engine without having the correct levels of coolant or oil – severe engine damage could result.

Rev and race the engine hard when the engine temperature is below 40C – this causes excessive wear and possible piston seizure.

Run the engine on the track at over 95C – overheating and possible damage may result.

Run the engine at maximum revs with the rev limiter in operation for any length of time.

Fail to change the oil every 2 hours – excess wear may occur.

Fail to adhere to karting safety warnings at the front of this publication.