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Kiwiprops™

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K4 - CUSTOMER MANUAL

Also available at: www.kiwiprops.co.nz

Kiwiprops™

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ALWAYS check our web site www.kiwiprops.co.nz for additional information if required ...

Continued 1 ……..

Refer first to exploded diagram on page 9 below and to the picture of the boss on page 2 ….

You are now the proud owner of an original *Kiwiprop*™ which has been carefully designed and engineered to deliver many years of carefree service on your vessel. There are some very simple recommendations you should be aware of to ensure your *Kiwiprop*™ will continue to deliver trouble free performance in the years ahead.

SHAFTS:

Before fitting your new *Kiwiprop*™ to a shaft first check that the shaft is free to rotate and can be spun easily by hand to ensure correct feathering.

Remove the nut from the Boss of the propeller by releasing the 2 x M10 locking screws.
Note that one is simply a blind M8 to provide mass balance and does not lock the nut.
Remove the key from the keyway on the shaft to enable correct mounting checks.

To ensure the key is sized correctly, mount the unit without the key, to ensure the taper is tight, and then again with the key to ensure it is not binding on the keyway which can then be ground down if required. Mark the front face of the propeller on the taper in each case.
All 1.500" units mount 1.000" down from the start of the taper to preserve a common boss.

Wipe all mating surfaces clean and lightly smear with a marine grease including both keyways. Check that the taper length will allow the nut to pull the propeller tight on to the shaft. In all cases the boss should protrude ~ ¼" or 6 mm aft of the small end of the taper, which is the SAE / ISO standard, to ensure the nut pulls up on the boss correctly and doesn't first bind on the thread giving only the appearance of correct mounting.

Check the fitting of the nut prior to finally mounting the propeller with key by ensuring the nut will freely go right down the thread. This will ensure the thread is clean and does not bind on the end of the shaft to ensure that the nut will subsequently push the rear face of the boss tightly onto the taper when mounted. Remove any burrs or impediments to the smooth operation of the nut. Smear the thread with a marine grease.

Failure to tighten the boss onto the taper and key with the nut will result in a loose mounting with subsequent shearing the key and loss of the entire propeller.

The existing key will be required for installation. *Always replace any key that is old or shows any signs of corrosion.* Keys are usually only a brass and will corrode rapidly in salt water. The shearing of a corroded key will result in the automatic loss of your new propeller.
NB: The key must not protrude aft past the small end of the taper and bind on the nut.

SAILDRIVES:

Ensure that both internal and external splines are scrupulously clean. While every effort is made to remove any burrs or hairs from machining these can cause jamming when mounting. The unit has been prefitted and should slide easily onto the spline.

Check the ~10 mm thick collar with seal shield is on the shaft. *(Yanmar #196420-09250)* Check the GF PP nose cone is not binding on the zinc. Some units such as Lombardini come with collars and washers which must be mounted. All Saildrives require that the distance from the end of the spline to the face taking the thrust is exactly 3.000". All Saildrive propellers then have bosses which are ~ 3.125" or 79.4 mm long to ensure they pull up tight on the thrust face before the M16 (M20 for Yanmar SD40 or SD50 Saildrives) nut starts to bind at the end of the thread.

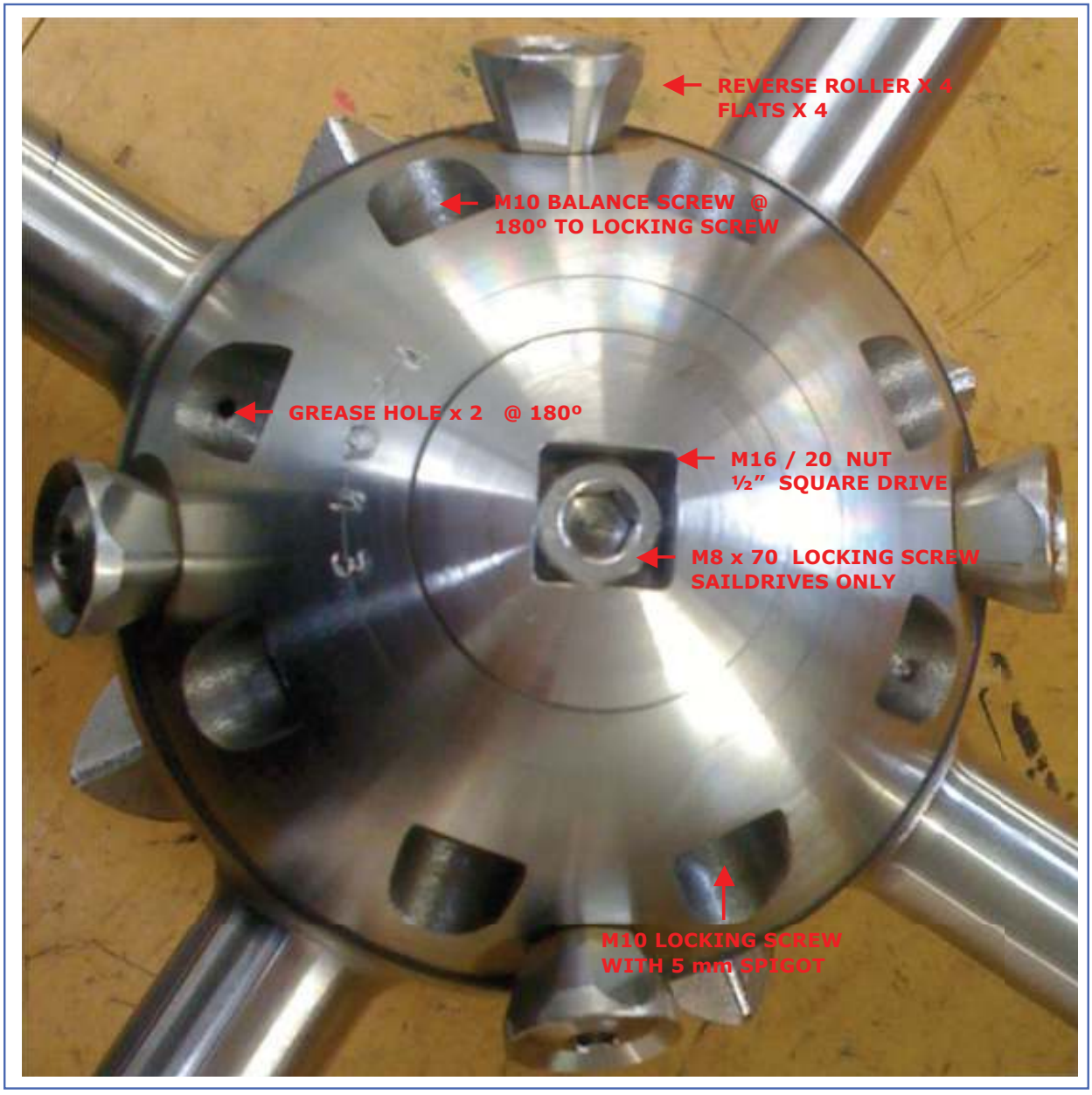
The photograph below shows a boss without the blades attached and clearly identifies the nut with it's ½" square drive recess and the two M10 locking screws that must first be removed to allow for removal of the nut from the unit. NB: One screw is for balance and has no spigot.

Continued 2 ……..

Remove the 2 x M10 locking screws. Coat all thread surfaces in Loctite™ .
Select a hole that is aligned internally and insert the screw with spigot into boss. Insert the other screw without spigot into a recess 180 deg. opposite to ensure balance of the unit.

There are 8 external holes and 9 internal using the Vernier principle so there is an alignment every = 360 / (8 x 9) or 5 º - You may need to make very small adjustments to the nut to ensure the spigot on the M10 locking screw aligns with a hole in the nut.

NB: A FAILURE TO TIGHTEN THESE TWO LOCKING SCREWS AND SECURE ALL THREADS WITH LOCTITE™ CAN LEAD TO THE LOSS OF THE ENTIRE PROPELLER UNIT OVER TIME ON A SAILDRIVE UNIT. THIS IS NOT SO CRITICAL ON A TAPERED SHAFT MOUNTING. SAILDRIVES HAVE AN ADDITIONAL M8 x 75 FAILSAFE RIGHT HAND LOCKING SCREW THAT PASSES THRU THE CENTER OF THE NUT INTO THE SPLINE.



Continued 3 ……..

APPLY Loctite™ to the M16 or M20 NUT & M8 x 75 Locking Capscrew on Saildrives.

DO NOT overtighten the nut which attaches to any standard ½ inch socket driver. This is particularly important on tapered shafts when you need to remove the propeller. Just nip it up using no more than an 20 foot lbs of torque or 14 Newton meter. This is equivalent to the weight of a two gallon or ten liter can of water suspended on your socket driver one foot or 300 mm from the nut.

SAILDRIVE nuts should be tightened to twice this torque – 40 ft-lbs or 28 Nm.
On Saildrives - Loctite™ fit & torque the M8 Failsafe Screw inside the square drive to 10 Nm.

NB: Saildrive nuts and their locking screws should be checked and re-tightened at each haul out as Splines by their nature may fret slightly in use and could loosen the locking screws.

To ensure the propeller feathers correctly, first throttle down to an idle, and then place the gearbox in neutral before stopping the engine. The shaft will then slow down as the blades align themselves with the water flow and slowly come to a stop. The shaft will then begin to rotate slowly in a reverse direction. Engage gear to prevent higher rates of wear.

Keep the gearbox engaged when sailing – unless you have a hydraulic box.
Do not allow the shaft to rotate continuously as it will generate high wear over time.

You are now ready to enjoy the ongoing benefits from your new *Kiwiprops™* unit.

PITCH SETTINGS: **NB: SPARE BLADES ARE SUPPLIED WITH NO PITCH SET**

The *Kiwiprop™* will have been set at the recommended pitch for your installation based on the engine model number, the reduction gear fitted and the particular characteristics you supplied of your vessel. You may however wish to take advantage of the simple pitch adjustment feature to accommodate the many variations between individual vessels and operating preferences to obtain the optimal motoring performance for your particular requirements.
One turn of the 8 mm pitch screw in a clockwise direction to each blade in turn will equate to 3 degrees of pitch **[not inches of pitch] and substantially increase the power required from the engine and drive train. This will translate to lower engine revs. We would recommend adjustments be made in no more than exact half turn increments to each blade, which has the effect of varying engine revs by some 200 ~ 300 rpm. Each installation is unique and only experience can deliver the appropriate settings and optimal cruising revs for your vessel. A pitch setting of 21 degrees on a 17" unit typically equates to a normal pitch of ~ 11 to 12 inches. [The required Allen key is 5/32" or 4 mm]**

GREASE HOLE x 2 @ 180º

This photo shows the rear of the blade aligned with the front of the aft seal which will equate to ~ 20 º of pitch.

Increasing the pitch by screwing the pitch screw in to align the blade surface with the rear edge of the seal will equate to ~ 24 º

IMPORTANT: To avoid damaging the blade roots in reverse by exceeding the designed pitch settings when increasing the pitch, first lock the propeller by engaging ahead with the engine stopped. Rotate the propeller by hand into the reverse position against the spring, and then only increase the pitch until the blade comes up against the reversing rollers.

You will not be able to exceed ~ 24 degrees : DO NOT EXCEED THIS SETTING
This represents the maximum pitch setting available from your Kiwiprop™.

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LUBRICATION:

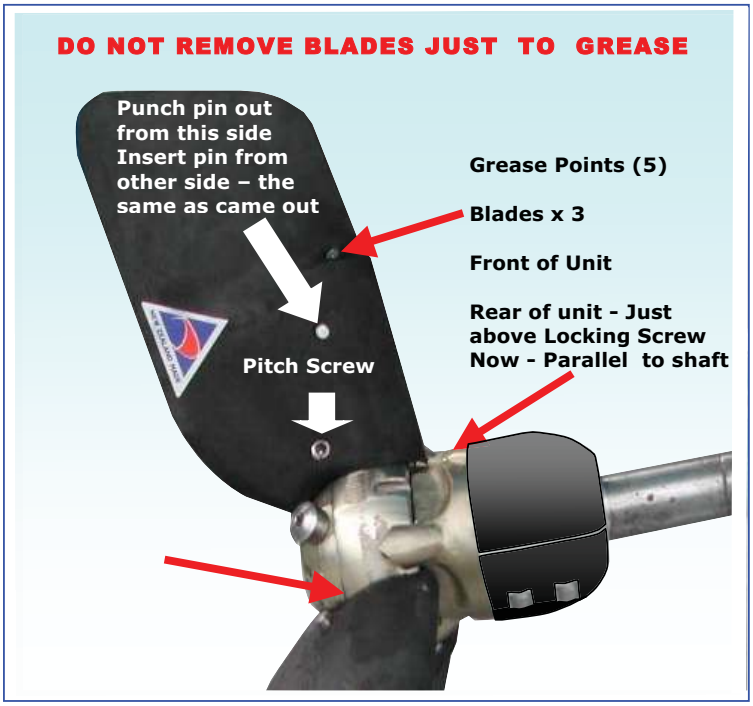
Greasing of K3 & K4 units is similar

The *Kiwiprop*™ contains lubricants sufficient until your next maintenance haulout. Each blade must then be greased via a lubrication point accessed by removing the small Pozidrive stainless screw on the blade face. In addition there are two small grease holes, one very close to the GF PP nose cone in the SS casting that takes the thrust of the pitch screws and one near the outer perimeter of the sphere at the rear of the unit inside one (2 on K4) of the locking screw recess.

These have been chamfered to accept a standard needle nosed grease point that we provide with every unit.

Each of these five grease points should then be filled with a high quality marine grease: Grade - NLGI No 2 Mobilgrease XHP 222 for example

Check the reversing rollers are free to turn and free up if necessary with CRC



ANTIFOULING:

To maintain the performance of any propeller it is essential to keep both faces, and in particular the tips clean. Barnacles and weed growth will have a serious impact on motoring performance. We recommend painting the whole propeller with a modern ablative antifouling which can be applied directly to the unit. The Zytel™ and GF PP require no special undercoats. While the paint will slowly erode from the tips of the blades over time this approach will still provide the best overall solution to fouling of the propeller. If not using a soft ablative paint that will wear away quickly with any contact from a moving blade, then care must be taken to ensure that the bottom root surface of the blade does not start to bind on the boss from a buildup of antifouling over time. *All Saildrives require non copper based antifouling. Always use the same antifouling on the propeller as the Saildrive.*

NB: Ensure there are no paint runs on the blade that can cause serious vibration problems.

REMOVAL OF BLADES:

Remove the small Pozidrive screws halfway out the face of each blade which are used to grease the unit. Gently tap out with a pin punch of less than ¼" diameter each retaining pin that holds the blades. The blades can now be removed simply by sliding off the pin on the boss. Check for wear and corrosion on these pins which can be replaced if required.

Clean the pins and the interior of each blade carefully with a petroleum based cleaner eg Mineral Turps to ensure any old lubricant which will contain dirt and abrasives is all removed. Any areas where the blades may be binding should now become obvious from any wear patterns. These should be filed or sanded down. This is most likely to occur on the boss where the root of the blades can get caught with antifouling and or barnacles over time.

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When both the mounting pin and the blade interiors are clean and dry you are now in a position to remount the blades on their correct pin and check for smooth rotation. Grease each pin hole. Smear a tablespoon of a good marine grease, Shell Nautilus Marine Grease, or similar lithium based, into the bore of each blade and also around the groove on the pin to ensure the assembly is full of grease when complete. Push the blade down fully and surplus grease will squirt from the grease hole, which must be open otherwise the blade will act like a hydraulic ram and become impossible to push back on.

Check the blade has been remounted on it's old pin. Now mount the retaining pin back into the reverse face of the blade from the side it came out of with a new wear face on the pin facing outwards. By tapping gently - reinsert the pin so that it is equidistant from each outer face of the blade. Refer photograph above for illustration.

Be careful to use a gentle striking motion with a small hammer slightly biased towards the leading edge of the blade, which will force the leading edge of the pin towards the trailing edge, to ensure it enters the hole on the opposite face cleanly. [The pin in effect pivots around the leading edge of the hole] Do not force with heavy striking. If aligned correctly it will require no more force to go in than required to take out. This should not be a problem, just a little care and common sense.

Replace the small Pozidrive screws after repeating the above process on each blade.

AUTO ROTATION:

If high speed autorotation occurs when sailing check for freedom of movement of each blade and the presence of foreign objects – typically fishing lines or pieces of rope, flotsam etc that has been picked up by the propeller.

To deal with extreme events such as broaching, falling off waves etc - each unit is biased with a small foil extension modifying the last few millimeters of the blade's trailing edge on one side so that any tendency to auto rotate will always be against the normal ahead direction and prevent the internal spring winding up and in effect engaging reverse. Normal operation will be for the prop to slow down and then stop but rotate slowly in reverse above ~ 6-8 knots.

Place the unit in gear to prevent this – but the shaft must be stopped first. The blades are still feathered. The water flows around the propeller of any yacht are very complex and turbulent. Lee way and disturbances from the shaft and strut make specific predictions very difficult. Eliminating rotation will minimise any potential blade movement and thus wear over time.

REVERSING FUNCTION:

It is important to understand some of the issues that need to be considered when reverse is engaged with this unit. Refer to our web page Reversing Issues where this is covered in detail.

NB: CHECK GEARBOX OIL LEVEL IS CORRECT TO ENSURE CORRECT CLUTCH ENGAGEMENT

Your Kiwiprop™ will automatically go to the maximum available pitch which is ~ 24 deg irrespective of the pitch that the blades have been set to in the ahead position. This is to ensure the propeller will deliver the maximum thrust in reverse at relatively low engine rpm.

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The latest Yanmar gearboxes will go to ~ 3.2:1 reduction in reverse irrespective of the ahead ratio and will have very adequate power in reverse. Many of the older boxes have the same ratio in astern that they have in ahead, and in this case, they will be loaded by the difference in pitch between what the propeller is currently set to and the maximum of ~ 24 deg.

Some gearboxes, Lombardini for example, while having a 2.6:1 ratio in ahead only have a 2.18:1 ratio in astern, which means that the propeller shaft will turn at a proportionally higher speed in reverse. Couple this with the extra pitch and the engine will be highly loaded in reverse and unable to achieve the same rpm that it can in ahead. It is not possible to design any propeller that is optimal in ahead and reverse for quite different shaft speeds.

All Saildrives have the same reduction ratio in ahead and astern.

REMOVAL OF THE UNIT:

If the unit is to be removed from a tapered shaft this must be done with a puller.

This involves removal of the 2 x outer M10 locking screws, then the Nut with square drive.

Under no circumstances should the unit be removed with a hammer as this will damage the face of the unit and is likely to distort the GF PP nose cone.

Removal from a Saildrive simply involves removal of the central M8 Lock screw, the 2 x outer M10 locking screws, the Nut with square drive and sliding the unit off the spline.

DISASSEMBLY OF THE UNIT:

If disassembling the unit, which should not be necessary, ensure when pre-loading the internal torsion spring that the blades are held in the reverse position to avoid damaging the spring from over-winding when reverse is subsequently engaged. The nose cone must be sealed with 3M 5200 Fast Cure or SIKA equivalent on the joint lines and under the friction surface which assists in preventing the nose cone turning on the shaft under the torque from the spring. This includes the area under the thrust groove in the boss. Clean all the matching surfaces with Mineral Turps before applying no more than a very light smear of 3M 5200 including the area under the thrust groove to maximise the area of 3M 5200. Clean up with Mineral Turps and allow to dry.

Ensure the alignment marks are now correctly located as per the diagram on page 9.

It is critical to ensure there is no sealant flowing into the internal spring mechanism which when hardened will cause the spring to bind during the reverse function and take the reverse torque on the spring – not the drive mechanism - which will break the spring.

ANNUAL MAINTENANCE:

Whenever the boat is hauled is an opportunity to ensure the propeller receives the following checks to ensure it will continue to operate correctly into the future.

Check the main attachment nut and associated M10 locking screws have not moved.
Check the Blade Retaining pins are in place.

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Ensure the blades are free of barnacles and any marine growth. If the blades have been antifouled as recommended this will minimise growth but with the expected wear near the tips these will over time accumulate growth as the paint is ablated away. Any roughness on the blades will interfere with motoring performance. Sanding with wet and dry paper will restore the blades to their original condition. Antifoul as suggested above.

Sand fair any nicks and dings on the leading edge from collision with flotsam.

Check that the spring within the nose of the propeller will return the blades to the feathered position when the blades are forced into the reverse position whilst holding the shaft of the unit to wind up the spring. Refer carefully to the above notes on disassembly.

Check that each of the small outer reversing rollers are free to turn on the small stub shafts. If the rollers are tight they can be freed up with pliers and a CRC or equivalent spray.

MAKE SURE THE 4 x REVERSE ROLLER HEX HEAD SCREWS ARE TIGHT IN THE BOSS THESE HAVE BEEN RIVETED ON THE INTERNAL THREADS AND CANNOT BE REMOVED

DO NOT attempt to remove these machine screws as they have been inserted with Loctite and are never intended to be removed. They can only be taken out with heat.

Check that each of the blades is free to turn on it's shaft. Any stiffness here will impact on the overall ability of the unit to feather properly in all conditions. If it feels as if this situation will not be rectified with subsequent lubrication it will be necessary to remove the blade from it's mounting following the instructions detailed above. If the blade becomes free following the removal of the attachment pin – but not the blade then the binding will be under the root of the blade

Careful observation of the blade and matching surfaces will indicate where the binding is occurring. It could be on the root of the blade from a buildup of marine growth and/or deposits which would need to be cleaned off. It could be foreign material in the surface between the blade and the pin. This would require that both surfaces be cleaned with a petroleum based cleaner such as mineral turps to remove all the grease and any contaminants. With only 0.003" clearance between the surfaces it takes very little to interfere with a smooth action about the pin.

While the blades are presoaked to pre-stress and stabilise them under water, Zytel is an aramid and may react further over time. If still binding on the shaft after cleaning the internal recess will need to be sanded with a piece of sandpaper on a round mandrel such as a piece of dowel or similar to remove any high spots which are causing the interference. Ensure the blade is cleaned thoroughly to remove all traces of abrasive prior to lubrication as detailed in the above section.

As a general guide each blade should fall slowly and smoothly under it's own weight when placed in a horizontal position after it has been lubricated and reassembled following the instructions above for blade removal.

Lubricate each blade in turn plus the nose and aft section of the unit as described in the section on lubrication detailed above. The unit should now be ready for another season.

The more regular lubrication the unit receives – the longer it will last.

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TOOLS REQUIRED:

The tools and consumables required to mount the unit are summarised below:

- **½" Square Drive Socket Head**
- **4 mm or 5/32" A/F Hex or Allen Key for M8 Socket Screw**
- **6 mm Allen Key for M10 Socket Screw**
- **Allen Key for M8 Cap Screw – Saildrives only**
- **Clean Rags with Mineral Turps or equivalent**
- **Marine grease & Loctite™**

BOATS STORED IN VERY LOW TEMERATURES:

In some situations around the world there will be operating environments where the vessel is stored on the hard over winter – typically where temperatures are below zero for extended periods.

We have had reports that when exposed to temperatures as low as – 50 deg C the blades have stiffened up on their mountings. Blades are shipped with 0.006" or 0.15 mm of clearance on diameter over the mounting pins.

Always check the blades are free to feather if your vessel has been exposed to very long periods of extreme low temperatures and may have had retained water in the pins.

NEW ENGINE WARRANTY ISSUES:

Engine manufacturers correctly require a new engine to reach it's rated max rpm for warranty purposes. Some engines tachometers are quite inaccurate and may also be driven off the alternator where new V belts typically can cause tachometer under reading errors of up to 350 rpm at 3600 rpm actual.

We can only respond to apparent propeller sizing issues with accurate data that has been obtained from a digital tachometer off the engine itself.

The propeller delivered will be sized to achieve rated max rpm as measured by a digital tachometer – not the tachometer supplied with the engine.

PERFORMANCE EVALUATION:

Evaluation of any propeller performance is always difficult given the problems of replicating an identical situation for any baseline comparison. Sea state, wind, fuel and water load, current, bottom state, dinghy etc will all contribute to changes in motoring performance.

Typically a new propeller has been fitted over winter and previous data may not be available or other additional changes have been made to the vessel.

It is important to ensure instruments are calibrated correctly prior to making comparative readings. Many engines for example now run the tachometer off the alternator so even a worn V-belt can change engine rpm readouts by effectively reducing the driven pulley diameter.

Continued 9 ……..

Using time over distance calculations to obtain boat speed requires an accurate knowledge of any current present.

New boat speed indicators may not be calibrated correctly – or the transmitter may have antifouling coverage affecting readout accuracy.

The average of two consecutive runs in opposite directions for a reasonable distance over the same course using a GPS in calm wind and water seems to deliver the most accurate results.

While the first evaluation will always be motoring – we stress that we would expect the benefits from your new propeller to be also manifested in improved sailing performance if you have replaced a fixed bladed propeller and in reversing function if you have replaced a folding type propeller. Sailing performance comparisons are even more difficult to quantify.

Remember that all feathering type propellers have flat blades with constant angle from the tips to the blade roots. Other types have progressive blade angle where the angle varies from high at the blade root to low at the tips. The pitch at the tips of any feathering unit will thus be higher than on a fixed or folding type unit. At low engine and boat speeds you may notice a slightly different noise coming from the propeller which goes away as soon as the engine rpm are increased. This can be caused by slight cavitation off the tips of the blades. As boat speed builds the effective pitch decreases and the unit begins to operate in it's normal design range. This is exacerbated by high shaft angles and thus does not generally occur on Saildrives.

CUSTOMER FEEDBACK:

We would appreciate receiving feedback from each customer after using their Kiwiprop for a period. In particular data on maximum and cruising rpm with corresponding boat speeds and the relative performance of the unit with the previous propeller installation allows us to continuously refine sizing recommendations.

Comments as to how the unit performs can be e-mailed to: kiwiprops@xtra.co.nz

Always consult our web page at www.sdcprops.co.nz for additional information if required

Kiwiprops™

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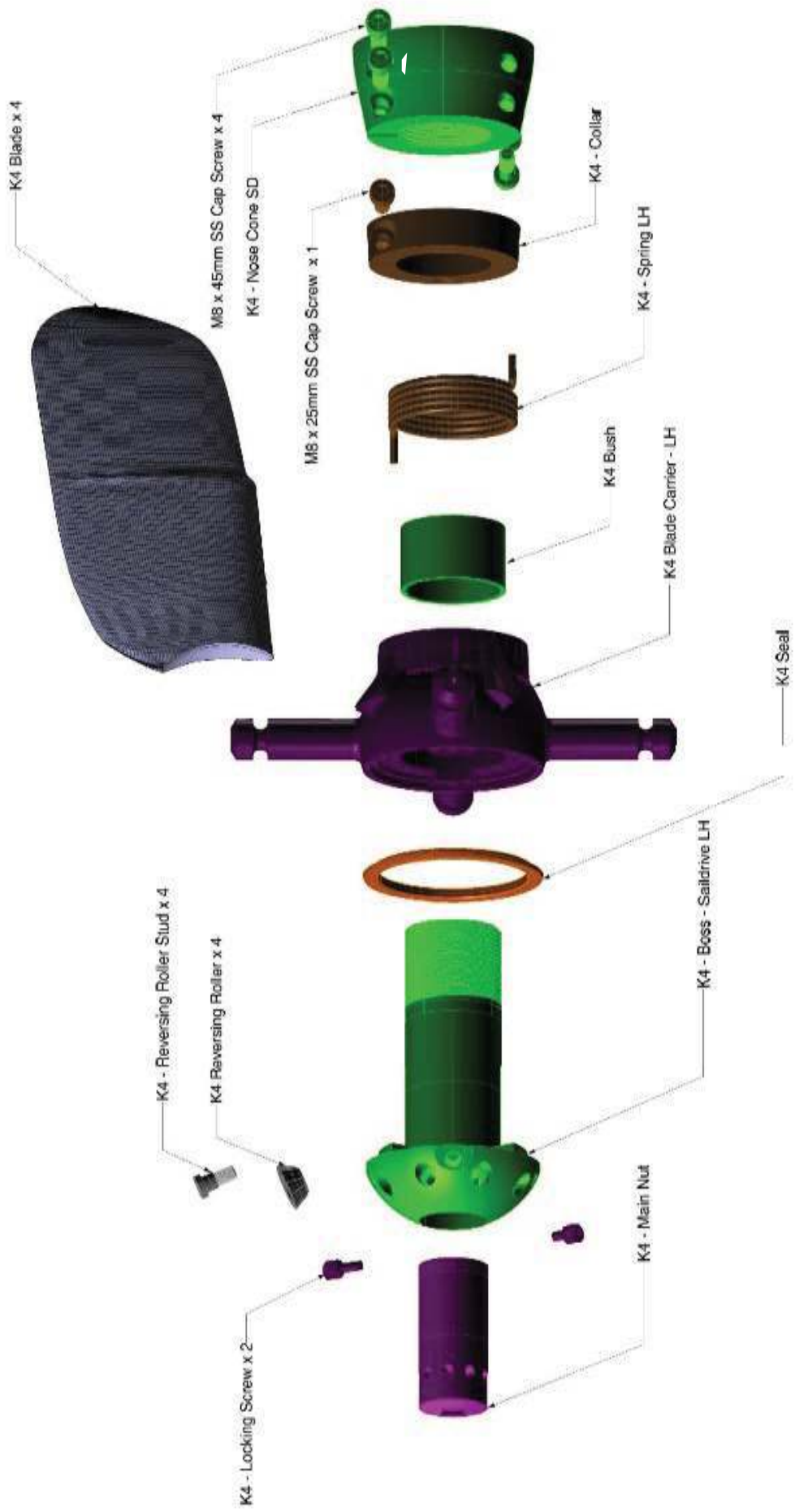

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WARNING: **Customers are strongly advised not to attempt to disassemble the unit unless this becomes absolutely essential. Re-assembly of all the components coupled with the need to ensure sealant is inserted into the nose cone whilst at the same time preloading the internal torsion spring makes for a tricky operation, particularly if no stub shaft is available to hold the unit whilst these operations are completed.**

In the absence of a stub shaft to hold the unit during assembly - it will be necessary to mount the unit on the actual shaft or spline which can then be locked by engaging the gearbox

BLADE SIZE CODES:

Blades are marked near the outer trailing edges with a code to indicate blade size:

No Mark:	**20.50" - Rounded Edges**
Small Line:	**19.50"**
No mark:	**18.00" - Rounded Edges**
One Dot:	**16.50"**
Two Dots:	**17.00"**
Three Dots:	**16.50"**
Four Dots:	**15.50" - Rounded Edges**

NB: IN ALL CASES THESE ARE NOMINAL SIZES – THE DIAMETER AT THE TIPS WILL BE ½" GREATER ie 19.50" Nominal = 20" @ TIPS