H6 BALL BEARING

FITTING, REMOVAL AND MAINTENANCE OF YOUR AUTOPROP.

The Autoprop is supplied assembled, tested, and ready to fit to your yacht. Observing the following notes will ensure correct fitting and trouble free service.

Tools required for maintenance and fitting/removal.

Selection of Allen keys.
Small punch.
Small flat blade screwdriver.
10mm socket spanner.
Small hammer.
Peg spanner. (Brunton's special tool for bearing adjustment)
Socket spanner for propeller shaft nut.
Propeller extractor tool. (Brunton's special tool for Autoprop removal)
Thread locking compound.

Parts available.

Anode nose cone kit.
Bearing adjustment kit.
Bearing service kit.
Replacement blades.
Individual components.

Fitting.

1. After removing the old propeller check that the shaft taper, key, and thread are undamaged. Try the new shaft nut on to the thread. The taper should be clean and dry. Check that the key will slide through the keyway in the Autoprop without jamming at any point.
2. Fit the key in to it's seat on the shaft. Push the Autoprop on to the shaft making sure it fits snugly on the taper. If it does not appear to fit well, there may be some foreign objects on the taper, or you may need to file the key down until the Autoprop fits snugly on to the taper.
3. Screw the new shaft nut up tight using a socket spanner, finishing with one of the flats of the nut coming under the shaft nut locking screw. If the shaft nut locking screw will bear on to the body of the shaft nut you will need to dimple the body of the shaft nut, with a drill bit.
4. Smear the thread of the shaft nut locking screw with thread locking compound and screw it down on to the shaft nut.
5. Hold the anode nose cone in place and screw in the nylon screws. Do not over tighten.
6. Your Autoprop is now ready for use. Do not attempt to grease it. The bearings are water lubricated.

Removal.

1. We recommend that you use a special extractor available from your Autoprop supplier. This is simple to use and avoids having to remove the rope cutter, if fitted. Most three legged pullers will fit the Autoprop.
2. Remove the anode nose cone by removing the nylon screws.
3. Unscrew the shaft nut locking screw until it is clear of the shaft nut.
4. Unscrew the shaft nut remembering whether it has a right or left hand thread.
5. You can now use you three legged puller to remove your Autoprop from the shaft. With the Brunton's extractor tool, slide the brass buffer in to the propeller boss . Screw the extractor plate on to the end of the propeller boss using the socket head screws provided. Screw in the jacking screw and tighten until the Autoprop loosens on the taper, and remove from the shaft.
6. Tape the key on to the shaft, or remove and keep in a safe place.

LAYING-UP.

When ever you haul-out for antifouling or laying-up for example, the Autoprop needs to be given a high pressure wash **before** it has a chance to dry out. This will remove the deposits which if left to dry will make the blades feel sticky when rotated. After this, rotate the blades by hand to ensure they are free moving, and 'rock' them to check that free movement is present in the bearing mechanism. At this stage the bearing clearance may be checked as outlined in BEARING ADJUSTMENT.

If the Autoprop is left out of the water for any length of time we suggest that a light lubricating oil is squirted in to the bearings to prevent them 'drying up'.

Before re-launching ensure that the blades are free to rotate and that the clearance as noted above is present.

BEARING ADJUSTMENT.
Remove the retaining cap by first removing the plastic tamperproof cap. Bend back the tang of the tab washer and slacken the retaining cap locking screw sufficiently to enable the retaining cap to be slackened and removed. If the retaining cap remains tight, tap the hexagon head of locking screw lightly to disengage the cap expanding cone.

Remove the retaining cap locking screw and discard the old tab washer. A new tab washer must be used. It is advisable to slightly pre-bend the end of one tang of the new tab washer to aid reassembly. Replace the retaining cap locking screw, complete with the new tab washer and tighten on to the cap expanding cone until this is lightly held in it's seat.

Replace the retaining cap on to the post, and tighten until it is lightly seated on the outer race assembly. Using the peg spanner and a torque wrench set to 14 lb./ft (18 Nm), further tighten the retaining cap. At this point the blade should still be able to be rotated through 360 degrees with some difficulty. Ensure that this is possible. If not, repeat the above procedure.

Make a mark on the edge of the retaining cap at a point no.1 as illustrated in figure 2. Slacken the retaining cap until the mark you have made is now in line with a point no.2 in figure 2. Tighten the retaining cap locking screw with a torque wrench set to 14 lb./ft. (18 Nm) whilst keeping the retaining cap in position with the peg spanner. Ensure that the blade is free to rotate through 360 degrees.

Ensure that a flat on the hexagon head of the retaining cap locking screw is aligned with the pre bent tang of the tab washer. If necessary align using a tightening action only. Bend up the tang against the flat side of the locking screw. Insert a new tamper proof cap.

Repeat for the remaining blades.

OUTER & INNER BEARING REPLACEMENT.
As wear takes place, the correct bearing clearance may be maintained by adjustment of the retaining cap. After a period of time, normally 1000-2000 motoring hours, or when smooth operation cannot be ensured via adjustment, the bearing races will need to be replaced. Before doing so, ensure that rough operation is not due to foreign objects which may have found their way in to the bearings.

Remove the retaining cap as in the previous section. The blade, and outer race assembly can now be removed by very carefully rocking the blade whilst pulling upwards. If it is difficult to remove, carefully levering under the blade with a screwdriver may help.
Remove the blade and outer race as a unit. This will expose the inner race. The stainless steel balls are not captive, and care should be taken not to loose any. If wear is evident in the outer or inner races, these may be replaced as follows:

Upper Outer Track :
Once the blade is removed from the boss, this is easily accessible.

Upper Lower Track :
This may be removed by inserting a screwdriver in the gap formed between the underside of the track and its seat in the blade, and then prizing out. The new track can be pushed in place carefully by hand, having ensured that the seat is clean and undamaged.

Upper Inner Track :
Two extraction holes in the blade allow access to the top of the track. Rest the underside of the blade on a surface which leaves the track exposed. With a punch tool, drive the track out using the two holes mentioned above. Insert the new track by pressing into position by hand, having ensured that the seat is clean and undamaged..

Lower Inner Track (in boss):
Locate the jacking thread visible through the nut pocket. Remove the propeller nut locking screw and screw in to the jacking thread. This will lever the track from it's seat sufficiently for it to be removed. Insert the new track by pressing into position by hand, having ensured that the seat is clean and undamaged.

Inner & Outer Track Balls:
Insert the new balls using a water soluble hand cleanser, or thin oil, to aid reassembly. Do not use grease.

Follow the Bearing Adjustment procedure to complete.

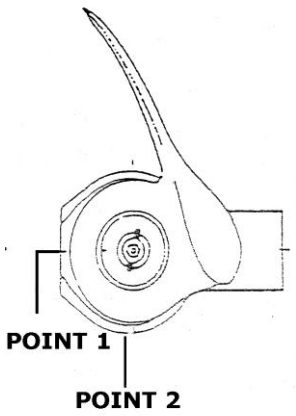
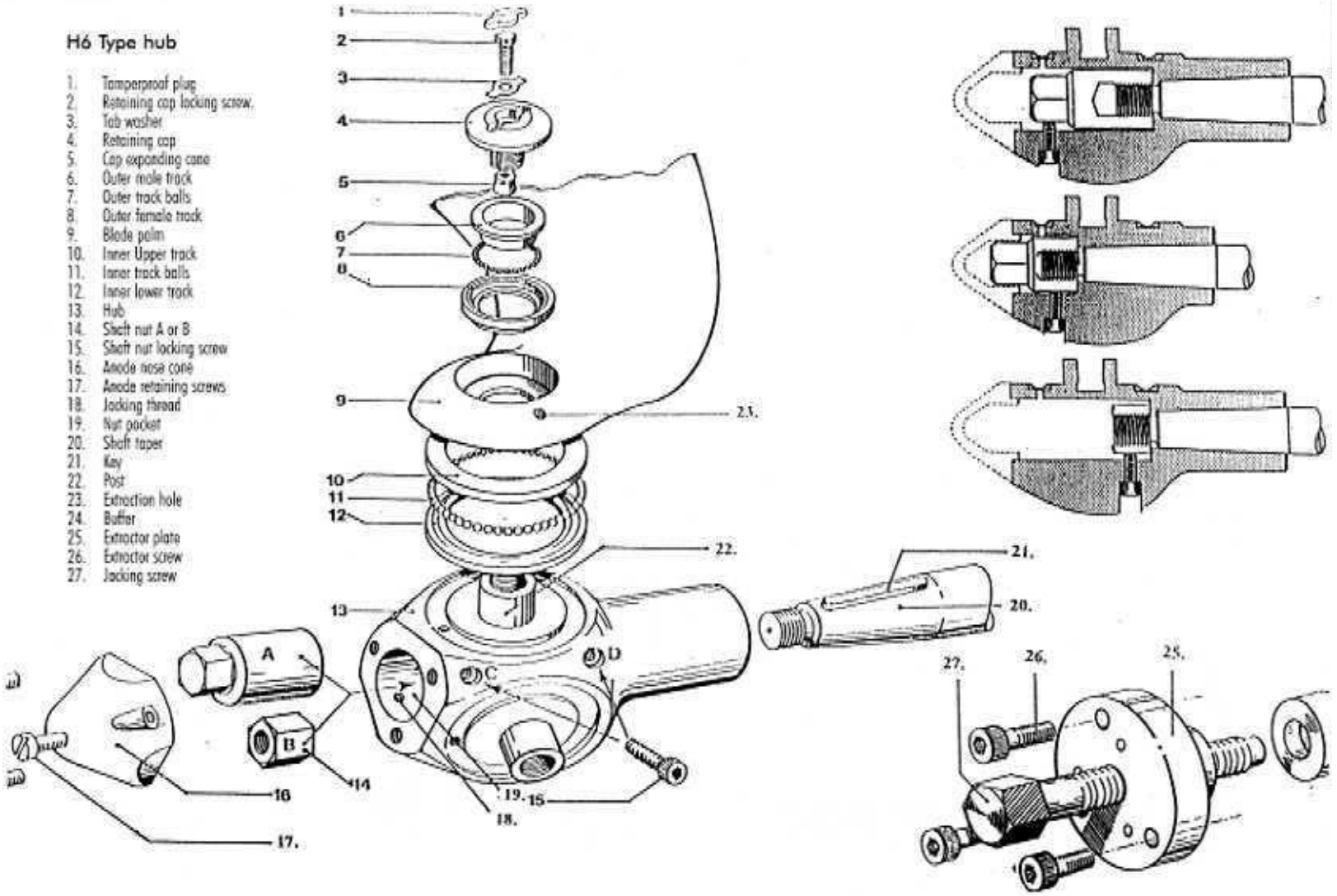


Fig 2

H6 Type hub

1. Tamperproof plug
2. Retaining cap locking screw.
3. Tab washer
4. Retaining cap
5. Cap expanding cone
6. Outer male track
7. Outer track balls
8. Outer female track
9. Blade palm
10. Inner Upper track
11. Inner track balls
12. Inner lower track
13. Hub
14. Shaft nut A or B
15. Shaft nut locking screw
16. Anode nose cone
17. Anode retaining screws
18. Locking thread
19. Nut pocket
20. Shaft taper
21. Key
22. Post
23. Extraction hole
24. Buffer
25. Extractor plate
26. Extractor screw
27. Locking screw



QUESTIONS YOU ASK.

How does the Autoprop work?
The Autoprop's blades are custom designed by Brunton's Propellers for the particular power, shaft revolutions, and vessel speed. The components of hydrodynamic and centrifugal forces balance, to set the blades at the correct pitch angle. As the yacht speed or engine revolutions change, the blades will automatically readjust to keep the optimum angle of attack to the water flow at all times.

What kind of performance can I expect under power?
The Autoprop will give you improved speed at the same rpm throughout the rev range over all other propellers. The maximum speed attained at maximum rpm will be similar to that of a well designed and made three bladed fixed propeller. The benefits of this are:

1) Achieve the same cruising speed at lower engine revolutions, typically 200-600 less, which means reduced engine noise and vibration, with greater fuel economy and potentially increased range.
2) Greater speed at the same engine revolutions over your previous propeller, which means shorter passage times.
3) When motor sailing, good drive from the engine is achieved at much lower engine revolutions, loading the engine more efficiently and reducing fuel consumption. The Autoprop senses the drive produced by the sails, and adjusts it's pitch accordingly.
4)Greatly improved stopping power and astern performance due to the fact that the blades rotate through 180 degrees. They are therefore always operating in the correct attitude. Typically, with the Autoprop, most yachts will be able to stop from a speed of six knots within one boats length.

Do I need to do anything to make the Autoprop 'feather' under sail?
All you need to do, is to stop the engine whilst motoring in ahead, and thereafter leave the engine engaged in ahead. With engines fitted with some hydraulic gearboxes, engage your shaft lock. Your Autoprop distributor will be able to advise you if this is necessary.

What performance increase can I expect under sail?
Under sail the blades of the Autoprop will feather to the water flow, reducing drag by up to 85% compared with a fixed three bladed propeller. Typically, this means that a speed increase of between 1/2 and 1 knot may be achieved, this being particularly noticeable below the maximum speed of the yacht.

What manoeuvring characteristics can I expect with the Autoprop?
Due to the self pitching action of the Autoprop, manoeuvring is different to conventional propellers. Firstly, in most cases, there is noticeably less 'prop-walk' experienced. This is due to the finer pitch setting at low speeds giving a reduced 'paddle wheel' effect. Secondly, due to this finer pitch, at low speeds there is less 'bite' felt when engaging ahead or astern from a standstill. This means that more engine revolutions than normal should be used when moving off from a standstill, or at very low speeds. Once some speed has been attained, the engine revolutions may be reduced.
This unique feature of the Autoprop, enables the full power of the engine to be used in situations such as towing, or in emergencies. With conventional propellers because the pitch is too coarse at very low speeds, the engine cannot achieve it's full revolutions, and therefore full thrust is not achievable.

Will the Autoprop 'seize up' due to fouling?
The Autoprop is prone to fouling like any other propeller. However, fouling within the bearing mechanism is not normally a problem. As long as your yacht is in an area which has some tidal or current movement, the blades of the Autoprop will be constantly moving back and forth. They will even do so if the yacht is subject to wave action. This movement is enough to dissuade any marine growth from developing on the bearing surfaces. If you are in an area of exceptionally still water or very high marine growth, then we recommend that you periodically run your engine, and put it into ahead and astern a few times. This will cause any marine growth on the bearings to be crushed by the blade action, and this will then be flushed out.

Will my Autoprop still work correctly even with heavy fouling?
The performance of the Autoprop will be impaired by marine growth just as any conventional propeller. With heavy fouling, thrust diminishes, and there is a reduction in the maximum engine revolutions attainable. However, the Autoprop will still pitch correctly. In areas of high fouling, smoothly coating the Autoprop with a high quality marine antifouling may help to reduce the amount of growth, being careful of course not to allow any antifouling to enter the bearings.

My yacht is kept on a drying mooring. Does this cause any problems?
Drying out in mud possess no problem to the operation of the Autoprop. Brunton's Propellers initial development program included fitting an Autoprop to a yacht which was kept in a mud berth. Despite drying out on every tide for two years, no problem was experienced in the operation of the Autoprop. The water lubricated self-rinsing bearings quickly clear themselves of any debris which accumulates whilst in the mud.

How will the Autoprop stand up to damage?
The Autoprop is some 40% stronger than conventional propellers, as it is made from a special high grade bronze alloy called Superston. The high resistance to impact damage means that you are less likely to damage the Autoprop. In the unlikely event that a blade becomes damaged, you only need to replace that blade, and not the complete Autoprop.

What maintenance does the Autoprop need?
When ever you haul-out for antifouling or laying-up for example, the Autoprop needs to be given a high pressure wash before it has a chance to dry out. This will remove the deposits which if left to dry will make the blades stick when rotated. After this, rotate the blades by hand to ensure they are free moving, and 'rock' them to check that free movement is present in the bearing mechanism. If the Autoprop is left out of the water for any length of time we suggest that a light lubricating oil is squirted in to the bearings to prevent them 'drying up'. And that's it !
The bearings should not need any adjustment for upwards of 1000 engine hours, depending on how hard the engine is used. More movement than normal may then be felt in the blades, and the extra movement can be taken up by adjusting the retaining cap. Eventually, the bearings will need replacing. This is a straight forward procedure covered in the maintenance section. With new bearings in place, your Autoprop is ready once more to power you on for many more miles.

I plan to fit a rope cutter. Is this possible with the Autoprop?
You may fit a rope cutter with the Autoprop in the same way as any other propeller. Rope cutters can also be fitted to Autoprops which are for saildrive installations. Follow the manufacturers fitting instructions for three bladed propellers. With conventional propellers you need to dismantle the rope cutter in order to use a puller for propeller removal. Although you can use most conventional three legged pullers to remove the Autoprop, with Brunton's Propellers purpose made puller there is no need to disturb the rope cutter.

I may fit a different engine or gearbox at a later date. Will I need a new Autoprop?

Not necessarily. Unless the new engine or gearbox necessitate a large change in the diameter of Autoprop needed, Brunton's Propellers can supply replacement blades only, matched to the new engine or gearbox. This will reduce the cost of your new installation.

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