# TECHNICAL DATA SHEET
# DS 057

**NON CONTROLLED UNLESS STATED OTHERWISE**

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| TITLE. | Instructions for the Installation of Type TSC Size T3 Combined Steel Spring and Rubber Spring Unit Isolators for Marine Propulsion Engines. |

Details of isolators as Leaflet PL001. All instructions should be read in conjunction with the appropriate application, offset and alignment drawings.

NOTE: Alignment of the engine to gearbox should be carried out with the hull in the water.

PREPARATION:

1. Fit engine mounting feet or bearers to the engine housing as per the engine builders instruction. The engine should be in working condition but without oil and water. Flexible connections are fitted after mounting installation.

2. Jacking devices are to be installed beneath each corner of the engine. These must permit the engine position to be adjusted in any direction independent of the isolators.

3. The TSC isolators complete with soleplates and proof packing plates are to be fitted to the engine mounting feet. The proof packing plates are to be suitably drilled and slotted to al low easy removal of the isolators for replacement or refurbishment.

4. Christie and Grey can supply jacking blocks incorporating thrust screws in each direction. These are not suitable for use on highly raked installations. For engines with a seating rake angle of more than 5 degrees or when these jacking blocks are not employed alternative thrust screws and brackets are to be used:

   (a) Fit two drive end restraint brackets, one each side of the engine. The restraint screws have domed ends where grease should be applied to minimise friction during alignment. For engines which are installed horizontally or at small rake angles, two extra end restraint brackets should be fitted at the front of the engine.

   (b) Transverse thrust brackets (supplied by others) are to be located down each side of the engine to enable transverse alignment to be accurately attained. The thrust screws should have domed ends where grease should be applied to minimise friction when aligning in the vertical and transverse directions.

5. Grease the sliding surface of the jacking block to allow easier movement of the engine when aligning along the ship's seating. The thrust screws should be centred to allow sufficient adjustment in all directions.

6. The engine complete with its isolators is then to be lowered onto the jacking blocks and the vertical alignment of the coupling set to within about 2 mm (0.08 inch). The clearance between the underside of the isolator soleplate and the ship's seating should not be less than 19 mm (0.75 inch).

7. Position the engine so that the coupling gap is at least 1 mm (0.04 inch) less than the nominal axial dimension (see coupling details). The transverse and longitudinal thrust screws are to be adjusted so that they are just in contact.

ALIGNMENT OF THE COUPLING:

8. Alignment of the engine to the driveshaft should now be effected using the various jacking and thrust screws.

NOTE: The dial gauges used for alignment should be fixed to the shaft which is being rotated. The overall readings from these gauges is equal to twice the centre line offset.

Firstly, align the engine in the vertical direction. Engines installed at large rake angles should be prevented from slipping by the drive end restraint brackets. The vertical alignment of the engine should be offset 'Z' high (see our offset & alignment drawing) to allow for initial settlement and for the weight of oil and water.

Secondly, assuming the rotation of the engine is anticlockwise facing the drive flange, the engine should be offset by 'X' (see our offset & alignment drawing) in the transverse direction towards the port side using the transverse thrust screws by equal amounts at each end of the engine. If the engine rotation is clockwise the offset 'X' is towards the starboard side.

If necessary allowance must then be made for the fore/aft deflection of the engine due to the angle of installation. The coupling gap should be set at the nominal dimension plus 'Y' (see our offset & alignment drawing). For engines installed horizontally the gap should be set at the coupling nominal dimension within angular tolerance - see manufacturer's instructions.

9. On completion of the alignment the thrust screws should be secured by the locknuts provided.

10. At this stage the isolator hold down bolt positions should be marked out on the ship's seating. Remove the isolators and drill the ship's seating for isolator hold down bolts. Refit the isolators to the engine mounting feet.

11. The four levelling screws in each isolator base should be well greased to prevent bonding to resin chock. They should now be screwed down until they are just in contact with the ship's seating. Ensure that the base of each isolator is parallel with the isolator top. Measure the height from the underside of the engine foot to the top of the isolator soleplate at the corners of each isolator. If the variation in the measured heights of any isolator is greater than 1mm (0.04 inch) minor adjustment of the levelling screws should be made to compensate.

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TRANSFERRING THE WEIGHT:

12. a) Transfer the weight of the engine from the jacking brackets to the isolators by screwing down the isolator levelling screws. Start by turning each screw once by 360 degrees in sequence around the engine. This will load the isolators without moving the engine. Continue by turning the screws on each isolator through 180 degrees in sequence around the engine until one of the jacking screws just becomes unloaded.

b) The remaining weight must be transferred to the isolators without moving the engine. To do this turn the screws down on the isolators in sequence by no more than 60 degrees at a time, in proportion to the distance of the isolator from the jack. When the jacks at one end or on one side are both free the adjacent isolator screws should require no more adjustment.

For engines at a large rake angle, there will be a displacement down the slope. This should be allowed to occur by slackening the fore/aft restraint screws to give about 2 mm clearance after transferring the vertical load.

c) Check that the isolator bases have remained parallel to the tops and correct as required whilst maintaining the **average** height of each.

13. After 60 minutes check the jacking blocks. These should now be slightly loaded due to primary creep of the isolators. Turn each levelling screw down in sequence by 60 degrees to restore the isolator loads. Leave for at least 48 hours for settlement.

14. After this period the shaft alignment should be rechecked. Any correction necessary is to be made by adjustment of the vertical jacking screws (not the isolator levelling screws). The horizontal thrust screws must not be adjusted. Any horizontal movement of the shaft is made by lowering one side whilst raising the other. The isolator levelling screws are then adjusted so that the weight is just relieved from the jacks as in step 12 (b). Withdraw the jacking screws.

15. An alignment indicator arm (supplied by others if required) may now be attached to the outer engine feet. This provides a readily available datum for future alignment checks.

FITTING THE CHOCKS:

16. The main seating chocks for fitting beneath the isolator soleplates should now be prepared and placed in position together with the isolator hold down bolts.

    When resin chocks are to be used, provision must be made by the shipyard to prevent the liquid resin from rising above the level of the underside of the isolator soleplates and the isolator hold down bolts are to be suitably greased.

17. When the chocks are set, secure the isolator hold down bolts and remove the levelling screws. The jacking blocks and end thrust screws and brackets if fitted may now be removed.

18. Fit the flexible drive coupling and flexible pipe connectors, and fill with oil and water.

19. Adjust the centre bolt in each isolator top so that the clearance 'AA' above the combined overload and rebound washer is as shown on our offset & alignment drawing. Securely tighten locknut on centre bolt after adjustment is complete. If required, coat the top of the centre bolts with a corrosion protection film or grease and seal the access holes in the engine feet with a polyethylene plug (supplied by others). The engine may now be run.

AFTER TRIALS:

20. After initial sea trials when the engine has been run at full load and been allowed to cool thoroughly, the shaft coupling alignment must be checked. Shakedown of about 0.7 mm (0.028 inch) is expected to occur and isolator hysteresis will prevent the alignment from returning to its original values. A position within + 0.5 mm of the revised alignment on each axis shown on our offset & alignment drawing should be found.

    Any adjustment necessary should be made either by fitting shims or by machining the proof plates between the engine mounting feet and the isolator tops. The jacking screws in the engine feet are used to first relieve the load on the proof plates to permit their removal. Care must be taken not to induce shear between the isolator top casting and the engine foot during this process.

21. The coupling alignment figures and the isolator heights should be measured for comparison with future measurements. Do not measure from the top of the isolator base casting. Either an average at the four corners of each isolator between machined surfaces, or the alignment indicator clearances should be recorded.

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PROBLEM SOLVING:

22. A number of difficulties have been found during installation of mountings for propulsion engines. Some guidance is given below which may assist, but in cases of doubt, please contact the Technical Department.

a) It is advisable to measure and record the isolator heights across the top and bottom faces at each corner before installing and to record the serial number and position of each. This enables us to determine the loads from our tests during manufacture, permitting faster resolution of installation and service problems.

b) The effect of production tolerances should be considered; variations in isolator stiffness, engine weight and centre of gravity position will usually result in variation of isolator compression at each position. The installation procedure should result in a gradual increase in isolator compression across the system. Total variations of more than about 4 mm are not expected and should be reported in case remedial action is necessary. The isolators may still be capable of functioning correctly, although the life of the system may be reduced.

c) Most installation problems result from incorrect sequence of levelling screw adjustment. Variations of loading must not be “rectified” by adjustment on only one or two isolators.

d) If the coupling alignment has changed during the installation, the quickest way of rectifying matters is usually to start again. The isolators show hysteresis which prevents the system returning to its original position if the direction of loading is reversed. By unloading the isolators and repositioning the engine on the jacks, the proper alignment can be reset.

Please contact our Technical Department at the address below if you have any problems relating to installation or selection.


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