



Confirmation of Product Type Approval

Please refer to the "Service Restrictions" shown below to determine if Unit Certification is required for this product.

This certificate reflects the information on the product in the ABS Records as of the date and time the certificate is printed.

Pursuant to the Rules of the American Bureau of Shipping (ABS), the manufacturer of the below listed product held a valid Manufacturing Assessment (MA) with expiration date of 29-JUN-2022. The continued validity of the Manufacturing Assessment is dependent on completion of satisfactory audits as required by the ABS Rules.

And; a Product Design Assessment (PDA) valid until subject to continued compliance with the Rules or standards used in the evaluation of the product.

The above entitle the product to be called Product Type Approved.

The Product Design Assessment is valid for products intended for use on ABS classed vessels, MODUs or facilities which are in existence or under contract for construction on the date of the ABS Rules used to evaluate the Product.

ABS makes no representations regarding Type Approval of the Product for use on vessels, MODUs or facilities built after the date of the ABS Rules used for this evaluation.

Due to wide variety of specifications used in the products ABS has evaluated for Type Approval, it is part of our contract that; whether the standard is an ABS Rule or a non-ABS Rule, the Client has full responsibility for continued compliance with the standard.

Product Name: Bearing, Water Lubricated Bearings
Model Name(s): Duramax DuraBlue

Presented to:
DURAMAX MARINE LLC
17990 Great Lakes Parkway
OH 44234
United States

Intended Service: Marine and Offshore Applications

Description: For use as rudder bushing, thrust washers, steering gear, stern tube bearing. Virtually no swelling in seawater, High strength-to-weight ration, self-lubricating formulation for dry running, Proprietary fiber matrix extending wear life, very low thermal coefficient of expansion.

Tier: 3

Ratings: Rudder Stock, Pintles, Steering Gear Bushings, stern tubes: Diameter: 25mm to 1070mm (1" to 42") Thrust Washers and Wear Pads Thickness: 1/8" to 3" Temperature Range: -29 °C to +93 °C; Maximum Nominal Bearing Pressure: 2176 psi (15 N/mm²) Basic Design Criteria for the Propeller Support Bearings are Maximum Bearing Pressure (P) not to exceed 0.60 N/mm², and for Bearing next to Propeller, the Length (L) not to be less than 2.0 times the required Tail Shaft Diameter as per the Rule Requirements.

Service Restrictions: Unit Certification is not required for this product. If the manufacturer or purchaser request an ABS Certificate for compliance with a specification or standard, the specification or standard, including inspection standards and tolerances, must be clearly defined. Acceptance on facilities with Ice Class Notations will be carried out on a case to case basis.

Comments: 1.The Manufacturer has provided a declaration about the control of, or the lack of

Asbestos in this product. 2. Bearings are to be installed in accordance with the manufacturer's recommendations and following points. For rudder bearings: The bearing length is to be not greater than 1.2 times the bearing outer diameter. For length/diameter ratios greater than 1.2 will be specially considered upon submission of calculations showing acceptable clearances at both ends of the bearing. In general, clearances are to be not less than 1.5 mm on diameter. Request of clearances less than 1.5 mm will be specially considered with the submission of documented evidence, such as manufacturer's recommendation on acceptable clearance, expansion allowance and satisfactory service history with reduced clearances. The bearing length of the rudder pintle is to be not less than 1.0 times the bearing outer diameter. The bearing pressure is to be in accordance with 3-2-14/Table 6. For aft (the next to and supporting the propeller) stern tube bearings: In general, the bearing length is to be not less than four (4) times the required tail-shaft diameter. However, such may be less than four times, but not less than two times the required tail shaft diameter, provided the bearing design is being substantiated by experimental tests to the satisfaction of ABS on a case by case basis.

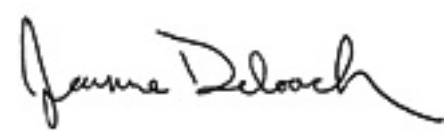
Notes / Documentation: Drawing No. DuraBlue Self-lubricating bushings document Drawing No. Type Approval DuraBlue Composite Rudder Bushing Test report Drawing No. 571690, Detailed Independent Report Drawing No. P-ENG-008, Rudder Bushing Test Plan and Procedure

Term of Validity: This Product Design Assessment (PDA) Certificate 17-HS1637367-PDA, dated 30/Jun/2017 remains valid until 29/Jun/2022 or until the Rules or specifications used in the assessment are revised (whichever occurs first). This PDA is intended for a product to be installed on an ABS classed vessel, MODU or facility which is in existence or under contract for construction on the date of the ABS Rules or specifications used to evaluate the Product. Use of the Product on an ABS classed vessel, MODU or facility which is contracted after the validity date of the ABS Rules and specifications used to evaluate the Product, will require re-evaluation of the PDA. Use of the Product for non ABS classed vessels, MODUs or facilities is to be to an agreement between the manufacturer and intended client.

ABS Rules: 2017 Steel Vessel Rules 1-1-4/7.7, 1-1-A3, 1-1-A4, 3-2-14/13.1, 3-2-14/15.1, 3-2-14/15.3 and 4-3-2/5.15.1 2017 Offshore Support Vessels Rules 1-1-4/7.7, 1-1-A3, 1-1-A4, 3-2-14/13.1, 3-2-14/15.1, 3-2-14/15.3 and 4-3-2/5.15.1 2017 Steel Vessels Under 90 Meters in Length Rules 1-1-4/7.7, 1-1-A3, 1-1-A4, 3-2-11/13.1, 3-2-11/15.1, 3-2-11/15.3 and 4-3-1/13.1.2 2017 High-Speed Craft Rules 1-1-4/11.9, 1-1-A2 and 1-1-A3, 3-2-8/13.1, 3-2-8/15.1, 3-2-8/15.3 and 4-3-1/13.1.2 2017 Yachts Rules 4-1-1/3.3, 1-1-A3, 1-1-A4,, 3-2-9/13.1, 3-2-9/15.1, 3-2-9/15.3 and 4-3-1/13.1.2 2017 Steel Vessels for Service on Rivers & Intracoastal Waterways 1-1-4/7.7, 1-1-A3, 1-1-A4, 4-2-1/11.1

National Standards:
International Standards:
Government Authority:
EUMED:
Others:

Model Certificate	Model Certificate No	Issue Date	Expiry Date
PDA	17-HS1637367-PDA	17-JUL-2017	29-JUN-2022



ABS Programs

ABS has used due diligence in the preparation of this certificate and it represents the information on the product in the ABS Records as of the date and time the certificate was printed. Type Approval requires Drawing Assessment, Prototype Testing and assessment of the manufacturer's quality assurance and quality control arrangements. Limited circumstances may allow only Prototype Testing to satisfy Type Approval. The approvals of Drawings and Products remain valid as long as the ABS Rule, to which they were assessed, remains valid. ABS cautions manufacturers to review and maintain compliance with all other specifications to which the product may have been assessed. Further, unless it is specifically indicated in the description of the product; Type Approval does not necessarily waive witnessed inspection or survey procedures (where otherwise required) for products to be used in a vessel, MODU or facility intended to be ABS classed or that is presently in class with ABS. Questions regarding the validity of ABS Rules or the need for supplemental testing or inspection of such products should, in all cases, be addressed to ABS.