

TYPE APPROVAL CERTIFICATE**This is to certify:****That the Rudder Bearing Bushing Material, Synthetic**with type designation(s)
Orkot® TLM Marine

Issued to

**Trelleborg Sealing Solutions Rotherham
Rotherham, United Kingdom**

is found to comply with

DNV GL class programme DNVGL-CP-0081 – Type approval – Synthetic bearing bushing materials**DNV GL rules for classification – Ships****DNV GL rules for classification – High speed and light craft****Application :****Maximum surface pressure 5.5 MPa for the synthetic bearing against steel, non-lubricated, maximum 10 MPa water, grease or oil lubricated. The Type Approval is valid only when the installation/application of the product is according to the DNV GL Rules and the Manufacturer's recommendations.****Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.**Issued at **Høvik** on **2017-04-25**for **DNV GL**This Certificate is valid until **2022-04-24**.DNV GL local station: **Manchester**Approval Engineer: **Gisle Hersvik****Martin Strande
Head of Section**

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid. The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.



Product description

Orkot® TLM Marine: A fibre reinforced thermosetting resin composite material with molybdenum disulphide and PTFE as additional lubricants.

Place of manufacture

Trelleborg Sealing Solutions Rotherham, Dodds Close, Badmarsh Business Park, Rotherham, South Yorkshire, S60 1BX, United Kingdom

Application/Limitation

Fields of Application;	<ul style="list-style-type: none">- Steering gear- Rudder neck bearings- Rudder pintle bearings- Rudder carriers- Stabilizer bearings
Lubricants;	<ul style="list-style-type: none">- Water, grease, oil- Self-lubrication (dry running)
Surface Pressure;	<ul style="list-style-type: none">- 10.0 MPa, maximum (lubricated)- 5.5 MPa, maximum (self-lubricated)
Max. service temperature;	<ul style="list-style-type: none">- 65°C
Installation;	<ul style="list-style-type: none">- Press fit- Freeze fit- Adhesive bonded- Mechanical retention
Dimensions;	<ul style="list-style-type: none">- As per DNV GL Rules and Manufacturer's recommendations.- Min – max diameters (OD): 50 – 2500 mm- Min – max thicknesses (WT): 8 – 120 mm- Optimum wall thickness, Ref. "Orkot® Marine Bearings Engineering Manual", Edition December 2016, pg. 10 (Design)

The Type Approval is valid only when the installation/application of the product is according to the specified DNV GL Rules and the Manufacturer's recommendations. Reference is made to Trelleborg Sealing Solutions' "Orkot® Marine Bearings Engineering Manual", Edition December 2016.

In accordance with DNV GL Rules for Ships, Pt.3 Ch.14, the bushing shall be effectively secured to the bearing.

Bushing fitted by means of shrink fitting alone is not considered effectively secured. Additional physical stoppers need to be arranged to prevent the bushing from accidentally rotating or shifting in vertical direction.

The maximum surface pressure of 10 MPa will be subject to evaluation w.r.t. service experience etc. in connection with renewal of the certificate.

Any significant changes in design and/or quality of the material will render the approval invalid.

Type Approval documentation

1. **Renewal of Type Approval Certificate No. S-7227 and KBZ 1199 HH.**

Job Id: **262.1-013900-2**
Certificate No: **TAS00000ZC**

2. Type Approval Assessment Report from DNV GL Manchester of 2016-12-05 and Type Approval Renewal Assessment Appendix – Trelleborg from DNV GL Manchester of 2016-12-05.
3. "Marine type approval documentation" for "Orkot TLM Marine" (V.2.0 – 13/03/2017).
4. TSSR evidence and supporting documentation.
5. Trelleborg Sealing Solutions' "Orkot® Marine Bearings Engineering Manual", Edition December 2016.
6. Application for Type Approval of 2012-09-25.
7. Survey Report from DNV Sheffield of 2012-09-20 and attachment dated 2012-09-19.
8. Letter from DNV Sheffield of 2008-09-30, incl. Engineering Manual.
9. Test Report "Extended wear and friction test on Orkot "TLM Marine" running against stainless steel", November 1995.

Tests carried out

Type Testing carried out according to **Type Approval documentation**.

Marking of product

Product/package shall be marked with *manufacturer's name*; **Trelleborg Sealing Solutions Rotherham, UK** or trademark and *type designation or type number identification*.

The marking is to be carried out in such a way that it is visible, legible and indelible. The marking of product is to enable traceability to the DNV GL Type Approval Certificate.

Periodical assessment

The scope of the Periodical Assessment is to verify that the conditions stipulated for the Type Approval is complied with and that no alterations are made to the product design or choice of materials.

Periodical Assessment to be performed after 2 and 3.5 years (Certificate Retention) and at renewal after 5 years (Certificate Renewal).

The main elements of the Periodical Assessment are to:

- Ensure that **Type Approval documentation** is available.
- Review design, materials, production process, and performance with respect to possible changes, in order to ensure compliance with **Type Approval documentation** and/or referenced material specifications.
- Ensure traceability between manufacturer's product marking and DNV GL Type Approval Certificate.

END OF CERTIFICATE