



# TYPE APPROVAL CERTIFICATE

Certificate No:  
**TAS00000ZC**  
Revision No:  
**1**

## This is to certify:

**That the Rudder Bearing Bushing Material, Synthetic**

with type designation(s)  
**Orkot® TLMM**

Issued to

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

is found to comply with

**DNV class programme DNV-CP-0081 – Type approval – Synthetic bearing bushing materials**  
**DNV rules for classification – Ships**  
**DNV 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 Rules and the Manufacturer's recommendations.**

**Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV.**

Issued at **Høvik** on **2022-04-25**

for **DNV**

This Certificate is valid until **2027-04-24**.

DNV local station: **UK & Ireland CMC & VMC**

Approval Engineer: **Gisle Hersvik**

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**Gustav Heiberg**  
**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.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV AS, its parent companies and their subsidiaries as well as their officers, directors and employees ("DNV") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to 300,000 USD.



## Product description

**Orkot® TLMM:** 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"><li>- Steering gear</li><li>- Rudder neck bearings</li><li>- Rudder pintle bearings</li><li>- Rudder carriers</li><li>- Stabilizer bearings</li></ul>
Lubricants:	<ul style="list-style-type: none"><li>- Water, grease, oil</li><li>- Self-lubrication (dry running)</li></ul>
Surface Pressure:	<ul style="list-style-type: none"><li>- 10.0 MPa, maximum (lubricated)</li><li>- 5.5 MPa, maximum (self-lubricated)</li></ul>
Max. service temperature:	<ul style="list-style-type: none"><li>- 65°C</li></ul>
Installation:	<ul style="list-style-type: none"><li>- Press fit</li><li>- Freeze fit</li><li>- Adhesive bonded</li><li>- Mechanical retention</li></ul>
Dimensions:	<ul style="list-style-type: none"><li>- As per DNV GL Rules and Manufacturer's recommendations.</li><li>- Min – max diameters (OD): 50 – 2500 mm</li><li>- Min – max thicknesses (WT): 8 – 120 mm</li><li>- Optimum wall thickness, Ref. "Orkot® Marine Bearings Engineering Manual", Edition February 2020, pg. 10 (Design)</li></ul>

The Type Approval is valid only when the installation/application of the product is according to the specified DNV Rules and the Manufacturer's recommendations. Reference is made to Trelleborg Sealing Solutions' "Orkot® Marine Bearings Engineering Manual", Edition February 2020.

In accordance with DNV 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. Type Approval Assessment Report from DNV Manchester of 2022-03-24, and Type Approval Renewal Assessment Appendix including ISO 9001-certificate, Trelleborg test results (ISO 604) etc.
2. Trelleborg Sealing Solutions' "Orkot® Marine Bearings Engineering Manual", Edition February 2020.
3. Trelleborg Sealing Solutions' "Orkot® TXMM and TLMM", Brochure (2009).
4. Trelleborg Sealing Solutions' "Orkot® TLM & TXM Marine Bearings", Brochure (2019).
5. Application for Type Approval of 2022-02-22.
6. Renewal of Type Approval Certificate No. S-7227 and KBZ 1199 HH.
7. 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.
8. "Marine type approval documentation" for "Orkot TLM Marine" (V.2.0 – 13/03/2017).
9. TSSR evidence and supporting documentation.



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10. Trelleborg Sealing Solutions' "Orkot® Marine Bearings Engineering Manual", Edition December 2016.
11. Application for Type Approval of 2012-09-25.
12. Survey Report from DNV Sheffield of 2012-09-20 and attachment dated 2012-09-19.
13. Letter from DNV Sheffield of 2008-09-30, incl. Engineering Manual.
14. 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 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 assessments (for Certificate Retention / Certificate Renewal) shall be performed according to DNV-CP-0338.

This certificate is only valid if required Periodical assessments are carried out with satisfactory results. To check the validity of this certificate, please look it up in <https://approvalfinder.dnv.com>

END OF CERTIFICATE