

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Rudder Bearing Bushing Material, Synthetic**with type designation(s)
THORDON XL

Issued to

Thordon Bearings Inc.
Burlington ON, Canada

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****DNV GL rules for classification – Inland navigation vessels****DNV GL rules for classification – Yachts****DNV GL rules for classification – Naval vessels****DNV GL rules for classification – Offshore units****Application :****Max. surface pressure 5.5 MPa for the synthetic bearing against steel, water, grease or oil lubricated. The Type Approval is valid only when the installation/application of the product is according to the specified 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 **2017-12-20**This Certificate is valid until **2022-12-19**.DNV GL local station: **Montreal**for **DNV GL**Approval Engineer: **Helene Munkhaugen**

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

THORDON XL: Elastomeric Rudder Bearing Bushing Material.

Place of manufacture

Thordon Bearings Inc., 3225 Mainway, Burlington, Ontario L7M 1A6, Canada

DNV GL local office: Montreal

Responsibility

The Company (stated on the front page of this Certificate) takes the responsibility that both design and production are in compliance with Rules, Standards and/or Regulations listed on page 1 of this certificate.

Application/Limitation

Fields of Application;	- Steering gears - Rudder stock bearings - Rudder pintle bearings - Rudder carrier bearings (rudder carrier bearing and rudder carrier disc) - Stabilizer bearings
Lubricants;	- Water, grease, oil
Surface Pressure;	- 5.5 MPa, maximum (wet)
Max. service temperature;	- +60°C (wet)
Installation;	- Press fit - Interference freeze fit - Adhesive bonded with TG-75 (or equivalent adhesive) Axial retention is required for press fit and interference fit installation.
Dimensions;	- As per DNV GL Rules and Manufacturer's recommendations. - Min – max diameters (OD): 35 mm - 3000 mm - Min – max thicknesses (WT): 8 – 120 mm - Minimum wall thickness (interference installation): Thordon Engineering Manual Version E2006.1, Figure 15 "Wall thickness guide" -page 18

Single and multiple segment sleeve bush bearings (cylindrical form) are approved for upper, middle and lower rudder stock, pintle, rudder carrier disc and rudder carrier bearing, steering gear, stabilizer.

Staves are approved for neck and pintle bearings, provided the lubrication and environmental conditions are kept stable.

Instruction for mounting of bushing with necessary pressfit to be supplied. Bonding with TG-75 or equivalent adhesive in accordance with Thordon Marine Bearing Installation Manual.

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 TBI's Engineering/Design Manual.

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

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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.

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

Type Approval documentation

Tests carried out

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

Marking of product

Product or packaging shall be marked with *manufacturer's name, type designation, bearing main dimensions, batch number and place of production*.

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 years and 3.5 years (Certificate Retention) and at renewal after five (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 the DNV GL Type Approval Certificate.

END OF CERTIFICATE