DNV·GL

Certificate No:
TAS00001FT

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Rudder Bearing Bushing Material, Synthetic

with type designation(s)
TL-III

Issued to
Shanghai Poly Science and Technology Development Co., Ltd.
Shanghai, China

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 10 MPa for the synthetic bearing against steel, water 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. The swelling properties of the bushing material to be considered.

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

Issued at **Høvik** on **2018-07-03**
This Certificate is valid until **2023-07-02**.
DNV GL local station: **Shanghai**

Approval Engineer: **Gisle Hersvik**

for **DNV GL**

Rikard Törnqvist
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.

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Product description

TL-III Rudder Bearing Bushing Material; A modified monomer casting polyamide, made by high-molecular weight polyamide with lubricating and anti-wear additives.

Application/Limitation

Fields of Application;	- Rudder neck bearings - Rudder pintle bearings
Lubricants;	- Water, oil
Surface Pressure;	- 10.0 MPa, maximum (lubricated)
Max. service temperature;	- 90°C
Installation;	- Press fit - Freeze fit - Adhesive bonded
Dimensions;	- As per DNV GL Rules and Manufacturer's recommendations. - Min – max diameters (OD): 50 – 2000 mm - Min – max thicknesses (WT): 8 – 300 mm - Minimum wall thickness, ref. Engineering Manual, "Tian Long" synthetic rudder bearing bushing materials (Oct 1st 2015) (pg. 2).

Remarks;
- The material is classified as swelling type with water swelling properties close to 3%, hence swelling of the material must be considered w.r.t. installation clearances and operational clearances.
- Retention of strength after 4 weeks of immersion in seawater at 20°C is 72% (requirement is min. 80%), and the corresponding minimum Compressive Strength is 86 MPa (mean - 2st.dev.).
- Area of application will be evaluated during approval of classified objects if the surface pressure exceeds 5.5 MPa, and/or for dry-running (non-lubrication) applications.

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 Shanghai Poly Science&Technology Development Co., Ltd.'s Engineering Manual, "Tian Long" synthetic rudder bearing bushing materials (Oct 1st 2015).

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

Tests carried out

Type Testing carried out in accordance with **Type Approval documentation**.

Marking of product

Product shall be marked with *manufacturer's name*; **Shanghai Poly Science & Technology Development Co., Ltd., China**, or *short name*; **Shanghai poly** and *type designation;* **TL (TL-III)**.

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 the DNV GL Type Approval Certificate.

END OF CERTIFICATE