

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Torsional Vibration Dampers**with type designation(s)
RB Damper

Issued to

**Vulkan Kupplungs- und Getriebebau Bernhard Hackforth
GmbH & Co. KG
Herne, Nordrhein-Westfalen, Germany**

is found to comply with

DNV GL rules for classification – Ships**DNV GL rules for classification – High speed and light craft****Application :****Product(s) approved by this certificate is/are accepted for installation on all vessels classed
by DNV GL.**Issued at **Hamburg** on **2018-11-06**This Certificate is valid until **2023-11-05**.DNV GL local station: **Essen**for **DNV GL**Approval Engineer: **Stanislav Avanesov**

**Burkhard Lilienthal
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

Leaf spring damper

Alternative place of production

WUXI VULKAN Technologies Co., Ltd.
Xinzhou Road I Lot 93D-3 in Wuxi Science & Technology Industrial Park
Jiangsu Prov. 214028
P.R. China

Application/Limitation

The type approval is valid for all dampers of similar design as those two mentioned (below) in the type approval documentation, provided that the following conditions are fulfilled:

Type Approval documentation

Tests carried out

Marking of product

Manufacturer's name or trade mark. Type number designation.

Periodical assessment

For retention of the Type Approval, a DNVGL surveyor shall perform a survey after 2 and 3,5 years after issue of certificate to verify that the conditions of the Type Approval are complied with.

The objective of the Periodical Assessment is to verify that the conditions for the Type Approval are not altered since the Type Approval Certificate was issued. The main scope of the Periodical Assessment will normally include:

- Verification of the Type Approval applicant's production and quality system w.r.t. ensuring continued consistent production of the Type Approved products at the Type Approval applicant's own premises and at other companies that are given the responsibility for manufacturing of the products.
- Review of the Type Approval documentation and that this is still used as basis for the production
- Review of possible changes to the design, the material and the performance of the product
- Verification of the product marking.

In cases where the Type Approved product is manufactured at other companies, the Periodical Assessment shall verify that the Type Approval applicant has a quality control system for consistent production at their licensees/subcontractors. Furthermore Periodical Assessment shall be carried out randomly at these companies.

When a Type Approved product is manufactured at other companies, the Type Approval applicant takes the sole responsibility for the conformity of the product to the applicable requirements.

Other conditions

Vulkan is to provide DNV as early as possible with the following data for each application:

- Mass moment of inertia (kgm^2) of outer part
- Mass moment of inertia (kgm^2) of inner part
- Twist angle (degrees) when reaching buffers
- Elastic torque (kNm) when reaching buffers considering max permissible wear
- Static torsional stiffness (kNm/rad)

Job Id: **262.1-006770-5**
Certificate No: **TAM00000ZJ**

- Dynamic torsional stiffness (kNm/rad), if measured
- Damping coefficient (kNms/rad), target value
- Damping coefficient (kNms/rad), measured value
- Permissible twist angle (degrees) for continuous operation
- Permissible twist angle (degrees) for transient operation, if applicable
- Crest value for damping torque depending on oil pressure (kNm/bar)
- Permissible power loss (kW)
- Required oil flow (l/min) corresponding to permissible power loss
- Max permissible wear (mm or degrees) of grooves and spring tips

Each application means:

A damper developed as a standard damper for a specific engine type. Only in the case of alterations new data need to be forwarded.

For a two-stroke application where the damper is provided for protection of the intermediate shaft, the data have to be forwarded for each case (except further sister vessels).

Appendix A dated 2004-06-02

Appendix B dated 2004-07-19

END OF CERTIFICATE