DNV·GL

Certificate No:
TAM000005U

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Torsional Vibration Dampers

with type designation(s)
AA, AU, GG, HA, HB, HE, ND, AP, AM, HV, AL

Issued to
Hasse & Wrede GmbH
Berlin, Germany

is found to comply with
DNV GL rules for classification – Ships
DNV GL rules for classification – High speed and light craft

Application :

The approval is valid for dampers used in propulsion and auxiliary engines.

The products approved by this certificate is accepted for installation on all vessels classed by DNV GL.

This Certificate is valid until **2021-02-14**.

Issued at **Høvik** on **2016-02-15**

for **DNV GL**

DNV GL local station: **Essen**

Approval Engineer: **Vidar Johansen**

Oddvar Deinboll
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

Viscous torsional vibration damper/Visco-Damper

Viscous damper definition:

A ring in a housing where the ring is connected to the housing by means of bearings and silicone oil only.

Places of production

Other production facilities than the certificate holder, which are using the same quality control documents and thereby covered by this type approval:

Hasse & Wrede North America, North Aurora, USA
Hasse & Wrede CVS Dalian, China Ltd.

Application/Limitation

The approval is valid for dampers to be used in propulsion and auxiliary engines and is based on the following main data:

Damper data given in "DNV - Verification - list" dated Okt. 2011 , Rev. 3 and corresponding CB-diagrams (received with e-mail from Hasse & Wrede dated 07-09-07).

Sizes not mentioned in the above mentioned list are also covered by this type approval, provided that the following data is submitted on individual basis:

Damper data:

DNV GL shall be provided with the following data:
- Damper type and ASK no.
- Engine manufacturer and type
- Diameter and width [mm]
- Ring inertia [kgm^2]
- Housing inertia [kgm^2]
- Damper (ring) area [m^2]
- Type of bearing
- Welded or bolted design
- Sample plug for visc. testing or not
- CB-diagram ("jelly" stiffness and damping coefficient as a function of vibr. frequency)[1)]
- Permissible damping power [kW] or [kW/m^2] as a fuction of engine speed[2)]

Hasse & Wrede is to keep DNV GL updated on any changes in the above data.

Unless otherwise stated, the viscosity tolerance ranges are:
New : max. –7.5 % to + 7.5 % of nominal value
Old : max. - 30 % to + 10 % of nominal value

For engines in DNV GL classed vessels:
The above mentioned data (stated by Hasse & Wrede) are to be conveyed to DNV GL by Hasse & Wrede or the engine manufacturer. Hasse & Wrede is to inform the engine manufacturer about this committment.

- For engines (typically 4 stroke) using standard dampers (even if other types are optional) this specification is needed once per engine type only.
- For plants (typically direct coupled 2 stroke plants) using tailor-made dampers (for a specific propeller & shafting) this specification is needed for each application (except sister ships).

Verification of damping

For engines using standard dampers the damping properties are to be verified once per engine series by measuring front end displacement amplitudes (using encoder technique) in a relevant speed range. In this context engine series are e.g. in-line engines (5-9 cylinders) or V-engines (≥ 12 cylinders). This should preferably be made during an engine workshop testing, but may also be made onboard. Measurements made prior to this type approval may also be accepted.

For dampers used for shaftline protection (direct coupled 2 stroke plants) the damping is to be verified for the first ship in a series of sisterships by measuring intermediate shaft strain and/or front end displacement amplitudes (encoder). Exclusion of the propeller damping may be made by calculations after having determined the phase angle between shaft torque and propeller displacement.

Type Approval documentation
Other conditions

Damper data for dampers not mentioned in the above mentioned Table to Visco-Damper Types or in the ASK-Nummernverzeichnis shall be submitted to DNV GL Høvik (att. MCANO373 Machinery) either direct from Hasse & Wrede GmbH or via the local DNV GL Station.

Marking of product

The dampers are to be marked with the manufacturer’s name or trademark and serial number.

Periodical assessment

For retention of the Type Approval, a DNV GL surveyor shall perform a survey every second year and before the expiry date of this 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.

END OF CERTIFICATE