SHAFT ALIGN CLASS NOTATIONS

DNV GL offers optional class notations Shaft align(1) and Shaft align(2) to meet market demand and provide customized requirements for evolving design trends and installations.

Prescriptive approach to shaft alignment
The two shaft align class notation options from DNV GL - Shaft align(1) and Shaft align(2) - are intended to enhance propeller shaft bearing performance for oil lubricated systems.

Shaft align(1) is a basic option intended for propulsion systems installed on vessels with conventional hull forms and facilitates enhanced aft bearing performance during normal and turning operating conditions.

The following key requirements for the Shaft align(1) class notation apply:
- Multi-sloped aft bearing is mandatory
- Increased propeller bending moment ranging from -30 to +30% MCR torque in the aft bearing loading criteria
- State-of-the-art measurement techniques for installation sighting (laser or equivalent)
- Means of warning for propeller immersion

Shaft align(2) is intended for propulsion systems requiring additional calculations to estimate hydrodynamic propeller loads during turning conditions. Typical installations are vessels with non-conventional hull forms such as asymmetric stern and twin skeg.

The following key requirements for the Shaft align(2) class notation apply:
- Design-specific hydrodynamic propeller load spectrum and transient forces (using CFD)
- FE analysis for transient bearing contact pressure and area
- Hull deflections where applicable
- Shaft align(1) requirements apply as the basic criteria
**Predominant design philosophy - transient turning margins**

The shaft alignment class notations put additional focus on the impact of transient hydrodynamic propeller forces and moments induced in turning conditions on the aft-most propeller shaft bearing. This is aided by a mandatory requirement for a multi-sloped aft bearing, coupled with an additional aft bearing lubrication evaluation criteria, with an increased propeller bending moment acting downwards on the bearing.

Compared to a single-sloped bearing, a multi-sloped design assists to better optimize the shaft-to-bearing contact area and surface pressure in all operating conditions, considering the hydrodynamic propeller loads.

For Shaft align(2), input from CFD-aided prediction of hydrodynamic propeller moments and forces acting on the aft bearing are used in conjunction with the FE analysis to estimate the bearing surface pressure and contact area. DNV GL class guidelines linked to the rules provide guidance on the criteria to be followed in this regard. Refer to DNV GL rules for classification, Ships (Jan 2018, Pt.6 Ch.2 Sec.10) for more details.

**Your advantages with a shaft alignment class notation from DNV GL:**
- Customized design criteria beyond generic class requirements
- Enhanced design and operating margins for continuous and transient (turning) operation
- Operators are able to reflect enhanced installations (class notations) in vessel’s certificates
- Provisions for warning against typical risks, e.g. inadvertent operation with incomplete propeller immersion
- Follow-up during operation is seamlessly integrated in the annual surveys

Figure 1 - Mapping of bearing contact pressure, using FE analysis for Shaft align(2)