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Ships and marine technology — Model test method for propeller cavitation noise evaluation in ship design —

Part 1: Source level estimation

Navires et technologie maritime — Méthode d'essai sur modèle pour évaluer le bruit de cavitation des hélices dans la conception des navires —

Partie 1: Estimation du niveau d'émission de la source

Reference number
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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, SC 8, *Ship design*.

Introduction

In order to reduce shipping noise, the characteristics of ship noise should be understood. Propeller noise, which is the major noise source in commercial ships, is mainly due to its turns as spectral harmonics and to cavitation as broadband noise. Special ships such as fishery research vessels and military vessels require quiet propellers with less or no cavitation in their operating conditions.

The propeller cavitation noise can be assessed by experimental and/or numerical methods in the propeller design stage. The numerical method such as CFD or empirical formulae might be a good alternative to propeller cavitation noise evaluations. However, the model tests are still used widely to predict the full-scale acoustic source strength of the propeller cavitation for a wide range of frequencies.

This document was developed to provide a standardized model test method for propeller cavitation noise evaluation. This document is aimed for appropriate evaluation of the propeller cavitation noise characteristics at the early design phase via model tests.

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1 Scope

This document specifies a model test method for propeller cavitation noise evaluation in ship design.

The procedure comprises reproduction of noise source, noise measurements, post processing and scaling. The target noise source is propeller cavitation. Thus, this document describes the test set-up and conditions to reproduce the cavitation patterns of the ship based on the similarity laws between the model and the ship. The propeller noise is measured at three stages. The measurement targets for each stage are propeller cavitation noise, background noise, and transmission loss. For the source level evaluations, corrections for the background noise and the transmission loss are applied to the measured propeller cavitation noise. Finally, the full-scale source levels are estimated from the model scale results using a scaling law.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 17208-1:2016, *Underwater acoustics — Quantities and procedures for description and measurement of underwater sound from ships — Part 1: Requirements for precision measurements in deep water used for comparison purposes*

IEC 61260, *Electroacoustics — Octave-band and fractional-octave-band filters*

ITTC — Recommended Procedures and Guidelines 7.5-02-01-05: *Model scale propeller cavitation noise measurements*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
acoustic centre
position where all the noise sources are co-located as a single point source

Note 1 to entry: The acoustic centre is the centre of the expected cavitation extent.

3.2
background noise
noise from all sources other than the source under test