INTERNATIONAL STANDARD

ISO 19030-1

First edition
2016-11-15

Ships and marine technology — Measurement of changes in hull and propeller performance —

Part 1: General principles

Navires et technologie maritime — Mesurage de la variation de performance de la coque et de l'hélice —

Partie 1: Principes généraux

Reference number
ISO 19030-1:2016(E)

© ISO 2016



COPYRIGHT PROTECTED DOCUMENT

© ISO 2016, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

 © ISO 2016 – All rights reserved

Contents

Page

Foreword ... **iv**

Introduction ... **v**

1 Scope ... **1**

2 Normative references ... **1**

3 Terms and definitions ... **1**

4 General principles ... **2**
4.1 Hull and propeller performance ... 2
4.2 Ship propulsion efficiency and total resistance ... 3
4.3 Primary parameters when measuring changes in hull and propeller performance ... 4
4.4 Secondary parameters ... 5
4.5 Measurement procedures ... 5
4.5.1 General ... 5
4.5.2 Data acquisition ... 6
4.5.3 Data storage ... 6
4.5.4 Data preparation ... 6

5 Performance indicators ... **6**
5.1 Dry-docking performance: Change in hull and propeller performance following present out-docking as compared with the average from previous out-dockings ... 7
5.2 In-service performance: The average change in hull and propeller performance over the period following out-docking to the end of the dry-docking interval ... 8
5.3 Maintenance trigger: Change in hull and propeller performance from the start of the dry-docking interval to a moving average at any chosen time ... 9
5.4 Maintenance effect: Change in hull and propeller performance measured before and after a maintenance event ... 10

6 Measurement uncertainties and the accuracy of the performance indicators ... **11**

Annex A (informative) **Method and assumptions for estimating the uncertainty of a performance analyses process** ... **13**

Bibliography ... **30**

© ISO 2016 – All rights reserved

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on 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.

The committee responsible for this document is ISO/TC 8, *Ships and marine technology*, Subcommittee SC 2, *Marine environment protection*.

A list of all parts in the ISO 19030 series can be found on the ISO website.

© ISO 2016 – All rights reserved

Introduction

Hull and propeller performance refers to the relationship between the condition of a ship's underwater hull and propeller and the power required to move the ship through water at a given speed. Measurement of changes in ship specific hull and propeller performance over time makes it possible to indicate the impact of hull and propeller maintenance, repair and retrofit activities on the overall energy efficiency of the ship in question.

The aim of the ISO 19030 series is to prescribe practical methods for measuring changes in ship specific hull and propeller performance and to define a set of relevant performance indicators for hull and propeller maintenance, repair and retrofit activities. The methods are not intended for comparing the performance of ships of different types and sizes (including sister ships) nor to be used in a regulatory framework.

The ISO 19030 series consists of three parts.

— ISO 19030-1 outlines general principles for how to measure changes in hull and propeller performance and defines a set of performance indicators for hull and propeller maintenance, repair and retrofit activities.

— ISO 19030-2 defines the default method for measuring changes in hull and propeller performance and for calculating the performance indicators. It also provides guidance on the expected accuracy of each performance indicator.

— ISO 19030-3 outlines alternatives to the default method. Some will result in lower overall accuracy but increase applicability of the standard. Others may result in same or higher overall accuracy but include elements which are not yet broadly used in commercial shipping.

The general principles outlined, and methods defined, in the ISO 19030 series are based on measurement equipment, information, procedures and methodologies which are generally available and internationally recognized.

© ISO 2016 – All rights reserved

Ships and marine technology — Measurement of changes in hull and propeller performance —

Part 1: General principles

1 Scope

This document outlines general principles for the measurement of changes in hull and propeller performance and defines a set of performance indicators for hull and propeller maintenance, repair and retrofit activities.

The general principles outlined and performance indicators defined are applicable to all ship types driven by conventional fixed pitch propellers, where the objective is to compare the hull and propeller performance of the same ship to itself over time.

NOTE Support for additional configurations (e.g. variable pitch propellers) will, if justified, be included in later revisions of this document.

2 Normative references

There are no normative references in this document.

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
hull and propeller performance
relationship between the condition of a ship's underwater hull and propeller and the power required to move the ship through water at a given speed

3.2
delivered power
P_D
power delivered to the propeller (propeller power)

3.3
speed through the water
V
ship's speed through water for a given set of service (environmental) and loading (displacement/trim) conditions

© ISO 2016 – All rights reserved

3.4
accuracy
described by trueness and precision, where trueness refers to the closeness of the mean of the measurement results to the actual (true) value and precision refers to the closeness of agreement within individual results

Note 1 to entry: See ISO 5725-1:1994, 3.6 and Introduction 0.1.

3.5
uncertainty
probability that the measurement of a quantity is within the specified accuracy to that quantity's actual (true) value

3.6
filtering
method of removing unwanted data

3.7
normalization
refers to the creation of shifted and scaled versions of statistics, where the intention is that these normalized values allow the comparison of corresponding normalized values in a way that eliminates the effects of specific influences

3.8
performance indicators
PIs
used to evaluate the effectiveness of, or to trigger, a particular activity

3.9
dry-docking
bringing the ship onto dry land to maintain, repair and/or retrofit the parts of the hull that are submerged while the ship is in service

3.10
out-docking
period immediately following a dry-docking

3.11
dry-docking interval
period between two consecutive dry-dockings

4 General principles

4.1 Hull and propeller performance

Hull and propeller performance refers to the relationship between the condition of a ship's underwater hull and propeller and the power required to move the ship through water at a given speed. Hull and propeller performance is related to variations in power, because ship hull resistance and propeller efficiency are not directly measurable quantities.

© ISO 2016 – All rights reserved