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Pumps - Rotodynamic pumps - Minimum required efficiency of water pumps and determination of Minimum Efficiency Index (MEI)

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 16480:2021 sisaldab Euroopa standardi EN 16480:2021 ingliskeelset teksti.	This Estonian standard EVS-EN 16480:2021 consists of the English text of the European standard EN 16480:2021.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 13.10.2021.	Date of Availability of the European standard is 13.10.2021.
Standard on kättesaadav Eesti Standardimis- ja Akrediteerimiskeskusest.	The standard is available from the Estonian Centre for Standardisation and Accreditation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

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EUROPEAN STANDARD

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English Version

Pumps - Rotodynamic pumps - Minimum required efficiency of water pumps and determination of Minimum Efficiency Index (MEI)

Pompes - Pompes rotodynamiques - Rendement minimal requis des pompes à eau et détermination de l'Indice de rendement minimal (MEI)

Pumpen - Kreiselpumpen - Geforderte Mindesteffizienz für Wasserpumpen sowie Bestimmung des Minimum Effizienz Indexes (MEI)

This European Standard was approved by CEN on 11 July 2021.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (EN 16480:2021) has been prepared by Technical Committee CEN/TC 197 “Pumps”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2022, and conflicting national standards shall be withdrawn at the latest by April 2022.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 16480:2016.

The main changes compared to the previous edition are as follows:

— the title and scope have been modified by the removal of the verification aspect throughout this document;

— Clause 3 on Terms and Definitions has been modified;

— Clause 6 on the determination of the Efficiency of a Test Pump has been updated;

— informative Annex D dealing with methods recommended for manufacturers to determine the mean values of hydraulic quantities of a size relevant for MEI has been deleted;

— informative Annex E giving a numerical example and informative Annex F describing the application of mathematical statistics on tests have been deleted;

— informative Annexes G, H and I, dealing with measurement uncertainties, the methodology of the verification procedure and the reporting of test results, respectively, have been deleted;

— the Annex ZA showing the relationship between this European Standard and the Ecodesign requirements of Commission Regulation (EU) No 547/2012 has been updated.

This document has been prepared under a Standardization Request given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s) / Regulation(s).

For relationship with EU Directive(s) / Regulation(s), see informative Annex ZA, which is an integral part of this document.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

Purpose and content of this document

The water pumps within the scope of this document are typically produced and sold by pump manufacturers as series of large to very large numbers. The performance characteristics of pumps of one size produced by a manufacturer show some scatter caused by manufacturing tolerances but are described by mean values and curves which represent that size.

The total consumption of electric energy by water pumps installed in applications within the scope of this document depends on the total number of installed pumps of each size and on its mean efficiency. The quality of a size in respect to its mean efficiency is quantitatively described by the Minimum Efficiency Index (MEI) which is defined and used in this document. To achieve a certain value of the Minimum Efficiency Index (MEI), a corresponding minimum value of the mean efficiency of a size is required.

This document defines – for each pump type and size within the scope of this document - the minimum required value of efficiency regarding a certain value of the Minimum Efficiency Index (MEI).

Normally, the qualification of a pump size for a certain MEI value done by the manufacturer will be based on tests and evaluations made on a sample of pumps of this size. Tests and evaluations carried out for the purpose of qualifying the corresponding size should fulfil certain requirements:

— From the tests on the sample pumps, it becomes possible to predict for the corresponding size the confidence intervals within which the true mean values of efficiencies which are relevant for the qualification are enclosed with a sufficiently high probability. Only in that way, the qualification of the size in respect to a required and/or indicated value of Minimum Efficiency Index (MEI) will ensure that the aspired effect of energy saving will be reached;

— This document provides manufacturers with a test procedure which confidently provides the MEI value which is representative of the pump size.

Caused by technical alignment procedures of the single pump components e.g. bearings or shaft seals the performance of the pump is gained after a certain running-in time.

Ways to prove the Minimum Efficiency Index (MEI) of a pump size

This document describes different ways how manufacturers can achieve the qualification of a pump size for a certain value of the Minimum Efficiency Index (MEI)

The MEI value shall be based on the mean value of the type series. Annex C describes methods to determine the mean value of MEIs and their confidence intervals.

A test to determine MEI-values on pumps of the size in question according to the requirements given in 6.2 to 6.4 of this document as well as evaluations as described in 6.5 of this document needs application of the methodology and procedure described in Clause 5 of this document.

Relevance of clauses of this document for qualification

Clause 5 describes nominal values of minimum required efficiency for a certain value of the Minimum Efficiency Index (MEI) and is generally relevant when applying this document.

Clause 6 specifies test procedures, test conditions and evaluations and has to be applied to determine mean values of a size by tests on sample pumps of a certain size.

Clause 7 describes the procedure to be applied by a manufacturer in order to determine particular threshold values of efficiency for a certain value of the Minimum Efficiency Index (MEI) of a size and to prove the justification of this MEI value by the fulfilment of criteria for the mean efficiency values.

1 Scope

This document specifies performance requirements (methods and procedures for testing and calculating) for determining the Minimum Efficiency Index (MEI) of rotodynamic glanded water pumps for pumping clean water, including where integrated in other products.

The pump types and sizes covered by this document are described in the Annex A. These pumps are designed and produced as duty pumps for pressures up to 16 bar for end suction pumps and up to 25 bar for multistage pumps, for all pumps designed for fluid temperatures between −10 °C and +120 °C. Also covered are 4" (10,16 cm) and 6" (15,24 cm) submersible multistage pumps designed for fluid temperatures between 0 °C and 90 °C.

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.

EN ISO 9906:2012, *Rotodynamic pumps — Hydraulic performance acceptance tests — Grades 1, 2 and 3 (ISO 9906:2012)*

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 https://www.electropedia.org/

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

3.1 List of quantities with definitions[1)]

3.1.1
reynolds number
dimension less number that gives a measure of the ratio of inertial forces to viscous forces and consequently quantifies the relative importance of these two types of forces for given flow conditions; in this document, it is defined by the relation:

$$\mathrm{Re} = \frac{D_{\mathrm{imp}} \cdot u}{\nu}$$

where u is the peripheral velocity at the outer impeller diameter D_{imp}

3.1.2
(volume) rate of flow
external rate of flow of the pump, i.e. the rate of flow discharged into the pipe from the outlet branch of the pump

Note 1 to entry: Losses or abstractions inherent to the pump, i.e.:

— discharge necessary for hydraulic balancing of axial thrust;

1) 3.1 gives specific definitions of terms - in deviation of EN ISO 9906:2012 - used in this document, together with any associated symbols which have been allocated and is based on ISO 80000.