PUMBAD. VEE TSENTRIFUGAALPUMPADE MINIMAALNE NÕUTAV JÕUDLUS

Pumps - Minimum required efficiency of rotodynamic water pumps

EESTI STANDARDIKESKUS
ESTONIAN CENTRE FOR STANDARDISATION

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 16480:2016 sisaldab Euroopa standardi EN 16480:2016 ingliskeelset teksti.	This Estonian standard EVS-EN 16480:2016 consists of the English text of the European standard EN 16480:2016.
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.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 18.05.2016.	Date of Availability of the European standard is 18.05.2016.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

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 - Minimum required efficiency of rotodynamic water pumps

Pompes - Rendement minimum requis des pompes à eau rotodynamiques

Pumpen - Geforderte Mindesteffizienz bei Kreiselpumpen für Wasser

This European Standard was approved by CEN on 4 March 2016.

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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

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European foreword

This document (EN 16480:2016) has been prepared by Technical Committee CEN/TC 197 “Pumps - Minimum required efficiency of rotodynamic water 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of an identical text or by endorsement, at the latest by November 2016, and conflicting national standards shall be withdrawn at the latest by November 2016.

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

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive 2009/125/EC.

For relationship with EU Directive 2009/125/EC, see informative Annex ZA, which is an integral part of this document.

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

Introduction

Purpose and content of the standard

The water pumps within the scope of this European Standard 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 European Standard 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 standard. 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 European Standard defines – for each pump type and size within the scope of the standard - the minimum required value of efficiency depending on the value of the Minimum Efficiency Index (MEI). Also, this standard prescribes how the value of the Minimum Efficiency Index (MEI) of a pump size indicated by the manufacturer can be verified by an independent institution (e.g. in the frame of market surveillance). For the manufacturer of the pump size it is generally left free how to prove the indicated value of the Minimum Efficiency Index (MEI) of a size. Nevertheless, this standard describes also a method to prove by the manufacturer that the mean values of efficiency meet the requirements for indicating 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. It is essential that tests and evaluations carried out for the purpose of qualifying the corresponding size 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 make sure that the aspired effect of energy saving will be reached.

— If a pump size has been qualified according to the criteria described in this European Standard, every test on one or more test pump(s) of the same size (with a full impeller diameter) which is carried out in the frame of a verification procedure shall result with a very high probability in a confirmation of the qualification.

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 and to verify the Minimum Efficiency Index (MEI) of a pump size

This European Standard describes different ways how manufacturers can achieve the qualification of a pump size for a certain value of the Minimum Efficiency Index (MEI) and how this qualification can be verified by an independent institution.

For the manufacturer, it is generally left free to choose and apply appropriate methods to prove that the mean efficiency values of a size are at least equal to or higher than particular threshold values of efficiency. These particular threshold values of efficiency are related to the value of the Minimum Efficiency Index (MEI) to be indicated for the size. The way to determine these values of efficiency is described in this standard. If the way chosen by the manufacturer to prove the MEI value of a size deviates from the way mentioned in the next paragraph, the manufacturer has to document all tests, evaluations and/or calculations which are carried out and the methods which are applied to prove the justification of the indicated MEI value.

If the manufacturer decides to determine the mean performance values of the size by one of the methods described in Annex D of this standard, he has to carry out tests according to the requirements given in Annex C of this standard and evaluations as described in Annex C of this standard and to prove – as described in Clause 7 of this standard – that the criteria for the achievement of a certain value of the Minimum Efficiency Index (MEI) of the size are fulfilled. The test conditions, the results of test evaluation and the fulfilment of the criteria are documented and stored. The time period to keep documentation available for the authorities to prove conformity is fixed by the legal text.

The independent institution carries out tests on pumps of the size in question according to the requirements given in 5.2 to 5.4 of this standard as well as evaluations as described in 5.5 of this standard and applies the methodology and procedure described in Clause 4 of this standard.

For an independent institution, two ways are possible and specified by this standard to verify the value of Minimum Efficiency Index (MEI) indicated by the manufacturer:

a) If the documentation of the qualification is presented by the manufacturer to the independent institution on request, the procedure of verification executed by the independent institution is based on the documentation of tests and evaluations done and documented by the manufacturer. In this case, the documentation will be checked by the independent institution in respect to being in accordance with requirements and criteria given in this standard.

b) If no documentation is presented by the manufacturer on request or if the documentation presented by the manufacturer on request is not accepted as proof of the indicated value of MEI, the independent institution carries out tests on pumps of the size in question according to the requirements given in Annex C of this standard as well as evaluations as described in 5.5 of this standard and applies the methodology and procedure described in Clause 4 of this standard.

Relevance of Sections of this standard for manufacturers or independent institutions

Clause 4 describes nominal values of minimum required efficiency for a certain value of the Minimum Efficiency Index (MEI) and is generally relevant when applying this standard.

Clause 5 specifies test procedures, test conditions and evaluations and has to be applied

— by a manufacturer in the case that he decides to determine mean values of a size by tests on sample pumps of this size (e.g. by methods described in Annex D),

— by an independent institution in the case that the Minimum Efficiency Index (MEI) of a pump size shall be verified by the procedure described in Clause 7.

Clause 6 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.

Clause 7 describes the methodology and procedure to be applied by an independent institution in the case that the Minimum Efficiency Index (MEI) of a size indicated by the manufacturer shall be verified by third party tests on pumps of this size.

Annex C is concerned with mean values of a pump size which are relevant for manufacturers to prove that a pump size achieves a certain value of the Minimum Efficiency Index (MEI).

1 Scope

This European Standard 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 standard 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, temperatures between -10 °C and +120 °C and 4" or 6" size for submersible multistage pumps at operating temperatures within a range of 0 °C and 90 °C.

In addition, this standard specifies how the value of the Minimum Efficiency Index (MEI) of a pump size indicated by the manufacturer can be checked by market surveillance.

Even if it is left free to the manufacturer of a pump size how to prove the rated value of the Minimum Efficiency Index (MEI), nevertheless this standard specifies a method to prove that this rated value meets the requirements within the confidence intervals with a sufficiently high probability.

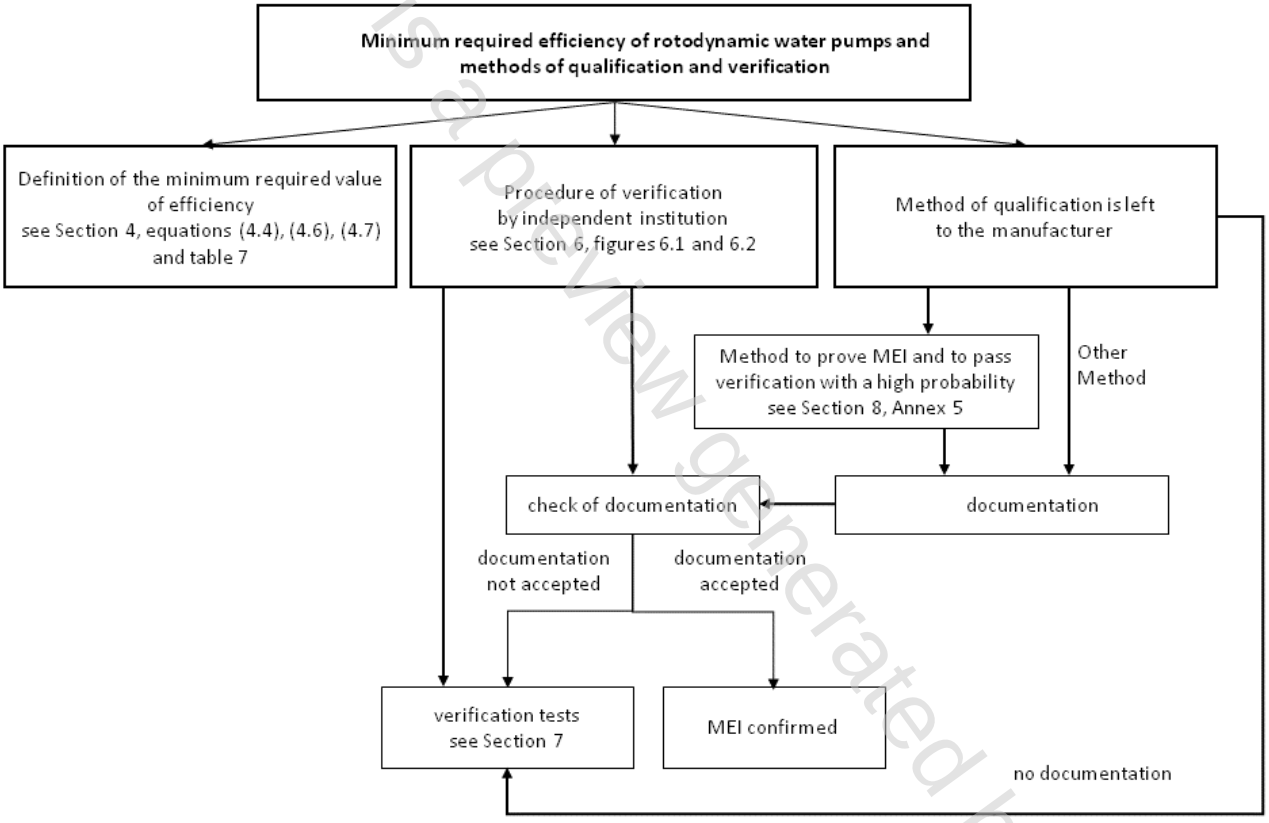

Figure 1 — Scheme of application of this standard

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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

3.1 General

For the purposes of this European Standard, the quantities, definitions, symbols and units given in EN ISO 9906 and in 3.2 apply. 3.2 gives specific definitions of terms - in deviation of EN ISO 9906 - used in this European Standard, together with any associated symbols which have been allocated and is based on ISO 80000.

Table 1 gives an alphabetical list of symbols used and Table 2 gives a list of subscripts. As far as possible, the quantities, definitions and symbols used in this standard comply with those used in EN ISO 9906. Quantities, definitions and symbols used in EN ISO 9906, but not needed in this standard are not contained in 3.2 and Tables 1 and 2, while these tables contain some quantities, definitions and symbols which are not used in EN ISO 9906.

In this European Standard, all formulae are given in coherent SI-units.

3.2 List of quantities with definitions

For the purposes of this document, the following terms and definitions apply. Most of the terms and definitions come from EN ISO 9906, except for the definition of MEI.

3.2.1
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 standard, it is defined by the relation:

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

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

3.2.2
(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;

— cooling of bearings of the pump itself;

— water seal to the packing.