

## Steam turbines - Part 1: Specifications

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

See Eesti standard EVS-EN IEC 60045-1:2020 sisaldab Euroopa standardi EN IEC 60045-1:2020 ingliskeelset teksti.	This Estonian standard EVS-EN IEC 60045-1:2020 consists of the English text of the European standard EN IEC 60045-1:2020.
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 10.07.2020.	Date of Availability of the European standard is 10.07.2020.
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ICS 27.040

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English Version

**Steam turbines - Part 1: Specifications  
(IEC 60045-1:2020)**

Turbines à vapeur - Partie 1: Spécifications  
(IEC 60045-1:2020)

Dampfturbinen - Teil 1: Anforderungen  
(IEC 60045-1:2020)

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## European foreword

The text of document 5/231/FDIS, future edition 2 of IEC 60045-1, prepared by IEC/TC 5 "Steam turbines" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60045-1:2020.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2021-03-17
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2023-06-17

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In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60300-3-3	NOTE	Harmonized as EN 60300-3-3
IEC 60812	NOTE	Harmonized as EN IEC 60812
IEC 61025	NOTE	Harmonized as EN 61025
IEC 61326 (series)	NOTE	Harmonized as EN IEC 61326 (series)
IEC 61508 (series)	NOTE	Harmonized as EN 61508 (series)
IEC 61508-5:2010	NOTE	Harmonized as EN 61508-5:2010 (not modified)
IEC 61511 (series)	NOTE	Harmonized as EN 61511 (series)
IEC 61511-1	NOTE	Harmonized as EN 61511-1
IEC 61511-3:2016	NOTE	Harmonized as EN 61511-3:2017 (not modified)
IEC 61882	NOTE	Harmonized as EN 61882
IEC 62381	NOTE	Harmonized as EN 62381
IEC 62541 (series)	NOTE	Harmonized as EN 62541 (series)
IEC 62682	NOTE	Harmonized as EN 62682
ISO/IEC 15408 (series)	NOTE	Harmonized as EN ISO/IEC 15408 (series)

IEC/IEEE 82079-1	NOTE	Harmonized as EN IEC/IEEE 82079-1
ISO 2553	NOTE	Harmonized as EN ISO 2553
ISO 3834 (series)	NOTE	Harmonized as EN ISO 3834 (series)
ISO 3834-1:2005	NOTE	Harmonized as EN ISO 3834-1:2005 (not modified)
ISO 5817	NOTE	Harmonized as EN ISO 5817
ISO 9241 (series)	NOTE	Harmonized as EN ISO 9241 (series)
ISO 9606 (series)	NOTE	Harmonized as EN ISO 9606 (series)
ISO 9692 (series)	NOTE	Harmonized as EN ISO 9692 (series)
ISO 9712	NOTE	Harmonized as EN ISO 9712
ISO 11970	NOTE	Harmonized as EN ISO 11970
ISO 12932	NOTE	Harmonized as EN ISO 12932
ISO 13857	NOTE	Harmonized as EN ISO 13857
ISO 13916	NOTE	Harmonized as EN ISO 13916
ISO 13919-1	NOTE	Harmonized as EN ISO 13919-1
ISO 14731	NOTE	Harmonized as EN ISO 14731
ISO 14732	NOTE	Harmonized as EN ISO 14732
ISO 15613	NOTE	Harmonized as EN ISO 15613
ISO 15614 (series)	NOTE	Harmonized as EN ISO 15614 (series)
ISO 17659	NOTE	Harmonized as EN ISO 17659
ISO 17663	NOTE	Harmonized as EN ISO 17663

## Annex ZA

(normative)

### Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: [www.cenelec.eu](http://www.cenelec.eu).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60034-3	-	Rotating electrical machines - Part 3: Specific requirements for synchronous generators driven by steam turbines or combustion gas turbines and for synchronous compensators	-	-
IEC 60079	series	Explosive atmospheres	-	-
IEC 60204-1	-	Safety of machinery - Electrical equipment of machines - Part 1: General requirements	EN 60204-1	-
IEC 60953	series	Rules for steam turbine thermal acceptance tests	-	-
IEC 61000-6-2	-	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments	EN IEC 61000-6-2	-
IEC 61000-6-4	-	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments	EN IEC 61000-6-4	-
IEC 61064	-	Acceptance tests for steam turbine speed control systems	EN 61064	-
ISO 1940	-	Mechanical vibration - Balance quality requirements for rotors in a constant (rigid) state	-	-
ISO 7919-3	-	Mechanical vibration - Evaluation of mechanical vibration by measurements on rotating shafts - Part 3: Coupled industrial machines	-	-

ISO 10494	-	Turbines and turbine sets - measurement of emitted airborne noise - engineering/survey method	-	-
ISO 11342	-	Mechanical vibration - Methods and criteria for the mechanical balancing of flexible rotors	-	-
ISO 10816-3	-	Mechanical vibration - Evaluation of machine vibration by measurements on non-rotating parts - Part 3: Industrial machines with nominal power above 15 kW and nominal speeds between 120 r/min and 15 000 r/min when measured in situ	-	-
ISO 12100	2010	Safety of machinery - General principles for design - Risk assessment and risk reduction	EN ISO 12100	2010
ISO 13850	-	Safety of machinery - Emergency stop function - Principles for design	EN ISO 13850	-
ISO 20816-1	-	Mechanical vibration - Measurement and evaluation of machine vibration - Part 1: General guidelines	-	-
ISO 20816-2	-	Mechanical vibration - Measurement and evaluation of machine vibration - Part 2: Land-based gas turbines, steam turbines and generators in excess of 40 MW, with fluid-film bearings and rated speeds of 1 500 r/min, 1 800 r/min, 3 000 r/min and 3 600 r/min	-	-
ISO 21940-31	-	Mechanical vibration - Rotor balancing - Part 31: Susceptibility and sensitivity of machines to unbalance	-	-

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**Steam turbines –  
Part 1: Specifications**

**Turbines à vapeur –  
Partie 1: Spécifications**





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# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**Steam turbines –  
Part 1: Specifications**

**Turbines à vapeur –  
Partie 1: Spécifications**

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ELECTROTECHNICAL  
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**STEAM TURBINES –****Part 1: Specifications****FOREWORD**

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International Standard IEC 60045-1 has been prepared by IEC technical committee 5: Steam turbines.

This second edition cancels and replaces the first edition published in 1991. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) Scope clarification and boundaries of applicability;
- b) general update to state-of-the-art technology;
- c) integration of product safety: Clause 5;
- d) integration of automation, incorporating the former annex on electronic governors: Clause 11;
- e) Informative Annex A on welding added.



The text of this International Standard is based on the following documents:

FDIS	Report on voting
5/231/FDIS	5/232/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 60045 series, published under the general title *Steam turbines*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

## INTRODUCTION

The first edition of IEC 60045 was issued in 1931. Subsequent revisions were made, the last being in 1991. In daily practice this document has added tremendous value throughout the years giving guidance in the tendering processes for steam turbines worldwide. Intensive development has resulted in new specific application requirements, the availability of more highly rated turbines, and tremendous advances in automation and control. The new revision of this document was consequently driven by the motivation to close the gap to available technology and a wish to provide a single standard valid for a wide range of industrial and utility steam turbine applications.

Specifically, in the beginning of the 21<sup>st</sup> century renewable energy sources are rapidly taking shares on the electricity market and steam turbines play an important role in the shift of energy systems:

- They are key components for new power plant concepts as for concentrated solar power (CSP), for geothermal power or in combined heat and power applications;
- They are requested to provide flexible thermal backup power generation with high efficiency (combined cycle) to compensate the increased volatility of the electrical grids;
- Higher steam parameters are technically viable and contribute to more efficient utilisation of energy sources and investments.

In the area of automation and controls the integration of relevant safety standards was necessary and a complete new Clause 5 is dedicated to this. Also, automation itself has formed its own Clause 11 integrating the former aspects of governing, controls, instrumentation and protection paving the way towards digitalization of power plants.

The overall structure of the document is intentionally kept close to the former revision to promote seamless application of the document.

Wherever practicable, this document takes into account the scope for applying to smaller turbines developments originally intended for larger machines, without implying that such applications would always be necessary or advantageous.

# STEAM TURBINES –

## Part 1: Specifications

### 1 Scope

This part of IEC 60045 is applicable primarily to land-based horizontal steam turbines driving generators for electrical power services. Some of its provisions are relevant to turbines for other applications. Generator, gear box and other auxiliaries which are considered as a part of the system are also mentioned in this document. Detailed specifications for this equipment are not included in this document.

The purpose of this document is to make an intending purchaser aware of options and alternatives which it may wish to consider, and to enable it to state its technical requirements clearly to potential suppliers. Consequently, final technical requirements will be in accordance with an agreement between the purchaser and the supplier in the contract.

### 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.

IEC 60034-3, *Rotating electrical machines – Part 3: Specific requirements for synchronous generators driven by steam turbines or combustion gas turbines*

IEC 60079 (all parts), *Explosive atmospheres*

IEC 60204-1, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements*

IEC 60953 (all parts), *Rules for steam turbine thermal acceptance tests*

IEC 61000-6-2, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments*

IEC 61000-6-4, *Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments*

IEC 61064, *Acceptance tests for steam turbine speed control systems*

ISO 1940, *Mechanical vibration – Balance quality requirements for rotors in a constant (rigid) state*

ISO 7919-3, *Mechanical vibration – Evaluation of mechanical vibration by measurements on rotating shafts – Part 3: Coupled industrial machines*

ISO 10494, *Turbines and turbine sets – Measurement of emitted airborne noise – Engineering/survey method*