SVENSK STANDARD SS-EN IEC 60045-1

Fastställd	Utgåva	Sida	Ansvarig kommitté
2020-10-21	2	1 (1+74)	SEK TK 5

Ångturbiner –
Del 1: Handledning vid upphandling

Steam turbines –
Part 1: Specifications

Som svensk standard gäller europastandarden EN IEC 60045-1:2020. Den svenska standarden innehåller den officiella engelska språkversionen av EN IEC 60045-1:2020.

Nationellt förord

Europastandarden EN IEC 60045-1:2020

består av:

– **europastandardens ikraftsättningsdokument,** utarbetat inom CENELEC
– **IEC 60045-1, Second edition, 2020 - Steam turbines - Part 1: Specifications**

utarbetad inom International Electrotechnical Commission, IEC.

Tidigare fastställd svensk standard SS-EN 60045-1, utgåva 1, 1993, gäller ej fr o m 2023-06-17.

ICS 27.040.00

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN IEC 60045-1

July 2020

ICS 27.040

Supersedes EN 60045-1:1993 and all of its amendments and corrigenda (if any)

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)

This European Standard was approved by CENELEC on 2020-06-17. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

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 CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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

Ref. No. EN IEC 60045-1:2020 E

SEK Svensk Elstandard

SS-EN IEC 60045-1, utg 2:2020

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

This document supersedes EN 60045-1:1993 and all of its amendments and corrigenda (if any).

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

Endorsement notice

The text of the International Standard IEC 60045-1:2020 was approved by CENELEC as a European Standard without any modification.

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.

Publication	Year	Title	EN/HD	Year
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	-	-

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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STEAM TURBINES –

Part 1: Specifications

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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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 21st 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*

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*

ISO 13850, *Safety of machinery – Emergency stop – Principles for design*

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*