

This document is a preview generated by EVS

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

Rotating electrical machines -- Part 3: Specific requirements for synchronous generators driven by steam turbines or combustion gas turbines

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 60034-3:2008 sisaldb Euroopa standardi EN 60034-3:2008 ingliskeelset teksti.	This Estonian standard EVS-EN 60034-3:2008 consists of the English text of the European standard EN 60034-3:2008.
Standard on kinnitatud Eesti Standardikeskuse 19.08.2008 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.	This standard is ratified with the order of Estonian Centre for Standardisation dated 19.08.2008 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.
Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kätesaadavaks tegemise kuupäev on 11.07.2008.	Date of Availability of the European standard text 11.07.2008.
Standard on kätesaadav Eesti standardiorganisatsionist.	The standard is available from Estonian standardisation organisation.

**ICS** 29.160

**Võtmesõnad:** electric machines, electrical equipment, rotating electric, rotating electric machines, specification (approval), specifications, synchronous machines, turbogenerators

**Standardite reproduutseerimis- ja levitamisõigus kuulub Eesti Standardikeskusele**

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonilisse süsteemi või edastamine ükskõik millises vormis või millisel teel on keelatud ilma Eesti Standardikeskuse poolt antud kirjaliku loata.

Kui Teil on küsimusi standardite autorikaitse kohta, palun võtke ühendust Eesti Standardikeskusega:  
Aru 10 Tallinn 10317 Eesti; [www.evs.ee](http://www.evs.ee); Telefon: 605 5050; E-post: [info@evs.ee](mailto:info@evs.ee)

July 2008

ICS 29.160

Supersedes EN 60034-3:2005

English version

**Rotating electrical machines -  
Part 3: Specific requirements for synchronous generators  
driven by steam turbines or combustion gas turbines  
(IEC 60034-3:2007)**

Machines électriques tournantes -  
Partie 3: Règles spécifiques pour  
les alternateurs synchrones entraînés  
par turbines à vapeur ou par turbines  
à gaz à combustion  
(CEI 60034-3:2007)

Drehende elektrische Maschinen -  
Teil 3: Besondere Anforderungen  
an Synchrongeneratoren angetrieben  
durch Dampfturbinen oder Gasturbinen  
(IEC 60034-3:2007)

This European Standard was approved by CENELEC on 2008-06-01. 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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

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

**CENELEC**

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

**Central Secretariat: rue de Stassart 35, B - 1050 Brussels**

## Foreword

The text of document 2/1461/FDIS, future edition 6 of IEC 60034-3, prepared by IEC TC 2, Rotating machinery, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60034-3 on 2008-06-01.

This European Standard supersedes EN 60034-3:2005.

The significant technical changes with respect to EN 60034-3:2005 are as follows:

- the contents is now restricted to synchronous generators driven by steam turbines or combustion gas turbines, but covers as well cylindrical rotor and salient-pole generators;
- synchronous motors have been taken out of the scope of Part 3.

The following dates were fixed:

- |  |       |            |
|--|-------|------------|
| – latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement | (dop) | 2009-03-01 |
| – latest date by which the national standards conflicting with the EN have to be withdrawn   | (dow) | 2011-06-01 |

Annex ZA has been added by CENELEC.

---

## Endorsement notice

The text of the International Standard IEC 60034-3:2007 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 60034-8

NOTE Harmonized as EN 60034-8:2007 (not modified).

---

**Annex ZA**  
(normative)**Normative references to international publications  
with their corresponding European publications**

The following referenced documents are indispensable for the application 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 When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60034-1	- <sup>1)</sup>	Rotating electrical machines - Part 1: Rating and performance	EN 60034-1	2004 <sup>2)</sup>
IEC 60034-4	- <sup>1)</sup>	Rotating electrical machines - Part 4: Methods for determining synchronous machine quantities from tests	EN 60034-4	1995 <sup>2)</sup>
IEC 60045-1	- <sup>1)</sup>	Steam turbines - Part 1: Specifications	EN 60045-1	1993 <sup>2)</sup>
IEC 60079 (mod)	Series	Explosive atmospheres	EN 60079	Series

<sup>1)</sup> Undated reference.

<sup>2)</sup> Valid edition at date of issue.

## CONTENTS

FOREWORD .....	4
1 Scope .....	6
2 Normative references .....	6
3 Terms and definitions .....	6
4 General .....	7
4.1 General rules .....	7
4.2 Rated conditions .....	7
4.3 Rated voltage .....	7
4.4 Power factor .....	7
4.5 Rated speed .....	7
4.6 Ranges of voltage and frequency .....	8
4.7 Direction of rotation .....	8
4.8 Stator winding .....	9
4.9 Generator rated field current and voltage .....	9
4.10 Winding insulation .....	9
4.10.1 Thermal class .....	9
4.10.2 Withstand voltage tests .....	9
4.11 Insulation against shaft current .....	9
4.12 Over-speed test .....	9
4.13 Critical speeds .....	9
4.14 P-Q capability diagram .....	9
4.15 Overcurrent requirements .....	11
4.16 Sudden short circuit .....	11
4.17 Short-circuit ratio .....	12
4.18 Direct axis transient and subtransient reactances for generators .....	12
4.19 Tolerances on short-circuit ratio and direct axis transient and subtransient reactances .....	12
4.20 Mechanical conditions for rotors .....	12
4.20.1 Number of starts .....	12
4.20.2 Turning gear operation .....	12
4.21 Coolers .....	13
5 Air-cooled generators .....	13
5.1 General .....	13
5.2 Generator cooling .....	13
5.3 Temperature of primary coolant .....	13
5.3.1 Temperature detectors .....	14
6 Hydrogen-cooled or liquid-cooled generators .....	14
6.1 General .....	14
6.2 Hydrogen pressure and purity in the casing .....	14
6.3 Generator housing and cover plates .....	14
6.4 Stator winding terminals .....	14
6.5 Temperature of primary coolants, temperatures and temperature rises of the generator .....	14
6.6 Temperature detectors .....	15
6.7 Auxiliary system .....	15

7	Generators for combustion gas turbines or combined cycle applications .....	16
7.1	General .....	16
7.2	Service conditions .....	16
7.2.1	General .....	16
7.2.2	Primary coolant temperature .....	16
7.2.3	Number of starts .....	16
7.2.4	Application of load .....	16
7.3	Rated output .....	16
7.4	Capabilities .....	17
7.4.1	General .....	17
7.4.2	Base capability .....	17
7.4.3	Temperature rise and temperature at base capability .....	18
7.4.4	Peak capability .....	19
7.5	Rating plate .....	19
7.6	Temperature tests .....	19
Annex A (normative)	Precautions to be taken when using hydrogen cooled turbine-driven synchronous generators .....	20
Bibliography .....	27	
Figure 1 – Operation over ranges of voltage and frequency .....	8	
Figure 2 – Typical P-Q capability diagram .....	10	
Figure 3 – Typical generator capability curves .....	18	
Figure A.1 – Example of a large hydrogen supply unit feeding one or more generators (simplified diagram) .....	26	

## ROTATING ELECTRICAL MACHINES –

### Part 3: Specific requirements for synchronous generators driven by steam turbines or combustion gas turbines

#### 1 Scope

This part of IEC 60034 applies to three-phase synchronous generators, having rated outputs of 10 MVA and above driven by steam turbines or combustion gas turbines. It supplements the basic requirements for rotating machines given in IEC 60034-1.

Common requirements are prescribed together with specific requirements for air, for hydrogen or for liquid cooled synchronous generators.

This part of IEC 60034 also gives the precautions to be taken when using hydrogen cooled generators including:

- rotating excitors driven by synchronous generators;
- auxiliary equipment needed for operating the generators;
- parts of the building where hydrogen might accumulate.

NOTE 1 These requirements also apply to a synchronous generator driven by both a steam turbine and a combustion gas turbine as part of a single shaft combined cycle unit.

NOTE 2 These requirements do not apply to synchronous generators driven by water (hydraulic) turbine or wind turbine.

NOTE 3 The precautions to be taken when using hydrogen are valid for all cases where hydrogen is used as a coolant.

#### 2 Normative references

The following referenced documents are indispensable for the application 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 60034-1, *Rotating electrical machines – Part 1: Rating and performance*

IEC 60034-4, *Rotating electrical machines – Part 4: Methods for determining synchronous machine quantities from tests*

IEC 60045-1, *Steam turbines – Part 1: Specifications*

IEC 60079 (all parts), *Electrical apparatus for explosive gas atmospheres*

#### 3 Terms and definitions

For the purposes of this document, the terms and definitions in IEC 60034-1 together with the following additions apply.