SLOVENSKI STANDARD
oSIST prEN 60034-30-3:2023

01-junij-2023

Električni rotacijski stroji - 30-3. del: Razredi učinkovitosti visokonapetostnih AC motorjev (oznaka IE)

Rotating electrical machines - Part 30-3: Efficiency classes of high voltage AC motors (IE code)

Ta slovenski standard je istoveten z: **prEN 60034-30-3:2023**

ICS:

29.160.30 Motorji Motors

oSIST prEN 60034-30-3:2023 **en,fr,de**

2/2131/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER: **IEC 60034-30-3 ED1**	
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IEC TC 2: ROTATING MACHINERY

SECRETARIAT: United Kingdom	SECRETARY: Mr Charles Whitlock
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD: ☐
	Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.

FUNCTIONS CONCERNED:

☐ EMC ☒ ENVIRONMENT ☐ QUALITY ASSURANCE ☐ SAFETY

☒ SUBMITTED FOR CENELEC PARALLEL VOTING	☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING
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Recipients of this document are invited to submit, with their comments, notification of

- any relevant patent rights of which they are aware and to provide supporting documentation,
- any relevant “in some countries” clauses to be included should this proposal proceed. Recipients are reminded that the enquiry stage is the final stage for submitting "in some countries" clauses. See AC/22/2007.

TITLE:

Rotating electrical machines – Part 30-3: Efficiency classes of high voltage AC motors (IE code)

PROPOSED STABILITY DATE: 2025

NOTE FROM TC/SC OFFICERS:

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ROTATING ELECTRICAL MACHINES –

Part 30-3: Efficiency classes of high voltage AC motors (IE-code)

FOREWORD

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This International Standard IEC 60034-30-3 has been prepared by IEC technical committee 2: Rotating machinery.

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

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

NOTE A table of cross-references of all IEC TC 2 publications can be found in the IEC TC 2 dashboard on the IEC website.

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

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

The National Committees are requested to note that for this publication the stability date is xxxx.

THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED AT THE PUBLICATION STAGE.

INTRODUCTION

This IEC standard provides the global harmonization of energy-efficiency classes of three-phase cage induction motors with rated voltage above 1000 V that are rated for direct online starting and fixed-speed operation at a 50 Hz or 60 Hz supply with sinusoidal voltage.

For these motors, the demands of the power supply and of the driven equipment in many cases govern the design of the electrical machine. Due to the large size and power of high-voltage (HV) motors, these demands are more complex than for low-voltage motors and often limit the design. Vice versa, the properties of the electrical machine itself influence the grid considerably in many cases.

In order to ensure an easy applicability of the standard, the scope must be limited to the most relevant applications, i.e. motors for driving the vast majority of pumps, fans, or compressors, which cover approximately 80% to 90% of all applications. Motors for special applications, e.g. for accelerating very high load inertia, for very low supply voltage during starting, for very low locked-rotor current or for accelerating against high load torque, are therefore out of the scope of this standard.

Despite this, the motor technology, namely

- rated voltage,
- method of cooling,
- locked-rotor current,

have a significant influence on the achievable motor efficiency as well as the rated frequency, the rated power and the number of poles, and must be considered when specifying the efficiency class.

NOTE When specifying or designing a power drive system, it should be considered that low voltage motors will mostly have a higher efficiency than high voltage motors with the same rated power. However, considering the losses of the complete system, i. e. including cabling and transformer losses, high voltage solution might be advantageous.

ROTATING ELECTRICAL MACHINES –

Part 30-3: Efficiency classes of high voltage AC motors (IE-code)

1 Scope

This part of IEC 60034 specifies efficiency classes for fixed-speed three-phase high-voltage cage induction motors in accordance with IEC 60034-1 that

- have a rated voltage exceeding 1000 V, but not exceeding 11 kV;
- have a rated power from 200 kW to 2000 kW;

NOTE 1 Motors with rated power above 2000 kW are produced in such small numbers and are designed and produced with a focus on achieving an optimum efficiency anyway even though fulfilling increasingly special requirements that assigning efficiency classes would be an additional effort without the result of any countable energy saving.

- have two, four and six poles;
- are line-operated single-speed;
- are intended for direct-on-line starting at rated or at reduced voltage and rated frequency;
- are constructed to any degree of protection;
- are designed for cooling methods IC411, IC511, IC611, IC01 or IC81W;
- are capable of continuous operation at their rated operating point (torque/power, speed) with a temperature rise within the specified insulation temperature class;

NOTE 2 Most motors covered by this standard are rated for duty type S1 (continuous duty). However, some motors that are rated for other duty cycles are still capable of continuous operation at their rated power and these motors are also covered.

- are rated for any ambient temperature or coolant temperature within the range of – 20 °C to + 60 °C;

NOTE 3 Motors rated for temperatures outside the range – 20 °C and + 60 °C are considered to be of special construction and are consequently excluded from this standard.

- are rated for an operating altitude up to 2 000 m above sea level.

NOTE 4 The rated efficiency and the efficiency class are based on a rating for altitudes up to 1 000 m above sea level.

- have a locked-rotor current I_l at stand-still and supply with rated voltage and frequency before application of any IEC or agreed tolerance in the range $I_l / I_N \geq 4{,}5$,
- are designed for a customer load torque during starting not exceeding an envelope with a minimum of 25% of the rated torque at low speed and a square shape $T \sim n^2$ up to a maximum load torque at full speed of 60% of the rated torque in case of 2pole motors or 100% of the rated torque in case of 4pole or 6pole motors, respectively, (see Figure 1), After starting is completed, the load torque of 2pole motors is increased to 100 % of the rated torque.
- have to accelerate an external moment of inertia as defined by the customer requirements not exceeding the values given in Table 1 considering all start up conditions defined in this standard for not more than three consecutive starts from cold condition or two starts from hot condition, respectively,
- are designed for a minimum locked-rotor steady state supply voltage of at least 80% of the rated voltage during starting.

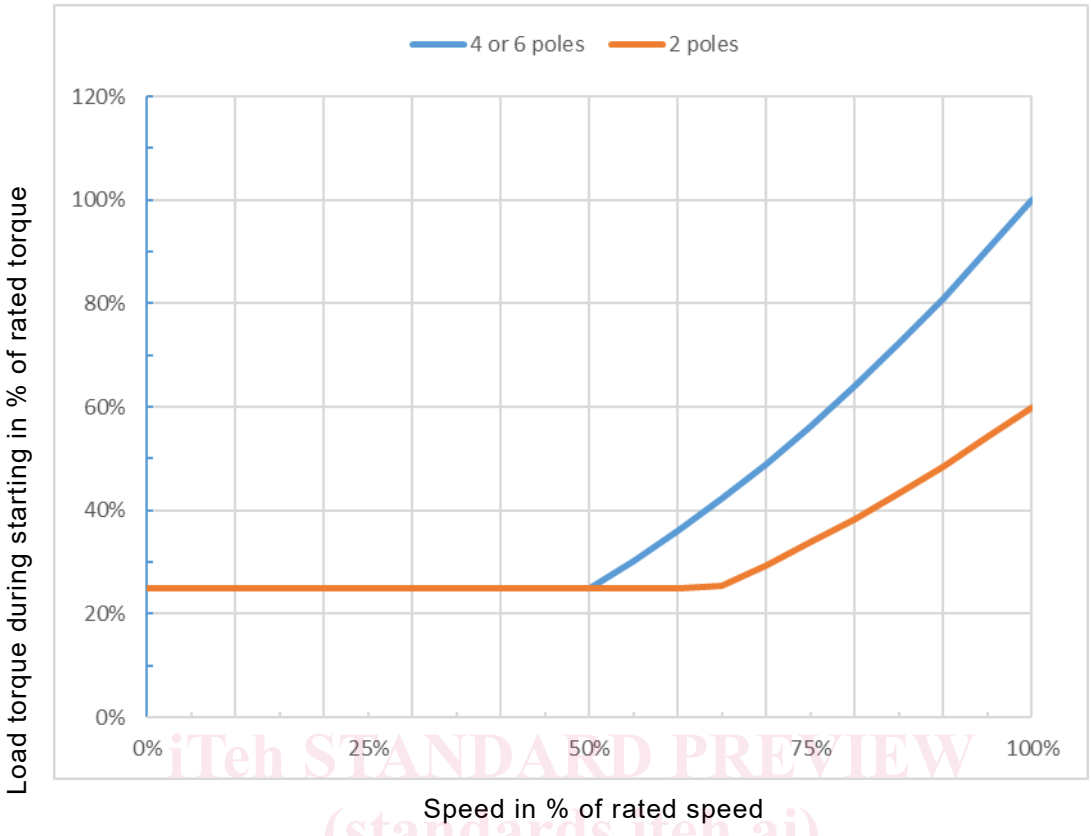

Figure 1 – Envelope of the load torque during starting: Load torque during starting in % of rated torque over speed in % of rated speed

79 **Table 1 – Maximum external moment of inertia**

Number of poles	**2**		**4**		**6**	
Frequency Hz	**50**	**60**	**50**	**60**	**50**	**60**
Rated output kW	**Moment of inertia *J*** kg m^2					
200	25	15	115	75	310	200
220	25	15	120	80	330	210
250	25	15	130	85	360	230
280	30	20	140	90	400	250
315	30	20	150	100	440	270
355	35	20	170	110	480	300
400	35	25	190	120	530	330
450	40	25	210	130	580	360
500	45	30	230	140	640	400
560	50	30	250	150	700	440
630	55	35	280	170	780	490
710	60	35	310	190	870	550
800	65	40	340	210	970	610
900	70	45	380	230	1 100	680
1 000	80	50	420	260	1 200	750
1 120	90	55	460	290	1 300	830
1 250	100	60	510	320	1 450	920
1 400	110	65	570	360	1 650	1 000
1 600	120	70	640	400	1 850	1 150
1 800	130	80	720	440	2 050	1 300
2 000	150	90	800	490	2 300	1 450

NOTE 1 The values of the moment of inertia given are in terms of mr^2 where m is the mass and r is the mean radius of gyration.

NOTE 2 Moment of inertia is defined in ISO 31/3 1992, Number 3-7.

NOTE 3 If necessary, linear interpolation is permitted between two adjacent values.

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81 Excluded are:

82 • Motors with mechanical commutators or slip-rings;

83 • Motors with 8 or more poles;

84 • Multi-speed motors;

85 • Motors with customer starting torque requirements exceeding the load torque envelope
86 above, and motors exceeding the maximum external inertia defined in Table 1.

87 • Motors designed specifically for operation fed by a power electronic frequency converter
88 with a temperature rise within the specified insulation thermal class or thermal class;

89 • Motors completely integrated with the driven machine (for example pumps, fans and
90 compressors). This means that the motor cannot be designed in such a way as to enable
91 the motor to be separated from the driven unit, i. e. it must not be possible to operate
92 the separated motor without the driven unit.

93 • Submersible motors specifically designed to operate wholly immersed in a liquid;

94 • Smoke extraction motors;

- Motors dedicated to operate in explosive atmospheres;
- Motors for operation in nuclear plants, especially nuclear power plants.

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.

IEC 60034-1, *Rotating electrical machines – Part 1: Rating and performance*

IEC 60034-2-1, *Rotating electrical machines – Part 2-1: Standard methods for determining losses and efficiency from tests (excluding machines for traction vehicles)*

IEC 60034-6, *Rotating electrical machines – Part 6: Methods of cooling (IC Code)*