

الهيئة السعودية للمواصفات والمقاييس والجودة
Saudi Standards, Metrology and Quality Org (SASO)



Draft Standard

SASO IEC 60034-30-1:XXXX

ROTATING ELECTRICAL MACHINES –

Part 30-1: Efficiency classes of line operated AC motors (IE code)

(IEC 60034-30-1 Ed 1.0, MOD)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ROTATING ELECTRICAL MACHINES –**Part 30-1: Efficiency classes of line operated AC motors (IE code)****Foreword**

The Saudi Standards, Metrology and Quality Organization (SASO) and the Saudi Energy Efficiency Center (SEEC) through the Saudi Energy Efficiency Program (SEEP) prepared this standard for efficiency classes of single-speed, three-phase, cage induction motors, and this standard will apply as a mandatory Saudi standard.

This SASO IEC 60034-30-1:2017 standard is a modified adoption of International Standard IEC 60034-30-1 , (ROTATING ELECTRICAL MACHINES –Part 30-1: Efficiency classes of line operated AC motors (IE code)). Standard has been varied as indicated to take account of Kingdom of Saudi Arabia conditions. The modifications are specified in the text of this standard and attached in Annex B.

The first edition of international IEC 60034-30-1 cancels and replaces IEC 60034-30 (2008). It also cancels and replaces Annex A of IEC 60034-31 (2010). In the next revision of IEC 60034-31:2010 this annex will be removed from its contents.

This Standard cancels and replaces SASO IEC 60034-30-1:2013 , Rotating electrical machines – part 30: rotating electrical machines - part 30-1: efficiency classes of line operated ac motors (IE code).

The IE4 class is newly included in international standard IEC 60034-30-1 2014 this standard. The informative definition of IE4, which was previously, included in IEC/TS 60034-31:2010, is therefore outdated. The new class IE5 is not yet defined in detail but is envisaged for potential products in a future edition of the standard.

The registration clause is newly included in this standard. It specifies the requirements and process of registration. The registration shall be done through registration system electronically via SASO website as take in account registration process indicated in clause 5.

ROTATING ELECTRICAL MACHINES –

Part 30-1: Efficiency classes of line operated AC motors (IE code)

1 Scope

This part of SASO IEC 60034-30-1:2017 specifies efficiency classes for 60 Hz, single-speed, three phase induction motors that:

- have a rated power P_N from **0,75** kW to 375 kW;
- have a rated voltage U_N above 50 V up to 1 kV;
- have 2, 4, 6 or 8 poles;
- motors covered by this standard are rated for duty type S1 (continuous duty).
- are marked with any ambient temperature within the range of -20 °C to $+60\text{ °C}$;

NOTE 1 The rated efficiency and efficiency classes are based on 25 °C ambient temperature according to IEC 60034-2-1.

NOTE 2 Motors rated for temperatures outside the range -20 °C and $+60\text{ °C}$ are considered to be of special construction and are consequently excluded from this standard.

NOTE 3 Smoke extraction motors with a temperature class of up to and including 300 °C are covered by this standard.

- are marked with an altitude up to 4 000 m above sea level.

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

This standard establishes a set of limit efficiency values based on frequency, number of poles and motor power. No distinction is made between motor technologies, supply voltage or motors with increased insulation designed specifically for converter operation even though these motor technologies may not all be capable of reaching the higher efficiency classes (see Table 1). This makes different motor technologies fully comparable with respect to their energy efficiency potential.

NOTE 5 Regulators should consider the above constraints when assigning national minimum energy-efficiency performance standards (MEPS) with respect to any particular type of motor.

The efficiency of power-drive systems is not covered by this standard. In particular, motor losses due to harmonic content of the supply voltage, losses in cables, filters and frequency-converters, are not covered.

Motors with flanges, feet and/or shafts with mechanical dimensions different from IEC 60072-1 are covered by this standard.

Geared motors are covered by this standard including those incorporating non-standard shafts and flanges.

Motors completely integrated into a machine are not covered by this standard (for example pump, fan and compressor) that cannot be practically tested separately from the machine even with provision of a temporary end-shield and drive-end bearing. This means the motor shall: a) share common components (apart from connectors such as bolts) with the driven unit (for example, a shaft or housing) and; b) not be designed in such a way as to enable the motor to be separated from the driven unit as an entire motor that can operate independently of the driven unit. That is, for a motor to be out of scope of this standard, the process of separation shall render the motor inoperative.

(TEAO, IC418) Totally enclosed air-over machines, i.e. totally enclosed frame-surface cooled machines intended for exterior cooling by a ventilating means external to the machine, are covered by this standard. Efficiency testing of such motors may be performed with the fan

removed and the cooling provided by an external blower with a similar airflow rate as the original fan.

- Motors with integrated frequency-converters (compact drives) are not covered by this standard when the motor cannot be tested separately from the converter. Energy efficiency classification of compact drives shall be based on the complete product (PDS : Power Drive System) and will be defined in a separate standard.

NOTE 6 A motor is not excluded when the motor and frequency-converter can be separated and the motor can be tested independently of the converter.

The following motors “Excluded motors“ are included in the scope (i.e. will have to register in the SASO system) but they are exempted from achieving the efficiency requirement:

- Brake motors when the brake is an integral part of the inner motor construction and can neither be removed nor supplied by a separate power source during the testing of motor efficiency.

NOTE 7 Brake motors with a brake coil that is integrated into the flange of the motor are covered as long as it is possible to test motor efficiency without the losses of the brake (for example by dismantling the brake or by energizing the brake coil from a separate power source).

When the manufacturer offers a motor of the same design with and without a brake the test of motor efficiency may be done on a motor without the brake. The determined efficiency may then be used as the rating of both motor and brake motor.

- Submersible motors specifically designed to operate wholly immersed in a liquid.
- Motors with cooling methods other than IC0Ax, IC1Ax, IC2Ax, IC3Ax or IC4Ax (see IEC 60034-6);
- Motors built for a restricted space (high-output design, i.e. smaller frame sizes than usual in national standards);
- Motors specifically built for operation in explosive environments according to IEC 60079-0 (due to safety requirements and possible design constraints of explosion proof motors such as increased air-gap, reduced starting current, enhanced sealing);
- Motors for special requirements of the driven machine beyond the requirements of the IEC 60034 series of standards (such as motors for heavy starting duty, special torque stiffness and/or breakdown torque characteristics, large number of start/stop cycles, very low rotor inertia);
- Motors for special characteristics of the grid supply beyond the requirements of the IEC 60034 series of standards (such as motors with limited starting current, increased tolerances of voltage and/or frequency);
- Motors with liquid cooling on account of their higher power density compared with air cooled motors of the same frame size;
- Smoke extraction motors with a temperature class higher than 300 °C.

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/TS 60034-2-3, *Rotating electrical machines – Part 2-3: Specific test methods for determining losses and efficiency of converter-fed AC induction motors*

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

IEC/TS 60034-25, *Rotating electrical machines – Part 25: Guidance for the design and performance of a.c. motors specifically designed for converter supply*

IEC 60038, *IEC standard voltages*

IEC 60079-0, *Explosive atmospheres – Part 0: Equipment – General requirements*

IEEE 112-2004, Test Procedure for Polyphase Induction Motors and Generators

CSA C390-10 Test methods, marking requirements, and energy efficiency levels for three-phase induction motors

3 Terms, definitions and symbols

3.1 Terms and definitions

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

3.1.1

single-speed motor

motor rated for 50 Hz and/or 60 Hz on-line operation

Note 1 to entry: Single-speed motors may be capable of frequency converter operation with variable speed.

3.1.2

multi-speed motor

motor rated for 50 Hz and/or 60 Hz on-line operation that has multiple windings or a switchable winding to provide two or more different number of poles with different synchronous speeds

3.1.3

variable speed motor

motor rated for a speed range and supplied by voltage of variable amplitude and frequency

3.1.4

brake motor

motor equipped with an electro-mechanical brake unit operating directly on the motor shaft without couplings

3.1.5

geared motor

motor equipped with an integral gearbox without couplings (i.e. the first gear wheel is fixed to the motor shaft)

3.1.6

pump motor

motor directly attached to a pump without couplings (i.e. the impeller is fixed to the motor shaft)

3.1.7

average efficiency

average efficiency value for a motor population of the same design and rating

3.1.8

nominal efficiency

efficiency value required to meet a certain efficiency class according to the efficiency tables in this standard

3.1.9

rated efficiency

efficiency value assigned by the manufacturer, equal to the nominal efficiency value or higher

3.2 Symbols

η_n is the nominal efficiency, %

η_N is the rated efficiency, %

f_N is the rated frequency, Hz

n_N is the rated speed, min^{-1}

P_N is the rated power, kW

T_N is the rated torque, Nm

U_N is the rated voltage, V

4 Efficiency

4.1 Determination

4.1.1 General

This standard deals with single-speed motors operated on-line. Motors operated by frequency-converters may have higher losses as compared to on-line (sinusoidal) power supply due to the harmonic voltage content (for details see IEC/TS 60034-25). They are covered in part two of this standard series.

In order to make efficiency class ratings comparable between different motor technologies, all tests according to this standard shall be performed on sinusoidal voltage.

Efficiency and losses shall be tested in accordance with the method of the individual motor type as given in IEC 60034-2-1 (Method 2-1-1B) or equivalent standard such as IEEE 112 method B and CSA C390-10

4.1.2 Rated voltages, rated frequencies and rated power

The rated efficiency shall be determined at rated power P_N , rated voltage U_N and rated frequency f_N .

Motors rated for an extended voltage tolerance (for example $400\text{ V} \pm 10\%$ according to IEC 60038) shall be assigned a single rated efficiency, i.e. the extended tolerance shall be disregarded.

Motors with rated voltage/frequency combinations of the same magnetic flux and power, for example 230 V/400 V (delta/star) or 230 V/460 V (double-star/star), shall have only one rated efficiency and efficiency class (IE code).

Motors with more than one rated voltage/frequency/power combination should be assigned a rated efficiency and a rated efficiency-class (IE code) for each rated voltage/frequency/power combination.

However, as a minimum the lowest efficiency value and the associated IE code (of all rated voltage/frequency/power combinations) shall always be printed on the rating plate.

All efficiency values and IE codes shall be available in the product documentation (catalogue or operating instructions).

NOTE For example in Japan the rating combination “200 V/50 Hz – 200 V/60 Hz – 220 V/60 Hz” is commonly used for single-speed motors and in Europe the rating combination “380 V/50 Hz – 400 V/50 Hz – 415 V/50 Hz –

460 V/60 Hz” is sometimes used. For these examples there will be three or four efficiency ratings and there may be several different IE codes.

4.1.3 Auxiliary devices

Some electric motors covered by this standard may be equipped with auxiliary devices such as shaft seals, external fans, mechanical brakes, back-stops and unidirectional bearings, speed sensors, tacho-generators in various combinations.

However, as long as these auxiliary devices are not an integral part of the basic motor design, the determination of efficiency in all possible combinations is not practical. Tests for efficiency of such modified standard motors shall be performed on basic motors with original cooling without auxiliary devices installed.

The losses of a separately driven fan are to be included in the efficiency determination procedure when the external fan is an integral part of the basic motor construction. When the external fan is just an optional add-on to a mass-produced motor, which normally carries a shaft-mounted fan, the losses of the basic motor (with the shaft-mounted fan) can be used.

Angular-contact bearings (thrust bearings) for vertical mounted motors may be replaced by standard bearings during efficiency testing. Such motors may be tested horizontally.

Some types of motors (such as geared motors, pump motors and others) are equipped with shaft seals to prevent ingress of oil or water into the motor. External seals shall be removed for efficiency testing. This applies only to seals that are accessible from the outside without dismantling of the motor (dismantling of the fan-cover and the fan is accepted).

Electro-mechanical brakes shall be removed during testing of motor efficiency. When the motor construction prohibits a removal of the brake, the brake-coil shall be energized from a separate power source and the energy consumption of the brake-coil shall be disregarded in the calculation of motor efficiency.

4.2 Rating

The efficiency declared by the manufacturer on the rating plate (rated efficiency) shall be greater or equal to the nominal efficiency as defined in this standard (according to the efficiency class (IE code) on the rating plate).

The full-load efficiency of any motor, when tested at rated voltage and rated frequency shall not be less than the rated-/classification efficiency minus the tolerance of the total losses in accordance with IEC 60034-1.

It is recommended to report efficiencies at 50 %, 75 % and full load in the product documentation. For the purpose of this standard only the efficiency at rated power applies.

Variations in materials, manufacturing processes and testing result in motor-to-motor efficiency variations for a given motor design; the full-load efficiency for a large population of motors of a single design is not a unique value but rather a band of efficiency. Therefore, the energy efficiency limits given in this standard are nominal.

4.3 Classification and marking

4.3.1 General

The designation of the energy efficiency class consists of the letters “IE” (short for International Energy efficiency class), directly followed by a numeral representing the classification according to Table 1.

4.3.2 Efficiency classification

Table 1 – IE efficiency classification

Designation	Definition
IE1	Motors with a rated full-load efficiency equal to or exceeding the limits listed in 4.4.1.
IE2	Motors with a rated full-load efficiency equal to or exceeding the limits listed in 4.4.2.
IE3	Motors with a rated full-load efficiency equal to or exceeding the limits listed in 4.4.3

IE4	Motors with a rated full-load efficiency equal to or exceeding the limits listed in 4.4.4.
IE5	Envisaged for a future edition of this standard. See Annex A.

4.3.3 Motors below IE1 efficiency

Some motors have rated efficiencies below the limits given in Table 2. No IE code marking of these motors shall be required.

4.3.4 Minimum Energy Performance standard (MEPS)

IE3 (or equivalent e.g. NEMA premium) is the minimum energy performance that is allowed to be manufactured and imported in the Kingdom.

4.3.5 Marking

Rating plate(s) shall be durably marked with the items in the following list:

- The manufacturer's name or mark
- The country of manufacture
- The manufacturer's serial number, or identification mark
- The manufacturer's machine code.
- The number of phases
- The rated efficiency and the IE code (or equivalent), for example "IE3 – 94,0 %"
- The class(es) of rating of the machine if designed for other than rating for continuous running duty S1
- The rated output(s) or range of rated output
- The rated voltage(s) or range of rated voltage
- The rated frequency
- The rated current(s) or range of rated current
- The rated speed(s) or range of rated speed and number of poles
- The rated power factor(s)
- The maximum ambient air temperature, if other than 40 °C.
- The minimum ambient air temperature, if other than -15 °C.
- The altitude for which the machine is designed, if exceeding 1 000 m above sea-level

4.4 Nominal limits for efficiency classes IE1, IE2, IE3 and IE4

NOTE Shaded areas in the tables indicate changes compared to the previous edition of this standard.

4.4.1 Nominal efficiency limits for IE1

Table 2 – Nominal efficiency limits (%) for 60 Hz IE1

P_N kW	Number of poles/synchronous speed min ⁻¹			
	2/3600	4/1800	6/1200	8/900
0,75	74,0	77,0	72,0	64,0
1,1	78,5	79,0	75,0	73,5
1,5	81,0	81,5	77,0	77,0
2,2	81,5	83,0	78,5	78,0
3,7	84,5	85,0	83,5	80,0
5,5	86,0	87,0	85,0	84,0
7,5	87,5	87,5	86,0	85,0
11	87,5	88,5	89,0	87,5
15	88,5	89,5	89,5	88,5
18,5	89,5	90,5	90,2	88,5
22	89,5	91,0	91,0	90,2
30	90,2	91,7	91,7	90,2
37	91,5	92,4	91,7	91,0
45	91,7	93,0	91,7	91,0
55	92,4	93,0	92,1	91,5
75	93,0	93,2	93,0	92,0
90	93,0	93,2	93,0	92,5
110	93,0	93,5	94,1	92,5
150 up to 375	94,1	94,5	94,1	92,5

4.4.2 Nominal efficiency limits for IE2

Table 3 – Nominal efficiency limits (%) for 60 Hz IE2

P_N kW	Number of poles/synchronous speed min^{-1}			
	2/3600	4/1800	6/1200	8/900
0,75	75,5	78,0	73,0	66,0
1,1	82,5	84,0	85,5	75,5
1,5	84,0	84,0	86,5	82,5
2,2	85,5	87,5	87,5	84,0
3,7	87,5	87,5	87,5	85,5
5,5	88,5	89,5	89,5	85,5
7,5	89,5	89,5	89,5	88,5
11	90,2	91,0	90,2	88,5
15	90,2	91,0	90,2	89,5
18,5	91,0	92,4	91,7	89,5
22	91,0	92,4	91,7	91,0
30	91,7	93,0	93,0	91,0
37	92,4	93,0	93,0	91,7
45	93,0	93,6	93,6	91,7
55	93,0	94,1	93,6	93,0
75	93,6	94,5	94,1	93,0
90	94,5	94,5	94,1	93,6
110	94,5	95,0	95,0	93,6
150	95,0	95,0	95,0	93,6
185	95,4	95,0	95,0	93,6
220 up to 335	95,4	95,4	95,0	93,6
375	95,4	95,8	95,0	94,1

4.4.3 Nominal efficiency limits for IE3

Table 4 – Nominal efficiency limits (%) for 60 Hz IE3

P_N kW	Number of poles / synchronous speed min^{-1}			
	2/3600	4/1800	6/1200	8/900
0,75	77,0	83,5	82,5	75,5
1,1	84,0	86,5	87,5	78,5
1,5	85,5	86,5	88,5	84,0
2,2	86,5	89,5	89,5	85,5
3,7	88,5	89,5	89,5	86,5
5,5	89,5	91,7	91,0	86,5
7,5	90,2	91,7	91,0	89,5
11	91,0	92,4	91,7	89,5
15	91,0	93,0	91,7	90,2
18,5	91,7	93,6	93,0	90,2
22	91,7	93,6	93,0	91,7
30	92,4	94,1	94,1	91,7
37	93,0	94,5	94,1	92,4
45	93,6	95,0	94,5	92,4
55	93,6	95,4	94,5	93,6
75	94,1	95,4	95,0	93,6
90	95,0	95,4	95,0	94,1
110	95,0	95,8	95,8	94,1
150	95,4	96,2	95,8	94,5
185 up to 375	95,8	96,2	95,8	95,0

4.4.4 Nominal efficiency limits for IE4

Table 5 – Nominal efficiency limits (%) for 60 Hz IE4

P_N kW	Number of poles / synchronous speed min^{-1}			
	2/3600	4/1800	6/1200	8/900
0,75	82,5	85,5	84,0	78,5
1,1	85,5	87,5	88,5	81,5
1,5	86,5	88,5	89,5	85,5
2,2	88,5	91,0	90,2	87,5
3,7	89,5	91,0	90,2	88,5
5,5	90,2	92,4	91,7	88,5
7,5	91,7	92,4	92,4	91,0
11	92,4	93,6	93,0	91,0
15	92,4	94,1	93,0	91,7
18,5	93,0	94,5	94,1	91,7
22	93,0	94,5	94,1	93,0
30	93,6	95,0	95,0	93,0
37	94,1	95,4	95,0	93,6
45	94,5	95,4	95,4	93,6
55	94,5	95,8	95,4	94,5
75	95,0	96,2	95,8	94,5
90	95,4	96,2	95,8	95,0
110	95,4	96,2	96,2	95,0
150	95,8	96,5	96,2	95,4
185	96,2	96,5	96,2	95,4
220	96,2	96,8	96,5	95,4
250 up to 375	96,2	96,8	96,5	95,8

NOTE Table 5 supersede Annex A of IEC 60034-31:2010.

4.4.5 Interpolation of nominal efficiency limits of intermediate rated powers for 60 Hz mains supply frequency

Normative, nominal limits are given in Tables 3, 5, 7 and 9. Normative, nominal limits of 60 Hz motors having rated powers not defined in the tables shall be determined as follows:

- The efficiency of a rated power at or above the midpoint between two consecutive power values from the tables shall be the higher of the two efficiencies.
- The efficiency of a rated power below the midpoint between two consecutive power values from the tables shall be the lower of the two efficiencies.

5 Registration

5.1 General

Product registration is mandatory if motor is in the scope (including excluded motors) of the standard, whereby information about registration requirements will be available in the website of the Saudi Standards, Metrology, and Quality Organization (SASO), and reference shall be made to the separate SASO registration forms and requirements.

Applications shall be submitted through the registration system electronically via SASO website. The applicant shall fulfil all updated requirements of the electronic registration system and any new requirement, procedure, and regulation required by SASO.

5.2 Type of documents needed for registration under the scope of this standard

For registration, a test report covering the submitted product shall be attached, except for excluded motors the test can be replaced by a declaration.

Note: this test report or declaration is not exclusive from other documents required by SASO (e.g. Safety,...) for registration.

Annex A (informative)

Nominal limits for efficiency class IE5

The levels of the IE5 efficiency class are envisaged to be incorporated into the next edition of this standard and/or in part two of this standard series. It is the goal to reduce the losses of IE5 by some 20 % relative to IE4. Motor technologies for IE5 are currently not well developed and not commercially available.

Further energy-efficiency optimizations will have to focus on improved system efficiency throughout the entire operating load cycle including all system-losses (converter, filter, cables, motor, etc.), see EN 52800.

Annex B: List of National modifications

(informative)

The text of the international Standard IEC 60034-30-1:2014 was approved by Saudi Standards, Metrology and Quality Organization as a Saudi Standard with agreed modification as indicated below.

Clause/Subclause	Text as specified in IEC 60034-30-1 2014	National Modification
Foreword	Foreword	Replaced by a national foreword
1. Scope	<ul style="list-style-type: none"> have a rated power P_N from 0,12 kW to 1 000 kW; 	Replace “0.12 to 1000 kW” with “0.75 to 375 kW”
1. Scope	<ul style="list-style-type: none"> are capable of continuous operation at their rated power with a temperature rise within the specified insulation temperature class; 	<ul style="list-style-type: none"> Replaced by “Motors covered by this standard are rated for duty type S1 (continuous duty)”
1. Scope	NOTE 1 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.	Delete “NOTE 1 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.”
1. Scope	NOTE 2	Change the sequence to “NOTE 1”
1. Scope	NOTE 3	Change the sequence to “NOTE 2”
1. Scope	NOTE 4	Change the sequence to “NOTE 3”
1. Scope	NOTE 5	Change the sequence to “NOTE 4”
1. Scope	NOTE 6	Change the sequence to “NOTE 5”
1. Scope	NOTE 7	Change the sequence to “NOTE 6”
1. Scope	NOTE 8	Change the sequence to “NOTE 7”
1. Scope	NOTE 4 Smoke extraction motors with a temperature class of up to and including 400 °C are covered by this standard.	Replaced by ” NOTE 3 Smoke extraction motors with a temperature class of up to and including 300 °C are covered by this standard.

<p>1. Scope</p>	<p>1. Scope</p>	<p>Text Added “Motors completely integrated into a machine are not covered by this standard (for example pump, fan and compressor) that cannot be practically tested separately from the machine even with provision of a temporary end-shield and drive-end bearing. This means the motor shall: a) share common components (apart from connectors such as bolts) with the driven unit (for example, a shaft or housing) and; b) not be designed in such a way as to enable the motor to be separated from the driven unit as an entire motor that can operate independently of the driven unit. That is, for a motor to be excluded from this standard, the process of separation shall render the motor inoperative.</p> <p>(TEAO, IC418) Totally enclosed air-over machines, i.e. totally enclosed frame-surface cooled machines intended for exterior cooling by a ventilating means external to the machine, are covered by this standard. Efficiency testing of such motors may be performed with the fan removed and the cooling provided by an external blower with a similar airflow rate as the original fan.”</p>
<p>1. Scope</p>	<p>1. Scope</p>	<p>Text Added“ Motors with integrated frequency-converters (compact drives) are not covered by this standard when the motor cannot be tested separately from the converter. Energy efficiency classification of compact drives shall be based on the complete product (PDS : Power Drive System) and will be defined in a separate standard.</p>
<p>1. Scope (i.e.</p>	<p>Single-speed motors with 10 or</p>	<p>Delete “Single-speed</p>

“Excluded are”)	more poles or multi-speed motors.	motors with 10 or more poles or multi-speed motors.”
1. Scope (i.e. “Excluded are”)	Motors with mechanical commutators (such as DC motors).	Delete “Motors with mechanical commutators (such as DC motors).”
1. Scope (i.e. “Excluded are”)	Motors completely integrated into a machine... =>...similar airflow rate as the original fan	Delete “Motors completely integrated into a machine... =>...similar airflow rate as the original fan.
1. Scope (i.e. “Excluded are”)	<p>Motors with integrated frequency-converters (compact drives) when the motor cannot be tested separately from the converter. Energy efficiency classification of compact drives shall be based on the complete product (PDS : Power Drive System) and will be defined in a separate standard.</p> <p>NOTE 7 A motor is not excluded when the motor and frequency-converter can be separated and the motor can be tested independently of the converter.</p>	<p>Delete “Motors with integrated frequency-converters (compact drives) when the motor cannot be tested separately from the converter. Energy efficiency classification of compact drives shall be based on the complete product (PDS : Power Drive System) and will be defined in a separate standard.</p> <p>NOTE 7 A motor is not excluded when the motor and frequency-converter can be separated and the motor can be tested independently of the converter.”</p>
1. Scope (i.e. “Excluded are”)	<ul style="list-style-type: none"> Smoke extraction motors with a temperature class above 400 °C. 	<ul style="list-style-type: none"> Delete “Smoke extraction motors with a temperature class above 400 °C.”
1. Scope (i.e. “Excluded are”)		<p><i>Add :</i></p> <ul style="list-style-type: none"> <i>Motors with cooling methods other than IC0Ax, IC1Ax, IC2Ax, IC3Ax or IC4Ax (see IEC 60034-6);</i> <i>Motors built for a restricted space (high-output design, i.e. smaller frame sizes than usual in national standards);</i> <i>Motors specifically built for operation in explosive environments according to IEC 60079-0 (due to safety requirements and possible design</i>

		<p><i>constraints of explosion proof motors such as increased air-gap, reduced starting current, enhanced sealing);</i></p> <ul style="list-style-type: none"> • <i>Motors for special requirements of the driven machine beyond the requirements of the IEC 60034 series of standards (such as motors for heavy starting duty, special torque stiffness and/or breakdown torque characteristics, large number of start/stop cycles, very low rotor inertia);</i> • <i>Motors for special characteristics of the grid supply beyond the requirements of the IEC 60034 series of standards (such as motors with limited starting current, increased tolerances of voltage and/or frequency);</i> • <i>Motors with liquid cooling on account of their higher power density compared with air cooled motors of the same frame size;</i> • <i>Smoke extraction motors with a temperature class higher than 300 °C.</i>
2. Normative references	2 Normative references	Add : <i>IEEE 112-2004 , Test Procedure for Polyphase Induction Motors and Generators</i>
2. Normative references	2 Normative references	Add: <i>CSA C390-10 TEST METHODS, MARKING REQUIREMENTS, AND ENERGY EFFICIENCY LEVELS FOR THREE-PHASE INDUCTION MOTORS</i>
4. Fields of application	4 Fields of application	Remove "The clause 4 Fields of application "and replace the sequence number with " 4 Efficiency "
4. Efficiency	Efficiency and losses shall be tested in accordance with the preferred method	Replace by " Efficiency and losses shall be tested in accordance with the

	of the individual motor type as given in IEC 60034-2-1.	method of the individual motor type as given in IEC 60034-2-1 (Method 2-1-1B) or equivalent such as IEEE 112, Method B. CSA C390-10
4. Efficiency		New clause added: 5.1.1 Minimum Energy Performance standard (MEPS)
4. Marking	The rated efficiency and the IE code (or equivalent) shall be durably marked on the rating plate, for example "IE3 – 94,0 %".	<p>Deleted: The rated efficiency and the IE code (or equivalent) shall be durably marked on the rating plate, for example "IE3 – 94,0 %".</p> <p>Replaced by:</p> <p>Rating plate(s) shall be durably marked with the items in the following list:</p> <ul style="list-style-type: none"> -The manufacturer's name or mark -The country of manufacture -The manufacturer's serial number, or identification mark -The manufacturer's machine code. -The number of phases -The rated efficiency and the IE code (or equivalent), for example "IE3 – 94,0 %" -The class(es) of rating of the machine if designed for other than rating for continuous running duty S1 -The rated output(s) or range of rated output -The rated voltage(s) or range of rated voltage -The rated frequency -The rated current(s) or range of rated current -The rated speed(s) or range of rated speed and number of poles -The rated power factor(s) -The maximum ambient air temperature, if other than 40 °C. -The minimum ambient air temperature, if other than -15 °C. -The altitude for which the machine is designed, if exceeding 1 000 m above sea-level

4 Motors below IE1 efficiency	Some motors have rated efficiencies below the limits given in Tables 2. No marking of these motors shall be required.	Deleted: Some motors have rated efficiencies below the limits given in Tables 2. No marking of these motors shall be required. Replaced by: Some motors have rated efficiencies below the limits given in Tables 2. No IE code marking of these motors shall be required
5. Registration	-	New clause Added with sequence number “ 5 Registration”

Bibliography

IEC 60034-5, *Rotating electrical machines – Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code) – Classification*

IEC 60034-12, *Rotating electrical machines – Part 12: Starting performance of single-speed three-phase cage induction motors*

IEC/TS 60034-31:2010, *Rotating electrical machines – Part 31: Selection of energy-efficient motors including variable speed applications – Application guide*

IEC 60072-1, *Dimensions and output series for rotating electrical machines – Part 1: Frame numbers 56 to 400 and flange numbers 55 to 1080*

ISO 3, *Preferred numbers – Series of preferred numbers*

EN 12101-3, *Smoke and heat control systems – Part 3: Specification for powered smoke and heat exhaust ventilators*

EN 50347, *General purpose three-phase induction motors having standard dimensions and outputs – Frame numbers 56 to 315 and flange numbers 65 to 740*

EN 52800, *Energy efficiency for power drive systems, motor starters, power electronics and their driven applications*

JIS C 4212 (Japanese Industrial Standard), *Low-voltage three-phase squirrel-cage high-efficiency induction motors*

NBR 17094-1, *Rotating electrical machines – Induction motors – Specification*

NEMA MG1, *Motors and Generators*

SANS 1804-1 (South African Standard), *Induction motors – Part 1: IEC requirements*
