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كفاءة استهلاك الطاقة للمحركات الكهربائية

Energy-Efficient for Electric Motors

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Energy-Efficient for Electric Motors

تـــــــــاريخ الاعتمـــــــــاد :
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Foreword

The Ministry of Industry and Advanced Technology is the authority responsible for standardization activities, according to Federal Decree Law No. 20 of 2020 regarding specifications and metrology. Among its tasks is the preparation of UAE standards and technical regulations by means of technical committees and specialized work teams.

The Ministry, through the Technical Committee for Electricity, has prepared the UAE technical regulation "UAE.S XXX:2022 Energy Efficiency for Electric Motors".

This standard has been approved, as a technical regulation, by UAE Cabinet Resolution No. ( ) dated / ## .#### / ##

Energy-Efficient for Electric Motors

Article 1. Scope

1.1 Scope

This regulation applies to all three Phase single-speed electric induction motors that are manufactured in or imported into the country, and are sold either as standalone equipment or as a component of a motor-driven unit, with 2, 4, 6 and 8 poles, rated output power from 0.75 kW to 375 kW (i.e. 1 HP to 500 HP) with rated voltage of 50 Volts and above, up to and including 1,000 Volts, with a rated frequency of 50 Hz. Which are designed to operate in any ambient temperature within the range of -30°C to + 60 °C.; and at any altitude up to 4000 m above mean sea level.

Motors which are rated for both fixed speed operation and variable speed operation, are within the scope of this regulation, but shall bear the IE efficiency class for fixed speed operation only.

The regulation applies to induction motors with squirrel-cage rotors as well as with wound- rotors.

1.2 Exclusions

This regulation does not apply to

- Motors other than induction motors;
- Induction motors that are mechanically or electrically integrated into the motor-driven unit to the extent that these are incapable of independent operation even if a temporary end shield or a drive end bearing is fitted;
- Motors rated for temperatures outside the range specified in scope as these are of special construction;
- Motors specifically designed to operate wholly immersed in a liquid;
- Multi-speed motors, torque motors;
- Totally enclosed non-ventilated (TENV) motors IC410; Motors with cooling methods other than IC0Ax, IC1Ax, IC2Ax, IC3Ax or IC4Ax (see IEC 60034-6);
- Motors intended for use in explosive atmospheres and certified as "Ex eb" increased safety motors, as defined in UAE.S IEC EN 60079-7:2015.

1.3 reference Standards

- IEC 60034-2-1 Ed. 2.0 Rotating electrical machines – Part 2-1: Standard methods for determining losses and efficiency.
- IEC 60034-30-1 Ed. 1.0 Rotating electrical machines – Part 30-1: Efficiency classes of line operated AC motors (IE code).

The testing requirements specified in above can be met by using the following alternative test method:

IEEE 112:2017 : Method B (Test Procedure for Polyphase Induction Motors and Generators)

Article 2. Terms and Definitions

a) '**Efficiency'** means the ratio of output power to input power expressed as a percentage.

b) **'Full load'** means the load that causes a motor to operate at its rating.

c) '**Full load value'** means a quantity value for a motor operating at full power, torque, current or speed.

d) **'IE Class'** means the 'International Efficiency' classification of motors and other components of a motor system defined by the respective IEC Standards.

e) **'Losses'** means the difference between the input power and the output power, comprising of various components viz. core losses, stator and rotor losses, friction and windage losses and stray load losses.

f) **'Motor-Driven Unit'** includes the aggregate of the motor, elements for transmitting its motion such as a coupling, belt, gear, clutch, brake etc., the driven equipment such as a pump, fan, compressor, conveyor etc., and a soft-starter or electronic speed control device.

g) **'Power factor'** means the ratio of 'active' or 'real' power (i.e. useful power) to 'apparent' power drawn by a motor from the mains.

h) **'Rated output'** means the value of the output included in the rating. For a motor it means the mechanical power available at the motor shaft under rated operating conditions. It is expressed in kilo-Watts (kW) or horsepower (hp) .

i) **'Rated value'** means a quantity value assigned, generally by a manufacturer, for a specified operating condition of a motor.

j) **'Single-speed motor'** means a motor rated for 50 Hz and/or 60 Hz on-line operation.

k) **'Tolerance'** means the permitted deviation between the declared value of a quantity and the measured value.

Article 3. Requirements

All electric induction motors in the scope of this regulation, that are manufactured in, or imported into the country, shall meet the minimum energy efficiency requirements, the product information requirements, and the compliance criteria in this Article.

3.1 Energy Efficiency Requirements

The nominal energy efficiency of a motor included in the scope of this regulation must not be less than the value specified in Table 1, **at full load and under rated operating conditions**.

For motors with a rated output power other than the values specified in Table 1, but within the range of 0.75 kW-375 kW, the efficiency value determined in accordance with the interpolation method specified in clause 5.4.5 of UAE.S IEC 60034-30-1 shall apply.

Table 1 : Nominal energy efficiency requirements for 50 Hz motors (IE3)

Rated output power (kW)	Energy Efficiency (%) No of poles / Synchronous speed			
	2-pole 3000 RPM	4-pole 1500 RPM	6-pole 1000 RPM	8-pole 750 RPM
0.12	60.8	64.8	57.7	50.7
0.18	65.9	69.9	63.9	58.7
0.20	67.2	71.1	65.4	60.6
0.25	69.7	73.5	68.6	64.1
0.37	73.8	77.3	73.5	69.3
0.40	74.6	78.0	74.4	70.1
0.55	77.8	80.8	77.2	73.0
0.75	80.7	82.5	78.9	75.0
1.1	82.7	84.1	81.0	77.7
1.5	84.2	85.3	82.5	79.7
2.2	85.9	86.7	84.3	81.9
3	87.1	87.7	85.6	83.5
4	88.1	88.6	86.8	84.8
5.5	89.2	89.6	88.0	86.2
7.5	90.1	90.4	89.1	87.3
11	91.2	91.4	90.3	88.6
15	91.9	92.1	91.2	89.6
18.5	92.4	92.6	91.7	90.1
22	92.7	93.0	92.2	90.6
30	93.3	93.6	92.9	91.3
37	93.7	93.9	93.3	91.8
45	94.0	94.2	93.7	92.2
55	94.3	94.6	94.1	92.5
75	94.7	95.0	94.6	93.1
90	95.0	95.2	94.9	93.4
110	95.2	95.4	95.1	93.7
132	95.4	95.6	95.4	94.0
160	95.6	95.8	95.6	94.3
200 up to 375	95.8	96.0	95.8	94.6
375 up to 1000	95.8	96.0	95.8	94.6

3.2 Product Information Requirements

Manufacturers shall provide the following information for the motors covered by this regulation. Either on one or more rating plates, in the technical documentation and free access websites.

- Year of manufacture
- Efficiency class (IE code) and
- Nominal efficiency (η) at 100%, 75 % and 50 % rated load and voltage (U_N);
- Rated efficiency class.
- Manufacturer's name
- Number of phases, i.e. 3
- Degree of protection (IP code),
- Thermal class and the limit of temperature rise.
- Rated power output (kW).
- Rated voltage(s) or range of rated voltage (V).
- Rated frequency (Hz).
- Rated current(s) or range of rated current.
- Rated speed(s) or range of rated speed.
- Rated power factor(s).
- For wound-rotor induction machines, the rated open-circuit voltage between slip- rings and the rated slip-ring current.
- Maximum ambient air temperature, if other than 40 °C
- Minimum ambient air temperature if other than -15 °C
- The altitude for which the motor is designed (if exceeding 1 000 m above sea-level)
- The approximate total mass of the motor, if exceeding 30 kg.
- For motors suitable for operation in only one direction of rotation, the direction of rotation indicated by an arrow. This arrow need not be on the rating plate, but it shall be easily visible.
- The connecting instructions by means of a diagram or text located near the terminals.

3.3 Compliance criteria

3.3.1 Certification and Registration

- Importers and manufacturers of motors covered by this regulation must be register their products with the MOIAT and get the conformity certificate (ECAS) through the submission of the full product information and required documents together with test reports.
- The test reports should be according the test standards mentioned in Article 2 above.
- Test reports should be from test laboratories that have been accredited according ISO 17025. These may be either manufacturer's in-house laboratories or third-party laboratories.

3.3.2 Market Surveillance

- Importers or manufacturers shall provide the information and technical documentation necessary for the market surveillance authority to assess conformity and verify compliance and any additional optional claims.
- In order to verify the compliance of the claimed energy efficiency of a motor design covered by this regulation,

- -market surveillance authority shall test one single motor to be picked directly from the market, according to the test method prescribed above.
- The motor consider as comply if the measured full-load efficiency of the motor at rated voltage and rated frequency is not less than the nominal efficiency,after allowing for the tolerance on the total losses according to IEC 60034-1 .
- If the selected motor fails this test, the market surveillance authority shall randomly test three additional motors of the same design. The motor design shall be considered to comply with this regulation, if the average of the measured full-load efficiency of the three test motors at rated voltage and rated frequency is not less than the nominal efficiency, after allowing for the tolerance on the total losses according to IEC 60034-1.
- If this result is not achieved, the motor design shall be considered to be not in compliance with this regulation. If a decision of non-compliance is taken, the market surveillance authority may take legal and enforcement actions against the manufacturer and / or importer, as well as, stope sale of the same model and recall it from the market.

The calculation of average efficiency is only relevant to the permit for verification by the competent authorities and may not be used by the manufacturer or the importer as a permit to determine the values in technical documentation or in the conformity.