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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 32891.1-2016

**Rotating electrical machines -- Efficiency classes (IE code) --
Part 1: Line operated AC motors
(English Translation)**

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Foreword

GB/T 32891 "Rotary motor efficiency classification (IE code)" is divided into two parts.

- Part 1. AC motor powered by grid;

Part 2. Variable speed AC motors.

This part is part 1 of GB/T 32891.

This part is drafted in accordance with the rules given in GB/T 1.1-2009.

This part uses the translation method equivalent to IEC 60034-30-1.:2014 "Rotating motor on-line operation of AC motor efficiency rating (IE code) ".

In this part of the normative reference to the international documents have a consistent correspondence between the following documents.

GB/T 156-2007 standard voltage (IEC 60038.:2002, MOD);

Rotating motor quota and performance (IEC 60034-1.:2004, IDT);

Rotating motor cooling method (IEC 60034-6.:1991, IDT);

GB 3836.1-2010 Explosive atmospheres - Part 1. General requirements for equipment (IEC 60079-0.:2007, MOD);

Guide for the design and performance of frequency converter power supply cage induction motors (IEC/T S60034-25.:2004, GB/T 21209-2007) IDT);

GB/T 25442-2010 Test method for determining the loss and efficiency of rotating electrical machines (excluding traction motors) (IEC 60034-2-1.

2007, IDT);

GB/T 32877-2016 Inverter-supplied AC induction motor Specific test method for determining loss and efficiency (IEC/T S60034-2-3..2013, IDT).

This section makes the following editorial changes.

- In order to coordinate with existing standards, change the standard name to "Energy efficiency rating (IE code) Part 1. Grid-powered AC motors".

This part is made by China Electrical Equipment Industry Association.

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Introduction

This section specifies the energy efficiency rating of the motor, involving a variety of motors rated for on-line operation (including buck start), as well as various amounts Constant voltage and frequency of all single-phase and three-phase low-voltage induction motor, including self-starting permanent magnet motor.

This part not only applies to three-phase, cage induction motor, also applies to the rated online operation of a variety of motor technology structure, power range from 0.12kW ~ 1000kW motor.

For a given output power and frame size, in general, the motor is designed to run directly on-line, 60Hz is easier than 50Hz to achieve high efficiency, see note 1.

Note 1: Because the relationship between the motor size and the torque is not as linearly as the theoretical relationship between the output power and the rotational speed, as the frequency increases from 50 Hz to 60% increase in 60Hz.

In the small and medium induction motor, the winding loss I^2R is the main loss. When the torque remains constant, the winding losses from 50Hz to 60Hz are based this remains the same. Although the wind friction and iron loss will increase with the frequency increases, but in 4 pole and above the motor stroke friction and iron consumption accounted for a smaller proportion.

Compared with the 50Hz motor, the 60Hz motor loss increases by less than 20% of the power increase, so the efficiency is improved.

In fact, either 50Hz or 60Hz single-speed motor output power is designed according to the standard power level, such as IEC 60072-1. because Thus, the increase in motor rated efficiency does not always meet the principle of 20%. However, if the motors are optimized at their respective frequencies, then, at 60 Hz the advantage is still applicable.

The difference in motor efficiency between 50 Hz and 60 Hz varies with the number of poles and the size of the motor. In general, three-phase cage induction motor power from the 0.75kW ~ 375kW, 60Hz when the efficiency of 50Hz than the efficiency of 0.5% to 2.5%. Only high-power 2P motor, due to iron consumption, wind consumption accounted for the proportion of large, at 60Hz when the efficiency is reduced.

Do not expect all manufacturers to produce all the efficiency levels and all power levels of the motor.

The user selects the efficiency level to refer to the actual run time. Due to increased inertia and starting loss, in the intermittent or short-term work system, Choose a high efficiency level of the motor is not necessarily energy saving.

Note 2: How to use the high efficiency motor, application guide IEC/T S60034-31..2010 gives further useful information.

In order to achieve a greater market share of satisfaction, in principle, the efficient motor should meet the relevant installation size and output power corresponding to the (Such as. seat size, flange size, etc.). The energy efficiency levels defined in this section are not subject to the size of the motor, so that all markets are born it is not possible to produce a high efficiency grade motor that meets the mechanical size standard.

IE code is not limited to motors, but also can be applied to other products, such as frequency converter and gearbox.

Other products also apply to an identical system. IE1 is inefficient and IE5 is the most efficient.

System combination products (such as electric drive systems) will have a comprehensive efficiency assessment. In order to avoid confusion, the assessment does not use IE code.

The efficiency levels of 50 Hz and 60 Hz in this section are not always consistent with all poles and the entire power range.

Rotary motor efficiency rating (IE code) Part 1. AC motor powered by the grid

1 Scope

This part of GB/T 32891 specifies that the range of IEC 60034-1 or IEC 60079-0 is designed to be controlled by a sine wave voltage the efficiency of single-speed motors is graded and meets the following requirements.

- a) Rated output power (PN). 0.12kW ~ 1000kW;
- b) Rated voltage (UN). 50V ~ 1000V;
- c) the number of poles. 2P, 4P, 6P, 8P;
- d) in the rated output power to ensure that its temperature limit to meet its insulation level can be long-term continuous operation;

Note 1: Most of the motor ratings included in this section are S1 (continuous operation), however some motors are rated for periodic work as long as they are rated the output power can be continuously operated, also covered in this section.

- e) Ambient temperature range. -20 °C ~ 60 °C;

Note 2: Rated efficiency and efficiency ratings are given according to IEC 60034-2-1 at ambient air temperature of 25 °C.

Note 3: Motors rated at or below -20 °C are generally considered to be of special construction and therefore are not included in this section.

motivation.

Note 4: This part includes the exhaust fan motor with temperature class ≤400 °C.

- f) not more than 4000m above sea level.

Note 5: rated efficiency and efficiency level is based on altitude ≤ 1000m.

The efficiency limit established in this section is based on the frequency, the number of poles and the output power of the motor, and does not distinguish between the motor