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Replacing GB 30253-2013

**Minimum allowable values of energy efficiency and energy
efficiency grades for permanent magnet synchronous motors**

永磁同步电动机能效限定值及能效等级

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Foreword

This document was drafted in accordance with the rules given in GB/T 1.1-2020, *Directives for standardization - Part 1: Rules for the structure and drafting of standardizing documents*.

This document replaces GB 30253-2013 *Minimum Allowable Values of Energy Efficiency and Energy Efficiency Grades for Permanent Magnet Synchronous Motors*; compared with GB 30253-2013, in addition to structural adjustments and editorial changes, the main technical changes are as follows:

- a) Change the scope of application of the standard (see Chapter 1; Chapter 1 of the 2013 edition);
- b) Delete the definitions of target minimum allowable values of energy efficiency for permanent magnet synchronous motors and evaluating values of energy conservation for permanent magnet synchronous motors (see 3.4 and 3.5 of the 2013 edition);
- c) Delete the requirements for target minimum allowable values and evaluating values for energy conservation for permanent magnet synchronous motors (see 4.4 and 4.5 of the 2013 edition);
- d) Change the energy efficiency grade index for asynchronous-start three-phase permanent-magnet synchronous motors of voltage 1 140 V and below and rated power 0.55 kW ~ 375 kW (see Table 1; Table 1 of the 2013 edition);
- e) Add energy efficiency grade index requirements for asynchronous-start three-phase permanent-magnet synchronous motor of voltage 1 140 V and below and rated power 400 kW ~ 1 000 kW (see Table 1);
- f) Add energy efficiency grade index requirements for asynchronous-start three-phase permanent-magnet synchronous motor of voltage level 3 kV (3.3 kV), 6 kV, 10 kV, cooling method IC81W, IC86W, IC71W (IC3W7), IC411, IC416, IC511, IC611, IC616, IC516, IC666, and rated power 200 kW ~ 2 000 kW (see Table 2 ~ Table 7);
- g) Change the energy efficiency grade index requirements for permanent-magnet synchronous motors driven by variable frequency equipment of voltage 1 140 V and below and rated power 0.55 kW ~ 90 kW (see Table 8 ~ Table 10; Table 3 of the 2013 edition);
- h) Add energy efficiency grade index requirements for permanent-magnet synchronous motors driven by variable frequency equipment of voltage 1 140 V and below and rated power 110 kW ~ 1 250 kW (see Table 8 ~ Table 10);

Minimum allowable values of energy efficiency and energy efficiency grades for permanent magnet synchronous motors

1 Scope

This document specifies the energy efficiency grades, technical requirements and test methods for permanent magnet synchronous motors.

This document is applicable to permanent magnet synchronous motors for general or explosion-proof purposes in continuous working mode, including the following scope:

- a) Asynchronous-start three-phase permanent-magnet synchronous motor powered by 50 Hz three-phase AC power supply, of voltage level 1 140 V and below, rated power 0.55 kW ~ 1 000 kW, and pole number 2 poles ~ 16 poles;
- b) Asynchronous-start three-phase permanent-magnet synchronous motor powered by 50 Hz three-phase AC power supply, of voltage 3 kV (3.3 kV), 6 kV and 10 kV, cooling method IC81W, IC86W, IC71W (IC3W7), IC411, IC416, IC511, IC611, IC616, IC516 and IC666, rated power 200 kW ~ 2 000 kW and pole number 4 poles ~ 12 poles;
- c) Permanent-magnet synchronous motor driven by variable frequency equipment powered by variable frequency power supply, of voltage 1 140 V and below, rated power 0.55 kW ~ 1 250 kW, and rated speed 45 r/min ~ 6 000 r/min;
- d) Permanent-magnet synchronous motor driven by variable frequency equipment powered by variable frequency power supply, of voltage 3 kV (3.3 kV) and 6 kV, 10 kV, cooling method IC81W, IC86W, IC71W (IC3W7), IC411, IC416, IC511, IC611, IC616, IC516, IC666, rated power 200 kW and above, and rated speed 45 r/min ~ 3 000 r/min;
- e) Permanent magnet synchronous motor for elevators powered by variable frequency power supply, of voltage 1 140 V and below, and rated power 0.55 kW ~ 110 kW.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the version corresponding to that date is applicable to this document; for undated references, the latest version (including all amendments) is applicable to this document.

GB/T 755, Rotating electrical machines - Rating and performance

GB/T 22669-2008, Test procedures for three-phase permanent magnet synchronous machines

GB/T 32877-2022, Specific test methods for determining losses and efficiency of converter-fed AC motors

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

asynchronous-start three-phase permanent-magnet synchronous motor

A permanent magnet synchronous motor that is started using the asynchronous torque generated by the starting winding at a certain frequency and voltage.

3.2

permanent-magnet synchronous motor driven by variable frequency equipment

A permanent magnet synchronous motor driven by a frequency converter.

3.3

minimum allowable values of energy efficiency for permanent magnet synchronous motors

The lowest standard value of efficiency allowed for permanent magnet synchronous motors under the test conditions specified in the standard.

4 Energy efficiency grades

The energy efficiency of permanent magnet synchronous motors is divided into 3 grades, among which grade 1 is the highest energy efficiency. The measured efficiency of permanent magnet synchronous motors of various grades under the specified test method shall not be lower than the requirements in Table 1 ~ Table 29.

The measured efficiency tolerance of permanent magnet synchronous motors of various grades under the specified test method shall comply with the provisions of GB/T 755.

Within the specified range, the efficiency of motors whose rated power and rated speed are not listed in the table is determined by linear interpolation.

5 Technical requirements

The minimum allowable values of energy efficiency for permanent magnet synchronous motors are as follows:

- a) The measured efficiency of asynchronous-start three-phase permanent-magnet synchronous motors of voltage level 1 140 V and below at rated power shall not be lower than the requirements of grade 3 in Table 1;
- b) When the voltage level is 3 kV (3.3k V), 6 kV, or 10 kV:
 - 1) The measured efficiency of asynchronous-start three-phase permanent-magnet synchronous motors of cooling method IC81W, IC86W, IC71W (IC3W7) at rated power shall not be lower than the requirements of grade 3 in Table 2 and Table 5;
 - 2) The measured efficiency of asynchronous-start three-phase permanent-magnet synchronous motors of colling method IC411 and IC416 at rated power shall not be lower than the requirements of grade 3 in Table 3 and Table 6;
 - 3) The measured efficiency of asynchronous-start three-phase permanent-magnet synchronous motor of cooling method IC511, IC611, IC616, IC516, and IC666 at rated power shall not be lower than the requirements of grade 3 in Table 4 and Table 7;
- c) The measured efficiency of permanent-magnet synchronous motors driven by variable frequency equipment of voltage level 1 140 V and below at rated torque and 90% rated speed shall not be lower than the requirements in Table 10;
- d) When the voltage level is 3 kV (3.3 kV), 6 kV, or 10 kV:
 - 1) The measured efficiency of permanent-magnet synchronous motors driven by variable frequency equipment of cooling method IC81W, IC86W, IC71W (IC3W7) at rated torque and 90% rated speed shall not be lower than the requirements in Table 13 and Table 22;
 - 2) The measured efficiency of permanent-magnet synchronous motors driven by variable frequency equipment of cooling method IC411, IC416 at rated torque and 90% rated speed shall not be lower than the requirements in Table 16 and Table 25;
 - 3) The measured efficiency of permanent-magnet synchronous motors driven by variable frequency equipment of cooling method IC511, IC611, IC616, IC516, IC666 at rated torque and 90% rated speed shall not be lower than the requirements in Table 19 and Table 28;

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