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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 32877-2022

Replacing GB/T 32877-2016

Specific test methods for determining losses and efficiency of converter-fed AC motors

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foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for Standardization Work Part 1.Structure and Drafting Rules of Standardization Documents"

drafted.

This document replaces GB/T 32877-2016 "Specific test methods for determining loss and efficiency of AC induction motors powered by frequency converters",

Compared with GB/T 32877-2016, except for structural adjustment and editorial changes, the main technical changes are as follows.

a) change the term "harmonic loss" to "additional high frequency loss" (see 3.3, 3.3 of the.2016 edition);

b) deleted 2-3-D calorimetry (see 6.5 of the.2016 edition);

c) Added the substitution efficiency determination method (AEDM method) (see 6.4);

d) The calculation method is added to determine the efficiency (see 6.5);

e) added the loss of any operating point by interpolation (see Chapter 7);

f) Deleted Appendix A "Definition of Output Voltage of Inverter for Test" (see Appendix A of the.2016 edition);

g) Added Appendix A "Loss of AC Motor" (see Appendix A);

h) Added Appendix B "Examples for Determining Loss and Efficiency at Each Load Point" (see Appendix B).

This document is equivalent to IEC 60034-2-3.2020 "Rotating electrical machines Part 2-3.Determination of losses and

Specific Test Methods for Efficiency".

The following minimal editorial changes have been made to this document.

--- In order to harmonize with existing standards, the name of the standard has been changed to "Specific tests for determining losses and efficiency of AC motors powered by frequency converters"

method";

--- Corrected the error of the switching frequency in 5.2.4, according to the provisions of 5.2.2, the switching frequency in 5.2.4 was changed from 4kHz or 4kHz in the original text.

8kHz corrected to 5kHz or 10kHz;

--- Corrected the typo in the original text in formula (1). The speed unit defined in this document is revolutions per minute, which needs to be divided by

60 is converted into revolutions per second, so the original formula P2C=2pi.TC.n is corrected to P2C=2pi.TC.n/60;

--- Corrected the typo in the original text in formula (5). The speed unit defined in this document is revolutions per minute, which needs to be divided by

60 is converted into revolutions per second, so the original formula Tref=

Pref

2pi.nref

Corrected to Tref=

Pref

2pi.nref/60

---All formulas are supplemented with serial numbers.

Please note that some content of this document may be patented. The issuing agency of this document assumes no responsibility for identifying patents.

Introduction

The purpose of this document is to define a test method for determining the total loss and efficiency of frequency converter powered motors, the total loss including the additional high frequency

loss. The additional high frequency loss is obviously a standard sine wave power supply, and the loss determined according to the test method of GB/T 25442-2018 is less than

outside. The results from this document will be used to compare losses and efficiencies of

different motors when powered by frequency converters.

In addition, this document defines seven standard operating points to describe extended characteristics of losses and efficiencies covering the entire torque/speed range, providing

An interpolation calculation program is provided to determine losses and efficiencies at any operating point (torque, speed).

In an electrical drive system (PDS), the electric motor and frequency converter are usually supplied by different manufacturers. Motors of the same design are used in large quantities

Production, may be driven by the grid or different types of inverters provided by different manufacturers, the respective performance of the inverters (such as switching frequency,

DC bus voltage level, etc.) will also affect the efficiency of the system, for each motor, frequency converter, connecting cable, output filter and parameter settings

It is impractical to determine the motor losses for the combination of motor losses, this document describes a limited number of

a method.

The losses determined in accordance with this document do not represent losses in actual use, but are used to compare whether different motor designs are suitable for frequency converter operation.

provide objective evidence.

Usually, the motor losses when powered by a frequency converter are higher than when operating in a standard sine wave system, the additional high frequency losses depend on the external frequency converter

The frequency spectrum (voltage or current) of the output quantity, which is affected by the inverter circuit and control method, see GB/T 21209-2017 for more information.

Compare drives

The latest empirical and theoretical analysis shows that the additional high-frequency losses generally do not increase with load, and most of the methods described in this document are based on pulse

Powered by a Pulse Width Modulated (PWM) frequency converter.

Given the wide variety of these drives and the growing need to verify compliance with national energy efficiency regulations, this document defines a so-called

Comparison frequency converters are used to test low voltage motors.

In principle, the comparative inverter is a voltage source with typical high frequency harmonics supplying the motor under test, which is not suitable for medium voltage motors.

Comparing the limitations of frequency converter applications

It should be noted that the test method described in this document for the application of comparative frequency converters is a standardized method and is intended for use with standard test strips.

Comparable efficiency values are provided under conditions. Through this method, the matching of the operation of the motor and the frequency converter can be obtained, but it does not mean that it is determined.

Actual losses of a motor powered by a specific frequency converter, which requires testing the entire electrical drive system powered by the end application specific frequency converter

(PDS).

Compared with the two-level voltage source inverter, when the multi-level voltage source or current source inverter drives the motor, the additional high frequency loss depends more on the

It depends on the speed and load, therefore, when determining the loss and efficiency, it is preferred to use the same frequency converter in practical application to test together with the motor.

Another option is to determine the additional high frequency losses of the motor by calculation. If this is a customer requirement, the pulse mode of the inverter is required.

This document does not cover this part of the program.

Provided interpolation routines to determine losses and efficiencies at any operating point (torque, speed), limited to the reference speed range (constant torque range).

range, constant magnetic flux range).

Inverter powered AC motors determine losses and

Specific Test Methods for Efficiency

1 Scope

This document outlines the test methods and plug-in for determining losses and efficiency of motors within the scope of GB/T 755-2019 when powered by frequency converters.

Value procedure, the motor is also part of the speed-regulated electrical drive system (PDS) defined in GB/T 12668.902-2021.

Motor efficiencies determined using the comparative frequency converter method of this document are used only to compare different motor designs.

This document also gives the determination of the motor in the reference speed range