

ICS 29.160.01  
CCS K 20



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

**GB/T 22720.1-2017**

---

**Rotating electrical machines -- Qualification and quality control tests of  
partial discharge free electrical insulation systems (Type I) used in  
rotating electrical machines fed from voltage converters**

**(English Translation)**

**Issued on: November 1, 2017**

**Implemented on: May 1, 2018**

---

**Issued by: General Administration of Quality Supervision, Inspection and  
Quarantine**

# Table of Contents

|                                                                     |    |
|---------------------------------------------------------------------|----|
| Foreword...                                                         | 3  |
| Introduction...                                                     | 6  |
| 1 Scope...                                                          | 8  |
| 2 Normative References...                                           | 8  |
| 3 Terms and Definitions...                                          | 9  |
| 4 Motor Terminal Voltage Generated during Converter Operation.....  | 14 |
| 5 Electrical Stresses in the Insulation System of Motor Windings... | 18 |
| 6 Types of Motor Insulation.....                                    | 22 |

## Foreword

Electrical Insulation Systems Used in Rotating Electrical Machines Fed from Voltage Converters is divided into two parts.

---GB/T 22720.1 Rotating Electrical Machines - Qualification and Quality Control Tests of Partial Discharge Free Electrical Insulation Systems (Type I) Used in Rotating Electrical Machines Fed from Voltage Converters;

---GB/Z 22720.2 Rotating Electrical Machines - Qualification and Acceptance Tests for Partial Discharge Resistant Electrical Insulation Systems (Type II) Used in Rotating Electrical Machines Fed from Voltage Converters.

This is Part 1 of Electrical Insulation Systems Used in Rotating Electrical Machines Fed from Voltage Converters.

This Part was drafted in accordance with the rules in GB/T 1.1-2009.

This Part serves as a replacement of GB/T 22720.1-2008 Rotating Electrical Machines - Qualification and Type Tests for Type I Electrical Insulation Systems Used in Rotating Electrical Machines Fed from Voltage Converters. In comparison with GB/T 22720.1-2008, the main technical changes are as follows.

---The Scope is modified (see Chapter 1; Chapter 1 of Version 2008);

---The term "Impulse Voltage Insulation Class" is added (see 3.19);

- The temperature selection for qualification test is modified (see 8.2; 8.2 of Version 2008);
- The "pre-diagnostic test" is added (see 10.4.2);
- The procedures for the type test of Type I insulation systems are modified (see Chapter 11; Chapter 11 of Version 2008);
- The "exit-factory test" is added (see Chapter 12);
- The "requirements for the application of impulse voltage" are added (see B.2);
- The "partial discharge test enhancement factors" are added (see B.3);
- Appendix C is added (see Appendix C);
- Appendix NA is added (see Appendix NA).

This Part uses the translation method in the identical adoption of IEC 60034-18-

#### **41.2014 Rotating Electrical Machines - Part 18-41.Partial Discharge Free Electrical**

Insulation Systems (Type I) Used in Rotating Electrical Machines Fed from Voltage Converters - Qualification and Quality Control Tests.

The Chinese documents that have a consistent correspondence relationship with the international documents in Normative References of this Part are as follows.

- GB/T 4074.7-2009 Winding Wires - Test Methods - Part 7.Test Procedure for the Determination of the Temperature Index of Enameled Winding Wires (IEC 60172.1987, IDT)
- GB/T 16935.1-2008 Insulation Coordination for Equipment within Low-voltage Systems - Part 1.Principles, Requirements and Tests (IEC 60664-1.2007, IDT)
- GB/T 17948.1-2000 Rotating Electrical Machines - Functional Evaluation of Insulation Systems - Test Procedures for Wire-wound Windings - Thermal Evaluation and Classification (IEC 60034-18-21.1992, IDT)
- GB/T 17948.3-2017 Rotating Electrical Machines - Functional Evaluation of Insulation Systems - Test Procedures for Form-wound Windings - Thermal Evaluation and Classification of Insulation Systems Used in Rotating Machines

(IEC 60034-18-31.2012, IDT)

---GB/T 20833.1-2016 Rotating Electrical Machines - The Stator Winding

Insulation of Rotating Electrical Machines - Part 1.Off-line Partial Discharge Measurements (IEC/TS 60034-27.2006, IDT)

---GB/T 21209-2007 Guide for the Design and Performance of Cage Induction Motors Specifically Designed for Converter Supply (IEC/TS 60034-25.2004, IDT)

---GB/Z 22720.2-2013 Rotating Electrical Machines - Qualification and Acceptance Tests for Partial Discharge Resistant Electrical Insulation Systems (Type II) Used in Rotating Electrical Machines Fed from Voltage Converters (IEC/TS 60034-18-42.2008, IDT)

---GB/T 23642-2017 Electrical Insulating Materials and Systems - Electrical Measurement of Partial Discharges (PD) under Short Rise Time and Repetitive Voltage Impulses (IEC/TS 61934.2011, IDT)

This Part makes the following editorial modifications.

---The title of the standard is modified;

---In accordance with the technical errata of IEC 60034-18-41.2014, "exit-factory inspection" is added; "maximum test voltage" in Table B.5 is modified;

---Appendix NA is added.

This Part was proposed by China Electrical Equipment Industry Association.

This Part shall be under the jurisdiction of National Technical Committee 26 on Electric Rotating Machinery of Standardization Administration of China (SAC/TC 26).

The drafting organizations of this Part. Shanghai Electrical Apparatus Research Institute Co., Ltd.; Beijing Gold Wind Kechuang Wind Power Equipment Co., Ltd.; Suzhou Jufeng Electrical Insulation System Co., Ltd.; CRRC Yongji Electric Co., Ltd.; Shanghai Electric System Energy-saving Engineering Technology Research Center Co., Ltd.; Shanghai Testing and Inspection Institute for Electrical Equipment; Lanzhou Electric Corporation; SEW-EURODRIVE (Suzhou) Co., Ltd.; DuPont (China) R&D

Management Co., Ltd.

## 1 Scope

This Part specifies the assessment criteria for stator / rotor winding insulation systems fed from voltage-source pulse-width-modulation (PWM). This Part is applicable to the stator / rotor winding insulation systems of single-phase or multi-phase AC motors powdered by converters.

## 2 Normative References

The following documents are indispensable to the application of this document. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 17948.7-2016 Rotating Electrical Machines - Functional Evaluation of Insulation Systems - General Guidelines (IEC 60034-18-1:2010, IDT)

## 3 Terms and Definitions

The following terms and definitions are applicable to this document.

Partial discharge extinction voltage refers to the voltage when the voltage applied to the sample gradually decreases from a certain relatively high value where partial discharge is detected to the voltage where no partial discharge can be detected in the test circuit.

## 4 Motor Terminal Voltage Generated during Converter Operation

Due to the switching characteristics of power semiconductor devices, the rise time of the current converter output voltage can be within the range of  $0.05\ \mu\text{s} \sim 2\ \mu\text{s}$ . IEC/TS 61800-8 may be used to calculate the motor terminal voltage fed from the converter, and the motor terminal voltage depends on several characteristics of the power supply system, such as.