CONTENTS

ANSI/ASHRAE Standard 222-2025
Standard Method of Test for Electrical Power Drive Systems

SECTION		PAGE
Foreword		2
1	Purpose	2
2	Scope	2
3	Definitions	2
4	Power Drive System Classifications	4
5	General Requirements	4
6	Installation and Operation	10
7	Test Procedure	10
8	Calculations	13
9	Test Report	14
10	Normative References	15
Informative Appendix A: Illustration of a Pulse-Width-Modulation Voltage Pulse at a Motor's Input Terminals		16
Informative Appendix B: Calculating AC Source Impedance		17
Informative Appendix C: Calculating DC Source Ripple		18
Informative Appendix D: Derivation of Motor Output Power Equations		19
Informative Appendix E: Informative References		20

NOTE

Approved addenda, errata, or interpretations for this standard can be downloaded free of charge from the ASHRAE website at www.ashrae.org/technology.

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FOREWORD

ASHRAE Standard 222 is a method of test for determining the performance of HVAC&R-related adjustable-speed electric alternating-current power drive systems, which include a complete drive module and a motor. The complete drive module is a semiconductor power converter with means for the control, protection, monitoring, and measurement of motors. Complete drive modules are fully integrated in the motor casing, directly attached to the motor, or mounted remotely from the motor with connecting cables. The standard is intended for rating the energy efficiency and electrical compatibility of the power drive systems with the power grid and with motor insulation.

An example application of the standard is its anticipated reference by AHRI and others for product certification and verification purposes of variable-frequency-drive systems. Those systems are a type of complete drive module that regulates the speed of a motor by adjusting the fundamental frequency and the voltage of the electrical power supplied to the motor. As such, the body of this standard is derived from AHRI Standard 1210, Appendix C, "Methods of Testing Variable Frequency Drives—Normative." AHRI requested that ASHRAE take ownership of this test method along with its ongoing maintenance and increased scope.

Power drive systems provide a variety of hardware and software options that influence their energy efficiency, power line harmonics, and motor stress. The methods in this standard characterize the overall power drive system performance for each uniquely tested configuration. Several efficiency test standards exist for motors and for power drive systems, including loss segregation methods and caloric methods. The efficiency determination in this standard is based strictly on a method involving input power and output power.

Hazardous currents, voltages, and forces can be present during power drive system tests. Users of this standard are cautioned to obtain appropriate safety training and equipment prior to conducting tests. For example, NFPA 70E-2018, Standard for Electrical Safety in the Workplace, and OSHA 29 CFR 1910, Sub Part S, describe safety equipment required to perform measurements involving energized equipment, including arc-flash protection, approach boundaries, and other personal protective equipment.

1. PURPOSE

To determine the performance of power drive systems for rating the energy efficiency and electrical compatibility with the power supply systems and with motor insulation.

2. SCOPE

2.1 The standard is intended for HVAC&R applications that operate from low voltage (≤690 V).

2.2 This standard applies to adjustable speed electric power drive systems, which combine semiconductor power converters, including means for their control, protection, monitoring, and measurement with connected electric motors. All electric rotary motor types are included.

2.3 This standard includes the following:

a. Power converters that are completely integrated in motor casings
b. Remote power converters that are tested with motors defined in this standard
c. Power drive systems that are operated from direct current or alternating current electricity supplies

3. DEFINITIONS

accuracy: the degree of conformity of an indicated value to an accepted standard value or true value. The degree of inaccuracy is known as *total measurement error* and is the sum of bias and precision errors.

bias error: the difference between the true or actual value to be measured and the mean indicated value from the measuring system that persists and is usually due to the particular instrument or technique of measurement. This error is determined and minimized through calibration.

carrier switching frequency: the frequency at which the power output devices of complete drive modules are switched ON and OFF to modulate motor input power.

complete drive module (CDM): the semiconductor power converter with means for their control, protection, monitoring, and measurement of motors. Complete drive modules are fully integrated in the motor casing, directly attached to the motor, or mounted remotely from the motor with connecting cables.