STANDARD

ANSI/ASHRAE Standard 23.2-2014

Methods of Test for Rating the Performance of Positive Displacement Compressors that Operate at Supercritical Pressures of the Refrigerants

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SPECIAL NOTE

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ASHRAE obtains consensus through participation of its national and international members, associated societies, and public review.

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a. interpretation of the contents of this Standard,
b. participation in the next review of the Standard,
c. offering constructive criticism for improving the Standard, or
d. permission to reprint portions of the Standard.

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ANSI/ASHRAE Standard 23.2-2014, Methods of Test for Rating the Performance of Positive Displacement Compressors that Operate at Supercritical Pressures of the Refrigerants

NOTE

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

(This foreword is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)

FOREWORD

ASHRAE Standard 23.1, Methods of Testing for Rating the Performance of Positive Displacement Refrigerant Compressors and Compressor Units that Operate at Subcritical Temperatures of the Refrigerant, *does not apply to the performance testing of positive displacement compressors that operate at supercritical pressures of the refrigerant (for example, compressors that operate on CO_2). This new standard fills that void by providing methods of test for rating the performance of positive displacement compressors and compressor units that operate at supercritical pressures of the refrigerant. This new standard is written in compliance with ASHRAE's mandatory language requirements.*

1. PURPOSE

The purpose of this standard is to provide methods of test for rating the thermodynamic performance of positive displacement refrigerant compressors and compressor units that operate at supercritical pressures of the refrigerant.

2. SCOPE

This standard applies to the methods of testing for rating the thermodynamic performance of positive displacement refrigerant compressors and compressor units that are operated at discharge pressures greater than the critical pressure of the refrigerant which either (a) do not have intermediate cooling or refrigerant injection or (b) incorporate intermediate cooling means or refrigerant injection that is achieved by compressor power and controlled by a steady-flow-rate method.

3. DEFINITIONS

The following definitions apply to the terms used in this standard.

calorimeter: a thermally insulated apparatus containing a heat exchanger in which the mass flow rate of a refrigerant is determined by measuring the heat input/output that will result in a corresponding enthalpy change for the refrigerant.

capacity: the rate of heat removal by the refrigerant used in the compressor or compressor unit in a refrigerating system. This rate equals the product of the refrigerant mass flow rate and the difference in the specific enthalpies of the refrigerant vapor at its thermodynamic state entering the compressor or compressor unit and refrigerant liquid at the thermodynamic state entering the evaporator.

compressor* or *compressor unit efficiency (isentropic efficiency): the ratio of the work absorbed for compressing a unit mass of refrigerant entering the stage of the compressor or compressor unit to the work absorbed for compressing the same unit mass of refrigerant by isentropic compression within the stage.

compressor unit: one or more positive displacement compressors and motors with ancillaries. ***Informative Note:*** Ancillaries might include fans, liquid receivers, interstage coolers, desuperheaters, strainers, service valves, check valves, suction filters, lubricant separators, motor starters, unloaders, variable-capacity controls, electronic or electromechanical, as supplied or specified by the manufacturer.

confirming test: a completely independent and simultaneous test conducted to verify the accuracy of the primary test (compare to *primary test*). Compressor or compressor unit ratings are determined from the primary test results.

energy efficiency ratio (EER): a dimensional ratio of the cooling capacity (Btu/h) to the power input (W).

enthalpy: thermodynamic parameter equal to the sum of the internal energy of a system and the product of its pressure and volume at the same thermodynamic condition (compare to *specific enthalpy*).

error: the difference between the true value of the quantity measured and the observed value. All errors in experimental data are classified as one of two types: systematic (fixed) errors or random (precision) errors. The terms *accuracy* and *precision* are often used to distinguish between systematic and random errors. A measurement with small systematic errors is said to be unbiased. A measurement with small random errors is said to have high precision. A measurement that is unbiased and precise is said to be accurate.

flowmeter: a device employing a detecting element that determines the flow rate of a refrigerant in the gaseous, liquid, or supercritical phase within a closed conduit by measuring a suitable response of the detecting element.

hermetic compressor: a motorcompressor assembly contained within a gas-tight housing that is permanently sealed by welding, brazing, soldering, or gluing with no access for servicing internal parts in the field.

intermediate cooling means: a method of cooling the compressor mechanism or lubricant, or a method of cooling the refrigerant between stages for the reduction of discharge temperature using a heat exchanger. When used, the heat exchanger component of the intermediate cooling means is integral to the compressor or compressor unit. The intermediate cooling means thermal load is not taken into account when calculating compressor or compressor unit capacity, volumetric efficiency, or isentropic compression work.

intermediate pressure: the pressure of the refrigerant returning to the compressor or compressor unit not from the evaporator but at pressures higher than the evaporator pressure from system components such as interstage coolers, economizers, or refrigerant injectors.

lubricant circulation rate: the ratio of the mass of lubricant circulating through a refrigerant system component to the total mass of refrigerant and lubricant flowing through the system component at a specified set of operating conditions.