STANDARD

ANSI/ASHRAE Standard 153-2015

Method of Test for Mass Flow Capacity of Four-Way Refrigerant Reversing Valves

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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

This standard provides a means for measuring the mass flow capacity of reversing valves used on heat pumps and other refrigerating systems. It was created because accurate capacity data is needed to facilitate the proper application of four-way valves in a variety of refrigerating systems that employ a variety of refrigerants.

The test method is intended to be within the capabilities of most users and producers employing conventional laboratory apparatus. It allows the use of a wide variety of test fluids, including the refrigerant intended for the end application.

1. PURPOSE

To provide a test method for measuring the refrigerant vapor mass flow capacity of four-way refrigerant reversing valves. The standard aims to measure mass flow capacity with sufficient accuracy to facilitate application decisions.

2. SCOPE

This standard describes test methods, procedures, instrumentation, computations, and suggested apparatus for this test.

3. DEFINITIONS

Where the following terms occur in this standard, the definitions provided in this section apply:

capacity: the refrigerant mass flow rate through a four-way reversing valve at specific operating conditions.

four-way reversing valve: a refrigerating-system control device for changing the direction of refrigerant flow through the heat exchangers of a refrigerating system by redirecting both the high-pressure flow (discharge) from the compressor and the low-pressure flow (suction) to the compressor. Also referred to as a *reversing valve*.

reversing valve: see *four-way reversing valve*.

shall and should: the word "shall" is to be understood as a requirement and the word "should" as a recommendation.

specified conditions: the conditions at which the mass flow capacity of the valve is to be measured. Typically, these conditions are approximately equivalent to the desired end-use application operating conditions.

valve position: one of either of two positions of the internal parts of the reversing valve to direct refrigerant flow in a specific direction.

4. REQUIRED TEST CONDITIONS

4.1 The fluid entering both flow paths of the reversing valve shall be conditioned such that no phase change occurs in the test fluid throughout the test.

4.2 The fluid pressure, fluid temperature, and ambient air temperature surrounding the valve under test shall be stabilized during the test.

4.3 If lubricant is added to the fluid flow, the lubricant fraction flowing through the valve under test shall not exceed the amount that would be contained in a thin coating on the internal wall of the system tubing and valve.

4.4 The fluid pressure entering the high-pressure flow path shall be higher than the pressure entering the low-pressure flow path to ensure that any pressure-sensitive seals are biased in the intended direction.

4.5 The flow rates through the reversing valve under test shall not exceed values that cause the pressure drop across the valve to exceed 10% of the absolute pressure entering the flow path to ensure that vapor flows (if vapor is used). This allows flow to be considered as incompressible for calculations. The test system flow rates shall be adjusted as necessary to meet this requirement.

4.6 Test flow rates shall extend above and below the intended end-use flow rate for the reversing valve. Select two (2) or more test conditions using the chosen fluid (gas or liquid) that will span the desired operating range. Compute and record the flow rate and the square root of the product of fluid density and the pressure drop across each flow path for the reversing valve for each test condition $(\rho \Delta P)^{1/2}$.

5. DATA REQUIRED

The test data for each position of the valve under test shall include all of the following in Sections 5.1 and 5.2:

5.1 General Test Information

a. Identification of specified conditions (end-use application operating conditions) used to establish test conditions
b. Descriptive information concerning the valve under test, including all of the following that apply: manufacturer's name and address, model, type, serial number, size, connection type, and connection size
c. Name and/or chemical formula of test fluid and identification of the source of information used to determine its thermophysical properties
d. Ambient temperature (air temperature surrounding valve under test)
e. Orientation of the valve under test (whether high-pressure inlet connection is top, bottom, or horizontal)
f. Barometric pressure

5.2 Test Conditions and Results (required for both flow paths in each position)

a. Valve position A or B (unless symmetrical)
b. Test fluid mass flow rate
c. Pressure drop(s) across the flow path(s) under test
d. Absolute pressures of the test fluid entering both flow paths of the valve under test
e. Temperatures of the test fluid entering *and* leaving the flow paths of the valve under test

See Informative Annex A for a sample data sheet.