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**ANSI/ASHRAE Standard 41.9-2021**  
**Standard Methods for Refrigerant Mass Flow Measurements Using Calorimeters**

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**NOTE**

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## FOREWORD

*This revision of Standard 41.9 is a comprehensive update and meets ASHRAE's mandatory language requirements. The most significant changes are to steady-state criteria and the lubricant circulation rate measurement methods.*

### 1. PURPOSE

This standard prescribes methods for measuring mass flow rates for refrigerants and refrigerant/lubricant mixtures using calorimeters.

### 2. SCOPE

**2.1** This standard applies to measuring mass flow rates for refrigerants and refrigerant/lubricant mixtures using calorimeters in laboratories.

**2.2** This standard applies where the entire flow stream of the refrigerant or the refrigerant/lubricant mixture enters the calorimeter as a subcooled liquid and leaves as a superheated vapor (evaporator type).

**2.3** This standard applies where the entire flow stream of the refrigerant or the refrigerant/lubricant mixture enters the calorimeter as a superheated vapor and leaves as a subcooled liquid (condenser type).

### 3. DEFINITIONS

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

**accuracy:** the degree of conformity of an indicated value to the corresponding true value.

**calorimeter:** a thermally insulated apparatus containing a heat exchanger that determines refrigerant mass flow rate by measuring the heat input/output that will result in a known enthalpy change for the refrigerant.

**error:** the difference between the test result and its corresponding true value.

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

**measurement system:** the instruments, signal conditioning systems (if any), and data acquisition system (if any).

**operating tolerance limit:** the upper or lower value of an operating tolerance that is associated with a test point or a targeted set point.

**random error:** the portion of the total error that varies randomly in repeated measurements of the true value throughout a test process.

**refrigerant mass flow rate:** the mass flow rate of refrigerant potentially mixed with lubricant.

**secondary fluid:** a fluid of known properties that is used as a heating medium.

**secondary refrigerant:** a refrigerant of known properties that is used as a heating medium.

**subcooling:** at a defined pressure, the difference between a given liquid temperature and the bubble-point temperature.

**superheat:** at a defined pressure, the difference between a given vapor temperature and the dew-point temperature.

**systematic error:** the portion of the total error that remains constant in repeated measurements of the true value throughout a test process.

**targeted set point:** a specific set of test conditions where the required refrigerant mass flow rate is known and has an associated operating tolerance.