ANSI/ASHRAE Addendum a to
ANSI/ASHRAE Standard 41.10-2020

Standard Methods
for Refrigerant Mass
Flow Rate Measurements
Using Flowmeters

Approved by ASHRAE and the American National Standards Institute on October 29, 2021.

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FOREWORD

The purposes of Addendum a is to (a) clearly define the steady-state criteria, (b) add requirements to the test plan to match the inputs needed to determine when steady-state operating conditions have been achieved, and (c) correct the expansion factor equation.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and strikethrough (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum a to Standard 41.10-2020

Add a new definition for “steady-state criteria” to Section 3 as shown.

steady-state criteria: the criteria that establish negligible change of refrigerant mass flow rate with time.

Revise Section 5.1 as shown.

5.1 Test Plan. A test plan shall specify the refrigerant mass flow rate measurement system accuracy and the test points to be performed. Additionally, the test plan shall include the test points, targeted set points, and corresponding operating tolerances to be performed. The test plan shall be one of the following documents:

a. A document provided by the person or the organization that authorized the tests and calculations to be performed.


c. A rating standard.

d. A regulation or code.

5.1.2 Any combination of items (a) through (d).

Modify Section 7.4.2 to correct Equation 7-5 as shown.

The dimensionless expansion factor \( \varepsilon \) for a long-radius nozzle\(^{10,11} \) shall be obtained from Equation 7-5.

\[
\varepsilon = \left[ \frac{r^{2/\gamma - 1}}{\gamma - 1} \left( \frac{\gamma - 1}{1 - r} \right)^{1/2} \frac{1 - \frac{\beta^4}{1 - \beta^4 r^2/\gamma}}{1 - \beta^4 r^2/\gamma} \right]^{1/2}
\]  

(7-5)

where

\( r = \frac{p_2/p_1}{(p_1/p_2) - 1} \)  

dimensionless

\( \gamma = \) ratio of specific heat at constant pressure to specific heat at constant volume, dimensionless
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