



ADDENDA

**ANSI/ASHRAE Addendum a to
ANSI/ASHRAE Standard 41.11-2020**

Standard Methods for Power Measurement

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

This addendum was approved by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the standard. Instructions for how to submit a change can be found on the ASHRAE® website (<https://www.ashrae.org/continuous-maintenance>).

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FOREWORD

The purpose of Addendum a is to (a) revise the steady-state and uncertainty procedures and (b) make it easier for method-of-test and method-of-rating standards to adopt this standard by reference.

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

Addendum a to Standard 41.11-2020

Modify Section 3 as shown.

~~error:~~ the difference between the test result and its corresponding true value; the difference between the observed value of the measure and its corresponding true value.

~~post-test uncertainty:~~ an analysis to establish the uncertainty of a test result after conducting the test.

~~pretest uncertainty:~~ an analysis to establish the expected uncertainty interval for a test result prior to the conduct of a test.

~~steady-state criteria:~~ the criteria that establish negligible change of power with time.

~~uncertainty:~~ a measure of the potential error in a measurement that reflects the lack of confidence in the result to a specified level; the limits of error within which the true value lies.

Revise Section 5.1 to make it easier for method-of-test (MOT) and method-of-rating (MOR) standards to adopt this standard by reference.

~~5.1 Test Plan.~~ A test plan shall specify the power measurement system accuracy and the test points 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
- b. A method of test standard
- c. A rating standard
- d. A regulation or code
- e. Any combination of items (a) through (d)

The test plan shall specify the following:

- a. The power measurement system accuracy
- b. The values to be determined and recorded that are selected from this list: power measurement and power measurement uncertainty
- c. Any combination of test points and targeted set points to be performed, together with operating tolerances

Modify Section 5.2 to make it easier for MOT/MOR standards to adopt this standard by reference.

5.2 Values to Be Determined and Reported if Specified in the Test Plan in Section 5.1

~~5.2.1~~ a. Power, W (hp)

~~5.2.2~~ b. Uncertainty in the power measurement, W (hp)

~~5.2.3~~ c. Displacement power factor for linear AC electrical power load measurements, ~~%~~ dimensionless

~~5.2.4~~ d. Real power factor for nonlinear AC electrical power load measurements, ~~%~~ dimensionless

Add new Section 5.4, modify Section 5.5, and renumber the remaining sections in Section 5. Also, renumber the references in Section 10 as shown.

5.4 Pretest Uncertainty Estimate. If required by the test plan in Section 5.1, perform an analysis to establish the expected uncertainty in each power measurement for a test prior to the conduct of that test in accordance with the pretest procedures in ASME PTC 19.1¹.

5.45 Post-Test Uncertainty Estimate. If required by the test plan in Section 5.1, perform an analysis to establish the expected power uncertainty for each power measurement test point in accordance with the post-test procedures in ASME PTC 19.1¹. ~~The uncertainty in each power measurement shall be estimated using the method in Section 8 for each test point unless otherwise specified in the test plan. Alternatively, if specified in the test plan, the worst-case uncertainty for all test points shall be estimated and the same value reported for each test point.~~

Renumber Section 5.5, and modify as shown to define the steady-state criteria requirements under laboratory and field test conditions.

5.56 Steady-State Test Criteria. Power test data shall be recorded at steady-state conditions unless otherwise specified in the test plan in Section 5.1. ~~If the test plan requires power test data points to be recorded at steady-state test conditions and provides the operating condition tolerance but does not specify the steady-state criteria, then determine that steady-state test conditions have been achieved using one of the following methods:~~

- a. ~~Apply the steady-state criteria in Section 5.5.1 if the test plan provides test points for power measurement.~~
- b. ~~Apply the steady-state criteria in Section 5.5.2 if the test plan provides targeted set points for power measurement.~~

5.6.1 Steady-State Test Criteria Under Laboratory Test Conditions. If the test plan requires power test data points to be recorded at steady-state test conditions and provides the operating condition tolerance but does not specify the steady-state criteria, then determine that steady-state test conditions have been achieved using one of the following methods:

- a. Apply the steady-state criteria in Section 5.6.3 if the test plan provides test points for power measurement.
- b. Apply the steady-state criteria in Section 5.6.4 if the test plan provides targeted set points for power measurement.

5.6.2 Steady-State Test Criteria Under Field Test Conditions. If the test plan requires power test data points to be recorded at steady-state test conditions and provides the operating condition tolerance but does not specify the steady-state criteria, the methods in Section 5.6.1 are optional.

Informative Note: The steady-state methods in Section 5.6.1 are likely to be impractical under field test conditions. Under these circumstances, the user may want to select another method to determine the conditions for field test data to be recorded.

Revise subsection numbers and Equation 5-16 as shown.

5.5.1-5.6.3 Steady-State Power Criteria for Test Points

5.5.2-5.6.4 Steady-State Power Criteria for Targeted Set Points

$$b\Delta_t \leq 0.50T_L \quad \text{W (hp)} \quad (5-16)$$

$$|b\Delta_t| \leq 0.50T_L \quad \text{W (hp)} \quad (5-16)$$

Revise Section 8.1 as shown to make it easier for MOT/MOR standards to adopt this standard by reference.

8.1 Uncertainty Estimate. An estimate of the power measurement system uncertainty performed in accordance with ASME PTC 19.1³ shall accompany each refrigerant flow measurement if specified in the test plan in Section 5.1.

Informative Note: Informative Appendix C provides an example of uncertainty calculations for a laboratory test of an electrical power measurement with a nonlinear load.

Revise Section 9.1.4 as shown to make it easier for MOT/MOR standards to adopt this standard by reference.

9.1.4 Test Results if Specified in the Test Plan in Section 5.1

- a. Power, W (hp)
- b. Pretest uncertainty ~~Uncertainty~~ in power measurement, W (hp)
- c. Post-test uncertainty in power measurement, W (hp)

Revise Section 9.2.3 as shown to make it easier for MOT/MOR standards to adopt this standard by reference.

9.2.3 Test Results if Specified in the Test Plan in Section 5.1

- a. Shaft speed, rev/s (rpm)
- b. Shaft torque, N·m (ft·lb_f)
- c. Power, W (hp)
- d. Pretest uncertainty ~~Uncertainty~~ in power measurement, W (hp)
- e. Post-test uncertainty in power measurement, W (hp)

Revise Section 9.3.3 as shown to make it easier for MOT/MOR standards to adopt this standard by reference.

9.3.3 Test Results if Specified in the Test Plan in Section 5.1

- a. Volumetric flow rate, m³/s (gpm)
- b. Differential pressure across the pump, kPa (psi)
- c. Power, W (hp)
- d. Uncertainty in power measurement, W (hp)

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