

AHRI 310/380-2017
(Formerly ANSI/AHRI 310/380-2014)
CSA C744-17

Packaged terminal air-conditioners and heat pumps



Approved by ANSI on 13 June 2023



we make life better®

2311 Wilson Boulevard, Suite 400
Arlington, VA 22201, USA
www.ahrinet.org
PH 703.524.8800
FX 703.562.1942

Legal Notice for Harmonized Standard Jointly Developed by AHRI and CSA Group

Intellectual property rights and ownership

As between Air-Conditioning, Heating, and Refrigeration Institute ("AHRI") and Canadian Standards Association (operating as "CSA Group") (collectively "AHRI and CSA Group") and the users of this document (whether it be in printed or electronic form), AHRI and CSA Group are the joint owners of all works contained herein that are protected by copyright, all trade-marks (except as otherwise noted to the contrary), and all inventions and trade secrets that may be contained in this document, whether or not such inventions and trade secrets are protected by patents and applications for patents. The unauthorized use, modification, copying, or disclosure of this document may violate laws that protect the intellectual property of AHRI and CSA Group and may give rise to a right in AHRI and CSA Group to seek legal redress for such use, modification, copying, or disclosure. AHRI and CSA Group reserve all intellectual property rights in this document.

Disclaimer and exclusion of liability

This document is provided without any representations, warranties, or conditions of any kind, express or implied, including, without limitation, implied warranties or conditions concerning this document's fitness for a particular purpose or use, its merchantability, or its non-infringement of any third party's intellectual property rights. AHRI and CSA Group do not warrant the accuracy, completeness, or currency of any of the information published in this document. AHRI and CSA Group make no representations or warranties regarding this document's compliance with any applicable statute, rule, or regulation.

IN NO EVENT SHALL AHRI AND CSA GROUP, THEIR RESPECTIVE VOLUNTEERS, MEMBERS, SUBSIDIARIES, OR AFFILIATED COMPANIES, OR THEIR EMPLOYEES, DIRECTORS, OR OFFICERS, BE LIABLE FOR ANY DIRECT, INDIRECT, OR INCIDENTAL DAMAGES, INJURY, LOSS, COSTS, OR EXPENSES, HOWSOEVER CAUSED, INCLUDING BUT NOT LIMITED TO SPECIAL OR CONSEQUENTIAL DAMAGES, LOST REVENUE, BUSINESS INTERRUPTION, LOST OR DAMAGED DATA, OR ANY OTHER COMMERCIAL OR ECONOMIC LOSS, WHETHER BASED IN CONTRACT, TORT (INCLUDING NEGLIGENCE), OR ANY OTHER THEORY OF LIABILITY, ARISING OUT OF OR RESULTING FROM ACCESS TO OR POSSESSION OR USE OF THIS DOCUMENT, EVEN IF AHRI OR CSA GROUP HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, INJURY, LOSS, COSTS, OR EXPENSES.

In publishing and making this document available, AHRI and CSA Group are not undertaking to render professional or other services for or on behalf of any person or entity or to perform any duty owed by any person or entity to another person or entity. The information in this document is directed to those who have the appropriate degree of experience to use and apply its contents, and AHRI and CSA Group accept no responsibility whatsoever arising in any way from any and all use of or reliance on the information contained in this document.

AHRI and CSA Group have no power, nor do they undertake, to enforce compliance with the contents of the standards or other documents they jointly publish.

Authorized use of this document

This document is being provided by AHRI and CSA Group for informational and non-commercial use only. The user of this document is authorized to do only the following:

If this document is in electronic form:

- load this document onto a computer for the sole purpose of reviewing it;
- search and browse this document; and
- print this document if it is in PDF format.

Limited copies of this document in print or paper form may be distributed only to persons who are authorized by AHRI and CSA Group to have such copies, and only if this Legal Notice appears on each such copy.

In addition, users may not and may not permit others to

- alter this document in any way or remove this Legal Notice from the attached standard;
- sell this document without authorization from AHRI and CSA Group; or
- make an electronic copy of this document.

If you do not agree with any of the terms and conditions contained in this Legal Notice, you may not load or use this document or make any copies of the contents hereof, and if you do make such copies, you are required to destroy them immediately. Use of this document constitutes your acceptance of the terms and conditions of this Legal Notice.



Standards Update Service

***AHRI 310/380-2017 • CSA-C744-17
July 2017***

Title: *Packaged terminal air-conditioners and heat pumps*

To register for e-mail notification about any updates to this publication

- go to shop.csa.ca
- click on **CSA Update Service**

The **List ID** that you will need to register for updates to this publication is **2425525**.

If you require assistance, please e-mail techsupport@csagroup.org or call 416-747-2233.

Visit CSA Group's policy on privacy at www.csagroup.org/legal to find out how we protect your personal information.

AHRI 310/380-2017 • CSA-C744-17
***Packaged terminal air-conditioners and
heat pumps***



we make life better™



®A trade-mark of the Canadian Standards Association,
operating as "CSA Group"

*Published in July 2017 by CSA Group
A not-for-profit private sector organization
178 Rexdale Boulevard, Toronto, Ontario, Canada M9W 1R3*

*To purchase standards and related publications, visit our Online Store at shop.csa.ca
or call toll-free 1-800-463-6727 or 416-747-4044.*

ISBN 978-1-4883-0933-5

© 2017 CSA Group

All rights reserved. No part of this publication may be reproduced in any form whatsoever
without the prior permission of the publisher.

Commitment for Amendments

This Standard is issued jointly by the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) and the Canadian Standards Association (operating as “CSA Group”). Amendments to this Standard will be made only after processing according to the Standards development procedures of both AHRI and CSA Group.

Published in July 2017 by
Air-Conditioning, Heating, and Refrigeration
Institute (AHRI)
2111 Wilson Blvd., Suite 500
Arlington, Virginia 22201, USA

www.ahrinet.org

© Copyright 2017 by Air-Conditioning, Heating,
and Refrigeration Institute
Registered United States Patent and Trademark
Office

Published in July 2017 by
CSA Group
178 Rexdale Boulevard
Toronto, Ontario, Canada M9W 1R3

To purchase CSA Group Standards and related
publications, visit the Online Store at shop.csa.ca
or call toll-free 1-800-463-6727 or 416-747-4044.

ISBN 978-1-4883-0933-5

© 2017 CSA Group
All rights reserved. No part of this publication
may be reproduced in any form whatsoever
without the prior permission of the publisher.

Contents

CSA Technical Committee on Heating, Ventilation, Air-Conditioning, and Refrigeration 3

Preface 5

0 Introduction 8

1 Scope 8

2 Reference publications 9

3 Definitions 10

4 Test requirements 12

4.1 General 12

4.2 Standard rating tests 12

4.2.1 General 12

4.2.2 Electrical conditions 12

4.2.3 Additional provisions for equipment set-up 12

4.3 Equipment 13

4.4 Air flow rate 13

4.5 Part-load rating conditions 14

4.6 Alternative efficiency determination method (AEDM) 14

4.6.1 General 14

4.6.2 Validation of AEDM 14

4.6.3 Individual model tolerances 14

4.6.4 Additional test unit requirements 14

5 Rating requirements 15

5.1 General 15

5.2 Values of standard capacity ratings 15

5.3 Values of energy efficiency ratio (EER) and coefficient of performance (COP) 15

5.4 Part-load rating 15

5.5 Application ratings 15

5.6 Tolerances 15

6 Minimum data requirements for published ratings 15

6.1 General 15

6.2 Capacity designations 15

7 Operating requirements 16

7.1 General 16

7.2 Maximum high-temperature operation tests 16

7.2.1 General 16

7.2.2 Temperature conditions 16

7.2.3 Voltages 16

7.2.4 Procedure 16

7.2.5 Requirements 16

7.3	Voltage tolerance test	16
7.3.1	General	16
7.3.2	Temperature conditions	16
7.3.3	Voltages	16
7.3.4	Procedure	17
7.3.5	Requirements	17
7.4	Insulation effectiveness test (cooling)	17
7.4.1	General	17
7.4.2	Temperature conditions	17
7.4.3	Procedure	17
7.4.4	Requirements	18
7.5	Condensate disposal test (cooling)	18
7.5.1	General	18
7.5.2	Temperature conditions	18
7.5.3	Procedure	18
7.5.4	Requirements	18
7.6	Air infiltration test	18
7.6.1	General	18
7.6.2	Temperature conditions	18
7.6.3	Procedure	18
7.6.4	Requirements	18
7.7	Test tolerances	19
8	Marking and nameplate data	19
9	Conformance conditions	19
10	Clauses applicable to Canada only	19
10.1	Definition	19
10.2	General requirements	19
10.3	Marking and nameplate data — Non-standard size units	19
10.4	Values of minimum standard EER and COP	20

Annex A (informative) — Standard rating requirements for non-US and non-Canada climate regions	23
--	----

CSA Technical Committee on Heating, Ventilation, Air-Conditioning, and Refrigeration

A. Carrier	Hydro-Québec, Montréal, Québec <i>Category: User Interest/Regulatory Authority</i>	<i>Chair</i>
T.K. Lau	BC Hydro, Vancouver, British Columbia <i>Category: User Interest/Regulatory Authority</i>	<i>Vice-Chair</i>
G. Butt	Emerson Electric Canada Limited, Markham, Ontario	<i>Associate</i>
J. Choy	Ontario Ministry of Energy, Toronto, Ontario	<i>Associate</i>
D. Chu	Independent Electricity System Operator (IESO), Toronto, Ontario	<i>Associate</i>
R. Cochrane	Natural Resources Canada, Ottawa, Ontario	<i>Associate</i>
G.E. Cooke	Air Solutions Incorporated, Cambridge, Ontario <i>Category: Producer Interest</i>	
B. Crossman	Caneta Research Inc / Caneta Energy, Mississauga, Ontario <i>Category: General Interest</i>	
P.F. Edwards	Peter Edwards Co., Mississauga, Ontario <i>Category: General Interest</i>	
P. Grinbergs	Airia Brands Inc., London, Ontario <i>Category: Producer Interest</i>	
E. Grzesik	Mississauga, Ontario	<i>Associate</i>

G.R. Hamer	BC Hydro, Burnaby, British Columbia	<i>Associate</i>
A.J. Heffler	Ottawa, Ontario <i>Category: User Interest/Regulatory Authority</i>	
G.D. Henriques	Henriques Consulting, Richmond, British Columbia	<i>Associate</i>
J.K. Hodge	Toronto, Ontario <i>Category: General Interest</i>	
C. Kahramanoglu	Ontario Ministry of Municipal Affairs and Housing, Toronto, Ontario <i>Category: General Interest</i>	
S. Krsikapa	Ontario Ministry of Energy, Toronto, Ontario <i>Category: User Interest/Regulatory Authority</i>	
C.K. Lee	Heating, Refrigeration and Air Conditioning Institute of Canada, Mississauga, Ontario	<i>Associate</i>
C. Li	Hydro One Networks Inc., Toronto, Ontario	<i>Associate</i>
R. Lord	Carrier Corporation, Murfreesboro, Tennessee, USA <i>Category: Producer Interest</i>	
M. Suami	Natural Resources Canada, Ottawa, Ontario <i>Category: User Interest/Regulatory Authority</i>	
D. Terlizzi	Toronto, Ontario <i>Category: Producer Interest</i>	
T. Wong	CSA Group, Toronto, Ontario	<i>Project Manager</i>

Preface

This is the fourth edition of the *Packaged terminal air-conditioners and heat pumps*, jointly published by the Air-Conditioning, Heating, and Refrigeration Institute (AHRI 310/380) and CSA Group (CSA C744). It supersedes the previous editions of this joint Standard published in 2014 and 2004 under the title *Standard for Packaged Terminal Air-Conditioners and Heat Pumps*.

This Standard, which applies to factory-manufactured residential, commercial, and industrial packaged terminal air-conditioners and heat pumps, provides requirements for rating, performance, and tests. Separate requirements are provided for Canadian jurisdictions for rating, performance, and tests (see Clause 10). These separate requirements reference CSA Group standards.

The publishers of this Standard acknowledge that the development of this Standard was made possible, in part, by the financial support of Natural Resources Canada.

This Standard is considered suitable for use for conformity assessment within the stated scope of the Standard.

This Standard was jointly prepared by the following Committees in order to harmonize their requirements: the CSA Technical Committee on Heating, Ventilation, Air-Conditioning, and Refrigeration (HVAC & R) and the CSA Strategic Steering Committee on Performance, Energy Efficiency, and Renewables; and the AHRI Packaged Terminal Engineering Committee under the jurisdiction of the AHRI Packaged Terminal Subsection.

Notes:

- 1) *Use of the singular does not exclude the plural (and vice versa) when the sense allows.*
- 2) *Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.*
- 3) *This Standard was developed by consensus, which is defined by CSA Policy governing standardization — Code of good practice for standardization as “substantial agreement. Consensus implies much more than a simple majority, but not necessarily unanimity”. It is consistent with this definition that a member may be included in the Technical Committee list and yet not be in full agreement with all clauses of this Standard.*
- 4) *Requests for interpretation of this Standard should be addressed to the Air-Conditioning, Heating, and Refrigeration Institute, 2111 Wilson Blvd., Suite 500, Arlington, Virginia 22201, USA, or submitted to CSA Group at inquiries@csagroup.org with “Request for interpretation” in the subject line. Requests for interpretation should*
 - a) *define the problem, making reference to the specific clause, and, where appropriate, include an illustrative sketch;*
 - b) *provide an explanation of circumstances surrounding the actual field condition; and*
 - c) *be phrased where possible to permit a specific “yes” or “no” answer.*

Interpretations are published by the Air-Conditioning, Heating, and Refrigeration Institute, and are available on the CSA Group Current Standards Activities page at standardsactivities.csa.ca.
- 5) *CSA Group Standards are subject to review within five years from the date of publication, and suggestions for their improvement will be referred to the appropriate committee. To submit a proposal for change, please send the following information to inquiries@csagroup.org and include “Proposal for change” in the subject line:*
 - a) *Standard designation (number);*
 - b) *relevant clause, table, and/or figure number;*
 - c) *wording of the proposed change; and*
 - d) *rationale for the change.*
- 6) *Attention is drawn to the possibility that some of the elements of this Standard may be the subject of patent rights. CSA Group is not to be held responsible for identifying any or all such patent rights. Users of this*

Standard are expressly advised that determination of the validity of any such patent rights is entirely their own responsibility.

AHRI Foreword

Important

Safety Disclaimer

AHRI does not set safety standards and does not certify or guarantee the safety of any products, components or systems designed, tested, rated, installed or operated in accordance with this standard/guideline. It is strongly recommended that products be designed, constructed, assembled, installed and operated in accordance with nationally recognized safety standards and code requirements appropriate for products covered by this standard/guideline.

AHRI uses its best efforts to develop standards/guidelines employing state-of-the-art and accepted industry practices. AHRI does not certify or guarantee that any tests conducted under its standards/guidelines will be non-hazardous or free from risk.

AHRI Certification Program Provisions

Scope of the Certification Program

The certification program includes all packaged terminal air-conditioners and heat pumps.

Certified Ratings

The following certification program ratings are verified by test at standard rating conditions (see Clause 4.2):

Packaged Terminal Air-Conditioners

- 1) Cooling Capacity, W, (Btu/h)
- 2) Energy Efficiency Ratio, EER, [Btu/(W•h)]
- 3) Heating Capacity, W, (Btu/h)

Packaged Terminal Heat Pumps

- 1) Cooling Capacity, W, (Btu/h)
- 2) Energy Efficiency Ratio, EER, [Btu/(W•h)]
- 3) High-Temperature Heating Capacity, W, (Btu/h)
- 4) High-Temperature Coefficient of Performance, COP, W/W

Conformance to the requirements of the Maximum High-Temperature Operation Tests, Voltage Tolerance Test, Insulation Effectiveness Test (Cooling), Condensate Disposal Test (Cooling), and Air Infiltration Test are also verified by certification program testing.

ICS codes: 23.120 and 27.080

Note: This standard supersedes ANSI/AHRI 310/380-2014.

AHRI 310/380-2017 • CSA-C744-17

Packaged terminal air-conditioners and heat pumps

0 Introduction

0.1

The purpose of this Standard is to establish the following for packaged terminal air-conditioner and heat pump equipment:

- a) test requirements;
- b) rating requirements;
- c) minimum data requirements for published ratings;
- d) operating requirements;
- e) marking and nameplate data; and
- f) conformance conditions.

0.2

This Standard is intended to guide manufacturers, engineers, installers, contractors, and users.

0.3

This Standard is subject to review and amendment as technology advances.

1 Scope

1.1

This Standard applies to factory-manufactured residential, commercial, and industrial packaged terminal air-conditioners and heat pumps as defined in Clause 3.

1.2

This Standard applies to electrically operated vapour-compression refrigeration systems.

1.3

This standard applies to packaged terminal air-conditioners and heat pumps intended for unducted installation, but may be employed with ductwork having external static resistance up to 25 Pa (0.1 in H₂O).

1.4

This Standard does not apply to the following:

- a) heat-operated air-conditioning/heat pump equipment or room air-conditioners/heat pumps, as defined in CAN/CSA-C368.1;
- b) water-to-air and brine-to-air heat pumps, as defined in CAN/CSA-C13256-1-01;

- c) unitary air-conditioners and air-source unitary heat pumps, as defined in CAN/CSA-C656 and ANSI/AHRI 210/240, with capacities less than 19 000 W (65 000 Btu/h);
- d) commercial and industrial unitary air-conditioners and heat pumps, as defined in CAN/CSA-C746 and ANSI/AHRI 340/360, with capacities of 19 000 W (65 000 Btu/h) or greater;
- e) commercial and industrial single package vertical air-conditioners and heat pumps, as defined in ANSI/AHRI 390, with capacities of 39 300 W (134 000 Btu/h) or less; and
- f) units with integral gas-fired heating.

1.5

In this Standard, “shall” is used to express a requirement, i.e., a provision that the user is obliged to satisfy in order to comply with the standard; “should” is used to express a recommendation or that which is advised but not required; and “may” is used to express an option or that which is permissible within the limits of the standard.

Notes accompanying clauses do not include requirements or alternative requirements; the purpose of a note accompanying a clause is to separate from the text explanatory or informative material.

Notes to tables and figures are considered part of the table or figure and may be written as requirements.

Annexes are designated normative (mandatory) or informative (non-mandatory) to define their application.

1.6

The values given in SI units are the units of record for the purposes of this Standard. The values given in parentheses are for information and comparison only.

2 Reference publications

This Standard refers to the following publications, and where such reference is made, it shall be to the edition listed below, including all amendments published thereto.

CSA Group

B52-13

Mechanical refrigeration code

C22.1-15

Canadian Electrical Code, Part I

CAN/CSA-C368.1-14

Energy performance of room air conditioners

CAN/CSA-C656-14

Performance Standard for split-system and single-package air conditioners and heat pumps

CAN/CSA-C746-06 (R2016)

Performance Standard for rating large and single packaged vertical air conditioners and heat pumps

CAN/CSA-C13256-1-01 (R2011)

Water-source heat pumps — Testing and rating for performance — Part 1: Water-to-air and brine-to-air heat pumps

ANSI/AHRI (American National Standards Institute/Air-Conditioning, Heating, and Refrigeration Institute)

110-2012

Air-Conditioning, Heating and Refrigerating Equipment Nameplate Voltages

210/240-2008

Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment

340/360-2007

Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment

390-2003

Performance Rating of Single Package Vertical Air-Conditioners and Heat Pumps

ANSI/ASHRAE (American National Standards Institute/American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.)

16-1983 (RA 2014)

Method of Testing for Rating Room Air Conditioners and Packaged Terminal Air Conditioners

37-2009

Methods of Testing for Rating Electrically Driven Unitary Air-Conditioning and Heat Pump Equipment

58-1986 (RA 2014)

Method of Testing for Rating Room Air Conditioner and Packaged Terminal Air Conditioner Heating Capacity

ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.)

ASHRAE Terminology

<https://www.ashrae.org/resources-publications/free-resources/ashrae-terminology-landing-page>

IEC (International Electrotechnical Commission)

60038:2009

IEC standard voltages

3 Definitions

The following definitions shall apply in this Standard:

Note: All terms in this Standard follow the standard industry definitions in ASHRAE Terminology (<https://www.ashrae.org/resources-publications/free-resources/ashrae-terminology-landing-page>) unless otherwise defined in this Clause.

Basic model — all units manufactured by one manufacturer within a single equipment class, having the same primary energy source (e.g., electric or gas), and which have the same or comparable compressors, same or comparable heat exchangers, and same or comparable air moving systems that have a cooling capacity within 300 Btu/h of one another.

Coefficient of performance (COP) — a ratio of the heating capacity in watts (W) to the power input values in watts (W) at any given set of rating conditions, expressed in watts/watts (W/W). For heating COP, supplementary resistance heat is excluded.

Cooling capacity — the capacity associated with the decrease in air enthalpy that includes the latent and sensible capacities, W (Btu/h).

Latent capacity — the capacity associated with a decrease in absolute humidity, W (Btu/h).

Sensible capacity — the capacity associated with an increase in the dry-bulb temperature at a constant absolute humidity, W (Btu/h).

Energy efficiency ratio (EER) — a ratio of the cooling capacity in Btu/h to the power input values in watts at any given set of rating conditions, expressed in Btu/(W•h).

Heating capacity — the capacity associated with the increase in the dry-bulb temperature, W (Btu/h).

Packaged terminal air-conditioner — a wall sleeve and a separate unencased combination of heating and cooling assemblies specified by the manufacturer and intended for mounting through the wall. It includes refrigeration components, separable outdoor louvres, forced ventilation, and heating availability by purchaser's choice of hot water, steam, or electrical resistance heat.

Note: *Models designated as "cooling only" units need not include heating elements if the physical characteristics and arrangement of the refrigeration system are identical to those of models with heating availability.*

Packaged terminal heat pump — a separate unencased refrigeration system installed in a cabinet having a function and configuration similar to that of a packaged terminal air-conditioner. It uses reverse cycle refrigeration as its prime heat source and should have other supplementary heat source(s) available to purchasers with the choice of hot water, steam, or electric resistance heat.

Published rating — a statement of the assigned values of those performance characteristics, under stated rating conditions, by which a unit can be chosen to fit its application. These values apply to all units of like nominal size and type (identification) produced by the same manufacturer.

Note: *The term "published rating" includes the rating of all performance characteristics shown on the unit or published in specifications, advertising, or other literature controlled by the manufacturer, at stated rating conditions.*

Application rating — a rating based on tests performed at application rating conditions (other than standard rating conditions).

Standard rating — a rating based on tests performed at standard rating conditions.

Rating conditions — any set of operating conditions under which a single level of performance results and which causes only that level of performance to occur.

Standard rating conditions — rating conditions used as the basis of comparison for performance characteristics.

Standard air — air weighing 1.2 kg/m³ (0.075 lb/ft³) that approximates dry air at 21 °C (70 °F) and at a barometric pressure of 101.3 kPa (29.92 in Hg).

4 Test requirements

4.1 General

Standard ratings shall be established at the standard rating conditions specified in Clauses 4.2 to 4.4. Standard ratings shall be verified by tests conducted in accordance with ANSI/ASHRAE 16, ANSI/ASHRAE 37, or ANSI/ASHRAE 58, as appropriate.

4.2 Standard rating tests

4.2.1 General

Note: Table 1 indicates the tests and test conditions that are required to determine values of standard capacity ratings and energy efficiency.

4.2.1.1

Standard cooling ratings shall be verified by tests conducted in accordance with

- a) ANSI/ASHRAE 16; or
- b) ANSI/ASHRAE 37, except that no secondary capacity check shall be used and no ductwork shall be attached to the condenser.

Instruments used for measuring electricity input shall be accurate to within $\pm 0.5\%$ of the quantity measured.

4.2.1.2

Standard heating ratings, including reverse-cycle heating, shall be verified by tests conducted in accordance with ANSI/ASHRAE 58.

Units with electrical heating elements shall be tested for heating capacity by measurement of room-side electrical component input.

4.2.1.3

Standard ratings relating to cooling capacity and heating capacity shall be net values, including the effects of circulating fan heat, but not including supplementary heat. Standard input ratings shall be the total power input to the compressor(s) and fans, plus controls and other items included as part of the model number(s).

4.2.2 Electrical conditions

Nameplate voltages are shown in Table 1 of ANSI/AHRI 110. Standard rating tests shall be performed at the nameplate rated voltage and frequency unless otherwise specified in this Standard.

For all other dual nameplate voltage equipment not covered in Table 1 of ANSI/AHRI 110, but covered by this Standard, the standard rating tests shall be performed at both voltages or at the lower voltage if only a single standard rating is published.

4.2.3 Additional provisions for equipment set-up

4.2.3.1

Manufacturers may optionally use a “break-in” period, not to exceed 20 h, to operate the equipment under test prior to conducting the test method. A manufacturer who elects to use an optional

compressor break-in period in its testing shall record this information (including the duration) in the test data underlying the ratings.

4.2.3.2

The unit shall be installed in a wall sleeve with a 0.356 m (14 in) depth if available. If a 0.356 m (14 in) deep wall sleeve is not available, the available wall sleeve option closest to 0.356 m (14 in) in depth shall be used. The area(s) between the wall sleeve and the insulated partition between the indoor and outdoor rooms shall be sealed to eliminate all air leakage through this area.

4.2.3.3

Water may be added to the condensate drain pan of the unit under test (until the water drains out due to overflow devices or until the pan is full) prior to conducting the test. No specific level of water mineral content or water temperature is required for the water added to the condensate drain pan.

4.2.3.4

If a manufacturer specifies a range of superheat, sub-cooling, and/or refrigerant pressure in its installation and operation manual for a given model, any value(s) within that range may be used to determine refrigerant charge or mass of refrigerant, unless the manufacturer clearly specifies a rating value in its installation and operation manual, in which case the specified rating value shall be used.

4.2.3.5

The only additional specifications that may be used in setting up the test are those set forth in the installation and operation manual shipped with the unit. Each unit should be set up for test in accordance with the manufacturer's installation and operation manuals. This standard shall take precedence when the instructions in the installation and operation manual conflict with the instruction in this Standard.

4.3 Equipment

Any air-mixers, air-inlets, grilles, deflecting vanes, and other standard equipment shall be in place during all tests, unless otherwise specified in the manufacturer's instructions to the user. The indoor filter used during testing shall be the standard or default filter option shipped with the unit. If the unit is shipped without a filter, the unit shall be tested with a MERV-1 filter sized appropriately for the filter slot.

4.4 Air flow rate

All standard rating tests shall be determined at a single fan speed setting set forth in the installation and operation manuals shipped with the unit, and clearly identified as that used to generate performance ratings, with the ventilation dampers closed. All air flow rates shall be expressed in m³/s (scfm) of standard air.

The standard rating conditions for determining air flow shall be as follows:

- a) The temperature of the air entering the indoor portion of the unit shall be between 21.1 and 26.7 °C (70 and 80 °F). The unit shall not be operated in either heating or cooling mode during the test.
- b) The static pressure difference between the room air-inlet and the outlet of the unit shall be 0.0 Pa (0.0 in H₂O).
- c) The fan speed shall be set at the maximum setting, and the ventilation dampers shall be closed.

4.5 Part-load rating conditions

The test conditions for part-load ratings shall be as specified in Table 1.

4.6 Alternative efficiency determination method (AEDM)

4.6.1 General

As an alternative to testing a basic model, a simulated efficiency value may be acceptable if the alternative method complies with the following criteria:

- a) The AEDM is derived from a mathematical model that estimates the energy efficiency or energy consumption characteristics of the basic model as measured by this test procedure;
- b) The AEDM is based on engineering or statistical analysis, computer simulation or modeling, or other analytic evaluation of performance data; and
- c) The manufacturer has validated the AEDM, in accordance with Clause 4.6.24.6.2 with basic models that meet the current minimum energy conservation standards.

4.6.2 Validation of AEDM

Before using an AEDM, the manufacturer shall validate the AEDM's accuracy and reliability as follows, the manufacturer shall:

- a) select at least the minimum number of basic models for each validation class specified in Table 3 to which the particular AEDM applies;
- b) using the AEDM, calculate the energy use or efficiency for each of the selected basic models;
- c) test a single unit of each selected basic model in accordance with Clause 4.6.44.6.4;
- d) compare the results from the single unit test and the AEDM energy use or efficiency output according to Clause 4.6.34.6.3.

The manufacturer shall be responsible for ensuring the accuracy and reliability of the AEDM.

4.6.3 Individual model tolerances

4.6.3.1

The predicted efficiency for each model calculated by applying the AEDM shall not be more than 5% greater than the efficiency determined from the corresponding test of the model.

4.6.3.2

The predicted energy consumption for each model, calculated by applying the AEDM, shall not be more than 5% less than the energy consumption determined from the corresponding test of the model.

4.6.3.3

The predicted energy efficiency or consumption for each model calculated by applying the AEDM shall meet or exceed the applicable minimum energy conservation performance standard.

4.6.4 Additional test unit requirements

Each AEDM shall be supported by test data obtained from physical tests of current models. Test results used to validate the AEDM shall meet or exceed current, applicable minimum efficiency standard and each test shall have been performed in accordance with this test procedure.

5 Rating requirements

Note: See Annex A for Standard rating requirements for non-US and non-Canada climate regions.

5.1 General

Standard ratings shall be expressed in cooling capacity or heating capacity. Power input ratings shall be expressed in multiples of 5 W. Air flow rates shall be expressed in multiples of 5 L/s (10 scfm).

5.2 Values of standard capacity ratings

Standard capacity ratings shall be expressed only in terms of watts, W (Btu/h), in multiples of 30 W (100 Btu/h).

5.3 Values of energy efficiency ratio (EER) and coefficient of performance (COP)

Standard measures of EER, whenever published, shall be expressed to the nearest 0.1 Btu/(W•h). COP for heating or cooling, whenever published, shall be expressed to the nearest 0.1 W/W.

5.4 Part-load rating

Systems that are capable of capacity reduction shall be rated at each step of capacity reduction provided by the refrigeration system(s) as published by the manufacturer.

5.5 Application ratings

Ratings at conditions other than those specified in Clauses 4.2 to 4.6.4.6 may be published as application ratings and shall be based on data determined by the methods prescribed in Clause 4.1.

5.6 Tolerances

Measured test results shall not be less than 95% of the published rating for performance ratios and capacity.

6 Minimum data requirements for published ratings

6.1 General

As a minimum, published ratings shall include all standard ratings. All claims to ratings within the scope of this Standard shall include the statement “Rated in accordance with AHRI 310/380 and CSA C744”*. All claims to ratings outside the scope of this Standard shall include the statement “Outside the scope of AHRI 310/380 and CSA C744”†. Wherever application ratings are published or printed, they shall include a statement of the conditions at which the ratings apply.

* The equivalent French wording is « Évalué selon AHRI 310/380 et CSA C744 ».

† The equivalent French wording is « Hors de la domaine d’application d’AHRI 310/380 et de CSA C744 ».

6.2 Capacity designations

As a minimum, capacities used in published specifications, literature, or advertising controlled by the manufacturer for equipment rated under this Standard shall be expressed in W (Btu/h) at the standard rating conditions specified in Clause 4.2 and at the part-load rating conditions specified in Clauses 4.5, 5.2, and 5.3.

7 Operating requirements

7.1 General

Production units shall meet the requirements detailed in Clause 7.

7.2 Maximum high-temperature operation tests

7.2.1 General

Packaged terminal air-conditioner and heat pump equipment shall pass the appropriate high-temperature operation tests with an air flow rate determined in accordance with Clause 4.4.

7.2.2 Temperature conditions

Temperature conditions shall be maintained as specified in Table 1.

7.2.3 Voltages

Tests shall be run at the “Range A” minimum utilization voltage from Table 1 of ANSI/AHRI 110, based on the unit’s nameplate rated published voltage(s). This voltage shall be supplied at the unit’s service connection.

7.2.4 Procedure

The unit shall be operated for 1 h at the temperature conditions and voltage specified.

7.2.5 Requirements

The unit shall operate without interruption for any reason for 1 h.

7.3 Voltage tolerance test

7.3.1 General

Packaged terminal air-conditioners and heat pumps shall pass the voltage tolerance test described in Clauses 7.3.2 to 7.3.5 with an air flow rate determined in accordance with Clause 4.4.

7.3.2 Temperature conditions

Temperature conditions shall be maintained at the standard cooling and/or standard heating steady state conditions as specified in Table 1.

7.3.3 Voltages

7.3.3.1

Tests shall be run at the “Range B” minimum and maximum utilization voltages from Table 1 of ANSI/AHRI 110, based on the unit’s nameplate rated published voltage(s). These voltages shall be supplied at the unit’s service connection and at rated frequency. A lower minimum or a higher maximum voltage shall be used, if listed, on the nameplate.

7.3.3.2

The power supplied to single-phase equipment shall be adjusted just prior to the shutdown period (see Clause 7.3.4.2) so that the resulting voltage at the unit’s service connection is 86% of the nameplate rated voltage when the compressor motor is on locked-rotor. (For 200 V or 208 V nameplate rated

equipment, the restart voltage shall be set at 180 V when the compressor motor is on locked-rotor.) Open circuit voltage for three-phase equipment shall not be greater than 90% of nameplate rated voltage.

7.3.3.3

Within 1 min after the equipment has resumed continuous operation (see Clause 7.3.5.3), the voltage shall be restored to the values specified in Clause 7.3.3.1.

7.3.4 Procedure

7.3.4.1

The equipment shall be operated for 1 h at the temperature conditions and voltage(s) specified.

7.3.4.2

All power to the equipment shall be interrupted for a period sufficient to cause the compressor to stop (not to exceed 5 s) and then be restored.

7.3.5 Requirements

7.3.5.1

During the test, the equipment shall operate continuously without failure of any of its parts.

7.3.5.2

The equipment shall operate continuously without interruption for the 1 h period preceding the power interruption.

7.3.5.3

The unit shall resume continuous operation within 2 h of the restoration of power and shall then operate continuously for 30 min. Safety devices may be operated and reset prior to the establishment of continuous operation.

7.4 Insulation effectiveness test (cooling)

7.4.1 General

Packaged terminal air-conditioner and heat pump equipment shall pass the insulation effectiveness test described in Clauses 7.4.2 to 7.4.4 when operating with an air flow rate determined in accordance with Clause 4.4 and with controls, dampers, and grilles set to produce the maximum tendency to sweat, provided that such settings are not contrary to the manufacturer's instructions to the user.

7.4.2 Temperature conditions

Temperature conditions shall be maintained as specified in Table 1.

7.4.3 Procedure

After establishment of the specified temperature conditions, the unit shall be operated continuously for 4 h.

7.4.4 Requirements

During the test, no condensed water shall drip, run, or blow off of the equipment's casing.

7.5 Condensate disposal test (cooling)

7.5.1 General

Packaged terminal air-conditioner and heat pump equipment shall pass the condensate disposal test described in Clauses 7.5.2 to 7.5.4 when operating with an air flow rate determined in accordance with Clause 4.4. Controls, dampers, and grilles shall be set to produce condensate at the maximum rate, provided that such settings are not contrary to the manufacturer's instructions to the user.

7.5.2 Temperature conditions

Temperature conditions shall be maintained as specified in Table 1.

7.5.3 Procedure

After establishment of the specified temperature conditions, the equipment shall be started with its condensate collection pan filled to the overflowing point and shall be operated continuously for 4 h after the condensate level has reached equilibrium.

7.5.4 Requirements

During the test and after the unit is turned off, no condensed water shall drip, run, or blow off of the unit.

7.6 Air infiltration test

7.6.1 General

Packaged terminal air-conditioner and heat pump equipment shall pass the air infiltration test described in Clauses 7.6.2 to 7.6.4 with ventilation dampers closed.

7.6.2 Temperature conditions

Temperature conditions shall be maintained as specified in Table 1.

7.6.3 Procedure

7.6.3.1

The equipment shall be installed in a facility suitable for determining the air infiltration quantity, such as a facility for leakage air flow measurements described in ANSI/ASHRAE 16 and ANSI/ASHRAE 58.

7.6.3.2

The indoor static pressure shall be maintained at 25 Pa (0.1 in H₂O) below the outdoor static pressure. The unit shall not be operating in the cooling, heating, or fan-only modes.

7.6.4 Requirements

During the entire test, the measured air flow rate, L/s (ft³/min), leaking into the indoor portion shall be considered to be the infiltration rate through the equipment and shall not exceed 3.1 L/(s•m) [2 ft³/(min•ft)] at the perimeter of the wall sleeve where it normally projects through the wall.

7.7 Test tolerances

The conditions for the tests specified in Clause 7 shall be average values, subject to tolerances of ± 0.6 °C (± 1.0 °F) for dry-bulb and wet-bulb temperatures, $\pm 1.0\%$ of the reading for voltages, and ± 5 Pa (± 0.02 in H₂O) for static pressure.

8 Marking and nameplate data

As a minimum, the nameplate shall display the manufacturer's name, the model designation, and the equipment's electrical characteristics.

Nameplate voltages for 60 Hz systems shall include one or more of the equipment nameplate voltage ratings shown in Table 1 of ANSI/AHRI 110. Nameplate voltages for 50 Hz systems shall include one or more of the utilization voltages shown in Table 1 of IEC 60038.

9 Conformance conditions

While conformance with this Standard is voluntary, conformance shall not be claimed or implied for products or equipment covered by the "Introduction" (Clause 0) and "Scope" (Clause 1) unless such claims meet all the requirements of this Standard.

10 Clauses applicable to Canada only

Note: *The requirements of these clauses modify the requirements of Clauses 1 to 9 where noted.*

10.1 Definition

The following additional definition shall apply in Clause 10:

Non-standard size unit — unit with a wall sleeves less than 0.41 m (16 in) high or less than 1.07 m (42 in) wide, and a wall sleeve cross-sectional area less than 0.43 m² (670 in²), unless it meets the minimum efficiency requirements for standard size units as shown in Table 2.

Note: *Non-standard size units are sometimes referred to as "replacement units".*

10.2 General requirements

Electrical and refrigeration safety requirements for design, construction, and assembly of packaged terminal air-conditioners and heat pumps are provided in the *Canadian Electrical Code, Part I*, and CSA B52.

10.3 Marking and nameplate data — Non-standard size units

Non-standard size units shall be factory labeled as follows:

MANUFACTURED FOR NON-STANDARD APPLICATIONS ONLY. NOT TO BE INSTALLED IN NEW CONSTRUCTION PROJECTS

and

FABRIQUÉ POUR DES APPLICATIONS DE DIMENSIONS NON-STANDARDS UNIQUEMENT. NE PAS INSTALLER DANS DES PROJETS DE NOUVELLES CONSTRUCTIONS

10.4 Values of minimum standard EER and COP

Packaged terminal air-conditioners and heat pumps shall have an EER and COP at standard rating conditions of not less than the values shown in Table 2 when tested under the standard rating conditions specified in Table 1.

Table 1
Operating conditions for standard rating and performance tests
 (See Clauses 4.2.1, 4.5, 7.2.2, 7.3.2, 7.4.2, 7.5.2, 7.6.2, and 10.4.)

Test	Indoor unit		Outdoor unit			Water	
	Air entering		Air entering		Wet-bulb °C (°F)	In °C (°F)	Out °C (°F)
	Dry-bulb °C (°F)	Wet-bulb °C (°F)	Dry-bulb °C (°F)	Wet-bulb °C (°F)			
Cooling	Standard rating conditions*	26.7 (80.0)	19.4 (67.0)	35.0 (95.0)	23.9† (75.0)	—	—
	Maximum high-temperature operation	26.7 (80.0)	19.4 (67.0)	46.1 (115.0)	23.9† (75.0)	—	—
	Insulation effectiveness	26.7 (80.0)	23.9 (75.0)	26.7 (80.0)	23.9† (75.0)	—	—
	Condensate disposal	26.7 (80.0)	23.9 (75.0)	26.7 (80.0)	23.9† (75.0)	—	—
	Air infiltration	21.1–26.7 (70.0–80.0)	—	21.1–26.7 (70.0–80.0)	—	—	—
Heating	Part-load conditions	26.7 (80.0)	19.4 (67.0)	27.8 (82.0)	18.3† (65.0)	—	—
	Standard rating (other than heat pump)‡	21.1 (70.0)	—	—	—	93.3 (200.0)	82.2 (180.0)
	Standard rating conditions high-temperature heat pump heating	21.1 (70.0)	15.6 (60.0) max	8.3 (47.0)	6.1 (43.0)	—	—
	Maximum high-temperature operation	26.7 (80.0)	—	23.9 (75.0)	18.3 (65.0)	—	—
	Part-load conditions	21.1 (70.0)	—	16.7 (62.0)	13.6 (56.5)	—	—

* Not required for heating-only units.

† Required when condensate is rejected to the condenser air stream.

‡ Where steam is the heating medium, the steam pressure shall be 13.8 kPa (2 psig).

Note: For all tests except air infiltration, the static pressure difference between the room air-inlet and the outlet of the unit shall be 0.0 Pa (0.0 in H₂O). For the air infiltration test, the indoor static pressure shall be 24.9 Pa (0.1 in H₂O) below outdoor static pressure.

Table 2
Minimum standard EER and COP
 (See Clauses 10.1 and 10.4.)

Equipment class			Minimum efficiency requirements*
Equipment	Category	Cooling capacity W (Btu/h)	
PTAC (packaged terminal air-conditioner)	Standard size †	< 2030 (7000)	EER = 11.9
		2030–4390 (7000–15 000)	EER = 14.0 – (0.300 × Cap/293.1 \$) [14.0 – (0.300 × Cap/1000 \$)]
		> 4390 (15 000)	EER = 9.5
	Non-standard size ‡	< 2030 (7000)	EER = 9.4
		2030–4390 (7000–15 000)	EER = 10.9 – (0.213 × Cap/293.1 \$) [10.9 – (0.213 × Cap/1000 \$)]
		> 4390 (15 000)	EER = 7.7
PTHP (packaged terminal heat pump)	Standard size †	< 2030 (7000)	EER = 11.9 COP = 3.3
		2030–4390 (7000–15 000)	EER = 14.0 – (0.300 × Cap/293.1 \$) [14.0 – (0.300 × Cap/1000 \$)] COP = 3.7 – (0.052 × Cap/293.1 \$) [3.7 – (0.052 × Cap/1000 \$)]
		> 4390 (15 000)	EER = 9.5 COP = 2.9
	Non-standard size ‡	< 2030 (7000)	EER = 9.3 COP = 2.7
		2030 – 4390 (7000–15 000)	EER = 10.8 – (0.213 × Cap/293.1 \$) [10.8 – (0.213 × Cap/1000 \$)] COP = 2.9 – (0.026 × Cap/293.1 \$) [2.9 – (0.026 × Cap/1000 \$)]
		> 4390 (15 000)	EER = 7.6 COP = 2.5

* All energy efficiency ratio (EER) values must be rated at 35 °C (95 °F) outdoor dry-bulb temperature for air-cooled equipment and evaporatively cooled equipment and at 29.4 °C (85 °F) entering water temperature for water-cooled equipment. All coefficient of performance (COP) values must be rated at 8.3 °C (47 °F) outdoor dry-bulb temperature for air-cooled equipment.
 † Standard size refers to PTAC or PTHP equipment with wall sleeve dimensions having an external wall opening greater than or equal to 0.41 m (16 in) high or greater than or equal to 1.07 m (42 in) wide, and a cross-sectional area greater than or equal to 0.43 m² (670 in²).
 ‡ Non-standard size refers to PTAC or PTHP equipment with existing wall sleeve dimensions having an external wall opening of less than 0.41 m (16 in) high or less than 1.07 m (42 in) wide, and a cross-sectional area less than 0.43 m² (670 in²).
 § “Cap” means cooling capacity in W [Btu/h] at 35 °C (95 °F) outdoor dry-bulb temperature.

Table 3
Validation classes to be used to validate AEDM
 (See Clause 4.6.24.6.2.)

Validation class	Minimum number of distinct models that shall be tested per AEDM
Packaged Terminal AC and HP	2 basic models

Annex A (informative)

Standard rating requirements for non-US and non-Canada climate regions

Note: This informative (non-mandatory) Annex has been written in normative (mandatory) language to facilitate adoption where users of the Standard or regulatory authorities wish to adopt it formally as additional requirements to this Standard.

A.1 Standard ratings

Standard ratings shall be established at the standard rating conditions specified in Table A.1.

Note: This section is for reference only, and is not required for products sold in the US and Canada.

A.2 Cooling temperature conditions

A.2.1

A.2.1.1

The T1, T2, and T3 temperature conditions specified in Table A.1 shall be considered standard rating conditions for the determination of cooling capacity and energy efficiency. Testing shall be conducted at one or more of the standard rating conditions specified in Table A.1.

A.2.1.2

Equipment manufactured for use only in a moderate climate similar to that specified by T1 shall have ratings determined by tests conducted at T1 conditions and shall be designated type T1 equipment.

A.2.1.3

Equipment manufactured for use only in a cool climate similar to that specified by T2 shall have ratings determined by tests conducted at T2 conditions and shall be designated type T2 equipment.

A.2.1.4

Equipment manufactured for use only in a hot climate similar to that specified by T3 shall have ratings determined by tests conducted at T3 conditions and shall be designated type T3 equipment.

A.2.1.5

Equipment manufactured for use in more than one of the climates defined in Table A.1 shall have the designated type (T1, T2, and/or T3) marked on the nameplate. The corresponding ratings shall be determined by the standard rating conditions specified in Table A.1.

A.3 Heating temperature conditions

A.3.1

The H1, H2, and H3 temperature conditions specified in Table A.1 shall be considered standard rating conditions for the determination of heating capacity and energy efficiency.

A.3.2

All heat pumps shall be rated based on testing at the H1 temperature conditions. Heating capacity and energy efficiency tests shall also be conducted at the H2 and/or H3 temperature conditions if the manufacturer rates the equipment for operation at one or both of these temperature conditions.

Table A.1
Conditions for standard rating tests and operating requirements for single capacity and variable capacity systems*
 (See Clauses A.1, A.2.1.1, A.2.1.5 and A.3.1.)

Test	Air entering indoor side		Air entering outdoor side		Air entering indoor side		Air entering outdoor side		Air entering indoor side		Air entering outdoor side	
	Dry-bulb °C (°F)	Wet-bulb °C (°F)	Dry-bulb °C (°F)	Wet-bulb °C (°F)	Dry-bulb °C (°F)	Wet-bulb °C (°F)	Dry-bulb °C (°F)	Wet-bulb °C (°F)	Dry-bulb °C (°F)	Wet-bulb °C (°F)	Dry-bulb °C (°F)	Wet-bulb °C (°F)
Full load capacity test cooling†,‡	T1			T2			T3					
	27.0 (80.6)	19.0 (66.2)	35.0 (95.0)	24.0 (75.2)	21.0 (69.8)	15.0 (59.0)	27.0 (80.6)	19.0 (66.2)	29.0 (84.2)	19.0 (66.2)	46.0 (114.8)	24.0 (75.2)
Full load capacity test heating†,‡	H1			H2			H3					
	20.0 (68.0)	15.0 (59.0) max.	7.0 (44.6)	6.0 (42.8)	20.0 (68.0)	15.0 (59.0) max.	2.0 (35.6)	1.0 (33.8)	20.0 (68.0)	15.0 (59.0) max.	-7.0 (19.4)	-8.0 (17.6)

* Temperature rating conditions derived from ISO Standard 5151.

† Same Conditions used for voltage tolerance tests.

‡ Variable capacity system samples under test shall be set at the maximum compressor speed corresponding to the full load capacity rating.

Notes:

- 1) Full Load Capacity is Maximum Capacity set point specified by manufacturer corresponding to rating point.
- 2) When not rejecting condensate, maintain the outdoor wet-bulb temperature at 22.2 °C± 0.6° (72 °F ±1°).

Prepared by



we make life better™



*®A trade-mark of the Canadian Standards Association,
operating as "CSA Group"*