AHRI Standard 365-2024 (SI/I-P)

Performance Rating of Commercial and Industrial Unitary Air-conditioning Condensing Units

AIR-CONDITIONING, HEATING, & REFRIGERATION INSTITUTE

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2311 Wilson Blvd, Suite 400
Arlington, VA 22201 USA
www.ahrinet.org
Phone: (703) 524-8800

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ICS Codes: 23.120, 27.080

Note:

This standard supersedes AHRI Standard 365-2009 (I-P) and AHRI Standard 366-2009 (SI).

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Intent

This standard is intended for the guidance of the industry, including manufacturers, engineers, installers, contractors, and users.

Review and Amendment

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

2024 Edition

This edition of AHRI Standard 365-2024 (SI/I-P*), Performance Rating of Commercial and Industrial Unitary Air-conditioning Condensing Units*, was prepared by the Commercial Unitary Standards Technical Committee. The standard was approved by the Standards Committee on 25 November 2024.

Origin and Development of AHRI Standard 365

The initial publication was ARI Standard 365-1987, *Commercial and Industrial Unitary Air-Conditioning Condensing Units*. Subsequent revisions were:

- ARI Standard 365-1994, *Commercial and Industrial Unitary Air-Conditioning Condensing Units*
- ARI Standard 365-2002, *Commercial and Industrial Unitary Air-Conditioning Condensing Units*
- AHRI Standard 365 (I-P)-2009, *Performance Rating of Commercial and Industrial Unitary Air-Conditioning Condensing Units*
- AHRI Standard 366 (SI)-2009, *Performance Rating of Commercial and Industrial Unitary Air-Conditioning Condensing Units*

Summary of Changes

AHRI Standard 365-2024 (SI/I-P*)* contains the following updates to the previous edition:

- Remove IPLV references
- Minor non-technical changes
- Revision to the *IEER* test procedure to align with AHRI 340/360 test and rating procedure for condenser temperatures
- Consolidate with AHRI Standard 366 (SI) to publish a joint unit standard

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Committee Personnel

Standards Work Group (SWG)-365 and 1365

Company/Organization	Participant	Voting Role
Voting Organizations		
Trane Technologies Inc	Beth Braddy (Chair)	Alternate voter
	Lane Liudahl	Primary voter
	Richard Pulfer	Alternate voter
Aaon	Harold Dubensky	Alternate voter
	Kevin Teakell	Primary voter
Allied Air Enterprises, LLC Lennox	Guru Ravi	Primary voter
Carrier	Richard Lord	Alternate voter
	Patrick Riley	Alternate voter
	Nick Schinner	Primary voter
Daikin Industries Goodman Manufacturing Company	Henry Ernst	Primary voter
	Jeff Whitelaw	Alternate voter
GD Midea Air-Conditioning Equipment Co., Ltd.	Edison Shen	Primary voter
U.S. Department of Energy	Lily Byer	Alternate voter
	Cortney Cavanaugh	Primary voter
	Sean Faltermeier	Alternate voter
	Anish Odhav	Alternate voter
Intertek	Tyler Stiles	Primary voter
Kentuckiana Curb Co., Inc.	Matthew Lea	Alternate voter
	Kevin Muldoon	Primary voter
Rheem Sales Company	Scott Creamer	Primary voter
Antonio Romeo		AHRI Staff Liaison

Standards Work Group (SWG)-365 and 1365 Scope:

This SWG is responsible for the revision of AHRI 365 and AHRI 1365.

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Commercial Unitary Standards Technical Committee

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Voting Organizations		
Carrier	Patrick Riley (Chairman)	Primary voter
	Richard Lord	Alternate voter
2050 Partners	John Bade	Primary voter
Aaon	Kevin Teakell	Primary voter
	Harold Dubensky	Alternate voter
Allied Air Enterprises, LLC Lennox	Dave Winningham	Primary voter
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	Jeff Whitelaw	Alternate voter
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	Anish Odhav	Alternate voter
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Energy Solutions	Aniruddh Roy	Primary voter
	Jeremy Wojtak	Alternate voter
G.D. Midea	Edison Shen	Primary voter
GMPI	Li Hongzhe	Primary voter
Greenheck Fan Company	Jason Freudigmann	Primary voter
Intertek	Anthony Cacciotti	Alternate voter
	Chris Haws	Alternate voter
	Matthew Mcilhenny	Alternate voter
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	Chris Forth	Alternate voter
	Steven Maddox	Primary voter
Kentuckiana Curb Co., Inc.	Kevin Muldoon	Kevin Muldoon
	Matthew Lea	Matthew Lea
Rheem Sales Company	Scott Creamer	Primary voter
	Gene Havard	Alternate voter
	Harshad Inamdar	Alternate voter
Trane Technologies Inc	Lane Liudahl	Primary voter
	Beth Braddy	Alternate voter
	Chad Bowers	Alternate voter
United CoolAir	Brad Dunn	Primary voter
Antonio Romeo		AHRI Staff Liaison

Commercial Unitary Standards Technical Committee (STC) Scope:

The Commercial Unitary STC is responsible for the development and maintenance of AHRI standards and guidelines pertaining to Commercial & Industrial Unitary Air-conditioning and Heat Pump Equipment including split systems, remote condensing units, and packaged equipment.

Out of scope: Unitary Small Equipment, Packaged Terminal AC/HP, Furnaces, Variable Refrigerant Systems (VRF), Geothermal and Water Source HP, Single Package Vertical Unit (SPVU), Performance Rating of Zoning products, DX-Dedicated Outdoor Air System Units (DOAS) Demand response and smart grid interface

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Daikin Applied Americas Inc.	Henry Ernst, Vice Chair	Primary
A.O. Smith Corporation	Hammam Amaireh	Primary
Bradford White Corp	Bryan Ahee	Primary
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Copeland	Aditya Sakhalkar	Primary
Danfoss	Justin Prosser	Primary
Johnson Controls, Inc.	Patrick Marks	Primary
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Mitsubishi Electric Cooling & Heating	Jeremy Tidd	Primary
Nailor Industries	Gus Faris	Primary
Rheem Sales Company, Inc.	Sachin Nehete	Primary
Swegon North America Inc.	Karl Peterman	Primary
Jerry Yeh		AHRI Staff Liaison

These lists represent the membership at the time the Standards Work Group, Standards Technical Committee, and Standards Committee were balloted on the final text of this edition. Since that time, changes in the membership may have occurred. Membership on these groups shall not in and of itself constitute an endorsement by the group's members or their employers of any document developed by the group on which the member serves.

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PERFORMANCE RATING OF COMMERCIAL AND INDUSTRIAL UNITARY AIR-CONDITIONING CONDENSING UNITS

Section 1. Purpose

This standard establishes definitions, classifications, test requirements, rating requirements, minimum data requirements for *published ratings*, operating requirements, marking and nameplate data, and conformance conditions for *commercial and industrial unitary air-conditioning condensing units*.

Section 2. Scope

2.1 Scope

This standard applies to factory-made *commercial and industrial unitary air-conditioning condensing units* greater than or equal to 135,000 Btu/h or 40.0 kW as defined in Section 3.2.

2.2 Exclusions

This standard does not apply to the testing and rating of condensing units for refrigeration purposes, as described in AHRI 520.

Section 3. Definitions

All terms in this document follow the standard industry definitions in the ASHRAE Terminology website unless otherwise defined Section 3.2. The standard-specific defined terms are italicized throughout the standard.

3.1 Expression of Provisions

Terms that provide clear distinctions between requirements, recommendations, permissions, options, and capabilities.

3.1.1 "Can" or "cannot"

Express an option or capability.

3.1.2 "May"

Signifies a permission expressed by the document.

3.1.3 "Must"

Indication of unavoidable situations and does not mean that an external constraint referred to is a requirement of the document.

3.1.4 "Shall" or "shall not"

Indication of mandatory requirements to strictly conform to the standard and where deviation is not permitted.

3.1.5 "Should" or "should not"

Indication of recommendations rather than requirements. In the negative form, a recommendation is the expression of potential choices or courses of action that is not preferred but not prohibited.

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3.2 Standard-specific Definitions

3.2.1 Air Sampling Device(s)

A combination of *air sampling tree(s)*, conduit, fan and *aspirating psychrometer* or *dew-point hygrometer* used to determine dry-bulb temperature and moisture content of an air sample from critical locations.

3.2.2 Aspirating Psychrometer

An instrument used to determine the humidity of air by simultaneously measuring both the wet-bulb and dry-bulb temperatures. The difference between these temperatures is referred to as the wet-bulb depression.

3.2.3 Bubble Point

Refrigerant liquid saturation temperature at a specified pressure.

3.2.4 Coefficient of Performance (COP_C)

A ratio of the *cooling capacity* in kW to the power input in kW at any given set of *rating conditions*.

3.2.5 Commercial and Industrial Unitary Air-conditioning Condensing Unit

A factory-made assembly of refrigeration components designed to compress and liquefy a specific refrigerant that consists of one or more refrigerant compressors, refrigerant condensers (air-cooled, evaporatively-cooled, or water-cooled, or a combination thereof), condenser fans and motors (where used), and factory-supplied accessories.

3.2.6 Cooling Capacity

The capacity in Btu/h (kW) obtained at specific conditions, equal to the increase in total enthalpy between the liquid refrigerant entering the expansion valve and superheated return gas multiplied by the mass flow rate of the refrigerant.

3.2.7 Dew Point

Refrigerant vapor saturation temperature at a specified pressure.

3.2.8 Dew-point Hygrometer

An instrument used to determine the humidity of air by detecting visible condensation of moisture on a cooled surface.

3.2.9 Energy Efficiency Ratio (EER)

A ratio of the *cooling capacity* in Btu/h to the power input value in watts at any given set of *rating conditions* expressed in Btu/(W·h).

3.2.9.1 Standard Energy Efficiency Ratio

A ratio of the capacity to power input value obtained at *standard rating conditions*.

3.2.10 Integrated Coefficient of Performance ($ICOP_C$)

A single number part-load efficiency figure of merit calculated in accordance with the method described in this standard expressed in W/W.

3.2.11 Integrated Energy Efficiency Ratio (IEER)

A weighted calculation of mechanical cooling efficiencies at full load and part load *standard rating conditions* expressed in Btu/W·h.

3.2.12 Manufacturer Instructions

3.2.12.1 Manufacturer's Installation Instructions (MII)

Manufacturer's documents that come packaged with or appear in the labels applied to the unit(s).

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3.2.13 Makeup Water

The water supplied to an evaporative cooled condenser to compensate for the water evaporated.

3.2.14 Published Rating

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

3.2.14.1 Application Rating

A rating based on tests performed at rating conditions other than *standard rating conditions*.

3.2.14.2 Standard Rating

A rating based on tests performed at *standard rating conditions*.

3.2.15 Rating Conditions

Any set of operating conditions where a single level of performance results and causes only that level of performance to occur.

3.2.15.1 Application Rating Condition

Rating conditions other than *standard rating conditions* that are within the scope of the standard.

3.2.15.2 Standard Rating Condition

Rating conditions used as the basis of comparison for performance characteristics.

3.2.16 Single Number Rating

The *cooling capacity* and *EER* (COP_C) determined by the results of the tests at *rating condition* No. 1 for air-cooled and evaporatively-cooled condensing units and at *rating condition* No. 3 for water-cooled condensing units (see Section 6).

Section 4. Classifications

Equipment covered within the scope of this standard shall be classified as shown in Table 1.

Table 1 Classifications of Commercial and Industrial Air-conditioning Condensing Units

Designation	AHRI Type[1]	Condenser Type	Arrangement
Remote Condensing Unit (RCU)	RCU-A	Air	COMP COND
	RCU-E	Evaporatively	
	RCU-W[2]	Water	

Notes:
1. "-A" indicates air-cooled condenser, "-E" indicates evaporatively-cooled (does not apply to evaporative pre-cooled) condenser, and "-W" indicates water-cooled condenser.
2. For water-cooled products, outdoor arrangement can move from outdoor side to indoor side.

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Section 5. Test Requirements

5.1 Standard Ratings

All *standard ratings* shall be verified by tests conducted in accordance with ASHRAE 23, ASHRAE 37, and ASHRAE 30 with the test methods and procedures as described in this standard and modified in Appendix C and Appendix D.

An alternate method of verification can be by tests conducted in accordance with ASHRAE 37 provided that the suction *dew point* temperature and the return gas superheat temperature are determined from the procedures in this standard.

5.2 Instruction Priority

Units shall be installed in accordance with the *MII*. In the event of conflicting instructions regarding the set-up of the unit under test, priority shall be given to installation instructions that appear on the unit's label over installation instructions that are shipped with the unit.

5.3 Break-in

Conduct a compressor break-in period prior to conducting the test if there is a *manufacturer-specified* break-in period. Conduct the break-in period using the *manufacturer-specified* duration and conditions; however, the duration shall not exceed twenty hours and the outdoor temperature shall not exceed 115°F or 46°C. When there is a *manufacturer-specified* break-in period, each compressor of the unit shall undergo this break-in period. Testing shall not commence until the *manufacturer-specified* break-in period is completed.

5.4 Head Pressure Control

For units with condenser head pressure controls, the head pressure controls shall be enabled and operated in automatic mode. Set head pressure controls as specified by the *MII*. If such instructions are not provided, use the as-shipped setting. If this results in unstable operation, meaning outside test tolerances in Section 8.3, and testing requirements cannot be met, then the procedures in Section D.6 shall be used.

5.5 Refrigerant Charging

Use the test or operating conditions specified in the *MII* for charging. If the *MII* do not specify a test or operating conditions for charging or *MII* are not provided, charging shall be conducted at *standard rating*. If the *MII* contain two sets of refrigerant charging criteria, one for field installation and one for lab testing, use the field installation criteria. Charging of refrigerant blends shall be performed with refrigerant in the liquid state.

5.5.1 Manufacturer-specified Range for Charging Parameter

If the *MII* give a *manufacturer-specified* range for a charging parameter, for example, superheat, subcooling, or refrigerant pressure, the average of the range shall be used to determine the refrigerant charge.

5.5.2 Parameters and Target Values not Provided

If *MII* are not provided or the *MII* do not provide parameters and target values, or both, set superheat to a target value of 12°F or 6.7°C for fixed orifice systems or set subcooling to a target value of 10°F or 5.5°C for expansion valve systems.

5.5.3 Conflicting Information

In the event of conflicting information between charging instructions, use the instruction priority order indicated in Section 5.2. Conflicting information is defined as multiple *manufacturer-specified* conditions given for charge adjustment where all *manufacturer-specified* conditions cannot be met. If such instances of conflicting information occur within the highest-ranking set of instructions where refrigerant charging instructions are provided, follow the hierarchy in Table 2, as applicable, unless the manufacturer specifies a different priority in the outdoor unit installation instructions.

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