ADDENDA

ANSI/ASHRAE Addendum a to
ANSI/ASHRAE Standard 205-2023

Representation of Performance Data for HVAC&R and Other Facility Equipment

Approved by ASHRAE and the American National Standards Institute on February 29, 2024.

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 (www.ashrae.org/continuous-maintenance).

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 ISSN 1041-2336

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Foreword to Addendum *a*

This addendum contains several "clean-up" changes to Standard 205-2023, as follows:

Deferred clarifications in response to public review comments.

- *Require parentheses in human-readable documentation of derived units*

Revisions proposed via the Continuous Maintenance Proposal (CMP) process.

- *Inclusion of standards that have been published since the initial publication of Standard 205*
- *Update of references that have been published since the initial publication of Standard 205*

Modifications proposed based on experience implementing Standard 205 supporting software.

- *Replace NULL as a data element property with OperationState data element(s)*
- *Removal of superfluous and redundant data in RS0001 (liquid-cooled chiller representation specification)*
- *Rework representation of liquid pressure differential in RS0001 (liquid-cooled chiller representation specification)*

Other corrections and clarifications.

[***Note***: This addendum makes changes to the current standard indicated in the text by underlining (for additions) and strikethrough (for deletions) except where the instructions specifically describe some other means of showing the changes.]

Addendum a to Standard 205-2023

Section 3 revised as follows:

3 DEFINITIONS

[…]

~~***Null:*** a conceptual representation of "no information provided" allowing omission of performance value(s). Null is transmitted in an implementation-specific manner in any given representation.~~

[…]

Table 5-2 revised as follows:

Table 5–2 Fundamental Data Type Definitions

Data Type	Description	JSON Schema Type	Examples
`Integer`	A positive or negative base 10 whole number (i.e., a number that can be written without a fractional part).	integer	3, 19, -4
`Numeric`	A base 10 number that may include a fractional part with optional leading sign and optional exponent (engineering notation). Numeric values are conveyed in CBOR files in IEEE 754[4] binary64 format without rounding.	number	3.43, 0, -4, 1.03e4
`Boolean`	True or false.	boolean	true, false
`String`	A sequence of characters of any length using any (specified) character set.	string	Indirect evaporative cooler
~~`Null`~~	~~Used to represent a missing value. Shall only be used in combination with other data types, e.g., `Numeric/Null`.~~	~~null~~	~~null~~

Section 5.4.3 revised as follows:

5.4.3 Units in Representation Specification Documentation. Units of all values in all representation specifications shall be documented using symbols defined below.

If a numeric data element does not have units, the hyphen "-" character shall be used for its units. When combining base units into derived units, the following rules shall apply:

- For a symbol raised to a power use the power as an exponent (e.g., m^2).

- For the product of two symbols use the interpunct "·" (e.g., N·m).
- For the quotient of two symbols use the solidus "/" (e.g., ~~W/m^2·K~~W/(m^2·K))
- Use only one solidus symbol per derived unit (e.g., m/s^2, not m/s/s).
- ~~Do not u~~Use parentheses for a denominator that is more than a single unit (e.g., ~~W/m^2·K, not W/(m^2·K)~~ W/(m^2·K), not W/m^2·K).
- Do not use negative exponents (e.g., ~~W/m^2·K~~ W/(m^2·K), not W·m^{-2}·K^{-1})

Section 5.7 revised as follows:

5.7 Common Enumerations. Common enumerations are used in more than one representation specification.

When a representation specification includes data elements of enumerations listed in this section, the specified enumerators shall be used.

[…]

Table 5–11 OperationState

Enumerator	**Description**	**Notes**
`NORMAL`	Indicates that the equipment is in normal operating state	
`STANDBY`	Indicates that the equipment is in standby operating state	

Section 6.3.3.6.1 revised as follows:

6.3.3.6.1 Operational Limits. Representation specifications shall define operational limits (physical or practical) that define the range of conditions under which the equipment can operate, as applicable. Such limits shall be conveyed using any of the following approaches:

a. explicitly defined via individual data elements (e.g., `maximum_environmental_temperature`),
b. implicitly defined by the limits of the grid variable values in performance maps (unless the representation specification explicitly defines extrapolation procedures), or
c. explicitly defined ~~through the use of Null~~ using a lookup variable of type OperationState ~~values~~ in performance maps.

Informative note: Application software utilizing the representation data should model the equipment in standby operation if any operational limit is exceeded.

Section 6.3.3.7 revised as follows:

6.3.3.7 PerformanceMap. Performance maps are required when the performance over the operational range of the equipment cannot be characterized by single data elements. One or more performance maps are included that convey equipment performance for a range of conditions and operating modes. Performance maps shall consist of data elements representing grid variables and lookup variables that relate the performance of the equipment over a range of operating conditions.

Lookup variable values shall be provided in a rectilinear, but not necessarily uniform, grid (as illustrated in Figure 6– 1 for three dimensions) defined by the grid variable values. The lookup variable values shall be provided at the vertex defined by the combination of the grid variable values. This implies that both the outer boundary and each cell are hyperrectangles (n-dimensional rectangles).

Grid variable value combinations at which the equipment is in standby operation shall be represented with corresponding lookup variable of type OperationState with a value of STANDBY~~values of Null~~. Standby operation shall be assumed for any conditions falling within a grid cell having a lookup variable of type OperationState with a value of STANDBY~~Null data~~ at any vertex.

Informative note: Application software may create temporary virtual operating points in regions of non-operation as a calculation convenience but shall not infer actual operation in non-operating regions.

Application rules shall define the conditions under which each performance map within a representation shall be used.

Lookup variable values shall be provided with sufficient grid variable spacing to capture non-linear performance characteristics (e.g., inflections).

Informative note: A minimum of two values is required to indicate the operational range of the equipment for each grid variable. A single value for a grid variable indicates that operation is limited to that value (unless otherwise noted for the specific grid variable).

Section 10 revised as follows:

10 REFERENCES

1. C. Bormann. *CBOR*. 2018. URL: http://cbor.io/.
2. JSON.org. *Introducing JSON*. 2018. URL: http://www.json.org/.
3. A. Wright and H. Andrews. *JSON Schema: A Media Type for Describing JSON Documents*. 2018. URL: https: //tools.ietf.org/html/draft-handrews-json-schema-01.
4. IEEE. *IEEE 754-2019 - IEEE Standard for Floating-Point Arithmetic*. 2019. URL: https://standards.ieee.org/ standard/754-2019.html.
5. ITU. *ITU-T X.667: Information technology – Procedures for the operation of object identifier registration authorities: Generation of universally unique identifiers and their use in object identifiers*. ITU, 2012.
6. ISO. *ISO 8601: Date and Time Format*. ISO, 2019.
7. SemVer. *Semantic Versioning 2.0.0*. 2013. URL: https://semver.org/.
8. ECMA. *Standard ECMA-262, ECMAScript® 2019 Language Specification*. 2019. URL: https:/ /www .ecmainternational.org/publications/standards/Ecma-262.htm.
9. ASHRAE. *SI Guide for HVAC&R*. Atlanta, Georgia: ASHRAE, 2013.

10. ASHRAE. *ASHRAE Handbook—Fundamentals*. Atlanta, Georgia: ASHRAE, ~~2017~~2021.
11. J. Schaad. *RFC 8152: CBOR Object Signing and Encryption (COSE)*. 2017. URL: https://www.rfc-editor.org/ info/rfc8152.

Section RS0001.1 revised as follows (the schema_version and Date will depend on the order of publication of the addenda and will be completed at the time of publication):

RS0001.1 Identification and History. `schema`: RS0001

`schema_version`	Date	Initial Approved Standard	Notes
1.0.0	2023	2023	Initial publication
2.0.0	2024	2023 - Addenda a, b, & c	

Section RS0001.3.1 revised as follows:

RS0001.3.1 Data Group Hierarchy. A representation implementation conforming to this representation specification shall consist of the following data groups:

```
- RS0001
    - Metadata
    - Description*
        - ProductInformation*
        - RatingAHRI550590*
            - PartLoadRatingPoint550590*
        - RatingAHRI551591*
            - PartLoadRatingPoint551591*
    - Performance
        - PerformanceMapCooling
            - GridVariablesCooling
            - LookupVariablesCooling
        - PerformanceMapStandby
            - GridVariablesStandby
            - LookupVariablesStandby
        - PerformanceMapEvaporatorLiquidPressureDifferential
            - GridVariablesEvaporatorLiquidPressureDifferential
            - LookupVariablesEvaporatorLiquidPressureDifferential
```

```
- PerformanceMapCondenserLiquidPressureDifferential
      - GridVariablesCondenserLiquidPressureDifferential
      - LookupVariablesCondenserLiquidPressureDifferential
```

where * indicates data groups that are not required to be present in a representation conforming to this representation specification.

Informative note: Required data elements of an optional data group are only required when the data group in present in a representation.

Informative note: When multiple chillers are designed to operate in concert, such as in a series counterflow arrangement, the performance of the chiller system can be represented in a single file. Other designs with multiple chillers operating independently should be represented with multiple files.

Table RS0001-2 revised as follows:

Table RS0001–2 AHRI550590TestStandardYear

Enumerator	Description	Notes
`IP_2015`	Ratings and design points defined using IP unit version of the standard, 2015 edition [1]	
`IP_2015_ADDENDUM_1`	Ratings and design points defined using IP unit version of the standard, 2015 edition with Addendum 1 [2]	
`IP_2018`	Ratings and design points defined using IP unit version of the standard, 2018 edition [3]	
`IP_2020`	Ratings and design points defined using IP unit version of the standard, 2020 edition [4]	
`IP_2020_ADDENDUM_1`	Ratings and design points defined using IP unit version of the standard, 2020 edition with Addendum 1 [5]	
`IP_2023`	Ratings and design points defined using IP unit version of the standard, 2023 edition [6]	

Table RS0001-3 revised as follows:

Table RS0001–3 AHRI551591TestStandardYear

Enumerator	Description	Notes
`SI_2015`	Ratings and design points defined using SI unit version of the standard, 2015 edition ~~[5]~~ [7]	
`SI_2015_ADDENDUM_1`	Ratings and design points defined using SI unit version of the standard, 2015 edition with Addendum 1 ~~[6]~~ [8]	
`SI_2018`	Ratings and design points defined using SI unit version of the standard, 2018 edition ~~[7]~~ [9]	
`SI_2020`	Ratings and design points defined using SI unit version of the standard, 2020 edition ~~[8]~~ [10]	
`SI_2020_ADDENDUM_1`	Ratings and design points defined using SI unit version of the standard, 2020 edition with Addendum 1 [11]	
`SI_2023`	Ratings and design points defined using SI unit version of the standard, 2023 edition [12]	

Table RS0001-6 revised as follows:

Table RS0001–6 ProductInformation

Name	Description	Data Type	Units	Constraints	Req	Notes
`manufacturer`	Manufacturer name	`String`				
`model_number`	Model number	`Pattern`				Pattern shall match all model numbers that can be represented by the representation
`nominal_voltage`	Unit nominal voltage	`Numeric`	V	`≥0.0`		If the unit can operate at multiple voltages, the lower of the two shall be stated
`nominal_frequency`	Unit nominal frequency	`Numeric`	Hz	`≥0.0`		Power supply frequency for the intended region of installation
`compressor_type`	Type of compressor	`<CompressorType>`				
`liquid_data_source`	Source of the liquid properties data	`String`				Example: 'ASHRAE Handbook Fundamentals 2013 chapter 31'
`refrigerant`	Refrigerant used in the chiller	`String`				The string shall start with 'R-' and then include the refrigerant number designation conforming to ANSI/ASHRAE Standard 34~~-2019~~~~[9]~~[13]
`hot_gas_bypass_installed`	Indicates if a hot-gas bypass valve is installed on the chiller	`Boolean`				

Table RS0001-11 revised as follows:

Table RS0001–11 Performance

Name	Description	Data Type	Units	Constraints	Req	Notes

evaporator_liquid_type	Type of liquid in evaporator	{LiquidMixture}			✓	• LiquidMixture specifies liquid constituents and their concentrations • Density shall be evaluated at the evaporator inlet liquid temperature
condenser_liquid_type	Type of liquid in condenser	{LiquidMixture}			✓	• LiquidMixture specifies liquid constituents and their concentrations • Density shall be evaluated at the condenser inlet liquid temperature
evaporator_fouling_factor	Factor of heat transfer inhibition due to heat exchanger fouling layer	Numeric	$m^2·K/W$	≥0.0	✓	• Evaporator fouling factor at which the performance map was created • May be different from the certification data supplied
condenser_fouling_factor	Factor of heat transfer inhibition due to heat exchanger fouling layer	Numeric	$m^2·K/W$	≥0.0	✓	• Condenser fouling factor at which the performance map was created • May be different from the certification data supplied
compressor_speed_control_type	Type of compressor speed control	<SpeedControlType>			✓	
~~maximum_power~~	~~Maximum input power at which the chiller operates reliably and continuously~~	~~Numeric~~	~~W~~	~~≥0.0~~		
cycling_degradation_coefficient	Cycling degradation coefficient (C_D) as described in AHRI	Numeric	-	≥0.0, ≤1.0	✓	Used when the unit cycles to meet a setpoint

	550/590 or AHRI 551/591					
`performance_map_cooling`	Data group describing cooling performance over a range of conditions	`{PerformanceMapCooling}`			✓	
`performance_map_standby`	Data group describing standby performance	`{PerformanceMapStandby}`			✓	
`performance_map_evaporator_liquid_pressure_differential`	Data group describing the liquid pressure differential through the evaporator	`{PerformanceMapEvaporatorLiquidPressureDifferential}`			✓	
`performance_map_condenser_liquid_pressure_differential`	Data group describing the liquid pressure differential through the evaporator	`{PerformanceMapCondenserLiquidPressureDifferential}`			✓	

Table RS0001-13 revised as follows:

Table RS0001–13 GridVariable

Name	Description	Data Type	Units	Constraints	Req	Notes
`evaporator_liquid_volumetric_flow_rate`	Chilled liquid (evaporator) flow	`[Numeric][1..]`	m^3/s	`>0.0`	✓	
`evaporator_liquid_leaving_temperature`	Leaving evaporator liquid temperature	`[Numeric][1..]`	K	`>0.0`	✓	
`condenser_liquid_volumetric_flow_rate`	Condenser liquid flow	`[Numeric][1..]`	m^3/s	`>0.0`	✓	
`condenser_liquid_entering_temperature`	Entering condenser liquid temperature	`[Numeric][1..]`	K	`>0.0`	✓	

compressor_sequence_number	Index indicating the relative capacity order of the compressor speed/stage expressed in order from lowest capacity (starting at 1) to highest capacity	[Integer][1..]	-	~~≥0~~ ≥1	✓	• If compressor_speed_control_type is DISCRETE, sequence numbers shall be provided for each discrete stage of the compressor(s) • If compressor_speed_control_type is CONTINUOUS, sufficient sequence numbers shall be provided to capture the continuous operation of the compressor(s)

Table RS0001-14 revised as follows:

Table RS0001–14 LookupVariablesCooling

Name	Description	Data Type	Units	Constraints	Req	Notes
input_power	Total power input	[Numeric~~/Null~~][1..]	W	≥0.0	✓	All power consumed by the chiller, including controls, motors,,variable speed drives, purge units, sump heaters, fans, etc.
net_evaporator_capacity	Refrigeration capacity	[Numeric~~/Null~~][1..]	W	≥0.0	✓	The available cooling capacity of the evaporator to the thermal load calculated using only the sensible heat transfer
net_condenser_capacity	Condenser heat rejection	[Numeric~~/Null~~][1..]	W	≥0.0	✓	The capacity of the condenser transferred to the condenser cooling stream using only the sensible heat transfer
~~evaporator_liquid_entering_temperature~~	~~Entering evaporator liquid temperature~~	~~[Numeric/Null][1..]~~	~~K~~	~~>0.0~~	~~✓~~	
~~condenser_liquid_leaving_temperature~~	~~Leaving condenser liquid temperature~~	~~[Numeric/Null][1..]~~	~~K~~	~~>0.0~~	~~✓~~	

~~evaporator_liquid_differential_pressure~~	~~Pressure difference across the evaporator~~	~~[Numeric/Null][1..]~~	~~Pa~~	~~>0.0~~	~~✓~~	
~~condenser_liquid_differential_pressure~~	~~Pressure difference across the condenser~~	~~[Numeric/Null][1..]~~	~~Pa~~	~~>0.0~~	~~✓~~	
oil_cooler_heat	Heat transferred to another liquid crossing the control volume boundary from the chiller oil cooler.	[Numeric~~/Null~~][1..]	W	≥0.0	✓	Set as 0 if not present or if heat rejection is met by condenser
auxiliary_heat	Heat transferred to another liquid crossing the control volume boundary from the chiller auxiliaries (motor, motor controller, inverter drive, starter, etc).	[Numeric~~/Null~~][1..]	W	≥0.0	✓	Set as 0 if not present or if heat rejection is met by condenser
operation_state	The operation state at the operating conditions	[<OperationState>]	-		✓	

Table RS0001-17 revised as follows:

Table RS0001–17 LookupVariablesStandby

Name	Description	Data Type	Units	Constraints	Req	Notes
input_power	Total power consumed in standby operation	[Numeric~~/Null~~][1..]	W	>0.0	✓	• Includes devices that cycle on and off (e.g., purge units and sump units) and devices that draw continuous power (e.g., fans and controls)

						• Expressed as a time averaged power consumption

Tables RS0001-18 through RS0001-23 added as follows:

Table RS0001–18 PerformanceMapEvaporatorLiquidPressureDifferential

Name	Description	Data Type	Units	Constraints	Req	Notes
`grid_variables`	Data group defining the grid variables for the evaporator liquid pressure differential	`{GridVariablesEvaporatorLiquidPressureDifferential}`			✓	
`lookup_variables`	Data group defining the lookup variables for the evaporator liquid pressure differential	`{LookupVariablesEvaporatorLiquidPressureDifferential}`			✓	

Table RS0001–19 GridVariablesEvaporatorLiquidPressureDifferential

Name	Description	Data Type	Units	Constraints	Req	Notes
`evaporator_liquid_volumetric_flow_rate`	Chilled liquid (evaporator) flow	`[Numeric][1..]`	m^3/s	`>0.0`	✓	
`evaporator_liquid_leaving_temperature`	Leaving evaporator liquid temperature	`[Numeric][1..]`	K	`>0.0`	✓	

Table RS0001–20 LookupVariablesEvaporatorLiquidPressureDifferential

Name	Description	Data Type	Units	Constraints	Req	Notes
`evaporator_liquid_differential_pressure`	Pressure difference across the evaporator	`[Numeric][1..]`	Pa	`>0.0`	✓	

Table RS0001–21 PerformanceMapCondenserLiquidPressureDifferential

Name	Description	Data Type	Units	Constraints	Req	Notes
`grid_variables`	Data group defining the grid variables for the	`{GridVariablesCondenserLiquidPressureDifferential}`			✓	

	condenser liquid pressure differential					
`lookup_variables`	Data group defining the lookup variables for the condenser liquid pressure differential	`{LookupVariablesCondenserLiquidPressureDifferential}`			✓	

Table RS0001–22 GridVariablesCondenserLiquidPressureDifferential

Name	Description	Data Type	Units	Constraints	Req	Notes
`condenser_liquid_volumetric_flow_rate`	Condenser liquid flow	`[Numeric][1..]`	m^3/s	`>0.0`	✓	
`condenser_liquid_entering_temperature`	Entering condenser liquid temperature	`[Numeric][1..]`	K	`>0.0`	✓	

Table RS0001–23 LookupVariablesCondenserLiquidPressureDifferential

Name	Description	Data Type	Units	Constraints	Req	Notes
`condenser_liquid_differential_pressure`	Pressure difference across the condenser	`[Numeric][1..]`	Pa	`>0.0`	✓	

Section RS0001.6 revised as follows:

RS0001.6 Application Rules

RS0001.6.1 Cooling Performance. `performance_map_cooling` shall be used to simulate performance when system controls call for cooling.

RS0001.6.2 Standby Performance. `performance_map_standby` shall be used to simulate performance under any of the following conditions:

a. system controls are not calling for cooling, or

b. system controls are calling for cooling, but either:

1. the current simulated conditions are outside the range of grid variables in `performance_map_cooling`, or
2. the corresponding lookup variable `operation_state` ~~values~~ in `performance_map_cooling` ~~have~~ has a value of ~~Null~~ STANDBY at the current simulated conditions.

<u>**RS0001.6.3 Fluid Types.** The fluid type used in the simulation shall be the same as defined in the representation. A warning shall be provided to the software user if the fluid types do not match.</u>

Section RS0001.7 revised as follows:

RS0001.7 References

1. AHRI. *~~ANSI/~~AHRI 550/590 (I-P) 2015: Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle*. Arlington, Virginia: AHRI, 2015.

2. AHRI. *~~ANSI/~~AHRI 550/590 (I-P) 2015 with Addendum 1: Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle*. Arlington, Virginia: AHRI, 2017.

3. AHRI. *~~ANSI/~~AHRI 550/590 (I-P) 2018 with Errata: Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle*. Arlington, Virginia: AHRI, 2018.

4. AHRI. *~~ANSI/~~AHRI 550/590 (I-P/2020): Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle*. Arlington, Virginia: AHRI, 2020.

<u>5. AHRI. *AHRI 550/590 (I-P) 2020 with Addendum 1: Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle.* Arlington, Virginia: AHRI, 2022.</u>

<u>6. AHRI. *ANSI/AHRI 550/590 (I-P) 2023: Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle.* Arlington, Virginia: AHRI, 2023.</u>

~~5~~<u>7</u>. AHRI. *~~ANSI/~~AHRI 551/591 (SI) 2015: Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle*. Arlington, Virginia: AHRI, 2015.

~~6~~<u>8</u>. AHRI. *~~ANSI/~~AHRI 551/591 (SI) 2015 with Addendum 1: Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle*. Arlington, Virginia: AHRI, 2017.

~~7~~<u>9</u>. AHRI. *~~ANSI/~~AHRI 551/591 (SI) 2018 with Errata: Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle*. Arlington, Virginia: AHRI, 2018.

~~8~~<u>10</u>. AHRI. *~~ANSI/~~AHRI 551/591 (SI/2020): Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle*. Arlington, Virginia: AHRI, 2020.

<u>11. AHRI. AHRI 551/591 (SI) 2020 with Addendum 1: Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle. Arlington, Virginia: AHRI, 2022.</u>

<u>12. AHRI. ANSI/AHRI 551/591 (SI) 2023: Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle. Arlington, Virginia: AHRI, 2023.</u>

~~9~~<u>13</u>. ASHRAE. *Standard 34~~-2019~~: Designation and Safety Classification of Refrigerants*. Atlanta, Georgia: ASHRAE, ~~2019~~<u>2022</u>.

Section RS0002.1 revised as follows (the schema_version and Date will depend on the order of publication of the addenda and will be completed at the time of publication):

RS0002.1 Identification and History. `schema`: RS0002

`schema_version`	Date	Initial Approved Standard	Notes
1.0.0	2023	2023	Initial publication
2.0.0	2024	2023 - Addenda a, b, & c	

Table RS0002-4 revised as follows:

Table RS0002–4 AHRI210240TestStandardYear

Enumerator	**Description**	**Notes**
`IP_2008`	Ratings defined using IP unit version of the standard, 2008 edition. ~~Rating is based on 2008 AHRI standard~~[1]	
`IP_2017`	Ratings defined using IP unit version of the standard, 2017 edition. ~~Rating is based on 2017 AHRI standard~~[2]	
`IP_2023`	Ratings defined using IP unit version of the standard, 2023 edition. ~~Rating is based on 2023 AHRI standard~~[3]	

Table RS0002-6 revised as follows:

Table RS0002–6 AHRI340360TestStandardYear

Enumerator	**Description**	**Notes**
`IP_2007`	Ratings defined using IP unit version of the standard, 2007 edition. ~~Rating is based on 2007 AHRI standard~~[4]	
`IP_2015`	Ratings defined using IP unit version of the standard, 2015 edition. ~~Rating is based on 2015 AHRI standard~~[5]	
`IP_2019`	Ratings defined using IP unit version of the standard, 2019 edition. ~~Rating is based on 2019 AHRI standard~~[6]	
`IP_2022`	Ratings defined using IP unit version of the standard, 2022 edition.[7]	

Table RS0002–14 Performance revised as follows:

Name	Description	Data Type	Units	Constraints	Req	Notes
`standby_power`	Continuous unit power draw regardless of fan or DX system operation	`Numeric`	W	`≥0.0`	✓	Includes on-board controls and other power not included in the fan or dx system representations
`indoor_fan_representation`	The corresponding Standard 205 fan assembly representation	`{RS0003}`				Required if the indoor fan is packaged with the unitary equipment
`fan_position`	Position of the fan relative to the cooling coil	`<FanPosition>`			`if indoor_fan_representation`	
`dx_system_representation`	The corresponding Standard 205 direct expansion system representation	`{RS0004}`			✓	

Section RS0002.7 revised as follows:

RS0002.7 References

1. AHRI. ~~ANSI/~~*AHRI 210/240 (2008) with Addenda 1 and 2: Performance Rating of Unitary Air-conditioning & Air-source Heat Pump Equipment*. Arlington, Virginia: AHRI, 2008.

2. AHRI. ~~ANSI/~~*AHRI 210/240 (2017) with Addendum 1: Performance Rating of Unitary Air-conditioning & Air-source Heat Pump Equipment*. Arlington, Virginia: AHRI, 2017.

3. AHRI. ~~ANSI/~~*AHRI 210/240-2023 (2020): Performance Rating of Unitary Air-conditioning & Air-source Heat Pump Equipment*. Arlington, Virginia: AHRI, 2020.

4. AHRI. ~~ANSI/~~*AHRI 340/360 (2007) with Addenda 1 and 2: Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment*. Arlington, Virginia: AHRI, 2007.

5. AHRI. ~~ANSI/~~*AHRI 340/360 (2015): Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment*. Arlington, Virginia: AHRI, 2015.

6. AHRI. ~~ANSI/~~*AHRI 340/360 (I-P/2019): Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment*. Arlington, Virginia: AHRI, 2019.

7. AHRI. *AHRI 340/360 (I-P/2022): Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment*. Arlington, Virginia: AHRI, 2022.

Section RS0003.1 revised as follows (the schema_version and Date will depend on the order of publication of the addenda and will be completed at the time of publication):

RS0003.1 Identification and History. `schema`: RS0003

`schema_version`	Date	Initial Approved Standard	Notes
1.0.0	2023	2023	Initial publication
2.0.0	2024	2023 - Addenda a, b, & c	

Table RS0003-14 revised as follows:

Table RS0003–14 LookupVariablesContinuous

Name	Description	Data Type	Units	Constraints	Req	Notes
`impeller_rotational_speed`	Rotational speed of fan impeller	`[Numeric~~/Null~~][1..]`	rev/s	`≥0.0`	✓	
`shaft_power`	Mechanical shaft power input to fan assembly	`[Numeric~~/Null~~][1..]`	W	`≥0.0`	✓	Does not include the mechanical efficiency of any mechanical drive used to modify rotational speed between the motor and impeller
`operation_state`	The operation state at the operating conditions	`[<OperationState>]`	-		✓	

Table RS0003-17 revised as follows:

Table RS0003–17 LookupVariablesDiscrete

Name	Description	Data Type	Units	Constraints	Req	Notes
`standard_air_volumetric_flow_rate`	Volumetric air flow rate through fan assembly at standard air conditions	`[Numeric~~/Null~~][1..]`	m^3/s	`≥0.0`	✓	
`shaft_power`	Mechanical shaft power input to fan assembly	`[Numeric~~/Null~~][1..]`	W	`≥0.0`	✓	Does not include the mechanical efficiency of any mechanical drive used to modify rotational speed between the motor and impeller
`impeller_rotational_speed`	Rotational speed of fan impeller	`[Numeric~~/Null~~][1..]`	rev/s	`≥0.0`	✓	
`operation_state`	The operation state at the operating conditions	`[<OperationState>]`	-		✓	

Section RS0003.6 revised as follows:

RS0003.6 Application Rules. Corrections to different operating conditions shall use fan laws from the ASHRAE SI Handbook of HVAC Systems and Equipment-2020[1], Chapter 21, based on the assumption that the fan assembly is a constant volume device. For instance, the fan power and static pressure values at standard air conditions would be modified according to the fan laws at different temperatures and atmospheric pressures by using density correction factors.

Section RS0004.1 revised as follows (the schema_version and Date will depend on the order of publication of the addenda and will be completed at the time of publication):

RS0004.1 Identification and History. `schema`: RS0004

`schema_version`	Date	Initial Approved Standard	Notes

1.0.0	2023	2023	Initial publication
2.0.0	2024	2023 - Addenda a, b, & c	

Table RS0004-4 revised as follows:

Table RS0004–4 ProductInformation

Name	Description	Data Type	Units	Constraints	Req	Notes
`outdoor_unit_manufacturer`	Outdoor unit manufacturer name	`String`				
`outdoor_unit_model_number`	Outdoor unit model number	`Pattern`				Pattern shall match all model numbers that can be represented by the representation
`indoor_unit_manufacturer`	Indoor unit manufacturer name	`String`				May be omitted for packaged systems with a single manufacturer
`indoor_unit_model_number`	Indoor unit model number	`Pattern`				Pattern shall match all model numbers that can be represented by the representation
`refrigerant`	Refrigerant used	`String`				The string shall start with 'R-' and then include the refrigerant number designation conforming to ANSI/ASHRAE Standard 34~~-2019~~[1]
`compressor_type`	Type of compressor	`<CompressorType>`				

Table RS0004-7 revised as follows:

Table RS0004–7 GridVariablesCooling

Name	Description	Data Type	Units	Constraints	Req	Notes

indoor_coil_entering_relative_humidity	Relative humidity of the air entering the indoor coil	[Numeric][1..]	-	≥0.0, ≤1.0	✓	As measured immediately before entering the coil (i.e., after the fan in a blow-through configuration)
indoor_coil_entering_dry_bulb_temperature	Dry bulb temperature of the air entering the indoor coil	[Numeric][1..]	K	≥0.0	✓	As measured immediately before entering the coil (i.e., after the fan in a blow-through configuration)
indoor_coil_air_mass_flow_rate	Mass flow rate of air entering the indoor coil	[Numeric][1..]	kg/s	>0.0	✓	
compressor_sequence_number	Index indicating the relative capacity order of the compressor speed/stage expressed in order from lowest capacity (starting at 1) to highest capacity	[Integer][1..]	-	~~≥0~~ ≥1	✓	• If compressor_speed_control_type is DISCRETE, sequence numbers shall be provided for each discrete stage of the compressor(s) • If compressor_speed_control_type is CONTINUOUS, sufficient sequence numbers shall be provided to capture the continuous operation of the compressor(s)
ambient_absolute_air_pressure	Ambient absolute air pressure	[Numeric][1..]	Pa	≥0.0	✓	

Table RS0004-8 revised as follows:

Table RS0004–8 LookupVariablesCooling

Name	Description	Data Type	Units	Constraints	Req	Notes
gross_total_capacity	Total heat removed by the indoor coil	[Numeric~~/Null~~][1..]	W	≥0.0	✓	Shall not include fan heat
gross_sensible_capacity	Sensible heat removed by the indoor coil	[Numeric~~/Null~~][1..]	W	≥0.0	✓	Shall not include fan heat

gross_power	Gross power draw (of the outdoor unit)	[Numeric~~/Null~~][1..]	W	>0.0	✓	• Includes compressor, outdoor fan, and any auxiliary power used by the unit's controls and any sump heater • Shall not include power drawn by the indoor fan
operation_state	The operation state at the operating conditions	[<OperationState>]	-		✓	

Table RS0004-11 revised as follows:

Table RS0004–11 LookupVariablesStandby

Name	**Description**	**Data Type**	**Units**	**Constraints**	**Req**	**Notes**
gross_power	Gross power draw (of the outdoor unit)	[Numeric~~/Null~~][1..]	W	>0.0	✓	Includes any auxiliary power used by the unit's controls and any sump heater

Section RS0004.4 revised as follows:

RS0004.4 Verification Rules. Performance data supplied must satisfy the following verification tests. The psychrometric functions used below shall follow the definitions provided by the ASHRAE Handbook of Fundamentals-2021, Chapter 1[2].

Section RS0004.6.2 revised as follows:

RS0004.6.2 Standby Performance. `performance_map_standby` shall be used to simulate performance under any of the following conditions:

a. system controls are not calling for cooling, or

b. system controls are calling for cooling, but either:

1. the current simulated conditions are outside the range of grid variables in `performance_map_cooling`, or
2. the corresponding lookup variable `operation_state` ~~values~~ in `performance_map_cooling` ~~have~~ has a value of ~~Null~~ STANDBY at the current simulated conditions.

Section RS0004.7 revised as follows:

RS0004.7 References

1. ASHRAE. *Standard 34~~-2019~~: Designation and Safety Classification of Refrigerants*. Atlanta, Georgia: ASHRAE, ~~2019~~ 2022.
2. ASHRAE. *ASHRAE Handbook—Fundamentals*. Atlanta, Georgia: ASHRAE, ~~2017~~2021.

Section RS0005.1 revised as follows (the schema_version and Date will depend on the order of publication of the addenda and will be completed at the time of publication):

RS0005.1 Identification and History. `schema`: RS0005

`schema_version`	Date	Initial Approved Standard	Notes
1.0.0	2023	2023	Initial publication
2.0.0	2024	2023 - Addenda a, b, & c	

Table RS0005-9 revised as follows:

Table RS0005–9 LookupVariables

Name	Description	Data Type	Units	Constraints	Req	Notes
`efficiency`	Efficiency of motor	`[Numeric~~/Null~~][1..]`	-	`≥0.0, ≤1.0`	✓	Defined as the ratio of mechanical shaft power to electrical input power of the motor
`power_factor`	Power factor of the motor	`[Numeric~~/Null~~][1..]`	-	`≥0.0, ≤1.0`	✓	

`operation_state`	The operation state at the operating conditions	`[<OperationState>]`	-		✓	

Section RS0005.6 revised as follows:

RS0005.6 Application Rules

RS0005.6.1 Standby Performance. `standby_power` shall be used to simulate performance under the following conditions:

a. when system controls are not calling for shaft rotation, or

b. system controls are calling for shaft rotation, but the corresponding lookup variable `operation_state` ~~values~~ in `performance_map_cooling` ~~have~~ has a value of ~~Null~~ STANDBY at the current simulated conditions.

Section RS0006.1 revised as follows (the schema_version and Date will depend on the order of publication of the addenda and will be completed at the time of publication):

RS0006.1 Identification and History. `schema`: RS0006

`schema_version`	Date	Initial Approved Standard	Notes
1.0.0	2023	2023	Initial publication
2.0.0	2024	2023 - Addenda a, b, & c	

Table RS0006-9 revised as follows:

Table RS0006–9 LookupVariables

Name	Description	Data Type	Units	Constraints	Req	Notes
`efficiency`	Efficiency of drive	`[Numeric~~/Null~~][1..]`	-	`≥0.0, ≤1.0`	✓	• Defined as the ratio of electrical output power (to the motor) to electrical input

						power (to the drive) • Input power shall include any power required to provide active air cooling for the device
operation state	The operation state at the operating conditions	[<OperationState>]	-		✓	

Section RS0006.6 revised as follows:

RS0006.6 Application Rules. `standby_power` shall be used to simulate performance under the following conditions:

a. when system controls are not calling for drive output, or
b. system controls are calling for drive output, but the corresponding lookup variable `operation state` ~~values~~ in `performance_map_cooling` ~~have~~ has a value of ~~Null~~ STANDBY at the current simulated conditions.

Section RS0007.1 revised as follows (the schema_version and Date will depend on the order of publication of the addenda and will be completed at the time of publication):

RS0007.1 Identification and History. `schema`: RS0007

`schema_version`	Date	Initial Approved Standard	Notes
1.0.0	2023	2023	Initial publication
2.0.0	2024	2023 - Addenda a, b, & c	

Table RS0007-9 revised as follows:

Table RS0007–9 LookupVariables

Name	Description	Data Type	Units	Constraints	Req	Notes
efficiency	Efficiency of drive	[Numeric~~/Null]~~[1..]	-	≥0.0, ≤1.0	✓	Defined as the ratio of output shaft power to input shaft power
operation state	The operation state at the operating conditions	[<OperationState>]	-		✓	

POLICY STATEMENT DEFINING ASHRAE'S CONCERN FOR THE ENVIRONMENTAL IMPACT OF ITS ACTIVITIES

ASHRAE is concerned with the impact of its members' activities on both the indoor and outdoor environment. ASHRAE's members will strive to minimize any possible deleterious effect on the indoor and outdoor environment of the systems and components in their responsibility while maximizing the beneficial effects these systems provide, consistent with accepted Standards and the practical state of the art.

ASHRAE's short-range goal is to ensure that the systems and components within its scope do not impact the indoor and outdoor environment to a greater extent than specified by the Standards and Guidelines as established by itself and other responsible bodies.

As an ongoing goal, ASHRAE will, through its Standards Committee and extensive Technical Committee structure, continue to generate up-to-date Standards and Guidelines where appropriate and adopt, recommend, and promote those new and revised Standards developed by other responsible organizations.

Through its *Handbook*, appropriate chapters will contain up-to-date Standards and design considerations as the material is systematically revised.

ASHRAE will take the lead with respect to dissemination of environmental information of its primary interest and will seek out and disseminate information from other responsible organizations that is pertinent, as guides to updating Standards and Guidelines.

The effects of the design and selection of equipment and systems will be considered within the scope of the system's intended use and expected misuse. The disposal of hazardous materials, if any, will also be considered.

ASHRAE's primary concern for environmental impact will be at the site where equipment within ASHRAE's scope operates. However, energy source selection and the possible environmental impact due to the energy source and energy transportation will be considered where possible. Recommendations concerning energy source selection should be made by its members.

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As an industry leader in research, standards writing, publishing, certification, and continuing education, ASHRAE and its members are dedicated to promoting a healthy and sustainable built environment for all, through strategic partnerships with organizations in the HVAC&R community and across related industries.

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2/24