BSR/ASHRAE Addendum e to
ANSI/ASHRAE Standard 205-2023

Public Review Draft

Proposed Addendum e to Standard 205-2023, Representation of Performance Data for HVAC&R and Other Facility Equipment

Second Public Review (January 2026)
(Draft Shows Proposed Independent Substantive Changes to Previous Public Review Draft)

This draft has been recommended for public review by the responsible project committee. To submit a comment on this proposed standard, go to the ASHRAE website at www.ashrae.org/standards-research--technology/public-review-drafts and access the online comment database. The draft is subject to modification until it is approved for publication by the Board of Directors and ANSI. Until this time, the current edition of the standard (as modified by any published addenda on the ASHRAE website) remains in effect. The current edition of any standard may be purchased from the ASHRAE Online Store at www.ashrae.org/bookstore or by calling 404-636-8400 or 1-800-727-4723 (for orders in the U.S. or Canada).

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Proposed BSR/ASHRAE/IBPSA Addendum *e* to ANSI/ASHRAE Standard 205-2023, *Representation of Performance Data for HVAC&R and Other Facility Equipment*

(This foreword is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)

Foreword to Addendum e Independent Substantive Change (ISC)

This Standard 205-2023 Addendum e ISC contains revisions made in response to comments received during the first public review of the addendum. The updated sections resolve the commenter's concerns.

The changes include:

- *Elimination of the unused and confusing PerformanceCapabilities HUMIDIFICATION and DEHUMIDIFICATION.*
- *Updated schematics for cooling and heating operation.*
- *Clarifications relating to cycling degradation.*
- *Revised approach to representation of defrost performance impacts, including informative diagrams and equations.*
- *Explicit nomenclature documentation.*
- *Miscellaneous minor corrections.*

[Note to Reviewers: This addendum makes proposed changes to the current standard. These changes are indicated in the text by underlining (for additions) and strikethrough (for deletions) except where the reviewer instructions specifically describe some other means of showing the changes. Only these changes to the current standard are open for review and comment at this time. Additional material is provided for context only and is not open for comment except as it relates to the proposed changes.]

Addendum *e* ISC to Standard 205-2023

Table 5–11 OperationState

Enumerator	Attributes
NORMAL	**Description:** Indicates that the equipment is in normal operating state
STANDBY	**Description:** Indicates that the equipment is in standby operating state

Table 5–12 PerformanceCapabilities

Enumerator	Attributes
COOLING	**Description:** Indicates that the equipment provides explicitly controlled cooling and the representation contains cooling-related performance data
HEATING	**Description:** Indicates that the equipment provides explicitly controlled heating and the representation contains heating-related performance data
~~DEHUMIDIFICATION~~	~~**Description:** Indicates that the equipment provides explicitly controlled dehumidification and the representation contains dehumidification-related performance data~~
~~HUMIDIFICATION~~	~~**Description:** Indicates that the equipment provides explicitly controlled humidification and the representation contains humidification-related performance data~~

5.9 Common Data Groups. The following data groups shall be referenced in representation specifications where applicable to avoid independent implementations of similar data structures.

5.9.1 Metadata. The `Metadata` data group is the header data group for all representation specifications. Each representation shall include this data group.

Table 5–13 Metadata

Name	Attributes
data_model	**Description:** Data model name **Data Type:** String **Constraints:** "ASHRAE_205" **Req:** ✓ **Notes:** Identifies the data model where the schema is defined
schema	**Description:** Schema name or identifier **Data Type:** <SchemaType> **Req:** ✓ **Notes:** Identifies the schema used to define the data content
schema_version	**Description:** The version of the schema the data complies with **Data Type:** Version **Req:** ✓
id	**Description:** Unique equipment identifier **Data Type:** UUID **Req:** ✓ **Notes:** • Assigned by data publisher to identify the contained data • id shall remain unchanged for revised data
description	**Description:** Description of data (suitable for display) **Data Type:** String **Req:** ✓

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RS0004 AIR-TO-AIR DIRECT EXPANSION SYSTEM

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	
3.0.0	2024	2023 - Addendum e	Add heating performance

RS0004.2 Scope and Description

RS0004.2.1 Applicability. Direct expansion vapor compression refrigerant systems with two coils (one evaporator and one condenser) both exchanging heat with air streams to provide cooling~~and/or heating~~, heating, or both.

RS0004.2.2 ~~Exclusions.~~

RS0004.2.3 Exclusions

- Systems with hot gas reheat used for dehumidification ~~.~~
- Systems with evaporative condenser type

RS0004.2.4 Embedded Representations. None.

RS0004.2.5 Referencing Representations

- RS0002: Unitary Cooling Air-Conditioning Equipment

RS0004.2.6 Schematic. Figure RS0004–1 illustrates the representation of components within the scope of this appendix during cooling operation.

Figure RS0004–2 illustrates the representation of components within the scope of this appendix during heating operation.

RS0004.3 Data Model

RS0004.3.1 Data Group Hierarchy. A representation implementation conforming to this representation specification shall consist of the following data groups:

```
- RS0004
    - Metadata
    - Description*
        - ProductInformation*
    - Performance
        - PerformanceMapCooling
            - GridVariablesCooling
            - LookupVariablesCooling
        - PerformanceMapHeating
            - GridVariablesHeating
            - LookupVariablesHeating
        - PerformanceMapDefrostCorrection
            - GridVariablesDefrostCorrection
            - LookupVariablesDefrostCorrection
        - PerformanceMapStandby
            - GridVariablesStandby
            - LookupVariablesStandby
```

where asterisks (*) indicate data groups that are not required to be present in a representation conforming to this representation specification.

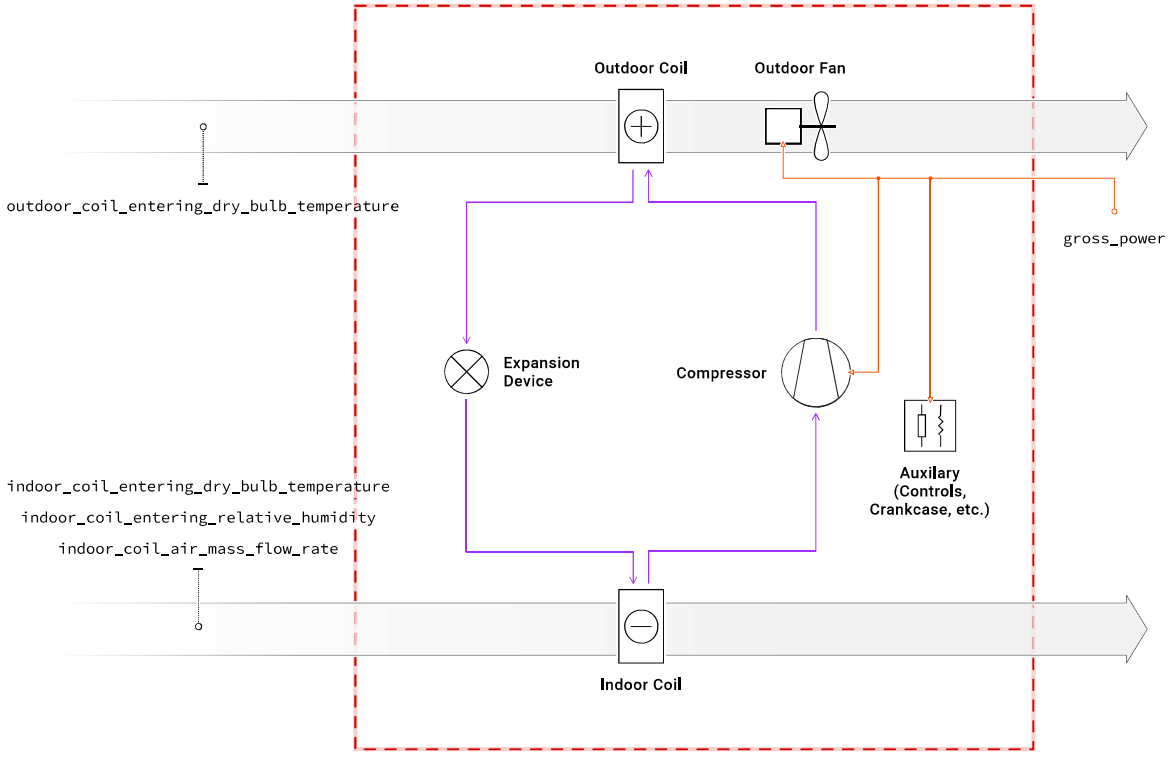

Figure RS0004–1 Air-to-Air direct expansion system during cooling operation.

RS0004.3.2 Enumerations. None.

RS0004.3.3 Data Groups

Table RS0004–2 RS0004

Name	Attributes
`metadata`	**Description:** Metadata data group **Data Type:** `{Metadata}` **Constraints:** `schema=RS0004` **Req:** ✓
`description`	**Description:** Data group describing product and rating information **Data Type:** `{Description}`
`performance`	**Description:** Data group containing performance information **Data Type:** `{Performance}` **Req:** ✓

Table RS0004–3 Description

Name	Attributes
`product_information`	**Description:** Data group describing product information **Data Type:** `{ProductInformation}`

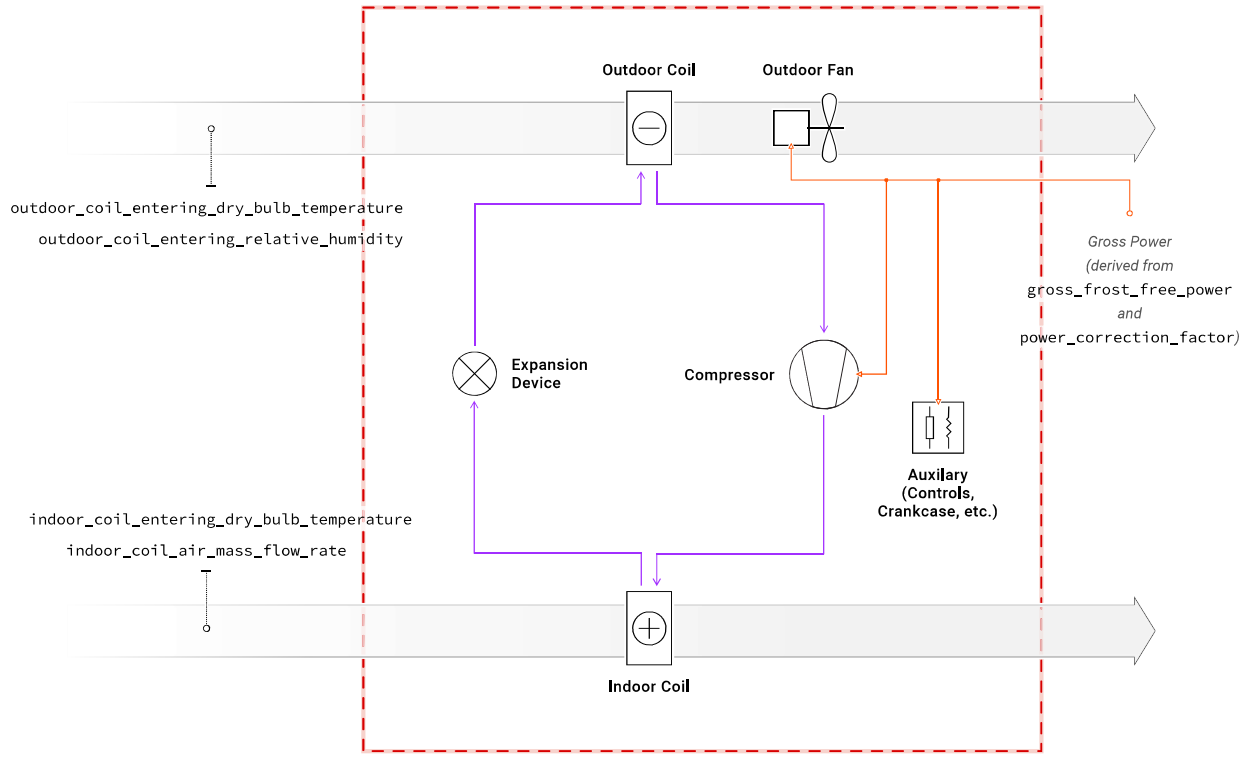

Figure RS0004–2 Air-to-Air direct expansion system during heating operation. Features unrelated to data elements may be omitted, such as the refrigerant reversing valve.

Table RS0004–4 ProductInformation

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

Table RS0004–5 Performance

Name	Attributes
`performance_capabilities`	**Description:** An array of unique operating modes that indicate the capabilities of the equipment **Data Type:** `[<PerformanceCapabilities>]` **Req:** ✓
`compressor_speed_control_type`	**Description:** Method used to control different speeds of the compressor **Data Type:** `<SpeedControlType>` **Req:** ✓
`cooling_cycling_degradation_coefficient`	**Description:** Cooling cycling degradation coefficient (C_D^c)~~as described in AHRI 210/240~~ **Data Type:** `Numeric` **Units:** - **Constraints:** `≥0.0, <1.0` **Req:** `if performance_capabilities contains(COOLING)` **Notes:** • Used for the lowest stage when the unit cycles to meet load • ~~***Informative note:*** 340/360 specifies a fixed cycling degradation coefficient of approximately 0.12~~

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Name	Attributes
heating_cycling_degradation_coefficient	**Description:** Heating cycling degradation coefficient (C_D^h)~~as described in AHRI 210/240~~ **Data Type:** Numeric **Units:** - **Constraints:** ≥0.0, <1.0 **Req:** if performance_capabilities contains(HEATING) **Notes:** • Used for the lowest stage when the unit cycles to meet load • ~~***Informative note:*** 340/360 specifies a fixed cycling degradation coefficient of approximately 0.12~~
scaling	**Description:** Specifies the range the performance data can be scaled to represent different capacity equipment **Data Type:** {Scaling} **Notes:** If not present, scaling of the performance data is not allowed
performance_map_cooling	**Description:** Data group describing cooling performance over a range of conditions **Data Type:** {PerformanceMapCooling} **Req:** if performance_capabilities contains(COOLING)
performance_map_heating	**Description:** Data group describing heating performance over a range of conditions **Data Type:** {PerformanceMapHeating} **Req:** if performance_capabilities contains(HEATING)
performance_map_defrost_correction	**Description:** Data group describing the impact on heating performance due to frost formation, defrost operation, or both **Data Type:** {PerformanceMapDefrostCorrection} **Req:** if performance_capabilities contains(HEATING)
performance_map_standby	**Description:** Data group describing standby performance **Data Type:** {PerformanceMapStandby} **Req:** ✓

Table RS0004–6 PerformanceMapCooling

Name	Attributes
grid_variables	**Description:** Data group defining the grid variables for cooling performance **Data Type:** {GridVariablesCooling} **Req:** ✓
lookup_variables	**Description:** Data group defining the lookup variables for cooling performance **Data Type:** {LookupVariablesCooling} **Req:** ✓

Table RS0004–7 GridVariablesCooling

Name	Attributes
`outdoor_coil_entering_dry_bulb_temperature`	**Description:** Dry bulb temperature of the air entering the outdoor coil **Data Type:** `[Numeric][1..]` **Units:** K **Constraints:** `≥0.0` **Req:** ✓
`indoor_coil_entering_relative_humidity`	**Description:** Relative humidity of the air entering the indoor coil **Data Type:** `[Numeric][1..]` **Units:** - **Constraints:** `≥0.0, ≤1.0` **Req:** ✓ **Notes:** As measured immediately before entering the coil (i.e., after the fan in a blow-through configuration)
`indoor_coil_entering_dry_bulb_temperature`	**Description:** Dry bulb temperature of the air entering the indoor coil **Data Type:** `[Numeric][1..]` **Units:** K **Constraints:** `≥0.0` **Req:** ✓ **Notes:** As measured immediately before entering the coil (i.e., after the fan in a blow-through configuration)
`indoor_coil_air_mass_flow_rate`	**Description:** Mass flow rate of air entering the indoor coil **Data Type:** `[Numeric][1..]` **Units:** kg/s **Constraints:** `≥0.0` **Req:** ✓ **Scalable:** ✓
`compressor_sequence_number`	**Description:** Index indicating the relative capacity order of the compressor speed/stage expressed in order from lowest capacity (starting at 1) to highest capacity **Data Type:** `[Integer][1..]` **Units:** - **Constraints:** `≥1` **Req:** ✓ **Notes:** • 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`	**Description:** Ambient absolute air pressure **Data Type:** `[Numeric][1..]` **Units:** Pa **Constraints:** `≥0.0` **Req:** ✓

Table RS0004–8 LookupVariablesCooling

Name	Attributes
`gross_total_capacity`	**Description:** Total heat removed by the indoor coil **Data Type:** `[Numeric][1..]` **Units:** W **Constraints:** `≥0.0` **Req:** ✓ **Scalable:** ✓ **Notes:** Shall not include fan heat
`gross_sensible_capacity`	**Description:** Sensible heat removed by the indoor coil **Data Type:** `[Numeric][1..]` **Units:** W **Constraints:** `≥0.0` **Req:** ✓ **Scalable:** ✓ **Notes:** Shall not include fan heat
`gross_power`	**Description:** Gross power draw (of the outdoor unit) **Data Type:** `[Numeric][1..]` **Units:** W **Constraints:** ~~>~~`≥0.0` **Req:** ✓ **Scalable:** ✓ **Notes:** • Includes compressor, outdoor fan, and any auxiliary power used by the unit's controls and any ~~sump~~ crankcase heater • Shall not include power drawn by the indoor fan
`operation_state`	**Description:** The operation state at the operating conditions **Data Type:** `[<OperationState>]` **Units:** - **Req:** ✓

Table RS0004–9 PerformanceMapHeating

Name	Attributes
`grid_variables`	**Description:** Data group defining the grid variables for heating performance **Data Type:** `{GridVariablesHeating}` **Req:** ✓
`lookup_variables`	**Description:** Data group defining the lookup variables for heating performance **Data Type:** `{LookupVariablesHeating}` **Req:** ✓

Table RS0004–10 GridVariablesHeating

Name	Attributes
outdoor_coil_entering_dry_bulb_temperature	**Description:** Dry bulb temperature of the air entering the outdoor coil **Data Type:** [Numeric][1..] **Units:** K **Constraints:** ≥~~0~~0.0 **Req:** ✓
~~outdoor_coil_entering_relative_humidity~~	~~**Description:** Relative humidity of the air entering the outdoor coil~~ ~~**Data Type:** [Numeric][1..]~~ ~~**Units:** -~~ ~~**Constraints:** ≥0, ≤1.0~~ ~~**Req:** ✓~~
indoor_coil_entering_dry_bulb_temperature	**Description:** Dry bulb temperature of the air entering the indoor coil **Data Type:** [Numeric][1..] **Units:** K **Constraints:** ≥~~0~~0.0 **Req:** ✓ **Notes:** As measured immediately before entering the coil (i.e., after the fan in a blow-through configuration)
indoor_coil_air_mass_flow_rate	**Description:** Mass flow rate of air entering the indoor coil **Data Type:** [Numeric][1..] **Units:** kg/s **Constraints:** ~~>0~~≥0.0 **Req:** ✓ **Scalable:** ✓
compressor_sequence_number	**Description:** Index indicating the relative capacity order of the compressor speed/stage expressed in order from lowest capacity (starting at 1) to highest capacity **Data Type:** [~~Numeric~~Integer][1..] **Units:** - **Constraints:** ≥~~0~~1 **Req:** ✓ **Notes:** ~~Expressed in order from initial stage /speed to final stage/speed~~ • 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 RS0004–11 LookupVariablesHeating

Name	Attributes
gross_~~steady~~frost_~~state~~free_capacity	**Description:** ~~Total~~ Rate of heat added by the indoor coil under ~~steady-state conditions (i.e., does not include the impact of frost accumulation or defrost operation)~~steady state conditions with no frost present on the outdoor coil **Data Type:** [Numeric][1..] **Units:** W **Constraints:** ~~>0~~≥0.0 **Req:** ✓ **Scalable:** ✓ **Notes:** • ***Informative note:*** Sometimes also referred to as "instantaneous" ~~capacity~~ • ~~Does not account for heat added by the fan~~
~~gross_integrated_capacity~~	~~**Description:** Total heat added by the indoor coil integrated over the time between defrost terminations~~ ~~**Data Type:** [Numeric][1..]~~ ~~**Units:** W~~ ~~**Constraints:** >0~~ ~~**Req:** ✓~~ ~~**Scalable:** ✓~~ ~~**Notes:**~~ • ~~Sometimes referred to as "frost accumulation~~or "steady state" capacity • Does not account for heat added by the fan
gross_~~steady~~frost_~~state~~free_power	**Description:** Gross power draw of the outdoor unit under ~~steady-state conditions (i.e., does not include the impact of frost accumulation or defrost operation)~~steady state conditions with no frost present on the outdoor coil **Data Type:** [Numeric][1..] **Units:** W **Constraints:** ~~>0~~≥0.0 **Req:** ✓ **Scalable:** ✓ **Notes:** • ***Informative note:*** Sometimes also referred to as "instantaneous" or "steady state" power • Does not include power drawn by the indoor fan • Includes compressor, outdoor fan, and any auxiliary power used by the unit's controls and any ~~sump~~ crankcase heater
~~gross~~operation_~~integrated_power~~state	**Description:** ~~Gross power draw of the outdoor unit integrated over the time between defrost terminations~~The operation state at the operating conditions **Data Type:** [<OperationState>] **Units:** - **Req:** ✓

Table RS0004–12 PerformanceMapDefrostCorrection

Name	Attributes
grid_variables	**Description:** Data group defining the grid variables for the impact on heating performance due to the effects of frost formation, defrost operation, or both **Data Type:** {GridVariablesDefrostCorrection} **Req:** ✓
lookup_variables	**Description:** Data group defining the lookup variables for the impact on heating performance due to the effects of frost formation, defrost operation, or both **Data Type:** {LookupVariablesDefrostCorrection} **Req:** ✓

Table RS0004–13 GridVariablesDefrostCorrection

Name	Attributes
outdoor_coil_entering_dry_bulb_temperature	**Description:** Dry bulb temperature of the air entering the outdoor coil **Data Type:** [Numeric][1..] **Units:** ~~W~~K **Constraints:** ~~>0~~≥0.0 **Req:** ✓ ~~**Scalable:** ✓~~ **Notes:** • ~~Sometimes referred to as "frost accumulation" power~~ • ~~Does not include power drawn by the indoor fan~~ • ~~Includes compressor, outdoor fan, and any auxiliary power used by the unit's defrost process, controls, and any sump heater~~ Shall not exceed the range of values provided for outdoor_coil_entering_dry_bulb_temperature in GridVariablesHeating
~~defrost~~outdoor_~~cycle~~coil_~~frequency~~entering_relative_humidity	**Description:** ~~Frequency of defrost terminations under the current operating conditions~~Relative humidity of the air entering the outdoor coil **Data Type:** [Numeric][1..] **Units:** ~~Hz~~- **Constraints:** ≥0.0, ≤1.0 **Req:** ✓
compressor_sequence_number	**Description:** Index indicating the relative capacity order of the compressor speed/stage expressed in order from lowest capacity (starting at 1) to highest capacity **Data Type:** [Integer][1..] **Units:** - **Constraints:** ≥1 **Req:** ✓ **Notes:** ~~This is the inverse of the duration between defrost terminations, a value of zero implies defrost is not occurring~~Shall be consistent with the values of compressor_sequence_number in GridVariablesHeating

Table RS0004–14 LookupVariablesDefrostCorrection

Name	Attributes
capacity_correction_factor	**Description:** Factor representing the correction to the gross frost-free heating capacity to account for impacts of frost formation, defrost operation, or both over the integrated time period **Data Type:** [Numeric][1..] **Units:** - **Constraints:** ≥0.0, ≤1.0 **Req:** ✓ **Notes:** A value of 1.0 indicates no frost formation or defrost operation
power_correction_factor	**Description:** Factor representing the correction to the gross frost-free power to account for impacts of frost formation, defrost operation, or both over the integrated time period **Data Type:** [Numeric][1..] **Units:** - **Constraints:** ≥0.0 **Req:** ✓ **Notes:** A factor greater than 1.0 indicates electric resistance strip heat might be applied to defrost the outdoor coil
defrost_time_fraction	**Description:** Fraction of ~~time between defrost terminations that the defrost process is engaged~~integrated time period when defrost operation is active **Data Type:** [Numeric][1..] **Units:** - **Constraints:** ≥~~0~~0.0, ≤1.0 **Req:** ✓ **Notes:** ***Informative note:*** This value is used to inform application software when it may need to control supplemental heating during defrost

Table RS0004–15 PerformanceMapStandby

Name	Attributes
grid_variables	**Description:** Data group defining the grid variables for standby performance **Data Type:** {GridVariablesStandby} **Req:** ✓
lookup_variables	**Description:** Data group defining the lookup variables for standby performance **Data Type:** {LookupVariablesStandby} **Req:** ✓

Table RS0004–16 GridVariablesStandby

Name	Attributes
outdoor_coil_environment_dry_bulb_temperature	**Description:** Dry bulb temperature of the air in the environment of the outdoor coil **Data Type:** [Numeric][1..] **Units:** K **Constraints:** ≥0.0 **Req:** ✓

Table RS0004–17 LookupVariablesStandby

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

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].

RS0004.4.1 Apparatus Dew Point. An apparatus dew point for the indoor coil must be determinable from the given combination of entering air conditions, total cooling capacity, and sensible heat ratio. That is, a line drawn on a psychrometric chart between the inlet and outlet conditions must intersect the saturation curve when extended beyond the outlet conditions:

There exists $T_{db,ADP}$ and ω_{ADP} such that:

$$\frac{\omega_e - \omega_l}{T_{db,e} - T_{db,l}} = \frac{\omega_e - \omega_{\text{ADP}}}{T_{db,e} - T_{db,ADP}}$$

and

$$\phi\left(T_{db,ADP}, \omega_{\text{ADP}}, P\right) = 1.0$$

RS0004.4.2 Moisture Conservation. The resulting humidity ratio of the air leaving the indoor coil shall not exceed the humidity ratio of the air entering the indoor coil:

$$\omega_l \leq \omega_e$$

RS0004.4.3 Nomenclature

Symbol	Description
ϕ	Relative humidity
ω	Humidity ratio, kg_{water} / kg~dry air~
~~T_{db}~~ T_{db}	Dry-bulb temperature, K
P	Absolute pressure, Pa
e	Subscript indicating entering coil conditions
l	Subscript indicating leaving coil conditions
~~ADP~~ ADP	Subscript indicating Apparatus Dew Point (ADP) conditions

RS0004.5 ~~Publishing Rules.~~

RS0004.6 Publishing Rules ~~None.~~

RS0004.6.1 Heating Performance. `performance_map_defrost_correction` approximates the impact on heating performance due to frost formation, defrost operation, or both over the integrated time period. Figure RS0004–3 and Figure RS0004–4 illustrate the modeling simplification used to represent capacity and power.

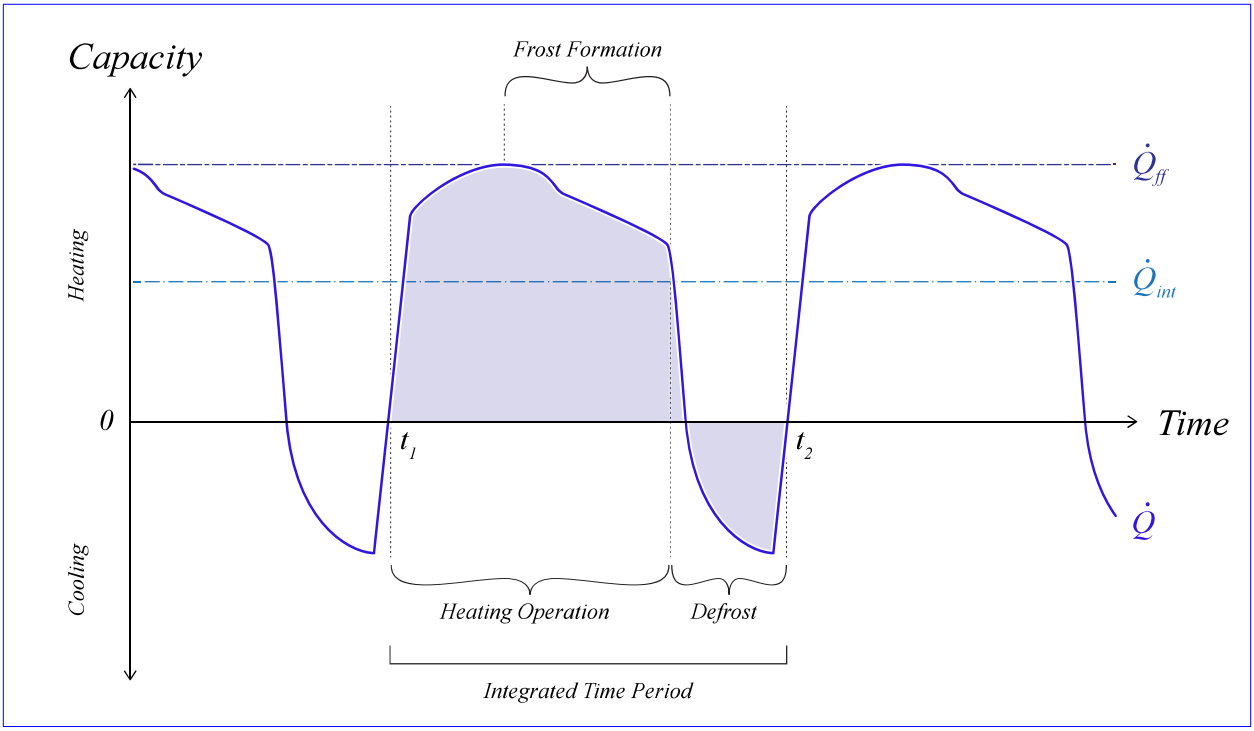

Figure RS0004–3 Reverse-cycle heat pump capacity performance during heating.

The time integrated average capacity shall be calculated with the following equation:

$$\dot{Q}_{int} = \frac{\int_{t_1}^{t_2} \dot{Q} dt}{t_2 - t_1}$$

The time integrated average power shall be calculated with the following equation:

$$\dot{P}_{int} = \frac{\int_{t_1}^{t_2} \dot{P} dt}{t_2 - t_1}$$

The `capacity_correction_factor` shall be calculated with the following equation:

$$f_{\dot{Q}} = \frac{\dot{Q}_{int}}{\dot{Q}_{ff}}$$

The `power_correction_factor` shall be calculated with the following equation:

$$f_{\dot{P}} = \frac{\dot{P}_{int}}{\dot{P}_{ff}}$$

`PerformanceMapDefrostCorrection` only needs to define correction factors for the range of outdoor conditions where frost formation or defrost operation occur. Outside this range, no defrost correction applies.

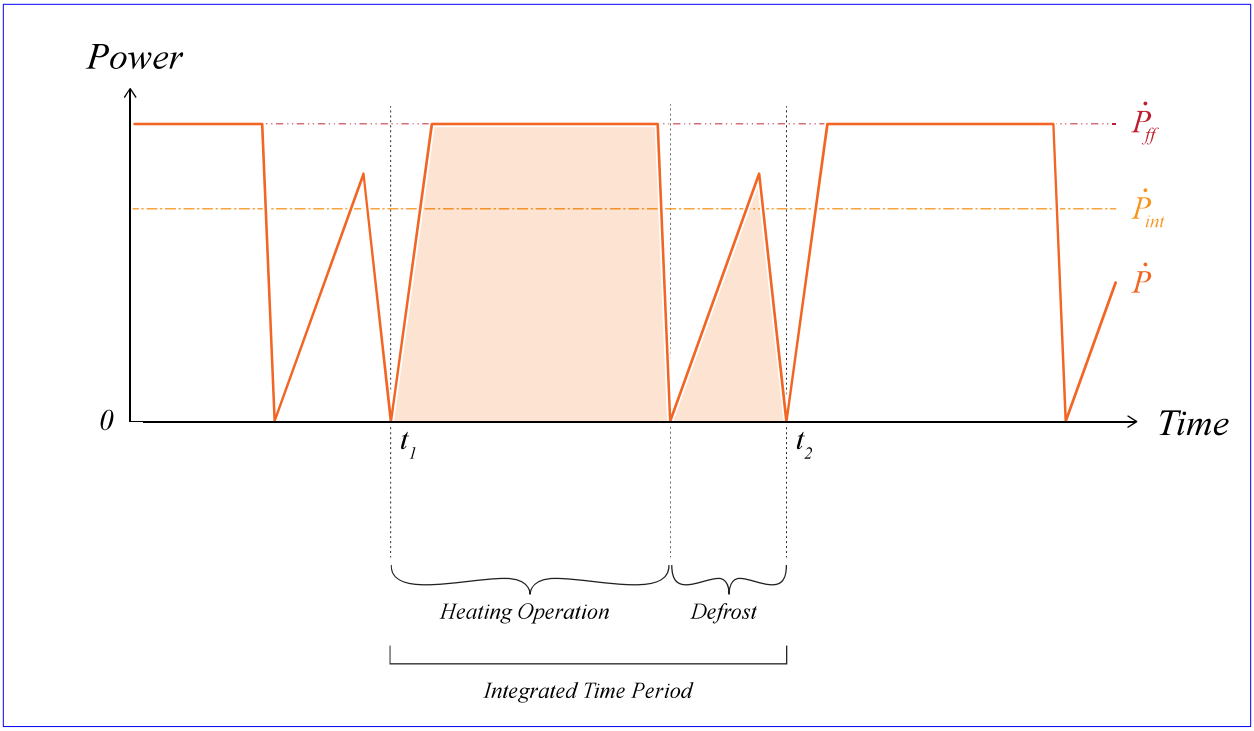

Figure RS0004–4 Reverse-cycle heat pump power during heating.

RS0004.6.2 Nomenclature

Symbol	Data element	Description
$\dot{Q}_{int}$		Time integrated average gross capacity over the integrated time period, W
$\dot{Q}_{ff}$	gross_frost_free_capacity	Rate of heat added by the indoor coil under steady state conditions with no frost present on the outdoor coil, W
$\dot{Q}$		Rate of heat added by the indoor coil, W
$f_{\dot{Q}}$	capacity_correction_factor	Factor representing the average correction to the gross frost-free capacity over the integrated time period
$\dot{P}_{int}$		Time integrated average gross power over the integrated time period, W
$\dot{P}_{ff}$	gross_frost_free_power	Gross power draw of the outdoor unit under steady state conditions with no frost present on the outdoor coil, W
$\dot{P}$		Gross power, W
$f_{\dot{P}}$	power_correction_factor	Factor representing the average correction to the gross frost-free power over the integrated time period
t_1		Time at the initial defrost termination, s
t_2		Time at the successive defrost termination, s

RS0004.7 Application Rules

RS0004.7.1 Cooling Performance. `performance_map_cooling` shall be used to simulate performance when system controls call for cooling.

RS0004.7.2 ~~Heating Performance.~~

RS0004.7.3 Heating Performance. `performance_map_heating` and `performance_map_defrost_correction` shall be used to simulate performance under the following conditions:

a. when system controls call for heating, and
b. the corresponding lookup variable `operation_state` in `performance_map_heating` has a value of `NORMAL` at the current simulated conditions

The simulated capacity shall be modeled with the following equation:

$$\dot{Q}_{int} = \dot{Q}_{ff} \cdot f_{\dot{Q}}$$

The simulated power shall be modeled with the following equation:

$$\dot{P}_{int} = \dot{P}_{ff} \cdot f_{\dot{P}}$$

`capacity_correction_factor` and `power_correction_factor` shall assume a value of 1.0 during heating operation outside of `PerformanceMapDefrostCorrection`.

RS0004.7.4 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 heating, or
b. system controls are calling for cooling or heating, but either:
    1. the current simulated conditions are outside the range of grid variables in the respective performance map, or
    2. the corresponding lookup variable `operation_state` in the respective performance map has a value of ~~STANDBY~~ `STANDBY` at the current simulated conditions.

RS0004.7.5 Cycling Degradation. The cycling degradation coefficients, `cooling_cycling_degradation_coefficient` and `heating_cycling_degradation_coefficient`, shall be used to adjust the gross power when the system is cycling between the lowest `compressor_sequence_number` of the respective performance map and standby operation.

The time integrated average gross power during heating or cooling operation while cycling shall be calculated as:

$$\overline{\dot{P}}_{cyc} = f_{cyc} \cdot \frac{\dot{P}_{low}}{1 - C_D \cdot (1 - f_{cyc})}$$

The average power during standby operation while cycling shall be calculated as:

$$\overline{\dot{P}}_{sb} = (1 - f_{cyc}) \cdot \dot{P}_{sb}$$

RS0004.7.6 Nomenclature

Symbol	Data element	Description
$\dot{Q}_{int}$		Time integrated average gross capacity over the integrated time period, W
$\dot{Q}_{ff}$	gross_frost_free_capacity	Rate of heat added by the indoor coil under steady state conditions with no frost present on the outdoor coil, W
f_Q	capacity_correction_factor	Factor representing the average correction to the gross frost-free capacity over the time between defrost terminations
$\dot{P}_{int}$		Time integrated average gross power over the integrated time period, W
$\dot{P}_{ff}$	gross_frost_free_power	Gross power draw of the outdoor unit under steady state conditions with no frost present on the outdoor coil, W
f_P	power_correction_factor	Factor representing the average correction to the gross frost-free power over the time between defrost terminations
f_{cyc}		Cycling ratio, fraction of time the system is in heating or cooling operation while cycling
$\overline{\dot{P}}_{cyc}$		Time integrated average heating or cooling gross power draw of the outdoor unit while cycling, W
$\dot{P}_{low}$		Gross power draw of the outdoor unit at its lowest compressor sequence number during the respective operating mode, W (Note: this is $\dot{P}_{int}$ in heating mode)
C_D	cooling_cycling_degradation_coefficient or heating_cycling_degradation_coefficient	Cycling degradation coefficient for the respective operating mode
$\overline{\dot{P}}_{sb}$		Time integrated average standby power draw of the outdoor unit while cycling, W
$\dot{P}_{sb}$		Gross power draw of the outdoor unit during standby operation, W

RS0004.8 References

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

RS0004.9 Example (Informative). See https://data.ashrae.org/Standard205/examples.html.