AHRI Standard 881-2017 (R2023) (SI)

2017 (Reaffirmed 2023) Standard for

Performance Rating of Air Terminals

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ICS Codes: 17.140.20, 23.120

Note:

For I-P ratings, see AHRI Standard 880-2017 (R2023) (I-P).

This Standard supersedes AHRI Standard 881 (SI)-2011 with Addendum 1.

This Standard was reaffirmed July 2023.

USE OF THE SOUND RATINGS

Sound power level data generated by use of this standard with air terminals are directly applicable to AHRI Standard 885, a procedure for using published sound ratings in the estimating of sound levels in occupied spaces.

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PERFORMANCE RATING OF AIR TERMINALS

Section 1. Purpose

1.1 *Purpose.* The purpose of this standard is to establish for Air Terminals: definitions; classifications; test requirements; rating requirements; minimum data requirements for Published Ratings; marking and nameplate data; and voluntary conformance conditions.

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

1.1.2 *Review and Amendment.* This standard is subject to review and amendment as technology advances.

Section 2. Scope

2.1 *Scope.* This standard applies to air control devices used in air distribution systems. These devices provide control of air volume with or without temperature control by one or more of the following means and may or may not include a fan:

2.1.1 Fixed or adjustable directional vanes (i.e. Bypass Air Terminal)
2.1.2 Pressure dependent volume Air Valves (including air induction nozzles)
2.1.3 Pressure independent (compensated) volume Air Valves (including air induction nozzles)
2.1.4 Integral heat exchange
2.1.5 On/off fan control
2.1.6 Variable speed fan control
2.1.7 Integral Diffuser Air Terminals

2.2 *Exclusions.* This standard does not apply to registers, diffusers and grilles that do not include an Air Valve or to products specifically covered by ANSI/AHRI Standard 410 or ANSI/AHRI Standard 440.

Section 3. Definitions

All terms in this document will follow the standard industry definitions in the ASHRAE Terminology website (https://www.ashrae.org/resources--publications/free-resources/ashrae-terminology) unless otherwise defined in this section.

3.1 *Acoustic Test Duct.* Duct used to convey the sound of the unit configuration under test to the reverberation room during a ducted discharge test. A Duct End Correction (E_1) shall be added to the sound data measured in the reverberation room to account for the presence of an open-ended duct termination.

3.2 *Acoustically Isolated.* The specimen under test shall have a sound pressure level at least 10 dB higher than any extraneous sound sources, such as sound generated from the air supply or duct walls, to insure that the test specimen is the sole contributor to the sound level being measured.

3.3 *Air.*

3.3.1 *Primary Air.* Air supplied to an air terminal inlet under positive static gage pressure, normally from an air handling unit.

3.3.2 *Secondary Air.* Air drawn into an Air Terminal by means of induction and discharged through the air terminal outlet.

3.3.3 *Standard Air.* Air weighing 1.2 kg/m^3 which approximates dry air at 21°C and at a barometric pressure of 101.3 kPa.

3.4 *Airflow.* Unit volume displacement of Standard Air per unit time, scfm. The various types of Airflow are defined as follows:

3.4.1 *Induced Airflow.* The flow of Secondary Air into an Air Terminal resulting from a pressure differential within the terminal.

3.4.2 *Rated Airflow.* The flow of Air through an Air Terminal at which test or performance data is generated.

3.4.3 *Standard Airflow.* Airflow corrected for the density of Standard Air.

3.5 *Air Terminal.* A device that modulates the volume of Air delivered to or removed from a defined space in response to an external demand (Figure 1). The various types of Air Terminals are shown in Figures 1.a through 1.k and described below.

3.5.1 *Bypass Air Terminal.* Air Terminal, typically having more than one outlet, that uses a method of volume modulation whereby Airflow is varied by distributing that volume required to meet the space requirements with the balance of Primary Air being diverted away from the space. See Figure 1.c.

3.5.2 *Dual Duct Air Terminal.* Air Terminal that mixes varying portions of two independent sources of Primary Air. See Figure 1.d.

3.5.3 *Fan-powered Air Terminal.*

3.5.3.1 *Booster Fan-powered Air Terminal.* Air Terminal similar to a series terminal unit without a primary Air Valve. Unit may have supplemental heat or reheat. See Figure 1.k.

3.5.3.2 *Parallel Flow Fan-powered Air Terminal.* Air Terminal in which the primary Air Valve is parallel to the fan allowing the primary air to bypass the fan. The fan induces Airflow only through the induction port. Unit may have supplemental heat or cooling. See Figure 1.h.

3.5.3.3 *Series Flow Fan-powered Air Terminal.* Air Terminal in which the primary Air Valve is in series with the fan and typically all air flows through the fan. The fan induces Airflow from the induction port and the primary Air Valve. Unit may have supplemental heat or cooling. See Figure 1.g.

3.5.4 *Induction Air Terminal.* Air Terminal, typically having more than one inlet, which supplies varying proportions of Primary Air and induced air (excludes Fan-powered Terminals). See Figure 1.b.

3.5.5 *Integral Diffuser Air Terminal.* Diffuser with the features of an Air Terminal. Air is modulated via outlet or inlet Air Valves. See Figures 1.e and 1.f.

3.5.6 *Modulating Diffuser Air Terminal.* A diffuser with an integral Air Terminal. See Figure 1.i.

3.5.7 *Single-duct Air Terminal.* Air Terminal supplied with one source of Primary Air (excludes Fan-powered Terminals). Unit may have supplemental heat. See Figure 1.a.

3.5.7.1 *Exhaust Air Terminal.* Air Terminal for regulating exhaust or return. See Figure 1.j.

3.5.7.2 *Mechanically Pressure Independent (Compensated) Air Terminal.* Air Terminal that mechanically regulates supply/exhaust Airflow, independent of pressure drop through the device. See Figure 1.a.1.

3.5.7.3 *Reheat Air Terminal.* Air Terminal that heats a single source of Primary Air from a cooling and/or dehumidification source.

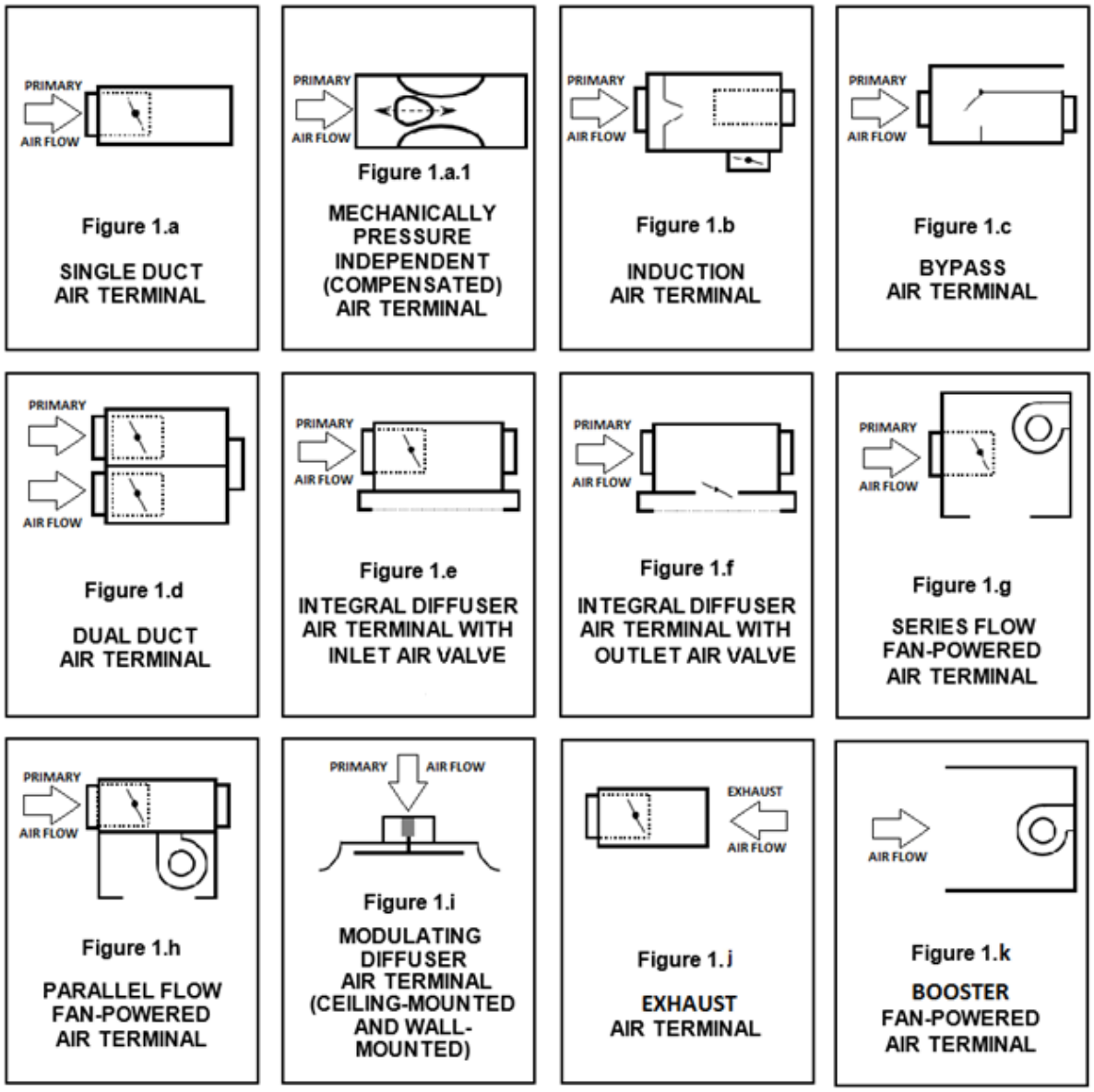

Figure 1. Air Terminal and Air Outlet Configurations

3.6 *Air Valve.* A device used to regulate or modulate the flow of air.

3.6.1 *Inlet Air Valve.* Controls all Air flowing into an Integral Diffuser Air Terminal. See Figure 1.e.

3.6.2 *Outlet Air Valve.* Controls only the air being discharged through the diffuser part of an Integral Diffuser Air Terminal. See Figure 1.f.

3.7 *Duct End Correction, E_1.* A correction in a frequency band that accounts for the acoustic energy in an Acoustic Test Duct that is prevented from entering the test space by the impedance mismatch created by the termination of the Acoustic Test Duct; a method for computing the Duct End Correction is described in Section 5.1.3.9.

3.8 *Equivalent Diameter.* Diameter of a circular equivalent of any duct used to determine equal cross-sectional areas.

3.9 *Exhaust Total Leakage.* Amount of Air (at standard conditions) entering into the terminal at a given negative static pressure with the Air Valve fully closed.

3.10 *Minimum Operating Pressure.* The static pressure drop across an Air Terminal at a given airflow rate with the Air Valve placed in its full open position by its actuator in its normal operating mode. Full open position for mechanically pressure independent (compensated) air terminal is the point at which the flow regulating device is first engaged (starts to control).

3.11 *Model.* An Air Terminal of the same type with similar characteristics available in a progression of sizes. For Fan-powered Air Terminals, a model is defined by a fan size and a progression of various inlet dimensions. For non-fan-powered air terminals, it is an Air Terminal of various inlet dimensions.

3.12 *Octave Band.* A band of sound covering a range of frequencies such that the highest is twice the lowest. The octave band center frequencies of interest are listed in Table 1.

3.13 *Piezometric Ring.* A duct static pressure averaging apparatus in which a common tube interconnects at least four evenly spaced duct wall taps and is connected to a pressure measuring device.

3.14 *Power Factor.* The ratio of real power to apparent power. Power Factor is a way to describe how much of the current contributes to power in the load. A Power Factor of one indicates that 100% of the current is contributing to power in the load.

3.15 *Pressure.* For the purpose of this standard, pressure shall be associated with Standard Air.

3.16 *Pressure Dependent Control System.* Airflow through the Air Terminal varies in response to system pressure.

3.17 *Pressure Independent (Compensated) Control System.* Airflow through the Air Terminal is independent of system pressure.

3.18 *Published Rating.* A rating of the assigned values of those performance characteristics, under stated Rating Conditions, by which a unit may be chosen to fit its application. These values apply to all units of like nominal size and type (identification) produced by the same manufacturer. As used herein, 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.

3.18.1 *Application Rating.* A rating based on tests performed at application Rating Conditions (other than Standard Rating Conditions).

3.18.2 *Standard Rating.* A rating based on tests performed at Standard Rating Conditions.

3.19 *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.

3.19.1 *Standard Rating Conditions.* Rating Conditions used as the basis of comparison for performance characteristics.

3.20 *Reference Sound Source (RSS).* A portable, aerodynamic sound source that produces a known stable broadband sound power output.

3.21 *Retrofit Unit.* Air Terminal intended for installation into existing air distribution systems, and containing little or no sound attenuating materials.

3.22 *"Shall" or "Should."* "Shall" or "should" shall be interpreted as follows:

3.22.1 *Shall.* Where "shall" or "shall not" is used for a provision, that provision is mandatory if compliance with the standard is claimed.

3.22.2 *Should.* "Should" is used to indicate provisions which are not mandatory but are desirable as good practice.

3.23 *Shutoff.* Condition when the Air Valve is in the position intended to disallow Airflow.

3.24 *Size.* Air Terminal characteristics related to the dimensions of the unit.

3.25 *Sound Power.* In a specified frequency band, the rate at which sound energy is radiated by a noise source, watts.

3.25.1 *Discharge Sound Power.* Sound Power transmitted from an air terminal outlet.

3.25.2 *Exhaust Sound Power.* Sound power that is transmitted from an exhaust terminal inlet back to the room (counter to the Airflow)

3.25.3 *Radiated Sound Power.* Sound Power transmitted from an air terminal casing (plus induction port for Fan-powered Air Terminals).

3.26 *Sound Power Level, L_w.* Ten times the logarithm to the base ten of the ratio of the Sound Power radiated by the source to a reference Sound Power, dB. The reference Sound Power used in this standard is 1 picowatt, pW.

3.27 *Sound Pressure.* In a specified frequency band, a fluctuating pressure superimposed on the static pressure by the presence of sound.

3.28 *Sound Pressure Level, L_p.* Twenty times the logarithm to the base ten of the ratio of the Sound Pressure radiated by the noise source under test to a reference sound pressure of 20 micropascals, dB.

3.29 *Terminal Casing Leakage.* Amount of air (at standard conditions) escaping from the terminal at a given inlet pressure with only the outlet(s) blocked and with the Air Valve fully opened.

3.30 *Terminal Air Valve Leakage.* Amount of air (at standard conditions) passing through an Air Valve in a shutoff position at a given inlet pressure.

Section 4. Classifications

4.1 *Classifications.* Air Terminal units falling within the scope of this standard shall be classified as one of the following nine types:

4.1.1 Single-Duct Air Terminals (Figures 1.a, 1.j and 1.a.1)
4.1.2 Induction Air Terminals (Figure 1.b)
4.1.3 Bypass Air Terminals (Figure 1.c)
4.1.4 Dual Duct Air Terminals (Figure 1.d)
4.1.5 Integral Diffuser Air Terminals with Inlet Air Valve (Figure 1.e)
4.1.6 Integral Diffuser Air Terminals with Outlet Air Valve (Figure 1.f)
4.1.7 Series Flow, Fan-powered Air Terminals (Figures 1.g and 1.k)
4.1.8 Parallel Flow, Fan-powered Air Terminals (Figure 1.h)
4.1.9 Modulating Diffuser Air Terminals (Ceiling-Mounted and Wall-Mounted) (Figure 1.i)

Section 5. Test Requirements

5.1 *Test Requirements.* Air Terminals shall be tested in accordance with ASHRAE Standard 130, except as noted below.

5.1.1 *Calibration.* Instruments shall be calibrated at least once per year by comparison with a certified standard in the range of use or shall itself have been certified as to accuracy.

5.1.2 *Airflow and Pressure Measurements.*

5.1.2.1 *Supply Air Static Pressure.* The static pressure of the air entering the test unit shall be measured by means of a Piezometric Ring per ASHRAE Standard 130.

5.1.2.2 *Discharge Air Static Pressure.* The static pressure of the air shall be measured downstream of the air terminal outlet according to ASHRAE Standard 130. A Piezometric Ring shall be used if static pressure traverse measurements are not uniform within 10%.

5.1.2.3 *Induced Airflow.* Induced Airflow is calculated by subtracting the primary Airflow from the discharge (total) Airflow. Primary Airflow and discharge (total) Airflow are measured in accordance with ASHRAE Standard 130.

5.1.2.4 *Radiated Sound Power Tests - Series Flow Fan Terminals.* The total Airflow discharging the test unit shall be measured using an Acoustically Isolated flow measuring device installed as shown in ASHRAE Standard 130.

5.1.3 *Sound Measurements.*

5.1.3.1 *Sound Power Determination.* Sound Power Levels shall be determined for the Octave Bands from 125 to 4000 Hertz according to ANSI/AHRI Standard 220. ANSI/AHRI Standard 220 specifies the instrumentation, test facilities, sound power calculation method, required data to be taken, Reference Sound Source (RSS) requirements and reverberation room qualification procedures. Unit setup and configuration shall be according to ASHRAE Standard 130. The octave band center frequencies of interest are listed in Table 1 below:

Table 1. Octave Band Center Frequencies

Octave Band	Center Frequency, Hz
2	125
3	250
4	500
5	1000
6	2000
7	4000

5.1.3.2 *Reverberation Room Qualification.* Units tested and rated in accordance with AHRI Standard 880 (I-P) are required to be tested in a reverberation room that meets the broadband requirements of ANSI/AHRI Standard 220. Units certified in accordance with the AHRI Standard 880 (I-P) Certification Program are required to be verified by a test in a reverberation room that meets both the broadband and pure tone qualification requirements of ANSI/AHRI Standard 220.

5.1.3.3 *Sound Data Requirements.* Sound measurements shall be performed in one-third octave band levels from 100 Hz to 5000 Hz center frequencies. Corrections for background noise and for the computation of the one third octave band sound power levels shall be per ANSI/AHRI Standard 220. When a Duct End Correction (Section 5.1.3.9) is required it shall only be applied to the one

third octave band Sound Power Levels. The octave band Sound Power Levels shall be calculated per ANSI/AHRI Standard 220 from the corrected one third octave band sound power levels.

5.1.3.4 *Discharge or Exhaust Sound Power.* To determine the discharge or exhaust Sound Power Level, the Air Terminal shall be installed in accordance with ASHRAE Standard 130 (ducted). The test duct shall be flush with the inside wall of the reverberation room and shall be constructed in accordance with Section 4.5.1 of ANSI/AHRI Standard 261 (SI). Alternatively, for Integral Diffuser Air Terminals, the discharge Sound Power Level may be determined in accordance with ASHRAE Standard 130. For Modulating Diffuser Air Terminals, the discharge Sound Power Level shall be determined in accordance with ASHRAE Standard 70. Exhaust/return diffusers shall be mounted in accordance to Figure 5 of ASHRAE Standard 70 and supply diffusers shall be mounted in accordance to Figure 5 or Figure 6 of ASHRAE Standard 70.

5.1.3.5 *Radiated Sound Power.* The Air Terminal shall be installed in accordance with ASHRAE Standard 130 to determine radiated Sound Power Level.

5.1.3.6 *Mounting of Equipment Requiring Support.* To achieve isolation, a trapeze type mounting with rubber isolating pads shall be used for all compatible Air Terminals.

5.1.3.7 *Dual Duct Air Terminal Test Configuration.* Dual Duct Air Terminals shall be tested with one Air Valve controlling airflow and one Air Valve fully closed.

5.1.3.8 *Acoustically Isolated Duct.* Recommendations for acoustically isolated ducts, or equivalents, used as inlet and outlet ducts in radiated sound tests are shown in Figures 2 and 3.

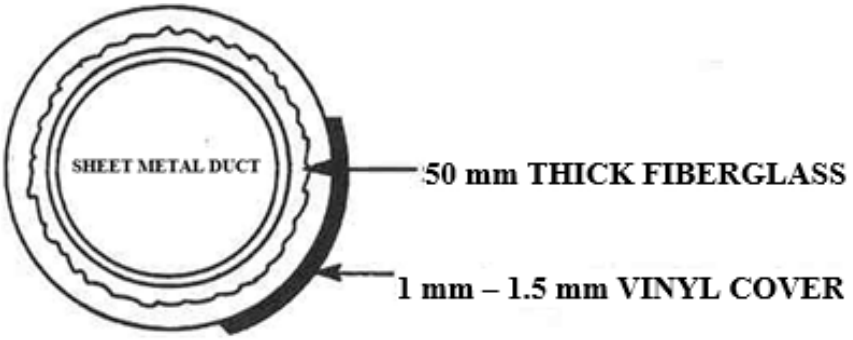

Figure 2. Acoustically Isolated Duct

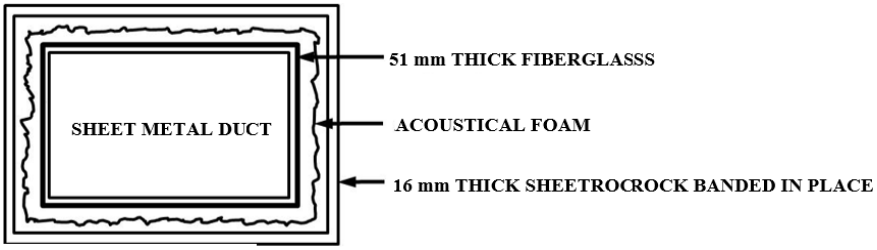

Figure 3. Acoustically Isolated (Lagged) Duct

5.1.3.9 *Ducted Discharge or Exhaust Sound Calculations.* For ducted discharge or exhaust sound installations a Duct End Correction (E_1) shall be added to each one-third octave band sound power level. The addition of the Duct End Correction (E_1) provides the user with the sound power that would be transmitted into an acoustically, non-reflective duct system. The Duct End Correction shall

be calculated using Equation 1. The Equivalent Diameter shall be calculated using Equation 2 as defined in ASHRAE Standard 130.

$$E_1 = 10 \log\left[1 + \left(\frac{0.7\,C_o}{\pi\, f\, D_e}\right)^2\right] \quad (1)$$

$$D_e = \sqrt{4 \cdot \frac{A}{\pi}} \quad (2)$$

Where:

A = Internal cross section of duct, m^2
C_o = Speed of sound in Air, m/s
D_e = Equivalent Diameter, m
E_1 = Duct End Correction, dB
f = One-third octave band center frequency, Hz

It should be understood that the Duct End Corrections become numerically large for products with small equivalent duct diameters. This may tend to overstate the sound power levels at low frequencies for such small products. Therefore, if the value for E_1 is greater than 14 dB, set E_1 equal to 14 dB.

Section 6. Rating Requirements

6.1 *Standard Ratings.* Standard Ratings shall be established at the Standard Rating Conditions specified in Section 6.2. All Standard Ratings shall be verified by tests in accordance with Section 6.

6.1.1 *Values of Standard Ratings.* Standard Ratings relating to airflow rates shall be expressed only in m^3/s of Standard Air and stated as follows:

Table 2. Airflow Rate Increments

Range, m^3/s of Standard Air	Recorded Increment, m^3/s of Standard Air
0 to 0.023	0.0005
0.024 to 0.094	0.0025
0.094 to 0.471	0.005
0.472 and over	0.01

Discharge, exhaust and radiated Sound Power Level shall be expressed to the nearest 1 dB. Levels lower than values shown in Table 3 shall be listed as being insignificant. The Sound Power Level shall be determined for the octave band center frequencies from 125 to 4000 Hz.

Fan power shall be expressed to the nearest watt. Optional units of watts/m_3/s of Standard Air shall be expressed to the nearest watt/m^3/s of Standard Air. Terminal Casing and Air Valve Leakages shall be expressed to the nearest m^3/s of Standard Air. Static pressure shall be expressed to the nearest 0.0025 kPa.

Table 3. Minimum Significant Sound Power Levels

Octave Band Center Frequency, Hz	125	250	500	1000	2000	4000
Sound Power Level, dB	36	29	26	22	19	17

6.2 *Standard Rating Conditions.*

6.2.1 *Airflow Rate and Minimum Operating Pressure.*

6.2.1.1 *Primary Air Valve.* The standard Rated Airflow and Minimum Operating Pressure shall be established in accordance with Table 4.

Table 4. Standard Rating Inlet Airflow Condition[1,2,3,4,5]

Nominal Inlet Duct Diameter, mm	Airflow, m^3/s of Standard Air
102	0.071
127	0.118
152	0.189
178	0.260
203	0.330
229	0.425
254	0.519
305	0.775
356	0.991
406	1.32
457	1.65
508	2.08
559	2.50
610	2.97

Notes:
1. Mechanically Pressure Independent (Compensated) Air Terminals with a rated minimum operating pressure of 0.075 kPa or less shall be rated at the airflow rate calculated from multiplying the nominal inlet area, m^2 by 5.08 m/s air velocity and for those with a rated minimum operating pressure of greater than 0.075 kPa shall be rated at the airflow rate calculated from multiplying the nominal inlet area, m^2 by 7.62 m/s air velocity.
2 For Series Flow Fan-powered Air Terminals, the Rated Airflow for the primary Air Valve shall be the lower of the fan rating flow or the Rated Airflow according to the above table.
3. Integral Diffuser Air Terminals and Bypass Air Terminals shall be rated at the manufacturer's recommended Airflow.
4. Modulating Diffuser Air Terminals shall be rated at 3.8 m/s and 2.0 m/s inlet velocity.
5. Any other size unit or configuration shall be rated at the airflow rate calculated from multiplying the nominal inlet area, m^2 by 10.2 m/s air velocity.

6.2.1.2 *Integral Fan.* The fan airflow rating shall be established and published at 0.06 kPa discharge static pressure or minimum manufacturer recommended pressure (whichever is greater) with any fan volume Air Valve at wide open position, and primary Air Valve closed.

6.2.1.3 *Induction Terminal.* The induced airflow shall be rated and published using 0.06 kPa discharge (downstream) static pressure with the primary air valve set to achieve 25% of the standard Rated Airflow and 0.35 kPa inlet static pressure. The induction Air Valve(s) shall be set in the full open position.

6.2.2 *Sound Power Rating.* The Sound Power Level, dB, for both Discharge, Exhaust and Radiated Sound Power shall be established at the Standard Rating Conditions (Table 5).

Table 5. Discharge/Exhaust/Radiated Sound Power Level Standard Rating Conditions

Terminal Type	Test Point	Type of Sound		Discharge (Downstream) Static Pressure, kPa[1]	Fan[2]	Primary Air	
		Radiated	Discharge or Exhaust[8]			Airflow Percent of Rated Airflow	Differential Static Pressure, kPa
Single Duct, Dual Duct, Integral Diffuser Air Terminals	1	Yes	—	NA	NA	100	0.37
	2	—	Yes	NA	NA	100	0.37
Modulating Diffuser Air Terminals	1	-	Yes	NA	NA	100[6]	Minimum
	2	-	Yes	NA	NA	Throttled[7]	See Note 7
Bypass Air Terminals	1	Yes	-	NA	NA	100	Minimum
	2	-	Yes	NA	NA	100	Minimum
Parallel Flow, Fan-Powered Air Terminals & Induction Air Terminals							
Fan Only	1	Yes	—	0.06	On	Off	—
	2	—	Yes	0.06	On	Off	—
Primary Air Only	3	Yes	—	0.06	Off[5]	100	0.37
	4	—	Yes	0.06	Off[5]	100	0.37
Series Flow, Fan-Powered Air Terminals							
Fan Only	1	—	Yes	0.06	On	Off	—
Fan and Primary Air	2	Yes	—	0.06	On	Off	—
	3	Yes	—	0.06	On	100[3]	0.37[4]

Notes:
1. All fan tests for Radiated and Discharge Sound Power in Fan-Powered Air Terminals shall be run at 0.06 kPa discharge static pressure or at minimum recommended discharge static pressure, whichever is higher.
2. Fan to be adjusted to its Rated Airflow, using manufacturer's recommended procedure.
3. Primary airflow set for 100% recommended inlet airflow in accordance with Table 5 or fan maximum Rated Airflow, whichever is lower.
4. Inlet static pressure referenced to atmosphere for Series Flow Fan-powered Air Terminal only.
5. Induction Terminals shall be tested with induction Air Valves set fully closed.
6. At full open air valve position and 3.8 m/s inlet velocity.
7. At the throttled air valve position which produces the manufacturer's maximum recommended inlet static pressure at 2.0 m/s inlet velocity.
8. Exhaust sound only pertains to single duct terminal types.

6.2.3 *Terminal Casing and Air Valve Leakage.*

6.2.3.1 *Casing and Air Valve Leakage for Single Duct Air Terminal Units.* The casing leakage on single duct air terminal units shall be established and published at the Standard Rating Condition of 0.12 kPa static pressure. For units designed for Shutoff, air valve leakage shall be established and published at an inlet static pressure of 0.25 kPa.

6.2.3.2 *Casing and Air Valve Leakage for Dual Duct Air Terminal Units.* The casing leakage on dual duct air terminal units shall be established at the Standard Rating Condition of 0.25 kPa static pressure. Air valve leakage shall be established and published at an inlet static pressure of 1.5 kPa.

6.3 *Application Ratings.* Data at conditions other than those specified in Section 6.2 may be published as Application Ratings and shall be determined in accordance with the method of testing described in Section 5.

6.4 *Appurtenance Ratings.* The air terminal data referred to in Section 6.2 represent the performance of the base Air Terminal without appurtenances.

6.5 *Publication of Ratings.* Wherever application ratings are published or printed, they shall include or be accompanied by the Standard Rating, clearly designated as such, including a statement of the conditions at which the ratings apply.

6.6 *Tolerances.* To comply with this standard, published ratings shall be based on data obtained in accordance with the provisions of Sections 5 and 6 of this standard, and shall be such that any production Air Terminal, when tested, will meet these ratings within the following tolerances:

6.6.1 Airflow shall be greater than or equal to 95% of the rating at the published Minimum Operating Pressure.

6.6.2 For Fan-powered Air Terminals, Airflow shall be greater than or equal to 95% of the rating at the published Minimum Operating Pressure, the electrical power input shall not be more than 110% of the rated value, and the optional energy consumption shall not be more than the rated value. For Induction Air Terminals, the Induced Airflow shall be greater than or equal to 95% of the rating.

6.6.3 Sound Power Levels shall not exceed the published values in each Octave Band by more than the rating tolerance shown below:

Table 6. Sound Power Level Rating Tolerances

Octave Band Center Frequencies, Hz	Tolerances, dB
125	6
250	4
500	3
1000	3
2000	3
4000	3

6.6.4 Terminal Casing Leakage, Exhaust Total Leakage, and Terminal Air Valve Leakage shall not exceed the published values by 5% or 0.0005 m^3/s of Standard Air, whichever is greater.

Section 7. Minimum Data Requirements for Published Ratings

7.1 *Minimum Data Requirements for Published Ratings.* Published ratings shall include Standard Ratings and may also include Application Ratings. The following information shall be published for all Standard Ratings.

7.1.1 A listing of all applicable rating conditions specified
7.1.2 Primary airflow rate, m^3/s of Standard Air
7.1.3 Induced or fan airflow rate, m^3/s of Standard Air
7.1.4 Minimum operating pressure, kPa
7.1.5 Octave Band Sound Power Level, dB (125 to 4000 Hz) (Radiated and/or Discharge/Exhaust with Duct End Correction)
7.1.6 Electrical power input at fan rating point, watts (Fan-powered Air Terminals only)
7.1.7 Terminal Casing Leakage, m^3/s of Standard Air (Except Series Flow Fan-Powered Air Terminal)
7.1.8 Terminal Air Valve Leakage, m^3/s of Standard Air
7.1.9 Exhaust Total Leakage, m^3/s of Standard Air

7.2 *Optional Published Ratings for Energy Consumption of Fan-powered Air Terminals.*

7.2.1 *Energy Consumption Rating Provisions for Series Flow Fan-powered Terminals.*

For Series Flow Fan-Powered Terminals, using a given fan size and motor combination, map the fan only energy consumption at 0.25 in. H2O external static pressure at four operating points: 100% fan operational range, 75% fan operational range, 50% fan operational range and 25% fan operational range, wherein fan operational range is the range between the manufacturer's designated maximum and minimum Airflow (Note: % fan operational range denotes an interpolation between the maximum and minimum Airflows. For example, 50% fan operational range would be at the midpoint between maximum and minimum). At each point, report (publish):

7.2.1.1 Energy consumption rating, watts/ m^3/s of Standard Air
7.2.1.2 Fan power, watts
7.2.1.3 Airflow, m^3/s of Standard Air
7.2.1.3.1 Maximum fan operational Airflow, m^3/s of Standard Air
7.2.1.3.2 Minimum fan operational Airflow, m^3/s of Standard Air
7.2.1.4 Voltage, V
7.2.1.5 Frequency, Hz
7.2.1.6 Motor designation, (for example: ECM or PSC)
7.2.1.7 Power Factor
7.2.1.8 Motor nameplate power, HP

7.2.2 *Energy Consumption Rating Provisions for Parallel Flow Fan-powered Terminals.* For Parallel Flow Fan-Powered Terminals, using a given fan size and motor combination, map the fan only energy consumption at 0.06 kPa external static pressure at four operating points: 80% fan operational range, 60% fan operational range, 40% fan operational range and 20% fan operational range, wherein fan operational range is the range between the manufacturer's designated maximum and minimum Airflow (Note: % fan operational range denotes an interpolation between the maximum and minimum Airflows. For example, 60% fan operational range would be at the 60% value between maximum and minimum). At each point, report (publish):

7.2.2.1 Energy consumption rating, watts/ m^3/s of Standard Air
7.2.2.2 Fan power, W
7.2.2.3 Airflow, m^3/s of Standard Air
7.2.2.3.1 Maximum fan operational Airflow, m^3/s of Standard Air
7.2.2.3.2 Minimum fan operational Airflow, m^3/s of Standard Air
7.2.2.4 Voltage, V
7.2.2.5 Frequency, Hz
7.2.2.6 Motor type (PSC, ECM or Other)
7.2.2.7 Power Factor
7.2.2.8 Motor nameplate power, HP

7.3 *Minimum Data Requirements for Published Ratings.* 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 Standard 881 (SI)". All claims to ratings outside the scope of this standard shall include the statement "Outside the scope of AHRI Standard 881 (SI)". Wherever Application Ratings are published or printed, they shall include a statement of the conditions at which the ratings apply.

Section 8. Marking and Nameplate Data

8.1 *Marking and Nameplate Data.* As a minimum, the following information shall be shown in a conspicuous place on the equipment:

8.1.1 The label on each Air Terminal shall include sufficient model and size identification to correlate with published data, literature and any other advertising issued by the manufacturer.

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

Section 9. Voluntary Conformance

9.1 *Conformance.* While conformance with this standard is voluntary, conformance shall not be claimed or implied for products or equipment within the standard's Purpose (Section 1) and Scope (Section 2) unless such product claims meet all the requirements of the standard and all of the testing and rating requirements are measured and reported in complete compliance with the standard. Any product that has not met all the requirements of the standard cannot reference, state, or acknowledge the standard in any written, oral, or electronic communication.

APPENDIX A. REFERENCES – NORMATIVE

A1 Listed here are all standards, handbooks, and other publications essential to the formation and implementation of the standard. All references in this appendix are considered as part of this standard.

A1.1 AHRI Standard 110-2016, *Air-Conditioning, Heating, and Refrigerating Equipment Nameplate Voltages*, 2016, Air-Conditioning, Heating, and Refrigeration Institute, 2311 Wilson Boulevard, Suite 400, Arlington, VA 22203, U.S.A.

A1.2 AHRI Standard 261 (SI)-2017, *Sound Rating of Ducted Air Moving and Conditioning Equipment*, 2017, Air-Conditioning, Heating, and Refrigeration Institute, 2311 Wilson Boulevard, Suite 400, Arlington, VA 22201, U.S.A.

A1.3 AHRI Standard 880 (I-P)-2016, *Performance Rating of Air Terminals*, 2016, Air-Conditioning, Heating, and Refrigeration Institute, 2311 Wilson Boulevard, Suite 400, Arlington, VA 22201, U.S.A.

A1.4 AHRI Standard 885-2008 (with Addendum 1 dated March 2011), *Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets*, 2008, Air-Conditioning, Heating, and Refrigeration Institute, 2311 Wilson Boulevard, Suite 400, Arlington, VA 22201, U.S.A.

A1.5 ANSI/AHRI Standard 220-2014, *Reverberation Room Qualification and Testing Procedures for Determining Sound Power of HVAC Equipment*, 2014, Air-Conditioning, Heating, and Refrigeration Institute, 2311 Wilson Boulevard, Suite 400, Arlington, VA 22201, U.S.A.

A1.6 ANSI/AHRI Standard 410-2001 with Addenda 1, 2 and 3, *Forced Circulation Air-Cooling and Air-Heating Coils*, 2001, Air-Conditioning, Heating, and Refrigeration Institute, 2311 Wilson Boulevard, Suite 400, Arlington, VA 22201, U.S.A.

A1.7 ANSI/AHRI Standard 440-2008 with Addendum 1, *Performance Rating of Room Fan-Coils*, 2008, Air-Conditioning, Heating, and Refrigeration Institute, 2311 Wilson Boulevard, Suite 400, Arlington, VA 22201, U.S.A.

A1.8 ANSI/ASHRAE 70-2006 (R2011), *Method of Testing for Rating the Performance of Air Outlets and Inlets*, 2006, American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., 1791 Tullie Circle N.E., Atlanta, GA 30329, U.S.A.

A1.9 ANSI/ASHRAE 130-2016, *Laboratory Methods of Testing Air Terminal Units*, 2016, American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., 1791 Tullie Circle N.E., Atlanta, GA 30329, U.S.A.

A1.10 ASHRAE Terminology, https://www.ashrae.org/resources--publications/free-resources/ashrae-terminology, 2017, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., 1791 Tullie Circle, N.E., Atlanta, GA 30329, U.S.A.

A1.11 IEC Standard 60038, *IEC Standard Voltages*, 2009, International Electrotechnical Commission, 3, rue de Varembe, P.O. Box 131, 1211 Geneva 20, Switzerland.

APPENDIX B. REFERENCES – INFORMATIVE

None.