SINGLE DUCT VAV TERMINALS

TSS

Johnson Controls

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AHRI CERTIFIED™
www.ahridirectory.org
VAV Terminals
AHRI Standard 880

Features and Benefits

Precise Zone Control

Model TSS terminals provide variable air volume (VAV) control beyond the typical single duct box. They are specifically designed for precise air delivery throughout the entire operating range, regardless of the installed inlet conditions. They also offer improved space comfort and flexibility for a wide variety of HVAC applications.

TSS terminals take advantage of typical benefits provided by single duct units, while performing at extremely low sound levels. This is critical in today's buildings, where occupants are placing more emphasis on indoor acoustics.

The ability to provide comfort to the occupant is the measurement of quality for any VAV terminal. Comfort is achieved through quiet and precise control of airflow to the occupied space.

The TSS terminal provides the ultimate in airflow control with the patented FlowStar™ airflow sensor. No other sensor in the industry can match the FlowStar's ability to quietly and precisely measure airflow. Accurate airflow measurement is the basis for airflow control.

Design Flexibility

Selection and Layout. The TSS provides flexibility in system design. The compact cabinet design and quiet operation give the system designer the versatility to place units directly above occupied spaces.

It is not necessary to locate the unit in the crowded space above a hall or corridor. This will reduce lengthy and cost of discharge duct runs.

The FlowStar™ sensor ensures accurate control, even when space constraints do not permit long straight inlet duct runs to the terminal.

Sizes. Model TSS terminals are available in ten unit sizes to handle airflow capacities between 45-8000 CFM [51-13600 CMH].

Convenience Installation

Quality. All TSS terminals are thoroughly inspected during each step of the manufacturing process, including a comprehensive "preship" inspection, to assure the highest quality product available. All TSS terminals are packaged to minimize damage during shipment.

Quick Installation. A standard single point electrical main power connection is provided with all electronic controls and electrical components located on the same side of the casing, for quick access, adjustment, and troubleshooting. Installation time is minimized with the availability of factory calibrated controls and a low profile compact design.

The FlowStar™ sensor ensures accurate airflow measurement, regardless of the field installation conditions. A calibration label and wiring diagram is located on the terminal for quick reference during start-up. The terminal is constructed to allow installation with standard metal hanging straps. Optional hanger brackets for use with all-thread support rods or wire hangers are also available.

Lasting Components and Low Cost Operation

Quality. All metal components are fabricated from galvanized steel.

Energy Efficiency. In addition to quiet and accurate temperature control, the building owner will benefit from lower operating costs. The highly amplified velocity pressure signal from the Flow- Star™ inlet sensor allows precise airflow control at low air velocities.

The FlowStar™ sensor's airfoil shape provides minimal pressure drop across the terminal. This allows the central fan to run at a lower pressure and with less brake horsepower.

Agency Certification. TSS terminals and accessories are wired in compliance with all applicable requirements and tested in accordance with AHRI Standard 880.

Maintenance and Service. TSS terminals require no periodic maintenance and provide trouble-free operation. Controls are located on the outside of the unit casing for easy access by maintenance personnel.

A Variety of Controls

Model TSS terminals are available with DDC, controls specifically designed for using with TSS terminals. These controls are designed to accommodate a multitude of control schemes.

From the most basic to the most sophisticated sequence of operation, the controls are designed by experts in VAV single duct terminal operation.

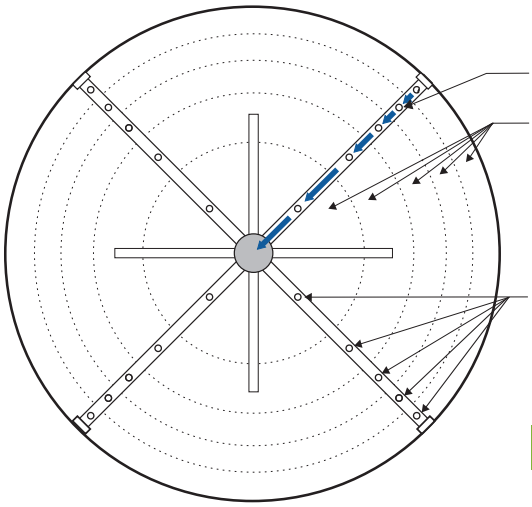
Available Control Types:

- Johnson Controls DDC for BACnet, or N2 etc.
- JFactory mounted consignment DDC

Standard Control Features:

- Patented FlowStar™ Airflow Sensor
- Standard Electric Control Box
- 24 Volt Control Transformer

Patented FlowStar™ Sensor Control

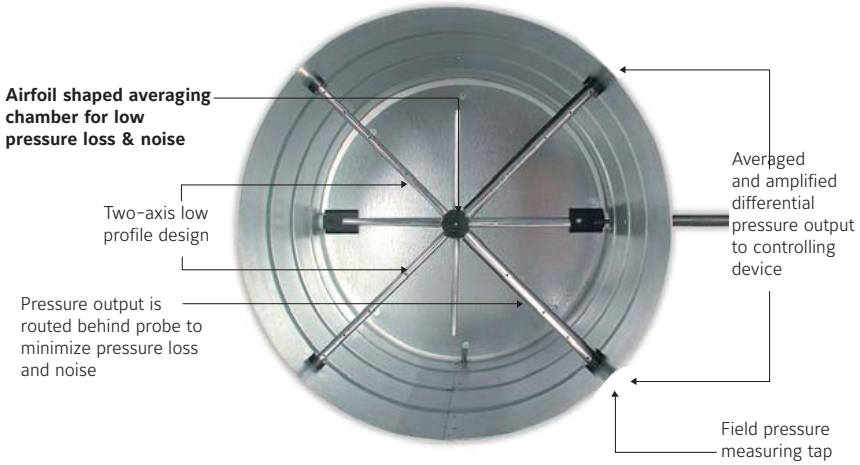


Each pressure input signal is routed to the center averaging chamber

Equal concentric circular areas
Sizes 6 & 8: 3 Circles
Sizes 10 & 12: 4 Circles
Sizes 14 & 16: 5 Circles (shown)

Total pressure measured at the center of each concentric circle for maximum accuracy, as outlined in ASHRAE Fundamentals Handbook.
Sizes 6 & 8: 12 Sensing Points
Sizes 10 & 12: 16 Sensing Points
Sizes 14 & 16: 20 Sensing Points

FlowStar™ Airflow Sensor Patent #5,481,925



The air valve features the FlowStar™ airflow sensor which has brought new meaning to airflow control accuracy. The multi-axis design utilizes between 12 and 20 sensing points that sample total pressure at center points within equal concentric crosssectional areas, effectively traversing the air stream in two planes. Each distinct pressure reading is averaged within the center chamber before exiting the sensor to the controlling device.

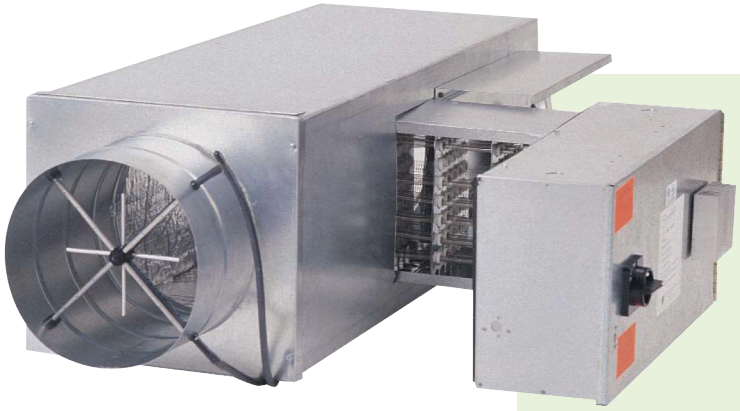
This sensor adds a new dimension to signal amplification. Most differential pressure sensors provide a signal equal to 1.5 times the equivalent velocity pressure signal. The FlowStar™ provides a differential pressure signal that is 2.5 to 3 times the equivalent velocity pressure signal. This amplified signal allows more accurate and stable airflow control at low airflow capacities. Low airflow control is critical for indoor air quality, reheat minimization, and preventing over cooling during light loads.

Unlike other sensors which use a large probe surface area to achieve signal amplification, the Flow-Star™ utilizes an unprecedented streamline design which generates amplified signals unrivaled in the industry. The streamlined design also generates less pressure drop and noise. The VAV schedule should specify the minimum and maximum airflow setpoints, maximum sound power levels, and maximum air pressure loss for each terminal. The specification for the VAV terminal must detail the required performance of the airflow sensor. For maximum building occupant satisfaction, the VAV system designer should specify the airflow sensor as suggested in the Guide Specifications of this catalog.

Using FlowStar™ sensing to amplify the airflow signal allows you to use lower minimum airflow setpoints
Many VAV controllers require a minimum differential pressure signal of 0.03 inch W.G. [7.5Pa]. The airflow sensor should be able to generate this signal with only 400 to 450 FPM [2.0-2.25 m/s] air velocity through the inlet collar.

Conventional airflow sensors without amplification capabilities require approximately 700 FPM [3.5 m/s] to generate a0.03 inch W.G. [7.5Pa] signal. If 700 FPM [3.5 m/s] represents a 20% minimum condition, the inlet velocity would be 3500 FPM [17.8 m/s] at the maximum airflow setpoint. This results in extremely noisy conditions. In addition, the airflow sensor should generate a differential pressure range of at least 1 inch W.G. [250Pa] over the operating range of the terminal unit.

Unique Electric Heat Design



The TSS-EH breaks new ground in single duct VAV electric heater design.
The patented FlowStar™ sensor permits modulation to lower airflow levels than all other sensors in the industry. This minimizes the energy expended for heat in many applications.

The FlowStar™ probe is visible in the inlet of the TSS-EH. The elements, partially removed for this photo, are midway between the inlet and the damper.

MODEL TSS-EH models are unique in that they correct common industry heating problems.

Historically, heater elements placed downstream of a VAV damper have experienced two major problems:

- Elements fail prematurely due to hot spots resulting from an uneven air velocity profile over the heater face.
- Heaters suffer rapid nuisance cycling of the contactors and elements because the airflow switch probe is located on the low pressure (downstream side) of the VAV damper.

Our unique electric heat VAV terminal, the TSS-EH, solves these problems. The heater elements are located midway between the air inlet and the damper. This design provides uniform airflow over the face of the electric heater at all damper positions. Element life is extended, reducing repair cost and inconvenience.

With the heater elements located on the high pressure side of the VAV damper, the airflow pressure switch receives a reliable pressure signal even at minimum damper positions. This arrangement provides greater safety, as well as enhanced reliability.

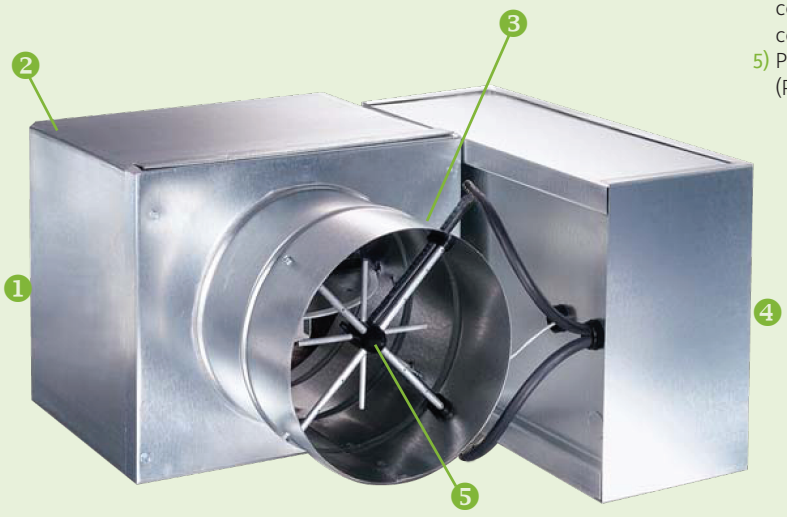
The TSS-EH design permits tremendous flexibility when selecting KW, voltage, phase, balanced or unbalanced circuiting and method of control.

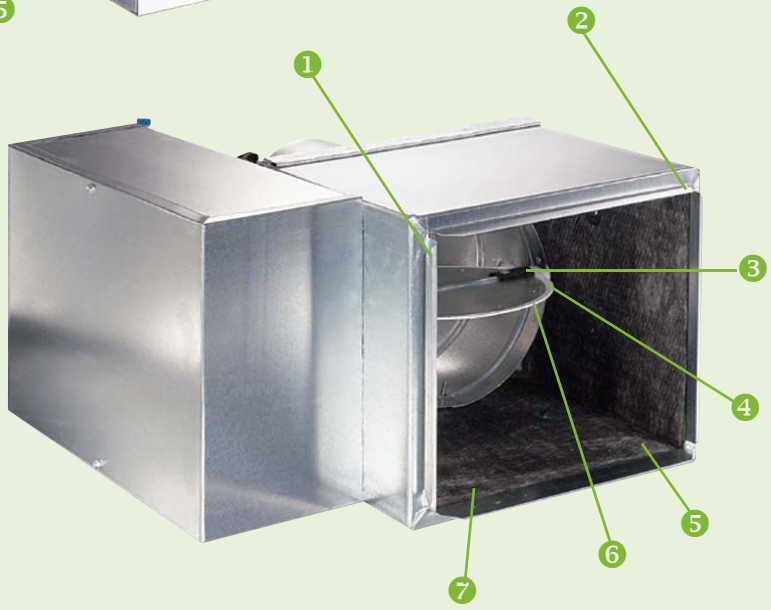
Standard Construction

Model TSS

The TSS terminal incorporates many standard features that are expensive options for other manufacturers.

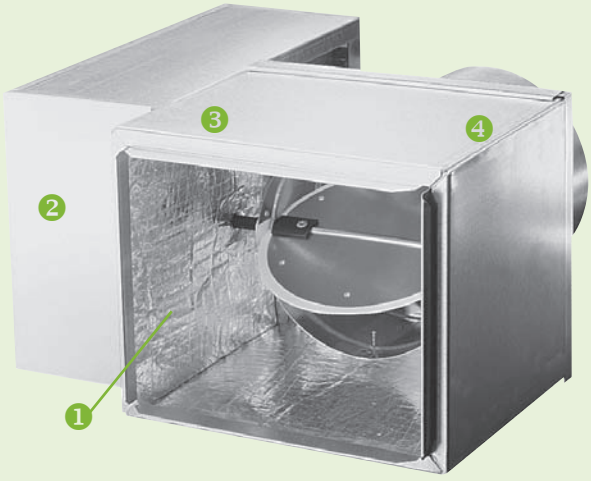
1) Product label includes tagging, airflow and electrical information
2) Mechanical lock construction ensures lowest possible casing leakage
3) Roll formed inlet collar with integral stiffening ribs adds strength and rigidity
4) Electrical devices installed within a electric control box enclosure, with single point power connection
5) Patented FlowStar™ airflow sensor (Patent #5,481,925)





1) Slip and drive discharge collar for quick field installation
2) Insulation edge covered by metal — no raw edges of insulation exposed to airstream
3) Solid composite damper shaft prevents condensation and breakage
4) Self-lubricating bearing to reduce friction and air leakage
5) Mechanically fastened insulation for added security
6) Low leakage damper incorporates closed cell foam gasket
7) 1/2" thick fiberglass insulation complying with BS476

Optional Construction



Model TSS

The TSS single duct terminal is available with many optional features to meet any project requirement.

1) Scrim reinforced foil faced insulation meeting ASTM C1136 for mold, mildew and humidity resistance
2) Factory control options:
   - DDC Electronic
   For more information, see corresponding Control Selection Guides
3) Double wall construction (not shown)
4) Mounting brackets (not shown) to accept all-thread hanging rods or wire hangers

Standard & Optional Features

Standard Features

Construction

- AHRI 880 certified and labeled
- 22 gauge galvanized steel casing and valve
- 1/2" thick fiberglass insulation, mechanically fastened for added security

Primary Air Valve

- Embossed rigidity rings
- Low thermal conductance damper shaft
- Position indicator on end of damper shaft
- Mechanical stops for open and closed position
- FlowStar™ center averaging airflow sensor
- Plenum-rated sensor tubing

Hot Water Coil

- Designed, manufactured, and tested
- Aluminum fin construction with die-formed spacer collars for uniform spacing
- Mechanically expanded copper tubes leak tested to 400 PSIG [2.8MPa] air pressure and rated at 230 PSIG [1.6MPa] working pressure.
- Male sweat type water connections
- 1, 2row configurations

Electrical

- Electric control box

Electric Heat

- Single point power connection
- Primary manual-reset high limit
- Fusing
- Wiring diagram

Optional Features

Construction

- 3/4" and 1" insulation
- Foil faced scrim backed insulation
- Double wall construction with 22 gauge liner

Hot Water Coil

- Multi-circuit coils for reduced water pressure drop
- Opposite hand water connections
- Bottom and top access plates for cleaning

Electrical

- Primary transformer fusing

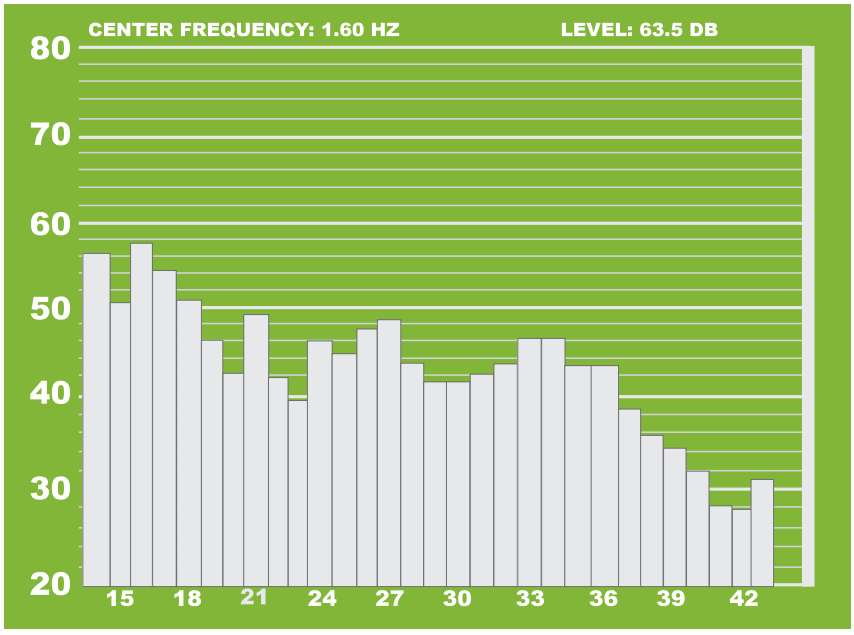
Electric Heat

- 24V control transformer

Controls

- Factory provided controls include
- Johnson controls DDC

Application and Selection



Acoustical Concepts

The focus on indoor air quality is also having an effect on proper selection of air terminal equipment with respect to acoustics.

Sound. At the zone level, the terminal unit generates acoustical energy that can enter the zone along two primary paths. First, sound from the primary air valve can propagate through the downstream duct and diffusers before entering the zone (referred to as Discharge or Airborne Sound). Acoustical energy is also radiated from the terminal casing and travels through the ceiling cavity and ceiling system before entering the zone (referred to as Radiated Sound).

To properly quantify the amount of acoustical energy emanating from a terminal unit at a specific operating condition (i.e. CFM and static pressure), manufacturers must measure and publish sound power levels.

The units of measurement, decibels, actually represent units of power (watts). The terminal equipment sound power ratings provide a consistent measure of the generated sound independent of the environment in which the unit is installed. This allows a straight forward comparison of sound performance between equipment manufacturers and unit models.

Noise Criteria (NC). The bottom line acoustical criteria for most projects is the NC (Noise Criteria) level. This NC level is derived from resulting sound pressure levels in the zone. These sound pressure levels are the effect of acoustical energy (sound power levels) entering the zone caused by the terminal unit and other sound generating sources (central fan system, office equipment, environment, etc.).

The units of measurement is once again decibels; however, in this case decibels represent units of pressure (Pascals), since the human ear and microphones react to pressure variations.

There is no direct relationship between sound power levels and sound pressure levels. Therefore, we must predict the resulting sound pressure levels (NC levels) in the zone based in part by the published sound power levels of the terminal equipment. The NC levels are totally dependent on the project specific design, architecturally and mechanically. For a constant operating condition (fixed sound power levels), the resulting NC level in the zone will vary from one project to another.

AHRI 885. A useful tool to aid in predicting space sound pressure levels is an application standard referred to as ARI Standard 885. This standard provides information (tables, formulas, etc.) required to calculate the attenuation of the ductwork, ceiling cavity, ceiling system, and conditioned space below a terminal unit. These attenuation values are referred to as the "transfer function" since they are used to transfer from the manufacturer's sound power levels to the estimated sound pressure levels resulting in the space below, and / or served by the terminal unit. The standard does not provide all of the necessary information to accommodate every conceivable design; however, it does provide enough information to approximate the transfer function for most applications. Manufacturers use different assumptions with respect to a "typical" project design; therefore, it is impossible to compare product performance simply by looking at the published NC values.

General Design Recommendations for A Quiet System

The AHU. Sound levels in the zone are frequently impacted by central fan discharge noise that either breaks out (radiates) from the ductwork or travels through the distribution ductwork and enters the zone as airborne (discharge) sound. Achieving acceptable sound levels in the zone begins with a properly designed central fan system which delivers relatively quiet air to each zone.

Supply Duct Pressure. The primary factor contributing to noisy systems (including single duct applications) is high static pressure in the primary air duct. This condition causes higher sound levels from the central fan and also higher sound levels from the terminal unit, as the primary air valve closes to reduce the pressure. This condition is compounded when flexible duct is utilized at the terminal inlet, which allows the central fan noise and air valve noise to break out into the ceiling cavity and then enter the zone located below the terminal. Ideally, the system static pressure should be reduced to the point where the terminal unit installed on the duct run associated with the highest pressure drop has the minimum required inlet pressure to deliver the design airflow to the zone. Many of today's HVAC systems experience

0.5'' w.g. [125Pa] pressure drop or less in the main trunk. For systems that will have substantially higher pressure variances from one zone to another, special attention should be paid to the proper selection of air terminal equipment.

To date, the most common approach has been to select (size) all of the terminals based on the worst case (highest inlet static pressure) condition. Typically, this results in 80% (or higher) of the terminal units being oversized for their application. This in turn results in much higher equipment costs, but more importantly, drastically reduced operating efficiency of each unit. This consequently decreases the ability to provide comfort control in the zone. In addition, the oversized terminals cannot adequately control the minimum ventilation capacity required in the heating mode.

A more prudent approach is to utilize a pressure reducing device upstream of the terminal unit on those few zones closest to the central fan. This device could simply be a manual quadrant type damper if located well upstream of the terminal inlet. In tight quarters, perforated metal can be utilized as a quiet means of reducing system pressure. This approach allows all of the terminal units to experience a similar (lower) inlet pressure. They can be selected in a consistent manner at lower inlet pressure conditions that will allow more optimally sized units.

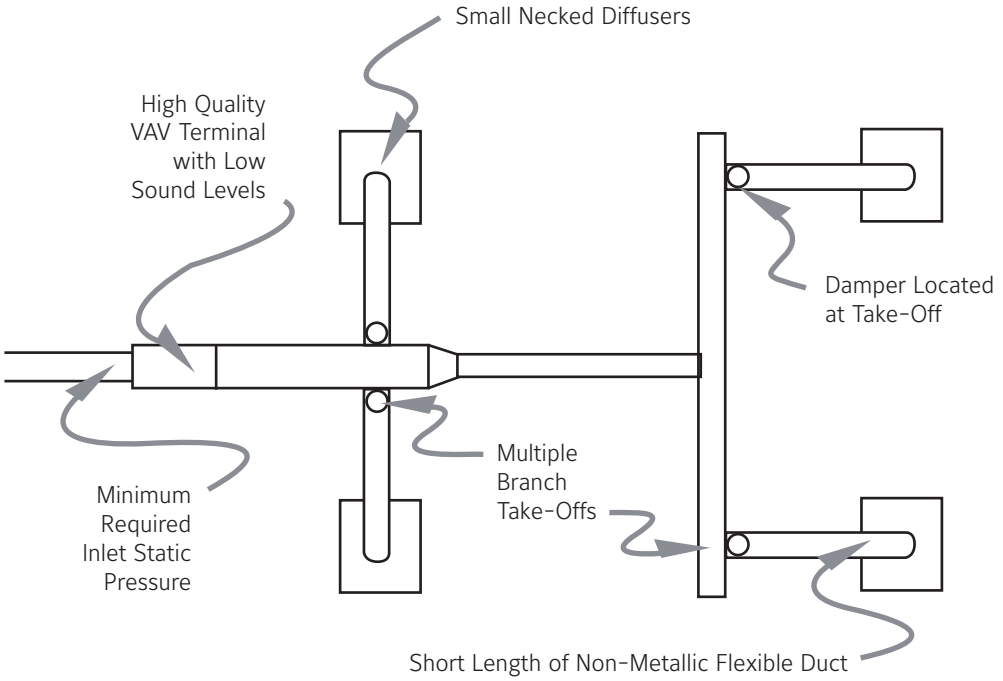
Inlet duct that is the same size as the inlet collar and as straight as possible will achieve the best acoustical performance. For critical applications, flexible duct should not be utilized at the terminal inlet.

Zoning. On projects where internal lining of the downstream duct is not permitted, special considerations should be made to assure acceptable noise levels will be obtained. In these cases, a greater number of smaller zones will help in reducing sound levels. Where possible, the first diffuser takeoff should be located after an elbow or tee and a greater number of small necked diffusers should be utilized, rather than fewer large necked diffusers.

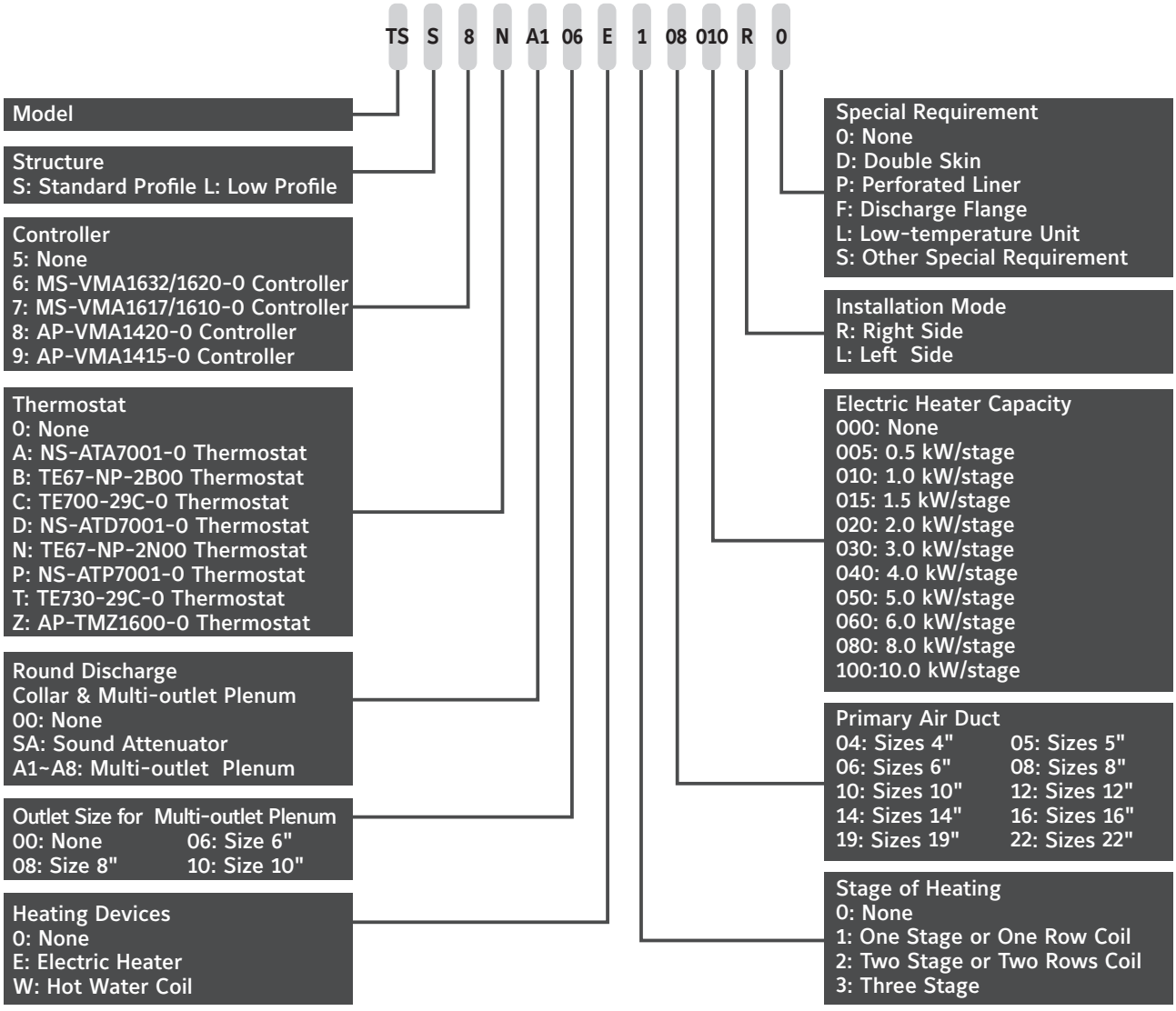
The downstream ductwork should be carefully designed and installed to avoid noise regeneration. Bull head tee arrangements should be located sufficiently downstream of the terminal discharge to provide an established flow pattern downstream of the fan. Place diffusers downstream of the terminal after the airflow has completely developed.

Downstream splitter dampers can cause noise problems if placed too close to the terminal, or when excessive air velocities exist. If tee arrangements are employed, volume dampers should be used in each branch of the tee, and balancing dampers should be provided at each diffuser tap. This arrangement provides maximum flexibility in quiet balancing of the system.

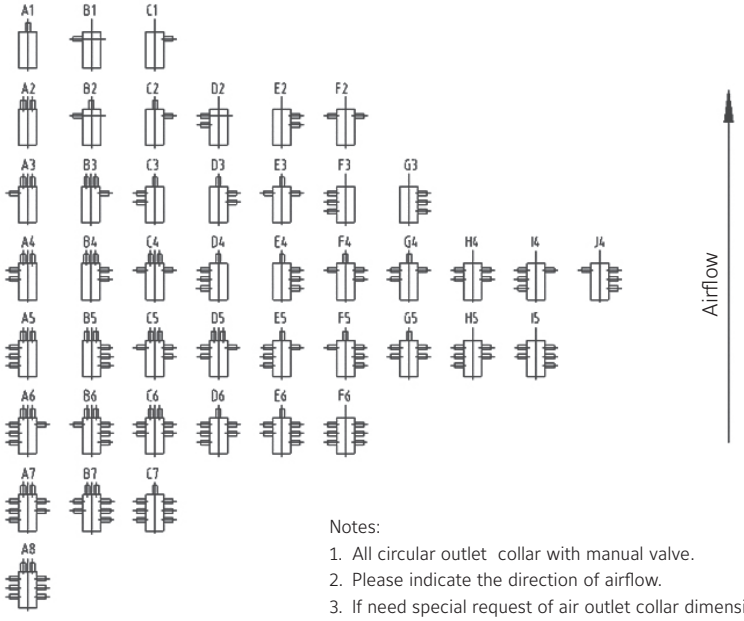
Ideal Duct Design



Nomenclature



Layout of Multi-outlet Plenum (MOP)



Notes:

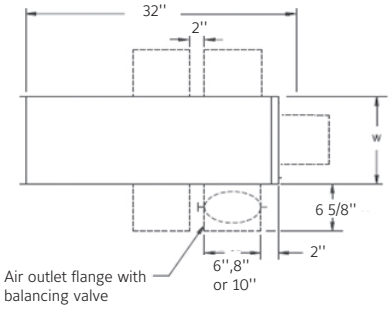
1. All circular outlet collar with manual valve.
2. Please indicate the direction of airflow.
3. If need special request of air outlet collar dimension or pernutation, please feel free to contact Johnson Controls

Mop Selection Table

Dimension of MOP	No. of MOP		Unit Size							
			4,5,6	8	10	12	14	16	19	22
6"	Face Size		1	1	1	1	2	2	2	2
	Single Size	813mm	3	3	3	3	3	3	3	3
	Total	813mm	7	7	7	7	8	8	8	8
8"	Face Size		1	1	1	1	2	2	2	2
	Single Size	813mm	2	2	2	2	2	2	2	2
	Total	813mm	5	5	5	5	6	6	6	6
10"	Face Size		N/A		1	1	1	1	2	2
	Single Size	813mm			2	2	2	2	2	2
	Total	813mm			5	5	5	5	6	6

Specification

Unit Size	W(mm)	H(mm)
4,5,6	254	260
8	305	260
10	356	324
12	406	387
14	508	451
16	610	451
19	762	451
22	864	451



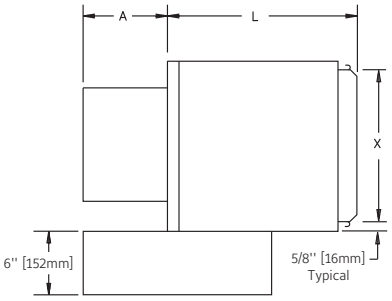
Dimensional Data

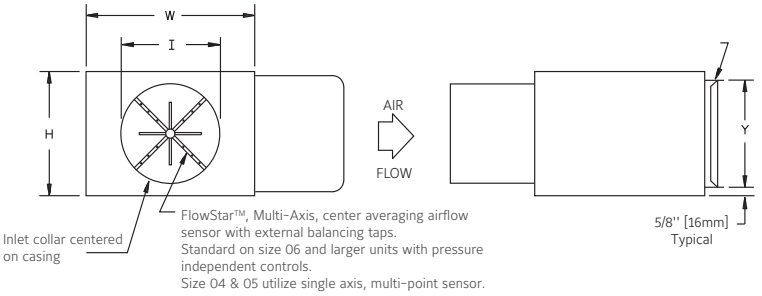
Model TSS

Unit	Unit Size	Dimensions inches [mm]						
		W	H	L	A	I	X	Y
TSS	04"	10 [254]	10 1/4 [260]	11 [279]	10 1/2 [267]	3 7/8 [98]	8 3/4 [222]	9 [228]
	05"	10 [254]	10 1/4 [260]	11 [279]	10 1/2 [267]	4 7/8 [124]	8 3/4 [222]	9 [228]
	06"	10 [254]	10 1/4 [260]	11 [279]	6 1/2 [165]	5 7/8 [149]	8 3/4 [222]	9 [228]
	08"	12 [305]	10 1/4 [260]	11 [279]	6 1/2 [165]	7 7/8 [200]	10 3/4 [273]	9 [228]
	10"	14 [356]	12 3/4 [324]	13 [330]	6 1/2 [165]	9 7/8 [251]	12 3/4 [324]	11 1/2 [292]
	12"	16 [406]	15 1/4 [387]	13 [330]	6 1/2 [165]	11 7/8 [302]	14 3/4 [375]	14 [355]
	14"	20 [508]	17 3/4 [451]	17 1/2 [445]	6 1/2 [165]	13 7/8 [352]	18 3/4 [476]	16 1/2 [419]
	16"	24 [610]	17 3/4 [451]	17 1/2 [445]	6 1/2 [165]	15 7/8 [403]	22 3/4 [578]	16 1/2 [419]
	19"	30 [762]	17 3/4 [451]	11 [279]	8 [203]	28 1/4 [718] x13 7/8 [352]	28 3/4 [730]	16 1/2 [419]
	22"	34 [864]	17 3/4 [451]	11 [279]	8 [203]	32 1/4 [819] x15 7/8 [403]	32 3/4 [832]	16 1/2 [419]

Notes:

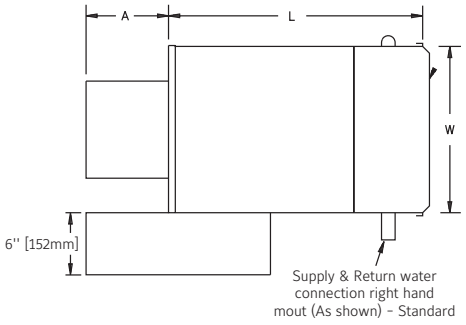
1. All dimensions are in inches [mm] with a tolerance of ±1/8" [3mm].
2. Sizes 19 and 22 have rectangular inlet collar.

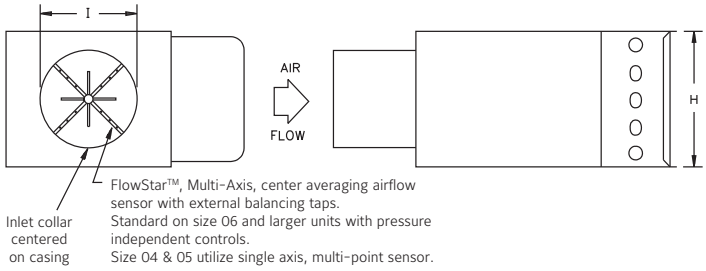




Model TSS - WC

Unit	Unit Size	Dimensions inches [mm]				
		W	H	L	A	I
TSS-WC	04"	10 [254]	10 1/4 [260]	15 1/2 [406]	10 1/2 [267]	3 7/8 [98]
	05"	10 [254]	10 1/4 [260]	15 1/2 [406]	10 1/2 [267]	4 7/8 [124]
	06"	10 [254]	10 1/4 [260]	15 1/2 [406]	6 1/2 [165]	5 7/8 [149]
	08"	12 [305]	10 1/4 [260]	15 1/2 [406]	6 1/2 [165]	7 7/8 [200]
	10"	14 [356]	12 3/4 [324]	17 1/2 [458]	6 1/2 [165]	9 7/8 [251]
	12"	16 [406]	15 1/4 [387]	17 1/2 [458]	6 1/2 [165]	11 7/8 [302]
	14"	20 [508]	17 3/4 [451]	21 1/2 [559]	6 1/2 [165]	13 7/8 [352]
	16"	24 [610]	17 3/4 [451]	21 1/2 [559]	6 1/2 [165]	15 7/8 [403]
	19"	30 [762]	17 3/4 [451]	15 1/2 [406]	8 [203]	28 1/4 [718] x13 7/8 [352]
	22"	34 [864]	17 3/4 [451]	15 1/2 [406]	8 [203]	32 1/4 [819] x15 7/8 [403]





Notes:

1. All dimensions are in inches [mm] with a tolerance of ±1/8" [3mm].
2. Sizes 19 and 22 have rectangular inlet collar.

Model TSS - EH

Unit	Unit Size	Dimensions inches [mm]						
		W	H	L	A	I	X	Y
TSS-EH	04"	10 [254]	10 1/4 [260]	41 1/2 [1056]	10 1/2 [267]	3 7/8 [98]	8 3/4 [222]	9 [228]
	05"	10 [254]	10 1/4 [260]	41 1/2 [1056]	10 1/2 [267]	4 7/8 [124]	8 3/4 [222]	9 [228]
	06"	10 [254]	10 1/4 [260]	41 1/2 [1056]	6 1/2 [165]	5 7/8 [149]	8 3/4 [222]	9 [228]
	08"	12 [305]	10 1/4 [260]	41 1/2 [1056]	6 1/2 [165]	7 7/8 [200]	10 3/4 [273	9 [228]
	10"	14 [356]	12 3/4 [324]	41 1/2 [1056]	6 1/2 [165]	9 7/8 [251]	12 3/4 [324]	11 1/2 [292]
	12"	16 [406]	15 1/4 [387]	41 1/2 [1056]	6 1/2 [165]	11 7/8 [302]	14 3/4 [375]	14 [355]
	14"	20 [508]	17 3/4 [451]	41 1/2 [1056]	6 1/2 [165]	13 7/8 [352]	18 3/4 [476]	16 1/2 [419]
	16"	24 [610]	17 3/4 [451]	41 1/2 [1056]	6 1/2 [165]	15 7/8 [403]	22 3/4 [578]	16 1/2 [419]
	19"	30 [762]	17 3/4 [451]	11 1/2 [285]	35 [889]	28 1/4 [718] x 13 7/8 [352]	28 3/4 [730]	16 1/2 [419]
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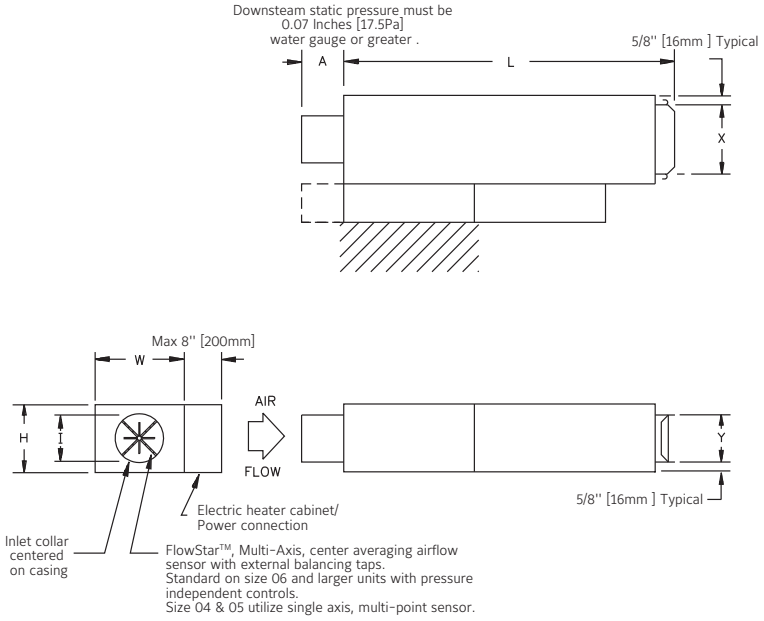
1. All dimensions are in inches [mm] with a tolerance of ±1/8" [3mm].
2. Sizes 19 and 22 have rectangular inlet collar.

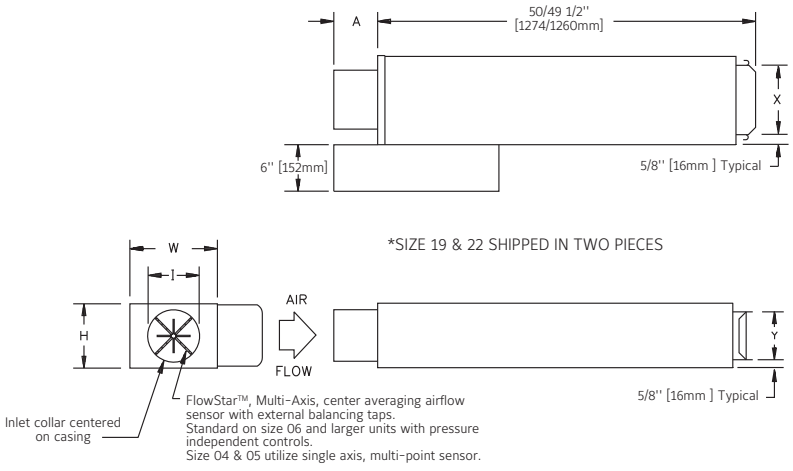


Model TSS - SA

Unit	Unit Size	Dimensions inches [mm]						
		W	H	L	A	I	X	Y
TSS-SA	04"	10 [254]	10 1/4 [260]	50 [1274]	10 1/2 [267]	3 7/8 [98]	8 3/4 [222]	9 [228]
	05"	10 [254]	10 1/4 [260]	50 [1274]	10 1/2 [267]	4 7/8 [124]	8 3/4 [222]	9 [228]
	06"	10 [254]	10 1/4 [260]	50 [1274]	6 1/2 [165]	5 7/8 [149]	8 3/4 [222]	9 [228]
	08"	12 [305]	10 1/4 [260]	50 [1274]	6 1/2 [165]	7 7/8 [200]	10 3/4 [273	9 [228]
	10"	14 [356]	12 3/4 [324]	50 [1274]	6 1/2 [165]	9 7/8 [251]	12 3/4 [324]	11 1/2 [292]
	12"	16 [406]	15 1/4 [387]	50 [1274]	6 1/2 [165]	11 7/8 [302]	14 3/4 [375]	14 [355]
	14"	20 [508]	17 3/4 [451]	50 [1274]	6 1/2 [165]	13 7/8 [352]	18 3/4 [476]	16 1/2 [419]
	16"	24 [610]	17 3/4 [451]	50 [1274]	6 1/2 [165]	15 7/8 [403]	22 3/4 [578]	16 1/2 [419]
	19"	30 [762]	17 3/4 [451]	49 1/2 [1260]	8 [203]	28 1/4 [718] x 13 7/8 [352]	28 3/4 [730]	16 1/2 [419]
	22"	34 [864]	17 3/4 [451]	49 1/2 [1260]	8 [203]	32 1/4 [819] x 15 7/8 [403]	32 3/4 [832]	16 1/2 [419]

Notes:

1. All dimensions are in inches [mm] with a tolerance of ±1/8" [3mm].
2. Sizes 19 and 22 have rectangular inlet collar.



Airflow Calibration

Airflow Ranges

Unit Size	Airflow Ranges		
	CMH	CFM	L/s
4	51~425	30~250	15~118
5	85~600	48~350	23~165
6	100~935	53~550	25~260
8	180~1670	105~1000	50~470
10	280~2720	165~1600	78~752
12	410~3900	240~2300	113~1081
14	570~5270	335~3100	158~1457
16	750~6970	440~4100	207~1927
19	1435~11050	845~6500	398~3055
22	2145~13600	1260~8000	593~3760

Notes:

1. Minimum and maximum airflow limits are dependent on the specific DDC controller supplied. Contact the control vendor to obtain the minimum and maximum differential pressure limits of the transducer utilized with the DDC controller.
2. Maximum airflow is limited to value shown in General Selection Data.

General Selection Data

UNIT SIZE	Air Flow	MINIMUM △Ps			DISCHARGE NOISE CRITERIA (NC)						RADIATED NOISE CRITERIA (NC)		
		Model TSS/ TSS-SA	Model TSS-WC 1 Row	Model TSS-WC 2 Row	Air Inlet Static Pressure 0.5''in.w.g. [125Pa]		Air Inlet Static Pressure 1.0''in.w.g. [250Pa]		Air Inlet Static Pressure 3.0''in.w.g. [750Pa]		Air Inlet Static Pressure 0.5''in.w.g. [125Pa]	Air Inlet Static Pressure 1.0''in.w.g. [250Pa]	Air Inlet Static Pressure 3.0''in.w.g. [750Pa]
	CFM [CMH]	in.w.g. [Pa]	in.w.g. [Pa]	in.w.g. [Pa]	Model TSS	Model TSS-SA	Model TSS	Model TSS-SA	Model TSS	Model TSS-SA	Model TSS&TSS-SA	Model TSS&TSS-SA	Model TSS&TSS-SA
4	100 [170]	0.01 [2.5]	0.02 [5.0]	0.03 [7.5]	--	--	--	--	20	--	--	--	20
	150 [255]	0.01 [2.5]	0.03 [7.5]	0.04 [10.0]	--	--	24	--	29	21	--	--	24
	200 [340]	0.01 [2.5]	0.04 [10.0]	0.07 [17.4]	23	--	29	23	34	28	--	22	29
	250 [425]	0.01 [2.5]	0.05 [12.4]	0.09 [22.4]	26	20	31	28	38	33	23	25	33
5	100 [170]	0.01 [2.5]	0.02 [5.0]	0.03 [7.5]	--	--	--	--	--	--	--	--	--
	200 [340]	0.01 [2.5]	0.04 [10.0]	0.07 [17.4]	--	--	24	--	28	--	--	--	24
	300 [510]	0.01 [2.5]	0.07 [17.4]	0.13 [32.3]	23	--	28	--	31	21	--	23	31
	350 [600]	0.01 [2.5]	0.09 [22.4]	0.16 [39.8]	24	--	30	21	33	24	21	25	33
6	200 [340]	0.02 [5.0]	0.05 [12.4]	0.08 [19.9]	--	--	--	--	25	--	--	--	29
	250 [425]	0.03 [7.5]	0.07 [17.4]	0.11 [27.4]	--	--	--	--	28	--	--	--	31
	300 [510]	0.04 [10.0]	0.1 [24.9]	0.16 [39.8]	--	--	--	--	28	20	--	20	33
	350 [595]	0.06 [14.9]	0.14 [34.8]	0.21 [52.3]	--	--	21	--	30	23	--	21	35
	450 [765]	0.1 [24.9]	0.22 [54.7]	0.33 [82.1]	--	--	24	--	33	25	--	24	36
	550 [935]	0.14 [34.8]	0.3 [74.7]	0.46 114.5	20	--	28	24	35	30	23	28	37
8	300 [510]	0.01 [2.5]	0.05 [12.4]	0.1 [24.9]	--	--	--	--	24	--	--	--	26
	400 [680]	0.01 [2.5]	0.08 [19.9]	0.15 37.3	--	--	--	--	26	--	--	--	29
	500 [850]	0.01 [2.5]	0.11 [27.4]	0.22 [54.7]	--	--	--	--	29	--	--	20	30
	600 [1020]	0.01 [2.5]	0.15 [37.3]	0.3 [74.7]	--	--	--	--	30	20	--	21	32
	800 [1560]	0.03 [7.5]	0.25 [62.2]	0.46 114.5	--	--	21	--	33	24	20	24	34
	1000 [1670]	0.04 [10.0]	0.35 [87.1]	0.66 164.2	21	--	25	21	35	28	23	26	37
10	600 [1020]	0.01 [2.5]	0.08 [19.9]	0.16 [39.8]	--	--	--	--	30	--	--	--	32
	800 [1360]	0.01 [2.5]	0.13 [32.3]	0.26 [64.7]	--	--	--	--	30	20	--	--	32
	1000 [1700]	0.02 [5.0]	0.2 [49.8]	0.39 [97]	--	--	20	--	31	24	--	21	32
	1200 [2040]	0.02 [5.0]	0.25 [62.2]	0.47 [117]	--	--	23	--	34	28	--	23	34
	1400 [2380]	0.03 [7.5]	0.32 [79.6]	0.61 [151.8]	--	--	25	20	35	29	20	24	35
	1600 [2720]	0.04 [10.0]	0.4 [99.5]	0.76 [189.1]	20	--	28	24	36	31	24	26	37
12	800 [1360]	0.01 [2.5]	0.08 [19.9]	0.15 [37.3]	--	--	--	--	26	--	--	21	33
	1100 [1870]	0.01 [2.5]	0.13 [32.3]	0.26 [64.7]	--	--	--	--	28	--	--	22	34
	1400 [2380]	0.02 [5.0]	0.21 [52.3]	0.4 [99.5]	--	--	20	--	30	24	--	24	35
	1700 [2890]	0.02 [5.0]	0.26 [64.7]	0.5 [124.4]	--	--	21	--	33	28	--	25	36
	2000 [3400]	0.03 [7.5]	0.34 [84.6]	0.65 [161.7]	--	--	23	--	35	30	20	26	37
	2300 [3900]	0.04 [10.0]	0.43 [107]	0.82 [204]	20	--	25	20	36	31	22	28	38
14	1100 [1870]	0.01 [2.5]	0.07 [17.4]	0.14 [34.8]	--	--	--	--	26	--	--	--	30
	1500 [2550]	0.02 [5.0]	0.13 [32.3]	0.24 [59.7]	--	--	--	--	29	23	--	--	31
	1900 [3230]	0.03 [7.5]	0.2 [49.8]	0.36 [89.6]	--	--	--	--	30	25	--	21	33
	2300 [3910]	0.05 [12.4]	0.26 [64.7]	0.47 [117]	--	--	21	--	33	28	--	23	34
	2700 [4590]	0.07 [17.4]	0.34 [84.6]	0.62 [154.3]	--	--	24	20	34	29	20	25	35
	3100 [5270]	0.09 [22.4]	0.43 [107]	0.77 [191.6]	21	--	26	21	35	31	22	28	37
16	1600 [2720]	0.01 [2.5]	0.1 [24.9]	0.19 [47.3]	--	--	--	--	24	--	--	--	33
	2100 [3570]	0.02 [5.0]	0.17 [42.3]	0.31 [77.1]	--	--	--	--	29	23	--	20	35
	2600 [4420]	0.03 [7.5]	0.24 [59.7]	0.45 [112]	--	--	20	--	34	29	--	21	35
	3100 [5270]	0.04 [10.0]	0.29 [72.2]	0.55 [136.9]	--	--	23	20	35	30	--	24	36
	3600 [6120]	0.05 [12.4]	0.37 [92.1]	0.7 [174.2]	20	--	25	21	37	34	21	26	37
	4100 [6970]	0.06 [14.9]	0.46 [114.5]	0.86 [214]	23	--	28	23	39	36	24	29	38
19	2500 [4250]	0.06 [14.9]	0.19 [47.3]	0.32 [79.6]	23	20	29	21	38	26	29	35	43
	3000 [5100]	0.09 [22.4]	0.27 [67.2]	0.45 [112]	24	21	30	25	39	30	30	36	44
	3500 [5950]	0.13 [32.3]	0.37 [92.1]	0.61 [151.8]	26	24	31	26	40	33	31	37	45
	4500 [7650]	0.21 [52.3]	0.53 [131.9]	0.86 [214]	26	24	31	28	40	36	34	40	48
	5500 [9345]	0.32 [79.6]	0.77 [191.6]	1.22 [303.6]	29	25	33	29	43	39	38	44	53
	6500 [11050]	0.44 [109.5]	1.03 [256.3]	1.62 [403.1]	31	28	33	29	45	41	41	48	56
22	4000 [6800]	0.06 [14.9]	0.3 [74.7]	0.55 [136.9]	28	24	33	26	41	33	31	37	48
	5000 [8495]	0.09 [22.4]	0.46 [114.5]	0.83 [206.5]	28	24	34	29	41	36	34	39	50
	6000 [10195]	0.14 [34.8]	0.56 [139.4]	0.99 [246.4]	29	26	34	31	43	38	36	41	53
	7000 [11895]	0.18 [44.8]	0.72 [179.2]	1.27 [316]	30	28	36	33	44	40	39	45	56
	8000 [13600]	0.24 [59.7]	0.91 [226.4]	1.59 [395.7]	33	29	37	34	45	41	41	47	58

Notes:

1. Min. △Ps is the static pressure difference between the terminal inlet and discharge with the damper wide open.
2. Performance data obtained from tests conducted in accordance with AHRI Standard 880.
3. Dash (-) indicates NC level less than 20.
4. NC values calculated based upon to AHRI Standard 885 Appendix E
   Typical Sound Attenuation Values (shown at right) using Ceiling Type 2 for calculating Radiated NC.
5. NC (sound pressure) levels predicted by subtracting appropriate values at right from published sound power levels (following pages).

Discharge Attenuation Values	Octave Band					
	2	3	4	5	6	7
Small Box (140L/s)	24	28	39	53	59	40
Medium Box (140-340L/s)	27	29	40	51	53	39
Large Box (340L/s)	29	30	41	51	52	39

Radiated Attenuation Values	Octave Band					
	2	3	4	5	6	7
Type 2 - Mineral Fiber Ceiling	17	18	21	25	29	35

Sound Power Data

Radiated Sound Power Data – Model TSS

Unit Size	CFM [CMH]	Octave Band																							
		0.5''in.w.g. [125Pa]						1.0''in.w.g. [250Pa]						1.5''in.w.g. [375Pa]						3.0''in.w.g. [750Pa]					
		2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7
4	100 [170]	46	43	35	29	26	27	49	44	39	32	27	24	49	46	42	34	29	26	48	50	46	38	33	31
	150 [255]	49	47	40	33	29	28	52	48	44	36	31	28	53	53	46	38	33	30	53	55	50	43	37	34
	200 [340]	52	51	44	37	32	29	56	52	48	40	35	31	56	54	50	42	37	33	58	59	54	47	41	38
	250 [425]	54	54	47	40	36	32	58	55	51	43	38	34	59	57	53	45	40	37	61	62	58	50	45	41
5	100 [170]	42	36	33	27	23	20	45	40	37	29	25	22	46	42	40	32	27	24	47	47	44	36	32	30
	200 [340]	46	44	40	33	28	28	49	48	44	36	31	28	50	49	46	38	33	29	52	53	50	43	37	34
	250 [425]	49	47	43	36	31	28	51	51	47	39	33	29	53	52	49	41	35	32	54	54	53	45	40	36
	300 [510]	51	49	45	38	34	30	54	53	49	41	36	32	55	55	51	43	38	34	56	57	56	48	42	39
	350 [600]	54	52	47	40	36	32	57	55	51	43	38	35	57	57	54	45	40	37	58	59	58	50	45	41
6	200 [340]	43	38	38	37	33	23	47	44	45	44	40	29	48	46	49	47	43	32	51	52	54	51	47	37
	250 [425]	46	41	39	36	32	23	48	46	45	44	41	30	49	49	51	49	46	34	53	54	56	55	51	40
	300 [510]	48	43	40	36	31	24	50	48	46	44	41	30	51	51	51	49	46	35	55	56	58	57	54	42
	350 [595]	50	46	42	37	31	26	53	50	47	43	40	30	52	52	51	49	46	36	57	58	60	58	55	43
	400 [680]	52	47	43	37	32	27	55	52	48	44	40	31	56	54	52	49	46	36	58	59	61	59	56	44
	450 [765]	54	48	45	38	32	28	57	53	50	45	40	32	58	55	53	49	46	36	60	60	61	59	56	45
	550 [935]	60	53	49	43	36	30	64	58	53	46	41	34	58	56	56	50	46	38	63	63	62	57	55	46
8	300 [510]	46	37	38	33	28	24	49	46	42	38	33	29	50	48	45	41	37	30	53	53	52	47	43	35
	400 [680]	49	40	40	35	30	24	52	47	44	39	35	30	54	49	47	43	38	32	58	56	54	49	44	37
	500 [850]	50	42	41	36	32	25	53	48	46	41	37	31	54	50	49	44	40	33	57	57	55	51	46	40
	600 [1020]	53	44	43	38	33	26	56	50	47	42	38	31	57	52	50	46	41	34	60	58	57	52	47	41
	700 [1190]	56	45	44	39	34	27	58	52	48	44	39	32	58	56	52	47	42	35	62	60	58	53	48	42
	800 [1360]	58	47	45	40	35	28	60	53	50	45	40	33	61	56	53	48	43	36	64	61	59	54	50	43
	1000 [1700]	60	52	48	42	37	30	62	56	52	46	42	35	63	58	55	50	45	38	67	63	62	56	51	45
10	600 [1020]	49	40	38	32	27	28	53	47	43	37	31	29	54	50	46	40	34	31	58	58	57	49	42	36
	800 [1360]	51	42	40	34	28	29	55	49	45	38	33	30	56	52	48	42	37	32	60	59	57	50	43	38
	1000 [1700]	53	44	43	36	30	29	56	51	47	40	35	30	58	53	50	44	38	33	62	60	57	50	45	40
	1100 [1870]	54	45	44	37	31	29	56	52	48	41	36	31	59	55	53	44	39	34	63	60	58	51	45	40
	1200 [2040]	55	46	45	37	32	29	57	53	49	42	37	31	59	55	53	45	40	35	64	61	59	52	46	41
	1400 [2380]	57	48	46	39	33	29	59	54	50	43	38	33	60	56	54	47	42	36	65	62	60	53	48	43
	1600 [2720]	61	51	48	40	34	29	63	56	52	45	40	34	64	58	55	48	43	38	67	63	62	54	49	44
12	800 [1360]	47	41	39	33	30	29	51	49	47	40	37	33	52	52	50	43	40	36	54	60	58	52	47	43
	1100 [1870]	49	44	41	34	31	29	54	51	48	42	38	33	55	54	51	45	40	36	58	61	59	53	48	45
	1400 [2380]	51	46	42	35	32	29	56	52	50	43	39	34	57	54	52	46	42	37	60	62	60	54	49	46
	1600 [2720]	52	47	44	37	33	29	56	53	51	44	39	34	59	56	53	44	40	35	62	63	61	55	49	46
	1700 [2890]	53	48	44	37	33	29	56	53	51	44	39	34	59	56	54	47	42	37	63	63	61	55	49	46
	2000 [3400]	54	49	46	39	33	29	58	54	52	45	40	34	60	56	54	48	42	37	64	64	62	56	50	46
	2300 [3910]	55	50	48	40	35	30	59	55	53	46	41	35	62	58	56	49	44	39	66	65	63	57	51	47
14	1100 [1870]	47	42	36	34	34	30	53	49	42	39	40	36	55	52	45	42	42	38	60	60	54	50	47	45
	1500 [2550]	49	44	39	36	34	30	54	51	45	40	41	36	56	54	48	43	43	39	62	61	55	52	48	47
	1900 [3230]	51	46	42	37	34	30	56	53	47	43	43	37	58	55	49	46	45	40	63	62	56	53	51	48
	2100 [3570]	52	47	43	38	34	30	56	54	48	43	43	37	60	58	51	46	46	41	64	62	57	54	52	49
	2300 [3910]	53	48	44	38	34	30	57	54	48	43	43	37	60	58	52	46	46	41	65	63	58	54	53	50
	2700 [4590]	55	50	46	40	35	31	59	56	50	45	43	37	61	58	54	48	46	41	66	64	60	55	54	50
	3100 [5270]	56	53	48	42	37	32	61	58	52	46	43	38	63	60	55	49	46	41	67	65	62	57	55	50
16	1600 [2720]	48	44	37	35	30	30	53	49	43	40	36	33	55	52	46	42	38	35	60	62	56	50	46	41
	2100 [3570]	50	46	40	36	33	30	55	52	46	41	39	34	57	55	48	44	41	37	61	64	56	52	47	44
	2600 [4420]	53	48	43	39	35	31	57	53	47	43	40	36	59	56	50	46	43	39	63	64	58	53	49	46
	280 [4760]	54	48	44	39	36	31	58	54	48	44	41	37	60	59	52	47	44	40	64	64	58	54	50	46
	3100 [5270]	55	49	45	41	37	32	59	55	49	45	42	38	61	59	52	48	45	41	65	65	59	55	51	47
	3600 [6120]	56	51	47	42	38	34	61	57	51	47	43	39	63	59	54	50	47	43	67	66	61	56	53	49
	4100 [6970]	58	53	50	44	40	35	62	59	53	48	45	40	65	61	56	51	48	44	69	67	63	58	54	50
19	2500 [4250]	59	57	54	47	41	33	65	60	60	52	46	39	66	63	63	55	50	42	70	67	67	63	57	50
	3000 [5100]	59	58	55	47	41	34	65	61	61	52	46	39	66	63	64	56	50	43	70	68	68	64	58	50
	3500 [5950]	60	59	56	48	42	35	66	62	62	53	47	40	67	64	65	57	51	44	71	68	69	64	59	51
	4500 [7650]	60	61	59	50	45	37	66	64	65	55	50	43	68	66	68	59	53	46	72	70	72	67	61	54
	5400 [9180]	62	62	62	52	48	40	67	66	68	57	52	45	68	68	71	61	56	49	73	72	75	69	64	57
	5500 [9350]	62	63	63	53	48	40	67	66	68	58	53	46	68	68	71	62	56	49	73	72	76	70	64	57
	6500 [11050]	66	65	66	56	51	44	67	68	72	61	56	49	69	70	75	65	60	53	75	75	79	73	67	60
22	4000 [6800]	59	60	56	48	42	36	65	63	62	53	47	41	66	66	65	57	51	46	70	71	72	67	60	54
	5000 [8500]	60	61	59	50	44	38	65	64	64	55	48	43	67	67	67	59	53	48	72	72	74	68	62	56
	6000 [10200]	62	62	61	51	46	40	65	65	66	56	50	45	67	68	70	61	54	49	72	73	76	70	64	58
	7000 [11900]	64	63	64	53	48	41	66	66	69	58	52	47	68	69	72	63	56	51	74	74	79	72	66	59
	7100 [12070]	64	63	64	54	48	41	66	66	69	59	53	47	69	69	73	63	57	51	74	74	79	72	66	59
	8000 [13600]	66	64	66	55	50	43	67	67	71	60	54	48	70	70	75	65	58	53	75	75	81	74	68	61

Notes:

- Performance data obtained from tests conducted in accordance with AHRI Standard 880.
- Sound levels are expressed in decibels, dB re: 1 x 10^{-12} watts.
- Certified AHRI data is highlighted blue. Application data (not highlighted blue) is outside the scope of the certification program.

Radiated Sound Power Data – Model TSS-SA

Unit Size	CFM [CMH]	Octave Band																	
		0.5''in.w.g. [125Pa]						1.0''in.w.g. [250Pa]						3.0''in.w.g. [750Pa]					
		2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7
4	100 [170]	46	43	35	29	26	27	49	44	39	32	27	24	48	50	46	38	33	31
	150 [255]	49	47	40	33	29	28	52	48	44	36	31	28	53	55	50	43	37	34
	200 [340]	52	51	44	37	32	29	56	52	48	40	35	31	58	59	54	47	41	38
	250 [425]	54	54	47	40	36	32	58	55	51	43	38	34	61	62	58	50	45	41
5	100 [170]	42	36	33	27	23	20	45	40	37	29	25	22	47	47	44	36	32	30
	200 [340]	46	44	40	33	28	28	49	48	44	36	31	28	52	53	50	43	37	34
	300 [510]	51	49	45	38	34	30	54	53	49	41	36	32	56	57	56	48	42	39
	350 [600]	54	52	47	40	36	32	57	55	51	43	38	35	58	59	58	50	45	41
6	200 [340]	43	38	38	37	33	23	47	44	45	44	40	29	51	52	54	51	47	37
	250 [425]	46	41	39	36	32	23	48	46	45	44	41	30	53	54	56	55	51	40
	300 [510]	48	43	40	36	31	24	50	48	46	44	41	30	55	56	58	57	54	42
	350 [595]	50	46	42	37	31	26	53	50	47	43	40	30	57	58	60	58	55	43
	450 [765]	54	48	45	38	32	28	57	53	50	45	40	32	60	60	61	59	56	45
	550 [935]	60	53	49	43	36	30	64	58	53	46	41	34	63	63	62	57	55	46
8	300 [510]	46	37	38	33	28	24	49	46	42	38	33	29	53	53	52	47	43	35
	400 [680]	49	40	40	35	30	24	52	47	44	39	35	30	58	56	54	49	44	37
	500 [850]	50	42	41	36	32	25	53	48	46	41	37	31	57	57	55	51	46	40
	600 [1020]	53	44	43	38	33	26	56	50	47	42	38	31	60	58	57	52	47	41
	800 [1360]	58	47	45	40	35	28	60	53	50	45	40	33	64	61	59	54	50	43
	1000 [1700]	60	52	48	42	37	30	62	56	52	46	42	35	67	63	62	56	51	45
10	600 [1020]	49	40	38	32	27	28	53	47	43	37	31	29	58	58	57	49	42	36
	800 [1360]	51	42	40	34	28	29	55	49	45	38	33	30	60	59	57	50	43	38
	1000 [1700]	53	44	43	36	30	29	56	51	47	40	35	30	62	60	57	50	45	40
	1200 [2040]	55	46	45	37	32	29	57	53	49	42	37	31	64	61	59	52	46	41
	1400 [2380]	57	48	46	39	33	29	59	54	50	43	38	33	65	62	60	53	48	43
	1600 [2720]	61	51	48	40	34	29	63	56	52	45	40	34	67	63	62	54	49	44
12	800 [1360]	47	41	39	33	30	29	51	49	47	40	37	33	54	60	58	52	47	43
	1100 [1870]	49	44	41	34	31	29	54	51	48	42	38	33	58	61	59	53	48	45
	1400 [2380]	51	46	42	35	32	29	56	52	50	43	39	34	60	62	60	54	49	46
	1700 [2890]	53	48	44	37	33	29	56	53	51	44	39	34	63	63	61	55	49	46
	2000 [3400]	54	49	46	39	33	29	58	54	52	45	40	34	64	64	62	56	50	46
	2300 [3910]	55	50	48	40	35	30	59	55	53	46	41	35	66	65	63	57	51	47
14	1100 [1870]	47	42	36	34	34	30	53	49	42	39	40	36	60	60	54	50	47	45
	1500 [2550]	49	44	39	36	34	30	54	51	45	40	41	36	62	61	55	52	48	47
	1900 [3230]	51	46	42	37	34	30	56	53	47	43	43	37	63	62	56	53	51	48
	2300 [3910]	53	48	44	38	34	30	57	54	48	43	43	37	65	63	58	54	53	50
	2700 [4590]	55	50	46	40	35	31	59	56	50	45	43	37	66	64	60	55	54	50
	3100 [5270]	56	53	48	42	37	32	61	58	52	46	43	38	67	65	62	57	55	50
16	1600 [2720]	48	44	37	35	30	30	53	49	43	40	36	33	60	62	56	50	46	41
	2100 [3570]	50	46	40	36	33	30	55	52	46	41	39	34	61	64	56	52	47	44
	2600 [4420]	53	48	43	39	35	31	57	53	47	43	40	36	63	64	58	53	49	46
	3100 [5270]	55	49	45	41	37	32	59	55	49	45	42	38	65	65	59	55	51	47
	3600 [6120]	56	51	47	42	38	34	61	57	51	47	43	39	67	66	61	56	53	49
	4100 [6970]	58	53	50	44	40	35	62	59	53	48	45	40	69	67	63	58	54	50
19	2500 [4250]	59	57	54	47	41	33	65	60	60	52	46	39	70	67	67	63	57	50
	3000 [5100]	59	58	55	47	41	34	65	61	61	52	46	39	70	68	68	64	58	50
	3500 [5950]	60	59	56	48	42	35	66	62	62	53	47	40	71	68	69	64	59	51
	4500 [7650]	60	61	59	50	45	37	66	64	65	55	50	43	72	70	72	67	61	54
	5500 [9350]	62	63	63	53	48	40	67	66	68	58	53	46	73	72	76	70	64	57
	6500 [11050]	66	65	66	56	51	44	67	68	72	61	56	49	75	75	79	73	67	60
22	4000 [6800]	59	60	56	48	42	36	65	63	62	53	47	41	70	71	72	67	60	54
	5000 [8500]	60	61	59	50	44	38	65	64	64	55	48	43	72	72	74	68	62	56
	6000 [10200]	62	62	61	51	46	40	65	65	66	56	50	45	72	73	76	70	64	58
	7000 [11900]	64	63	64	53	48	41	66	66	69	58	52	47	74	74	79	72	66	59
	8000 [13600]	66	64	66	55	50	43	67	67	71	60	54	48	75	75	81	74	68	61

Notes:

- Performance data obtained from tests conducted in accordance with AHRI Standard 880.
- Sound levels are expressed in decibels, dB re: 1 x 10^{-12} watts.
- Certified AHRI data is highlighted blue. Application data (not highlighted blue) is outside the scope of the certification program.

Sound Power Data

Discharge Sound Power Data – Model TSS

Unit Size	CFM [CMH]	Octave Band																							
		0.5"in.w.g. [125Pa]						1.0"in.w.g. [250Pa]						1.5"in.w.g. [375Pa]						3.0"in.w.g. [750Pa]					
		2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7
4	100 [170]	57	55	46	42	36	35	61	59	50	46	43	43	61	61	52	48	45	45	62	61	56	53	52	52
	150 [255]	62	60	50	46	41	39	66	64	54	50	46	45	68	67	58	54	49	48	68	68	60	57	56	56
	200 [340]	66	63	53	49	44	42	71	67	57	53	48	48	72	69	59	55	50	50	73	72	64	60	58	58
	250 [425]	69	65	55	53	46	45	73	70	59	55	51	49	74	71	61	57	53	52	77	76	67	62	60	59
5	100 [170]	55	53	44	40	35	33	58	57	48	43	42	43	59	58	50	46	44	45	59	59	54	50	50	51
	200 [340]	63	60	51	46	41	39	66	64	54	50	45	44	67	66	57	52	47	47	66	67	61	57	55	55
	250 [425]	65	62	53	48	43	41	69	67	56	52	47	45	70	68	59	55	51	50	69	69	63	59	56	56
	300 [510]	68	64	54	50	45	43	71	68	58	54	49	47	72	70	60	56	51	50	71	71	64	60	58	56
	350 [600]	69	65	55	51	47	45	73	70	59	55	50	49	74	71	62	57	53	51	73	72	66	62	60	57
6	200 [340]	54	51	48	44	39	36	59	56	52	48	44	42	60	59	55	51	47	45	65	65	62	57	54	53
	250 [425]	59	53	49	46	40	37	63	58	53	49	45	43	64	61	56	52	48	47	66	67	63	59	56	55
	300 [510]	61	55	51	47	41	39	64	60	54	51	46	44	65	63	57	54	50	48	68	68	64	60	57	55
	350 [595]	62	57	52	48	42	40	65	63	55	52	47	46	66	64	58	55	51	50	70	70	65	62	58	57
	400 [680]	63	58	53	50	43	41	66	64	57	53	48	48	69	67	60	57	52	52	71	71	66	63	59	58
	450 [765]	64	59	54	51	44	42	68	65	58	54	49	48	70	68	60	57	52	52	73	72	67	64	59	60
	550 [935]	67	62	55	53	46	45	70	68	61	56	50	50	72	70	63	59	54	53	76	74	69	66	61	63
8	300 [510]	55	50	47	44	41	37	58	55	52	47	47	45	60	58	55	50	50	48	65	65	65	60	60	59
	400 [680]	58	53	49	46	43	39	61	58	53	50	48	46	63	61	56	53	51	49	67	67	66	60	60	59
	500 [850]	60	55	51	48	44	41	64	60	54	52	49	47	65	63	57	55	53	50	69	69	67	61	61	60
	600 [1020]	62	57	52	50	46	42	66	61	56	53	50	48	67	65	59	56	54	52	71	70	68	63	61	60
	700 [1190]	64	58	54	51	47	43	68	63	57	55	52	49	69	67	62	60	57	55	73	72	68	64	62	60
	800 [1360]	66	60	55	52	48	44	69	64	59	56	53	50	71	67	63	60	57	55	74	73	68	65	63	61
	1000 [1700]	70	63	57	54	50	46	72	67	62	58	55	52	74	70	64	61	58	56	78	75	70	67	65	62
10	600 [1020]	57	53	49	46	44	40	63	59	56	50	49	46	64	62	59	53	51	50	69	70	68	63	59	57
	800 [1360]	60	55	52	49	46	42	64	61	57	52	51	48	67	63	60	55	54	52	71	71	69	64	61	59
	1000 [1700]	63	58	54	51	48	44	67	63	59	54	52	50	69	65	61	57	56	53	74	72	69	64	63	60
	1100 [1870]	64	58	55	52	48	45	68	64	59	55	53	50	70	67	63	60	57	54	74	73	69	65	64	61
	1200 [2040]	65	59	55	53	49	45	69	65	60	56	54	51	71	67	63	61	57	55	75	74	70	66	64	62
	1400 [2380]	67	61	57	54	50	47	70	67	62	58	55	52	73	69	64	61	58	56	77	75	71	67	65	63
	1600 [2720]	69	63	59	56	51	48	74	69	65	60	56	53	76	71	67	62	60	57	80	76	73	69	67	64
12	800 [1360]	57	52	49	45	43	40	61	59	58	54	52	50	63	61	61	56	54	52	68	68	68	63	60	59
	1100 [1870]	61	55	52	48	46	42	65	61	60	55	53	52	67	63	62	58	56	54	71	69	68	65	63	61
	1400 [2380]	63	57	54	51	48	44	67	63	61	56	54	52	70	65	63	59	56	54	74	71	71	67	64	62
	1600 [2720]	65	58	56	52	49	45	69	64	62	57	55	52	71	67	64	61	59	57	75	72	72	68	65	63
	1700 [2890]	66	59	56	53	49	46	69	64	62	58	55	52	72	67	65	61	59	57	76	73	72	69	66	64
	2000 [3400]	68	61	58	54	51	47	71	65	64	60	57	53	74	68	66	62	60	57	78	75	73	70	67	66
	2300 [3910]	69	63	61	56	52	49	73	67	65	61	58	55	75	70	67	63	60	58	80	76	75	70	68	67
14	1100 [1870]	58	51	49	46	43	40	63	58	54	53	52	52	64	61	57	56	54	54	69	68	67	64	62	62
	1500 [2550]	61	54	52	48	46	42	65	59	56	54	53	52	67	62	59	57	56	55	72	70	68	65	63	63
	1900 [3230]	64	57	55	51	47	44	68	62	58	55	54	53	70	64	61	58	56	56	74	71	69	66	64	63
	2100 [3570]	65	58	56	52	48	45	69	63	59	56	54	54	71	67	64	60	58	57	76	72	69	67	65	64
	2300 [3910]	66	59	57	53	49	46	70	63	60	56	55	54	73	67	65	60	58	57	77	73	70	68	66	64
	2700 [4590]	68	60	59	54	50	47	72	65	62	58	56	55	74	68	65	61	59	58	79	74	72	69	67	65
	3100 [5270]	70	62	61	56	52	48	74	66	64	60	57	56	76	69	67	62	60	59	80	75	74	70	68	67
16	1600 [2720]	60	52	51	46	43	41	63	57	54	54	52	51	66	59	57	56	54	53	70	65	64	62	62	60
	2100 [3570]	63	55	54	49	46	43	67	60	57	55	54	51	69	63	60	58	56	54	73	70	67	65	64	62
	2600 [4420]	65	57	56	51	47	45	69	63	59	56	54	53	71	66	62	59	57	56	76	74	69	68	67	65
	280 [4760]	66	58	57	52	48	45	70	64	60	56	54	53	74	68	65	60	58	57	76	74	70	68	67	65
	3100 [5270]	67	59	58	53	49	46	71	65	61	57	55	54	75	69	65	60	58	57	78	75	71	69	67	66
	3600 [6120]	69	61	59	54	50	47	73	67	63	58	56	54	75	69	66	61	59	57	80	77	73	70	68	67
	4100 [6970]	71	63	62	56	51	49	75	68	67	60	57	55	77	71	69	62	60	58	81	79	74	70	68	68
19	2500 [4250]	69	65	59	57	57	51	72	70	67	63	63	59	73	73	71	68	65	62	77	78	77	76	74	71
	3000 [5100]	70	66	60	59	58	52	73	71	69	65	64	60	74	74	73	69	66	62	78	79	78	77	74	71
	3500 [5950]	71	68	61	61	60	55	74	72	70	66	66	61	75	75	74	70	68	63	79	80	79	78	75	72
	4500 [7650]	72	68	63	63	62	58	75	72	72	69	68	64	77	76	76	72	70	66	82	80	81	80	78	74
	5400 [9180]	73	70	66	65	65	61	76	73	73	71	70	67	77	78	79	75	70	68	84	82	83	83	79	76
	5500 [9350]	73	70	66	65	65	61	76	73	73	71	70	67	78	78	79	75	72	69	84	82	83	83	79	76
	6500 [11050]	75	72	71	68	67	63	78	73	74	72	71	69	80	79	80	77	73	71	87	84	85	85	80	78
22	4000 [6800]	71	69	64	60	56	54	75	73	70	66	62	60	77	76	74	70	65	63	82	81	81	79	75	72
	5000 [8500]	72	69	66	63	59	57	77	74	74	68	64	62	79	76	76	72	67	65	84	81	83	80	76	73
	6000 [10200]	74	70	69	66	62	60	79	74	76	71	67	65	81	77	78	74	70	68	85	82	85	82	77	75
	7000 [11900]	77	71	71	68	64	63	80	76	77	73	69	67	81	78	79	75	71	69	86	83	86	83	79	76
	7100 [12070]	77	71	71	68	64	63	80	76	77	73	69	67	82	80	82	76	71	69	86	83	86	83	79	76
	8000 [13600]	79	72	74	70	66	65	81	77	78	75	71	69	83	80	82	77	73	71	87	84	88	84	80	77

Notes:

- Performance data obtained from tests conducted in accordance with AHRI Standard 880.
- Sound levels are expressed in decibels, dB re: 1 x 10^{-12} watts.
- Certified AHRI data is highlighted blue. Application data (not highlighted blue) is outside the scope of the certification program.

Discharge Sound Power Data - Model TSS-SA

Unit Size	CFM [CMH]	Octave Band																	
		0.5''in.w.g. [125Pa]						1.0''in.w.g. [250Pa]						3.0''in.w.g. [750Pa]					
		2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7
4	100 [170]	52	47	35	29	21	22	55	51	42	34	24	24	55	54	48	41	30	28
	150 [255]	55	52	39	32	23	22	61	57	45	37	27	23	63	62	54	45	35	32
	200 [340]	60	56	43	35	24	25	66	61	48	40	29	26	68	67	58	48	37	34
	250 [425]	64	59	46	41	28	26	70	63	51	43	32	27	73	71	62	50	39	34
5	100 [170]	49	43	35	29	20	20	50	44	39	30	23	24	53	51	45	37	28	27
	200 [340]	53	49	39	30	20	21	56	51	44	35	24	23	60	60	54	44	34	31
	300 [510]	60	53	43	34	21	22	65	57	48	39	26	24	66	63	58	48	37	32
	350 [600]	62	55	45	36	24	21	68	60	50	42	29	25	68	65	60	51	39	32
6	200 [340]	49	45	35	28	19	22	54	50	43	32	22	23	59	58	51	43	32	29
	250 [425]	56	49	38	30	22	23	59	54	46	35	23	23	61	59	53	45	33	31
	300 [510]	59	52	41	32	22	23	61	57	48	37	25	23	64	62	57	46	35	31
	350 [595]	59	54	44	35	23	24	62	60	51	40	27	24	65	64	59	48	37	33
	450 [765]	60	55	46	37	23	24	65	61	54	42	28	24	69	66	61	50	38	36
	550 [935]	64	59	50	42	26	26	67	65	57	46	32	29	73	70	65	52	39	38
8	300 [510]	52	45	39	29	22	22	53	50	47	36	28	27	59	56	57	47	38	36
	400 [680]	55	46	40	30	23	23	57	51	46	37	28	28	60	57	58	47	38	36
	500 [850]	57	50	43	34	24	24	61	54	49	39	30	28	63	60	60	50	41	38
	600 [1020]	58	52	45	36	26	24	63	56	49	42	30	28	65	62	62	52	41	38
	800 [1360]	62	55	49	39	29	26	66	60	53	45	34	30	71	66	62	53	43	39
	1000 [1700]	66	60	53	44	33	29	69	64	57	49	40	32	75	69	65	55	44	40
10	600 [1020]	54	49	42	34	23	23	58	54	51	40	30	29	64	59	57	49	37	37
	800 [1360]	56	51	43	35	25	24	61	57	52	42	31	30	66	63	60	53	40	39
	1000 [1700]	59	54	47	38	28	26	63	59	54	44	34	32	70	66	62	55	43	40
	1200 [2040]	60	57	49	40	29	27	65	61	56	45	37	33	72	69	64	56	44	42
	1400 [2380]	62	59	51	43	32	29	67	63	58	48	40	35	74	70	66	58	46	44
	1600 [2720]	65	61	56	47	35	32	71	66	62	51	43	37	77	72	68	61	48	46
12	800 [1360]	52	49	44	35	28	26	55	55	54	45	36	33	61	59	58	51	42	40
	1100 [1870]	54	52	47	37	29	28	59	58	56	46	38	38	65	62	61	55	47	43
	1400 [2380]	56	54	50	40	32	28	62	60	57	47	40	38	66	66	66	58	49	45
	1700 [2890]	58	55	52	42	34	31	64	61	58	49	42	38	70	69	67	60	52	48
	2000 [3400]	61	59	54	45	37	33	66	62	60	51	45	40	74	71	69	61	53	51
	2300 [3910]	65	61	57	48	40	37	69	63	61	52	47	42	76	72	70	61	55	52
14	1100 [1870]	53	47	42	38	32	26	60	55	50	44	39	35	65	62	59	53	48	45
	1500 [2550]	57	50	45	39	34	28	62	57	52	45	41	38	67	65	62	57	51	48
	1900 [3230]	57	52	48	42	35	29	65	60	54	46	43	41	70	67	65	58	53	49
	2300 [3910]	60	56	51	45	38	32	66	61	56	47	45	43	72	69	65	60	56	51
	2700 [4590]	62	57	54	47	40	36	68	63	58	49	47	45	75	70	67	61	57	53
	3100 [5270]	64	59	56	49	42	37	67	64	60	51	48	46	77	72	68	61	58	56
16	1600 [2720]	54	48	43	36	32	27	58	54	50	47	39	34	64	59	53	51	48	43
	2100 [3570]	58	52	47	40	34	29	63	58	52	48	42	37	66	65	59	57	52	47
	2600 [4420]	59	53	50	43	36	30	66	61	54	49	43	41	70	70	63	62	56	51
	3100 [5270]	61	57	52	46	39	33	67	63	57	49	45	43	74	71	66	61	57	53
	3600 [6120]	62	59	56	47	41	36	68	64	60	50	47	44	77	74	68	62	58	55
	4100 [6970]	64	61	59	50	42	38	68	65	63	52	49	45	79	76	70	62	59	57
19	2500 [4250]	66	63	54	50	47	38	70	64	60	56	50	42	72	68	65	62	58	51
	3000 [5100]	67	64	56	53	49	41	71	67	63	58	52	46	74	71	68	66	61	54
	3500 [5950]	68	66	57	54	50	46	72	68	65	59	55	49	75	73	70	69	63	56
	4500 [7650]	69	66	59	56	52	49	73	69	68	61	58	53	79	76	75	71	68	61
	5500 [9350]	70	67	62	58	56	51	74	70	69	63	61	57	82	79	78	75	69	64
	6500 [11050]	72	69	67	60	58	53	75	70	69	64	63	59	85	81	80	77	71	67
22	4000 [6800]	68	66	60	53	46	41	73	68	66	58	50	46	78	73	74	69	63	57
	5000 [8500]	68	66	62	57	49	45	75	70	70	61	53	50	80	76	77	73	65	59
	6000 [10200]	71	68	65	60	53	49	77	72	73	63	57	54	82	78	79	73	67	62
	7000 [11900]	74	69	68	62	55	53	78	73	74	65	60	57	84	80	81	74	68	63
	8000 [13600]	76	70	71	64	57	55	78	74	74	67	63	59	85	81	82	75	70	65

Notes:

- Performance data obtained from tests conducted in accordance with AHRI Standard 880.
- Sound levels are expressed in decibels, dB re: 1×10^{-12} watts.
- Certified AHRI data is highlighted blue. Application data (not highlighted blue) is outside the scope of the certification program.

AHRI Ratings

AHRI Standard Ratings

Unit Size	Rated Airflow CFM	Minimum Operating Pressure (IN. W.G.)	Standard Ratings - Sound Power Level, dB RE: 1 x 10^{-12} Watts											
			1.5'' Water Static Pressure											
			Radiated						Discharge					
			Hz Octave Band Center Frequency						Hz Octave Band Center Frequency					
			125	250	500	1000	2000	4000	125	250	500	1000	2000	4000
4	150	0.01	53	53	46	38	33	30	68	67	58	54	49	48
5	250	0.02	53	52	49	41	35	32	70	68	59	55	51	50
6	400	0.10	56	54	52	49	46	36	69	67	60	57	52	52
8	700	0.03	58	56	52	47	42	35	69	67	62	60	57	55
10	1100	0.03	59	55	53	44	39	34	70	67	63	60	57	54
12	1600	0.04	59	56	53	44	40	35	71	67	64	61	59	57
14	2100	0.06	60	58	51	46	46	41	71	67	64	60	58	57
16	2800	0.04	60	59	52	47	44	40	74	68	65	60	58	57
19	5400	0.38	68	68	71	61	56	49	77	78	79	75	70	68
22	7100	0.20	69	69	73	63	57	51	82	80	82	76	71	69

Rated in accordance with AHRI Standard 880.

Hot Water Coil Data

Model TSS-WC

Standard Features

- Designed, manufactured, and tested
- Aluminum fin construction with die-formed spacer collars for uniform spacing
- Mechanically expanded copper tubes leak tested to 400 PSIG [2.8MPa] air pressure and rated at 230 PSIG [1.6MPa] working pressure
- 1, 2 row configurations

Optional Features

- Multi-circuit coils for reduced water pressure drop
- Opposite hand water connections
- Bottom and top access plates for cleaning

Selection Procedure

TSS-WC Hot Water Coil Performance Tables are based upon a temperature difference of 125°F [70℃] between the entering water and the entering air. If this △T is suitable, proceed directly to the tables for selection. All pertinent performance data is tabulated. **For Variable Air Volume Applications, the static pressure drop must be based on the maximum air volume.**

Entering Water - Air Temperature Different (ΔT) Correction Factors															
ΔT(°F[°C])	20 [11]	25 [14]	30 [17]	35 [19]	40 [22]	45 [25]	50 [28]	55 [31]	60 [33]	65 [36]	70[39]	75[42]	80[44]	85[47]	90[50]
Factor	0.15	0.19	0.23	0.27	0.31	0.35	0.39	0.43	0.47	0.51	0.55	0.59	0.63	0.67	0.71
ΔT(°F[°C])	95 [53]	100 [56]	105 [58]	110 [61]	115 [64]	120 [67]	125 [69]	130 [72]	135 [75]	140 [78]	145 [81]	150 [83]	155 [86]	160 [89]	165 [92]
Factor	0.75	0.79	0.83	0.88	0.92	0.96	1	1.04	1.08	1.13	1.17	1.21	1.25	1.29	1.33

The table above gives correction factors for various entering ΔT's (difference between EWT and EAT). Multiply MBH values obtained from selection tables by the appropriate correction factor above to obtain the actual MBH value. Air and water pressure drop can be read directly from the selection tables. The LAT and LWT can be calculated from the following fundamental formulas:

LAT-EAT[°F]=BTU/(1.085 × CFM)
LAT-EAT[°C]=829×kW/L/s

EWT-LWT[°F]=BTUH/(500 × GPM)
EWT-LWT[°C]=0.244×kW/L/s

Definition of Terms

EAT	Entering Air Temperature (°F[°C])
EWT	Entering Water Temperature (°F[°C])
LWT	Leaving Water Temperature (°F[°C])
LAT	Leaving Air Temperature (°F[°C])
CFM	Air Volume (Cubic Feet per Minute)
L/S	Air/Water Volume (Litre per Second)

GPM	Water Capacity (Gallons per Minute)
MBH	1,000 BTUH
BTUH	Coil Heating Capacity (British Thermal Units per Hour)

Hot Water Coil Data

Model TSS-WC • Sizes 4, 5, 6

Airflow		Air PD		Water Flow		Water PD				LAT				LWT				Capacity			
CFM	[CMH]	(IN.W.G.) [Pa]		GPM	[L/s]	1 Row (FT.W.G.)	[kPa]	2 Row (FT.W.G.)	[kPa]	1 Row °F	[℃]	2 Row °F	[℃]	1 Row °F	[℃]	2 Row °F	[℃]	1 Row MBH	[kW]	2 Row MBH	[kW]
50	[85]	1Row 0.01	[2.5]	0.5	[0.03]	0.3	[0.89]	0.1	[0.30]	123.7	[50.9]	149.3	[65.2]	164.7	[73.7]	159.1	[70.6]	3.7	[1.08]	5.1	[1.49]
				1	[0.06]	1	[2.98]	0.3	[0.89]	128.4	[53.6]	155.8	[68.8]	171.8	[77.7]	168.8	[76]	4	[1.17]	5.5	[1.61]
		2Row 0.01	[2.5]	2	[0.12]	3.4	[10.13]	0.9	[2.68]	131.2	[55.1]	159.3	[70.7]	175.8	[79.9]	174.2	[79]	4.1	[1.2]	5.7	[1.67]
				4	[0.25]	12.2	[36.36]	3.4	[10.13]	132.7	[55.9]	161.2	[71.8]	177.8	[81]	177	[80.6]	4.2	[1.23]	5.8	[1.7]
100	[170]	1Row 0.01	[2.5]	0.5	[0.03]	0.3	[0.89]	0.1	[0.30]	105.7	[40.9]	127.4	[53]	157.5	[69.7]	147.9	[64.4]	5.5	[1.61]	7.8	[2.29]
				1	[0.06]	1	[2.98]	0.3	[0.89]	111.2	[44.0]	137	[58.3]	167.5	[75.3]	161.8	[72.1]	6.1	[1.79]	8.9	[2.61]
		2Row 0.02	[5.0]	2	[0.12]	3.4	[10.13]	1	[2.68]	114.6	[45.9]	142.8	[61.6]	173.4	[78.6]	170.2	[76.8]	6.5	[1.9]	9.5	[2.78]
				4	[0.25]	12.2	[36.36]	3.4	[10.13]	116.5	[46.9]	146.2	[63.4]	176.6	[80.3]	174.9	[79.4]	6.7	[1.96]	9.9	[2.9]
150	[255]	1Row 0.02	[5.0]	0.5	[0.03]	0.3	[0.89]	0.1	[0.30]	96	[35.6]	114	[45.6]	152.7	[67.1]	140.8	[60.4]	6.7	[1.96]	9.6	[2.81]
				1	[0.06]	1	[2.98]	0.3	[0.89]	101.7	[38.7]	124.7	[51.5]	164.4	[73.6]	156.8	[69.3]	7.6	[2.22]	11.3	[3.31]
		2Row 0.03	[7.5]	2	[0.12]	3.4	[10.13]	1	[2.68]	105.3	[40.7]	131.7	[55.4]	171.6	[77.6]	167.2	[75.1]	8.2	[2.4]	12.5	[3.66]
				4	[0.25]	12.2	[36.36]	3.4	[10.13]	107.5	[41.9]	135.8	[57.7]	175.6	[79.8]	173.3	[78.5]	8.5	[2.49]	13.1	[3.84]
200	[340]	1Row 0.03	[7.5]	0.5	[0.03]	0.3	[0.89]	0.1	[0.30]	89.8	[32.1]	104.9	[40.5]	149.1	[65.1]	135.8	[57.7]	7.5	[2.2]	10.8	[3.16]
				1	[0.06]	1	[2.98]	0.3	[0.89]	95.4	[35.2]	115.9	[46.6]	162	[72.2]	153	[67.2]	8.8	[2.58]	13.2	[3.87]
		2Row 0.06	[15]	2	[0.12]	3.4	[10.13]	1	[2.68]	99.1	[37.3]	123.5	[50.8]	170.2	[76.8]	164.8	[73.8]	9.6	[2.81]	14.8	[4.33]
				4	[0.25]	12.2	[36.36]	3.4	[10.13]	101.4	[38.6]	128.1	[53.4]	174.8	[79.3]	171.9	[77.7]	10	[2.93]	15.8	[4.63]
250	[425]	1Row 0.04	[10]	0.5	[0.03]	0.3	[0.89]	0.1	[0.30]	85.4	[29.7]	98.4	[36.9]	146.3	[63.5]	132	[55.6]	8.2	[2.41]	11.8	[3.46]
				1	[0.06]	1	[2.98]	0.3	[0.89]	90.9	[32.7]	109.3	[42.9]	160.1	[71.2]	149.9	[65.5]	9.7	[2.84]	14.7	[4.31]
		2Row 0.08	[20]	2	[0.12]	3.4	[10.13]	1	[2.68]	94.6	[34.8]	117.1	[47.3]	169	[76.1]	162.7	[72.6]	10.7	[3.14]	16.8	[4.92]
				4	[0.25]	12.2	[36.36]	3.4	[10.13]	96.9	[36.1]	122.1	[50.1]	174.2	[79]	170.7	[77.1]	11.3	[3.31]	18.2	[5.33]
300	[510]	1Row 0.06	[15]	0.5	[0.03]	0.3	[0.89]	0.1	[0.30]	82.1	[27.8]	93.4	[34.1]	144	[62.2]	129	[53.9]	8.8	[2.58]	12.5	[3.66]
				1	[0.06]	1	[2.98]	0.3	[0.89]	87.4	[30.8]	104.1	[40.1]	158.4	[70.2]	147.3	[64.1]	10.5	[3.08]	16	[4.69]
		2Row 0.12	[30]	2	[0.12]	3.4	[10.13]	1	[2.68]	91.1	[32.8]	112	[44.4]	167.9	[75.5]	161	[71.7]	11.7	[3.43]	18.5	[5.42]
				4	[0.25]	12.2	[36.36]	3.4	[10.13]	93.4	[34.1]	117.2	[47.3]	173.6	[78.7]	169.6	[76.4]	12.5	[3.66]	20.2	[5.92]
350	[595]	1Row 0.08	[20]	0.5	[0.03]	0.3	[0.89]	0.1	[0.30]	79.5	[26.4]	89.5	[31.9]	142.1	[61.2]	126.6	[52.6]	9.3	[2.72]	13.1	[3.84]
				1	[0.06]	1	[2.98]	0.3	[0.89]	84.6	[29.2]	99.9	[37.7]	157	[69.4]	145.2	[62.9]	11.2	[3.28]	17	[4.98]
		2Row 0.15	[37]	2	[0.12]	3.4	[10.13]	1	[2.68]	88.3	[31.3]	107.8	[42.1]	167	[75]	159.5	[70.8]	12.6	[3.69]	20	[5.86]
				4	[0.25]	12.2	[36.36]	3.4	[10.13]	90.6	[32.6]	113.1	[45.1]	173.1	[78.4]	168.7	[75.9]	13.5	[3.96]	22	[6.45]
400	[680]	1Row 0.10	[25]	0.5	[0.03]	0.3	[0.89]	0.1	[0.30]	77.4	[25.2]	86.4	[30.2]	140.4	[60.2]	124.6	[51.4]	9.7	[2.84]	13.6	[3.98]
				1	[0.06]	1	[2.98]	0.3	[0.89]	82.4	[28]	96.4	[35.8]	155.7	[68.7]	143.3	[61.8]	11.9	[3.49]	17.9	[5.24]
		2Row 0.19	[47]	2	[0.12]	3.4	[10.13]	1	[2.68]	86	[30]	104.3	[40.2]	166.2	[74.6]	158.1	[70.1]	13.4	[3.93]	21.4	[6.27]
				4	[0.25]	12.2	[36.36]	3.4	[10.13]	88.3	[31.3]	109.6	[43.1]	172.6	[78.1]	167.8	[75.4]	14.4	[4.22]	23.7	[6.94]

Model TSS-WC • Size 8

Airflow		Air PD		Water Flow		Water PD				LAT				LWT				Capacity			
CFM	[CMH]	(IN.W.G.) [Pa]		GPM	[L/s]	1 Row (FT.W.G.)	[kPa]	2 Row (FT.W.G.)	[kPa]	1 Row °F	[℃]	2 Row °F	[℃]	1 Row °F	[℃]	2 Row °F	[℃]	1 Row MBH	[kW]	2 Row MBH	[kW]
175	[298]	1Row 0.02	[5.0]	0.5	[0.03]	0.3	[0.89]	0.1	[0.30]	95.7	[35.4]	113.1	[45.1]	148.4	[64.7]	135	[57.2]	7.7	[2.26]	11	[3.22]
				1	[0.06]	1	[2.98]	0.3	[0.89]	101.7	[38.7]	124.5	[51.4]	161.8	[72.1]	153	[67.2]	8.9	[2.61]	13.2	[3.87]
		2Row 0.03	[7.5]	2	[0.12]	3.5	[10.43]	1	[2.98]	105.6	[40.9]	131.9	[55.5]	170.1	[76.7]	165	[73.9]	9.6	[2.81]	14.6	[4.28]
				4	[0.25]	12.7	[37.85]	3.5	[10.43]	107.9	[42.2]	136.2	[57.9]	174.8	[79.3]	172.1	[77.8]	10	[2.93]	15.4	[4.51]
250	[425]	1Row 0.03	[7.5]	0.5	[0.03]	0.3	[0.89]	0.1	[0.30]	88	[31.1]	101.9	[38.8]	143.4	[61.9]	128.2	[53.4]	8.9	[2.61]	12.7	[3.72]
				1	[0.06]	1	[2.98]	0.3	[0.89]	94	[34.4]	113.5	[45.3]	158.4	[70.2]	147.6	[64.2]	10.6	[3.11]	15.8	[4.63]
		2Row 0.06	[15]	2	[0.12]	3.6	[10.73]	1	[2.98]	97.9	[36.6]	121.6	[49.8]	168.1	[75.6]	161.5	[71.9]	11.6	[3.4]	18	[5.27]
				4	[0.25]	12.7	[37.85]	3.5	[10.43]	100.4	[38]	126.6	[52.6]	173.7	[78.7]	170	[76.7]	12.3	[3.6]	19.4	[5.68]
325	[553]	1Row 0.05	[12.5]	0.5	[0.03]	0.3	[0.89]	0.1	[0.30]	83	[28.3]	94.4	[34.7]	139.7	[59.8]	123.5	[50.8]	9.9	[2.9]	13.9	[4.07]
				1	[0.06]	1	[2.98]	0.3	[0.89]	88.7	[31.5]	105.7	[40.9]	155.7	[68.7]	143.5	[61.9]	11.9	[3.49]	17.9	[5.24]
		2Row 0.10	[25]	2	[0.12]	3.6	[10.73]	1	[2.98]	92.7	[33.7]	114.1	[45.6]	166.4	[74.7]	158.7	[70.4]	13.3	[3.9]	20.8	[6.09]
				4	[0.25]	12.7	[37.85]	3.6	[10.73]	95.2	[35.1]	119.5	[48.6]	172.7	[78.2]	168.3	[75.7]	14.1	[4.13]	22.7	[6.65]
400	[680]	1Row 0.07	[17.5]	0.5	[0.03]	0.3	[0.89]	0.1	[0.30]	79.4	[26.3]	89	[31.7]	136.8	[58.2]	119.9	[48.8]	10.6	[3.11]	14.7	[4.31]
				1	[0.06]	1	[2.98]	0.3	[0.89]	84.9	[29.4]	99.9	[37.7]	153.4	[67.4]	140.2	[60.1]	13	[3.81]	19.5	[5.71]
		2Row 0.14	[35]	2	[0.12]	3.6	[10.73]	1	[2.98]	88.8	[31.6]	108.3	[42.4]	165	[73.9]	156.3	[69.1]	14.7	[4.31]	23.1	[6.77]
				4	[0.25]	12.7	[37.85]	3.6	[10.73]	91.3	[32.9]	113.9	[45.5]	171.9	[77.7]	166.9	[74.9]	15.7	[4.6]	25.5	[7.47]
475	[808]	1Row 0.09	[22.5]	0.5	[0.03]	0.3	[0.89]	0.1	[0.30]	76.7	[24.8]	85	[29.4]	134.4	[56.9]	117.1	[47.3]	11.2	[3.28]	15.4	[4.51]
				1	[0.06]	1	[2.98]	0.3	[0.89]	82	[27.8]	95.4	[35.2]	151.6	[66.4]	137.6	[58.7]	13.9	[4.07]	20.8	[6.09]
		2Row 0.19	[47.5]	2	[0.12]	3.6	[10.73]	1	[2.98]	85.8	[29.9]	103.7	[39.8]	163.7	[73.2]	154.3	[67.9]	15.9	[4.66]	25.1	[7.35]
				4	[0.25]	12.7	[37.85]	3.6	[10.73]	88.3	[31.3]	109.4	[43]	171.2	[77.3]	165.6	[74.2]	17.1	[5.01]	28	[8.2]
550	[935]	1Row 0.12	[30]	0.5	[0.03]	0.3	[0.89]	0.1	[0.30]	74.6	[23.7]	81.9	[27.7]	132.4	[55.8]	114.9	[46.1]	11.7	[3.43]	16	[4.69]
				1	[0.06]	1	[2.98]	0.3	[0.89]	79.6	[26.4]	91.7	[33.2]	149.9	[65.5]	135.3	[57.4]	14.7	[4.31]	21.9	[6.42]
		2Row 0.25	[62.5]	2	[0.12]	3.6	[10.73]	1	[2.98]	83.4	[28.6]	100	[37.8]	162.6	[72.6]	152.6	[67]	16.9	[4.95]	26.8	[7.85]
				4	[0.25]	12.7	[37.85]	3.6	[10.73]	85.8	[29.9]	105.7	[40.9]	170.6	[77]	164.5	[73.6]	18.4	[5.39]	30.2	[8.85]
625	[1063]	1Row 0.15	[37.5]	0.5	[0.03]	0.3	[0.89]	0.1	[0.30]	72.9	[22.7]	79.3	[26.3]	130.6	[54.8]	113	[45]	12.1	[3.55]	16.5	[4.83]
				1	[0.06]	1	[2.98]	0.3	[0.89]	77.7	[25.4]	88.7	[31.5]	148.5	[64.7]	133.4	[56.3]	15.4	[4.51]	22.8	[6.68]
		2Row 0.31	[77.5]	2	[0.12]	3.6	[10.73]	1	[2.98]	81.4	[27.4]	96.8	[36]	161.7	[72.1]	151	[66.1]	17.9	[5.24]	28.3	[8.29]
				4	[0.25]	12.7	[37.85]	3.6	[10.73]	83.8	[28.8]	102.5	[39.2]	170	[76.7]	163.5	[73.1]	19.5	[5.71]	32.2	[9.43]
700	[1190]	1Row 0.19	[47.5]	0.5	[0.03]	0.3	[0.89]	0.1	[0.30]	71.4	[21.9]	77.2	[25.1]	129.1	[53.9]	111.4	[44.1]	12.5	[3.66]	16.9	[4.95]
				1	[0.06]	1	[2.98]	0.3	[0.89]	76.1	[24.5]	86.2	[30.1]	147.3	[64.1]	131.7	[55.4]	16	[4.69]	23.7	[6.94]
		2Row 0.38	[95]	2	[0.12]	3.6	[10.73]	1	[2.98]	79.7	[26.5]	94.1	[34.5]	160.8	[71.6]	149.7	[65.4]	18.7	[5.48]	29.6	[8.67]
				4	[0.25]	12.7	[37.85]	3.6	[10.73]	82.1	[27.8]	99.8	[37.7]	169.5	[76.4]	162.6	[72.6]	20.5	[6.01]	34	[9.96]

Data is based on 180°F[82.2℃] entering water and 55°F[12.7℃] entering air at sea level. See selection procedure for other conditions.

Model TSS-WC • Size 10

Airflow		Air PD		Water Flow		Water PD				LAT				LWT				Capacity			
CFM	[CMH]	(IN.W.G.) [Pa]		GPM	[L/s]	1 Row (FT.W.G.)	[kPa]	2 Row (FT.W.G.)	[kPa]	1 Row °F	[℃]	2 Row °F	[℃]	1 Row °F	[℃]	2 Row °F	[℃]	1 Row MBH	[kW]	2 Row MBH	[kW]
300	[510]	1Row 0.02	[5.0]	0.5	[0.03]	0.3	[0.89]	0.1	[0.30]	89.6	[32]	103	[39.4]	134.1	[56.7]	116.4	[46.9]	11.2	[3.28]	15.6	[4.57]
				1	[0.06]	1.2	[3.58]	0.3	[0.89]	96.5	[35.8]	116.2	[46.8]	152.4	[66.9]	139.4	[59.7]	13.5	[3.96]	19.9	[5.83]
		2Row 0.04	[10.0]	2	[0.12]	4.2	[12.52]	1.2	[3.58]	101.1	[38.4]	125.3	[51.8]	164.6	[73.7]	156.6	[69.2]	15	[4.4]	22.9	[6.71]
				4	[0.25]	14.9	[44.40]	4.2	[12.52]	103.9	[39.9]	130.9	[54.9]	171.8	[77.7]	167.3	[75.2]	15.9	[4.66]	24.7	[7.24]
400	[680]	1Row 0.04	[10.0]	0.5	[0.03]	0.3	[0.89]	0.1	[0.30]	83.8	[28.8]	94.5	[34.7]	129.1	[53.9]	110.4	[43.6]	12.5	[3.66]	17.1	[5.01]
				1	[0.06]	1.2	[3.58]	0.3	[0.89]	90.4	[32.4]	107.3	[41.8]	148.6	[64.8]	133.7	[56.5]	15.4	[4.51]	22.7	[6.65]
		2Row 0.07	[17.4]	2	[0.12]	4.2	[12.52]	1.2	[3.58]	95.1	[35.1]	116.9	[47.2]	162.2	[72.3]	152.5	[66.9]	17.4	[5.1]	26.8	[7.85]
				4	[0.25]	14.9	[44.40]	4.2	[12.52]	98	[36.7]	123	[50.6]	170.4	[76.9]	164.9	[73.8]	18.6	[5.45]	29.5	[8.64]
500	[850]	1Row 0.05	[12.4]	0.5	[0.03]	0.3	[0.89]	0.1	[0.30]	79.8	[26.6]	88.6	[31.4]	125.2	[51.8]	106	[41.1]	13.4	[3.93]	18.2	[5.33]
				1	[0.06]	1.2	[3.58]	0.3	[0.89]	86.1	[30.1]	100.8	[38.2]	145.5	[63.1]	129.4	[54.1]	16.9	[4.95]	24.8	[7.27]
		2Row 0.11	[27.4]	2	[0.12]	4.2	[12.52]	1.2	[3.58]	90.7	[32.6]	110.5	[43.6]	160.2	[71.2]	149.3	[65.2]	19.3	[5.65]	30	[8.79]
				4	[0.25]	14.9	[44.40]	4.2	[12.52]	93.6	[34.2]	116.9	[47.2]	169.3	[76.3]	162.8	[72.7]	20.9	[6.12]	33.5	[9.82]
600	[1020]	1Row 0.07	[17.4]	0.5	[0.03]	0.3	[0.89]	0.1	[0.30]	76.8	[24.9]	84.2	[29]	122.2	[50.1]	102.8	[39.3]	14.2	[4.16]	19	[5.57]
				1	[0.06]	1.2	[3.58]	0.3	[0.89]	82.9	[28.3]	95.8	[35.4]	143	[61.7]	125.9	[52.2]	18.1	[5.3]	26.5	[7.76]
		2Row 0.15	[37.3]	2	[0.12]	4.2	[12.52]	1.2	[3.58]	87.4	[30.8]	105.4	[40.8]	158.4	[70.2]	146.5	[63.6]	21	[6.15]	32.7	[9.58]
				4	[0.25]	14.9	[44.40]	4.2	[12.52]	90.3	[32.4]	111.9	[44.4]	168.2	[75.7]	161	[71.7]	22.9	[6.71]	37	[10.84]
700	[1190]	1Row 0.10	[24.9]	0.5	[0.03]	0.3	[0.89]	0.1	[0.30]	74.5	[23.6]	80.9	[27.2]	119.7	[48.7]	100.2	[37.9]	14.8	[4.34]	19.6	[5.74]
				1	[0.06]	1.2	[3.58]	0.3	[0.89]	80.3	[26.8]	91.8	[33.2]	140.8	[60.4]	123.1	[50.6]	19.2	[5.63]	27.9	[8.17]
		2Row 0.19	[47.3]	2	[0.12]	4.2	[12.52]	1.2	[3.58]	84.7	[29.3]	101.2	[38.4]	156.9	[69.4]	144.1	[62.3]	22.5	[6.59]	35.1	[10.28]
				4	[0.25]	15	[44.70]	4.2	[12.52]	87.6	[30.9]	107.9	[42.2]	167.3	[75.2]	159.4	[70.8]	24.7	[7.24]	40.1	[11.75]
800	[1360]	1Row 0.12	[29.9]	0.5	[0.03]	0.3	[0.89]	0.1	[0.30]	72.7	[22.6]	78.3	[25.7]	117.6	[47.6]	98.1	[36.7]	15.3	[4.48]	20.2	[5.92]
				1	[0.06]	1.2	[3.58]	0.3	[0.89]	78.2	[25.7]	88.6	[31.4]	138.9	[59.4]	120.7	[49.3]	20.1	[5.89]	29.1	[8.53]
		2Row 0.25	[62.2]	2	[0.12]	4.2	[12.52]	1.2	[3.58]	82.5	[28.1]	97.8	[36.6]	155.6	[68.7]	142.1	[61.2]	23.8	[6.97]	37.1	[10.87]
				4	[0.25]	15	[44.70]	4.2	[12.52]	85.3	[29.6]	104.4	[40.2]	166.5	[74.7]	158	[70]	26.3	[7.71]	42.8	[12.54]
900	[1530]	1Row 0.15	[37.3]	0.5	[0.03]	0.3	[0.89]	0.1	[0.30]	71.2	[21.8]	76.1	[24.5]	115.7	[46.5]	96.4	[35.8]	15.8	[4.63]	20.6	[6.04]
				1	[0.06]	1.2	[3.58]	0.3	[0.89]	76.5	[24.7]	85.9	[29.9]	137.3	[58.5]	118.6	[48.1]	20.9	[6.12]	30.1	[8.82]
		2Row 0.30	[74.7]	2	[0.12]	4.2	[12.52]	1.2	[3.58]	80.6	[27]	94.9	[34.9]	154.4	[68]	140.3	[60.2]	25	[7.33]	38.9	[11.4]
				4	[0.25]	15	[44.70]	4.2	[12.52]	83.4	[28.6]	101.5	[38.6]	165.8	[74.3]	156.8	[69.3]	27.7	[8.12]	45.3	[13.27]
1000	[1700]	1Row 0.18	[44.8]	0.5	[0.03]	0.3	[0.89]	0.1	[0.30]	69.9	[21.1]	74.4	[23.6]	114.2	[45.7]	94.9	[34.9]	16.2	[4.75]	21	[6.15]
				1	[0.06]	1.2	[3.58]	0.3	[0.89]	75	[23.9]	83.6	[28.7]	135.8	[57.7]	116.8	[47.1]	21.6	[6.33]	31	[9.08]
		2Row 0.37	[92.1]	2	[0.12]	4.2	[12.52]	1.2	[3.58]	79.1	[26.2]	92.4	[33.6]	153.3	[67.4]	138.7	[59.3]	26.1	[7.65]	40.5	[11.87]
				4	[0.25]	15	[44.70]	4.2	[12.52]	81.8	[27.7]	98.9	[37.2]	165.1	[73.9]	155.6	[68.7]	29.1	[8.53]	47.6	[13.95]

Model TSS-WC • Size 12

Airflow		Air PD		Water Flow		Water PD				LAT				LWT				Capacity			
CFM	[CMH]	(IN.W.G.) [Pa]		GPM	[L/s]	1 Row (FT.W.G.)	[kPa]	2 Row (FT.W.G.)	[kPa]	1 Row °F	[℃]	2 Row °F	[℃]	1 Row °F	[℃]	2 Row °F	[℃]	1 Row MBH	[kW]	2 Row MBH	[kW]
400	[680]	1Row 0.02	[5.0]	0.5	[0.03]	0.4	[1.19]	0.1	[0.30]	87.5	[30.8]	98.9	[37.2]	122.5	[50.3]	102.7	[39.3]	14.1	[4.13]	19	[5.57]
				1	[0.06]	1.4	[4.17]	0.4	[1.19]	95.3	[35.2]	113.5	[45.3]	144.3	[62.4]	128.3	[53.5]	17.4	[5.1]	25.3	[7.41]
		2Row 0.04	[10.0]	2	[0.12]	4.9	[14.60]	1.4	[4.17]	100.6	[38.1]	124	[51.1]	159.7	[70.9]	149.4	[65.2]	19.8	[5.8]	29.9	[8.76]
				4	[0.25]	17.4	[51.85]	4.9	[14.60]	103.9	[39.9]	130.5	[54.7]	169.1	[76.2]	163.2	[72.9]	21.2	[6.21]	32.7	[9.58]
550	[935]	1Row 0.04	[10.0]	0.5	[0.03]	0.4	[1.19]	0.1	[0.30]	81.3	[27.4]	89.8	[32.1]	116.2	[46.8]	95.8	[35.4]	15.7	[4.6]	20.7	[6.07]
				1	[0.06]	1.4	[4.17]	0.4	[1.19]	88.6	[31.4]	103.5	[39.7]	139.1	[59.5]	121.1	[49.5]	20	[5.86]	28.9	[8.47]
		2Row 0.07	[17.4]	2	[0.12]	4.9	[14.60]	1.4	[4.17]	93.9	[34.4]	114.5	[45.8]	156.2	[69]	143.8	[62.1]	23.2	[6.8]	35.4	[10.37]
				4	[0.25]	17.4	[51.85]	4.9	[14.60]	97.3	[36.3]	121.6	[49.8]	167.1	[75.1]	159.7	[70.9]	25.2	[7.38]	39.7	[11.63]
700	[1190]	1Row 0.05	[12.4]	0.5	[0.03]	0.4	[1.19]	0.1	[0.30]	77.1	[25.1]	83.8	[28.8]	111.7	[44.3]	91.3	[32.9]	16.8	[4.92]	21.9	[6.42]
				1	[0.06]	1.4	[4.17]	0.4	[1.19]	84	[28.9]	96.6	[35.9]	135.1	[57.3]	115.8	[46.6]	22	[6.45]	31.5	[9.23]
		2Row 0.11	[27.4]	2	[0.12]	4.9	[14.60]	1.4	[4.17]	89.2	[31.8]	107.4	[41.9]	153.4	[67.4]	139.4	[59.7]	25.9	[7.59]	39.7	[11.63]
				4	[0.25]	17.4	[51.85]	4.9	[14.60]	92.6	[33.7]	114.9	[46.1]	165.4	[74.1]	156.7	[69.3]	28.5	[8.35]	45.4	[13.3]
850	[1445]	1Row 0.08	[19.9]	0.5	[0.03]	0.4	[1.19]	0.1	[0.30]	74.2	[23.4]	79.6	[26.4]	108.2	[42.3]	88.1	[31.2]	17.7	[5.19]	22.7	[6.65]
				1	[0.06]	1.4	[4.17]	0.4	[1.19]	80.6	[27]	91.4	[33]	131.8	[55.4]	111.8	[44.3]	23.6	[6.91]	33.5	[9.82]
		2Row 0.16	[39.8]	2	[0.12]	5	[14.90]	1.4	[4.17]	85.7	[29.8]	102	[38.9]	151.1	[66.2]	135.8	[57.7]	28.3	[8.29]	43.3	[12.69]
				4	[0.25]	17.5	[52.15]	5	[14.90]	89	[31.7]	109.6	[43.1]	163.9	[73.3]	154.3	[67.9]	31.3	[9.17]	50.3	[14.74]
1000	[1700]	1Row 0.10	[24.9]	0.5	[0.03]	0.4	[1.19]	0.1	[0.30]	71.9	[22.2]	76.5	[24.7]	105.4	[40.8]	85.6	[29.8]	18.4	[5.39]	23.3	[6.83]
				1	[0.06]	1.4	[4.17]	0.4	[1.19]	78	[25.6]	87.4	[30.8]	129.1	[53.9]	108.6	[42.6]	24.9	[7.3]	35.1	[10.28]
		2Row 0.21	[52.3]	2	[0.12]	5	[14.90]	1.4	[4.17]	82.9	[28.3]	97.7	[36.5]	149	[65]	132.8	[56]	30.2	[8.85]	46.2	[13.54]
				4	[0.25]	17.5	[52.15]	5	[14.90]	86.2	[30.1]	105.3	[40.7]	162.6	[72.6]	152.1	[66.7]	33.8	[9.9]	54.5	[15.97]
1150	[1955]	1Row 0.10	[32.3]	0.5	[0.03]	0.4	[1.19]	0.1	[0.30]	70.2	[21.2]	74.1	[23.4]	103.1	[39.5]	83.7	[28.7]	18.9	[5.54]	23.8	[6.97]
				1	[0.06]	1.4	[4.17]	0.4	[1.19]	75.9	[24.4]	84.3	[29.1]	126.8	[52.7]	105.9	[41.1]	26.1	[7.65]	36.4	[10.67]
		2Row 0.27	[67.2]	2	[0.12]	5	[14.90]	1.4	[4.17]	80.7	[27.1]	94.2	[34.6]	147.3	[64.1]	130.2	[54.6]	32	[9.38]	48.8	[14.3]
				4	[0.25]	17.5	[52.15]	5	[14.90]	83.9	[28.8]	101.7	[38.7]	161.5	[71.9]	150.2	[65.7]	36.1	[10.58]	58.2	[17.05]
1300	[2210]	1Row 0.17	[42.3]	0.5	[0.03]	0.4	[1.19]	0.1	[0.30]	68.8	[20.4]	72.2	[22.3]	101.1	[38.4]	82.1	[27.8]	19.4	[5.68]	24.2	[7.09]
				1	[0.06]	1.4	[4.17]	0.4	[1.19]	74.2	[23.4]	81.7	[27.6]	124.8	[51.6]	103.7	[39.8]	27.1	[7.94]	37.5	[10.99]
		2Row 0.33	[82.1]	2	[0.12]	5	[14.90]	1.4	[4.17]	78.8	[26]	91.2	[32.9]	145.7	[63.2]	128	[53.3]	33.5	[9.82]	51	[14.94]
				4	[0.25]	17.5	[52.15]	5	[14.90]	82	[27.8]	98.7	[37.1]	160.5	[71.4]	148.5	[64.7]	38.1	[11.16]	61.5	[18.02]
1450	[2465]	1Row 0.20	[49.8]	0.5	[0.03]	0.4	[1.19]	0.1	[0.30]	67.6	[19.8]	70.6	[21.4]	99.5	[37.5]	80.8	[27.1]	19.8	[5.8]	24.5	[7.18]
				1	[0.06]	1.4	[4.17]	0.4	[1.19]	72.8	[22.7]	79.5	[26.4]	123.1	[50.6]	101.8	[38.8]	27.9	[8.17]	38.5	[11.28]
		2Row 0.40	[99.5]	2	[0.12]	5	[14.90]	1.4	[4.17]	77.2	[25.1]	88.7	[31.5]	144.3	[62.4]	126.1	[52.3]	34.9	[10.23]	52.9	[15.5]
				4	[0.25]	17.5	[52.15]	5	[14.90]	80.4	[26.9]	96.1	[35.6]	159.6	[70.9]	147	[63.9]	39.9	[11.69]	64.5	[18.9]

Data is based on 180°F[82.2℃] entering water and 55°F[12.7℃] entering air at sea level. See selection procedure for other conditions.

Hot Water Coil Data

Model TSS-WC • Size 14

Airflow		Air PD		Water Flow		Water PD				LAT				LWT				Capacity			
CFM	[CMH]	(IN.W.G.) [Pa]		GPM	[L/s]	1 Row (FT.W.G.) [kPa]		2 Row (FT.W.G.) [kPa]		1 Row °F [℃]		2 Row °F [℃]		1 Row °F [℃]		2 Row °F [℃]		1 Row MBH	[kW]	2 Row MBH	[kW]
700	[1190]	1Row 0.03	[7.5]	0.5	[0.03]	0.5	[1.49]	0.1	[0.30]	80.2	[26.8]	87	[30.6]	102.4	[39.1]	81.8	[27.7]	19.1	[5.6]	24.2	[7.09]
				1	[0.06]	1.7	[5.07]	0.5	[1.49]	88.6	[31.4]	102.1	[38.9]	128.1	[53.4]	107.4	[41.9]	25.5	[7.47]	35.7	[10.46]
		2Row 0.06	[14.9]	2	[0.12]	6	[17.88]	1.7	[5.07]	94.9	[34.9]	114.8	[46]	149	[65]	133.7	[56.5]	30.3	[8.88]	45.4	[13.3]
				4	[0.25]	21	[62.58]	6	[17.88]	99.1	[37.3]	123.3	[50.7]	162.9	[72.7]	153.5	[67.5]	33.4	[9.79]	51.8	[15.18]
900	[1530]	1Row 0.04	[10.0]	0.5	[0.03]	0.5	[1.49]	0.1	[0.30]	75.9	[24.4]	81	[27.2]	97.3	[36.3]	77.5	[25.3]	20.4	[5.98]	25.3	[7.41]
				1	[0.06]	1.7	[5.07]	0.5	[1.49]	83.7	[28.7]	94.7	[34.8]	123.1	[50.6]	101.4	[38.6]	27.9	[8.17]	38.7	[11.34]
		2Row 0.09	[22.4]	2	[0.12]	6	[17.88]	1.7	[5.07]	89.9	[32.2]	107.2	[41.8]	145.2	[62.9]	128.1	[53.4]	34	[9.96]	50.9	[14.91]
				4	[0.25]	21.1	[62.88]	6	[17.88]	94	[34.4]	116.1	[46.7]	160.5	[71.4]	149.5	[65.3]	38	[11.13]	59.6	[17.46]
1100	[1870	1Row 0.06	[14.9]	0.5	[0.03]	0.5	[1.49]	0.1	[0.30]	72.9	[22.7]	76.9	[24.9]	93.5	[34.2]	74.6	[23.7]	21.3	[6.24]	26	[7.62]
				1	[0.06]	1.7	[5.07]	0.5	[1.49]	80.1	[26.7]	89.3	[31.8]	119.1	[48.4]	97	[36.1]	29.9	[8.76]	40.9	[11.98]
		2Row 0.13	[32.3]	2	[0.12]	6.1	[18.18]	1.7	[5.07]	86.1	[30.1]	101.4	[38.6]	142.1	[61.2]	123.6	[50.9]	37	[10.84]	55.3	[16.2]
				4	[0.25]	21.1	[62.88]	6	[17.88]	90.2	[32.3]	110.5	[43.6]	158.5	[70.3]	146.2	[63.4]	41.9	[12.28]	66.1	[19.37]
1300	[2210]	1Row 0.08	[19.9]	0.5	[0.03]	0.5	[1.49]	0.1	[0.30]	70.6	[21.4]	73.9	[23.3]	90.6	[32.6]	72.5	[22.5]	22	[6.45]	26.6	[7.79]
				1	[0.06]	1.7	[5.07]	0.5	[1.49]	77.4	[25.2]	85.3	[29.6]	115.8	[46.6]	93.6	[34.2]	31.5	[9.23]	42.6	[12.48]
		2Row 0.17	[42.3]	2	[0.12]	6.1	[18.18]	1.7	[5.07]	83.1	[28.4]	96.9	[36.1]	139.5	[59.7]	120	[48.9]	39.6	[11.6]	58.9	[17.26]
				4	[0.25]	21.1	[62.88]	6	[17.88]	87.2	[30.7]	105.9	[41.1]	156.8	[69.3]	143.4	[61.9]	45.3	[13.27]	71.7	[21.01]
1500	[2550]	1Row 0.11	[27.4]	0.5	[0.03]	0.5	[1.49]	0.1	[0.30]	68.9	[20.5]	71.6	[22]	88.3	[31.3]	70.9	[21.6]	22.6	[6.62]	27	[7.91]
				1	[0.06]	1.8	[5.36]	0.5	[1.49]	75.2	[24]	82.1	[27.8]	113.1	[45.1]	90.8	[32.7]	32.9	[9.64]	44	[12.89]
		2Row 0.22	[54.7]	2	[0.12]	6.1	[18.18]	1.8	[5.36]	80.8	[27.1]	93.2	[34]	137.2	[58.4]	116.9	[47.2]	41.9	[12.28]	62	[18.17]
				4	[0.25]	21.2	[63.18]	6.1	[18.18]	84.7	[29.3]	102.1	[38.9]	155.2	[68.4]	140.9	[60.5]	48.3	[14.15]	76.5	[22.41]
1700	[2890]	1Row 0.14	[34.8]	0.5	[0.03]	0.5	[1.49]	0.1	[0.30]	67.5	[19.7]	69.8	[21]	86.3	[30.2]	69.6	[20.9]	23.1	[6.77]	27.3	[8]
				1	[0.06]	1.8	[5.36]	0.5	[1.49]	73.5	[23.1]	79.5	[26.4]	110.8	[43.8]	88.6	[31.4]	34	[9.96]	45.1	[13.21]
		2Row 0.27	[67.2]	2	[0.12]	6.1	[18.18]	1.8	[5.36]	78.8	[26]	90.1	[32.3]	135.2	[57.3]	114.3	[45.7]	43.9	[12.86]	64.6	[18.93]
				4	[0.25]	21.2	[63.18]	6.1	[18.18]	82.7	[28.2]	98.9	[37.2]	153.9	[67.7]	138.7	[59.3]	51	[14.94]	80.8	[23.67]
1900	[3230]	1Row 0.17	[42.3]	0.5	[0.03]	0.5	[1.49]	0.1	[0.30]	66.4	[19.1]	68.4	[20.2]	84.7	[29.3]	68.6	[20.3]	23.5	[6.89]	27.5	[8.06]
				1	[0.06]	1.8	[5.36]	0.5	[1.49]	72	[22.2]	77.4	[25.2]	108.8	[42.7]	86.7	[30.4]	35	[10.26]	46	[13.48]
		2Row 0.33	[82.1]	2	[0.12]	6.1	[18.18]	1.8	[5.36]	77.2	[25.1]	87.5	[30.8]	133.4	[56.3]	112	[44.4]	45.6	[13.36]	66.9	[19.6]
				4	[0.25]	21.2	[63.18]	6.1	[18.18]	81	[27.2]	96.1	[35.6]	152.6	[67]	136.8	[58.2]	53.5	[15.68]	84.7	[24.82]
2100	[3570]	1Row 0.20	[49.8]	0.5	[0.03]	0.5	[1.49]	0.1	[0.30]	65.5	[18.6]	67.2	[19.6]	83.3	[28.5]	67.8	[19.9]	23.9	[7]	27.8	[8.15]
				1	[0.06]	1.8	[5.36]	0.5	[1.49]	70.8	[21.6]	75.6	[24.2]	107	[41.7]	85.1	[29.5]	35.9	[10.52]	46.8	[13.71]
		2Row 0.40	[99.5]	2	[0.12]	6.1	[18.18]	1.8	[5.36]	75.8	[24.3]	85.3	[29.6]	131.8	[55.4]	110	[43.3]	47.2	[13.83]	68.8	[20.16]
				4	[0.25]	21.2	[63.18]	6.1	[18.18]	79.5	[26.4]	93.7	[34.3]	151.5	[66.4]	135	[57.2]	55.7	[16.32]	88.1	[25.81]

Model TSS-WC • Size 16

Airflow		Air PD		Water Flow		Water PD				LAT				LWT				Capacity			
CFM	[CMH]	(IN.W.G.) [Pa]		GPM	[L/s]	1 Row (FT.W.G.) [kPa]		2 Row (FT.W.G.) [kPa]		1 Row °F [℃]		2 Row °F [℃]		1 Row °F [℃]		2 Row °F [℃]		1 Row MBH	[kW]	2 Row MBH	[kW]
1600	[2720]	1Row 0.09	[22.4]	0.5	[0.03]	0.6	[1.79]	0.1	[0.30]	68.9	[20.5]	71.2	[21.8]	82.5	[28.1]	66.6	[19.2]	24.1	[7.06]	28.1	[8.23]
				1	[0.06]	1.9	[5.66]	0.6	[1.79]	75.6	[24.2]	82.1	[27.8]	107.4	[41.9]	85	[29.4]	35.7	[10.46]	46.9	[13.74]
		2Row 0.18	[44.8]	2	[0.12]	6.6	[19.67]	1.9	[5.66]	81.7	[27.6]	94	[34.4]	132.8	[56]	111.3	[44.1]	46.3	[13.57]	67.5	[19.78]
				4	[0.25]	22.9	[68.24]	6.6	[19.67]	86.1	[30.1]	103.7	[39.8]	152.4	[66.9]	136.9	[58.3]	53.9	[15.79]	84.4	[24.73]
1800	[3060]	1Row 0.11	[27.4]	0.5	[0.03]	0.6	[1.79]	0.1	[0.30]	67.6	[19.8]	69.5	[20.8]	80.7	[27.1]	65.5	[18.6]	24.5	[7.18]	28.3	[8.29]
				1	[0.06]	1.9	[5.66]	0.6	[1.79]	73.9	[23.3]	79.6	[26.4]	105.1	[40.6]	82.9	[28.3]	36.9	[10.81]	47.9	[14.03]
		2Row 0.22	[54.7]	2	[0.12]	6.6	[19.67]	1.9	[5.66]	79.8	[26.6]	91	[32.8]	130.7	[54.8]	108.7	[42.6]	48.3	[14.15]	70.1	[20.54]
				4	[0.25]	22.9	[68.24]	6.6	[19.67]	84.1	[28.9]	100.6	[38.1]	150.9	[66.1]	134.6	[57]	56.8	[16.64]	88.9	[26.05]
2000	[3400]	1Row 0.13	[32.3]	0.5	[0.03]	0.6	[1.79]	0.1	[0.30]	66.5	[19.2]	68.2	[20.1]	79.2	[26.2]	64.7	[18.2]	24.9	[7.3]	28.5	[8.35]
				1	[0.06]	1.9	[5.66]	0.6	[1.79]	72.5	[22.5]	77.5	[25.3]	103.1	[39.5]	81.2	[27.3]	37.9	[11.1]	48.8	[14.3]
		2Row 0.26	[64.7]	2	[0.12]	6.6	[19.67]	1.9	[5.66]	78.1	[25.6]	88.4	[31.3]	128.8	[53.8]	106.4	[41.3]	50.1	[14.68]	72.4	[21.21]
				4	[0.25]	23	[68.54]	6.6	[19.67]	82.4	[28]	97.9	[36.6]	149.6	[65.3]	132.6	[55.9]	59.4	[17.4]	92.9	[27.22]
2200	[3740]	1Row 0.16	[39.8]	0.5	[0.03]	0.6	[1.79]	0.1	[0.30]	65.6	[18.7]	67	[19.4]	78	[25.6]	64	[17.8]	25.2	[7.38]	28.7	[8.41]
				1	[0.06]	1.9	[5.66]	0.6	[1.79]	71.3	[21.8]	75.8	[24.3]	101.3	[38.5]	79.7	[26.5]	38.7	[11.34]	49.5	[14.5]
		2Row 0.31	[77.1]	2	[0.12]	6.6	[19.67]	1.9	[5.66]	76.7	[24.8]	86.2	[30.1]	127.2	[52.9]	104.4	[40.2]	51.8	[15.18]	74.4	[21.8]
				4	[0.25]	23	[68.54]	6.6	[19.67]	80.9	[27.2]	95.5	[35.3]	148.4	[64.7]	130.7	[54.8]	61.8	[18.11]	96.6	[28.3]
2400	[4080]	1Row 0.18	[44.8]	0.5	[0.03]	0.6	[1.79]	0.1	[0.30]	64.8	[18.2]	66.1	[18.9]	76.8	[24.9]	63.4	[17.4]	25.5	[7.47]	28.8	[8.44]
				1	[0.06]	1.9	[5.66]	0.6	[1.79]	70.2	[21.2]	74.3	[23.5]	99.7	[37.6]	78.4	[25.8]	39.5	[11.57]	50.2	[14.71]
		2Row 0.37	[92.1]	2	[0.12]	6.6	[19.67]	1.9	[5.66]	75.5	[24.2]	84.3	[29.1]	125.6	[52]	102.6	[39.2]	53.3	[15.62]	76.2	[22.33]
				4	[0.25]	23	[68.54]	6.6	[19.67]	79.6	[26.4]	93.4	[34.1]	147.3	[64.1]	129.1	[53.9]	64	[18.75]	99.9	[29.27]
2600	[4420]	1Row 0.21	[52.3]	0.5	[0.03]	0.6	[1.79]	0.1	[0.30]	64.1	[17.8]	65.3	[18.5]	75.9	[24.4]	62.9	[17.2]	25.7	[7.53]	29	[8.5]
				1	[0.06]	1.9	[5.66]	0.6	[1.79]	69.3	[20.7]	73	[22.8]	98.3	[36.8]	77.3	[25.2]	40.2	[11.78]	50.7	[14.86]
		2Row 0.42	[104.5]	2	[0.12]	6.6	[19.67]	1.9	[5.66]	74.4	[23.6]	82.6	[28.1]	124.2	[51.2]	101	[38.3]	54.7	[16.03]	77.8	[22.8]
				4	[0.25]	23	[68.54]	6.6	[19.67]	78.4	[25.8]	91.5	[33.1]	146.2	[63.4]	127.5	[53.1]	66	[19.34]	102.9	[30.15]
2800	[4760]	1Row 0.24	[59.7]	0.5	[0.03]	0.6	[1.79]	0.1	[0.30]	63.6	[17.6]	64.6	[18.1]	75	[23.9]	62.5	[16.9]	25.9	[7.59]	29.1	[8.53]
				1	[0.06]	1.9	[5.66]	0.6	[1.79]	68.5	[20.3]	71.9	[22.2]	97	[36.1]	76.3	[24.6]	40.9	[11.98]	51.2	[15]
		2Row 0.48	[119.4]	2	[0.12]	6.7	[19.97]	1.9	[5.66]	73.5	[23.1]	81.1	[27.3]	123	[50.6]	99.6	[37.6]	56	[16.41]	79.2	[23.21]
				4	[0.25]	23	[68.54]	6.6	[19.67]	77.4	[25.2]	89.9	[32.2]	145.2	[62.9]	126.1	[52.3]	67.9	[19.89]	105.7	[30.97]
3000	[5100]	1Row 0.27	[67.2]	0.5	[0.03]	0.6	[1.79]	0.1	[0.30]	63	[17.2]	64	[17.8]	74.2	[23.4]	62.1	[16.7]	26.1	[7.65]	29.2	[8.56]
				1	[0.06]	1.9	[5.66]	0.6	[1.79]	67.8	[19.9]	70.9	[21.6]	95.9	[35.5]	75.4	[24.1]	41.4	[12.13]	51.7	[15.15]
		2Row 0.55	[136.9]	2	[0.12]	6.7	[19.97]	1.9	[5.66]	72.6	[22.6]	79.8	[26.6]	121.8	[49.9]	98.3	[36.8]	57.1	[16.73]	80.5	[23.59]
				4	[0.25]	23.1	[68.84]	6.6	[19.67]	76.5	[24.7]	88.3	[31.3]	144.3	[62.4]	124.8	[51.6]	69.7	[20.42]	108.3	[31.73]

Data is based on 180°F[82.2℃] entering water and 55°F[12.7℃] entering air at sea level. See selection procedure for other conditions.

Model TSS-WC · Size 19

Airflow		Air PD		Water Flow		Water PD				LAT				LWT				Capacity			
CFM	[CMH]	(IN.W.G.) [Pa]		GPM	[L/s]	1 Row (FT.W.G.)	[kPa]	2 Row (FT.W.G.)	[kPa]	1 Row °F	[℃]	2 Row °F	[℃]	1 Row °F	[℃]	2 Row °F	[℃]	1 Row MBH	[kW]	2 Row MBH	[kW]
2300	[3910]	1Row 0.11	[27.4]	0.5	[0.03]	0.6	[1.79]	0.1	[0.3]	65.7	[18.7]	66.9	[19.4]	72.3	[22.4]	60.5	[15.8]	26.6	[7.79]	29.6	[8.67]
				1	[0.06]	2.2	[6.56]	0.6	[1.79]	71.9	[22.2]	76.1	[24.5]	94.6	[34.8]	73.8	[23.2]	42.1	[12.34]	52.5	[15.38]
		2Row 0.23	[57.2]	2	[0.12]	7.4	[22.05]	2.2	[6.56]	78.1	[25.6]	87.5	[30.8]	121.5	[49.7]	97.9	[36.6]	57.4	[16.82]	80.9	[23.7]
				4	[0.25]	25.6	[76.29]	7.4	[22.05]	82.8	[28.2]	97.9	[36.6]	144.5	[62.5]	125.5	[51.9]	69.4	[20.33]	106.9	[31.32]
2600	[4420]	1Row 0.14	[34.8]	0.5	[0.03]	0.6	[1.79]	0.1	[0.3]	64.6	[18.1]	65.6	[18.7]	70.8	[21.6]	59.9	[15.5]	27	[7.91]	29.7	[8.7]
				1	[0.06]	2.2	[6.56]	0.6	[1.79]	70.3	[21.3]	73.9	[23.3]	92.4	[33.6]	72.2	[22.3]	43.2	[12.66]	53.3	[15.62]
		2Row 0.28	[69.7]	2	[0.12]	7.4	[22.05]	2.2	[6.56]	76.2	[24.6]	84.6	[29.2]	119.1	[48.4]	95.3	[35.2]	59.8	[17.52]	83.5	[24.47]
				4	[0.25]	25.7	[76.59]	7.4	[22.05]	80.9	[27.2]	94.8	[34.9]	142.7	[61.5]	122.9	[50.5]	72.9	[21.36]	112	[32.82]
2900	[4930]	1Row 0.17	[42.3]	0.5	[0.03]	0.6	[1.79]	0.1	[0.3]	63.7	[17.6]	64.5	[18.1]	69.7	[20.9]	59.4	[15.2]	27.3	[8]	29.8	[8.73]
				1	[0.06]	2.2	[6.56]	0.6	[1.79]	69.1	[20.6]	72.2	[22.3]	90.4	[32.4]	70.8	[21.6]	44.2	[12.95]	54	[15.82]
		2Row 0.34	[84.6]	2	[0.12]	7.5	[22.35]	2.2	[6.56]	74.7	[23.7]	82.3	[27.9]	117	[47.2]	93	[33.9]	61.8	[18.11]	85.7	[25.11]
				4	[0.25]	25.7	[76.59]	7.4	[22.05]	79.2	[26.2]	92.1	[33.4]	141.1	[60.6]	120.6	[49.2]	76.1	[22.3]	116.6	[34.16]
3200	[5440]	1Row 0.21	[52.3]	0.5	[0.03]	0.6	[1.79]	0.1	[0.3]	62.9	[17.2]	63.6	[17.6]	68.7	[20.4]	59	[15]	27.5	[8.06]	29.9	[8.76]
				1	[0.06]	2.2	[6.56]	0.6	[1.79]	68	[20]	70.7	[21.5]	88.7	[31.5]	69.7	[20.9]	45	[13.19]	54.6	[16]
		2Row 0.41	[102]	2	[0.12]	7.5	[22.35]	2.2	[6.56]	73.4	[23]	80.3	[26.8]	115.2	[46.2]	91.1	[32.8]	63.7	[18.66]	87.6	[25.67]
				4	[0.25]	25.8	[76.88]	7.4	[22.05]	77.8	[25.4]	89.8	[32.1]	139.6	[59.8]	118.5	[48.1]	79	[23.15]	120.7	[35.37]
3500	[5950]	1Row 0.24	[59.7]	0.5	[0.03]	0.6	[1.79]	0.1	[0.3]	62.3	[16.8]	62.9	[17.2]	67.8	[19.9]	58.7	[14.8]	27.7	[8.12]	30	[8.79]
				1	[0.06]	2.2	[6.56]	0.6	[1.79]	67.1	[19.5]	69.5	[20.8]	87.3	[30.7]	68.7	[20.4]	45.7	[13.39]	55	[16.12]
		2Row 0.48	[119.4]	2	[0.12]	7.5	[22.35]	2.2	[6.56]	72.2	[22.3]	78.6	[25.9]	113.5	[45.3]	89.5	[31.9]	65.3	[19.13]	89.3	[26.16]
				4	[0.25]	25.8	[76.88]	7.5	[22.35]	76.6	[24.8]	87.8	[31]	138.3	[59.1]	116.7	[47.1]	81.7	[23.94]	124.4	[36.45]
3800	[6460]	1Row 0.28	[69.7]	0.5	[0.03]	0.6	[1.79]	0.1	[0.3]	61.8	[16.6]	62.3	[16.8]	67.1	[19.5]	58.4	[14.7]	27.9	[8.17]	30.1	[8.82]
				1	[0.06]	2.2	[6.56]	0.6	[1.79]	66.3	[19.1]	68.5	[20.3]	86	[30]	67.9	[19.9]	46.4	[13.6]	55.4	[16.23]
		2Row 0.56	[139.4]	2	[0.12]	7.5	[22.35]	2.2	[6.56]	71.2	[21.8]	77.1	[25.1]	112	[44.4]	88	[31.1]	66.8	[19.57]	90.8	[26.6]
				4	[0.25]	25.8	[76.88]	7.5	[22.35]	75.4	[24.1]	86	[30]	137	[58.3]	115	[46.1]	84.2	[24.67]	127.7	[37.42]
4100	[6970]	1Row 0.32	[79.6]	0.5	[0.03]	0.6	[1.79]	0.1	[0.3]	61.3	[16.3]	61.8	[16.6]	66.5	[19.2]	58.2	[14.6]	28.1	[8.23]	30.2	[8.85]
				1	[0.06]	2.2	[6.56]	0.6	[1.79]	65.6	[18.7]	67.6	[19.8]	84.8	[29.3]	67.2	[19.6]	47	[13.77]	55.8	[16.35]
		2Row 0.64	[159.3]	2	[0.12]	7.5	[22.35]	2.2	[6.56]	70.4	[21.3]	75.7	[24.3]	110.6	[43.7]	86.7	[30.4]	68.2	[19.98]	92.1	[26.99]
				4	[0.25]	25.8	[76.88]	7.5	[22.35]	74.5	[23.6]	84.4	[29.1]	135.8	[57.7]	113.5	[45.3]	86.5	[25.34]	130.7	[38.3]
4400	[7480]	1Row 0.36	[89.6]	0.5	[0.03]	0.6	[1.79]	0.1	[0.3]	60.9	[16.1]	61.3	[16.3]	65.9	[18.8]	58	[14.4]	28.2	[8.26]	30.2	[8.85]
				1	[0.06]	2.2	[6.56]	0.6	[1.79]	65	[18.3]	66.8	[19.3]	83.7	[28.7]	66.6	[19.2]	47.5	[13.92]	56.1	[16.44]
		2Row 0.73	[181.7]	2	[0.12]	7.5	[22.35]	2.2	[6.56]	69.6	[20.9]	74.6	[23.7]	109.4	[43]	85.5	[29.7]	69.5	[20.36]	93.3	[27.34]
				4	[0.25]	25.9	[77.18]	7.5	[22.35]	73.6	[23.1]	83	[28.3]	134.8	[57.1]	112.1	[44.5]	88.6	25.96	133.5	[39.12]

Model TSS-WC · Size 22

Airflow		Air PD		Water Flow		Water PD				LAT				LWT				Capacity			
CFM	[CMH]	(IN.W.G.) [Pa]		GPM	[L/s]	1 Row (FT.W.G.)	[kPa]	2 Row (FT.W.G.)	[kPa]	1 Row °F	[℃]	2 Row °F	[℃]	1 Row °F	[℃]	2 Row °F	[℃]	1 Row MBH	[kW]	2 Row MBH	[kW]
3100	[5270]	1Row 0.16	[39.8]	0.5	[0.03]	0.7	[2.09]	0.1	[0.3]	63.4	[17.4]	64	[17.8]	66.6	[19.2]	58	[14.4]	28	[8.2]	30.2	[8.85]
				1	[0.06]	2.3	[6.85]	0.7	[2.09]	68.8	[20.4]	71.6	[22]	86	[30]	67.6	[19.8]	46.4	[13.6]	55.6	[16.29]
		2Row 0.31	[77.1]	2	[0.12]	8	[23.84]	2.3	[6.85]	74.7	[23.7]	81.9	[27.7]	112.8	[44.9]	88.6	[31.4]	66.1	[19.37]	90.2	[26.43]
				4	[0.25]	27.5	[81.95]	8	[23.84]	79.5	[26.4]	92.2	[33.4]	137.9	[58.8]	116.4	[46.9]	82.4	[24.14]	124.9	[36.6]
3500	[5950]	1Row 0.19	[47.3]	0.5	[0.03]	0.7	[2.09]	0.1	[0.3]	62.5	[16.9]	63	[17.2]	65.5	[18.6]	57.6	[14.2]	28.3	[8.29]	30.3	[8.88]
				1	[0.06]	2.3	[6.85]	0.7	[2.09]	67.5	[19.7]	69.8	[21]	84	[28.9]	66.4	[19.1]	47.4	[13.89]	56.2	[16.47]
		2Row 0.39	[97]	2	[0.12]	8	[23.84]	2.3	[6.85]	73.1	[22.8]	79.4	[26.3]	110.4	[43.6]	86.3	[30.2]	68.4	[20.04]	92.5	[27.1]
				4	[0.25]	27.6	[82.25]	8	[23.84]	77.8	[25.4]	89.3	[31.8]	135.9	[57.7]	113.8	[45.4]	86.3	[25.29]	130.1	[38.12]
3900	[6630]	1Row 0.23	[57.2]	0.5	[0.03]	0.7	[2.09]	0.1	[0.3]	61.8	[16.6]	62.2	[16.8]	64.7	[18.2]	57.4	[14.1]	28.5	[8.35]	30.4	[8.91]
				1	[0.06]	2.3	[6.85]	0.7	[2.09]	66.4	[19.1]	68.4	[20.2]	82.3	[27.9]	65.4	[18.6]	48.2	[14.12]	56.7	[16.61]
		2Row 0.47	[117]	2	[0.12]	8	[23.84]	2.3	[6.85]	71.7	[22.1]	77.4	[25.2]	108.3	[42.4]	84.3	[29.1]	70.5	[20.66]	94.5	[27.69]
				4	[0.25]	27.6	[82.25]	8	[23.84]	76.2	[24.6]	86.9	[30.5]	134.2	[56.8]	111.5	[44.2]	89.7	[26.28]	134.7	[39.47]
4300	[7310]	1Row 0.28	[69.7]	0.5	[0.03]	0.7	[2.09]	0.1	[0.3]	61.2	[16.2]	61.5	[16.4]	63.9	[17.7]	57.1	[13.9]	28.7	[8.41]	30.4	[8.91]
				1	[0.06]	2.3	[6.85]	0.7	[2.09]	65.5	[18.6]	67.3	[19.6]	80.8	[27.1]	64.5	[18.1]	49	[14.36]	57.1	[16.73]
		2Row 0.56	[139.4]	2	[0.12]	8	[23.84]	2.3	[6.85]	70.5	[21.4]	75.6	[24.2]	106.5	[41.4]	82.6	[28.1]	72.3	[21.18]	96.1	[28.16]
				4	[0.25]	27.7	[82.55]	8	[23.84]	74.9	[23.8]	84.8	[29.3]	132.6	[55.9]	109.4	[43]	92.9	[27.22]	138.8	[40.67]
4700	[7990]	1Row 0.33	[82.1]	0.5	[0.03]	0.7	[2.09]	0.1	[0.3]	60.7	[15.9]	61	[16.1]	63.3	[17.4]	56.9	[13.8]	28.9	[8.47]	30.5	[8.94]
				1	[0.06]	2.3	[6.85]	0.7	[2.09]	64.7	[18.2]	66.3	[19.1]	79.6	[26.4]	63.9	[17.7]	49.6	[14.53]	57.5	[16.85]
		2Row 0.66	[164.2]	2	[0.12]	8.1	[24.14]	2.3	[6.85]	69.5	[20.8]	74.2	[23.4]	104.8	[40.4]	81.2	[27.3]	74	[21.68]	97.6	[28.6]
				4	[0.25]	27.7	[82.55]	8	[23.84]	73.8	[23.2]	83	[28.3]	131.2	[55.1]	107.6	[42]	95.7	[28.04]	142.4	[41.72]
5100	[8670]	1Row 0.38	[94.6]	0.5	[0.03]	0.7	[2.09]	0.1	[0.3]	60.2	[15.7]	60.5	[15.8]	62.8	[17.1]	56.8	[13.8]	29	[8.5]	30.5	[8.94]
				1	[0.06]	2.3	[6.85]	0.7	[2.09]	64.1	[17.8]	65.5	[18.6]	78.4	[25.8]	63.3	[17.4]	50.2	[14.71]	57.8	[16.94]
		2Row 0.76	[189.1]	2	[0.12]	8.1	[24.14]	2.3	[6.85]	68.7	[20.4]	72.9	[22.7]	103.4	[39.7]	79.9	[26.6]	75.4	[22.09]	98.8	[28.95]
				4	[0.25]	27.7	[82.55]	8	[23.84]	72.8	[22.7]	81.4	[27.4]	129.8	[54.3]	106	[41.1]	98.4	[28.83]	145.7	[42.69]
5500	[9350]	1Row 0.43	[107]	0.5	[0.03]	0.7	[2.09]	0.1	[0.3]	59.9	[15.5]	60.1	[15.6]	62.3	[16.8]	56.7	[13.7]	29.1	[8.53]	30.5	[8.94]
				1	[0.06]	2.3	[6.85]	0.7	[2.09]	63.5	[17.5]	64.7	[18.2]	77.5	[25.3]	62.8	[17.1]	50.7	[14.86]	58	[16.99]
		2Row 0.87	[216.5]	2	[0.12]	8.1	[24.14]	2.3	[6.85]	67.9	[19.9]	71.8	[22.1]	102	[38.9]	78.8	[26]	76.8	[22.5]	100	[29.3]
				4	[0.25]	27.7	[82.55]	8.1	[24.14]	71.9	[22.2]	80	[26.7]	128.6	[53.7]	104.5	[40.3]	100.8	[29.53]	148.7	[43.57]
5900	[10030]	1Row 0.49	[121.9]	0.5	[0.03]	0.7	[2.09]	0.1	[0.3]	59.6	[15.3]	59.8	[15.4]	62	[16.7]	56.6	[13.7]	29.2	[8.56]	30.6	[8.97]
				1	[0.06]	2.3	[6.85]	0.7	[2.09]	63	[17.2]	64.1	[17.8]	76.6	[24.8]	62.3	[16.8]	51.1	[14.97]	58.2	[17.05]
		2Row 0.99	[246.4]	2	[0.12]	8.1	[24.14]	2.3	[6.85]	67.2	[19.6]	70.8	[21.6]	100.8	[38.2]	77.8	[25.4]	78	[22.85]	101	[29.59]
				4	[0.25]	27.8	[82.84]	8.1	[24.14]	71.1	[21.7]	78.7	[25.9]	127.5	[53.1]	103.1	[39.5]	103	[30.18]	151.4	[44.36]

Data is based on 180°F[82.2℃] entering water and 55°F[12.7℃] entering air at sea level. See selection procedure for other conditions.

Electric Heat

Model TSS-EH

Standard Features

- Single point power connection
- Primary manual-reset high limit
- Fusing
- Wiring diagram
- Available kW increments are as follows:
  - 0.5 to 2 kW - 0.5kW
  - 2 to 6 kW - 1kW
  - Above 6 kW - 2kW

Selection Procedure

With standard heater elements, the maximum capacity (kW) is obtained by dividing the heating (minimum) CFM by 70[CMH by 120]. In other words, the terminal must have at least 70 CFM[120 CMH] per kW.
In addition, each size terminal has a maximum allowable kW based upon the specific heater element configuration (i.e. voltage, phase, number of steps, etc.). Contact your local representative or refer to the VAV computer selection program for design assistance. Heaters require a minimum of 0.07" w.g. [17Pa]downstream static pressure to ensure proper operation.

Electric Heating	**Heating Element**	**Electric Heating**							
	Unit Size	4~6"	8"	10"	12"	14"	16"	19	22
	Total Power	0.5~5.0kW	0.5~6.0kW	0.5~8.0kW	0.5~8.0kW	0.5~10.0kW	0.5~10.0kW	0.5~10.0kW	0.5~10.0kW
	Series	1 or 2	1 or 2 or 3	1 or 2 or 3	1 or 2 or 3	1 or 2 or 3	1 or 2 or 3	1 or 2 or 3	1 or 2 or 3

Selection Equations

$$kW = \frac{CFM \times \Delta T \times 1.085^*}{3413}$$

$$CFM = \frac{kW \times 3413}{\Delta T \times 1.085^*}$$

$$\Delta T = \frac{kW \times 3413}{CFM \times 1.085^*}$$

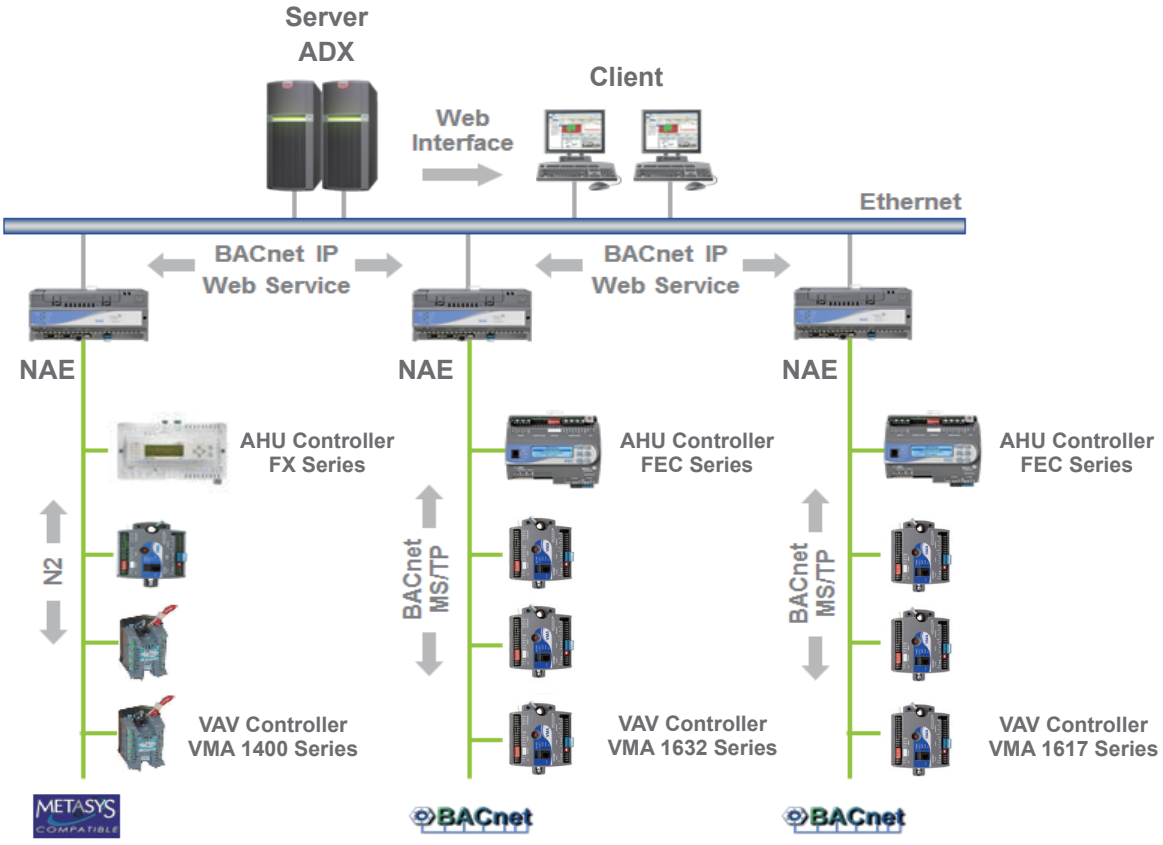
* Air density at sea level - reduce by 0.036 for each 1000 feet of altitude above sea level.

Electric Heater Pressure Drop

Airflow		**Static Pressure Drop △Ps(inches w.g.)[Pa]**															
CFM	**[CMH]**	**size4,5,6**		**size8**		**size10**		**size12**		**size14**		**size16**		**size19**		**size22**	
100	**[180]**	0.022	[5.6]	\	\	\	\	\	\	\		\	\	\	\	\	\
150	**[270]**	0.05	[12.5]	\	\	\	\	\	\	\		\	\	\	\	\	\
200	**[360]**	0.088	[22.1]	0.018	[4.5]	\	\	\	\	\		\	\	\	\	\	\
250	**[450]**	0.138	[34.4]	0.028	[7]	\	\	\	\	\		\	\	\	\	\	\
300	**[540]**	0.199	[49.9]	0.041	[10.2]	0.011	[2.8]	\	\	\		\	\	\	\	\	\
400	**[720]**	0.353	[88.3]	0.072	[18.1]	0.02	[5]	\	\	\		\	\	\	\	\	\
500	**[900]**	0.538	[134.7]	0.112	[28.1]	0.031	[7.8]	0.014	[3.4]	\		\	\	\	\	\	\
600	**[1080]**	\	\	0.162	[40.5]	0.045	[11.2]	0.019	[4.9]	\		\	\	\	\	\	\
700	**[1260]**	\	\	0.22	[55]	0.061	[15.3]	0.027	[6.7]	0.011	[2.8]	\	\	\	\	\	\
800	**[1440]**	\	\	0.287	[71.8]	0.079	[19.9]	0.035	[8.8]	0.014	[3.6]	\	\	\	\	\	\
900	**[1620]**	\	\	0.363	[90.8]	0.101	[25.2]	0.044	[11.1]	0.018	[4.5]	\	\	\	\	\	\
1000	**[1800]**	\	\	0.443	[110.8]	0.127	[31.8]	0.056	[14]	0.023	[5.7]	0.013	[3.2]	\	\	\	\
1500	**[2520]**	\	\	\	\	0.244	[61.1]	0.107	[26.7]	0.044	[10.9]	0.024	[6.1]	\	\	\	\
2000	**[3240]**	\	\	\	\	\	\	0.179	[44.7]	0.071	[17.8]	0.039	[9.9]	0.092	[2.3]	\	\
2500	**[4320]**	\	\	\	\	\	\	\	\	0.129	[32.3]	0.072	[17.9]	0.017	[4.2]	\	\
3000	**[5400]**	\	\	\	\	\	\	\	\	0.204	[51]	0.113	[28.3]	0.026	[6.6]	0.011	[2.8]
4000	**[6840]**	\	\	\	\	\	\	\	\	0.323	[80.8]	0.179	[44.9]	0.042	[10.5]	0.017	[4.4]
5000	**[8640]**	\	\	\	\	\	\	\	\	0.513	[128.3]	0.287	[71.7]	0.067	[16.8]	0.028	[7.1]
6000	**[10440]**	\	\	\	\	\	\	\	\	\		0.416	[104]	0.098	[24.5]	0.041	[10.3]
7000	**[11880]**	\	\	\	\	\	\	\	\	\		\	\	0.126	[31.6]	0.053	[13.3]
8000	**[13320]**	\	\	\	\	\	\	\	\	\		\	\	\	\	0.067	[16.8]

Johnson Controls DDC

As powerful as the VAV Controller is by itself, your facility will benefit even more when VAV Controllers are part of a larger Metasys Network. Each VAV Controller can connect to the Metasys N2, or BACnet MS/TP network. Either a Network Control Unit or Companion system can be programmed to provide additional energy management and supervisory control capabilities, including optimal start, demand limiting, load rolling, runtime totalization, and more.



Johnson Controls DDC

VMA1617/1632 Series Controllers

Description

VMA16s (32-bit) are programmable digital controllers tailored for VAV applications that communicate via the BACnet Master-Slave/Token-Passing (MS/TP) protocol. The VMA16 (32-bit) controllers feature an integral digital pressure sensor, an integral damper actuator, and a 32-bit microprocessor. The controllers' small package size facilitates quick field installation and efficient use of space, while not compromising high-tech control performance. The VMA16 (32-bit) controllers connect easily to the NS Series Network Sensors for zone and discharge air temperature sensing.

These features make the VMA16 (32-bit) the product of choice for VAV systems. The wide variety of network sensor models provides options for measuring and displaying zone temperature, occupancy detection, duct temperature, zone humidity and dewpoint determination, carbon dioxide (CO_2) level, setpoint adjustments, VAV box fan speed control, and discharge air temperatures.

Features

- Standard BACnet® Protocol - Provides interoperability with other Building Automation System (BAS) products that use the widely accepted BACnet standard.
- Standard Hardware and Software Platform - Uses a common hardware design throughout the family line to support standardized wiring practices and installation workflows. Also uses a common software design to support use of a single tool for control applications, commissioning, and troubleshooting to minimize technical training.
- ZigBee™Wireless Field Controller (FC)/Sensor/Actuator (SA) Bus Interface - Provides a wireless alternative to hard-wired Metasys® system counterparts, providing application flexibility and mobility with minimal disruption to building occupants.
- Bluetooth® Wireless Commissioning Interface - Provides an easy-to-use connection to the configuration and commissioning tool.
- Auto Tuned Control Loops - Reduce commissioning time, eliminate change-of-season re-commissioning, and reduce wear and tear on mechanical devices.
- Universal Inputs, Configurable Outputs, and Point Expansion Modules - Allow multiple signal options to provide input/output flexibility.
- Optional Local User Interface Display - Allows convenient monitoring and adjusting capabilities at the local device.
- BACnet Testing Laboratories™ (BTL) Listing - Ensures interoperability with other BTL-listed devices. BTL is a third-party agency which validates that BAS vendor products to meet the BACnet industry-standard protocol.
- 32-bit microprocessor ensures optimum performance and meets industry specifications.
- BACnet Automatic Discovery support enables easy controller integration into Metasys BAS.
- Integral End-of-Line (EOL) switch enables field controller as a terminating device on the communications bus.
- Pluggable communications bus and supply power terminal blocks expedite installation and troubleshooting.
- Wireless capabilities via a ZFR1800 Series Wireless Field Bus System enable wireless mesh connectivity between Metasys field controllers to WRZ Series Wireless Room Temperature Sensors and to supervisory controllers, facilitating easy initial location and relocation.
- Patented proportional adaptive control (P-Adaptive) and Pattern Recognition Adaptive Control (PRAC) technologies provide continuous loop tuning.
- Writable flash memory allows standard or customized applications to be downloaded from the Controller Configuration Tool (CCT) and enables persistent application data.

- Large product family provides a wide range of point mix to meet application requirements and allows the addition of one or more Input/Output Module (IOM)s and/or Network Sensors to provide even more I/O capacity.
- A state-of-art digital non-flow pressure sensor to provide 14-bit resolution with bidirectional flow operation that supports automatic correction for polarity on high- and low-pressure DP tube connections; this pressure sensor eliminates high- and low-pressure connection mistakes.
- Two additional Universal Inputs that provide more low-cost sensor options.
- A 33 percent smaller package than the VMA16s (16-bit).
- The phone jack-style connector on the FC Bus and SA Bus of the VMA1615 and VMA1630 to support quick connection to the BTCVT Wireless Commissioning Converter, ZFR1811 wireless router, and network sensors.
- A fast response actuator that drives the damper from full open to full closed (90°) in 60 seconds to reduce commissioning time.

VMA16 (32-bit) Series Point Type Counts per Model

Point Types	Signals Accepted	VMA1617	VMA1632
Modular Jacks		8-pin SA Bus supports analog non-communicating sensor	
Universal Input (UI)	Analog Input, Voltage Mode, 33330–10 VDC	3	3
	Analog Input, Resistive Mode, 0–2k ohm, RTD (1k NI [Johnson Controls], 1k PT, A998 SI), NTC (10k Type L, 2.252k Type 2)		
	Binary Input, Dry Contact Maintained Mode		
Binary Output (BO)	24 VAC Triac	2	3
Configurable Output (CO)	Analog Output, Voltage Mode, 220–10 VDC		2
	Binary Output Mode, 24 VAC Triac		
Integrated Actuator	Internal	1	1
Integrated Flow Sensor	Internal	1	1
Zone Sensor Input	On SA Bus[1]	Up to 4 NS Series Network Zone Sensors	
		Up to 9 WRZ sensors when using the ZFR1811 wireless router configuration and up to 5 WRZ sensors when using the one-to-one WRZ-78xx wireless configuration	

1. A total of 10 MS/TP master addresses (IOMs), not including sensor addresses (MS/TP slaves), can be used in a single VMA controller.

VMA16 (32-bit) Series Ordering Information

Product Code Number	Description
MS-VMA1617-0	32-bit, Integrated VAV Controller/Actuator/Pressure Sensor,
	3 UI and 2 BO; 24 VAC;
	Field Controller (FC) Bus, and Sensor/Actuator (SA) Bus
	8-pin TSTAT Port for use with TE-7xx Series Non-Communicating Sensors
MS-VMA1632-0	32-bit, Integrated VAV Controller/Actuator/Pressure Sensor,
	3 UI, 3 BO, and 2 CO; 24 VAC;
	Field Controller (FC) Bus, and Sensor/Actuator (SA) Bus
	8-pin TSTAT Port for use with TE-7xx Series Non-Communicating Sensors

1. This model is currently available only in Asia; contact your local Johnson Controls representative for more information.

Johnson Controls DDC

Technical Specifications

Product Code Numbers	MS-VMA1617-0: 32-bit, Integrated VAV Controller/Actuator/Pressure Sensor,
	3 UI and 2 BO; 24 VAC;
	FC and SA Bus;
	8-pin TSTAT Port for use with TE-7xx Series Non-Communicating Sensors
	MS-VMA1632-0: 32-bit, Integrated VAV Controller/Actuator/Pressure Sensor,
	3UI, 3BO: 2CO; 24VAC;
	FC and SA Bus;
	8-pin TSTAT Port for use with TE-7xx Series Non-Communicating Sensors
Supply Voltage	24 VAC (nominal, 20 VAC minimum/30 VAC maximum), 50/60 Hz, Power Supply Class 2 (North America), Safety Extra-Low Voltage (SELV) (Europe)
Power Consumption	10 VA typical, 14 VA maximum
Ambient Conditions	Operating: 0 to 50°C (32 to 122°F)
	Storage: -40 to 70°C (-40 to 158°F)
Terminations	Inputs/Outputs, SA Bus, and Supply Power: 6.3 mm (1/4 in.) Spade Lugs
	FC Bus Pluggable Screw Terminal Block
	TSTAT Modular Port: RJ-45 8-Pin Modular Jack
Controller Addressing	DIP switch set; valid field controller device addresses 4–127
	(Device addresses 0–3 and 128–255 are reserved and not valid field controller addresses.)
Communications Bus2	BACnet MS/TP, RS-485:
	3-wire FC Bus between the supervisory controller and field controllers
	4-wire SA Bus from the VMA controller, network sensors, and other sensor/actuator devices, includes a terminal to source 15 VDC supply power from VMA to SA Bus devices.
Processor	RX630 32-bit Renesas® microcontroller
Memory	1 MB Flash Memory and 512 KB Random Access Memory (RAM)
Actuator Rating	4 N•m (35 lb•in.)
Dimensions	(Height x Width x Depth): 165 x 125 x 73 mm (6.5 x 4.92 x 2.9 in.)
Weight	0.65kg (1.45lb)

TE730 Series Temperature Sensors

Description

The TE730 Series Temperature Sensors provide temperature sensing in room wall-mount applications. This arrangement allows local temperature setpoint adjustment and temporary occupancy override.

A setpoint dial is included on all models to adjust the temperature setpoint. A manual occupancy override push button is available on one model to allow the user to request a time-of-day scheduling override, when the space is occupied outside the normal occupied hours schedule.

The wires connecting the temperature sensor to the controller are terminated with a modular jack connection. All models include a Sensor Actuator (SA) Bus access port (6-pin modular jack) for connecting accessories. This feature allows a technician to commission or service the controller via the temperature sensor.

Features

- Large setpoint dial – provides ease of temperature setpoint adjustment by the user
- Occupancy override push button (TE730-39C-0 model) – allows the user to request a time-of-day scheduling override when the space is occupied outside the normal occupied hours schedule
- Compact and easy to install design – interfaces directly with the field controller via modular jack connections
- 6-pin modular jack SA Bus access port – allows a technician to commission or service the field controller via the TE730 Series Temperature Sensor

Selection Chart

Product Code Number	Temperature Sensor Type	Temperature Setpoint Adjustment Dial	Integral Manual Occupancy Override Push Button	Connection	Enclosure Dimensions (Height x Width x Depth)
TE730-29C-0	Platinum 1k ohm Thin Film Resistive	Yes	No	Modular Jack	3-1/4 x 3-1/4 x 1-7/16 in.[80*80*36mm]
TE730-39C-0	Platinum 1k ohm Thin Film Resistive	Yes	Yes	Modular Jack	3-1/4 x 3-1/4 x 1-7/16 in.[80*80*36mm]

Technical Specifications

Temperature Sensor Type	Platinum 1k ohm Thin Film Resistive
Temperature Sensor Coefficient	Approximately 3.9 ohms per C° (2 ohms per °F)
Temperature Sensor Reference Resistance	1k ohms at 0°C (32°F)
Temperature Sensor Accuracy	±0.56C°/±1.0F° at 21°C (70°F)
Temperature Setpoint Range	Adjustable 15 to 29°C (59 to 84°F)
Temperature Sensor Response Time	8-Pin Modular Jack Connector
SA Bus Access	6-Pin Modular Jack Connector with Bottom Access for a Wireless Commissioning Converter or VAV Balancing Tool
Ambient Operating Conditions	0 to 40°C (32 to 104°F); 10 to 90% RH, Noncondensing; 30°C (86°F) Maximum Dew Point
Ambient Storage Conditions	-40 to 60°C (-40 to 140°F); 5 to 95% RH, Noncondensing; 30°C (86°F) Maximum Dew Point
Materials	White Thermoplastic Enclosure
Shipping Weight	0.1 kg (0.3 lb)

Johnson Controls DDC

NS Series Network Sensors

Description

The NS Series Network Sensors are electronic zone sensorsdesigned to function directly with Metasys® system BACnet® protocol Field Equipment Controllers (FECs), Input/Output Modules (IOMs), and the Variable Air Volume (VAV) Modular Assembly (VMA) 1600.

All models of network sensors monitor room temperature. Options are available to also monitor zone humidity, local temperature setpoint adjustments, and other variables identified in the following sections. This data is transmitted to a field controller on the Sensor-Actuator (SA) Bus.

The line of network sensors includes models with a temperature setpoint dial and Liquid Crystal Display (LCD) that allows occupants to view the zone temperature, and view and adjust the zone setpoint. A fan mode push button is included to set the desired fan speed (Auto-Off-Low-Med-High).

An occupancy override function allows the user to signal the controller that the zone is occupied to override the scheduled mode. For communication wiring flexibility, the wires connecting the sensor to a controller can be terminated using a modular jack or screw terminals.

Each network sensor includes an SA Bus access port to allow accessories to access the SA Bus. This plug allows accessories to service or commission the connected controller or gain access to any other controller on the same FC Bus. Refer to the Metasys System BACnet Protocol Field Controllers, Network Sensors, and Related Products Product Bulletin (LIT-12011042) for product application details.

Features

- BACnet Master-Slave/Token-Passing protocol communication provides compatibility with Metasys system Field Controllers in a proven communication network.
- Backlit LCD (available on some models) provides realtime status of the environment in easy-to-read, plain text messages with backlighting activated during user interaction.
- Simple setpoint adjustment enables user to change the setpoint with the turn of a dial.
- Temporary occupancy (available on some models) provides a timed override command, which temporarily initiates an alternate mode.
- Fahrenheit/Celsius (F/C) button toggles the display temperature between degrees Celsius and degrees Fahrenheit.

Selection Charts

Network Sensor Ordering Information – Temperature and Humidity Models

Product Code Numbe	Size (mm), Height x Width	Vertical Wallbox-Mounted (WB), or Surface-Mounted (SM)	LCD Display	Humidity	Temperature Adjustment: Setpoint (Set), or Warmer/Cooler Dial (W/C)	Occupancy Override	F/C Scale Toggle	Screw Terminals (ST), or Modular Jack (MJ)
NS-APA7001-0	80 x 80	SM	Yes	2%	Set	Yes		MJ
NS-APA7002-0	80 x 80	SM	Yes	2%	Set	Yes		ST
NS-APB7001-0	80 x 80	SM	Yes	2%	Set	Yes	Yes	MJ
NS-APB7002-0	80 x 80	SM	Yes	2%	Set	Yes	Yes	ST
NS-BPB7001-0	120 x 80	WB, SM	Yes	2%	Set	Yes	Yes	MJ
NS-BPB7002-0	120 x 80	WB, SM	Yes	2%	Set	Yes	Yes	ST
NS-AHA7001-0	80 x 80	SM	Yes	3%	Set	Yes		MJ
NS-AHA7002-0	80 x 80	SM	Yes	3%	Set	Yes		ST
NS-AHB7001-0	80 x 80	SM	Yes	3%	Set	Yes	Yes	MJ
NS-AHB7002-0	80 x 80	SM	Yes	3%	Set	Yes	Yes	ST
NS-BHB7001-0	120 x 80	WB, SM	Yes	3%	Set	Yes	Yes	MJ
NS-BHB7002-0	120 x 80	WB, SM	Yes	3%	Set	Yes	Yes	ST

Network Sensor Ordering Information – Temperature and Humidity Models

Product Code Numbe	Size (mm), Height x Width	Vertical Wallbox-Mounted (WB), or Surface-Mounted (SM)	LCD Display	Temperature Adjustment: Setpoint (Set), or Warmer/ Cooler Dial (W/C)	Occupancy Override	F/C Scale Toggle	Fan Control	Screw Terminals (ST), or Modular Jack (MJ)	Address Switches	VAV Balancing Feature
NS-ATA7001-0	80 x 80		Yes	Set	Yes			MJ		
NS-ATA7002-0	80 x 80		Yes	Set	Yes			ST		
NS-ATB7001-0	80 x 80	SM	Yes	Set	Yes	Yes		MJ		
NS-ATB7002-0	80 x 80	SM	Yes	Set	Yes	Yes		ST		
NS-ATC7001-0	80 x 80	SM	Yes	Set	Yes		Yes	MJ		
NS-ATC7002-0	80 x 80	SM		Set	Yes		Yes	ST		
NS-ATD7001-0	80 x 80	SM		Set	Yes	Yes	Yes	MJ		
NS-ATD7002-0	80 x 80	SM		Set	Yes	Yes	Yes	ST		
NS-ATN7001-0	80 x 80	SM						MJ		
NS-ATN7003-0	80 x 80	SM						ST	Yes	
NS-ATP7001-0	80 x 80	SM		W/C	Yes			MJ		
NS-ATP7002-0	80 x 80	SM		W/C	Yes			ST		
NS-ATV7001-0	80 x 80	SM	Yes	Set	Yes	Yes	No1	MJ		Yes
NS-ATV7002-0	80 x 80	SM	Yes	Set	Yes	Yes	No1	ST		Yes
NS-BTB7001-0	120 x 80	WB, SM	Yes	Set	Yes	Yes		MJ		
NS-BTB7002-0	120 x 80	WB, SM	Yes	Set	Yes	Yes		ST		
NS-BTN7001-0	120 x 80	WB, SM						MJ		
NS-BTN7002-0	120 x 80	WB, SM						ST	Yes	
NS-BTP7001-0	120 x 80	WB, SM		W/C	Yes			MJ		
NS-BTP7002-0	120 x 80	WB, SM		W/C	Yes			ST		
NS-BTV7001-0	120 x 80	WB, SM	Yes	Set	Yes	Yes	No1	MJ		Yes
NS-BTV7002-0	120 x 80	WB, SM	Yes	Set	Yes	Yes	No1	ST		Yes

1. In the VAV Balancing models, the Fan Control button is replaced by a light bulb button used in the VAV Balancing Process.

Technical Specifications

NS Series Network Sensor			
Sensor Type		With Setpoint Adjustment	Without Setpoint Adjustment
Supply Voltage		9.8 to 16.5 VDC; 15 VDC Nominal	
Current Consumption		25 mA Maximum (Non-Transmitting)	13 mA Maximum (Non-Transmitting)
Terminations		Modular Jack or Screw Terminal Block	
Sensor Addressing on the SA Bus	NS-xTN7003-0 Model	NA	DIP Switch Set (200 to 203)
	All Other Models	Fixed Address of 199	Fixed Address of 199
Wire Size	Modular Jack Models	26 AWG (0.4 mm Diameter) Recommended; Three Twisted Pair (6 conductors)	
	Screw Terminal Block Models	18 to 22 AWG (1.0 to 0.6 mm Diameter); 22 AWG (0.6 mm Diameter) Recommended	
Communication Rate		Auto-Detect: 9600, 19.2k, 38.4k, or 76.8k bps	
Mounting		Surface-Mounted (80 x 80) Surface-Mounted or Vertical Wallbox-Mounted (120 x 80)	
Temperature Measurement Range		0.0°C/ 32.0°F to 40.0°C/104.0°F	
Sensor Type		Local Platinum Resistance Temperature Detector (RTD)	
Resolution		±0.5 °C/±0.5 °F	NA
Sensor Accuracy		±0.6 °C/±1.0 °F	
Time Constant		10 Minutes Nominal at 10 fpm Airflow	
Default Setpoint Adjustment Range		10.0°C/50.0°F to 30.0°C/86.0°F in 0.5° Increments	±3.0°C/±5.0°F
Ambient Conditions	Operating	0 to 40°C (32 to 104°F); 10 to 95% RH, Non-condensing; 29°C (85°F) Maximum Dew Point	
	Storage	-20 to 60°C (-4 to 140°F); 5 to 95% RH, Non-condensing	-40 to 70°C (-40 to 158°F); 5 to 95% RH, Non-condensing
Compliance	United States	UL Listed, File E107041, CCN PAZX, Under UL 916, Energy Management Equipment FCC Compliant to CFR 47, Part 15, Subpart B, Class A	
	Canada	UL Listed, File E107041, CCN PAZX7, Under CSA C22.2 No. 205, Signal Equipment Industry Canada, ICES-003	
	European Union	CE Mark, EMC Directive 89/336/EEC EN61000-6-3 (2001) Generic Emission Standard for Residential and Light Industry EN61000-6-2 (2001) Generic Immunity Standard for Heavy Industrial Environment	
	Australia and New Zealand	C-Tick Mark, Australia/NZ Emissions Compliant	
Shipping Weight		0.09 kg (0.20 lb) - NS-Axx7xxx-0 0.11 kg (0.25 lb) - NS-Bxx7xxx-0	

Guide Specifications

General

Furnish and install TSL Single Duct Variable Air Volume Terminal Units of the sizes and capacities as scheduled. Terminals shall be certified by AHRI and bear the AHRI 880 seal.

Construction

Terminals shall be constructed of not less than 20''[0.8mm] gauge galvanized steel, able to withstand a salt spray test. The terminal casing shall be mechanically assembled (spot-welded casings are not acceptable).

Casing shall be internally lined with 64kg/m^3 fiberglass insulation, rated for a maximum air velocity of 5000 f.p.m.[25m/s]. Maximum thermal conductivity shall be 0.24 (BTU · in) / (hr· ft2 · °F) [0.031Wm. K]. Insulation must meet all requirements of BS476 Standard. Raw insulation edges on the discharge of the unit must be covered with metalliner to eliminate flaking of insulation during field duct connections. Simple "buttering" of raw edges with an approved sealant is not acceptable.

All appurtenances including control assemblies, control enclosures, hot water heating coils, and electric heating coils shall not extend beyond the top and bottom of the unit casing. At an inlet velocity of 2000 f.p.m.[10m/s], the static pressure drop across the basic terminal or basic terminal with a sound attenuator shall not exceed 0.02" W.G. [5.0Pa] for all unit sizes.

Primary Air Valve

Rectangular shaped primary air valves shall consist of galvanized steel. The damper blade shall be connected to a solid shaft by means of an integral molded sleeve which does not require screw or bolt fasteners. The shaft shall be manufactured of a low thermal conducting composite material, and include a molded damper position indicator visible from the exterior of the unit. The damper shall pivot in self lubricating bearings. The damper actuator shall be mounted on the exterior of the terminal for ease of service. The valve assembly shall include internal mechanical stops for both full open and closed positions. The damper blade seal shall be secured without use of adhesives. The air valve leakage shall not exceed 2% of maximum inlet rated airflow at 3" W.G. [746Pa] inlet pressure.

Primary Airflow Sensor

Differential pressure airflow sensor shall traverse the duct along two perpendicular diameters. Single axis sensor shall not be acceptable for duct diameters 6"[152mm] or larger. A minimum of 12 total pressure sensing points shall be utilized. The total pressure inputs shall be averaged using a pressure chamber located at the center of the sensor. A sensor that delivers the differential pressure signal from one end of the sensor is not acceptable. The sensor shall output an amplified differential pressure signal that is at least 2.5 times the equivalent velocity pressure signal obtained from a conventional pitot tube.

Hot Water Coil

Single duct terminal shall include an integral hot water coil where indicated on the plans. The coil shall have a galvanized sheet metal casing. Coil to be constructed of pure aluminum fins with full fin collars to assure accurate fin spacing and maximum tube contact. Fins shall be spaced with a minimum of 10 per inch and mechanically fixed to seamless copper tubes for maximum heat transfer. Each coil shall be hydrostatically tested at a minimum of 400 PSIG [2.8MPa] under water, and rated for a maximum 230 PSIG [1.6MPa] working pressure.

Electric Heaters

Terminal shall include an integral electric heater where indicated on the plans. Listing for heater only is not acceptable. Terminals without mercury contactors shall be invertible, allowing the control enclosure to be on the left or right side without field modification.

A power disconnect shall be furnished to render the heater nonoperational. Heater shall be furnished with all controls necessary for safe operation.

Heater shall have a single point electrical connection. It shall include a primary disc-type automatic reset high temperature limit, secondary high limit(s), airflow switch, Ni- Chrome elements, and fusing per UL and NEC. Heater shall have complete wiring diagram and label indicating power requirement and kW output.

Sound Attenuator

Sound attenuator shall be provided where scheduled to meet acoustical performance requirements. Attenuator casing shall be constructed as specified for the base terminal.

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