Parallel Flow Fan-Powered VAV Terminals

TVS/TVL

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

Johnson Controls

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FEATURES AND BENEFITS

QUIET, EFFICIENT COMFORT

Model TVS/TVL fan terminals are specifically designed for quiet operation. They also offer improved space comfort and flexibility for a wide variety of HVAC systems. This is critical in today's buildings, where occupants are placing more emphasis on indoor acoustics.

OCCUPANT-SENSITIVE DESIGN

Due to heightened interest in Indoor Air Quality, many HVAC system designers are focusing on the effects of particulate contamination within a building's occupied space. Often, HVAC system noise is overlooked as a source of occupied space contamination. The TVS/TVL terminal is specifically designed to eliminate obtrusive fan noise from reaching the occupants, while providing constant air motion in the space.

Occupants will benefit from the TVS/TVL design that minimizes low frequency (125Hz~250Hz) sound levels that typically dominate the space sound level. The TVS/TVL also minimizes the fluctuation in sound levels that occur during VAV damper modulation.

FLEXIBILITY

Selection and Layout. The TVS/TVL provides flexibility in system design. Reduced noise at the fan terminal allows the system designer to place properly sized units directly above occupied spaces. It is not necessary to use the crowded space above a hall or corridor to locate the equipment. This will reduce lengthy and expensive discharge duct runs. The TVS casing height (15 1/2" up to 20") [395mm~510mm], The TVL casing height (10.9" up to 12") [276mm~305mm] minimizes conflict with other systems competing for ceiling space. The FlowStar™ sensor ensures accurate control, even when space constraints do not permit long straight inlet duct runs to the terminal.

Sizes. Primary air valves and fans are available in various size combinations to provide fan capacities between 20% and 100% of the selected maximum primary airflow. Model TVS terminals are available with primary valves handling up to 4100 CFM[6970CMH]. Six fan sizes provide a range of heating capacities between 45 and 2175 CFM[77~3700CMH]. Model TVL terminals are available with primary valves handling up to 3100 CFM[5270CMH]. Three fan sizes provide a range of heating capacities between 178 and 1246CFM[303~2119CMH].

CONVENIENCE

Quality. All TVS/TVL terminals are thoroughly inspected during each step of the manufacturing process, including a comprehensive "pre-ship" inspection, to assure the highest quality product available. Each unit is also "run tested" before leaving the factory to ensure trouble free field "start-up."

Quick Installation. A standard single point electrical main power connection is provided. Electronic controls and electrical components are 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.

Finite fan speed adjustment can be accomplished with an optional electronic SCR controller. The SCR fan speed controller is manufactured by Johnson Controls and is compatible with the fan motor. This minimizes electronic interference and harmonic distortion that occurs from non-compatible motor and SCR components. Increased motor life and efficiency result from the compatible design.

TVS/TVL terminals utilize three tap motors that accommodate a broad range of flow and static pressure field conditions while dramatically increasing efficiency.

TVS terminals optional ECM (electronically commutated motor) fan motors are significantly increases the operating efficiency of fan terminal units. Johnson Controls offers your two ECM fan motor options, constant airflow ECM motor and standard ECM motor.

Constant airflow ECM motor with built-in integral microprocessor based speed controller can provide constant airflow operation by automatically adjusting the speed and torque in response to system pressure.

New standard ECM motor with integral microprocessor based speed controller can preset three stages of air volume at factory.

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.

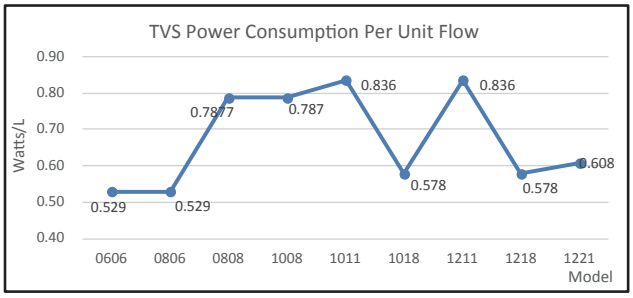
VALUE AND SECURITY

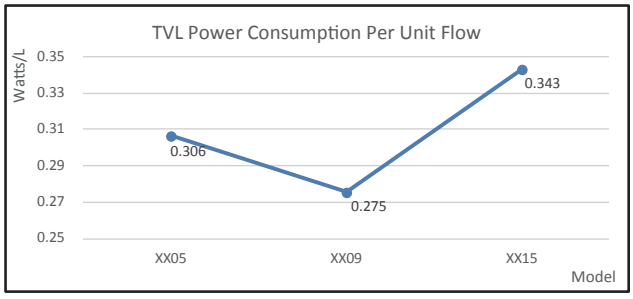
Agency Certification. TVS terminals are tested in accordance with AHRI Standard 880, and are certified by AHRI. Detailed AHRI rating performance refer to Page 31.

Quality. All metal components are fabricated from galvanized steel. Unlike most manufacturers' terminals, the steel used in the TVS/TVL is capable of withstanding salt spray test without showing any evidence of red rust.

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 FlowStar™ inlet sensor allows precise airflow control at low air velocities. The FlowStar™ sensor's airfoil shape provides minimal pressure drop across the terminal. The box structure with low resistance design to futher reduce the pressure drop of terminal. This allows the central fan to run at a lower pressure and with less brake horsepower. Energy efficient three tap, three winding, permanent split capacitor fan motors are manufactured to ensure efficient, quiet, reliable, and low maintenance operation.

Input power of fan under rated air volume is certified by AHRI certification. TVS series fan power consumption data can refer to the AHRI website. The following figure is the curve of TVS/TVL power consumption per unit flow.





Note:
1.The chart shows the power consumption per unit flow at rated air volume condition with 62.5 Pa external static pressure
2.Data obtained from tests conducted in accordance with AHRI Standard 880.

Three tap motors provide superior energy efficiency over single speed motors by delivering three separate horsepower outputs. For example, a nominal 1/2 HP[373W] motor delivers 1/3 HP[249W] on medium tap and 1/4 HP[187W] on low tap. This allows the motor to operate at a higher efficiency when at a reduced fan capacity.
Fan terminals that utilize a single speed motor must rely solely on an SCR controller to obtain the reduction in fan capacity. At minimum turndown, they suffer from excessive power consumption and high motor winding temperatures, significantly reducing the motor life.

Maintenance and Service. TVS/TVL fan terminals require no periodic maintenance other than optional filter replacement. If component replacement becomes necessary, the unit is designed to minimize field labor. The bottom casing panels can be removed to provide easy access to the fan assembly, and the motor electrical leads are easily unplugged.

Controls. Model TVS/TVL terminals are available with consignment DDC and Johnson Controls DDC for BACnet. These controls are designed to accommodate a multitude of control schemes.

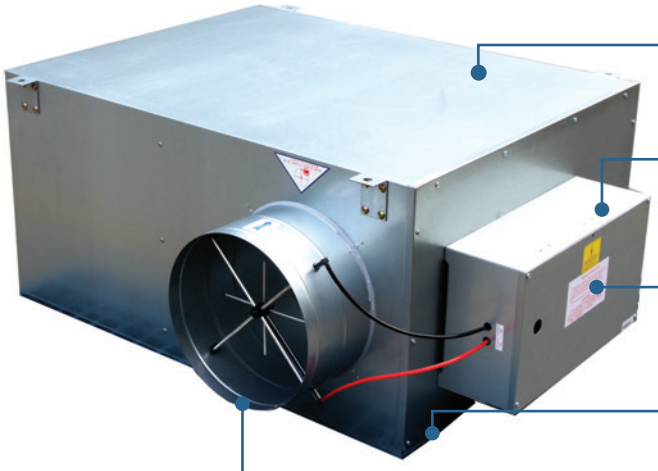
From the most basic to the most sophisticated sequence of operation, the controls are designed by experts in VAV terminal operation.

Optional three speed remote controller for convenience on-site commissioning.

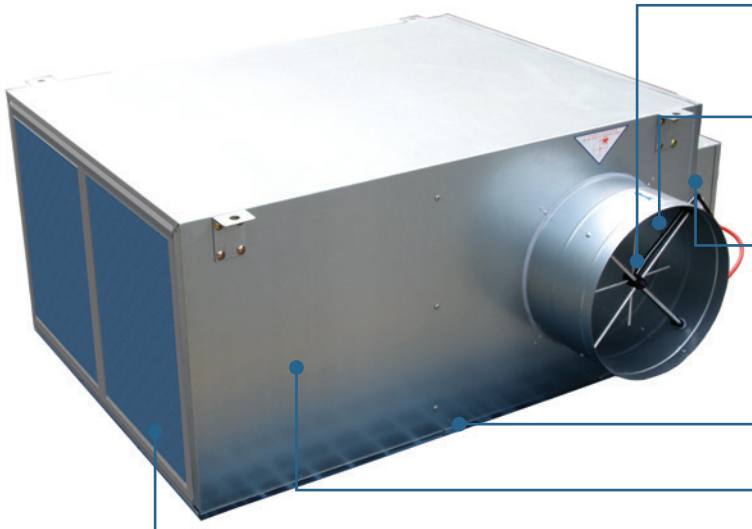
Standard features include the patented FlowStar™ airflow sensor, standard electirc box, 24 volt control transformer.

CONSTRUCTION FEATURES

MODEL TVS



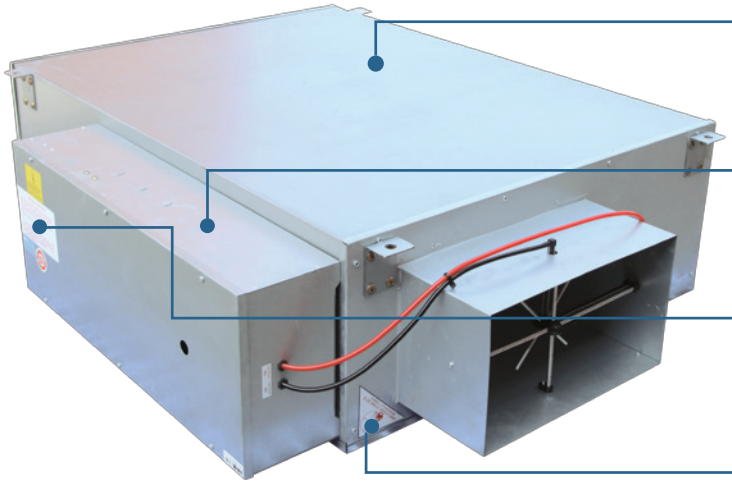
- Galvanized steel casing withstands salt spray test
- Electrical devices installed within a standard electrical box, with single point power connection
- Product label includes tagging, airflow, and electrical information
- 1" fiberglass insulation, conform to BS476 standard
- Roll formed inlet collar with integral stiffening ribs adds strength and rigidity



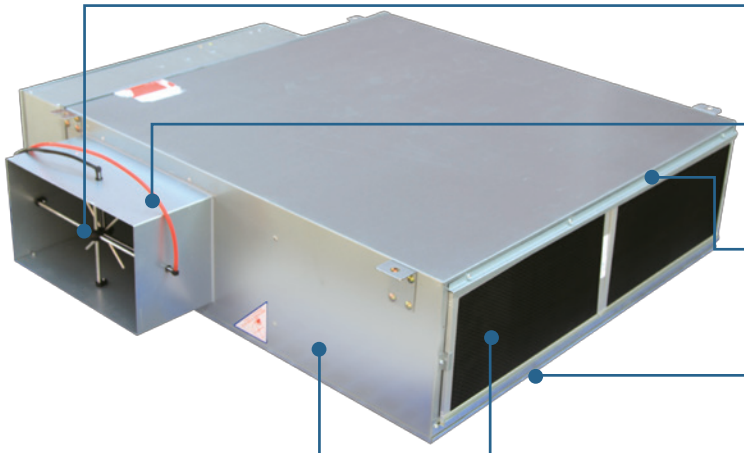
- Patented FlowStar airflow sensor (Patent #5,481,925)
- Low leakage damper incorporates closed cell foam gasket
- Low leakage rate casing
- Full bottom removable access panels
- Fan assembly utilizes a forward curved, dynamically balanced, galvanized wheel with a direct drive motor
- Equipped with return air filter

CONSTRUCTION FEATURES

MODEL TVL



- Galvanized steel casing withstands salt spray test
- Electrical devices installed within a standard electrical box, with single point power connection
- Product label includes tagging, airflow, and electrical information
- 1" fiberglass insulation, conform to BS476 standard



- Patented FlowStar™ airflow sensor (Patent #5,481,925)
- Low leakage damper incorporates closed cell foam gasket
- Low leakage rate casing
- Full bottom removable access panels
- Equipped with return air filter
- Fan assembly utilizes a forward curved, dynamically balanced, galvanized wheel with a direct drive motor

Note: Model TVL 10" and above are square inlet.

CONSTRUCTION FEATURES

ACCURATE AND ENERGY-SAVING AIRFLOW CONTROL WITH THE PATENTED Flowstar™ SENSOR

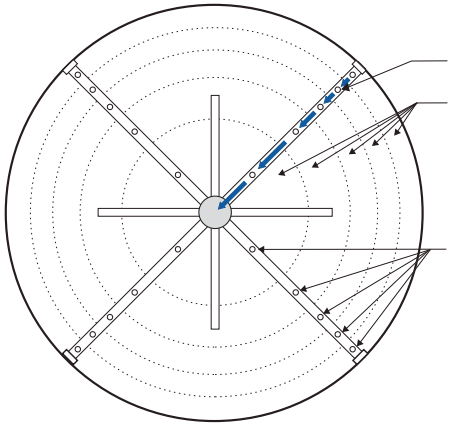
The Johnson Controls air valve features the FlowStar™ airflow sensor which has brought new meaning to airflow control accuracy. The multiaxis design utilizes between 12 and 20 sensing points that sample total pressure at center points within equal concentric crosssectional areas, effectively traversing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

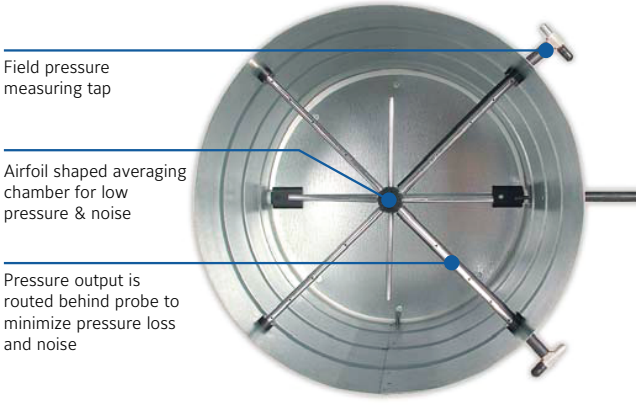
This sensor adds a new dimension to signal amplification. Most differential pressure sensors provide a signal between 0.5 and 2 times the equivalent velocity pressure signal. The FlowStar™ provides a differential pressure signal that is 2.5 to 3 times the equivalent velocity pressure signal. This amplified 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 FlowStar™ 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.

FlowStar™ Airflow Sensor Patent #5,481,925





APPLICATION AND SELECTION

PURPOSE OF PARALLEL FLOW FAN TERMINALS

Parallel flow fan powered terminals offer improved space comfort and flexibility in a wide variety of applications. Substantial operating savings can be realized through the recovery of waste heat, reduced central fan horsepower requirements and night setback operation.

Heat Recovery. The TVS/TVL recovers heat from lights and core areas to offset heating loads in perimeter zones. Additional heat is available at the terminal unit using electric, or hot water heating coils. Controls are available to energize remote heating devices such as wall fin, fan coils, radiant panels, and roof load plenum unit heaters.

IAQ. The TVS/TVL enhances the indoor air quality of a building by providing constant air motion, and higher air volumes in the heating mode than typically provided by straight VAV single duct terminals or parallel flow fan terminals. The higher air capacity provides continuous air motion in the space and lowers the heating discharge air temperature. This combination improves air circulation, preventing accumulation of CO2 concentrations in stagnant areas. Increased air motion improves occupant comfort. The higher air capacity also improves the performance of diffusers and minimizes diffuser “dumping”.

SELECTION GUIDELINES

The TVS/TVL fan terminal has been designed to provide maximum flexibility in matching primary air valve capacities (cooling loads) with unit fan capacities. The overall unit size is dictated by the fan size. With each unit fan size, multiple primary air valve sizes are available to handle a wide range of cooling capacities.

The primary air valve should be sized first to determine the unit size. Typically, the primary air valve sound is insignificant relative to the unit fan sound performance. The selection process typically involves choosing an air valve size that is as small as possible while yielding acceptable sound levels and pressure drop. For nonacoustically sensitive applications such as shop-ping malls and airports, the primary air valve can be sized at the maximum rated capacity.

After the primary air valve has been selected, the fan can be selected from the various sizes available for that unit size. The selection is made by cross plotting the specified fan capacity and external static pressure on the appropriate fan performance curves. Terminals utilizing hot water heating coils require the summation of the coil air pressure drop and the design E.S.P. to determine the total E.S.P. It is common to have more than one fan size which can meet the design requirements. Typically, the selection begins with the smallest fan that can meet the capacity. Occasionally, this selection may not meet the acoustical requirements and thus, the next larger fan size would be selected.

Each fan performance curve depicts the actual performance of the relative motor tap without any additional fan balance adjustment. Actual specified capacities which fall below a particular fan curve (low, medium, or high) is obtained by adjustment of an optional electronic (SCR) fan speed controller.

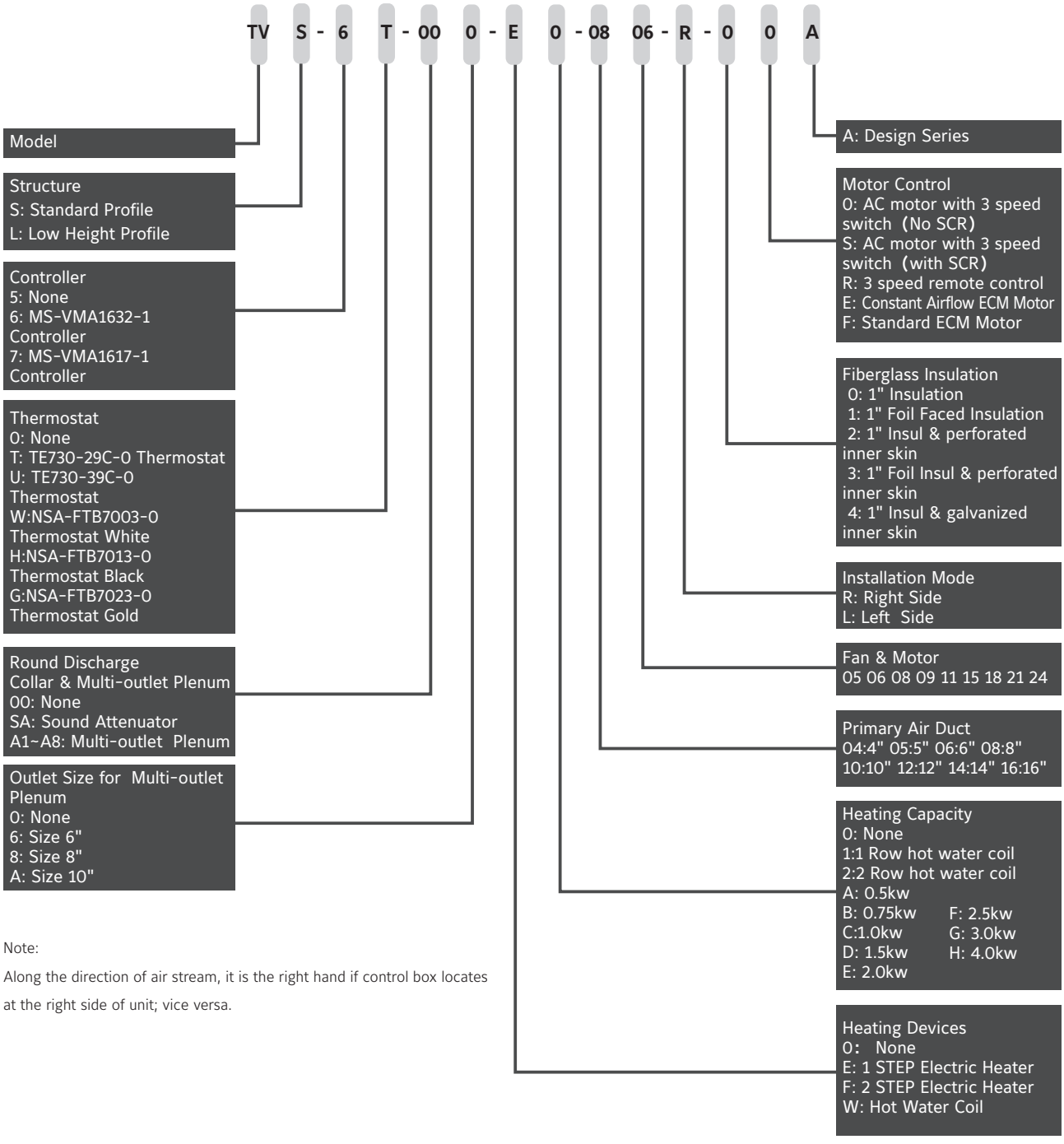
SYSTEM PRESSURE CONSIDERATIONS

Since the terminal unit fan is selected to move 100% of the design airflow to the zone, all downstream pressure losses are neglected when determining minimum primary air inlet pressure to the unit. The central fan is only required to overcome the minimal loss through the unit air valve, reducing the central fan total pressure and horsepower requirements.

COMMON MISAPPLICATION

The central fan is required to produce sufficient inlet static pressure to force the air through the primary air valve, unit casing, downstream ductwork and fittings, and diffusers with the unit fan off. The TVS has been designed to reduce central fan power consumption by placing the optional hot water heating coil in the induction air stream, eliminating the coil from these central system pressure considerations.

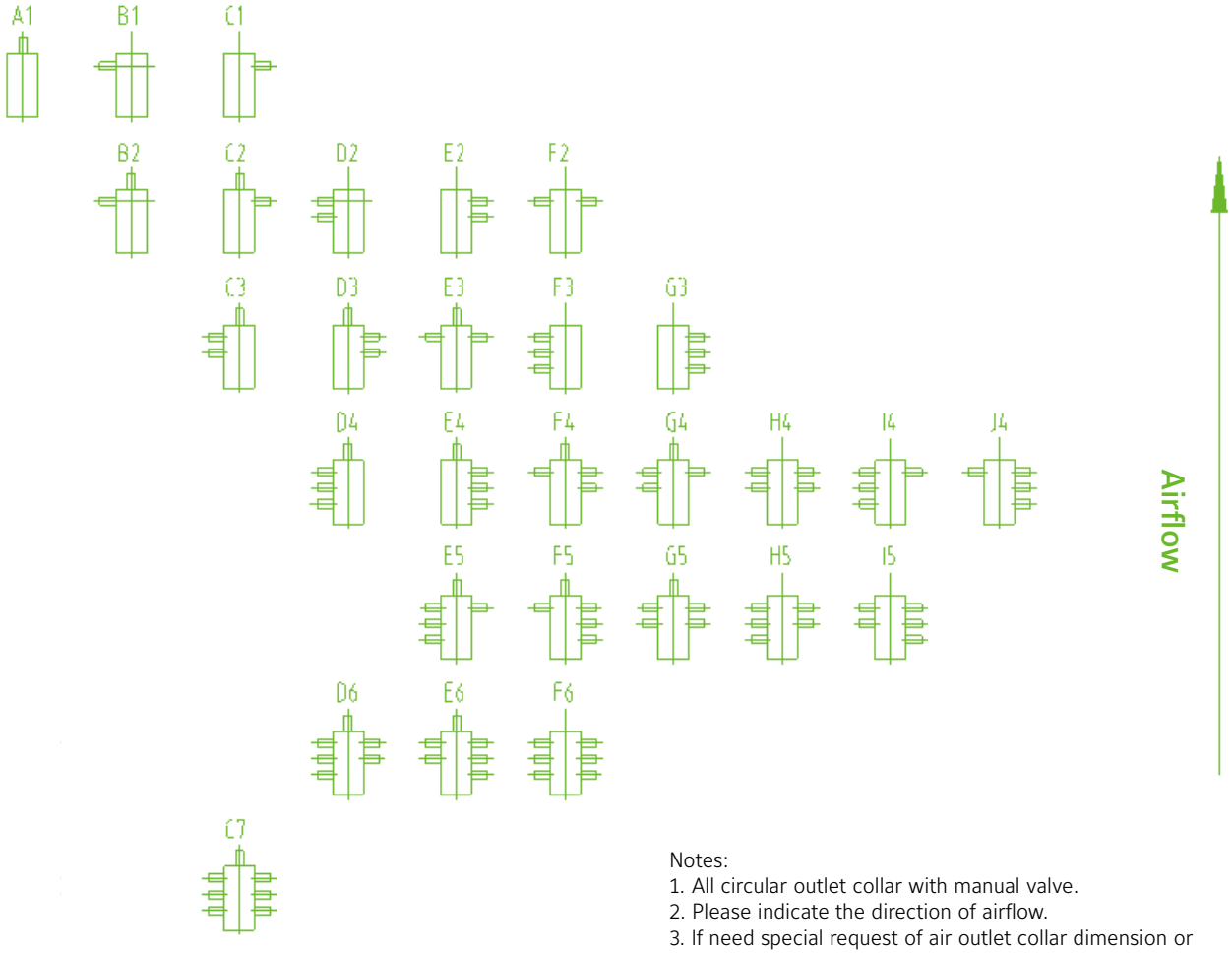
NOMENCLATURE



Note:

Along the direction of air stream, it is the right hand if control box locates at the right side of unit; vice versa.

TVS 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

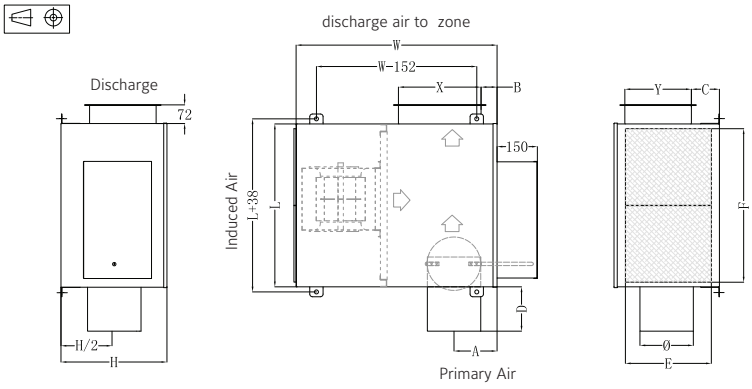
Mop Selection Table

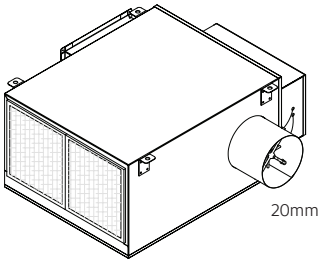
Dimension of MOP	No. of MOP		Unit Size														
			TVS0606	TVS0806	TVS0808	TVS1008	TVS1011	TVS1018	TVS1211	TVS1218	TVS1221	TVS1411	TVS1418	TVS1421	TVS1424	TVS1621	TVS1624
6"	Face Size		1	1	1	1	1	1	-	-	-	-	-	-	-	-	-
	Single Size	813mm	3	3	3	3	3	3									
	Total	813mm	7	7	7	7	7	7									
8"	Face Size		1	1	1	1	1	1	1	1	1	-	-	-	-	-	-
	Single Size	813mm	2	2	2	2	2	2	2	2	2						
	Total	813mm	5	5	5	5	5	5	5	5	5						
10"	Face Size		-	-	-	-	-	-	-	-	-	1	1	1	1	1	1
	Single Size	813mm										2	2	2	2	2	2
	Total	813mm										5	5	5	5	5	5

TVS DIMENSIONAL DATA

UNIT SIZE	DIMENSION inch [mm]											
	A	B	C	D	E	F	Ø	X	Y	W	H	L
0606	5 1/2 [140]	2 3/8 [60]	4 [102]	6 1/2 [165]	12 3/4[325]	22 5/8[575]	5 7/8 [149]	9 1/2[240]	9 1/2[240]	29 1/2[750]	15 1/2[395]	24 [610]
0806	6 1/4 [160]	2 3/8 [60]	4 1/8 [105]	6 1/2 [165]	12 3/4[325]	22 5/8[575]	7 7/8 [200]	12 [307]	9 3/4[247]	29 1/2[750]	15 1/2[395]	24 [610]
0808	6 1/4 [160]	2 3/8 [60]	4 1/8 [105]	6 1/2 [165]	12 3/4[325]	22 5/8[575]	7 7/8 [200]	12 [307]	9 3/4[247]	29 1/2[750]	15 1/2[395]	24 [610]
0811*	6 1/4 [160]	2 3/8 [60]	4 1/8 [105]	6 1/2 [165]	12 3/4[325]	22 5/8[575]	7 7/8 [200]	12 [307]	9 3/4[247]	29 1/2[750]	15 1/2[395]	24 [610]
1008	7 3/4[196]	2 3/8 [60]	5 5/8[142]	6 1/2 [165]	14 3/4[375]	29 [735]	9 7/8 [251]	15 [380]	11 3/4[300]	38 1/2[980]	19 [485]	30 1/8 [765]
1011	7 3/4[196]	2 3/8 [60]	5 5/8[142]	6 1/2 [165]	14 3/4[375]	29 [735]	9 7/8 [251]	15 [380]	11 3/4[300]	38 1/2[980]	19 [485]	30 1/8 [765]
1018	7 3/4[196]	2 3/8 [60]	5 5/8[142]	6 1/2 [165]	14 3/4[375]	29 [735]	9 7/8 [251]	15 [380]	11 3/4[300]	38 1/2[980]	19 [485]	30 1/8 [765]
1211	8 5/8 [220]	2 3/8 [60]	4 3/4 [122]	6 1/2 [165]	14 3/4[375]	29 [735]	11 7/8 [302]	17 [430]	12 5/8[320]	38 1/2[980]	19 [485]	30 1/8 [765]
1218	8 5/8 [220]	2 3/8 [60]	4 3/4 [122]	6 1/2 [165]	14 3/4[375]	29 [735]	11 7/8 [302]	17 [430]	12 5/8[320]	38 1/2[980]	19 [485]	30 1/8 [765]
1221	8 5/8 [220]	2 3/8 [60]	4 3/4 [122]	6 1/2 [165]	14 3/4[375]	29 [735]	11 7/8 [302]	17 [430]	12 5/8[320]	38 1/2[980]	19 [485]	30 1/8 [765]
1411	9 [230]	2 3/8 [60]	5 [127]	6 1/2 [165]	16 3/4[425]	29 [735]	13 7/8 [352]	23 1/4[590]	13 3/8[340]	46 1/2[1180]	20 [510]	30 1/8 [765]
1418	9 [230]	2 3/8 [60]	5 [127]	6 1/2 [165]	16 3/4[425]	29 [735]	13 7/8 [352]	23 1/4[590]	13 3/8[340]	46 1/2[1180]	20 [510]	30 1/8 [765]
1421	9 [230]	2 3/8 [60]	5 [127]	6 1/2 [165]	16 3/4[425]	29 [735]	13 7/8 [352]	23 1/4[590]	13 3/8[340]	46 1/2[1180]	20 [510]	30 1/8 [765]
1424	9 [230]	2 3/8 [60]	5 [127]	6 1/2 [165]	16 3/4[425]	29 [735]	13 7/8 [352]	23 1/4[590]	13 3/8[340]	49 5/8[1260]	20 [510]	30 1/8 [765]
1621	10 [254]	2 3/8 [60]	5 [127]	6 1/2 [165]	16 3/4[425]	29 [735]	15 7/8 [403]	25 1/8[640]	13 3/8[340]	46 1/2[1180]	20 [510]	30 1/8 [765]
1624	10 [254]	2 3/8 [60]	5 [127]	6 1/2 [165]	16 3/4[425]	29 [735]	15 7/8 [403]	25 1/8[640]	13 3/8[340]	49 5/8[1260]	20 [510]	30 1/8 [765]

Note: All dimensions are in inches [mm].
0811 is only available for ECM motor

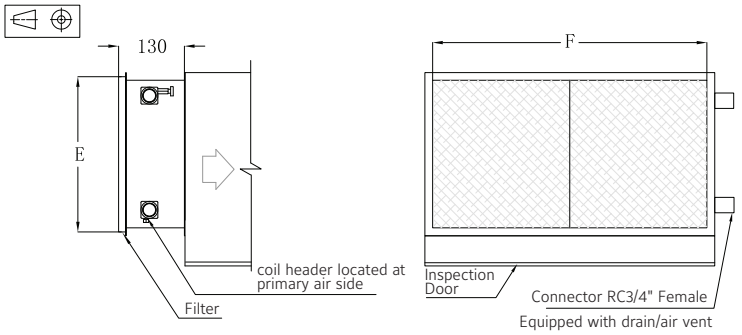




Drawing shows right hand unit
Discharge flange width 20mm
Removable inspection door

MODEL TVS-W (HOT WATER COIL)

Hot Water Coil Detail (End View)

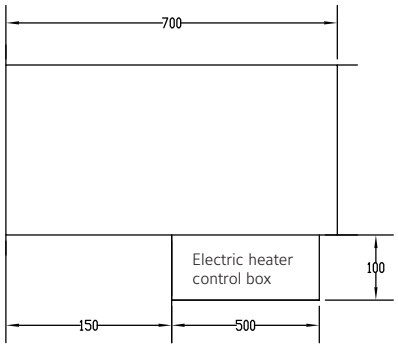


TVS DIMENSIONAL DATA

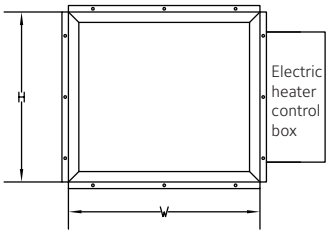
MODEL TVS-E ELECTRIC HEATER DETAIL

UNIT SIZE	DIMENSION mm	
	W	H
TVS06XX	290	290
TVS08XX	320	290
TVS10XX	390	350
TVS12XX	425	390
TVS14XX	560	430
TVS16XX	630	430

Top View

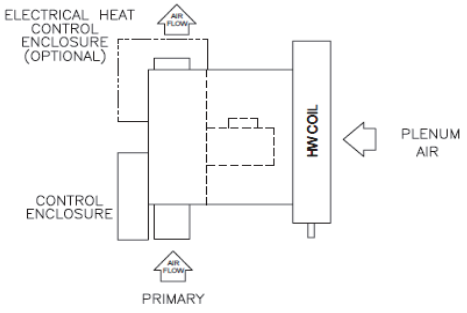


Front View

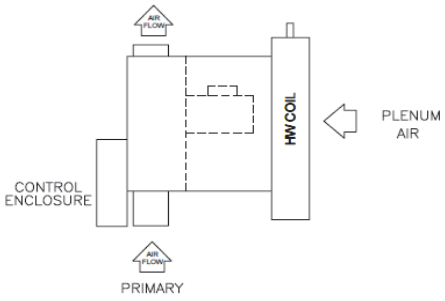


Air Flow

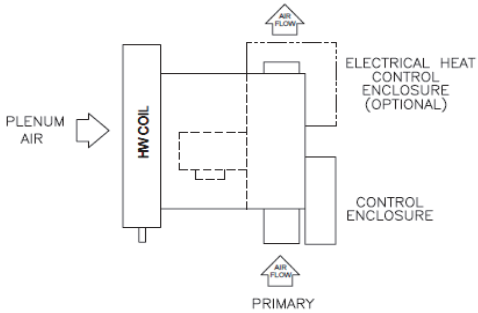
TVS/TVL UNIT ARRANGEMENT



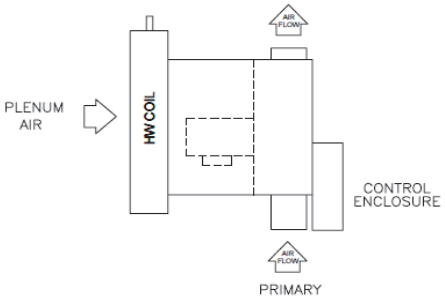
ARRANGEMENT 1
LEFT HAND CONTROL UNIT
WITH LEFT HAND COIL



ARRANGEMENT 2
LEFT HAND CONTROL UNIT
WITH RIGHT HAND COIL



ARRANGEMENT 3
RIGHT HAND CONTROL UNIT
WITH RIGHT HAND COIL

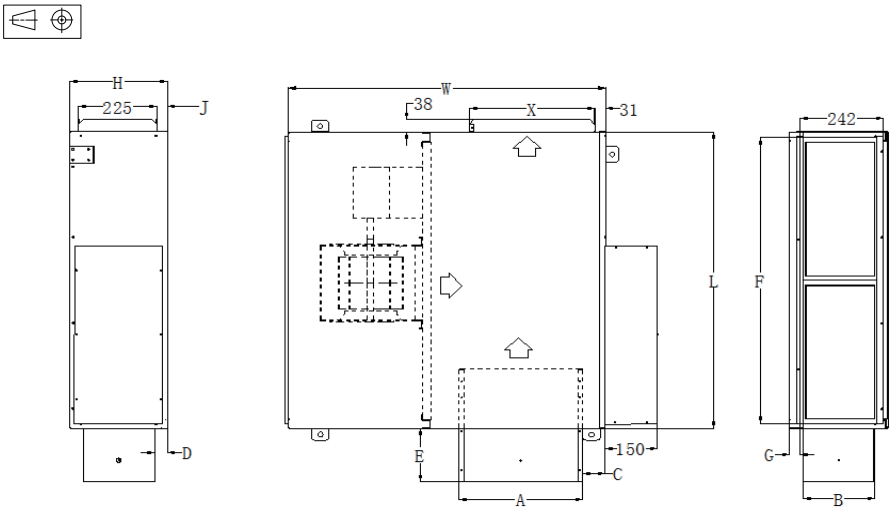


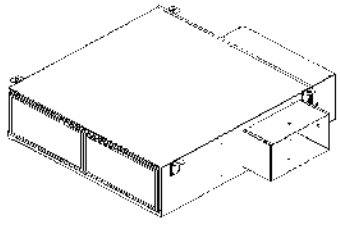
ARRANGEMENT 4
RIGHT HAND CONTROL UNIT
WITH LEFT HAND COIL

TVL DIMENSIONAL DATA

UNIT SIZE	DIMENSION inch [mm]											
	A	B	C	D	E	F	G	J	X	W	L	H
0405	3 6/7 [98]	3 6/7 [98]	5 1/8 [130]	3 4/7 [91]	10 1/2 [267]	22 2/7 [566]	1 1/6 [30]	1 [27.5]	13 5/7 [348]	29 [737]	23 1/2 [597]	10 6/7 [276]
0505	4 7/8 [124]	4 7/8 [124]	4 3/5 [117]	3 [78]	10 1/2 [267]	22 2/7 [566]	1 [25.5]	6/7 [22]	13 5/8 [346]	29 [737]	23 1/2 [597]	10 6/7 [276]
0605	5 6/7 [149]	5 6/7 [149]	4 1/7 [105]	2 3/5 [66]	6 1/2 [165]	22 2/7 [566]	1 1/6 [30]	1 [27.5]	13 5/7 [348]	29 [737]	23 1/2 [597]	10 6/7 [276]
0805	7 7/8 [200]	7 7/8 [200]	3 1/9 [79]	1 4/7 [40]	6 1/2 [165]	22 2/7 [566]	1 1/6 [30]	1 [27.5]	13 5/7 [348]	29 [737]	23 1/2 [597]	10 6/7 [276]
1009	10 [254]	8 [203]	2 1/2 [64]	1 1/2 [37.5]	6 1/2 [165]	34 3/4 [883]	1 1/6 [30]	1 [27.5]	16 [408]	36 [914]	36 [914]	10 6/7 [276]
1209	14 [356]	8 [203]	2 1/2 [64]	1 1/2 [37.5]	6 1/2 [165]	34 3/4 [883]	1 1/6 [30]	1 [27.5]	16 [408]	36 [914]	36 [914]	10 6/7 [276]
1215	14 [356]	8 [203]	2 1/2 [64]	2 [51]	6 1/2 [165]	38 7/9 [985]	1 2/3 [42.5]	1 4/7 [40]	20 [508]	40 [1016]	40 [1016]	12 [305]
1415	14 [356]	10 [254]	2 1/2 [64]	1 [25]	6 1/2 [165]	38 7/9 [985]	1 2/3 [42.5]	1 4/7 [40]	20 [508]	40 [1016]	40 [1016]	12 [305]

NOTES:
1. Sizes 0405, 0505, 0605 and 0805 have round inlets, sizes 1009, 1209, 1215 and 1415 have rectangular inlets.
2. All dimensions are in inches [mm].





Drawing shows right hand unit
Center installated air outlet
8" and the following specifications,
the primary air pipe is round inlet
Removable bottom panel

TVS/TVL AIRFLOW CALIBRATION

MODEL TVS

PRIMARY AIRFLOW RANGES (CFM [CMH] [L/S])

UNIT SIZE	AIRFLOW RANGES		
	CFM	CMH	L/S
0606	59~550	100~935	28~260
0806,0808,0811	106~982	180~1670	50~464
1008,1011,1018	165~1600	280~2720	78~756
1211,1218,1221	241~2294	410~3900	114~1083
1411,1418,1421,1424	335~3100	570~5270	158~1464
1621,1624	441~4100	750~6970	208~1936

FAN AIRFLOW RANGES (CFM [CMH] [L/S])

UNIT SIZE	FAN AIRFLOW								
	CFM			CMH			L/S		
	HI	MED	LOW	HI	MED	LOW	HI	MED	LOW
06	71~509	56~441	45~398	120~865	95~750	77~677	33~240	26~208	21~188
08	593~774	421~609	309~506	1008~1315	715~1035	525~860	280~365	199~288	146~239
11	871~1109	729~882	547~724	1480~1885	1240~1500	930~1230	411~524	344~417	258~342
18	906~1891	722~1481	460~1147	1540~3215	1227~2518	780~1950	428~893	341~699	217~542
21	1214~2194	894~1791	729~1359	2064~3730	1520~3045	1240~2310	573~1036	422~846	344~642
24	1298~2159	1206~2007	1059~1813	2207~3670	2051~3412	1800~3082	613~1019	570~948	500~856

MODEL TVL

PRIMARY AIRFLOW RANGES (CFM [CMH] [L/S])

UNIT SIZE	AIRFLOW RANGES		
	CFM	CMH	L/S
0405	30~250	51~425	14~118
0505	48~350	82~595	23~165
0605	59~550	100~935	28~260
0805	106~982	180~1670	50~464
1009	165~1600	280~2720	78~756
1209,1215	241~2294	410~3900	114~1083
1415	335~3100	570~5270	158~1464

FAN AIRFLOW RANGES (CFM [CMH] [L/S])

UNIT SIZE	FAN AIRFLOW								
	CFM			CMH			L/S		
	HI	MED	LOW	HI	MED	LOW	HI	MED	LOW
05	344 ~465	276 ~371	178 ~267	584~790	470~630	303~454	162 ~219	131 ~175	84 ~126
09	314 ~1053	270 ~876	222 ~739	534~1790	459~1489	378~1256	148 ~497	128 ~414	105 ~349
15	561 ~1246	421 ~1083	307 ~971	953~2119	716~1841	622~1650	265 ~589	199 ~511	145 ~458

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 (inches W.G.) of the transducer utilized with the DDC controller.
2. Maximum CFM is limited to value shown in General Selection Data.

TVS GENERAL SELECTION – 50 Hz PSC MOTOR

PRIMARY AIR VALVE

UNIT SIZE	AIRFLOW	MIN. ΔPs	ROOM NOISE CRITERIA (NC)					
			0.5" W.G. [125Pa] ΔPs		1.0" W.G. [250Pa] ΔPs		3.0" W.G. [750Pa] ΔPs	
	CFM [CMH] [L/S]	(IN. W.G.) [Pa]	Dis.	Rad.	Dis.	Rad.	Dis.	Rad.
0606	200 [340] [94]	0.03[7.5]	--	--	--	--	--	22
	250 [425] [118]	0.04[10]	--	--	--	--	--	24
	300 [510] [142]	0.06[15]	--	--	--	--	--	25
	350 [595] [165]	0.08[20]	--	--	--	20	--	28
	450 [765] [213]	0.14[35]	--	22	--	25	24	32
	550 [935] [260]	0.21[52.5]	--	29	23	29	28	34
0806 0808	300 [510] [142]	0.01[2.5]	--	--	--	--	--	29
	400 [680] [189]	0.03[7.5]	--	--	--	20	--	32
	500 [850] [236]	0.04[10]	--	--	--	23	22	33
	600 [1020] [283]	0.06[15]	--	22	--	25	25	35
	800 [1360] [378]	0.1[25]	--	27	20	30	29	38
	1000 [1700] [472]	0.15[37.5]	20	32	24	35	32	40
1008 1011 1018	600 [1020] [283]	0.01[2.5]	--	--	--	24	24	32
	800 [1360] [378]	0.01[2.5]	--	23	--	27	25	35
	1000 [1700] [472]	0.01[2.5]	--	25	--	29	28	37
	1200 [2040] [567]	0.02[5]	--	29	20	32	30	40
	1400 [2380] [661]	0.02[5]	--	33	23	33	33	42
	1600 [2720] [756]	0.03[7.5]	22	34	25	35	34	44
1211 1218 1221	800 [1360] [378]	0.01[2.5]	--	20	--	24	24	34
	1100 [1870] [519]	0.02[5]	--	24	--	28	28	37
	1400 [2380] [661]	0.04[10]	--	28	22	32	32	40
	1700 [2890] [803]	0.06[15]	--	32	24	34	35	45
	2000 [3400] [944]	0.08[20]	--	35	25	38	38	48
	2300 [3910] [1086]	0.1[25]	22	37	28	40	40	50
1411 1418 1421 1424	1100 [1870] [519]	0.02[5]	--	--	--	23	25	33
	1500 [2550] [708]	0.04[10]	--	22	20	28	32	40
	1900 [3230] [897]	0.06[15]	--	24	24	33	35	44
	2300 [3910] [1086]	0.08[20]	--	28	27	37	38	47
	2700 [4590] [1275]	0.12[30]	22	30	28	38	43	50
	3100 [5270] [1464]	0.15[37.5]	25	33	30	42	47	52
1621 1624	1600 [2720] [756]	0.01[2.5]	--	24	--	33	29	42
	2100 [3570] [992]	0.02[5]	--	28	23	37	33	47
	2600 [4420] [1228]	0.03[7.5]	22	30	28	39	36	49
	3100 [5270] [1464]	0.04[10]	24	35	33	42	40	50
	3600 [6120] [1700]	0.05[12.5]	25	37	37	43	44	54
	4100 [6970] [1936]	0.07[17.5]	27	38	38	45	50	57

FAN

UNIT SIZE	AIRFLOW	ROOM NOISE CRITERIA (NC)	
	CFM [CMH] [L/S]	Dis.	Rad.
0606 0806	450 [765] [213]	--	27
0808 1008	900 [1530] [425]	--	29
1011 1211	950 [1615] [449]	--	32
1411	980 [1666] [463]	--	32
1018	1400 [2380] [661]	--	33
1218	1400 [2380] [661]	--	35
1418	1850 [3145] [874]	--	37
1221	1500 [2550] [708]	--	34
1421 1621	2000 [3400] [944]	--	36
1424	2100 [3570] [992]	--	35
1624	2100 [3570] [992]	23	39

NOTES:

- Min. ΔPs is the static pressure difference between the terminal inlet and discharge with the damper wide open. Terminals equipped with electric heat (Model TVS-EH) require the addition of the heater pressure drop to determine the cumulative minimum ΔPs for the unit.
- Performance data obtained from tests conducted in accordance with AHRI Standard 880.
- Dash (-) indicates NC level less than 20.
- NC values calculated based upon the 2002 Addendum to ARI Standard 885 Appendix E Typical Sound Attenuation Values (shown below), using Ceiling Type 2 for calculating Radiated NC.

DISCHARGE ATTENUATION VALUES	OCTAVE BAND					
	2	3	4	5	6	7
Small Box (< 300 CFM)	24	28	39	53	59	40
Medium Box (300-700 CFM)	27	29	40	51	53	39
Large Box (> 700 CFM)	29	30	41	51	52	39

RADIATED ATTENUATION VALUES	OCTAVE BAND					
	2	3	4	5	6	7
Type 2 - Mineral Fiber Ceiling	18	19	20	26	31	36

FAN POWER / AMPERAGE DATA

UNIT SIZE	FAN INPUT POWER(W)			AMPERAGE 220V		
	HI	MED	LOW	HI	MED	LOW
0606, 0806	68	54	46	0.32	0.25	0.24
0808, 1008	254	178	131	1.15	0.81	0.59
1011, 1211, 1411	403	294	223	1.83	1.34	1.03
1018, 1218, 1418	409	354	252	2.27	1.65	1.22
1221, 1421, 1621	581	445	322	2.84	2.13	1.63
1424, 1624	694	520	408	3.26	2.56	2.05

TVL GENERAL SELECTION - 50 Hz PSC MOTOR

PRIMARY AIR VALVE

UNIT SIZE	AIRFLOW	MIN. ΔPs	ROOM NOISE CRITERIA (NC)					
			0.5" W.G. [125Pa] ΔPs		1.0" W.G. [250Pa] ΔPs		3.0" W.G. [750Pa] ΔPs	
	CFM [CMH] [L/S]	(IN. W.G.) [Pa]	Dis.	Rad.	Dis.	Rad.	Dis.	Rad.
0405	100[170][47]	0.01[2.5]	-	-	-	20	-	27
	150[255][71]	0.02[5]	-	22	-	26	20	31
	200[340][94]	0.02[5]	-	26	-	28	25	36
	250[425][118]	0.03[7.5]	-	30	22	32	30	38
0505	100[170][47]	0.01[2.5]	-	-	-	-	-	22
	200[340][94]	0.01[2.5]	-	-	-	22	-	30
	300[510][142]	0.02[5]	-	25	-	28	21	36
	350[595][165]	0.02[5]	-	27	-	32	22	38
0605	200[340][94]	0.03[7.5]	-	-	-	-	-	22
	250[425][118]	0.04[10]	-	-	-	20	-	27
	300[510][142]	0.06[14.9]	-	-	-	22	-	30
	350[595][165]	0.09[22.4]	-	22	-	26	-	31
	450[765][213]	0.15[37.3]	-	26	-	28	23	36
	550[935][260]	0.22[54.7]	-	30	22	32	27	38
0805	300[510][142]	0.02[5]	-	-	-	-	-	22
	400[680][189]	0.03[7.5]	-	-	-	20	-	27
	500[850][236]	0.04[10]	-	-	-	22	22	30
	600[1020][283]	0.05[12.4]	-	22	-	26	25	31
	800[1360][378]	0.1[24.9]	-	26	-	28	28	36
	1000[1700][472]	0.15[37.3]	-	30	22	32	31	38
1009	600[1020][283]	0.03[7.5]	-	-	-	21	26	32
	800[1360][378]	0.05[12.4]	-	-	-	23	28	36
	1000[1700][472]	0.08[19.9]	-	22	-	25	32	38
	1200[2040][567]	0.12[29.9]	-	26	-	28	33	40
	1400[2380][661]	0.16[39.8]	-	28	-	30	35	42
	1600[2720][756]	0.21[52.3]	-	34	-	33	35	43
1209	800[1360][378]	0.03[7.5]	-	-	-	21	22	30
	1100[1870][519]	0.06[14.9]	-	-	-	23	28	36
	1400[2380][661]	0.09[22.4]	-	22	-	25	32	38
	1700[2890][803]	0.13[32.3]	-	26	-	28	33	40
	2000[3400][944]	0.19[47.3]	-	28	-	30	35	42
	2300[3910][1086]	0.27[67.2]	-	34	-	33	35	43
1215	800[1360][378]	0.03[7.5]	-	-	-	-	27	30
	1100[1870][519]	0.06[14.9]	-	-	-	22	31	31
	1400[2380][661]	0.09[22.4]	-	-	-	25	32	33
	1700[2890][803]	0.13[32.3]	-	22	-	27	33	36
	2000[3400][944]	0.19[47.3]	-	28	-	30	35	38
	2300[3910][1086]	0.27[67.2]	-	30	-	30	35	41
1415	1200[2040][567]	0.05[12.4]	-	-	-	21	25	31
	1500[2550][708]	0.09[22.4]	-	-	-	23	30	32
	1800[3060][850]	0.13[32.3]	-	20	-	25	37	33
	2100[3570][992]	0.18[44.8]	-	21	-	27	37	36
	2400[4080][1133]	0.25[62.2]	-	23	20	28	37	37
	2700[4590][1275]	0.32[79.6]	-	30	21	30	37	38
	3000[5100][1417]	0.41[102]	-	32	22	30	37	41

FAN POWER / AMPERAGE DATA

UNIT SIZE	INPUT POWER(W)			AMPERAGE 220V		
	HI	MED	LOW	HI	MED	LOW
0405, 0505, 0605, 0805	105	83	60	0.5	0.4	0.3
1009, 1209	206	175	148	0.9	0.8	0.7
1215, 1415	311	263	236	1.4	1.2	1.1

FAN

UNIT SIZE	AIRFLOW	ROOM NOISE CRITERIA (NC)	
	CFM [CMH] [L/S]	Dis.	Rad.
0405 0505 0605 0805	200[340][94]	-	22
	300[510][142]	-	27
	400[680][189]	-	31
	500[850][236]	-	33
1009 1209	300[510][142]	-	24
	400[680][189]	-	27
	500[850][236]	-	29
	600[1020][283]	-	32
	700[1190][331]	-	35
	800[1360][378]	-	37
	900[1530][425]	21	38
1215 1415	600[1020][283]	-	31
	700[1190][331]	-	33
	800[1360][378]	-	35
	900[1530][425]	-	36
	1000[1700][472]	-	38
	1100[1870][519]	-	38
	1200[2040][567]	-	39
	1300[2210][614]	20	40
	1400[2380][661]	22	41

NOTES:

- Min. ΔPs is the static pressure difference between the terminal inlet and discharge with the damper wide open. Terminals equipped with electric heat (Model TVS-EH) require the addition of the heater pressure drop to determine the cumulative minimum ΔPs for the unit.
- Performance data obtained from tests conducted in accordance with AHRI Standard 880.
- Dash (-) indicates NC level less than 20.
- NC values calculated based upon the 2002 Addendum to ARI Standard 885 Appendix E Typical Sound Attenuation Values (shown below), using Ceiling Type 2 for calculating Radiated NC.

DISCHARGE ATTENUATION VALUES	OCTAVE BAND					
	2	3	4	5	6	7
Small Box (< 300 CFM)	24	28	39	53	59	40
Medium Box (300-700 CFM)	27	29	40	51	53	39
Large Box (> 700 CFM)	29	30	41	51	52	39

RADIATED ATTENUATION VALUES	OCTAVE BAND					
	2	3	4	5	6	7
Type 2 - Mineral Fiber Ceiling	18	19	20	26	31	36

TVS SOUND POWER DATA – 50 Hz PSC MOTOR

PRIMARY AIR VALVE, RADIATED

UNIT SIZE	AIRFLOW	OCTAVE BAND NUMBER																	
		0.5" W.G. [125Pa] ΔPs						1.0" W.G. [250Pa] ΔPs						3.0" W.G. [750Pa] ΔPs					
	CFM [CMH] [L/S]	2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7
0606	200 [340] [94]	47	40	37	32	27	28	51	44	41	35	29	28	57	51	48	41	34	32
	250 [425] [118]	49	42	39	34	29	28	53	46	43	36	30	28	59	53	50	42	35	32
	300 [510] [142]	52	45	41	36	30	28	56	47	44	38	31	28	62	55	51	43	36	33
	350 [595] [165]	55	47	43	37	32	29	57	49	46	39	33	29	64	57	52	44	37	33
	450 [765] [213]	59	52	46	39	33	29	62	54	49	42	36	31	67	60	55	47	40	35
	550 [935] [260]	65	56	50	42	35	31	65	57	52	43	37	32	69	62	57	48	41	36
0806 0808	300 [510] [142]	51	43	39	33	28	26	57	50	45	37	31	28	62	57	54	47	38	35
	400 [680] [189]	53	45	40	35	29	27	58	51	46	39	32	29	65	61	57	48	40	36
	500 [850] [236]	56	47	42	36	31	28	60	52	47	40	34	30	66	62	58	49	41	37
	600 [1020] [283]	59	49	44	37	33	29	62	53	48	41	36	31	68	64	59	50	43	38
	800 [1360] [378]	63	53	47	40	36	30	66	56	50	44	39	32	71	67	60	51	45	39
	1000 [1700] [472]	67	57	51	43	38	32	70	60	54	46	41	34	74	69	61	52	46	41
1008 1011 1018	600 [1020] [283]	57	48	41	34	29	27	61	52	46	38	32	29	67	60	56	48	39	35
	800 [1360] [378]	60	51	44	37	31	28	63	54	48	40	33	30	70	62	58	50	41	38
	1000 [1700] [472]	62	52	45	39	33	29	65	56	50	43	37	34	71	64	59	51	43	39
	1200 [2040] [567]	65	55	48	41	35	32	67	58	52	45	39	36	74	65	60	52	46	43
	1400 [2380] [661]	68	58	51	44	38	34	68	60	54	46	40	37	75	67	61	54	47	46
	1600 [2720] [756]	69	60	52	45	39	35	70	62	56	48	42	38	77	68	62	55	49	47
1211 1218 1221	800 [1360] [378]	58	48	42	36	29	27	61	53	47	39	33	30	68	63	57	48	42	39
	1100 [1870] [519]	61	52	46	38	31	28	64	55	49	41	35	31	71	65	59	50	44	40
	1400 [2380] [661]	64	56	48	40	33	29	67	58	52	43	37	33	74	67	61	52	45	41
	1700 [2890] [803]	67	59	52	43	36	31	69	61	54	46	39	35	78	69	63	54	47	43
	2000 [3400] [944]	70	61	54	46	38	33	72	63	57	48	41	36	80	71	64	55	49	45
	2300 [3910] [1086]	71	63	56	47	40	35	74	65	59	50	43	38	82	72	66	57	51	47
1411 1418 1421 1424	1100 [1870] [519]	55	46	41	34	28	28	60	52	46	38	31	30	68	62	56	46	40	38
	1500 [2550] [708]	59	49	43	36	30	29	64	55	48	40	33	31	74	66	59	50	42	39
	1900 [3230] [897]	61	52	45	38	32	30	68	57	49	42	35	33	77	68	61	51	45	42
	2300 [3910] [1086]	64	54	47	40	34	31	71	59	51	44	38	35	79	69	62	52	46	43
	2700 [4590] [1275]	66	56	49	42	36	33	72	61	53	46	40	38	82	70	63	54	48	46
	3100 [5270] [1464]	68	58	51	44	38	34	75	62	55	47	42	40	83	71	63	55	49	47
1621 1624	1600 [2720] [756]	61	53	47	37	30	28	68	60	53	43	36	32	75	69	62	52	45	42
	2100 [3570] [992]	64	56	49	42	34	31	71	62	55	46	39	35	79	73	66	56	49	45
	2600 [4420] [1228]	66	58	51	43	37	33	73	64	56	48	40	36	81	74	67	57	50	46
	3100 [5270] [1464]	70	60	53	44	38	34	75	65	58	50	42	37	82	76	68	59	51	47
	3600 [6120] [1700]	71	61	54	46	39	35	76	66	59	51	43	39	84	77	69	61	52	48
	4100 [6970] [1936]	72	63	57	48	40	36	78	68	60	52	44	40	86	78	70	62	55	51

NOTES:

- Data obtained from tests conducted in accordance with AHRI Standard 880.
- Sound levels are expressed in decibels, dB.
- ΔPs is the difference in static pressure across the primary air valve.

TVS SOUND POWER DATA – 50 Hz PSC MOTOR

PRIMARY AIR VALVE, DISCHARGE

UNIT SIZE	AIRFLOW	OCTAVE BAND NUMBER																	
		0.5" W.G. [125Pa] ΔPs						1.0" W.G. [250Pa] ΔPs						3.0" W.G. [750Pa] ΔPs					
	CFM [CMH] [L/S]	2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7
0606	200 [340] [94]	47	44	41	33	30	29	49	49	45	39	34	34	53	54	52	50	44	44
	250 [425] [118]	49	47	42	35	31	30	51	51	46	40	34	34	56	57	54	51	44	44
	300 [510] [142]	52	49	44	37	31	30	54	53	48	41	35	35	58	59	55	51	45	45
	350 [595] [165]	55	51	46	38	34	33	57	56	50	43	37	37	61	61	58	52	45	45
	450 [765] [213]	60	56	51	43	38	37	62	59	54	46	41	40	65	65	61	54	47	47
	550 [935] [260]	64	59	54	47	41	40	67	64	58	50	45	44	69	68	64	57	50	50
0806 0808	300 [510] [142]	49	46	43	38	33	31	53	52	48	44	38	37	58	57	58	58	49	48
	400 [680] [189]	52	49	46	41	36	32	57	54	50	46	41	40	62	61	61	59	50	50
	500 [850] [236]	55	51	48	43	38	35	59	56	52	47	43	41	64	63	62	60	51	51
	600 [1020] [283]	58	54	50	45	40	38	61	59	55	49	45	43	67	66	63	61	53	52
	800 [1360] [378]	63	58	53	48	43	41	66	63	58	52	48	47	70	70	66	62	56	55
	1000 [1700] [472]	67	63	58	53	47	46	70	66	61	56	51	50	73	72	69	63	59	58
1008 1011 1018	600 [1020] [283]	54	50	45	40	35	32	58	56	51	46	41	40	64	65	63	59	51	50
	800 [1360] [378]	56	52	47	41	36	34	62	59	53	49	43	41	67	67	64	60	53	52
	1000 [1700] [472]	60	56	50	46	40	37	64	61	56	51	46	44	70	69	65	61	55	53
	1200 [2040] [567]	63	58	53	49	42	40	65	63	57	53	47	45	72	71	67	63	57	55
	1400 [2380] [661]	66	61	56	52	45	43	68	65	60	55	49	47	75	73	68	64	58	57
	1600 [2720] [756]	69	64	59	55	47	46	71	67	62	57	51	49	76	74	70	65	60	58
1211 1218 1221	800 [1360] [378]	57	52	48	41	37	33	61	58	54	49	46	43	67	66	65	61	55	54
	1100 [1870] [519]	60	55	51	45	42	38	65	61	57	52	48	45	71	69	67	62	57	56
	1400 [2380] [661]	62	57	52	47	44	41	68	64	59	54	50	48	74	72	68	64	59	58
	1700 [2890] [803]	65	60	55	50	46	44	70	66	61	56	52	50	79	75	71	67	62	60
	2000 [3400] [944]	68	62	59	53	49	47	73	67	62	57	53	51	81	78	73	68	64	61
	2300 [3910] [1086]	70	64	61	55	51	49	75	69	64	60	55	54	84	80	75	70	66	63
1411 1418 1421 1424	1100 [1870] [519]	60	53	49	40	35	30	65	60	55	49	46	42	72	67	64	59	56	53
	1500 [2550] [708]	62	55	51	45	41	36	69	62	57	52	48	45	76	72	68	63	59	56
	1900 [3230] [897]	64	57	53	48	43	39	72	64	59	53	49	46	79	75	71	65	61	58
	2300 [3910] [1086]	67	60	56	52	46	42	74	66	61	55	51	48	83	77	72	66	62	59
	2700 [4590] [1275]	70	62	59	57	50	46	75	68	63	58	53	50	87	79	74	68	63	60
	3100 [5270] [1464]	73	65	61	58	53	49	77	69	64	62	55	52	90	81	75	69	64	61
1621 1624	1600 [2720] [756]	62	55	51	46	43	40	66	62	57	53	50	47	74	70	67	64	61	58
	2100 [3570] [992]	66	58	54	48	45	42	71	64	60	55	52	49	77	73	70	66	63	60
	2600 [4420] [1228]	70	61	55	50	48	45	75	67	62	57	54	52	81	76	72	67	65	62
	3100 [5270] [1464]	72	63	57	53	50	48	79	70	64	58	56	54	85	79	74	69	67	64
	3600 [6120] [1700]	73	64	59	56	52	50	82	72	65	60	57	56	88	81	76	71	68	66
	4100 [6970] [1936]	74	66	62	58	55	53	83	73	67	62	59	57	93	83	77	72	69	67

NOTES:

- Data obtained from tests conducted in accordance with AHRI Standard 880.
- Sound levels are expressed in decibels, dB.
- ΔPs is the difference in static pressure across the primary air valve.

TVS SOUND POWER DATA – 50 Hz PSC MOTOR

UNIT FAN ONLY

UNIT SIZE	AIRFLOW	DISCHARGE SOUND POWER DATA						RADIATED SOUND POWER DATA					
		OCTAVE BAND NUMBER						OCTAVE BAND NUMBER					
	CFM [CMH] [L/S]	2	3	4	5	6	7	2	3	4	5	6	7
0606 0806	240 [408] [113]	60	50	46	38	32	27	60	54	47	42	40	35
0808 1008	353 [600] [167]	63	54	49	44	40	38	63	59	52	47	45	42
1011 1211 1411	400 [680] [189]	65	57	50	48	45	45	65	63	55	50	49	47
	750 [1275] [354]	71	63	57	55	49	49	69	67	61	57	57	55
1018 1218 1418	800 [1360] [378]	65	58	58	53	47	45	64	60	54	51	47	43
	1100 [1870] [519]	68	60	59	55	48	47	67	62	57	54	50	47
	1400 [2380] [661]	72	61	59	56	49	50	70	65	61	58	54	51
1221 1421 1621	1200 [2040] [567]	67	60	59	55	50	50	66	62	57	55	49	49
	1400 [2380] [661]	70	62	60	57	51	51	69	65	59	58	52	52
	1600 [2720] [756]	73	64	61	58	52	52	72	68	62	60	56	54
1424 1624	1500 [2550] [708]	71	63	61	57	52	52	71	67	60	59	54	53
	1850 [3145] [874]	74	66	63	60	54	54	73	70	63	62	57	56

NOTES:

- Data obtained from tests conducted in accordance with AHRI Standard 880.
- Sound levels are expressed in decibels, dB.
- ΔPs is the difference in static pressure across the primary air valve.

TVL SOUND POWER DATA – 50 Hz PSC MOTOR

PRIMARY AIR VALVE, RADIATED

UNIT SIZE	AIRFLOW	OCTAVE BAND NUMBER																	
		0.5" W.G. [125Pa] ΔPs						1.0" W.G. [250Pa] ΔPs						3.0" W.G. [750Pa] ΔPs					
	CFM [CMH] [L/S]	2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7
0405	100[170][47]	55	45	40	34	31	31	58	47	43	36	32	31	64	56	52	44	39	35
	150[255][71]	60	49	43	37	33	32	63	52	47	41	36	33	67	60	56	47	41	36
	200[340][94]	63	53	49	39	34	32	65	56	52	43	38	33	71	64	59	49	45	37
	250[425][118]	66	56	53	44	37	32	68	59	56	46	39	33	73	66	61	52	48	40
0505	100[170][47]	52	40	38	34	31	30	56	45	41	35	31	31	60	50	48	40	36	33
	200[340][94]	56	44	41	35	33	31	60	50	46	38	35	32	65	58	55	45	39	35
	300[510][142]	62	52	46	38	34	31	65	56	52	42	38	33	71	64	59	49	45	37
	350[595][165]	64	54	50	41	36	32	68	59	55	45	38	33	73	67	62	52	49	38
0605	200[340][94]	52	40	38	34	31	30	56	45	41	35	31	31	60	50	48	40	36	33
	250[425][118]	55	42	40	34	31	31	58	47	43	36	32	31	64	56	52	44	39	35
	300[510][142]	56	44	41	35	33	31	60	50	46	38	35	32	65	58	55	45	39	35
	350[595][165]	60	49	43	37	33	32	63	52	47	41	36	33	67	60	56	47	41	36
	450[765][213]	63	53	49	39	34	32	65	56	52	42	38	33	71	64	59	49	45	37
	550[935][260]	66	56	53	44	37	32	68	59	56	46	39	33	73	66	61	52	48	41
0805	300[510][142]	52	40	40	34	31	30	56	45	41	35	31	31	60	50	48	40	36	33
	400[680][189]	55	42	40	34	31	31	58	47	43	36	32	31	64	56	52	44	39	35
	500[850][236]	56	44	40	35	33	31	60	50	46	38	35	33	65	58	55	45	39	35
	600[1020][283]	60	49	43	37	33	32	63	52	47	41	36	33	67	60	56	47	41	36
	800[1360][378]	63	53	49	39	34	32	65	56	52	42	38	33	71	64	59	49	45	37
	1000[1700][472]	66	56	53	44	37	32	68	59	56	46	39	33	73	66	61	52	48	41
1009	600[1020][283]	54	46	36	37	35	31	56	53	39	38	37	32	64	62	54	47	44	41
	800[1360][378]	56	49	42	37	35	32	59	55	44	39	37	33	67	65	55	47	43	41
	1000[1700][472]	57	52	48	38	35	33	62	56	49	40	37	34	71	67	57	48	43	41
	1200[2040][567]	59	54	52	41	37	34	65	57	52	43	39	35	74	68	57	49	44	42
	1400[2380][661]	62	55	54	46	39	35	66	59	54	45	40	36	76	69	59	50	45	43
	1600[2720][756]	66	60	59	50	42	36	67	60	58	49	43	37	77	69	60	52	47	43
1209	800[1360][378]	54	47	39	36	35	32	59	52	42	38	36	33	64	60	53	47	42	40
	1100[1870][519]	55	48	42	37	35	32	59	54	43	38	36	33	67	65	55	47	43	41
	1400[2380][661]	57	51	48	39	35	33	62	56	49	40	38	34	70	67	56	47	43	41
	1700[2890][803]	59	54	52	42	37	34	64	58	52	42	39	35	73	68	57	49	44	42
	2000[3400][944]	62	55	54	46	39	35	66	59	54	45	40	36	76	69	59	50	45	43
	2300[3910][1086]	66	60	59	50	42	36	67	60	58	49	43	37	77	69	60	52	47	43
1215	800[1360][378]	52	47	42	36	36	37	56	51	44	38	37	38	60	58	55	49	45	44
	1100[1870][519]	55	49	43	37	37	38	58	54	46	40	39	39	63	61	56	50	47	46
	1400[2380][661]	56	50	45	38	37	38	61	56	48	41	40	40	66	63	58	51	48	47
	1700[2890][803]	58	52	48	40	38	38	64	57	50	43	41	40	69	65	60	53	49	48
	2000[3400][944]	59	55	54	43	40	39	66	59	53	45	43	41	72	67	61	54	50	49
	2300[3910][1086]	61	56	55	45	43	41	66	60	55	47	45	42	74	70	62	55	51	49
1415	1200[2040][567]	54	48	43	38	37	37	57	53	45	40	39	39	62	61	56	50	46	46
	1500[2550][708]	56	49	44	37	37	38	59	55	46	40	39	39	65	62	57	51	47	46
	1800[3060][850]	57	50	46	38	37	38	62	56	49	41	40	40	67	63	58	52	48	47
	2100[3570][992]	58	52	47	39	38	38	64	57	50	43	40	40	69	65	59	52	49	48
	2400[4080][1133]	58	53	49	40	39	39	65	58	51	44	41	41	70	66	60	53	49	48
	2700[4590][1275]	59	55	55	43	40	39	66	59	53	45	43	41	72	67	61	54	50	49
	3000[5100][1417]	62	57	57	46	43	41	66	60	55	47	45	42	74	70	62	55	51	49

NOTES:

- Data obtained from tests conducted in accordance with AHRI Standard 880.
- Sound levels are expressed in decibels, dB.
- ΔPs is the difference in static pressure across the primary air valve.

TVL SOUND POWER DATA - 50 Hz PSC MOTOR

PRIMARY AIR VALVE, DISCHARGE

UNIT SIZE	AIRFLOW	OCTAVE BAND NUMBER																	
		0.5" W.G. [125Pa] ΔPs						1.0" W.G. [250Pa] ΔPs						3.0" W.G. [750Pa] ΔPs					
	CFM [CMH] [L/S]	2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7
0405	100[170][47]	49	50	42	36	32	29	50	52	47	41	36	32	52	53	50	46	46	43
	150[255][71]	51	53	45	40	35	32	53	57	51	44	40	36	58	61	56	50	49	46
	200[340][94]	54	57	48	43	38	35	57	60	53	47	43	39	63	65	59	52	41	48
	250[425][118]	58	60	51	47	41	38	61	63	56	50	45	41	67	69	62	54	52	50
0505	100[170][47]	44	44	42	36	33	30	45	45	46	42	38	34	50	47	48	47	48	45
	200[340][94]	48	47	44	40	36	33	51	51	49	44	41	37	57	56	55	52	51	48
	300[510][142]	55	54	49	45	40	36	56	56	53	48	44	40	63	62	59	54	52	49
	350[595][165]	57	56	52	48	43	39	59	58	55	51	46	42	65	64	61	56	54	51
0605	200[340][94]	48	45	42	36	33	30	50	49	47	42	38	34	55	54	53	50	48	45
	250[425][118]	50	48	43	38	34	31	52	51	48	43	38	34	58	57	55	51	48	45
	300[510][142]	51	50	45	40	34	31	55	53	50	44	39	35	60	59	56	51	49	46
	350[595][165]	56	52	47	41	38	34	58	56	52	46	41	37	63	61	59	52	49	46
	450[765][213]	61	57	52	46	42	38	63	59	56	49	45	40	67	65	62	54	51	48
	550[935][260]	65	60	55	50	45	41	68	64	60	53	49	44	71	68	65	57	54	51
0805	300[510][142]	51	48	46	43	38	34	55	53	52	49	42	39	61	58	58	56	51	49
	400[680][189]	54	50	47	44	39	34	58	55	52	49	44	40	63	61	63	59	53	51
	500[850][236]	57	53	49	45	42	36	61	57	54	50	47	42	66	64	64	59	55	52
	600[1020][283]	58	55	51	47	44	38	62	60	55	52	49	43	68	66	66	60	57	54
	800[1360][378]	63	59	55	51	48	42	66	62	59	54	53	47	72	70	67	63	61	56
	1000[1700][472]	65	61	59	55	51	46	69	65	62	57	55	50	75	72	70	64	63	58
1009	600[1020][283]	53	48	47	43	41	38	60	57	52	48	47	47	67	67	63	57	55	57
	800[1360][378]	54	50	48	44	42	39	62	58	53	49	48	48	69	70	65	58	56	59
	1000[1700][472]	55	52	49	45	43	40	64	59	54	50	49	49	71	73	67	59	57	61
	1200[2040][567]	55	55	55	47	44	41	64	59	55	50	49	50	75	74	67	60	58	63
	1400[2380][661]	56	56	61	50	46	43	64	61	57	51	50	51	77	75	67	60	59	64
	1600[2720][756]	59	57	66	54	50	48	64	62	65	53	52	52	78	75	67	61	59	64
1209	800[1360][378]	53	48	45	43	40	36	58	56	50	47	47	44	62	60	61	62	55	54
	1100[1870][519]	55	50	47	45	43	39	63	59	52	49	48	47	68	70	66	58	57	59
	1400[2380][661]	55	52	48	45	43	40	64	59	54	49	49	48	70	73	67	58	57	60
	1700[2890][803]	55	54	53	46	43	41	64	59	55	50	49	49	74	74	67	59	58	62
	2000[3400][944]	56	56	61	50	46	43	64	61	57	51	50	51	77	75	67	60	59	64
	2300[3910][1086]	59	57	66	54	50	48	64	62	65	53	52	52	78	75	67	61	59	64
1215	800[1360][378]	55	50	47	44	42	39	63	59	51	48	48	47	67	69	66	59	57	58
	1100[1870][519]	55	50	48	45	43	40	64	59	52	49	49	48	69	72	67	58	57	60
	1400[2380][661]	55	52	49	45	43	40	64	59	54	50	49	49	71	73	67	59	57	61
	1700[2890][803]	55	57	55	47	44	41	64	59	55	50	49	50	75	74	67	60	58	63
	2000[3400][944]	56	57	61	50	46	43	64	61	57	51	50	51	77	75	67	60	59	64
	2300[3910][1086]	59	57	66	54	50	48	64	62	65	53	52	52	78	75	67	61	59	64
1415	1200[2040][567]	57	53	48	46	44	41	65	61	52	49	48	47	65	67	65	59	58	59
	1500[2550][708]	57	53	49	46	43	42	65	62	54	50	49	49	68	71	67	59	58	60
	1800[3060][850]	58	54	52	46	44	42	66	62	55	50	50	49	72	77	69	60	59	61
	2100[3570][992]	60	56	53	47	45	44	67	62	57	51	50	50	77	77	69	61	59	62
	2400[4080][1133]	61	60	56	48	46	45	68	63	58	52	50	51	78	77	69	61	59	62
	2700[4590][1275]	61	61	59	51	47	45	68	64	60	53	51	51	78	77	69	62	60	63
	3000[5100][1417]	62	62	60	55	49	47	69	65	63	55	52	52	79	77	69	62	60	63

NOTES:

- Data obtained from tests conducted in accordance with AHRI Standard 880.
- Sound levels are expressed in decibels, dB.
- ΔPs is the difference in static pressure across the primary air valve.

TVL SOUND POWER DATA – 50 Hz PSC MOTOR

UNIT FAN ONLY

UNIT SIZE	AIRFLOW	DISCHARGE SOUND POWER DATA						RADIATED SOUND POWER DATA					
		OCTAVE BAND NUMBER						OCTAVE BAND NUMBER					
	CFM [CMH] [L/S]	2	3	4	5	6	7	2	3	4	5	6	7
0405,0505, 0605,0805	200[340][94]	51	48	46	42	39	33	58	52	48	42	33	32
	300[510][142]	55	51	48	46	41	36	60	57	53	46	39	36
	400[680][189]	56	54	49	50	42	38	63	60	56	49	42	41
1009 1209	300[510][142]	53	56	53	53	43	42	59	62	57	53	43	44
	400[680][189]	54	55	52	52	43	41	60	62	56	52	42	43
	500[850][236]	54	57	54	53	46	44	61	66	60	56	46	46
	600[1020][283]	55	58	55	55	49	47	61	64	60	55	50	49
	700[1190][331]	57	60	57	57	51	49	63	67	64	60	54	54
	800[1360][378]	60	63	59	59	54	53	68	68	67	63	58	59
1215 1415	600[1020][283]	57	57	52	52	46	44	63	66	57	51	45	46
	700[1190][331]	60	58	53	54	48	47	67	68	59	54	50	49
	800[1360][378]	61	60	55	57	51	49	67	69	62	57	54	52
	900[1530][425]	63	61	57	59	53	52	69	70	64	59	56	55
	1000[1700][472]	64	63	59	61	55	54	69	71	65	61	58	56

NOTES:

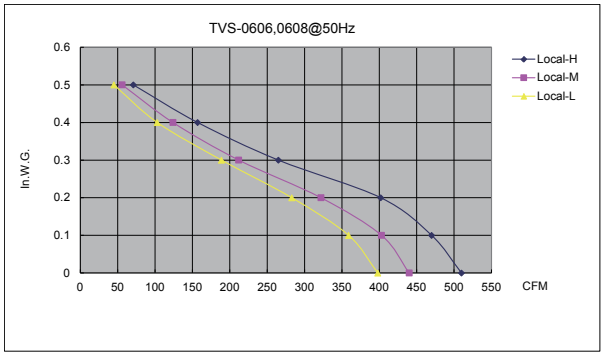
- Data obtained from tests conducted in accordance with AHRI Standard 880.
- Sound levels are expressed in decibels, dB.
- ΔPs is the difference in static pressure across the primary air valve.

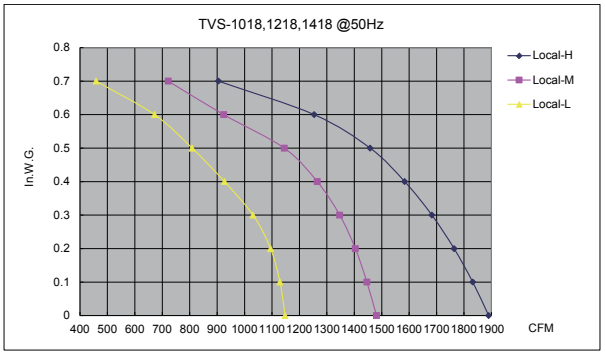
TVS FAN PERFORMANCE DATA – 50 Hz PSC MOTOR

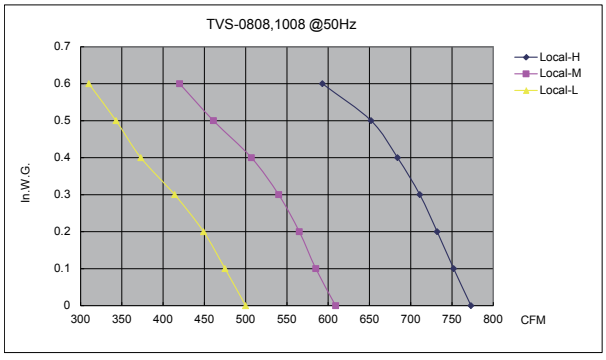
GENERAL FAN NOTE

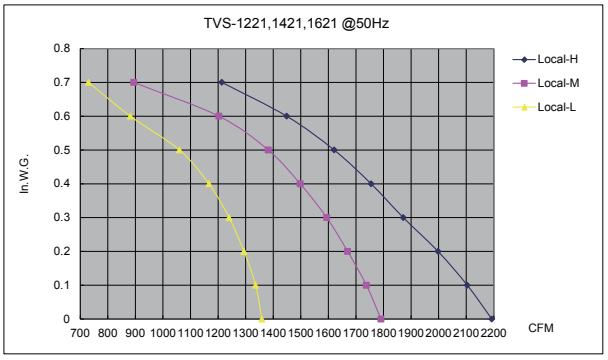
Each fan curve depicts the actual performance for the relative motor tap without any additional fan balance adjustment. Actual specified capacities which fall below a particular fan curve (LOW, MED or HI) can be obtained by adjustment of the electronic fan speed controller. Selections should only be made in the area below and/or to the left of each particular fan curve.

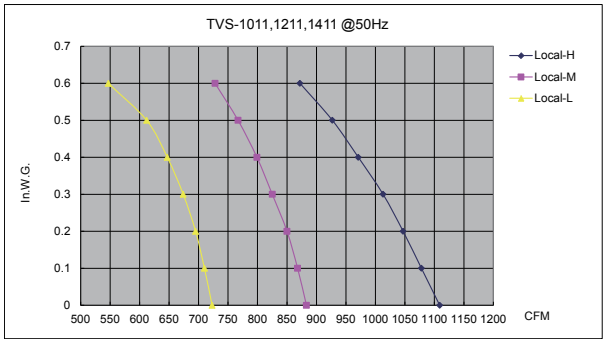
Terminals with electric heat (Model TVS-EH) require a minimum of 0.1" w.g. downstream pressure.

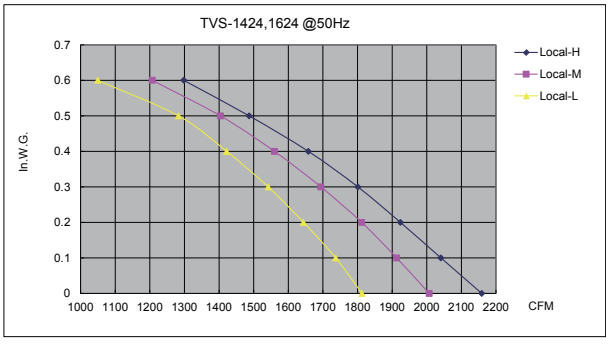








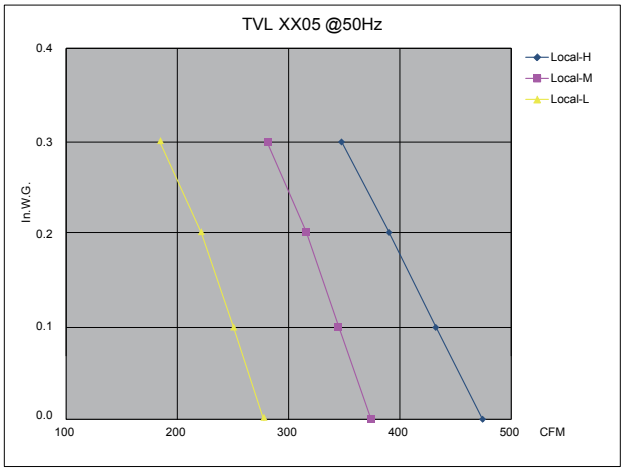


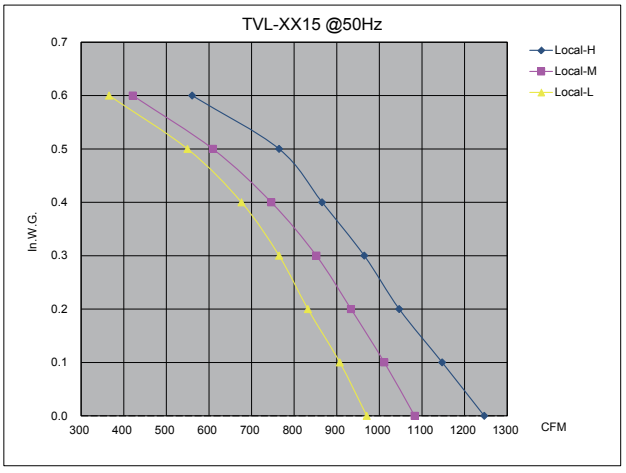


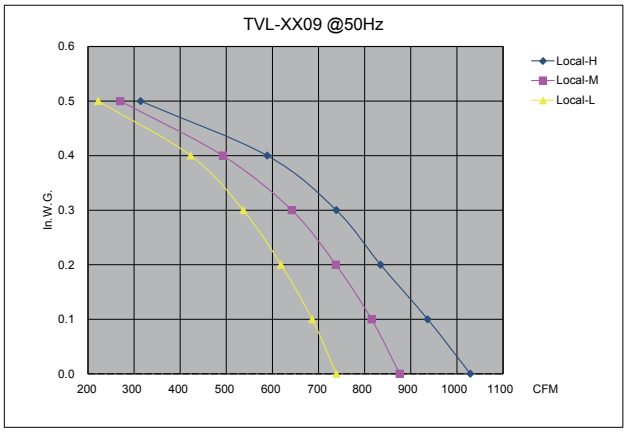
TVL FAN PERFORMANCE DATA – 50 Hz PSC MOTOR

GENERAL FAN NOTE

Each fan curve depicts the actual performance for the relative motor tap without any additional fan balance adjustment. Actual specified capacities which fall below a particular fan curve (LOW, MED or HI) can be obtained by adjustment of the electronic fan speed controller. Selections should only be made in the area below and/or to the left of each particular fan curve.







TVS ECM FAN MOTOR OPTION

THE ENERGY EFFICIENT SOLUTION

Johnson Controls offers an alternative to the PSC motor that significantly increases the operating efficiency of fan terminal units. This motor is frequently referred to as an ECM (electronically commutated motor). It is a brushless DC (BLDC) motor utilizing a permanent magnet rotor. The motor has been in production for years and is commonly used in residential HVAC units. Fan speed control is accomplished through a microprocessor based variable speed controller (inverter) integral to the motor. The motor provides peak efficiency ratings between 70 & 80% for most applications.

CONSTANT AIRFLOW ECM FEATURES AND BENEFITS

Ultra-High Motor & Controller Energy Efficiency

DC motors are significantly more efficient than AC motors. At full load the ECM is typically 20% more efficient than a standard induction motor. Due to acoustical considerations, the fan motor on a fan powered terminal typically operates considerably less than full load. At this condition the overall motor / controller (SCR) efficiency can be cut in half. Due to the permanent magnet, DC design, the ECM™ maintains a high efficiency at low speeds. Most fan powered unit selections will have an overall efficiency greater than 75%. Furthermore, the motor heat gain is greatly reduced providing additional energy savings by reducing the cold primary air requirement.

Pressure Independent Fan Volume

The integral microprocessor based controller includes a feature that provides sensorless (no external feedback) constant airflow operation by automatically adjusting the speed and torque in response to system pressure changes. This breakthrough will no doubt have far reaching benefits and endless applications. For starters, the fan volume supplied to the space will not significantly change as a filter becomes loaded. This provides new opportunities for medical applications where space pressurization and HEPA filters are applied. The air balance process will become simpler and more accurate since the fan volume will not need to be re-adjusted after the diffuser balance is accomplished.

Factory Calibrated Fan Volume

Due to the pressure independent feature, the fan capacity can now be calibrated at the factory. Within the published external pressure limits, the fan motor will automatically adjust to account for the varying static pressure requirements associated with different downstream duct configurations. This feature should not preclude the final field air balance verification process during the commissioning stage of a project. Each terminal unit has provided a factory installed 0 to 10V Converter Cable for DDC controlled fan CFM adjustment.

This 0 to 10V Converter Cable is is an accessory to enable Genteq EON motors that have been setup for PWM operation to work in systems where there is an analog 0 to 10VDC control signal available to control the motor. A fan volume verses DC volts calibration chart is provided.

Designer / Owner Flexibility

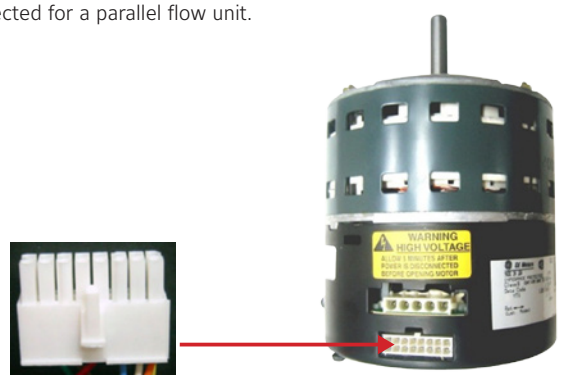
The ECM incorporates ball bearings in lieu of sleeve bearings typically utilized with an induction motor. Unlike a sleeve bearing motor, the ECM does not have a minimum RPM requirement for bearing lubrication. This allows it to operate over a much wider speed range. One motor can handle the capacity range previously handled by two motors, allowing simplification of the product line and considerable flexibility to the designer. The owner also benefits since equipment changes are much less likely with tenant requirement changes. A reduced spare parts inventory is another plus.

Custom Applications –Programmable Fan Operation

Boundless control opportunities arise due to the controllability of a DC motor combined with an integral microprocessor. Various input signals can direct the motor to behave in an application specific mode. For instance, multiple discrete fan capacities can be achieved. In addition, the fan speed can be varied in response to the space temperature load. The fan can also be programmed for a soft start. The motor starts at a very low speed and slowly ramps up to the required speed. This is especially beneficial for parallel flow fan terminals since the perceived change in space sound levels is lessened.

Extended Motor Life

The high motor efficiency provides a significantly reduced operating temperature compared to an induction motor. The lower temperature increases the longevity of all electrical components and therefore the life of the motor. The ball bearings do not require lubrication and do not adversely impact the motor life. Most fan powered applications will provide a motor life between 60,000 and 100,000 hours. A motor life of twenty five years will not be uncommon for a series flow fan terminal and a longer life can be expected for a parallel flow unit.



TVS GENERAL SELECTION – CONSTANT AIRFLOW ECM MOTOR

PRIMARY AIR VALVE

UNIT SIZE	AIRFLOW	MIN. ΔPs	ROOM NOISE CRITERIA (NC)					
			0.5" W.G. [125Pa] ΔPs		1.0" W.G. [250Pa] ΔPs		3.0" W.G. [750Pa] ΔPs	
	CFM [CMH] [L/S]	(IN. W.G.)	Dis.	Rad.	Dis.	Rad.	Dis.	Rad.
0811	300 [510] [142]	0.01	--	--	--	--	--	29
	400 [680] [189]	0.03	--	--	--	20	--	32
	500 [850] [236]	0.04	--	--	--	23	22	33
	600 [1020] [283]	0.06	--	22	--	25	25	35
	800 [1360] [378]	0.1	--	27	20	30	29	38
	1000 [1700] [472]	0.15	20	32	24	35	32	40
1011	600 [1020] [283]	0.01	--	--	--	24	24	32
	800 [1360] [378]	0.01	--	23	--	27	25	35
	1000 [1700] [472]	0.01	--	25	--	29	28	37
	1200 [2040] [567]	0.02	--	29	20	32	30	40
	1400 [2380] [661]	0.02	--	33	23	33	33	42
1218	800 [1360] [378]	0.01	--	20	--	24	24	34
	1100 [1870] [519]	0.02	--	24	--	28	28	37
	1400 [2380] [661]	0.04	--	28	22	32	32	40
	1700 [2890] [803]	0.06	--	32	24	34	35	45
	2000 [3400] [944]	0.08	--	35	25	38	38	48
	2300 [3910] [1086]	0.1	22	37	28	40	40	50
1421	1100 [1870] [519]	0.02	--	--	--	23	25	33
	1500 [2550] [708]	0.04	--	22	20	28	32	40
	1900 [3230] [897]	0.06	--	24	24	33	35	44
	2300 [3910] [1086]	0.08	--	28	27	37	38	47
	2700 [4590] [1275]	0.12	22	30	28	38	43	50
	3100 [5270] [1464]	0.15	25	33	30	42	47	52
1624	1600 [2720] [756]	0.01	--	24	--	33	29	42
	2100 [3570] [992]	0.02	--	28	23	37	33	47
	2600 [4420] [1228]	0.03	22	30	28	39	36	49
	3100 [5270] [1464]	0.04	24	35	33	42	40	50
	3600 [6120] [1700]	0.05	25	37	37	43	44	54
	4100 [6970] [1936]	0.07	27	38	38	45	50	57

FAN

UNIT SIZE	AIRFLOW	ROOM NOISE CRITERIA (NC)	
	CFM [CMH] [L/S]	Dis.	Rad.
0811	300 [510] [142]	--	28
	400 [680] [189]	--	28
	500 [850] [236]	--	29
	600 [1020] [283]	--	31
	700 [1190] [331]	--	33
1011	400 [680] [189]	--	28
	500 [850] [236]	--	29
	600 [1020] [283]	--	31
	700 [1190] [331]	--	33
	900 [1530] [425]	--	36
1218	800 [1360] [378]	--	33
	1100 [1870] [519]	--	35
	1400 [2380] [661]	20	37
1421	1200 [2040] [567]	--	34
	1600 [2720] [756]	20	38
	2000 [3400] [944]	28	43
1624	1500 [2550] [708]	--	35
	1900 [3230] [897]	23	39
	2300 [3910] [1086]	28	43

DISCHARGE ATTENUATION VALUES	OCTAVE BAND					
	2	3	4	5	6	7
Small Box (< 300 CFM)	24	28	39	53	59	40
Medium Box (300-700 CFM)	27	29	40	51	53	39
Large Box (> 700 CFM)	29	30	41	51	52	39

NOTES:

- Min. ΔPs is the static pressure difference between the terminal inlet and discharge with the damper wide open. Terminals equipped with electric heat (Model TVS-EH) require the addition of the heater pressure drop (see page 22) to determine the cumulative minimum ΔPs for the unit.
- Performance data obtained from tests conducted in accordance with AHRI Standard 880.
- Dash (-) indicates NC level less than 20.
- NC values calculated based upon the 2002 Addendum to ARI Standard 885 Appendix E Typical Sound Attenuation Values (shown below), using Ceiling Type 2 for calculating Radiated NC.
- NC (sound pressure) levels predicted by subtracting appropriate values below from published sound power levels (following pages).

HORSEPOWER / AMPERAGE DATA

UNIT SIZE	INPUT POWER	AMP
		220V
	W	FLA
0808, 1011	460	3.0
1218	515	5.0
1421	830	7.3
1624	1100	9.4

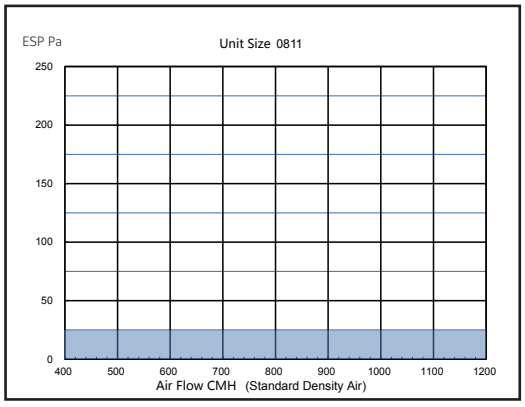
RADIATED ATTENUATION VALUES	OCTAVE BAND					
	2	3	4	5	6	7
Type 2 - Mineral Fiber Ceiling	18	19	20	26	31	36

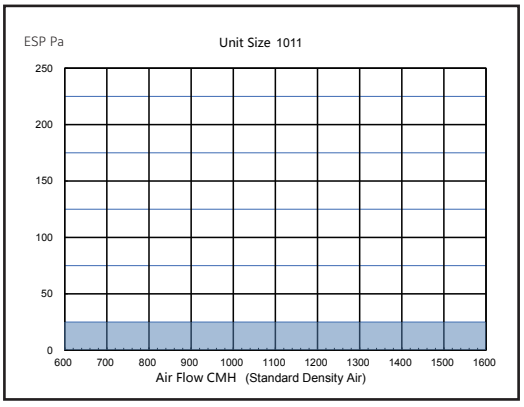
TVS FAN PERFORMANCE DATA – CONSTANT AIRFLOWECM MOTOR

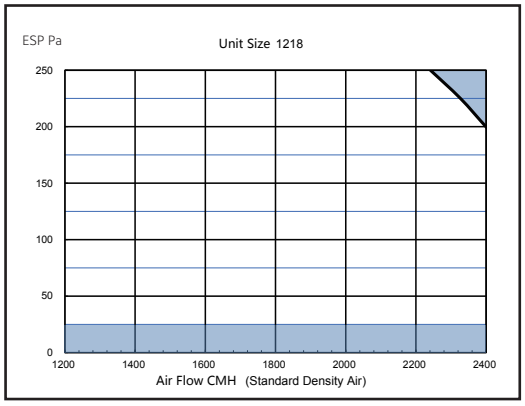
GENERAL FAN NOTE

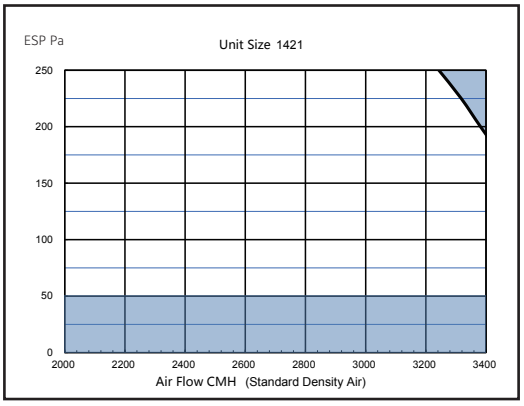
The fan curves depicted on this page are for ECM™ type motors. Actual specified capacities which fall below the fan curve can be obtained by adjustment of the fan speed controller. Selections should only be made in the non-shaded areas. The minimum external static pressure requirement is shown for each fan assembly. The unit fan should not be energized prior to realizing this minimum external static pressure.

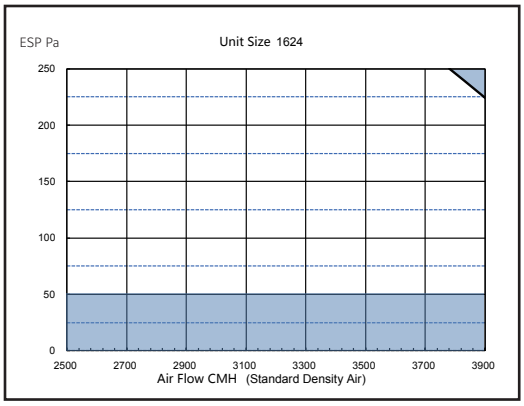
Terminals equipped with a hot water heating coil require the addition of the coil pressure drop to the specified external static pressure before making the fan selection.









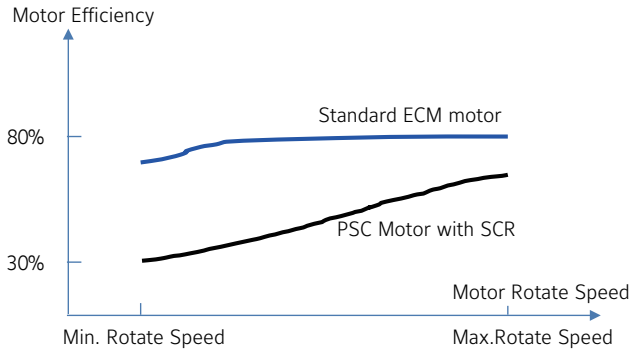


TVS ECM MOTOR OPTION - STANDARD ECM MOTOR

STANDARD ECM FEATURES AND BENEFITS

Ultra-High Energy Efficiency Motor

ECM motors are significantly more efficient than AC motors. At full load the ECM is typically 20% more efficient than a standard induction motor. Fan motor on a fan powered terminal typically operates considerably less than full load. At this condition the overall motor / controller (SCR) efficiency can be cut in half. Due to the permanent magnet, the ECM maintains a high efficiency at low speeds. Most fan powered unit selections will have an overall efficiency greater than 75%~80%.



Patented Dissipation Structure Design of Controller

Patented dissipation structure design of ECM controller, provides a significantly reduced operating temperature of ECM motor.The lower temperature increases the longevity of all electrical components and therefore the life of the motor.

Perfect Integrated Design of ECM Motor and Centrifugal Fan

ECM motor is intergrated with the intermediate partition of centrifugal fan, and Y bracket is used to fix both sides. The design can obviously reduce the negative pressure caused by the motor blocking the inlet of the fan, and improve the efficiency and capability of the fan. Bilateral balanced impeller bracket structure enhance the stable and reliable of bracket. ECM motor with compact size, wide air volume, high efficiency and stability features and will greatly improve the application of fan-powered VAV terminals.

Factory Calibrated Fan Volume

The air volume of the fan is controlled by the voltage of 0 ~ 10VDC control signal.The control voltage of three stages of air volume has been preset at factory by CCT control software. Through CCT control software, the fan can be adjusted to switch between the preset three-stage air volume, and the control voltage of each stage can also be adjusted by CCT to meet the required air volume according to the fan curve.Default control voltage of three stages and allowable range of control voltage please refer to IOM.

TVS GENERAL SELECTION – STANDARD ECM MOTOR

PRIMARY AIR VALVE

UNIT SIZE	AIRFLOW			MIN. ΔPs	ROOM NOISE CRITERIA (NC)					
					0.5" W.G. [125Pa] ΔPs		1.0" W.G. [250Pa] ΔPs		3.0" W.G. [750Pa] ΔPs	
	CFM	CMH	L/S	(IN. W.G.)	Dis.	Rad.	Dis.	Rad.	Dis.	Rad.
0808	300	510	142	0.01	--	--	--	--	--	29
	400	680	189	0.03	--	--	--	20	--	32
	500	850	236	0.04	--	--	--	23	22	33
	600	1020	283	0.06	--	22	--	25	25	35
	800	1360	378	0.10	--	27	20	30	29	38
1008	600	1020	283	0.01	--	--	--	24	24	32
	800	1360	378	0.01	--	23	--	27	25	35
	1000	1700	472	0.01	--	25	--	29	28	37
	1200	2040	567	0.02	--	29	20	32	30	40
1018	600	1020	283	0.01	--	--	--	24	24	32
	800	1360	378	0.01	--	23	--	27	25	35
	1000	1700	472	0.01	--	25	--	29	28	37
	1200	2040	567	0.02	--	29	20	32	30	40
1218	800	1360	378	0.01	--	20	--	24	24	34
	1100	1870	519	0.02	--	24	--	28	28	37
1221	800	1360	378	0.01	--	20	--	24	24	34
	1100	1870	519	0.02	--	24	--	28	28	37
	1400	2380	661	0.04	--	28	22	32	32	40
1421	1100	1870	519	0.02	--	--	--	23	25	33
	1500	2550	708	0.04	--	22	20	28	32	40
1424	1100	1870	519	0.02	--	--	--	23	25	33
	1500	2550	708	0.04	--	22	20	28	32	40
	1900	3230	897	0.06	--	24	24	33	35	44

FAN

UNIT SIZE	AIRFLOW			ROOM NOISE CRITERIA (NC)	
	CFM	CMH	L/S	Dis.	Rad.
0808 1008	900	1530	425	--	29
1018	1400	2380	661	--	33
1218	1400	2380	661	--	35
1221	1500	2550	708	--	34
1421	2000	3400	944	--	36
1424	2100	3570	992	--	35
	2100	3570	992	23	39

NOTES:

- Min. ΔPs is the static pressure difference between the terminal inlet and discharge with the damper wide open. Terminals equipped with electric heat (Model TVS-EH) require the addition of the heater pressure drop (see page 22) to determine the cumulative minimum ΔPs for the unit.
- Performance data obtained from tests conducted in accordance with AHRI Standard 880.
- Dash (-) indicates NC level less than 20.
- NC values calculated based upon the 2002 Addendum to ARI Standard 885 Appendix E Typical Sound Attenuation Values (shown below), using Ceiling Type 2 for calculating Radiated NC.
- NC (sound pressure) levels predicted by subtracting appropriate values below from published sound power levels (following pages).

DISCHARGE ATTENUATION VALUES	OCTAVE BAND					
	2	3	4	5	6	7
Small Box (< 300 CFM)	24	28	39	53	59	40
Medium Box (300-700 CFM)	27	29	40	51	53	39
Large Box (> 700 CFM)	29	30	41	51	52	39

RADIATED ATTENUATION VALUES	OCTAVE BAND					
	2	3	4	5	6	7
Type 2 - Mineral Fiber Ceiling	18	19	20	26	31	36

HORSEPOWER / AMPERAGE DATA

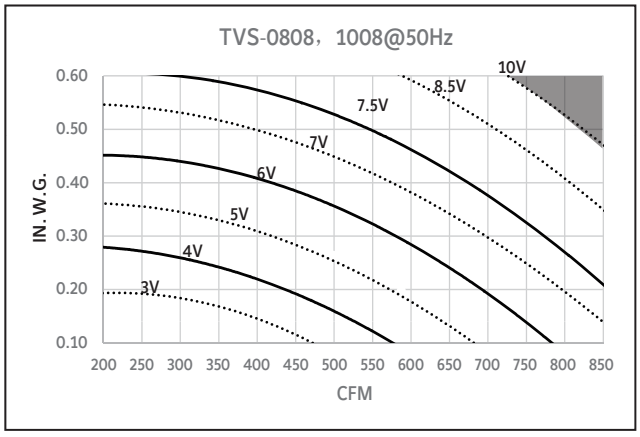
UNIT SIZE	INPUT POWER	AMP
		220V
	W	FLA
0808, 1008	191	2.8
1018,1218	381	2.8
1221,1421	497	3.7
1424	760	6.2

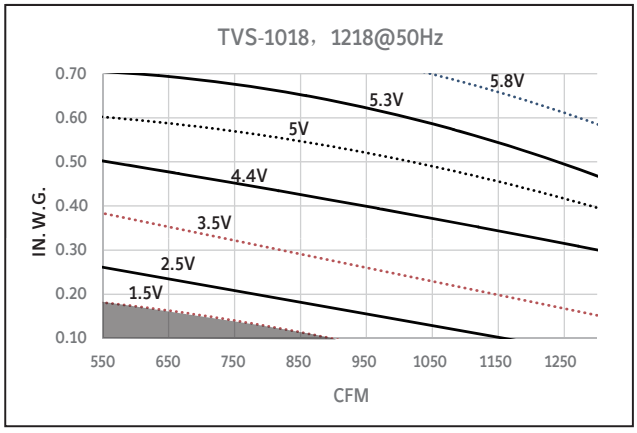
TVS FAN PERFORMANCE DATA - STANDARD ECM MOTOR

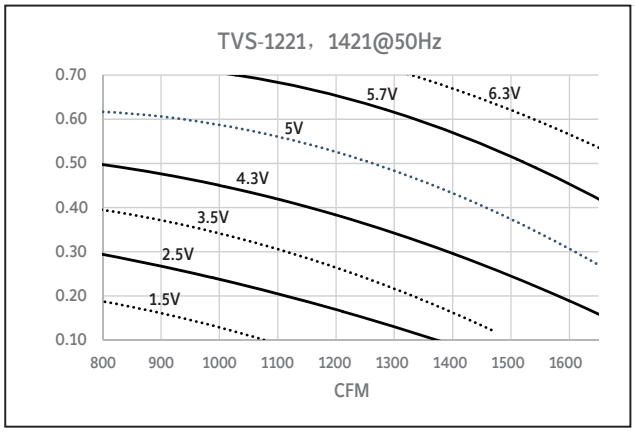
GENERAL FAN NOTE

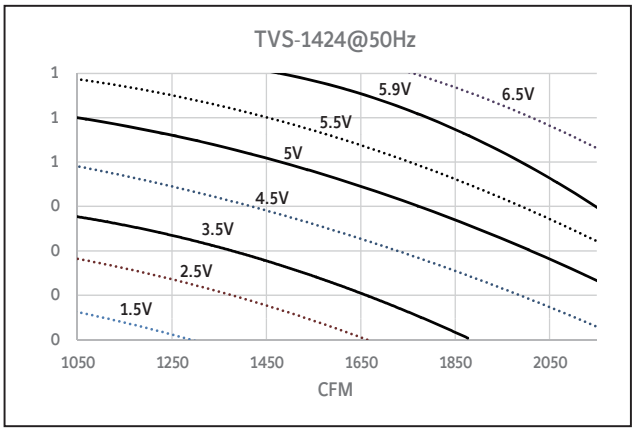
The fan curves depicted on this page are for standard ECM motors. Actual specified capacities which fall below the fan curve can be obtained by adjustment of the fan speed controller. Selections should only be made in the non-shaded areas. The minimum external static pressure requirement is shown for each fan assembly. The unit fan should not be energized prior to realizing this minimum external static pressure.

Terminals equipped with a hot water heating coil require the addition of the coil pressure drop to the specified external static pressure before making the fan selection.









TVS AHRI RATINGS

FAN PERFORMANCE

SIZE	FAN AIRFLOW RATE (CFM)	ELECTRIC POWER INPUT (WATTS)	STANDARD RATINGS - SOUND POWER LEVEL, dB RE:1 X 10-12 WATTS											
			DISCHARGE						RADIATED					
			Hz Octave Band Center Frequency						Hz Octave Band Center Frequency					
			125	250	500	1000	2000	4000	125	250	500	1000	2000	4000
0606	240	60	60	50	46	38	32	27	60	54	47	42	40	35
0806	240	60	60	50	46	38	32	27	60	54	47	42	40	35
0808	700	260	71	63	57	55	49	49	69	67	61	57	57	55
1008	700	260	71	63	57	55	49	49	69	67	61	57	57	55
1011	750	296	71	63	57	55	49	49	69	67	61	57	57	55
1018	1400	382	72	61	59	56	49	50	70	65	61	58	54	51
1211	750	296	71	63	57	55	49	49	69	67	61	57	57	55
1218	1400	382	72	61	59	56	49	50	70	65	61	58	54	51
1221	1600	459	73	64	61	58	52	52	72	68	62	60	56	54

NOTE: Based on standard PSC motor.
· Fan external static pressure is 0.25" w.g.
· Duct end corrections included in sound power levels per AHRI Standard 880.

PRIMARY AIR VALVE PERFORMANCE

SIZE	PRIMARY AIRFLOW RATE (CFM)	MINIMUM OPERATING PRESSURE (IN. W.G.)	STANDARD RATINGS - SOUND POWER LEVEL, dB RE:1 X 10-12 WATTS											
			DISCHARGE						RADIATED					
			Hz Octave Band Center Frequency						Hz Octave Band Center Frequency					
			125	250	500	1000	2000	4000	125	250	500	1000	2000	4000
0606	400	0.15	66	61	54	45	42	40	66	60	53	46	39	36
0806	700	0.06	75	67	60	51	49	44	67	61	56	49	42	38
0808	700	0.06	75	67	60	51	49	44	67	61	56	49	42	38
1008	1100	0.04	72	63	59	55	52	48	67	59	58	55	53	49
1011	1100	0.04	72	63	59	55	52	48	67	59	58	55	53	49
1018	1100	0.04	72	63	59	55	52	48	67	59	58	55	53	49
1211	1600	0.09	77	70	65	59	55	51	70	61	58	49	43	37
1218	1600	0.09	77	70	65	59	55	51	70	61	58	49	43	37
1221	1600	0.09	77	70	65	59	55	51	70	61	58	49	43	37

NOTE: Based on standard PSC motor.
· Inlet static pressure is 1.5" w.g.
· Duct end corrections included in sound power levels per AHRI Standard 880.

TVS ELECTRIC HEATER DATA

MODEL TVS-E

Standard Features

- Primary automatic reset thermal protection
- Secondary thermal fuse protection
- Wiring diagram
- Power supplier: 220V/1/50Hz
- Available kW increments are as follows:
  0.5 kW increments from 0.5 to 2 kW
  1 kW increments from 2 to 6 kW
  2 kW increments from 6 to 8 kW

Selection Procedure

With standard heater elements, the maximum capacity (kW) is obtained by dividing the heating (fan) CMH by 120.In other words, the terminal must have at least 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 Johnson Controls representative for design assistance.

Heaters require a minimum of 28Pa downstream static pressure to ensure proper operation.For optimum diffuser performance in overhead heating applications, the supply air temperature should be within 11°C of the desired space temperature. This typically requires a higher air capacity which provides higher air motion in the space increasing thermal comfort. The electric heater should be selected with this in mind, keeping the LAT as low as possible.

Selection Equations

$$kW=\frac{CMH\times\Delta T\times\rho\times c}{3600}$$

* Air density at sea level - reduce by 0.036 for each 1000 feet(304.8 meter) of altitude above sea level.

	Heater Elements	Electric heating tube					
Electric Heater	Unit Size	TVS06XX	TVS08XX	TVS10XX	TVS12XX	TVS14XX	TVS16XX
	Available kW	0.5-4kW	0.5-6kW	0.5-8kW	0.5-8kW	0.5-8kW	0.5-8kW
	Stage of Heating	1 or 2 Stages	1 or 2 Stages	1 or 2 Stages	1 or 2 Stages	1 or 2 Stages	1 or 2 Stages

TVS HOT WATER COIL DATA

MODEL TVS-W

Standard Features

- Designed, manufactured and tested by Johnson Controls
- Aluminum fin construction with die-formed spacer collars for uniform spacing
- Mechanically expanded copper tubes, leak tested to 406 PSIG[2.8MPa] air pressure and rated at 232 PSIG[1.6MPa] working pressure.
- 1, 2 row configurations
- Top and bottom access plate in coil casing for fan sizes 04 through 24. Coil access through bottom casing panel for fan sizes 30, 40 and 44.

Optional Features

- 3 rows configurations
- Multi-circuit coils for reduced water pressure drop
- Opposite hand water connections

Selection Procedure

Hot Water Coil Performance Tables are based upon a temperature difference of 105.8°F[41°C] between entering water and entering air. If this ΔT is suitable, proceed directly to the performance tables for selection. All pertinent performance data is tabulated.

Entering Water - Air Temperature Different (ΔT) Correction Factors °F[°C]															
ΔT	10[6]	15[8]	20[11]	25[14]	30[17]	35[19]	40[22]	45[25]	50[28]	55[31]	60[33]	65[36]	70[39]	75[41]	80[44]
Factor	0.23	0.29	0.35	0.42	0.48	0.54	0.60	0.66	0.72	0.78	0.85	0.91	0.97	1.00	1.09
ΔT	85[47]	90[50]	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]
Factor	1.15	1.22	1.28	1.35	1.42	1.48	1.54	1.60	1.66	1.74	1.80	1.86	1.92	1.98	2.05

The table above gives correction factors for various entering ΔT's (difference between entering water and entering air temperatures). 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 table. The leaving air and leaving water temperatures can be calculated from the following fundamental formulas:

$$LAT = EAT + \frac{BTUH}{1.085 \times CFM}$$

$$LWT = EWT + \frac{BTUH}{500 \times GPM}$$

EAT	Entering Air Temperature (°F)[°C]
LAT	Leaving Air Temperature (°F)[°C]
EWT	Entering Water Temperature (°F)[°C]
LWT	Leaving Water Temperature (°F)[°C]

TVS HOT WATER COIL DATA

MODEL TVS-W UNIT SIZES 0606, 0806, 0808, 0811

Airflow				Water Flow						LAT (°F) [°C]				LWT (°F) [°C]				Capactiy (MBH) [kW]			
Rate (CFM)	[CMH]	[L/S]	Air PD (IN. W.G.)[Pa]	Rate (GPM)	[L/s]	Water PD (FT.W.G.) [kPa]															
						1 Row		2 Row		1 Row		2 Row		1 Row		2 Row		1 Row		2 Row	
200	[340]	[94]	1 Row 0.01 [1.6] 2 Row 0.02 [3.9]	0.5	[0.03]	0.20	0.60	0.13	0.38	92.4	33.6	104.0	40.0	115.7	46.5	104.9	40.5	5.7	1.7	8.2	2.4
				1	[0.06]	0.70	2.09	0.45	1.33	99.6	37.5	114.3	45.7	124.5	51.4	117.7	47.6	7.2	2.1	10.4	3.0
				2	[0.13]	2.87	8.58	1.80	5.38	107.1	41.7	125.2	51.8	131.3	55.1	127.4	53.0	8.8	2.6	12.7	3.7
				3	[0.19]	5.80	17.33	3.61	10.78	109.2	42.9	128.3	53.5	133.7	56.5	130.9	55.0	9.3	2.7	13.4	3.9
				4	[0.25]	9.68	28.92	5.99	17.90	110.2	43.4	129.6	54.2	135.1	57.3	132.9	56.1	9.5	2.8	13.7	4.0
				5	[0.32]	15.40	46.03	9.48	28.33	111.3	44.1	131.3	55.2	136.1	57.8	134.3	56.9	9.7	2.9	14.1	4.1
300	[510]	[142]	1 Row 0.01 [2.7] 2 Row 0.03 [6.5]	0.5	[0.03]	0.20	0.60	0.13	0.38	84.8	29.4	93.8	34.4	114.1	45.6	101.6	38.7	6.0	1.8	9.0	2.6
				1	[0.06]	0.70	2.09	0.45	1.33	92.1	33.4	104.6	40.3	122.0	50.0	113.3	45.2	8.4	2.5	12.4	3.6
				2	[0.13]	2.87	8.58	1.80	5.38	97.8	36.5	113.0	45.0	129.9	54.4	125.0	51.7	10.2	3.0	15.2	4.4
				3	[0.19]	5.80	17.33	3.61	10.78	99.9	37.7	116.2	46.8	132.6	55.9	129.0	53.9	10.9	3.2	16.2	4.7
				4	[0.25]	9.68	28.92	5.99	17.90	101.1	38.4	117.9	47.7	134.2	56.8	131.4	55.2	11.3	3.3	16.8	4.9
				5	[0.32]	15.40	46.03	9.48	28.33	102.2	39.0	119.6	48.7	135.3	57.4	133.0	56.1	11.7	3.4	17.3	5.1
400	[680]	[189]	1 Row 0.02 [4.0] 2 Row 0.04 [9.6]	0.5	[0.03]	0.20	0.60	0.13	0.38	81.2	27.3	88.8	31.6	112.3	44.6	98.1	36.7	6.5	1.9	9.8	2.9
				1	[0.06]	0.70	2.09	0.45	1.33	87.5	30.8	98.4	36.9	120.3	49.1	110.2	43.4	9.2	2.7	13.9	4.1
				2	[0.13]	2.87	8.58	1.80	5.38	92.8	33.8	106.4	41.4	128.6	53.7	122.8	50.4	11.5	3.4	17.4	5.1
				3	[0.19]	5.80	17.33	3.61	10.78	94.6	34.8	109.1	42.9	131.7	55.4	127.4	53.0	12.3	3.6	18.5	5.4
				4	[0.25]	9.68	28.92	5.99	17.90	95.8	35.4	110.9	43.9	133.4	56.3	130.1	54.5	12.8	3.7	19.3	5.7
				5	[0.32]	15.40	46.03	9.48	28.33	96.8	36.0	112.5	44.7	134.7	57.0	131.9	55.5	13.2	3.9	20.0	5.9
500	[850]	[236]	1 Row 0.02 [5.5] 2 Row 0.05 [13.1]	0.5	[0.03]	0.20	0.60	0.13	0.38	78.5	25.8	85.1	29.5	111.5	44.2	96.2	35.7	6.6	1.9	10.2	3.0
				1	[0.06]	0.70	2.09	0.45	1.33	84.1	28.9	93.7	34.3	119.3	48.5	108.2	42.3	9.7	2.8	14.8	4.3
				2	[0.13]	2.87	8.58	1.80	5.38	89.2	31.8	101.5	38.6	127.7	53.2	121.1	49.5	12.4	3.6	19.1	5.6
				3	[0.19]	5.80	17.33	3.61	10.78	91.2	32.9	104.6	40.3	130.9	54.9	126.0	52.2	13.5	4.0	20.7	6.1
				4	[0.25]	9.68	28.92	5.99	17.90	92.1	33.4	106.0	41.1	132.8	56.0	128.9	53.8	14.0	4.1	21.5	6.3
				5	[0.32]	15.40	46.03	9.48	28.33	93.2	34.0	107.7	42.1	134.1	56.7	131.0	55.0	14.6	4.3	22.4	6.6
600	[1020]	[283]	1 Row 0.03 [7.0] 2 Row 0.07 [16.8]	0.5	[0.03]	0.20	0.60	0.13	0.38	76.3	24.6	81.8	27.7	112.0	44.5	96.5	35.8	6.5	1.9	10.1	3.0
				1	[0.06]	0.70	2.09	0.45	1.33	81.4	27.4	89.8	32.1	118.9	48.3	107.2	41.8	9.8	2.9	15.3	4.5
				2	[0.13]	2.87	8.58	1.80	5.38	86.4	30.2	97.6	36.4	127.1	52.8	119.9	48.8	13.1	3.8	20.3	6.0
				3	[0.19]	5.80	17.33	3.61	10.78	88.4	31.3	100.7	38.2	130.3	54.6	124.9	51.6	14.4	4.2	22.3	6.5
				4	[0.25]	9.68	28.92	5.99	17.90	89.5	32.0	102.5	39.1	132.2	55.7	127.9	53.3	15.1	4.4	23.5	6.9
				5	[0.32]	15.40	46.03	9.48	28.33	90.6	32.6	104.2	40.1	133.6	56.5	130.1	54.5	15.8	4.6	24.6	7.2
700	[1190]	[331]	1 Row 0.03 [8.7] 2 Row 0.08 [20.9]	0.5	[0.03]	0.20	0.60	0.13	0.38	75.1	24.0	80.2	26.8	111.0	43.9	94.4	34.7	6.8	2.0	10.6	3.1
				1	[0.06]	0.70	2.09	0.45	1.33	79.8	26.6	87.6	30.9	117.9	47.7	105.3	40.7	10.3	3.0	16.2	4.7
				2	[0.13]	2.87	8.58	1.80	5.38	84.5	29.2	95.0	35.0	126.3	52.4	118.4	48.0	13.9	4.1	21.8	6.4
				3	[0.19]	5.80	17.33	3.61	10.78	86.4	30.2	98.0	36.7	129.6	54.2	123.7	51.0	15.3	4.5	24.0	7.0
				4	[0.25]	9.68	28.92	5.99	17.90	87.5	30.8	99.6	37.6	131.7	55.4	127.0	52.8	16.1	4.7	25.3	7.4
				5	[0.32]	15.40	46.03	9.48	28.33	88.6	31.4	101.4	38.6	133.2	56.2	129.3	54.1	16.9	5.0	26.6	7.8
800	[1360]	[378]	1 Row 0.04 [10.9] 2 Row 0.11 [26.2]	0.5	[0.03]	0.20	0.60	0.13	0.38	74.2	23.5	79.0	26.1	110.2	43.4	92.7	33.7	6.9	2.0	11.0	3.2
				1	[0.06]	0.70	2.09	0.45	1.33	78.9	26.0	86.3	30.2	116.5	46.9	102.7	39.3	11.0	3.2	17.4	5.1
				2	[0.13]	2.87	8.58	1.80	5.38	83.1	28.4	93.0	33.9	125.5	52.0	117.1	47.3	14.6	4.3	23.2	6.8
				3	[0.19]	5.80	17.33	3.61	10.78	84.9	29.4	95.8	35.5	129.1	53.9	122.7	50.4	16.1	4.7	25.6	7.5
				4	[0.25]	9.68	28.92	5.99	17.90	86.0	30.0	97.6	36.4	131.2	55.1	126.1	52.3	17.1	5.0	27.1	7.9
				5	[0.32]	15.40	46.03	9.48	28.33	87.0	30.5	99.2	37.3	132.8	56.0	128.5	53.6	18.0	5.3	28.5	8.3

NOTES:

1. Data is based on 140°F[60°C] entering water and 66.2°F[19°C] entering air temperature at sea level.
2. For optimum diffuser performance in overhead heating applications, the supply air temperature should be within 20°F[11°C] of the desired space temperature. This typically requires a higher air capacity which provides higher air motion in the space, increasing thermal comfort. The hot water coil should be selected with this in mind, keeping the LAT as low as possible.
3. Above data is based on standard coil configuation, for multi-circuit coils please contact your Johnson Controls representative for design assistance.

TVS HOT WATER COIL DATA

MODEL TVS-W UNIT SIZES 1008, 1011, 1018, 1211, 1218, 1221

Airflow				Water Flow						LAT (°F) [°C]				LWT (°F) [°C]				Capactiy (MBH) [kW]			
Rate (CFM)	[CMH]	[L/S]	Air PD (IN. W.G.)[Pa]	Rate (GPM)	[L/s]	Water PD (FT.W.G.) [kPa] 1 Row		2 Row		1 Row		2 Row		1 Row		2 Row		1 Row		2 Row	
400	[680]	[189]	1 Row 0.01 [2.4] 2 Row 0.02 [5.7]	0.5	[0.03]	0.12	0.35	0.23	0.70	83.7	28.7	92.0	33.3	107.5	42.0	92.2	33.4	7.6	2.2	11.2	3.3
				1	[0.06]	0.40	1.21	0.80	2.38	92.0	33.4	104.3	40.2	116.0	46.7	104.7	40.4	11.2	3.3	16.4	4.8
				2	[0.13]	1.63	4.86	3.20	9.56	100.8	38.2	117.2	47.3	125.2	51.8	118.2	47.9	14.9	4.4	22.0	6.5
				3	[0.19]	3.25	9.72	6.38	19.07	102.6	39.2	119.8	48.8	129.4	54.1	124.3	51.3	15.7	4.6	23.2	6.8
				4	[0.25]	5.38	16.09	10.56	31.56	103.4	39.7	121.0	49.4	131.7	55.4	127.8	53.2	16.1	4.7	23.7	6.9
				5	[0.32]	8.50	25.41	16.67	49.80	104.4	40.2	122.5	50.3	133.4	56.3	130.2	54.6	16.5	4.8	24.3	7.1
600	[1020]	[283]	1 Row 0.02 [4.1] 2 Row 0.04 [9.8]	0.5	[0.03]	0.12	0.35	0.23	0.70	79.1	26.2	85.7	29.8	104.2	40.1	85.7	29.9	8.4	2.4	12.6	3.7
				1	[0.06]	0.40	1.21	0.80	2.38	86.3	30.2	96.6	35.9	112.1	44.5	97.7	36.5	13.0	3.8	19.7	5.8
				2	[0.13]	1.63	4.86	3.20	9.56	93.0	33.9	106.7	41.5	122.8	50.5	114.0	45.6	17.3	5.1	26.3	7.7
				3	[0.19]	3.25	9.72	6.38	19.07	94.9	34.9	109.6	43.1	127.4	53.0	120.9	49.4	18.6	5.4	28.1	8.2
				4	[0.25]	5.38	16.09	10.56	31.56	95.7	35.4	110.9	43.8	130.2	54.5	125.1	51.7	19.1	5.6	28.9	8.5
				5	[0.32]	8.50	25.41	16.67	49.80	96.6	35.9	112.3	44.6	132.1	55.6	128.0	53.3	19.7	5.8	29.9	8.8
800	[1360]	[378]	1 Row 0.02 [6.0] 2 Row 0.06 [14.5]	0.5	[0.03]	0.12	0.35	0.23	0.70	76.3	24.6	81.8	27.7	102.5	39.2	82.2	27.9	8.7	2.6	13.5	4.0
				1	[0.06]	0.40	1.21	0.80	2.38	82.7	28.1	91.6	33.1	109.5	43.0	92.9	33.8	14.2	4.2	22.0	6.4
				2	[0.13]	1.63	4.86	3.20	9.56	88.9	31.6	101.3	38.5	120.6	49.2	110.0	43.3	19.6	5.7	30.3	8.9
				3	[0.19]	3.25	9.72	6.38	19.07	90.3	32.4	103.4	39.7	125.9	52.2	118.2	47.9	20.8	6.1	32.2	9.4
				4	[0.25]	5.38	16.09	10.56	31.56	91.3	33.0	105.0	40.5	128.8	53.8	122.8	50.4	21.7	6.4	33.5	9.8
				5	[0.32]	8.50	25.41	16.67	49.80	92.1	33.4	106.2	41.2	131.0	55.0	126.1	52.3	22.4	6.6	34.6	10.1
1000	[1700]	[472]	1 Row 0.03 [8.3] 2 Row 0.08 [20.0]	0.5	[0.03]	0.12	0.35	0.23	0.70	74.5	23.6	79.2	26.2	101.5	38.6	79.6	26.4	9.0	2.6	14.1	4.1
				1	[0.06]	0.40	1.21	0.80	2.38	80.0	26.7	87.9	31.1	108.0	42.2	89.8	32.1	14.9	4.4	23.4	6.9
				2	[0.13]	1.63	4.86	3.20	9.56	85.8	29.9	96.9	36.1	119.1	48.4	107.2	41.8	21.1	6.2	33.2	9.7
				3	[0.19]	3.25	9.72	6.38	19.07	87.3	30.7	99.3	37.4	124.5	51.4	115.8	46.5	22.8	6.7	35.8	10.5
				4	[0.25]	5.38	16.09	10.56	31.56	88.2	31.2	100.6	38.1	127.8	53.2	120.8	49.4	23.7	7.0	37.2	10.9
				5	[0.32]	8.50	25.41	16.67	49.80	89.1	31.7	102.1	38.9	130.1	54.5	124.4	51.3	24.7	7.2	38.7	11.3
1200	[2040]	[567]	1 Row 0.04 [11.1] 2 Row 0.11 [26.6]	0.5	[0.03]	0.12	0.35	0.23	0.70	73.2	22.9	77.3	25.2	101.0	38.3	78.0	25.6	9.1	2.7	14.4	4.2
				1	[0.06]	0.40	1.21	0.80	2.38	78.4	25.8	85.5	29.7	106.2	41.2	86.3	30.2	15.8	4.6	25.0	7.3
				2	[0.13]	1.63	4.86	3.20	9.56	83.7	28.7	94.0	34.4	117.6	47.5	104.4	40.2	22.7	6.6	36.0	10.5
				3	[0.19]	3.25	9.72	6.38	19.07	85.2	29.5	96.3	35.7	123.3	50.7	113.5	45.3	24.6	7.2	39.1	11.4
				4	[0.25]	5.38	16.09	10.56	31.56	86.0	30.0	97.7	36.5	126.8	52.7	119.0	48.3	25.7	7.5	40.8	11.9
				5	[0.32]	8.50	25.41	16.67	49.80	86.9	30.5	99.0	37.2	129.2	54.0	122.9	50.5	26.8	7.8	42.5	12.5
1400	[2380]	[661]	1 Row 0.06 [14.4] 2 Row 0.14 [34.6]	0.5	[0.03]	0.12	0.35	0.23	0.70	72.2	22.3	75.8	24.4	101.0	38.3	77.4	25.2	9.1	2.7	14.6	4.3
				1	[0.06]	0.40	1.21	0.80	2.38	76.8	24.9	83.2	28.5	105.6	40.9	84.8	29.3	16.0	4.7	25.7	7.5
				2	[0.13]	1.63	4.86	3.20	9.56	81.9	27.7	91.3	33.0	116.5	47.0	102.4	39.1	23.7	6.9	38.0	11.1
				3	[0.19]	3.25	9.72	6.38	19.07	83.4	28.6	93.8	34.3	122.4	50.2	111.7	44.3	26.0	7.6	41.7	12.2
				4	[0.25]	5.38	16.09	10.56	31.56	84.3	29.1	95.2	35.1	125.9	52.2	117.4	47.4	27.4	8.0	43.9	12.9
				5	[0.32]	8.50	25.41	16.67	49.80	85.2	29.5	96.6	35.9	128.5	53.6	121.5	49.7	28.7	8.4	46.0	13.5
1600	[2720]	[756]	1 Row 0.07 [18.1] 2 Row 0.17 [43.4]	0.5	[0.03]	0.12	0.35	0.23	0.70	71.6	22.0	74.9	23.9	99.9	37.7	75.2	24.0	9.3	2.7	15.1	4.4
				1	[0.06]	0.40	1.21	0.80	2.38	75.8	24.3	81.8	27.7	104.3	40.2	82.3	27.9	16.6	4.9	26.9	7.9
				2	[0.13]	1.63	4.86	3.20	9.56	80.6	27.0	89.5	32.0	115.4	46.3	100.1	37.8	24.9	7.3	40.3	11.8
				3	[0.19]	3.25	9.72	6.38	19.07	82.1	27.8	91.9	33.3	121.4	49.7	109.9	43.3	27.4	8.0	44.4	13.0
				4	[0.25]	5.38	16.09	10.56	31.56	82.9	28.3	93.2	34.0	125.1	51.7	115.9	46.6	28.9	8.5	46.7	13.7
				5	[0.32]	8.50	25.41	16.67	49.80	83.8	28.8	94.7	34.8	127.8	53.2	120.2	49.0	30.4	8.9	49.2	14.4
1800	[3060]	[850]	1 Row 0.09 [22.1] 2 Row 0.21 [53.0]	0.5	[0.03]	0.12	0.35	0.23	0.70	71.0	21.7	74.0	23.3	100.1	37.8	74.8	23.8	9.3	2.7	15.2	4.5
				1	[0.06]	0.40	1.21	0.80	2.38	74.9	23.8	80.4	26.9	103.6	39.8	80.6	27.0	17.0	5.0	27.7	8.1
				2	[0.13]	1.63	4.86	3.20	9.56	79.6	26.5	88.1	31.2	114.1	45.6	97.8	36.6	26.1	7.7	42.6	12.5
				3	[0.19]	3.25	9.72	6.38	19.07	81.0	27.2	90.4	32.5	120.5	49.1	108.1	42.3	28.8	8.5	47.1	13.8
				4	[0.25]	5.38	16.09	10.56	31.56	81.9	27.7	91.7	33.2	124.3	51.3	114.4	45.8	30.4	8.9	49.7	14.5
				5	[0.32]	8.50	25.41	16.67	49.80	82.7	28.1	93.1	33.9	127.1	52.8	119.0	48.3	32.0	9.4	52.2	15.3

NOTES:

1. Data is based on 140°F[60°C] entering water and 66.2°F[19°C] entering air temperature at sea level.
2. For optimum diffuser performance in overhead heating applications, the supply air temperature should be within 20°F[11°C] of the desired space temperature. This typically requires a higher air capacity which provides higher air motion in the space, increasing thermal comfort. The hot water coil should be selected with this in mind, keeping the LAT as low as possible.
3. Above data is based on standard coil configuation, for multi-circuit coils please contact your Johnson Controls representative for design assistance.

TVS HOT WATER COIL DATA

MODEL TVS-W UNIT SIZES 1411, 1418, 1421, 1424, 1621, 1624

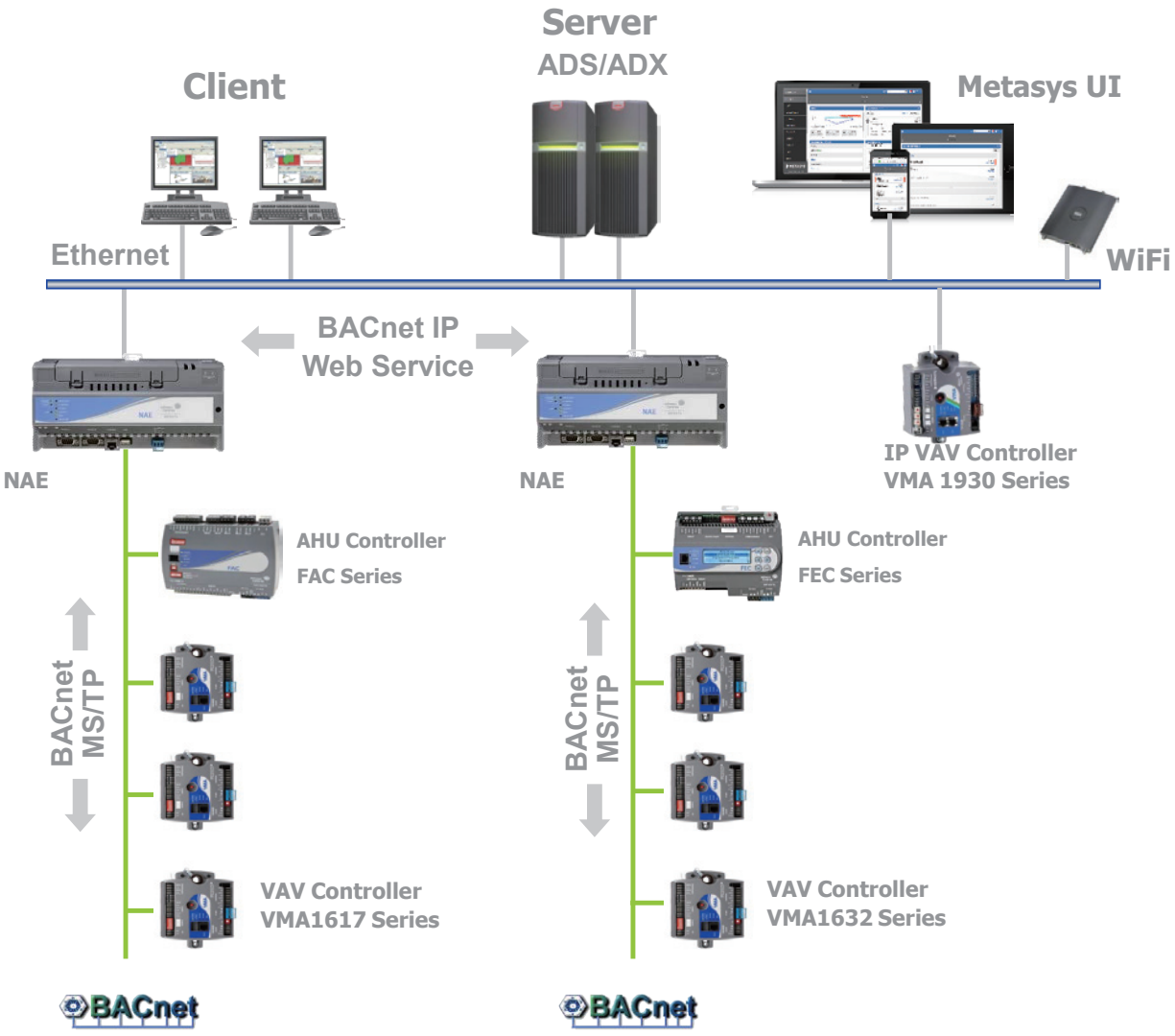
Airflow				Water Flow						LAT (°F) [°C]				LWT (°F) [°C]				Capactiy (MBH) [kW]			
Rate (CFM)	[CMH]	[L/S]	Air PD (IN. W.G.)[Pa]	Rate (GPM)	[L/s]	Water PD (FT.W.G.) [kPa] 1 Row		Water PD (FT.W.G.) [kPa] 2 Row		1 Row		2 Row		1 Row		2 Row		1 Row		2 Row	
1000	[1700]	[472]	1 Row 0.03 [6.8] 2 Row 0.07 [16.4]	0.5	[0.03]	0.12	0.35	0.23	0.70	74.6	23.7	79.2	26.2	101.2	38.4	79.7	26.5	9.1	2.7	14.1	4.1
				1	[0.06]	0.40	1.21	0.80	2.38	80.5	26.9	88.4	31.3	106.9	41.6	88.6	31.5	15.4	4.5	23.9	7.0
				2	[0.13]	1.63	4.86	3.20	9.56	87.8	31.0	99.7	37.6	116.9	47.2	104.1	40.1	23.3	6.8	36.2	10.6
				3	[0.19]	3.25	9.72	6.38	19.07	89.1	31.7	101.8	38.8	123.2	50.7	113.9	45.5	24.8	7.3	38.5	11.3
				4	[0.25]	5.38	16.09	10.56	31.56	90.1	32.3	103.3	39.6	126.7	52.6	119.4	48.5	25.8	7.6	40.1	11.7
				5	[0.32]	8.50	25.41	16.67	49.80	90.8	32.7	104.5	40.3	129.3	54.1	123.4	50.8	26.6	7.8	41.4	12.1
1200	[2040]	[567]	1 Row 0.04 [8.9] 2 Row 0.09 [21.3]	0.5	[0.03]	0.12	0.35	0.23	0.70	73.3	23.0	77.4	25.2	100.4	38.0	77.8	25.4	9.2	2.7	14.5	4.2
				1	[0.06]	0.40	1.21	0.80	2.38	78.5	25.8	85.5	29.7	105.8	41.0	86.2	30.1	15.9	4.7	25.1	7.3
				2	[0.13]	1.63	4.86	3.20	9.56	85.4	29.6	96.3	35.7	115.4	46.3	101.3	38.5	24.8	7.3	39.1	11.4
				3	[0.19]	3.25	9.72	6.38	19.07	86.7	30.4	98.5	37.0	122.0	50.0	111.6	44.2	26.6	7.8	41.9	12.3
				4	[0.25]	5.38	16.09	10.56	31.56	87.6	30.9	99.9	37.7	125.7	52.1	117.5	47.5	27.8	8.1	43.7	12.8
				5	[0.32]	8.50	25.41	16.67	49.80	88.5	31.4	101.2	38.5	128.4	53.6	121.7	49.9	28.8	8.5	45.4	13.3
1400	[2380]	[661]	1 Row 0.05 [11.5] 2 Row 0.11 [27.6]	0.5	[0.03]	0.12	0.35	0.23	0.70	72.3	22.4	75.9	24.4	100.2	37.9	76.8	24.9	9.3	2.7	14.7	4.3
				1	[0.06]	0.40	1.21	0.80	2.38	77.0	25.0	83.4	28.6	104.9	40.5	84.2	29.0	16.4	4.8	26.0	7.6
				2	[0.13]	1.63	4.86	3.20	9.56	83.6	28.7	93.8	34.3	114.0	45.5	98.7	37.0	26.3	7.7	41.8	12.2
				3	[0.19]	3.25	9.72	6.38	19.07	85.1	29.5	96.2	35.7	120.7	49.3	109.3	42.9	28.5	8.4	45.4	13.3
				4	[0.25]	5.38	16.09	10.56	31.56	85.8	29.9	97.3	36.3	124.8	51.5	115.8	46.5	29.6	8.7	47.1	13.8
				5	[0.32]	8.50	25.41	16.67	49.80	86.6	30.3	98.7	37.0	127.6	53.1	120.3	49.0	30.9	9.0	49.1	14.4
1600	[2720]	[756]	1 Row 0.06 [14.4] 2 Row 0.14 [34.6]	0.5	[0.03]	0.12	0.35	0.23	0.70	71.6	22.0	74.8	23.8	100.3	38.0	76.3	24.6	9.3	2.7	14.8	4.3
				1	[0.06]	0.40	1.21	0.80	2.38	75.9	24.4	81.7	27.6	104.2	40.1	82.5	28.1	16.7	4.9	26.8	7.9
				2	[0.13]	1.63	4.86	3.20	9.56	82.2	27.9	91.8	33.2	112.7	44.8	96.2	35.7	27.6	8.1	44.2	13.0
				3	[0.19]	3.25	9.72	6.38	19.07	83.5	28.6	94.0	34.4	119.7	48.7	107.5	41.9	29.9	8.8	48.0	14.1
				4	[0.25]	5.38	16.09	10.56	31.56	84.4	29.1	95.4	35.2	123.8	51.0	114.0	45.6	31.4	9.2	50.4	14.8
				5	[0.32]	8.50	25.41	16.67	49.80	85.2	29.5	96.6	35.9	126.8	52.7	118.9	48.3	32.7	9.6	52.5	15.4
1800	[3060]	[850]	1 Row 0.07 [17.6] 2 Row 0.17 [42.3]	0.5	[0.03]	0.12	0.35	0.23	0.70	71.0	21.7	74.0	23.3	99.8	37.6	74.9	23.9	9.4	2.7	15.2	4.4
				1	[0.06]	0.40	1.21	0.80	2.38	74.9	23.8	80.3	26.8	103.6	39.8	81.2	27.3	16.9	5.0	27.4	8.0
				2	[0.13]	1.63	4.86	3.20	9.56	80.9	27.2	89.9	32.2	111.8	44.3	94.3	34.6	28.5	8.4	46.1	13.5
				3	[0.19]	3.25	9.72	6.38	19.07	82.3	28.0	92.3	33.5	118.8	48.2	105.7	40.9	31.3	9.2	50.6	14.8
				4	[0.25]	5.38	16.09	10.56	31.56	83.1	28.4	93.6	34.2	123.0	50.6	112.6	44.8	32.9	9.7	53.3	15.6
				5	[0.32]	8.50	25.41	16.67	49.80	83.9	28.9	94.9	34.9	126.1	52.3	117.6	47.5	34.5	10.1	55.8	16.3
2000	[3400]	[944]	1 Row 0.08 [21.0] 2 Row 0.20 [50.5]	0.5	[0.03]	0.12	0.35	0.23	0.70	70.6	21.4	73.4	23.0	99.2	37.3	73.5	23.1	9.5	2.8	15.5	4.5
				1	[0.06]	0.40	1.21	0.80	2.38	74.2	23.5	79.3	26.3	102.8	39.3	79.4	26.3	17.4	5.1	28.3	8.3
				2	[0.13]	1.63	4.86	3.20	9.56	79.9	26.6	88.5	31.4	110.7	43.7	92.3	33.5	29.6	8.7	48.2	14.1
				3	[0.19]	3.25	9.72	6.38	19.07	81.3	27.4	90.8	32.7	117.9	47.7	104.0	40.0	32.6	9.6	53.1	15.6
				4	[0.25]	5.38	16.09	10.56	31.56	82.1	27.8	92.1	33.4	122.3	50.2	111.2	44.0	34.3	10.1	55.9	16.4
				5	[0.32]	8.50	25.41	16.67	49.80	82.9	28.3	93.4	34.1	125.5	51.9	116.3	46.9	36.1	10.6	58.9	17.2
2200	[3740]	[1039]	1 Row 0.10[24.8] 2 Row 0.24 [59.4]	0.5	[0.03]	0.12	0.35	0.23	0.70	70.2	21.2	72.7	22.6	99.3	37.4	73.3	23.0	9.5	2.8	15.5	4.6
				1	[0.06]	0.40	1.21	0.80	2.38	73.6	23.1	78.3	25.7	102.5	39.2	78.6	25.9	17.5	5.1	28.6	8.4
				2	[0.13]	1.63	4.86	3.20	9.56	79.1	26.2	87.3	30.7	109.7	43.2	90.3	32.4	30.6	9.0	50.2	14.7
				3	[0.19]	3.25	9.72	6.38	19.07	80.5	26.9	89.6	32.0	117.1	47.3	102.4	39.1	33.9	9.9	55.5	16.3
				4	[0.25]	5.38	16.09	10.56	31.56	81.3	27.4	90.9	32.7	121.6	49.8	109.8	43.2	35.8	10.5	58.8	17.2
				5	[0.32]	8.50	25.41	16.67	49.80	82.1	27.8	92.2	33.4	124.8	51.6	115.2	46.2	37.7	11.0	61.8	18.1

NOTES:

1. Data is based on 140°F[60°C] entering water and 66.2°F[19°C] entering air temperature at sea level.
2. For optimum diffuser performance in overhead heating applications, the supply air temperature should be within 20°F[11°C] of the desired space temperature. This typically requires a higher air capacity which provides higher air motion in the space, increasing thermal comfort. The hot water coil should be selected with this in mind, keeping the LAT as low as possible.
3. Above data is based on standard coil configuation, for multi-circuit coils please contact your Johnson Controls representative for design assistance.

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 be connected to the BACnet MS/TP network. Either a Network Automation Engine, Network Control Engine or supervisory 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 (CO2) 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 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-the-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

Johnson Controls DDC

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, 3 3 3 3 0–10 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, 2 2 0–10 VDC		2
	Binary Output Mode, 24 VAC Triac		
Integrated Actuator	Internal	1	1
Integrated Flow Sensor	Internal	1	1
Zone Sensor Input	On SA Bus1	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-VMA1617-1	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-VMA1632-1	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.

Technical Specifications

Product Code Numbers	MS-VMA1617-1: 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-VMA1632-1: 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）

Johnson Controls DDC

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 of 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 adjustments 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 of 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 SEPCIFICATIONS

Temperature Sensor Type	Platinum 1k ohm Thin Film Resistive
Temperature Sensor Coefficient	Approximately 3.9 ohms per C° (2 ohms per °F)
Temperature Sensor	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

NSA SERIES NETWORK SENSORS

The flush-mounted NSA7000 series network sensor with LCD is an electronic zone sensor designed to function directly with Johnson Controls® BACnet® MS/TP digital controllers in heating, ventilating and air conditioning (HVAC) systems. Models in this series monitor the temperature set point, zone temperature and humidity, and transmit this data to a field controller on the sensor actuator (SA) bus.

NSA-FHR71X3-0 can toggle between temperature and RH on the display, and has the capability to set the desired default display to either temperature or RH. A fan mode push button is included in NSA-FTD70X3-0 to set the desired fan speed (OFF-LOW-MED-HIGH-AUTO). Besides NSA-FHN70X1-0, all other models have occupancy override button which allows user to signal the controller that the zone is occupied to override the scheduled mode.

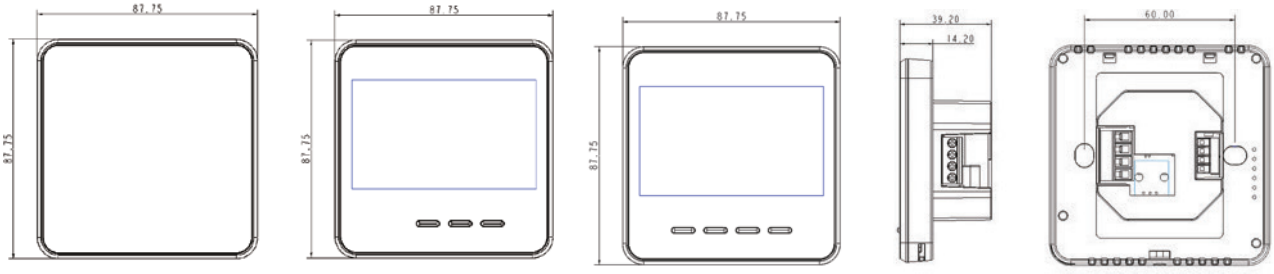
For communication wiring flexibility, all models equipped with both a modular jack and screw terminals, connecting the NSA7000 network sensor to controllers.

Features and Benefits

Features	Benefits
BACnet® MS/TP protocol communication	Provides compatibility with Metasys system field controllers and Facility Explorer programmable controllers in a proven communication network.
Field-changeable address on some models	Allows user to change address of NSA7000
Backlit LCD available on some models	Provides real time status of the environment with backlighting activated during user interaction
Simple temperature set point adjustment available on some models	Enables user to change the set point by pushing buttons
Temporary occupancy available on some models	Provides a push button for user to override the scheduled mode
Field-selectable default display setting on some models	Allows user to toggle between temperature and RH on the display.
Field-selectable Fahrenheit/Celsius (F/C) unit display on some models	Toggles the display temperature between degrees Celsius and degrees Fahrenheit

IMPORTANT:
Use this NSA7000 sensor only as an operating control. Where failure of malfunction of the NSA7000 sensor could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the system. Incorporate and maintain other devices such as supervisory or alarm systems or safety or limit controls intended to warn of, or protect against, failure or malfunction of the NSA7000 sensor.

Product dimensions



Johnson Controls DDC

NSA7000 series network sensor product code number

Product code number	Color1	LCD	Fan control	Humidity 2	Temp. adjustment 3	F/C scale toggle	Occupancy override	Screw terminal 4	Address selection 5
NSA-FHN7001-0	White	No	No	Yes (±3%)	N/A	No	No	ST/MJ	No
NSA-FTD7003-0	White	Yes	Yes	No	Set/WC	Yes	Yes	ST/MJ	Yes
NSA-FTB7003-0	White	Yes	No	No	Set/WC	Yes	Yes	ST/MJ	Yes
NSA-FHR7103-0	White	Yes	No	Yes (±3%)	Set/WC	Yes	Yes	ST/MJ	Yes
NSA-FHN7011-0	Black	No	No	Yes (±3%)	N/A	No	No	ST/MJ	No
NSA-FTD7013-0	Black	Yes	Yes	No	Set/WC	Yes	Yes	ST/MJ	Yes
NSA-FTB7013-0	Black	Yes	No	No	Set/WC	Yes	Yes	ST/MJ	Yes
NSA-FHR7113-0	Black	Yes	No	Yes (±3%)	Set/WC	Yes	Yes	ST/MJ	Yes
NSA-FHN7021-0	Gold	No	No	Yes (±3%)	N/A	No	No	ST/MJ	No
NSA-FTD7023-0	Gold	Yes	Yes	No	Set/WC	Yes	Yes	ST/MJ	Yes
NSA-FTB7023-0	Gold	Yes	No	No	Set/WC	Yes	Yes	ST/MJ	Yes
NSA-FHR7123-0	Gold	Yes	No	Yes (±3%)	Set/WC	Yes	Yes	ST/MJ	Yes

Note

1. There is MOQ (Minimum Order Quantity) requirement for black and gold color.
2. For models with humidity sensor, the humidity value also can be displayed in LCD, and the measurement accuracy is 3%RH.
3. Set/WC means this model can work under set or W/C mode, selected in setting.
4. All models equipped with both ST and MJ, can be selected by user in the field.
5. The address can be selected in setting (199-215), and default address is 199. User need to calculate the current consumption, to decide max. NSA7000 connected in one SA Bus.

Technical specifications

NSA7000 series network sensor

Supply Voltage	9.8 to 16.5 VDC; 15VDC norminal (From SA Bus)
Current consumption	30mA maximum
Terminations	Modular jack or screw terminal block
Sensor addressing	All models with factory set address 199. NSA-FTD70X3-0, NSA-FTB70X3-0 and NSA-FHR71X3-0 can set address from 199 to 215 in setting page
Wire size	Modular jack: 24 AWG or 26 AWG (0.5 or 0.4 mm diameter) recommended; Three twisted pair (six conductors)
Wire size	Screw terminal block: 18 to 22 AWG (1.0 to 0.6 mm diameter); 22AWG (0.6 mm diameter) recommended
Communication rate	Auto-detect: 9.6k, 19.2k, 38.4k or 76.8k bps
Mounting	Flush-mounted
Temperature measurement range	0 to 40°C (32 to 104°F)
Humidity measurement range	Full range: 0 to 100% RH
Temperature accuracy	0.5℃ (1°F)
Humidity accuracy	3%RH
Default temperature set point adjustment range	10.0℃ to 30.0℃ (50.0 to 86.0) in 0.5℃ increments
Ambient conditions	Operating: 0 to 40°C (32 to 104°F), 10 to 90% RH, noncondensing, 29°C (85°F) maximum dew point
	Storage: -20 to 60℃ (-4 to 140°F), 5 to 95% RH, noncondensing
Shipping weight	Approx. 300g
Compliance	CE mark
	RCM mark, Australia/NZ emissions compliance

Guide Specifications

General

Furnish and install Johnson Controls Model TVS/TVL Parallel Flow Variable Volume Fan Powered Terminals of the sizes and capacities scheduled. Terminals shall include a single point electrical connection.

The entire unit shall be designed and built as a single unit. Field-assembled components or built-up terminals employing components from multiple manufacturers are not acceptable.

Construction

Terminals shall be constructed of not less than 22 gauge galvanized steel, able to with-stand a salt spray test. The terminal casing shall be mechanically assembled (spotwelded casings are not acceptable).

Casing shall be internally lined with 48kg/m3 fiberglass insulation, rated for a maximum air velocity of 5000 f.p.m.[25m/s] Insulation must meet BS476 standard. Raw insulation edges on the discharge of the unit must be covered with metal liner to eliminate flaking of insulation during field duct connections. Simple "buttering" of raw edges with an approved sealant is not acceptable.

Insulation thickness of the low height unit will be optimized according to the casing performance.

Casing shall have full bottom access to gain access to the primary air valve and fan assembly. The opening shall be sufficiently large to allow complete removal of the fan if necessary. The casing shall be constructed in a manner to provide a single rectangular discharge collar. Multiple discharge openings are not acceptable. All appurtenances including control assemblies, control enclosures, hot water heating coils, and electric heating coils shall not extend beyond the top or bottom of the unit casing.

The casing leakage shall not exceed 1% of maximum inlet rated airflow at 3" W.G.[750Pa] inlet pressure.

Primary Air Valve

The primary air valve shall consist of cylindrical body that includes embossment rings for rigidity. 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 TVS air valve leakage shall not exceed 0.5% of maximum inlet rated airflow at 4" W.G.[1000Pa] inlet pressure.

The TVL air valve leakage shall not exceed 0.5% of maximum inlet rated airflow at 3" W.G.[750Pa] inlet pressure.

Primary Airflow Sensor

The TVS/TVL terminal provides the ultimate in airflow control with the patented FlowStarTM airflow sensor. Cylindrically shaped inlets shall utilize the equal cross sectional area or log-linear traverse method. Single axis sensor shall not be acceptable for duct diameters 6" 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 2.3 times the equivalent velocity pressure signal obtained from a conventional pitot tube.

FAN ASSEMBLY

The unit fan shall utilize a forward curved, dynamically balanced, galvanized wheel with a direct drive motor. The motor shall be taps. Single speed motors with electronic speed controllers are not acceptable.

The motor shall utilize permanently lubricated sleeve type bearings, include thermal overload protection and be suitable for use with electronic and/or mechanical fan speed controllers. The motor shall be mounted to the fan housing using torsion isolation mounts properly isolated to minimize vibration transfer.

The terminal shall utilize an electronic (SCR) fan speed controller for aid in balancing the fan capacity. The speed controller shall have a turn down stop to prevent possibility of harming motor bearings.

HOT WATER COIL

Terminal shall include an integral hot water coil where indicated on the plans. The coil shall be manufactured by the terminal unit manufacturer and shall have a minimum 22 gauge 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 406 PSIG[2.8MPa] under water, and rated for a maximum 232 PSIG[1.6MPa] working pressure. Coils shall incorporate a built in, flush mounted access plate, allowing top and bottom access to coil.

ECM™ Fan Motor

Fan motor shall be ECM™. Motor shall be brushless DC controlled by an integral controller / inverter that operates the wound stator and senses rotor position to electronically commutate the stator. Motor shall be permanent magnet type with near-zero rotor losses designed for synchronous rotation. The motor shall utilize permanently lubricated ball bearings. Motor shall maintain minimum 70% efficiency over the entire operating range. Motor speed control shall be accomplished through a PWM (pulse width modulation) controller specifically designed for compatibility with the ECM™. The speed controller shall have terminals for field verification of fan capacity utilizing a digital volt meter. A calibration graph shall be supplied indicating Fan CFM verses DC Volts.

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Johnson Controls is a global diversified technology and multi industrial leader serving a wide range of customers in more than 150 countries. Our 120,000 employees create intelligent buildings, efficient energy solutions, integrated infrastructure and next generation transportation systems that work seamlessly together to deliver on the promise of smart cities and communities. Our commitment to sustainability dates back to our roots in 1885, with the invention of the first electric room thermostat. We are committed to helping our customers win and creating greater value for all of our stakeholders through strategic focus on our buildings and energy growth platforms.For additional information, please visit http://www.johnsoncontrols.com or follow us @johnsoncontrols on Twitter.

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Australia (Sydney)
Tel: +61 (2) 9805 8300
Fax: +61 (2) 9247 7750

China (Shanghai)
Tel: +86 (21) 2285 7000
Fax: +86 (21) 2285 7599

China (Hong Kong)
Tel: +852 2885 4451
Fax: +852 2885 7760

China (Macau)
Tel: +853 2875 1820
Fax: +853 2875 1825

Indonesia (Jakarta)
Tel: +62 (21) 5366 8500
Fax: +61 (21) 5366 8300

Japan (Tokyo)
Tel: +81 (3) 5738 6100
Fax: +81 (3) 5738 6298

Korea (Seoul)
Tel: +822 1588 9117
Fax: +822 6009 9014

India (Mumbai)
Tel: +91 (22) 6683 7000
Fax: +91 (22) 6683 7002

Malaysia (Kuala Lumpur)
Tel: +60 (3) 7628 4300
Fax: +60 (3) 7874 1180

New Zealand (Auckland)
Tel: +64 (9) 635 0880
Fax: +64 (9) 633 1862

Singapore
Tel: +65 6748 0202
Fax: +65 6743 4420

Thailand (Bangkok)
Tel: +66 (2) 794 0101
Fax: +66 (2) 717 1327-8

Asia Engineering Centre: Wuxi, China
Shanghai Distribution Center: Shanghai, China
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