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ISO 9001 CERTIFIED COMPANY



VARIABLE AIR VOLUME

AIR TERMINAL UNITS



go green with Airmaster VAVs



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INDEX

SECTION	TOPIC	PAGE
22.1	Introduction	3-5
22.2	Bypass VAV	6
22.3	• Dimensional Details	7
22.4	• Performance Data	8
22.5	Pressure Independent VAV	9
22.6	• Dimensional Details	10
22.7	• Discharge Sound Power Level	11
22.8	• Radiated Sound Power Level	12
22.9	• Performance Data	13
22.10	Pressure Independent VAV with Heater	14-15
22.11	Controls	16
22.12	Thermostat	17
22.13	Other Ducting Products	18
22.14	Fire & Safety Products	19

INTRODUCTION

We live in an era of global warming. Sustainability, carbon foot print, energy conservation and efficiency are topics commonly discussed and of greatest concern. A majority of construction and manufacturing sectors in the world have already started to feel the pressure from government and other regulatory bodies to use energy efficient products. Building HVAC is one such sector which has caught the attention of keen 'environmentalist' architects and engineers as an ideal target to promote 'Green' products.

In the middle-east, air-conditioning load in buildings constitute more than 60% of the total energy consumption. This may be attributed to the harsh climatic conditions, especially during peak summer where demand for power is more than twice as compared to winter. Many products are being introduced to improve system performance and energy efficiency. Variable air volume (VAV) terminal is one such product being promoted in the field of building HVAC.

What is a VAV terminal? A VAV terminal *modulates* the supply airflow at constant temperature into an occupied space based on cooling demand. As the load increases the supply of cool air increases and as the load decreases the air supply also decreases. It consists of a thermostat, actuator, controller, damper and airflow sensor (for pressure independent type only).

Application Example: Consider a ducting system connecting FOUR Reception halls served by only 1 AHU (see Fig-1). In scenario 1, A/C duct branch serves reception hall 1 & 2 without VAV. i.e., volume of supply air cannot be varied. In scenario 2, the A/C duct branch serves Halls 3 & 4 with VAV. i.e., volume of air supply can be varied.

Cooling load in all these 4 Halls need not be necessarily the same. It depends on several factors like occupancy level, space size, internal and external heat loads and so on.

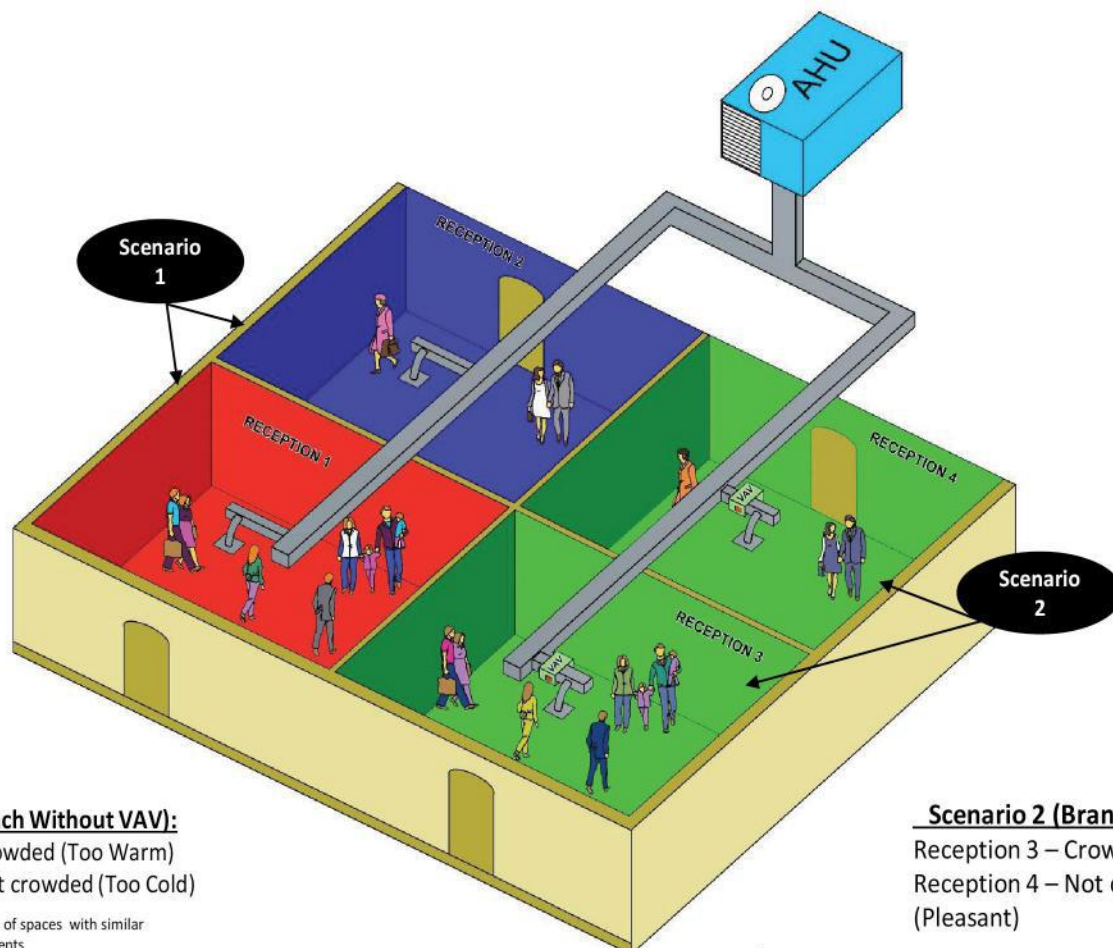
Observation is as below:

Scenario 1 (Branch without VAV)

- Rcptn Hall 1 : Crowded – insufficient air supply for cooling – too warm - discomfort experienced.
- Rcptn Hall 2 : Less crowded - air supply more than required too cold - discomfort experienced.

Scenario 2 (Branch with VAV)

- Rcptn Hall 3 : Crowded – air supply increased to attain set point temperature - optimal temperature maintained – occupants comfortable.
- Rcptn Hall 4 : Less crowded – limited air supply to maintain set point temperature - optimal room condition – occupants comfortable.



Scenario 1 (Branch Without VAV):

Reception 1 – Crowded (Too Warm)
Reception 2 – Not crowded (Too Cold)

1 - Zone: a space or group of spaces with similar heating/cooling requirements

Scenario 2 (Branch With VAV):

Reception 3 – Crowded (Pleasant)
Reception 4 – Not crowded (Pleasant)



VAV Types: Airmaster manufactures two basic types of VAV air terminals:

- a) Bypass VAV
- b) Pressure Independent single duct air terminal.

a) Bypass VAV: Only sufficient amount of air will be supplied to the occupied space just enough to meet the demand (i.e., set point temperature). Excess supply air will be by passed into the ceiling plenum or return air duct. This type of VAV device neither measures nor maintains air flow between desired cfm limits.

It is generally chosen where a Constant Volume Air handler² is employed by the designer. The volume of air entering into the space is a function of static pressure of the upstream air duct.. In other words the air flowing into the room fluctuates depending on the duct static pressure which may lead to occupants discomfort if it is not balanced properly.

b) Pressure Independent VAV: This type of VAV is designed to control the volume of air entering into occupied without being affected by pressure variation in the duct.

Working : It is equipped with a airflow probe that measures and limits the air flow between cfm ranges that are factory calibrated. The input to the actuator controller is derived from the thermostat. Actuator throttles the damper just enough to meet the cooling load. For example, if the room temperature has increased by 1°C above set-point temperature, the thermostat calls for more cooling. The actuator controller receives signal from thermostat to open the damper to let in more air till the room temperature matches set-point.

The volume of air entering into the space does not depend on pressure inside the duct. Even if the duct pressure fluctuates, the flow sensor communicates this change to the actuator controller in order to maintain a steady air flow to achieve comfortable conditions in the occupied space.

Note: A variation in this model would be to add heat to the air whenever required. This process of "Reheat" can be achieved by complementing the pressure independent VAV box with Reheat coil (Duct Heater).

How is energy conserved? When the cooling load in an area decreases, the actuator controller receives a signal from thermostat to reduce air volume by closing down the damper to predefined minimum airflow. As a result the duct static Pressure (SP) elevates. Pressure sensors inside the duct communicates with the fan controller (also known as Variable Frequency Drive, VFD) about the increase in duct SP. The fan speed is thus reduced to sustain the designed duct SP thereby saving fan energy.

Reduction in volume of air handled also reduces the load on compressor. Therefore through the process of controlling fan speed, a remarkable amount of energy is conserved.

In the case of a bypass VAV, the bypassed air mixes with return air thereby reducing the resultant air temperature before entering the Air Handler. Energy savings can be achieved in terms of reduction in energy required by compressor to cool the return air.

Advantages of VAV air terminal:

1. Energy efficient air conditioning system.
2. Occupants are more comfortable as optimum temperature is always maintained.
3. Multiple zones can be controlled with the same air handler.
4. Low AHU maintenance as load on fan and compressor is reduced.
5. Lower energy bills and low carbon foot print

Installation & Commissioning Guidelines:

Extreme care has to be taken during VAV selection, installation & commissioning. Failure to do so can lead to dissatisfactory results and system may not perform as expected. Unprofessional selection or installation may tend to generate undesirable noise or may result in cold air 'dumping' due to low air velocity at the terminal. This will severely affect occupant's comfort. Below are some precautions to be taken:

- a) Sizing: All VAV's have to be selected based on design air flow. Oversizing or under sizing VAV's can invite troubles mentioned above. At Airmaster we ensure that all VAVs are selected based on the design air flow to guarantee maximum comfort for the occupants.

* Contact Airmaster sales team for VAV selection

- b) Installation: Bypass VAV's should always be placed in downstream of a volume control damper for the purpose of air balancing, as it cannot regulate the incoming quantity of air by itself.
- c) Balancing :
 - i. Bypass VAV: A damper should be provided in the upstream of VAV and balanced in such a way that the duct pressure at VAV Inlet must be same at both damper positions; i.e. Fully open position (100% air supply to occupied zone) and Fully closed position (100% air bypassed).
 - ii. Pressure Independent VAV's are factory calibrated. However, they can also be calibrated at site based on design requirement using the 'K' factor provided.

²Fan speed cannot be varied automatically with VFD based on demand

- e) Duct design with a Centralized Bypass Damper: During low load demand in the occupied zone, the actuator modulates the damper to close thereby increasing the duct SP drastically. This might be detrimental to the ducting system. Therefore, it is highly recommended to have a well-designed Bypass damper to eliminate excess duct pressure wherever Pressure Independent VAV system is used (refer to Fig2).
- f) VAV location: For the airflow probe to detect accurately in a pressure independent VAV, it is highly recommended to allow straight duct length of up to 4 times duct diameter in the upstream and 4 feet in the downstream.
- g) Accessibility: No system is maintenance proof. Ease of accessibility should be prioritized during the installation phase. The orientation of control components while installation should be based on ease of accessibility.
- h) Handling & Storage: VAV's must be handled very carefully while loading, transporting, offloading and installation. They must be stored in dry and dust free location in the indoors away from high temperature.

Sample VAV Installation and Application Ductwork

- Pressure independent VAV.
- DDC VAV control (with BACnet).
- Thermostat.
- Multipoint flow sensor.
- Heater (optional) .
- Bypass damper (optional).
- Multi function zoning equipment controller(interface).
- 24VAC step down transformer.
- MS/TP network.

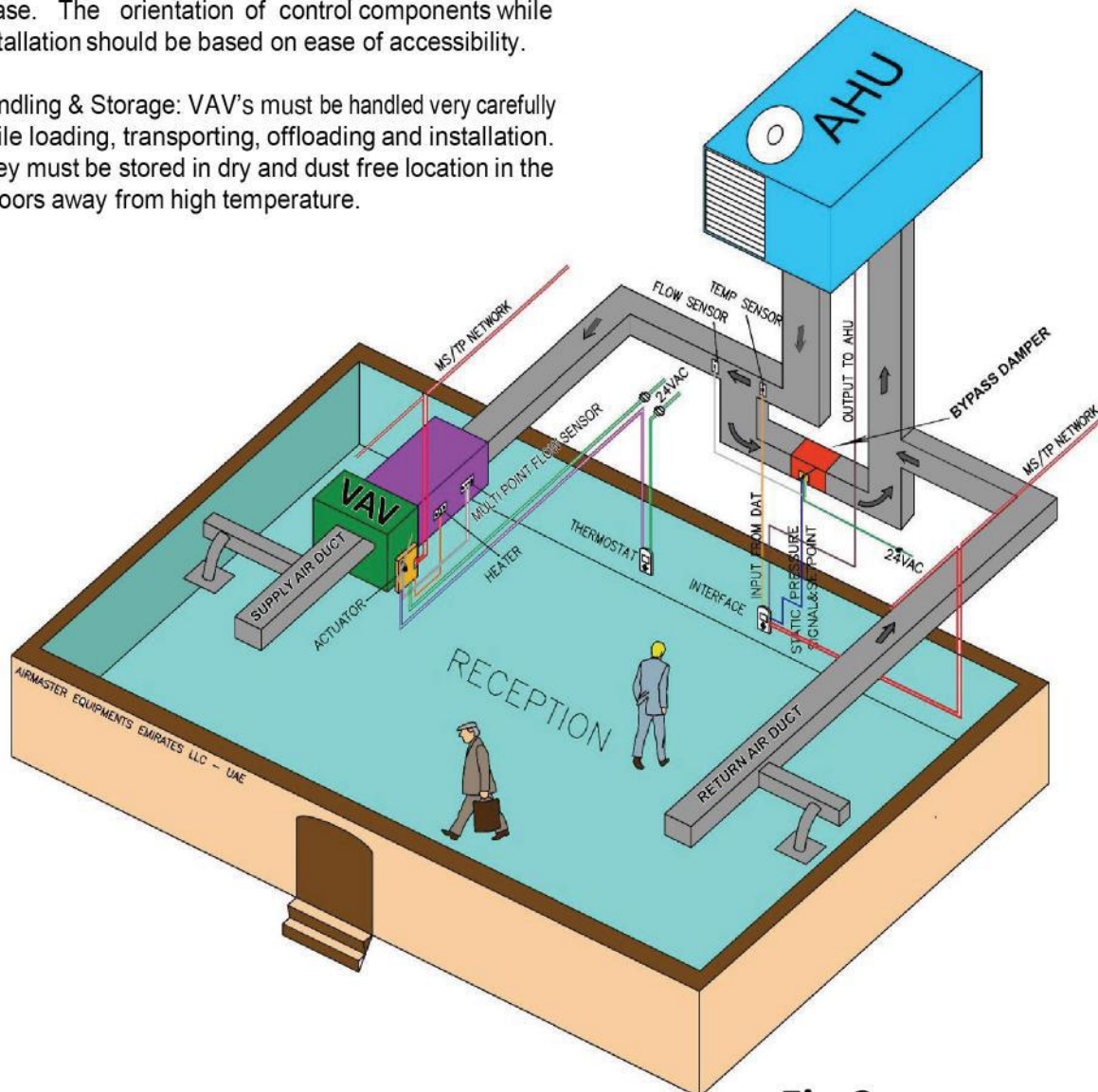


Fig:2

VARIABLE AIR VOLUME
BYPASS**CONSTRUCTION:**

Casing: High quality galvanized steel sheet of 0.9mm thickness.

Bypass Balancing Damper: 0.9mm thick field adjustable balancing damper on the bypass outlet.

Actuator: 0-10 V, Modulating actuator.

Acoustic Media: Interior surface of unit casing is acoustically and thermally lined with ½ inch, 32 kg/m³ density glass fibre with high density facing. UL listed and meets NFPA 90A and UL 181.

Transformer: Step-down transformer, 240-24V.

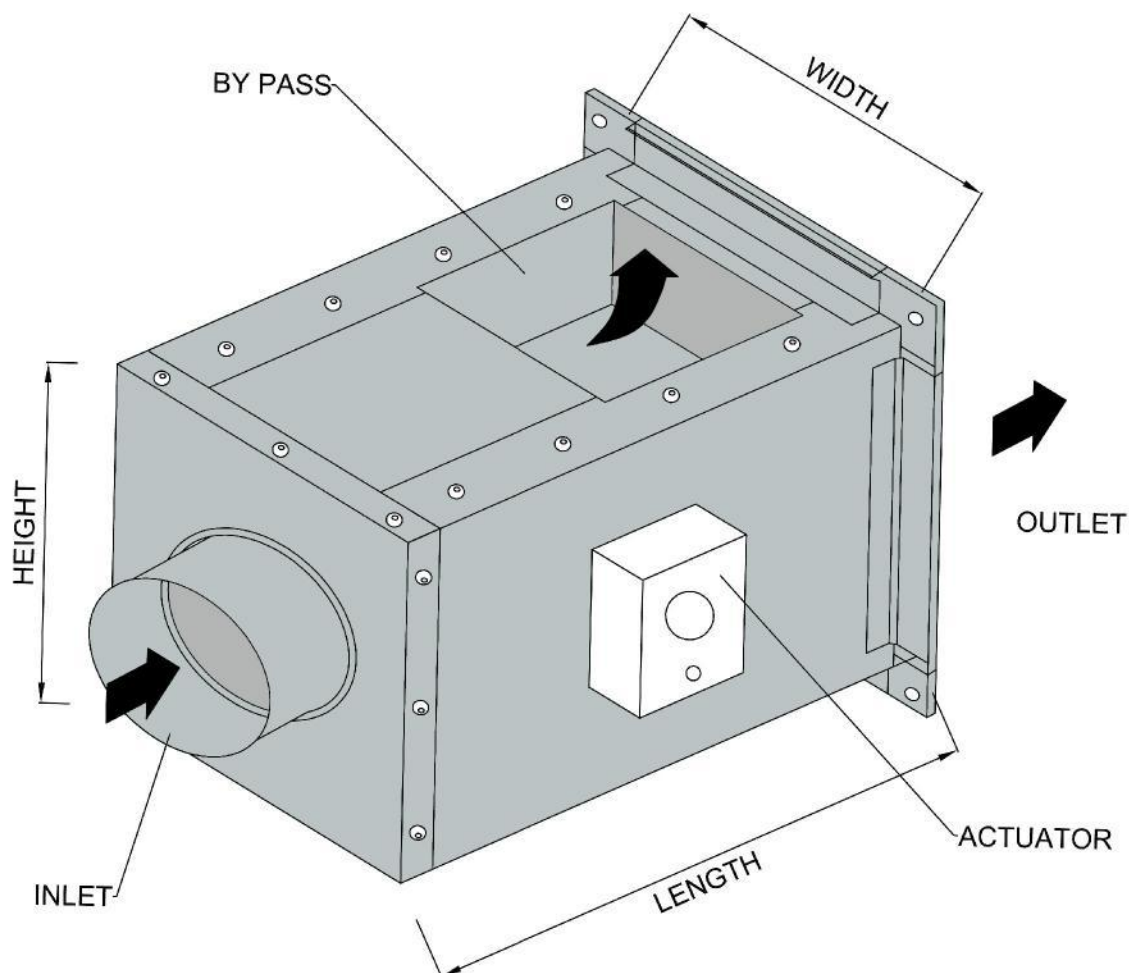
Thermostat: 0-10V, Analog or Digital.

Description:

- Unit has one primary air inlet, one rectangular discharge outlet to the room and one rectangular bypass discharge outlet.
- Units are tested by ETL Intertek in accordance with AHRI Standards 880-2011, "Performance Rating of Air Terminals" And ASHRAE 130-2008, "Methods of Testing Air Terminal Units".
- Capacities range from 50 – 3200 CFM in 8 sizes.
- Integral sound attenuator provides excellent noise control. In case of lower noise control, additional sound attenuator can be provided.
- Conveniently accessible externally mounted controls.
- Inlet connection bead offers a means for secure flex duct connections.
- NEMA1 enclosure control box for control mounting.
- Damper edge is sealed with foam gasket to prevent air leakage. The damper shaft is made of solid G.I rotating in low friction, self lubricating permanently impregnated brass bearings.
- Ductmate flanges on all four sides of rectangular discharge as standard and optional "S" drive duct connection also available.
- Sturdy construction and low noise generating capacity to obtain required NC without compromising performance. Manufactured to ensure long and maintenance free service.
- On/Off, modulating DC controls 0 to 10V. **Belimo / KMC controls / Neptronic** or any controllers and electronic thermostats of customers choice available. BMS compatible actuators can be provided on request.
- Casing construction meets SMACNA standards and provides excellent strength and rigidity. Thoroughly sealed to prevent air leakage.
- Acoustic infill media is of superior quality & fire rated meeting the requirement of BS476 standards part 4-6 & 7 ; also classified as non combustible material (A1) according to the European standard CSNEN 13501-1. It has excellent sound absorption characteristics with an additional qualification of being biologically inert.



Dimensional Details:



S.NO	CFM	MODEL	INLET DIA (mm)	WIDTH (mm)	HEIGHT (mm)	LENGTH (mm)
1	0 – 220	ABV-12	125	255	205	400
2	0 – 425	ABV-20	205	305	255	400
3	0 – 600	ABV-25	255	355	305	550
4	0 – 850	ABV-30	305	405	355	550
5	0 – 1250	ABV-35	355	455	405	600
6	0 – 1525	ABV-40	405	505	255	620
7	0 – 2450	ABV-45	405 x 455	610	255	620
8	0 – 3200	ABV-60	405 x 610	810	255	620

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VARIABLE AIR VOLUME
BYPASS
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Performance Data - Discharge/Radiated Sound Power Levels - Selection Guide

Model	Airflow		Min. Inlet Δ Ps		Sound Power Octave Band, Lw dB re 10^{-12} Watts													
					Discharge							Radiated						
ABV	cfm	L/s	Pa	" w.g	2	3	4	5	6	7	NC	2	3	4	5	6	7	NC
12	70	33	7	0.03	39	32	29	21	-	-	-	34	28	24	18	-	-	-
	120	57	13	0.05	46	40	38	32	24	-	-	41	32	30	27	20	-	-
	170	81	19	0.08	52	49	45	34	28	19	-	48	40	38	31	24	-	-
	220	104	23	0.09	58	55	50	43	38	27	-	51	48	44	39	32	23	-
20	200	95	9	0.04	46	37	29	27	-	-	-	34	30	27	21	-	-	-
	275	130	15	0.06	50	42	35	31	19	-	-	39	35	31	24	-	-	-
	350	166	25	0.10	54	46	40	36	23	19	-	44	38	37	31	20	-	-
	425	201	36	0.14	58	50	45	42	30	27	-	49	44	43	36	25	19	-
25	300	142	8	0.03	45	41	34	27	22	15	-	32	28	26	20	-	-	-
	400	190	13	0.05	49	45	39	33	28	21	-	37	33	30	23	-	-	-
	500	237	18	0.07	53	48	44	39	34	27	-	41	38	36	28	18	-	-
	600	284	26	0.10	56	51	48	42	38	30	-	46	40	41	34	23	-	-
30	550	261	13	0.05	44	35	25	21	18	-	-	34	29	23	20	-	-	-
	650	308	18	0.07	49	41	33	30	24	18	-	39	33	29	24	20	-	-
	750	355	25	0.10	53	46	39	36	31	21	-	43	37	34	30	24	19	-
	850	403	31	0.12	56	51	44	42	38	28	-	47	41	38	34	29	26	-
35	800	379	16	0.06	46	38	31	27	20	-	-	39	31	28	22	19	-	-
	950	450	24	0.10	51	44	37	34	28	19	-	42	36	34	28	21	18	-
	1100	521	30	0.12	54	48	43	40	34	25	-	47	41	39	33	27	22	-
	1250	592	44	0.18	60	53	47	46	41	31	-	51	45	44	38	33	28	-
40	1000	474	14	0.06	46	42	35	27	21	-	-	43	38	33	28	18	-	-
	1175	557	20	0.08	49	46	39	31	24	18	-	48	44	38	33	24	19	-
	1350	640	30	0.12	54	50	43	36	28	23	-	52	49	43	38	27	22	-
	1525	723	43	0.17	58	54	47	39	32	27	-	57	55	46	41	31	25	23
45	1400	664	25	0.10	45	41	33	25	20	18	-	43	36	31	25	18	-	-
	1750	829	39	0.16	50	45	39	33	25	21	-	47	40	36	31	22	18	-
	2100	995	51	0.20	55	49	45	40	33	28	-	53	46	39	32	27	21	-
	2450	1161	72	0.29	59	56	51	45	41	34	-	58	53	42	35	29	27	21
60	2300	1090	29	0.12	52	45	39	29	22	19	-	51	43	37	27	19	-	-
	2600	1232	45	0.18	54	49	44	35	28	24	-	54	48	43	32	24	20	-
	2900	1374	52	0.21	57	55	50	41	34	29	-	58	54	47	38	31	23	22
	3200	1517	58	0.23	62	58	54	47	43	35	-	61	56	52	44	36	30	26

Performance notes:

- Sound power levels are in decibels, dB re 10^{-12} watts.
- Data 880-2011 and ASHRAE 130-2008.
- End reflection power levels as specified in AHRI standard 880-2011.
- Min Δ Ps is the minimum pressure drop required to deliver CFM shown with damper fully open (i.e., Bypass fully closed)
- Discharge sound power level is the noise emitted from the unit discharge into the downstream duct.
- Radiated sound power is the breakout noise transmitted through the unit casing walls.
- Dash (-) in the octave band indicates sound power levels less than 18 dB
- Dash (-) in the NC column indicates NC value less than 20.
- NC values are calculated based on procedures outlines by AHRI standard 885 "Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets".

CONSTRUCTION

Casing: High quality galvanized steel sheet of 0.9mm thickness.

Airflow sensor: Multipoint differential pressure flow grid

Actuator: 0-10 V, modulating actuator.

Acoustic Media: Interior surface of unit casing is acoustically and thermally lined with ½ inch, 32 kg/m³ density glass fibre with high density facing. UL listed and meets NFPA 90A and UL 181.

Transformer: Step-down transformer, 240 to 24V.

Thermostat: 0-10V, Analog or Digital.

Description:

- Unit has one primary air inlet, one rectangular discharge outlet to the room.
- Capacities range from 40 – 4000 CFM in 7 sizes.
- Units are tested by ETL Intertek in accordance with AHRI Standards 880-2011, "Performance Rating of Air Terminals" And ASHRAE 130-2008, "Methods of Testing Air Terminal Units".
- Factory calibrated to job requirements.
- Equipped with high quality multi-point differential pressure flow grid for accurate airflow measurement.
- NEMA1 enclosure control box for control mounting.
- Damper edge is sealed with foam gasket to prevent air leakage. The damper shaft is made of solid G.I rotating in low friction, self lubricating permanently impregnated brass bearings.
- Ductmate flange on all four sides of rectangular discharge as standard and optional "S" drive duct connection also available. Inlet connection bead offers a means for secure flex duct connections.
- Sturdy construction and low noise generating capacity to obtain required NC without compromising performance. Manufactured to ensure long and maintenance free service.
- On/Off, modulating DC controls 0 to 10V having options of state of the art DDC controls with inbuilt BACnet for BMS compatibility. **Belimo/KMC controls/Neptronic** or controllers of customers choice available.
- Integral sound attenuator provides excellent noise control. In case of lower noise control, additional sound attenuator can be provided.
- Casing construction meets SMACNA standards and provides excellent strength and rigidity. Thoroughly sealed to prevent air leakage.
- Acoustic infill media is of superior quality fire rated media meeting the requirement of BS476 standards part 4-6 & 7; also classified as non combustible material (A1) according to the European standard CSNEN 13501-1. It has excellent sound absorption characteristics with an additional qualification of being biologically inert.



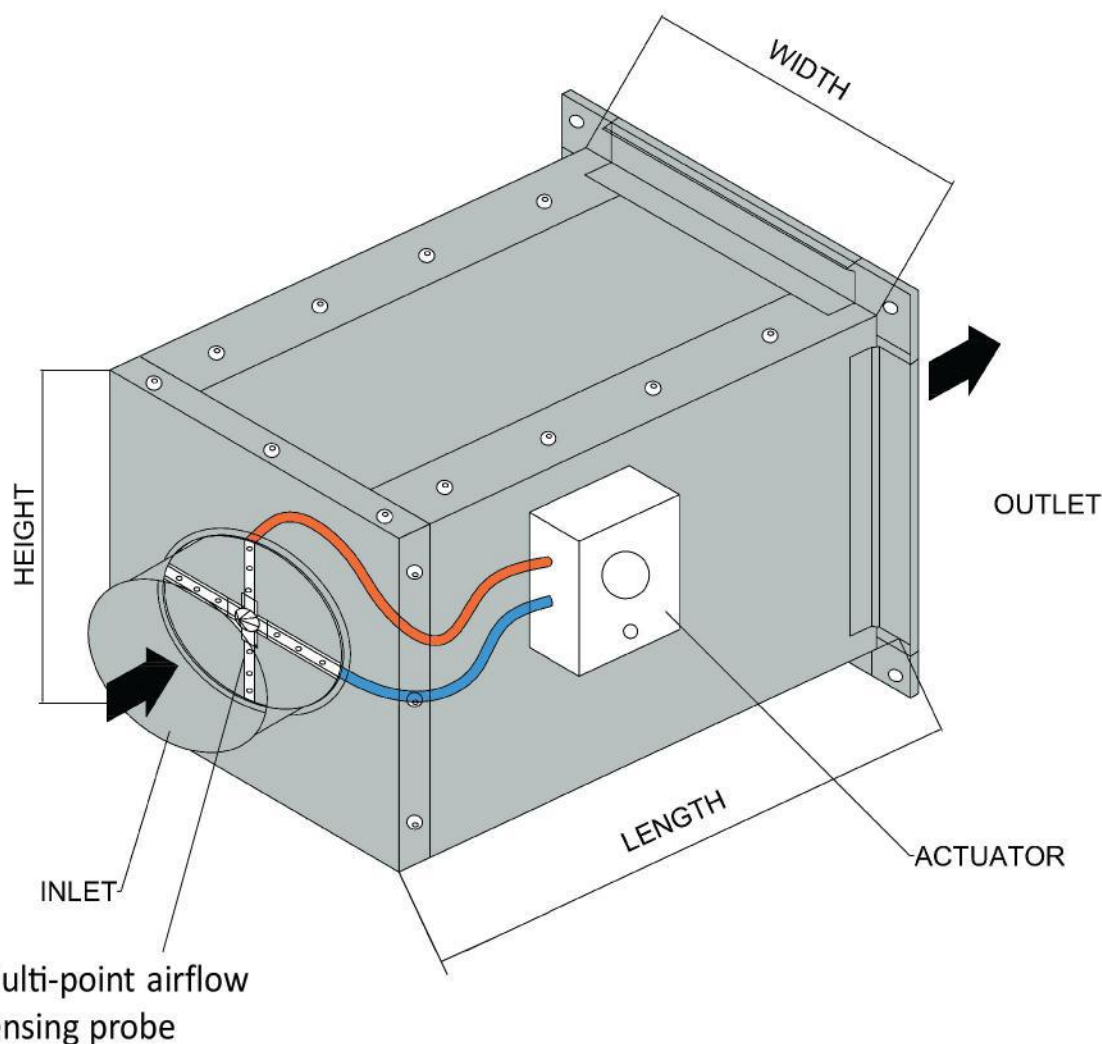
VARIABLE AIR VOLUME

PRESSURE INDEPENDENT



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Dimensions



S.NO	CFM	MODEL	INLET DIA (mm)	WIDTH (mm)	HEIGHT (mm)	LENGTH (mm)
1	0 - 300	APV - 12	125	310	210	400
2	65 - 410	APV - 14	140	310	210	400
3	120 - 520	APV - 16	158	310	260	400
4	400 - 800	APV - 20	198	310	260	400
5	600 - 1350	APV - 25	248	360	320	400
6	1000 - 2100	APV - 30	313	410	385	500
7	1650 - 4000	APV - 40	398	615	460	500

* Contact airmaster sales team for selection.

Discharge Sound Power Level

			Sound Power Octave Band, Lw dB re 10 ⁻¹² Watts																							
Model	Airflow		0.5"w.g (125 Pa)						1"w.g (250 Pa)						1.5"w.g (500 Pa)						3"w.g (750 Pa)					
	cfm	L/s	2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7
12	40	19	58	45	42	37	36	34	59	47	45	43	40	39	59	53	51	48	45	43	62	53	52	48	47	46
	80	38	60	47	44	41	41	37	61	50	50	46	48	45	62	55	53	50	47	46	63	58	57	54	52	51
	150	71	64	52	50	46	44	40	66	56	55	51	52	49	68	60	58	54	53	51	69	61	62	59	56	54
	230	109	66	55	52	48	46	43	69	59	57	53	53	51	71	63	60	57	57	55	72	64	63	61	58	55
	300	142	71	60	56	52	49	45	74	63	61	58	56	53	76	67	64	61	59	57	77	68	67	64	60	58
14	65	31	53	42	41	38	38	35	57	49	47	44	42	41	59	51	49	45	43	41	61	53	52	50	49	45
	90	43	56	45	44	40	40	36	59	51	49	45	47	44	61	52	51	46	45	44	63	55	57	54	53	51
	190	90	63	51	49	45	44	40	65	56	54	50	51	48	67	58	56	54	48	46	66	61	60	58	56	54
	290	137	65	54	51	47	46	42	68	59	56	53	53	50	70	61	58	53	51	49	71	64	62	61	58	55
	410	194	70	58	55	51	48	44	73	63	60	57	55	52	74	65	61	58	56	53	75	71	67	65	60	58
16	120	57	54	46	38	38	38	32	58	50	43	44	46	42	62	54	47	44	44	43	64	59	53	53	55	50
	220	104	59	50	43	42	41	35	62	55	50	48	50	45	65	57	51	49	48	45	69	64	59	57	56	53
	320	152	62	54	47	45	44	38	65	59	54	51	52	47	68	61	55	52	50	48	72	67	63	60	59	55
	420	199	64	58	51	48	46	40	68	63	58	54	54	49	71	67	59	55	54	50	75	71	67	63	63	57
	520	246	66	59	53	49	47	41	70	64	59	57	56	50	72	68	60	56	55	51	76	73	68	66	64	57
20	400	190	60	53	45	45	44	39	64	59	53	52	51	47	67	62	57	54	56	52	70	68	64	61	60	58
	500	237	61	55	47	47	45	40	66	61	55	53	53	49	69	64	59	57	57	54	72	70	66	63	62	60
	600	284	63	56	50	49	46	42	68	63	57	54	53	50	70	66	61	59	58	55	75	72	68	65	65	63
	700	332	65	58	52	50	48	43	69	64	59	57	54	51	72	68	63	60	60	58	76	74	70	68	66	65
	800	379	67	59	53	51	49	44	71	65	60	58	56	52	73	69	65	61	61	59	78	76	72	67	67	66
25	600	284	62	54	48	47	44	41	67	60	55	51	51	49	69	64	59	54	56	55	74	71	65	61	60	59
	800	379	65	56	50	49	45	43	69	63	57	54	52	51	72	66	61	57	57	56	76	73	67	64	63	61
	1000	474	67	58	52	51	46	44	71	64	58	55	53	52	74	68	62	58	58	57	78	75	69	68	65	64
	1200	569	68	59	53	52	48	46	72	65	59	57	54	53	75	69	63	59	58	59	79	76	71	69	67	66
	1350	640	69	60	54	53	49	47	74	67	61	58	55	54	77	71	64	61	59	59	81	77	73	70	68	67
30	1000	474	61	56	51	49	46	44	65	63	57	55	54	52	70	67	61	59	57	55	73	73	67	65	64	63
	1300	616	63	58	52	50	49	47	68	64	59	57	55	53	71	68	63	61	59	57	76	74	69	67	66	65
	1600	758	65	59	54	53	51	49	71	65	61	59	57	55	74	69	64	63	61	60	79	76	71	69	68	67
	1900	900	68	59	55	54	52	50	72	66	61	60	58	56	75	70	65	63	62	61	81	76	71	70	69	68
	2100	995	70	60	56	55	53	51	74	66	62	61	59	57	77	70	66	65	63	62	84	77	72	71	70	69
40	1650	782	62	55	51	50	48	44	66	62	57	57	56	52	70	66	61	61	60	56	77	73	66	68	67	64
	1900	900	64	58	55	52	51	46	68	65	60	59	58	54	73	69	65	63	62	58	79	76	69	70	69	66
	2400	1137	65	60	58	53	53	49	71	67	63	60	60	56	75	71	68	64	64	61	81	78	72	71	70	68
	2800	1327	68	61	59	55	54	50	73	68	65	61	60	57	77	72	68	65	64	62	84	78	74	73	72	69
	3400	1611	69	63	62	56	55	52	74	69	68	63	62	59	79	73	71	67	66	64	85	80	77	76	74	71
	4000	1896	71	64	64	57	56	53	77	71	69	64	63	61	81	75	73	68	67	65	87	81	78	77	75	72

Performance notes:

1. Sound power levels are in decibels, dB re 10⁻¹² watts.
2. Performance is based on tests conducted in accordance with AHRI standard 880-2011 and ASHRAE 130-2008.
3. End reflection correction values have been applied to discharge sound power levels as specified in AHRI standard 880-2011.
4. Discharge sound power level is the noise emitted from the unit discharge into the downstream duct.
5. Radiated sound power is the breakout noise transmitted through the unit casing walls.
6. Dash (-) in the octave band indicates sound power levels less than 18 dB.
7. NC values are calculated based on procedures outlined by AHRI standard 885 "Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets".

Note: All inlet diameters are rounded to nearest value in 'mm'

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PRESSURE INDEPENDENTair master
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Radiated Sound Power Level

			Sound Power Octave Band, Lw dB re 10 ⁻¹² Watts																													
Model	Airflow		0.5"w.g (125 Pa)							1"w.g (250 Pa)							1.5"w.g (500 Pa)							3"w.g (750 Pa)								
	cfm	L/s	2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7
12	40	19	44	34	27	21	18	14	48	36	31	25	23	19	50	39	35	29	27	21	53	41	40	33	32	26	53	41	40	33	32	26
	80	38	50	36	31	23	21	16	52	39	35	28	25	20	53	41	38	31	29	24	55	43	42	37	36	32	55	43	42	37	36	32
	150	71	56	43	38	29	23	17	58	45	41	33	30	24	59	47	43	36	33	29	61	50	47	40	40	36	61	50	47	40	40	36
	230	109	59	46	40	32	25	19	61	48	44	36	32	26	62	50	46	38	37	31	64	53	50	44	43	38	64	53	50	44	43	38
	300	142	64	50	44	35	30	21	66	53	48	39	36	29	67	55	50	42	40	33	69	57	55	47	47	40	69	57	55	47	47	40
14	65	31	42	32	27	23	19	16	46	34	32	28	24	22	48	37	36	32	28	24	50	39	41	36	34	30	50	39	41	36	34	30
	90	43	48	34	32	26	22	18	49	37	36	30	26	23	50	39	38	34	30	28	52	40	43	39	37	36	52	40	43	39	37	36
	190	90	53	40	38	32	24	19	55	43	42	36	31	28	56	44	43	40	35	33	58	47	48	44	42	41	58	47	48	44	42	41
	290	137	56	43	41	35	26	22	58	45	45	40	34	30	59	47	45	42	38	35	61	50	52	48	44	43	61	50	52	48	44	43
	410	194	61	47	45	39	31	24	63	50	49	43	37	33	64	52	51	47	42	37	66	54	56	51	49	46	66	54	56	51	49	46
16	120	57	44	36	33	28	24	22	48	39	37	33	31	28	49	41	39	36	36	33	52	45	43	42	41	40	52	45	43	42	41	40
	220	104	48	40	38	33	29	23	51	44	42	39	36	31	53	46	45	41	40	35	56	50	48	47	45	43	56	50	48	47	45	43
	320	152	50	43	42	36	31	25	53	47	46	42	38	33	55	49	47	44	43	37	59	53	52	50	47	45	59	53	52	50	47	45
	420	199	53	46	45	40	34	28	56	50	49	44	41	35	58	52	50	48	46	40	61	56	56	54	53	47	61	56	56	54	53	47
	520	246	54	48	47	41	35	29	57	52	51	47	42	36	59	54	52	49	47	41	62	58	57	55	54	48	62	58	57	55	54	48
20	400	190	51	41	36	30	28	19	54	45	43	37	35	28	56	48	46	41	40	35	59	53	50	47	47	45	59	53	50	47	47	45
	500	237	53	43	38	33	29	20	56	48	45	40	37	29	58	51	48	43	41	36	61	56	55	49	48	46	61	56	55	49	48	46
	600	284	54	45	41	35	30	21	58	50	46	41	38	31	60	53	50	44	42	37	63	58	57	51	49	47	63	58	57	51	49	47
	700	332	56	47	42	36	31	22	59	52	48	42	38	32	61	54	52	48	45	39	64	59	58	53	50	47	64	59	58	53	50	47
	800	379	57	48	43	37	32	23	60	53	49	44	40	33	62	56	53	48	46	40	68	63	59	54	52	47	68	63	59	54	52	47
25	600	284	51	41	34	28	27	23	54	48	42	34	31	29	57	52	46	37	35	32	60	58	54	44	40	38	60	58	54	44	40	38
	800	379	53	44	38	31	29	24	56	50	45	36	35	31	59	54	49	40	38	34	62	60	56	46	44	40	62	60	56	46	44	40
	1000	474	54	45	40	33	31	25	58	52	47	39	37	32	60	55	51	42	40	35	64	62	58	48	45	41	64	62	58	48	45	41
	1200	569	55	46	41	34	32	26	59	53	48	40	38	33	61	56	53	44	41	36	65	63	60	50	47	41	65	63	60	50	47	41
	1350	640	58	49	45	38	35	27	61	55	50	42	40	34	64	59	55	46	44	37	69	64	61	51	48	42	69	64	61	51	48	42
30	1000	474	52	47	41	36	28	24	55	52	48	43	34	29	58	57	52	46	37	33	62	62	59	52	43	39	62	62	59	52	43	39
	1300	616	54	48	43	40	32	26	58	54	50	46	37	32	61	58	54	50	41	35	65	64	61	55	47	41	65	64	61	55	47	41
	1600	758	57	50	45	43	36	29	61	56	52	49	42	35	64	60	57	53	47	40	68	65	63	59	50	45	68	65	63	59	50	45
	1900	900	58	51	46	44	37	31	63	57	53	50	43	36	65	61	58	54	48	41	69	66	64	60	53	46	69	66	64	60	53	46
	2100	995	60	52	48	46	40	32	64	58	54	52	46	38	67	62	59	55	49	42	71	67	65	61	55	47	71	67	65	61	55	47
40	1650	782	55	48	39	37	31	25	59	54	44	42	36	30	61	57	47	45	40	33	65	62	51	47	44	37	65	62	51	47	44	37
	1900	900	58	50	44	41	35	28	62	56	49	46	41	33	64	59	51	49	44	36	68	65	56	54	48	41	68	65	56	54	48	41
	2400	1137	60	52	48	44	40	31	64	58	52	49	44	36	66	61	55	52	47	39	70	67	60	57	51	44	70	67	60	57	51	44
	2800	1327	62	53	50	45	41	33	65	59	54	51	46	38	67	62	56	53	48	40	71	68	62	58	53	45	71	68	62	58	53	45
	3400	1611	64	55	54	49	44	35	68	61	56	53	49	40	70	65	61	56	52	43	74	70	66	61	56	48	74	70	66	61	56	48
	4000	1896	65	56	56	50	46	37	69	62	58	55	51	42	71	68	64	58	53	45	75	71	68	62	58	50	75	71	68	62	58	50

Performance notes:

1. Sound power levels are in decibels, dB re 10⁻¹² watts.
2. Performance is based on tests conducted in accordance with AHRI standard 880-2011 and ASHRAE 130-2008.
3. End reflection correction values have been applied to discharge sound power levels as specified in AHRI standard 880-2011.
4. Discharge sound power level is the noise emitted from the unit discharge into the downstream duct.
5. Radiated sound power is the breakout noise transmitted through the unit casing walls.
6. Dash (-) in the octave band indicates sound power levels less than 18 dB.
7. NC values are calculated based on procedures outlined by AHRI standard 885 "Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets".

Note: All inlet diameters are rounded to nearest value in 'mm'

Performance Data - Selection Guide

APV Series - Basic Unit				Discharge NC ΔPst across Unit				Radiated NC ΔPst across Unit				
Model	Airflow		Min Inlet ΔPs		0.5" w.g	1" w.g	1.5" w.g	3" w.g	0.5" w.g	1" w.g	1.5" w.g	3" w.g
	cfm	L/s	Pa	" w.g	125Pa	250Pa	375Pa	750Pa	125Pa	250Pa	375Pa	750Pa
12	40	19	2	0.008	-	-	-	-	-	-	-	-
	80	38	7	0.028	-	-	-	-	-	-	-	-
	150	71	19	0.076	20	22	25	26	-	20	21	23
	230	109	25	0.1	22	26	28	30	21	23	25	27
	300	142	42	0.168	28	32	35	36	27	30	31	33
14	65	31	2	0.008	-	-	-	-	-	-	-	-
	90	43	6	0.024	-	-	-	-	-	-	-	-
	190	90	12	0.048	-	21	23	22	-	-	-	20
	290	137	23	0.092	21	25	27	28	-	20	21	23
	410	194	48	0.192	23	27	28	30	23	26	27	31
16	120	57	4	0.016	-	-	-	20	-	-	-	-
	220	104	14	0.056	-	-	21	26	-	-	-	22
	320	152	20	0.08	-	21	25	30	-	-	22	26
	420	199	26	0.104	-	22	26	31	-	-	24	31
	520	246	42	0.168	-	23	28	33	-	-	26	32
20	400	190	7	0.028	-	-	20	26	-	-	20	24
	500	237	10	0.04	-	-	22	30	-	-	22	30
	600	284	16	0.064	-	21	24	32	-	20	24	32
	700	332	20	0.08	-	22	27	35	-	21	26	33
	800	379	26	0.104	-	22	28	36	-	22	27	34
25	600	284	5	0.02	-	20	22	31	-	-	20	28
	800	379	8	0.032	-	20	24	32	-	-	23	31
	1000	474	11	0.044	-	22	26	35	-	20	25	33
	1200	569	16	0.064	-	23	28	36	-	21	27	35
	1350	640	20	0.08	20	26	30	37	20	23	30	36
30	1000	474	2	0.008	-	-	25	32	-	-	26	34
	1300	616	3	0.012	-	-	26	33	-	20	28	36
	1600	758	4	0.016	-	22	27	36	-	23	32	38
	1900	900	6	0.024	-	23	29	36	20	26	33	39
	2100	995	7	0.028	21	26	30	38	22	27	34	40
40	1650	782	3	0.012	-	-	24	32	-	22	26	32
	1900	900	4	0.016	-	-	27	36	20	25	28	36
	2400	1137	5	0.02	-	25	30	38	22	27	31	38
	2800	1327	7	0.028	-	26	31	39	25	28	32	39
	3400	1611	9	0.036	20	27	32	40	29	32	36	41
	4000	1896	15	0.06	22	30	35	42	31	33	39	43

Performance notes:

- Performance is based on tests conducted in accordance with AHRI standard 880-2011 and ASHRAE 130-2008.
- End reflection correction values have been applied to discharge sound power levels as specified in AHRI standard 880-2011.
- ΔPst is the difference in static pressure from inlet to discharge.
- Min ΔPs is the minimum pressure drop required to deliver CFM shown with damper fully open
- Dash (-) indicates NC value less than 20.
- NC values are calculated based on procedures outlined by AHRI standard 885 "Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets".

Note: All inlet diameters are rounded to nearest value in 'mm'

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VARIABLE AIR VOLUME

PRESSURE INDEPENDENT WITH HEATER


air master
 ISO 9001 CERTIFIED COMPANY
CONSTRUCTION :

Casing material: galvanized steel

Heater type: Electric heater as standard

Heater controls: Modulating , On-Off

Heating Element: open coil / tubular / Fined tubular

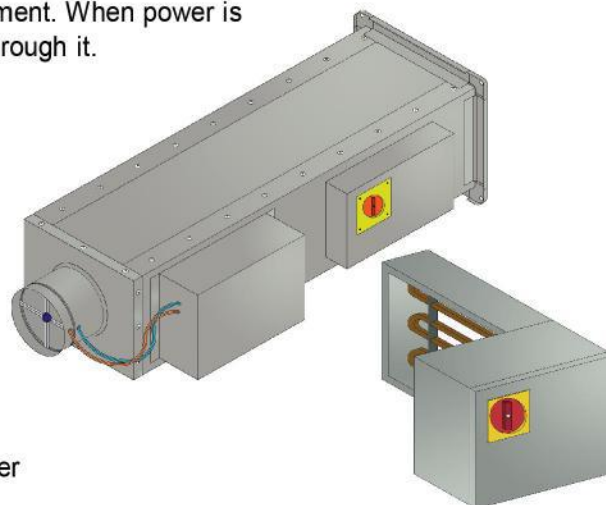
Heating capacity: 0.5 to 1000KW

Installation type: Slip-in type with horizontal mounting as standard (airflow is horizontal)

Description:

For some regions, adding a duct heater to a single duct pressure independent VAV may tend to be more economical than having an exclusive heating system. There are two types of duct heaters: Electric and Hot water.

- Airmaster APV-H series VAV's are manufactured using 'Neptronic' (Canada) make **Electric Duct heaters** as standard. Electric heaters are factory mounted to the VAV terminal and are UL, CSA and ETL certified.
- Electric heaters are made from electric resistance heating element. When power is supplied, it heats up and transfers its heat to the air passing through it.
- Available in modulating type or ON/OFF (staging) type
- Transformer is supplied with fuse as standard.
- Control panel is extended to the left as standard.
- Magnetic contactor provides power to the individual stages of the heater.
- Integrated electronic air flow sensor for additional safety. Power supply to the heater will be cut off in case of no air flow.
- Frame and control panel is made of galvanized steel with NEMA 1 enclosure control panel as standard.
- VAV controller and thermostat specification is the same as that of APV model (Pressure Independent type).
- Equipped with automatic reset thermal cut-out device which disconnects power in case of overheating.
- Input signals are converted to modulating or On-OFF output through contactors and solid state relays.
- The SCR controller is patented product and includes staging functions for up to 10 heating stages
- 0.5 to 1000KW heater capacity is standard. Larger loads are available on request.



* software based coil selection is performed on request. Any other heater make also available.

Options:

1. Heating Element



Open Coil



Finned tubular



Tubular

2. Electric heater installation: Slip-in type / Flange type



Slip-in



Flanged

3. Mechanical Construction:

- Material - Galvanized Steel or Stainless steel 304
- Enclosure Type - Nema 1 or Nema 12 or Nema 4/4X

4. Disconnect Switch: Cuts the power supply to the heater in order to safely perform installation and maintenance tasks

5. Manual Reset Thermal Cut-Out: A secondary safety device which removes power to the elements if overheating occurs

6. Fuses: protect the total load and/or the individual heater stages

7. Control Panel extension: Left (standard) . Center and Right is optional




Heater selection checklist for APV-H Model:

1. Construction Material : Galvanized Steel or Stainless steel 304
2. Enclosure Type : Nema 1, Nema 12, Nema 4 / 4X
3. Application : Dehumidification / Heating
4. Coil type : Open / Tubular / Finned
5. Control : Modulating / ON-OFF
6. Air Quantity (cfm or m³/s)
7. Power (W)
8. Input Voltage (V) : 110V / 220V
9. Duct Heater Location : Indoor / Outdoor
10. Special options to be mentioned





CONTROLS


air master
 ISO 9001 CERTIFIED COMPANY

BYPASS VAV:

 <p>KMC (USA) Model: MEP-4002</p>	 <p>BELIMO (SWISS) Model: LM24A-SR</p>	 <p>NEPTRONIC (CANADA) Model: BM200S</p>
<ul style="list-style-type: none"> • Supply voltage : 24 VAC • Frequency : 50/60 Hz. • Control signal : 2 to 10 VDC • Torque : 4.5 Nm (40 in-lb) • Noise Level : < 35 dBA max. at 1 meter • Auxiliary Switch : Optional 	<ul style="list-style-type: none"> • Supply voltage : 24 VAC / 24 VDC • Frequency : 50/60 Hz. • Control signal : 0 to 10 VDC • Torque : 5 Nm • Sound power level Max.: 35 dB (A) • Auxiliary Switch : Optional 	<ul style="list-style-type: none"> • Supply voltage : 220-260 VAC • Frequency : 50/60 Hz. • Control signal : 2 to 10 VDC • Torque : 5.6 Nm (50 in-lb) • Auxiliary Switch : Optional • Inbuilt UL listed Transformer

PRESSURE INDEPENDENT VAV:

 <p>KMC (USA) Model: CSP-4702</p>	 <p>KMC (USA) SimplyVAV-BAC 800x</p>	 <p>NEPTRONIC(CANADA) Model: EVC series</p>	 <p>BELIMO (SWISS) Model: LMV-D3-MP</p>
<ul style="list-style-type: none"> • Supply voltage : 24 VAC • Frequency : 50/60 Hz. • Control signal : 2 to 10 VDC • Output supply : 16 VDC to power thermostat • Torque : 4.5 Nm (40 in-lb) • Noise Level : < 35 dBA max. at 1 meter • ΔP range : 0 to 500 Pa 	<ul style="list-style-type: none"> • Supply voltage : 24 VAC • Frequency : 50/60 Hz. • Output voltage: 0 – 10 VDC • Torque : 4.5 Nm (40 in-lb) • Noise Level : < 35 dBA max. at 1 meter • ΔP range : 0 to 500 Pa • BACnet application specific controllers • Single duct heating/cooling VAV • Automatic heating/cooling changeover 	<ul style="list-style-type: none"> • Supply voltage : 24 VAC • Frequency : 50/60 Hz. • Output voltage : 0 – 10 VDC • Torque : 8 Nm (70 in-lb) • ΔP range : 0 to 250 Pa • BACnet application specific or Standalone controllers • Single duct heating/cooling VAV • Automatic heating/cooling changeover 	<ul style="list-style-type: none"> • Supply voltage : 24 VAC / 24 VDC • Frequency : 50/60 Hz. • Control signal : 0 to 10 VDC • Torque : 5 Nm • Noise Level : max 35 dBA • ΔP range : 0 to 600 Pa • Bus Function: LONWORKS, KONNEX, Modbus RTU, BACnet & DDC controller with MP interface



THERMOSTAT



CTE-5202

- Supply Voltage : 24 VAC
- Output:0-12VDC
- Inbuilt temperature sensor
- Simple three-button interface
- Used with SimplyVAV series controllers for applications with BACnet communication
- Used for both Bypass and Pressure independent VAV applications



BELIMO®

EXT-F2000LV-A-N



- Supply Voltage : 24VAC
- Output:Analog DC0...10V,1mA
- Multifunctional LCD display
- Inbuilt temperature sensor
- Sensingrange: 5...50°C
- Mounting standards : On inside walls only
- Dimensions (H x W x D) : 120 x 90 x 24 mm
- Used for both Bypass and Pressure independent VAV applications.



TRO5404

- Main supply 24 VAC
- Compatible with Model: BM200S
- Stand-alone
- In-built temperature sensor
- 0-10 VDC output
- For Bypass VAV



TRO24T4

- Main supply 22 - 26 VAC
- Compatible with Model: BM200S
- 0-10 VDC output, cool/heat
- 4 TRIAC output (ON/OFF, pulse or floating)
- For Bypass VAV



TRL54

- Main supply 24VAC or VDC
- Compatible only with EVCB model Controllers
- BACnet MS/TP or Modbus communication network
- In-built temperature sensor
- 0-10 VDC output, cool/heat
- 4 TRIAC output (ON/OFF, pulse or floating)
- For Pressure Independent VAV



TRL24

- Main supply 24VAC or VDC
- Compatible only with EVCB model Controllers
- BACnet MS/TP or Modbus communication network
- In-built temperature sensor
- 0-10 VDC output, cool/heat
- 4 TRIAC output (ON/OFF, pulse or floating)
- For Pressure Independent VAV

Other Ducting Products of Airmaster

Sound Attenuator



Non Return Damper



Pressure Relief Damper



Access Door



Plenum Box



Volume Control Damper



Round Volume Control Damper



Adhesive Tapes & Flexible Ducts



NBR Insulation

XPE Insulation

Aluminium Foil Tape

FSK Tape

Sealing Tape

Surface Protection Tape

Foam Tape

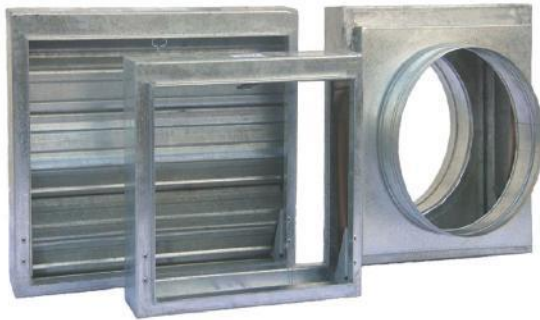
Double Side Tape

Alu-glass Tape

Flexible Duct, Rigid aluminium Duct

Flexible duct connector

Curtain Type Fire Damper



Motorized Fire Damper



Motorized Fire & Smoke Damper



Motorized Smoke Damper



Fire Doors & Frames





air master
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