

CATALOG

DDR Dual-Duct VAV Terminals



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NOTES:

- All data is subject to change without notice. Drawings in this guide are not for installation purposes.
- Some drawings are not shown in this catalog. Construction drawings and performance data contained herein should not be used for submittal purposes.
- ETL Listing Number 492864.
- Visit www.enviro-tec.com for current literature and submittal drawings or contact your local sales representative for more information.



FEATURES AND BENEFITS

PRECISE ZONE CONTROL

Model DDR terminals provide variable air volume (VAV) control beyond the typical dual-duct box. They are specifically designed for precise air delivery throughout the entire operating range, regardless of the installed inlet conditions. They also offer improved space comfort and flexibility for a wide variety of HVAC applications. DDR terminals take advantage of typical benefits provided by dual duct units, while performing at extremely low sound levels. This is critical in today's buildings, where occupants are placing more emphasis on indoor acoustics.

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

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

DESIGN FLEXIBILITY

Selection and Layout The DDR provides flexibility in system design. The compact cabinet design and quiet operation give the system designer the versatility to place units directly above occupied spaces. It is not

necessary to locate the unit in the crowded space above a hall or corridor. This will reduce lengthy and expensive discharge duct runs. The FlowStar™ sensors ensure accurate control, even when space constraints do not permit long straight inlet duct runs to the terminal.

Sizes. Model DDR terminals are available in eight unit sizes to handle airflow capacities between 45 and 4100 CFM.

A web-based Computer Selection Program, "Web-Select", is available to facilitate the selection process. Contact your representative to obtain access to this powerful and time-saving program.

CONVENIENT INSTALLATION

Quality All DDR terminals are thoroughly inspected during each step of the manufacturing process, including a comprehensive "pre-ship" inspection, to maintain the highest quality product available. All DDR terminals are packaged to minimize damage during shipment.

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

The FlowStar™ sensors ensure accurate airflow measurement, regardless of the field installation conditions. A calibration label and wiring diagram is located on the terminal for quick reference during start-up.

The terminal is constructed to allow installation with standard metal hanging straps. Optional hanger brackets for use with all-thread support rods or wire hangers are also available.

LASTING COMPONENTS AND LOW COST OPERATION

Quality All metal components are fabricated from galvanized steel. Unlike most manufacturers' terminals, the DDR is capable of withstanding a 125 hour 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 sensors allows for precise airflow control at low air velocities.

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

Agency Certification Model DDR terminals with electronic controls are listed with ETL as an assembly, and bear the ETL label.

DDR terminals and accessories are wired in compliance with all applicable NEC requirements and tested in accordance with AHRI Standard 880.

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

PATENTED FLOWSTAR™ SENSOR CONTROL

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

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

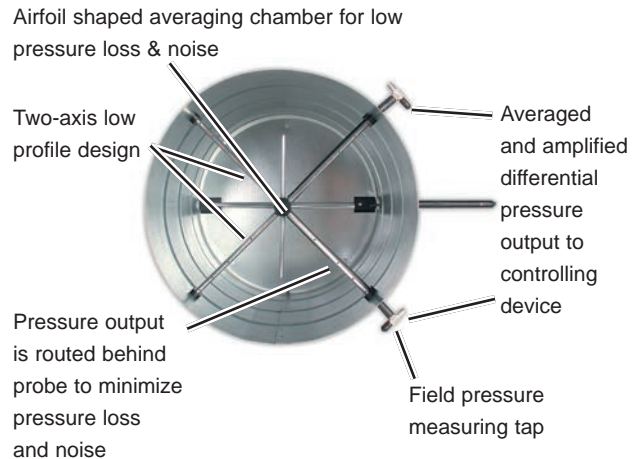
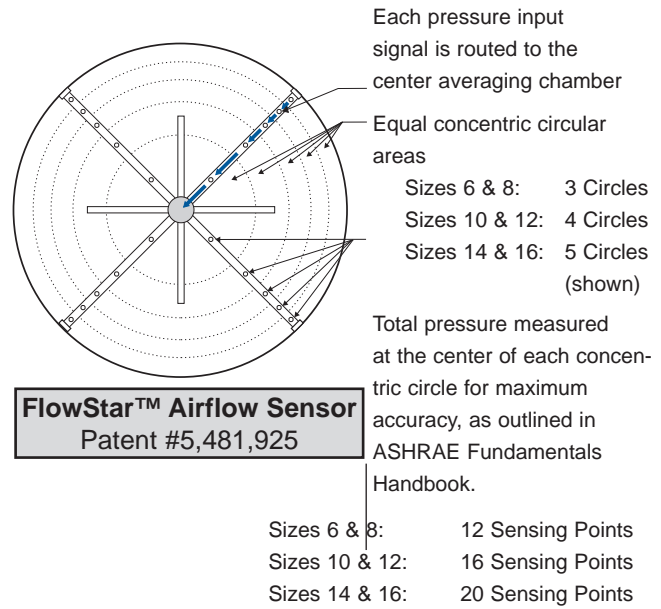
The VAV schedule should specify the minimum and maximum airflow setpoints, maximum sound power levels, and maximum air pressure loss for each terminal.

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.

FEATURES AND BENEFITS

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

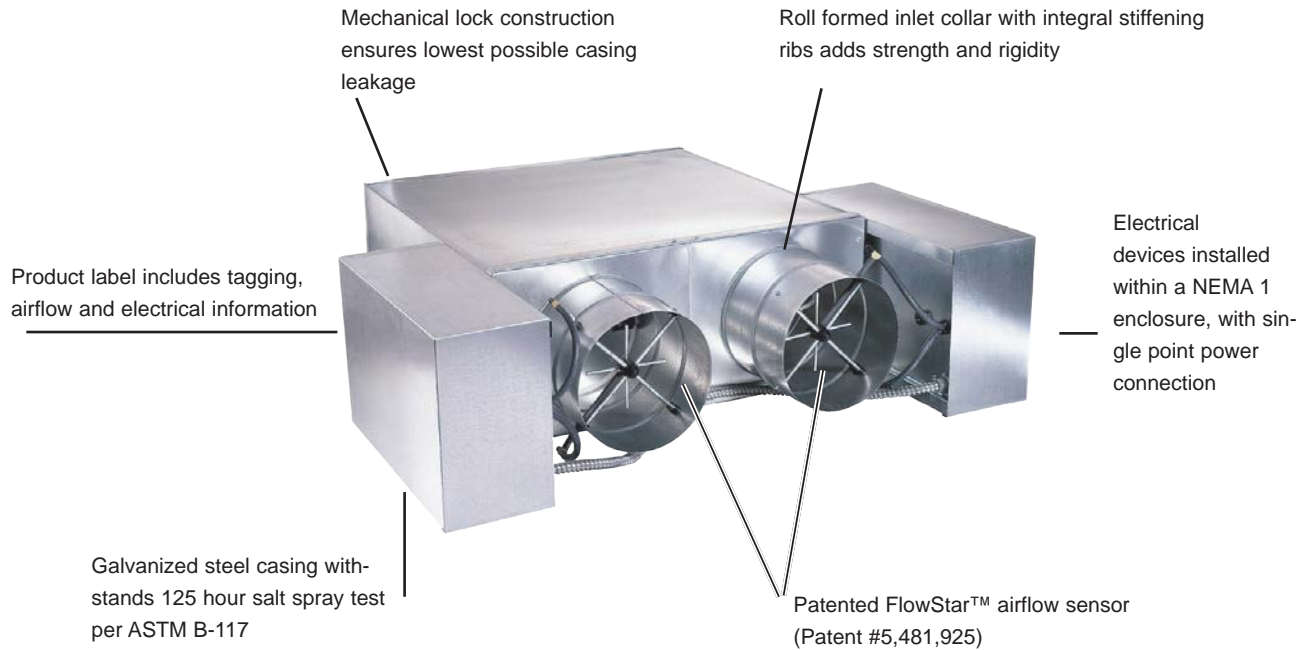
Conventional airflow sensors without amplification capabilities require approximately 700 FPM to generate a 0.03 inch W.G. signal. If 700 FPM represents a 20% minimum condition, the inlet velocity would be 3500 FPM at the maximum airflow setpoint. This results in extremely noisy conditions. In addition, the airflow sensor should generate a differential pressure range of at least one inch W.G. over the operating range of the terminal unit.



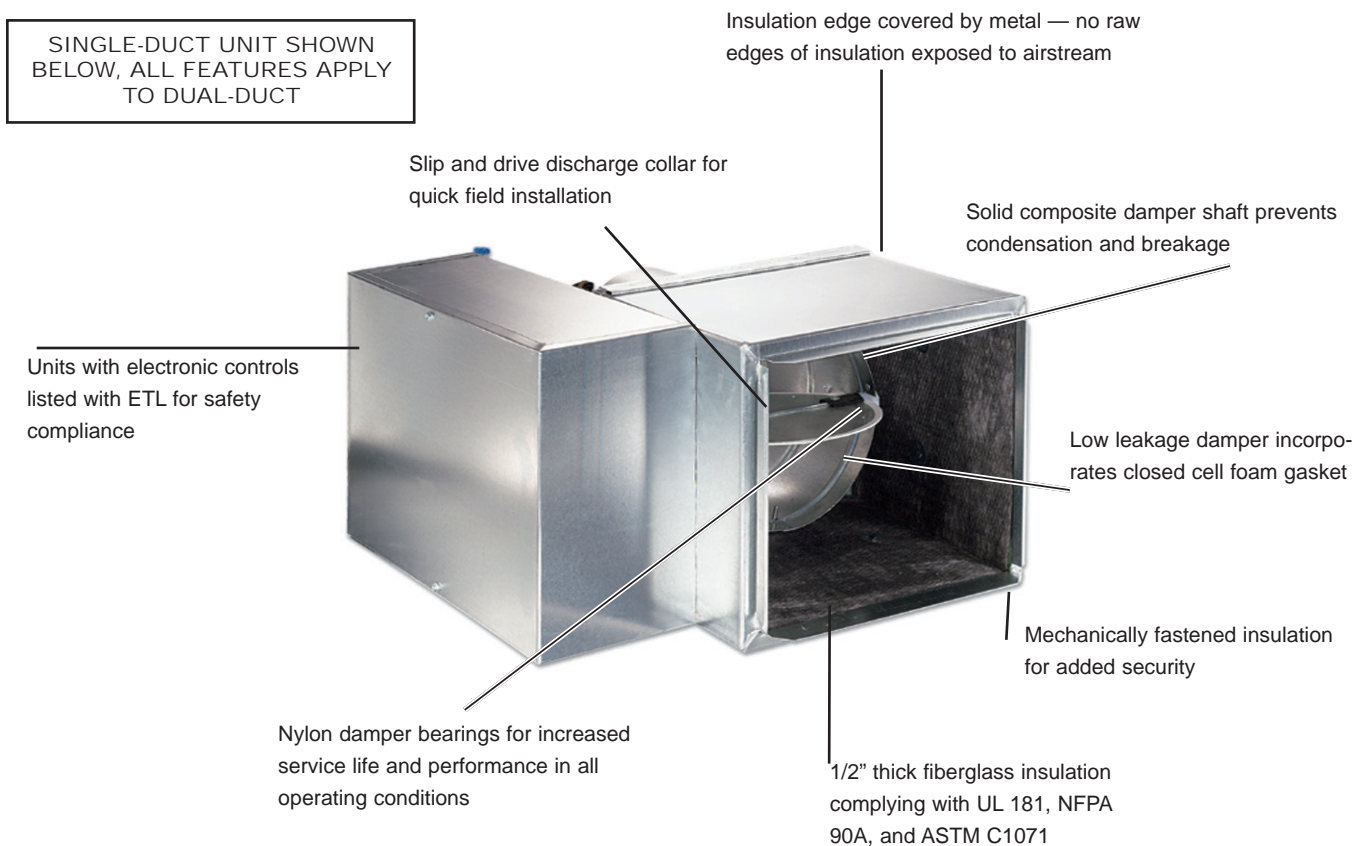
STANDARD CONSTRUCTION

MODEL DDR

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



SINGLE-DUCT UNIT SHOWN BELOW, ALL FEATURES APPLY TO DUAL-DUCT



OPTIONAL CONSTRUCTION

MODEL DDR

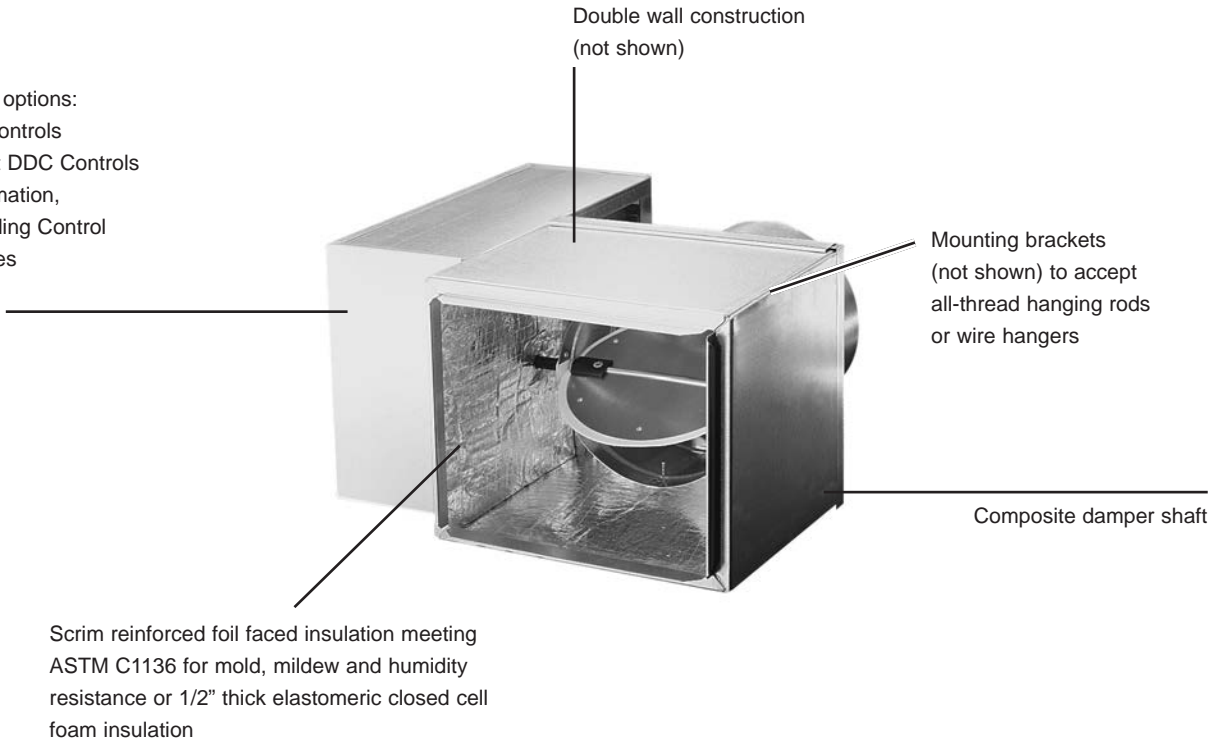
(SINGLE-DUCT UNIT SHOWN BELOW, ALL FEATURES APPLY TO DUAL-DUCT)

The DDR dual duct terminal is available with many optional features to meet any project requirement.

Factory control options:

- Pneumatic Controls
- Consignment DDC Controls

For more information,
see corresponding Control
Selection Guides



STANDARD AND OPTIONAL FEATURES

STANDARD FEATURES

Construction

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

Primary Air Valve

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

Electrical

- cETL listed for safety compliance with UL 1996
- NEMA 1 wiring enclosure

OPTIONAL FEATURES

Construction

- 20 gauge galvanized steel construction
- 1" insulation
- Foil faced scrim backed insulation
- 1/2" thick elastomeric closed cell foam insulation
- Double wall construction with 22 gauge liner

Electrical

- Toggle disconnect switch
- Primary and secondary transformer fusing

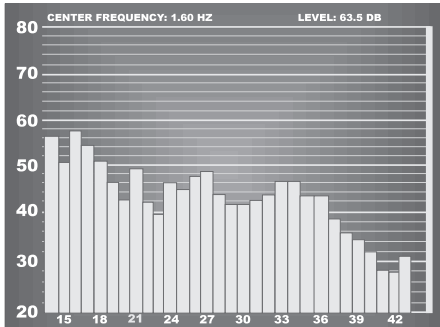
Controls

- Pneumatic Controls
- Consignment DDC controls (factory mount and wire controls provided by others)

APPLICATION AND SELECTION

ACOUSTICAL CONCEPTS

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



Sound. At the zone level, the terminal unit generates acoustical energy that can enter the zone along two primary paths. First, sound from the primary

air valve can propagate through the downstream duct and diffusers before entering the zone (referred to as Discharge or Airborne Sound). Acoustical energy is also radiated from the terminal casing and travels through the ceiling cavity and ceiling system before entering the zone (referred to as Radiated Sound).

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

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

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

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

There is no direct relationship between sound power levels and sound pressure levels. Therefore, we must predict the resulting sound pressure levels (NC levels) in the zone based in part by the published sound power

levels of the terminal equipment. The NC levels are totally dependent on the project specific design, architecturally and mechanically. For a constant operating condition (fixed sound power levels), the resulting NC level in the zone will vary from one project to another.

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

GENERAL DESIGN RECOMMENDATIONS FOR A QUIET SYSTEM

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

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

APPLICATION AND SELECTION

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

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

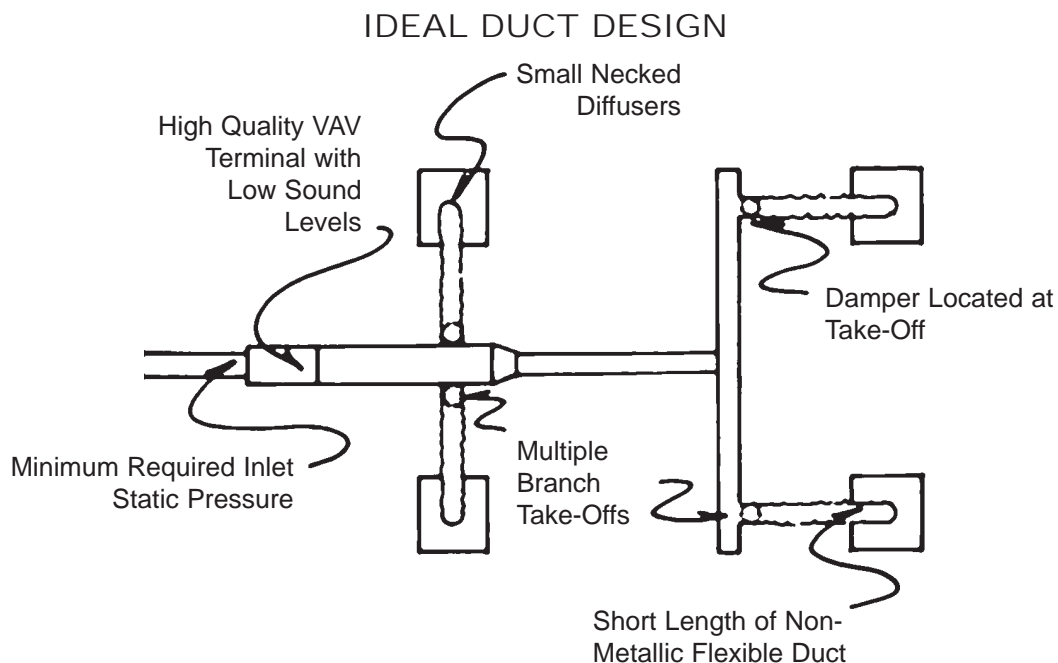
A more prudent approach is to utilize a pressure reducing device upstream of the terminal unit on those few zones closest to the central fan. This device could simply be a manual quadrant type damper if located well upstream of the terminal inlet. In tight quarters, perforated metal can be utilized as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

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

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

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

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



DIMENSIONAL DATA

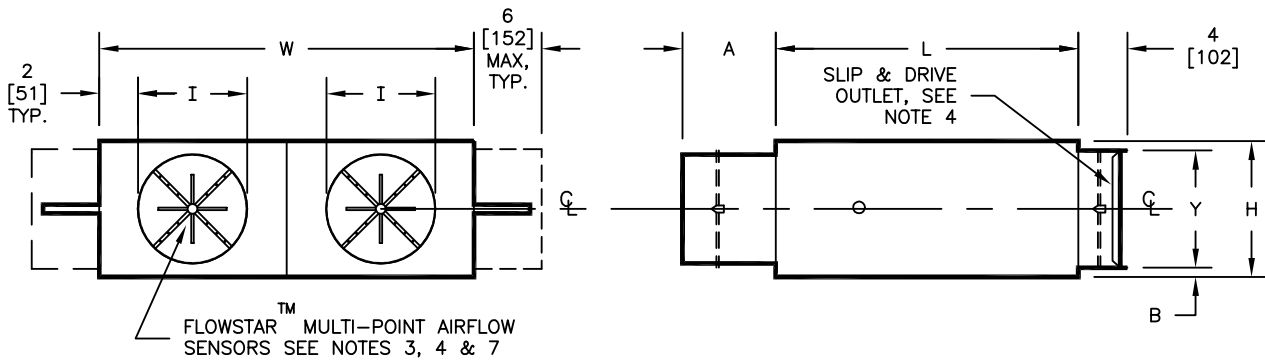
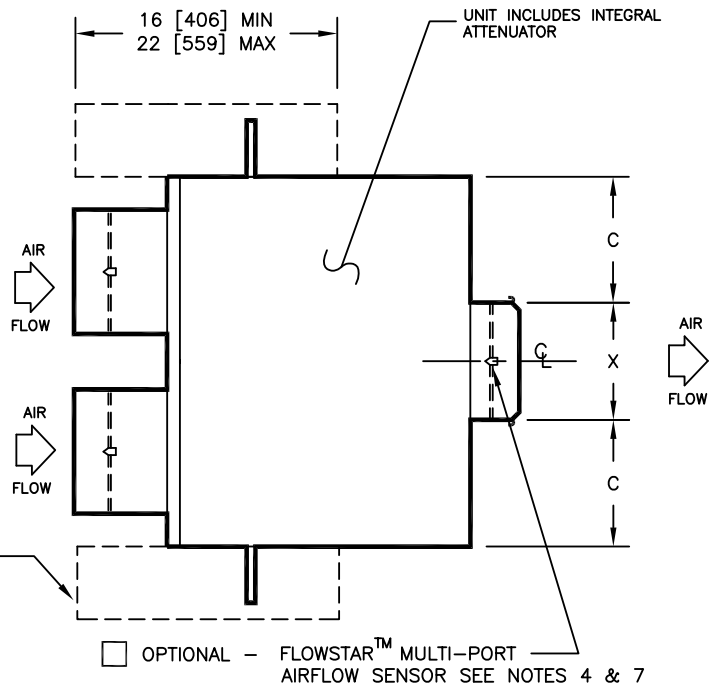
MODEL DDR

NOTES:

1. All dimensions are Inches [millimeters]. All dimensions are $\pm 1/4"$ [6mm]. Metric values are soft conversion.
2. Provide sufficient clearance to permit access to controls and comply with applicable codes and ordinances.
3. Sizes 4 and 5 inlets use a single-axis multi-point averaging airflow sensor.
4. Inlet and outlet collars must be externally insulated in the field "by others" if required.
5. All unit dimensions based on largest inlet.
6. No raw edges of insulation should be exposed to the airstream in the downstream ductwork.
7. All FlowStar™ probes include exterior balance taps.

INLET SIZE COMBINATIONS ARE LIMITED, SEE DRAWING 25-80001 FOR ALLOWABLE COMBINATIONS

CONTROL ENCLOSURE
TYPICAL ON UNITS WITH
ELECTRONIC CONTROLS,
OPTIONAL ON UNITS WITH
PNEUMATIC CONTROLS,
SEE NOTE 2

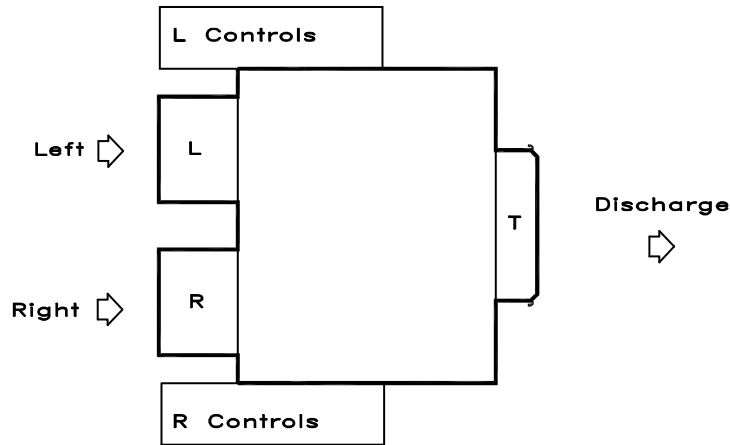


DIMENSIONS - In [mm]

NOM MAX INLET SIZE	W	H	L	A	B	C	I	X	Y
4	20-1/2 [521]	10 [254]	24 [610]	10-1/2 [267]	2-1/16 [52]	7-5/16 [186]	3-7/8 [98]	5-7/8 [149]	5-7/8 [149]
5	20-1/2 [521]	10 [254]	24 [610]	10-1/2 [267]	2-1/16 [52]	7-5/16 [186]	4-7/8 [124]	5-7/8 [149]	5-7/8 [149]
6	20-1/2 [521]	10 [254]	24 [610]	6-1/2 [165]	2-1/16 [52]	7-5/16 [186]	5-7/8 [149]	5-7/8 [149]	5-7/8 [149]
8	24-1/2 [622]	10 [254]	24 [610]	6-1/2 [165]	1-1/16 [27]	8-5/16 [211]	7-7/8 [200]	7-7/8 [200]	7-7/8 [200]
10	28-1/2 [724]	12-1/2 [318]	30 [762]	6-1/2 [165]	1-5/16 [33]	9-5/16 [237]	9-7/8 [251]	9-7/8 [251]	9-7/8 [251]
12	32-1/2 [826]	15 [381]	30 [762]	6-1/2 [165]	1-9/16 [40]	10-5/16 [262]	11-7/8 [302]	11-7/8 [302]	11-7/8 [302]
14	38-1/2 [978]	17-1/2 [445]	36 [914]	6-1/2 [165]	1-13/16 [46]	12-5/16 [338]	13-7/8 [352]	13-7/8 [352]	13-7/8 [352]
16	38-1/2 [978]	17-1/2 [445]	36 [914]	6-1/2 [165]	13/16 [21]	11-5/16 [414]	15-7/8 [403]	15-7/8 [403]	15-7/8 [403]

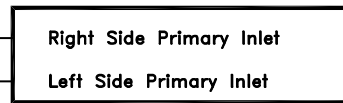
DIMENSIONAL DATA

MODEL DDR - APPLICATIONS / CONFIGURATIONS



Plan View

Model			Size	
DDR	T	L	08	10



Size- Allowable Configuration

Select	Cold Deck Locations
	L = Left
	R = Right

See note 4

Probe Locations/ Controller Connections		
0 = Standard – Probes provided in both Left and Right Primary Inlet		
T = Totalizing (Discharge) Probe Installed, includes standard R and L Probes.		
Allowable Configurations– Cold/ Hot Deck Control Connections		
Select	Config.	Probe Connections
	0	If Cold Deck = L, Hot Deck Connected R Controller If Cold Deck = R, Hot Deck Connected L Controller
	T	If Cold Deck = L; R not used; T Connected R Controller If Cold Deck = R, L not used; T Connected L Controller

Select	Left	Right	Select	Left	Right
	04	04		10	04
	04	05		10	05
	04	06		10	06
	04	08		10	08
	04	10		10	10
	04	12		10	12
	04	14		10	14
	04	16		10	16
	05	04		12	04
	05	05		12	05
	05	06		12	06
	05	08		12	08
	05	10		12	10
	05	12		12	12
	05	14		12	14
	05	16		12	16
	06	04		14	04
	06	05		14	05
	06	06		14	06
	06	08		14	08
	06	10		14	10
	06	12		14	12
	06	14		14	14
	06	16		14	16
	08	04		16	04
	08	05		16	05
	08	06		16	06
	08	08		16	08
	08	10		16	10
	08	12		16	12
	08	14		16	14
	08	16		16	16

Notes:

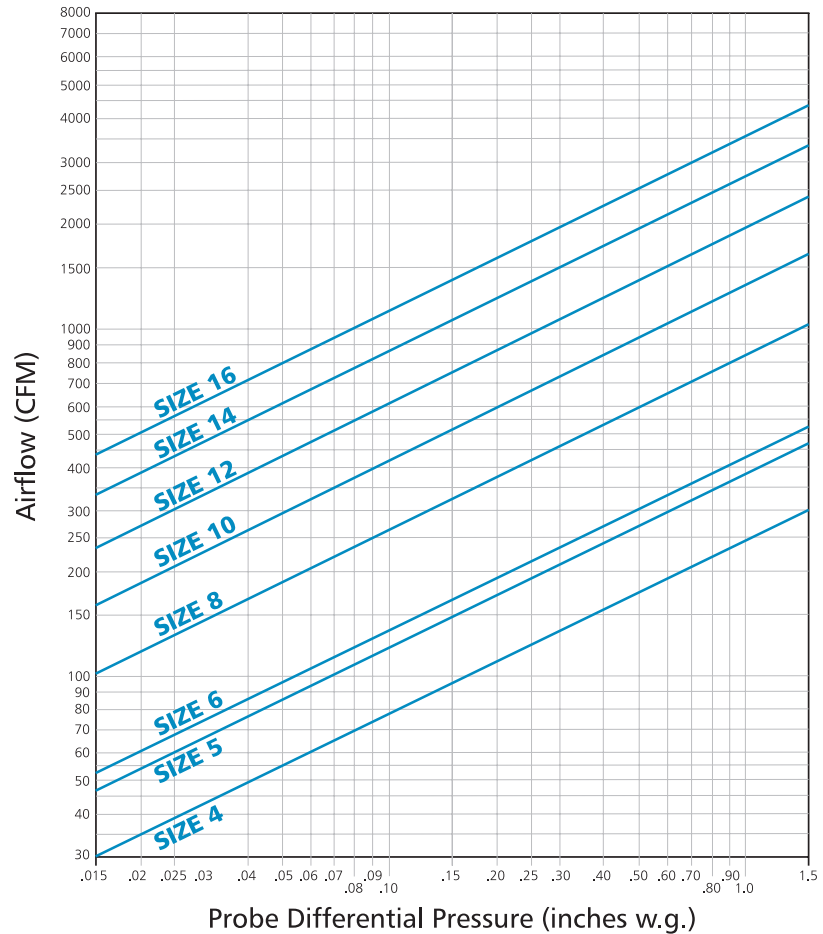
1. Cold Deck Probes always connected to adjacent controller.
2. For OSA applications, connect OSA as if a hot deck.
3. OSA applications must be supplied with pretreated air.
4. See 25–80000 for Unit size and height dimensions.
Unit dimensions dictated by largest inlet size.

AIRFLOW CALIBRATION

FLOWSTAR™ CALIBRATION CHART

(For dead-end differential pressure transducers)

NOTE: Maximum and minimum CFM limits are dependent on the type of controls that are utilized. Refer to the table below for specific values. When DDC controls are furnished by others, the CFM limits are dependent on the specific control vendor that is employed. After obtaining the differential pressure range from the control vendor, the maximum and minimum CFM limits can be obtained from the chart above (many controllers are capable of controlling minimum setpoint down to .015" w.g.).



AIRFLOW RANGES (CFM)

UNIT SIZE	400 SERIES (PNEUMATIC) STANDARD CONTROLLER		7000 SERIES ANALOG ELECTRONIC (FOR REFERENCE ONLY)		DDC CONSIGNMENT CONTROLS (See Notes Below)				
	MIN.	MAX.	MIN.	MAX.	MIN.			MAX.	
					MIN. TRANSDUCER DIFFERENTIAL PRESSURE (IN. W.G.)			MAX. TRANSDUCER DIFFERENTIAL PRESSURE (IN. W.G.)	
					0.015	0.03*	0.05	1.0	≤1.5
4	43	250	35	250	30	43	55	250	250
5	68	350	50	350	48	65	88	350	350
6	75	490	60	550	53	75	97	435	530
8	145	960	115	1000	105	145	190	840	1000
10	235	1545	185	1600	165	235	305	1355	1600
12	340	2250	285	2300	240	340	440	1975	2300
14	475	3100	390	3100	335	475	615	2750	3100
16	625	4100	520	4100	440	625	805	3595	4100

NOTES:

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

SELECTION DATA

UNIT SIZE	CFM	Min. Δ Ps (IN W.G.)	ROOM NOISE CRITERIA (NC)							
			Min Δ Ps		Min Δ Ps + 0.5"		Min Δ Ps + 1.0"		Min Δ Ps + 3.0"	
			Dis.	Rad.	Dis.	Rad.	Dis.	Rad.	Dis.	Rad.
4	100	.06	-	-	-	-	-	-	-	-
	150	.36	-	-	-	-	-	-	-	20
	200	.37	-	-	-	-	-	-	20	27
5	100	.03	-	-	-	-	-	-	-	-
	200	.26	-	-	-	-	-	-	-	24
	350	.56	-	-	-	-	-	-	-	32
6	200	.12	-	-	-	-	-	-	-	24
	350	.35	-	-	-	-	-	-	-	30
	450	.58	-	-	-	-	-	-	24	34
8	300	.07	-	-	-	-	-	-	-	22
	750	.37	-	-	-	-	-	21	32	35
	1000	.75	-	-	-	21	-	25	35	38
10	600	.1	-	-	-	-	-	20	20	32
	1150	.36	-	-	-	-	-	27	32	37
	1600	.72	-	-	-	23	-	30	34	43
12	800	.07	-	-	-	-	-	23	22	32
	1500	.28	-	-	-	-	-	25	35	39
	2300	.68	-	-	-	29	-	29	36	42
14	1100	.07	-	-	-	-	-	-	27	36
	1900	.23	-	-	-	-	-	24	35	39
	3100	.68	-	-	-	27	-	28	36	40
16	1600	.11	-	-	-	-	-	28	28	39
	2400	.27	-	-	-	-	-	29	34	42
	4100	.78	-	-	-	31	-	33	36	45

Notes:

- Minimum Pressure Drop (Δ P) is the pressure difference between the terminal inlet and discharge with the damper wide open.
- Performance data obtained from tests conducted in accordance with ARI standard 880.
- NC values are based on assumptions outlined in ARI Standard 885.
- Dash (-) indicates NC level less than 20
- Discharge NC values based upon:
 - 10 dB room absorption
 - 5' lined duct (12" x 22") with 1" thick fiberglass insulation
 - 6' lined flexible duct (8") to diffuser
 - Maximum 300 CFM per diffuser
- Radiated NC values based upon:
 - 10 dB room absorption
 - 3' deep ceiling cavity
 - 5/8" thick - 35lb/ft³ mineral fiber ceiling tile

SOUND DATA

DISCHARGE SOUND POWER DATA - MODEL DDR

UNIT SIZE	CFM	MIN Δ Ps (IN W.G.)	DISCHARGE SOUND POWER (dB-re 10 ⁻¹² Watts)																											
			0.5" INLET Δ Ps							1.0" INLET Δ Ps							1.5" INLET Δ Ps							3.0" INLET Δ Ps						
			2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7				
4	100	0.060	60	51	38	33	29	28	61	56	43	37	33	31	-	-	-	-	-	-	58	55	48	43	40	39				
	150	0.320	-	-	-	-	-	-	-	-	-	-	-	-	72	65	55	47	45	45	-	-	-	-	-	-				
	200	0.360	67	56	44	39	36	34	71	62	49	43	41	40	-	-	-	-	-	-	73	67	57	51	47	47				
	250	0.370	69	59	47	41	38	36	73	63	51	45	43	42	-	-	-	-	-	-	78	71	60	53	49	50				
5	100	0.030	54	45	37	33	30	27	56	50	42	36	34	31	-	-	-	-	-	-	57	54	49	43	40	39				
	200	0.120	59	49	39	36	34	31	63	54	46	41	40	38	-	-	-	-	-	-	65	61	55	49	46	46				
	250	0.220	-	-	-	-	-	-	-	-	-	-	-	-	70	63	55	48	44	45	-	-	-	-	-	-				
	300	0.260	64	52	44	39	36	33	67	59	48	43	42	41	-	-	-	-	-	-	73	65	59	52	50	51				
400	0.560	65	53	45	40	36	34	69	60	50	44	42	41	-	-	-	-	-	-	76	67	60	53	51	52					
6	200	0.120	58	47	38	36	33	30	61	54	44	40	40	38	-	-	-	-	-	-	64	60	55	49	47	47				
	250	0.180	60	49	39	36	33	30	63	56	45	41	41	39	-	-	-	-	-	-	67	62	56	50	49	49				
	300	0.260	61	50	40	37	35	31	67	59	48	42	41	40	-	-	-	-	-	-	69	64	57	51	50	51				
	350	0.350	61	50	43	38	36	33	67	59	48	42	41	41	-	-	-	-	-	-	71	67	58	52	51	52				
	400	0.480	-	-	-	-	-	-	-	-	-	-	-	-	69	62	56	49	45	45	-	-	-	-	-	-				
	450	0.580	-	-	-	-	-	-	68	59	50	44	42	41	-	-	-	-	-	-	75	71	60	53	51	53				
550	0.850	-	-	-	-	-	-	70	61	50	45	42	42	-	-	-	-	-	-	84	80	67	60	57	60					
8	300	0.070	60	51	40	39	38	32	63	58	47	45	45	42	-	-	-	-	-	-	67	64	56	54	53	52				
	400	0.120	60	52	41	40	39	33	65	60	48	45	46	43	-	-	-	-	-	-	69	65	57	55	55	52				
	500	0.190	60	52	41	40	39	33	65	60	48	45	46	43	-	-	-	-	-	-	74	72	61	57	56	57				
	600	0.280	62	55	44	41	40	35	68	63	50	46	47	45	-	-	-	-	-	-	74	72	61	57	56	57				
	700	0.420	-	-	-	-	-	-	-	-	-	-	-	-	72	69	59	53	51	52	-	-	-	-	-	-				
	800	0.470	64	56	46	42	41	38	70	65	54	48	48	47	-	-	-	-	-	-	78	77	65	58	57	59				
1000	0.750	-	-	-	-	-	-	71	64	54	48	49	48	-	-	-	-	-	-	81	79	66	59	57	60					
10	600	0.100	60	50	41	41	40	36	67	59	49	47	48	46	-	-	-	-	-	-	70	65	58	56	55	56				
	800	0.180	61	51	42	41	41	37	68	60	48	47	48	46	-	-	-	-	-	-	74	70	60	58	57	59				
	1000	0.280	63	52	43	42	41	38	70	61	49	47	49	48	-	-	-	-	-	-	77	74	62	59	58	62				
	1100	0.380	-	-	-	-	-	-	-	-	-	-	-	-	73	67	59	54	54	54	-	-	-	-	-	-				
	1200	0.400	65	52	44	44	43	39	71	62	52	48	49	49	-	-	-	-	-	-	80	76	64	59	58	62				
	1400	0.560	-	-	-	-	-	-	71	62	52	49	50	49	-	-	-	-	-	-	81	77	64	59	58	62				
1600	0.720	-	-	-	-	-	-	71	62	52	50	51	50	-	-	-	-	-	-	82	77	65	59	58	63					
12	800	0.070	59	51	43	44	44	40	67	60	51	50	51	49	-	-	-	-	-	-	72	67	63	60	60	62				
	1100	0.150	60	52	44	44	45	42	68	61	52	50	51	49	-	-	-	-	-	-	76	75	66	62	61	64				
	1400	0.250	61	53	46	45	46	43	68	61	52	50	53	52	-	-	-	-	-	-	79	78	68	62	62	65				
	1600	0.350	-	-	-	-	-	-	-	-	-	-	-	-	74	69	60	57	58	59	-	-	-	-	-	-				
	1700	0.370	62	55	49	47	47	44	69	62	53	51	54	54	-	-	-	-	-	-	80	78	68	63	62	66				
	2000	0.520	-	-	-	-	-	-	71	63	55	52	54	54	-	-	-	-	-	-	81	79	69	63	62	67				
2300	0.360	-	-	-	-	-	-	72	63	57	53	55	55	-	-	-	-	-	-	82	79	69	63	63	67					
14	1100	0.070	58	51	44	45	45	40	68	61	51	50	51	49	-	-	-	-	-	-	72	70	63	61	60	61				
	1500	0.140	59	52	45	45	47	43	68	62	52	50	53	51	-	-	-	-	-	-	77	77	67	62	61	63				
	1900	0.230	61	54	47	46	47	43	68	62	53	50	54	53	-	-	-	-	-	-	78	77	67	62	62	65				
	2100	0.350	-	-	-	-	-	-	-	-	-	-	-	-	74	69	61	55	56	57	-	-	-	-	-	-				
	2300	0.360	62	54	50	47	48	44	69	62	54	51	54	54	-	-	-	-	-	-	79	78	67	62	63	67				
	2700	0.490	62	54	53	49	49	45	70	63	56	53	55	55	-	-	-	-	-	-	79	78	67	62	63	68				
3100	0.680	-	-	-	-	-	-	70	63	58	54	55	55	-	-	-	-	-	-	80	78	68	63	63	68					
16	1600	0.110	59	52	46	48	48	49	68	61	53	53	56	54	-	-	-	-	-	-	77	71	67	65	65	66				
	2100	0.190	61	53	47	49	51	46	69	61	53	53	57	55	-	-	-	-	-	-	81	75	68	65	65	68				
	2600	0.300	62	54	48	49	52	48	70	62	54	54	58	56	-	-	-	-	-	-	83	77	68	65	66	69				
	2800	0.400	-	-	-	-	-	-	-	-	-	-	-	-	74	69	61	58	60	62	-	-	-	-	-	-				
	3100	0.430	62	55	50	50	52	48	70	63	55	54	58	57	-	-	-	-	-	-	84	78	69	65	66	70				
	3600	0.590	-	-	-	-	-	-	71	63	59	55	59	58	-	-	-	-	-	-	85	78	69	65	66	70				
4100	0.780	-	-	-	-	-	-	71	63	62	56	59	59	-	-	-	-	-	-	85	78	69	65	67	71					

Note: Includes adjustments for discharge end reflection
 Performance data obtained from tests conducted in accordance with AHRI Standard 880.
 Sound levels are expressed in decibels, dB re: 1 x 10⁻¹² watts
 Duct end corrections included in sound power levels per AHRI Standard 880.
 Certified AHRI data is highlighted blue. Application data (not highlighted blue) is outside the scope of the certification program.

SOUND DATA

RADIATED SOUND POWER DATA - MODEL DDR

UNIT SIZE	CFM	MIN ΔP_s (IN W.G.)	RADIATED SOUND POWER (dB- re 10^{-12} Watts)																	
			0.5" INLET ΔP_s					1.0" INLET ΔP_s					3.0" INLET ΔP_s							
			2	3	4	5	6	7	2	3	4	5	6	7	2	3	4	5	6	7
4	100	0.060	48	42	35	29	28	30	48	47	38	30	28	30	49	47	43	36	32	32
	200	0.360	51	47	39	33	30	31	57	53	45	34	31	31	58	57	52	42	36	35
	250	0.370	51	48	42	37	35	32	58	55	46	38	35	33	62	61	55	44	39	36
5	100	0.030	44	37	32	29	27	29	45	41	36	30	28	29	49	48	42	36	33	32
	200	0.120	49	42	35	30	28	29	52	47	40	33	30	30	56	55	49	41	37	34
	300	0.260	51	45	38	32	30	30	57	51	43	35	32	31	61	59	53	43	39	37
	350	0.560	52	46	41	34	32	30	58	52	45	36	34	31	63	61	54	44	40	38
6	200	0.120	47	40	34	29	28	29	51	46	39	32	30	29	55	55	49	41	36	33
	250	0.180	51	42	35	30	28	29	53	47	40	33	31	30	58	57	51	42	37	34
	300	0.260	52	43	37	30	28	29	56	49	42	34	31	30	59	59	53	43	38	35
	350	0.350	52	44	38	31	28	29	57	51	43	35	32	30	61	60	53	43	39	36
	450	0.580	-	-	-	-	-	-	58	52	46	37	34	31	64	63	55	45	40	38
550	0.850	-	-	-	-	-	-	58	52	47	39	36	32	67	65	57	47	41	39	
8	300	0.070	51	40	33	30	28	29	54	47	39	33	30	31	58	53	47	42	38	37
	400	0.120	53	41	34	31	28	29	58	49	40	34	31	31	61	56	51	43	38	37
	500	0.190	53	43	35	31	28	30	59	51	41	35	32	32	63	59	52	44	39	39
	600	0.280	54	45	37	32	29	30	60	51	42	36	33	33	65	61	53	44	39	40
	800	0.470	54	45	41	35	30	31	61	53	45	37	33	33	70	66	56	47	41	42
1000	0.750	-	-	-	-	-	-	62	53	47	40	35	34	72	66	57	47	41	43	
10	600	0.100	52	44	36	32	28	29	59	52	43	37	33	32	64	61	54	46	41	40
	800	0.180	54	45	37	34	29	29	60	53	43	38	34	32	66	65	55	48	42	42
	1000	0.280	56	47	40	36	31	31	62	54	44	39	35	34	69	68	57	49	44	43
	1200	0.400	58	48	43	39	34	33	64	55	46	41	36	35	72	69	57	49	44	45
	1400	0.560	-	-	-	-	-	-	65	56	48	44	38	36	75	69	58	50	45	46
1600	0.720	-	-	-	-	-	-	66	56	49	45	39	37	76	69	58	50	45	46	
12	800	0.070	52	44	38	36	29	29	60	52	43	42	35	32	67	61	55	50	45	41
	1100	0.150	53	45	39	37	30	30	61	53	45	43	37	33	71	65	57	51	46	44
	1400	0.250	55	49	42	41	35	31	62	53	45	43	37	34	72	68	58	52	46	44
	1700	0.370	56	48	44	41	35	31	63	54	47	45	39	35	73	68	59	53	47	45
	2000	0.520	-	-	-	-	-	-	64	55	49	46	40	36	74	68	59	53	48	46
2300	0.680	-	-	-	-	-	-	65	56	53	48	42	38	75	69	60	54	48	47	
14	1100	0.070	51	44	36	33	32	29	58	53	43	37	35	34	66	65	56	48	43	41
	1500	0.140	52	45	38	34	32	30	58	53	44	38	36	34	67	67	58	50	44	45
	1900	0.230	54	47	40	36	33	33	61	54	45	39	37	36	69	68	59	50	45	46
	2300	0.360	55	49	43	38	34	33	61	55	46	41	38	36	69	68	59	51	45	46
	2700	0.490	56	50	48	40	36	34	62	56	49	43	39	37	70	68	59	51	46	47
3100	0.680	-	-	-	-	-	-	64	57	52	44	41	39	73	69	60	52	47	48	
16	1600	0.110	57	45	38	35	33	31	64	54	45	40	39	37	73	67	59	51	47	48
	2100	0.190	58	47	40	36	35	33	65	55	46	40	39	37	75	70	61	52	48	50
	2600	0.300	60	49	42	37	35	33	66	55	47	41	40	39	76	71	61	52	49	51
	3100	0.430	61	52	45	39	37	35	67	57	48	42	41	40	78	71	61	52	49	51
	3600	0.590	-	-	-	-	-	-	68	58	51	44	43	42	78	71	62	53	49	52
4100	0.780	-	-	-	-	-	-	68	58	57	46	45	43	78	72	62	53	50	52	

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

AHRI RATINGS

SIZE	RATED AIRFLOW CFM	MINIMUM OPERATING PRESSURE (IN. W.G.)	STANDARD RATINGS – SOUND POWER LEVEL, dB RE: 1 x 10 ⁻¹² WATTS											
			1.5" WATER STATIC PRESSURE											
			RADIATED						DISCHARGE					
			Hz Octave Band Center Frequency						Hz Octave Band Center Frequency					
			125	250	500	1000	2000	4000	125	250	500	1000	2000	4000
4	150	0.32	53	52	43	35	31	31	72	65	55	47	45	45
5	250	0.22	60	55	48	39	35	33	70	63	55	48	44	45
6	400	0.48	61	58	50	42	36	35	69	62	56	49	45	45
8	700	0.42	64	59	51	43	38	38	72	69	59	53	51	52
10	1100	0.38	68	60	52	45	40	40	73	67	59	54	54	54
12	1600	0.35	68	62	55	48	44	39	74	69	60	57	58	59
14	2100	0.35	65	62	53	45	41	40	74	69	61	55	56	57
16	2800	0.41	71	63	54	48	45	44	74	69	61	58	60	62

- Rated in accordance with AHRI Standard 880
- Duct end corrections included in sound power levels per AHRI Standard 880.



GUIDE SPECIFICATIONS

GENERAL

Furnish and install ENVIRO-TEC Model DDR Dual Duct Variable Air Volume Terminal Units of the sizes and capacities as scheduled. Terminals shall be certified by AHRI and bear the AHRI 880 seal.

CONSTRUCTION

Terminals shall be constructed of not less than 22 gauge galvanized steel, able to withstand a 125 hour salt spray test per ASTM B-117. Stainless steel casings, or galvanized steel casings with a baked enamel paint finish, may be used as an alternative. The terminal casing shall be mechanically assembled (spot-welded casings are not acceptable).

Casing shall be internally lined with 1/2" thick fiberglass insulation, rated for a maximum air velocity of 5000 f.p.m. Maximum thermal conductivity shall be $.24 \text{ (BTU} \cdot \text{in) / (hr} \cdot \text{ft}^2 \cdot \text{°F)}$. Insulation must meet all requirements of ASTM C1071 (including C665), UL 181 for erosion, and carry a 25/50 rating for flame spread/smoke developed per ASTM E-84, UL 723 and NFPA 90A. 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.

All appurtenances including; control assemblies and control enclosures shall not extend beyond the top and bottom of the unit casing. At an inlet velocity of 2000 ft/min, the static pressure drop across the basic terminal shall not exceed the performance scheduled for all unit sizes.

PRIMARY AIR VALVE

The primary air valve shall consist of a minimum 22 gauge cylindrical body that includes embossment rings for rigidity. Each damper blade shall be connected to an independently linked solid shaft by means of an integral molded sleeve, which does not require screw or bolt fasteners.

The shafts shall be manufactured of a low thermal conducting composite material, and include a molded damper position indicators visible from the exterior of the unit. The dampers shall pivot in nylon bearings. The damper actuators shall be mounted on the exterior of the terminal for ease of service.

The valve assemblies shall include internal mechanical stops for both full open and closed positions. The damper blade seals shall be secured without use of adhesives. The air valve leakage shall not exceed 1% of maximum inlet rated airflow at 3" W.G. inlet pressure.

PRIMARY AIRFLOW SENSORS

For inlet diameters 6" or greater, the differential pressure airflow sensors shall traverse their corresponding ducts using equal cross sectional area or log-linear traverse method along two perpendicular diameters. Single axis sensors shall not be acceptable for duct diameters 6" or larger. A minimum of 12 total pressure-sensing points shall be utilized on each sensor. The total pressure inputs shall be averaged using a pressure chamber located at the center of each sensor. The sensors shall output an amplified differential pressure signal that is at least 2.5 times the equivalent velocity pressure signal obtained from conventional pitot tubes. The sensors shall develop a differential pressure of 0.03" W.G. at an air velocity of <450 FPM. Documentation shall be submitted which substantiates this requirement. Balancing taps and airflow calibration charts shall be provided for field airflow measurements.

OPTIONS

Foil Faced Insulation

Insulation shall be covered with scrim backed foil facing. All insulation edges shall be covered with foil or metal nosing. Insulation shall meet ASTM C1136 for mold, mildew, and humidity resistance.

Elastomeric Closed Cell Foam Insulation

Provide Elastomeric Closed Cell Foam Insulation in lieu of standard. Insulation shall conform to UL 181 for erosion and NFPA 90A for fire, smoke and melting, and comply with a 25/50 Flame Spread and Smoke Developed Index per ASTM E-84 or UL 723. Additionally, insulation shall comply with Antimicrobial Performance Rating of 0, no observed growth, per ASTM G-21. Polyethylene insulation is not acceptable.

Double Wall Construction

The terminal casing shall be double wall construction using a 22 gauge galvanized metal liner covering all insulation.

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