

Suggested Specifications

Acutherm Advantage® Series Bladed Diffuser

Division 23 – Heating, Ventilating, and Air Conditioning

Section 23 37 13 – Diffusers, Registers, and Grilles

The following specification is for a defined application. Acutherm would be pleased to assist in developing a specification for your specific need.

PART 1 – GENERAL

1.01 Section includes:

- A. Advantage® Bladed Diffusers

1.02 Related Requirements

- A. Section 01 30 00 – Administrative Requirements
- B. Section 01 40 00 – Quality Requirements
- C. Section 01 60 00 – Product Requirements
- D. Section 01 74 21 – Construction/Demolition Waste Management and Disposal
- E. Section 01 78 00 – Closeout Submittals
- F. Section 01 79 00 – Demonstration and Training

1.03 Reference Standards

- A. All referenced standards and recommended practices in this section pertain to the most recent publication thereof, including all addenda and errata.
- B. ASHRAE Standard 55 – Thermal Environmental Conditions for Human Occupancy
- C. ASHRAE Standard 70 – Method of Testing the Performance of Air Outlets and Air Inlets
- D. ASTM 610 – Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces
- E. ASTM 714 – Test Method for Evaluating Degree of Blistering of Paints
- F. ASTM D1308 – Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes
- G. ASTM D1654 – Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
- H. ASTM D4752 – Standard Practice for Measuring MEK Resistance of Ethyl Silicate (Inorganic) Zinc-Rich Primers by Solvent Rub
- I. NFPA 90A – Standard for the Installation of Air-Conditioning and Ventilating Systems

1.04 Submittals

- A. See Section 01 30 00 – Administrative Requirements for submittal procedures.
- B. Product Data: Provide data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings that indicate air flow, static pressure, and NC designation.
- C. Shop Drawings: Indicate configuration, general assembly, and materials used in fabrication.
- D. Certificates: Certify that air capacities, pressure drops, and selection procedures meet or exceed specified requirements.
- F. Project Record Documents: Record actual locations of units and control components.
- H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements for additional provisions.

1.06 Quality Assurance

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum ten years of documented experience.

1.07 Warranty

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide 12 month manufacturer warranty from date of shipment of diffusers.

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PART 2 – PRODUCTS

2.01 Manufacturer

- A. Basis of Design: Acutherm Industries, Inc.
 - 1. Advantage® Bladed Diffusers, Model: PBD
- B. General:
 - 1. The Advantage® Series bladed diffuser shall be supplied to deliver a 4-way, horizontal air flow pattern. The back cone shall be a one-piece die-formed design with smooth, aerodynamically designed surfaces and no corner joints. This contoured design shall protect the ceiling and help to prevent smudging and streaking.

2.02 Advantage® Series

- A. Description:
 - 1. Furnish and install Acutherm Advantage® Series Bladed self-modulating diffusers in sizes and capacities as shown by the plans and air distribution schedule.
 - 2. The diffuser shall provide variable air volume control and regulate supply air volume to maintain room temperature settings. The variable air volume (VAV) actuator mechanism shall be fully electronic direct drive with immediate response to control signals from the controller board.
 - 3. Thermal expansion devices shall not be acceptable.
- B. Construction:
 - 1. Diffuser construction shall be of steel with one-piece back pan, aerodynamically designed inner cone damper assembly, and plaque faceplate.
 - 2. A plaque assembly shall be incorporated and shall drop no more than ¼ inch below the ceiling plane to assure proper air distribution performance.
 - 3. The plaque assembly shall be completely removable from the diffuser face to allow for full access to any dampers or other ductwork components located near the diffuser neck.
 - 4. The diffuser shall integrate with all duct sizes shown on the plans without affecting the face size and appearance of the unit.
 - 5. The face panel shall have smooth edges and rounded corners to blend with the back cone.
 - 6. The diffuser ceiling module size shall be 24 x 24 inches (600 x 600 millimeters).
- C. Power Requirements:
 - 1. Acutherm Advantage® Series diffusers shall be powered by 24VAC, 3.0 VA per unit, with supply power frequency: **(select one)**
 - a. 60Hz
 - b. 50Hz
- D. Controls:
 - 1. Controls shall be direct digital microprocessor based with the following features:
 - a. Proportional plus integral (PI) control algorithms for cooling and heating.
 - b. Automatic heating/cooling changeover.
 - c. Power and output signals to fully control Advantage® drone units.
 - d. 24 volt AC output with auto-reset overload protection and indicator lights, and the ability to be set for binary, pulse width modulation, or pulse delay to activate reheat.
 - e. Retention of set-point and setting information in case of power loss. The information shall be stored via electronically erasable programmable read-only memory (EEPROM) indefinitely without the use of a battery.
 - f. Static pressure at the inlet of the diffuser shall be at least 0.05 inches water gauge (12 Pascal) and maximum of 0.25 inches water gauge (62 Pascal). Static pressures below 0.05 inches water gauge (12 Pascal) will result in low air flow, and poor thermal comfort.
 - g. Operation at a static pressure above .25 inches water gauge (62 Pascal) will result in excessive noise.
- E. Modulating Damper Assembly:
 - 1. The modulating damper assembly shall have the following features:
 - a. Quiet, ultra-long life brushless AC drive motor.
 - b. Linkage driven damper control system with zero maintenance and long life.
 - c. Completely automatic damper recalibration as needed.
- F. Paint Specification:
 - 1. Paint finish shall be **(select one)**:
 - a. Baked-on powder coat finish.
 - 1. The paint film thickness shall be a minimum of 2 mils.
 - 2. The finish shall have a hardness of 2H as tested in accordance with ASTM D3363.
 - 3. The finish shall pass an ASTM B117 Corrosive Environment Salt Spray Test for 1000 hours with no measurable creep, rusting or blistering as per ASTM D1654, D610 and D714.

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4. The finish shall pass an ASTM D870 Water Immersion test of a minimum of 500 hours with no measurable with no rusting or blistering as per ASTM D610 and D714.
 5. The finish shall have an impact resistance of 100 inch-pounds in accordance with ASTM D2794.
 - b. All components shall have a custom finish in a color to match a customer supplied sample.
- G. Mounting Frame:
1. The diffuser mounting frame shall be suitable for lay-in or surface mount applications with the following frame style (**select one**):
 - a. 9/16 inch wide T-bar with drop frame
 - b. Concealed spline
 - c. 15/16 inch wide flat T-bar
 - d. Snap-in T-bar
 - e. Surface mount
- H. Options (**select all that apply**):
1. Auxiliary Heat:
 - a. The diffuser shall supply a 24 VAC pulsed signal for (**select one**):
 1. On/off signal suitable for a 12 VA mechanical relay (BIN).
 2. Pulse delay modulation signal for hot water reheat, suitable for a 12 VA SSR switching relay by others (PDM).
 3. Pulse width modulation signal for electric reheat, suitable for a 12 VA SSR switching relay by others (PWM).
 2. Insulated Back pan (T-bar mounting frame only):
 - a. The diffuser back pan shall be externally insulated with ½ inch fiberglass with foil/scrim vapor barrier which meets the requirements of UL 181 and NFPA 90A.
 3. Network Interface:
 - a. The direct digital controls (DDC) shall be supplied with a native BACnet Master Slave Token Passing (MS/TP) network on-board interface.
 - b. The network connections shall be shielded by RJ45 connections for tool-free hookup.
 - c. Each DDC controller shall be supplied with a 35 foot plenum-rated shielded network cable. Multiple values shall be shared through the MS/TP network, including but not limited to room temperature, room set-point, and room load.
 4. Transformer (**select one**):
 - a. The diffuser shall be supplied with a 115 volt, 24 VAC, 20 VA transformer (TR115).
 - b. The diffuser shall be supplied with a 240 volt, 24 VAC, 20 VA transformer (TR240).
 - c. The diffuser shall be supplied with a 277 volt, 24 VAC, 20 VA transformer (TR277).
 5. Pressure Relief Collar:
 - a. A pressure relief collar (PRC) shall be fitted to the inlet collar of the Advantage® diffuser to relieve excess static pressure arising from modulation of the air flow by the Advantage® diffuser.
 6. Power Module:
 - a. A power module (PPM) shall provide 24 VAC power supply to Advantage® diffusers via plenum cables with modular connectors.
 - b. The single power module shall power up to fifteen Advantage® units.
 7. Pressure Control Valve:
 - a. Furnish and install Acutherm variable volume control valve assemblies of the series and capacities as shown on the plans.
 - b. The duct shall be constructed of 24 gauge type zinc-coated steel for round ducts, and 22 gauge zinc-coated steel for rectangular ducts.
 - c. The damper shall be 22 gauge zinc-coated steel, with polyethylene damper shaft bearings and damper gasket. The damper shaft shall be zinc-coated steel.
 - d. The control enclosure and mounting bracket shall be zinc coated steel.
 - e. In the full closed position, air leakage past the closed damper shall not exceed two percent of the nominal catalogue rating at three inches water gauge inlet static pressure when tested in accordance with ASHRAE 130.
 - f. An air flow sensor of a cross configuration shall be located at the inlet of the assembly. The sensor shall have twelve total pressure sensing ports and center averaging chamber designed to accurately average the flow across the inlet of the assembly. The sensor shall provide accuracy within five percent with a 90 degree sheet metal elbow directly at the inlet of the assembly. The air flow sensor shall amplify the sensed air flow signal.
 8. Operational Mode:
 - a. The operational mode shall be defined by product configuration (**select one**):
 1. Advantage® Bladed Diffusers, PBD, Type: Master (MSTR)
 2. Advantage® Bladed Diffusers, PBD, Type: Drone (DRN)

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2.03 Advantage® Bladed Diffuser, PBD, Type: Master (MSTR)

- A. Operational Mode:
 - 1. The diffuser operational mode shall be Acutherm Advantage® Bladed Diffuser Model PBD, Type: Master (MSTR), providing VAV cooling and constant volume heating.
 - 2. Set-point adjustment shall be configurable (**select one**):
 - a. Thermostat with Dial Setpoint Adjustment (DIAL)
 - b. Thermostat with Blank Face (SENS)
 - c. Thermostat with LCD Screen (LCD)
 - d. LCD Thermostat with Motion Sensor (MOT)
 - e. Wireless Thermostat with Dial Setpoint Adjustment (WL)
 - f. LCD Thermostat with CO₂ and Humidity Sensors (CO2H)
 - g. On-board Manual Setpoint Adjustment (MA)
 - h. Built-in Thermostat Option (BI)
 - 3. A wall mounted thermostat will provide room temperature sensing as well as set-point adjustment for heating and cooling. (Thermostat Setpoint Adjustment only)
 - 4. Output jacks (RJ11) shall provide power and signals for up to five drone units, and shall be accessible on the junction bracket.
 - 5. Master units shall have auto model detection in order to recognize the function of the drone unit and adjust itself accordingly.

2.04 Advantage® Bladed Diffuser, PBD, Type: Drone (DRN)

- A. Operational Mode:
 - 1. Diffuser operational mode shall be Acutherm Advantage® Bladed Diffuser Model PBD, Type: Drone (DRN), providing drone operation only.
 - 2. The diffuser shall respond to a signal provided by the controlling (master) unit.
 - 3. Output jacks (RJ11) on the Advantage® master units shall provide the drone with power and signals. Up to five drones may be connected to one Advantage® master unit.
 - 4. The PBD, Type: Drone (DRN) shall automatically recalibrate itself as needed.

PART 3 – EXECUTION

3.01 Examination

- A. Verify that conditions are suitable for installation.
- B. Verify that field measurements are as shown on the drawings.

3.02 Installation

- A. Install in accordance with manufacturer's instructions.
- B. See drawings for the size(s) and locations of diffusers.

3.03 Field Quality Control

- A. See Section 01 40 00 – Quality Requirements for additional requirements.

3.05 Cleaning

- A. See Section 01 74 19 – Construction Waste Management and Disposal for additional requirements.

3.06 Closeout Activities

- A. See Section 01 78 00 – Closeout Submittals for closeout documentation requirements.
- B. See Section 01 79 00 – Demonstration and Training for additional requirements.