**Acutherm AdvantageSeries Personal Diffusers**

**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. **Section includes**:
1. Acutherm Advantage Personal Diffusers
	1. **Related Requirements**
2. Section 01 30 00 – Administrative Requirements
3. Section 01 40 00 – Quality Requirements
4. Section 01 60 00 – Product Requirements
5. Section 01 74 21 – Construction/Demolition Waste Management and Disposal
6. Section 01 78 00 – Closeout Submittals
7. Section 01 79 00 – Demonstration and Training
	1. **Reference Standards**
8. All referenced standards and recommended practices in this section pertain to the most recent publication thereof, including all addenda and errata.
9. ASHRAE 55 – Standard for Thermal Environmental Conditions for Human Occupancy
10. ASHRAE 70 – Standard Method of Testing the Performance of Air Outlets and Air Inlets
11. ASTM 610 – Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces
12. ASTM 714 – Test Method for Evaluating Degree of Blistering of Paints
13. ASTM D1308 – Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes
14. ASTM D1654 – Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
15. ASTM D4752 – Standard Practice for Measuring MEK Resistance of Ethyl Silicate (Inorganic) Zinc-Rich Primers by Solvent Rub
16. 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**

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

**1.07 Warranty**

1. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
2. Provide 24 month manufacturer warranty from date of shipment of diffusers.

**PART 2 – PRODUCTS**

**2.01 Manufacturer**

1. Basis of Design: Acutherm Inc
2. Advantage Personal Diffusers, Master Units
3. Advantage Personal Diffusers, Drone Unit
4. General:
	1. The Advantage Series personal square plaque diffuser shall be supplied to deliver a 360 degree radial, 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**

1. Description:
	1. Furnish and install Acutherm Advantage Series personal 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.
2. Construction:
	1. Diffuser construction shall be of steel with a one-piece back pan, an aerodynamically designed inner cone damper assembly, and a plaque type faceplate.
	2. The plaque face assembly 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).
3. Controls:
	1. Controls shall be direct digital microprocessor based with the following features:
		1. Proportional plus integral (PI) control algorithms for cooling and heating.
		2. Automatic heating/cooling changeover.
		3. Power and output signals to fully control Advantage drone units.
		4. 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.
		5. 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.
		6. Static pressure at the inlet of the diffuser shall be within 0.05 inches water gauge (12 Pascal) and 0.25 inches water gauge (62 Pascal) at full and partial air flows.
4. Modulating Damper Assembly:
	1. The modulating damper assembly shall have the following features:
		1. Quiet, ultra-long life brushless AC drive motor.
		2. Direct drive system without gears, belts, or levers, resulting in zero maintenance and long life.
		3. Completely automatic damper recalibration as needed.
5. Paint Specification:
	1. Paint finish shall be (**select one**):
		1. All components shall have a baked-on powder coat finish.
			1. The paint finish must demonstrate no degradation when tested in accordance with ASTM D1308 (covered and spot immersion) and ASTM D4752 (MEK double rub) paint durability tests.
			2. The paint film thickness shall be a minimum of 2.0 mils.
			3. The finish shall have a hardness of 2H.
			4. The finish shall withstand a minimum salt spray exposure of 1000 hours with no measurable creep in accordance with ASTM D1654, and 1000 hours of exposure with no rusting or blistering as per ASTM D610 and ASTM D714.
			5. The finish shall have an impact resistance of 80 inch-pounds.
		2. All components shall have a custom baked enamel finish in a color to match a customer supplied sample.
6. Mounting Frame:
	1. The diffuser mounting frame shall be suitable for lay-in or surface mount applications with the following frame style (select one):
		1. 9/16 inch wide T-bar with drop frame
		2. Concealed spline
		3. 15/16 inch wide flat T-bar
		4. Snap-in T-bar
		5. Surface mount
7. Options (**select all that apply**):
	1. Auxiliary Heat:
		1. The diffuser shall supply a 24 VAC pulsed signal for (**select one**):
			1. On/off signal suitable for a 12 VA mechanical relay.
			2. Pulse delay modulation signal for hot water reheat, suitable for a 12VA SSR switching relay by others.
			3. Pulse width modulation signal for electric reheat, suitable for a 12VA SSR switching relay by others.
	2. Insulated Back pan (T-bar mounting frame only):
		1. 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:
		1. The direct digital controls (DDC) shall be supplied with a native BACnet Master Slave Token Passing (MS/TP) network on-board interface.
		2. The network connections shall be shielded by RJ45 connections for tool-free hookup.
		3. 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):
		1. The diffuser shall be supplied with a 115 volt, 24 VAC, 20 VA transformer.
		2. The diffuser shall be supplied with a 240 volt, 24 VAC, 20 VA transformer.
		3. The diffuser shall be supplied with a 277 volt, 24 VAC, 20 VA transformer.
	5. Pressure Relief Collar:
		1. An Acutherm Pressure Relief Collar (ARC) shall be fitted to the inlet collar of the Advantagediffuser to relieve excess static pressure arising from modulation of the air flow by the Advantagediffuser.
	6. Advantage Power Module:
		1. The Advantage Power Module (APM) shall provide 24 VAC power supply to Advantagediffusers via plenum cables with modular connectors.
		2. The single APM shall power up to 15 Advantageunits.
	7. Pressure Control Valve:
		1. Furnish and install Acutherm variable volume Pressure Control Valve (ACV) assemblies of the series and capacities as shown on the plans.
		2. The ACV duct shall be constructed of 24 gauge type zinc-coated steel for round ducts, and 22 gauge zinc-coated steel for rectangular ducts.
		3. 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.
		4. The control enclosure and mounting bracket shall be zinc coated steel.
		5. 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.
		6. 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, four static sensing ports, and a 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:
		1. The operational mode shall be defined by model selection (**select one**):
			1. Advantage Personal Diffusers, Master Unit without Thermostat.
			2. Advantage Personal Diffusers, Master Unit with Thermostat.
			3. Advantage Personal Diffusers: Drone Unit.

**2.03 Advantage Personal Diffuser, Master Unit without Thermostat**

1. Operational Mode:
	1. The diffuser operational mode shall be Acutherm Advantage Personal Diffuser Master Unit, providing VAV cooling and constant volume heating.
	2. The room temperature sensor shall be mounted on the diffuser face and enclosed to provide a continuous appearance.
	3. The set-point shall be adjusted manually at the diffuser.
	4. Output jacks (RJ12) shall provide power and signals for up to five drone units, and shall be accessible on the junction bracket.
	5. Advantage master units shall have auto model detection in order to recognize the function of the drone unit and self-adjust accordingly.

**2.04 Advantage Personal Diffuser, Master Unit with Thermostat**

1. Operational Mode:
	1. Diffuser operational mode shall be Acutherm Advantage Personal Diffuser Master Unit with Thermostat, providing VAV cooling and VAV heating.
	2. A diffuser mounted temperature sensor shall be used in cooling mode. A wall mounted assembly will provide room temperature sensing in heating mode, as well as set-point adjustment for heating and cooling.
	3. Output jacks (RJ12) shall provide power and signals for up to five drone units, and shall be accessible on the junction bracket.
	4. Advantage master units shall have auto model detection in order to recognize the function of the drone unit and self-adjust accordingly.

**2.05 Advantage Personal Diffuser, Drone Unit**

1. Operational Mode:
	1. Diffuser operational mode shall be Acutherm Advantage Personal Diffuser Drone Unit, providing drone operation only. The diffuser shall respond to a signal provided by the controlling (master) unit.
	2. Output jacks (RJ12) on the Advantage master units shall provide the drone with power and signals. Up to five drones may be connected to one Advantagemaster unit.
	3. The drone unit shall automatically recalibrate itself as needed.

**PART 3 – EXECUTION**

**3.01 Examination**

1. Verify that conditions are suitable for installation.
2. Verify that field measurements are as shown on the drawings.

**3.02 Installation**

1. Install in accordance with manufacturer’s instructions.
2. See drawings for the size(s) and locations of diffusers.

**3.03 Field Quality Control**

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

**3.05 Cleaning**

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

**3.06 Closeout Activities**

1. See Section 01 78 00 – Closeout Submittals for closeout documentation requirements.
2. See Section 01 79 00 – Demonstration and Training for additional requirements.