

## Section 23 34 39 – High Volume, Low Speed Propeller Fans

### MacroAir Z Series HVLS Fans

**Model Options: MZ08-0100-MA, MZ10-0100-MA, MZ12-0100-MA, MZ14-0100-MA, MZ16-0100-MA, MZ18-0100-MA, MZ20-0150-MA, MZ24-0200-MA**

## PART 1 GENERAL

### 1.1 SUMMARY

- A. Section Includes
  - 1. The large diameter ceiling fan is the model scheduled with the performance capabilities expressed. Included with the ceiling fan will be the select mounting hardware relevant to the model and application space and MacroAir analog controller for speed control. The MacroAir fan will provide thorough, energy efficient air movement to achieve thermal comfort.
- B. Work Summary
  - 1. Any and all work outside the scope of the installation guide shall be outsourced. Factory trained installers are recommended and available upon request. MacroAir certified installers will not install equipment from other manufacturers.

### 1.2 RELATED SECTIONS

- A. 23 00 00 – Heating, Ventilating, and Air Conditioning (HVAC)
- B. 23 34 00 – HVAC Fans

### 1.3 REFERENCES

- A. Underwriters Laboratories (UL 507)
- B. CE
- C. IP
- D. National Fire Protection Agency (NFPA 13)

### 1.4 SUBMITTALS

- A. Submit under provisions of Section 01300
- B. Product Data: Manufacturer's data sheets on each product to be used shall include:
  - 1. Storage and handling requirements and recommendations
  - 2. Power and mounting requirements
  - 3. Application Drawings: Submit plan, section, elevation and isometric views as necessary to convey the information required to detail all installation conditions for each unit specified.
- C. AutoCAD Files: dwg file format for architectural design.
- D. Installation Manual: The manufacturer will provide an installation, operation, and maintenance document for the fan. Information included in the document may change without notice.
- E. Schedule

### 1.5 QUALITY ASSURANCE

- A. Certifications
  - Product Details
- B. Manufacturer Qualifications
  - 1. MacroAir shall provide sole source for design, engineering, manufacturing and warranty claims handling.
  - 2. The fan and any accessories shall be supplied by MacroAir Fans, which has a minimum of fifteen (15) years of product experience.

## **1.6 PROJECT CONDITIONS**

- A. Maintain environmental conditions (temperature, humidity and ventilation) within limits recommended by manufacturer for optimal results. Do not install products in environmental conditions outside MacroAir's absolute limits. The storage of all MacroAir products prior to installation will be in an "out of weather" position. Failure to maintain the integrity of the shipment is not the responsibility of MacroAir.

## **1.7 WARRANTY**

- A. MacroAir shall repair or replace warranted defective parts as follows:
  - 1. Lifetime warranty on airfoils and mounting
  - 2. 5-year electrical warranty
    - a. Integral Gearmotor
    - b. VFD
    - c. Controller/Remote
- B. At project closeout, provide to Owner or Owner's Representative an executed copy of MacroAir's standard limited warranty against manufacturing defect, outlining its terms, conditions and exclusions from coverage.

## **1.8 COORDINATION**

- A. The fan shall be capable of receiving a stop command from the fire panel, an ASD (Aspirating Smoke Detection) device, or any number of smoke, flame or heat detectors.
- B. The fans shall be as follows:
  - 1. The fan shall meet the air velocity requirements of FM Global's 2.0 data sheet for ESFR sprinklers.
  - 2. If required by the local fire prevention authority or desired by the purchaser, the fan shall be wired into the building's fire suppression system so that the fan will automatically shut off within a maximum of 90 seconds after sprinklers are activated. To facilitate this automatic shut-down, the low voltage wire and relay needed to accomplish this must be supplied by the Fire Alarm installer. See Manufactures installation instructions for further details.
  - 3. Upon fire detection as described above, the fans shall coast to stop as required by NFPA guidelines.

## **PART 2 PRODUCTS**



**2.1 APPROVED MANUFACTURERS**

- A. Acceptable Manufacturer: MacroAir Technologies, Inc., which is located at: 794 South Allen Street, San Bernardino, CA 92408-2210 Toll Free Tel: 866-668-3247; Tel: 909- 890-2270; Website: macroairfans.com
- B. Substitutions: Not permitted
- C. Requests for substitutions will be considered in accordance with provisions of Section 01600

**2.2 HIGH VOLUME, LOW SPEED FANS – MACROAIR Z SERIES**

- A. Regulatory Requirements: Assembly standards
  - 1. Sustainable Characteristics: The MacroAir Z Series is designed to generate large volumes of thorough air movement throughout a space at a low velocity to create a comfortable environment at a low energy consumption, contributing to cost-efficient facility management and operation practices. The efficiencies of the MacroAir high volume, low speed fan concept are such that air is thoroughly mixed within a space, achieving thermal equalization, and gentle air movement is delivered to occupants contributing to indoor air quality. The MacroAir Z Series is designed to operate with forward (counterclockwise) and reverse (clockwise) performance capabilities, for cooling and heating solutions.
- B. Performance
  - 1. The fan shall be listed to applicable UL Standards and requirements by UL.

Model #	Diameter	Horsepower	Hanging Weight	RPM	Industry Spacing***	Max Affected Area****	Max dBA*****
MZ08	8 ft / 2.44 m	1.0 HP / 0.75 kW	193 lbs / 87.7 Kg	209	50 ft / 15.2 m	3,600 ft2 [336 m2]	58
MZ10	10 ft / 3.05 m	1.0 HP / 0.75 kW	200 lbs / 90.6 Kg	162	60 ft / 18.29 m	6,000 ft2 [557 m2]	58
MZ12	12 ft / 3.66 m	1.0 HP / 0.75 kW	211 lbs / 95.6 Kg	120	65 ft / 19.81 m	8,000 ft2 [743 m2]	58
MZ14	14 ft / 4.27 m	1.0 HP / 0.75 kW	217 lbs / 98.5 Kg	105	70 ft / 21.34 m	10,000 ft2 [929 m2]	58
MZ16	16 ft / 4.88 m	1.0 HP / 0.75 kW	217 lbs / 98.3 Kg	88	85 ft / 25.91 m	12,000 ft2 [1,115 m2]	58
MZ18	18 ft / 5.49 m	1.0 HP / 0.75 kW	230 lbs / 104.3 Kg	72	90 ft / 27.43 m	14,000 ft2 [1,301 m2]	58
MZ20	20 ft / 6.07 m	1.5 HP / 1.125 kW	239 lbs / 108.4 Kg	73	100 ft / 30.48 m	18,000 ft2 [1,673 m2]	61
MZ24	24 ft / 7.32 m	2.0 HP / 1.5 kW	270 lbs / 122.5 Kg	62	110 ft / 33.52 m	20,000 ft2 [1,858 m2]	61

\*\*\*Delivers 2.8-4.2 ft/s [0.86-1.27 m/s] of average air speed in the occupied space. This relates to perceived cooling or set point change or 4.9-6.1 F [2.7-4.3 C]. Consult our online AirViz tool for more details. \*\*\*\*Delivers 2.7-3.8 ft/s [0.82-1.16 m/s] of average air speed in the occupied space. This relates to a perceived cooling or set point change of 4.8-5.8 F [2.6-3.2 C]. Consult our online AirViz tool for more details. \*\*\*\*\*Sound testing taken with the sensor 5 ft above the ground and 20 ft from the center of the fan with the fan running full speed and mounted at 20 ft high. Dba levels of the fans may alter dependent upon the application space and conditions.

**C. Airfoils**

1. The fan shall be equipped with six (6) aerospace aluminum, down wash XL airfoils. The airfoils shall consist of anodized 6061 T4 precision extruded aluminum and be of the MacroAir XL design, with fan diameters ranging from 8 to 20 feet in two (2) foot increments and a 24 foot fan diameter. The airfoils shall be connected to six (6) individual aluminum 6005 T6 struts by means of two (2) 5/16-24 x 2-inch grade 5 hex bolts, two (2) 5/16-inch flat washers and two (2) 5/16-inch nylon lock nuts per airfoil.
  - a. Number of Airfoils: 6
  - b. Airfoil Material: 6061 T4 Extruded Aluminum
  - c. Airfoil Finish: Anodized
  - d. Option Airfoil Finish: Custom powder coated colors per Drylac RAL color chart

**D. Motor (8-18 foot models)**

1. The fan shall be equipped with a Nord 1 Hp, 3-phase gearmotor (explosion proof and stainless steel wash down configurations available). The gearmotor shall be of Class 1.0, Div. 2.0, Gr. B, C and D. The motor shall be of Class I, Zone II, IIC. Motor winding shall meet NEMA MG1 Part 30 and 31. Motor shall have CSA and CE markings.
  - a. HP: 1.
  - b. 3-Phase.
  - c. RPM: 1730.
  - d. Service Factor: 1.0.
  - e. Full Load Amp draw: 3.14 /1.57.
  - f. Insulation Class: F.
  - g. Motor Finish and Color: grey.
  - h. Enclosure: TEFC.
  - i. Frame: D56C.
  - j. Duty: Continuous.

**E. Motor (20-foot model)**

1. The fan shall be equipped with a Nord 1.5 Hp, 3-phase gearmotor. The gearmotor shall be ventilated, capable of continuous operation up to 104°F (40/50° C) ambient conditions.
  - a. HP: 1.5.
  - b. 3-Phase.
  - c. RPM: 1740.
  - d. Service Factor: 1.25.
  - e. Full Load Amp draw: 4.2/2.1.
  - f. Insulation Class: B.
  - g. Motor Finish and Color: grey.
  - h. Enclosure: TEFC.
  - i. Frame: 56C.
  - j. Duty: Continuous.

**F. Motor (24-foot model)**

1. The fan shall be equipped with a Baldor 2.0 Hp, 3-phase gearmotor. The gearmotor shall operate on voltage ranging from 208-230/460 three (3) phase and 50/60 Hz. The gearmotor shall be of the insulation class F. The gearmotor shall be ventilated, capable of continuous operation up to 104°F (40/50° C) ambient conditions.
  - a. HP: 2.0.
  - b. 3 Phase.
  - c. RPM: 1725.
  - d. Service Factor: 1.15.
  - e. Full Load Amp draw: 5.6 – 5.2/2.6.
  - f. Insulation Class: F.
  - g. Motor Finish and Color: grey.
  - h. Enclosure: TEFC.
  - i. Frame: D90.
  - j. Duty: Continuous.

**G. Motor Control Panel (MCP) and Remote**

1. Each Motor Control Panel is built pursuant to UL Standards as Industrial Control Panels and pursuant to construction guidelines set forth by UL article 508A and the National Electrical Code. The controls shall be housed in a NEMA 1 (optional NEMA 4X) enclosure to prevent unwanted exposure and to exclude entry of unwanted contaminants. The MCP shall include a Yaskawa V1000 Variable Frequency Drive (VFD) for 208-240V and 480V. The VFD shall operate on carrier frequency of no less than 8 kHz in order to minimize sound. The VFD shall have a UL, CE and RoHS rating.
2. Motor cable shall be a Belden foil-shielded cable with no more than 25 feet in length and provided by MacroAir. No motor cable substitutions are allowed. The fan shall include a NEMA 4X Remote Switchbox for wall mounting and 100 feet of remote cable (up to 600 feet in length optional). Remote Switchbox shall include a forward, off, reverse and a speed control knob.
3. Electrical Requirements
  - a. 110-120VAC single (1) phase 50/60 Hz
  - b. 208-240VAC single (1) phase 50/60 Hz.
  - c. 208-240VAC three (3) phase 50/60 Hz.
  - d. 380-415VAC three (3) phase 50 Hz.
  - e. 460-480VAC three (3) phase 50/60 Hz.
  - f. 600VAC three (3) phase 50/60 Hz.
4. Lockable disconnect switch.
5. Pre-programmed VFD with dynamic acceleration and deceleration.
6. Fire panel integration contacts.

## H. Mounting

1. The fan mounting system shall be equipped with hardware, no less than SAE grade 5 for safe installation. The fan shall be equipped with a stress relieving swivel (SRS) mount.
2. The fan mount shall encompass multiple mounting options for I-beam, Purlin and Glulam applications (specified upon order).
  - a. Standard Mount: UMH with guy wires, SRS I-beam clamp with 3' drop
  - b. Optional Mounting Hardware: Glulam Mounting Brackets
  - c. Mounting Drops: Extensions available in one (1) to ten (10) foot lengths in (1) foot increments (custom sizes available).
  - d. Mounting Drop Material: A36 Welded Steel.
  - e. Mounting Drop Material: A36 Welded Steel.
  - f. Frame Finish: Black powder coated.
  - g. Optional Frame Finish: Custom powder coated colors per Drylac RAL color chart.
  - h. Mount Finish: Black powder coated.
  - i. Optional Mount Finish: Custom powder coated colors per Drylac RAL color chart.
  - j. Frame Material: A36 Welded Steel.
  - k. Mount Material: A36 Welded Steel.

## I. Hybrid Hub

1. The fan shall be equipped with a patent-pending, aluminum hybrid hub. The hybrid hub shall have six (6) removable, black anodized, 6005 T6 aluminum H- beam struts. The struts shall be designed with airfoil guides to ensure precision alignment.
  - a. Hub Material: 356 T6 Cast Aluminum.
  - b. Airfoil Strut Material: 6005 T6 Aluminum.
  - c. Airfoil Strut Finish: Black Anodized.
  - d. Hardware: Twelve (12) 3/8-24 x 1 3/4 -inch Grade 8 Hex Bolts.
  - e. Hardware: Twelve (12) 3/8-inch flat washers (SAE).
  - f. Hardware: Twelve (12) 3/8-inch nylon lock nuts.

## J. Safety System

1. The fan shall include a patented two-part interlocking hybrid hub safety system. The hybrid hub safety system shall prevent hub separation from the gear reducer. The fan shall include four (4) guy wires attached to the building structure at recommended 45° angles to level and secure frame position. The fan shall include one-piece airfoil retainer links to prevent airfoil separation from the hybrid hub. Included in the safety system shall be fuses and a disconnect to prevent fire or misuse. Each fan shall be E-stop compatible for fire and building automated systems (BAS).
  - a. Safety Cable Material: 1/4" x 7 x 19 Aircraft Grade Braided Steel.
  - b. Safety Cable Finish: Galvanized.
  - c. Guy Wire Material: 1/8" x 7 x 10 Aircraft Grade Braided Steel.
  - d. Guy Wire Finish: Galvanized.
  - e. Safety Disc Material: A36 Laser-cut Steel.
  - f. Safety Disc Finish: Clear Zinc.
  - g. Safety Retainer Plate Material: A36 Laser-cut Steel.
  - h. Safety Retainer Plate Finish: Black powder coated.
  - i. Airfoil Retainer Link Material: 10 Gauge A36 Steel.
  - j. Airfoil Retainer Link Finish: Clear Zinc.
  - k. Hub Retainer Bushing.

## **PART 3 EXECUTION**

### **3.1 PREPARATION**

- A. Fan installation location requires a typical bar joist, existing I-beam or glulam structure from which to mount the fan. Other mounting options may be available.
- B. Obstacles such as lights, racking, cables, or other structural components shall remain outside of the fan proximity. Consult the fan installation manual for proper placement.
- C. Check accuracy of dimensions indicated for openings to receive fans.
- D. Check location and availability of utility services to ensure proper voltage and installation preparation.
- E. Coordinate location and installation of the HVLS Fans.
- F. Ensure building structural members are sufficient to support the weight and operation of the fan. Consult professional engineer or registered architect as required.
- G. The fan requires a fused disconnect to be installed on the incoming power for emergency and maintenance use per national and international code compliance which may include CE, CSA, IEC, UL, and NEC.

### **3.2 INSTALLATION**

- A. Install units per the fan installation manual.
- B. Fan airfoil height to be a minimum of 10 feet from the floor in accordance with MacroAir's recommendations.
- C. All safety and support features must be installed. These include any guy wires and safety cables as well as airfoil retainer locking features.
- D. Adjust unit as required for proper operation in accordance with manufacturer's installation instructions.
- E. Securely anchor units.
- F. Ensure that operating parts turn freely prior to initial startup.
- G. Repair or replace damaged parts, dents, buckles, abrasions or other damage affecting appearance or serviceability, as acceptable to Architect.

### **3.3 PROTECTION**

- A. Protect finished Work until date of Substantial Completion.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

### **3.4 CLEANING**

- A. Clean Work per Section 01 74 00.
- B. Clean and inspect fans per manufacturer's instructions.
- C. Remove temporary protective cover at date of Substantial Completion.

END OF SECTION