

SECTION 23 81 20 - DUCTLESS SPLIT-SYSTEM AIR-CONDITIONING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes packaged mini-split heat pump and cooling only systems.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Provide wiring Diagrams: For power, signal, and control wiring.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Provide operation and maintenance Data.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain all mini-split units and accessories through one source from a single manufacturer, regularly engaged in production of heat pumps and the associated components.
- B. All units shall be tested by a Nationally Recognized Testing Laboratory (NRTL) and shall bear the ETL label.
- C. All wiring shall be in accordance with the National Electrical Code (N.E.C.) and local codes as required.
- D. The units shall be rated in accordance with Air-conditioning, Heating, and Refrigeration Institute's (AHRI) Standard 210/240 and bear the ARI Certification label.
- E. A dry air holding charge shall be provided in all indoor units.
- F. All outdoor units shall be pre-charged with R-410A refrigerant.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. All system components shall be stored and handled in accordance with the manufacturer's recommendations.

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1.6 WARRANTY

- A. Provide written warranty indicating the entire installation will be warranted for a period of 1 year from the date of substantial completion. The warranty will include all parts, materials, and labor for replacement of any of the unit's components that fail in materials and/or workmanship within the warranty period.
- B. In addition to the above all units shall have a manufacturer's parts and defects warranty for a period five (5) year from date of installation. All compressors shall have a warranty of seven (7) years from date of installation. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. The warranty does not include labor.

1.7 EXTRA MATERIALS

- A. In addition to the equipment and materials furnished with the mini-split systems, furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing the contents:
 - 1. Filters: provide two additional filter(s) for each unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide ductless split-system units manufactured by Mitsubishi Electric, or approved equal.
- B. Provide units that match the style of units indicated on the drawings.

2.2 INDOOR WALL MOUNTED UNIT

- A. The wall-mounted indoor unit shall be factory assembled, wired, and run tested. Contained within the unit shall be all factory wiring, piping, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.
- B. Unit Cabinet: All casings shall have a white finish. Multi directional drain and refrigerant piping offering four (4) directions for refrigerant piping and two (2) directions for draining shall be standard. There shall be a separate back plate which secures the unit firmly to the wall.
- C. Fan: The indoor fan shall be statically and dynamically balanced to run on a single motor with permanently lubricated bearings. A manual adjustable guide vane shall be provided with the ability to change the airflow from side to side (left to right). A motorized air sweep louver shall provide an automatic change in airflow by directing the air up and down to provide uniform air distribution.
- D. Filter: Return air shall be filtered by means of an easily removable, washable filter.
- E. Coil: The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing. The tubing shall have inner grooves for high efficiency heat exchange. All tube joints shall be brazed with phosphor copper or silver alloy. The coils shall be pressure tested at the factory.

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- F. Electrical: The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz. The system shall be capable of satisfactory operation within voltage limits of 198 to 253 volts. The power to the indoor unit shall be supplied from the outdoor unit using the manufacturer's recommended system. Provide conductor wire and ground per manufacture's requirements.

2.3 EXTERIOR UNITS

- A. General: Provide outdoor units compatible with the indoor units. The outdoor unit shall be equipped with an electronic control board that interfaces with the indoor unit to perform all necessary operation functions. The system shall be capable of cooling operation down to ambient temperature of 0°F for heat pump systems and -20°F for cooling only systems without additional low ambient controls. The outdoor unit shall be able to operate with a maximum height difference of 100 feet between indoor and outdoor units.
- B. Cabinet: Provide a casing constructed from galvanized steel plate, finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection. Mounting feet shall be provided and shall be welded to the base of the cabinet and be of sufficient size to afford reliable equipment mount and stability. Easy access shall be afforded to all serviceable parts by means of removable panel sections. The fan grill shall be of ABS plastic.
- C. Fan: Provide single or dual DC fan motors. The fan blade(s) shall be of aerodynamic design for quiet operation, and the fan motor bearings shall be permanently lubricated. The outdoor unit shall have horizontal discharge airflow. The fan shall be mounted in front of the coil, pulling air across it from the rear and dispelling it through the front. The fan shall be provided with a raised guard to prevent external contact with moving parts.
- D. Coil: The L shaped condenser coil shall be of copper tubing with flat aluminum fins to reduce debris build up and allow maximum airflow. The coil shall be protected with an integral metal guard. Refrigerant flow from the condenser shall be controlled by means of an electronic linear expansion valve metering device which shall be a microprocessor-controlled step motor. All refrigerant lines between outdoor and indoor units shall be of annealed, refrigeration grade copper tubing, ACR Type, meeting ASTM B280 requirements, individually insulated in twin-tube, flexible, closed-cell, CFC-free, elastomeric material for the insulation of refrigerant pipes and tubes with thermal conductivity equal to or better than 0.27 BTU-inch/hour per Sq Ft / °F, a water vapor transmission equal to or better than 0.08 Perm-inch and superior fire ratings such that insulation will not contribute significantly to fire and up to 1" thick insulation shall have a - Flame-Spread Index of less than 25 and a Smoke-development Index of less than 50.
- E. Compressor: The compressor shall be a DC twin-rotor rotary compressor with Variable Speed Inverter Drive Technology. The compressor shall be driven by inverter circuit to control compressor speed. The compressor speed shall dynamically vary to match the room load for significantly increasing the efficiency of the system which shall result in significant energy savings. To prevent liquid from accumulating in the compressor during the off cycle, a minimal amount of current shall be automatically, intermittently applied to the compressor motor windings to maintain sufficient heat to vaporize any refrigerant. No crankcase heater is to be used. The outdoor unit shall have an accumulator and high-pressure safety switch. The compressor shall be mounted to avoid the transmission of vibration.
- F. Electrical: The electrical power of the unit shall be 208volts or 230 volts, single phase, 60 hertz. The unit shall be capable of satisfactory operation within voltage limits of 198 volts to 253 volts. Power for the indoor unit shall be supplied from the outdoor unit via a factory controller. The power to the indoor unit shall be supplied from the outdoor unit.

2.4 CONTROLS

- A. Provide wall mounted thermostat for each system.

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- B. Provide all required wiring and controls including two microprocessors, one on each indoor and outdoor unit, interconnected by a single non-polar two-wire cable. The microprocessor located in the indoor unit shall have the capability of monitoring return air temperature and indoor coil temperature, receiving and processing commands from a wireless or wired controller, providing emergency operation, and controlling the outdoor unit. The control signal between the indoor and outdoor unit shall be pulse signal 24 volts DC.

2.5 REFRIGERANT PIPING

- A. Drawn-Temper Copper Tube: ASTM B 280, Type ACR, ASTM B 88, Type L.
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.
- D. Brazing Filler Metals: AWS A5.8, Classification BAg-1 (silver), BAg-2 (silver)
- E. Flexible Connectors: 500-psig (3450-kPa) minimum operating pressure; seamless tin-bronze core, high-tensile bronze-braid covering, and solder-joint end connections; dehydrated, pressure tested, minimum 7 inches long.
- F. Provide all refrigerant accessories for a complete a working system.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install units level and plumb.
- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- C. Install roof-mounted compressor-condenser components on roof support curbs.
- D. Connect refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.
- E. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends. Piping to be sized to meet the installed conditions relative to length and elevation between the evaporator and the condensing unit,
- F. Provide roof curbs with pipe portal covers for installation of the refrigerant piping through the roof at all required locations.
- G. Provide a complete and operational system including thermostats and all control and line voltage wiring where necessary.

3.2 CONNECTIONS

- A. Install piping adjacent to unit to allow service and maintenance.
- B. Unless otherwise indicated, connect piping with unions and shutoff valves to allow units to be disconnected without draining piping. Refer to piping system Sections for specific valve and specialty arrangements.

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C. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

- A. Installation Inspection: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections, and to prepare a written report of inspection.
- B. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
- C. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new components, and retest.
- D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 COMMISSIONING

- A. Start-up service shall be provided by the equipment manufacturer's authorized representative and shall include complete testing of all controls and unit operation. The agency responsible for start-up shall record all data. Copies of this data are to be supplied to the owner.
- B. Complete installation and startup checks according to manufacturer's written instructions and do the following:
 1. Inspect for physical damage to unit casing.
 2. Verify that access doors move freely and are weathertight.
 3. Clean units and inspect for construction debris.
 4. Verify that controls are connected and operational.
 5. Lubricate bearings on fans.
 6. Engage a factory-authorized service representative to perform startup service.

END OF SECTION 23 81 20