**23 81 29 VARIABLE REFRIGERANT VOLUME HVAC SYSTEM**

1. **GENERAL**
	1. **SECTION INCLUDES**
		1. Variable refrigerant volume HVAC system includes:
			1. Outdoor/Condensing unit(s):
				1. Size Range: 6 to 40 Tons Nominal
				2. Daikin Model Numbers:

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| --- | --- |
| RXYQ72AATJ\* |  |
| RXYQ96AATJ\* |  |
| RXYQ120AATJ\* |  |
| RXYQ144AATJ\* |  |
| RXYQ168AATJ\* |  |
| RXYQ192AATJ\* |  |
| RXYQ216AATJ\* |  |
| RXYQ240AATJ\* |  |
| RXYQ264AATJ\* | (RXYQ144AATJ\* + RXYQ120AATJ\*) |
| RXYQ288AATJ\* | (RXYQ144AATJ\* + RXYQ144AATJ\*) |
| RXYQ312AATJ\* | (RXYQ168AATJ\* + RXYQ144AATJ\*) |
| RXYQ336AATJ\* | (RXYQ168AATJ\* + RXYQ168AATJ\*) |
| RXYQ360AATJ\* | (RXYQ168AATJ\* + RXYQ192AATJ\*) |
| RXYQ384AATJ\* | (RXYQ192AATJ\* + RXYQ192AATJ\*) |
| RXYQ408AATJ\* | (RXYQ192AATJ\* + RXYQ216AATJ\*) |
| RXYQ432AATJ\* | (RXYQ216AATJ\* + RXYQ216AATJ\*) |
| RXYQ456AATJ\* | (RXYQ216AATJ\* + RXYQ240AATJ\*) |
| RXYQ480AATJ\* | (RXYQ240AATJ\* + RXYQ240AATJ\*) |

* + - 1. Indoor Units
				1. *\*Input information as required*
	1. **RELATED REQUIREMENTS**
		1. N/A
	2. **REFERENCES**
		1. N/A
	3. **SUBMITTALS**
		1. N/A
	4. **QUALITY ASSURANCE**
		1. MANUFACTURER QUALIFICATIONS:
			1. The units shall be tested by a National Recognized Testing Laboratory (NRTL), in accordance with ANSI/UL 1995 – Heating and Cooling Equipment and bear the Listed Mark.
			2. All wiring shall be in accordance with the National Electric Code (NEC).
			3. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.
			4. The condensing unit will be factory charged with R410A.
	5. **DELIVERY, STORAGE AND HANDLING**
		1. Unit shall be stored and handled according to the manufacturer’s recommendations.
	6. **WARRANTY**
		1. STANDARD LIMITED WARRANTY
			1. Complete warranty details available from your local Daikin representative or at [www.daikincomfort.com](http://www.daikincomfort.com).
			2. Daikin North America LLC warrants original owner of the non-residential building, multifamily residence or residence in which the Daikin products are installed that under normal use and maintenance for comfort cooling and conditioning applications such products (the “Products”) will be free from defects in material and workmanship. This warranty applies to compressor and all parts and is limited in duration to ten (10) years starting from the ‘’installation date’’ which is one of the two dates below:
				1. The installation date is the date that the unit is originally commissioned, but no later than 18 months after the manufacture date noted on the unit’s rating plate.
				2. If the date the unit is originally commissioned cannot be verified, the installation date is three months after the manufacture date.
1. **PRODUCTS**
	1. **MANUFACTURERS**
		1. DESIGN BASIS:
			1. The HVAC equipment basis of design is Daikin North America. All bidders shall furnish the minimum system standards as defined by the base bid model numbers, model families or as otherwise specified herein (see Appendix A HVAC Equipment Alternate General Information). In any event, the contractor shall be responsible for all specified items and intents of this document without further compensation.
	2. **HVAC SYSTEM DESIGN**
		1. SYSTEM DESCRIPTION:
			1. The variable capacity heat pump air conditioning system shall be a Daikin Variable Refrigerant Volume Series (heat or cool model) system as specified.
			2. The system shall consist of multiple evaporators using PID control, REFNET™ joints and headers and Daikin VRVâ condenser unit.
			3. The condenser shall be a direct expansion (DX), air-cooled heat pump, multi-zone air-conditioning system with variable speed inverter driven compressors using R-410A refrigerant.
			4. The condensing unit may connect an indoor evaporator nominal capacity up to 200% of the condensing unit nominal capacity. All zones are each capable of operating separately with individual temperature control.
			5. The Daikin condensing unit shall be able to connect to indoor unit models CXTQ, FXFQ, FXHQ, FXMQ, FXLQ, FXNQ, FXSQ, FXTQ, FXDQ, FXZQ, FXUQ, FXEQ, FXAQ and FXMQ\_MF, and shall range in capacity from 5,800 Btu/h to 96,000 Btu/h in accordance with Daikin’s engineering data book detailing each available indoor unit.
				1. The indoor units shall be connected to the condensing unit utilizing Daikin’s REFNET™ specified piping joints and headers to ensure correct refrigerant flow and balancing. T style joints are not acceptable for a variable refrigerant system.
			6. Operation of the system shall permit either individual cooling or heating of each indoor unit simultaneously. Each indoor unit or group of indoor units shall be able to provide set temperature independently via a local remote controller, an Intelligent Controller, an Intelligent Manager or a BMS interface.
			7. The RXYQ\_AA condensing unit model numbers and the associated number of connectable indoor units per RXYQ\_AA condensing unit is indicated in the following table. Each indoor unit or group of indoor units shall be independently controlled.

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| --- | --- | --- |
| **MODEL NUMBER** | **NOMINAL CAPACITY (Tons)** | **MAXIMUM NUMBER OF INDOOR UNITS** |
| RXYQ72AATJ\* | 6 | 12 |
| RXYQ96AATJ\* | 8 | 16 |
| RXYQ120AATJ\* | 10 | 20 |
| RXYQ144AATJ\* | 12 | 25 |
| RXYQ168AATJ\* | 14 | 29 |
| RXYQ192AATJ\* | 16 | 33 |
| RXYQ216AATJ\* | 18 | 37 |
| RXYQ240AATJ\* | 20 | 41 |
| RXYQ264AATJ\* | 22 | 45 |
| RXYQ288AATJ\* | 24 | 49 |
| RXYQ312AATJ\* | 26 | 54 |
| RXYQ336AATJ\* | 28 | 58 |
| RXYQ360AATJ\* | 30 | 64 |
| RXYQ384AATJ\* | 32 | 64 |
| RXYQ408AATJ\* | 34 | 64 |
| RXYQ432AATJ\* | 36 | 64 |
| RXYQ456AATJ\* | 38 | 64 |
| RXYQ480AATJ\* | 40 | 64 |

* + 1. *VRV EMERION* FEATURES AND BENEFITS
			1. Voltage Platform - Heat Pump condensing units shall be available with a 208-230V/3ph/60 Hz power supply.
			2. Single-module outdoor units shall be available from 6 to 20 T in nominal cooling capacity and can be combined to offer up to 40 T in a dual-module configuration, which helps minimize the overall space required for mechanical equipment and optimize total project costs.
			3. The condensing unit shall feature a sealed E-box with a minimum of IP55 rating to provide high dust and moisture protection for reliability.
			4. Gas Furnace Connectivity – Heat Pump condensing units shall be connectable to Daikin Communicating gas furnaces with AFUE ranging from 80% to 97%.
			5. System shall be capable of connecting to multiple VRV A-coils (CXTQ) paired with Daikin Communicating gas furnaces allowing for options of gas or heat pump heating to optimize operational costs based on changing utility costs.
			6. The system shall be able to switch between heat pump heating and gas furnace heating at a field selectable change-over temperature which can be configured via condensing unit field settings.
			7. Each system shall be able to enlarge from single to dual module without the need for installed main pipe size changes. The manufacturer shall provide predefined pipe sizes and design rules ensuring reliable system operation and offering design flexibility in phased installation applications.
			8. Stable Operation – System shall provide stable inverter operation at varied ambient conditions.
			9. No Drain Pan Heater – System shall be capable of heating operation without the need for a drain pan heater. If an alternate manufacturer is chosen, an additional drain pan heater shall be provided by the manufacturer.
			10. Auto Changeover – System shall, below the field selected outdoor ambient temperature provide signal to initiate auxiliary or back up heat.
			11. Advanced Zoning - A single system shall provide for up to 64 zones.
			12. Independent Control - Each indoor unit shall use a dedicated electronic expansion valve with up to 2000 positions for independent control.
			13. VFD Inverter Control and Variable Refrigerant Temperature - Each condensing unit shall use high efficiency, variable speed all “inverter” based flash vapor injection compressor(s) coupled with inverter fan motors to optimize part load performance. The system capacity and refrigerant temperatures shall be modulated automatically to set suction and condensing pressures while varying the refrigerant volume for the needs of the cooling or heating loads. The control will be automatic and customizable depending on load and weather conditions.
				1. Indoor shall use PID to control superheat to deliver a comfortable room temperature condition and optimize efficiency.
			14. Configurator software - Each system shall be available with configurator software package to allow for remote configuration of operational settings and also for assessment of operational data and error codes.
				1. If this software is not provided by an alternate manufacturer, for each individual outdoor unit the contractor shall do the settings manually and keep detailed records for future maintenance purposes.
			15. Each system shall include a built-in data recorder that can store up to 40 minutes of operational data which can help identify the issue in case of a product failure.
			16. Heating during Defrost and Oil Return. Reverse cycle (cooling mode) in these modes shall not be permitted due to the potential reduction in space temperature.
			17. Low Ambient Cooling - Each system shall be capable of low ambient cooling operation to -4°FDB (-20°CDB).
			18. Flexible Design –
				1. Systems shall be capable of up to 540ft (165m) [623 ft. (190m) equivalent] of linear piping between the condensing unit and furthest located indoor unit.
				2. Systems shall be capable of up to 3,280ft (1,000m) total “one-way” piping in the piping network.
				3. Systems shall have a vertical (height) separation of up to 361 ft between the condensing unit and the indoor units.
				4. Systems shall be capable of up to 295ft (90m) from the first REFNET™ / branch point.
				5. The condensing unit shall have the ability to connect an indoor unit evaporator capacity of up to 200% of the condensing unit nominal capacity.
				6. Systems shall be capable of 98ft (30m) vertical separation between indoor units.
				7. Condensing units shall be supported with a fan motor ESP up to 0.32” WG as standard to allow connection of discharge ductwork and to prevent discharge air short circuiting.
			19. Oil return – Each system shall be furnished with a centrifugal oil separator and active oil recovery cycle.
			20. Simple wiring – Systems shall use 16/18 AWG, 2 wire, stranded, non-shielded and non-polarized daisy chain control wiring.
			21. Space saving – Each system shall not exceed the dimensions shown below

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| **MODEL NUMBER** | **Dimensions in Inch (H x W x D)** |
| RXYQ72AATJ\* | 65-3/8 x 36-5/8 x 30-1/8 |
| RXYQ96AATJ\* | 65-3/8 x 48-13/16 x 30-1/8 |
| RXYQ120AATJ\* |
| RXYQ144AATJ\* |
| RXYQ168AATJ\* |
| RXYQ192AATJ\* | 65-3/8 x 68-7/8 x 30-1/8 |
| RXYQ216AATJ\* |
| RXYQ240AATJ\* |
| RXYQ264AATJ\* | (65-3/8 x 48-13/16 x 30-1/8) + (65-3/8 x 48-13/16 x 30-1/8) |
| RXYQ288AATJ\* |
| RXYQ312AATJ\* |
| RXYQ336AATJ\* |
| RXYQ360AATJ\* | (65-3/8 x 48-13/16 x 30-1/8) + (65-3/8 x 68-7/8 x 30-1/8) |
| RXYQ384AATJ\* | (65-3/8 x 68-7/8 x 30-1/8) + (65-3/8 x 68-7/8 x 30-1/8) |
| RXYQ408AATJ\* |
| RXYQ432AATJ\* |
| RXYQ456AATJ\* |
| RXYQ480AATJ\* |

* + - 1. Each condensing unit shall include a multi-functional digital display that can provide system operation status such as operating refrigerant temperatures, pressures, outdoor electronic expansion valve opening and compressor operation time.
			2. Each condensing unit shall include a service window that can provide easy access to system field settings and operation status without completely removing the condensing unit panel.
			3. Advanced diagnostics – Systems shall include a self-diagnostic, auto-check function to detect a malfunction and display the type and location.
			4. Each condensing unit shall incorporate contacts for electrical demand shedding with optional 3 stage demand control with 12 customizable demand settings.
			5. Advanced controls – Each system shall have at least one remote controller capable of controlling up to 16 indoor units.
			6. Each system shall be capable of integrating with open protocol BACnet, LonWorks and Modbus building management systems.
			7. Low sound levels - Each system shall use indoor and condensing units with quiet operation as low as 27 dB(A).
			8. The system shall be certified and listed in OSHPD directory for seismic certification.
			9. The condensing unit can be installed up to 200 ft above the ground without requiring any additional field modifications to the unit to comply with the Florida Miami Dade Wind code requirements.
			10. The condensing unit shall be factory equipped with a Schrader valve for connection to a pressure relief kit for compliance with City of Chicago Pressure relief code.
		1. PERFORMANCE:
			1. The VRV RXYQ\_AA system shall perform as indicated below:

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| **MODEL NUMBER** | **SYSTEM IEER** **(Ducted)** | **SYSTEM IEER****(Non-Ducted)** |
| RXYQ72AATJ\* | 21.40 | 27.00 |
| RXYQ96AATJ\* | 24.80 | 28.50 |
| RXYQ120AATJ\* | 23.40 | 26.60 |
| RXYQ144AATJ\* | 22.90 | 25.40 |
| RXYQ168AATJ\* | 21.20 | 23.40 |
| RXYQ192AATJ\* | 21.20 | 23.60 |
| RXYQ216AATJ\* | 21.00 | 22.20 |
| RXYQ240AATJ\* | 19.60 | 21.80 |
| RXYQ264AATJ\* | 19.20 | 22.60 |
| RXYQ288AATJ\* | 19.20 | 22.40 |
| RXYQ312AATJ\* | 19.20 | 21.80 |
| RXYQ336AATJ\* | 18.50 | 21.40 |
| RXYQ360AATJ\* | 18.50 | 20.40 |
| RXYQ384AATJ\* | 18.80 | 21.40 |
| RXYQ408AATJ\* | 18.10 | 21.30 |
| RXYQ432AATJ\* | 17.20 | 20.60 |
| RXYQ456AATJ\* | 16.80 | 19.80 |
| RXYQ480AATJ\* | 16.40 | 19.00 |

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| --- | --- | --- |
| **MODEL NUMBER** | **SYSTEM EER** **(Ducted)** | **SYSTEM EER****(Non-Ducted)** |
| RXYQ72AATJ\* | 13.00 | 15.20 |
| RXYQ96AATJ\* | 12.80 | 14.30 |
| RXYQ120AATJ\* | 12.00 | 12.60 |
| RXYQ144AATJ\* | 11.70 | 12.40 |
| RXYQ168AATJ\* | 11.00 | 11.20 |
| RXYQ192AATJ\* | 11.60 | 11.60 |
| RXYQ216AATJ\* | 10.90 | 11.01 |
| RXYQ240AATJ\* | 10.60 | 11.00 |
| RXYQ264AATJ\* | 10.00 | 11.20 |
| RXYQ288AATJ\* | 10.30 | 11.40 |
| RXYQ312AATJ\* | 10.20 | 10.70 |
| RXYQ336AATJ\* | 10.20 | 10.10 |
| RXYQ360AATJ\* | 10.10 | 11.00 |
| RXYQ384AATJ\* | 10.10 | 10.20 |
| RXYQ408AATJ\* | 9.80 | 10.20 |
| RXYQ432AATJ\* | 9.50 | 10.20 |
| RXYQ456AATJ\* | 9.50 | 9.60 |
| RXYQ480AATJ\* | 9.50 | 9.60 |

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| **MODEL NUMBER** | **SYSTEM COP@47°F****(Ducted)** | **SYSTEM COP@47°F****(Non-Ducted)** |
| RXYQ72AATJ\* | 3.54 | 4.00 |
| RXYQ96AATJ\* | 3.52 | 4.10 |
| RXYQ120AATJ\* | 3.43 | 3.77 |
| RXYQ144AATJ\* | 3.36 | 3.70 |
| RXYQ168AATJ\* | 3.33 | 3.40 |
| RXYQ192AATJ\* | 3.40 | 3.66 |
| RXYQ216AATJ\* | 3.32 | 3.62 |
| RXYQ240AATJ\* | 3.25 | 3.42 |
| RXYQ264AATJ\* | 3.24 | 3.50 |
| RXYQ288AATJ\* | 3.31 | 3.50 |
| RXYQ312AATJ\* | 3.22 | 3.50 |
| RXYQ336AATJ\* | 3.20 | 3.50 |
| RXYQ360AATJ\* | 3.20 | 3.50 |
| RXYQ384AATJ\* | 3.24 | 3.35 |
| RXYQ408AATJ\* | 3.24 | 3.35 |
| RXYQ432AATJ\* | 3.24 | 3.35 |
| RXYQ456AATJ\* | 3.22 | 3.30 |
| RXYQ480AATJ\* | 3.20 | 3.20 |

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| **MODEL NUMBER** | **SYSTEM COP@17°F****(Ducted)** | **SYSTEM COP@17°F****(Non-Ducted)** |
| RXYQ72AATJ\* | 2.42 | 2.49 |
| RXYQ96AATJ\* | 2.42 | 2.53 |
| RXYQ120AATJ\* | 2.42 | 2.46 |
| RXYQ144AATJ\* | 2.12 | 2.18 |
| RXYQ168AATJ\* | 2.12 | 2.18 |
| RXYQ192AATJ\* | 2.12 | 2.22 |
| RXYQ216AATJ\* | 2.12 | 2.18 |
| RXYQ240AATJ\* | 2.12 | 2.16 |
| RXYQ264AATJ\* | 2.12 | 2.33 |
| RXYQ288AATJ\* | 2.12 | 2.41 |
| RXYQ312AATJ\* | 2.12 | 2.35 |
| RXYQ336AATJ\* | 2.12 | 2.18 |
| RXYQ360AATJ\* | 2.12 | 2.14 |
| RXYQ384AATJ\* | 2.12 | 2.18 |
| RXYQ408AATJ\* | 2.12 | 2.18 |
| RXYQ432AATJ\* | 2.12 | 2.18 |
| RXYQ456AATJ\* | 2.12 | 2.18 |
| RXYQ480AATJ\* | 2.12 | 2.18 |

* + - 1. Performance Conditions:
				1. Cooling: Indoor temperature of 80°FDB (26.7°CDB), 67°FWB (19.5°CWB) and outdoor temperature of 95°FDB (35°CDB).
				2. Heating: Indoor temperature of 70°FDB (21.1°CDB) and outdoor temperature of 47°FDB (8.3°CDB), 43°FWB (6.1°CDB).
				3. Equivalent piping length: 25ft (7.5m)
			2. Cooling Operation:
				1. The standard operating range in coolingwill be 23°FDB (-5°CDB) ~ 122°FDB (50°CDB).
				2. Cooling mode indoor room temperature range will be 57-77°FWB (13.9 - 25°CWB).
			3. Heating Operation:
				1. The standard operating range in heating will be -13° – 60°FWB (-25 – 15.6°CWB).

If an alternate equipment manufacturer is selected, the mechanical contractor shall provide, at their own risk and cost, all additional material and labor to meet low ambient operating condition and performance.

* + - * 1. Heating mode indoor room temperature range will be 59°FDB - 80°F DB (15°CDB – 26.7°CDB).
	1. **EQUIPMENT**
		1. ELECTRICAL:
			1. The power supply to the condensing unit shall be:

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| **POWER SUPPLY VOLTAGE** | **VOLTAGE RANGE** |
| 208-230V / 3ph / 60 Hz | 187V – 253V (±10%) |
| **MODEL NUMBER** | **MCA** | **MOP** |
| RXYQ72AATJ\* | 27.3 A | 30 A |
| RXYQ96AATJ\* | 34.1 A | 35 A |
| RXYQ120AATJ\* | 36.5 A | 40 A |
| RXYQ144AATJ\* | 47.8 A | 50 A |
| RXYQ168AATJ\* | 54.9 A | 60 A |
| RXYQ192AATJ\* | 59.8 A | 60 A |
| RXYQ216AATJ\* | 67.2 A | 70 A |
| RXYQ240AATJ\* | 73.7 A | 80 A |
| RXYQ264AATJ\* | 36.5+47.8 A | 40+50 A |
| RXYQ288AATJ\* | 47.8+47.8 A | 50+50 A |
| RXYQ312AATJ\* | 47.8+54.9 A | 50+60 A |
| RXYQ336AATJ\* | 54.9+54.9 A | 60+60 A |
| RXYQ360AATJ\* | 54.9+59.8 A | 60+60 A |
| RXYQ384AATJ\* | 59.8+59.8 A | 60+60 A |
| RXYQ408AATJ\* | 59.8+67.2 A | 60+70 A |
| RXYQ432AATJ\* | 67.2+67.2 A | 70+70 A |
| RXYQ456AATJ\* | 67.2+73.7 A | 70+80 A |
| RXYQ480AATJ\* | 73.7+73.7 | 80 + 80 A |

* + 1. WIRING:
			1. The control voltage between the indoor and condensing unit shall be 16VDC non-shielded, stranded 2 conductor cable.
			2. The control wiring shall be a two-wire multiplex transmission system, making it possible to connect multiple indoor units to one condensing unit with one 2-cable wire, thus simplifying the wiring installation.
			3. The control wiring maximum lengths shall be as shown below:

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|  | **CONDENSER TO INDOOR UNIT** | **CONDENSER TO CENTRAL CONTROLLER** | **INDOOR UNIT TO REMOTE CONTROL** |
| CONTROL WIRING LENGTH | 6,560ft (2,000m)  | 3,280ft (1,000m) | 1640 ft. (500m) |
| WIRE TYPE | 16/18 AWG, 2 wire, non-polarity, non-shielded, stranded |

* + 1. REFRIGERANT PIPING:
			1. The system shall be capable of refrigerant piping up to 540ft (165m) actual or 623ft (190m) equivalent from the condensing unit to the furthest indoor unit, a total combined liquid line length of 3,280ft (1,000m) of piping between the condensing and indoor units, without any oil traps or additional components.
			2. REFNET™ piping joints and headers shall be used to ensure proper refrigerant balance and flow for optimum system capacity and performance.
				1. T style joints shall not be acceptable as this will negatively impact proper refrigerant balance and flow for optimum system capacity and performance.
		2. PAINT/CORROSION RESISTANCE:
			1. Paint and corrosion resistance shall be at a minimum per the table below:

|  |  |
| --- | --- |
| **COMPONENT** | **VRV EMERION** |
| **BASE MATERIAL** | **SURFACE TREATMENT** | **COATING THICKNESS** |
| **External & Internal Surface** |
| EXTERNAL PANEL BASE | Galvanized steel | POLYESTER | ≧1.5 mils |
| EXTERNAL FRONT PANEL | Galvanized steel | POLYESTER | ≧1.5 mils |
| PILLAR | Galvanized steel | POLYESTER | ≧1.5 mils |
| COMPRESSOR COVER | ASTM material | Resin Paint | ≧0. 78 mils |
| FIN GUARD | Iron wire | Resin Paint | ≧0. 79 mils |
| FAN GUARD AND DRUM | Polypropylene | No treatment required | N/A |
| FAN | Acrylonitrile - glass | No treatment required | N/A |
| FAN MOTOR FRAME | Resin | No treatment required | N/A |
| FAN MOTOR SHAFT | Carbon steel | No treatment required | N/A |
| FAN MOTOR SUPPORT | Galvanized steel | POLYESTER | ≧1.5 mils |
| HEAT EXCHANGERS (FIN ONLY) | Aluminum | Polymer Anti-corrosion surface treatment | Salt Spray 1000 hours, blister rating 10 |
| ELECTRICAL PARTS BOX | Hot-dip zinc-coated steel | No treatment required | N/A |
| ELECTRICAL PARTS BOARD | Glass cloth / Glass nonwoven cloth material | Insulation Varnish | No specific thickness |
| SCREWS | Carbon steel wire rods | High corrosion resistance treatment | ≧0. 28 mils |

* 1. **OUTDOOR/CONDENSING UNIT**
		1. GENERAL:
			1. The condensing unit is designed specifically for use with VRV series components.
			2. The refrigeration circuit of the condensing unit shall consist of Daikin inverter scroll P-Type compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports, liquid receiver and suction accumulator.
			3. Liquid and suction lines must be individually insulated between the condensing and indoor units.
			4. The condensing unit can be wired and piped with access from the left, right, rear or bottom.
			5. The connection ratio of indoor units to condensing unit shall be permitted up to 200% of nominal capacity.
			6. Each condensing system shall be able to support the connection of up to 64 indoor units dependent on the model of the condensing unit.
			7. The sound pressure level standard shall be that value as listed in the Daikin engineering manual for the specified models at 3 feet from the front of the unit. The condensing unit shall be capable of operating automatically at further reduced noise during night time or via an external input.
			8. The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for reprogramming.
			9. The condensing unit shall be modular in design and should allow for side-by-side installation.
			10. The following safety devices shall be included on the condensing unit, high pressure sensor and switch, low pressure sensor, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.
			11. To ensure the liquid refrigerant does not flash when supplying to the various indoor units, the circuit shall be provided with a sub-cooling feature.
			12. Oil recovery cycle shall be automatic occurring 2 hours after start of operation and then every 8 hours of operation.
			13. The condensing unit shall be capable of heating operation at -13°F (-25°C) wet bulb ambient temperature without additional low ambient controls or an auxiliary heat source.
		2. UNIT CABINET:
			1. The condensing unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed galvanized steel panels coated with a baked enamel finish.
			2. Each condensing unit shall have a three-segment panel design which allows for direct access to outdoor fans, critical mechanical and electrical components separately for ease of installation and service.
			3. Each outdoor unit shall have separate knock-outs for both refrigerant piping and wiring on the bottom panel.

FAN:

* + - 1. The condensing unit shall consist of one or more propeller type, direct-drive fan motors that have multiple speed operation via a DC (digitally commutating) inverter. Reference table below.

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| --- | --- |
| **MODEL NUMBER** | **FAN MOTOR OUTPUT (W) & QUANTITY** |
| RXYQ72AATJ\* | 950 x 1 |
| RXYQ96AATJ\* | 650 x 2 |
| RXYQ120AATJ\* | 650 x 2 |
| RXYQ144AATJ\* | 650 x 2 |
| RXYQ168AATJ\* | 650 x 2 |
| RXYQ192AATJ\* | 950 x 2 |
| RXYQ216AATJ\* | 950 x 2 |
| RXYQ240AATJ\* | 950 x 2 |
| RXYQ264AATJ\* | (650 x 2) + (650 x 2) |
| RXYQ288AATJ\* | (650 x 2) + (650 x 2) |
| RXYQ312AATJ\* | (650 x 2) + (650 x 2) |
| RXYQ336AATJ\* | (650 x 2) + (650 x 2) |
| RXYQ360AATJ\* | (650 x 2) + (950 x 2) |
| RXYQ384AATJ\* | (950 x 2) + (950 x 2) |
| RXYQ408AATJ\* | (950 x 2) + (950 x 2) |
| RXYQ432AATJ\* | (950 x 2) + (950 x 2) |
| RXYQ456AATJ\* | (950 x 2) + (950 x 2) |
| RXYQ480AATJ\* | (950 x 2) + (950 x 2) |

* + - 1. The condensing unit fan motor shall have multiple speed operation of the DC (digitally commutating) inverter type, and be of high external static pressure and shall be factory set as standard at 0.12 in. WG. A field setting switch to a maximum 0.32 in. WG pressure is available to accommodate field applied duct for indoor mounting of condensing units.
			2. The condensing unit shall have configurable settings for intermittent fan operation to help minimize snow accumulation on fan blades when the system is off.
			3. Each outdoor unit fan shall be a vertical discharge configuration and the nominal airflow rate for each module will range from 6,210 CFM to 14,510 CFM dependent on model specified.
			4. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted.
			5. The fan motor shall be provided with a fan guard to prevent contact with moving parts.
		1. SOUND:
			1. Nominal sound pressure levels shall be as shown below.

|  |  |
| --- | --- |
| **MODEL NUMBER** | **SOUND PRESSURE LEVEL dB(A)** |
| RXYQ72AATJ\* | 58 dBA |
| RXYQ96AATJ\* | 61 dBA |
| RXYQ120AATJ\* | 61 dBA |
| RXYQ144AATJ\* | 65 dBA |
| RXYQ168AATJ\* | 65 dBA |
| RXYQ192AATJ\* | 67 dBA |
| RXYQ216AATJ\* | 68 dBA |
| RXYQ240AATJ\* | 69 dBA |
| RXYQ264AATJ\* | 67 dBA |
| RXYQ288AATJ\* | 69 dBA |
| RXYQ312AATJ\* | 69 dBA |
| RXYQ336AATJ\* | 69 dBA |
| RXYQ360AATJ\* | 70 dBA |
| RXYQ384AATJ\* | 71 dBA |
| RXYQ408AATJ\* | 71 dBA |
| RXYQ432AATJ\* | 72 dBA |
| RXYQ456AATJ\* | 72 dBA |
| RXYQ480AATJ\* | 73 dBA |

* + - 1. Night setback control of the fan motor for low noise operation by way of automatically limiting the maximum speed shall be a standard feature. Operation sound level shall be selectable from 3 steps.

|  |  |
| --- | --- |
| **OPERATION SOUND dB(A)** | **NIGHT MODE****SOUND PRESSURE LEVEL dB(A) APPROX.** |
| Level 1 | 55 |
| Level 2 | 50 |
| Level 3 | 45 |

* + 1. CONDENSER COIL:
			1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.
			2. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance.
			3. The heat exchanger on the condensing units shall be manufactured from Hi-X seamless copper tube with N-shape internal grooves mechanically bonded on to aluminum fins to an e-Pass Design.
			4. The fins shall be coated with an anti-corrosion hydrophilic blue coating as standard from factory with a salt spray test rating of 1000hr per ASTM B117 test standards.
			5. The outdoor coil shall have three-circuit heat exchanger design eliminating the need for a drain pan heater. The lower part of the coil shall be used for inverter cooling and be on or off during operation enhancing the defrost operation.
				1. An alternate manufacturer must provide a drain pan heater to enable adequate defrosting of the unit in defrost operation.
			6. The condensing unit shall be factory equipped with condenser coil guards on all sides.
		2. COMPRESSOR:
			1. The Daikin inverter scroll compressors shall be variable speed (PVM inverter) controlled which is capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure as measured in the condensing unit.
				1. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures detected are read every 20 seconds and calculated. With each reading, the compressor capacity (INV frequency) shall be controlled to eliminate deviation from target value.

Non –inverter-driven compressors, which may cause starting motor current to exceed the nominal motor current (RLA) and require larger wire sizing, shall not be allowed.

* + - 1. The inverter driven compressors in the condensing unit shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed scroll “P-type”.
			2. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type.
				1. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.
			3. The capacity control range shall be as low as 1% to 100%.
			4. The compressor’s motor shall have a cooling system using discharge gas, to avoid sudden changes in temperature resulting in significant stresses on winding and bearings.
			5. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
			6. Oil separators shall be standard with the equipment together with an intelligent oil management system.
			7. The compressor shall be mounted on vibration dampening rubber grommets to minimize the transmission of vibration, eliminating the standard need for external spring isolation.
			8. In the event of compressor failure, the remaining compressors, if applicable, shall continue to operate and provide heating or cooling as required at a proportionally reduced capacity. The microprocessor and associated controls shall be manually activated to specifically address this condition for single module and manifold systems.
			9. In the case of multiple condenser modules, combined operation hours of the compressors shall be balanced by means of the Duty Cycling Function, ensuring sequential starting of each module at each start/stop cycle, completion of oil return, completion of defrost or every 8 hours. When connected to a central control system sequential start is activated for all system on each DIII network.
			10. Compressor configurations:

|  |  |  |  |
| --- | --- | --- | --- |
| **MODEL NUMBER** | **COMPRESSOR MOTOR** **OUTPUT (W)** | **QUANTITY** | **COMPRESSOR TYPES** |
| RXYQ72AATJ\* | 4540 | 1 | Inverter controlled |
| RXYQ96AATJ\* | 2610 + 2960 | 2 | Inverter controlled |
| RXYQ120AATJ\* | 3260 + 3700 | 2 | Inverter controlled |
| RXYQ144AATJ\* | 3360 + 5410 | 2 | Inverter controlled |
| RXYQ168AATJ\* | 3970 + 6460 | 2 | Inverter controlled |
| RXYQ192AATJ\* | 5860 + 6180  | 2 | All inverter controlled |
| RXYQ216AATJ\* | 6660 + 6980  | 2 | All inverter controlled |
| RXYQ240AATJ\* | 7260 + 7580 | 2 | All inverter controlled |
| RXYQ264AATJ\* | (3260 + 3700) + (3360 + 5410) | 4 | All inverter controlled |
| RXYQ288AATJ\* | (3360 + 5410) + (3360 + 5410) | 4 | All inverter controlled |
| RXYQ312AATJ\* | (3360 + 5410) + (3970 + 6460) | 4 | All inverter controlled |
| RXYQ336AATJ\* | (3970 + 6460) + (3970 + 6460) | 4 | All inverter controlled |
| RXYQ360AATJ\* | (3970 + 6460) + (5860 + 6180) | 4 | All inverter controlled |
| RXYQ384AATJ\* | (5860 + 6180) + (5860 + 6180)  | 4 | All inverter controlled |
| RXYQ408AATJ\* | (5860 + 6180) + (6660 + 6980) | 4 | All inverter controlled |
| RXYQ432AATJ\* | (6660 + 6980) + (6660 + 6980) | 4 | All inverter controlled |
| RXYQ456AATJ\* | (6660 + 6980) + (7260 + 7580) | 4 | All inverter controlled |
| RXYQ480AATJ\* | (7260 + 7580) + (7260 + 7580) | 4 | All inverter controlled |

* 1. **INDOOR/EVAPOTATOR UNITS**

\*INSERT AS REQUIRED

1. **EXECUTION**

\*INSERT AS REQUIRED

**END OF SECTION**

**APPENDIX A**

**HVAC EQUIPMENT ALTERNATE (GENERAL INFORMATION)**

1. The alternate equipment supplier shall provide to the bidding mechanical contractor a complete equipment data package.
	1. This package shall include, but is not limited to, equipment capacities at the design condition, power requirements, indoor units CFM/static pressures, fan curves, installation requirements, and physical dimensions. Nominal performance data is not acceptable.
	2. The mechanical contractor shall request and receive the equipment data package 15 days prior to bid date and submit this package with the alternate bid.
	3. The mechanical contractor shall list the equipment supplier and submit the required data package with the bid detailing a complete comparison of the proposed alternate equipment to the specified equipment and the associated cost reduction of the alternate equipment. The contractor bids an alternate manufacturer with full knowledge that that manufactures product may not be acceptable or approved.
	4. All equipment must have visible and permanent label clearly identifying the original manufacturer of the equipment. These labels shall have original manufacturer’s name and contact information and be located both inside and outside the equipment and on all equipment-related literature. Submittals shall include the above statement as confirmation by supplier that all conditions are agreed to and complied to. Failure to comply with these requirements shall be sufficient cause for rejection of the submittal and product with no further consideration.
2. The alternate equipment supplier shall furnish a complete drawing package to the mechanical contractor 15 days prior to bid day for bidding and installation.
	1. The drawing format shall be .dxf or equivalent, on 30"x42" sheets.
	2. The HVAC and electrical series design documents will be made available in electronic format for use by the equipment supplier in preparing their drawings.
	3. The alternate equipment supplier shall prepare the following drawings:
		1. XXX HVAC Floor Plan
		2. XXX HVAC Refrigerant Piping Plan
		3. XXX HVAC Refrigerant Piping/Controls Details
		4. XXX HVAC Details
		5. XXX HVAC Schedules
	4. The alternate equipment supplier shall draft all piping circuits, components, overall building control schematic, detailed control wiring diagrams, system details and schedules for their system. The drawings shall convey all requirements to successfully install the alternate equipment supplier’s system.
	5. Provide (2) drawing package sets plotted on 20 lb. vellum. Provide (1) drawing package in electronic format (.dxf files) on CD.
	6. The submitted documents shall be complete system designs and show no less information than the HVAC equipment/controls contract bid documents.
3. The equipment supplier shall submit, as part of the equipment data package, condensing unit data sheets. Data sheets to include the following:
	1. COOLING capacities at project design conditions:
		1. Cooling (Btu/h)
		2. Cooling Input Power:
			1. Ducted (kW)
			2. Ductless (kW)
			3. Mixed (kW)
		3. Part Load IEER:
			1. Ducted
			2. Ductless
			3. Mixed
		4. Full Load EER:
			1. Ducted
			2. Ductless
			3. Mixed
	2. HEATING capacities at project design conditions:
		1. Heating (Btu/h)
		2. Heating Input Power:
			1. Ducted (kW)
			2. Ductless (kW)
			3. Mixed (kW)
		3. Full Load COP @ 47°F:
			1. Ducted
			2. Ductless
			3. Mixed
		4. Full Load COP @ 17°F:
			1. Ducted
			2. Ductless
			3. Mixed
	3. The submitted capacity and efficiency performance must meet or exceed the listed performance on the schedule at the designed space conditions including de-rate factors for defrost if applicable and refrigerant piping losses.
		1. OPERATING TEMPERATURE RANGE:
			1. Cooling
			2. Heating
		2. POWER SUPPLY:
			1. Maximum Circuit Amps (MCA)
			2. Maximum Overcurrent Protection Amps (MOP)
			3. Maximum Starting Current (MSC)
			4. Condenser Fan Motor
		3. REFRIGERANT:
			1. Refrigerant type and charge details including field charge for piping to ensure code compliance.
			2. Control of refrigerant temperature based on weather and load or alternative function.
		4. UNIT DATA:
			1. Max. number of indoor units
			2. Sound pressure level at 3ft (dBA)
			3. Weight (lbs)
			4. Dimensions
			5. Demand limit function description
			6. Details on sequential start functionality
			7. Coil anticorrosion data
4. The equipment supplier shall guarantee the performance of their system and all published data submitted. Performance shall be based on the design criteria below.
	1. Room Temperature (Cooling)
	2. Room Temperature (Heating)
	3. Ambient Temperature (Summer)
	4. Ambient Temperature (Winter)
	5. Defrost De-rate Factor
	6. Refrigerant Piping Loss
5. The alternate equipment supplier shall submit with bid, indoor unit data sheets. Data sheets to include the following:
	1. Capacities at project design conditions:
		1. Cooling (Btu/h)
		2. Cooling Input Power (kW)
		3. Part Load IEER
		4. Full Load EER
		5. Heating (Btu/h)
		6. Heating Input Power (kW)
		7. Full Load COP@47°F
		8. Full Load COP@17°F
		9. Air Flow (CFM)
	2. External Static Pressure (ESP)
	3. Electrical Data (MAC, MOP, MSC, RLA)
	4. Weight (lbs)
	5. Dimensions
6. The equipment supplier shall provide a certificate which states that the equipment has a minimum salt spray resistance of 1000 hours.
7. The equipment supplier shall submit the warranty certificate to the mechanical contractor.