Catalog 1640-8

Daikin Classroom Self-Contained Unit Ventilators

Model ARQ Water Source Heat Pump – Standard Range
Model GRQ Water Source Heat Pump – Geothermal Range

Size 024 (2 Ton) to 048 (4 Ton)

MicroTech® (“J” Vintage)

Model ARQ

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Daikin Classroom Unit Ventilators

For nearly a century schools have relied on unit ventilators to keep classrooms comfortable.

Students learn more readily in a quiet, well-ventilated environment. That is why Herman Nelson invented the unit ventilator in 1917. Daikin Applied continues to set the industry standard for performance, features and quality. Today Daikin remains committed to continuing the Herman Nelson-AAF-McQuay legacy as the industry leader and meeting the changing requirements of schools with the highest quality unit ventilator products available.

We realize that keeping expenditures down is a high priority for school administrators and school boards.

Daikin unit ventilators are inexpensive to install and operate, and they are designed and built to provide years of trouble-free service.

Quiet Operation

Daikin unit ventilators are engineered and manufactured to deliver quiet, continuous comfort. We developed our GentleFlo™ air moving system to minimize operating sound levels—even as demands for more fresh air require units to operate longer and work harder.

Low Operating Costs

Daikin unit ventilators minimize energy usage by utilizing a two-stage compressor and multi-speed fan to better match changing room loads. They take maximum advantage of “free” cooling opportunities to reduce operating costs. During unoccupied periods and at night, units operate sparingly to conserve energy.

Built To Last

Our proven institutional design can withstand the rigors of the classroom environment. It features an extra-sturdy chassis and double-wall damper on the inside; scuff-resistant finishes and tamper prevention features on the outside. In fact, many units installed over 30 years ago continue to provide quiet, reliable classroom comfort.

MicroTech Control For Superior Performance, Easy Integration

Daikin unit ventilators can be equipped with MicroTech® unit controllers for superior performance. Factory integrated and tested controller, sensor, actuator and unit options promote quick, reliable start-up and minimize costly field commissioning. Our protocol selectability feature provides easy, low-cost integration into most building automation systems. Daikin units with MicroTech controls have on-board BACnet® communications, with an optional LonWorks® module to communicate control and monitoring information to your BAS, without the need for costly gateways.

The Geothermal System (Model GRQ)

Model GRQ Ground Source heat pump utilize the natural properties of the earth to provide heating and cooling to a building. Heat addition and rejection take place below the ground, inside hundreds of feet of high density polyethylene pipe, known as a ground loop. Fluid is circulated through the ground loop and into the geothermal units. The Geothermal heat pump unit simply amplifies and directs conditioned air to the desired location.

In the **Heating Mode** the earth acts as a heat source, allowing the circulating fluid to extract natural heat from the earth and transfer it to the space where it can be used for heating.

In the **Cooling Mode**, the earth acts as a heat sink enabling the circulating fluid to transfer the excess heat, absorbed by the unit, from the building zones to the earth where it is absorbed and stored for future heating requirements.

Rejection of heat into the ground

Addition of warmth from the ground

AHRI Performance Data

Water Loop – ARQ

Unit Size	Compressor Capacity	Fan Speed	Nominal Airflow	Cooling Performance		Heating Performance	
				Total Capacity	Efficiency	Total Capacity	Efficiency
			CFM	Btuh	EER	Btuh	COP
024	Full	High	1000	23300	13.7	27400	4.66
	Part	Med	750	17000	14.7	19400	4.97
	Part	Low	650	16500	14.6	18800	4.69
040	Full	High	1250	40000	14.0	49700	4.30
	Part	Med	1000	28300	14.7	35500	4.40
	Part	Low	800	27100	14.5	34200	3.90
048	Full	High	1500	49100	14.0	57300	4.39
	Part	Med	1050	35100	14.7	38500	4.37
	Part	Low	850	33300	14.1	39800	4.35

Notes: Full and part load cooling conditions: Indoor 80.6°F db / 66.2°F wb / Entering Water Temperature 86°F and high-speed fan.
Full and part load heating conditions: Indoor 68°F db / 59°F wb / Entering Water Temperature 68°F and high-speed fan.
Fluid is fresh water.

Ground Loop – GRQ

Unit Size	Compressor Capacity	Fan Speed	Nominal Airflow	Cooling Performance		Heating Performance	
				Total Capacity	Efficiency	Total Capacity	Efficiency
			CFM	Btuh	EER	Btuh	COP
024	Full	High	1000	24500	15.7	17100	3.37
	Part	Med	750	19000	21.3	13200	3.53
	Part	Low	650	18200	20.9	12700	3.37
040	Full	High	1250	41200	15.9	32800	3.30
	Part	Med	1000	29200	17.5	25300	3.40
	Part	Low	800	27200	17.0	24200	3.10
048	Full	High	1500	51200	16.1	38500	3.44
	Part	Med	1050	37700	20.1	29100	3.48
	Part	Low	850	36100	19.8	27200	3.19

Notes: Full load cooling conditions: Indoor 80.6°F db / 66.2°F wb / Entering Water Temperature 77°F and high-speed fan.
Full load heating conditions: Indoor 68°F db / 59°F wb / Entering Water Temperature 32°F and high-speed fan.
Part load cooling conditions: Indoor 80.6°F db / 66.2°F wb / Entering Water Temperature 68°F and medium or low-speed fan.
Part load heating conditions: Indoor 68°F db / 59°F wb / Entering Water Temperature 41°F and medium or low-speed fan.
Fluid is 15% methanol solution.

Models ARQ & GRQ Floor Unit

Models ARQ & GRQ are vertical, floor-standing units that utilize refrigerant for cooling and heating. Supplemental electric heat is available as an option. Their built-in refrigeration section eliminates the need need for chillers and and outdoor condensing units, making them the perfect choice for low- first cost new or retrofit construction. Older buildings with baseboard radiant heat or other hydronic heating systems can be easily adapted to work efficiently with these units. The major features of these models are shown below and described in more detail on the following pages.

Model ARQ – Self-Contained - Standard Range WSHP, Ultra Quiet
Model GRQ – Self-Contained - Geothermal Range WSHP, Ultra Quiet

Overall Unit Dimensions:

Size 024 – 86" × 30 × 16-5/8" or (21-7/8 with Adapter Back)
Size 040 – 98" × 30" × 16-5/8" or (21-7/8" with Adapter Back)
Size 048 – 110" × 30" × 16-5/8" or (21-7/8" with Adapter Back)

Note: *Unit size 024 shown (3-fans)*

1. **Welded one-piece chassis**
   - offers superior strength, durability, and vibration reduction
2. **Unique draw-thru design**
   - provides uniform air distribution across the coil for even discharge air temperatures
3. **Quiet, aerodynamic fans**
   - utilize GentleFlo technology for exceptionally quiet unit operation
4. **Modular fan section**
   - improves balance, alignment and simplifies maintenance
5. **Fan motor**
   - located out of air stream and away from heating coil reduces heat exposure to prolong life
6. **Outside air/return air dampers & linkage**
   - provides superior mixture of outdoor air and room air for precise temperature control
7. **MicroTech® controls (optional)**
   - provide superior comfort control and easy integration into the building automation system of your choice
8. **Advanced heat transfer coil**
   - design provides extra capacity
9. **Sturdy cabinet construction**
   - includes hidden reinforcement, a non-glare textured surface, and a tough, scuff- and mar-resistant finish to stand up to the abuses of a classroom environment
10. **Sectionalized front access panels**
    - provide easy access to unit interior. Panels are easily removed by a single person. Front side panels can be removed while unit is running
11. **Two hinged top access doors**
    - provide easy access to the motor, electrical, and refrigeration components
12. **Sampling chamber for unit-mounted sensor**
    - provides accurate sensing of room temperature
13. **Optional adjustable caster**
    - left and right ends
14. **Insulated double-wall outdoor air damper**
    - seals tightly without twisting
15. **Full-length air filter**
    - is efficient and easy to replace. All air delivered to classroom is filtered.
16. **Sloped galvanized steel drain pan**
17. **Tamper resistant fasteners on access panels**

GentleFlo Delivery

Daikin unit ventilators are engineered and manufactured to deliver quiet, continuous comfort. We developed our GentleFlo™ air moving system to minimize operating sound levels – even as demands for more fresh air require units to operate longer and work harder. GentleFlo features include:

- Fan wheels are large, wide and rotate at a low speed to reduce fan sound levels. They are impact-resistant and carefully balanced to provide consistent performance.
- Offset, aerodynamic fan wheel blades move air efficiently (Figure 1).
- Precision tolerances help reduce flow and pressure turbulence, resulting in lower sound levels.

Figure 1: GentleFlo Fan Technology

- Fan housings incorporate the latest logarithmic-expansion technology for smoother, quieter air flow (Figure 2).
- A large, expanded discharge opening minimizes air resistance, further lowering sound levels.
- Modular fan construction contributes to equal outlet velocities and promotes quiet operation.
- Fan shafts are of ground and polished steel to minimize deflections and provide consistent, long-term operation.
- Fan assemblies are balanced before unit assembly, then tested after assembly (and rebalanced if necessary) to provide stable, quiet operation.

Figure 2: GentleFlo Reduces Turbulence

The Right Amount of Fresh Air and Cooling

Daikin unit ventilators deliver required amounts of fresh air to meet ventilation requirements and added cooling capacity to maintain consistent comfort for students and teachers. Our Economizer Operation, Demand Control Ventilation (DCV) and Part Load, Variable Air options allow you to match classroom comfort requirements even more closely, and reduce operating costs.

This means that you can be confident that your school is meeting ventilation standards for Indoor Air Quality and that your students are receiving adequate air to be attentive to instruction. At the same time, you are saving money in early morning hours, between classes or after hours when classrooms are heated and cooled but not always fully occupied.

Economizer Operation

It is well recognized that cooling, not heating, is the main thermal challenge in school classrooms. The typical classroom is cooled by outdoor air over half the time, even in cold climates. It is therefore essential that unit ventilators efficiently deliver outdoor air when classroom conditions call for “free” or economizer cooling.

With Daikin unit ventilators, you can have outdoor air whenever it is needed. Economizer operation is facilitated by the outdoor air damper, which automatically adjusts the above-minimum outside air position to provide free cooling when the outdoor air temperature is appropriate (Figure 3). On units equipped with MicroTech controls, three levels of economizer control are available.

Figure 3: Full Economizer Mode

Part-Load Variable Air Control

Part Load Variable Air control can be used to automatically adjust the unit ventilator fan speed based upon the room load and the room temperature. This MicroTech control option provides higher latent cooling capabilities and quieter operation during non-peak load periods by basing indoor fan speed upon room load.

Lower fan speeds in conjunction with our GentleFlo fan technology contributes to a very quiet classroom environment.

Room-temperature PI control loops determine the speed of the fan, which varies according to the room load. It also provides a built-in delay to prevent overshooting for better comfort control. The outdoor air damper’s minimum-air position is adjusted with the fan speed to bring in a constant amount of fresh air.

Demand Control Ventilation

Daikin unit ventilators can be equipped to use input from a CO_2 controller to ventilate the space based on actual occupancy instead of a fixed design occupancy. This Demand Controlled Ventilation (DCV) system monitors the amount of CO_2 so enough fresh outdoor air is introduced to maintain good air quality. The system is designed to achieve a target ventilation rate (e.g., 15 cfm/person) based on actual occupancy.

By using DCV to monitor the actual occupancy pattern in a room, the system can allow code-specific levels of outdoor air to be delivered when needed. Unnecessary over-ventilation is avoided during periods of low or intermittent occupancy, leading to improved energy efficiencies and cost savings.

Precise Temperature and Dehumidification Control

Daikin unit ventilators provide precise temperature and dehumidification control to keep students and teachers comfortable while making maximum use of “free” outdoor-air cooling to reduce operating costs. They utilize a draw-thru fan design that contributes to even heat transfer and provides uniform discharge air temperatures into the classroom. MicroTech control strategies and 2-stage compressor operation provide precise control of temperature and humidity levels under both part-load and full-load conditions.

Draw-Thru Design For Even Discharge Temperatures

The Daikin Draw-Thru design sets our unit ventilators apart from most competitive models. With this system, fans draw air through the entire heat transfer element (Figure 4) rather than blowing it through highly concentrated areas of the coil element. The result is more uniform discharge air temperatures into the classroom and more efficient unit ventilator operation.

Figure 4: Draw-Thru Design Provides Even Discharge Air

Figure 5: Draw-Thru Vs. Blow-Thru Design

Low Installation Costs

Daikin unit ventilators have many features that make them economical to purchase and to install in both new construction and retrofit applications. It is this attention to detail and understanding of school applications that make them the system of choice.

Perfect For Both New & Retrofit Applications

New construction installations are easily accomplished with Daikin unit ventilators because they avoid the added cost and space required for expensive ductwork. Further savings can be realized because piping installations use less space than duct systems.

This is important in existing buildings and also in new construction where floor-to-floor heights can be reduced, saving on overall building costs.

Retrofit installations are also economical because new units fit the same space occupied by existing ones. Using Daikin Applied unit ventilators, central equipment, such as chillers, can be sized smaller using building diversity. This results in a low capital-cost system.

Built In Flexibility

Daikin unit ventilators include features that make them easy to set up and reconfigure as needed to meet special requirements. These features include:

- **Reversible Drain Connections:** All units come with a galvanized steel drain pan that has drain connections on either end. The drain-side connection can be selected in the field. The direction in which the drain pan slants can also be field-modified.
- **Built-In Wire Race:** A built-in metal wire race runs from one end of the unit to the other to provide extra protection for wires and protect them from unit air.

Controls Flexibility

Multiple control options—including MicroTech controls with our Protocol Selectability feature—provide easy, low cost integration of Daikin unit ventilators into the building automation system of your choice (See "Communication Types" on page 85).

MicroTech controls come with on-board BACnet MS/TP communications, with optional LonTalk, to communicate control and monitoring information to your BAS, without the need for costly gateways.

Low Operating Costs

Schools consume more than 10% of the total energy expended in the United States for comfort heating and cooling of buildings. As energy costs increase, educators are placed in a difficult position: caught between rising costs, lower budgets and the requirements to raise educational standards.

Fortunately, the technology and the system exists for schools to take control of their energy expenditures while providing a comfortable environment for learning. And that system is the Daikin unit ventilator.

Consider these realities of school environments:

- Most heating energy in schools is expended to heat unoccupied spaces. Because lights, computers and students give off considerable heat, occupied spaces require little supplemental heat.
- The removal of heat is usually required in occupied classrooms, even when outside temperatures are moderately cold (i.e., 35 to 40°F).
- Then consider how Daikin unit ventilators, located in each classroom, take advantage of these realities to lower operating costs:
- They provide individual classroom control and comfort.
- They can be cycled on when the room is occupied and cycled off when it is not.
- They bring in fresh air from directly outside the classroom for high indoor air quality.
- During most of the school year, they use outdoor air to keep classrooms comfortable without the expense of mechanical cooling.

MicroTech Control Options Further Reduce Operating Costs

Many of the MicroTech control options available with Daikin unit ventilators can further reduce operating costs. For example:

- **Economizer Operation:** Economizer operation automatically adjusts the above-minimum outside air position to provide free cooling when the outdoor air temperature is appropriate.
- **Demand Control Ventilation:** By using CO_2 levels to monitor the actual occupancy pattern in a room, the system can allow code-specific levels of outdoor air to be delivered when needed without costly over-ventilation during periods of low or intermittent occupancy (Figure 6).

Figure 6: Energy Savings with Demand Control Ventilation

- **Occupancy Mode Operation:** Units can be programmed to operate only sparingly during unoccupied periods and at night to conserve energy.

Two-Stage Compressor

Air conditioning units are usually sized for worse case conditions. During high load requirement the unit will operate in high fan speed and high compressor capacity. Most of the time there is not a full load on the compressor. Operation in lower load will be at medium or low fan speeds which will be at the lower displacement compressor stage. The two stage compressor will remain at low speed until more cooling is required. With the two-stage compressor, the unit will run on lower fan speeds most of the time improving comfort through better humidity control and quieter operation, while minimizing issues with over-sizing.

Other units utilizing single stage compressors operate at full compressor capacity all of the time regardless of fan speed.

Easy To Maintain

Daikin Unit Ventilators are designed to provide easy access for maintenance and service personnel to all serviceable components. Most maintenance tasks are easily handled by a single person.

Modular Fan Deck

The entire fan deck is easily removed as a single unit. This provides ready access to fan wheels, motors, bearings and other components for service, cleaning or repair.

The fan deck's rotating element has one large, self-aligning end bearing and a permanently lubricated motor bearing for smooth operation. On most sizes the location of the fan shaft bearing is at the end of the shaft (out of the air stream). This enables easy access for oiling on units built with an oilable end bearing (some units built with permanently sealed end bearings).

Figure 7: Long-Life Bearings

Heavy-Duty Discharge Grille

The discharge grille on the top of the unit is made from extra-strength steel bar stock, promoting long life (Figure 8). It can be removed to facilitate cleaning of fans and fan housings. A built-in 10-degree angle provides proper air throw to blanket the room for proper air circulation and comfort.

Figure 8: Heavy-Duty Steel Discharge Grille

Easy Motor Removal

Unlike with many competitive models, the motor in Daikin unit ventilators is separate from the fan assembly and is located out of the airstream at the end of the fan shaft–away from the hot coil—for easier maintenance and removal. Locating the motor away from the coil (Figure 9) has the added benefit of extending motor life. Our direct-coupled motor and self-aligning motor mount facilitate motor change-out. The motor comes with a molex plug that fits all sizes and further simplifies removal.

Figure 9: Modular Design

Tamper-Resistant Fasteners

Front panels and top access doors are held in place by tamper-resistant, positive-positioning fasteners. They are quickly removed or opened with the proper tool, but deter unauthorized access to the unit's interior (Figure 10).

Sectionalized Access Panels and Doors

All units have three separate front panels and hinged top access doors, sized for convenient handling by a single person (Figure 11). The result is easy, targeted access to the component that needs servicing:

- Two end panels provide easy access to piping, temperature control components and the fan switch. Unlike units with full-length front panels, these can be removed without disturbing the normal operation of the unit.
- Hinged top access doors provide easy access into the end compartments to facilitate convenient servicing of the motor, electrical, and refrigeration components.
- Center front panel provides easy access to the filter and the fan shaft bearing on unit sizes 048.

Filter

Three filter types are offered:

- Units come standard with a single-use filter which is designed to be used once and discarded.
- Optional, permanent metal filters are available and can be removed for cleaning and reused numerous times.
- Renewable media filters, which consist of a heavy-duty, painted-metal structural frame and renewable media.

Figure 10: Easy Access to Filter

Figure 11: Easy Access with Tamper-Resistant Fasteners

Built To Last

Our industrial-strength design provides the durability to withstand the rigors of the classroom environment. Its solid construction and rugged finish promotes continued alignment, structural strength and long-lasting beauty decades after the unit is installed. In fact, many units installed over 30 years ago continue to provide quiet, reliable classroom comfort.

Heavy Duty Frame Construction

Daikin's exclusive, unitized frame (Figure 12) is far superior to the fastener-type construction used by other manufacturers. Loosened fasteners can cause vibration, rattles and sagging panels. With unitized construction, there are no fasteners (screws or bolts) to come loose.

Other design features that promote trouble-free operation and long life include:

- A corrosion-resistant, galvanized-steel frame.
- Extra-strength, steel-bar discharge grille.
- Heavy-gauge-metal cabinet access panels and doors.
- An extra-strength pipe tunnel that stiffens the structure while adding aerodynamic air flow within the unit.
- Hidden reinforcement that provides additional built-in support for the top section as well as better support for the fan deck assembly.
- A rigid exterior that is strong enough to support maintenance personnel without fear of damaging the unit.

Rugged Exterior Finish

The superior finish of the unit ventilator's cabinets fosters long-lasting beauty as well as resistance to abuse and corrosion. We apply the very highest standards at every step of the finishing process to provide lasting quality:

- High-quality furniture steel is carefully inspected before painting. Scratches and marks that might show through are removed.
- After fabrication, the metal undergoes a five-stage cleaning and phosphatizing process to provide a good bonding surface and reduce the possibility of peeling or corrosion.
- A specially formulated, environmentally friendly, thermosetting urethane powder is applied electrostatically to the exterior panels. This film is oven-cured to provide correct chemical cross-linking and to obtain maximum scuff- and mar-resistance.
- The top of the unit is finished with a textured, non-glare and scuff-resistant, charcoal bronze electrostatic paint. End and front panels are available in a pleasing array of architectural colors.
- The Oxford brown steel kickplate is coated and baked with a thermosetting urethane powder paint to blend with floor moldings and provide years of trouble-free service.
- Each unit is painstakingly inspected before boxing, then encapsulated in a clear plastic bag, surrounded by an extra-heavy-duty cardboard box and secured to a skid to help provide damage-free shipment.

Figure 12: Heavy-Duty, Welded Chassis

Durable, Energy Efficient Fan Motors

Daikin Applied unit ventilators are equipped with 115/60/1 NEMA motors that feature low operating current and wattage (Figure 13).

Figure 13: Energy-Efficient Fan Motor

Additional features of these motors include:

- Split-capacitor (PSC) design with automatic reset and thermal-overload protection.
- No brushes, contacts or centrifugal starting switches the most common causes of motor failure.
- A built-in, decoupled isolation system to reduce transmission of vibrations for quieter operation.
- A multi-tap, auto-transformer (Figure 14) provides multiple fan motor speed control through the speed switch. The motor is independent of supply voltage, which allows stocking of one motor (school district-wide) for various voltage applications.

Figure 14: Multi-Tap Auto-Transformer

Durable Damper Design

All dampers in Daikin Unit Ventilators use the turned-metal principle on their long closing edges (Figure 15). Positive sealing is provided by embedding the edge into wool mohair (no metal to metal contact). There are no plastic gaskets to become brittle with time, sag with heat or age, or require a difficult slot fit to seal. Nylon damper bearings foster quiet, maintenance-free operation.

Additional features include:

- Outdoor air dampers are made of galvanized steel to inhibit corrosion, with double-wall welded construction for rigidity and encapsulated insulation (Figure 15). Additional insulation is provided on the exterior of the outdoor air damper blade and on the outdoor air entry portion of the unit.

Figure 15: Outdoor Damper Seals Out Cold Weather

- Room air dampers are free-floating and designed to prevent intermittent gusts of cold air from blowing directly into the classroom on windy days (Figure 16). They are constructed of aluminum with built-in rigidity. The metal forming technique that is employed resists twisting and incorporates a full-length counter weight for easy rotation. The simple principle of an area exposed to a force is used to automatically close the damper, rather than open it, when gusts of cold air occur.

Figure 16: Room Air Damper Auto-Closed by Wind Gusts

Nomenclature

U	ARQ	9	024	H	G	12	Z	B1	AL	22	G	I	B	1
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Category	Code Item	Code Option	Code Designation & Description			
Product Category	1	1	U	Unit Ventilators		
Model Type	2	2-4	ARQ	WSHP Standard Range, Ultra Quiet	GRQ	WSHP Ground Source, Ultra Quiet
Design Series	3	5	9	Design J		
Nominal Capacity	4	6-8	024	24,000	048	48,000
			040	40,000		
Voltage	5	9	C	208/60/1	H	230/60/3
			G	230/60/1	K	460/60/3
			D	208/60/3		
Coil Options	6	10	G	Direct Expansion	9	Direct Expansion with Stainless Steel Drain Pan
Heating Options	7	11-12	12	3 Element Low Cap. Electric Heat	00	None
			13	6 Element Low Cap. Electric Heat		
Hand Orientation	8	13	Z	Not Available		
Controls CO_2 = Return Air CO_2 Sensor	9	14-15	##	MicroTech Controls (see control code table below)		

Control Features		Feature Selections							
Open Protocol	BACnet / Stand-Alone	•		•		•	•		
	LonMark		•		•			•	•
DCV	CO_2 Sensor			•	•		•		•
Factory-Installed Keypad	LUI					•	•	•	•
		Control Code							
Economizer Control	Basic	B1	B5	B9	BD	BH	BL	BP	BT
	Expanded	E1	E5	E9	ED	EH	EL	EP	ET
	Leading-Edge	L1	L5	L9	LD	LH	LL	LP	LT

Category	Code Item	Code Option	Code Designation & Description			
			44	Electromechanical w/2-Position OA Damper for Remote Thermostat		
Discharge	10	16-17	AL	16-5/8" Top Bar Grille	AP	21-7/8" Top Bar Grille Full Adapter Back, Cold Pipe Tunnel, Top Duct In
			AK	21-7/8" Top Bar Grille Partial Adapter Back, Open Tunnel	AM	21-7/8" Top Bar Grille 2" Step, Full Adapter Back, Closed Tunnel
			AN	21-7/8" Top Bar Grille Full Adapter Back, Closed Tunnel	AB	21-7/8" Top Bar Grille Full Adapter Back, Closed Pipe Tunnel w/ Solid Back
Return Air/Outside Air	11	18-19	22	Return Air Bottom Front/ Outdoor Air Rear	24	Recirculation Only/ No OA or RA Dampers
Power Connection	12	20	G	Box With Switch		
			J	Box w/switch, w/USB		
			K	Box w/switch, w/SD		
			M	Box w/switch, w/USB, w/SD		
Color	13	21	I	Antique Ivory	G	Soft Gray
			W	Off White	C	Cupola White
			B	Putty Beige		
SKU Type	14	22	B	Standard Delivery		
Product Style	15	23	1	1st Style Change		

Unit Arrangements: 16-5/8" Deep

Arrangement AL – Open Refrigerant Pipe Tunnel

Arrangement AL units are 16-5/8” deep. They are available as open refrigerant piping (Figure 17). This arrangement is most often used when there is a chased wall for water supply and return piping. Choose closed refrigerant piping arrangement when the refrigerant piping tunnel will be open to air flow along the back of the unit. See "Arrangement AL – Closed Refrigerant Pipe Tunnel Accessory" on page 23.

Figure 17: 16⅝" Arrangement AL with Open Refrigerant Piping

Chased Wall Unit Installation with Floor-Level Outdoor Air Intake:

Chased Wall Unit Installation with Above-Floor-Level Outdoor Air Intake:

Top of intake louver up to 21" (533mm) above floor. (With adapter back available as an accessory)

Unit Arrangements: 21-7/8" Deep

Arrangement AK

The AK arrangement has a partial adapter back with the refrigerant piping open and a rear outdoor inlet.

Figure 18: 21⅞" Arrangement AK

Installation with Floor-Level Outdoor Air Intake:

This installation provides extra space for piping. Fresh air is directlty opposite the unit outside air opening. The unit back and outdoor enclosure are insulated.

Arrangement AM

The AM arrangement has a full adapter back with the refrigerant piping closed and a 2" painted finish step down for a lower height window and sash application.

Figure 19: 21⅞" Arrangement AM

Installation with 2" Finished Stepdown Top:

This installation allows window sills below the standard 30" unit height to project a finished image from outside. Allows fresh air to enter 27" from the floor to compensate for conditions that can arise during renovation or new construction.

Arrangement AN

The AN arrangement has a full adapter back with the refrigerant piping closed and a rear outdoor air inlet.

Figure 20: 21⅞" Arrangement AN

Installation with Floor-Level Outdoor Air Intake:

Fresh air is directly opposite the unit outside air opening. Piping can be run through the insulated, closed piping tunnel. Unit top, back and vertical adapter back partitions are insulated.

Installation with Above-Floor Outdoor Air intake:

Allows fresh air to enter from just below the top of the unit to the bottom. Thus, architectural and snow considerations can be accommodated.

Arrangement AP

The AP arrangement has a full adapter back with the refrigerant pipe tunnel closed and an outdoor air duct collar inlet.

Figure 21: 21⅞" Arrangement AP

Installation with Floor-Level Outdoor Air Intake:

Allows fresh air to enter from the top of the unit from window intake situations that can arise during renovation or new construction.

Arrangement AB

The AB arrangement has a full metal back cover that allows cutting a direct fresh air connection to the outside air opening when desired. The unit top, back vertical adapter back partitions and center inside metal back are insulated.

Figure 22: 21⅞" Arrangement AB

Installation with Floor-to-Top Outdoor Air intake:

MicroTech® Controls

Daikin unit ventilators equipped with MicroTech unit controllers can provide superior performance and easy integration into your building automation system of choice. MicroTech benefits include:

- Factory integrated and tested controller, sensor, actuator and unit options promote quick, reliable start-up and minimize costly field commissioning.
- High-performance features and advanced control options can quickly pay for themselves in saved energy costs and more comfortable classrooms.
- Select from two control levels: stand-alone or network control.
- For network control applications, our Protocol Selectability feature provides easy, low-cost integration of Daikin unit ventilators into most building automation systems.
- Flexible BAS network communication options guard against controls obsolescence, keeping MicroTech viable for the life of your Daikin equipment.

Three Control Levels

MicroTech unit controllers provide the flexibility to operate Daikin unit ventilators on any of three levels:

- As stand-alone units, with control either at the unit or from a wall sensor.
- Controlled as part of a network using a centralized building automation system.
- In a client-server relationship, where client units follow the server unit for some or all functions.

Stand-Alone Control

When operating in stand-alone mode, the MicroTech controller performs complete room temperature and ventilation control. Units can be operated in occupied, unoccupied, stand-by, or bypass (tenant override) modes. Occupied/unoccupied changeover can be accomplished:

- Automatically by an internal Daily Schedule (two occupied times and two unoccupied times for each of the seven days, and one holiday schedule)
- Using a field-wired occupancy sensor.

If a school has more than one zone, separate, internally-programmed schedules are used to regulate each zone.

Client-Server Control

Designate the server and client units and we will factory configure and install the controllers so they are set up for a local peer-to-peer network between units (leaving only the network wiring between these units to be field installed).

Client units can be field-configured to be dependent or independent as follows:

- Dependent client units follow the server unit completely. They are ideal for large spaces that have even loads across the space (such as some libraries).
- Independent client units (default) use server setpoints and client sensors. The client follows the server unit modes, such as heat or cool, but has the flexibility to provide the conditioning required for its area within the space. Independent client units perform better in spaces where loads vary from one area of the space to the other (such as stairwells or cafeterias).

Network Control

MicroTech controllers provide easy integration into your building automation system of choice. All factory-installed options are handled by the unit controller. This simplifies the transmission of monitoring and setpoint data to the building automation system.

MicroTech® controls have on-board BACnet communication, with optional LonTalk, to communicate control and monitoring information to your BAS, without the need for costly gateways (see "Communication Types" on page 85).

Flexible network communication options via our Protocol Selectability feature help you avoid control obsolescence over the life of your Daikin equipment.

USB Interface

An optional USB-A port can be factory-configured. This option simplifies field access to the MicroTech controller. The USB interface can be used for downloading code, changing unit configuration, accessing external memory, or a field-connection to run the service tool. Technicians will have access to read all inputs, download code, setup/download trend data, and backup, restore, or change unit configuration.

SD Card

An optional SD card can be factory configured. The SD card allows storage of data trending and configuration parameters. For further details see page 90.

Economizer Modes

Economizer operation is facilitated by the outdoor air damper, which automatically adjusts the above-minimum outside air position to provide free cooling when the outdoor air temperature is appropriate. Three levels of economizer control are available:

Basic Economizer Operation: The MicroTech controller compares the inside and outside temperatures. If the temperature comparison is satisfactory, then free- air economizer operation is used to cool the space. Reheat units also come configured with an indoor humidity sensor.

Expanded Economizer Operation: In addition to comparing inside and outside temperatures, outdoor relative humidity is measured to calculate outside air enthalpy. If the enthalpy set point is not exceeded, and the temperature comparison is satisfactory, then free economizer operation is used to cool the space. This helps to minimize the entrance of humid outside air.

Leading-Edge Economizer Operation: The MicroTech controller compares both indoor and outdoor temperatures and indoor and outdoor relative humidities. Then it calculates both inside and outside air enthalpy to determine if free economizer operation can cool the space with non-humid outside air. This is a true enthalpy economizer—a first for unit ventilators.

Demand Control Ventilation

The optional unit mounted, single beam absorption infrared gas sensor has a sensing range of 0 – 2000 ppm and voltage output of 0 to 10 VDC (100 ohm output impedance). The pitot tube sensing device is located in the unit ventilator's return air stream. The optional CO_2 sensor is used with the UVC's Demand Control Ventilation feature to vary the amount of outside air based on actual room occupancy. With network applications, the unit mounted sensor can be overridden by a remote sensor through the network.

Figure 23: Optional CO_2 Sensor

Arrangement AL – Closed Refrigerant Pipe Tunnel Accessory

Figure 24: 16⅝" Arrangement AL Closed Refrigerant Pipe Tunnel

Chased Wall Unit Installation with Floor-Level Outdoor Air Intake:

Extra wall space is used to deliver fresh air to the unit outdoor opening. When a chased wall is used, pipes and fin tube radiation can be run inside the chased wall. The back of the accessory must be field-installed.

Chased Wall Unit Installation with Window Below Unit Top:

This installation allows window sills below the standard 30" unit height to project a finished image from outside. It also allows fresh air to be placed directly opposite the unit outside air opening. A 9" painted, insulated plate accessory encloses the pipe tunnel on the back of the unit.

End Panels

Daikin end panels and sub-bases can be used to match up Daikin Applied unit ventilators with existing furniture or units, or with field-supplied storage, sink and bubbler cabinet offerings.

One-inch end panels are typically used to finish off stand-alone floor units (Figure 25). Six-inch end panels with kick plates can be used to provide extra space needed for piping (Figure 26). All end panels are individually wrapped in plastic and boxed to help prevent damage during construction.

Figure 25: 1" End Panel

Figure 26: 6" End Panel

Wall Louvers & Grilles

Daikin wall louvers allow outdoor air to be drawn in while blending with the building architecture. They are sized to match the unit outside air opening and provide maximum air intake. Heavy-gauge, all aluminum construction is standard, with a decorative grille optional.

Both louvers and grilles are available either painted or unpainted. When painted, a specially formulated, environmentally friendly thermosetting urethane powder is applied electrostatically and baked for long lasting beauty as well as resistance to corrosion. The paint is then oven cured to provide correct chemical crosslinking, which can provide years of service. The extruded 6063-T5 aluminum used for louvers and grilles is suitable for color anodizing by others.

Louver Details

Louvers are available in both horizontal and vertical blade configurations (Figure 27):

- Horizontal blade construction turns the incoming air to keep moisture from entering. Bottom weep holes drain moisture to the outside.
- Vertical-blade construction provides positive water impingement and entrapment. The bottom lip drains moisture to the outside.

Louvers can be supplied with or without flanges:

- Flanged louvers are typically used for a panel wall finish (Figure 28 on page 24).
- Unflanged louvers are typically used for recessing into a masonry wall.

Figure 27: Intake Louvers

Figure 28: Flanged Louver (Indoor View)

Daikin decorative intake grilles constructed of 6063-T5 extruded aluminum are available painted or unpainted with holes for mounting to building exteriors (Figure 29). Their square holes are designed to match the blades of the Daikin louver, maximizing the air opening (Figure 30).

Grille Details

A diamond pattern expanded aluminum mesh bird screen (Figure 28) located on the leaving air side of the louver prevents birds and other small animals from entering. The screen's strong aluminum mesh is designed to minimize air pressure drops, unlike expanded metal mesh.

Figure 29: Horizontal Louver with Decorative Intake Grille

Figure 30: Vertical Louver with Decorative Intake Grille Detail

VentiMatic Shutter Room Exhaust Ventilation

Outdoor air introduced by the unit ventilator must leave the room in some way. In some states, exhaust vents are required by law or code to accomplish this. The VentiMatic Shutter is a more economical solution to the problem.

The VentiMatic shutter is a continuously variable, gravity-actuated room exhaust vent (Figure 31). It operates in direct response to positive static air pressure created when ventilation air is brought into the room by the unit ventilator. It is a "one-way" shutter that opposes any flow of air into the room.

Figure 31: VentiMatic Shutter

The VentiMatic Shutter's ability to exhaust only the amount of air required results in considerable energy savings. In the heating mode, the unit ventilator will be able to bring in only the required percent minimum outdoor air. Unlike systems that rely on powered exhaust, no energy will be wasted heating excess outdoor air. In the cooling mode, the unit ventilator will be able to bring in 100% outdoor air for full natural or free cooling when it is energy effective.

Since it is not powered, VentiMatic Shutter operation is inherently silent. Unlike other non-powered vents, it opens at an extremely low positive pressure (0.005"). Its shutter flaps are made of temperature-resistant glass fabric impregnated with silicone rubber for flexibility and long life. This fabric retains its original properties down to -50°F.

Physical Data

Table 3: AR General Data

			024	040	048
Fan Data	Nominal CFM (L/s)	High Speed	1000 (472)	1250 (590)	1500 (708)
		Medium speed	750 (354)	1000 (472)	1150 (543)
		Low Speed	650 (307)	800 (378)	950 (448)
	Number of Fans		3	4	4
	Size	Diameter - in (mm)	8.12 (206mm)	8.12 (206mm)	8.12 (206mm)
		Width- in (mm)	8.25 (210mm)	8.25 (210mm)	8.25 (210mm)
Room Fan Motor Horsepower			1/4	1/4	1/4
Filter Data	Nominal Size	in	10 x 48½ x 1	10 x 60½ x 1	(2) 10 x 36½ x 1
		(mm)	254 x 1232 x 25	254 x 1537 x 25	(2) 254 x 927 x 25
	Area - Ft^2 (m^2):		3.37 (.31)	4.2 (.39)	5.08 (.47)
	Quantity		1	1	2
Shipping Weight	lb (kg)		690 (310)	720 (325)	760 (340)
Refrigerant Charge	oz		81	132	109

Model ARQ and GRQ Self-Contained – Size 024

Model ARQ and GRQ Self-Contained – Size 040

1 Control Compartment
2 Compressor Compartment
3 Unit Mounting Holes
4 Unit Power On/Off Switch
5 Unit Power Wiring Entry

Note: If wall is chased, wall opening for outdoor air, must be within 67" × 21" (Open Pipe Tunnel) or 67" × 28" (Closed Pipe Tunnel).

Model ARQ and GRQ Self-Contained – Size 048

End Panels

Figure 32: 1" (25mm) End Panel Dimensions

All Dim. in inches	16⅝" (422mm) Deep End Panels	21⅞" (556mm) Deep End Panels
Top View		
End View with No Cut-Out		
End View With 2" x 5-1/4" (51mm x 133mm) Step Down		

Figure 33: 6" (152mm) End Panel Dimensions

All Dim. in inches	16⅝" (422mm) Deep End Panels	21⅞" (556mm) Deep End Panels
Top View		
End View with No Cut-Out		

Wall Intake Louvers & Grilles

Louvers are available in both horizontal and vertical blade configurations:

- **Horizontal blade construction** turns the incoming air to keep moisture from entering. Bottom weep holes drain moisture to the outside.
- **Vertical-blade construction** provides positive water impingement and entrapment. The bottom lip drains moisture to the outside.

Louvers can be supplied with or without flanges:

- **Flanged louvers** are typically used for a panel wall finish.
- **Unflanged louvers** are typically used for recessing into a masonry wall.

A half-inch-square mesh bird screen located on the leaving air side of the louver prevents birds and other small animals from entering. The screen's strong aluminum mesh is designed to minimize air pressure drops, unlike expanded metal mesh.

Figure 34: Louver with Flange (Horizontal Blades Shown)

Figure 35: Louver without Flange (Horizontal Blades Shown)

Figure 36: Louver with Flange (Vertical Blades Shown)

Figure 37: Louver without Flange (Vertical Blades Shown)

Table 4: Louver Specifications

Unit	Nominal Air Flow		Louver Dimensisons ± 1/16" (± 2mm)		Recommended Wall Opening	
	CFM	L/s	L = Length	Height	Length	Height
024	750	472	48" (1219mm)	10-3/8" (264mm)	48-1/4" (1225mm)	10-1/2" (267mm)
040	1250	590	60" (1524mm)		60-1/8" (1527mm)	
048	1500	708	72" (1829mm)		72-1/4" (1835mm)	

VentiMatic Shutter Assembly

Notes:

1 Horizontal blade louver shown. Vertical blade louver also available with Ventimatic shutter.
2 Optional exterior grille matches unit ventilator louver in material and design. Mounted in wall louver.
3 Optional interior grille mounting hardware is not included.
4 Louver leaves seal against plate to prevent air infiltration.

Figure 38: VentiMatic Shutter Assembly with Optional Grille

Table 5: VentiMatic Shutter Assembly Dimensions & Maximum Air Capacities

Exterior Grille A		Louver Width B		Interior Grille Width C		Recommended Wall Opening For Shutter				Max. Number of VentiMatic Shutters to Mount on Standard Louver		VentiMatic Shutter(s) Max. Air Capacity	
						Length		Width					
inches	mm	inches	mm	inches	mm	inches	mm	inches	mm	24" (610mm) Shutter	36" (914mm) Shutter	CFM	L/s
23¾	603	24	610	27	686	24¼	616	10½	267	1	0	500	236
36¾	933	36	914	39	991	36¼	921			0	1	750	354
47¾	1213	48	1219	51	1295	48¼	1225			2	0	1000	472
59¾	1518	60	1524	63	1600	60¼	1530			1	1	1250	590
71¾	1822	72	1829	75	1905	72¼	1835			0	2	1500	708

Quick Selection Procedure

The following procedure will provide you with a rough determination of unit capacity for cooling and/or heating based on the number of coil rows. Use capacity tables for final selection. Consult your local Daikin representative for details on the computer selection programs Daikin Applied provides for this purpose

ARQ Cooling and Heating Capacity – Water Loop

Table 6: Standard ISO Water Loop

Unit Size	Compressor Capacity	Fan Speed	Nominal Airflow	Nominal WaterFlow	Pressure Drop		Cooling		Heating	
							Total Capacity	Efficiency	Total Capacity	Efficiency
			CFM	GPM	PSI	Ft	Btuh	EER	Btuh	COP
024	Full	High	1000	6.5	0.79	1.82	23300	13.7	27400	4.66
	Part	Med	750				17000	14.7	19400	4.97
	Part	Low	650				16500	14.6	18800	4.69
040	Full	High	1250	10	3.45	7.95	40000	14.0	49700	4.30
	Part	Med	1000				28300	14.7	35500	4.40
	Part	Low	800				27100	14.5	34200	3.90
048	Full	High	1500	12	6.60	15.23	49100	14.0	57300	4.39
	Part	Med	1050				35100	14.7	38500	4.37
	Part	Low	850				33300	14.1	39800	4.35

Notes: Full and part load cooling conditions: Indoor 80.6°F db / 66.2°F wb / Entering Water Temperature 86°F and high-speed fan for full load.
Full and part load heating conditions: Indoor 68°F db / 59°F wb / Entering Water Temperature 68°F and high-speed fan for full load.
Fluid is fresh water.

GRQ Cooling and Heating Capacity – Ground Loop

Table 8: Standard ISO Ground Loop

Unit Size	Compressor Capacity	Fan Speed	Nominal Airflow	Nominal WaterFlow	Pressure Drop		Cooling		Heating	
							Total Capacity	Efficiency	Total Capacity	Efficiency
			CFM	GPM	PSI	Ft	Btuh	EER	Btuh	COP
024	Full	High	1000	6.5	0.79	1.82	24500	15.7	17100	3.37
	Part	Med	750				19000	21.3	13200	3.53
	Part	Low	650				18200	20.9	12700	3.37
040	Full	High	1250	10	3.45	7.95	41200	15.9	32800	3.30
	Part	Med	1000				29200	17.5	25300	3.40
	Part	Low	800				27200	17.0	24200	3.10
048	Full	High	1500	12	6.60	15.23	51200	16.1	38500	3.44
	Part	Med	1050				37700	20.1	29100	3.48
	Part	Low	850				36100	19.8	27200	3.19

Notes: Full load cooling conditions: Indoor 80.6°F db / 66.2°F wb / Entering Water Temperature 77°F and high-speed fan.
Full load heating conditions: Indoor 68°F db / 59°F wb / Entering Water Temperature 32°F and high-speed fan.
Part load cooling conditions: Indoor 80.6°F db / 66.2°F wb / Entering Water Temperature 68°F and medium or low-speed fan.
Part load heating conditions: Indoor 68°F db / 59°F wb / Entering Water Temperature 41°F and medium or low-speed fan.
Fluid is 15% methanol solution.

Selection Procedure

Step 1: Determine Design Conditions

Determine design indoor and outdoor air temperatures in accordance with established engineering practices, as outlined in the ASHRAE Guide or other authoritative source. Indoor temperatures of 80°F dry bulb, 67°F wet bulb for summer and 70°F dry bulb for winter usually are acceptable for design or peak load conditions, even though the expected operating conditions of the system may be somewhat different.

Step 2: Determine Heating and Cooling Loads

Calculate design winter heating losses and summer cooling loads in accordance with the procedures outlined by the ASHRAE Guide or other authoritative source. Perhaps the greatest consideration in calculating design loads is solar heat gain. August solar heat values might be used for summer cooling loads, but should not be used for ventilation air or "natural cooling" capacity calculations; since these cooling loads reach their maximum in the spring and autumn months. The natural cooling capacity is usually calculated for 55° or 60°F outdoor air temperature.

Table 10: Outdoor Air Ventilation Sensible Cooling Capacites Based On 75°F Room Temperature

Unit Series	Nominal CFM	Outdoor Air Temperature	
		55°F	60°F
024	1000	21.7 MBH	16.3 MBH
040	1250	27.1 MBH	20.3 MBH
048	1500	32.6 MBH	24.4 MBH

Step 3: Determine Air Quantity Required

Air quantity for heating applications is determined from circulation of a definite number of room air volumes per hour. Table 11 gives the recommended number of room air changes per hour.

Table 11: Recommended Room Air Changes Per Hour

Type of Space	Recommended Number of Room Air Changes Per Hour
Classrooms, Offices	6 to 9
Laboratories, Shops	6 to 8
Cafeterias & Kitchens	4½ to 7

For rooms facing east, south or west, the higher values shown in the table should be used so adequate ventilation cooling will be available to prevent overheating during mild sunny weather. The following equation is helpful to determine the CFM air delivery for any given rate of circulation:

Equation 1: CFM For Given Rate Of Circulation

$$\frac{\text{Room Volume (cu ft)} \times \text{Room Changes per Hour}}{60} = CFM$$

In mechanical cooling applications, the total air quantity may be determined or verified by use of the sensible cooling load equation:

Equation 2: CFM Based On Sensible Cooling Load

$$CFM = \frac{Q\ \text{sensible (space)}}{1.086 \times TD}$$

Q sensible is the maximum sensible room load and T.D. is the temperature difference between the room design dry bulb temperature and the final or leaving-air dry bulb temperature. For these calculations, a T.D. of 20°F is usually assumed to be desirable to avoid delivering air too cold for comfort. This figure may be varied one or two degrees for reasons of practicality.

Note: *The sensible load used in the preceding equation is the space load and excludes the ventilation load.*

Most areas have ventilation codes which govern the amount of ventilation air required for school applications. For other than school applications or areas not having codes, the ASHRAE Guide may be used for authoritative recommendations and discussion of the relation between odor control and outdoor air quantities.

The minimum outdoor air quantity recommended by ASHRAE for K-12 classrooms is 10 CFM per person plus 0.12 CFM/ft^2. Lower percent minimum outdoor air settings are more economical. In the interest of economy, it may be desirable to use lower percent minimums if there are no ventilation codes.

Step 4: Select Unit Size

The unit should be selected to meet or exceed the CFM delivery requirement previously determined. All model types are available with nominal capacities of 1000, 1250 and 1500 CFM. Unit sizes 024, 040, and 048.

Cooling Capacity

Unit cooling capacity should be selected to equal or slightly exceed the sum of computed room sensible and latent heat gains (Room Total Capacity). When operating on the mechanical cooling cycle, the control system introduces a constant amount of outdoor air for ventilation. The latent and sensible heat gain from this outdoor ventilation air must be added to the room total cooling load before choosing the proper capacity unit.

Heating Capacity

Unit heating capacity should be selected to equal or slightly exceed the computed room heat loss. For units installed for 100% recirculation, it is good practice to increase the heating capacity by 15% to aid in quick room warm-up. This allowance is unnecessary for units delivering a minimum outdoor air of 20% or more, since the outdoor air damper remains closed until the room is up to temperature. The heat normally expended in heating the minimum-percent outdoor air up to room temperature is available for quick warm-up purposes.

The heating required to warm the outdoor ventilating air up to room temperature must also be calculated. The Total Capacity should be used in sizing, piping, boilers, etc.

Cooling Selection Example

Step 1: Determine Design Conditions

Assume the following design indoor and outdoor air temperatures are given:

- Outdoor design temperature = 96°F DB / 74°F WB
- Room design temperature = 76°F DB / 65°F WB

Step 2: Determine Cooling Loads

Assume the following cooling loads are given:

- Minimum total capacity (TC) = 40.5 MBH
- Minimum sensible capacity (SC) = 23.9 MBH
- Minimum outdoor air = 20%
- Entering Fluid Temperature = 90° F
- Room volume = 9,000 cubic feet
- Desired number of air changes per hour = 8

Step 3: Determine Air Quantity Required

Equation 1 on page 34 indicates that to obtain eight room volumes per hour, a unit capable of delivering 1200 CFM standard air must be used, as follows:

$$\text{CFM} = \frac{(\text{Room Volume Ft}^3) \times (\text{Room Changes per Hour})}{80}$$

$$\text{CFM} = \frac{9000 \times 8}{60} = 1200$$

This indicates that a size 040 Unit Ventilator should be used, which delivers 1250 CFM.

Step 4: Select Unit Size

Determine the unit performance as follows:

Determine Entering Dry Bulb Temperature

The entering dry bulb (EDB) temperature is calculated using the following formula:

$$\text{EDB} = \text{Room DB} \times \frac{\%\text{RA}}{100} + \text{Outdoor DB} \times \frac{\%\text{OA}}{100}$$

$$\text{EDB} = 76(0.8) + (96)(0.2) = 80°\text{F}$$

Determine Entering Wet Bulb Temperature

The entering wet bulb (EWB) temperature is determined by calculating the Enthalpy (H) at saturation, then looking up the corresponding EWB (Table 12 on page 36). Enthalpy (H) is calculated as follows:

$$\text{Enthalpy (H)} = \text{Room Enthalpy} \times \frac{\%\text{RA}}{100} + \text{Outdoor Enthalpy} \times \frac{\%\text{OA}}{100}$$

$$\text{Enthalpy (H)} = 30.06\ (0.8) + 37.66\ (0.2) = 31.58\ \text{btu/lb}$$

Referring to Table 12 on page 36, EWB for 31.58 btu/lb = 67°F

Look Up Capacities

Look up the Total and Sensible cooling capacity for a Size 040 unit at High Fan Speed from "ARQ – Size 040 (1250 SCFM) – 2nd Stage High Fan (Continued)" on page 45. Interpolation between the values for GPM = 6.7 and 10.0, at Entering Water Temperature = 90°F and Entering Air Temperature DB/WB = 80/67°F, will yield the following results.

- 40.5 MBH (TC)
- 25.1 MBH (SC)
- 8.2 GPM

Leaving air temperatures dry bulb °F (LDB) and wet bulb °F (LWB) may be calculated as follows:

$$\text{LDB} = \text{EDB} - \frac{\text{SC(Btuh)}}{\text{CFM} \times 1.085} = 80 - \frac{25100}{1250 \times 1.085} = 61.5°\text{F}$$

$$\text{LWBH} = \text{EWBH} - \frac{\text{TC(Btuh)}}{\text{CFM} \times 4.5} = 31.62 - \frac{40500}{1250 \times 4.5} = 24.4$$

From "Size 040 (1250 SCFM) – 2nd Stage High Fan" on page 45:

LWB at 24.4 H = 56.9°F.

Note: *Interpolation within each table and between sets of tables for each unit series is permissible.*

For conditions of performance beyond the scope of the catalog selection procedures, Daikin offers computer selection programs for cooling, hot water and steam coils. Consult your local Daikin representative for details.

Table 12: Enthalpy (H) at Saturation But Per Pound of Dry Air

Wet Bulb Temp. °F	Tenths of A Degree									
	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
50	20.3	20.36	20.41	20.47	20.52	20.58	20.64	20.69	20.75	20.8
51	20.86	20.92	20.97	21.03	21.09	21.15	21.2	21.26	21.32	21.38
52	21.44	21.5	21.56	21.62	21.67	21.73	21.79	21.85	21.91	21.97
53	22.02	22.08	22.14	22.2	22.26	22.32	22.38	22.44	22.5	22.56
54	22.62	22.68	22.74	22.8	22.86	22.92	22.98	23.04	23.1	23.16
55	23.22	23.28	23.34	23.41	23.47	23.53	23.59	23.65	23.72	23.78
56	23.84	23.9	23.97	24.03	24.1	24.16	24.22	24.29	24.35	24.42
57	24.48	24.54	24.61	24.67	24.74	24.8	24.86	24.93	24.99	25.06
58	25.12	25.19	25.25	25.32	25.38	25.45	25.52	25.58	26.65	25.71
59	25.78	25.85	25.92	25.98	26.05	26.12	26.19	26.26	26.32	26.39
60	26.46	26.53	26.6	26.67	26.74	26.81	26.87	26.94	27.01	27.08
61	27.15	27.22	27.29	27.36	27.43	27.5	27.57	27.64	27.71	27.78
62	27.85	27.92	27.99	28.07	28.14	28.21	28.28	28.35	28.43	28.5
63	28.57	28.64	28.72	28.79	28.87	28.94	29.01	29.09	29.16	29.24
64	29.31	29.39	29.46	29.54	29.61	29.69	29.76	29.84	29.91	29.99
65	30.06	30.14	30.21	30.29	30.37	30.45	30.52	30.6	30.68	30.78
66	30.83	30.91	30.99	31.07	31.15	31.23	31.3	31.38	31.46	31.54
67	31.62	31.7	31.78	31.86	31.94	32.02	32.1	32.18	32.26	32.34
68	32.42	32.5	32.59	32.67	32.75	32.84	32.92	33	33.08	33.17
69	33.25	33.33	33.42	33.5	33.59	33.67	33.75	33.84	33.92	34.01
70	34.09	34.18	34.26	34.35	34.43	34.52	34.61	34.69	34.78	34.86
71	34.95	35.04	35.13	35.21	35.3	35.39	35.48	35.57	35.65	35.74
72	35.83	35.92	36.01	36.1	36.19	36.29	36.38	36.47	36.56	36.65
73	36.74	36.83	36.92	37.02	37.11	37.2	37.29	37.38	37.48	37.57
74	37.66	37.76	37.85	37.95	38.04	38.14	38.23	38.33	38.42	38.52
75	38.61	38.71	38.8	38.9	38.99	39.09	39.19	39.28	39.38	39.47
76	39.57	39.67	39.77	39.87	39.97	40.07	40.17	40.27	40.37	40.47
77	40.57	40.67	40.77	40.87	40.97	41.08	41.18	41.28	41.38	41.48
78	41.58	41.68	41.79	41.89	42	42.1	42.2	42.31	42.41	42.52
79	42.62	42.73	42.83	42.94	43.05	43.16	43.26	43.37	43.48	43.58
80	43.69	43.8	43.91	44.02	44.13	44.24	44.34	44.45	44.56	44.67
81	44.78	44.89	45	45.12	45.23	45.34	45.45	45.56	45.68	45.79
82	45.9	46.01	46.13	46.24	46.36	46.47	46.58	46.7	46.81	46.93
83	47.04	47.16	47.28	47.39	47.51	47.63	47.75	47.87	47.98	48.1
84	48.22	48.34	48.46	48.58	48.7	48.83	48.95	49.07	49.19	49.31
85	49.43	49.55	49.68	49.8	49.92	50.05	50.17	50.29	50.41	50.54

Antifreeze

In areas where minimum entering loop temperatures drop below 40°F (5°C) or where piping will be routed through areas subject to freezing, antifreeze is required.

Alcohols and glycols are commonly used as antifreeze, however, your local sales office should be consulted to determine the antifreeze best suited to your area. Freeze protection should be maintained to 15°F (9°C) below the lowest expected entering loop temperature. For example; if 30°F (-1°C) is the minimum expected entering loop temperature, the leaving loop temperature would be 22 to 25°F (-6° to -4°C) and freeze protection should be at 15°F (-10°C). Calculation is as follows: 30°F - 15°F = 15°F (-1°C - 9°C = -10°C).

Antifreeze Correction Factors

Table 13: Correction Factors for Ethylene Glycol

Ethylene Glycol% Weight	10%	20%	30%	40%	50%
Cooling Capacity	0.9950	0.9920	0.9870	0.9830	0.9790
Heating Capacity	0.9910	0.9820	0.9770	0.9690	0.9610
Pressure Drop	1.0700	1.1300	1.1800	1.2600	1.2800

Table 14: Correction Factors for Propylene Glycol

Propylene Glycol% Weight	10%	20%	30%	40%	50%
Cooling Capacity	0.9900	0.9800	0.9700	0.9600	0.9500
Heating Capacity	0.9870	0.9750	0.9620	0.9420	0.9300
Pressure Drop	1.0700	1.1500	1.2500	1.3700	1.4200

Table 15: Correction Factors for Methanol

Methanol% Weight	10%	20%	30%	40%	50%
Cooling Capacity	0.9980	0.9720	–	–	–
Heating Capacity	0.9950	0.9700	–	–	–
Pressure Drop	1.0230	1.0570	–	–	–

Table 16: Correction Factors for Ethanol

Ethanol% Weight	10%	20%	30%	40%	50%
Cooling Capacity	0.9910	0.9510	–	–	–
Heating Capacity	0.9950	0.9600	–	–	–
Pressure Drop	1.0350	1.0680	–	–	–

Table 17: Antifreeze Percentage by Volume

Type	Minimum Temperature for Low Temperature Protection			
	10°F (-12.2°C)	15°F (-9.4°C)	20°F (-6.7°C)	25°F (-3.9°C)
Methanol	25%	21%	16%	10%
Propylene Glycol[1]	38%	25%	22%	15%
Ethanol[2]	29%	25%	20%	14%

Notes: 1 100% USP Food Grade.
2 Must not be denatured with any petroleum product.

Operating Limits

Table 19: Air Limits

Air Limits	Standard Range Units		Geothermal Range Units	
	Cooling	Heating	Cooling	Heating
Min. Ambient Air	50°F (10°C)	50°F (10°C)	40°F (4°C)	40°F (4°C)
Normal Ambient Air	80°F (27°C)	70°F (21°C)	80°F (27°C)	70°F (21°C)
Maximum Ambient Air	100°F/77°F (38°C/25°C)	85°F (29°C)	100°F/77°F (38°C/25°C)	85°F (29°C)
Minimum Entering Air [1, 2]	50°F (18°C/13°C)	50°F (10°C)	50°F (10°C)	40°F (4°C)
Normal Entering Air db/wb	80°F/67°F (27°C/19°C)	70°F (21°C)	80°F/67°F (27°C/19°C)	70°F (21°C)
Maximum Entering Air db/wb [1, 2]	100°F/83°F (38°C/28°C)	80°F (27°C)	100°F/83°F (38°C/28°C)	80°F (27°C)

Table 20: Water Limits

Water Limits	Standard Range Units		Geothermal Range Units	
	Cooling	Heating	Cooling	Heating
Minimum Entering Water [1, 2]	55°F (13°C)	55°F (13°C)	30°F (-1°C)	20°F (-6°C)
Normal Entering Water	85ºF (29°C)	70°F (21°C)	77°F (25°C)	40°F (4°C)
Maximum Entering Water	110°F (43°C)	90°F (32°C)	110°F (43°C)	90°F (32°C)
Minimum GPM/Ton	2.0			
Nominal GPM/Ton	3.0			
Maximum GPM/Ton	4.0			

Notes: 1 At ISO 13256-1 flow rate.
2 Maximum and minimum values may not be combined. If one value is at maximum or minimum, the other two conditions may not exceed the normal condition for standard units. Extended range units may combine any two maximum or minimum conditions, but not more than two, with all other conditions being normal conditions.

ARQ – Size 024 (1000 SCFM) – 2nd Stage High Fan

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
60	4.0	0.3	0.7	65/55	21700	16800	1.358	26300	16.0	24600	1.571	19200	4.59
		0.3	0.7	70/59	23100	17400	1.371	27800	16.8	24400	1.645	18800	4.35
		0.3	0.7	75/63	24500	18000	1.384	29200	17.7	24300	1.719	18400	4.14
		0.3	0.7	80/67	25900	18600	1.397	30700	18.5	24100	1.793	18000	3.94
		0.3	0.7	85/71	27300	19300	1.410	32100	19.4				
	6.0	0.7	1.6	65/55	21900	16900	1.280	26300	17.1	25300	1.618	19800	4.58
		0.7	1.6	70/59	23300	17500	1.293	27700	18.0	25100	1.692	19300	4.35
		0.7	1.6	75/63	24700	18100	1.306	29200	18.9	24900	1.766	18900	4.13
		0.7	1.6	80/67	26200	18700	1.319	30700	19.9	24700	1.840	18400	3.93
		0.7	1.6	85/71	27600	19300	1.332	32100	20.7				
	8.0	1.2	2.8	65/55	22100	16900	1.202	26200	18.4	25900	1.665	20200	4.56
		1.2	2.8	70/59	23600	17600	1.215	27700	19.4	25700	1.739	19800	4.33
		1.2	2.8	75/63	25000	18200	1.228	29200	20.4	25600	1.813	19400	4.14
		1.2	2.8	80/67	26400	18800	1.241	30600	21.3	25400	1.887	19000	3.94
		1.2	2.8	85/71	27800	19400	1.254	32100	22.2				
70	4.0	0.3	0.7	65/55	20800	16200	1.497	25900	13.9	27200	1.633	21600	4.88
		0.3	0.7	70/59	22300	16800	1.510	27500	14.8	27000	1.707	21200	4.63
		0.3	0.7	75/63	23700	17500	1.523	28900	15.6	26800	1.781	20700	4.41
		0.3	0.7	80/67	25100	18100	1.536	30300	16.3	26700	1.855	20400	4.22
		0.3	0.7	85/71	26500	18700	1.549	31800	17.1				
	6.0	0.7	1.6	65/55	21100	16300	1.419	25900	14.9	27800	1.680	22100	4.85
		0.7	1.6	70/59	22500	16900	1.432	27400	15.7	27700	1.754	21700	4.63
		0.7	1.6	75/63	23900	17600	1.445	28800	16.5	27500	1.828	21300	4.41
		0.7	1.6	80/67	25300	18200	1.458	30300	17.4	27300	1.902	20800	4.21
		0.7	1.6	85/71	26800	18800	1.471	31800	18.2				
	8.0	1.2	2.7	65/55	21300	16400	1.341	25900	15.9	28500	1.727	22600	4.84
		1.2	2.7	70/59	22700	17000	1.354	27300	16.8	28300	1.801	22200	4.60
		1.2	2.7	75/63	24200	17600	1.367	28900	17.7	28100	1.875	21700	4.39
		1.2	2.7	80/67	25600	18300	1.380	30300	18.6	28000	1.949	21300	4.21
		1.2	2.7	85/71	27000	18900	1.393	31800	19.4				
80	4.0	0.3	0.7	65/55	19700	15700	1.654	25300	11.9	29600	1.693	23800	5.12
		0.3	0.7	70/59	21100	16300	1.667	26800	12.7	29400	1.767	23400	4.87
		0.3	0.7	75/63	22600	16900	1.680	28300	13.5	29200	1.841	22900	4.65
		0.3	0.7	80/67	24000	17500	1.693	29800	14.2	29100	1.915	22600	4.45
		0.3	0.7	85/71	25400	18100	1.706	31200	14.9				
	6.0	0.7	1.5	65/55	20000	15800	1.576	25400	12.7	30200	1.740	24300	5.09
		0.7	1.5	70/59	21400	16400	1.589	26800	13.5	30000	1.814	23800	4.85
		0.7	1.5	75/63	22800	17000	1.602	28300	14.2	29900	1.888	23500	4.64
		0.7	1.5	80/67	24200	17600	1.615	29700	15.0	29700	1.962	23000	4.44
		0.7	1.5	85/71	25600	18200	1.628	31200	15.7				
	8.0	1.2	2.7	65/55	20200	15800	1.498	25300	13.5	30900	1.787	24800	5.07
		1.2	2.7	70/59	21600	16500	1.511	26800	14.3	30700	1.861	24300	4.83
		1.2	2.7	75/63	23000	17100	1.524	28200	15.1	30500	1.935	23900	4.62
		1.2	2.7	80/67	24500	17700	1.537	29700	15.9	30400	2.009	23500	4.43
		1.2	2.7	85/71	25900	18300	1.549	31200	16.7				

ARQ – Size 024 (1000 SCFM) – 2nd Stage High Fan (Continued)

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
90	4.0	0.3	0.7	65/55	18500	15200	1.829	24700	10.1	31800	1.751	25800	5.32
		0.3	0.7	70/59	19900	15900	1.842	26200	10.8	31600	1.825	25400	5.07
		0.3	0.7	75/63	21300	16500	1.855	27600	11.5	31500	1.899	25000	4.86
		0.3	0.7	80/67	22700	17100	1.867	29100	12.2	31300	1.973	24600	4.65
		0.3	0.7	85/71	24100	17700	1.880	30500	12.8				
	6.0	0.7	1.5	65/55	18700	15300	1.751	24700	10.7	32500	1.798	26400	5.30
		0.7	1.5	70/59	20100	15900	1.764	26100	11.4	32300	1.872	25900	5.06
		0.7	1.5	75/63	21500	16600	1.776	27600	12.1	32100	1.946	25500	4.83
		0.7	1.5	80/67	23000	17200	1.789	29100	12.9	32000	2.020	25100	4.64
		0.7	1.5	85/71	24400	17800	1.802	30600	13.5				
	8.0	1.2	2.7	65/55	18900	15400	1.673	24600	11.3	33100	1.845	26800	5.26
		1.2	2.7	70/59	20400	16000	1.685	26200	12.1	33000	1.919	26500	5.04
		1.2	2.7	75/63	21800	16700	1.698	27600	12.8	32800	1.993	26000	4.82
		1.2	2.7	80/67	23200	17300	1.711	29000	13.6	32600	2.067	25500	4.62
		1.2	2.7	85/71	24600	17900	1.724	30500	14.3	Operation Not Recommended			
100	4.0	0.3	0.7	65/55	17300	15000	2.021	24200	8.6				
		0.3	0.7	70/59	18700	15600	2.034	25600	9.2				
		0.3	0.7	75/63	20100	16200	2.047	27100	9.8				
		0.3	0.7	80/67	21500	16800	2.060	28500	10.4				
		0.3	0.7	85/71	22900	17500	2.073	30000	11.0				
	6.0	0.7	1.5	65/55	17500	15100	1.943	24100	9.0				
		0.7	1.5	70/59	18900	15700	1.956	25600	9.7				
		0.7	1.5	75/63	20300	16300	1.969	27000	10.3				
		0.7	1.5	80/67	21700	16900	1.982	28500	10.9				
		0.7	1.5	85/71	23200	17500	1.995	30000	11.6				
	8.0	1.1	2.6	65/55	17700	15200	1.865	24100	9.5				
		1.1	2.6	70/59	19100	15800	1.878	25500	10.2				
		1.1	2.6	75/63	20600	16400	1.891	27100	10.9				
		1.1	2.6	80/67	22000	17000	1.904	28500	11.6				
		1.1	2.6	85/71	23400	17600	1.917	29900	12.2				
110	4.0	0.3	0.7	65/55	16300	14800	2.232	23900	7.3				
		0.3	0.7	70/59	17700	15400	2.244	25400	7.9				
		0.3	0.7	75/63	19100	16100	2.257	26800	8.5				
		0.3	0.7	80/67	20500	16700	2.270	28200	9.0				
		0.3	0.7	85/71	21900	17300	2.283	29700	9.6				
	6.0	0.6	1.5	65/55	16500	14900	2.153	23800	7.7				
		0.6	1.5	70/59	17900	15500	2.166	25300	8.3				
		0.6	1.5	75/63	19300	16200	2.179	26700	8.9				
		0.6	1.5	80/67	20700	16800	2.192	28200	9.4				
		0.6	1.5	85/71	22200	17400	2.205	29700	10.1				
	8.0	1.1	2.6	65/55	16700	15000	2.075	23800	8.0				
		1.1	2.6	70/59	18100	15600	2.088	25200	8.7				
		1.1	2.6	75/63	19600	16200	2.101	26800	9.3				
		1.1	2.6	80/67	21000	16900	2.114	28200	9.9				
		1.1	2.6	85/71	22400	17500	2.127	29700	10.5				

Legend:

Btu/hr = British Thermal Units per Hour

CFM = Airflow Rate, Cubic Feet per Minute

COP = Coefficient of Performance

EAT = Entering Air Temperature

EER = Energy Efficiency Ratio

EWT = Entering Water Temperature

Ft of W.C. = Feet of Water Column

WPD = Waterside Pressure Drop

GPM = Gallons per Minute

kW = Kilowatts

LAT = Leaving Air Temperature

PSI = Pounds per Square Inch

THA = Total Heat of Absorption

THR = Total Heat of Rejection

ARQ – Size 024 (750 SCFM) – 1st Stage Medium Fan

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
60	4.0	0.3	0.7	65/55	15700	12300	0.864	18600	18.2	17100	1.077	13400	4.65
		0.3	0.7	70/59	17100	12900	0.877	20100	19.5	16900	1.152	13000	4.30
		0.3	0.7	75/63	18500	13500	0.890	21500	20.8	16700	1.227	12500	3.99
		0.3	0.7	80/67	19900	14100	0.903	23000	22.0	16600	1.302	12200	3.74
		0.3	0.7	85/71	21300	14700	0.916	24400	23.3				
	6.0	0.7	1.6	65/55	15900	12400	0.786	18600	20.2	17600	1.088	13900	4.74
		0.7	1.6	70/59	17300	13000	0.799	20000	21.7	17500	1.163	13500	4.41
		0.7	1.6	75/63	18700	13600	0.812	21500	23.0	17300	1.238	13100	4.09
		0.7	1.6	80/67	20100	14200	0.825	22900	24.4	17100	1.313	12600	3.82
		0.7	1.6	85/71	21500	14800	0.838	24400	25.7				
	8.0	1.2	2.8	65/55	16100	12400	0.707	18500	22.8	18200	1.099	14400	4.85
		1.2	2.8	70/59	17500	13100	0.720	20000	24.3	18000	1.174	14000	4.49
		1.2	2.8	75/63	18900	13700	0.733	21400	25.8	17900	1.249	13600	4.20
		1.2	2.8	80/67	20300	14300	0.746	22800	27.2	17700	1.324	13200	3.92
		1.2	2.8	85/71	21800	14900	0.759	24400	28.7				
70	4.0	0.3	0.7	65/55	14600	11800	0.981	17900	14.9	19200	1.087	15500	5.18
		0.3	0.7	70/59	16000	12400	0.994	19400	16.1	19000	1.162	15000	4.79
		0.3	0.7	75/63	17400	13000	1.007	20800	17.3	18800	1.236	14600	4.46
		0.3	0.7	80/67	18800	13600	1.020	22300	18.4	18700	1.311	14200	4.18
		0.3	0.7	85/71	20200	14300	1.033	23700	19.6				
	6.0	0.7	1.6	65/55	14900	11900	0.902	18000	16.5	19800	1.098	16100	5.28
		0.7	1.6	70/59	16300	12500	0.915	19400	17.8	19600	1.173	15600	4.90
		0.7	1.6	75/63	17700	13100	0.928	20900	19.1	19400	1.248	15100	4.55
		0.7	1.6	80/67	19100	13700	0.941	22300	20.3	19300	1.323	14800	4.27
		0.7	1.6	85/71	20500	14300	0.954	23800	21.5				
	8.0	1.2	2.7	65/55	15100	12000	0.824	17900	18.3	20300	1.109	16500	5.36
		1.2	2.7	70/59	16500	12600	0.837	19400	19.7	20200	1.184	16200	5.00
		1.2	2.7	75/63	17900	13200	0.850	20800	21.1	20000	1.259	15700	4.65
		1.2	2.7	80/67	19300	13800	0.863	22200	22.4	19800	1.334	15200	4.35
		1.2	2.7	85/71	20700	14400	0.876	23700	23.6				
80	4.0	0.3	0.7	65/55	13400	11300	1.122	17200	11.9	21100	1.093	17400	5.66
		0.3	0.7	70/59	14900	11900	1.135	18800	13.1	20900	1.168	16900	5.24
		0.3	0.7	75/63	16300	12500	1.148	20200	14.2	20800	1.243	16600	4.90
		0.3	0.7	80/67	17700	13200	1.161	21700	15.2	20600	1.318	16100	4.58
		0.3	0.7	85/71	19100	13800	1.174	23100	16.3				
	6.0	0.7	1.5	65/55	13700	11400	1.044	17300	13.1	21700	1.104	17900	5.76
		0.7	1.5	70/59	15100	12000	1.057	18700	14.3	21500	1.179	17500	5.34
		0.7	1.5	75/63	16500	12600	1.069	20100	15.4	21300	1.254	17000	4.98
		0.7	1.5	80/67	17900	13200	1.082	21600	16.5	21200	1.329	16700	4.67
		0.7	1.5	85/71	19300	13900	1.095	23000	17.6				
	8.0	1.2	2.7	65/55	13900	11500	0.965	17200	14.4	22200	1.116	18400	5.83
		1.2	2.7	70/59	15300	12100	0.978	18600	15.6	22100	1.191	18000	5.44
		1.2	2.7	75/63	16700	12700	0.991	20100	16.9	21900	1.266	17600	5.07
		1.2	2.7	80/67	18100	13300	1.004	21500	18.0	21700	1.341	17100	4.74
		1.2	2.7	85/71	19500	13900	1.017	23000	19.2				

ARQ – Size 024 (750 SCFM) – 1st Stage Medium Fan (Continued)

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
90	4.0	0.3	0.7	65/55	12300	10900	1.288	16700	9.5	22800	1.096	19100	6.10
		0.3	0.7	70/59	13700	11500	1.301	18100	10.5	22600	1.171	18600	5.65
		0.3	0.7	75/63	15100	12100	1.314	19600	11.5	22400	1.246	18100	5.27
		0.3	0.7	80/67	16500	12700	1.326	21000	12.4	22300	1.321	17800	4.95
		0.3	0.7	85/71	17900	13300	1.339	22500	13.4				
	6.0	0.7	1.5	65/55	12500	11000	1.209	16600	10.3	23300	1.108	19500	6.16
		0.7	1.5	70/59	13900	11600	1.222	18100	11.4	23200	1.183	19200	5.75
		0.7	1.5	75/63	15300	12200	1.235	19500	12.4	23000	1.258	18700	5.36
		0.7	1.5	80/67	16800	12800	1.248	21100	13.5	22800	1.333	18300	5.01
		0.7	1.5	85/71	18200	13400	1.261	22500	14.4				
	8.0	1.2	2.7	65/55	12800	11100	1.131	16700	11.3	23900	1.119	20100	6.26
		1.2	2.7	70/59	14200	11700	1.144	18100	12.4	23700	1.194	19600	5.82
		1.2	2.7	75/63	15600	12300	1.156	19500	13.5	23600	1.269	19300	5.45
		1.2	2.7	80/67	17000	12900	1.169	21000	14.5	23400	1.344	18800	5.10
		1.2	2.7	85/71	18400	13500	1.182	22400	15.6	Operation Not Recommended			
100	4.0	0.3	0.7	65/55	11400	10600	1.477	16400	7.7				
		0.3	0.7	70/59	12800	11200	1.490	17900	8.6				
		0.3	0.7	75/63	14200	11800	1.503	19300	9.4				
		0.3	0.7	80/67	15600	12400	1.516	20800	10.3				
		0.3	0.7	85/71	17000	13000	1.529	22200	11.1				
	6.0	0.7	1.5	65/55	11600	10700	1.398	16400	8.3				
		0.7	1.5	70/59	13000	11300	1.411	17800	9.2				
		0.7	1.5	75/63	14400	11900	1.424	19300	10.1				
		0.7	1.5	80/67	15800	12500	1.437	20700	11.0				
		0.7	1.5	85/71	17200	13100	1.450	22100	11.9				
	8.0	1.1	2.6	65/55	11800	10800	1.320	16300	8.9				
		1.1	2.6	70/59	13200	11400	1.333	17700	9.9				
		1.1	2.6	75/63	14600	12000	1.346	19200	10.8				
		1.1	2.6	80/67	16000	12600	1.359	20600	11.8				
		1.1	2.6	85/71	17500	13200	1.372	22200	12.8				
110	4.0	0.3	0.7	65/55	10800	10500	1.689	16600	6.4				
		0.3	0.7	70/59	12200	11100	1.702	18000	7.2				
		0.3	0.7	75/63	13600	11700	1.715	19500	7.9				
		0.3	0.7	80/67	15000	12300	1.728	20900	8.7				
		0.3	0.7	85/71	16400	12900	1.741	22300	9.4				
	6.0	0.6	1.5	65/55	11000	10600	1.611	16500	6.8				
		0.6	1.5	70/59	12500	11200	1.624	18000	7.7				
		0.6	1.5	75/63	13900	11800	1.636	19500	8.5				
		0.6	1.5	80/67	15300	12400	1.649	20900	9.3				
		0.6	1.5	85/71	16700	13000	1.662	22400	10.0				
	8.0	1.1	2.6	65/55	11300	10700	1.532	16500	7.4				
		1.1	2.6	70/59	12700	11300	1.545	18000	8.2				
		1.1	2.6	75/63	14100	11900	1.558	19400	9.1				
		1.1	2.6	80/67	15500	12500	1.571	20900	9.9				
		1.1	2.6	85/71	16900	13100	1.584	22300	10.7				

Legend:

Btu/hr = British Thermal Units per Hour

CFM = Airflow Rate, Cubic Feet per Minute

COP = Coefficient of Performance

EAT = Entering Air Temperature

EER = Energy Efficiency Ratio

EWT = Entering Water Temperature

Ft of W.C. = Feet of Water Column

WPD = Waterside Pressure Drop

GPM = Gallons per Minute

kW = Kilowatts

LAT = Leaving Air Temperature

PSI = Pounds per Square Inch

THA = Total Heat of Absorption

THR = Total Heat of Rejection

AQR – Size 024 (650 SCFM) – 1st Stage Low Fan

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
60	4.0	0.3	0.7	65/55	15000	10600	0.833	17800	18.0	16600	1.096	12900	4.44
		0.3	0.7	70/59	16400	11300	0.846	19300	19.4	16500	1.170	12500	4.13
		0.3	0.7	75/63	17900	11900	0.859	20800	20.8	16300	1.243	12100	3.84
		0.3	0.7	80/67	19300	12500	0.872	22300	22.1	16100	1.317	11600	3.58
		0.3	0.7	85/71	20700	13100	0.885	23700	23.4				
	6.0	0.7	1.6	65/55	15200	10700	0.754	17800	20.2	17200	1.107	13400	4.55
		0.7	1.6	70/59	16700	11400	0.767	19300	21.8	17000	1.181	13000	4.22
		0.7	1.6	75/63	18100	12000	0.780	20800	23.2	16900	1.255	12600	3.95
		0.7	1.6	80/67	19500	12600	0.793	22200	24.6	16700	1.328	12200	3.68
		0.7	1.6	85/71	21000	13200	0.806	23800	26.1				
	8.0	1.2	2.8	65/55	15500	10800	0.676	17800	22.9	17800	1.118	14000	4.66
		1.2	2.8	70/59	16900	11400	0.689	19300	24.5	17600	1.192	13500	4.33
		1.2	2.8	75/63	18300	12100	0.702	20700	26.1	17500	1.266	13200	4.05
		1.2	2.8	80/67	19800	12700	0.715	22200	27.7	17300	1.339	12700	3.79
		1.2	2.8	85/71	21200	13300	0.728	23700	29.1				
70	4.0	0.3	0.7	65/55	14100	10300	0.957	17400	14.7	18600	1.121	14800	4.86
		0.3	0.7	70/59	15500	10900	0.970	18800	16.0	18400	1.195	14300	4.51
		0.3	0.7	75/63	16900	11500	0.983	20300	17.2	18200	1.268	13900	4.21
		0.3	0.7	80/67	18300	12200	0.996	21700	18.4	18100	1.342	13500	3.95
		0.3	0.7	85/71	19800	12800	1.009	23200	19.6				
	6.0	0.7	1.6	65/55	14300	10400	0.878	17300	16.3	19200	1.132	15300	4.97
		0.7	1.6	70/59	15700	11000	0.891	18700	17.6	19000	1.206	14900	4.62
		0.7	1.6	75/63	17100	11600	0.904	20200	18.9	18800	1.279	14400	4.31
		0.7	1.6	80/67	18600	12200	0.917	21700	20.3	18700	1.353	14100	4.05
		0.7	1.6	85/71	20000	12900	0.930	23200	21.5				
	8.0	1.2	2.7	65/55	14500	10500	0.800	17200	18.1	19700	1.143	15800	5.05
		1.2	2.7	70/59	16000	11100	0.813	18800	19.7	19600	1.217	15400	4.72
		1.2	2.7	75/63	17400	11700	0.826	20200	21.1	19400	1.291	15000	4.40
		1.2	2.7	80/67	18800	12300	0.839	21700	22.4	19200	1.364	14500	4.12
		1.2	2.7	85/71	20200	12900	0.852	23100	23.7				
80	4.0	0.3	0.7	65/55	12900	9900	1.098	16600	11.7	20300	1.140	16400	5.22
		0.3	0.7	70/59	14300	10500	1.111	18100	12.9	20200	1.214	16100	4.88
		0.3	0.7	75/63	15800	11100	1.124	19600	14.1	20000	1.288	15600	4.55
		0.3	0.7	80/67	17200	11700	1.137	21100	15.1	19800	1.362	15200	4.26
		0.3	0.7	85/71	18600	12400	1.150	22500	16.2				
	6.0	0.7	1.5	65/55	13200	10000	1.020	16700	12.9	20900	1.152	17000	5.32
		0.7	1.5	70/59	14600	10600	1.033	18100	14.1	20700	1.225	16500	4.95
		0.7	1.5	75/63	16000	11200	1.046	19600	15.3	20600	1.299	16200	4.65
		0.7	1.5	80/67	17400	11800	1.059	21000	16.4	20400	1.373	15700	4.35
		0.7	1.5	85/71	18900	12400	1.072	22600	17.6				
	8.0	1.2	2.7	65/55	13400	10000	0.941	16600	14.2	21500	1.163	17500	5.42
		1.2	2.7	70/59	14800	10700	0.954	18100	15.5	21300	1.236	17100	5.05
		1.2	2.7	75/63	16200	11300	0.967	19500	16.8	21100	1.310	16600	4.72
		1.2	2.7	80/67	17700	11900	0.980	21000	18.1	21000	1.384	16300	4.45
		1.2	2.7	85/71	19100	12500	0.993	22500	19.2				

ARQ – Size 024 (650 SCFM) – 1st Stage Low Fan (Continued)

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
90	4.0	0.3	0.7	65/55	11700	9500	1.250	16000	9.4	21900	1.155	18000	5.56
		0.3	0.7	70/59	13100	10100	1.263	17400	10.4	21800	1.229	17600	5.20
		0.3	0.7	75/63	14600	10700	1.276	19000	11.4	21600	1.302	17200	4.86
		0.3	0.7	80/67	16000	11300	1.289	20400	12.4	21400	1.376	16700	4.56
		0.3	0.7	85/71	17400	11900	1.302	21800	13.4				
	6.0	0.7	1.5	65/55	12000	9500	1.172	16000	10.2	22500	1.166	18500	5.65
		0.7	1.5	70/59	13400	10200	1.184	17400	11.3	22400	1.240	18200	5.29
		0.7	1.5	75/63	14800	10800	1.197	18900	12.4	22200	1.313	17700	4.95
		0.7	1.5	80/67	16200	11400	1.210	20300	13.4	22000	1.387	17300	4.65
		0.7	1.5	85/71	17700	12000	1.223	21900	14.5				
	8.0	1.2	2.7	65/55	12200	9600	1.093	15900	11.2	23100	1.177	19100	5.75
		1.2	2.7	70/59	13600	10300	1.106	17400	12.3	22900	1.251	18600	5.36
		1.2	2.7	75/63	15000	10900	1.119	18800	13.4	22800	1.325	18300	5.04
		1.2	2.7	80/67	16500	11500	1.132	20400	14.6	22600	1.398	17800	4.74
		1.2	2.7	85/71	17900	12100	1.145	21800	15.6	Operation Not Recommended			
100	4.0	0.3	0.7	65/55	10600	9100	1.404	15400	7.5				
		0.3	0.7	70/59	12000	9700	1.417	16800	8.5				
		0.3	0.7	75/63	13400	10300	1.430	18300	9.4				
		0.3	0.7	80/67	14800	11000	1.443	19700	10.3				
		0.3	0.7	85/71	16300	11600	1.456	21300	11.2				
	6.0	0.7	1.5	65/55	10800	9200	1.326	15300	8.1				
		0.7	1.5	70/59	12200	9800	1.339	16800	9.1				
		0.7	1.5	75/63	13600	10400	1.352	18200	10.1				
		0.7	1.5	80/67	15100	11000	1.365	19800	11.1				
		0.7	1.5	85/71	16500	11700	1.377	21200	12.0				
	8.0	1.1	2.6	65/55	11000	9300	1.247	15300	8.8				
		1.1	2.6	70/59	12500	9900	1.260	16800	9.9				
		1.1	2.6	75/63	13900	10500	1.273	18200	10.9				
		1.1	2.6	80/67	15300	11100	1.286	19700	11.9				
		1.1	2.6	85/71	16700	11700	1.299	21100	12.9				
110	4.0	0.3	0.7	65/55	9500	8800	1.553	14800	6.1				
		0.3	0.7	70/59	11000	9400	1.566	16300	7.0				
		0.3	0.7	75/63	12400	10000	1.579	17800	7.9				
		0.3	0.7	80/67	13800	10700	1.592	19200	8.7				
		0.3	0.7	85/71	15300	11300	1.605	20800	9.5				
	6.0	0.6	1.5	65/55	9800	8900	1.475	14800	6.6				
		0.6	1.5	70/59	11200	9500	1.488	16300	7.5				
		0.6	1.5	75/63	12600	10100	1.501	17700	8.4				
		0.6	1.5	80/67	14100	10800	1.514	19300	9.3				
		0.6	1.5	85/71	15500	11400	1.526	20700	10.2				
	8.0	1.1	2.6	65/55	10000	9000	1.396	14800	7.2				
		1.1	2.6	70/59	11400	9600	1.409	16200	8.1				
		1.1	2.6	75/63	12900	10200	1.422	17800	9.1				
		1.1	2.6	80/67	14300	10800	1.435	19200	10.0				
		1.1	2.6	85/71	15700	11500	1.448	20600	10.8				

Legend:

Btu/hr = British Thermal Units per Hour

CFM = Airflow Rate, Cubic Feet per Minute

COP = Coefficient of Performance

EAT = Entering Air Temperature

EER = Energy Efficiency Ratio

EWT = Entering Water Temperature

Ft of W.C. = Feet of Water Column

WPD = Waterside Pressure Drop

GPM = Gallons per Minute

kW = Kilowatts

LAT = Leaving Air Temperature

PSI = Pounds per Square Inch

THA = Total Heat of Absorption

THR = Total Heat of Rejection

ARQ – Size 040 (1250 SCFM) – 2nd Stage High Fan

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
60	6.7	1.7	3.8	65/55	37200	26700	2.481	45700	15.0	44100	2.937	34100	4.40
		1.7	3.8	70/59	39700	27600	2.517	48300	15.8	43600	3.163	32800	4.04
		1.7	3.8	75/63	42200	28600	2.554	50900	16.5	43100	3.390	31500	3.73
		1.7	3.8	80/67	44700	29500	2.591	53500	17.3	42600	3.617	30300	3.45
		1.7	3.8	85/71	47200	30500	2.627	56200	18.0				
	10.0	3.6	8.3	65/55	38200	27100	2.114	45400	18.1	47400	3.175	36600	4.37
		3.6	8.3	70/59	40700	28000	2.150	48000	18.9	46900	3.401	35300	4.04
		3.6	8.3	75/63	43200	29000	2.187	50700	19.8	46400	3.628	34000	3.75
		3.6	8.3	80/67	45700	29900	2.224	53300	20.5	45800	3.855	32600	3.48
		3.6	8.3	85/71	48200	30800	2.260	55900	21.3				
	13.3	6.2	14.2	65/55	39300	27400	1.747	45300	22.5	50600	3.412	39000	4.35
		6.2	14.2	70/59	41800	28400	1.783	47900	23.4	50100	3.639	37700	4.03
		6.2	14.2	75/63	44300	29300	1.820	50500	24.3	49600	3.866	36400	3.76
		6.2	14.2	80/67	46700	30300	1.857	53000	25.1	49100	4.093	35100	3.51
		6.2	14.2	85/71	49200	31200	1.893	55700	26.0				
70	6.7	1.6	3.8	65/55	35600	25200	2.710	44800	13.1	47300	3.033	36900	4.57
		1.6	3.8	70/59	38100	26100	2.747	47500	13.9	46800	3.260	35700	4.21
		1.6	3.8	75/63	40600	27100	2.784	50100	14.6	46300	3.486	34400	3.89
		1.6	3.8	80/67	43100	28000	2.820	52700	15.3	45800	3.713	33100	3.61
		1.6	3.8	85/71	45500	29000	2.857	55300	15.9				
	10.0	3.5	8.1	65/55	36600	25600	2.343	44600	15.6	50600	3.271	39400	4.53
		3.5	8.1	70/59	39100	26500	2.380	47200	16.4	50100	3.497	38200	4.20
		3.5	8.1	75/63	41600	27500	2.417	49800	17.2	49600	3.724	36900	3.90
		3.5	8.1	80/67	44100	28400	2.453	52500	18.0	49100	3.951	35600	3.64
		3.5	8.1	85/71	46600	29400	2.490	55100	18.7				
	13.3	6.1	13.9	65/55	37700	26000	1.976	44400	19.1	53900	3.509	41900	4.50
		6.1	13.9	70/59	40200	26900	2.013	47100	20.0	53300	3.735	40600	4.18
		6.1	13.9	75/63	42600	27900	2.050	49600	20.8	52800	3.962	39300	3.90
		6.1	13.9	80/67	45100	28800	2.086	52200	21.6	52300	4.189	38000	3.66
		6.1	13.9	85/71	47600	29800	2.123	54800	22.4				
80	6.7	1.6	3.7	65/55	33400	23900	2.959	43500	11.3	50400	3.122	39700	4.73
		1.6	3.7	70/59	35900	24900	2.995	46100	12.0	49900	3.349	38500	4.37
		1.6	3.7	75/63	38400	25800	3.032	48700	12.7	49400	3.576	37200	4.05
		1.6	3.7	80/67	40900	26800	3.069	51400	13.3	48900	3.803	35900	3.77
		1.6	3.7	85/71	43400	27700	3.105	54000	14.0				
	10.0	3.5	7.9	65/55	34500	24300	2.592	43300	13.3	53700	3.360	42200	4.68
		3.5	7.9	70/59	36900	25300	2.628	45900	14.0	53200	3.587	41000	4.35
		3.5	7.9	75/63	39400	26200	2.665	48500	14.8	52700	3.814	39700	4.05
		3.5	7.9	80/67	41900	27200	2.702	51100	15.5	52200	4.040	38400	3.79
		3.5	7.9	85/71	44400	28100	2.738	53700	16.2				
	13.3	6.0	13.7	65/55	35500	24700	2.224	43100	16.0	56900	3.598	44600	4.63
		6.0	13.7	70/59	38000	25700	2.261	45700	16.8	56400	3.825	43300	4.32
		6.0	13.7	75/63	40500	26600	2.298	48300	17.6	55900	4.051	42100	4.04
		6.0	13.7	80/67	43000	27600	2.335	51000	18.4	55400	4.278	40800	3.79
		6.0	13.7	85/71	45400	28500	2.371	53500	19.1				

ARQ – Size 040 (1250 SCFM) – 2nd Stage High Fan (Continued)

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
90	6.7	1.6	3.6	65/55	30900	23000	3.225	41900	9.6	53600	3.205	42700	4.90
		1.6	3.6	70/59	33400	23900	3.262	44500	10.2	53100	3.432	41400	4.53
		1.6	3.6	75/63	35900	24900	3.298	47200	10.9	52600	3.658	40100	4.21
		1.6	3.6	80/67	38400	25800	3.335	49800	11.5	52100	3.885	38800	3.93
		1.6	3.6	85/71	40900	26800	3.372	52400	12.1				
	10.0	3.4	7.8	65/55	31900	23400	2.858	41700	11.2	56900	3.443	45100	4.84
		3.4	7.8	70/59	34400	24300	2.895	44300	11.9	56400	3.670	43900	4.50
		3.4	7.8	75/63	36900	25300	2.931	46900	12.6	55900	3.896	42600	4.20
		3.4	7.8	80/67	39400	26200	2.968	49500	13.3	55300	4.123	41200	3.93
		3.4	7.8	85/71	41900	27200	3.005	52200	13.9				
	13.3	5.9	13.4	65/55	33000	23800	2.491	41500	13.2	60100	3.681	47500	4.78
		5.9	13.4	70/59	35500	24700	2.527	44100	14.0	59600	3.907	46300	4.47
		5.9	13.4	75/63	38000	25700	2.564	46800	14.8	59100	4.134	45000	4.19
		5.9	13.4	80/67	40400	26600	2.601	49300	15.5	58600	4.361	43700	3.94
		5.9	13.4	85/71	42900	27600	2.638	51900	16.3	Operation Not Recommended			
100	6.7	1.6	3.6	65/55	28200	22200	3.509	40200	8.0				
		1.6	3.6	70/59	30700	23100	3.546	42800	8.7				
		1.6	3.6	75/63	33200	24100	3.583	45400	9.3				
		1.6	3.6	80/67	35700	25000	3.619	48100	9.9				
		1.6	3.6	85/71	38200	26000	3.656	50700	10.4				
	10.0	3.4	7.7	65/55	29300	22600	3.142	40000	9.3				
		3.4	7.7	70/59	31800	23500	3.179	42600	10.0				
		3.4	7.7	75/63	34300	24500	3.216	45300	10.7				
		3.4	7.7	80/67	36700	25400	3.252	47800	11.3				
		3.4	7.7	85/71	39200	26400	3.289	50400	11.9				
	13.3	5.8	13.3	65/55	30300	22900	2.775	39800	10.9				
		5.8	13.3	70/59	32800	23900	2.812	42400	11.7				
		5.8	13.3	75/63	35300	24800	2.849	45000	12.4				
		5.8	13.3	80/67	37800	25800	2.885	47600	13.1				
		5.8	13.3	85/71	40300	26700	2.922	50300	13.8				
110	6.7	1.5	3.5	65/55	25700	21100	3.812	38700	6.7				
		1.5	3.5	70/59	28200	22000	3.849	41300	7.3				
		1.5	3.5	75/63	30600	23000	3.886	43900	7.9				
		1.5	3.5	80/67	33100	23900	3.922	46500	8.4				
		1.5	3.5	85/71	35600	24900	3.959	49100	9.0				
	10.0	3.3	7.6	65/55	26700	21400	3.445	38500	7.8				
		3.3	7.6	70/59	29200	22400	3.482	41100	8.4				
		3.3	7.6	75/63	31700	23300	3.519	43700	9.0				
		3.3	7.6	80/67	34200	24300	3.555	46300	9.6				
		3.3	7.6	85/71	36700	25200	3.592	49000	10.2				
	13.3	5.7	13.1	65/55	27700	21800	3.078	38200	9.0				
		5.7	13.1	70/59	30200	22800	3.115	40800	9.7				
		5.7	13.1	75/63	32700	23700	3.152	43500	10.4				
		5.7	13.1	80/67	35200	24700	3.188	46100	11.0				
		5.7	13.1	85/71	37700	25600	3.225	48700	11.7				

Legend:

Btu/hr = British Thermal Units per Hour

CFM = Airflow Rate, Cubic Feet per Minute

COP = Coefficient of Performance

EAT = Entering Air Temperature

EER = Energy Efficiency Ratio

EWT = Entering Water Temperature

Ft of W.C. = Feet of Water Column

WPD = Waterside Pressure Drop

GPM = Gallons per Minute

kW = Kilowatts

LAT = Leaving Air Temperature

PSI = Pounds per Square Inch

THA = Total Heat of Absorption

THR = Total Heat of Rejection

ARQ – Size 040 (1000 SCFM) – 1st Stage Medium Fan

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
60	6.7	1.7	3.8	65/55	23500	17700	1.566	28800	15.0	30500	1.971	23800	4.53
		1.7	3.8	70/59	25900	18600	1.601	31400	16.2	30000	2.194	22500	4.01
		1.7	3.8	75/63	28300	19500	1.637	33900	17.3	29500	2.417	21300	3.58
		1.7	3.8	80/67	30600	20400	1.673	36300	18.3	29100	2.640	20100	3.23
		1.7	3.8	85/71	33000	21300	1.709	38800	19.3				
	10.0	3.6	8.3	65/55	24500	18000	1.206	28600	20.3	33700	2.205	26200	4.48
		3.6	8.3	70/59	26900	18900	1.242	31100	21.7	33200	2.428	24900	4.01
		3.6	8.3	75/63	29200	19800	1.278	33600	22.8	32700	2.651	23700	3.61
		3.6	8.3	80/67	31600	20700	1.314	36100	24.0	32200	2.874	22400	3.28
		3.6	8.3	85/71	34000	21700	1.350	38600	25.2				
	13.3	6.2	14.2	65/55	25500	18400	0.847	28400	30.1	36800	2.439	28500	4.42
		6.2	14.2	70/59	27900	19300	0.883	30900	31.6	36300	2.662	27200	4.00
		6.2	14.2	75/63	30200	20200	0.919	33300	32.9	35800	2.884	26000	3.64
		6.2	14.2	80/67	32600	21100	0.955	35900	34.1	35300	3.107	24700	3.33
		6.2	14.2	85/71	35000	22000	0.991	38400	35.3				
70	6.7	1.6	3.8	65/55	22500	17000	1.783	28600	12.6	33200	2.003	26400	4.86
		1.6	3.8	70/59	24900	17900	1.819	31100	13.7	32700	2.226	25100	4.30
		1.6	3.8	75/63	27300	18800	1.854	33600	14.7	32200	2.449	23800	3.85
		1.6	3.8	80/67	29600	19700	1.890	36100	15.7	31700	2.671	22600	3.48
		1.6	3.8	85/71	32000	20600	1.926	38600	16.6				
	10.0	3.5	8.1	65/55	23500	17300	1.424	28400	16.5	36300	2.237	28700	4.75
		3.5	8.1	70/59	25900	18200	1.459	30900	17.8	35800	2.459	27400	4.27
		3.5	8.1	75/63	28200	19100	1.495	33300	18.9	35300	2.682	26100	3.86
		3.5	8.1	80/67	30600	20000	1.531	35800	20.0	34800	2.905	24900	3.51
		3.5	8.1	85/71	33000	21000	1.567	38300	21.1				
	13.3	6.1	13.9	65/55	24500	17700	1.064	28100	23.0	39500	2.470	31100	4.69
		6.1	13.9	70/59	26900	18600	1.100	30700	24.5	39000	2.693	29800	4.24
		6.1	13.9	75/63	29200	19500	1.136	33100	25.7	38500	2.916	28500	3.87
		6.1	13.9	80/67	31600	20400	1.172	35600	27.0	38000	3.139	27300	3.55
		6.1	13.9	85/71	34000	21300	1.208	38100	28.1				
80	6.7	1.6	3.7	65/55	21300	16400	2.025	28200	10.5	36100	2.029	29200	5.21
		1.6	3.7	70/59	23700	17300	2.061	30700	11.5	35600	2.252	27900	4.63
		1.6	3.7	75/63	26100	18200	2.097	33300	12.4	35100	2.475	26700	4.16
		1.6	3.7	80/67	28500	19100	2.132	35800	13.4	34600	2.698	25400	3.76
		1.6	3.7	85/71	30800	20000	2.168	38200	14.2				
	10.0	3.5	7.9	65/55	22300	16700	1.666	28000	13.4	39200	2.263	31500	5.08
		3.5	7.9	70/59	24700	17600	1.702	30500	14.5	38700	2.486	30200	4.56
		3.5	7.9	75/63	27100	18500	1.737	33000	15.6	38200	2.709	29000	4.13
		3.5	7.9	80/67	29500	19400	1.773	35600	16.6	37700	2.931	27700	3.77
		3.5	7.9	85/71	31800	20400	1.809	38000	17.6				
	13.3	6.0	13.7	65/55	23300	17100	1.306	27800	17.8	42400	2.497	33900	4.98
		6.0	13.7	70/59	25700	18000	1.342	30300	19.2	41900	2.720	32600	4.51
		6.0	13.7	75/63	28100	18900	1.378	32800	20.4	41400	2.942	31400	4.12
		6.0	13.7	80/67	30500	19800	1.414	35300	21.6	40900	3.165	30100	3.79
		6.0	13.7	85/71	32800	20700	1.450	37700	22.6				

ARQ – Size 040 (1000 SCFM) – 1st Stage Medium Fan (Continued)

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
90	6.7	1.6	3.6	65/55	20100	15800	2.275	27900	8.8	39800	2.051	32800	5.69
		1.6	3.6	70/59	22500	16700	2.311	30400	9.7	39300	2.274	31500	5.06
		1.6	3.6	75/63	24800	17600	2.347	32800	10.6	38800	2.496	30300	4.55
		1.6	3.6	80/67	27200	18500	2.383	35300	11.4	38300	2.719	29000	4.13
		1.6	3.6	85/71	29600	19400	2.419	37900	12.2				
	10.0	3.4	7.8	65/55	21100	16200	1.916	27600	11.0	43000	2.284	35200	5.52
		3.4	7.8	70/59	23500	17100	1.952	30200	12.0	42500	2.507	33900	4.97
		3.4	7.8	75/63	25800	18000	1.988	32600	13.0	42000	2.730	32700	4.51
		3.4	7.8	80/67	28200	18900	2.024	35100	13.9	41500	2.953	31400	4.12
		3.4	7.8	85/71	30600	19800	2.060	37600	14.9				
	13.3	5.9	13.4	65/55	22100	16500	1.557	27400	14.2	46100	2.518	37500	5.36
		5.9	13.4	70/59	24400	17400	1.593	29800	15.3	45600	2.741	36200	4.87
		5.9	13.4	75/63	26800	18400	1.629	32400	16.5	45100	2.964	35000	4.46
		5.9	13.4	80/67	29200	19300	1.664	34900	17.5	44600	3.187	33700	4.10
		5.9	13.4	85/71	31600	20200	1.700	37400	18.6	Operation Not Recommended			
100	6.7	1.6	3.6	65/55	18800	15200	2.517	27400	7.5				
		1.6	3.6	70/59	21200	16100	2.553	29900	8.3				
		1.6	3.6	75/63	23600	17000	2.589	32400	9.1				
		1.6	3.6	80/67	26000	17900	2.624	35000	9.9				
		1.6	3.6	85/71	28300	18900	2.660	37400	10.6				
	10.0	3.4	7.7	65/55	19800	15600	2.158	27200	9.2				
		3.4	7.7	70/59	22200	16500	2.194	29700	10.1				
		3.4	7.7	75/63	24600	17400	2.229	32200	11.0				
		3.4	7.7	80/67	26900	18300	2.265	34600	11.9				
		3.4	7.7	85/71	29300	19200	2.301	37200	12.7				
	13.3	5.8	13.3	65/55	20800	16000	1.798	26900	11.6				
		5.8	13.3	70/59	23200	16900	1.834	29500	12.6				
		5.8	13.3	75/63	25600	17800	1.870	32000	13.7				
		5.8	13.3	80/67	27900	18700	1.906	34400	14.6				
		5.8	13.3	85/71	30300	19600	1.942	36900	15.6				
110	6.7	1.5	3.5	65/55	17600	14600	2.733	26900	6.4				
		1.5	3.5	70/59	20000	15500	2.769	29500	7.2				
		1.5	3.5	75/63	22300	16400	2.805	31900	8.0				
		1.5	3.5	80/67	24700	17300	2.841	34400	8.7				
		1.5	3.5	85/71	27100	18200	2.876	36900	9.4				
	10.0	3.3	7.6	65/55	18600	14900	2.374	26700	7.8				
		3.3	7.6	70/59	21000	15800	2.410	29200	8.7				
		3.3	7.6	75/63	23300	16700	2.446	31600	9.5				
		3.3	7.6	80/67	25700	17700	2.481	34200	10.4				
		3.3	7.6	85/71	28100	18600	2.517	36700	11.2				
	13.3	5.7	13.1	65/55	19600	15300	2.015	26500	9.7				
		5.7	13.1	70/59	22000	16200	2.051	29000	10.7				
		5.7	13.1	75/63	24300	17100	2.086	31400	11.6				
		5.7	13.1	80/67	26700	18000	2.122	33900	12.6				
		5.7	13.1	85/71	29100	18900	2.158	36500	13.5				

Legend:

Btu/hr = British Thermal Units per Hour

CFM = Airflow Rate, Cubic Feet per Minute

COP = Coefficient of Performance

EAT = Entering Air Temperature

EER = Energy Efficiency Ratio

EWT = Entering Water Temperature

Ft of W.C. = Feet of Water Column

WPD = Waterside Pressure Drop

GPM = Gallons per Minute

kW = Kilowatts

LAT = Leaving Air Temperature

PSI = Pounds per Square Inch

THA = Total Heat of Absorption

THR = Total Heat of Rejection

ARQ – Size 040 (800 SCFM) – 1st Stage Low Fan

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
60	6.7	1.7	3.8	65/55	23600	16100	1.568	29000	15.1	28700	2.147	21400	3.92
		1.7	3.8	70/59	26100	17000	1.605	31600	16.3	28300	2.371	20200	3.50
		1.7	3.8	75/63	28500	17900	1.641	34100	17.4	27800	2.595	18900	3.14
		1.7	3.8	80/67	31000	18900	1.677	36700	18.5	27300	2.819	17700	2.84
		1.7	3.8	85/71	33400	19800	1.713	39200	19.5				
	10.0	3.6	8.3	65/55	24700	16400	1.207	28800	20.5	31800	2.382	23700	3.91
		3.6	8.3	70/59	27100	17400	1.243	31300	21.8	31300	2.606	22400	3.52
		3.6	8.3	75/63	29600	18300	1.279	34000	23.1	30800	2.830	21100	3.19
		3.6	8.3	80/67	32000	19200	1.315	36500	24.3	30400	3.054	20000	2.92
		3.6	8.3	85/71	34500	20200	1.351	39100	25.5				
	13.3	6.2	14.2	65/55	25700	16800	0.845	28600	30.4	34900	2.617	26000	3.91
		6.2	14.2	70/59	28100	17800	0.881	31100	31.9	34400	2.841	24700	3.55
		6.2	14.2	75/63	30600	18700	0.917	33700	33.4	33900	3.065	23400	3.24
		6.2	14.2	80/67	33000	19600	0.953	36300	34.6	33400	3.289	22200	2.98
		6.2	14.2	85/71	35500	20600	0.990	38900	35.9				
70	6.7	1.6	3.8	65/55	22300	14900	1.769	28300	12.6	32000	2.211	24500	4.24
		1.6	3.8	70/59	24800	15900	1.805	31000	13.7	31500	2.435	23200	3.79
		1.6	3.8	75/63	27200	16800	1.841	33500	14.8	31000	2.659	21900	3.42
		1.6	3.8	80/67	29700	17700	1.877	36100	15.8	30600	2.883	20800	3.11
		1.6	3.8	85/71	32100	18700	1.913	38600	16.8				
	10.0	3.5	8.1	65/55	23300	15300	1.407	28100	16.6	35100	2.446	26800	4.20
		3.5	8.1	70/59	25800	16300	1.443	30700	17.9	34600	2.670	25500	3.80
		3.5	8.1	75/63	28200	17200	1.479	33200	19.1	34100	2.894	24200	3.45
		3.5	8.1	80/67	30700	18100	1.516	35900	20.3	33600	3.118	23000	3.16
		3.5	8.1	85/71	33100	19100	1.552	38400	21.3				
	13.3	6.1	13.9	65/55	24400	15700	1.046	28000	23.3	38200	2.681	29000	4.17
		6.1	13.9	70/59	26800	16600	1.082	30500	24.8	37700	2.905	27800	3.80
		6.1	13.9	75/63	29300	17600	1.118	33100	26.2	37200	3.129	26500	3.48
		6.1	13.9	80/67	31700	18500	1.154	35600	27.5	36700	3.353	25300	3.21
		6.1	13.9	85/71	34200	19400	1.190	38300	28.7				
80	6.7	1.6	3.7	65/55	20400	13400	1.990	27200	10.3	35100	2.267	27400	4.54
		1.6	3.7	70/59	22900	14300	2.026	29800	11.3	34600	2.492	26100	4.07
		1.6	3.7	75/63	25300	15300	2.062	32300	12.3	34200	2.716	24900	3.69
		1.6	3.7	80/67	27800	16200	2.098	35000	13.3	33700	2.940	23700	3.36
		1.6	3.7	85/71	30200	17100	2.134	37500	14.2				
	10.0	3.5	7.9	65/55	21500	13800	1.628	27100	13.2	38200	2.502	29700	4.47
		3.5	7.9	70/59	23900	14700	1.664	29600	14.4	37700	2.727	28400	4.05
		3.5	7.9	75/63	26400	15700	1.701	32200	15.5	37200	2.951	27100	3.69
		3.5	7.9	80/67	28800	16600	1.737	34700	16.6	36800	3.175	26000	3.40
		3.5	7.9	85/71	31300	17500	1.773	37400	17.7				
	13.3	6.0	13.7	65/55	22500	14200	1.267	26800	17.8	41300	2.737	32000	4.42
		6.0	13.7	70/59	24900	15100	1.303	29300	19.1	40800	2.962	30700	4.04
		6.0	13.7	75/63	27400	16000	1.339	32000	20.5	40300	3.186	29400	3.71
		6.0	13.7	80/67	29800	17000	1.375	34500	21.7	39800	3.410	28200	3.42
		6.0	13.7	85/71	32300	17900	1.411	37100	22.9				

ARQ – Size 040 (800 SCFM) – 1st Stage Low Fan (Continued)

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
90	6.7	1.6	3.6	65/55	18300	11700	2.219	25900	8.2	38100	2.317	30200	4.82
		1.6	3.6	70/59	20800	12600	2.256	28500	9.2	37600	2.541	28900	4.34
		1.6	3.6	75/63	23200	13500	2.292	31000	10.1	37100	2.765	27700	3.93
		1.6	3.6	80/67	25700	14500	2.328	33600	11.0	36600	2.989	26400	3.59
		1.6	3.6	85/71	28100	15400	2.364	36200	11.9				
	10.0	3.4	7.8	65/55	19300	12100	1.858	25600	10.4	41100	2.552	32400	4.72
		3.4	7.8	70/59	21800	13000	1.894	28300	11.5	40700	2.776	31200	4.30
		3.4	7.8	75/63	24200	13900	1.930	30800	12.5	40200	3.000	30000	3.93
		3.4	7.8	80/67	26700	14900	1.966	33400	13.6	39700	3.224	28700	3.61
		3.4	7.8	85/71	29100	15800	2.002	35900	14.5				
	13.3	5.9	13.4	65/55	20400	12400	1.496	25500	13.6	44200	2.787	34700	4.65
		5.9	13.4	70/59	22800	13400	1.532	28000	14.9	43700	3.011	33400	4.25
		5.9	13.4	75/63	25300	14300	1.568	30700	16.1	43300	3.235	32300	3.92
		5.9	13.4	80/67	27700	15200	1.605	33200	17.3	42800	3.459	31000	3.63
		5.9	13.4	85/71	30200	16200	1.641	35800	18.4	Operation Not Recommended			
100	6.7	1.6	3.6	65/55	16200	10000	2.445	24500	6.6				
		1.6	3.6	70/59	18600	10900	2.481	27100	7.5				
		1.6	3.6	75/63	21100	11800	2.518	29700	8.4				
		1.6	3.6	80/67	23500	12800	2.554	32200	9.2				
		1.6	3.6	85/71	26000	13700	2.590	34800	10.0				
	10.0	3.4	7.7	65/55	17200	10300	2.084	24300	8.3				
		3.4	7.7	70/59	19700	11300	2.120	26900	9.3				
		3.4	7.7	75/63	22100	12200	2.156	29500	10.3				
		3.4	7.7	80/67	24600	13100	2.192	32100	11.2				
		3.4	7.7	85/71	27000	14100	2.228	34600	12.1				
	13.3	5.8	13.3	65/55	18200	10700	1.722	24100	10.6				
		5.8	13.3	70/59	20700	11600	1.758	26700	11.8				
		5.8	13.3	75/63	23100	12600	1.794	29200	12.9				
		5.8	13.3	80/67	25600	13500	1.830	31800	14.0				
		5.8	13.3	85/71	28000	14400	1.867	34400	15.0				
110	6.7	1.5	3.5	65/55	14300	8500	2.655	23400	5.4				
		1.5	3.5	70/59	16800	9400	2.692	26000	6.2				
		1.5	3.5	75/63	19200	10300	2.728	28500	7.0				
		1.5	3.5	80/67	21700	11300	2.764	31100	7.9				
		1.5	3.5	85/71	24100	12200	2.800	33700	8.6				
	10.0	3.3	7.6	65/55	15400	8800	2.294	23200	6.7				
		3.3	7.6	70/59	17800	9800	2.330	25800	7.6				
		3.3	7.6	75/63	20300	10700	2.366	28400	8.6				
		3.3	7.6	80/67	22700	11600	2.402	30900	9.5				
		3.3	7.6	85/71	25200	12600	2.438	33500	10.3				
	13.3	5.7	13.1	65/55	16400	9200	1.932	23000	8.5				
		5.7	13.1	70/59	18800	10100	1.968	25500	9.6				
		5.7	13.1	75/63	21300	11100	2.004	28100	10.6				
		5.7	13.1	80/67	23700	12000	2.040	30700	11.6				
		5.7	13.1	85/71	26200	12900	2.077	33300	12.6				

Legend:

Btu/hr = British Thermal Units per Hour

CFM = Airflow Rate, Cubic Feet per Minute

COP = Coefficient of Performance

EAT = Entering Air Temperature

EER = Energy Efficiency Ratio

EWT = Entering Water Temperature

Ft of W.C. = Feet of Water Column

WPD = Waterside Pressure Drop

GPM = Gallons per Minute

kW = Kilowatts

LAT = Leaving Air Temperature

PSI = Pounds per Square Inch

THA = Total Heat of Absorption

THR = Total Heat of Rejection

ARQ – Size 048 (1500 SCFM) – 2nd Stage High Fan

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
60	8.0	3.2	7.2	65/55	43300	31900	2.587	52100	16.7	50700	3.412	39100	4.35
		3.2	7.2	70/59	47200	33300	2.606	56100	18.1	50400	3.566	38200	4.14
		3.2	7.2	75/63	51200	34700	2.626	60200	19.5	50100	3.720	37400	3.95
		3.2	7.2	80/67	55100	36000	2.646	64100	20.8	49700	3.874	36500	3.76
		3.2	7.2	85/71	59000	37400	2.666	68100	22.1				
	12.0	6.9	15.6	65/55	43600	32000	2.523	52200	17.3	53400	3.608	41100	4.34
		6.9	15.6	70/59	47500	33400	2.543	56200	18.7	53000	3.762	40200	4.13
		6.9	15.6	75/63	51400	34800	2.563	60100	20.1	52700	3.916	39300	3.94
		6.9	15.6	80/67	55300	36200	2.582	64100	21.4	52300	4.070	38400	3.77
		6.9	15.6	85/71	59200	37500	2.602	68100	22.8				
	16.0	11.8	27.0	65/55	43900	32100	2.459	52300	17.9	56000	3.804	43000	4.31
		11.8	27.0	70/59	47800	33500	2.479	56300	19.3	55700	3.957	42200	4.12
		11.8	27.0	75/63	51700	34900	2.499	60200	20.7	55300	4.111	41300	3.94
		11.8	27.0	80/67	55600	36300	2.519	64200	22.1	55000	4.265	40400	3.78
		11.8	27.0	85/71	59500	37600	2.539	68200	23.4				
70	8.0	3.1	7.1	65/55	41300	31100	2.886	51100	14.3	56000	3.567	43800	4.60
		3.1	7.1	70/59	45200	32400	2.906	55100	15.6	55600	3.721	42900	4.38
		3.1	7.1	75/63	49100	33800	2.926	59100	16.8	55300	3.875	42100	4.18
		3.1	7.1	80/67	53000	35200	2.945	63100	18.0	54900	4.029	41100	3.99
		3.1	7.1	85/71	56900	36600	2.965	67000	19.2				
	12.0	6.7	15.3	65/55	41500	31200	2.822	51100	14.7	58600	3.763	45800	4.56
		6.7	15.3	70/59	45400	32600	2.842	55100	16.0	58200	3.917	44800	4.35
		6.7	15.3	75/63	49300	33900	2.862	59100	17.2	57900	4.071	44000	4.17
		6.7	15.3	80/67	53300	35300	2.882	63100	18.5	57600	4.225	43200	3.99
		6.7	15.3	85/71	57200	36700	2.902	67100	19.7				
	16.0	11.6	26.5	65/55	41800	31300	2.759	51200	15.2	61200	3.959	47700	4.53
		11.6	26.5	70/59	45700	32700	2.779	55200	16.4	60900	4.112	46900	4.34
		11.6	26.5	75/63	49600	34000	2.798	59100	17.7	60500	4.266	45900	4.16
		11.6	26.5	80/67	53500	35400	2.818	63100	19.0	60200	4.420	45100	3.99
		11.6	26.5	85/71	57400	36800	2.838	67100	20.2				
80	8.0	3.0	7.0	65/55	39100	30200	3.257	50200	12.0	61200	3.722	48500	4.82
		3.0	7.0	70/59	43000	31600	3.277	54200	13.1	60800	3.876	47600	4.60
		3.0	7.0	75/63	47000	33000	3.297	58300	14.3	60500	4.030	46700	4.40
		3.0	7.0	80/67	50900	34400	3.316	62200	15.3	60100	4.184	45800	4.21
		3.0	7.0	85/71	54800	35700	3.336	66200	16.4				
	12.0	6.6	15.0	65/55	39400	30300	3.193	50300	12.3	63800	3.918	50400	4.77
		6.6	15.0	70/59	43300	31700	3.213	54300	13.5	63500	4.072	49600	4.57
		6.6	15.0	75/63	47200	33100	3.233	58200	14.6	63100	4.226	48700	4.37
		6.6	15.0	80/67	51100	34500	3.253	62200	15.7	62800	4.380	47900	4.20
		6.6	15.0	85/71	55000	35800	3.273	66200	16.8				
	16.0	11.4	26.0	65/55	39700	30400	3.130	50400	12.7	66400	4.114	52400	4.73
		11.4	26.0	70/59	43600	31800	3.150	54400	13.8	66100	4.267	51500	4.54
		11.4	26.0	75/63	47500	33200	3.169	58300	15.0	65800	4.421	50700	4.36
		11.4	26.0	80/67	51400	34600	3.189	62300	16.1	65400	4.575	49800	4.19
		11.4	26.0	85/71	55300	36000	3.209	66300	17.2				

ARQ – Size 048 (1500 SCFM) – 2nd Stage High Fan (Continued)

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
90	8.0	3.0	6.8	65/55	37000	29400	3.700	49600	10.0	66400	3.877	53200	5.02
		3.0	6.8	70/59	40900	30800	3.720	53600	11.0	66000	4.031	52200	4.80
		3.0	6.8	75/63	44800	32100	3.739	57600	12.0	65700	4.185	51400	4.60
		3.0	6.8	80/67	48700	33500	3.759	61500	13.0	65400	4.339	50600	4.42
		3.0	6.8	85/71	52600	34900	3.779	65500	13.9				
	12.0	6.5	14.8	65/55	37200	29500	3.636	49600	10.2	69000	4.073	55100	4.96
		6.5	14.8	70/59	41100	30900	3.656	53600	11.2	68700	4.227	54300	4.76
		6.5	14.8	75/63	45000	32200	3.676	57500	12.2	68300	4.381	53300	4.57
		6.5	14.8	80/67	49000	33600	3.695	61600	13.3	68000	4.535	52500	4.39
		6.5	14.8	85/71	52900	35000	3.715	65600	14.2				
	16.0	11.2	25.5	65/55	37500	29600	3.572	49700	10.5	71700	4.269	57100	4.92
		11.2	25.5	70/59	41400	31000	3.592	53700	11.5	71300	4.422	56200	4.72
		11.2	25.5	75/63	45300	32400	3.612	57600	12.5	71000	4.576	55400	4.55
		11.2	25.5	80/67	49200	33700	3.632	61600	13.5	70600	4.730	54500	4.37
		11.2	25.5	85/71	53100	35100	3.652	65600	14.5	Operation Not Recommended			
100	8.0	3.0	6.7	65/55	34700	28500	4.214	49100	8.2				
		3.0	6.7	70/59	38600	29900	4.234	53100	9.1				
		3.0	6.7	75/63	42500	31300	4.254	57000	10.0				
		3.0	6.7	80/67	46500	32700	4.273	61100	10.9				
		3.0	6.7	85/71	50400	34100	4.293	65100	11.7				
	12.0	6.4	14.6	65/55	35000	28700	4.150	49200	8.4				
		6.4	14.6	70/59	38900	30000	4.170	53100	9.3				
		6.4	14.6	75/63	42800	31400	4.190	57100	10.2				
		6.4	14.6	80/67	46700	32800	4.210	61100	11.1				
		6.4	14.6	85/71	50600	34200	4.230	65000	12.0				
	16.0	11.0	25.2	65/55	35300	28800	4.087	49200	8.6				
		11.0	25.2	70/59	39200	30100	4.107	53200	9.5				
		11.0	25.2	75/63	43100	31500	4.126	57200	10.4				
		11.0	25.2	80/67	47000	32900	4.146	61200	11.3				
		11.0	25.2	85/71	50900	34300	4.166	65100	12.2				
110	8.0	2.9	6.7	65/55	32400	27700	4.800	48800	6.8				
		2.9	6.7	70/59	36400	29100	4.820	52900	7.6				
		2.9	6.7	75/63	40300	30500	4.840	56800	8.3				
		2.9	6.7	80/67	44200	31800	4.860	60800	9.1				
		2.9	6.7	85/71	48100	33200	4.879	64800	9.9				
	12.0	6.3	14.4	65/55	32700	27800	4.737	48900	6.9				
		6.3	14.4	70/59	36600	29200	4.756	52800	7.7				
		6.3	14.4	75/63	40500	30600	4.776	56800	8.5				
		6.3	14.4	80/67	44400	31900	4.796	60800	9.3				
		6.3	14.4	85/71	48400	33300	4.816	64800	10.0				
	16.0	10.9	24.9	65/55	33000	27900	4.673	48900	7.1				
		10.9	24.9	70/59	36900	29300	4.693	52900	7.9				
		10.9	24.9	75/63	40800	30700	4.713	56900	8.7				
		10.9	24.9	80/67	44700	32100	4.732	60900	9.4				
		10.9	24.9	85/71	48600	33400	4.752	64800	10.2				

Legend:

Btu/hr = British Thermal Units per Hour

CFM = Airflow Rate, Cubic Feet per Minute

COP = Coefficient of Performance

EAT = Entering Air Temperature

EER = Energy Efficiency Ratio

EWT = Entering Water Temperature

Ft of W.C. = Feet of Water Column

WPD = Waterside Pressure Drop

GPM = Gallons per Minute

kW = Kilowatts

LAT = Leaving Air Temperature

PSI = Pounds per Square Inch

THA = Total Heat of Absorption

THR = Total Heat of Rejection

ARQ – Size 048 (1050 SCFM) – 1st Stage Medium Fan

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
60	8.0	3.2	7.2	65/55	30300	21600	1.694	36100	17.9	33700	2.401	25500	4.11
		3.2	7.2	70/59	33400	22700	1.714	39200	19.5	33400	2.555	24700	3.83
		3.2	7.2	75/63	36600	23800	1.735	42500	21.1	33000	2.710	23800	3.57
		3.2	7.2	80/67	39800	24900	1.755	45800	22.7	32700	2.865	22900	3.34
		3.2	7.2	85/71	42900	25900	1.776	49000	24.2				
	12.0	6.9	15.6	65/55	30500	21700	1.628	36100	18.7	36000	2.448	27600	4.31
		6.9	15.6	70/59	33700	22800	1.649	39300	20.4	35600	2.602	26700	4.01
		6.9	15.6	75/63	36900	23900	1.669	42600	22.1	35300	2.757	25900	3.75
		6.9	15.6	80/67	40000	25000	1.690	45800	23.7	35000	2.911	25100	3.52
		6.9	15.6	85/71	43200	26100	1.710	49000	25.3				
	16.0	11.8	27.0	65/55	30800	21800	1.562	36100	19.7	38300	2.494	29800	4.50
		11.8	27.0	70/59	34000	22900	1.583	39400	21.5	37900	2.649	28900	4.19
		11.8	27.0	75/63	37100	24000	1.603	42600	23.1	37600	2.804	28000	3.93
		11.8	27.0	80/67	40300	25100	1.624	45800	24.8	37300	2.958	27200	3.69
		11.8	27.0	85/71	43500	26200	1.644	49100	26.5				
70	8.0	3.1	7.1	65/55	28600	20500	1.909	35100	15.0	37100	2.451	28700	4.44
		3.1	7.1	70/59	31800	21600	1.930	38400	16.5	36700	2.605	27800	4.13
		3.1	7.1	75/63	34900	22700	1.950	41600	17.9	36400	2.760	27000	3.86
		3.1	7.1	80/67	38100	23800	1.971	44800	19.3	36100	2.915	26200	3.63
		3.1	7.1	85/71	41300	24900	1.991	48100	20.7				
	12.0	6.7	15.3	65/55	28900	20600	1.843	35200	15.7	39400	2.498	30900	4.62
		6.7	15.3	70/59	32000	21700	1.864	38400	17.2	39000	2.652	29900	4.31
		6.7	15.3	75/63	35200	22800	1.884	41600	18.7	38700	2.807	29100	4.04
		6.7	15.3	80/67	38400	23900	1.905	44900	20.2	38400	2.962	28300	3.80
		6.7	15.3	85/71	41500	25000	1.925	48100	21.6				
	16.0	11.6	26.5	65/55	29100	20700	1.778	35200	16.4	41600	2.544	32900	4.79
		11.6	26.5	70/59	32300	21800	1.798	38400	18.0	41300	2.699	32100	4.48
		11.6	26.5	75/63	35500	22900	1.819	41700	19.5	41000	2.854	31300	4.21
		11.6	26.5	80/67	38600	24000	1.839	44900	21.0	40600	3.008	30300	3.95
		11.6	26.5	85/71	41800	25100	1.860	48100	22.5				
80	8.0	3.0	7.0	65/55	26900	19800	2.185	34400	12.3	40500	2.501	32000	4.74
		3.0	7.0	70/59	30100	20900	2.205	37600	13.7	40100	2.656	31000	4.42
		3.0	7.0	75/63	33200	22000	2.226	40800	14.9	39800	2.810	30200	4.15
		3.0	7.0	80/67	36400	23100	2.246	44100	16.2	39500	2.965	29400	3.90
		3.0	7.0	85/71	39600	24200	2.267	47300	17.5				
	12.0	6.6	15.0	65/55	27200	19900	2.119	34400	12.8	42700	2.548	34000	4.91
		6.6	15.0	70/59	30300	21000	2.140	37600	14.2	42400	2.702	33200	4.60
		6.6	15.0	75/63	33500	22100	2.160	40900	15.5	42100	2.857	32300	4.32
		6.6	15.0	80/67	36700	23200	2.181	44100	16.8	41700	3.012	31400	4.06
		6.6	15.0	85/71	39800	24300	2.201	47300	18.1				
	16.0	11.4	26.0	65/55	27400	20000	2.053	34400	13.3	45000	2.595	36100	5.08
		11.4	26.0	70/59	30600	21100	2.074	37700	14.8	44700	2.749	35300	4.76
		11.4	26.0	75/63	33800	22200	2.094	40900	16.1	44400	2.904	34500	4.48
		11.4	26.0	80/67	36900	23300	2.115	44100	17.4	44000	3.059	33600	4.21
		11.4	26.0	85/71	40100	24400	2.135	47400	18.8				

ARQ – Size 048 (1050 SCFM) – 1st Stage Medium Fan (Continued)

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
90	8.0	3.0	6.8	65/55	25200	19500	2.541	33900	9.9	43800	2.551	35100	5.03
		3.0	6.8	70/59	28400	20500	2.561	37100	11.1	43500	2.706	34300	4.71
		3.0	6.8	75/63	31500	21600	2.582	40300	12.2	43200	2.860	33400	4.43
		3.0	6.8	80/67	34700	22700	2.602	43600	13.3	42800	3.015	32500	4.16
		3.0	6.8	85/71	37900	23800	2.623	46900	14.4				
	12.0	6.5	14.8	65/55	25500	19600	2.475	33900	10.3	46100	2.598	37200	5.20
		6.5	14.8	70/59	28600	20700	2.496	37100	11.5	45800	2.753	36400	4.87
		6.5	14.8	75/63	31800	21800	2.516	40400	12.6	45500	2.907	35600	4.59
		6.5	14.8	80/67	35000	22900	2.537	43700	13.8	45100	3.062	34600	4.32
		6.5	14.8	85/71	38100	23900	2.557	46800	14.9				
	16.0	11.2	25.5	65/55	25700	19700	2.409	33900	10.7	48400	2.645	39400	5.36
		11.2	25.5	70/59	28900	20800	2.430	37200	11.9	48100	2.799	38500	5.04
		11.2	25.5	75/63	32100	21900	2.450	40500	13.1	47700	2.954	37600	4.73
		11.2	25.5	80/67	35200	23000	2.471	43600	14.2	47400	3.109	36800	4.47
		11.2	25.5	85/71	38400	24100	2.491	46900	15.4	Operation Not Recommended			
100	8.0	3.0	6.7	65/55	23500	19500	2.997	33700	7.8				
		3.0	6.7	70/59	26700	20600	3.017	37000	8.8				
		3.0	6.7	75/63	29800	21600	3.038	40200	9.8				
		3.0	6.7	80/67	33000	22700	3.058	43400	10.8				
		3.0	6.7	85/71	36200	23800	3.079	46700	11.8				
	12.0	6.4	14.6	65/55	23800	19600	2.931	33800	8.1				
		6.4	14.6	70/59	26900	20700	2.951	37000	9.1				
		6.4	14.6	75/63	30100	21800	2.972	40200	10.1				
		6.4	14.6	80/67	33300	22900	2.992	43500	11.1				
		6.4	14.6	85/71	36400	23900	3.013	46700	12.1				
	16.0	11.0	25.2	65/55	24000	19700	2.865	33800	8.4				
		11.0	25.2	70/59	27200	20800	2.886	37000	9.4				
		11.0	25.2	75/63	30400	21900	2.906	40300	10.5				
		11.0	25.2	80/67	33500	23000	2.927	43500	11.4				
		11.0	25.2	85/71	36700	24100	2.947	46800	12.5				
110	8.0	2.9	6.7	65/55	21900	19800	3.572	34100	6.1				
		2.9	6.7	70/59	25000	20900	3.593	37300	7.0				
		2.9	6.7	75/63	28200	22000	3.613	40500	7.8				
		2.9	6.7	80/67	31400	23100	3.634	43800	8.6				
		2.9	6.7	85/71	34500	24200	3.654	47000	9.4				
	12.0	6.3	14.4	65/55	22100	19900	3.507	34100	6.3				
		6.3	14.4	70/59	25300	21000	3.527	37300	7.2				
		6.3	14.4	75/63	28500	22100	3.547	40600	8.0				
		6.3	14.4	80/67	31600	23200	3.568	43800	8.9				
		6.3	14.4	85/71	34800	24300	3.588	47000	9.7				
	16.0	10.9	24.9	65/55	22400	20000	3.441	34100	6.5				
		10.9	24.9	70/59	25600	21100	3.461	37400	7.4				
		10.9	24.9	75/63	28700	22200	3.482	40600	8.2				
		10.9	24.9	80/67	31900	23300	3.502	43900	9.1				
		10.9	24.9	85/71	35100	24400	3.523	47100	10.0				

Legend:

Btu/hr = British Thermal Units per Hour

CFM = Airflow Rate, Cubic Feet per Minute

COP = Coefficient of Performance

EAT = Entering Air Temperature

EER = Energy Efficiency Ratio

EWT = Entering Water Temperature

Ft of W.C. = Feet of Water Column

WPD = Waterside Pressure Drop

GPM = Gallons per Minute

kW = Kilowatts

LAT = Leaving Air Temperature

PSI = Pounds per Square Inch

THA = Total Heat of Absorption

THR = Total Heat of Rejection

ARQ – Size 048 (850 SCFM) – 1st Stage Low Fan

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
60	8.0	3.2	7.2	65/55	28300	20100	1.657	34000	17.1	33800	2.487	25300	3.98
		3.2	7.2	70/59	31400	21100	1.678	37100	18.7	33500	2.640	24500	3.72
		3.2	7.2	75/63	34600	22100	1.698	40400	20.4	33100	2.793	23600	3.47
		3.2	7.2	80/67	37700	23200	1.718	43600	21.9	32700	2.946	22600	3.25
		3.2	7.2	85/71	40900	24200	1.739	46800	23.5				
	12.0	6.9	15.6	65/55	28500	20200	1.592	33900	17.9	36400	2.533	27800	4.21
		6.9	15.6	70/59	31700	21200	1.612	37200	19.7	36000	2.686	26800	3.93
		6.9	15.6	75/63	34800	22300	1.633	40400	21.3	35700	2.839	26000	3.68
		6.9	15.6	80/67	38000	23300	1.653	43600	23.0	35300	2.993	25100	3.46
		6.9	15.6	85/71	41200	24300	1.673	46900	24.6				
	16.0	11.8	27.0	65/55	28800	20300	1.526	34000	18.9	39000	2.579	30200	4.43
		11.8	27.0	70/59	32000	21300	1.547	37300	20.7	38600	2.733	29300	4.14
		11.8	27.0	75/63	35100	22400	1.567	40400	22.4	38200	2.886	28400	3.88
		11.8	27.0	80/67	38300	23400	1.587	43700	24.1	37800	3.039	27400	3.64
		11.8	27.0	85/71	41400	24400	1.608	46900	25.7				
70	8.0	3.1	7.1	65/55	26700	19500	1.863	33100	14.3	38400	2.555	29700	4.40
		3.1	7.1	70/59	29800	20500	1.883	36200	15.8	38000	2.708	28800	4.11
		3.1	7.1	75/63	33000	21500	1.903	39500	17.3	37600	2.861	27800	3.85
		3.1	7.1	80/67	36200	22600	1.924	42800	18.8	37300	3.014	27000	3.63
		3.1	7.1	85/71	39300	23600	1.944	45900	20.2				
	12.0	6.7	15.3	65/55	27000	19600	1.797	33100	15.0	40900	2.601	32000	4.61
		6.7	15.3	70/59	30100	20600	1.818	36300	16.6	40600	2.754	31200	4.32
		6.7	15.3	75/63	33300	21600	1.838	39600	18.1	40200	2.907	30300	4.05
		6.7	15.3	80/67	36400	22700	1.858	42700	19.6	39800	3.060	29400	3.81
		6.7	15.3	85/71	39600	23700	1.879	46000	21.1				
	16.0	11.6	26.5	65/55	27200	19700	1.732	33100	15.7	43500	2.647	34500	4.82
		11.6	26.5	70/59	30400	20700	1.752	36400	17.4	43100	2.800	33500	4.51
		11.6	26.5	75/63	33500	21700	1.772	39500	18.9	42800	2.954	32700	4.25
		11.6	26.5	80/67	36700	22800	1.793	42800	20.5	42400	3.107	31800	4.00
		11.6	26.5	85/71	39800	23800	1.813	46000	22.0				
80	8.0	3.0	7.0	65/55	25100	18800	2.153	32400	11.7	42900	2.622	34000	4.79
		3.0	7.0	70/59	28300	19900	2.174	35700	13.0	42600	2.775	33100	4.50
		3.0	7.0	75/63	31400	20900	2.194	38900	14.3	42200	2.929	32200	4.22
		3.0	7.0	80/67	34600	21900	2.214	42200	15.6	41800	3.082	31300	3.97
		3.0	7.0	85/71	37700	23000	2.235	45300	16.9				
	12.0	6.6	15.0	65/55	25400	18900	2.088	32500	12.2	45500	2.669	36400	4.99
		6.6	15.0	70/59	28500	20000	2.108	35700	13.5	45100	2.822	35500	4.68
		6.6	15.0	75/63	31700	21000	2.128	39000	14.9	44700	2.975	34500	4.40
		6.6	15.0	80/67	34800	22000	2.149	42100	16.2	44400	3.128	33700	4.16
		6.6	15.0	85/71	38000	23100	2.169	45400	17.5				
	16.0	11.4	26.0	65/55	25600	19000	2.022	32500	12.7	48000	2.715	38700	5.18
		11.4	26.0	70/59	28800	20100	2.043	35800	14.1	47700	2.868	37900	4.87
		11.4	26.0	75/63	31900	21100	2.063	38900	15.5	47300	3.021	37000	4.59
		11.4	26.0	80/67	35100	22100	2.083	42200	16.9	46900	3.175	36100	4.33
		11.4	26.0	85/71	38300	23200	2.104	45500	18.2				

ARQ – Size 048 (850 SCFM) – 1st Stage Low Fan (Continued)

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
90	8.0	3.0	6.8	65/55	23500	18200	2.529	32100	9.3	47500	2.690	38300	5.17
		3.0	6.8	70/59	26700	19200	2.549	35400	10.5	47100	2.843	37400	4.85
		3.0	6.8	75/63	29800	20300	2.569	38600	11.6	46700	2.996	36500	4.57
		3.0	6.8	80/67	33000	21300	2.590	41800	12.7	46300	3.150	35500	4.31
		3.0	6.8	85/71	36100	22300	2.610	45000	13.8				
	12.0	6.5	14.8	65/55	23800	18300	2.463	32200	9.7	50000	2.736	40700	5.35
		6.5	14.8	70/59	26900	19300	2.483	35400	10.8	49700	2.890	39800	5.04
		6.5	14.8	75/63	30100	20400	2.504	38600	12.0	49300	3.043	38900	4.75
		6.5	14.8	80/67	33200	21400	2.524	41800	13.2	48900	3.196	38000	4.48
		6.5	14.8	85/71	36400	22400	2.545	45100	14.3				
	16.0	11.2	25.5	65/55	24100	18400	2.398	32300	10.1	52600	2.783	43100	5.54
		11.2	25.5	70/59	27200	19500	2.418	35500	11.2	52200	2.936	42200	5.21
		11.2	25.5	75/63	30400	20500	2.438	38700	12.5	51800	3.089	41300	4.91
		11.2	25.5	80/67	33500	21500	2.459	41900	13.6	51500	3.242	40400	4.65
		11.2	25.5	85/71	36700	22600	2.479	45200	14.8	Operation Not Recommended			
100	8.0	3.0	6.7	65/55	21900	17600	2.989	32100	7.3				
		3.0	6.7	70/59	25100	18600	3.009	35400	8.3				
		3.0	6.7	75/63	28200	19700	3.030	38500	9.3				
		3.0	6.7	80/67	31400	20700	3.050	41800	10.3				
		3.0	6.7	85/71	34600	21700	3.071	45100	11.3				
	12.0	6.4	14.6	65/55	22200	17700	2.924	32200	7.6				
		6.4	14.6	70/59	25400	18700	2.944	35400	8.6				
		6.4	14.6	75/63	28500	19800	2.964	38600	9.6				
		6.4	14.6	80/67	31700	20800	2.985	41900	10.6				
		6.4	14.6	85/71	34800	21800	3.005	45100	11.6				
	16.0	11.0	25.2	65/55	22500	17800	2.858	32300	7.9				
		11.0	25.2	70/59	25600	18800	2.878	35400	8.9				
		11.0	25.2	75/63	28800	19900	2.899	38700	9.9				
		11.0	25.2	80/67	31900	20900	2.919	41900	10.9				
		11.0	25.2	85/71	35100	21900	2.940	45100	11.9				
110	8.0	2.9	6.7	65/55	20400	17000	3.534	32500	5.8				
		2.9	6.7	70/59	23500	18000	3.555	35600	6.6				
		2.9	6.7	75/63	26700	19000	3.575	38900	7.5				
		2.9	6.7	80/67	29800	20100	3.596	42100	8.3				
		2.9	6.7	85/71	33000	21100	3.616	45300	9.1				
	12.0	6.3	14.4	65/55	20600	17100	3.469	32400	5.9				
		6.3	14.4	70/59	23800	18100	3.489	35700	6.8				
		6.3	14.4	75/63	26900	19100	3.510	38900	7.7				
		6.3	14.4	80/67	30100	20200	3.530	42100	8.5				
		6.3	14.4	85/71	33200	21200	3.551	45300	9.3				
	16.0	10.9	24.9	65/55	20900	17200	3.404	32500	6.1				
		10.9	24.9	70/59	24000	18200	3.424	35700	7.0				
		10.9	24.9	75/63	27200	19200	3.444	39000	7.9				
		10.9	24.9	80/67	30300	20300	3.465	42100	8.7				
		10.9	24.9	85/71	33500	21300	3.485	45400	9.6				

Legend:

Btu/hr = British Thermal Units per Hour

CFM = Airflow Rate, Cubic Feet per Minute

COP = Coefficient of Performance

EAT = Entering Air Temperature

EER = Energy Efficiency Ratio

EWT = Entering Water Temperature

Ft of W.C. = Feet of Water Column

WPD = Waterside Pressure Drop

GPM = Gallons per Minute

kW = Kilowatts

LAT = Leaving Air Temperature

PSI = Pounds per Square Inch

THA = Total Heat of Absorption

THR = Total Heat of Rejection

GRQ – Size 024 (1000 SCFM) – 2nd Stage High Fan

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
20	4.0	0.4	0.8	65/55	Operation Not Recommended					12700	1.299	8300	2.86
		0.4	0.8	70/59						12600	1.373	7900	2.69
		0.4	0.8	75/63						12400	1.446	7500	2.51
		0.4	0.8	80/67						12200	1.520	7000	2.35
		0.4	0.8	85/71									
	6.0	0.8	1.8	65/55						13400	1.346	8800	2.92
		0.8	1.8	70/59						13200	1.420	8400	2.72
		0.8	1.8	75/63						13000	1.493	7900	2.55
		0.8	1.8	80/67						12900	1.567	7600	2.41
		0.8	1.8	85/71									
	8.0	1.4	3.1	65/55						14000	1.393	9200	2.94
		1.4	3.1	70/59						13900	1.466	8900	2.78
		1.4	3.1	75/63						13700	1.540	8400	2.61
		1.4	3.1	80/67						13500	1.614	8000	2.45
		1.4	3.1	85/71									
30	4.0	0.3	0.8	65/55						15800	1.368	11100	3.38
		0.3	0.8	70/59	22100	16100	1.072	25800	20.6	15600	1.442	10700	3.17
		0.3	0.8	75/63	23500	16700	1.085	27200	21.7	15400	1.516	10200	2.98
		0.3	0.8	80/67	25000	17400	1.098	28700	22.8	15300	1.589	9900	2.82
		0.3	0.8	85/71	26400	18000	1.111	30200	23.8				
	6.0	0.8	1.7	65/55	20900	15600	0.980	24200	21.3	16400	1.415	11600	3.40
		0.8	1.7	70/59	22300	16200	0.993	25700	22.5	16300	1.489	11200	3.21
		0.8	1.7	75/63	23800	16800	1.006	27200	23.7	16100	1.563	10800	3.02
		0.8	1.7	80/67	25200	17400	1.019	28700	24.7	15900	1.636	10300	2.85
		0.8	1.7	85/71	26600	18100	1.032	30100	25.8				
	8.0	1.3	3.0	65/55	21100	15700	0.901	24200	23.4	17100	1.462	12100	3.43
		1.3	3.0	70/59	22600	16300	0.914	25700	24.7	16900	1.536	11700	3.22
		1.3	3.0	75/63	24000	16900	0.927	27200	25.9	16700	1.609	11200	3.04
		1.3	3.0	80/67	25400	17500	0.940	28600	27.0	16600	1.683	10900	2.89
		1.3	3.0	85/71	26900	18200	0.953	30200	28.2				
40	4.0	0.3	0.8	65/55	21800	16900	1.145	25700	19.0	18800	1.436	13900	3.84
		0.3	0.8	70/59	23200	17500	1.158	27200	20.0	18600	1.509	13400	3.61
		0.3	0.8	75/63	24700	18100	1.171	28700	21.1	18500	1.583	13100	3.42
		0.3	0.8	80/67	26100	18700	1.184	30100	22.0	18300	1.657	12600	3.24
		0.3	0.8	85/71	27500	19300	1.197	31600	23.0				
	6.0	0.7	1.7	65/55	22000	16900	1.066	25600	20.6	19500	1.483	14400	3.85
		0.7	1.7	70/59	23500	17600	1.079	27200	21.8	19300	1.556	14000	3.63
		0.7	1.7	75/63	24900	18200	1.092	28600	22.8	19100	1.630	13500	3.43
		0.7	1.7	80/67	26300	18800	1.105	30100	23.8	19000	1.704	13200	3.27
		0.7	1.7	85/71	27800	19400	1.118	31600	24.9				
	8.0	1.3	3.0	65/55	22300	17000	0.987	25700	22.6	20100	1.529	14900	3.85
		1.3	3.0	70/59	23700	17700	1.000	27100	23.7	19900	1.603	14400	3.64
		1.3	3.0	75/63	25100	18300	1.013	28600	24.8	19800	1.677	14100	3.46
		1.3	3.0	80/67	26600	18900	1.026	30100	25.9	19600	1.751	13600	3.28
		1.3	3.0	85/71	28000	19500	1.039	31500	26.9				
50	4.0	0.3	0.7	65/55	22100	17200	1.250	26400	17.7	21700	1.501	16600	4.24
		0.3	0.7	70/59	23500	17800	1.263	27800	18.6	21600	1.575	16200	4.02
		0.3	0.7	75/63	25000	18400	1.276	29400	19.6	21400	1.649	15800	3.80
		0.3	0.7	80/67	26400	19000	1.289	30800	20.5	21200	1.722	15300	3.61
		0.3	0.7	85/71	27800	19700	1.302	32200	21.4				
	6.0	0.7	1.6	65/55	22400	17200	1.171	26400	19.1	22400	1.548	17100	4.24
		0.7	1.6	70/59	23800	17900	1.184	27800	20.1	22200	1.622	16700	4.01
		0.7	1.6	75/63	25200	18500	1.197	29300	21.1	22000	1.696	16200	3.80
		0.7	1.6	80/67	26600	19100	1.210	30700	22.0	21900	1.769	15900	3.63
		0.7	1.6	85/71	28100	19700	1.223	32300	23.0				
	8.0	1.3	2.9	65/55	22600	17300	1.092	26300	20.7	23000	1.595	17600	4.23
		1.3	2.9	70/59	24000	18000	1.105	27800	21.7	22900	1.669	17200	4.02
		1.3	2.9	75/63	25400	18600	1.118	29200	22.7	22700	1.742	16800	3.82
		1.3	2.9	80/67	26900	19200	1.131	30800	23.8	22500	1.816	16300	3.63
		1.3	2.9	85/71	28300	19800	1.144	32200	24.7				
60	4.0	0.3	0.7	65/55	21800	16900	1.372	26500	15.9	24500	1.565	19200	4.59
		0.3	0.7	70/59	23200	17500	1.385	27900	16.8	24300	1.639	18700	4.34
		0.3	0.7	75/63	24600	18100	1.398	29400	17.6	24100	1.712	18300	4.12
		0.3	0.7	80/67	26100	18700	1.411	30900	18.5	24000	1.786	17900	3.94
		0.3	0.7	85/71	27500	19400	1.424	32400	19.3				
	6.0	0.7	1.6	65/55	22000	16900	1.293	26400	17.0	25100	1.612	19600	4.56
		0.7	1.6	70/59	23400	17600	1.306	27900	17.9	25000	1.685	19200	4.35
		0.7	1.6	75/63	24900	18200	1.319	29400	18.9	24800	1.759	18800	4.13
		0.7	1.6	80/67	26300	18800	1.332	30800	19.7	24600	1.833	18300	3.93
		0.7	1.6	85/71	27700	19400	1.345	32300	20.6				
	8.0	1.2	2.8	65/55	22200	17000	1.214	26300	18.3	25800	1.659	20100	4.56
		1.2	2.8	70/59	23700	17700	1.227	27900	19.3	25600	1.732	19700	4.33
		1.2	2.8	75/63	25100	18300	1.240	29300	20.2	25400	1.806	19200	4.12
		1.2	2.8	80/67	26500	18900	1.253	30800	21.1	25300	1.880	18900	3.94
		1.2	2.8	85/71	28000	19500	1.266	32300	22.1				

GRQ – Size 024 (1000 SCFM) – 2nd Stage High Fan (Continued)

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
70	4.0	0.3	0.7	65/55	21000	16300	1.512	26200	13.9	27000	1.627	21400	4.86
		0.3	0.7	70/59	22400	16900	1.525	27600	14.7	26900	1.700	21100	4.64
		0.3	0.7	75/63	23800	17600	1.538	29000	15.5	26700	1.774	20600	4.41
		0.3	0.7	80/67	25200	18200	1.551	30500	16.2	26500	1.848	20200	4.20
		0.3	0.7	85/71	26700	18800	1.564	32000	17.1				
	6.0	0.7	1.6	65/55	21200	16400	1.433	26100	14.8	27700	1.673	22000	4.85
		0.7	1.6	70/59	22600	17000	1.446	27500	15.6	27500	1.747	21500	4.61
		0.7	1.6	75/63	24000	17600	1.459	29000	16.4	27400	1.821	21200	4.41
		0.7	1.6	80/67	25500	18300	1.472	30500	17.3	27200	1.895	20700	4.21
		0.7	1.6	85/71	26900	18900	1.485	32000	18.1				
	8.0	1.2	2.7	65/55	21400	16500	1.355	26000	15.8	28300	1.720	22400	4.82
		1.2	2.7	70/59	22900	17100	1.368	27600	16.7	28200	1.794	22100	4.61
		1.2	2.7	75/63	24300	17700	1.381	29000	17.6	28000	1.868	21600	4.39
		1.2	2.7	80/67	25700	18400	1.394	30500	18.4	27800	1.941	21200	4.20
		1.2	2.7	85/71	27100	19000	1.407	31900	19.3				
80	4.0	0.3	0.7	65/55	19800	15700	1.671	25500	11.8	29400	1.686	23600	5.11
		0.3	0.7	70/59	21300	16400	1.684	27000	12.6	29200	1.760	23200	4.86
		0.3	0.7	75/63	22700	17000	1.697	28500	13.4	29100	1.834	22800	4.65
		0.3	0.7	80/67	24100	17600	1.710	29900	14.1	28900	1.908	22400	4.44
		0.3	0.7	85/71	25500	18200	1.723	31400	14.8				
	6.0	0.7	1.5	65/55	20100	15800	1.592	25500	12.6	30100	1.733	24200	5.09
		0.7	1.5	70/59	21500	16500	1.605	27000	13.4	29900	1.807	23700	4.85
		0.7	1.5	75/63	22900	17100	1.618	28400	14.2	29700	1.881	23300	4.63
		0.7	1.5	80/67	24300	17700	1.631	29900	14.9	29600	1.954	22900	4.44
		0.7	1.5	85/71	25800	18300	1.644	31400	15.7				
	8.0	1.2	2.7	65/55	20300	15900	1.513	25500	13.4	30700	1.780	24600	5.05
		1.2	2.7	70/59	21700	16500	1.526	26900	14.2	30600	1.854	24300	4.84
		1.2	2.7	75/63	23100	17200	1.539	28400	15.0	30400	1.928	23800	4.62
		1.2	2.7	80/67	24600	17800	1.552	29900	15.9	30200	2.001	23400	4.42
		1.2	2.7	85/71	26000	18400	1.565	31300	16.6				
90	4.0	0.3	0.7	65/55	18600	15300	1.847	24900	10.1	31700	1.744	25700	5.33
		0.3	0.7	70/59	20000	15900	1.860	26300	10.8	31500	1.818	25300	5.08
		0.3	0.7	75/63	21400	16600	1.873	27800	11.4	31300	1.892	24800	4.85
		0.3	0.7	80/67	22800	17200	1.886	29200	12.1	31100	1.965	24400	4.64
		0.3	0.7	85/71	24300	17800	1.899	30800	12.8				
	6.0	0.7	1.5	65/55	18800	15400	1.768	24800	10.6	32300	1.791	26200	5.28
		0.7	1.5	70/59	20200	16000	1.781	26300	11.3	32100	1.865	25700	5.04
		0.7	1.5	75/63	21700	16600	1.794	27800	12.1	32000	1.939	25400	4.84
		0.7	1.5	80/67	23100	17300	1.807	29300	12.8	31800	2.012	24900	4.63
		0.7	1.5	85/71	24500	17900	1.820	30700	13.5				
	8.0	1.2	2.7	65/55	19000	15500	1.689	24800	11.2	33000	1.838	26700	5.26
		1.2	2.7	70/59	20500	16100	1.702	26300	12.0	32800	1.912	26300	5.03
		1.2	2.7	75/63	21900	16700	1.715	27800	12.8	32600	1.985	25800	4.81
		1.2	2.7	80/67	23300	17400	1.728	29200	13.5	32400	2.059	25400	4.61
		1.2	2.7	85/71	24700	18000	1.741	30600	14.2	Operation Not Recommended			
100	4.0	0.3	0.7	65/55	17300	15100	2.041	24300	8.5				
		0.3	0.7	70/59	18800	15700	2.054	25800	9.2				
		0.3	0.7	75/63	20200	16300	2.067	27300	9.8				
		0.3	0.7	80/67	21600	16900	2.080	28700	10.4				
		0.3	0.7	85/71	23000	17500	2.093	30100	11.0				
	6.0	0.7	1.5	65/55	17600	15100	1.963	24300	9.0				
		0.7	1.5	70/59	19000	15800	1.976	25700	9.6				
		0.7	1.5	75/63	20400	16400	1.989	27200	10.3				
		0.7	1.5	80/67	21900	17000	2.002	28700	10.9				
		0.7	1.5	85/71	23300	17600	2.015	30200	11.6				
	8.0	1.1	2.6	65/55	17800	15200	1.884	24200	9.4				
		1.1	2.6	70/59	19200	15900	1.897	25700	10.1				
		1.1	2.6	75/63	20700	16500	1.910	27200	10.8				
		1.1	2.6	80/67	22100	17100	1.923	28700	11.5				
		1.1	2.6	85/71	23500	17700	1.936	30100	12.1				
110	4.0	0.3	0.7	65/55	16300	14900	2.254	24000	7.2				
		0.3	0.7	70/59	17800	15500	2.267	25500	7.9				
		0.3	0.7	75/63	19200	16100	2.280	27000	8.4				
		0.3	0.7	80/67	20600	16800	2.293	28400	9.0				
		0.3	0.7	85/71	22000	17400	2.306	29900	9.5				
	6.0	0.6	1.5	65/55	16600	15000	2.175	24000	7.6				
		0.6	1.5	70/59	18000	15600	2.188	25500	8.2				
		0.6	1.5	75/63	19400	16200	2.201	26900	8.8				
		0.6	1.5	80/67	20800	16900	2.214	28400	9.4				
		0.6	1.5	85/71	22300	17500	2.227	29900	10.0				
	8.0	1.1	2.6	65/55	16800	15100	2.096	24000	8.0				
		1.1	2.6	70/59	18200	15700	2.109	25400	8.6				
		1.1	2.6	75/63	19700	16300	2.122	26900	9.3				
		1.1	2.6	80/67	21100	16900	2.135	28400	9.9				
		1.1	2.6	85/71	22500	17600	2.148	29800	10.5				

GRQ – Size 024 (750 SCFM) – 1st Stage Medium Fan

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
20	4.0	0.4	0.8	65/55	Operation Not Recommended					8800	0.995	5400	2.59
		0.4	0.8	70/59						8600	1.069	5000	2.36
		0.4	0.8	75/63						8400	1.143	4500	2.15
		0.4	0.8	80/67						8300	1.217	4100	2.00
		0.4	0.8	85/71									
	6.0	0.8	1.8	65/55						9300	1.006	5900	2.71
		0.8	1.8	70/59						9200	1.080	5500	2.50
		0.8	1.8	75/63						9000	1.154	5100	2.29
		0.8	1.8	80/67						8800	1.228	4600	2.10
		0.8	1.8	85/71									
	8.0	1.4	3.1	65/55						9900	1.017	6400	2.85
		1.4	3.1	70/59						9700	1.091	6000	2.61
		1.4	3.1	75/63						9600	1.165	5600	2.41
		1.4	3.1	80/67						9400	1.239	5200	2.22
		1.4	3.1	85/71									
30	4.0	0.3	0.8	65/55						10400	1.017	6900	3.00
		0.3	0.8	70/59	17500	13400	0.680	19800	25.7	10200	1.091	6500	2.74
		0.3	0.8	75/63	18900	14000	0.693	21300	27.3	10000	1.165	6000	2.51
		0.3	0.8	80/67	20300	14600	0.706	22700	28.8	9900	1.239	5700	2.34
		0.3	0.8	85/71	21700	15200	0.718	24200	30.2				
	6.0	0.8	1.7	65/55	16300	12800	0.589	18300	27.7	10900	1.028	7400	3.11
		0.8	1.7	70/59	17700	13500	0.602	19800	29.4	10800	1.102	7000	2.87
		0.8	1.7	75/63	19100	14100	0.615	21200	31.1	10600	1.177	6600	2.64
		0.8	1.7	80/67	20500	14700	0.627	22600	32.7	10400	1.251	6100	2.44
		0.8	1.7	85/71	21900	15300	0.640	24100	34.2				
	8.0	1.3	3.0	65/55	16600	12900	0.511	18300	32.5	11500	1.039	8000	3.24
		1.3	3.0	70/59	18000	13500	0.524	19800	34.4	11300	1.114	7500	2.97
		1.3	3.0	75/63	19400	14100	0.536	21200	36.2	11200	1.188	7100	2.76
		1.3	3.0	80/67	20800	14800	0.549	22700	37.9	11000	1.262	6700	2.55
		1.3	3.0	85/71	22200	15400	0.562	24100	39.5				
40	4.0	0.3	0.8	65/55	16500	12800	0.705	18900	23.4	12400	1.036	8900	3.51
		0.3	0.8	70/59	17900	13400	0.718	20400	24.9	12300	1.110	8500	3.25
		0.3	0.8	75/63	19300	14000	0.731	21800	26.4	12100	1.185	8100	2.99
		0.3	0.8	80/67	20700	14600	0.744	23200	27.8	11900	1.259	7600	2.77
		0.3	0.8	85/71	22100	15200	0.756	24700	29.2				
	6.0	0.7	1.7	65/55	16800	12900	0.627	18900	26.8	13000	1.047	9400	3.64
		0.7	1.7	70/59	18100	13500	0.640	20300	28.3	12800	1.122	9000	3.34
		0.7	1.7	75/63	19500	14100	0.653	21700	29.9	12700	1.196	8600	3.11
		0.7	1.7	80/67	20900	14700	0.665	23200	31.4	12500	1.270	8200	2.88
		0.7	1.7	85/71	22300	15300	0.678	24600	32.9				
	8.0	1.3	3.0	65/55	17000	12900	0.549	18900	31.0	13500	1.059	9900	3.74
		1.3	3.0	70/59	18400	13600	0.562	20300	32.7	13400	1.133	9500	3.47
		1.3	3.0	75/63	19800	14200	0.574	21800	34.5	13200	1.207	9100	3.20
		1.3	3.0	80/67	21200	14800	0.587	23200	36.1	13100	1.281	8700	3.00
		1.3	3.0	85/71	22600	15400	0.600	24600	37.7				
50	4.0	0.3	0.7	65/55	16300	12600	0.770	18900	21.2	14600	1.052	11000	4.07
		0.3	0.7	70/59	17700	13200	0.782	20400	22.6	14500	1.126	10700	3.77
		0.3	0.7	75/63	19100	13800	0.795	21800	24.0	14300	1.201	10200	3.49
		0.3	0.7	80/67	20500	14400	0.808	23300	25.4	14100	1.275	9700	3.24
		0.3	0.7	85/71	21900	15000	0.821	24700	26.7				
	6.0	0.7	1.6	65/55	16500	12600	0.691	18900	23.9	15200	1.063	11600	4.19
		0.7	1.6	70/59	17900	13300	0.704	20300	25.4	15000	1.138	11100	3.86
		0.7	1.6	75/63	19300	13900	0.717	21700	26.9	14900	1.212	10800	3.60
		0.7	1.6	80/67	20700	14500	0.730	23200	28.4	14700	1.286	10300	3.35
		0.7	1.6	85/71	22100	15100	0.743	24600	29.7				
	8.0	1.3	2.9	65/55	16700	12700	0.613	18800	27.2	15800	1.075	12100	4.31
		1.3	2.9	70/59	18100	13300	0.626	20200	28.9	15600	1.149	11700	3.98
		1.3	2.9	75/63	19500	13900	0.639	21700	30.5	15400	1.223	11200	3.69
		1.3	2.9	80/67	20900	14600	0.652	23100	32.1	15300	1.297	10900	3.46
		1.3	2.9	85/71	22300	15200	0.665	24600	33.5				
60	4.0	0.3	0.7	65/55	15600	12200	0.860	18500	18.1	16900	1.065	13300	4.65
		0.3	0.7	70/59	17000	12800	0.873	20000	19.5	16700	1.139	12800	4.30
		0.3	0.7	75/63	18300	13400	0.886	21300	20.7	16500	1.213	12400	3.99
		0.3	0.7	80/67	19700	14000	0.899	22800	21.9	16400	1.288	12000	3.73
		0.3	0.7	85/71	21100	14600	0.912	24200	23.1				
	6.0	0.7	1.6	65/55	15800	12300	0.782	18500	20.2	17400	1.076	13700	4.74
		0.7	1.6	70/59	17200	12900	0.795	19900	21.6	17300	1.150	13400	4.41
		0.7	1.6	75/63	18600	13500	0.808	21400	23.0	17100	1.225	12900	4.09
		0.7	1.6	80/67	20000	14100	0.821	22800	24.4	16900	1.299	12500	3.81
		0.7	1.6	85/71	21400	14700	0.833	24200	25.7				
	8.0	1.2	2.8	65/55	16000	12400	0.704	18400	22.7	18000	1.088	14300	4.85
		1.2	2.8	70/59	17400	13000	0.717	19800	24.3	17800	1.162	13800	4.49
		1.2	2.8	75/63	18800	13600	0.730	21300	25.8	17700	1.236	13500	4.20
		1.2	2.8	80/67	20200	14200	0.742	22700	27.2	17500	1.310	13000	3.91
		1.2	2.8	85/71	21600	14800	0.755	24200	28.6				

GRQ – Size 024 (750 SCFM) – 1st Stage Medium Fan (Continued)

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
70	4.0	0.3	0.7	65/55	14500	11700	0.976	17800	14.9	19000	1.075	15300	5.18
		0.3	0.7	70/59	15900	12300	0.989	19300	16.1	18800	1.149	14900	4.79
		0.3	0.7	75/63	17300	12900	1.002	20700	17.3	18600	1.223	14400	4.46
		0.3	0.7	80/67	18700	13500	1.015	22200	18.4	18500	1.297	14100	4.18
		0.3	0.7	85/71	20100	14200	1.027	23600	19.6				
	6.0	0.7	1.6	65/55	14800	11800	0.898	17900	16.5	19500	1.086	15800	5.26
		0.7	1.6	70/59	16100	12400	0.911	19200	17.7	19400	1.160	15400	4.90
		0.7	1.6	75/63	17500	13000	0.924	20700	18.9	19200	1.234	15000	4.56
		0.7	1.6	80/67	18900	13600	0.936	22100	20.2	19000	1.308	14500	4.26
		0.7	1.6	85/71	20300	14200	0.949	23500	21.4				
	8.0	1.2	2.7	65/55	15000	11900	0.820	17800	18.3	20100	1.097	16400	5.37
		1.2	2.7	70/59	16400	12500	0.833	19200	19.7	19900	1.171	15900	4.98
		1.2	2.7	75/63	17800	13100	0.845	20700	21.1	19700	1.245	15500	4.64
		1.2	2.7	80/67	19200	13700	0.858	22100	22.4	19600	1.320	15100	4.35
		1.2	2.7	85/71	20600	14300	0.871	23600	23.7				
80	4.0	0.3	0.7	65/55	13400	11200	1.117	17200	12.0	20800	1.081	17100	5.64
		0.3	0.7	70/59	14700	11800	1.129	18600	13.0	20700	1.155	16800	5.25
		0.3	0.7	75/63	16100	12500	1.142	20000	14.1	20500	1.230	16300	4.88
		0.3	0.7	80/67	17500	13100	1.155	21400	15.2	20300	1.304	15800	4.56
		0.3	0.7	85/71	18900	13700	1.168	22900	16.2				
	6.0	0.7	1.5	65/55	13600	11300	1.038	17100	13.1	21400	1.092	17700	5.74
		0.7	1.5	70/59	15000	11900	1.051	18600	14.3	21200	1.167	17200	5.32
		0.7	1.5	75/63	16400	12500	1.064	20000	15.4	21100	1.241	16900	4.98
		0.7	1.5	80/67	17800	13100	1.077	21500	16.5	20900	1.315	16400	4.66
		0.7	1.5	85/71	19200	13800	1.090	22900	17.6				
	8.0	1.2	2.7	65/55	13800	11400	0.960	17100	14.4	22000	1.104	18200	5.84
		1.2	2.7	70/59	15200	12000	0.973	18500	15.6	21800	1.178	17800	5.42
		1.2	2.7	75/63	16600	12600	0.986	20000	16.8	21600	1.252	17300	5.05
		1.2	2.7	80/67	18000	13200	0.999	21400	18.0	21500	1.326	17000	4.75
		1.2	2.7	85/71	19400	13800	1.012	22900	19.2				
90	4.0	0.3	0.7	65/55	12200	10800	1.281	16600	9.5	22500	1.085	18800	6.08
		0.3	0.7	70/59	13600	11400	1.294	18000	10.5	22300	1.159	18300	5.64
		0.3	0.7	75/63	15000	12000	1.307	19500	11.5	22200	1.233	18000	5.28
		0.3	0.7	80/67	16400	12600	1.320	20900	12.4	22000	1.307	17500	4.93
		0.3	0.7	85/71	17800	13200	1.333	22300	13.4				
	6.0	0.7	1.5	65/55	12400	10900	1.203	16500	10.3	23100	1.096	19400	6.18
		0.7	1.5	70/59	13800	11500	1.216	18000	11.3	22900	1.170	18900	5.73
		0.7	1.5	75/63	15200	12100	1.229	19400	12.4	22700	1.244	18500	5.35
		0.7	1.5	80/67	16600	12700	1.242	20800	13.4	22600	1.318	18100	5.02
		0.7	1.5	85/71	18000	13300	1.255	22300	14.3				
	8.0	1.2	2.7	65/55	12700	11000	1.125	16500	11.3	23600	1.107	19800	6.25
		1.2	2.7	70/59	14100	11600	1.138	18000	12.4	23500	1.181	19500	5.83
		1.2	2.7	75/63	15500	12200	1.151	19400	13.5	23300	1.255	19000	5.44
		1.2	2.7	80/67	16900	12800	1.164	20900	14.5	23100	1.329	18600	5.09
		1.2	2.7	85/71	18300	13400	1.177	22300	15.5	Operation Not Recommended			
100	4.0	0.3	0.7	65/55	11300	10500	1.470	16300	7.7				
		0.3	0.7	70/59	12700	11100	1.482	17800	8.6				
		0.3	0.7	75/63	14100	11700	1.495	19200	9.4				
		0.3	0.7	80/67	15500	12300	1.508	20600	10.3				
		0.3	0.7	85/71	16900	13000	1.521	22100	11.1				
	6.0	0.7	1.5	65/55	11500	10600	1.391	16200	8.3				
		0.7	1.5	70/59	12900	11200	1.404	17700	9.2				
		0.7	1.5	75/63	14300	11800	1.417	19100	10.1				
		0.7	1.5	80/67	15700	12400	1.430	20600	11.0				
		0.7	1.5	85/71	17100	13000	1.443	22000	11.9				
	8.0	1.1	2.6	65/55	11800	10700	1.313	16300	9.0				
		1.1	2.6	70/59	13100	11300	1.326	17600	9.9				
		1.1	2.6	75/63	14500	11900	1.339	19100	10.8				
		1.1	2.6	80/67	15900	12500	1.352	20500	11.8				
		1.1	2.6	85/71	17300	13100	1.365	22000	12.7				
110	4.0	0.3	0.7	65/55	10700	10400	1.681	16400	6.4				
		0.3	0.7	70/59	12100	11000	1.694	17900	7.1				
		0.3	0.7	75/63	13500	11600	1.706	19300	7.9				
		0.3	0.7	80/67	14900	12200	1.719	20800	8.7				
		0.3	0.7	85/71	16300	12900	1.732	22200	9.4				
	6.0	0.6	1.5	65/55	11000	10500	1.603	16500	6.9				
		0.6	1.5	70/59	12400	11100	1.615	17900	7.7				
		0.6	1.5	75/63	13800	11700	1.628	19400	8.5				
		0.6	1.5	80/67	15200	12300	1.641	20800	9.3				
		0.6	1.5	85/71	16600	12900	1.654	22200	10.0				
	8.0	1.1	2.6	65/55	11200	10600	1.524	16400	7.3				
		1.1	2.6	70/59	12600	11200	1.537	17800	8.2				
		1.1	2.6	75/63	14000	11800	1.550	19300	9.0				
		1.1	2.6	80/67	15400	12400	1.563	20700	9.9				
		1.1	2.6	85/71	16800	13000	1.576	22200	10.7				

GRQ – Size 024 (650 SCFM) – 1st Stage Low Fan

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
20	4.0	0.4	0.8	65/55	Operation Not Recommended					5700	0.953	2400	1.75
		0.4	0.8	70/59						5500	1.028	2000	1.57
		0.4	0.8	75/63						5300	1.102	1500	1.41
		0.4	0.8	80/67						5200	1.176	1200	1.30
		0.4	0.8	85/71									
	6.0	0.8	1.8	65/55						6200	0.964	2900	1.88
		0.8	1.8	70/59						6100	1.039	2600	1.72
		0.8	1.8	75/63						5900	1.113	2100	1.55
		0.8	1.8	80/67						5700	1.188	1600	1.41
		0.8	1.8	85/71									
	8.0	1.4	3.1	65/55						6800	0.976	3500	2.04
		1.4	3.1	70/59						6700	1.050	3100	1.87
		1.4	3.1	75/63						6500	1.124	2700	1.69
		1.4	3.1	80/67						6300	1.199	2200	1.54
		1.4	3.1	85/71									
30	4.0	0.3	0.8	65/55						9000	0.999	5600	2.64
		0.3	0.8	70/59	16800	11400	0.656	19000	25.6	8800	1.074	5100	2.40
		0.3	0.8	75/63	18200	12000	0.669	20500	27.2	8600	1.148	4700	2.19
		0.3	0.8	80/67	19600	12600	0.682	21900	28.7	8500	1.222	4300	2.04
		0.3	0.8	85/71	21000	13200	0.695	23400	30.2				
	6.0	0.8	1.7	65/55	15600	10900	0.565	17500	27.6	9500	1.011	6000	2.75
		0.8	1.7	70/59	17000	11500	0.577	19000	29.5	9400	1.085	5700	2.54
		0.8	1.7	75/63	18400	12100	0.590	20400	31.2	9200	1.159	5200	2.33
		0.8	1.7	80/67	19800	12700	0.603	21900	32.8	9000	1.234	4800	2.14
		0.8	1.7	85/71	21200	13300	0.616	23300	34.4				
	8.0	1.3	3.0	65/55	15800	11000	0.486	17500	32.5	10100	1.022	6600	2.90
		1.3	3.0	70/59	17200	11600	0.499	18900	34.5	10000	1.096	6300	2.67
		1.3	3.0	75/63	18600	12200	0.512	20300	36.3	9800	1.170	5800	2.45
		1.3	3.0	80/67	20000	12800	0.525	21800	38.1	9600	1.245	5400	2.26
		1.3	3.0	85/71	21400	13400	0.538	23200	39.8				
40	4.0	0.3	0.8	65/55	15600	10800	0.668	17900	23.4	11800	1.040	8300	3.32
		0.3	0.8	70/59	17000	11500	0.681	19300	25.0	11700	1.114	7900	3.08
		0.3	0.8	75/63	18400	12100	0.694	20800	26.5	11500	1.189	7400	2.83
		0.3	0.8	80/67	19800	12700	0.707	22200	28.0	11300	1.263	7000	2.62
		0.3	0.8	85/71	21200	13300	0.720	23700	29.4				
	6.0	0.7	1.7	65/55	15800	10900	0.590	17800	26.8	12400	1.051	8800	3.46
		0.7	1.7	70/59	17200	11500	0.603	19300	28.5	12200	1.126	8400	3.17
		0.7	1.7	75/63	18600	12100	0.616	20700	30.2	12100	1.200	8000	2.95
		0.7	1.7	80/67	20000	12800	0.629	22100	31.8	11900	1.274	7600	2.74
		0.7	1.7	85/71	21400	13400	0.642	23600	33.3				
	8.0	1.3	3.0	65/55	16100	11000	0.511	17800	31.5	13000	1.063	9400	3.58
		1.3	3.0	70/59	17500	11600	0.524	19300	33.4	12800	1.137	8900	3.30
		1.3	3.0	75/63	18900	12200	0.537	20700	35.2	12700	1.211	8600	3.07
		1.3	3.0	80/67	20300	12800	0.550	22200	36.9	12500	1.286	8100	2.85
		1.3	3.0	85/71	21700	13500	0.563	23600	38.5				
50	4.0	0.3	0.7	65/55	15400	10700	0.734	17900	21.0	14300	1.076	10600	3.89
		0.3	0.7	70/59	16800	11300	0.747	19300	22.5	14200	1.150	10300	3.62
		0.3	0.7	75/63	18200	11900	0.760	20800	23.9	14000	1.224	9800	3.35
		0.3	0.7	80/67	19600	12500	0.773	22200	25.4	13800	1.299	9400	3.11
		0.3	0.7	85/71	21000	13100	0.786	23700	26.7				
	6.0	0.7	1.6	65/55	15600	10800	0.656	17800	23.8	14900	1.087	11200	4.02
		0.7	1.6	70/59	17000	11400	0.669	19300	25.4	14700	1.161	10700	3.71
		0.7	1.6	75/63	18400	12000	0.682	20700	27.0	14600	1.236	10400	3.46
		0.7	1.6	80/67	19800	12600	0.695	22200	28.5	14400	1.310	9900	3.22
		0.7	1.6	85/71	21200	13200	0.707	23600	30.0				
	8.0	1.3	2.9	65/55	15800	10900	0.577	17800	27.4	15500	1.098	11800	4.14
		1.3	2.9	70/59	17200	11500	0.590	19200	29.2	15300	1.172	11300	3.82
		1.3	2.9	75/63	18600	12100	0.603	20700	30.8	15100	1.247	10800	3.55
		1.3	2.9	80/67	20000	12700	0.616	22100	32.5	15000	1.321	10500	3.33
		1.3	2.9	85/71	21400	13300	0.629	23500	34.0				
60	4.0	0.3	0.7	65/55	14700	10400	0.833	17500	17.6	16500	1.106	12700	4.37
		0.3	0.7	70/59	16100	11000	0.846	19000	19.0	16400	1.180	12400	4.07
		0.3	0.7	75/63	17500	11700	0.859	20400	20.4	16200	1.255	11900	3.78
		0.3	0.7	80/67	18900	12300	0.872	21900	21.7	16000	1.329	11500	3.53
		0.3	0.7	85/71	20300	12900	0.885	23300	22.9				
	6.0	0.7	1.6	65/55	14900	10500	0.754	17500	19.8	17100	1.117	13300	4.49
		0.7	1.6	70/59	16300	11100	0.767	18900	21.3	16900	1.192	12800	4.15
		0.7	1.6	75/63	17700	11700	0.780	20400	22.7	16800	1.266	12500	3.89
		0.7	1.6	80/67	19100	12400	0.793	21800	24.1	16600	1.340	12000	3.63
		0.7	1.6	85/71	20500	13000	0.806	23300	25.4				
	8.0	1.2	2.8	65/55	15200	10600	0.676	17500	22.5	17700	1.128	13900	4.60
		1.2	2.8	70/59	16600	11200	0.689	19000	24.1	17500	1.203	13400	4.26
		1.2	2.8	75/63	18000	11800	0.702	20400	25.6	17300	1.277	12900	3.97
		1.2	2.8	80/67	19400	12400	0.715	21800	27.1	17200	1.352	12600	3.73
		1.2	2.8	85/71	20800	13100	0.728	23300	28.6				

GRQ – Size 024 (650 SCFM) – 1st Stage Low Fan (Continued)

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
70	4.0	0.3	0.7	65/55	13800	10100	0.957	17100	14.4	18500	1.131	14600	4.79
		0.3	0.7	70/59	15200	10700	0.970	18500	15.7	18300	1.205	14200	4.45
		0.3	0.7	75/63	16600	11300	0.983	20000	16.9	18100	1.280	13700	4.14
		0.3	0.7	80/67	18000	11900	0.996	21400	18.1	17900	1.354	13300	3.87
		0.3	0.7	85/71	19400	12500	1.009	22800	19.2				
	6.0	0.7	1.6	65/55	14000	10200	0.878	17000	15.9	19000	1.142	15100	4.87
		0.7	1.6	70/59	15400	10800	0.891	18400	17.3	18900	1.217	14700	4.55
		0.7	1.6	75/63	16800	11400	0.904	19900	18.6	18700	1.291	14300	4.24
		0.7	1.6	80/67	18200	12000	0.917	21300	19.8	18500	1.365	13800	3.97
		0.7	1.6	85/71	19600	12600	0.930	22800	21.1				
	8.0	1.2	2.7	65/55	14200	10200	0.800	16900	17.8	19600	1.153	15700	4.98
		1.2	2.7	70/59	15600	10900	0.813	18400	19.2	19400	1.228	15200	4.63
		1.2	2.7	75/63	17000	11500	0.826	19800	20.6	19300	1.302	14900	4.34
		1.2	2.7	80/67	18400	12100	0.839	21300	21.9	19100	1.377	14400	4.06
		1.2	2.7	85/71	19800	12700	0.852	22700	23.2				
80	4.0	0.3	0.7	65/55	12700	9700	1.098	16400	11.6	20200	1.151	16300	5.14
		0.3	0.7	70/59	14100	10300	1.111	17900	12.7	20000	1.225	15800	4.78
		0.3	0.7	75/63	15500	10900	1.124	19300	13.8	19900	1.299	15500	4.49
		0.3	0.7	80/67	16900	11500	1.137	20800	14.9	19700	1.374	15000	4.20
		0.3	0.7	85/71	18300	12100	1.150	22200	15.9				
	6.0	0.7	1.5	65/55	12900	9800	1.020	16400	12.6	20800	1.162	16800	5.24
		0.7	1.5	70/59	14300	10400	1.033	17800	13.8	20600	1.236	16400	4.88
		0.7	1.5	75/63	15700	11000	1.046	19300	15.0	20400	1.311	15900	4.56
		0.7	1.5	80/67	17100	11600	1.059	20700	16.1	20300	1.385	15600	4.29
		0.7	1.5	85/71	18500	12200	1.072	22200	17.3				
	8.0	1.2	2.7	65/55	13100	9800	0.941	16300	13.9	21300	1.173	17300	5.32
		1.2	2.7	70/59	14500	10500	0.954	17800	15.2	21200	1.248	16900	4.98
		1.2	2.7	75/63	15900	11100	0.967	19200	16.4	21000	1.322	16500	4.65
		1.2	2.7	80/67	17300	11700	0.980	20600	17.7	20800	1.396	16000	4.37
		1.2	2.7	85/71	18700	12300	0.993	22100	18.8				
90	4.0	0.3	0.7	65/55	11500	9300	1.250	15800	9.2	21800	1.165	17800	5.48
		0.3	0.7	70/59	12900	9900	1.263	17200	10.2	21600	1.240	17400	5.10
		0.3	0.7	75/63	14300	10500	1.276	18700	11.2	21500	1.314	17000	4.79
		0.3	0.7	80/67	15700	11100	1.289	20100	12.2	21300	1.388	16600	4.50
		0.3	0.7	85/71	17100	11700	1.302	21500	13.1				
	6.0	0.7	1.5	65/55	11700	9400	1.172	15700	10.0	22400	1.177	18400	5.58
		0.7	1.5	70/59	13100	10000	1.184	17100	11.1	22200	1.251	17900	5.20
		0.7	1.5	75/63	14500	10600	1.197	18600	12.1	22000	1.325	17500	4.86
		0.7	1.5	80/67	15900	11200	1.210	20000	13.1	21900	1.400	17100	4.58
		0.7	1.5	85/71	17300	11800	1.223	21500	14.1				
	8.0	1.2	2.7	65/55	11900	9400	1.093	15600	10.9	22900	1.188	18800	5.65
		1.2	2.7	70/59	13300	10000	1.106	17100	12.0	22800	1.262	18500	5.29
		1.2	2.7	75/63	14700	10700	1.119	18500	13.1	22600	1.337	18000	4.95
		1.2	2.7	80/67	16100	11300	1.132	20000	14.2	22400	1.411	17600	4.65
		1.2	2.7	85/71	17500	11900	1.145	21400	15.3	Operation Not Recommended			
100	4.0	0.3	0.7	65/55	10300	8900	1.404	15100	7.3				
		0.3	0.7	70/59	11700	9500	1.417	16500	8.3				
		0.3	0.7	75/63	13100	10100	1.430	18000	9.2				
		0.3	0.7	80/67	14500	10700	1.443	19400	10.0				
		0.3	0.7	85/71	15900	11300	1.456	20900	10.9				
	6.0	0.7	1.5	65/55	10600	9000	1.326	15100	8.0				
		0.7	1.5	70/59	12000	9600	1.339	16600	9.0				
		0.7	1.5	75/63	13400	10200	1.352	18000	9.9				
		0.7	1.5	80/67	14800	10800	1.365	19500	10.8				
		0.7	1.5	85/71	16200	11400	1.377	20900	11.8				
	8.0	1.1	2.6	65/55	10800	9100	1.247	15100	8.7				
		1.1	2.6	70/59	12200	9700	1.260	16500	9.7				
		1.1	2.6	75/63	13600	10300	1.273	17900	10.7				
		1.1	2.6	80/67	15000	10900	1.286	19400	11.7				
		1.1	2.6	85/71	16400	11500	1.299	20800	12.6				
110	4.0	0.3	0.7	65/55	9400	8600	1.553	14700	6.1				
		0.3	0.7	70/59	10800	9200	1.566	16100	6.9				
		0.3	0.7	75/63	12200	9800	1.579	17600	7.7				
		0.3	0.7	80/67	13600	10500	1.592	19000	8.5				
		0.3	0.7	85/71	15000	11100	1.605	20500	9.3				
	6.0	0.6	1.5	65/55	9600	8700	1.475	14600	6.5				
		0.6	1.5	70/59	11000	9300	1.488	16100	7.4				
		0.6	1.5	75/63	12400	9900	1.501	17500	8.3				
		0.6	1.5	80/67	13800	10500	1.514	19000	9.1				
		0.6	1.5	85/71	15200	11200	1.526	20400	10.0				
	8.0	1.1	2.6	65/55	9800	8800	1.396	14600	7.0				
		1.1	2.6	70/59	11200	9400	1.409	16000	7.9				
		1.1	2.6	75/63	12600	10000	1.422	17500	8.9				
		1.1	2.6	80/67	14000	10600	1.435	18900	9.8				
		1.1	2.6	85/71	15400	11200	1.448	20300	10.6				

GRQ – Size 040 (1250 SCFM) – 2nd Stage High Fan

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
20	6.7	1.9	4.3	65/55	Operation Not Recommended					23300	2.410	15100	2.83
		1.9	4.3	70/59						22800	2.630	13800	2.54
		1.9	4.3	75/63						22300	2.850	12600	2.29
		1.9	4.3	80/67						21900	3.070	11400	2.09
		1.9	4.3	85/71									
	10.0	4.1	9.2	65/55						26300	2.641	17300	2.92
		4.1	9.2	70/59						25800	2.861	16000	2.64
		4.1	9.2	75/63						25400	3.081	14900	2.42
		4.1	9.2	80/67						24900	3.301	13600	2.21
		4.1	9.2	85/71									
	13.3	7.0	15.9	65/55						29300	2.872	19500	2.99
		7.0	15.9	70/59						28900	3.092	18300	2.74
		7.0	15.9	75/63						28400	3.312	17100	2.51
		7.0	15.9	80/67						27900	3.531	15800	2.32
		7.0	15.9	85/71									
30	6.7	1.8	4.2	65/55						29000	2.530	20400	3.36
		1.8	4.2	70/59	38200	27900	1.918	44700	19.9	28600	2.750	19200	3.05
		1.8	4.2	75/63	40600	28800	1.955	47300	20.8	28100	2.970	18000	2.77
		1.8	4.2	80/67	43100	29800	1.991	49900	21.6	27600	3.190	16700	2.54
		1.8	4.2	85/71	45500	30700	2.027	52400	22.4				
	10.0	3.9	9.0	65/55	36800	27400	1.519	42000	24.2	32100	2.760	22700	3.41
		3.9	9.0	70/59	39200	28300	1.555	44500	25.2	31600	2.980	21400	3.11
		3.9	9.0	75/63	41600	29200	1.591	47000	26.1	31100	3.200	20200	2.85
		3.9	9.0	80/67	44100	30100	1.628	49700	27.1	30600	3.420	18900	2.62
		3.9	9.0	85/71	46500	31100	1.664	52200	27.9				
	13.3	6.8	15.4	65/55	37800	27700	1.155	41700	32.7	35100	2.991	24900	3.44
		6.8	15.4	70/59	40200	28700	1.191	44300	33.8	34600	3.211	23600	3.16
		6.8	15.4	75/63	42700	29600	1.228	46900	34.8	34100	3.431	22400	2.91
		6.8	15.4	80/67	45100	30500	1.264	49400	35.7	33700	3.651	21200	2.70
		6.8	15.4	85/71	47500	31400	1.300	51900	36.5				
40	6.7	1.8	4.0	65/55	37100	28000	2.055	44100	18.1	33800	2.643	24800	3.75
		1.8	4.0	70/59	39500	28900	2.092	46600	18.9	33300	2.863	23500	3.41
		1.8	4.0	75/63	41900	29800	2.128	49200	19.7	32800	3.083	22300	3.12
		1.8	4.0	80/67	44400	30700	2.164	51800	20.5	32300	3.303	21000	2.87
		1.8	4.0	85/71	46800	31700	2.201	54300	21.3				
	10.0	3.8	8.7	65/55	38100	28300	1.692	43900	22.5	36800	2.873	27000	3.75
		3.8	8.7	70/59	40500	29300	1.728	46400	23.4	36300	3.093	25700	3.44
		3.8	8.7	75/63	42900	30200	1.765	48900	24.3	35800	3.313	24500	3.17
		3.8	8.7	80/67	45400	31100	1.801	51500	25.2	35400	3.533	23300	2.94
		3.8	8.7	85/71	47800	32000	1.837	54100	26.0				
	13.3	6.6	15.0	65/55	39100	28700	1.329	43600	29.4	39800	3.104	29200	3.76
		6.6	15.0	70/59	41500	29600	1.365	46200	30.4	39300	3.324	28000	3.46
		6.6	15.0	75/63	43900	30600	1.401	48700	31.3	38900	3.544	26800	3.22
		6.6	15.0	80/67	46400	31500	1.437	51300	32.3	38400	3.764	25600	2.99
		6.6	15.0	85/71	48800	32400	1.474	53800	33.1				
50	6.7	1.7	3.9	65/55	37200	27400	2.247	44900	16.6	37700	2.749	28300	4.02
		1.7	3.9	70/59	39600	28300	2.283	47400	17.3	37200	2.969	27100	3.67
		1.7	3.9	75/63	42000	29200	2.320	49900	18.1	36700	3.189	25800	3.37
		1.7	3.9	80/67	44500	30100	2.356	52500	18.9	36300	3.409	24700	3.12
		1.7	3.9	85/71	46900	31100	2.392	55100	19.6				
	10.0	3.7	8.5	65/55	38200	27700	1.883	44600	20.3	40700	2.980	30500	4.00
		3.7	8.5	70/59	40600	28700	1.920	47200	21.1	40300	3.200	29400	3.69
		3.7	8.5	75/63	43100	29600	1.956	49800	22.0	39800	3.420	28100	3.41
		3.7	8.5	80/67	45500	30500	1.992	52300	22.8	39300	3.640	26900	3.16
		3.7	8.5	85/71	47900	31500	2.029	54800	23.6				
	13.3	6.4	14.6	65/55	39200	28100	1.520	44400	25.8	43800	3.210	32800	4.00
		6.4	14.6	70/59	41600	29000	1.556	46900	26.7	43300	3.430	31600	3.70
		6.4	14.6	75/63	44100	30000	1.593	49500	27.7	42800	3.650	30300	3.44
		6.4	14.6	80/67	46500	30900	1.629	52100	28.5	42300	3.870	29100	3.20
		6.4	14.6	85/71	48900	31800	1.665	54600	29.4				
60	6.7	1.7	3.8	65/55	36400	26100	2.456	44800	14.8	41100	2.849	31400	4.23
		1.7	3.8	70/59	38800	27000	2.493	47300	15.6	40600	3.069	30100	3.88
		1.7	3.8	75/63	41200	27900	2.529	49800	16.3	40100	3.289	28900	3.57
		1.7	3.8	80/67	43700	28800	2.565	52500	17.0	39600	3.509	27600	3.31
		1.7	3.8	85/71	46100	29800	2.602	55000	17.7				
	10.0	3.6	8.3	65/55	37400	26400	2.093	44500	17.9	44100	3.080	33600	4.20
		3.6	8.3	70/59	39800	27400	2.129	47100	18.7	43600	3.300	32300	3.870
		3.6	8.3	75/63	42200	28300	2.166	49600	19.5	43100	3.519	31100	3.59
		3.6	8.3	80/67	44700	29200	2.202	52200	20.3	42700	3.739	29900	3.35
		3.6	8.3	85/71	47100	30100	2.238	54700	21.0				
	13.3	6.2	14.2	65/55	38400	26800	1.730	44300	22.2	47100	3.310	35800	4.17
		6.2	14.2	70/59	40800	27700	1.766	46800	23.1	46600	3.530	34600	3.87
		6.2	14.2	75/63	43200	28700	1.802	49400	24.0	46200	3.750	33400	3.61
		6.2	14.2	80/67	45700	29600	1.838	52000	24.9	45700	3.970	32200	3.37
		6.2	14.2	85/71	48100	30500	1.875	54500	25.7				

GRQ – Size 040 (1250 SCFM) – 2nd Stage High Fan (Continued)

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
70	6.7	1.6	3.8	65/55	34800	24600	2.684	44000	13.0	44100	2.942	34100	4.39
		1.6	3.8	70/59	37200	25600	2.720	46500	13.7	43600	3.162	32800	4.04
		1.6	3.8	75/63	39600	26500	2.757	49000	14.4	43100	3.382	31600	3.73
		1.6	3.8	80/67	42100	27400	2.793	51600	15.1	42600	3.602	30300	3.47
		1.6	3.8	85/71	44500	28300	2.829	54200	15.7				
	10.0	3.5	8.1	65/55	35800	25000	2.321	43700	15.4	47100	3.173	36300	4.35
		3.5	8.1	70/59	38200	25900	2.357	46200	16.2	46600	3.393	35000	4.02
		3.5	8.1	75/63	40700	26900	2.393	48900	17.0	46100	3.613	33800	3.74
		3.5	8.1	80/67	43100	27800	2.430	51400	17.7	45700	3.833	32600	3.49
		3.5	8.1	85/71	45500	28700	2.466	53900	18.5				
	13.3	6.1	13.9	65/55	36800	25400	1.957	43500	18.8	50100	3.404	38500	4.31
		6.1	13.9	70/59	39200	26300	1.993	46000	19.7	49700	3.624	37300	4.02
		6.1	13.9	75/63	41700	27200	2.030	48600	20.5	49200	3.843	36100	3.75
		6.1	13.9	80/67	44100	28200	2.066	51200	21.3	48700	4.063	34800	3.51
		6.1	13.9	85/71	46500	29100	2.102	53700	22.1				
80	6.7	1.6	3.7	65/55	32700	23400	2.930	42700	11.2	46900	3.029	36600	4.54
		1.6	3.7	70/59	35100	24300	2.966	45200	11.8	46500	3.249	35400	4.19
		1.6	3.7	75/63	37500	25300	3.002	47700	12.5	46000	3.469	34200	3.89
		1.6	3.7	80/67	40000	26200	3.039	50400	13.2	45500	3.689	32900	3.61
		1.6	3.7	85/71	42400	27100	3.075	52900	13.8				
	10.0	3.5	7.9	65/55	33700	23800	2.566	42500	13.1	50000	3.260	38900	4.49
		3.5	7.9	70/59	36100	24700	2.603	45000	13.9	49500	3.480	37600	4.17
		3.5	7.9	75/63	38500	25600	2.639	47500	14.6	49000	3.700	36400	3.88
		3.5	7.9	80/67	41000	26600	2.675	50100	15.3	48500	3.919	35100	3.63
		3.5	7.9	85/71	43400	27500	2.711	52700	16.0				
	13.3	6.0	13.7	65/55	34700	24200	2.203	42200	15.8	53000	3.490	41100	4.45
		6.0	13.7	70/59	37100	25100	2.239	44700	16.6	52500	3.710	39800	4.15
		6.0	13.7	75/63	39500	26000	2.275	47300	17.4	52000	3.930	38600	3.88
		6.0	13.7	80/67	42000	26900	2.312	49900	18.2	51600	4.150	37400	3.64
		6.0	13.7	85/71	44400	27900	2.348	52400	18.9				
90	6.7	1.6	3.6	65/55	30200	22500	3.193	41100	9.5	49900	3.109	39300	4.70
		1.6	3.6	70/59	32600	23400	3.230	43600	10.1	49400	3.329	38000	4.35
		1.6	3.6	75/63	35100	24300	3.266	46200	10.7	48900	3.549	36800	4.04
		1.6	3.6	80/67	37500	25200	3.302	48800	11.4	48500	3.769	35600	3.77
		1.6	3.6	85/71	39900	26200	3.339	51300	11.9				
	10.0	3.4	7.8	65/55	31200	22800	2.830	40900	11.0	52900	3.340	41500	4.64
		3.4	7.8	70/59	33600	23800	2.866	43400	11.7	52500	3.560	40300	4.32
		3.4	7.8	75/63	36100	24700	2.903	46000	12.4	52000	3.780	39100	4.03
		3.4	7.8	80/67	38500	25600	2.939	48500	13.1	51500	4.000	37800	3.77
		3.4	7.8	85/71	40900	26600	2.975	51100	13.7				
	13.3	5.9	13.4	65/55	32200	23200	2.467	40600	13.1	56000	3.571	43800	4.59
		5.9	13.4	70/59	34700	24100	2.503	43200	13.9	55500	3.790	42600	4.29
		5.9	13.4	75/63	37100	25100	2.539	45800	14.6	55000	4.010	41300	4.02
		5.9	13.4	80/67	39500	26000	2.575	48300	15.3	54500	4.230	40100	3.78
		5.9	13.4	85/71	42000	26900	2.612	50900	16.1	Operation Not Recommended			
100	6.7	1.6	3.6	65/55	27600	21700	3.475	39500	7.9				
		1.6	3.6	70/59	30000	22600	3.512	42000	8.5				
		1.6	3.6	75/63	32500	23500	3.548	44600	9.2				
		1.6	3.6	80/67	34900	24400	3.584	47100	9.7				
		1.6	3.6	85/71	37300	25400	3.620	49700	10.3				
	10.0	3.4	7.7	65/55	28600	22000	3.112	39200	9.2				
		3.4	7.7	70/59	31000	23000	3.148	41700	9.8				
		3.4	7.7	75/63	33500	23900	3.184	44400	10.5				
		3.4	7.7	80/67	35900	24800	3.221	46900	11.1				
		3.4	7.7	85/71	38300	25800	3.257	49400	11.8				
	13.3	5.8	13.3	65/55	29600	22400	2.748	39000	10.8				
		5.8	13.3	70/59	32100	23300	2.785	41600	11.5				
		5.8	13.3	75/63	34500	24300	2.821	44100	12.2				
		5.8	13.3	80/67	36900	25200	2.857	46700	12.9				
		5.8	13.3	85/71	39400	26100	2.894	49300	13.6				
110	6.7	1.5	3.5	65/55	25100	20600	3.775	38000	6.6				
		1.5	3.5	70/59	27500	21500	3.811	40500	7.2				
		1.5	3.5	75/63	29900	22400	3.848	43000	7.8				
		1.5	3.5	80/67	32400	23400	3.884	45700	8.3				
		1.5	3.5	85/71	34800	24300	3.920	48200	8.9				
	10.0	3.3	7.6	65/55	26100	21000	3.412	37700	7.6				
		3.3	7.6	70/59	28500	21900	3.448	40300	8.3				
		3.3	7.6	75/63	31000	22800	3.484	42900	8.9				
		3.3	7.6	80/67	33400	23700	3.521	45400	9.5				
		3.3	7.6	85/71	35800	24700	3.557	47900	10.1				
	13.3	5.7	13.1	65/55	27100	21300	3.048	37500	8.9				
		5.7	13.1	70/59	29500	22300	3.085	40000	9.6				
		5.7	13.1	75/63	32000	23200	3.121	42700	10.3				
		5.7	13.1	80/67	34400	24100	3.157	45200	10.9				
		5.7	13.1	85/71	36800	25000	3.193	47700	11.5				

GRQ – Size 040 (1000 SCFM) – 1st Stage Medium Fan

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
20	6.7	1.9	4.3	65/55	Operation Not Recommended					9700	1.729	3800	1.64
		1.9	4.3	70/59						9200	1.944	2600	1.39
		1.9	4.3	75/63						8700	2.158	1300	1.18
		1.9	4.3	80/67						8200	2.373	100	1.01
		1.9	4.3	85/71									
	10.0	4.1	9.2	65/55						12800	1.954	6100	1.92
		4.1	9.2	70/59						12300	2.169	4900	1.66
		4.1	9.2	75/63						11800	2.383	3700	1.45
		4.1	9.2	80/67						11300	2.598	2400	1.27
		4.1	9.2	85/71									
	13.3	7.0	15.9	65/55						15900	2.179	8500	2.14
		7.0	15.9	70/59						15400	2.394	7200	1.88
		7.0	15.9	75/63						14900	2.608	6000	1.67
		7.0	15.9	80/67						14400	2.823	4800	1.49
		7.0	15.9	85/71									
30	6.7	1.8	4.2	65/55						15800	1.779	9700	2.60
		1.8	4.2	70/59	26100	21100	1.429	31000	18.3	15300	1.993	8500	2.25
		1.8	4.2	75/63	28400	21900	1.470	33400	19.3	14800	2.208	7300	1.96
		1.8	4.2	80/67	30700	22800	1.510	35900	20.3	14300	2.422	6000	1.73
		1.8	4.2	85/71	33000	23700	1.551	38300	21.3				
	10.0	3.9	9.0	65/55	24800	20500	0.984	28200	25.2	18900	2.004	12100	2.76
		3.9	9.0	70/59	27100	21400	1.025	30600	26.4	18400	2.218	10800	2.43
		3.9	9.0	75/63	29400	22300	1.065	33000	27.6	17900	2.433	9600	2.16
		3.9	9.0	80/67	31700	23100	1.106	35500	28.7	17400	2.648	8400	1.93
		3.9	9.0	85/71	33900	24000	1.146	37800	29.6				
	13.3	6.8	15.4	65/55	25800	20900	0.580	27800	44.5	21900	2.229	14300	2.88
		6.8	15.4	70/59	28000	21800	0.620	30100	45.2	21500	2.443	13200	2.58
		6.8	15.4	75/63	30300	22600	0.661	32600	45.8	21000	2.658	11900	2.31
		6.8	15.4	80/67	32600	23500	0.701	35000	46.5	20500	2.873	10700	2.09
		6.8	15.4	85/71	34900	24400	0.742	37400	47.0				
40	6.7	1.8	4.0	65/55	23800	18800	1.435	28700	16.6	21900	1.824	15700	3.52
		1.8	4.0	70/59	26000	19700	1.476	31000	17.6	21400	2.038	14400	3.08
		1.8	4.0	75/63	28300	20600	1.516	33500	18.7	20900	2.253	13200	2.72
		1.8	4.0	80/67	30600	21500	1.556	35900	19.7	20400	2.467	12000	2.42
		1.8	4.0	85/71	32900	22300	1.597	38400	20.6				
	10.0	3.8	8.7	65/55	24700	19200	1.031	28200	24.0	25000	2.049	18000	3.57
		3.8	8.7	70/59	27000	20100	1.071	30700	25.2	24500	2.263	16800	3.17
		3.8	8.7	75/63	29300	20900	1.111	33100	26.4	24000	2.478	15500	2.84
		3.8	8.7	80/67	31600	21800	1.152	35500	27.4	23500	2.692	14300	2.56
		3.8	8.7	85/71	33800	22700	1.192	37900	28.4				
	13.3	6.6	15.0	65/55	25700	19600	0.626	27800	41.1	28100	2.274	20300	3.62
		6.6	15.0	70/59	27900	20400	0.666	30200	41.9	27600	2.488	19100	3.25
		6.6	15.0	75/63	30200	21300	0.707	32600	42.7	27100	2.703	17900	2.94
		6.6	15.0	80/67	32500	22200	0.747	35000	43.5	26600	2.917	16600	2.67
		6.6	15.0	85/71	34800	23000	0.788	37500	44.2				
50	6.7	1.7	3.9	65/55	23300	17800	1.566	28600	14.9	26700	1.864	20300	4.20
		1.7	3.9	70/59	25600	18700	1.607	31100	15.9	26200	2.078	19100	3.69
		1.7	3.9	75/63	27900	19500	1.647	33500	16.9	25700	2.293	17900	3.28
		1.7	3.9	80/67	30100	20400	1.688	35900	17.8	25200	2.507	16600	2.95
		1.7	3.9	85/71	32400	21300	1.728	38300	18.8				
	10.0	3.7	8.5	65/55	24200	18100	1.162	28200	20.8	29700	2.089	22600	4.17
		3.7	8.5	70/59	26500	19000	1.202	30600	22.0	29300	2.303	21400	3.73
		3.7	8.5	75/63	28800	19900	1.243	33000	23.2	28800	2.518	20200	3.35
		3.7	8.5	80/67	31100	20800	1.283	35500	24.2	28300	2.732	19000	3.04
		3.7	8.5	85/71	33400	21600	1.323	37900	25.2				
	13.3	6.4	14.6	65/55	25200	18500	0.757	27800	33.3	32800	2.314	24900	4.15
		6.4	14.6	70/59	27500	19400	0.798	30200	34.5	32400	2.528	23800	3.76
		6.4	14.6	75/63	29800	20200	0.838	32700	35.6	31900	2.743	22500	3.41
		6.4	14.6	80/67	32000	21100	0.878	35000	36.4	31400	2.957	21300	3.11
		6.4	14.6	85/71	34300	22000	0.919	37400	37.3				
60	6.7	1.7	3.8	65/55	22600	17000	1.764	28600	12.8	30000	1.899	23500	4.63
		1.7	3.8	70/59	24800	17800	1.804	31000	13.7	29500	2.113	22300	4.09
		1.7	3.8	75/63	27100	18700	1.845	33400	14.7	29000	2.328	21100	3.65
		1.7	3.8	80/67	29400	19600	1.885	35800	15.6	28500	2.542	19800	3.28
		1.7	3.8	85/71	31700	20400	1.926	38300	16.5				
	10.0	3.6	8.3	65/55	23500	17300	1.359	28100	17.3	33000	2.124	25800	4.55
		3.6	8.3	70/59	25800	18200	1.400	30600	18.4	32600	2.338	24600	4.09
		3.6	8.3	75/63	28100	19000	1.440	33000	19.5	32100	2.553	23400	3.68
		3.6	8.3	80/67	30400	19900	1.480	35500	20.5	31600	2.768	22200	3.34
		3.6	8.3	85/71	32600	20800	1.521	37800	21.4				
	13.3	6.2	14.2	65/55	24500	17700	0.955	27800	25.7	36100	2.349	28100	4.50
		6.2	14.2	70/59	26700	18500	0.995	30100	26.8	35700	2.563	27000	4.08
		6.2	14.2	75/63	29000	19400	1.035	32500	28.0	35200	2.778	25700	3.71
		6.2	14.2	80/67	31300	20300	1.076	35000	29.1	34700	2.993	24500	3.40
		6.2	14.2	85/71	33600	21100	1.116	37400	30.1				

GRQ – Size 040 (1000 SCFM) – 1st Stage Medium Fan (Continued)

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
70	6.7	1.6	3.8	65/55	21600	16300	2.008	28500	10.8	32500	1.929	25900	4.94
		1.6	3.8	70/59	23900	17100	2.049	30900	11.7	32100	2.144	24800	4.39
		1.6	3.8	75/63	26200	18000	2.089	33300	12.5	31600	2.358	23600	3.93
		1.6	3.8	80/67	28400	18900	2.130	35700	13.3	31100	2.573	22300	3.54
		1.6	3.8	85/71	30700	19800	2.170	38100	14.1				
	10.0	3.5	8.1	65/55	22500	16600	1.604	28000	14.0	35600	2.154	28200	4.84
		3.5	8.1	70/59	24800	17500	1.644	30400	15.1	35200	2.369	27100	4.35
		3.5	8.1	75/63	27100	18400	1.685	32900	16.1	34700	2.583	25900	3.94
		3.5	8.1	80/67	29400	19200	1.725	35300	17.0	34200	2.798	24700	3.58
		3.5	8.1	85/71	31700	20100	1.765	37700	18.0				
	13.3	6.1	13.9	65/55	23500	17000	1.199	27600	19.6	38700	2.379	30600	4.77
		6.1	13.9	70/59	25800	17900	1.240	30000	20.8	38200	2.594	29300	4.31
		6.1	13.9	75/63	28100	18700	1.280	32500	22.0	37800	2.808	28200	3.94
		6.1	13.9	80/67	30300	19600	1.320	34800	23.0	37300	3.023	27000	3.62
		6.1	13.9	85/71	32600	20500	1.361	37200	24.0				
80	6.7	1.6	3.7	65/55	20500	15700	2.281	28300	9.0	35400	1.954	28700	5.31
		1.6	3.7	70/59	22800	16600	2.322	30700	9.8	34900	2.169	27500	4.71
		1.6	3.7	75/63	25000	17400	2.362	33100	10.6	34400	2.384	26300	4.23
		1.6	3.7	80/67	27300	18300	2.402	35500	11.4	33900	2.598	25000	3.82
		1.6	3.7	85/71	29600	19200	2.443	37900	12.1				
	10.0	3.5	7.9	65/55	21400	16100	1.877	27800	11.4	38500	2.179	31100	5.18
		3.5	7.9	70/59	23700	16900	1.917	30200	12.4	38000	2.394	29800	4.65
		3.5	7.9	75/63	26000	17800	1.957	32700	13.3	37500	2.609	28600	4.21
		3.5	7.9	80/67	28300	18700	1.998	35100	14.2	37000	2.823	27400	3.84
		3.5	7.9	85/71	30600	19500	2.038	37600	15.0				
	13.3	6.0	13.7	65/55	22400	16400	1.472	27400	15.2	41600	2.405	33400	5.07
		6.0	13.7	70/59	24700	17300	1.512	29900	16.3	41100	2.619	32200	4.60
		6.0	13.7	75/63	26900	18100	1.553	32200	17.3	40600	2.834	30900	4.20
		6.0	13.7	80/67	29200	19000	1.593	34600	18.3	40100	3.048	29700	3.85
		6.0	13.7	85/71	31500	19900	1.634	37100	19.3				
90	6.7	1.6	3.6	65/55	19300	15200	2.563	28000	7.5	39100	1.975	32400	5.80
		1.6	3.6	70/59	21600	16000	2.604	30500	8.3	38600	2.190	31100	5.16
		1.6	3.6	75/63	23800	16900	2.644	32800	9.0	38100	2.404	29900	4.64
		1.6	3.6	80/67	26100	17800	2.685	35300	9.7	37600	2.619	28700	4.21
		1.6	3.6	85/71	28400	18600	2.725	37700	10.4				
	10.0	3.4	7.8	65/55	20200	15500	2.159	27600	9.4	42200	2.200	34700	5.62
		3.4	7.8	70/59	22500	16400	2.199	30000	10.2	41700	2.415	33500	5.06
		3.4	7.8	75/63	24800	17300	2.239	32400	11.1	41200	2.629	32200	4.59
		3.4	7.8	80/67	27100	18100	2.280	34900	11.9	40700	2.844	31000	4.19
		3.4	7.8	85/71	29400	19000	2.320	37300	12.7				
	13.3	5.9	13.4	65/55	21200	15900	1.754	27200	12.1	45200	2.425	36900	5.46
		5.9	13.4	70/59	23500	16700	1.794	29600	13.1	44800	2.640	35800	4.97
		5.9	13.4	75/63	25700	17600	1.835	32000	14.0	44300	2.854	34600	4.55
		5.9	13.4	80/67	28000	18500	1.875	34400	14.9	43800	3.069	33300	4.18
		5.9	13.4	85/71	30300	19400	1.916	36800	15.8	Operation Not Recommended			
100	6.7	1.6	3.6	65/55	18100	14600	2.835	27800	6.4				
		1.6	3.6	70/59	20300	15500	2.876	30100	7.1				
		1.6	3.6	75/63	22600	16400	2.916	32600	7.8				
		1.6	3.6	80/67	24900	17200	2.957	35000	8.4				
		1.6	3.6	85/71	27200	18100	2.997	37400	9.1				
	10.0	3.4	7.7	65/55	19000	15000	2.431	27300	7.8				
		3.4	7.7	70/59	21300	15800	2.471	29700	8.6				
		3.4	7.7	75/63	23600	16700	2.512	32200	9.4				
		3.4	7.7	80/67	25900	17600	2.552	34600	10.1				
		3.4	7.7	85/71	28100	18400	2.593	36900	10.8				
	13.3	5.8	13.3	65/55	20000	15300	2.026	26900	9.9				
		5.8	13.3	70/59	22200	16200	2.067	29300	10.7				
		5.8	13.3	75/63	24500	17100	2.107	31700	11.6				
		5.8	13.3	80/67	26800	17900	2.148	34100	12.5				
		5.8	13.3	85/71	29100	18800	2.188	36600	13.3				
110	6.7	1.5	3.5	65/55	16900	14000	3.079	27400	5.5				
		1.5	3.5	70/59	19200	14900	3.119	29800	6.2				
		1.5	3.5	75/63	21500	15700	3.160	32300	6.8				
		1.5	3.5	80/67	23700	16600	3.200	34600	7.4				
		1.5	3.5	85/71	26000	17500	3.241	37100	8.0				
	10.0	3.3	7.6	65/55	17800	14300	2.674	26900	6.7				
		3.3	7.6	70/59	20100	15200	2.715	29400	7.4				
		3.3	7.6	75/63	22400	16100	2.755	31800	8.1				
		3.3	7.6	80/67	24700	16900	2.796	34200	8.8				
		3.3	7.6	85/71	27000	17800	2.836	36700	9.5				
	13.3	5.7	13.1	65/55	18800	14700	2.270	26500	8.3				
		5.7	13.1	70/59	21100	15600	2.310	29000	9.1				
		5.7	13.1	75/63	23400	16400	2.351	31400	10.0				
		5.7	13.1	80/67	25600	17300	2.391	33800	10.7				
		5.7	13.1	85/71	27900	18200	2.431	36200	11.5				

GRQ – Size 040 (800 SCFM) – 1st Stage Low Fan

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
20	6.7	1.9	4.3	65/55	Operation Not Recommended					13700	1.756	7700	2.29
		1.9	4.3	70/59						13200	1.971	6500	1.96
		1.9	4.3	75/63						12700	2.187	5200	1.70
		1.9	4.3	80/67						12200	2.403	4000	1.49
		1.9	4.3	85/71									
	10.0	4.1	9.2	65/55						16700	1.982	9900	2.47
		4.1	9.2	70/59						16200	2.198	8700	2.16
		4.1	9.2	75/63						15700	2.414	7500	1.91
		4.1	9.2	80/67						15200	2.630	6200	1.69
		4.1	9.2	85/71									
	13.3	7.0	15.9	65/55						19700	2.208	12200	2.61
		7.0	15.9	70/59						19200	2.424	10900	2.32
		7.0	15.9	75/63						18700	2.640	9700	2.08
		7.0	15.9	80/67						18200	2.856	8500	1.87
		7.0	15.9	85/71									
30	6.7	1.8	4.2	65/55						17500	1.844	11200	2.78
		1.8	4.2	70/59	21300	13900	1.359	25900	15.7	17000	2.060	10000	2.42
		1.8	4.2	75/63	23500	14700	1.398	28300	16.8	16500	2.276	8700	2.12
		1.8	4.2	80/67	25700	15600	1.438	30600	17.9	16100	2.491	7600	1.89
		1.8	4.2	85/71	27900	16400	1.477	32900	18.9				
	10.0	3.9	9.0	65/55	20000	13400	0.926	23200	21.6	20500	2.070	13400	2.90
		3.9	9.0	70/59	22200	14300	0.965	25500	23.0	20000	2.286	12200	2.56
		3.9	9.0	75/63	24400	15100	1.005	27800	24.3	19500	2.502	11000	2.28
		3.9	9.0	80/67	26600	15900	1.044	30200	25.5	19100	2.718	9800	2.06
		3.9	9.0	85/71	28800	16700	1.083	32500	26.6				
	13.3	6.8	15.4	65/55	21000	13800	0.532	22800	39.5	23500	2.297	15700	3.00
		6.8	15.4	70/59	23100	14600	0.571	25000	40.5	23000	2.513	14400	2.68
		6.8	15.4	75/63	25300	15400	0.611	27400	41.4	22500	2.728	13200	2.42
		6.8	15.4	80/67	27500	16300	0.650	29700	42.3	22100	2.944	12100	2.20
		6.8	15.4	85/71	29700	17100	0.689	32100	43.1				
40	6.7	1.8	4.0	65/55	20900	14400	1.392	25700	15.0	21200	1.926	14600	3.23
		1.8	4.0	70/59	23100	15200	1.431	28000	16.1	20700	2.141	13400	2.83
		1.8	4.0	75/63	25300	16000	1.470	30300	17.2	20200	2.357	12200	2.51
		1.8	4.0	80/67	27400	16900	1.510	32600	18.1	19800	2.573	11000	2.25
		1.8	4.0	85/71	29600	17700	1.549	34900	19.1				
	10.0	3.8	8.7	65/55	21800	14700	0.998	25200	21.8	24200	2.152	16900	3.29
		3.8	8.7	70/59	24000	15500	1.037	27500	23.1	23700	2.368	15600	2.93
		3.8	8.7	75/63	26200	16400	1.076	29900	24.3	23200	2.584	14400	2.63
		3.8	8.7	80/67	28400	17200	1.116	32200	25.4	22800	2.799	13200	2.39
		3.8	8.7	85/71	30500	18000	1.155	34400	26.4				
	13.3	6.6	15.0	65/55	22700	15000	0.604	24800	37.6	27200	2.378	19100	3.35
		6.6	15.0	70/59	24900	15900	0.643	27100	38.7	26700	2.594	17800	3.02
		6.6	15.0	75/63	27100	16700	0.682	29400	39.7	26200	2.810	16600	2.73
		6.6	15.0	80/67	29300	17500	0.722	31800	40.6	25800	3.026	15500	2.50
		6.6	15.0	85/71	31400	18400	0.761	34000	41.3				
50	6.7	1.7	3.9	65/55	21500	14700	1.525	26700	14.1	24700	2.000	17900	3.62
		1.7	3.9	70/59	23600	15500	1.565	28900	15.1	24200	2.216	16600	3.20
		1.7	3.9	75/63	25800	16400	1.604	31300	16.1	23700	2.432	15400	2.86
		1.7	3.9	80/67	28000	17200	1.644	33600	17.0	23300	2.648	14300	2.58
		1.7	3.9	85/71	30200	18000	1.683	35900	17.9				
	10.0	3.7	8.5	65/55	22400	15000	1.132	26300	19.8	27700	2.227	20100	3.64
		3.7	8.5	70/59	24500	15900	1.171	28500	20.9	27200	2.443	18900	3.26
		3.7	8.5	75/63	26700	16700	1.210	30800	22.1	26700	2.658	17600	2.94
		3.7	8.5	80/67	28900	17500	1.250	33200	23.1	26300	2.874	16500	2.68
		3.7	8.5	85/71	31100	18400	1.289	35500	24.1				
	13.3	6.4	14.6	65/55	23300	15400	0.738	25800	31.6	30700	2.453	22300	3.67
		6.4	14.6	70/59	25400	16200	0.777	28100	32.7	30200	2.669	21100	3.32
		6.4	14.6	75/63	27600	17000	0.816	30400	33.8	29700	2.885	19900	3.02
		6.4	14.6	80/67	29800	17900	0.856	32700	34.8	29300	3.101	18700	2.77
		6.4	14.6	85/71	32000	18700	0.895	35100	35.8				
60	6.7	1.7	3.8	65/55	21000	14300	1.708	26800	12.3	28000	2.068	20900	3.97
		1.7	3.8	70/59	23200	15100	1.748	29200	13.3	27600	2.284	19800	3.54
		1.7	3.8	75/63	25400	15900	1.787	31500	14.2	27100	2.500	18600	3.18
		1.7	3.8	80/67	27600	16800	1.826	33800	15.1	26600	2.716	17300	2.87
		1.7	3.8	85/71	29700	17600	1.866	36100	15.9				
	10.0	3.6	8.3	65/55	21900	14600	1.314	26400	16.7	31000	2.295	23200	3.96
		3.6	8.3	70/59	24100	15500	1.354	28700	17.8	30600	2.511	22000	3.57
		3.6	8.3	75/63	26300	16300	1.393	31100	18.9	30100	2.726	20800	3.24
		3.6	8.3	80/67	28500	17100	1.432	33400	19.9	29600	2.942	19600	2.95
		3.6	8.3	85/71	30600	17900	1.472	35600	20.8				
	13.3	6.2	14.2	65/55	22800	15000	0.920	25900	24.8	34000	2.521	25400	3.95
		6.2	14.2	70/59	25000	15800	0.960	28300	26.0	33600	2.737	24300	3.60
		6.2	14.2	75/63	27200	16600	0.999	30600	27.2	33100	2.953	23000	3.28
		6.2	14.2	80/67	29400	17400	1.038	32900	28.3	32600	3.169	21800	3.01
		6.2	14.2	85/71	31600	18300	1.078	35300	29.3				

GRQ – Size 040 (800 SCFM) – 1st Stage Low Fan (Continued)

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
70	6.7	1.6	3.8	65/55	19800	13300	1.926	26400	10.3	31200	2.130	23900	4.29
		1.6	3.8	70/59	22000	14100	1.966	28700	11.2	30800	2.346	22800	3.85
		1.6	3.8	75/63	24200	15000	2.005	31000	12.1	30300	2.561	21600	3.47
		1.6	3.8	80/67	26400	15800	2.045	33400	12.9	29800	2.777	20300	3.14
		1.6	3.8	85/71	28600	16600	2.084	35700	13.7				
	10.0	3.5	8.1	65/55	20800	13600	1.533	26000	13.6	34200	2.356	26200	4.25
		3.5	8.1	70/59	22900	14500	1.572	28300	14.6	33800	2.572	25000	3.85
		3.5	8.1	75/63	25100	15300	1.611	30600	15.6	33300	2.788	23800	3.50
		3.5	8.1	80/67	27300	16100	1.651	32900	16.5	32800	3.004	22500	3.20
		3.5	8.1	85/71	29500	17000	1.690	35300	17.5				
	13.3	6.1	13.9	65/55	21700	14000	1.139	25600	19.1	37200	2.582	28400	4.22
		6.1	13.9	70/59	23800	14800	1.178	27800	20.2	36800	2.798	27300	3.85
		6.1	13.9	75/63	26000	15600	1.217	30200	21.4	36300	3.014	26000	3.53
		6.1	13.9	80/67	28200	16500	1.257	32500	22.4	35800	3.230	24800	3.25
		6.1	13.9	85/71	30400	17300	1.296	34800	23.5				
80	6.7	1.6	3.7	65/55	18200	11900	2.167	25600	8.4	34300	2.184	26800	4.60
		1.6	3.7	70/59	20400	12800	2.207	27900	9.2	33800	2.400	25600	4.13
		1.6	3.7	75/63	22500	13600	2.246	30200	10.0	33300	2.616	24400	3.73
		1.6	3.7	80/67	24700	14400	2.285	32500	10.8	32900	2.832	23200	3.40
		1.6	3.7	85/71	26900	15300	2.325	34800	11.6				
	10.0	3.5	7.9	65/55	19100	12300	1.773	25200	10.8	37300	2.411	29100	4.53
		3.5	7.9	70/59	21300	13100	1.813	27500	11.7	36800	2.626	27800	4.11
		3.5	7.9	75/63	23500	13900	1.852	29800	12.7	36300	2.842	26600	3.74
		3.5	7.9	80/67	25600	14800	1.891	32100	13.5	35900	3.058	25500	3.44
		3.5	7.9	85/71	27800	15600	1.931	34400	14.4				
	13.3	6.0	13.7	65/55	20000	12600	1.379	24700	14.5	40300	2.637	31300	4.48
		6.0	13.7	70/59	22200	13400	1.419	27000	15.6	39800	2.853	30100	4.09
		6.0	13.7	75/63	24400	14300	1.458	29400	16.7	39300	3.069	28800	3.75
		6.0	13.7	80/67	26500	15100	1.498	31600	17.7	38900	3.284	27700	3.47
		6.0	13.7	85/71	28700	15900	1.537	33900	18.7				
90	6.7	1.6	3.6	65/55	16300	10400	2.417	24500	6.7	37200	2.232	29600	4.88
		1.6	3.6	70/59	18500	11200	2.457	26900	7.5	36700	2.448	28300	4.39
		1.6	3.6	75/63	20600	12000	2.496	29100	8.3	36200	2.664	27100	3.98
		1.6	3.6	80/67	22800	12900	2.535	31500	9.0	35700	2.880	25900	3.63
		1.6	3.6	85/71	25000	13700	2.575	33800	9.7				
	10.0	3.4	7.8	65/55	17200	10700	2.023	24100	8.5	40200	2.458	31800	4.79
		3.4	7.8	70/59	19400	11600	2.063	26400	9.4	39700	2.674	30600	4.35
		3.4	7.8	75/63	21600	12400	2.102	28800	10.3	39200	2.890	29300	3.97
		3.4	7.8	80/67	23700	13200	2.141	31000	11.1	38700	3.106	28100	3.65
		3.4	7.8	85/71	25900	14000	2.181	33300	11.9				
	13.3	5.9	13.4	65/55	18100	11100	1.629	23700	11.1	43200	2.685	34000	4.71
		5.9	13.4	70/59	20300	11900	1.669	26000	12.2	42700	2.901	32800	4.31
		5.9	13.4	75/63	22500	12700	1.708	28300	13.2	42200	3.116	31600	3.97
		5.9	13.4	80/67	24600	13600	1.747	30600	14.1	41700	3.332	30300	3.67
		5.9	13.4	85/71	26800	14400	1.787	32900	15.0	Operation Not Recommended			
100	6.7	1.6	3.6	65/55	14400	8900	2.663	23500	5.4				
		1.6	3.6	70/59	16600	9700	2.703	25800	6.1				
		1.6	3.6	75/63	18800	10500	2.742	28200	6.9				
		1.6	3.6	80/67	20900	11300	2.781	30400	7.5				
		1.6	3.6	85/71	23100	12200	2.821	32700	8.2				
	10.0	3.4	7.7	65/55	15300	9200	2.269	23000	6.7				
		3.4	7.7	70/59	17500	10000	2.309	25400	7.6				
		3.4	7.7	75/63	19700	10800	2.348	27700	8.4				
		3.4	7.7	80/67	21800	11700	2.387	29900	9.1				
		3.4	7.7	85/71	24000	12500	2.427	32300	9.9				
	13.3	5.8	13.3	65/55	16200	9500	1.875	22600	8.6				
		5.8	13.3	70/59	18400	10400	1.915	24900	9.6				
		5.8	13.3	75/63	20600	11200	1.954	27300	10.5				
		5.8	13.3	80/67	22700	12000	1.993	29500	11.4				
		5.8	13.3	85/71	24900	12800	2.033	31800	12.2				
110	6.7	1.5	3.5	65/55	12700	7500	2.892	22600	4.4				
		1.5	3.5	70/59	14900	8300	2.931	24900	5.1				
		1.5	3.5	75/63	17100	9200	2.971	27200	5.8				
		1.5	3.5	80/67	19300	10000	3.010	29600	6.4				
		1.5	3.5	85/71	21500	10800	3.049	31900	7.1				
	10.0	3.3	7.6	65/55	13700	7900	2.498	22200	5.5				
		3.3	7.6	70/59	15800	8700	2.537	24500	6.2				
		3.3	7.6	75/63	18000	9500	2.577	26800	7.0				
		3.3	7.6	80/67	20200	10300	2.616	29100	7.7				
		3.3	7.6	85/71	22400	11200	2.656	31500	8.4				
	13.3	5.7	13.1	65/55	14600	8200	2.104	21800	6.9				
		5.7	13.1	70/59	16700	9000	2.144	24000	7.8				
		5.7	13.1	75/63	18900	9900	2.183	26400	8.7				
		5.7	13.1	80/67	21100	10700	2.222	28700	9.5				
		5.7	13.1	85/71	23300	11500	2.262	31000	10.3				

GRQ – Size 048 (1500 SCFM) – 2nd Stage High Fan

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
20	8.0	3.6	8.1	65/55	Operation Not Recommended					29900	2.806	20300	3.12
		3.6	8.1	70/59						29500	2.960	19400	2.92
		3.6	8.1	75/63						29200	3.115	18600	2.75
		3.6	8.1	80/67						28800	3.270	17600	2.58
		3.6	8.1	85/71									
	12.0	7.7	17.5	65/55						32500	3.002	22300	3.17
		7.7	17.5	70/59						32100	3.157	21300	2.98
		7.7	17.5	75/63						31800	3.312	20500	2.81
		7.7	17.5	80/67						31500	3.466	19700	2.66
		7.7	17.5	85/71									
	16.0	13.3	30.3	65/55						35100	3.199	24200	3.21
		13.3	30.3	70/59						34800	3.354	23400	3.04
		13.3	30.3	75/63						34400	3.508	22400	2.87
		13.3	30.3	80/67						34100	3.663	21600	2.73
		13.3	30.3	85/71									
30	8.0	3.4	7.8	65/55						35100	2.961	25000	3.47
		3.4	7.8	70/59	53300	35900	2.170	60700	24.6	34700	3.116	24100	3.26
		3.4	7.8	75/63	57200	37300	2.190	64700	26.1	34400	3.271	23200	3.08
		3.4	7.8	80/67	61200	38700	2.210	68700	27.7	34100	3.425	22400	2.92
		3.4	7.8	85/71	65100	40100	2.230	72700	29.2				
	12.0	7.4	17.0	65/55	49700	34600	2.085	56800	23.8	37700	3.158	26900	3.50
		7.4	17.0	70/59	53600	36000	2.105	60800	25.5	37400	3.313	26100	3.31
		7.4	17.0	75/63	57500	37400	2.125	64800	27.1	37000	3.467	25200	3.13
		7.4	17.0	80/67	61400	38800	2.146	68700	28.6	36700	3.622	24300	2.97
		7.4	17.0	85/71	65400	40200	2.166	72800	30.2				
	16.0	12.8	29.3	65/55	49900	34800	2.021	56800	24.7	40300	3.355	28800	3.52
		12.8	29.3	70/59	53800	36100	2.041	60800	26.4	40000	3.509	28000	3.34
		12.8	29.3	75/63	57800	37500	2.061	64800	28.0	39700	3.664	27200	3.17
		12.8	29.3	80/67	61700	38900	2.081	68800	29.6	39300	3.819	26300	3.02
		12.8	29.3	85/71	65600	40300	2.101	72800	31.2				
40	8.0	3.3	7.6	65/55	47500	33700	2.235	55100	21.3	40300	3.117	29700	3.79
		3.3	7.6	70/59	51400	35100	2.255	59100	22.8	40000	3.272	28800	3.58
		3.3	7.6	75/63	55300	36500	2.276	63100	24.3	39600	3.426	27900	3.39
		3.3	7.6	80/67	59200	37800	2.296	67000	25.8	39300	3.581	27100	3.22
		3.3	7.6	85/71	63200	39200	2.316	71100	27.3				
	12.0	7.2	16.5	65/55	47700	33800	2.171	55100	22.0	42900	3.314	31600	3.79
		7.2	16.5	70/59	51700	35200	2.191	59200	23.6	42600	3.468	30800	3.60
		7.2	16.5	75/63	55600	36600	2.211	63100	25.1	42200	3.623	29800	3.41
		7.2	16.5	80/67	59500	37900	2.231	67100	26.7	41900	3.778	29000	3.25
		7.2	16.5	85/71	63400	39300	2.251	71100	28.2				
	16.0	12.5	28.5	65/55	48000	33900	2.106	55200	22.8	45600	3.510	33600	3.81
		12.5	28.5	70/59	51900	35300	2.126	59200	24.4	45200	3.665	32700	3.61
		12.5	28.5	75/63	55800	36700	2.146	63100	26.0	44900	3.820	31900	3.44
		12.5	28.5	80/67	59800	38100	2.166	67200	27.6	44500	3.974	30900	3.28
		12.5	28.5	85/71	63700	39400	2.187	71200	29.1				
50	8.0	3.3	7.4	65/55	45500	32800	2.394	53700	19.0	45500	3.273	34300	4.07
		3.3	7.4	70/59	49400	34200	2.414	57600	20.5	45200	3.428	33500	3.86
		3.3	7.4	75/63	53300	35600	2.434	61600	21.9	44800	3.582	32600	3.66
		3.3	7.4	80/67	57300	37000	2.454	65700	23.3	44500	3.737	31700	3.49
		3.3	7.4	85/71	61200	38400	2.474	69600	24.7				
	12.0	7.0	16.0	65/55	45800	33000	2.329	53700	19.7	48100	3.470	36300	4.06
		7.0	16.0	70/59	49700	34300	2.349	57700	21.2	47800	3.624	35400	3.86
		7.0	16.0	75/63	53600	35700	2.369	61700	22.6	47500	3.779	34600	3.68
		7.0	16.0	80/67	57500	37100	2.389	65700	24.1	47100	3.933	33700	3.51
		7.0	16.0	85/71	61500	38500	2.409	69700	25.5				
	16.0	12.1	27.7	65/55	46000	33100	2.264	53700	20.3	50800	3.666	38300	4.06
		12.1	27.7	70/59	49900	34400	2.285	57700	21.8	50400	3.821	37400	3.86
		12.1	27.7	75/63	53900	35800	2.305	61800	23.4	50100	3.975	36500	3.69
		12.1	27.7	80/67	57800	37200	2.325	65700	24.9	49800	4.130	35700	3.53
		12.1	27.7	85/71	61700	38600	2.345	69700	26.3				
60	8.0	3.2	7.2	65/55	43500	32000	2.625	52500	16.6	50700	3.429	39000	4.33
		3.2	7.2	70/59	47400	33400	2.645	56400	17.9	50400	3.583	38200	4.12
		3.2	7.2	75/63	51300	34800	2.665	60400	19.2	50100	3.738	37300	3.93
		3.2	7.2	80/67	55200	36200	2.685	64400	20.6	49700	3.893	36400	3.74
		3.2	7.2	85/71	59200	37500	2.705	68400	21.9				
	12.0	6.9	15.6	65/55	43700	32100	2.560	52400	17.1	53400	3.625	41000	4.32
		6.9	15.6	70/59	47700	33500	2.580	56500	18.5	53000	3.780	40100	4.11
		6.9	15.6	75/63	51600	34900	2.600	60500	19.8	52700	3.935	39300	3.92
		6.9	15.6	80/67	55500	36300	2.620	64400	21.2	52300	4.089	38300	3.75
		6.9	15.6	85/71	59400	37600	2.640	68400	22.5				
	16.0	11.8	27.0	65/55	44000	32200	2.495	52500	17.6	56000	3.822	43000	4.29
		11.8	27.0	70/59	47900	33600	2.515	56500	19.0	55700	3.977	42100	4.10
		11.8	27.0	75/63	51800	35000	2.536	60500	20.4	55300	4.131	41200	3.92
		11.8	27.0	80/67	55800	36400	2.556	64500	21.8	55000	4.286	40400	3.76
		11.8	27.0	85/71	59700	37700	2.576	68500	23.2				

GRQ – Size 048 (1500 SCFM) – 2nd Stage High Fan (Continued)

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
70	8.0	3.1	7.1	65/55	41400	31200	2.928	51400	14.1	56000	3.584	43800	4.58
		3.1	7.1	70/59	45300	32500	2.948	55400	15.4	55600	3.739	42800	4.36
		3.1	7.1	75/63	49200	33900	2.968	59300	16.6	55300	3.894	42000	4.16
		3.1	7.1	80/67	53200	35300	2.989	63400	17.8	54900	4.048	41100	3.97
		3.1	7.1	85/71	57100	36700	3.009	67400	19.0				
	12.0	6.7	15.3	65/55	41600	31300	2.864	51400	14.5	58600	3.781	45700	4.54
		6.7	15.3	70/59	45600	32700	2.884	55400	15.8	58200	3.936	44800	4.33
		6.7	15.3	75/63	49500	34000	2.904	59400	17.0	57900	4.090	43900	4.15
		6.7	15.3	80/67	53400	35400	2.924	63400	18.3	57600	4.245	43100	3.98
		6.7	15.3	85/71	57300	36800	2.944	67300	19.5				
	16.0	11.6	26.5	65/55	41900	31400	2.799	51500	15.0	61200	3.978	47600	4.51
		11.6	26.5	70/59	45800	32800	2.819	55400	16.2	60900	4.132	46800	4.32
		11.6	26.5	75/63	49800	34100	2.839	59500	17.5	60500	4.287	45900	4.13
		11.6	26.5	80/67	53700	35500	2.859	63500	18.8	60200	4.442	45000	3.97
		11.6	26.5	85/71	57600	36900	2.879	67400	20.0				
80	8.0	3.0	7.0	65/55	39200	30300	3.305	50500	11.9	61200	3.740	48400	4.79
		3.0	7.0	70/59	43200	31700	3.325	54500	13.0	60800	3.895	47500	4.57
		3.0	7.0	75/63	47100	33100	3.345	58500	14.1	60500	4.049	46700	4.38
		3.0	7.0	80/67	51000	34500	3.365	62500	15.2	60100	4.204	45800	4.19
		3.0	7.0	85/71	54900	35800	3.385	66500	16.2				
	12.0	6.6	15.0	65/55	39500	30400	3.240	50600	12.2	63800	3.937	50400	4.75
		6.6	15.0	70/59	43400	31800	3.260	54500	13.3	63500	4.091	49500	4.55
		6.6	15.0	75/63	47400	33200	3.280	58600	14.5	63100	4.246	48600	4.35
		6.6	15.0	80/67	51300	34600	3.300	62600	15.5	62800	4.401	47800	4.18
		6.6	15.0	85/71	55200	36000	3.320	66500	16.6				
	16.0	11.4	26.0	65/55	39800	30500	3.176	50600	12.5	66400	4.133	52300	4.71
		11.4	26.0	70/59	43700	31900	3.196	54600	13.7	66100	4.288	51500	4.52
		11.4	26.0	75/63	47600	33300	3.216	58600	14.8	65800	4.443	50600	4.34
		11.4	26.0	80/67	51600	34700	3.236	62600	15.9	65400	4.597	49700	4.17
		11.4	26.0	85/71	55500	36100	3.256	66600	17.0				
90	8.0	3.0	6.8	65/55	37100	29500	3.754	49900	9.9	66400	3.896	53100	4.99
		3.0	6.8	70/59	41000	30900	3.774	53900	10.9	66000	4.050	52200	4.77
		3.0	6.8	75/63	44900	32200	3.794	57800	11.8	65700	4.205	51300	4.58
		3.0	6.8	80/67	48800	33600	3.814	61800	12.8	65400	4.360	50500	4.39
		3.0	6.8	85/71	52800	35000	3.834	65900	13.8				
	12.0	6.5	14.8	65/55	37300	29600	3.689	49900	10.1	69000	4.092	55000	4.94
		6.5	14.8	70/59	41300	31000	3.709	54000	11.1	68700	4.247	54200	4.74
		6.5	14.8	75/63	45200	32300	3.729	57900	12.1	68300	4.402	53300	4.55
		6.5	14.8	80/67	49100	33700	3.750	61900	13.1	68000	4.556	52500	4.37
		6.5	14.8	85/71	53000	35100	3.770	65900	14.1				
	16.0	11.2	25.5	65/55	37600	29700	3.625	50000	10.4	71700	4.289	57100	4.90
		11.2	25.5	70/59	41500	31100	3.645	53900	11.4	71300	4.444	56100	4.70
		11.2	25.5	75/63	45400	32500	3.665	57900	12.4	71000	4.598	55300	4.52
		11.2	25.5	80/67	49400	33800	3.685	62000	13.4	70600	4.753	54400	4.35
		11.2	25.5	85/71	53300	35200	3.705	65900	14.4	Operation Not Recommended			
100	8.0	3.0	6.7	65/55	34800	28600	4.276	49400	8.1				
		3.0	6.7	70/59	38800	30000	4.296	53500	9.0				
		3.0	6.7	75/63	42700	31400	4.316	57400	9.9				
		3.0	6.7	80/67	46600	32800	4.336	61400	10.7				
		3.0	6.7	85/71	50500	34200	4.356	65400	11.6				
	12.0	6.4	14.6	65/55	35100	28700	4.211	49500	8.3				
		6.4	14.6	70/59	39000	30100	4.231	53400	9.2				
		6.4	14.6	75/63	42900	31500	4.251	57400	10.1				
		6.4	14.6	80/67	46900	32900	4.271	61500	11.0				
		6.4	14.6	85/71	50800	34300	4.292	65400	11.8				
	16.0	11.0	25.2	65/55	35400	28800	4.147	49600	8.5				
		11.0	25.2	70/59	39300	30200	4.167	53500	9.4				
		11.0	25.2	75/63	43200	31600	4.187	57500	10.3				
		11.0	25.2	80/67	47100	33000	4.207	61500	11.2				
		11.0	25.2	85/71	51100	34400	4.227	65500	12.1				
110	8.0	2.9	6.7	65/55	32500	27800	4.870	49100	6.7				
		2.9	6.7	70/59	36500	29200	4.890	53200	7.5				
		2.9	6.7	75/63	40400	30600	4.911	57200	8.2				
		2.9	6.7	80/67	44300	31900	4.931	61100	9.0				
		2.9	6.7	85/71	48200	33300	4.951	65100	9.7				
	12.0	6.3	14.4	65/55	32800	27900	4.806	49200	6.8				
		6.3	14.4	70/59	36700	29300	4.826	53200	7.6				
		6.3	14.4	75/63	40700	30700	4.846	57200	8.4				
		6.3	14.4	80/67	44600	32000	4.866	61200	9.2				
		6.3	14.4	85/71	48500	33400	4.886	65200	9.9				
	16.0	10.9	24.9	65/55	33100	28000	4.741	49300	7.0				
		10.9	24.9	70/59	37000	29400	4.761	53200	7.8				
		10.9	24.9	75/63	40900	30800	4.781	57200	8.6				
		10.9	24.9	80/67	44800	32100	4.802	61200	9.3				
		10.9	24.9	85/71	48800	33500	4.822	65300	10.1				

GRQ – Size 048 (1050 SCFM) – 1st Stage Medium Fan

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
20	8.0	3.6	8.1	65/55	Operation Not Recommended					20000	2.207	12500	2.66
		3.6	8.1	70/59						19700	2.362	11600	2.44
		3.6	8.1	75/63						19300	2.517	10700	2.25
		3.6	8.1	80/67						19000	2.672	9900	2.08
		3.6	8.1	85/71									
	12.0	7.7	17.5	65/55						22300	2.253	14600	2.90
		7.7	17.5	70/59						22000	2.409	13800	2.68
		7.7	17.5	75/63						21600	2.564	12800	2.47
		7.7	17.5	80/67						21300	2.719	12000	2.30
		7.7	17.5	85/71									
	16.0	13.3	30.3	65/55						24600	2.300	16800	3.13
		13.3	30.3	70/59						24200	2.456	15800	2.89
		13.3	30.3	75/63						23900	2.611	15000	2.68
		13.3	30.3	80/67						23600	2.766	14200	2.50
		13.3	30.3	85/71									
30	8.0	3.4	7.8	65/55						23400	2.257	15700	3.04
		3.4	7.8	70/59	37500	28400	1.246	41800	30.1	23000	2.412	14800	2.79
		3.4	7.8	75/63	40600	29500	1.267	44900	32.0	22700	2.567	13900	2.59
		3.4	7.8	80/67	43800	30600	1.287	48200	34.0	22400	2.722	13100	2.41
		3.4	7.8	85/71	46900	31700	1.308	51400	35.9				
	12.0	7.4	17.0	65/55	34600	27400	1.159	38600	29.9	25600	2.304	17700	3.26
		7.4	17.0	70/59	37800	28500	1.180	41800	32.0	25300	2.459	16900	3.01
		7.4	17.0	75/63	40900	29600	1.200	45000	34.1	25000	2.614	16100	2.80
		7.4	17.0	80/67	44000	30700	1.221	48200	36.0	24600	2.769	15100	2.60
		7.4	17.0	85/71	47200	31900	1.242	51400	38.0				
	16.0	12.8	29.3	65/55	34900	27500	1.092	38600	32.0	27900	2.351	19900	3.48
		12.8	29.3	70/59	38000	28600	1.113	41800	34.1	27600	2.506	19000	3.23
		12.8	29.3	75/63	41200	29700	1.134	45100	36.3	27300	2.661	18200	3.01
		12.8	29.3	80/67	44300	30900	1.154	48200	38.4	26900	2.816	17300	2.80
		12.8	29.3	85/71	47400	32000	1.175	51400	40.3				
40	8.0	3.3	7.6	65/55	33000	25100	1.379	37700	23.9	26700	2.307	18800	3.39
		3.3	7.6	70/59	36100	26300	1.400	40900	25.8	26400	2.462	18000	3.14
		3.3	7.6	75/63	39300	27400	1.420	44100	27.7	26100	2.617	17200	2.92
		3.3	7.6	80/67	42400	28500	1.441	47300	29.4	25700	2.772	16200	2.72
		3.3	7.6	85/71	45600	29600	1.462	50600	31.2				
	12.0	7.2	16.5	65/55	33300	25300	1.312	37800	25.4	29000	2.354	21000	3.61
		7.2	16.5	70/59	36400	26400	1.333	40900	27.3	28700	2.509	20100	3.35
		7.2	16.5	75/63	39500	27500	1.354	44100	29.2	28300	2.664	19200	3.11
		7.2	16.5	80/67	42700	28600	1.374	47400	31.1	28000	2.819	18400	2.91
		7.2	16.5	85/71	45800	29700	1.395	50600	32.8				
	16.0	12.5	28.5	65/55	33500	25400	1.246	37800	26.9	31300	2.401	23100	3.82
		12.5	28.5	70/59	36700	26500	1.267	41000	29.0	30900	2.556	22200	3.54
		12.5	28.5	75/63	39800	27600	1.287	44200	30.9	30600	2.711	21300	3.31
		12.5	28.5	80/67	43000	28700	1.308	47500	32.9	30300	2.866	20500	3.10
		12.5	28.5	85/71	46100	29800	1.329	50600	34.7				
50	8.0	3.3	7.4	65/55	31500	23300	1.534	36700	20.5	30100	2.357	22100	3.74
		3.3	7.4	70/59	34700	24500	1.554	40000	22.3	29800	2.512	21200	3.48
		3.3	7.4	75/63	37800	25600	1.575	43200	24.0	29400	2.668	20300	3.23
		3.3	7.4	80/67	40900	26700	1.596	46300	25.6	29100	2.823	19500	3.02
		3.3	7.4	85/71	44100	27800	1.616	49600	27.3				
	12.0	7.0	16.0	65/55	31800	23500	1.467	36800	21.7	32400	2.404	24200	3.95
		7.0	16.0	70/59	34900	24600	1.488	40000	23.5	32000	2.559	23300	3.66
		7.0	16.0	75/63	38100	25700	1.509	43300	25.2	31700	2.714	22400	3.42
		7.0	16.0	80/67	41200	26800	1.529	46400	26.9	31400	2.870	21600	3.21
		7.0	16.0	85/71	44300	27900	1.550	49600	28.6				
	16.0	12.1	27.7	65/55	32100	23600	1.401	36900	22.9	34600	2.451	26200	4.14
		12.1	27.7	70/59	35200	24700	1.422	40100	24.8	34300	2.606	25400	3.86
		12.1	27.7	75/63	38300	25800	1.442	43200	26.6	34000	2.761	24600	3.61
		12.1	27.7	80/67	41500	26900	1.463	46500	28.4	33600	2.917	23600	3.37
		12.1	27.7	85/71	44600	28000	1.484	49700	30.1				
60	8.0	3.2	7.2	65/55	30000	21900	1.710	35800	17.5	33500	2.408	25300	4.08
		3.2	7.2	70/59	33100	23000	1.731	39000	19.1	33100	2.563	24400	3.78
		3.2	7.2	75/63	36200	24100	1.751	42200	20.7	32800	2.718	23500	3.54
		3.2	7.2	80/67	39400	25200	1.772	45400	22.2	32500	2.873	22700	3.31
		3.2	7.2	85/71	42500	26400	1.793	48600	23.7				
	12.0	6.9	15.6	65/55	30200	22000	1.644	35800	18.4	35700	2.455	27300	4.26
		6.9	15.6	70/59	33400	23100	1.664	39100	20.1	35400	2.610	26500	3.97
		6.9	15.6	75/63	36500	24200	1.685	42300	21.7	35100	2.765	25700	3.72
		6.9	15.6	80/67	39600	25400	1.706	45400	23.2	34700	2.920	24700	3.48
		6.9	15.6	85/71	42800	26500	1.726	48700	24.8				
	16.0	11.8	27.0	65/55	30500	22100	1.577	35900	19.3	38000	2.501	29500	4.45
		11.8	27.0	70/59	33600	23300	1.598	39100	21.0	37700	2.657	28600	4.16
		11.8	27.0	75/63	36800	24400	1.618	42300	22.7	37300	2.812	27700	3.89
		11.8	27.0	80/67	39900	25500	1.639	45500	24.3	37000	2.967	26900	3.65
		11.8	27.0	85/71	43000	26600	1.660	48700	25.9				

GRQ – Size 048 (1050 SCFM) – 1st Stage Medium Fan (Continued)

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
70	8.0	3.1	7.1	65/55	28300	20800	1.927	34900	14.7	36800	2.458	28400	4.39
		3.1	7.1	70/59	31500	21900	1.948	38100	16.2	36500	2.613	27600	4.09
		3.1	7.1	75/63	34600	23100	1.969	41300	17.6	36100	2.768	26700	3.82
		3.1	7.1	80/67	37700	24200	1.989	44500	19.0	35800	2.923	25800	3.59
		3.1	7.1	85/71	40900	25300	2.010	47800	20.3				
	12.0	6.7	15.3	65/55	28600	20900	1.861	35000	15.4	39100	2.505	30600	4.57
		6.7	15.3	70/59	31700	22100	1.881	38100	16.9	38800	2.660	29700	4.27
		6.7	15.3	75/63	34900	23200	1.902	41400	18.3	38400	2.815	28800	4.00
		6.7	15.3	80/67	38000	24300	1.923	44600	19.8	38100	2.970	28000	3.76
		6.7	15.3	85/71	41100	25400	1.944	47700	21.1				
	16.0	11.6	26.5	65/55	28800	21100	1.794	34900	16.1	41400	2.552	32700	4.75
		11.6	26.5	70/59	32000	22200	1.815	38200	17.6	41000	2.707	31800	4.44
		11.6	26.5	75/63	35100	23300	1.836	41400	19.1	40700	2.862	30900	4.17
		11.6	26.5	80/67	38300	24400	1.856	44600	20.6	40400	3.017	30100	3.92
		11.6	26.5	85/71	41400	25500	1.877	47800	22.1				
80	8.0	3.0	7.0	65/55	26600	20100	2.206	34100	12.1	40200	2.508	31600	4.70
		3.0	7.0	70/59	29800	21200	2.226	37400	13.4	39800	2.663	30700	4.38
		3.0	7.0	75/63	32900	22300	2.247	40600	14.6	39500	2.818	29900	4.11
		3.0	7.0	80/67	36100	23500	2.268	43800	15.9	39200	2.973	29100	3.86
		3.0	7.0	85/71	39200	24600	2.288	47000	17.1				
	12.0	6.6	15.0	65/55	26900	20200	2.139	34200	12.6	42400	2.555	33700	4.86
		6.6	15.0	70/59	30000	21300	2.160	37400	13.9	42100	2.710	32900	4.55
		6.6	15.0	75/63	33200	22500	2.181	40600	15.2	41800	2.865	32000	4.27
		6.6	15.0	80/67	36300	23600	2.201	43800	16.5	41400	3.020	31100	4.02
		6.6	15.0	85/71	39500	24700	2.222	47100	17.8				
	16.0	11.4	26.0	65/55	27200	20300	2.073	34300	13.1	44700	2.602	35800	5.03
		11.4	26.0	70/59	30300	21500	2.093	37400	14.5	44400	2.757	35000	4.72
		11.4	26.0	75/63	33400	22600	2.114	40600	15.8	44000	2.912	34100	4.43
		11.4	26.0	80/67	36600	23700	2.135	43900	17.1	43700	3.067	33200	4.17
		11.4	26.0	85/71	39700	24800	2.155	47100	18.4				
90	8.0	3.0	6.8	65/55	24900	19800	2.565	33700	9.7	43500	2.558	34800	4.98
		3.0	6.8	70/59	28100	20900	2.586	36900	10.9	43200	2.714	33900	4.66
		3.0	6.8	75/63	31200	22000	2.606	40100	12.0	42900	2.869	33100	4.38
		3.0	6.8	80/67	34400	23100	2.627	43400	13.1	42500	3.024	32200	4.12
		3.0	6.8	85/71	37500	24200	2.648	46500	14.2				
	12.0	6.5	14.8	65/55	25200	19900	2.498	33700	10.1	45800	2.605	36900	5.15
		6.5	14.8	70/59	28300	21000	2.519	36900	11.2	45500	2.760	36100	4.83
		6.5	14.8	75/63	31500	22100	2.540	40200	12.4	45100	2.916	35100	4.53
		6.5	14.8	80/67	34600	23200	2.561	43300	13.5	44800	3.071	34300	4.27
		6.5	14.8	85/71	37800	24300	2.581	46600	14.6				
	16.0	11.2	25.5	65/55	25500	20000	2.432	33800	10.5	48100	2.652	39000	5.31
		11.2	25.5	70/59	28600	21100	2.453	37000	11.7	47700	2.807	38100	4.98
		11.2	25.5	75/63	31700	22200	2.473	40100	12.8	47400	2.963	37300	4.69
		11.2	25.5	80/67	34900	23300	2.494	43400	14.0	47100	3.118	36500	4.43
		11.2	25.5	85/71	38000	24400	2.515	46600	15.1	Operation Not Recommended			
100	8.0	3.0	6.7	65/55	23300	19800	3.025	33600	7.7				
		3.0	6.7	70/59	26400	20900	3.046	36800	8.7				
		3.0	6.7	75/63	29500	22000	3.066	40000	9.6				
		3.0	6.7	80/67	32700	23100	3.087	43200	10.6				
		3.0	6.7	85/71	35800	24200	3.108	46400	11.5				
	12.0	6.4	14.6	65/55	23500	19900	2.959	33600	7.9				
		6.4	14.6	70/59	26700	21000	2.979	36900	9.0				
		6.4	14.6	75/63	29800	22100	3.000	40000	9.9				
		6.4	14.6	80/67	32900	23200	3.021	43200	10.9				
		6.4	14.6	85/71	36100	24300	3.041	46500	11.9				
	16.0	11.0	25.2	65/55	23800	20000	2.892	33700	8.2				
		11.0	25.2	70/59	26900	21100	2.913	36800	9.2				
		11.0	25.2	75/63	30100	22200	2.934	40100	10.3				
		11.0	25.2	80/67	33200	23300	2.954	43300	11.2				
		11.0	25.2	85/71	36400	24400	2.975	46600	12.2				
110	8.0	2.9	6.7	65/55	21600	20100	3.606	33900	6.0				
		2.9	6.7	70/59	24800	21200	3.627	37200	6.8				
		2.9	6.7	75/63	27900	22400	3.647	40300	7.7				
		2.9	6.7	80/67	31100	23500	3.668	43600	8.5				
		2.9	6.7	85/71	34200	24600	3.689	46800	9.3				
	12.0	6.3	14.4	65/55	21900	20200	3.540	34000	6.2				
		6.3	14.4	70/59	25000	21400	3.560	37200	7.0				
		6.3	14.4	75/63	28200	22500	3.581	40400	7.9				
		6.3	14.4	80/67	31300	23600	3.602	43600	8.7				
		6.3	14.4	85/71	34500	24700	3.622	46900	9.5				
	16.0	10.9	24.9	65/55	22200	20400	3.473	34100	6.4				
		10.9	24.9	70/59	25300	21500	3.494	37200	7.2				
		10.9	24.9	75/63	28400	22600	3.515	40400	8.1				
		10.9	24.9	80/67	31600	23700	3.535	43700	8.9				
		10.9	24.9	85/71	34700	24800	3.556	46800	9.8				

GRQ – Size 048 (850 SCFM) – 1st Stage Low Fan

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
20	8.0	3.6	8.1	65/55	Operation Not Recommended					15500	2.215	7900	2.05
		3.6	8.1	70/59						15100	2.369	7000	1.87
		3.6	8.1	75/63						14700	2.522	6100	1.71
		3.6	8.1	80/67						14400	2.675	5300	1.58
		3.6	8.1	85/71									
	12.0	7.7	17.5	65/55						18000	2.262	10300	2.33
		7.7	17.5	70/59						17600	2.415	9400	2.14
		7.7	17.5	75/63						17300	2.568	8500	1.97
		7.7	17.5	80/67						16900	2.721	7600	1.82
		7.7	17.5	85/71									
	16.0	13.3	30.3	65/55						20500	2.308	12600	2.60
		13.3	30.3	70/59						20200	2.461	11800	2.40
		13.3	30.3	75/63						19800	2.615	10900	2.22
		13.3	30.3	80/67						19400	2.768	10000	2.05
		13.3	30.3	85/71									
30	8.0	3.4	7.8	65/55						20000	2.283	12200	2.57
		3.4	7.8	70/59	36200	23000	1.586	41600	22.8	19600	2.436	11300	2.36
		3.4	7.8	75/63	39300	24000	1.607	44800	24.5	19200	2.590	10400	2.17
		3.4	7.8	80/67	42500	25000	1.628	48100	26.1	18800	2.743	9400	2.01
		3.4	7.8	85/71	45600	26100	1.648	51200	27.7				
	12.0	7.4	17.0	65/55	33300	22100	1.500	38400	22.2	22500	2.330	14500	2.83
		7.4	17.0	70/59	36400	23100	1.520	41600	23.9	22100	2.483	13600	2.61
		7.4	17.0	75/63	39600	24100	1.541	44900	25.7	21700	2.636	12700	2.41
		7.4	17.0	80/67	42800	25200	1.561	48100	27.4	21400	2.789	11900	2.25
		7.4	17.0	85/71	45900	26200	1.582	51300	29.0				
	16.0	12.8	29.3	65/55	33600	22200	1.434	38500	23.4	25000	2.376	16900	3.08
		12.8	29.3	70/59	36700	23200	1.454	41700	25.2	24600	2.529	16000	2.85
		12.8	29.3	75/63	39900	24200	1.475	44900	27.1	24300	2.682	15100	2.65
		12.8	29.3	80/67	43000	25300	1.495	48100	28.8	23900	2.836	14200	2.47
		12.8	29.3	85/71	46200	26300	1.516	51400	30.5				
40	8.0	3.3	7.6	65/55	31400	21300	1.516	36600	20.7	24400	2.351	16400	3.04
		3.3	7.6	70/59	34600	22400	1.536	39800	22.5	24100	2.504	15600	2.82
		3.3	7.6	75/63	37800	23400	1.557	43100	24.3	23700	2.657	14600	2.61
		3.3	7.6	80/67	40900	24400	1.577	46300	25.9	23300	2.811	13700	2.43
		3.3	7.6	85/71	44100	25500	1.598	49600	27.6				
	12.0	7.2	16.5	65/55	31700	21400	1.450	36600	21.9	27000	2.397	18800	3.30
		7.2	16.5	70/59	34900	22500	1.470	39900	23.7	26600	2.551	17900	3.06
		7.2	16.5	75/63	38000	23500	1.491	43100	25.5	26200	2.704	17000	2.84
		7.2	16.5	80/67	41200	24500	1.511	46400	27.3	25900	2.857	16100	2.66
		7.2	16.5	85/71	44300	25600	1.532	49500	28.9				
	16.0	12.5	28.5	65/55	32000	21500	1.383	36700	23.1	29500	2.444	21200	3.54
		12.5	28.5	70/59	35100	22600	1.404	39900	25.0	29100	2.597	20200	3.28
		12.5	28.5	75/63	38300	23600	1.425	43200	26.9	28700	2.750	19300	3.06
		12.5	28.5	80/67	41400	24600	1.445	46300	28.7	28400	2.903	18500	2.87
		12.5	28.5	85/71	44600	25700	1.466	49600	30.4				
50	8.0	3.3	7.4	65/55	29900	20700	1.551	35200	19.3	28900	2.419	20600	3.50
		3.3	7.4	70/59	33000	21700	1.572	38400	21.0	28500	2.572	19700	3.25
		3.3	7.4	75/63	36200	22800	1.593	41600	22.7	28200	2.725	18900	3.03
		3.3	7.4	80/67	39300	23800	1.613	44800	24.4	27800	2.878	18000	2.83
		3.3	7.4	85/71	42500	24800	1.634	48100	26.0				
	12.0	7.0	16.0	65/55	30100	20800	1.485	35200	20.3	31400	2.465	23000	3.73
		7.0	16.0	70/59	33300	21800	1.506	38400	22.1	31100	2.618	22200	3.48
		7.0	16.0	75/63	36400	22900	1.526	41600	23.9	30700	2.772	21200	3.24
		7.0	16.0	80/67	39600	23900	1.547	44900	25.6	30300	2.925	20300	3.04
		7.0	16.0	85/71	42700	24900	1.568	48100	27.2				
	16.0	12.1	27.7	65/55	30400	20900	1.419	35200	21.4	34000	2.512	25400	3.97
		12.1	27.7	70/59	33500	21900	1.440	38400	23.3	33600	2.665	24500	3.69
		12.1	27.7	75/63	36700	23000	1.460	41700	25.1	33200	2.818	23600	3.45
		12.1	27.7	80/67	39900	24000	1.481	45000	26.9	32900	2.971	22800	3.24
		12.1	27.7	85/71	43000	25000	1.502	48100	28.6				
60	8.0	3.2	7.2	65/55	28300	20100	1.673	34000	16.9	33400	2.487	24900	3.93
		3.2	7.2	70/59	31400	21100	1.694	37200	18.5	33000	2.640	24000	3.66
		3.2	7.2	75/63	34600	22100	1.714	40400	20.2	32700	2.793	23200	3.43
		3.2	7.2	80/67	37700	23200	1.735	43600	21.7	32300	2.946	22200	3.21
		3.2	7.2	85/71	40900	24200	1.755	46900	23.3				
	12.0	6.9	15.6	65/55	28500	20200	1.607	34000	17.7	35900	2.533	27300	4.15
		6.9	15.6	70/59	31700	21200	1.627	37300	19.5	35500	2.686	26300	3.87
		6.9	15.6	75/63	34800	22300	1.648	40400	21.1	35200	2.839	25500	3.63
		6.9	15.6	80/67	38000	23300	1.669	43700	22.8	34800	2.993	24600	3.41
		6.9	15.6	85/71	41200	24300	1.689	47000	24.4				
	16.0	11.8	27.0	65/55	28800	20300	1.541	34100	18.7	38400	2.579	29600	4.36
		11.8	27.0	70/59	32000	21300	1.561	37300	20.5	38100	2.733	28800	4.08
		11.8	27.0	75/63	35100	22400	1.582	40500	22.2	37700	2.886	27900	3.83
		11.8	27.0	80/67	38300	23400	1.602	43800	23.9	37300	3.039	26900	3.60
		11.8	27.0	85/71	41400	24400	1.623	46900	25.5				

GRQ – Size 048 (850 SCFM) – 1st Stage Low Fan (Continued)

EWT (°F)	GPM	WPD		EAT (°F)	Cooling					Heating			
		PSI	FT of W.C.		Total (Btu/hr)	Sensible (Btu/hr)	Power Input (kW)	THR (Btu/hr)	EER	Total (Btu/hr)	Power Input (kW)	THA (Btu/hr)	COP
70	8.0	3.1	7.1	65/55	26700	19500	1.880	33100	14.2	37900	2.555	29200	4.35
		3.1	7.1	70/59	29800	20500	1.901	36300	15.7	37500	2.708	28300	4.06
		3.1	7.1	75/63	33000	21500	1.922	39600	17.2	37100	2.861	27300	3.80
		3.1	7.1	80/67	36200	22600	1.942	42800	18.6	36800	3.014	26500	3.58
		3.1	7.1	85/71	39300	23600	1.963	46000	20.0				
	12.0	6.7	15.3	65/55	27000	19600	1.814	33200	14.9	40400	2.601	31500	4.55
		6.7	15.3	70/59	30100	20600	1.835	36400	16.4	40000	2.754	30600	4.26
		6.7	15.3	75/63	33300	21600	1.855	39600	18.0	39700	2.907	29800	4.00
		6.7	15.3	80/67	36400	22700	1.876	42800	19.4	39300	3.060	28900	3.76
		6.7	15.3	85/71	39600	23700	1.897	46100	20.9				
	16.0	11.6	26.5	65/55	27200	19700	1.748	33200	15.6	42900	2.647	33900	4.75
		11.6	26.5	70/59	30400	20700	1.769	36400	17.2	42500	2.800	32900	4.45
		11.6	26.5	75/63	33500	21700	1.789	39600	18.7	42200	2.954	32100	4.19
		11.6	26.5	80/67	36700	22800	1.810	42900	20.3	41800	3.107	31200	3.94
		11.6	26.5	85/71	39800	23800	1.830	46000	21.7				
80	8.0	3.0	7.0	65/55	25100	18800	2.174	32500	11.5	42300	2.622	33400	4.73
		3.0	7.0	70/59	28300	19900	2.194	35800	12.9	42000	2.775	32500	4.43
		3.0	7.0	75/63	31400	20900	2.215	39000	14.2	41600	2.929	31600	4.16
		3.0	7.0	80/67	34600	21900	2.235	42200	15.5	41200	3.082	30700	3.92
		3.0	7.0	85/71	37700	23000	2.256	45400	16.7				
	12.0	6.6	15.0	65/55	25400	18900	2.107	32600	12.1	44900	2.669	35800	4.93
		6.6	15.0	70/59	28500	20000	2.128	35800	13.4	44500	2.822	34900	4.62
		6.6	15.0	75/63	31700	21000	2.149	39000	14.8	44100	2.975	33900	4.34
		6.6	15.0	80/67	34800	22000	2.169	42200	16.0	43800	3.128	33100	4.10
		6.6	15.0	85/71	38000	23100	2.190	45500	17.4				
	16.0	11.4	26.0	65/55	25600	19000	2.041	32600	12.5	47400	2.715	38100	5.12
		11.4	26.0	70/59	28800	20100	2.062	35800	14.0	47000	2.868	37200	4.80
		11.4	26.0	75/63	31900	21100	2.082	39000	15.3	46700	3.021	36400	4.53
		11.4	26.0	80/67	35100	22100	2.103	42300	16.7	46300	3.175	35500	4.27
		11.4	26.0	85/71	38300	23200	2.124	45500	18.0				
90	8.0	3.0	6.8	65/55	23500	18200	2.553	32200	9.2	46800	2.690	37600	5.10
		3.0	6.8	70/59	26700	19200	2.573	35500	10.4	46500	2.843	36800	4.79
		3.0	6.8	75/63	29800	20300	2.594	38700	11.5	46100	2.996	35900	4.51
		3.0	6.8	80/67	33000	21300	2.614	41900	12.6	45700	3.150	34900	4.25
		3.0	6.8	85/71	36100	22300	2.635	45100	13.7				
	12.0	6.5	14.8	65/55	23800	18300	2.486	32300	9.6	49400	2.736	40100	5.29
		6.5	14.8	70/59	26900	19300	2.507	35500	10.7	49000	2.890	39100	4.97
		6.5	14.8	75/63	30100	20400	2.528	38700	11.9	48600	3.043	38200	4.68
		6.5	14.8	80/67	33200	21400	2.548	41900	13.0	48200	3.196	37300	4.42
		6.5	14.8	85/71	36400	22400	2.569	45200	14.2				
	16.0	11.2	25.5	65/55	24100	18400	2.420	32400	10.0	51900	2.783	42400	5.46
		11.2	25.5	70/59	27200	19500	2.441	35500	11.1	51500	2.936	41500	5.14
		11.2	25.5	75/63	30400	20500	2.461	38800	12.4	51100	3.089	40600	4.85
		11.2	25.5	80/67	33500	21500	2.482	42000	13.5	50800	3.242	39700	4.59
		11.2	25.5	85/71	36700	22600	2.503	45200	14.7	Operation Not Recommended			
100	8.0	3.0	6.7	65/55	21900	17600	3.017	32200	7.3				
		3.0	6.7	70/59	25100	18600	3.038	35500	8.3				
		3.0	6.7	75/63	28200	19700	3.059	38600	9.2				
		3.0	6.7	80/67	31400	20700	3.079	41900	10.2				
		3.0	6.7	85/71	34600	21700	3.100	45200	11.2				
	12.0	6.4	14.6	65/55	22200	17700	2.951	32300	7.5				
		6.4	14.6	70/59	25400	18700	2.972	35500	8.5				
		6.4	14.6	75/63	28500	19800	2.992	38700	9.5				
		6.4	14.6	80/67	31700	20800	3.013	42000	10.5				
		6.4	14.6	85/71	34800	21800	3.034	45200	11.5				
	16.0	11.0	25.2	65/55	22500	17800	2.885	32300	7.8				
		11.0	25.2	70/59	25600	18800	2.906	35500	8.8				
		11.0	25.2	75/63	28800	19900	2.926	38800	9.8				
		11.0	25.2	80/67	31900	20900	2.947	42000	10.8				
		11.0	25.2	85/71	35100	21900	2.967	45200	11.8				
110	8.0	2.9	6.7	65/55	20400	17000	3.568	32600	5.7				
		2.9	6.7	70/59	23500	18000	3.589	35700	6.5				
		2.9	6.7	75/63	26700	19000	3.609	39000	7.4				
		2.9	6.7	80/67	29800	20100	3.630	42200	8.2				
		2.9	6.7	85/71	33000	21100	3.650	45500	9.0				
	12.0	6.3	14.4	65/55	20600	17100	3.502	32600	5.9				
		6.3	14.4	70/59	23800	18100	3.522	35800	6.8				
		6.3	14.4	75/63	26900	19100	3.543	39000	7.6				
		6.3	14.4	80/67	30100	20200	3.564	42300	8.4				
		6.3	14.4	85/71	33200	21200	3.584	45400	9.3				
	16.0	10.9	24.9	65/55	20900	17200	3.436	32600	6.1				
		10.9	24.9	70/59	24000	18200	3.456	35800	6.9				
		10.9	24.9	75/63	27200	19200	3.477	39100	7.8				
		10.9	24.9	80/67	30300	20300	3.497	42200	8.7				
		10.9	24.9	85/71	33500	21300	3.518	45500	9.5				

Electrical Data

ARQ and GRQ – Size 024

Volt/Hz/Phase	Voltage Range		Room Fan FLA	Compressor		Heating Option				Power Supply	
	Min.	Max.		RLA	LRA	Heat Type		Heater Kw	Rated Heater Amps	MCA	Maximum Fuse
208/60/1	197	228	3.2	11.7	58.3	None		–	–	17.67	25
			3.2	11.7	58.3	Elec. Heat[1]	Low (3 elem.)	8.0	38.5	66.55	70
			3.2	11.7	58.3		High (6 elem.)	16.0	76.9	114.55	125
230/60/1	207	253	3.2	11.7	58.3	None		–	–	17.67	25
			3.2	11.7	58.3	Elec. Heat[1]	Low (3 elem.)	7.3	33.3	60.05	70
			3.2	11.7	58.3		High (6 elem.)	14.7	66.7	101.80	110
208/60/3	197	228	3.2	6.5	55.4	None		–	–	11.17	15
			3.2	6.5	55.4	Elec. Heat[1]	Low (3 elem.)	8.0	22.2	39.68	40
			3.2	6.5	55.4		High (6 elem.)	16.0	44.4	67.43	70
230/60/3	207	257	3.2	6.5	55.4	None		–	–	11.17	15
			3.2	6.5	55.4	Elec. Heat[1]	Low (3 elem.)	7.3	19.2	35.93	40
			3.2	6.5	55.4		High (6 elem.)	14.7	38.5	60.05	70
460/60/3	414	506	3.2	3.5	28.0	None		–	–	7.42	15
			3.2	3.5	28.0	Elec. Heat[1]	Low (3 elem.)	7.3	9.6	20.18	25
			3.2	3.5	28.0		High (6 elem.)	14.7	19.2	32.18	35

[1] Electric Heat Options are with Compressor.

ARQ and GRQ – Size 040

Volt/Hz/Phase	Voltage Range		Room Fan FLA	Compressor		Heating Option				Power Supply	
	Min.	Max.		RLA	LRA	Heat Type		Heater Kw	Rated Heater Amps	MCA	Maximum Fuse
208/60/1	197	228	3.2	17.9	96.0	None		–	–	25.42	40
			3.2	17.9	96.0	Elec. Heat[1]	Low (3 elem.)	10.0	48.1	86.30	90
			3.2	17.9	96.0		High (6 elem.)	20.0	96.2	146.43	150
230/60/1	207	253	3.2	17.9	96.0	None		–	–	25.42	40
			3.2	17.9	96.0	Elec. Heat[1]	Low (3 elem.)	9.2	41.7	78.30	80
			3.2	17.9	96.0		High (6 elem.)	18.4	83.3	130.30	150
208/60/3	197	228	3.2	14.2	88.0	None		–	–	20.79	30
			3.2	14.2	88.0	Elec. Heat[1]	Low (3 elem.)	10.0	27.8	56.30	60
			3.2	14.2	88.0		High (6 elem.)	20.0	55.5	90.93	100
230/60/3	207	253	3.2	14.2	88.0	None		–	–	20.79	30
			3.2	14.2	88.0	Elec. Heat[1]	Low (3 elem.)	9.2	24.1	51.68	60
			3.2	14.2	88.0		High (6 elem.)	18.4	48.1	81.68	90
460/60/3	414	506	3.2	6.2	44.0	None		–	–	10.79	15
			3.2	6.2	44.0	Elec. Heat[1]	Low (3 elem.)	9.2	12.0	26.55	30
			3.2	6.2	44.0		High (6 elem.)	18.4	24.1	41.68	45

[1] Electric Heat Options are with Compressor.

FLA = Full Load Amps RLA = Rated Load Amps LRA = Locked Rotor Amps MCA = Minimum Circuit Ampacity

ARQ and GRQ – Size 048

Volt/Hz/Phase	Voltage Range		Room Fan FLA	Compressor		Heating Option				Power Supply	
	Min.	Max.		RLA	LRA	Heat Type		Heater Kw	Rated Heater Amps	MCA	Maximum Fuse
208/60/1	197	228	3.2	21.2	104.0	None		–	–	29.54	50
			3.2	21.2	104.0	Elec. Heat[1]	Low (3 elem.)	12.0	57.7	102.43	110
			3.2	21.2	104.0		High (6 elem.)	24.0	115.4	174.55	175
230/60/1	207	253	3.2	21.2	104.0	None		–	–	29.54	50
			3.2	21.2	104.0	Elec. Heat[1]	Low (3 elem.)	11.0	50.0	92.80	100
			3.2	21.2	104.0		High (6 elem.)	22.0	100.0	155.30	175
208/60/3	197	228	3.2	14.0	83.1	None		–	–	20.54	30
			3.2	14.0	83.1	Elec. Heat[1]	Low (3 elem.)	12.0	33.3	62.93	70
			3.2	14.0	83.1		High (6 elem.)	24.0	66.6	104.55	110
230/60/3	207	257	3.2	14.0	83.1	None		–	–	20.54	30
			3.2	14.0	83.1	Elec. Heat[1]	Low (3 elem.)	11.0	28.9	57.43	60
			3.2	14.0	83.1		High (6 elem.)	22.0	57.7	93.43	100
460/60/3	414	506	3.2	6.4	41.0	None		–	–	11.04	15
			3.2	6.4	41.0	Elec. Heat[1]	Low (3 elem.)	11.0	14.4	29.80	30
			3.2	6.4	41.0		High (6 elem.)	22.0	28.9	47.93	50

[1] Electric Heat Options are with Compressor.

FLA = Full Load Amps RLA = Rated Load Amps LRA = Locked Rotor Amps MCA = Minimum Circuit Ampacity

Typical MicroTech Wiring Diagram – 460V / 60Hz / 3Ph

Figure 39: Typical MicroTech Wiring Diagram – 460V / 60Hz / 3Ph

Note: See Figure 40 on page 77 for typical MicroTech service and disconnect wiring and wiring schematic legend.

Typical MicroTech Wiring Diagram – Service and Disconnect 460V / 60Hz / 3Ph

Figure 40: Typical MicroTech Wiring Diagram – Service and Disconnect – 460V / 60Hz / 3Ph

Legend - Symbols	
– – –	Accessory or field mounted component
⏚	Ground
⊠	Wire nut / splice
●	Overlap point - common potential wires
L1/1.20	Wire link (wire link ID / page # . line #)

TR1 Speed Settings			
	048	**040**	**024**
High	GN	WH / GN	YE
Med	YE	PK	GY
Low	PK	GY	GY / BK

Table 26: Wiring Diagram Legend for Figure 39 on page 76 and Figure 40 on page 77

Symbol	Description	Symbol	Description	Symbol	Description
A1	Actuator- Outdoor Air	HP	High Pressure Switch	R32	Relay - Drain Pan Heater
A2	Actuator- Face & Bypass	ICT	Sensor - Indoor DX Coil Temperature	R28	Relay - Outdoor Motor Air
CP1	Motor Compressor 2-Stage	IH	Sensor - Indoor Humidity	RV	Reversing Valve
C1	Compressor Contactor	MCB	Main Control Board	RAT	Sensor - Room Air Temperature
CAP1	Capacitor Run	NTWK	Network Connection	T6	Thermostat - Freeze Stat
CEH1-3	Electric Heat Contactor	OAT	Sensor - Outdoor Air Temperature	TB1	Terminal Block - 24VAC+
CO2	Sensor - Indoor Air CO2	OCT	Sensor - Outdoor DX Coil Temperature	TB2	Terminal Block – 24VAC Gnd
DAT	Sensor - Discharge Air Temperature	OH	Sensor - Outdoor Humidity	TB3	(A, B) Terminal Block – Main Power
DCS	Switch - Unit Power	OH1	Thermostat - Overheat	TBE	Terminal Block - Electric Heat
DF	Dead Front Switch	OH2	Thermostat - Overheat	TR1	Transformer - Motor Speed
EH1-6	Heater - Electric	OHM	E.H. Man Reset - Overheat Stat	TR3	Transformer - 208 / 230V-24V, 75VA
EH10	Heater - Outdoor Drain Pan	PL1	LED Occupancy / Fault Status	TR4	Transformer - 460V–230V
F1A/F1B	Fuse - Compressor	R1-R3	Relay Electric Heat (Backup)	TR5	Transformer - 208 / 230V-24V
F2A/F3C	Fuse - Electric Heat	R10-R12	Relay – Electric Heat	V1	Valve - Heat EOC (Accessory)
FA/FB	Fuse– Control, Load	R4H	Relay – Fan High Speed	V2	Valve - Cool EOC (Accessory)
FC/FD	Fuse– Control, Transformer	R4M	Relay– Fan Medium Speed	VH	Valve - Heat (Accessory)
FMI	Motor - Room Fan	R4L	Relay– Fan Low Speed	VC	Valve - Cool (Accessory)
FMO	Motor Outdoor Air				

Notes:
1. All electrical installation must be in accordance with national and local electrical codes and job wiring schematic.
2. External wiring options - see IM for the different configured options, wiring to be minimum 18 gauge, 90°C.
3. EC motors are factory programmed for specified air flow. Contact Daikin Applied for replacement.
4. Cap extra wire. Switch wire 42A to red wire for 208V operation.
5. Switch wire 509 to terminal 2 for 208V operation.
6. Devices in legend may or may not be on unit.

Typical Wall Sensor Diagrams

Figure 41: Wall-Mounted Temperature Sensor Wiring

Note: *The "R" terminal is used only with sensor part numbers 910247458 (6-button) and 910247448 (4-button).*

Power & Control Field Wiring

Figure 42: External Input Wiring Examples with or without Daisy Chaining of Units

Figure 43: External Output Wiring - Single Unit

Figure 44: External Output Wiring - Multiple Units Shown

Electromechanical Control

Figure 45: Electromechanical Control

Note: For troubleshooting, refer to unit-mounted schematic. See Table 29 for wiring diagram legend and notes.

Table 29: Figure 45 Wiring Diagram Legend

Symbol	Description	Line No.	Symbol	Description	Line No.
A1	Actuator – Outdoor Air Proportional	16	R4L	Relay – Low Fan Speed (Coil 24 VAC)	8
C1	Contactor – Compressor	17	R7	Relay Compressor Lockout	18
FA/FB	Fuse – Control	6	RV	Reversing Valve	14
F1A/F1C	Fuse – Compressor	1, 3	SW1	Switch – Disconnect	1
HP	Switch – High Pressure (600 psi)	17	SW2	Switch – ON-OFF, Fan Speeds	5,10
M	Motor – Room Fan	7	TB1	Terminal Board – Control	19
M1	Compressor (2 Stage)	2	TDR1	Relay Time Delay Compressor (20.5V)	16
M2	Condensing Motor	2	T2	Thermostat Low Temp (28°F)	18
R2S	Relay High (2nd) Stage Compressor	17	X1	Transformer– Motor	6
R4	Relay – Fan (Coil 24 VAC)	13	X2	Transformer – Control (75VA)	10
R4H	Relay – High Fan Speed (Coil 24 VAC)	8	X4	Transformer – 460V/120V	4
R4M	Relay – Medium Fan Speed (Coil 24 VAC)	8			

Notes:
1. All electrical installation must be in accordance with national and local electrical codes and job wiring schematic.
2. NEC Class 1 wiring factory mounted night controls connect to Blk & Wht wires. When remote night controls are used, they must be connected to Blk & Wht wires shown capped, and the Blk & Wht wires in the main control box must be disconnected and individually capped.
3. Numbers along right side of schematic designate the location of the contacts by line number.
4. See control and thermostat drawing for additional controls.
5. SW2 contact 5, 6 and 7, **8 open only when SW2 is in OFF position**.
6. SW2 contacts H, M and L.

7. High (2nd Stage) compressor rectifier energized when compressor is ON and fan speed is on HIGH.

8. Actuators, 24VAC for 2 to 10 VDC control input. For a 4 to 20 mA input control signal, add a 500 Ohm resistor across WHT and BLK. Output signal of 2 to 10 VDC for position feedback.

Control Modes and Functions

Daikin Applied unit ventilators equipped with MicroTech unit controllers can be programmed to operate in a variety of modes based on the current situation in the room and the status of the unit ventilator. Changes in mode can be triggered manually, via network signals, by sensor readings, or by date and time. External inputs and outputs can be used to change modes, communicate data to network controls or change the functional operation of the unit.

Occupancy Modes

MicroTech controls can be set up to change modes based on room occupancy. Four different occupancy modes are provided, as described below.

Occupied Mode

This is the normal daytime operation mode. The controller maintains a room set point using the outside air capability and other functions.

Note: *For non-school applications, the unit can also be configured to cycle the fan in response to the room load. In this case, the fan would normally be in the Off Mode until heating or cooling is required. The outside air damper is always closed when the fan is off. When the fan starts, the outside air damper opens to the required position, usually minimum position.*

Unoccupied Mode

This is the night setback operating mode, in which the unit responds to a new room set point and cycles to maintain the condition. The fan comes on when heating or cooling is needed and runs until the load is satisfied. The outdoor air damper is closed during this mode. When a cooling load is satisfied by a refrigerant system, the compressor is de-energized and the unit ventilator indoor fan continues to run for a fixed period of time to remove coldness from the evaporator coil. This reduces the potential for low refrigerant temperatures to exist on the evaporator coil.

Stand By Mode

In this mode, the unit maintains the occupied mode set point temperature with the outdoor air damper closed. The fan runs continuously unless it is configured to cycle in response to the load.

Bypass Mode

This is a tenant override operating mode initiated by using the optional LUI or by depressing the tenant override switch on the optional room sensor. The unit is place back into occupied mode for a predetermined time (default 120 minutes). This time can be set in 1-minute increments from 1 minute to 240 minutes through the unit ventilator service tool or a network.

Economizer Modes

Economizer operation is facilitated by the outdoor air damper, which automatically adjusts the above-minimum outside air position to provide free cooling when the outdoor air temperature is appropriate. Three levels of economizer control are available:

Basic Economizer Operation: The MicroTech controller compares the inside and outside temperatures. If the temperature comparison is satisfactory, then free-air economizer operation is used to cool the space. Reheat units also come configured with an indoor humidity sensor.

Expanded Economizer Operation: In addition to comparing inside and outside temperatures, outdoor relative humidity is measured to calculate outside air enthalpy. If the enthalpy set point is not exceeded, and the temperature comparison is satisfactory, then free economizer operation is used to cool the space. This helps to minimize the entrance of humid outside air.

Leading-Edge Economizer Operation: The MicroTech controller compares both indoor and outdoor temperatures and indoor and outdoor relative humidities. Then it calculates both inside and outside air enthalpy to determine if free economizer operation can cool the space with non-humid outside air. This is a true enthalpy economizer—a first for unit ventilators.

Night Purge Mode

Under this mode, the unit is configured to purge the room space for one hour for various reasons (odor or fume removal, drying, etc.). During Night Purge the outside air damper is open full and the fan is run on high speed. No “normal” heating or cooling takes place (the emergency heat set point is maintained) and the exhaust fan, if the room is so equipped, is signaled to turn on.

Emergency Heat Mode

If the unit is left in a mode that does not normally allow heating (such as Off, Fan Only, Cool, or Night Purge) and the room temperature falls below 55°F, the unit will heat the space to above 55°F and then return to the previously set mode of operation. This mode of operation can be field configured and/or be disabled.

External Input Functions

The unit ventilator controller is provided with four (4) binary inputs that allow a single set of dry contacts to be used as a signal to it, and two (2) binary inputs that allow a 24VAC signal. Input signal choices are described below. Multiple units can be connected to a single set of dry contacts.

Note: *Not all of the functions listed can be used at the same time. The unit ventilator controller is provided with configuration parameters that can be adjusted to select which function will be used for these inputs where multiple functions are indicated below.*

Note: ***Unoccupied Input Signal***

This input signals the unit ventilator controller to go into unoccupied or occupied mode. When the contacts close, the unit ventilator controller goes into unoccupied mode; when the contacts open, it goes into occupied mode. Additional variables can affect occupancy mode and override this binary input. See "Occupancy Modes" on page 82.

Remote Shutdown Input Signal

This input signals the unit ventilator controller to go into shutdown mode. When the contacts close, the controller goes into shutdown mode; when the contacts open, it returns to normal operation.

Ventilation Lockout Input Signal

This input signals the unit ventilator controller to close the outdoor air damper. When the contacts close (ventilation lockout signal) the controller closes the outdoor damper; when the contacts open, it returns to normal outdoor damper operation.

Exhaust Interlock Input Signal

This input signals the unit ventilator controller that an exhaust fan within the space has been energized. The controller then repositions the outdoor air damper to a user-adjustable minimum position. When the contacts close (exhaust fan on signal) the controller uses the value defined by the Exhaust Interlock OA Damper Min Position Setpoint as the new minimum outdoor air damper position regardless of the indoor air fan speed. When the contacts open, it returns to normal outdoor damper operation.

External Output Functions

The unit ventilator controller is provided with three (3) binary outputs to perform the functions described below. These are relay type outputs that supply 24 VAC.

Note: *Not all of the functions listed can be used at the same time. The unit ventilator controller is provided with configuration parameters that can be adjusted to select which function will be used for these outputs when multiple functions are indicated below.*

Fault Signal

This relay output provides one set of Normally Open (NO) (reversible through keypad/software), 24VAC contacts that can be used to signal a fault condition. When a fault exists, the unit ventilator controller energizes this relay output. When the fault or faults are cleared, it de-energizes this relay output.

Exhaust Fan On/Off Signal

This relay output provides one set of Normally Open (NO) (reversible through keypad/software), 24VAC contacts that can be used to signal the operation of an exhaust fan. When the outdoor air damper opens more than the Energize Exhaust Fan OA Damper Setpoint, the relay output will signal the exhaust fan on (contacts closed). When the outdoor damper closes below this setpoint, the relay output will signal the exhaust fan off (contacts open).

Auxiliary Heat Signal

This relay output provides one set of Normally Open (NO) (reversible through keypad/software), 24VAC contacts that can be used to operate an auxiliary heat device. The unit ventilator controller by default is configured to operate a NO auxiliary heat device (de-energize when heat is required) such as a wet heat valve actuator with a spring setup to open upon power failure. However, the Auxiliary Heat Configuration variable can be used to set the controller to use an NC auxiliary heat device (energize when heat is required) such as electric heat.

Advanced Control Options

MicroTech controls make possible a number of advanced control options that can quickly pay for themselves in saved energy costs and more comfortable classrooms, as described below.

Part Load Variable Air Control

Part Load Variable Air control can be used in conjunction with face and bypass damper temperature control to automatically adjust the unit ventilator fan speed based upon the room load and the room-temperature PI control loop. This MicroTech control option provides higher latent cooling capabilities and quieter operation during non-peak load periods by basing indoor fan speed upon room load.

During low-load or normal operation (about 60% of the time) the fan will operate on low speed. When the load increases to an intermediate demand, the fan will automatically shift to the medium-speed setting. Under near-design or design-load conditions, the fan will operate on high speed. A built-in, 10-minute delay helps minimize awareness of fan speed changes. Low-speed fan operation under normal operating conditions, in conjunction with our GentleFlo fan technology contributes to a very quiet classroom environment.

Demand-Controlled Ventilation (Optional)

Daikin unit ventilators can be equipped to use input from a CO_2 controller to ventilate the space based on actual occupancy instead of a fixed design occupancy. This Demand Controlled Ventilation (DCV) system monitors the amount of CO_2 produced by students and teachers so that enough fresh outdoor air is introduced to maintain good air quality. The system is designed to achieve a target ventilation rate (e.g., 15 cfm/person) based on actual occupancy.

By using DCV to monitor the actual occupancy pattern in a room, the system can allow code-specific levels of outdoor air to be delivered when needed. Unnecessary over-ventilation is avoided during periods of low or intermittent occupancy.

With DCV you can be confident that your school is meeting ventilation standards for Indoor Air Quality and that your students are receiving adequate air to be attentive to instruction. At the same time, you are saving money in early morning hours, in between classes, or after hours when classrooms are heated and cooled but not always fully occupied.

As Simple as a Thermostat

Demand Controlled Ventilation is easy to apply. When DCV is ordered, a CO_2 sensor is mounted on the unit and configured for operation. The system does the rest. If desired, the ventilation control setpoint can be adjusted through the MicroTech controller.

Acceptance By Codes And Standards

ASHRAE Standard 62-2004 Ventilation for Indoor Air Quality recognizes CO_2 based DCV as a means of controlling ventilation based on occupancy. The ASHRAE standard has been referenced or adopted by most regional and local building codes. This standard references ventilation on a per-person basis.

Using CO_2 control will sometimes lower the absolute amount of outside air delivered into a room but will maintain the per-person rate. For example, if a classroom is designed for 30 students, the ventilation rate is 450 cfm (30 students $\times$ 15 cfm/student). However, when there are only ten students in the classroom, the CO_2 control will adjust ventilation to 150 cfm (10 students $\times$ 15 cfm/student). A minimum base ventilation rate (typically 20% of design levels) is provided when in the occupied mode. This provides outdoor air to offset any interior source contamination while allowing for proper space pressurization.

DX System Control

The unit ventilator controller is configured to operate the compressor as seconday (mechanical) cooling when economizer cooling is available, and as primary cooling when economizer cooling is not available. Additional DX control features include:

Compressor Cooling Lockout: The unit ventilator controller is configured to lock out compressor cooling when the entering fluid temperature falls below the compressor cooling lock out setpoint. Below this temperature setpoint, compressor operation is not allowed.

Minimum On And Off Time: The unit ventilator controller is provided with minimum-on and minimum-off timers to prevent adverse compressor cycling (3-minutes default).

Compressor Start Delay Variable: This variable is intended to be adjusted as part of the start-up procedure for each unit. It is used to prevent multiple unit compressors from starting at the same time after a power failure or after an unoccupied-to-occupied changeover. Each unit should be configured at start-up with a slightly different (random) delay, or groups of units should be provided with different delays.

System Components

The main components of the MicroTech system are:

- A Unit Ventilator Controller (UVC) with on-board BACnet MS/TP communications
- Optional Local User Interface (LUI)
- Optional Lon plug-in network communication module

In addition, unit ventilators equipped with Daikin factory controls feature factory-mounted sensors and actuators for system control and feedback.

Unit Ventilator Controller

The MicroTech UVC is a DDC, microprocessor-based controller designed to provide sophisticated comfort control of an economizer-equipped Daikin unit ventilator. In addition to normal operating control, it provides alarm monitoring and alarm-specific component shutdown if critical system conditions occur. Each UVC is factory wired, factory programmed and factory run-tested for the specific unit ventilator model and configuration ordered by the customer.

Figure 46: MicroTech Control Board

Local User Interface (Optional)

An optional built-in LUI touch pad with digital LED Display is located in the right hand compartment below the top right access door. The LUI features a 4 x 20 OLED digit display, 4 keys, and 2 individual LED indicators. In addition to the Operating Mode States and Fan Functions, the Touch Pad will digitally display:

- The room set point temperature.
- The current room temperature.
- Any fault code for quick diagnostics at the unit.

Figure 47: User Interface Touch Pad

The User Interface has individual touch-sensitive printed circuit board mounted buttons, and comes with a built-in menu structure (Password Protected) to change many of the common operating variables.

Four Operating Mode States

Four different user operating mode states can be chosen on the LUI:

- **Heat:** Heating and economizer operation only.
- **Cool:** Cooling and economizer operation only.
- **Fan Only:** Fan only operation.
- **Auto:** The unit automatically switches between heating, cooling and economizer operation to satisfy the room load conditions. The current unit state is also displayed.

Four Fan States

Four fan states are provided on all units: high, medium low and Auto speed modulation. The Auto speed function (part load, variable air) varies the fan speed automatically to meet the room load whether the unit is in heating, cooling or economizer mode.

All this is accomplished with a standard, single-speed NEMA frame motor. A built-in 10-minute delay helps minimize awareness of speed changes. During low-load or normal operation (about 60% of the time) the fan will operate at low speed. The low speed operation, along with GentleFlo fan technology, contributes to a very quiet classroom environment.

When the load increases to an intermediate demand, the fan automatically shifts to the medium speed setting. At near-design or design-load conditions the fan will operate on high speed.

With four fan states and GentleFlo fan technology, there is no need to oversize units or worry about uncomfortable conditions.

Communication Types

On-board BACnet communication or an optional Lon communication module provide control and monitoring information to your building automation system without the need for costly gateways.

MicroTech® Controller with on-board BACnet MS/TP

The MicroTech controller allows the UVC to inter-operate with systems that use the BACnet (MS/TP) protocol with a conformance level of 3. It meets the requirements of the ANSI/ASHRAE 135-2008 standard for BACnet systems.

LonWorks SCC Communication Module

This module supports the LonWorks SCC (Space Comfort Communication) profile number 8500-10. Unit controllers are LonMark certified with this optional LonWorks communication module.

MicroTech Sensor and Component Locations

Figure 48: MicroTech Sensor and Component Locations

Figure 49: Unit Main Power "On-Off" Switch (SW1)

Figure 50: Water Out & Water Coil DX Temperature Sensors

CO_2 Sensor for Demand Controlled Ventilation

On units equipped for Demand Controlled Ventilation (DCV) the UVC is configured to use a 0-2000 PPM, 0-10 VDC, single beam absorption infrared gas sensor. CO_2 sensors are available as unit mounted only. An air collection probe (pitot tube and filter) is installed in the return air of the unit (Figure 51).

Figure 51: CO_2 Sensor For Demand Control Ventilation

Room Temperature Sensors used with MicroTech Unit Controls

Digitally Adjustable Display Sensor – 910247458

The display sensor is used in conjunction with MicroTech equipped units. This digitally adjustable sensor displays room temperature, fan speed (AUTO/HIGH/MEDIUM/LOW), system mode (HEAT/COOL/AUTO/OFF), ALARM, override and occupancy.

Digitally Adjustable Display Sensor – 910247448

The display sensor is used in conjunction with MicroTech equipped units. The sensor has a digital display for temperature, occupancy, alarm, setpoint and status indication. Controls include four buttons for setpoint, occupied/unoccupied request, and override reset.

Basic Room Sensor With Cool to Warm – 910247453

The basic room sensor with adjustment (cool to warm) is used in conjunction with MicroTech equipped units. The sensor has an output for temperature, and LED status indication and includes an override reset button.

Basic Room Sensor – 910247450

The basic room sensor is used in conjunction with MicroTech equipped units. The sensor has an output for temperature, and LED status indication and includes an override reset button.

Table 30: Room Temperature Sensors for BAS Operation

Room Temperature Sensors used with Unit Ventilator – Building Automated System (BAS) Operation		**Digitally Adjustable Display Sensor**	**Digitally Adjustable Display Sensor**	**Basic Room Sensor With Cool to Warm Adjust**	**Basic Room Sensor**
		Part No. 910247458	**Part No.** 910247448	**Part No.** 910247453	**Part No.** 910247450
Feature					
Setpoint Adjustment		Digitally Adjustable	Digitally Adjustable	Cool to Warm	None
Display	Room Temperature & Setpoint	●	●		
Operating Modes	System	Heat-Cool-Auto-Off-			
	Fan	Auto-High-Medium-Low			
	Occupancy	LCD Display of Occupied-Unoccupied Icon	LCD Display of Occupied-Unoccupied Icon		
Annunciation	Status LED	LCD Display of Unit Status	LCD Display of Unit Status	●	●
	LCD Alarm Display	●	●		
Reset	Alarm	●	●	●	●
	Setback Override	●	●	●	●

Actuators

Face & Bypass Damper Actuator

On units equipped with face & bypass damper control, the UVC is configured to operate a proportional, direct-coupled, face & bypass damper actuator. To increase accuracy, the controller has an overdrive feature for the 0% and 100% positions and a periodic (12-hour) auto-zero PI control loop for each modulating actuator.

Figure 52: Face & Bypass Actuator

Outdoor Air/Return Air Damper (OAD) Actuator

The UVC is configured to operate a proportional, direct-coupled actuator for the outdoor air damper. This actuator provides spring-return operation upon loss of power for positive close-off of the outdoor air damper. To increase actuator positioning accuracy, the UVC is provided with an overdrive feature for the 0% and 100% positions and a periodic (12- hour) auto-zero PI control loop for each modulating actuator.

Figure 53: Outdoor Air Damper Actuator

2-Position End-of-Cycle Valve Actuators (Optional)

On units equipped with 2-way or 3-way, end-of-cycle (EOC) valves, the UVC is configured to operate 2-position End-Of-Cycle (EOC) valve actuators (Figure 54). Spring return actuators are used for all End of Cycle (EOC) valves. All wet heat and heat/ cool EOC valves are normally open, and all cooling EOC valves are normally closed.

Figure 54: End of Cycle Valve Actuator

Modulating Valve Actuators (Optional)

On units equipped with modulating valves, the UVC is configured to operate proportional actuators for modulating 2-way and 3-way valves (Figure 55).

Figure 55: Modulating Valve Actuators

2-Way Valve

3-Way Valve

A Wide Variety of Input, Output & Alarm Data Points Available

A wide variety of data is available from Daikin Applied unit ventilators when equipped with MicroTech controllers in a network situation. They provide a clear picture of just what's happening in each classroom and notify your building automation system of alarm conditions regardless of the protocol you select. Table 31 below shows a list of inputs, outputs and alarm functions available.

Table 31: Network Operation -Typical Data Points[1]

Read/Write Attributes	Read Only Attributes	Read/Write Setpoint Attributes	Typical Alarms
• Application Mode • Compressor Enable • Emergency Override • Energy Hold Off • Heat/Cool Mode • Occupancy Override • Outdoor Air Humidity • Outdoor Air Temperature • Reset Alarm • Reset Filter Alarm • Source (Water In) Temperature • Space CO_2 • Space Humidity • Space Temperature • Economizer Enable • Heating Setpoint Shift • Cooling Setpoint Shift	• Binary Input Status • Binary Output Status • UV Software Application Version • Compressor Run Time • Chiller Water Valve Position • Discharge Air Temperature • Discharge Air Temperature Setpoint • Effective Setpoint • Fan Speed • F & BP Damper Position • Outdoor Air Damper Position • Space Fan Runtime • Unit Ventilator Controller State • Water-Out Temperature • WH or CW/HW Valve Position • OA Minimum Position	• Econ. IA/OA Enthalpy Differential Setpoint • Econ. IA/OA Temp. Differential. Setpoint • Econ. Outdoor Air Enthalpy Setpoint • OAD Min. Position Low-Speed Setpoint • OAD Min. Position Med.-Speed Setpoint • Occupied Cooling Setpoint • Occupied Heating Setpoint • Space CO_2 Setpoint • Space Humidity Setpoint • Standby Cooling Setpoint • Unoccupied Cooling Setpoint • Unoccupied Heating Setpoint	• Indoor Air Temperature Sensor Failure • DX Pressure Fault • Indoor Air Coil DX Temperature Sensor Failure • Outdoor Air Temperature Sensor Failure • Discharge Air Temperature Sensor Failure • Outdoor Air Coil DX Temperature Sensor Failure (or) • Water Coil DX Temperature Sensor Failure • Water-Out Temperature Sensor Failure (or) • Water-In Temperature Sensor Failure • Space Humidity Sensor Failure • Outdoor Humidity Sensor Failure • Space CO_2 Sensor Failure • Source Temperature (Water-In) Inadequate Indication • Change Filter Indication

1 Not all data points or alarms listed will be available in all unit ventilator configurations. Humidity and CO_2 points require the use of optional sensors.

ServiceTools™

ServiceTools for MicroTech Unit Ventilators is software for operation on a personal computer. This software provides representation of the sequence of operation and enables the service technician to:

- Monitor equipment operation
- Configure network communications
- Diagnose unit operating problems
- Download application code and configure the unit

This software is a purchased tool for service technicians and will run on PCs with Microsoft Windows, Windows 7 and newer operating systems.

This tool provides more capabilities than the unit's user interface touch pad and is highly recommended for startup and servicing. (It may be required for startup and/or servicing, depending upon unit integration and other requirements.) It does not replace BAS functions, such as system wide scheduling or sequencing, and it cannot serve as a Work Station Monitoring package. ServiceTools interfaces with the MicroTech controller using serial communications through a USB type A connector.

Setpoints and Configuration Parameters

The UVC can save a snapshot of all setpoints and configuration parameters in the controller. Those configurations and setpoints can be saved onto a SD flash memory card, ensuring the controller can be reverted to those settings at a later date. Additionally, the settings saved to a SD can be taken to another UVC and loaded into it. Certain parameters, such as BACnet addressing and location, can be optionally restored to prevent duplication.

Data Trending

Data can be written to an optional SD card inserted into the control unit. The parameters that can be trended through MicroTech can be found in OM 732. Six options for trending frequency are available:

- None
- Occupancy Change
- 1 Minute
- 10 Minutes
- Hourly
- Daily

A separate trend file will be created of each day. If a "Daily" trend is selected, the trend file will contain a header and 1 line of data. If an "Hourly" trend is selected, the trend file will contain a header and 24 lines of data. The last 3 alarms in the Alarm History are always recorded.

Why Classrooms Overheat

Overheated classrooms occur every day in schools in every area of the country. The most serious result is their detrimental effect on students' ability to concentrate and learn. Research has determined that the ability to learn and retain knowledge decreases rapidly as the temperature exceeds recommendations. Overheated rooms also represent wasted fuel, resulting in excessive operating costs.

Correcting an overheating problem in an existing building is very difficult and expensive. It calls for redesign and alteration of the heating and ventilating system, necessitating considerable renovation. This potential problem should be recognized, understood and planned for when heating and ventilating systems are designed for new and existing buildings.

Schools Have Special Needs

Schools have unique heating and ventilating needs, in large part because of their variable occupancy and usage patterns. Fewer cubic feet of space is provided per student in a school building than in any other type of commercial or public building. School classrooms are typically occupied only six hours a day, five days a week, for only three-fourths of the year, with time out for vacations. All in all, this represents approximately 15% of the hours in a year that a classroom is occupied.

To understand the overheating problem in schools, one must first realize that the excess heat comes from what is commonly termed "uncontrolled heat sources." To gain some perspective on how this affects heating and cooling decisions, let's take a look at a typical classroom in the northern section of the midwestern United States.

Suppose we have a classroom that is 24 by 38 feet with 10-foot ceilings and 100 square feet of window area along the outside wall. At an outside temperature of 0°F and a desired room temperature of 72°F, let's assume the normal amount of heat loss from the room to the outside is 55,000 BTUs per hour.

As the outside temperature changes, so does the amount of heat that the room loses. This is represented in Figure 59 by Room Heat Loss Line A, which ranges from 55,000 BTUs per hour at 0°F outside air temperature to zero BTUs at 70°F. Obviously, if the heating system were the only source of heat in the classroom, the solution would be simple: The room thermostat would cause the heating system to supply exactly the amount of heat required to maintain the room at the thermostat temperature setting. In reality, the introduction of excess heat from a variety of uncontrolled sources makes the challenge considerably more complex.

Figure 56: Heat Gain Vs. Heat Loss In Occupied Classrooms

As Figure 56 illustrates, even in very cold weather an occupied classroom is more likely to require cooling than heating.

Heat From Students

Body heat generated by students in a classroom is one of the three primary sources of uncontrolled heat. In a typical classroom of 30 students, the amount of heat given off at all times will vary according to factors such as age, activity, gender, etc. A conservative estimate is 260 BTUs per hour per pupil. Multiply this by 30 and you get a total of 7,800 BTUs per hour added to the room by the students alone. This excess heat is noted in Figure 56 as "Heat Gain from Students."

Heat Gain From Lights

Heat emitted by the lighting system constitutes a second uncontrolled heat source. Artificial lighting is needed in most classrooms even during daylight hours to prevent unbalanced lighting and eye strain. A typical classroom requires approximately 2,500 watts of supplemental lighting to provide properly balanced lighting. Fluorescent lights add heat to the room at the rate of 3.4 BTU per watt per hour, or a total of 8,500 BTU per hour. This extra heat is represented in Figure 56 as "Heat Gain from Lights."

Add the heat gain from lighting to the 7,800 BTUs introduced by student body heat and we now have an extra 16,300 BTU/HR being introduced into the classroom by uncontrolled sources. This heat gain remains constant regardless of the outdoor air temperature.

Solar Heat Gain

The sun is a third uncontrolled source of heat. And, because it is neither positive nor constant, calculating its contribution to the overall heat gain is difficult. Solar heat gain can be the worst offender of the three in classrooms with large windows. Indirect or reflected solar radiation is substantial even on cloudy days, even in rooms with north exposure, as a result of what is termed "skyshine."

To get an idea of the potential effect of the sun, let's assume that the solar heat gain in our hypothetical classroom will peak at 240 BTU/HR per square foot of glass area. If we then assume a glass area of 100 square feet and at least

100 BTU/HR per square foot of glass for solar heat gain, we can calculate a very conservative estimate of 10,000 BTU/HR heat gain through windows. If we add this to the heat from the lights and body heat, total heat gain adds up to 26,300 BTU/HR from sources other than the heating and ventilating system. This is indicated in Figure 56 on page 91 by the top horizontal line, which intersects Room Heat Loss Line A at approximately 37°F. This is a reasonable estimate of the maximum uncontrolled heat gain that can be received in the typical classroom from these common heat sources.

The Analysis

From Figure 56 on page 91 it is evident that, at an outside temperature of 48°F or higher, the heat given off by 30 students and classroom lighting is sufficient to cause overheating. This is true even if the classroom is occupied at night when solar heat gain is not a factor. But, since classrooms are occupied during the day, solar addition provides heat in varying amounts even in classrooms with north exposures. Consequently, the heating and ventilating system in our typical classroom must provide cooling at all times when the outdoor temperature is above 48°F and at any time during colder weather when the solar heat gain exceeds room heat loss.

If we assume an average winter temperature of approximately 33°F in the region where our typical classroom is located, we know that, half of the time, both night and day, the outside temperature will be above 33°F. However, since it is generally warmer during the day, when school is in session, the heating and ventilating system will be required to provide cooling for this classroom during much of the time that the room is occupied.

In this example, we've assumed that our classroom had a room heat loss of 55,000 BTU/HR at a design outdoor air temperature of 0°F (Room Heat Loss Line "A"). Bear in mind, however, that the recent trend in "energy-saving" building design often results in rooms with lower room heat loss, as indicated by Room Heat Loss Lines "B", "C" and "D." At 0°F design outdoor air temperature:

- Room "B" has a room heat loss of 45,000 BTU/HR,
- Room "C" has a room heat loss of 35,000 BTU/HR,
- Room "D" has a room heat loss of 25,000 BTU/HR.

Note the lowering of the temperature above which cooling will always be required as the room heat loss decreases.

We've noted that cooling is always required in Classroom "A" when outdoor air temperatures exceed 48°F. In Classroom "B," "C," and "D" cooling is always required when outdoor temperatures exceed 44°, 36°and 23°F, respectively (Figure 56 on page 91).

Now that we understand the reason for classrooms overheating, the solution is simple: The heating and ventilating system must provide cooling to take care of the heat given off in the classroom by uncontrolled heat sources.

Cooling The Classroom

The Daikin Unit Ventilator has become a standard for heating and ventilating systems in schools because it provides the solution for overheating classrooms. The unit ventilator cools as well as heats. During the heating season the outdoor air temperature is nearly always below the desired room temperature. It stands to reason then that the outside air should be used to provide the cooling necessary to keep classrooms down to thermostat temperature.

The classroom unit ventilator does just that. By incorporating an automatically controlled outdoor air damper, a variable quantity of outdoor air is introduced in the classroom, metered exactly to counteract overheating. Since our problem is more one of cooling than of heating, it is evident that more than just the room heat loss must be determined to design a good heating and ventilating system. The cooling requirements should be assessed as well, and the free-cooling capacity of the equipment specified along with the heating capacity required. If this is done, the optimum learning temperature can be maintained in each classroom.

Meeting IAQ Requirements

Good indoor air quality (IAQ), which is important in the home and at work, is no less important to students and faculty in schools. For the past several years, efforts to reduce energy costs in new school buildings have seen the use of tighter construction, sealed windows and heavier insulation. While these construction techniques have helped reduce energy costs, tightly sealed buildings, or envelopes, when combined with increased use of recirculated air, have led to a condition known as sick building syndrome.

In a poorly ventilated school building, fumes and vapors from plastics and other synthetics are often not properly exhausted, while mold, fungus, and bacteria are able to flourish. These conditions can cause various ailments, including nausea, smarting eyes, and coughing, as well as increased student absenteeism and diminished productivity.

For these reasons, the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) now has recommendations for minimum ventilations rates for various types of classrooms and no longer endorses the practice of little or no usage of outdoor air.

Following ASHRAE Control Cycle II

ASHRAE Cycle II is a very economical sequence of control because only minimum amounts of outdoor air are heated and free outdoor air—natural cooling—is available to offset the large internal heat gain associated with the dense occupancy of classrooms.

Daikin unit ventilators are normally controlled according to ASHRAE Control Cycle II. ASHRAE control cycles apply only to heating, heating-and-ventilating and free-cooling operation. (For more information on the ASHRAE Control Cycle II sequence, see "Application Condsiderations" on page 95.)

Under ASHRAE Cycle II, the outdoor air damper is closed during warmup of the room. As the room temperature approaches the thermostat setting, the outdoor air damper opens to a predetermined minimum percentage of outside air. The heating coil capacity controller then modulates to maintain the thermostat setting.

If the room temperature rises above the thermostat setting, the heating coil is turned off and the outdoor air damper opens beyond the minimum position to maintain the thermostat setting.

EXAMPLE: For a 60°F entering air mixture temperature and 70°F room temperature, with 30°F outdoor air temperature, 25% outdoor air will produce the 60°F mixture air temperature. When the outdoor air temperature drops to 10°F, 12.5% outdoor air will produce the 60°F mixture air temperature.

Night Setback

Substantial fuel savings can be realized by operating the unit ventilator system at a reduced room setting at night and during other unoccupied periods, such as weekends and holidays. Units with steam or hot-water coils will provide convective heat during the setback period. If the space temperature falls below the setting of the unoccupied thermostat, the unit fans will be brought on to provide additional heat. Units with electric heat coils do not provide convective heat. The electric coil and the unit fans will be brought on to maintain the thermostat setting.

Typical Temperature Control

In general, unit ventilators require the following basic DDC electrical components in order to operate on any of the standard unit ventilator ASHRAE cycles of control. The control components listed in this section are for familiarization purposes only and should not be construed as a bill of material.

Outdoor Air Damper Actuator

This is a modulating device under the control of the room and discharge sensors. It positions the outdoor air damper to admit the amount of outdoor air required at any given point in the control cycle. The room air damper is mechanically linked to the outdoor air damper, which permits the use of a single actuator. Electric actuators should be of the spring-return type so that the outdoor air damper closes whenever the electric power supply to the unit is interrupted.

Discharge Airstream Sensor

This device overrides the room sensor and modulates the outdoor air damper toward the closed position when the unit discharge air falls to a potentially uncomfortable temperature.

Electric Heat Step Control:

A modulating step controller, under control of the room sensor, steps individual electric heating elements on and off as required. Staging relays are sometimes used in lieu of a step controller.

Room Temperature Sensor

The room temperature sensor is a device that modulates the intensity of an electric signal to the controlled components within the unit to maintain the room sensor's comfort setting. Room sensors can be mounted on the wall or within the unit.

Room Temperature Sensor Chamber:

When the Room Temperature Sensor is to be mounted within the unit ventilator rather than on the wall, it is located behind a series of holes in the unit front panel with the sensing element sealed within the room temperature chamber. The room temperature chamber is a standard feature with units furnished with MicroTech controls.

DX Cooling Low Ambient Lockout:

This lockout must be used on DX systems to lock out the condensing unit when the outdoor air temperature is below 64°F (17.5°C). This device must be integrated into the control system so that the unit has full ventilation cooling capability during the lockout period.

DX Low Temperature Limit:

This limit must be used on DX cooling units to de-energize the compressor when the refrigerant falls below freezing. DX units with MicroTech controls have a factory-installed sensor on the return bend of the DX coil that provides a sample of the coil's temperature.

Two Stage Compressors

Our self-contained units with the two-stage compressor will run on lower fan speeds up to 70% of the time, improving comfort through better humidity control and quieter operation, while minimizing issues with over sizing. The unit is designed to operate in low compression mode while in medium and low fan speed. The reduced cooling/heating capacity in the medium and low fan speed will allow the system to run longer at moderate and low load conditions providing better humidity control. When the high capacity is needed the high speed will provide high compression and full capacity cooling/heating.

Long Lasting Electric Heating Coils

With our draw-thru design, electric coils are directly exposed to the air stream. They come with a built-in switch to de-energize the coil when the center front panel is removed. A unit-mounted disconnect switch is included. A continuous electric sensory element for high temperature is not required because the air is drawn smoothly and evenly across the coils, prolonging life. (Blow-thru designs use cal rods inserted into the tube of a fin tube coil that results in reduced heat transfer. The constant movement of the electric heating cal rod within the tube shortens life.)

ASHRAE Cycle II

We strongly recommend that ASHRAE Cycle II be implemented with all unit ventilators using controls by others. ASHRAE Cycle II is a very economical sequence since only the minimum amount of outside air is conditioned and free natural cooling is available.

During warm-up (any classroom temperature 3°F or more below heating setpoint), the outdoor air damper is closed and the unit conditions only room air. As room temperature approaches the heating setpoint the outdoor air damper opens to a position that permits a predetermined minimum amount of outside air to be drawn in. Unit capacity is then controlled as needed to maintain room setpoints. If room temperature rises above room cooling setpoint, and the outside air is adequate for economizer cooling, then the outdoor air damper may open above the minimum position to provide economizer cooling.

ASHRAE Cycle II requires that a minimum of three temperature measurements be made:

1. Classroom temperature.
2. Unit discharge air temperature.
3. Outdoor air temperature.

Additionally, the control sequence should incorporate a Discharge Air Low Limit function which requires a discharge air temperature sensor and can override classroom temperature control in order to maintain a discharge air temperature setpoint of 55°F.

When the discharge air temperature drops below 55°F, the discharge-air low-limit function will disable cooling (if enabled) and modulate the unit's heating capability as needed to maintain the 55°F discharge-air setpoint regardless of room temperature.

If the unit's heating capability reaches 100%, then the discharge air low-limit function will modulate the outdoor air damper toward closed to maintain the 55°F discharge air setpoint. Outdoor air temperature is used to determine when to use economizer as a first stage of cooling, and when to use mechanical or hydronic cooling as the first stage of cooling.

Figure 57: ASHRAE Cycle II Operation

Typical Outdoor Air Damper Operation

A Outdoor air damper closed.

B Outdoor air damper at minimum position.

C Economizer function is increasing the outdoor air damper position.

Note: If outdoor air temperature is not adequate for free cooling, secondary mechanical cooling can be used in place of economizer cooling. A low discharge air function is used to help maintain comfort and provide additional equipment protection by preventing the discharge air from falling too low (typically 55°F), and may force the outdoor air damper toward closed to maintain the discharge air temperature regardless of room temperature.)

D Damper is at full open.

Typical Heating Operation

E Heating capability is closed (or off).

F Heating begins to modulate (or on).

G Heating capability has reached 100%.

Typical Mechanical Cooling Operation

H Mechanical cooling (DX) is closed (or off).

J Mechanical cooling (DX) has reached 100%.

Unit Installation

The floor unit ventilator is typically applied exposed on an outside wall below a window in the classroom. This allows fresh air (outdoor air) to be directly fed into the classroom after filtering or tempering. The floor unit is usually mounted flush against the wall with the fresh air opening in the back and the return air opening in the front. All units have a fully insulated back with gasketing for added protection.

Wall and Floor Considerations

It is critical to consider the floor and wall structures when installing floor-mounted unit ventilators. The following requirements apply:

- The unit must be securely mounted against an outside wall into which an opening is cut for an outdoor air intake louver.
- Placement of the outdoor air intake louver is critical for proper ventilation. It must be unobstructed, with no plants, trees or walls blocking the opening within 3 feet.
- Four pre-drilled holes are provided for securing the unit to the wall. Structural members must be available in the wall to support these attachments. Securing the unit to the wall compresses the unit back insulation and gasketing to help prevent air leaks and freezing of piping or coils.
- The floor must have sufficient strength to support the unit and prevent tipping.
- Space must be available under the floor to feed piping supply and return lines to the unit.

The following are general instructions for suggested applications. In all cases, good engineering practices and local codes must be followed.

Lintels

When brickwork is built up to the top of the intake, lintels must be used above the wall louvers. While the wall is still wet, finish the brick on the top, bottom and both sides of the intake opening with 1/2" cement mortar. With the standard location of the wall louver, the bottom of the intake opening must slope from the louver frame up toward the intake opening to a point 1" above the finished base of the unit.

If a metal sleeve connection is to be used between the unit ventilator and the wall louver, this sleeve must be installed after the unit ventilator is set, making a weather-tight connection to the unit ventilator cabinet. Turn the sleeve over the edge of the louver frame by proper peening before the louver is finally installed.

Figure 58: Typical Wall Opening with Lintels

Figure 59: Typical Classroom Unit Ventilator Installation and Louver Details

Wall Louvers

The outdoor air wall louver is usually set directly back of the unit ventilator. The position of the wall louver is determined in general by the building construction. The top of the lower channel of the louver frame should be at least 1/2" below the level of the inlet to the unit ventilator.

However, if a high intake opening is necessary, the top of this opening should be not more than 28" above the surface upon which the unit ventilator will set.

Recessed Wall Louvers

Set recessed wall louvers into the wall in a bed of mortar with the face of the louver frame set slightly inside the wall line. The complete wall louver frame must be level with the face plumb and the louver frame set so that the drain holes on the bottom are toward the outside of the building.

The mortar should seal the frame perimeter water-tight to help prevent leaks. Do not block drain holes in the frame with mortar (Figure 60).

Figure 60: Recessed Wall Louver Installation Detail

Flanged Wall Louvers

Set flanged wall louvers into the wall in a bed of mortar with the face of the louver frame flush with the wall line (Figure 61). The complete wall louver and frame must be set level. Do not block drain holes in the frame with mortar.

Figure 61: Flanged Wall Louver Installation Detail

Use appropriate fasteners to secure the louver through the flange into the adjacent wall. Caulk the entire perimeter of the flange. For panel wall construction applications, caulk and seal the top and vertical sides of the vertical blade louver. Be sure that the drainage holes are pointing outward and that a metal channel is used to drain moisture (Figure 62).

Figure 62: Panel Wall Louver Installation Detail

Interior Considerations

The interior wall surface behind the unit ventilator must be smooth and level. A wall that is slightly out of plumb can cause major problems with outside air leakage into the room and unit. This could cause drafts and potentially freeze coils.

Be certain that no gap is left between the unit and the outside air louver opening. Otherwise, outside air can leak into the room.

A rubberized, self-adhering membrane around the outside air opening can be used to seal any air or water leaks that might result from construction. Provide a seal under the unit to prevent air infiltration. In addition, seal the unit top and side perimeters to prevent unnecessary air infiltration due to uneven walls.

Indoor Air Exhaust Considerations

All outdoor air introduced by the unit ventilator must leave the room in some way. In some states, exhaust vents are required by law. In states where vents are not required by law, a decision must be made about how best to handle this problem.

The venting system chosen should have the ability to exhaust varying amounts of air equal to the amount of outside air introduced by the floor unit ventilator. A constant volume system, such as a powered exhaust, is unable to respond to changing conditions. It will either exhaust too much air, resulting in a negative pressure, which draws in more outdoor air than desired. Or, it will exhaust too little air, resulting in increased positive pressure, which restricts the amount of outside air being brought into the room.

The Daikin Ventimatic shutter is a more economical solution to the problem. See "VentiMatic Shutter Room Exhaust Ventilation" on page 25 for information on this system and its proper installation.

VentiMatic™ Installation Considerations

Figure 63: VentiMatic Shutter Components

Louver ships assembled as one piece

The VentiMatic Shutter should be mounted on the same wall as the unit ventilator. This neutralizes the effect of wind pressure forcing excess air into the room through the unit ventilator louver. That's because the wind press air flow that could occur with opposite-wall mounting.

The VentiMatic Shutter is generally mounted on an Daikin wall louver (ordered separately) which is then used for exhaust (Figure 64). For large unit ventilators, two Ventimatic Shutters may be mounted side by side on the same wall louver to adequately promote exhaust air capacity. The size and appearance of wall louvers and grilles used for unit ventilators and for VentiMatic Shutters are identical and present an architecturally coordinated and pleasing installation.

An ideal method of integrating the VentiMatic Shutter with the unit ventilator is to locate the shutter behind a matching open-shelf or closed-shelf storage cabinet mounted next to the unit ventilator. For example, 48-inch-length wall louver can be accommodated behind a 4-foot-high storage cabinet. The cabinet should be ordered with a slotted-type kick plate to provide a concealed exhaust air path to the shutter. This combination will enable a complete, integrated, energy-efficient HVAC and room exhaust system

Note: *Storage cabinets are provided by others. Contact your Daikin sales representative for options.*

Figure 64: VentiMatic Shutter Installation

Daikin Applied Unit Ventilator – Model ARQ and GRQ

General

Furnish and install where shown on plans, with unit capacities and characteristics as listed in schedule for self-contained water source heat pump units.

The units shall ship fully assembled with the exception of the end panels which shall be packaged separately to allow easy access for piping and electrical rough-in.

Unit Construction

All internal sheet metal parts must be made of galvanized steel to inhibit corrosion. The entire frame must be welded construction to provide strength and rigidity. Hidden reinforced top panel support shall be integral with the frame and support the fan assembly. Frames assembled with sheet metal fasteners shall not be acceptable. Unit shall be of a draw-thru design. Blow-thru design is not acceptable. Unit shall have a built-in metal wire raceway from one end compartment to the other.

Cabinets

Exterior cabinet panels shall be constructed of heavy gauge steel. All sheet metal panels must be cleaned and phosphatized, then painted electrostatically with an oven baked environmentally friendly thermosetting urethane powder finish. Opening or removing the unit left- or right-hand front panels shall not affect unit operation in order to facilitate testing and servicing. Internal sheet metal parts shall be constructed of galvanized steel to inhibit corrosion. Unit discharge grille shall be constructed of continuous round edged steel bars to provide 10-degrees vertical deflection. Adjustable side deflection vanes shall be provided beneath the discharge grille to provide optimum lateral air distribution. Cabinet depth shall not exceed 16-5⁄8" (422mm) [21-7⁄8" (566mm) if adapter back is used]. [A 1⁄4" (6mm) mesh screen shall be provided beneath the discharge grille to protect against objects being dropped through the discharge grille.] Unit shall have glass fiber blanket insulation. This shall act as an outdoor air seal on 16-5⁄8" (422mm) deep units. Units that are 21-7⁄8" (566mm) deep shall also have glass fiber blanket insulation on those adapter back parts which come In contact with outdoor air. Units that are 21-7⁄8" (566mm) deep shall have a vinyl foam air seal which shall go around the perimeter of the wall opening for the wall intake louver.

Fan and Motor

The motor and fan assembly shall be low speed designed to assure maximum quietness and efficiency. Fans shall be double inlet, forward curved centrifugal type. Fan wheels shall be constructed of dark, high density, injection molded polypropylene having high impact strength, chemical resistance and thermal stability. Assembly shall be statically and dynamically balanced. Fan housings shall be of steel construction. Fan shaft shall be 1-1⁄4" (32mm) diameter, hollow steel with 1-1⁄4" (32mm) bearing. Fan and motor assembly shall be direct drive type. Motor speed shall be controlled by factory furnished and mounted multi-tap transformer through High-Off-Low switch. Fan/coil arrangement shall be draw-thru design for uniform coil face velocity and discharge air temperature In addition to providing the kinetic energy for optimum air distribution. Motors shall be permanent split capacitor (PSC), plug-in type designed specifically for unit ventilator operation. Motors shall be located out of the airstream and have an internal thermal overload device (auto-reset). Fan motors and controls shall have each hot line protected by factory Installed cartridge type fuse(s). All components of the fan/motor assembly shall be removable from the front of the unit. The motor and fan shaft shall have sleeve type bearings with precision tolerances. Motors shall have permanently lubricated bearings. Fan shaft may have sleeve type bearing that requires oiling no more than once annually. Units requiring oiling will have an oil cap accessed from the left-side end compartment (or on the middle of the fan shaft on size 48MBH). Some units are built with permanently sealed bearings that do not require oiling. Check for oil cap to determine which bearing type is present.

Outdoor/Room Air Dampers

Each unit shall be provided with separate room air and outdoor air dampers. The room air damper shall be constructed of aluminum using metal-forming techniques to resist twisting and shall be counterbalanced against back pressure. Outdoor air damper shall be two-piece double-wall construction with 1/2" thick, 1.5 lbs. density fiberglass insulation encapsulated between welded 20 ga. galvanized steel blades for rigidity and to inhibit corrosion, and have additional insulation on the exterior surfaces of the damper blade and on the ends of the outdoor air chamber. Dampers shall be fitted with mohair seals along all the sealing edges. Dampers shall use turned-metal principle on long closing ends with no metal-to-metal contact. No plastic or rubber gaskets shall be acceptable. Damper bearings shall be made of nylon or other material which does not require lubrication.

Drain Pan

All units shall have a drain pan constructed of galvanized steel. A drain outlet shall be provided on both ends of the pan. The drain hand of connection shall be easily field reversed to the opposite end. The drain pan shall be able to be sloped in either direction for proper condensate removal. An optional stainless steel drain pan is available.

Agency Listing

Unit ventilators shall be listed by Underwriters Laboratories Inc. (U.L.) for the United States and Canada. Motors shall conform to the latest applicable requirements of NEMA, IEEE, ANSI, and NEC standards.

Refrigeration System

The refrigeration section shall be constructed of galvanized steel and shall include a factory sealed compressor, a water-to-refrigerant coil, and air-to refrigerant coil and reversing valve. The reversing valve shall have a replaceable external solenoid coil which is energized only when space heating is required. The equipment manufacturer is to be fully responsible for the integrity of the refrigerant piping and the entire refrigeration circuit, including compressor, water-to-refrigerant coil and air-to-refrigerant coil, shall be fully assembled and tested prior to shipment. The motor compressor unit shall be vibration isolated internally and externally and shall be connected in such a manner as to prevent transmission of vibration to other components within the section.

The water-to-refrigerant coil shall be stainless steel plate- to plate heat exchanger. Either type shall be constructed to be suitable for 300 lbs. (2069 kPa) water working pressure and 450 lbs. (3104 kPa) refrigerant pressure. Refrigerant (R-410A) shall be metered by a thermostatic expansion valve In lieu of capillary tubing to achieve balanced evaporator performance and to protect the compressor from floodback of liquid refrigerant. The refrigerant section shall be adequately insulated to prevent “sweating.” The unit shall be furnished and wired with the following safety devices: compressor thermal/current overloads and high pressure cutout switch. Gauge ports shall be provided to allow reading of refrigerant pressures at the suction and discharge of the compressor.

Single phase only: Single phase units shall have permanent split capacitor (PSC) compressor motor with start assist consisting of a compressor start capacitor and compressor start relay.

Units with three-phase power: Shall utilize three-phase compressors for balanced electrical compressor loads.

The condenser coil shall be constructed of copper tubes mechanically expanded to embossed aluminum plate fins. The unit shall be so designed as to allow access to the entering side of the condenser coil for cleaning without opening the sealed refrigeration circuit. The evaporator coil shall be constructed of copper tubing having embossed aluminum plate fins mechanically bonded thereto and shall be positioned above a galvanized steel drain pan. Refrigerant shall be metered by a thermostatic expansion valve in lieu of capillary tubing to achieve evaporator performance and to protect the compressor from floodback of liquid refrigerant. The refrigerant section shall be adequately insulated to prevent “sweating.” The unit shall be furnished and wired with compressor thermal/current overload and high pressure cutout. Gauge ports shall be provided to allow reading of refrigerant pressures at the suction and discharge of the compressor. Compressor shall be equipped with internal pressure relief valve to protect against excessive pressure buildup.

(Optional) Electric Coils

Heating elements shall be of the open wire type. Electric heat shall be controlled in [three] stages. A capillary type high limit thermostat shall be provided to disconnect the heating elements through backup contactors if an overheat condition is detected. A front panel interlock switch shall be furnished to de-energize the electric resistance heating element when center front panel is opened.

Filter

Filter shall be one-piece type. Throwaway filter shall be factory furnished initially installed in the unit.

[Option: Furnish _____ extra set(s) of throw-away filters.]

[Option: Furnish one set of wire mesh permanent filters as final filter.]

[Option: Furnish one set of renewable (metal frame with glass fiber media) filters as final filter.]

[Option: Furnish _____ roll(s) of renewable filter media.]

(Optional] Boilerless Systems

Units shall utilize reverse cycle operation for heating until the water loop temperature drops below 60°F (16°C), [20°F (-6°C) GRQ], at which time the unit switches over to electric resistance heating. Heating elements shall be of the open wire type. Units have up to three stages of electric heat. A capillary tube type high limit thermostat shall be provided to disconnect the heating elements through backup contactors if an overheat condition is detected. A front panel interlock switch shall be furnished to de-energize the electric resistance heating coil when the center front access panel is opened.

Acoustical Features

The compressor shall be mounted on compressor isolators for external vibration isolation. Compressor enclosure panels shall be 16-gauge minimum. Complete interior of compressor compartment shall be lined with a multi-functional material that serves as a sound barrier, an absorber of sound and also must act as a decoupler to the compressor enclosure. This multi-functional material shall have a mylar coating on the face to act as a sound reflector and to increase the strength of the material. Damping material shall be textured foam type. The exterior of the compressor compartment shall be coated with a high density damping material to eliminate impact noise and vibration. The right-hand front panel and the hinged top access door shall be coated with a high density material to minimize noise and vibration.

VentiMatic Shutter (Room Exhaust)

Where indicated, the unit ventilator manufacturer shall provide an “in-room” air relief VentiMatic shutter mounted on a separate wall intake louver to prevent excessive static pressure build-up In the room. The VentiMatic shutter shall be constructed of galvanized steel with shutter dampers of woven glass fabric impregnated with silicone rubber.

Temperature Controls

Each unit ventilator shall be furnished with a factory installed and wired, microprocessor based DDC Unit Ventilator Controller (UVC), by the manufacturer of the unit ventilator, which is pre-programmed, factory pretested prior to shipment and capable of complete, standalone unit control, or incorporation into a building-wide network using on-board BACnet MS/TP or an optional LonWorks plug-in communication module. The UVC shall be preprogrammed with the application code required to operate the unit using ASHRAE Cycle II. The unit control system shall include all required temperature sensors, input/output board, main microprocessor module, optional Local User Interface (referred to as LUI) Touch Pad with Digital LED Display, wiring, 24 volt power and direct coupled damper actuators. The UVC shall support up to 16 analog inputs, 8 binary inputs, 4 analog inputs, 2 PWM outputs, and 14 binary inputs.

Network System

1. The unit control system shall perform all unit control functions, unit diagnostics and safeties. The unit shall operate in the standalone or network capable mode of operation. Standalone units to have on-board BACnet MS/TP communication built in. Field furnished and installed controls shall not be allowed. When network capable, network communication module shall be factory installed, tested and able to communicate via plug-in communication module that connect directly to the UVC using:

a. BACnet Client-Server/Token Passing (MS/TP) allowing the UVC to inter-operate with systems that use the BACnet (MS/TP) protocol with a conformance level of 3 meeting the requirements of ANSI/ASHRAE 135- 2008 standard for BACnet systems.

b. LonMark space comfort control that supports the LonMark SCC profile number 8500-10 allowing LonWorks network communication capability to the UVC.

2. Unit controls shall allow for monitoring and adjustment via Daikin ServiceTools using a PC with Windows® 7 or newer operating systems.When using this PC and software, the unit shall be capable of reacting to commands for changes in control sequence and set points

Room Temperature Sensor

All units shall come equipped with a factory mounted room temperature sensor located in a sampling chamber (front, center panel) where room air is continuously drawn through for fast response to temperature changes in the room. When using a remote wall-mounted temperature sensor the ability shall exist to simply disconnect the unit-mounted temperature sensor using the provided quick disconnect plug. The room temperature sensor shall; (SELECT one):

A. be unit-mounted.

B. be an optional wall-mounted temperature sensor, with integral tenant override capability

Wall-Mounted Sensor with Tenant Override

A thermistor type temperature sensor with integral tenant override and status LED shall be furnished with the unit ventilators.

SELECT one:

A. Remote wall-mounted sensor with tenant override

B. Expanded remote wall-mounted sensor with room set point adjustment capability of zero plus or minus 3°F (1.5°C)

Night Controls

Night set-back/set-up control shall be provided by
SELECT one:

A. An internal daily schedule provides two occupied times and two unoccupied times for each of the seven days of the week and one set for holidays. The operator may select the month and date when the holiday schedule is used by selecting a start date and the number of days to run for up to sixteen periods.

B. The network DDC control system.

External Signal Connections

The unit shall have three (3) multi-pin External Signal Connection Plugs factory provided and pre-wired with short wire whips that are capped for field wiring of:

A. Remote Wall-Mounted Temperature Sensor.

B. External Input Signals (by others) availability dependent upon unit configuration: unoccupied, remote shutdown, ventilation lockout, dew point/ humidity, or exhaust interlock signals.

C. External Output Options (by others) availability dependent upon unit configuration: motorized water valve open/close, fault indication signal, pump restart, exhaust fan on/off or auxiliary heat signal.

[Accessory] Outdoor Air Intake Louver

Intake louvers shall be in the quantity and size shown on the plans and specifications, and as manufactured by Daikin.

[Accessory] Horizontal Blade Aluminum Louver

Aluminum masonry louver shall be constructed with horizontal chevron-type, heavy-gauge aluminum blades and aluminum frame. The standard aluminum shall be suitable for color anodizing (by others) or for factory painting. Weep holes shall be provided in the louver frame. A diamond pattern mesh screen shall be furnished on the interior side of the louver. Expanded metal is not acceptable. Louver shall be fabricated of mill finish 6063-T5 aluminum. [Optional: Louver shall be (1) aluminum with clear anodized finish (2) aluminum with an oven-baked powder paint finish. (3) unpainted.]

[Accessory] Vertical Blade Louver

Vertical blade aluminum louver shall be constructed with double-break, aluminum blades for mounting in panel wall or masonry wall applications. The louver frame shall be heavy-gauge aluminum, 2.14" deep in direction of airflow, and have weep holes along face of bottom edge. The standard aluminum alloy shall be suitable for color anodizing (by others) or for factory painting. A diamond pattern mesh screen shall be provided on the interior side of the louver. Louver shall be fabricated of mill finish 6063-T5 aluminum. [Optional: Louver shall be (1) aluminum with clear anodized finish (2) aluminum with an oven-baked powder paint finish (3) unpainted. A four-sided flange shall be provided around perimeter of intake of same material and finish as louver.]

[Accessory] Grille

Decorative aluminum intake grille shall be constructed of heavy-gauge aluminum with square holes to match the louver opening, maximizing the air opening. The grille shall come with holes for mounting to building exteriors. The standard 6063-T5 aluminum shall be suitable for color anodizing (by others) or for factory painting.

Daikin Applied Training and Development

Now that you have made an investment in modern, efficient Daikin equipment, its care should be a high priority. For training information on all Daikin HVAC products, please visit us at www.DaikinApplied.com and click on Training, or call 540-248-9646 and ask for the Training Department.

Warranty

All Daikin equipment is sold pursuant to its standard terms and conditions of sale, including Limited Product Warranty. Consult your local Daikin Applied representative for warranty details. Refer to Form 933-430285Y. To find your local Daikin Applied representative, go to www.DaikinApplied.com.

Aftermarket Services

To find your local parts office, visit www.DaikinApplied.com or call 800-37PARTS (800-377-2787). To find your local service office, visit www.DaikinApplied.com or call 800-432-1342.

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