Product Manual

PM AGS-1

# GeneSys™

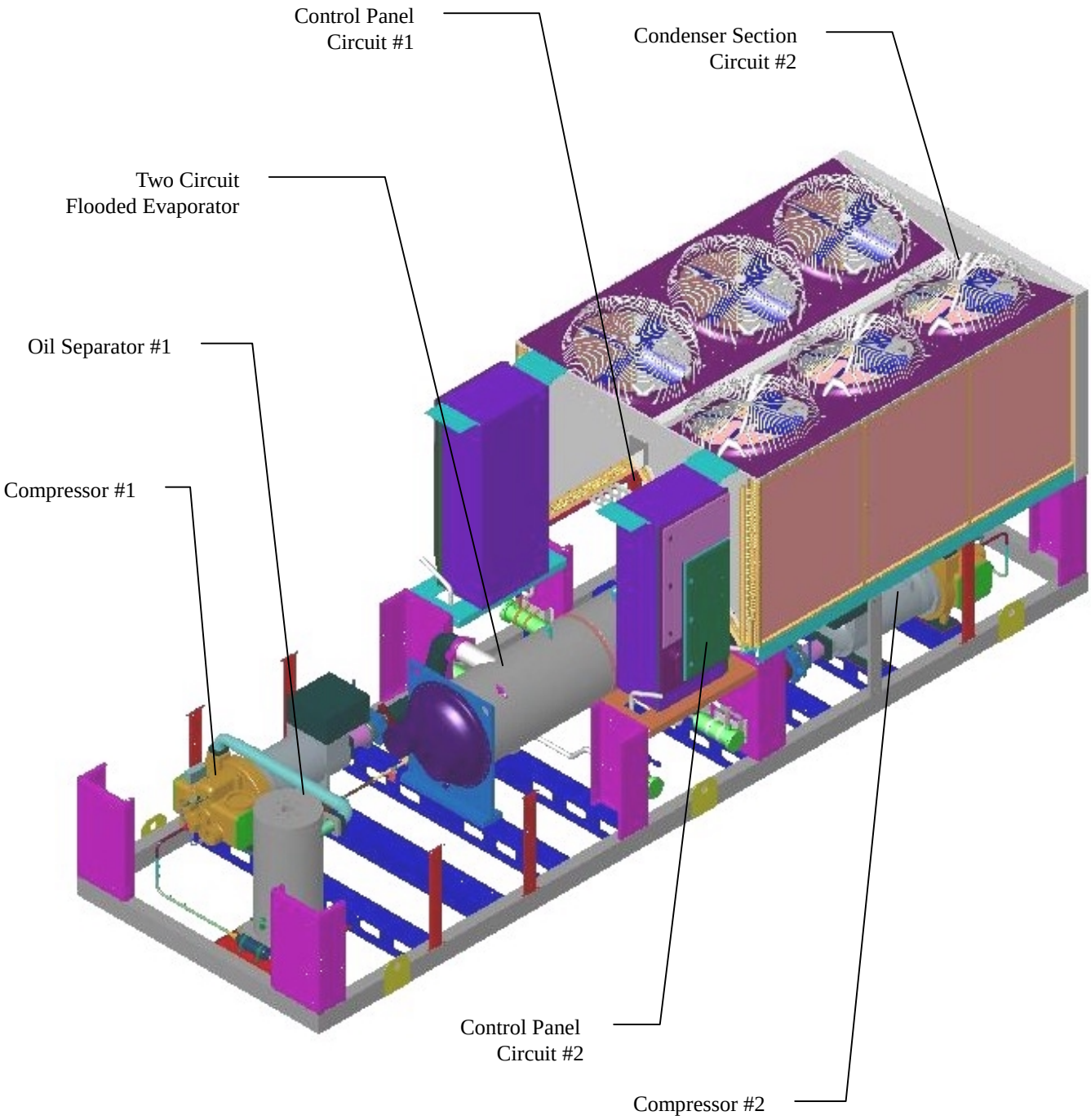
## Air-Cooled Rotary Screw Chillers

**Models AGS 230B to AGS 475B**
**230 to 475 Tons, 805 to 1662 kW**
**HFC-134a**
**60 Hz**


McQuay Air Conditioning

*Engineered for flexibility and performance.*™

***Cutaway View of a Two-Compressor AGS Chiller, Typical of Models AGS 230B through 320B. Models AGS 340B through AGS 475B are similar but with three compressors.***



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Our facility is **ISO Certified**

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# Introduction

The ***GeneSys™*** air-cooled screw chillers continue McQuay's legacy of high quality, high efficiency, latest technology and quiet operation. Our model AGS units utilize a **NEW** compressor design utilizing R-134a refrigerant. Superior control is used with the **NEW** MicroTech II™ family of controllers with Protocol Selectability. ***GeneSys*** continues McQuay's position of being the ONLY air-cooled screw compressor chiller with superior SOLID STATE STARTERS as standard equipment. Perhaps MOST IMPORTANT, ***GeneSys*** continues McQuay's reputation for quiet operation making ***GeneSys*** "neighborhood friendly". ***GeneSys*** provides the best overall value in air-cooled screw chillers available today!!

**The AGS chillers are equipped with state-of-the-art solid state starters to provide stepless acceleration, controlled deceleration, and advanced motor/compressor protection features. McQuay is the only manufacturer to provide this advanced technology as standard equipment on air-cooled chillers.**

## UNSURPASSED EFFICIENCY

- Exceeds ASHRAE 90.1 October 2001 efficiency standard
- Single-screw compressor design
- Electronic expansion valve control
- Flooded evaporator
- High efficiency lanced condenser fins

## QUIET OPERATION

- Continuing the legacy of McQuay chillers
- Virtually vibration-free operation

## OUTSTANDING RELIABILITY

- Solid State Starters for smooth acceleration and deceleration
- Independent refrigerant circuits
- Rugged compressor design
- Low thrust loads on bearings
- Advanced composite gaterotor material
- Multiple compressors with independent controllers
- Proactive control logic
- Full factory-run-testing to optimize trouble-free operation
- McQuayService start-up

## SUPERIOR CONTROL LOGIC

- Precise control and improved efficiency
- Easy to read 4-line by 20-character LCD display
- Protocol Selectability™ for simple BAS interface
- Superior reliability under extreme operating conditions

# Customer Benefits

Many customer benefits make ***GeneSys*** the best overall value for your cooling needs. Compare ***GeneSys*** to other offerings before selecting a chiller.

### Low Operating Costs -- High Efficiency Operation

Any product catalog will mention high efficiency operation. In our case, we have the performance to support this claim. ***GeneSys*** uses the NEW McQuay compressor with latest technology. ***GeneSys*** was designed with large condenser coil surface areas for maximum heat transfer. Large condenser fans are used to move large volumes of air across the heat exchangers. Flooded evaporators provide superior performance compared to direct expansion type vessels.

Enough generalities, look at the numbers as shown on page 15 through page 19. For two compressor models, the full load EER ranges up to 10.5. Three compressor units have full load EERs up to 10.6. Many other available chillers struggle to reach the minimum allowable full load EER of 9.6 as required by ASHRAE 90.1, October, 2001. Part load performance with IPLVs up to 14.0 is part of the ***GeneSys*** offering.

### Reliability Through Superior Motor Control -- Solid State Starters – Our Only Offering

***GeneSys*** air-cooled chillers are the ONLY units available that provide the superior motor control of solid-state starters as standard and as our only offering.

A primary benefit is that the compressors are started slowly requiring from three to seven seconds to go from a stop to full-speed condition. This reduces vibration and compressor stresses for longer life. Should liquid refrigerant be present at the compressor intake, the slow acceleration easily moves the liquid out without damage to the compressor.

Perhaps more important is the slow deceleration when operation is no longer required. The traditional "jerking" and backward rotation allowed by conventional starters is eliminated with solid-state starters. Again, extended compressor life is expected.

Another great benefit is the superior electrical system monitoring. In the event of main electrical power problems, the solid-state starters tightly monitor the power quality and make protective decisions to prevent compressor motor damage. See page 8 for a full description.

### Quietest Operation – "Neighborhood Friendly"

If there is one feature that sets ***GeneSys*** apart from other screw chillers, it is the low operating sound levels. The primary reason for quiet operation is the compressor design itself. McQuay's latest compressor design continues the philosophy of a single main rotor with two adjacent rotating gaterotors making gas flow velocities and subsequent noise levels the lowest available. This compressor design is unique and proven by years of excellent service. Condenser fans are selected for both good performance and low sound levels.

***GeneSys*** sound data is proudly presented in this catalog for an easy comparison with other offerings. Although others claim low sound levels, it is difficult to find their published sound data to support their claims. See page 22 in this catalog for the details.

## User Friendly Control with New MicroTech II™ – "State of Art"

Sometimes it is difficult to decide which benefit is the most important. Such is the case with the NEW control system used with ***GeneSys.*** MicroTech II control is "State of the Art". The controller provides a user-friendly environment for the operator. The control logic is designed to provide maximum efficiency, to continue operation in unusual operating conditions and provide a history of operating conditions.

Perhaps the greatest benefit is Protocol Selectability® for interfacing into your building automation system. MicroTech II controllers will allow interfacing with most control systems using open standard protocols such as LonTalk®, MODBUS® and BACnet®. Contact your local McQuay Representative for availability. See the complete control description on page 10 in this catalog.

MicroTech II uses distributed control with each refrigerant circuit having a dedicated microprocessor. Distributed control architecture means that if any compressor controller should malfunction, the remaining controllers are unaffected and their compressors will continue to operate. This feature greatly enhances chiller reliability.

## Summary

Four major benefits separate the ***GeneSys*** chiller from a typical air-cooled screw chiller. Consider the

1. Superior control with the new MicroTech II family
2. Superior motor control with solid state starters
3. Low operating costs with our high efficiency design
4. Very quiet operation

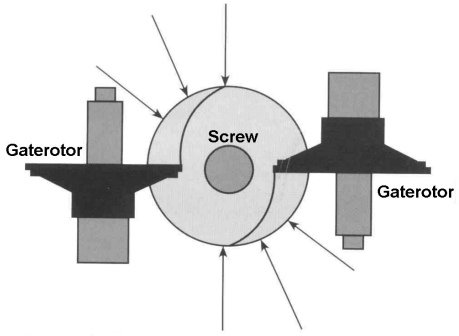
# Compressor

## Unsurpassed Efficiency

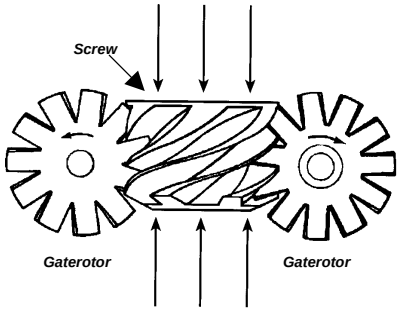
- Zero clearance fit between the two gaterotors and main screw rotor virtually eliminates leakage between the high and low-pressure sides during compression. Special gaterotor material made from an advanced composite, temperature stable material makes a zero clearance design possible.
- The AGS air-cooled chiller is equipped with the most advanced means of refrigerant flow control available. An electronic expansion valve coupled with the MicroTech II controller's control logic provides excellent operating efficiencies both at full and part load operation.
- Infinite unloading matches compressor capacity to load.

## Outstanding Reliability

- Full factory testing of the unit with water hookups helps provides a trouble-free start-up. Extensive quality control checks during testing means that each equipment protection and operating control is properly adjusted and operates correctly before it leaves the factory. Factory-installed options minimize field expenses and startup labor.
- The rugged design of the single-screw compressor allows it to be tolerant of liquid slugging. The AGS screw chiller will start and operate under conditions that would often destroy other compressors.
- Very low loading enhances the bearing and compressor reliability. Due to symmetrical compression taking place on both sides of the main screw rotor, balanced forces result in the elimination of the large radial force loads inherent in twin-screw compressors.
- Integral to the basic design of the single-screw compressor, the main screw rotor shaft and the gaterotor shafts cross at right angles in the compressor. The result is ample space to locate heavy duty bearings and increase compressor reliability since no limitations are placed on bearing design as found in twin-screw compressors.




*Balanced radial forces*




*Balanced axial forces*

- Recent technological advancements have made available a composite material that prevents premature wear on the gaterotor. The composite material is made from a material designed for strength, temperature-stability and durability.

# Flooded Evaporator

- Flooded evaporators are well recognized to be more efficient on large tonnage R-134a chillers than direct expansion evaporators. Water filled tubes are immersed in boiling liquid refrigerant for maximum heat transfer. Approach temperatures (a measure of heat exchanger efficiency) are reduced to less than half that of a DX evaporator.

## "W" Shaped Condenser Coils

- The McQuay designed "W" shaped condenser coil provides the maximum condenser heat transfer per foot of unit length. This translates to a smaller footprint, less structural elements and smaller pad size. McQuay's unique slanted fan deck helps improve unit efficiency and reduces hot air recirculation.

## Unmatched Serviceability

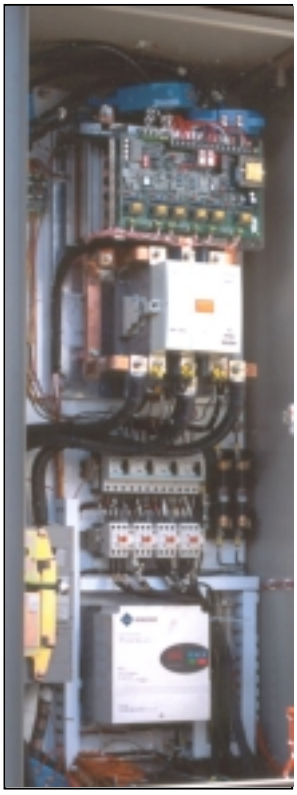
- Field serviceability has not been sacrificed to meet design performance objectives. Compressors are equipped with discharge check valves and an optional suction service valve is available.
- Compressors are located on the outside edges of the base allowing ready access.
- The "W" shaped coil provides excellent headroom under the unit for inspection and service.
- The MicroTech II control gives detailed information on the causes of an alarm or fault.

## Standard Solid-State Starters

The addition of solid-state starters as standard (a McQuay exclusive) on the AGS units takes a giant step forward in motor/compressor protection from failures from machine or electrical faults and includes self-diagnostics, metering and display. The starters provide smooth, slow stepless acceleration and controlled slow deceleration, reducing mechanical and electrical stress for even greater compressor/motor life. Some of the information available to the operator or service technician on each starter LED display follows:

| Operating Messages | Fault Messages |
|---|---|
| Line voltage not present | System power not three phase |
| Voltage present, starter ready | Phase sequence incorrect |
| Motor accelerating | Line frequency less than 25 Hz |
| Motor at full speed | Line frequency more than 72 Hz |
| Motor at full speed, ramp time expired | Excessive current unbalance |
| Stop command received, motor decelerating | Operating parameters lost |
| overload has reached 90% to 99% | No current after "Run" command |
| overload at 100%, motor stopped | Undercurrent trip occurred |
| Passcode enabled | Control power too low |
| Passcode disabled | Motor stalled during acceleration |
| % Thermal overload content | External fault |

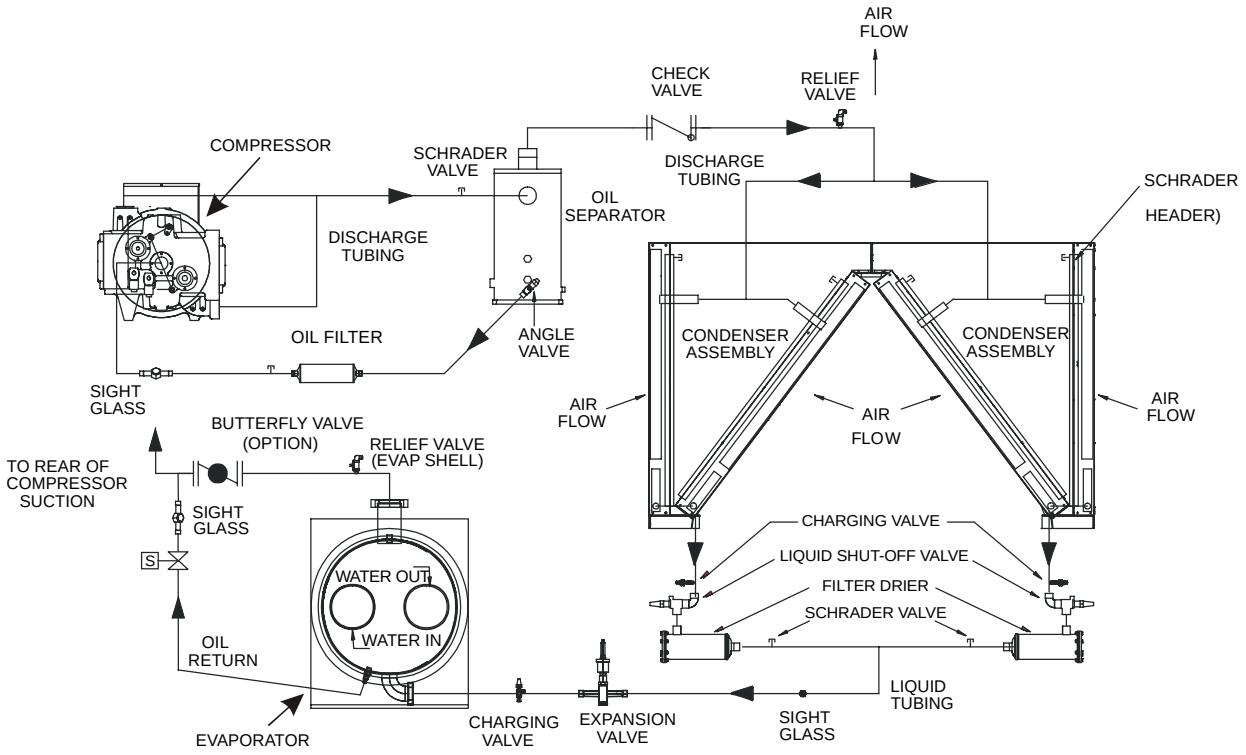
**Power Panel**



## Platform

The structural steel base, G-90 galvanized steel structural members and sheet-metal panels are painted with corrosion-resistant, 500-hour salt spray paint (passes ASTM B117). This finish enhances the appearance of the unit and deters corrosion.

***Figure 1, Piping Schematic with Flooded Evaporator (one circuit shown)***



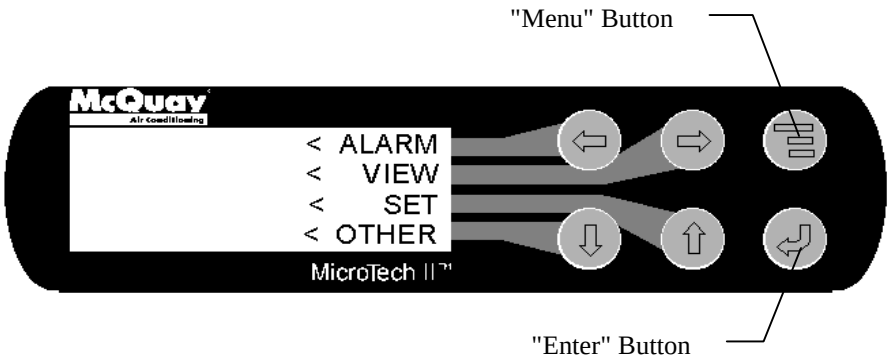
## MicroTech II™ Controller, The Ultimate Control System

The ***GeneSys*** MicroTech II controller is "State of the Art" in the industry. The controller provides a user-friendly environment for the operator. The control logic is designed to provide maximum efficiency, to continue safe operation in unusual operating conditions and provide a history of operating conditions.

- Distributed control architecture enhances unit reliability. Each compressor circuit has its own microprocessor controller so that if one controller should be inoperative, the other circuits are unaffected and will continue to run.
- A logic control system employed in the AGS screw chiller optimizes the suction line superheat and the positioning of the electronic expansion valve at all compressor capacities. Intelligent fan staging and use of the optional fan variable frequency drive also contributes to optimizing unit efficiency at all operating conditions.
- The MicroTech II chiller controller is a new generation of MicroTech control, already considered superior to all other chiller control systems on reciprocating, scroll, and centrifugal chillers. This advanced microprocessor-based control maintains a precise and stable leaving chilled fluid temperature. Utilization of advanced logic means compressor cycling is minimized, reducing wear on both compressor and starting components.
- Stand-alone unit controls designed with the system operator in mind provide access to the unit temperatures, pressures, setpoints, operating states, and alarm messages. The MicroTech II controllers include password protection to guard against unauthorized or accidental setpoint or parameter changes. Each compressor circuit has a dedicated controller. In the event of a compressor-controller failure, the remaining compressor(s) will remain operational.
- Complete instrumentation with state-of-the-art pressure transducers, temperature sensors and optical oil level sensors for unparalleled operator information and diagnostics.
- Superior discharge pressure control that maximizes unit efficiency by determining optimum condenser fan operation. At least 6 and as many as 8 stages of heat rejection per circuit are provided.
- MicroTech II controllers feature optional Protocol Selectability®. The simple addition of an optional communications module to the standard unit controller will enable the controller to communicate using standard protocols such as LonTalk®, MODBUS® and BACnet® using any of the following data link layer options: BACnet MS/TP, BACnet/IP, BACnet Ethernet or Lon Talk (FTT-10A). The result can be reduced installation costs by eliminating additional gateways and simplifying system wiring, greater reliability, and a seamless operator interface with all equipment in the building. The communications module can be added later in the field to the existing controller.

- MicroTech II controllers have a proactive limit control feature that keeps the unit online when selected operating parameters start to exceed design settings. For example, should the discharge pressure start to climb for some reason, rather than shutting down the unit, the control will inhibit capacity increase to prevent further heat rejection to the condenser. If the pressure continues to climb, the control will unload the compressor in an attempt to keep the pressure within bounds. Either of these actions will illuminate a signal on the controller and also be recorded in the fault register. If these two defenses fail, and the pressure still continues to rise, the control will shut the compressor off at the shut off setpoint.
- The operator interface is through a 4-line by-20 character/line liquid crystal display and 6-key keypad mounted on the unit controller. Its layout is shown below.

## Keypad/Display




## Electronic Expansion Valve

The AGS air-cooled chiller is equipped with the most advanced means of refrigerant flow control available. An electronic expansion valve coupled with a MicroTech II unit controller provides excellent operating efficiencies both at full and part load operation.

Unlike conventional thermal expansion valves which require a large pressure drop across the valve and result in higher condenser head pressure, the electronic valve does not need a large pressure drop across it to operate effectively. During part load operation the electronic valve allows the system to operate at lower condensing pressure, minimizes suction line superheat and provides for a more stable system operation. Unit efficiencies are dramatically improved. The electronic expansion valve is an excellent choice of control for the AGS chiller line, providing precise control with a very fast response time.

At unit shutdown, the expansion valve will close tight to provide a positive shut-off downstream of the filter-drier.

## 60 Hz - I-P Units

The performance data on the following pages are based on a 10-degree F (5.5-degree C) Delta-T through the evaporator (2.4 gpm/ton). Adjustment factors for other Delta-Ts can be found in Table 3. The minimum leaving chilled water temperature without glycol is 38.0°F (4.4°C). For brine selections refer to Table 1 or Table 2 for ethylene or propylene glycol adjustment factors. Ratings are based on a 0.0001 $ft^2$ x hr x °F/BTU (0.0176 $m^2$ x °C/kW) fouling factor in the evaporator and sea level operation. For other fouling factors or elevations refer to Table 3.

For applications outside the catalog ratings contact your local McQuay sales representative.

**Selection Example**
Specification: 250 tons

95°F ambient air temperature, 4000 feet elevation

500 gpm, 56°F to 44°F, 0.0001 evaporator fouling factor

1. Use the following formula (for water only) to calculate any missing elements:

   (gpm x Delta-T) /24 = tons

2. From Performance Data, IP Units in Table 4, an AGS 270B at the given conditions will produce 267.5 tons with compressor kW input of 307.0 and a unit EER of 10.5. The unit performance at standard conditions must be corrected for both altitude and Delta-T from Table 3.

   Capacity: 267.5 tons x 0.986 = 263.7 tons

   Power: 307.0 kW x 1.022 = 313.7 kW

   EER = Output / Input = 10.5 x 0.986 / 1.022 = 10.1

3. Determine the evaporator pressure drop. Using Figure 2, enter at 500 gpm and follow up to the AGS 270B line intersect. Read horizontally to obtain an evaporator pressure drop of 11.5 ft.

**Selection example utilizing ethylene glycol**
Given:

250 tons, 95°F ambient temperature

56°F to 44°F chilled fluid temperature

0.0001 evaporator fouling factor.

Protect against freezing to 0°F

1. From Table 1 select an ethylene glycol concentration of 40% to protect to 0°F.
2. Adjustment factors at 40% glycol from Table 1:

   Capacity = 0.943, Power = 0.973, Flow = 1.132, Pressure Drop = 1.664.

3. Adjustment Factor for 12 degree chilled water range from Table 3 is 1.000 Capacity and 1.000 Power. The effect of 12-degree Delta-T is negligible. If the correction factor were other than zero, it would be applied to the unit's cataloged performance, in addition to the glycol correction.

4. Select an AGS 270B with a capacity of 267.5 tons and correct performance with 40% ethylene glycol factors.

   Correct capacity: 0.943 x 1.000 x 267.5 tons = 252.3 tons.

   Correct compressor power: 0.973 x 1.000 x 307.0 kW = 298.7 kW

5. Correct chilled fluid flow:

   Fluid flow (water) at 250 tons

   gpm (water) = (tons x 24) / delta-T

   gpm = (250 tons x 24) / 12 degrees = 500 gpm

   Fluid flow required with 40% EG solution:

   500 gpm (water) x 1.132 flow correction factor = 566 gpm (ethylene glycol)

6. Determine the evaporator pressure drop. Using Figure 2, enter at 500 gpm (water flow rate, not the glycol flow rate) and follow to the AGS 270B line intersect. Read horizontally to obtain an evaporator pressure drop of 11.5 ft.

7. Correct the pressure drop for 40% EG solution:

   11.5 ft x 1.664 pressure drop correction factor = 19.1 ft for ethylene glycol.

# Performance Adjustment Factors

## Ethylene and Propylene Glycol Factors

AGS chiller units are designed to operate with leaving chilled fluid temperatures of 20.0°F to 50.0°F (-6.7°C to 10.0°C). Consult the local McQuay sales office for performance outside these temperatures. Leaving chilled fluid temperatures below 38°F (4.4°C) result in evaporating temperatures at or below the freezing point of water and a glycol solution is required. McQuay also recommends double insulation, and the system designer should determine its necessity. The use of glycol will reduce the performance of the unit depending on its concentration. This should be taken into consideration during initial system design. On glycol applications the supplier normally recommends that a minimum of 25% solution by weight be used for protection against corrosion or additional inhibitors.

***Table 1, Ethylene Glycol***

| % E.G | Freeze Point | | Capacity | Power | Flow | Pressure Drop |
|---|---|---|---|---|---|---|
| | °F | °C | | | | |
| 10 | 26 | -3.3 | 0.994 | 0.998 | 1.036 | 1.104 |
| 20 | 18 | -7.8 | 0.979 | 0.990 | 1.060 | 1.256 |
| 30 | 7 | -13.9 | 0.964 | 0.983 | 1.092 | 1.424 |
| 40 | -7 | -21.7 | 0.943 | 0.973 | 1.132 | 1.664 |
| 50 | -28 | -33.3 | 0.920 | 0.963 | 1.182 | 1.944 |

***Table 2, Propylene Glycol***

| % P.G | Freeze Point | | Capacity | Power | Flow | Pressure Drop |
|---|---|---|---|---|---|---|
| | °F | °C | | | | |
| 10 | 26 | -3.3 | 0.985 | 0.993 | 1.017 | 1.120 |
| 20 | 19 | -7.2 | 0.964 | 0.983 | 1.032 | 1.272 |
| 30 | 9 | -12.8 | 0.932 | 0.969 | 1.056 | 1.496 |
| 40 | -5 | -20.6 | 0.889 | 0.948 | 1.092 | 1.792 |
| 50 | -27 | -32.8 | 0.846 | 0.929 | 1.139 | 2.128 |

## Altitude Correction Factors

Performance tables are based on sea-level altitude. At elevations higher than sea level, the performance of the unit will be decreased due to the lower air density. For performance at elevations other than sea level refer to Table 3.

## Evaporator Temperature Drop Factors

Performance tables are based on a 10-degree F (5.6 degree C) temperature drop through the evaporator. Other delta-Ts will require adjustment factors found in Table 3. Temperature drops outside a 6 to 16 degree F (3.3- to 8.9-degree C) range can adversely affect the system's capability to maintain acceptable control and are not recommended.

The maximum water temperature that can be circulated through the evaporator in a non-operating mode is 100°F (37.8°C). High temperatures can result in poor performance and damage to the equipment.

## Fouling Factor

Performance tables are based on water with a fouling factor of 0.0001 $ft^2$ x hr x °F/BTU (0.0176 $m^2$ x °C/kW) per ARI 550/590-98. As fouling is increased, performance decreases. For performance at other fouling factors refer to Table 3.

Foreign matter in the chilled water system will adversely affect the heat transfer capability of the evaporator and could increase the pressure drop and reduce the water flow. For optimum unit operation, proper water treatment and filtration must be maintained.

***Table 3, Correction Factors***

| AGS Capacity and Power Multiplier | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Altitude | Chilled Water Delta T | | Fouling Factor | | | | | | | |
| | | | 0.0001 (0.0176) | | 0.00025 (0.044) | | 0.00075 (0.132) | | 0.00175 (0.308) | |
| | °F | °C | Cap. | Power | Cap. | Power | Cap. | Power | Cap. | Power |
| Sea Level | 7 | 3.9 | 1.000 | 1.000 | 0.982 | 0.992 | 0.927 | 0.966 | 0.832 | 0.923 |
| | 8 | 4.4 | 1.000 | 1.000 | 0.982 | 0.992 | 0.927 | 0.966 | 0.832 | 0.923 |
| | 10 | 5.6 | 1.000 | 1.000 | 0.983 | 0.992 | 0.927 | 0.966 | 0.832 | 0.923 |
| | 12 | 6.7 | 1.000 | 1.000 | 0.983 | 0.992 | 0.927 | 0.966 | 0.832 | 0.923 |
| | 14 | 6.8 | 1.001 | 1.000 | 0.983 | 0.992 | 0.927 | 0.966 | 0.833 | 0.924 |
| | 16 | 8.9 | 1.001 | 1.001 | 0.984 | 0.992 | 0.928 | 0.967 | 0.833 | 0.924 |
| 2000 feet 610 meters | 7 | 3.9 | 0.993 | 1.010 | 0.976 | 1.002 | 0.920 | 0.976 | 0.826 | 0.933 |
| | 8 | 4.4 | 0.993 | 1.010 | 0.976 | 1.002 | 0.920 | 0.976 | 0.826 | 0.933 |
| | 10 | 5.6 | 0.993 | 1.011 | 0.976 | 1.002 | 0.921 | 0.976 | 0.827 | 0.933 |
| | 12 | 6.7 | 0.994 | 1.011 | 0.976 | 1.002 | 0.921 | 0.976 | 0.827 | 0.933 |
| | 14 | 6.8 | 0.994 | 1.011 | 0.977 | 1.003 | 0.921 | 0.977 | 0.827 | 0.933 |
| | 16 | 8.9 | 0.995 | 1.011 | 0.977 | 1.003 | 0.922 | 0.977 | 0.828 | 0.933 |
| 4000 feet 1220 meters | 7 | 3.9 | 0.985 | 1.022 | 0.968 | 1.014 | 0.913 | 0.987 | 0.820 | 0.944 |
| | 8 | 4.4 | 0.986 | 1.022 | 0.968 | 1.014 | 0.913 | 0.987 | 0.820 | 0.944 |
| | 10 | 5.6 | 0.986 | 1.022 | 0.969 | 1.014 | 0.914 | 0.988 | 0.820 | 0.944 |
| | 12 | 6.7 | 0.986 | 1.022 | 0.969 | 1.014 | 0.914 | 0.988 | 0.821 | 0.944 |
| | 14 | 6.8 | 0.986 | 1.023 | 0.969 | 1.014 | 0.914 | 0.988 | 0.821 | 0.944 |
| | 16 | 8.9 | 0.987 | 1.023 | 0.970 | 1.014 | 0.915 | 0.988 | 0.821 | 0.944 |
| 6000 feet 1830 meters | 7 | 3.9 | 0.977 | 1.036 | 0.960 | 1.027 | 0.905 | 1.001 | 0.813 | 0.956 |
| | 8 | 4.4 | 0.977 | 1.036 | 0.960 | 1.027 | 0.905 | 1.001 | 0.813 | 0.956 |
| | 10 | 5.6 | 0.977 | 1.036 | 0.960 | 1.027 | 0.906 | 1.001 | 0.813 | 0.956 |
| | 12 | 6.7 | 0.977 | 1.036 | 0.960 | 1.027 | 0.906 | 1.001 | 0.813 | 0.956 |
| | 14 | 6.8 | 0.978 | 1.036 | 0.961 | 1.028 | 0.906 | 1.001 | 0.814 | 0.956 |
| | 16 | 8.9 | 0.978 | 1.036 | 0.961 | 1.028 | 0.907 | 1.001 | 0.814 | 0.957 |

# Performance Data

## IP Units

***Table 4, AGS 230B – AGS 340B***

| AGS Unit Size | Fan Power (kW) | LWT (°F) | Ambient Air Temperature (°F) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 75 | | | 85 | | | 95 | | | 105 | | | 115 | | |
| | | | Unit Tons | PWR kWi | Unit EER | Unit Tons | PWR kWi | Unit EER | Unit Tons | PWR kWi | Unit EER | Unit Tons | PWR kWi | Unit EER | Unit Tons | PWR kWi | Unit EER |
| 230B | 21.6 | 40 | 230.4 | 218.6 | 12.6 | 217.4 | 234.2 | 11.1 | 204.1 | 251.3 | 9.7 | 190.6 | 270.0 | 8.5 | 176.8 | 290.2 | 7.3 |
| | 21.6 | 42 | 239.5 | 223.4 | 12.9 | 226.0 | 239.0 | 11.3 | 212.2 | 256.2 | 9.9 | 198.2 | 274.9 | 8.7 | 184.0 | 295.1 | 7.5 |
| | 21.6 | 44 | 248.7 | 228.3 | 13.1 | 234.7 | 243.9 | 11.6 | **220.5** | **261.1** | **10.1** | 206.1 | 279.8 | 8.8 | 191.4 | 300.1 | 7.7 |
| | 21.6 | 46 | 258.1 | 233.3 | 13.3 | 243.7 | 249.0 | 11.7 | 229.0 | 266.2 | 10.3 | 214.1 | 285.1 | 9.0 | 198.9 | 305.3 | 7.8 |
| | 21.6 | 48 | 267.6 | 238.5 | 13.5 | 252.8 | 254.2 | 11.9 | 237.6 | 271.4 | 10.5 | 222.2 | 290.3 | 9.2 | 206.5 | 310.7 | 8.0 |
| | 21.6 | 50 | 277.4 | 243.9 | 13.6 | 262.1 | 259.6 | 12.1 | 246.4 | 277.0 | 10.7 | 230.5 | 295.7 | 9.4 | 214.3 | 316.1 | 8.1 |
| 250B | 25.2 | 40 | 254.7 | 236.9 | 12.9 | 240.3 | 254.5 | 11.3 | 225.5 | 273.7 | 9.9 | 210.5 | 294.8 | 8.6 | 195.3 | 317.6 | 7.4 |
| | 25.2 | 42 | 264.7 | 241.9 | 13.1 | 249.8 | 259.5 | 11.6 | 234.6 | 278.8 | 10.1 | 219.1 | 299.9 | 8.8 | 203.4 | 322.7 | 7.6 |
| | 25.2 | 44 | 274.9 | 246.9 | 13.4 | 259.6 | 264.6 | 11.8 | **243.9** | **284.0** | **10.3** | 227.8 | 305.2 | 9.0 | 211.6 | 328.1 | 7.7 |
| | 25.2 | 46 | 285.4 | 252.2 | 13.6 | 269.5 | 269.9 | 12.0 | 253.3 | 289.3 | 10.5 | 236.8 | 310.6 | 9.1 | 220.0 | 333.5 | 7.9 |
| | 25.2 | 48 | 296.0 | 257.5 | 13.8 | 279.7 | 275.3 | 12.2 | 262.9 | 294.9 | 10.7 | 245.9 | 316.1 | 9.3 | 228.5 | 339.2 | 8.1 |
| | 25.2 | 50 | 306.9 | 263.1 | 14.0 | 290.0 | 280.9 | 12.4 | 272.7 | 300.5 | 10.9 | 255.1 | 321.9 | 9.5 | 237.2 | 344.9 | 8.3 |
| 270B | 28.8 | 40 | 279.2 | 255.4 | 13.1 | 263.4 | 274.8 | 11.5 | 247.3 | 296.3 | 10.0 | 230.8 | 319.6 | 8.7 | 214.0 | 345.0 | 7.4 |
| | 28.8 | 42 | 290.2 | 260.4 | 13.4 | 273.9 | 280.1 | 11.7 | 257.3 | 301.5 | 10.2 | 240.3 | 325.1 | 8.9 | 222.9 | 350.4 | 7.6 |
| | 28.8 | 44 | 301.5 | 265.7 | 13.6 | 284.7 | 285.4 | 12.0 | **267.5** | **307.0** | **10.5** | 249.9 | 330.6 | 9.1 | 232.0 | 356.2 | 7.8 |
| | 28.8 | 46 | 313.1 | 271.2 | 13.9 | 295.7 | 290.9 | 12.2 | 277.9 | 312.7 | 10.7 | 259.8 | 336.2 | 9.3 | 241.4 | 361.9 | 8.0 |
| | 28.8 | 48 | 324.8 | 276.7 | 14.1 | 306.9 | 296.5 | 12.4 | 288.6 | 318.4 | 10.9 | 269.9 | 342.0 | 9.5 | 250.8 | 367.8 | 8.2 |
| | 28.8 | 50 | 336.8 | 282.4 | 14.3 | 318.3 | 302.4 | 12.6 | 299.4 | 324.2 | 11.1 | 280.1 | 348.1 | 9.7 | 260.5 | 373.8 | 8.4 |
| 300B | 28.8 | 40 | 296.2 | 275.5 | 12.9 | 279.2 | 297.1 | 11.3 | 261.9 | 321.3 | 9.8 | 244.2 | 348.0 | 8.4 | 226.2 | 377.6 | 7.2 |
| | 28.8 | 42 | 307.9 | 281.1 | 13.1 | 290.3 | 302.8 | 11.5 | 272.4 | 327.0 | 10.0 | 254.1 | 353.8 | 8.6 | 235.5 | 383.3 | 7.4 |
| | 28.8 | 44 | 319.7 | 286.8 | 13.4 | 301.6 | 308.6 | 11.7 | **283.1** | **332.9** | **10.2** | 264.2 | 359.7 | 8.8 | 245.0 | 389.2 | 7.6 |
| | 28.8 | 46 | 331.9 | 292.7 | 13.6 | 313.2 | 314.6 | 11.9 | 294.1 | 339.0 | 10.4 | 274.6 | 365.8 | 9.0 | 254.8 | 395.2 | 7.7 |
| | 28.8 | 48 | 344.2 | 298.9 | 13.8 | 324.9 | 320.8 | 12.2 | 305.2 | 345.1 | 10.6 | 285.1 | 372.0 | 9.2 | 264.7 | 401.5 | 7.9 |
| | 28.8 | 50 | 356.8 | 305.1 | 14.0 | 336.9 | 327.1 | 12.4 | 316.6 | 351.6 | 10.8 | 295.8 | 378.5 | 9.4 | 274.7 | 407.9 | 8.1 |
| 320B | 28.8 | 40 | 315.7 | 297.0 | 12.8 | 297.2 | 320.7 | 11.1 | 278.4 | 347.6 | 9.6 | 259.2 | 377.5 | 8.2 | 239.8 | 411.1 | 7.0 |
| | 28.8 | 42 | 328.1 | 303.1 | 13.0 | 309.0 | 326.9 | 11.3 | 289.5 | 353.7 | 9.8 | 269.7 | 383.6 | 8.4 | 249.6 | 417.0 | 7.2 |
| | 28.8 | 44 | 340.7 | 309.4 | 13.2 | 321.0 | 333.4 | 11.6 | **300.9** | **360.1** | **10.0** | 280.4 | 390.1 | 8.6 | 259.6 | 423.2 | 7.4 |
| | 28.8 | 46 | 353.6 | 316.1 | 13.4 | 333.2 | 339.9 | 11.8 | 312.4 | 366.6 | 10.2 | 291.3 | 396.6 | 8.8 | 269.9 | 429.8 | 7.5 |
| | 28.8 | 48 | 366.7 | 322.8 | 13.6 | 345.7 | 346.7 | 12.0 | 324.2 | 373.6 | 10.4 | 302.4 | 403.3 | 9.0 | 280.2 | 436.5 | 7.7 |
| | 28.8 | 50 | 380.0 | 329.7 | 13.8 | 358.4 | 353.6 | 12.2 | 336.2 | 380.5 | 10.6 | 313.7 | 410.3 | 9.2 | 290.8 | 443.3 | 7.9 |
| 340B | 32.4 | 40 | 349.4 | 330.0 | 12.7 | 329.5 | 353.2 | 11.2 | 309.3 | 378.8 | 9.8 | 288.6 | 406.8 | 8.5 | 267.7 | 437.0 | 7.4 |
| | 32.4 | 42 | 363.0 | 337.2 | 12.9 | 342.5 | 360.4 | 11.4 | 321.5 | 386.2 | 10.0 | 300.2 | 414.1 | 8.7 | 278.6 | 444.4 | 7.5 |
| | 32.4 | 44 | 377.0 | 344.6 | 13.1 | 355.8 | 367.9 | 11.6 | **334.1** | **393.7** | **10.2** | 312.1 | 421.6 | 8.9 | 289.7 | 452.0 | 7.7 |
| | 32.4 | 46 | 391.2 | 352.2 | 13.3 | 369.3 | 375.7 | 11.8 | 346.9 | 401.4 | 10.4 | 324.2 | 429.6 | 9.1 | 301.0 | 459.8 | 7.9 |
| | 32.4 | 48 | 405.7 | 360.0 | 13.5 | 383.1 | 383.6 | 12.0 | 360.0 | 409.3 | 10.6 | 336.5 | 437.6 | 9.2 | 312.6 | 468.1 | 8.0 |
| | 32.4 | 50 | 420.5 | 368.3 | 13.7 | 397.1 | 391.7 | 12.2 | 373.3 | 417.7 | 10.7 | 349.0 | 445.7 | 9.4 | 324.3 | 476.3 | 8.2 |

**NOTES:**

1. Rated in accordance with ARI Standard 550/590-1998.
2. Ratings based on HFC-134a, evaporator fouling factor of 0.0001, 10 degree delta-T, evaporator flow of 2.4 gpm/ton and sea level altitude.
3. Interpolation is allowed, extrapolation is not permitted. Consult McQuay for performance outside the cataloged ratings.
4. KW and EER are for the entire unit, including compressors, fan motors and control power.

## *Table 5, AGS 370B – AGS 475B*

| AGS Unit Size | Fan Power (kW) | LWT (°F) | Ambient Air Temperature (°F) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 75 | | | 85 | | | 95 | | | 105 | | | 115 | | |
| | | | Unit | PWR | Unit | Unit | PWR | Unit | Unit | PWR | Unit | Unit | PWR | Unit | Unit | PWR | Unit |
| | | | Tons | kWi | EER | Tons | kWi | EER | Tons | kWi | EER | Tons | kWi | EER | Tons | kWi | EER |
| 370B | 36.0 | 40 | 376.5 | 349.7 | 12.9 | 355.0 | 374.8 | 11.4 | 333.0 | 402.4 | 9.9 | 310.6 | 432.7 | 8.6 | 287.9 | 465.5 | 7.4 |
| | 36.0 | 42 | 391.4 | 357.1 | 13.2 | 369.1 | 382.3 | 11.6 | 346.4 | 410.2 | 10.1 | 323.3 | 440.4 | 8.8 | 299.8 | 473.2 | 7.6 |
| | 36.0 | 44 | 406.5 | 364.9 | 13.4 | 383.5 | 390.1 | 11.8 | **360.0** | **418.0** | **10.3** | 336.1 | 448.3 | 9.0 | 311.9 | 481.2 | 7.8 |
| | 36.0 | 46 | 422.1 | 372.8 | 13.6 | 398.3 | 398.2 | 12.0 | 374.0 | 426.1 | 10.5 | 349.3 | 456.5 | 9.2 | 324.2 | 489.4 | 8.0 |
| | 36.0 | 48 | 437.9 | 381.0 | 13.8 | 413.3 | 406.4 | 12.2 | 388.2 | 434.3 | 10.7 | 362.7 | 464.9 | 9.4 | 336.8 | 497.9 | 8.1 |
| | 36.0 | 50 | 454.0 | 389.4 | 14.0 | 428.6 | 414.8 | 12.4 | 402.7 | 442.9 | 10.9 | 376.4 | 473.5 | 9.5 | 349.6 | 506.5 | 8.3 |
| 400B | 39.6 | 40 | 401.8 | 368.3 | 13.1 | 378.8 | 395.3 | 11.5 | 355.3 | 425.2 | 10.0 | 331.4 | 457.7 | 8.7 | 307.1 | 493.1 | 7.5 |
| | 39.6 | 42 | 417.7 | 375.9 | 13.3 | 393.9 | 403.2 | 11.7 | 369.7 | 433.1 | 10.2 | 345.0 | 465.8 | 8.9 | 319.9 | 501.1 | 7.7 |
| | 39.6 | 44 | 434.0 | 383.9 | 13.6 | 409.4 | 411.2 | 11.9 | **384.3** | **441.2** | **10.5** | 358.8 | 474.0 | 9.1 | 332.9 | 509.5 | 7.8 |
| | 39.6 | 46 | 450.6 | 392.0 | 13.8 | 425.2 | 419.4 | 12.2 | 399.3 | 449.6 | 10.7 | 372.9 | 482.4 | 9.3 | 346.2 | 518.0 | 8.0 |
| | 39.6 | 48 | 467.5 | 400.4 | 14.0 | 441.3 | 427.9 | 12.4 | 414.6 | 458.1 | 10.9 | 387.4 | 491.0 | 9.5 | 359.7 | 526.8 | 8.2 |
| | 39.6 | 50 | 484.8 | 409.0 | 14.2 | 457.8 | 436.7 | 12.6 | 430.2 | 467.0 | 11.1 | 402.0 | 500.1 | 9.6 | 373.5 | 535.7 | 8.4 |
| 420B | 43.2 | 40 | 427.3 | 386.9 | 13.3 | 402.8 | 416.0 | 11.6 | 377.8 | 448.1 | 10.1 | 352.3 | 482.9 | 8.8 | 326.5 | 520.8 | 7.5 |
| | 43.2 | 42 | 444.3 | 394.8 | 13.5 | 419.0 | 424.1 | 11.9 | 393.1 | 456.2 | 10.3 | 366.8 | 491.3 | 9.0 | 340.1 | 529.1 | 7.7 |
| | 43.2 | 44 | 461.6 | 403.0 | 13.7 | 435.5 | 432.3 | 12.1 | **408.8** | **464.5** | **10.6** | 381.6 | 499.7 | 9.2 | 354.0 | 537.9 | 7.9 |
| | 43.2 | 46 | 479.4 | 411.4 | 14.0 | 452.4 | 440.8 | 12.3 | 424.8 | 473.3 | 10.8 | 396.8 | 508.4 | 9.4 | 368.2 | 546.7 | 8.1 |
| | 43.2 | 48 | 497.5 | 419.9 | 14.2 | 469.6 | 449.4 | 12.5 | 441.2 | 482.0 | 11.0 | 412.2 | 517.3 | 9.6 | 382.7 | 555.7 | 8.3 |
| | 43.2 | 50 | 515.9 | 428.6 | 14.4 | 487.2 | 458.5 | 12.7 | 457.8 | 491.0 | 11.2 | 427.9 | 526.7 | 9.7 | 397.5 | 564.9 | 8.4 |
| 440B | 43.2 | 40 | 447.3 | 408.6 | 13.1 | 421.3 | 439.9 | 11.5 | 394.8 | 474.5 | 10.0 | 367.8 | 512.6 | 8.6 | 340.4 | 554.5 | 7.4 |
| | 43.2 | 42 | 465.1 | 417.0 | 13.4 | 438.2 | 448.4 | 11.7 | 410.7 | 483.0 | 10.2 | 382.8 | 521.3 | 8.8 | 354.5 | 563.1 | 7.6 |
| | 43.2 | 44 | 483.2 | 425.8 | 13.6 | 455.4 | 457.2 | 12.0 | **427.1** | **491.9** | **10.4** | 398.2 | 530.3 | 9.0 | 369.0 | 572.2 | 7.7 |
| | 43.2 | 46 | 501.7 | 434.8 | 13.8 | 473.0 | 466.2 | 12.2 | 443.7 | 501.1 | 10.6 | 413.9 | 539.4 | 9.2 | 383.7 | 581.4 | 7.9 |
| | 43.2 | 48 | 520.6 | 444.0 | 14.1 | 491.0 | 475.5 | 12.4 | 460.7 | 510.6 | 10.8 | 430.0 | 549.0 | 9.4 | 398.7 | 590.9 | 8.1 |
| | 43.2 | 50 | 539.9 | 453.5 | 14.3 | 509.3 | 485.2 | 12.6 | 478.0 | 520.2 | 11.0 | 446.3 | 558.7 | 9.6 | 414.0 | 600.6 | 8.3 |
| 450B | 43.2 | 40 | 461.9 | 427.7 | 13.0 | 434.9 | 461.2 | 11.3 | 407.4 | 498.6 | 9.8 | 379.4 | 540.1 | 8.4 | 351.0 | 586.1 | 7.2 |
| | 43.2 | 42 | 480.1 | 436.5 | 13.2 | 452.2 | 470.1 | 11.5 | 423.8 | 507.5 | 10.0 | 394.8 | 549.0 | 8.6 | 365.5 | 594.9 | 7.4 |
| | 43.2 | 44 | 498.6 | 445.7 | 13.4 | 469.8 | 479.4 | 11.8 | **440.5** | **516.7** | **10.2** | 410.6 | 558.4 | 8.8 | 380.3 | 604.1 | 7.6 |
| | 43.2 | 46 | 517.6 | 455.3 | 13.6 | 487.9 | 488.8 | 12.0 | 457.5 | 526.3 | 10.4 | 426.6 | 567.9 | 9.0 | 395.3 | 613.8 | 7.7 |
| | 43.2 | 48 | 537.0 | 464.9 | 13.9 | 506.2 | 498.6 | 12.2 | 474.9 | 536.3 | 10.6 | 443.0 | 577.7 | 9.2 | 410.6 | 623.5 | 7.9 |
| | 43.2 | 50 | 556.6 | 474.9 | 14.1 | 524.9 | 508.6 | 12.4 | 492.6 | 546.3 | 10.8 | 459.7 | 587.8 | 9.4 | 426.2 | 633.5 | 8.1 |
| 475B | 43.2 | 40 | 476.5 | 446.9 | 12.8 | 448.6 | 482.5 | 11.2 | 420.1 | 522.8 | 9.6 | 391.1 | 567.5 | 8.3 | 361.7 | 617.8 | 7.0 |
| | 43.2 | 42 | 495.1 | 456.1 | 13.0 | 466.3 | 491.8 | 11.4 | 436.8 | 532.0 | 9.9 | 406.9 | 576.7 | 8.5 | 376.5 | 626.8 | 7.2 |
| | 43.2 | 44 | 514.1 | 465.7 | 13.2 | 484.3 | 501.6 | 11.6 | **453.9** | **541.6** | **10.1** | 423.0 | 586.5 | 8.7 | 391.6 | 636.1 | 7.4 |
| | 43.2 | 46 | 533.6 | 475.7 | 13.5 | 502.8 | 511.5 | 11.8 | 471.3 | 551.5 | 10.3 | 439.4 | 596.3 | 8.8 | 406.9 | 646.1 | 7.6 |
| | 43.2 | 48 | 553.3 | 485.9 | 13.7 | 521.5 | 521.6 | 12.0 | 489.1 | 562.0 | 10.4 | 456.1 | 606.5 | 9.0 | 422.6 | 656.1 | 7.7 |
| | 43.2 | 50 | 573.4 | 496.3 | 13.9 | 540.6 | 532.1 | 12.2 | 507.1 | 572.5 | 10.6 | 473.1 | 617.3 | 9.2 | 438.5 | 666.5 | 7.9 |

**NOTES:**
1. Rated in accordance with ARI Standard 550/590-1998.
2. Ratings based on HFC-134a, evaporator fouling factor of 0.0001, 10 degree delta-T, evaporator flow of 2.4 gpm/ton and sea level altitude.
3. Interpolation is allowed, extrapolation is not permitted. Consult McQuay for performance outside the cataloged ratings.
4. KW and EER are for the entire unit, including compressors, fan motors and control power.

# SI Units

### *Table 6, AGS 230B - AGS 340B*

| AGS Unit Size | Fan Power (kW) | LWT (°C) | Ambient Air Temperature (°C) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 25 | | | 30 | | | 35 | | | 40 | | | 45 | | |
| | | | Unit | PWR | Unit | Unit | PWR | Unit | Unit | PWR | Unit | Unit | PWR | Unit | Unit | PWR | Unit |
| | | | kW | kWi | COP | kW | kWi | COP | kW | kWi | COP | kW | kWi | COP | kW | kWi | COP |
| 230B | 21.6 | 5.0 | 816.9 | 224.1 | 3.65 | 774.9 | 238.3 | 3.25 | 732.1 | 253.8 | 2.88 | 688.6 | 270.6 | 2.55 | 644.4 | 288.6 | 2.24 |
| | 21.6 | 6.0 | 845.4 | 228.5 | 3.70 | 802.2 | 242.7 | 3.31 | 758.1 | 258.2 | 2.94 | 713.2 | 275.0 | 2.60 | 667.7 | 293.1 | 2.28 |
| | 21.6 | 7.0 | 874.5 | 232.9 | 3.76 | 829.9 | 247.1 | 3.36 | 784.5 | 262.7 | 2.99 | 738.3 | 279.5 | 2.64 | 691.4 | 297.6 | 2.33 |
| | 21.6 | 8.0 | 904.1 | 237.5 | 3.81 | 858.2 | 251.8 | 3.41 | 811.4 | 267.3 | 3.04 | 763.8 | 284.3 | 2.69 | 715.5 | 302.3 | 2.37 |
| | 21.6 | 9.0 | 934.2 | 242.2 | 3.86 | 886.9 | 256.5 | 3.46 | 838.8 | 272.0 | 3.08 | 789.8 | 289.0 | 2.74 | 740.0 | 307.2 | 2.41 |
| | 21.6 | 10.0 | 964.8 | 247.0 | 3.91 | 916.1 | 261.3 | 3.51 | 866.6 | 277.0 | 3.13 | 816.1 | 293.9 | 2.78 | 765.0 | 312.1 | 2.45 |
| 250B | 25.2 | 5.0 | 902.9 | 242.9 | 3.72 | 856.5 | 258.9 | 3.31 | 809.1 | 276.3 | 2.93 | 760.9 | 295.2 | 2.58 | 711.9 | 315.6 | 2.26 |
| | 25.2 | 6.0 | 934.6 | 247.4 | 3.78 | 886.8 | 263.5 | 3.37 | 838.1 | 280.9 | 2.98 | 788.4 | 299.9 | 2.63 | 737.9 | 320.3 | 2.31 |
| | 25.2 | 7.0 | 967.0 | 252.1 | 3.84 | 917.7 | 268.1 | 3.43 | 867.6 | 285.6 | 3.04 | 816.4 | 304.7 | 2.68 | 764.5 | 325.2 | 2.36 |
| | 25.2 | 8.0 | 999.9 | 256.8 | 3.90 | 949.3 | 272.9 | 3.48 | 897.6 | 290.4 | 3.09 | 845.0 | 309.6 | 2.73 | 791.5 | 330.1 | 2.40 |
| | 25.2 | 9.0 | 1033.4 | 261.6 | 3.95 | 981.3 | 277.8 | 3.53 | 928.1 | 295.4 | 3.14 | 874.0 | 314.6 | 2.78 | 818.9 | 335.2 | 2.45 |
| | 25.2 | 10.0 | 1067.4 | 266.6 | 4.01 | 1013.8 | 282.8 | 3.59 | 959.2 | 300.5 | 3.19 | 903.5 | 319.7 | 2.83 | 846.9 | 340.3 | 2.49 |
| 270B | 28.8 | 5.0 | 990.0 | 261.8 | 3.79 | 939.1 | 279.6 | 3.36 | 887.2 | 298.9 | 2.97 | 834.2 | 320.0 | 2.61 | 780.4 | 342.7 | 2.28 |
| | 28.8 | 6.0 | 1025.0 | 266.5 | 3.85 | 972.6 | 284.4 | 3.42 | 919.2 | 303.7 | 3.03 | 864.6 | 324.9 | 2.66 | 809.2 | 347.6 | 2.33 |
| | 28.8 | 7.0 | 1060.6 | 271.3 | 3.92 | 1006.7 | 289.2 | 3.48 | 951.7 | 308.7 | 3.08 | 895.6 | 329.9 | 2.72 | 838.6 | 352.8 | 2.38 |
| | 28.8 | 8.0 | 1096.9 | 276.2 | 3.98 | 1041.5 | 294.2 | 3.54 | 984.9 | 313.8 | 3.14 | 927.2 | 335.0 | 2.77 | 868.5 | 357.9 | 2.43 |
| | 28.8 | 9.0 | 1133.9 | 281.2 | 4.04 | 1076.9 | 299.3 | 3.60 | 1018.7 | 319.0 | 3.19 | 959.3 | 340.3 | 2.82 | 898.9 | 363.2 | 2.48 |
| | 28.8 | 10.0 | 1171.4 | 286.4 | 4.10 | 1112.8 | 304.6 | 3.66 | 1053.0 | 324.2 | 3.25 | 991.9 | 345.7 | 2.87 | 929.8 | 368.7 | 2.53 |
| 300B | 28.8 | 5.0 | 1050.0 | 282.6 | 3.72 | 995.2 | 302.4 | 3.29 | 939.4 | 324.2 | 2.90 | 882.4 | 348.2 | 2.54 | 824.7 | 374.5 | 2.21 |
| | 28.8 | 6.0 | 1086.9 | 287.7 | 3.78 | 1030.5 | 307.6 | 3.35 | 973.0 | 329.4 | 2.95 | 914.4 | 353.5 | 2.59 | 854.9 | 379.7 | 2.26 |
| | 28.8 | 7.0 | 1124.4 | 293.0 | 3.84 | 1066.4 | 312.8 | 3.41 | 1007.2 | 334.7 | 3.01 | 946.9 | 358.9 | 2.64 | 885.6 | 385.1 | 2.30 |
| | 28.8 | 8.0 | 1162.6 | 298.3 | 3.90 | 1102.9 | 318.3 | 3.47 | 1042.0 | 340.2 | 3.06 | 979.9 | 364.3 | 2.69 | 916.9 | 390.6 | 2.35 |
| | 28.8 | 9.0 | 1201.4 | 303.9 | 3.96 | 1140.0 | 323.8 | 3.52 | 1077.4 | 345.8 | 3.12 | 1013.5 | 370.0 | 2.74 | 948.7 | 396.3 | 2.40 |
| | 28.8 | 10.0 | 1240.9 | 309.5 | 4.01 | 1177.8 | 329.6 | 3.58 | 1113.4 | 351.6 | 3.17 | 1047.7 | 375.8 | 2.79 | 981.0 | 402.0 | 2.44 |
| 320B | 28.8 | 5.0 | 1118.7 | 304.8 | 3.68 | 1059.2 | 326.5 | 3.25 | 998.6 | 350.7 | 2.85 | 936.9 | 377.5 | 2.48 | 874.5 | 407.3 | 2.15 |
| | 28.8 | 6.0 | 1157.9 | 310.4 | 3.74 | 1096.5 | 332.1 | 3.30 | 1034.1 | 356.3 | 2.90 | 970.6 | 383.2 | 2.54 | 906.2 | 412.8 | 2.20 |
| | 28.8 | 7.0 | 1197.7 | 316.2 | 3.79 | 1134.5 | 338.0 | 3.36 | 1070.3 | 362.0 | 2.96 | 1004.9 | 389.0 | 2.59 | 938.6 | 418.6 | 2.25 |
| | 28.8 | 8.0 | 1238.2 | 322.2 | 3.85 | 1173.2 | 343.9 | 3.41 | 1107.1 | 368.0 | 3.01 | 1039.7 | 394.9 | 2.64 | 971.5 | 424.5 | 2.29 |
| | 28.8 | 9.0 | 1279.4 | 328.2 | 3.90 | 1212.5 | 350.0 | 3.47 | 1144.4 | 374.3 | 3.06 | 1075.1 | 401.0 | 2.68 | 1004.9 | 430.5 | 2.34 |
| | 28.8 | 10.0 | 1321.3 | 334.5 | 3.96 | 1252.5 | 356.3 | 3.52 | 1182.4 | 380.5 | 3.11 | 1111.1 | 407.3 | 2.73 | 1038.8 | 436.7 | 2.38 |
| 340B | 32.4 | 5.0 | 1238.5 | 338.3 | 3.67 | 1174.4 | 359.4 | 3.27 | 1109.2 | 382.5 | 2.90 | 1042.8 | 407.6 | 2.56 | 975.6 | 434.7 | 2.25 |
| | 32.4 | 6.0 | 1281.7 | 344.8 | 3.72 | 1215.7 | 366.0 | 3.32 | 1148.5 | 389.2 | 2.95 | 1080.1 | 414.3 | 2.61 | 1010.8 | 441.4 | 2.29 |
| | 32.4 | 7.0 | 1325.7 | 351.5 | 3.78 | 1257.7 | 372.8 | 3.38 | 1188.5 | 396.0 | 3.00 | 1118.1 | 421.2 | 2.66 | 1046.7 | 448.3 | 2.34 |
| | 32.4 | 8.0 | 1370.6 | 358.5 | 3.83 | 1300.5 | 379.9 | 3.43 | 1229.3 | 403.0 | 3.05 | 1156.7 | 428.4 | 2.70 | 1083.2 | 455.4 | 2.38 |
| | 32.4 | 9.0 | 1416.1 | 365.6 | 3.88 | 1344.0 | 387.0 | 3.48 | 1270.7 | 410.1 | 3.10 | 1196.0 | 435.6 | 2.75 | 1120.2 | 462.8 | 2.42 |
| | 32.4 | 10.0 | 1462.5 | 373.0 | 3.93 | 1388.3 | 394.3 | 3.52 | 1312.7 | 417.7 | 3.14 | 1235.9 | 442.9 | 2.79 | 1157.9 | 470.2 | 2.47 |

**NOTES:**

1. Rated in accordance with ARI Standard 550/590-1998**.**
2. Ratings based on HFC 134a, evaporator fouling factor of 0.0176, 5.6°C degree delta-T, and sea level altitude.
3. Interpolation is allowed, extrapolation is not permitted. Consult McQuay for performance outside the cataloged ratings.
4. KW and COP are for the entire unit, including compressors, fan motors and control power.

## *Table 7, AGS 370B - AGS 475B*

| AGS Unit Size | Fan Power (kW) | LWT (°C) | Ambient Air Temperature (°C) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 25 | | | 30 | | | 35 | | | 40 | | | 45 | | |
| | | | Unit | PWR | Unit | Unit | PWR | Unit | Unit | PWR | Unit | Unit | PWR | Unit | Unit | PWR | Unit |
| | | | kW | kWi | COP | kW | kWi | COP | kW | kWi | COP | kW | kWi | COP | kW | kWi | COP |
| 370B | 36.0 | 5.0 | 1334.9 | 358.4 | 3.73 | 1265.4 | 381.3 | 3.32 | 1194.6 | 406.3 | 2.94 | 1122.6 | 433.5 | 2.59 | 1049.7 | 462.8 | 2.27 |
| | 36.0 | 6.0 | 1381.9 | 365.3 | 3.79 | 1310.3 | 388.2 | 3.38 | 1237.4 | 413.3 | 2.99 | 1163.2 | 440.5 | 2.64 | 1088.0 | 469.8 | 2.32 |
| | 36.0 | 7.0 | 1429.8 | 372.3 | 3.85 | 1356.0 | 395.3 | 3.43 | 1280.9 | 420.4 | 3.05 | 1204.5 | 447.7 | 2.69 | 1127.1 | 477.1 | 2.37 |
| | 36.0 | 8.0 | 1478.6 | 379.5 | 3.90 | 1402.6 | 402.6 | 3.49 | 1325.3 | 427.7 | 3.10 | 1246.6 | 455.2 | 2.74 | 1166.9 | 484.5 | 2.41 |
| | 36.0 | 9.0 | 1528.2 | 386.9 | 3.95 | 1450.0 | 410.0 | 3.54 | 1370.4 | 435.2 | 3.15 | 1289.4 | 462.7 | 2.79 | 1207.3 | 492.2 | 2.46 |
| | 36.0 | 10.0 | 1578.7 | 394.5 | 4.01 | 1498.2 | 417.7 | 3.59 | 1416.3 | 442.9 | 3.20 | 1332.9 | 470.4 | 2.84 | 1248.3 | 499.9 | 2.50 |
| 400B | 39.6 | 5.0 | 1424.6 | 377.5 | 3.78 | 1350.4 | 402.3 | 3.36 | 1274.8 | 429.2 | 2.97 | 1197.9 | 458.5 | 2.61 | 1119.9 | 490.0 | 2.29 |
| | 39.6 | 6.0 | 1475.0 | 384.6 | 3.84 | 1398.5 | 409.4 | 3.42 | 1320.7 | 436.4 | 3.03 | 1241.4 | 465.8 | 2.67 | 1161.1 | 497.4 | 2.34 |
| | 39.6 | 7.0 | 1526.3 | 391.8 | 3.90 | 1447.6 | 416.7 | 3.48 | 1367.4 | 443.7 | 3.08 | 1285.8 | 473.2 | 2.72 | 1203.1 | 505.0 | 2.39 |
| | 39.6 | 8.0 | 1578.6 | 399.2 | 3.96 | 1497.6 | 424.1 | 3.53 | 1415.1 | 451.3 | 3.14 | 1331.1 | 480.9 | 2.77 | 1245.8 | 512.6 | 2.43 |
| | 39.6 | 9.0 | 1631.8 | 406.8 | 4.02 | 1548.5 | 431.8 | 3.59 | 1463.5 | 459.0 | 3.19 | 1377.0 | 488.7 | 2.82 | 1289.3 | 520.5 | 2.48 |
| | 39.6 | 10.0 | 1686.0 | 414.5 | 4.07 | 1600.2 | 439.7 | 3.64 | 1512.8 | 467.0 | 3.24 | 1423.8 | 496.7 | 2.87 | 1333.5 | 528.6 | 2.53 |
| 420B | 43.2 | 5.0 | 1515.1 | 396.7 | 3.82 | 1436.1 | 423.3 | 3.40 | 1355.6 | 452.1 | 3.00 | 1273.7 | 483.6 | 2.64 | 1190.6 | 517.4 | 2.31 |
| | 43.2 | 6.0 | 1568.8 | 404.0 | 3.89 | 1487.5 | 430.6 | 3.46 | 1404.7 | 459.5 | 3.06 | 1320.3 | 491.2 | 2.69 | 1234.7 | 525.0 | 2.36 |
| | 43.2 | 7.0 | 1623.6 | 411.4 | 3.95 | 1539.9 | 438.1 | 3.52 | 1454.6 | 467.1 | 3.11 | 1367.8 | 498.8 | 2.74 | 1279.6 | 532.9 | 2.41 |
| | 43.2 | 8.0 | 1679.5 | 418.9 | 4.01 | 1593.4 | 445.7 | 3.58 | 1505.6 | 475.0 | 3.17 | 1416.1 | 506.7 | 2.80 | 1325.4 | 540.8 | 2.45 |
| | 43.2 | 9.0 | 1736.3 | 426.7 | 4.07 | 1647.7 | 453.6 | 3.64 | 1557.4 | 482.9 | 3.22 | 1465.3 | 514.7 | 2.85 | 1371.9 | 548.9 | 2.50 |
| | 43.2 | 10.0 | 1794.1 | 434.6 | 4.13 | 1702.9 | 461.8 | 3.69 | 1610.0 | 491.0 | 3.28 | 1515.4 | 523.1 | 2.90 | 1419.3 | 557.3 | 2.55 |
| 440B | 43.2 | 5.0 | 1585.7 | 419.1 | 3.79 | 1501.8 | 447.6 | 3.36 | 1416.4 | 478.7 | 2.96 | 1329.5 | 513.1 | 2.59 | 1241.5 | 550.4 | 2.26 |
| | 43.2 | 6.0 | 1641.9 | 426.8 | 3.85 | 1555.4 | 455.4 | 3.42 | 1467.4 | 486.6 | 3.02 | 1377.9 | 521.0 | 2.65 | 1287.3 | 558.3 | 2.31 |
| | 43.2 | 7.0 | 1699.1 | 434.8 | 3.91 | 1610.1 | 463.4 | 3.48 | 1519.5 | 494.7 | 3.07 | 1427.3 | 529.2 | 2.70 | 1333.9 | 566.5 | 2.36 |
| | 43.2 | 8.0 | 1757.5 | 442.9 | 3.97 | 1665.8 | 471.6 | 3.54 | 1572.5 | 503.0 | 3.13 | 1477.6 | 537.5 | 2.75 | 1381.4 | 574.9 | 2.41 |
| | 43.2 | 9.0 | 1816.8 | 451.3 | 4.03 | 1722.4 | 480.0 | 3.59 | 1626.4 | 511.6 | 3.18 | 1528.7 | 546.1 | 2.80 | 1429.7 | 583.5 | 2.45 |
| | 43.2 | 10.0 | 1877.2 | 459.8 | 4.09 | 1780.0 | 488.7 | 3.65 | 1681.2 | 520.2 | 3.23 | 1580.6 | 554.9 | 2.85 | 1478.7 | 592.2 | 2.50 |
| 450B | 43.2 | 5.0 | 1637.0 | 438.8 | 3.74 | 1550.0 | 469.4 | 3.31 | 1461.5 | 503.1 | 2.90 | 1371.4 | 540.4 | 2.54 | 1280.2 | 581.3 | 2.21 |
| | 43.2 | 6.0 | 1694.6 | 446.9 | 3.80 | 1605.0 | 477.5 | 3.36 | 1513.8 | 511.2 | 2.96 | 1421.0 | 548.6 | 2.59 | 1327.0 | 589.4 | 2.26 |
| | 43.2 | 7.0 | 1753.2 | 455.3 | 3.86 | 1660.9 | 485.9 | 3.42 | 1567.0 | 519.6 | 3.02 | 1471.5 | 557.1 | 2.64 | 1374.7 | 597.9 | 2.30 |
| | 43.2 | 8.0 | 1812.9 | 463.9 | 3.91 | 1717.9 | 494.5 | 3.48 | 1621.2 | 528.3 | 3.07 | 1522.9 | 565.7 | 2.69 | 1423.2 | 606.5 | 2.35 |
| | 43.2 | 9.0 | 1873.6 | 472.7 | 3.97 | 1775.8 | 503.4 | 3.53 | 1676.3 | 537.3 | 3.12 | 1575.0 | 574.6 | 2.74 | 1472.5 | 615.3 | 2.40 |
| | 43.2 | 10.0 | 1935.3 | 481.6 | 4.02 | 1834.7 | 512.4 | 3.58 | 1732.3 | 546.3 | 3.17 | 1628.1 | 583.7 | 2.79 | 1522.5 | 624.4 | 2.44 |
| 475B | 43.2 | 5.0 | 1688.5 | 458.7 | 3.69 | 1598.4 | 491.2 | 3.26 | 1506.7 | 527.4 | 2.86 | 1413.5 | 567.7 | 2.49 | 1319.0 | 612.3 | 2.16 |
| | 43.2 | 6.0 | 1747.4 | 467.1 | 3.75 | 1654.7 | 499.7 | 3.31 | 1560.2 | 535.9 | 2.91 | 1464.2 | 576.2 | 2.54 | 1366.9 | 620.5 | 2.21 |
| | 43.2 | 7.0 | 1807.4 | 475.9 | 3.80 | 1711.9 | 508.6 | 3.37 | 1614.7 | 544.6 | 2.96 | 1515.8 | 585.0 | 2.59 | 1415.6 | 629.2 | 2.25 |
| | 43.2 | 8.0 | 1868.5 | 484.9 | 3.86 | 1770.2 | 517.5 | 3.42 | 1670.1 | 553.6 | 3.02 | 1568.3 | 593.9 | 2.64 | 1465.1 | 638.2 | 2.30 |
| | 43.2 | 9.0 | 1930.6 | 494.1 | 3.91 | 1829.4 | 526.7 | 3.48 | 1726.3 | 563.0 | 3.07 | 1621.5 | 603.1 | 2.69 | 1515.4 | 647.3 | 2.35 |
| | 43.2 | 10.0 | 1993.6 | 503.5 | 3.97 | 1889.5 | 536.1 | 3.53 | 1783.5 | 572.5 | 3.12 | 1675.6 | 612.8 | 2.74 | 1566.4 | 656.7 | 2.39 |

**NOTES:**
1. Rated in accordance with ARI Standard 550/590-1998.
2. Ratings based on HFC 134a, evaporator fouling factor of 0.0176, 5.6°C degree delta-T, and sea level altitude.
3. Interpolation is allowed, extrapolation is not permitted. Consult McQuay for performance outside the cataloged ratings.
4. KW and COP are for the entire unit, including compressors, fan motors and control power.

# Part Load Data

***Table 8, AGS 230B – AGS 475B***

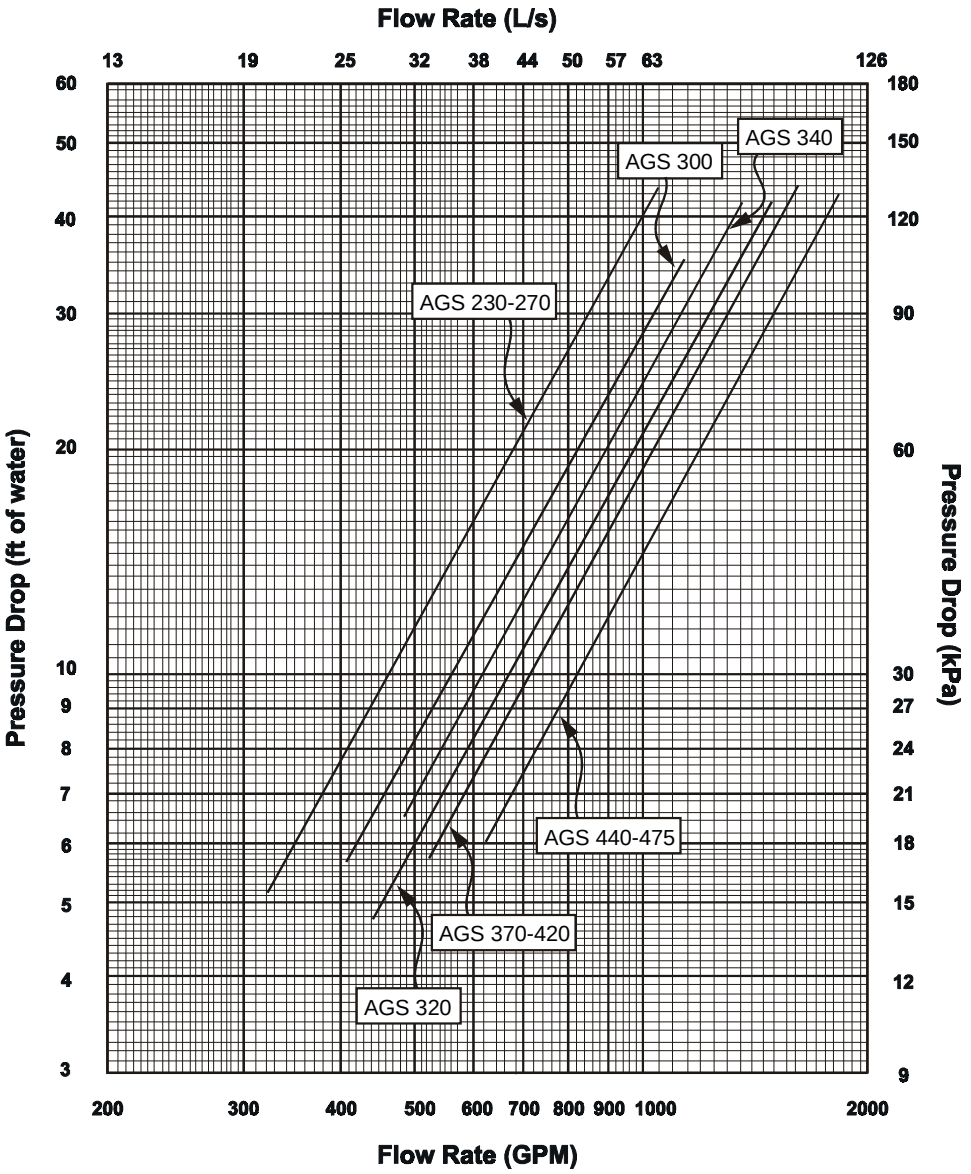
| Unit Size | % Load | Capacity Tons | Power Unit kW | EER | IPLV |
|---|---|---|---|---|---|
| 230B | 100.00 | 220.6 | 261.1 | 10.1 | 13.0 |
| | 75.00 | 165.4 | 171.1 | 11.6 | |
| | 50.00 | 110.3 | 90.7 | 14.6 | |
| | 25.00 | 55.1 | 54.2 | 12.2 | |
| 250B | 100.00 | 243.8 | 284.0 | 10.3 | 13.1 |
| | 75.00 | 182.9 | 179.6 | 12.2 | |
| | 50.00 | 121.9 | 102.7 | 14.2 | |
| | 25.00 | 61.0 | 62.0 | 11.8 | |
| 270B | 100.00 | 267.5 | 307.0 | 10.5 | 13.7 |
| | 75.00 | 200.6 | 183.2 | 13.1 | |
| | 50.00 | 133.7 | 110.2 | 14.6 | |
| | 25.00 | 66.9 | 62.6 | 12.8 | |
| 300B | 100.00 | 283.1 | 332.9 | 10.2 | 13.7 |
| | 75.00 | 212.4 | 199.4 | 12.8 | |
| | 50.00 | 141.6 | 114.8 | 14.8 | |
| | 25.00 | 70.8 | 65.6 | 12.9 | |
| 320B | 100.00 | 300.9 | 360.1 | 10.0 | 13.1 |
| | 75.00 | 225.7 | 217.6 | 12.4 | |
| | 50.00 | 150.4 | 127.9 | 14.1 | |
| | 25.00 | 75.2 | 74.2 | 12.2 | |
| 340B | 100.00 | 334.1 | 393.7 | 10.2 | 13.0 |
| | 75.00 | 250.6 | 238.2 | 12.6 | |
| | 50.00 | 167.1 | 150.8 | 13.3 | |
| | 25.00 | 83.5 | 76.7 | 13.1 | |

| Unit Size | % Load | Capacity Tons | Power Unit kW | EER | IPLV |
|---|---|---|---|---|---|
| 370B | 100.00 | 360.0 | 418.0 | 10.3 | 13.0 |
| | 75.00 | 270.0 | 257.1 | 12.6 | |
| | 50.00 | 180.0 | 161.0 | 13.4 | |
| | 25.00 | 90.0 | 81.8 | 13.2 | |
| 400B | 100.00 | 384.3 | 441.2 | 10.5 | 13.4 |
| | 75.00 | 288.3 | 274.6 | 12.6 | |
| | 50.00 | 192.2 | 162.4 | 14.2 | |
| | 25.00 | 96.1 | 87.4 | 13.2 | |
| 420B | 100.00 | 408.8 | 464.5 | 10.6 | 14.0 |
| | 75.00 | 306.6 | 294.7 | 12.5 | |
| | 50.00 | 204.4 | 164.0 | 15.0 | |
| | 25.00 | 102.2 | 77.4 | 15.9 | |
| 440B | 100.00 | 427.1 | 491.9 | 10.4 | 13.9 |
| | 75.00 | 320.3 | 309.8 | 12.4 | |
| | 50.00 | 213.5 | 172.0 | 14.9 | |
| | 25.00 | 106.8 | 80.3 | 16.0 | |
| 450B | 100.00 | 440.5 | 516.7 | 10.2 | 13.6 |
| | 75.00 | 330.4 | 324.9 | 12.2 | |
| | 50.00 | 220.2 | 182.6 | 14.5 | |
| | 25.00 | 110.1 | 83.1 | 15.9 | |
| 475B | 100.00 | 453.9 | 541.6 | 10.1 | 13.3 |
| | 75.00 | 340.4 | 339.7 | 12.0 | |
| | 50.00 | 226.9 | 193.3 | 14.1 | |
| | 25.00 | 113.5 | 91.9 | 14.8 | |

1. Rated in accordance with the ARI Water-Chilling Packages Using the Vapor Compression Cycle Certification Program, which is based on ARI Standard 550/590-1998.

# Pressure Drop

***Figure 2, Evaporator Pressure Drop, AGS 230B - AGS 475B***




***Minimum/Nominal/Maximum Flow Rates***

| AGS Unit Size | Minimum Flow | | Nominal Flow | | Maximum | |
|---|---|---|---|---|---|---|
| | Flow | ΔP | Flow | ΔP | Flow | ΔP |
| | gpm | ft. | gpm | ft. | gpm | ft |
| **230B** | 330 | 5.3 | 529 | 12.8 | 882 | 32.0 |
| **250B** | 365 | 6.5 | 585 | 15.3 | 975 | 37.5 |
| **270B** | 401 | 7.8 | 642 | 18.2 | 1070 | 44.0 |
| **300B** | 424 | 6.1 | 679 | 14.2 | 1132 | 35.2 |
| **320B** | 451 | 4.9 | 722 | 11.5 | 1203 | 39.0 |
| **340B** | 501 | 7.0 | 801 | 16.0 | 1336 | 42.0 |
| **370B** | 540 | 6.1 | 864 | 14.4 | 1440 | 36.0 |
| **400B** | 576 | 6.8 | 922 | 16.0 | 1537 | 40.0 |
| **420B** | 613 | 7.5 | 981 | 18.2 | 1635 | 44.0 |
| **440B** | 640 | 6.4 | 1025 | 15.2 | 1708 | 38.0 |
| **450B** | 660 | 6.7 | 1057 | 16.4 | 1762 | 41.0 |
| **475B** | 680 | 7.1 | 1089 | 17.0 | 1815 | 43.0 |

# Sound Data

Sound levels can be as important as unit cost and efficiency, and must be addressed before the start of any project design. Efforts by McQuay design engineers to design chillers that are sensitive to the sound requirements of the market, combined with McQuay's inherently quiet rotary screw compressors, have paid off.

## Standards

ARI has established standards to provide uniform methods for the determination of the sound levels of equipment. For large air-cooled chillers it is ARI Standard 370, *Sound Ratings of Large Outdoor Refrigeration and Air-Conditioning Equipment.*

## Background Information

Sound is a vibration in an elastic medium and is essentially a pressure and particle displacement phenomena. A vibrating body produces compression waves and as the waves are emitted from the vibrating body, molecules are ultimately compressed. These values are transmitted through gases, liquids or solids-anything that is elastic or viscous.

The sound data provided in this section is presented with both sound pressure and sound power levels. Sound power is the total sound energy radiated by a source per unit of time integrated over the surface through which the sound is radiated. Sound power is a calculated quantity and cannot be measured directly like sound pressure. Sound power is not dependent on the surrounding environment or distance from the source.

Sound pressure varies with the distance from the source and is dependent on its surroundings. For example, a brick wall located 10 feet from a unit (two reflecting surfaces, the roof and the wall) will affect the sound pressure measurements differently than a unit mounted on a roof with only one reflecting surface (the roof). Sound pressure is measured in decibels (dB), which is a dimensionless ratio (on a logarithmic scale) between measured sound pressure and a reference sound pressure level.

## Sound Pressure Levels - Full Load

All sound pressure tables give the overall "A" weighted sound pressure levels which are considered typical of what can be measured in a hemispherical field with a hand held sound meter in the absence of any nearby reflective surfaces other than the ground itself. The sound pressure in Table 9 measured at 30 feet from the side of the unit, at 100% unit load, no reflecting walls (Q=2), and ARI conditions; 95°F (35°C) ambient air temperature and 54/44°F (12/7°C) chilled water temperatures.

## Sound Power Levels

Acoustical consultants can require sound power octave band data to perform a detailed acoustical analysis. Sound measurements are taken over a prescribed area around the unit and the data is mathematically calculated to give the sound power in dB.

### *Table 9, Sound Pressure Octave Band Data, 60 Hz*

| Unit Model | Octave Band & Center Frequency, Hz. | | | | | | | | Overall A-Weighted |
|---|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | |
| 230B | 70 | 73 | 71 | 69 | 69 | 66 | 58 | 51 | 73 |
| 250B | 71 | 74 | 71 | 70 | 70 | 67 | 59 | 52 | 74 |
| 270B | 70 | 72 | 69 | 69 | 70 | 66 | 57 | 50 | 74 |
| 300B | 70 | 72 | 69 | 69 | 70 | 66 | 57 | 50 | 74 |
| 320B | 70 | 72 | 69 | 69 | 70 | 66 | 57 | 50 | 74 |
| 340B | 72 | 75 | 72 | 71 | 72 | 68 | 59 | 53 | 76 |
| 370B | 73 | 74 | 73 | 70 | 70 | 67 | 60 | 54 | 75 |
| 400B | 74 | 75 | 74 | 71 | 71 | 69 | 62 | 56 | 76 |
| 420B | 74 | 75 | 74 | 71 | 71 | 69 | 62 | 56 | 76 |
| 440B | 74 | 75 | 74 | 71 | 71 | 69 | 62 | 56 | 76 |
| 450B | 74 | 75 | 74 | 71 | 71 | 69 | 62 | 56 | 76 |
| 475B | 76 | 76 | 75 | 72 | 72 | 70 | 63 | 57 | 77 |

Note: Data at:
r=30 ft., .sound pressure at 30 feet (9.1 meters) from unit
Q=2, unit on a flat roof or ground with no adjacent wall(s).

### *Table 10, Sound Power Octave Band Data, 60 Hz*

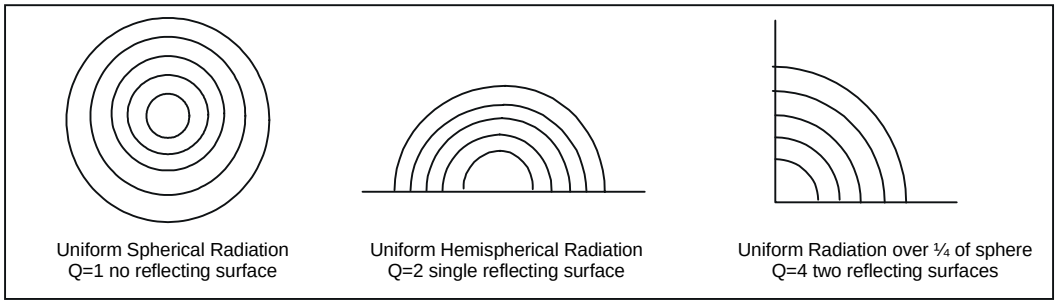
| Unit Model | Octave Band & Center Frequency, Hz. | | | | | | | | Overall A-Weighted |
|---|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | |
| 230B | 97 | 100 | 98 | 96 | 96 | 93 | 85 | 78 | 100 |
| 250B | 98 | 101 | 98 | 97 | 97 | 94 | 86 | 79 | 101 |
| 270B | 97 | 99 | 96 | 96 | 97 | 93 | 84 | 77 | 101 |
| 300B | 97 | 99 | 96 | 96 | 97 | 93 | 84 | 77 | 101 |
| 320B | 97 | 99 | 96 | 96 | 97 | 93 | 84 | 77 | 101 |
| 340B | 99 | 102 | 99 | 98 | 99 | 95 | 86 | 80 | 103 |
| 370B | 100 | 101 | 100 | 97 | 97 | 94 | 87 | 81 | 102 |
| 400B | 100 | 102 | 100 | 98 | 98 | 96 | 89 | 83 | 103 |
| 420B | 100 | 102 | 101 | 98 | 98 | 96 | 89 | 83 | 103 |
| 440B | 100 | 102 | 101 | 98 | 98 | 96 | 89 | 83 | 103 |
| 450B | 100 | 102 | 101 | 98 | 98 | 96 | 89 | 83 | 103 |
| 475B | 103 | 103 | 102 | 99 | 99 | 97 | 90 | 84 | 104 |

Note: Sound power octave band data, dB per ARI Standard 370.

## Sound Reduction Due to Distance from a Unit

The distance between a source of sound and the location of the sound measurement plays an important role in minimizing sound problems. The equation below can be used to calculate the *sound pressure level* at any distance if the *sound power* is known. Results for typical distances are tabulated in Table 11. Another way of determining the effect of distance is to work from sound pressure only. "Q", the directionality factor, is a dimensionless number that compensates for the type of sound reflection from the source. For example, a unit sitting on a flat roof or ground with no other reflective surfaces or attenuation due to grass, snow, etc., between source and receiver: Q=2.

### *Figure 3, "Q" Definition, Plan View, Unit Located in Center*



Sound pressure can be calculated at any distance from the unit if the sound power is known.

$$Lp=Lw-(20 \log r) + (10 \log Q) - .5$$

Lp = sound pressure  r = distance from unit in feet

Lw = sound power  Q = directionality factor

With Q=1, Unit suspended in space (theoretical condition), the equation simplifies to:

$$Lp = Lw – (20)(\log r) –0.5$$

With Q=2, for a unit sitting on a flat roof or ground with no adjacent vertical wall as a reflective surface, the equation simplifies to:

$$Lp = Lw – (20)(\log r) + 2.5$$

With Q=4 for a unit sitting on a flat roof or ground with one adjacent vertical wall as a reflective surface, the equation simplifies to:

$$Lp = Lw – (20)(\log r) + 5.5$$

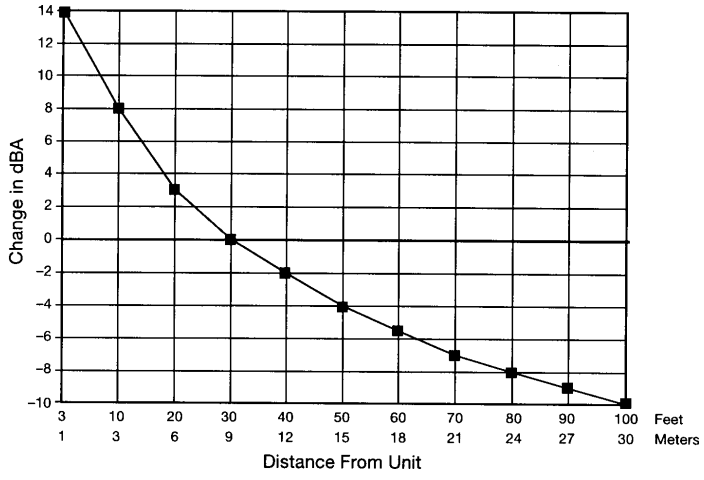
The equations are reduced to table form in Table 11 for various distances and the two most usual cases of "Q" type of location.

***Table 11, dB Conversion of Sound Power to Pressure for Distance***

| Distance from Sound Source ft. (m) | dB Reduction from Sound Power at the Source to Sound Pressure at Referenced Distance | |
|---|---|---|
| | Q=2 | Q=4 |
| 30 (9) | 27.1 | 24.0 |
| 50 (15) | 31.6 | 28.5 |
| 75 (23) | 35.1 | 32.0 |
| 100 (30) | 37.6 | 34.5 |
| 150 (46) | 41.1 | 38.0 |
| 200 (61) | 43.6 | 40.5 |
| 300 (91) | 47.6 | 44.0 |

Figure 4 gives the reduction in *sound pressure* due to distance.

***Figure 4, Sound Pressure Attenuation Due to Distance from Unit***



## Sound Isolation

The low sound level for the AGS screw chiller satisfies most customer requirements. However, there can be applications where even lower sound levels can be required. The most effective isolation method is to locate the unit away from sound sensitive areas. Avoid locations beneath windows or between structures where normal-operating sounds can be objectionable. Isolating water lines, electrical conduit and the unit itself can reduce structurally transmitted sound. Wall sleeves and rubber isolated piping hangers can be used to reduce transmission of water or pump noise into occupied spaces, and flexible electrical connections can be used to isolate sound through electrical conduit. Spring isolators are effective in reducing the low amplitude sound generated by screw compressors and can be used for unit isolation in sound sensitive areas.

## Sound Pressure Levels, Low Ambient Operation

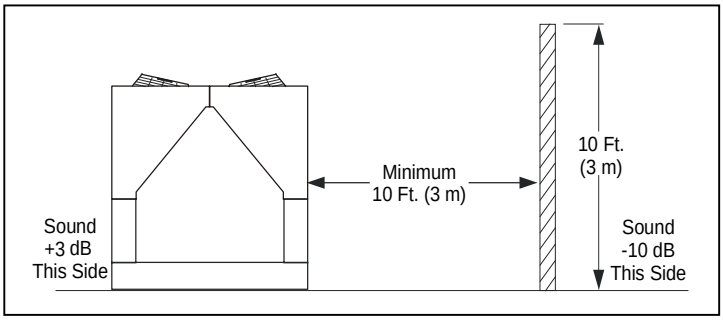
Unit operation at a lower ambient temperature than 95°F will also result in lower sound pressure levels. The sound pressure level will decrease approximately 1 dBA for ambient air temperatures between 85°F and 94°F, approximately 2 dBA for ambient air temperatures between 75°F and 84°F, and approximately 3 dBA for ambient air temperatures between 65°F and 74°F.

## Sound Pressure Levels, Multiple Units

Multiple air-cooled unit installations will have a higher sound level than a single unit. Two units will have approximately 3 dB higher sound level of one unit, 4 units will be approximately 6 dB louder, and 8 units approximately 9 dB louder than one unit.

## Sound Control

Walls adjacent to a unit (20 feet {6.1 meters} or less) will reflect sound outwards, increasing the sound pressure on the side away from the wall. This sound increase could be as high as 3 dB for one wall and as high as 6 dB for a corner location. Unit orientation and/or distance as noted above will decrease sound levels.




Sound levels can also be controlled by the installation of barrier walls. To be effective as sound blockers, walls must be solid with no open penetrations. Sound tends to leak out of openings. Block walls with filler material and slots on the side facing the unit are especially effective. The wall should be about 10 feet high (two feet higher than the unit) and located at least 10 feet away so as not to affect unit performance. A three-sided enclosure will be the most effective solution and will reduce sound levels by about 10 dB. Remember that the sound blocker wall will *increase* the sound level on the side of the unit opposite it by 3 to 6 dB (one or three sided wall).

**Note:** The effect of adjacent walls on air recirculation and restriction must always be considered when employing sound barrier walls.

# Electrical Data

### *Table 12, AGS 230B – AGS 475B, Electrical Data, Optional Single-Point*

| AGS UNIT SIZE | VOLTS | HZ | MINIMUM CIRCUIT AMPACITY (MCA) | POWER SUPPLY | | | | FIELD FUSE SIZE or HACR BREAKER SIZE | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | FIELD WIRE | | HUB (Conduit Connection) | | | |
| | | | | QTY | WIRE GAUGE | QTY | NOMINAL SIZE (In.) | RECOM-MENDED | MAXIMUM |
| **230** | 460 | 60 | 475 | 6 | 250 | 2 | 2.5 | 600 | 600 |
| | 575 | | 418 | 6 | 4/0 | 2 | 2.0 | 500 | 500 |
| **250** | 460 | 60 | 519 | 6 | 300 | 2 | 3.0 | 600 | 700 |
| | 575 | | 447 | 6 | 4/0 | 2 | 2.0 | 500 | 600 |
| **270** | 460 | 60 | 555 | 6 | 300 | 2 | 3.0 | 700 | 700 |
| | 575 | | 471 | 6 | 250 | 2 | 2.5 | 600 | 600 |
| **300** | 460 | 60 | 586 | 6 | 350 | 2 | 3.0 | 700 | 800 |
| | 575 | | 496 | 6 | 250 | 2 | 2.5 | 600 | 700 |
| **320** | 460 | 60 | 611 | 6 | 350 | 2 | 3.0 | 700 | 800 |
| | 575 | | 516 | 6 | 300 | 2 | 3.0 | 600 | 700 |
| **340** | 460 | 60 | 688 | 12 | 4/0 | 2 | 3.0 | 800 | 800 |
| | 575 | | 605 | 12 | 3/0 | 2 | 3.0 | 700 | 700 |
| **370** | 460 | 60 | 732 | 12 | 250 | 2 | 4.0 | 800 | 800 |
| | 575 | | 634 | 12 | 3/0 | 2 | 3.0 | 700 | 800 |
| **400** | 460 | 60 | 768 | 12 | 250 | 2 | 4.0 | 800 | 800 |
| | 575 | | 658 | 12 | 4/0 | 2 | 3.0 | 800 | 800 |
| **420** | 460 | 60 | 804 | 12 | 250 | 2 | 4.0 | 1000 | 1000 |
| | 575 | | 683 | 12 | 4/0 | 2 | 3.0 | 800 | 800 |
| **440** | 460 | 60 | 835 | 12 | 300 | 2 | 4.0 | 1000 | 1000 |
| | 575 | | 708 | 12 | 4/0 | 2 | 3.0 | 800 | 800 |
| **450** | 460 | 60 | 860 | 12 | 300 | 2 | 4.0 | 1000 | 1000 |
| | 575 | | 728 | 12 | 4/0 | 2 | 3.0 | 800 | 800 |
| **475** | 460 | 60 | 885 | 12 | 300 | 2 | 4.0 | 1000 | 1000 |
| | 575 | | 748 | 12 | 250 | 2 | 4.0 | 800 | 800 |

1. Table based on 75°C field wire.
2. A “HACR” breaker is a circuit breaker designed for use on equipment with multiple motors. It stands for Heating, Air Conditioning, and Refrigeration.
3. Complete notes are on page 29.

### *Table 13, AGS 230B – AGS 320B, Electrical Data, Standard Multiple-Point, Two-Circuit Units*

| AGS UNIT SIZE | VOLTS | HZ | ELECTRICAL CIRCUIT 1 (COMP 1) | | | | | | | ELECTRICAL CIRCUIT 2 (COMP 2) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | MINIMUM CIRCUIT AMPS (MCA) | POWER SUPPLY | | | | FIELD FUSING | | MINIMUM CIRCUIT AMPS (MCA) | POWER SUPPLY | | | | FIELD FUSING | |
| | | | | FIELD WIRE | | HUB (Conduit Connection) | | REC FUSE SIZE | MAX FUSE SIZE | | FIELD WIRE | | HUB (Conduit Connection) | | REC FUSE SIZE | MAX FUSE SIZE |
| | | | | QTY | WIRE GAUGE | QTY | HUB SIZE | | | | QTY | WIRE GAUGE | QTY | HUB SIZE | | |
| **230** | 460 | 60 | 262 | 6 | 3/0 (3) | 1 | 3.0 | 350 | 450 | 262 | 6 | 3/0 (3) | 1 | 3.0 | 350 | 450 |
| | 575 | | 230 | 3 | 250 | 1 | 2.5 | 300 | 400 | 230 | 3 | 250 | 1 | 2.5 | 300 | 400 |
| **250** | 460 | 60 | 262 | 6 | 3/0 (3) | 1 | 3.0 | 350 | 450 | 306 | 6 | 3/0 | 1 | 3.0 | 400 | 500 |
| | 575 | | 230 | 3 | 250 | 1 | 2.5 | 300 | 400 | 260 | 6 | 3/0 (3) | 1 | 3.0 | 350 | 400 |
| **270** | 460 | 60 | 306 | 6 | 3/0 | 1 | 3.0 | 400 | 500 | 306 | 6 | 3/0 | 1 | 3.0 | 400 | 500 |
| | 575 | | 260 | 6 | 3/0 (3) | 1 | 3.0 | 350 | 400 | 260 | 6 | 3/0 (3) | 1 | 3.0 | 350 | 400 |
| **300** | 460 | 60 | 306 | 6 | 3/0 | 1 | 3.0 | 400 | 500 | 337 | 6 | 4/0 | 1 | 3.0 | 450 | 500 |
| | 575 | | 260 | 6 | 3/0 (3) | 1 | 3.0 | 350 | 400 | 285 | 6 | 3/0 | 1 | 3.0 | 350 | 450 |
| **320** | 460 | 60 | 337 | 6 | 4/0 | 1 | 3.0 | 450 | 500 | 337 | 6 | 4/0 | 1 | 3.0 | 450 | 500 |
| | 575 | | 285 | 6 | 3/0 | 1 | 3.0 | 350 | 450 | 285 | 6 | 3/0 | 1 | 3.0 | 350 | 450 |

NOTE:
1. Table based on 75°C field wire.
2. Complete notes are on page 29.
3. 3/0 wire is required for the disconnect switch option,2/0 may be used for power block connection.

### *Table 14, AGS 340B–AGS 475B, Electrical Data, Standard Multiple-Point, (Circuits # 1 & 2)*

| AGS UNIT SIZE | VOLTS | HZ | ELECTRICAL CIRCUIT 1 (COMP 1) | | | | | | | ELECTRICAL CIRCUIT 2 (COMP 2) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | MINIMUM CIRCUIT AMPS (MCA) | POWER SUPPLY | | | | FIELD FUSING | | MIN. CIRCUIT AMPS (MCA) | POWER SUPPLY | | | | FIELD FUSING | |
| | | | | FIELD WIRE | | HUB (Conduit Connection) | | REC FUSE SIZE | MAX FUSE SIZE | | FIELD WIRE | | HUB (Conduit Connection) | | REC FUSE SIZE | MAX FUSE SIZE |
| | | | | QTY | WIRE GAUGE | QTY | HUB SIZE | | | | QTY | WIRE GAUGE | QTY | HUB SIZE | | |
| **340** | 460 | 60 | 262 | 6 | 3/0 (3) | 1 | 3.0 | 350 | 450 | 262 | 6 | 3/0 (3) | 1 | 3.0 | 350 | 450 |
| | 575 | | 230 | 3 | 250 | 1 | 2.5 | 300 | 400 | 230 | 3 | 250 | 1 | 2.5 | 300 | 400 |
| **370** | 460 | 60 | 262 | 6 | 3/0 (3) | 1 | 3.0 | 350 | 450 | 262 | 6 | 3/0 (3) | 1 | 3.0 | 350 | 450 |
| | 575 | | 230 | 3 | 250 | 1 | 2.5 | 300 | 400 | 230 | 3 | 250 | 1 | 2.5 | 300 | 400 |
| **400** | 460 | 60 | 262 | 6 | 3/0 (3) | 1 | 3.0 | 350 | 450 | 306 | 6 | 3/0 | 1 | 3.0 | 400 | 500 |
| | 575 | | 230 | 3 | 250 | 1 | 2.5 | 300 | 400 | 260 | 6 | 3/0 (3) | 1 | 3.0 | 350 | 400 |
| **420** | 460 | 60 | 306 | 6 | 3/0 | 1 | 3.0 | 400 | 500 | 306 | 6 | 3/0 | 1 | 3.0 | 400 | 500 |
| | 575 | | 260 | 6 | 3/0 (3) | 1 | 3.0 | 350 | 400 | 260 | 6 | 3/0 (3) | 1 | 3.0 | 350 | 400 |
| **440** | 460 | 60 | 306 | 6 | 3/0 | 1 | 3.0 | 400 | 500 | 306 | 6 | 3/0 | 1 | 3.0 | 400 | 500 |
| | 575 | | 260 | 6 | 3/0 (3) | 1 | 3.0 | 350 | 400 | 260 | 6 | 3/0 (3) | 1 | 3.0 | 350 | 400 |
| **450** | 460 | 60 | 306 | 6 | 3/0 | 1 | 3.0 | 400 | 500 | 337 | 6 | 4/0 | 1 | 3.0 | 450 | 500 |
| | 575 | | 260 | 6 | 3/0 (3) | 1 | 3.0 | 350 | 400 | 285 | 6 | 3/0 | 1 | 3.0 | 350 | 450 |
| **475** | 460 | 60 | 337 | 6 | 4/0 | 1 | 3.0 | 450 | 500 | 337 | 6 | 4/0 | 1 | 3.0 | 450 | 500 |
| | 575 | | 285 | 6 | 3/0 | 1 | 3.0 | 350 | 450 | 285 | 6 | 3/0 | 1 | 3.0 | 350 | 450 |

NOTE:
1. Table based on 75°C field wire.
2. Complete notes are on page 29.
3. 3/0 wire is required for the disconnect switch option,2/0 may be used for power block connection.

### *Table 14, Electrical Data, AGS 340B – 475B, (Circuit #3)*

| AGS UNIT SIZE | VOLTS | HZ | ELECTRICAL CIRCUIT 3 (COMP 3) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | MINIMUM CIRCUIT AMPS (MCA) | POWER SUPPLY | | | | FIELD FUSING | |
| | | | | FIELD WIRE | | HUB (Conduit Connection) | | REC FUSE SIZE | MAX FUSE SIZE |
| | | | | QTY | WIRE GAUGE | QTY | HUB SIZE | | |
| **340** | 460 | 60 | 262 | 6 | 3/0 (3) | 1 | 3.0 | 350 | 450 |
| | 575 | | 230 | 3 | 250 | 1 | 2.5 | 300 | 400 |
| **370** | 460 | 60 | 306 | 6 | 3/0 | 1 | 3.0 | 400 | 500 |
| | 575 | | 260 | 6 | 3/0 (3) | 1 | 3.0 | 350 | 400 |
| **400** | 460 | 60 | 306 | 6 | 3/0 | 1 | 3.0 | 400 | 500 |
| | 575 | | 260 | 6 | 3/0 (3) | 1 | 3.0 | 350 | 400 |
| **420** | 460 | 60 | 306 | 6 | 3/0 | 1 | 3.0 | 400 | 500 |
| | 575 | | 260 | 6 | 3/0 (3) | 1 | 3.0 | 350 | 400 |
| **440** | 460 | 60 | 337 | 6 | 4/0 | 1 | 3.0 | 450 | 500 |
| | 575 | | 285 | 6 | 3/0 | 1 | 3.0 | 350 | 450 |
| **450** | 460 | 60 | 337 | 6 | 4/0 | 1 | 3.0 | 450 | 500 |
| | 575 | | 285 | 6 | 3/0 | 1 | 3.0 | 350 | 450 |
| **475** | 460 | 60 | 337 | 6 | 4/0 | 1 | 3.0 | 450 | 500 |
| | 575 | | 285 | 6 | 3/0 | 1 | 3.0 | 350 | 450 |

NOTES:
1. Table based on 75°C field wire.
2. Complete notes are on page 29.
3. 3/0 wire is required for the disconnect switch option,2/0 may be used for power block connection.

### *Table 15, AGS230B–AGS 475B, Compressor and Condenser Fan Motor Amp Draw*

| AGS UNIT SIZE | VOLTS | HZ | RATED LOAD AMPS | | | NO OF FAN MOTORS | FAN MOTORS FLA (EACH) | L R A FAN MOTORS (EACH) | SOLID-STATE STARTING INRUSH AMPS PER COMPRESSOR | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | CIRCUIT #1 | CIRCUIT #2 | CIRCUIT #3 | | | | CIRCUIT #1 | CIRCUIT #2 | CIRCUIT #3 |
| **230** | 460 | 60 | 195 | 195 | - | 12 | 3.0 | 20 | 585 | 585 | - |
| | 575 | | 171 | 171 | - | | 2.7 | 18 | 513 | 513 | - |
| **250** | 460 | 60 | 195 | 225 | - | 14 | 3.0 | 20 | 585 | 675 | - |
| | 575 | | 171 | 190 | | | 2.7 | 18 | 513 | 570 | - |
| **270** | 460 | 60 | 225 | 225 | - | 16 | 3.0 | 20 | 675 | 675 | - |
| | 575 | | 190 | 190 | - | | 2.7 | 18 | 570 | 570 | - |
| **300** | 460 | 60 | 225 | 250 | - | 16 | 3.0 | 20 | 675 | 750 | - |
| | 575 | | 190 | 210 | - | | 2.7 | 18 | 570 | 630 | - |
| **320** | 460 | 60 | 250 | 250 | - | 16 | 3.0 | 20 | 750 | 750 | - |
| | 575 | | 210 | 210 | - | | 2.7 | 18 | 630 | 630 | - |
| **340** | 460 | 60 | 195 | 195 | 195 | 18 | 3.0 | 20 | 585 | 585 | 585 |
| | 575 | | 171 | 171 | 171 | | 2.7 | 18 | 513 | 513 | 513 |
| **370** | 460 | 60 | 195 | 195 | 225 | 20 | 3.0 | 20 | 585 | 585 | 675 |
| | 575 | | 171 | 171 | 190 | | 2.7 | 18 | 513 | 513 | 570 |
| **400** | 460 | 60 | 195 | 225 | 225 | 22 | 3.0 | 20 | 586 | 675 | 675 |
| | 575 | | 171 | 190 | 190 | | 2.7 | 18 | 513 | 570 | 570 |
| **420** | 460 | 60 | 225 | 225 | 225 | 24 | 3.0 | 20 | 675 | 675 | 675 |
| | 575 | | 190 | 190 | 190 | | 2.7 | 18 | 570 | 570 | 570 |
| **440** | 460 | 60 | 225 | 225 | 250 | 24 | 3.0 | 20 | 675 | 675 | 750 |
| | 575 | | 190 | 190 | 210 | | 2.7 | 18 | 570 | 570 | 630 |
| **450** | 460 | 60 | 225 | 250 | 250 | 24 | 3.0 | 20 | 675 | 750 | 750 |
| | 575 | | 190 | 210 | 210 | | 2.7 | 18 | 570 | 630 | 630 |
| **475** | 460 | 60 | 250 | 250 | 250 | 24 | 3.0 | 20 | 750 | 750 | 750 |
| | 575 | | 210 | 210 | 210 | | 2.7 | 18 | 630 | 630 | 630 |

### *Table 16, AGS 230B – AGS 475B, Customer Wiring Information With Single-Point Power*

| AGS UNIT SIZE | VOLTS | HZ | WIRING TO STANDARD UNIT POWER BLOCK | | WIRING TO OPTIONAL NONFUSED DISCONNECT SWITCH IN UNIT | |
|---|---|---|---|---|---|---|
| | | | TERMINAL SIZE AMPS | CONNECTOR LUG RANGE PER PHASE (COPPER WIRE ONLY) | SIZE | CONNECTOR LUG RANGE PER PHASE (COPPER WIRE ONLY) |
| **230** | 460 | 60 | 1000 | #6-350 | 800 | #6-350 |
| | 575 | | 1000 | #6-350 | 800 | #6-350 |
| **250** | 460 | 60 | 1000 | #6-350 | 800 | #6-350 |
| | 575 | | 1000 | #6-350 | 800 | #6-350 |
| **270** | 460 | 60 | 1000 | #6-350 | 800 | #6-350 |
| | 575 | | 1000 | #6-350 | 800 | #6-350 |
| **300** | 460 | 60 | 1000 | #6-350 | 800 | #6-350 |
| | 575 | | 1000 | #6-350 | 800 | #6-350 |
| **320** | 460 | 60 | 1000 | #6-350 | 800 | #6-350 |
| | 575 | | 1000 | #6-350 | 800 | #6-350 |
| **340** | 460 | 60 | 1000 | #6-350 | 1000 | #6-350 |
| | 575 | | 1000 | #6-350 | 800 | #6-350 |
| **370** | 460 | 60 | 1000 | #6-350 | 1000 | #6-350 |
| | 575 | | 1000 | #6-350 | 800 | #6-350 |
| **400** | 460 | 60 | 1000 | #6-350 | 1000 | #6-350 |
| | 575 | | 1000 | #6-350 | 800 | #6-350 |
| **420** | 460 | 60 | 1000 | #6-350 | 1000 | #6-350 |
| | 575 | | 1000 | #6-350 | 800 | #6-350 |
| **440** | 460 | 60 | 1000 | #6-350 | 1000 | #6-350 |
| | 575 | | 1000 | #6-350 | 800 | #6-350 |
| **450** | 460 | 60 | 1000 | #6-350 | 1000 | #6-350 |
| | 575 | | 1000 | #6-350 | 800 | #6-350 |
| **475** | 460 | 60 | 1000 | #6-350 | 1000 | #6-350 |
| | 575 | | 1000 | #6-350 | 800 | #6-350 |

1. Terminal size amps are the maximum amps that the power block is rated for.
2. Complete notes are on page 29.

### *Table 17, AGS 230B–AGS 475B, Wiring Information with Multiple-Point*

| AGS UNIT SIZE | VOLTS | HZ | WIRING TO UNIT POWER BLOCK | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | TERMINAL SIZE (AMPS) | | | CONNECTOR WIRE RANGE PER PHASE (COPPER WIRE ONLY) | | |
| | | | CKT 1 | CKT 2 | CKT 3 | CKT 1 | CKT 2 | CKT 3 |
| **230** | 460<br>575 | 60 | 400 | 400 | -- | #6-350 | #6-350 | -- |
| **250** | 460<br>575 | 60 | 400 | 400 | -- | #6-350 | #6-350 | -- |
| **270** | 460<br>575 | 60 | 400 | 400 | -- | #6-350 | #6-350 | -- |
| **300** | 460<br>575 | 60 | 400 | 400 | -- | #6-350 | #6-350 | -- |
| **320** | 460<br>575 | 60 | 400 | 400 | -- | #6-350 | #6-350 | -- |
| **340** | 460<br>575 | 60 | 400 | 400 | 400 | #6-350 | #6-350 | #6-350 |
| **370** | 460<br>575 | 60 | 400 | 400 | 400 | #6-350 | #6-350 | #6-350 |
| **400** | 460<br>575 | 60 | 400 | 400 | 400 | #6-350 | #6-350 | #6-350 |
| **420** | 460<br>575 | 60 | 400 | 400 | 400 | #6-350 | #6-350 | #6-350 |
| **440** | 460<br>575 | 60 | 400 | 400 | 400 | #6-350 | #6-350 | #6-350 |
| **450** | 460<br>575 | 60 | 400 | 400 | 400 | #6-350 | #6-350 | #6-350 |
| **475** | 460<br>575 | 60 | 400 | 400 | 400 | #6-350 | #6-350 | #6-350 |

1. Terminal size amps are the maximum amps that the power block is rated for.
2. Complete notes are on page 29.

### *Table 18, AGS 230B–AGS 475B, Wiring Information with Multiple-Point*

| AGS UNIT SIZE | VOLTS | HZ | WIRING TO UNIT DISCONNECT SWITCH | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | TERMINAL SIZE (AMPS) | | | CONNECTOR WIRE RANGE PER PHASE (COPPER WIRE ONLY) | | |
| | | | CKT 1 | CKT 2 | CKT 3 | CKT 1 | CKT 2 | CKT 3 |
| **230** | 460<br>575 | 60 | 400 | 400 | - | 3/0 - 500 | 3/0 - 500 | - |
| **250** | 460<br>575 | 60 | 400 | 400 | - | 3/0 - 500 | 3/0 - 500 | - |
| **270** | 460<br>575 | 60 | 400 | 400 | - | 3/0 - 500 | 3/0 - 500 | - |
| **300** | 460<br>575 | 60 | 400 | 400 | - | 3/0 - 500 | 3/0 - 500 | - |
| **320** | 460<br>575 | 60 | 400 | 400 | - | 3/0 - 500 | 3/0 - 500 | - |
| **340** | 460<br>575 | 60 | 400 | 400 | 400 | 3/0 - 500 | 3/0 - 500 | 3/0 - 500 |
| **370** | 460<br>575 | 60 | 400 | 400 | 400 | 3/0 - 500 | 3/0 - 500 | 3/0 - 500 |
| **400** | 460<br>575 | 60 | 400 | 400 | 400 | 3/0 - 500 | 3/0 - 500 | 3/0 - 500 |
| **420** | 460<br>575 | 60 | 400 | 400 | 400 | 3/0 - 500 | 3/0 - 500 | 3/0 - 500 |
| **440** | 460<br>575 | 60 | 400 | 400 | 400 | 3/0 - 500 | 3/0 - 500 | 3/0 - 500 |
| **450** | 460<br>575 | 60 | 400 | 400 | 400 | 3/0 - 500 | 3/0 - 500 | 3/0 - 500 |
| **475** | 460<br>575 | 60 | 400 | 400 | 400 | 3/0 - 500 | 3/0 - 500 | 3/0 - 500 |

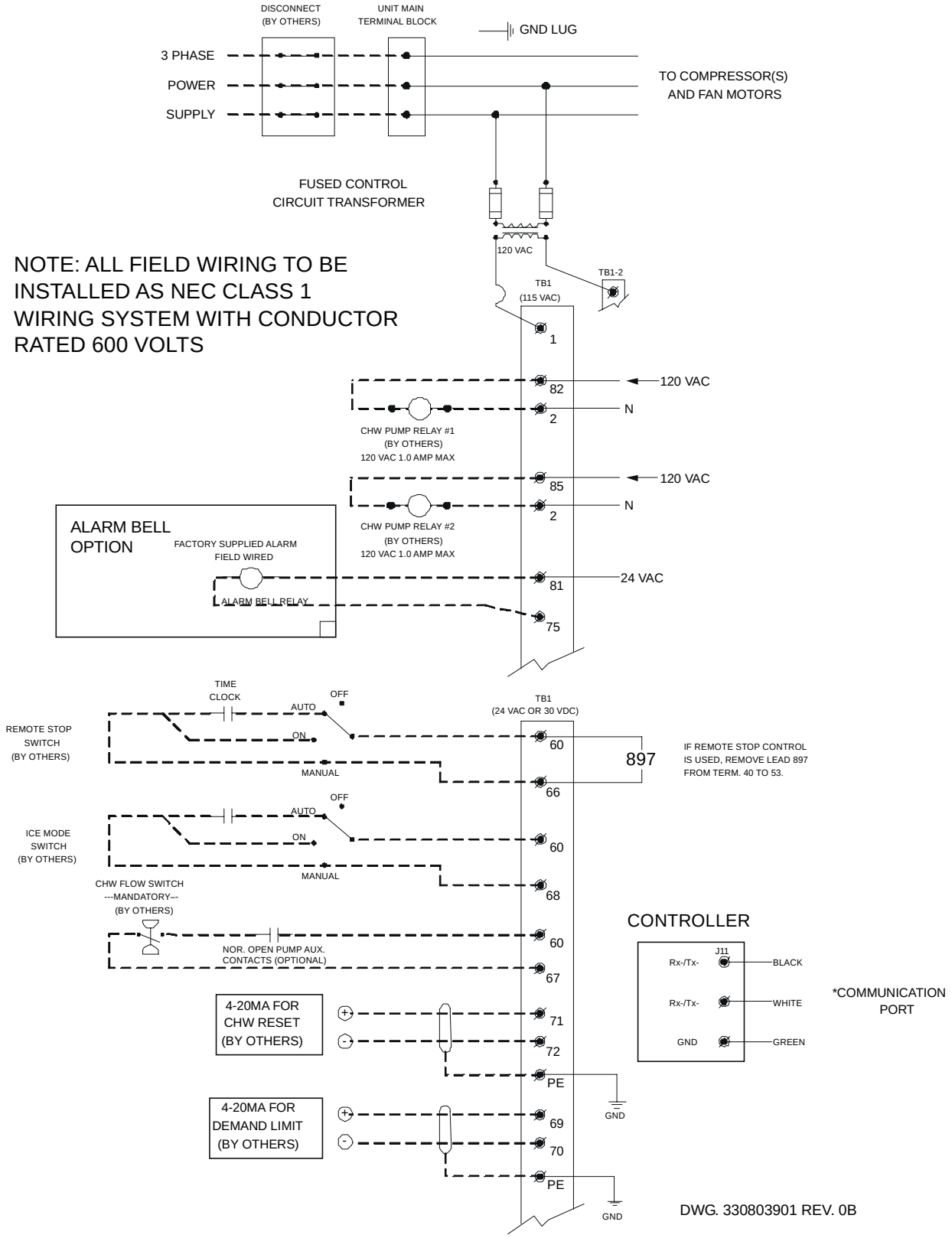
## Electrical Data Notes

1. Allowable voltage limits
   Unit nameplate 460V/60Hz/3Ph: 414V to 506V
   Unit nameplate 575V/60Hz/3Ph: 518V to 632V
2. Unit wire size ampacity (MCA) is equal to 125% of the largest compressor-motor RLA plus 100% of RLA of all other loads in the circuit.
3. Single point power supply requires a single disconnect to supply electrical power to the unit. This power must be fused.
4. All field wiring to unit power block or optional nonfused disconnect switch must be copper.
5. External disconnect switch(s) or HACR breakers must be field supplied.

   **Note**: A non-fused disconnect switch in the cabinet is available as an option for single-point or multi-point power connections.
6. All wiring must installed as NEC Class 1 wiring system with conductor rated 600 volts and be done in accordance with applicable local and national codes.
7. Recommended time delay fuse size or HACR circuit breakers are equal to 150% of the largest compressor motor RLA plus 100% of remaining compressor RLAs and the sum of condenser fan FLAs.
8. Maximum time delay fuse size or HACR circuit breakers are equal to 225% of the largest compressor-motor RLA plus 100% of remaining compressor RLAs and the sum of condenser fan FLAs.
9. If the evaporator heater is to be powered during winter shutdown and it is desired to disconnect the main power to the unit, then the unit-mounted 3 kva control transformer can be unwired and a field 115-volt, 30 amp power source wired to terminals TB1-1 and TB1-2. The MicroTech II control must be powered in order for the heater to work.

# Field Wiring Diagram

***Figure 5, Typical Field Wiring Diagram, Circuit #1 Control Box***



# Physical Data

### *Table 19, Physical Data, AGS 220B – AGS 270B*

| DATA | AGS MODEL NUMBER | | | | | |
|---|---|---|---|---|---|---|
| | 230B | | 250B | | 270B | |
| | Ckt 1 | Ckt 2 | Ckt 1 | Ckt 2 | Ckt 1 | Ckt 2 |
| **BASIC DATA** | | | | | | |
| Unit Cap. @ ARI Conditions, tons (kW) | 220.5 (774) | | 243.9 (856) | | 267.5 (939) | |
| Unit Operating Charge lbs (kg) | 298 (135) | 298 (135) | 298 (135) | 321 (145) | 321 (145) | 321 (145) |
| Cabinet Dimensions L x W x H, in. (mm) | 278 x 88 x 100 (7087 x 2235 x 2550) | | 317 x 88 x 100 (8052 x 2235 x 2550) | | 355 x 88 x 100 (9017 x 2235 x 2550) | |
| Unit Operating Weight, lbs. (kg) | 16285 (7394) | | 17301 (7855) | | 18319 (8317) | |
| Unit Shipping Weight, lbs (kg) | 15862 (7201) | | 16877 (7662) | | 17895 (8124) | |
| **COMPRESSORS, SCREW, SEMI-HERMETIC** | | | | | | |
| Nominal Capacity, tons (kW) | 100 (350) | 100 (350) | 100 (350) | 125 (437) | 125 (437) | 125 (437) |
| **CONDENSERS, HIGH EFFICIENCY FIN AND TUBE TYPE WITH INTEGRAL SUBCOOLER** | | | | | | |
| Coil Face Area, $ft^2$. ($m^2$) | 159 (14.8) | 159 (14.8) | 159 (14.8) | 213 (19.8) | 213 (19.8) | 213 (19.8) |
| Fins Per Inch x Rows Deep | 16 x 3 | 16 x 3 | 16 x 3 | 16 x 3 | 16 x 3 | 16 x 3 |
| **CONDENSER FANS, DIRECT DRIVE PROPELLER TYPE** | | | | | | |
| No. of Fans -- Fan Dia., in. (mm) | 12 – 30 (762) | | 14 – 30 (762) | | 16 – 30 (762) | |
| No. of Motors -- hp (kW) | 12 – 2 (1.5) | | 14 – 2 (1.5) | | 16 – 2 (1.5) | |
| Fan & Motor RPM, 60Hz | 1140 | | 1140 | | 1140 | |
| 60 Hz Fan Tip Speed, fpm | 8954 | | 8954 | | 8954 | |
| 60 Hz Total Unit Airflow, cfm (l/s) | 129,600 | | 151,200 | | 172,800 | |
| **EVAPORATOR, FLOODED SHELL AND TUBE** | | | | | | |
| Shell Dia.-Tube Length in.(mm) - in. (mm) | 24 (610) – 96 (2438) | | 24 (610) – 96 (2438) | | 24 (610) – 96 (2438) | |
| Evaporator R-134a Charge lbs (kg) | 182 (37) | 182 (37) | 182 (37) | 182 (37) | 182 (37) | 182 (37) |
| Water Volume, gallons (liters) | 48 (182) | | 48 (182) | | 48 (182) | |
| Max. Water Pressure, psi (kPa) | 150 (1034) | | 150 (1034) | | 150 (1034) | |
| Max. Refrigerant Press., psi (kPa) | 200 (1379) | | 200 (1379) | | 200 (1379) | |

### *Table 20, Physical Data, AGS 300B – AGS 320B*

| DATA | AGS MODEL NUMBER | | | |
|---|---|---|---|---|
| | 300B | | 320B | |
| | Ckt 1 | Ckt 2 | Ckt 1 | Ckt 2 |
| **BASIC DATA** | | | | |
| Unit Cap. @ ARI, tons (kW) | 283.1 (994) | | 300.9 (1056) | |
| Unit Operating Charge lbs (kg) | 335 (152) | 335 (152) | 360 (163) | 360 (163) |
| Cabinet Dimensions L x W x H, in. (mm) | 355 x 88 x 100 (9017 x 2235 x 2550) | | 355 x 88 x 100 (9017 x 2235 x 2550) | |
| Unit Operating Weight, lbs. (kg) | 18447 (8375) | | 18787 (8266) | |
| Unit Shipping Weight, lbs (kg) | 17995 (8170) | | 18272 (8295) | |
| **COMPRESSORS, SCREW, SEMI-HERMETIC** | | | | |
| Nominal Capacity, tons (kW) | 125 (437) | 150 (525) | 150 (525) | 150 (525) |
| **CONDENSERS, HIGH EFFICIENCY FIN AND TUBE TYPE WITH INTEGRAL SUBCOOLER** | | | | |
| Coil Face Area, $ft^2$. ($m^2$) | 213 (19.8) | 213 (19.8) | 213 (19.8) | 213 (19.8) |
| Fins Per Inch x Rows Deep | 16 x 3 | 16 x 3 | 16 x 3 | 16 x 3 |
| **CONDENSER FANS, DIRECT DRIVE PROPELLER TYPE** | | | | |
| No. of Fans -- Fan Dia., in. (mm) | 16 – 30 (762) | | 16 – 30 (762) | |
| No. of Motors -- hp (kW) | 16 – 2 (1.5) | | 16 – 2 (1.5) | |
| Fan & Motor RPM, 60Hz | 1140 | | 1140 | |
| 60 Hz Fan Tip Speed, fpm | 8954 | | 8954 | |
| 60 Hz Total Unit Airflow, cfm (l/s) | 172,800 | | 172,800 | |
| **EVAPORATOR, FLOODED SHELL AND TUBE** | | | | |
| Shell Dia.-Tube Length in.(mm) - in. (mm) | 24 (610) – 96 (2438) | | 26 (660) – 96 (2438) | |
| Evaporator R-134a Charge lbs (kg) | 196 (89) | 196 (89) | 221 (100) | 221 (100) |
| Water Volume, gallons (liters) | 51 (195) | | 59 (221) | |
| Max. Water Pressure, psi (kPa) | 150 (1034) | | 150 (1034) | |
| Max. Refrigerant Press., psi (kPa) | 200 (1379) | | 200 (1379) | |

### *Table 21, Physical Data, AGS 340B – AGS 400B*

| DATA | AGS MODEL NUMBER | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 340B | | | 370B | | | 400B | | |
| | Ckt. 1 | Ckt. 2 | Ckt. 3 | Ckt. 1 | Ckt. 2 | Ckt. 3 | Ckt. 1 | Ckt. 2 | Ckt. 3 |
| **BASIC DATA** | | | | | | | | | |
| Unit Cap. @ ARI, tons (kW) | 334.1 (1173) | | | 360.0 (1264) | | | 384.3 (1349) | | |
| Unit Operating Charge, lbs (kg) | 285 (129) | 285 (129) | 285 (129) | 312 (141) | 312 (141) | 312 (141) | 312 (141) | 335 (152) | 335 (152) |
| Cabinet Dim., L x W x H, in. (mm) | 434 x 88 x 100 (11024 x 2235 x 2550) | | | 472 x 88 x 100 (11989 x 2235 x 2550) | | | 510 x 88 x 100 (12954 x 2235 x 2550) | | |
| Unit Operating Weight, lbs. (kg) | 23507 (10672) | | | 25645 (11643) | | | 26667 (11734) | | |
| Unit Shipping Weight, lbs (kg) | 22958 (10101) | | | 25034 (11015) | | | 26056 (11829) | | |
| **COMPRESSORS, SCREW, SEMI-HERMETIC** | | | | | | | | | |
| Nominal Capacity, tons (kW) | 100 (350) | 100 (350) | 100 (350) | 100 (350) | 100 (350) | 125 (437) | 100 (350) | 125 (437) | 125 (437) |
| **CONDENSERS, HIGH EFFICIENCY FIN AND TUBE TYPE WITH INTEGRAL SUBCOOLER** | | | | | | | | | |
| Coil Face Area, $ft^2$. ($m^2$) | 159 (14.8) | 159 (14.8) | 159 (14.8) | 159 (14.8) | 159 (14.8) | 213 (19.9) | 159 (14.8) | 213 (19.9) | 213 (19.9) |
| Fins Per Inch x Rows Deep | 16 x 3 | 16 x 3 | 16 x 3 | 16 x 3 | 16 x 3 | 16 x 3 | 16 x 3 | 16 x 3 | 16 x 3 |
| **CONDENSER FANS, DIRECT DRIVE PROPELLER TYPE** | | | | | | | | | |
| No. of Fans - Fan Dia., in. (mm) | 18 – 30 (762) | | | 20 – 30 (762) | | | 22 – 30 (732) | | |
| No. of Motors -- hp (kW) | 18 – 2 (1.5) | | | 20 – 2 (1.5) | | | 22 – 2 (1.5) | | |
| Fan & Motor RPM, 60Hz | 1140 | | | 1140 | | | 1140 | | |
| 60 Hz Fan Tip Speed, fpm | 8954 | | | 8954 | | | 8954 | | |
| 60 Hz Total Unit Airflow, cfm (l/s) | 194,400 | | | 216,000 | | | 237,600 | | |
| **EVAPORATOR, FLOODED SHELL AND TUBE** | | | | | | | | | |
| Shell Dia.,Tube Length in.(mm) | 26 (660) – 108 (2743) | | | 30 (762) – 108 (2743) | | | 30 (762) – 108 (2743) | | |
| Evaporator R-134a Charge lbs (kg | 164 (74) | 164 974) | 164 (74) | 191 (86) | 191 (86) | 191 (86) | 191 (86) | 191 (86) | 191 (86) |
| Water Volume, gallons (liters) | 63 (237) | | | 70 (263) | | | 70 (263) | | |
| Max. Water Pressure, psi (kPa) | 150 (1034) | | | 150 (1034) | | | 150 (1034) | | |
| Max. Refrigerant Press., psi (kPa) | 200 (1379) | | | 200 (1379) | | | 200 (1379) | | |

### *Table 22, Physical Data, AGS 420B – AGS 440B*

| DATA | AGS MODEL NUMBER | | | | | |
|---|---|---|---|---|---|---|
| | 420B | | | 440B | | |
| | Ckt. 1 | Ckt. 2 | Ckt. 3 | Ckt. 1 | Ckt. 2 | Ckt. 3 |
| **BASIC DATA** | | | | | | |
| Unit Cap. @ ARI, tons (kW) | 408.8 (1435) | | | 427.1 (1499) | | |
| Unit Operating Charge, lbs (kg) | 335 (152) | 335 (152) | 335 (152) | 358 (162) | 358 (162) | 358 (162) |
| Cabinet Dim., L x W x H, in. (mm) | 548 x 88 x 100 (13919 x 2235 x 2550) | | | 548 x 88 x 100 (13919 x 2235 x 2550) | | |
| Unit Operating Weight, lbs. (kg) | 27684 (12568) | | | 28042 (12731) | | |
| Unit Shipping Weight, lbs (kg) | 27072 (12291) | | | 27345 (12415) | | |
| **COMPRESSORS, SCREW, SEMI-HERMETIC** | | | | | | |
| Nominal Capacity, tons (kW) | 125 (437) | 125 (437) | 125 (437) | 125 (437) | 125 (437) | 150 (525) |
| **CONDENSERS, HIGH EFFICIENCY FIN AND TUBE TYPE WITH INTEGRAL SUBCOOLER** | | | | | | |
| Coil Face Area, $ft^2$. ($m^2$) | 213 (19.9) | 213 (19.9) | 213 (19.9) | 213 (19.9) | 213 (19.9) | 213 (19.9) |
| Fins Per Inch x Rows Deep | 16 x 3 | 16 x 3 | 16 x 3 | 16 x 3 | 16 x 3 | 16 x 3 |
| **CONDENSER FANS, DIRECT DRIVE PROPELLER TYPE** | | | | | | |
| No. of Fans -- Fan Dia., in. (mm) | 24 – 30 (762) | | | 24 – 30 (762) | | |
| No. of Motors -- hp (kW) | 24 – 2 (1.5) | | | 24 – 2 (1.5) | | |
| Fan & Motor RPM, 60Hz | 1140 | | | 1140 | | |
| 60 Hz Fan Tip Speed, fpm | 8954 | | | 8954 | | |
| 60 Hz Total Unit Airflow, cfm (l/s) | 259,200 | | | 259,200 | | |
| **EVAPORATOR, FLOODED SHELL AND TUBE** | | | | | | |
| Shell Dia. -- Tube Length in.(mm) - in. (mm) | 30 (762) – 108 (2743) | | | 30 (762) – 108 (2743) | | |
| Evaporator R-134a Charge lbs (kg | 191 (86) | 191 (86) | 191 (86) | 214 (97) | 214 (97) | 214 (97) |
| Water Volume, gallons (liters) | 70 (263) | | | 79 (300) | | |
| Max. Water Pressure, psi (kPa) | 150 (1034) | | | 150 (1034) | | |
| Max. Refrigerant Press., psi (kPa) | 200 (1379) | | | 200 (1379) | | |

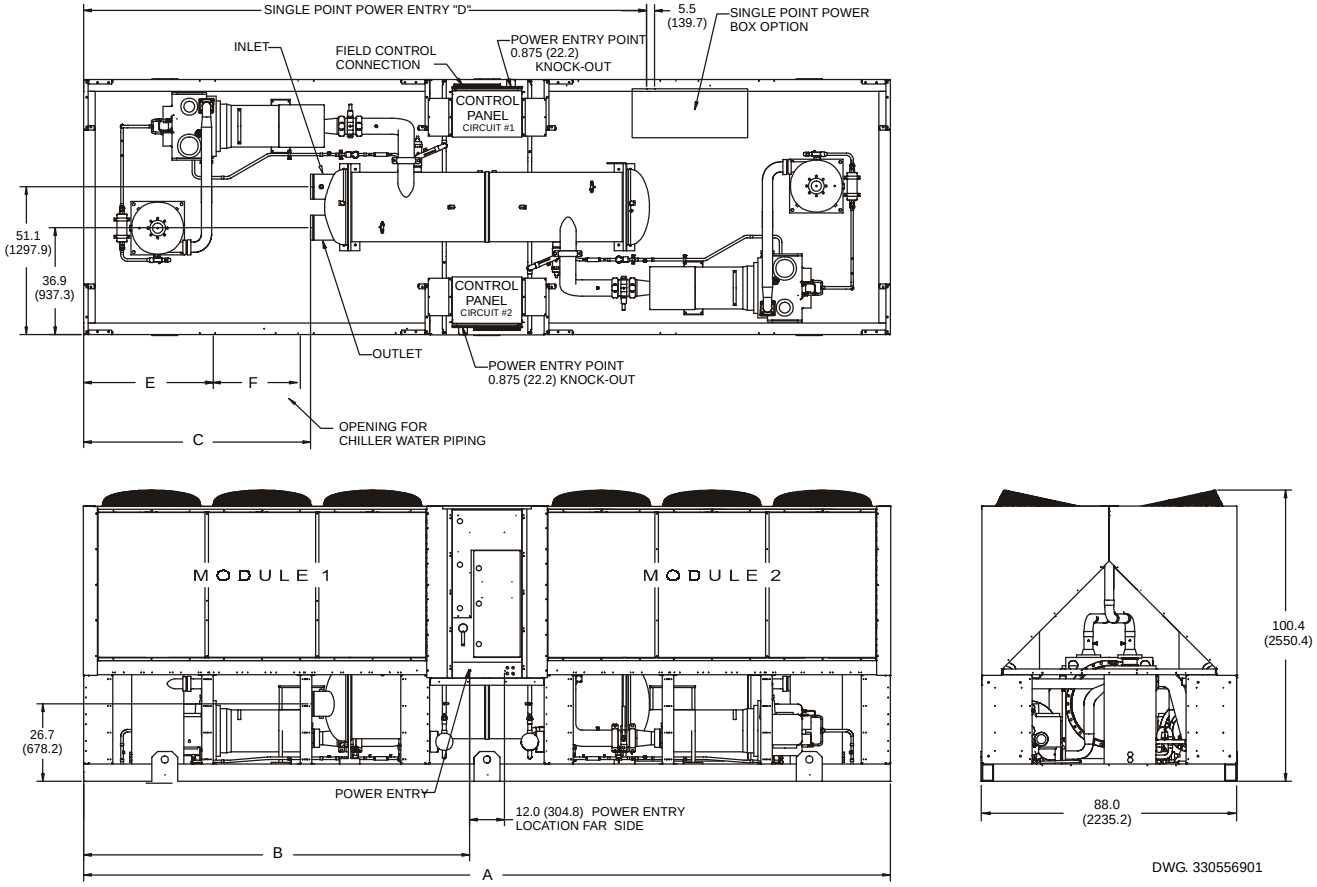
### *Table 23, Physical Data, AGS 450B – AGS 475B*

| DATA | AGS MODEL NUMBER | | | | | |
|---|---|---|---|---|---|---|
| | 450B | | | 475B | | |
| | Ckt. 1 | Ckt. 2 | Ckt. 3 | Ckt. 1 | Ckt. 2 | Ckt. 3 |
| **BASIC DATA** | | | | | | |
| Unit Cap. @ ARI, tons (kW) | 440.5 (1546) | | | 453.9 (1593) | | |
| Unit Operating Charge, lbs (kg) | 358 (162) | 358 (162) | 358 (162) | 358 (162) | 358 (162) | 358 (162) |
| Cabinet Dim., L x W x H, in. (mm) | 548 x 88 x 100 (13919 x 2235 x 2550) | | | 548 x 88 x 100 (13919 x 2235 x 2550) | | |
| Unit Operating Weight, lbs. (kg) | 28042 (12731) | | | 28042 (12731) | | |
| Unit Shipping Weight, lbs (kg) | 27345 (12415) | | | 27345 (12415) | | |
| **COMPRESSORS, SCREW, SEMI-HERMETIC** | | | | | | |
| Nominal Capacity, tons (kW) | 125 (437) | 150 (525) | 150 (525) | 150 (525) | 150 (525) | 150 (525) |
| **CONDENSERS, HIGH EFFICIENCY FIN AND TUBE TYPE WITH INTEGRAL SUBCOOLER** | | | | | | |
| Coil Face Area, $ft^2$. ($m^2$) | 213 (19.9) | 213 (19.9) | 213 (19.9) | 213 (19.9) | 213 (19.9) | 213 (19.9) |
| Fins Per Inch x Rows Deep | 16 x 3 | 16 x 3 | 16 x 3 | 16 x 3 | 16 x 3 | 16 x 3 |
| **CONDENSER FANS, DIRECT DRIVE PROPELLER TYPE** | | | | | | |
| No. of Fans -- Fan Dia., in. (mm) | 24 – 30 (762) | | | 24 – 30 (762) | | |
| No. of Motors -- hp (kW) | 24 – 2 (1.5) | | | 24 – 2 (1.5) | | |
| Fan & Motor RPM, 60Hz | 1140 | | | 1140 | | |
| 60 Hz Fan Tip Speed, fpm | 8954 | | | 8954 | | |
| 60 Hz Total Unit Airflow, cfm (l/s) | 259,200 | | | 259,200 | | |
| **EVAPORATOR, FLOODED SHELL AND TUBE** | | | | | | |
| Shell Dia. -- Tube Length in.(mm) - in. (mm) | 30 (762) – 108 (2743) | | | 30 (762) – 108 (2743) | | |
| Evaporator R-134a Charge lbs (kg | 214 (97) | 214 (97) | 214 (97) | 214 (97) | 214 (97) | 214 (97) |
| Water Volume, gallons (liters) | 79 (300) | | | 79 (300) | | |
| Max. Water Pressure, psi (kPa) | 150 (1034) | | | 150 (1034) | | |
| Max. Refrigerant Press. psi (kPa) | 200 (1379) | | | 200 (1379) | | |

# Dimensions, AGS

### *Figure 6, Dimensions, AGS 230B – AGS 320B*

**Note**: See page 36 for lifting locations, mounting locations, weights and mounting loads.

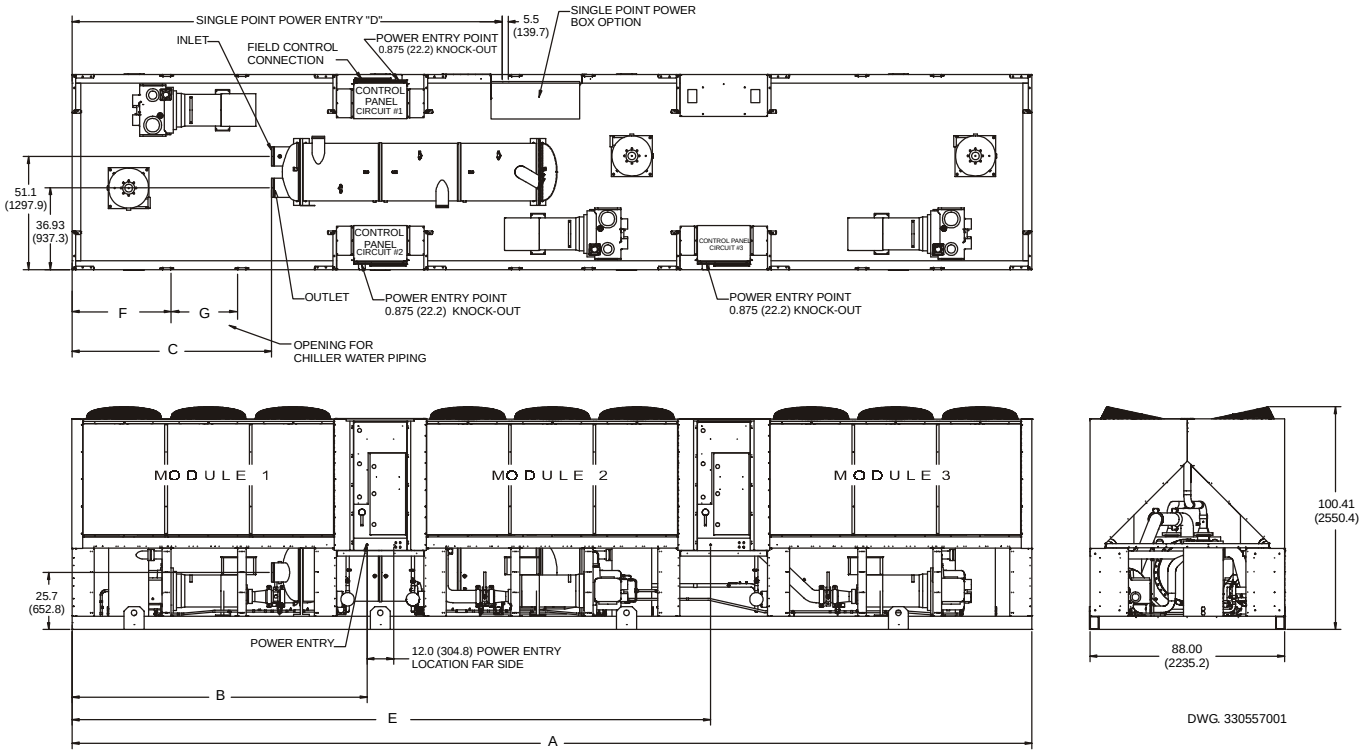



**NOTE**: Chilled water piping must enter and exit the unit platform in the opening between the base rail and the bottom of the condenser coil as shown in the plan view above.

| AGS Unit Size | Dimensions Inches (mm) | | | | Water Piping Inches (mm) | | Connection Sizes Inches (mm) | Fan Modules | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | | No. of Fans | Module 1 | Module 2 |
| AGS 230 | 278.8 (7081.5) | 133.4 (3388.4) | 78.4 (1991.4) | 192.6 (4892.0) | 44.8 (1137.4) | 30.0 (762.8) | 8 (203.2) | 12 Fan | 6 | 6 |
| AGS 250 | 316.9 (8049.3) | 133.4 (3388.4) | 78.4 (1991.4) | 192.6 (4892.6) | 44.8 (1137.4) | 30.0 (762.8) | 8 (203.2) | 14 Fan | 6 | 8 |
| AGS 270-320 | 355.2 (9022.1)) | 171.6 (4358.6) | 116.6 (2961.6) | 230.8 (5862.3 | 80.9 (2054.8) | 31.4 (797.6) | 8 (203.2) | 16 Fan | 8 | 8 |

## *Figure 7, Dimensions, AGS 340B –475B*

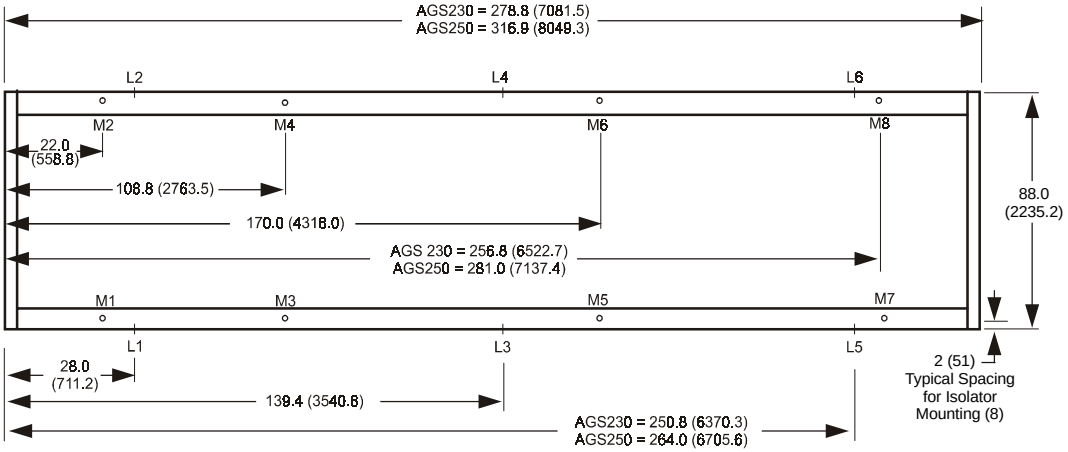
**Note**: See page 37 for lifting locations, mounting locations, weights and mounting loads.



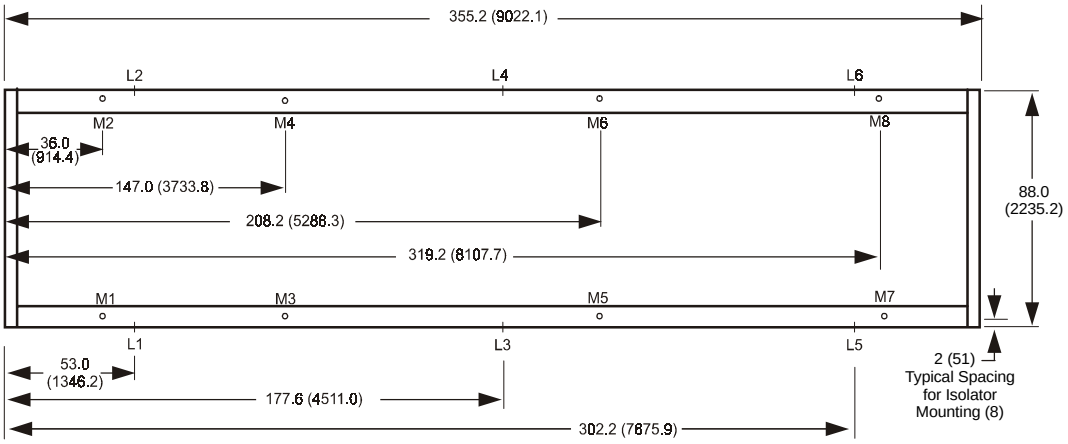

**NOTE**: Chilled water piping must enter and exit the unit platform in the opening between the base rail and the bottom of the condenser coil as shown in the plan view above.

| AGS Unit Size | Dimensions Inches (mm) | | | | | Water Piping Inches (mm) | | Connection Sizes Inches (mm) | Fan Modules | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | | No. of Fans | Module 1 | Module 2 | Module 3 |
| AGS 340 | 434.2 (11027.9) | 133.4 (3388.0) | 90.3 (2292.4) | 192.6 (4892.0) | 288.8 (7335.5) | 44.7 (1137.4) | 30.0 (762.8) | 8 (203.2) | 18 Fan | 6 | 6 | 6 |
| AGS 370 | 472.4 (11998.2) | 133.4 (3388.1) | 90.3 (2292.4) | 192.6 (4892.0) | 288.8 (7335.5) | 44.7 (1137.4) | 30.0 (762.8) | 10 (254.0) | 20 Fan | 6 | 6 | 8 |
| AGS 400 | 510.6 (12968.5) | 133.4 (3388.1) | 87.3 (2140.0) | 192.6 (4892.0) | 327.0 (8305.8) | 44.7 (1137.4) | 30.0 (762.8) | 10 (254.0) | 22 Fan | 6 | 8 | 8 |
| AGS 420-475 | 548. 8 (13939.0) | 171.6 (4358.4) | 125.5 (3186.4) | 230. 8 (5862.3) | 365.2 (9276.1) | 80.9 (2054.8) | 31.4 (797.6) | 10 (254.0) | 24 Fans | 8 | 8 | 8 |

### *Figure 8, AGS 230B – AGS 250B Lifting and Mounting Locations*




### *Figure 9, AGS 270B - AGS 320B Lifting and Mounting Locations*




### *Table 24, AGS 230B - AGS 320B Lifting and Mounting Weights*

| AGS Model | | Lifting Weight for Each Point lb (kg) | | | | | | Mounting Loads for Each Point lb. (kg) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | L1 | L2 | L3 | L4 | L5 | L6 | M1 | M2 | M3 | M4 | M5 | M6 | M7 | M8 |
| 230B | Lbs. | 2183 | 3043 | 2563 | 2563 | 3043 | 2183 | 1683 | 2325 | 1681 | 2322 | 2322 | 1681 | 2325 | 1683 |
| | (kg) | 991 | 1382 | 1164 | 1164 | 1382 | 991 | 764 | 1055 | 763 | 1054 | 1054 | 763 | 1055 | 764 |
| 250B | Lbs. | 2183 | 3043 | 2700 | 2704 | 3374 | 2509 | 1683 | 2325 | 1681 | 2322 | 2693 | 2018 | 2421 | 1814 |
| | (kg) | 991 | 1382 | 1226 | 1228 | 1532 | 1139 | 764 | 1055 | 763 | 1054 | 1223 | 916 | 1099 | 824 |
| 270B | Lbs. | 2509 | 3374 | 2841 | 2841 | 3374 | 2509 | 1814 | 2421 | 2018 | 2693 | 2693 | 2018 | 2421 | 1814 |
| | (kg) | 1139 | 1532 | 1290 | 1290 | 1532 | 1139 | 824 | 1099 | 916 | 1223 | 1223 | 916 | 1099 | 824 |
| 300B | Lbs. | 2520 | 3383 | 2871 | 2871 | 3383 | 2520 | 1821 | 2425 | 2043 | 2721 | 2721 | 2043 | 2425 | 1821 |
| | (kg) | 1144 | 1536 | 1304 | 1304 | 1536 | 1144 | 827 | 1101 | 928 | 1235 | 1235 | 928 | 1101 | 827 |
| 320B | Lbs. | 2550 | 3407 | 2956 | 2956 | 3407 | 2550 | 1838 | 2435 | 2111 | 2797 | 2797 | 2111 | 2435 | 1838 |
| | (kg) | 1158 | 1547 | 1342 | 1342 | 1547 | 1158 | 834 | 1106 | 958 | 1270 | 1270 | 958 | 1106 | 834 |

**NOTES:**

1. Lifting tabs with 2½ in. (63.5 mm) holes at location "L" on side of base rail.
2. 1 in. (25.4 mm) mounting holes at location "M" on bottom of base rails.

***Figure 10, AGS 340B – AGS 400B Lifting and Mounting Locations***

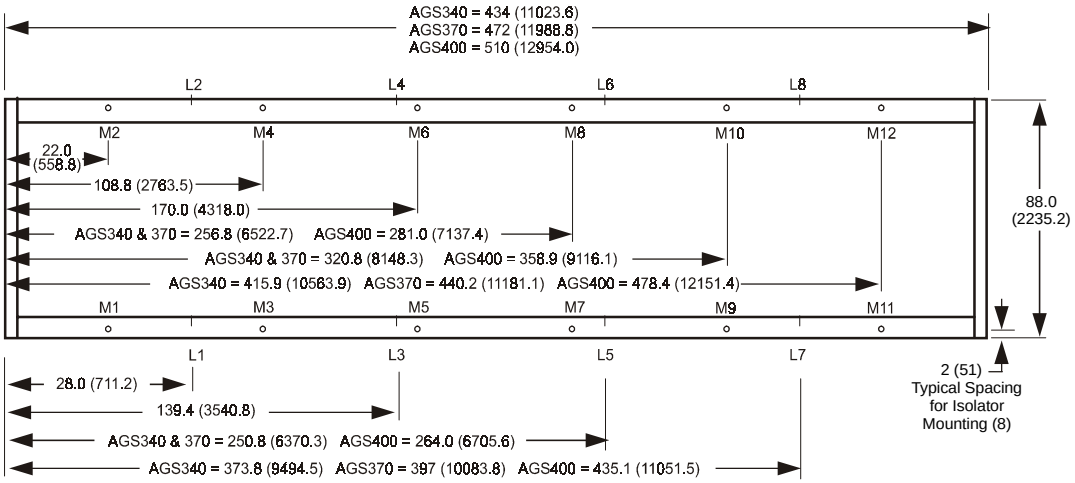



***Figure 11, AGS 420B - AGS 475B Lifting and Mounting Locations***

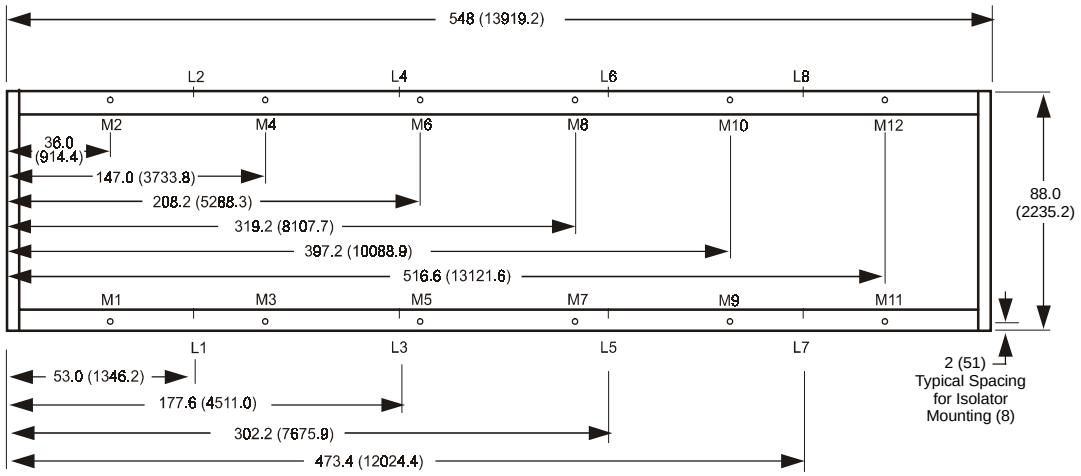



***Table 25, AGS 340B - AGS 475B Lifting Weights***

| AGS Model | | Lifting Weight for Each Point lb (kg) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | L1 | L2 | L3 | L4 | L5 | L6 | L7 | L8 |
| 340B | lbs | 2312 | 3173 | 2681 | 2681 | 3352 | 2473 | 3192 | 2880 |
| | (kg) | 1050 | 1441 | 1217 | 1217 | 1522 | 1123 | 1449 | 1307 |
| 370B | lbs | 2449 | 3296 | 2951 | 2951 | 3617 | 2742 | 3519 | 3216 |
| | (kg) | 1112 | 1496 | 1340 | 1340 | 1642 | 1245 | 1597 | 1460 |
| 400B | lbs | 2449 | 3296 | 3119 | 3117 | 3917 | 3044 | 3519 | 3216 |
| | (kg) | 1112 | 1496 | 1416 | 1415 | 1778 | 1382 | 1597 | 1460 |
| 420B | lbs | 2751 | 3596 | 3285 | 3285 | 3917 | 3044 | 3519 | 3216 |
| | (kg) | 1249 | 1633 | 1491 | 1491 | 1778 | 1382 | 1597 | 1460 |
| 440B | lbs | 2783 | 3624 | 3361 | 3361 | 3945 | 3076 | 3519 | 3216 |
| | (kg) | 1263 | 1645 | 1526 | 1526 | 1791 | 1396 | 1597 | 1460 |
| 450B | lbs | 2783 | 3624 | 3361 | 3361 | 3945 | 3076 | 3519 | 3216 |
| | (kg) | 1263 | 1645 | 1526 | 1526 | 1791 | 1396 | 1597 | 1460 |
| 475B | lbs | 2783 | 3624 | 3361 | 3361 | 3945 | 3076 | 3519 | 3216 |
| | (kg) | 1263 | 1645 | 1526 | 1526 | 1791 | 1396 | 1597 | 1460 |

***Table 26, AGS 340B - AGS 475B Mounting Weights***

| AGS Model | | Mounting Loads for Each Point lb. (kg) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | M1 | M2 | M3 | M4 | M5 | M6 | M7 | M8 | M9 | M10 | M11 | M12 |
| 340B | lbs | 1798 | 2442 | 1787 | 2426 | 2426 | 1787 | 2442 | 1798 | 1726 | 1557 | 1645 | 1484 |
| | kg | 816 | 1109 | 811 | 1101 | 1101 | 811 | 1109 | 816 | 784 | 707 | 747 | 674 |
| 370B | lbs | 1885 | 2511 | 1981 | 2638 | 2638 | 1981 | 2511 | 1885 | 1973 | 1803 | 1867 | 1706 |
| | kg | 856 | 1140 | 899 | 1198 | 1198 | 899 | 1140 | 856 | 896 | 819 | 847 | 775 |
| 400B | lbs | 1885 | 2511 | 1981 | 2638 | 3055 | 2357 | 2562 | 1977 | 1973 | 1803 | 1867 | 1706 |
| | kg | 856 | 1140 | 899 | 1198 | 1387 | 1070 | 1163 | 897 | 896 | 819 | 847 | 775 |
| 420B | lbs | 1977 | 2562 | 2357 | 3055 | 3055 | 2357 | 2562 | 1977 | 1973 | 1803 | 1867 | 1706 |
| | kg | 897 | 1163 | 1070 | 1387 | 1387 | 1070 | 1163 | 897 | 896 | 819 | 847 | 775 |
| 440B | lbs | 1999 | 2579 | 2425 | 3128 | 3128 | 2425 | 2579 | 1999 | 1973 | 1803 | 1867 | 1706 |
| | kg | 908 | 1171 | 1101 | 1420 | 1420 | 1101 | 1171 | 908 | 896 | 819 | 847 | 775 |
| 450B | lbs | 1999 | 2579 | 2425 | 3128 | 3128 | 2425 | 2579 | 1999 | 1973 | 1803 | 1867 | 1706 |
| | kg | 908 | 1171 | 1101 | 1420 | 1420 | 1101 | 1171 | 908 | 896 | 819 | 847 | 775 |
| 475B | lbs | 1999 | 2579 | 2425 | 3128 | 3128 | 2425 | 2579 | 1999 | 1973 | 1803 | 1867 | 1706 |
| | kg | 908 | 1171 | 1101 | 1420 | 1420 | 1101 | 1171 | 908 | 896 | 819 | 847 | 775 |

# Installation and Application

## Rigging

Care must be taken to avoid dropping the unit during unloading or moving as this can result in serious property damage and personal injury. Do not push or pull the unit. Do not lift the unit with a fork lift truck. To lift the unit, three (or four depending on unit size) 2 1/2 inch (65mm) diameter lifting holes are provided on each side in the base of the unit. All lifting holes must be used when lifting the unit. Lengthwise and crosswise spreader bars must be used between rigging lines to prevent damage to the condenser coils or unit cabinet and to keep the lines coming up from the rigging holes to the spreaders vertical.

**WARNING**

**Improper lifting or moving unit can result in property damage, severe personal injury or death. Follow rigging and moving instructions carefully.**

## Unit Placement

For roof mounted applications, the unit must be installed on a steel channel or I-beam frame to support the unit above the roof. For ground level applications, the unit must be installed on a substantial base that will not settle. McQuay recommends a one piece concrete slab with footings extended below the frost line, and the installation engineer should determine its necessity. The foundation must be level within 1/2 inch (13mm) over its length and width and strong enough to support the unit's operating weight as listed in the Physical Data tables.

On ground level applications fin protection against vandalism is recommended, either by the optional factory installed lower guards or a field installed screen fence. Note that the fence must allow free flow of air to the condenser coil for proper unit operation. Wire mesh coil guards are standard.

## Operating Limits:

Maximum standby ambient temperature, 130°F (55°C)

Maximum operating ambient temperature, 115°F (46°C) or 125°F (52°C) with optional high ambient package

Minimum operating ambient temperature (standard), 35°F (2°C)

Minimum operating ambient temperature (optional low-ambient control), 0°F (-18°C)

Leaving chilled water range, 38°F to 50°F (3°C to 10°C)

Leaving chilled fluid range (with anti-freeze), 20°F to 50°F (7°C to 10°C)

Operating Delta-T range, 6 degrees F to 16 degrees F (10.8 to 28.8 degrees C)

Maximum operating inlet fluid temperature, 66°F (19°C)

Maximum startup inlet fluid temperature, 90°F (32°C)

Maximum non-operating inlet fluid temperature, 100°F (38°C)

NOTE: Contact the local McQuay sales office for operation outside of these limits.

## Clearances

Air-cooled units require free air flow to and from the condenser coils. Units should be installed per the listed installation clearances. There must be **no obstructions** above the fan discharge that can cause air recirculation. Air restriction and recirculation can cause high pressure trips and will reduce capacity, efficiency, and compressor life. Do not install ductwork on condenser fans. Structures, other equipment, fencing, plants, and trees must be considered for air flow interference. Ventilators and any sources of contaminated or heated discharges gases and air will affect system performance. Pit type installation must meet McQuay's requirements.

The power wiring connection is made at the lower left front of each control panel (except for single-point connection option). Exercise care that conduit does not block access to the filter-driers mounted on the base under the control panel.

## Service Access

Compressors, filter-driers, and manual liquid line shutoff valves are accessible on each side of the unit adjacent to the control box. The evaporator heater is controlled by the MicroTech controller sensing the water temperature inside the evaporator.

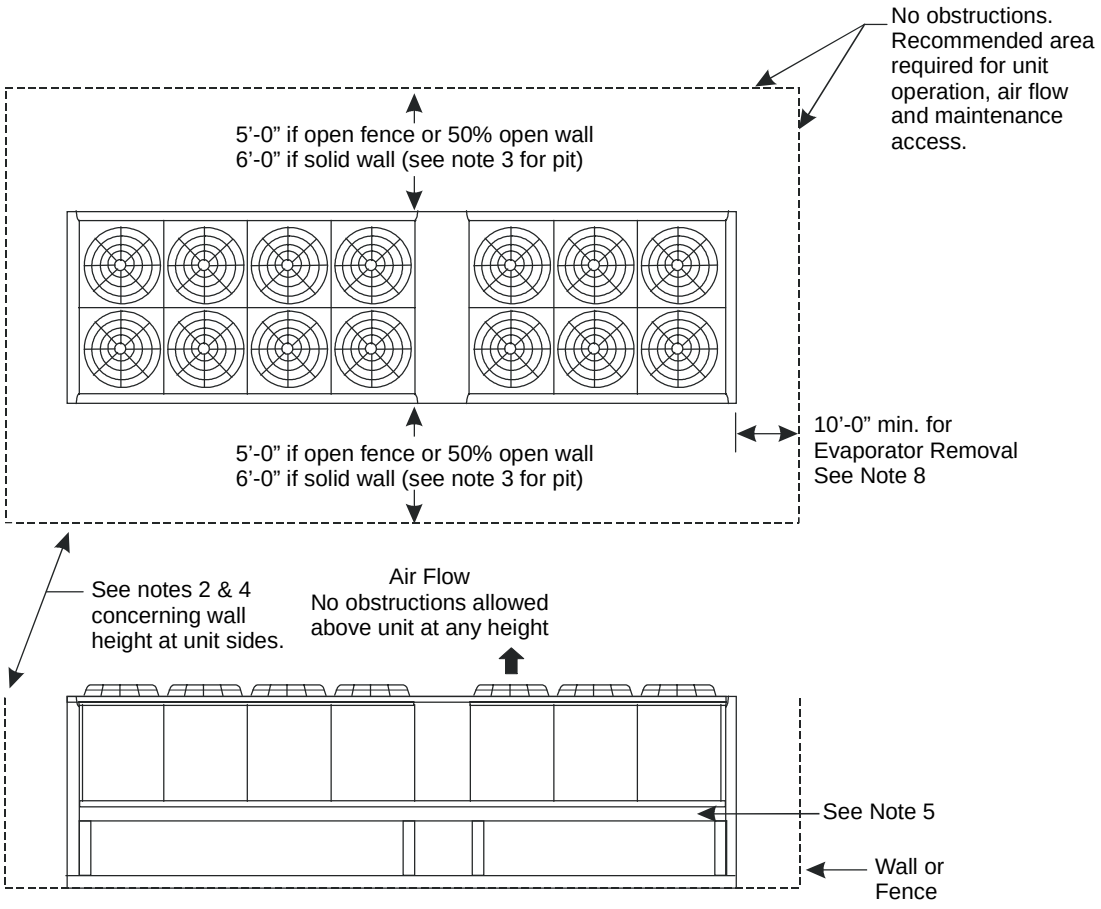
Each compressor (two or three depending on unit size) has its own duplex control panel located on the sides of the chiller. The outer control box contains the compressor microprocessor. The box for circuit #1 also contains the unit microprocessor controller. The solid state starter, fan control and other power equipment are in the inner panel.

The side clearance required for air flow provides sufficient service clearance.

On all AGS units the condenser fans and motors can be removed from the top of the unit. The complete fan/motor assembly can be removed for service.

Do not block access to the sides or ends of the unit with piping or conduit. These areas must be open for service access. Do not block any access to the control panels with a field-mounted disconnect switches. In particular, be sure that the power conduit to each panel does not interfere with access to the filter-driers located on the unit base under the panels.

***Figure 12, Clearance Requirements, AGS 230B – 475B***




Notes:

1. Minimum side clearance between two units is 12 feet (3.7 meters).
2. Unit must not be installed in a pit or enclosure that is deeper or taller than the height of the unit unless extra clearance is provided per note 4.
3. Minimum clearance on each side is 8 feet (2.4 meters) when installed in a pit no deeper than the unit height.
4. Minimum side clearance to a side wall or building taller than the unit height is 6 feet (1.8 meters) provided no solid wall above 6 feet (1.8 meters) is closer than 12 feet (3.7 meters) to the opposite side of the unit.
5. Do not mount electrical conduits where they can block service access to compressor controls, refrigerant filter-driers or valves.
6. There must be no obstruction of the fan discharge.
7. Field installed switches must not interfere with service access or air flow.
8. The 10-ft. clearance required for removal of the evaporator is on the end that the evaporator connections face. See dimension drawings for detail.

# Restricted Air Flow

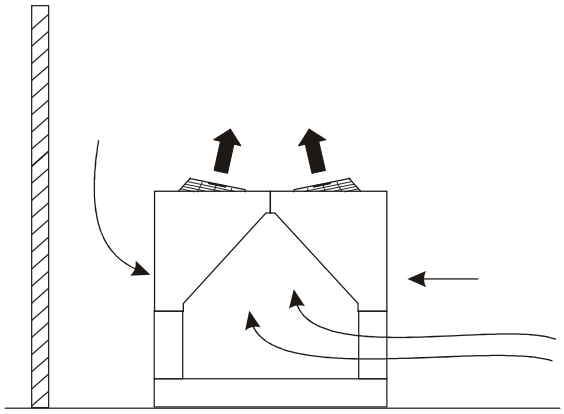
## General

The clearances required for design operation of AGS air-cooled condensers are described in the previous section. Occasionally, these clearances cannot be maintained due to site restrictions such as units being too close together or a fence or wall restricting airflow, or both.

Fortunately the McQuay AGS chillers have several features that can mitigate the penalties attributable to restricted airflow.

- The condenser section is “W” shaped, as shown below. This allows inlet air for these coils to come in from both sides and the bottom. All the coils in one "W" section serve one compressor. Every compressor always has its own independent refrigerant circuit.
- The MicroTech II control is proactive in response to “off-design conditions”. In the case of single or compounded influences restricting airflow to the unit, the microprocessor will act to keep the compressor(s) running (at reduced capacity) rather than allowing a shut-off on high discharge pressure.

***Figure 13, Coil and Fan Arrangement***



The following sections discuss the most common situations of condenser air restriction and give capacity and power adjustment factors for each. Note that in unusually severe conditions, the MicroTech II controller would adjust the unit operation to remain online until a less severe condition is reached.

## Case 1, Building or Wall on One Side of One Unit

The existence of a screening wall or the wall of a building in close proximity to an air-cooled chiller is common in both rooftop and ground level applications. Hot air recirculation on the coils adjoining the wall will increase compressor discharge pressure, decreasing capacity and increasing power consumption.

When close to a wall, it is desirable to place chillers on the North or East side of them. It is also desirable to have prevailing winds blowing parallel to the unit's long axis. The worst case is to have wind blowing hot discharge air into the wall.

***Figure 14, Unit Adjacent to Wall***

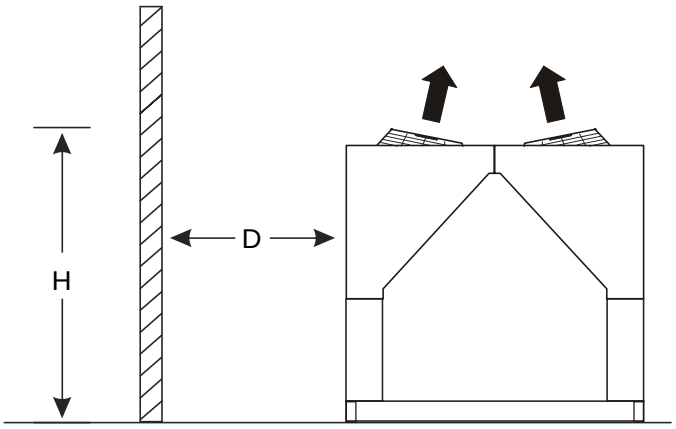
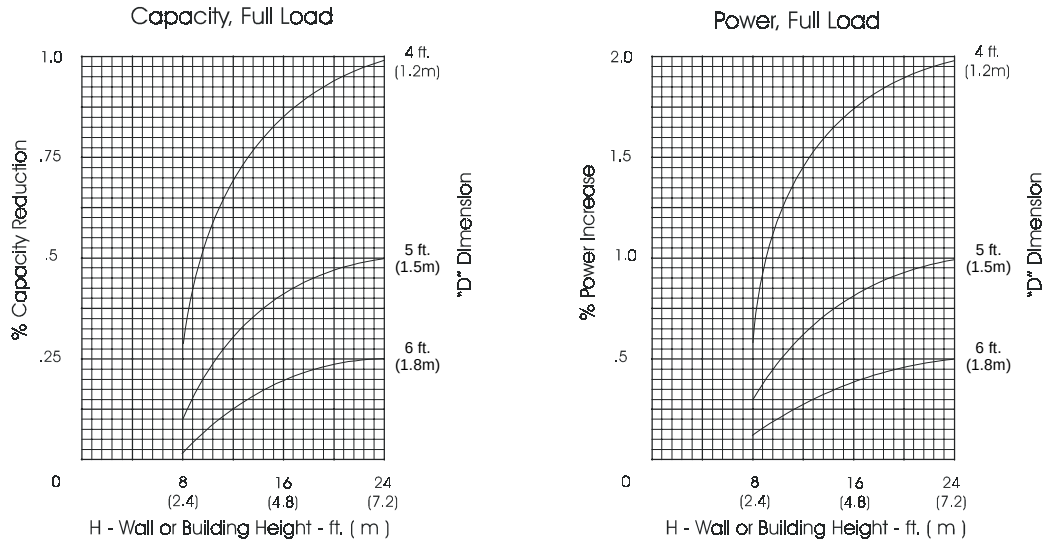



***Figure 15, Adjustment Factors***



## Case 2, Two Units Side By Side

Two or more units sited side by side are common. If spaced closer than 12 feet (3.7 meters) it is necessary to adjust the performance of each unit; circuits adjoining each other are affected. If one of the two units also has a wall adjoining it, see Case 1. Add the two adjustment factors together and apply to the unit located between the wall and the other unit.

Mounting units end to end will not necessitate adjusting performance. Depending on the actual arrangement, sufficient space must be left between the units for access to the control panel door opening and/or evaporator tube removal. See “Clearance” section of this guide for requirements for specific units.

Pit or solid wall surrounds should not be used where the ambient air temperature exceeds 105°F (40°C).

***Figure 16, Two Units Side by Side***

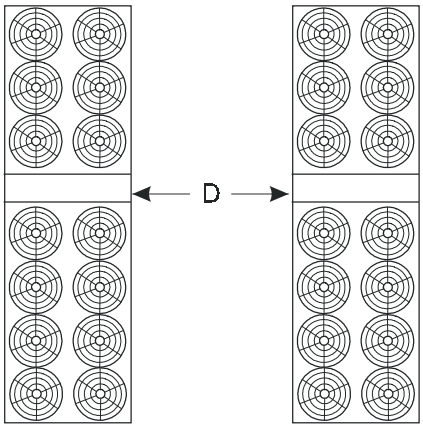
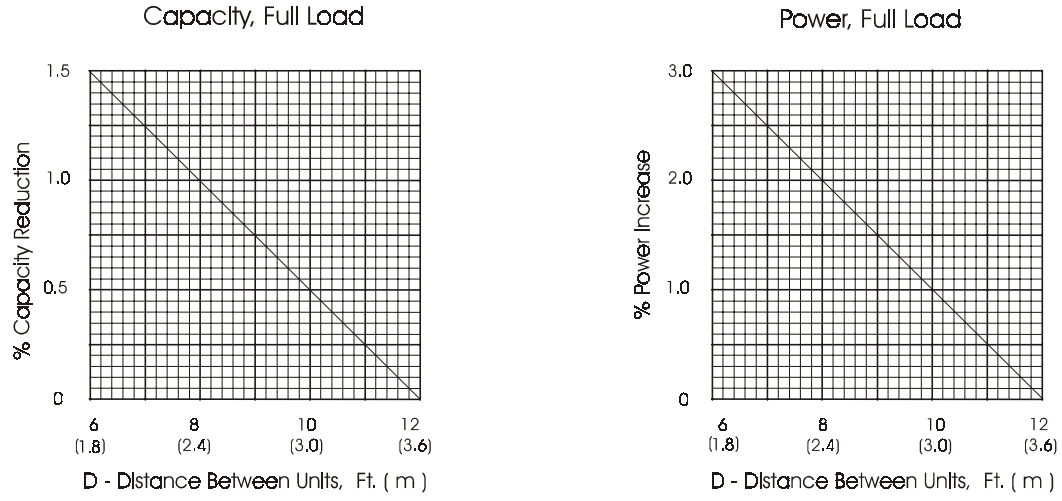



***Figure 17, Adjustment Factor***



## Case 3, Open Screening Walls

Decorative screening walls are often used to help conceal a unit either on grade or on a rooftop. These walls should be designed such that the combination of their open area and distance from the unit do not require performance adjustment. It is assumed that the wall height is equal to or less than the unit height when mounted on its base support. This is usually satisfactory for concealment. If the wall height is greater than the unit height, see Case 4, Pit Installation.

The distance from the sides of the unit to the side walls should be sufficient for service, opening control panel doors.

If each side wall is a different distance from the unit, the distances can be averaged providing either wall is not less than 8 feet (2.4 meters) from the unit. For example, do not average *4 feet* and 20 feet to equal 12 feet.

***Figure 18, Open Screening Walls***

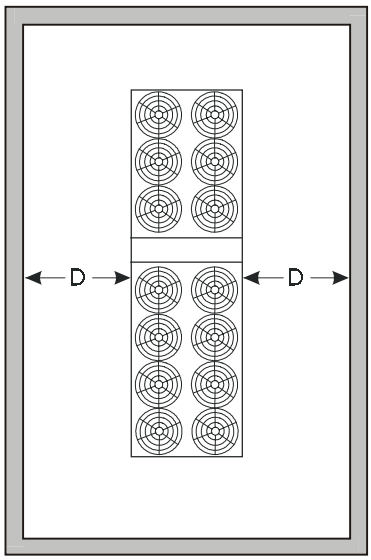
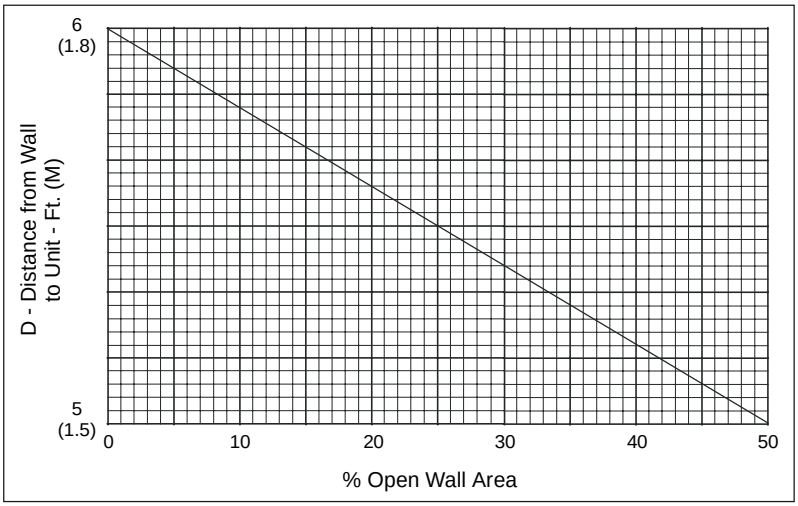



***Figure 19, Wall Free Area vs Distance***



## Case 4, Pit/Solid Wall Installation

Pit installations can cause operating problems and great care should be exercised if they are to be used on an installation. Recirculation and restriction can both occur. A solid wall surrounding a unit is substantially the same as a pit and the data presented here should be used.

Steel grating is sometimes used to cover a pit to prevent accidental falls or trips into the pit. The grating material and installation design must be strong enough to prevent such accidents, yet provide abundant open area or serious recirculation problems will occur. Have any pit installation reviewed by McQuay application engineers prior to installation to make sure it has sufficient air-flow characteristics. The installation design engineer must approve the work to avoid an unreasonable risk of accident.

***Figure 20, Pit Installation***

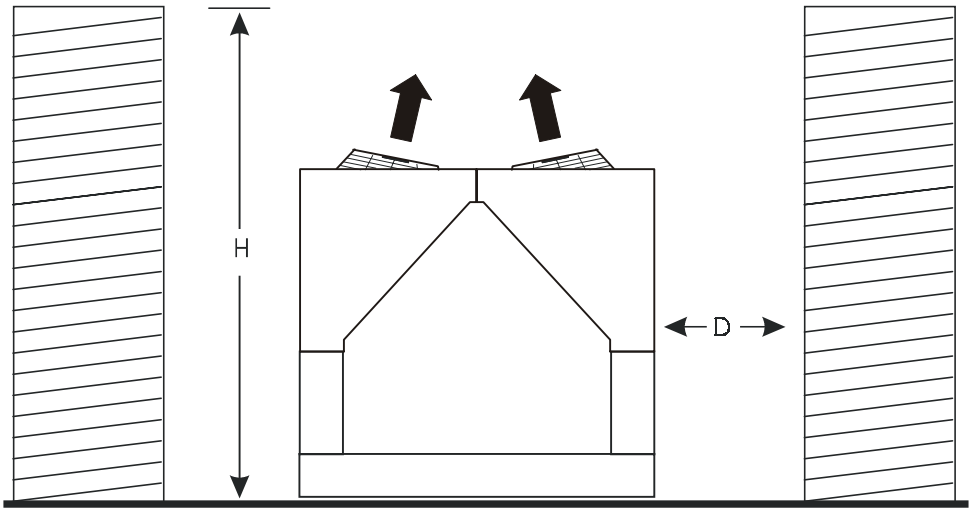
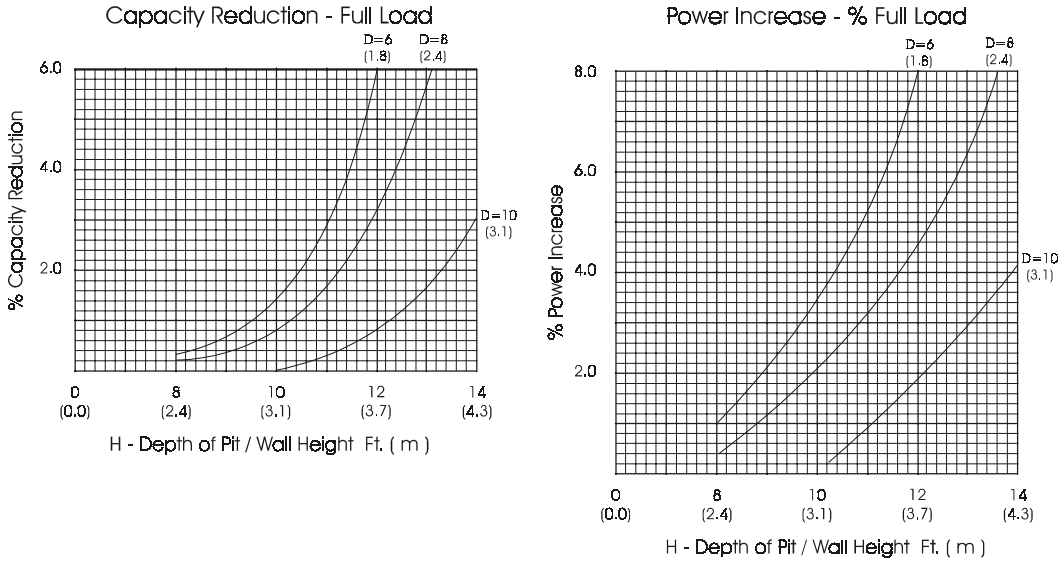



***Figure 21, Adjustment Factor***



# Chilled Water Systems

McQuay requires that chilled water piping for its chillers be designed and installed in conformance with the system recommendations described in (American Society of Heating Refrigeration and Air-Conditioning Engineers, Inc.) ASHRAE Handbooks.

## Multiple Units

Chillers are frequently installed in multiple. Doing so provides standby reliability and improved performance, and is recommended. Multiplicity of machines however can result in unexpected problems where chiller controls or capacity reduction are overlooked in the design. Single chiller installations are equally susceptible to application oversight. The following offers supplemental information to that discussed in ASHRAE for the purpose of minimizing installation problems.

## Water Flow

Chilled water systems are normally designed with leaving chilled water temperatures of 38°F to 46°F (3°C to 8°C), a 10 degree F (6 degree C) water temperature difference and 0.0001 fouling factor. Catalog performance tables display data for the chillers at these conditions. Actual design can be different, and Product Manuals include adjustment factors or special rating tables to account for other conditions.

1. Addition of secondary coolants such as ethylene glycol,
2. Variances from 10 degree F (6 degree C) water temperature differences,
3. Greater than standard water fouling, and
4. Elevation and ambient air temperatures.

Specifications and start-up procedures should:

1. Confirm that the chilled water piping system had been properly flushed out before being connected to the chiller vessel.
2. Confirm that the piping contains
   a) A cleanable strainer to remove impurities before they reach the chiller vessel,
   b) An expansion tank in the piping, and
   c) An air vent located at the system high point to purge trapped air in the piping system. An air vent is also located at the top of the direct expansion chiller vessel and in the water head of a flooded vessel evaporator or condenser.

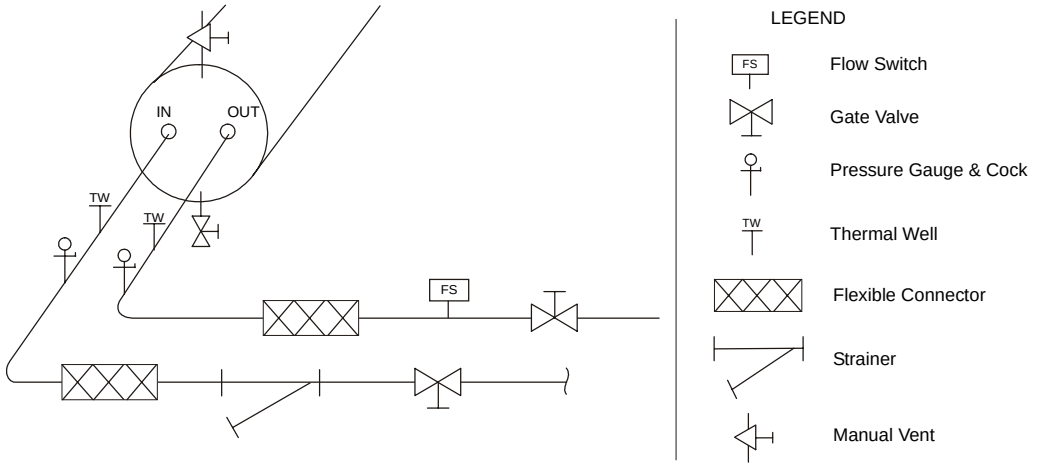
      **Note:** The evaporator will not provide venting and must not be the high point in the system.

All water systems include air in solution with the water. The percentage of air that can be retained in solution is a function of the water temperature and water pressure. Since these two values change in both chilled and hot water systems, the presence of both "b" and "c" components listed above are vital to the successful operation of the system.

The presence of a cleanable filter or strainer (2a above) in a chilled water piping system is frequently taken for granted. The fact is that the filter or strainer may be inadequate for the installation or may be installed in the wrong location.

Many chiller installations today are replacements for older less efficient machines or chillers with CFC refrigerants. Existing piping is drained down, opened to atmosphere, and reconnected to the new chiller vessel. Rust formed over the years and during the replacement process can break loose, pass through a conventional strainer, and settle in the chiller vessel that is frequently the lowest point in the piping system. Not only is a higher capacity filter required for these installations, but chemical treatment of the water is recommended immediately and should be maintained throughout the equipment life.

***Figure 22, Typical Chilled Water Piping***




Notes:
1. Connections for vent and drain fittings are located on the top and bottom of both evaporator water heads.
2. Piping must be supported to avoid putting strain on the evaporator nozzles.

# Checking Water Flow

The simplest method of checking water flow in a clean system (the chiller vessel has not been fouled nor is air bound), is to read the entering and leaving pressures and compare the actual pressure drop to the value published in the product catalog.

Pressure drops at the job are read in psi or feet of water (kPa). Published values are displayed in feet of water. Use the following formula to convert from one to another.

2.31 x PSI = Feet of water

*or*

Feet of water x 0.433 = PSI

# System Water Volume

It is important to have adequate water volume in the system to provide an opportunity for the chiller to sense a load change, adjust to the change and stabilize. As the expected load change becomes more rapid, a greater water volume is needed. The system water volume is the total amount of water in the evaporator, air handling products and associated piping. If the water volume is too low, operational problems can occur including rapid compressor cycling, rapid loading and unloading of compressors, erratic refrigerant flow in the chiller, improper motor cooling, shortened equipment life and other undesirable occurrences.

For normal comfort cooling applications where the cooling load changes relatively slowly, we recommend a minimum system volume of four minutes times the flow rate (gpm). For example, if the design chiller flow rate is 600 gpm, we recommend a minimum system volume of 2400 gallons (600 gpm x 4 minutes).

For process applications where the cooling load can change rapidly, additional system water volume is needed. A process example would be the cooling of hot metal objects. The load would be very stable until the hot metal is dipped into the water tank. Then, the load would increase drastically. For this type of application, we recommend the normal comfort cooling recommendation addressed above plus three minutes of ballast for every 10% quick change in load. For example, if the hot-metal example load changes from a stable 50% load to an immediate 100% load for metal cooling, the recommended system volume would increase to 7600 gallons.

System volume = {400 gpm x 4 minutes} + {(5 increment of 10% increase) x (3 minutes) x 400 gpm} = 7600 gallons

Since there are many other factors that can influence performance, systems can successfully operate below these suggestions. However, as the water volume decreases below these suggestions, the possibility of problems increases. We believe that these guidelines should be an industry standard and not just recommendations from McQuay.

## Freeze Protection

Flooded evaporators are popular with chiller manufacturers because of their inherent high efficiency. Care must be exercised in the equipment design and in the operation of these evaporators to prevent freezing between 32°F and -20°F.

For freeze protection down to 0°F (-18°C), the AGS chillers are equipped with thermostatically controlled evaporator heaters that protect against freeze-up provided the chiller goes through its normal pumpdown cycle. Several occurrences can prevent this normal pumpdown from happening:

1. A power failure will prevent pumpdown and there is a potential for freezing outdoor equipment in systems using 100 percent water as the chilled fluid.
2. Unit shutdown due to a fault will cause immediate compressor shutdown without the pumpdown cycle. This situation can be remedied by correcting the fault, restarting the unit, and allowing it to go through its normal shutdown pumpdown.

The heaters come from the factory connected to the control power circuit. The control power (not just the heater power since the unit microprocessor must also be powered) can be rewired to a separate 115V supply. If this is done, the disconnect switch should be clearly marked to avoid accidental deactivation of the heater during freezing temperatures. Exposed chilled water piping also requires protection.

For additional protection to -20°F (-29°C) and to protect against the consequences described above, it is recommended that at least one of the following procedures be used during periods of sub-freezing temperatures;

1. Addition of a concentration of a glycol anti-freeze with a freeze point 15 degrees below the lowest expected temperature. This will result in decreased capacity and increased pressure drop.

   **Note:** Do not use automotive grade antifreezes as they contain inhibitors harmful to chilled water systems. Only use glycols specifically designated for use in building cooling systems.

2. Draining the water from outdoor equipment and piping and blowing the chiller tubes dry from the chiller. Do <u>not</u> energize the chiller heater when water is drained from the vessel.

**CAUTION**

**If fluid is absent from the evaporator, the evaporator heater must be de-energized to avoid burning out the heater and causing damage from the high temperatures.**

3. Providing operation of the chilled water pump, circulating water through the chilled water system and through the evaporator. The chiller microprocessor will automatically start up the pump if so wired.

***Table 27, Freeze Protection***

| Temperature °F (°C) | Percent Volume Glycol Concentration Required | | | |
|---|---|---|---|---|
| | For Freeze Protection | | For Burst Protection | |
| | Ethylene Glycol | Propylene Glycol | Ethylene Glycol | Propylene Glycol |
| 20 (6.7) | 16 | 18 | 11 | 12 |
| 10 (-12.2) | 25 | 29 | 17 | 20 |
| 0 (-17.8) | 33 | 36 | 22 | 24 |
| -10 (-23.3) | 39 | 42 | 26 | 28 |
| -20 (-28.9) | 44 | 46 | 30 | 30 |
| -30 (-34.4) | 48 | 50 | 30 | 33 |
| -40 (-40.0) | 52 | 54 | 30 | 35 |
| -50 (-45.6) | 56 | 57 | 30 | 35 |
| -60 (-51.1) | 60 | 60 | 30 | 35 |

Note:
1. These figures are examples only and can not be appropriate to every situation. Generally, for an extended margin of protection, select a temperature at least 5°F lower than the expected lowest ambient temperature. Inhibitor levels should be adjusted for solutions less than 30% glycol.
2. Glycol of less than 20% concentration is not recommended because of the potential for bacterial growth and loss of heat transfer efficiency. Additional inhibitors may be required.

# Chilled Water Pump

It is recommended that the chilled water pumps' starter be wired to and controlled by the chiller's microprocessor. The controller will energize the pump whenever at least one circuit on the chiller is *enabled* to run, whether there is a call for cooling or not. The pump will also be energized when the controller senses a near-freezing temperature at the chiller outlet sensor to assist in cold weather freeze protection. Connection points are shown in Figure 5 on page 30.

## Variable Speed Pumping

Variable water flow involves changing the water flow through the evaporator as the load changes. McQuay chillers are designed for this duty provided that the rate of change in water flow is slow and the minimum and maximum flow rates for the vessel are not exceeded.

The recommended maximum change in water flow is 10 percent of the change per minute.

The water flow through the vessel must remain between the minimum and maximum values listed on Figure 2. If flow drops below the minimum allowable, large reductions in heat transfer can occur. If the flow exceeds the maximum rate, excessive pressure drop and tube erosion can occur.

# Electrical Connections

All wiring must be done in accordance with applicable local and national codes.

AGS units can be ordered with either standard multiple point power or optional single point connections. Wiring within the unit is sized in accordance with the U.S.A. National Electrical Code. Separate field-supplied or factory-supplied disconnects are required for each circuit.

***Table 28, Electric Power Connection Options***

| AGS 230 - 320 | AGS 370 - 475 |
|---|---|
| Standard: 2-points with power blocks | Standard: 3-points with power blocks |
| Optional: 2-points with disconnect switches | Optional: 3-points with disconnect switches |
| Optional: single-point with power block | Optional: single-point with power block |
| Optional: single-point with disconnect switch | Optional: single-point with disconnect switch |

NOTE: Above arrangements are with Standard Withstand Amp Rating as standard equipment. (See options section)

Disconnecting means are addressed by Article 440 of the U.S.A. National Electrical Code (NEC) which requires "disconnecting means capable of disconnecting air conditioning and refrigerating equipment including motor-compressors, and controllers from the circuit feeder." The disconnect switch should be selected and located within the NEC guidelines. Maximum recommended fuse sizes are given in the electrical data tables of this catalog for help in sizing the disconnect.

Terminals are provided in a unit control center for optional field hookup of the control circuit to a separate fused 115 volt power supply. A control circuit transformer is factory installed to eliminate the requirement for a separate power supply to the control circuit.

Terminals are provided in the unit control center for field hookup of the evaporator heater to either a separate 115 volt power supply or to control circuit power.

# Standard Features

## Full Factory Testing

Factory run tests with water hookups on all units prior to shipment help provide a trouble free start-up. Each unit is pressure tested, evacuated, and charged with a full operating charge of R-134a refrigerant and oil. McQuay performs extensive quality control checks and individual unit tests so that all controls are properly adjusted and operating correctly. Job site start-up and expenses are kept to a minimum as the unit is shipped ready to operate.

## Rigging

Designed for easy handling and low installation costs, the AGS air-cooled screw chillers are assembled on a rugged structural steel and painted base. The channel base distributes the unit weight for uniform low roof loading. Lifting tabs with holes are provided in the base of the unit to simplify lifting. See dimension drawing for location.

## Construction

The structural steel base and G-90 galvanized steel structural members and sheet-metal casings are painted with a corrosion-resistant 500-hour salt spray paint (passes ASTM B117). This finish enhances the appearance of the unit and deters corrosion.

## Compressors

All units feature multiple compressors with independent refrigerant circuits. The compressor is a direct drive, 3600 rpm, single-screw type with one main rotor that meshes with two diametrically opposed gaterotors. The two exactly opposed gaterotors create two exactly opposed compression cycles resulting in a well-balanced compression cycle.

Each compressor is equipped with a discharge check valve downstream of the oil separator. An optional suction service shutoff valve is available.

## Evaporator

The evaporator is a flooded, shell-and-tube type with water flowing in the tubes and refrigerant residing in the shell side. The vessel is divided into multiple refrigerant circuits, one per compressor with liquid feed in the bottom and the suction gas connection on the top.

The evaporator is constructed with a carbon steel shell and seamless high efficiency copper tubes. Roll expansion anchors the refrigerant tubes in the carbon steel end and intermediate tube sheets.

Water heads are constructed of carbon steel and are removable to permit access to the tubes from either end. For easy draining and venting of the shell, 3/8 inch vent and drain plugs are provided on the top and bottom of each head.

The evaporator is insulated with ¾ inch thick vinyl nitrate polymer sheet insulation and provided with insertion heaters to provide freeze protection down to -20°F (-29°C) ambient air temperature.

The evaporator insulation has a K factor of 0.28 at 75°F (24°C). The insulation is fitted and cemented in place. Double insulation is available as an option.

The shell side maximum working pressure is 200 psi (1379 kPa). The standard water side working pressure is 150 psi (1034 kPa) with 300 psi (2068kPa) available as an option. Victaulic connections are standard with an option for flanges. All evaporators

are designed, constructed, inspected and stamped in accordance with the requirements of the ASME Boiler and Pressure Vessel Code.

## Condenser Fans and Motors

Multiple direct-drive propeller fans operate in formed bell shaped orifices at low tip speeds for maximum static efficiency and minimum noise and vibration. Each fan is protected by a heavy-gauge, close meshed PVC coated fan guard and is positioned within the unit cabinet for maximum protection against the elements.

A heavy-duty, 3-phase TEAO motor with rain shield, VFD rated, with permanently lubricated ball bearings and inherent overload protection direct drives each condenser fan. Factory circuit breakers provide positive protection from short-circuiting.

## Condenser Coils

The condenser coils are constructed with internally enhanced seamless copper tubes arranged in a staggered row pattern and mechanically expanded into McQuay lanced and rippled aluminum fins with full fin collars. The fins have full drawn collars to completely cover the copper tube for protection against atmospheric corrosion and provide excellent heat transfer. An integral subcooler on the air inlet side provides sufficient subcooling to effectively reduce the possibility of liquid flashing and increase unit efficiency. Standard PVC coated wire mesh guards protect the coils.

## Control Centers

The AGS screw chiller is shipped with all operating and equipment protection controls, phase voltage monitor, control transformer and solid-state motor starting and protection equipment, all factory-wired, operationally tested, and ready for service. The solid-state starter provides:

| | | |
|---|---|---|
| Controlled acceleration | Electronic thermal overload | Stalled motor protection |
| Controlled deceleration | Over/under current protection | Single phase protection |
| Phase rotation protection | Current unbalance protection | High load current |

Each compressor has its own controller and control panel. This provides an important reliability feature in that if one compressor's controller should malfunction, the other compressor(s) will continue to operate normally.

The controls for each circuit are located in a weather-resistant, hinged control center, with tool-locked doors to prevent unauthorized entry. The microprocessor controllers are located in a separate box within the main panel to separate it from power wiring and components.

## Power Connections

The standard power connection arrangement is multi-point. One line to a power block on each circuit (2 or 3). No circuit breakers or disconnects.

## Microprocessor Control

The AGS chillers are equipped with the new McQuay MicroTech II™ controller, a new version of the very highly regarded MicroTech™ control family. The MicroTech II has all the features of previous controllers plus simplified Building Automation System interface with Protocol Selectability™. The control is described in more detail beginning on page 10.

# Optional Features

## Controls

### Low Ambient Head Pressure Control

Optional VFD head pressure control on first two fans permits unit operation down to 0°F (-18°C) ambient (balance of fans are staged on and off. However, since the actual minimum ambient can be dependent on wind conditions, wind baffles are also available.

### Ice Storage

The unit is equipped with control logic to handle the low temperatures associated with thermal storage applications. Additional evaporator insulation is recommended.

### Water Flow Switch

(Part Number 01750330) A water flow switch is available for field installation in the chilled water piping to protect against evaporator freeze-up under low or no flow conditions. Terminals are provided in the unit control center for field hook up of the water flow detection switch. Installation of a flow detection device is required.

### Building Automation System (BAS) Interface

This is the Protocol Selectability® option to the MicroTech II controller. The addition of this optional communications module to the standard unit controller enables the controller to communicate using standard protocols such as LonTalk®, MODBUS® and BACnet® using any of the following data link layer options: BACnet MS/TP, BACnet/IP, BACnet Ethernet or Lon Talk (FTT-10A). It is necessary to identify the data link layer that will be used when entering an order. The communications module can also be added later in the field to an existing controller.

## Electrical

### Single-Point Power Block

A single power supply to a power block mounted in a box located on the unit's frame. Each circuit is factory-wired from the box to a power block in each circuit's power panel. Includes factory wiring to a circuit breaker located in each circuit's power panel. Multiple-point power block (one circuit per compressor) is standard.

### Multi-Point w/Disconnect Switch

Separate power supply to each circuit's power panel which is equipped with a disconnect switch with a through-the-door handle. Each disconnect switch can isolate its circuit for service purposes.

### Single-Point w/ Disconnect Switch

Single power supply to a factory-mounted disconnect switch. Includes factory wiring to a circuit breaker located in each circuit's power panel.

### High- Short Circuit Current Protection

The control panel and single point connection box (if ordered) will have the high short circuit current rating as shown below.

| Unit | Standard Interrupting Circuit Breaker | | High Interrupting Circuit Breaker | |
|---|---|---|---|---|
| | Interrupting Capacity (kA) | | Interrupting Capacity (kA) | |
| | 480 V | 600 V | 480 V | 600 V |
| All | 35 | 5 | 65 | 25 |

### 115 Volt Convenience Outlet

A 10.0 amp, 115-volt convenience outlet mounted inside the control panel is available as an option on all units. The outlet is located in the #2 circuit control box.

### Ground Fault Protection

A ground fault interrupter can be provided to shut down the entire unit if a ground fault condition is sensed. Contact local sales office for connection location.

### Lightning Arrestor per Compressor

## Unit

### Black Fin Coil

Aluminum fin stock is precoated with a phenolic-epoxy coating with 1000 hour salt spray resistance (ASTM B117-90).

### Copper Fin Condenser Coils

Copper fin condenser coils are available as an option on all models.

### Baked Epoxy Condenser Coil Coating

*Electro Fin*™ flexible dip and baked epoxy protective coating with 3000+ hour salt spray resistance (ASTM B117-90) is available on the condenser coils and coil frames. Provides protection against adverse environments such as salt air as found on seacoast applications and many chemical environments. The coating can be applied to copper or aluminum coils. Consult the local McQuay sales office for complete specification and chemical resistance chart.

### Protective Base Guards

Optional factory installed wire mesh lower base guards provide protection for ground level installations. Coil guards are standard.

### Wind Baffles/Hail Guard

The presence of wind will have an adverse affect on any air-cooled chiller. Wind across a condenser coil will not allow a chiller to operate as efficiently, or possibly not even start, at low ambient temperatures. Wind in effect raises the minimum ambient temperature in which the chiller can operate. The AGS air-cooled chillers are available with field installed wind baffles which allow the chiller to operate effectively down to the ambient temperature for which it was designed.

Hail can have a damaging effect on the performance of an air-cooled condenser. As the finned area is flattened against the coil, restricting airflow, the efficiency of the coil is reduced.

If desired, the wind/hail guards can be purchased for only one side of a unit in cases where an adjacent wall provides protection.

### Fan Discharge Chimneys

Six-inch high fan discharge chimneys reduce unit sound level and reduce air recirculation in non-standard unit siting.

### Vibration Isolators

Spring vibration isolators are available for field installation under the unit base frame on sound sensitive applications. Consult the local McQuay sales office for seismic isolation.

### Water Connections

Standard connections are 150 psi victaulic. Options include 300 psi victaulic, 150 psi flanges and 300 psi flanges. The water-side is designed and constructed to ASME standards but not stamped.

### Evaporator Insulation

Double evaporator thermal insulation is available and recommended for low fluid temperature applications.

### Suction Butterfly Valve

An optional factory-mounted suction butterfly shutoff valve is available to assist in isolating the compressor for service.

### High Ambient Operation

Option required for operation between 115°F and 125°F (46°C and 52°C). Compressor loading and unloading is adaptively determined by system load, ambient air temperature and other inputs to the MicroTech control algorithms.

## Future Options

The following options will be available in the future:

- Sound reduction package including compressor enclosures
- Remote evaporator
- Variable frequency drives for all fan motors for unit operation in lower ambient temperatures.

# Limited Warranty

Consult your local McQuay Representative for warranty details. Refer to Form 933-43285Y. To find your local McQuay Representative, go to www.mcquay.com.

# Specifications

The specification is available in MSWord from the local McQuay sales office.

**SECTION 15XXX**

**AIR-COOLED ROTARY SCREW CHILLERS**

**PART 1 - GENERAL**

1.01 SUMMARY

Section includes design, performance criteria, refrigerants, controls, and installation requirements for air-cooled rotary screw packaged chillers

1.02 REFERENCES

Comply with applicable Standards/Codes of ARI 550/590, ANSI/ASHRAE 15, ASHRAE 90.1 October 2001 requirements, and ASME Section VIII.

1.03 SUBMITTALS

A. Submit shop drawings and product data in accordance with specification requirements.

B. Submittals shall include the following:

1. Dimensioned plan and elevation view drawings, required clearances, and location of all field connections.
2. Summary of all auxiliary utility requirements such as electricity, water, compressed air, etc. Summary shall indicate quality and quantity of each required utility.
3. Single line schematic drawing of the power field hookup requirements, indicating all items that are furnished.
4. Schematic diagram of control system indicating points for field connection. Diagram shall fully delineate field and factory wiring.
5. Certification of factory run test signed by company officer.
6. Installation manuals.

1.04 QUALITY ASSURANCE

A. Qualifications; Equipment manufacturer must specialize in the manufacture of the products specified and have five years experience with the equipment and refrigerant offered.

B. Regulatory Requirements: Comply with the codes and standards specified.

C. Chiller manufacturer must be ISO registered.

1.05 DELIVERY AND HANDLING

A. Chillers shall be delivered to the job site completely assembled and charged with refrigerant and oil by the manufacturer.

B. Comply with the manufacturers instructions for rigging and handling.

1.06 WARRANTY

The refrigeration equipment manufacturer's warranty shall be for a period of one year from date of equipment start up but not more than 18 months from shipment. It shall cover defects in material and workmanship having proven defective within the above period-**OR-**describe extended warranty.

**PART 2--PRODUCTS**

2.01 ACCEPTABLE MANUFACTURERS

A. McQuay International

B. (Approved Equal)

2.02 UNIT DESCRIPTION

Provide and install as shown on the plans factory assembled, factory charged with R-134a, and factory-run-tested air-cooled rotary screw compressor packaged chillers in the quantity specified. Each chiller shall consist of multiple semi-hermetic screw compressors, flooded evaporator, air-cooled condenser section, control system and all components necessary for controlled unit operation.

2.03 DESIGN REQUIREMENTS

A. General: Provide a complete rotary screw packaged chiller as specified herein and as shown on the drawings. The unit shall be in accordance with the standards referenced in section 1.02 and any local codes in effect.

B. Performance: Refer to the schedule of performance on the drawings. The chiller shall be capable of stable operation to a minimum of 12.5 percent of full load without hot gas bypass. The unit shall be capable of operating to 35°F (4.4°C) **–OR-** 0°F (-18°F) ambient air temperature. Performance shall be in accordance with ARI Standard 550/590-98.

C. Acoustics: Sound pressure levels for the units shall meet or be lower than _____dBA on the overall "A" weighted sound pressure level.

Measurements to be taken at full load at a distance of 30 feet (9.14 meters) from the side of the unit.

2.04 CHILLER COMPONENTS

A. Compressors: The compressors shall be semi-hermetic, single-screw type with one main helical rotor meshing with two opposed gaterotors. The gaterotors' contact elements shall be constructed of a composite material designed for extended life. If a twin-screw compressor is used, the manufacturer shall provide an extended 5-year parts and labor warranty covering all moving parts due to the large bearing loads inherent with this design.

Electric motors shall be two-pole, semi-hermetic, squirrel-cage induction type and cooled by suction gas.

B. Evaporator: The evaporator shall be of the flooded type with carbon steel shell, and high efficiency finned copper tubes rolled into steel tubesheets. The evaporator shall be insulated with 3/4 inch (19mm) closed cell polyurethane insulation and heated with an electric heater in both heads to help freeze protection. The evaporator shall be designed, inspected, and stamped in accordance with ASME Section VIII requirements.

C. Condenser: The condenser coils shall have seamless copper tubes mechanically bonded into plate type fins. The fins shall have full drawn collars to completely cover the tubes. A subcooling coil shall be an integral part of the main condenser coil. Condenser fans shall be propeller type arranged for vertical air discharge and individually driven by direct drive fan motors. Each fan shall be equipped with a heavy-gauge fan guard. Fan motors shall be totally enclosed, air-over, three-phase, direct-drive, 1140 rpm. Coils shall be protected by a vinyl coated, wire mesh guard.

D. Refrigerant Circuit: The unit must have refrigerant circuits completely independent of each other with one compressor per circuit. Each circuit shall include an oil separator, electronic expansion valve, compressor suction shutoff valve, discharge check valve, liquid line shutoff valves, replaceable core filter-driers, sightglass with moisture indicator and insulated suction line.

E. Unit casing and all structural members and rails shall be fabricated of continuous G90 galvanized steel and painted to meet ASTM B117 500-hour salt spray test. The control enclosure and unit panels shall be corrosion resistant painted before assembly.

F. The compressor starters shall be solid-state and contain at least, the following functions: controlled acceleration and deceleration, phase rotation protection, electronic thermal overload, over/under current protection, stalled motor protection, single phase protection, high load current, and current unbalance protection and ground fault protection.

G. Microprocessor based control system: Weatherproof control panels shall contain the field power connection points, control interlock terminals, and control system. Power and starting components shall include factory fusing of fan motors and control circuit; fan motor contactors, inherent fan motor overload protection and unit power terminal blocks for connection to remote disconnect switch. Terminals shall also be provided for power supply to the evaporator heater circuit. Hinged access doors shall be tool-lockable. Barrier panels or separate panel sections are required to protect against accidental contact with line voltage when accessing the control system.

The system shall stage the unit based on the leaving water temperature. Equipment protection functions controlled by the microprocessor shall include high discharge pressure, loss of refrigerant, loss of water flow, freeze protection, and low refrigerant pressure. Controls shall include auto/stop switch, chilled water setpoint adjustment, anti-recycle timer, and digital display with water temperature and setpoint, operating temperatures and pressures, and diagnostic messages. The following features and functions shall be included:

1. The LCD type display shall have a minimum of 4-line by 20-characters with all messages in English. Units of measure will be I-P. Coded messages and LED displays are not acceptable.
2. Critical parameters shall have their own section of control and be password protected.
3. Resetting chilled water temperature by a remote 4-20 mA signal.

4. A soft-load function to prevent the system from operating at full load during the chilled fluid pulldown period.
5. Auto restart after a power failure without an external battery back-up or auxiliary power for maintaining program memory.
6. Safety shutdowns shall be date and time stamped with system temperatures and pressures recorded. A minimum of six previous occurrences shall be kept in a revolving memory.
7. Start-to-start and stop-to-start timers to provide minimum compressor off-time with maximum motor protection.
8. Lead-lag by manual selection or automatically by circuit run hours.
9. Discharge pressure control through intelligent cycling of fans.
10. Pro-active compressor unloading in response to high discharge pressure or low evaporator pressure.
11. Continuous diagnostic checks of unit operation to provide a pre-alarm signal in advance of a shutdown allowing time for remedial action to be taken.
12. Unit controller shall be compatible with industry standard protocols through a RS485/LON/Ethernet port.

2.05 OPTIONS AND ACCESSORIES

The following options are to be included:

- Nonfused service disconnect switch, factory mounted
- Single-point power connection
- Low ambient head pressure control to 0°F (-18°C), factory mounted
- Copper fin condenser coils
- Baked epoxy condenser coating
- Black fin - precoated fin option
- Chilled water flow switch to be field mounted by contractor in the chilled water line and field wired to terminals in the control panel.
- Spring vibration isolators for field installation
- Protective welded wire lower base guards on compressor section
- 115 volt convenience outlet mounted in control panel
- Wind baffles and hail guards for field installation by installing contractor
- High fault short circuit current protection, to 65 kA at 480 volts

- Ground fault protection
- Lightning arrestor per compressor
- 300 psi water side with victaulic connections
- 150 psi water side with flanged connections
- 300 psi water side with flange connections

## PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in strict accordance with manufacturer's requirements, shop drawings, and contract documents.

B. Adjust and level chiller in alignment on supports.

C. Coordinate electrical installation with electrical contractor.

D. Coordinate controls with control contractor.

E. Provide all appurtenances required to insure a fully operational and functional chiller.

3.02 START-UP

A. Provide proper charge of refrigerant and oil.

B. Provide Authorized Factory starting of chillers, and instruction to the owner on proper operation and maintenance.

This document contains the most current product information as of this printing. For the most up-to-date product information, please go to **www.mcquay.com.**