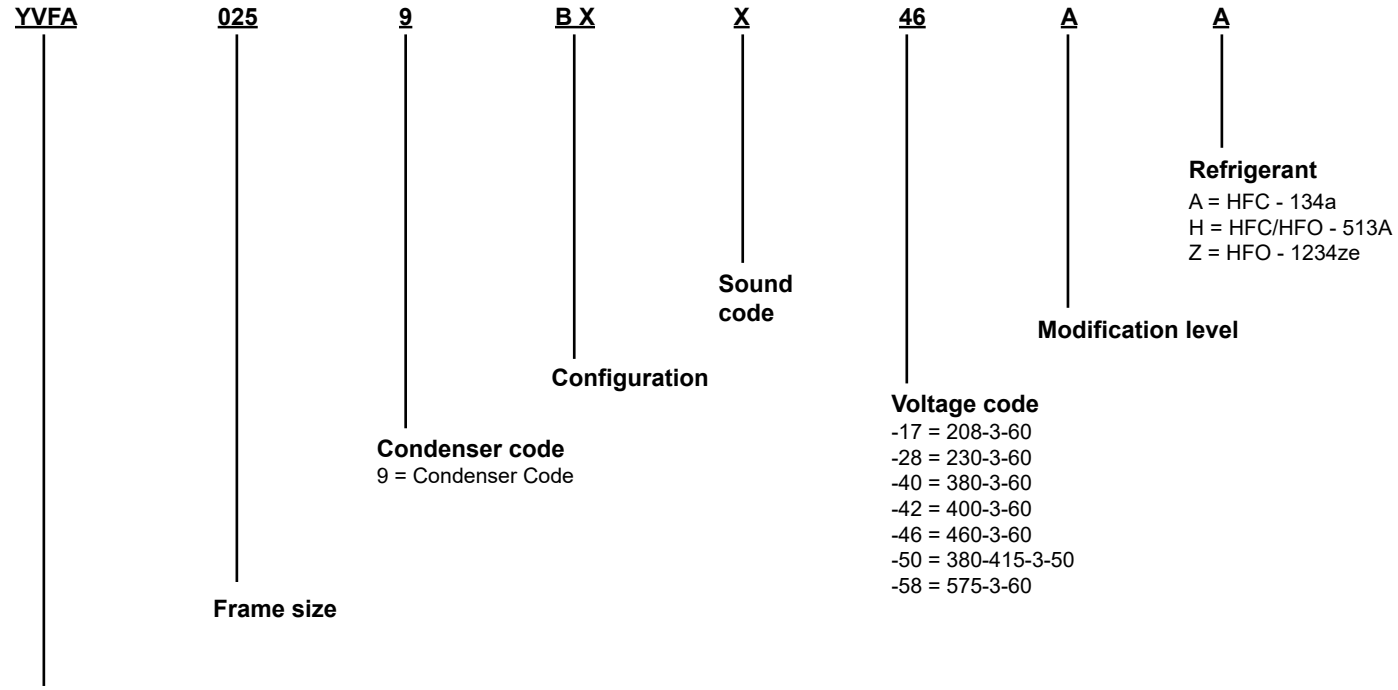
FORM 201.31-EG1 (1023)

Model YVFA
Air-Cooled Liquid Chillers with VSD Screw Compressor and Integrated Free Cooling
Style A

115 ton to 500 ton
400 kW to 1,340 kW
Two Compressor
50 Hz and 60 Hz
R-134a, R-513A, and R-1234ze

YORK®

Nomenclature



Approvals

- ASME Boiler and Pressure Vessel Code – Section VIII Division 1.
- AHRI Standard 550/590 and 551/591.
- UL 1995 – Heating and Cooling Equipment
- UL 60335-2-40
- AHRI 370 – Sound Rating of Large Outdoor Refrigerating and Air Conditioning Equipment
- ANSI/NFPA Standard 70 – National Electrical Code (NEC)
- ASHRAE 15 – Safety Code for Mechanical Refrigeration
- ASHRAE Guideline 3 – Reducing Emission of Halogenated Refrigerants in Refrigeration and Air-Conditioning Equipment and Systems
- NEC – National Electrical Code
- OSHA – Occupational Safety and Health Act

Due to the configurability of this product, images contained in this document are illustrations and may not represent a specific unit.

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Introduction

The YORK YVFA Free-Cooling, Air-Cooled Screw Chiller delivers the lowest possible operating cost by combining superior engineering and technology in a packaged design that's simple to own and operate. Advanced technologies including a variable speed drive (VSD) compressor, energy optimized hybrid cooling mode and air to liquid free cooling coils designed by our heat transfer experts are intelligently controlled to maximize efficiency year-round, automatically. YORK, the leader in air cooled chillers with VSD compressors, continues a legacy of innovation with the first integrated VSD screw chiller with free cooling.

Allows YVFA compressors to operate efficiently across all cooling load and ambient temperature conditions.

Efficiency

Industry-leading VSD technology: allows YVFA compressors to operate efficiently across all cooling load and ambient temperature conditions.

High-efficiency, air-to-liquid free-cooling coils: reduce or eliminate the need for mechanical cooling when ambient conditions allow. Plus, the free-cooling coils are integrated within a traditional chiller footprint to conserve space.

Intelligent controls: optimize operation year-round, constantly evaluating conditions and controlling bypass valves to reduce pump energy when free cooling is not beneficial.

Performance is assured by AHRI certification: the first time certification has been given to an air-cooled screw chiller with free cooling.

Annual energy cost (AEC) report verifies payback in as little as three years: to confirm that your chiller selection delivers the smallest possible energy footprint, we use AEC modeling to produce a customized report factoring in all key variables, such as geographic location, building type, operating hours, utility costs and local weather data. In most locations, a facility operating 24/7 with a constant cooling load can achieve an operating cost payback within three or four years. Our AHRI-certified testing laboratory can demonstrate performance under your application's conditions.

Hybrid mode uses advanced technologies: for unsurpassed efficiency at part-load conditions. The VSD screw compressor can turn down capacity to reduce power draw below the power required by fan motors to move air. At part-load conditions, the chiller uses optimized hybrid mode with free-cooling coils to provide pre-cooling, with the compressor efficiently delivering the final cooling to meet the setpoint.

Optimized liquid circuit prevents wasted pump energy: designed with low liquid pressure drop in mind, the YVFA chiller employs oversized pipe and fittings, a highly optimized free cooling coil, and an automatic bypass to prevent pumping through the coils when not beneficial.

Introduction (cont'd)

Simplicity

Packaged controls include single-point convenience

YVFA controls simplify operation with single-point control that easily accommodates process or building changes. When a new setpoint is required, adjustment can be made at the chiller control panel or through a Building Automation System (BAS). The free-cooling function automatically adjusts to deliver the best performance at the required conditions.

Open-loop unit design maximizes free cooling

The YVFA open-loop unit design permits building glycol to flow through the free-cooling coils directly, providing the best performance at the lowest first cost.

Reliability

Three generations of Johnson Controls expertise in VSD, air-cooled chillers ensure superior efficiency and reliability in the YVFA design. Variable-frequency inverter technology enables a zero-inrush soft start and a high displacement power factor across the entire operating range. For critical process and data center applications, the Quick Start option achieves full load after a power-loss restart in 4 min or less. On the jobsite, all YVFA models fit within a standard 40 ft shipping container for lowest possible rigging and shipping costs.

Unit overview

Semi-hermetic YORK twin screw compressors

The direct-drive, semi-hermetic rotary twin-screw compressors incorporate advanced technology in a rugged design. The continuous function, microprocessor controlled VSD provides smooth capacity control from 100% down to 10% of chiller capacity. State-of-the-art technology, obtained from decades of screw compressor design, ensures optimal efficiencies at all chiller load points. With no unloading steps or slide valves in the compressors, the YVFA VSD compressors have 50% fewer moving parts than fixed-speed compressors with slide valves. The YVFA compressor is one of the most efficient and reliable screw compressors in the industry.

Free-cooling economizer

YVFA is the first VSD screw chiller to include integrated free cooling economizer coils. The free cooling coils eject heat directly to the atmosphere when ambient temperature permits, reducing mechanical cooling requirement and saving energy. The free cooling economizer coils are round tube, plate fin design, delivering a low liquid-side pressure drop to reduce pump energy and providing a robust design that can accommodate small particle debris from the building liquid loop without clogging. Coils are two-row depth and circuited to make draining for service easy. The coils are factory piped to the evaporator, providing simple single-point inlet and outlet connections to the unit. A pair of factory-mounted, unit-powered and controlled butterfly valves divert liquid to the economizer when ambient is suitable for free cooling. The coils are bypassed during high ambient to avoid an unnecessary pressure drop and reduce pump energy.

Evaporator

The evaporator is a shell and tube, hybrid falling film type heat exchanger. It contains a balance of flooded and falling film technology to optimize efficiency, minimize refrigerant charge, and maintain reliable control. A specially designed distribution system provides uniform refrigerant flow for optimum performance.

Condenser

YVFA uses microchannel condenser heat exchangers, which provide excellent heat transfer and airflow for the best efficiency while operating mechanical cooling. Charge quantity is reduced up to 30% compared to traditional round tube condenser coils and the heat exchangers are single-row depth for simple rinse cleaning. Microchannel coils are made of a single material to avoid galvanic corrosion due to dissimilar metals. Tubes, fins, and headers are brazed as one piece, minimizing leaks. The inherently rugged construction, which includes non-overhanging fins, eliminates the possibility of fin damage.

The condenser fans are composed of corrosion resistant aluminum hub and glass-fiber reinforced polypropylene composite blades molded into a low-noise airfoil section. All blades are statically and dynamically balanced for vibration-free operation. Fan motors are totally enclosed air-over (TEAO), inverter duty, IP54 rated, and current protected. Standard VSDs reduce energy use and sound at part load while maximizing condenser and economizer heat transfer performance. The motors feature double-sealed and permanently lubricated ball bearings, reducing maintenance costs over the life of the unit.

Unit overview (cont'd)

Refrigerant circuit

The YVFA has one independent refrigerant circuit for each compressor. Each circuit uses copper refrigerant pipe formed on computer-controlled bending machines. By using computer-aided technology, over 60% of the system piping brazed joints are eliminated when compared with designs that use fittings, resulting in a highly reliable and leak-resistant system.

Complete factory package

Each unit is shipped as a complete factory package, completely assembled with all interconnecting refrigerant piping and internal wiring, ready for field installation. Before shipping, each individual chiller undergoes an extensive testing procedure, ensuring workmanship is the highest quality and that the initial start-up is trouble-free.

Before leaving the factory, each refrigerant circuit is factory pressure tested, evacuated, and then fully charged with refrigerant and oil. Units selected with R-1234ze may optionally ship less refrigerant and with a nitrogen holding charge. An operational test is performed with water flowing through the evaporator to ensure each circuit functions correctly.

Electrical

All controls and motor starting equipment necessary for unit operation are factory wired and function tested, ensuring that the unit starts up correctly from the first use.

The chillers are available with a single-point power connection and are supplied with a factory mounted and wired control transformer that powers all unit controls from the main unit power supply. The transformer uses scheduled line voltage on the primary side and provides 115 V/1Ø on secondary. The standard unit is equipped with terminal block electrical connections. All exposed power wiring is routed through liquid-tight, UV-stabilized, non-metallic conduit. Selection of frame 36 and larger are standard dual point, with single-point option.

VSD power, or control panel, includes main power connections, VSD and fan motor contactors, current overloads, and factory wiring. Use the keypad and control display access door to access all display and control features, eliminating the need to open the main cabinet doors.

Building automation system capabilities

The YVFA is available with optional factory-installed interface card, SQ-EQUIP, which is required for connection with Johnson Controls Connected Services for BACnet, Modbus, N2, or LON communication protocols. You must install additional field-provided hardware, such as the SC-AP access point, remotely from the chiller interface using the Connected Services remote operations center. Contact your local Johnson Controls office to learn more about Connected Services and to schedule installation during chiller commissioning.

Unit overview (cont'd)

AHRI certification program

YORK YVFA chillers have been tested and certified by Air-Conditioning, Heating and Refrigeration Institute (AHRI) in accordance with the latest edition of AHRI Standard 550/590 (I-P). Under this certification program, chillers are regularly tested in strict compliance with this standard. This provides an independent, third-party verification of chiller performance. Refer to the AHRI site at www.ahrinet.org/ for complete Program Scope, Inclusions, and Exclusions as some options listed herein fall outside the scope of the AHRI certification program. For verification of certification, go to the AHRI Directory at www.ahridirectory.org.

Rated in accordance with the latest issuance of AHRI Standard 550/590 and 551/591.

YVFA units conform with the following European Directives:

- Machinery Directive (2006/42/EC)
- EMC Directive (2004/108/EC)
- Pressure Equipment Directive (97/23/CEE)
- Safety Code for Mechanical Refrigeration EN 378- 2 (2008)/A2(2012) [Safety accessories according to essential requirements in PED paragraph 2.11.1 have been calculated according to EN13136:2001/A1:2005 and are not following the requirements in EN378-2:2008 paragraph 6.2.6.2, unless dual relief valves are fitted]
- Safety of machinery - Electrical Equipment of Machine (EN 60204-1)
- Generic emissions and immunity standards for industrial environment EN61000-6-4:2007 & 61000- 6-2:2005
- ISO 9614 – Determination of sound power levels of noise sources using sound intensity
- ECO Design Directive (2009/125/EC) Fan/motor Efficiency EN ISO 5801
- Manufactured in an EN ISO 9001 accredited organization
- Conform to CE Testing Services for construction of chillers and provide CE Listed Mark

Unit overview (cont'd)

Off-design performance

Because the majority of operating hours are spent at off-design conditions, choose a chiller not only to meet the full load design, but also for its ability to perform efficiently at lower loads. It is not uncommon for chillers with the same full load efficiency to have an operating cost difference of over 10% due to differences in off-design (part load) efficiencies.

Calculate the annual energy cost quickly and accurately by computer using simple inputs of geographic location, building a load profile, and operating hours. For a facility with higher operating hours and load profile than comfort cooling, annual energy cost must be considered when comparing overall performance of mechanical and economizer operation.

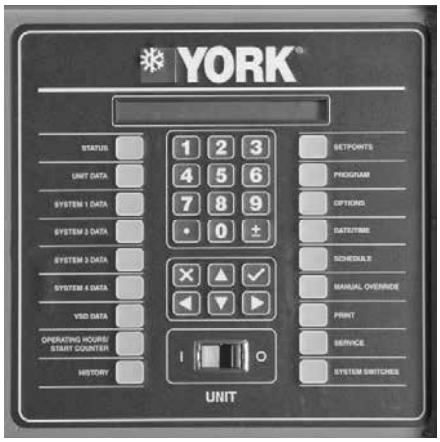
In addition to annual energy cost, YVFA ratings also include Integrated part load value (IPLV) and non-standard part load value (NPLV), standardized within the AHRI Certification Program. These values do not include economizer operation, as this is outside the scope of the AHRI program.

YVFA control center

Unit control center

The unit control center provides automatic control of chiller operation including compressor start/stop and load/unload anti-recycle timers, condenser fans, chilled liquid pump, evaporator heater, unit alarm contacts and run signal contacts. The microcomputer control center comes online as soon as the main power switch on the unit is switched on. Immediately, the microcomputer control center begins to continuously monitor all variables.

Figure 1: YVFA control center keypad and display



LD19911

The microprocessor controls the unit's capacity by matching the actual leaving chilled liquid temperature (LCHLT) to the user-defined setpoint. Factors that may cause the system's actual LCHLT to fluctuate are changes in ambient temperature, load, and chilled liquid loop flow rate and volume. The controls system reacts to such changes by adjusting the number of compressors that are on and the loading of each compressor in order to keep the LCHLT at the setpoint.

The controls system logic monitors the rate at which the LCWT is approaching the setpoint to ramp up or down compressor capacity as required. The variable frequency drive allows the compressor capacity to match the load.

During extreme or unusual conditions, for example blocked condenser coils, or ambient above scheduled maximum, the chiller control system avoids shutdown by varying capacity. By monitoring motor current and suction and discharge pressures, the chiller can maintain maximum available cooling output without shutting down.

Unit Safeties are provided for the chiller to perform auto-reset shut down for the following conditions:

- Ambient temperature above or below allowable range
- Out of range leaving chilled liquid temperature
- Under voltage
- Flow switch operation

YVFA control center (cont'd)

Display data

- Leaving chilled liquid temperature
- Returning liquid temperature
- Ambient temperature
- Lead system
- Compressor capacity (% of full load amps)
- VSD output frequency/compressor speed
- Compressor run hours
- Compressor number of starts
- Oil pressure and temperature (for each compressor)
- Chilled liquid pump status
- Evaporator heater status
- History data for last 20 normal shutdowns
- History data for last ten shutdown faults

Programmable setpoints

- Chiller on/off
- Chilled liquid (water or glycol)
- Local or remote control
- Units of measure (Imperial or SI)
- System lead/lag
- Remote temperature reset
- Remote current limit
- Leaving chilled liquid temperature setpoint and range

Accessories and options

All options factory mounted unless otherwise noted.

Free cooling circuit type

The standard YVFA design permits the building liquid loop to circulate through the free cooling coils when ambient temperature is low enough to provide energy savings. Glycol is required in the building loop to prevent freeze damage from occurring in the free cooling coils at low ambient temperatures.

Closed-loop option: The closed loop option isolates the free cooling coils from the building liquid loop by use of a brazed plate heat exchanger and circulating pump that moves glycol through the free cooling coils. This permits water to be used on the building loop. The brazed plate heat exchanger is protected by factory installed unit powered heaters. The free cooling glycol pump is controlled and powered by the chiller to operate when ambient temperature is low enough to provide energy savings. This option also includes evaporator water box heaters, powered by the chiller. Factory installed, unit powered heat trace on the internal water pipework completes freeze protection for the entire chiller to -20F / -28.9C. The glycol loop can be selected to have either 30% or 50% propylene or ethylene glycol. Units shipping by closed container must specify container ready or factory container load options to ensure unit is equipped with additional glycol expansion tanks required for high temperature storage.

Sound attenuation

Low noise kits: The standard chiller configuration is equipped with variable speed, high airflow fans. There are several sound attenuation options available to further reduce sound at its source thereby meeting local sound level regulations.

Condenser coil protection

The alloys used in the YVFA microchannel condenser and economizer coils are carefully selected and tested for high corrosion resistance. However, all metals can corrode in harsh conditions. Consider protecting coils from corrosive environments such as coastal, marine, urban, and industrial.

Environment guard premium: Microchannel condenser coils coated with an electro-deposited and baked flexible epoxy coating that is finished with a polyurethane UV resistant top-coat.

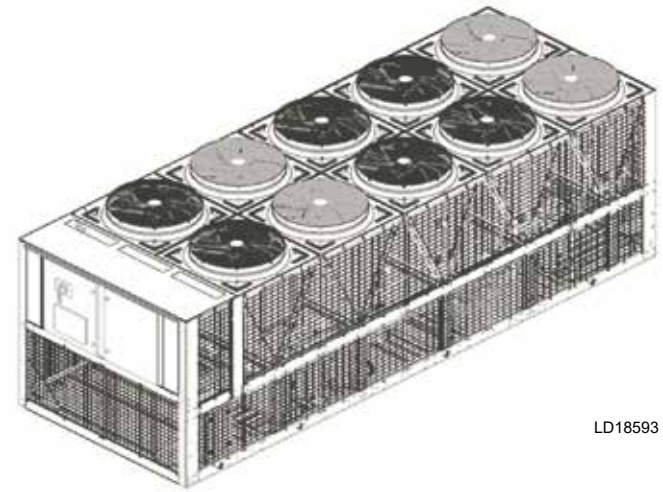
Environment guard basic: Microchannel condenser coils treated with immersion bath-applied chemical treatment.

Accessories and options (cont'd)

Protective chiller panels

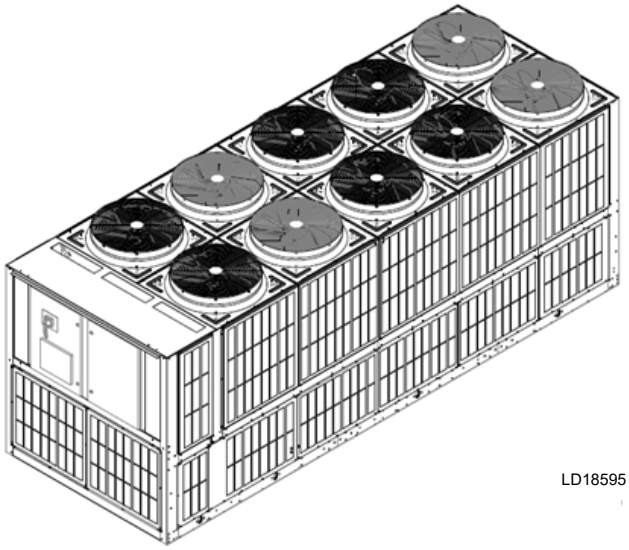
Wire panels: Heavy-gauge, welded-wire-mesh guards mounted on the exterior of the full unit. The guards are coated to prevent corrosion with a UV stabilized material. The wire panels protect condenser coil faces and prevent unauthorized access to refrigerant components (compressors, pipes, evaporator, and so on), yet provide free air flow. This can cut installation cost by eliminating the need for separate, expensive fencing. See Figure 2.

Figure 2: Full unit wire panels



Louvered panels: Louvered panels, painted the same color as the unit, enclose the unit to visually screen and protect the coils as well as prevent unauthorized access to internal components. Also available as a condenser-only option. See Figure 3.

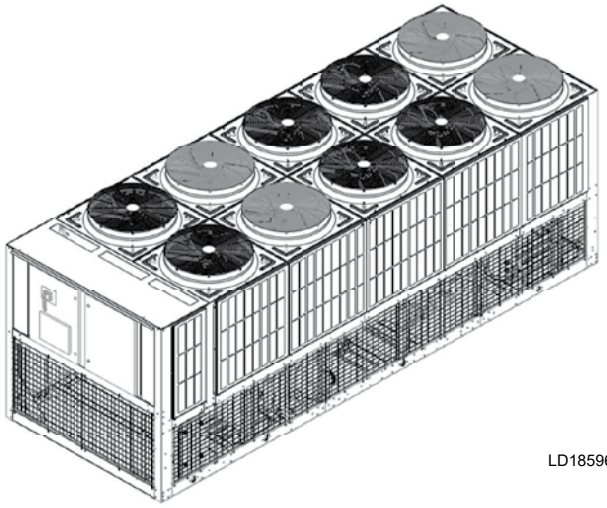
Figure 3: Full unit louvered panels



Accessories and options (cont'd)

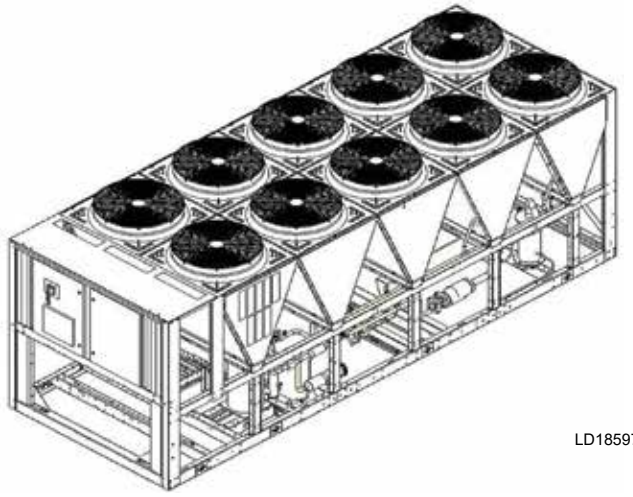
Louvered or wire panels combination: Louvered panels, painted the same color as the unit, are mounted on external condenser coil faces. Heavy gauge, welded wire-mesh panels, coated to resist corrosion with a UV stabilized material, are mounted around base of machine to restrict unauthorized access. See Figure 4.

Figure 4: Louvered/Wire panels combination



V-Guard panels: Solid panels, painted the same color as the unit, are installed along the sides of the units to cover exposed piping within the condenser section without impacting airflow. These guard panels can be combined with End Hail Guard option for additional protection from flying debris. See Figure 5.

Figure 5: V-guard option



Accessories and options (cont'd)

Evaporator options

Flange kit: Provides contractor with the couplings best suited to connect the chiller to the chilled liquid piping. All flanges are ANSI 150 psig (10.3 barg). Field mounted. Options include:

- **ANSI/AWWA C-606 flanges:** Two flanges, for applications where field piping has existing flanges
- **Weld flanges:** Four flanges, two ANSI/AWWA C-606 connections to chiller and two weld flanges for field piping

Water box immersion heater: Unless an appropriate freeze protection fluid is used in the chilled fluid circuit, optional water box heaters are required if the chiller is exposed to environments that reach ambient temperatures below 0°F (-17.8°C). When the water box heaters are operated along with other required freeze protection protocols, they protect the evaporator from freeze damage in ambient temperatures down to -20ºF (-28.9ºC). A separate, customer-supplied 120 V/60 Hz or 230 V/50 Hz single phase power supply is required to provide power to the water box heaters. In order to control the operation of the water box heaters, continuous power must be provided to the chiller control panel. See the *Application Data* section for requirements for protection against freeze damage.

Controls options

Building automation system interface (temperature): Factory installed option to accept a 4 to 20 mA or a 0 to 10 VDC input to allow remote reset of the Leaving Chilled Liquid Temperature Setpoint. The setpoint can be positively offset upwards up to 40°F (22.2°C). This option is useful for process applications or for periods where higher chilled liquid temperatures are adequate for low loads. Available alone or in combination with BAS Load Limit.

Building automation system interface (load limit): Factory installed option to accept a 4 to 20 mA or a 0 to 10 VDC input to allow remote reset of the Load Limit Setpoint. The setpoint can limit system demand from 30-100%. Available alone or in combination with BAS Temperature Reset.

General options

Thermal dispersion flow switch: Solid state thermal dispersion flow switch with no moving parts for high reliability and long service life. Stainless steel probe and IP 67 housing with LED status indicator of flow and output condition. Includes 10m IP67 cable required for field installation near chiller and bronzed steel welding adapter to ensure correct insertion depth. **Field mounted.**

Differential pressure switch: This 3 psig to 45 psig (0.2 barg to 3 barg) range switch, with 1/4 in. NPTE pressure connections, is an alternative to the paddle-type flow switch. **Field mounted**.

Accessories and options (cont'd)

Service isolation valve: You can add a compressor suction service isolation valve to each refrigerant circuit on the unit.

Chicago code relief valve: Special relief valves per Chicago code.

Dual pressure relief valve: Two safety relief valves are mounted in parallel; one is always operational to assist in valve replacement during maintenance.

Pressure vessel options: The evaporator can be provided with ASME, PED or GB pressure vessel codes certification.

Circuit breaker: Unit-mounted circuit breaker(s) with external lockable handle(s) are supplied to isolate the power voltage for servicing. The circuit breaker(s) is (are) sized to provide motor branch circuit protection, short circuit protection and ground fault protection for the motor branch-circuit conductors, the motor control apparatus, and the motors.

Quick start: Special software allows the chiller to achieve full capacity within 4 min of power being restored. Designed for process and data center applications where recovering liquid temperature control rapidly after power loss is especially critical. Not recommended for comfort cooling applications as chiller may temporarily reach liquid temperature below set point while ramping quickly to achieve full load.

Non-fused disconnect switch: Unit-mounted disconnect switch(es) with external lockable handle can be supplied to isolate the unit power voltage for servicing. Separate external fusing must be supplied by the power wiring, which must comply with local codes.

Special requirement documents: There are two options to select from:

- Special Requirement Document Package (SRDP) includes Pressure Vessel Report, Unit Run Test Report, Production System Check Sheet, and Final Unit Inspection Check Sheet.
- Materials Package includes steel mill material reports for vessels in addition to the SRDP.

Vibration isolation

Elastomeric isolation: This option is recommended for normal installations. It provides very good performance in most applications for the least cost. **Field mounted.**

1 in. spring isolators: Spring and cage type isolators for mounting under the unit base rails are available to support unit. They are level adjustable. 1 in. nominal deflection may vary slightly by application. **Field mounted.**

Refrigerant flow diagram

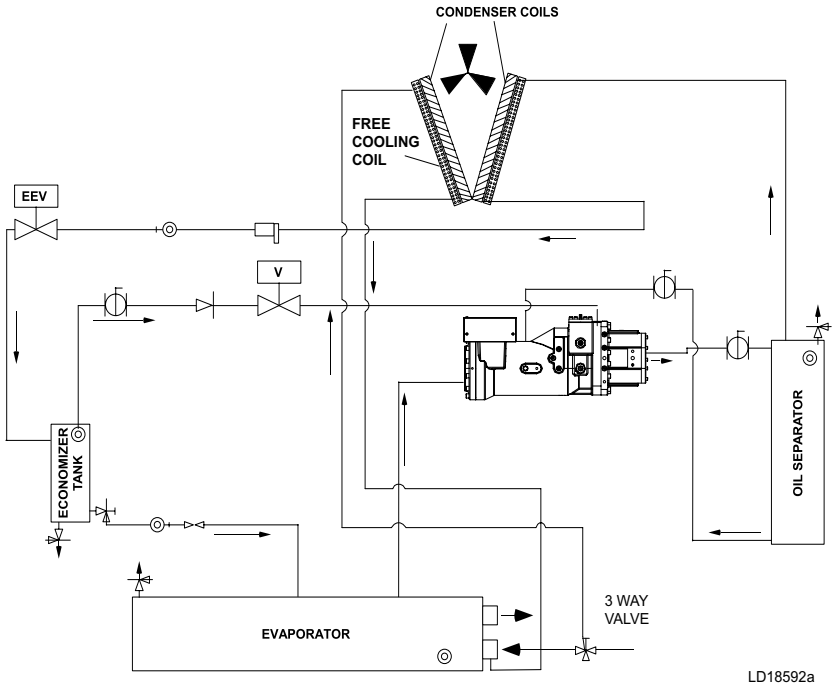
Low pressure refrigerant (liquid and gas) enters the evaporator and is sprayed across the top of the tube bundle from spray nozzles. The liquid refrigerant from the nozzles gravity drains down across the tube bundle and is evaporated and superheated by the heat energy absorbed from the chilled liquid passing through the tubes.

The low pressure refrigerant vapor leaves the top of the evaporator and enters the compressor where the refrigerant vapor is compressed and the pressure and superheat are increased. The high-pressure superheated gas enters the air-cooled condenser where heat is rejected through the condenser coils and fans.

The fully condensed and sub-cooled liquid leaves the air cooled condenser, flows through the filter drier and enters the economizer tank. The flow of refrigerant into the economizer is controlled by the electronic expansion valve.

Additional cooling of the refrigerant liquid may take place in the economizer tank when the economizer valve is opened. After leaving the economizer tank, liquid refrigerant flows through an orifice where pressure reduction and further cooling take place. The low pressure refrigerant (liquid and gas) then enters the evaporator.

Figure 6: Refrigerant flow



symbol	YVFA system components
	Electronic Expansion Valve
	Ball Valve
	Relief Valve
	Stop Valve Angle, Access
	Replacement Core Filter/Dryer
	Sight Glass
	Orifice
	Check Valve
	Valve

Application data

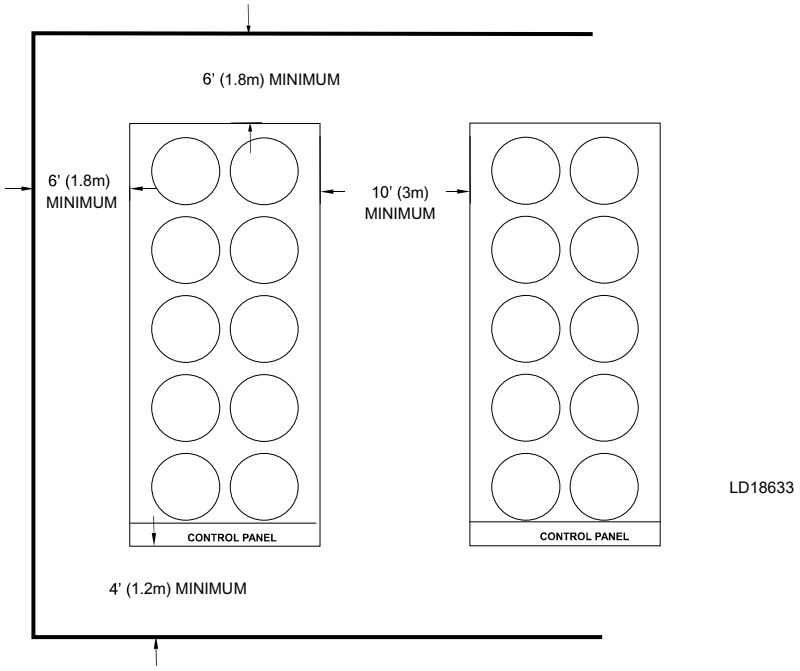
Unit sizing

Avoid over-sizing a chiller. Correctly sized chillers operate stably and provide the best life cycle cost. When designing phased projects, select multiple small chillers to match demand for each phase. Use multiple small chillers when the minimum cooling demand is less than 10% of the maximum cooling demand.

Unit location

The YVFA chillers are designed for outdoor installation. To achieve optimum performance and trouble-free service provide adequate space around chillers (see Figure 7).

Figure 7: Acceptable minimum clearances around/between unit(s) for correct airflow



When selecting chiller installation sites, follow these requirements:

- Installation sites can be either on a roof or on ground level. See *Foundation*.
- Provide space for air to flow into condensers as shown in Dimensions on page 18. Restricted airflow or hot air recirculation diminish performance. Johnson Controls unit controls optimize the operation without nuisance high pressure safety cutouts; however, the system designer MUST consider potential performance degradation. Recommended clearances for all units are as follows:
    - Access to the unit control center stipulates the unit is no higher than on spring isolators.

Application data (cont'd)

- Recommended minimum clearances:
  - Side to wall: 6 ft (1.8 m)
  - Rear to wall: 6 ft (1.8 m)
  - Control panel end to wall: 4 ft (1.2 m)
  - Top: no obstructions whatsoever
  - Distance between adjacent units: 10 ft (3 m)
- Ensure that no more than one wall around the chiller yard is higher than the chillers.

- Avoid locations near windows or structures where normal operating sounds may be objectionable.
- The condenser fans are propeller-type and are not recommended for use with duct-work, filters, or other impediments to airflow in the condenser air stream.
- When obstructions to airflow exist, they must not add more than 0.1 in. external static pressure.
- Protection against corrosive environments is available by ordering the units with cured epoxy-coating on the condenser microchannel. If installing any units by the seashore, where salt spray may hit the units, or where acid rain is prevalent, use epoxy-coated coils.
- On installations where winter operation is intended and snow accumulations are expected, additional elevation must be provided to insure normal condenser air flow.
- Provide adequate space for tubes to be removed from evaporator. For clearances, contact your nearest Johnson Controls Sales Office.

Foundation

Mount units on a flat and level foundation, ground or roof, capable of supporting the entire operating weight of the equipment. Contact your nearest Johnson Controls Sales Office for shipping and operating weights.

Roof locations: Provide structure to safely support the entire weight of the unit and service personnel. Do not damage the roof during installation. If the roof is of bonded construction, consult a building contractor or architect for special installation requirements. Use spring isolators to minimize vibration transmission into building structure. Provide additional structural support at the spring-isolator locations.

Ground locations: Units must be installed on a substantial base that does not settle and cause strain on the refrigerant lines, resulting in possible leaks. A one-piece concrete slab, with footers extending below the frost line is recommended. Do not tie the slab to the main building foundation as operational noise can telegraph. Mounting holes (5/8 in.) are provided in the base rails for bolting the unit to its foundation. See *Isolator Locations on Page 19* for location of the mounting holes.

For ground installations, take precautions to protect the unit from tampering by, or injury to, unauthorized persons. Fasteners on access panels prevent casual tampering; however, further safety precautions such as unit enclosure options, a fenced-in enclosure, or locking devices on the panels may be advisable. Check local authorities for safety regulations.

Application data (cont'd)

Seismic applications: Avoid installing chillers on springs or roofs where earthquakes are a risk. Springs and roofs amplify earthquake forces. Rigidly mounting chillers to ground level concrete pads is typically the best option for earthquake zones. Contact Johnson Controls equipment specialists for help with projects that have seismic requirements.

Chilled liquid piping

Design the chilled liquid piping system so that the circulating pump discharges into the chiller inlet piping. The inlet and outlet liquid connections are given in *Figure 14 on page 31*. Hand stop valves are recommended in all lines to facilitate servicing. Provide drain connections at low points to permit complete drainage of the chiller and system piping.

The chiller must be protected by a strainer, preferably of 16 mesh, fitted as close as possible to the liquid inlet connection, and provided with a means of local isolation.

The chiller must not be exposed to flushing velocities or debris released during flushing. It is recommended that a suitably sized bypass and valve arrangement is installed to allow flushing of the piping system. The bypass can be used during maintenance to isolate the chiller without disrupting flow to other units.

Pressure-gauge connections are recommended for installation in the inlet and outlet liquid lines. Gauges are not provided with the unit and are to be furnished by others.

A flow switch is available as an accessory on all units. A flow switch must be installed in the leaving liquid piping of the chiller and must not be used to start and stop the unit.

Wrap chilled liquid lines exposed to the weather with a supplemental heater cable and insulated, or add glycol to the chilled liquid to protect against freezing if low-ambient periods are expected.

Freeze damage protection

Failure to follow the required freeze protection protocols can void the factory warranty.

The YVFA is designed for use with appropriate glycol concentration to prevent freezing during a power loss. If the YVFA is exposed to subfreezing ambient temperatures at any time during its life, it is critical to protect against freeze damage. To prevent evaporator freeze damage, follow protocol A, B, or C:

A. Freeze protection fluid: Use an appropriate freeze protection fluid selected for the lowest possible ambient temperature in the chilled fluid circuit.

B. Drain the evaporator: To completely drain the fluid in the evaporator, complete the following steps

1. Remove the power to the water box heaters.
2. Close the chilled fluid circuit isolation valves.
3. Drain the chilled fluid from the evaporator.
4. Leave the evaporator drain valves open.

Application data (cont'd)

C. Pumps flow fluid through the evaporator: Chilled fluid circuit valves must remain open and pumps must continuously flow fluid through the evaporator when the ambient air temperature is below 36°F (2.2°C). Fluid flow through the evaporator protects against freeze damage in ambient air temperatures down to 0°F (-17.8°C). Fluid flow through the evaporator plus the operation of the water box immersion heaters protects against freeze damage in ambient air temperatures down to -20°F (-28.9°C). After wiring the available dry contacts, the YVFA control logic can send a signal to turn on the chilled fluid circuit pumps when conditions could result in freeze damage. Ensure there is continuous power supply to the chiller control panel and the chilled fluid circuit pumps so that water flow is provided through the evaporator and that the heaters have power. If you cannot guarantee continuous power to the heaters and the minimum flow rate through the evaporator, then follow protocol A or B.

Application data (cont'd)

Chiller control of chilled fluid circuit pumps

This evaporator pump control routine is designed to provide freeze protection to the chiller evaporator tubes when exposed to low ambient during the time the chiller is not running. The purpose of activating the evaporator pump in low ambient conditions is to bring the warmer building liquid temperature into the evaporator, thus preventing freeze and increasing suction pressure. See unit IOM for installation details.

Mimimum liquid volume

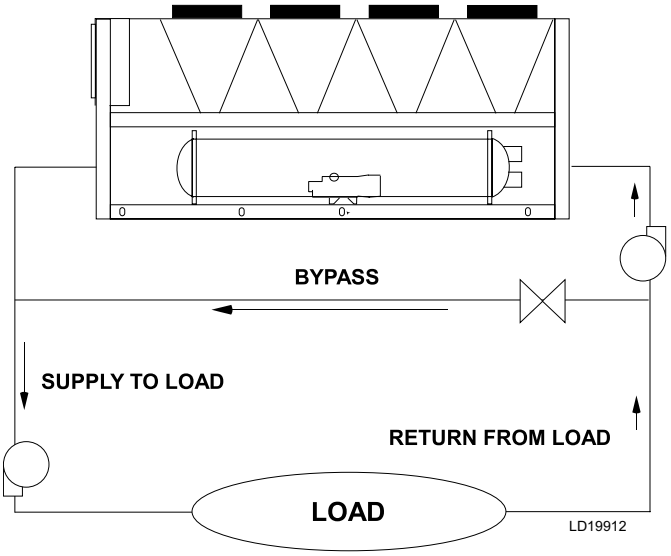
It is good practice to include as much liquid volume as possible in a chilled liquid loop. This increases the thermal mass and Flywheel effect within the system (that is, the more the better) which in turn promotes stable liquid temperature control and increases reliability by reducing compressor cycling.

For air conditioning applications, a minimum of 3 gal/ton (3.2 L/cooling kW) is recommended. It is preferred that the gal/ton ratio be within the 5 gal/ton to 8 gal/ton (5.4 L/cooling kW) to 8.6 L/cooling kW) range for constant flow rate chilled liquid systems. See *Variable primary flow* for recommendations for VPF systems. For process applications, a minimum of 6 gal/ton (6.5 L/cooling kW) ratio is recommended with preference towards a range of 7 gal/ton to 11 gal/ton (7.5 L/cooling kW to 11.8 L/cooling kW). Install a tank or increase pipe sizes to provide sufficient liquid volume.

Leaving liquid temperature out of range

The YVFA chiller line has a maximum leaving liquid temperature of 70°F (21.1°C), though the maximum allowable leaving liquid temperature may be higher for models using CTS170 compressors or R-1234ze. Some process applications require a chilled liquid temperature higher than what the chiller provides. In those applications, a simple piping change can remove the problem. By using a mixture of chiller-cooled liquid and returning process liquid, the chilled liquid entering the process can be held at the desired temperature. A tank can also be used to meet high leaving liquid temperature requirements. See *Figure 8*.

Figure 8: Leaving liquid temperature out of range suggested layout



Application data (cont'd)

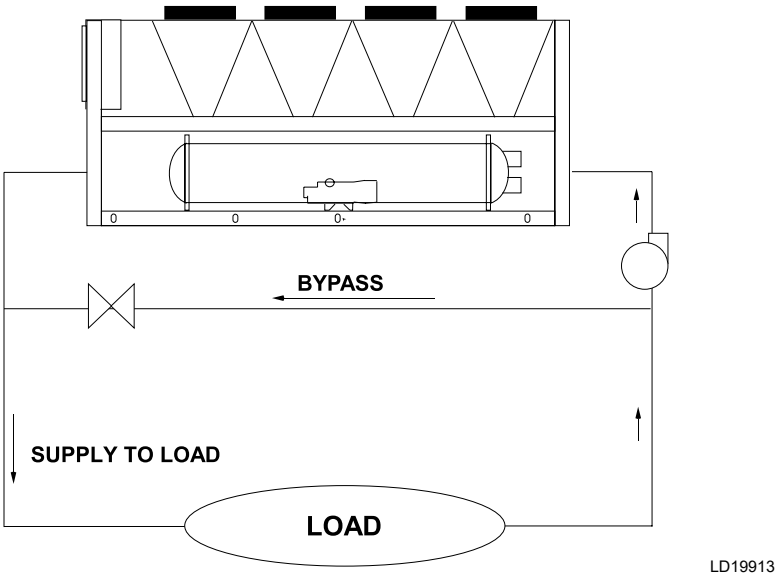
Flow rate out of range

Each YVFA chiller has a minimum and maximum flow rate. Some process applications require a flow rate that is out of range for the evaporator. In those applications, a piping change can remove the problem.

In applications where the required flow rate is less than the evaporator's minimum allowable, the chilled liquid can be recirculated to the chiller. See *Figure 9*.

In applications where the required flow rate is greater than the evaporator's maximum allowable, the chilled liquid can be recirculated to the load see *Figure 9*.

Figure 9: Suggested layout for applications with a flow rate greater than the maximum allowable flow rate



Variable primary flow

Johnson Controls recommends a maximum 10% a minute flow rate of change, based on design flow, for variable primary flow applications. 8 gal to 10 gal for each chiller ton (8.6 L to 10.8 L a cooling kW) is recommended for the system liquid volume. Insufficient system volume and rapid flow changes can cause control problems or can even cause chiller shutdowns. There are many other design issues to evaluate with variable primary flow systems. Consult your Johnson Controls Sales Office for more information about successfully applying YVFA chillers.

Physical data

Microchannel coil, English (SI)

The data shown in this table is applicable to selected typical configurations. Other configurations are available through our configuration selection software. Contact your nearest Johnson Controls Sales Office for the chiller configuration that best matches your specific needs.

Table 1: Open-loop physical data, R-134a and R-513A

Open loop								
YVFA model number	**0159/0539**	**0209/0709**	**0259/0889**	**0289/1009**	**0309/1069**	**0359/1239**	**0409/1419**	**0459/1589**
Evaporators								
Min. flow rate, gpm (L/s)	250 (16)	200 (13)	300 (19)	410 (26)	410 (26)	410 (26)	470 (30)	550 (35)
Max. flow rate glycol, gpm (L/s)	580 (37)	700 (44)	810 (51)	925 (58)	925 (58)	1,040 (66)	1,160 (73)	1,160 (73)
Inlet/outlet diameter in. (mm)	6 (154)	6 (154)	6 (154)	8 (219)	8 (219)	8 (219)	8 (219)	8 (219)
Compressors								
Type	Semi-hermetic screw							
Number of circuits	2							
Number of compressors	2							
Refrigerant type	R-134a, R-513A							
Refrigerant charge, lb (kg)	190/190 (86/86)	190/170 (86/78)	250/225 (114/102)	270/270 (123/123)	310/265 (141/121)	310/310 (141/141)	420/345 (191/156)	365/390 (166/177)
Oil charge, gal (L)	2.2/2.2 (8.4/8.4)	2.6/2.1 (9.9/8.0)	2.9/2.8 (11.1/10.6)	3.1/3.1 (11.8/11.8)	3.8/3.1 (14.4/11.8)	3.8/3.8 (14.4/14.4)	4.0/4.0 (15.1/15.1)	4.0/4.0 (15.1/15.1)
Condenser fans								
Number of fans or coils, circuit No.1 / circuit No.2	5/5	7/5	8/6	8/8	9/7	9/9	12/8	10/10
Fan power, 50 Hz (kW)	30	36	42	48	48	54	60	60
Fan power, 60 HZ (kW)	26	31	36	42	42	47	52	52
Air flow, CFM (50 Hz units)	121,360	145,632	169,904	194,176	194,176	218,448	242,720	242,720
Air flow, m³/s (50 Hz units)	57.3	68.7	80.2	91.6	91.6	103.1	114.6	114.6
Air flow, CFM (60 Hz units)	122,500	147,000	171,500	196,000	196,000	220,500	245,000	245,000
Air flow, m³/s (60 Hz units)	57.8	69.4	80.9	92.5	92.5	104.1	115.6	115.6
Shipping data								
Unit length, in. (mm)	247.2 (6,278.9)	291.2 (7396.5)	335.2 (8514.1)	379.2 (9631.7)	379.2 (9631.7)	423.1 (10,747)	467.1 (11,864)	467.1 (11,864)
Unit width, in. (mm)	88.3 (2,242.8)	88.3 (2,242.8)	88.3 (2,242.8)	88.3 (2,242.8)	88.3 (2,242.8)	88.3 (2,242.8)	88.3 (2,242.8)	88.3 (2,242.8)
Unit height, in. (mm)	94.6 (2,402.8)	94.6 (2,402.8)	94.6 (2,402.8)	94.6 (2,402.8)	94.6 (2,402.8)	94.6 (2,402.8)	94.6 (2,402.8)	94.6 (2,402.8)
Shipping weight, lb (kg)	15,757 (7,147)	17,190 (7,797)	21,039 (9,543)	24,130 (10,945)	24,224 (10,988)	26,463 (12,003)	28,536 (12,944)	33,486 (15,189)
Operation weight, lb (kg)	16,975 (7,700)	18,615 (8,444)	22,907 (10,390)	26,689 (12,106)	26,424 (11,986)	29,155 (13,224)	31,153 (14,131)	36,671 (16,634)

Physical data (cont'd)

Table 2: Open-loop physical data, R-1234ze

Open loop			
YVFA model	**0159/0539**	**0209/0709**	**0259/0889**
Evaporators			
Min. flow rate, gpm (L/s)	410 (25.9)	470 (29.6)	550 (34.7)
Max. flow rate glycol, gpm (L/s)	1,040 (65.6)	1,160 (73.2)	1,160 (73.2)
Inlet/outlet diameter, in. (mm)	8 (219)	8 (219)	8 (219)
Compressors			
Type	Semi-hermetic screw		
Circuit No.	2		
Compressor No.	2		
Refrigerant type	R-1234ze		
Refrigerant charge, R-1234ze, lb (kg)	300/300 (136/136)	406/334 184/151)	353/377 (160/171)
Oil charge, YORK LZ, gal (L)	3.8/3.8 (14.4/14.4)	4.0/4.0 (15.1/15.1)	4.0/4.0 (15.1/15.1)
Condenser fans			
No. of fans = No. of coils	9/9	12/8	10/10
Fan power, kW (50 Hz units)	48.0	58.4	60.7
Fan power, kW (60 Hz units)	43.5	52.9	54.8
Air flow, CFM (50 Hz units)	208,741	239,536	242,720
Air flow, m^3/s (50 Hz units)	98.5	113.0	114.6
Air flow, CFM (60 Hz units)	210,890	242,104	245,000
Air flow, m^3/s (60 Hz units)	99.5	114.3	115.6
Shipping data			
Unit length, in. (mm)	247.2 (6,278.9)	291.2 (7,396.5)	335.2 (8,514.1)
Unit width, in. (mm)	88.3 (2242.8)	88.3 (2242.8)	88.3 (2242.8)
Unit height, in. (mm)	94.6 (2,402.8)	94.6 (2,402.8)	94.6 (2,402.8)
Shipping weight, lb (kg)	15,757 (7,147)	17,190 (7,797)	21,039 (9,543)
Operation weight, lb (kg)	16,975 (7,700)	18,615 (8,444)	22,907 (10,390)

Physical data (cont'd)

Table 3: Closed-loop physical data, R-134a and R-513A

Closed loop								
YVFA model number	**0159/0539**	**0209/0709**	**0259/0889**	**0289/1009**	**0309/1069**	**0359/1239**	**0409/1419**	**0459/1589**
Evaporators								
Min. flow rate, gpm (L/s)	250 (16)	250 (16)	300 (19)	410 (26)	410 (26)	420 (27)	480 (30)	550 (35)
Max. flow rate glycol, gpm (L/s)	650 (41)	700 (44)	800 (51)	1,300 (82)	1,300 (82)	1,400 (88)	1,560 (98)	1,560 (98)
FC loop glycol volume, gallons (L)	148 (560)	152 (575)	197 (746)	286 (1,083)	285 (1,079)	333 (1,272)	378 (1,431)	380 (1,438)
Inlet/outlet diameter in. (mm)	6 (154)	6 (154)	6 (154)	8 (219)	8 (224)	8 (219)	8 (219)	8 (219)
Compressors								
Type	Semi-hermetic screw							
Number of circuits	2.0							
Number of compressors	2							
Refrigerant type	R-134a, R-513A							
Refrigerant charge, lb (kg)	190/190 (86/86)	190/170 (86/78)	250/225 (114/102)	270/270 (123/123)	310/265 (141/121)	310/310 (141/141)	420/345 (191/156)	365/390 (166/177)
Oil charge, gal (L)	2.2/2.2 (8.3/8.3)	2.6/2.1 (9.9/8.0)	2.9/2.8 (11.1/10.6)	3.0/3.0 (11.4/11.4)	3.8/3.1 (14.4/11.7)	3.8/3.8 (14.4/14.4)	4.0/4.0 (15.1/15.1)	4.0/4.0 (15.1/15.1)
Condenser fans								
No. of fans = No. of coils	5/5	7/5	8/6	8/8	9/7	9/9	12/8	10/10
Fan power, 50 Hz (kW)	30.0	36.0	42.0	48.0	48.0	54.0	60.0	60.0
Fan power, 60 HZ (kW)	26	31	36	42	42	47	52	52
Air flow, CFM (50 Hz units)	121,360	145,632	169,904	194,176	194,176	218,448	242,720	242,720
Air flow, m^3/s (50 Hz units)	57.3	68.7	80.2	91.6	91.6	103.1	114.6	114.6
Air flow, CFM (60 Hz units)	122,500	147,000	171,500	196,000	196,000	220,500	245,000	245,000
Air flow, m^3/s (60 Hz units)	57.8	69.4	80.9	92.5	92.5	104.1	115.6	115.6
Shipping data								
Unit length, in. (mm)	247.2 (6,278.9)	291.2 (7396.5)	335.2 (8514.1)	379.2 (9631.7)	379.2 (9631.7)	423.1 (10,747)	467.1 (11,864)	467.1 (11,864)
Unit width, in. (mm)	88.3 (2,242.8)	88.3 (2,242.8)	88.3 (2,242.8)	88.3 (2,242.8)	88.3 (2,242.8)	88.3 (2,242.8)	88.3 (2,242.8)	88.3 (2,242.8)
Unit height, in. (mm)	94.6 (2,402.8)	94.6 (2,402.8)	94.6 (2,402.8)	94.6 (2,402.8)	94.6 (2,402.8)	94.6 (2,402.8)	94.6 (2,402.8)	94.6 (2,402.8)
Shipping weight, lb (kg)	19,788 (8,976)	21,411 (9,712)	27,243 (12,357)	31,990 (14,510)	32,029 (14,528)	36,145 (16,395)	38,785 (17,593)	45,232 (20,517)
Operation weight, lb (kg)	20,540 (9,317)	22,073 (10,012)	28,260 (12,819)	33,595 (15,238)	33,634 (15,256)	37,591 (17,051)	40,349 (18,302)	47,458 (21,527)

Notes:

1. Shipping and operating weights shown are for base unit. Selected options may add weight to unit. Contact your nearest Johnson Controls Sales office for weight data.
2. For leaving liquid temperature below 40°F (4.4°C) or above 60°F (15.6°C), contact your nearest Johnson Controls Sales Office for application requirements.

Physical data (cont'd)

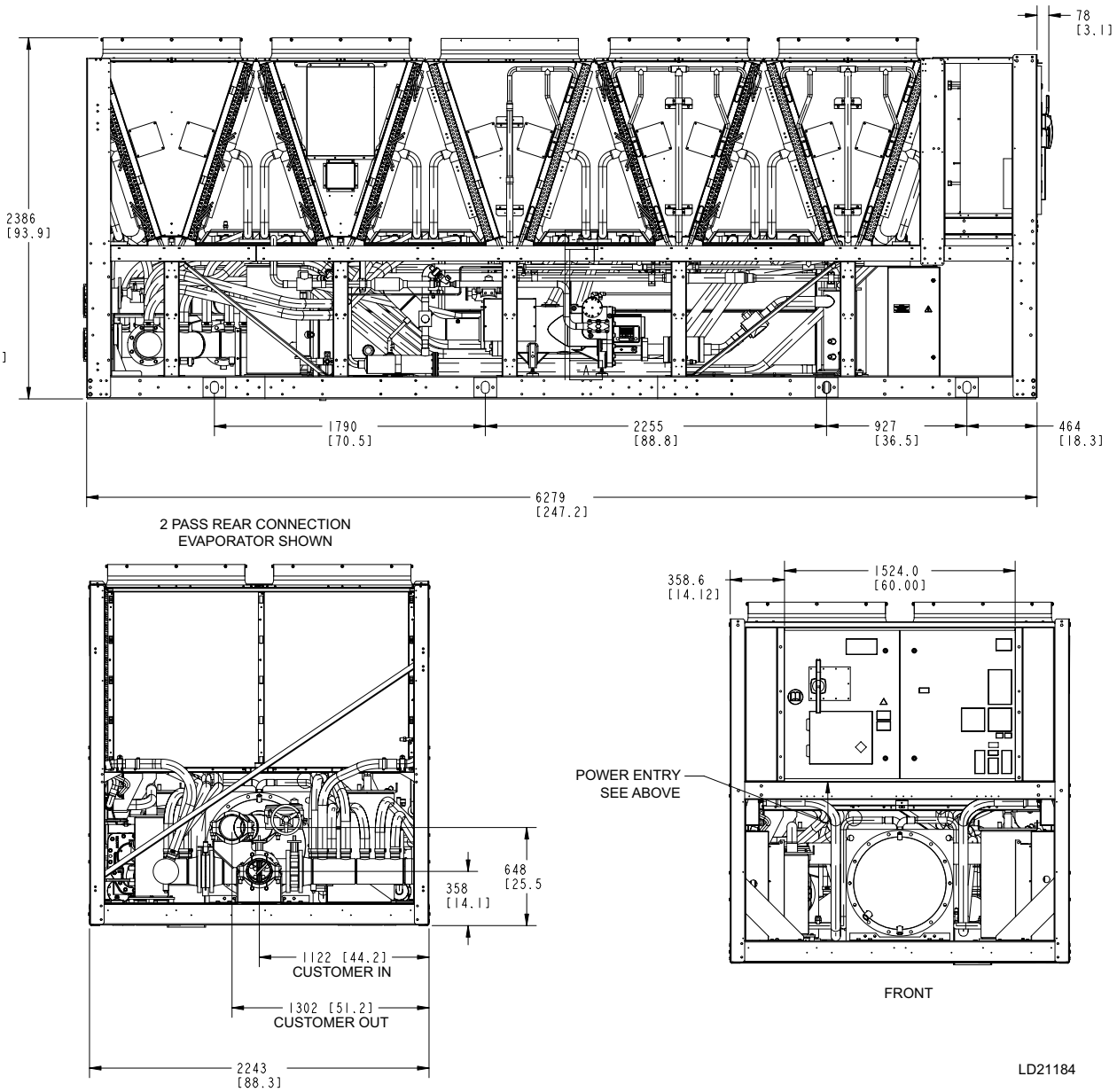
Table 4: Closed-loop physical data, R-1234ze

Closed loop			
YVFA model number	**0359/1239**	**0409/1419**	**0459/1589**
Evaporators			
Min. flow rate, gpm (L/s)	420 (26.5)	480 (30.3)	550 (34.7)
Max. flow rate glycol, gpm (L/s)	1,400 (88.3)	1,560 (98.4)	1,560 (98.4)
FC loop glycol volume, gal (L)	333 (1,272)	378 (1,431)	380 (1,438)
Inlet/outlet diameter in. (mm)	8 (219)	8 (219)	8 (219)
Compressors			
Type	Semi-hermetic screw		
Number of circuits	2		
Number of compressors	2		
Refrigerant type	R-1234ze		
Refrigerant charge, lb (kg)	300/300 (136/136)	406/334 (184/151)	353/377 (160/171)
Oil charge, gal (L)	3.8/3.8 (14.4/14.4)	4.0/4.0 (15.1/15.1)	4.0/4.0 (15.1/15.1)
Condenser fans			
Number of fans or coils, circuit No.1 / circuit No.2	9/9	12/8	10/10
Fan power, 50 Hz (kW)	48.0	58.4	60.7
Fan power, 60 HZ (kW)	43.5	52.9	54.8
Air flow, CFM (50 Hz units)	208,741	239,536	242,720
Air flow, m^3/s (50 Hz units)	98.5	113.0	114.6
Air flow, CFM (60 Hz units)	210,890	242,104	245,000
Air flow, m^3/s (60 Hz units)	99.5	114.3	115.6
Shipping data			
Unit length, in. (mm)	423.1 (10,747)	467.1 (11,864)	467.1 (11,864)
Unit width, in. (mm)	88.3 (2242.8)	88.3 (2242.8)	88.3 (2242.8)
Unit height, in. (mm)	94.6 (2,402.8)	94.6 (2,402.8)	94.6 (2,402.8)
Shipping weight, lb (kg)	36,145 (16,395)	38,785 (17,593)	45,232 (20,517)
Operation weight, lb (kg)	37,591 (17,051)	40,349 (18,302)	47,458 (21,527)

Physical data (cont'd)

YVFA0159 and YVFA0539 unit dimensions, open-loop option

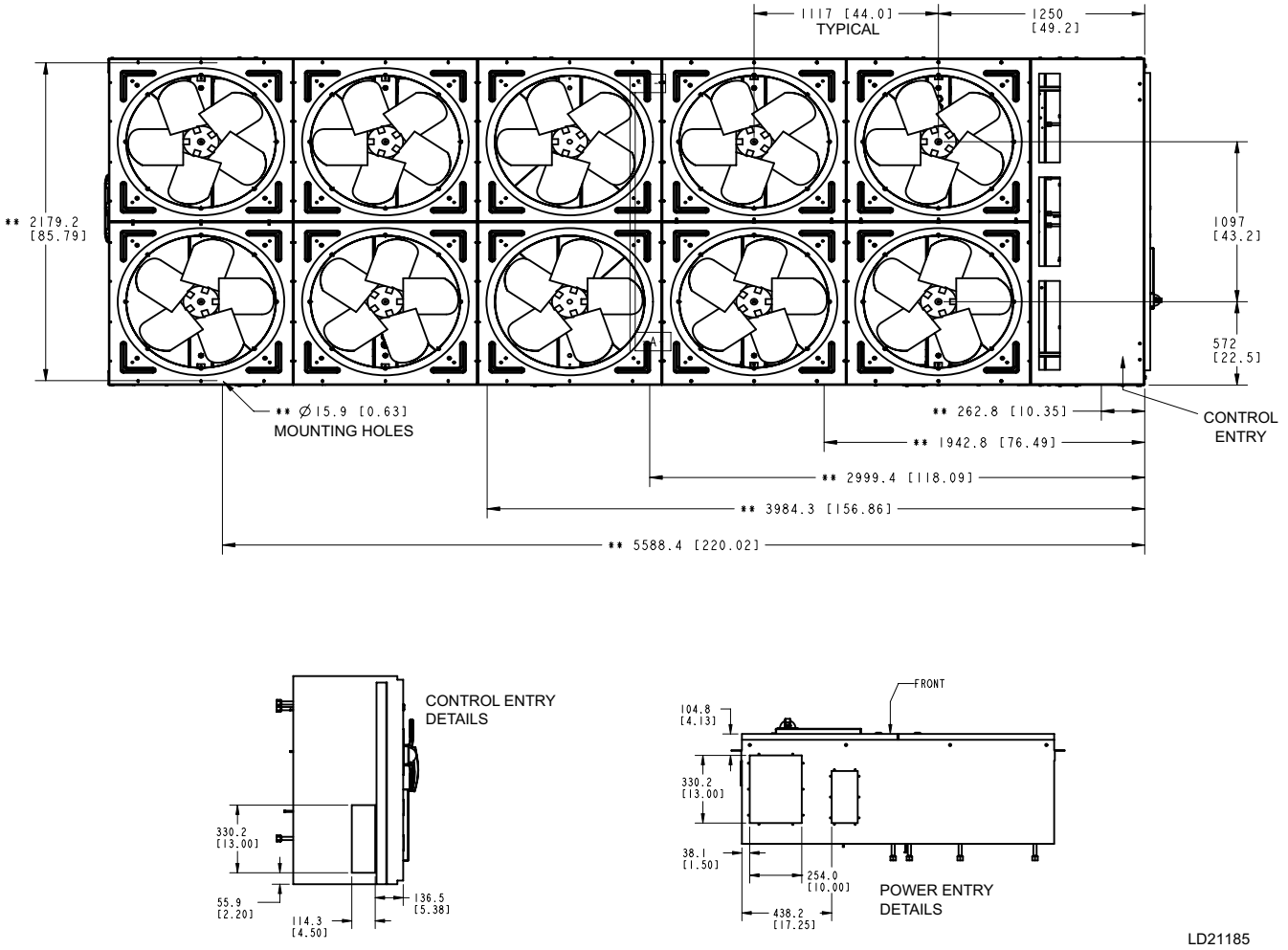
Figure 10: YVFA0159 and YVFA0539 unit dimensions, open-loop option



Physical data (cont'd)

YVFA0159 and YVFA0539 unit dimensions, open-loop option

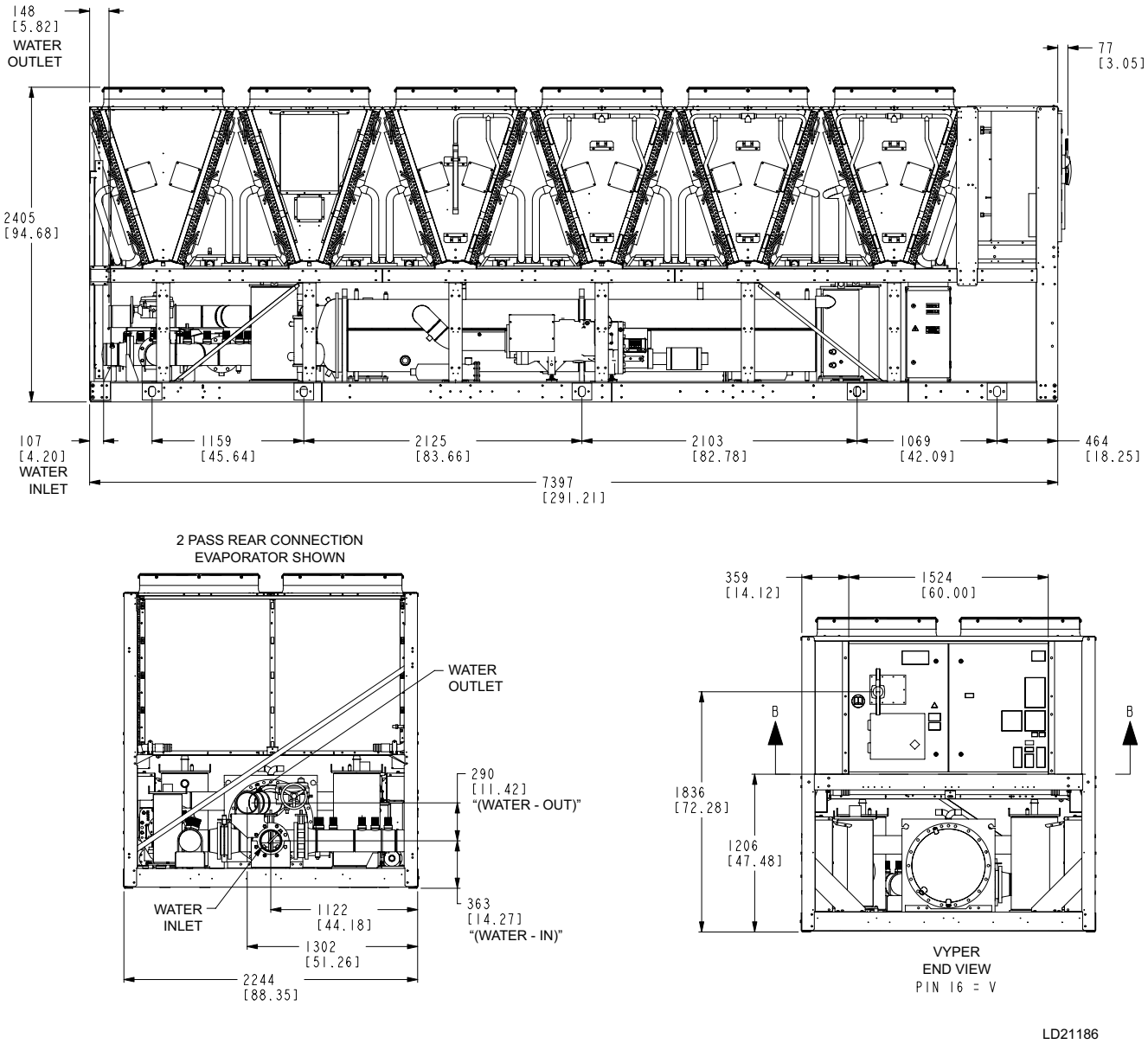
Figure 11: YVFA0159 and YVFA0539 unit dimensions, open-loop option



Physical data (cont'd)

YVFA0209 and YVFA0709 unit dimensions, open-loop option

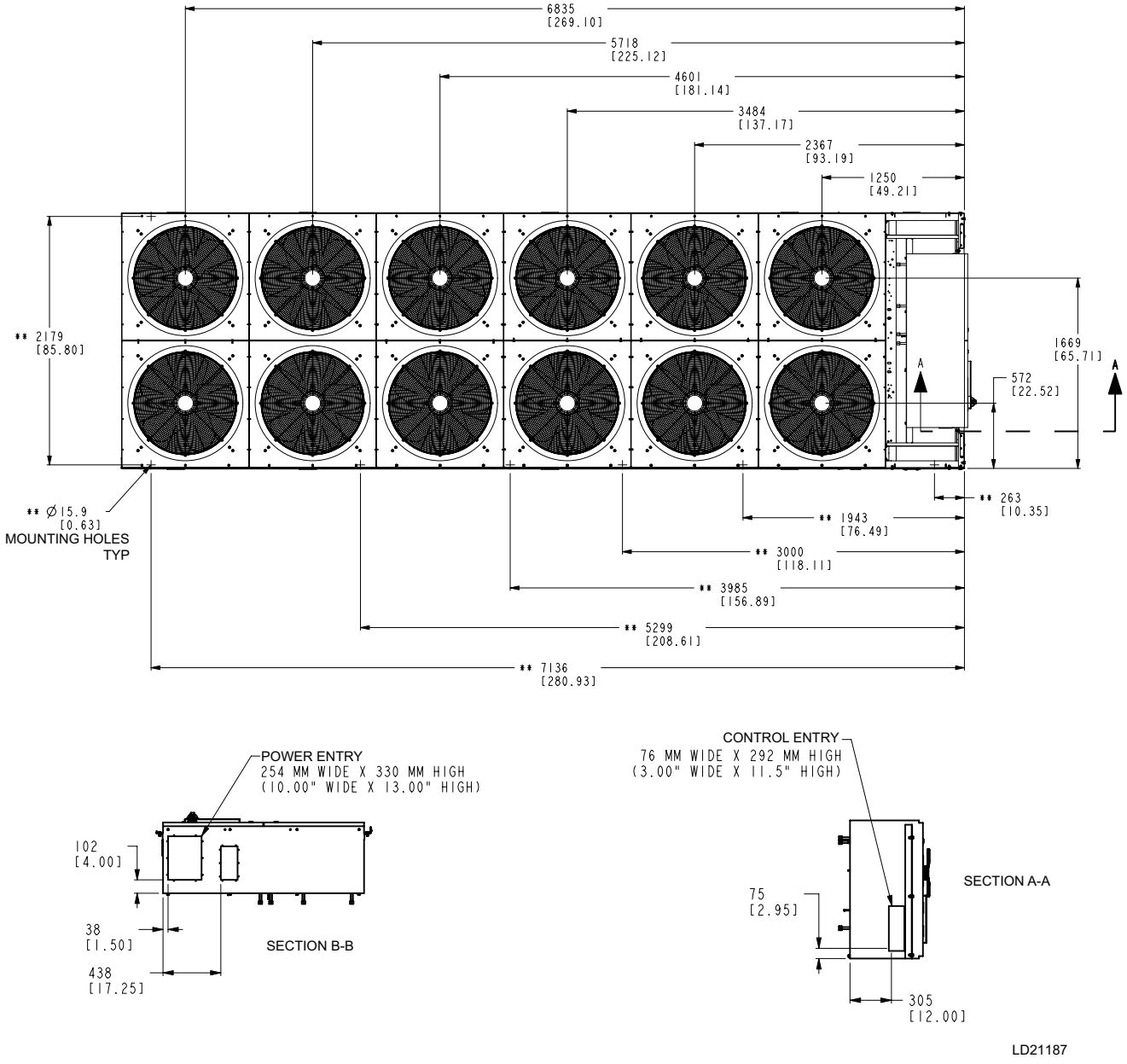
Figure 12: YVFA0209 and YVFA0709 unit dimensions, open-loop option



Physical data (cont'd)

YVFA0209 and YVFA0709 unit dimensions, open-loop option

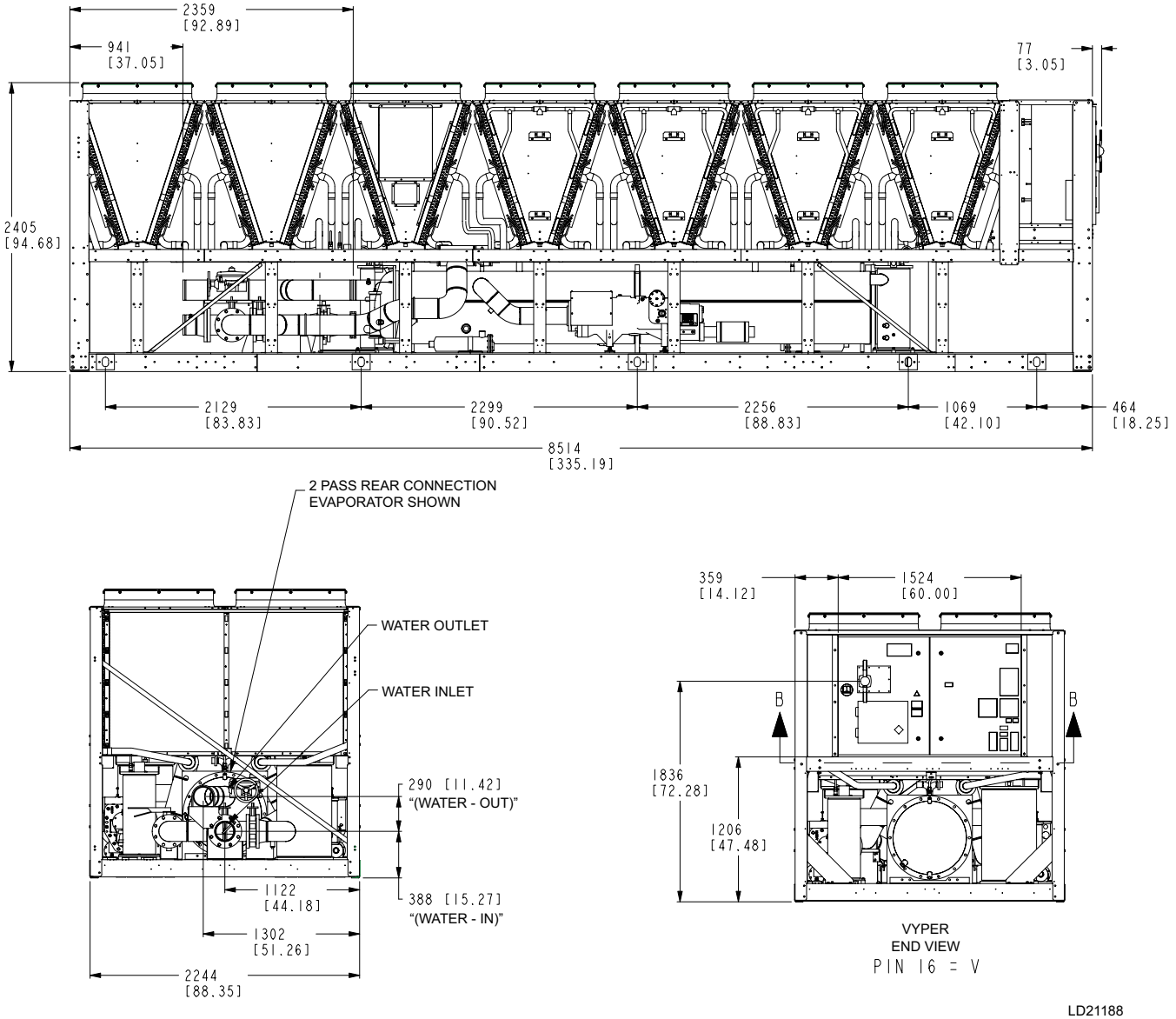
Figure 13: YVFA0209 and YVFA0709 unit dimensions, open-loop option



Physical data (cont'd)

YVFA0259 and YVFA0889 unit dimensions, open-loop option

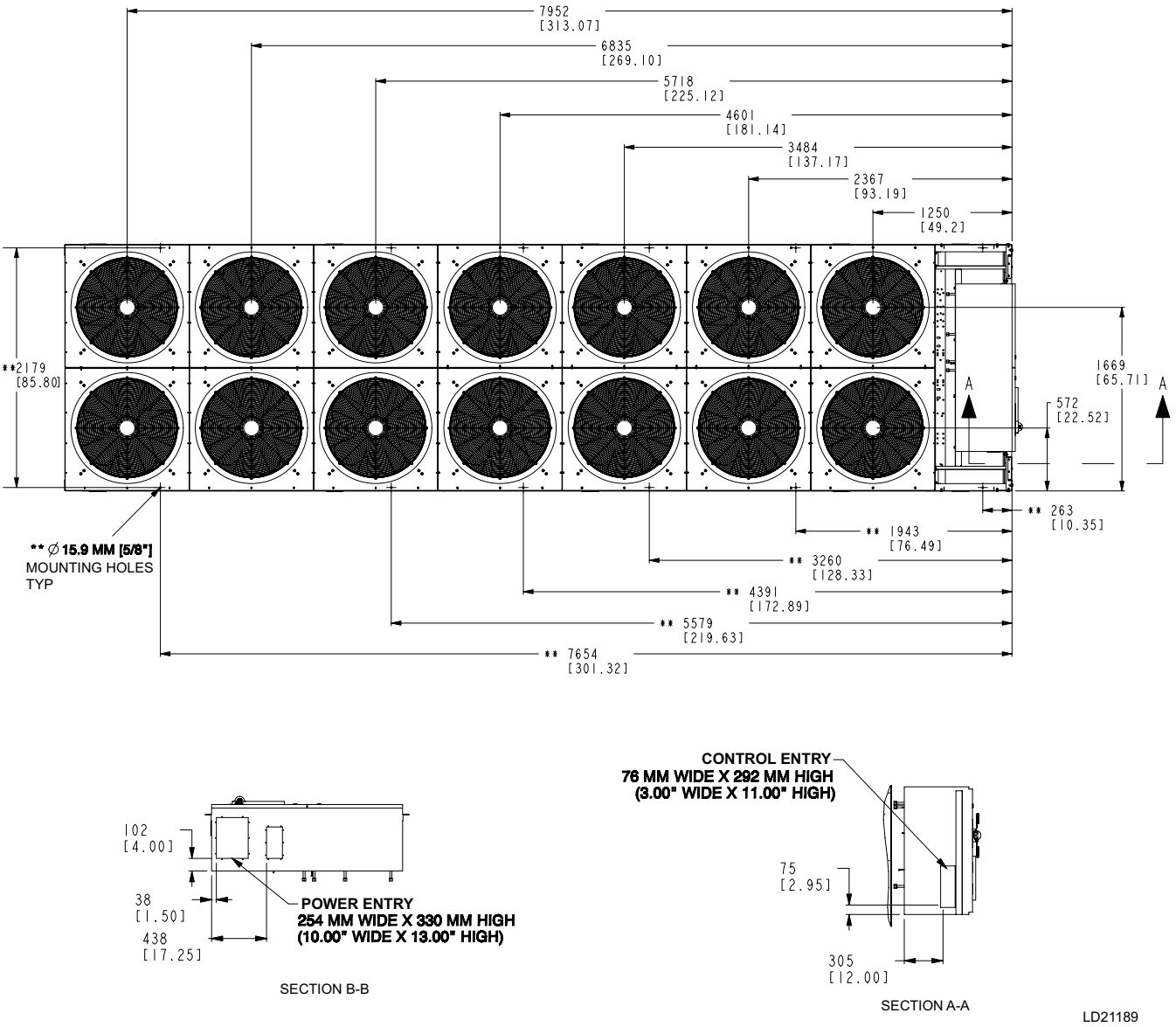
Figure 14: YVFA0259 and YVFA0889 unit dimensions, open-loop option



Physical data (cont'd)

YVFA0259 and YVFA0889 unit dimensions, open-loop option

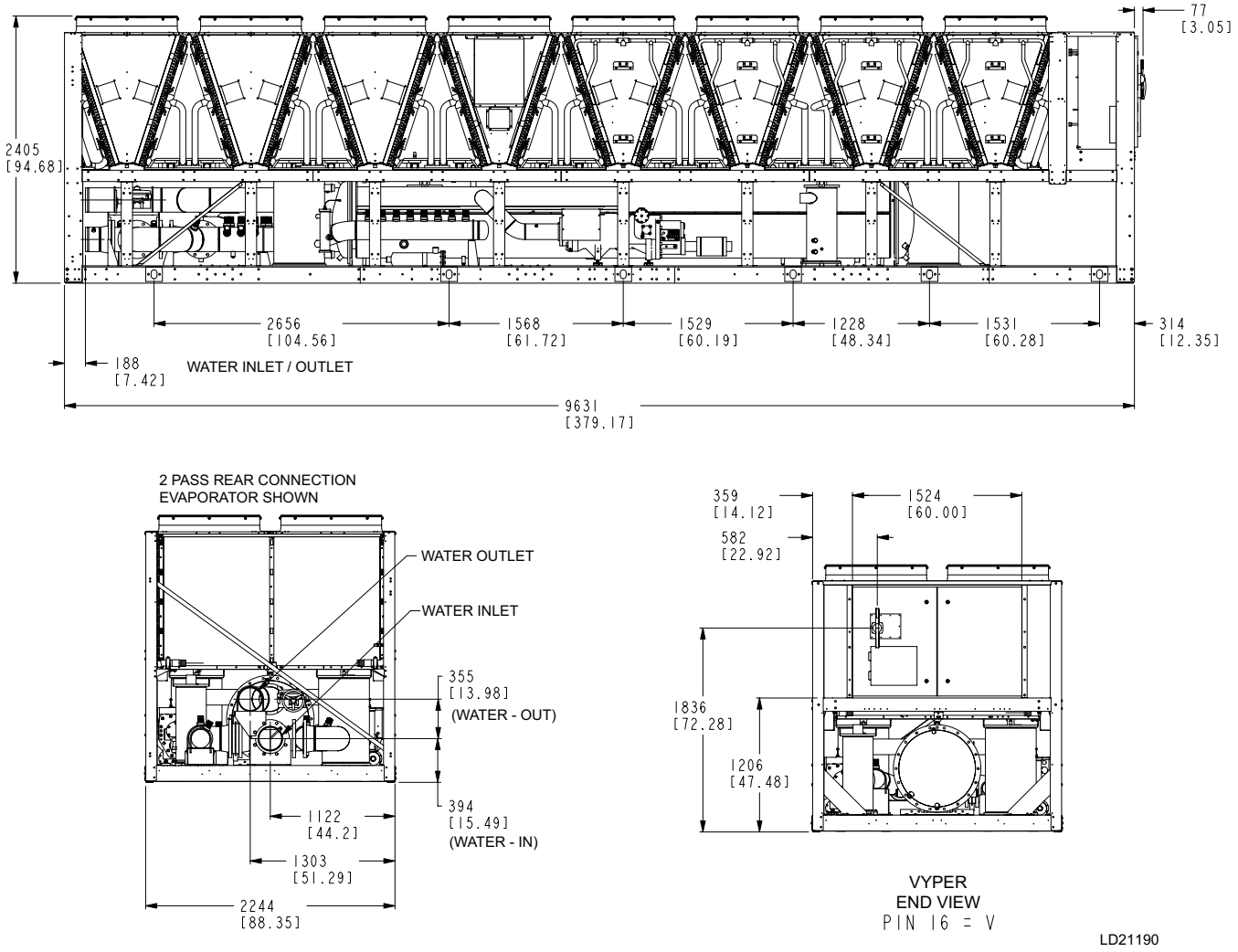
Figure 15: YVFA0259 and YVFA0889 unit dimensions, open-loop option



Physical data (cont'd)

YVFA0289 and YVFA1009 unit dimensions, open-loop option

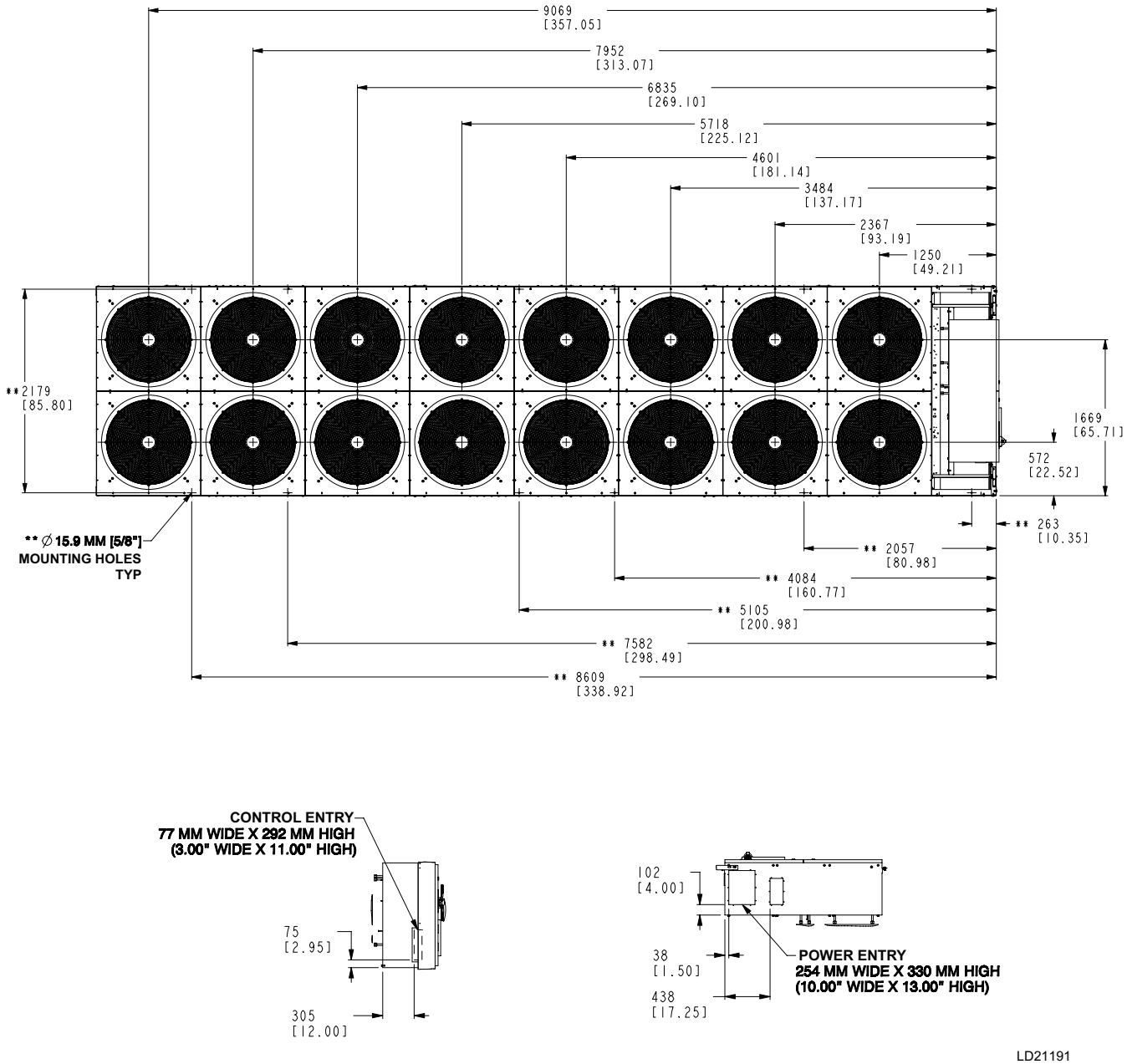
Figure 16: YVFA0289 and YVFA1009 unit dimensions, open-loop option



Physical data (cont'd)

YVFA0289 and YVFA1009 unit dimensions, open-loop option

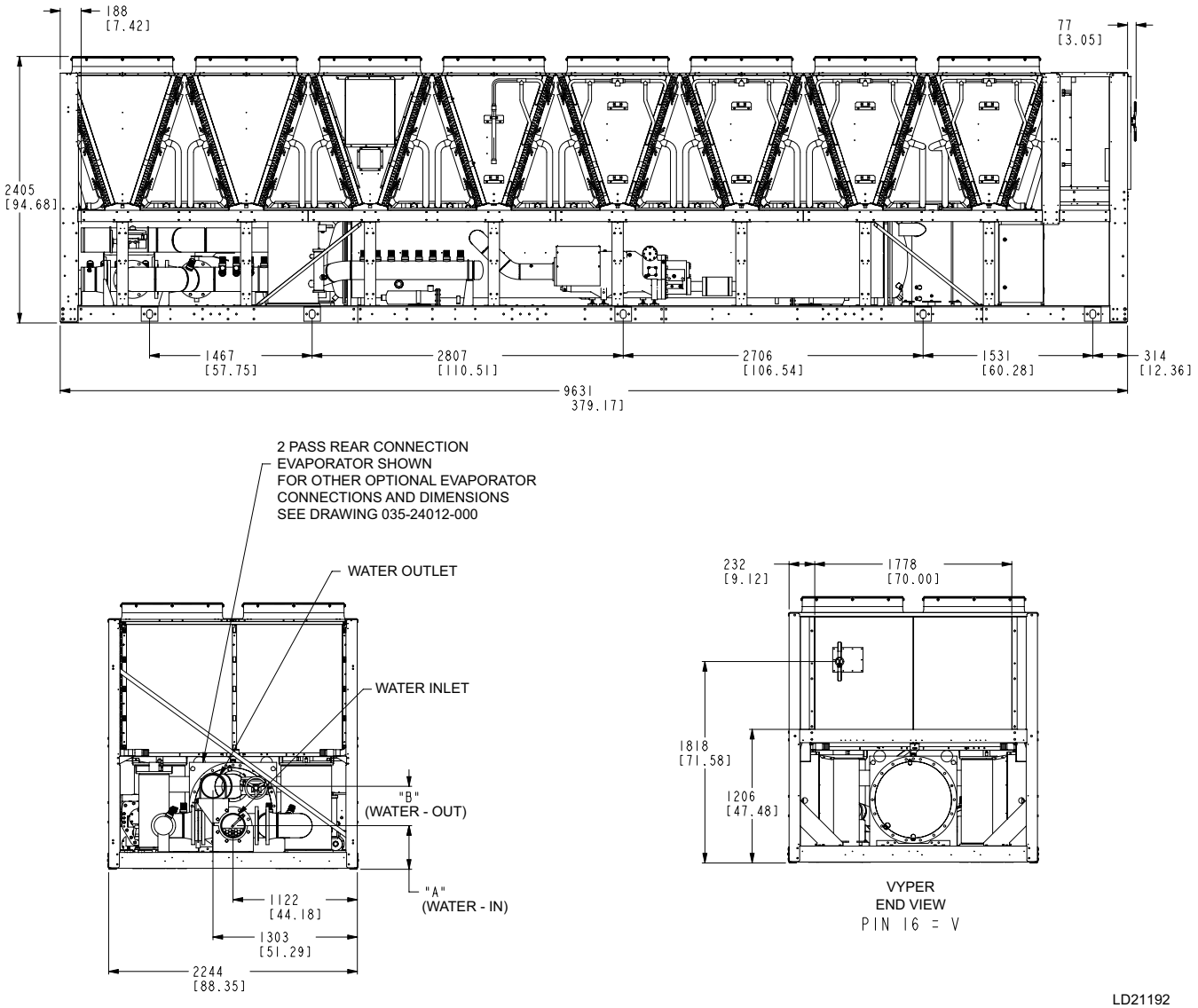
Figure 17: YVFA0289 and YVFA1009 unit dimensions, open-loop option



Physical data (cont'd)

YVFA0309 and YVFA1069 unit dimensions, open-loop option

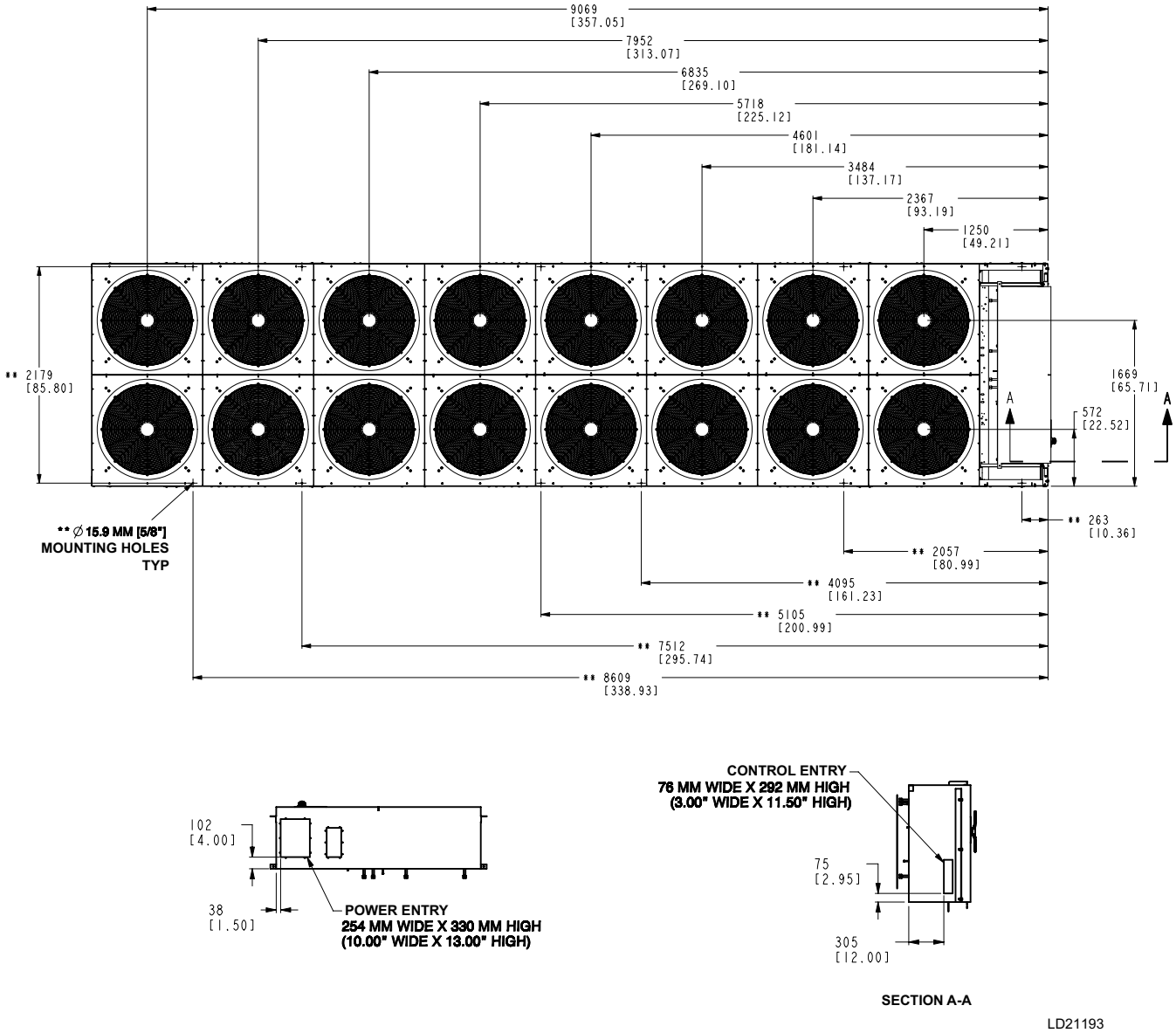
Figure 18: YVFA0309 and YVFA1069 unit dimensions, open-loop option



Physical data (cont'd)

YVFA0309 and YVFA1069 unit dimensions, open-loop option

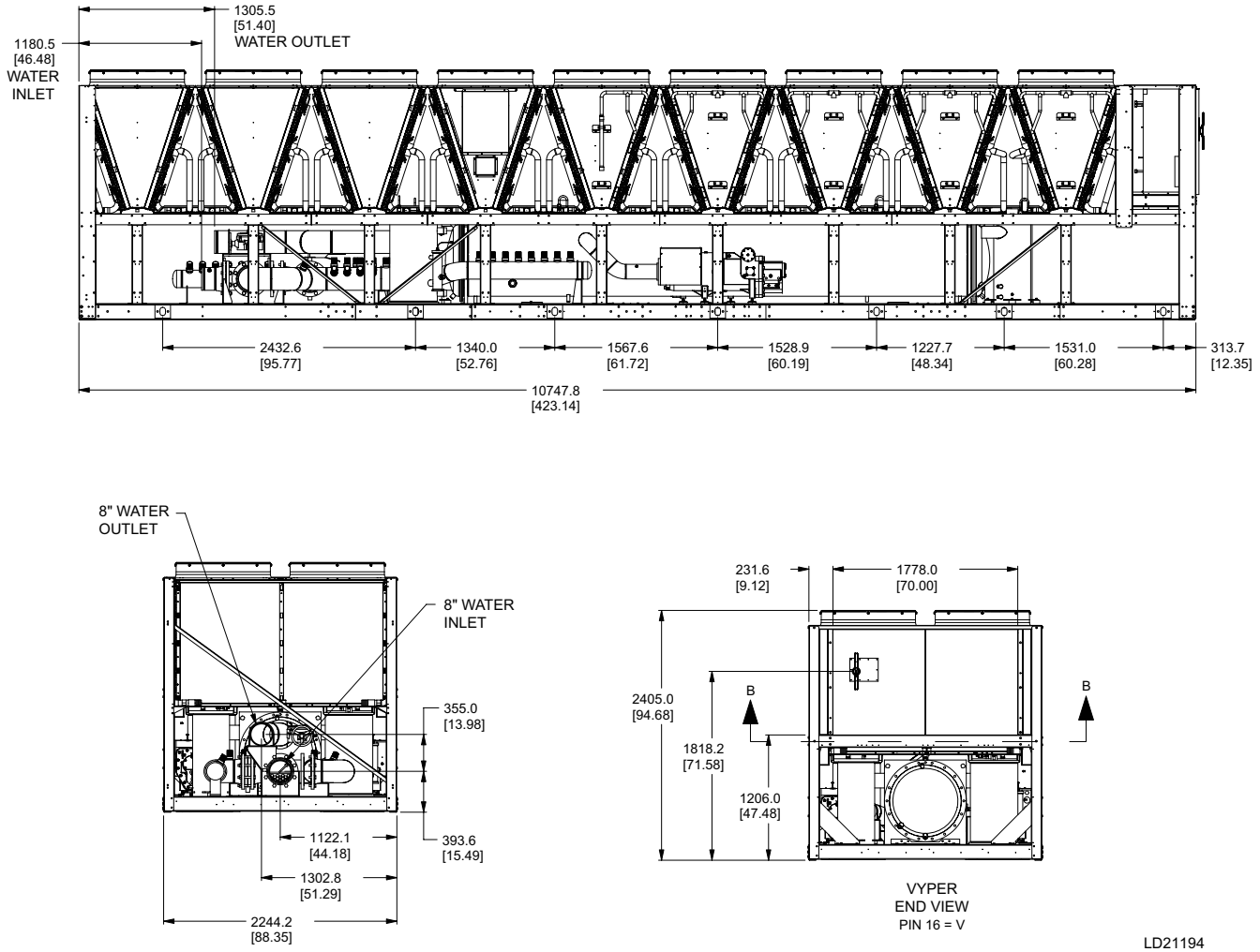
Figure 19: YVFA0309 and YVFA1069 unit dimensions, open-loop option



Physical data (cont'd)

YVFA0359 and YVFA1239 unit dimensions, open-loop option

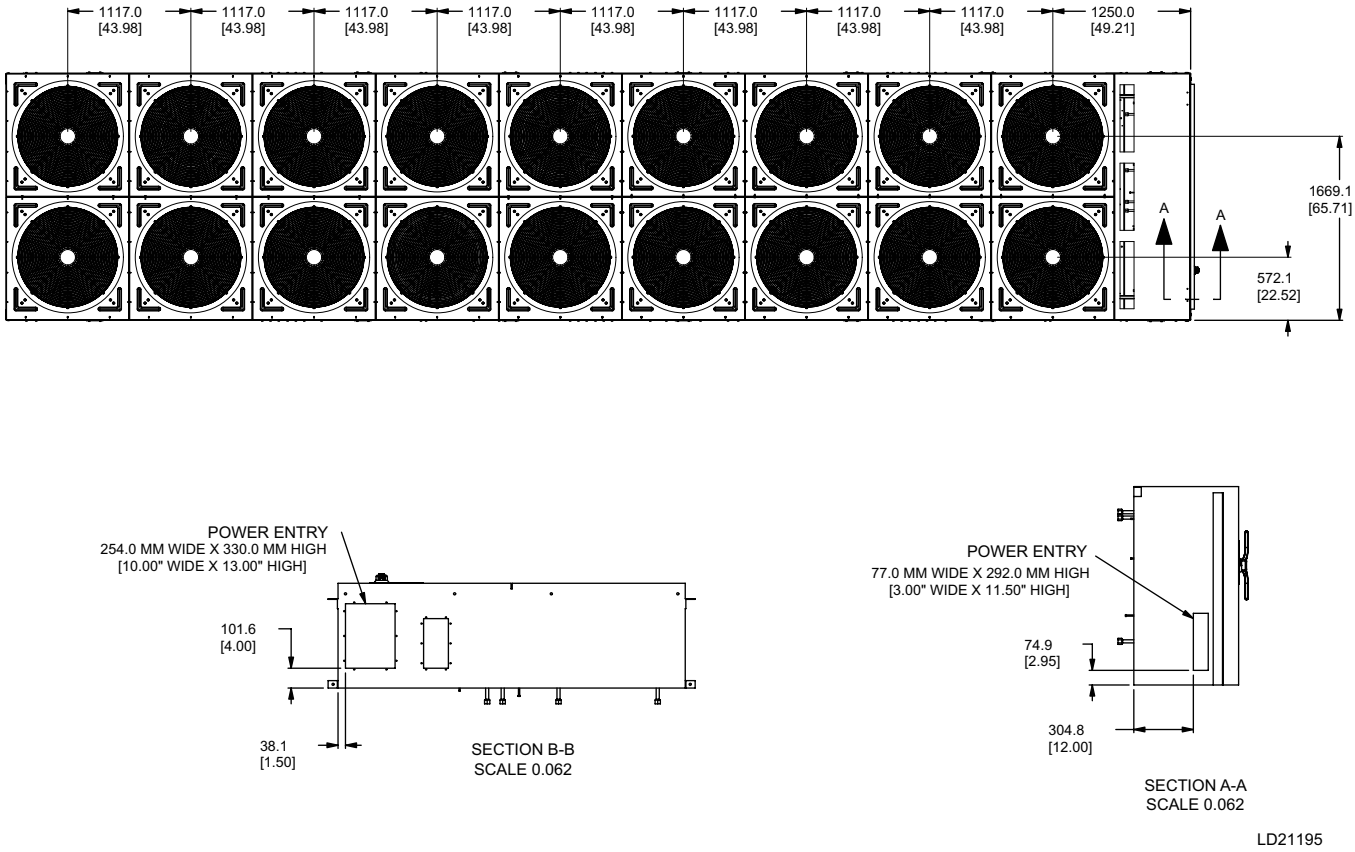
Figure 20: YVFA0359 and YVFA1239 unit dimensions, open-loop option



Physical data (cont'd)

YVFA0359 and YVFA1239 unit dimensions, open-loop option

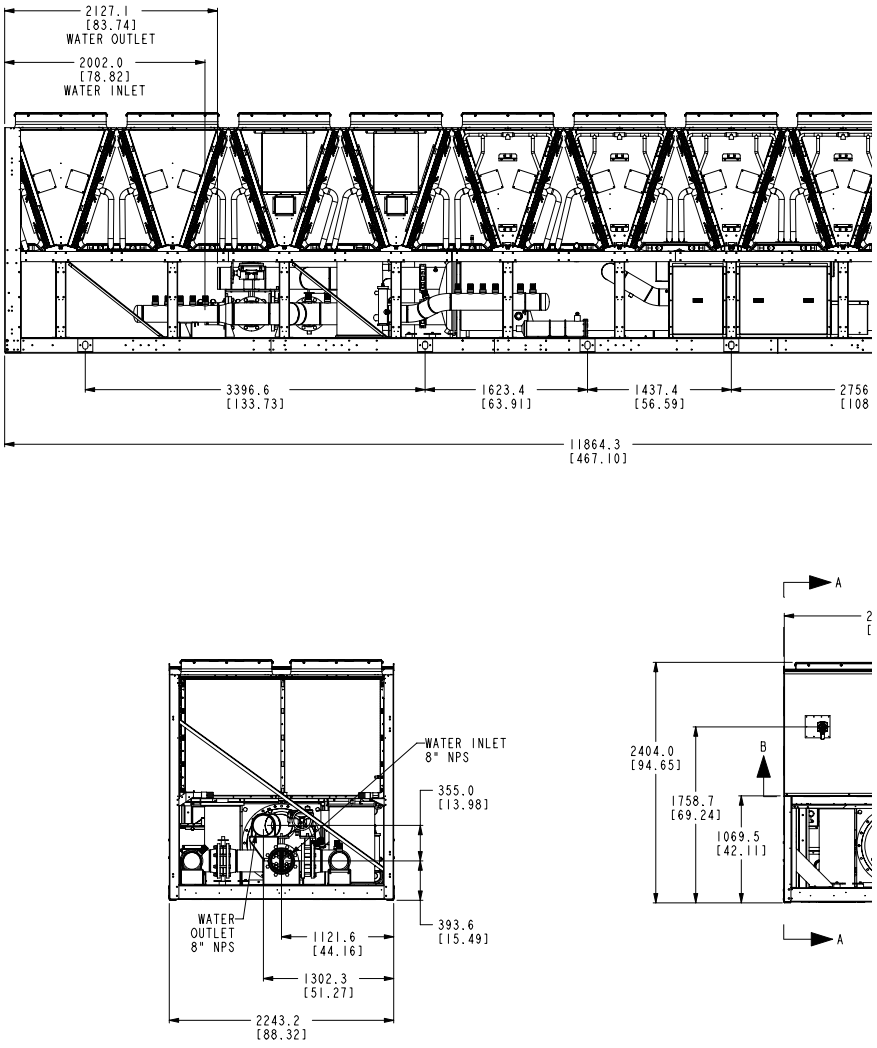
Figure 21: YVFA0359 and YVFA1239 unit dimensions, open-loop option



Physical data (cont'd)

YVFA0409 and YVFA1419 unit dimensions, open-loop option

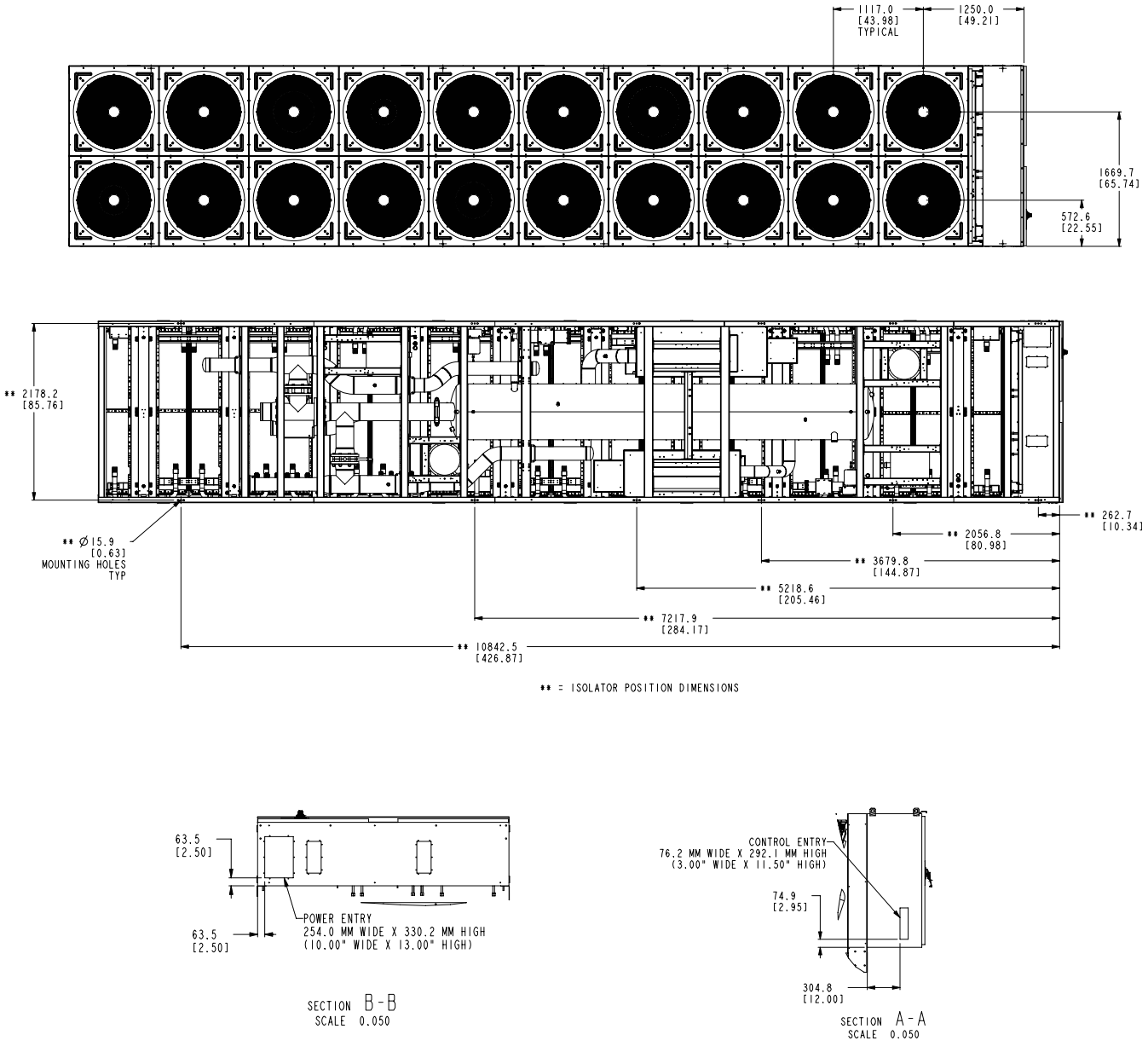
Figure 22: YVFA0409 and YVFA1419 unit dimensions, open-loop option



Physical data (cont'd)

YVFA0409 and YVFA1419 unit dimensions, open-loop option

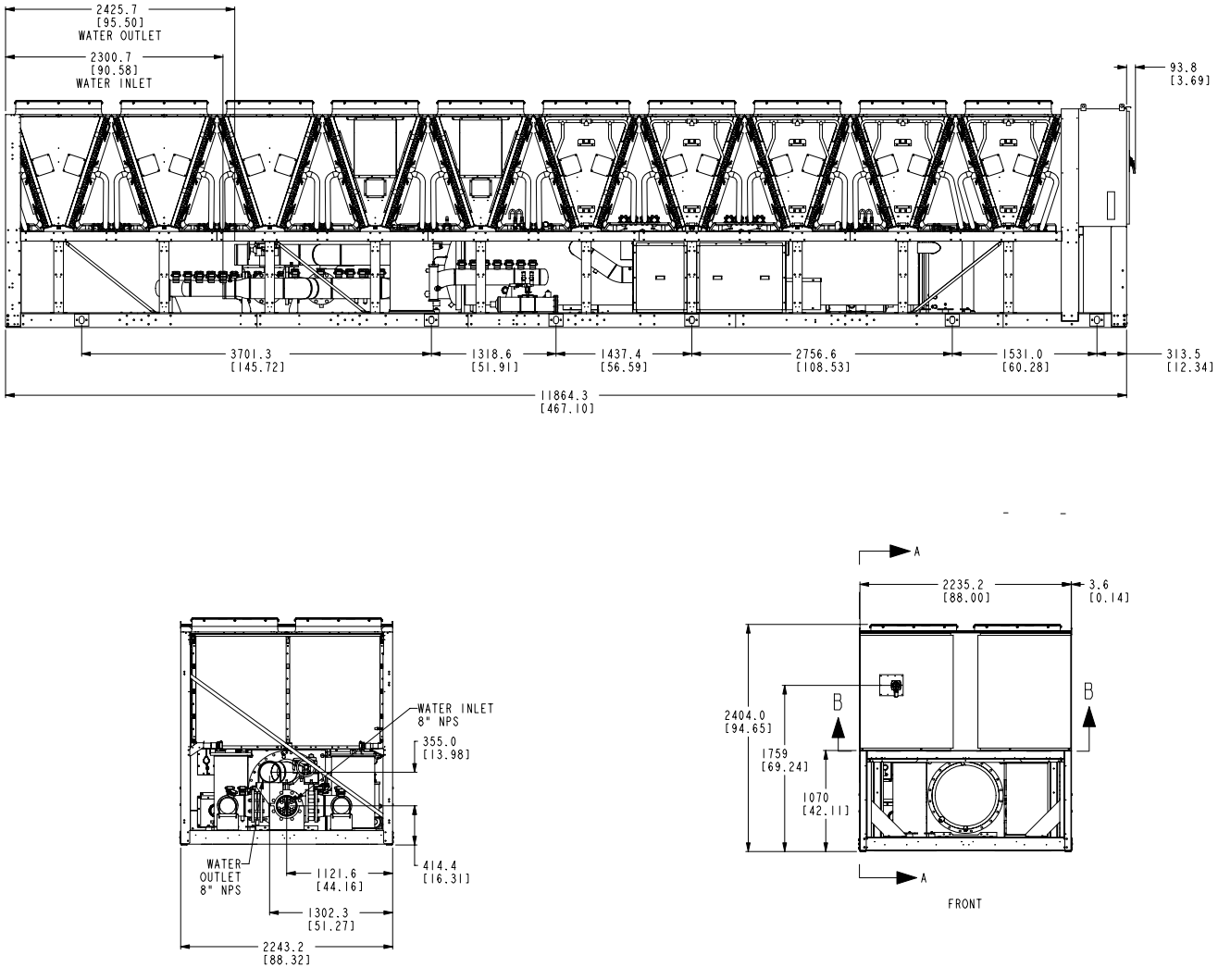
Figure 23: YVFA0409 and YVFA1419 unit dimensions, open-loop option



Physical data (cont'd)

YVFA0459 and YVFA1589 unit dimensions, open-loop option

Figure 24: YVFA0459 and YVFA1589 unit dimensions, open-loop option

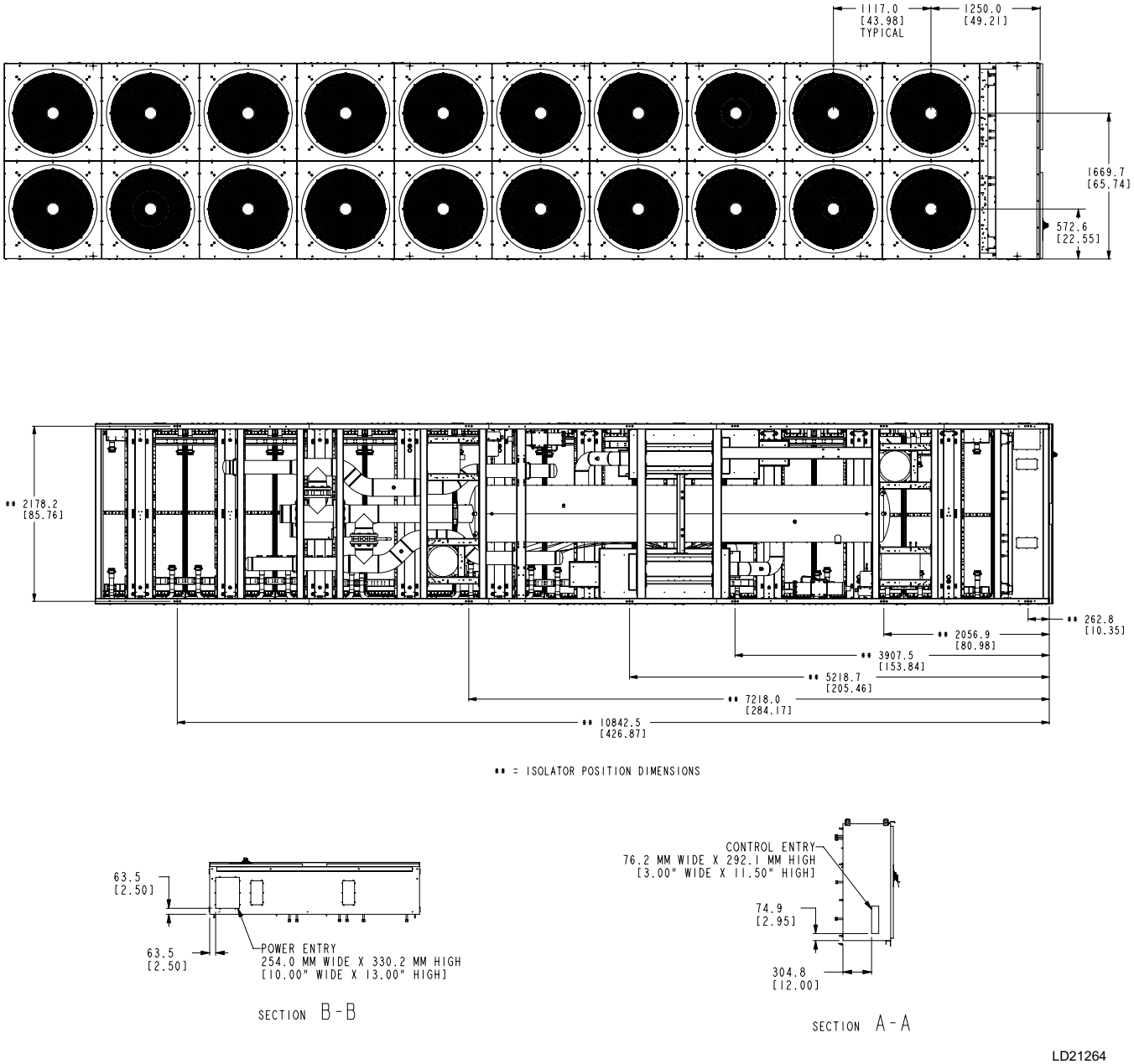


LD21263

Physical data (cont'd)

YVFA0459 and YVFA1589 unit dimensions, open-loop option

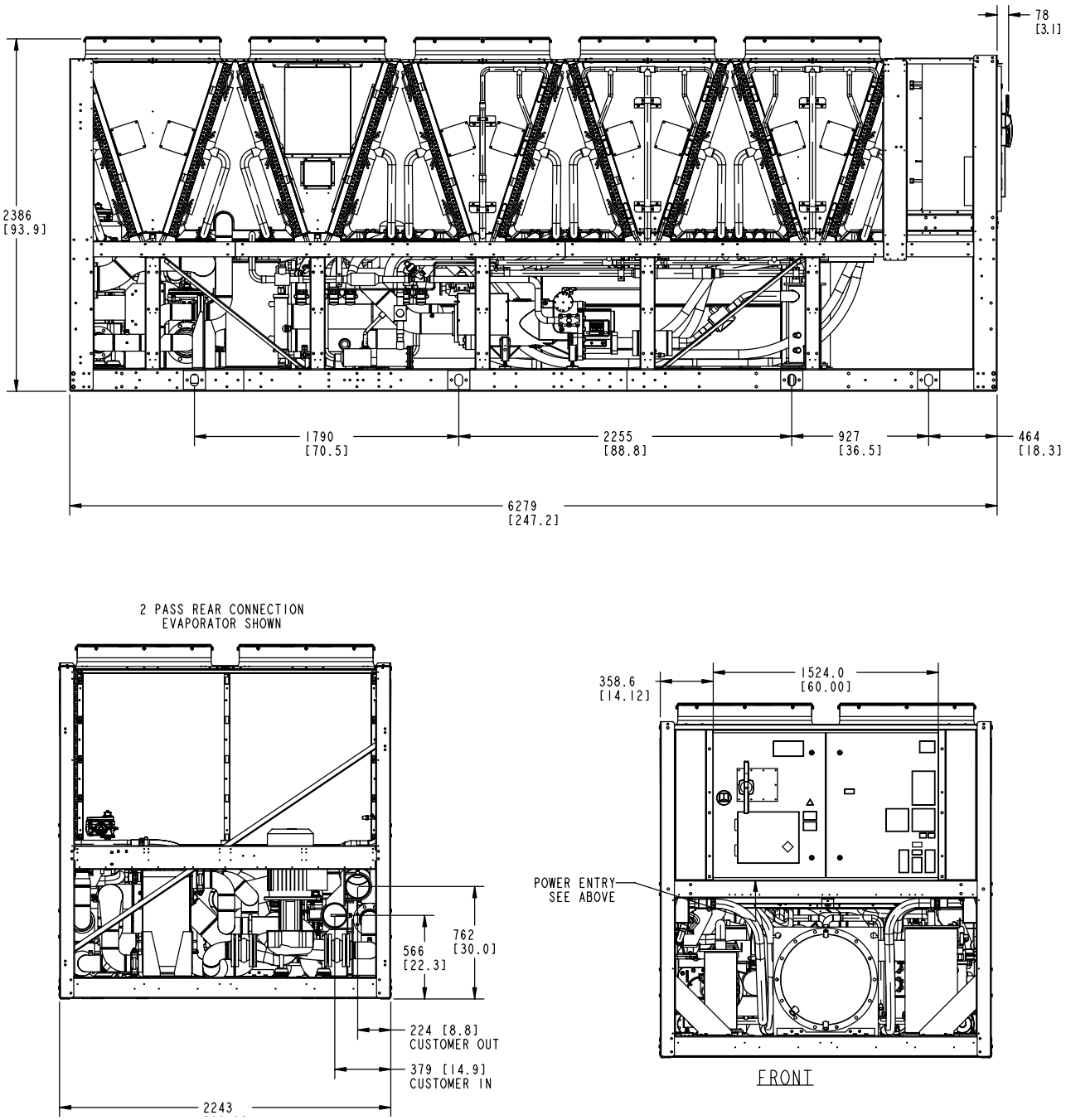
Figure 25: YVFA0459 and YVFA1589 unit dimensions, open-loop option



Physical data (cont'd)

YVFA0159 and YVFA0239 unit dimensions, closed-loop option

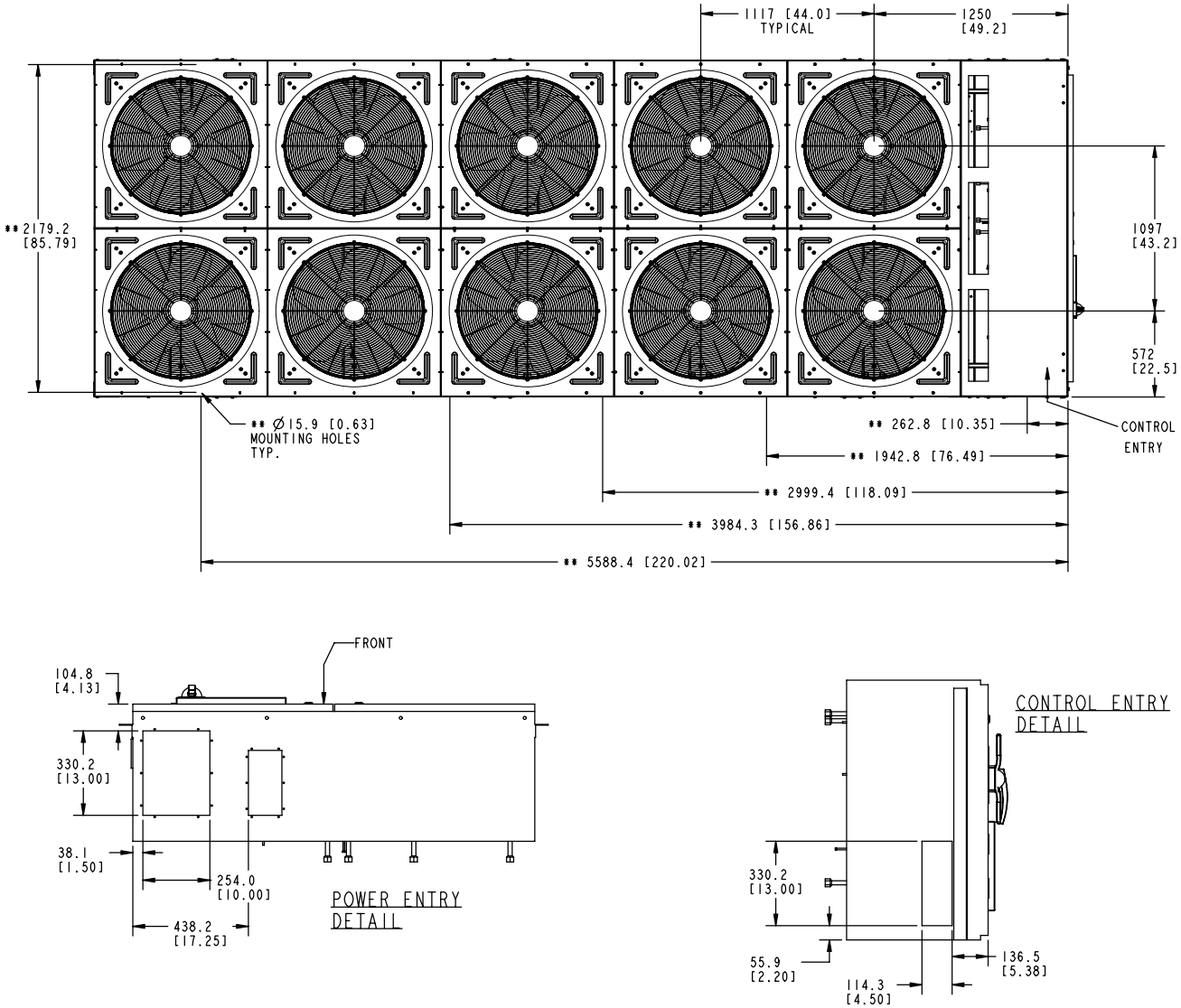
Figure 25: YVFA0159 and YVFA0239 unit dimensions, closed-loop option



Physical data (cont'd)

YVFA0159 and YVFA0239 unit dimensions, closed-loop option

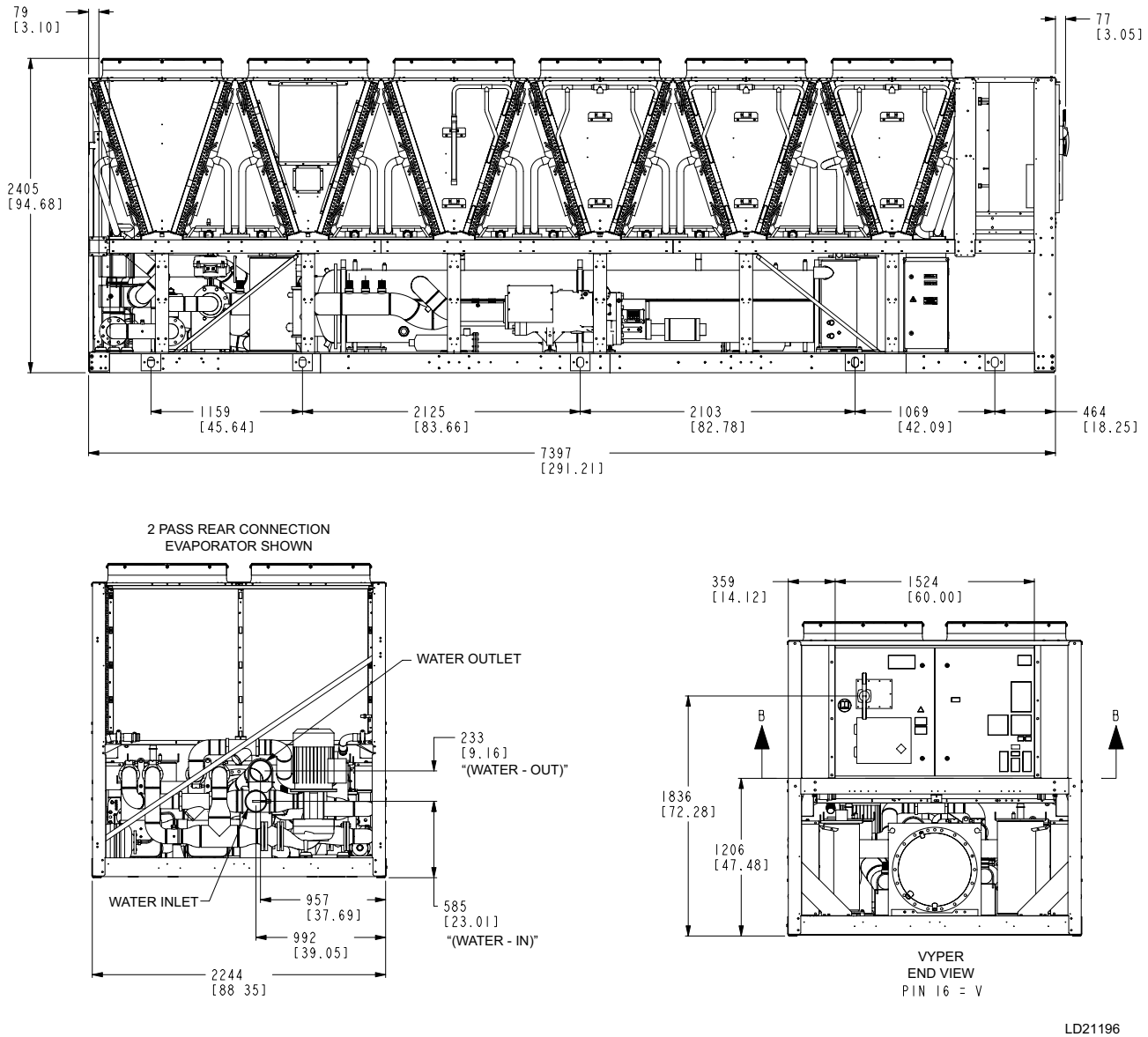
Figure 26: YVFA0159 and YVFA0239 unit dimensions, closed-loop option



Physical data (cont'd)

YVFA0209 and YVFA0709 unit dimensions, closed-loop option

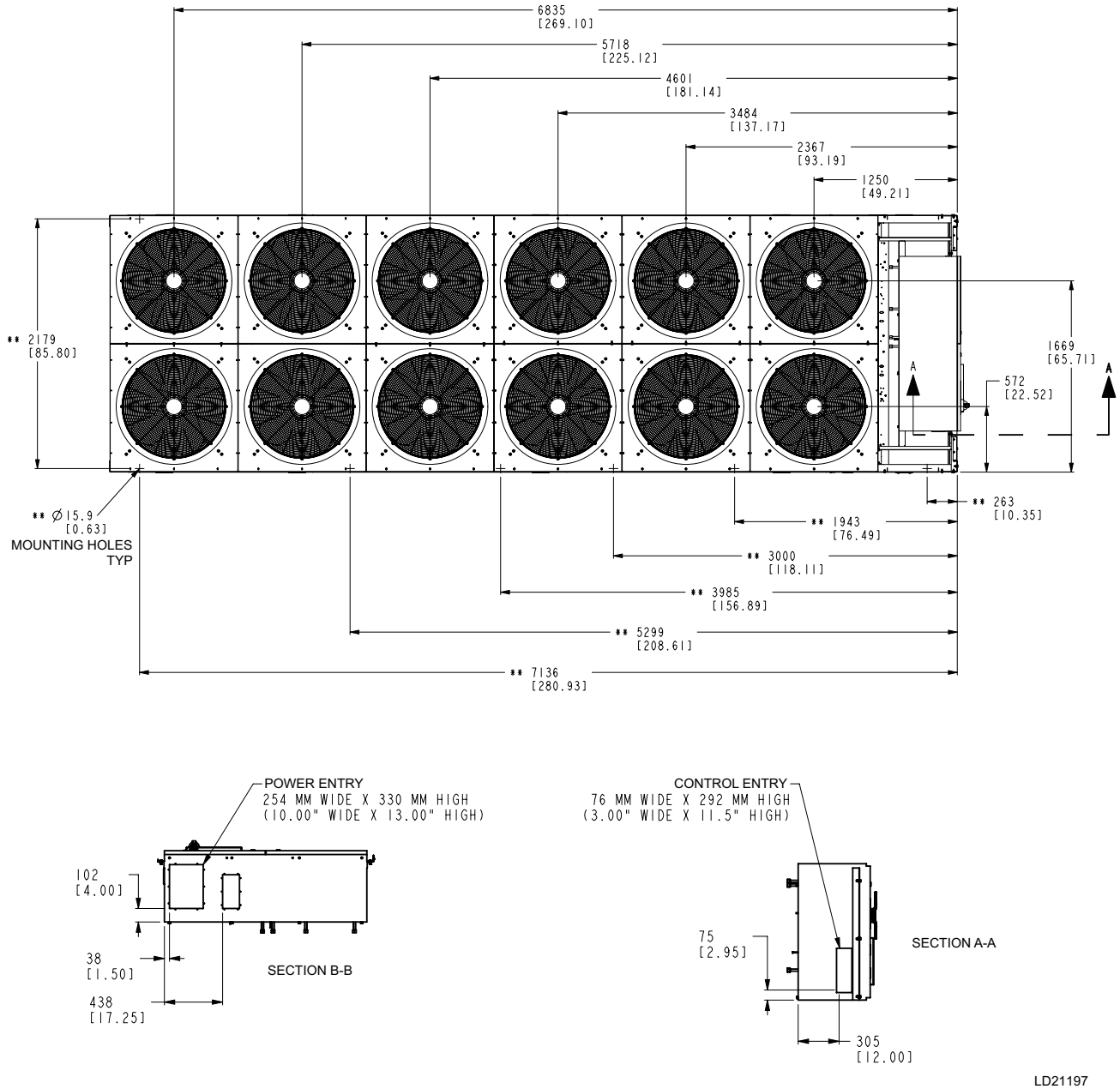
Figure 27: YVFA0209 and YVFA0709 unit dimensions, closed-loop option



Physical data (cont'd)

YVFA0209 and YVFA0709 unit dimensions, closed-loop option

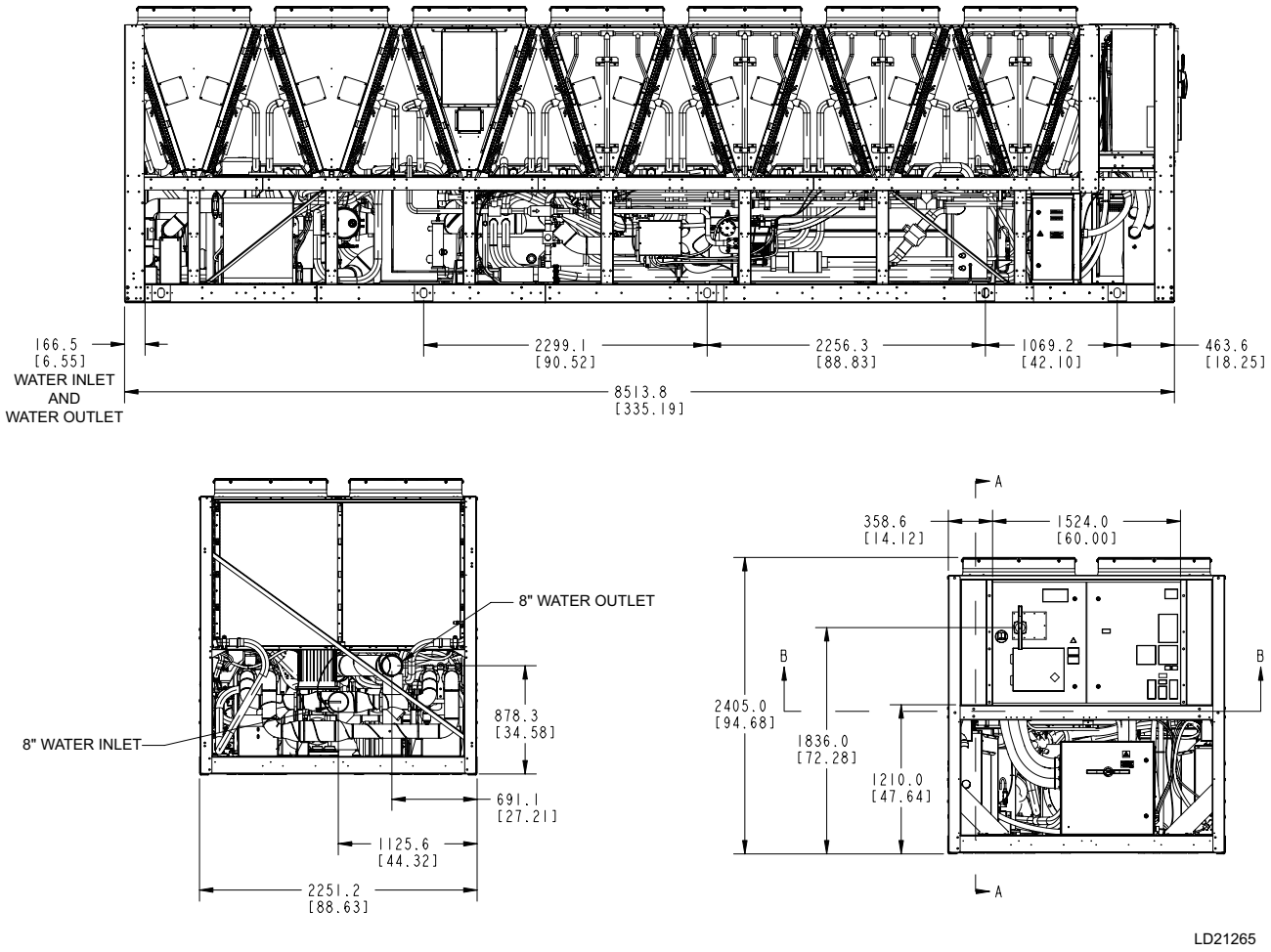
Figure 28: YVFA0209 and YVFA0709 unit dimensions, closed-loop option



Physical data (cont'd)

YVFA0259 and YVFA0889 unit dimensions, closed-loop option

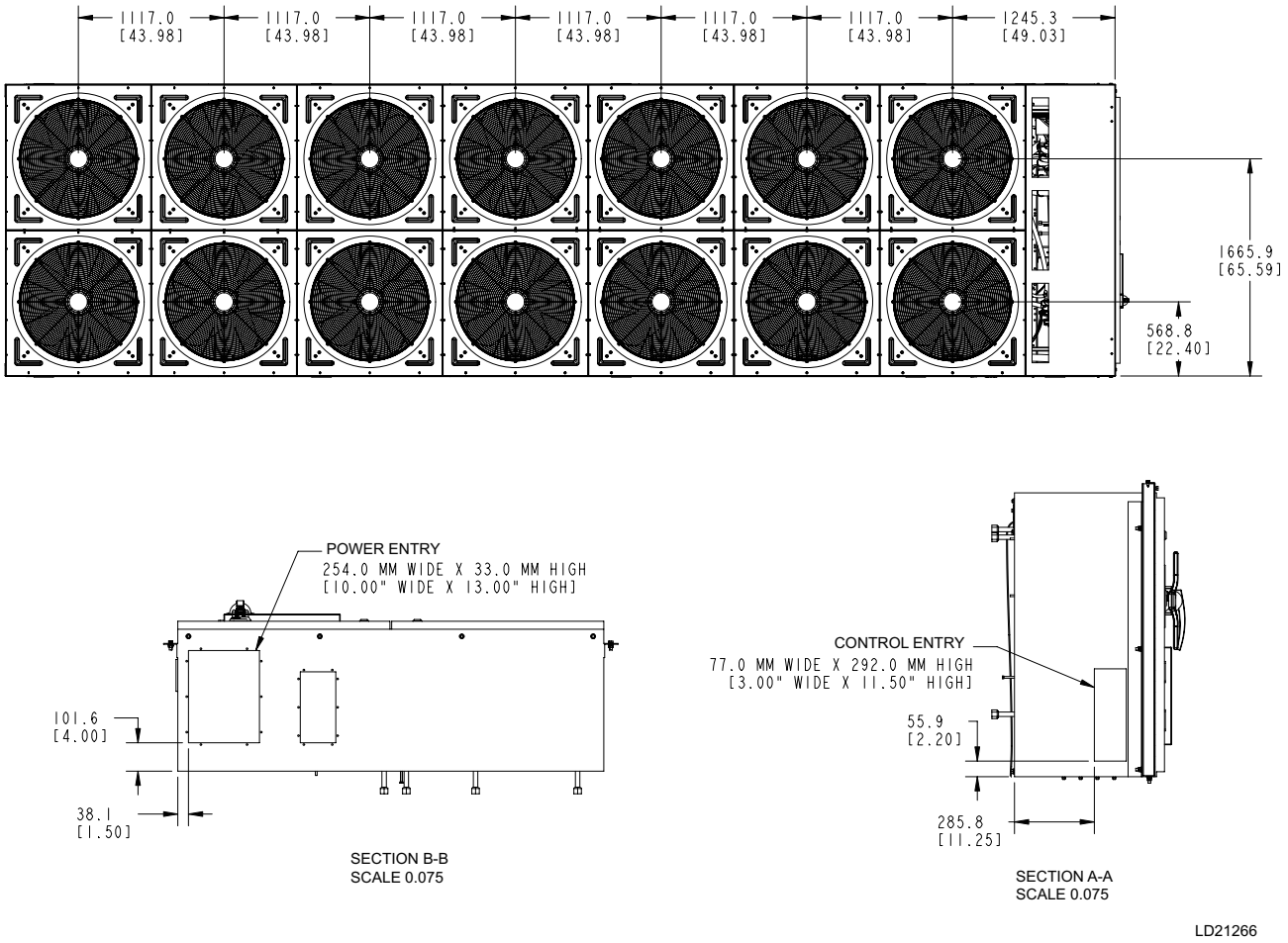
Figure 29: YVFA0259 and YVFA0889 unit dimensions, closed-loop option



Physical data (cont'd)

YVFA0259 and YVFA0889 unit dimensions, closed-loop option

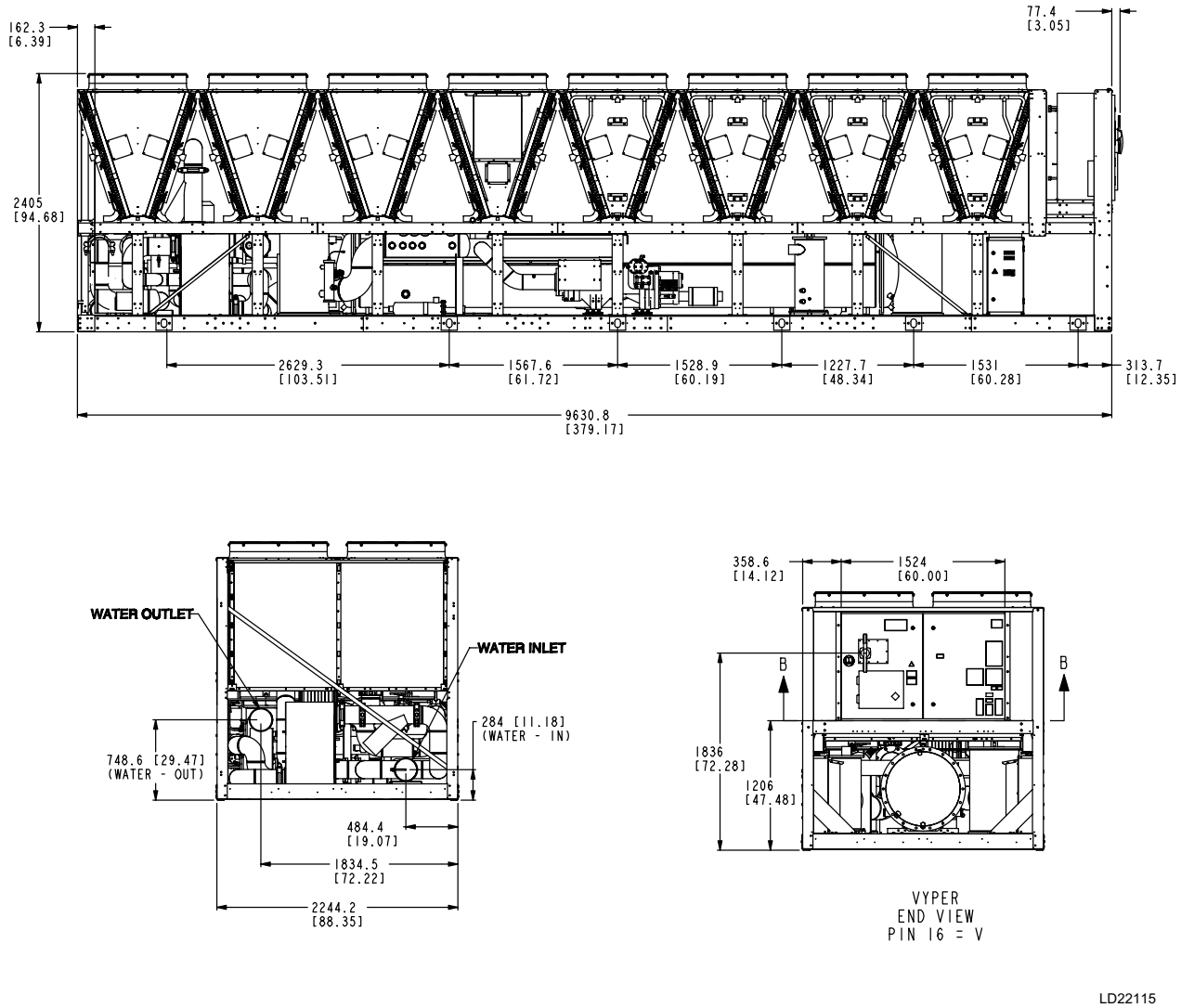
Figure 30: YVFA0259 and YVFA0889 unit dimensions, closed-loop option



Physical data (cont'd)

YVFA0289 and YVFA1009 unit dimensions, closed-loop option

Figure 31: YVFA0289 and YVFA1009 unit dimensions, closed-loop option

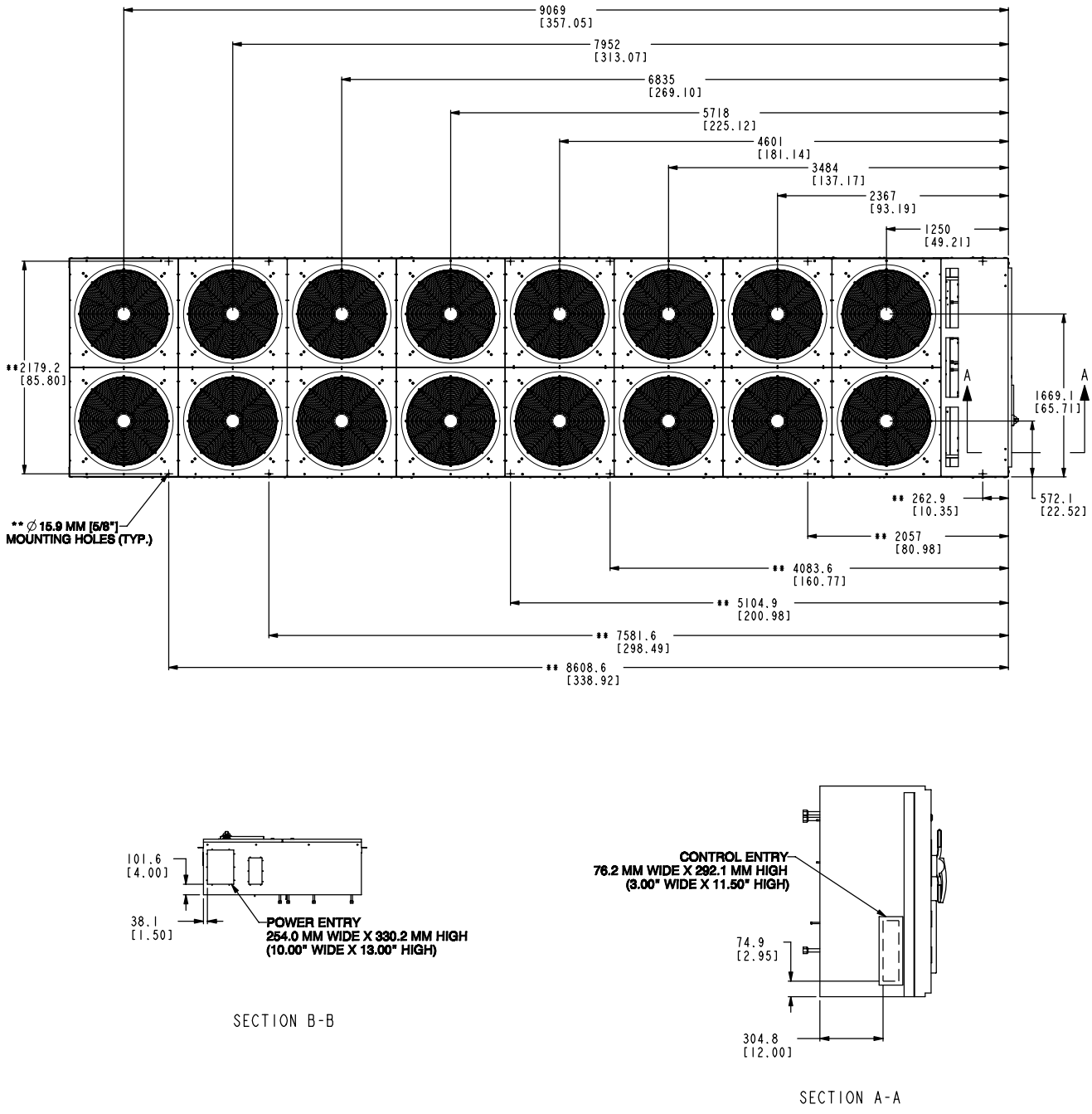


LD22115

Physical data (cont'd)

YVFA0289 and YVFA1009 unit dimensions, closed-loop option

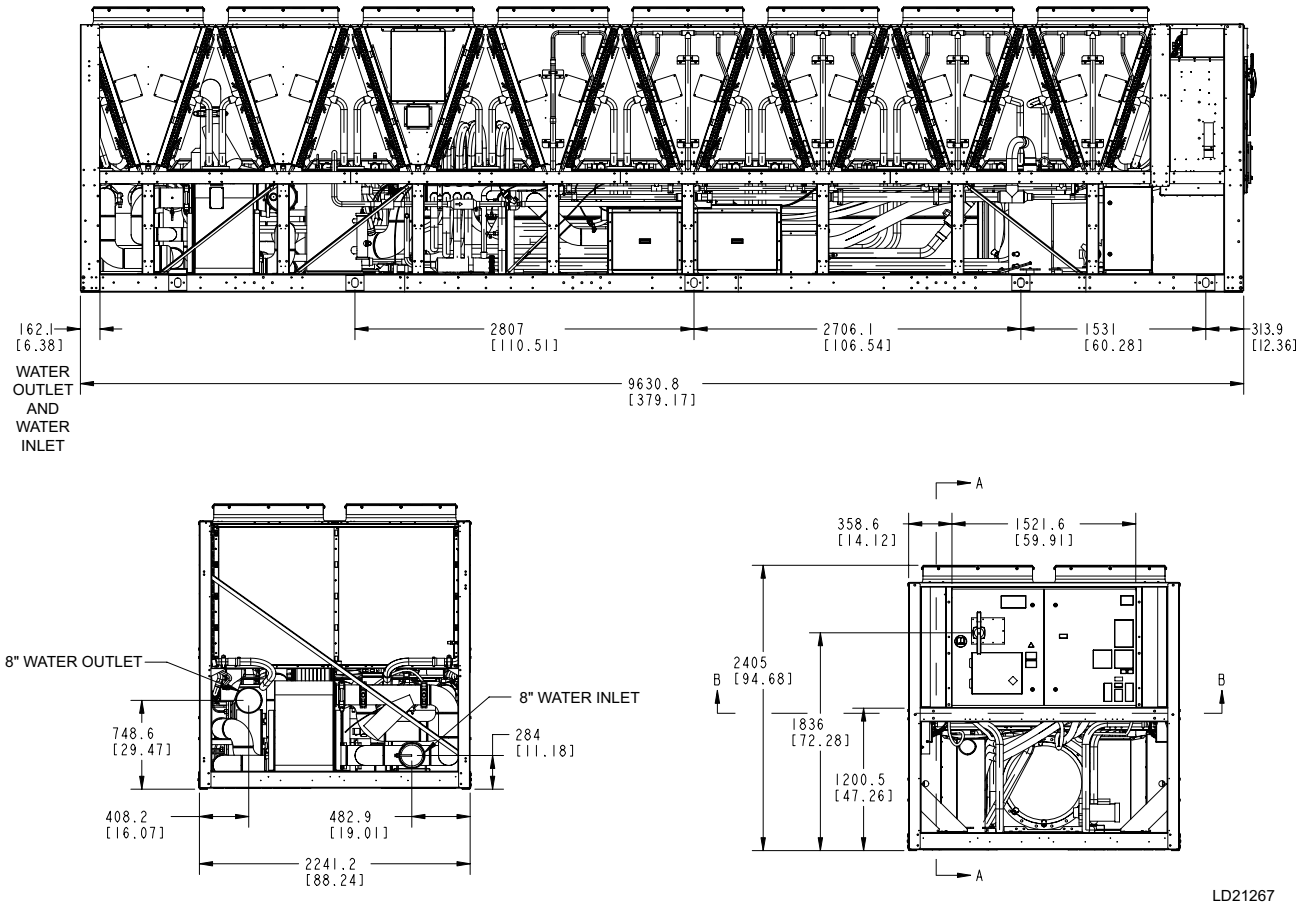
Figure 32: YVFA0289 and YVFA1009 unit dimensions, closed-loop option



Physical data (cont'd)

YVFA0309 and YVFA1069 unit dimensions, closed-loop option

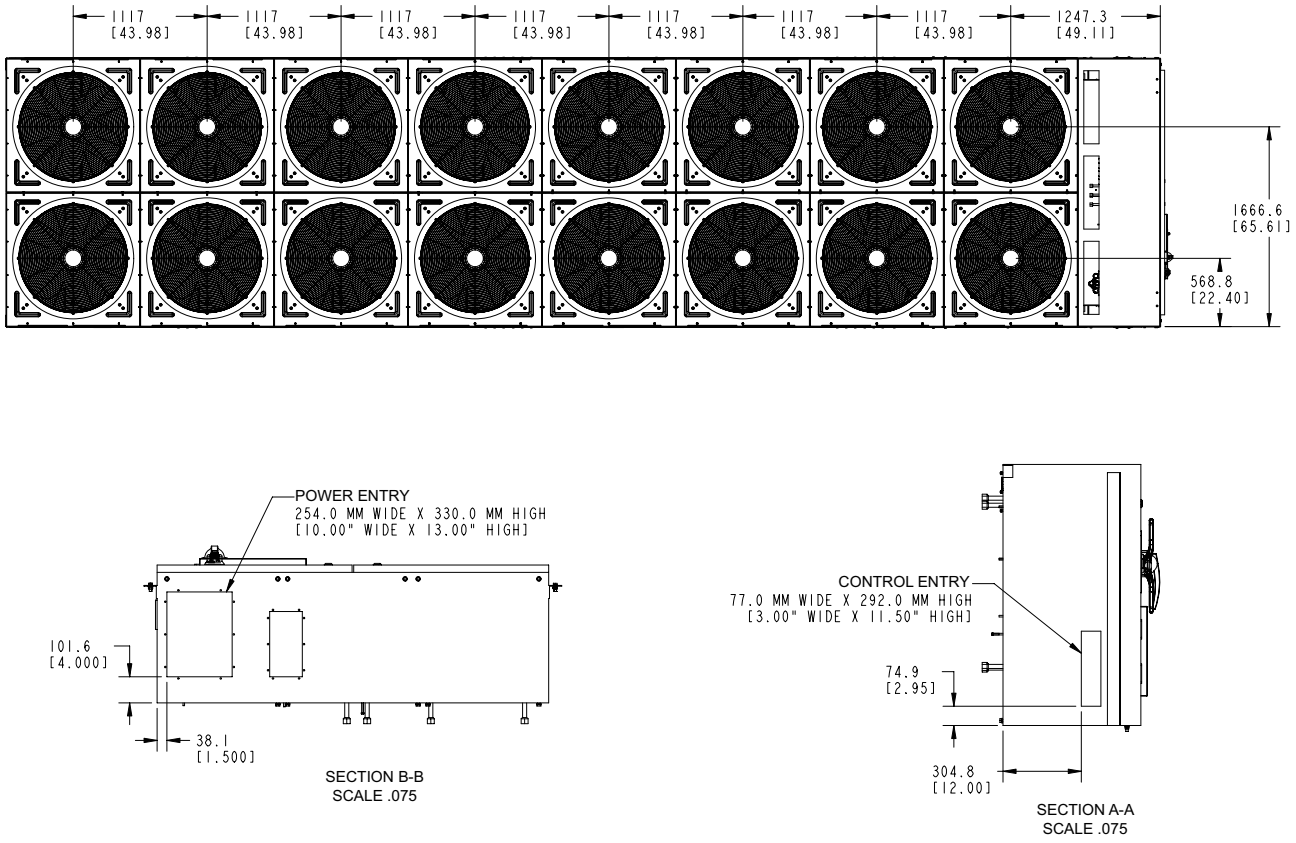
Figure 33: YVFA0309 and YVFA1069 unit dimensions, closed-loop option



Physical data (cont'd)

YVFA0309 and YVFA1069 unit dimensions, closed-loop option

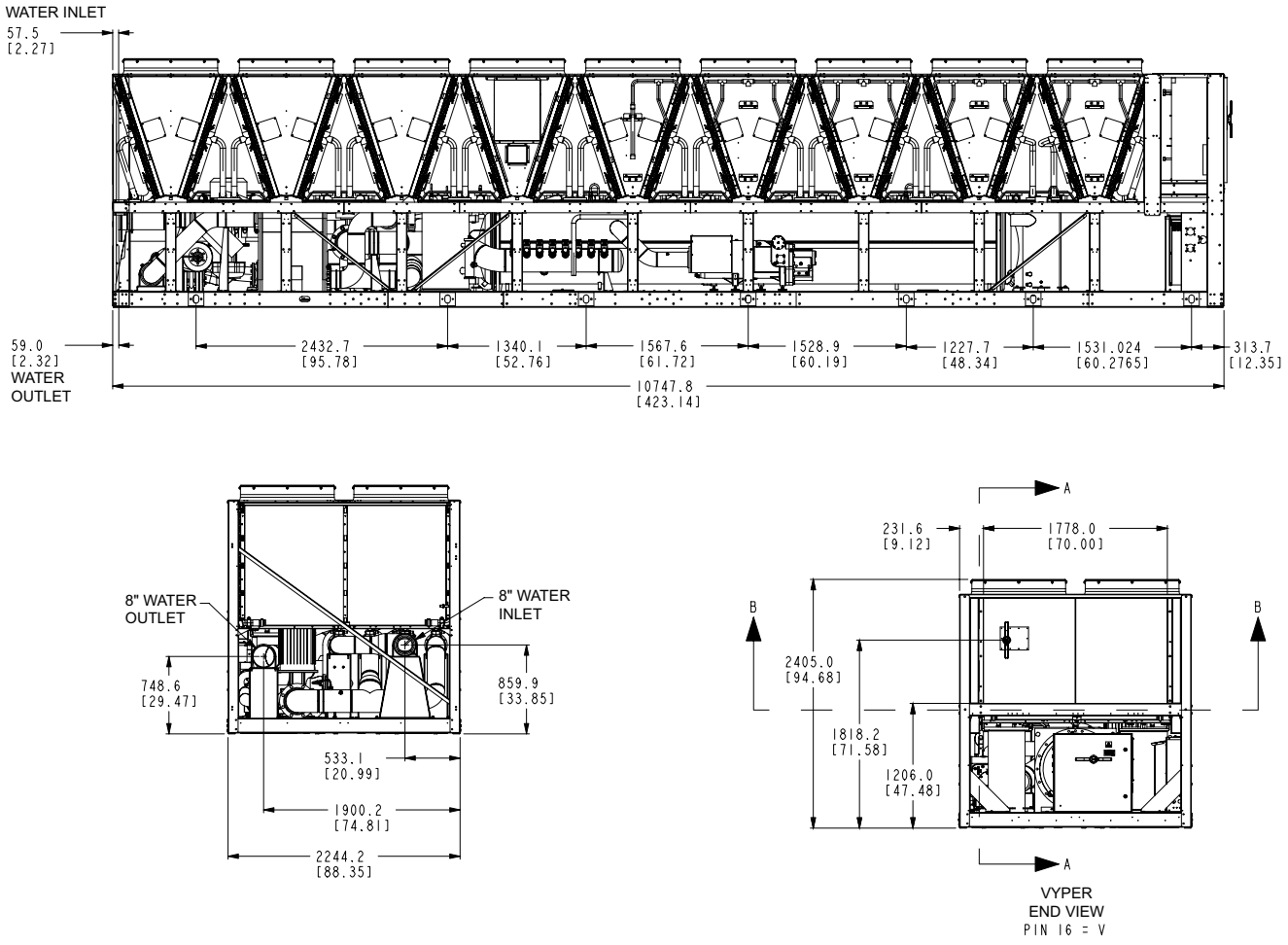
Figure 34: YVFA0309 and YVFA1069 unit dimensions, closed-loop option



Physical data (cont'd)

YVFA0359 and YVFA1239 unit dimensions, closed-loop option

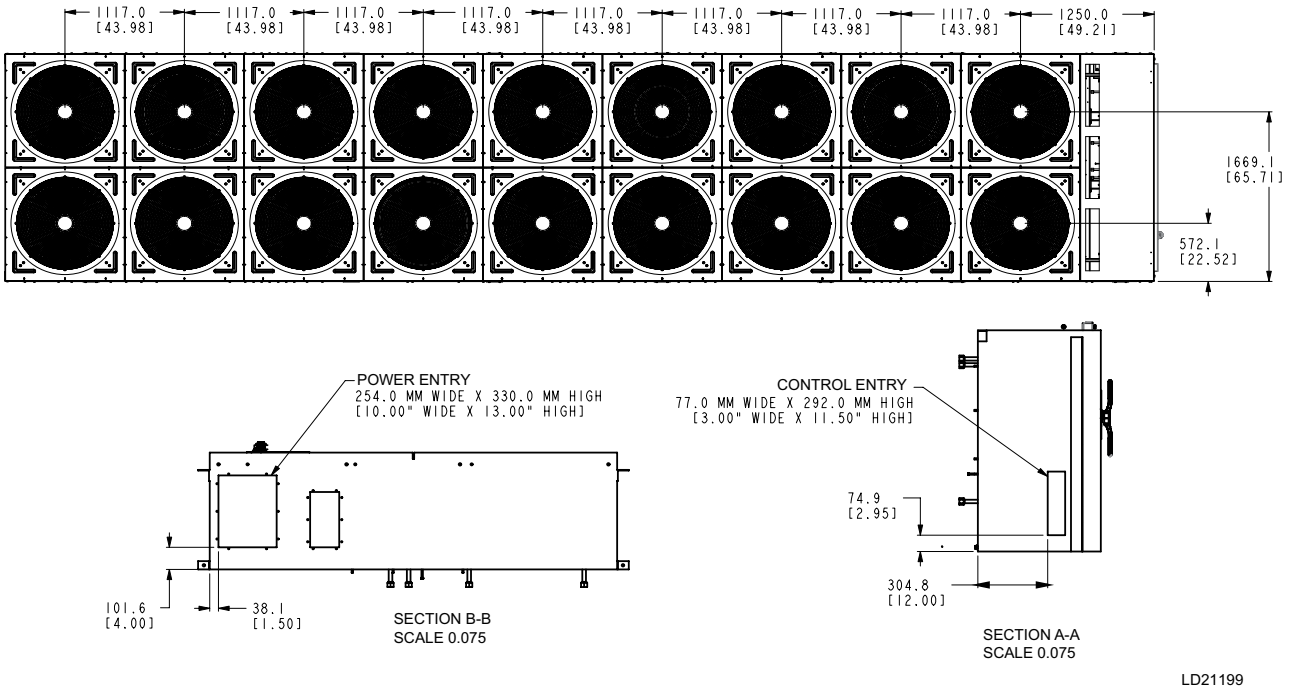
Figure 35: YVFA0359 and YVFA1239 unit dimensions, closed-loop option



Physical data (cont'd)

YVFA0359 and YVFA1239 unit dimensions, closed-loop option

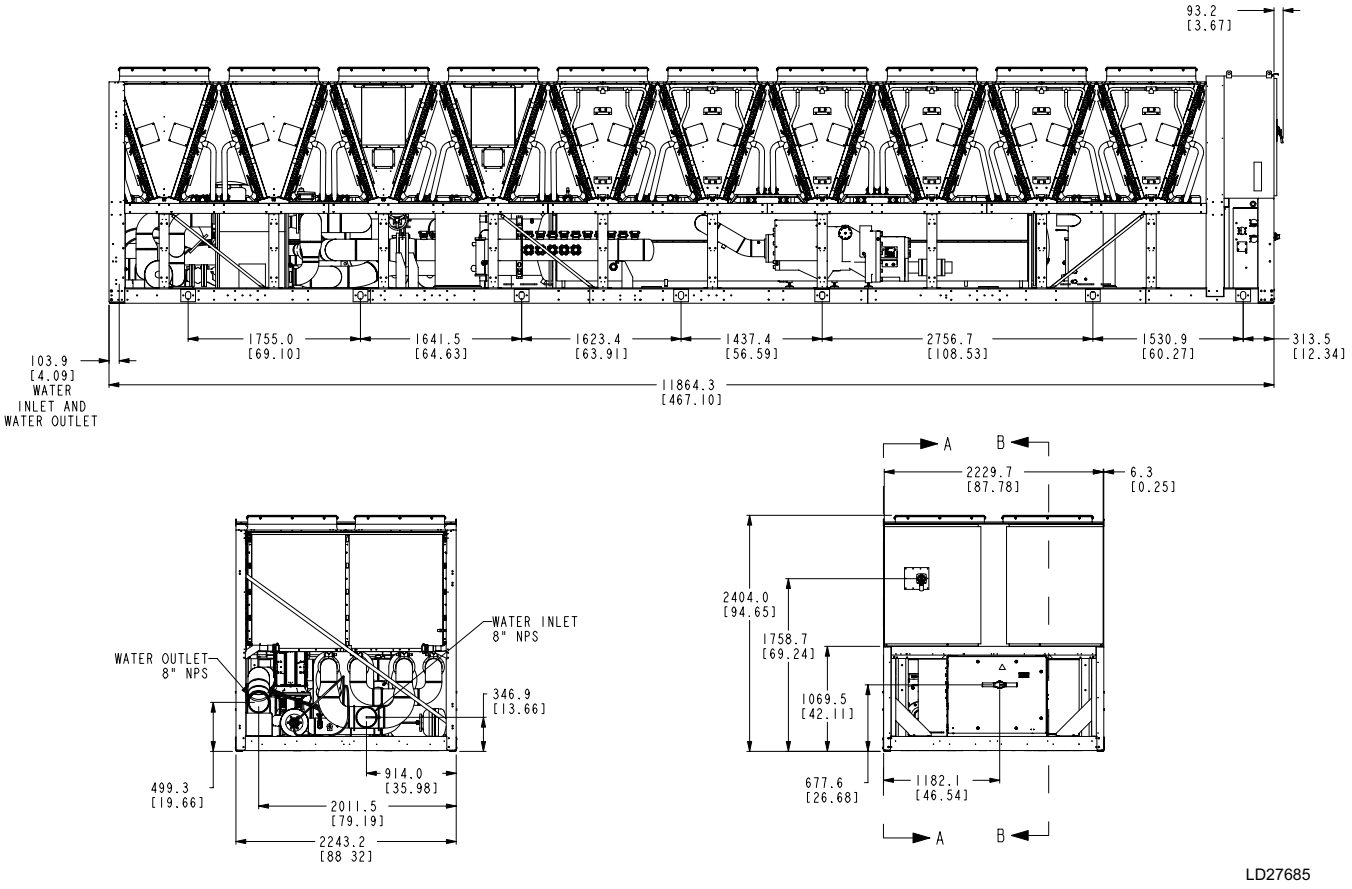
Figure 36: YVFA0359 and YVFA1239 unit dimensions, closed-loop option



Physical data (cont'd)

YVFA0409 and YVFA1419 unit dimensions, closed-loop option

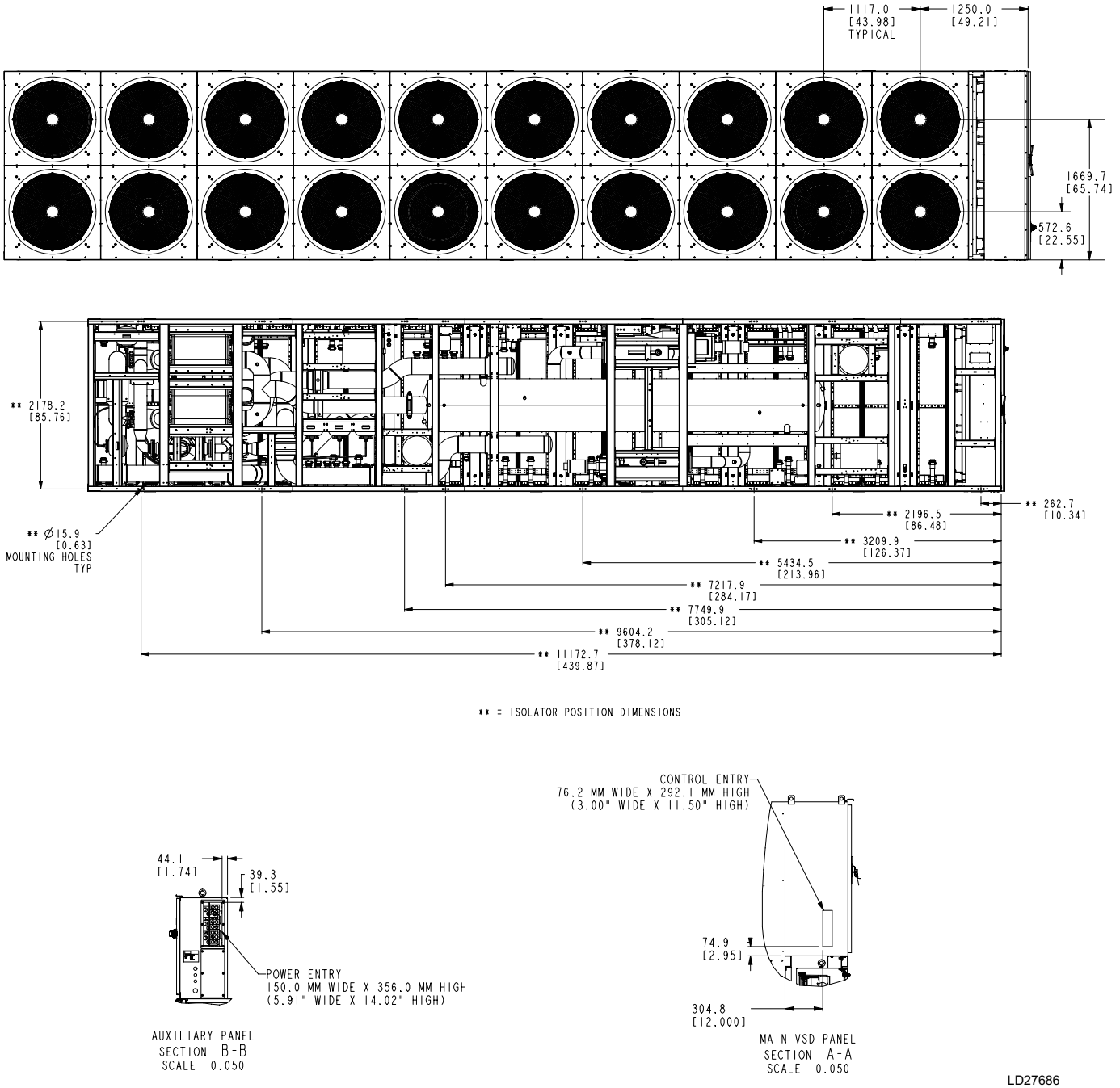
Figure 37: YVFA0409 and YVFA1419 unit dimensions, closed-loop option



Physical data (cont'd)

YVFA0409 and YVFA1419 unit dimensions, closed-loop option

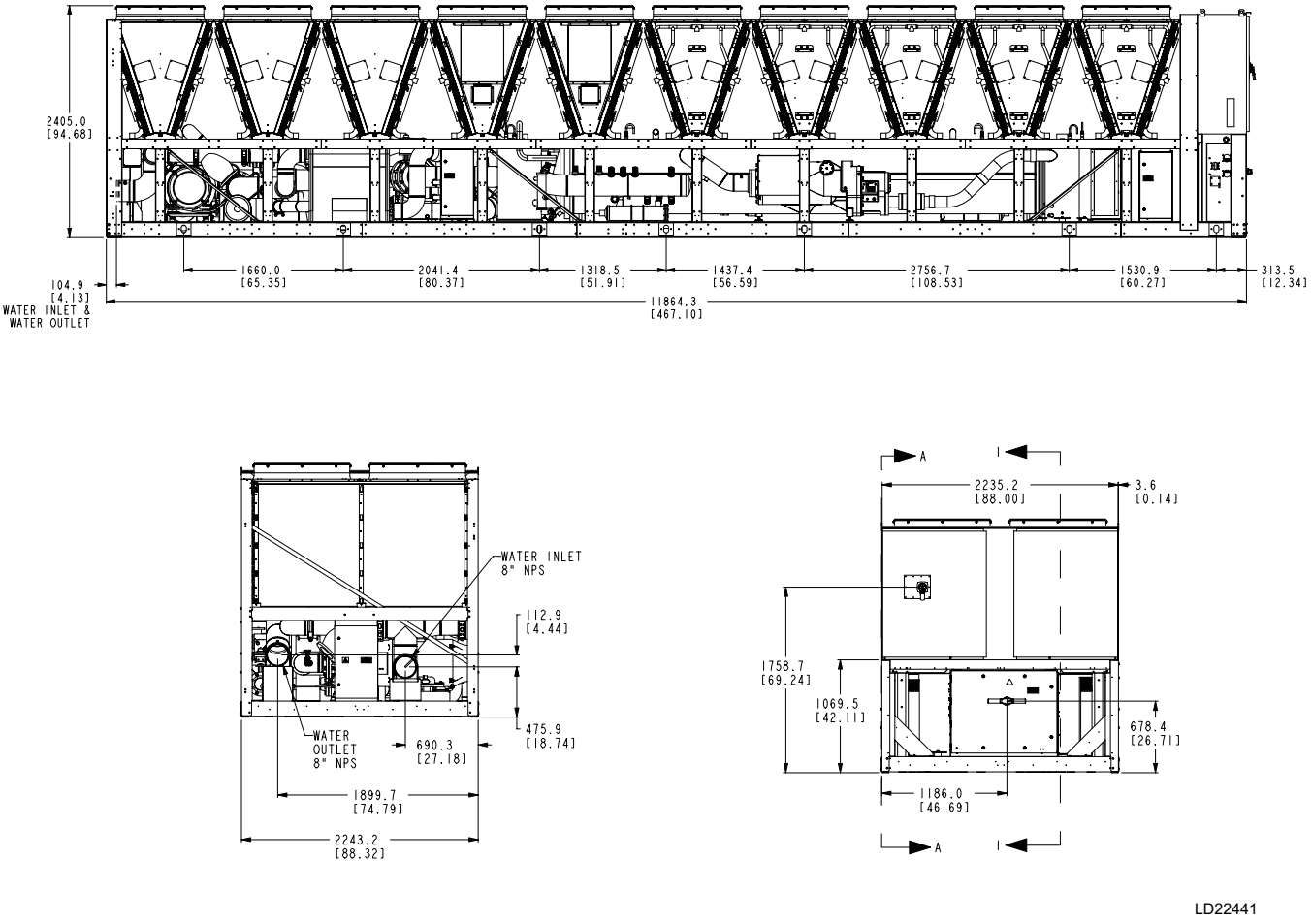
Figure 38: YVFA0409 and YVFA1419 unit dimensions, closed-loop option



Physical data (cont'd)

YVFA0459 and YVFA1589 unit dimensions, closed-loop option

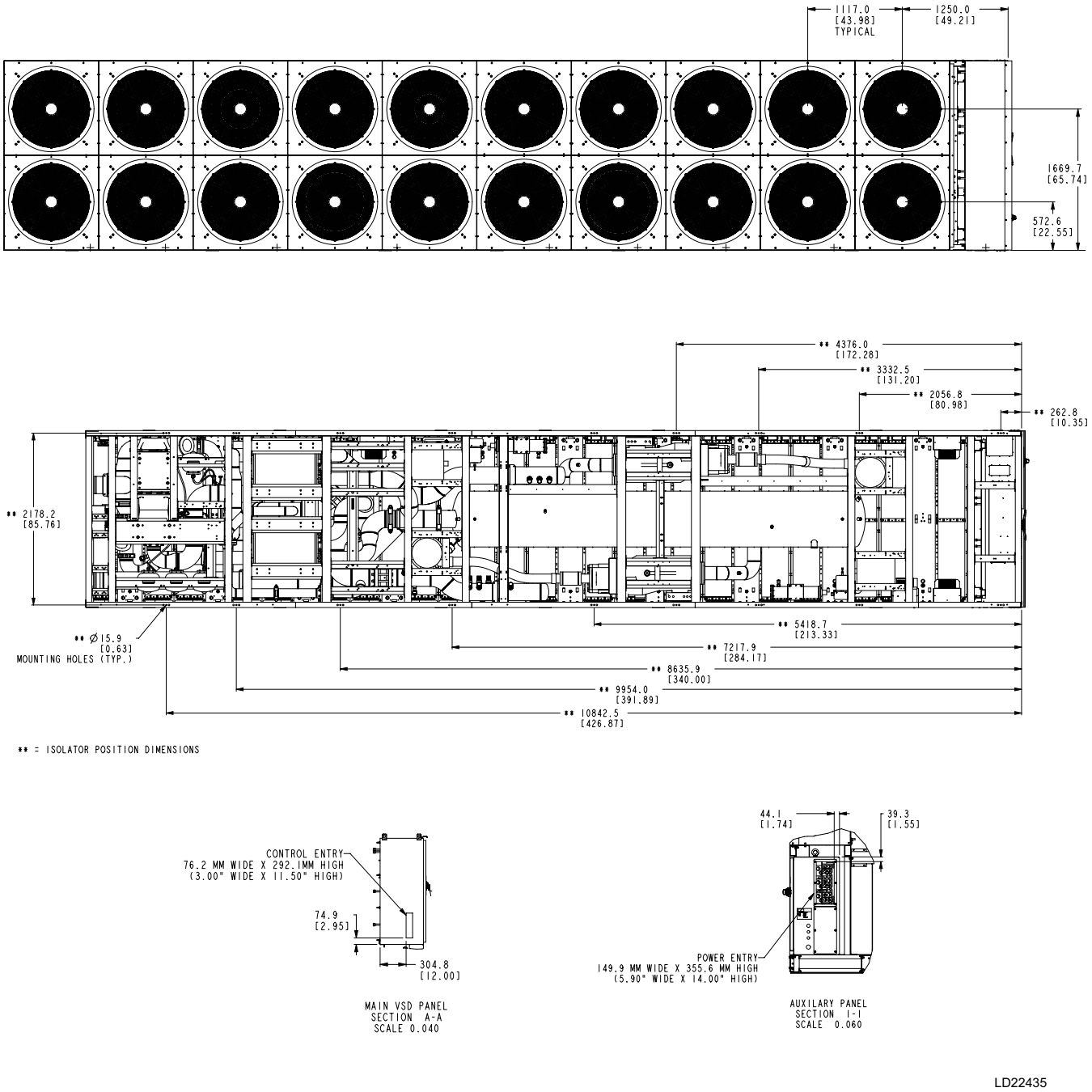
Figure 39: YVFA0459 and YVFA1589 unit dimensions, closed-loop option



Physical data (cont'd)

YVFA0459 and YVFA1589 unit dimensions, closed-loop option

Figure 40: YVFA0459 and YVFA1589 unit dimensions, closed- loop option



Physical data (cont'd)

Elastomeric isolators

Figure 41: Elastomeric isolators

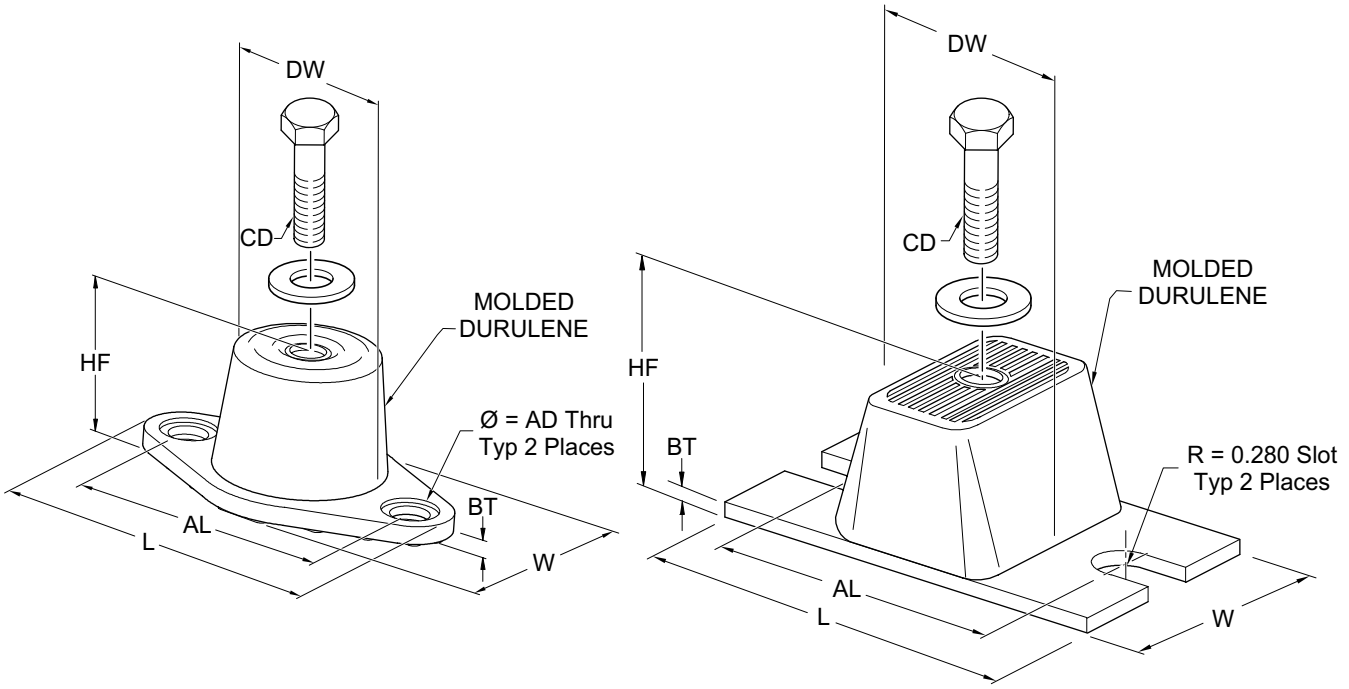


Table 5: Elastomeric isolators dimensions

Model P/N	Dimension data, in. (mm)							
	L	W	HF	AL	AD	BT	CD	DW
Type A 029-25335-001 (434002)	5.50 (139.7)	3.38 (85.85)	2.88 (73.15)	4.13 (104.90)	0.56 (14.22)	0.25 (6.35)	1/2-13 UNC X 1 (M27 X 3)	2.50 (63.50)
Type B 029-25335-002 (434004) Type B 029-25335-004 (434005)	6.25 (158.75)	4.63 (117.6)	2.75 (69.85)	5.00 (127.00)	0.56 (14.22)	0.38 (9.65)	1/2-13 UNC X 1 (M27 X 3)	3.00 (76.20)

Table 6: Elastomeric weights and color

Model P/N	Isolator color	Weight range	
		lb	kg
029-25335-001 (434002)	Charcoal	Up to 825	Up to 374
029-25335-002 (434004)	Brick red	826 to 1,688	375 to 766
029-25335-004 (434005)	Charcoal	1,689 to 4,000	767 to 1,814

Physical data (cont'd)

1 in. deflection spring isolator

Figure 42: 1 in. deflection spring isolator

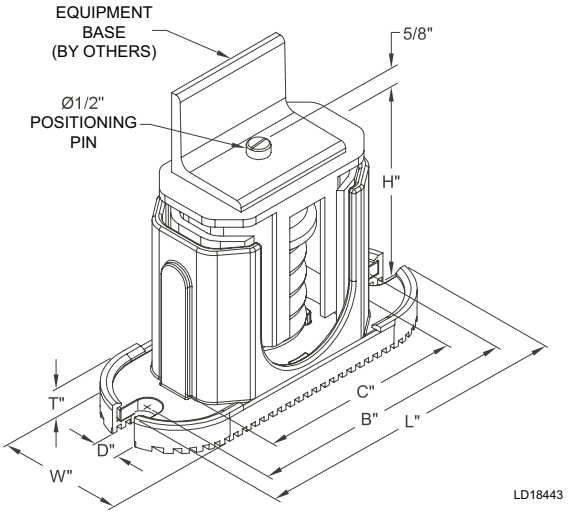


Table 7: 1 in. deflection spring isolator dimensions

Mount type	Dimension data, in.						
	W	**D**	**L**	**B**	**C**	**T**	**H**
Type A	3	5/8	7 3/4	6 1/2	4-3/4	1/2	5 5/8
Type B	3	5/8	10 1/2	9 1/4	7 3/4	9/16	6

Table 8: 1 in. deflection spring isolator wieghts and color

Type A model P/N	Color code	Rated capacity, for units with all load points less than 1,785 lb (810 kg)		
		lb	**kg**	**Part number**
029-25334-002 (433668)	Black	Up to 434	Up to 197	029-25334-002
029-25334-003 (433669)	Dark green	435 to 765	198 to 347	029-25334-003
029-25334-004 (433670)	Gray	766 to 1,020	348 to 463	029-25334-004
029-25334-005 (433871)	White	1,021 to 1,156	464 to 524	029-25334-005
029-25334-006 (433872)	Gray/Red	1,157 to 1,785	525 to 810	029-25334-006

Type B model P/N	Color code	Rated capacity, for units with any load point above 1518 lb (689 kg)		
		lb	**kg**	**Part number**
029-25334-008 (433997)	Dark purple	Up to 1148	Up to 521	029-25334-008
029-25334-009 (433998)	Dark green	1,149 to 1,530	522 to 694	029-25334-009
029-25334-010 (433999)	Gray	1,531 to 2,040	695 to 925	029-25334-010
029-25334-012 (434000)	White	2,041 to 2,312	926 to 1,049	029-25334-012
029-25334-013 (434001)	Gray/red	2,313 to 3,570	1,050 to 1,619	029-25334-013

Physical data (cont'd)

2 in. deflection restrained spring isolator

Figure 43: 2 in. deflection restrained srpring isolator

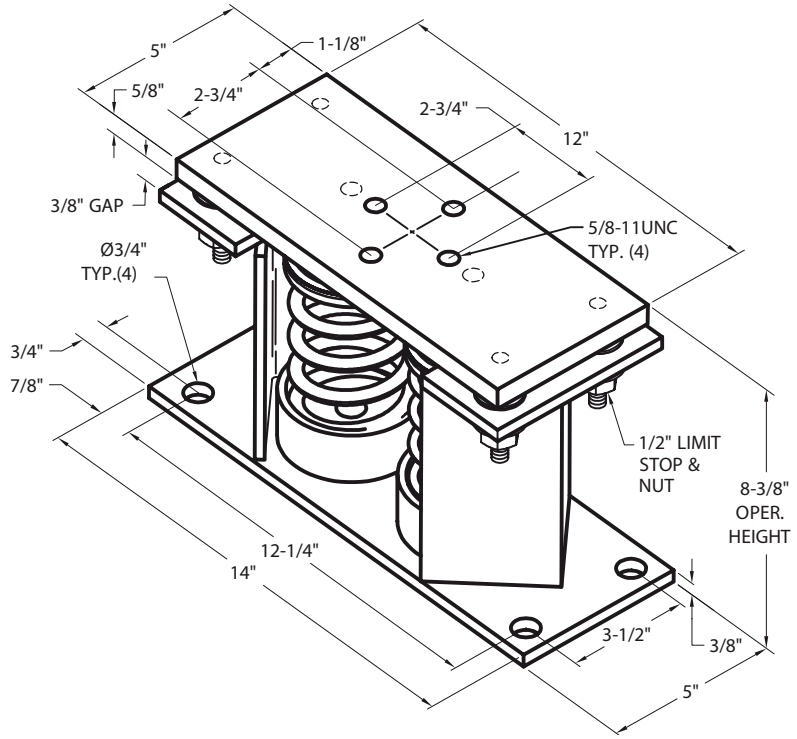


Table 9: 2 in. deflection restrained srpring isolator weights and color

Weight range		Model P/N	Color
lb	kg		
Up to 391	Up to 177	029-25336-006 (688690)	Green
392 to 604	178 to 274	029-25336-008 (688691)	Dark brown
605 to 740	275 to 336	029-25336-009 (688692)	Red
741 to 1,020	337 to 463	029-25336-010 (688693)	Red/black
1,021 to 1,437	464 to 652	029-25336-011 (688694)	Pink
1,438 to 2,244	653 to 1,018	029-25336-012 (688695)	Pink/gray
2,245 to 2,618	1,019 to 1,188	029-25336-013 (688697)	Pink/gray/orange
2,619 to 3,740	1,189 to 1,696	029-25336-014 (688698)	Pink/gray/dark brown

Note: Weight value is de-rated by 15%

Electrical data

Table 10: Electrical lug data, open loop

Field wiring lugs				3 hp VSD fans					
				Terminal block		Circuit breaker		Non-fused disconnect switch	
YVFA model		Input V	Input freq.	Wire per phase	Lug wire range	Wire per phase	Lug wire range	Wire per phase	Lug wire range
0159	0539	200	60	4	1/0 - 700 kcmil	–	–	–	–
		230	60	4	#2 - 600 kcmil	4	4/0 - 500 kcmil	–	–
		380	60	2	#2 - 600 kcmil	2	#1 - 500 kcmil	3	#2 - 600 kcmil
		400*	50	2	#2 - 600 kcmil	2	#1 - 500 kcmil	3	#2 - 600 kcmil
		400**	50	–	–	2	#1 - 500 kcmil	3	#2 - 600 kcmil
		460	60	2	#2 - 600 kcmil	2	#1 - 500 kcmil	3	#2 - 600 kcmil
		575	60	2	#2 - 600 kcmil	2	#1 - 500 kcmil	2	#2 - 600 kcmil
0209	0709	200	60	4	1/0 - 700 kcmil	–	–	–	–
		230	60	4	#2 - 600 kcmil	4	4/0 - 500 kcmil	–	–
		380	60	3	#2 - 600 kcmil	3	3/0 - 400 kcmil	3	#2 - 600 kcmil
		400*	50	3	#2 - 600 kcmil	3	3/0 - 400 kcmil	3	#2 - 600 kcmil
		400**	50	–	–	3	3/0 - 400 kcmil	3	#2 - 600 kcmil
		460	60	2	#2 - 600 kcmil	2	#1 - 500 kcmil	3	#2 - 600 kcmil
		575	60	2	#2 - 600 kcmil	2	#1 - 500 kcmil	2	#2 - 600 kcmil
0259	0889	200	60	4	1/0 - 700 kcmil	–	–	–	–
		230	60	4	#2 - 600 kcmil	4	4/0 - 500 kcmil	–	–
		380	60	3	#2 - 600 kcmil	3	3/0 - 400 kcmil	3	#2 - 600 kcmil
		400*	50	3	#2 - 600 kcmil	3	3/0 - 400 kcmil	3	#2 - 600 kcmil
		400**	50	–	–	3	3/0 - 400 kcmil	3	#2 - 600 kcmil
		460	60	3	#2 - 600 kcmil	3	3/0 - 400 kcmil	3	#2 - 600 kcmil
		575	60	2	#2 - 600 kcmil	2	#1 - 500 kcmil	2	#2 - 600 kcmil
0289	1009	200	60	4	1/0 - 700 kcmil	–	–	–	–
		230	60	4	#2 - 600 kcmil	4	4/0 - 500 kcmil	–	–
		380	60	3	#2 - 600 kcmil	3	3/0 - 400 kcmil	3	#2 - 600 kcmil
		400*	50	3	#2 - 600 kcmil	3	3/0 - 400 kcmil	3	#2 - 600 kcmil
		400**	50	–	–	3	3/0 - 400 kcmil	3	#2 - 600 kcmil
		460	60	3	#2 - 600 kcmil	3	3/0 - 400 kcmil	3	#2 - 600 kcmil
		575	60	2	#2 - 600 kcmil	2	#1 - 500 kcmil	2	#2 - 600 kcmil
0309	1069	200	60	–	–	–	–	–	–
		230	60	–	–	–	–	–	–
		380	60	4	#2 - 600 kcmil	4	4/0 - 500 kcmil	4	#2 - 600 kcmil
		400*	50	4	#2 - 600 kcmil	4	4/0 - 500 kcmil	4	#2 - 600 kcmil
		400**	50	–	–	4	4/0 - 500 kcmil	4	#2 - 600 kcmil
		460	60	3	#2 - 600 kcmil	4	4/0 - 500 kcmil	3	#2 - 600 kcmil
		575	60	3	#2 - 600 kcmil	3	3/0 - 400 kcmil	3	#2 - 600 kcmil
0359	1239	200	60	–	–	–	–	–	–
		230	60	–	–	–	–	–	–
		380	60	4	#2 - 600 kcmil	4	4/0 - 500 kcmil	4	#2 - 600 kcmil
		400*	50	4	#2 - 600 kcmil	4	4/0 - 500 kcmil	4	#2 - 600 kcmil
		400**	50	–	–	4	4/0 - 500 kcmil	4	#2 - 600 kcmil
		460	60	3	#2 - 600 kcmil	4	4/0 - 500 kcmil	3	#2 - 600 kcmil
		575	60	3	#2 - 600 kcmil	3	3/0 - 400 kcmil	3	#2 - 600 kcmil
0409	1419	200	60	–	–	–	–	–	–
		230	60	–	–	–	–	–	–
		380	60	3	#2 - 600 kcmil	3	3/0 - 400 kcmil	3	3/0 - 400 kcmil
		400*	50	3	#2 - 600 kcmil	3	3/0 - 400 kcmil	3	3/0 - 400 kcmil
		400**	50	–	–	3	3/0 - 400 kcmil	3	3/0 - 400 kcmil
		460	60	2	#2 - 600 kcmil	3	3/0 - 400 kcmil	3	3/0 - 400 kcmil
		575	60	2	#2 - 600 kcmil	2	#1 - 500 kcmil	2	#1 - 500 kcmil
0459	1589	200	60	–	–	–	–	–	–
		230	60	–	–	–	–	–	–
		380	60	3	#2 - 600 kcmil	3	3/0 - 400 kcmil	3	3/0 - 400 kcmil
		400*	50	3	#2 - 600 kcmil	3	3/0 - 400 kcmil	3	3/0 - 400 kcmil
		400**	50	–	–	3	3/0 - 400 kcmil	3	3/0 - 400 kcmil
		460	60	2	#2 - 600 kcmil	3	3/0 - 400 kcmil	3	3/0 - 400 kcmil
		575	60	2	#2 - 600 kcmil	2	#1 - 500 kcmil	2	#1 - 500 kcmil

* Electrical lug data for GB. ** Electrical lug data for CE.

Electrical data (cont'd)

Table 11: Electrical lug data, closed loop

Field wiring lugs				3 hp VSD fans					
				Terminal block		Circuit breaker		Non-fused disconnect switch	
YVFA model		Input, V	Input freq.	Wire per phase	Lug wire range	Wire per phase	Lug wire range	Wire per phase	Lug wire range
		200	60						
		230	60						
		380	60	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
0159	0539	400*	50	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
		400**	50	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
		460	60	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
		575	60	–	–	–	–	–	–
		200	60	–	–	–	–	–	–
		230	60	–	–	–	–	–	–
		380	60	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
0209	0709	400*	50	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
		400**	50	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
		460	60	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
		575	60	–	–	–	–	–	–
		200	60	–	–	–	–	–	–
		230	60	–	–	–	–	–	–
		380	60	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
0259	0889	400*	50	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
		400**	50	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
		460	60	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
		575	60	–	–	–	–	–	–
		200	60	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
		230	60	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
		380	60	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
0289	1009	400*	50	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
		400**	50	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
		460	60	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
		575	60	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
		200	60	–	–	–	–	–	–
		230	60	–	–	–	–	–	–
		380	60	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
0309	1069	400*	50	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
		400**	50	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
		460	60	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
		575	60	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
		200	60	–	–	–	–	–	–
		230	60	–	–	–	–	–	–
		380	60	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
0359	1239	400*	50	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
		400**	50	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
		460	60	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
		575	60	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
		200	60	–	–	–	–	–	–
		230	60	–	–	–	–	–	–
		380	60	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
0409	1419	400*	50	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
		400**	50	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
		460	60	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
		575	60	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil
		200	60	–	–	–	–	–	–
		230	60	–	–	–	–	–	–
		380	60	4	500 - 1,000 kcmil	4	500 - 1,000 kcmil	4	500 - 1,000 kcmil
0459	1589	400*	50	4	500 - 1,000 kcmil	4	500 - 1,000 kcmil	4	500 - 1,000 kcmil
		400**	50	4	500 - 1,000 kcmil	4	500 - 1,000 kcmil	4	500 - 1,000 kcmil
		460	60	4	500 - 1,000 kcmil	4	500 - 1,000 kcmil	4	500 - 1,000 kcmil
		575	60	4	#2 - 600 kcmil	4	#2 - 600 kcmil	4	#2 - 600 kcmil

* Electrical lug data for GB. ** Electrical lug data for CE.

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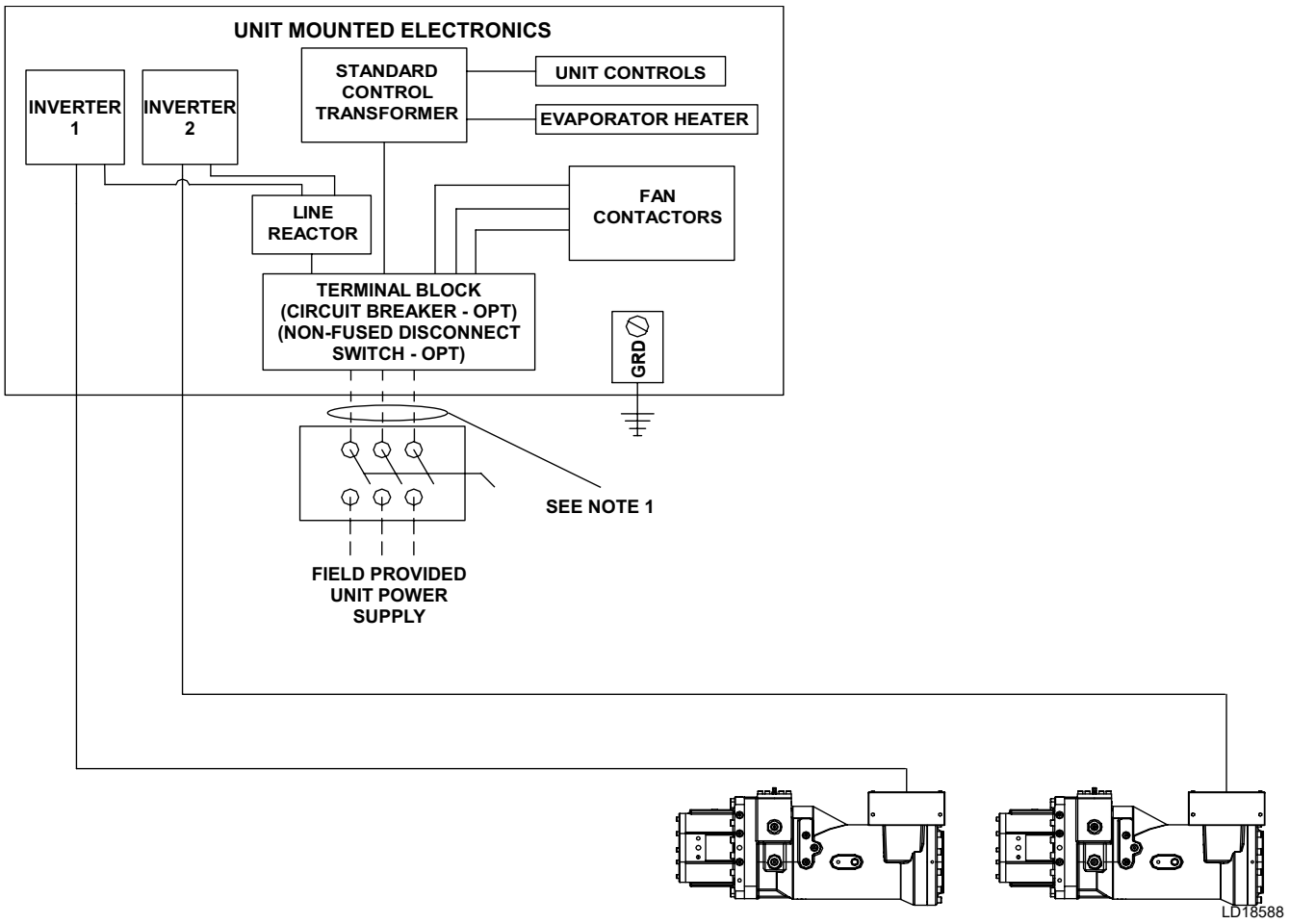
Wiring

Single-point wiring

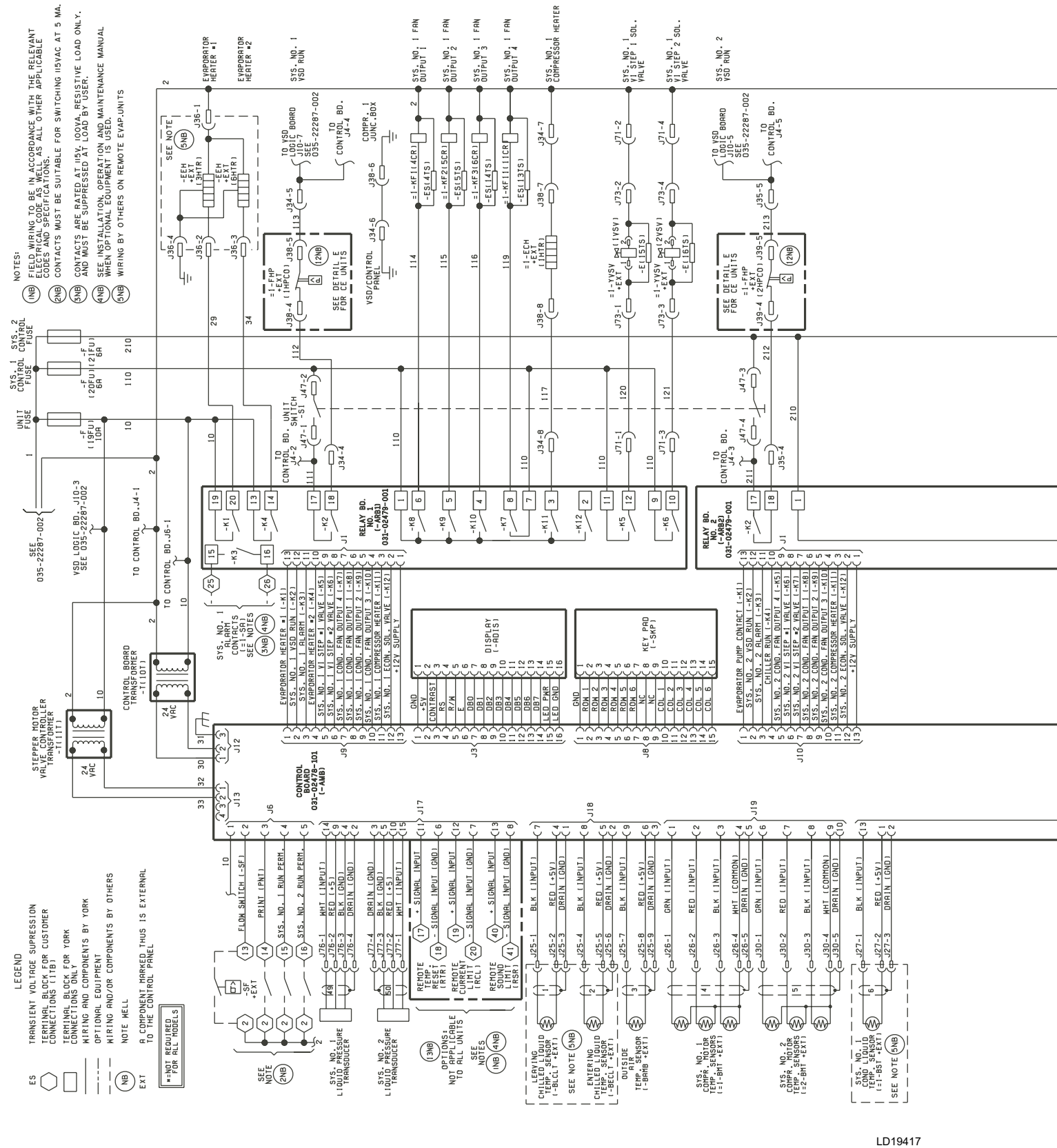
Figure 44: Single-point wiring



Wiring (cont'd)

Control wiring

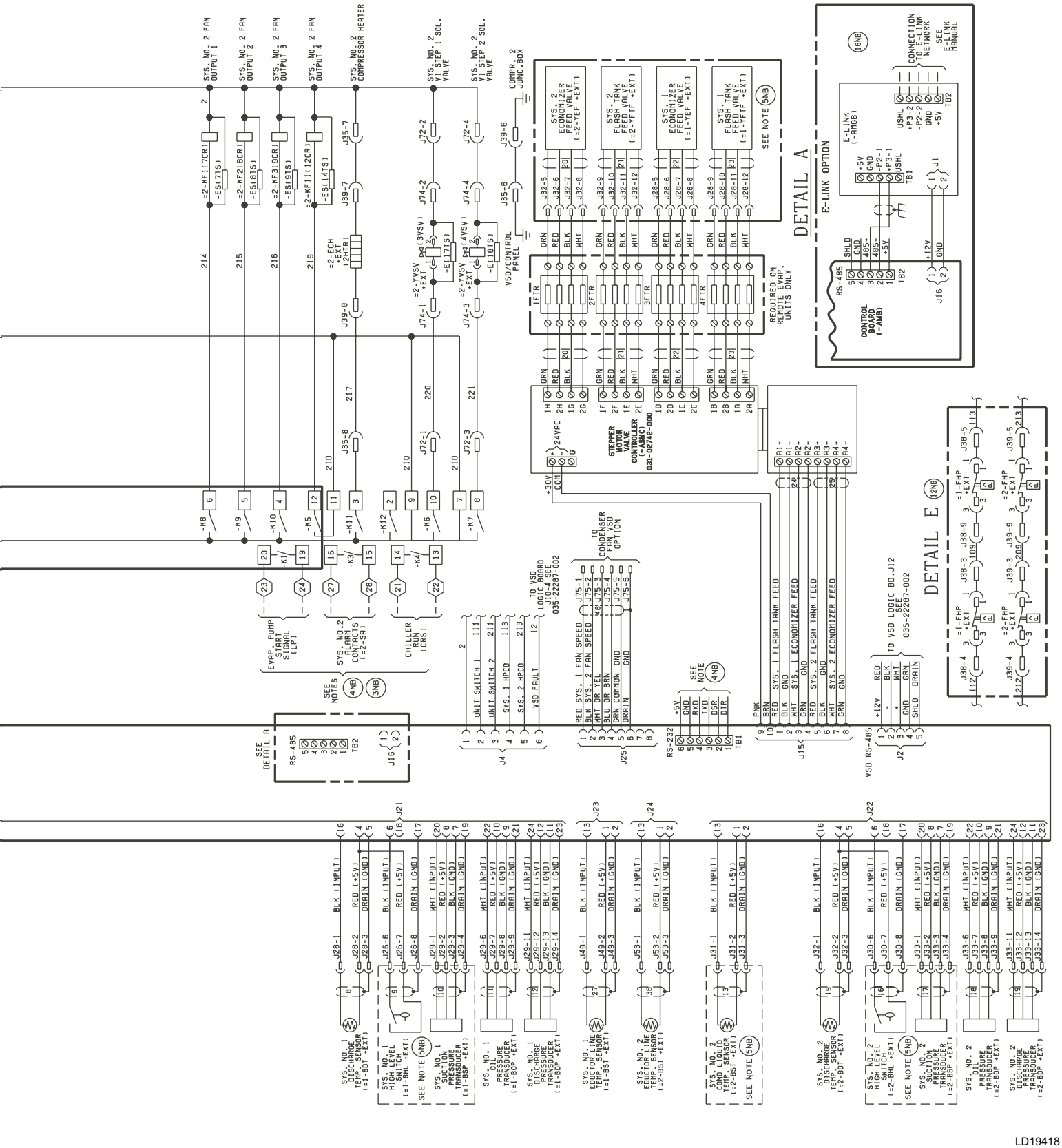
Figure 45: Control wiring



Wiring (cont'd)

Control wiring

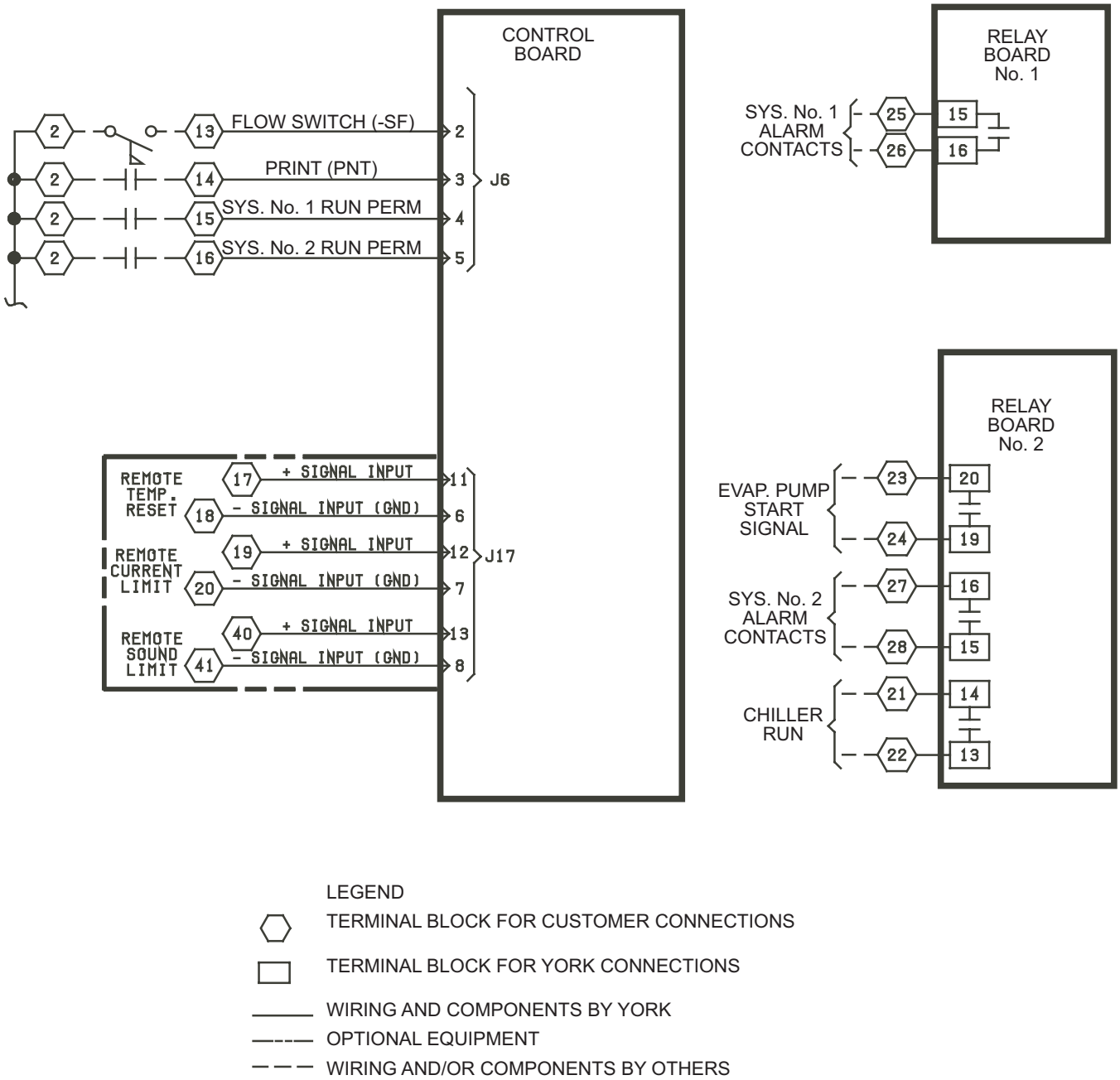
Figure 45: Control wiring, cont'd



Wiring (cont'd)

Customer control wiring

Figure 46: Customer control wiring



Guide specifications

Part 1: General

1.01 General requirements

A. The requirements of this section must conform to the general provisions of the contract, including general and supplementary conditions, conditions of the contract, and contract drawings.

1.02 Scope

A. Provide microprocessor controlled, twin-screw compressor, air-cooled, liquid chillers with auxiliary liquid cooling coils of the scheduled capacities as shown and indicated on the drawings, including but not limited to:

1. Chiller package
2. Charge of refrigerant and oil
3. Electrical power and control connections
4. Chilled liquid connections
5. Manufacturer start-up

1.03 Quality assurance

A. Products must be designed, tested, rated and certified in accordance with, and installed in compliance with applicable sections of the following standards and codes:

1. AHRI 550/590 – Water Chilling Packages Using the Vapor Compression Cycle
2. AHRI 370 – Sound Rating of Large Outdoor Refrigerating and Air-Conditioning Equipment
3. ANSI/ASHRAE 15 – Safety Code for Mechanical Refrigeration
4. ANSI/ASHRAE 34 – Number Designation and Safety Classification of Refrigerants
5. ASHRAE 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings
6. ANSI/NFPA 70 – National Electrical Code (NEC)
7. ASME Boiler and Pressure Vessel Code, Section VIII, Division 1
8. OSHA – Occupational Safety and Health Act
9. Manufactured in facility registered to ISO 9001
10. Conform to Intertek Testing Services for construction of chillers and provide ETL/cETL Listed Mark

Guide specifications (cont'd)

1.04 Delivery and handling

A. Unit must be delivered to job site fully assembled with all interconnecting refrigerant piping and internal wiring ready for field installation and charged with refrigerant and oil by the Manufacturer. Units selected with R-1234ze may optionally ship less refrigerant and with a nitrogen holding charge.

B. Provide protective covering over vulnerable components for unit protection during shipment. Fit nozzles and open ends with plastic enclosures.

C. Unit must be stored and handled per the manufacturer's instructions.

Part 2: Products

2.01 Manufacturers

A. The design shown on the drawings is based on YORK Model YVFA VSD screw chiller with integrated waterside economizer manufactured by Johnson Controls. Alternate equipment is acceptable if the manufacturer's equipment meets the scheduled performance and complies with these specifications. If equipment manufactured by a manufacturer other than that scheduled is utilized, then the mechanical contractor must be responsible for coordinating with the general contractor and all affected subcontractors to insure proper provisions for installation of the furnished unit. This coordination includes, but is not limited to, the following:

1. Structural supports for units.
2. Piping size and connection or header locations.
3. Electrical power requirements and wire/conduit and overcurrent protection sizes.
4. Chiller physical size on plant layout.
5. Site noise considerations.
6. Annual energy cost analysis including site location, building use profile, electrical and demand charges.

B. The mechanical contractor is responsible for all costs incurred by the general contractor, subcontractors, and consultants to modify the building provisions to accept the furnished alternate equipment.

C. The equipment manufacturer must specialize in the design and manufacture of the products specified and must have a minimum of ten years of experience in supplying VSD compressor technology on the type of equipment and refrigerant specified.

2.02 General

A. Description: furnish, install, and commission factory assembled, charged, and operational run tested air-cooled screw compressor chiller with integrated waterside economizer glycol coils as specified herein and shown on the drawings. The chiller includes, but is not limited to: a complete system with multiple independent refrigerant circuits, semi hermetic twin screw compressors, tube-in-shell hybrid falling film type evaporator, air-cooled condenser, glycol economizer coils, refrigerant, lubrication system, interconnecting wiring, safety and operating controls including capacity controller, control center, motor starting components, and special features as specified herein or required for safe, automatic operation. Units selected with R-1234ze may optionally ship less refrigerant and with a nitrogen holding charge.

Guide specifications (cont'd)

B. Operating Characteristics:

1. Provide low and high ambient temperature control options as required to ensure unit is capable of operation from -20°F to 131°F (-28.9°C to 55°C) ambient temperature.

2. Provide capacity control system capable of reducing unit capacity to 10% of full load for 2 compressor units. The compressor starts in the unloaded condition. Hot gas bypass is not acceptable to meet the specified minimum load.

C. Cabinet: Unit panels, structural elements, control boxes and heavy gauge structural base must be constructed of painted galvanized steel. All exposed sheet steel must be coated with baked on powder paint to meet 500-h salt spray test in accordance with the ASTM B117 standard.

D. Shipping: The unit ships in one piece and requires installer to provide only a single evaporator inlet and outlet pipe connection. If providing chiller model that ships in multiple pieces, bid must include all of the material and field labor costs for factory authorized personnel to install a trim kit to connect the pieces as well as all interconnecting piping and wiring.

2.03 Compressors

A. Compressors: Must be direct drive, semi hermetic, rotary twin-screw type, including: muffler, temperature actuated 'off-cycle' heater, rain-tight terminal box, discharge shut-off service valve, and precision machined cast iron housing. Design working pressure of entire compressor, suction to discharge, is 350 psig (24 barg) or higher. Compressor must be UL Recognized.

Optional: A suction shut-off service valve for each compressor.

B. Compressor Motors: Refrigerant suction-gas cooled accessible hermetic compressor motor, full suction gas flow through 0.006 in. (0.1524 mm) maximum mesh screen, with inherent internal thermal overload protection and external current overload on all three phases.

C. Balancing Requirements: All rotating parts must be statically and dynamically balanced.

D. Lubrication System: External oil separators with no moving parts, 450 psig (31 barg) design working pressure, and ETL and/or CE listing must be provided on the chiller. Refrigerant system differential pressure provides oil flow through service replaceable, 0.5 micron, full flow, cartridge type oil filter internal to compressor. Filter bypass, less restrictive media, or oil pump not acceptable.

E. Capacity Control: Compressors start at minimum load. Provide Microprocessor control to command com-pressor capacity to balance compressor capacity with cooling load.

Guide specifications (cont'd)

2.04 Refrigerant circuit components

A. Refrigerant: R-134a. Classified as Safety Group A1 according to ASHRAE 34.

Optional: EN 378-2. This only applies when optional dual safety relief valves are fitted.

Optional: Refrigerant: R-513A. Classified as Safety Group A1 according to ASHRAE 34.

Optional: R-1234ze refrigerant is optional and classified as Safety Group A2L according to ASHRAE 34.

B. Equipment supplied must comply with LEED Energy & Atmospheric Credit 4, Enhanced Refrigerant Management.

C. Each independent refrigerant circuit incorporates all components necessary for the designed operation including: liquid line shut-off valve with charging port, low side pressure relief device, removable core filter-drier and sight glass with moisture indicator.

D. The chiller manufacturer provides an independent circuit for each compressor to provide maximum redundancy during chiller operation. If the equipment does not have independent circuits for each compressor, the manufacturer must provide the owner with one spare compressor of each unique size.

E. Discharge lines must be provided with manual compressor shut-off service valves.

2.05 Heat exchangers

A. Evaporator:

1. The evaporator must be tube-in-shell, hybrid falling film type to optimize efficiency and refrigerant charge. Tubes must be high-efficiency, internally and externally enhanced type copper tubes with 0.035 in. (0.89 mm) minimum wall thickness at all intermediate tube supports to provide maximum tube wall thickness at the support area. Each tube must be roller-expanded into the tube sheets providing a leak proof seal, and be individually replaceable. Independent refrigerant circuits must be provided for each compressor.

2. Constructed, tested, and stamped in accordance with applicable sections of ASME pressure vessel code for minimum 235 psig (16 barg) refrigerant side design working pressure and 150 psig (10 barg) liquid side design working pressure.

   Optional: Constructed, tested, and stamped in accordance with applicable sections of PED pressure vessel code for minimum 235 psig (16 barg) refrigerant side design working pressure and 150 psig (10 barg) liquid side design working pressure.

   Optional: Constructed, tested, and stamped in accordance with applicable sections of GB pressure vessel code for minimum 235 psig (16 barg) refrigerant side design working pressure and 150 psig (10 barg) liquid side design working pressure.

3. Water boxes must be removable to permit tube cleaning and replacement. Water boxes must include liquid nozzle connections suitable for ANSI/AWWA C-606 grooved couplings, welding, or flanges.

   Optional: 150 psig (10.3 barg) ANSI raised-face weldable flanges with companion flanges. Flanges are field-welded by Contractor. Bolts, nuts, and gaskets are not included.

Guide specifications (cont'd)

Optional: 150 psig (10.3 barg) ANSI raised-face flanges with ANSI/AWWA C-606 couplings with companion flanges. Flanges are field-mounted by Contractor. Bolts, nuts, and gaskets are not included.

4. Provide vent and drain fittings, and thermostatically controlled shell heaters to assist in preventing freeze damage.

   Optional: A separate power connection for evaporator waterbox heaters is required to assist in freeze damage protection down to -20ºF (-28.9ºC) ambient temperature and must be provided by the contractor.

5. Connection location: Chilled liquid inlet and outlet nozzle connections are located at rear (opposite control panel) end of unit for the standard two-pass arrangement.

   Optional: Inlet and outlet nozzle connections located at front end of unit. Available for select configurations.

B. Air-cooled Condenser and Waterside Economizer Glycol Cooling Coils:

1. Condenser coils must be microchannel type, parallel flow aluminum alloy tubes metallurgically brazed as one piece to enhanced aluminum alloy fins. Condenser coils must be made of a single material to avoid galvanic corrosion due to dissimilar metals. Tube and fin type condenser coils are an acceptable alternate when tubes and fins are fabricated of the same metal material to avoid galvanic corrosion due to dissimilar metals. Coils must be designed for 350 psig (24 barg) or higher working pressure.

   Optional: Coils, internally enhanced, seamless copper tubes, mechanically expanded into aluminum alloy fins with full height collars. Subcooling coil an integral part of condenser. The design working pressure must be 350 psig (24 barg).

   Optional: Post-coated, epoxy-dipped condenser microchannel: The unit must be built with microchannel sections that have been applied with an electrodeposited and baked flexible epoxy coating that is finished with a polyurethane UV resistant top-coat suitable for highly corrosive applications.

   Optional: Wire Panels: Heavy gauge, welded wire mesh coated to resist corrosion, to protect condenser coils from incidental damage and also restrict unauthorized access to internal components.

   Optional: Louvered Panels (Condenser Coils): Painted steel to match unit panels, over external condenser coil faces.

   Optional: Louvered Panels (Full Unit): Painted steel to match unit panels, over internal components.

   Optional: Louvered or wire panels: Louvered steel panels on external condenser coil faces, painted to match unit panels. Heavy gauge, welded wire mesh, coated to resist corrosion, around base of machine to restrict unauthorized access.

   Optional: End Hail Guard: Louvered steel panels on rear of unit, opposite end of control panel, painted to match unit panels.

   Optional: V-Guard Panels: Steel panels installed over exposed condenser piping to protect from damage.

Guide specifications (cont'd)

2. High airflow fans with VSDs. All fans must be powered by VSD. Fans provide vertical air discharge from extended orifices. Fans are composed of corrosion resistant aluminum hub and glass-fiber-reinforced polypropylene composite blades molded into a low-noise airfoil section. Fan impeller must be dynamically balanced for vibration-free operation. Fan guards of heavy gauge, PVC (polyvinyl chloride) coated or galvanized steel.

3. Fan motors: High efficiency, direct drive, three-phase, insulation class “F”, current protected, Totally Enclosed Air-Over (TEAO), IP54 with double sealed, permanently-lubricated ball bearings. Open Drip Proof (ODP) fan motors are not acceptable.

C. Integrated Waterside Economizer Heat Exchangers:

1. Integrated Waterside Economizer coils must be seamless copper tubes mechanically expanded into aluminum alloy fins with full height collars. Design working pressure is 150 psig (10.3 barg) or higher

   Optional: Coils can be post-coated with an electro-deposited and baked flexible epoxy coating that is finished with a polyurethane UV resistant top-coat suitable for highly corrosive applications.

2. Liquid inlet and outlet must be single connection for simple field piping. Piping to connect evaporator and integrated waterside economizer coils must be internal to the unit frame. All internal connections are factory-connected.

3. Unit must be equipped with a valve to permit bypass of waterside economizer coils when ambient temperature is above liquid return temperature, to avoid unnecessary liquid pressure drop and reduce pumping power consumption. The valve must be automatically controlled and powered by unit control panel. This feature is not required with the closed loop option.

4. **Optional:** Unit must be provided with Closed Loop Option including a closed circuit with glycol to water brazed-plate heat exchanger(s), glycol circulating pump, and glycol charge, to permit use of water in evaporator. Closed circuit must include freeze protection to -20°F / -28.9°C.

2.06 Insulation

A. Material: Closed-cell, flexible, UV protected, thermal insulation complying with ASTM C 534 Type 2 (Sheet) for preformed flexible elastomeric cellular thermal insulation in sheet and tubular form.

B. Thickness: 3/4 in. (19mm).

C. Thermal conductivity: 0.26 (BTU/HR-Ft^2-°F/in.) maximum at 75°F mean temperature.

D. Factory-applied insulation over cold surfaces of liquid chiller components including evaporator shell, water boxes, and suction line. Liquid nozzles must be insulated by contractor after pipe installation.

E. Adhesive: As recommended by insulation manufacturer and applied to 100% of insulation contact surface including all seams and joints.

Guide specifications (cont'd)

2.07 Acoustical data

A. Provide acoustical sound power or sound pressure level data in decibels (dB) at the scheduled eight octave band center frequencies. A-weighted sound data alone is not acceptable.

B. Provide all sound power or sound pressure level data at 100%, 75%, 50%, and 25% load.

C. Supplied equipment must not exceed the scheduled sound power or sound pressure level data at any load point. The mechanical contractor is responsible for any additional costs associated with equipment deviation.

D. Acoustical performance ratings must be in accordance with AHRI Standard 370.

Optional: Provide optional control input to limit sound output of the chiller based on time of day. Must be programmable at the chiller panel or controlled remotely by a signal (4 mA to 20 mA or 0 VDC to 10 VDC) from BAS system. Chillers without this feature must be provided with the necessary sound attenuation to meet the scheduled sound performance data at all load points.

2.08 Power and electrical requirements

A. Power or control panel:

1. Factory installed and wired NEMA 3R / IP55, powder painted steel cabinets with tool lockable, hinged, latched, and gasket sealed outer doors equipped with wind struts for safer servicing. Provide main power connection(s), compressor starters and fan motor contactors, current overloads, and factory wiring.
2. The panel includes control display access door.
3. Control cabinet must be a closed design, without requirement for external airflow for component cooling.

B. Single-point Power:

1. Provide single-point power connection to chiller, must be 3 phase of scheduled voltage.
2. Terminal Block connections must be provided at the point of incoming single-point connection for field connection and interconnecting wiring to the compressors. Separate external protection must be supplied, by others, in the incoming power wiring, which must comply with local codes.

Optional: Single-point Disconnect: A non-fused disconnect and lockable external handle must be provided at the point of incoming single-point connection for field connection, interconnecting wiring to the compressors, and isolating the unit power voltage for servicing. Separate external fusing must be supplied, by others, in the incoming power wiring which must comply with local codes.

Optional: Single-point Circuit Breaker: A unit-mounted Circuit Breaker with external lockable handle must be provided at the point of incoming single-point connection for field connection, interconnecting wiring to the compressors, and isolating the power voltage for servicing. Incoming power wiring must comply with local codes. Circuit breaker must be sized to provide the motor branch circuit protection, short circuit protection and ground fault protection for the motor branch-circuit conductors, the motor control apparatus and the motors.

Guide specifications (cont'd)

C. Control transformer: power panel must be supplied with a factory mounted and wired control transformer that supplies all unit control voltage from the main unit power supply. The transformer uses scheduled line voltage on the primary side and provide 115 V/1Ø on secondary.

D. Short circuit withstand rating of the chiller electrical enclosure must be (380, 400, and 460 V): 30,000 Amps.

Optional: Short Circuit Withstand Rating of the chiller electrical enclosure shall be (380, 400, and 460 V): 50,000 Amps

Optional: Short Circuit Withstand Rating of the chiller electrical enclosure must be (380, 400, and 460 V): 65,000 Amps. Rating shall be published in accordance with UL508.

Optional: Rating shall be published in accordance EN 60204-1

E. Motor Starters: Motor starters shall be Variable Frequency Drive type with zero electrical inrush current. Wye-Delta, Solid State, and Across the Line type starters are not acceptable.

F. Power factor:

1. Provide equipment with power factor correction capacitors as required to maintain a displacement power factor of 95% at all load conditions.

2. The installing contractor is responsible for additional cost to furnish and install power factor correction capacitors if they are not factory mounted and wired.

G. All exposed power wiring is routed through liquid-tight, UV-stabilized, non-metallic conduit.

H. Supplied equipment must not exceed scheduled Minimum Circuit Ampacity (MCA). The mechanical contractor is responsible for any additional costs associated with equipment deviation.

2.09 Controls

A. General:

1. Provide automatic control of chiller and waterside economizer operation including compressor start/stop and load/unload, anti-recycle timers, condenser fans, evaporator pump, evaporator heater, waterside economizer bypass valve, unit alarm contacts and run signal contacts.

2. Provide evaporator pump start signal from chiller control panel to enable operation of chilled fluid pumps. Contractor shall wire chilled fluid circuit pump(s) run signal from the chiller control panel's evaporator start relay to allow the chiller to enable chilled fluid flow through the evaporator to prevent freeze damage.

3. Chiller shall automatically reset to normal chiller operation after power failure.

4. Unit operating software shall be stored in non-volatile memory. Field programmed set points must be retained in lithium battery backed regulated time clock (RTC) memory for minimum five years.

5. Alarm contacts shall be provided to remote alert for any unit or system safety fault.

Guide specifications (cont'd)

B. Display and keypad:

1. Provide minimum 80 character liquid crystal display that is both viewable in direct sunlight and has LED backlighting for nighttime viewing. Provide one keypad and display panel for each chiller.

2. Display and keypad is accessible through display access door without opening main control/electrical cabinet doors.

3. Display provides a minimum of unit setpoints, status, electrical data, temperature data, pressures, safety lockouts and diagnostics without the use of a coded display.

4. Descriptions in English (or available language options), numeric data in English (or Metric) units.

5. Sealed keypad includes unit On/Off switch.

C. Programmable setpoints (within manufacturer limits): Display language, chilled liquid cooling mode, local/remote control mode, display units mode, system lead/lag control mode, remote temperature reset, remote current limit, remote sound limit, low ambient temperature cutout enable/disable, leaving chilled liquid setpoint and range, maximum remote temperature reset.

D. Display data: Chilled liquid leaving and entering temperatures; outside ambient air temperature; lead system; evaporator pump status; active remote control; compressor suction, discharge, and oil pressures for each refrigerant circuit; compressor discharge, motor, and oil temperatures for each refrigerant circuit; saturation temperatures for each refrigerant circuit; compressor speed; condenser fan status; condenser subcooling temperature; condenser drain valve percentage open; compressor capacity in percentage of full load amps; compressor number of starts; run time; operating hours; evaporator heater status; history data for last ten shutdown faults; history data for last 20 normal (non-fault) shutdowns.

E. Predictive control points: Unit controls avoid safety shutdown when operating outside design conditions by optimizing the chiller controls and cooling load output to stay online and avoid safety limits being reached. The system monitors the following parameters and maintain the maximum cooling output possible without shutdown of the equipment: motor current, suction pressure, discharge pressure, starter internal ambient temperature, and starter baseplate temperature.

F. High/low differential oil pressure, low discharge superheat, high motor temperature, system control voltage.

G. Unit safeties: Must be automatic reset and cause compressors to shut down if: high or low ambient temperature, low leaving chilled liquid temperature, under voltage, flow switch operation. Contractor shall provide flow switch and wiring per chiller manufacturer requirements.

H. The manufacturer provides any controls not listed above which are necessary for automatic chiller operation. The mechanical contractor provides field control wiring necessary to interface sensors to the chiller control system.

Guide specifications (cont'd)

2.10 Accessories and options

Some accessories and options supersede standard product features. All options are factory-mounted unless otherwise noted.

A. Controls options:

1. Building Automation System Interface: Chiller to accept 4 to 20 mA or 0 to 10 VDC input from BAS (by others) to reset the leaving chilled liquid temperature setpoint.
2. Building Automation System Interface: Chiller to accept 4 to 20 mA or 0 to 10 VDC input from BAS (by others) to reset the load limit setpoint.
3. Building Automation System Interface: Chiller to accept 4 to 20 mA or 0 to 10 VDC input from BAS (by others) to reset the leaving chilled liquid temperature and load limit setpoints.
4. **Optional**: Gateway: SC-Equip is factory-mounted and provides communication for Building Automation Systems, including BACnet (MS/TP), Modbus, N2, and LON.

B. General options:

1. Solid state thermal dispersion flow switch with stainless steel probe and IP 67 housing with LED status indicator of flow and output condition. 300 Bar pressure rating, -13°F to 176°F (-25°C to 80°C) ambient temperature range. This is field-mounted by the contractor.
2. Differential Pressure Switch: 3 psig to 45 psig (0.2 barg to 3 barg) range with 1/4 in. NPTE pressure connections. This is field-mounted by the contractor.
3. Chicago Code Relief Valve – Special relief valves in compliance with Chicago Code.
4. Dual pressure relief valves – Two safety relief valves mounted in parallel; one is always operational. Pressure relief valves on both low and high pressure sides. Option available for ETL units only.
5. Special Requirement Documents:
    a. Special Requirement Document Package (SRDP) includes Pressure Vessel Report, Unit Run Test Report, Production System Check Sheet and Final Unit Inspection Check Sheet.
    b. Materials Package includes steel mill material reports for vessels in addition to Pressure Vessel Report, Unit Run Test Report, Production System Check Sheet and Final Unit Inspection Check Sheet

C. Vibration Isolation. All options are field-mounted by the contractor:

    a. Provide Elastomeric Isolators.
    b. Provide 1 in. deflection spring isolators: Level adjustable, spring and cage type isolators for mounting under the unit base rails.

Guide specifications (cont'd)

Part 3: Execution

3.01 Installation

A. General: Rig and install in full accordance with manufacturer's requirements, project drawings, and contract documents.

B. Location: Locate chiller as indicated on drawings, including cleaning and service maintenance clearance in accordance with the manufacturer instructions. Adjust and level chiller on support structure.

C. Components: Installing contractor must provide and install all auxiliary devices and accessories for fully operational chiller.

D. Electrical: Coordinate electrical requirements and connections for all power feeds with electrical contractor.

E. Controls: Coordinate all control requirements and connections with controls contractor.

F. Finish: Installing contractor must paint damaged and abraded factory finish with touch-up paint matching factory finish.

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