LZ Series
Chillers and
Outdoor Mechanical Rooms
Engineering Catalog

AHRI CERTIFIED®
www.ahridirectory.org
Air-Cooled Water Chilling Packages
AHRI Standards 550/590 and 551/591

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System Integration
- Complete System with AAON Chilled Water Air Handling Units
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Environmentally Friendly
- R-410A or R-134a Refrigerant

Extended Life
- Optional 5 Year Compressor Warranty
- Condenser Coil Guards
- 2,500 Hour Salt Spray Tested Exterior Corrosion Protection
- 10,000 Hour Salt Spray Tested Polymer E-Coated Condenser Coils

Features and Benefits Details

Flexibility of Design
With model sizes ranging from 45 to 540 tons the AAON LZ Series chiller can suit any application.

Convenience and Serviceability
The AAON LZ Series chiller was designed with convenient installation and servicing in mind. The LZ Series chiller is delivered to the jobsite ready for installation and startup. AAON offers a wide variety of standard and optional features, including pumping packages and compression tanks. All of these components are piped, wired and run tested before they are shipped from the factory.

All models feature lockable, hinged access doors to the cabinet interior. A lighted walk-in controls vestibule provides indoor access to vital controls components, the electrical system and compressors. Vestibule fan, chilled water coil and electric heater options are available. All controls components are labeled and connected with color-coded wiring to match the unit wiring diagram. Water connections may be specified in the front or back of the cabinet, which may be rooftop, platform or ground-level slab mounted. With all components internal to the cabinet, the LZ Series chiller does not require mounting in a remote location or a screened, protected area to prevent contact with building or visiting personnel.

Figure 1 - Walk-in Compressor and Control Compartment

Reliability
The cabinet's composite construction, galvanized G-90 sheet steel paneling surrounding insulating foam, provides strength, rigidity and excellent thermal resistance. Corrosion resistant external polyurethane paint surpasses a 2,500 hour salt spray test. The evaporative-condensed section is factory equipped with a three tank water treatment system (2 biocide, 1 scale protection) to maintain clean and efficient operation, and all wetted surfaces are 304 stainless steel, copper or other non-corrosive material. The air-cooled condenser section has standard condenser coil guards to reduce any potential damage. Additional coil corrosion protection is available with a

polymer e-coating which surpasses a 10,000 hour salt spray test. AAON integrates the latest in compressor technology into its all of its products for operational reliability. Each chiller is factory inspected and checked for leaks before leaving the factory.

Quiet Operation

In addition to being dependable, the hermetic scroll compressors and optional centrifugal Turbocor compressors included in LZ Series chiller offer quieter operation than comparable reciprocating compressors. Each compressor is placed on raised structural decks and rubber isolation mounted minimizing vibration. The chiller cabinet construction, composite paneling with 2" thick foam insulation, not only provides good thermal insulation, but also minimizes excessive exterior sound levels. A standard feature on all AAON chillers is axial flow condenser fans providing maximum airflow with minimal noise levels. For quieter condenser section operation, Variable Frequency Drives (VFDs) are available to reduce condenser fan energy consumption and noise at part load operation. The low sound ECM condenser fans offer the best sound as they are specifically designed for reduced and redirected sound emission.

Efficiency

All condenser fans utilize direct drive motors for maximum efficiency. VFDs are available on all pump motors and condenser fans for efficient operation at part load conditions. In addition to providing energy savings of 20 to 40% over the air-cooled model, the evaporative-condensed chiller contains a standard de-superheater that reduces water consumption by 20% or more. The use of scroll compressors, while being both reliable and quiet, also boasts reduced frictional losses and improved efficiency over comparable reciprocating compressors. Variable capacity oil-free magnetic bearing centrifugal Turbocor compressors provide load matching cooling capacity, with quiet energy efficient operation and oil free design is highly reliable. Variable capacity VFD controlled scroll compressors also provide load matching cooling capacity, with quiet energy efficient operation. The LZ Series chiller maintains control on the leaving water temperature by varying capacity, maintaining efficient operation across the entire range of operation.

Smart Controls

Every model is furnished with a Micro Control Systems (MCS) Magnum controller that maintains the leaving water temperature over a wide range of operating conditions. A convenient interface is provided with a large LCD display. Inputs are made using 9 large keys with menu driven prompts. Schedules are available with a seven day built-in time clock. Terminals are provided for remote stop-start and for remote reset of the leaving water temperature setpoint. The controller features 12 analog and 4 digital inputs, 10 relay outputs and 4 analog outputs. Non-volatile memory is used for all control functions. Optional features include diagnostic sensors for pressure and temperature on each refrigerant circuit, current sensors for each compressor, a full color touchscreen interface and a RS-485 port and Ethernet port allowing communication with a building management system.

Figure 2 - LCD Control and Display Panel

Factory Installed Pumping Packages
AAON has taken the lead with factory engineered and installed pumping packages that save time and expenses associated with jobsite construction of the equipment room. The LZ Series effectively becomes a packaged outdoor mechanical room and eliminates the need to use valuable indoor floor space.

The factory installed piping package is configurable, it can include primary and secondary pumps with a factory mounted air separator, compression tanks, and piping access to the building through the sides or bottom. Grooved end piping and fittings are furnished as a standard feature, and the insulated compartment can even be provided with heating or cooling for technician comfort while periodic maintenance is performed. Primary pumping packages include: Armstrong® pumps, butterfly valves, strainers, ball valves, pressure relief valves and makeup water pressure reduction valve with backflow prevention. Primary/Secondary pumping packages for variable flow systems include all the primary pumping package components listed above plus a secondary pump and associated additional components.


Figure 3 - Chilled Water Pumping Package Piping

Individual redundant pumps or DualArm pumps are also available. The DualArm Armstrong pump is available for both the primary or secondary pumps. The inlet and outlet ports on the casing are at least one size larger than a single pump size, so that both units may operate in parallel with no loss of single pump efficiency. Each port is fitted with an isolation valve that allows the units to operate in parallel or standby, and may also be used to isolate one pumping unit for servicing or removal, with the other pump still operating.

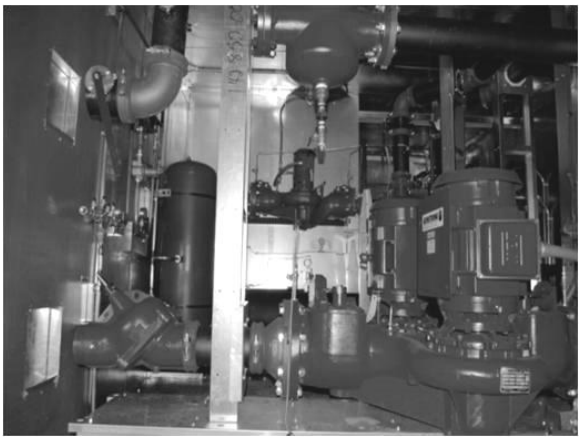
Figure 4 - Chilled Water Pumping Package with DualArm Pump

For added convenience, selection of pumping packages is handled through the AAON selection software, AAONECat™. Pumps are selectable for primary or primary/secondary pumping arrangements. When a compression/expansion tank option is selected, the appropriate compression/expansion tank size for the package will be selected. Refer to the AAON website for further information and the AAONECat selection software. Manual selection of the pumping package components is not possible due to the many combinations and applications conditions that may be selected. All the primary and primary/secondary pumping systems are supported throughout the LZ Series chiller sizes and associated flow rates. After pump selection is made, the AAONECat software will generate a rating sheet, pump performance curves, and a piping diagram.

Application Information

Heat Exchanger Design Data

The system can start and pull down with up to 80°F entering water temperature. For continuous operation, it is recommended that the entering water temperature not exceed 65°F. The chiller must not be operated with a leaving water temperature of less than 42°F for a plain water application. When lower leaving fluid temperatures are required, an appropriate glycol solution must be used. The solution must have a freezing point at least 15°F lower than the design leaving fluid temperature. The temperature difference between fluid entering and leaving the chiller must be in the range of 6 to 16°F. The absolute maximum fluid temperature that can be circulated continuously through the heat exchanger is 110°F.

Fluid Volume

Consideration must be given to the total volume of fluid in the system. In close coupled, low volume systems, the leaving fluid temperature will change quickly with steps of capacity control. This is not acceptable if close control is desired for a conditioned space or an industrial process. In order to accurately determine the fluid volume needed for the application, you must resolve and agree on the amount of swing in fluid temperature that can be tolerated. This will depend on the control system, the terminal equipment operation, and use. Use the following example as a guide to determine swing in fluid temperature tolerable.

Loop Volume Example

An LZ-090 with Air-Cooled Condenser and Turbocor Compressors is rated at 87.5 tons at the operating conditions. The chiller is running at 40°F suction and 111°F discharge temperatures. It is desired to have no greater than a +/- 2°F leaving water temperature variation due to compressor unloading. What is the minimum water volume required in the chilled water loop?

Solution: Use the following equation to determine the minimum allowable water loop volume.

$$Minimum\ Water\ Loop\ Volume = \frac{Actual\ Tons\ x\ Min\ Volume\ (\frac{Gal - °F\ swing}{Ton})}{Allowable\ °F\ Swing}$$

Allowable °F Swing is specified in the problem statement. With a tolerance of +/- 2°F, the total allowable swing is 4°F.

Select the value of Minimum Volume from Table 3.

For LZ-090 TurboCor at 40°F suction and 111°F discharge temperature:

Interpolate to solve for X

Discharge Temperature	104	111	114
Minimum Volume	50.67	X	57.33

$$\frac{X - 50.67}{57.33 - 50.67} = \frac{111 - 104}{114 - 104}$$

$$Minimum\ Volume = 55.33\ \frac{Gal - °F}{Ton}$$

Compute the Minimum Water Loop Volume with the known performance of 87.5 tons of cooling at the application conditions:

$$Min\ Water\ Loop\ Volume = \frac{87.5\ tons * 55.33 \frac{Gal - °F}{Ton}}{4°F}$$
$$= 1210\ gallons$$

Notice if this system was selected for a 45°F leaving water temperature, the temperature will vary between 43°F to 47°F (recall the variation tolerance +/- 2°F) with the modulation of the compressors at the water loop volume of 1210 gallons. The final selection should ensure the leaving water temperature does not drop below 42°F. If a leaving water temperature below 42°F is indicated, then the loop volume should be increased or glycol should be included with the design.

If the fluid loop contains glycol, the above **water loop volume** should be multiplied by the correction factor in Table 5.

Table 1 - Scroll Compressor Chiller Minimum Water Loop Volume

Air-Cooled Condenser Model	Maximum % Capacity Step	Minimum Volume (Gal-°F Swing)/ton	Evaporative-Condensed Model	Maximum % Capacity Step	Minimum Volume (Gal-°F Swing)/ton
LZ-045	30.8	36.96	LZ-053	27.3	32.76
LZ-055	31.5	37.80	LZ-061	28.5	34.20
LZ-060	28.9	34.68	LZ-069	26.4	31.68
LZ-075	26.0	31.20	LZ-078	24.6	29.52
LZ-095	32.4	38.88	LZ-106	29.3	35.16
LZ-105	29.5	35.40	LZ-121	26.0	31.20
LZ-120	32.3	38.76	LZ-134	30.1	36.12
LZ-140	31.3	37.56	LZ-161	29.9	35.88
LZ-170	20.5	24.60	LZ-193	18.2	21.84
LZ-200	20.7	24.84	LZ-239	20.2	24.24
			LZ-274	15.3	18.36
			LZ-319	15.3	18.36
			LZ-356	11.4	13.68
			LZ-401	12.4	14.88
			LZ-441	10.4	12.48
			LZ-478	10.3	12.36

Table 2 - Turbocor Compressor Chiller Minimum Water Loop Volume at 35°F Suction

Discharge Temperature	68°F	77°F	86°F	95°F	104°F	113°F	122°F
Air-Cooled Condenser Model	Minimum Volume - (Gal-°F Swing)/ton						
LZ-090	26.67	32.00	40.00	46.67	56.00	61.33	65.33
LZ-120		33.00	36.00	42.00	50.00	61.00	71.00
LZ-150	28.80	32.00	36.80	41.60	48.80	56.80	
LZ-180	29.33	38.67	50.00	64.67	80.00		
LZ-181	13.33	16.00	20.00	23.33	28.00	30.67	32.67
LZ-240		16.50	18.00	21.00	25.00	30.50	32.50
LZ-300	14.40	16.00	18.40	20.80	24.40	28.40	
LZ-360	14.67	19.33	25.00	32.33	40.00		
LZ-450	9.60	10.67	12.27	13.87	16.27	18.93	
LZ-540	9.78	12.89	16.67	21.56	26.67		

Table 3 - Turbocor Compressor Chiller Minimum Water Loop Volume at 40°F Suction

Discharge Temperature	68°F	77°F	86°F	95°F	104°F	113°F	122°F
Air-Cooled Condenser Model	Minimum Volume - (Gal-°F Swing)/ton						
LZ-090	22.67	28.00	37.33	44.00	50.67	57.33	64.00
LZ-120		33.00	36.00	40.00	47.00	55.00	66.00
LZ-150	28.00	30.40	34.40	38.40	68.40	44.80	
LZ-180	28.00	34.00	45.33	58.00	74.67		
LZ-181	11.33	14.00	18.67	22.00	25.33	28.67	32.00
LZ-240		16.50	18.00	20.00	23.50	27.50	33.00
LZ-300	14.00	15.20	17.20	19.20	22.40	26.00	
LZ-360	14.00	17.00	22.67	29.00	37.33		
LZ-450	9.33	10.13	11.47	12.80	14.93	17.33	
LZ-540	9.33	11.33	15.11	19.33	24.89		

Table 4 - Turbocor Compressor Chiller Minimum Water Loop Volume at 50°F Suction

Discharge Temperature	68°F	77°F	86°F	95°F	104°F	113°F	122°F
Air-Cooled Condenser Model	Minimum Volume - (Gal-°F Swing)/ton						
LZ-090		14.67	28.00	41.33	49.33	56.00	64.00
LZ-120		33.00	36.00	39.00	45.00	50.00	59.00
LZ-150		28.80	32.00	36.80	41.60	49.60	
LZ-180		32.67	37.33	46.00	60.00	74.67	
LZ-181		7.33	14.00	20.67	24.67	28.00	32.00
LZ-240		16.50	18.00	19.50	22.50	25.00	29.50
LZ-300		14.40	16.00	18.40	20.80	24.80	
LZ-360		16.33	18.67	23.00	30.00	37.33	
LZ-450		9.60	10.67	12.27	13.87	16.53	
LZ-540		10.89	12.44	15.33	20.00	24.89	

Table 5 - Glycol Volume Correction Factors

% by Weight	Glycol Volume Correction Factor	
	Ethylene	Propylene
10	1.038	1.017
20	1.066	1.033
30	1.100	1.058
40	1.140	1.092
50	1.192	1.142

It may be necessary to install a storage tank in the system to provide the necessary volume for close temperature control. When this is done, the tank should be installed in the loop between the fluid leaving from the chiller and the supply to the building. Figure 5 illustrates a proper storage tank usage.

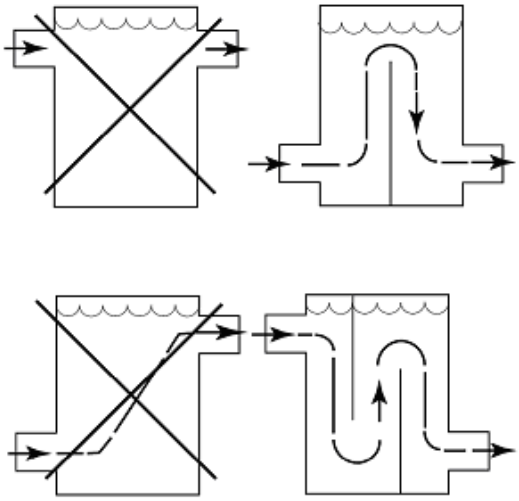

Figure 5 - Storage Tank Usage

Oversizing Chillers

Generally speaking, fully loaded equipment operates more efficiently than large equipment running at or near minimum capacity. When selecting a chiller, the anticipated part load operation of the system should be evaluated with respect to the NPLV rating of the equipment under consideration. Larger future loading requirements may cause temporary oversizing of equipment that is initially selected and installed. This should be done with care, although the AAON LZ Series chiller is more tolerant than older designs that use a single compressor.

Chiller Placement

The AAON LZ Series chiller is designed for outdoor applications and mounting at ground level or on a roof. It must be placed on a level and solid foundation that has been prepared to support its weight. When installed at ground level, a one-piece concrete slab should be used with footings that extend below the frost line. With ground level installation, care must be taken to protect the coil fins from damage due to vandalism or other causes. The placement relative to the building air intakes and other structures is critical and must be carefully selected. .

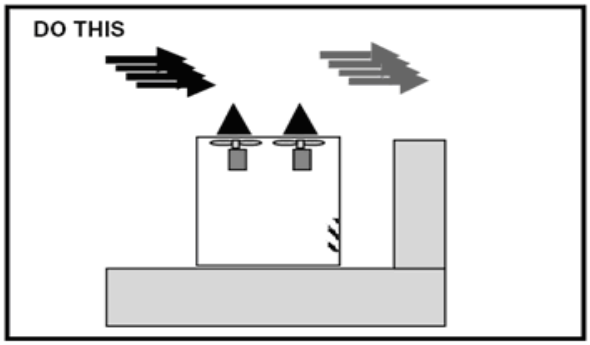

Figure 6 - Proper Chiller Placement

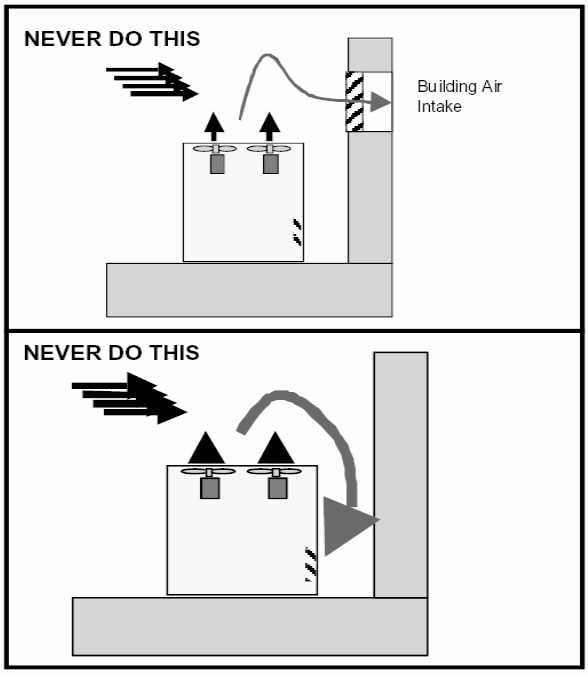

Figure 7- Improper Chiller Placement

Be sure to observe the dimensions that are on the rating plate of the chiller for operational and service clearances. For proper unit operation, the immediate area must remain free of debris that may be drawn in and obstruct airflow in the condensing section. Table 6 shows the typical clearances found on the rating plate of each unit.

Table 6 - Service Clearances

Location	45-540 tons
Left	96”
Right	
Compressor End	72”
Chiller HXC End	
Top	Unobstructed

Always remember, there should be no obstruction above the unit that could deflect the discharge air downward where it could recirculate to the inlet of the condensing section. The position of the chiller must provide sufficient side and end clearance to allow air to enter, as well as, to permit the access for any future service. This is particularly important on evaporative-condensed chiller models where clearance on the back side (opposite the controls vestibule door) must allow free access to the condensing section. If the low ambient option has been ordered with the equipment, special consideration must be given to snow accumulation when placing the unit. Condenser coils and fans must be free of snow or any other obstructions in order to start and operate properly with a correct amount of airflow.

Access Doors

When planning the placement of the chiller, take into consideration the access doors to the equipment. A lockable access door is provided to the compressor and controls vestibule. A separate access door is also provided to the evaporator/heat exchanger compartment. A light switch is on the wall of the compressor and controls vestibule.

Mounting Isolation

For roof mounted applications or anytime vibration transmission may be a factor, vibration isolators may be considered.

Electrical Power Supply

A disconnect switch that is accessible from the outside of the cabinet is available factory installed. The single point electrical power connections are made in the compressor/electrical controls vestibule. The power and control wiring is brought up through the utility entry to either the power supply terminal blocks or the disconnect switch. The controller furnished with the unit is supplied with its own power supply factory wired to the main power of the chiller. The voltage to the chiller must be within plus or minus 10% of the nameplate rating value on the unit.

All units are furnished with a single point power supply standard, but dual point power is available on dual ended condensing unit models. The largest capacity single point power supply terminal supplied from AAON is rated at 1200 amps.

Electrical Data
When a pumping package is selected, the amp draw of the pumps is added to the standard electrical data. This will increase the minimum circuit ampacity and the maximum fuse size. Consult AAONECat or the Electrical Service Sizing Data section of this catalog for electrical sizing information.

Dimensional Drawings
Equipment dimensions vary based on unit capacity, type of condenser, pumping system and if the unit includes a boiler system. AAONECat should be used with all the job application information in order to receive an accurate drawing for a specific model and feature set.

Optional Oversized Heat Exchangers
Oversized heat exchangers are available on all model sizes and may be selected to improved performance with water or to use with systems that contain glycol to aid in offsetting the decreased capacity due to the thermal properties of glycol.

Factory Insulated Evaporators
Shell and tube and brazed plate heat exchangers are insulated at the factory before shipment. The suction lines and the line between the TXV and the chiller barrel / brazed plate are also insulated at the factory, but the ports are still accessible so the piping connections and components can be leak checked in the field.

Unit Selection

Selection Procedure
Chiller selection will require knowledge of:

Chiller
- Condenser Type
- Compressor Type
- Pumping System Type

Chiller Conditions
- System Load
- Ambient Conditions
- Entering Water/Glycol Temperature
- Leaving Water/Glycol Temperature (or Design Temperature Drop through the Chiller)
- Chiller Flow Rate
- Glycol Percentage
- Water Fouling Factor

Pumping System Conditions
- Building Pressure Drop
- Building Flow Rate
- Minimum/Maximum Loop Temperature
- External Loop Volume

Water Fouling Factor
The standard fouling factor is assumed at 0.0001 ft^2 x hr °F/Btu with AAONECat. If calculating a solution with an alternative fouling factor, apply the appropriate correction factor shown in Table 9.

Glycol Chillers
A minimum leaving fluid temperature of 42°F is allowed when water is used as a heat transfer fluid to ensure freeze protection and continued operation of the heat exchanger. When lower leaving temperatures are desired, glycol must be added to the circulating fluid. AAONECat will calculate correction factors of propylene glycol systems based on the percentage of glycol input into the Unit Conditions window. If calculating a solution requiring ethylene glycol, apply the appropriate correction factor from Table 7. Propylene glycol correction factors are shown in Table 8.

Chilled Water Flow Rate
An approximation of the chilled water flow rate in gallons per minute (gpm) is given by the following equation:

$$GPM = \frac{Tons\ x\ 24}{\Delta T\ water}$$

Selection Example 1
An air-cooled condenser scroll compressor chiller is needed that can provide 120 tons of cooling capacity at 105°F DB and 77°F WB ambient air temperature. The leaving water temperature needed is 44°F with a 10°F ΔT, or entering water temperature of 54°F. Assume a standard fouling factor, a standard sized chiller heat exchanger and no glycol.

System Load = 120 tons
Ambient Dry Bulb Conditions = 105°F
Entering Water temperature = 54°F
Leaving Chilled Water Temperature = 44°F
ΔT = 10°F

Solution: The approximate water flow rate is computed from the equation:

$$GPM = \frac{120\ tons\ x\ 24}{10°\text{F}} = 288\ GPM$$

Using AAONECat, the performance of a LZ-140 at these specific unit conditions is 120.4 tons of cooling capacity, the associated power input is 185.8 kW, the EER at operating conditions is 7.78, the kW/ton is 1.54, Unit NPLV is 14.65 Btu/W-hr, and the total pressure drop through the heat exchanger is 5.45 ftH_2O.

If an evaporative-condensed chiller is selected, using AAONECat, the performance of a LZ-134 at these specific unit conditions is 130.8 tons of cooling capacity, the associated power input is 108.3 kW, the EER at operating conditions is 14.5, the kW/ton is 0.8, Unit NPLV is 18.5 Btu/W-hr, and the pressure drop through the heat exchanger is 7.73 ftH_2O.

Selection Example 2
An air-cooled condenser scroll compressor chiller is needed that can provide 90 tons of cooling capacity at 95°F DB and 78°F WB ambient air temperature. The leaving water temperature needed is 44°F with a 10°F ΔT, or entering water temperature of 54°F. Assume a standard fouling factor and a standard sized chiller heat exchanger. The chiller fluid circuit needs to be protected down to 10°F.

System Load = 90 tons
Ambient Dry Bulb Conditions = 95°F
Entering Water temperature = 54°F
Leaving Chilled Water Temperature = 44°F
ΔT = 10°F

Solution: The approximate water flow rate is computed from the equation:

$$GPM = \frac{90\ tons\ x\ 24}{10°\text{F}} = 216\ GPM$$

Using AAONECat, with a 30% propylene glycol to satisfy the freeze protection requirement down to 10°F, the performance of a LZ-095 at these specific unit conditions is 88.5 tons of cooling capacity, the associated power input is 107.1 kW, the EER at operating conditions is 9.91, the kW/ton is 1.21, Unit NPLV is 15.67, and the pressure drop through the heat exchanger is 10.5 ftH_2O.

If an oversized chiller barrel heat exchanger is used, using AAONECat, the performance of a LZ-095 at these specific unit conditions is 90.0 tons of cooling capacity, the associated power input is 107.4 kW, the EER at operating conditions is 10.1, the kW/ton is 1.19, Unit NPLV is 15.96, and the pressure drop through the heat exchanger is 14.3 ftH_2O.

Using AAONECat, with water and a standard sized chiller heat exchanger, the performance of a LZ-095 at these specific unit conditions is 90.5 tons of cooling capacity, the associated power input is 107.5 kW, the EER at operating conditions is 10.1, the kW/ton is 1.19, Unit NPLV is 15.92, and the pressure drop through the heat exchanger is 8.11 ftH_2O.

Consulting Table 7, the correction factors applicable for a 30% ethylene mix are:

Capacity = 0.97
Power = 0.99
Pressure Drop = 1.15
Flow Factor = 26.4

Applying the correction factors to the water performance:

$$Corrected\ Capacity = 90.5\ tons\ x\ 0.97 = 87.8\ tons$$

$$Corrected\ System\ kW = 107.7kW\ x\ 0.99 = 106.1kW$$

$$Corrected\ Flow\ Rate = \frac{87.8\ tons\ x\ 26.4}{10°\text{F}} = 232\ GPM$$

$$Corrected\ Heat\ Exchanger\ Pressure\ Drop = 8.1ftH_2O\ x\ 1.15 = 9.3ftH_2O$$

Selection Example 3
An evaporative-condensed Turbocor compressor chiller is needed that can provide 300 tons of cooling capacity at 90°FDB and 73°F WB ambient air temperature. The leaving water temperature needed is 44°F with a 14°F ΔT, or entering water temperature of 58°F. Assume the chiller has a water fouling factor of 0.00075 ft^2 x hr °F/Btu.

System Load = 300 tons
Ambient Dry Bulb Conditions = 90°F
Entering Water temperature = 58°F
Leaving Chilled Water Temperature = 44°F
ΔT = 14°F

Solution: The approximate water flow rate is computed from the equation:

$$GPM = \frac{300\ tons\ x\ 24}{14°F} = 514\ GPM$$

Using AAONECat, the performance of a LZ-360 at these specific unit conditions is 299.8 tons of cooling capacity, the associated power input is 205.8 kW, the EER at operating conditions is 17.5, the kW/ton is 0.69, Unit NPLV is 24.43, and the pressure drop through the heat exchanger is 5.64 ftH_2O.

Consulting Table 9, the correction factors applicable for a 0.00075 ft^2 x hr °F/Btu water fouling factor with 14°F ΔT are:

Capacity = 0.980
Power = 0.996

Applying the correction factors to the water performance:

$$Corrected\ Capacity = 299.8\ tons\ x\ 0.98$$
$$= 293.8\ tons$$

$$Corrected\ System\ kW$$
$$= 205.8 kW\ x\ 0.996$$
$$= 205.0 kW$$

$$Calculated\ EER = \frac{293.8\ tons\ x\ 12}{205.0\ kW}$$
$$= 17.20\ EER$$

Performance Correction Factors

Table 7 - Ethylene Glycol Correction Factors

% Ethylene Glycol by Weight	Freeze Point °F	Capacity Factor	Power Factor	Pressure Drop Factor	Flow Factor
10	26	0.998	0.998	1.03	24.9
20	17	0.995	0.997	1.09	25.6
30	5	0.970	0.990	1.15	26.4
40	-10	0.941	0.985	1.23	27.4
50	-32	0.950	0.970	1.31	28.6

Table 8 - Propylene Glycol Correction Factors

% Propylene Glycol by Weight	Freeze Point °F	Capacity Factor	Power Factor	Pressure Drop Factor	Flow Factor
10	26	0.998	0.996	1.08	24.4
20	19	0.975	0.975	1.21	24.8
30	9	0.960	0.985	1.40	25.4
40	-6	0.921	0.975	1.67	26.2
50	-28	0.910	0.965	1.98	27.4

Table 9 - Water Fouling Correction Factor

Chilled Water ΔT (°F)	0.0001		0.00025		0.00075		0.00175	
	Capacity Factor	Power Factor	Capacity Factor	Power Factor	Capacity Factor	Power Factor	Capacity Factor	Power Factor
6	0.990	0.998	0.989	0.996	0.962	0.986	0.920	0.973
8	0.994	0.999	0.991	0.998	0.965	0.988	0.923	0.975
10	1.000	1.000	0.993	0.999	0.970	0.991	0.928	0.978
12	1.005	1.001	0.999	1.000	0.975	0.993	0.933	0.980
14	1.008	1.002	1.005	1.001	0.980	0.996	0.937	0.983
16	1.010	1.003	1.008	1.003	0.984	0.998	0.941	0.985

Evaporator Pressure Drops

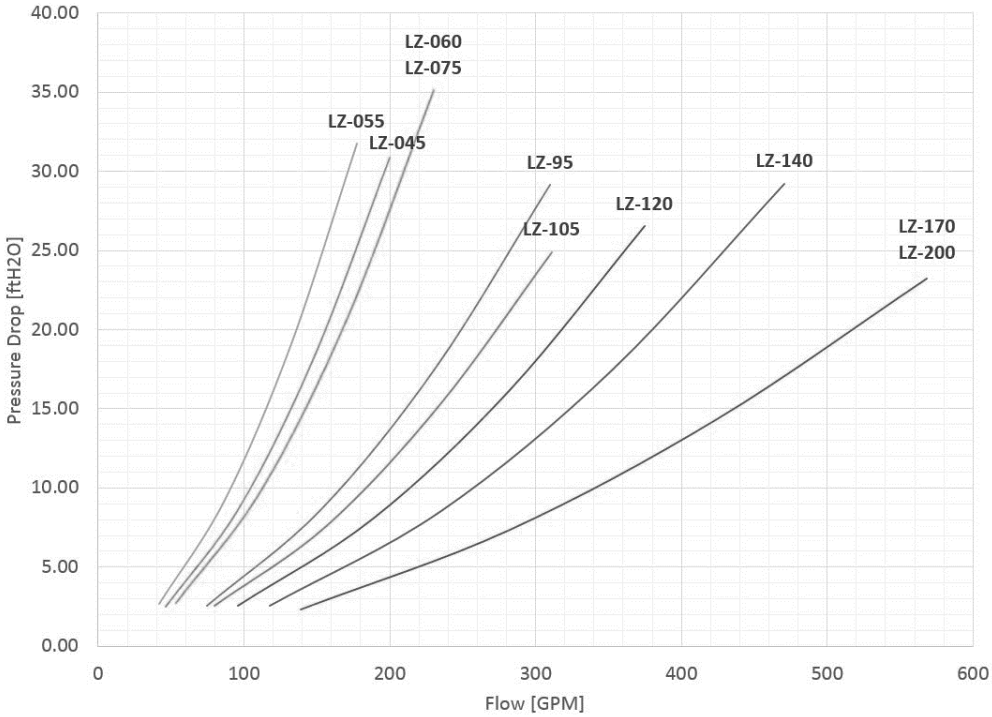

Figure 8 - Pressure Drop Across Standard Air-Cooled Chiller Shell and Tube Heat Exchanger

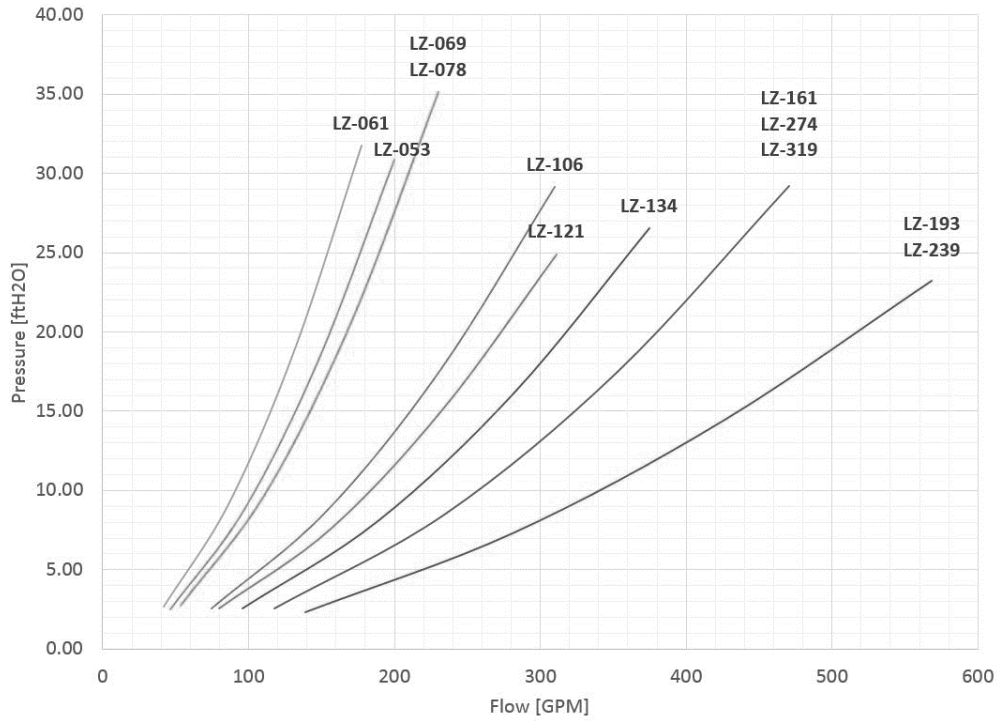

Figure 9 - Pressure Drop Across Standard Evaporative Condensed Chiller Shell and Tube Heat Exchanger

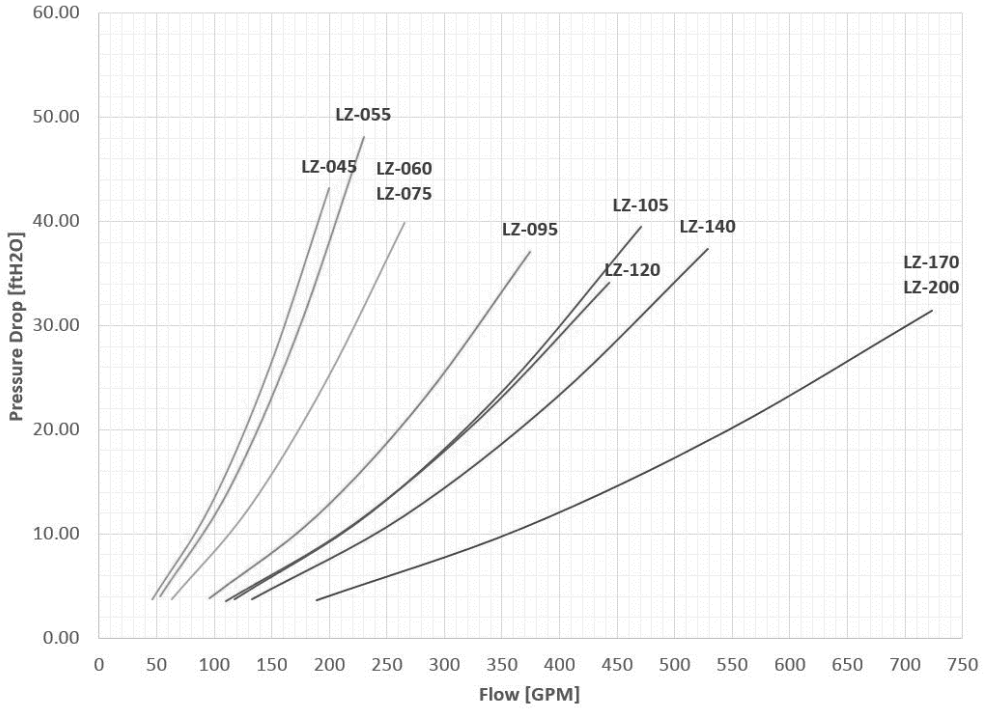

Figure 10 - Pressure Drop Across Oversized Air-Cooled Chiller Shell and Tube Heat Exchanger

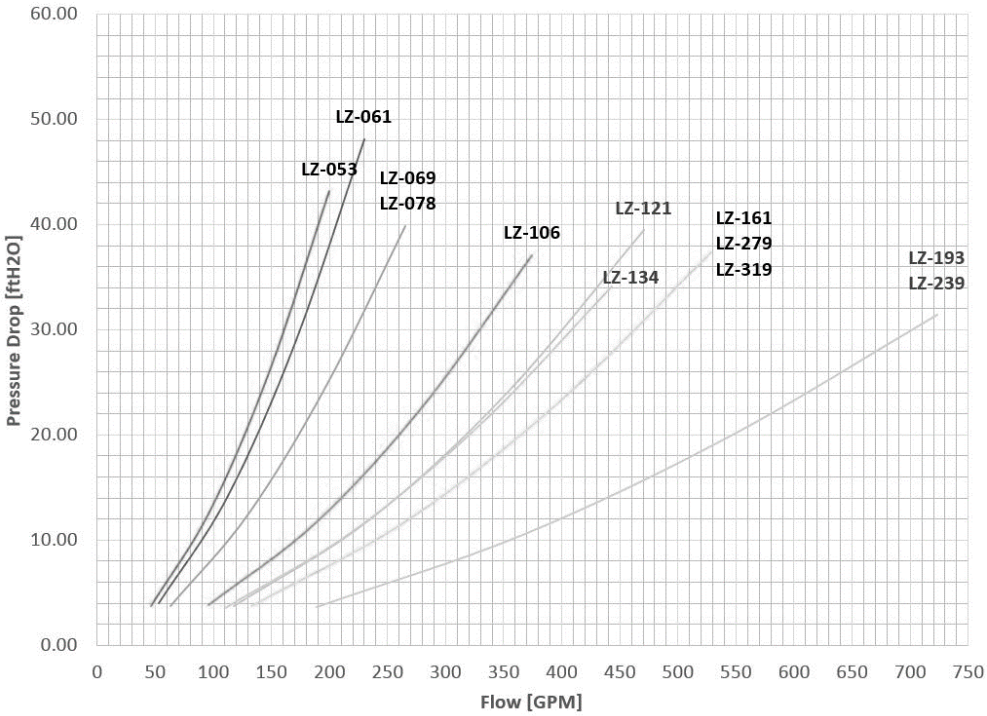

Figure 11 - Pressure Drop Across Oversized Evaporative Condensed Chiller Shell and Tube Heat Exchanger

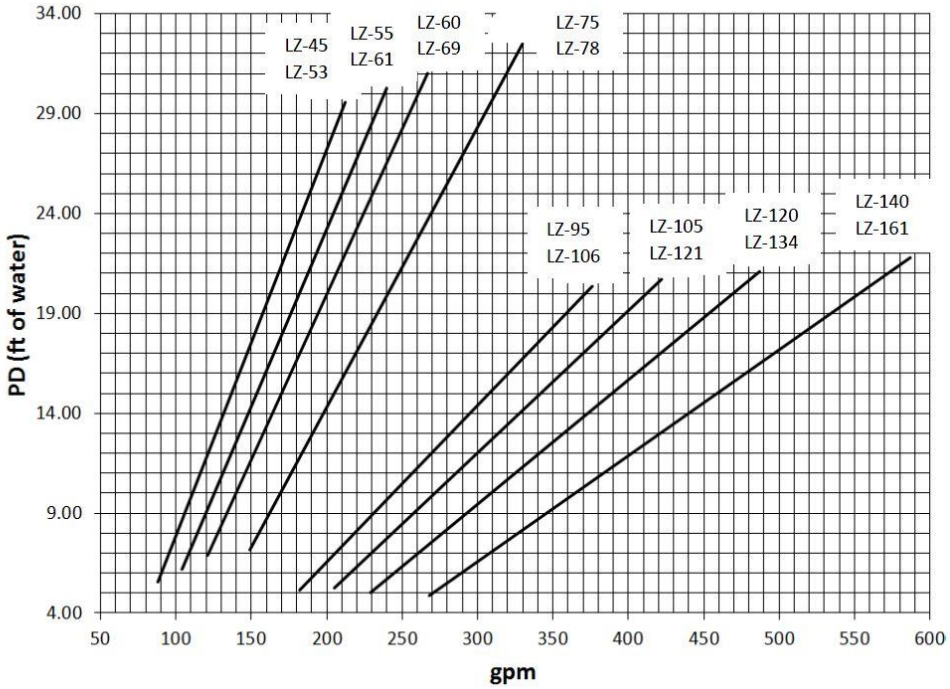

Figure 12 - Pressure Drop Across Standard Brazed Plate Heat Exchanger

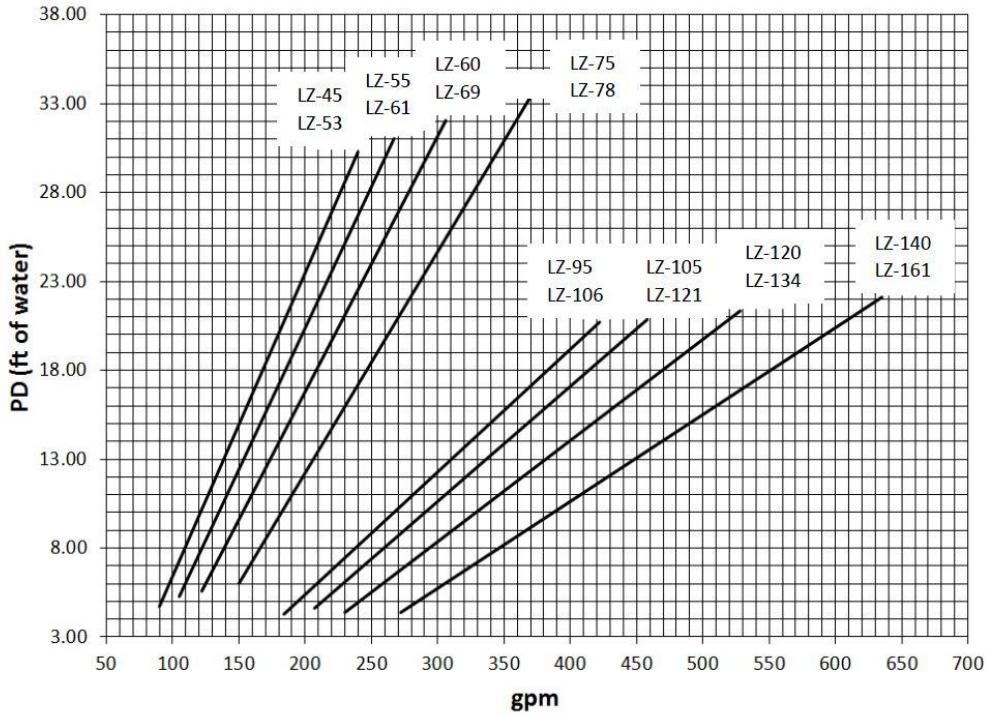

Figure 13 - Pressure Drop Across Oversized Brazed Plate Heat Exchanger

LZ Series Feature String Nomenclature

Model Options : Unit Feature Options

GEN	MJREV	SIZE	SERIES	MNREV	VLT	A1	A2	A3	A4	A5	B1	B2	B3	B4		1	2	3A	3B	3C	3D	4A	4B	4C	4D	5A	5B	5C	5D	6	7	8A	8B	8C
LZ	A	- 140	- C	- A	- 3	- F	A	C	0	E -	0	0	0	0	:	E	0	- 0	0	0	0	- 0	0	0	0	- 0	0	0	0	- 0	0	- 0	0	0
		0 -	0	E	0	0 -	0	0	C	0	0 -	0	J	0	0	0 -	0	0	0	0	0 -	0	0	0	0	0	0 -	0	0	0	0 -	0	D	B
	9		10A	10B	10C	10D	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26A	26B	26C	26D	26E	26F	27	28	29	30	31	32	33	34	35

MODEL OPTIONS

Series and Generation
LZ

Major Revision
A

Unit Size

Air-Cooled	*Evaporative-Condensed*
045 = 45 ton Capacity	053 = 53 ton Capacity
055 = 55 ton Capacity	061 = 61 ton Capacity
060 = 60 ton Capacity	069 = 69 ton Capacity
075 = 75 ton Capacity	078 = 78 ton Capacity
090 = 90 ton Capacity	090 = 90 ton Capacity
095 = 95 ton Capacity	106 = 106 ton Capacity
105 = 105 ton Capacity	120 = 120 ton Capacity
120 = 120 ton Capacity	121 = 121 ton Capacity
140 = 140 ton Capacity	134 = 134 ton Capacity
170 = 170 ton Capacity	150 = 150 ton Capacity
181 = 181 ton Capacity	161 = 161 ton Capacity
200 = 200 ton Capacity	180 = 180 ton Capacity
	181 = 181 ton Capacity
	193 = 193 ton Capacity
	239 = 239 ton Capacity
	240 = 240 ton Capacity
	274 = 274 ton Capacity
	300 = 300 ton Capacity
	319 = 319 ton Capacity
	356 = 356 ton Capacity
	360 = 360 ton Capacity
	401 = 401 ton Capacity
	441 = 441 ton Capacity
	450 = 450 ton Capacity
	478 = 478 ton Capacity
	540 = 540 ton Capacity

Series - Scroll Compressor

Air-Cooled	*Evaporative-Condensed*
A = 45-60 ton units	A = 53-69 ton units
B = 75 ton unit	B = 78 ton unit
C = 95-140 ton units	C = 106-161 ton units
D = 170-200 ton units	D = 193-239 ton units
	E = 274-319 ton units
	F = 356-401 ton units
	G = 441-478 ton units

Series - Turbocor Compressor

Air-Cooled	*Evaporative-Condensed*
H = 90-120 ton units	H = 90-120 ton units
K = 181 ton unit	J = 150-180 ton units
	K = 181 ton unit
	L = 240 ton unit
	M = 300-360 ton units
	N = 450-540 ton units

Minor Revision
0 = Evaporative-Condensed (not AHRI certified)
A = Air-Cooled with AHRI certification

Voltage
2 = 230V/3Φ/60Hz
3 = 460V/3Φ/60Hz
4 = 575V/3Φ/60Hz
8 = 208V/3Φ/60Hz

A1: Compressor Style
F = R-410A Tandem VFD Compatible Scroll Compressor
H = R-134a Turbocor Centrifugal Compressor
J = R-134a Turbocor Centrifugal Compressor with Economizer

A2: Condenser Style
A = Air-Cooled Microchannel Condenser
H = Evaporative-Condensed

A3: Evaporator Configuration
A = Brazed Plate
B = Oversized Brazed Plate
C = Shell & Tube
D = Oversized Shell & Tube

A4: Coating
0 = Standard
E = Polymer E-Coated Condenser Coil

A5: Staging
0 = Staged On/Off Compressors
E = All Circuits with Variable Capacity Compressors
G = Half Circuits with Variable Capacity Compressors

LZ Series Feature String Nomenclature

Model Options : Unit Feature Options

GEN MJREV SIZE SERIES MNREV VLT A1 A2 A3 A4 A5 **B1 B2 B3 B4 1 2 3A 3B** 3C 3D 4A 4B 4C 4D 5A 5B 5C 5D 6 7 8A 8B 8C

LZ A - 140 - C - A - 3 - F A C 0 E **- 0 0 0 0 : E 0 - 0 0** 0 0 - 0 0 0 0 - 0 0 0 0 - 0 0 - 0 0 0

0 - 0 E 0 0 - 0 0 C 0 0 - 0 J 0 0 0 - 0 0 0 0 0 - 0 0 0 0 0 0 - 0 0 0 0 0 - 0 0 D B

9 10A 10B 10C 10D 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26A 26B 26C 26D 26E 26F 27 28 29 30 31 32 33 34 35

B1: Type
0 = No Boilers

B2: Boiler Quantity
0 = No Boilers

B3: Type and Pipe Size
0 = No Boilers

B4: Boiler Capacity
0 = No Boilers

UNIT FEATURE OPTIONS

1: Unit Orientation
E = Walk-in Vestibule Left Access Left Water Connections
F = Walk-in Vestibule Left Access Right Water Connections
G = Walk-in Vestibule Left Access Bottom Water Connections
J = Walk-in Vestibule Right Access Left Water Connections
K = Walk-in Vestibule Right Access Right Water Connections
L = Walk-in Vestibule Right Access Bottom Water Connections

2: Pumping Style
0 = No Pumps
A = Const. Primary Pumping System Small Pipe Size
B = Const. Primary Pumping System Large Pipe Size
C = Var. Primary Pumping System Small Pipe Size
D = Var. Primary Pumping System Large Pipe Size
E = Primary/Secondary Pumping System Small Pipe Size
F = Primary/Secondary Pumping System Large Pipe Size

3A: Building Pump Configuration
0 = No Building Pumps
A = 1 Pump + High Eff Motor
B = 1 Dual Pump + High Eff Motors
C = 2 Single Pumps + High Eff Motors
D = 1 Pump + VFD + High Eff Motor
E = 1 Dual Pump + 2 VFD's + High Eff Motors
F = 2 Single Pumps + 2 VFD’s + High Eff Motors
K = 1 Pump + Field Installed VFD + High Eff Motor
L = 1 Dual Pump + 2 Field Installed VFD's + High Eff Motors
M = 2 Single Pumps + 2 Field Installed VFD’s + High Eff Motors

3B: Building Pump Series and RPM
0 = No Building Pumps
A = 4360 (1,170 nominal rpm)
B = 4360 (1,760 nominal rpm)
C = 4360 (3,520 nominal rpm)
D = 4380 (1,170 nominal rpm)
E = 4380 (1,760 nominal rpm)
F = 4380 (3,520 nominal rpm)
G = 4300 (1,170 nominal rpm)
H = 4300 (1,760 nominal rpm)
J = 4300 (3,520 nominal rpm)
K = 4382 (1,170 nominal rpm)
L = 4382 (1,760 nominal rpm)
M = 4382 (3,520 nominal rpm)
N = 4302 (1,170 nominal rpm)
P = 4302 (1,760 nominal rpm)
Q = 4302 (3,520 nominal rpm)

LZ Series Feature String Nomenclature

Model Options : Unit Feature Options

GEN MJREV SIZE SERIES MNREV VLT A1 A2 A3 A4 A5 B1 B2 B3 B4 1 2 3A 3B **3C 3D** **4A 4B** 4C 4D 5A 5B 5C 5D 6 7 8A 8B 8C

LZ A - 140 - C - A - 3 - F A C 0 E - 0 0 0 0 : E 0 - 0 0 **0 0 - 0 0** 0 0 - 0 0 0 0 - 0 0 - 0 0 0

0 - 0 E 0 0 - 0 0 C 0 0 - 0 J 0 0 0 - 0 0 0 0 0 - 0 0 0 0 0 0 - 0 0 0 0 0 - 0 0 D B

9 10A 10B 10C 10D 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26A 26B 26C 26D 26E 26F 27 28 29 30 31 32 33 34 35

3C: Pump Size
0 = No Building Pumps
A = 1.5B
B = 2B
C = 2D
D = 3D
E = 1.5x1.5x6
F = 2x2x6
G = 3x3x6
H = 4x4x6
J = 6x6x6
K = 1.5x1.5x8
L = 2x2x8
M = 3x3x8
N = 4x4x8
P = 5x5x8
Q = 6x6x8
R = 8x8x8
S = 2x2x10
T = 3x3x10
U = 4x4x10
V = 6x6x10
W = 8x8x10
Y = 4x4x11.5
Z = 5x5x11.5
1 = 6x6x11.5
2 = 8x8x11.5
3 = 4x4x13
4 = 6x6x13
5 = 8x8x13

3D: Building Pump Motor Size
0 = No Building Pumps
C = 1 hp
D = 1.5 hp
E = 2 hp
F = 3 hp
G = 5 hp
H = 7.5 hp
J = 10 hp
K = 15 hp
L = 20 hp
M = 25 hp
N = 30 hp

3D: Building Pump Motor Size-continued
P = 40 hp
Q = 50 hp
R = 60 hp
S = 75 hp

4A: Recirculating Pump Configuration
0 = No Recirculating Pumps
A = 1 Pump + High Eff Motor
B = 1 Dual Pump + High Eff Motors
C = 2 Single Pumps + High Eff Motors

4B: Recirculation Pump Series & RPM
0 = No Recirculating Pumps
A = 4360 (1,170 nominal rpm)
B = 4360 (1,760 nominal rpm)
C = 4360 (3,520 nominal rpm)
D = 4380 (1,170 nominal rpm)
E = 4380 (1,760 nominal rpm)
F = 4380 (3,520 nominal rpm)
G = 4300 (1,170 nominal rpm)
H = 4300 (1,760 nominal rpm)
J = 4300 (3,520 nominal rpm)
K = 4382 (1,170 nominal rpm)
L = 4382 (1,760 nominal rpm)
M = 4382 (3,520 nominal rpm)
N = 4302 (1,170 nominal rpm)
P = 4302 (1,760 nominal rpm)
Q = 4302 (3,520 nominal rpm)

LZ Series Feature String Nomenclature

Model Options : Unit Feature Options

GEN MJREV SIZE SERIES MNREV VLT A1 A2 A3 A4 A5 B1 B2 B3 B4 1 2 3A 3B 3C 3D 4A 4B **4C 4D** **5A 5B 5C 5D** **6 7** **8A 8B** 8C

LZ A - 140 - C - A - 3 - F A C 0 E - 0 0 0 0 : E 0 - 0 0 0 0 - 0 0 **0 0 - 0 0 0 0 - 0 0 - 0 0** 0

0 - 0 E 0 0 - 0 0 C 0 0 - 0 J 0 0 0 - 0 0 0 0 0 - 0 0 0 0 0 0 - 0 0 0 0 0 - 0 0 D B

9 10A 10B 10C 10D 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26A 26B 26C 26D 26E 26F 27 28 29 30 31 32 33 34 35

4C: Recirculating Pump Size

0 = No Recirculating Pumps
A = 1.5B
B = 2B
C = 2D
D = 3D
E = 1.5x1.5x6
F = 2x2x6
G = 3x3x6
H = 4x4x6
J = 6x6x6
K = 1.5x1.5x8
L = 2x2x8
M = 3x3x8
N = 4x4x8
P = 5x5x8
Q = 6x6x8
R = 8x8x8
S = 2x2x10
T = 3x3x10
U = 4x4x10
V = 6x6x10
W = 8x8x10
Y = 4x4x11.5
Z = 5x5x11.5
1 = 6x6x11.5
2 = 8x8x11.5
3 = 4x4x13
4 = 6x6x13
5 = 8x8x13

4D: Recirculating Pump Motor Size

0 = No Recirculating Pumps
A = 0.5 hp
B = 0.75 hp
C = 1 hp
D = 1.5 hp
E = 2 hp
F = 3 hp
G = 5 hp
H = 7.5 hp
J = 10 hp
K = 15 hp
L = 20 hp

4D: Recirculating Pump Motor Size-continued

M = 25 hp
N = 30 hp
P = 40 hp
Q = 50 hp
R = 60 hp
S = 75 hp

5A: Boiler Building Pump Configuration

0 = No Boiler Pumps

5B: Boiler Building Pump Series & RPM

0 = No Boiler Pumps

5C: Boiler Building Pump Size

0 = No Boiler Pumps

5D: Boiler Building Pump Motor Size

0 = No Boiler Pumps

6: Refrigeration Options

0 = None
A = Hot Gas Bypass on Non-Variable Capacity Compressor Circuits
B = Hot Gas Bypass on All Circuits

7: Refrigeration Accessories

0 = Standard
A = Sight Glass
B = Compressor Isolation Valves
C = Option A + B

8A: Unit Disconnect Type

0 = Standard Single Point Power Block
A = Single Point Power Non-fused Disconnect

8B: Disconnect 1 Size

0 = Power Block
N = 100 amps
R = 150 amps
V = 250 amps
Z = 400 amps
3 = 600 amps
5 = 800 amps
7 = 1200 amps

LZ Series Feature String Nomenclature

Model Options : Unit Feature Options

GEN	MJREV	SIZE	SERIES	MNREV	VLT	A1	A2	A3	A4	A5	B1	B2	B3	B4	1	2	3A	3B	3C	3D	4A	4B	4C	4D	5A	5B	5C	5D	6	7	8A	8B	**8C**
LZ	A	- 140	- C	- A	- 3	- F	A	C	0	E	- 0	0	0	0	: E	0	- 0	0	0	0	- 0	0	0	0	- 0	0	0	0	- 0	B	- 0	0	**0**
		0	- **0**	**E**	**0 0**	- **0 0**		**C**	**0 0**		- **0**	J	0	0	0	- 0	0	0	0	0	- 0	0	0	0	0	0	- 0	0	0	0	0	- 0	0	D	B
		9		**10A**	**10B**	**10C**	**10D**	**11**	**12**	**13**	**14**	**15**	**16**	17	18	19	20	21	22	23	24	25	26A	26B	26C	26D	26E	26F	27	28	29	30	31	32	33	34	35

8C: Blank
0 = Standard

9: Accessories
0 = None
B = Phase & Brown Out Protection

10A: Unit Control Sequence
0 = Standard AAON Controls

10B: Unit Control Supplier
E = MCS Controls

10C: Control Supplier Options
0 = None
A = Touchscreen Computer Interface
C = Modem
G = Option A + C

10D: BMS Connection & Diagnostics
0 = None
A = BACnet IP
B = BACnet MSTP
C = Modbus IP
D = Modbus RTU
E = LonTalk
H = No BMS Connection with Diagnostics
J = BACnet IP with Diagnostics
K = BACnet MSTP with Diagnostics
L = Modbus IP with Diagnostics
M = Modbus RTU with Diagnostics
N = LonTalk with Diagnostics

11: Cabinet Options
0 = None
B = Access Door Windows

12: Vestibule Accessories
0 = None
A = Refrigerant Leak Detector
B = Motorized Service Vestibule Fresh Air
C = Vestibule Heating (Electric)
D = Vestibule Cooling (Fan/Coil)
F = Option A + B

12: Vestibule Accessories-continued
G = Option A + C
H = Option A + D
K = Option B + C
L = Option B + D
N = Option C + D
R = Option A + B + C
S = Option A + B + D
U = Option A + C + D
Y = Option B + C + D
3 = Option A + B + C + D

13: Maintenance Accessories
C = Service Lights
F = 115VAC Convenience Outlet - Factory Wired + Option C
J = 115VAC Convenience Outlet - Field Wired + Option C

14: Option Boxes
0 = None
A = 2 ft Option Box
B = 4 ft Option Box
C = 6 ft Option Box
D = 8 ft Option Box
F = 10 ft Option Box
G = 12 ft Option Box

15: Code Options
0 = Standard ETL U.S.A. Listing
A = Chicago Code
B = ETL U.S.A. + Canada Listing

16: Shipping Splits
0 = One Piece Unit
A = Two Piece Unit

LZ Series Feature String Nomenclature

Model Options : Unit Feature Options

GEN MJREV SIZE SERIES MNREV VLT A1 A2 A3 A4 A5 B1 B2 B3 B4 1 2 3A 3B 3C 3D 4A 4B 4C 4D 5A 5B 5C 5D 6 7 8A 8B 8C

LZ A - 140 - C - A - 3 - F A C 0 E - 0 0 0 0 : E 0 - 0 0 0 0 - 0 0 0 0 - 0 0 0 0 - 0 B - 0 0 0

0 - 0 E 0 0 - 0 0 C 0 0 - 0 **J 0 0 0 - 0 0 0 0 0 - 0 0** 0 0 0 0 - 0 0 0 0 0 - 0 0 D B

9 10A 10B 10C 10D 11 12 13 14 15 16 **17 18 19 20 21 22 23 24 25 26A 26B** 26C 26D 26E 26F 27 28 29 30 31 32 33 34 35

17: Air-Cooled Condenser Accessories
J = Cond Coil Guards + 3Φ Condenser Fan Motor + VFD Condenser Fan Head Pressure Control (0°F Low Ambient)
S = Cond. Coil Guards + Low Sound ECM Cond. Fans - Head Pressure Control (0°F Low Ambient)

18: Evaporative-Condensed Chiller Accessories
0 = None (No Evaporative-Condenser)
A = No Sump Heat
B = Sump Heaters

19: Blank
0 = Standard

20: Blank
0 = Standard

21: Chiller Compression Tank
0 = None
A = AX-15V
B = AX-20V
C = AX-40V
D = AX-60V
E = AX-80V
F = AX-100V
G = AX-120V
H = AX-180V
J = AX-200V
K = AX-240V
L = AX-260V
M = AX-280V

22: Boiler Compression Tank
0 = None

23: Blank
0 = Standard

24: Chiller Accessories
0 = None
A = Glycol chiller
B = Air Separator
C = Thermometers & Pressure Gauges
D = Chemical Pot Feeder
E = Auto Glycol Feeder
F = Option A + B
G = Option A + C
H = Option A + D
J = Option A + E
K = Option B + C
L = Option B + D
M = Option B + E
N = Option C + D
P = Option C + E
Q = Option D + E
R = Option A + B + C
S = Option A + B + D
T = Option A + B + E
U = Option A + C + D
V = Option A + C + E
W = Option A + D + E
Y = Option B + C + D
Z = Option B + C + E
1 = Option B + D + E
2 = Option C + D + E
3 = Option A + B + C + D
4 = Option A + B + C + E
5 = Option A + B + D + E
6 = Option A + C + D + E
7 = Option B + C + D + E
8 = Option A + B + C + D + E

25: Blank
0 = Standard

26A: Blank
0 = Standard

26B: Blank
0 = Standard

LZ Series Feature String Nomenclature

Model Options : Unit Feature Options

GEN MJREV SIZE SERIES MNREV VLT A1 A2 A3 A4 A5 B1 B2 B3 B4 1 2 3A 3B 3C 3D 4A 4B 4C 4D 5A 5B 5C 5D 6 7 8A 8B 8C

LZ A - 140 - C - A - 3 - F A C 0 E - 0 0 0 0 : E 0 - 0 0 0 0 - 0 0 0 0 - 0 0 0 0 - 0 0 - 0 0 0

0 - 0 E 0 0 - 0 0 C 0 0 - 0 J 0 0 0 - 0 0 0 0 0 - 0 0 **0 0 0 0** - **0 0 0 0 0** - **0 0 D B**

9 10A 10B 10C 10D 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26A 26B **26C 26D 26E 26F 27 28 29 30 31 32 33 34 35**

26C: Blank
0 = Standard

26D: Blank
0 = Standard

26E: Blank
0 = Standard

26F: Blank
0 = Standard

27: Blank
0 = Standard

28: Blank
0 = Standard

29: Blank
0 = Standard

30: Blank
0 = Standard

31: Blank
0 = Standard

32: Blank
0 = Standard

33: Warranty
0 = Standard Warranty
D = Compressor Warranty Years 2-5

34: Cabinet Material
D = Galvanized Cabinet 6” Base Rail + Double Slope Roof
H = Galvanized Cabinet 8” Base Rail + Double Slope Roof

35: Paint & Special Pricing Authorizations
B = Premium AAON Gray Paint Exterior
E = Premium AAON Gray Paint Exterior + Shrink Wrap
X = Special Pricing Authorization + Premium AAON Gray Paint Exterior
1 = Option X + Shrink Wrap
4 = Special Pricing Authorization + Special Exterior Paint Color
7 = Option 4 + Shrink Wrap

Unit Series, Major Revision, Sizes, Series, and Minor Revision

Example: **LZA-140-C-A**-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

The first number of the model string designates nominal tons of cooling capacity at AHRI conditions. Actual capacities will vary with conditions. Refer to the AAON ECat software for performance and cooling capacities at design conditions.

Table 10 - Unit Series, Major Revision, Sizes, Series, and Minor Revision

Series	Major Revision	Unit Size Air-Cooled	Unit Size Evaporative-Condensed	Series	Minor Revision
LZ	A	045	053	A Cabinet	0 = Evap-Condensed A= Air-Cooled
		055	061		
		060	069		
		075	078	B Cabinet	
		095	106	C Cabinet	
		105	121		
		120	134		
		140	161		
		170	193	D Cabinet	
		200	239		
			274	E Cabinet	
			319		
			356	F Cabinet	
			401		
			441	G Cabinet	
			478		
		090	090	H Cabinet	
		120	120		
			150	J Cabinet	
			180		
		181	181	K Cabinet	
			240	L Cabinet	
			300	M Cabinet	
			360		
			450	N Cabinet	
			540		

Minor Revision

0 = *First Revision* - Evaporative-Condensed Chillers are under minor revision 0 because they are not included in the AHRI certification program.
A = *Revision A* - Air-Cooled Chillers are under minor revision A because they are included in the AHRI certification program in accordance with AHRI Standard 550/590.

Voltage

Example: LZA-140-C-A-**3**-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

All units have single point power blocks with grounding lugs and 120 VAC control circuits.

2 = *230V/3Φ/60Hz*
3 = *460V/3Φ/60Hz*
4 = *575V/3Φ/60Hz*
8 = *208V/3Φ/60Hz*

Model Option A1 - Compressor Style

Example: LZA-140-C-A-3-**F**AC0E-0000:E0-0000-0000-0000-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

F = *R-410A Tandem VFD Compatible Scroll Compressors* - R-410A scroll compressors that can be factory provided with VFD speed control.
H = *R-134a Turbocor Variable Capacity Oil-Free Magnetic Bearing Centrifugal Compressors* - R-134a variable capacity oil-free magnetic bearing Turbocor centrifugal compressors.
J = *R-134a Turbocor Variable Capacity Oil-Free Magnetic Bearing Centrifugal Compressors + Economizer* - Option H + a refrigerant sub-cooler economizer. The economizer diverts part of the liquid line refrigerant to an expansion valve and refrigerant-to-refrigerant heat exchanger that provides additional sub-cooling of the remaining liquid line refrigerant, increasing capacity of the chiller. The refrigerant gas leaving the heat exchanger flows into an inter-stage economizer port of the Turbocor compressor, improving the efficiency of the compressor. The Refrigerant Sub-Cooler Economizer on Turbocor centrifugal compressor air-cooled condenser chillers optimizes operation at higher ambient conditions.

Model Option A2 - Condenser Style

Example: LZA-140-C-A-3-F**A**C0E-0000:E0-0000-0000-0000-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

A = *Air-Cooled Microchannel Condenser* - Air-cooled condenser coils will be aluminum microchannel tubes.
H = *Evaporative-Condensed* - Evaporative-condensed chiller unit. Option includes AAON patented de-superheater and corrosion resistant material on all wetted surfaces

Model Option A3 - Evaporator Configuration

Example: LZA-140-C-A-3-FA**C**0E-0000:E0-0000-0000-0000-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

A = *Standard Brazed Plate Constant Flow* - Brazed Plate heat exchanger with grooved end piping water connections and 3/4" closed-cell rubberized insulation. Option includes a 3/4" manual operation drain valve. Option is available on 45-140 ton units.
B = *Oversized Brazed Plate Constant Flow* - Brazed Plate heat exchanger with grooved end piping water connections and 3/4" closed-cell rubberized insulation. Option includes a 3/4" manual operation drain valve. Option is available on 45-140 ton units.
C = *Standard Shell & Tube Constant Flow* - Shell and tube heat exchanger evaporator with grooved end piping, fittings and water connections and 3/4 inch closed cell polymer insulation with a minimum R-value of 3.5. Option includes a 3/4 inch manual operation drain valve.
D = *Oversized Shell & Tube Constant Flow* - Shell and tube heat exchanger evaporator with grooved end piping, fittings and water connections and 3/4 inch closed cell polymer insulation with a minimum R-value of 3.5. Option includes a 3/4 inch manual operation drain valve.

Model Option A4 - Coating

Example: LZA-140-C-A-3-FAC**0**E-0000:E0-0000-0000-0000-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

0 = *Standard*
E = *Polymer E-Coated Condenser Coil* - Polymer e-coating is applied only to the condenser coils. Complete coil and casing are coated. Coating capable of withstanding at least 10,000 hours of salt spray per ASTM B117-90, yet is only 0.8-1.2 mils thick and has excellent flexibility. Option is intended for use in coastal saltwater conditions under the stress of heat, salt, sand and wind and is applicable to all corrosive environments where a polymer e-coating is acceptable. Coating includes a 5 year warranty, from the date of original equipment shipment from the factory. Instructions coil cleaning, maintenance, and recording keeping must be followed. Refer to the unit Installation, Operation and Maintenance Manual.

Model Option A5 - Staging

Example: LZA-140-C-A-3-FAC0**E**-0000:E0-0000-0000-0000-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

0 = *Staged Compressors* - On/off staged scroll compressors. Hot gas bypass is recommended on all circuits.
E = *All Circuits with Variable Capacity Compressors* - Each refrigeration circuit contains a compressor with variable capacity VFD speed control. See the General Data tables for the number of variable capacity refrigeration circuits.
G = *Half Circuits with Variable Capacity Compressors* - Half of the refrigeration circuits contain a compressor with variable capacity VFD speed control. The remaining refrigeration circuits contain on/off capacity control. See the General Data tables for the number of variable capacity and on/off refrigeration circuits.

Model Option B1 - Heating Type

Example: LZA-140-C-A-3-FAC0E-**0**000:E0-0000-0000-0000-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

0 = *No Boilers*

Model Option B2 - Boiler Quantity

Example: LZA-140-C-A-3-FAC0E-0**0**00:E0-0000-0000-0000-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

0 = *No Boilers*

Model Option B3 - Heating Type

Example: LZA-140-C-A-3-FAC0E-00**0**0:E0-0000-0000-0000-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

0 = *No Boilers*

Model Option B4 - Heating Type

Example: LZA-140-C-A-3-FAC0E-000**0**:E0-0000-0000-0000-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

0 = *No Boilers*

Unit Feature 1 - Orientation Options

Example: LZA-140-C-A-3-FAC0E-0000:**E**0-0000-0000-0000-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

E = *Walk-in Vestibule Left Access Left Water Connections* - Access doors to the walk-in vestibule will be on the left. Water piping connected within the cabinet through piping cutouts on the unit's left.
F = *Walk-in Vestibule Left Access Right Water Connections* - Access doors to the walk-in vestibule will be on the left. Water piping connected within the cabinet through piping cutouts on the unit's right.
G = *Walk-in Vestibule Left Access Bottom Water Connections* - Access doors to the walk-in vestibule will be on the left. Water piping connected within the cabinet through piping cutouts on the unit's bottom.
J = *Walk-in Vestibule Right Access Left Water Connections* - Access doors to the walk-in vestibule will be on the right. Water piping connected within the cabinet through piping cutouts on the unit's left.
K = *Walk-in Vestibule Right Access Right Water Connections* - Access doors to the walk-in vestibule will be on the right. Water piping connected within the cabinet through piping cutouts on the unit's right.
L = *Walk-in Vestibule Right Access Bottom Water Connections* - Access doors to the walk-in vestibule will be on the right. Water piping connected within the cabinet through piping cutouts on the unit's bottom.

Unit Feature 2 - Pump Style

Example: LZA-140-C-A-3-FAC0E-0000:E**0**-0000-0000-0000-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

0 = *No Pumping Package*
A = *Constant Flow Primary Pumping System Small Pipe Size* - Primary pumping package for constant flow systems which includes a building pump, recirculating pump, butterfly valves, strainers, ball valves, pressure relief valves, a pressure reduction valve, combination valves (isolation, check, and balancing) and city make-up water connection with backflow preventer. Glycol chillers do not include a city make-up connection. Grooved end piping and fittings and Armstrong pumps are standard. Select this option if water flow from the chiller to the building is constant.
B = *Constant Flow Primary Pumping System Large Pipe Size* - Primary pumping package for constant flow systems which includes a building pump, recirculating pump, butterfly valves, strainers, ball valves, pressure relief valves, a pressure reduction valve, combination valves (isolation, check, and balancing) and city make-up water connection with backflow preventer. Glycol chillers do not include a city make-up connection. Grooved end piping and fittings and Armstrong pumps are standard. Select this option if water flow from the chiller to the building is constant.
C = *Variable Flow Primary Pumping System Small Pipe Size* - Primary pumping package for variable flow systems which includes a building pump, recirculating pump, butterfly valves, strainers, ball valves, pressure relief valves, a pressure reduction valve, combination valves (isolation, check, and balancing) and city make-up water connection with backflow preventer. Glycol chillers do not include a city make-up connection. Grooved end piping and fittings and Armstrong pumps are standard. Select this option to modulate the flow of water through the chiller and to the building.
D = *Variable Flow Primary Pumping System Large Pipe Size* - Primary pumping package for variable flow systems which includes a building pump, recirculating pump, butterfly valves, strainers, ball valves, pressure relief valves, a pressure reduction valve, combination valves (isolation, check, and balancing) and city make-up water connection with backflow preventer. Glycol chillers do not include a city make-up connection. Grooved end piping and fittings and Armstrong pumps are standard. Select this option to modulate the flow of water through the chiller and to the building.
E = *Primary/Secondary Pumping System Small Pipe Size* - Primary and secondary pumping package for variable flow systems which includes a building pump, recirculating pump, butterfly valves, strainers, ball valves, pressure relief valves, a pressure reduction valve, combination valves (isolation, check and balancing) and city make-up water connection with backflow preventer. Glycol chillers do not include a city make-up connection. Grooved end piping and fittings and Armstrong pumps are standard. Select this option if the loads will vary as the building unit's cycle on and off, to modulate the flow of water to the building.

Unit Feature 2 – Pump Style Continued

Example: LZA-140-C-A-3-FAC0E-0000:E**0**-0000-0000-0000-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

F = *Primary/Secondary Pumping System Large Pipe Size* - Primary and secondary pumping package for variable flow systems which includes a building pump, recirculating pump, butterfly valves, strainers, ball valves, pressure relief valves, a pressure reduction valve, combination valves (isolation, check and balancing) and city make-up water connection with backflow preventer. Glycol chillers do not include a city make-up connection. Grooved end piping and fittings and Armstrong pumps are standard. Select this option if the loads will vary as the building unit's cycle on and off, to modulate the flow of water to the building.

Unit Feature 3A - Building Pump Configuration

Example: LZA-140-C-A-3-FAC0E-0000:E0-**0**000-0000-0000-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

0 = *No Building Pumps*
A = *1 Pump and High Efficiency Motor*
B = *1 Dual Pump and High Efficiency Motors*
C = *2 Single Pumps and High Efficiency Motors*
D = *1 Pump, 1 VFD, and High Efficiency Motor*
E = *1 Dual Pump, 2 VFD's, and High Efficiency Motors*
F = *2 Single Pumps, 2 VFD's, and High Efficiency Motors*
K = *1 Pump, 1 Field Installed VFD, and High Efficiency Motor*
L = *1 Dual Pump, 2 Field Installed VFD's, and High Efficiency Motors*
M = *2 Single Pumps, 2 Field Installed VFD's, and High Efficiency Motors*

AAON ECat will select the correct available options for Feature 3A based on unit conditions and the input from the pump selection program. To create a pump configuration select a pump option in Feature 2 and after all other features have been selected, input water conditions into the Unit Conditions window. Next, in the Pump Selection and Rating window, select the quantity and size of pumps, select the quantity and size of motors, select VFDs, and view pump curves.

Unit Feature 3B - Building Pump Series and RPM

Example: LZA-140-C-A-3-FAC0E-0000:E0-0**0**00-0000-0000-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

0 = *No Building Pumps*
A = *4360 (1,170 nominal rpm)*
B = *4360 (1,760 nominal rpm)*
C = *4360 (3,520 nominal rpm)*
D = *4380 (1,170 nominal rpm)*
E = *4380 (1,760 nominal rpm)*
F = *4380 (3,520 nominal rpm)*
G = *4300 (1,170 nominal rpm)*
H = *4300 (1,760 nominal rpm)*
J = *4300 (3,520 nominal rpm)*
K = *4382 (1,170 nominal rpm)*
L = *4382 (1,760 nominal rpm)*
M = *4382 (3,520 nominal rpm)*
N = *4302 (1,170 nominal rpm)*
P = *4302 (1,760 nominal rpm)*
Q = *4302 (3,520 nominal rpm)*

AAON ECat will select the correct available options for Feature 3B based on unit conditions and the input from the pump selection program. To create a pump configuration select a pump option in Feature 2 and after all other features have been selected, input water conditions into the Unit Conditions window. Next, in the Pump Selection and Rating window, select the quantity and size of pumps, select the quantity and size of motors, select VFDs, and view pump curves.

Unit Feature 3C - Building Pump Size

Example: LZA-140-C-A-3-FAC0E-0000:E0-00**0**0-0000-0000-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

0 = *No Building Pumps*
A = *1.5B*
B = *2B*
C = *2D*
D = *3D*
E = *1.5x1.5x6*
F = *2x2x6*
G = *3x3x6*
H = *4x4x6*
J = *6x6x6*
K = *1.5x1.5x8*
L = *2x2x8*
M = *3x3x8*
N = *4x4x8*
P = *5x5x8*
Q = *6x6x8*
R = *8x8x8*
S = *2x2x10*
T = *3x3x10*
U = *4x4x10*
V = *6x6x10*
W = *8x8x10*
Y = *4x4x11.5*
Z = *5x5x11.5*
1 = *6x6x11.5*
2 = *8x8x11.5*
3 = *4x4x13*
4 = *6x6x13*
5 = *8x8x13*

AAON ECat will select the correct available options for Feature 3C based on unit conditions and the input from the pump selection program. To create a pump configuration select a pump option in Feature 2 and after all other features have been selected, input water conditions into the Unit Conditions window. Next, in the Pump Selection and Rating window, select the quantity and size of pumps, select the quantity and size of motors, select VFDs, and view pump curves.

Unit Feature 3D - Building Pump Motor Size

Example: LZA-140-C-A-3-FAC0E-0000:E0-000**0**-0000-0000-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

0 = *No Building Pumps*
C = *1 hp*
E = *2 hp*
F = *3 hp*
G = *5 hp*
H = *7.5 hp*
J = *10 hp*
K = *15 hp*
L = *20 hp*
M = *25 hp*
N = *30 hp*
P = *40 hp*
Q = *50 hp*
R = *60 hp*
S = *75 hp*

AAON ECat will select the correct available options for Feature 3D based on unit conditions and the input from the pump selection program. To create a pump configuration select a pump option in Feature 2 and after all other features have been selected, input water conditions into the Unit Conditions window. Next, in the Pump Selection and Rating window, select the quantity and size of pumps, select the quantity and size of motors, select VFDs, and view pump curves.

Unit Features 4A - Recirculating Pump Configuration

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-**0**000-0000-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

0 = *No Recirculating Pumps*
A = *1 Pump and High Efficiency Motor*
B = *1 Dual Pump and High Efficiency Motors*
C = *2 Single Pumps and High Efficiency Motors*

AAON ECat will select the correct available options for Feature 4A based on unit conditions and the input from the pump selection program. To create a pump configuration select a pump option in Feature 2 and after all other features have been selected, input water conditions into the Unit Conditions window. Next, in the Pump Selection and Rating window, select the quantity and size of pumps, select the quantity and size of motors, select VFDs, and view pump curves.

Unit Features 4B - Recirculating Pump Series and RPM

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0**0**00-0000-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

0 = *No Recirculating Pumps*
A = *4360 (1,170 nominal rpm)*
B = *4360 (1,760 nominal rpm)*
C = *4360 (3,520 nominal rpm)*
D = *4380 (1,170 nominal rpm)*
E = *4380 (1,760 nominal rpm)*
F = *4380 (3,520 nominal rpm)*
G = *4300 (1,170 nominal rpm)*
H = *4300 (1,760 nominal rpm)*
J = *4300 (3,520 nominal rpm)*
K = *4382 (1,170 nominal rpm)*
L = *4382 (1,760 nominal rpm)*
M = *4382 (3,520 nominal rpm)*
N = *4302 (1,170 nominal rpm)*
P = *4302 (1,760 nominal rpm)*
Q = *4302 (3,520 nominal rpm)*

AAON ECat will select the correct available options for Feature 4B based on unit conditions and the input from the pump selection program. To create a pump configuration select a pump option in Feature 2 and after all other features have been selected, input water conditions into the Unit Conditions window. Next, in the Pump Selection and Rating window, select the quantity and size of pumps, select the quantity and size of motors, select VFDs, and view pump curves.

Unit Features 4C - Recirculating Pump Size

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-00**0**0-0000-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

0 = *No Recirculating Pumps*
A = *1.5B*
B = *2B*
C = *2D*
D = *3D*
E = *1.5x1.5x6*
F = *2x2x6*
G = *3x3x6*
H = *4x4x6*
J = *6x6x6*
K = *1.5x1.5x8*
L = *2x2x8*
M = *3x3x8*
N = *4x4x8*
P = *5x5x8*
Q = *6x6x8*
R = *8x8x8*
S = *2x2x10*
T = *3x3x10*
U = *4x4x10*
V = *6x6x10*
W = *8x8x10*
Y = *4x4x11.5*
Z = *5x5x11.5*
1 = *6x6x11.5*
2 = *8x8x11.5*
3 = *4x4x13*
4 = *6x6x13*
5 = *8x8x13*

AAON ECat will select the correct available options for Feature 4C based on unit conditions and the input from the pump selection program. To create a pump configuration select a pump option in Feature 2 and after all other features have been selected, input water conditions into the Unit Conditions window. Next, in the Pump Selection and Rating window, select the quantity and size of pumps, select the quantity and size of motors, select VFDs, and view pump curves.

Unit Features 4D - Recirculating Pump Motor Size

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-000**0**-0000-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

0 = *No Building Pumps*
A = *0.5 hp*
B = *1 hp*
D = *1.5 hp*
C = *1 hp*
E = *2 hp*
F = *3 hp*
G = *5 hp*
H = *7.5 hp*
J = *10 hp*
K = *15 hp*
L = *20 hp*
M = *25 hp*
N = *30 hp*
P = *40 hp*
Q = *50 hp*
R = *60 hp*
S = *75 hp*

AAON ECat will select the correct available options for Feature 4D based on unit conditions and the input from the pump selection program. To create a pump configuration select a pump option in Feature 2 and after all other features have been selected, input water conditions into the Unit Conditions window. Next, in the Pump Selection and Rating window, select the quantity and size of pumps, select the quantity and size of motors, select VFDs, and view pump curves.

Unit Features 5A - Boiler Building Pump Configuration

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-**0**000-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

0 = *No Boiler Pumps*

Unit Features 5B - Boiler Building Pump Series and RPM

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0**0**00-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

0 = *No Boiler Pumps*

Unit Features 5C - Boiler Building Pump Size

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-00**0**0-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

0 = *No Boiler Pumps*

Unit Features 5D - Boiler Building Pump Size

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-000**0**-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

0 = *No Boiler Pumps*

Unit Feature 6 - Refrigeration Options

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-**0**B-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

0 = *Standard*
A = *Hot Gas Bypass on Non-Variable Capacity Refrigeration Circuits* - Field adjustable pressure activated bypass valve on all non-variable capacity compressor refrigerant circuits factory setup to divert hot compressor discharge gas to the evaporator if the pressure on the evaporator side of the valve drops below 105 psi for R-410A (34°F at sea level). The bypass valve is at full capacity after 6 degrees of differential (28°F at sea level). This option is used to prevent freeze-up during periods of low flow or cold entering heat exchanger conditions. This option is used for refrigerant system protection only and cannot be used for cooling capacity modulation.
B = *Hot Gas Bypass on All Refrigeration Circuits* - Field adjustable pressure activated bypass valve on all refrigerant circuits factory setup to divert hot compressor discharge gas to the evaporator if the pressure on the evaporator side of the valve drops below 105 psi for R-410A (34°F at sea level). The bypass valve is at full capacity after 6 degrees of differential (28°F at sea level). This option is used to prevent freeze-up during periods of low flow or cold entering heat exchanger conditions. This option is used for refrigerant system protection only and cannot be used for cooling capacity modulation.

Unit Feature 7 - Refrigeration Accessories

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0**B**-000-0-0E00-00C00-0J000-00000-000000-00000-00DB

0 = Standard
A = *Sight Glass* - Moisture indication sight glass attached to the refrigeration circuit liquid lines. The moisture indicator shows a green color when refrigerant is dry, a chartreuse color (green with a yellow tint or bright green) indicates caution and a yellow color indicates a wet condition. The sight glass is not a charge indicator.
B = *Compressor Isolation Valves* - Ball type service valves mounted on the refrigeration circuit discharge and suction lines permitting isolation of the compressor for service or replacement. The valves are located close to the compressors and work through a quarter turn from open to closed. Teflon seals and gaskets are used with a nylon cap gasket to prevent accidental loss. This option reduces the amount of refrigerant that must be recovered during compressor service or replacement.
C = *Sight Glass and Compressor Isolation Valves* - Options A + B

Table 11 - Moisture Content in the Refrigerant

Indicator Color	75° F Liquid Line Temperature
Green DRY	Below 75 ppm
Chartreuse CAUTION	75-150 ppm
Yellow WET	Above 150 ppm

Unit Feature 8A - Unit Disconnect Type

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-**0**00-0-0E00-00C00-0J000-00000-000000-00000-00DB

0 = *Standard Single Point Power Block*
A = *Single Point Power Non-fused Disconnect Power Switch*

Individual components within the control cabinet are fused. Switch options include molded case, non-fused, disconnect switch externally mounted. The switch is accessible from the exterior of the unit. The switch disconnects high voltage service to the unit.

Unit Feature 8B - Disconnect 1 Size

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-0**0**0-0-0E00-00C00-0J000-00000-000000-00000-00DB

0 = *Standard Power Block*
N = *100 Amp*
R = *150 Amp*
V = *250 Amp*
Z = *400 Amp*
3 = *600 Amp*
5 = *800 Amp*
7 = *1200 Amp*

To add a switch, choose any switch and after all options have been selected and the pump program is completed AAON ECat will automatically calculate the minimum allowable ampacity and choose the correct size switch.

Unit Feature 8C - Blank

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-00**0**-0-0E00-00C00-0J000-00000-000000-00000-00DB

0 = *Standard*

Unit Feature 9 - Accessories

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-**0**-0E00-00C00-0J000-00000-000000-00000-00DB

0 = *None*
B = *Phase and Brown Out Protection* - Voltage monitor that is used to protect motors and compressors from voltage imbalance, over/under voltage, and phase loss. Reset is automatic.

Unit Feature 10A - Unit Control Sequence

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-**0**E00-00C00-0J000-00000-000000-00000-00DB

0 = *Standard AAON Controls*

Unit Feature 10B - Unit Control Supplier

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0**E**00-00C00-0J000-00000-000000-00000-00DB

E = *MCS Controls* - Micro Control Systems (MCS) maintains the chiller leaving water temperature. LCD interface is included within the controls compartment for unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling. PC with MCS-Connect software connected to the controller via RS-232 or Ethernet can also be used for unit configuration, setpoint adjustment, sensor status viewing, unit alarm view, and occupancy scheduling.

Unit Feature 10C - Unit Control Supplier Options

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E**0**0-00C00-0J000-00000-000000-00000-00DB

0 = *None*
A = *Touchscreen Computer Unit Control Interface* - Full color 15" 1024x768 pixel touchscreen computer interface included within the control compartment for unit configuration, setpoint adjustment, sensor status viewing, unit alarm view and occupancy scheduling. Graphical user interface allows for easy monitoring and troubleshooting of the chiller. Unit, controls, compressor and VFD literature can be viewed from the touchscreen.
C = *Modem* - A 56K modem which can allow MCS, AAON, or customer to remotely communicate with the unit in order to assist service in the field.
G = *Touchscreen Unit Control Interface and Modem*- Options A + C

Unit Feature 10D - BMS Connections & Diagnostic

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E0**0**-00C00-0J000-00000-000000-00000-00DB

0 = *None*
A = *BACnet IP* - Ethernet communications port for end user interfacing via the BACnet IP protocol.
B = *BACnet MS/TP* - Adapter EIA-485 communications port for end user interfacing via the BACnet MS/TP protocol.

Unit Feature 10D - BMS Connections & Diagnostic Continued

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E0**0**-00C00-0J000-00000-000000-00000-00DB

C = *Modbus IP* - Ethernet communications port for end user interfacing via the Modbus IP protocol.
D = *Modbus RTU* - EIA-485 communications port for end user interfacing via the Modbus RTU protocol.
E = *LonTalk* - Adapter communications port for end user interfacing via the LonTalk protocol.
H = *No BMS Connection with Diagnostics* - A diagnostics package of suction, discharge and liquid pressure transducers, temperature sensors that monitor compressor performance and current sensors that confirm mode of operation.
J = *BACnet IP with Diagnostics* - Option A + A diagnostics package of suction, discharge and liquid pressure transducers, temperature sensors that monitor compressor performance and current sensors that confirm mode of operation.
K = *BACnet MS/TP with Diagnostics* - Option B + A diagnostics package of suction, discharge and liquid pressure transducers, temperature sensors that monitor compressor performance and current sensors that confirm mode of operation.
L = *Modbus IP with Diagnostics* - Option C + A diagnostics package of suction, discharge and liquid pressure transducers, temperature sensors that monitor compressor performance and current sensors that confirm mode of operation.
M = *Modbus RTU with Diagnostics* - Option C + A diagnostics package of suction, discharge and liquid pressure transducers, temperature sensors that monitor compressor performance and current sensors that confirm mode of operation.
N = *LonTalk with Diagnostics* - Option E + A diagnostics package of suction, discharge and liquid pressure transducers, temperature sensors that monitor compressor performance and current sensors that confirm mode of operation.

Unit Feature 11 - Cabinet Options

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E00-**0**0C00-0J000-00000-000000-00000-00DB

0 = *None*
B = *Access Door Windows* - 12” x 12”, wire reinforced glass, double pane windows which permit visual inspection of cabinet interior while the access doors are closed. A window is included on all cabinet access doors of the unit.

Unit Feature 12 - Vestibule Accessories

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E00-0**0**C00-0J000-00000-000000-00000-00DB

0 = *None*
A = *Refrigerant Leak Detector* - This option includes a refrigerant monitoring system with three separate factory installed refrigerant sensors. Leak alarm set point is field configured.
B = *Motorized Service Vestibule Fresh Air* - This option includes a ventilation fan in the service vestibule that provides air circulation to the service vestibule when occupied.
C = *Vestibule Heating (Electric)* - 1kW base board heater mounted in the chiller evaporator compartment.
D = *Vestibule Cooling (Fan/Coil)* - This option includes a thermostatically controlled fan/coil unit. This fan/coil unit is connected to the chilled water circuit if a pumping package is ordered.
F = *Refrigerant Leak Detector+ Motorized Service Vestibule Fresh Air* - Options A + B
G = *Refrigerant Leak Detector Vestibule Heating (Electric)* - Options A + C
H = *Refrigerant Leak Detector + Vestibule Cooling (Fan/Coil)* - Options A + D
K = *Motorized Service Vestibule Fresh Air + Vestibule Heating (Electric)* - Options B + C
L = *Motorized Service Vestibule Fresh Air + Vestibule Cooling (Fan/Coil)* - Options B + D
N = *Vestibule Heating (Electric) + Vestibule Cooling (Fan/Coil)* - Options C + D
R = *Refrigerant Leak Detector+ Motorized Service Vestibule Fresh Air + Vestibule Heating (Electric)* - Options A + B + C
S = *Refrigerant Leak Detector+ Motorized Service Vestibule Fresh Air + Vestibule Cooling (Fan/Coil)* - Options A + B + D
U = *Refrigerant Leak Detector+ Vestibule Heating (Electric) + Vestibule Cooling (Fan/Coil)* - Options A + C + D
Y = *Motorized Service Vestibule Fresh Air + Vestibule Heating (Electric) + Vestibule Cooling (Fan/Coil)* - Options B + C + D
3 = *Refrigerant Leak Detector+ Motorized Service Vestibule Fresh Air + Vestibule Heating (Electric) + Vestibule Cooling (Fan/Coil)* - Options A + B + C + D

Unit Feature 13 - Maintenance Accessories

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E00-00**C**00-0J000-00000-000000-00000-00DB

C = *Service Lights* - Standard unit construction with service lights included in the controls and compressor compartments. The light circuit is wired to the line side of the unit power block, permitting use of the lights while the power to the unit is shut off.

Unit Feature 13 – Maintenance Accessories Continued

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E00-00**C**00-0J000-00000-000000-00000-00DB

F = *Factory Wired 115V Convenience Outlet + Service Lights* - Factory wired 2x4 inch electrical box with ground fault interrupter receptacle located within the controls vestibule. The circuit is rated at 12 amps maximum and is factory wired to a step-down transformer, fuse block and outlet disconnect. The circuit is wired to the line side of the unit power block or power switch permitting use of the outlet while power to the unit is shut off. **Caution: When the power to the unit is disconnected with the factory installed unit power switch, the convenience outlet will remain live.** + Option C.
J = *Field Wired 115V Convenience Outlet + Service Lights* - Field wired 2x4 inch electrical box with ground fault interrupter receptacle, located within the controls vestibule. Receptacle is rated for 20 amps. The outlet must be field wired to a 115 VAC power supply.
+ Option C.

Unit Feature 14 - Option Boxes

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E00-00C**0**0-0J000-00000-000000-00000-00DB

0 = *None*
A = *2 ft Option Box* - Additional 2 ft box for field provided accessories.
B = *4 ft Option Box* - Additional 4 ft box for field provided accessories.
C = *6 ft Option Box* - Additional 6 ft box for field provided accessories.
D = *8 ft Option Box* - Additional 8 ft box for field provided accessories.
F = *10 ft Option Box* - Additional 10 ft box for field provided accessories.
G = *12 ft Option Box* - Additional 12 ft box for field provided accessories.

Unit Feature 15 - Code Options

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E00-00C0**0**-0J000-00000-000000-00000-00DB

0 = *Standard ETL USA Listing* - All AAON equipment is ETL listed and tested in accordance with the latest revision of UL 1995. If a Special Pricing Authorization (SPA) is applied there may be additional costs incurred to secure the ETL label.
A = *Chicago Code* - Chicago code for a unit with cooling and gas heat. Chicago code states that unit wiring to the condenser fan motors must be in flexible conduit and refrigerant pressure relief valves must be supplied.

Unit Feature 15 – Code Options Continued

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E00-00C0**0**-0J000-00000-000000-00000-00DB

B = *ETL USA + Canada Listing* - Canadian and USA listings for export. The nameplate, safety labels, drain and pump warnings will be in English and French.

Unit Feature 16 - Shipping Split

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E00-00C00-**0**J000-00000-000000-00000-00DB

0 = *One Piece Unit*
A = *Two Piece Unit* - If unit weight or length creates concern for rigging or shipping, the unit may be shipped in two pieces. Refer to AAONECat drawings for sizes of individual pieces.

Unit Feature 17 - Air-Cooled Condenser Accessories

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E00-00C00-0**J**000-00000-000000-00000-00DB

J = *Cond. Coil Guards + VFD Controlled Cond. Fans - Head Pressure Control (0°F Low Ambient)* - Condenser coil guards fabricated from galvanized sheet metal, painted and factory mounted across the condenser coil face. VFD controlled variable speed air-cooled condenser fans allow operation down to 0°F ambient.
S = *Cond. Coil Guards + Low Sound ECM Cond. Fans - Head Pressure Control (0°F Low Ambient)* - Condenser coil guards fabricated from galvanized sheet metal, painted and factory mounted across the condenser coil face. Condenser fans are specifically designed for reduced and redirected sound emission. The fans include optimized orifice, guide vanes, and serrated blades. These condenser fans are driven by EC motors which either speed up or slow down to adjust air flow in order to maintain the head pressure setpoint. The head pressure setpoint is field adjustable from 260-400 psi with a default setting of 340 psi with a Head Pressure Control Module. Option includes Low Sound ECM condenser fans, condenser head pressure controller and discharge pressure transducers. This option adds 9 inches of height to the standard unit. ECM air-cooled condenser fans allow operation down to 0°F ambient.

Unit Feature 18 - Evaporative-Condensed Chiller Accessories

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E00-00C00-0J**0**00-00000-000000-00000-00DB

0 = *No Evaporative Condenser*
A = *No Sump Heater* - Evaporative-condensed chiller without electric immersion sump heater. This option is for applications where the evaporative-condensed chiller will not contain water during freezing conditions.
B = *Sump Heaters* - 5 kW electric immersion sump heater included in the evaporative-condensed sump. This option is for applications where the evaporative-condensed chiller may contain water during freezing conditions.

Unit Features 19-20 - Blank

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E00-00C00-0J0**00**-00000-000000-00000-00DB

00 = *Standard*

Unit Features 21 - Chiller Compression Tank

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E00-00C00-0J000-**0**0000-000000-00000-00DB

0 = *No Chiller Compression Tank*
A = *AX-15V*
B = *AX-20V*
C = *AX-40V*
D = *AX-60V*
E = *AX-80V*
F = *AX-100V*
G = *AX-120V*
H = *AX-180V*
J = *AX-200V*
K = *AX-240V*
L = *AX-260V*
M = *AX-280V*

Unit Features 22 - Boiler Compression Tank

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E00-00C00-0J000-0**0**000-000000-00000-00DB

0 = *No Boiler Compression Tank*

Unit Features 23 - Blank

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E00-00C00-0J000-00**0**00-000000-00000-00DB

0 = *Standard*

Unit Feature 24 - Chiller Accessories 1

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E00-00C00-0J000-000**0**0-000000-00000-00DB

0 = *Standard*
A = *Glycol Chiller* - Propylene glycol chiller system which does not include city make up water connections. Glycol is selected within the unit conditions window.
B = *Air Separator* - Chilled water system and pumping package with air separator factory installed upstream of the primary pump to remove air bubbles from the system. Air separator is required with a pumping package. This option includes city make up water connections.
C = *Thermometers and Pressure Gauges* - Chilled water system with pumping package and thermometers and pressure gauges factory installed on the pumping package to indicate water temperature and pressure drop of various components.
D = *Chemical Pot Feeder* - Factory installed high pressure bypass feeder for slug feeding of chemicals to the closed loop fluid system. Option includes funnel and gate valve at chemical feeder inlet. A local water expert is required for addition of chemicals to the water loop.
E = *Auto Glycol Feeder* - Factory installed auto glycol feed system that maintains a consistent glycol concentration in the closed loop fluid system. A local water expert is required for addition of chemicals to the water loop.
F = *Glycol Chiller + Air Separator* - Options A + B
G = *Glycol Chiller + Thermometers and Pressure Gauges* - Options A + C
H = *Glycol Chiller + Chemical Pot Feeder* - Options A + D
J = *Glycol Chiller + Auto Glycol Feeder* - Options A + E
K = *Air Separator + Thermometers and Pressure Gauges* - Options B + C

Unit Feature 24 – Chiller Accessories 1 Continued

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E00-00C00-0J000-000**0**0-000000-00000-00DB

L = *Air Separator + Chemical Pot Feeder* - Options B + D
M = *Air Separator + Auto Glycol Feeder* - Options B + E
N = *Thermometers and Pressure Gauges + Chemical Pot Feeder* - Options C + D
P = *Thermometers and Pressure Gauges + Auto Glycol Feeder* - Options C + E
Q = *Chemical Pot Feeder + Auto Glycol Feeder* - Options D + E
R = *Glycol Chiller + Air Separator + Thermometers and Pressure Gauges* - Options A + B + C
S = *Glycol Chiller + Air Separator + Chemical Pot Feeder* - Options A + B + D
T = *Glycol Chiller + Air Separator + Auto Glycol Feeder* - Options A + B + E
U = *Glycol Chiller + Thermometers and Pressure Gauges + Chemical Pot Feeder* - Options A + C + D
V = *Glycol Chiller + Thermometers and Pressure Gauges + Auto Glycol Feeder* - Options A + C + E
W = *Glycol Chiller + Chemical Pot Feeder + Auto Glycol Feeder* - Options A + D + E
Y = *Air Separator + Thermometers and Pressure Gauges + Chemical Pot Feeder* - Options B + C + D
Z = *Air Separator + Thermometers and Pressure Gauges + Auto Glycol Feeder* - Options B + C + E
1 = *Air Separator + Chemical Pot Feeder + Auto Glycol Feeder* - Options B + D + E
2 = *Thermometers and Pressure Gauges + Chemical Pot Feeder + Auto Glycol Feeder* - Options C + D + E
3 = *Glycol Chiller + Air Separator + Thermometers and Pressure Gauges + Chemical Pot Feeder* - Options A + B + C + D
4 = *Glycol Chiller + Air Separator + Thermometers and Pressure Gauges + Auto Glycol Feeder* - Options A + B + C + E
5 = *Glycol Chiller + Air Separator + Chemical Pot Feeder + Auto Glycol Feeder* - Options A + B + D + E
6 = *Glycol Chiller + Thermometers and Pressure Gauges + Chemical Pot Feeder + Auto Glycol Feeder* - Options A + C + D + E
7 = *Air Separator + Thermometers and Pressure Gauges + Chemical Pot Feeder + Auto Glycol Feeder* - Options B + C + D + E
8 = *Glycol Chiller + Air Separator + Thermometers and Pressure Gauges + Chemical Pot Feeder + Auto Glycol Feeder* - Options A + B + C + D + E

Unit Feature 25 - Blank

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E00-00C00-0J000-0000**0**-000000-00000-00DB

0 = *Standard*

Unit Features 26A-26F - Blank

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E00-00C00-0J000-00000-**000000**-00000-00DB

000000 = *Standard*

Unit Features 27-31 - Blank

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E00-00C00-0J000-00000-000000-**00000**-00DB

00000 = *Standard*

Unit Feature 32 - Blank

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E00-00C00-0J000-00000-000000-00000-**0**0DB

0 = *Standard*

Unit Feature 33 - Warranty

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E00-00C00-0J000-00000-000000-00000-0**0**DB

0 = *Standard Warranty*
D = *Compressor Warranty Years 2-5* - Extends warranty coverage of compressors for the second to fifth years of unit operation from date of shipment.

Unit Feature 34 - Cabinet Material

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00**D**B

D = *Double Wall + R-13 Foam Insulation + Galvanized Cabinet 6" Base Rail* - Option is standard on all A through D and H through K cabinets.
H = *Double Wall + R-13 Foam Insulation + Galvanized Cabinet 8" Base Rail* - Option is standard on all E through G and L through N cabinets.

Unit Feature 35 - Paint and Special Pricing Authorization

Example: LZA-140-C-A-3-FAC0E-0000:E0-0000-0000-0000-0B-000-0-0E00-00C00-0J000-00000-000000-00000-00D**B**

B = *Premium AAON Gray Paint Exterior* - Cabinet exterior is primer washed then spray coated with a two part polyurethane, heat-baked exterior paint. The paint is gray in color and is capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with the ASTM B 117-95 test procedure.
E = *Premium AAON Gray Paint Exterior and Shrink Wrap* - Option B + Unit is shrink-wrapped prior to shipment to protect unit during shipment and while in storage awaiting installation.
X = *Special Pricing Authorization and Premium AAON Gray Paint Exterior* - Option B + the Applications Department must issue a Special Pricing Authorization (SPA) to include a non-standard option.
1 = *Special Pricing Authorization, Premium AAON Gray Paint Exterior, and Shrink Wrap* - Option C + the Applications Department must issue a Special Pricing Authorization (SPA) to include a non-standard option.
4 = *Special Pricing Authorization and Special Exterior Paint Color* - If a special paint color is specified, a set-up charge and price add per unit is required. The Applications Department must issue a Special Pricing Authorization (SPA) to include a non-standard option.
7 = *Special Pricing Authorization, Special Exterior Paint Color, and Shrink Wrap* - Option 4 + unit is shrink-wrapped prior to shipment to protect unit during shipment and while in storage awaiting installation.

General Data

Unit Information

Table 12 - 45-78 ton Scroll Compressor Units Compressor Information

Air-Cooled / Evaporative-Condensed Chiller Size	Model			
	LZ-045/ LZ-053	LZ-055/ LZ-061	LZ-060/ LZ-069	LZ-075/ LZ-078
R-410A VFD Compatible Scroll Compressors				
Quantity/Nominal tons Staged	2/10, 2/13	2/13, 2/15	2/13, 2/20	2/15, 2/20
Quantity/Nominal tons All Variable	2/13, 2/10 Var.	2/15, 2/13 Var.	2/20, 2/13 Var.	2/20, 2/15 Var.
Quantity/Nominal tons Half Variable	2/13, 1/10, 1/10 Var.	2/15, 1/13, 1/13 Var.	2/20, 1/13, 1/13 Var.	2/20, 1/15, 1/15 Var.
Quantity of Circuits	2			
Nominal Unit Staged Capacity Steps (%) Staged	27%, 56%, 79%, 100%	28%, 58%, 80%, 100%	25%, 52%, 78%, 100%	25%, 53%, 78%, 100%
Nominal Unit Staged Capacity Steps (%) All Variable	19%-28%, 39%-59%, 67%-80%, 90%-100%	20%-29%, 43%-60%, 69%-81%, 91%-100%	19%-26%, 38%-55%, 68%-79%, 93%-100%	18%-24%, 38%-50%, 66%-75%, 89%-100%
Nominal Unit Staged Capacity Steps (%) Half Variable	19%-28%, 47%-57%, 74%-79%, 95%-100%	21%-29%, 50%-59%, 75%-80%, 95%-100%	19%-27%, 46%-54%, 74%-78%, 96%-100%	19%-25%, 45%-51%, 73%-76%, 94%-100%
Compressor VFD Range				
208V, 230V, 460V, & 575V	35-60 Hz			

Table 13 - 45-78 ton Scroll Compressor Units Evaporator and Condenser Information

Air-Cooled / Evaporative-Condensed Chiller Size	Model			
	LZ-045/ LZ-053	LZ-055/ LZ-061	LZ-060/ LZ-069	LZ-075/ LZ-078
Evaporator				
Quantity	(1) Shell & Tube or (1) Brazed Plate			
Max Water Pressure	125 psig			
Connection Sizes	3”			4”
Standard- Shell and Tube				
Max gpm	197		216	269
Min gpm	83		90	113
Oversized- Shell and Tube				
Max gpm	216		245	269
Min gpm	83		90	113
Standard- Brazed Plate				
Max gpm	178	197	216	278
Min gpm	68	83	90	113
Oversized- Brazed Plate				
Max gpm	197	216		278
Min gpm	83	90		113
Air-Cooled Cond. Fans				
Quantity	4			8
Type	36” Propeller Fan			
hp	1.5			
Evaporative-Condenser Fans				
Quantity	2			
Type	36” Propeller Fan			
hp	3.0			
Evaporative-Condenser Pump				
Quantity/hp	1/1		1/1.5	
Boilers				
Input Capacity/Output Capacity (MBH)				
Quantity				

Table 14 - 95-161 tons Scroll Compressor Units Compressor Information

Air-Cooled / Evaporative-Condensed Chiller Size	Model			
	LZ-095/ LZ-106	LZ-105/ LZ-121	LZ-120/ LZ-134	LZ-140/ LZ-161
R-410A VFD Compatible Scroll Compressors				
Quantity/Nominal tons Staged	4/25	2/25, 2/32	4/32	2/35, 2/40
Quantity/Nominal tons All Variable	2/25, 2/25 Var.	2/32, 2/25 Var.	2/32, 2/32 Var.	2/40, 2/35 Var.
Quantity/Nominal tons Half Variable	3/25, 1/25 Var.	2/32, 1/25, 1/25 Var.	3/32, 1/32 Var.	2/40, 1/35, 1/35 Var.
Quantity of Circuits	2			
Nominal Unit Staged Capacity Steps (%) Staged	30 %, 62%, 82%, 100%	27%, 56%, 79%, 100%	31%, 63%, 82%, 100%	30%, 61%, 81%, 100%
Nominal Unit Staged Capacity Steps (%) All Variable	18%-30%, 38%-62%, 64%-82%, 86%-100%	16%-27%, 34%-56%, 63%-79%, 88%-100%	18%-31%, 38%-63%, 64%-82%, 86%-100%	18%-30%, 37%-61%, 65%-82%, 87%-100%
Nominal Unit Staged Capacity Steps (%) Half Variable	18%-30%, 50%-62%, 74%-82%, 92%-100%	16%-27%, 45%-56%, 73%-79%, 94%-100%	18%-31%, 51%-63%, 75%-82%, 93%-100%	18%-30%, 50%-61%, 75%-81%, 94%-100%
Compressor VFD Range				
208V, 230V, 460V, & 575V	35-60 Hz			

Table 15 - 95-161 tons Units Scroll Compressor Evaporator and Condenser Information

Air-Cooled / Evaporative-Condensed Chiller Size	Model			
	LZ-095/ LZ-106	LZ-105/ LZ-121	LZ-120/ LZ-134	LZ-140/ LZ-161
Evaporator				
Quantity	(1) Shell & Tube or (1) Brazed Plate			
Max Water Pressure	125 psig			
Connection Sizes	4”		5”	
Standard- Shell and Tube				
Max gpm	350	388		555
Min gpm	143	158	180	210
Oversized- Shell and Tube				
Max gpm	378	388		611
Min gpm	143	158	180	210
Standard- Brazed Plate				
Max gpm	350	422	449	555
Min gpm	152	172	201	248
Oversized- Brazed Plate				
Max gpm	389		449	555
Min gpm	172	188	220	272
Air-Cooled Cond. Fans				
Quantity	8			
Type	36” Propeller Fan			
hp	1.5			
Evaporative-Condenser Fans				
Quantity	4			
Type	36” Propeller Fan			
hp	3.0			
Evaporative-Condenser Pump				
Quantity/hp	1/5			
Boilers				
Input Capacity/Output Capacity (MBH)				
Quantity				

Table 16 - 170-319 ton Scroll Compressor Units Compressor Information

Air-Cooled / Evaporative-Condensed Chiller Size	Model			
	LZ-170/ LZ-193	LZ-200/ LZ-239	- / LZ-274	- / LZ-319
R-410A VFD Compatible Scroll Compressors				
Quantity/Nominal tons Staged	3/25, 3/32	3/35, 3/40	8/32	4/35, 4/40
Quantity/Nominal tons All Variable	3/32, 3/25 Var.	3/35, 3/40 Var.	4/32, 4/32 Var.	4/35, 4/40 Var.
Quantity/Nominal tons Half Variable	3/32, 1/25, 2/25 Var.	3/40, 1/35, 2/35 Var.	6/32, 2/32 Var.	4/40, 2/35, 2/35 Var.
Quantity of Circuits	3		4	
Nominal Unit Staged Capacity Steps (%) Staged	17%, 36%, 56%, 71%, 86%, 100%	19%, 40%, 61%, 75%, 88%, 100%	13%, 27%, 42%, 57%, 68%, 78%, 90%, 100%	13%, 26%, 40%, 55%, 66%, 78%, 89%, 100%
Nominal Unit Staged Capacity Steps (%) All Variable	10%-18%, 21%-38%, 32%-58%, 52%-73%, 70%-87%, 86%-100%	12%-19%, 24%-40%, 37%-61%, 56%-75%, 73%-88%, 88%-100%	8%-13%, 16%-27%, 25%-42%, 33%-57%, 46%-68%, 59%-79%, 71%-90%, 83%-100%	7%-13%, 15%-27%, 23%-42%, 31%-57%, 45%-68%, 57%-79%, 70%-90%, 83%-100%
Nominal Unit Staged Capacity Steps (%) Half Variable	11%-18%, 21%-38%, 40%-57%, 60%-72%, 76%-87%, 95%-100%	12%-19%, 24%-40%, 45%-61%, 63%-75%, 79%-88%, 92%-100%	8%-13%, 16%-27%, 30%-42%, 45%-57%, 58%-68%, 71%-79%, 81%-90%, 92%-100%	8%-13%, 16%-28%, 29%-42%, 43%-56%, 56%-67%, 69%-78%, 80%-89%, 91%-100%
Compressor VFD Range				
208V, 230V, 460V, & 575V	35-60 Hz			

Table 17 - 170-319 ton Scroll Compressor Units Evaporator and Condenser Information

Air-Cooled / Evaporative-Condensed Chiller Size	Model			
	LZ-170/ LZ-193	LZ-200/ LZ-239	- / LZ-274	- / LZ-319
Evaporator				
Quantity	(1) Shell & Tube		(2) Shell & Tube	
Max Water Pressure	125 psig			
Connection Sizes	6”		8”	
Standard- Shell and Tube				
Max gpm	755		1,000	
Min gpm	250		420	
Oversized- Shell and Tube				
Max gpm	830		1,100	
Min gpm	250		420	
Air-Cooled Cond. Fans				
Quantity	12			
Type	36” Propeller Fan			
hp	1.5			
Evaporative-Condenser Fans				
Quantity	6		8	
Type	36” Propeller Fan			
hp	3.0			
Evaporative-Condenser Pump				
Quantity/hp	1/5		2/5	
Boilers				
Input Capacity/Output Capacity (MBH)				
Quantity				

Table 18 - 356-478 tons Scroll Compressor Units Compressor Information

Air-Cooled / Evaporative-Condensed Chiller Size	Model			
	- / LZ-356	- / LZ-401	- / LZ-441	- / LZ-478
R-410A VFD Compatible Scroll Compressors				
Quantity/Nominal tons Staged	5/32, 5/35	5/35, 5/40	12/35	6/35, 6/40
Quantity/Nominal tons All Variable	5/35, 5/32 Var.	5/40, 5/35 Var.	6/35, 6/35 Var.	6/40, 6/35 Var.
Quantity/Nominal tons Half Variable	5/35, 2/32, 3/32 Var.	5/40, 2/35, 3/35 Var.	9/35, 3/35 Var.	6/40, 3/35, 3/35 Var.
Quantity of Circuits	5		6	
Nominal Unit Staged Capacity Steps (%) Staged	10%, 21%, 32%, 43%, 55%, 64%, 74%, 82%, 91%, 100%	10%, 21%, 31%, 43%, 54%, 64%, 73%, 82%, 91%, 100%	9%, 18% 27%, 37%, 47%, 57%, 65%, 72%, 79%, 86%, 93%, 100%	8%, 17% 26%, 35%, 45%, 55%, 63%, 70%, 78%, 85%, 93%, 100%
Nominal Unit Staged Capacity Steps (%) All Variable	6%-10%, 12%-21%, 19%-32%, 25%-43%, 32%-55%, 43%-64%, 53%-74%, 64%-82%, 74%-91%, 84%-100%	6%-11%, 12%-22%, 18%-33%, 25%-45%, 31%-57%, 42%-66%, 52%-75%, 63%-83%, 73%-92%, 83%-100%	5%-9%, 11%-18%, 17%-27%, 22%-37%, 28%-47%, 34%-57%, 43%-65%, 51%-72%, 59%-79%, 68%-86%, 76%-93%, 84%-100%	5%-9%, 10%-18%, 15%-27%, 21%-37%, 26%-47%, 31%-57%, 40%-65%, 49%-72%, 57%-79%, 66%-86%, 74%-93%, 83%-100%
Nominal Unit Staged Capacity Steps (%) Half Variable	6%-10%, 12%-21%, 19%-32%, 30%-43%, 41%-55%, 52%-64%, 62%-74%, 73%-82%, 82%-91%, 91%-100%	6%-11%, 12%-22%, 19%-33%, 29%-45%, 40%-56%, 51%-65%, 62%-74%, 72%-83%, 81%-92%, 90%-100%	5%-9%, 11%-18%, 17%-27%, 26%-37%, 36%-47%, 46%-57%, 54%-65%, 63%-72%, 71%-79%, 78%-86%, 85%-93%, 92%-100%	5%-9%, 10%-18%, 16%-28%, 24%-37%, 33%-46%, 42%-56%, 52%-64%, 61%-71%, 69%-78%, 77%-86%, 84%-93%, 91%-100%
Compressor VFD Range				
208V, 230V, 460V, & 575V	35-60 Hz			

Table 19 - 356-478 tons Scroll Compressor Units Evaporator and Condenser Information

Air-Cooled / Evaporative-Condensed Chiller Size	Model			
	- / LZ-356	- / LZ-401	- / LZ-441	- / LZ-478
Evaporator				
Quantity	(2) Shell & Tube			
Max Water Pressure	125 psig			
Connection Sizes	8”			
Standard- Shell and Tube				
Max gpm	1,300		1,510	
Min gpm	465		500	
Oversized- Shell and Tube				
Max gpm	1,370		1,660	
Min gpm	465		500	
Evaporative-Condenser Fans				
Quantity	10		12	
Type	36” Propeller Fan			
hp	3.0			
Evaporative-Condenser Pump				
Quantity/hp	2/5		2/10	
Boilers				
Input Capacity/Output Capacity (MBH)				
Quantity				

Table 20 - 90-180 tons Turbocor Compressor Units Information

Air-Cooled / Evaporative-Condensed Chiller Size	Model			
	LZ-090/ LZ-090	LZ-120/ LZ-120	- / LZ-150	- / LZ-180
Compressors				
Quantity/Nominal tons				
R-134a Oil-Free Magnetic Bearing Centrifugal	1/90	1/120	1/150	1/200
Quantity of Circuits	1			
Capacity Steps	Variable Capacity			
Evaporator				
Quantity	(1) Shell & Tube			
Max Water Pressure	125 psig			
Connection Sizes	4”		5”	
Standard - Shell and Tube				
Max gpm	250	330	430	470
Min gpm	110	130	185	220
Air-Cooled Cond. Fans				
Quantity	8			
Type	36” Propeller Fan			
hp	1.5			
Evaporative-Condenser Fans				
Quantity	4		6	
Type	36” Propeller Fan			
hp	3			
Evaporative-Condenser Pump				
Quantity/hp	1/5	2/5		
Boilers				
Input Capacity/Output Capacity (MBH)				
Quantity				

Table 21 - 181-360 tons Turbocor Compressor Units Information

Air-Cooled / Evaporative-Condensed Chiller Size	Model			
	LZ-181/ LZ-181	- / LZ-240	- / LZ-300	- / LZ-360
Compressors				
Quantity/Nominal tons				
R-134a Oil-Free Magnetic Bearing Centrifugal	2/90	2/120	2/150	2/200
Quantity of Circuits	1	2		
Capacity Steps	Variable Capacity			
Evaporator				
Quantity	(1) Shell & Tube			
Max Water Pressure	125 psig			
Connection Sizes	5”	6”	8”	
Standard - Shell and Tube				
Max gpm	470	680	820	1070
Min gpm	220	290	360	430
Air-Cooled Cond. Fans				
Quantity	12			
Type	36” Propeller Fan			
hp	1.5			
Evaporative-Condenser Fans				
Quantity	6	8		
Type	36” Propeller Fan			
hp	3			
Evaporative-Condenser Pump				
Quantity/hp	1/5	2/5		
Boilers				
Input Capacity/Output Capacity (MBH)				
Quantity				

Table 22 - 450-540 tons Turbocor Compressor Units Information

Air-Cooled / Evaporative-Condensed Chiller Size	Model	
	- / LZ-450	- / LZ-540
Compressors		
Quantity/Nominal tons		
R-134a Oil-Free Magnetic Bearing Centrifugal	3/150	3/180
Quantity of Circuits	3	
Capacity Steps	Variable Capacity	
Evaporator		
Quantity	(1) Shell & Tube	
Max Water Pressure	125 psig	
Connection Sizes	8”	
Standard - Shell and Tube		
Max gpm	1290	1620
Min gpm	540	650
Evaporative-Condenser Fans		
Quantity	12	
Type	36” Propeller Fan	
hp	3	
Evaporative-Condenser Pump		
Quantity/hp	2/5	2/10
Boilers		
Input Capacity/Output Capacity (MBH)		
Quantity		

Control Vendors

Micro Control Systems (MCS) Magnum Control System

Figure 14 - LCD Interface, MCS Magnum Controller, and Touchscreen Computer Interface

The MCS Magnum controller is factory provided on all AAON chiller systems. The controller efficiently varies the cooling capacity of the compressors to maintain a leaving water temperature over a wide variety of operating conditions.

Configuration
Standard LCD interface is included within the controls compartment for unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling. PC with free MCS-Connect software can be connected to the controller via RS-232 or Ethernet for unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling. Optional full color 15" 1024x768 pixel touchscreen computer interface is available, and includes graphical user interface that allows for easy monitoring and troubleshooting of the chiller. Unit, controls, compressor, and VFD literature can be viewed from the touchscreen.

Diagnostics
Optional diagnostic sensors are available to provide each refrigerant circuit's suction, discharge and liquid temperature and pressure and also monitor each compressor's current. These sensors can be monitored from the MCS-Connect software.

Network Capability
The MCS Magnum controller can be directly integrated with BACnet IP or Modbus IP protocols via Ethernet port and Modbus RTU protocols via EIA-485 port. With adapter, the controller can be integrated with BACnet MS/TP or LonTalk protocols. Optional 56K modem allows remote communication to the unit from MCS, AAON, or the customer to assist with service, diagnosis, and program updates.

Electrical Service Sizing Data

Use the following equations to correctly size the electrical service wiring and disconnect switch for the unit.

To calculate the correct Minimum Circuit Ampacity (MCA) and Maximum Overcurrent Protection (MOP) values for units, use the equations below.

MCA = 1.25(Load 1) + Load 2 + Load 3

MOP = 2.25(Load 1) + Load 2 + Load 3

Where:
Load 1 = Current of the largest motor/compressor
Load 2 = Sum of the currents of the remaining motors, including chiller pump motors, compressors, evaporative-condenser pump motors, boiler building pump motors and boiler recirculating pump motors
Load 3 = Additional currents, including evaporative-condenser sump heaters and boilers

Use Rated Load Amps (RLA) for compressors and Full Load Amps (FLA) for all other motors and electric heaters. Evaporative-condenser currents should be added only if the unit is equipped with an evaporative-condenser section. Boiler current should be added only if the unit is equipped with a boiler.

Select a fuse rating equal to the MOP value. If the MOP does not equal a standard fuse rating select the next lower standard fuse rating. If the MOP is less than the MCA then select the fuse rating equal to or greater than the MCA.

Standard Ampere Ratings for Fuses (From NEC Handbook, 240-6)
The standard ratings for fuses shall be considered 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 110, 125, 150, 175, 200, 225, 250, 300, 350, 400, 450, 500, 600, 700, 800 and 1000 amperes.

Disconnect (Power) Switch Size

To calculate the disconnect switch size use the equation shown below.

DSS $\geq$ MOP

Select the standard switch size equal to the calculated Disconnect Switch Size (DSS) value. If this value is not a standard size, select the next larger size.

AAON Evaporative-Condensed Chiller Features and Water Treatment

The AAON evaporative-condensed chiller is the only evaporative-condenser sold in the HVAC business with an integral de-superheater coil located above moisture eliminators. The de-superheater coil reduces the refrigerant temperature by 50° to 70° before the refrigerant reaches the condensing coil. This creates several advantages:

1. A minimum of 22% of the heat of rejection is accomplished with the de-superheater as sensible heat transfer; therefore the evaporative-condensed chiller uses over 22% less water.

2. A minimum of 22% less water usage reduces water and water treatment costs.

3. Scale formation is reduced in the wetted section of the condenser because the surface temperature of the tubes is lower. This reduced scale potential allows the condenser tubes to withstand recirculating water with greater mineral content, and as a result, requires less make up water, less water treatment, and lower operating costs.

4. The de-superheater has the effect of increasing the temperature of the air leaving the wetted section therefore the air passing over the fan motor is not 100% relative humidity as with other draw-through designs but is closer to 70%. With the motor in a non-condensing environment there are fewer tendencies for any water to infiltrate the motor.

5. All motors draw in surrounding air during the off cycle when using on/off control. AAON uses VFD control of the fan motors to keep the motors turning at reduced loads. Energized motors stay warm and prevent water from being drawn into the condenser.

6. AAON incorporates VFD control of the condenser fans for reduce energy consumption when compared with on-off control. Additional benefits of VFD control include: Energized motors stay warm and prevent water from being drawn into the condenser, and keep from spinning backwards and resulting in nuisance power trips.

7. The sub-cooling circuit is integral to the wetted coil section.

8. The AAON cabinet is all 304 stainless steel. This includes the sump, all structural members and all interior.

9. The AAON condenser tube bundles are built such that each independent refrigerant circuit can be removed separately for repair or replacement.

10. ABS tube sheet isolators are used to prevent contact between the copper tube bundle and the stainless steel tube sheet.

11. Water treatment feed and control systems include 2 Biocide systems (feed) and 1 Corrosion system (control) are factory installed standard.

Water Treatment and Evaporative-Condensed Chiller

Langelier Saturation Index (LSI)

The LSI is an equilibrium model derived from the theoretical concept of saturation and provides an indicator of the degree of saturation of water with respect to calcium carbonate. It can be shown that the LSI approximates the base 10 logarithm of the calcite saturation level. The Langelier saturation level approaches the concept of saturation using pH as a main variable. The LSI can be interpreted, as the pH change required returning water to equilibrium.

Water with a Langelier saturation index of 1.0 is one pH unit above saturation. Reducing the pH by 1 unit will bring the water into equilibrium. This occurs because the portion of total alkalinity present as $CO3^{2-}$ decreases as the pH decreases, according to the equilibriums describing the dissociation of carbonic acid:

$$H_2CO_3 \rightleftharpoons HCO_3^- + H^+$$

$$HCO_3^- \rightleftharpoons CO_3^{2-} + H^+$$

If LSI is negative: No potential to scale, the water will dissolve $CaCO_3$
If LSI is positive: Scale can form and $CaCO_3$ precipitation may occur
If LSI is close to zero: Borderline scale potential. Water quality or changes in temperature, or evaporation could change the index.

The LSI is probably the most widely used indicator of cooling water scale potential. It is purely an equilibrium index and deals only with the thermodynamic driving force for calcium carbonate scale formation and growth. It provides no indication of how much scale or calcium carbonate will actually precipitate to bring water to equilibrium. It simply indicates the driving force for scale formation and growth in terms of pH as a master variable.

In order to calculate the LSI, it is necessary to know the alkalinity (mg/L as $CaCO_3$), the calcium hardness (mg/L Ca^{2+} as $CaCO_3$), the total dissolved solids (mg/L TDS), the actual pH, and the temperature of the water (°C). If TDS is unknown, but conductivity is, one can estimate mg/L TDS using a conversion table such as the one presented here. LSI is defined as:

LSI = pH - pHs

Where:
pH is the measured water pH
pHs is the pH at saturation in calcite or calcium carbonate and is defined as:
pHs = (9.3 + A + B) - (C + D)
Where:
A = (Log_{10} [TDS] - 1) / 10
B = -13.12 x Log_{10} (°C + 273) + 34.55
C = Log_{10} [Ca^{2+} as $CaCO_3$] - 0.4
D = Log_{10} [alkalinity as $CaCO_3$]

AAONECat allows calculation of the LSI and can be used as a reference for understanding the impact of water treatment on the performance of the evaporative-condensed chiller system.

As an example, the LSI is computed for a system using 3 cycles of concentration (mineral content of the refrigerant water is 3 times that of the makeup water) of Niagara River water. In the AAON evaporative-condensed chiller, refrigerant exits the de-superheater at 90% quality (90% gas, 10% liquid) in the example following the refrigerant enters the wetted section of the condenser at 101.7°F.

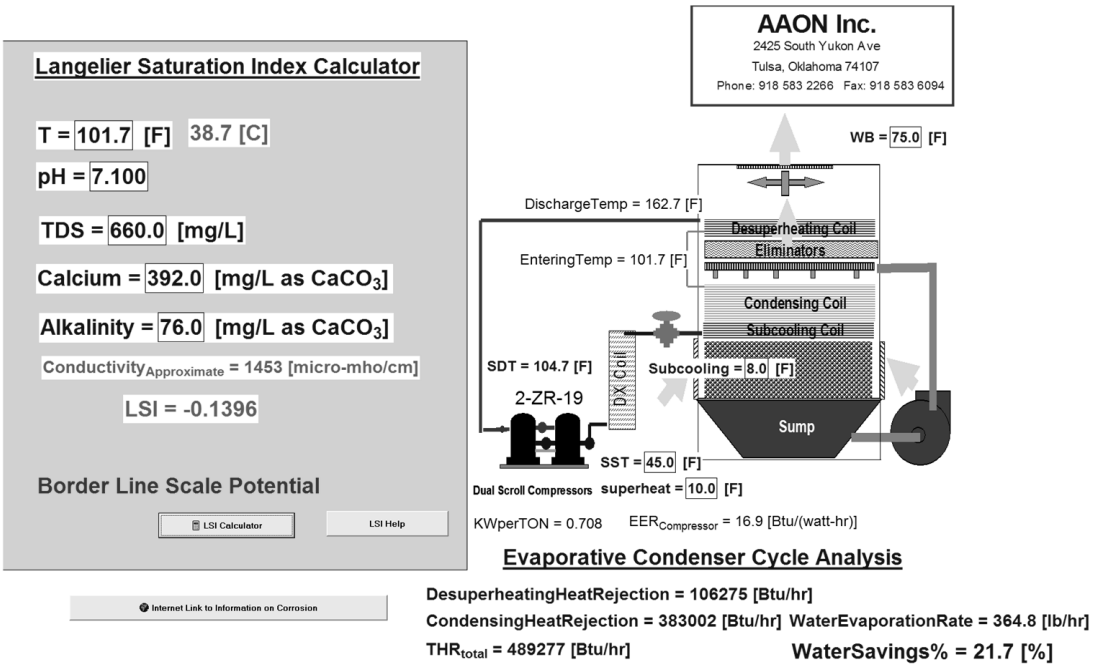

Figure 15 - Example Evaporative-Condenser with De-superheater

Let's assume that the desuperheater is not in the system, and then 163.4°F refrigerant would enter the coil in the wetted section of the condenser. The LSI can be computed, resulting in definite scale potential:

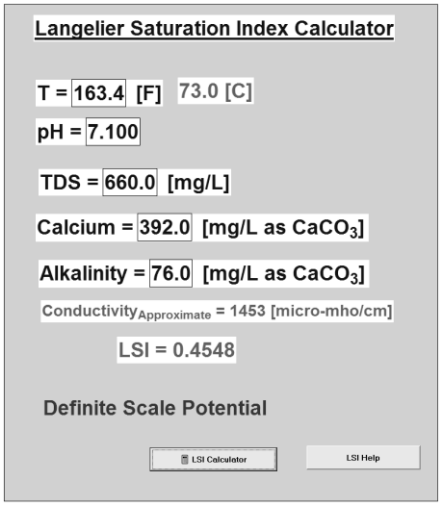

Figure 16 - Example Evaporative-Condenser without De-superheater

Literature Change History

April 2015
Initial version.

November 2016
Revision of the amp rating of the factory installed convenience outlet in Feature 13.

November 2018
Added minor revision "A" for Air-Cooled LZ Chillers that are now AHRI certified. Updated E-coating description to include more detailed information about warranty coverage. Changed terminology from Evaporative-Cooled Condenser to Evaporative-Condensed Chiller. Added Low Sound ECM condenser fan option in Feature 17. Updated the selection examples. Updated connection sizes in the General Tables.

December 2018
Added Evaporator Pressure Drop charts for the shell and tube heat exchanger and brazed plates.

June 2019
Updated the e-coating definition for 10,000 hours of salt spray. Revised the AAON recommended entering water temperature of 65ºF or less for continuous operating conditions.

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