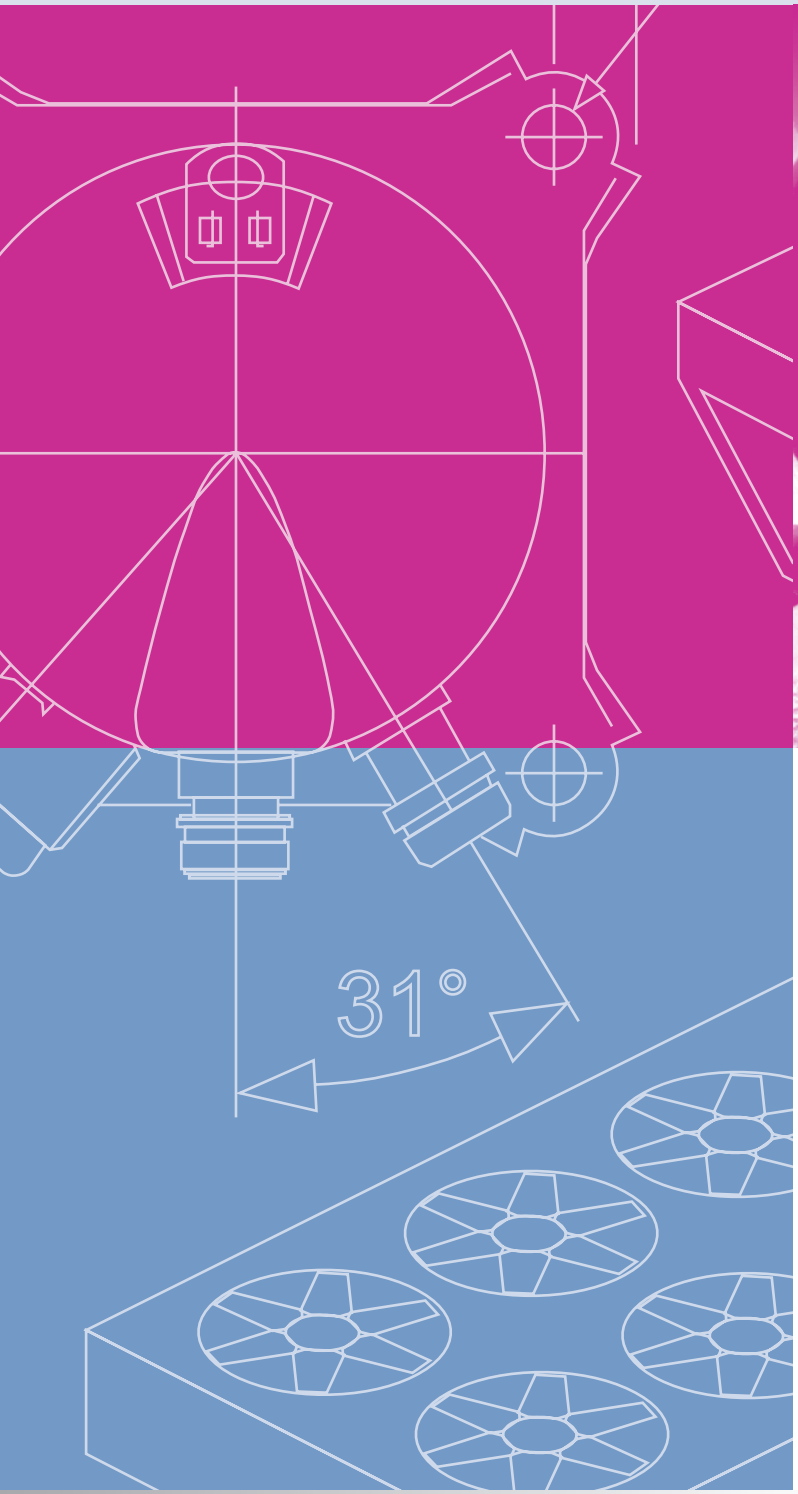
Copeland® EazyCool™

Outdoor Condensing Units

ZX Range



EMERSON™
Climate Technologies

1 Safety instructions

Copeland EazyCool™ ZX Outdoor Refrigeration Condensing Units are manufactured according to the latest European and US Safety Standards. Particular emphasis has been placed on the user's safety.

These condensing units are intended for installation in machines and systems according to the EC Machines directive. They may be put to service only if they have been installed in these systems according to instructions and conform to the corresponding provisions of legislation. For relevant standards please refer to Manufacturers Declaration, available on request.

These instructions should be retained throughout the lifetime of the compressor as well as the condensing unit.

You are strongly advised to follow these safety instructions.

1.1 Icon explanation

	**WARNING** This icon indicates instructions to avoid personal injury and material damage.		**CAUTION** This icon indicates instructions to avoid property damage and possible personal injury.
	**High Voltage** This icon indicates operations with a danger of electric shock.		**IMPORTANT** This icon indicates instructions to avoid malfunction of the compressor.
	**Danger of burning or frostbite** This icon indicates operations with a danger of burning or frostbite.	***NOTE***	This word indicates a recommendation for easier operation.
	**Explosion Hazard** This icon indicates operations with a danger of explosion.		

1.2 Safety statements

- **Refrigerant compressors must be employed only for their intended use.**
- **Only qualified and authorized HVAC or refrigeration personnel are permitted to install, commission and maintain this equipment.**
- **Electrical connections must be made by qualified electrical personnel.**
- **All valid standards for connecting electrical and refrigeration equipment must be observed.**

Use personal safety equipment. Safety goggles, gloves, protective clothing, safety boots and hard hats should be worn where necessary.

1.3 General instructions

WARNING
System breakdown! Personal injuries! Never install a system in the field and leave it unattended when it has no charge, a holding charge, or with the service valves closed without electrically locking out the system.
System breakdown! Personal injuries! Only approved refrigerants and refrigeration oils must be used.

High shell temperature! Burning! Do not touch the compressor until it has cooled down. Ensure that other materials in the area of the compressor do not get in touch with it. Lock and mark accessible sections.

CAUTION
Overheating! Bearing damage! Do not operate compressors without refrigerant charge or without being connected to the system.

IMPORTANT
Transit damage! Compressor malfunction! Use original packaging. Avoid collisions and tilting.

The contractor, responsible for the installation of the unit, should ensure sufficient liquid sub-cooling in the line to the expansion valve(s) to avoid “flash-gas” in the liquid line.

It is of vital importance that the discharge stop valve has been fully opened before the compressor is started. If the discharge stop valve is closed or partly closed an unacceptable pressure with accordingly high temperatures may develop on the discharge outlet in the compressor. When operating with air the so-called diesel effect may occur, ie, the air sucked in is mixed with oil gas and can explode due to the high temperature, and thereby destroy the compressor.

2 Product description

2.1 Common information about Copeland EazyCool™ ZX condensing units

Emerson Climate Technologies has developed the Copeland EazyCool™ ZX Outdoor Condensing Unit of second generation to meet primarily the demands of the food retail services and logistics sectors. It is a refrigeration air-cooled condensing unit that uses the latest Copeland® Brand Products patented Scroll technology as the main driver and has electronic protection and diagnostics features built in the compact chassis. With a large coil, low speed fan design coupled with built-in fan speed control, the new Copeland EazyCool™ ZX product offers a refrigeration condensing unit especially designed for night operation.

2.2 About this guideline

This guideline is intended to enable users to ensure the safe installation, starting, operation and maintenance of Copeland EazyCool™ ZX condensing units.

This guideline is not intended to replace the system expertise available from system manufacturers.

For additional information, please refer to the Product Catalogue or to the Copeland® Brand Products Selection Software accessible from the Emerson Climate Technologies website at www.emersonclimate.eu.

2.3 Product range

The application range is between –30°C and 7°C evaporating temperature. This condensing unit is released for R404A only. The single-fan units are ZXME020E, ZXME030E and ZXME040E (2, 3 and 4 hp nominal ARI MT) and the dual-fan units are ZXME050E, ZXME060E and ZXME075E (5, 6 and 7.5 hp nominal ARI MT). These condensing units are built for robust outdoor applications and have excellent air-conditioning wall-mountable type aesthetics.

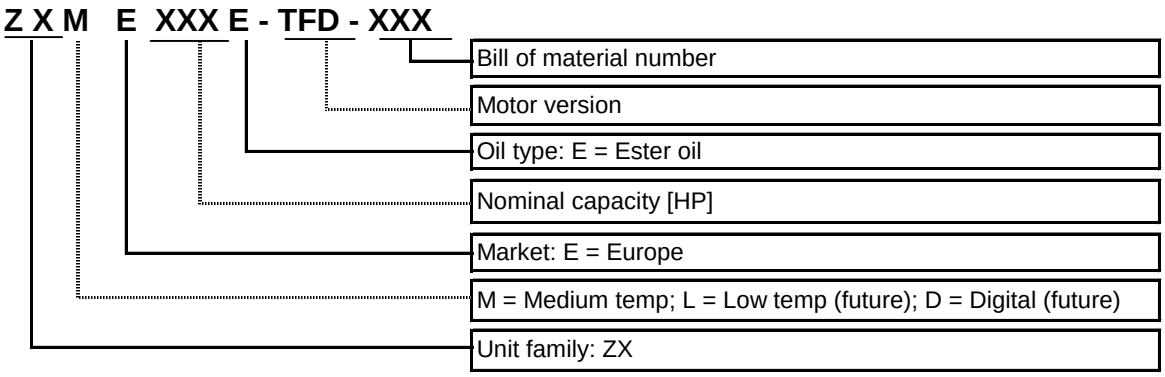
2.4 Product nameplate

The condensing unit nameplate shows model designation and serial number, as well as locked rotor amps, maximum operating current, safety pressures, refrigerant and weight.

The compressor has its own nameplate with all electrical characteristics.

2.5 Nomenclature

The model designation contains the following technical information about the compressor:



Standard motor version available:
TFD: 380-420V / 3 Ph / 50 Hz

2.6 Application range

2.6.1 Qualified refrigerants and oils

	ZXME020E	ZXME030E	ZXME040E	ZXME050E	ZXME060E	ZXME075E
Qualified refrigerant	R404A/R507					
Qualified servicing oil	Emkarate RL 32 3MAF					
	Mobil EAL Artic 22 CC					
Oil charge (litre)	1	1.1	1.85	1.85	1.85	1.85

Table 1: Qualified refrigerants and oils

2.6.2 Application limits

For application envelopes, please refer to the compressor application envelopes available in Copeland® Brand Products Selection Software.

Evaporating temperature is from –30°C up to 7°C, and ambient temperature range depending on model used. See Copeland® Brand Products Selection Software or literature for further information.

2.7 Main component description

2.7.1 Compressor

Unit model	Compressor model
ZXME020E	ZX15KCE-TFD
ZXME030E	ZX21KCE-TFD
ZXME040E	ZX30KCE-TFD
ZXME050E	ZX38KCE-TFD
ZXME060E	ZX45KCE-TFD
ZXME075E	ZX51KCE-TFD

Table 2: Compressor type used in ZX condensing unit

2.7.2 Condenser fan(s)

The condensers of the ZX condensing units are equipped with single-phase fans.

Condensing units	N° of fans	Fan speed **(r/min)**	Fan Motor **(W)**	Diameter **mm**	Voltage **V/ph/Hz**	Power input **(W)**
ZXME020E	1	830	60	450	220-240 1~50	116
ZXME030E						
ZXME040E						
ZXME050E	2					246
ZXME060E						
ZXME075E						

Table 3: Condenser fans technical data

2.8 Electronic board control and operating features

The function of the electronic board is to react to the On/Off signals received from devices such as thermostat to operate and protect the ZX unit. The electronic board control panel is fitted as standard and has been developed along with the compressor to provide the following control and protection systems:

2.8.1 Electronic board features

Automatic liquid injection: The electronic board automatically injects cool liquid refrigerant into the suction line of the Scroll compressor to reduce discharge temperatures generated when the unit operates at increasing compression ratios. The electronic board controller reacts automatically to a thermistor embedded in a pocket inserted into the top of the compressor. The controller converts this signal for the linear stepper motor driving the liquid injection valve to a position that enables the compressor to continue operating within its safe envelope. This advanced control strategy extends the operating range and is not normally associated with a standard refrigeration condensing unit of this size making this feature a clear point of differentiation from the competition.

Compressor phase reversal: Ensures that the compressor remains running in one direction only – necessary for a compliant Scroll compressor to compress and pump refrigerant. Reset is automatic once the phase rotation is correct for the compressor.

Motor current overload protection is provided (also via the electronic board) eliminating the need for external current protection for the compressor motor.

Fixed low- and high-pressure switches: These are non-adjustable protection devices to prevent the compressor operating outside of its safe evaporating and condensing pressure ranges. Reset is automatic for a set number of trips, and then the unit will lock out and require manual restart. The latter feature is important to prevent the ZX unit cycling under these controls for a long period of time.

A **crankcase heater** is wired through a normally closed contact of the compressor contactor in the usual manner, becoming energized whenever the compressor cycles off.

In addition to the above, the ZX has the following features:

- **Liquid line assembly** (filter drier and sight glass/moisture indicator) - fitted
- **Anti corrosion treatment to the condenser fins** - supplied as standard
- **Adjustable LP switch** for low-pressure pump down control - fitted

The electronic board is also the **base controller** for the connection of many **optional** and **customer supplied** functions such as:

- **Main load controller** (or thermostat)
- **Evaporator electric defrost heater contactor**
- **Evaporator fan contactor**
- **Diagnostic module**: This option provides the ZX with a self-diagnostic function, signalling individual component failure in three ways:
  - (a) **Visible LED combination**
  - (b) **Remote audible buzzer**
  - (c) A **dialer connection** for the purpose of sending a common fault signal through a telephone service to a remote location.

2.8.2 Electronic board description

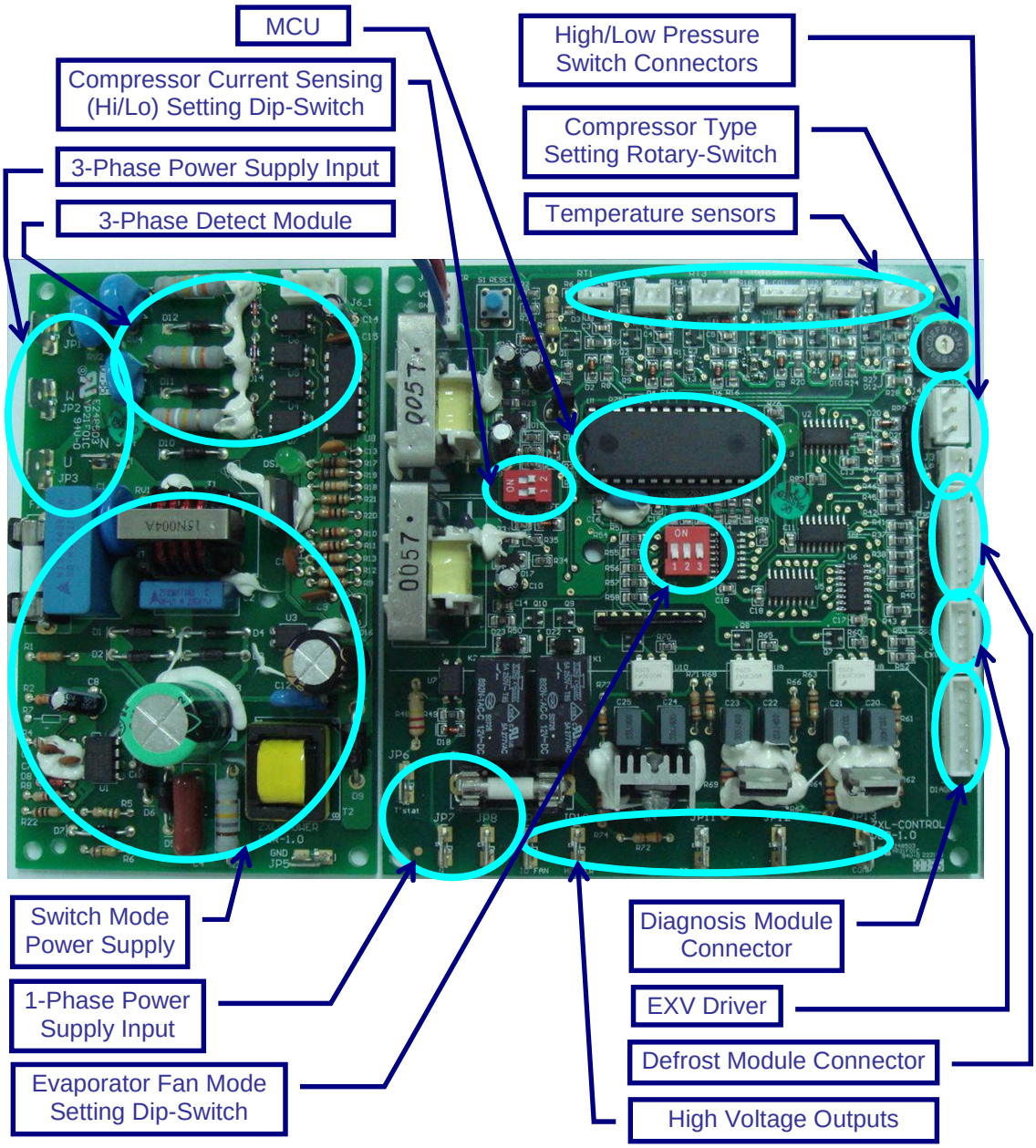


Figure 1: Electronic board

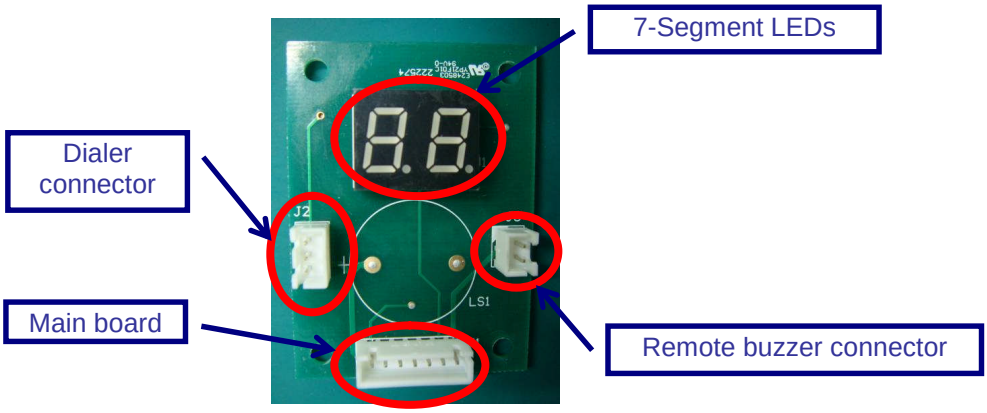


Figure 2: Diagnostic module

2.8.3 Diagnostic signal

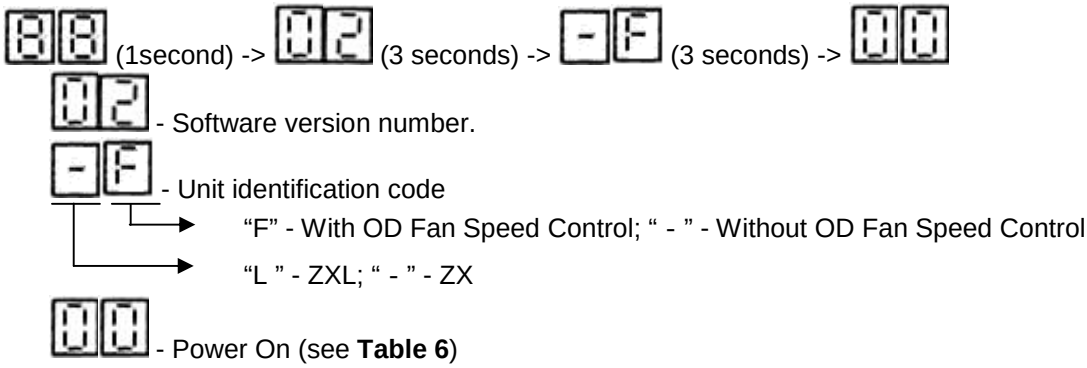
Display	LED 1 - Unit Status	LED 2 - Error/Warning Code
0	Idle (stops when reaches set-point)	No error/warnings
1	Run	Compressor Phase Error (wrong phase sequence/loss of phase)
2	About to start(*)	Compressor Inside Thermal Protector Trip
3	Defrost	Compressor Over Current
4	Stop due to error	Discharge Gas Overheat
5	Lockout	Compressor High Pressure Cut-out
6		Compressor Low Pressure Cut-out
7		DLT Thermistors Failure
8		Ambient Temperature Sensor Failure
9		Mid-coil Temperature Sensor Failure
F		System Liquid Floodback Warning

Table 4: Definition of diagnostic signal

(*) This signal is for Fresh Start, Normal Start Program and any start request delay.

NOTE: **All error/warning messages are priority-ranked from highest to lowest.**

If unit is initially powered on, the diagnosis module will show signals as follows:



Unit Type	OD Fan Speed Control	Software Version No.	Unit Identification Code
ZX	Yes	02	– F
ZX	No	03	– –

Table 5: Initialization signals

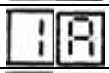
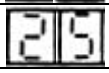
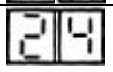
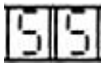
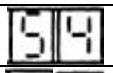
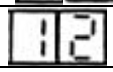
Events		LEDs	Events		LEDs
Unit Off / Phase “U” or “N” missing		Off	DLT Thermistors Failure	When compressor On	
Power On	W/O error			When compressor On	
Compressor On	W/O error		PHE Vapour Inlet Temp. Sensor Failure (only ZXL)	When compressor On	
Compressor about to turn On O,1	W/O error		PHE Vapour Outlet Temp. Sensor Failure (only ZXL)	When compressor On	
Defrost	W/O error		Compressor High Pressure Cut-out	Try to restart	
Discharge Gas Overheat Error	Try to restart			System lock	
	System lock		Compressor Low Pressure Cut-out	Try to restart	
Outdoor Ambient Temp. Sensor Failure	When compressor On		Compressor Over Current	Try to restart	
	When compressor Off			System lock	
Condenser Mid-coil Temp. Sensor Failure	When compressor On		Compressor Wrong Phase Sequence / Loss of Phase	System lock	
	When compressor Off		Warning – System Liquid Floodback	When compressor On	
Warning – Compressor intends to start but current transformers sense no current					

Table 6: Common signals

2.9 Compressor / Unit setting

Each ZX unit model has a unique compressor model and this has to be programmed in the set-up of the electronic board controller. For this purpose a compressor rotary switch is located near the top right-hand corner of the electronic board (shown on **Fig. 1** above). This is factory set and should not be re-set after leaving the factory. Any tampering with this compressor rotary switch may result in any warranty claim becoming null and void.

For maintenance purpose, the electronic board (replacement) needs to be configured according to the compressor use (please see underneath settings to be done on the electronic board).

Compressor Model**	Rotary Switch	2-bit Dip-switch	3-bit Dip-switch
	0	On/On	Off/Off/Off
ZX15KCE-TFD	1	On/On	Evaporator fan On/Off logic same as compressor
ZX21KCE-TFD	2	On/On	
ZX30KCE-TFD	3	On/On	
ZX38KCE-TFD	4	On/On	
ZX45KCE-TFD	5	On/On	
ZX51KCE-TFD	6	On/On	

Table 7: Setting of switches

NOTE: **Please set switches to the right position according to compressor model.**

2.10 Compressor motor protection

The electronic board protects the compressor motor against the following:

- Over current
- Loss of any one phase
- Incorrect phase rotation

If the compressor motor current exceeds a pre-defined current limit (non-adjustable), then the electronic board shuts down the unit and generates an error signal to the LED's on the board. For this function to operate, two of the main phase supply lines to the compressor (compressor via the contactor) are routed through the current abnormality coils.

2.11 Compressor pressure protection

2.11.1 High pressure

A sensor is registered by the electronic board. The sensing device is a non-adjustable, high-pressure switch that will open in the event of an abnormally high discharge pressure (above 28 bar).

- The unit will stop and then restart automatically after a 3-minute delay and after unit pressure has decreased to 24 bar.
- After 5 successive HP cut-outs over 1 hour, the unit will lock-out.

2.11.2 Low pressure

In a similar way to the high-pressure sensor, the electronic board registers the switching action of a non-adjustable, low-pressure switch that will open in the event of an abnormally low suction pressure (below 1 bar).

- The unit will stop then restart automatically after a 3-minute delay and when unit pressure attains 2 bar.

2.12 Other inputs to the board

2.12.1 Customer-supplied control (thermostat)

The electronic board accepts a normal 220 volt AC input On/Off signal (such as the switching action of a normal commercial thermostat) and relays a similar action as an output to the compressor contactor in the case of a thermostat-controlled system (refer to the wiring diagram in section 3.2.2). If the system is controlled by low-pressure cut-out for a multiple evaporator system and/or pump down system, the electronic board accepts signals directly from an adjustable low-pressure switch (optional).

2.12.2 Case temperature controller

An alternative method of system temperature control can be used. The electronic board accepts an input from a common commercial thermostat.

Failure/Incident Type	Setting	Electronic Board Reaction	Reset Procedure
High-pressure cut-out	Contact open 30 bar ± 1.5 bar Contact close 24 bar ± 1.5 bar	Execute STOP program and show out the signal of HP cut-out, after 3 minutes run normal START program to restart the CDU. On the 6th request for reset, HP error is set and system will be locked out. **(HP cut-out)**	5 auto resets are allowed within 1 hour
Low-pressure cut-out	Contact open 1 bar ± 0.5 bar Contact close 2 bar ± 0.5 bar	Execute STOP program and show out the signal of LP cut-out, after 3 minutes run normal START program to restart the CDU.	
Discharge gas overheat	DLT over 132°C	Execute STOP program and show out the error message, after 3 minutes run normal START program to restart the CDU. On the 6th request for reset, DLT Error is set and system will be locked out. **(DLT over limit)**	5 auto resets are allowed within 1 hour
Discharge line sensor failure		If both the discharge line and coil-in sensors are under-range (80°C and 10°C) after 3 minutes of the compressor starting, show out the error message. When both the discharge line and coil-in sensors fail, the error message will be shown. **(DLT thermistor**	
Incorrect phase sequence/Loss of phase	Inapplicable for 1~ph compressor	If 3-phase supply is incorrectly connected to the contactor terminals, the system will be locked out and show out the error message. **(Compressor incorrect phase sequence)**	Unit will not start unless it is re-wired correctly
Over current	Different settings for different compressors	Execute STOP program and show out the error message, after 3 minutes run normal START program to restart the CDU. On the 6th request for reset, over current error is set and system will be locked out. **(Compressor over current)**	5 auto resets are allowed within 1 hour
Power cut	In case there is a power outage	Upon the return of power supply, E2 will start the unit on a fresh start mode. **(Fresh start)**	
Compressor rapid cycling	Minimum 3 minutes OFF time	Any start request will be postponed until 3 minutes if the compressor has stopped within last 3 minutes. If start request is postponed, the status of compressor will be shown through diagnosis module. **(Compressor about to start)**	
Fresh start program	If ambient temperature is less than 38°C when the compressor is about to start	Compressor will start for 3 seconds and stop for 20 seconds. This happens for 3 cycles then the compressor runs continuously. The status of fresh start is shown through diagnosis module.	
Electrical failure (Protector trip)	Compressor intends to start but current transformers sense no current	Error message will be shown through diagnosis module	

Table 8: Electronic board 2C control reference guide

2.12.3 Condenser coil & ambient air thermistors

These two thermistor type sensors are supplied by Emerson Climate Technologies and connected to the electronic board for condenser fan speed control. This is usually applicable where low ambient and (sometimes) low condensing temperatures are likely to adversely affect refrigeration performance and control.

2.13 Other outputs from the electronic board

2.13.1 Liquid line solenoid valve (not supplied)

An On/Off output connection is provided and wired to the main terminal strip for convenience to assist the customer for wiring of the liquid line solenoid valve coil into the unit. When the customer uses LP switch for pull down system, the solenoid valve should be driven by customer thermostat.

***NOTE:* The solenoid valve has to be fitted externally by the customer. The solenoid coil voltage rating is to be 220VAC and the board can accommodate current ratings of 30VA (hold) or 300VA (inrush). If the rating of solenoid coil is larger than the limit, please use a proper contactor to control the valve instead of connecting the solenoid coil to board directly.**

2.13.2 Defrost heater contactor coil (not supplied)

An On/Off output connection is provided on the electronic board for direct connection of a customer-supplied contactor (coil) for convenience when the defrost option is included. Terminals are male spade type. Coil voltage rating should be 220VAC and current ratings 30VA (hold) and 330VA (inrush).

2.13.3 Evaporator fan contactor coil (not supplied)

An On/Off output connection is provided on the electronic board for direct connection of a customer supplied contactor (coil) for convenience when the evaporator fan is included. Terminals are male spade type. Coil voltage rating should be 220VAC and current ratings 30VA (hold) and 330VA (inrush).

2.14 Dimensions in mm

The figures hereunder show the overall dimensions of the ZX condensing units:

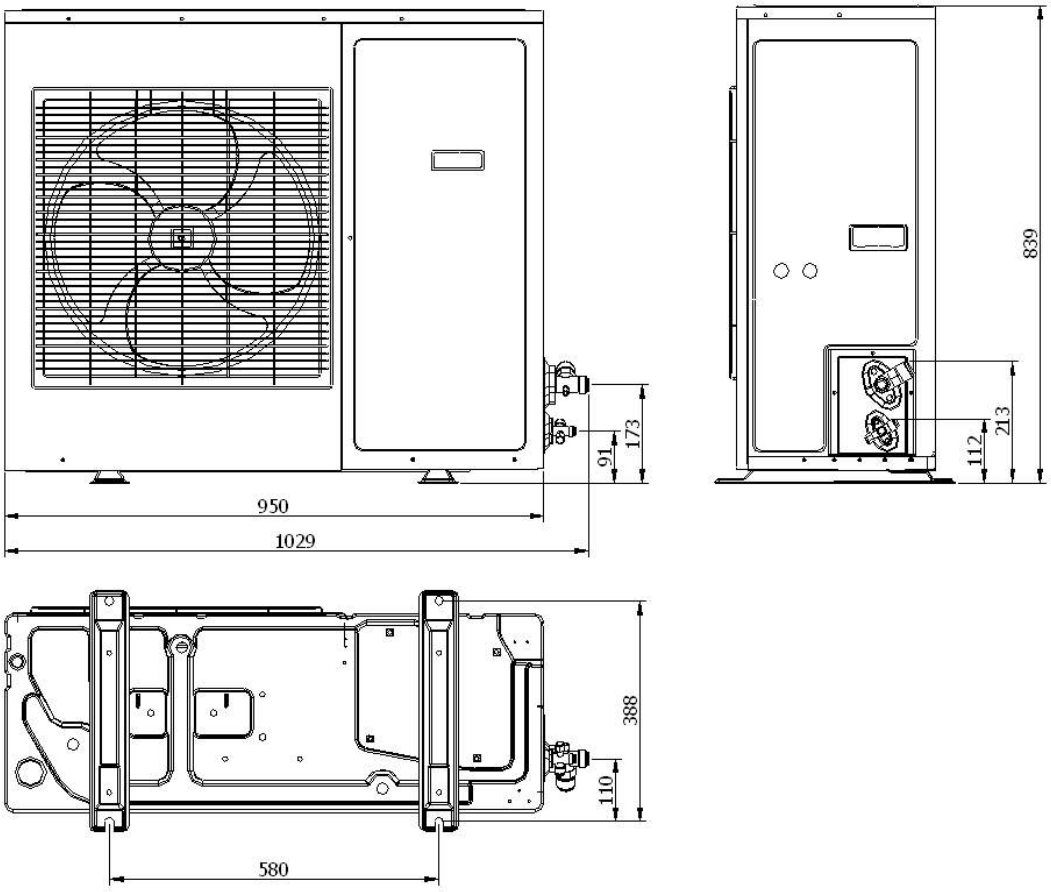


Figure 3: Physical dimensions of ZXME020E, ZXME030E and ZXME040E (Single-fan units)

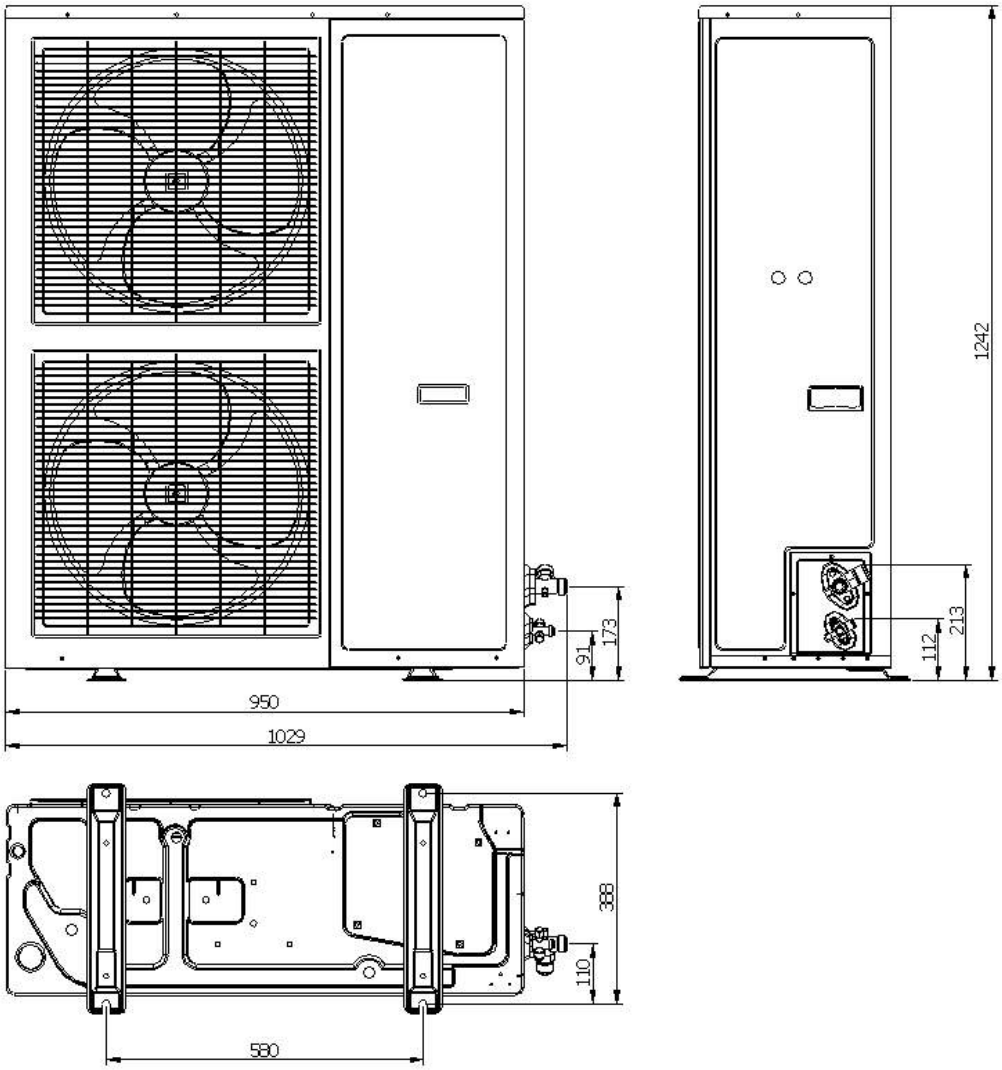


Figure 4: Physical dimensions of ZXME050E, ZXME060E and ZXME075E (Dual-fan units)

3 Installation

WARNING
High pressure! Injury to skin and eyes possible! Be careful when opening connections on a pressurized item

Copeland EazyCool™ ZX condensing units are delivered with a holding charge of neutral gas.

The condensing unit should be located in such a place to prevent any dirt, plastic bag, leaves or papers from covering the condenser and its fins.

The unit must be installed without restricting the airflow.

A clogged condenser will increase the condensing temperature, thus reduce the cooling capacity, and lead to a high-pressure switch tripping. Clean the condenser fins on a regular basis.

3.1 Condensing unit handling

3.1.1 Transport and storage

WARNING
Risk of collapse! Personal injuries! Move compressors only with appropriate mechanical or handling equipment according to weight. Keep in the upright position. Do not stack single boxes on top of each other. Keep the packaging dry at all times.

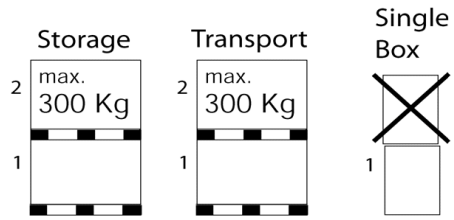


Figure 5

3.1.2 Weights

Condensing unit	Weight (kg)
ZXME020E	98
ZXME030E	100
ZXME040E	107
ZXME050E	118
ZXME060E	121
ZXME075E	153

Table 9: Weights

3.2 Electrical connection

3.2.1 Power supply connections

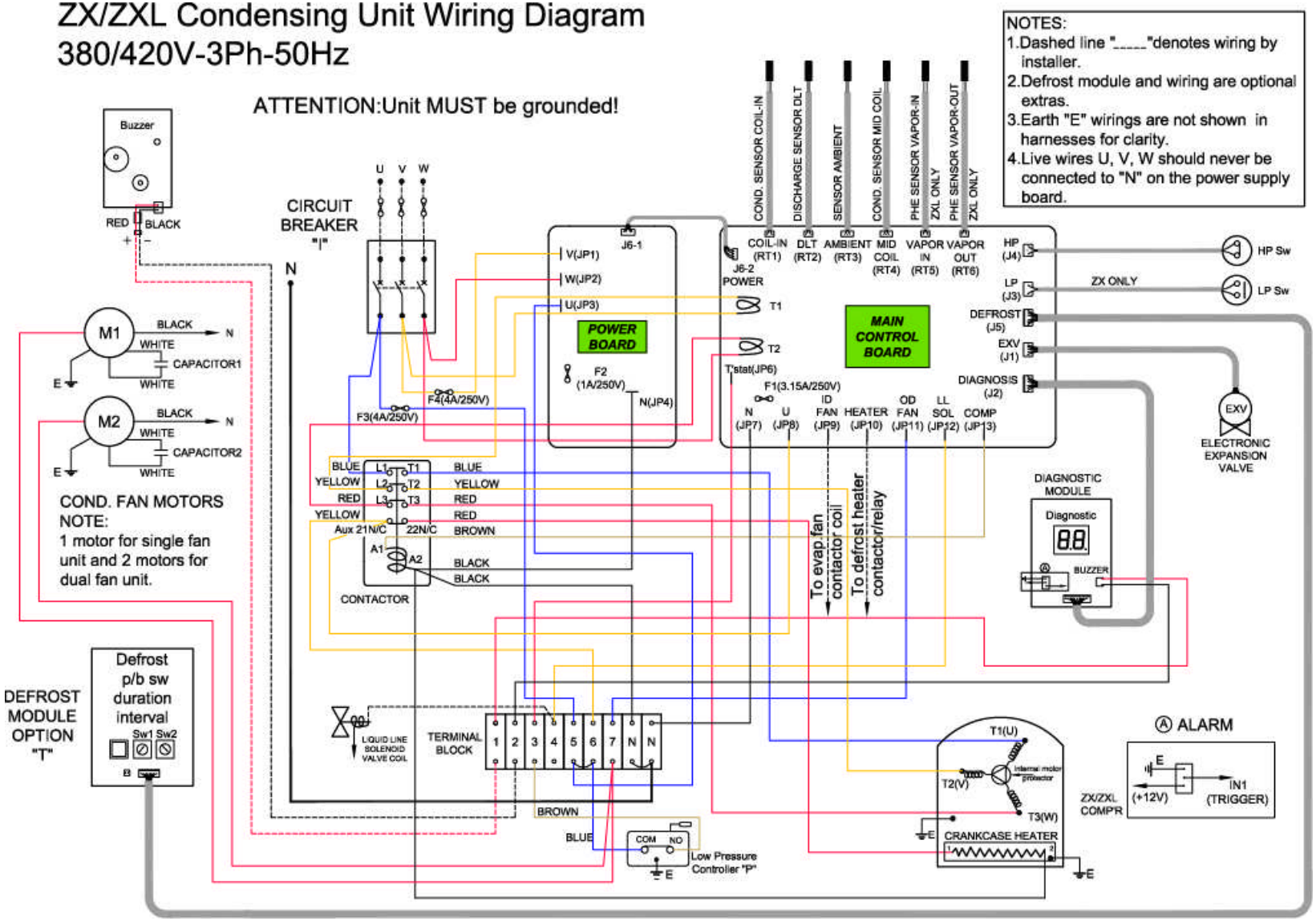
The electrical connection of the ZX condensing unit to the power supply must be made by qualified technicians, who should refer to the electrical diagrams located inside the electric connection panel.

3.2.2 Wiring diagram

Before commissioning, ensure that the neutral "N" wire is connected on the terminal block (extreme right "N"). After proper connection the control LED on power board and control board will lighten.

See diagram next page.

ZX/ZXL Condensing Unit Wiring Diagram
380/420V-3Ph-50Hz



3.2.3 Electrical protection standard (protection class)

- Scroll compressors up to ZX51 are IP21 according to IEC 34.
- Fan IP44 according to IEC 34.
- Solenoid valve coils: IP65 according to DIN 43650.

3.3 Refrigeration connections

3.3.1 Refrigeration piping installation

IMPORTANT
All interconnecting piping should be of refrigeration grade, clean, dehydrated and remain capped at both ends until installation. Even during installation, if the system is left for any reasonable period of time (say 2 hours), pipes should be re-capped to prevent moisture and contaminant from entering the system.

It is advisable to insulate both the suction and liquid interconnecting piping between the ZX unit and the evaporator. Usually the suction line is insulated, but the liquid line is not. However the liquid line can pick up additional heat from the ambient and adversely affect the sub-cooling desirable for the liquid refrigerant before it enters the expansion valve.

The pipe should be sized to ensure optimum performance and good oil return; the sizing must also take into account the full capacity range through which this particular unit will need to operate.

Pipe runs should be kept as short as possible, using the minimum number of directional changes. Use large radius bends and avoid trapping of oil and refrigerant. This is particularly important for the suction line. The suction line should ideally slope gently towards the unit. Recommendation slope is 1/200~1/250. P traps, double risers and reduced pipe diameters may be required for suction lines where long vertical risers cannot be avoided.

All pipes should be adequately supported to prevent sagging which can also create oil traps. The recommended support distances are shown in **Table 10** below:

Tube size	Max distance between 2 supports
12.7 mm (1/2 inch)	1.20 m
16.0 mm (5/8 inch	1.50 m
22.0 mm (7/8 inch)	1.85 m
28.5 mm (11/8 inch)	2.20 m

Table 10

IMPORTANT
Do not assume that the service connection sizes on the unit (at the service valves) are in fact the correct size to run your interconnecting refrigeration pipes. The service valve sizes have been selected for convenience of installation and in some cases (larger units) these may be considered too small; however for the very short pipe run within our units these service connection sizes are adequate. All interconnecting piping should be sized to satisfy the duty required.

3.3.2 Brazing recommendations

IMPORTANT
Blockage! Compressor breakdown! Maintain a flow of oxygen-free nitrogen through the system at very low pressure during brazing. Nitrogen displaces the air and prevents the formation of copper oxides in the system. If allowed to form, the copper oxide material can later be swept through the system and block screens such as those protecting capillary tubes, thermal expansion valves, and accumulator oil return holes.
Contamination or moisture! Bearing failure! Do not remove the plugs until the compressor is set into the unit. This minimises any entry of contaminants and moisture.

- Remove the fishtails (= compressed tube ends) by cutting them off in the following sequence:
  1. Remove the discharge connection fishtail
  2. Then remove the suction connection fishtail

  Removing the plugs in this sequence prevents oil mist from coating the suction tube making brazing difficult.
- Be sure tube fitting inner diameter and tube outer diameter are clean prior to assembly.
- Both tubes are extended from the condensing unit housing, therefore we recommend to isolate the housing by using a wet cloth on the copper tubing.
- Recommended brazing materials: a copper/phosphorous or copper/phosphorous/silver alloy rod should be used for joining copper to copper whereas to join dissimilar or ferric metals a silver alloy rod either flux coated or with a separate flux would be used.
- Use a double-tipped torch.

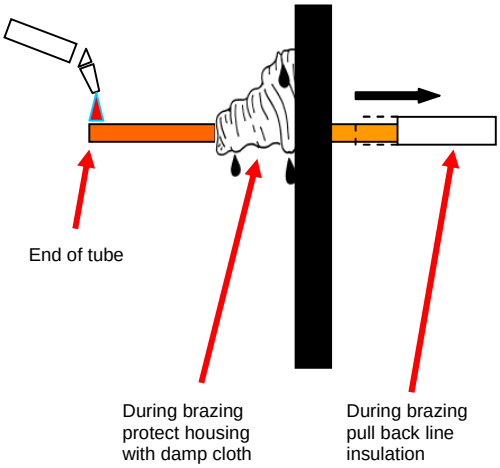
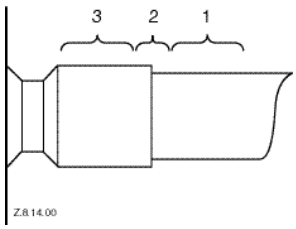


Figure 6: Sectional view

3.3.3 Brazing procedure

For brazing of the tubes, please refer to **Figure 7** and procedure hereunder:



1. Fit the copper tube into the compressor tube.
2. Heat area 1. As the tube approaches brazing temperature:
3. Heat area 2 until braze temperature is attained. It is necessary to heat the tube evenly. Move the torch up and down and rotating around the tube.
4. Add braze material to the joint while moving the torch around the joint to flow braze material around the circumference.
5. Then heat area 3. This will draw the brazing material down into the joint.

Figure 7: Suction tube brazing

***NOTE:* The time spent heating area 3 should be minimal. As with any brazed joint, overheating may be detrimental to the final result.**

To disconnect:

- Heat joint areas 2 and 3 slowly and uniformly until solder softens and tube can be pulled out of the fitting.

To reconnect:

- See the procedure above.

WARNING
Danger of frostbite! Liquid line should be insulated with 19 mm insulation thickness. Temperature could be as low as –15°C.

3.4 Location & fixings

IMPORTANT
The unit should never be installed adjacent to a dust source. External fouling of the condenser fins also leads to high condensing temperatures, and will reduce the life of the unit.

It is recommended that a clearance of 300 mm from the wall (or the next unit) be maintained from the unit left and rear panels whereas a clearance of 500 mm is to be maintained from the unit right, top and front panels (seen facing the front of the unit). Both service access and airflow have been considered in making these recommendations.

Where multiple units are to be installed in the same location, the contractor needs to consider each individual case carefully. There can be many variations of unit quantities and available space and it is not the intention of this manual to go over these here. However, in general terms, air by-pass around each condenser and between the units should be avoided at all times.

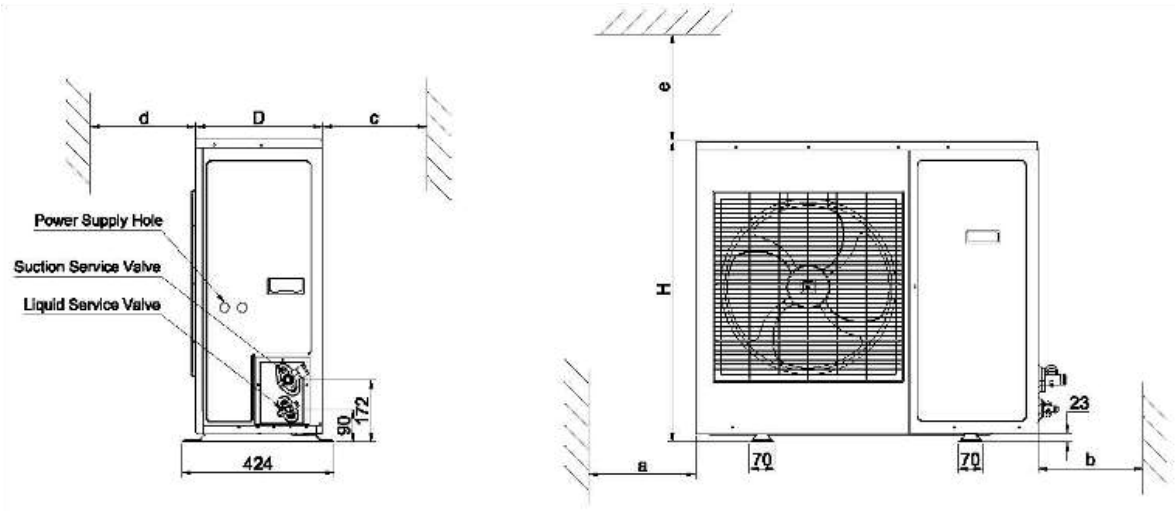


Figure 8: End elevation & elevation views - Single-fan unit

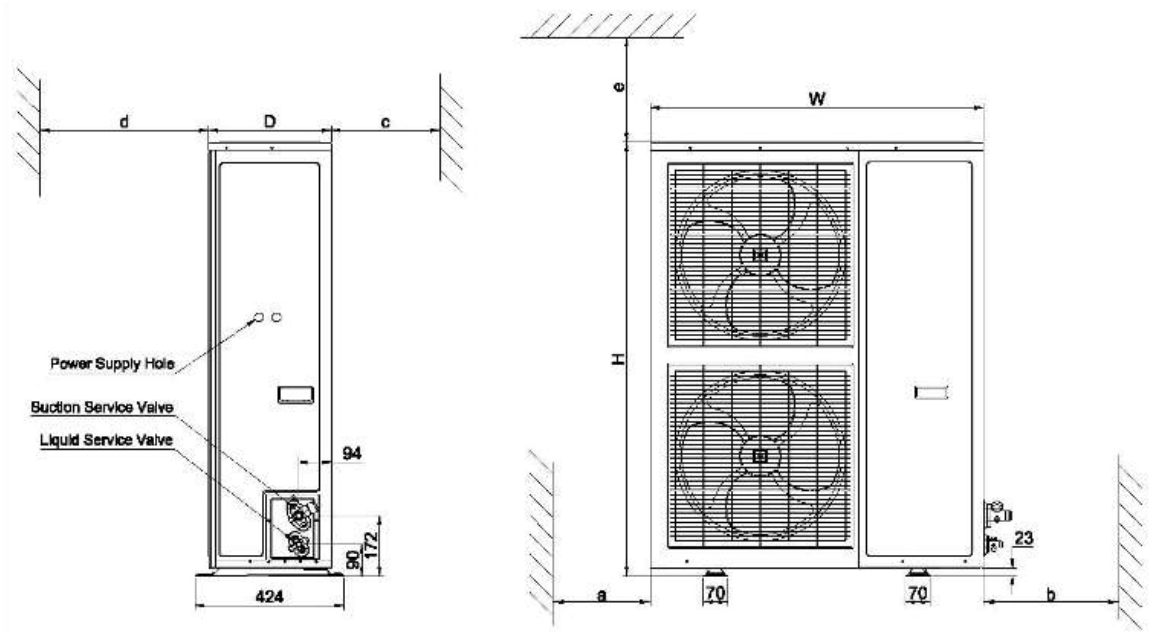


Figure 9: End elevation & elevation views - Dual-fan unit

Ideally, the unit should be mounted level on a solid concrete slab with rubber strips between unit feet and concrete. However the ZX has also been designed for mounting on suitable brackets for wall mounting. In this case it is not only equally important that the spatial guidelines given above

are followed but additional consideration needs to be given for possible air recycling if units are stacked above and below each other. Wall mounting brackets are not included.

Another factor to consider in finding a good installation site is the direction of the prevailing wind. For example if the air leaving the condenser faces the prevailing wind, the air flow through the condenser can be impeded, causing high condensing temperatures and ultimately resulting in reducing the life of the unit. A baffle is a remedy for this situation.

4 Starting up & operation

Before commissioning, ensure that all Rotalock valves and other valves on the condensing unit are fully opened.

4.1 Evacuation

NOTE: **The following procedure is based upon achieving an actual system vacuum standard and is NOT TIME DEPENDENT!**

Step-by-step:

- Check suction capability of the vacuum pump with a gauge before commencing evacuation process. The vacuum pump must be rated to achieve at least 300 microns vacuum levels.
- Connect the vacuum gauge to the system. We have included a convenient point for this on the ZX unit.
- It is recommended to carry out a three-time evacuation process as detailed below:
- Start the vacuum pump and then open the main valve. At this point it is assumed that the liquid line solenoid is energized, the cabinet (evaporator) fans run and the compressor crankcase heaters are energized. This will involve powering up the unit so it is important to disconnect the live feed wire to the compressor contactor (so the compressor cannot run and the crankcase heaters can be energized).

NOTE: **Ensure that the vacuum pump cannot be switched off during the evacuation process, otherwise the pump may lose its lubrication oil to the system and contaminate it. Therefore the pump must have a vacuum breaker fitted to it.**

- 1st time vacuum: Bring system down to 1500 microns and then break vacuum to 2 psig with the same refrigerant.
- 2nd time vacuum: Same as the 1st time vacuum
- 3rd time vacuum: Leave the pump running while checking the vacuum regularly. **The target system vacuum is 500 microns.**
- Once the target vacuum level is reached, the quality of the vacuum within the system must be tested. This is achieved by shutting off the main pump valve, allowing the internal system pressure to rise and recording the time taken for the vacuum to rise by no more than 300 microns within 30 minutes, ie; to 100 microns.
- This process is only complete once the vacuum quality is achieved. Then close the two manifold valves tightly. Close the pump main valve, switch off and remove the vacuum pump.

4.2 Charging procedure

4.2.1 Refrigerant charging procedure

IMPORTANT
The Scroll compressor design requires system charging as quickly as possible with liquid refrigerant into the liquid line. This will avoid running the compressor under conditions whereby insufficient suction gas is available to cool not only the motor but also the rotating scrolls. Temperature builds up very quickly in the scrolls if this is not done!

IMPORTANT
Do not vapour (gas) charge the ZX Scroll unit!
The suction service valve must not be fully closed at any time when the compressor is running. To do so would cause damage to the compressor in the same manner as explained above. This valve is provided for ease of connection and for the fitting of service gauges without removing the unit panel.

Step-by-step:

- Ensure that there is no power supply to the ZX unit. The liquid line solenoid needs to be kept open for the charging process and this may require a temporary power feed to it. At this point it is all right to leave the crankcase heater off.
- Connect the refrigerant cylinder to main service hose and purge line at the manifold end.

- Then invert the refrigerant cylinder if necessary to ensure only liquid refrigerant can be charged into the system. This will be charged through the high-pressure side of the manifold and ZX unit liquid service valve.
- The refrigerant cylinder should be weighed at this point to be able to record the final refrigerant charge. Note that the standard receiver capacity is 4.4 kg of refrigerant for single-fan units (ZXME20E to ZXME40E) and 6.2 kg of refrigerant for twin-fan units (ZXME50E to ZXME75E) at 80% capacity and 32°C ambient temperature (R404A).
- Now open the liquid service valve (off the back seat). With a good vacuum in the system the refrigerant cylinder inverted and at ambient you should not need to run the compressor at all.
- In colder ambient, it may be necessary to run the compressor in order to complete the charging process. It is advisable to do this after the previous step, allowing the system/bottle pressures to equalize and almost fully closing the receiver liquid outlet valve (front seat).
- The compressor can then be started, and the unit continued to be charged (with liquid refrigerant through the liquid service valve). The quantity of charge should always be measured.
- Turn off the unit and open the receiver outlet valve (which was almost fully closed earlier).
- The system needs to be operated down to its design evaporating temperature before you can be sure the charge is correct. It is at this point that the normal refrigeration operational checks can be carried out - such as checking the liquid line sight glass for violent bubbles and the operating pressures.
- In the event that the system is still short of refrigerant, repeat from the last 4 steps onwards.

4.2.2 Oil charging procedure

Copeland EazyCool™ ZX condensing units are supplied only with a compressor oil charge. After commissioning, oil level should be checked and recharged if necessary.

NOTE: **The oil level should be approximately halfway up the sight glass.**

Emerson Climate Technologies recommends charging the oil with one of the following oil types:

- Emkarate RL 32 3MAF
- Mobil EAL Artic 22 CC

Charging is done through the Schraeder valve located on the suction Rotalock valve.

4.3 Rotation direction of Scroll compressors

Scroll compressors, like several other types of compressors, will only compress in one rotational direction. Direction of rotation is not an issue with single-phase compressors since they will always start and run in the proper direction. Three-phase compressors will rotate in either direction depending upon phasing of the power. Since there is a 50-50 chance of connecting power in such a way as to cause rotation in the reverse direction, **it is important to include notices and instructions in appropriate locations on the equipment to ensure proper rotation direction when the system is installed and operated.**

4.4 Maximum compressor cycle

Maximum permitted starts per hour: 10.

4.5 Checks before starting & during operation

- Please check that all Rotalock valves are fully opened.
- Check that the electrical panel is closed.
- After starting and operation conditions are stabilised, we recommend to check the oil level in compressor(s) and if needed to add oil to insure a sufficient oil level (halfway up the sight glass).

5 Maintenance & repair

5.1 Replacing a compressor

CAUTION
Inadequate lubrication! Bearing destruction! Exchange the accumulator after replacing a compressor with a burned out motor. The accumulator oil return orifice or screen may be plugged with debris or may become plugged. This will result in starvation of oil to the new compressor and a second failure.

In the case of a motor burnout, the majority of contaminated oil will be removed with the compressor. The rest of the oil is cleaned through the use of suction and liquid line filter driers. A 100% activated alumna suction line filter drier is recommended but must be removed after 72 hours. **It is highly recommended that the suction accumulator be replaced if the system contains one.** This is because the accumulator oil return orifice or screen may be plugged with debris or may become plugged shortly after a compressor failure. This will result in starvation of oil to the replacement compressor and a second failure. When a single compressor or tandem is exchanged in the field, it is possible that a major portion of the oil may still be in the system. While this may not affect the reliability of the replacement compressor, the extra oil will add to rotor drag and increase power usage.

- De-energize the condensing unit before any intervention.
- Unscrew and lift the housing top panel to get access from the top to the compressor.
- Close Rotalock valves or ball valve to isolate the compressor from the system and unscrew the flare Rotalock connector from the compressor.
- Release the compressor mounting parts then lift it to replace with a new compressor.

For more detailed instructions, please refer to the compressor application guideline.

5.2 Condenser fins

CAUTION
Do not use acidic solutions to clean the coil. After cleaning, the fins should be brushed lightly with a proper fin comb.

Condenser fins become dirty over time as ambient air is induced to the condenser. Dirty coil surfaces result in high condensing temperatures and poor unit performance. Regular cleaning is recommended, the frequency of doing so being dependent on the installation and the surrounding environment. As a general guide it is advisable to do this at least once every two months.

As a general rule and for a clean environment we recommend the fins be cleaned with liquid detergent diluted with clean water. The ZX has a well designed chassis with falling levels towards a large drainage hole and provided the unit is installed level, any cleaning solution should be able to drain away. A light brush downward (in the direction of the fins) should be done before washing to remove heavy deposits.

5.3 Electrical connections

CAUTION
Make sure to turn off the unit isolating switch before undertaking this work!

All condensing units generate vibration of some degree. The ZX is no exception except the vibration levels from the compliant scroll technology is less severe than units employing reciprocating compressors. Because of this, the ZX can be mounted on simple, less expensive rubber strips. Over time however and also due to temperature extremes within the unit housing, electrical terminations can come loosened.

It is suggested that the main electromechanical terminations be checked for tightness at least once every 6 months. The components most likely to be affected by vibrations are the main terminal strip and compressor contactor.

Most of the control wiring (and terminations) are low voltage connections and should not be affected in the same way as the heavier electro-mechanical terminations. Most terminations are of the crimped type and inside plastic plugs. Visual inspection once per half year should be sufficient for these terminations.

5.4 Electronic panel

This is a fixed PCB (Printed Circuit Board) and other than the terminations mentioned in the previous section, the panel itself is not a routine maintenance item.

It does have one fuse as protection and the wiring diagram provides a guide to its location on the board. It is important not to upgrade it from its design 3.5 A rating otherwise the electronic board will not be protected. If the fuse keeps blowing this is usually an indication that some external (to electronic panel) and connected device, eg, solenoid valve coil is causing the problem.

It is strongly advisable not to touch any components on the electronic board unless anti-static finger gloves are used.

NOTE: **The electronic board casing must not be removed and the electronic board must not be tampered with unless absolutely necessary!**

5.5 Routine leak testing

All joints within the system should be leak-tested as part of a regular maintenance schedule.

5.6 Condenser fan(s) & motor(s)

A yearly inspection of these items is recommended. Fastenings can come loose, bearings may wear and fans may require cleaning of solid deposits that can cause rotational imbalance. Motors come with lifelong lubrication bearings that do not require lubricating on a routine basis, but just need to be checked for wear.

6 Certification & approval

- The piping is in compliance with the Pressure Equipment Directive 97/23/EEC (Art.3§3 - Sound Engineering Practice).
- Components of the condensing units carry a CE mark as far as required and thereby establish conformity with the relevant directives.
- Conformity Declarations for components are available as far as required.
- The units are in conformity with the low voltage directive. The applied harmonised standard is EN 60335-2-891 (Safety Household and Similar Electrical Appliance, Part 1: General Requirements)
- To incorporate these products into a machine the Manufacturer's Declaration of Incorporation has to be respected.

7 Dismantling & disposal

Removing oil and refrigerant:
Do not disperse in the environment.
Use the correct equipment and method of removal.
Dispose of oil and refrigerant properly.
Dispose of unit properly.

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