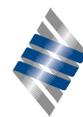
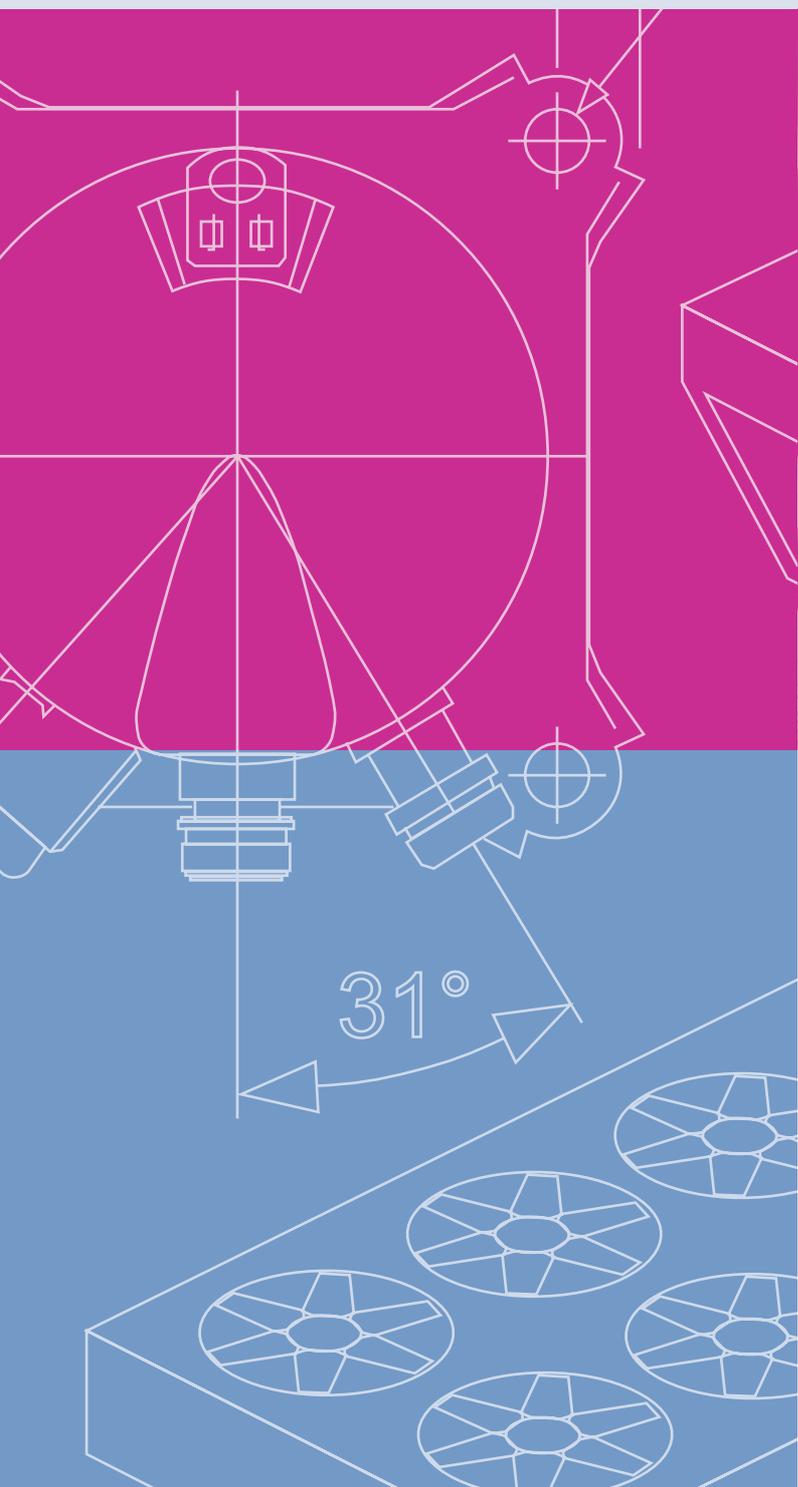


**Copeland®**  
**EasyCool™**

## Outdoor Condensing Units

ZX Range - BOM 302/452



**EMERSON™**  
Climate Technologies

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## 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

 <p><b>WARNING</b> This icon indicates instructions to avoid personal injury and material damage.</p>	 <p><b>CAUTION</b> This icon indicates instructions to avoid property damage and possible personal injury.</p>
 <p><b>High voltage</b> This icon indicates operations with a danger of electric shock.</p>	 <p><b>IMPORTANT</b> This icon indicates instructions to avoid malfunction of the compressor.</p>
 <p><b>Danger of burning or frost burn</b> This icon indicates operations with a danger of burning or frost burn.</p>	<p><b>NOTE</b> This word indicates a recommendation for easier operation.</p>
 <p><b>Explosion hazard</b> This icon indicates operations with a danger of explosion.</p>	

### 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.



### WARNING

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

## 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 condenser, 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 quiet 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 available on [www.emersonclimate.eu](http://www.emersonclimate.eu).

### 2.3 Product range

Copeland EazyCool™ ZX outdoor condensing units are released for R404A / R507 only. They have two cabinet sizes and are equipped with one or two fans. Depending on the compressor in use they are designed for medium temperature or low temperature refrigeration applications.

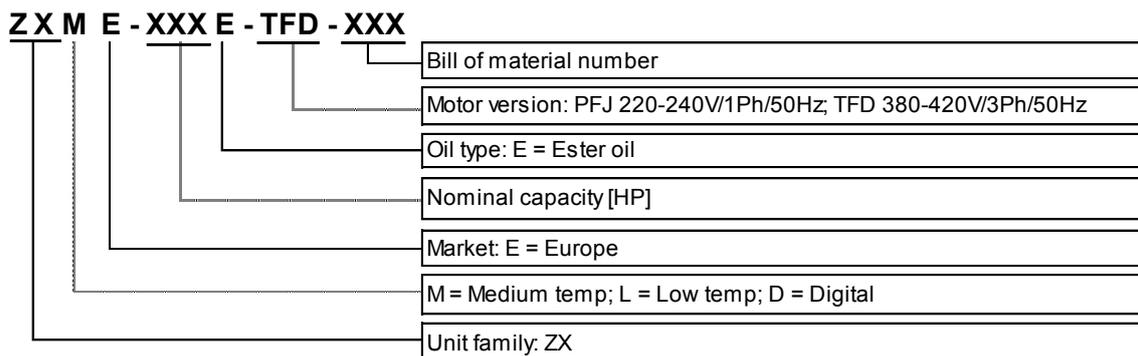
### 2.4 Product nameplate

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 condensing unit:



## 2.6 Application range

### 2.6.1 Qualified refrigerants and oils

Qualified refrigerant	R404A/R507					
Qualified servicing oils	Emkarate RL 32 3MAF					
	Mobil EAL Artic 22 CC					
Oil charge medium temp (litre)	ZXME020E/025E	ZXME030E	ZXME040E	ZXME050E	ZXME060E	ZXME075E
	1	1.1	1.85	1.85	1.85	1.85
Oil charge low temp (litre)	ZXLE020E	ZXLE030E	ZXLE040E	ZXLE050E	ZXLE060E	
	1.1	1.1	1.75	1.75	2.3	
Oil charge Digital (litre)			ZXDE040E	ZXDE050E	ZXDE060E	ZXDE075E
			1.24	1.77	1.77	1.77

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.

ZX Units can be used with a surrounding temperature from -30°C to 48°C.

#### Medium temperature range (ZXME/ZXDE)

Evaporating temperature from -20°C to 7°C. Ambient temperature range dependant on model. Refer to Copeland® Brand Products Selection Software or literature for further information.

#### Low temperature range (ZXLE)

Evaporating temperature from -40°C to 0°C. Ambient temperature range dependant on model. Refer to Copeland® Brand Products Selection Software or literature for further information.

## 2.7 Main component description

### 2.7.1 Compressor

Medium temperature		Low temperature	
Unit model	Compressor model	Unit model	Compressor model
R404A/R507		R404A/R507	
<b>Standard</b>			
ZXME020E	ZX15KCE-TFD/PFJ	ZXLE020E	ZXI06KCE-TFD
ZXME025E	ZX19KCE-TFD/PFJ	ZXLE025E	ZXI08KCE-TFD
ZXME030E	ZX21KCE-TFD/PFJ	ZXLE030E	ZXI09KCE-TFD
ZXME040E	ZX29KCE-TFD/PFJ	ZXLE040E	ZXI14KCE-TFD
ZXME050E	ZX38KCE-TFD	ZXLE050E	ZXI15KCE-TFD
ZXME060E	ZX45KCE-TFD	ZXLE060E	ZXI18KCE-TFD
ZXME075E	ZX51KCE-TFD		
<b>Digital</b>			
ZXDE040E	ZBD29KQE-TFD		
ZXDE050E	ZBD38KQE-TFD		
ZXDE060E	ZBD45KQE-TFD		
ZXDE075E	ZBD48KQE-TFD		

Table 2: Compressor types used in ZX condensing units

### 2.7.2 Condenser fan(s)

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

Condensing units			Nr of fans	Fan speed	Diameter	Voltage	Power input
Medium temperature		Low temperature					
Standard	Digital			pcs	(rpm)	(mm)	V/ph/Hz
ZXME020E		ZXLE020E	1	830	450	220-240 / 1 / 50	116
ZXME025E							
ZXME030E		ZXLE030E					
ZXME040E		ZXLE040E					
	ZXDE040E		2				246
ZXME050E	ZXDE050E	ZXLE050E					
ZXME060E	ZXDE060E	ZXLE060E					
ZXME075E	ZXDE075E						

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 instructs cool liquid refrigerant to be injected 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 which is attached to the discharge line on all ZXME and ZXLE models. 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.

**Compressor phase reversal (ZXME/ZXLE):** 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 (ZXME/ZXLE):** is provided (also via the electronic board) eliminating the need for external current protection for the compressor motor.

**Fixed low-pressure and high-pressure switches (ZXME):** 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 condensing unit 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 module provides the ZX with a self-diagnostic function, signalling individual component failure in three ways:
  - 1) **Visible LED combination** (supplied with ZXME/ZXLE);
  - 2) **Remote audible buzzer** (supplied with ZXLE);
  - 3) **A "ring out" dial connection** for the purpose of sending a common fault signal through a telephone service to a remote location.

## 2.8.2 Electronic board description

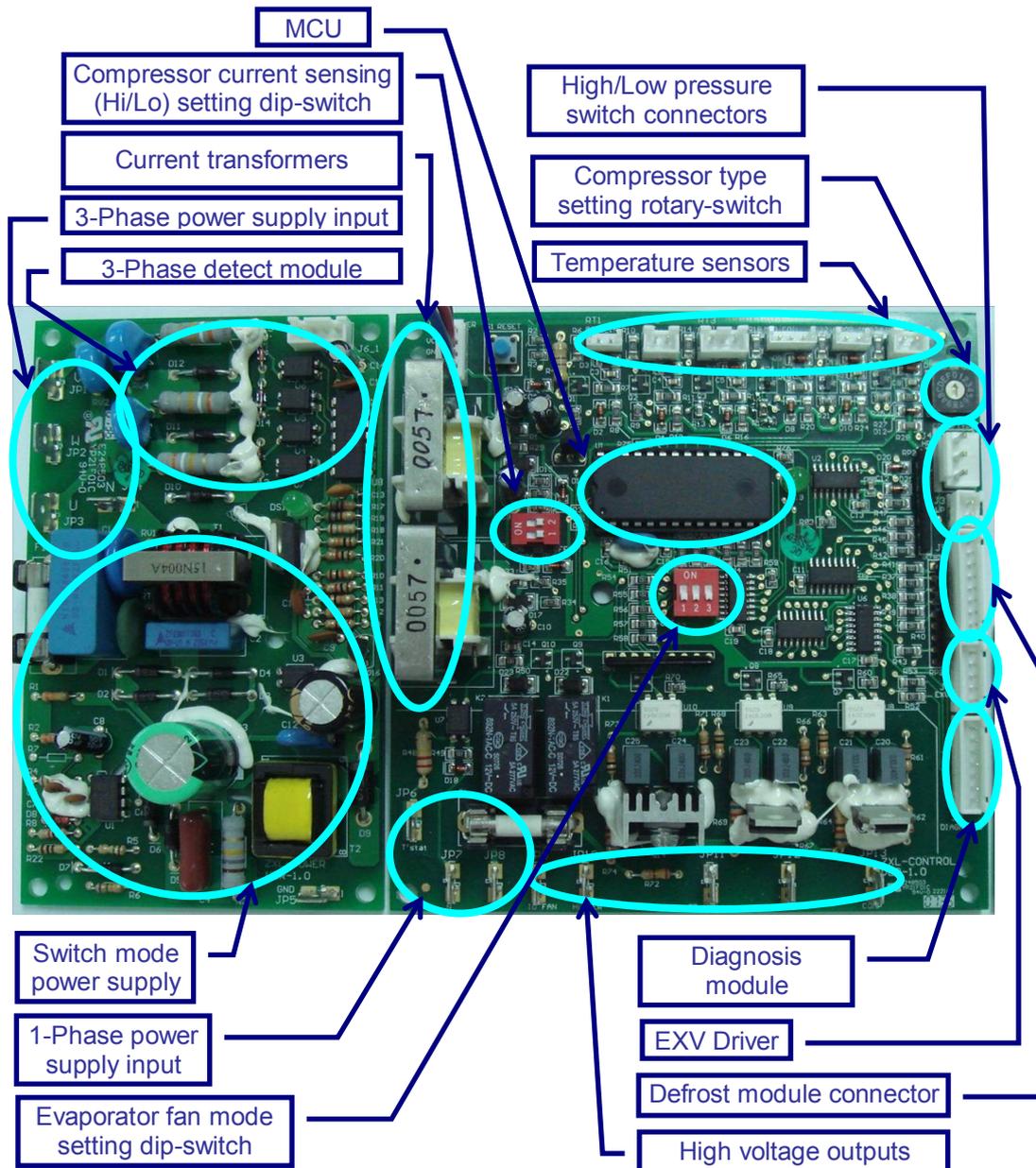


Figure 1: Electronic board

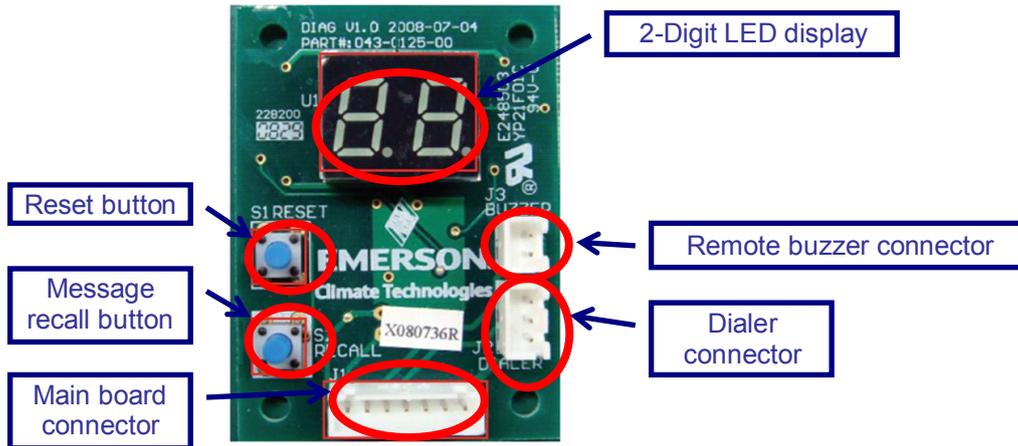


Figure 2: Diagnostic module

### 2.8.3 Diagnostic signals (only on ZXME & ZXLE models)

LED1-Unit Status		LED2-Error/Warning Code	
Display	Status	Display	Error/Warning
0	Idle (Stop When Reach To Set-point)	0	No error/warnings
1	Run	1	Compressor Phase Error (Wrong Phase Sequence/Loss Of Phase)
2	About To Start <sup>1</sup>	2	Compressor Inside Thermal Protector Trip
3	Defrost	3	Compressor Over Current
4	Stop Due To Error	4	Discharge Gas Overheat
5	Lockout	5	Compressor High Pressure Cut Out
		6	Compressor Low Pressure Cut Out <sup>2</sup>
		7	DLT Thermistors Failure
		8	Ambient Temperature Sensor Failure
		9	Mid-coil Temperature Sensor Failure
		39	PHE Vapor In Temperature Sensor Failure or over range <sup>3</sup>
		37	PHE Vapor Out Temperature Sensor Failure or over range <sup>3</sup>
		m	System Liquid Flood Back Warning

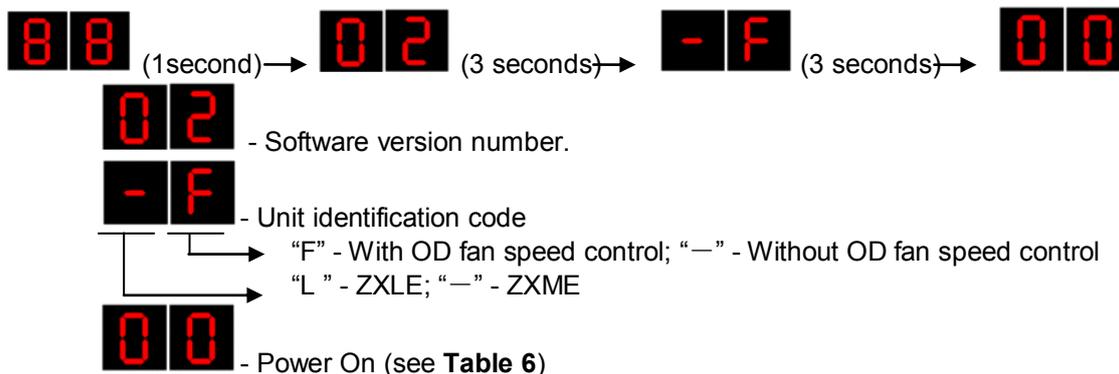
Note:

- <sup>1</sup> This signal is for Fresh Start, Normal Start Program and any start request delay.
- <sup>2</sup> "LP Cutout" signal is not applicable in ZXL condensing unit.
- <sup>3</sup> PHE Vapor In/Out Temperature Sensor is not applicable in ZX medium temperature condensing unit.

Table 4: Description of diagnostic signals

**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
ZXME	Yes	02	- F
ZXLE	Yes	00	L F

**Table 5: Initialization signals**

Events		LEDs	Events		LEDs
Unit Off / Phase “U” or “N” missing		Off	DLT Thermistor Failure	When compressor On	17
Power On	W/O error	00		When compressor Off	07
Compressor On	W/O error	10		Try To Restart (Only in ZXL Unit)	27
Compressor about to turn On O,1	W/O error	20	Compressor High Pressure Cut-out	Try to restart	25
Defrost	W/O error	30		System lock	55
Discharge Gas Overheat Error	Try to restart	24	Compressor Over Current	Try to restart	23
Outdoor Ambient Temp. Sensor Failure	When compressor On	18		System lock	53
	When compressor Off	08	Compressor Wrong Phase Sequence / Loss of Phase	Try to restart	21
Condenser Mid-coil Temp. Sensor Failure	When compressor On	19		When Compressor Off	41
	When compressor Off	09	PHE Vapour Inlet Temp. Sensor Failure (only ZXL)	When compressor On	1A
Compressor Low Pressure Cut-out	Try to restart	26		When compressor Off	0A
Warning – System Liquid Floodback	When compressor On	1E	PHE Vapour Outlet Temp. Sensor Failure (only ZXL)	When compressor On	1C
				When compressor Off	0C
Warning – Compressor intends to start but current transformers sense no current					12

**Table 6: Common signals**

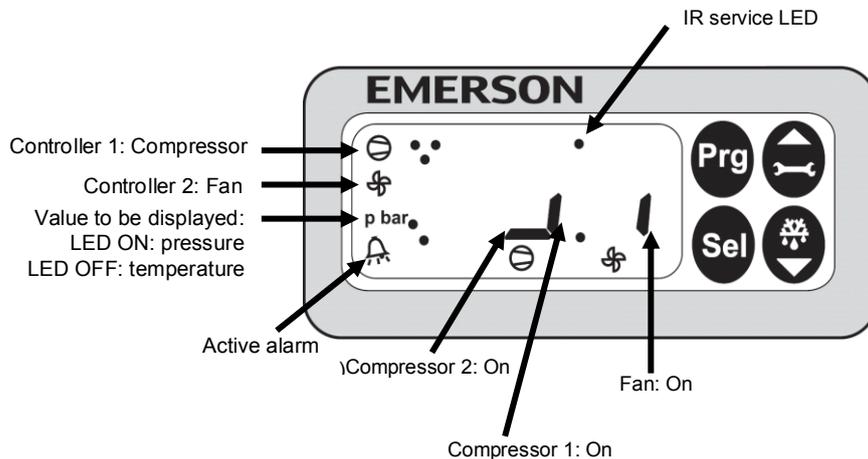
**NOTE: For failure types, possible errors and solutions please refer to Appendix 1 "Electronic board control reference guide".**

## 2.9 Electronic controller EC2-552

The EC2-552 electronic controller has been specially developed for condensing units. All Digital EazyCool™ ZXDE condensing units are equipped with an EC2-552.

The electronic controller enables:

1. Compressor modulation and / or staging based on suction pressure;
2. TCP/IP Ethernet with web server functionality allows monitoring and configuration of controllers through a standard web browser;
3. Alarm messaging by email.



**Figure 3: Electronic controller EC2-552**

The controller has been pre-programmed with a number of parameter values that are most likely correct. Individual installation requirements however may make it necessary to alter parameter settings.

The control target of the compressor controller (1) is to maintain the suction pressure at a defined value by varying the available compressor capacity.

The control target of the condenser controller (2) is to maintain the condensing pressure at a defined value. This is done by varying the fan speed.

## 2.10 Parameters

### 2.10.1 Select parameter configuration

The configuration parameters can be protected by a numerical password. A value of "0" disables this protection (default password: 12).

To select the parameter configuration:

- Press the **Prg** button for more than 5 seconds

In case of password value equal to "0":

- The first modifiable parameter code is displayed (/1)
- To modify parameters see "Parameter modification" below

In case of password value not equal to "0":

- A flashing 0 is displayed
- Press **▲** or **▼** until the password value is displayed
- Press **SEL** to confirm password
- The first modifiable parameter code is displayed (/1)
- To modify parameters see "Parameter modification" below

## /1 Value to show on display

- 0 = Compressors and fans states (controller 1 = Compressor, and controller 2 = Fan(s))
- 1 = Suction pressure (bar(g))
- 2 = Saturation temperature from suction pressure (°C)
- 3 = Condensing pressure (bar(g))
- 4 = Saturation temperature from condensing pressure (°C)
- 5 = Digital Scroll<sup>™</sup> capacity (%)
- 6 = Fan speed (%)
- 7 = Digital Scroll<sup>™</sup> discharge temperature (°C)

## **2.10.2 Parameter modification**

- Press  or  to show the code of the parameter that has to be changed
- Press **SEL** to display the selected parameter value
- Press  or  to increase or decrease the value
- Press **SEL** to temporarily confirm the new value and display its code

Repeat the procedure from the beginning "press  or  to show..." to modify another parameter, etc.

To exit modifying the parameters with the new values:

- Press PRG to confirm the new values and exit the parameter modification procedure

To exit without modifying any parameter:

- Do not press any button for at least 60 seconds (TIME OUT)

## **2.10.3 Important parameters on EC2-552 to configure according to unit model**

Major parameters for operation of Copeland EazyCool<sup>™</sup> ZX condensing unit with Digital Scroll<sup>™</sup> compressor:

		EC2-552			
c	Application parameters	Min	Max	Unit	Def
c1	Number of compressors	1	2	-	1
c4	Compressor 1 control mode	0	2	flag	2

Table 7

### **c1 Number of compressors**

This default parameter is set to "1".

### **c4 Compressor mode for ZXDE models**

This parameter must be set to "2".

		EC2-552			
F	Modulating parameters	Min	Max	Unit	Def
F2	Minimum output value	10	100	%	20
F3	Maximum output value	10	100	%	100

Table 8

Minimum and maximum output values can be adjusted. In case of a single-compressor Copeland EazyCool<sup>™</sup> ZX condensing unit with a Digital Scroll<sup>™</sup> compressor, the maximum output could be set below 100% if system requests less than the maximum capacity. In that case **F3 > F2**.

## 2.11 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** on page 6). 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 purposes only: any replacement electronic board needs to be configured according to the compressor use (see recommended electronic board switch settings in **Table 9**).

**NOTE: Switches must be set to the right position according to compressor model.**

Compressor model		Rotary switch	2-bit Dip-switch	3-bit Dip-switch
Medium temperature	Low temperature			
		0	On/On	Off/Off/Off
ZX15KCE-TFD	ZX106KCE-TFD	1	On/On	Bit 1: To set evaporator fan control mode - "Off": Evaporator fan On/Off logic same as compressor - "On": Evaporator fan will be On all the time whether compressor is On, Off or defrosting Bit 2 and Bit 3 must be set as Off
ZX21KCE-TFD	ZX108KCE-TFD	2	On/On	
ZX30KCE-TFD	ZX109KCE-TFD	3	On/On	
ZX38KCE-TFD	ZX111KCE-TFD	4	On/On	
ZX45KCE-TFD	ZX114KCE -TFD	5	On/On	
ZX51KCE-TFD	ZX115KCE-TFD	6	On/On	
ZX15KCE-PFJ	ZX118KCE-TFD	7	On/On	
ZX19KCE-PFJ		8	On/On	
ZX21KCE-PFJ		9	On/On	
ZX29KCE-PFJ		A	Off/Off	

**Table 9: Setting of switches (only for ZXME & ZXLE models)**

## 2.12 Fresh Start Program

This “Fresh Start Program” is a bump start procedure that will energize and start the compressor for 3 seconds then stop it for a 20-second off-cycle time. This will occur for 3 cycles then continuous power will be supplied to the compressor for normal operation.

The “Fresh Start Program” will be executed on initial start up or anytime power is reapplied when the ambient temperature is lower than 35°C. In addition the “Fresh Start Program” will be executed for any start when the unit has been cycled off for more than an hour when the ambient temperature is lower than 35°C.

## 2.13 Stop Program

When the unit reaches the target setting or there is an error which requires the unit to be shut down, the controller will execute a Stop Program. The compressor and the condenser fan will cycle off and the injection valves will close.

For ZXLE units with vapour injection, the EXV will close immediately when the unit is switched off, but the compressor will delay shutdown for 5 seconds to prevent reverse rotation.

## 2.14 Automatic liquid injection

Automatic liquid injection ensures that the scroll compressor operates within safe temperature limits. ZX condensing units use a patented liquid injection system that injects a saturated refrigerant into the suction line at the compressor. A thermistor attached to the compressor discharge line activates the liquid injection valve. A signal is sent to the stepper motor of the injection valve, opening the valve in response to increasing discharge temperature, which injects saturated refrigerant to reduce the discharge temperature.

## 2.15 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 (non-adjustable) current limit, 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.

## 2.16 Compressor pressure protection

### 2.16.1 High pressure switch

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 30 bar).

- The unit will stop 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.

### 2.16.2 Low pressure switch

**Fixed LP switch cut-out (ZXME):** 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 reaches 2 bar.

**Adjustable LP cut-out:** There is an adjustable LP cut-out in all ZXME and ZXLE units with pre-settings as follows:

- ZXME models: 4 bar(g) cut-in and 2 bar(g) differential cut-out.
- ZXLE models: 2 bar(g) cut-in and 2 bar(g) differential cut-out.

For units with Digital Scroll compressors (ZXDE) the low pressure adjustments are made by means of the electronic controller.

## 2.17 Other inputs to the board

### 2.17.1 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 (see wiring diagrams in **Appendices 2 to 4**). 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).

### 2.17.2 Case temperature controller

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

### 2.17.3 Condenser coil & ambient air thermistors

These two thermistor-type sensors are supplied by Emerson Climate Technologies and are 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.

## 2.18 Other outputs from the electronic board

### 2.18.1 Liquid line solenoid valve (not supplied)

An On/Off output connection is provided and wired to the main terminal strip for convenience of installation. This will assist the customer in wiring the liquid line solenoid valve coil into the unit. When the customer uses LP switch for pump 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 must be 220VAC and the board can accommodate current ratings of 30VA (hold) or 300VA (inrush). If the rating of the solenoid coil is above the limit, please use a proper contactor to control the valve instead of connecting the solenoid coil to the board directly.

### 2.18.2 Defrost heater contactor coil (not supplied)

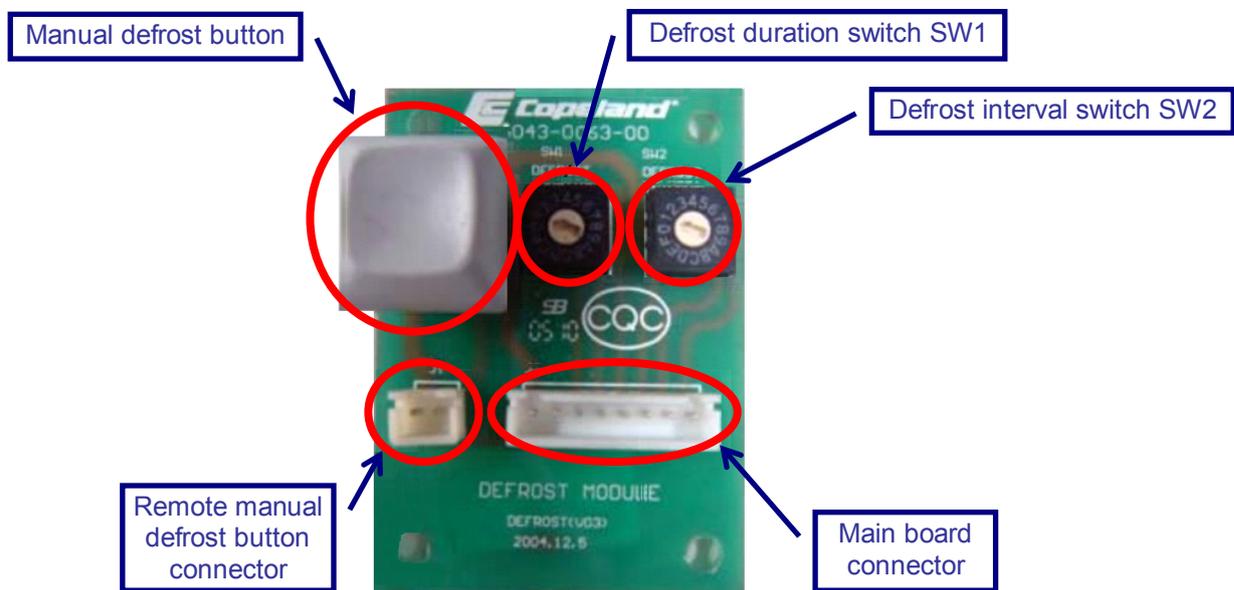
An On/Off output connection is provided on the electronic board for direct connection of a customer-supplied contactor (coil) for convenience of installation when the defrost option is included. Terminals are male spade type. Coil voltage rating should be 220VAC and current ratings 30VA (hold) and 330VA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

### 2.18.3 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 of installation 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).

### 2.18.4 Defrost module (not supplied)

The defrost module is a basic time-initiated control board which is an add-on feature on ZX condensing units. The defrost control board can control either off cycle or electronic defrost.



**Figure 4: Defrost module**

When the defrost is initiated the liquid line solenoid valve will close together with the compressor stop. After defrost time has expired, the solenoid valve will open and the compressor will start.

Due to heater amperage loads, electric defrost requires an additional relay or contactor to energize the defrost heater.

The defrost cycle can be executed either automatically or manually. There are two rotary dip switches by which the user can set up the defrost cycle (see **Figure 4**). One rotary dip switch sets the defrost duration (SW1) and the second rotary dip switch sets the time interval between defrost cycles (SW2). For automatic defrost set SW1 and SW2 as desired. See **Table 10** for time settings.

The defrost module also incorporates a manual defrost button that enables a manual defrost as an override to the rotary switch setting the defrost interval. Upon the completion of a manual defrost the system will reset to the refrigeration cycle with the same procedure as automatic defrost and then the automatic defrost timer will reset.

For setting manual defrost only set SW1 as desired and SW2 to “0”. Whenever the manual defrost button is pressed, one defrost cycle will be executed and the duration of defrost will be determined by the setting of the rotary dip switch SW1.

**NOTE: There is no method to terminate a defrost cycle without resting the control board.**

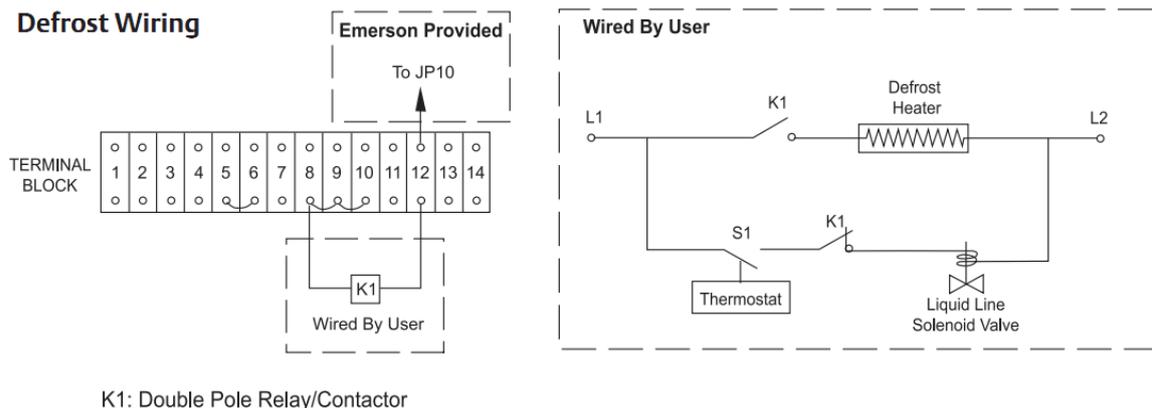
**Table 10** below lists the choices that can be made by the rotary dip switches.

Switch 1	Defrost duration (minutes)	Switch 2	Time interval between defrost
0	No defrost (manual defrost only)	0	No defrost (manual defrost only)
1	5 minutes	1	1 hour
2	10 minutes	2	2 hours
3	15 minutes	3	3 hours
4	20 minutes	4	4 hours
5	25 minutes	5	5 hours
6	30 minutes	6	6 hours
7	35 minutes	7	7 hours

**Table 10**

An On/Off output connection is provided on the control board (JP10) for direct connection of a customer supplied contactor coil/relay when the defrost option is used. Terminals are male spade type. Coil voltage rating should be 220VAC and current ratings 30VA (hold) and 330VA (inrush).

For customers using their existing defrost timer, remove the defrost cable connecting the defrost control board to the unit control board. Also on the unit control board change the mode setting dip switch bit 2 to On and proceed to standard defrost wiring.



**Figure 5: Defrost wiring**

### 2.18.5 Alarm output

In case of an alarm status as indicated by the diagnostic module the unit supplies a 12VDC alarm signal which can be connected to a buzzer or other indicating device (see wiring diagrams in **Appendices 2 to 4**). In idle condition this signal is 3VDC.

## 2.19 Dimensions in mm

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

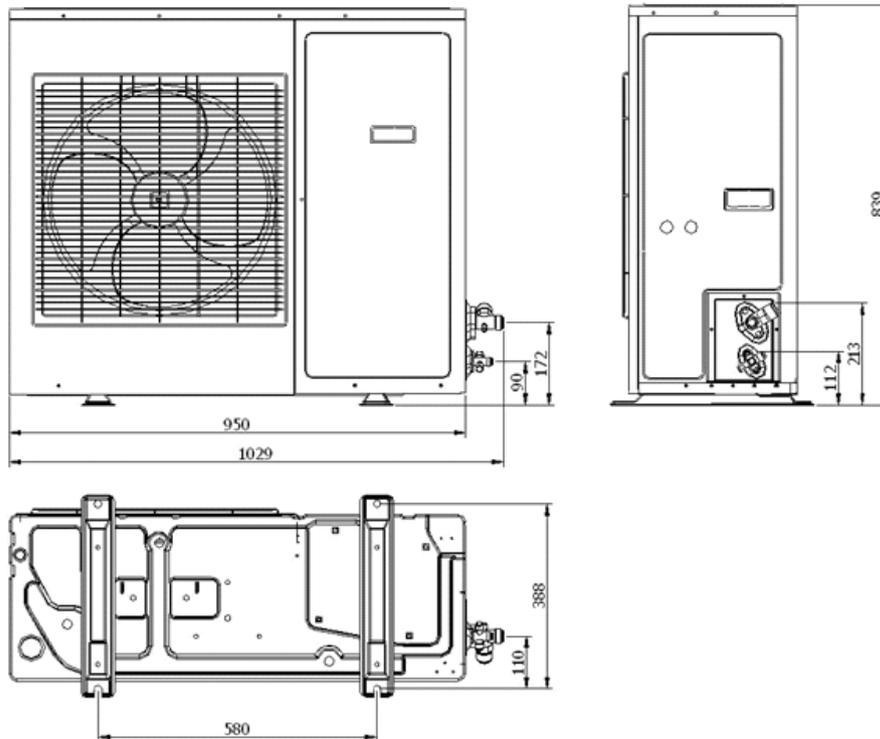


Figure 6: Physical dimensions of models ZXME020E, ZXME025E, ZXME030E & ZXME040E and models ZXLE020E, ZXLE030E & ZXLE040E (single-fan units)

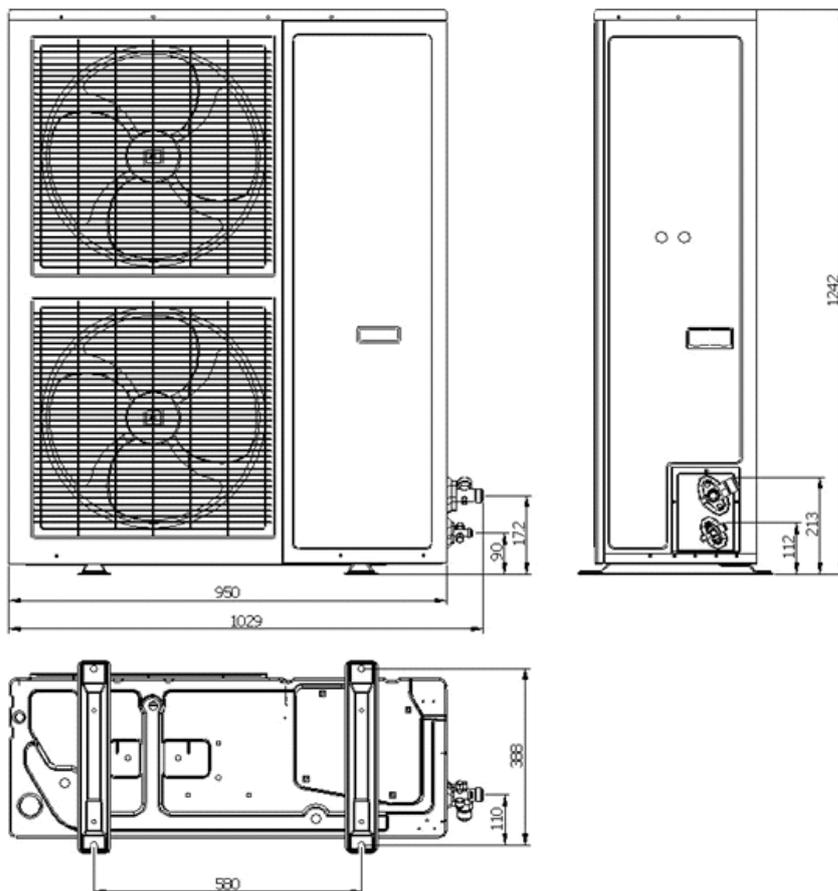


Figure 7: Physical dimensions of models ZXME050E, ZXME060E, ZXME075E, ZXDE040E, ZXDE050E, ZXDE060E, ZXDE075E, ZXLE050E & ZXLE060E (dual-fan units)

## 3 Installation



### WARNING

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

Copeland EazyCool<sup>™</sup> 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, dust, 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 condensing unit only with appropriate mechanical or handling equipment according to weight. Keep in the upright position. Stack pallets on top of each other when not exceeding 300 kg. Do not stack single boxes on top of each other. Keep the packaging dry at all times.

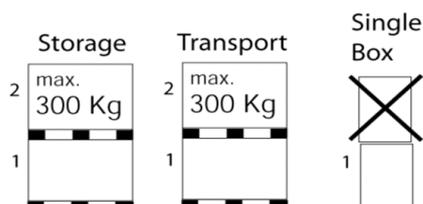


Figure 8

#### 3.1.2 Weights

Condensing units					
Standard compressors				Digital compressors	
Medium temperature	Weight (kg)	Low temperature	Weight (kg)	Medium temperature	Weight (kg)
ZXME020E	76	ZXLE020E	79		
ZXME025E	79	ZXLE025E	81		
ZXME030E	79	ZXLE030E	81		
ZXME040E	91	ZXLE040E	93	ZXDE040E	104
ZXME050E	108	ZXLE050E	106	ZXDE050E	112
ZXME060E	112	ZXLE060E	116	ZXDE060E	114
ZXME075E	118			ZXDE075E	122

Table 11: Weights

### 3.2 Electrical connection

#### 3.2.1 Power supply connections

The electrical connection of the 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.

The units are designed for a 400V / 3Ph / 50 Hz power supply for TFD, 230V / 1Ph / 50 Hz for PFJ. A voltage tolerance of  $\pm 10\%$  is acceptable.

The circuit breaker must be switched off before opening the front panel.

**Table 12** hereafter shows power supply wire sizes, and can also be used for the ground wire selection.

Unit model	Minimum current-carrying capacity	Wire size	
		mm <sup>2</sup>	AWG*
<b>Medium temperature</b>			
<b>Standard</b>			
ZXME-020E-TFD	7.3	0.82	18
ZXME-030E-TFD	8.6	0.82	18
ZXME-040E-TFD	10.4	1.3	16
ZXME-050E-TFD	14.2	2.1	14
ZXME-060E-TFD	14.8	2.1	14
ZXME-075E-TFD	16.8	2.1	14
ZXME-020E-PFJ	17.6	2.1	14
ZXME-025E-PFJ	19.3	3.3	12
ZXME-030E-PFJ	20.3	3.3	12
ZXME-040E-PFJ	26.1	5.3	10
<b>Digital</b>			
ZXDE-040E-TFD	11.7	1.3	16
ZXDE-050E-TFD	15.1	2.1	14
ZXDE-060E-TFD	14.1	2.1	14
ZXDE-075E-TFD	17.6	2.1	14
<b>Low temperature</b>			
ZXLE-0200E-TFD	8.1	0.82	18
ZXLE-0300E-TFD	8.6	0.82	18
ZXLE-0400E-TFD	12.3	1.3	16
ZXLE-0500E-TFD	14.6	2.1	14
ZXLE-0600E-TFD	16.0	3.3	12

\* AWG = American Wire Gauge

**Table 12**

### 3.2.2 Electrical wiring

Before commissioning, ensure that the neutral "N" wire is connected on the terminal block ("N" furthest to the right). After proper connection the control LED on power board and control board will lighten. For more details, see wiring diagrams in **Appendices 2 to 4**.

### 3.2.3 Electrical protection standard (protection class)

- Scroll compressors up to ZX51: IP21 according to IEC 34.
- Fan: IP44 according to IEC 34.
- Solenoid valve coils: IP65 according to DIN 43650.
- EC2-551 controller: IP65 according to DIN 43650.

## 3.3 Refrigeration connections

### 3.3.1 Refrigeration piping installation

#### IMPORTANT

**Tubing quality! Installation contamination!** All interconnecting piping should be of refrigeration grade, clean, dehydrated and must 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.

**Connection sizes! Unsuitable refrigerant flow rate!** 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.



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 to 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 create oil traps. The recommended pipe clamp support distance is shown in **Table 13** below:

Tube size	Max distance between 2 clamp 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 (1 1/8 inch)	2.20 m

Table 13

### 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 discharge connection cap.
- Then remove the suction connection cap.
- Open both valves mid way. Care should be taken to avoid the holding charge releasing too quickly.
- 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.

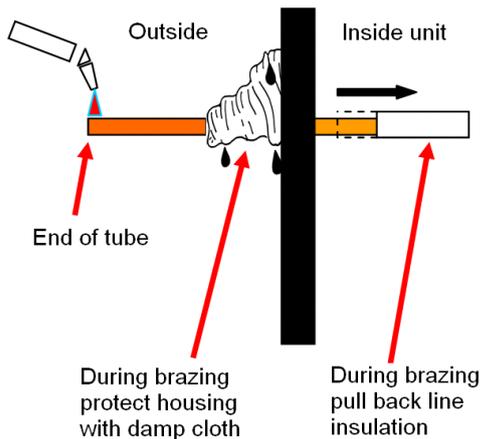


Figure 9: Sectional view

### 3.3.3 Brazing procedure

For brazing of the tubes, please refer to **Figure 10** and procedure hereunder:

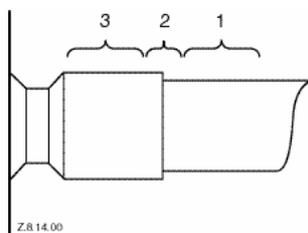


Figure 10: Suction tube brazing

1. Fit the copper tube into the unit 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.

**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 procedure above.



#### WARNING

**Low surface temperature! Danger of frostbite!** The liquid line should be insulated with 19 mm insulation thickness. Temperature could be as low as  $-15^{\circ}\text{C}$ .

### 3.4 Location & fixings



#### IMPORTANT

**Dust and dirt contamination! Unit life reduction!** The unit should always be installed in a location that ensures clean air flow. External fouling of the condenser fins also leads to high condensing temperatures, and will reduce the lifetime 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 must 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. However, in general terms, air by-pass around each condenser and between the units should be avoided at all times.

Ideally, the unit should be mounted level on a solid concrete slab with anti-vibration pads between unit feet and concrete. However the ZX condensing unit has also been designed for wall mounting on suitable brackets. In this case it is equally important that the dimensional guidelines given on page 19 are followed and that additional consideration is 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.

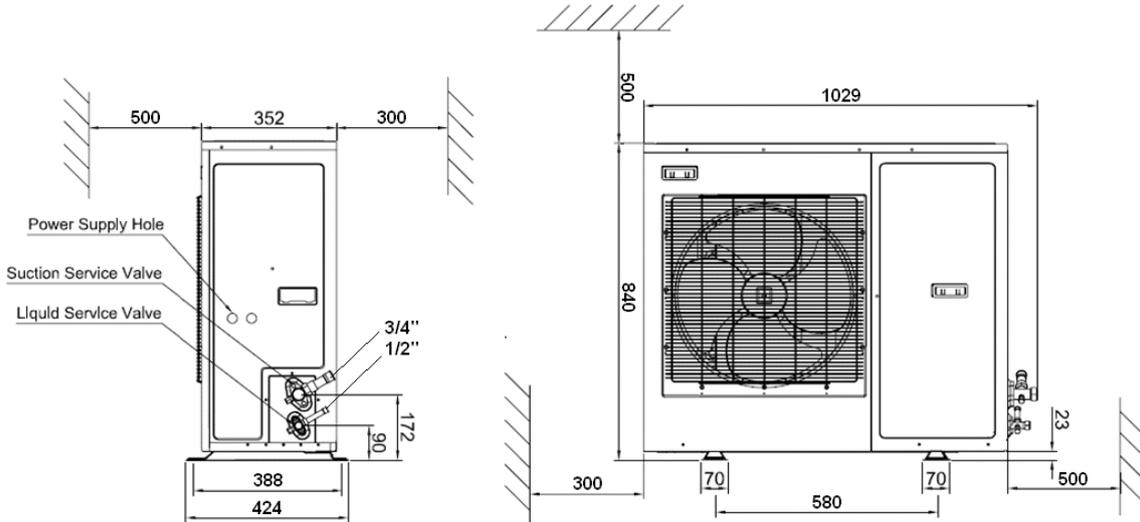


Figure 11: Fixing dimensions and distances - Single-fan unit

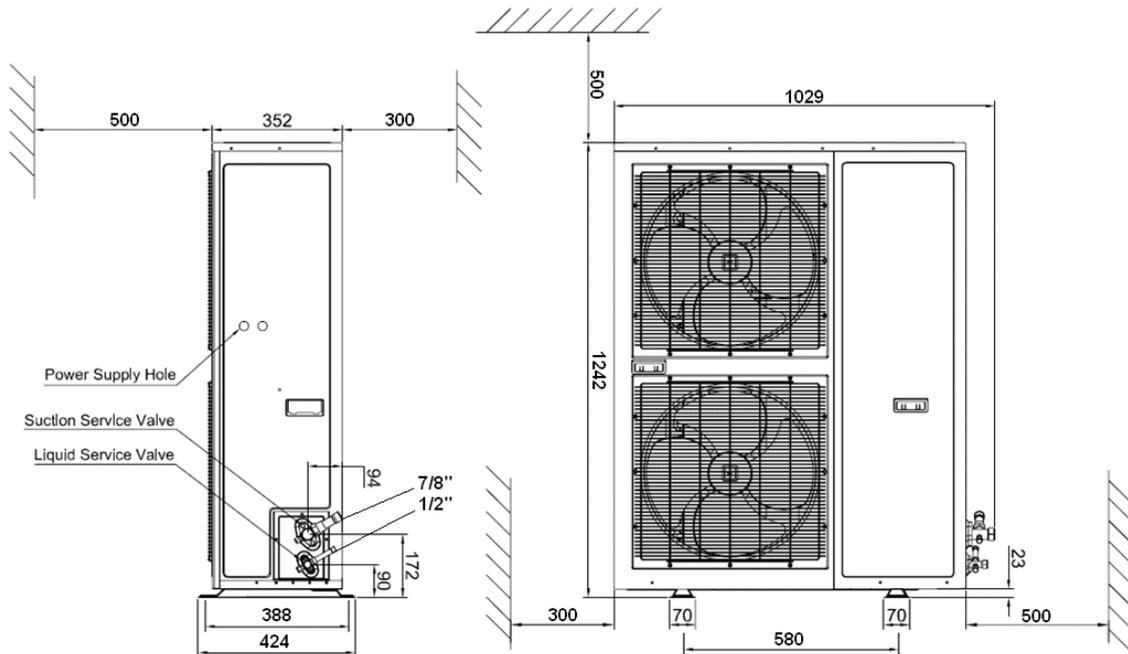


Figure 12: Fixing dimensions and distances - Dual-fan unit

## 4 Starting up & operation

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

### 4.1 Evacuation



#### IMPORTANT

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

Before the installation is put into commission, it has to be evacuated with a vacuum pump. Proper evacuation reduces residual moisture to 50 ppm. The installation of adequately sized access valves at the furthest point from the compressor in the suction and liquid lines is advisable. To achieve undisturbed operation the compressor valves are closed and the system is evacuated down to 0.3 mbar / 0.225 Torr. Pressure must be measured using a vacuum pressure (Torr) gauge on the access valves and not on the vacuum pump; this serves to avoid incorrect measurements resulting from the pressure gradient along the connecting lines to the pump.

### 4.2 Charging procedure

#### 4.2.1 Refrigerant charging procedure



#### IMPORTANT

**Inadequate charge! Overheating!** 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 scrolls. Temperature builds up very quickly in the scrolls if this is not done!

**Service valve closed! Compressor damage!** 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.

It is recommended to charge the ZX unit with refrigerant via its service valves.

Recommendation is to break vacuum in the system with partial charge of refrigerant, then start the system.

For charge adjustment it is recommended to check the liquid sight glass just before the expansion valve.

#### 4.2.2 Oil charging procedure

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

**NOTE: The oil level should be approximately halfway up the sight glass (ZXLE/ZXDE units).**

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 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



##### **IMPORTANT**

**Liquid valves not fully opened! Liquid trap!** Both valves should be fully opened on the liquid line, in order to prevent trapping liquid.

- Check that all valves are fully opened.
- 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 alumina 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 compressor 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 to the top of the compressor.
- Close valves to isolate the compressor from the system.
- Release the compressor mounting parts then lift it to replace with a new compressor.

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

### 5.2 Condenser fins



#### CAUTION

**Acid cleaning! Corrosion of condenser fins!** 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



#### WARNING

**Isolating switch "On"! Danger of electric shock!** Turn off the unit isolating switch before undertaking this task!

All condensing units will generate some degree of vibration. Copeland EazyCool™ ZX units are no exception. However the vibration level from the compliant scroll technology is less severe than in units using reciprocating compressor technology. Due to this reduced vibration, ZX condensing units can be mounted on simple, less expensive rubber mounting pads.

Over time, due to temperature extremes within the unit housing, electrical terminations might become loose. The components most likely to be affected are the main terminal strip and the compressor contactor. It is suggested to check the main electrical terminations for tightness and

to carry out a visual inspection of the low voltage crimped terminals at least once every 6 months.

## 5.4 Electronic panel

The electronic panel 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.

The PCB has 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

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- The piping is in compliance with the Pressure Equipment Directive 97/23/EEC (Art.3 §3 - Sound Engineering Practice).
- The 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 2: Particular requirements for commercial refrigerating appliances with an incorporated or remote refrigerant condensing unit or compressor).
- To incorporate these products into a machine the Manufacturer's Declaration of Incorporation has to be respected.

## 7 Dismantling & disposal

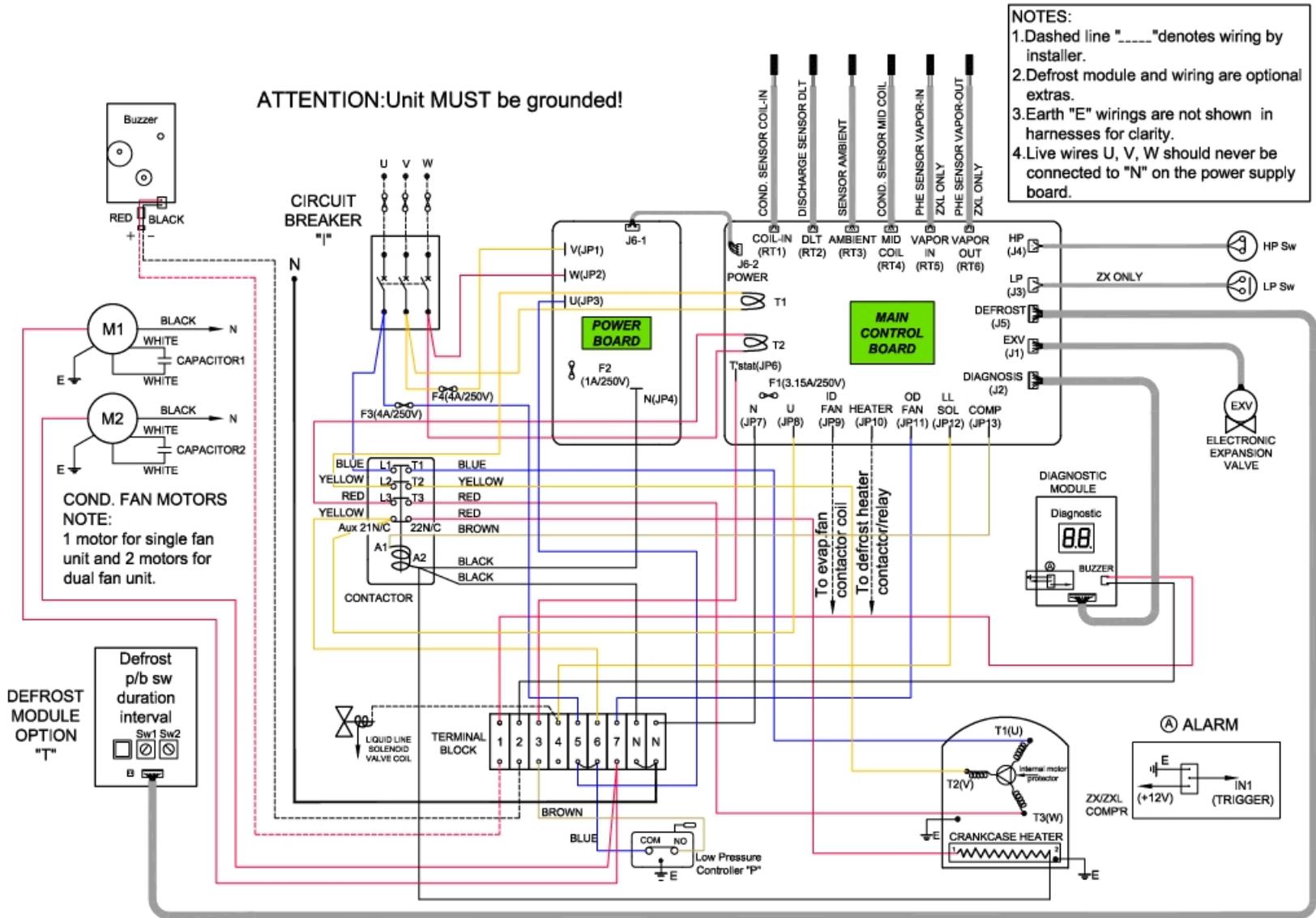
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### Removing oil and refrigerant:

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

**Appendix 1: ZXM / ZXL Condensing unit wiring diagram (380-420V / 3Ph / 50 Hz)**

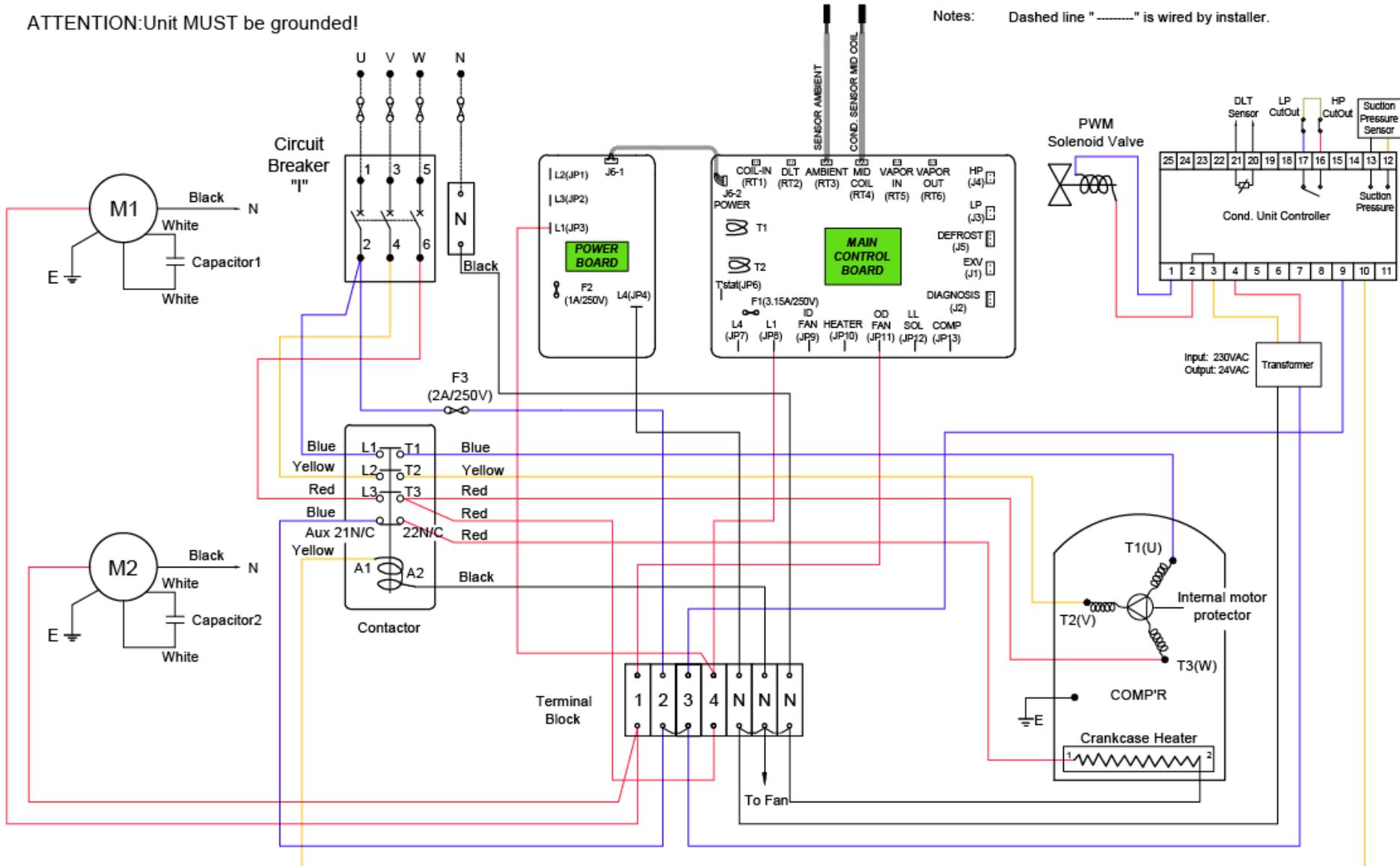




**Appendix 3: ZXD Condensing unit wiring diagram (with fan speed control function) (380-420V / 3Ph / 50 Hz)**

ATTENTION: Unit MUST be grounded!

Notes: Dashed line "-----" is wired by installer.



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