Copeland™ Large ZX Condensing Unit

For Refrigeration Applications

User Manual

COPELAND™

EMERSON™

Copeland™ Scroll Large ZX Condensing Unit

Emerson is pleased to offer Copeland scroll large ZX condensing unit for refrigeration applications.

In addition to 2-9 HP condensing unit, Emerson expands Next Generation ZX platform to 12-20 HP medium temperature and low temperature condensing unit, configuring with digital modulation for best in class energy efficiency and food safety.

Emerson ZX series has been highly successful in global market and enjoys proven success with its energy savings and customer-friendly electronic features.

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Overview

Disclaimer

Thanks for purchasing Copeland™ Scroll Large ZX Condensing Unit from Emerson. We hope that this product meets your refrigeration needs efficiently and effectively. Large ZX Condensing Unit exhibit market-leading quality in terms of cooling capacity and operating range, as part of product extension for Next Generation ZX platform in larger capacity range. The product is designed to operate reliably and to deliver high operating efficiencies in medium and low temperature refrigeration applications. It also provides constant monitoring of the compressor operating conditions and displays the running or fault conditions of the condensing unit.

Please read through this User Manual thoroughly to familiarize yourself with the installation and commissioning process of this product and how to use it optimally. Please do read the following information in this page before proceeding with the rest of the manual. The Emerson™ ZX-Series refrigeration condensing units should only be installed by suitably qualified and experienced refrigeration technicians. No responsibility can be accepted for damage caused by inexperienced or inadequately trained site technicians or improper system design. All instructions and procedures described in this manual are based on good refrigeration trade practices as applicable to this particular product. The installation contractor may prefer to use variations to these recommendations. However, the methods described in this manual represent the minimum requirements to avoid any subsequent warranty claims for this equipment and its components. These instructions do not cover the fundamentals of good electrical or refrigeration practice and are therefore intended for use only by qualified and/or experienced personnel or technicians.

These instructions are general in nature for this family of products and due to our policy of continuous improvement, some of the details may not apply to the unit you are installing. If in doubt, please consult your local sales office, quoting unit model, and serial number as shown on the nameplate. In case of ambiguity, the wiring diagram supplied with each unit takes precedence over the diagram in this manual.

ZX condensing unit introduction

ZX series condensing units have gained market popularity and have achieved great success in the Asian market with their energy-saving and friendly control experience. ZX/ZXB/ZXD/ZXL/ZXLD units in Asia are used on-site by famous end-users and cold chain retailers. ZX platform products have been widely recognized in the global market. Specially developed models have been exported to the United States, Latin America, Europe and the Middle East markets.

Receiving your unit

All units are filled with dry nitrogen at a positive pressure before transportation. The unit and package are clearly labeled. The unit shut-off valve is equipped with a maintenance interface to check the unit pressure maintenance.

Caution!

When you receive a unit from Emerson or an authorized representative, it is very important to check the pressure of each unit. If it is found that packing pressure has disappeared, please contact Emerson or an authorized representative. Failure to report this may cause subsequent failure reports to be unobstructed.

Damage to the unit caused by the transport process should fall within the category of insurance claims and not be a manufacturing defect. It is also advisable to inspect the rest of the unit for obvious physical damage and inform us or our authorized representative in case any is discovered.

ZX platform condensing unit were designed based on three factors demanded by industry users:

Intelligent store™ solutions - A most innovative approach to enterprise facility management, Emerson Intelligent Store architecture integrates hardware and services, to provide retailers a single view into their entire work of facilities and understand what facilities actually cost to operate and maintain.

The Intelligent Store architecture transforms data from store equipment and controls into actionable insights. Designed to deliver value in both new and existing stores, Emerson aims to help the retailers:

- Make better decisions on recources investment for greatest impact
- Gain accurate feedback and customized service to your specific needs
- Reduce operational costs and boost the profitability at most convenience

Energy efficiency - Utilizing Copeland™ scroll compressor technology, variable speed fan motor, large capacity condenser coil and advanced control algorithms, energy consumption is significantly reduced. End-users can save more than 20% on annual energy costs compared to equivalent reciprocating units.

Reliability - Combining the proven reliability of Copeland scroll compressors with advanced electronics controller and diagnostics, equipment reliability is greatly enchanced. Fault code alerts and fault code retrieval capabilities provide information to help improve speed and accuracy of system diagnostics. Integrated electronics provide protection against over-current, over-heating, incorrect phase rotation, compressor cycling, high pressure resets, low pressure cut-outs. It can also send out a warning message to an operator when there is liquid floodback, which can prevent critical damage on the unit.

Intelligent store	→	Better decision making
Highest efficiency	→	Lower enery bills
Reliability	→	Lower maintenance cost

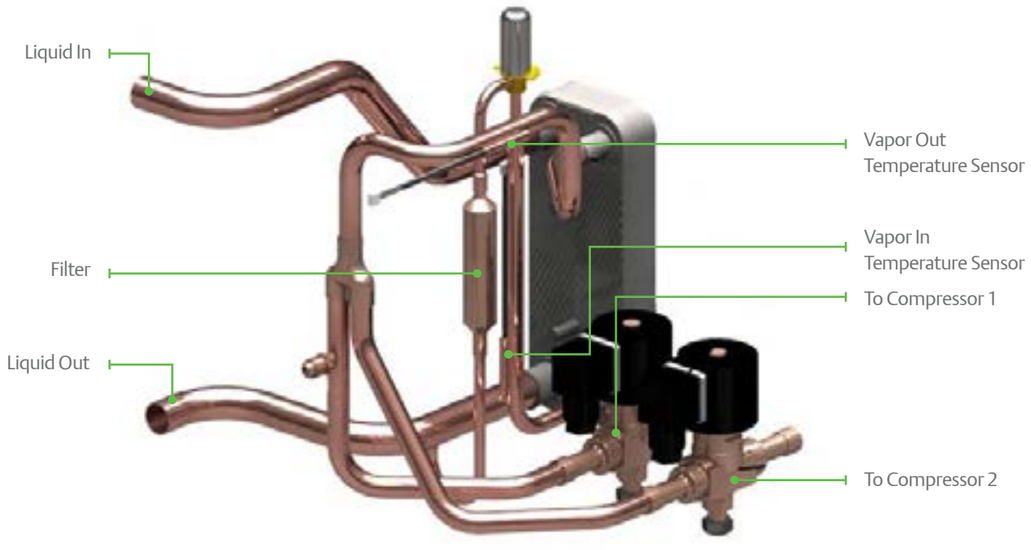
Large ZX condensing unit features

Copeland™ scroll compressor technology
Highly efficient, ultra-quiet and highly reliable

Configured with CoreSense controller
- Provides electronic diagnosis, protection and communication modules for energy-saving and reliable unit control
- Provides digital modulation control

Emerson unique digital technology
- Proven reliable modulation technology for end user energy saving, accurate temperature control and best food safety

Enhanced vapor injection
- Vapor injection provide high efficiency for refrigeration application
- Well-tuned electronics algorithm with one big PHE to sub-cool the liquid temperature, and feed gas into the compressors' EVI ports



Design features
- Real-time monitoring of compressor operating conditions
- Compressor reverse rotation protection
- Compressor over current protection
- Compressor internal motor protector trip
- Discharge gas over heat protection
- Over voltage protection
- Under voltage protection
- High pressure protection
- Low pressure protection
- Refrigerant floodback warning
- Compressor minimum off time
- Internal thermal sensor failure warning
- Compressor oil shortage protection
- Intelligent Store™ Solution: Communication and retail store monitoring

Nomenclature

Large ZX Condensing Unit

ZX	D	160	B	E	-	TFD	-	551
Condensing unit family	LD = Digital low temp D = Digital medium temp	12 to 20 HP	Generation	E = Ester oil		TFD = 380V/420V- 3ph- 50 Hz		5XX = Without door
Base model						Electrical Code		Bill of Material

Bill of material

Model	ZXD120			ZXLD120		
BOM	551	581	521	551	581	521
Liquid Line Filter Dryer	√	√	√	√	√	√
Moisture Indicator	√	√	√	√	√	√
Liquid Receiver	√	√	√	√	√	√
Pressure Relief Valve on Liquid Receiver		√	√		√	√
Oil Separator (w/ Reservoir)	√	√	√	√	√	√
Oil Filter	√	√	√	√	√	√
Accumulator				√	√	√
LP Transducer	√	√	√	√	√	√
HP Transducer	√	√	√	√	√	√
HP Pressure Gauge			√			√
LP Pressure Gauge			√			√
Fixed LP Switch	√	√	√			
Adjustable LP Switch				√	√	√
Fixed HP Switch	√	√	√	√	√	√
CoreSense Controller	√	√	√	√	√	√
Digital Modulation	√	√	√	√	√	√
Fan Speed Control	√	√	√	√	√	√
Sound Jacket	√	√	√	√	√	√
Low Ambient Kit		√			√	
Electronic Oil Level Protective Control	√	√	√	√	√	√
Service Valves	√	√	√	√	√	√
Discharge Line Check Valve	√	√	√	√	√	√
Vapor Injection				√	√	√
Liquid Injection	√	√	√			
Emergency mode						

ZXD160			ZXLD160			ZXD200			ZXLD200		
551	581	521	551	581	521	551	581	521	551	581	521
√	√	√	√	√	√	√	√	√	√	√	√
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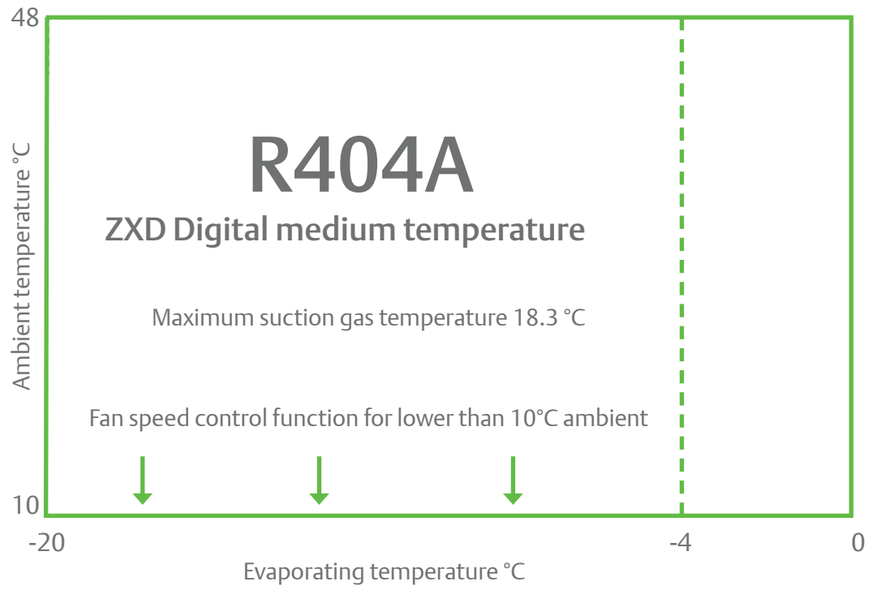
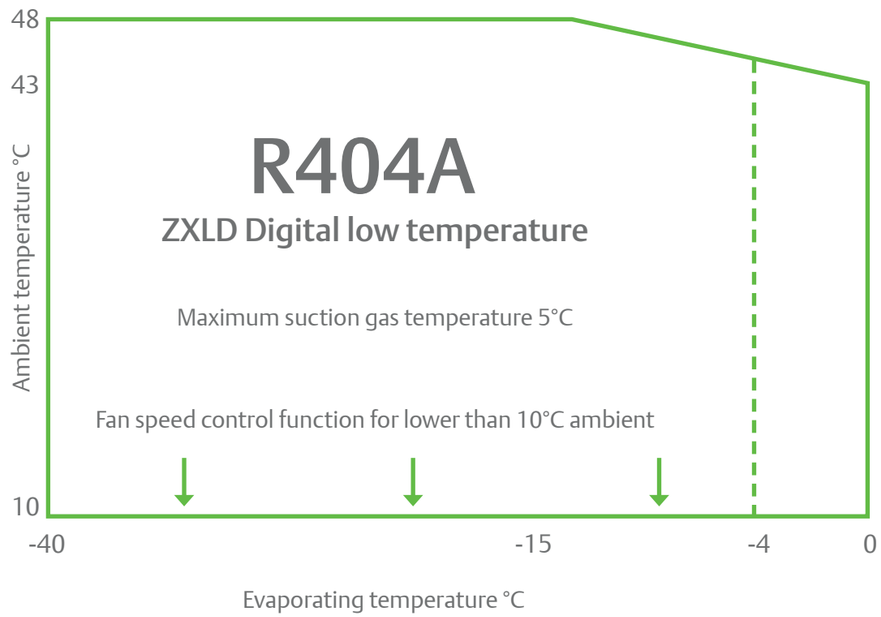
Envelope

Large ZX Condensing unit



Note: ZXD120/160BE maximum evaporating temperature is 0 °C;
ZXD200BE maximum evaporating temperature is -4°C



Note: ZXLD120BE maximum evaporating temperature is 0 °C;
ZXLD160/200BE maximum evaporating temperature is -4°C

Technical Data

Large ZX Condensing Unit			ZXD-120BE-TFD	ZXLD-120BE-TFD	ZXD-160BE-TFD	ZXLD-160BE-TFD	ZXD-200BE-TFD	ZXLD-200BE-TFD
Nominal Horsepower		HP	12		16		20	
Powered by	Compressor		3PH-380V-50Hz					
	Fan		1PH-220V-50Hz					
Performance R404A	ET/AT/RGT	°C	-7/32/18	-32/32/5	-7/32/18	-32/32/5	-7/32/18	-32/32/5
	Capacity	kW	24.22	11.76	29.81	15.72	37.90	17.91
	COP	W/W	2.41	1.30	2.37	1.42	2.34	1.52
	Sound Pressure Level (@1m)	dB(A)	65	69	69	69	72	72
Compressor	Rated Load Ampere	A	9.6+10.1	11.1+11.1	12.7 + 11.1	14.6 + 14.6	14.6+14.6	14.6+15.6
	Locked Rotor Ampere	A	74	74	74	102	102	121
	Oil Type		RL32 3MAF					
	Oil Charge Volume	L	1.9+1.8	1.9+1.9	1.9 + 1.9	1.9 + 1.9	1.9+1.9	1.9+1.9
Fan Motor	Number of Fan		2	2	2	2	3	3
	Fan Diameter	mm	600	600	600	600	600	600
	Fan Maximum Speed	rpm	930	930	930	930	930	930
	Maximum Air Flow	m_3/h	15600	15600	15600	15600	23400	23400
	Total Fan Motor Power	W	700	700	700	700	1050	1050
Other	Oil Separator Oil Charge	L	2.5	2.5	2.5	2.5	6	6
	Receiver Volume	L	18.7	18.7	18.7	18.7	18.7	18.7
	Suction Pipe OD	inch	1 3/8"	1 3/8"	1 3/8"	1 3/8"	1 3/8"	1 3/8"
	Liquid Line Pipe OD	inch	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"
	Dimension (W x D X H)	mm	1619 x 1010 x 1124	1619 x 1010 x 1124	1619 x 1010 x 1124	1619 x 1010 x 1124	2033x857x 1913	2033x857x 1913
	Weight (Net)	kg	357kg	362kg	362kg	362kg	550kg	550kg
	Weight (Gross)	kg	457kg	462kg	462kg	462kg	600kg	600kg

Physical layout

The following picture shows the outline of the Large ZX condensing unit.

Figure 1. 12-16HP Large ZX layout

The normal oil level should be lower than the upper observation port, but higher than the lower observation port. If the oil level is lower than the lower observation port, replenish oil immediately. When the unit is running, replenish from the unit's suction service valve using a high pressure oil gun.

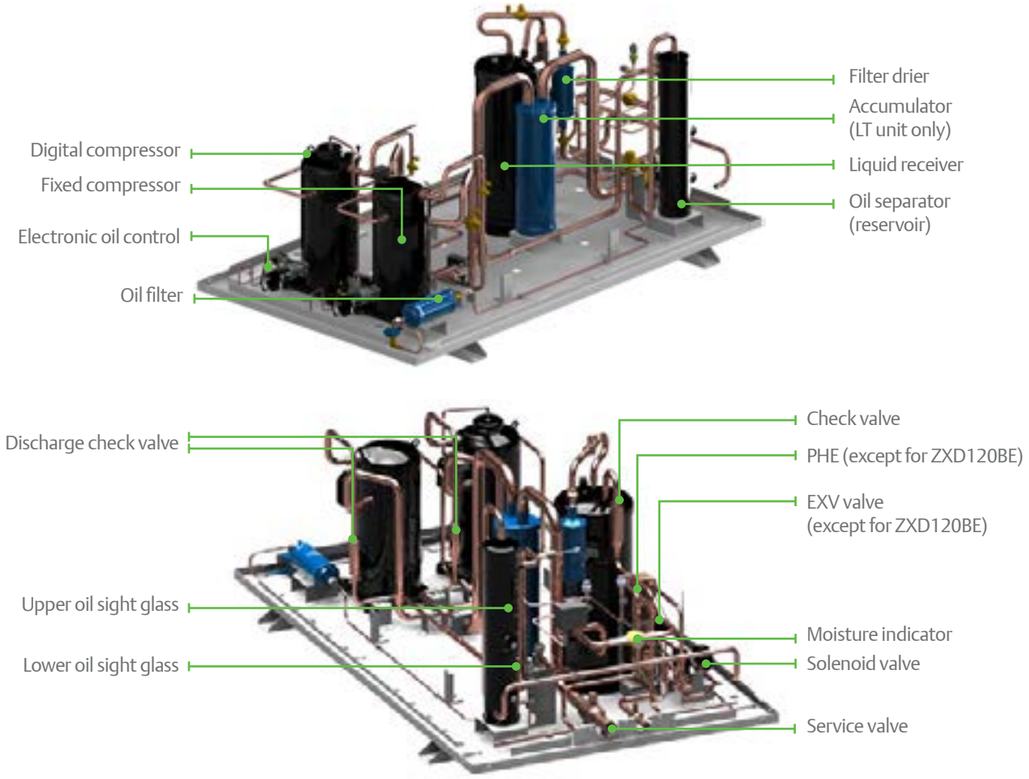


Figure 2. Main components of 12-16HP Large ZX

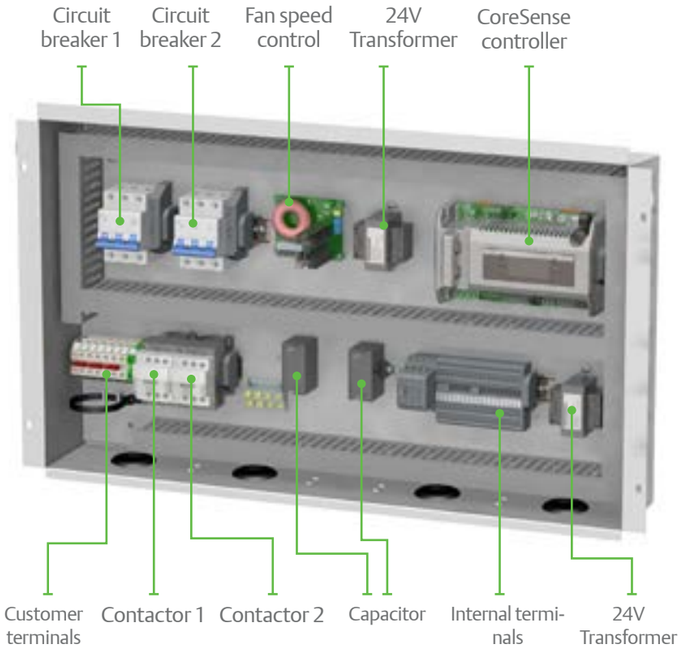


Figure 3. Electrical module of 12-16HP Large ZX

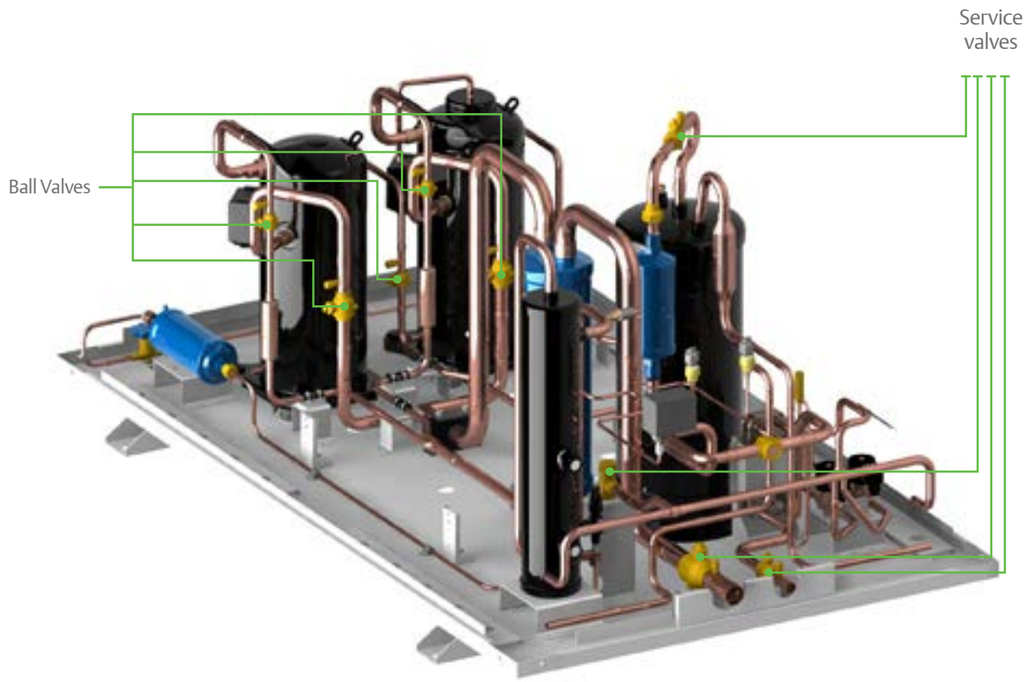
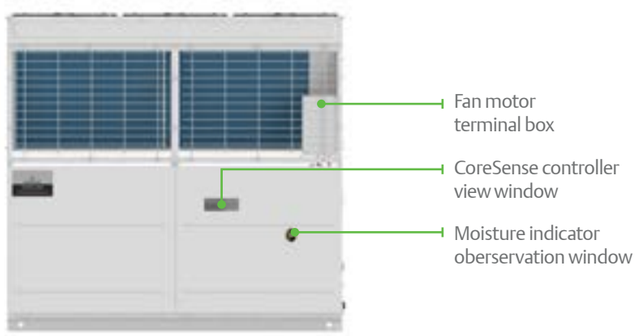
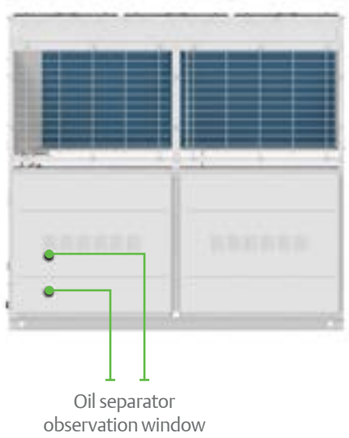


Figure 4. Service valves of 12-16HP Large ZX

The following pictures shows the outlines of 20HP Large ZX condensing unit.





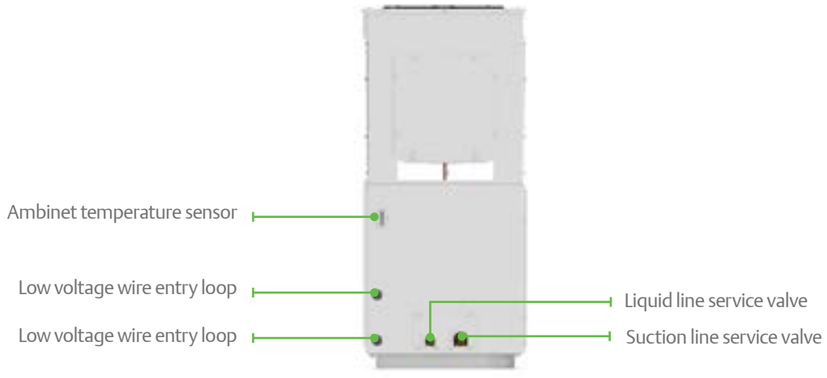
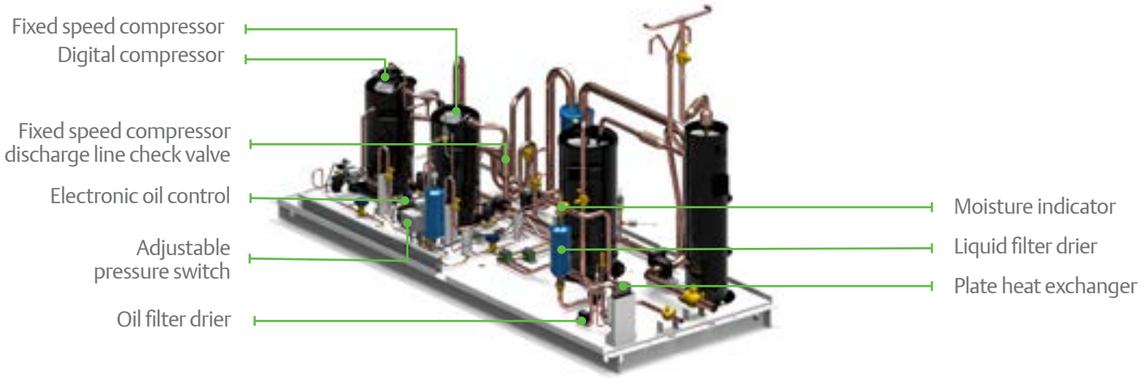


Figure 5. 20HP layout



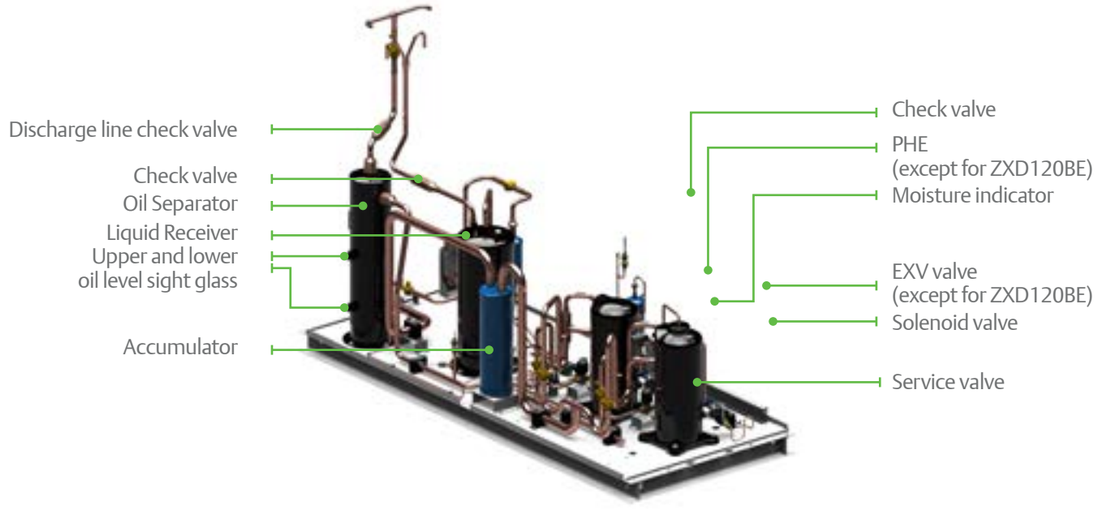


Figure 6. 20HP main components

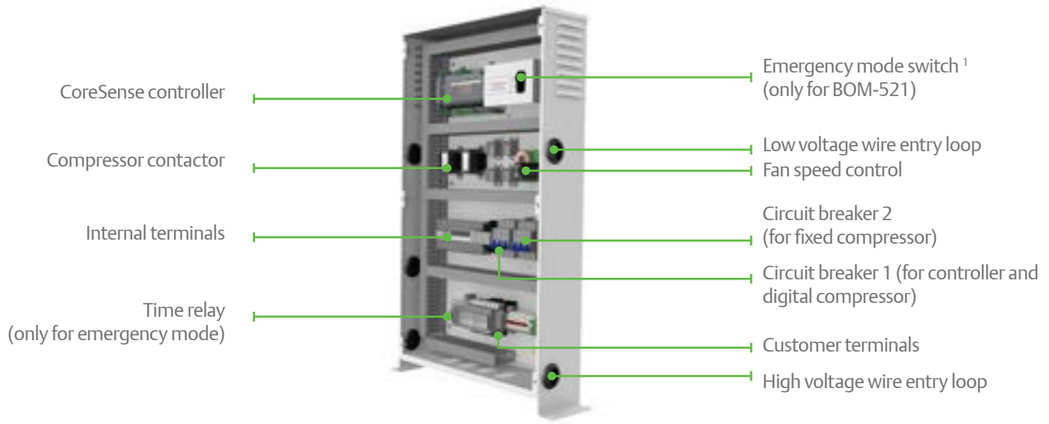


Figure 7. 20HP electrical module

(1) Emergency mode (only for BOM-521):
When electronic control system is malfunctioned, for example if controller failure occurs, emergency mode can be activated by pressing the emergency mode switch. During emergency mode, the two compressors are running according to the set up on the two adjustable pressure switches:
- When suction pressure is higher than pressure switch 1 setting, compressor 1 and fan 1&2 start up
- When suction pressure is higher than pressure switch 2 setting, compressor 2 and fan 3 start up after certain time delay (defalt 3 min)

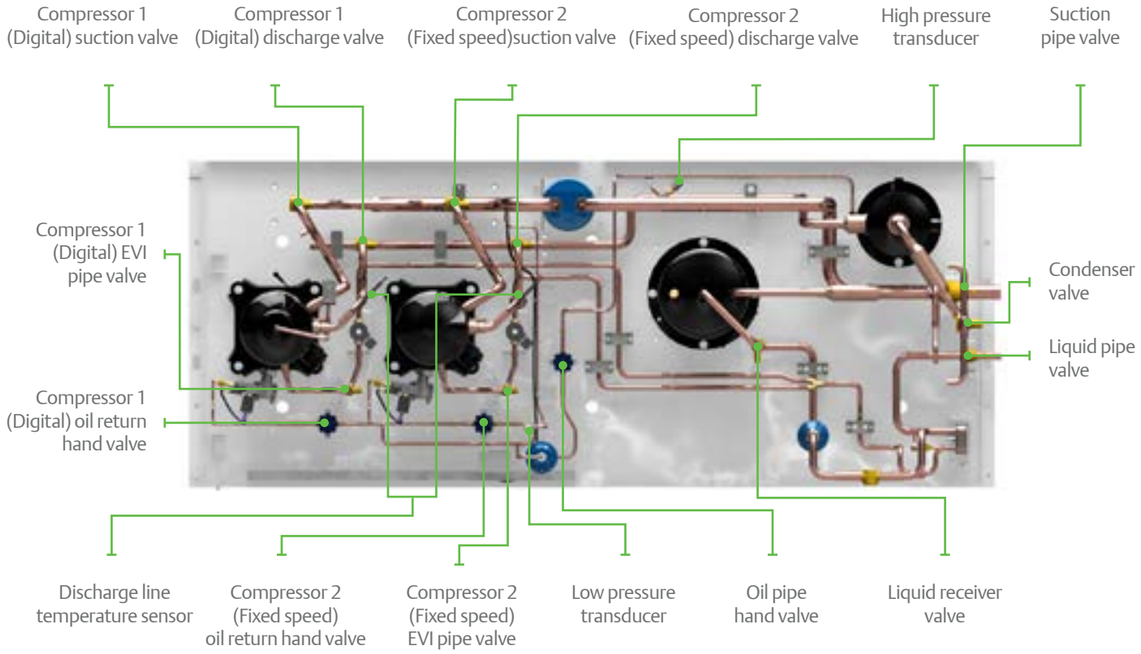


Figure 8. 20HP service valve location

CoreSense controller

LED descriptions

LED	Status	Description
	On	Compressor 1 is running
	Flashing	Compressor 1 is ready to start
	On	Compressor 2 is running
	Flashing	Compressor 2 is ready to start
	On	Condensing fan is running
	On	Digital compressor is unloading
	On	Display with C
	Flashing	Programmable mode

LED	Status	Description
	On	Browsing the service menu
	Flashing	Browsing the fast access menu
	On	A new alarm happened
	Flashing	Browsing the alarm menu
	On	An alarm is occuring
	On	Liquid line solenoid valve on
	–	Reserved

Keyboard descriptions - Single button

SET	Set	Displays target set point; In programming mode, select a parameter or confirm an operation.
Start	Reset	Hold for 5 seconds to reset any lockouts if the current state of the controller allow for it to be reset.
∧	Up	Enter the fast access menu; In programming mode, browse the parameter codes or increases the displayed value.
∨	Down	In programming mode it browses the parameter code or decreases the displayed value
	Service	Enter the service and alarm menu.
	Defrost	Hold for 3 seconds to start a manual defrost or terminate an active defrost (Not available at the moment).

Keyboard descriptions - Combined buttons

∨ + ∧	Press and hold for about 3 seconds to lock (Pon) or unlock (Pof) the keyboard.
SET + ∧	Pressed together to exit programming mode or menu; under rtC and PAr, this combination allows the user to go back to previous level.
SET + ∨	Pressed together for 3 seconds allows access to first level of programming mode.
SET +	Pressed together for 3 seconds allows access to EXV manual setting.

Controller display upon start-up

Step	Action	Phenomenon and description
1	Power on controller	All LEDs will light up for 3 seconds.
2		Firmware version will be displayed for 3 seconds.
3		Parameter setting file (bin file) identifier will be displayed for 3 seconds.
4		Normal display (actual suction temperature will be displayed)

Bin files number range

Bin number range	Family
1-200	ZX
201-300	ZXB
301-500	ZXL
501-700	ZXD/ZXLD

After installation and initial power on, it is critical to double check the parameters below:

RTC (Real Time Clock) setting

Step	Action	Phenomenon and description
1	Press "SET" + "∨"	Enter menu to select
2	Press "∧" + "∨"	Select rtC
3	Press "SET"	n01, minute n02, hour n03, day n04, month n05, year (last two digits)
4	Press "SET"	Display actual value
5	Press "∧" + "∨"	Modify the value
6	Press "SET"	Press SET: the value will flash for 3 seconds, then move to the next value
7	Press "SET" + "∧"	Exit to rtC
8	Press "SET" + "∧"	Exit to main menu (or wait for 120 seconds and exit automatically)

Refrigerants

Step	Action	Phenomenon and description
1	Press "SET" + "▽"	Enter menu to select PAr (parameter) or rtC
2	Press "△" + "▽"	Select PAr (parameter)
3	Press "SET"	Confirm selection
4	Press "△" or "▽"	Browse to parameter C07
5	Press "SET"	Confirm selection
6	Press "△" or "▽"	Select refrigerant to be used
7	Press "SET"	The number will flash for 3 seconds and confirm the refrigerant selection
8	Press "△" or "▽"	Exit (or exit automatically after waiting for 120 seconds)

Evaporating temperature

Step	Action	Phenomenon and description
1	Press "SET" > 3 seconds	Press SET button for more than 3 seconds, the measurement units (°C) will flash together
2	Press "△" or "▽"	Modify the number for target evaporating temperature
3	Press "SET"	Press SET to confirm, the number wil flash for 2 seconds (or wait for about 10 seconds to confirm)

Replacing controller

After a new controller is replaced and initial power is on, it is critical to reset parameters defined on the label below the nameplate on the unit panel. Here is an example of a label:

Controller Parameter Default Setting		
MODEL		
Parameter	**Description**	**Default Value**
H07	Digital Compressor MCC	
H09	Digital Compressor Current Protection	
H27	Fixed Compressor MCC	
H28	Fixed Compressor Current Protection	
H13	MIN. Operating Voltage	
H14	MAX. Operating Voltage	
C07*	Refrigerant	
Notes: *Ensure that parameter C07 is set to match the actual refrigerant used. If not, set C07 following label "Unit Operation Setting After Installation".		

Notes: C07 is accessible in Pr1 parameter, and the other parameters are assessible in Pr2 parameter

The step-by-step procedure to access and modify the Pr1 and Pr2 parameters are outlined below:

Pr1 parameter (1st level) browse and modification

Step	Action	Phenomenon and description
1	Press "SET" + "▽"	Enter menu to select
2	Press "△" or "▽"	Select PAr (parameter)
3	Press "SET"	Confirm, select, and browse Pr1 parameters
4	Press "△" or "▽"	Browse to Pr1 parameters
5	Press "SET"	View the actual number of the Pr1 parameters
6	Press "△" or "▽"	Modify the actual number of the Pr1 parameters
7	Press "SET"	Press SET: the number will flash for 3 seconds and confirm the modifications; Will go to the next Pr1 parameter
8	Press "SET" + "△"	Exit (or exit automatically after waiting for 120 seconds)

Pr2 parameter (2nd level) browse and modification

Step	Action	Phenomenon and description
1	Press "SET" + "▽" >3 seconds	Enter Menu to select PAr (parameter) or rtC, enter into parameter browse & setting mode.
2	Press "△" or "▽"	Select PAr (parameter)
3	Press "SET"	Confirm above selection & display Pr1 level parameters
4	Press "△" or "▽"	Find parameter “t18”
5	Press "SET"	“PAS” will flash for 3 times, then display “0--”, “0” flashes (Prompt to enter pass code “321”)
6	Press "△" or "▽"	Change value to "3"
7	Press "SET"	Display “30-”, “0” flashes
8	Press "△" or "▽"	Change value to“2”
9	Press "SET"	Display “320”, “0” flashes
10	Press "△" or "▽"	Change value to “1”
11	Press "SET"	Confirm password & enter into Pr2 level parameter
12	Press "△" or "▽"	Browse detailed Pr2 level parameter name
13	Press "SET"	View current parameter setting values
14	Press "△" or "▽"	Change parameter setting values
15	Press "SET"	Confirm the changes, changed values flash for 3 times, then display next parameter name
16	Press "SET" + "△"	Display “Par”, exit parameter browse & setting mode.
17	Press "SET" + "△"	Exit to main menu

Quick access menu browse - Sensor status and actual values

Step	Action	Phenomenon and description	
1	Press "△"	Enter quick access menu, will display P1P (Press Up or Down to view other sensors)	
2	Press "SET"	View the actual value of P1P	
3	Press "SET"	Change to next sensor code	
4	Press "SET" + "△"	Exit (or exit automatically after waiting for 60 seconds)	
Sensor code and values descriptions (nP, noP, or nA means that the sensor does not exist; Err means that the sensor fails, out of range, disconnected, or does not configure properly)		P1P	Suction pressure sensor
		P2P	Condensing pressure sensor
		P2t	Mid-coil temperature sensor
		P3t	Digital compressor discharge line temperature sensor
		P4t	PHE vapor inlet temperature sensor
		P5t	PHE vapor outlet temperature sensor
		P6t	Ambient temperature sensor
		P7t	ON-OFF compressor discharge line temperature sensor
		5H	PHE superheat
		oPP	EXV opening percentage
		LL5	Solenoid valve status (not used)
		Std	Condensing temperature set point
		Aoo	Fan's analog output signal percentage
		dso	Percentage of PWM output driving the valve of the Digital Scroll compressor
		Lt	Minimum cold room temperature (unused)
		Ht	Maximum cold room temperature (unused)
		tU1	#1 voltage sensor
		tU2	#2 voltage sensor
		tU3	#3 voltage sensor
		tA`	#1 current sensor
		TA2	#2 current sensor
		Hm	Time menu

Access alarm code (Maximum of 50 record)

Step	Action	Phenomenon and description
1	Press ""	Display SEC
2	Press "SET"	Display A01
3	Press ""	Display alarm code in A01
4	Press ""	Display A02
5	Press ""	Display alarm code in A02
6	...	...
7	Press "SET"+""	Exit (or exit automatically after waiting for 15 seconds)

Exact timing of the alarm

Step	Action	Phenomenon and description
1	Press ""	Display SEC
2	Press "SET"	Display A01
3	Press ""	Display alarm code in A01
4	Press "SET"	Display Hr
5	Press ""	Display the alarm exact timing: hour
6	Press ""	Display Min
7	Press ""	Display the alarm exact timing: minute
8	Press ""	Display dAy
9	Press ""	Display the alarm exact timing: day
10	Press ""	Display Mon
11	Press ""	Display the alarm exact timing: month
12	Press ""	Display yEA
13	Press ""	Display the alarm exact timing: year
14	Press "SET"+""	Exit (or exit automatically after waiting for 15 seconds)

Upload the program from the controller to Hot-Key

Step	Action	Phenomenon and description
1	Insert Hot-key when the controller is on	
2	Press " ^ "	The uPL message will appear followed by a flashing End label (Note: If Err is displayed, it means it failed to upload the program to hot-key. Please restart the process.)
3	Press "SET"	End will stop flashing
4	Turn off the controller and remove the Hot-key	
5	Turn on the controller	

Download the program from Hot-key to controller

Step	Action	Phenomenon and description
1	Turn off the controller	
2	Insert Hot-key	
3	Turn on the controller	The doL message will blink followed by a flashing End label (Note: If Err is displayed, it means it failed to download the program to Hot-key. Please restart the process.)
4		Controller will restart working with the new parameters after 10 seconds
5	Remove Hot-key	

Network wiring

Dixell XWEB serial address

- Connect to the ModBUS network using cable with shielded wires, minimum section 0.75mm^2 (e.g. BELDEN8761).
- Do not connect shield to ground.
- Do not connect the "Gnd" terminal.
- Remember to draw a map of the line. This will help you to find an error if something is wrong.
- RS485 devices are polarity sensitive.

Figure 9. Correct network wiring

Figure 10. Incorrect network wiring

Dixell XWEB Configuration

XWEB is compatible with CDU/Rack if XWEB has the library of Large ZX and EMP Rack CoreSense controller.

Termination resistor for XWEB

If XWEB is placed at the beginning or end of the line, please install its termination resistor by adding a jumper in position 2 (JMP2 on the back side of the unit). Do not add the jumper if XWEB is placed in the middle of the RS485 line.

Large ZX CDU connected to XWEB

Large ZX CDU connected to the Dixell XWEB with the Intelligent Store Solution module using RS485 Modbus.

Connect the ZX CDU to the ModBUS network as shown on figure 11.

Connect the network cable to the three-terminal connector on the XWEB port that has been configured as ModBuS port (COM 12, 13, 14).

Connect port "13" of XWEB to port "D0485 +" of CoreSense and port "12" of XWEB to port "D1485 -" of CoreSense for RS485 communication.

Refer to XWEB application manual for the setting of XWEB.

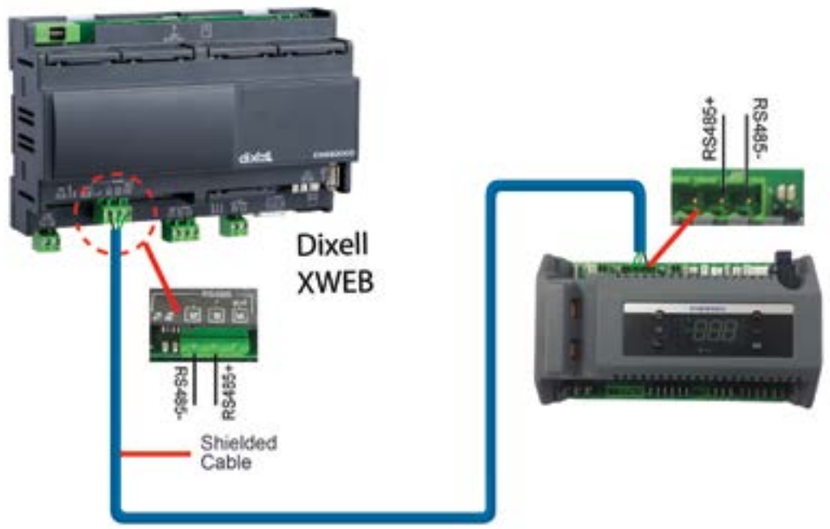


Figure 11. XWEB connected to the Intelligent Store Solution module

Installation

Large ZX CDU is 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 reducing the cooling capacity, which leads to a high-pressure switch tripping. Clean the condenser fins on a regular basis.

Electrical connection

Power supply

Large ZX CDU electrical connection 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 below power supply at ± 10% voltage tolerance. The circuit breaker must be switched off before opening the front panel.

Electrical wiring

Before commissioning, ensure the neutral "N" wire is connected to the terminal block ("N" furthest to the right). After proper connection of the ZX condensing unit, the control LED on the power board and control board will light up (see wiring diagrams for more details). Customers' wire size needs to be selected to allow for the maximum operation current of each unit.

Refrigeration piping installation

All interconnecting pipes 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 (e.g. two hours), pipes should be re-capped to prevent moisture and contaminants from entering the system.

Do not assume that the service connection sizes on the unit (at the service valves) are 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 pipes within our units, these service connection sizes are adequate. All interconnecting pipes should be sized to satisfy the duty required.

The suction line of condensing unit must be well insulated. Large ZX is featured with vapor injection, thus the liquid line must be insulated too, because 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 1/100~1/200. 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 below:

Tube size	Max distance between two clamp supports
12.7 mm (1/2 inch)	1.20 mm
16.0 mm (5/8 inch)	1.50 mm
22.0 mm (7/8 inch)	1.85 mm
28.5 mm (1 1/8 inch)	2.20 mm
34.93 mm (1 3/8 inch)	2440 mm

Suction filter

When brazing, the system should be protected with an inert gas such as nitrogen at a very low pressure. Only materials and components approved for refrigeration engineering are suitable.

It is necessary that all impurities (dirt, brazing scale, flux, etc.) are removed from the system before operation to avoid breakdowns. Many of these impurities are so small that they can pass through a filter and enter the suction side of the compressor. Other blockages can occur in the suction filter, and a high pressure drop can cause damage. For this reason, it is strongly recommended the usage of a large suction filter (which causes only a minimal drop of pressure) on all installations which are to be assembled on site in cases where the required cleanliness cannot be guaranteed. The suction filter core is highly recommended to be changed after first time 72 hours commissioning.

STAS Series

For selection of Emerson flow controls STAS filter drier for Large ZX please contact Application Engineering in your region.

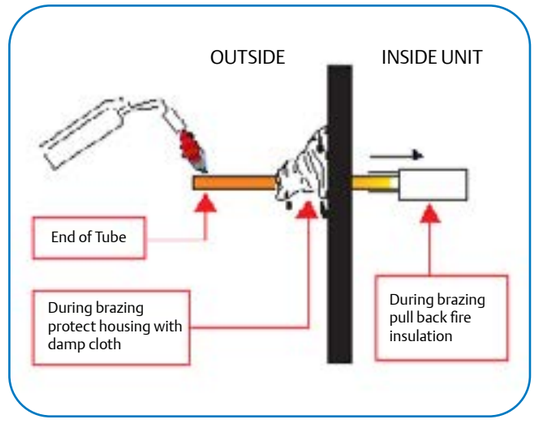
Liquid line insulation

Large ZX is featured with vapor injection, the liquid line must be insulated with at least 19 mm thick, to avoid sub-cooling loss through heat absorption from ambient.

Brazing recommendations

Maintain a flow of oxgen-free nitrogen through the system at a very low pressure during brazing. Nitrogen displaces the air and prevents the formation of copper oxides in the system. If copper oxidization is allowed to form, the copper oxide material can be swept later through the system and block screens such as those protecting capillary tubes, thermal expansion valves, and accumulator oil return holes. This minimizes any entry of contaminants and moisture.

- Remove the liquid line connetion cap.
- Then remove the suction connection cap.
- Open both valves midway. Care should be taken to avoid the holding charge from releasing too quickly.
- Be sure that tube fitting inner diameter and tube outer diameter are clean prior to assembly.
- Since both tubes are extended from the condensing unit housing, we recommend insulating 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, use a silver allloy rod, either flux coated or seperate.
- Use a double tip torch.



Expansion valve selection for low ambient application

For systems expected to operate in varying ambient conditions - namely summer and winter temperatures - the expansion valve (TXV or EXV) sizing should take into consideration the maximum expected saturated condensing temperature at high ambient conditions (summer) and the minimum expected saturated condensing temperature during low ambient conditions (winter).

The chosen expansion valve's operating capacities should all be well within these limits to ensure satisfactory system performance

The liquid refrigerant from the low temperature ZXLD unit in liquid line is subcooled to very low temperature when it goes through PHE, so system expansion valve selection should take it into consideration. The table below lists the reference liquid line temperature.

Standard supply temperature °C R404A

Evaporation temperature °C	Ambient temperature °C					
	20	27	32	38	43	48
-40	-8	-1	3	8	13	19
-35	-4	2	6	11	15	21
-30	0	6	9	13	18	23
-25	5	10	13	17	21	26
-20	9	14	17	20	24	30
-15	13	18	21	24	28	34
-10	18	23	27	32	36	-
-5	21	27	31	27	42	-

Location and fixing

Large ZX should always be installed in a location free of other source of heat radiation and not be blown by wind in winter time. The place should have clean air circulation. The minimum operating space for unit are described in below figures. Where multiple units or racks are to be installed in the same location, the contractor needs to consider space for each equipment carefully. The installation location should avoid the affecting to surrounding residents, without air blows directly to residents' windows.

The units should be mounted on a solid concrete slab with anti-vibration pads between unit feet and concrete. When the installation location is easy of water accumulation, the mounting base should have a certain height of cement base station at about 300 mm. At snowy areas, there should be additional cover be installed on top of the unit besides a cement base in the bottom. The snow cover should be mounted at least 1500 mm higher than top of the unit.

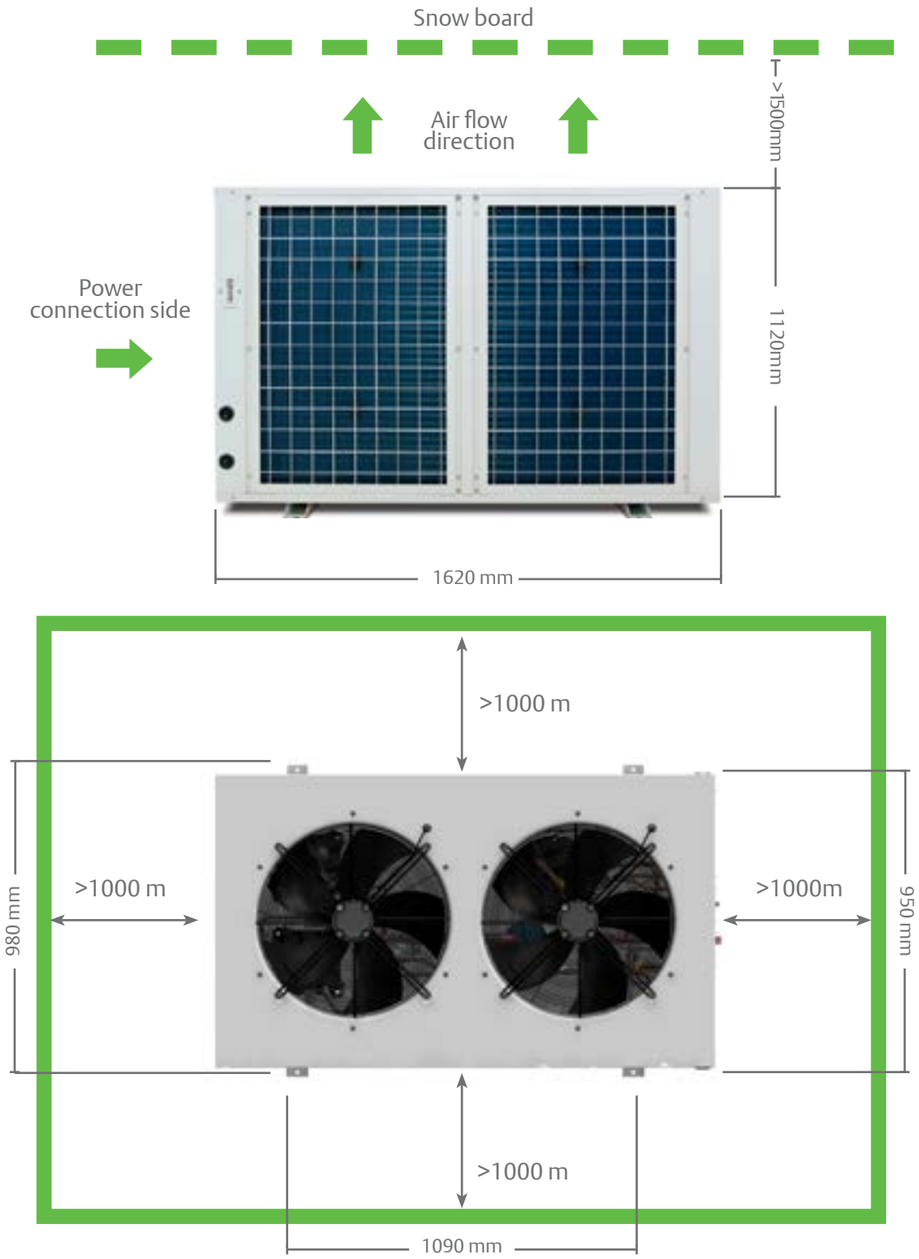


Figure 12. 12-16HP Large ZX fixing

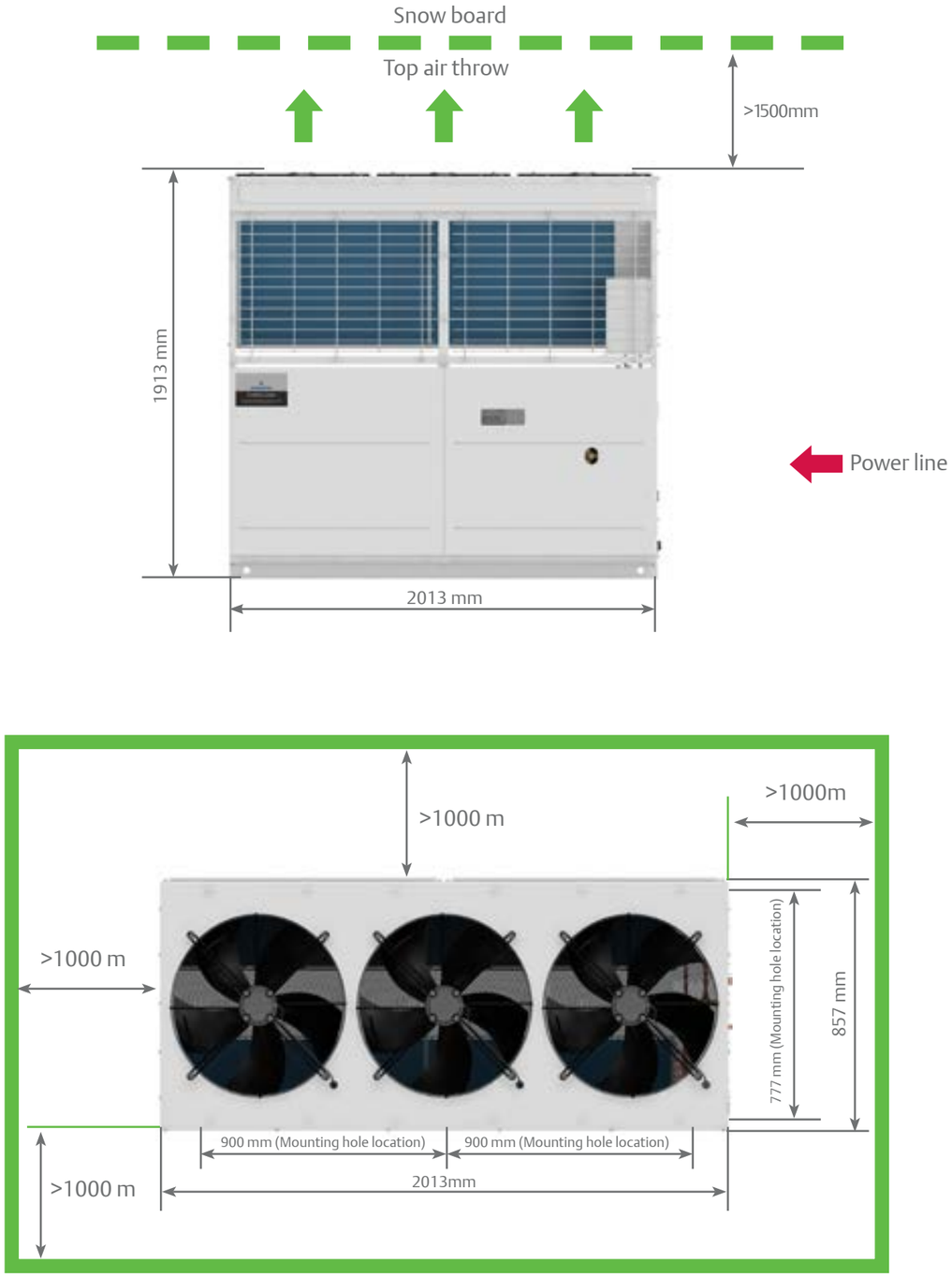


Figure 13. 20HP Unit fixing

Lifting of Unit

Condensing unit vshould always be kept vertical during transportation or operation. Refer to the figures below for the lifting method.

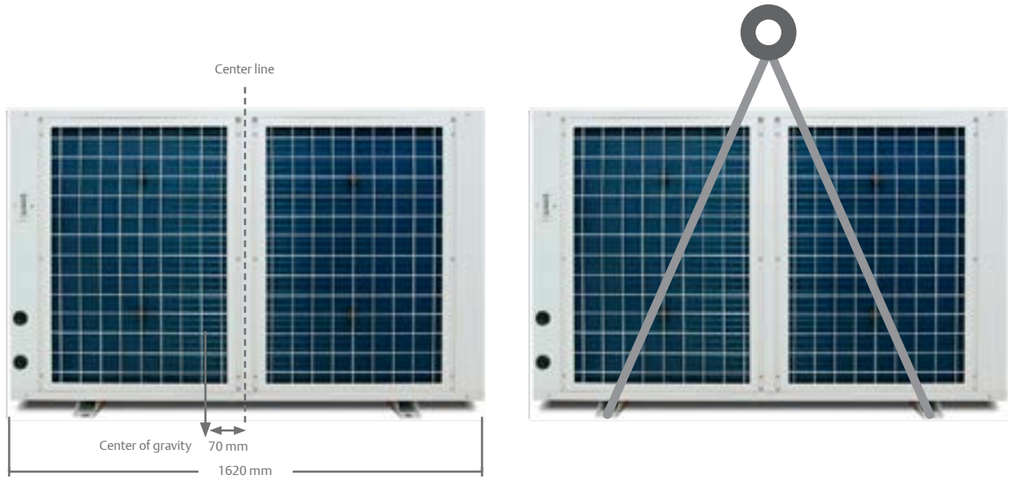


Figure 14. 12-16HP Large ZX and lifting

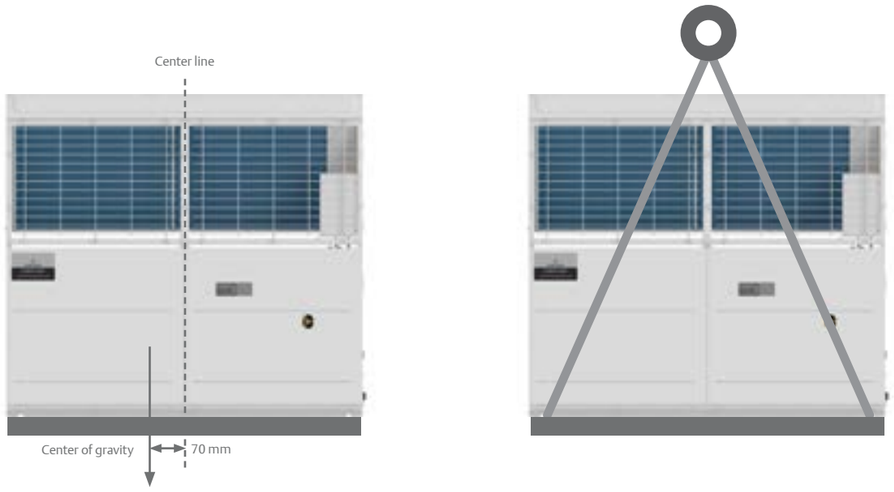


Figure 15. 20HP Unit lifting

Start Up and Operation

Before commissioning, make sure that all valves in condensing unit are fully opened. Make sure that each protector's wiring is normal and in working condition.

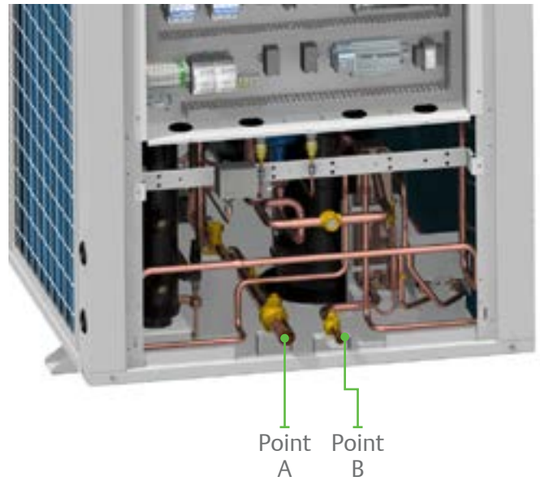
Leak detection and pressure holding

During pressure holding, the high pressure should be less than 18 barg, and the low pressure should be less than 12 barg. Vacuum method is also allowed to detect leaks.

Vacuuming

Do not use the compressor to vacuum the system!

The evacuation procedure is based upon achieving an actual system vacuum standard and is not time dependent. Before the installlation is put into commission, it has to be evacuated with a vacuum pump. Proper evacuation reduces residual moisture to 50ppm. 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 30Pa (225umHg). Pressure must be measured using a vacuum pressure gauge on the access valves and not on the vacuum pump; this is done to avoid incorrect measurements resulting from the pressure gradient along the connecting lines to the pump.



Before vacuuming, make sure the manual valves are opened. Please refer to the figure on the right, vacuum operation must be performed separately from points A and B.

Refrigerant charging procedure

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 where there is insufficient suction gas. Sufficient 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. **Do not charge vapor refrigerant into Large ZX condensing unit.** The suction service valves must be fully opened at any time while the compressor is running.

Refrigerant should be fully charged before start-up. The best filling port is at the liquid line service valve. If one-time charge from liquid line is not enough, charging the refrigerant at compressor running may cause to multiple pressure cut off and delayed restart, during which by-pass the low-pressure control and low-pressure protection are prohibited.

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

For Large ZX unit, configured with PHE sub-cooler, please charge liquid refrigerant from point C. After starting up, you can continue to charge liquid refrigerant from point A. When there is insufficient refrigerant charge, there is gas in the moisture indicator, the controller will show E47 (electronic expansion fully open) or E48 (injection shortage) warnings. After there is no gas bubble in the moisture indicator, please continue to charge about 1 kg of refrigerant.

Oil charging procedure

Emerson Large ZX are supplied with oil charge in compressor at the factory. Please confirm the oil level in the oil sight glass of the compressor after a short period of trial operation. If the oil level is above half of the sight glass, it can be considered sufficient oil. If oil charging is needed, charge oil through the needle valve port on the suction service valve.

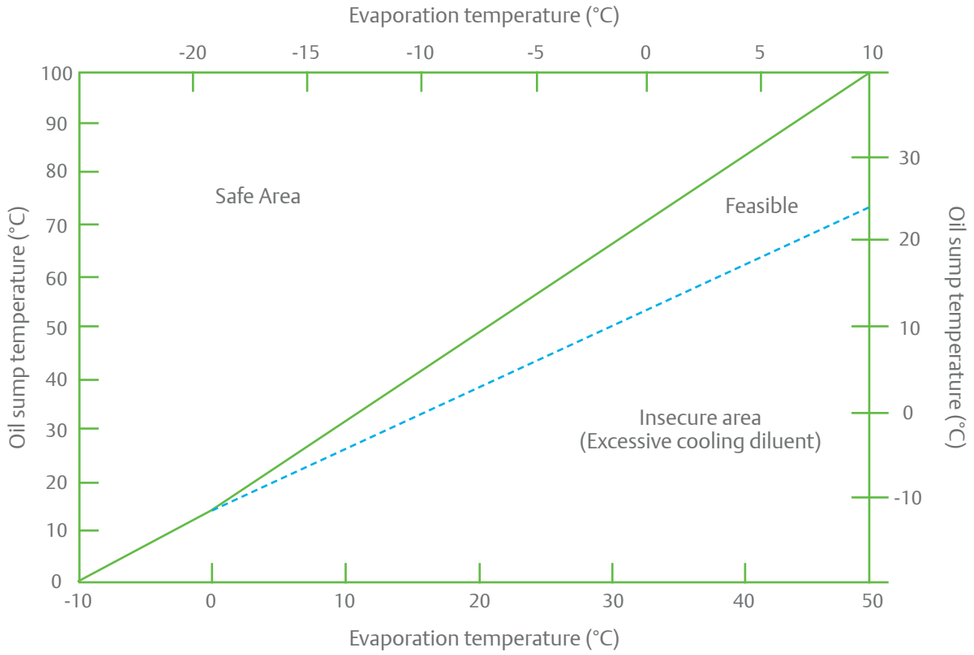
When the length of one-way pipeline exceeds 20m, it is necessary to add oil at mid-glass in the upper oil sight glass of the oil reservoir before unit start up. If the oil level goes down below the lower oil sight glass after system running stable, it is suggested to add oil at least to mid-glass in the lower oil sight glass.

Qualified refrigerant and oil

Refrigerant	Oil
R404A, R507, R448A, R449A, R407F	Emkarate RL 32 3MAF Mobil EAL Arctic 22 CC

Check before starting & during operation

- Check all the valves are fully opened, to prevent trapping liquid.
- After starting and running stable, it is recommended to check the compressor oil level
- to confirm whether it is necessary to refuel the oil (halfway up the sight glass).
- Discharge line temperature should be lower than 125°C, discharge pressure should be
- lower than 28 barg, and the operating current is within the normal range.
- The oil sump temperature at the bottom of the compressor should be within the safe
- range shown in the figure below:



Alarm Codes

Level	Description
Warning	The unit (including the compressor) will keep running, but some status & data is already in an unsafe range; alarm dry-contact will not close; reset automatically
Alarm	The unit (including the compressor) may run not with full functions; alarm dry-contact will not close; reset automatically
Lock	The unit (including the compressor) stops working; alarm dry-contact will close; manual reset is needed

Code	Description	Possible Reasons	Action	Reset
E01	Suction pressure sensor failure alarm	Sensor failure or overrange	Digital compressor operates in preset mode	Reset automatically when the sensor is working
E02	Condensing pressure sensor failure alarm	Sensor failure or overrange	Function: fan speed control is disabled	Reset automatically when the sensor is working
E03	Digital compressor discharge line temperature sensor failure alarm	Sensor failure or overrange	Function: discharge temperature protection is disabled	Reset automatically when the sensor is working
E04	PHE vapor inlet temperature probe failure alarm	Sensor failure or overrange	Function: PHE superheat control is disabled	Reset automatically when the sensor is working
E05	PHE vapor outlet temperature probe failure alarm	Sensor failure or overrange	Function: PHE superheat control is disabled	Reset automatically when the sensor is working
E06	Ambient temperature probe failure alarm	Sensor failure or overrange	Related functional disabled	Reset automatically when the sensor is working
E07	Fixed-speed compressor discharge line temperature sensor failure alarm	Sensor failure or overrange	Fixed-speed compressor discharge line temperature protection function disabled	Reset automatically when the sensor is working
E09	1# current sensor fault alarm	Current overrange	Current protection function disabled	Reset automatically when the sensor is working
E10	2# current sensor fault alarm	Current overrange	Current protection function disabled	Reset automatically when the sensor is working
E11	1# voltage sensor fault alarm	Voltage overrange	Voltage protection disabled	Reset automatically when the sensor is working
E12	2# voltage sensor fault alarm	Voltage overrange	Voltage protection disabled	Reset automatically when the sensor is working
E13	3# voltage sensor fault alarm	Voltage overrange	Voltage protection disabled	Reset automatically when the sensor is working
E20	Missing phase alarm	One or two phases of the compressor power supply are missing or the voltage sensor is working abnormally	The compressor will be tripped	Automatically with time delay
L20	Missing phase lock	Missing phase alarm happened frequently	The compressor will be tripped and the unit will be locked	Press "Start" > 5 seconds or manually power cycle
L21	Wrong phase sequence lock	Compressor power supply has wrong sequence	The compressor will be tripped and the unit will be locked	Press "Start" > 5 seconds or manually power cycle

Code	Description	Possible Reasons	Action	Reset
E22	Three-phase imbalance warning	3-Ph voltages are not balanced	no	no
E23	Digital compressor over current alarm	Digital compressor current is larger than settings	The compressor will be tripped	Automatically with time delay
L23	Digital compressor over current lock	Digital compressor over current alarm happens frequently	The compressor will be tripped and the unit will be locked	Press "Start" > 5 seconds or manually power cycle
E26	Low voltage alarm	Voltage is lower than settings; or voltage sensors do not work	The compressor will be tripped	Automatically with time delay
L26	Low voltage lock	Low voltage alarm happens frequently	The compressor will be tripped and the unit will be locked	Press "Start" > 5 seconds or manually power cycle
E27	Over voltage alarm	Voltage is higher than settings	The compressor will be tripped	Automatically with time delay
L27	Over voltage lock	Over voltage alarm happens frequently	The compressor will be tripped and the unit will be locked	Press "Start" > 5 seconds or manually power cycle
E28	Digital compressor built-in protector opens alarm	Digital compressor built-in protector opens	The digital compressor will be tripped	Automatically with time delay
E31	Fix speed compressor over current alarm	Fix speed compressor current is larger than settings	The compressor will be tripped	Automatically with time delay
L31	Fixed speed compressor over current lock	Fix compressor over current alarm happens frequently	The compressor will be tripped and the unit will be locked	Press "Start" > 5 seconds or manually power cycle
E32	Fix speed compressor built-in protector opens alarm	Fixed speed compressor built-in protector opens	The digital compressor will be tripped	Automatically with time delay
E40	High pressure switch alarm	High pressure switch is open	The digital compressor will be tripped	Automatically when HP switch closes
L40	High pressure switch lock	High pressure switch alarm happens frequently	The compressor will be tripped and the unit will be locked	Press "Start" > 5 seconds or manually power cycle
E41	Low pressure switch alarm	Low pressure switch is open	The digital compressor will be tripped	Automatically when LP switch closes and time delay
E44	Digital compressor discharge line temperature overheating alarm	Digital compressor Discharge temperature is higher than settings	The digital compressor will be tripped	Automatically when discharge temperature is lower than settings and time delay
L44	Digital compressor discharge temperature overheating lock	Digital compressors high discharge temperature alarm happens frequently	The compressor will be tripped and the unit will be locked	Press "Start" > 5 seconds or manually power cycle
E45	High condensing pressure warning	Condensing pressure is higher than settings	no	Automatically when condensing pressure is lower than settings
E46	High condensing temperature warning	Condensing temperature is higher than settings	no	Automatically when condensing temperature is lower than settings
E47	EXV full-open warning	Less refrigerant charge or leakage	no	Automatically reset when the EXV is not fully open
E48	Less injection warning	Less refrigerant charge or leakage	no	Automatically when PHE super heat is smaller than settings

Code	Description	Possible Reasons	Action	Reset
E50	Liquid flood back warning	Low evaporator super heat or Too much liquid injection to the compressor	no	Automatically when the difference of discharge temperature and condensing temperature is higher than settings and time delay
E55	Fix speed compressor discharge line temperature overheating alarm	Fix speed compressor Discharge temperature is higher than settings	The digital compressor will be tripped	Automatically when discharge temperature is lower than settings and time delay
L55	Fix speed compressor discharge temperature overheating lock	Fix speed compressors high discharge temperature alarm happens frequently	The compressor will be tripped and the unit will be locked	Press "Start" > 5 seconds or manually power cycle
E56	Compressor oil shortage alarm	Compressor lack of oil	The digital compressor will be tripped	Automatically with time delay
L56	Compressor oil shortage lock	Compressor lack of oil alarm happens frequently	The compressor will be tripped and the unit will be locked	Press "Start" > 5 seconds or manually power cycle
E80	RTC warning	The time is configured for the new controller	no	Automatically when finish time configuration
E81	RTF warning	Communication error between MCU and unit clock	no	Automatically when the communication recovers
E82	Probe configuration error alarm	The same probes are configured	no	Automatically when the probes are configured correctly
E83	Digital inputs configuration error alarm	The same digital inputs are configured	Related functional failure	Automatically when the digital inputs are configured correctly
E84	Compressor configuration error alarm	Digital compressor and solenoid valve configuration does not match	The compressor will not work	Manually power off and power on after the compressor configuration is right
E85	Injection probe configuration error alarm	EXV and injection configuration dnot match	EXV will not work	Automatically when injection probe is configured correctly
L86	EEPROM read/write error lock	Write/read error into EEPROM	The compressor will tripped and the unit will be locked	Hold “start” button for 5s or manual power off and on, alarm will disappear when the communica-tion between MCU and EEPROM is success.

Troubleshooting

Digital compressor Fixed-speed compressor

Fault phenomenon	Direct cause	Inspection analysis and adjustment
Before the following troubleshooting, first of all ensure the correctness, robustness and reliability of all wiring.		
1 Compressor does not start Not bright / flashing, Compressor does not start Long bright, But the compressor does not start	The controller did not receive a start signal	Check whether the low pressure reaches the low pressure set point
		Check terminal No. 3 and NEUTRAL neutral line for 220VAC
		Check whether the wiring of terminal block No. 3 to controller input DI1 is reliable
		Normal shutdown will not start within 3 minutes, waiting time exceeds 3 minutes
	Contactor failure or wiring failure	Check whether the contactor coil A1 has 220V AC. If there is 220VAC, check the virtual connection of the compressor terminal and the contactor coil terminal or replace the contactor; if no 220VAC, check if the controller C2 FireWire is connected properly
	Controller failure	Replace the controller
	Electricity failure	Need to confirm that the power supply voltage and waveform are normal
	The fuse is blown	Replace the fuse and monitor the current after restart
	Air switch trip	Need to confirm whether over current, whether leakage, grounding is normal, whether the air switch itself is faulty
	Contactor failure	Need to confirm whether the contact is stuck, whether the starting voltage is insufficient
	Unit control is in protection status (alarm code display)	Check whether it is a true protection action or a malfunction due to a fault code
	Power supply phase error (L21)	Refer to Article 14 [Phase of three phases] Related Content
	Power Phase Loss (E20 or L20)	Refer to Article 13 [Three-phase phase loss] Related content
	Three-phase voltage imbalance	Need to confirm whether there is a virtual connection of the power line, whether it is used in a phase of high-power single-phase lectrical appliances
	Compressor Overcurrent (E23/L23: Digital Compressor, E31/L31: Constant Speed Compressor)	Refer to Article 15 [Overcurrent Errors] Related Content
	Exhaust pressure too high protection (E40 or L40)	Refer to Article 2[Exhaust Pressure High Protection] Related Content
	Inspiratory pressure too low protection (E41)	Refer to Sections 3, 4 [Insufflation Pressure Protection] Related Content
	Excessive exhaust temperature protection (E44/L44: digital compressor, E55/L55: fixed speed compressor)	Refer to Article 5 [Exhaust temperature protection is too high] Related content
	User-side temperature controller instruction shutdown	Need to confirm whether it has reached the temperature set point, whether it enters the defrost program, whether the thermostat is faulty
	Controller failure or transformer failure	Need to confirm the controller display is on replace the controller to see if the fault still exists
	Built-in compressor protection (E28: digital compressor, E32: fixed speed compressor)	Refer to Article 15 [Controller Output Run Command but No Compressor Current Detected]
	Power supply voltage is too low	A) Check whether the power supply voltage deviation meets the unit usage requirements
	Capacitor failure	A) Confirm that the capacitor wiring and specifications are correct (refer to the unit wiring diagram) B) Check if the capacitor is damaged

Fault phenomenon	Direct cause	Inspection analysis and adjustment
2 Code "E40 or L40" Discharge pressure High protection or lock	If the high pressure is high (high pressure protection value 30 kg):	
	Shutoff valve or other system valve forgot to open	One-by-one confirmation of system processes
	The ambient temperature is too high or the air intake channel is blocked	Improve ventilation and ensure that the return air temperature of the condenser is equal to the ambient temperature outside the building, ensure sufficient airflow space before and after the unit.
	Condensing fan is working abnormally	Reference No. 12 [Condensing fan does not operate, or operates abnormally
	Dirty condenser surface	Sweep condenser
	Too much refrigerant	For non-azeotropic refrigerants, such as R404A, release some of the refrigerant from the stop valve of the liquid tube, and use slow release to prevent excessive loss of the lubricant.
	Air inside the system	There may be intermittent air bubbles in the sight glass. If it is confirmed that air is in system, need to remove air (re-vacuum and add refrigerant)
	Over-throttle	A) Check throttling device is normally open B) Choosing throttling device is too small
	High pressure switch failure	Short-circuit the two ends of the controller directly to connect the high pressure switch, and confirm whether the high pressure switch is damaged
	FireWire to C2 port is open all the way	If the "E40 or L40" is reported at the same time the fan is not working, please check: 1. If the two fuses next to the contactor are damaged; 2. Check the terminal block and the controller under the line wiring for loose or wrong connection
	Controller failure	Controller shows error, replace controller
3 Code "E41" suction pressure Low protection (limited to medium temperature unit)	Wrong controller	The controller for medium tempearure unit ZXD and the low temperature unit ZXLD must be used in one-to-one correspondence.
	Low pressure switch and wiring fault	Ensure that the low pressure switch should be closed (turned on) when the low pressure is greater than 1 kg
4 Suction pressure is too low	Shutoff valves in the system does not open properly	Check the system valves one by one
	System lack of refrigerant	Need to confirm whether the charge is insufficient, whether the system leaks. If the system leaks, need to find leak point and handle properly
	Abnormal evaporator, heat exchanger is too small	Need to confirm whether the evaporator fan and the motor are abnormal, whether it is defrosting, defrosting is not clean, whether the drainage is not smooth, and whether the sundries obstruct the airflow passage.
	Expansion valve opening is too small	Whether the expansion valve is blocked or if the expansion valve is improperly adjusted. Whether temperature package leaks
	Filter plugging, suction pipe pressure drop too high	Need to confirm whether filter is dirty, if it is blocked by ice, if it needs to be replaced, replace the filter or replace the filter core
	Part selection deviation	Evaporator selection is too small, or the expansion valve selection is too small, or the unit selection is too large. Recheck the load and select the model. Whether medium temperature units are used for low temperature applications

Fault phenomenon	Direct cause	Inspection analysis and adjustment
5 Code "E44/L44" Digital compressor discharge gas overheating alarm or locked Code "E55/L55" Fixed speed compressor discharge gas overheating alarm or locked	Low pressure during normal operation	Measure operating low pressure. Need to confirm whether the low pressure set in controller is correctly, whether the controller or low pressure switch is faulty. If there is a fault, replace the corresponding device. Also refer to [3. suction pressure Low protection] Related Content
	High pressure during normal operation	To measure the operating high pressure, make sure that the high pressure switch is working properly. If there is a fault, replace the corresponding device. Also refer to [2. Discharge pressure High protection Or lock]
	Suction superheat is too high	Need to confirm whether there is lack of refrigerant, whether the opening of the expansion valve is too small, whether insufficient insulation of the suction pipe
	Injection system failure	A) The need to confirm whether the electronic expansion valve failure: coil damage, dirty or ice blocking. B) Need to confirm if the filter before the electronic expansion valve is blocked. C) It is necessary to confirm whether the inlet/ temperature sensor for PHE is faulty or missing. Refer to the sensor temperature-resistance characteristics table in this manual. D) It is necessary to confirm whether insufficient charging leads to gas-liquid two-phase in the liquid pipe, so that the injection circuit cannot take liquid properly. E) Need to confirm if the controller is faulty.
	Refrigerant mixed with impurities, refrigerant composition changes	Re-evacuation and charge of qualified refrigerant
	System lacks of refrigerant	1, the sight glass should be full glass status. 2, the liquid pipe should have sufficient subcooling. Need to confirm whether the charge is insufficient, whether the system leaks. If leaks need to find leak point and handle properly
	Compressor failure	It is necessary to confirm whether the compressor current corresponds to operating high and low pressure. If not, the compressor may have worn
	Discharge temperature sensor and wiring fault (measured discharge temperature is less than 125 degrees)	Check if the sensor fails and check if the sensor falls out. Refer to the sensor temperature-resistance characteristics table in this manual
6 The system continues to have liquid, back Suction superheat less than 5K (such as frost o compressor body in medium tempearature unit)	Expansion valve opening too large	Need to confirm whether the expansion valve is oversized and whether it is excessive opening
	Abnormal evaporator, heat exchanger is too small	Need to confirm whether the evaporator fan and the motor are abnormal, whether it is defrosting, defrosting is not clean, whether the drainage is not smooth, and whether the sundries obstruct the airflow passage.
	Too much refrigerant	For non-azeotropic refrigerants, such as R404A, release some of the refrigerant from the stop valve of the liquid tube, and release slowly to prevent excessive loss of the lubricant.

Fault phenomenon	Direct cause	Inspection analysis and adjustment
7 Frequent compressors start up	If the compressor starts frequently during the defrosting process:	
	Operating suction pressure low due to low load	Need to confirm whether the unit selection is too large, the expansion valve selection is too small. Consider taking all indoor evaporator synchronization defrosting procedures
	Leakage of liquid line solenoid valve	Check if the low pressure rises during stop, replace the corresponding equipment (coil or valve body) when confirming the failure of the solenoid valve.
	Too much pressure drop in suction piping	Measure the pressure change at compressor suction and evaporator outlet during the shutdown process. It may be that the compressor suction pressure has decreased to the stop setting and the evaporator side liquid refrigerant has not completely evaporated. Need to improve piping design
	If the compressor is frequently started during normal operation:	
	The unit is at initial startup	It is normal phenomenon. At first time start after power on or over 1 hour shut off, the unit is in initial start procedure, during which the compressor will strat up 3 times with 3 seconds running in each time, each time with 20 seconds interval.
	Frequent compressor protection (alarm code display)	Refer to [Compressor overcurrent], [Discharge pressure high pressure], [Suction pressure too low protection], [Discharge gas overheating] related content for detailed system check
	Thermostat failure	Check if the temperature difference between the start and stop of the thermostat is too small, and whether the thermostat fault frequently issues a stop command. If there is a fault, replace the corresponding device
	Controller failure	Try to replace the controller and see if the fault persists
	Low pressure during normal operation	Measure operating low pressure. Need to confirm whether the low pressure set is correctly, whether the low pressure switch is faulty? If there is a fault, replace the corresponding device. Also refer to the relevant content of Article 3 [suction pressure Low protection]

Fault phenomenon	Direct cause	Inspection analysis and adjustment
8 Abnormal noise	Compressor reverse running	Swap any two-phase wiring
	The compressor is overloaded	Check if the high-pressure pressure is running high, whether the low-pressure pressure is low, and whether the pressure ratio is too large.
	The compressor oil level is too low or too high	Confirm the oil level and perform oil drain or replenishment
	Too much refrigerant	Release some of the refrigerant from the stop valve liquid line slowly to prevent excessive loss of lubricating oil
	Continuous liquid back	Check if compressor oil tank temperature is low
	System with liquid start	Check whether the compressor crankcase heater is working during compressor stops and whether the liquid solenoid valve leaks.
	Compressor internal failure	Check if the compressor current corresponds to operating high and low pressure. If it is too high, it may indicate that the inside of the compressor may have worn
	Unit resonance	Try to press each pipe, bracket, housing, condenser, etc., and observe if the noise changes. After confirming the source of noise, reinforce, separate, or add sponge cushions to the corresponding parts.
	Unit contacts surrounding objects	Ensure that the space around the unit is clean and open, and that the unit body does not touch other objects (such as wires, sundries, etc.)
	Unit installation is loose	Re-confirm that the feet of the unit are firmly installed, no nuts in loose and no feet are impending
	Low condensing pressure	Low Ambient Kit (BOM-*81) should be selected in extremely low ambient areas, check if the fan speed control is normal
9 Cooling capacity cannot meet load demand	The unit is operating normally	Check if the unit operating is normal by checking if high pressure, low pressure, current, discharge temperature, return gas temperature, oil temperature are within a normal range. If yes, it is possible that the outdoor or indoor equipemnt selection is too small, and the system needs to be redesigned.
	Unit protection	Refer to above related content for detailed system check
	The compressor itself is working abnormally	Refer to section 1[Compressor does not start] for detailed system check]
	Flash gas before system expansion valve	The liquid line should be full of liquid before expansion valve (sight glass should be installed before the expansion valve)
	Liquid supply pipe insulation for units with PHE	The liquid supply pipe should be well insulated for units with PHE
	System lack of refrigerant	1, the sight glass should be full glass liquid 2, (for units with PHE) The liquid pipe should have sufficient subcooling, check whether the charge is insufficient and whether the system is leaking. If the system leaks, need to find leaking point and fix it
	Abnormal application status	Check the working status of the evaporator, check if the cooler's door is closed, check the goods temperature when putting into the cooler

Fault phenomenon	Direct cause	Inspection analysis and adjustment
10 Controller has no display	Circuit breaker cannot be turned on after closing	When the breaker is closed, the breaker has 380V input voltage and output voltage
	Natural wiring error	Any line-to-neutral voltage is 220VAC
	Broken fuse	Whether the two fuses next to the contactor are damaged
	Transformer damage	Measure whether the transformer input has 220V voltage and whether the output has 24V voltage. If the output is abnormal, replace the transformer.
11 Controller does not work	Controller code does not change or garbled	Power off and power on the unit, after re-start the controller, if the fault disappears, the fault can be ignored.
	Controller failure	If the fault continues, replace the controller
12 The condenser fan is not running, or in abnormal operation	Check if the fan blade is damaged	Check if the fan blade is damaged
	Check if fan motor malfunctions	Fan should be connected to fan capacitor and wired to 220VAC; check if fan motor failure or fan capacitor failure
	Check if the fan capacitor is damaged	Fan should be connected to fan capacitor and wired to 220VAC; check if fan motor failure or fan capacitor failure
	If above causes are excluded, replace the controller	Note: The condensing fan speed control is based on the condensing temperature collected, when condensing temperature sensor failures, will use ambient temperature sensor for speed control, if both sensors fail, the fan will be fully open. Refer to the sensor temperature-resistance characteristics table in this manual
13 Code "E20" or "L20" three-phase phase missing	Controller H25 parameter setting error	Check the label of the unit and check whether the parameters of the controller H25 are set correctly. The three-phase power is set to Yes and the single-phase is No. Please pay special attention to this after replacing the controller
14 Code "L21" three-phase phase Fault	The phase sequence of the unit incoming 3-ph lines is incorrect	Check the three-phase incoming line of the unit and exchange the two phases of the breaker input line.
	Controller three-phase error	Check whether the three-phase input of R, S, T in the lower left corner of the controller is consistent with the phase sequence on the terminal of the compressor (U, V, W). Take special attention when replacing a new controller.

Fault phenomenon	Direct cause	Inspection analysis and adjustment
15 Code "E28" controller outputs digital compressor operation instructions, No current detected Code "E32" controller outputs fix speed compressor operation command, No current detected	Built-in compressor protection	Measure the resistance between the terminals of the compressor to determine if the resistance is infinite and whether the three-phase resistance is balanced. After the compressor is fully cooled, try to start again. If normal operation can be performed again, please refer to [Compressor overcurrent], [Discharge pressure high protection], [Suction pressure low protection] and [Discharge gas overheating] to perform detailed system checks.
	Compressor motor burned	Measure the resistance between the terminals of the compressor. If it is confirmed that the compressor is faulty, replace the compressor.After restarting, you must refer to [Compressor overcurrent], [Discharge pressure high protection], [suction pressure low protection], [Discharge gas overheating] to perform detailed system checks.
	Compressor mechanical failure	Need to confirm whether the current is too high, whether the noise is high, with or without abnormal noise. If it is confirmed that the compressor is faulty, replace the compressor. After restarting, you must refer to[Compressor overcurrent], [Discharge pressure high protection], [suction pressure low protection], [Discharge gas overheating] to perform detailed system checks.
	Contactor and wiring fault	Check the three-phase voltage at the lower end of the contactor to determine whether there is loose or virtual connection, and replace the contactor.
	Controller failure	Replace the controller.
16 Code "E23/L23" Digital Compressor Over current alarm or lock Code "E31/L31" Fix Speed Compressor Over current alarm or lock	Controller current protection setting wrong	Check whether the controller H07/H09 (digital compressor) and H27/H28 (fix speed compressor) parameter values are consistent with the unit label. Especially when replacing a new controller, adjust the controller parameters to match the unit's labeling requirements.
	Contactor failure	Check the three-phase voltage at the lower end of the contactor to determine whether there is loose or virtual, resulting in excessive current due to missing phase.
	Internal damage to the compressor	Measure the actual operating current of the compressor, and determine whether the operating current is too high by refering to the high and low pressures.
17 Code "E03"(digital compressor), "E07" (fix speed compressor) discharge line temperature sensor error	Discharge line temperature sensor falls out or is not heat insulated well	Check if the temperature sensor is out or the heat insulation is not good
	The sensor itself fails	It is recommended to replace the temperature sensor directly
18 Code "E01" Suction pressure transducer failure	Actual suction pressure exceeds the transducer measuring range	Find out why the pressure is abnormal, like if there is no refrigerant in the system, or if the refrigerant is too much, so the pressure in the suction is too high.
	Pressure is normal, sensor connection or sensor itself fails	Check if the sensor wiring is normal and there is no blockage in the pressure tube where the sensor is located. Try replacing the sensor to see if it can eliminate the fault.

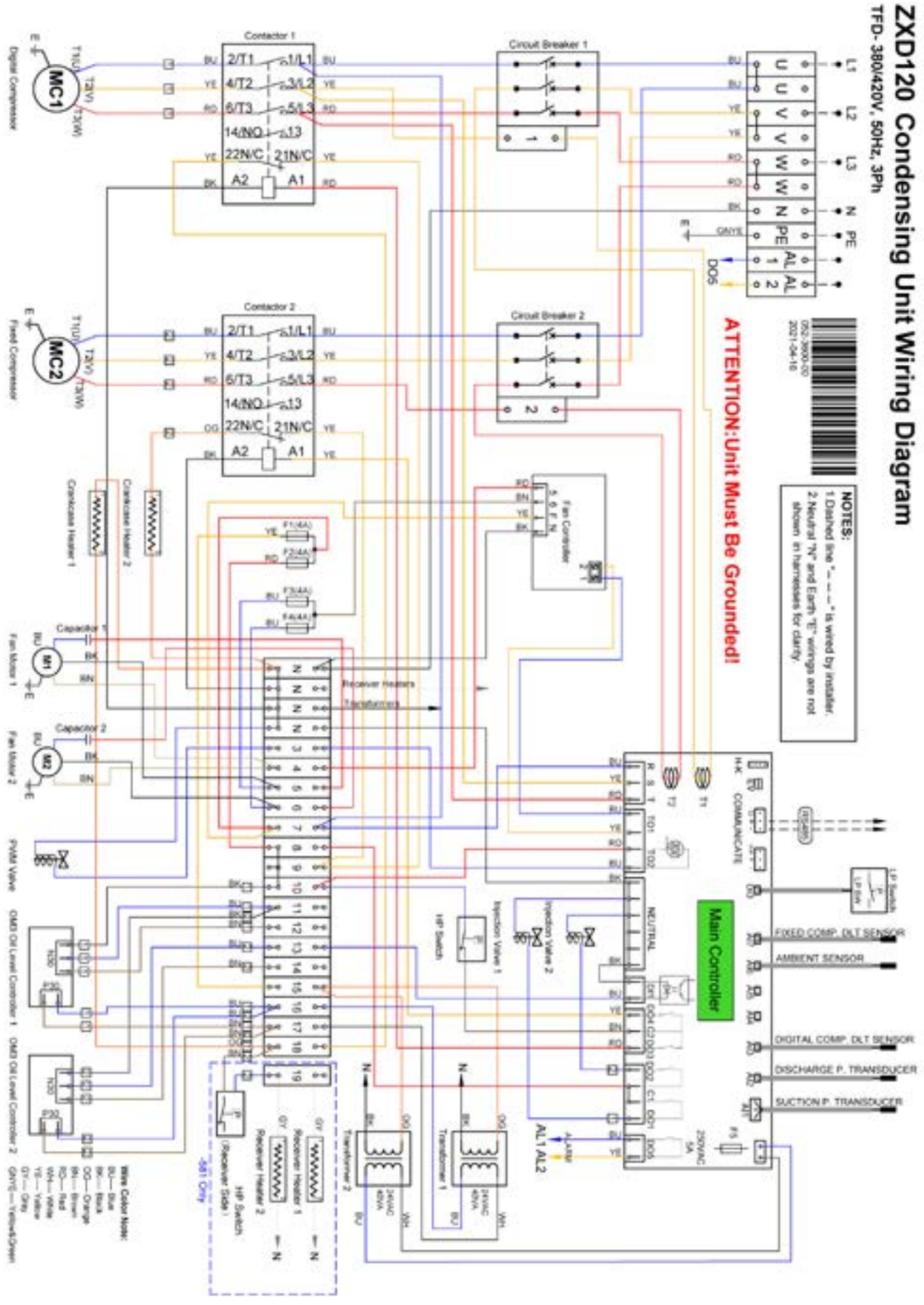
Fault phenomenon	Direct cause	Inspection analysis and adjustment
19 Code "L86" Controller internal memory EEPROM is abnormal	Controller internal memory is abnormal	Check whether the external device has remote communication with the controller, and whether there is any abnormality in the remote communication wiring and signal transmission. If the signal continues to be written into the controller, it will cause its memory to be damaged, and each writing requires a write completion instruction. Try to restart the controller if it can be solved. After the above troubleshooting, if the controller is still abnormal, replace the controller.

Temperature Sensor Resistance Table

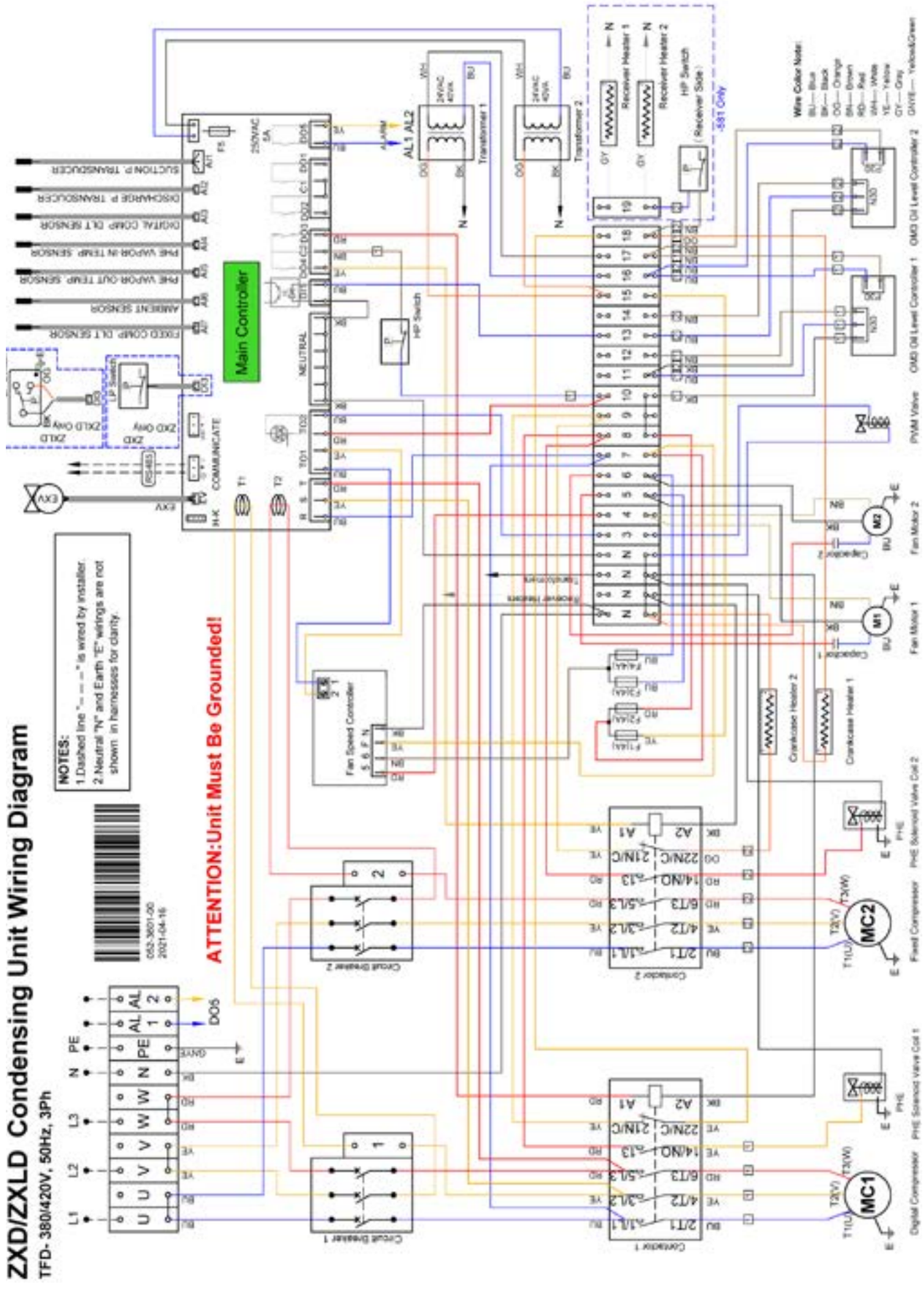
Temperature (°C)	-30	-10	25	60	80	100	120
Discharge line temperature sensor resistance (Ω)	1522k	457k	86k	21k	11k	5.8k	3.4k
Condensing tempreature, PHE vapor inlet and outlet temeprature and ambient temperature sensor resistance (Ω)	111k	67.7k	42.5k	27.3k	17.9k	10k	5.82k

Wiring diagram

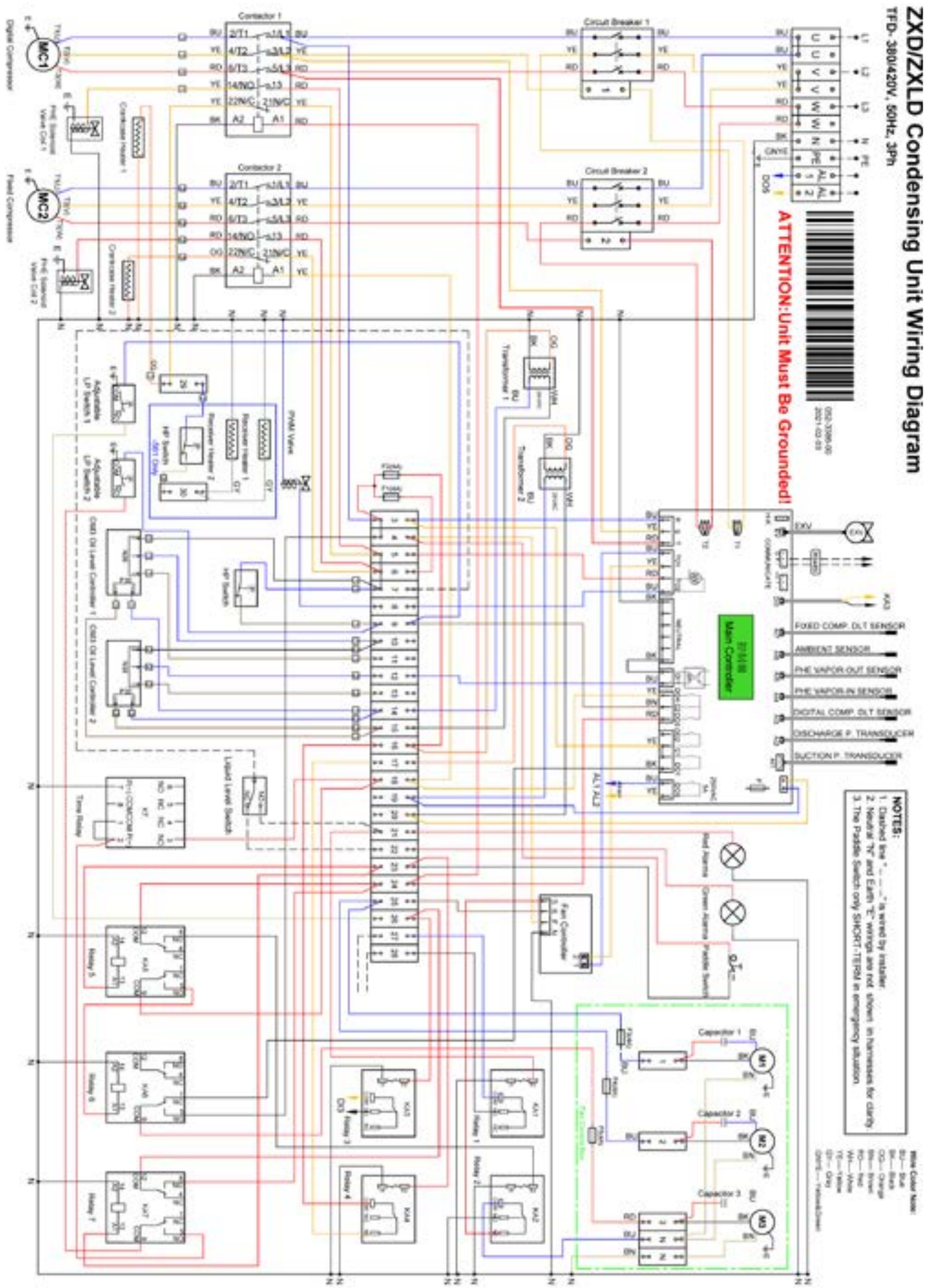
ZXD120BE Condensing Unit Wiring Diagram, BOM-521/551/581
TFD - 380-420V, 50Hz, 3Ph



ZXD160BE, ZXLD120/160BE Condensing Unit Wiring Diagram, BOM-521/551/581
TFD - 380-420V, 50Hz, 3Ph



ZXD200BE, ZXLD200BE Condensing Unit Wiring Diagram, BOM-521/551/581
TFD - 380-420V, 50Hz, 3Ph



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Contact Us

Asia Pacific Headquarters
Suite 2503-10A, 25/F, Exchange Tower,
33 Wang Chiu Road, Kowloon Bay,
Kowloon, Hong Kong
Tel: (852) 2866 3108
Fax: (852) 2520 6227

Australia
356 Chisholm Road
Auburn NSW 2144, Australia
Tel: (612) 9795 2800
Fax: (612) 9738 1699

China - Beijing
Room 1203-1205,
North Wing Junefield Plaza Central Tower,
No. 10 Xuan Wu Men Wai Street,
XiCheng District, Beijing, PRC
Tel: (8610) 5095 2188

China - Guangzhou
Guangzhou Office
Unit 2202B, 22/F, Leatop Plaza,
32 Zhujiang East Road, Tianhe Dist.,
Guangzhou 510623, PRC
Tel: (8620) 8595 5188

China - Shanghai
Shanghai Sales Office
7/F, Emerson Building, 1582 Gumei
Rd, Shanghai, PRC
Tel: (8621) 3338 7333

India - Mumbai
601-602, 6/F Delphi B-Wing,
Central Avenue,
Hiranandani Business Park,
Powai, Mumbai 400076, India
Tel: (9122) 6786 0793
Fax: (9122) 6662 050

Egypt
P.O. Box 11799
11 &12/ 1138 Mustafa
Refaat Street Sheraton,
Heliopolis Cairo, Egypt
Tel: +20 2 226 5854

India - Pune
Plot No. 23, Rajiv Gandhi Infotech Park,
Phase - II, Hinjewadi,
Pune 411 057, Maharashtra, India
Tel: (9120) 4200 2000
Fax: (9120) 4200 2099

Indonesia
23/F North Tower,
Sampoerna Strategic Square–
Jl. Jend. Sudirman Kav. 45-46,
12930, Jakarta Indonesia
Tel: (6221) 2509 1400,
(6221) 5793 1000
Fax: (6221) 5793 0883

Japan
No. 3-9-5 Shin-Yokohama,
Shin-yokohama Tosho Building,
Kohoku-ku, Yokohama,
222-0033 Japan
Tel: (8145) 475 6371
Fax: (8145) 475 3565

Malaysia
No. 1, Block A
Jalan SS13/5 Subang Jaya
Selangor 47500, Malaysia
Tel: (603) 5624 2888

Middle East & Africa
PO Box 26382
Jebel Ali Free Zone - South
Dubai, UAE
Tel: (9714) 811 8100
Fax: (9714) 886 5465

Philippines
10/F SM Cyber West Avenue,
EDSA cor. West Avenue,
Barangay Bungad, Diliman,
Quezon City 1105, Philippines
Tel: (632) 689 7200 ext. 4395

South Africa
11 Quark Crescent
Linbro Business Park
Sandton 2065, South Africa
Toll Free: 0800 980 3711

Saudi Arabia
PO Box 34332 - 3620
3620 Building 7874, Unit 1,
67th street 2nd Industrial City
Dammam, Saudi Arabia
Toll Free: 800 844 3426
Tel: (966) 3814 7560
Fax: (966) 3814 7570

South Korea
14/F, NIA Building,
Cheonggyecheon-ro,
Jung-gu 04520, Seoul Korea
Tel: (822) 3483 1500
Fax: (822) 592 7883

Taiwan
3/F, No. 122 Lane 235,
Pao Chiau Rd., XinDianv Dist.,
New Taipei City 23145, Taiwan (R.O.C.)
Tel: (8862) 8912 1360
Fax: (8862) 8912 1890

Thailand
34/F, Interlink Tower,
1558/133, Bangna Trad,
Bangkok 10260, Thailand
Tel: (662) 716 4700
Fax: (662) 751 4241

United Arab Emirates
Jebel Ali Free Zone
P.O. Box 26382, Dubai
United Arab Emirates
Toll Free: 80004413428
Tel: +97148118100
Fax: +97148865465

Vietnam
9.04/F, Block A2, Viettel Tower
285 Cach Mang Thang Tam, District 10
Ho Chi Minh City, Vietnam
Tel: (84) 28 6290 8243

Scan to visit:

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