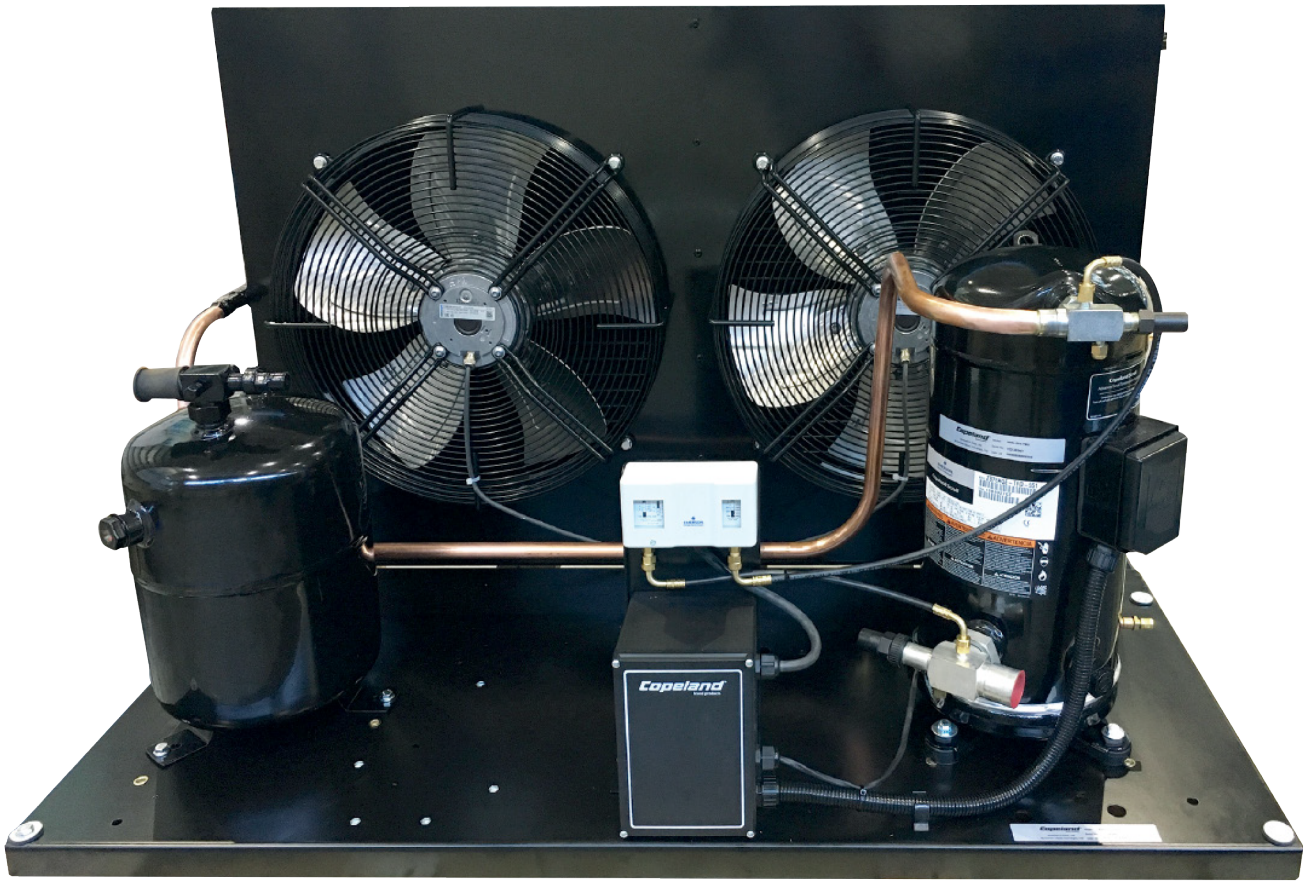
F-series scroll condensing units

For medium and low temperature refrigeration applications

User Manual



COPELAND™

EMERSON™

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Disclaimer and Safety Information

Thank you for purchasing the Copeland Scroll™ F-Seires indoor condensing unit. We hope that this product meets your refrigeration needs efficiently and effectively.
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™ F-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.

Important

The information contained in this manual is critical to the correct operation and maintenance of the condensing unit and should be read by all persons responsible for the installation, commissioning, and maintenance of this unit.

Safety

The equipment has been designed and manufactured to meet international safety standards but, like any mechanical/electrical equipment, care must be taken if you are to obtain the best results.

Caution ⚠
1. Service and maintenance of this unit, that is, Electrical and Mechanical in nature should be carried out by technically trained and competent personnel. They should be familiar with Local Standards and Codes of Practice.
2. When carrying out unit maintenance, ensure that the equipment is disconnected from the electrical power supply.
3. Refrigerant used in this unit is classified under the COSHH regulations as an irritant, with set Occupational Exposure Levels (OEL) for consideration if installed in confined or poorly ventilated areas.

General instructions

Warning ⚠
Risk of collapse! Personal injuries! Move condensing units with the correct mechanical handling equipment. Keep the units in the upright position. For storage stack units one on top of the other (max. 2 high), for transport do not stack at all. Keep the packaging dry at all times.

Rapid release of pressurised gas! Personal injuries! Units are factory charged with pressurised dry air to between 1.5 and 2 bar to ensure no ingress of air or moisture during transit. Pressure must be safely reduced prior to fully opening connections or removing blanking components.

System breakdown! Personal injuries! Systems without a full charge or with the service valves closed should be electrically locked/tagged if left unattended. Only approved refrigerants and refrigeration oils must be used. Never block the condenser fins, ensure continual airflow through the condenser.

High pressure! Injury to skin and eyes possible! Be careful when opening up a pressurized component or system.

High pressure! Personal injuries! Use of safety relief valves according to EN 378 is mandatory. Consider personal safety requirements and refer to test pressures prior to test.

Rotating machinery! Personal injuries! When the unit is running do not put your hand inside the unit or remove the fan guard, protective covers etc. Electrically isolate the unit removing fuses before working on the unit.

Warning 
Conductor cables! Electrical shock! Shut off the power supply and remove all of the fuses before working on the electrics.

Warning 
Diesel effect! Compressor destruction! The mixture of air and oil at high temperature can lead to an explosion. Avoid operating with air.

System explosion! Personal injuries! DO NOT USE other industrial gases.

Explosive flame! Burning! Oil/refrigerant mixtures are highly flammable. Remove all refrigerant before opening the system. Never work with a naked flame on a refrigerant charged/pressurized system.

Warning 
High surface temperature! Burning! Do not touch the compressor or system pipe-work until they have cooled down. Ensure that other materials in the area of the compressor do not get in contact with it. Mark and secure accessible sections.

Low surface temperatures! Frostbite! Do not touch any surface or pipe-work of the system until they are at room temperature. Mark and secure accessible sections.

Receiving your unit

All units are shipped with a holding charge of Inert Gas inside at a low but positive pressure. Suitable labeling is prominently displayed on both the unit and the packaging. Service connectors are provided on the CDU service valve for the convenient checking of the integrity of the holding charge.

Caution 
It is very important to check that this holding pressure exists at the time you receive each unit from us or our authorized representatives. Please inform us or our authorized representative if the holding charge is non-existent. Failure to do so could void the claim for other related system faults at a later period. Transit damage is essentially an insurance claim and is not covered under 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.

F-Series Scroll Condensing Unit was designed based on key features demanded by industry users:

- Wide operating Envelope
- Low Applied Cost - Factory Built
- Compact design
- Optimal layout of components for easy serviceability
- Energy efficient silent fans
- Condenser coils options available for both moderate and high ambient conditions
- Liquid receiver, HP/LP switch as standard feature
- Local availability
- Pre-wired electrical junction box
- Copeland Scroll™ compressor
- Proven reliability
- Lower sound levels and pulsations
- Dual compliance for superior efficiency and better liquid handling

Nomenclature

F M C 8 A - Z S 0 9 - P F Z - 0

Family series
F series

Condenser model

Revision no.

Compressor model reference

Bill of material
0 –Base supply

Application range

Code	Application	Refrigerant
M	Medium temperature	R-404A/134a
L	Low temperature	R-404A

Unit voltage code

Code	Voltage supply-phase
PFZ	230 V ±10 % - 1~ - 50Hz
TFM	400 V ±10 % - 3~ - 50Hz

Scope of supply

- HP/LP switch
- Crankcase heater
- Liquid Receiver

Scroll compressor features

Dual compliance

Compliance means sealing between the orbiting and fixed scroll involutes. Dual compliance means the sealing is on both the axial and radial directions. This prevents refrigerant leak back across successive scroll pressure pockets. Compliance design also allows the scroll involutes to separate in both the radial and axial directions. This allows debris or liquid refrigerant to pass through the scroll involutes without damaging the compressor. Benefits of dual compliance are:

- Increased efficiency
- Better liquid handling capability
- Better handling of debris

Scroll wear -in

The scroll involutes of Copeland Scroll™ compressor wear-in, rather than wear-out. So unlike in other compressor technologies among similar categories, there is no constant degradation of performance with time due to wear-out.

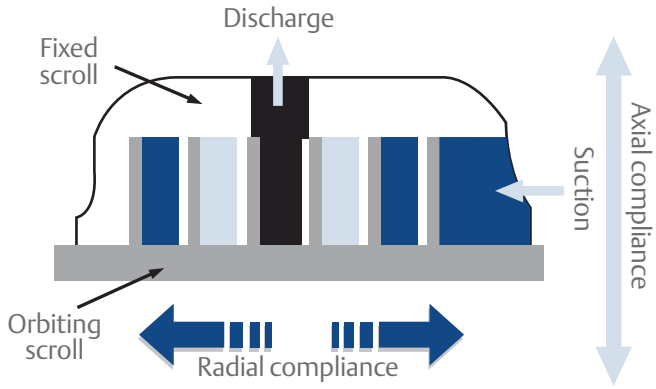


Figure 1

Lower sound, vibration and pulsation

The compression process in a scroll set is symmetrical and continuous. This inherently reduces the sound, vibration and pulsation. This eliminates the need for use of vibration absorbers and suction or discharge mufflers in most of the applications. Further, ZB scroll compressors are engineered to produce smooth sound spectrum which improves the quality of sound.

Unloaded start

The scroll sets separate at the instant of compressor shutdown. This allows the scroll set internal pressures to equalize on compressor stops. In addition to this, the scroll sets are not engaged at the instant of starting. Scroll sets engage only after few milliseconds of startup. This allows easier startup of ZB scroll compressors. Due to this design feature, typically a start assist kit is not required even on single phase compressors.

DU bearings

A space age bearing material comprising of porous bronze with PTFE-lead overlay. These bearings are used in ZB scroll compressors in the scroll drive and main bearings. DU bear-ings work with exceptionally low friction between the load bearing surfaces. In addition, DU bearings can operate safely for a short time with loss of lubrication. This situations could happen on compressor applications due to oil pump out during a flooded start or heavy oil dilution after a defrost cycle.

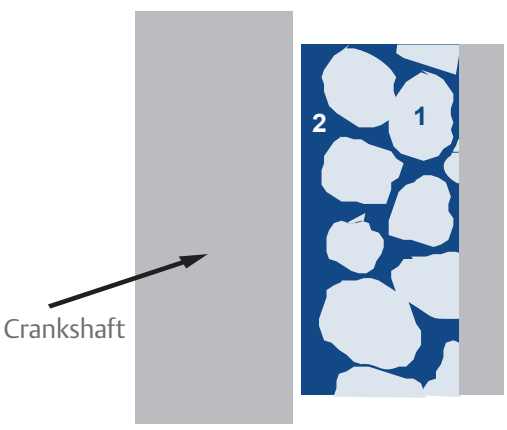
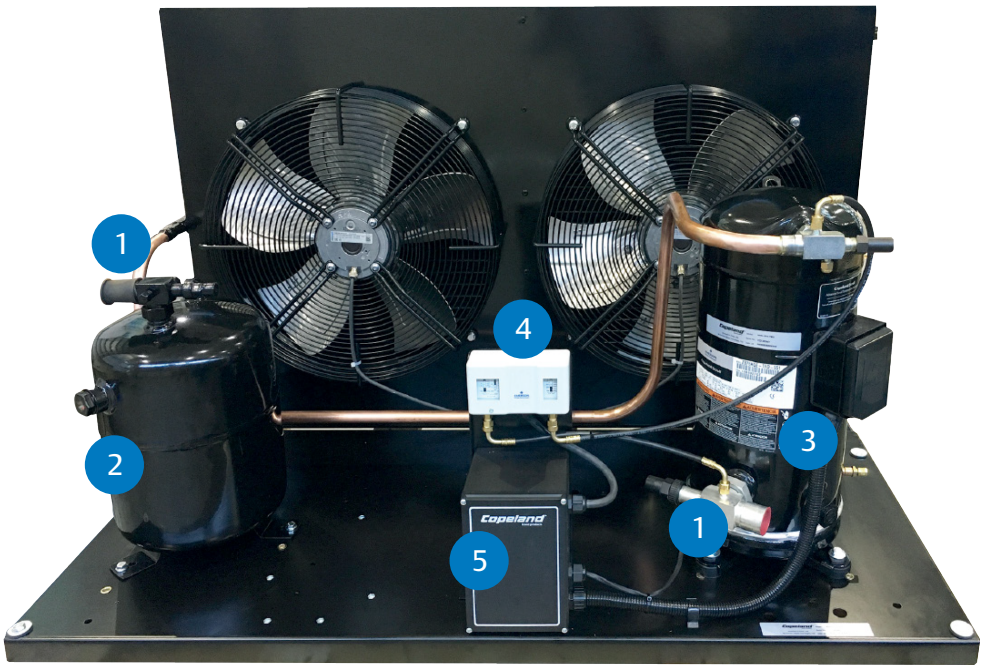


Figure 2

Physical Layout of the unit



1. Service valves for customer connection 2. Liquid receiver
3. Scroll compressor 4. HP/LP cutout 5. Junction box

Transport and Storage

Move F-Series unit only with appropriate mechanical or handling equipment according to weight. Keep in the upright position. Do not stack single boxes on top of each other without pallet in any case. Keep the packaging dry at all times.

Unit Lifting

If the unit is dropped, it should immediately be checked for damage.

Caution ⚠
The unit should be lifted from the base and where possible, with all packing and protection in position.

The installation position should be selected with the following points in mind:

- Leveling should be +/- 5 mm.
- Pipework and electrical connections are readily accessible.
- Ensure there are no obstructions in front of the condenser inlet.

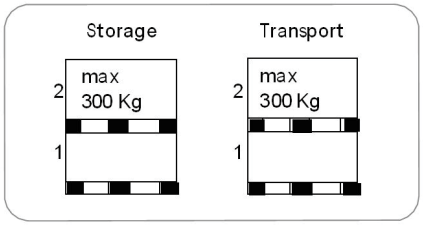
It is recommended to have a clearance of at least 500mm between the condenser face and adjacent wall or unit.

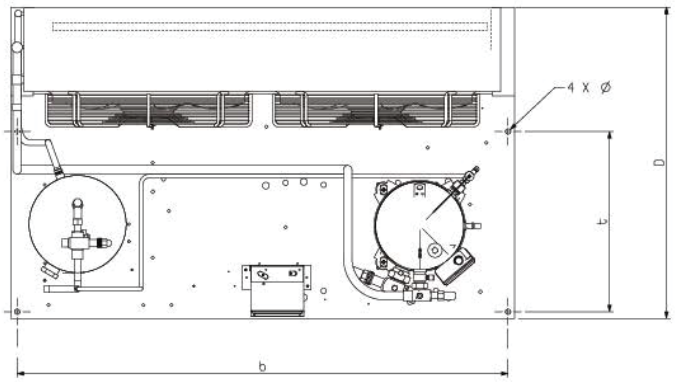
Where multiple units are to be installed in the same location, the contractor needs to consider each individual case carefully.

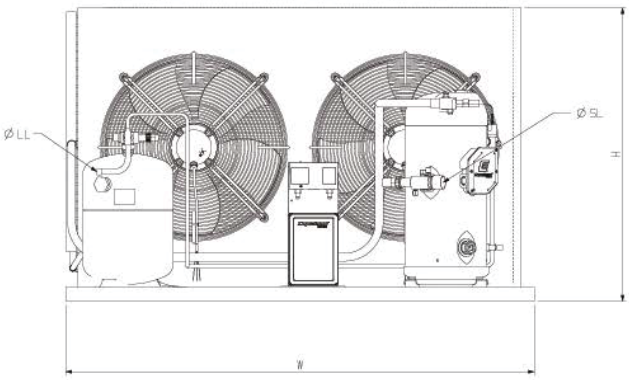
Due care should be taken to avoid the discharge air from each unit adversely affecting other units in the vicinity.

There can be many variations of unit quantities and available space and this manual does not cover all such possible options. In general terms, air recirculation and local heat build up should be avoided at all times.

Caution ⚠
The unit should never be installed adjacent to a dust source (such as a dirty road or extractor fan). External contamination of the condenser fins lead to high condensing temperatures and will reduce the life of the unit.







Mechanical data - 50Hz

Medium temperature

Condensing unit model	Compressor model	Gross weight (kg)	b	t	D	W	H
FMV9A-ZB 58-TFM	ZB58KQE-TFD-551	225	1294	475	820	1329	832
FMV9A-ZB 66-TFM	ZB66KQE-TFD-551	230	1294	475	820	1329	832
FMV6A-ZB 66-TFM	ZB66KQE-TFD-551	247	1294	475	820	1329	832
FMV6A-ZB 76-TFM	ZB76KQE-TFD-551	248	1294	475	820	1329	832
FMV6A-ZB 95-TFM	ZB95KQE-TFD-551	252	1294	475	820	1329	832
FMC8A-ZS 09-PFZ	ZS09KAE-PFJ-600	55	530	330	570	560	444.04
FMC8A-ZS 09-TFM	ZS09KAE-TFD-600	55	530	330	570	560	444.04
FMC8A-ZS 11-PFZ	ZS11KAE-PFJ-600	55	530	330	570	560	444.04
FMC8A-ZS 11-TFM	ZS11KAE-TFD-600	55	530	330	570	560	444.04
FMD8A-ZS 11-PFZ	ZS11KAE-PFJ-600	55	530	330	570	560	444.04
FMD8A-ZS 11-TFM	ZS11KAE-TFD-600	55	530	330	570	560	444.04
FMD8A-ZB 15-TFM	ZB15KQE-TFD-559	58	530	330	570	560	444.04
FMH7A-ZB 15-TFM	ZB15KQE-TFD-559	79	700	370	679.5	735	531
FMH7A-ZB 19-TFM	ZB19KQE-TFD-559	81	700	370	679.5	735	531
FMH8A-ZB 19-TFM	ZB19KQE-TFD-559	81	700	370	679.5	735	531
FMH8A-ZB 21-TFM	ZB21KQE-TFD-559	83	700	370	679.5	735	531
FMM8A-ZB 21-TFM	ZB21KQE-TFD-559	93	700	390	730	735	707.04
FMH8A-ZB 26-TFM	ZB26KQE-TFD-559	82	700	370	679.5	735	531
FMM8A-ZB 26-TFM	ZB26KQE-TFD-559	92	700	390	730	735	707.04
FMM8A-ZB 29-TFM	ZB29KQE-TFD-559	93	700	390	730	735	707.04
FMR6A-ZB 29-TFM	ZB29KQE-TFD-559	135	1095	475	820	1130	630
FMR6A-ZB 38-TFM	ZB38KQE-TFD-559	143	1095	475	820	1130	630
FMR7A-ZB 38-TFM	ZB38KQE-TFD-559	143	1095	475	820	1130	630
FMR7A-ZB 45-TFM	ZB45KQE-TFD-559	148	1095	475	820	1130	630
FMS9A-ZB 45-TFM	ZB45KQE-TFD-559	158	1095	475	820	1130	706
FMR7A-ZB 48-TFM	ZB48KQE-TFD-559	147	1095	475	820	1130	630
FMS9A-ZB 48-TFM	ZB48KQE-TFD-559	157	1095	475	820	1130	706
FMS9A-ZB 58-TFM	ZB58KQE-TFD-551	175	1095	475	820	1130	706

Low temperature

Condensing unit model	Compressor model	Gross weight (kg)	b	t	D	W	H
FLD8A-ZF 06-TFM	ZF06K4E-TFD-551	58	530	330	570	560	444.04
FLD8A-ZF 09-TFM	ZF09K4E-TFD-551	60	530	330	570	560	444.04
FLH7A-ZF 09-TFM	ZF09K4E-TFD-551	81	700	370	679.5	735	531
FLH7A-ZF 11-TFM	ZF11K4E-TFD-551	82	700	370	679.5	735	531
FLH8A-ZF 11-TFM	ZF11K4E-TFD-551	82	700	370	679.5	735	531
FLH8A-ZF 13-TFM	ZF13KQE-TFD-551	92	700	370	679.5	735	531
FLM8A-ZF 13-TFM	ZF13KQE-TFD-551	102	700	390	730	735	707.04
FLM8A-ZF 15-TFM	ZF15KQE-TFD-551	103	700	390	730	735	707.04
FLR6A-ZF 15-TFM	ZF15KQE-TFD-551	145	1095	475	820	1130	630
FLR6A-ZF 18-TFM	ZF18KQE-TFD-551	147	1095	475	820	1130	630
FLR7A-ZF 18-TFM	ZF18KQE-TFD-551	147	1095	475	820	1130	630
FLR7A-ZF 25-TFM	ZF25KQE-TFD-551	147	1095	475	820	1130	630
FLS9A-ZF 25-TFM	ZF25KQE-TFD-551	159	1095	475	820	1130	706
FLV9A-ZF 34-TFM	ZF34KQE-TFD-564	230	1294	475	820	1329	832
FLV6A-ZF 34-TFM	ZF34KQE-TFD-564	247	1294	475	820	1329	832
FLV6A-ZF 41-TFM	ZF41KQE-TFD-564	251	1294	475	820	1329	832

Mechanical data - 60Hz

Medium temperature

Description	Compressor model	Gross weight (kg)	b	t	D	W	H
FMH8A-ZB 15-TF7	ZB15KQE-TF7-559	79	700	370	679.5	735	531
FMM8A-ZB 19-TF7	ZB19KQE-TF7-559	91	700	390	730	735	707.04
FMM8A-ZB 21-TF7	ZB21KQE-TF7-559	91	700	390	730	735	707.04
FMR6A-ZB 26-TF7	ZB26KQE-TF7-559	135	1095	475	820	1130	630
FMR7A-ZB 29-TF7	ZB29KQE-TF7-559	139	1095	475	820	1130	630
FMS9A-ZB 38-TF7	ZB38KQE-TF7-559	155	1095	475	820	1130	706
FMV6A-ZB 58-TF7	ZB58KQE-TF7-551	244	1294	475	820	1329	832
FMV6A-ZB 66-TF7	ZB66KQE-TF7-551	246	1294	475	820	1329	832
FMV9A-ZB 45-TF7	ZB45KQE-TF7-559	208	1294	475	820	1329	832
FMV9A-ZB 48-TF7	ZB48KQE-TF7-559	209	1294	475	820	1329	832

Low temperature

Description	Compressor model	Gross weight (kg)	b	t	D	W	H
FLH7A-ZF 06-CFV	ZF06K4E-PFV-551	82	700	370	679.5	735	531
FLH8A-ZF 09-CFV	ZF09K4E-PFV-551	83	700	370	679.5	735	531
FLM8A-ZF 11-CFV	ZF11K4E-PFV-551	93	700	390	730	735	707.04
FLM8A-ZF 13-TF7	ZF13KQE-TF7-551	104	700	390	730	735	707.04
FLR6A-ZF 13-TF7	ZF13KQE-TF7-551	146	1095	475	820	1130	630
FLR7A-ZF 15-TF7	ZF15KQE-TF7-551	146	1095	475	820	1130	630
FLS9A-ZF18-TF7	ZF18KQE-TF7-551	158	1095	475	820	1130	706

Installation, System processing and commissioning

Utmost care must be taken while handling the scroll condensing unit.
Please go through the contents below to ensure proper handling:

Leak test, evacuation, and charging

The following assumes the condensing unit to be leak-free on arrival. That is an important step before proceeding with the following.

Leak test is particularly important for field-connected systems. Typically, field systems lose as much as 20%–30% of their refrigeration charge annually. This is not only an unnecessary expense but also damages the environment. Compressor oil can be lost at the same time as refrigerant and eventually lead to compressor failure. (Time spent on leak test will eventually reduce the time spent on the evacuation process).

Ensure that all service valves are open during the leak test process. It is important to recheck all joints within the unit as well as the external joints.

Initial pressure test (by vacuum and nitrogen)

Step-by-step

1. Use a 4-port gauge manifold with 3/8” hose and connections to the vacuum pump. The vacuum gauge does not have to be connected for this part of the process.
2. Connect the gauges to service ports provided on receiver valve and suction tube.
   In order to remove any non-condensable that may have entered the system during installation, follow these steps:
   * Start the vacuum pump. The evaporator fan should be running and the compressor crankcase heater is energized at this point. This will involve powering up the unit so it is important to disconnect the live feed wire to the compressor contactor (so the compressor cannot run and the crankcase heater can be energized).
3. Open both valves on the manifold and then open the main vacuum valve on the pump. Run the system until the vacuum level of -0.85 bar (as read on manifold gauge) is achieved.
4. Shut off the main vacuum pump valve. Check for vacuum rise using the manifold compound gauge. A rise would indicate a large leak.
5. If vacuum holds for 10 minutes, break vacuum with nitrogen and pressurize to 20 bar. Check for leaks and repair leakage.

Leak test (by nitrogen pressure)

Release nitrogen from system. Start vacuum pump and open main pump valve.

Evacuation

Note that the following procedure is based upon achieving an actual system vacuum stan-dard and it is NOT TIME- DEPENDENT!

Step-by-Step:

1. Check suction capability of the vacuum pump with a gauge before commencing evacuation process. The vacuum pump must be rated to achieve a vacuum level of at least 100 μmHg (microns) or 13 Pa.
2. Connect the vacuum gauge to the system.
3. It is recommended to carry out the evacuation process three times as detailed below: Start the vacuum pump and then open the main valve. It is assumed that the crank case heater is still energized and the compressor cannot start.
   Caution ⚠ Ensure that the vacuum pump cannot be switched off during evacuation –otherwise the pump may lose its lubrication oil to the system and contaminate it. Therefore, the pump must have a Vacuum Breaker fitted to it.
4. Step 1 Evacuation: Evacuate to 1500 μmHg (microns) or 200 Pa and break vacuum to 0.1 bar with Nitrogen
5. Step 2 Evacuation: Same as in Step 1
6. Step 3 Evacuation: Leave the pump running while checking the vacuum regularly. The target system vacuum is 500 μmHg (microns) or 67 Pa.

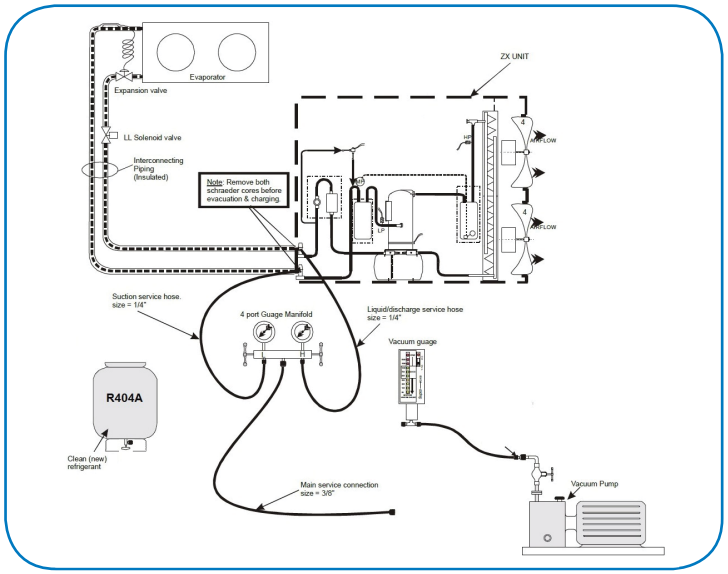
Once the target vacuum level is reached, the quality of the vacuum within the system must be tested. This is achieved by shutting off the main pump valve, allowing the internal system pressure to rise, and recording the time taken for the vacuum to rise by no more than 300 μmHg (microns) or 40 Pa within 30 minutes. (i.e. to 100 μmHg (microns) or 13.3 Pa). Evacuation is only complete once the vacuum quality is achieved. Close the manifold valves tightly. Close the pump main valve, switch off, and remove the vacuum pump.

Charging and commissioning

Step-by-step:

1. Ensure that there is no power supply to the unit. Hence, it is acceptable to leave the crankcase heater off.
2. Connect the refrigerant cylinder to main service hose and purge line at the manifold end.
3. Invert the refrigerant cylinder if necessary to ensure only liquid refrigerant can be charged into the system. This will be charged through the high pressure side of the manifold and liquid service valve.
4. The refrigerant cylinder should be weighed at this point to be able to record the final refrigerant charge. Refer to the table below for the approximate holding capacity of receiver is at 32oC when it is 80% full. 5..Now open the liquid service valve (off the back seat). In warm ambients, with a good vacuum in the system and the refrigerant cylinder inverted, it may not be necessary to run the compressor.

5. In cooler ambients, it may be necessary to run the compressor in order to complete charging.
   IMPORTANT! TO BE CLEARLY UNDERSTOOD PRIOR TO RUNNING ANY SCROLL COMPRESSOR
   Scroll compressor systems should be charged as quickly as possible by bleeding liquid refrigerant into the suction line with the compressor running.
   DO NOT VAPOR CHARGE SCROLL CONDENSING UNIT SYSTEM!
6. The system needs to be operated down to its set point before you can be sure that the charge is correct. It is at this point that the normal refrigeration operational checks can be carried out —such as checking the liquid line sight glass for bubbles and the operating pressures.
7. If the system is still short of the refrigerant, bleed liquid refrigerant into the suction side with the compressor running.
8. Check the oil level and add oil if necessary.



Unit Operation

Before starting the unit, ensure the following:

- All the electrical connections are correct and as per the recommended wiring diagrams
- All low side tubings are properly insulated
- Leak check is done and unit is pre-charged with refrigerant through high side
- Check for superheat setting on the expansion valve (TXV) appropriate or not

Adding refrigerant on a cold weather results to an overcharged unit, which may then trip out on high pressure limit during warm weather.

Suction Superheat should be 10–15 K for reliable operation.

 Remember that the refrigerant is under pressure. Always wear protective equipment, i.e. safety glasses or goggles and gloves when working with refrigerant, and guard against refrigerant spray-ing into the face or skin. Line pressures on an operating conditioning unit will vary with outdoor temperatures. As outdoor temperatures rise, pressures will also rise.

 Caution

DO NOT, UNDER ANY CIRCUMSTANCES, HEAT THE REFRIGERANT CYLINDER WITH A TORCH OR BY ANY OTHER MEANS OTHER THAN WARM WATER. EXCESSIVE PRESSURES GENERATED IN THIS MANNER MAY WEAKEN THE REFRIGERANT CONTAINER AND RESULT TO A CYLINDER EXPLOSION!

Application tips for scroll compressors

- Do not use compressor to pull vacuum
- Never use the compressor to suck oil into the system
- Do not test compressor by closing suction valve
- Do not set low pressure switch below 0 bar
- Do not bypass LP controls
- Do not pump down below 0 bar
- Reverse Rotation

- Incorrect rotation can be identified by:
Low current, noise, balanced suction, and discharge pressure;
- Correct by interchanging any two phases
- Short-term reverse rotation will not damage the compressor

Approved compressor oil

POE-32: Polyolester Oil (Copeland Ultra 32-3MAF, Lubrizol Emkarate RL32-3MAF, Everest 32-3MAF, National NL PE32-3MAF, Parker EMKARATE RL32-3MAF/ (Virginia) LE323MAF, Nu Calgon 4314-66/EMKARATE RL32-3MAF, Everest 22 CC, Copeland Ultra 22 CC, Mobil Arctic 22 CC). Last three are approved for 'top off' only, 32-3MAF preferred.

High and low pressure control settings

Model	Control type	R-404A/507	R-134A	R-22 / R-407A / R-407C / R407F / R-448A / R-449A
ZF* K5E	Low High	0 psig min. 400 psig min.	---	2 in. Hg Min. 335 psig Max.
ZB*K5E	Low High	17 psig min. 450 psig max	4 psig min. 263 psig max	37 psig min. 381 psig max

Maintenance

Condenser Fins

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 with frequency depending on the installation and the surrounding environment. As a general guide, it is advisable to do this at least once every two months.

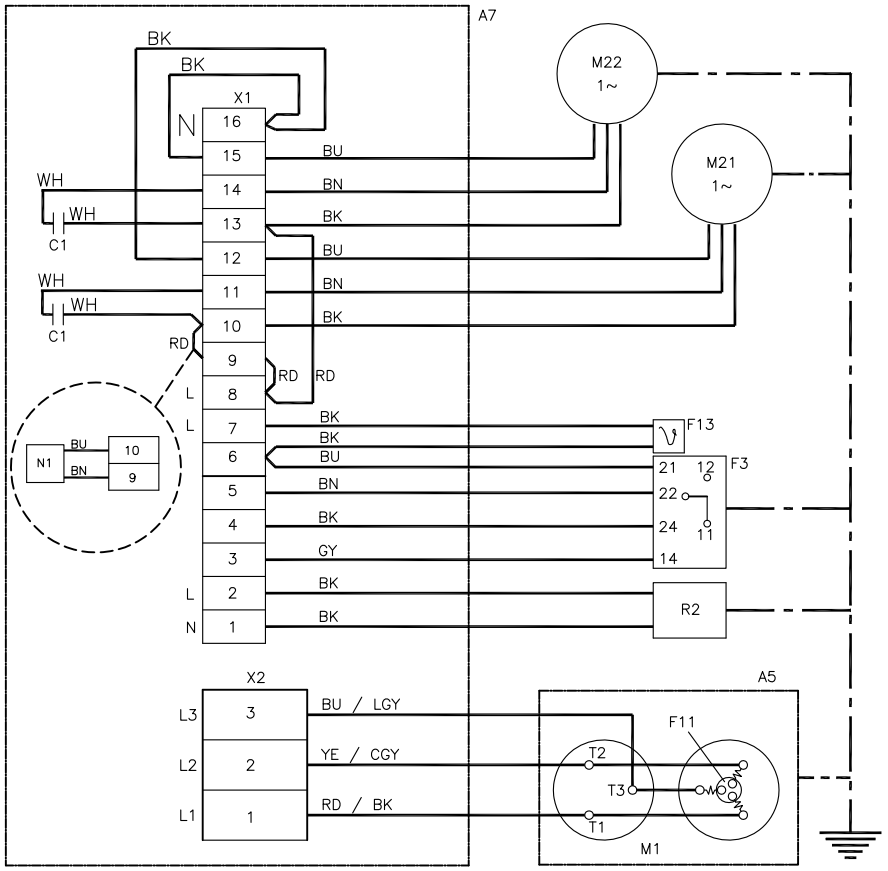
Fins should be cleaned with liquid detergent diluted with clean water. Before washing, a light brush downward (in the direction of the fins) should be done to remove heavy deposits. Electrical Connections Check tightness of electrical connections occasionally.

Routine Leak Test

All joints should be checked for leaks during site visits. All joints should be leak tested once a year. Condenser Fan(s) and Motor(s) An annual inspection of these items is recommended. Fastenings may loosen, bearings may wear, and fans may require cleaning of solid deposits which can cause imbalance.

⚠ TURN OFF OR DISCONNECT THE ELECTRICAL POWER SOURCE BEFORE CLEANING THE CONDENSER COIL OR DOING MAINTENANCE.

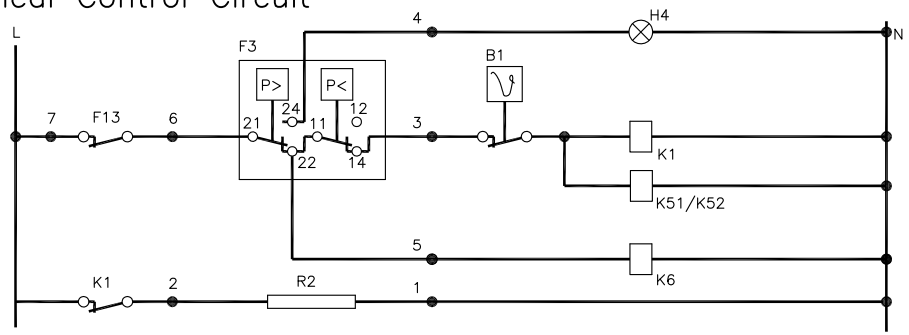
F Series Condensing Unit	TFM	TF7	052-2988-01
Compressor	CR-TFM/D//KCM-E//ZB,ZS,ZF-TFD	ZB,ZS,ZF-TF7	
X1 (L-N)	230 ± 10% V/1/50Hz	230 ± 10% V/1/60Hz	
X2 (L1-L2-L3)	400 ± 10% V/3/50Hz	380 ± 10% V/3/60Hz	Rev 00



Remarks:

A5 = Terminal Box Compressor
A7 = Terminal Box Condensing Unit
B1 = Room Thermostat
C1 = Run Capacitor M21/M22
F3 = Pressure Control Switch
F11 = Internal Over-Current Thermal Protector
F13 = Discharge Gas Thermostat (If Fitted)
H4 = Signal Lamp F3 High Discharge Pressure (If Fitted)
K1 = Contactor M1
K51 = Contactor M21
K52 = Contactor M22
K6 = Relay Unit Alarm (If Fitted)
M1 = Compressor Motor
M21 = Fan Motor / Condenser
M22 = Fan Motor / Condenser
N1 = Speed Control Fan (If Fitted)
R2 = Crankcase Heater
X1 = Terminal Block
X2 = Terminal Block

Typical Control Circuit

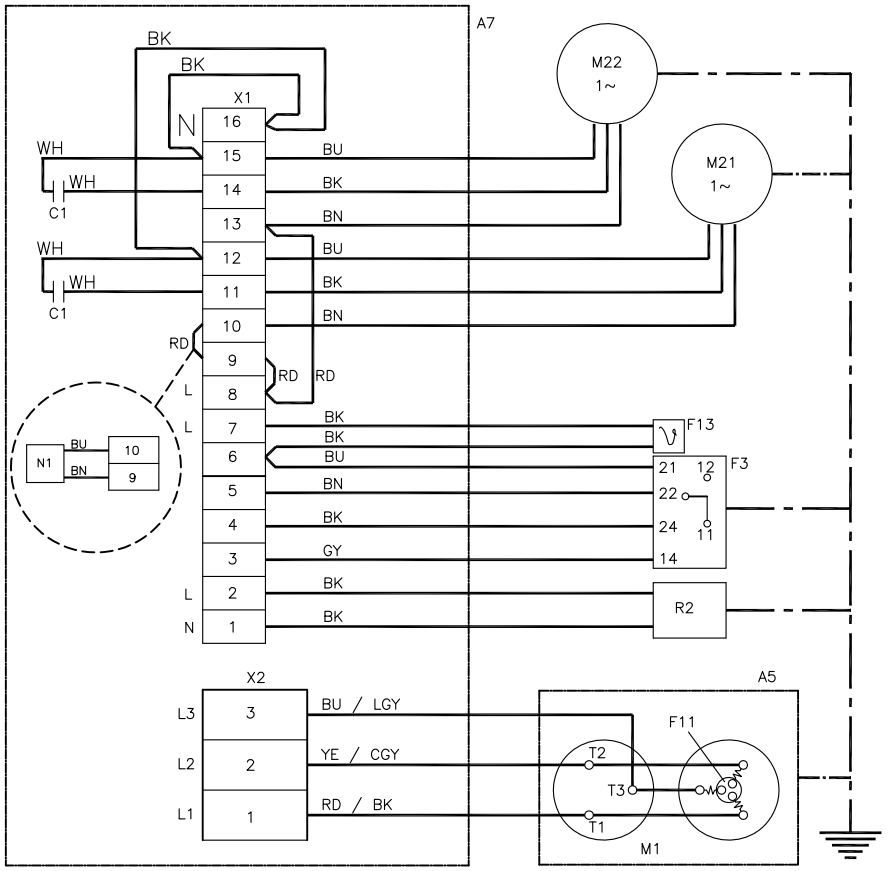


Condenser: B8	71 Fan
Condenser: C8,D8,H7,R6	121 Fan

Cable Colours:

WH = White	BU = Blue	LGY = Light Grey
GY = Grey	RD = Red	CGY = Charcoal Grey
BK = Black	YE = Yellow	
BN = Brown	G/Y = Green/Yellow	

F Series Condensing Unit	TFM	TF7	052-2988-02
Compressor	CR-TFM/D//KCM-E//ZB,ZS,ZF-TFD	ZB,ZS,ZF-TF7	
X1 (L-N)	230 ± 10% V/1/50Hz	230 ± 10% V/1/60Hz	
X2 (L1-L2-L3)	400 ± 10% V/3/50Hz	380 ± 10% V/3/60Hz	Rev 00



Remarks:

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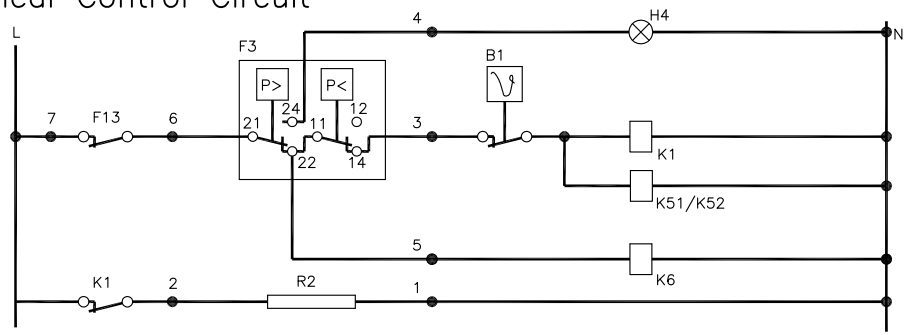
X2 = Terminal Block

Typical Control Circuit

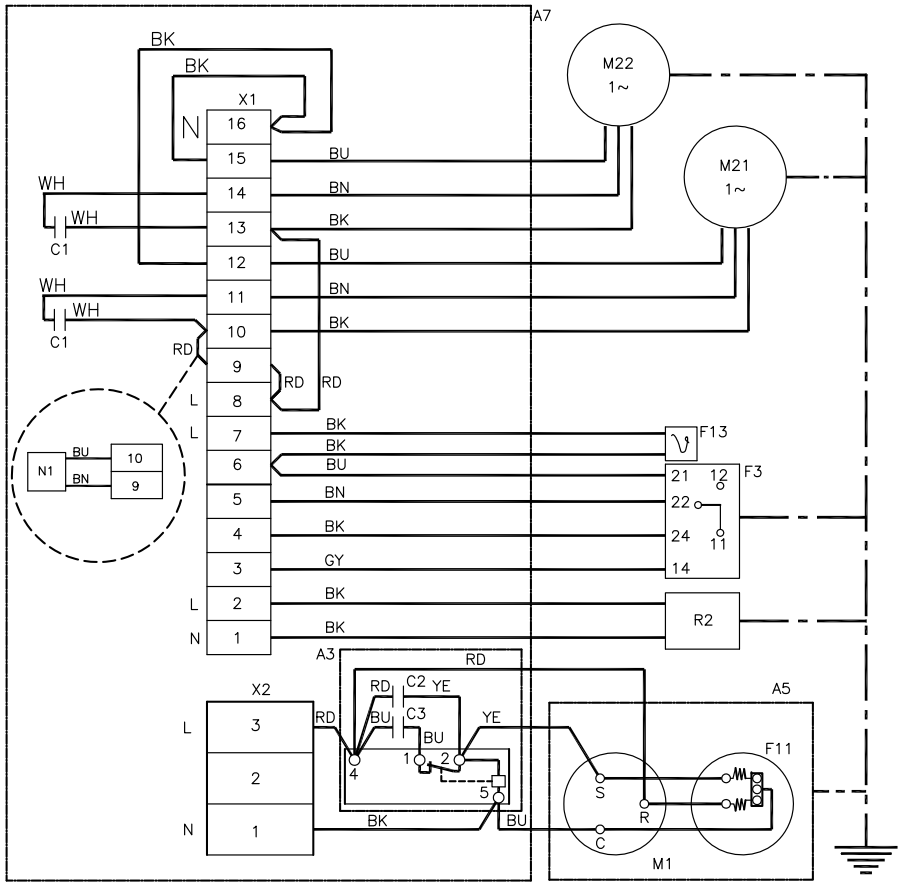


Condenser: H8,M8,R7,S9,V9	271 Fan
Condenser: V6,W9	611 Fan

Cable Colours:

WH = White	BU = Blue
GY = Grey	RD = Red
BK = Black	YE = Yellow
BN = Brown	G/Y = Green/Yellow

F Series Condensing Unit	CFZ	CFV	052-3145-02
Compressor	ZB,ZS,ZF-PFJ	ZB,ZS,ZF-PFV	
	KCJ-B/S//CR-PF1/Z//KCM-B/C		
X1/X2 (L-N)	230 ± 10% V/1/50Hz	230 ± 10% V/1/60Hz	Rev 00



Remarks:

A3 = Capacitor/ Relay Assembly
A5 = Terminal Box Compressor
A7 = Terminal Box Condensing Unit
B1 = Room Thermostat
C1 = Run Capacitor M21/M22
C2 = Run Capacitor M1
C3 = Start Capacitor M1
F3 = Pressure Control Switch
F11 = Internal Over-Current Thermal Protector
F13 = Discharge Gas Thermostat (If Fitted)
H4 = Signal Lamp F3 High Discharge Pressure (If Fitted)
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M21 = Fan Motor / Condenser
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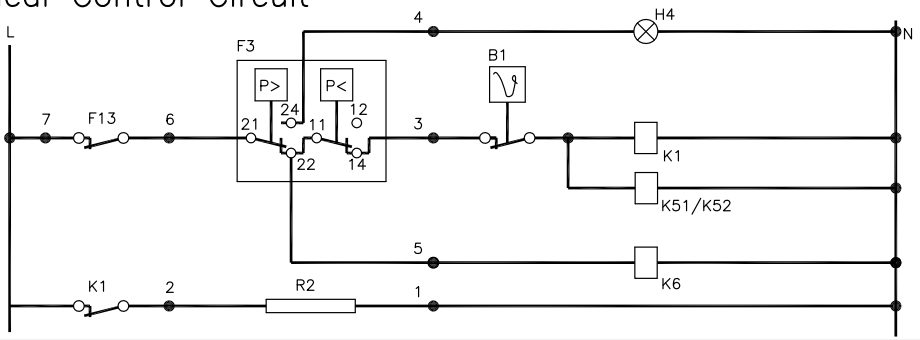
N1 = Speed Control Fan (If Fitted)
R2 = Crankcase Heater
X1 = Terminal Block
X2 = Terminal Block

Typical Control Circuit

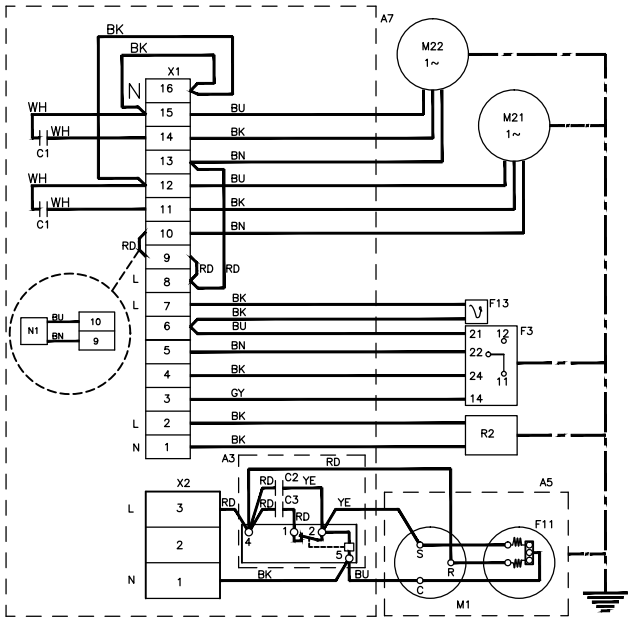


Condenser: B8	71 Fan
Condenser: C8,D8,H7,R6	121 Fan

Cable Colours:

WH = White	BU = Blue	LGY = Light Grey
GY = Grey	RD = Red	CGY = Charcoal Grey
BK = Black	YE = Yellow	
BN = Brown	G/Y = Green/Yellow	

F Series Condensing Unit	CFZ	CFV	052-3145-04 Rev 00
Compressor	ZB,ZS,ZF-PFJ	ZB,ZS,ZF-PFV	
	KCJ-B/S//CR-PF1/Z//KCM-B/C		
X1/X2 (L-N)	230 ± 10% V/1/50Hz	230 ± 10% V/1/60Hz	



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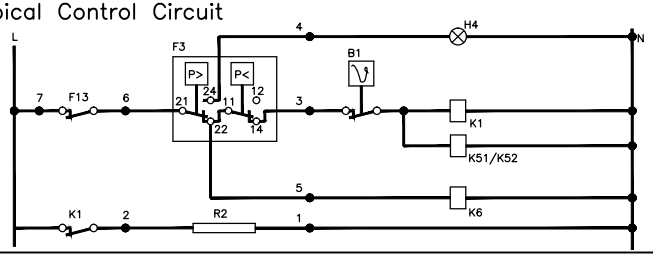
X1 = Terminal Block
X2 = Terminal Block

Typical Control Circuit



Condenser: H8,M8,R7,S9,V9	271 Fan

Cable Colours:

WH = White		BU = Blue	
GY = Grey		RD = Red	
BK = Black		YE = Yellow	
BN = Brown		G/Y = Green/Yellow	

176.00

3.00 TYP.

125.00

SPECIFICATIONS	
ES NO.	DESCRIPTION
ES22-122	PACKAGING
ES81-159	CLEANLINESS
ES81-250	IDENTIFICATION
ES92-167	REGULATORY COMPLIANCE

NOTES:

1. DO NOT USE THIS DRAWING FOR ARTWORK.

2 MATERIAL SPECIFICATION:
FACESTOCK: 2 MIL WHITE
POLYESTER (FASSON 40443)
ADHESIVE: S730 SOLVENT ACRYLIC
SERVICE TEMPERATURE: -40° TO 300°F
LINER: 50# BLEACHED CALENDARED
KRAFT PAPER
LAMINATE: 1 MIL CLEAR POLYESTER
(FASSON 77844)

3. DIAGRAM TO BE SUPPLIED IN SHEETS.

EMERSON.
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DO NOT SCALE DRAWING
THIRD ANGLE PROJECTION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE MILLIMETER OR [INCH] TOLERANCES:
1-PLACE ±
2-PLACE ±
ANGULAR ±

ENG NOTICE NO.	REV.NO.	REVISIONS	DATE	BY	CHKD	APPR
ECN301553	0	RELEASED	01-17-17	RLP		

36

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MATERIAL SPECIFICATION	DRAWN BY RLP	SUPERSEDES DWG. NO. / REV. NO.
	DATE 01-17-17	SCALE NONE
		DATE FORMAT: MM-DD-YY

TITLE: DIAGRAM-WIRING
DRAWING NUMBER 052-3145-04 SHEET 1 OF 1
DWG 4 SIZE

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