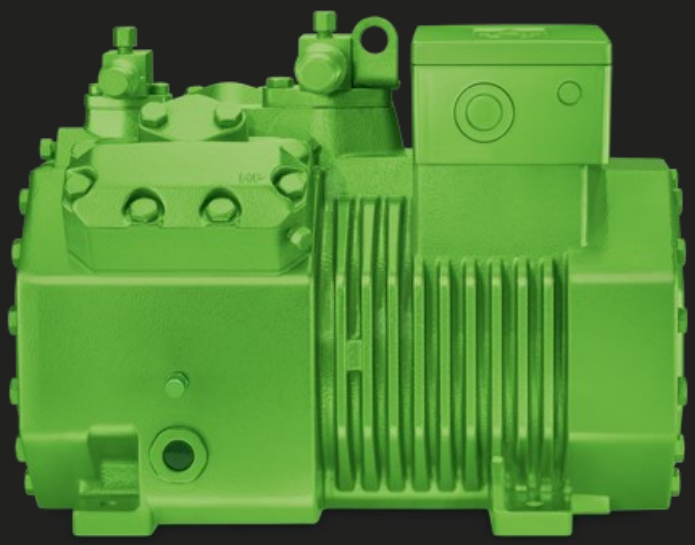
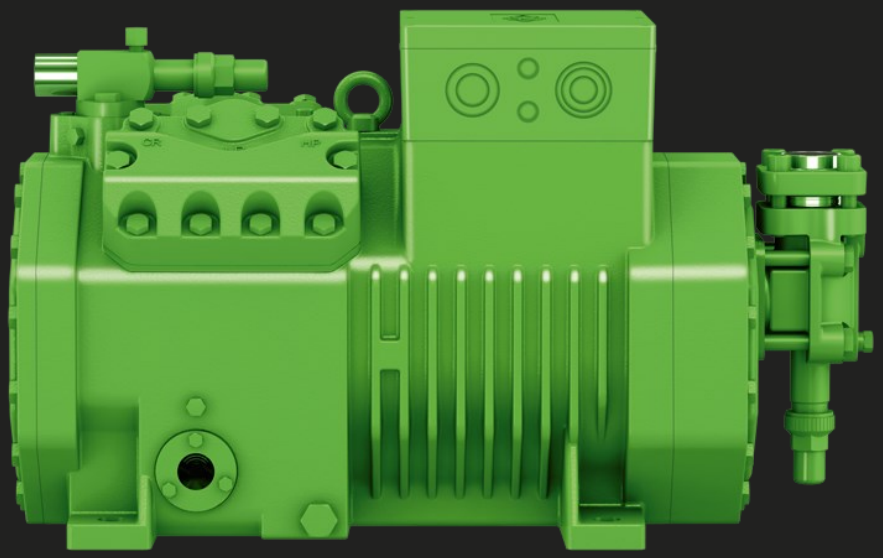
COPELAND™ SCROLL TO BITZER ECOLINE
CONVERSION GUIDE

For Models

Copeland ZF Scrolls to CE3 and CE4 Reciprocating Compressors





XR-0015-02 // 60Hz Version

The intention of this document is to serve as general guidelines. The information contained is not intended to replace specific equipment and/or system manufacturer's information or guidelines. BITZER implies no liability for the information contained. It is BITZER's implicit intention that nothing contained in this guide replaces any past, present or future warranty policy of BITZER and/or any other manufacturer's equipment

These guidelines are not a replacement for information specific to that of the manufacturer or the manufacturer's system technical product information.

Each system may vary in design, usage and specifications. This document is intended for use specific to the compressor only and not intended to be a "catch all" for any and every possible application of the compressor.

BITZER's intention is that only qualified and certified (where applicable) individuals specific to the refrigeration industry use the information contained and all standard refrigeration handling and safety practices must be followed at all times.

BITZER's intention is that all electric work is performed by qualified and certified (where applicable) individuals and all standard electrical safety practices must be followed at all times.

WARNING
This icon indicates instructions to avoid personal injury and material damage

CAUTION
This icon indicates instructions to avoid property damage and possible personal injury

HIGH VOLTAGE
This icon indicates operations with a danger of electric shock

TABLE OF CONTENTS

Replacing Scrolls with Reciprocating Compressors

Purpose/Scope:

These guidelines are for retro-fitting scroll compressor racks with BITZER semi-hermetic reciprocating compressors.

According to the terms and conditions of sale, BITZER warrants compressors for a specified length of time due to any defect in material or workmanship.

Typically, there exists a concession or an agreement with customers on an individual basis to warrant a compressor's first failure for reason outside of the terms and conditions of sale. Retrofitting a rack from a scroll compressor to a reciprocating compressor could potentially put the new reciprocating compressor into a harmful situation that would shorten the life of the product. These guidelines are intended to accompany any additional concession or agreements outside of the terms and conditions.

The guideline neither verifies nor disputes any legal binding agreement or contract.

Guidelines:

1. BITZER US, INC will only be responsible for providing technical data regarding BITZER compressors – (e.g. capacities, electrical, and dimensional drawings.)
2. BITZER will not be responsible for system engineering or re-engineering. This includes final compressor selection, condenser sizing, refrigeration line sizing, oil system, electrical wiring or components.
3. BITZER Applications Engineering is available for review of the final compressor selection and to provide recommendations as necessary. "Before" and "after" legends shall be provided in .pdf format (emailed to techsupport@bitzerus.com).
4. The complete suction group must be retro-fitted as a whole with no combination of scroll and reciprocating compressors on the same suction header.
5. System suction accumulators must be evaluated and sized properly to meet system demands. Any low temp suction header must have a suction accumulator dedicated to the header.
6. If a check valve is present in the discharge line, it must be removed.
7. All compressors must be equipped with oil safety cut off devices design to provide compressor shutdown in the event of less than 9 psig positive oil pressure for 90 seconds. In the event that an "S" style compressor without a positive pressure oil pump is used, an optical oil sensor must be used.
8. System oil must be as specified for use with BITZER compressors under the design conditions.
9. System oil must be tested for moisture and acid before and after retro-fit. If oil is of questionable quality, a complete oil change(s) must be completed until satisfactory results are achieved. It is recommended that at least 2 oil changes be completed. An oil sample verifying its integrity (moisture, acid, cleanliness, viscosity) must be performed after 100 operating hours and the results emailed to techsupport@bitzerus.com (or a vile can be sent directly to BITZER).

10. All suction filters, liquid line filter/driers, and oil filters must be changed upon completion of the retro-fit and follow up checked for proper operation at 7 days and 21 days after completion.
11. The contractor must send contact information regarding any system subcontractor to BITZER. A representative of BITZER compressor must have the option to be present during the start up process (notify regional sales manager).
12. All standard practices for the installation of refrigeration equipment must be observed.
13. All other application requirements and limits should be followed as stated in BITZER literature KB -115, KP-108, KW-105, KT-100, KT-110, KT-122, KT-130, KT-150, KT-151, KT-170, KT-180, KT-600, and KT 602, where applicable ("see document Application Requirements – Single Stage Semi Recips"). Note that where SE-B1 or SE-B2 is mentioned, SE-B3 is applicable. Also, where the term "CIC" is mentioned, it should be replaced with another suitable desuperheating system as outlined by application limits.
14. Liquid injection and unloading must not be allowed to take place at the same time.
15. Unloading on any compressor requires a head cooling fan.
16. Oil system must have the ability to seal itself off from discharge gas either through a float style separator or a level sensor. Level sensor would be located in the reservoir and connected to a solenoid valve that can close off the oil supply from bleeding discharge gas into the main oil service line.
17. A startup report (see attached) must be completed and faxed/emailed to BITZER US.

Notes

Additional Costco Scroll Retrofit Recommendations

These recommendations are based on analysis of previously retrofitted stores and feedback from the contractors performing the retrofits. These recommendations have no bearing on the warranty outlined in the terms and conditions or other concessions/agreements.

Guidelines:

1. Each compressor should have a new contactor, mounting bracket, refrigeration oil, suction filters, liquid line filters/driers, oil filters and any other miscellaneous material to insure a complete and fully operational system.
2. Each suction header should be fitted with a device for draining liquid out of the bottom of the header (example: Refrigeration Technologies Compressor Protection System (CPS)).
3. All liquid injection desuperheating valves should be installed with a normally closed solenoid valve prior to the desuperheating valve and controlled by the auxiliary contacts of the compressor.
4. If a crankcase heater is required, it should operate off of auxiliary contacts of the compressor contactor.
5. Most systems have a Turboshed oil separator that is unserviceable and often full of broken compressor pieces. Furthermore, some Turbosheds have been found with broken vanes, severely limiting the oil separation percentage. This should be replaced with a brand new serviceable separator that is adequately sized for the discharge header. It is recommended that this separator also has a float for closing off flow of oil or gas at low level.
6. The reservoir of the oil system should be kept under low pressure using a regulator valve to bleed back to the medium temp suction header (or whichever header has the highest saturated temperature) with a pressure differential of 20-30psi.
7. All low temp compressors must have a discharge temperature sensor wired in series with the motor protection control.
8. It is encouraged to add a vibration eliminator as this is generally a good practice and common on parallel rack applications. It should be installed after the compressor discharge outlet and run parallel to the compressor crankshaft.

Low Temp Selections

Note: Scroll and reciprocating compressors compress at different ratios. Thus, as the pressure ratio changes, the scroll and recip compressor's capacities change in different ratios.

-28°F SST*						
Copeland Scroll	100°F SDT		110°F SDT		120°F SDT	
	BITZER	Capacity Difference	BITZER	Capacity Difference	BITZER	Capacity Difference
ZF15K4E	4EES-4	-13%	4DES-5	-7%	4CES-6	1%
	4DES-5	6%	4CES-6	18%	4CES-6	1%
ZF18K4E	4DES-5	-10%	4CES-6	0%	4CES-6	-14%
	4CES-6	13%	4CES-6	0%	4VE-7	17%
ZF24K4E	4CES-6	-6%	4CES-6	-16%	4VE-7	-3%
	4VE-7	14%	4VE-7	6%	4VE-7	-3%
ZF33K4E	4TE-9	-2%	4TE-9	-9%	4PE-12	-4%
	4PE-12	13%	4PE-12	4%	4NE-14	15%
ZF40K4E	4PE-12	-7%	4PE-12	-13%	4NE-14	-3%
	4NE-14	10%	4NE-14	3%	4NE-14	-3%
ZF48K4E	4NE-14	-4%	4NE-14	-11%	4NE-14	-18%
	4JE-15**	1%	4HE-18**	8%	4HE-18**	-1%

-23°F SST*						
Copeland Scroll	100°F SDT		110°F SDT		120°F SDT	
	BITZER	Capacity Difference	BITZER	Capacity Difference	BITZER	Capacity Difference
ZF15K4E	4EES-4	-5%	4EES-4	-15%	4DES-5	-8%
	4DES-5	15%	4DES-5	4%	4CES-6	15%
ZF18K4E	4DES-5	-2%	4DES-5	-12%	4CES-6	-2%
	4CES-6	21%	4CES-6	10%	4VE-7	26%
ZF24K4E	4CES-6	1%	4CES-6	-8%	4CES-6	-18%
	4CES-6	1%	4VE-7	13%	4VE-7	5%
ZF33K4E	4TE-9	3%	4TE-9	-3%	4TE-9	-9%
	4PE-12	19%	4PE-12	12%	4PE-12	5%
ZF40K4E	4PE-12	-2%	4PE-12	-7%	4PE-12	-12%
	4NE-14	15%	4NE-14	9%	4NE-14	4%
ZF48K4E	4NE-14	1%	4NE-14	-5%	4NE-14	-11%
	4NE-14	1%	4JE-15**	1%	4HE-18**	10%

-18°F SST*						
Copeland Scroll	100°F SDT		110°F SDT		120°F SDT	
	BITZER	Capacity Difference	BITZER	Capacity Difference	BITZER	Capacity Difference
ZF15K4E	4EES-4	1%	4EES-4	-8%	4EES-4	-18%
	4EES-4	1%	4DES-5	13%	4DES-5	2%
ZF18K4E	4DES-5	4%	4DES-5	-4%	4DES-5	-13%
	4DES-5	4%	4CES-6	18%	4CES-6	8%
ZF24K4E	4DES-5	-13%	4CES-6	-1%	4CES-6	-10%
	4CES-6	7%	4CES-6	-1%	4VE-7	12%
ZF33K4E	4CES-6	-24%	4TE-9	2%	4TE-9	-3%
	4TE-9	8%	4TE-9	2%	4PE-12	12%
ZF40K4E	4TE-9	-12%	4PE-12	-3%	4PE-12	-7%
	4PE-12	2%	4NE-14	15%	4NE-14	10%
ZF48K4E	4PE-12	-11%	4NE-14	0%	4NE-14	-5%
	4NE-14	4%	4NE-14	0%	4JE-15**	2%

Parameters Assumed:R22, 460V/3PH/60Hz, 65°F RETURN GAS, 100% USEFUL SUPERHEAT

* For temperatures below -4°F SST (with 130°F SCT), special set-up/liquid injection is required. Refer to the section on low temperature application setup. For lower condensing temperatures, liquid injection may only be required at lower SST temperatures, consult with Bitzer for exact parameters.

** BE5 compressors have larger overall dimensions than CE4 compressors, please review dimensions to ensure fit

Contact Bitzer Tech Support (techsupport@bitzerus.com) if specific data or more information is required.

2.2 Medium Temp Cross Reference

Medium Temp Selections

Note: Scroll and reciprocating compressors compress at different ratios. Thus, as the pressure ratio changes, the scroll and recip compressor's capacities change in different ratios.

19°F SST						
Copeland Scroll	100°F SDT		110°F SDT		120°F SDT	
	BITZER	Capacity Difference	BITZER	Capacity Difference	BITZER	Capacity Difference
ZF15K4E	4FES-5	5%	4FES-5	2%	4FES-5	-2%
	4FES-5	5%	4FES-5	2%	4EES-6	21%
ZF18K4E	4FES-5	-13%	4FES-5	-15%	4EES-6	1%
	4EES-6	8%	4EES-6	5%	4EES-6	1%
ZF24K4E	4EES-6	-10%	4EES-6	-13%	4DES-7	3%
	4DES-7	9%	4DES-7	6%	4DES-7	3%
ZF33K4E	4DES-7	-20%	4CES-9	1%	4VE-10	-3%
	4VE-10	6%	4CES-9	1%	4TE-12	17%
ZF40K4E	4TE-12	0%	4TE-12	-2%	4TE-12	-4%
	4TE-12	0%	4PE-15	17%	4PE-15	14%
ZF48K4E	4TE-12	-13%	4PE-15	1%	4PE-15	-1%
	4PE-15	4%	4PE-15	1%	4NE-20	15%

10°F SST						
Copeland Scroll	100°F SDT		110°F SDT		120°F SDT	
	BITZER	Capacity Difference	BITZER	Capacity Difference	BITZER	Capacity Difference
ZF15K4E	4FES-5	0%	4FES-5	-3%	4FES-5	-7%
	4FES-5	0%	4EES-6	20%	4EES-6	14%
ZF18K4E	4FES-5	-16%	4EES-6	0%	4EES-6	-4%
	4EES-6	4%	4EES-6	0%	4DES-7	17%
ZF24K4E	4EES-6	-13%	4DES-7	2%	4DES-7	-2%
	4DES-7	6%	4DES-7	2%	4CES-9	19%
ZF33K4E	4VE-10	1%	4VE-10	-3%	4VE-10	-6%
	4VE-10	1%	4TE-12	17%	4TE-12	13%
ZF40K4E	4TE-12	-2%	4TE-12	-5%	4TE-12	-7%
	4PE-15	16%	4PE-15	13%	4PE-15	11%
ZF48K4E	4PE-15	1%	4PE-15	-2%	4PE-15	-4%
	4PE-15	1%	4NE-20	14%	4NE-20	11%

5°F SST						
Copeland Scroll	100°F SDT		110°F SDT		120°F SDT	
	BITZER	Capacity Difference	BITZER	Capacity Difference	BITZER	Capacity Difference
ZF15K4E	4FES-5	-2%	4FES-5	-7%	4FES-5	-11%
	4EES-6	21%	4EES-6	16%	4EES-6	10%
ZF18K4E	4EES-6	2%	4EES-6	-3%	4EES-6	-7%
	4EES-6	2%	4DES-7	19%	4DES-7	13%
ZF24K4E	4EES-6	-15%	4DES-7	0%	4DES-7	-5%
	4DES-7	4%	4DES-7	0%	4CES-9	16%
ZF33K4E	4VE-10	-1%	4VE-10	-5%	4CES-9	-19%
	4TE-12	19%	4TE-12	15%	4TE-12	11%
ZF40K4E	4TE-12	-4%	4TE-12	-6%	4TE-12	-9%
	4PE-15	14%	4PE-15	11%	4PE-15	9%
ZF48K4E	4PE-15	-1%	4PE-15	-4%	4PE-15	-5%
	4PE-15	15%	4PE-15	12%	4NE-20	9%

Parameters Assumed:

		65°F RETURN	
R22	460V/3PH/60HZ	GAS	100% USEFUL SUPERHT

Contact Bitzer Tech Support (techsupport@bitzerus.com) if specific data or more information is required.

Selecting the Bitzer Compressor and Accessories

1. Select Bitzer compressor.
(see cross reference table on page 7 & 8)

Select Heater

2. Add crankcase heater ?

CE3 Models (4FES-3…4CES-9) → 892-1120-01 (110V)
892-1120-02 (220V)

CE4 Models (4VE-7…4NE-20) → 892-1120-13 (110V)
892-1120-14 (220V)

Select Oil Level Control
(Traxoil Replacement)

3. New Oil Level Control/Electronic Oil Float needed or re-using Emerson MB control ?

New → CE3 Models → 990-8000-02 (adaptor) → 31S381 (24VAC)
41S381 (115V)
52S381 (230v)

New → CE4 Models → 31S381 (24VAC)
41S381 (115V)
52S381 (230v)

Re-using existing OMB control → For CE3 compressors: order adaptor 990-8000-02
No adaptor required for CE4 models
Note: It is not recommended to re-use the old oil level control

Select Oil Control

4. Select Oil Control

CE3 Models → OLC-K1: 347318-07 (110v)
347318-06 (220V)

CE4 Models → 347318-11 (Delta P-II)
or
860-3003-01 (Johnson P545)
(P400 sensor included)

Additional Selections for Low Temp R22 Applications

Refer to Page 39-42 for additional info

Select Head Fan Bracket

1. Head Fan is required

CE3 Models
0705467-KIT

CE4 Models
0705482-KIT

Select Head Fan
415-2100-15KIT (110V)
415-2100-28KIT (220V)
415-2100-46KIT (460V)

See pages 14 for application limits

2. For CE4 models select a desuperheating method from the two options below:

A. CIC-System – Bitzer's electronically controlled liquid injection system

347702-16 (4VE(S)-7 .. 4NE(S)-20)

- The standard CIC module is 220V. For a 115V module add "-115" to the end of the part number.
- All kits come with a 220V 50/60Hz coil.

B. Sporlan Y1037 Valve*

Select appropriate size based on chart:
873-0407-13 (1/3 Ton, 240°F)
873-0109-05 (1/2 Ton, 240°F)
873-0109-11 (1 Ton, 240°F)
873-0109-15 (1-1/2 Ton, 240°F)

*BITZER carries 240°F Y1037 valves. Using a Y1037 valve below 230°F is not recommended.

Temperature Responsive Expansion Valve - Y1037 - Sizing Chart (Tons)

SST (Evap Temp)	-10F		-20F		-30F	
Return Gas Temp	*20F*	*40F*	*20F*	*40F*	*20F*	*40F*
4VE(S)-7	1/3	1/3	1/2	1/2	1/2	1/2
4TE(S)-9	1/3	1/2	1/2	1/2	1/2	1/2
4PE(S)-12	1/3	1/2	1/2	1	1/2	1
4NE(S)-14	1/3	1/2	1/2	1	1/2	1
4JE-15*	1/2	1/2	1/2	1	1	1

*4JE-15 – BE5 series compressors are larger than CE4 series

Saturated Condensing / Liquid Temp = 110°F

3. Optional Discharge Gas Temp Sensor: 347023-03 (not required with CIC-System)

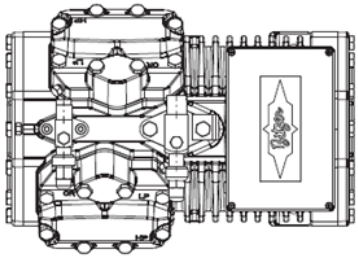
Note: Oil Cooling is not needed!

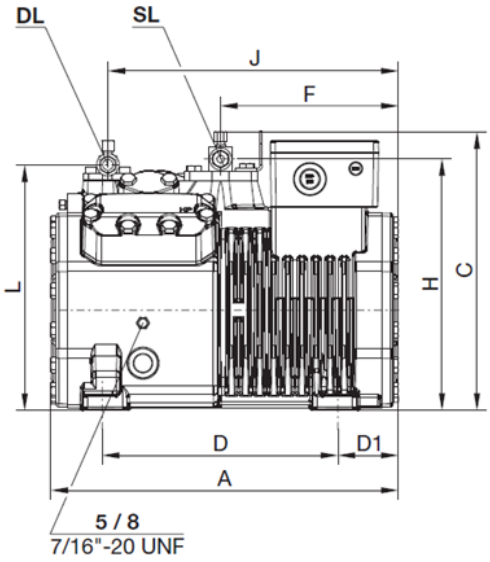
Notes

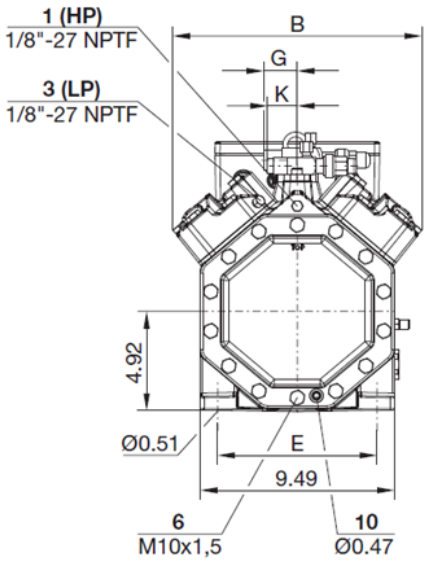
ECOLINE Dimensions and Port Locations

CE3 Models: 4FES – 4CES

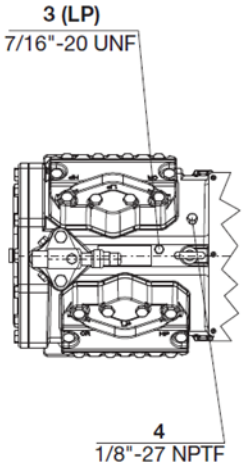
4FES-3(Y) .. 4CES-9(Y)

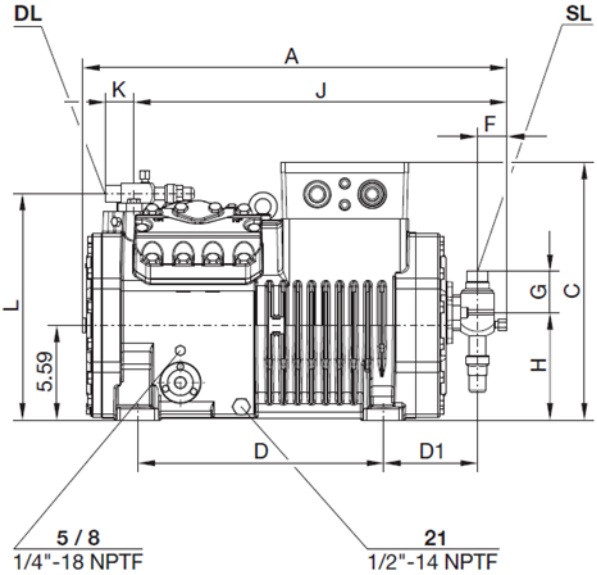


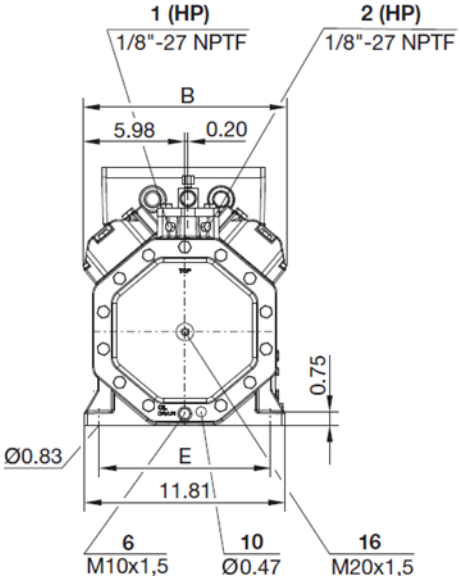




CE4 Models: 4VE – 4NE







ECOLINE Dimensions

CE3 Models	A	B	C	D	D1	E	F	G	H	J	K	L
4FES-3	17.01	12.17	13.66	11.54	2.95	7.80	8.70	1.65	12.32	14.21	1.46	12.05
4FES-5												
4EES-4			13.68					2.21	12.44			
4EES-6												
4DES-5											1.65	12.21
4DES-7	18.00				3.98		9.69			15.20	1.46	
4CES-6												
4CES-9												
CE3 Models	A	B	C	D	D1	E	F	G	H	J	K	L
4VE(S)-7	24.92	11.93	15.16	14.45	5.51	10.08	1.73	2.20	6.34	21.97	1.65	13.31
4VE(S)-10												
4TE(S)-9								2.52		21.93	2.21	13.46
4TE(S)-12												
4PE(S)-12												
4PE(S)-15	25.91				6.38		1.89	4.33	6.81	22.91		
4NE(S)-14	24.92				5.51		1.73	2.52	6.34	21.93		
4NE(S)-20	25.91				6.38		1.89	4.33	6.81	22.91		
BE5 Models	A	B	C	D	D1	E	F	G	H	J	K	L
4JE-15**	27.09	17.95	18.50	15.00	5.94	12.01	2.60	4.33	14.21	19.72	2.21	14.25

** BE5 compressors have larger overall dimensions than CE4 compressors, please review dimensions to ensure fit Contact Bitzer Tech Support (techsupport@bitzerus.com) if specific data or more information is required.

Port Locations

1	High pressure connection (HP)	**10**	Crankcase heater
2	Discharge gas temp sensor (HP) or LI sensor	**11**	High pressure oil connection (7/16” - 20 UNF)
3	Low pressure connection (LP)	**12**	Low pressure oil connection (7/16” - 20 UNF)
4	Liquid Injection spray nozzle (LP)	**16**	Connection for oil monitoring (M20 Thread)
5	Oil fill plug	**21**	Connection for oil service valve
6	Oil drain (magnetic screw)		

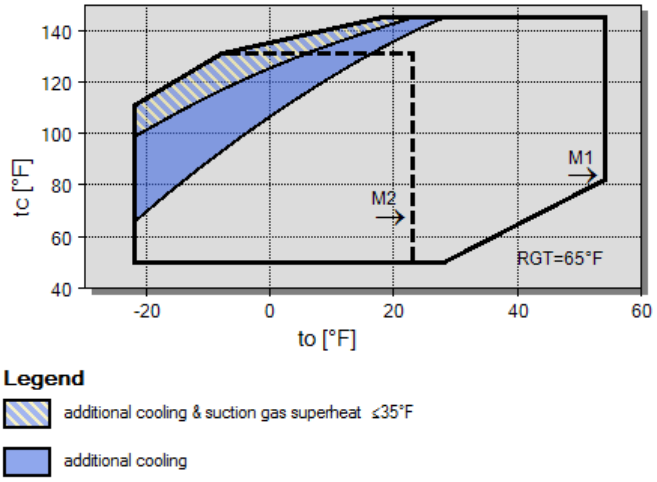
R22 LOW TEMP APPLICATIONS

The use of R22 in low temp applications can place a high demand on the compressor and lubricant. Discharge gas temperatures can reach very high values that are not sustainable for the compressor. The maximum discharge temperature measured at the discharge line within 4-8” of the discharge valve should not exceed 250°F. It is necessary to cool the return gas to ensure that the performance of the compressor will prevail.
Note: BITZER reciprocating compressors that are run with R22 need to use BITZER Oil: B5.2 or Alkyl benzene SUS 150 oil (AB 150).

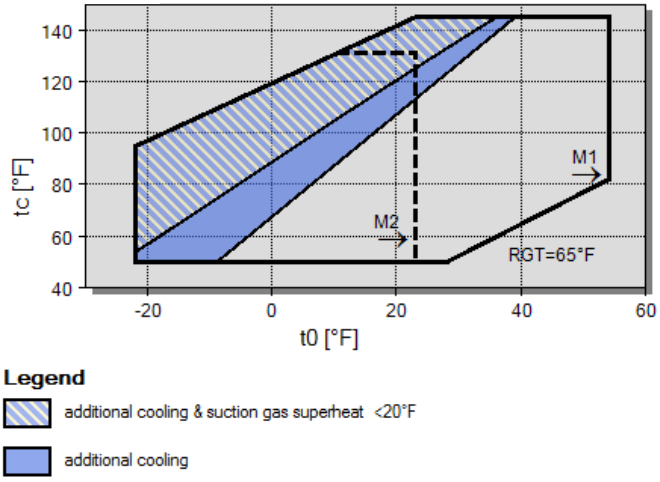
Application Limits: Explanation of when special cooling methods are required

To obtain application limit diagrams at various conditions, use the BITZER software (download free from www.bitzerus.com). Note the areas that indicate head fan, superheat settings, VARICOOL, and liquid injection requirements. Head fan cooling can be done by an air cooled condenser fan blowing over the compressor.

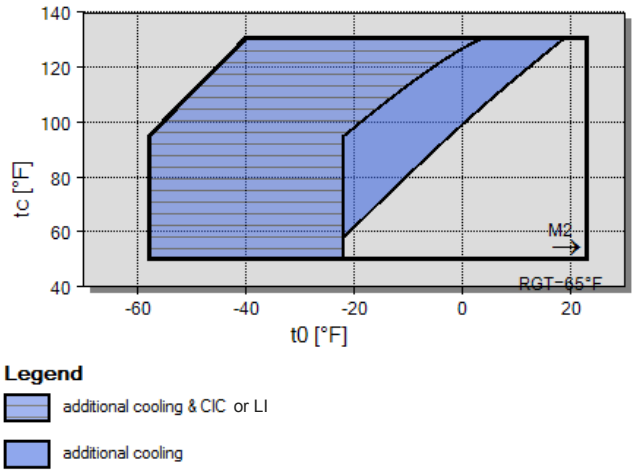
R22 100%



R22 50%



R22 CIC or LIQUID INJECTION SYSTEM
4VE(S) .. 4NE(S)



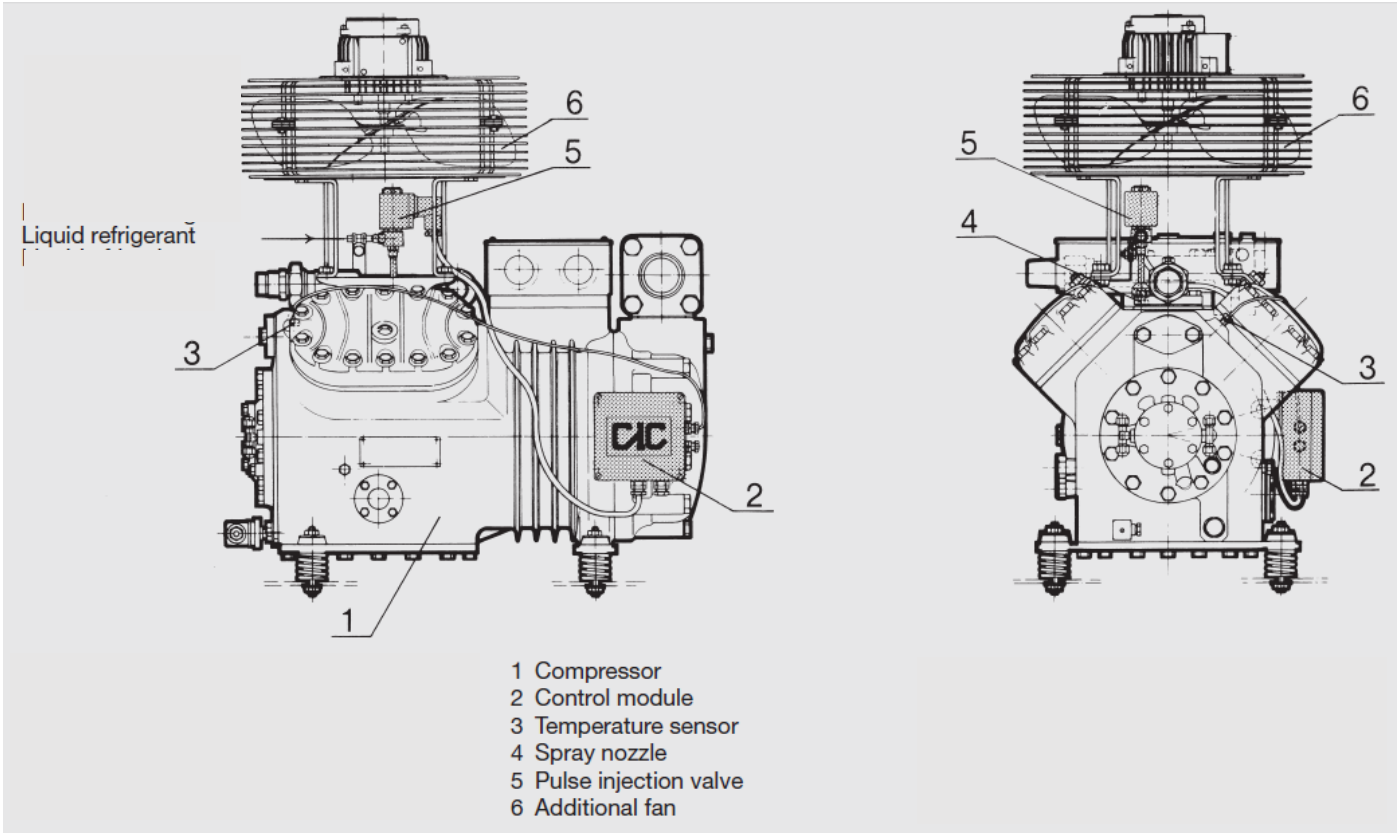
BITZER CIC System for CE4 compressor

(For more detailed information refer to KT-130)

The CIC system is a reliable electronically controlled refrigerant injection device for limiting the temperature of 4 and 6 cylinder single stage reciprocating compressors operating in low temperature systems with R22. For improved cooling in the thermal limit area, BITZER developed a system, where suction gas cooling, external forced air cooling and controlled refrigerant injection are combined.

The central unit of this combined method of cooling is the electronic CIC system with control module, temperature sensor and pulse injection valve. The primary function of these components is the continuous control of the discharge gas temperature, as evaluated by the control module.

When a defined preset value is exceeded, liquid refrigerant is injected into the suction chamber of the compressor (after the motor) and directed against the hot cylinder walls by means of a special spray nozzle. The pulse injection valve ensures exactly dosed quantity regulation.
The liquid refrigerant cools the cylinder area, due to evaporation, and at the same time reduces the temperature of the (superheated) suction gas transported from the motor. This measure combined with external forced air cooling also maintains the discharge gas temperature with single stage compression at a level considered as safe under practical conditions.



Y1037 valves for CE4 compressor

(See page 10 for valve sizing and part number)

The CE4 model compressors can be run with TREVs to lower the temperature of the refrigerant inside the compressor.

The Sporlan TREV Y1037 valves are available from BITZER US or various refrigeration wholesalers and have a variety of set points. Valves suitable for BITZER compressors are also available directly through BITZER US. These valves regulate the discharge gas temperature to 240°F*. Most valves have 3/8” SAE connections and the bulb sensor is 5 feet long. The only exception is the 1/3 ton valve which has 3/8 sweat connection and a 30 inch long sensor.

BITZER recommends injecting into the low pressure port of the compressor after the motor. These ports are shown in the figure below as port 4.

Be sure to install the TREV bulb 4-8 inches away from the discharge valve and properly insulate it to prevent influence from the ambient and head fan air.

It is also recommended to install a solenoid valve before the Y-1037 valve to ensure the liquid feed is off when the compressor is off.

*BITZER carries 240°F Y1037 valves. Using a Y1037 valve below 230°F is not recommended.

CE4 Series

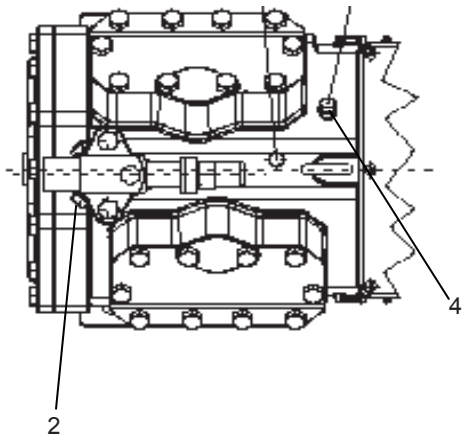


Figure 4.4**:** Port locations for valve and discharge temp sensor

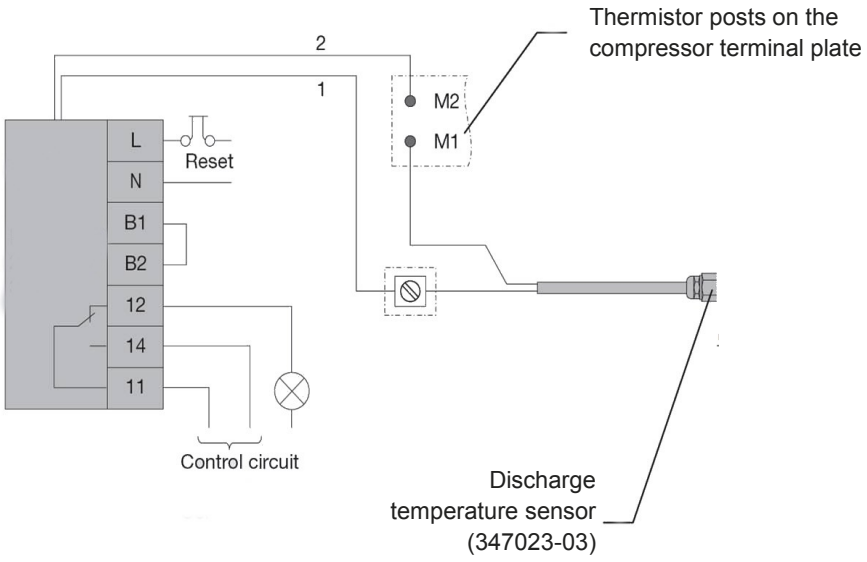
Installing a Discharge Temperature Sensor

The use of a discharge temperature sensor as a backup safety is recommended as an additional step to protect the compressor from damage. This safety device has proved especially useful when using R22 in low temperature applications, even when an injection device is in place to cool the return gas.
For CE3 compressors it will only monitor the temperature of one head.

BITZER offers a discharge temperature sensor (part # 347023-03) that will open the SE-B INT module at 140°C / 284°F.

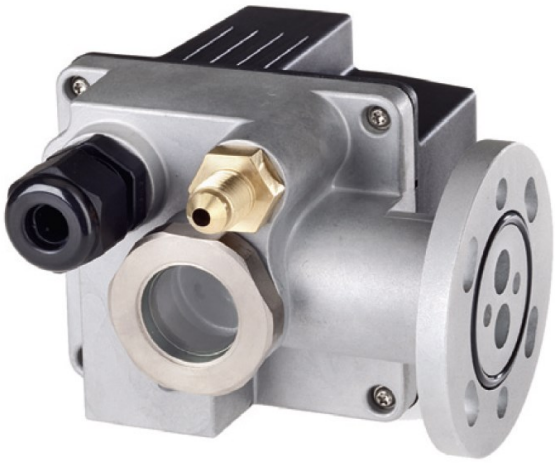
Installation: Apply Teflon tape sealant to the threads of the sensor and install into port 2 (see Figure 5.4). The sensor must not be installed further downstream (e.g. at discharge piping) due to the ability of the gas to lose heat quickly; doing so would allow unsafe temperatures in the head.

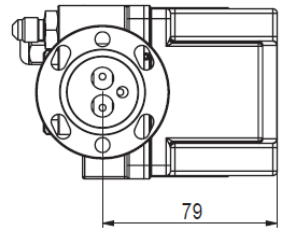
Wire the sensor according to diagram below:

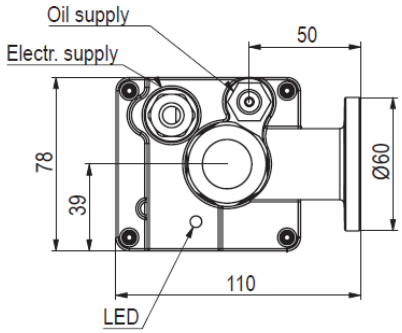


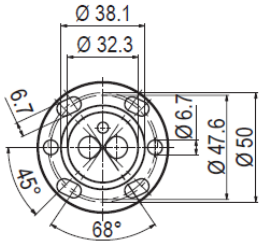
Installing the Oil Level Control - INT280 Oil Level Regulator

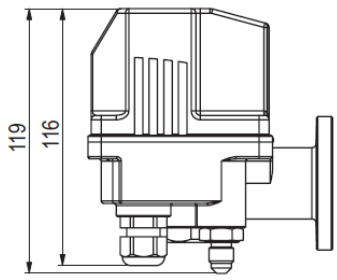
- Oil connection size: 7/16”-20 UNF
- 180 reversible – 2 possible installation positions
- Adaptor for threaded sight glass models (CE3): 990-8000-02
- Torque threaded sight glass adaptor to 65 Nm or 48lbf-ft.
- Torque sight glass bolts to 11 Nm or 8.1 lbf-ft.
- See page 19 for wiring diagram.

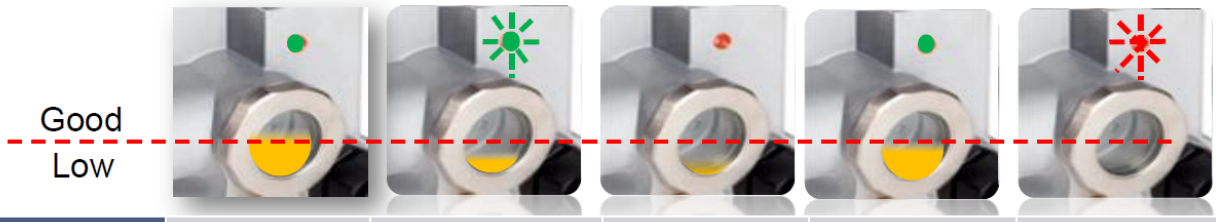












Control Status	Normal	Filling	Alarmed	Normal	Fault Detected
Oil Level	Good	Low	Low	Good	N/A
Compressor Status	Online	Online	Offline	Online	Offline
LED Status	Solid Green	Blinking Green	Solid Red	Solid Green	Blinking Red
Solenoid Control Algorithm	Fill De-energized	1. 5 On / 5 Off 2. 10 On / 10 Off 3. 20 On / 20 Off 4. 30 On / 30 Off Compressor Offline	Cont. algorithm 30 On /30 Off Compressor will restart once level is satisfied.	Adequate level Confirmed. Fill De-energized and Compressor restarts.	Fill De-energized

KWN body 02 copy

Installing Bitzer Oil Monitoring System

(For S models only. Does not apply to oil pump models)

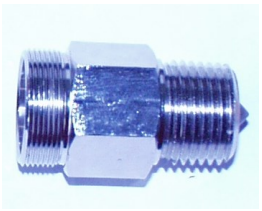
OLC-K1 Optical Level Monitor

Bitzer Part: 347318-07 (110V – M20 threads)

347318-06 (230V – M20 threads)

OLC-K1 is comprised of two parts to make installation and maintenance easier.

Oil Level Evaluation Unit



Screw In Unit

1. Release the pressure with both service valves closed and the power supply disconnected.
2. Remove the M20 center bolt and metal gasket. (Figure 5.1).
3. Install the adapter into the bearing cap. Max torque 75Nm or 56ft-lb. (Figure 5.2a & 5.2b).

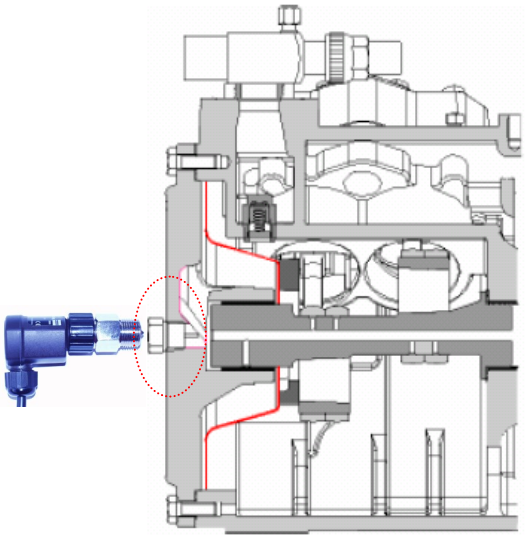


Figure 5.1

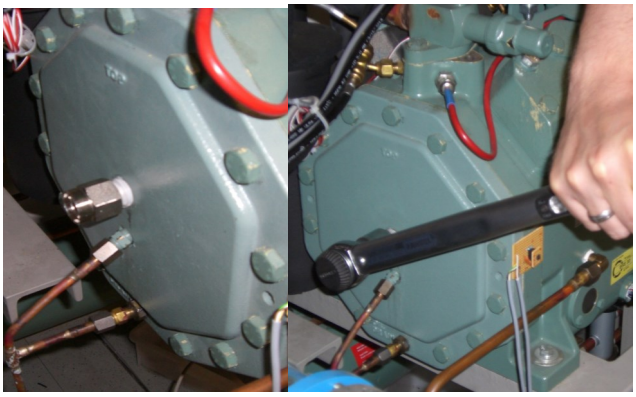


Figure 5.2a Figure 5.2b

4. Install the electrical sensor into the adapter and tighten the coupling ring approximately 10Nm or 7.4ft-lb (Figure 5.1). Pay attention to the position of the lead (cable exit downwards). For wiring directions, refer to the electrical appendix.

Mechanical or Electronic Oil Protection

(For pump models only. Does not apply to S models)

1. There are several options available for oil pressure monitoring including: Bitzer's Delta PII (p/n: 347318-11) or Johnson P545 control w/P400 sensor (p/n: 860-3003-02).
2. When using the Johnson electronic control P545-NCB25 the electronic sensor is connected as shown in Figure 5.3.

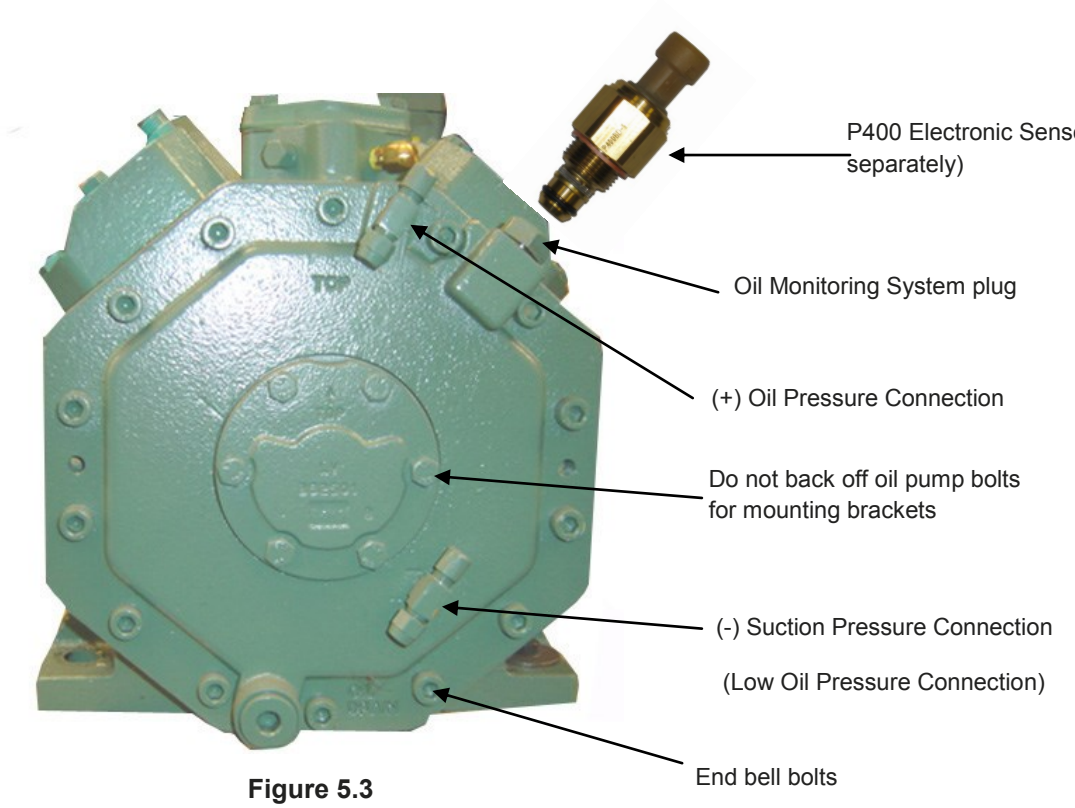


Figure 5.3

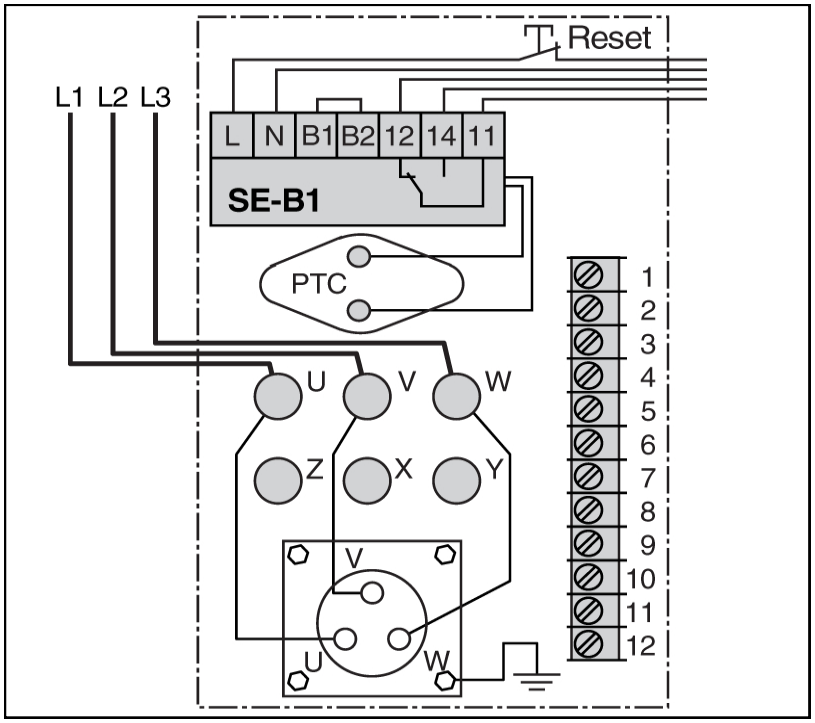
3. Mechanical oil safety control connects to the (+) and (-) fittings shown in Figure 5.3.
4. High pressure oil is connected to the ¼" SAE marked "+" and the suction is connected to the fitting marked "-".
6. Refer to the wiring appendix for diagrams for the electrical connections.
7. Bitzer's Delta PII oil pressure monitoring device is inserted in the same position as the P400 shown above. Torque the sensor piece to 75 Nm / 56 lbf.ft.

Notes

Wiring Diagram Located in Terminal Box

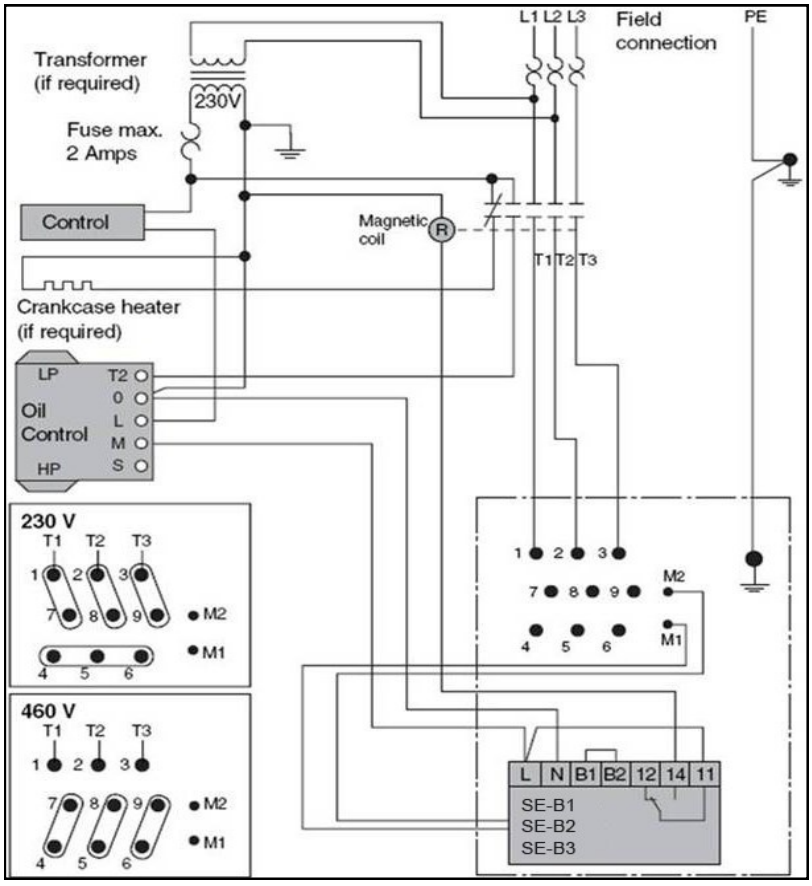
CE3 Models: 4FES – 4CES

"-4SU" motor: 460V/3ph/60Hz



CE4 Models: 4VE(S) – 4NE(S)

"-2NU" motor: 460V/3ph/60Hz



Wiring Diagram Appendix

DANGER OF ELECTROCUTION!!!

ALL WORK TO BE PERFORMED BY A TRAINED PROFESSIONAL

!!!ATTENTION!!!

WIRING SCHEMATICS ARE DIFFERENT FOR EVERY SYSTEM. THESE DRAWINGS ARE PROVIDED ONLY FOR REFERENCE AND MAY NOT BE USED LITERALLY.

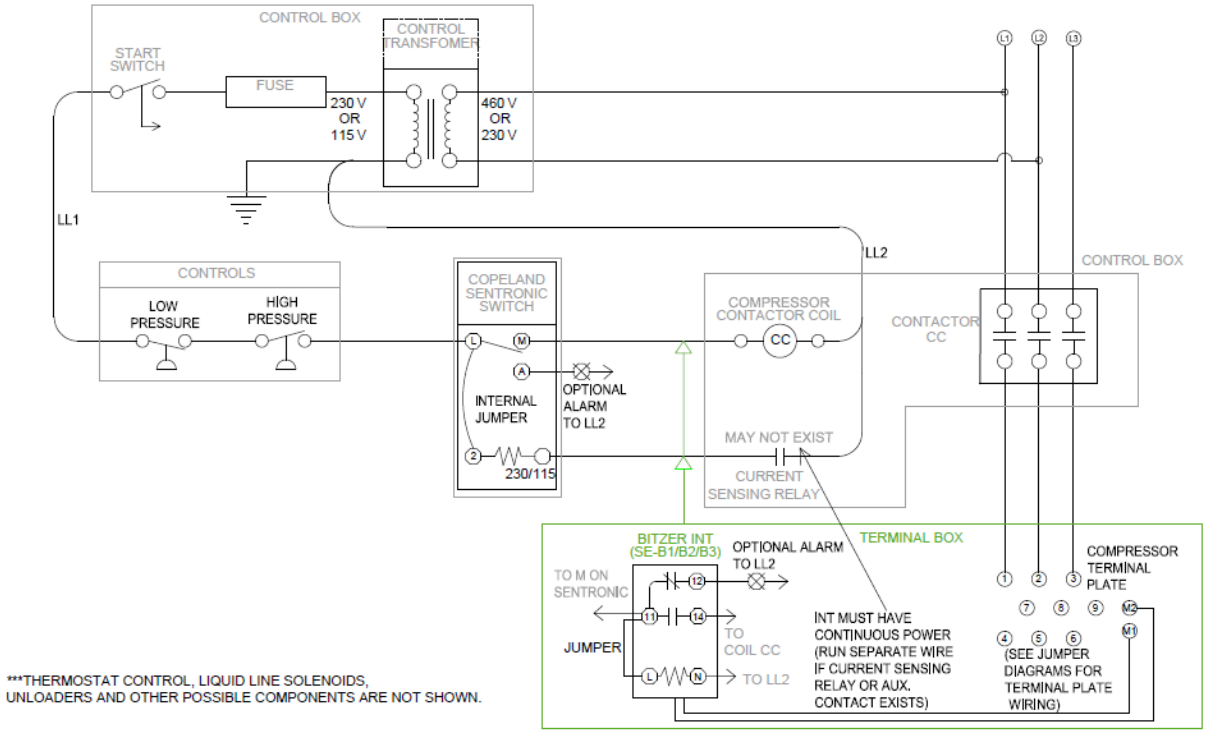
CONSULT SYSTEM MANUFACTURER OR OTHER QUILFIED SYSTEM ENGINEER IF UNSURE OF REWIRING

Installing the BITZER INT (motor protection device:"SE-B")

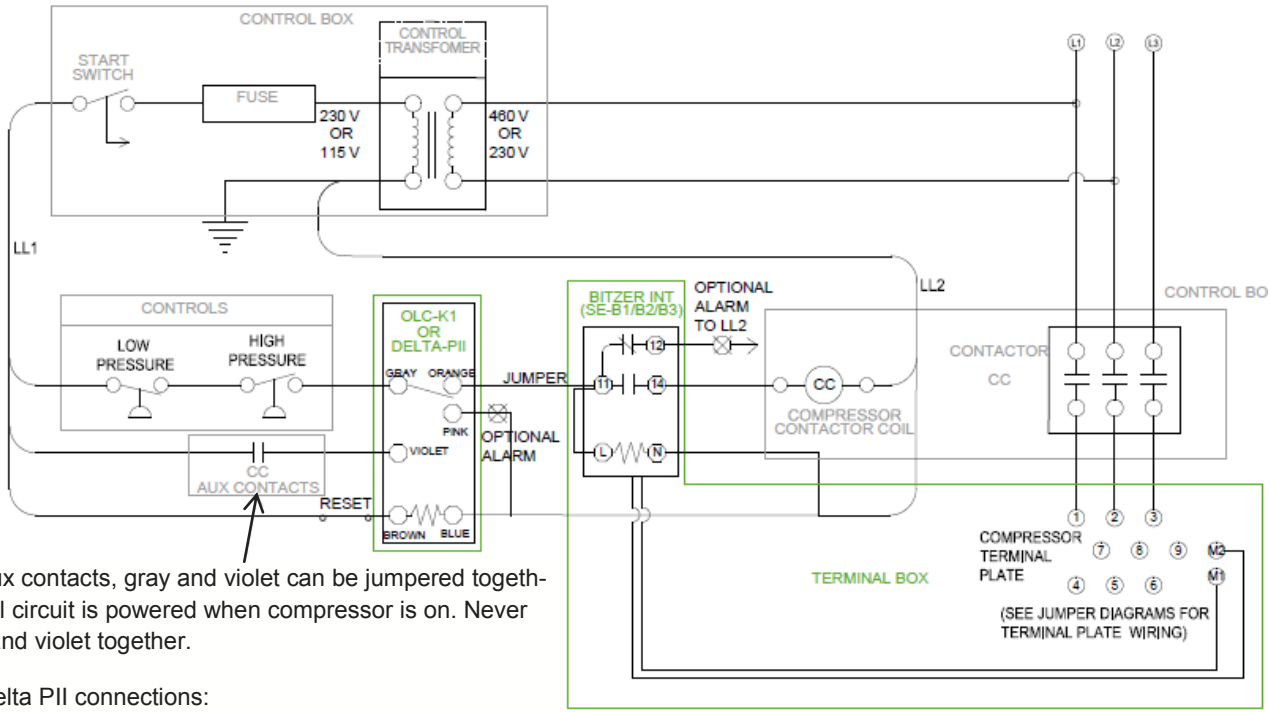
General directions (may not be applicable depending system):

1. Use 11 and 14 of the BITZER INT as part of the control circuit to replace M1 and M2 of the Copeland Module.
2. Use L and N on the INT to replace the line power T1 and T2.
3. Make sure the orange wires of the INT are connected to thermistors on the compressor terminal plate.
4. 11 and 14 will close when INT has power and the thermistors have resistance below 4500 Ω.
5. If the resistance is greater than 4500 Ω, the module with trip. Disconnect power at L or N for 5 seconds to reset.
6. If possible, maintain separate power to L from 11 so the BITZER INT cannot be reset accidentally or be an electronic controller

Replacing Copeland Models That Have No Overload (3Ds)



Using the OLC-K1 or Delta PII Oil Control



In lieu of NO aux contacts, gray and violet can be jumpered together only if control circuit is powered when compressor is on. Never jumper brown and violet together.

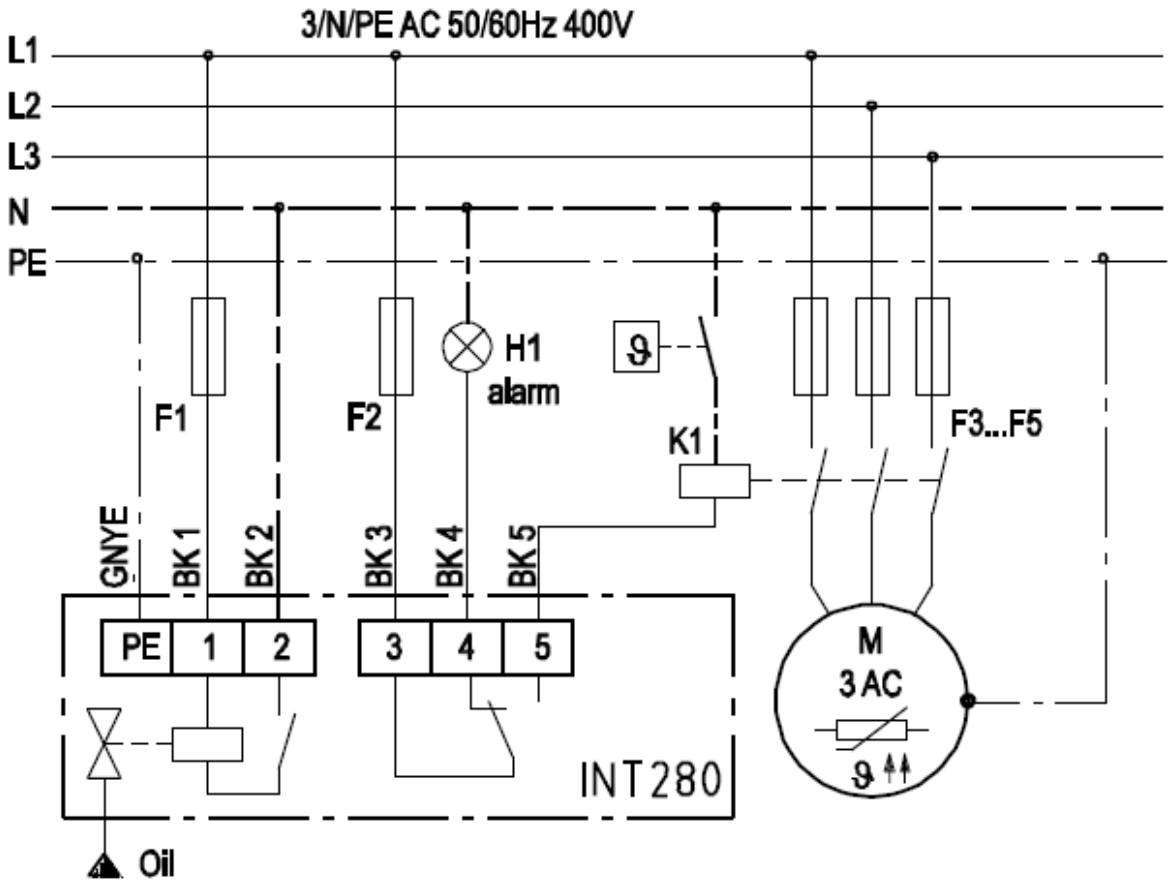
OLC-K1 and Delta PII connections:

- Brown and blue power the unit
- Gray and orange are the control circuit relays
- Violet is the run proof for on-delay timers
- Pink (and gray) is alarm circuit

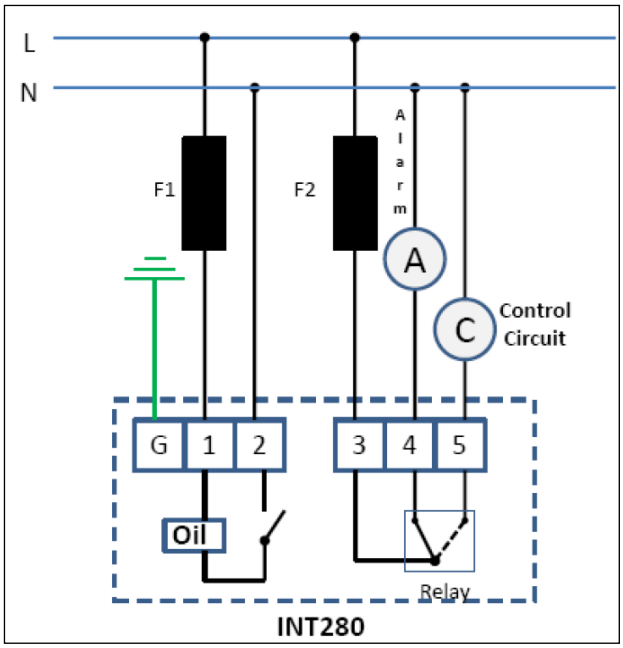
Note: Thermostat control, liquid line solenoids, unloaders and other possible components are not shown.

Notes

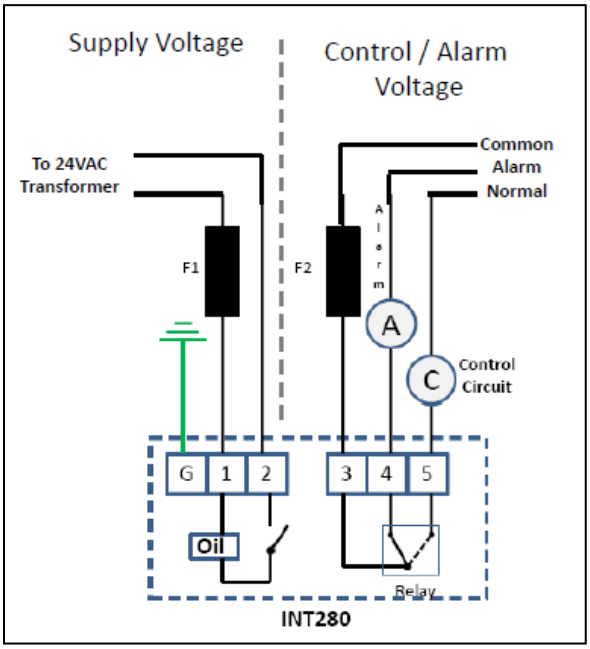
Wiring Oil Level Regulator (INT 280)



Simplified version:



24v verision:



10.0 Troubleshooting

Observation	Possible Cause	Trouble Shooting Steps
Compressor is not running	Loss of power	Check voltage between phases before and after breaker, contactor and at the terminal box. Check voltage between the contactor coil.
	Overload protection (INT) tripped	Check resistance between M1 and M2. If resistance is lower than 1000 ohms, reset the INT. If the resistance is greater, check motor windings, supply voltage and ensure connections are tight.
	Burnt motor	Check windings. Check continuity and resistance between windings. All windings should have the same resistance of about 1 ohm and should show continuity. Also check continuity and resistance between each pin and ground. Resistance should be at least 50 Megaohms (non-continuous).
	Other protections tripped	Check continuity for all control circuit devices (e.g. low/high pressure switches, phase loss, oil failure, etc)
Compressor is noisy	Broken reeds	Check suction and discharge pressure. Turn off the compressor and look for the pressures to equalize. If the pressures equalize almost immediately, change valve plate.
	Wet suction	Check superheat on the suction side of the compressor (superheat should be at least 20° F). Adjust TXV to the appropriate superheat.
	Broken rod	Check for heavy vibrations. Replace compressor.
Compressor leaking	Gaskets / o-rings	Tighten bolts according to the torque chart. If the problem is not solved then change the gasket or o-ring. Inspect mating surfaces when changing gaskets. Only use BITZER gaskets / o-rings.
	Oil adapter / sight glass	Replace the oil adapter.
Oil pump	Low pressure differential	Minimum pressure differential is 9psi. Check oil level at the sightglass. Reverse the rotation by changing two phases of the power supply, look for improvement. If no improvement, change oil pump.
	No pressure differential	Open oil pump. If the oil pump bearing is worn, change the complete oil pump.
	Oil level low	Add oil and check for leaks.
Flooded start	Crankcase heater	May not be operating or installed. Crankcase heater remains on when compressor is off.
	Piping	Piping is allowing liquid to enter the compressor when the compressor is off. Change piping.
	Migration	Ensure proper crankcase heating. If the compressor is outdoors, use housing or machine room.
Floodback	Suction line frozen	Check superheat at evaporator. Adjust TXV.
	Liquid coming back	Check evaporator fans for proper operation. Clean evaporator coil.

Observation	Possible Cause	Trouble Shooting Steps
Compressor is running hot	High discharge	Check condenser fans for proper operation. Clean coil.
	Suction temp high	Check return gas temperature.
	Compression ratio is too high	Check set points and application limits.
Oil failure trips	No oil at sightglass	Check for leaks and check piping. Possibility of improper traps.
Oil failure trips	Oil at normal level	Possibility of liquid refrigerant in the crankcase.
Oil failure trips	Oil sightglass full	Too much oil in the system.

Bitzer model number		Date	
Serial Number		Location	
Compressor/equipment bought from		Tech name	
		Phone	

Refrigerant	
Set points	
Suction pressure	
Discharge pressure	

Compressor installed in		Parallel system
		Condensing unit (remote)
		Chiller (self contained)

Defrost	
Quantity	
Duration (mins)	
Type (air, elctric or gas)	

System description

DATA		Voltage between phases	/ /	Comments
Date		Amps per phase	/ /	
Time				
Suction pressure	psi	Oil level at sightglass	/8	
Discharge pressure	psi	Oil color		
Suction temp	F	Any foam?	YES/NO	
Discharge temp	F	Oil pump (pressure dif)	psi	
Compressor superheat	F	Condenser clean?	YES/NO	
Evaporator superheat	F	Fans running?	YES/NO	
Liquid temp	F	Using subcooler	YES/NO	
Any noise?	YES/NO	Other protections		
		Low pressure switch		
		High pressure switch		
		Phase loss		
		Oil failure		

Notes

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