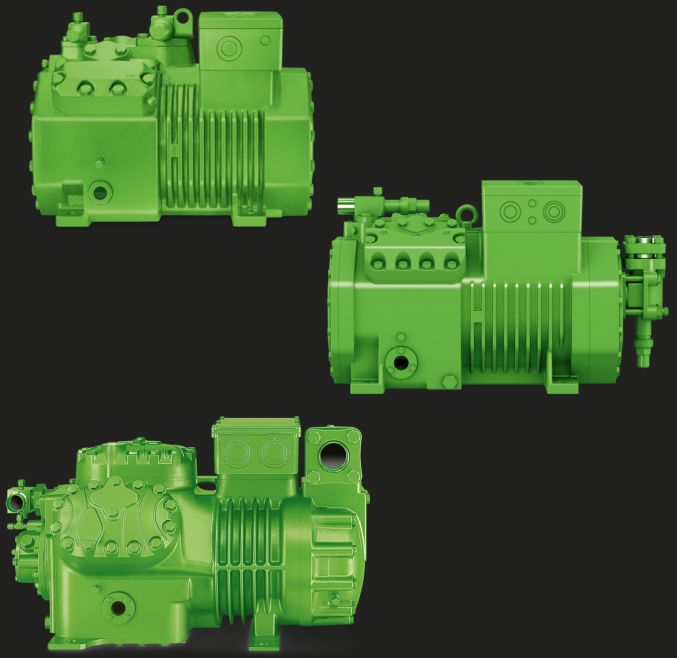
SERVICE GUIDE
ECOLINE COMPRESSORS



SG-0012-08// Revision 4/2014 // IP Units

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.

General safety references:

Warning!
The **compressor is under pressure** with a holding charge of 14 psi above atmospheric pressure. Incorrect handling may cause injury to skin and eyes. Wear safety goggles while working on compressor. Do not open connections before pressure has been released.

Caution!
During operation, **surface temperatures** exceeding 140°F or below 32° F can be reached. Serious burnings possible. Lock and mark accessible sectors. Before working on the compressor: Switch off and let cool down.

Warning!
If working on the compressor after the plant has been commissioned: Compressor is under pressure! In case of improper handling serious injuries are possible. Release the pressure in the compressor!
Wear safety goggles!

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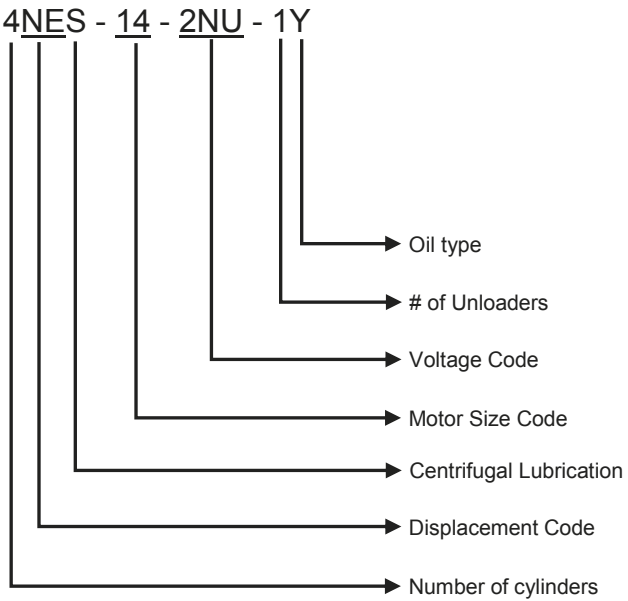
1.2 ECOLINE Nomenclature



Note: The suffix (e.g.“-1Y”) is used for ordering and shipping purposes but is not displayed on the data tag (nameplate) of the compressor.

1.3 Serial Number Significance starting 01/09/2003

The serial number contains 10 figures. The first 2 digits indicate the *factory*, the 3 following digits indicate the *manufacturing date*, and the last 5 digits are running subsequently. ***Factory codes*** are the first 2 digits of the serial number (see Table 1). ***Date Codes*** are **the next** 3 digits that indicate the manufacturing date (use Table 3 for the 1st digit and Table 2 for the 2nd and 3rd digit).

Table 1: Factory Codes	
10	Rottenburg - Germany
11	Hailfingen - Germany
16	Schkeuditz - Germany
12	Castelo Branco - Portugal
13	Sao Paulo - Brazil
15	Milton Keynes - UK
17	Works BBR - China
18	Works Capetown - South Africa
20	Works BCB - China
21	Jawa Barat - Indonesia
22	St. Marys - Austrialia
23	Sunshine, Victoria - Australia
24	Point Claire - Canada
25	Flowery Branch, GA - USA
27	Syracuse, NY - USA

Table 2: Date Codes					
	2011	2012	2013	2014	2015
Jan	801	821	841	861	881
Feb	802	822	842	862	882
Mar	803	823	843	863	883
Apr	804	824	844	864	884
May	805	825	845	865	885
Jun	806	826	846	866	886
Jul	807	827	847	867	887
Aug	808	828	848	868	888
Sep	809	829	849	869	889
Oct	810	830	850	870	890
Nov	811	831	851	871	891
Dec	812	832	852	872	892

Table 3: Date Code
1986 until 1990 = Value 3
1991 until 1995 = Value 4
1996 until 2000 = Value 5
2001 until 2005 = Value 6
2006 until 2010 = Value 7
2011 until 2016 = Value 8

Example: SERIAL NUMBER 2572100001		
DIGITS 1 AND 2	DIGITS 3 TO 5	DIGITS 5 TO 10
FACTORY CODE	DATE CODE	SUBSEQUENT NUMBERING
25	826	00001
Flowery Branch	Jun-12	Unambiguous subsequent numbering

1.4 BITZER Quick Ship Program

QUICKSHIP

Placing your Order:

- Call 770-503-9226 M-F from 8am - 5pm
- Call 1-888-GO BITZER (1-888-462-4893)

Choose from 4 Shipping Options:

- Next Day Delivery
- Second Day Delivery
- Standard Ground Transportation
- Customer Pick-Up

Please provide the following information to our Customer Service Associates:

- Failed Model Number
- Serial Number
- Contact Name
- Contact Phone Number
- Email Address
- Ship to Address
- Is a liftgate needed?
- Credit Card Number
  (American Express / Visa / Mastercard)

1.5 BITZER Core Charge Return Policy

Contact customer service at 770-503-9226 or email rma@bitzerus.com for a RMA form.

Please Note:

A credit card number (or a PO if you have a BITZER account) is required for the replacement compressor and core deposit. We will call you back with a delivery confirmation ASAP.

Once a Return Material Authorization (RMA) form is filled out, we will also arrange to have your failed compressor picked up. BITZER will pay the freight back to the factory and, as soon as it arrives at the Atlanta area plant, we will issue you a credit against your core deposit.

BITZER does not charge a core charge for your replacement compressor if you adhere to the following procedures:

1. After receiving your replacement compressor, you have 2 weeks to contact us to schedule the pick up of your core. If you fail to do so BITZER will execute the core charge on your current PO.

2. The compressor should be shipped fully sealed: Use blank offs or the service valves shipped with replacement compressor.

3. Attach Return Material Authorization form to the compressor. Your RMA form will be issued when placing your order.

1.6 Technical Support

If there has been more than one failure in a system, speak to an application engineer:

Contact technical support at 770-503-9226 or email techsupport@bitzerus.com

Please provide as much of the following information as possible:

- Model number
- Serial number
- Refrigerant
- Voltage
- Evaporating SST or Pressure
- Condensing SDT or Pressure
- Return Gas Temperature
- Liquid Subcooling / Liquid Temperature
- Discharge gas temperature
- Amp draw
- Oil pressure

See back page for system parameter.

1.7 ECOLINE vs Standard models

ECOLINE is 100% backwards compatible with existing BITZER recips (Dimensions on page 16)

Extended application limits (See page 38)

New unloader head design (See page 77 for part numbers)

Improved valve plate design (See page 80 for part numbers)

	ECOLINE M/N	US M/N	Global M/N
CE1	2KES-05	2C0173SH	2KC-05.2
	2JES-07	2C0222SH	2JC-07.2
	2HES-1	2C0278SL	2HC-1.2
	2HES-2	2C0278SH	2HC-2.2
	2GES-2	2C0323SH	2GC-2.2
	2FES-2	2C0407SL	2FC-2.2
	2FES-3	2C0407SH	2FC-3.2
CE2	2EES-2	2C0484SL	2EC-2.2
	2EES-3	2C0484SH	2EC-3.2
	2DES-2	2C0572SL	2DC-2.2
	2DES-3	2C0572SH	2DC-3.2
	2CES-3	2C0692SL	2CC-3.2
	2CES-4	2C0692SH	2CC-4.2
CE3	4FES-3	4C0770SL	4FC-3.2
	4FES-5	4C0770SH	4FC-5.2
	4EES-4	4C0969SL	4EC-4.2
	4EES-6	4C0969SH	4EC-6.2
	4DES-5	4C1145SL	4DC-5.2
	4DES-7	4C1145SH	4DC-7.2
	4CES-6	4C1385SL	4CC-6.2
	4CES-9	4C1385SH	4CC-9.2

	ECOLINE M/N	US M/N	Global M/N
CE4	4VE-7	4C1480PL	4VC-6.2
	4VE-10	4C1480PH	4VC-10.2
	4VES-7	4C1480SL	4VCS-6.2
	4VES-10	4C1480SH	4VCS-10.2
	4TE-9	4C1761PL	4TC-8.2
	4TE-12	4C1761PH	4TC-12.2
	4TES-9	4C1761SL	4TCS-8.2
	4TES-12	4C1761SH	4TCS-12.2
	4PE-12	4C2067PL	4PC-10.2
	4PE-15	4C2067PH	4PC-15.2
	4PES-12	4C2067SL	4PCS-10.2
	4PES-15	4C2067SH	4PCS-15.2
	4NE-14	4C2397PL	4NC-12.2
	4NE-20	4C2397PH	4NC-20.2
	4NES-14	4C2397SL	4NCS-12.2
	4NES-20	4C2397SH	4NCS-20.2
BE5	4JE-15	4B2707PL	4J-13.2
	4JE-22	4B2707PH	4J-22.2
	4HE-18	4B3139PL	4H-15.2
	4HE-25	4B3139PH	4H-25.2
	4GE-23	4B3604PL	4G-20.2
	4GE-30	4B3604PH	4G-30.2
	4FE-28		
	4FE-35		
BE6	6JE-25	6B4060PL	6J-22.2
	6JE-33	6B4060PH	6J-33.2
	6HE-28	6B4709PL	6H-25.2
	6HE-35	6B4709PH	6H-35.2
	6GE-34	6B5406PL	6G-30.2
	6GE-40	6B5406PH	6G-40.2
	6FE-44	6B6462PL	6F-40.2
	6FE-50	6B6462PH	6F-50.2

2.1 CE1, CE2, CE3 Technical Data

Series	Ecoline Model Number	Motor	CFM	CFH	CR Ready	Single Phase Option	Dual Voltage 230/460	Oil Charge (oz)	Weight (lbs)	Tube Connections DL (in.)	Tube Connections SL (in.)
CE1	2KES-05	1	2.9	173	--	Yes	--	35	95	1/2	5/8
CE1	2JES-07	1	3.7	222	--	Yes	--	35	95	1/2	5/8
CE1	2HES-1	2	4.6	278	--	Yes	--	35	97	1/2	5/8
CE1	2HES-2	1	4.6	278	--	Yes	--	35	99	1/2	5/8
CE1	2GES-2	1	5.4	323	--	Yes	--	35	99	1/2	5/8
CE1	2FES-2	2	6.8	407	--	Yes	--	35	99	1/2	5/8
CE1	2FES-3	1	6.8	407	--	--	--	35	103	1/2	5/8
CE2	2EES-2	2	8.1	486	--	--	--	53	150	5/8	7/8
CE2	2EES-3	1	8.1	486	--	Yes	--	53	157	5/8	7/8
CE2	2DES-2	2	9.5	571	--	--	--	53	150	5/8	7/8
CE2	2DES-3	1	9.5	571	--	Yes	--	53	157	5/8	7/8
CE2	2CES-3	2	11.5	691	--	Yes	--	53	154	5/8	7/8
CE2	2CES-4	1	11.5	691	--	--	--	53	154	5/8	7/8
CE3	4FES-3	2	12.8	772	10% - 100%	--	--	70	181	5/8	7/8
CE3	4FES-5	1	12.8	772	10% - 100%	--	--	70	190	5/8	7/8
CE3	4EES-4	2	16.2	968	10% - 100%	--	--	70	185	5/8	1 1/8
CE3	4EES-6	1	16.2	968	10% - 100%	--	--	70	190	5/8	1 1/8
CE3	4DES-5	2	19.1	1142	10% - 100%	--	--	70	190	7/8	1 1/8
CE3	4DES-7	1	19.1	1142	10% - 100%	--	--	70	196	7/8	1 1/8
CE3	4CES-6	2	23.1	1385	10% - 100%	--	--	70	201	7/8	1 1/8
CE3	4CES-9	1	23.1	1385	10% - 100%	--	--	70	201	7/8	1 1/8

2.2 CE4 Technical Data

Series	Ecoline Model Number	Motor	CFM	CFH	CR Ready	Single Phase Option	Dual Voltage 230/460	Oil Charge (oz)	Weight (lbs)	Tube Connections DL (in.)	Tube Connections SL (in.)
CE4	4VE(S)-6Y	3	24.7	1479	10% - 100%	--	Yes	92	285	7/8	1 1/8
CE4	4VE(S)-7Y	2	24.7	1479	10% - 100%	--	Yes	92	285	7/8	1 1/8
CE4	4VE(S)-10Y	1	24.7	1479	10% - 100%	--	Yes	92	307	7/8	1 1/8
CE4	4TE(S)-8Y	3	29.4	1760	10% - 100%	--	Yes	92	296	1 1/8	1 3/8
CE4	4TE(S)-9Y	2	29.4	1760	10% - 100%	--	Yes	92	296	1 1/8	1 3/8
CE4	4TE(S)-12Y	1	29.4	1760	10% - 100%	--	Yes	92	311	1 1/8	1 3/8
CE4	4PE(S)-10Y	3	34.5	2067	10% - 100%	--	Yes	92	307	1 1/8	1 3/8
CE4	4PE(S)-12Y	2	34.5	2067	10% - 100%	--	Yes	92	307	1 1/8	1 3/8
CE4	4PE(S)-15Y	1	34.5	2067	10% - 100%	--	Yes	92	324	1 1/8	1 5/8
CE4	4NE(S)-12Y	3	40	2395	10% - 100%	--	Yes	92	311	1 1/8	1 3/8
CE4	4NE(S)-14Y	2	40	2395	10% - 100%	--	Yes	92	311	1 1/8	1 3/8
CE4	4NE(S)-20Y	1	40	2395	10% - 100%	--	Yes	92	331	1 1/8	1 5/8

2.3 BE5, BE6 Technical Data

Series	Ecoline Model Number	NOMINAL HP	CFM	CFH	CR Ready	Single Phase Option	Dual Voltage 230/460	Oil Charge (oz)	Weight (lbs)	Tube Connections	
										DL (in.)	SL (in.)
BE5	4JE-13	3	45.1	2707	10% - 100%	--	Yes	141	395	1 1/8	1 5/8
BE5	4JE-15	2	45.1	2707	10% - 100%	--	Yes	141	419	1 1/8	1 5/8
BE5	4JE-22	1	45.1	2707	10% - 100%	--	Yes	141	419	1 1/8	1 5/8
BE5	4HE-15	3	52.3	3141	10% - 100%	--	Yes	141	404	1 1/8	1 5/8
BE5	4HE-18	2	52.3	3141	10% - 100%	--	Yes	141	419	1 1/8	1 5/8
BE5	4HE-22	1	52.3	3141	10% - 100%	--	Yes	141	428	1 1/8	2 1/8
BE5	4GE-20	3	60.1	3606	10% - 100%	--	Yes	158	423	1 1/8	2 1/8
BE5	4GE-23	2	60.1	3606	10% - 100%	--	Yes	158	423	1 1/8	2 1/8
BE5	4GE-30	1	60.1	3606	10% - 100%	--	Yes	158	454	1 1/8	2 1/8
BE5	4FE-25	3	72.3	4339	10% - 100%	--	Yes	158	432	1 1/8	2 1/8
BE5	4FE-28	2	72.3	4339	10% - 100%	--	Yes	158	456	1 1/8	2 1/8
BE5	4FE-35	1	72.3	4339	10% - 100%	--	Yes	158	456	1 1/8	2 1/8
BE6	6JE-22	3	67.7	4062	10% - 100%	--	Yes	167	470	1 3/8	2 1/8
BE6	6JE-25	2	67.7	4062	10% - 100%	--	Yes	167	503	1 3/8	2 1/8
BE6	6JE-33	1	67.7	4062	10% - 100%	--	Yes	167	509	1 3/8	2 1/8
BE6	6HE-25	3	78.5	4710	10% - 100%	--	Yes	167	494	1 3/8	2 1/8
BE6	6HE-28	2	78.5	4710	10% - 100%	--	Yes	167	503	1 3/8	2 1/8
BE6	6HE-35	1	78.5	4710	10% - 100%	--	Yes	167	518	1 3/8	2 1/8
BE6	6GE-30	3	90.1	5404	10% - 100%	--	Yes	167	503	1 3/8	2 1/8
BE6	6GE-34	2	90.1	5404	10% - 100%	--	Yes	167	503	1 3/8	2 1/8
BE6	6GE-40	1	90.1	5404	10% - 100%	--	Yes	167	525	1 3/8	2 1/8
BE6	6FE-40	3	107.7	6461	10% - 100%	--	Yes	167	525	1 5/8	2 1/8
BE6	6FE-44	2	107.7	6461	10% - 100%	--	Yes	167	532	1 5/8	2 1/8
BE6	6FE-50	1	107.7	6461	10% - 100%	--	Yes	167	532	1 5/8	2 1/8

2.4 2-Stage Technical Data

Series	Model Number	Global Model Number	CFH (LP/HP)	Single Phase Option	Dual Voltage 230/460	Oil Charge (oz)	Weight (lbs)	Tube Connections DL (in.)	Tube Connections SL (in.)
BS4	S4T-5.2(Y)	S4T-5.2(Y)	840/537	--	Yes	106	300	7/8	1 1/8
BS4	S4N-8.2(Y)	S4N-8.2(Y)	1193/763	--	Yes	106	310	7/8	1 1/8
BS5	S4G-12.2(Y)	S4G-12.2(Y)	1803/1151	--	Yes	158	365	1 1/8	1 3/8
BS6	S6J-16.2(Y)	S6J-16.2(Y)	2706/1355	--	Yes	167	460	1 3/8	1 5/8
BS6	S6H-20.2(Y)	S6H-20.2(Y)	3137/1573	--	Yes	167	485	1 3/8	1 5/8
BS6	S6G-25.2(Y)	S6G-25.2(Y)	3602/1803	--	Yes	167	515	1 3/8	1 5/8
BS6	S6F-30.2(Y)	S6F-30.2(Y)	4309/2152	--	Yes	167	517	1 3/8	1 5/8

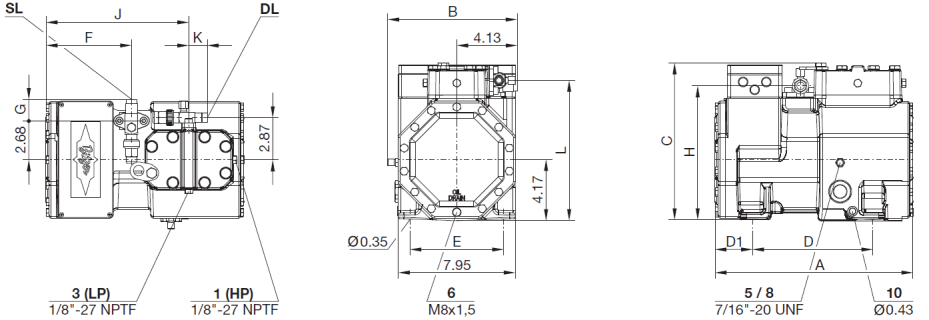
2.5 Dimensional Drawings and Connections

Series	ECOLINE Model Number
CE1	2KES-05
CE1	2JES-07
CE1	2HES-1
CE1	2HES-1
CE1	2GES-2
CE1	2FES-2
CE1	2FES-3

CE1 Series

CE1 Series – Dimensions and Connection Ports

2KES-05(Y) .. 2FES-3(Y)



A	B	C	D	D1	E	F	G	H	J	K	L
13.50	8.66	10.75	8.19	2.56	6.38	5.83	1.46	9.53	9.72	1.26	9.13

Legend for connections see page 29

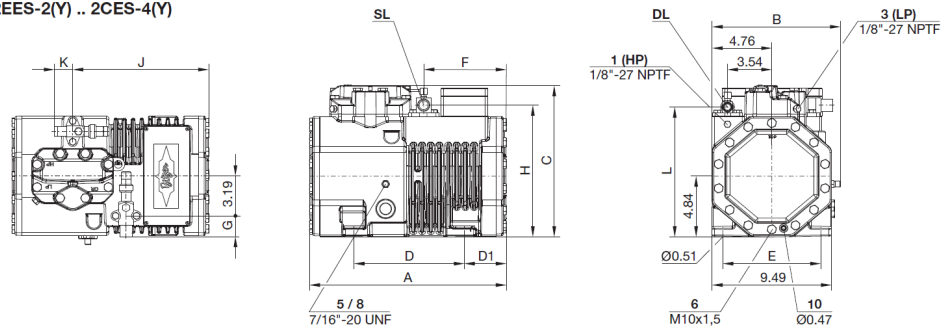
All dimensions in inches

CE2 Series

Series	ECOLINE Model Number
CE2	2EES-2
CE2	2EES-3
CE2	2DES-2
CE2	2DES-3
CE2	2CES-3
CE2	2CES-4

CE2 Series – Dimensions and Connection Ports

2EES-2(Y) .. 2CES-4(Y)



A	B	C	D	D1	E	F	G	H	J	K	L
15.67	10.20	12.10	8.78	3.35	7.80	6.58	1.65	10.47	10.83	1.46	9.13

Legend for connections see page 29

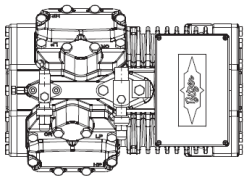
All dimensions in inches

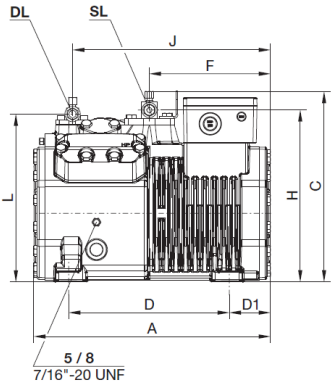
CE3 Series

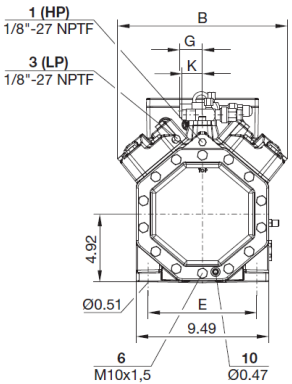
Series	ECOLINE Model Number
CE3	4FES-3
CE3	4FES-5
CE3	4EES-4
CE3	4EES-6
CE3	4DES-5
CE3	4DES-7
CE3	4CES-6
CE3	4CES-9

CE3 Series – Connection Ports

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





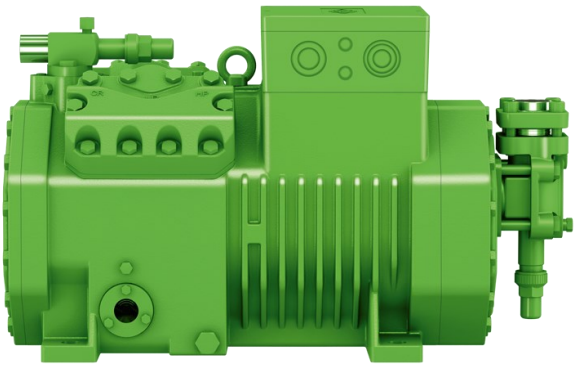


	A	B	C	D	D1	E	F	G	H	J	K	L
4FES	17.01	12.17	13.66	11.54	2.95	7.80	8.70	1.65	12.32	14.21	1.46	12.05
4EES	17.01	12.17	13.86	11.54	2.95	7.80	8.70	2.21	12.44	14.21	1.46	12.05
4DES-5	17.01	12.17	13.86	11.54	2.95	7.80	8.70	2.21	12.44	14.21	1.65	12.21
4DES-7, 4CES	18.00	12.17	13.86	11.54	3.98	7.80	9.69	2.21	12.44	15.20	1.46	12.21

Legend for connections see page 29

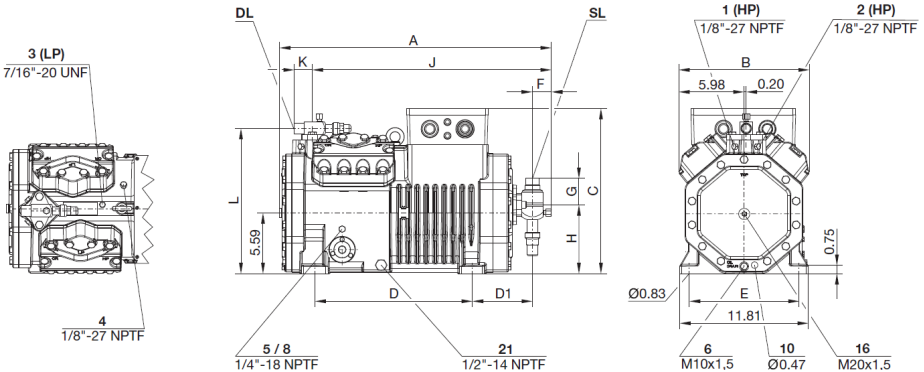
All dimensions in inches

CE4 Series



Series	ECOLINE Model Number
CE4	4VE(S)-6
CE4	4VE(S)-7
CE4	4VE(S)-10
CE4	4TE(S)-8
CE4	4TE(S)-9
CE4	4TE(S)-12
CE4	4PE(S)-10
CE4	4PE(S)-12
CE4	4PE(S)-15
CE4	4NE(S)-12
CE4	4NE(S)-14
CE4	4NE(S)-20

CE4 Series – Dimensions and Connection Ports

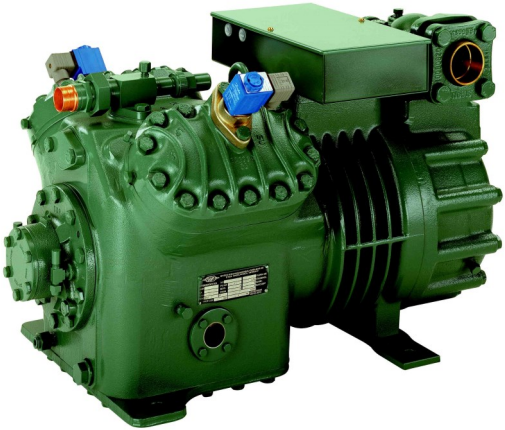


	A	B	C	D	D1	E	F	G	H	J	K	L
4VES	24.92	11.93	15.16	14.45	5.51	10.08	1.73	2.40	6.34	21.97	1.65	13.31
4TES	24.92	11.93	15.16	14.45	5.51	10.08	1.73	2.52	6.34	21.93	2.21	13.46
4PES-10, 4PES-12	24.92	11.93	15.16	14.45	5.51	10.08	1.73	2.52	6.34	21.93	2.21	13.46
4PES15	25.91	11.93	15.16	14.45	6.38	10.08	1.89	4.33	6.81	22.91	2.21	13.46
4NES-12, 4NES-14	24.92	11.93	15.16	14.45	5.51	10.08	1.73	2.52	6.34	21.93	2.21	13.46
4NES-20	25.91	11.93	15.16	14.45	6.38	10.08	1.89	4.33	6.81	22.91	2.21	13.46

Legend for connections see page 29

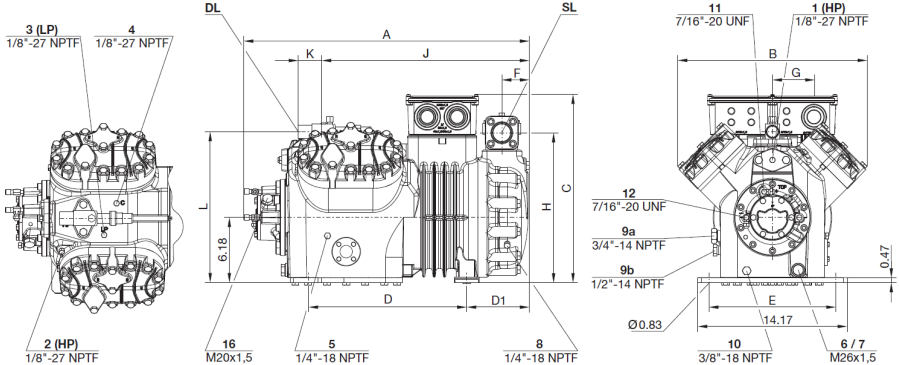
All dimensions in inches

BE5 Series



Series	ECOLINE Model Number
BE5	4JE-13
BE5	4JE-15
BE5	4JE-22
BE5	4HE-15
BE5	4HE-18
BE5	4HE-25
BE5	4GE-20
BE5	4GE-23
BE5	4GE-30
BE5	4FE-25
BE5	4FE-28
BE5	4FE-35

BE5 Series – Dimensions and Connection Ports

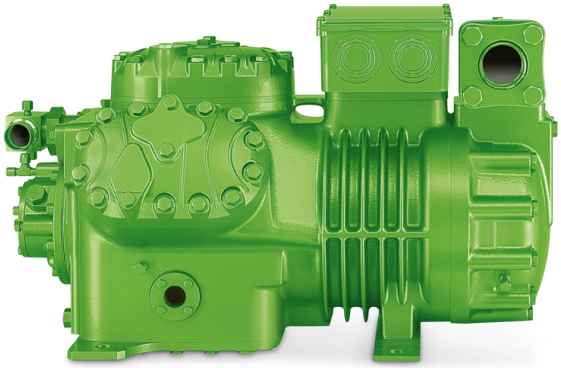


	A	B	C	D	D1	E	F	G	H	J	K	L
4JE	27.09	17.95	18.50	15.00	5.94	12.01	2.60	4.33	14.21	19.72	2.21	14.25
4HE-15, 4HE-18	27.09	17.95	18.50	15.00	5.94	12.01	2.60	4.33	14.21	19.72	2.21	14.25
4HE-25	29.02	17.95	18.50	15.00	7.87	12.01	3.43	5.00	14.84	21.61	2.21	14.25
4GE-20,4GE-23	27.80	17.95	18.50	15.00	6.65	12.01	2.99	5.00	14.84	20.43	2.21	14.25
4GE-30	29.02	17.95	18.50	15.00	7.87	12.01	3.43	5.00	14.84	21.61	2.21	14.25
4FE	29.02	17.95	18.50	15.00	7.87	12.01	3.43	5.00	14.84	21.61	2.21	14.25

Legend for connections see page 29

All dimensions in inches

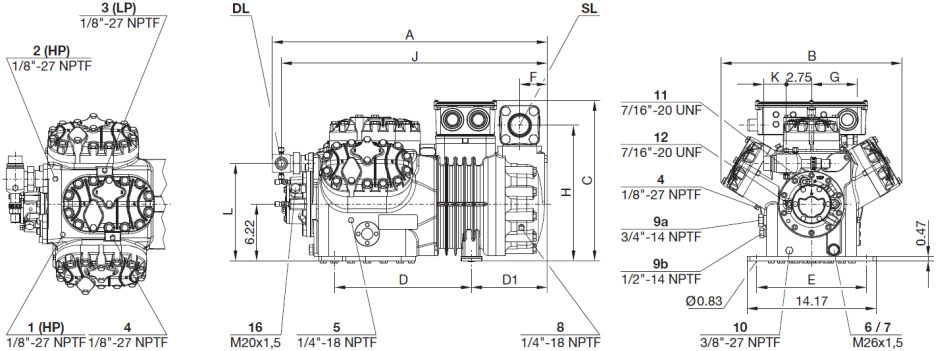
BE6 Series



Series	ECOLINE Model Number
BE6	6JE-22
BE6	6JE-25
BE6	6JE-33
BE6	6HE-25
BE6	6HE-28
BE6	6HE-35
BE6	6GE-30
BE6	6GE-34
BE6	6GE-40
BE6	6FE-40
BE6	6FE-44
BE6	6FE-50

BE6 Series – Dimensions and Connection ports

6JE-22Y .. 6GE-40(Y)



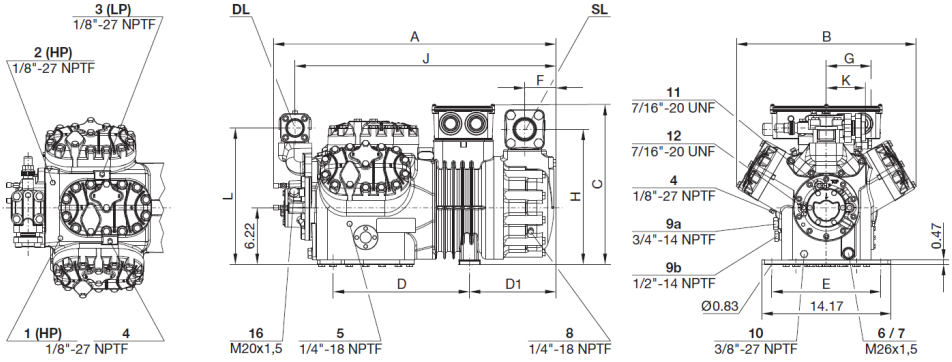
	A	B	C	D	D1	E	F	G	H	J	K	L
6JE-22, 6JE25	30.16	19.80	18.50	15.00	8.31	12.01	2.99	5.00	14.84	29.13	2.52	10.67
6JE-33	31.38	19.80	18.50	15.00	9.53	12.01	3.43	5.00	14.84	30.35	2.52	10.67
6HE-25, 6HE-28	30.16	19.80	18.50	15.00	8.31	12.01	2.99	5.00	14.84	29.13	2.52	10.67
6HE-35	31.38	19.80	18.50	15.00	9.53	12.01	3.43	5.00	14.84	30.35	2.52	10.67
6GE-30, 6GE-34	30.16	19.80	18.50	15.00	8.31	12.01	2.99	5.00	14.84	29.13	2.52	10.67
6GE-40	31.38	19.80	18.50	15.00	9.53	12.01	3.43	5.00	14.84	30.35	2.52	10.67

Legend for connections see page 29

All dimensions in inches

BE6 Series – Dimensions and Connection ports

6FE-40Y / 6FE-50(Y)



	A	B	C	D	D1	E	F	G	H	J	K	L
6FE	31.38	19.80	18.50	15.00	9.53	12.01	3.43	5.00	14.84	28.71	4.37	15.00

Legend for connections see page 29

All dimensions in inches

Legend for Connection Positions

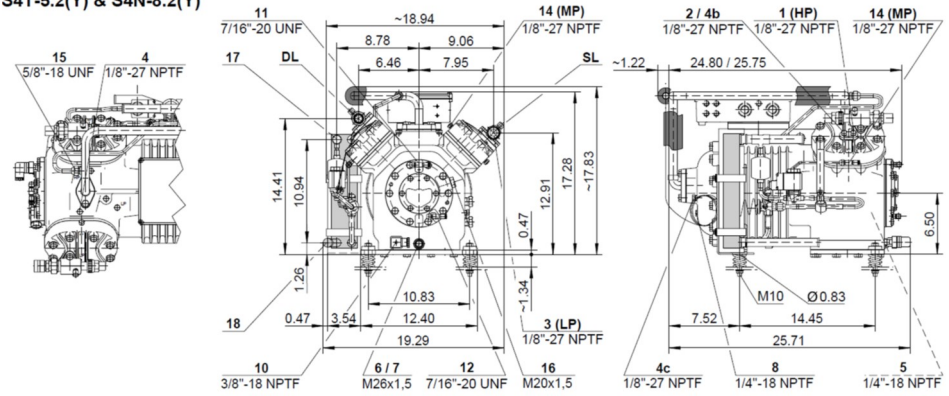
1	High pressure connection (HP)
2	Discharge gas temperature sensor (HP) or LI sensor
3	Low pressure connection (LP)
4	Liquid Injection: spray nozzle (LP)
4b	Liquid Injection sensor (HP)
4c	Liquid Injection sensor (MP / operation with a liquid subcooler)
5	Oil fill plug
6	Oil drain (magnetic screw)
7	Oil filter
8	Oil return (oil separator)
9a	Gas equalization (parallel operation)
9b	Oil equalization (parallel operation)
10	Crankcase heater
11	High Oil pressure connection (7/16” - 20 UNF Thread)
12	Low Oil pressure connection (7/16” - 20 UNF Thread)
14	Intermediate pressure connection (MP)
15	Liquid injection (operation without liquid subcooler and with thermostatic expansion valve)
16	Connection for oil monitoring (oil sensor or differential oil pressure switch “Delta-P”) (M20 Thread)
17	Refrigerant inlet at liquid subcooler
18	Refrigerant outlet at liquid subcooler
21	Connection for oil service valve

2-Stage Series

Series	Model Number
BS4	S4T-5.2(Y)
BS4	S4N-8.2(Y)

2-Stage SB4 Series - Dimensions and Conection Ports

S4T-5.2(Y) & S4N-8.2(Y)



Legend for connections see page 29

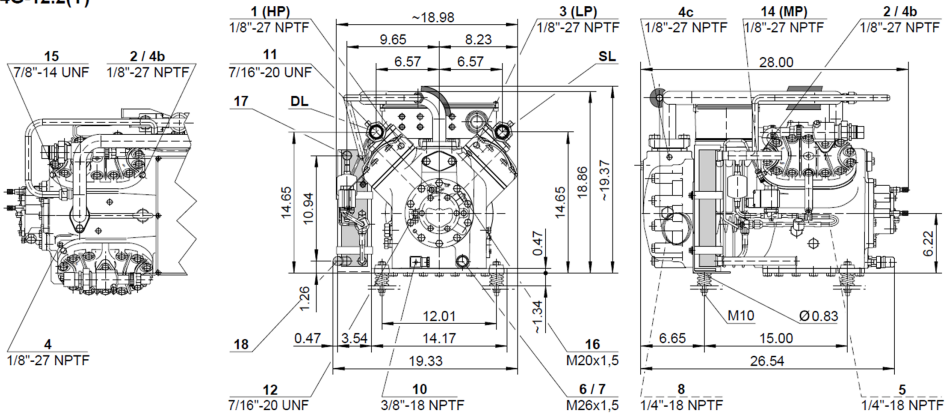
All dimensions in inches

2-Stage Series

Series	Model Number
BS5	S4G-12.2(Y)

2-Stage BS5 Series - Dimensions and Conection Ports

S4G-12.2(Y)



Legend for connections see page 29

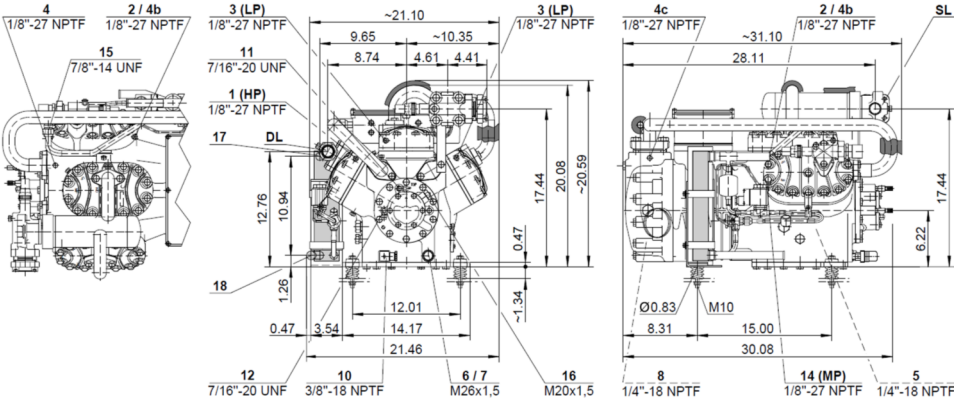
All dimensions in inches

2-Stage BS6 Series

Series	Model Number
BS6	S6J-16.2(Y)
BS6	S6H-20.2(Y)
BS6	S6G-25.2(Y)
BS6	S6F-30.2(Y)

2-Stage BS6 Series - Dimensions and Conection Ports

S6J-16.2(Y) .. S6F-30.2(Y)



Legend for connections see page 39

All dimensions in inches

2.6 Application Limits

Explanation of Application Limits Diagram of Semi Hermetic Reciprocating Compressors

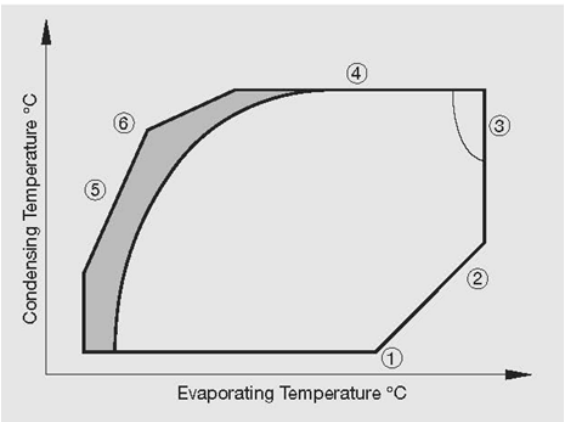


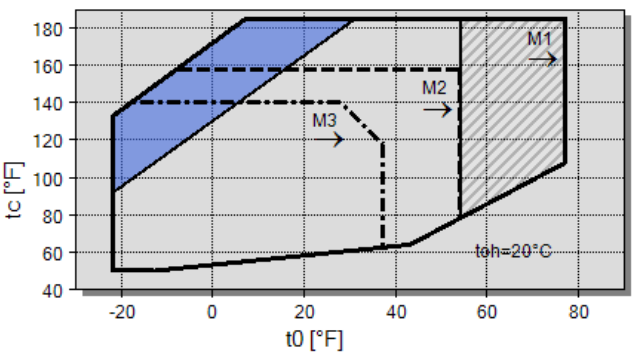
Figure 2.9.1.Simplified application limits diagram

Limitations of the application limits diagram:

1-Pressure differential / pressure ratio
If the pressure differential / pressure ratio of the compressor gets too low the resulting force is insufficient to properly open or close the reeds on the valve plate. This can lead to a breakage of the reeds. Furthermore the volumetric displacement decreases due to reverse expansion from the pressure chamber into the working chamber.

2-Maximum evaporating temperature
If the compressor operates at an evaporating temperature close to the maximum allowed evaporating temperature the compressor delivers a high refrigerant mass flow. Hence high forces develop on bearings and drive gear.
3-Motor Load
The motor load of a semi hermetic reciprocating compressor depends on the operating point. The higher the evaporating temperature and the higher the condensing temperature, the higher the corresponding motor load.
4-Maximum condensing temperature
The maximum condensing temperature is limited by the saturated vapor pressure as well as the maximum allowable operating pressure on the high pressure side of the compressor. According to EN378-2 the maximum allowable operating pressure of the systems with pressure relief devices must not exceed 0.9 x maximum allowable operating pressure.
5-Minimum evaporating temperature
With decreasing evaporating temperature the saturated vapor pressure of the refrigerant decreases as well. For safe operation the circuit should not be operated at pressures too much below ambient air in order to avoid penetration of ambient air into the suction side of the system through a leakage.
At low evaporating temperatures the refrigerant mass flow of the compressor as well as the suction gas density are decreasing. This can possibly lead to an insufficient motor cooling as the delivered refrigerant mass flow is too low.
6-Thermal limit
At low evaporating temperatures in combination with high condensing temperatures the thermal load limit of the compressor restricts the operation. There are various possibilities to extend the application limits such as water cooled cylinder heads, additional fans, restricting the allowable suction gas superheat or, in individual cases, a direct liquid injection into the suction side of the compressor. The recommended methods for additional cooling are displayed in the application limits diagram as icons.

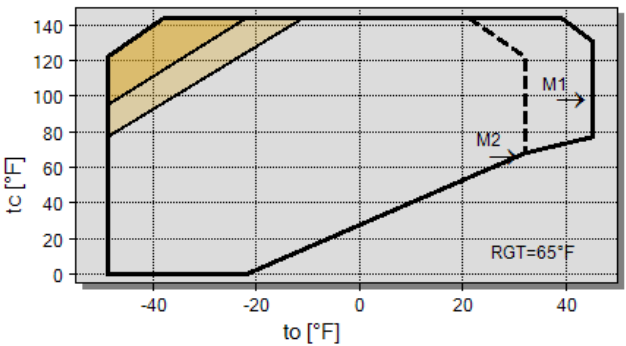
Semi-hermetic Recips
Application limits: R134a
R134a 100%
2KES-05 .. 6FE-50



R134a Legend

- Additional cooling
- Suction gas superheat >20°F
- M1: motor 1
- M2: motor 2
- M3: motor 3

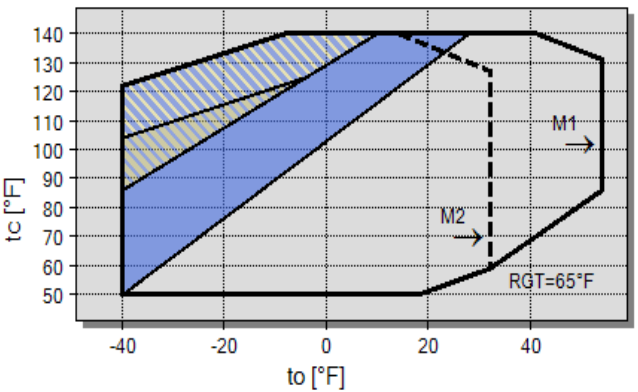
Semi-hermetic Recips
Application limits: R404A and R507A
R404A / R507A 100%
2KES-05 .. 6FE-50



R404A / R507A Legend

- Additional cooling or suction gas superheat ≤35°F
- Additional cooling or max suction gas temp<40°F
- M1: motor 1
- M2: motor 2

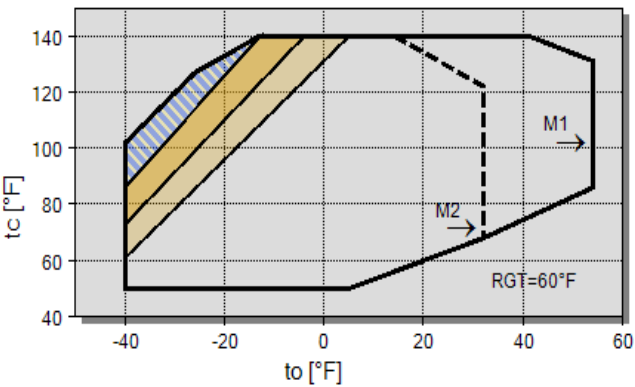
Semi-hermetic Recips
Application limits: R407A
R407A 100%
2KES-05 .. 4CES-9



Legend

- Additional cooling & suction gas superheat ≤35°F
- Additional cooling & max suction gas temp <40°F
- Additional cooling
- M1: motor 1
- M2: motor 2

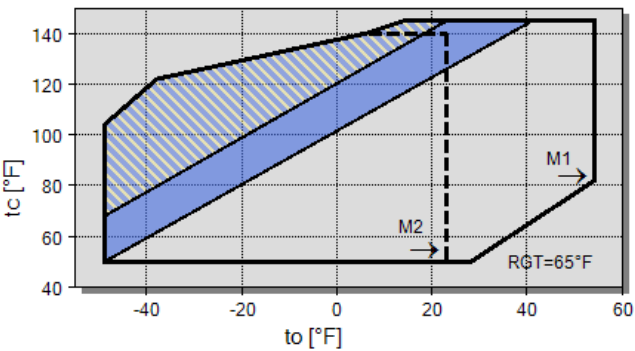
Semi-hermetic Recips
Application limits: R407A
R407A 100%
4VES-7 .. 6FE-50



Legend

- Additional cooling & suction gas superheat ≤35°F
- Additional cooling or suction gas superheat ≤35°F
- Additional cooling or max suction gas temp <40°F
- M1: motor 1
- M2: motor 2

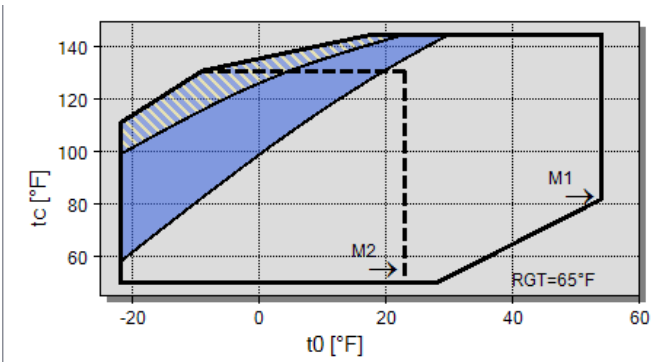
Semi-hermetic Recips
Application limits: R22
R22 100%
2KES-05 .. 4CES-9



Legend

- Additional cooling & suction gas superheat ≤35°F
- Additional cooling
- M1: motor 1
- M2: motor 2

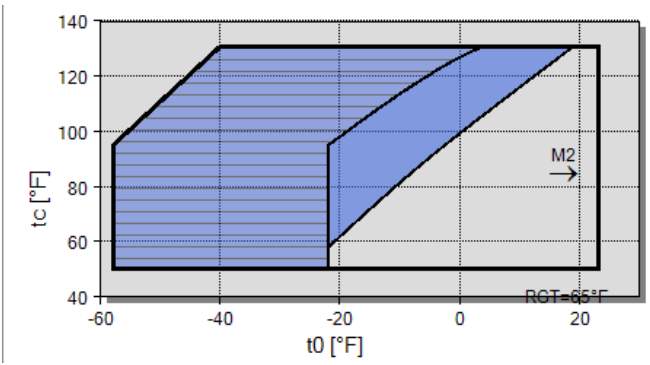
Semi-hermetic Recips
Application limits: R22
R22 100%
4VES-7 .. 6FE-50



Legend

- Additional cooling & suction gas superheat ≤35°F
- Additional cooling
- M1: motor 1
- M2: motor 2

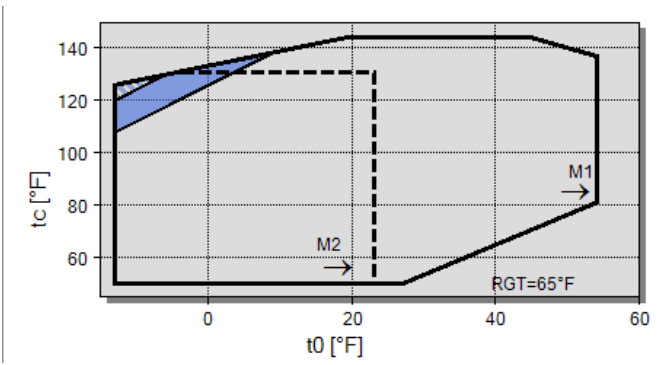
Semi-hermetic Recips
Application limits: R22
R22 w/CIC
4VES-7 .. 6FE-44



Legend for R22 w/CIC

- Additional cooling
- Additional cooling & CIC
- M2: motor 2

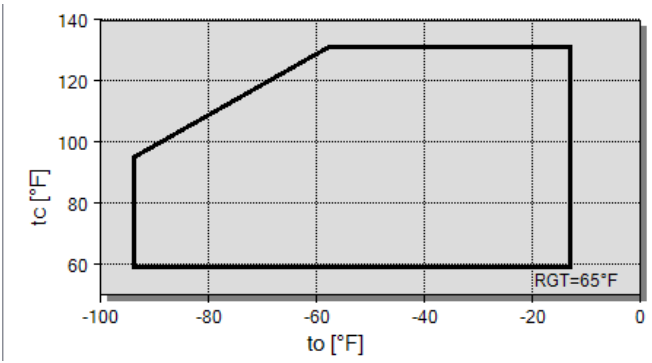
Semi-hermetic Recips
Application limits: R407C
R407C 100%
2KES-05 .. 6FE-50



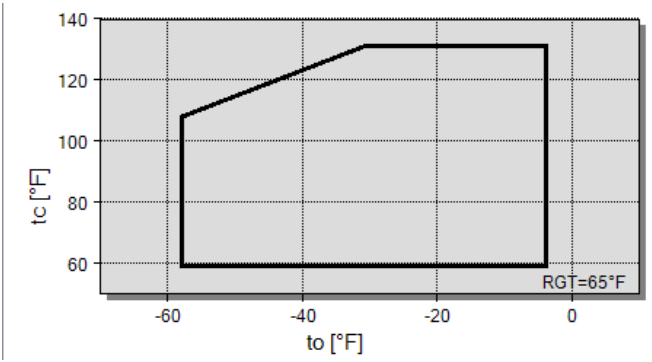
Legend

- Additional cooling & suction gas superheat ≤35°F
- Additional cooling
- M1: motor 1
- M2: motor 2

2-Stage Semi-hermectic Recips:
Application limits:
R404A / 507A
S4T .. S6F



R22
S4T .. S6F



2.7 Operating Parameters

Temperatures and Pressures

Parameter	min	max	nominal
Discharge Temp	SCT + 40°F (50°F w/R22)	250°F	--
Oil Temp	95°F (55°F > SST)	175°F	--
Superheat	15°F	--	20 - 30°F
Oil Pressure Diff	10psi	--	20 - 50psi

Electrical

Parameter	Trip	Reset	Ambient
Motor PTCs (M1 to M2)	≈4500Ω (≈280°F)	≈ 2700Ω	150 - 650Ω

Parameter	Terminal Pins		min	max
Motor Windings (3PU, 4PU, 5PU) (6 pin terminal)	1-7 2-8 3-9		.3Ω	2.0Ω
	Pin to ground		OPEN	
Motor Windings (2NU)* (9 pin terminal) *jumper bars removed	1-4 2-5 3-6	7-8 8-9 7-9	.3Ω	2.0Ω
	Pin to ground		OPEN	

Variable Frequency Drives

Parameter*	min	max
CE1, CE2, CE3	30Hz	70Hz*
CE4, BE5	25Hz*	70Hz*
BE6	30Hz	70Hz*

***Consult BITZER AE department for operation between 25-30Hz and 60-70HZ**

3.1 Maximum Operating Amps (MOA) and Maximum MCC

BITZER compressors are equipped with highly efficient large volume electric motors. According to UL specification, contactors and cables can be selected by either MCC or RLA or by means of the MOA (maximum operating amps) specified in the following tables.

MCC and RLA
All BITZER semi-hermetic compressors come standard with PTC temperature sensors (thermistors) embedded in the motor windings which work with the motor protection module to provide an electrical overload thermal protection system. As such, the motors comply with UL & NEC definitions of inherent thermal protection and have the wording “Thermally Protected” included on the compressor name-plate.

The thermal protection system will not allow the compressor to run higher than the amperage value that is referred to as Maximum Continuous Current (MCC).

RLA = MCC / 1.4
A minimum Rated Load Amperage (RLA) is used for sizing electrical components and unit ratings.

With motors that are thermally protected, UL and NEC requires that a 156% factor is used to calculate the RLA from the MCC value. In the past, a more conservative factor of 140% has been used. Both values are given in the table. An important factor related to compressor reliability is proper sizing of the compressor contactor. Undersized contactors can result in increased pitting and wear of the contact surfaces. In order to avoid possible compressor motor failure due to undersized contactors, BITZER recommends sizing the contactor using the more conservative 140% factor.

RLA = MCC / 1.56
UL and NEC allows using the RLA calculated from the 156% factor for all other component sizing and unit rating.

MOA
MOA ("Maximum Operating Amperage") is the maximum amperage that the compressor should ever draw based on the application limit window (normally at the maximum evaporating temp and max condensing temp for a given motor version). The values in the table should correspond to the values found in the BITZER software. It should be noted that it is possible under high load conditions for the operating amperage to exceed the RLA value. This can result in nuisance tripping of the circuit breaker if it is not sized properly. For this reason, the circuit breaker selection should at least 125% of MOA. Please note that for 208V, the MOA has a separate higher value than 230V.

LRA
LRA ("Locked Rotor Amperage") is stated on the name plate of the compressor. This value indicates the maximum current the windings will draw on start up or if the running gear is unable to rotate. For part winding motors, there are two values: the lower value is for a part winding start and the higher value is for a direct (across the line) start.

RLA ("Running load Amps")
Running load amps is often abbreviated RLA and should not be used for sizing any electrical devices. The running load amps indicates the amperage that the compressor is pulling at a specific condition. This amperage can be found by using the BITZER software and input the exact conditions (SST/SDT etc.).

For further information contact BITZER US Application Engineering at (770) 503-9226 or techsupport@bitzerus.com.

Note: All electrical calculations are based on 3 phase at 60Hz.

CE1 to CE3 Models

Model Number	kW	CFH	Max MCC			LRA			MOA		
			230V	460V	575V	230V	460V	575V	230V	460V	575V
2KES-05	0.37	173	7.6	3.6	2.7	32	16	12.8	5.6	2.8	2.2
2JES-07	0.56	222	9.4	4.5	3.3	40	20	16	7.4	3.7	3.0
2HES-1	0.75	278	10.2	4.8	3.7	42	19	13	7.6	3.8	3.0
2HES-2	1.5	278	15.5	6.3	5	54	24	17	9.5	4.5	3.6
2GES-2	1.5	323	15.3	6.7	5.2	54	24	17	10.0	5.0	4.0
2FES-2	1.5	407	14	6.4	5	54	24	17	10.6	5.3	4.2
2FES-3	2.2	407	17.6	8	6.8	60	27.5	19	12.2	6.1	4.9
2EES-2	1.5	486	16.8	7.6	5.6	70	28.5	20.5	12.0	6.0	4.8
2EES-3	2.2	486	21.9	10.2	8.2	97	39.5	28.5	15.0	7.5	6.0
2DES-2	1.5	571	18.3	9	6.6	80.5	33	23.5	15.0	7.5	6.0
2DES-3	2.2	571	23.8	11.3	8	97	39.5	28.5	17.2	8.6	6.9
2CES-3	2.2	691	20.9	9.8	7.9	97	39.5	28.5	18.2	9.1	7.3
2CES-4	3.0	691	28.4	12.7	10.2	115.5	47.5	34	20.0	10.0	8.0
4FES-3	2.2	772	28.1	12.6	9.6	115.5	47.5	34	20.0	9.5	7.6
4FES-5	3.7	772	37.8	20.5	13.6	163	66.5	48	21.6	10.8	8.6
4EES-4	3.0	968	31.4	14.4	11.6	142	58	41.5	24.4	12.2	9.8
4EES-6	4.5	968	43.8	20.9	14.7	163	66.5	48	27.2	13.6	10.9
4DES-5	3.7	1142	32.2	16.8	14	163	66.5	48	29	14.5	11.6
4DES-7	5.2	1142	48.3	23.8	17.2	215	88	63.5	33	16.5	13.2
4CES-6	4.5	1385	39	22.1	17.5	215	88	63.5	35.4	17.7	14.2
4CES-9	6.7	1385	53.3	26.6	21.3	215	88	63.5	40.4	20.2	16.2

CE4 & BE5 Models

Model Number	kW	CFH	Max MCC			LRA			MOA		
			230V	460V	575V	230V	460V	575V	230V	460V	575V
4VE(S)-6	4.5	1479	38	19	15	150	75	60	18.8	9.4	7.5
4VE(S)-7	5.2	1479	38	19	15	150	75	60	33.2	16.6	13.3
4VE(S)-10	7.5	1479	60	30	24	222	111	89	39.8	19.9	15.9
4TE(S)-8	6.0	1760	44	22	19	180	90	72	22.8	11.4	17.6
4TE(S)-9	6.7	1760	44	22	19	180	90	72	39.8	19.9	15.9
4TE(S)-12	9.0	1760	66	33	26.4	252	126	101	50.2	25.1	20.1
4PE(S)-10	7.5	2067	54	27	22.4	222	111	89	25.8	12.9	10.3
4PE(S)-12	9.0	2067	54	27	22.4	222	111	89	45.4	22.7	18.2
4PE(S)-15	11.2	2067	76	38	30.5	294	147	117	56.4	28.2	22.6
4NE(S)-12	9.0	2395	62	31	24.8	252	126	101	29.8	14.9	11.9
4NE(S)-14	10.4	2395	62	31	24.8	252	126	101	53.2	26.6	21.3
4NE(S)-20	14.9	2395	90	45	36.8	352	176	140	66.4	33.2	26.6
4JE-13	9.7	2707	68	34	27	294	147	117	37.6	18.8	15.0
4JE-15	11.2	2707	78	39	31.2	352	176	140	61.6	30.8	24.6
4JE-22	16.4	2707	96	48	38	352	176	140	74.4	37.2	29.8
4HE-15	11.2	3141	72	36	28.8	294	147	117	42.8	21.4	17.1
4HE-18	13.4	3141	84	42	33.8	352	176	140	73.4	36.7	29.4
4HE-25	18.7	3141	118	59	47	436	218	174	88.0	44.0	35.2
4GE-20	14.9	3606	90	45	36	352	176	140	49.2	24.6	19.7
4GE-23	17.2	3606	90	45	36	352	176	140	87.8	43.9	35.1
4GE-30	22.4	3606	140	70	56	490	245	196	102.4	51.2	41.0
4FE-25	18.7	4339	120	60	48	436	218	174	56.4	28.2	22.6
4FE-28	20.9	4339	120	60	48	490	245	196	105.6	52.8	42.2
4FE-35	26.1	4339	148	72	59	490	245	196	124.2	62.1	49.7

BE6, 8C & 2-Stage Models

Model	Number	kW	CFH	Max MCC			LRA			MOA		
				230V	460V	575V	230V	460V	575V	230V	460V	575V
	6JE-22	16.4	4062	102	51	41	436	218	174	53.2	26.6	21.3
	6JE-25	18.7	4062	111	55	44	490	245	196	92.8	46.4	37.1
	6JE-33	24.6	4062	156	78	62	550	275	220	106.4	53.2	42.6
	6HE-25	18.7	4710	108	54	43	436	218	174	62.6	31.3	25.0
	6HE-28	20.9	4710	121	61	48	490	245	196	106.4	53.2	42.6
	6HE-35	26.1	4710	164	82	65	550	275	220	128.8	64.4	51.5
	6GE-30	22.4	5404	132	66	52	490	245	196	76.0	38.0	30.4
	6GE-34	25.4	5404	132	66	52	490	245	196	131.0	65.5	52.4
	6GE-40	29.8	5404	220	110	88	700	350	280	147.8	73.9	59.1
	6FE-40	29.8	6461	152	76	61	700	350	280	97	48.5	38.8
	6FE-44	32.8	6461	152	76	61	700	350	280	166.4	83.2	66.6
	6FE-50	37.3	6461	224	112	89	950	425	340	192.4	96.2	77.0
	8GE-60	44.6	7865	281	141	113	1230	513	410	226	113	91
	8FE-70	52.2	9419	329	164	132	1288	590	472	278	139	112
	S4T-5.2	3.7	839/537	28	28	11.2	150	75	60	28	14	11.2
	S4N-8.2	6	1193/763	39.2	39.2	15.7	180	90	72	34	17	11.2
	S4G-12.2	9	1803/1151	56	56	22.4	252	126	101	48	24	19.2
	S6J-16.2	12	2707/1355	84	84	33.6	294	147	117	62	31	24.8
	S6H-20.2	15	3137/1573	95.2	95.2	38	352	176	140	74	37	29.6
	SG6-25.2	18.5	3602/1803	116	116	46.4	436	218	174	86	43	34.4
	S6F-30.2	22	4309/2152	134.4	134.4	53.5	490	245	196	81.6	51	40.8

3.2 Operating Amps
R22 & R134a Operating Amps*
460V/3/60Hz **(*Use the Bitzer software for specific conditions)**

Model Number	Motor	R22			R134a		
		45°F/ 130°F	32°F/ 130°F	0°F/ 130°F	45°F/ 130°F	32°F/ 130°F	0°F/ 130°F
2KES-05	1	2.30	2.17	1.76	1.76	1.68	1.46
2JES-07	1	2.94	2.77	2.30	2.29	2.20	1.91
2HES-1	2			2.69	2.57	2.45	2.12
2HES-2	1	3.80	3.60	3.04	2.93	2.84	2.57
2GES-2	1	4.12	3.92	3.31	3.15	3.02	2.66
2FES-2	2			3.60	3.49	3.30	2.78
2FES-3	1	5.03	4.73	3.89	3.77	3.59	3.10
2EES-2	2			4.00	3.95	3.61	2.84
2EES-3	1	6.01	5.68	4.67	4.64	4.36	3.75
2DES-2	2			4.79	4.69	4.28	3.29
2DES-3	1	6.95	6.53	5.22	5.13	4.77	3.94
2CES-3	2			6.13	5.93	5.44	4.28
2CES-4	1	8.27	7.78	6.18	6.00	5.57	4.58
4FES-3	2			6.28	6.20	5.67	4.53
4FES-5	1	8.88	8.35	6.70	6.64	6.19	5.23
4EES-4	2			7.45	7.43	6.69	4.87
4EES-6	1	10.98	10.24	7.88	7.86	7.23	5.80
4DES-5	2			9.15	8.86	8.02	6.07
4DES-7	1	13.04	12.23	9.66	9.42	8.72	7.12
4CES-6	2			11.43	10.93	9.99	7.79
4CES-9	1	15.92	14.86	11.43	10.93	9.99	7.79

R22 & R134a Operating Amps*
460V/3/60Hz (Continued)
(*Use the Bitzer software for specific conditions)

Model Number	Motor	R22			R134a		
		45°F/ 130°F	32°F/ 130°F	0°F/ 130°F	45°F/ 130°F	32°F/ 130°F	0°F/ 130°F
4VE(S)-6	3					9.60	6.81
4VE(S)-7	2			10.66	10.73	9.60	6.81
4VE(S)-10	1	16.38	15.19	11.45	11.55	10.60	8.24
4TE(S)-8	3					11.64	8.17
4TE(S)-9	2			13.50	13.00	11.64	8.17
4TE(S)-12	1	19.64	18.15	13.53	13.58	12.37	9.45
4PE(S)-10	3					13.20	9.36
4PE(S)-12	2			14.58	14.73	13.20	9.36
4PE(S)-15	1	23.00	21.20	15.95	16.21	14.90	11.82
4NE(S)-12	3					15.34	10.79
4NE(S)-14	2			17.30	17.12	15.31	10.75
4NE(S)-20	1	26.30	24.30	18.30	18.60	17.09	13.54
4JE-13	3					18.79	14.15
4JE-15	2			20.10	20.20	18.63	14.67
4JE-22	1	29.70	27.30	19.95	19.94	18.36	14.34
4HE-15	3					21.40	15.53
4HE-18	2			22.8	22.30	21.20	15.90
4HE-25	1	35.50	32.90	24.90	24.50	22.70	18.07
4GE-20	3					24.60	17.50
4GE-23	2			27.40	26.50	23.70	16.73
4GE-30	1	41.70	38.80	29.80	29.30	27.10	21.70
4FE-25	3					30.60	21.80
4FE-28	2			34.40	35.30	31.90	23.90
4FE-35	1	49.60	45.80	34.10	34.50	31.20	23.30

R22 & R134a Operating Amps*
460V/3/60Hz (Continued)
(*Use the Bitzer software for specific conditions)

Model Number	Motor	R22			R134a		
		45°F/ 130°F	32°F/ 130°F	0°F/ 130°F	45°F/ 130°F	32°F/ 130°F	0°F/ 130°F
6JE-22	3					27.3	19.9
6JE-25	2			31.2	31.5	28.7	22.1
6JE-33	1	46.6	43.3	33.2	33.3	31.0	25.3
6HE-25	3					31.5	22.1
6HE-28	2			36.3	36.1	32.7	24.2
6HE-35	1	54.5	50.5	38.0	37.3	34.2	26.7
6GE-30	3					38.0	27.5
6GE-34	2			41.5	41.4	37.1	26.5
6GE-40	1	63.0	58.9	46.2	46.5	43.2	34.9
6FE-40	3					48.7	38.0
6FE-44	2			53.4	53.0	48.7	38.0
6FE-50	1	82.1	78.3	64.8	63.7	59.5	48.0

R404A & R507A Operating Amps*
460V/3/60Hz
(*Use the Bitzer software for specific conditions)

Model Number	Motor	R404A / (R507A*)			R407A		
		20°F/ 110°F	0°F/ 110°F	-25°F/ 110°F	20°F/ 110°F	0°F/ 110°F	-25°F/ 110°F
2KES-05	1	1.88	1.74	1.52	1.82	1.63	1.40
2JES-07	1	2.54	2.32	2.02	2.44	2.18	1.88
2HES-1	2	3.03	2.65	2.22	2.83	2.47	2.09
2HES-2	1	3.33	3.04	2.66	3.16	2.86	2.54
2GES-2	1	3.65	3.29	2.81	3.44	3.06	2.64
2FES-2	2	4.19	3.71	3.06	4.02	3.45	2.82
2FES-3	1	4.34	3.86	3.26	4.15	3.64	3.07
2EES-2	2	4.71	4.00	3.13	4.30	3.57	2.80
2EES-3	1	5.26	4.67	3.97	4.92	4.33	3.71
2DES-2	2	5.64	4.78	3.69	5.13	4.24	3.24
2DES-3	1	5.97	5.20	4.27	5.51	4.74	3.89
2CES-3	2	7.11	6.08	4.80	6.48	5.43	4.25
2CES-4	1	7.07	6.14	5.01	6.50	5.56	4.56
4FES-3	2	7.64	6.61	5.28	6.79	5.66	4.49
4FES-5	1	7.86	6.98	5.87	7.14	6.18	5.20
4EES-4	2	9.30	7.83	5.81	8.14	6.50	4.59
4EES-6	1	9.41	8.09	6.41	8.48	7.08	5.59
4DES-5	2	11.16	9.45	7.21	9.87	8.06	6.05
4DES-7	1	11.37	9.91	8.06	10.26	8.76	7.11
4CES-6	2	13.42	11.36	8.77	12.14	10.10	7.81
4CES-9	1	13.42	11.36	8.77	12.14	10.10	7.81

* R507A values are approximately 3% greater than the listed 404A values.

R404A & R507A Operating Amps*
460V/3/60Hz (Continued)
(*Use the Bitzer software for specific conditions)

Model Number	Motor	R404A / (R507A*)			R407A		
		20°F/ 110°F	0°F/ 110°F	-25°F/ 110°F	20°F/ 110°F	0°F/ 110°F	-25°F/ 110°F
4VE(S)-7	2	13.55	10.88	7.72	11.88	9.43	6.57
4VE(S)-10	1	13.87	11.66	9.04	12.48	10.43	8.11
4TE(S)-9	2	16.54	13.42	9.53	14.67	11.74	8.16
4TE(S)-12	1	16.48	13.74	10.51	14.85	12.34	9.44
4PE(S)-12	2	18.52	15.05	10.73	16.50	13.20	9.30
4PE(S)-15	1	19.36	16.27	12.78	17.59	14.80	11.75
4NE(S)-14	2	21.1	17.96	12.78	19.50	15.53	10.87
4NE(S)-20	1	22.4	18.84	14.87	20.0	16.87	13.42
4JE-15	2	25.2	21.2	16.34	22.3	18.34	14.07
4JE-22	1	24.5	20.5	15.82	21.9	18.12	13.95
4HE-18	2	29.7	24.6	18.30	26.0	21.0	15.53
4HE-25	1	29.8	25.3	19.98	26.4	22.1	17.33
4GE-23	2	35.2	28.7	20.8	30.7	24.7	17.79
4GE-30	1	35.3	30.1	24	31.4	26.7	21.4
4FE-28	2	43.3	36.4	26.7	37.5	31.1	23.7
4FE-35	1	42.4	35.7	27.1	36.5	30.2	23.0

* R507A values are approximately 3% greater than the listed 404A values.

R404A & R507A Operating Amps*
460V/3/60Hz (Continued)
(*Use the Bitzer software for specific conditions)

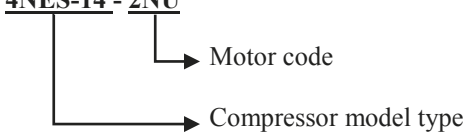
Model Number	Motor	R404A / (R507A*)			R407A		
		20°F/ 110°F	0°F/ 110°F	-25°F/ 110°F	20°F/ 110°F	0°F/ 110°F	-25°F/ 110°F
6JE-25	2	38.5	32.6	25.2	34.5	28.5	21.9
6JE-33	1	39.0	33.7	27.3	35.9	30.7	25.1
6HE-28	2	44.8	37.5	28.1	40.1	32.7	24.2
6HE-35	1	45.0	38.5	30.4	40.7	34.1	26.8
6GE-34	2	53.1	44.3	33.0	46.0	37.0	26.4
6GE-40	1	53.9	47.1	38.4	49.2	42.4	34.5
6FE-44	2	65.3	56.2	44.1	57.7	48.7	38.0
6FE-50	1	74.1	66.1	53.7	68.4	60.0	48.6

* R507A values are approximately 3% greater than the listed 404A values.

3.3 UL Motor Codes

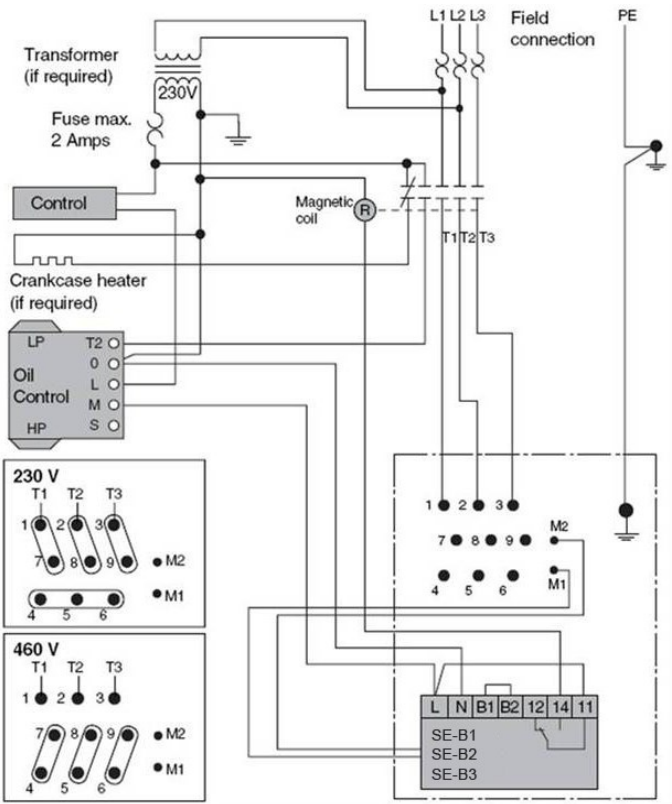
Compressor Model	Motor Code	Nominal Voltage	Voltage Range	Motor Connection
CE1, CE2, CE3 (2KES .. 4CES)	2EU	208 / 230	208 - 230	1 Phase
	2DU	208 / 230	208 - 230	D
	4SU	460	440 - 480	Y
	5SU	575	575	Y
CE4, BE5, BE6 (4VE .. 6FE) **2-Stage** (S4-S6)	2NU	208/230	208 - 230	Y/YY (Dual voltage)
	2NU	460	440 - 480	Y (Dual voltage)
	3PU	380	360 - 400	Y/YY
	4PU	460	440 - 480	Y/YY
	5PU	575	575	Y/YY

Example:



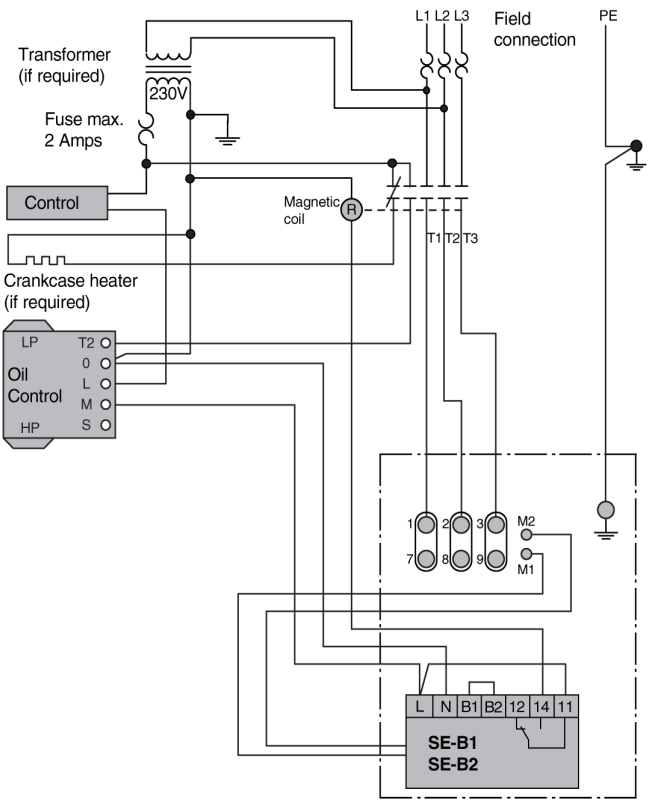
Legend:
Y or S = Star wiring
D = Delta wiring
P = Part winding
N = Dual Voltage
U = UL approval
Y/YY = part winding option available
Note: All motor information listed for 60Hz

3.4 Wiring Diagrams / Power Connection
Direct Start
2NU Motor 230V or 460V/3/60Hz



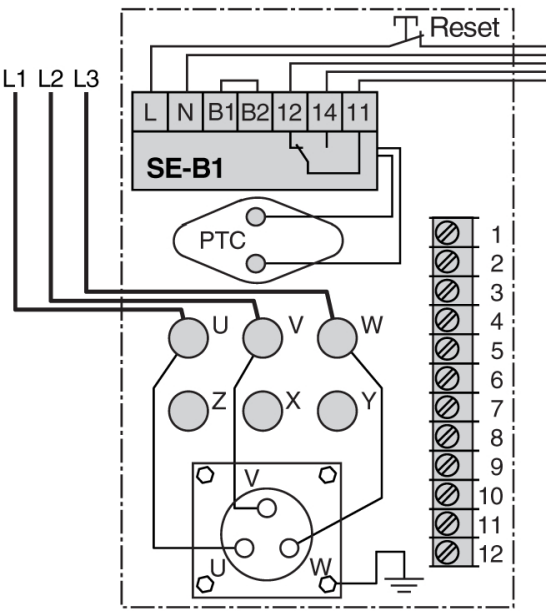
ATTENTION! Terminals B1- B2, M1- M2 and cables 1-2 must not come into contact with supply or control voltage.

Direct Start
4PU Motor 460V/3/60HZ & 5PU Motor 575V/3/60



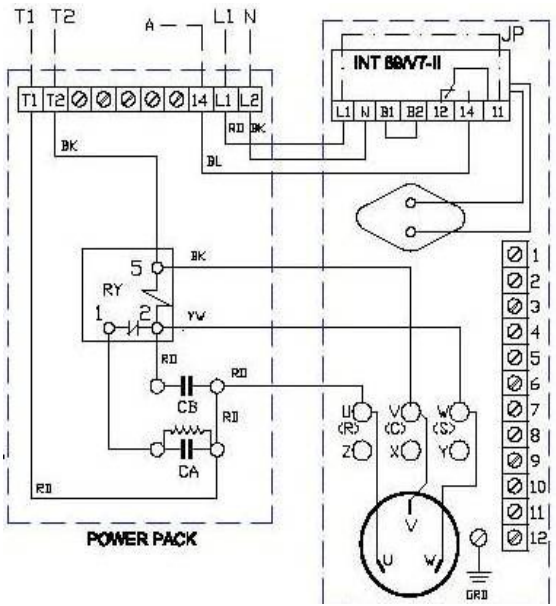
ATTENTION! Terminals B1- B2, M1- M2 and cables 1-2 must not come into contact with supply or control voltage.

Direct Start
2DU 230V/3/60HZ, 4SU 460V/3/60HZ & 5SU 575V/3/60HZ



ATTENTION:
Do not supply voltage at the PTC terminals

Direct Start
2EU 1 Phase (UL)



Legend
A = Comp. control circuit
CA = Start capacitor
CB = Run Capacitor
JP = Field installation jumper (req'd)
RY = Start relay
T1/T2 = From compressor contactor
B1/B2 = Remove B1/B2 to enable "automatic reset" mode

ATTENTION:
Do not supply voltage at the PTC terminals
Bleed Resistor = 15000Ω

4.1 Protection Devices

Protection Module Part Numbers and Pictures

Protection Module	Part Number	Picture
INT: SE-B3 (Motor)	347035-01	
OLC-K1 (Oil)	347318-07 (110V) 347318-06 (230V)	
Delta-P II (Oil)	347318-11 (110V / 230V)	

SE-B3

When installing a dual voltage INT, the service tech should conduct the following tests to ensure proper operation:

- WITH THE POWER OFF, remove one of the leads from either M1 or M2 on the compressor terminal board.
- Turn on the power and confirm that the control voltage appears between terminal 12 and N on the device.
- If an optional signal light (H1) is used, it should be illuminated.
- NO voltage should appear between terminal 14 and N.

Please Note: After supplying power between L and N, there will be a 3-second time delay.

Manual Reset

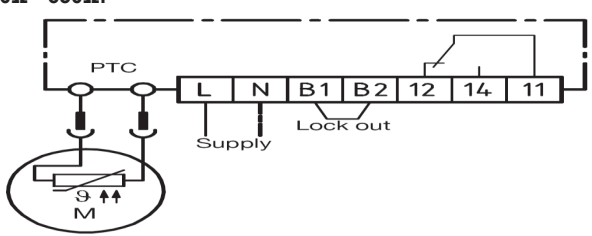
A manual reset function prevents the compressor from restarting and eliminates short cycling. This can be reset by briefly interrupting the supply voltage for 5 seconds, either by means of the main switch or by a reset push-button which can be installed in the supply line.

Automatic Reset

In exceptional cases, the lockout function can be cancelled by removing the link between B1-B2. The compressor then restarts automatically after cooling down. This modification is only permissible if the cycling rate is limited to 6-8 starts per hour by using an additional time-lag relay or timer.

Note: INT trips at 4500Ω

The typical resistance at ambient conditions for M1 and M2 is 150Ω - 650Ω.



Oil Monitoring Devices:

Delta-P II: Monitors oil pressure differential of compressors with oil pumps

OLC-K1: Optically monitors oil presence at the crankshaft of centrifugal disk (“S”) compressors

Technical Features:

- The Delta-P II and OLC-K1 consists of two parts: a sensor unit and an electronic unit.
- Because the mechanical component screws separately into the BITZER housing, the hermetically sealed electrical unit can be replaced without refrigerant or oil loss.

Device Trip:
Delta-P II:

- If the differential oil pressure drops below 9.5 ± 2 psid (for any amount of time) a red light will illuminate on the front of the electrical unit.
- If the pressure remains below for 9.5 ± 2 psid for longer than the allowable time (see chart on p.70) then the output relay opens (stopping the compressor).

OLC-K1:

- If there is no oil present for any amount of time in the oil pocket (center of front bearing cap), a red light will illuminate on the front of the electrical unit.
- If no oil is sensed for longer than the allowable time (see chart on p.70) then the output relay opens (stopping the compressor).

Delta-P II / OLC-K1:

- In case the supply voltage is too low or if the electronic unit is not properly mounted, the device will lock out after 5 seconds. The LED at the front end of the electronic unit will flash.

LED indications:

- LED is off: Sufficient oil supply
- LED is on (red): Insufficient oil supply (presently)
- LED is flashing (red): Fault (Voltage or installation)

Manual Reset
Interrupt power supply for at least 5 seconds.
Note: Always try to diagnose the issue in the event of an oil trip instead of repeatedly resetting the device. (Tip: View the red LED indicator to see if oil is intermittently dropping out)

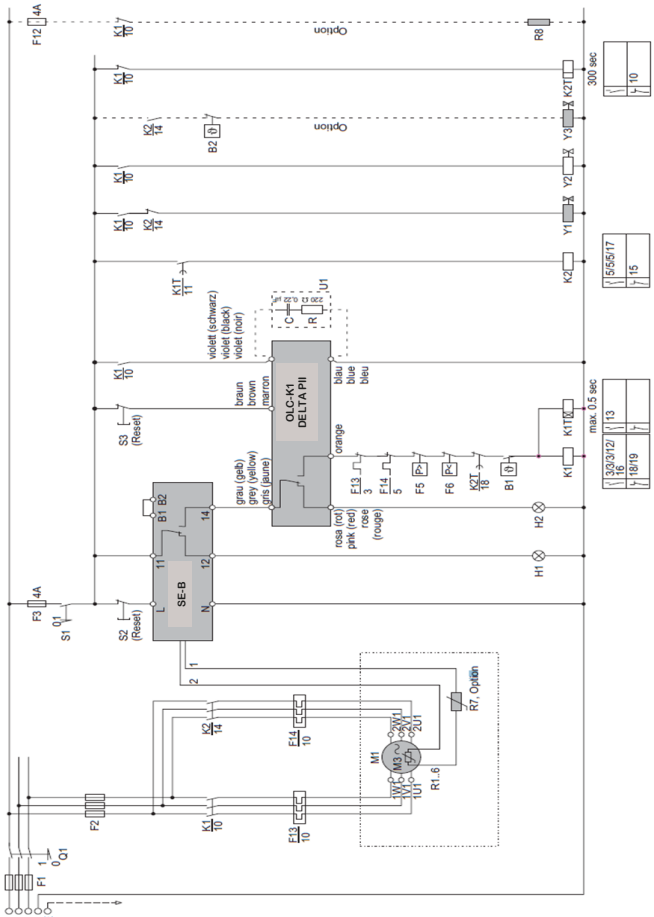
Wiring (see following page):
The Delta-P II and the OLC-K1 have identical wire connections:

- Brown and Blue are the main power and used for resetting.
- Gray and Orange are the relay (should be in series with the control circuit). They will close when there is power to the unit and the oil supply remain sufficient (see chart for trip delays)
- Pink is the alarm part of the relay. Gray and Pink will close during an oil trip or when there is no power to the unit.
- Violet is a run proof to start the timing sequences. This must have power only when the compressor is on (typically uses the N.O. auxiliary contacts of compressor contactor).

Troubleshooting Tip:
If there is a similar compressor adjacent, unscrew electrical units and temporarily swop to see if the issue stays with compressor or device.

Delay Times	Delta-P II	OLC-K1
After Compressor Starts	5s	90s
In Operation	90s	5s

SE-B3, Delta-PII, OLC-K1 Wiring Diagram

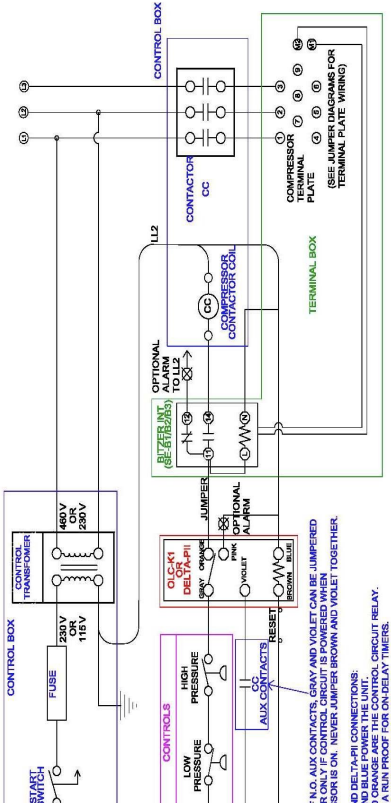


Legend for SE-B, Delta-PII, OLC-K1 wiring diagram

B1 .....Control unit
B2 .....Control unit of capacity regulator (option)
F1 .....Main fuse
F2 .....Compressor fuse
F3 .....Control circuit fuse
F5 .....High pressure cut out
F6 .....Low pressure cut out
F12 ....Fuse of crankcase heater
F13 ....Thermal overload "motor" PW1 (recommended)
F14 ....Thermal overload "motor" PW2 (recommended)
H1 .....Signal lamp "over temperature (motor and discharge gas)" and "oil supply fault"
H2 .....Signal lamp "oil supply fault"
K1 .....Contactor "first PW"
K2 .....Contactor "second PW"
K1T ....Time relay "part winding"
K2T ....Time relay "pause time" 300 s
M1 .....Compressor
Q1 .....Main switch
R1-6 ..PTC sensors in motor windings
R7 .....Discharge gas temperature sensor (option)
R8 .....Crankcase heater (option)
S1 .....Control switch
S2 .....Fault reset "over temperature (motor / discharge gas)"
S3 .....Fault reset "lack of oil"
U1 .....EMC screening unit (if required)
Y1 .....Solenoid valve "start unloading" (option)
Y2 .....Solenoid valve "liquid line"
Y3 .....Solenoid valve "capacity control" (option)

Using the OLC/K1 or Delta-PII Oil Control

- Brown and Blue are the main power and used for resetting.
- Gray and Orange are the relay (should be in series with the control circuit). They will close when there is power to the unit and the oil supply remain sufficient (see chart for trip delays)
- Pink is the alarm part of the relay. Gray and Pink will close during an oil trip or when there is no power to the unit.
- Violet is a run proof to start timing sequences. This must have power only when the compressor is on (typically uses the N.O. auxiliary contacts of compressor contactor).



4.2 Other Oil Monitoring Devices and Adaptors Part Numbers

Compressor Model	Other Oil Monitoring Devices and adaptors			Pressure differential		Sight Glass Oil Level
	Oil Safety Type	Part Number	Lubrication Type	Mini-mum	Nominal	
CE1 (2KES .. 2FES)	Oil Float Adapter	990-8000-02	Centrifugal Disk	-	-	1/4 to 3/4 Full
	Mechanical Oil Float	794-0201-05				
CE2 (2EES .. 2CES)	Oil Float Adapter	990-8000-02	Centrifugal Disk	-	-	
	Mechanical Oil Float	794-0201-05				
CE3 (4FES .. 4CES)	Oil Float Adapter	990-8000-02	Centrifugal Disk	-	-	
	Mechanical Oil Float	794-0201-05				
CE4 (4VE .. 4NE)	MP54	860-3002-01	Pump	9psi	20-35 psi	
	P545	860-3003-01	Pump			
	Mechanical Oil Float	794-0201-05	Both			
BE5 - BE6 (4JE .. 6FE) 2-Stage (S4 .. S6)	MP54	860-3002-01	Pump	9psi	20-50 psi	
	P545	860-3003-01				
	Oil Float Adapter	990-8000-01				
	Mechanical Oil Float	794-0201-05				

Mechanical
Oil Float
PN# - 794-0201-05

4 Bolt - 3 Bolt
Oil Float Adapter
PN# - 990-8000-01

Thread - 3 Bolt
Oil Float Adapter
PN# - 990-8000-02

4.3 Refrigeration Oils

Guiding values for changing refrigeration oils

Designation	Manufacturer	Oil Type	Total acid number (TAN) (ppm)		Water content (ppm)	
			New Oil	**Oil acidified Oil change necessary**	New oil	**Oil change necessary**
HFC (R134a, R407C, R404A, R507A, R407a ...)						
BSE32[2]	BITZER	POE	≤ 0,05	**≥ 0,2**	≤ 50	**≥ 200**
BSE55	BITZER	POE	≤ 0,03	**≥ 0,2**	≤ 50	**≥ 200**
HFC (R22, ...)						
B5.2[2]	BITZER	MO/AB	≤ 0,04	**≥ 0,07**	-	**≥ 50**
HCFC (R290, R1270, ...)						
Arctic SHC226E[2]	Exxon Mobil	PAO	-	**≥ 0,1**	-	**≥ 80**
Clavus G68	Shell	MO	≤ 0,04	**≥ 0,1**	-	**≥ 80**
Ammonia (R717), Ammonia - DME (R723)						
Clavus 68[2]	Shell	MO	≤ 0,04	**-**	-	**≥ 100**
CO_2 (R744)						
BSE85K[2]	BITZER	POE	≤ 0,02	**≥ 0,1**	≤ 30	**≥ 150**
BSE60K	BITZER	POE	≤ 0,03	**≥ 0,1**	≤ 30	**≥ 150**

Legend
PAO = poly alpha olefin
POE = polyol ester
MO/AB = mineral oil/alkyl benzene
MO = mineral oil

[2] Standard charge
[2] Change filter drier
[4] Change oil and filter drier

BITZER Approved Oils

Model	Compressor Type	Refrigerant	SCT < 130°F	SCT > 130°F
CE1 CE2 CE3 CE4 BE5 BE6	Semi-hermetic	R134A/R407C/R407A R404A/R507A	BSE32	BSE55
		R22 (R12/R502)	B5.2	B5.2
		R124A	S68	S68
		R410A	BSE55	BSE55
2x.2 4x.2 6x.2 (x=T,N,P , H,G, F)	Open Drive Semi-hermetic	R134A/R407C/R407A R404A/R507A	BSE32	BSE55
		R22 (R12/R502)	B5.2	B5.2
		NH3 (R717)	Clavus G68	Clavus G68
S4 - S6	2 Stage	R404A/R507A	BSE32	BSE32
		R22	B5.2	B5.2
I to VII	Slow Open Drives	R134A/R407C/R407A R404A/R507A	BSE32	BSE55
		R22	B5.2	B5.2
CO2	Semi-hermetic	R744 (CO2)	BSE85K	BSE85K
410A	Semi-hermetic	R410A	BSE55	BSE55

Oil Part Numbers and Temperature Ranges

Oil Part Numbers

BITZER Oils	Lubricant type	5 gallon	1 gallon	1 quart
B5.2	MO/AB	793-3150-34	793-1150-24	793-1150-04
BSE32	POE	793-1031-24	793-1031-34	793-1031-04
BSE55 / BSE 68G	POE		793-1068-34	793-1068-04
Clavus G68	MO	915119-03	915119-01	
S68	AB	793-3300-34	793-3300-24	
BSE85K	POE	915128-01 (10liters)	915128-03 (5liters)	915128-02 (1liter)

Legend:
MO = Mineral Oil
AB = Alkylbenzene Oil
POE = Polyolester Oil
1 gallon = 3.78 liters

Temperature Ranges	
H	t_e > 30F
M	t_e > 20F
L	t_e < 20F
(L)	t_e < 20F & t_c>130F

t_e = saturated suction temp
t_c = saturated discharge temp

Note: When changing oil, remove the oil strainer to inspect and clean.

Approved Alternative Oils

BITZER oil	Alternative oil	Manufacturer
B5.2 (AB 150)	Zerice S46	Exxon Mobil
	Zerice S68	Exxon Mobil
	Zerol 150	Petrosynthese
	Clavus SD2212	Shell
	Reniso SP46	Fuchs
	Reniso SP32	Fuchs
BSE32 (POE 32)	Clavus R32	Shell
	RL32 H	Uniquema
	SEZ32	Fuchs
	Castrol Icematic SW32	Deutsche BP
	EAL Arctic 22 CC	Exxon Mobil
	EAL Arctic 32	Exxon Mobil
	Solest 31-HE	CPI
BSE55 / BSE68G	Solest 68	CPI
(POE 68)	SE55	Fuchs
	Castrol Icematic SW68	Deutsche BP
	RL68 S	Uniquema
	Clavus R68	Shell
	EAL Arctic 68	Exxon Mobil
S68 (AB 300)	Alkyl 300	BVA
For more information see KT-500 & KT-510		

4.4 Capacity Regulator

The BITZER capacity control is based on the principle of suction shut -off. Hereby the suction-side gas flow to the individual cylinder bank is shut off by means of a control piston.

In **Full-load operation** the compressor delivers on all cylinders. The solenoid coil is DE-ENERGIZED. The gas ports in the valve plate and cylinder head are opened.

In **Part-load operation** the pistons of the switched-off cylinder bank run idle without gas pressure. The solenoid coil is ENERGIZED, the suction port in the corresponding cylinder head is shut off by means of a servo valve.

Application limits with part load operation
With capacity regulator operation the temperature level rises due to:

- reduced refrigerant mass flow,
- reduced motor cooling and
- electrical and mechanical losses.

Therefore the application ranges of the capacity controlled compressors are restricted to some extent.

Attention! For low temp applications and open drive reciprocating compressors the use of capacity control is restricted.

Capacity regulator head kit (w/gasket and stem) part numbers:

Compressor Model	Unloader Head (w/ gasket & stem) Part Number:
CE3 (4FES .. 4CES)	302355-35
CE4 (4VE .. 4NE)	302355-34
BE5 (4JE .. 4FE)	302355-33
BE6 (6JE .. 6FE)	302355-33

Compressor Type	Possible residual capacity*	Number of capacity regulators
4-Cylinder	50%	1
	10 - 100%	2
6-Cylinder	66%	1
	66% - 33%	2
	10 - 100%	3

***See KT-101 for CRII Capacity Control information.**

Variable unloading (VU CRI & VU CRII):
Refer to TB-0011 for information on VU CRI
Refer to TB-0050 for information on VU CRII

5.1 Service Part Changes

Service part	Compressor series					
	CE1	CE2	CE3	CE4	BE5	BE6
Bearing cap kit	x					
Head kit		x	x	x	x	x
Valve plate kit		x	x	x	x	x
Valve plate gasket		x	x	x		
Unloader head kit			x	x	x	x
Discharge valve kit					x	x
Discharge valve					x	x
Discharge valve gasket kit					x	x*
Head fan brackets		x		x	x	x

X - denotes incompatibility between ECOLINE and older models

* 6FE models excluded

5.2 Mounting Kit Part Numbers

Compressor Model	Mounting Kits	
	Hard	Rubber
2KES .. 2FES	313095-01	370000-19
2EES .. 2CES	313095-01	370000-20
4FES .. 4CES	313095-01	370000-20

		Installation Location			
Compressor Model	Spring Mounting Kits	Crankcase Side	Color	Motor Side	Color
4VE .. 4NE	308001-59	370003-05	Yellow	370003-07	Brown
4JE .. 4GE23, 4FE25	308001-62	370004-01	Brown	370004-02	Red
4GE30, 4FE28 .. 6FE	308001-61	370004-01	Brown	370004-03	Blue
S4T-5.2, S4N-8.2	308001-63	370003-05	Yellow	370003-06	Green
S4G-12.2	308001-60	370004-01	Brown	370004-01	Brown
S6J-16.2	308001-62	370004-01	Brown	370004-02	Red
S6H20.2 - S6F-30.2	308001-61	370004-01	Brown	370004-03	Blue

Note for CE4, BE5, BE6 Models - Hard mount parallel applications

5.3 Oil Pump, Valve Plate, Terminal Box Kit, Terminal Plate Kit, Complete Gasket Set Part Numbers

Compressor Model #	Oil Pump	Valve Plate (w/ Gaskets)	Terminal Box Kit	Terminal Plate Kit	Complete Gasket Set
2KES	N/A	304055-04	343509-01	345500-16 / 372938-10	372834-01
2JES	N/A	304055-05	343509-01	345500-16 / 372938-10	372834-02
2HES	N/A	304055-04	343509-01	345500-16 / 372938-10	372830-01
2GES	N/A	304055-02	343509-01	345500-16 / 372938-10	372830-02
2FES	N/A	304055-03	343502-41	345500-16 / 372938-10	372830-03
2EES	N/A	304059-10	343502-41	343428-01-3LD	372835-01
2DES	N/A	304059-11	343502-41	343428-01-3LD	372835-02
2CES	N/A	304059-12	343502-41	343428-01-3LD	372835-03
4FES	N/A	304059-09	343502-41	345507-06 (3LD)	372835-04
4EES	N/A	304059-10	343502-41	345507-06 (3LD)	372835-05
4DES	N/A	304059-11	343502-41	345507-06 (3LD)	372835-06
4CES	N/A	304059-12	343502-41	345507-06 (3LD)	372835-07
4VE	362503-01	304063-28	308002-58	345507-02 (9LD)	372841-04
4TE	362503-01	304063-29	308002-58	345507-02 (9LD)	372841-03
4PE	362503-01	304063-30	308002-58	345507-02 (9LD)	372841-02
4NE	362503-01	304063-31	308002-58	345507-02 (9LD)	372841-01

Compressor Model Number	Oil Pump	Valve Plate (w/ Gaskets)	Terminal Box Kit	Terminal Plate Kit (9 Lead)	Complete Gasket Set
4JE	362503-02	304063-32	343502-13	345501-10	372811-02
4HE-15	362503-02	304063-33	343502-13	345501-10	372811-03
4HE-25	362503-02	304063-33	343502-13	345501-10	372811-06
4GE	362503-02	304063-34	343502-13	345501-10	372811-04
4FE	362503-02	304063-35	343502-13	345501-10	372811-09
6JE	362503-02	304063-32	343502-13	345501-10	372811-05
6HE	362503-02	304063-33	343502-13	345501-10	372811-07
6GE	362503-02	304063-34	343502-13	345501-10	372811-08
6FE	362503-02	304063-35	343502-13	345501-10	372811-09
2-Stage Series		-LP / LP(mid) / HP			
S4T-5.2	362503-01	304017-03/ --/ 01	343502-06	345501-10	372817-01
S4N-8.2	362503-01	304017-02/ --/ 01	343502-06	345501-10	372817-01
S4G-12.2	362503-02	LP:304016-07 HP:304018-01	343502-13	345501-10	372818-01
S6J-16.2	362503-02	304016-05/ 09/ 01	343502-13	345501-10	372816-01
S6H-20.2	362503-02	304016-06/ 10/ 02	343502-13	345501-10	372816-02
SG6-25.2	362503-02	304016-07/ 11/ 03	343502-13	345501-10	372816-03
S6F-30.2	362503-02	304016-08/ 12/ 04	343502-13	345501-10	372816-04

5.4Crankcase Heater and Head Fan

Crankcase Heater Part Numbers

Compressor Model	Watts	Control Voltage	Part Number
2KES .. 2FES	60	110V	892-0060-01
		220V	892-0060-02
2EES .. 4CES	120	110V	892-1120-01
		220V	892-1120-02
4VE .. 4NE	120	110V	892-1120-13
		220V	892-1120-14
4JE .. 6FE	140	110V	892-1140-01
		220V	892-1140-02
S4T-5.2 - S4N-8.2	100	110V	892-0100-01
		220V	892-0100-02
S4G12.2 - S6F-30.2	140	110V	892-1140-01
		220V	892-1140-02

Heater paste: 939002-01 (small tube), 939002-03 (350 ml)

Head Fan Part Numbers

Compressor	Bracket Kits
2KES .. 2FES	0705468-KIT
2EES .. 2CES	0705484-KIT
4FES .. 4CES	0705467-KIT
4VE .. 4NE	0705482-KIT
4JE .. 4FE	0705481-KIT
6JE .. 6FE	0705480-KIT

Voltage	Head Fan Kit
110V	415-2100-15KIT
208V	415-2100-28KIT
460V	415-2100-46KIT

Compressor	Hardware*
4VE .. 4NE	999-0011-02
4JE .. 4FE	999-0011-03
6JE .. 6FE	999-0011-04

* Mounting hardware only, no bracket

6.1 Operating Temperatures and Oil Guidelines

Guide values for operating temperatures*

Operating Temperatures		
Suction gas superheat	min.	~15°F
	typical	20-30°F
Discharge gas temperature	min.	40°F above condensing temp. (50° F for R22)
	max.	250°F; measured at discharge line
2 Stage Intermediate (middle) pressure superheat	min.	~40°F+subcooler saturation temp; measured at bulb on MP line

*Values in practice depend much on operating conditions (A/C, medium temp., low temp.) and refrigerant! Please check individual cases with the selection software or BITZER.

Note: Compressor/Oil Pump rotates in both directions.

Guide values for oil maintenance

Oil Guidelines		
Oil temperatures - on Start-up**	typical	25-35°F above ambient
Oil temperatures - Operating	min.	95°F (min. 55°F > SST)
	max.	170°F
Oil pressure differential	min.	9.5 ± 2 psi (see p. 69 - 70 for oil monitoring devices)
Oil change		Every 3 years or 10000 hrs of operation

**Oil heater recommended.

Note: When changing oil, remove the oil strainer to inspect and clean.

6.2 Switching Frequency and Vibrations

Switching frequency and minimum running time

Nominal Motor (HP)	Starts per hour		Minimum running time (min)
	recommended	maximum	
up to 7.5	10	20	2
up to 20	8	12	3
above 20	6	6	5

Vibrations on the high pressure side

Vibrations on the high pressure side of refrigeration systems are mainly caused by: Pulsations, Structure-borne vibrations, Frame design / basement

Pulsations

Pulsations (longitudinal gas vibrations on the high pressure side) are created by the discharge process of the gas out of the cylinders. Their amplitude and frequency depend on:

- Compressor speed
- Number of cylinders
- Cylinder alignment
- Refrigerant properties (pressure, temperature and sonic speed)

Critical discharge gas vibrations can be found if the frequency of the oscillating gas column in a straight discharge tube section gets into resonance with the natural frequency of the pipework. In the worst case this could result in a fracture of the piping. The length of the pipe segment with a resonance frequency corresponding to the natural frequency of the gas flow is designated as "critical pipe length".

6.3 Tightening Torques for Screw Fixings of Non-Aluminum Reciprocating Compressors

A. Normal bolts

	M5	M6	M8	M10	M12	M16	M20	Units
With gasket	----	16	40	80	125	220	220	Nm
	----	12	30	59	92	162	162	lb ft

B. Special bolts

Sealing plugs	lb ft	Nm
1/8"-27 NPTF	7..10	10..13
1/4"-18 NPTF	15..17	20..23
3/8"-18 NPTF	31..35	42..47
1/2"-14 NPTF	47..51	64..69
3/4"-14 NPTF	72..80	98..108
Oil drain	lb ft	Nm
M22	100..114	135..155
M26	114..129	155..175
Sight glass	lb ft	Nm
M6	6	8
M6	8	11
1 1/8"-18 UNEF (Thread)	37..44	50..60
Oil Pump	**lb ft**	**Nm**
M8	17	23

Shut-off valve and flanges	lb ft	Nm
M8	18	25
M10	37	50
M12	74	100
M16	110	150
M18	147	200
M20	147	200
Screws at terminal lugs at 68F	lb ft	Nm
M4	1	2
M6	4	6
M8	7	10
M10	15	20
Rotor screws	lb ft	Nm
M10	15	20
M12	15	20
M16	44	60

DO NOT OIL METALIC OR TEFLON GASKETS
OIL WHITE PAPER GASKETS
TIGHTEN SCREWS CROSSWISE AND AT LEAST IN TWO STEPS (50/100%)

6.4 Common Wrench Sizes for Basic Compressor Service

Bolt	Metric Wrench Size (mm)	Metric size in inches (decimal)	Metric size to closest inch (1/16")*
M5 HHC	8mm	0.315	5/16
M6 HHC	10mm	0.394	3/8
M8 HHC	13mm	0.512	1/2
M8 SHC	6mm (Allen)	0.236	1/4
M10 HHC	17mm	0.669	11/16
M10 SHC	8mm (Allen)	0.315	5/16
M12 HHC	19mm	0.748	3/4
M12 SHC	10mm (Allen)	0.394	3/8
M16 HHC	24mm	0.945	15/16

*** SAE standard equivalent wrenches may be used as a substitute for metric wrenches. Use caution as bolt may strip from incorrect tool size use.**

Legend
HHC = Hex Head Cap
SHC = Socket Head Cap

6.5 Cylinder head and valve plate replacement guidelines

1. Remove cylinder head bolts.
2. If a capacity regulator (unloader) is installed, remove the bolts holding the unloader stem as they are part of the cylinder head bolts.

3. Remove the cylinder head.
4. Remove the valve plate and inspect for damage.
5. Install a new valve plate gasket
6. Install a new valve plate.
   -Note: the new valve plate may look different than the original (number of discharge reeds and diameter of holes may vary) - this is normal and will not affect performance.

   -Use the dowel/guide pins to align and hold the gasket and valve plate correctly.

6. Install a new head gasket
7. Replace the cylinder head, tighten the screws crosswise and in at least two steps. Torque the screws to the appropriate force listed on page 78.

6.6 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.
	Motor Burnout	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 accordingly 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.

Troubleshooting (cont'd)

Situation	Possible Cause	Trouble Shooting Steps
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 and/or install check valve.
	Migration	Ensure proper crankcase heating. If the compressor is outdoors, use housing or machining room.
Flood back	Suction line frozen	Check superheat at evaporator. Adjust TXV.
	Liquid coming back	Clean evaporator coil.
Compressor is running hot	High discharge	Check condenser is operating and clean.
	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 at normal level	Possibility of liquid refrigerant in the crankcase.
	Oil sightglass full	Too much oil in the system.

Official literature can be found at www.bitzerus.com

Semi Hermetic ECOLINE

Spare Parts

KE-121 SPARE PARTS LIST CE1 - CE3

KE-140 S4T/S4N: 4 CYL OPEN DRIVE AND 2 STAGE (B4)

KE-150 SPARE PARTS LIST B5,B6, S4G - S6F

KE-160 SPARE PARTS LIST C4

Performance Data

KP-109 SEMI-HERMETIC ECOLINE (IP UNITS @ 60Hz)

KP-115 SINGLE STAGE TANDEM (IP UNITS @ 60Hz)

KP-155 2 STAGE (IP UNITS @ 60Hz)

Operating Instructions

KB-104 SEMI HERMETIC ECOLINE

KB-150 2 STAGE (SUPPLEMENT TO KB-104)

Technical and Application Information

KT-100 CAPACITY CONTROL

KT-101 CRII - CAPACITY CONTROL

KT-122 INT SE-B MOTOR OVERLOAD CONTROL

KT-140 ADDITIONAL COOLING - HEAD FANS & WATER COOLED HEADS

KT-150 CRANKCASE HEATING

KT-151 OCTAGON SUPPLEMENT FOR CRANKCASE HEATING

KT-170 OIL PRESSURE CONTROL FOR PUMP MODELS

KT-180 OPTICAL OIL SENSING CONTROL FOR NON-PUMP MODELS

KT-400 PART WINDING MOTOR INFO

KT-410 MOTOR CODE INFO

KT-420 USING FREQUENCY INVERTERS WITH RECIPS

KT-600 COMBINED OR PARALLEL OPERATION WITH RECIPS

KT-601 OCTAGON TANDEM SUPPLEMENT FOR KT-600

KT-602 PARTALLEL COMPOUNDING WITH OCTAGON COMPRESSORS

KW-105 GENERAL TORQUE (IP UNITS)

Documentation available by contacting BITZER US

Technical Bulletins

TB-0006 OLC-K1 Optical Oil Sensor

TB-0007 BITZER C4 HEATER WELL - FIELD NOTIFICATION

TB-0010 HEAD FAN BRACKETS AND KITS

TB-0011 VARIABLE UNLOADING I (VU CRI)

TB-0028A 3 LEAD TERMINAL PLATE

TB-0028B 6 LEAD TERMINAL PLATE

TB-0028C 9 LEAD TERMINAL PLATE

TB-0033 R22 LOW TEMP APPLICATIONS

TB-0040 VARIABLE SPEED INTALL SETUP

TB-0041 CAPACITY CONTROL MODULES

TB-0043 R407A/F LOW TEMPERATURE APPLICATIONS

TB-0050 VARIABLE UNLOADING II (VU CRII)

Retrofit Documentation

XR-0008 COPELAND TO BITZER CONVERSION GUIDE

XR-0013 CARLYLE TO BITZER CONVERSION GUIDE

XR-0015 COPELAND SCROLLS TO BITZER RECIP CONVERSION GUIDE

Maintenance Bulletin

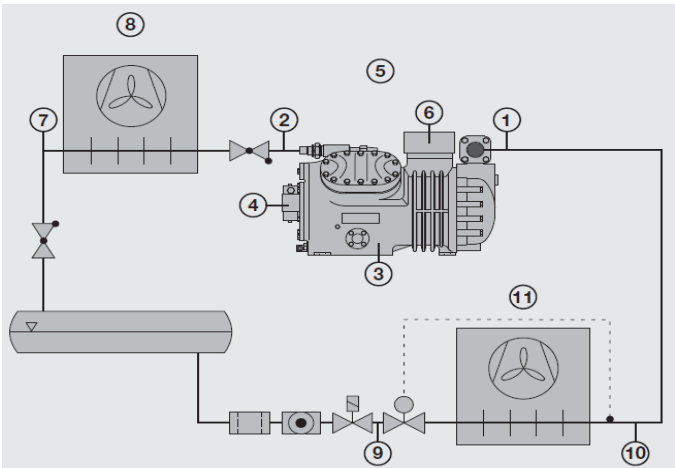
MB-0030 2NU MOTOR CHECK

Customer Forms

CF-0001 RETURN MATERIAL AUTHORIZATION (RMA) FORM

CF-0015 RECIP SYSTEM INFORMATION REQUEST

CF-0016 2-STAGE SYSTEM INFORMATION REQUIEST



	Parameter	Note
1	Suction Pressure/Temperature	Compressor Superheat
2	Discharge Pressure/Temperature	Discharge Superheat
3	Oil Temperature	
4	Oil Pressure Differential	+ HP (oil), - LP (crankcase)
5	Ambient Temperature	
6	Voltage/Operating current	
7	Liquid Temperature	Exiting Condenser/subcooler
8	Ambient/Fluid Temperature	Condenser
9	Liquid Temperature	Before TXV
10	Suction Gas Temperature	Exiting Evaporator
11	Air/Fluid Temperature	Evaporator

In order to properly assist with troubleshooting and technical support, Application Engineers will need as much information related to the compressor operation as possible. Bitzer can provide a form (CF-0015 or CF-0016) to document this information.

Key Compressor Operating Parameters

Compressor Superheat (SH): Adequate SH insures that liquid refrigerant is not returning to the suction side of the compressor. BITZER recommends 20°F - 30°F of SH at the compressor. SH can be calculated by subtracting the saturated suction temperature from the return gas temperature (Reference point 1).

Discharge Temperature: The discharge temperature should be measure 6" - 8" from the discharge service valve. The max discharge temperature is 250°F. High (or low) discharge temperatures indicate a compressor or system problem. The BITZER software or technical support can provide normal discharge temperatures.

Suction/Discharge Pressure/Temperature: Suction and discharges pressures and temperatures at the compressor can be used to determine compressor or system performance and calculate suction and discharge superheats.

Oil Pressure Differential: For compressor models with oil pumps, the oil pressure differential is the difference between the high side of the oil pump (label +HP on the pump) and the crankcase pressure (-LP). Oil pump/compressor that are operating normally should have an oil pressure differential of 20 - 50psi. Minimum differential is 9psi.

Operating Voltage: When measured during operation, the voltage at each terminal pin should be within 2% of the others and 10% of the compressor nameplate voltage.

Operating Current: When measured during operation, the amperage at each terminal pin should be within 10% of the others.

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