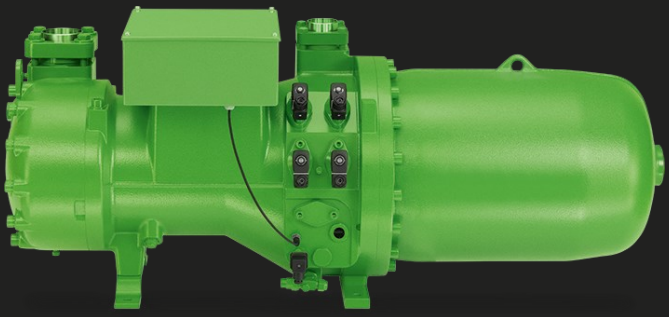
SERVICE GUIDE
CS SERIES SCREW COMPRESSORS



SG-0005-01 // Revision 9/2014 // 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.

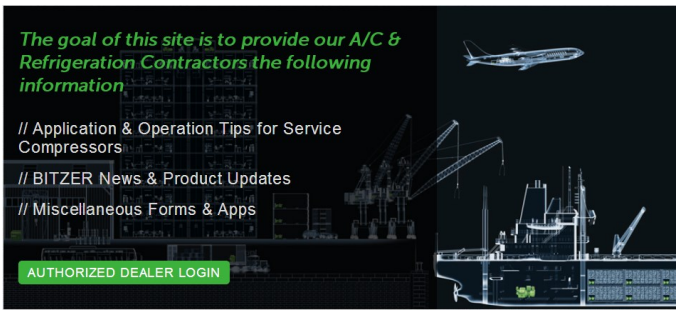
General safety references:

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!

BITZER Aftermarket Solutions



BITZER Contractors have replaced over 100 different models of Screw and Recip compressors, manufactured by 14 different companies, with BITZER high-efficiency Screw Compressors.

Visit **www.bitzerams.com** or contact technical support (770-718-2900) for more information.

BITZER PT Reference App

Download the BITZER app to your smartphone!

Available on Apple, Android and Blackberry devices.

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sales@bitzerus.com
techsupport@bitzerus.com

24hr Quick Ship Emergency Replacement Hotline for US Customers:
1-888-GO BITZER (1-888-462-4893)

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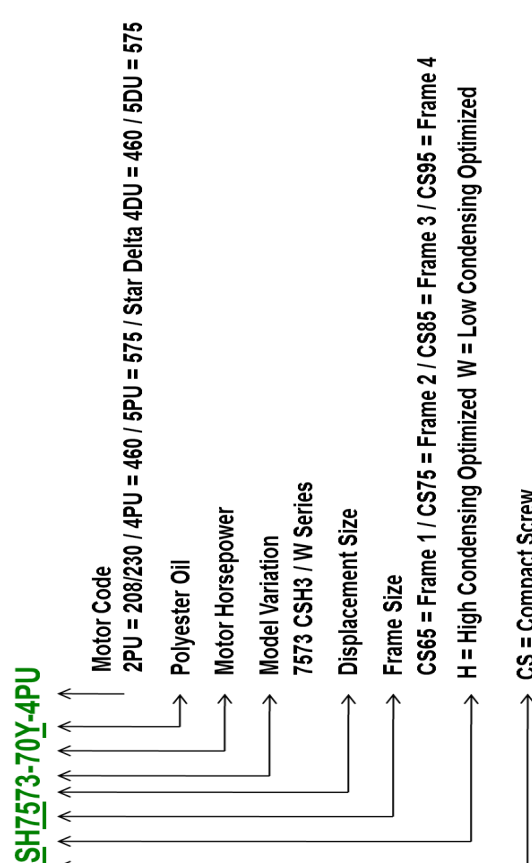
1.2 CS Screw Nomenclature



"Y" after the 11th Digit is Oil Type (when required)
"Y" = BSE170 for HFC's / If no "Y" in Model Number = B320SH for R22

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 1086400001		
DIGITS 1 AND 2	DIGITS 3 TO 5	DIGITS 5 TO 10
FACTORY CODE	DATE CODE	SUBSEQUENT NUMBERING
10	864	00001
Rottenburg, Germany	Apr-14	Unambiguous subsequent numbering

1.4 BITZER Quick Ship Program

Placing your Order:

- Call 770-718-2900 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 lift gate needed?
- Credit Card Number
  (American Express / Visa / MasterCard)

QUICKSHIP

1.5 BITZER Core Charge Return Policy

Contact customer service at 770-718-2900 or email customerservice@bitzerus.com for a RMA form.

1.6 Technical Support

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

Contact technical support at 770-718-2900 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
- Compressor Suction Superheat
- Liquid Subcooling / Liquid Temperature
- Discharge gas temperature
- Amp draw

See back page for start-up check list.

2.1 CSH65, CSH75 Technical Data

Frame Size	Model Number	HP	Motor Version	CFM	CFH	CR*	Dual Voltage 230/460	Oil Charge (gal)	Weight (lbs)	Tube Connections DL (in.)	Tube Connections SL (in.)
1	CSH6553-35Y	35	2	97	5830	25 - 100%	NA	2.5	692	1 5/8	2 1/8
1	CSH6553-50(Y)	50	1	97	5830	25 - 100%	NA	2.5	710	1 5/8	2 1/8
1	CSH6563-40Y	40	2	121	7240	25 - 100%	NA	2.6	692	1 5/8	2 1/8
1	CSH6563-60(Y)	60	1	121	7240	25 - 100%	NA	2.6	710	1 5/8	2 1/8
1	CSH6583-50Y	50	2	139	8334	25 - 100%	NA	4.0	805	2 1/8	2 5/8
1	CSH6593-60Y	60	2	157	9394	25 - 100%	NA	4.0	805	2 1/8	2 5/8
2	CSH7553-50Y	50	2	140	8405	25 - 100%	NA	4.0	1103	2 1/8	3/18
2	CSH7553-70(Y)	70	1	140	8405	25 - 100%	NA	4.0	1136	2 1/8	3/18
2	CSH7563-60Y	60	2	161	9676	25 - 100%	NA	4.0	1125	2 1/8	3/18
2	CSH7563-80(Y)	80	1	161	9676	25 - 100%	NA	4.0	1147	2 1/8	3/18
2	CSH7573-70Y	70	2	183	10983	25 - 100%	NA	4.0	1136	2 1/8	3/18
2	CSH7573-90(Y)	90	1	183	10983	25 - 100%	NA	4.0	1169	2 1/8	3/18
2	CSH7583-80Y	80	2	210	12572	25 - 100%	NA	4.0	1158	2 1/8	3/18
2	CSH7583-100Y	100	1	210	12572	25 - 100%	NA	4.0	1213	2 1/8	3/18
2	CSH7593-90Y	90	2	239	14338	25 - 100%	NA	4.0	1169	2 1/8	3/18
2	CSH7593-110Y	110	1	239	14338	25 - 100%	NA	4.0	1235	2 1/8	3/18

*Capacity control: Infinite or 4 step control (25% increments)

2.2 CSH85, CSH95 Technical Data

Frame Size	Model Number	HP	Motor Version	CFM	CFH	CR*	Dual Voltage 230/460	Oil Charge (gal)	Weight (lbs)	Tube Connections DL (in.)	Tube Connections SL (in.)
3	CSH8553-80Y	80	2	224	13420	25 - 100%	NA	5.8	1830	3 1/8	4 1/8
3	CSH8553-110(Y)	110	1	224	13420	25 - 100%	NA	5.8	1852	3 1/8	4 1/8
3	CSH8563-90Y	90	2	255	15291	25 - 100%	NA	5.8	1830	3 1/8	4 1/8
3	CSH8563-125(Y)	125	1	255	15291	25 - 100%	NA	5.8	1874	3 1/8	4 1/8
3	CSH8573-110Y	110	2	291	17481	25 - 100%	NA	5.8	1852	3 1/8	4 1/8
3	CSH8573-140(Y)	140	1	291	17481	25 - 100%	NA	5.8	1896	3 1/8	4 1/8
3	CSH8583-125Y	125	2	334	20024	25 - 100%	NA	5.0	1874	3 1/8	4 1/8
3	CSH8583-140Y	140	2	334	20024	25 - 100%	NA	5.0	1874	3 1/8	4 1/8
3	CSH8593-140Y	140	2	380	22814	25 - 100%	NA	5.0	1896	3 1/8	4 1/8
3	CSH8593-160Y	160	2	380	22814	25 - 100%	NA	5.0	1874	3 1/8	4 1/8
4	CSH9553-180(Y)	180	1	380	22814	25 - 100%	NA	7.9	2822	3 1/8	4 1/8
4	CSH9563-160Y	160	2	437	26204	25 - 100%	NA	7.9	2800	3 1/8	4 1/8
4	CSH9563-210(Y)	210	1	437	26204	25 - 100%	NA	7.9	2867	3 1/8	4 1/8
4	CSH9573-180Y	180	2	497	29841	25 - 100%	NA	7.9	2822	3 1/8	4 1/8
4	CSH9573-240(Y)	240	1	497	29841	25 - 100%	NA	7.9	2889	3 1/8	4 1/8
4	CSH9583-210Y	210	2	572	34326	25 - 100%	NA	7.9	2933	4 1/8	5
4	CSH9583-280Y	280	1	572	34326	25 - 100%	NA	7.9	3000	4 1/8	5
4	CSH9593-240Y	240	2	646	38776	25 - 100%	NA	7.9	2977	4 1/8	5

2.3 CSW65, CSW75 Technical Data

Frame Size	Model Number	HP	Motor Version	CFM	CFH	CR*	Dual Voltage 230/460	Oil Charge (gal)	Weight (lbs)	Tube Connections DL (in.)	Tube Connections SL (in.)
1	CSW6583-40Y	40	2	139	8334	25 - 100%	NA	2.6	794	2 1/8	2 5/8
1	CSW6583-50(Y)	50	1	139	8334	25 - 100%	NA	2.6	805	2 1/8	2 5/8
1	CSW6593-50Y	50	2	157	9394	25 - 100%	NA	2.6	794	2 1/8	2 5/8
1	CSW6593-60(Y)	60	1	157	9394	25 - 100%	NA	2.6	805	2 1/8	2 5/8
2	CSW7573-60Y	60	2	183	10983	25 - 100%	NA	4.0	1136	2 5/8*	3/18
2	CSW7573-70(Y)	70	1	183	10983	25 - 100%	NA	4.0	1147	2 5/8*	3/18
2	CSW7583-70Y	70	2	210	12572	25 - 100%	NA	4.0	1158	2 5/8*	3/18
2	CSW7583-80(Y)	80	1	210	12572	25 - 100%	NA	4.0	1169	2 5/8*	3/18
2	CSW7593-80Y	80	2	239	14338	25 - 100%	NA	4.0	1169	2 5/8*	3/18
2	CSW7593-90(Y)	90	1	239	14338	25 - 100%	NA	4.0	1180	2 5/8*	3/18

*Capacity control: Infinite or 4 step control (25% increments)

* 2 1/8 Prior to mid 2013

2.4 CSW85, CSW95 Technical Data

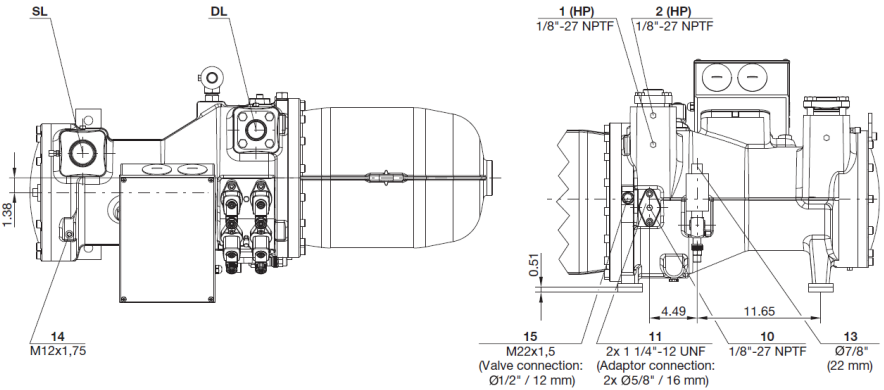
Frame Size	Model Number	HP	Motor Version	CFM	CFH	CR*	Dual Voltage 230/460	Oil Charge (gal)	Weight (lbs)	Tube Connections DL (in.)	Tube Connections SL (in.)
3	CSW8573-90Y	90	2	291	17481	25 - 100%	NA	5.8	1852	3 1/8	4 1/8
3	CSW8573-110(Y)	110	1	291	17481	25 - 100%	NA	5.8	1874	3 1/8	4 1/8
3	CSW8583-110Y	110	2	334	20024	25 - 100%	NA	5.0	1874	3 1/8	4 1/8
3	CSW8583-125(Y)	125	1	334	20024	25 - 100%	NA	5.0	1896	3 1/8	4 1/8
3	CSW8593-125Y	125	2	380	22814	25 - 100%	NA	5.0	1918	3 1/8	4 1/8
3	CSW8593-140(Y)	140	1	380	22814	25 - 100%	NA	5.0	11940	3 1/8	4 1/8
4	CSW9563-140Y	140	2	437	26204	25 - 100%	NA	7.9	2800	4 1/8	4 1/8
4	CSW9573-160Y	160	2	497	29841	25 - 100%	NA	7.9	2778	4 1/8	4 1/8
4	CSW9573-180(Y)	180	1	497	29841	25 - 100%	NA	7.9	2844	4 1/8	4 1/8
4	CSW95783-180Y	180	2	572	34326	25 - 100%	NA	7.9	2911	4 1/8	5
4	CSW9583-210(Y)	210	1	572	34326	25 - 100%	NA	7.9	2977	4 1/8	5
4	CSW9593-210Y	210	2	646	38776	25 - 100%	NA	7.9	3000	4 1/8	5

*Capacity control: Infinite or 4 step control (25% increments)

2.5 Dimensional Drawings and Connections

Series	Model Number
65	CSH6553-35Y
65	CSH6553-50
65	CSH6563-40Y
65	CSH6563-60
65	CSH6583-50Y
65	CSH6593-60Y

CSH65 Series – Dimensions and Connection Ports



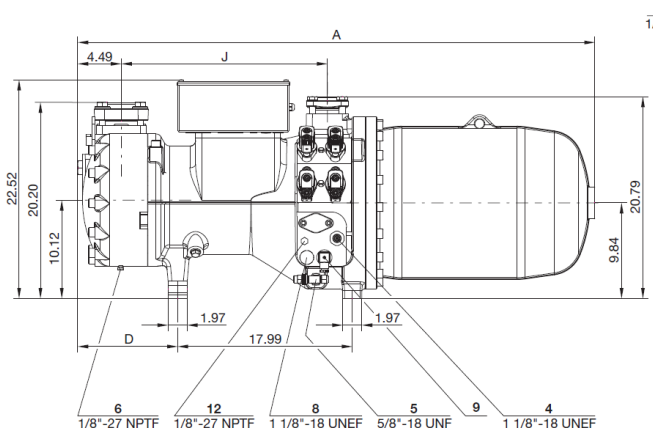
All dimensions in inches
M10, M22 and M26: metric screws
Drawing with optional ECO shut off valve (position 13)

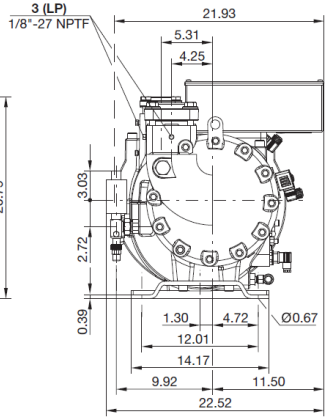
Legend for connections see page 30

CSH75 Series

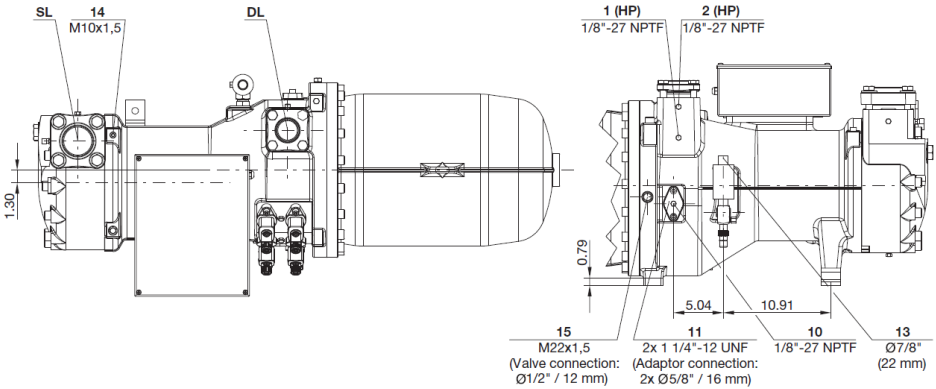
	A inch	D inch	J inch
CSH7553 / CSH7563 / CSH7573 / CSH7583-80Y / CSH7593-90Y	53.26	10.27	21.25
CSH7583-100(Y) / CSH7593-110(Y)	54.44	11.45	22.44

Series	Model Number	Series	Model Number
75	CSH7553-50Y	75	CSH7583-80Y
75	CSH7553-70	75	CSH7583-100
75	CSH7563-60Y	75	CSH7593-90Y
75	CSH7563-80	75	CSH7593-110
75	CSH7573-70Y		
75	CSH7573-90		





CHS75 Series – Dimensions and Connection Ports

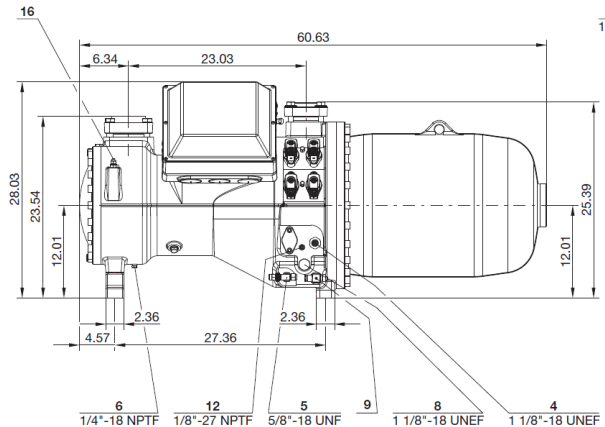


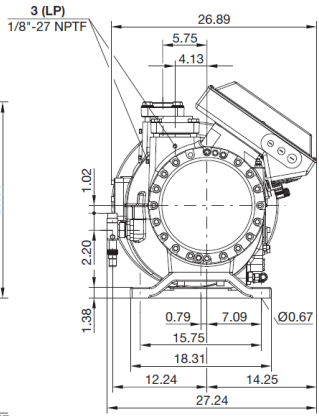
All dimensions in inches
M10 and M22: metric screws
Drawing with optional ECO shut off valve (position 13)

Legend for connections see page 30

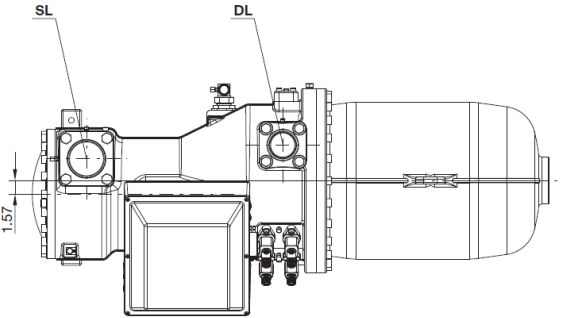
CSH85 Series

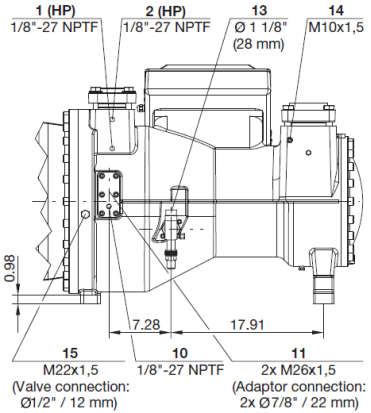
Series	Model Number	Series	Model Number
85	CSH8553-80Y	85	CSH8583-125Y
85	CSH8553-110	85	CSH8583-160
85	CSH8563-90Y	85	CSH8593-140Y
85	CSH8563-125	85	CSH8593-180
85	CSH8573-110Y		
85	CSH8573-140		





CSH85 Series – Dimensions and Connection Ports





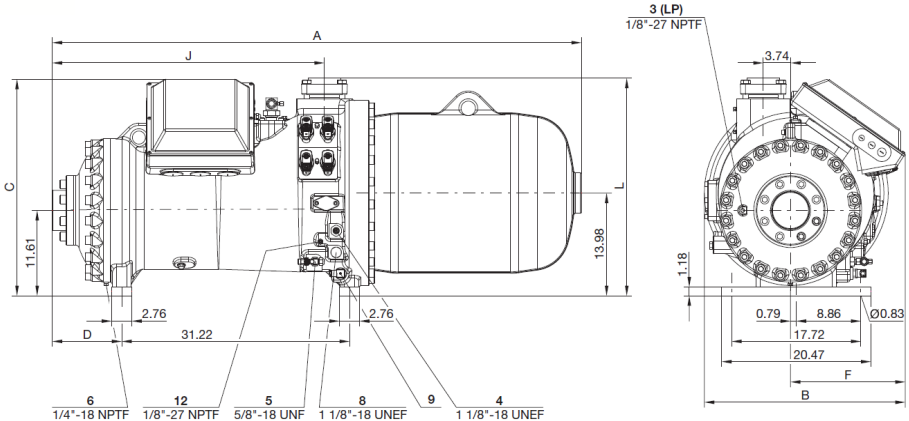
All dimensions in inches
M10, M22 and M26: metric screws
Drawing with optional ECO shut off valve (position 13)

Legend for connections see page 30

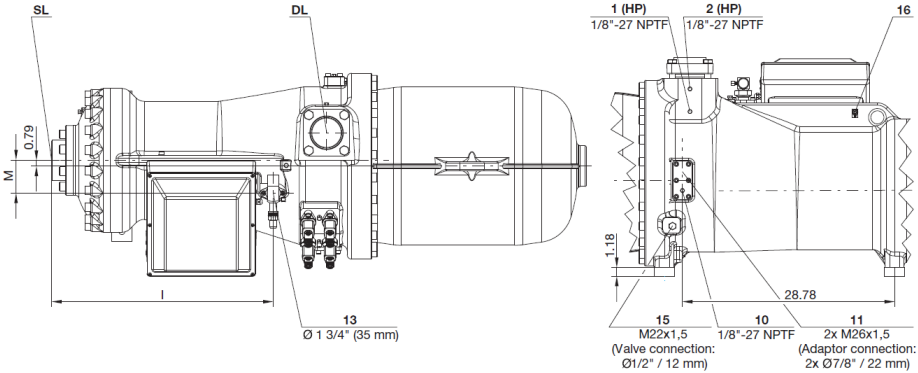
CSH95 Series

All dimensions in inches
M22 and M26: metric screws
Drawing with optional ECO shut off valve (position 13)

Series	Model Number	Series	Model Number
95	CSH9553-180	95	CSH9583-280
95	CSH9563-160Y	95	CSH9593-240Y
95	CSH9563-210	95	CSH9593-300
95	CSH9573-180Y	95	CSH95103-280Y
95	CSH9573-240	95	CSH95103-320
95	CSH9583-210Y		



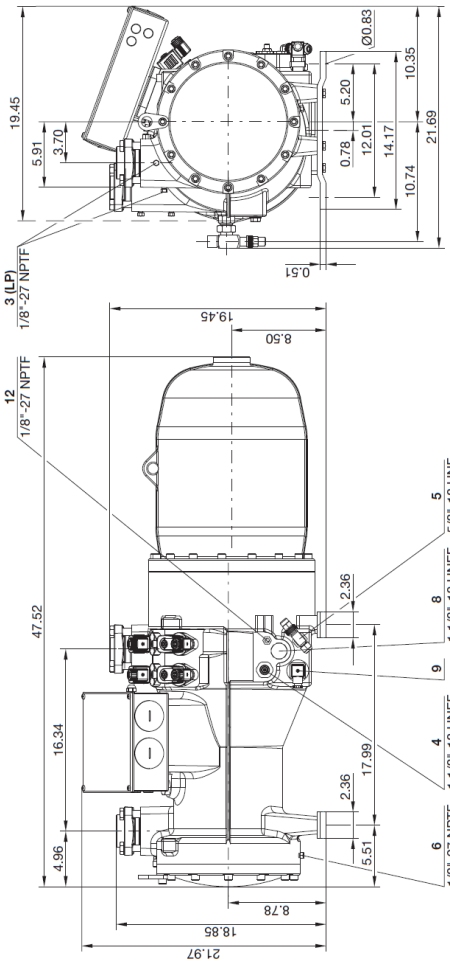
CSH95 Series – Dimensions and Connection Ports



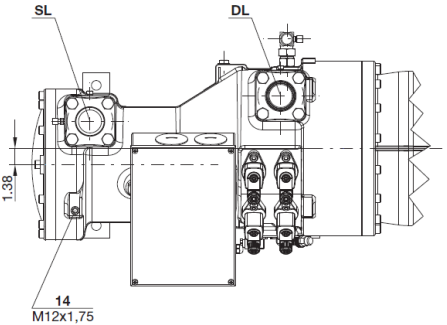
	A inch	B inch	C inch	D inch	F inch	I inch	J inch	L inch	M inch
CSH9553 / CSH9563 / CSH9573	71.81	27.52	29.49	8.82	15.71	29.33	36.57	29.21	4.17
CSH9583-210Y / CSH9593-240Y	72.52	27.52	29.49	9.52	15.71	30.38	37.32	29.60	4.45
CSH9583-280(Y) / CSH9593-300(Y)	73.58	27.52	29.49	10.60	15.71	31.14	38.38	29.60	4.45
CSH95103-280Y	76.97	29.76	32.32	10.60	17.95	31.14	38.38	29.84	4.45
CSH95103-320(Y)	77.75	29.76	32.32	11.38	17.95	31.89	39.17	29.84	4.45

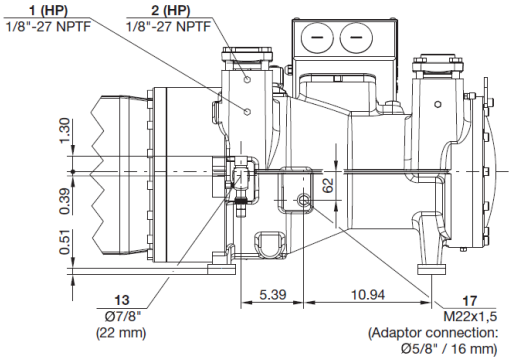
Series	Model Number
65	CSW6583-40Y
65	CSW6583-50
65	CSW6593-50Y
65	CSW6593-60

CSW65 Series



CSW65 Series – Dimensions and Connection Ports





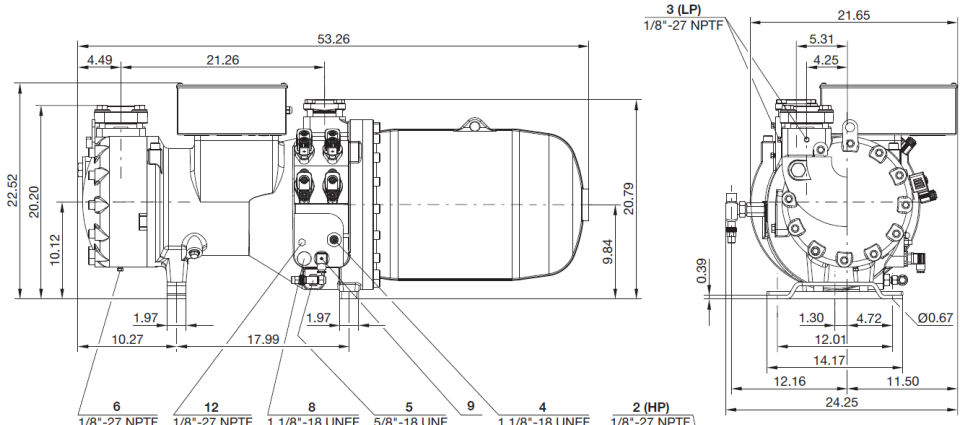
All dimensions in inches
M12 and M22: metric screws
Drawing with optional ECO shut off valve (position 13)

Legend for connections see page 31

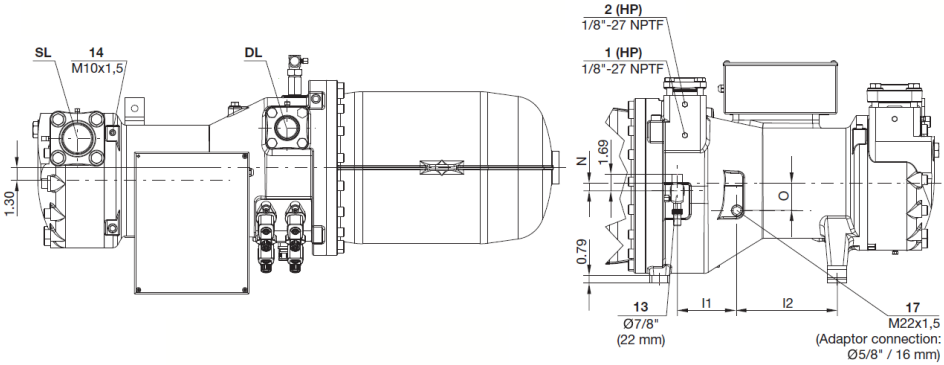
CSW75 Series

All dimensions in inches
M10 and M22: metric screws
Drawing with optional ECO shut off valve
(position 13)

Series	Model Number
75	CSW7573-60Y
75	CSW7573-70
75	CSW7583-70Y
75	CSW7583-80
75	CSW7593-80Y
75	CSW7593-90



CHS75 Series – Dimensions and Connection Ports



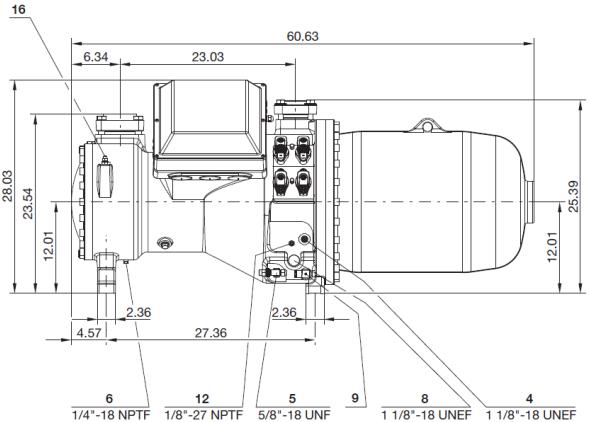
	l_1 inch	l_2 inch	N inch	O inch
CSW7573	6.02	10.15	0.79	2.75
CSW7583 / CSW7593	6.18	10.27	0.91	2.71

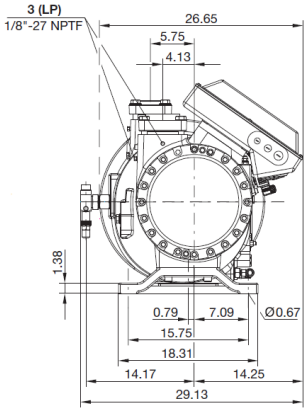
Legend for connections see page 31

CHW85 Series

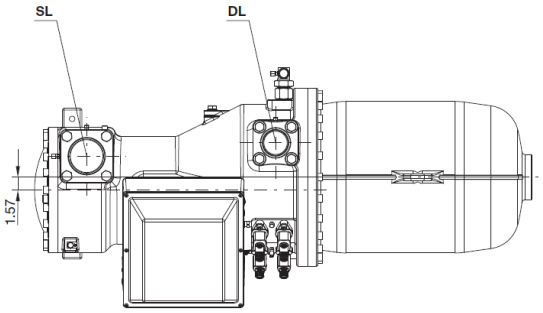
All dimensions in inches
M10 and M26: metric screws
Drawing with optional ECO shut off valve
(position 13)

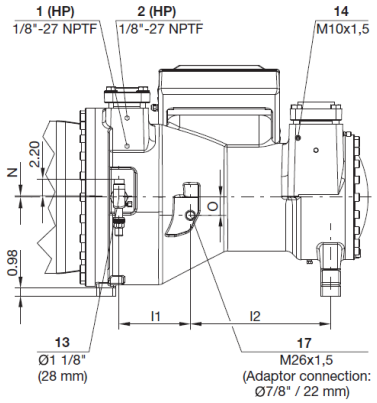
Series	Model Number
85	CSW8573-90Y
85	CSW8573-110
85	CSW8583-110Y
85	CSW8583-125
85	CSW8593-125Y
85	CSW8593-140





CHW85 Series – Dimensions and Connection Ports





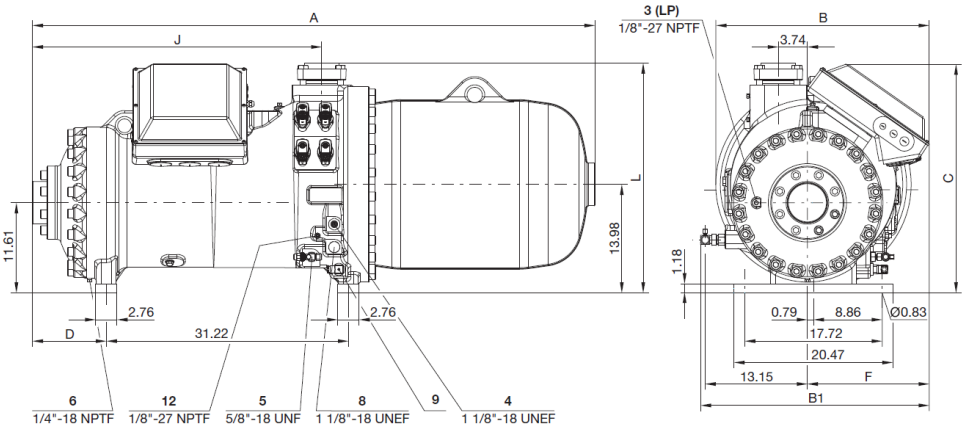
	l_1 inch	l_2 inch	N inch	O inch
CSW8573	8.70	17.08	0	2.20
CSW8583 / CSW8593	8.97	17.00	0.16	1.97

Legend for connections see page 31

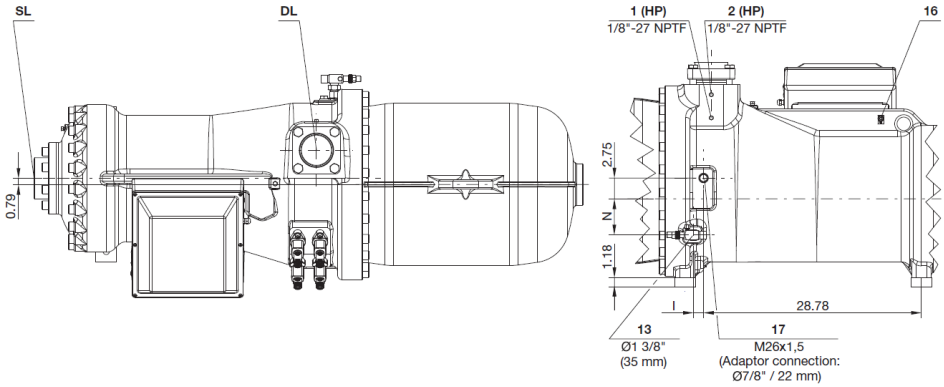
CHW95 Series

All dimensions in inches
M26: metric screws
Drawing with optional ECO shut off valve (position 13)

Series	Model Number	Series	Model Number
95	CSW9563-140Y	95	CSW9593-210Y
95	CSW9563-160	95	CSW9593-240
95	CSW9573-160Y	95	CSW95103-240Y
95	CSW9573-180	95	CSW95103-280
95	CSW95783-180Y	95	CSW95113-280Y
95	CSW95783-210		



CSW95 Series – Dimensions and Connection Ports



	A inch	B inch	B1 inch	C inch	D inch	F inch	I inch	J inch	L inch	N inch
CSW9563 / CSW9573	71.81	27.52	29.64	29.49	8.82	15.71	1.61	37.01	29.60	4.64
CSW9583 / CSW9593	72.52	27.52	29.64	29.49	9.52	15.71	1.34	37.32	29.60	4.80
CSW95103-240Y	75.86	29.76	31.89	32.32	9.52	17.95	1.06	37.32	29.84	4.72
CSW95103-280(Y) / CSW95113-280Y	76.97	29.76	31.89	32.32	10.60	17.95	1.06	38.38	29.84	4.72
CSW95113-320(Y)	77.75	29.76	31.89	32.32	11.38	17.95	1.06	39.17	29.84	4.72

CSH Connection Positions

1	High pressure connection (HP)
2	Additional HP connection
3	Low pressure connection (LP)
4	Oil sight glass
5	Oil service valve (std) / connection for oil equalization (parallel operation)
6	Oil drain plug (motor housing)
8	Connection for opto-electrical oil level switch OLC-D1-S (optional)
9	Oil heater with sleeve (std)
10	Oil pressure connection
11	External oil cooler connections (adaptor with control valve optional)
12	Oil temperature sensor (PTC)
13	Economizer connection (ECO) (pulsation muffler w/ shut-off valve optional)
14	Threaded hole for pipe support (ECO or LI line)
15	Liquid injection connection (LI)
16	Grounding screw for housing

SL	Suction line
DL	Discharge Lin

CSW Connection Positions

1	High pressure connection (HP)
2	Additional HP connection
3	Low pressure connection (LP)
4	Oil sight glass
5	Oil service valve (std) / connection for oil equalization (parallel operation)
6	Oil drain plug (motor housing)
7	Oil charge connection - alternative use for pos. 8
8	Optical oil level switch
9	Oil heater with sleeve (std)
12	Oil temperature sensor (PTC)
13	Economizer connection (pulsation muffler w/ shut-off valve optional)
14	Threaded hole for pipe support (ECO line)
16	Grounding screw for housing
17	Connection for oil and gas return (for systems with flooded evaporator - adaptor optional)

SL	Suction line
DL	Discharge Lin

2.6 Application Limits

Explanation of Application Limits Diagram

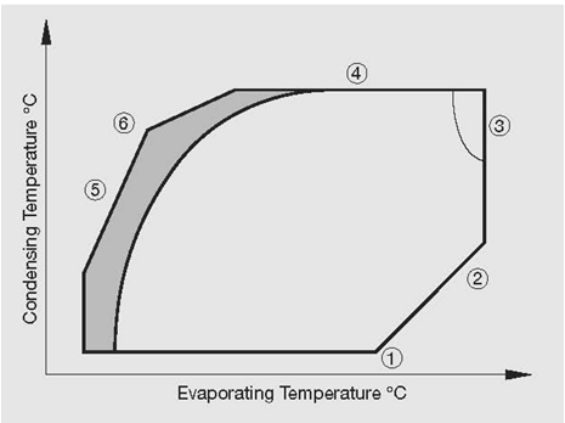


Figure 2.9.1.Simplified application limits diagram

Limitations of the application limits diagram:

1-Pressure differential / pressure ratio
A minimum pressure differential of 70psi should be maintained to insure proper oil flow through the compressor. Lower pressure ratios may not provide sufficient oil flow to adequately lubricate the running gear.

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 CSH screw 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.

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 leak.

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. The recommended methods for additional cooling are displayed in the application limits diagram as icons.

CSH Screw Compressors
Explanation of Application Limits

The thermal limits for capacity control (CR) and additional cooling (liquid injection and external oil cooling) depend on the compressor type.
The maximum condensing temperature may be restricted for certain application.

Legend

SST Saturated suction temperature (°F)

SH Suction superheat (°F)

SDT Saturated discharge temperature (°F)

Compressor capacity max. 75%

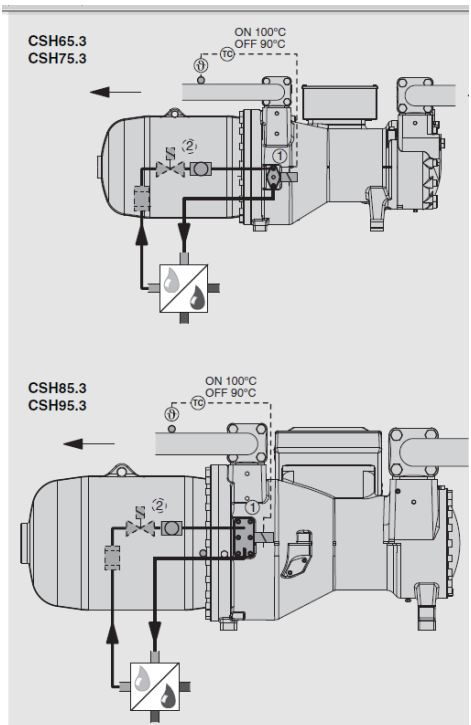
Liquid injection or external oil cooling required.
For part-load operation the respective application limits (CR 75%, CR 50% and CR 25%) can be lifted with liquid injection by 10 °F in the condensing temperature, however at maximum up to the full-load limits.

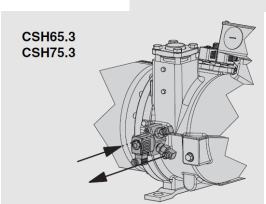
External oil cooling required

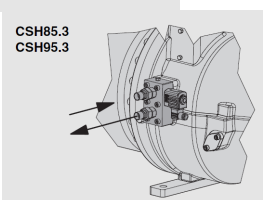
① Maximum saturated discharge temperature with CSH8583, CSH8593, CSH9593 and CSH95103

② Maximum saturated discharge temperature with CSH8583, CSH8593, CSH9583, CSH9593 and CSH95103

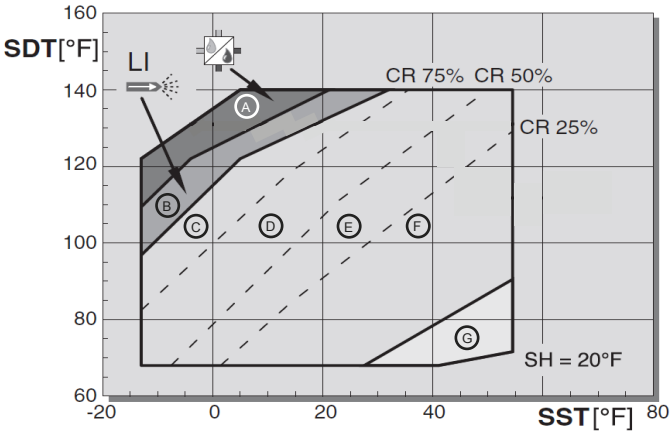
Oil Cooling Diagram and Symbol







CSH Screw Compressor
Application limits: Explanation



A Capacity control limit = 100% with external oil cooler

B Capacity control limit = 100% with liquid injection

CR 100% C Capacity control limit = 100%[1]

CR 75% D Capacity control limit = 75-100%[1]

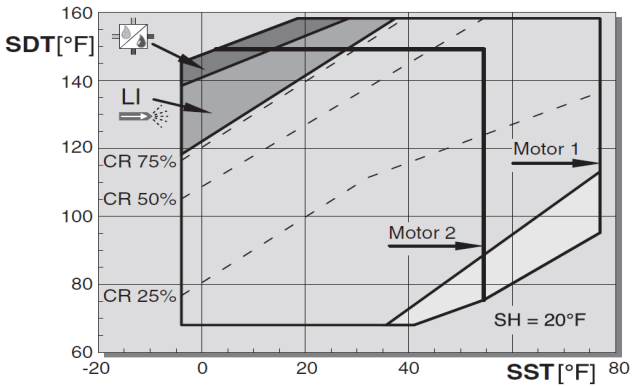
CR 50% E Capacity control limit = 50-100%[1]

CR 25% F Capacity control limit = 25-100%

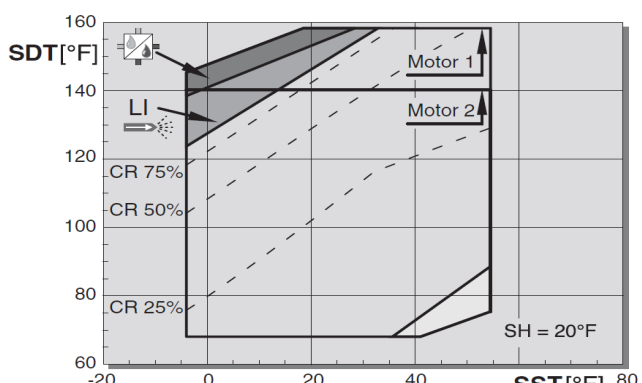
CR ≤75% G Capacity control limit = 75% or less

[1] Additional cooling may be required. Consult BITZER software.

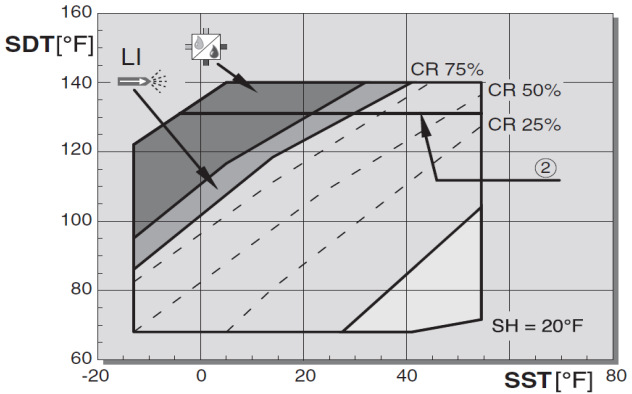
CSH Screw Compressor
Application limits: R134a Standard



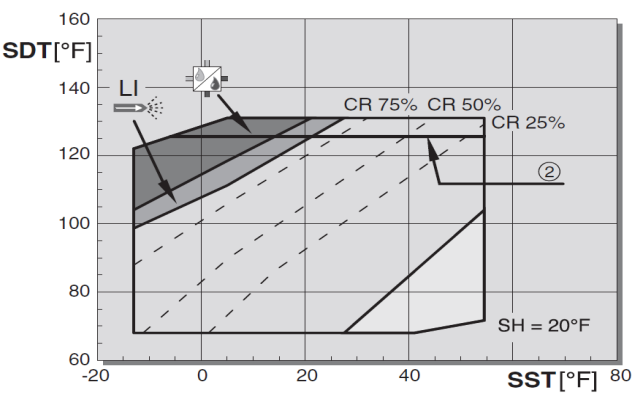
CSH Screw Compressor
Application limits: R134a ECO



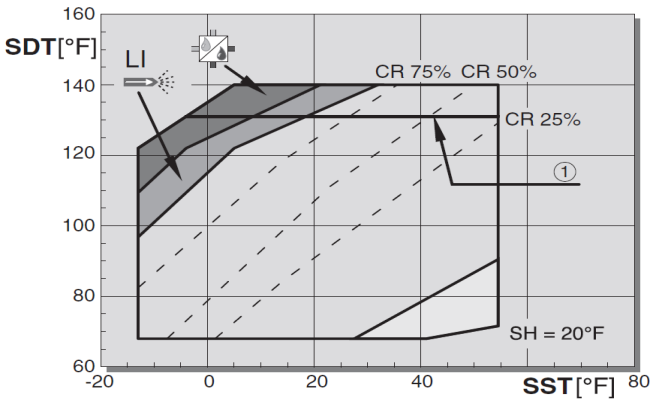
CSH Screw Compressor
Application limits: R22 Standard



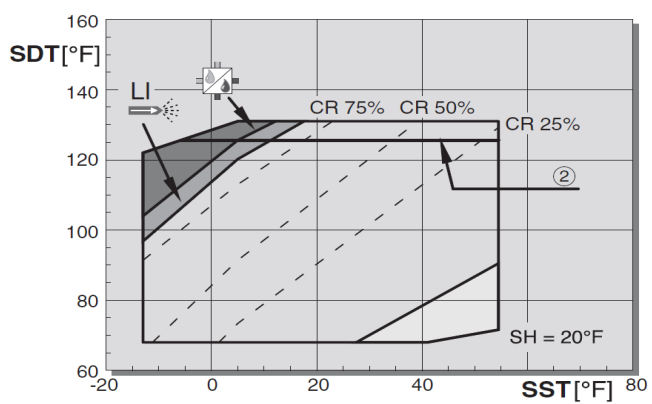
CSH Screw Compressor
Application limits: R22 ECO



CSH Screw Compressor
Application limits: R407C Standard



CSH Screw Compressor
Application limits: R407C ECO



CSW Screw Compressors
Explanation of Application Limits

The thermal limits for capacity control and additional cooling (liquid injection and external oil cooling) depend on the compressor type. The maximum condensing temperature may be restricted for certain application.

Legend

SST Saturated suction temp. (°F)

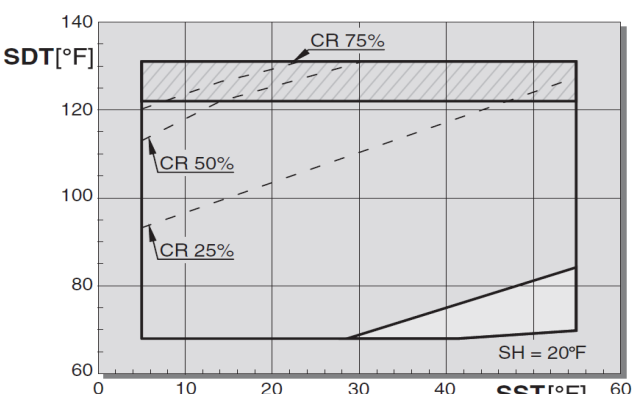
SDT Saturated discharge temp. (°F)

SH Suction superheat (°F)

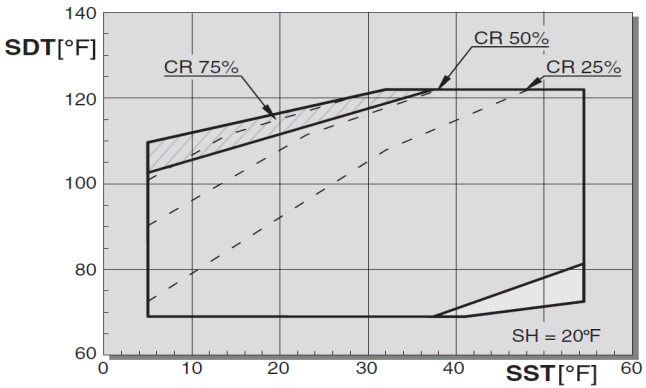
Suction superheat < 10°F

Compressor capacity max. 75%

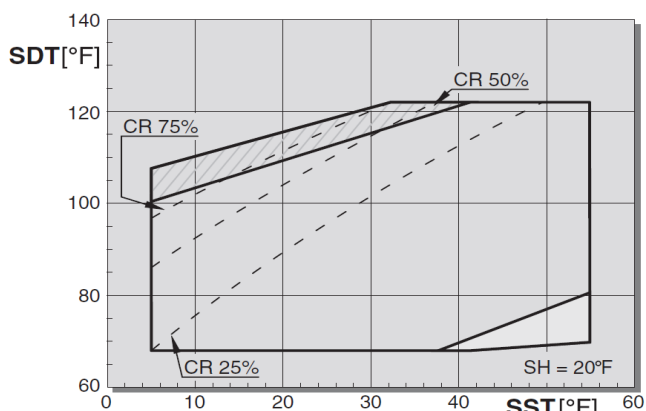
CSW Screw Compressors
Application limits: R134a



CSW Screw Compressors
Application limits: R22



CSW Screw Compressors
Application limits: R134a



2.7 Operating Parameters

Temperatures and Pressures

Parameter	min	max	recommended
Motor Temp	--	210°F	--
Discharge Temp	SCT + 32°F (54°F w/R22/407C)	248°F	--
Oil Temp	130°F	250°F	140°F
Superheat	5°F	35°F	15°F
Eco Superheat	5°F	35°F	20°F
Pressure Diff	70psi	--	--

Electrical

Parameter	Trip	Reset	Ambient
Motor PTCs (T1 to T2)	≈ 11.4kΩ	≈ 2.95kΩ	300 - 500Ω

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

Variable Frequency Drives

Parameter*	min	max
Speed range*	25Hz	60Hz

*** Slider cannot be used with VFD. Compressor must run at 100%**
*** Standard SE-E1 module must be replaced with SE-E2 for VFD and soft-starters**

Notes

3.1 Maximum Operating Amps (MOA) and Maximum MCC

BITZER compressors are equipped with highly efficient large volume electric motors.

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.

CSH65 and CSH75 Models

Model Number	HP	kW	Max MCC			LRA (ACL/ PW or D/Y)			MOA	
			230V	460V	575V	230V	460V	575V	230V	460V	575V
CSH6553-35Y	35	26.1	126	62.8	50.2	535 / 286	254 / 136	203 / 109	117	56	45
CSH6553-50	50	37.3	162	81	65	939 / 498	411 / 218	329 / 174	172	86	69
CSH6553-50Y	50	29.8	206	103	82	939 / 498	411 / 218	329 / 174	172	86	69
CSH6563-40Y	40	29.8	168	84	67.2	737 / 394	329 / 176	263 / 141	136	65	52
CSH6563-60	60	44.8	230	115	92	1162 / 616	508 / 269	406 / 215	216	108	87
CSH6563-60Y	60	44.8	252	126	101	1162 / 616	508 / 269	406 / 215	216	108	87
CSH6583-50Y	50	37.3	228	114	91	999 / 609	425 / 259	333 / 203	172	86	69
CSH6593-60Y	60	44.8	276	138	110	1233 / 752	522 / 318	421 / 251	216	108	87
CSH7553-50Y	50	37.3	231	115	92.4	795 / 501	359 / 226	296 / 186	165	79	63
CSH7553-70	70	52.2	280	134	107	1015 / 607	485 / 290	404 / 260	256	128	103
CSH7553-70Y	70	52.2	295	141	113	1015 / 607	485 / 290	404 / 260	256	128	103
CSH7563-60Y	60	44.8	251	125	100	939 / 559	449 / 267	357 / 212	205	98	78
CSH7563-80	80	59.7	293	140	112	1224 / 732	585 / 350	433 / 279	288	144	116
CSH7563-80Y	80	59.7	343	164	131	1224 / 732	585 / 350	433 / 279	288	144	116
CSH7573-70Y	70	52.2	306	153	123	1120 / 706	485 / 290	386 / 231	256	124	99
CSH7573-90	90	67.1	341	163	130	1435 / 885	686 / 423	546 / 358	324	162	130
CSH7573-90Y	90	67.1	358	171	137	1435 / 885	686 / 423	546 / 358	324	162	130
CSH7583-80Y	80	59.7	264	132	112	1281 / 781	556 / 339	483 / 295	288	144	116
CSH7583-100Y	100	74.6	320	160	128	1734 / 1052	796 / 482	666 / 404	340	170	136
CSH7593-90Y	90	67.1	330	158	135	1463 / 890	703 / 426	603 / 367	324	162	130
CSH7593-110Y	110	82.1	378	189	151	1821 / 1142	828 / 520	695 / 436	360	180	150

CSH85 and CSH95 Models

Model Number	HP	kW	Max MCC			LRA (ACL/ PW or D/Y)			MOA		
			230V	460V	575V	230V	460V	575V	230V	460V	575V
CSH8553-80Y	80	59.7	269	135	108	1416 / 966	632 / 433	505 / 346	301	144	114
CSH8553-110	110	82.1	398	199	159	1807 / 1250	895 / 619	648 / 448	360	180	144
CSH8553-110Y	110	82.1	423	212	169	1807 / 1250	895 / 619	648 / 448	360	180	144
CSH8563-90Y	90	67.1	324	162	129	1522 / 1053	690 / 477	555 / 384	314	155	119
CSH8563-125	125	93.3	444	222	178	2072 / 1434	958 / 663	843 / 583	432	216	173
CSH8563-125Y	125	93.3	488	244	195	2072 / 1434	958 / 663	843 / 583	432	216	173
CSH8573-110Y	110	82.1	371	186	148	1807 / 1250	895 / 619	648 / 448	383	182	145
CSH8573-140	140	104.4	503	251	201	2336 / 1612	1036 / 716	835 / 577	492	246	197
CSH8573-140Y	140	104.4	517	259	207	2336 / 1612	1036 / 716	835 / 577	492	246	197
CSH8583-125Y	125	93.3	455	227	182	2072 / 1434	958 / 663	766 / 530	432	196	172
CSH8583-140Y	140	104.4	452	226	181	2336 / 1612	1036 / 716	835 / 577	NA	239	NA
CSH8593-140Y	140	104.4	490	245	196	2336 / 1612	1036 / 716	835 / 577	462	214	185
CSH8593-160Y	160	119.4	510	225	204	2983 / 1950	1218 / 693	1133 / 741	NA	260	NA
CSH9553-180	180	134.3	NA	354	283	NA	1473 / 472	1312 / 424	NA	330	264
CSH9553-180Y	180	134.3	NA	367	294	NA	1473 / 472	1312 / 424	NA	330	264
CSH9563-160Y	160	119.4	NA	316	253	NA	1373 / 439	1271 / 393	NA	280	224
CSH9563-210	210	156.7	NA	425	340	NA	1880 / 595	1597 / 516	NA	370	296
CSH9563-210Y	210	156.7	NA	435	348	NA	1880 / 595	1597 / 516	NA	370	296
CSH9573-180Y	180	134.3	NA	339	271	NA	1473 / 472	1312 / 424	NA	310	248
CSH9573-240	240	179.0	NA	483	386	NA	2059 / 660	1775 / 573	NA	420	336
CSH9573-240Y	240	179.0	NA	477	381	NA	2059 / 660	1775 / 573	NA	420	336
CSH9583-210Y	210	156.7	NA	395	316	NA	1880 / 595	1597 / 516	NA	320	256
CSH9583-280Y	280	208.8	NA	459	367	NA	2829 / 943	2300 / 767	NA	450	NA
CSH9593-240Y	240	179.0	NA	460	368	NA	2059 / 660	1775 / 573	NA	360	288

CSW65 and CSW75 Models

Model Number	HP	kW	Max MCC			LRA (ACL/ PW or D/Y)			MOA		
			230V	460V	575V	230V	460V	575V	230V	460V	575V
CSW6583-40Y	40	29.8	168	84	67.2	737 / 394	329 / 176	263 / 141	156	74	59
CSW6583-50	50	37.3	162	81	65	939 / 498	411 / 218	329 / 174	184	92	77
CSW6583-50Y	50	37.3	206	103	82	939 / 498	411 / 218	329 / 174	184	92	77
CSW6593-50Y	50	37.3	228	114	91	999 / 609	425 / 259	333 / 203	176	84	68
CSW6593-60	60	44.8	230	115	92	1162 / 616	508 / 269	406 / 215	210	105	88
CSW6593-60Y	60	44.8	252	126	101	1162 / 616	508 / 269	406 / 215	210	105	88
CSW7573-60Y	60	44.8	251	125	100	939 / 559	449 / 267	357 / 212	207	98	78
CSW7573-70	70	52.2	280	134	107	1015 / 607	485 / 290	404 / 260	246	123	103
CSW7573-70Y	70	52.2	295	141	113	1015 / 607	485 / 290	404 / 260	246	123	103
CSW7583-70Y	70	52.2	306	153	123	1120 / 706	484 / 303	412 / 259	236	112	89
CSW7583-80	80	59.7	293	140	112	1224 / 732	585 / 350	433 / 279	294	140	117
CSW7583-80Y	80	59.7	343	164	131	1224 / 732	585 / 350	433 / 279	294	140	117
CSW7593-80Y	80	59.7	264	132	112	1281 / 781	556 / 339	483 / 295	270	128	102
CSW7593-90	90	67.1	341	163	130	1435 / 885	686 / 423	546 / 358	320	160	133
CSW7593-90Y	90	67.1	358	171	137	1435 / 885	686 / 423	546 / 358	320	160	133

CSW85 and CSW95 Models

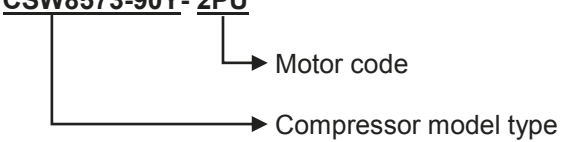
Model Number	HP	kW	Max MCC			LRA (ACL/ PW or D/Y)			MOA		
			230V	460V	575V	230V	460V	575V	230V	460V	575V
CSW8573-90Y	90	67.1	324	162	129	1522 / 1053	690 / 477	555 / 384	329	156	124
CSW8573-110	110	82.1	398	199	159	1807 / 1250	895 / 619	648 / 448	409	195	163
CSW8573-110Y	110	82.1	423	212	169	1807 / 1250	895 / 619	648 / 448	409	195	163
CSW8583-110Y	110	82.1	371	186	148	1807 / 1250	895 / 619	648 / 448	373	177	140
CSW8583-125	125	93.3	444	222	178	2072 / 1434	958 / 663	843 / 583	442	221	184
CSW8583-125Y	125	93.3	488	244	195	2072 / 1434	958 / 663	843 / 583	442	221	184
CSW8593-125Y	125	93.3	455	227	182	2072 / 1434	958 / 663	843 / 583	428	203	161
CSW8593-140	140	104.4	503	251	201	2336 / 1612	1036 / 716	835 / 577	508	254	212
CSW8593-140Y	140	104.4	517	259	207	2336 / 1612	1036 / 716	835 / 577	508	254	212
CSW9563-140Y	140	104.4	NA	280	224	NA	1199 / 382	1040 / 336	NA	233	188
CSW9573-160Y	160	119.4	NA	316	253	NA	1373 / 439	1271 / 393	NA	266	NA
CSW9573-180	180	134.3	NA	354	283	NA	1473 / 472	1312 / 424	NA	333	278
CSW9573-180Y	180	134.3	NA	367	294	NA	1473 / 472	1312 / 424	NA	333	278
CSW9583-180Y	180	134.3	NA	339	271	NA	1473 / 472	1312 / 424	NA	306	NA
CSW9583-210	210	156.7	NA	425	340	NA	1880 / 595	1597 / 516	NA	383	NA
CSW9583-210Y	210	156.7	NA	435	348	NA	1880 / 595	1597 / 516	NA	383	NA
CSW9593-210Y	210	156.7	NA	395	316	NA	1880 / 595	1597 / 516	NA	345	NA

3.3 UL Motor Codes

Compressor Model	Motor Code	Nominal Voltage	Voltage Range	Motor Connection
CSH CSW	4DU	460	414 - 506	Y/Δ
	5DU	575	517 - 633	Y/Δ
	2PU	208 / 230	187 - 253	Y/YY
	4PU	460	414 - 506	Y/YY
	5PU	575	517 - 633	Y/YY

Other voltages available

Example:

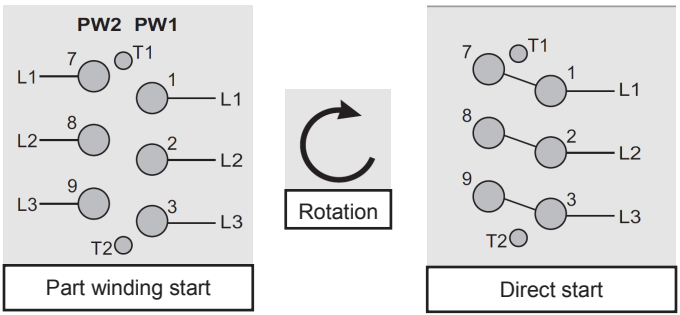


Legend:

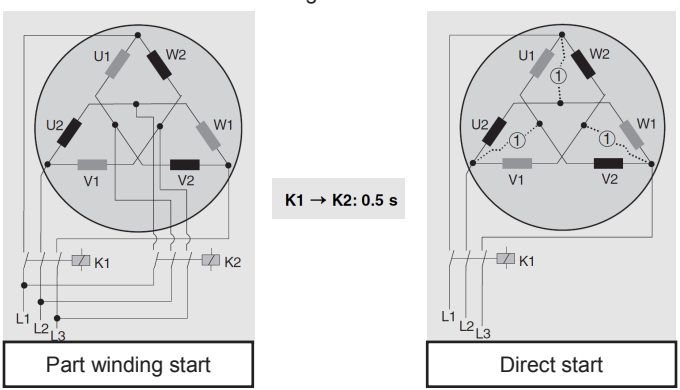
D = Delta wiring
P = Part winding
U = UL approval
Y/YY = part winding option available
Note: All motor information listed for 60Hz

3.4 Wiring Diagrams / Power Connection
Part Winding Motors - 2PU, 4PU and 5PU

Motor Connection



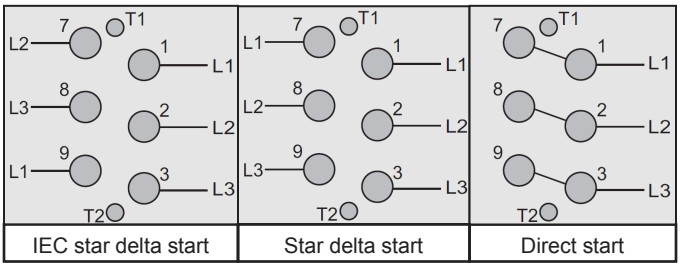
Wiring Schematic



① Optional Bridges

Star-delta Motors - 4DU 5DU

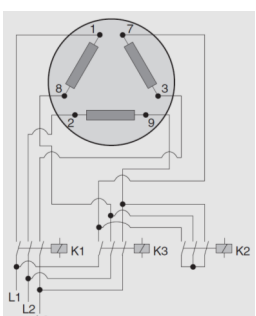
Motor Connection



IEC star delta start	Star delta start	Direct start

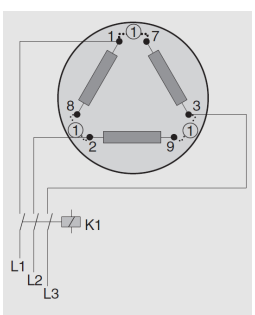
Rotation

Wiring Schematic



Star-delta start

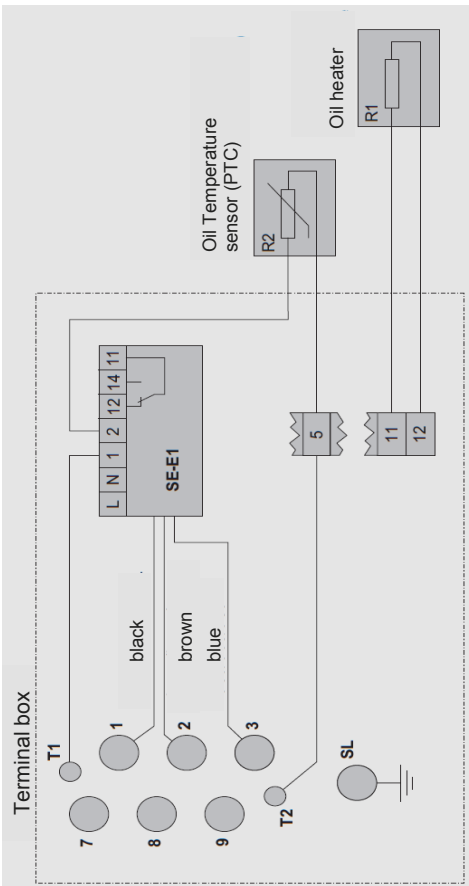
K1/K2 → K1/K3: 1 s



Direct start

① Optional Bridges

Wiring for protection devices
SE-E1, oil temperature sensor and oil heater



SE-E1 Monitoring functions	
Temperature	Immediate lock out at max motor or oil temperature
Rotation	Monitors for 5s at start up, immediate lock out in case of reverse rotation
Phase	6 min delay at start up if phase failure detected during first 5s Lock out if 3 phase failures within 18 minutes Lock out if 10 phase failures within 24 hours.

Schematic wiring diagrams legend

B2 .....Control unit

F1 .....Main fuse
F2 .....Compressor fuse
F3 .....Control circuit fuse
F4 .....Control circuit fuse
F5 .....High pressure cut out
F6 .....Low pressure cut out
F7 .....Cut in delay "ECO"
F8 .....Oil level switch (option) ①
F9 .....Control thermostat "LI"
F10 ....Control thermostat "oil cooling"
F13 ....Thermal overload 1 "motor" ②
F14 ....Thermal overload 2 "motor" ②

H1 .....Signal lamp "motor fault"
(over temp. / phase failure)
H4 .....Signal lamp "oil level fault"

K1 .....Contactor "first PW" (for PW)
"Mains contactor" (Y/Δ)
K2 .....Contactor "second PW" (PW)
"Star contactor" (Y/Δ)
K3 ....."Delta contactor" (Y/Δ)
K4 .....Auxiliary contactor (option)

K2T ....Time relay "pause time" 300 s
K3T ....Time relay "part winding" 0.5 s
or "star-delta" 1 s /
CS.95 max. 2 s
K4T ....Time relay "oil level switch" 90 s
K5T ....Fixed pulse relay "CR4" flash-
ing function on / off 10 s ③

M1 .....Compressor

Q1 .....Main switch

R1 .....Oil heater ④
R2 .....Oil temperature sensor (PTC)④
R3-8 ..Motor PTC sensors ④

S1 .....On-off switch
S2 .....Fault reset
"motor & discharge gas temp."
"motor rotating direction"
S4 .....Fault reset "oil level"

Schematic wiring diagrams legend

U .....EMC screening unit (if required, e. g. from Murr Elektronik)

Y1 .....SV "capacity control" ④⑤
Y2 .....SV "capacity control" ④⑤
Y3 .....SV "capacity control" ④⑤
Y4 .....SV "capacity control" ④⑤
Y5 .....SV "liquid line"
Y6 .....SV "ECO"
Y7 .....SV "LI"
Y8 .....SV "additional oil injection"
Y9 .....SV "oil cooler line"

SE-E1 Compressor protection device for motor and oil temperature monitoring ④
(alternative option: SE-E2 for frequency inverter operation)

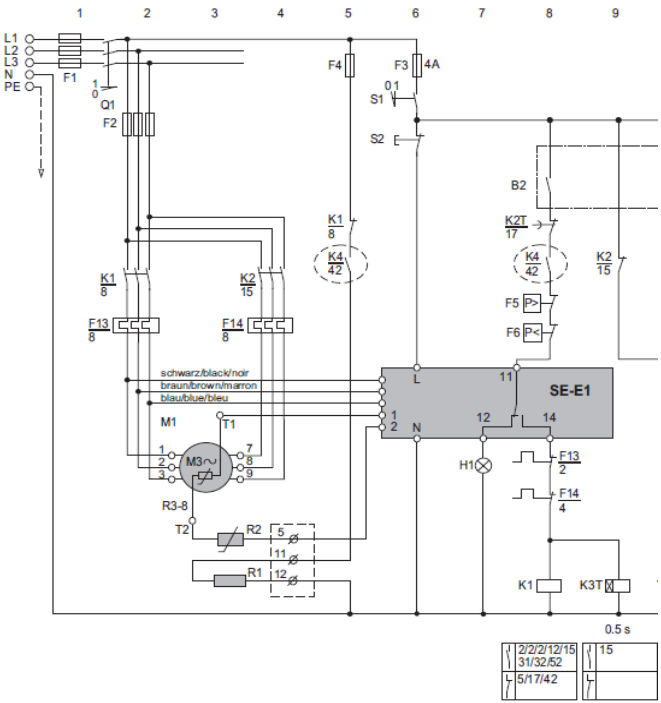
OLC-D1 Opto-electronical oil level switch

SV = Solenoid valve

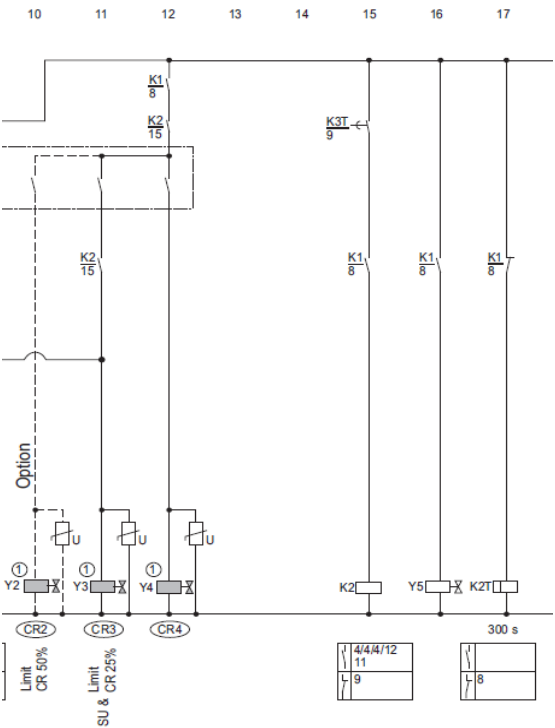
① maximum contact load 250 V / 0.5 A / 10 VA
② see "additional motor protection", page 59
③ recommended presetting see also chapter 2.7
④ parts belong to the extent of delivery of the compressor
⑤ capacity control
Y1 ....CR1, Y2 ....CR2
Y3 ....CR3, Y4 ....CR4
(Control sequences see page 12.)

Part winding with SE-E1, Infinite capacity control

Schematic wiring diagram



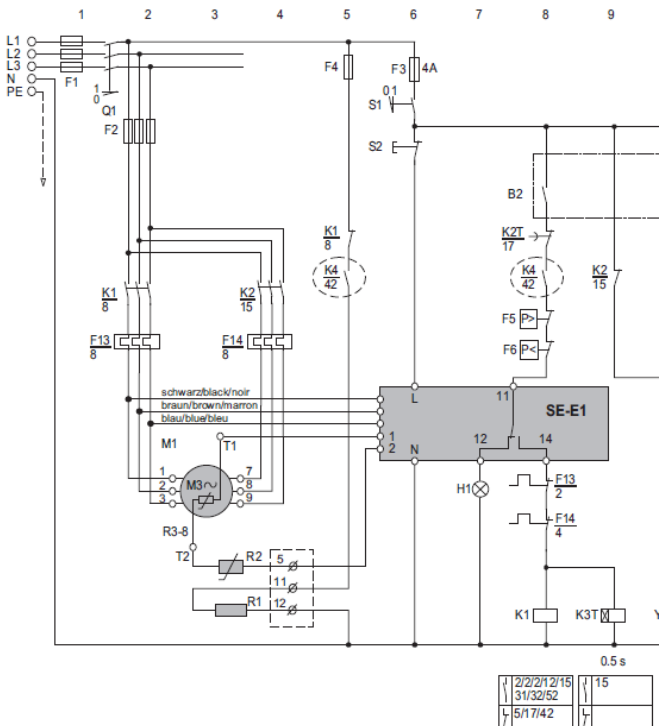
① Adjustable time pulse relais 10 s / 10 s,



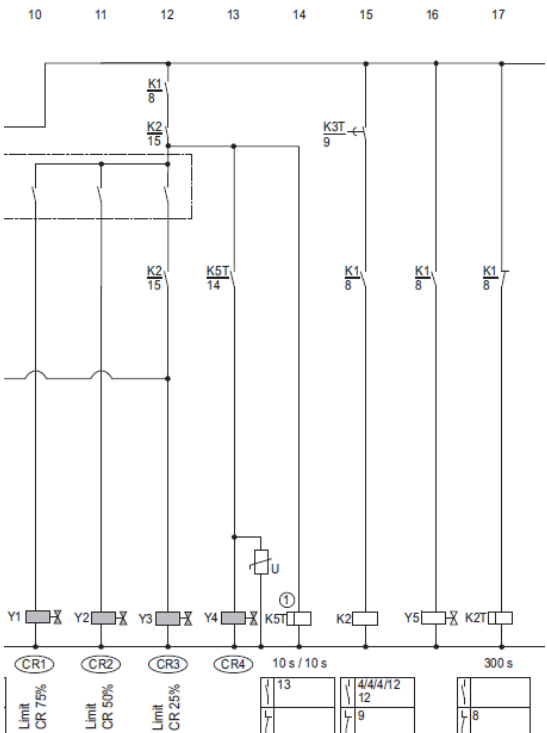
Legend for connections see page 54

Part winding with SE-E1, 4-step capacity control

Schematic wiring diagram



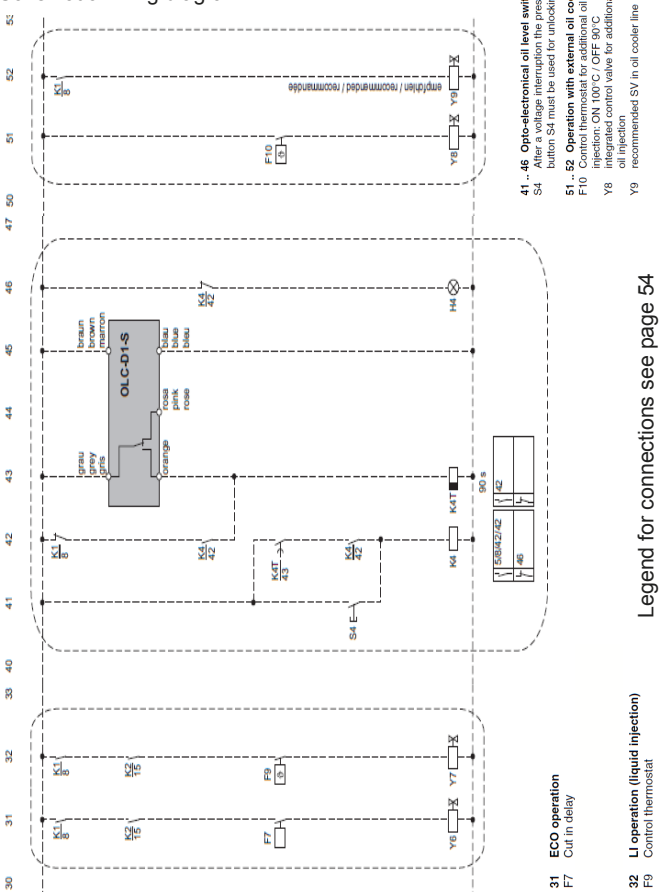
① Adjustable time pulse relais 10 s / 10 s,



Legend for connections see page 54

Part winding with SE-E1 - options

Schematic wiring diagram

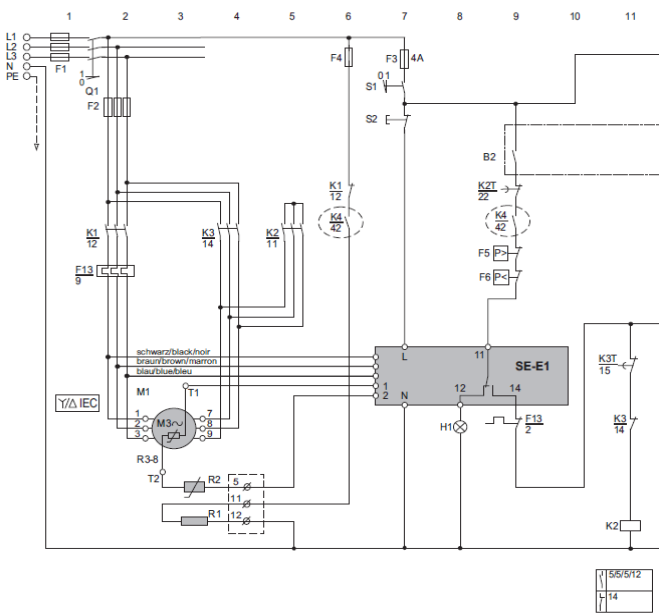


Legend for connections see page 54

Notes:

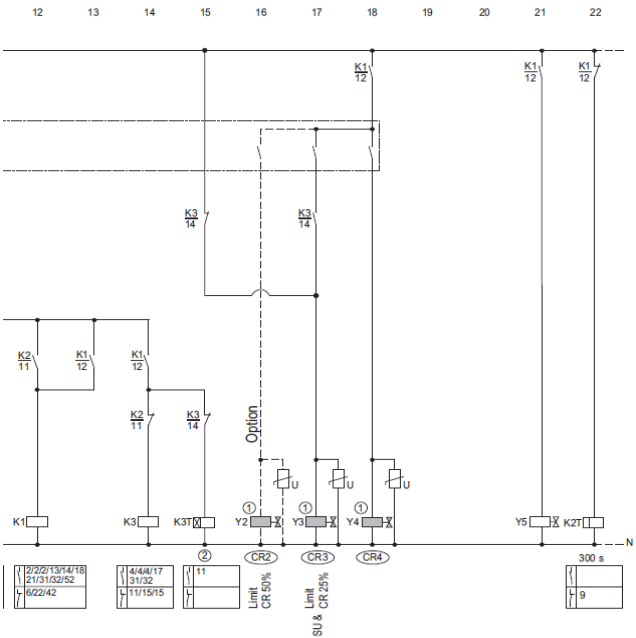
Star-delta with SE-E1, Infinite capacity control

Schematic wiring diagram



① Pulsing time approx. 0.5 s .. max. 1 s, depending on system characteristic,

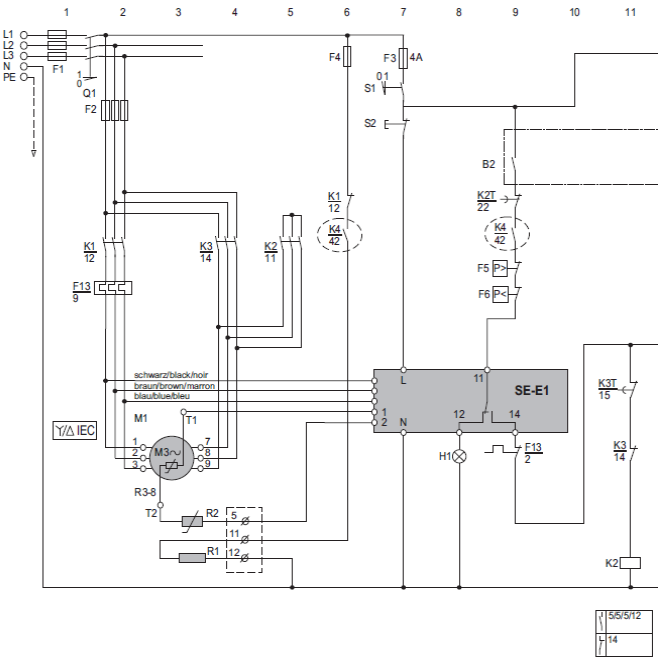
② Time relay K3T:
CS.65 .. CS.85: 1 s, CS.95: 1,5 .. 2 s.



Legend for connections see page 54

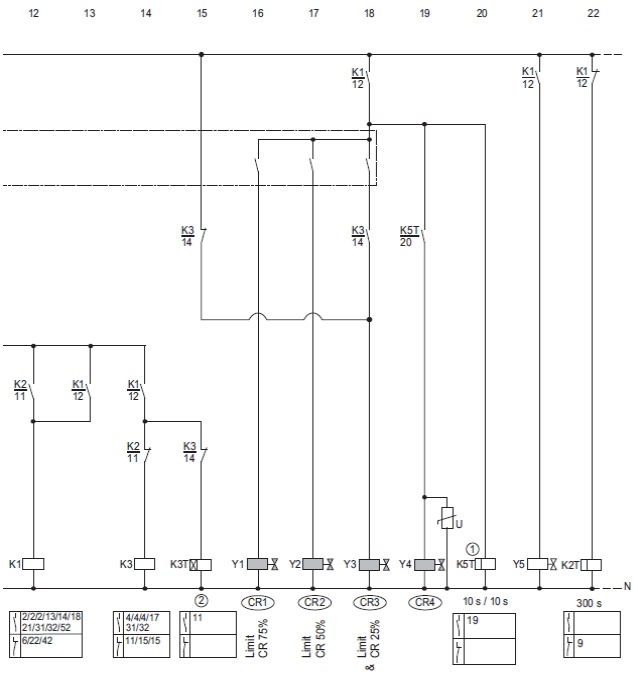
Star-delta with SE-E1, 4-step capacity control

Schematic wiring diagram



① Pulsing time approx. 0.5 s .. max. 1 s, depending on system characteristic,

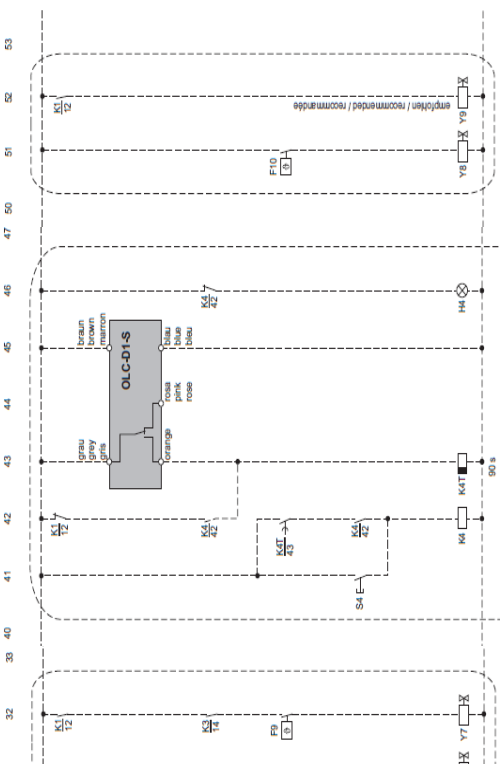
② Time relay K3T:
CS.65 .. CS.85: 1 s, CS.95: 1,5 .. 2 s.



Legend for connections see page 54

Star-delta with SE-E1 - options

Schematic wiring diagram



Notes

4.1 Protection Devices

Protection Module Part Numbers and Pictures

Protection Module	Part Number	Picture
INT: SE-E1 (Motor)	347017-10 (110/230V) 347017-14 (24v) 347038-01 (SE-E2)	
Mechanical (Oil)	347403-05 (CS65) 347403-03 (CS75,85) 347403-06 (CS95)	
OLC-D1-S (Oil) (optional)	347962-01 (230V) 347962-02 (110V) 347962-03 (24V)	

Motor Protection Devices:

SE-E1 (cannot be used with VFD)	
Temperature monitoring	Locks out: - 212°F motor temp - 251°F discharge gas/oil temp
Rotation detections	Locks out if reverse rotation is detected during first 5s
Phase monitoring	Delay (auto reset): - 6m delay if phase failure occurs during first 5s after start up Lock out: discharge gas/oil temp - 3 phase failures within 12m - 10 phase failures within 24h
Reset	5s interrupt of supply voltage

SE-E2	
Temperature monitoring	Locks out: - 212°F motor temp - 251°F discharge gas/oil temp
Rotation detections	Locks out if reverse rotation is detected during first 6s. Continuous phase monitoring.
Phase asymmetry (constant monitoring)	Delay (auto reset): - 10s delay if phase asymmetry detected Lock out: - 4 phase failures within 20m - 11 phase failures within 24h
Reset	5s interrupt of supply voltage

Oil Monitoring Device:

OLC-D1-S: Optically monitors oil presence at the compressor

Technical Features:

- The OLC-D1-S consists of two parts: a sensor unit and an electronic unit.
- Because the sensor unit screws separately into the BITZER housing, the hermetically sealed electrical unit can be replaced without refrigerant or oil loss.

Device Trip:
OLC-D1-S:

- If there is no oil present for any amount of time at the sensor, 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 below) then the output relay opens (stopping the compressor).
- 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)

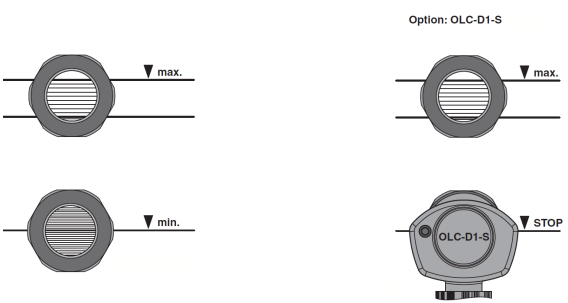
Manual Reset
Interrupt power supply for at least 5 seconds.
Note: Always try to diagnose the issue in the event of an oil trip instead of repeatedly resetting the device. (Tip: View the red LED indicator to see if oil is intermittently dropping out)

Wiring - See page 60 for Part winding motors and page 66 for Star-delta motors.

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.

Operation	OLC-D1-S
Time delays at start up	3s
Level monitoring after start delay: -Relay off (level missing) -Relay off (error) -Relay on (level good) -Relay on (no errors)	 5s 5s 5s 5s

Recommended Oil Level (dual sightglass design)



4.2 Refrigeration Oils

BITZER Approved Oils

Model	Refrigerant	Oil Type	5 Gal (* =10L)	1 Gal (* =5L)
CSH	R134A R407C R404A R507A	BSE170	793-3170-34	793-1170-34
	R22	B320SH	793-3320-34	793-3320-01
CSW	R134A	BSE170L	915188-02*	915118-01*
	R134A R407C R404A R507A	BSE170	793-3170-34	793-1170-34
	R22	B320SH	793-3320-34	793-3320-01

Approved Alternative Oils

BITZER oil	Alternative oil	Manufacturer
BSE170	Solest 170	CPI
(POE 170)	Emkarate RL170 H	Uniquema
	Zerol 150	Petrosynthese
	Reniso SE170	Fuchs
There are no approved Alternative Oils for B320SH or BSE170L		

Guiding values for changing refrigeration oils

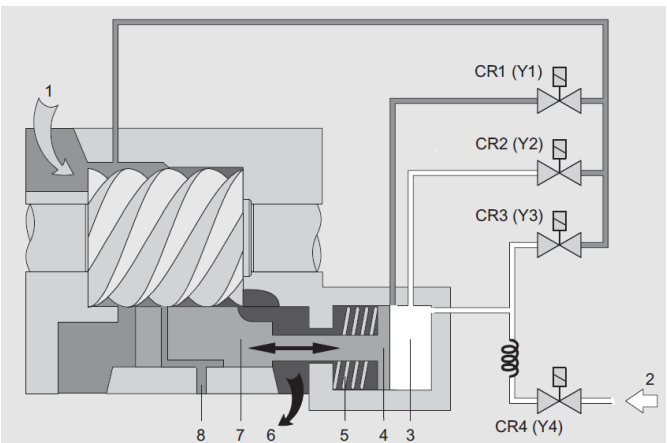
Designation	Manufacturer	Oil Type	Total acid number (TAN) (ppm)		Water content (ppm)	
			New Oil	**Oil acidified Oil change necessary**	New Oil	**Oil change necessary**
CSH - HFC (R134a, R407C, R404A, R507A, R407a ...)						
BSE170	BITZER	POE	≤ 0.1	**≥ 0.5**	≤ 100	**≥ 300**
CSW - HFC R134a						
BSE170L	BITZER	POE	≤ 0.1	**≥ 0.5**	≤ 100	**≥ 300**
CSW - HFC (R407C, R404A, R507A, R407a ...)						
BSE170	BITZER	POE	≤ 0.1	**≥ 0.5**	≤ 100	**≥ 300**
CSH/CSW HFC (R22, ...)						
B320SH	BITZER	POE	≤ 0.2	**≥ 0.5**	≤ 100	**≥ 300**

Bitzer Oil Analysis Kit P/N: 999-060-00

4.3 Integral Dual Capacity Control

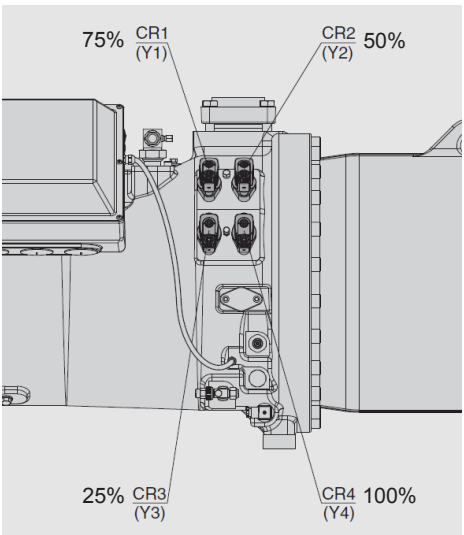
The BITZER CSH and CSW compressors come standard with Dual Capacity Control utilizing a slide valve design that provides the option of infinite or 4-step capacity control .The different operating modes can be achieved by simply changing the control sequence of the solenoid valve. A dual set point controller is suitable as a control module.

Start unloading is another standard feature of the CSH and CSW compressors. This reduces the starting torque and acceleration time of the compressor at start up, resulting in lower stress on the motor and mechanical parts in addition to reducing the load on the power supply network.



1 Suction Gas	3 Pressure Chamber	5 Spring	7 Control Slider
2 Oil Pressure	4 Hydraulic Piston	6 Discharge gas	8 Economizer (CSH only)

Solenoid Valve Arrangement



Series	Slide Valve Travel	Average Time
CS65	25% to 100%	20s
	100% to 25%	15s
CS75	25% to 100%	30s
	100% to 25%	25s
CS85	25% to 100%	60s
	100% to 25%	40s
CS95	25% to 100%	100s
	100% to 25%	55s

Infinite Capacity Control Sequence - 25% - 100%

CR	1	2	3	4
Start / Stop	○	○	●	○
CAP ⇧	○	○	○	◉
CAP ⇩	○	○	◉	○
CAP ⇔	○	○	○	○

Infinite Capacity Control Sequence - 50% - 100%

Start / Stop	○	○	●	○
CAP ⇧	○	○	○	◉
CAP min 50% ⇩	○	◉	○	○
CAP ⇔	○	○	○	○

CAP ⇧ Increasing CAP
CAP ⇔ Constant CAP
CAP ⇩ Decreasing CAP

CAP Cooling capacity

○ Solenoid valve de-energized
● Solenoid valve energized
◉ Solenoid valve pulsing

4-step Capacity Control Sequence

CR	1	2	3	4
Start / Stop	○	○	●	○
CAP 25%	○	○	●	◑
CAP 50%	○	●	○	◑
CAP 75%	●	○	○	◑
CAP 100%	○	○	○	◑

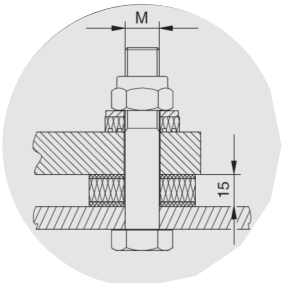
○ Solenoid valve de-energized
● Solenoid valve energized
◉ Solenoid valve pulsing
◑ Solenoid valve intermittent
(10s ON / 10s OFF)

Solenoid Coil Voltage	Buerkert[1] P/N	Danfoss[2] P/N	Danfoss[3] P/N
230v	343313-01	343309-01	884-0203-01
110v	343313-02	343311-02	884-0202-01
24v	343313-03	343305-02	884-0202-00

[1] Standard - 1/2" stem with DIN connection
[2] Optional - 5/8" stem with DIN connection
[3] Optional - 5/8" stem without DIN connection
NOTE: BUERKERT & DANFOSS COILS ARE NOT INTERCHANGEABLE.

Manufacturer	Unloader stem	Gasket
Buerkert	347161-01	372708-03
Danfoss (pre 2008)	347690-06	372708-03

5.1 Mounting Kit Part Numbers



Compressor	M
CS65	M10
CS75	M16
CS85	M16
CS95	M20
15mm = 9/16”	

	Mounting Pad Location	
Compressor Model	**Crankcase Side**	**Motor Side**
CS65	370012-03 black	370012-03 black
CS75	370012-06 black	370012-06 black
CS85	370012-07 black	370012-07 black
CS95 (53 thru 73)	370012-10 yellow	370012-09 blue
CS95 (83 thru 93)	370012-09 black	370012-09 black

5.2 Crankcase Heater

Compressor Series	Watts	Control Voltage	Part Number
CS65 CS75	200	110V	343213-08
		220V	343213-07
CS85 CS95	300	110V	343218-01
		220V	343218-02

5.3 CSH Compressors - Gaskets, discharge check valves, check valve gaskets and discharge temperature sensors.

CSH Compressor Series	Complete Gasket set	Discharge Check valve*	Discharge Check Valve Gasket	Discharge Temp Sensor
CSH6553	372836-01	369108-03	372301-15	347032-03
CSH6563	372836-01	369108-03	372301-15	347032-03
CSH6583	372836-02	369108-01	372301-03	347032-03
CSH6593	372836-02	369108-01	372301-03	347032-03
CSH7553	372833-01	369108-01	372303-02	347032-02
CSH7563	372833-01	369108-01	372303-02	347032-02
CSH7573	372833-01	369108-01	372303-02	347032-02
CSH7583	372833-01	369108-01	372303-02	347032-02
CSH7593	372833-01	369108-01	372303-02	347032-02
CSH8553	372837-01	369108-04	372301-05	347032-03
CSH8563	372837-01	369108-04	372301-05	347032-03
CSH8573	372837-01	369108-04	372301-05	347032-03
CSH8583	372837-02	369108-04	372301-05	347032-03
CSH8593	372837-02	369108-04	372301-05	347032-03
CSH9553	372847-01	369116-01	372301-05	347032-03
CSH9563	372847-01	369116-01	372301-05	347032-03
CSH9573	372847-01	369116-01	372301-05	347032-03
CSH9583	372847-02	369116-02	372303-13	347032-03
CSH9593	372847-02	369116-02	372303-13	347032-03

*Discharge check valve does not include the discharge check valve gasket. The discharge check valve gasket must be order separately.

5.3 CSW Compressors - Gaskets, discharge check valves, check valve gaskets and discharge temperature sensors.

CSW Compressor Series	Complete Gasket set	Discharge Check valve*	Discharge Check Valve Gasket	Discharge Temp Sensor
CSW6583	372836-02	369108-01	372301-03	347032-03
CSW6593	372836-02	369108-01	372301-03	347032-03
CSW7573	372833-01	369108-01	372303-02	347032-02
CSW7583	372833-01	369108-01	372303-02	347032-02
CSW7593	372833-01	369108-01	372303-02	347032-02
CSW8573	372837-01	369108-04	372301-05	347032-03
CSW8583	372837-02	369108-04	372301-05	347032-03
CSW8593	372837-02	369108-04	372301-05	347032-03
CSW9563	372847-01	369116-05	372301-13	347032-03
CSW9573	372847-01	369116-05	372301-13	347032-03
CSW9583	372847-02	369116-02	372303-13	347032-03
CSW9593	372847-02	369116-02	372303-13	347032-03

*Discharge check valve does not include the discharge check valve gasket. The discharge check valve gasket must be order separately.

5.4 CS Compressors - Terminal box and electrical connections

Series	Terminal box	Basic Terminal box kit[1]	Complete Terminal box kit[2]	Electrical Connection Kit[3]	Jumper Bars
CS65	324500-12	NA	NA	343431-03	NA
CS75	362500-13	962-0003-00	962-0002-00	NA	837-0300-00

[1] Basic kit - terminal plate not included - see p. 84 for kit components
[2] Complete kit - terminal plate included - see p. 84 for kit components
[3] Connection kit includes jumper bars and hardware

Series	Terminal box	Basic Terminal box kit[1]	Complete Terminal box kit[2]	Conduit Adaptor Kit[3]	Jumper Bars
CS85	300905-01	962-0005-00	962-0004-00	521-0294-00	343431-04
CS95	300905-01	962-0005-00	962-0004-00	521-0294-00	343431-04

[1] Basic kit - terminal plate not included - see p. 85 for kit components
[2] Complete kit - terminal plate included - see p. 85 for kit components
[3] Includes metric to ept conduit adaptors

Terminal Box Kit Components

CS75 Terminal Box Kit (Basic) 962-0003-00		
P/N	Description	Qty
837-0300-00	Jumper Bar for Direct On Line Starting	3
345902-01	12 Position Connector Strip	1
375051-02	Insulator for Brass Lug	6
345021-01	Brass lug	8
380306-83	Brass Lug Metric Cable Bolt (short)	8
380306-84	Brass Lug/Insulator Metric Bolt (long)	6
372126-01	Terminal Box Foam Gasket	1
345007-02	Module Spade Connectors	3
375907-01	Terminal Mylar Identification Insulator	1
381301-06	M10 Hexagon Brass Nut for Ground Lugs	2
382002-04	M10 Flat Washer for Ground Lugs	2
344006-01	Grounding Cable	1
CS75 Terminal Box Kit (Complete) 962-0002-00		
Adds the following components to the list above		
324500-13	Terminal Box	1
324910-02	Terminal Box Cover	1
380501-52	Terminal Box Screws M6x12	4
380501-54	Terminal Box Cover Screws M6x16	4
345500-10	Terminal Plate	1
372421-03	Terminal Plate Body Gasket	1
372429-05	Terminal Box Cover Gasket	1

CS85 & CS95 Terminal Box Kit (Basic) 962-0005-00		
P/N	Description	Qty
372429-03	Terminal Box Cover Gasket	1
343431-04	Jumper Bar for Direct On Line Starting	3
345902-01	12 Position Connector Strip	1
375051-02	Insulator for Brass Lug	8
311018-09	Spacer Sleeve Bushing for Connectors	8
382002-04	M10 Flat Washer	8
382201-55	M10 Lock Washer	8
381301-06	M10 Nut	8
345007-02	Module Spade Connectors	3
375907-04	Terminal Mylar Identification Insulator	1
344006-01	Grounding Cable	1
CS85 & CS95 Terminal Box Kit (Basic) 962-0004-00		
Adds the following components to the list above		
300905-01	Terminal Box	1
321204-01	Terminal Box Cover	1
380501-52	Terminal Box Cover Screws (M6x12)	6
380501-53	Terminal Box Mounting Screws (M6x20)	8
343427-01	Terminal Plate	1
380306-83	Terminal Plate Bolts (M10x25)	14
372429-02	Terminal Box Foam Gasket	1
372441-01	Terminal Plate Body Gasket	1
324390-04	Module Bracket	1
399102-03	Module Bracket Foam Pad	1
345126-04	M63x1.5 Sealing Cap Plug	3
345126-03	M25x1.5 Sealing Cap Plug	2
345126-02	M20x1.5 Sealing Cap Plug	2
345126-01	M16x1.5 Sealing Cap Plug	1
345121-01	M16X1.5 Oil/Disch Temp Sensor Sealing Plug	1

6.1 Operating Temperatures and Oil Guidelines

Guide values for operating temperatures*

Operating Temperatures		
Superheat	min.	5°F
	Suction	15°F
	Economizer	20°F
Discharge gas temperature	min.	SCT + 32°F (SCT+ 54°F for R22/407C)
	max.	248°F; measured at discharge line

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

Guide values for oil maintenance

Oil Guidelines		
Oil temperatures - Operating	min.	130°F
	max.	251°F
Oil change		Dependent on yearly oil sample results

6.2 Switching Frequency and Vibrations

Switching frequency and minimum running time

Nominal Motor	Starts per hour	Minimum running time
35-95HP (CS65/75)	6	5 min
110-320HP (CS85/95)	4	5 min

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 compressor. Their amplitude and frequency depend on:

- Compressor speed
- 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 Torque Specifications

Description	CS65	CS75	CS85
Suction Valve	M16 - 162 ft/lbs	M16 - 162 ft/lbs	M20 - 162 ft/lbs
Suction Valve Flange and / or Companion Flange	M16 - 162 ft/lbs	M18 - 162 ft/lbs	M20 - 162 ft/lbs
Discharge Valve	M12 - 66 ft/lbs	M16 - 162 ft/lbs	M16 - 162 ft/lbs
Discharge Valve Flange and / or Companion Flange	M12 - 66 ft/lbs	M18 - 162 ft/lbs	M18 - 162 ft/lbs
Eco Fitting	M22 - 66 ft/lbs	M22 - 66 ft/lbs	M10 - 22 ft/lbs
Liquid Injection Fitting	M22 - 66 ft/lbs	M22 - 66 ft/lbs	M10 - 22 ft/lbs
Liquid Inj. Pipe Plug	M22 - 66 ft/lbs	M22 - 66 ft/lbs	N/A
Terminal Plate	M10 - 59 ft/lbs	M10 - 59 ft/lbs	M10 - 59 ft/lbs
Unloaders	M10 - 59 ft/lbs	M10 - 59 ft/lbs	M10 - 59 ft/lbs
Sightglass	1 1/8" - 29.5 ft/lbs with o-ring	1 1/8" - 29.5 ft/lbs with o-ring	1 1/8" - 29.5 ft/lbs with o-ring
Oil Drain Valve	360-480 in/lbs	360-480 in/lbs	360-480 in/lbs
Oil Drain Valve Fitting	66 ft/lbs with alum washer	66 ft/lbs with alum washer	66 ft/lbs with alum washer

PLEASE NOTE: DO NOT OIL GASKETS
TIGHTEN SCREWS CROSSWISE AND AT LEAST IN TWO STEPS (50/100%)

Description	CS65	CS75	CS85
Discharge / Oil Sensor	1/4" NPTF - 15 ft/lbs	1/4" NPTF - 15 ft/lbs	1/4" NPTF - 15 ft/lbs
Stator Cover	(11) M12 - 92 ft/lbs	(12) M16 - 162 ft/lbs	(20) M16 - 162 ft/lbs
Oil Separator Housing	(16) M12 - 92 ft/lbs	(16) M16 - 162 ft/lbs	(24) M16 - 162 ft/lbs
Oil Separator End Cap	M52 - 59 ft/lbs with o-ring	M52 - 59 ft/lbs with o-ring	M10 - 59 ft/lbs with gasket
Oil Separator End Cap Plug	N/A	N/A	M20 - 55 ft/lbs
Stator Pin Plug	M22 - 29.5 ft/lbs with o-ring	M22 - 66 ft/lbs with alum washer	M22 - 66 ft/lbs with alum washer
Oil Level Control Flange	M10 - 59 ft/lbs	M10 - 59 ft/lbs	M10 - 59 ft/lbs
External Oil Cooler Adapter	M10 - 59 ft/lbs	M10 - 59 ft/lbs	M10 - 59 ft/lbs
Terminal Lug Screws	N/A	M10 - 175 in/lbs	N/A
Terminal Lug Nuts	M8 - 203 in/lbs with lockwasher	N/A	M10 - 370 in/lbs w/ flat & lockwasher
Grounding Lug Nuts	N/A	M10 - 371 in/lbs with flat washer	M10 - 370 in/lbs w/ flat & lockwasher
Grounding Lug Bolt	M6- 90 in/lbs with lockwasher	N/A	N/A
Sensor Nuts	M4 - 35 in/lbs with washer	N/A	N/A

PLEASE NOTE: DO NOT OIL GASKETS
TIGHTEN SCREWS CROSSWISE AND AT LEAST IN TWO STEPS (50/100%)

A. Standard Bolts

	M5	M6	M8	M10	M12	M16	M20	Units
With gasket	5	12	30	59	92	162	162	lb ft
	62	141	352	704	--	--	--	lb in

B. Pipe Plugs

	NPTF 1/8"	NPTF 1/4"	NPTF 3/8"	NPTF 1/2"	NPTF 3/4"
lb ft	--	--	33	49	76
lb in	102	190	--	--	--

C. Rotalock Coupling w/ Teflon O-ring

	3/4" - 16	1" - 14	1 1/4" - 12	1 1/2" - 12	1 3/4" - 12
lb ft	30 - 40	50 - 60	90 - 100	100 - 120	120 - 140

D. Special Bolts

	M8
Check Valve Nut	13.25 lb ft

	M10
Check Valve Cover	40 lb ft

	M22 (Al)	M22 (Cu)	M52 (Al)	M52 (Cu)
Oil Drain plug (gasket)	29.5 lb ft	107 lb ft	81 lb ft	118 lb ft

	M4	M5	M6	M8
Electrical Terminals	18 lb in	35 lb ft	53 lb ft	89 lb ft

	M22	M52
Sightglass w/ O-ring	29.5 lb ft	59 lb ft

	M16 (8.8)	M16 (10.9)
Motor Rotor Bolts	74 lb ft	92 lb ft

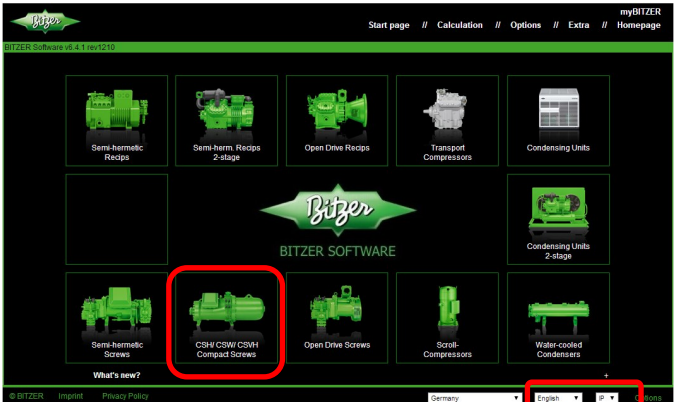
	All
Schrader Fittings	180 in ft

	All
Valve Stem Caps	Hand Tight

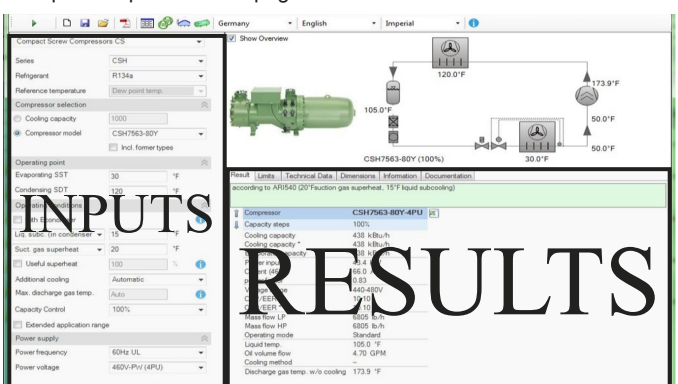
PLEASE NOTE: DO NOT OIL GASKETS
TIGHTEN SCREWS CROSSWISE AND AT LEAST IN TWO STEPS (50/100%)

BITZER has an online software than can be used not only for compressor sizing but also for on-site diagnostics:

www.bitzer-software.com



From the home screen, select the proper compressor series, language and units. The image below identifies the primary areas of the compressor performance page.



BITZER Software as an on-site diagnostic tool:

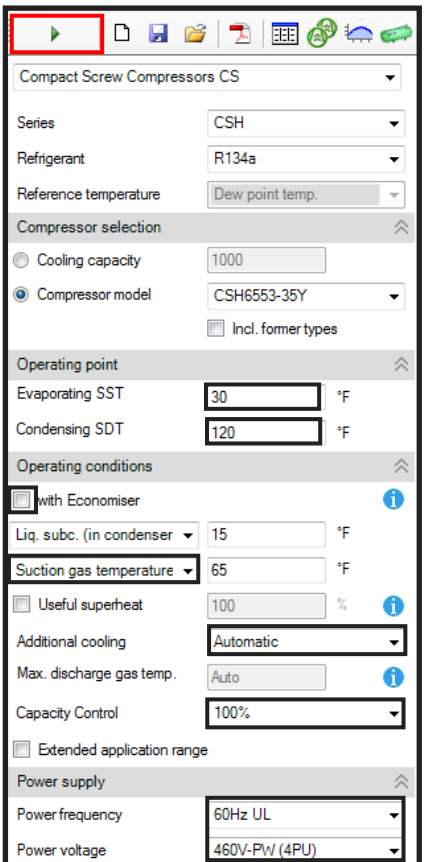
Using the drop downs, buttons, and textboxes, select or type in:

- Series
- Refrigerant
- Compressor model
- SST
- SDT
- Economizer
- Suction gas temp
- Additional cooling
- Frequency
- Power Voltage

Then click on the CALCULATE button at the top left.

The compressor performance data will appear in the results section of the window.

Clicking the CALCULATE button is required every time you change an input. Check all inputs before calculating the result.



BITZER Software as an on-site diagnostic tool:

In order to obtain the most accurate performance data, actual conditions should be measured via refrigeration gauges, thermocouples (avoid infrared sensor if possible) and multi-meters while the compressor is running stable at 100%.

- Pressures should be measured at the compressor
- Temperatures should be measured 12” from the service valve

Evaporating SST & Condensing SDT: Using pressure gauges, convert the suction and discharge pressures to temperature using the BITZER PT Reference App. Enter the corresponding temperature into the software programs.

Economizer: If an economizer is being used, check the box. Compare interstage pressure from software to actual and take this into account when comparing amp draws and other performance data.

Liq. Subc (in condenser).: This value will effect the calculated overall system capacity only and will not effect compressor amps or discharge gas temp.

Suction gas temperature: Select the drop down for “Suction gas temperature” and enter the return gas temperature (measured 12” from the compressor). This value will greatly effect the calculated “Discharge gas temp. w/o cooling.”

Additional cooling: Select this if you are using external oil cooling such as heat exchanger or liquid injection (rare for CS compressors).

Capacity Control: Capacity control cannot be changed from 100%. It is important that all field data is collected while the compressor is operating fully loaded. Unloaded CS compressors typically have lower amp draw and higher discharge temperatures. Contact BITZER Tech support for unloaded data.

Power frequency and voltage: Amp draw is calculated based on the frequency and voltage selected. Please note the nominal voltage used in comparison to your actual voltage.

BITZER Software as an on-site diagnostic tool:

Result | Limits | Technical Data | Dimensions | Information | Documentation

according to ARI540 (20°Fsuction gas superheat, 15°F liquid subcooling)

Compressor	CSH6553-35Y-4PU
Capacity steps	100%
Cooling capacity	269 kBtu/h
Cooling capacity *	266 kBtu/h
Evaporator capacity	269 kBtu/h
Power input	26.6 kW
Current (460V)	40.6 A
Voltage range	440-480V
COP/EER	10.12
COP/EER *	10.01
Mass flow LP	3981 lb/h
Mass flow HP	3981 lb/h
Operating mode	Standard
Liquid temp.	105.0 °F
Oil volume flow	2.14 GPM
Cooling method	--
Discharge gas temp. w/o cooling	189.9 °F

The results section of the window provides the performance data for the compressor at the selected condition. If the compressor is operating properly, the measured values at the compressor should be close to the results from the software.

A large discrepancy in these values may indicate an issue with the compressor, the system or a component. As mentioned before, try to measure the data while the compressor is running in a stable condition and at 100% loading.

BITZER Software as an on-site diagnostic tool:

Two of the simplest data points that can be used for diagnostics are current and discharge gas temperature. Please be sure to adjust the software's current output if needed:

$$\text{Current (Adj)} = \text{Current (Software)} \times \frac{\text{Voltage (Software)}}{\text{Voltage (Actual)}}$$

Example using data from p.92 and actual power supply of 430V:

Current (Adj) = 40.6 * 460 / 430 = 43.4 Amps

Helpful Hints

High Current:

- Poor voltage supply / high voltage asymmetry
- Bad contactor or other electrical components
- High oil level
- Internal running gear wear
- Suction and/or discharge pressures are actually much higher than measured

Low Current:

- Compressor operating unloaded (unable to fully load)
- Suction and/or discharge pressures are actually much lower than measured

High Discharge Gas / Oil Temperature:

- High return gas temperature (p.84)
- Internal running gear wear
- Lack of oil or poor oil quality (p.72)

Low Discharge Gas/Oil Temperature:

- Low compressor superheat (p.84)
- Low economizer superheat (p.84)
- Low oil cooling set point

Official literature can be found at www.bitzerus.com

Spare Parts

SE-161 CS65 SERIES

SE-171 CS75 SERIES

SE-181 CS85 SERIES

SE-191 CS95 SERIES

Performance Data

SP-173 CSW SCREW COMPRESSORS (IP UNITS @ 60Hz)

SP-176 CSH SCREW COMPRESSORS (IP UNITS @ 60Hz)

Operating Instructions

SB-170 CS SCREW COMPRESSORS

Application Manual

SH-170 CS3 SCREW COMPRESSORS

Technical Information

ST-120 SE-E1 PROTECTION DEVICES

ST-121 SE-C1 &SE-C2 PROTECTION DEVICES

ST-122 SE-E2 PROTECTION DEVICES

ST-130 OLC-D1-S OIL LEVEL MONITORING

ST-410 MOTOR CODES

ST-500 OIL PROPERTIES

ST-600 PIPING ARRANGEMENT

ST-610 ECONOMIZER OPERATION

ST-620 PARALLEL OPERATION

Maintenance Information

SW-100 TORQUE SPECIFICATION

SW-120 CHECKING AND ADJUSTING AXIAL CLEARANCE

SW-170 INSPECTION AND REPLACEMENT INTERVALS

Other documents available upon request

Technical Bulletins

TB-0008 CONTROL MODULES AND APPLICATION KIT FOR SCREWS
TB-0012 CAPACITY CONTROLLER FOR CSH
TB-0014 COMPACT SCREW OILS
TB-0016 LIQUID INJECTION FOR CSH SCREWS
TB-0017 OIL DRAINING FOR CSH SCREWS
TB-0018 HSKC TO CSH CONVERSION GUIDELINES
TB-0020 CS SCREW COMPRESSOR BOLT TORQUE SPECIFICATIONS
TB-0021 INT69 TO SE-E1 FIELD REPLACEMENT INSTRUCTIONS
TB-0022 SE-E1 TROUBLESHOOTING GUIDELINES
TB-0023 OLC-D1-S OPTICAL OIL SENSOR FOR CS SCREWS
TB-0029 SE-E2 MOTOR PROTECTION MODULE
TB-0030 BITZER GUIDELINES FOR CS FIELD MOTOR REPLACEMENT
TB-0035 REPLACING THE DISCHARGE CHECK VALVE FOR CSH
TB-0038 CSH1 TO CSH3 CONVERSION GUIDELINES
TB-0039 ADDITIONAL SLIDE VALVE CAPACITY CONTROLLERS
TB-0041 SYSTEM CONTROL MODULE

Reference Charts

CRC-0012 COMPRESSOR OIL CAPACITIES
CRC-0048 OIL TYPES
CRC-0050 SCREW INFORMATION
CRC-0051 CONTACTORS

Service Guides

SG-0004 CS TROUBLESHOOTING GUIDE

Customer Forms

CF-0001 RETURN MATERIAL AUTHORIZATION (RMA) FORM
CF-0017 SCREW COMPRESSOR SYSTEM INFORMATION REQUEST

BITZER US, Inc.
4080 Enterprise Way
Flowery Branch, GA 30542
Phone: 770-718-2900
Fax: 770-503-9440
Email: sales@bitzerus.com

24h Emergency Replacement Hotline for US Customers:
1.888.GO BITZER (1.888.462.4893)

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