Carlyle Paragon Series to BITZER CSW

Competitive Replacement Guideline

XR-0024-01 02/13

techsupport@BITZERus.com

BITZER Screw Compressors CS High Temp Series

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These guidelines are supplied as a recommended procedure for troubleshooting the CS screw compressor
These guidelines are not a replacement for information specific to that of the manufacturer or the manufacturer's system technical product information.
Each system may vary in design, usage and specifications. This document is intended for use specific to the compressor only and not intended to be a "catch all" for any and every possible application of the compressor.
BITZER's intention is that only qualified and certified (where applicable) individuals specific to the refrigeration industry use the information contained and all standard refrigeration handling and safety practices must be followed at all times.
BITZER's intention is that all electric work is performed by qualified and certified (where applicable) individuals and all standard electrical safety practices must be followed at all times.

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

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

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

Table of Contents

Scope of Standard Delivery (as supplied by Manufacturer)	Bitzer CSH	06T Series
Capacity control system : 4-Steps or Infinite Continuous (See Below)	No Modification Req	2 Step
25% to 100% Capacity Control	●	●
Conversion Kit Stepped to Stepless Control	Not Required	N/A
4 Step Capacity Control	●	No
Infinite Capacity Control	●	●
Solenoid coils for capacity control	●	Δ
Volume ratio Vi, Option Vi=2.2, 2.6, 3.0, 3.5	Built In	Built In
Discharge Check Valve	● Internal	● Internal
Suction Coupling tube and/or Flange	N/A	Δ
Discharge Coupling tube and/or Flange	N/A	Δ
Suction Service Valve	●	Δ
Discharge Service Valve	●	Δ
Suction service valve location	Top	End
Discharge service valve location	Top	Side
Oil Charge	●	Δ External
Electronic Module (Rotation)	●	Δ External
Electronic Module (Temperature)	●	Δ External
PTC100 type temperature sensor	N/A	N/A
PTC120 type temperature sensor	●	N/A
PT100 type motor temperature sensor	PTC Sensors	N/A
PTC110 type temperature sensor	N/A	N/A
Screw in Discharge temperature sensor	● (251F)	Thermistor
IP-54 Terminal box	●	Δ
Crankcase oil heater	●	Δ External
Compress chamber (Middle side) liquid inject port	●	N/A
Motor side (Low side) liquid inject port	Not Required	●
Economizer port	●	●
Oil cooling connection	●	●
Liquid injection oil cooling port	●	●
Oil drain valve	●	N/A
Oil level switch	Δ	Δ External
Oil filter different pressure (ΔP) protector switch	Not Required	Δ External
Liquid injection expansion valve	N/A	N/A
Liquid injection solenoid valve	N/A	N/A
Safety Relief Valve	● Internal	● Internal
Position sensor (Capacity control)	N/A	N/A
Slide fit motor	●	No
Starting type PWS	●	No
Starting type Start Delta	Δ	●
Jumper bars for DOL starting	●	Δ
Rubber mounting pads	●	No
Oil Separator	Intregal	Δ Requires External
● (Standard) Δ (Option) N/A Not Applicable		

Carlyle Paragon

Recommended Replacement Model Chart			
BITZER CSW Low Condensing Series			
Bitzer CSW Screw		Carlyle 06T Series	
BITZER Number	Tons	Model Number	Tons
CSW6583-40Y	48	06TSA137-G1C	45
CSW6593-50Y	54	06TSA155-J1C	51
CSW7573-60Y	66	06TSA186-J1C	60
CSW7593-80Y	85	06TTA266-P1C	93
CSW8573-90Y	106	06TTA301-1IC	104
CSW8583-110Y	115	06TTA356-S1C	123
CSW8593-125Y	131		
CSW9563-140Y	159	06TUA483-W1C	165
CSW9573-160Y	182	06TUA554-W1C	187
Based on 45/100/0sc/18sh R134A			

Recommended Replacement Model Chart			
BITZER CSW Low Condensing Series			
Bitzer CSW Screw		Carlyle 06T Series	
BITZER Number	Tons	Model Number	Tons
CSW6583-40Y	52	06TSA137-G1C	49
CSW6593-50Y	58	06TSA155-J1C	56
CSW7573-60Y	70	06TSA186-J1C	67
CSW7593-80Y	91	06TTA266-P1C	102
CSW8573-90Y	113	06TTA301-1IC	116
CSW8583-110Y	124	06TTA356-S1C	139
CSW8593-125Y	139		
CSW9563-140Y	173	06TUA483-W1C	183
CSW9573-160Y	195	06TUA554-W1C	205
Based on 45/100/18sc/18sh Economized R134A			

Model Number Nomenclature

Model	0	6	T	T	A	3	5	6	S	S
DIGIT	1	2	3	4	5	6	7	8	9	10

1st & 2nd = Semi Hermetic

3rd & 4th = Model Code TT -TS-TU-TV = Paragon

5th = Design Variable A = Air Cooled / R = Refrigeration / W = Water Cooled

6th, 7th & 8th = Displacement CFM at 60 Hz

9th = Motor Voltages

S = 400/460-3-50/60

T = 575-3-60

W = 380-3-60

X = 200/230-3-50/60

Z = 200-3-60

10th = Motor Size

G = 60

J = 75

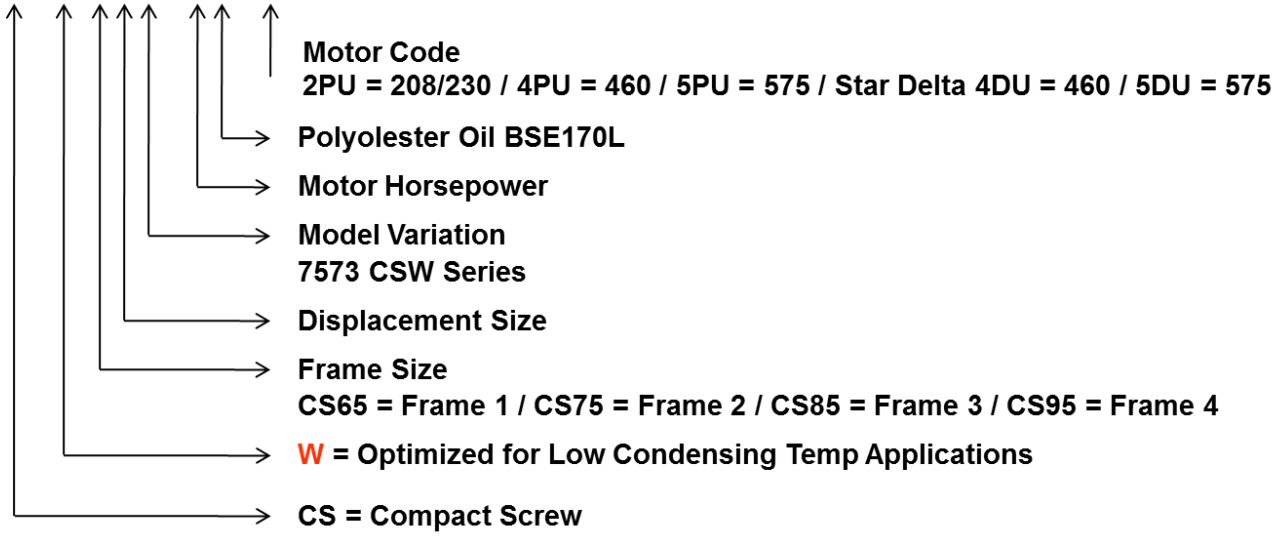
P = 120

S = 150

T = 160

W = 225

CSW7573-70Y-4PU



Overview

To aid in the conversion from a Carlyle Paragon Screw Compressor to a BITZER CSW Screw Compressor the following information has been assembled.

For replacement compressor selection a capacity comparison of each compressor is given on page #3 and dimensional information is given on page #11.

The suction and discharge connection sizes are different between the Carlyle and the BITZER CSW compressors.
Size information is given on page #12.
The Carlyle Paragon Compressors have the suction connection located on the end of the compressor.
The discharge connection is located on the side of the compressor.
The BITZER CSW compressors have the service valves located on the top of the compressor for the CS65, 75 and 85 series.
The suction connection is located on the ends for the CSW9563-140Y and CSW9573-160Y.

The suction and discharge isolation valves (if used) can be removed from the existing piping on the Carlyle compressor. The BITZER CS compressors are supplied with suction and discharge service valves and an internal discharge check valve.

The weights of the compressors are similar and are listed on page #13.

The control wiring for these compressors also has some differences.
The Carlyle Paragon series has an optional Safety Control Module. This module provides safety control functionality for discharge temperature, oil level (external oil separator), reverse rotation and oil flow monitoring.
The Carlyle has a thermal motor protector where the control circuit is wired through terminals S1 & S2.
On the BITZER CSW compressors the control circuit is wired through terminals 11 & 14 and module power is connected to L & N.
There is an additional connection on the BITZER CSW protection module at terminal 12. This can be used to indicate a general compressor failure.
The optional safety module used on the Paragon should be removed. The BITZER electronic module provides oil temperature and motor winding temperature protection as well as phase rotation protection.

The loading and unloading between the compressors is very similar.
The Carlyle Paragon Series offers Infinite Capacity Control via two solenoids.
The BITZER CSW Series offers Infinite Capacity Control or 4 Step Discreet Capacity Control via four solenoids provided on the compressor.
Stepped Capacity control is not provided on the Paragon compressors.
Either mode of capacity control can be achieved without any modification required when using the BITZER CSW compressors.

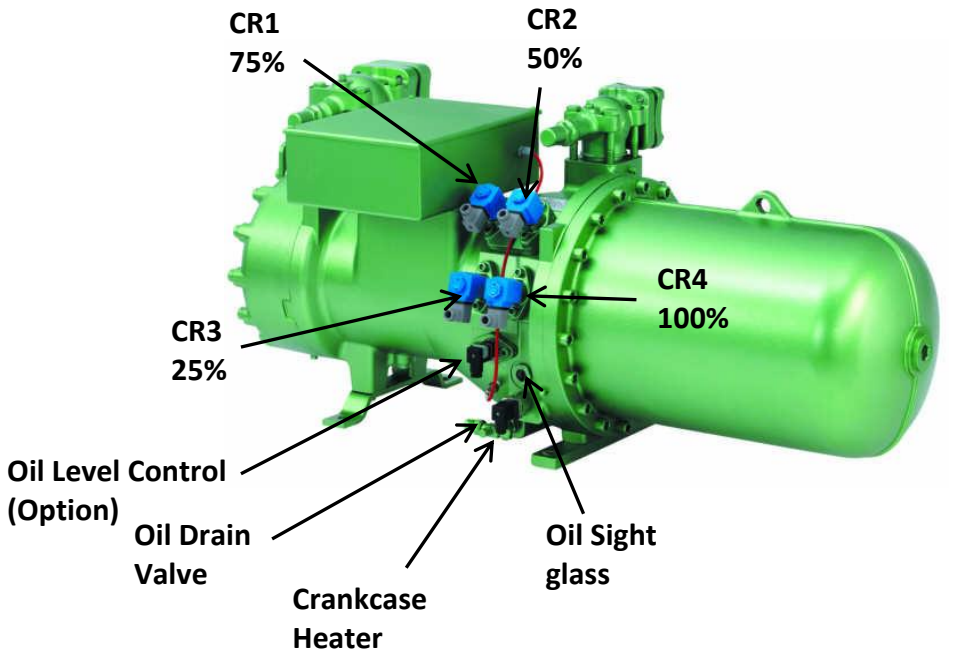
Capacity Control

Mode	Increase Capacity	Decrease Capacity	Partial Capacity*
Solenoid #1	Energized	De-energized	De-energized
Solenoid #2	Energized	De-energized	Energized
* Maintain capacity: Solenoid activation after proper slide valve position has been attained.			

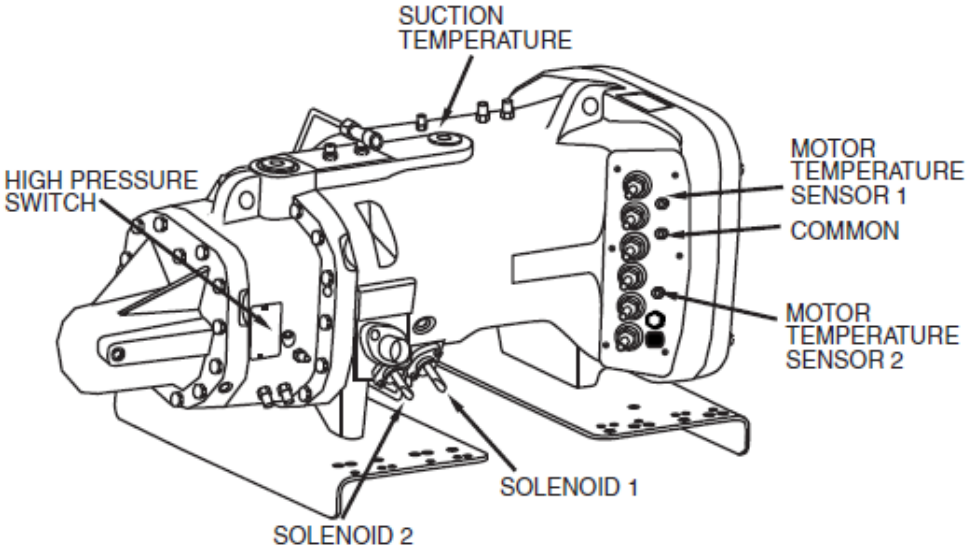
For the BITZER CSW Compressor Infinite Capacity Control		
Operation	**Solenoid 3**	**Solenoid 4**
Start / Stop	Energized	De-energized
Loading	De-energized	Energized
Unloading	Energized	De-energized
Constant Load	De-energized	De-energized

For the BITZER CSW Compressor Stepped Control				
Operation	**Solenoid 1**	**Solenoid 2**	**Solenoid 3**	**Solenoid 4**
100%	De-energized	De-energized	De-energized	Energized
75%	Energized	De-energized	De-energized	De-energized
50%	De-energized	Energized	De-energized	De-energized
25% (Start)	De-energized	De-energized	Energized	De-energized

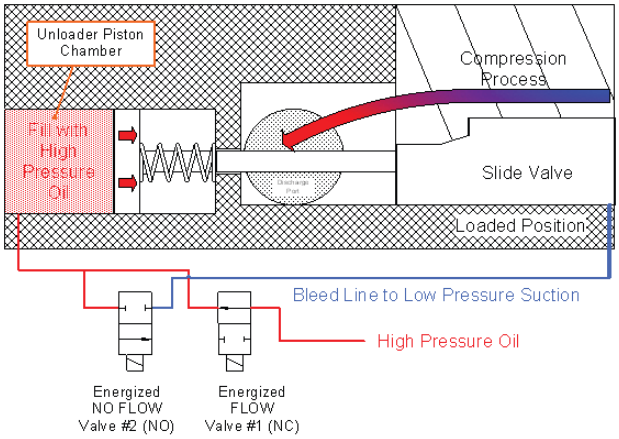
Bitzer Screw Compressors Frame 2 Shown



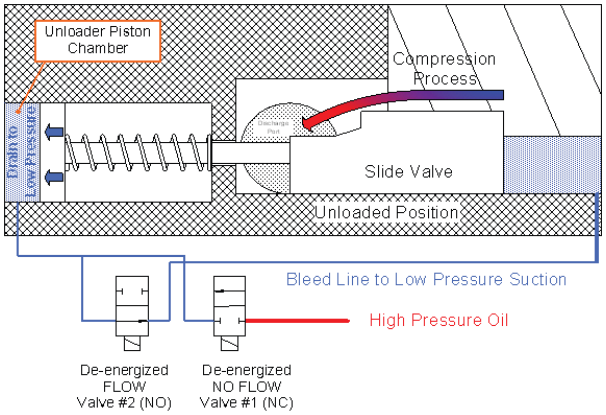
Carlyle Paragon 06 Series Screw Compressors



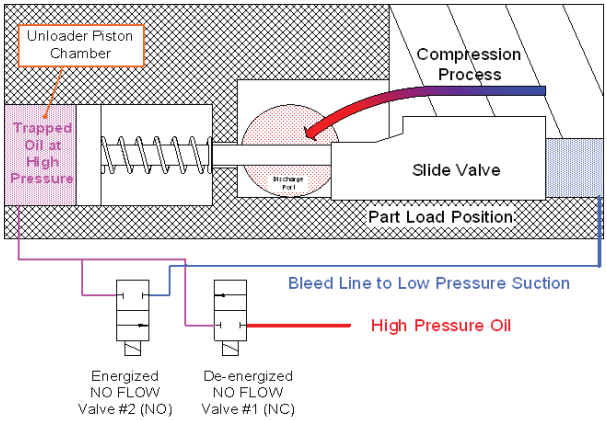
To fully load the compressor, both solenoid #1 and #2 are energized. This allows high pressure oil to enter the unloader piston chamber moving the slide valve providing more engagement under the screw rotors. Both solenoids should remain energized to maintain the full load position.



To unload the compressor, both solenoids are de-energized. This exposes the unloader piston chamber to suction pressure pulling the slide valve out from under the screw rotors reducing the amount of compression being performed.



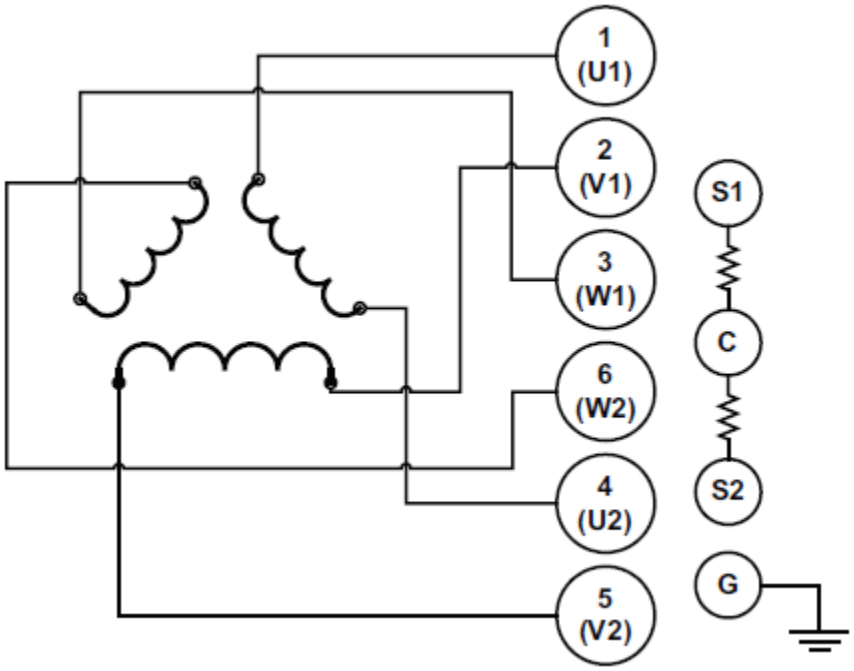
Part load is achieved by stopping the load or unload solenoids described above at an intermediate slide valve position. Stopping the valve at an intermediate position is accomplished by de-energizing solenoid #1 and energizing solenoid #2. When this takes place, both valves are closed and the piston cannot move. Cycling of the solenoids may be required to maintain the position due to leak rates around the seal.



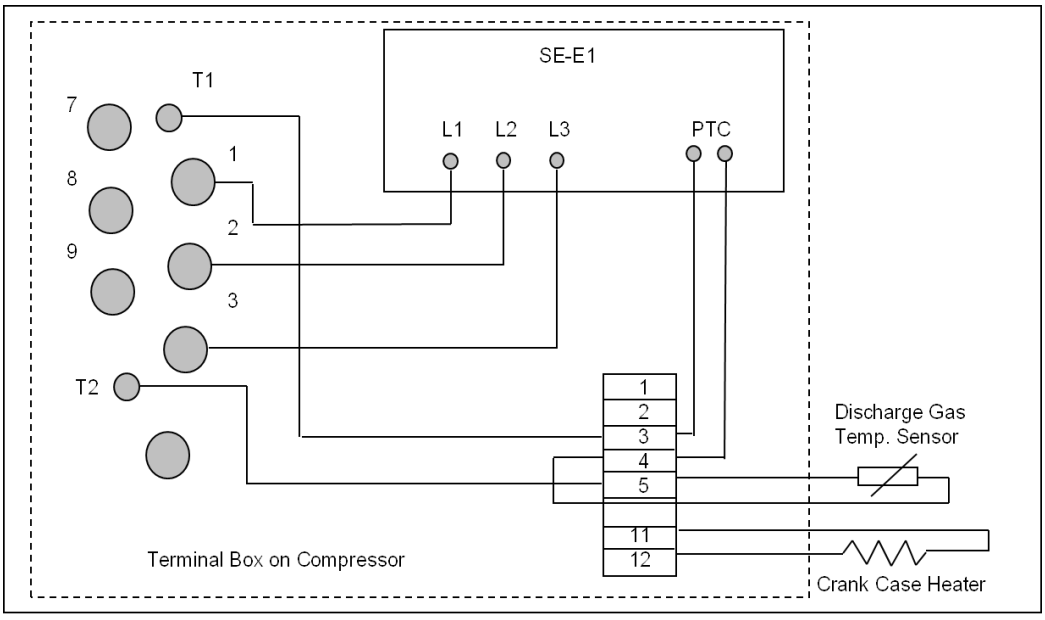
The last thing that needs to be checked is starting. In applications where reduced voltage starting is used the Paragon will have a Star - Delta starter which is different than the BITZER CS compressor, which uses part winding starting for the CS65, 75 and 85 series. The CS95 series utilize Star - Delta reduced voltage starting. Full voltage or direct on line starting is the same for both compressors.

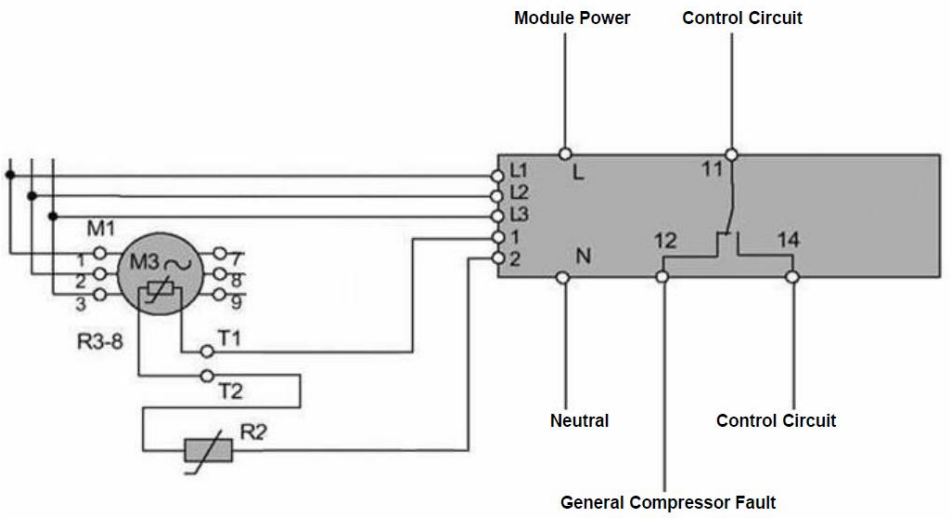
The overload relay and the contactors must be checked for proper sizing.

06 Series Typical Terminal Box Wiring



CS Terminal Box Wiring





The SE-E1 is a dual voltage 115V / 230V which is supplied standard or 24V AC module as an option. The module will sense what voltage is being supplied.

• Each module is pre-wired inside the terminal box. The module monitors discharge gas / oil temperature via a PTC sensor. The module also monitors motor winding temperature via the motor sensors embedded into the motor windings which are wired in series and connected to the module. Phase sequence control for direction of rotation is also monitored.

• As mentioned above, each module is pre-wired inside the terminal box. The following connections should be checked for tightness.

Voltage / Phase Connections:

L-1 (black) connected to L-1 spade connection on the terminal plate.

L-2 (brown) connected to L-2 spade connection on the terminal plate.

L-3 (blue) connected to L-3 spade connection on the terminal plate.

Note: Each lead is identified at the plug connector with number markings and can also be found laser etched on the front of the module.

Motor Winding Temperature Connections:

T-1 (brown) connected to number 1 on the module.

T-2 (brown) connected to position 5 on the connector strip.

Discharge Gas / Oil Temperature Sensor PTC120:

The blue wire is connected to the opposite side of position 5 with the T-2 connection.

The brown wire connected to number 2 on the module.

• Compressor Control Circuit is wired through terminal 11 and 14.

• Terminal 12 can be utilized as a general compressor fault output. It will be powered whenever the module trips.

• Module power supply is connected to terminals L and N.

Dimensions / Oil

Carlyle Model	Height	Width	Length
06TSA137	16	19	41
06TSA155	16	19	41
06TSA186	16	19	43
06TTA266	19	21	50
06TTA301	19	21	51
06TTA356	19	21	53
06TUA483	21	23	58
06TUA554	21	23	60
All dimensions without electrical box, service valves or oil separator (inches)			

Carlyle Model	Height	Width	Length
CSW6583-40Y	22	22	44
CSW6593-50Y	22	22	44
CSW7573-60Y	24	22	53
CSW7593-80Y	24	22	53
CSW8573-90Y	24	22	53
CSW8583-110Y	29	28	61
CSW8593-125Y	29	28	61
CSW9563-140Y	29	28	61
CSW9573-160Y	33	28	72
All dimensions with electrical box, integral oil separator and service valves (inches)			

BITZER Oil and Refrigerant Types	
Refrigerant	**Standard Factory Oil**
R134A	**Solest 170L**

Carlyle Oil and Refrigerant Types	
Refrigerant	**Required Oil**
R134A	**Emkarate RL 220H Plus**

Connection Sizes & Weights

Connection Size			
Bare Compressor Weight / No Oil Separator or Oil			
Model Number	**Suct**	**Disch**	**Weight**
06TSA137-G1C	3-1/8"	2-5/8"	550
06TSA155-J1C	3-1/8"	2-5/8"	645
06TSA186-J1C	3-1/8"	2-5/8"	815
06TTA266-P1C	4-1/8"	3-1/8"	1450
06TTA301-1IC	4-1/8"	3-1/8"	1495
06TTA356-S1C	4-1/8"	3-1/8"	1565
06TUA483-W1C	5"	4-1/8"	2008
06TUA554-W1C	5"	4-1/8"	2092

Connection Size			
Weight Includes Oil Separator and Oil Charge			
Model Number	**Suct**	**Disch**	**Weight**
CSW6583-40Y	2-5/8"	2-1/8"	805
CSW6593-50Y	2-5/8"	2-1/8"	805
CSW7573-60Y	3-1/8"	2-5/8"	1147
CSW7593-80Y	3-1/8"	2-1/8"	1180
CSW8573-90Y	3-1/8"	2-1/8"	1180
CSW8583-110Y	4-1/8"	3-1/8"	1896
CSW8593-125Y	4-1/8"	3-1/8"	1918
CSW9563-140Y	4-1/8"	4-1/8"	2822
CSW9573-160Y	4-1/8"	4-1/8"	2844

Carlyle Model	Weight
06TSA137	814
06TSA155	830
06TSA186	867
06TTA266	1352
06TTA301	1389
06TTA356	1460
06TUA483	2018
06TUA554	2108
without valves	

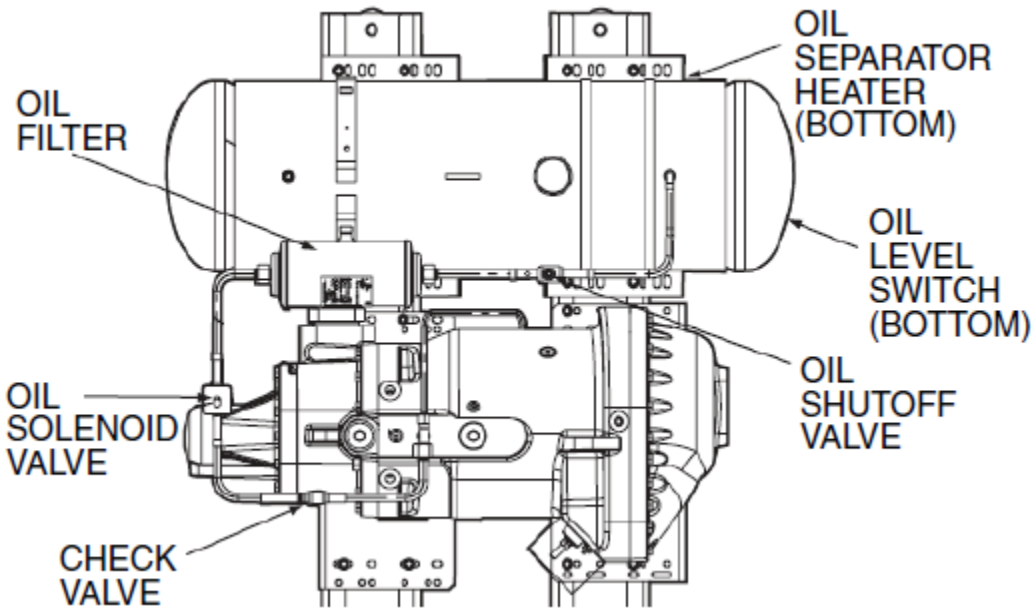
BITZER Model	**Weight**
CSW6583-40Y	805
CSW6593-50Y	805
CSW7573-60Y	1147
CSW7593-80Y	1180
CSW8573-90Y	1874
CSW8583-110Y	1896
CSW8593-125Y	1918
CSW9563-140Y	2822
CSW9573-160Y	2844

CFH and Motor Horsepower Rating

Carlyle 06T		Bitzer CSW	
Model Number	Motor HP	Model Number	Motor HP
06TSA137-G1C	60	CSW6583-40Y	40
06TSA155-J1C	75	CSW6593-50Y	50
06TSA186-J1C	75	CSW7573-60Y	60
06TTA266-P1C	120	CSW7593-80Y	80
06TTA301-1IC	150	CSW8573-90Y	90
06TTA356-S1C	150	CSW8583-110Y	110
06TUA483-W1C	225	CSW8593-125Y	125
06TUA554-W1C	225	CSW9563-140Y	140
		CSW9573-160Y	160

CFH Rating Model Chart			
BITZER CSW Low Condensing Series			
Bitzer CSW Screw		Carlyle 06T Series	
BITZER Number	CFH 60Hz	Model Number	CFH 60Hz
CSW6583-40Y	8299	06TSA137-G1C	8220
CSW6593-50Y	9323	06TSA155-J1C	9300
CSW7573-60Y	10989	06TSA186-J1C	11160
CSW7593-80Y	14338	06TTA266-P1C	15960
CSW8573-90Y	17491	06TTA301-1IC	18060
CSW8583-110Y	20024	06TTA356-S1C	21360
CSW8593-125Y	22602		
CSW9563-140Y	26212	06TUA483-W1C	28980
CSW9573-160Y	29835	06TUA554-W1C	33240

Oil Separator and Components



All external oil components used on the Paragon screw compressors including the oil separator, oil filter, piping, etc can be removed.

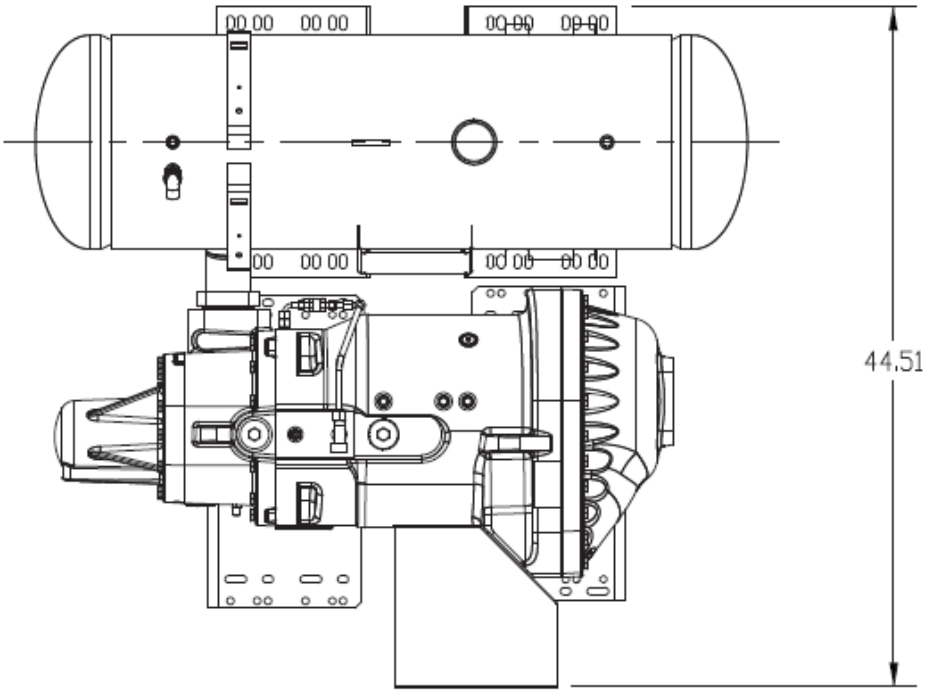
BITZER Oils for CS Series		
Model	**Refrigerant**	**Oil**
CSH	R22	B320SH
	R134a/R407C/R404A/R507A	BSE170
CSW	R22	B320SH
	R134a	BSE170L

B320SH Polyolester Oil	
Unit of Measurement	**Part #**
1 gallon	793-3320-01
5 gallon	793-3320-34

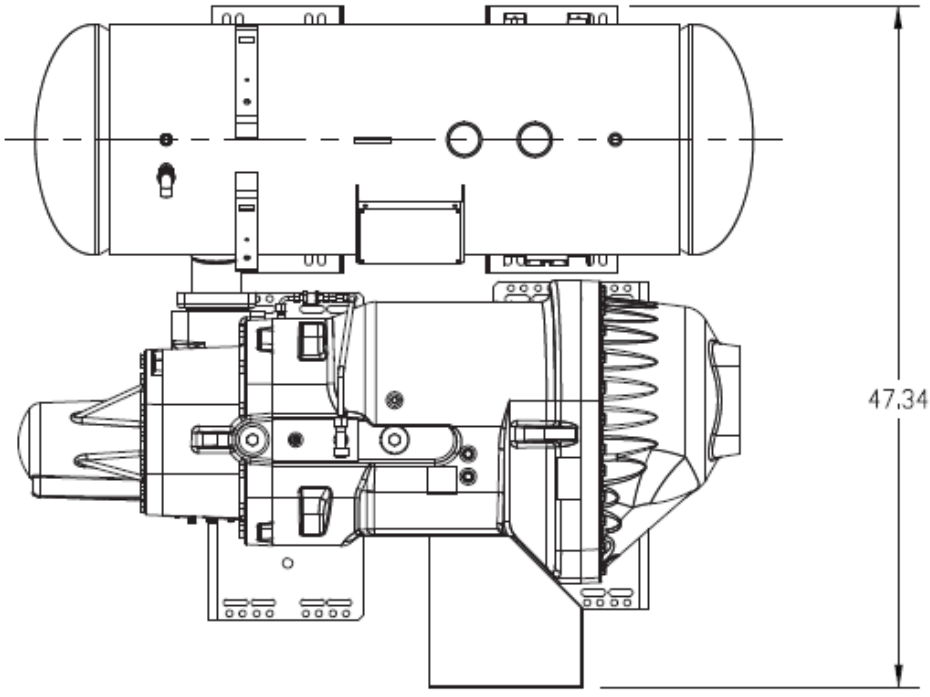
BSE 170 Polyolester Oil	
Unit of Measurement	**Part #**
1 gallon	793-1170-34
5 gallon	793-3170-34

BSE 170 L Polyolester Oil	
Unit of Measurement	**Part #**
1 liter	915118-06
5 liter	915118-01
10 liter	915118-02

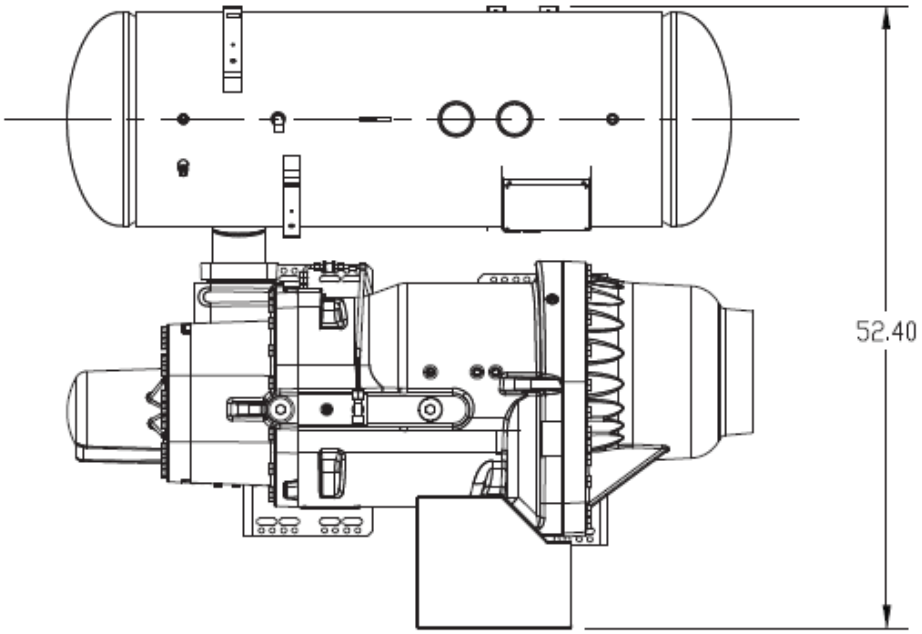
06TSA137 / 06TSA155 / 06TSA186 Assembly Drawing



06TTA266 / 06TTA301 / 06TTA356 Assembly Drawing

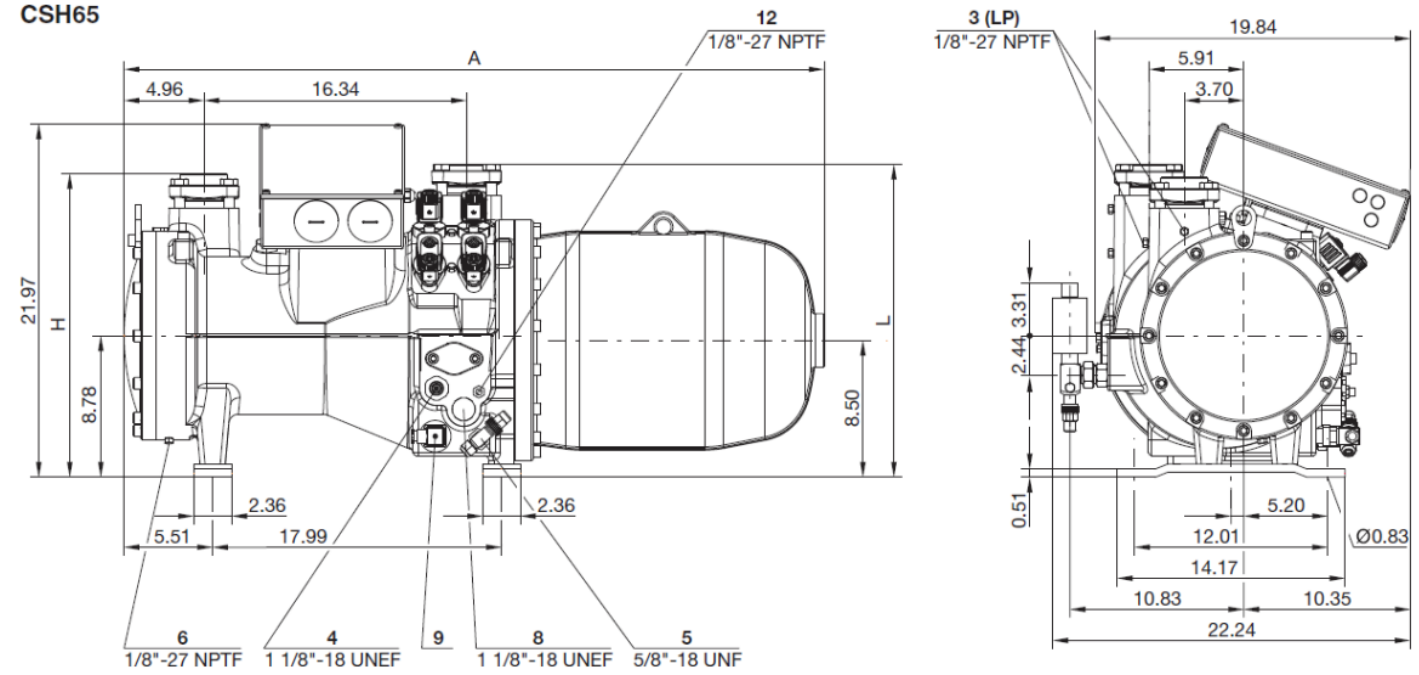


06TUA483 / 06TUA554 Assembly Drawing

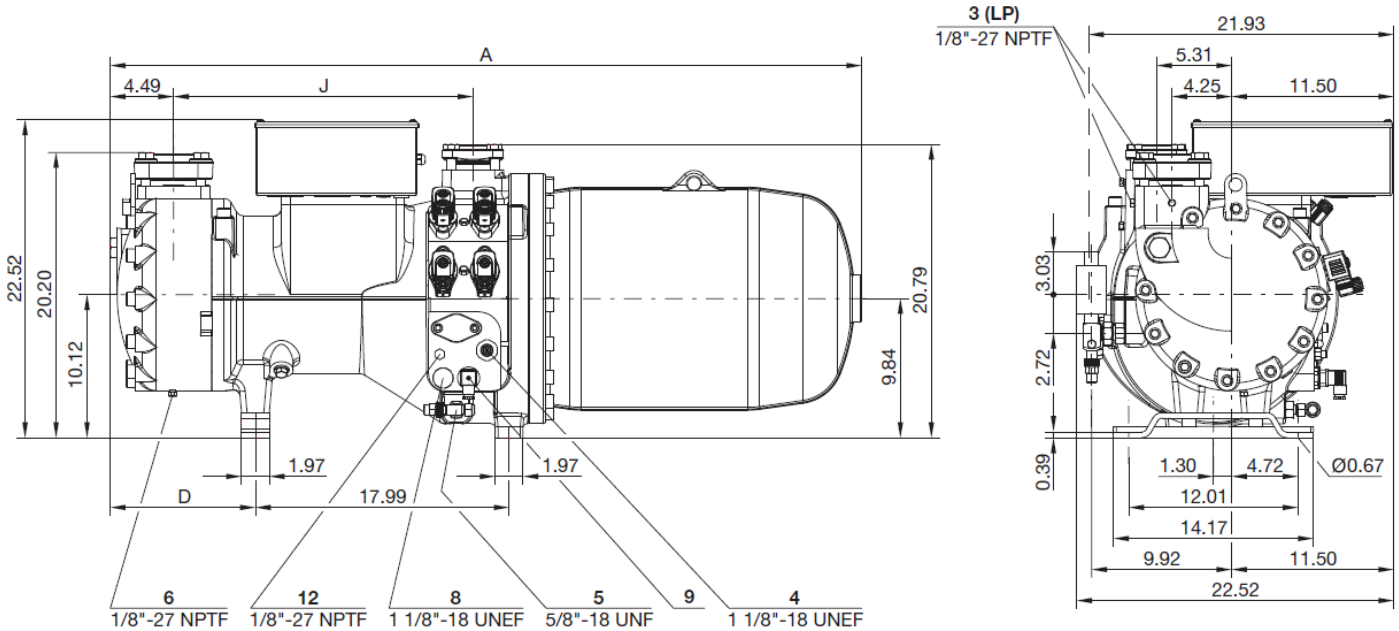


BITZER CSH Screw Compressor Dimensional Data

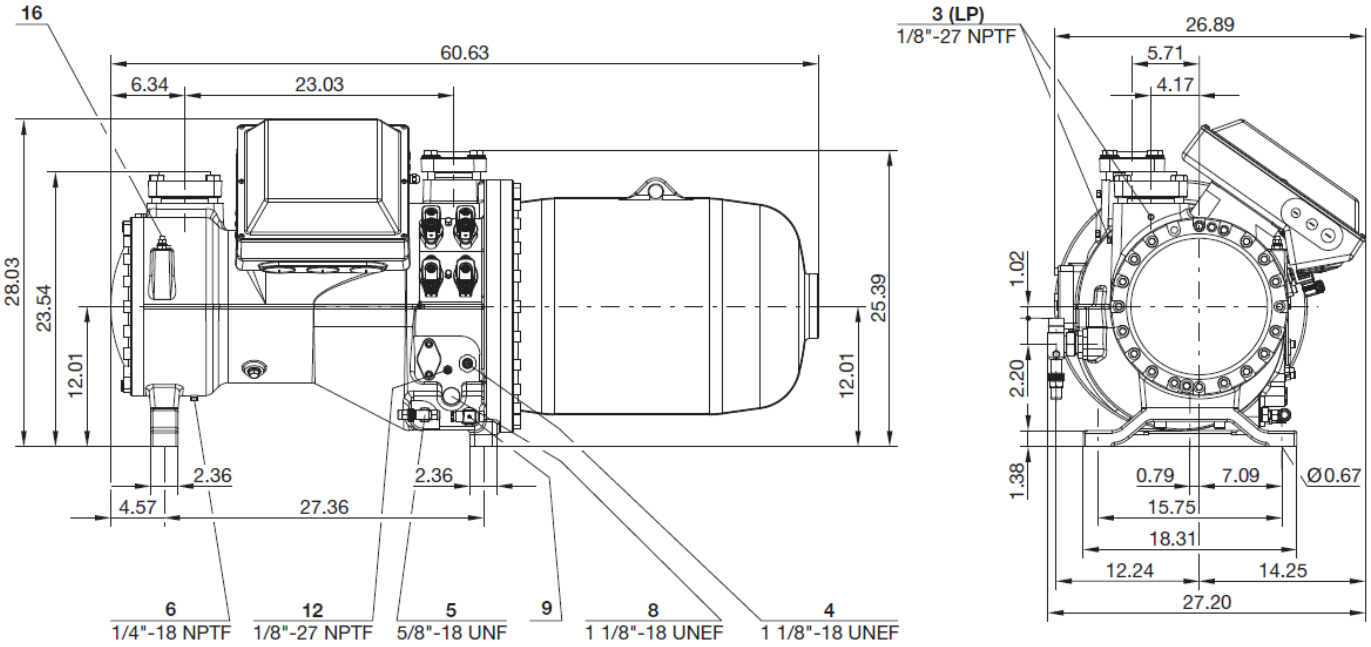
CSH65



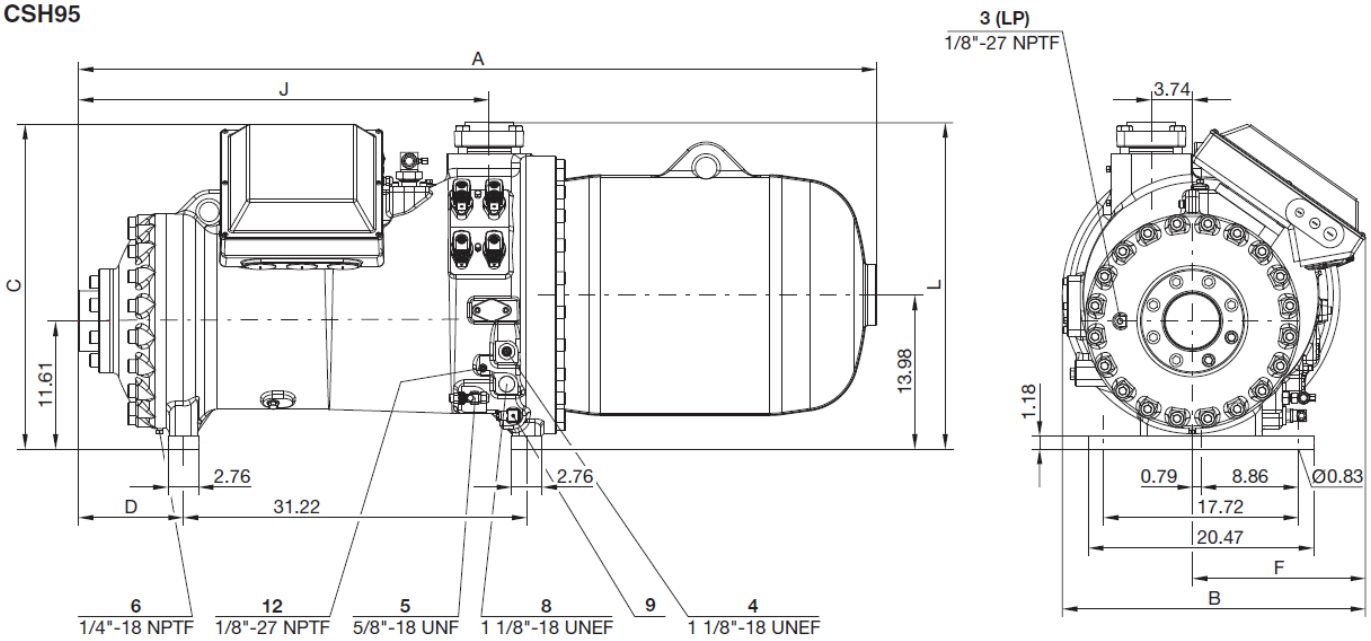
CSH75



CSH85


16
60.63
6.34
23.03
28.03
23.54
12.01
25.39
12.01
2.36
2.36
4.57
27.36
6
1/4"-18 NPTF
12
1/8"-27 NPTF
5
5/8"-18 UNF
9
8
1 1/8"-18 UNEF
4
1 1/8"-18 UNEF
3 (LP)
1/8"-27 NPTF
26.89
5.71
4.17
1.02
2.20
1.38
0.79
7.09
Ø0.67
15.75
18.31
12.24
14.25
27.20

CSH95


A
J
C
11.61
L
13.98
2.76
2.76
D
31.22
6
1/4"-18 NPTF
12
1/8"-27 NPTF
5
5/8"-18 UNF
8
1 1/8"-18 UNEF
9
4
1 1/8"-18 UNEF
3 (LP)
1/8"-27 NPTF
3.74
1.18
0.79
8.86
Ø0.83
17.72
20.47
F
B

Notes

Please Note:

The advice given herein and/or any conclusions made by BITZER US, Inc. represent BITZER US, Inc's best advice and judgment under the circumstances, but such advice and/or conclusions made or results obtained shall be deemed used at your sole risk. For further assistance, please contact our application engineering department using the contact information on the back page of this booklet.

BITZER Competitive Replacement Inquiry

Date: _____

Name	
Company Name	
Address	
City, State, Zip	
Phone	
Cell Phone	
Email	
Customer's Name	
Address	

Brand of the compressor you are replacing:_____

Compressor Model No.:_____ **Serial No.:**_____

System Manufacturer (OEM) and Unit Model #:_____

Please specify single circuit or compressor is in parallel:_____

Type of refrigerant used:_____ **Tonnage requirement:**_____

Operating condition: **Evaporating:**_____

Condensing:_____

Suction superheat:_____

Subcooling:_____

Voltage:_____

Reason for replacement:_____

_____

How many compressors are you looking to replace?: _____

Please provide any additional comments:_____

_____