FuSheng SR Series to BITZER CSH

Competitive Replacement Guideline

XR-0017-01 01/13

techsupport@BITZERus.com

BITZER Screw Compressors CS High Temp Series

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 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	FuSheng SR
Capacity control system : 4-Steps or Infinite Continuous (See Below)	No Modification Required	Δ 3 Step
25% to 100% Capacity Control	●	●
Conversion Kit Stepped to Stepless Control	Not Required	Δ
4 Step Capacity Control	●	●
Infinite Capacity Control	●	Δ
Solenoid coils for capacity control	●	Δ
Volume ratio Vi, Option Vi=2.2, 2.6, 3.0, 3.5	Built In	
Discharge Check Valve	● Internal	● External
Suction Coupling tube and/or Flange	N/A	●
Discharge Coupling tube and/or Flange	N/A	●
Suction Service Valve	●	Δ
Discharge Service Valve	●	Δ
Suction service valve location	Top	End
Discharge service valve location	Top	End or Top
Oil Charge	●	●
Electronic Module (Rotation)	●	Δ
Electronic Module (Temperature)	●	●
PTC100 type temperature sensor	N/A	N/A
PTC120 type temperature sensor	●	●
PT100 type motor temperature sensor	PTC Sensors	N/A
PTC110 type temperature sensor	N/A	●
Screw in Discharge temperature sensor	● (251F)	● (266F)
IP-54 Terminal box	●	
Crankcase oil heater	●	●
Compress chamber (Middle side) liquid inject port	●	Δ
Motor side (Low side) liquid inject port	Not Required	●
Economizer port	●	●
Oil cooling connection	●	●
Liquid injection oil cooling port	●	●
Oil drain valve	●	●
Oil level switch	Δ	Δ
Oil filter different pressure (ΔP) protector switch	Not Required	Not Required
Liquid injection expansion valve	N/A	Δ
Liquid injection solenoid valve	N/A	Δ
Safety Valve	● Internal	Δ
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	●	Δ
Oil Separator	Intregal	Intregal

● (Standard) Δ (Option) N/A Not Applicable

FuSheng

R22 – Water Cooled					
BITZER Model	**Capacity kBtu**	**Capacity Tons**	**FuSheng Model**	**Capacity kBtu**	**Capacity Tons**
CSH6553-50	576	48	**SR-1**	470	39
CSH6563-60	723	60	**SR-2**	574	48
CSH7553-70	844	70	**SR-3**	705	59
CSH7563-80	980	82	**SR-434**	824	69
CSH7573-90	1171	96			
CSH8553-110	1412	118	**SR-4**	1207	101
CSH8563-125	1609	134			
CSH8573-140	1868	156	**SR-5**	1492	124
CSH8573-140	1868	156	**SR-561**	1576	131
CSH9553-180	2484	207	**SR-6**	1845	154
CSH9563-210	2885	240	**SR-7**	2297	191
CSH9573-240	3317	276	**SR-8**	2805	234
CSH9583-280	3780	315			
CSH9593-300	4200	350			
Operating Condition 41/105/9/9			**Operating Conditions 41/105/9/9**		

R22 – Air Cooled					
BITZER Model	**Capacity kBtu**	**Capacity Tons**	**FuSheng Model**	**Capacity kBtu**	**Capacity Tons**
CSH6553-50	507	42	**SR-1H**	450	38
CSH6563-60	636	53	**SR-2H**	548	46
CSH7553-70	740	62	**SR-3H**	668	56
CSH7563-80	856	71	**SR-434H**	822	69
CSH7573-90	1031	86			
CSH8553-110	1231	103	**SR-4H**	1145	95
CSH8563-125	1402	117			
CSH8573-140	1659	138	**SR-5H**	1455	121
CSH8573-140	1659	138	**SR-561H**	1528	127
CSH9553-180	2185	182	**SR-6H**	1752	146
CSH9563-210	2544	212	**SR-7H**	2157	180
CSH9573-240	2918	243	**SR-8H**	2739	228
CSH9583-280	3297	275			
CSH9593-300	3731	311			
Operating Condition 41/113/9/9			**Operating Conditions 41/113/9/9**		

R407C – Air Cooled					
BITZER Model	**Capacity kBtu**	**Capacity Tons**	**FuSheng Model**	**Capacity kBtu**	**Capacity Tons**
CSH6553-50Y	488	41	**SR-1H**	463	39
CSH6563-60Y	604	50	**SR-2H**	576	48
CSH7553-70Y	701	58	**SR-3H**	650	54
CSH7563-80Y	827	69	**SR-434H**	833	69
CSH7573-90Y	939	78			
CSH8553-110Y	1178	98			
CSH8563-125Y	1347	112	**SR-4H**	1251	104
CSH8573-140Y	1537	128	**SR-5H**	1431	119
CSH8573-140Y	1537	128	**SR-561H**	1503	125
CSH9553-180Y	2022	169	**SR-6H**	1837	153
CSH9563-210Y	2333	194	**SR-7H**	2115	176
CSH9573-240Y	2652	221			
CSH9583-280Y	3018	252	**SR-8H**	2720	227
CSH9593-300Y	3407	284			
Operating Condition 41/113/9/9			**FuSheng w/o suction service valve (5" optional)**		

R134a					
BITZER Model	**Capacity kBtu**	**Capacity Tons**	**FuSheng Model**	**Capacity kBtu**	**Capacity Tons**
CSH6553-35Y	363	30	**SRA-1**	319	27
CSH6563-40Y	451	36	**SRA-2**	393	33
CSH7553-50Y	515	43	**SRA-3**	466	39
CSH7563-60Y	584	49	**SRA-434**	581	48
CSH7573-70Y	697	58			
CSH8553-80Y	846	71			
CSH8563-90Y	975	81	**SRA-434**	846	71
CSH8573-110Y	1148	96	**SRA-5**	993	83
CSH8573-110Y	1148	96	**SRA-561**	1046	87
CSH8583-125Y	1266	106	**SRA-6**	1276	106
CSH8593-140Y	1441	120	**SRA-7**	1451	121
CSH9563-160Y	1710	142			
CSH9573-180Y	1995	166	**SRA-8**	1941	162
CSH9583-210Y	2255	188			
CSH9593-240Y	2563	214			
Operating Condition 41/113/9/9			**Fu Sheng w/o suction service valve (5" optional)**		

Recommended Replacement Model Chart			
BITZER CSW Low Condensing Series (where applicable)			
Bitzer Screw Compressor		FuSheng	
BITZER Number	Tons	Model Number	Tons
CSH6553-50	50	**SR1**	55
CSH6563-60	62	**SR2**	67
CSW6593-60	83	**SR3**	82
CSW7573-70	102	**SR434**	96
CSH7573-90	96	**SR4**	141
CSW8573-110	163	**SR5**	168
CSW8583-125	179	**SR561**	178
CSH8573-140	157	**SR6**	216
CSH9553-180	207	**SR7**	261
CSW9583-210	323	**SR8**	330
Based on 45/105/9/9 R22			

FuSheng SR2(H)
SR = Screw Refrigerant
2 = Series Number
(H) = Air Cooled

CSH7573-70Y-4PU

- Motor Code
  2PU = 208/230 / 4PU = 460 / 5PU = 575 / Star Delta 4DU = 460 / 5DU = 575
- Polyolester Oil BSE170L
- Motor Horsepower
- Model Variation
  7573 CSH3 Series
- Displacement Size
- Frame Size
  CS65 = Frame 1 / CS75 = Frame 2 / CS85 = Frame 3 / CS95 = Frame 4
- H = High Condensing Optimized
- CS = Compact Screw

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

CSW7573-70Y-4PU

- Motor Code
  2PU = 208/230 / 4PU = 460 / 5PU = 575 / Star Delta 4DU = 460 / 5DU = 575
- Polyolester Oil BSE170L
- Motor Horsepower
- Model Variation
  7573 CSW Series
- Displacement Size
- Frame Size
  CS65 = Frame 1 / CS75 = Frame 2 / CS85 = Frame 3 / CS95 = Frame 4
- W = Optimized for Low Condensing Temp Applications
- CS = Compact Screw

Overview

To aid in the conversion from a FuSheng Horizontal Screw Compressor to a BITZER CS Compressor the following information has been assembled.

For replacement compressor selection a capacity comparison of each compressor is given in table #1 and dimensional information is given in table #2.

The suction and discharge connection sizes are different between the FuSheng and the BITZER CS compressors.
Size information is given in table #2.
The FuSheng SR-1, 2 and 3 screws have the suction and discharge connections located on the ends.
The FuSheng SR-4, 5, 6, and 7 connections are located on the top of the compressor.
The BITZER CS compressors have them located on the top of the compressor for the CS65, 75 and 85 series.
The suction valve connection is located on the end for the CSH9553-180 through the CSH9573-240.

The suction and discharge isolation valves as well as the discharge check valve can be removed from the existing piping on the FuSheng. The BITZER CS compressors are supplied with suction and discharge service valves and an internal check valve.

The weights of the compressors are similar and listed in table #2.

The control wiring for these compressors also has some differences.
The FuSheng has a thermal motor protector where the control circuit is wired through terminals T1 & T2.
On the BITZER CS 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 CS protection module at terminal 12. This can be used to indicate a general compressor failure.
The reverse phase and high discharge temperature protection that was used for the FuSheng must be removed as this function is incorporated into the BITZER CS protection module.

The loading and unloading between the compressors is very similar.

Capacity Control

For the FuSheng Compressor Linear Control		
Operation	**Solenoid 1 (SV1)**	**Solenoid 2 (SV2)**
Start / Stop	Energized	De-energized
Loading	De-energized	De-energized
Unloading	Energized	De-energized
Holding	De-energized	Energized

For the BITZER CS 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 FuSheng Compressor Stepped Control			
Operation	**Solenoid 1 (SV1)**	**Solenoid 2 (SV2)**	**Solenoid 3 (SV3)**
100%	De-energized	De-energized	De-energized
75%	De-energized	Energized	De-energized
50%	De-energized	De-energized	Energized
25% (Start)	Energized	De-energized	De-energized

For the BITZER CS 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

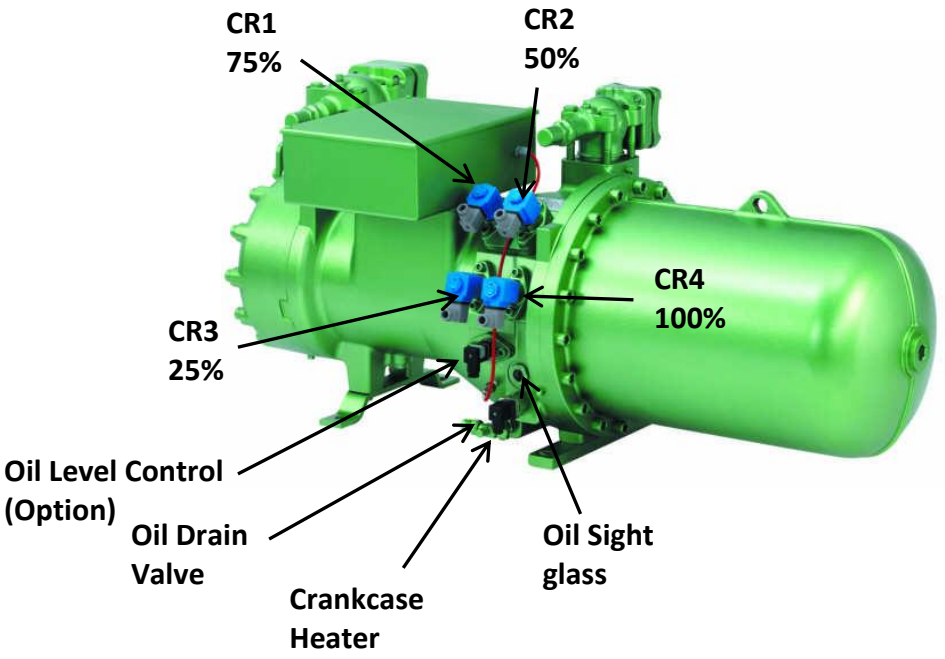
For the FuSheng Compressor Linear		
Operation	**Solenoid 1**	**Solenoid 2**
Start / Stop	On	Off
Loading	Off	Off
Unloading	On	Off
Holding	Off	On

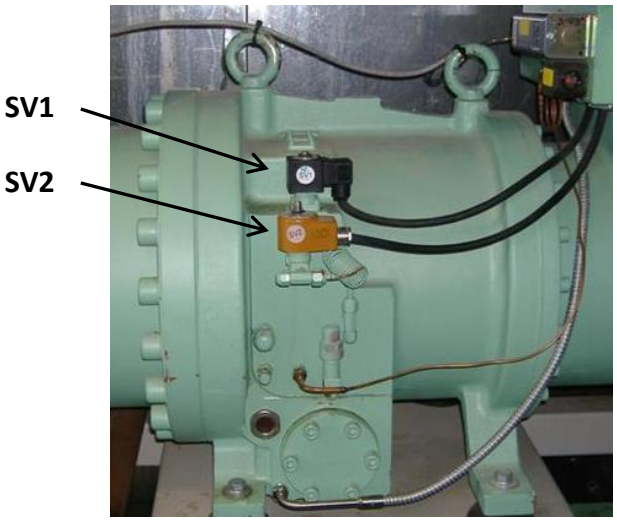
For the Bitzer Screw Compressor Infinite		
Operation	**Solenoid 3**	**Solenoid 4**
Start / Stop	Energized	De-energized
Loading	De-energized	Energized
Unloading	Energized	De-energized
Constant Load	De-energized	De-energized

For the Fusheng 4 Step Capacity Control			
Operation	**Solenoid 1**	**Solenoid 2**	**Solenoid 3**
Start / Stop 25%	On	Off	Off
50%	Off	Off	On
75%	Off	On	Off
100%	Off	Off	Off

For the Bitzer Screw Compressor 4 Step Capacity Control				
Operation	**Solenoid 1**	**Solenoid 2**	**Solenoid 3**	**Solenoid 4**
Start / Stop 25%	De-energized	De-energized	Energized	De-energized
50%	De-energized	Energized	De-energized	Pulse
75%	Energized	De-energized	De-energized	Pulse
100%	De-energized	De-energized	De-energized	Energized
CR4 can be pulsed 1 sec On 10 sec Off or as required to maintain capacity				

Bitzer Screw Compressors Frame 2 Shown

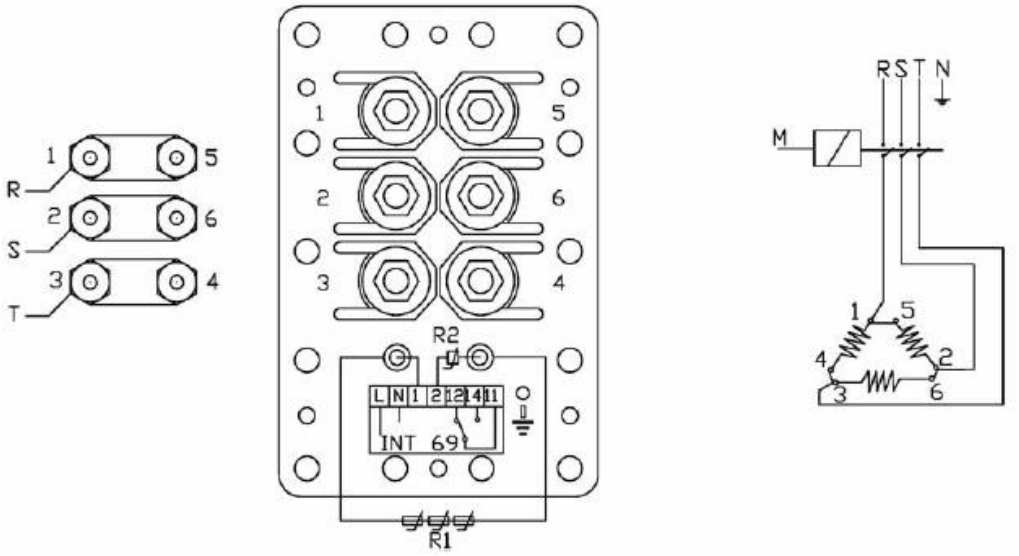




The last thing that needs to be checked is starting. In applications where reduced voltage starting is used the FuSheng will have a Star - Delta starter which is different than the BITZER CS compressor, which uses part winding starting for the CS65, 75 and 85 series. The CS95 series utilize Star - Delta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

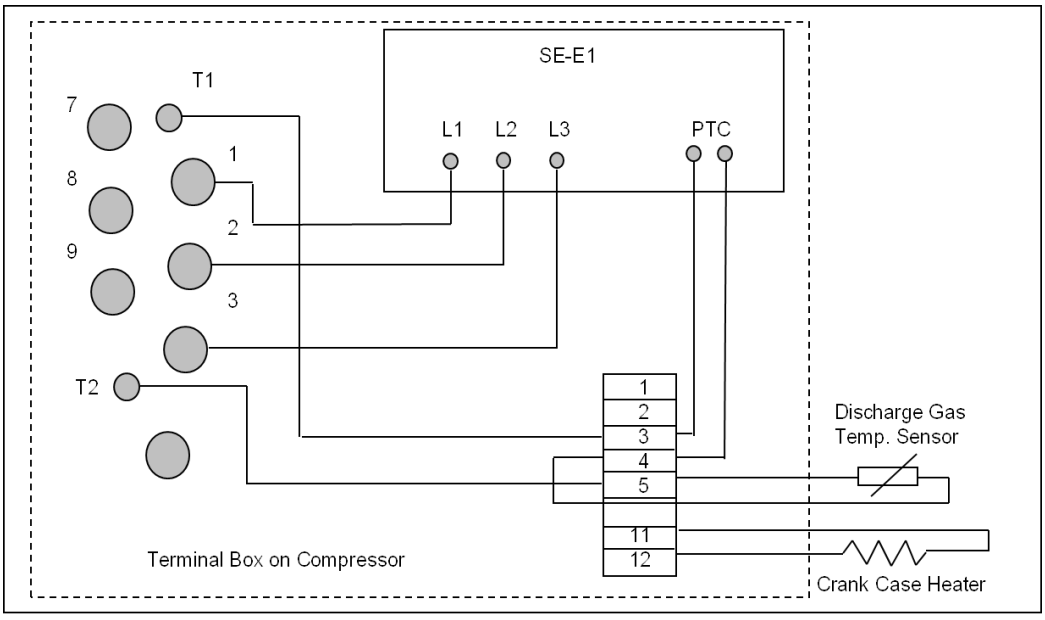
SR Series Typical Terminal Box Wiring

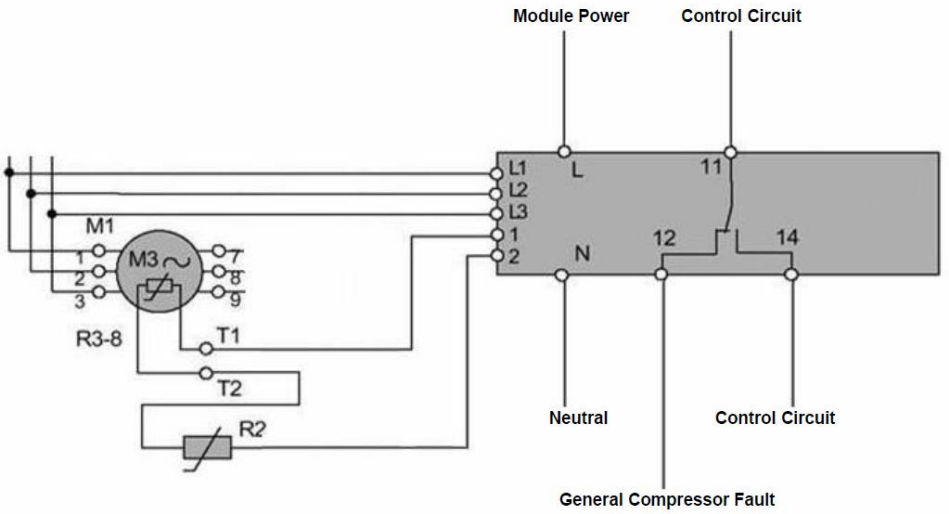


R1:Motor thermistor PTC
R2:Discharge Temp. thermistor PTC
R-S-T:Power supply
M,S: Start contactors
M,D: Run contactors

L/N: Phase/neutral 230V(115V) - 50Hz/ 60Hz
11/14: Control circuit(NO)
11/12: Control circuit)NC)
1/2 : Conn. wires to thermistor(INT69)

CS Terminal Box Wiring





The SE-E1 is a dual voltage 115V / 230V or 24V AC module. 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.

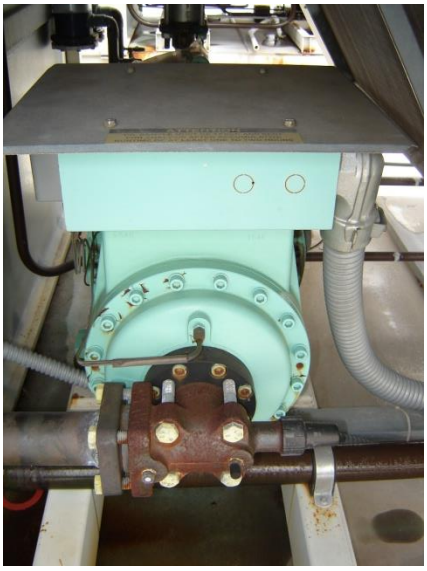
• Terminal 12 can be utilized as a general compressor fault output. It will be powered whenever the module trips.

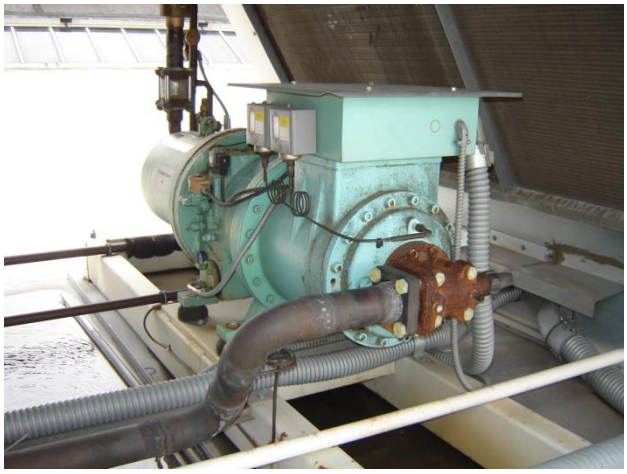
• Module power supply connected to terminals L and N.

Dimension / Connection / Oil

BITZER Screw CS Compressor				
Model Number	**L x W x H (in)**	**Weight (lb)**	**Suction Conn.**	**Discharge Conn.**
CSH6553-50	44x22x22	716	2 1/8"	1 5/8"
CSH6563-60	44x22x22	716	2 1/8"	1 5/8"
CSH7553-70	53x22x24	1,076	3 1/8"	2 1/8"
CSH7563-80	53x22x24	1,085	3 1/8"	2 1/8"
CSH7573-90	53x22x24	1,103	3 1/8"	2 1/8"
CSH8553-110	61x28x29	1,753	4 1/8"	3 1/8"
CSH8563-125	61x28x29	1,766	4 1/8"	3 1/8"
CSH8573-140	61x28x29	1,788	4 1/8"	3 1/8"
CSH9553-180	72x28x34	2,734	4 1/8"	3 1/8"
CSH9563-210	72x28x34	2,778	4 1/8"	3 1/8"
CSH9573-240	72x28x34	2,800	4 1/8"	3 1/8"
FuSheng				
Model Number	**L x W x H (in)**	**Weight (lb)**	**Suction Conn.**	**Discharge Conn.**
SR1	57x18x23	924	2 5/8"	1 5/8"
SR2	61x19x23	1,144	2 5/8"	1 5/8"
SR3	61x19x23	1,166	2 5/8"	1 5/8"
SR4	68x32x33	1,980	4 1/8"	2 5/8"
SR5	70x32x33	2,046	4 1/8"	2 5/8"
SR6	71x32x34	2,420	4 1/8"	3 1/8"
SR7	73x32x34	2,530	4 1/8"	3 1/8"

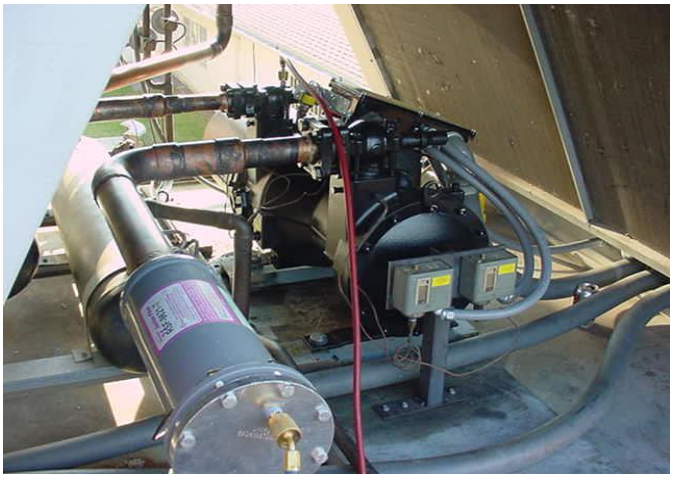
Oil Types			
FuSheng	SR Series	R22 Oil	CPI4214-320
FuSheng	SR Series	R22 Oil	CP-4214-150
FuSheng	SR Series	R22 Oil	Suniso 4GSD
FuSheng	SR Series	R22 Oil	Suniso 5GSD
BITZER	CSH Series	R22 Oil	CPI4214-320

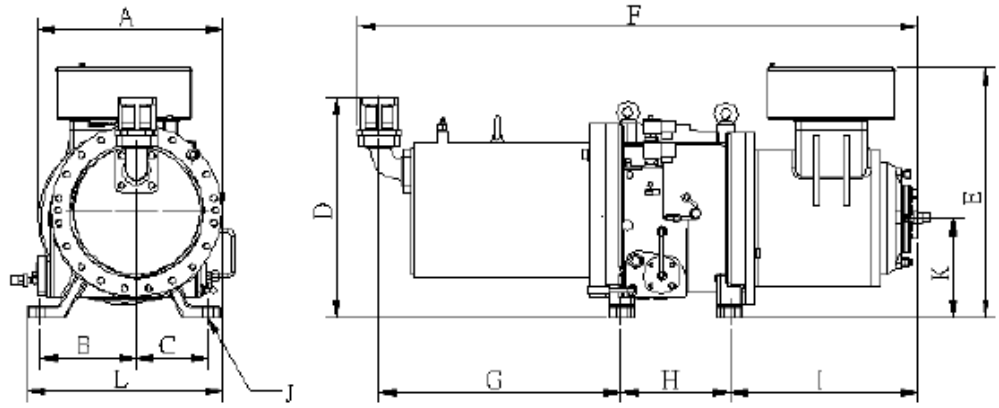




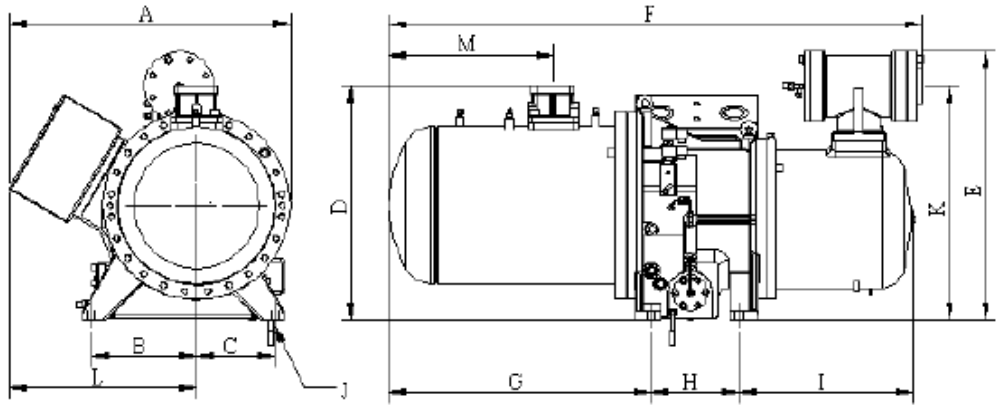
Remove FuSheng External Discharge Service Valve

Remove FuSheng External Check Valve

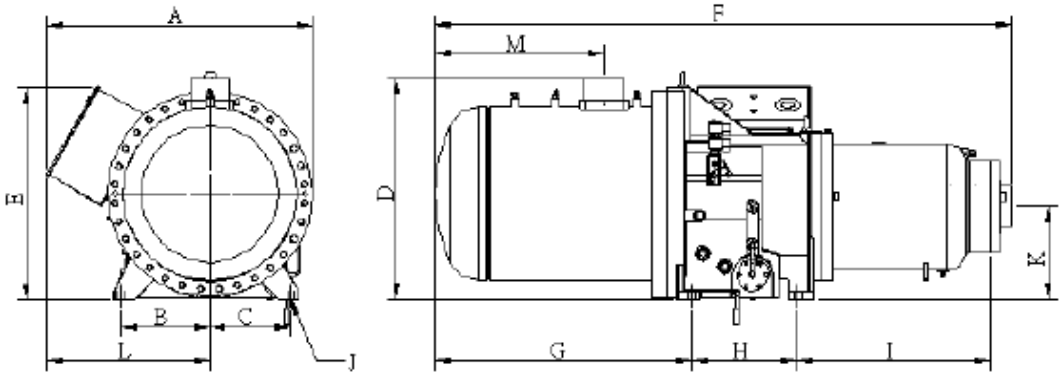




SR(A)-1,2,3(H),SF(A)-50



SR-4,5,561,6,7(H)



SR(A)-8(H), SF(A)-270

CFH and Motor Horsepower Rating

Bitzer Screw Compressor		
Model Number	**CFH Displ 60Hz**	**Motor HP**
CSH6553-50	5830	50
CSH6563-60	7244	60
CSH7553-70	8410	70
CSH7563-80	9682	80
CSH7573-90	10989	90
CSH8553-110	13428	110
CSH8563-125	15300	125
CSH8573-140	17491	140
CSH9553-180	22802	180
CSH9563-210	26212	210
CSH9573-240	29835	240
CSH9583-280	34310	280
CSH9593-300	38786	300

FuSheng		
Model Number	**CFH Displ 60Hz**	**Motor HP**
SR1	6144	60
SR2	7768	72
SR3	9357	84
SR434	12323	115
SR4	15325	150
SR5	18326	175
SR561	20974	175
SR6	23587	240
SR7	29731	270
SR8	35239	320

Bitzer Screw Compressor		
Model Number	**CFH Displ 60Hz**	**Motor HP**
CSW6583-50	8299	50
CSW6593-60	9323	60
CSW7573-70	10989	70
CSW7583-80	12572	80
CSW7593-90	14338	90
CSW8573-110	17491	110
CSW8583-125	20024	125
CSW8593-140	22602	140
CSW9563-160	26212	160
CSW9573-180	29835	180
CSW9583-210	34310	210
CSW9593-240	38786	240
CSW95103-280	43261	280

CSH / CSW Screw Accessories

Crankcase Heater - Special Voltage Heater	
Part # (Voltage)	**Model**
343213-07 (230V)(200W)	(CS 65 - CS 75)
343213-02 (230V)(300W)	(CS 85 - CS 95)

Oil Level Control - Mechanical (CSH Series)	
Part #	**Model**
347403-05	(CSH 65)
347403-03	(CSH 75 - CSH 85)
347403-06	(CSH 95)

Oil Level Control - Electronic (CSH Series)	
Part #	**Voltage**
347962-02	115V
347962-01	230V
347962-03	24VAC

Liquid Injection Adapter Kit
Part #
361332-10

Liquid Injection Controller
Part #
085-0164-17

Economizer Adapter	
Model:	**Part #**
CS65	361329-16
CS75	361329-16
CS85	361330-05
CS95	361330-07

Pressure Controller with 1/4" NPT Transducer Sensor
Kit Part #
999-0005-01

Temperature - Strap On Sensor with Capacity Controller
Kit Part #
999-0003-01

Temperature - 1/4" NPT Insert Sensor with Capacity Controller
Kit Part #
999-0004-01

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

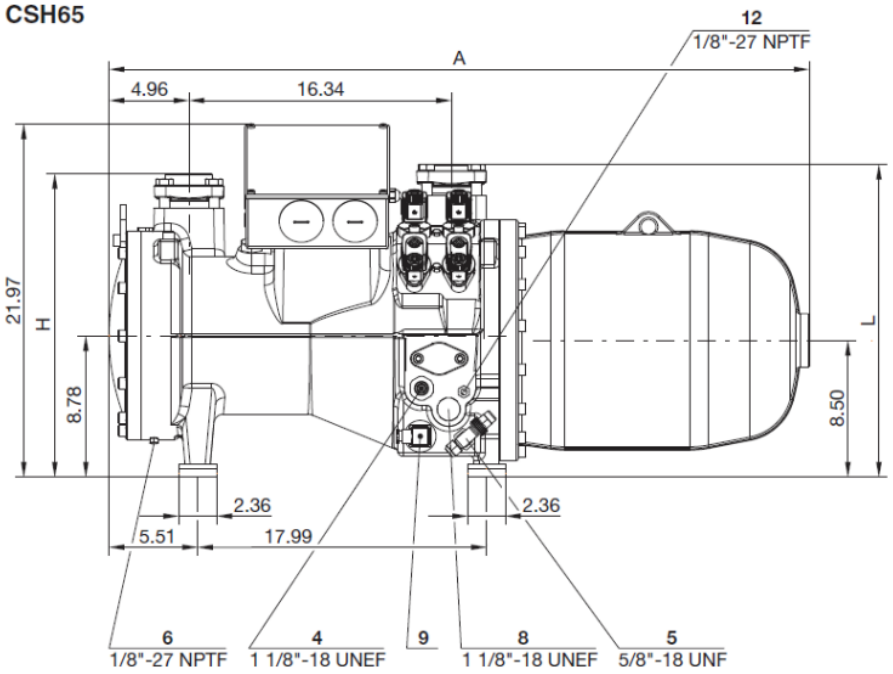
B320SH Polyolester Oil	
Unit of Measurement	**Part #**
1 gallon	793-3320-01
5 gallon	793-3320-34

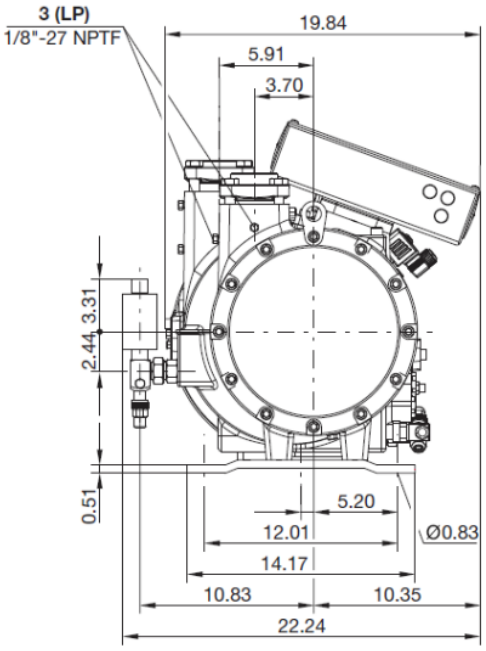
BSE 170 Polyolester Oil	
Unit of Measurement	**Part #**
1 gallon	793-1170-34
5 gallon	793-3170-34

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

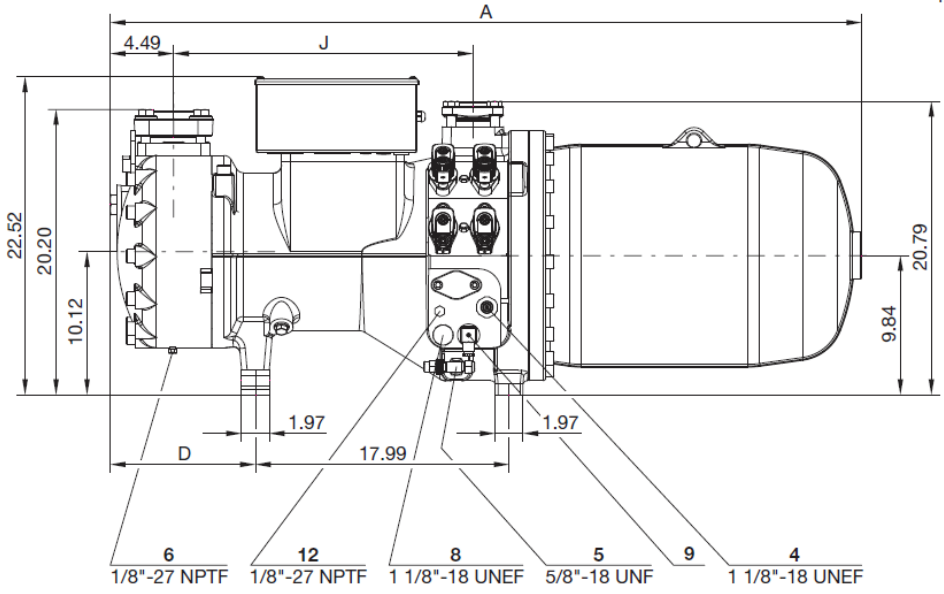
BITZER CSH Screw Compressor Dimensional Data

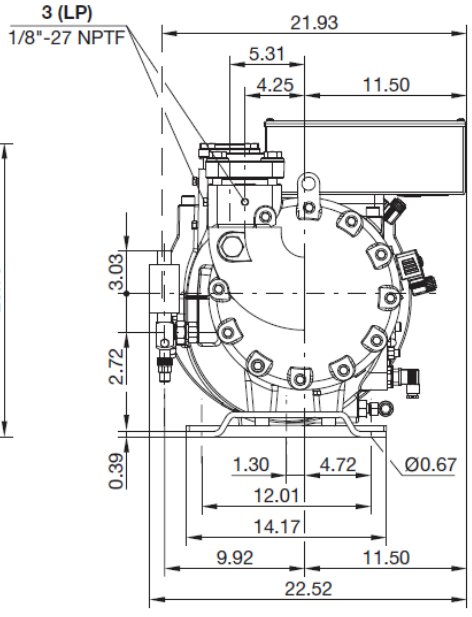
CSH65



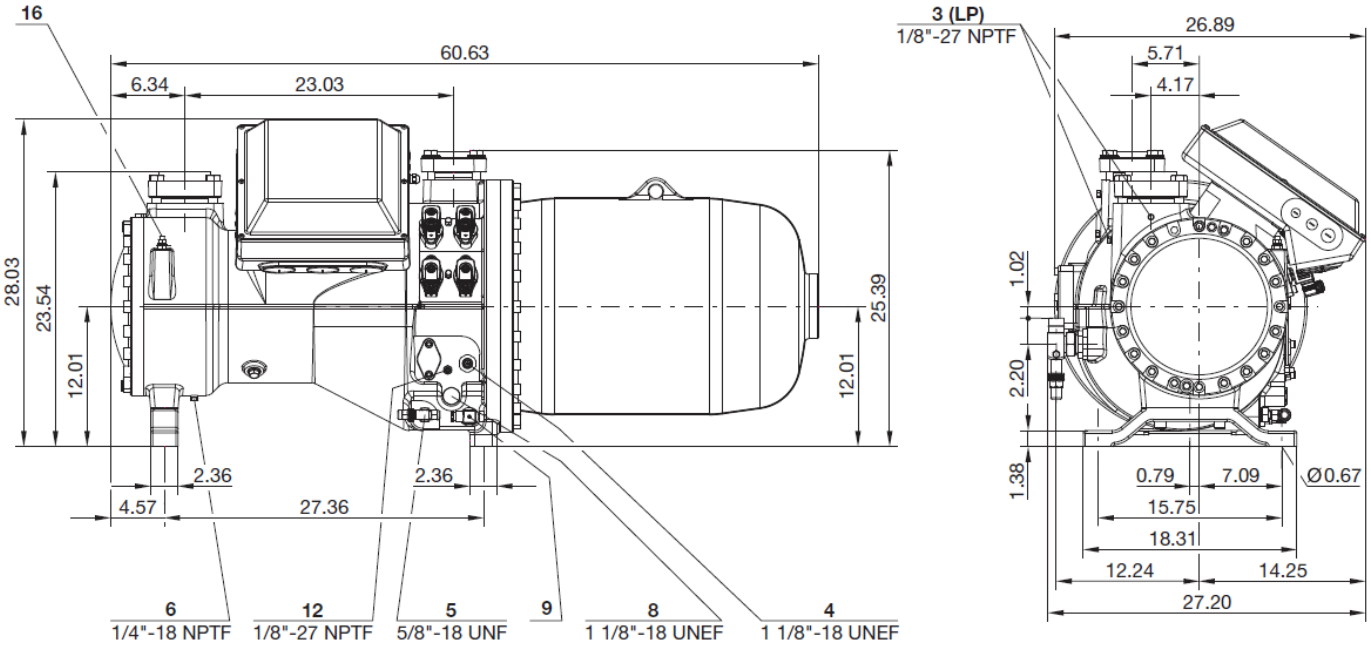


CSH75

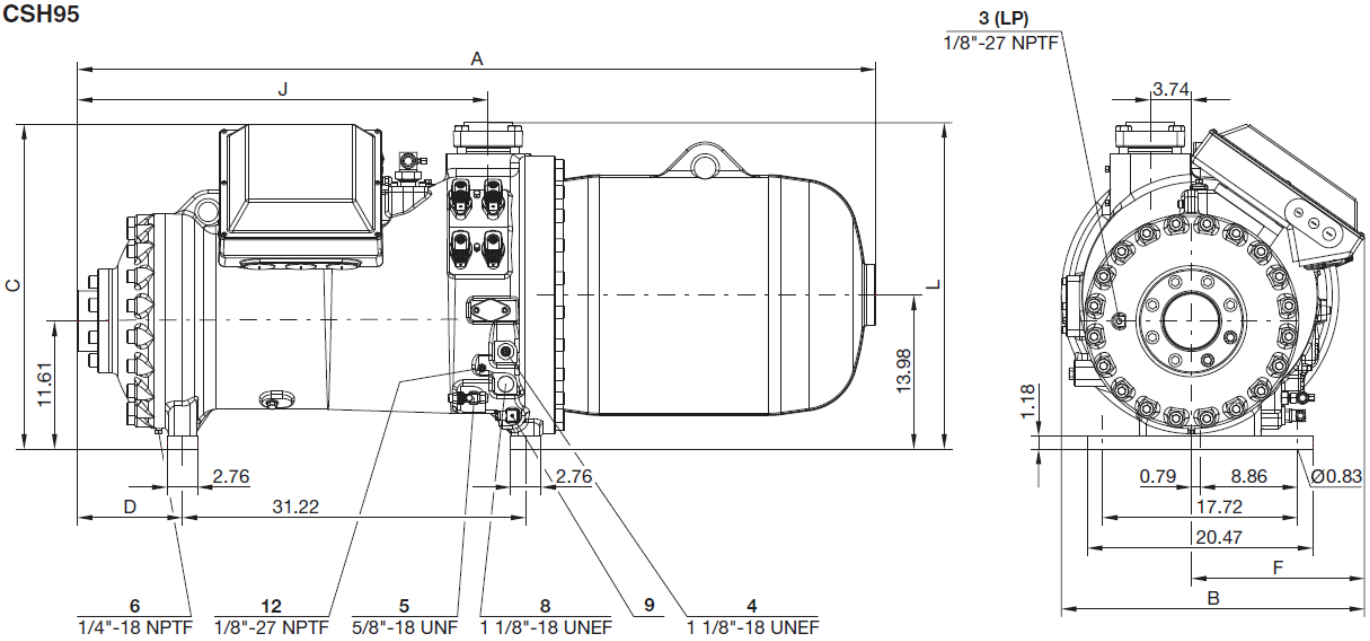




CSH85


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:_____

_____