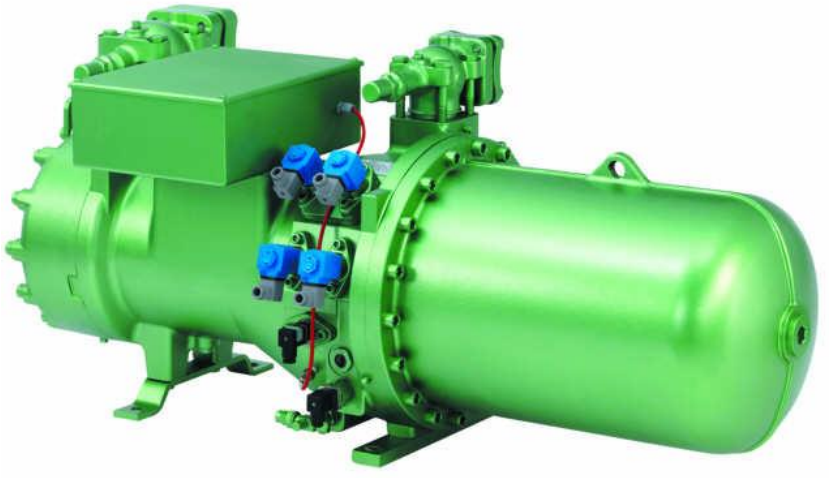
Hitachi SC Series to BITZER CSH Series

Competitive Replacement Guidelines

XR-0020-01 01/13



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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	Hitachi SC
Capacity control system : 4-Steps or Infinite Continuous	No Modification Req	No
25% to 100% Capacity Control	●	No
Conversion Kit Stepped to Stepless Control	Not Required	No
4 Step Capacity Control	●	No
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	Built In
Discharge Check Valve	● Internal	Δ 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
Oil Charge	●	●
Electronic Module (Rotation)	●	Δ
Electronic Module (Temperature)	●	Δ
PTC100 type temperature sensor	N/A	
PTC120 type temperature sensor	●	
PT100 type motor temperature sensor	PTC Sensors	
PTC110 type temperature sensor	N/A	
Screw in Discharge temperature sensor	● (251F)	● (248F)
IP-54 Terminal box	●	
Crankcase oil heater	●	Δ
Compress chamber (Middle side) liquid inject port	●	
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	
Oil filter different pressure (ΔP) protector switch	Not Req	Not Req
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	Integral	Integral

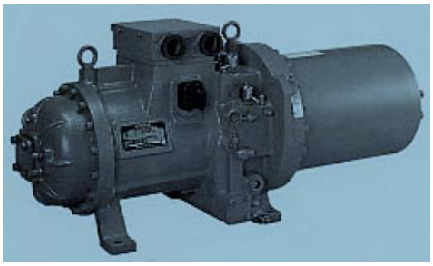
● (Standard) Δ (Option) N/A Not Applicable

Hitachi SC-Z or H			BITZER CSH Model		
Model	**60 Hz Tons @45/105**	**Nominal HP (converted kW)**	**CSH**	**Nominal HP**	**60 Hz Tons @45/105**
4002 / 4005 SC	45	54	**6553-50**	50	47
5002 / 5005 SC	56	67	**6563-60**	60	59
6002 / 6005 SC	69	80.5	**7553-70**	70	70
10001 SC	115	134	**8553-110**	110	115
Rated Capacity Based @45°sst/105°cdt/9°sh/9°sc					
Hitachi - when using 4GS oil, the operating range is limited and the cooling capacity is @ 2-4% less					

CFH Ratings			
Model	**Hitachi SC-Z or H**	**Model**	**Bitzer CSH**
4005 SC	5850	**6553-50**	5830
5005 SC	7212	**6563-60**	7244
6005 SC	8880	**7553-70**	8410
10001 SC	13950	**8553-110**	13428

Compressor Horsepower Rating			
Model	**Hitachi SC-Z or H**	**Model**	**Bitzer CSH**
4005 SC	54	**6553-50**	50
5005 SC	67	**6563-60**	60
6005 SC	80.5	**7553-70**	70
10001 SC	134	**8553-110**	110

Hitachi



To aid in the conversion from a Hitachi Horizontal Screw Compressor to a BITZER CS Screw 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 connections are different between the Hitachi and the BITZER compressors.
The Hitachi screw has the valves located on the ends of the compressor.
The BITZER screw compressor has the valves located on the top for the CS65 thru CS85.
The suction valve connection is located on the end for the CS95.
The connection sizes are also different and the size information is given in table #2

The suction and discharge isolation valves as well as the discharge check valve can be removed from the existing piping, the BITZER 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. See table #5.
The Hitachi has a motor protection module where the control circuit is wired through terminals M1 & M2 and module power is connected to L1 & L2.
On the BITZER screw compressor the control circuit is wired through terminals 11 & 14 and module power is connected to L & N.
There is an additional connection on the protection module at terminal 12. This can be used to indicate a general compressor failure.
The external reverse phase protection that was used for the Hitachi must be removed as this function is incorporated into the BITZER screw protection module.

The loading and unloading of the compressors is also very similar.

The last thing that needs to be checked is starting.

In applications where reduced voltage starting is used the Hitachi will have a Star Delta starter which is different than the BITZER screw 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.

Hitachi Dimensions			
Model	**Length**	**Height**	**Width**
4005 SC	52"	22"	16"
5005 SC	56"	23"	18"
6005 SC	57"	23"	18"
10001 SC	59"	23"	25"
Without Service Valves			

Bitzer CSH Dimensions			
Model	**Length**	**Height**	**Width**
6553-50	44"	22"	19"
6563-60	44"	22"	19"
7553-70	53"	23"	22"
8553-110	60"	28"	27"
With Service Valves			

Hitachi Model	Hitachi Weight	Bitzer Model	Bitzer Weight
4005 SC	795	**6553-50**	710
5005 SC	925	**6563-60**	710
6005 SC	970	**7553-70**	1136
10001 SC	1820	**8553-110**	1852

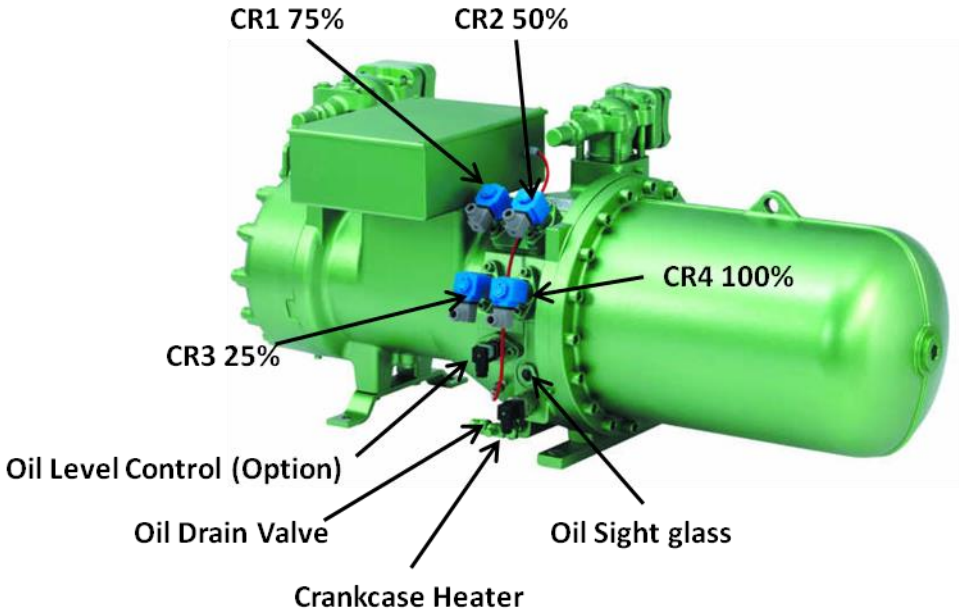
Hitachi Model	Suction Connection	Discharge Connection
4005 SC	2-1/8"	1-5/8"
5005 SC	2-1/8"	1-5/8"
6005 SC	2-1/8"	1-5/8"
10001 SC	3-5/8"	2-5/8"

CSH Model	Suction Valve	Discharge Valve
6553-50	2-1/8"	1-5/8"
6563-60	2-1/8"	1-5/8"
7553-70	3-1/8"	2-1/8"
8553-110	4-1/8"	3-1/8"

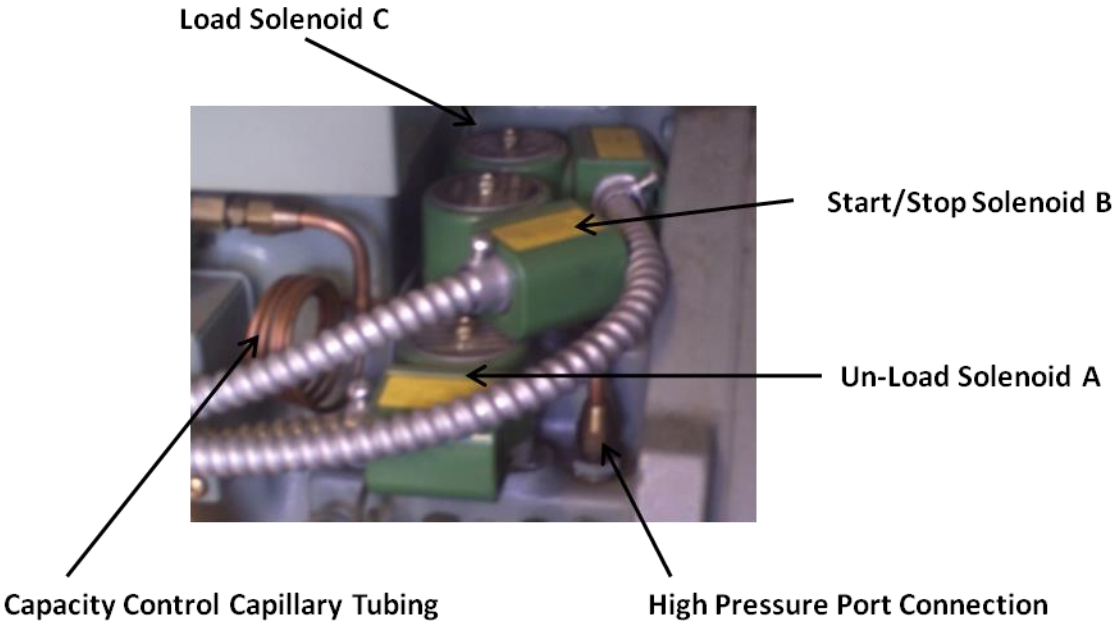
Hitachi Model	Oil Charge (Liters)	Oil Type
4005 SC	6	Hitachi SR30 or Suniso 4GS
5005 SC	7	
6005 SC	7	
10001 SC	10	

CSH Model	Oil Charge (Gallons)	Oil Type
6553-50	2.5	CPI4214-320
6563-60	2.5	
7553-70	3.96	
8553-110	5.8	

Bitzer Screw Compressors Frame 2 Shown



Hitachi 4002/5, 5002/5, 6002/5 Screw Compressors



Bitzer Screw

CSH6553-50-4PU / CSH6563-60-4PU / CSH7553-70-4PU
CSH8553-110-4PU
R22 460-6-60

Bitzer Infinite Control

#3 Unload or Minimum Capacity
#4 Load or Maximum Capacity Control

Minimum Capacity = 25%

Operation of Solenoids

#3 coil is "pulsed" to the desired capacity required

#4 coil is "pulsed" to the desired capacity required

Starting:
Automatic Start Unloading
No solenoids are energized

Hitachi Screw

4002SC-H / 5002SC-H / 6002SC-H / 10001SC-H
4005SC-H / 5005SC-H / 6005SC-H / 10005SC-H
R22 460-3-60

Hitachi Infinite Control

Solenoid A Unload or Minimum Capacity
Solenoid B Start-Stop
Solenoid C Load or Maximum Capacity

Minimum Capacity = 33% (4002) / 25% (5002/6002)

Operation of Solenoids

"B" is energized to start or stop the compressor
"C" is energized to Load the compressor
"A" is energized to Unload the compressor

Starting:
"B" solenoid is energized
"B" solenoid is to maintain on for 30 seconds
after starting prior to loading compressor

HITACHI SCREW COMPRESSOR
MODEL 10001SC-Z
INFINITE CAPACITY CONTROL SYSTEM

Condition	Solenoid A	Solenoid B	Solenoid C
Start / Stop	ON	OFF	OFF
Loading up	OFF	ON	OFF
Unloading	OFF	OFF	ON
Load Constant	OFF	OFF	OFF

Location of Solenoid Valves

The location of the three solenoid valves are shown in Figure 2-5.

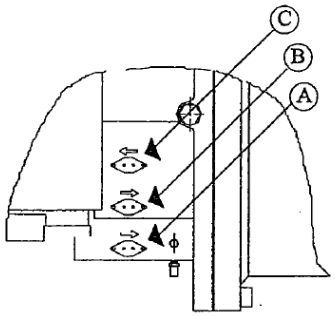
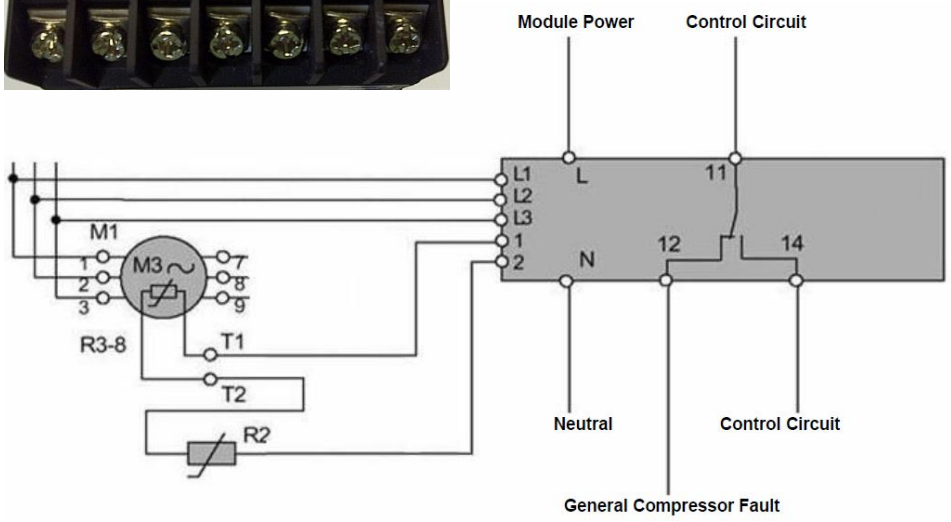


Figure 2-5 Compressor Casing
Viewed from the Top



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.

Bitzer Module provides:
Phase Protection
Motor temp protection (212°F max)
Disch Gas/Oil temp (251°F max)

Hitachi Module provides:
Phase Protection: Optional Accessory
Motor temp protection (194°F max)
Disch Gas/Oil temp (248°F max)

Module Wiring with SE-E1
Module is Supplied Pre-wired
Module power supplied to "L and N"
Module is Dual voltage 110/220 volt
Other voltages available (24 volt ac or dc)
Control Circuit supplied to "11 and 14"
Alarm Output "12"
Terminals "1 and 2" are pre-wired to
T-1, T-2 and Disch/Oil Temp Sensor
L-1,L-2,L-3 from the module are connected
to the terminal plate on L-1,L-2,L-3

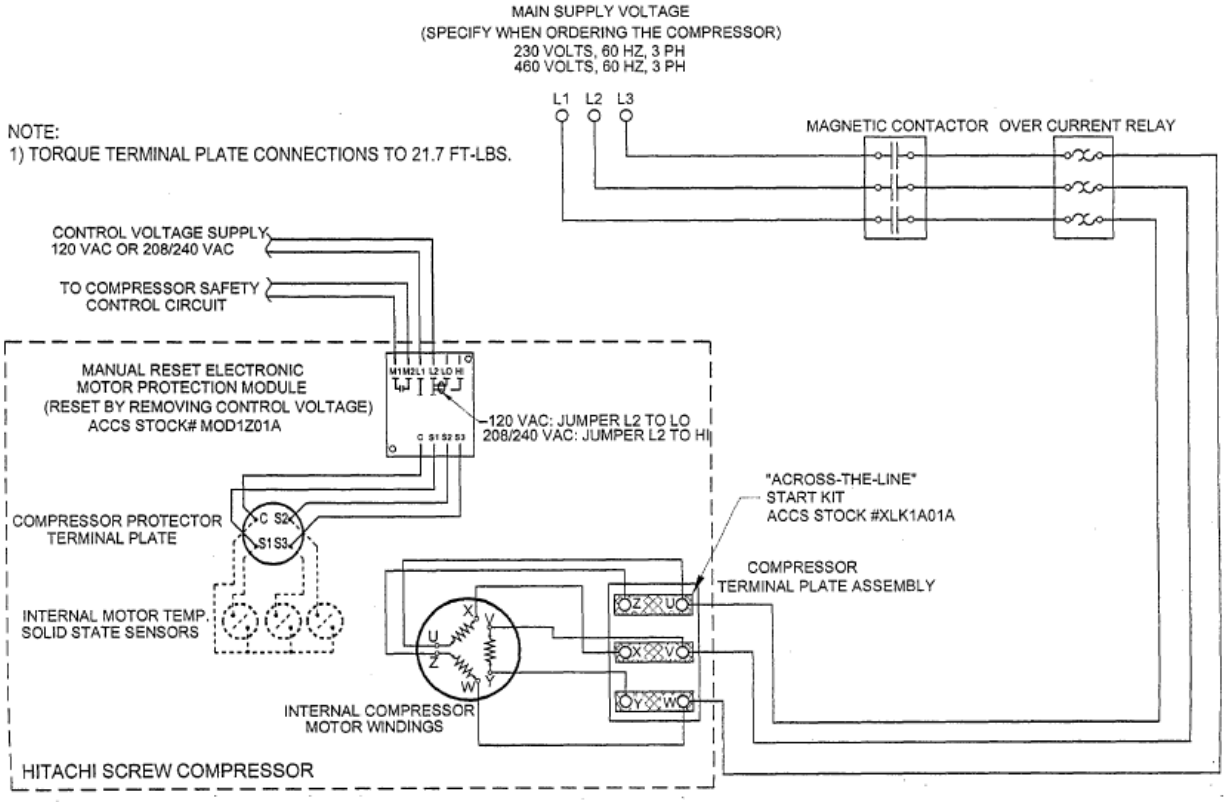
Hitachi Standard Module

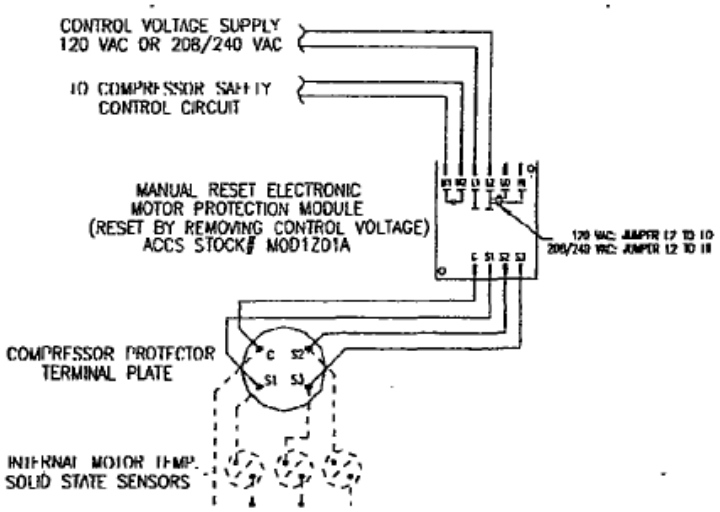
Module power supplied to "L1 and L2"
Control Circuit supplied to "M1 and M2"

The control wiring for these compressors also has some differences,
The Hitachi does have a motor protection module where the control circuit is wired through terminals M1 & M2 and module power is connected to L1 & L2.

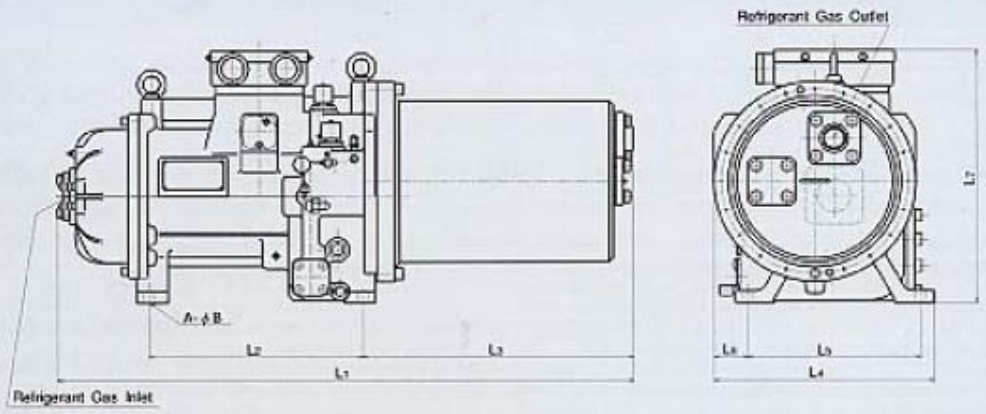
On the Bitzer CS Screw the control circuit is wired through terminals 11 & 14.
and module power is connected to L & N.
There is also an additional connection, terminal 12 that can be used to indicate a general compressor fault.

HITACHI SRM SEMI-HERMETIC SCREW COMPRESSOR - SERIES 4002SC-H, 5002SC-H & 6002SC-H
WIRING DIAGRAM FOR ACROSS-THE-LINE STARTING





4005SC-H / 5005SC-H / 6005SC-H / 4005SC-Z / 5005SC-Z / 6005SC-Z

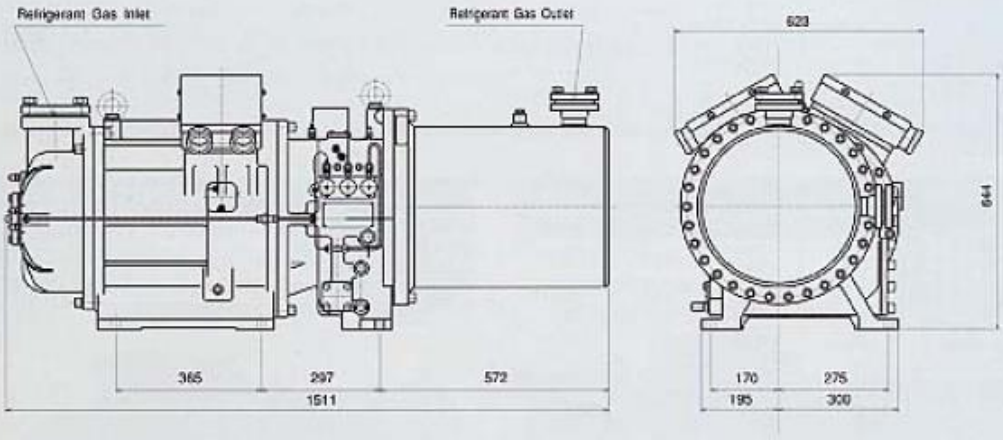


(mm)

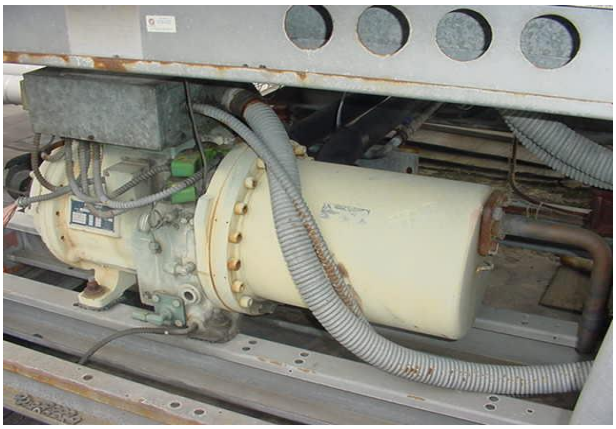
Model	L1	L2	L3	L4	L5	A-ϕB	L6	L7
4005SC-H 4005SC-Z	1,093	335	525	413	300	4-22	78	505
5005SC-H 5005SC-Z	1,179	445	548	456	360	4-22	70	530
6005SC-H 6005SC-Z	1,209	445	548	456	360	4-22	70	530

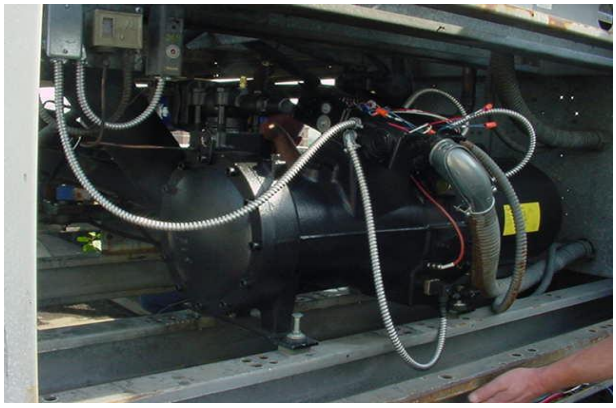
10001SC-H / 10001SC-Z

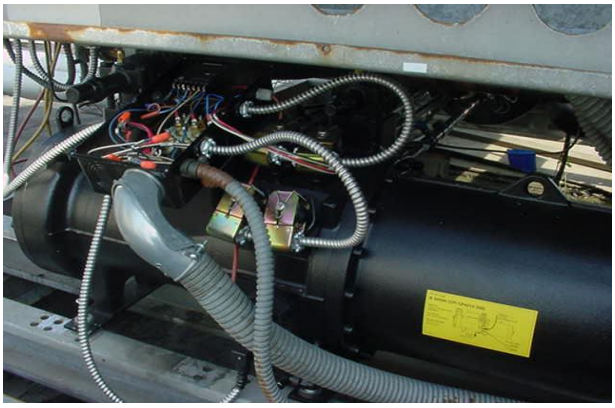
(mm)

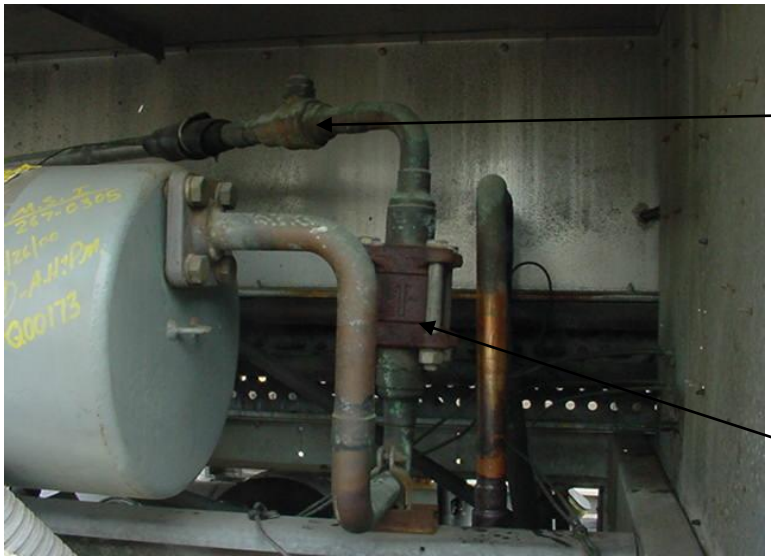



COMP-1









Remove Hitachi External Discharge Valve

Remove Hitachi External Discharge Check Valve

CSH / CSW Screw Accessories

Crankcase Heater - Special Voltage Heater	
Part # (Voltage)	**Model**
343213-07 (230V)(200W)	(CS65 - CS75)
343213-02 (230V)(300W)	(CS85 - CS95)

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 (CSW 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

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

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

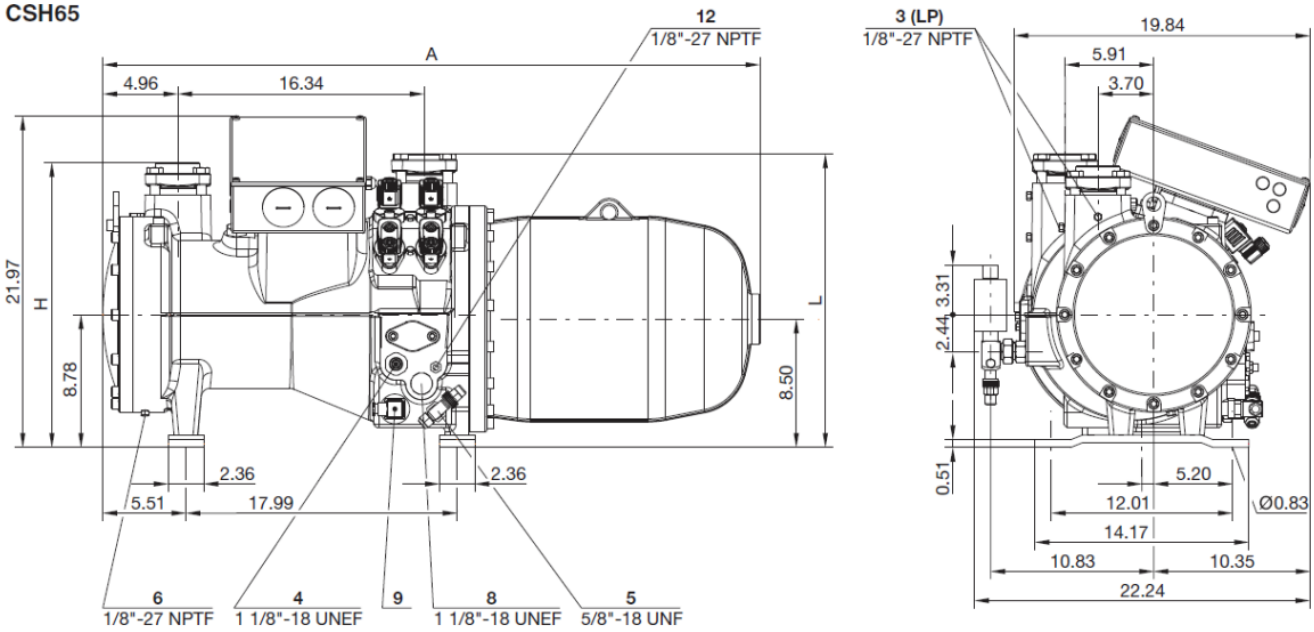
BSE 170 Polyolester Oil	
Unit of Measurement	**Part #**
1 gallon	793-1170-34
5 gallon	793-3170-34

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

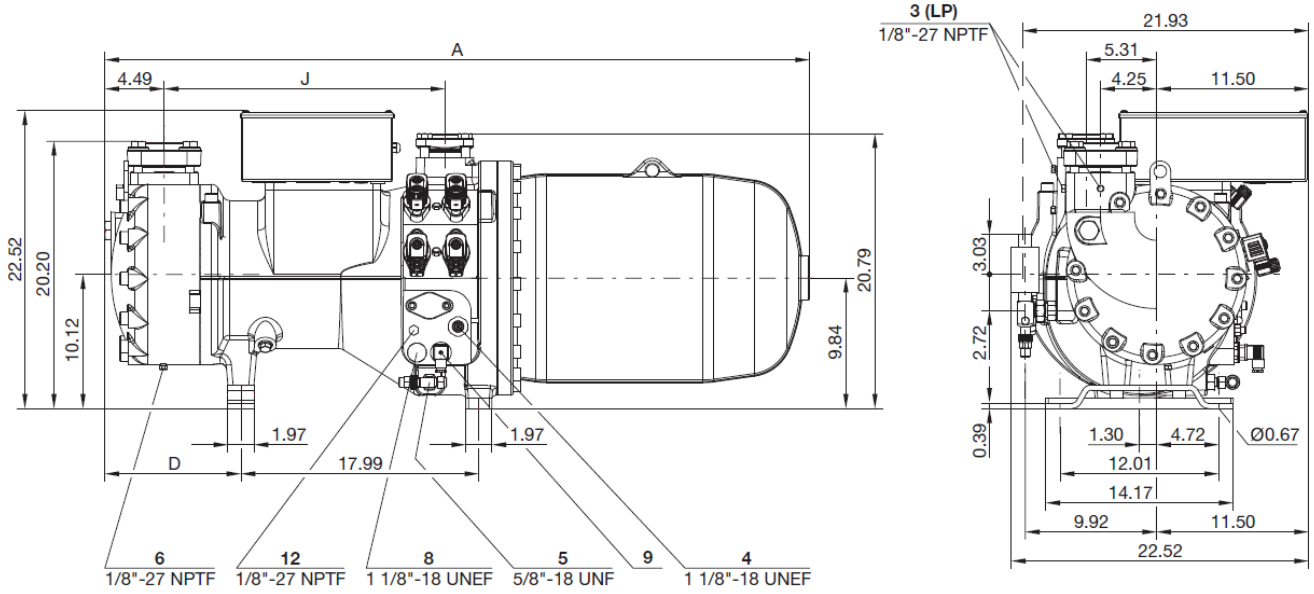
BITZER Oils for CS Series		
Model	**Refrigerant**	**Oil**
CSH	R22	B320SH
	R134a/R407C/R404A/R507A	BSE170
CSW	R22	B320SH
	R134a	BSE170L

BITZER CSH Screw Compressor Dimensional Data

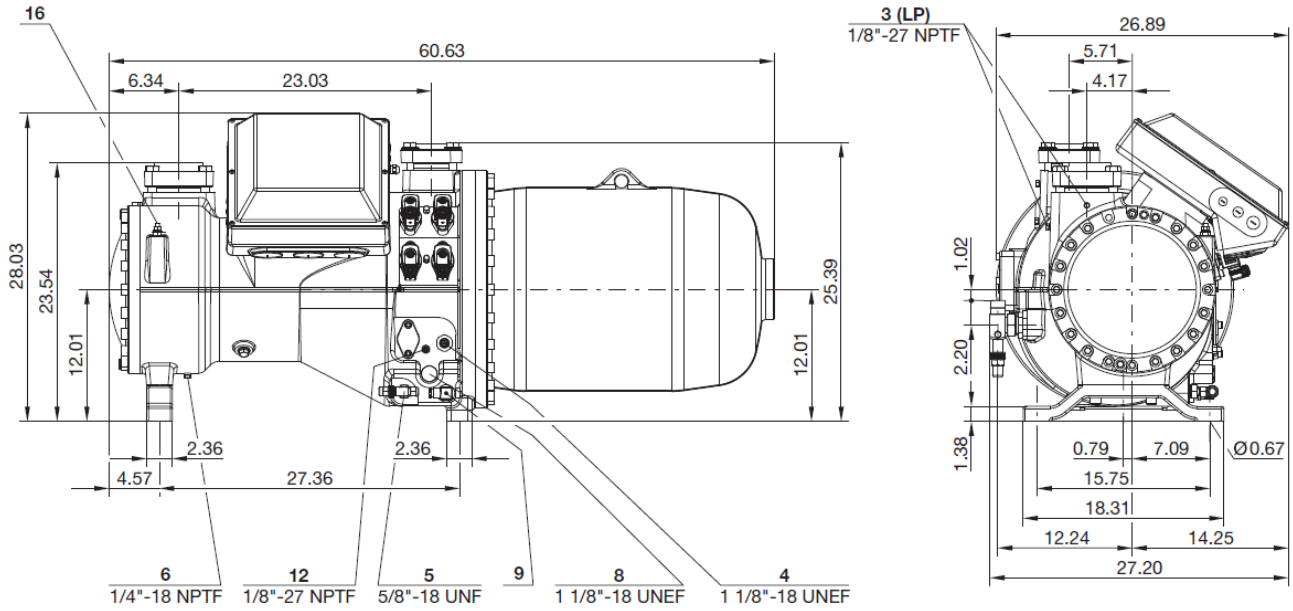
CSH65



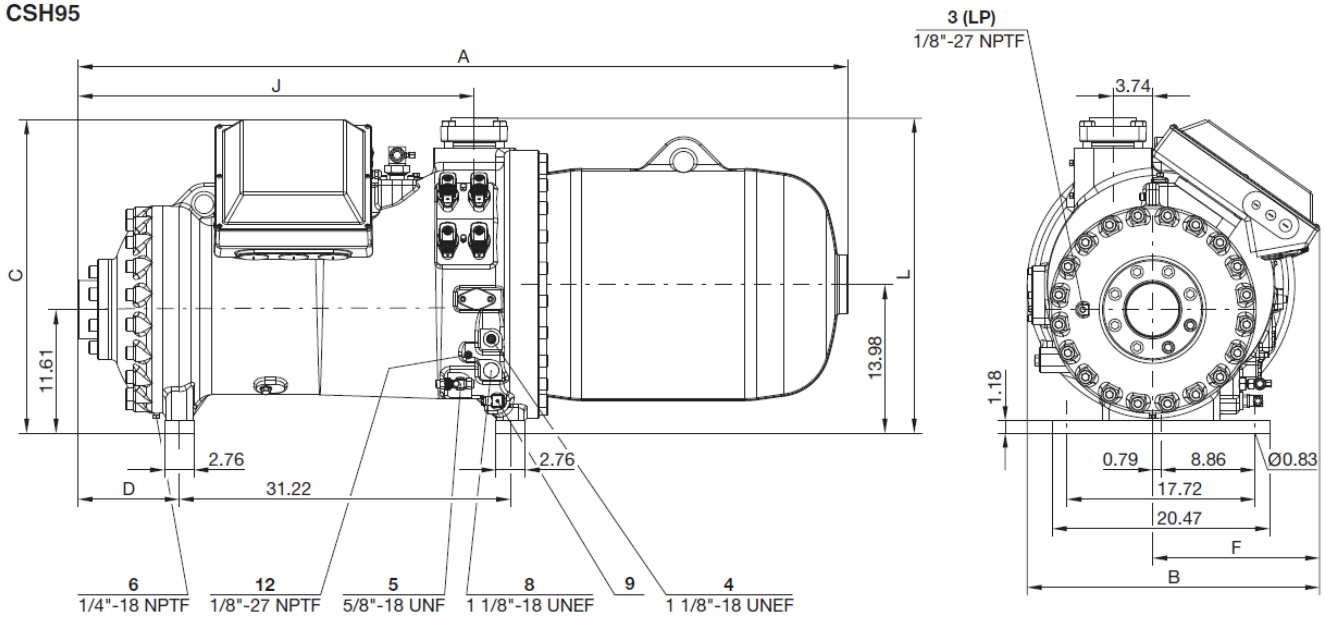
CSH75



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:_____

_____