Carlyle Scroll Compressor

Application Guide

Carlyle™

Introduction

Scroll compressors are becoming more prevalent in the HVAC industry. They have excellent reliability, high efficiency, low sound and vibration, and a flatter capacity curve over a range of operating characteristics when compared to reciprocating and rotary compressors.

This application manual is comprehensive and is intended to cover the majority of design/ manufacturing issues involved in applying the **CARLYLE** scroll compressor in HVAC systems.

Section 1.0

Describes the operating characteristics of the scroll compressor to familiarize the system designer with its features and key components.

Section 2.0

Provides a detailed explanation of the design specifications of the **CARLYLE** scroll compressor.

Section 3.0

Contains guidelines for the system designer, to assist in the successful application of the compressor.

Section 4.0

System Controls

Section 5.0

Provides guidelines for incorporating scroll compressors in the assembly process at the manufacturing site.

Section 6.0

Details techniques for servicing scroll compressors in the factory or field environment.

Section 7.0

Describes the excessive liquid floodback test procedure, used to determine the need for suction accumulators.

1.0 Scroll Compressor Functional Description

1.1 Key Components

1. Discharge Plenum
2. Discharge Tube
3. Fixed Scroll
4. Orbiting Scroll
5. Crankcase
6. Terminal Cover
7. Electric Terminal
8. Lower Bearing
9. Thrust Washer
10. Magnet
11. Shell
12. Eccentric Shaft
13. Stator
14. Rotor
15. Counterweight
16. Oil Drain Tube
17. Slider Block
18. O-Ring
19. Heat Shield
20. Lifting Lug
21. Internal Pressure Relief Valve (hidden)
22. Check Valve

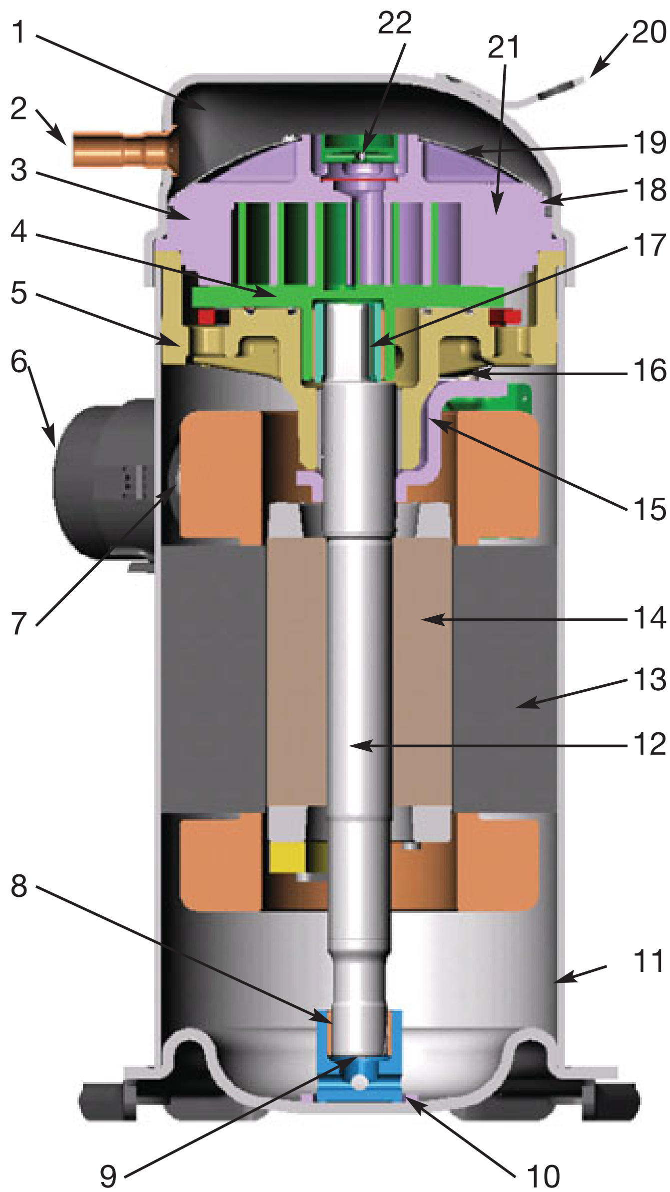


Figure 1-1

Scroll Compressor Components

A cutaway view of the scroll compressor with key components labeled is shown in Figure 1-1. The motor stator is rigidly attached to the shell. The rotor is shrink-fit onto the eccentric shaft. The shaft is supported by two bearings, one in the crankcase and the second below the motor.

1.2 Scroll Compression Process

The diagram shown describes the scroll compression process. The two components shown are mating involute scrolls. One scroll is fixed in place and the other scroll orbits within this fixed scroll. One part that is not shown in this diagram but is essential to the operation of the scroll is the anti-rotation coupling. This device maintains a fixed angular relation of 180 degrees between the fixed and orbiting scrolls. This fixed angular relation, coupled with the movement of the orbiting scroll, is the basis for the formation of gas compression pockets.

As shown here, the compression process involves three orbits of the orbiting scroll. In the first orbit, the scrolls ingest and trap-off two pockets of suction gas. During the second orbit, the two pockets of gas are compressed to an intermediate pressure. In the final orbit, the two pockets reach discharge pressure and are simultaneously opened to the discharge port.

This simultaneous process of suction, intermediate compression, and discharge leads to the smooth continuous compression process of the scroll compressor.

SUCTION

COMPRESSION

DISCHARGE

Figure 1-2

2.0 Key Features of CARLYLE Scroll Compressors

2.1 General

CARLYLE scroll compressors are manufactured in a world-class production facility using the latest state-of-the-art machining, assembly, and process control techniques. During all designing phases of both the compressor and the manufacturing facility, careful consideration was given to maintaining high standards of reliability and process control. The result is a product with world leadership in efficiency, low sound, and high reliability. The key features of the design are described below.

2.2 Reliability

Reliability objectives for the **CARLYLE** scroll compressor are more stringent than criteria for comparable reciprocating compressors. A rigorous qualification test program has been completed to ensure that these objectives have been met. These compressors have been tested in ambient temperatures ranging from -29°C to 51.6°C (-20°F to 125°F). Abusive test conditions such as transient slug and flooded start have exposed compressors to the equivalent of a fifteen-year life. Field-installed test systems with extensive instrumentation have been continuously monitored.

2.3 General Compressor Specifications

2.3.1 Condensing & Evaporating Temperature Ranges

The operating envelope for **CARLYLE** scroll compressors is shown in Table 2-1 where the condensing and evaporating temperatures represent the range for steady-state operation. Under transient conditions, such as start-up and defrost conditions (for heat pump applications), the compressor may operate outside this envelope for short periods.

Table 2-1 Operating Ranges

TEMPERATURE RANGE	Deg F	Deg C
Evaporating	-25 to 55	-31.7 to 12.8
Condensing	80 to 155 (150 max. for hi-eff)	26.7 to 68.3 (65.6 max. for hi-eff)
Maximum Discharge	280	137.8

2.3.2 Insulation Resistance/Dielectric Strength

The insulation resistance shall be greater than 1 megohm when measured with a 500 volt-direct current megohm tester.

Each compressor motor is tested at the factory with a high potential voltage (hi-pot) above the UL requirement of [(2 x Rated Voltage + 1000) X 1.25] for longer than the 1 second required. The leakage current should be less than 0.5mA.

CARLYLE scroll compressors are configured with the motor below the pump assembly located at the top of the shell. As a result, the motor is partially immersed in refrigerant and oil. The presence of refrigerant around the motor windings will result in lower resistance values and higher leakage current readings. These readings are not cause for concern and do not indicate a faulty compressor. It is recommended to operate the system for a brief period of time to redistribute the refrigerant throughout the system, and then retest the compressor for insulation resistance or current leakage.

2.3.3 Residual Moisture

Every compressor is dehydrated, evacuated, and charged with dry nitrogen at the factory prior to shipment. Maximum residual moisture levels for the two frame sizes are shown in Table 2-2.

Table 2-2 Residual Moisture Levels

FRAME SIZE	RESIDUAL MOISTURE mg (oz.)
XC/XG SERIES	300 (0.0106) max.
XN/XR SERIES	500 (0.0176) max.

2.3.4 Oil Charge Levels

The compressors are charged with oil at the factory to the levels shown in Table 2-3. Alkylbenzene oil is used for R-22 models, the oil is Sontex SA32 with 1.5% Syn-O-Ad. R-410A and 407C use POE oil, Hatco FRL 32ST, ISO viscosity grade 32. If additional oil charge is added for in-service conditions, only use the oils noted above.

Table 2-3 Oil Charge Levels

Frame	Phase	Capacity	Oil Charge ml (fl. oz.)
XC	All	30-42	1065 (36)
		43-47	1330 (45)
XG	All	32-41	1065 (36)
XR/XN	All	All	1567 (53)

2.3.5 Starting Voltage

At a temperature of 20°C (68°F) or above, the compressor will start at 90% of the lowest nameplate voltage when measured near to the compressor (92% for 1ø high efficiency models), with the compressor energized. Voltage should not be measured directly at the compressor terminals under energized conditions with the terminal cover removed. Prior to energizing, verify that leads and terminal connectors are in proper working condition. The closest point of safe terminal voltage measurement is typically at the load side of the contactor.

2.3.6 PTC Starting Kits

If start assist is required for single-phase compressors, a 12.5 ohm Positive Thermal Coefficient (PTC) device, shown in Figure 2-1, is recommended. The PTC device should
be installed across the terminals of the compressor run capacitor. The PTC is a fail-safe device. If the component becomes defective, it fails open. If a unit having a PTC fails to start on the first attempt, it is necessary to wait 5 to 10 minutes for the device to cool down and reset before attempting to start again.

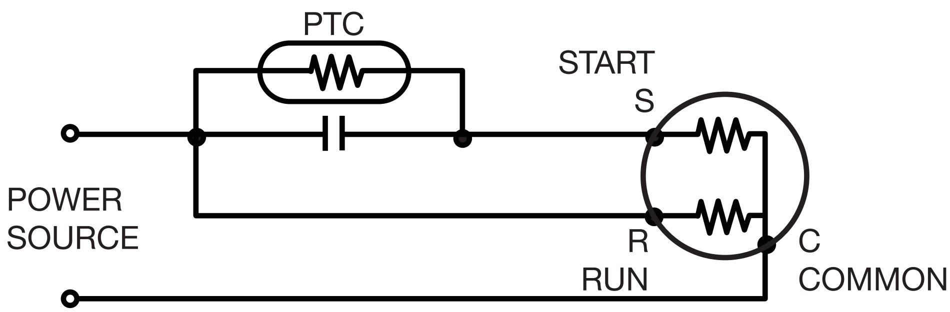


Figure 2-1

2.3.7 Internal Motor Protection

CARLYLE scroll compressors are protected by internal line breaks mounted on the motor windings. These protectors are automatic reset devices containing a snap action bimetal switch.

Internal protectors respond to over current and high temperature. They are designed to interrupt motor current under a variety of fault conditions such as failure to start, running overload, and fan failure. In single-phase compressors, internal protectors protect against external miswiring, such as reversing electrical connections to the Run (r) and Start (S) terminals. In three-phase compressors these devices provide protection during secondary single-phase conditions.

2.3.8 Dimensions

Table 2-4 Outline Drawings*

Frame	Standard	Screw Terminal	Tandem
XC/XG	0XC6301B	N/A	N/A
XR/XN	0XR6002B	0XR6089B	0XR6049B

*See individual specification document for further details.

3.0 System Design Considerations

3.1 General

The successful application of scroll compressors is dependent on a good match between the system design and the compressor. A poorly matched system will result in the compressor running beyond the limitations specified in this manual. This may result in poor performance and/or reduced reliability.

3.2 Sound Levels

3.2.1 At Start-Up

During the start-up transient it is natural for the compressor sound levels to be slightly higher. These scroll compressor models exhibit very little start-up transient sound. If the compressor is miswired in 3-phase models, the compressor will run in the reverse direction. The reverse rotation is characterized by an objectionable sound from the compressor. This can be corrected by disconnecting power and switching any two power leads at the unit contactor. Never switch leads directly at the compressor.

3.2.2 Normal Running

Scroll compressors are designed with optimized discharge ports and wrap geometry to control the sound levels of each compressor. Properly designed shock loops for suction and discharge connecting tubes will enhance the sound level benefit of the scroll, as well
as reduce vibration and premature tube breakage. (Tube design and testing information is available from the Application Engineering Department).

The use of a sound shield is not required, but is acceptable if an application requires it.

3.3 Voltage Range

Running voltage measured at the compressor between common and run terminals should be within ± 10% of the nominal rated voltage of the compressor to ensure continued operation.

For three-phase applications the voltage measured at the compressor terminals for any phase should be within ± 2% of the average for all phases.

Warning: For safety reasons, these voltage measurements should be at the unit contactor, not at the compressor terminals. Always keep the terminal cover in place when the compressor is energized.

3.4 Refrigerant

The **CARLYLE** scroll compressor was designed to operate with Refrigerant-22 (using Alkylbenzene oil), 407C and 410A (using polyolester oil).

3.5 Evaporating Temperature Range

The minimum continuous saturated suction temperature is -31.7°C (-25°F) which corresponds to a pressure of 50.9 kPa (7.39 psig) for R-22, 25.5 kPa (3.7 psig) for R-407C and 155.2 kPa (22.5 psig) for R-410A. The maximum continuous saturated suction temperature is 12.8°C (55°F) which corresponds to a pressure of 638.4 kPa (92.56 psig) for R-22, 590.5 kPa (85.6 psig) for R-407C and 1075.2 kPa (155.5 psig) for R-410A. During transient conditions such as start-up and defrost cycles (for heat pump applications) the compressor may operate beyond these limits for brief periods of time.

3.6 Condensing Temperature Range

The minimum continuous saturated discharge temperature is 26.7°C (80°F) which corresponds to a pressure of 989.4 kPa (143.6 psig) for R-22, 950.4 kPa (137.8 psig) for R-407C and 1622.9 kPa (235.3 psig) for R-410A. The maximum continuous saturated discharge temperature is 68.3°C (155°F) which corresponds to a pressure of 2791.1 kPa (405.1 psig) for R-22, 2922.7 kPa (423.8 psig) for R-407C and 4448.6 kPa (645 psig) for R-410A. The maximum for high efficiency models is 65.6°C (150°F) corresponding to 2631.2 kPa (381.5 psig) for R-22 and 4194.1 kPa (608.1 psig) for R-410A. During transient conditions such as start-up and defrost cycles (for heat pump applications), the compressor may operate beyond these limits for brief periods of time.

3.7 Maximum Discharge Gas Temperature

Discharge gas temperature should be measured with an isolated thermocouple attached to the discharge line 15.3 cm (6 inches) from the shell of the compressor. Maximum discharge gas temperature must not exceed 137.8°C (280°F) when the compressor is running within the approved operating envelope.

3.8 Maximum Suction Gas Temperature

Maximum suction gas temperature under steady-state operating conditions is 41°C (105°F).

3.9 Maximum Length and Elevation of Piping

In split system type applications, the maximum length of piping between the indoor and outdoor sections is not to exceed 15.25 m (50 feet). The maximum elevation difference between the indoor and outdoor section cannot exceed 7.62 m (25 feet). System manufacturers should specify precautions for any applications that exceed these limits to ensure compressor reliability.

3.10 Maximum Refrigerant Charge Without Suction Accumulators

Maximum refrigerant nameplate charge for the XC/XG frame size is 3.63 kg (8 lb.) and 5.44 kg (12 lb.) for the XN/XR frame size. Refer to Section 6.0 for outlining the suction accumulator requirements when maximum charge levels are exceeded.

3.11 Maximum Operating Angle of Inclination

The inclination from the vertical plane shall not exceed 7 degrees.

3.12 Maximum Operating Condition

The maximum load condition for long term operation is 638.5 kPa (92.6 psig) suction pressure and 2792 kPa (405 psig) discharge pressure for R-22, and 90% rated voltage. (Pressures for R-407C are 590.5 kPa (85.6 psig) suction and 2922.7 kPa (423.8 psig) discharge, and for R-410A are 1072.5 kPa (155.5 psig) suction and 4448.5 kPa (645 psig) discharge).

3.13 Residual Moisture

Residual moisture content of the system with refrigerant charge should be less than 60 PPM for systems with no drier and less than 10 PPM for systems with a drier.

3.14 Residual Contaminates

Residual solid contaminates in the system should not exceed 28 mg per 1.0 kW of nominal system capacity. The compacted volume of solid contaminates should not exceed 0.07 cc per 1.0 kW of nominal system capacity.

3.15 High-Pressure Ratio

Scroll compressors are fixed volume ratio machines and therefore operate more efficiently near the designed pressure-ratio. In the extreme case, do not exceed 7.5:1 pressure ratio (discharge pressure to suction pressure in psia) for extended periods.

3.16 Three Phase Reverse Rotation

Scroll compressors will only compress in one rotational direction. This is particularly important with three-phase compressors since the motor will run equally well in either direction. Reverse rotation results in excessive noise, no suction/discharge pressure differential and warming of the suction line (rather than immediate cooling). A service mechanic should be present at initial start-up to verify incoming power is properly phased to the system, and that both compressor and blowers are rotating in the correct direction.

4.0 System Controls

4.1 Low Pressure Switch

A manual reset low pressure switch is recommended for applications where charge loss may go unnoticed for extended periods.

4.2 High Pressure Switch

A manual reset high pressure switch is recommended in order to protect the compressor during the blocked coil or fan failure condition. The recommended set point should be at 3103 kPa ± 34.5 kPa (450 psig ± 5 psig) for R-22 and 407C and 4207 kPa ± 70 kPa (610 psig ± 10 psig) R-410A.

4.3 Three Phase Reverse Rotation

Scroll compressors will only compress in one rotational direction. This is particularly important with three-phase compressors since the motor will run equally well in either direction. Reverse rotation results in excessive noise, no suction/discharge pressure differential and warming of the suction line (rather than immediate cooling). A service mechanic should be present at initial start-up to verify incoming power is properly phased to the system, and that both compressor and blowers are rotating in the correct direction.

4.4 Crankcase Heater

Crankcase heaters are recommended for all applications. Typical sizing is 40 watt for XC/XG frame and 50 watt for XR/XN frame unless application dictates different needs.

4.5 Liquid Line Filter/Dryers

A properly sized filter/drier is required for all **CARLYLE** scroll applications. Filter/Dryers are to be located in the liquid line.

4.6 Minimum Sump Superheat

The minimum sump temperature is on a sliding scale from -12.22 to -1.11°C (10 to 30°F) based on saturated suction temperature. Refer to Figure 7-3 and to Section 7.0 for floodback test criteria and procedures.

4.7 Mounting Hardware

CARLYLE recommends the use of a neoprene grommet with a durometer range of 34-45. Mounting hardware: bolts, nuts, washers, and sleeve should be low carbon steel that is treated to withstand at least 100 hours of salt spray testing.

7SC5828B	Neoprene grommet
0SC5831B	Sleeve washers, and screw assembly

5.0 System Assembly and Process Considerations

5.1 Compressor Holding Charge

Each compressor is shipped with a dry nitrogen nominal holding charge between 71kPa and 101 kPa (10.3 psig and 14.7 psig) and is sealed with elastomer plugs. The plugs should be removed with care to avoid the loss of oil when the holding charge is released.

5.2 Tube Brazing Procedure

During brazing the unit piping to the compressor, a nitrogen purge must be used. Do not bend the discharge or suction lines or force the unit piping into the compressor connections since this will increase stresses and potential for failure. For brazing procedures and recommended material, see Figure 4-1 and the procedures listed below.

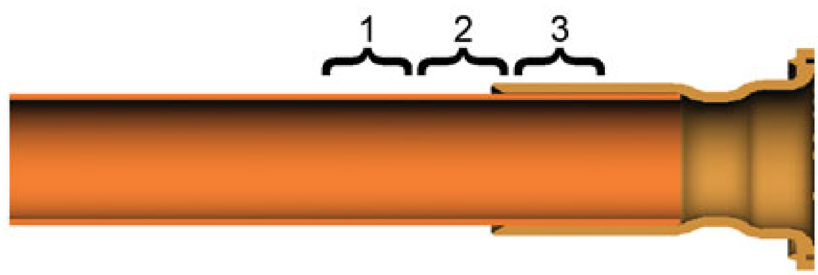


Figure 5.1

1. Recommended brazing material: A copper-phosphorus brazing material is recommended for copper suction and discharge fittings. Sil-fos and other silver braze materials are acceptable as well.

2. Clean the compressor tubing and system piping prior to assembly. Do not remove copper plating.

3. A double-tipped torch is recommended during brazing.

- **a.)** Apply heat to Area 1, moving the torch up and down and rotating around the tube in order to heat the tube evenly. It will become a dull orange color.
- **b.)** Move the torch to Area 2 until it reaches a dull orange color. Move the torch up and down and rotate it around tube in order to heat the tube evenly.
- **c.)** Add braze material to the joint while moving the torch around joint to flow braze material evenly around the circumference.
- **d.)** After braze material flows around the joint, move torch to Area 3. This will draw the braze material into the joint. The time spent heating Area 3 should be minimal, in order to keep excess braze material from entering the compressor.

5.3 System Evacuation

The system must be evacuated to a vacuum level of at least 200 microns of mercury to remove residual moisture.

5.4 System Charging

It is recommended that system charging be done using the weighed charge method, by adding refrigerant to the high side of the system. Charging the high and low sides of a system with gas simultaneously and at controlled rate is also an acceptable method. Do not exceed the recommended unit charge and never charge liquid to the low side.

5.5 Wiring Connections

The **CARLYLE** scroll compressors will only compress gas in the counter-clockwise direction when viewed from the top. Since single-phase motors will start and run in only one direction, reverse rotation is not a major consideration. Three-phase motors will start and run in either direction depending on the phase angles of the supplied power. This requires care during installations to ensure the compressor is operating in the proper direction. Verification of proper rotation is done by observing suction and discharge pressures when the compressor is energized. A decrease in discharge pressure and an increase in suction pressure indicate reverse rotation. After several minutes of operation the compressor line break will de-energize the compressor. In order to correct this, disconnect power and switch any two power leads at the unit contactor. Never switch leads directly at the compressor.

Internal wiring of the **CARLYLE** three-phase scroll compressor is consistent with the direction or rotation. As a result, once the correct phasing is determined for a specific system or installation, connecting properly phased power leads to the same terminals should maintain proper rotation direction. A phase monitor can be applied to ensure correct rotation when power is initiated. Figure 5-2A shows the electrical terminal labeling for reference when wiring the compressor. For three phase applications the terminals are labeled T1, T2 and T3. For single-phase applications the terminals are labeled C (common), S (start), and R (run). Each compressor is labeled with both sets of labels as shown in Figure 5-2A. Compressors are available with ring terminals, shown in Figure 5-2B.

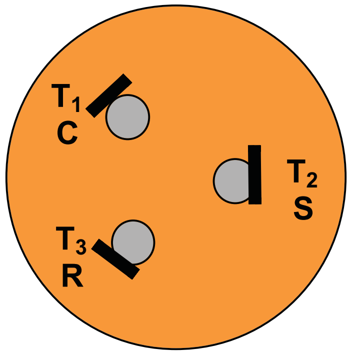


Figure 5-2A

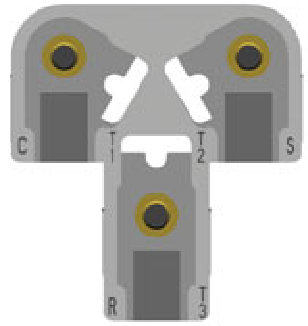


Figure 5-2B

5.6 Terminal Cover and Gasket

The terminal cover and gasket should be installed prior to operation of the compressor. The terminal cover has two tabs on the outside diameter 180 degrees apart which engage into the terminal fence. To ensure the cover is installed properly, check that the lead wires are not pinched under it. To avoid placing the cover upside-down, check the inside of the terminal cover for the arrow, which indicates the top of the terminal cover. Please refer to Figure 5-3. The inside of the terminal cover as well as the gasket each label the terminal pin, C (common), R (run), and S (start).

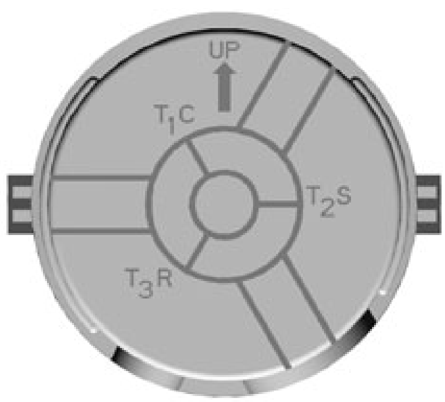


Figure 5-3

6.0 Service Considerations

6.1 System Evacuation

When evacuating a system in the field, it is extremely important to use a vacuum manifold set with at least 2 vacuum lines connected to the system. One line must be connected to the high side of the system and one line must be connected to the low side of the system. This procedure is necessary to ensure that the system is completely evacuated, since the scroll sets can seal under some non-energized conditions and in turn isolate the high and low sides from each other. If this situation occurs and only a single evacuation line is used; it is possible to unknowingly leave some charge in the system. This could create a hazard if the system was unbrazed with a refrigerant charge still present in the system. Whenever the compressor is replaced, the filter drier should be replaced at the same time. Please be sure to follow all government regulations regarding refrigerant reclamation and storage.

6.2 Unbrazing System Components

The preferred method of replacing a compressor is to cut the connecting lines using a tubing cutter, however unbrazing is acceptable using the following precautions. Before unbrazing any system component, it is extremely important to check both the high and low sides of the system with manifold gauges to ensure that all refrigerant has been reclaimed. A refrigerant and oil mixture can ignite if it comes in contact with a flame. This hazard dictates the caution that must be taken when unbrazing system components.

6.3 Replacing Filter Drier

Reference manufacturer's sizing instructions.

6.4 Brazing Procedure

Please note Figure 6-1 and the procedure listed for field servicing of system components.

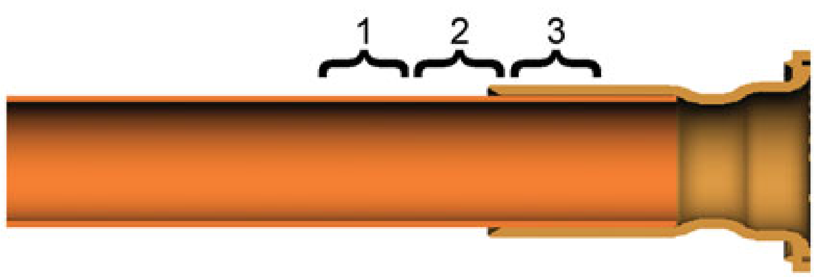


Figure 6.1

To Disconnect:

1. Disconnect power and remove wires from junction box.

2. Insure all pressure is out of the system (check high and low sides).

3. Heat Areas 2 and 3 slowly and uniformly until braze material softens and the tube can be pulled from the compressor fitting.

6.4 Brazing Procedures (Continued)

To Reconnect:

1. Recommended brazing material: See Section 5.2

2. Clean tube and fitting.

3. Reinsert tube into fitting.

4. Heat tube uniformly in Area 1, moving slowly to Area 2. When joint reaches brazing temperature (a dull orange color), apply the brazing material.

5. Heat joint uniformly around the circumference to flow the braze material completely around and into the joint.

6. Slowly move the torch into Area 3 to draw the braze material into the joint.

7. Do not overheat the joint. In some applications a cherry red color is indicative of overheating, which can weaken the joint and fittings.

6.5 CARLYLE Scroll Compressor Functional Check

In order to evaluate whether the **CARLYLE** scroll compressor is functioning properly, the following procedures should be observed:

1. Voltage of the unit should be measured and verified as being correct.

2. An evaluation of the electrical system should be performed next. The status of the motor should be checked by using continuity and short to ground testing. The internal motor protector should be given time to reset if a continuity break is found in the motor windings.

3. Operation of indoor and outdoor fan/blower should be checked and verified as being correct.

4. Check charge levels by connecting service gauges to the suction and liquid service valves and then turning on the compressor. Correlate the operating pressures to the system manufacturer specifications for the existing conditions in which the unit is operating.

5. After checking the reversing valve and determining the operation is acceptable (heat pump only), verify that the compressor current is within the published compressor specifications at the proper operating conditions. If significant deviation from published specification occurs (+/- 15%), this may indicate a defective compressor.

6.6 Compressor Replacement – Motor Burn Out

If a motor burn out is present, follow the evacuation procedure in section 6.1. Remove and replace the liquid line filter drier, and install properly sized suction line filter drier (section 6.3). Be sure to use the proper clean out procedures. The suction line filter drier should be checked within 48 hours to check the pressure drop across it. If a pressure drop exists that exceeds the filter drier recommendations, the liquid line and suction line filter dryers must be replaced.

6.6.1 Clean Out Procedure

Recover refrigerant from the system using standard recovery procedures and equipment. Remove failed compressor. Install manufacturer's recommended size filter-drier in the suction line, and an oversized filter drier in the liquid line. Evacuate system (section 6.1) before recharging with refrigerant through a filter drier. Monitor pressure drop across the filter Dryers as contaminants are filtered out for next four hours. If the maximum limit of pressure drop has been reached replace the filter drier and restart system.

7.0 Floodback Test Procedure

CARLYLE recommends the use of a thermostatic expansion valve for all air conditioning and heat pump system applications. The inherent benefit of TXVs is not only in modulating the system for varying load conditions, but protects the compressors from excessive floodback during adverse running conditions.

When the use of fixed orifice devices are designated in the system design, the following tests should be conducted.

ACCUMULATORS AND LIQUID FLOODBACK

Excessive liquid refrigerant floodback during steady state operation is a major system design consideration for all types of compressors. Oil dilution that occurs at excessive floodback can have a significant effect on bearing reliability. Suction accumulators may be required in some applications to prevent floodback.

The following test procedures are provided for determining the need for suction accumulators. Refer to Figure 7-1 and Figure 7-2 to determine when to apply the following test.

7.1 Excessive Liquid Floodback Test

7.1.1 Split Unit Cooling Mode

Set up a system with the smallest rated indoor section for the tested outdoor section. Charge the system with 120% system nameplate charge using 7.62 m (25 feet) of interconnecting tubing. The indoor and outdoor sections are to be operated with full airflow. Operate the compressor at nameplate voltage. Operate the system at 46.1°C (115°F) dry bulb outdoor and 19.4°C (67°F) dry bulb, 13.9°C (57°F) wet bulb indoor for a minimum
of one hour. The sump superheat (compressor base temperature minus saturated suction temperature) must be in “ACCEPTABLE ZONE” as shown in Figure 6-3 or a suction accumulator is required.

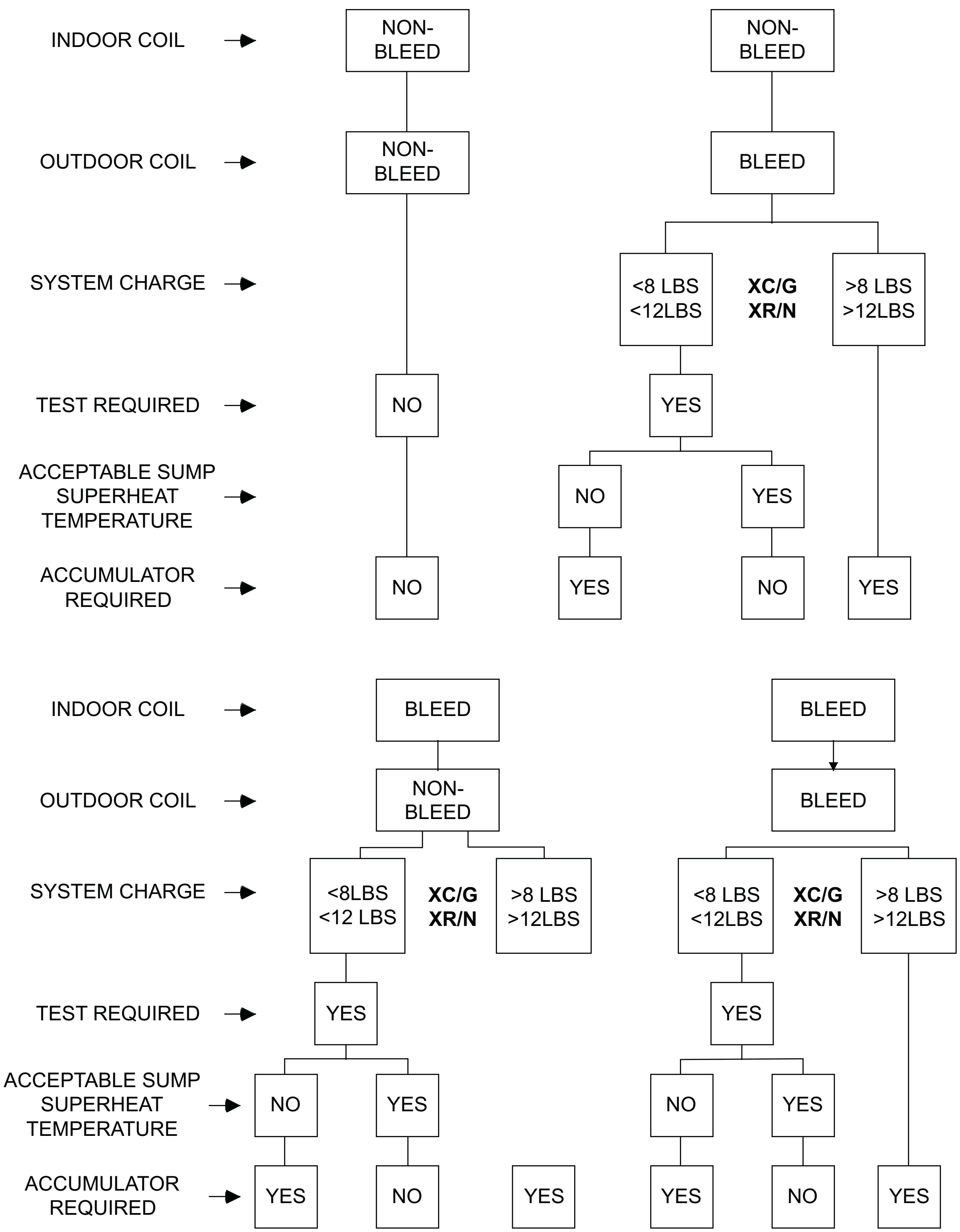
7.1.2 Split Unit Heating Mode

Repeat the test in paragraph 6.1.1 except with the system in heating mode and with the outdoor temperature at -17.8°C (0°F) dry bulb. The sump superheat must be in the “ACCEPTABLE ZONE” as shown in Figure 6-3 or a suction accumulator is required.

7.2 Accumulator Application

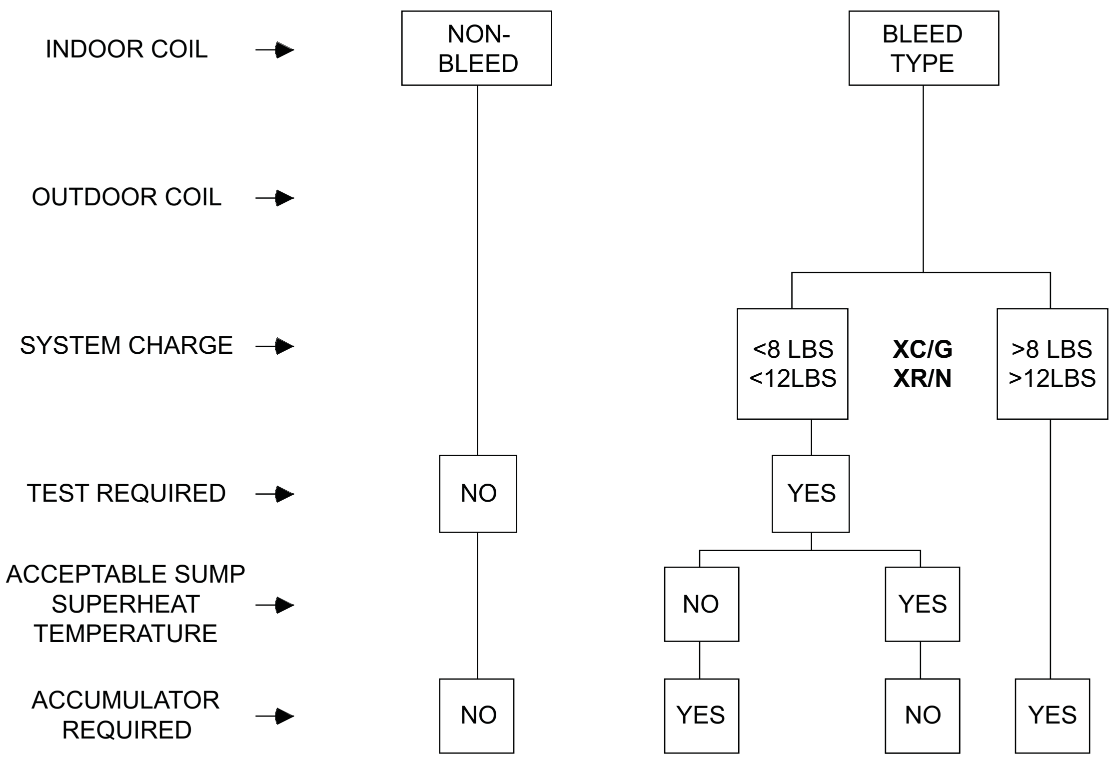
7.2.1 Contact CARLYLE for correct information.

Figure 7.1 Heat Pumps



Floodback Test Procedure

Figure 7.2 Air Conditioning



Floodback Test Procedure

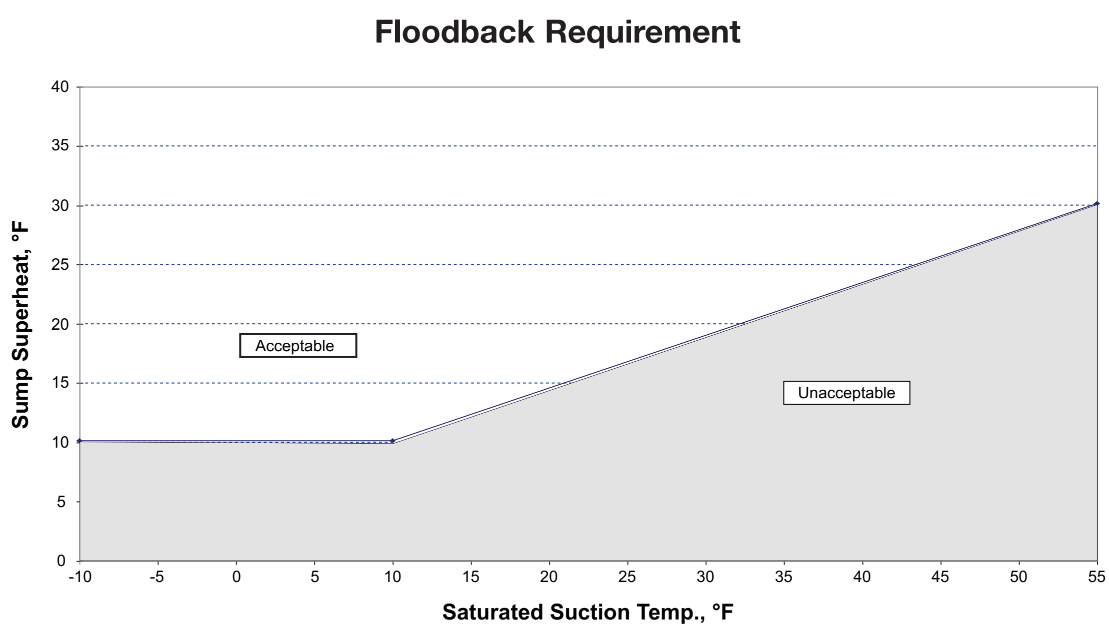


Figure 7-3

For more information about Carlyle's line of scroll compressors, contact:

Carlyle Compressor Company

P.O. Box 4808

Syracuse, New York 13221, U.S.A.

Phone: 1-800-GO-CARLYLE (1-800-462-2759) U.S.A. & Puerto Rico

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