Carlyle | Installation Instructions

06T Semi-Hermetic Screw Compressor

General

1. Inspect compressor for shipping damage and file claim with shipping company if damaged or incomplete.
2. Check compressor nameplate for correct model and voltage designation.
3. The Carlyle 06T twin screw compressor offers the same physical dimensions and port locations for all models.

WARNING: This compressor has metric threads. All parts of this compressor are fastened with bolts having metric threads including service shut-off valves and lifting holes with the following exceptions:

Economizer port: 1-5/16-12 SAE O-ring boss
(Hex Head 1-1/2" nut)
Oil Feed ports: 3/8" Flare
Terminal Box covers" #10-24
Terminal Bolts: 3/8-16 UNC

4. The screw application guidelines should be carefully reviewed by the personnel responsible for the design of the units in which these compressors will be installed. It is important that these guidelines are carefully followed to ensure safe and reliable operation.
5. To facilitate customer installation requirements, the following parts are factory supplied in a separate parts bag located in the compressor terminal box or packed in the compressor shipping container:

Miscellaneous Parts:

Item	Part Number	Description	Qty.
1	06EA500551	Jumper Bar (2 hole)	3
2	AT14QA241	Jam Nuts (3/8")	6
3	KH11HH066	Oil Inlet Screen	1
4	AK16AS126	Thread cutting screw	4
5	06EA500652	Cover Plate	1
6	574-031	Instruction Sheet	1

Service Valve Parts Packages:

For 06T **065 thru 06T 108 & ALL 05T Compressors**

Item	Part Number	Description	Qty.
1	06TA660004	Rotolok Valve & Spud	1
2	06TA680008	Service Valve Package	2

For 06T **033 thru 06T 054 Compressors**

Item	Part Number	Description	Qty.
1	06TA660004	Rotolok Valve & Spud	1
2	06TA660001	Service Valve Package	2

SAFETY INSTRUCTIONS

1. Follow recognized safety procedures and practices.
2. Do not remove any compressor bolts or fittings until factory supplied holding charge has been relieved. Exhaust holding charge pressure through the suction schrader valve connection (located on rotor housing; Fig. 5). Remove the connection cap and depress the internal stem. **Do not** exhaust the holding charge from the discharge schrader valve because oil may be exhausted with the holding charge.
3. Do not apply any power to the compressor unless all valves are open and on (suction/discharge service valves, economizer and oil shut off valves).
4. Do not operate or provide any electrical power to the compressor unless the terminal box cover is in place and secured. Measurements of the current and voltage during running conditions must be taken at other points in the power supply.
5. Do not remove terminal box cover until all electrical sources have been disconnected.
6. Follow recommended safety precautions listed on the terminal box cover label before attempting any service work on the compressor.

WARNING: Failure to follow these instructions could result in serious personal injury.

INSTALLATION PROCEDURES

1. HOLDING CHARGE

   The screw compressor is factory supplied with 15 psig (2 bar) holding charge of nitrogen or dry air. The internal pressure must be relieved before attempting to remove any compressor fitting or part. Relieve the holding charge by removing the threaded cap on the low pressure schrader connection fitting and depressing the internal schrader type stem (see Fig. 5 for low pressure fitting connection).

CAUTION: This compressor may contain trace amounts of oil. Do not relieve the holding charge or open the compressor ports until it is ready to be connected to a closed dry system. Excessive moisture may shorten compressor life.

2. SERVICE VALVES

   The suction and discharge service valves along with appropriate gaskets are shipped with the compressor. A special Rotalock® service valve is also shipped with the compressor (mounted on the motor housing) for the economizer or liquid injection line shut off.

Bolt Size	Torque		Description
	(lb-ft)	(Nm)	
M12 – 1.75 x 40	75-85	102-115	Bolts For 06TA680008
M12 – 1.75 x 60	75-85	102-115	Bolts For 06TA660001
1-5/16 x 12 SAE	129-141	175-191	Spud For 06TA660004

WARNING: All bolts for the Carlyle 06T screw compressor are metric (except as noted under "General" item #3).

When brazing piping to service valve, wrap it in a wet cloth to prevent heat damage.

3. OIL SCREEN

   06T screw compressors are supplied with an oil inlet screen. It must be installed upstream of the oil feed connection point by inserting the screen into the connecting 3/8" oil feed tubing. As an alternative, a Carlyle combination oil solenoid/sight glass (EF23ZZ025) can be used at the compressor oil feed connection point. It includes an oil screen at its oil inlet.

4. OILS

   Adding and removing oil is done through the oil separator not the compressor. Draining the oil should be done from the bottom of the oil separator. The compressor has no oil sump and is not charged with oil. When additional oil or a complete oil change is required use only the listed Carlyle approved oils.

FIGURE 1

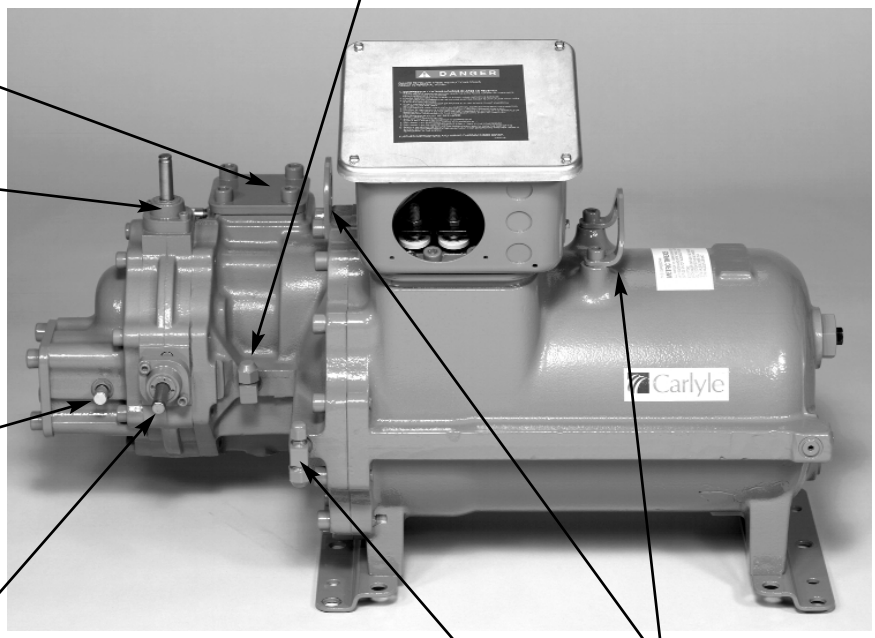


FIGURE 2



FIGURE 3

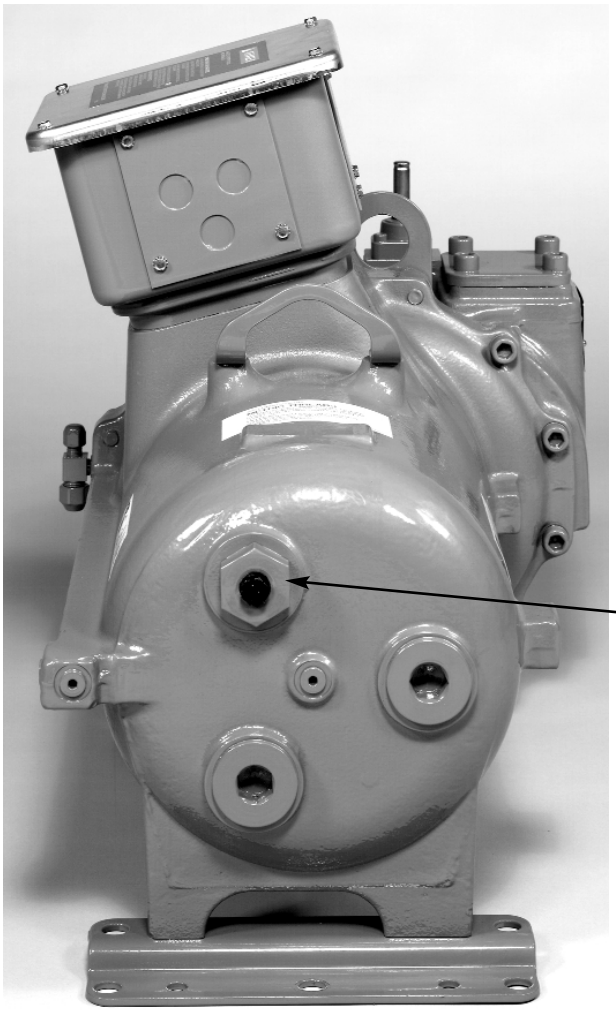
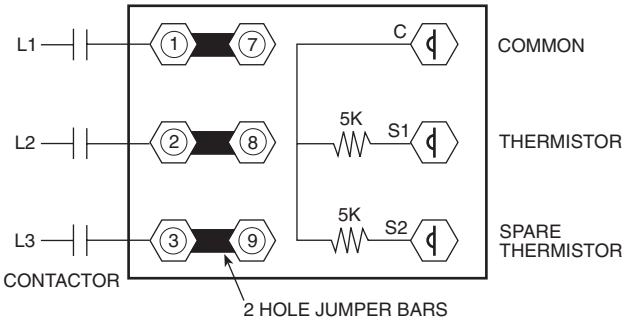
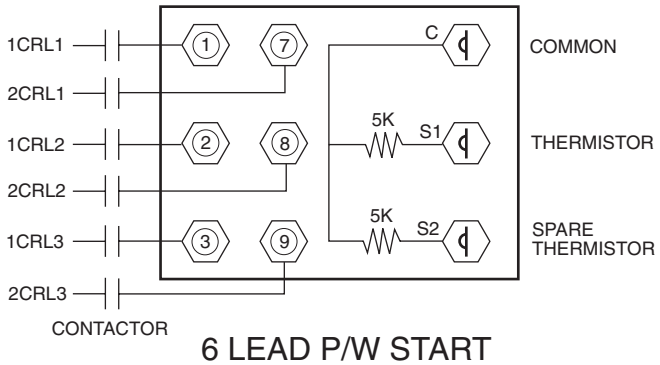


Diagram A



3 LEAD X/L START

Diagram B



6 LEAD P/W START

Approved Oils:

POE Oil Type	R-404A & R-507		R-134A	R-22	
	Low Temp	Med Temp	Mid Temp & A/C	Low Temp	Med Temp
Castrol SW100*	No	Yes	Yes	No	Yes
CPI Solest BVA 120*	Yes	Yes	Yes	Yes	Yes
ICI Emkarate RL 100S	Yes	Yes	Yes	Yes	Yes
Castrol E100*	Yes	Yes	Yes	Yes	Yes
CPI Solest 170**	Yes	Yes	Yes	Yes	Yes

* UL Certified

** Required for R-22 systems operating without an oil cooler

NOTES:

a. Use of oil additives is not allowed without written approval from Carlyle Application Engineering.

b. **POE oils readily absorb moisture and cause acid formation in the system. Keep oil exposure to the atmosphere to a minimum.**

5. LIFTING COMPRESSOR

   The compressor is supplied with 2 lifting lugs. See Fig. 1 for location.

6. MOUNTING

   Carlyle 06T compressors may be rigid mounted. However, Carlyle recommends the use of isolation mounts (P/N KA75KR002). These rubber mounts isolate the compressor from the system framework which helps to reduce noise transmission.

ELECTRICAL

GENERAL

Consult Diagrams A and B for connection locations (also located inside the compressor terminal box cover).

TERMINAL BOX

The compressor terminal box is supplied with two support plates to mount the connector for the power wiring conduit. Select the one support plate with the opening suitable for the size of the conduit connector to be used and fasten it to the terminal box with the (4) screws provided.

TERMINAL PLATE WIRING

1. Parts items 1-3 (see page 1 under "General" item #5) are supplied in the parts bag with the compressor and are used when wiring the terminal plate.

2. Customer supplied wiring to the compressor terminal plate must be provided with insulated wire terminal connectors and be suitable for accommodating the 3/8" diameter terminal pins.

3. *3-Lead Across-the-Line (X/L) Start*
   The three jumper bars supplied with the compressor are required for 3-lead XL start only. Jumpers are assembled directly on terminal studs connecting T1 & T7, T2 & T8, and T3 & T9 (see Diagram A). The three power leads are to be assembled to the applicable terminal stud directly on top of the jumper bar. Secure wire terminals and jumper bars to the terminal studs with the (6) 3/8-16 jam nuts provided with the compressor. Torque jam nuts to 18 lb-ft (24 n-m) maximum.

4. *6-Lead Across-the-Line (X/L) or Part Winding (P/W) Start*
   The 6 power leads are to be assembled and secured to the applicable terminal studs with the (6) 3/8-16 jam nuts provided with the compressor. Torque jam nuts to 18 lb-ft (24 n-m) maximum. (see Diagram B)

NOTE: Jumper bars are not used with 6-lead or any P/W start applications.

5. Connect motor thermistor wires to S1 & C using insulated 1/4" quick connect electrical fitting. Ensure connection is secure. Use S2 to C as backup in event S1 sensor fails.

MOTOR PROTECTION

OVERCURRENT PROTECTION — Customer Supplied

1. 06T compressors are supplied without motor overcurrent protection devices. Compressor user must provide properly sized overcurrent motor protection. See the Application Manual (Lit. No. 574-030) and price pages for specifications.

2. Carlyle recommends the use of calibrated circuit breakers. Circuit breakers based on X/L start with trip settings selected for proper compressor motor size and voltage are available from Carlyle.

OVER TEMPERATURE PROTECTION — Customer Supplied

A Carlyle Electronic Module (LonCEM) must be purchased separately and is required for each compressor. The CEM provides active motor and discharge temperature cooling in addition to thermal protection. See the Application Manual for specifications and wiring information.

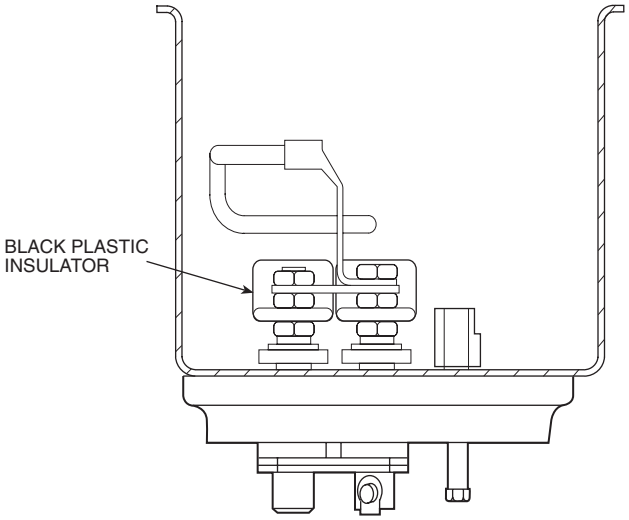
WARNING: Wrong direction of rotation will cause severe compressor damage. Do not start the compressor without first reviewing the Start-Up sections of this document (see pages 6, 7).

SCREW COMPRESSOR WIRING PROCEDURES

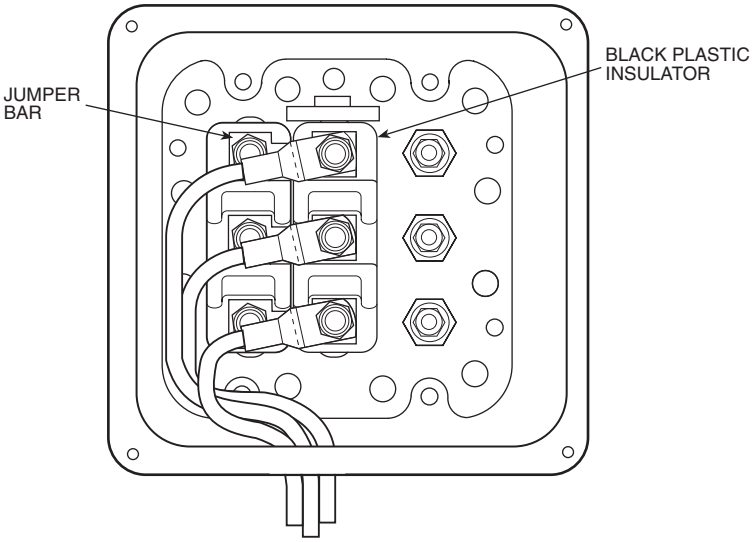
The following procedures will prevent damage to the electrical terminals and the possibility of personal injury.

The black plastic insulator block (P/N 06EA500672) is factory installed using jam nuts (P/N AT14GA241). The insulator block is held in place on top of jam nut #1 (see "Detail View of Terminal Post Arrangement") by jam nut #2. Jam nut #2 is 1 lb-ft. Applying too much torque to the jam nut #2 **will crack or break the insulator block.**

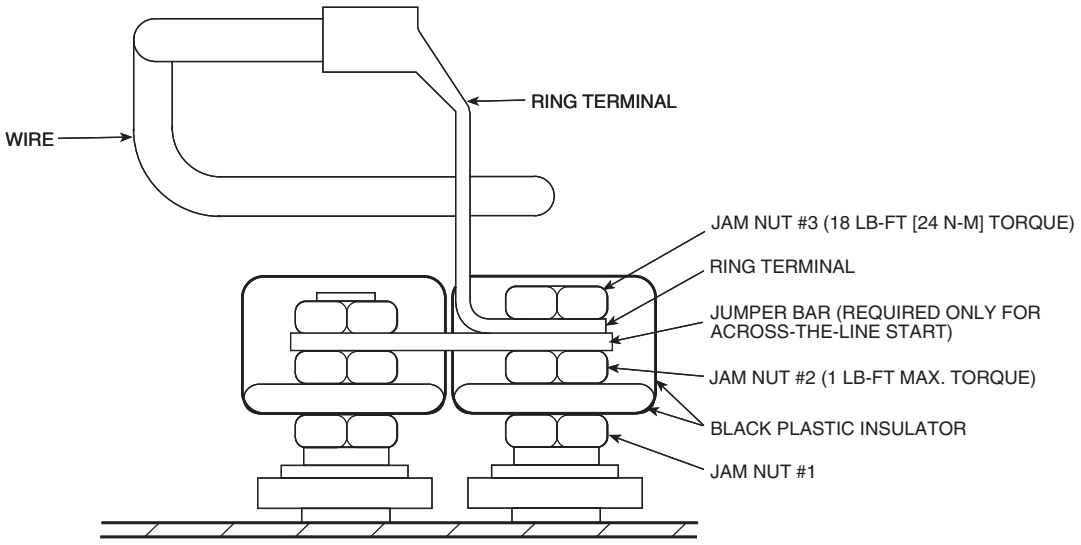
All electrical wiring is connected between jam nuts #2 and #3. Ring terminals are recommended for ease in wiring instead of using a plain wire hookup, especially if heavy gauge wiring is used. Jumper bars (P/N 06EA500551) are only required for across the line start configuration and when used they are also installed between jam nuts #2 and #3. The recommended torque for jam nut #3 is 18 lb-ft (24 n-m). Once all the jam nuts are properly torqued on the terminal plate, a small amount of serviceable Loctite should be applied to prevent the jam nuts from loosening. All the accompanying drawings are shown using ring terminals and jumper bars.



SIDE VIEW OF ELECTRICAL BOX
SEE DETAIL BELOW



TOP VIEW OF ELECTRICAL BOX



DETAIL VIEW OF TERMINAL POST
ARRANGEMENT

START-UP PROCEDURE

OIL CHARGING PROCEDURE

The oil cooler must be filled with oil. The oil separator should be filled to the top sight glass. Pulling a vacuum on the oil separator and drawing oil into the system through the oil header is recommended for ease of oil charging. This method will also fill the oil header.

TESTING THE CONTROL CIRCUIT

Before testing the control circuit make sure all service valves, ball valves and solenoid valves are closed (with solenoid valves check to make sure they are not manually open). Test the control circuit verifying the operation of all time delays and the economizer and oil feed line solenoids.

PRE-START-UP CHECK LIST

1. Open suction, discharge and economizer service valves (also any service valves upstream of liquid injection valves).

2. Open service valves in the oil feed lines.

3. Check high and low pressure switches for proper settings and ensure they are wired into the compressor control circuit. The high and low pressure switches must be connected to the compressor body, not at the service valves or piping.

4. Check the reverse rotation protection switch (low-pressure switch) to ensure that it is connected to the compressor high pressure switch port and that it is wired into the compressor control circuit. The switch must be located above the compressor high pressure switch port location. 1/4" tubing must be used for the pressure switch connection. Do not use capillary tubing as this may cause a time delay in the trip setting. (This does not apply to systems using the newer LonCEM Module or pressure transducer connections for newer LonCEM).

5. Check oil pressure differential switch to ensure that it is connected in the proper location (high side on the pressure discharge and low side at the oil inlet connection port). Oil pressure cut-out must be set at 45 psid (3 bar) with a 45-second time delay.

6. Check the LonCEM or Carlyle Electronic Module and ensure that it is properly wired into the control circuit and compressor.

7. The Heinemann/Airpax calibrated circuit breakers recommended in this application guide are required for each compressor or a Carlyle Application Engineering approved equivalent.

8. Connect a service gage to the compressor discharge port (at the high pressure switch connection location). **Caution:** The compressor has an internal check valve, therefore the gage must be connected to the high pressure switch port. Connect a service gage to the oil feed manifold between the oil line solenoid and the compressor. (Another alternative is at oil fitting at back of motor).

9. Check direction of rotation of the compressor. Proper rotation is critical. If the compressor is operated in reverse, severe damage may occur. To check for proper rotation follow the steps in start-up worksheet section.

START-UP WORKSHEET

1. **While monitoring the discharge gage (located on the high pressure connection port on the compressor body, not the discharge service valve), bump the compressor (turn the power on for 1/2 to 1 second). If the discharge pressure increases, the direction of rotation of the compressor is correct. If the discharge pressure drops, the compressor is experiencing reverse rotation and the phase sequence must be reversed. The phase sequence may be changed by switching any two leads at the compressor motor. (If a variable speed drive is used, see Step 2.)**

   Discharge pressure reading when bumped: _____

2. ***Warning:*** **If a variable speed drive is used, the rotation of the compressor must be checked (as noted in Step 1) both with the inverter and through inverter bypass. When bumping the compressor with the inverter, watch the service gage carefully as it may take 1-5 seconds for significant rotation to occur. The phase sequence entering the variable speed drive may not be the same as the phase sequence leaving the variable speed drive. If the compressor rotation is incorrect both through the inverter and in bypass mode, any two leads must be switched at the compressor. If only the inverter or bypass mode is experiencing incorrect rotation, any two leads leaving the device causing reverse rotation must be switched.** ***After any wiring change the compressor rotation must be checked both with the inverter and in bypass mode.***

3. If a variable speed drive is used and the compressor will not start within 10 seconds, shut down the compressor and check the inverter size and logic.

4. After rotation has been verified prior to running the compressor, ensure gages have been connected to the oil feed manifold (between oil line solenoid and compressor). Upon start-up, immediately check oil pressure (difference between oil feed pressure and suction) to ensure that it is greater than 45 psid (3 bar). If oil pressure is less than 45 psid (3 bar), shut compressor off and check all oil line valves, filters, oil level and head pressure. Check the oil pressure drop across the oil filter. If the pressure drop exceeds 45 psid (3 bar), change the filter element.

   Oil Filter Inlet (Psi): _____ Oil Manifold Pressure: _____

   Oil Filter Outlet (Psi): _____ Suction Pressure (Psi): _____

   Pressure Differential:_____ Oil Pressure (Psi):_____

5. During compressor operation ensure that the economizer solenoid (if the economizer is used), liquid injection solenoid and oil line solenoid (taking into account the time delay) are energized and de-energize on shut down.

6. If an economizer is used, set the superheat leaving the subcooler to 6°F to 15°F (3°C to 9°C).

   Subcooler Vapor Pressure:_____

   Saturation Temperature: _____

   Superheat: _____

7. Check the oil temperature entering the compressor and ensure that it is less than 190°F (88°C).

   Oil Temperature: _____

8. Check functionality of the LonCEM/Carlyle Electronic Module:

   - Disconnect either 5K thermistor from the LonCEM/CEM to verify that the compressor will not start and all solenoid valves stay off.

   - Check to ensure that the motor cooling valve will feed (head pressure may have to be manually raised).

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