Installation and Startup Instructions

ORBIT 8 Series R410A Scroll Compressors

Content Page
1 General 1
2 Safety Instructions 1
3 Installation Procedures 2
4 Accessory Items 6
5 Compressor Installation / Preparation 7
6 Checks before Starting 7
7 Operational Checks 8

1 General
This document provides installation and startup instructions for BITZER’s ORBIT 8 Series R410A Scroll compressors. A more complete description of the compressors and application requirements can be found in the 8 Series Compressor Application Manual, which is available on BITZER’s website (www.bitzerus.com).

2 Safety Instructions

WARNING
ELECTRICAL SHOCK HAZARD
Failure to follow these safety warnings could result in serious injury or death. All installation and servicing activity should be performed only by trained personnel. Wear safety goggles. Shut off all power to this equipment during installation and service. Lock and tag all disconnect locations until work is completed.

CAUTION
Compressors contain oil and refrigerant under pressure. Release pressure from both high and low side of compressor before installation or servicing.

CAUTION
Tube brazing and compressor operation can produce hot surfaces. To avoid burns, allow surfaces to cool down before continuing installation or servicing.

NOTICE
Do not remove oil drain plug as the entire oil charge could be lost. Do not reuse drained oil that has been exposed to the atmosphere.

1. The compressor should be inspected for shipping damage and a claim filed with the shipping company if the compressor arrives damaged.

2. Check the compressor nameplate to insure you have the correct model and voltage for the application. Also, insure that the maximum pressure/temperature ratings listed on the nameplate are not exceeded during installation or operation of the compressor.

3. Before attempting to install the compressor, be sure to review this document in its entirety as well as all related BITZER application literature. You should familiarize yourself with the compressor application requirements before continuing with the installation. The literature is available through BITZER’s website (www.bitzerus.com).

4. Insure that all work on compressor and refrigeration systems shall be carried out only by refrigeration personnel which have been properly trained and instructed. Applicable safety procedures and practices should be followed.

5. The compressor is under pressure with a holding charge of approximately 7 psi (0.5 bar) above atmospheric pressure. Do not open any connections before relieving the pressure as discussed in the holding charge section below. Incorrect handling may cause injury.

6. Safety glasses should be worn while working on compressor.

7. Do not apply any power supply to the compressor unless all suction and discharge valves (i.e. service valves) are installed and opened.

8. Do not operate or provide any electrical power to the compressor unless the terminal box cover is in place and secured. Measurement of amps and volts during running conditions must be taken at other points in the power supply.

9. Do not remove terminal box cover until all electrical sources have been disconnected.
10. Follow recommended safety precautions listed on terminal box cover label before attempting any service work on the compressor.

11. During operation surface temperatures can exceed 275°F (135°C). Severe burns are possible.

### 3 Installation Procedures

#### Transporting

Compressor should be transported either bolted down to a wooden pallet or lifted using the lifting lugs that are welded to the compressor as shown in Figure 1.

![Figure 1 – Transporting Compressor](image)

#### Mounting

For most applications the compressor is isolated from the unit with rubber grommets. For single compressor applications the grommets are placed between the compressor and the unit. For tandem and trio applications, the compressors are hard mounted to base rails with rubber grommets placed between the rails and the unit base. The available grommet packages are listed in the accessory item summary on page 6. The Compressor Application Manual should be referenced for detailed mounting instructions.

### NOTICE

The PVE oil used in this compressor is very hygroscopic (i.e. will absorb moisture), similar to POE oil. The compressor should be installed quickly with limited exposure to the atmosphere to avoid moisture contamination.

#### Holding Charge

The compressor is shipped under pressure with a holding charge of dry air or nitrogen approximately 7 psi (0.5 bar) above atmospheric pressure. Do not remove any compressor bolts or fittings until the factory supplied holding charge has been relieved. Exhaust the holding charge through the high (HP) pressure connections, see Figure 2, by removing the Schrader valve cap and depressing the internal Schrader valve. Exhausting the holding charge via the LP pressure connections can allow pressure to remain in the high side of the compressor.

#### Rotalock / Braze Connections

The compressor may have either braze or rotalock connections. Remove the factory supplied suction and discharge connection caps and/or plugs. When installing rotalock connections, torque:

- **Suction Rotalock**: 180-190 Nm (133-140 FT·LB)
- **Discharge Rotalock**: 150-160 Nm (111-118 FT·LB)

When brazing pipe to the rotalock valve, disassemble the valve or wrap in a wet cloth to prevent heat damage. Remove the teflon gasket when brazing to the rotalock fittings.

### NOTICE

The system piping must be carefully designed to ensure that under all circumstances, oil is returned to the compressor, and as little as possible remains in the evaporator. Consult BITZER Application Manual for further details.

#### Refrigerant Piping

Brazing should be accompanied with a nitrogen purge to prevent scale and oxidation build-up. Tubing should be clean and free of burrs, cuttings, or other material that may enter the compressor.

#### Refrigerant / Oil

The GSD8 Series compressors are only approved for R410A medium and high temperature applications. See ORBIT 8 Series Application Manual for the allowable operating envelope and detailed application requirements.

Most compressors are shipped with a factory oil charge. The only oil approved for the 8 Series compressors is the PVE oil noted below. If an alternate oil is shipped with the compressor, the oil type will be denoted by an oil label added adjacent to the compressor sight glass. If the compressor is shipped without oil, a “No Oil Added” wire tag will be added to the oil charge fitting. See application manual for a list of all approved refrigerant oils.

#### 10. Follow recommended safety precautions listed on terminal box cover label before attempting any service work on the compressor.

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The oil level should generally remain at 1/4 to 3/4 up the sight-glass. During multi (tandem/trio) operation it is possible for the oil level to move outside this range. See the application manual for further details on acceptable oil levels. Check the oil level after the compressor has run for a few hours as it may be necessary to top off the oil after startup.

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The compressor should be isolated from the system before adding or removing oil. Use only the oil access port (3) to add and remove oil from the compressor, see Figure 2.

### Oil Charge

**Refrigerant Oil:** Polyvinylether Oil (PVE)

**Oil Volume:** 179 oz. (5.3L)

**BITZER Oil Type:** BVC32

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**NOTICE**

Do not charge compressor with oil through the suction/discharge access fittings as it may result in damage to the compressor.

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### Access Points

<table>
<thead>
<tr>
<th>Access Points</th>
<th>Thread</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. High pressure connection (HP)*</td>
<td>1/8-27 NPTF, with Plug</td>
</tr>
<tr>
<td>1a. High pressure connection (HP)*</td>
<td>1/8-27 NPTF, with Schrader Valve</td>
</tr>
<tr>
<td>2. Low pressure connection (LP)</td>
<td>1/8-27 NPTF, with Schrader Valve</td>
</tr>
<tr>
<td>3. Oil fill port</td>
<td>1/8-27 NPTF, with Schrader Valve</td>
</tr>
</tbody>
</table>

**Connection Points**

| SL  | Suction gas line | 2-1/4" – 12 UNF, Rotalock only | 1-5/8* ODF |
| DL  | Discharge gas line | 1-3/4" – 12 UNF, Rotalock only | 1-3/8* ODF |
| SG  | Sight Glass | 1-3/4" – 12 UNF, Rotalock only |

* Used for discharge gas sensor (optional, see page 7). Sensor can be installed in any of the (HP) fittings.
Electrical Wiring

The motor protection for the 8 Series compressors and electrical terminal plate wiring are discussed below. The standard compressor shipment will include the SE-B3 protection module (SE-B2 and SE-E1 are optional). Consult the compressor wiring diagram on the underside of the terminal box cover along with the diagrams below for correct compressor wiring.

**NOTICE**

Running the compressor in reverse (reverse rotation) will cause compressor damage. Insure compressor is wired for correct rotation.

Compressor must be phased for correct rotation. See Startup Procedures at end of this document for reverse rotation test.

Motor Protection

Figure 3 below shows the wiring of the electronic motor protection module.

The orange wires on the SE-B3 are connected between the M1 & M2 terminals on the compressor terminal plate. Terminals 1 and 2 on the optional SE-E1 must be connected to M1 and M2. The incoming power from the controller is wired in series with the compressor safeties and connected to the module at terminal 11. Terminal 14 is wired to the compressor contactor. Terminal 12 (optional) is wired to the alarm output. If the motor overheats, the resistance of the internal sensors will spike (generally over 2.5k Ohms) causing the module to lockout requiring a manual reset.

To reset the module, the power supply must be interrupted for at least 5 seconds. The SE-E1 module is an optional upgrade in compressor protection. It provides motor thermal overload protection exactly the same as the SE-B3 module, but adds the following additional protection features:

- **Reverse Rotation Protection** – checks the rotation direction during the first 5 seconds after a compressor start.
- **Phase Loss Protection** – checks for phase loss during first 5 seconds of operation. Locks out for 6 minutes if phase loss is detected. A manual reset is required (interrupt power for at least 5 seconds) if three phase failures are detected within 18 minutes or 10 phase failures during 24 hours.

Figure 3 – Electrical Wiring Schematic
Testing Module after Installation

To test the control module after compressor installation, the service technician should conduct the following tests:

- **All testing should be conducted with main compressor power and control power supply to liquid solenoid(s) locked-out.**
- Remove one of the leads from either M1 or M2 on the compressor terminal plate.
- Provide power to the module (control power only) and confirm that the control voltage appears between terminal 12 and N on the device (i.e. device has tripped). **NO** voltage should appear between terminal 14 and N.

Terminal Plate Wiring

Figure 4 shows a schematic of the terminal plate. Ring terminals should be added to the incoming power wires and affixed to the L1, L2 & L3 terminal plate power connections using the screws shipped with the compressor.

**Recommended Ring Terminal:**
1/4”/M6 stud size, insulated ring terminal

**Ring Terminal Connection Torque:**
M6 screw, Torque: 4.5-5.1 NM (40-45 in-lbs)

**Ground Lug**
M8 Hex Nut, Torque: 4.5-5.1 NM (40-45 in-lbs)
4 Accessory Items

Mounting Kits
In order to reduce sound/vibration transmittal to the surrounding structure, it is recommended that all compressors be mounted using rubber isolation mounts. Different isolation mounts are required for single and multi compressor installations as summarized in Table 1.

Table 1: BITZER Rubber Isolation Mounting Kits

<table>
<thead>
<tr>
<th>Description</th>
<th>BITZER Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Compressor Application</td>
<td>37002001</td>
</tr>
<tr>
<td>Multi-Compressor (i.e. tandem / trio)</td>
<td>37002101</td>
</tr>
</tbody>
</table>

Note: Mounting kits contain 4 of each: rubber grommets, washers, spacers. The mounting bolt (not included) requirements will depend on the application. The sleeve is sized for 3/8” (9.5 mm) diameter fastener

Rotalock Service Valves and Connection Adapters
These parts are only applicable to compressors that ship with rotalock connections. A variety of valves and connectors are available for the compressor as summarized in Table 2 below.

Table 2: BITZER Rotalock Kits

Rotalock Standard Service Valves

<table>
<thead>
<tr>
<th>Application</th>
<th>Thread Connection</th>
<th>Connection Size</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge Port*</td>
<td>1 3/4” – 12 UNF</td>
<td>1-3/8* rotalock valve</td>
<td>361321-11</td>
</tr>
<tr>
<td>Suction Port</td>
<td>2 1/4” – 12 UNF</td>
<td>1-5/8* rotalock valve</td>
<td>361321-12</td>
</tr>
</tbody>
</table>

Rotalock Standard Braze Adapter Fittings

<table>
<thead>
<tr>
<th>Application</th>
<th>Thread Connection</th>
<th>Connection Size</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge Port*</td>
<td>1 3/4” – 12 UNF</td>
<td>1-3/8* rotalock braze adapter</td>
<td>366000-07</td>
</tr>
<tr>
<td>Suction Port</td>
<td>2 1/4” – 12 UNF</td>
<td>1-5/8* rotalock braze adapter</td>
<td>366000-22</td>
</tr>
</tbody>
</table>

* Can also be used for Sight Glass connection.

Oil Heater
A bellyband heater is an optional accessory item, see application manual for application recommendations and requirements.

Table 3: 8 Series Bellyband Heaters

<table>
<thead>
<tr>
<th>Description</th>
<th>Wattage (W)</th>
<th>Voltage (V/1Ph)</th>
<th>BITZER Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Band heater, metal strap</td>
<td>140</td>
<td>120</td>
<td>343255-01</td>
</tr>
<tr>
<td>Band heater, metal strap</td>
<td>140</td>
<td>240</td>
<td>343255-02</td>
</tr>
</tbody>
</table>
Discharge Gas Sensor

A discharge gas sensor is an optional accessory item, see application manual for application recommendations and requirements. The sensor provides over-temperature protection for the compressor when wired in series with the motor PTCs (see electrical drawings in Figure 3). The protection module will lock the compressor out if the discharge temperature exceeds 285°F (140°C).

Table 4: Discharge Gas Sensor

<table>
<thead>
<tr>
<th>Description</th>
<th>BITZER Kit Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>140°C Discharge Gas sensor (PTC)</td>
<td>347023-06</td>
</tr>
</tbody>
</table>

The sensor kit includes everything required to mount and wire the sensor into the PTC control circuit (Figure 3). The sensor has a 1/8" NPTM threaded connection designed to be screwed into the discharge access fitting (1a) as shown in Figure 5.

5 Compressor Installation / Preparation

Be sure to follow installation instructions covered in this document, including: compressor mounting, piping connections, oil charging and electrical wiring instructions.

6 Checks before Starting

- Insure all wiring connections to the compressor terminal plate and related components (i.e. circuit breaker, contactor) are tight.
- Insure oil level is 1/4 – 3/4 up the sight glass.
- Test installation, wiring and operation of all compressor safeties. The safeties must lock the compressor out when they trip.
- Insure low and high pressure switches (LPS / HPS) are set appropriately for the application.
- Is the motor protection module installed, wired and functioning properly (test per instructions on page 5)?
- Are the shut-off / isolation valves open?

Reverse Rotation Check

Before starting the compressor and letting it run, correct rotation must be checked. Operation of the compressor in the wrong direction for more than a few minutes can lead to a compressor failure. In order to monitor for reverse rotation a pressure gauge should be added to the discharge port and monitored while the compressor is “bump-started”. The discharge pressure must rise when the compressor starts. If reverse rotation is found, two of the motor leads should be reversed to achieve proper rotation.
## 7 Operational Checks

An initial check should be made of the following parameters after the compressor starts. A second set of readings should be taken once the operation has stabilized (typically 20 – 30 minutes after startup). These readings should be recorded for future reference.

<table>
<thead>
<tr>
<th>Operating Parameter</th>
<th>Acceptable Level</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil Level**</td>
<td>1/4 - 3/4 Sight Glass</td>
<td>Extended range approved for tandem/trio applications.</td>
</tr>
<tr>
<td>Low (suction) Pressure</td>
<td>35 psig (2.4 bar)</td>
<td>Low pressure switch must be set no lower than 35 psig (2.4 bar).</td>
</tr>
<tr>
<td>High (discharge) Pressure</td>
<td>610 psig (42 bar)</td>
<td>High pressure switch must be set no higher than 625 psig (43 bar).</td>
</tr>
<tr>
<td>Max Differential Pressure (Discharge – Suction)</td>
<td>609 psig (42 bar)</td>
<td>Internal Relief Valve may open at differential pressures (high to low) that exceed 609 psi (42 bar).</td>
</tr>
<tr>
<td>Max Discharge Temperature</td>
<td>250°F (120°C)</td>
<td>Temperature on discharge pipe, measured within 4” of the service valve adapter fittings, must be less than 250°F (120°C).</td>
</tr>
<tr>
<td>Max Return Gas Temperature</td>
<td>65°F (18°C)*</td>
<td>Temperature on suction pipe, measured within 4” of the service valve must be less than 65°F (18°C).</td>
</tr>
<tr>
<td>Min Superheat</td>
<td>10°F (5 K)</td>
<td>Suction superheat at the compressor inlet should generally be maintained at or above 10°F (5 K). Lower superheat settings may be applicable for certain applications.**</td>
</tr>
<tr>
<td>Amp Draw**</td>
<td>See performance data</td>
<td>Measured amp draw should be compared to amp draw from BITZER Software or performance data. Unbalance ≤2%.</td>
</tr>
<tr>
<td>Voltage**</td>
<td>+/- 10% of Nominal</td>
<td>Voltage unbalance should be ≤10%.</td>
</tr>
<tr>
<td>Compressor Cycling**</td>
<td>6 starts per hour</td>
<td>Compressor cycling rate should be less than 6 starts per hour with a minimum run-time of 3 minutes.</td>
</tr>
</tbody>
</table>

* Or as limited by the operating envelope.
** See application manual for further details.

### NOTICE

During the running-in period scroll compressors show an increase in performance. In case of performance tests a running-in period must be considered. See BITZER Software for details.