



13-25-633
Version: 00
September 21, 2018

**APEX
SINGLE STAGE
VARIABLE AND FIXED SPEED
BASE- MOUNTED and TANK MOUNTED
COMPRESSORS**

AirSmart™ G2 Controller

MODELS

APEX25-30B, APEXVS18-22B

60HZ

**OPERATING AND
SERVICE MANUAL**

**MAINTAIN COMPRESSOR RELIABILITY AND PERFORMANCE WITH
GENUINE GARDNER DENVER® COMPRESSOR PARTS AND SUPPORT SERVICES**

Gardner Denver® Compressor genuine parts, manufactured to design tolerances, are developed for optimum dependability . specifically for Gardner Denver compressor systems. Design and material innovations are the result of years of experience with hundreds of different compressor applications. Reliability in materials and quality assurance is incorporated in our genuine replacement parts.

Your authorized Gardner Denver Compressor distributor offers all the backup you need. An AirSmart[™] network of authorized distributors provides the finest product support in the air compressor industry.

Your authorized distributor can support your Gardner Denver air compressor with these services:

1. Trained parts specialists to assist you in selecting the correct replacement parts.
2. Factory warranted new and remanufactured rotary screw air ends. Most popular model remanufactured air ends are maintained in stock at the factory, for purchase on an exchange basis with liberal core credit available for the replacement unit.
3. A full line of factory tested AEON[™] compressor lubricants specifically formulated for use in Gardner Denver compressors.
4. Repair and maintenance kits designed with the necessary parts to simplify servicing your compressor.

Authorized distributor service technicians are factory trained and skilled in compressor maintenance and repair. They are ready to respond and assist you by providing fast, expert maintenance and repair services.

To Contact Gardner Denver or locate your local distributor:

Visit: www.contactgd.com/compressors

Or

Call: (800) 682-9868

INSTRUCTIONS FOR ORDERING REPAIR PARTS

When ordering parts, specify Compressor MODEL, Method of Cooling, HORSEPOWER and SERIAL NUMBER (see nameplate on unit). The Air end Serial Number is also stamped on top of the discharge bearing carrier casting.

All orders for Parts should be placed with the nearest authorized distributor.

Where NOT specified, quantity of parts required per compressor or unit is one (1); where more than one is required per unit, quantity is indicated in parenthesis. SPECIFY EXACTLY THE NUMBER OF PARTS REQUIRED.

DO NOT ORDER BY SETS OR GROUPS.

To determine the Right-Hand and Left-Hand side of a compressor, stand at the motor end and look toward the compressor. Right-Hand and Left- Hand are indicated in parenthesis following the part name, i.e. (RH) and (LH), when appropriate.

WARNING – PROHIBITION – MANDATORY LABEL INFORMATION

Gardner Denver Rotary Screw compressors are the result of advanced engineering and skilled manufacturing. To be assured of receiving maximum service from this machine, the owner must exercise care in its operation and maintenance. This book is written to give the operator and maintenance department essential information for day-to-day operation, maintenance and adjustment. Careful adherence to these instructions will result in economical operation and minimum downtime.

Boxed text formats are used, within this manual, to alert users of the following conditions:

Safety Labels are used, within this manual and affixed to the appropriate areas of the compressor package, to alert users of the following conditions:



Indicates a hazard with a high level of risk, which if not avoided, WILL result in death or serious injury.



Equipment Starts Automatically



Health Hazard . Explosive Release of Pressure



Cutting of Finger or Hand Hazard . Rotating Impeller Blade



High Voltage . Hazard of Shock, Burn, or Death Present until Electrical Power is Removed



Cutting of Finger or Hand Hazard . Rotating Fan Blade



Entanglement of Fingers or Hand/Rotating Shaft

WARNING

Indicates a hazard with a medium level of risk which, if not avoided, **COULD** result in death or serious injury.



Asphyxiation Hazard . Poisonous Fumes or Toxic Gases in Compressed Air

CAUTION

Indicates a hazard with a low level of risk which, if not avoided, **MAY** result in a minor or moderate injury.



Burn Hazard . Hot surface

PROHIBITION/MANDATORY ACTION REQUIREMENTS



Do not Operate Compressor with Guard Removed



Lockout Electrical Equipment in De-Energized State



Do Not Lift Equipment with Hook . No Lift Point



Loud Noise Hazard . Wear Ear Protection



Handle Package at Forklift Points Only



Read the Operator's Manual Before Proceeding with Task

SAFETY PRECAUTIONS

Safety is everybody's business and is based on your use of good common sense. All situations or circumstances cannot always be predicted and covered by established rules. Therefore, use your past experience, watch out for safety hazards and be cautious. Some general safety precautions are given below:



Failure to observe these notices will result in injury to or death of personnel.

- **Keep fingers and clothing away** from rotating fan, drive coupling, etc.
- **Disconnect the compressor unit** from its power source, lockout and tagout before working on the unit – this machine is automatically controlled and may start at any time.
- **Do not loosen or remove** the oil filler plug, drain plugs, covers, the thermostatic mixing valve or break any connections, etc., in the compressor air or oil system until the unit is shut down and the air pressure has been relieved.
- **Electrical shock** can and may be fatal.
- **Perform all wiring** in accordance with the National Electrical Code (NFPA-70) and any applicable local electrical codes. Wiring and electrical service must be performed only by qualified electricians.

Open main disconnect switch, lockout and tagout and check for voltage before working on the control.



Failure to observe these notices could result in damage to equipment.

- **Stop the unit** if any repairs or adjustments on or around the compressor are required.
- **Do not use the air discharge** from this unit for breathing – not suitable for human consumption.
- **An Excess Flow Valve** should be on all compressed air supply hoses exceeding 1/2 inch inside diameter (OSHA Regulation, Section 1926.302).
- **Do not exceed** the rated maximum pressure values shown on the nameplate.
- **Do not operate unit** if safety devices are not operating properly. Check periodically. Never bypass safety devices.

TABLE OF CONTENTS

Maintain Compressor Reliability And Performance With Genuine Gardner Denver Compressor Parts And Support Services	1
Instructions For Ordering Repair Parts.....	1
Warning . Prohibition . Mandatory Label Information	2
Safety Precautions	4
Index	6
SECTION 1, General Information.....	8
SECTION 2, Installation.....	13
SECTION 3, Starting & Operating Procedures	19
SECTION 4, Controls & Instrumentation	24
SECTION 5, Lubrication. Oil Cooler, Oil Filter & Separator.....	53
SECTION 6, HEAT EXCHANGERS (OIL/AIR)	60
SECTION 7, Air Filters.....	63
SECTION 8, Belt Drive System.....	65
SECTION 9, Servicing Of Miscellaneous Devices	68
SECTION 10, Tank Mounted Compressor - Total System	75
SECTION 11, Motor Lubricant	77
SECTION 12, Maintenance Schedule	78
SECTION 13, Troubleshooting	80

This book covers the following models:

POWER	PSIG	Air Cooled	Parts List	Controller Manual
25, 30 HP	110, 125, 175	APEX25-30B	13-25-556	13-17-613
18, 22 KW	110, 125, 175	APEXVS18-22B	13-25-509	13-17-613

INDEX

<ul style="list-style-type: none"> Air Cooled Unit 13 Air Filters <ul style="list-style-type: none"> Section 7.....65 Air Flow in Compressor System..... 9 Air Receiver <ul style="list-style-type: none"> Auxiliary.....16 BELT DRIVE SYSTEM SECTION 8.....67 Cold Weather <ul style="list-style-type: none"> Installation16 Compression Principle..... 8 Compressor..... 8 Controls & Instrumentation <ul style="list-style-type: none"> AirSmart G2 Controller Operation.....24 General Description24 Section 4.....24 Cooling, Sealing and Lubrication..... 9 Daily Check.....22 Discharge Service Line.....16 ELECTRICAL WIRING17 ELECTRICAL WIRING Sizing.....17 Enclosure15 Foundation14 GENERAL INFORMATION SECTION 1..... 8 Grounding18 HEAT EXCHANGERS (OIL/AIR) Section 6.....62 Inlet Line16 Installation <ul style="list-style-type: none"> Cold Weather.....16 General.....13 Section 2.....13 Lifting Unit.....13 Location13 Lubrication, Cooling and Sealing..... 9 LUBRICATION, OIL COOLER, OIL FILTER & SEPARATOR SECTION 5.....53 MAINTENANCE SCHEDULE SECTION 10.....77 SECTION 12.....80 Miscellaneous Control Devices.....49 	<ul style="list-style-type: none"> Moisture Separator/Trap <ul style="list-style-type: none"> Optional..... 16 Motor Lubrication 18 MOTOR LUBRICATION SECTION 11 79 Oil Reservoir <ul style="list-style-type: none"> Drain 14 Piping <ul style="list-style-type: none"> Control 16 Prestart-Up Instructions..... 19 <ul style="list-style-type: none"> Air Filter.....19 Compressor Oil19 Electrical 19 Enclosure21 Grounding 19 Inlet Filter 19 Operating Mode..... 21 Piping..... 19 Rotation.....20 System Pressure20 Target Pressure.....21 Unload Pressure.....20 Quick Start Guide.....23 SAFETY PRECAUTIONS 4 Sealing, Lubrication and Cleaning 9 Service Check List80 <ul style="list-style-type: none"> Every 1000 Hours Operation..... 80 Every 125 Hours Operation 80 Every 4000 Hours Operation..... 80 Every 8 Hours Operation 80 Every Year 80 Motor Lubrication..... 80 SERVICING OF MISCELLANEOUS DEVICES SECTION 9 70 STARTING & OPERATING PROCEDURES SECTION 3 19 Starting the Unit22 <ul style="list-style-type: none"> Unit Cold22 Stopping the Unit22 TROUBLE SHOOTING SECTION 13 82 TROUBLESHOOTING VOLTAGE PROBLEMS 85 WARNING . PROHIBITION . MANDATORY LABEL INFORMATION 2 Wiring <ul style="list-style-type: none"> Electrical 17
--	---

LIST OF ILLUSTRATIONS

Figure 1-1 - Compressor Cycle	8
Figure 1-2 . Compressor Illustration . Variable Speed.....	10
Figure 1-3 . Compressor Illustration . Fixed Speed.....	11
Figure 1-4 - Compressor Illustration - Total System.....	11
Figure 2-1 . Typical Compressor Room.....	14
Figure 2-2 . Air Flow Chart.....	14
Figure 2-3 . Cold Weather Installation	15
Figure 2-4 . Electrical Wiring Sizing . FS Variants.....	17
Figure 4-1 . Controller Layout And Main Screen.....	24
Figure 4-2 . Wiring Diagram . VS (230 Volt)	26
Figure 4-3. Wiring Diagram . VS (575 Volt)	30
Figure 4-4 . Wiring Diagram . VS (380-460 Volt)	34
Figure 4- 5 . Wiring Diagram . FS (208 . 230, 460 Volt)	38
Figure 4- 6 . Wiring Diagram . FS (380-415, 460 Volt).....	41
Figure 4- 7 . Wiring Diagram . FS (575 Volt).....	44
Figure 4- 8 . Piping And Instrumentation Illustration	52
Figure 5-1 . Oil Level Sight Glass.....	53
Figure 5-2 . Dew Point Chart °F.....	57
Figure 5-3 . Dew Point Chart °C.....	57
Figure 5-4 . Oil Change Interval	58
Figure 6-1 . Air Flow Chart.....	62
Figure 6-2 . Cooler Access	64
Figure 7-1 . Compressor Air Filter, Package Pre-Filter And Vfd Filter Locations.....	66
Figure 8 - 1 - Coupling Components	67
Figure 8 - 2 . Coupling Element Spacing.....	68
Figure 8 . 3 . Compressor-Motor Assembly Details.....	69
Figure 8 . 4 . Coupling Hub Removal Tool In Place	69
Figure 9-1 . Inlet Valve Assembly.....	70
Figure 9-2 . Inlet Valve Body Hex.....	71
Figure 9-3 - Pressure Relief Valve	72
Figure 9-4 - Minimum Pressure Valve And Seat.....	73
Figure 9-5 . Thermal Mixing Valve	74
Figure 9-5 . Shaft Seal Illustration . Direct Drive Variant Shown.....	75
Figure 9-6 . Compressor (Direct Drive Variant) Hardware Illustration.....	76

SECTION 1 GENERAL INFORMATION

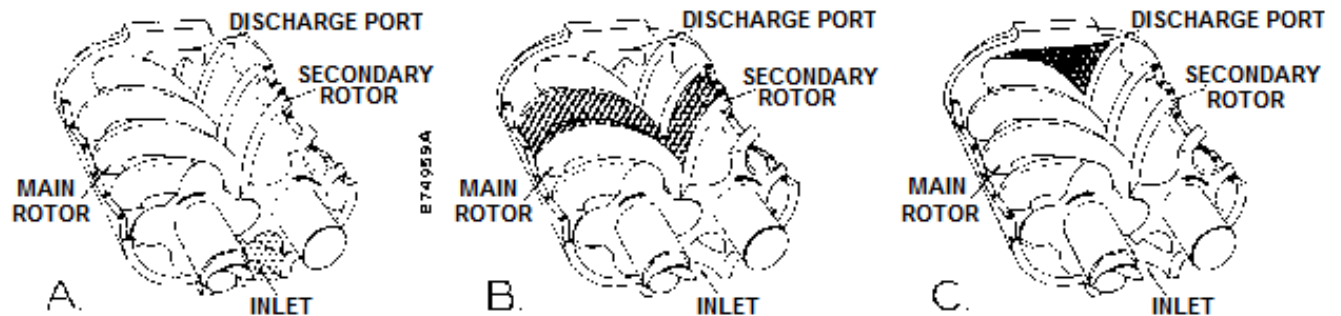


Figure 1-1 - COMPRESSOR CYCLE

COMPRESSOR - The rotary screw compressor is a single stage, positive displacement rotary machine using meshing helical rotors to effect compression. Both rotors are supported between high capacity anti-friction bearings located outside the compression chamber. Roller bearings are used at the inlet end of the rotors to carry part of the radial loads. Angular contact ball and roller bearings at the discharge end locate each rotor axially and carry all thrust loads and the remainder of the radial loads.

COMPRESSION PRINCIPLE (Figure 1-1) - Compression is accomplished by the main and secondary rotors synchronously meshing in a one-piece cylinder. The main rotor has four (5) helical lobes 72° apart. The secondary rotor has five (6) matching helical grooves 60° apart to allow meshing with main rotor lobes.

The air inlet port is located on top of the compressor cylinder near the drive shaft end. The discharge port is near the bottom at the opposite end of the compressor cylinder. *Figure 1-1 is an inverted view to show inlet and discharge ports.* The compression cycle begins as the rotors unmesh at the inlet port and air is drawn into the cavity between the main rotor lobes and the secondary rotor grooves (A). When the rotors pass the inlet port cutoff, air is trapped in the interlobe cavity and flows axially with the meshing rotors (B). As meshing continues, more of the main rotor lobe enters the secondary rotor groove, normal volume is reduced and pressure increases.

Oil is injected into the cylinder to remove the heat of compression and seal internal clearances. Volume reduction and pressure increase continues until the air/oil mixture trapped in the interlobe cavity by the rotors passes the discharge port and is released to the oil reservoir (C). Each rotor cavity follows the same ~~oil-compress-discharge~~ cycle in rapid succession to produce a discharge air flow that is continuous, smooth and shock free.

AIR FLOW IN THE COMPRESSOR SYSTEM

Figure 4- 8 page 52 - Air enters the air filter and passes through the inlet unloader valve and on into the compression chamber where oil is injected into the air. After compression, the air/oil mixture passes into the oil reservoir where most of the entrained oil is removed by velocity change and impingement and drops back into the reservoir. The air and remaining oil then passes through the air/oil separator. The air then passes through the minimum pressure/check valve, the after cooler and the moisture separator and into the plant air lines.

LUBRICATION, COOLING AND SEALING - Oil is forced by air pressure from the oil reservoir through the oil cooler, thermostatic mixing valve, and oil filter and discharge into the compressor main oil gallery. A portion of the oil is directed through internal passages to the bearings and shaft oil seal. The balance of the oil is injected directly into the compression chamber to remove heat of compression, seal internal clearances and lubricate the rotors.

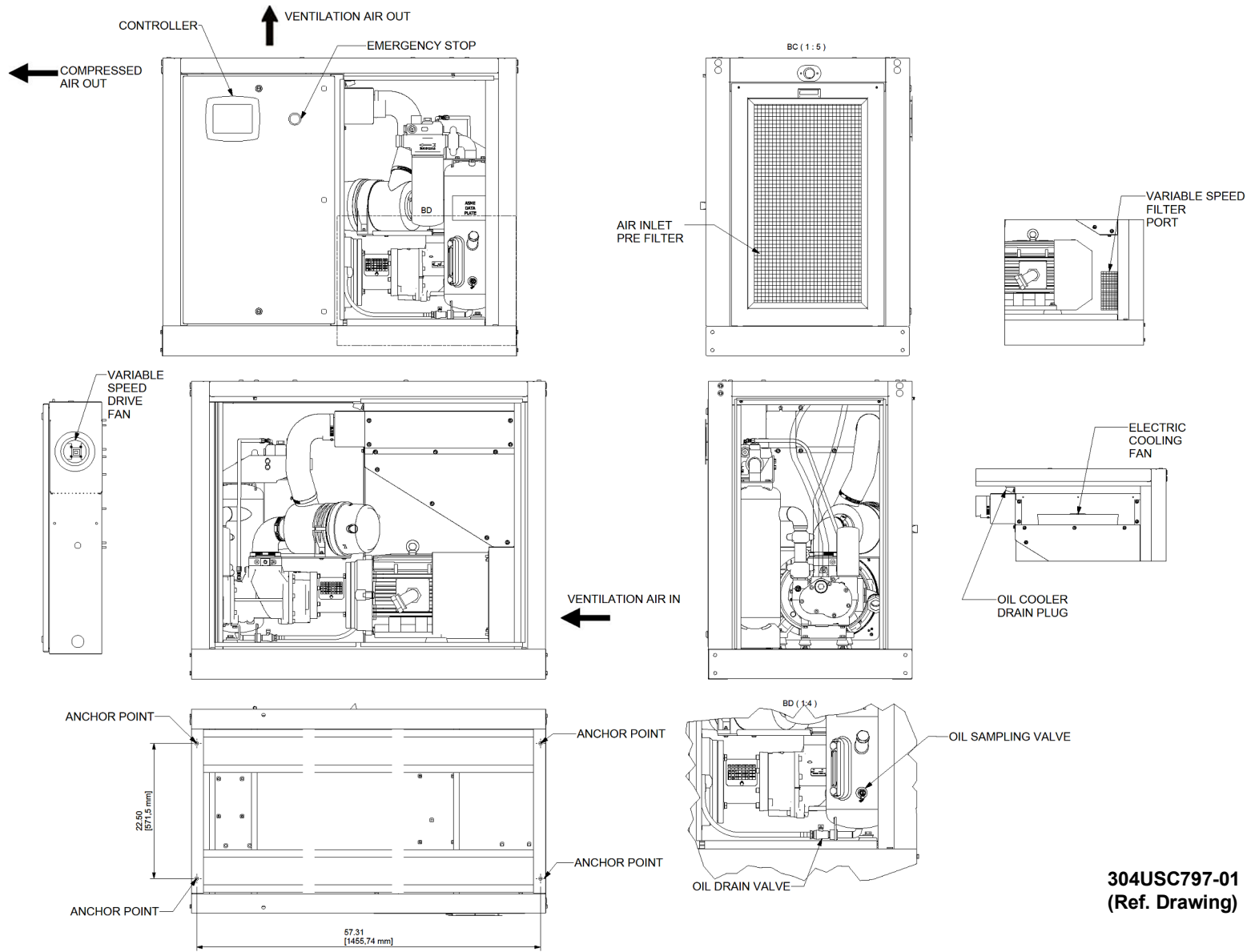


Figure 1-2 – COMPRESSOR ILLUSTRATION – VARIABLE SPEED

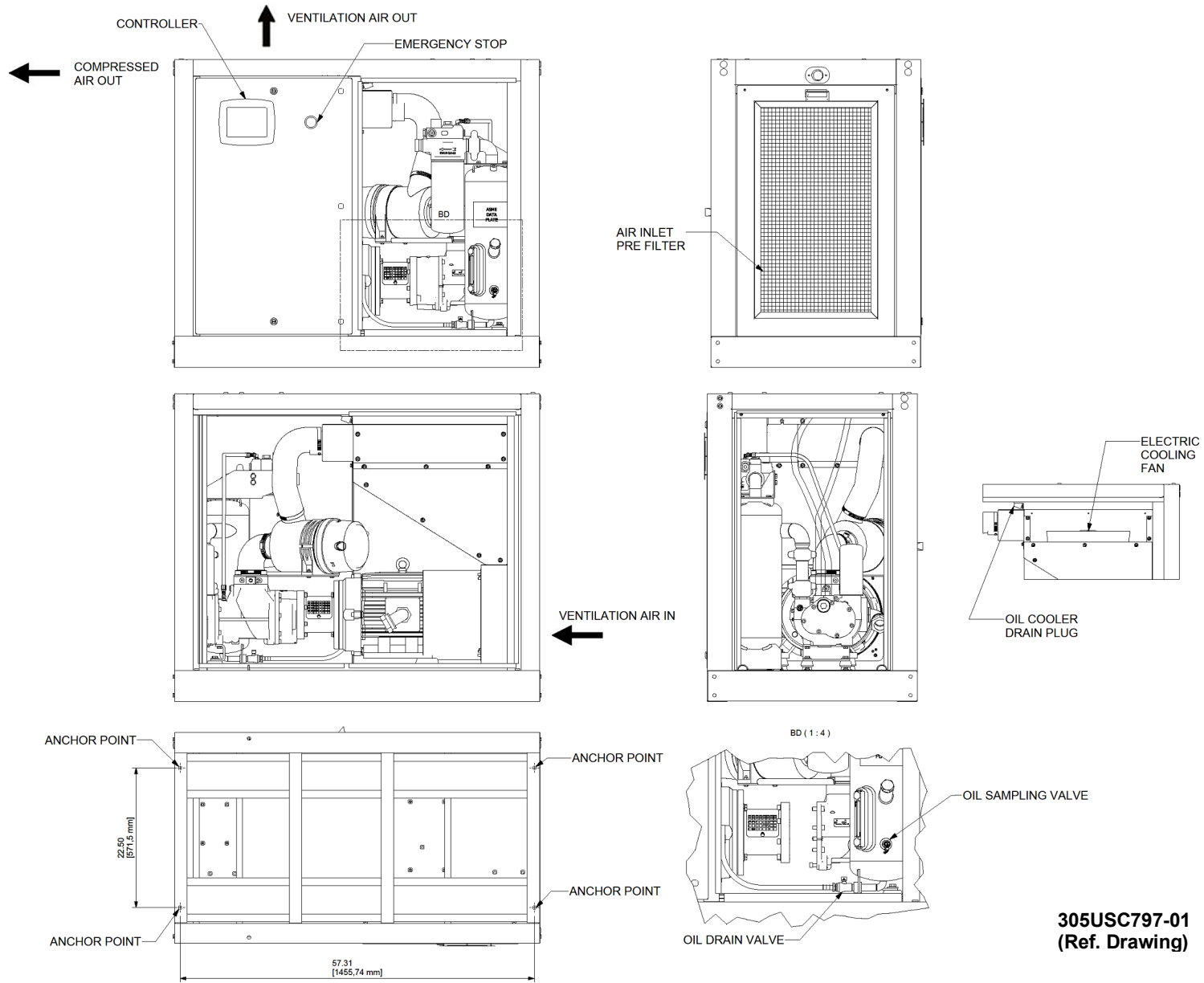
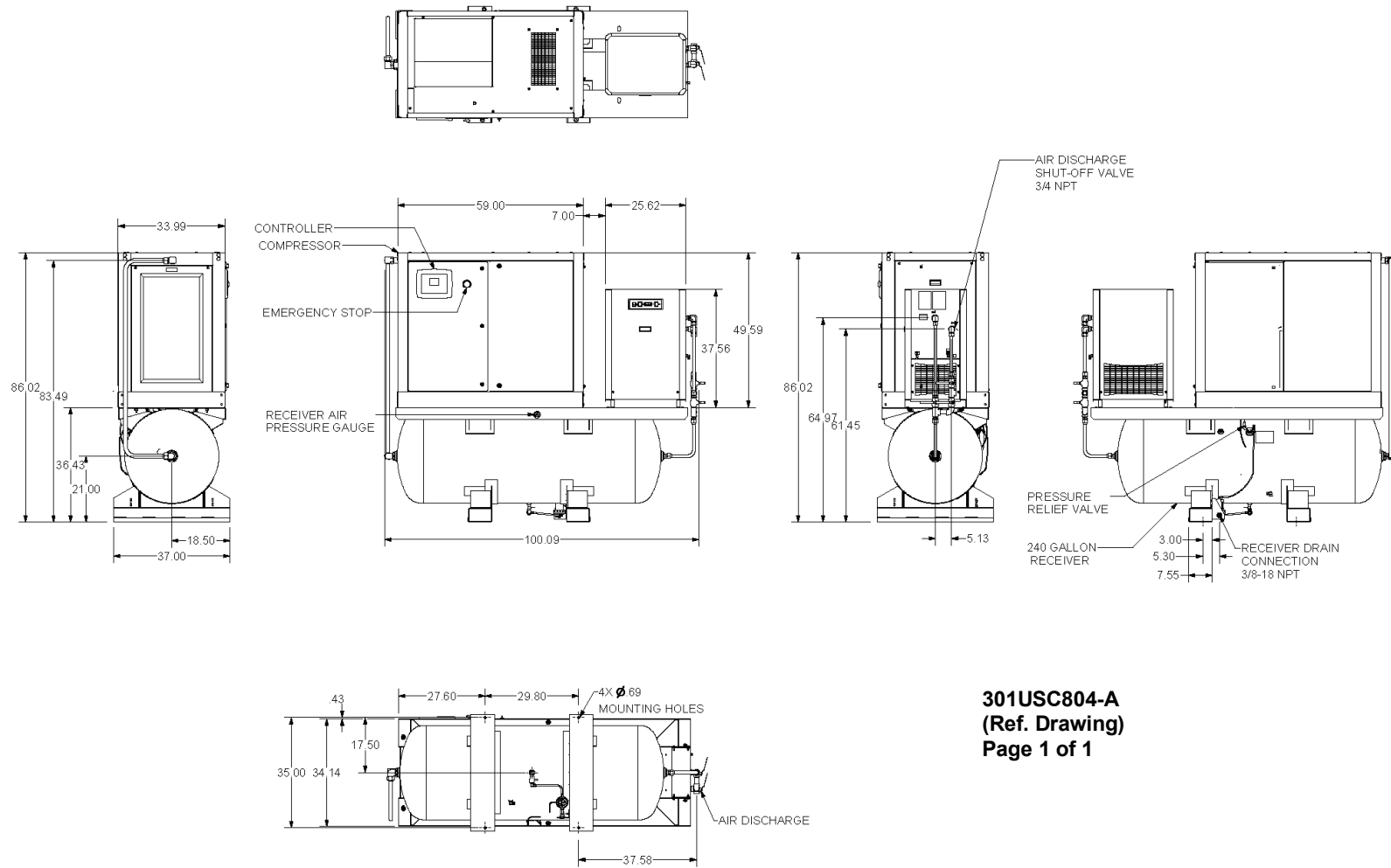


Figure 1-3 – COMPRESSOR ILLUSTRATION – FIXED SPEED

305USC797-01
(Ref. Drawing)



301USC804-A
(Ref. Drawing)
Page 1 of 1

Figure 1-4 – COMPRESSOR ILLUSTRATION - TOTAL SYSTEM

SECTION 2 INSTALLATION

GENERAL - On receipt of the unit, check for any damage that may have been incurred during transit. Report any damage or missing parts as soon as possible.



Do not electric weld on the compressor or base; bearings can be damaged by passing of current.

LIFTING UNIT - Proper lifting and/or transporting methods must be used to prevent damage. Unit may be moved into location by lift truck.



Lift compressor unit under base only. Do not use other places such as motor, compressor or discharge manifold piping as lifting points.

The eyebolts or lugs provided on the motor are for lifting the motor only and should not be used to lift any additional weight. All eyebolts must be securely tightened. When lifting the motor the lifting angle must not exceed 15 degrees. Failure to observe this warning may result in damage to equipment or personal injury.



Compressor, air/oil reservoir, separator chamber and all piping and tubing may be at high temperature during and after operation.

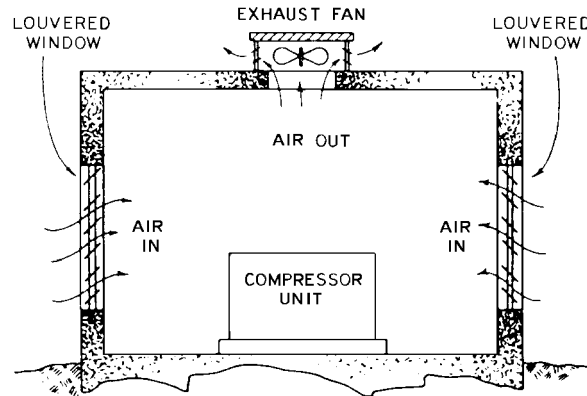
LOCATION (Figure 2-1, page 14) - The compressor must be installed where it is protected from rain, snow and freezing temperatures, in a clean, well-lighted, well-ventilated area with ample space all around for maintenance. Select a location that provides a cool, clean, dry source of air. In some cases it may be necessary to install the air filter at some distance from the compressor to obtain proper air supply, see %alet Line, page 15 and 16.

AIR-COOLED UNIT - A combination oil/air cooler is supplied as standard equipment on all air-cooled units. An electric fan module supplies the ventilation needs for the oil/air cooler (Figure 1-2, page 10). Air is drawn into the unit through the main intake grill and discharged through the cooler cores. Do not block the air flow to and from the unit. Allow three and one half (3-1/2) feet to the nearest obstruction on the control box end of the unit. Allow two (2) feet to the nearest obstruction above and on other sides of unit.

For continuous efficiency, the cooler cores must be periodically cleaned with either vacuum or compressed air. If wet cleaning is required, shield motor and spray on a mild soap solution and flush with clean water.

NOTICE

Coolers are aluminum; do not use any cleaning solution that is not compatible with aluminum. Use of improper solution may result in damage to the cooler.



A75119

Figure 2-1 – TYPICAL COMPRESSOR ROOM

Minimum Air Flow* For Compressor And Cooling (cubic Feet/Minute)	
	Air Cooled
VS models	3022 CFM
FS models	2684 CFM

* 80°F Inlet Air

Figure 2-2 – AIR FLOW CHART

FOUNDATION - The rotary screw compressor requires no special foundation, but should be mounted on a smooth, solid surface. Whenever possible install the unit near level. Mounting bolts are not normally required. However, installation conditions such as piping rigidity, angle of tilt, or danger of shifting from outside vibration or moving vehicles may require the use of mounting bolts and shims to provide uniform support for the base. Belt alignment and tension should be checked after installation. (For information on belt alignment and tension, Section 8 see page 67.)

OIL RESERVOIR / OIL COOLER DRAIN - Both reservoir and core oil charge is drained from a single connection and plug provided on the lower, left-hand side of the oil cooler core.

ENCLOSURE - The compressor, electric motor, oil cooler and after cooler are mounted inside the enclosure.

Service panels are provided for maintenance access. Be sure to allow enough space around the unit for the panels to be removed. Any of the enclosure panels may be removed by opening the latch and lifting it up slightly.



Do not operate the compressor with the fan and belt guard removed. Exposed fan and belts may cause injury to personnel.



The enclosure doors and panels must be closed and latched while the compressor is operating. Failure to close and latch the doors and panels will cause high temperature shutdowns.

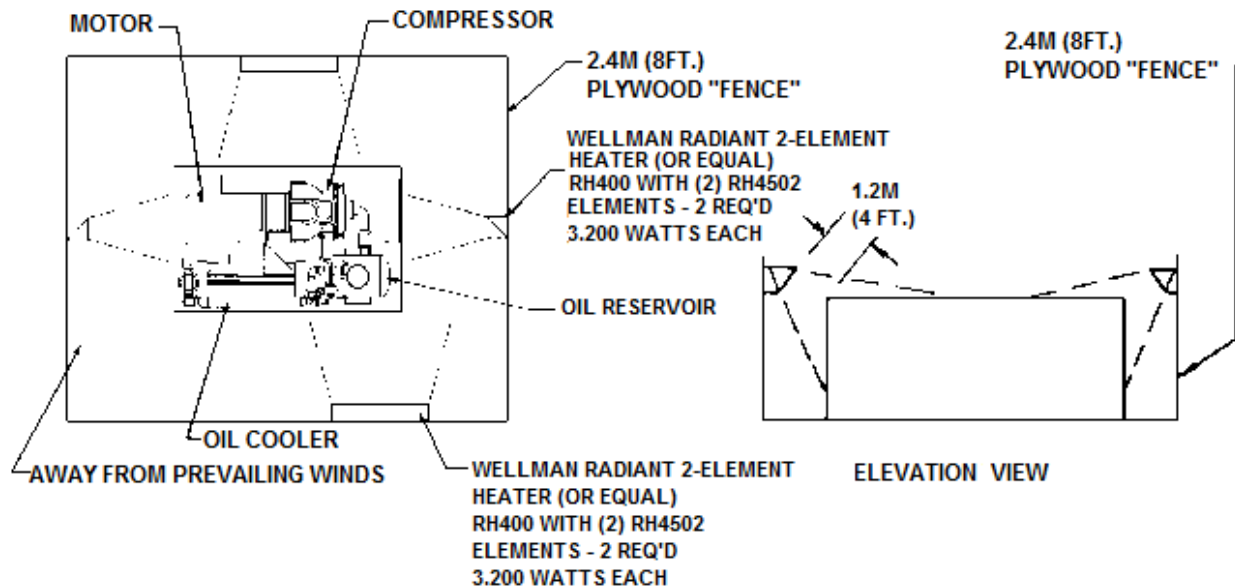


Figure 2-3 – COLD WEATHER INSTALLATION

INSTALLATION FOR COLD WEATHER OPERATION (Figure 2-3, page 15) - It is recommended that the unit be installed inside a shelter that will be heated to temperatures above freezing (32°F, 0°C). This will eliminate many of the problems associated with operating units in cold climates, such as freezing in control lines and downstream of the cooler.

Refer to Engineering Data Sheet 13-9-411 for the advantages of using the heat recovered from rotary compressors. This heat recovery could easily pay for an adequate shelter for the unit.

When the unit must be installed in an outdoors installation and/or exposed to ambient temperatures below freezing (32°F, 0°C), contact Gardner Denver for recommendations.

When using a Total System with a compressed air dryer option, refer to Section 10 for details.



Unsheltered (outdoors) installation shall be avoided. Installation next to a heated building may be sufficient to keep the compressor package room above freezing temperature and thus avoid operational complications.

AUXILIARY AIR RECEIVER - An auxiliary air receiver is not required if the piping system is large and provides sufficient storage capacity to prevent rapid cycling. When used, an air receiver should be of adequate size, provided with a relief valve of proper setting, a pressure gauge and a means of draining condensate

OPTIONAL MOISTURE SEPARATOR/TRAP - The unit can be provided with an optional stand-alone combination moisture separator and trap that is field-installed downstream of the after cooler.

CONTROL PIPING - Control piping is not necessary since the rotary screw unit is factory wired and piped for the control system specified.

INLET LINE - The filter is close-coupled to the compressor intake flange, thus no inlet line is used or recommended.

DISCHARGE SERVICE LINE - The discharge service line connection is provided at the outlet of the field installed water separator, which in turn is located at the upper right hand side of the inlet air grill.

A hand operated valve, (air service valve) and a separate (swing-type) check valve must be installed between the unit and the customer's air system. If a fast operating valve such as a ball valve is used, it must be closed slowly to give the intake valve time to shut and keep the discharge pressure from spiking.

When using a Total System, refer to Section 10 for details.



The controller has an automatic start/stop sequence built in. You do NOT need to close the air service valve. Closing the air service valve on start-up or prior to shutdown will cause rapid cycling, and could cause a high pressure shutdown.

When piping two or more rotary screw units on a common discharge line, each unit shall be isolated by the check valve in the unit discharge line.

If a rotary screw and a reciprocating compressor are piped to a common discharge line, an air receiver must be located between the two units.



Discharge air used for breathing will cause severe injury or death.

Consult filtration specialists for additional filtration and treatment equipment to meet health and safety standards.

ELECTRICAL WIRING - Standard Units - The compressor package is factory wired for all connections from the starter to the motor, for the horsepower and voltage specified on the order. The standard unit is supplied with:

- UL Type 4 (NEMA 4) starter and controls enclosure and TEFC main motor on FS variants. Note that the overload settings are to be selected based on motor nameplate full load amperage
- UL Type 1 (IP54 VFD and controls enclosure and TEAO main motor on VS variants.

See ~~Location~~ paragraph on page 13, for distance to the nearest obstruction on the control box side of the package.

Perform all wiring in accordance with the National Electrical Code (NFPA-70) and any applicable local electrical codes. Wiring must be performed only by qualified electricians.



Electrical shock can cause injury or death. Open main disconnect switch, lockout and tag out before working on control box.

Electrical Wire Sizing - A certified electrician familiar with National Electric Codes and applicable local codes shall size the electrical power wires serving the compressor package. Refer to Figure 2-4, 2-5 for a summary of maximum package current draw values.

Power	Phase-Voltage	Max Current Draw - amps
25 / 30 HP package	3-575	30.1 / 35.4
"	3-460	37.6 / 43.8
"	3-230	73.6 / 86.1
"	3-208	82.9 / 94.9
RNC 125 dryer	1-115	18.0
RNC 150 dryer	1-115	18.0

Figure 2-4 – Electrical Wiring Sizing – FS Variants

Power	Phase-Voltage	Max Current Draw - amps
18 / 22 KW package	3-575	41.0 / 41.0
"	3-460	61.0 / 61.0
"	3-230	91.0 / 91.0
RES 120 dryer	1-115	18.3
RES 140 dryer	1-115	18.3

Figure 2-5 – Electrical Wiring Sizing – VS Variants

Line Reactor (VS var) – A line reactor provides conditioning of the electrical power supply to the compressor package by attenuating noise and fluctuations. It shall be required in your particular application if any of the following conditions exist:

- Transformer KVA is greater than recommended . see Fig 2-5
- Line has switched Power Factor correction capacitors.
- Existing line reactor is not properly sized . see Fig 2.5
- Other large loads share the power feed to the compressor package.

GD Model	Voltage	VFD kW Rating	Max kVA
VS 18 / 22	575	18 / 22	Consult Factory
‰	460	18 / 22	1000
‰	380	18 / 22	1000
‰	230	18 / 22	600

GROUNDING - Equipment must be grounded in accordance with Section 250 of the National Electrical Code.



Failure to properly ground the compressor package could result in injury or death. Install ground wiring in accordance with the National Electrical Code and any applicable local codes.

MOTOR LUBRICATION . Long time satisfactory operation of an electric motor depends in large measure on proper lubrication of the bearings. Refer to Section 11 of this manual for motor lubrication specifications and details.

SECTION 3

STARTING & OPERATING PROCEDURES

PRESTART-UP INSTRUCTIONS - A new unit as received from the factory has been prepared for shipping only. Do not attempt to operate the unit until checked and serviced as follows:

1. **Compressor Oil** - The oil level must be checked before starting the unit and every 8 hours of operation. For instructions on checking the oil and the proper oil level, refer to %oil level gauge+, SECTION 5 see page 53

Do not mix different type oils. Standard Unit is shipped filled with Gardner Denver AEON 4000 lubricant which is suitable for the first 4000 hours under normal operating conditions. Other AEON lubricants are available. Check the decal on the reservoir to be sure which lubricant is in the machine.

NOTICE

Regular maintenance and replacement at required intervals of the oil filter, air filter and air/oil separator is necessary to achieve maximum service and extended drain intervals of AEON 4000 lubricant. Use only genuine Gardner Denver filters designed and specified for this compressor.



Always stop the unit and release air pressure before removing oil filler plug. Failure to release pressure may result in personal injury or death.

Air Filter - Inspect the air filter to be sure it is clean and tightly assembled. Refer to SECTION 7, page 65 for complete servicing instructions. Be sure the inlet line, if used, is tight and clean.

2. **Package Inlet Filter** - Figure 1-2, page 10. Inspect the Pre-Filter to be sure it is clean. Refer to Section 7, page 65 for complete servicing instructions
3. **Piping** . Refer to SECTION 2, page 13 %Discharge Service Line+and make sure all piping meets all recommendations.

Electrical - Check the wiring diagrams furnished with the unit to be sure it is properly wired. See Figure 4-2 thru Figure 4-8 pages 26 thru page 46 for general wiring diagrams and SECTION 2, Page 13, for %Electrical Wiring+.

4. **Grounding** - Unit must be properly grounded according to Section 250 of the National Electrical Code.
5. When using a Total System with a compressed air dryer option, refer to Section 10 for details.

 **CAUTION**

Failure to properly ground the compressor package could result in controller malfunction.

6. **Rotation** - Check for correct motor rotation by jogging the motor. See %Maintenance, Motor Jog+ menu in Controller Operating and Service Manual. Compressor drive shaft rotation must be:
- 1) For Direct-Drive compressor, counterclockwise when facing the compressor shaft.
 - 2) For Gear-Drive compressor, clockwise when facing the compressor shaft.

 **CAUTION**

Operation with incorrect motor rotation can damage equipment and cause oil eruption from the compressor inlet. When checking motor rotation, induce minimum rotation (less than one revolution if possible). Never allow motor to reach full speed.

 **CAUTION**

The compressor unit's direction of rotation must be checked every time the compressor package or its main motor is reconnected to the power supply.

NOTICE



Read the Controller Operating and Service Manual before operating the compressor.

7. **Unload Pressure** - This is the package discharge pressure beyond which the controller will initiate an unload action. The controller limits the unload pressure value to 3psi above the maximum operating pressure on the compressor nameplate. See "Operational Settings" menu in Controller Operating and Service Manual.
8. **Load Pressure** - This is the package discharge pressure at which the controller will halt the unload action and load the compressor. It is typically selected 15psig below the Unload setting. See "Operational Settings" menu in Controller Operating and Service Manual.

9. **Target Pressure** - This is the package discharge pressure that the controller would maintain. For fixed speed units, a pressure rise of 3psi above the target value would result in an unload action. For flow modulating units (e.g., variable speed or inlet throttling), a pressure rise above the target would result in flow modulation. Note that inlet throttling is only available with the Fixed Speed models. **DO NOT EXCEED THE MAXIMUM OPERATING PRESSURE ON THE COMPRESSOR NAMEPLATE.** See %Operational Settings+menu in Controller Operating and Service Manual.



Operation at excessive discharge air pressure can cause personal injury or damage to equipment. Do not adjust the full discharge air pressure above the maximum stamped on the unit nameplate.

10. **Operating Mode** - See "Operational Settings, Operating Mode" menu in Controller Operating and Service Manual.
11. **Enclosure** - Check for damaged panels or doors. Check all screws and latches for tightness. Be sure doors are closed and latched.



The compressor starts and stops automatically. Automatic restarting can cause injury or death. Open, lockout and tag out main disconnect and any other circuits before servicing the unit.



After an emergency stop, be sure that the pressure in the air/oil reservoir is less than 5 psig. Wait one minute or more before restarting.



The controller has an automatic start/stop sequence built in. You do NOT need to close the air service valve. Closing the air service valve on start-up or prior to shutdown will cause rapid cycling, and could cause a high pressure shutdown.

STARTING THE UNIT - Observe the following starting procedures:

Unit Cold or Hot:

1. When using a Total System with a compressed air dryer option, refer to Section 10 for details.
2. Open the air service valve (customer furnished) between the main air system and the check valve on the package.
3. Turn on power to the compressor package. To start, press STOP key to clear shutdown conditions, then press RUN key.
4. Run for approximately several minutes until the temperature stabilizes.
5. The unit is equipped with a minimum (60psig) pressure/check valve. No special procedure is required to maintain the unit reservoir pressure.

DAILY CHECK - Refer to Maintenance Schedule, Section 10 for details

STOPPING THE UNIT:

1. To stop compressor operation, press STOP key.
2. Wait approximately one minute to allow the compressor to stop. The oil reservoir will automatically blow down as the motor stops.
3. When using a Total System with a compressed air dryer option, refer to Section 10 for details.

Quick Start Guide

For your convenience, the following excerpt from the Controller Operating and Service Manual is presented to assist in programming the basic operating parameters. However, we strongly recommend you read the Controller Operating and Service manual before attempting operating the compressor package.



Figure 3-1 – Controller Layout and Main Screen



Figure 3-2 – Typical Value Entry Screen

- **Controller Hardware layout.**
 - See Fig 3-1 for the layout of the main screen and input devices.
 - The functions available (e.g., "enter", "left arrow", "select", etc.) on any menu are shown on lower and right edge of the screen, next to seven (7) adjacent keypad buttons. To select a function, the adjacent keypad button must be pressed!
 - The "STOP" and "RUN" keypad buttons are separate and self-evident in Figure 3-1.
- **Setting the Target, Unload, and Load Pressures**
 1. Press "menu" button
 2. Navigate with [↑↓] button to "Operation" sub-menu and press [↵] button to enter selection.
 3. Navigate with [↑↓] button to "Set Points" sub-menu and press [↵] button to enter selection.
 4. Navigate with [↑↓] button to "Target Pressure" sub-menu and press [↵] button to enter selection - see Fig 3-2 for value entry display.
 5. Last stored target pressure value is displayed on top are and cursor is located at "clr" (clear) command key. Press "sel" button to clear displayed target pressure. Note that cursor location is evident by font color change (yellow) of numeral displayed.
 6. Navigate with [↑↓] button to first numeral key and press [↵] button to enter selection.
 7. Navigate with [↑↓] button to second numeral key and press [↵] button to enter selection.
 8. Navigate with [↑↓] button to third numeral key and press [↵] button to enter selection.
 9. Navigate with [↑↓] button to "Enter" key and press [↵] button to enter selection. The target pressure value is stored in the Controller.
 10. Navigate with [↑↓] button to "Back" key and press [↵] button to return to the previous (Set Points) sub-menu.
 11. Repeat steps 2 to 10 to select and set the "Unload" and "Load" pressure values.

SECTION 4 CONTROLS & INSTRUMENTATION

GENERAL DESCRIPTION

The Gardner Denver rotary screw compressor is pre-wired with all controls, motor and starter to match specific voltage and horsepower as ordered. It is necessary only to connect the compressor unit to the correct power supply and to the shop air line. A standard package unit consists of the modular compressor assembly, air/oil cooling and filtration system, control components, electric motor drive, associated starting module, sound attenuation metal enclosure and common support steel base.

ELECTRONIC CONTROLLER AND STARTER ASSEMBLY HARDWARE - See to the Wiring Diagrams listed [by voltage] at the end of this section, for more details on the location of the referred hardware.

AirSmart® G2 Controller - The compressor package features the ASG2 controller, which integrates all the control functions under microprocessor control - see Fig 4-1 for general detail of the controller keypad and display. Controller functions include safety and shutdown, compressor regulation, operator control and advisory/maintenance indicators. The keypad and display provides a logical and easily operated control of the compressor and indication of its condition. The controller is factory adjusted for the compressor package, but allows tuning for specific applications.



Figure 4-1 – Controller Layout and Main Screen

Emergency Stop Pushbutton - This is a maintained pushbutton, and removes power from the controller outputs regardless of controller status. It is located on the electrical panel door, below the controller keypad. This should be used for emergency purposes only - use the keypad [STOP] for normal controlled stopping.

Control Transformer – A control transformer is provided to energize the power supply from 575V primary. A secondary fuse is provided on the control transformer. Refer to adjacent labeling for replacement information.

Fuse Blocks – Two fuse blocks provide line side protection for the power supply and control transformer. Three fuse blocks provide line side protection for the cooling fan contactor.

Power Supply – This single-phase device supplies all 24 VDC needs within the control enclosure from the available AC supply line.

Terminal Strip - This device provides an interconnection between the ASG2 controller and the low voltage hardware such as sensors and switches within the enclosure.

Main Starter - Hardware details will vary with the type of speed regulation ordered:

- **Fixed speed** models are fitted with a wye-delta type starter that provides control and overload protection for the TEFC main drive motor. Wiring diagrams are illustrated on pages 28 thru 42. The overloads are adjustable and are factory set based on the motor nameplate amps and the instructions provided. All electrical components are housed in a common Type 4 (NEMA 4) enclosure.
- **Variable speed** models are fitted with a pulse-width modulation, variable frequency drive (aka VFD) that provides control and overload protection for the TEAO main drive motor. Wiring diagrams are illustrated on pages 43 to 48. The VFD/main motor combination enables the compressor to match the air supply to the customer's demands in real time and in a step-less fashion. The operational logic which govern the VFD and motor is provided by the ASG2 controller. All electrical components are housed in a common Type 1 (IP54) enclosure.
 - A small centrifugal fan ventilates the interior of the electrical enclosure by drawing fresh air through a reusable foam filter assembly and discharging it into the confines of the sound attenuating package enclosure.
 - A temperature sensor monitors the average temperature within the common enclosure and warns, via the ASG2 controller, against high levels . an indication that the local temperature has been exceeded or that the air filter needs cleansing.

Ventilation fan (heat exchanger, main motor) contactor - This contactor provides control for the cooler fan motor . in variable speed models, the contactor also controls the main motor ventilation fan. Overload protection is provided by a thermal switch integral to the fan motor and externally wired to the contactor. With the exception of the 575volt service, the overload protection for the main motor cooling fan is provided internally.

NOTICE



Read the Operator's Manual before operating the compressor. It is critical that the detailed instructions for the controller, found in the controller manual are read and understood. Once the appropriate parameters have been selected into the controller, compressor operation may commence. For convenience, a "Quick Start" excerpt from the controller manual is shown on Section 3

FIELD CONVERSION OF MUTI-VOLTAGE ELECTRICAL SYSTEM (FIXED SPEED VARIANTS ONLY)

. To convert the compressor package from its as-built voltage configuration to one of its optional ones, refer to Voltage Conversion Kit 300USC1255 for details and hardware list.

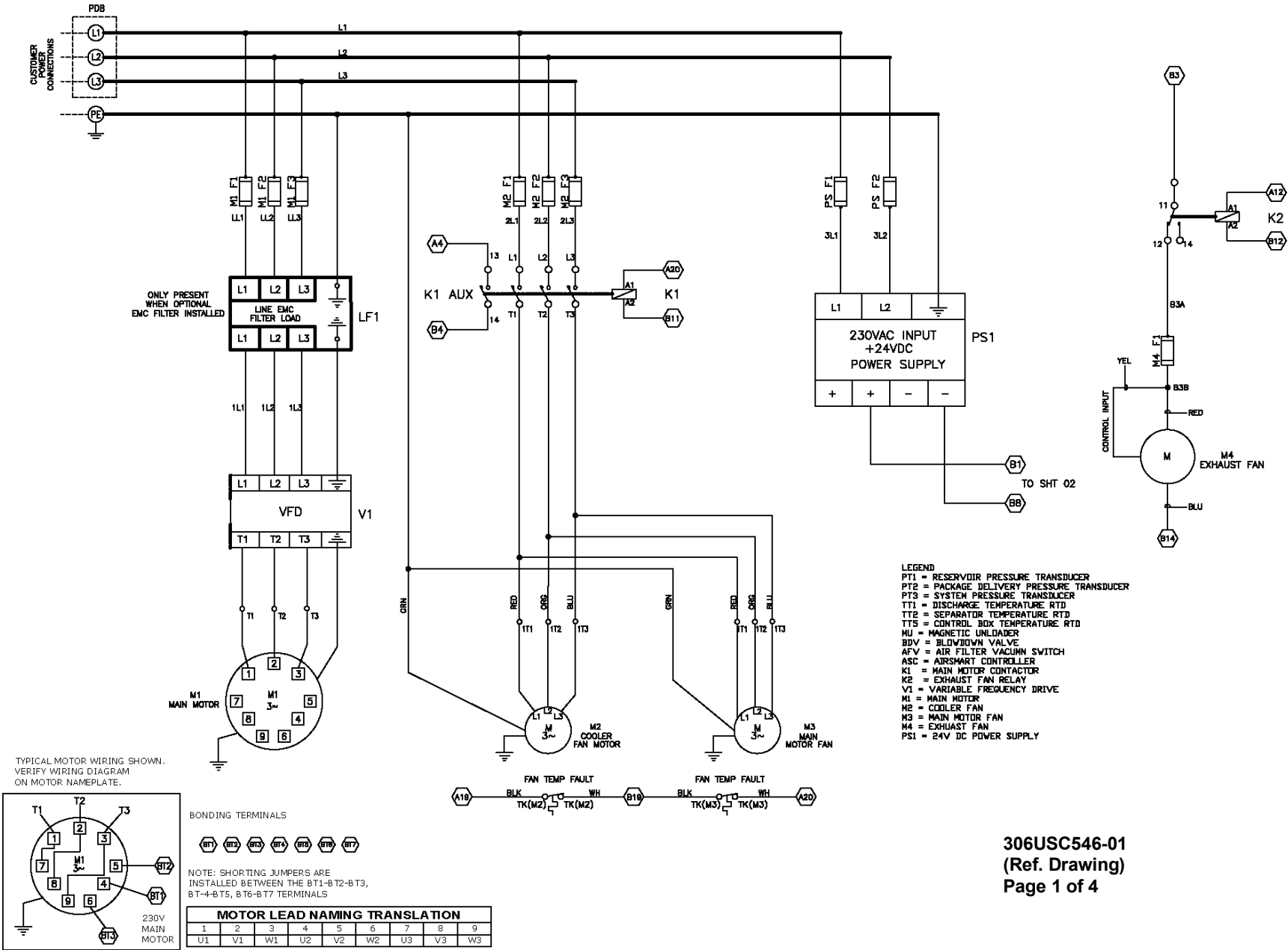


Figure 4-2 – WIRING DIAGRAM – VS (230 VOLT)

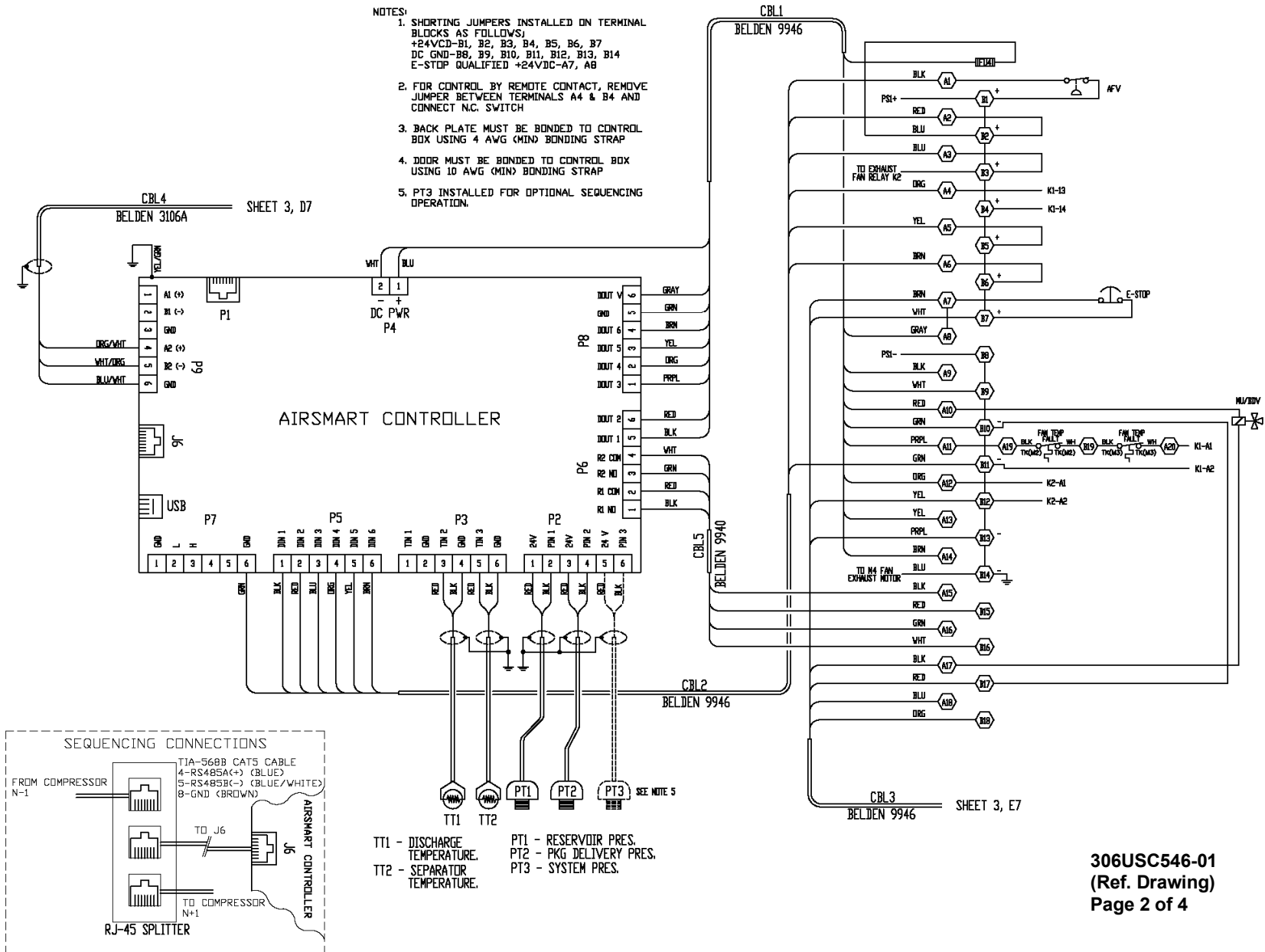
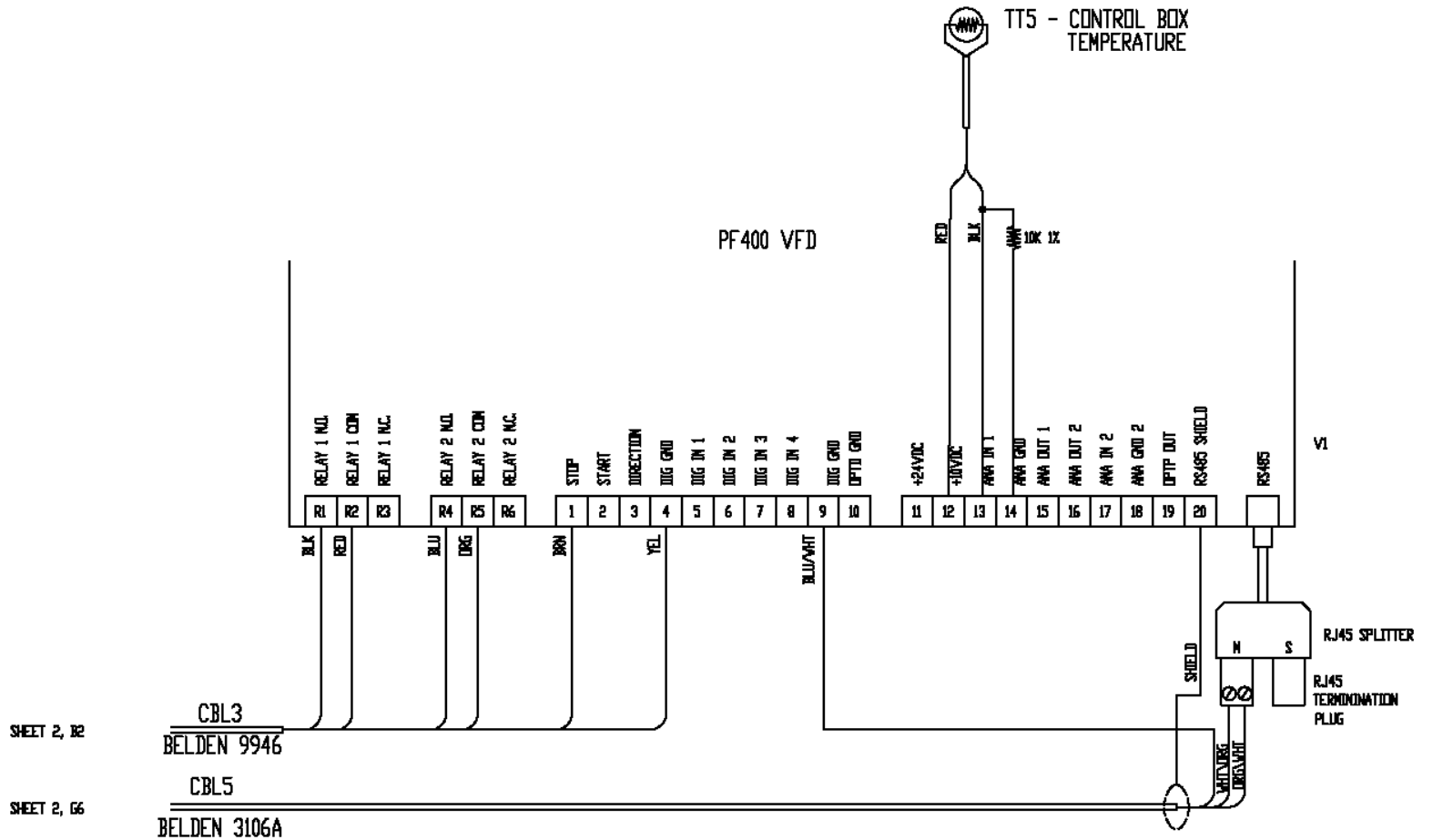


Figure 4-3 – WIRING DIAGRAM – VS (230 VOLT)



SHEET 2, B2

SHEET 2, G6

CBL3
BELDEN 9946
CBL5
BELDEN 3106A

306USC546-01
(Ref. Drawing)
Page 3 of 4

Figure 4-3 – WIRING DIAGRAM – VS (230 VOLT)

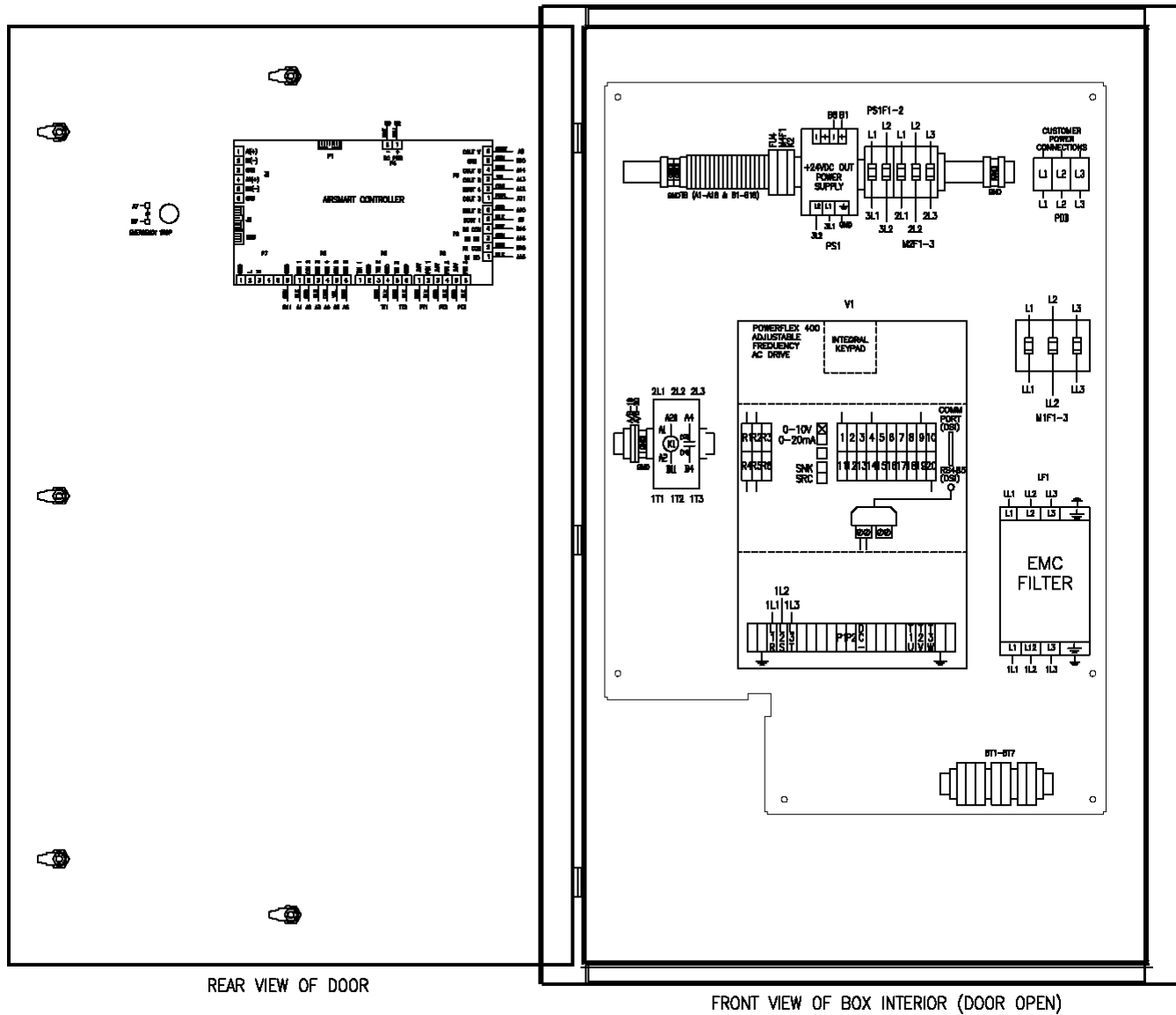


Figure 4-3 – WIRING DIAGRAM – VS (230 VOLT)

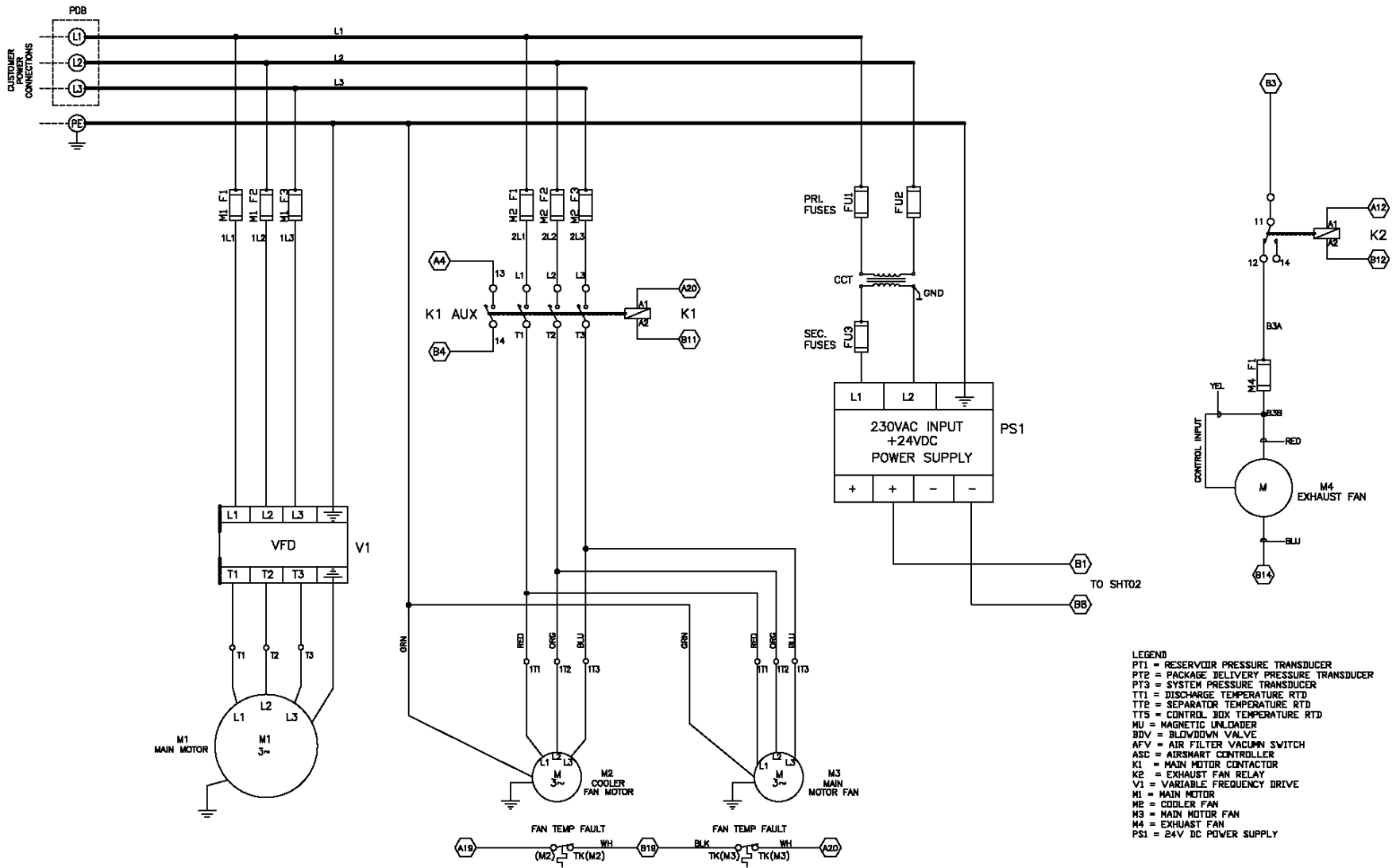


Figure 4-3- WIRING DIAGRAM – VS (575 VOLT)

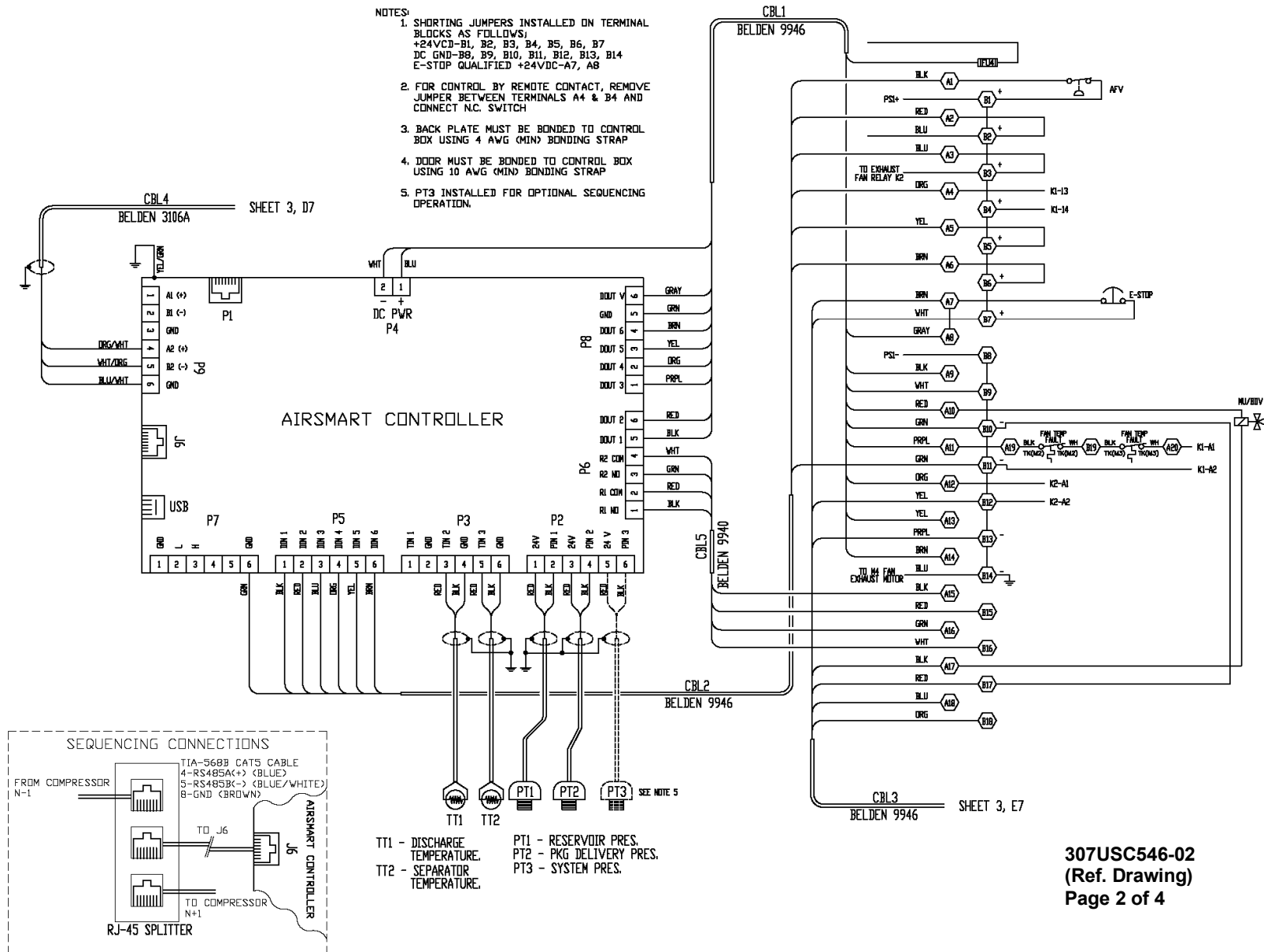
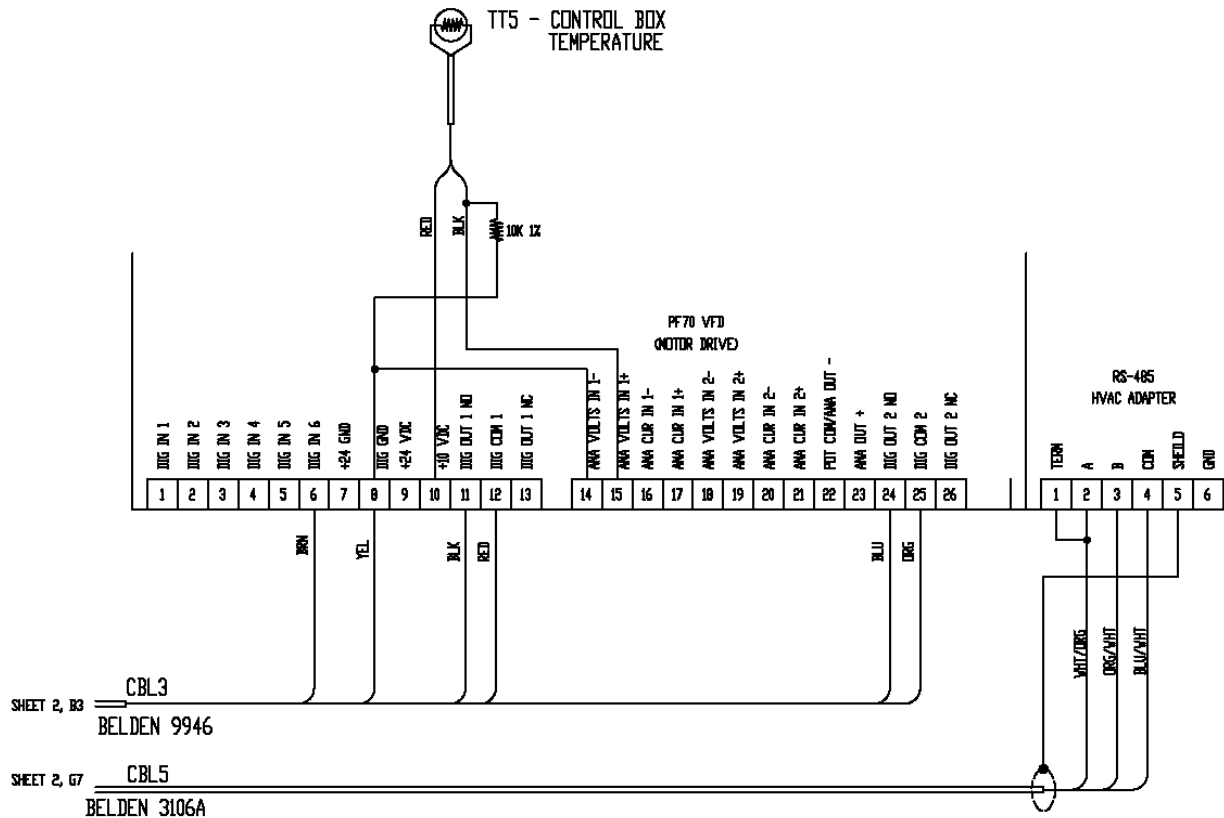


Figure 4-4 – WIRING DIAGRAM – VS (575 VOLT)



NOTES:

1. SHORTING JUMPERS INSTALLED ON TERMINALS BLOCKS AS FOLLOWS
 +24VDC - B1, B2, B3, B4, B5, B6, B7
 DC GND - B8, B9, B10, B11, B12, B13, B14
 E-STOP QUALIFIED +24VDC - A7, A8
2. FOR CONTROL BY REMOTE CONTACT, REMOVE JUMPER BETWEEN TERMINALS A6 AND B6 AND CONNECT N.C. SWITCH
3. BACK PLATE MUST BE BONDED TO CONTROL BOX USING STAR WASHERS UNDER MOUNTING HARDWARE.
4. CONTROL BOX DOOR MUST BE BONDED TO CONTROL BOX USING 10AWG (MIN) BONDING STRAP.

307USC546-02
 (Ref. Drawing)
 Page 3 of 4

Figure 4-4 – WIRING DIAGRAM – VS (575 VOLT)

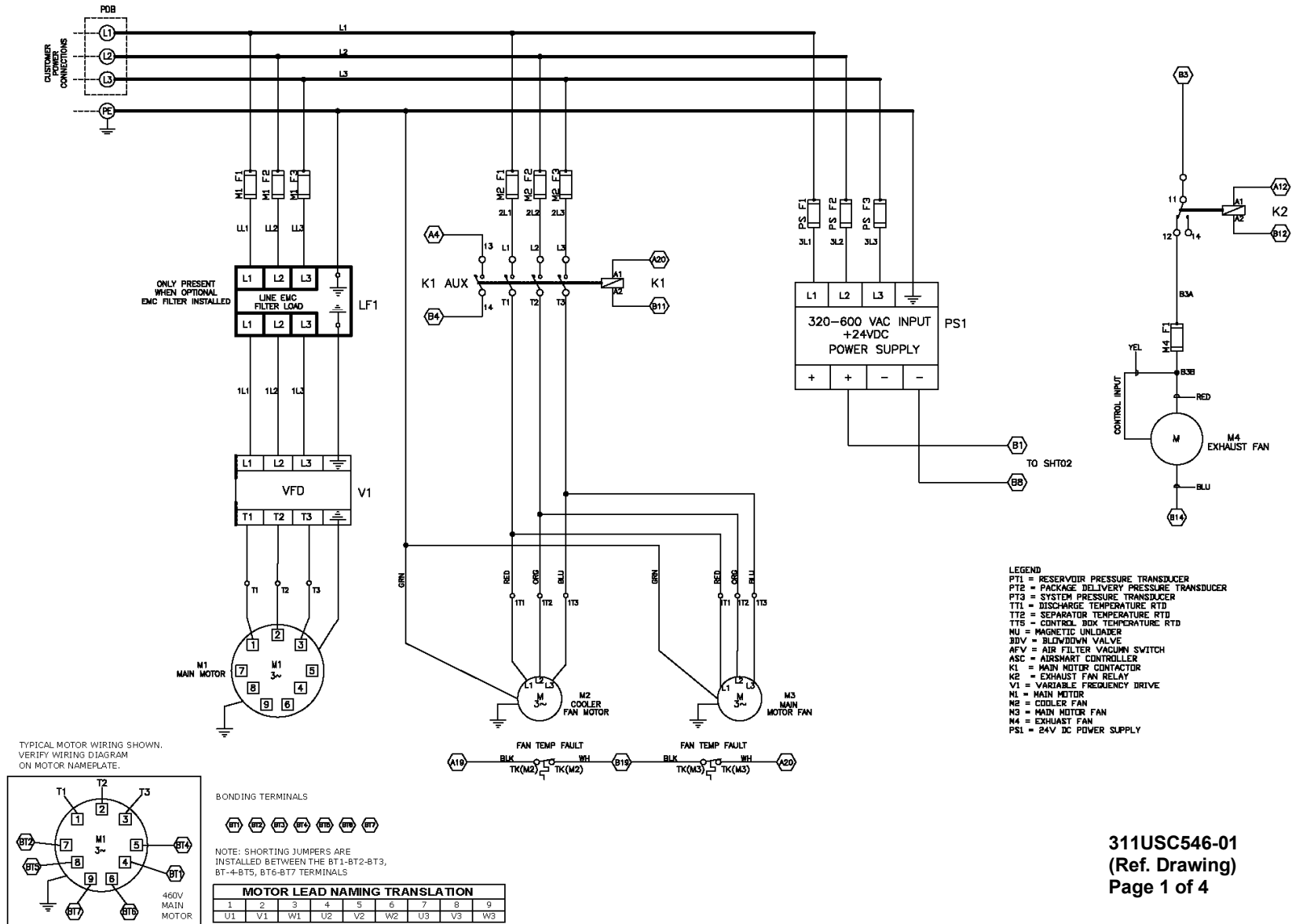
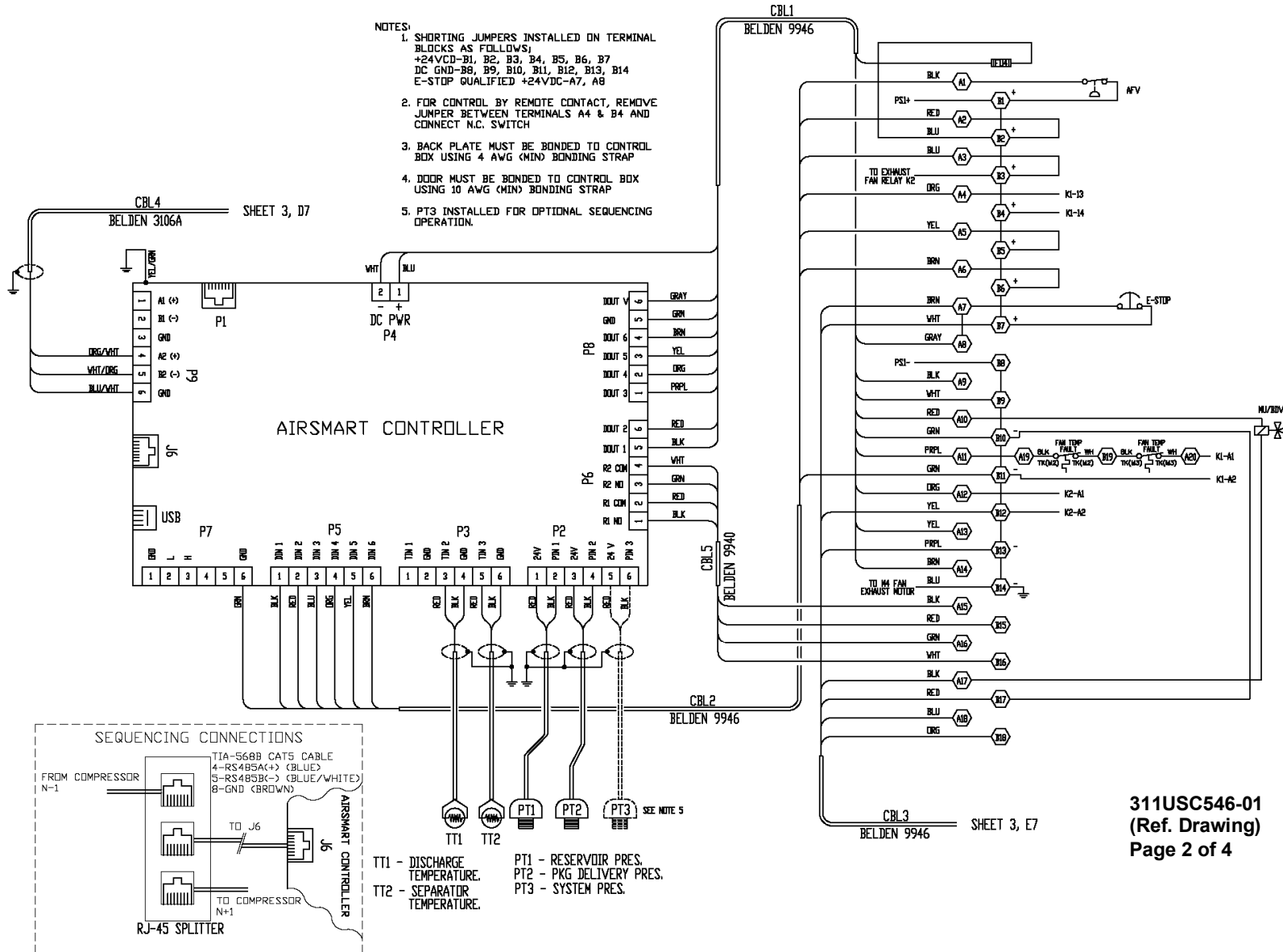
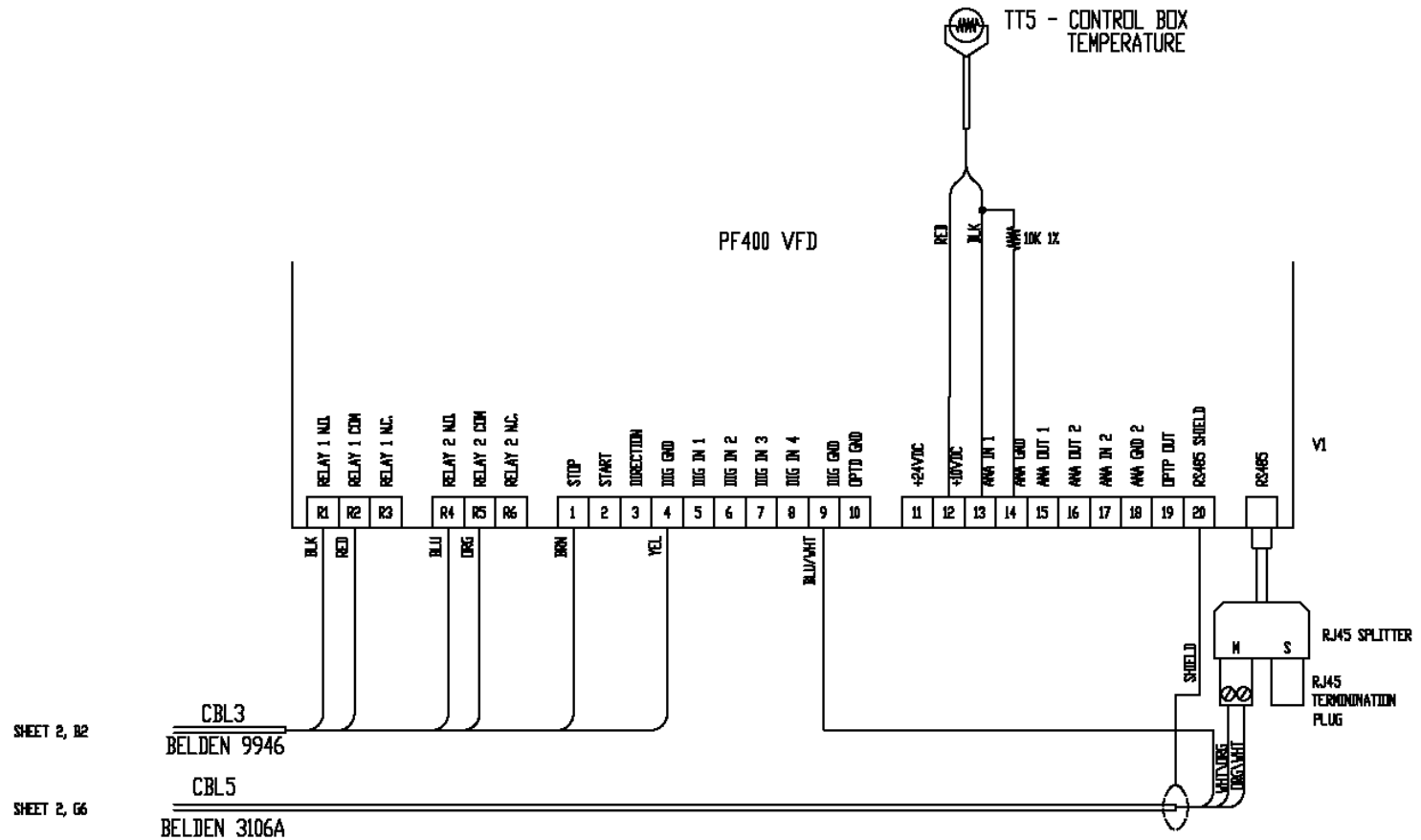


Figure 4-4 – WIRING DIAGRAM – VS (380-460 VOLT)



311USC546-01
(Ref. Drawing)
Page 2 of 4



SHEET 2, B2

SHEET 2, G6

NOTES:

- SHORTING JUMPERS INSTALLED ON TERMINALS BLOCKS AS FOLLOWS
 +24VDC - B1, B2, B3, B4, B5, B6, B7
 DC GND - B8, B9, B10, B11, B12, B13, B14
 E-STOP QUALIFIED +24VDC - A7, A8
- FOR CONTROL BY REMOTE CONTACT, REMOVE JUMPER BETWEEN TERMINALS A6 AND B6 AND CONNECT N.C. SWITCH
- BACK PLATE MUST BE BONDED TO CONTROL BOX USING STAR WASHERS UNDER MOUNTING HARDWARE.
- CONTROL BOX DOOR MUST BE BONDED TO CONTROL BOX USING 10AWG (MIN) BONDING STRAP.

311USC546-01
 (Ref. Drawing)
 Page 3 of 4

Figure 4-5 – WIRING DIAGRAM – VS (380-460 VOLT)

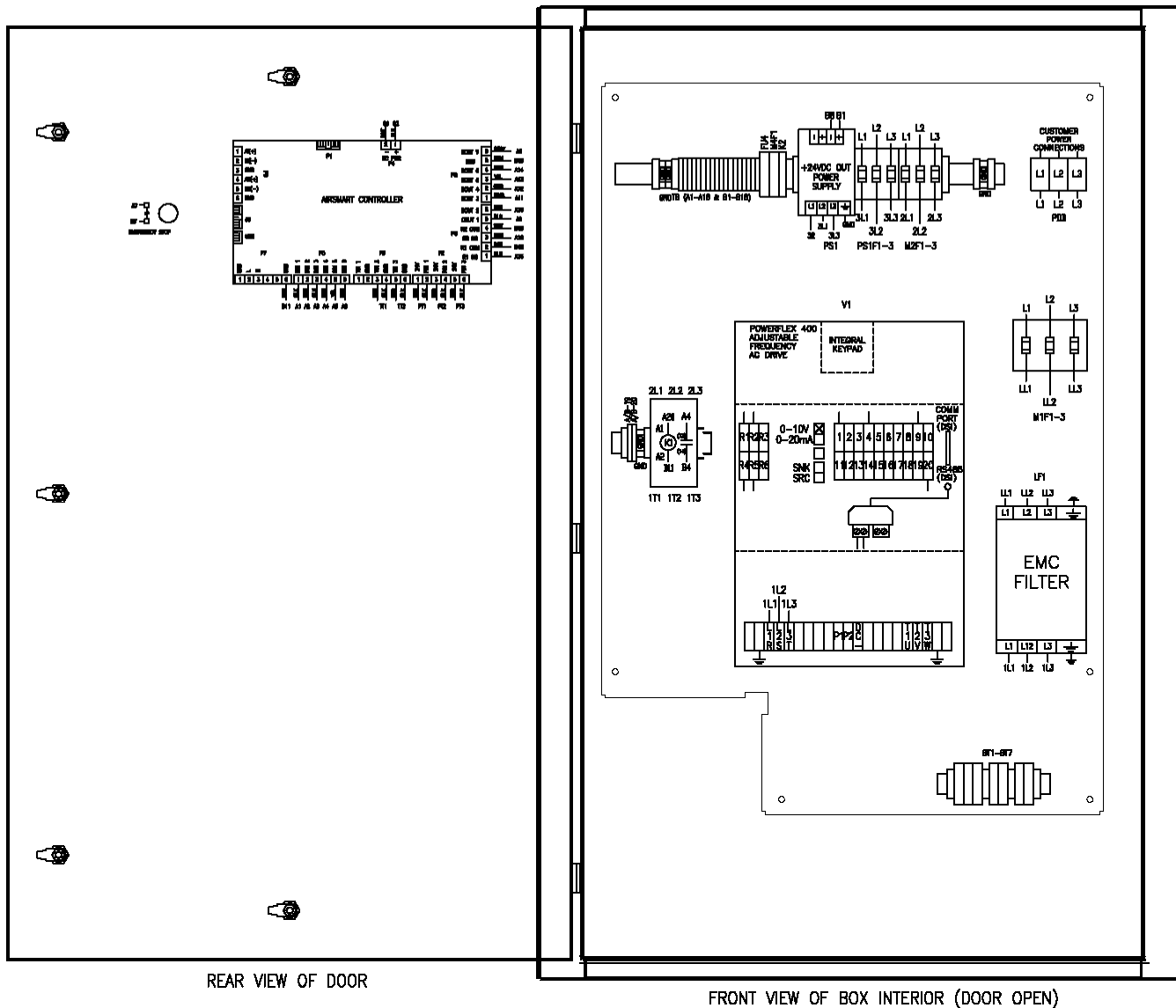


Figure 4-5 – WIRING DIAGRAM – VS (380-460 VOLT)

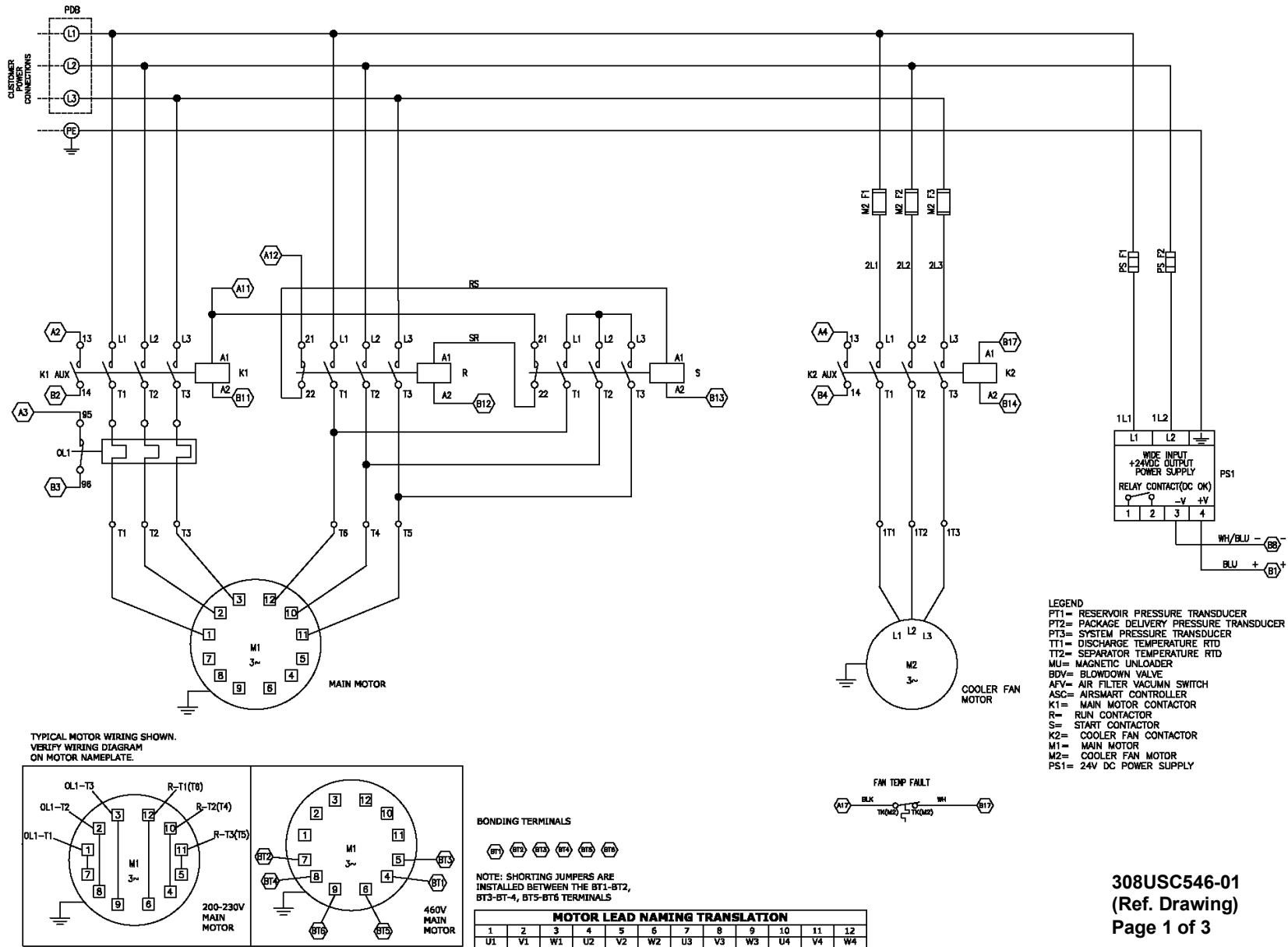
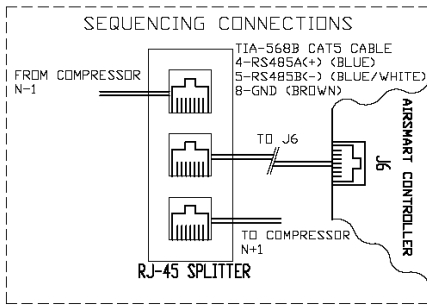
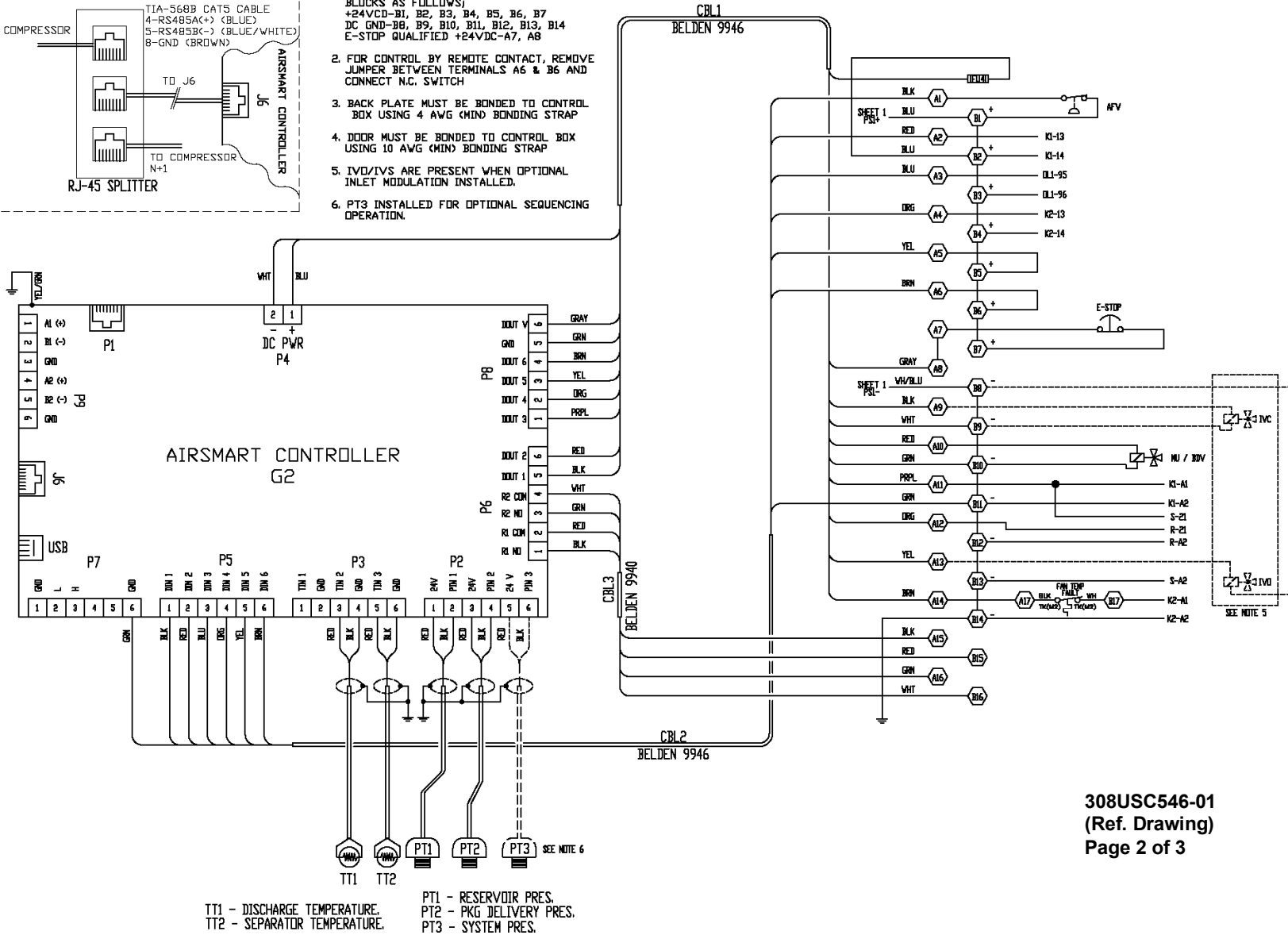


Figure 4- 5 – WIRING DIAGRAM – FS (208 – 230, 460 VOLT)



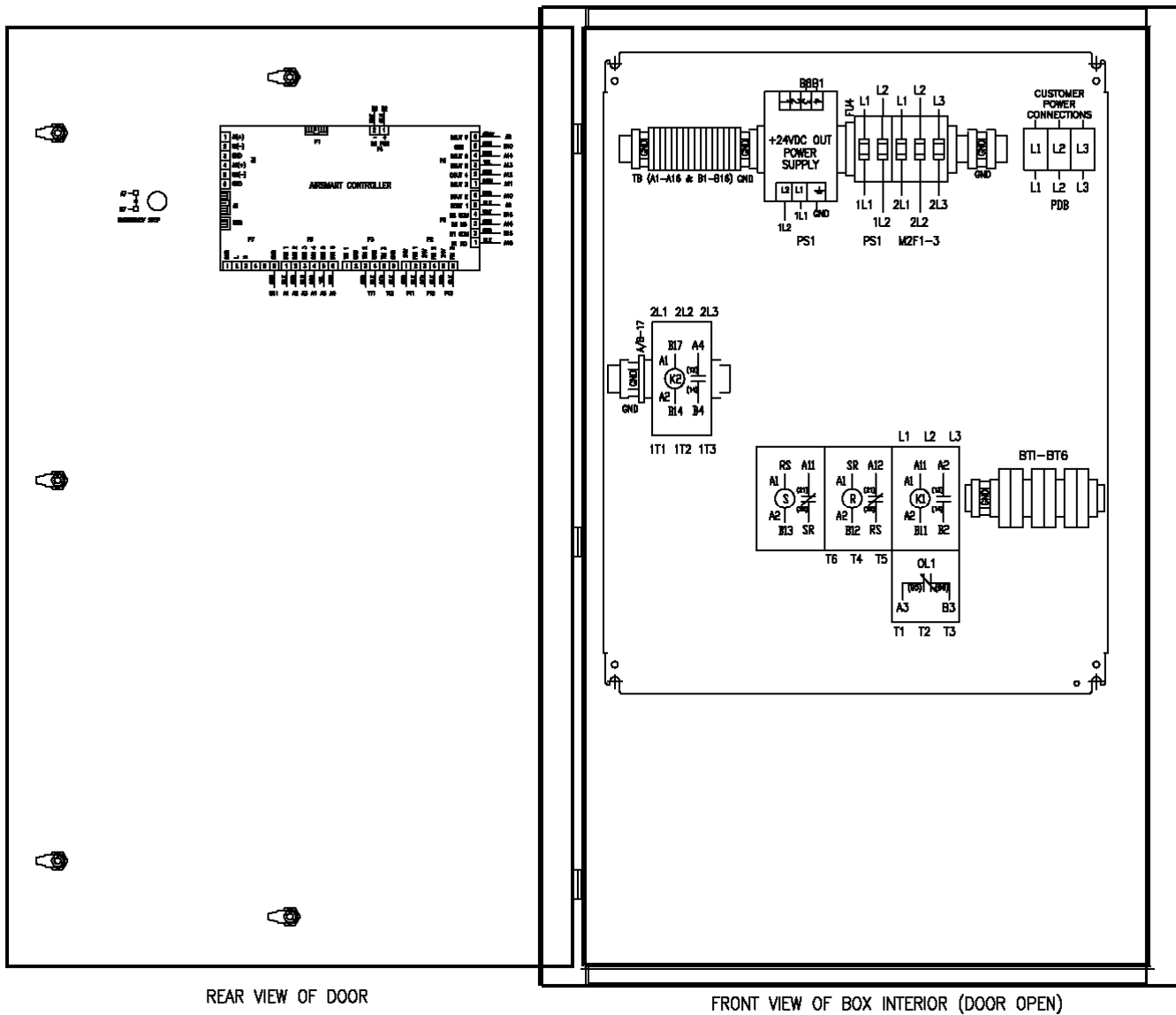
- NOTES:
1. SHORTING JUMPERS INSTALLED ON TERMINAL BLOCKS AS FOLLOWS:
+24VDC-B1, B2, B3, B4, B5, B6, B7
DC GND-B8, B9, B10, B11, B12, B13, B14
E-STOP QUALIFIED +24VDC-A7, A8
 2. FOR CONTROL BY REMOTE CONTACT, REMOVE JUMPER BETWEEN TERMINALS A6 & B6 AND CONNECT N.C. SWITCH
 3. BACK PLATE MUST BE BONDED TO CONTROL BOX USING 4 AWG (MIN) BONDING STRAP
 4. DOOR MUST BE BONDED TO CONTROL BOX USING 10 AWG (MIN) BONDING STRAP
 5. IVD/IVS ARE PRESENT WHEN OPTIONAL INLET MODULATION INSTALLED.
 6. PT3 INSTALLED FOR OPTIONAL SEQUENCING OPERATION.



TT1 - DISCHARGE TEMPERATURE.
TT2 - SEPARATOR TEMPERATURE.
PT1 - RESERVOIR PRES.
PT2 - PKG DELIVERY PRES.
PT3 - SYSTEM PRES.

308USC546-01
(Ref. Drawing)
Page 2 of 3

Figure 4-6 – WIRING DIAGRAM – FS (208 – 230, 460 VOLT)



REAR VIEW OF DOOR

FRONT VIEW OF BOX INTERIOR (DOOR OPEN)

Figure 4-6 – WIRING DIAGRAM – FS (208 – 230, 460 VOLT)

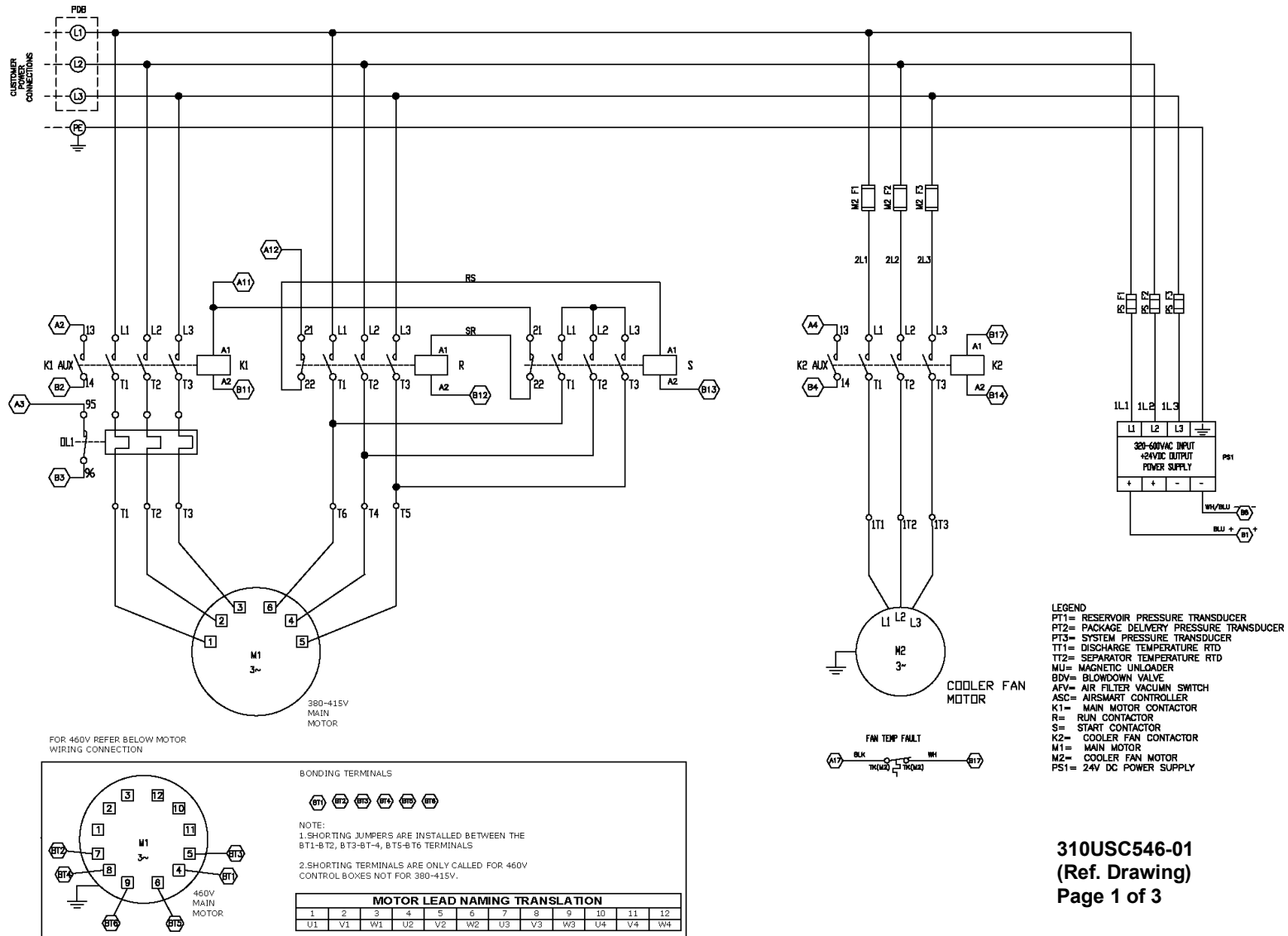
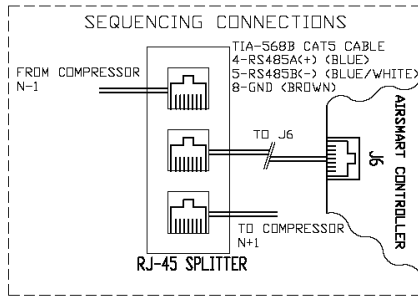
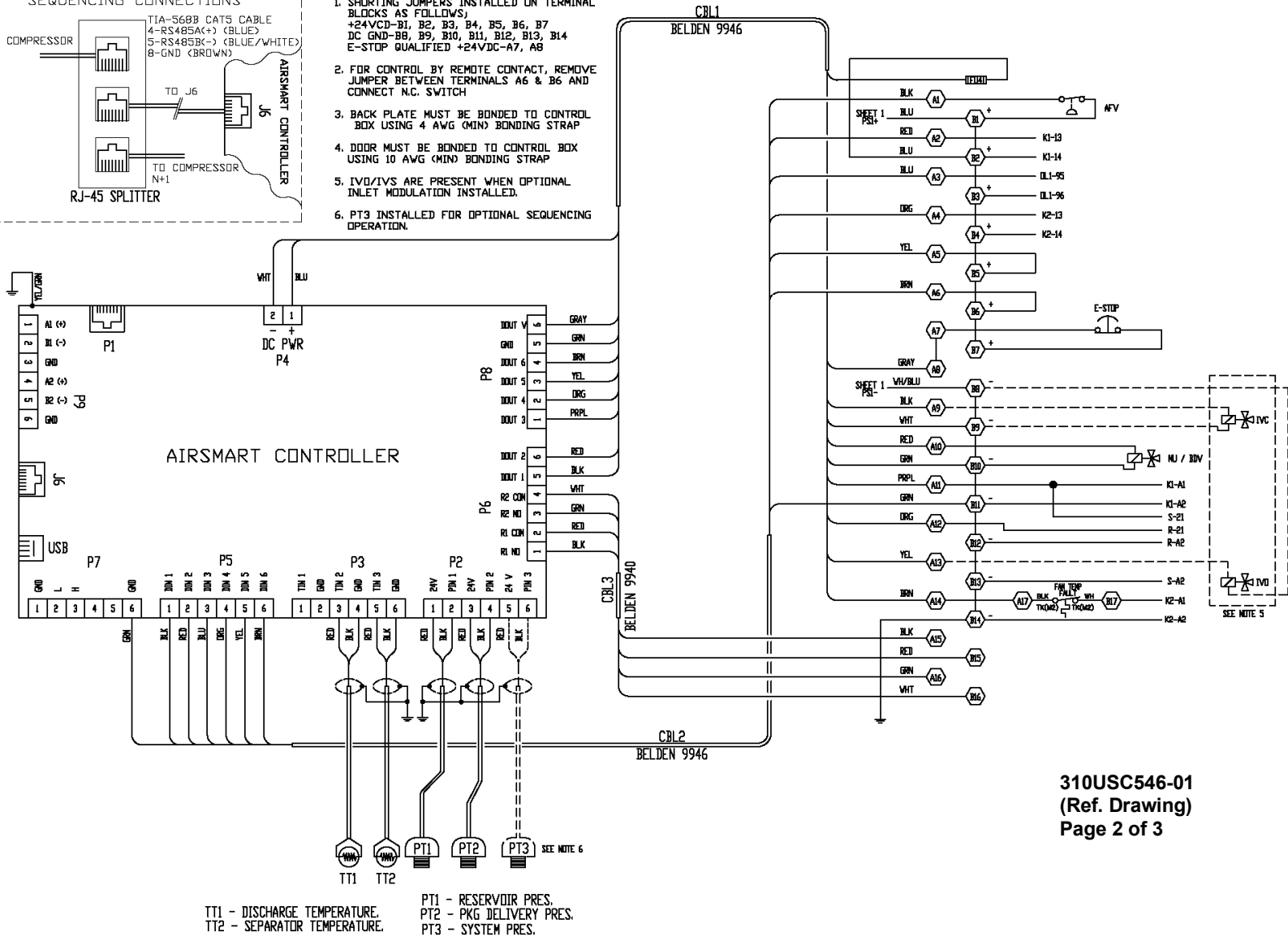


Figure 4- 6 – WIRING DIAGRAM – FS (380-415, 460 VOLT)

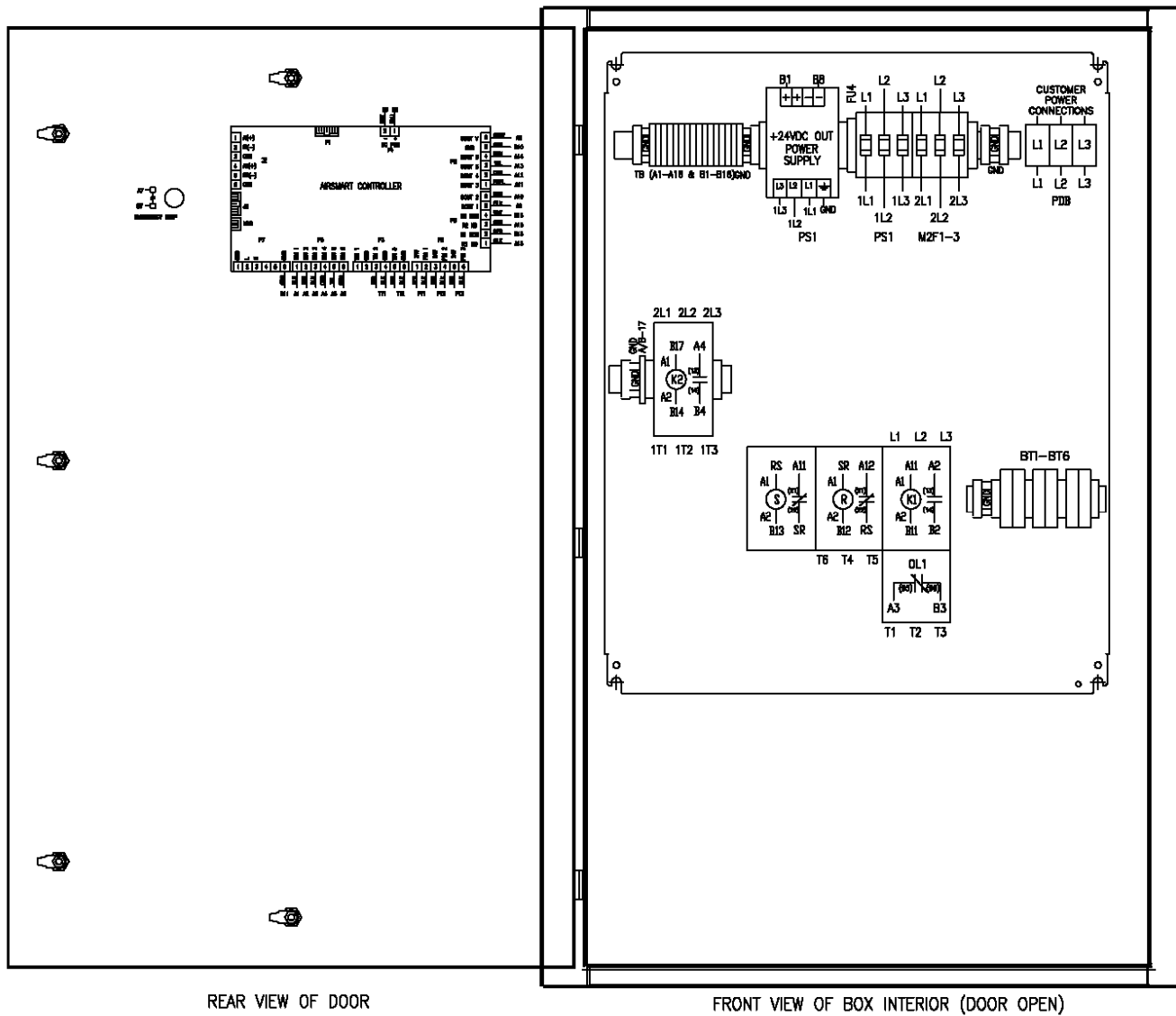


- NOTES:
1. SHORTING JUMPERS INSTALLED ON TERMINAL BLOCKS AS FOLLOWS:
 +24VDC-B1, B2, B3, B4, B5, B6, B7
 DC GND-B8, B9, B10, B11, B12, B13, B14
 E-STOP QUALIFIED +24VDC-A7, A8
 2. FOR CONTROL BY REMOTE CONTACT, REMOVE JUMPER BETWEEN TERMINALS A6 & B6 AND CONNECT N.C. SWITCH
 3. BACK PLATE MUST BE BONDED TO CONTROL BOX USING 4 AWG (MIN) BONDING STRAP
 4. DOOR MUST BE BONDED TO CONTROL BOX USING 10 AWG (MIN) BONDING STRAP
 5. IVD/IVS ARE PRESENT WHEN OPTIONAL INLET MODULATION INSTALLED.
 6. PT3 INSTALLED FOR OPTIONAL SEQUENCING OPERATION.



310USC546-01
 (Ref. Drawing)
 Page 2 of 3

Figure 4-7 – WIRING DIAGRAM – FS (380-415, 460 VOLT)



REAR VIEW OF DOOR

FRONT VIEW OF BOX INTERIOR (DOOR OPEN)

310USC546-01
(Ref. Drawing)
Page 3 of 3

Figure 4-7 – WIRING DIAGRAM – FS (380-415, 460 VOLT)

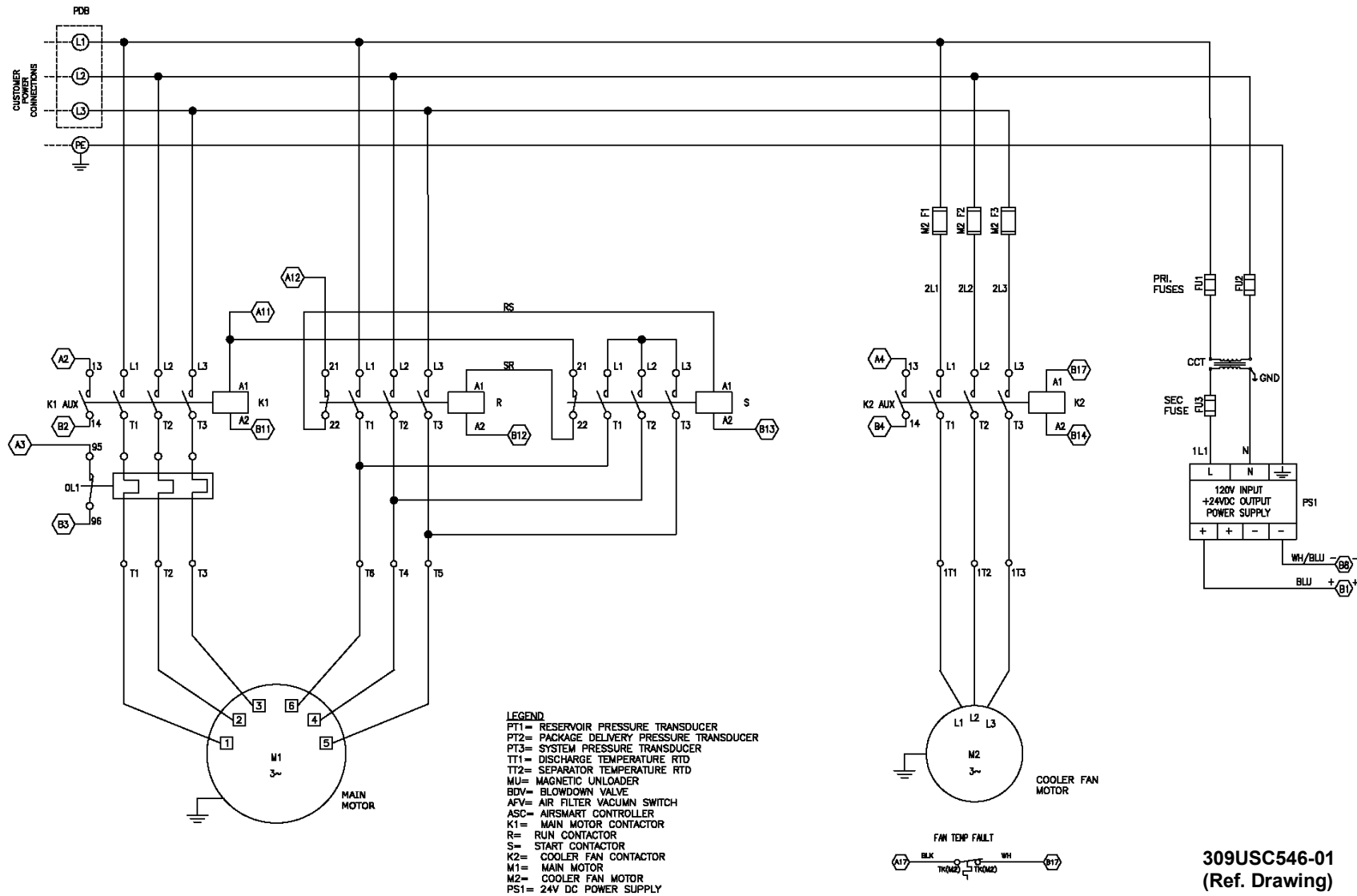


Figure 4- 7 – WIRING DIAGRAM – FS (575 VOLT)

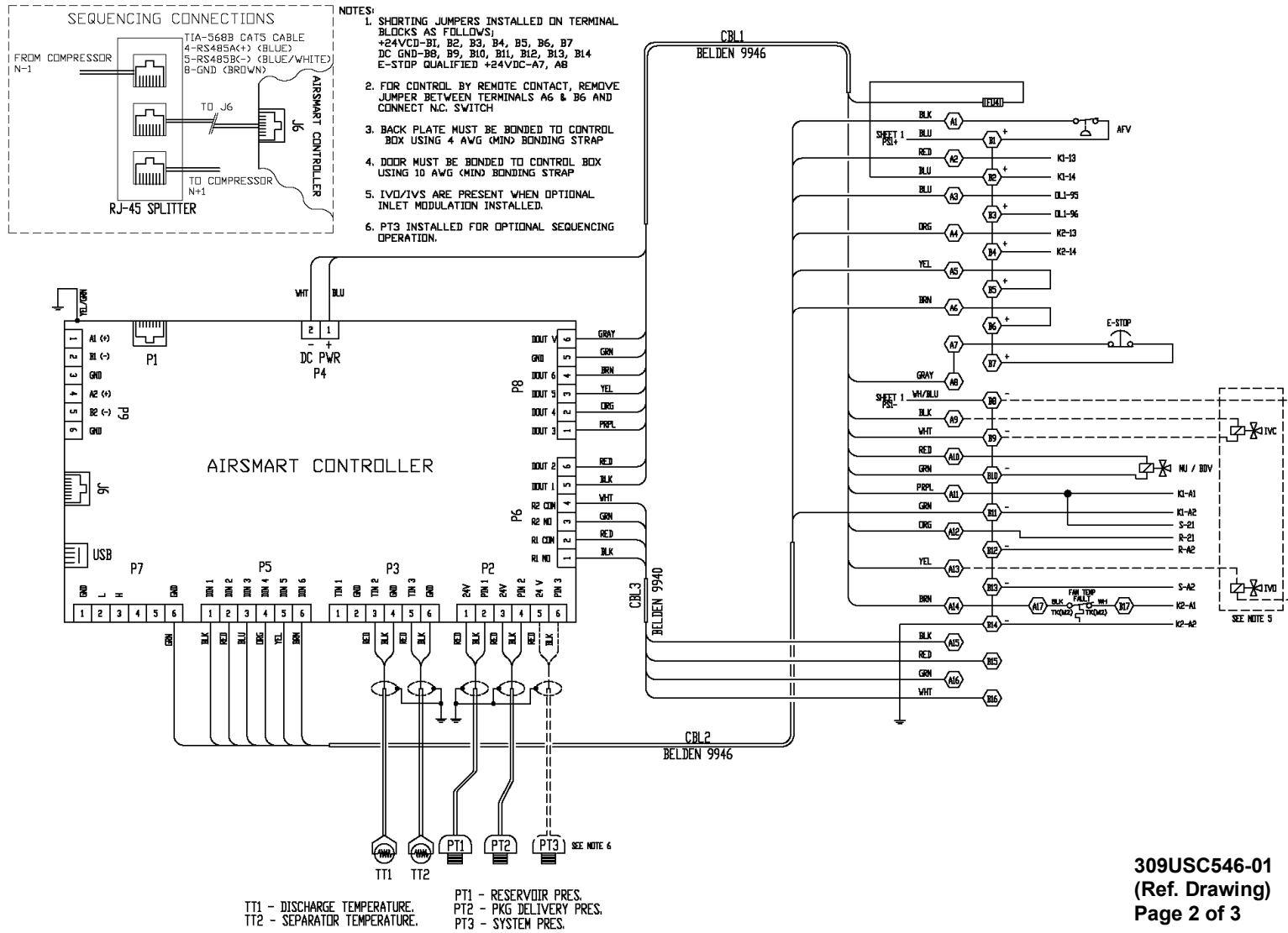


Figure 4-8 – WIRING DIAGRAM– FS (575 VOLT)

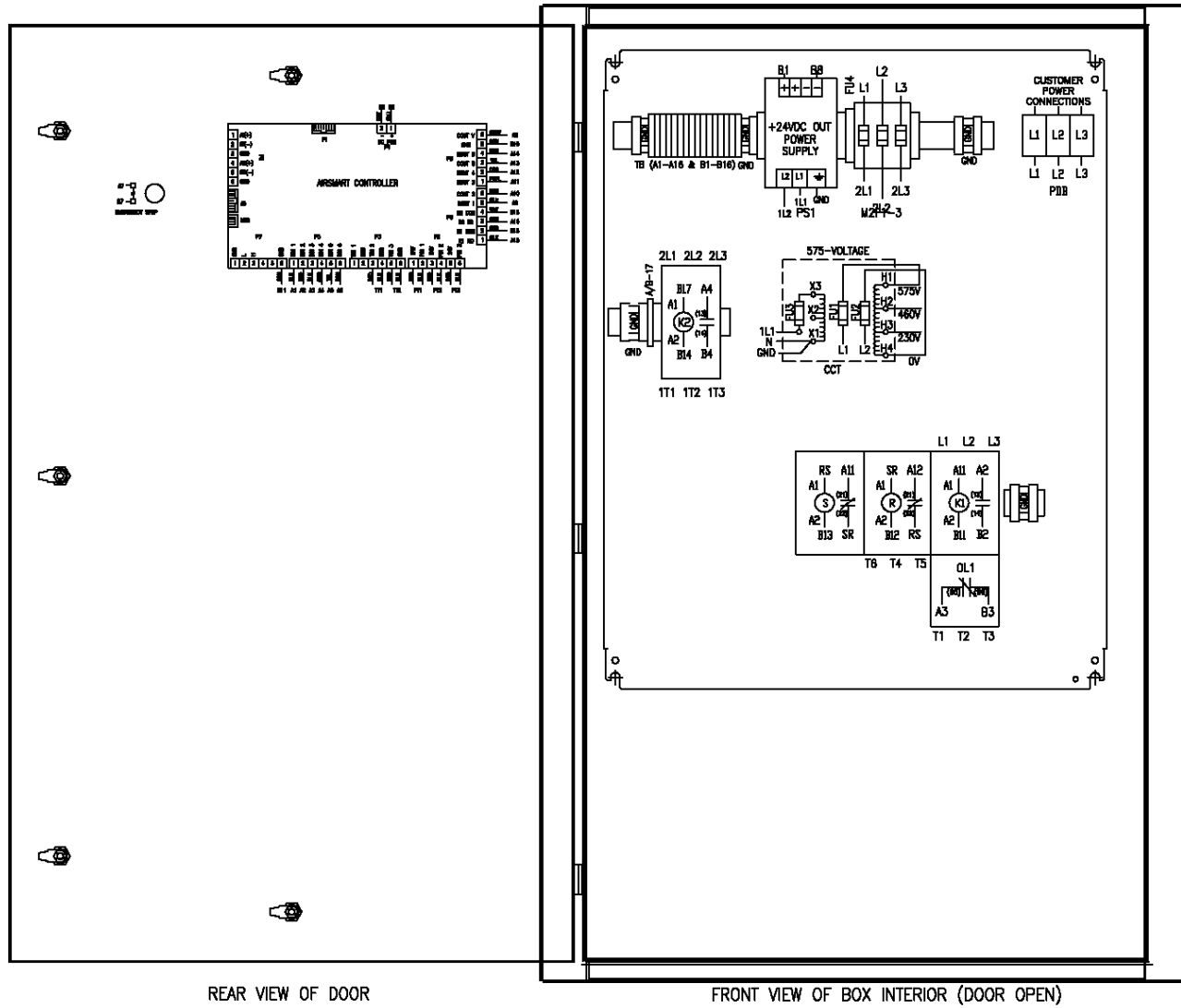


Figure 4-8 – WIRING DIAGRAM – FS (575 VOLT)

MISCELLANEOUS CONTROL DEVICES - Refer to

Figure 4- 8, page 52 for the schematic diagram of the control system.

Intake [Air] Filter (1) - Captures solid impurities in the air stream entering compressor inlet. It also attenuates noise emitted by the compressor inlet.

Inlet-Valve Assembly (2) - This device controls the intake of atmospheric air entering the compressor during the Load/Unload or the optional Inlet Modulation operational phases:

- During the loaded state: The **inlet poppet (2.2)** remains open and enables atmospheric air to enter the compressor inlet - this is done by venting to atmosphere the gas trapped underside of the piston via **check valve (19)** and **orifice (18)**.
- During the unloaded state: The **3/2-way solenoid valve (Y)** feeds pressurized air underneath the **piston (2.1)**, forcing it and **the inlet poppet (2.2)** upward and blocking-off the compressor intake. A small purge **check valve (2.3)**, located in the poppet, allows a stream of air to reach (e.g., purge) the rotors and keep them from unstable, noisy operation and producing sufficient pressure to maintain cooling / lubricating oil flow. A small amount of air is dispensed by **orifice (18)** to scavenge shaft seal challenge back into the compressor inlet. See Section 9, page 70, for maintenance information.
- During inlet modulation state: See the segment further down on Inlet Flow Modulation Hardware Option for details of this sub-system. Note that this option is available only for Fixed Speed package variants.

Electric Motor (3) – Drives the **compressor (4)** via a **belt drive assembly (5)**. It is energized by the wye-delta-type starter, which in turn is controlled by the ASG2 controller.

Oil Sump (6) – This pressure vessel separates by inertial effects the bulk of the compressed air and injection oil streams and serves as a sump for the latter.

Air/oil separator (7) - Intercepts and coalesces the aerosol oil stream in the compressed air exiting the inertial separation process within the oil sump.

Oil Filler Cap (8) – Oil fill port on the oil sump.

Oil drain [valve and plug] (9) . It is the low drainage point for the oil system. It is located at the bottom of the sump and includes a flexible hose to route drained oil unto a suitable container.

Oil Level Indicator (10) - This gauge is located on the oil sump and indicates the oil level. See **Oil Level Gauge+** on Section 5, Page 53, for more details.

Oil Filter (11) - Captures solid impurities in the oil entering the compressor injection port.

Oil Cooler (12) – The air-cooled heat exchanger removes heat from the oil stream prior to injection.

Pressure Relief Valve (13) . This device protects the pressure containing components of the compressor package against high pressure exceeding 188.5 psig. Section 9, See page 70, for maintenance information.

Minimum Discharge Pressure/Check Valve (14) - This device maintains minimum pressure (60psig) within the air/oil sump, thus ensuring adequate lubricating oil injection flow to the compressor even when no air delivery into the system is taking place. It also functions as a check valve to prevent reversed air flow from the system line during compressor stoppage. See Section 9, page 70, for maintenance information.

Air cooler (15) – The air-cooled heat exchanger removes heat from the air stream prior to exit from the package.

Scavenge line orifice (16) – This orifice controls the amount of oil and compressed air that is returned from the air/oil separator back into the compressor.

Thermal Mixing Valve (17) – This device mixes hot oil from the oil sump and cooled oil from the oil cooler prior to delivery to the oil filter and ultimate injection. See Section 9, page 70, for maintenance information.

3/2 Solenoid Valve (Y) - This valve controls the position of the inlet valve in response to signals from the AirSmart Controller. It also provides a small amount of scavenge air to carry off compressor shaft seal oil challenge. See inlet valve assembly (2) for more information.

Pressure Sensor - Sump Dry Side (B1) - This device is connected after the minimum pressure valve. It converts the pressure in the plant air system into an electrical signal for use by the %ASG2+controller for monitoring and control load/unload operation.

Pressure Sensor - Sump Wet Side (B2) - This device is connected to the oil sump. It converts the pressure in the oil sump into an electrical signal for use by the %ASG2+controller for monitoring and control. Its signal, when compared to that of sensor (B1), indicates the pressure loss across the air/oil separator element and it can also trigger a shutdown event in case an exceedingly high pressure is detected.

Air Filter Vacuum Switch (B3) - This switch is used to monitor air filter condition and alert the user if the filter requires service or replacement.

Temperature Sensor - Sump Wet Side (R1) - This device is connected to the oil sump. It measures the temperature in the compressor discharge port via the %ASG2+controller. Its signal can trigger a shutdown event in case an exceedingly high temperature is detected.

Temperature Sensor – Sump Dry Side (R2) – This device is connected to the outlet side of the air/oil coalescing element assembly bolted to the discharge of the oil sump. It measures the temperature of the compressed air, via the ASG2 controller, after final oil separation has been achieved. Its signal can trigger a shutdown event in case an exceedingly high temperature is detected.

The following items are provided in the Total System Hardware option:

Receiver (21) - Provides storage of compressed air and serves as a support for the compressor unit and optional dryer.

Refrigerated dryer (22) - The [optional] electric refrigerated dryer cools and lowers the dew point of the compressed air stream delivered by the compressor unit by removing the condensed water vapor entrained.

Dryer bypass valve (23) - This pair of three-way valves allows the isolation of the refrigerated dryer (from the compressed air line) for trouble shooting or maintenance purposes.

Drain isolation valve (24) - This valves isolate the condensate drain device from the compressed air lines, thus allowing for maintenance and/or temporary condensate drainage functions.

Condensate drain valve (25) - This device provides automatic condensate drainage from the receiver. It, along with the receiver, replaces the water separator shipped loose with the basic package.

Pressure relief valve (26) - This device protects the pressure containing components included with the received against high pressure exceeding 188.5 psig. Section 9, See page 70, for maintenance information.

Pressure gauge (27) - This device monitors the compressed air pressure within the receiver.

The following items are provided in the Inlet Flow Modulation Hardware option:

The inlet valve modulation system is employed to match the supply of compressed air delivered by the compressor to the customer's grid demand. Air flow modulation is achieved by gradually throttling (e.g., closing) the intake valve poppet until a steady state discharge pressure level is reached. A PID algorithm stored in the ASG2 controller regulates the duration and frequency two-way solenoid valves fill or vent the compressed air stream that adjust the position of the intake valve poppet . and thus its throttling setting.

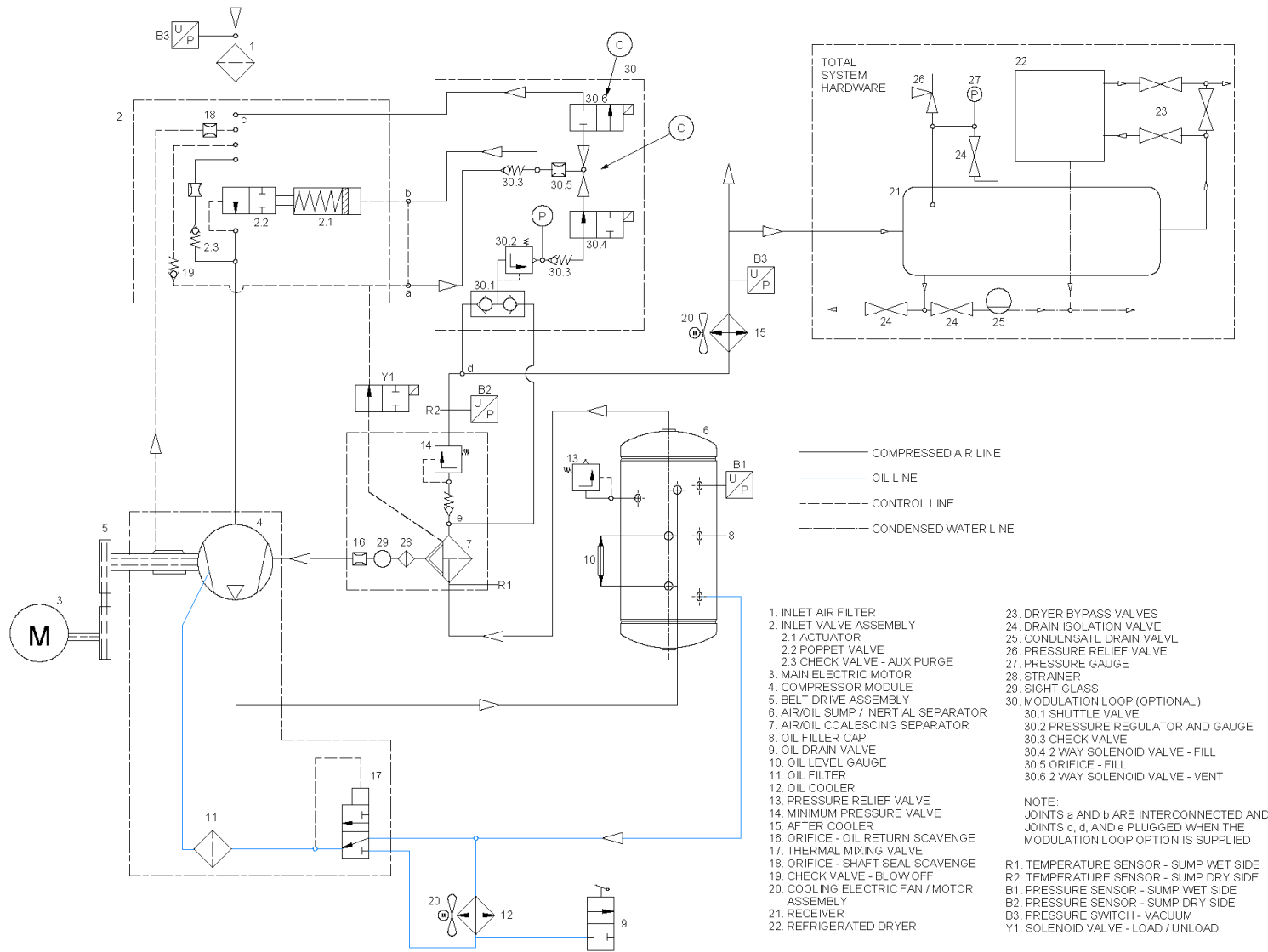
Shuttle valve (30.1) – This device taps compressed air for the modulation system from within the package or the customer grid, avoiding supply pressure lapses during start-up.

Pressure regulator and Gauge (30.2) – These devices regulate and indicate the compressed air signal that is used by the modulation system. A setting of 25-30 psig is recommended.

Check valves (30.3) – These devices control the unidirectional flow of compressed air within the modulation system.

Two-way solenoid valve -Fill (30.4) – This device fills the inlet valve **Actuator (2.1)** with compressed air, gradually closing it and thus reducing the intake air flow to the compressor. An **orifice (30.4)** limits the fill flow rate.

Two-way solenoid valve -Vent (30.7) – This device vents the compressed air within inlet valve **Actuator (2.1)**, gradually opening it and thus increasing the intake air flow to the compressor. An **orifice (30.5)** limits the vent flow rate.



301USC797-C
(Ref. Drawing)

Figure 4- 8 – PIPING AND INSTRUMENTATION ILLUSTRATIONJ

SECTION 5

LUBRICATION

OIL COOLER, OIL FILTER & SEPARATOR

COMPRESSOR OIL SYSTEM - Lubricating oil is employed to absorb the heat of compression, lubricate moving parts and seal internal clearances between the rotor and the air cylinder. Pressure differential between the air/oil sump and the final injection point into the compressor is used to move the oil mass through the various oil system components. Refer to Figure 4- 8, page 50, for the arrangement of the oil system components - they are highlighted in blue for identification ease.

Oil exits the air/oil sump and is delivered to the heat exchanger and thermal mixing valve, where cold (oil cooler branch) and hot (oil bypass branch) are mixed to the desired (131°F) injection temperature. The tempered oil is cleansed via the oil filter before injection into the compressor casing.

RECOMMENDED LUBRICANT - Gardner Denver compressors is factory filled with one of several Gardner Denver AEO lubricants. These lubricants are formulated to the highest quality standards and are factory authorized, tested and approved for use in rotary screw compressors. AEON lubricants are available through your authorized Gardner Denver compressor distributor.

OIL SPECIFICATIONS - The standard factory fill compressor lubricant is Gardner Denver AEON 4000, a superior semi-synthetic blend of petroleum stock and various protective additives, suitable for year-round operation. For exceedingly high or low operating temperatures, see lubricant recommendations in this and in Section 2, page 14.

OIL LEVEL INDICATOR (GAUGE) indicates the amount of oil in the oil reservoir - See Fig 5-1 for details. Read oil level when unit is in operation and stable (discharge pressure and temperature). In operation the oil level will fluctuate as the compressor loads and unloads. Adequate oil level falls between the MAX and MIN limits of the sight glass:

- The approximate oil system total capacity is 3.3 Gals (12.5 L)
- The differential between "MAX" and "MIN" levels on sight glass is 1.7 Gals (6.4 L).
- Oil level may vary when air flow is modulated.

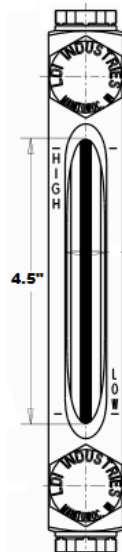


Figure 5-1 – Oil Level Sight Glass

Before draining, adding, or changing the lubricant oil in the compressor, be aware of the following hazards associated with these tasks:



Air/oil under pressure will cause severe personal injury or death. Shut down compressor, relieve system of all pressure, disconnect, tag and lockout power supply to the starter before removing valves, caps, plugs, fittings, bolts and filters.



Compressor, air/oil reservoir, separator chamber and all piping and tubing may be at high temperature during and after operation.



Use of improper lubricants will cause damage to equipment. Do not mix different types of lubricants or use inferior lubricants.



Improper equipment maintenance with use of synthetic lubricants will damage equipment. Oil filter and oil separator change intervals remain the same as for AEON 4000 – See “Maintenance Schedule”, page 80.



High temperature operation can cause damage to equipment or personal injury. Do not repeatedly restart the unit after high temperature stops operation. Find and correct the malfunction before resuming operation.



Read the oil level when the unit is in operation for an accurate measurement.



All materials used in Gardner Denver compressor units are compatible with AEON 9000SP Lubricant. Use caution when selecting downstream components such as air line lubricating bowls, gaskets and valve trim.

AEON 9000SP Synthetic Lubricant is not compatible with low nitrile Buna N or acrylic paints. AEON 9000SP is compatible with most air system downstream components.

Material Safety Sheets (MSDS) are available for all AEON lubricants at web address.
www.gardnerdenverproducts.com/downloads.aspx

LUBRICANT CHANGE PROCEDURE - If upgrading to a different lubricant type (e.g., longer life, higher temperature, food grade, etc.), following the proceeding steps.

1. Be sure the unit is completely off and that no air pressure is in the oil reservoir.
2. Disconnect, tag and lockout the power supply to the starter.
3. Thoroughly drain oil system while hot . refer to Compressor Illustration on Page 50 for location of various drain points:
 - Drain oil from oil sump by opening the drain valve at its bottom. Close drain valve.
 - Drain oil from the air end by removing the G1-1/2+plug at the bottom of the discharge housing. Replace the plug.
 - Drain oil from the oil cooler by removing the G3/4+plug on the oil header. Replace the plug.
 - Remove and drain oil from the oil filter. Reinstall the used filter.
4. Fill the system with a 50 percent charge of the new lubricant:
 - Start the machine and monitor its operation.
 - Allow the machine to reach a stable discharge temperature (5-7min), then shut down.
5. Thoroughly drain oil system . see Item 3 above.
6. Replace used oil filter and air/oil separator element with new ones.
7. Fill the system with a full charge of the new lubricant.
8. Machine should then be run normally; however, total run time after the initial change-out should be 50 percent of normal anticipated service life of the new lubricant.
 - Drain all lubricant from the system, change the filter and separator, and replace with a full charge of the new lubricant.
7. Subsequent lubricant change-outs should be at normal intervals. (See %Oil Change Interval+, Figure 5-4, page 56).

COLD AMBIENT OPERATION - See %Installation for Cold Weather Operation+, page 164 and Figure 2-3, page 15.

ADDITION OF OIL BETWEEN CHANGES must be made when the oil level is below the minimum level of the sight glass as read while the unit is completely off and blown down, and the foam has settled out.

1. Be sure the unit is completely off and that no air pressure is in the oil reservoir.
2. Disconnect, tag and lockout the power supply to the starter.
3. Wipe away all dirt around the oil filler plug.
4. Remove the oil filler plug and add oil as required to return the oil level to the middle of the sight gauge.
5. Install oil filler plug, run and check for leaks.

DO NOT OVERFILL (you should see oil slightly above the full line after running fully loaded and then shutting down the machine and allowing the foam to settle out). The quantity required to raise the oil level from **MIN** to **FULL** is 1.7 Gals (6.4 L). Repeated addition of oil between oil changes may indicate excessive oil carry-over and should be investigated.



Excessive oil carry-over can damage equipment. Never fill oil reservoir above the "FULL" marker.

MOISTURE IN THE OIL SYSTEM – During periods of low ambient temperatures, light duty cycles, high humidity, or in the event of thermal mixing valve malfunction, the oil charge residing in the sump may not reach a high enough temperature to keep water vapor from condensing as liquid water, a condition that contaminates the oil charge, may cause excessive oil carryover, or result in compressor failure.

To help the end user determine if the compressor package is operating under potential water condensing conditions, the charts in Fig 5-2 and 5-3 have been provided. To use, find the prevailing ambient temperature along the horizontal scale of the chart, move vertically from this point until intercepting the slanted line corresponding to the operating discharge pressure; and finally, move horizontally from this point to read the corresponding water vapor dew point on the vertical scale. The compressor discharge temperature must be maintained at a minimum of 10° F (5.5° C) above this dew-point temperature to prevent condensation accumulation in the lubricant reservoir. Note that the charts conservatively assume 100% relative humidity for the ambient air.

The presence of water in the oil may be identified by one of the following means:

- Oil drawn from the oil sampling valve attached to the sump (see Fig 1-2 on page 10).
- Oil volume drained during an oil exchange.
- Periodic (e.g., every 2000hrs) oil sample analyzed by a reputable laboratory.

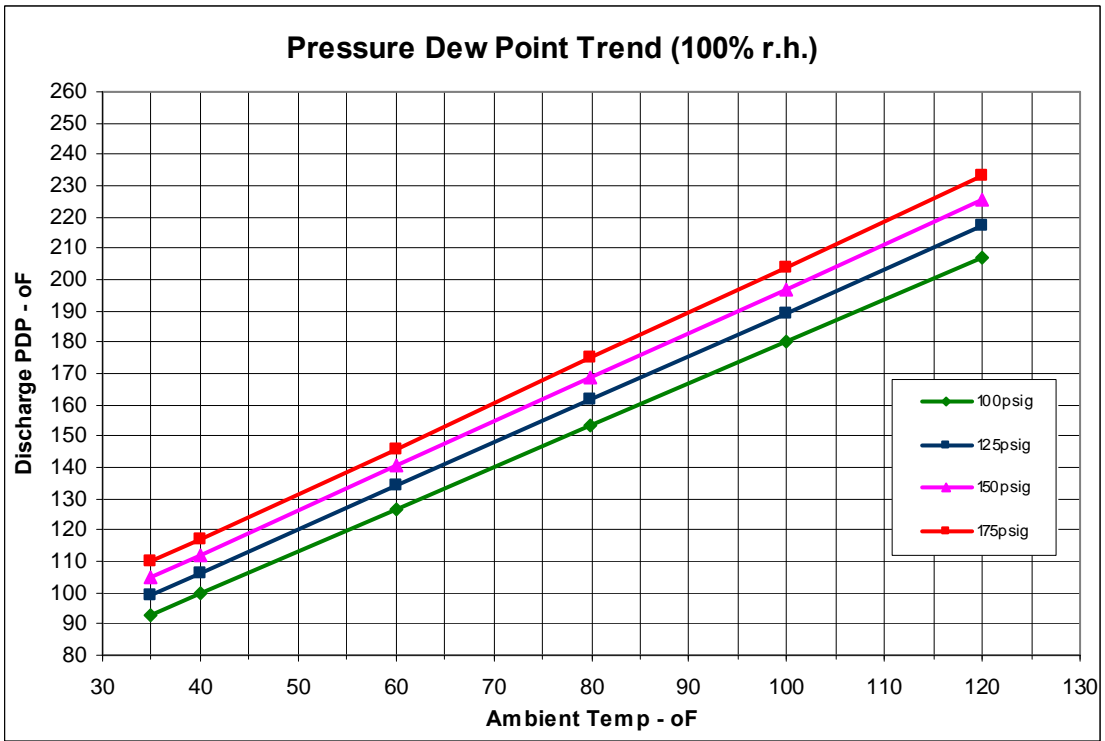


Figure 5-2 – Dew Point Chart °F

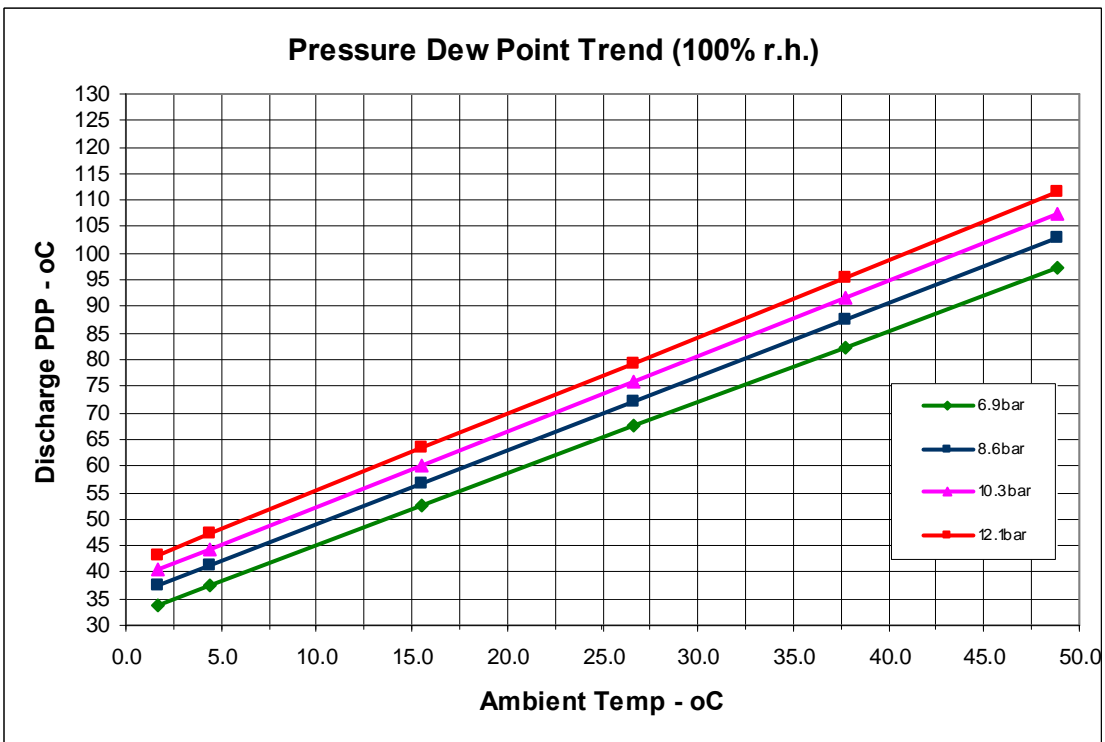


Figure 5-3 – Dew Point Chart °C

If water is found in the oil, drain sufficient volume of oil until no visible water is found - the heavier water will collect at the low elevations of the oil system, thus it will likely be expelled first. If this condition persists, consider the following solutions to avoid water condensation in the compressor oil:

- Make sure that the correct setting for the thermostatic mixing valve element is used - value is stamped on valve body. Fixed speed packages typically use 55°C elements and variable speed packages use 70°C elements.
- If using a Fixed Speed unit, replace the standard 55°C element with the 70°C one. Refer to the segment on the Thermostatic Mixing Valve within this Section for further details.

OIL CHANGE INTERVAL - Recommended oil change intervals are based on oil temperature - see Figure 5-4, for typical trends for the standard lubricant (AEON 4000) and a synthetic lubricant (AEON 9000SP). Consult GD for additional lubricant types available for your compressor.

When operating conditions are severe (very dusty, high humidity, etc.), it will be necessary to change the oil more frequently. Operating conditions and the appearance of the drained oil must be surveyed and the oil change intervals planned accordingly by the user. Gardner Denver offers a free oil analysis program with the AEON lubricants, and we recommend a sample be sent in at 100 hours on a new unit.

Discharge Temperature	AEON 4000 Change Interval	AEON 9000SP Change Interval
Up to 180° F (82° C)	4000 hrs.	8000 hrs.
180° to 190° F (82° C to 88° C)	3000 hrs.	6000 hrs.
190° to 200° F (88° C to 93° C)	2000 hrs.	4000 hrs.
200° F+ (93° C)	1000 hrs.	2000 hrs.

Figure 5-4 – Oil Change Interval

DRAINING AND REFILLING THE OIL SYSTEM - Always drain the complete system. Draining when the oil is hot will help to prevent varnish deposits and carry away impurities.

1. Be sure the unit is completely off and that no air pressure is in the oil reservoir.
2. Disconnect, tag and lockout the power supply to the starter.
3. Thoroughly drain oil system while hot . refer to Compressor Illustration on Page 10 for location of various drain points:
 - Drain oil from oil sump by opening the drain valve at its bottom. Close drain valve.
 - Drain oil from the air end by removing the G1-1/2+plug at the bottom of the discharge
 - Drain oil from the oil cooler by removing the G3/4+plug on the oil header. Replace the plug.
 - Remove and drain oil from the oil filter. Reinstall the used filter. CAUTION - If the drained oil and/or oil filter element is contaminated, discontinue this procedure and follow instead the "Lubricant Change Procedure" listed on page 55.
4. Replace both used oil filter and air/oil separator element with new ones.
 - Remove each spin-on element.
 - Clean each gasket face of the filter body.
 - Coat each new element gasket with clean lubricant used in the unit
 - Screw each new element on the filter body and tighten by hand. Tighten 1/2 turn more after gasket makes contact. DO NOT OVERTIGHTEN ELEMENT.
5. Wipe away all dirt around the oil filler plug.
6. Remove the oil filler plug and add oil as required to return the oil level to the full marker on the gauge.

7. Install the oil filler plug and operate the unit for about a minute allowing oil to fill all areas of the system. Check for leaks.
8. Shut down unit, allowing the oil to settle, and be certain all pressure is relieved.
9. Add oil, if necessary, to bring level to FULL.

Use only CLEAN containers and funnels so no dirt enters the reservoir. Provide for clean storage of oils. Changing the oil will be of little benefit if done in a careless manner.



Use only the replacement element shown on the filter tag or refer to the parts list for the part number.



Excessive oil carry-over can damage equipment. Never fill oil reservoir above the "FULL" marker.



Improper oil filter maintenance will cause damage to equipment. Replace filter element every 1000 hours of operation. More frequent replacement could be required depending on operating conditions. A filter element left in service too long may damage equipment

THERMOSTATIC MIXING VALVE. This device, housed within the compressor body, mixes hot and cooled oil and delivers a tempered mixture to the oil filter and finally the compressor injection port - see FIGURE9- 1, Page 76, for its location.

The thermostatic element expands with heat. When oil coming from the sump is 5°C below its setting, the oil flow from the cooler is blocked. Within these two temperature limits the valve gradually mixes hot separator oil with cooled heat exchanger oil to maintain a nearly constant injection temperature. When the oil temperature exceeds the element's setting, the valve blocks all hot oil from entering and only cooled oil is delivered.

Its nominal setting is stamped on the valve body. It may be verified by immersing the valve assembly into an open container with lubricating oil, raising its temperature to its nominal setting and checking that the element strokes fully from closed to open.)

Fixed speed packages typically use 55°C thermostatic elements and variable speed packages use 70°C ones. If the standard element on a fixed speed package does not prevent water condensation for a given combination of discharge pressure, ambient temperature and ambient relative humidity, it may be replaced with the higher temperature one (70°C). When this modification is made, it may be desirable to change (see "Lubricant Change Procedure in this section) the oil charge with a high temperature one (AEON 9000TH). Depending on the prevailing ambient temperature, the controller setting for the high discharge temperature shutdown may have to be reset to 240°F also. Consult GD for further details.

Optional Element. If the compressor is used in a predominantly cold (<32°F, 0°C) and/or humid environment, proper oil viscosity and avoidance of water vapor condensation in the oil system may be achieved by using a higher setting (158°F, 70°C) thermostatic element. Consult Gardner Denver for details.

OIL SUMP (RESERVOIR) - This device provides the inertial separation of air and oil streams discharged by the compressor - the bulk (98%) of the air/oil separation is done at this step. It also serves as a holding and degassing volume for the major portion of the oil charge. It provides limited air storage for control and gauge actuation.

AIR / OIL SEPARATOR - This device provides the final (2%) of the air/oil separation - typically 2ppm oil content at the final discharge of the compressor package. It is housed in a removable spin-on cartridge.

Its high level of performance may be affected by the following conditions:

- Compromised media (e.g., ruptured).
- Contaminated media (e.g., varnish, moisture, inadequate oil type).
- High oil level in oil sump.
- Blockage of oil return orifice.
- Abnormally frequent or fast depressurization cycles.

Oil separator element life cannot be predicted; it will vary greatly depending on the conditions of operation, the quality of the oil used and the maintenance of the oil and air filters. The condition of the separator can be determined by pressure differential or by inspection.

Separator Pressure Differential - The pressure drop across the separator is equivalent to the difference between the two (2) pressure sensors in use:

- The pressure differential value may be calculated by subtracting the sump dry side pressure value from its wet side discharge pressure value.
- A pressure differential of 8psi will trigger a service advisory to change the element.
- A pressure differential of 15psi will trigger a system shutdown.

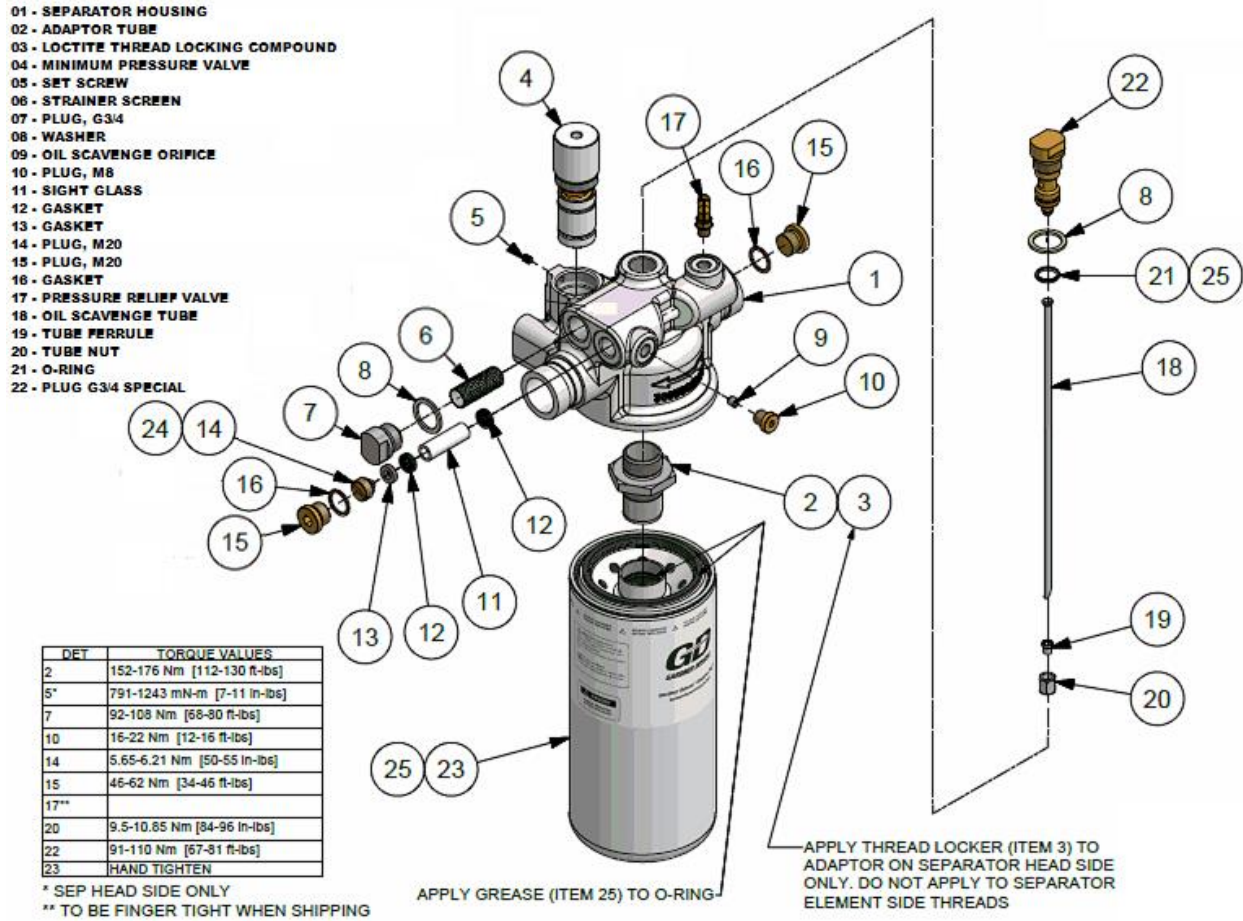


Using an oil separator element at excessive pressure differential can cause damage to equipment. Replace the separator when the “Change Separator” advisory appears.

OIL FILTER, AIR/OIL SEPARATOR ELEMENT or OIL SCAVENGE RETURN ORIFICE INSPECTION PROCEDURE

1. Remove the spin-on element.
2. Clean the gasket seating surface of the head.
3. Inspect the element internals by shining a light unto the media surface. If signs of contamination (dirt, rust, varnish, etc.) or damage is evident, replace the element.
4. In case the inspection involves the air/oil separator element, refer to Fig. 4-8, Page 50, for the location of the oil scavenge return orifice. Insert a drill bit smaller than the 1.1mm (.0039") orifice diameter to clear any debris away. If the orifice opening is damaged or cannot be cleared, replace it.
5. Before reassembly, coat the element gasket with the same lubricant used in the unit.
6. Screw on element until gasket makes contact. Hand tighten 1/3 to 1/2 turn extra.

7. Run the unit and check for leaks.



336LSE810-B
 (Ref. Drawing)

Figure 5-4 Air/Oil Separation Housing Illustration

SECTION 6

HEAT EXCHANGERS (OIL/AIR)

OIL/AIR HEAT EXCHANGERS – The heat of compression absorbed by the oil injected into the compressors (for cooling and lubrication) is ultimately rejected in a convenient medium such as air - for these air-cooled cores. Proper operation of the heat exchangers is essential for the following processes:

- The oil core delivers a stable, cool (typically 131°F at 80°F ambient) supply of injection oil to the compressor. Under these conditions, the oil core allows 15 gpm (56.8 lpm) oil flow with 16 psi pressure loss at 110 psig discharge pressure. The standard (AEON4000) lubricating and cooling oil must be kept at a normal operating temperature below 225°F in order to preserve its longevity.
- The air core discharges 144 acfm of compressed air with 110psig of pressure and at a temperature 17°F above the ambient level at full load - 30hp package. Be aware that this temperature differential (aka approach) may increase several degrees due to environmental conditions such as high ambient temperatures and high ambient humidity.

VENTILATION CONFIGURATION . Air-cooled cores (radiator-type) are provided as standard feature. One (1) axial fan, located behind the fresh air inlet grille, delivers an air stream to meet the cooling demands of the air/oil combination heat exchanger on its way out the package confines. The fan is driven by a close-coupled, IP54-protected, electric motor which includes its own overload protection. In addition, an open-weave, non-metallic mesh media is held in place over the fresh air inlet grill to pre clean the cooling air stream.

Refer to Figure 6-1 for estimates of ventilation requirements. Please note that the air-cooled package requires the combined total of the heat exchanger plus the enclosure ventilation flow rates (which include motor ventilation and compressor intake). Furthermore, when package location makes it necessary to duct fresh cooling air in/out, these ducts must be sized with a maximum (total) pressure loss of .1 inch water gauge to avoid impacting the heat exchanger cooling air system. An external ventilation fan may be required to properly evacuate hot air from the compressor room.

Minimum Cooling Air Flow Requirements	
Model HP size	CFM
25-30 HP	2684
18-22 kW	3022

FIGURE 6- 1 – Air Flow Chart

HEAT EXCHANGER MAINTENANCE - All the required hardware, mechanical and electrical connections have been made at the Gardner Denver factory, thus the only regular maintenance required is to keep the exterior core fins free from dirt and other airborne debris per the following procedure:

CAUTION



Compressor, air/oil sump and all piping and tubing may be at high temperature during and after operation.

DANGER



Do not attempt inspection or cleaning of air-cooled heat exchangers until cooling fan has stopped rotating. Disconnect lockout and tag out package from power supply.

CAUTION

Air-cooled heat exchanger cores are fabricated from aluminum. Do not use caustic liquids to cleanse core or permanent damage will take place.

1. Be sure the unit is completely off and that oil reservoir is depressurized.
2. Open and/or remove enclosure door panel adjacent to the cooler assembly. Unscrew and remove end grilled panel housing the non-metallic pre-filter mat.
3. Unscrew the access panel attached to the side of the fan air plenum . See Figure 6-2 on Page 62 for details. Also remove
4. Inspect core area. If blocked with debris, use a moderate (e.g., 100psi) source of compressed air while directing nozzle (pointed to outer core finned surface) to dislodge debris and clean. Vacuum (applied from inner finned core surface) can also be employed to clean the surfaces.
5. Remove all loose debris from inner surfaces of the fan air plenum, including the main cooling fan area and its pre-filter, after cleaning process is complete.
6. Re-install the removed enclosure door panels.

⚠ CAUTION

The ventilation system for the air-cooled package relies on positive back pressure to cool the heat exchanger. Make sure that the access panel next to the heat exchanger is closed during operation, or the compressor discharge temperature will reach shutdown levels quickly.

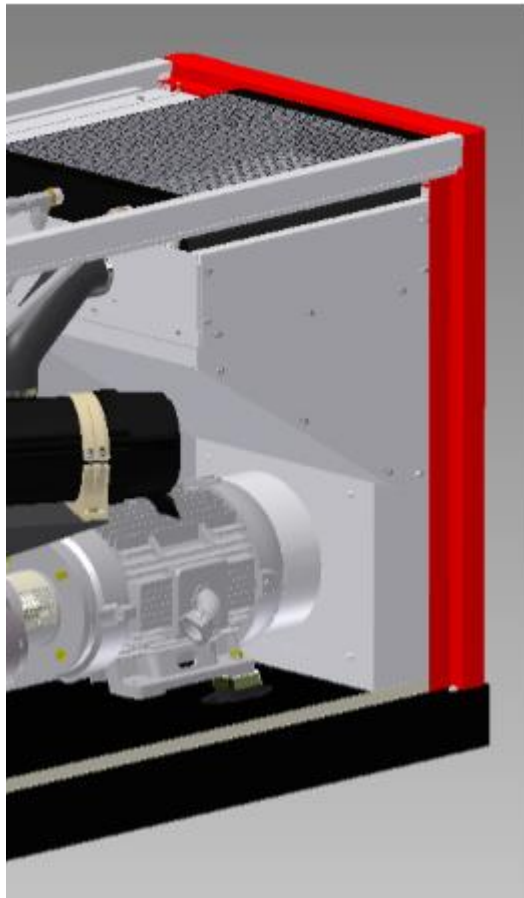


FIGURE 6- 2 – Cooler Access

SECTION 7 AIR FILTERS

COMPRESSOR AIR FILTER - This device cleans the air stream entering the compressor inlet and is furnished as standard equipment on the compressor package. It is a single stage, high efficiency, cellulose media element housed in a non-corrosive housing.

Efficient compressor package operation depends on the unrestricted, clean supply of fresh air delivered by the air filter. In turn, the longevity of the filter element depends on the cleanliness of the local environment.

NOTICE

Use only genuine Gardner Denver air filter elements on Gardner Denver compressor units. Genuine parts are available through your authorized Gardner Denver distributor.



Do not oil this element. Do not wash in inflammable cleaning fluids. Do not use solvents other than water. Improper cleaning may damage the element.



Never operate the unit without the element. Never use elements that are damaged, ruptured or wet. Never use gaskets that won't seal. Keep spare elements and gaskets on hand to reduce downtime. Store elements in a protected area free from damage, dirt and moisture. Handle all parts with care.

FILTER ELEMENT INSPECTION AND/OR REPLACEMENT

1. Loosen latches fastening end cover to the filter housing, remove the end cover and remove the air filter element - see Fig 7-1 for details
2. Visually inspect the filter element (4). Replace it if:
 - Flaws (tears in media, damage to sealing surfaces) are evident.
 - Contamination (dirt, grease, etc.) is evident.
 - Vacuum sensor has triggered service reminder for air filter due to high differential (in excess of 30" w.g.).
3. Insert the element into the air filter housing, replace the air filter housing cover in place and engage the latches.

PACKAGE PRE-FILTER MAINTENANCE

1. Cleanse the pre-filter media with vacuum cleaner to remove debris trapped in its fibers. The media may be removed from the intake air grill frame if washing is needed to remove dirt.
2. Replace the pre-filter media in the reverse order.

VFD FILTER MAINTENANCE

1. Remove the intake air grill panel from the package by first removing the top-located screws and washers.
2. Remove the vfd filter by sliding out sideways through the provided slot.
3. If fouling is evident, cleanse the filter media gently with water . do not remove from the aluminum frame. Replace the filter media if media is heavily fouled or ruptured.
4. Replace the filter and the intake air grill panel in the reverse order.

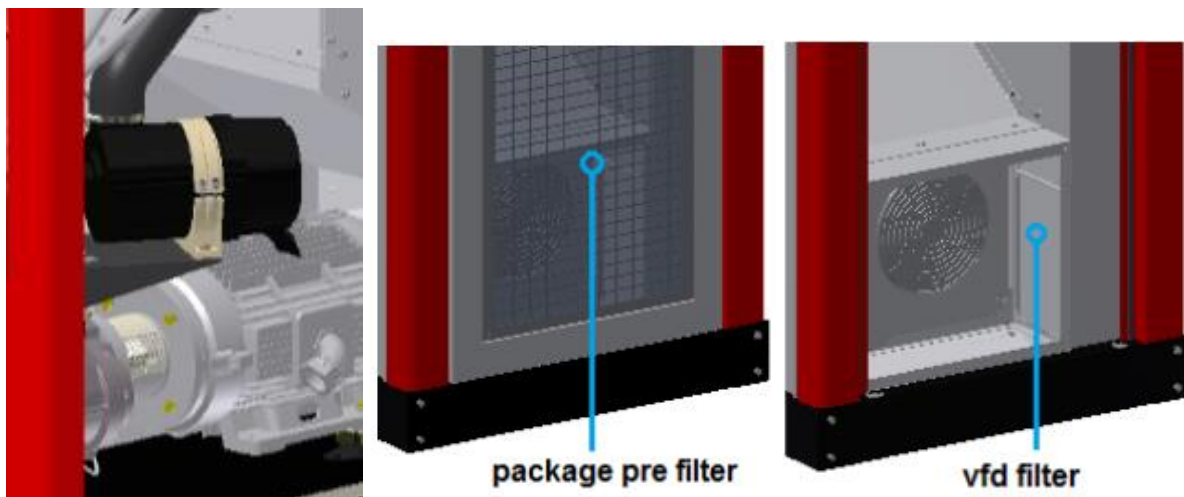


FIGURE 7- 1 – COMPRESSOR AIR FILTER, PACKAGE PRE-FILTER AND VFD FILTER LOCATIONS

SECTION 8 DRIVE SHAFT COUPLING

SHAFT COUPLING – The main motor drives the compressor by means of a curved jaw-type coupling. Each coupling hub is fixed to the shaft with a set screw and key combination. The motor power is delivered to the compressor via a single, vibrations damping element . see Figure 8-1 for the details of the coupling components. The motor and compressor shafts are aligned with the help of a stiff, cast and machined housing assembly. The coupling assembly requires no lubrication.

Component	Quantity	Designation
1	2	hub
2	1	spider
3	2	setscrew

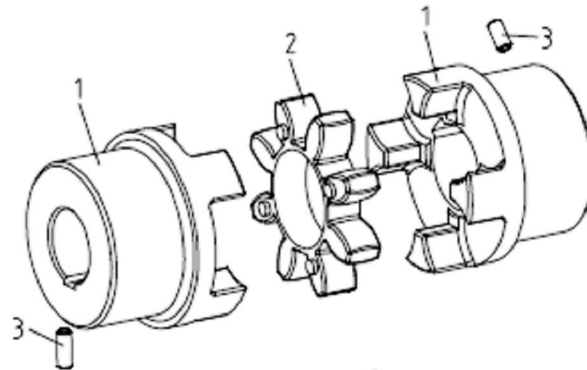


FIGURE 8- 1 - COUPLING COMPONENTS



⚠ DANGER

The compressor starts and stops automatically. Automatic restarting can cause injury or death. Open, lockout and tag out main disconnect and any other circuits before servicing the unit.

Coupling Element and Hub Inspection.

1. Rotating machinery can cause injury or death. Open main disconnect, lockout and tagout power supply to compressor package before working on the electric motor.
2. Remove fasteners securing the coupling guard to access to the coupling area within the adaptor housing.
3. Inspect the outer surfaces of the hubs and element and check the gap between the hub jaws . see dimension ϕ on Figure 8-2. If the gap has increased by more than 2-3mm beyond its nominal limit of 24/25.8mm, or if damage (e.g., deformation, breakage, extrusion) to the element is evident in any of its eight (8) outer spokes or damage to the hubs (e.g., wear and tear, breakage) is evident on its jaws, the components must be removed for a thorough inspection and replaced.

- If coupling gap did not exceed 2-3mm beyond its nominal limit of 24/25.8mm, loosen M8 set screw on motor coupling hub and move to close gap to nominal limit. If coupling gap is still within its nominal limits of 24/25.8 mm, verify that each M8 set screw fixing the hub to the shaft is tight. If either hub set screw is loose, apply a locking compound to its threads and tighten to 10 N-m torque. Reinstall the coupling guard with the provided fasteners.

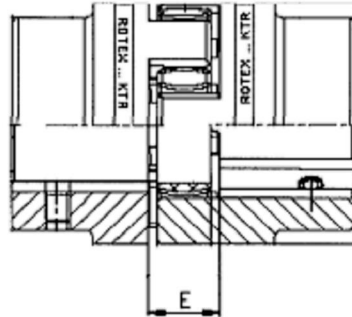


FIGURE 8- 2 – COUPLING ELEMENT SPACING

Coupling Element Removal.

- Cleanse the visible shaft area behind the motor shaft hub. Loosen the M8 set screw fastening it to shaft and slide it away from the compressor hub.
- Retrieve the coupling element by pulling away from either hub and lifting away through the gap between shafts. Take this opportunity to thoroughly inspect the coupling element and hubs.
- Install the new coupling element on the compressor hub and slide the motor hub on the motor shaft until the engaging the remaining slots on the coupling element. Check that the gap between the hubs jaws is within 24/25.8 mm . see dimension E on Figure 8-2. A smaller gap may produce abnormal element wear by friction as well as thermal expansion. Make sure that the keys are in proper alignment with the keyways on hubs.
- Apply a thread-locking compound to the hub set screw (M8 size) and tighten to 10 N-m torque. Reinstall the coupling guard with provided fasteners.

Coupling Hub Removal.

To remove either coupling hub the compressor must be removed from the package first.

- Drain oil entrained in the compressor . see **Lubricant Change Procedure** in Section 5.
- Remove the following hardware connecting the compressor to the package. Make sure to identify each item and matching [compressor-side connection] for its reassembly. You may refer to the Parts List 13-25-509 for further help identifying the components:
 - Hose segment between intake filter and compressor inlet valve.
 - Oil lines between oil cooler and compressor.
 - Discharge line between oil sump inlet and compressor discharge.
 - Oil scavenge line between separator housing and compressor cylinder.
 - Compressed air line between oil sump and inlet valve feed port.
- Prop suitable support underneath the main motor and base frame to help re-alignment after compressor removal.
- Remove four (4) bolt, nut and washer groups securing compressor to adaptor housing.
- Lift and pull away compressor from adaptor housing and motor.
- Cleanse the visible shaft area behind the shaft hub. Loosen the M8 set screw fastening it to shaft and slide it away from the shaft. **CAUTION!** If either coupling hub failed to dismount after removal of the M8 set screw, consider it interference fit to the shaft - see **Installation and Removal of Interference-fitted Coupling Hubs** instructions at the end of this paragraph.
- Take this opportunity to thoroughly inspect the coupling element and hubs. Replace any damaged components.

- Re-assembly the compressor and associated components in reverse order. Remember to set the proper spacing between the coupling jaws (24/25.8mm) and tighten the M8 set screws to the proper torque (10 N-m).

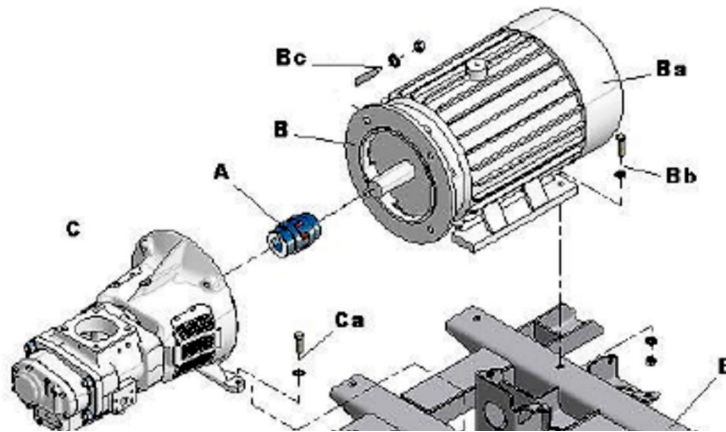


FIGURE 8- 3- COMPRESSOR-MOTOR ASSEMBLY DETAILS

Installation and Removal of Interference Fitted Coupling Hubs.

The coupling hubs are designed to mount on the compressor and motor shafts with a transitional interference fit [H7 (bore) / k6 (shaft)] that results in a light interference 50% of the time. If such condition is present for either of the two (2) hubs/shaft combinations, proceed as follows:

Removal:-

- Use 3-jaws tool 90500151 to remove coupling hub from shaft. A torque not exceeding 130 lb-ft (176 N-m) should be sufficient to pull hub from shaft. See Figure 8-4 for details.
- Prior to hub removal, note and record position of shaft end with respect to coupling hub inner surface. Same offset shall be provide when re-installing the hub.

Installation:

- Make sure that shaft and hub bore surfaces and keyways are cleansed and de-burred. Also make sure that keys fit in their matching keyways easily and are in place prior to installing the coupling hub.
- Provide a temporary stop on the shaft to insert the coupling hub to the correct offset identified during the removal process above. Lockjaw self-adjusting pliers provide may be used as stop.
- Heat evenly the coupling hub until it reaches 250°F (120°C) . an oven is preferred method. Using insulating gloves, install the hot hub unto shaft until it hits the stop.
- After coupling hubs cools down, install the M8 set screw with 10 N-m torque.

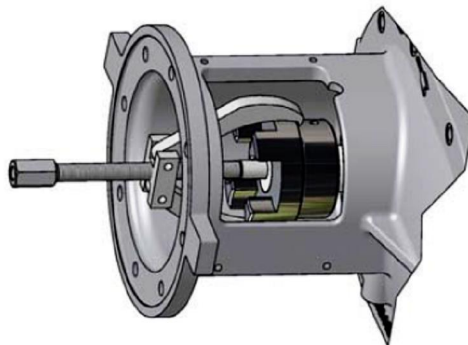


FIGURE 8- 4 - Coupling hub removal tool in place

SECTION 9 SERVICING OF MISCELLANEOUS DEVICES

This section will cover basic maintenance of various control devices used with the compressor module. Refer to Fig 9-1, Page 70, for pictorials of referenced hardware.

INLET CONTROL VALVE ASSEMBLY

Inlet-Valve Assembly (2) - This device is located within and below the intake flange of the compressor - see Fig. 9-1 for internal details. During the loaded state, the **inlet poppet (2.2)** remains open and enables atmospheric air to enter the compressor inlet - this is done by venting to atmosphere the gas trapped underside of the piston via **check valve (19)** and **orifice (18)**. During the unloaded state, a two-way solenoid valve feeds pressurized air underneath the **piston (2.1)**, forcing it and **the inlet poppet (2.2)** upward and blocking-off the compressor intake. A small purge check valve, located in the poppet, allows a stream of air to reach (e.g., purge) the rotors and keep them from unstable, noisy operation and producing sufficient pressure to maintain cooling / lubricating oil flow.

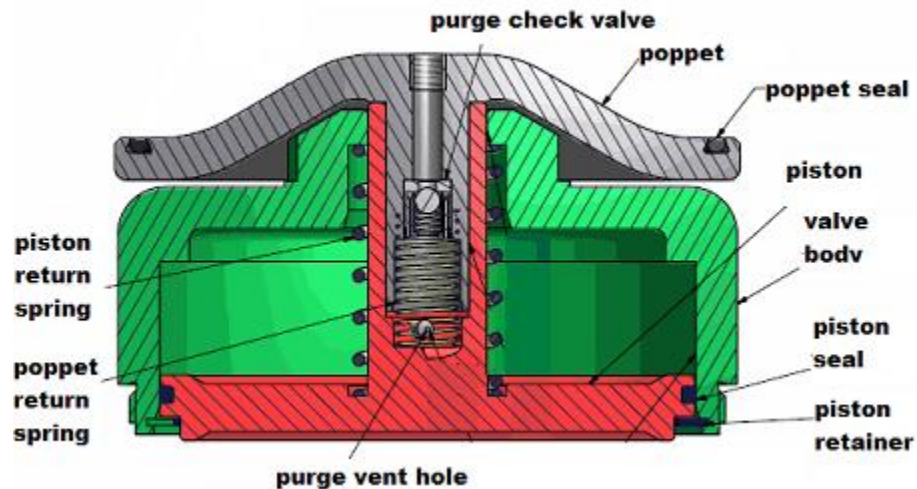


FIGURE 9- 1 – Inlet Valve Assembly



Air/oil pressure will cause severe personal injury or death. Shut down compressor, relieve system of all pressure, disconnect, lockout and tagout power supply to the starter before removing valves, caps, plugs, fittings, bolts and filters.

Inlet Valve (Body) Inspection - The valve does not require maintenance or lubrication. If air/oil leaks develop across the valve disc during pressurized conditions (e.g., machine stopped), valve seals should be inspected for wear and tear signs:

1. Be sure the unit is completely off and oil sump is depressurized.
2. Disconnect, lockout and tagout power supply to the compressor package.
3. Close (when provided) valve isolating compressor package from air system.
4. Refer to FIGURE9- 1 for hardware details.
5. Loosen and remove the air filter housing cover and remove the filter element.
6. Remove four bolts securing inlet flange to the compressor body and remove the flange.
7. Remove the poppet assembly and the poppet return spring.
8. Unscrew the valve body from the compressor housing using the hex pattern provided on the valve body - See for Figure 9-1, details.
9. Inspect poppet seal (o-ring) (5) for wear and tear.
10. In case of noted malfunction (e.g., valve will not open/close properly with good air signal), proceed to dismantle internal piston assembly.
 - a. Remove lock ring to release piston assembly.
 - b. Inspect the piston seal and piston return spring. If any component is found worn or damage, replace the complete valve. **CAUTION!** If the unit includes the inlet valve modulation option, the piston return spring will be different (and stronger) than the standard one. Make sure that you have the right part number before making any substitutions.
 - c. Re-assemble the piston assembly in reverse order.
11. Reassemble inlet valve in reverse order.

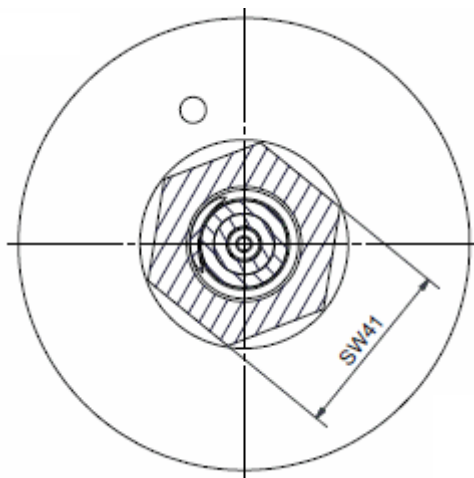


FIGURE 9- 2 – Inlet Valve Body Hex

PRESSURE RELIEF VALVE

Pressure Relief Valve - This device protects the pressure-containing components of the compressor package against pressures exceeding 200 psig. It is installed on the wet-side of the oil sump.



FIGURE 9- 3 - Pressure relief valve



Before inspecting the pressure relief valve, release air pressure, lockout and tagout the power supply to the compressor package. Failure to release pressure or properly disconnect the power may result in personal injury or death.



Never paint, lubricate or alter a relief valve. Do not plug vent or restrict.



Operation of the unit with improper relief valve setting can result in severe personal injury or machine damage. Ensure properly set valves are installed and maintained.

Pressure Relief Valve Check During Operation - The pressure relief valve has no user-serviceable or repairable components. However, it should be tested for proper operation at least once every year. To test the pressure relief valve:

- Raise the system operating pressure to its normal level
- Pull the stem ring to open valve and let it vent for a few seconds.
- Release the stem ring to close the valve.

MINIMUM PRESSURE VALVE

Minimum Pressure Valve Inspection – This device has no user-serviceable or repairable components. If it fails to maintain adequate minimum pressure (55-65psig) or fails to check the backflow of system compressed air after compressor stoppage, replace it as follows:

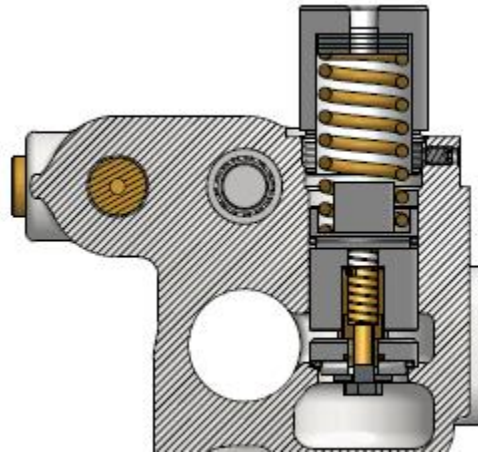


FIGURE 9- 4 - Minimum Pressure Valve and Seat



Air/oil pressure will cause severe personal injury or death. Shut down compressor, relieve system of all pressure, disconnect, lockout and tagout power supply to the starter before removing valves, caps, plugs, fittings, bolts and filters.

1. Be sure the unit is completely off and that no air pressure is in the oil reservoir and in the air cooled after cooler. Close the service valve.
2. Disconnect lockout and tagout the power supply to the starter.
3. Loosen the set screw fastening the valve body to the air/oil separator housing, unscrew the top cap and remove the valve assembly.
4. Inspect the valve seat surface area machined into the air/oil separator housing. Also inspect the valve poppet seal and cleanse as needed. If the valve poppet is damaged, replace the complete minimum pressure valve assembly.
5. Assemble the minimum pressure check valve assembly into the housing and lock it in place with the set screw provided.
6. Run the unit and check for leaks.

THERMOSTATIC MIXING VALVE

Thermostatic Mixing Valve (TMV) Inspection – This device has no user-serviceable or repairable components. If it fails to maintain adequate compressor discharge temperature, replace it as follows:

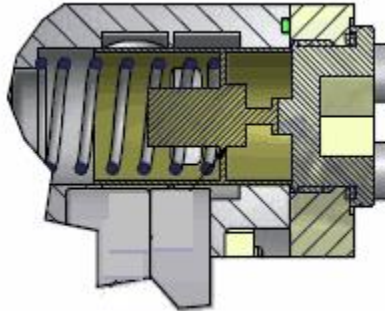


FIGURE 9- 5 – Thermal Mixing Valve

1. Be sure the unit is completely off and that no air pressure is in the oil reservoir and in the air cooled after cooler. Close the service valve.
2. Disconnect lockout and tagout the power supply to the starter.
3. Unscrew the G1-1/2+plug retaining the TMV assembly in place. Remove the TMV body and its spring from the compressor housing.
4. Inspect the valve seat surfaces for damage or foreign matter. Note its setting temperature . it is stamped on the valve seat area and will read %55°C+or %70°C+
5. Immerse the valve body in a bath of compressor oil; heat the oil slowly and observe if the seat starts extending about 5°C below its setting and reaches full stroke at the stamped setting. Replace the device if one of the following conditions is present:
 - a. The stamped setting on the valve seat is not correct. The Fixed Speed compressor package should be fitted with the 55°C TMV, unless by consultation with Gardner Denver, it has been approved to use the 70°C element instead.
 - b. The seat fails to stroke fully at the correct temperature.
6. Assemble the TMV assembly into the housing in the reverse order.
7. Run the unit and check for leaks.

INPUT SHAFT SEAL ASSEMBLY

Input Shaft Seal Maintenance – Normal wear and tear of the shaft seal may result in a small lubricating oil from the input shaft area. The shaft seal assembly is replaceable and part numbers (for direct drive and geared compressor variants) are provided in Parts List Manual listed on Page 5. Be aware that replacement of the shaft seal assembly involves removing the compressor from the package, an operation that may be best handled by an experienced Gardner Denver technician.

Shaft Seal Replacement (applies to both direct drive and geared drive compressors):

1. Have the proper shaft seal replacement kit available.
2. Be sure the unit is completely off and that no air pressure is in the oil reservoir and in the air cooled after cooler. Close the service valve.
3. Disconnect lockout and tagout the power supply to the starter.
4. Remove the compressor from the package and remove its coupling hub . refer to %Coupling Hub Removal+ in Section 8, page 67, for instructions.
5. Remove four (4) bolts securing the seal cover to the compressor cylinder and pull away from the input shaft to dismount. Remove the snap ring securing the shaft seal assembly to the seal cover and remove the latter. Replace the shaft seal assembly and secure in place with the snap ring.
6. Remove the shaft key. Pull away the internal wear ring from the shaft to dismount. Replace the internal wear sleeve with a new one . make sure to smear compressor oil unto the new o-ring seal to ease its installation unto the shaft.
7. Carefully slide back shaft assembly and the seal cover unto the shaft and secure the latter with the provided four (4) bolts.
8. Re-install the compressor shaft key, coupling hub and compressor assembly in the reverse order.
9. Operate the compressor for a short time and make sure that the shaft seal is not leaking.

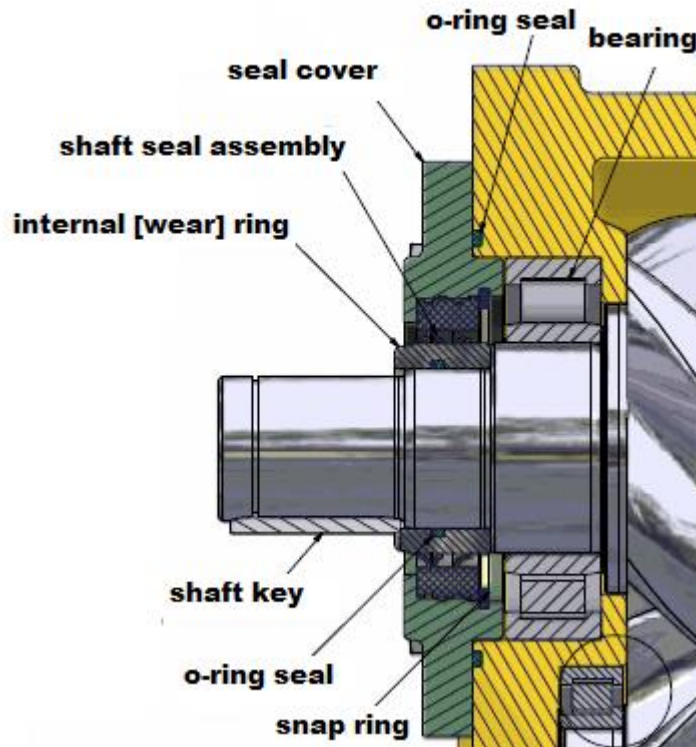
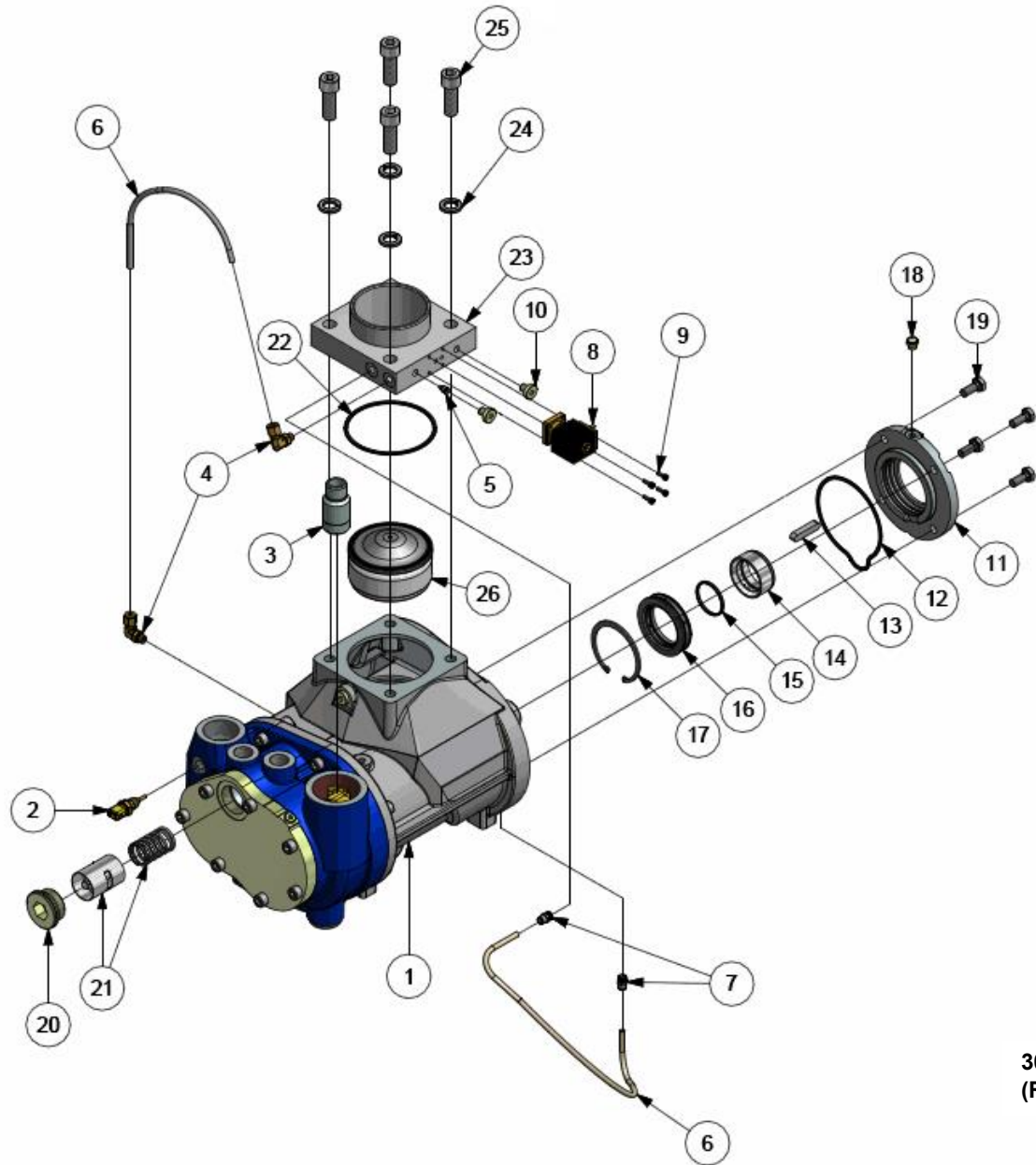


FIGURE 9- 6 – Shaft Seal Illustration – Direct Drive variant shown.



308USC810-C
(Ref. Drawing)

FIGURE9- 1 – Compressor (Direct Drive variant) Hardware Illustration

SECTION 10 TANK MOUNTED COMPRESSOR - TOTAL SYSTEM

DESCRIPTION - The basic compressor can be furnished mounted on an optional compressed air receiver (240 gallon size) and paired to an optional RNC [refrigerated non-cycling] compressed air dryer, as shown on Fig 10-1.

- Refer to Figure 1-4 on Page 12 for dimensioned outline drawing.
- Refer to Fig 4-8 on Page 50 for the instrument and piping schematic and to Sec 4 for the description of the main components that comprise the Total System.
- Refer to vendor-supplied instruction manual included with the refrigerated dryer for full details on the installation, operation and maintenance of this optional device when supplied.

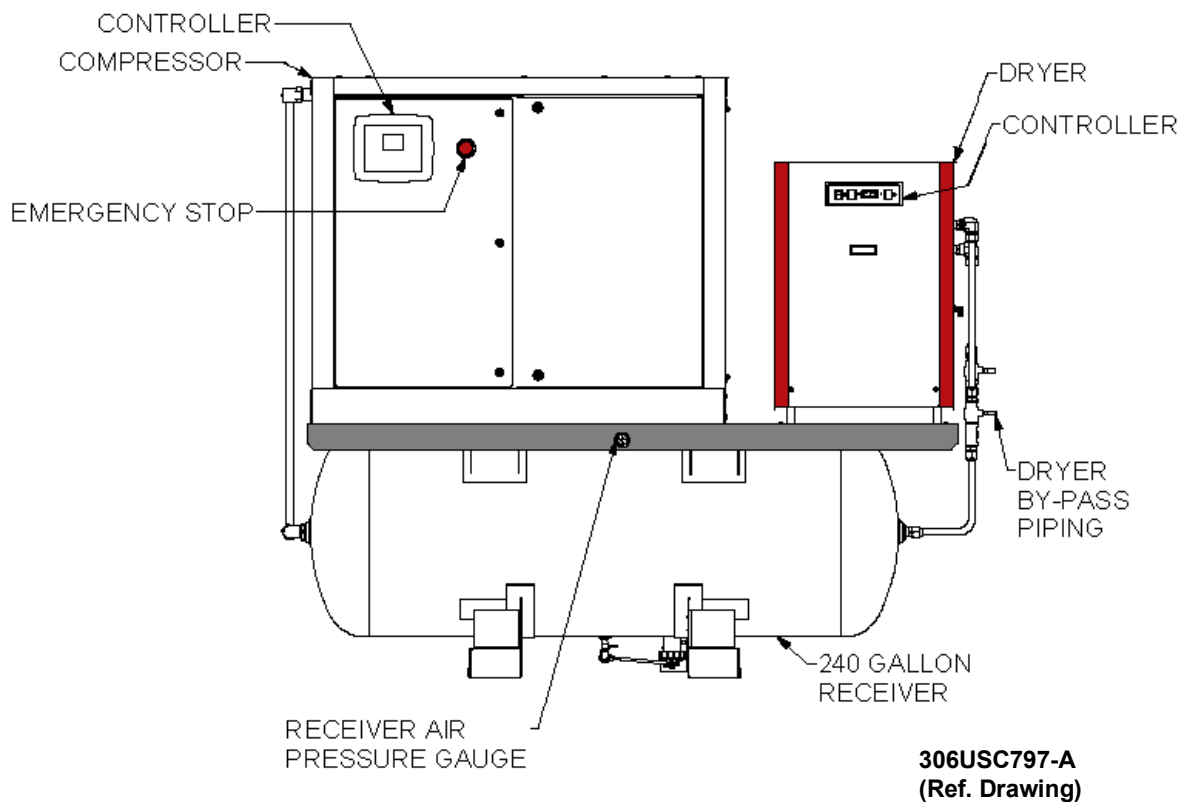


FIGURE 10- 1 – Total System + Dryer Arrangement

NOTICE



Read the Vendor-Supplied Instruction Manual For The Dryer Before Operating It.

It is critical to refer to the vendor-supplied instruction manual, included with the refrigerated dryer, for full details on the installation, operation and maintenance of this optional device. When the dryer is part of the Total System, the following are some of the critical items to keep in mind:

- Dryer models corresponding to compressor package models:

Apex unit nominal power	25hp	30hp	18kW	22kW
Dryer model	RNC125	RNC150	RES 120	RES 140

- Installation - Package must installed in a location with an ambient temperature range of 40°F to 110°F (3°C to 43°C). Consult Gardner Denver for operation outside this range.
- Discharge service pipe - The discharge service line connection is provided at the outlet of the bypass valve assembly. A hand operated valve, (air service valve) and a separate (swing-type) check valve must be installed between the unit and the customer's air system. If a fast operating valve such as a ball valve is used, it must be closed slowly to give the intake valve time to shut and keep the discharge pressure from spiking.
- Electrical power connections - Provide a grounded 1ph-60Hz-115vac receptacle to plug in the dryer power cord. Refer to the dryer serial number tag for the proper ampacity.
- Starting and stopping the dryer -
 - Energize the receptacle - green power light will illuminate in the control panel.
 - Toggle ON/OFF switch to the ON position to start dryer operation. It is recommended that the dryer be started 15min before the compressed air flow begins.
 - Do not stop or de-energize the dryer during the normal operational shift (e.g., 8 hrs.) of compressed air system.
 - The RNC dryer runs continuously when turned on. This is normal operation.
 - Toggle ON/OFF switch to the OFF position to stop dryer operation.

SECTION 11 MOTOR LUBRICATION



Rotating machinery can cause injury or death. Open main disconnect, lockout and tagout power supply to compressor package before working on the electric motor.

Motor Lubrication – Long time satisfactory operation of an electric motor depends in large measure on the proper lubrication of the bearings. The following charts show recommended grease qualities and re-greasing intervals for ball bearing motors. For additional information refer to the motor manufacturer's instructions. The following procedure should be used in re-greasing:

1. Disconnect, lockout and tagout power supply to the compressor package.
2. Locate the automatic grease relief fittings (one at each motor bottom end) and make sure that their spring loaded covers are operational.
3. Locate the grease fittings provided at each motor top end. Wipe each grease fitting clean and add grease with a hand-operated grease gun until excess grease starts draining from the companion grease relief fitting. Make sure that the grease volume does not exceed the motor manufacturer's recommendation by a factor of approximately 2X.
4. Wipe off excess grease expelled by the automatic grease relief fittings.
5. Re-start the unit.

ELECTRIC MOTOR GREASE RECOMMENDATIONS (-30° TO 50° C)

MANUFACTURER	TRADE NAME
CHEVRON	SRI #2
SHELL	DOLIUM R
EXXON	UNIREX #2
EXXON	POLYREX

ELECTRIC MOTOR REGREASING INTERVAL

Service Type	Typical	Rating	Lubrication Interval
Standard	One or Two Shift Operation	25-30 HP	18 Months
Severe	Continuous Operation	25-30 HP	9 Months
Very Severe	Dirty, humid, hot ambient	25-30 HP	4 Months

SECTION 12

MAINTENANCE SCHEDULE

SERVICE CHECK LIST .

Air Filter and Pre-Filter - Operating conditions determine frequency of service. See %Air Filter,+ SECTION 7, page 63.

Motor Lubrication - Refer to Section 2, page 13

Every 8 Hours Operation

1. Check the reservoir oil level - add oil if required. See Section 11, page 77.
2. Observe if the unit loads and unloads properly.
3. Check discharge pressure and temperature.
4. Check control panel display for advisory text messages.

Every 125 Hours Operation

1. Check for dirt accumulation on oil, air core finned faces and the cooling fan. If cleaning is required, clean the exterior fin surfaces of the cores by blowing compressed air carrying a nonflammable safety solvent in a direction opposite that of the cooling fan air flow. This cleaning operation will keep the exterior cooling surfaces clean and ensure effective heat dissipation.

Every 1000 Hours Operation

1. Change oil filter element.

Every 4000 Hours Operation

1. Change the compressor lubricant. Under adverse conditions, **change more frequently** (refer to %Oil Change Interval+, Figure 5-4, page 58. Flush system if required.

Every Year

1. Check the pressure relief valve for proper operation. See Section 9, page 68.
2. Change oil separator, see %Removal of Oil Separator for Inspection or Replacement+, Section 5, page 53 for further details (or when 8 psid pressure differential across the element).
3. If the [optional] compressed air dryer is included in your unit, refer to Sec 10, Page 75, for required maintenance information.

MAINTENANCE SCHEDULE (See Detail Notes above)

Maintenance Action	As Indicated by AirSmart Controller	Every 8 Hours	Every 50 Hours	Every 125 Hours	Every 1000 Hours	Every 4000 Hours	Every Year
Check/Change Air Filter.....	•						
Check/Change Package Inlet Filters			•				
Change Oil Separator	•						•
Check Reservoir Oil Level **.....		•					
Check for Proper Load/Unload.....		•					
Check Dirt Accumulation on Cooler.....				•			
Change Oil Filter Element & Clean Oil Return Orifice...					•		
Change Compressor Lubricant (AEON 4000) *.....						•	
Check Relief Valve.....							•
Check Condition of Hoses						•	•
Check Operation of Condensate Removal Drain Valve		•					

* See Oil Change Interval Chart, Figure 5-4 page 56, for specific lubricant life.

** Must be checked when the compressor is stopped and the air/oil mixture is separated.

SECTION 13 TROUBLESHOOTING

SYMPTOM	POSSIBLE CAUSE	REMEDY
Compressor fails to start	1. No electrical power.	1. Check main disconnect, fuses and supply line.
	2. [FS] Motor starter overload relay tripped.	2. Reset and investigate cause of overload.
	3. Pressure in reservoir.	3. Inspect unload valve.
	4. Wrong lead connections	4. Change leads.
	5. Emergency stop depressed.	5. Release button.
	6. Unacknowledged fault	6. Clear fault at controller
Compressor starts but stops after a short time	1. High separator/ high compressor temperature shutdown event	1. See %High Discharge Air Temperature,+this section.
	2. [FS] Delta motor wiring configuration is incorrect.	2. Inspect and correct.
	3. Blown fuse in starter/ control box.	3. Replace fuse (investigate if fuses continue to blow).
	4. Motor starter or vfd overload relay tripped.	4. Reset and investigate cause of overload.
	5. Fast pressure buildup due to open inlet valve	5. Inspect inlet valve and unloader valve operation. Replace if faulty.
	6. High oil viscosity.	6. Review oil type for ambient temperature or provide site heating.
	7. Aftercooler is frozen.	7. Thaw out. Operation below 32°F is not allowed.
Compressor does not unload (or load)	1. Improperly adjusted control.	1. Refer to Control Manual 13-17-600 and adjust control.
	2. Faulty inlet valve or unloaded valve solenoid.	2. Inspect and/or replace faulty component.
Compressor cycles from load to unload excessively	1. Insufficient receiver capacity.	1. Increase receiver size.
	2. Restriction in service piping.	2. Inspect and clean service piping.
	3. Pressure range too narrow.	3. Extend pressure range.
	4. [Mo] Feed pressure regulator not adjusted	4. Inspect, adjust or replace regulator.
Compressor starts too slowly	1. [FS] Wye Delta switch time set too long.	1. Contact your Gardner Denver distributor.

SYMPTOM		POSSIBLE CAUSE		REMEDY
Compressor starts too slowly	1.	[FS] Wye Delta switch time set too long.	1.	Contact your Gardner Denver distributor.
	2.	Minimum Pressure Valve is faulty.	2.	Inspect and/or replace.
	3.	Supply voltage is too low.	3.	Check the supply voltage.
	4.	Acceleration time on vfd set tool long.	4.	Contact GD for help.
Compressor does not reach load pressure	1.	Restricted air filter.	1.	Clean or replace filter.
	2.	Partially closed inlet valve.	2.	Inspect, clean or replace inlet valve.
	3.	Minimum pressure valve stuck closed.	3.	Inspect, clean or replace inlet valve.
	4.	Oil separator clogged.	4.	Replace.
	5.	Condensate drain valve remains open.	5.	Inspect, clean or replace drain valve.
	6.	Leaks in the compressed air system.	6.	Check for leaks, fix any leaks found.
	7.	Pressure limits incorrectly set.	7.	Check/correct pressure limits in the AirSmart Controller.
High discharge air temperature	1.	Dirty or clogged cooler core or fins.	1.	Clean cooler.
	2.	Insufficient cooling air flow.	2.	Provide unrestricted supply of cooling air.
	3.	Clogged oil filter or cooler (interior).	3.	Replace filter or clean cooler.
	4.	Low compressor oil level.	4.	Add oil to proper level.
	5.	Faulty temperature sensor.	5.	Replace sensor.
	6.	Thermostatic mixing valve stuck open.	6.	Inspect and/or replace valve.
Excessive oil consumption	1.	Oil carryover through lines.	1.	See %Oil Carryover+; in this section.
	2.	Oil leaks at all fittings and gaskets.	2.	Tighten or replace fittings or gaskets.
	3.	Shaft seal leaking.	3.	Inspect shaft seal scavenge orifice

SYMPTOM	POSSIBLE CAUSE	REMEDY
Oil carryover	1. Overfilling the reservoir.	1. Drain excess oil from system.
	2. Clogged scavenge orifice	2. Inspect and cleanse.
	3. Ruptured oil separator element.	3. Replace element.
	4. Loose assembly.	4. Tighten all fittings and gaskets.
	5. Foaming caused by use of incorrect oil.	5. Use Gardner Denver AEON 4000 or 9000SP lubricating coolant.
	6. Inoperative minimum pressure valve.	6. Inspect and/or replace.
	7. Operation at elevated discharge temperatures.	7. Reduce temperature. See %High Discharge Air Temperature+; this section.
	8. Water condensate in oil.	8. Check oil reservoir temperature and if low, change thermal mixing valve element to one with higher temperature setting.
Excessive water in air delivery line	1. Water separator drain (basic unit or total system receiver and/or dryer) malfunction.	1. Inspect and cleanse or replace drain float valve
	2. Dryer not energized	2. Check that dryer is plugged and turned on.
	3. Dryer bypass valve is in bypass position	3. Inspect and cleanse.
	4. Dryer malfunction	3. Refer to dryer manual for further details.

Legend: FS = Fixed Speed Unit Issue - otherwise, issue applies to both FS/VS Units.
Mo = Modulation [inlet valve] option.



Air/oil under pressure will cause severe personal injury or death. Shut down compressor, relieve system of all pressure, disconnect, lockout and tagout power supply to the starter before removing valves, caps, plugs, fittings, bolts and filters

TROUBLESHOOTING VOLTAGE PROBLEMS

The compressor package has been designed, built, and tested to operate within one of the following standard ranges:

200-208 Volts, 60 Hertz

230-240 Volts, 60 Hertz

460-480 Volts, 60 Hertz

575-600 Volts, 60 Hertz

Connection to higher voltages will reduce the life of electrical devices within the compressor package. As voltages get further above the design range, other symptoms may show up.

High voltages may lead to high motor currents. The overload relay will sense these and shut down the compressor to protect the motor.

If the power supply and/or control transformer primary fuses blow, check that the devices are properly connected for the incoming line voltage.

Operation with lower voltages will reduce motor life and load capacity. As voltages get further below the design range, other symptoms may show up.

Low voltages may lead to high motor currents. The overload relay will sense these and shut down the compressor to protect the motor. If voltage is low while the compressor is off, locate and correct the cause. If the voltage drops low only while the compressor is running, look for poor connections or undersized wiring.

If any of the starters or contactors within the box chatters, or if the electronic controller drops out while attempting to start, it is a clear indication that the wiring is inadequate for the compressor. Look for poor connections or undersized wiring.

NOTICE

Gardner Denver factory remanufactured replacement compressor air end units are available from your authorized distributor, on an exchange basis, for all rotary screw compressor units.

Standard Warranty

Oil-Lubricated Rotary Screw / Rotary Vane Compressor Packages

APEX, APEX VS, Electra Screw, Integra, Electra Saver II, Electra Saver, L, LRS, VS, VST, V, HV, HV RS, and HR Series

STANDARD WARRANTY

Gardner Denver (the "Company") warrants to each original retail purchaser ("Purchaser") of its new products from the Company or its authorized distributor that such products are, at the time of delivery to the Purchaser, free of defects in material and workmanship. **This Standard Warranty statement applies to compressors shipped after April 1st, 2015.**

STANDARD WARRANTY PERIOD

The Company's obligation under this warranty is limited to repairing or, at its option, replacing, during normal business hours at an authorized service facility of the Company, any part which in its judgment proved not to be as warranted within the applicable warranty period as follows. **Regular maintenance in accordance with the service manual is required. Use of genuine Gardner Denver OEM parts and lubricants are highly recommended. If a component failure is deemed a result of using non-genuine Gardner Denver parts and lubricants, warranty will not be allowed.**

COMPONENT	STANDARD WARRANTY COVERAGE	DETAILS
Package	12 months from startup or 15 months from date of shipment to first purchaser, whichever occurs first	All components within the package, excluding normal wear items
Airend	24 months from startup or 27 months from date of shipment to first purchaser, whichever occurs first	Normal wearing items, such as shaft seals and inlet valve components, along with the servicing of these items is not covered under the warranty unless deemed as material or workmanship defects. Any disassembly or partial disassembly of the airend, or failure to return the unopened+ airend per Company instructions, will be cause for denial of warranty
Electric Motors	12 months from startup or 15 months from date of shipment to first purchaser, whichever occurs first	Includes both drive motor and cooling fan motor. For nonstandard motors, the original manufacturer's warranty will take precedence.
Major Package Components	24 months from startup or 27 months from date of shipment to first purchaser, whichever occurs first	Includes package controller, variable frequency drive if applicable, air/oil reservoir, air/oil cooler, and precision mixing valve (VS Series)
Labor	<p>Package / Electric Motors: 12 months from startup or 15 months from date of shipment to first purchaser, whichever occurs first</p> <p>Airend / Major Package Components: 24 months from startup or 27 months from date of shipment to first purchaser, whichever occurs first</p>	Service will be provided by Company representative or authorized service personnel, for repair or replacement of any product or part which in the Company's sole judgment is proved not to be as warranted. Labor shall be limited to the amount specified in the Company's labor rate schedule. All costs of transportation of product, parts, and repaired or replacement parts claimed not to be as warranted to and from such service facilities shall be borne by the Purchaser. The Company may require the return of any part claimed not to be as warranted to one of its facilities as designated by Company, transportation prepaid by Purchaser, to establish a claim under this warranty. Replacement parts provided under the terms of the warranty are warranted for the remainder of the Warranty Period.

NO WARRANTY IS MADE WITH RESPECT TO:

1. ANY PRODUCT WHICH HAS BEEN REPAIRED OR ALTERED IN SUCH A WAY, IN THE COMPANY'S JUDGMENT, AS TO AFFECT THE PRODUCT ADVERSELY
2. ANY PRODUCT WHICH HAS, IN THE COMPANY'S JUDGMENT BEEN SUBJECT TO NEGLIGENCE, ACCIDENT, IMPROPER STORAGE, OR IMPROPER INSTALLATION OR APPLICATION
3. ANY PRODUCT WHICH HAS NOT BEEN OPERATED OR MAINTAINED IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE COMPANY
4. ANY RECONDITIONED OR PRIOR OWNED PRODUCT

STANDARD WARRANTY DISCLAIMER

THE FOREGOING WARRANTY IS EXCLUSIVE AND IT IS EXPRESSLY AGREED THAT, EXCEPT AS TO TITLE, THE COMPANY MAKES NO OTHER WARRANTIES AND HEREBY EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES, INCLUDING WITHOUT LIMITATION, EXPRESSED, IMPLIED OR STATUTORY WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE. THE REMEDY PROVIDED UNDER THIS WARRANTY SHALL BE THE SOLE, EXCLUSIVE AND ONLY REMEDY AVAILABLE TO PURCHASER AND IN NO CASE SHALL THE COMPANY BE SUBJECT TO ANY OTHER OBLIGATIONS OR LIABILITIES. UNDER NO CIRCUMSTANCES SHALL THE COMPANY BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, EXPENSES, LOSSES OR DELAYS HOWSOEVER CAUSED. NO STATEMENT, REPRESENTATION, AGREEMENT, OR UNDERSTANDING, ORAL OR WRITTEN, MADE BY ANY AGENT, DISTRIBUTOR, REPRESENTATIVE, OR EMPLOYEE OF THE COMPANY WHICH IS NOT CONTAINED IN THIS WARRANTY WILL BE BINDING UPON THE COMPANY UNLESS MADE IN WRITING AND EXECUTED BY AN OFFICER OF THE COMPANY. THIS WARRANTY SHALL NOT BE EFFECTIVE AS TO ANY CLAIM WHICH IS NOT PRESENTED WITHIN 30 DAYS AFTER THE DATE UPON WHICH THE PRODUCT IS CLAIMED NOT TO HAVE BEEN AS WARRANTED. ANY ACTION FOR BREACH OF THIS WARRANTY MUST BE COMMENCED WITHIN ONE YEAR AFTER THE DATE UPON WHICH THE CAUSE OF ACTION OCCURRED. ANY ADJUSTMENT MADE PURSUANT TO THIS WARRANTY SHALL NOT BE CONSTRUED AS AN ADMISSION BY THE COMPANY THAT ANY PRODUCT WAS NOT AS WARRANTED. WARRANTY IS NOT TRANSFERRABLE

Gardner Denver®

For additional information, contact your local representative or visit:
www.contactgd.com/compressors

©2018 Gardner Denver, Inc. Printed in U.S.A.

