# Smart Vapor Management Unit

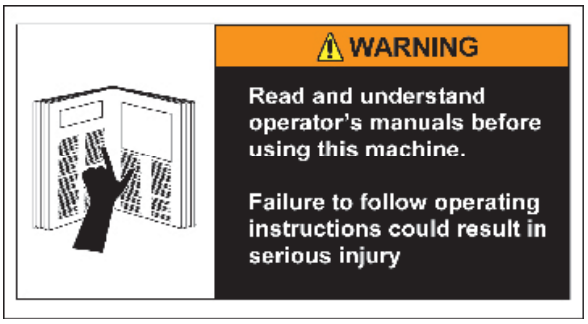
## Installation, Operation & Maintenance Manual

Models SVM 44 / 56 / 88 / 112

Vilter

EMERSON
Climate Technologies

# Important Message




**READ CAREFULLY BEFORE INSTALLING AND STARTING YOUR SMART VAPOR MANAGEMENT (SVM) UNIT.**

The following instructions have been prepared to assist in installation, operation and maintenance of Vilter SVMs. Following these instructions will result in a long life of the unit with satisfactory operation.

The entire manual should be reviewed before attempting to install, operate, service or repair the SVM.

**A SVM unit is a positive displacement machine. It is designed to compress gas. The compressor must not be subjected to liquid carry over. Care must be exercised in properly designing and maintaining the system to prevent conditions that could lead to liquid carry over. Vilter Manufacturing is not responsible for the system or the controls needed to prevent liquid carry over and as such Vilter Manufacturing cannot warrant equipment damaged by improperly protected or operating systems.**

**SVM components are thoroughly inspected at the factory. However, damage can occur in shipment. For this reason, the equipment should be thoroughly inspected upon arrival. Any damage noted should be reported immediately to the Transportation Company. This way, an authorized agent can examine the unit, determine the extent of damage and take necessary steps to rectify the claim with no serious or costly delays. At the same time, your distributor should be notified of any claims made.**

All inquires should include the Vilter sales order number, SVM serial and model number.

All requests for information, services or parts should be directed to your distributor.

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## Figures

# List of Tables and Figures

**Figure** **Section Number**

## How To Use This Manual

This manual contains instructions for Vilter Smart Vapor (SVM) units. It has been divided into nine sections:

Section 1: General Information

Section 2: Theory of Operation

Section 3: Installation

Section 4: Operation

Section 5: Maintenance & Service

Section 6: Troubleshooting

Section 7: Warranty and Parts

Section 8: Spare Parts

Appendices

It is highly recommended that the manual be reviewed prior to servicing system parts.

Figures and tables are included to illustrate key concepts.

### ADDITIONAL IMPORTANT NOTES

- Due to continuing changes and unit updates, always refer to the Vilter.com website to make sure you have the latest manual.
- Any suggestions of manual improvements can be made to Info.Vilter@Emerson.com.

## Safety Symbol Used in This Manual Information

### SAFETY ALERT SYMBOL

When you see this symbol on the SVM or in this manual, look for one of the following words and be aware of the potential for personal injury or property damage.

### WARNING

A Warning describes hazards that CAN or WILL cause serious personal injury, death or major property damage.

### CAUTION

A Caution describes hazards that CAN cause personal injury or property damage.

### NOTE

A Note indicates special instructions that are very important and must be followed.

## Important Safety Information

This manual contains important instructions for installation, operation and maintenance for the SVM.

### WARNING

The SVM must be installed ONLY in systems that have been designed by qualified engineering personnel. The system must conform to all applicable local and national regulations and safety standards.

These instructions are intended to assist in the installation and operation of the SVM and MUST be kept with the unit.

Service and maintenance of the SVM must be performed by qualified technicians only. Service and maintenance must conform to all applicable local and national regulations and safety standards.

Thoroughly review this manual, all instructions and hazard warnings before performing any work on the SVM.

Maintain all SVM operation and hazard warning labels.

### WARNING

Flammable gas can form explosive mixtures with air. Explosive gases can cause property damage, serious personal injury or death.

## WARNING

Failure to disconnect and lockout electrical power from the SVM before attempting maintenance can cause shock, burns, severe personal injury or death.

## WARNING

Loosening or removing pressure-containing components from the SVM when it is in operation can cause major property damage, serious personal injury or death.

Failure to relieve system pressure prior to performing service or maintenance on the SVM can cause property damage or serious personal injury.

## CAUTION

Extreme heat can cause personal injury or property damage.

## CAUTION

Always use a lifting device capable of supporting the full weight of the SVM or component being lifted.

Handling or lifting heavy assemblies can cause personal injury or property damage.

## SVM Nomenclature

The SVM model name can be found on the nameplate. For nameplate location, see SVM Component Identification.

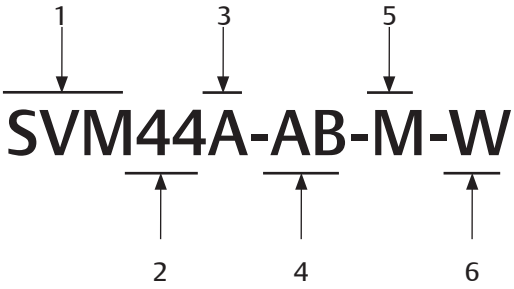



Figure 1-1. SVM Nomenclature

**1. System Identifier**

SVM = Smart Vapor Management

**2. Capacity**

44 = Nominal Capacity At Rating Condition

56 = Nominal Capacity At Rating Condition

88 = Nominal Capacity At Rating Condition

112 = Nominal Capacity At Rating Condition

**3. SVM Input Voltage**

A = AC, 50/60 Hz, 480V-3

B = AC, 50/60 Hz, 240V-3

**4. Controls Package**

R = ROC

AB = Allen Bradley PLC

**5. VFD Starter**

L = (Shipped) Loose

M = Mounted

**6. Insulation for Compressor & Scrubber**

W = Winter (Insulation)

Table 1-1. SVM Models

| Model | Max Delivery Pressure (PSIG) | Max Flow @20 PSIG (MCFD) | Drive HP | Low Pressure Limit (“H2O) | High Pressure Limit (PSIG) | High Temp Setting (˚F) | Controls Package |
|---|---|---|---|---|---|---|---|
| **Scroll SVM Units** | | | | | | | |
| SVM 44 | 190 | 200 | 30 | -6”H20 | 230 PSIG | 280 ˚F | AB/ROC |
| SVM 56 | 160 | 260 | 30 | | | | |
| SVM 88 | 190 | 200 | 30 | | | | |
| SVM 112 | 160 | 260 | 30 | | | | |

## SVM Component Identification

The SVM unit comes equipped with one or two Copeland Scroll® Compressors designed for Class 1 Division II applications. The standard unit also includes a suction scrubber, horizontal oil stabilizer, lube oil cooler, and controls package. This section provides an overview of these components.

These terms are used throughout this manual:

- Compressor – A hermetically sealed Copeland Scroll compressor
- Oil Stabilizer – Insulated horizontal oil stabilizer
- SVM – Smart Vapor Management
- VFD – Variable Frequency Drive used to power a variable speed compressor
- PLC – Programmable Logic Controller used to control and monitor SVM

1 - Suction Scrubber
2 - Suction Scrubber Filter Element Cover
3 - Suction Scrubber Inlet Connection
4 - Level Sight Glasses
5 - Condensate Drain Valve
6 - Vessel Nameplate
7 - Base Assembly
8 - Lifting Handle
9 - Discharge Outlet Line Connection
10 - Pressure Regulator
11 - Oil Stabilizer Heater
12 - Oil Stabilizer Vessel Nameplate
13 - Relief Valve (Discharge Line)
14 - Oil Drain Valve
15 - Oil Level Sight Glasses
16 - Needle Valve (Oil Return)
17 - Flow Gauge (Oil Return)
18 - Oil Stabilizer
19 - VFD Panel
20 - PLC Panel

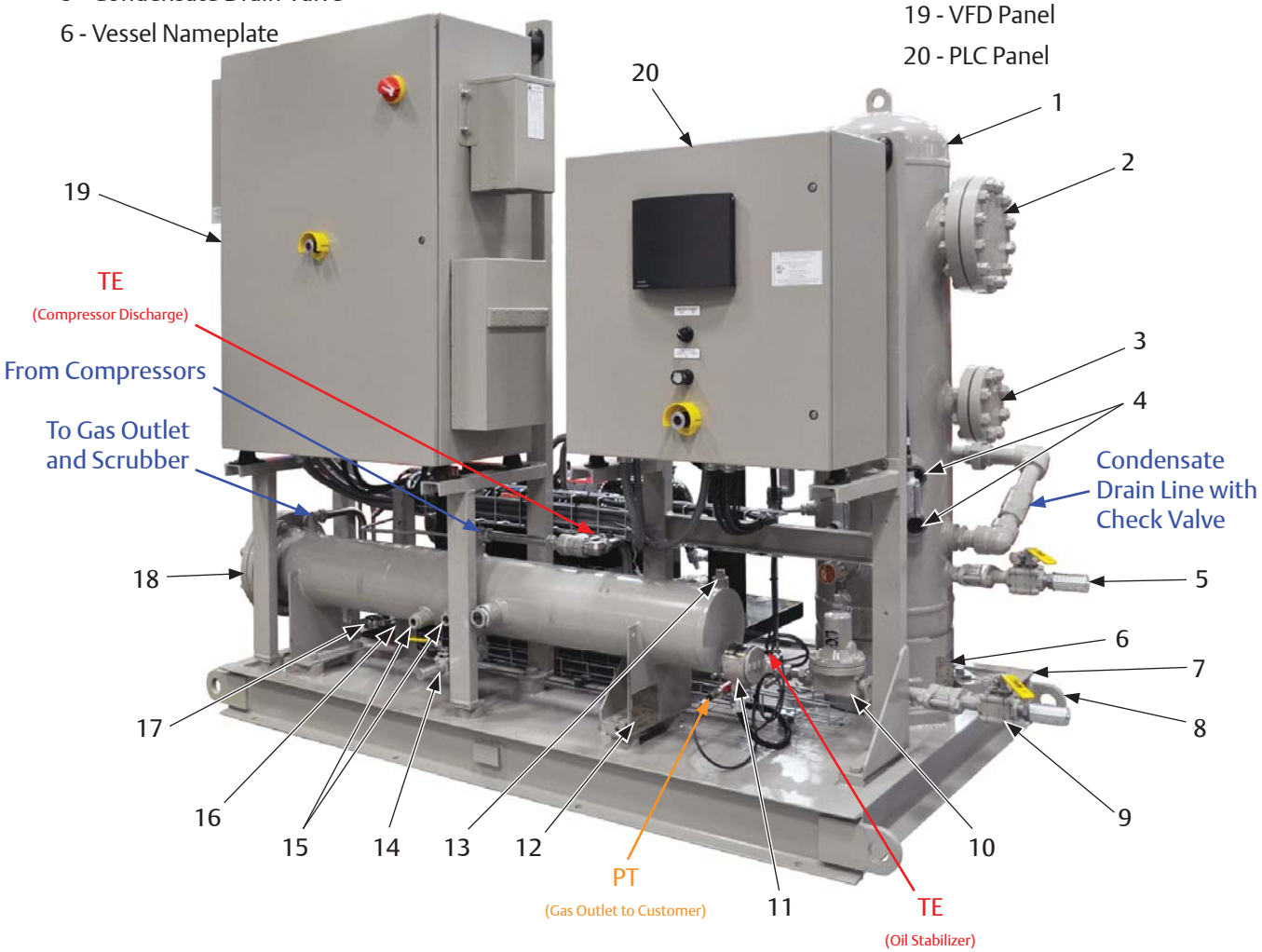



Figure 1-1. SVM 44/56 Components (with VFD Panel)

21 - System Pressure Equalizing Solenoid

22 - Condensate Level Switch High High

23 - Scrubber Pressure Control Solenoid

24 - Condensate Level Switch High

25 - Oil Level Switch Low Low

26 - Pressure Differential Switch Shutdown High High

27 - Oil Filter (Part of Compressor Module)

28 - Skid Drain

29 - Compressor Module

30 - Air Cooled Oil Cooler (Part of Compressor Module)

31 - Compressors (Part of Compressor Module)

32 - Relieve Valve, Suction Scrubber

33 - Suction Manifold

34 - Condensate Blowdown Solenoid

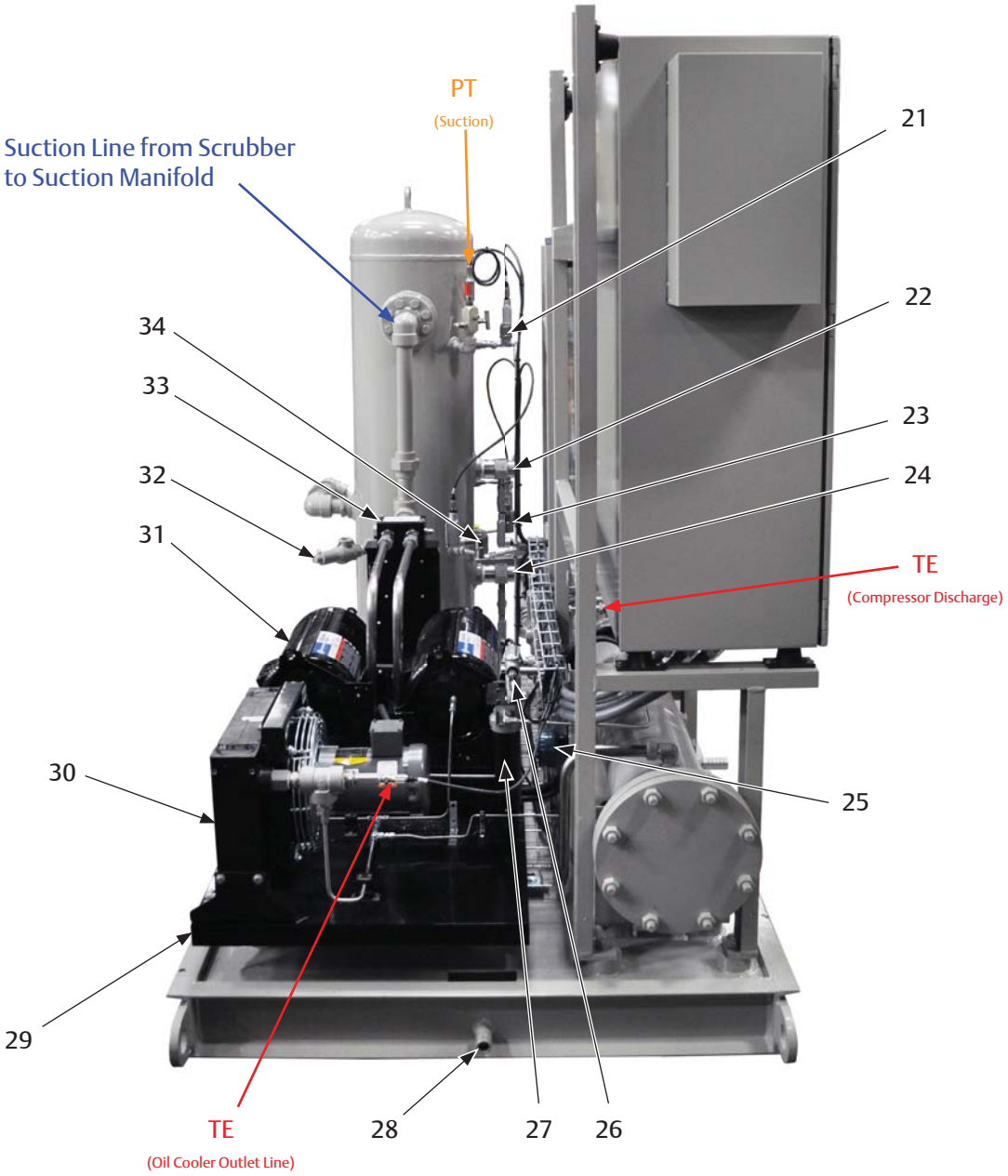



**Figure 1-2. SVM 44/56 Components (without VFD Panel)**

*Units with a VFD Panel do not come with a Junction Box

1 - Air Cooled Oil Cooler (Part of Compressor Module)
2 - Compressors (Part of Compressor Module)
3 - Suction Manifold
4 - Compressor Module
5 - Suction Scrubber
6 - Suction Scrubber Filter Element Cover
7 - System Pressure Equalizing Solenoid
8 - Unit Nameplate
9 - Vessel Nameplate
10 - Suction Scrubber Inlet Connection
11 - Condensate Level Switch High High
12 - Level Sight Glasses
13 - Base Assembly
14 - Lifting Handle
15 - Condensate Drain Valve
16 - Scrubber Pressure Control Solenoid
17 - Discharge Outlet Line Connection
18 - Condensate Level Switch High
19 - Pressure Regulator
20 - Condensate Blowdown Solenoid
21 - Junction Box 1
22 - Oil Stabilizer Heater
23 - Oil Stabilizer Vessel Nameplate
24 - PLC Panel
25 - Junction Box 2
26 - Oil Level Sight Glasses
27 - Oil Drain Valve
28 - Frame, Quad
29 - Relief Valve (Discharge Line)
30 - Oil Stabilizer
31 - Oil Filter (Part of Compressor Module)
32 - Pressure Differential Switch Shutdown High High

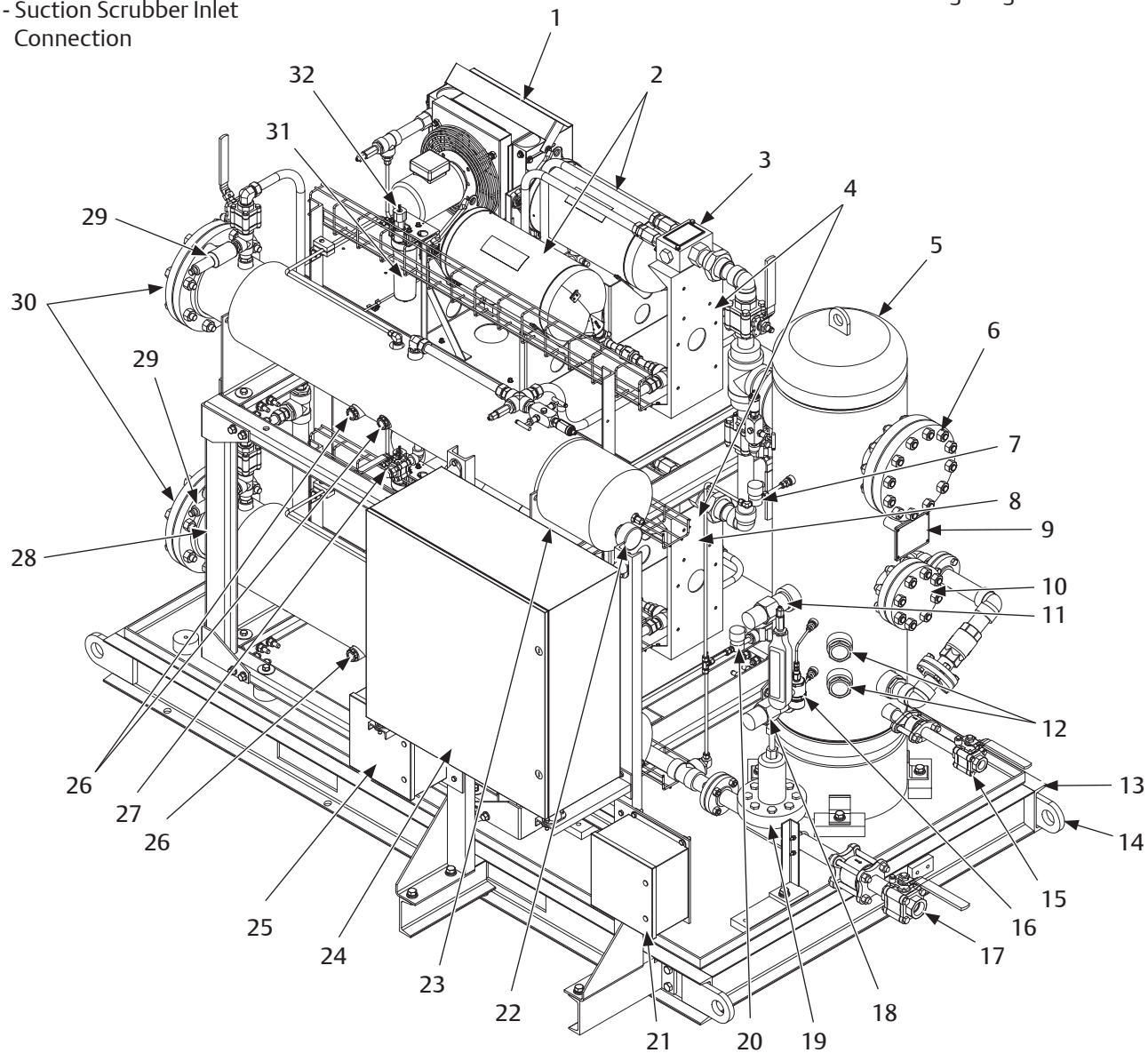



**Figure 1-3. SVM 88/112 Components (1 of 2)**

33 - Relieve Valve, Suction Scrubber
34 - Oil Level Switch Low Low
35 - Skid Drain
36 - Needle Valve (Oil Return)
37 - Oil Flow Sight Glass (Oil Return)
38 - VFD Panel

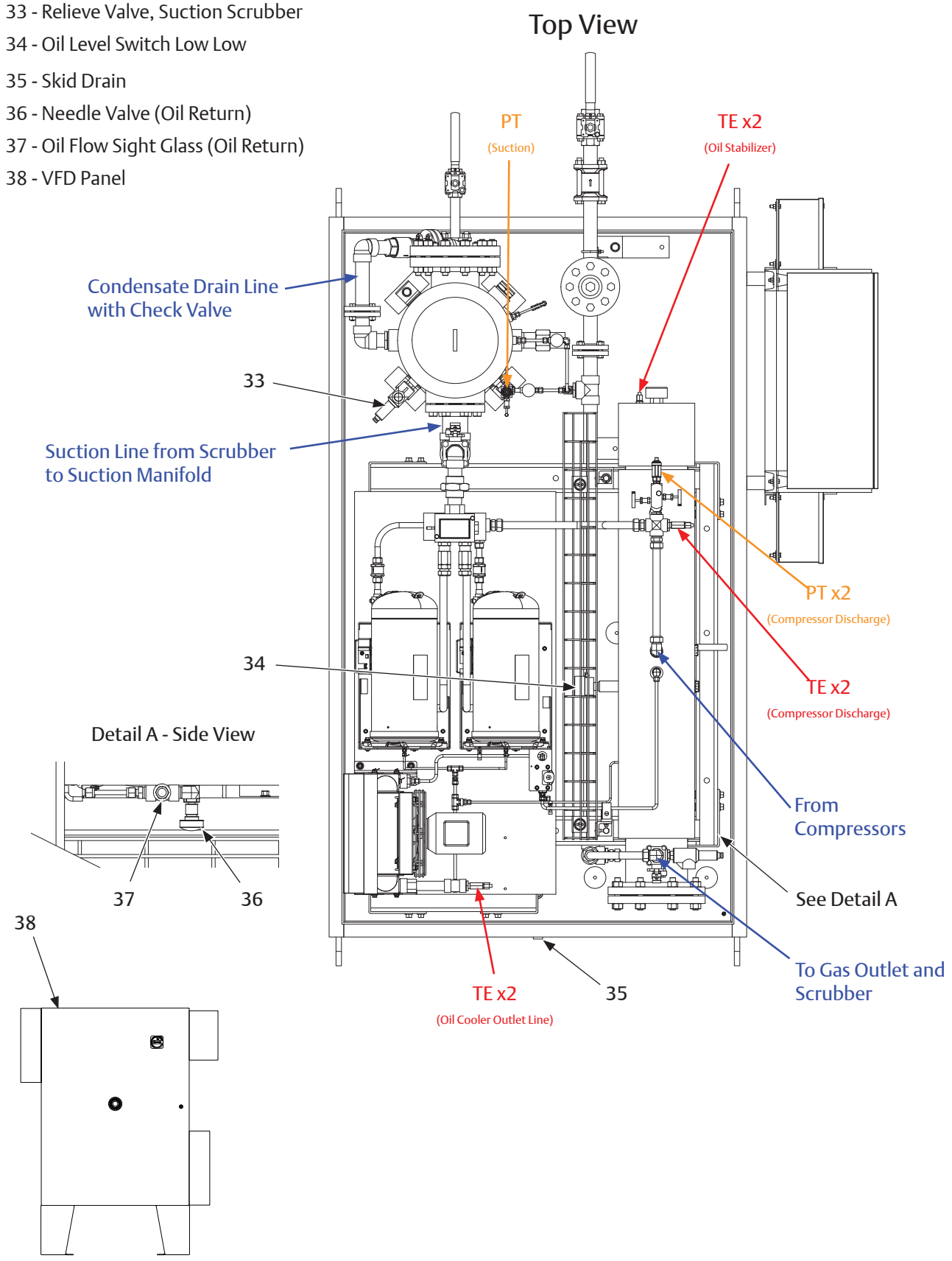



Figure 1-3. SVM 88/112 Components (2 of 2)

## SVM Specifications

### Table 1-2. SVM Specifications

| | |
|---|---|
| **General Information** | |
| Inlet Pressure Range | Approximately -0.75 to 25 psig |
| Outlet Pressure Range | 60 to 190 psig<br>(Depends on model and application limitations, see Table 1-1) |
| **Mechanical Description** | |
| Module Weight | Estimated 2500 lbs (1134 kg) |
| Suction Connection | 4" 300# RF Flange |
| Discharge Connection | 1" NPT |
| Sound Level | Approximately 75 dBA @ 1 m, 60 dBA @ 10 m |
| Vibration | 3 mil at 60 Hz |
| Minimum Cold Start Ambient Temperature (1,4) | Compressor -20°F (-29°C) VFD power 14°F (-10°C) |
| Ambient Operating Temperature Range (1,4) | 0 to 122°F (-18 to 50°C) |
| Module Dimensions | See Installation Clearances and Dimensions in Section 3. |
| **Materials of Construction** | |
| Compressor - General | Cold rolled steel, aluminum, cast iron as required |
| Compressor Bearings | Self-lubricated, sleeve type, steel backed |
| Oil Heat Exchanger | Aluminum |
| Oil/Gas Separator Tank | Cold rolled steel |
| Tubes/Fittings/Skid Structure | Stainless/carbon steel |
| **Lubrication** | |
| Oil Type | Vilter Methane PAO 100 |
| System Oil Capacity, oz. (ml) | 960 oz. (28,390 ml) |
| Projected Oil Consumption 2 | Approximately 40 oz. (1183 ml) / 8,000 hours at 0.25 psig suction (<5ppm) |
| **System Electrical (Standard)** | |
| Minimum VFD Ambient Startup Temperature (3,4) | +14°F (-10°C) |
| Power Supply to Inverter<br>• Voltage Range<br>• Input Frequency Range | 240 to 480 VAC (50/60 Hz) |
| Overpressure Detection (Outlet) | 250 PSIG Relief Valve (200 PSIG Setpoint) |
| Under-pressure Detection (Inlet) | Low Pressure System (-6"$H_2O$ Setpoint) |
| Oil Over-temperature Detection | 280°F (138°C) open |
| **Gas Medium** | |
| **Natural gas** | |
| $H_2S$ maximum content (5) | 24 ppm |
| Moisture content (5) | 100% saturated, no free liquids |
| Inlet temperature (5) | -20 to 115°F (-28 to 46°C); protection from freezing if water is present |

1. If the Compressors are started at temperatures above the listed minimums and continue to run, the minimum operating temperature is 20°F (-29°C).
2. Based on sweet gas wellhead gas. Results may vary due to gas quality and site conditions.
3. Do not apply power to the VFD if ambient temperature is below this level.
4. If power is continuously supplied to the VFD when the Compressor is off, the minimum starting temperature is -4°F (-20°C).
5. Consult factory for more details and applications guidelines.

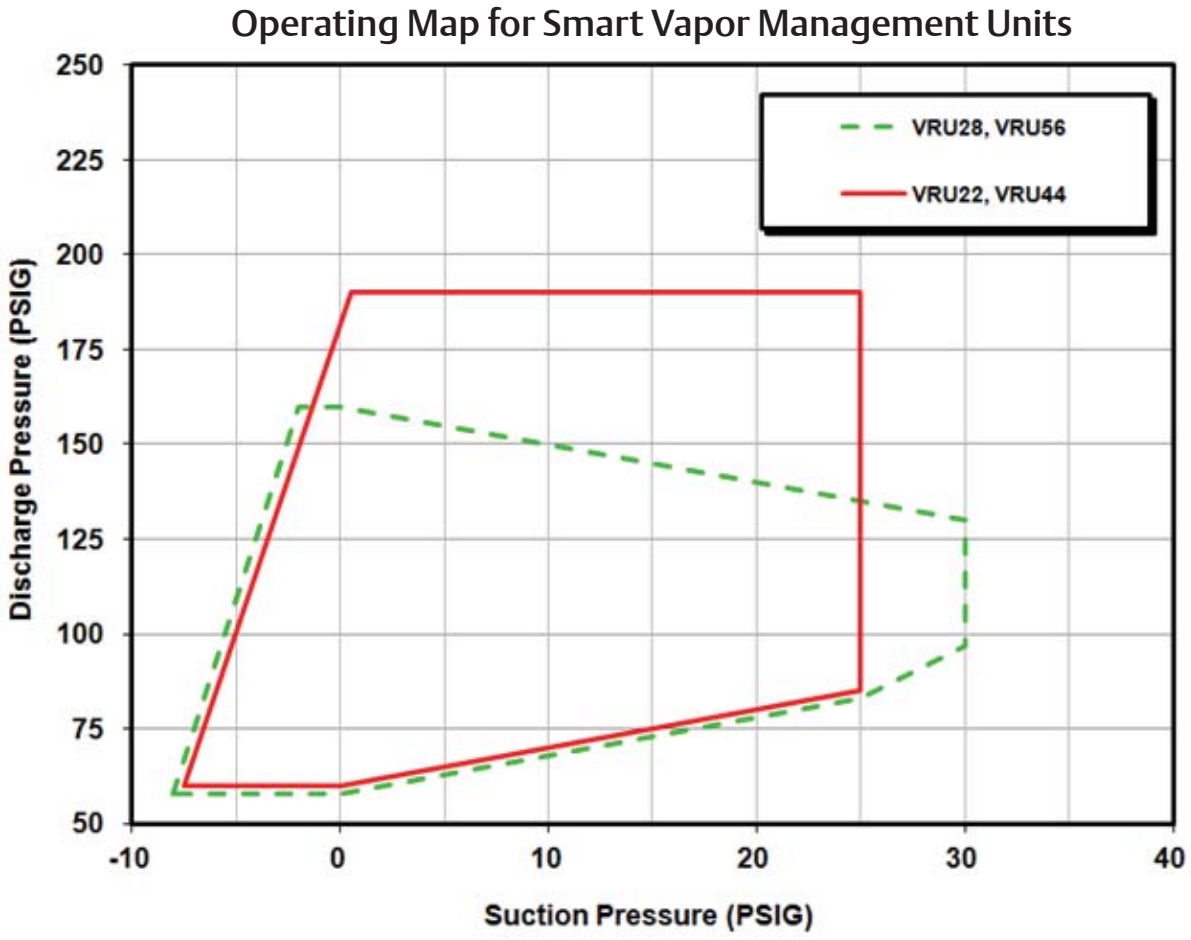



Figure 1-4. SVM Operating Map

## Instrument Identification Letters

Use this list to identify components shown in the Piping & Instrumentation Diagram.

| | |
|---|---|
| A | Analysis |
| AAH | Concentration High |
| AAHH | Concentration/Detection High High |
| AI | Analysis/Moisture Indicator |
| AIT | Analysis/Detection Indicating Transmitter |
| AT | Analysis/Detection (Blind) |
| AU | Analysis/Detection Monitor |
| BFV | Butterfly Valve |
| CV | Check Valve |
| E | Voltage |
| EAH | Voltage High |
| EAHH | Voltage High High (Shutdown) |
| EI | Voltage Indication |
| F | Flow |
| FAH | Flow High |
| FAHH | Flow High High (Shutdown) |
| FAL | Flow Low |
| FALL | Flow Low Low |
| FC | Flow Controller/Fail Close |
| FG | Flow Gauge |
| FI | Flow Indication (Soft)/ Flow Sight Indicator (Glass) |
| FIC | Flow Indicating Controller |
| FIT | Flow Indicating Transmitter |
| FOP | Orifice Plate |
| FT | Flow Transmitter (Blind) |
| FV | Flow Control Valve |
| FY | Flow/Relay/Convertor |
| G | Gas |
| GIT | Gas Detecting Indicating Transmitter |
| GAH | Gas Detected Concentration Level High |
| GAHH | Gas Detected Concentration Level High High (Shutdown) |
| H | Hand |
| HH | Hand Hole |
| HO | Held Open (Solenoid Valve Only) |
| HV | Hand Valve |
| I | Current |
| IAH | Amperage High |
| IAHH | Amperage High High (Shutdown) |
| II | Current Indication |
| IT | Current Transmitter (Blind) |
| J | Power |
| JB | Junction Box (Wire Termination) |
| JI | Power Indication |
| JIT | Power Indicating Transmitter |
| JT | Power Transmitter (Blind) |
| K | Time Schedule |
| KC | Time Controller (Blind) |
| KI | Time Indication |
| KIC | Time Indication Controller |
| KR | Time Recorder |
| KY | Time/Relay/Convertor |
| L | Level |
| LAH | Liquid Level High |
| LAHH | Liquid Level High High (Shutdown) |
| LAL | Liquid Level Low |
| LALL | Liquid Level Low Low (Shutdown) |
| LC | Level Controller |
| LE | Level Probe (Element) |
| LG | Level Gauge |
| LI | Indication (Soft)/Level Sight Indicator (Glass) |
| LIT | Level Indicating Transmitter |
| LO | Lock Open |
| LSH | Level Switch High |
| LSHH | Level Switch High High (Shutdown) |
| LSL | Level Switch Low |
| LSLL | Level Switch Low Low (Shutdown) |
| LT | Level Transmitter (Blind) |
| LV | Level Control Valve |
| LY | Level/Relay/Convertor |
| MCC | Motor Control Center |
| MGV | Manifold Gauge Valve |
| NC | Normally Closed |
| NO | Normally Open |
| NV | Needle Valve |
| P | Pressure |
| PAH | Pressure High |
| PAHH | Pressure High High (Shutdown) |
| PAL | Pressure Low |
| PALL | Pressure Low Low |
| PC | Pressure Control |
| PDAH | Pressure Differential High |
| PDAHH | Pressure Differential High High (Shutdown) |
| PDAL | Pressure Differential Low |
| PDALL | Pressure Differential Low Low (Shutdown) |
| PDC | Pressure Differential Control |
| PDI | Differential Pressure Indication |
| PDIC | Pressure Differential Indicating Controller |

| | |
|---|---|
| PDIT | Pressure Differential Indicating Transmitter |
| PDSH | Pressure Differential Switch High |
| PDSHH | Pressure Differential Switch High High (Shutdown) |
| PDSL | Pressure Differential Switch Low |
| PDSLL | Pressure Differential Switch Low Low (Shutdown) |
| PDT | Differential Pressure Transmitter (Blind) |
| PDV | Pressure Differential Control Valve (Pneumatic Actuator) |
| PFY | Pressure Ratio Convertor/ Relay |
| PFC | Pressure Ratio Controller |
| PG | Pressure Gauge |
| PI | Pressure Indication (Soft) |
| PIC | Pressure Indicating Controller |
| PIT | Pressure Indicating Transmitter |
| PSE | Pressure Rupture Disk |
| PSH | Pressure Switch High |
| PSHH | Pressure Switch High High (Shutdown) |
| PSL | Pressure Switch Low |
| PSLL | Pressure Switch Low Low (Shutdown) |
| PSV | Pressure Safety Relief Valve |
| PT | Pressure Transmitter (Blind) |
| PV | Pressure Control Valve |
| Q | Quantity and Heat |
| QE | Heater Element, Immersion, Tracing |
| R | Radiation |
| S | Speed, Frequency |
| SC | Speed Control |
| SD | Shutdown |
| SIC | Speed Indicating Controller |
| T | Temperature |
| TC | Temperature Controller |
| TAH | Temperature High |
| TAHH | Temperature High High (Shutdown) |
| TAL | Temperature Low |
| TALL | Temperature Low Low (Shutdown) |
| TE | Temperature Element (RTD, Thermocouple, etc.) |
| TG | Temperature Gauge |
| TI | Temperature Indication (Soft) |
| TIC | Temperature Indicating Controller |
| TIT | Temperature Indicating Transmitter |
| TRV | Transfer Valve 3-Way |
| TSH | Temperature Switch High |
| TSHH | Temperature Switch High High (Shutdown) |
| TTSL | Temperature Switch Low |
| TSLL | Temperature Switch Low Low (Shutdown) |
| TT | Temperature Transmitter (Blind) |
| TV | Temperature Control Valve |
| TW | Temperature Thermo-well |
| TY | Temperature/Relay/ Convertor |
| U | Multi Variable |
| V | Vibration, Mechanical Analysis |
| VE | Vibration Probe |
| VFD | Variable Frequency Drive |
| VG | Block/Bleed, Gauge Valve |
| VSH | Vibration Switch High |
| VSHH | Vibration Switch High High (Shutdown) |
| VT | Vibration Transmitter (Blind) |
| VU | Vibration Monitoring System |
| W | Weight |
| XA | Status (Stopping/Not Running) Alarm/Common Alarm |
| XC | State Controller |
| XI | Running Indication |
| XV | Solenoid Valve |
| XY | State Relay/Convertor |
| Y | Event, State, Presence |
| YAH | Fire Alarm |
| YE | Fire Detecting Sensor |
| YIT | Fire Indicate and Transmit |
| YK | Fire Control Station |
| Z | Position, Dimension |
| ZC | Position Controller |
| ZE | Position Element |
| ZI | Position Indicator |
| ZIT | Position Indicating Transmitter |
| ZT | Position Transmitter (Blind) |
| ZY | Position Transmitter (Blind) |
| ZZ | Position Actuator (Capacity or Volume) |

## Symbol Identification

Use this list to identify symbols shown in the Piping & Instrumentation Diagram.


3-Way Valve


3-Way Solenoid Valve


Angle Valve


Ball Valve


Basket Strainer


Block/Bleed Gauge Valve


Butterfly Valve


Check Valve


Diaphragm Actuator

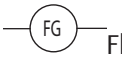

Diaphragm Spring-Opposed


Diaphragm Pressure-Balanced


Differential Pressure Regulating Valve


Drive Coupling


Flange Set



Flow/Sight Glass


Gate Valve


Globe Valve


Hand Expansion Valve

Heater


Heat Trace


Insulation

Man-Way Cover


Manifold Gauge Valve

Motorized Ball Valve


Needle Valve


Orifice Plate

Pilot Light


Pipe Plug


Pipe Reducer


Pneumatic Actuator Control Valve


Relief Valve


Regulating Valve Inlet Pressure


Regulating Valve Outlet Pressure


Rotary Valve


Rupture Disc


Schroder Valve


Solenoid Valve


Spring-Closing Drain Valve


Stop/Check Valve


Strainer


Thermostatic Valve 3-Way


Thermowell (SW or NPT)


Thermowell (SW or NPT)


Venturi Injector Nozzle


Vibration Absorber



Scope of Supply

## Major Component Identification

Use this list to identify major components shown in the Piping & Instrumentation Diagram.



Air Drive


Compressor


Damper or Louver


Engine Drive


Filter


Finned Tube Heat Exchanger


Heat Exchanger


Motor


Shell and Tube Heat Exchanger


Fan


Tank/Drum Vessel


Positive Displacement Pump

## Major Component Identification (Continued)


Centrifugal Pump


Rotary Pump

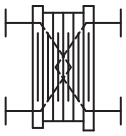
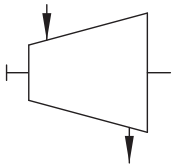


Plate & Frame Heat Exchanger


Turbine

## Control and Instrument Identification


Discrete Instrument, Field Mounted


Discrete Instrument, Remote, Mount, Normally Accessible to Operator


Discrete Instrument, Local Rack Mounted, Normally Accessible to Operator


Shared Display/Control, Field Mounted


Shared Display/Control, DCS or Remote Control Panel Normally Accessible to Operator


Shared Display/Control, Local Control Panel Normally Accessible to Operator


Programmable Logic Control, Field Mounted

Safety Instrumented System, Field Mounted


Programmable Logic Control, DCS or Remote Control Panel, Normally Accessible to Operator

Safety Instrumented System Main Control Panel or DCS


Programmable Logic Control, Auxiliary (Local) Control Panel, Normally Accessible to Operator

Safety Instrumented System Auxiliary (Local) Control Panel


Computer Function, Field Mounted

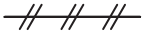

Computer Function, DCS or Remote Control Panel, Normally Accessible to Operator

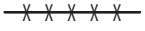

Computer Function, Local Operator Panel, Normally Accessible to Operator

Interlock

Permissive

## Line Type Designations


Pneumatic Signal

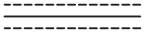

Capillary Tube

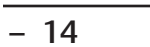

Electrical Signal


Internal System Link (Software or Data Link)


Mechanical Link


Hydraulic Signal


Customer Field Piping


Insulation

## Valve and Instrument Tagging

a-bc-yz = ABC-DEFGH-IJKL

a = ABC, b = DE, c = FGH, y = IJK, z = L

A - Process cell or stage of compressor

B - Unit number in process cell or stage of compression

C - Service in process cell or stage of compression

- 1 - Gas lines
- 2 - Coolant lines
- 3 - Oil lube lines
- 4 - Refrigerant lines
- 5 - Condensate lines
- 6 - Air lines

D - Measured variable

E - Variable Modifiers

F - Readout or passive function

G - Output or active function

H - Function modifier

I - Loop number or sequential number

J - Loop number or sequential number

K - Loop number or sequential number

L - Suffix

**SAMPLE TAG**

105-LSH-300-A

1 - First process cell or stage of compression

0 - First unit number in process cell or stage of compression

5 - Condensate service

L - Level

S - Switch

H - High

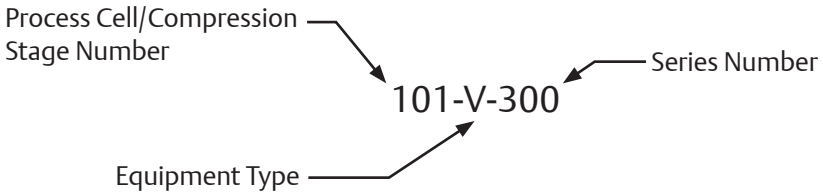
3 - Loop number or sequential number

0 - Loop number or sequential number

0 - Loop number or sequential number

A - Another exactly the same device in the same loop as 105-LSH-300

## Equipment Number Identification




**EQUIPMENT TYPE**

A - Agitator, Mechanical Mixers, Aerators

B - Blowers

C - Compressors

D - Drivers

E - Heat Exchangers

F - Fans

P - Pumps

R - Reactors

U - Filters, Strainers

V - Vessels, Tanks, Separators, Scrubbers

## Pipe Line Data Identification

AB - C - D - E - F / X - Y - Z

20-LFG-001-10-STD / PS-1-ET

A - Process cell or stage of compression
- 1 - Process cell first stage of compression
- 2 - Process cell first stage of compression
- 3 - Process cell first stage of compression
- 4 - Process cell first stage of compression
- 5 - Process cell low pressure refrigeration (booster)
- 6 - Process cell high pressure refrigeration (high stage)
- 7 - Open
- 8 - Open
- 9 - Open

B - Unit number in process cell or stage of compression

C - Service
- AR - Process Air
- BD - Blowdown
- BRR - Brine
- CHWS - Chilled Water Supply
- CHWR - Chilled Water Return
- CWR - Cooling Water Return
- CWS - Cooling Water Supply
- DR - Drain
- ER - Ethylene Refrigerant
- GLR - Glycol Return
- GLS - Glycol Supply
- H - Hydrogen
- HR - Hydrocarbon Refrigerant
- IAS - Instrument Air Supply
- LFG - Land Fill Gas
- LO - Lube Oil
- N - Nitrogen
- NG - Natural Gas
- NH - Ammonia
- PC - Process Condensate
- PG - Process Gas
- PR - Propylene Refrigerant/Propane
- SV - Safety Relief
- SO - Seal Oil
- VC - Vacuum Condensate

D - Numerical Sequence Number

E - Size
- #" - Nominal Pipe Size (Inches)

F - Standard/Other Standard
- STD -Vilter
- 0 - Other Standard (Not Vilter)

X - Insulation
- AC -Acoustic Control
- CC - Cold Service
- CP - Condensation Control
- N - Not Required
- PP - Personnel Protection
- PS - Process Stability
- TR - Traced (See Tracing Type)

Y - Insulation Thickness
- BO - By Others
- #" - Nominal Thickness (Inches)
- 0 - Insulation Not Required

Z - Heat Tracing
- ET - Electrical Heat Trace
- N - None

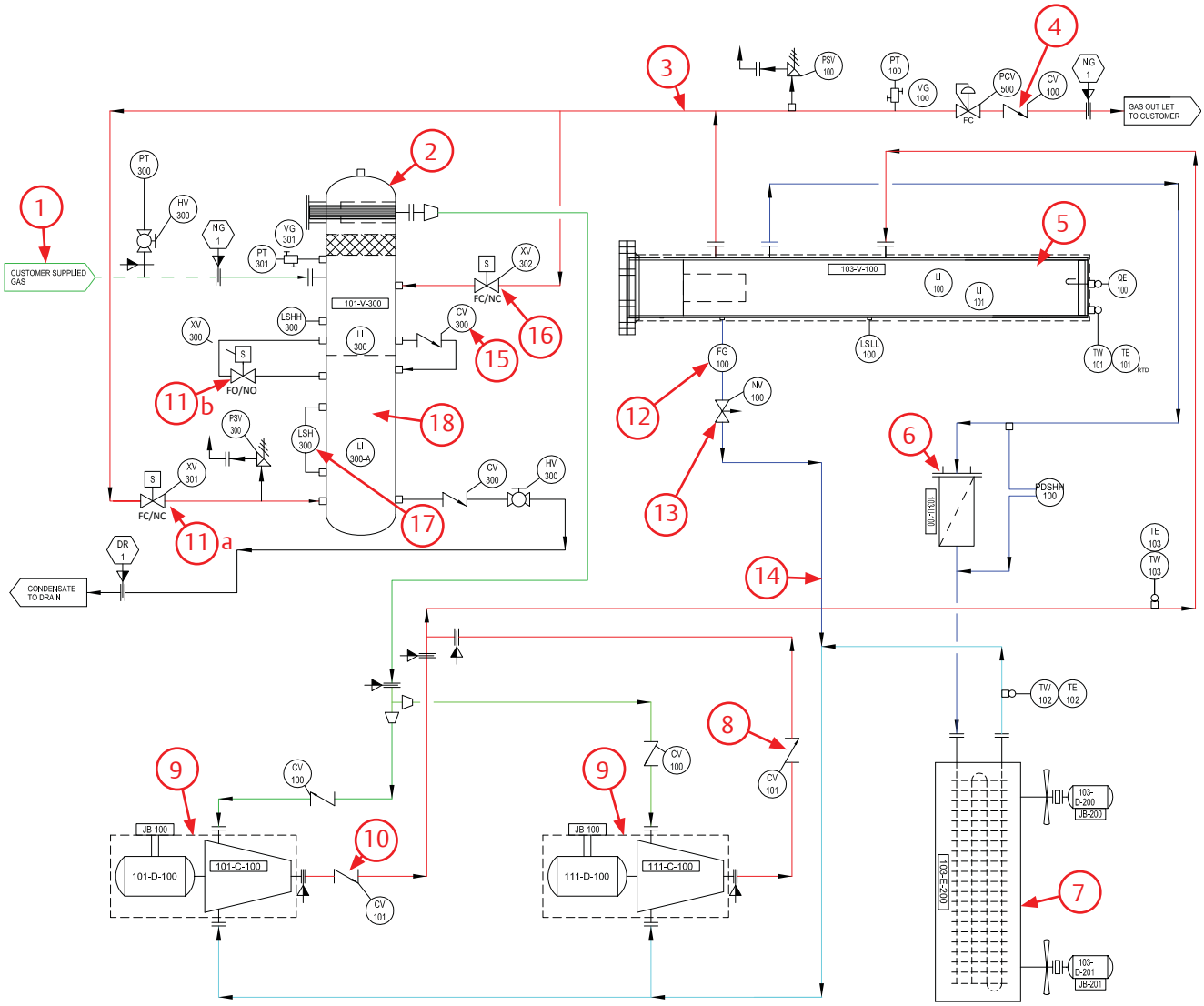



Figure 2-1. SVM P&ID (Dual Compressor Module Shown)

The gas and oil systems work in unison, but each one will be explained separately. Reference Figure 2-1 for gas and oil flow descriptions.

## Gas Flow

Vapor recovery begins as process gas enters the suction inlet line (1) and flows into the suction scrubber (2). In the suction scrubber, free water, condensed hydrocarbons, and heavier particles are removed. The process gas is then pressurized by the compressors (9) and discharged as a mixture of oil and high pressure gas vapor into the oil stabilizer (5). The oil stabilizer is designed to prevent oil dilution due to hydrocarbon condensation. The operation of the oil stabilizer can be optimized based on process conditions and gas composition. The second main function of the oil stabilizer is the separation of oil and gas. Oil is knocked out of the gas stream as it flows through the oil stabilizer and then through a coalescing element. The gas vapor then flows out of the oil stabilizer into the discharge line (3) before leaving the unit.

## Inlet Scrubber with Internal Blow Case Operation

The suction scrubber (2) is designed to capture particulates and liquids from the inlet gas stream before entering the inlet of the compressors (9). The suction

scrubber allows condensed liquids to collect by gravity flow through check valve (15) into the bottom half of the suction scrubber known as the blow case (18). The purpose of the blow case is to collect condensed liquids or condensate and return them to the tank from which the compressor vapors are coming from by using the compressor discharge gas from the oil stabilizer (5) to push the liquids out.

During normal operations the suction scrubber (2) and the blow case (18) are kept at the same operating pressures by equalizing the pressure between the two chambers through a normally open solenoid valve (11b).

In Figure 2-2, once the liquids accumulating in the blow case (18) has reached a level high enough to lift the float level switch (17), the process will initiate the emptying of the blow case. This automatic process will close off the equalization solenoid valve (11b) and open the blow case pressurization solenoid valve (11a). This will allow the compressor discharge gas to pressurize the blow case but not the filter chamber, and push the liquids from the blow case back to the tank. Once the level float switch reaches its lower limit signifying the liquids were drained, the process will automatically reverse the cycle to put the suction scrubber back into normal operating mode. During this process the equalization solenoid valve will open and the blow case pressurization solenoid valve will close.

Note that the float level switch (17) is a two-way acting switch with a low and high limit.

## Oil Life and Oil Flow

The quality of the oil is directly affected by process conditions and gas composition. Oil free of water and hydrocarbon condensate flows from the oil stabilizer (5) through the oil filter (6), air cooled oil cooler (7), and then back to the compressors (9) where it mixes with process gas during compression. Oil injection temperature is controlled by variable speed fans located on the oil cooler. Oil in the SVM serves three primary purposes; compressor lubrication, sealing clearances between moving parts, and heat removal resulting from heat of compression and friction. There is no oil pump, pressure differential between suction and discharge causes oil to flow through the unit. A 60 PSIG pressure differential must be maintained to ensure proper oil flow.

An oil scavenge line (14) is used to return any oil that is collected by the coalescing element back to the compressors (9). A flow gauge (12) and a needle valve (13) are also installed on the oil scavenge line used to help control flow. This oil stream bypasses the oil filter (6) and oil cooler (7) because the volume is typically very low.

This is a continuous cycle.

## SVM Quad

The SVM quad was designed to meet the demands of higher gas flow requirements. The system runs the same as a SVM dual unit, except the quad unit incorporates an additional compressor module, making it have four compressors in total. The unit is now capable of producing a max flow of 520 MCFD at 20 psig with a max delivery pressure of 160 psig.

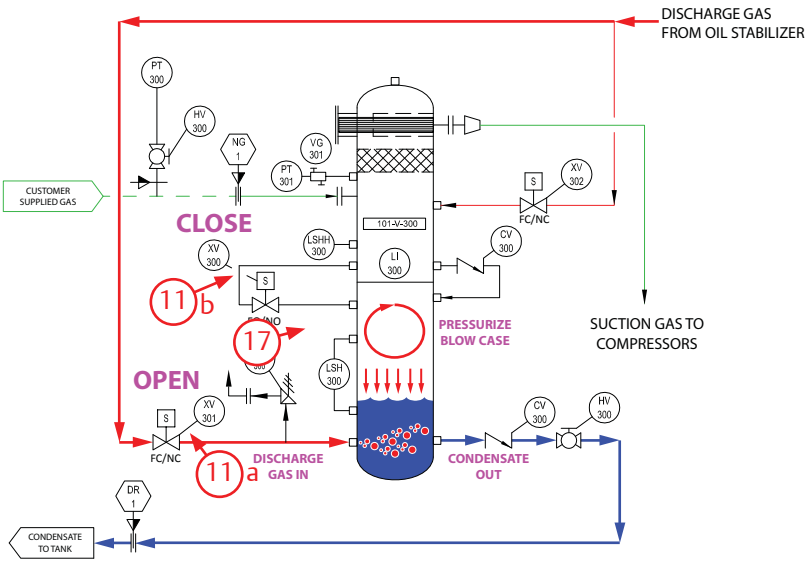



Figure 2-2. Suction Scrubber - Blow Case Operation

## Delivery Inspection

All equipment supplied by Vilter are thoroughly inspected at the factory. However, damage can occur in shipment. For this reason, the units should be thoroughly inspected upon arrival, prior to off-loading. Any damage noted should be photographed and reported immediately to the transportation company. This way, an authorized agent can examine the unit, determine the extent of damage and take necessary steps to rectify the claim with no serious or costly delays. At the same time, the local Vilter representative should be notified of any claims made within ten (10) days after its discovery. Refer to long term storage for additional recommendations.

## Rigging and Lifting of SVM Unit

**WARNING**

**When rigging and lifting a Vapor Recovery Unit, use proper lifting device capable of lifting and maneuvering the weight and size of the unit. Use only qualified personnel and additional personnel and lifting equipment (i.e. spreader bar) as required. Failure to comply may result in death, serious injury and/or damage to equipment.**

Only qualified personnel shall operate rigging and lifting equipment. Ensure that the lifting device is capable of lifting the weight of the SVM unit, refer to the supplied Vilter General Assembly (GA) drawing.

To lift the SVM unit, attach lifting device to the lifting points located on the unit, see Figure 3-1.

There are a few points to consider prior to moving the unit:

- Ensure that the weight is evenly distributed amongst the lifting device (i.e. lifting chains and spreader bar) prior to lifting.
- Ensure that the lifting device is not obstructed by any part of the SVM unit to prevent damage to components.
- Use additional personnel as needed to spot and aid in maneuvering the SVM unit.
- Ensure there is plenty of space to maneuver the SVM unit and a clear path to its location.

*Use lifting chains/straps and spreader bar. Evenly distribute weight. Keep lifting chains and spreader bar clear of components to prevent damage.*

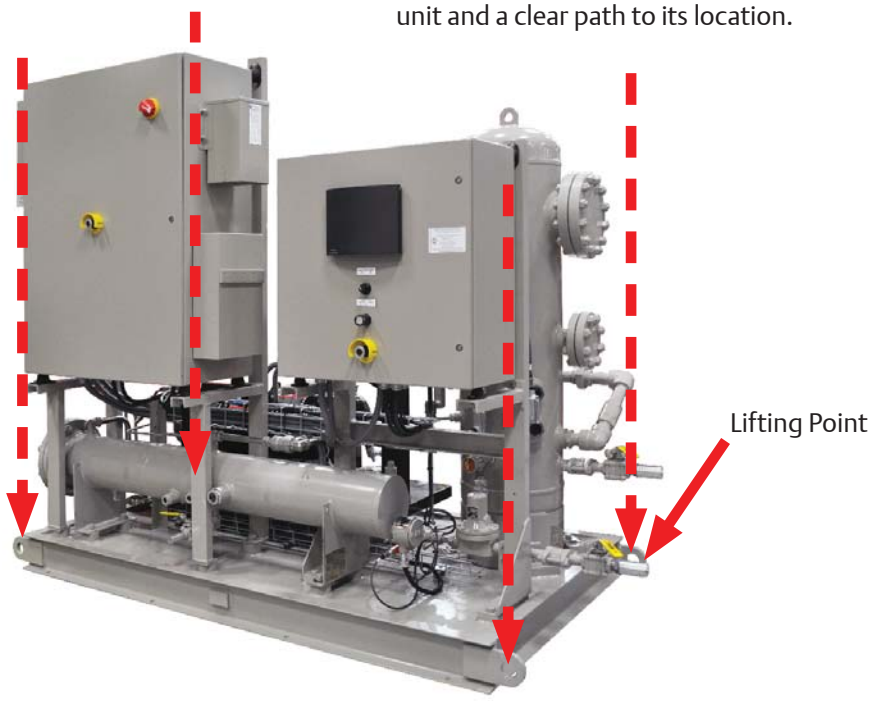



**Figure 3-1. Rigging and Lifting Points**

## Long Term Storage Recommendations

The procedure described is a general recommendation for long term storage (over one month of no operation) of SVM units. It is the responsibility of the installation firm and end user to address any unusual conditions.

The following are recommendations regarding long term storage:

- If the unit is designed for indoor duty, it must be stored in a heated building.
- If the unit is designed for outdoor duty and is to be stored outdoors, a canvas tarp is recommended for protection until installation. Adequate drainage should be provided. Place wood blocks under the base skid so that water does not collect inside the base perimeter or low spots in the tarp.
- All compressor stop valves are to be closed to isolate the compressor from the remainder of the system. All other valves, except those venting to atmosphere, are to be open. The unit is shipped with dry nitrogen holding charge of approximately 5 psi above atmospheric pressure. It is essential that the nitrogen holding charge be maintained.
- Cover all bare metal surfaces (coupling, flange faces, etc.) with rust inhibitor.
- Desiccant is to be placed in the control panel. If the panel is equipped with a space heater, it is to be energized. Use an approved electrical spray-on corrosion inhibitor for panel components (relays, switches, etc.)
- All pneumatic controllers and valves (Fisher, Taylor, etc.) are to be covered with plastic bags and sealed with desiccant bags inside.
- The nitrogen charge in the system and compressor are to be monitored on a regular basis for leakage. If not already installed, it is required that a gauge is to be added to help monitor the nitrogen holding charge pressure. If a drop in pressure occurs, the source of leakage must be found and corrected. The system must be evacuated and recharged with dry nitrogen to maintain the package integrity.
- Maintenance log to be kept with documenting dates to show all the procedures have been completed.

## SVM Unit Inspections Prior to Storage or Installation

The SVM unit must be inspected prior to installation since components could have come loose and/or damaged during shipment or moving.

- Check for loose bolts, particularly mounting nuts and bolts.
- Check for bent or damaged components. The compressor module should have also been inspected prior to off-loading, see Delivery Inspection.
- Check that the nitrogen pressure is still holding pressure. The pressure gauge is located on the oil stabilizer. Any leaks must be fixed and the system purged and re-charged with dry nitrogen.

# Installation

### GENERAL GUIDELINES

Follow these general guidelines for installation:

- The SVM unit must be installed and operated in compliance with all applicable codes and regulations.
- The system must be installed on a level surface.
- Install pipe unions or flanges to connect the system to the inlet and discharge piping for ease of service.
- Install isolation valves on the inlet and discharge piping.
- The SVM unit must be grounded in compliance with the National Electric Code (NEC) and any other applicable codes.

### INLET AND DISCHARGE PRESSURES

For acceptable inlet and discharge pressure levels, see Table 3-1.

### AMBIENT TEMPERATURE RANGE

The SVM unit operating ambient temperature is 20°F to 122°F (-29°C to 50°C).

### INSTALLATION CLEARANCES AND DIMENSIONS

Allow sufficient clearance on all sides for service access, especially for gas and electrical connections at the front of the compressor module. Check applicable national and local electrical codes.

Cooling air flow is front to back—from the gas connection end to the oil cooler end. Do not block or restrict the cooler fans or oil cooler.

For SVM unit dimensions, see Figure 3-2.

**Table 3-1. Inlet and Discharge Pressure Limits**

| Type | Level | Operating Guidelines |
|---|---|---|
| **Minimum Inlet** | -6”H2O | PLC will shutdown compressors when pressure drop below the limit. |
| **Maximum Inlet** | 25 PSIG | Operation at pressure above 25 PSIG will result in:<br>• Excessive oil carryover<br>• Loss of oil from SVM unit |
| **Discharge Pressure Range** | 60 to 190 PSIG (See Table 1-1) | When the discharge pressure of the SVM unit reaches maximum which ranges from 60 to 190 PSIG (depending on the model and application limitations, see Table 1-1):<br>• The safety pressure relief valve will open<br>• The PLC will shutdown the compressors<br>A minimum pressure differential of 60 PSIG between inlet and discharge pressure is required for proper oil circulation. |

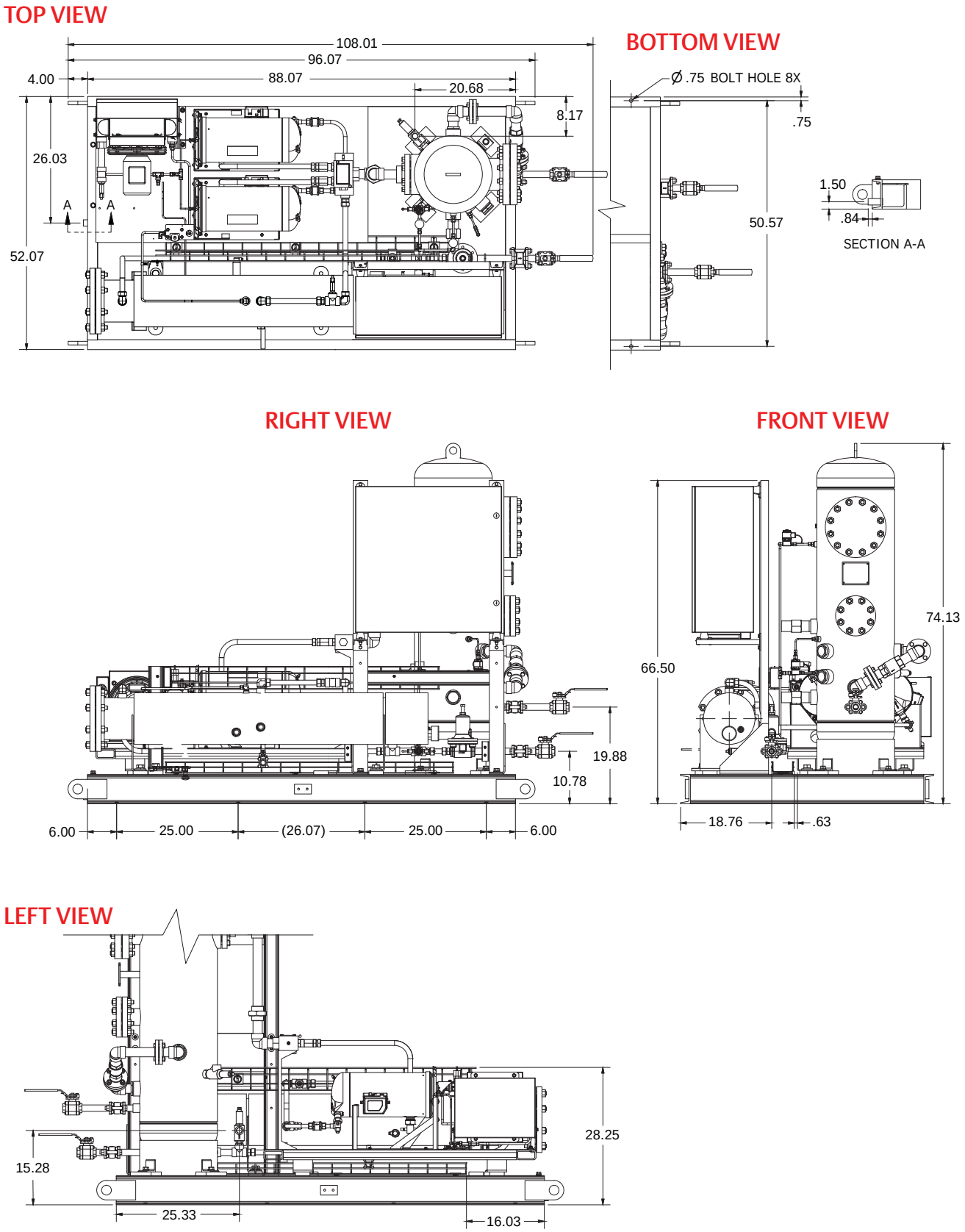



Figure 3-2. SVM unit Dimensions, in. (SVM unit Dual) (1 of 3)

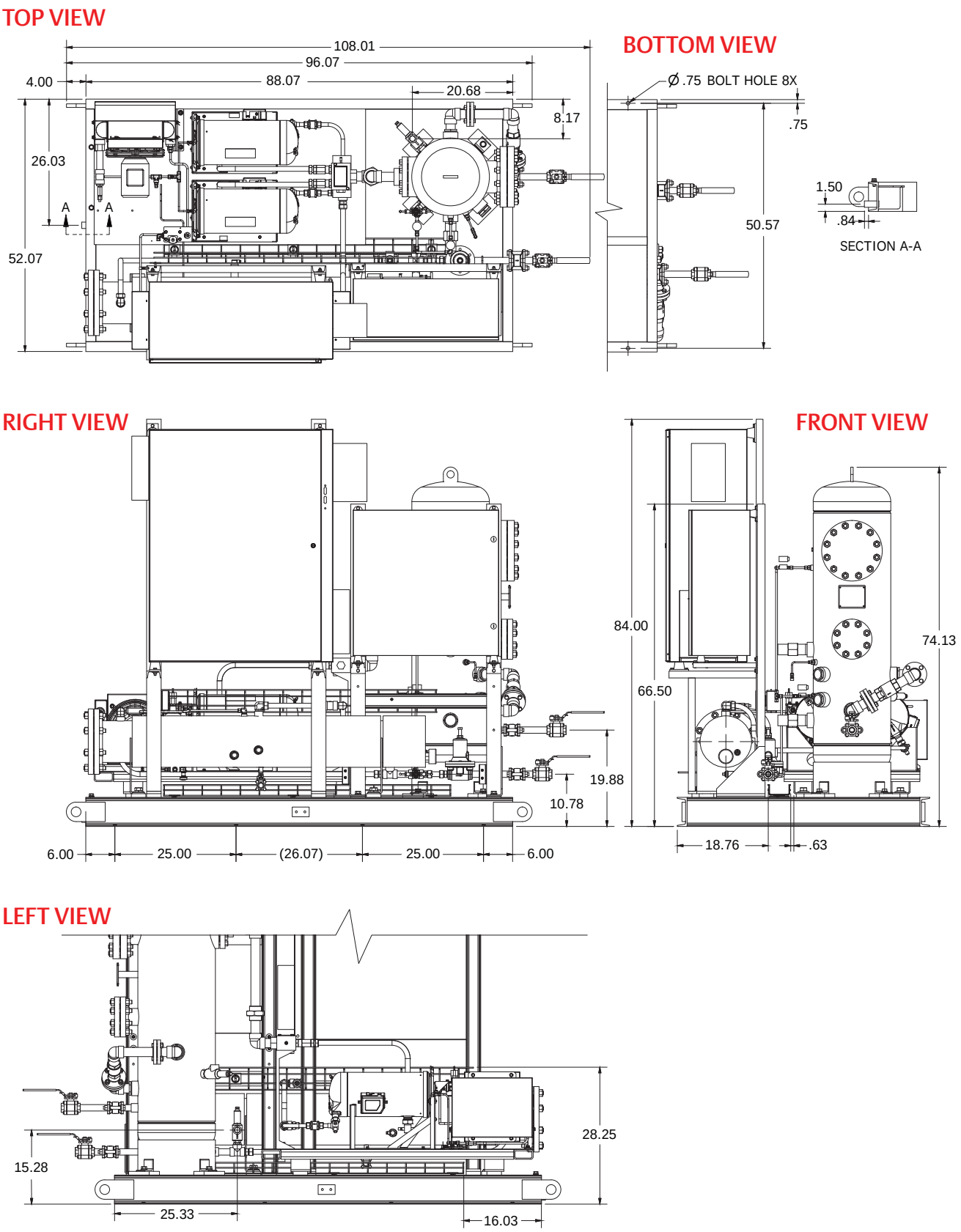
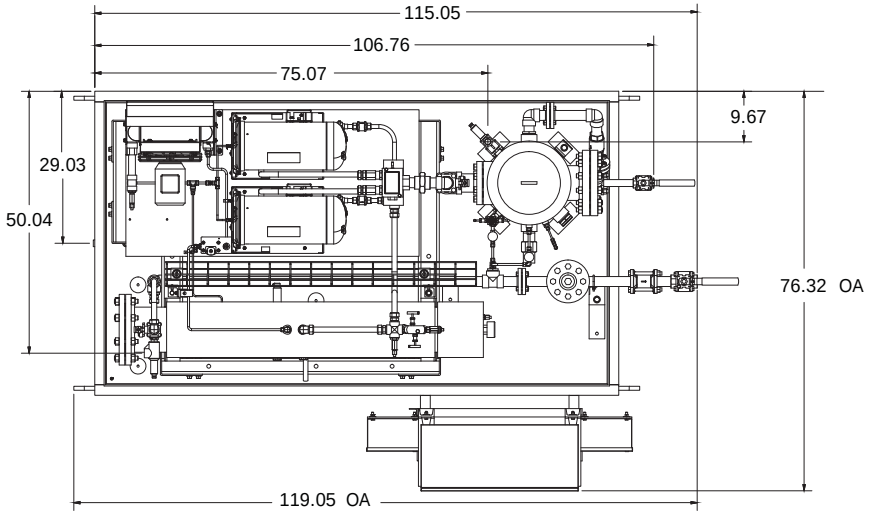
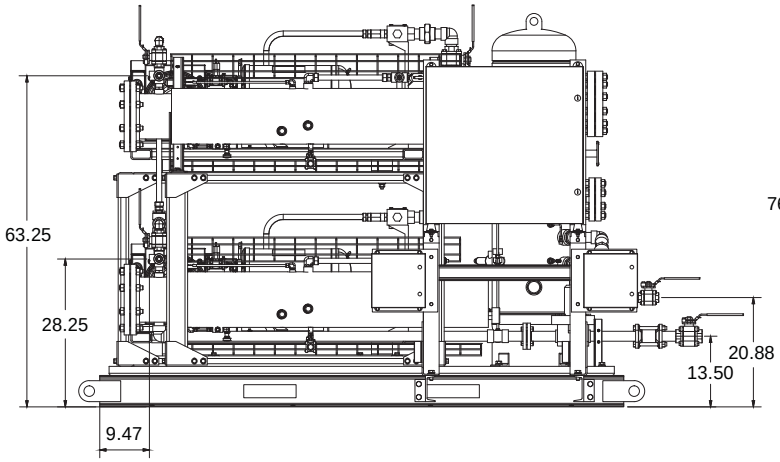



Figure 3-2. SVM unit Dimensions, in. (SVM unit Dual with VFD Panel) (2 of 3)

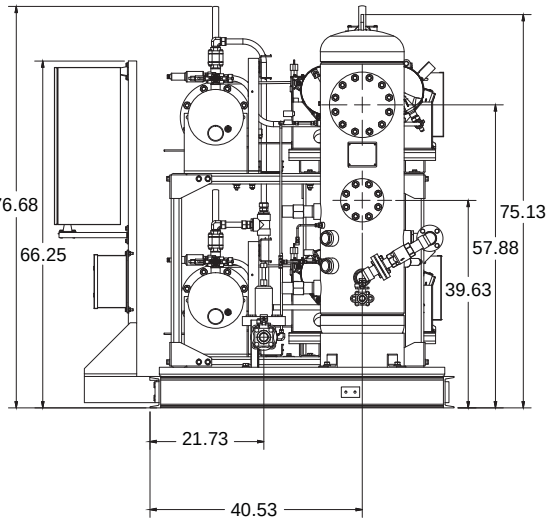
## TOP VIEW




## RIGHT VIEW




## FRONT VIEW




## LEFT VIEW

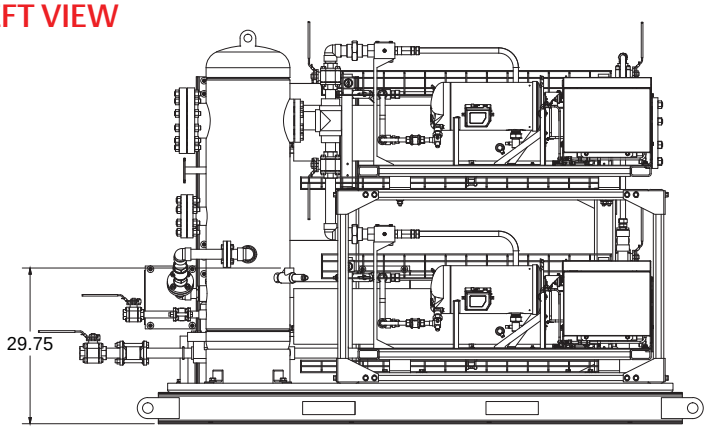



Figure 3-2. SVM unit Dimensions, in. (SVM unit Quad) (3 of 3)

## Electrical Controls

### PLC CONTROLLED RUN PERMISSIONS

The PLC will not start the Compressors unless the following conditions are met:

- Inlet Pressure: -6" H20 < P1 < 25 PSIG
- Oil Stabilizer Temperature: Temperature must be greater than 220˚F

### PLC CONTROLLED SHUTDOWNS

- High Temperature: Discharge oil temperature must be below 280˚F
- High Discharge Pressure: Discharge pressure set point depends on model number
- Pressure Differential: Differential pressure must be greater than 60 PSIG

### ELECTRICAL CONSIDERATIONS - VARIABLE SPEED COMPRESSORS

- The Compressor power for a variable speed Compressor is the Variable Frequency Drive (VFD).
- Compressor speed control is a 4-20 mA signal from a pressure transducer applied to the PLC.

## Oil Cooler Control

OIL COOLER FAN CONTROL

The discharge temperature of the SVM unit is controlled by managing oil flow and temperature. Precise temperature control is critical to system performance and equipment life. Maintaining proper temperature control reduces the possibility of gas condensing into liquids during operations.

- Cooling fan motor requires 230/460VDC, 2/1A. Fan speed is controlled by a 4-20mA control signal.
- The 4-20mA signal is controlled through the PLC using a PID control loop. The temperature signal is based on a RTD installed at the inlet port of the oil cooler.

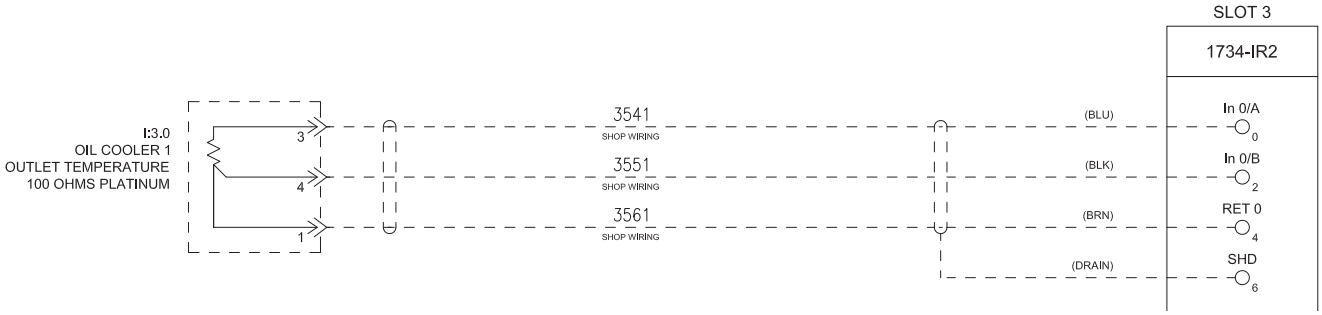
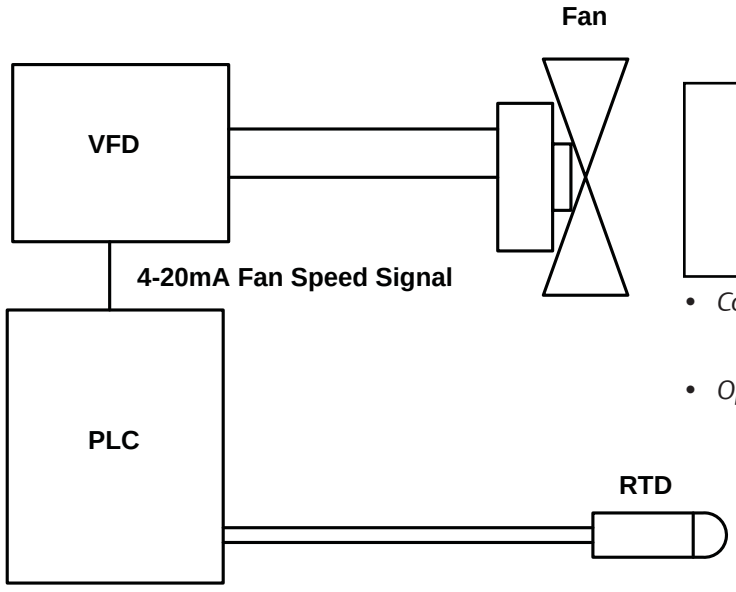



Figure 3-3. Oil Cooler Fan Wiring




**Compressor Module**

- *Compressor requirements:*
  - *2 to 3 GPM (7.6 to 11.4 LPM) flow rate*
- *Operating temperature range, standard:*
  - *170° to 200°F (77°- 93°C)*

Figure 3-4. Basic Fan Control System

## Electrical Field Wiring Requirements

There are a couple different field wiring requirements depending on the model variation. Typically, field wiring power is required for all units. Units with remotely mounted VFDs will also require additional field wiring to the PLC. The below table is a simple breakdown of the models and their field wiring requirements.

### CAUTION

Check that all connections are secure prior to energizing.

Before drilling into panel, protect all devices inside panel from metal filings and wire clippings.

Before energizing, clean out all metal filings and wire clippings.

### Table 3-2. SVM unit Models and Field Wiring Requirements

| SVM unit Model | Field Wiring Requirements | | | |
|---|---|---|---|---|
| | Power | Remotely mounted VFD (wiring to PLC) | Locally mounted VFD (wiring to PLC) | Number of VFDs |
| 44/56 | Required | Required | Not Required (Already pre-wired from factory) | 1 |
| 88/112 | Required | Required | N/A (VFDs are always mounted remotely) | 2 |

The following figures illustrate the field wiring differences for Dual and Quad SVM units.

### NOTE

Units with a locally mounted VFD panel will have no junction box. The only field wiring requirement will be the customer supplied power to the VFD panel.

Also, all SVM units are only suitable for a non-hazardous area and conforming to UL-508A.

For specific electrical wiring information, refer to supplied electrical drawings.

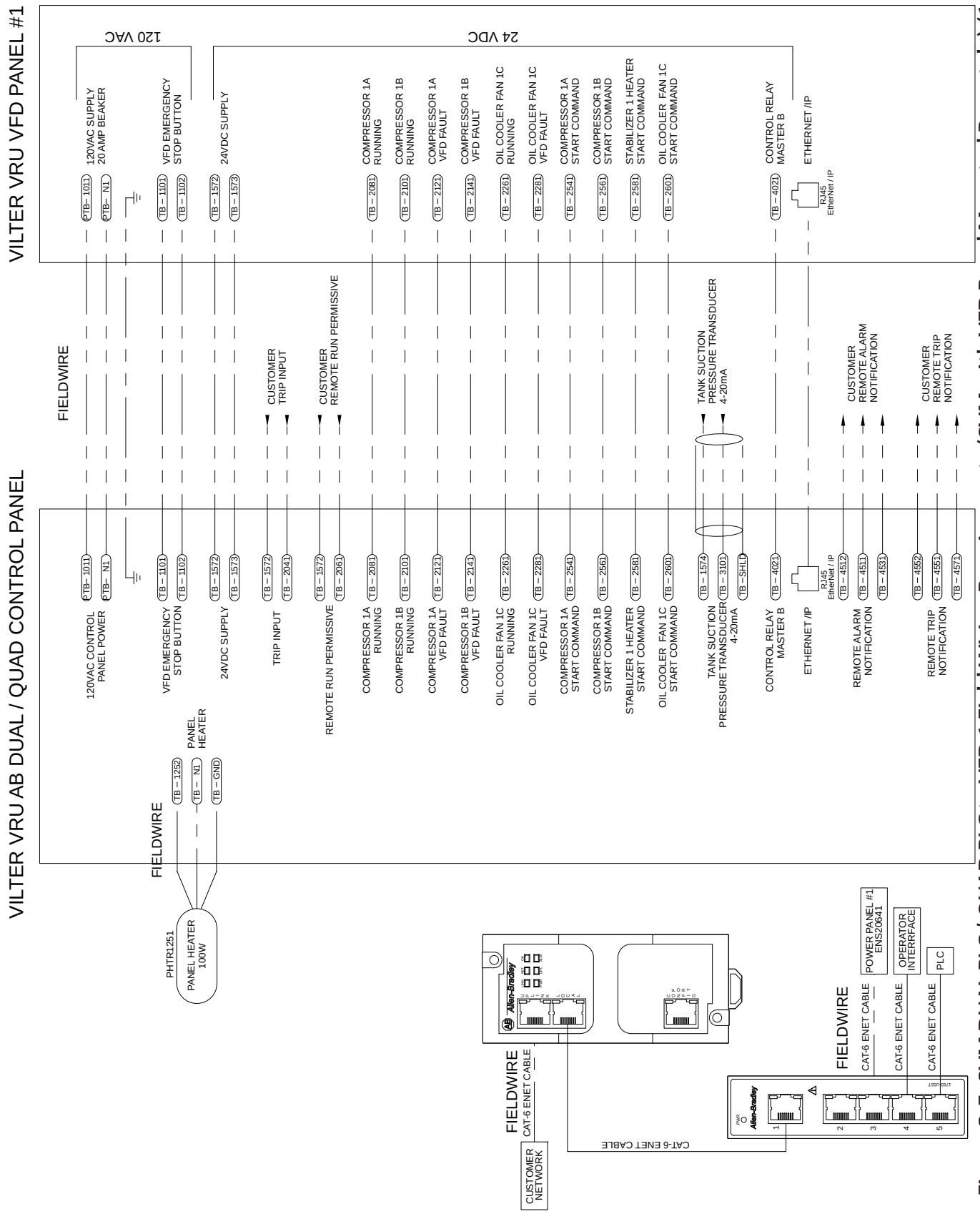



Figure 3-5. SVM DUAL PLC / QUAD PLC to VFD 1 Field Wiring Requirements (SVM with VFD Panel Mounted Remotely) (1 of 2)

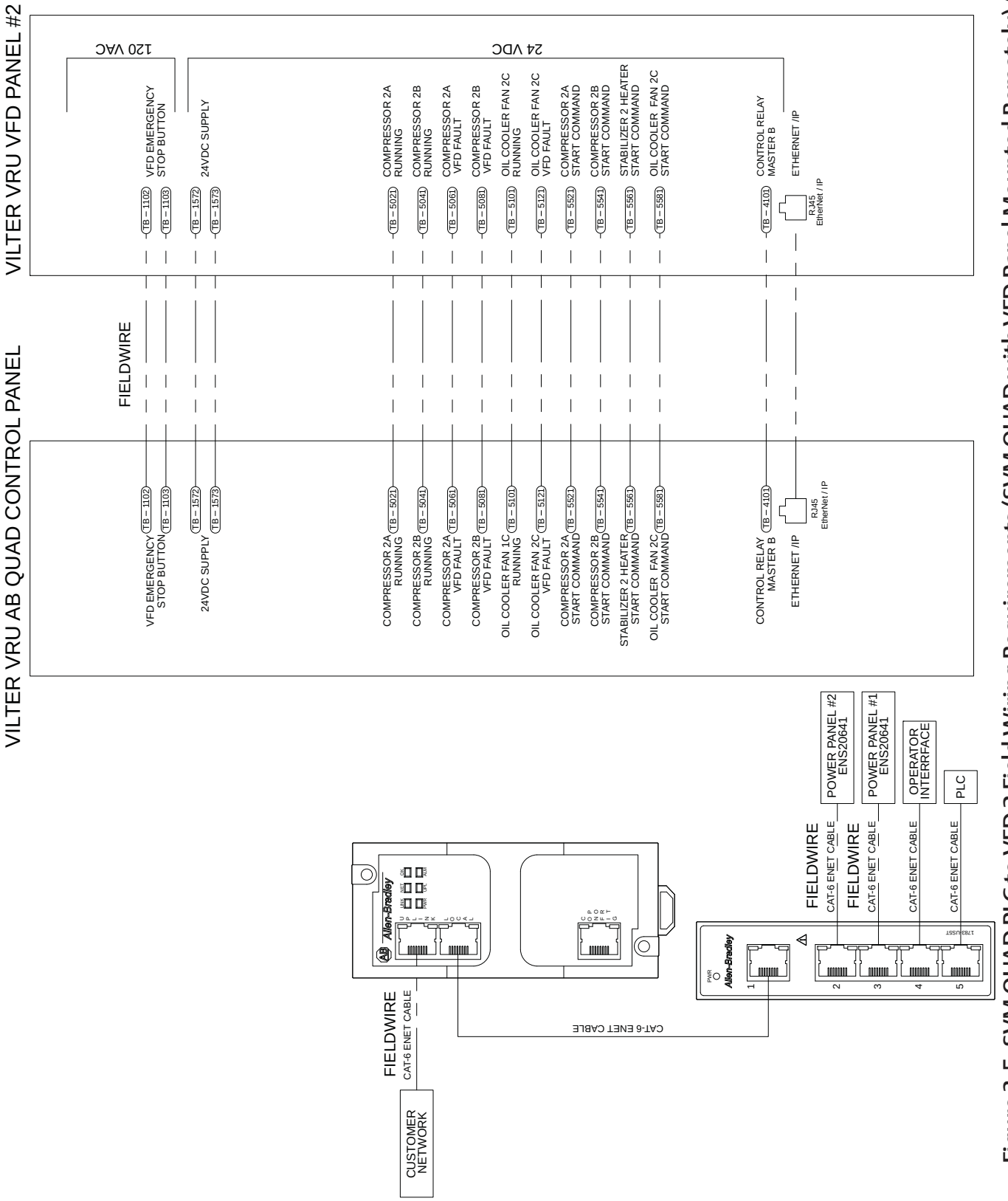



Figure 3-5. SVM QUAD PLC to VFD 2 Field Wiring Requirements (SVM QUAD with VFD Panel Mounted Remotely) (2 of 2)

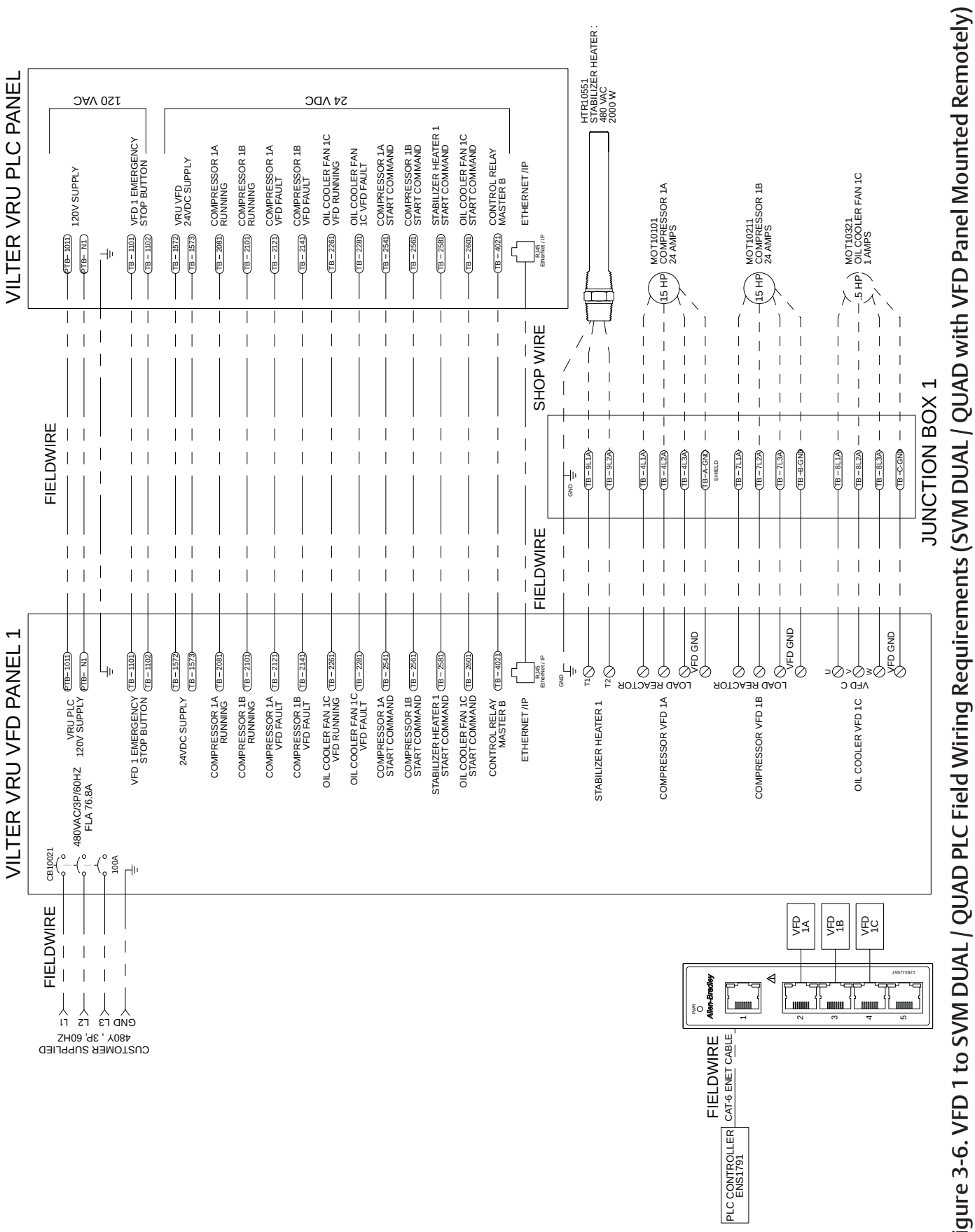



Figure 3-6. VFD 1 to SVM DUAL / QUAD PLC Field Wiring Requirements (SVM DUAL / QUAD with VFD Panel Mounted Remotely)

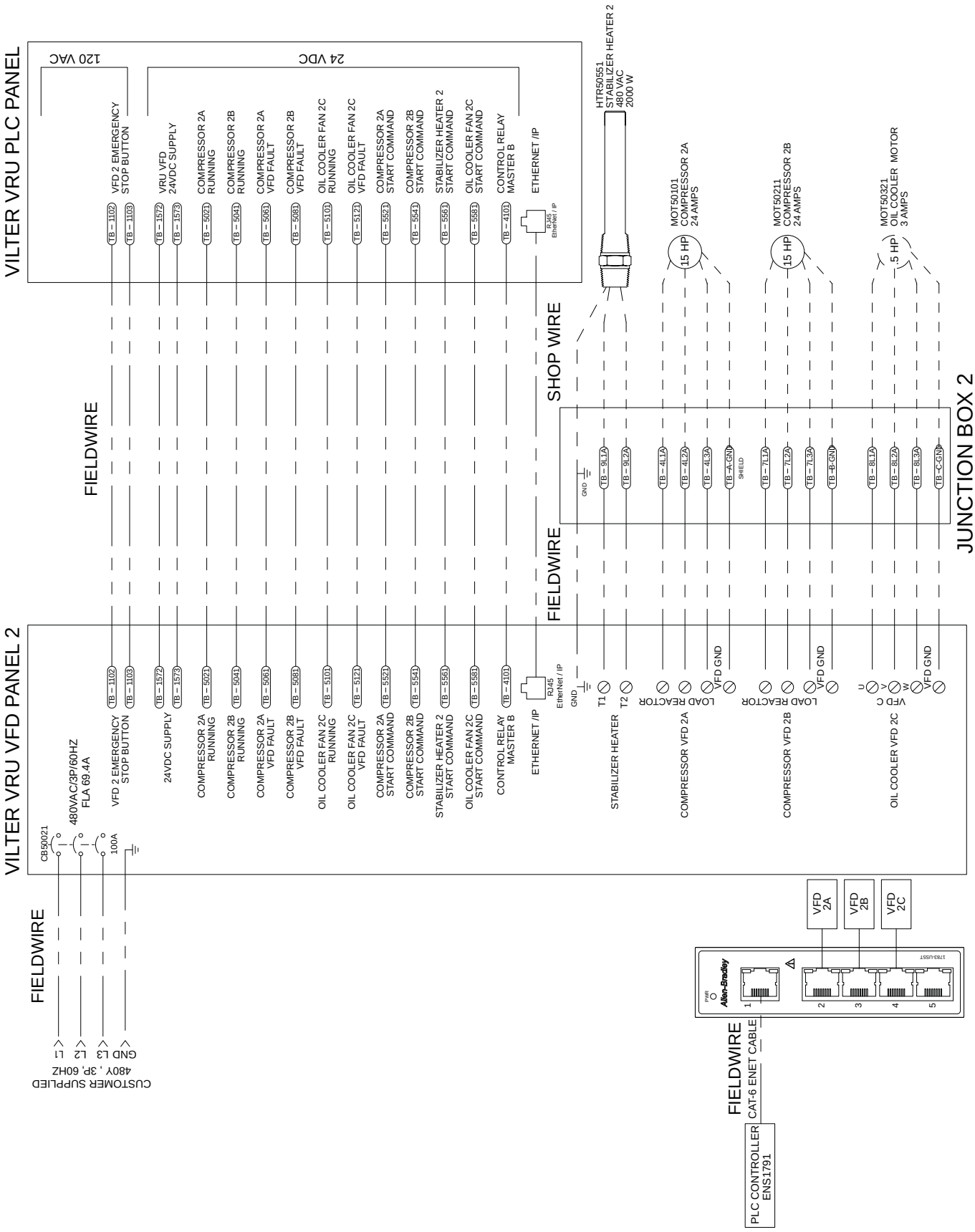



Figure 3-7. VFD 2 to SVM QUAD PLC Field Wiring Requirements (SVM QUAD with VFD Panel Mounted Remotely)

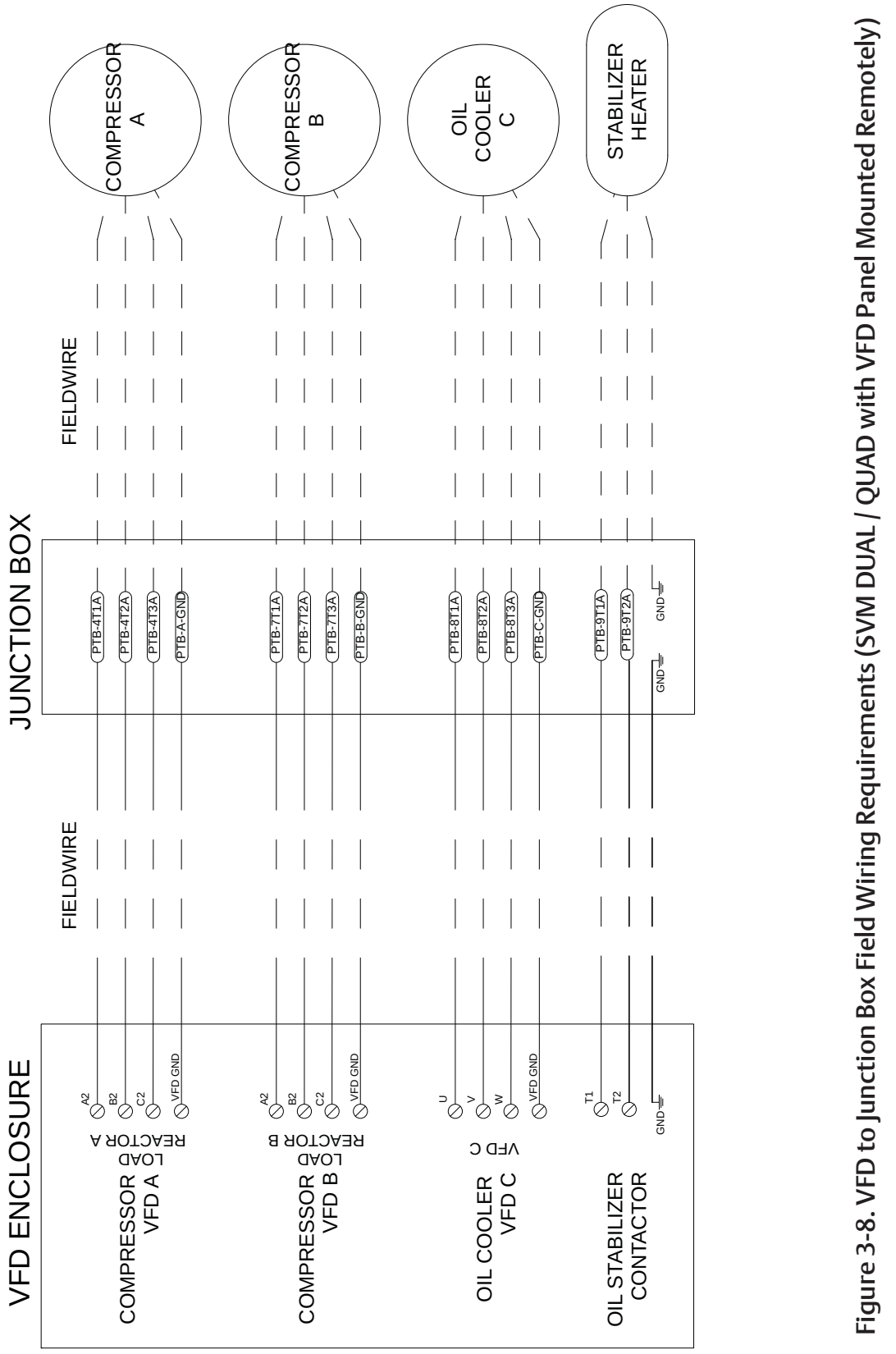



Figure 3-8. VFD to Junction Box Field Wiring Requirements (SVM DUAL / QUAD with VFD Panel Mounted Remotely)

## Oil Charge and Drain (Initial Charge/During Shutdown/ Complete Drain and Charge)

This oil charging procedure can be used for the initial oil charge, during shutdown periods or a complete drain and charge. After the oil charge and with the system running, additional oil can be charged through the control valves on either compressor suction fitting, see procedure for Oil Charging During Operation in Section 5.

**NOTE**

**This procedure applies to both the dual and quad units, but only the dual unit is shown.**

PARTS

- Oil, Vilter Methane PAO 100 (Qty. 7 gallons) (VPN 3143A (5 gal. Pail))

TOOLS AND EQUIPMENT

- Maintenance Tool Kit (VPN 998-0063-00)
- Adapter Fitting, 3/4" NPT Male to 1/4" NPT Control Valve
- Clean Container, 5 gallon (including Lid with Spout hole)
- Manual Rotary Hand Pump, 5 gallon

**WARNING**

**Avoid skin contact with oil. Wear rubber gloves and a face shield when working with oil. Failure to comply may result in serious injury or death.**

**NOTE**

**Dispose of the oil in a appropriate manner following all Local, State and Federal ordinances regarding the disposal of used oil.**

CHARGE PROCEDURE 1 OF 2

CHARGE COMPRESSOR(S)

1. Connect extension hose to oil pump.
2. Connect extension hose to valve on charging hose. Ensure valve is in the closed position.
3. Pour 5 gallons of oil into clean container and insert oil pump.
4. Turn knob on back-seating control valve fully counterclockwise to the closed position.
5. Remove protective cap from control valve on

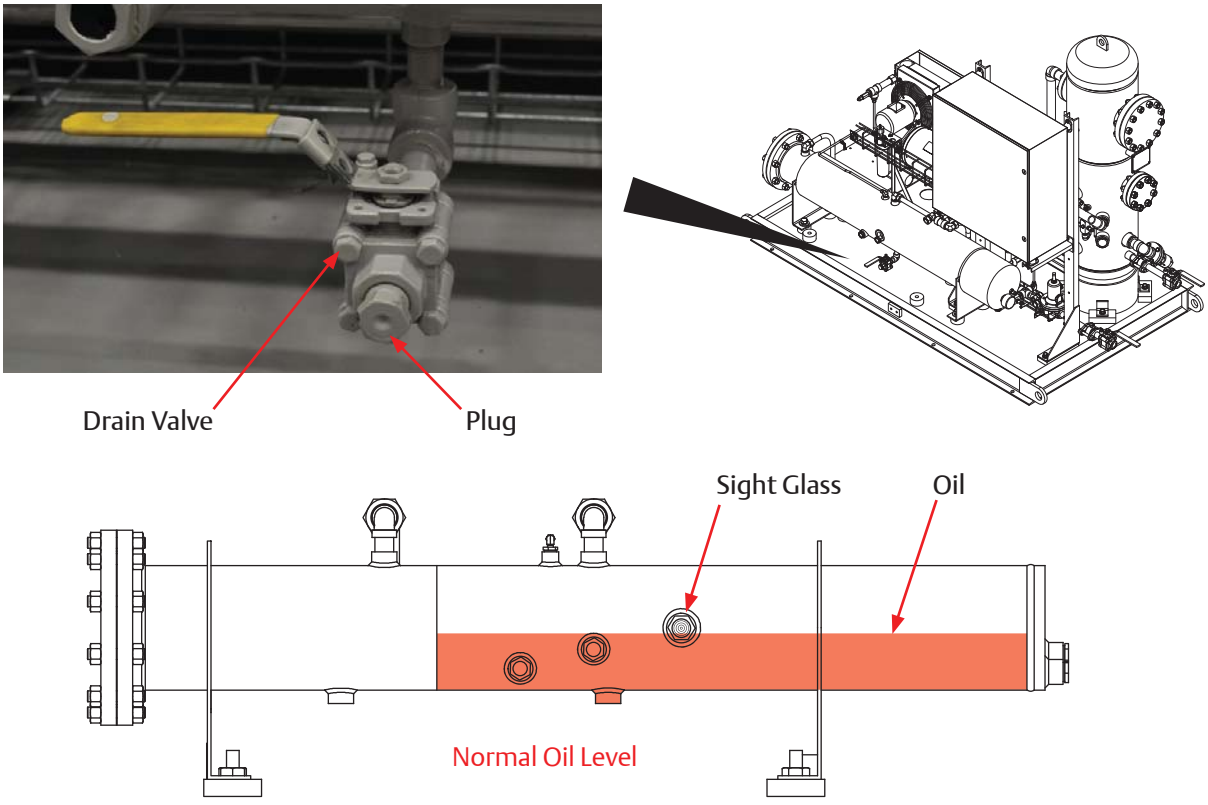



Figure 3-9. Oil Stabilizer Drain Valve, Plug and Normal Oil Level

compressor suction fitting.
6. Connect back-seating control valve to control valve.
7. Connect charging hose to back-seating control valve.
8. Turn knob on back-seating control valve clockwise to open control valve and then, slowly turn valve on charging hose to open position.
9. Pump 1 gallon of oil into compressor.
10. Turn knob on back-seating control valve counter-clockwise to close control valve.
11. Remove charging hose from back-seating control valve.
12. Remove back-seating control valve from control valve.
13. Install protective cap on control valve.
14. If equipped with second compressor, repeat steps 4 to 13.

### CHARGE PROCEDURE 2 OF 2

### CHARGE OIL STABILIZER

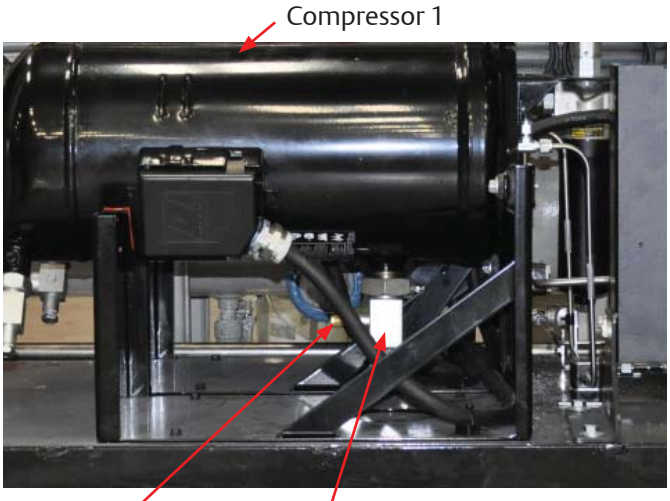
15. Remove plug from drain valve on oil stabilizer.
16. Install adapter fitting on drain valve.
17. Turn knob on back-seating control valve fully counterclockwise to closed position.
18. Remove protective cap from control valve on adapter fitting, if equipped.
19. Connect back-seating control valve to control valve.
20. Connect charging hose to back-seating control valve.
21. Turn knob on back-seating control valve clockwise to open control valve.
22. Turn valve on charging hose to open position.
23. Turn drain valve to open position.

**NOTE**

**The normal oil level is 1/4 in. below the bull's-eye of the upper-most sight glass.**

24. Pump 5 gallons of oil into oil stabilizer until normal oil level is reached. Add additional oil into container as required.
25. Turn drain valve to closed position.
26. Turn valve on charging hose to closed position.
27. Turn knob on back-seating control valve counter-clockwise to close control valve.
28. Disconnect charging hose from adapter fitting.
29. Remove adapter fitting from drain valve.
30. Install protective cap on adapter, if equipped.
31. Install plug on drain valve.
32. When ready, run SVM unit (see Start-Up Checklist).
33. Check for leaks at all fittings that have been disturbed.
34. Check oil level during operation and if needed, add additional oil. See Adding/Draining Oil procedure in Section 5.

LEFT SIDE VIEW




RIGHT SIDE VIEW

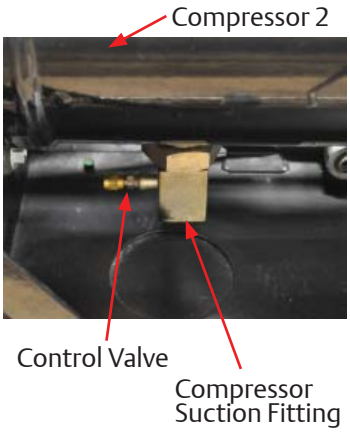



Figure 3-10. Initial Oil Charge/Drain - Control Valve Locations

DRAIN PROCEDURE 1 OF 3

DRAIN COMPRESSORS

**WARNING**

**Avoid skin contact with oil. Wear rubber gloves and a face shield when working with oil. Failure to comply may result in serious injury or death.**

**NOTE**

**Dispose of the oil in a appropriate manner following all Local, State and Federal ordinances regarding the disposal of used oil.**

**NOTE**

Under normal operation, the compressors and oil circuit remain under pressure when the SVM unit is turned off. This pressure can be used to drain most of the oil. It is also possible to use the gas supply pressure to force oil out of the SVM unit. In some cases it may necessary to pressurize the module with an inert gas to remove the oil.

1. Turn knob on back-seating control valve fully counterclockwise to closed position.
2. Remove protective cap from control valve on compressor suction fitting.
3. Connect back-seating control valve to control valve.
4. Connect charging hose to back-seating control valve. Ensure that valve on charging hose is in closed position.
5. Turn knob on back-seating control valve clockwise to open control valve.
6. Slowly turn valve on charging hose to open position and allow oil to fully drain into container.
7. Turn valve on charging hose to closed position.
8. Turn knob on back-seating control valve counterclockwise to close control valve.
9. Disconnect charging hose from back-seating control valve.
10. Disconnect back-seating control valve from control valve.
11. Install protective cap on control valve.
12. Repeat procedure for second compressor.

DRAIN PROCEDURE 2 OF 3

DRAIN OIL COOLER

13. Ensure system is vented to atmosphere prior to draining.
14. Place drain pan under drain valve.
15. Remove relief plug from oil cooler.
16. Remove drain plug from oil cooler and allow oil to completely drain.
17. Install relief plug and drain plug on oil cooler.

DRAIN PROCEDURE 3 OF 3

DRAIN OIL STABILIZER

18. Ensure system is vented to atmosphere prior to draining.
19. Place drain pan under drain valve.
20. Remove plug from drain valve on oil stabilizer and allow oil to completely drain.
21. Install plug on drain valve.

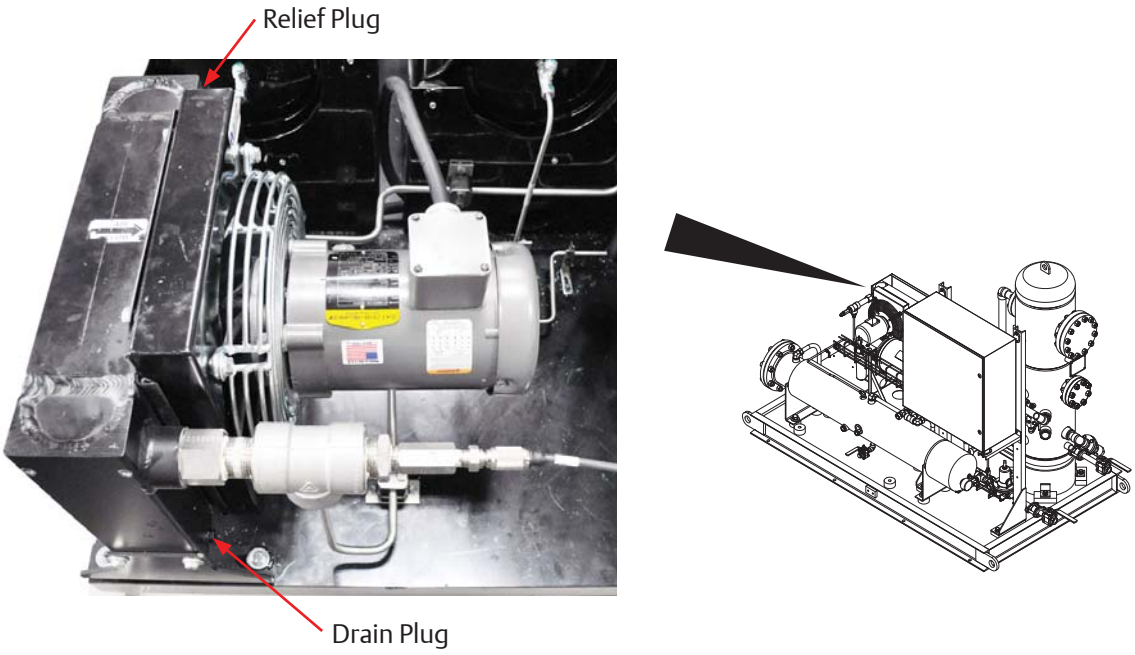



Figure 3-11. Oil Cooler Drain Plug and Relief Plug Locations

## Start-Up Checklist

The following check list is to help verify and check equipment during initial start-up.

- ☐ 1. SVM unit builds pressure on initial start-up; no unusual mechanical noise.
- ☐ 2. Oil level is correct.
- ☐ 3. No gas leaks are present.
- ☐ 4. No oil leaks are present.
- ☐ 5. Oil cooler fans turn on and run at the appropriate temperature.
- ☐ 6. Oil cooler fan speed varies with temperature.
- ☐ 7. Compressor Module is leak tight (maintains approximately 30 PSIG or more when the Compressors are initially turned off).

## Normal Operation Checklist

The following check list is to help verify and check equipment during normal operation.

- ☐ 1. Compressor speed should range from 2400 to 4800 RPM
- ☐ 2. Suction pressure should range from -6" H2O to 25 PSIG
- ☐ 3. Discharge pressure should range from 60 PSIG (min.) to 190 PSIG (max.) depending on the model and application limitations.
- ☐ 4. Pressure differential between suction and discharge is at least 60 PSIG.
- ☐ 5. Oil cooler fan should either run continuously or cycle periodically.
- ☐ 6. Oil stabilizer temperature should remain higher than 250˚F.
- ☐ 7. Discharge gas temperature should remain under 280˚F.

## Check Oil Level

**WARNING**

When working with LFG, NG or other dangerous or flammable gases, ensure there are adequate ventilation and vapor detectors. Refer to national fire and building codes. Failure to comply may result in serious injury or death.

**WARNING**

Avoid skin contact with any condensate or oil. Wear rubber gloves and a face shield when working with condensate or oil. Failure to comply may result in serious injury or death.

Inspect oil level through the sight glass on the oil stabilizer, see Figure 4-1. Oil Operating Levels. Drain or fill oil as required. For oil draining and filling procedures, refer to Section 5.

**NOTE**

The normal oil level is 1/4 in. below the bull's-eye of the upper-most sight glass.

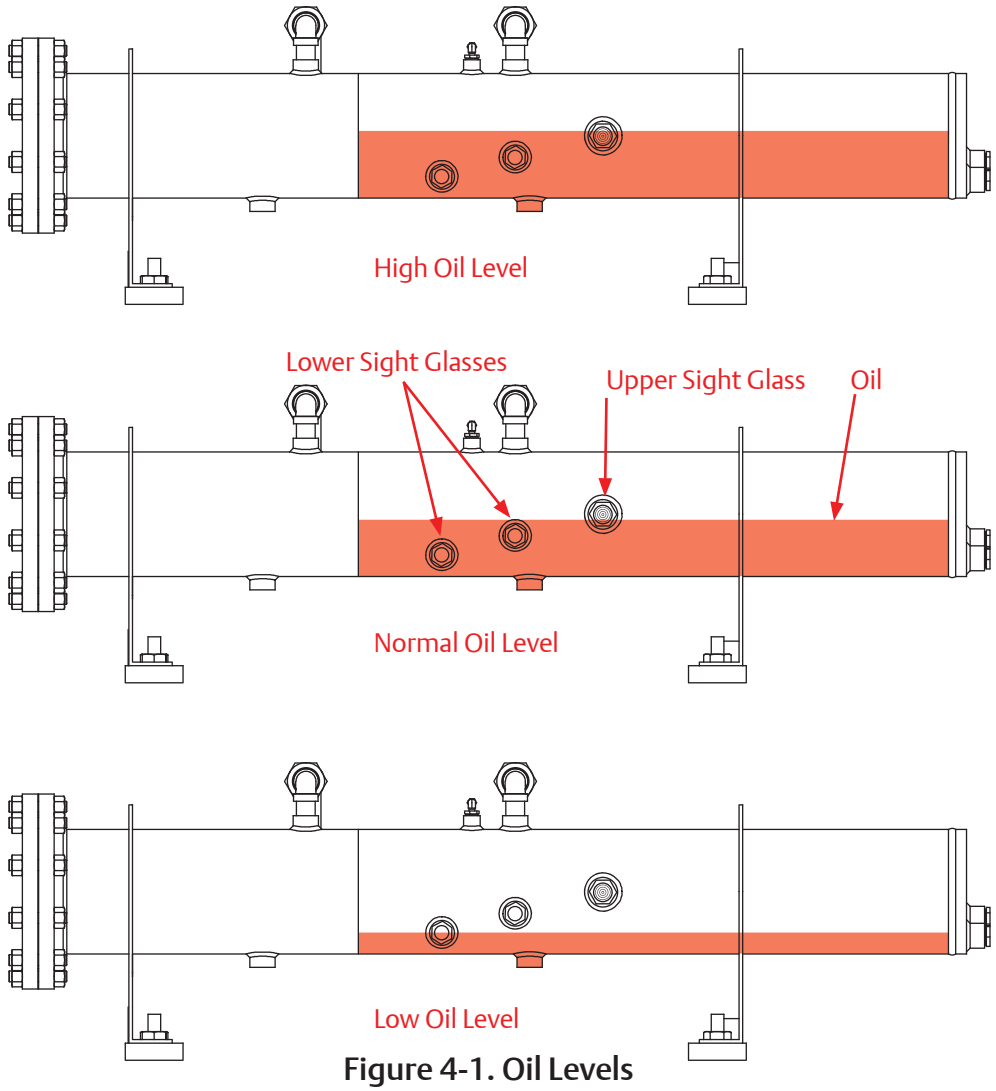



Figure 4-1. Oil Levels

## Purging with Dry Nitrogen (SVM DUAL)

Purging the SVM unit with dry nitrogen is recommended if the SVM unit will be inactive for over a month. For additional long term storage information, refer to Long Term Storage Recommendations in Section 3.

### PARTS

- Nitrogen (Approx. 180 Cu. Ft. at 5 PSIG)

### TOOLS AND EQUIPMENT

- Adapter Fitting, 3/4" NPT Male to 1/4" NPT Control Valve
- Nitrogen Tank with regulator, hoses and fittings

### PURGING

**CAUTION**

Do not purge compressor unit with oxygen. Failure to comply may result in damage to equipment.

**NOTE**

Use appropriate Nitrogen equipment capable of charging the SVM system to 5 PSIG.

1. Stop SVM unit. Allow unit to equalize to suction pressure.
2. Isolate SVM unit by turning off suction, discharge and condensate valves.
3. Vent system to atmosphere.
4. Drain oil, see Oil Charge and Drain procedure in Section 3.
5. Remove plug from drain valve.
6. Connect nitrogen hose to drain valve on oil stabilizer.
7. Turn drain valve to open position.
8. Slowly open nitrogen cylinder to fill SVM unit with nitrogen until 5 PSIG is reached, refer to PLC screen for system pressure.
9. Close nitrogen cylinder.
10. Turn drain valve to closed position.
11. Wait 10 minutes to make sure there are no leaks and that the pressure is holding. If the unit does not hold pressure, check all isolation valves for correct operation.
12. Disconnect nitrogen hose from drain valve.
13. Install drain plug on drain valve.
14. Shutdown SVM unit and isolate it from all power sources.

**CAUTION**

With a purged system, when getting the compressor unit ready for start-up, it is important to slowly open the drain valve to prevent a sudden rush of gas and oil. Failure to comply may result in damage to equipment.

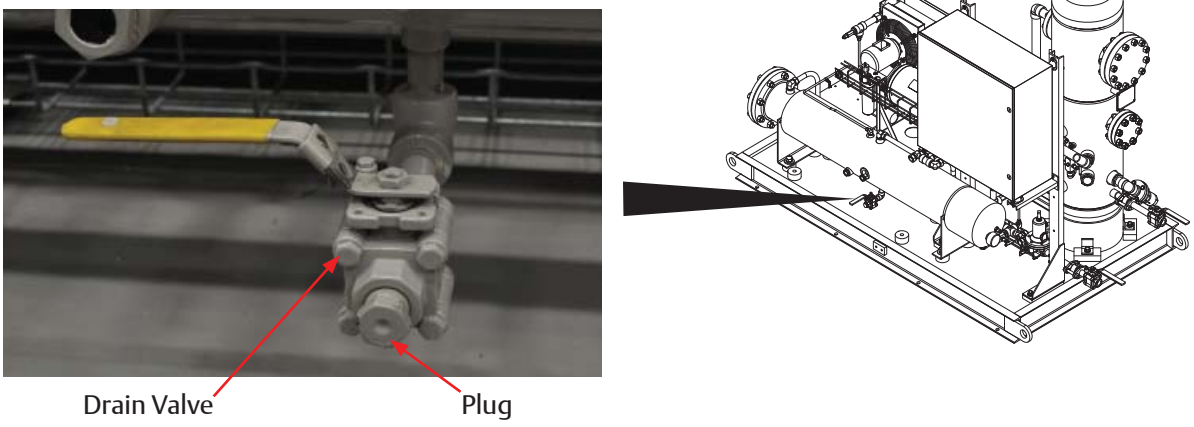



Figure 4-2. Purging with Dry Nitrogen for SVM Dual- Oil Stabilizer Drain Valve

## Purging with Dry Nitrogen (SVM QUAD)

Purging the SVM unit with dry nitrogen is recommended if the SVM unit will be inactive for over a month. For additional long term storage information, refer to Long Term Storage Recommendations in Section 3.

### PARTS

- Nitrogen (Approx. 360 Cu. Ft. at 5 PSIG)

### TOOLS AND EQUIPMENT

- Adapter Fitting, 3/4" NPT Male to 1/4" NPT Control Valve
- Nitrogen Tank with regulator, hoses and fittings

### PURGING

**CAUTION**

Do not purge compressor unit with oxygen. Failure to comply may result in damage to equipment.

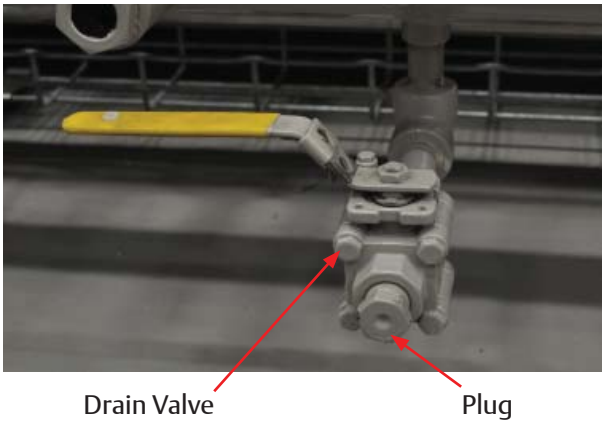
**NOTE**

Use appropriate Nitrogen equipment capable of charging the SVM unit system to 5 PSIG.

1. Stop SVM unit. Allow unit to equalize to suction pressure.
2. Isolate SVM unit by turning off suction, discharge and condensate valves.
3. Vent system to atmosphere.
4. Drain oil from both compressor modules, see Oil Charge and Drain procedure in Section 3.
5. Remove plug from drain valve on bottom oil stabilizer.
6. Connect nitrogen hose to drain valve.
7. Turn drain valve to open position.
8. Slowly open nitrogen cylinder to fill SVM unit with nitrogen until 5 PSIG is reached, refer to PLC screen for system pressure.
9. Close nitrogen cylinder.
10. Turn drain valve to closed position.
11. Wait 10 minutes to make sure there are no leaks and that the pressure is holding. If the unit does not hold pressure, check all isolation valves for correct operation.
12. Disconnect nitrogen hose from drain valve.
13. Install drain plug on drain valve.
14. Shutdown SVM unit and isolate it from all power sources.

**CAUTION**

With a purged system, when getting the compressor unit ready for start-up, it is important to slowly open the drain valve to prevent a sudden rush of gas and oil. Failure to comply may result in damage to equipment.



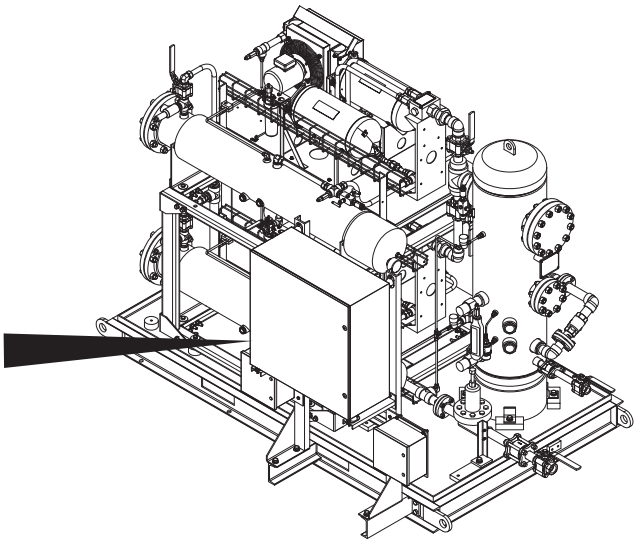



Figure 4-3. Purging with Dry Nitrogen for SVM Quad - Oil Stabilizer Drain Valve

## Oil Scavenge Line Setup

Over time, oil will accumulate on the coalescing side of the oil stabilizer. As a result, an oil return line with a needle valve is installed from the coalescing side of the oil stabilizer to the outlet line of the oil cooler.

**NOTE**

**This procedure applies to both the dual and quad units, but only the dual unit is shown.**

To adjust the return flow, proceed with the follow procedure:

**NOTE**

Do not fully open the needle valve. Leaving the needle valve fully open will reduce efficiency of the unit.

1. While the unit is in operation, crack open needle valve and observe oil level drop in sight glass, see Figure 4-4.
2. Slowly open needle valve until level of oil starts to slowly drop.

**NOTE**

The sight glass should never be full with oil.

3. Periodically check oil level in the sight glass and adjust needle valve as needed so that oil does not accumulate.

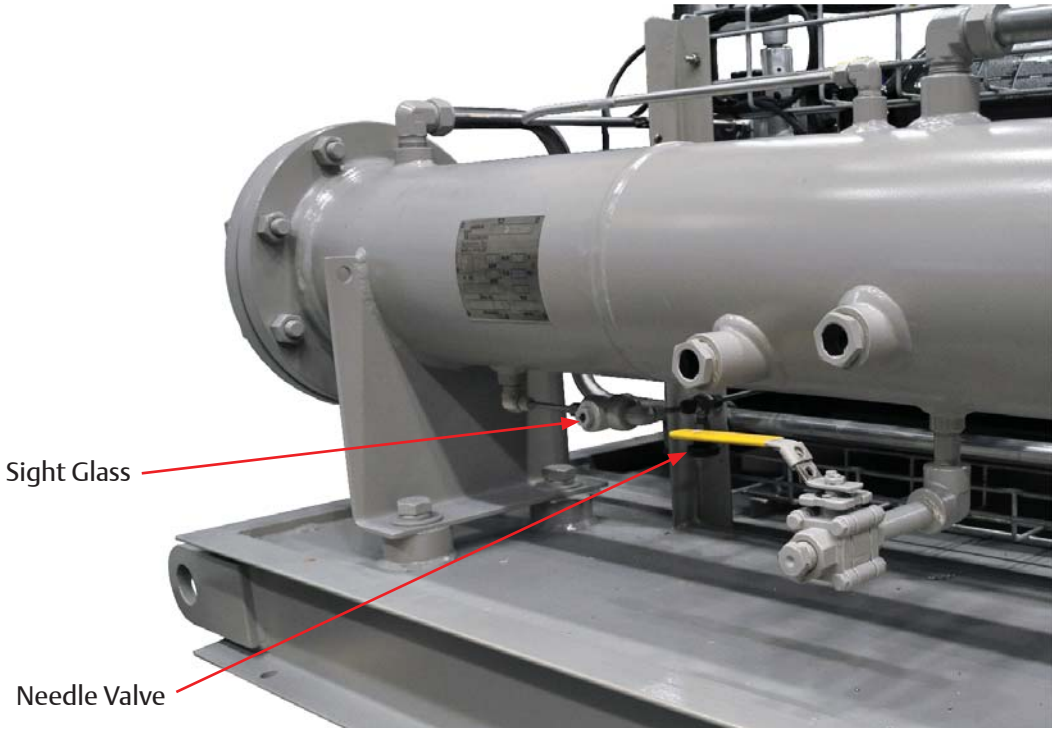



Figure 4-4. Coalescing Oil Return Line - Needle Valve and Sight Glass

## Maintenance and Service Schedule

Follow this table for maintaining and servicing the compressor module.

**Table 5-1. Maintenance/Service Schedule**

| Components | Daily /Periodic Checks | Annual Maintenance/Service | Reason |
|---|---|---|---|
| Lubrication & Cooling System | Routinely check oil levels and for possible leaks. | - | A low oil level or loss of oil in the system will result in overheating or mechanical failure. |
| | Add oil as needed. | - | |
| | Check condition of oil periodically. Normal oil color is clear or light gray. | - | - |
| | - | Change oil annually. | A high oil level may result in excessive oil carryover and oil discharge from the SVM unit. |
| | - | Change oil filter annually or as needed based on oil analysis. | |
| Gas Inlet System | - | Inspect and clean compressor inlet screen annually. | A restricted inlet screen or suction scrubber filter will result in reduced flow. |
| | - | Change suction scrubber filter annually. | |
| Oil Stabilizer Filter Element | - | Change oil stabilizer element annually or as needed based on oil analysis. | A dirty or plugged separator element will result in excessive oil carryover. |
| Oil Heat Exchanger | Ensure heat exchanger cooling fins are clear of dust and debris. Verify that fans run freely. | - | - |

## Maintenance Tools

In Figure 5-1 are tools needed for maintenance of the compressor module. Contact your Service provider or Distributor to obtain a maintenance tool kit. These are typical air conditioning and refrigeration service tools.

### CAUTION

When pressure is applied to the oil pump, the handle may extend rapidly.

### NOTE

One full stroke oil pump of the handle dispenses 1.6 oz. (47 ml) of oil. Move the pump handle slowly using long, slow, full strokes.

### NOTE

The hose fittings contain a core depressor that opens the control valve when the fittings are attached. A backseat control valve can be used to open the control valves on the compressor module.

Verify the compressor module pressure is 0 psig before removing the second-stage oil separator.

When the knob is turned fully counterclockwise, the core depressor is retracted and the backseat control valve can be installed on a control valve without loss of oil.

When the knob is turned clockwise, the core retractor is extended, opening the control valve.

**Back-seating control valve**

**Oil pump, piston type, high pressure**
***Designed to operate up to 250 psig***

**Filter wrench**
***Alternate product: Strap filter wrench***

**Extension hose 60" (1524mm)**

**Charging hose with valve 6" (152mm)**

Figure 5-1. Maintenance Tools (VPN 998-0063-00)

## Oil Sampling

**WARNING**

**When working with LFG, NG or other dangerous or flammable gases, ensure there are adequate ventilation and vapor detectors. Refer to national fire and building codes. Failure to comply may result in serious injury or death.**

**WARNING**

**Avoid skin contact with any condensate or oil. Wear rubber gloves and a face shield when working with condensate or oil. Failure to comply may result in serious injury or death.**

Use Vilter Oil Analysis Kit (VPN 3097A) to collect an oil sample for analysis. For an example, see Figure 5-2 and Appendix B. Fill out label for bottle. Place in mailing tube and seal with the preaddressed mailing label. Below are a few points to remember when taking a sample:

- Sample running compressor units, not cold units.
- Sample upstream of the oil filter.
- Create specific written procedures for sampling.
- Ensure sampling valves and devices are thoroughly flushed prior to taking a sample.
- Ensure samples are taken as scheduled in the Maintenance and Service Schedule.
- Send samples immediately to the oil analysis lab after sampling, do not wait 24 hours.

An oil analysis report will show the physical properties of the oil, such as:

- Water content
- Viscosity
- Acid number
- Particle count
- Antioxidant level
- Wear metals
- Contaminate/additive metals

**Figure 5-2. Oil Analysis Kit**

## Oil Charge / Drain During Operation

Oil is charged and drained through the control valves on the compressor suction fittings during operation, see Figure 5-3.

### NOTE

**This procedure applies to both the dual and quad units, but only the dual unit is shown.**

#### PARTS

- Oil, Vilter Methane PAO 100 (Qty. 7.5 gallons) (VPN 3143A)

#### TOOLS AND EQUIPMENT

- Maintenance Tool Kit (VPN 998-0063-00)
- Clean Container, 5 gallon (including Lid with Spout hole)

#### OIL CHARGE

### WARNING

**Avoid skin contact with oil. Wear rubber gloves and a face shield when working with oil. Failure to comply may result in serious injury or death.**

### NOTE

**Dispose of the oil in a appropriate manner following all Local, State and Federal ordinances regarding the disposal of used oil.**

### NOTE

Adding oil through the control valve on either compressor suction fitting permits adding the oil with the compressor running.

1. Connect extension hose to oil pump.
2. Connect extension hose to valve on charging hose. Ensure valve is in the closed position.
3. Pour 1 gallon of oil into clean container and insert oil pump.
4. Turn knob on back-seating control valve fully counterclockwise to the closed position.
5. Remove protective cap from control valve on compressor suction fitting.
6. Connect back-seating control valve to control valve.
7. Connect charging hose to back-seating control valve.

### CAUTION

When pressure is applied to the oil pump, the handle may extend rapidly.

8. Turn knob on back-seating control valve clockwise to open control valve and then, slowly turn valve on charging hose to open position.

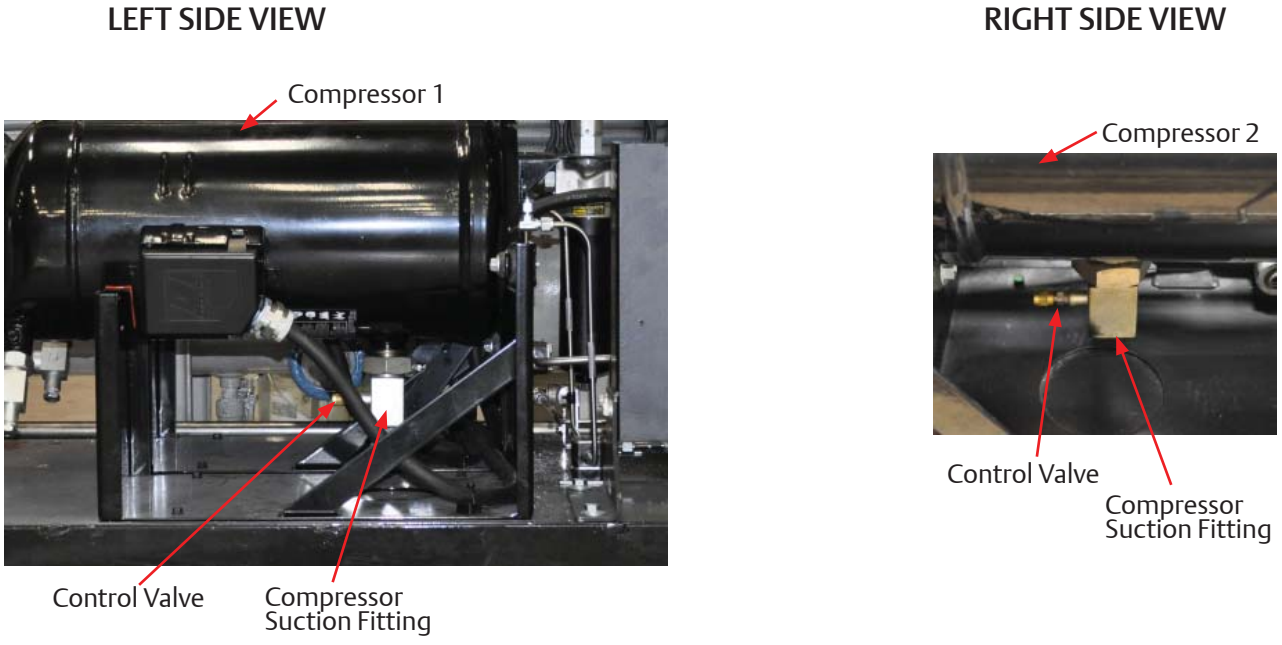



Figure 5-3. Oil Charging During Operation - Control Valve Locations

## NOTE

Move pump handle slowly using long, slow, full strokes on pump handle to transfer oil.

One full pump stroke dispenses 1.6 oz. (47 ml) of oil.

9. Pump oil into compressor until normal oil level is reached, see Figure 5-4.
10. Turn knob on back-seating control valve counter-clockwise to close control valve.
11. Remove charging hose from back-seating control valve.
12. Remove back-seating control valve from control valve.
13. Install protective cap on control valve.
14. If equipped with second compressor, repeat steps 4 to 13.
15. Return SVM unit to service.
16. Check for leaks at all fittings that have been disturbed.

### OIL DRAIN

Under normal operation, the Compressor and oil circuit remain under pressure when the Compressor is turned off. This pressure can be used to drain most of the oil. It is also possible to use the gas supply pressure to force oil out of the Compressor Module. In some cases it may necessary to pressurize the module with an inert gas to remove the oil.

17. Turn the knob on the back-seating control valve fully counterclockwise.
18. Connect the back-seating control valve to the control valve near the bottom of the first-stage oil separator.
19. Connect one end of the oil transfer hose to the back-seating control valve.
20. Place the free end of the hose into a suitable container and turn the knob on the back-seating control valve clockwise to open the control valve and open the oil transfer hose ball valve.
21. Leave the valves open until the oil stops flowing and gas comes out of the hose; close the valves.
22. Relocate the hose to the control valve on the inlet of one compressor and repeat steps 5 and 6. Repeat for the other compressor on the compressor module.
23. Move the hose to the control valve on the oil cooler and repeat steps 5 and 6.
24. Close the valves, remove the service hose and replace the protective caps on all control valves.

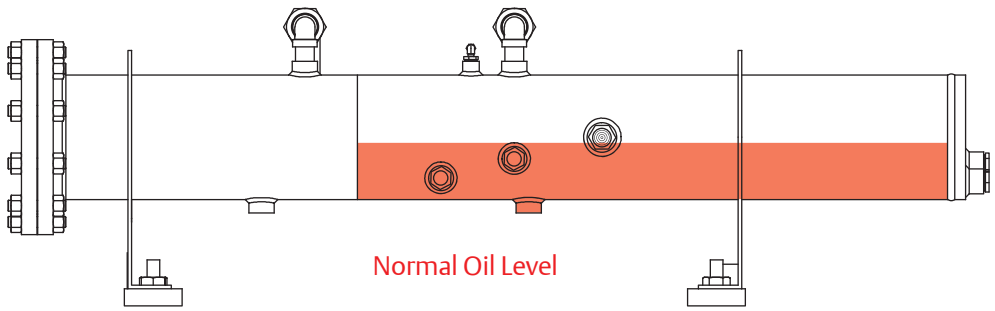



Figure 5-4. Oil Stabilizer - Normal Oil Level

## Inlet Screen Inspection & Service

The mesh screen in the inlet block must remain unobstructed for optimal flow rate. If the flow rate is lower than expected even when the compressor is running properly, this screen may be obstructed.

### NOTE

**This procedure applies to both the dual and quad units, but only the dual unit is shown.**

#### PARTS

- Plug (O-ring included) (VPN 036-0853-00)

#### INSPECTION & REMOVAL

### WARNING

**When working with LFG, NG or other dangerous or flammable gases, ensure there are adequate ventilation and vapor detectors. Refer to national fire and building codes. Failure to comply may result in serious injury or death.**

### WARNING

**Follow local lockout/tagout procedure. Failure to comply may result in serious injury, death and/or damage to equipment.**

1. Shutdown and isolate SVM unit from all power sources.
2. Isolate SVM unit from gas supply by closing suction inlet and discharge outlet valves.
3. Vent system to atmosphere.
4. Remove plug from suction manifold. Discard plug.
5. Remove screen.
6. Inspect and clean screen. Replace screen if damaged.
7. Clean inside of manifold block .

#### INSTALLATION

8. Install screen in suction manifold.
9. Install new plug on suction manifold.
10. Return SVM unit to service.
11. Check replaced components for leaks and at all fittings that have been disturbed.

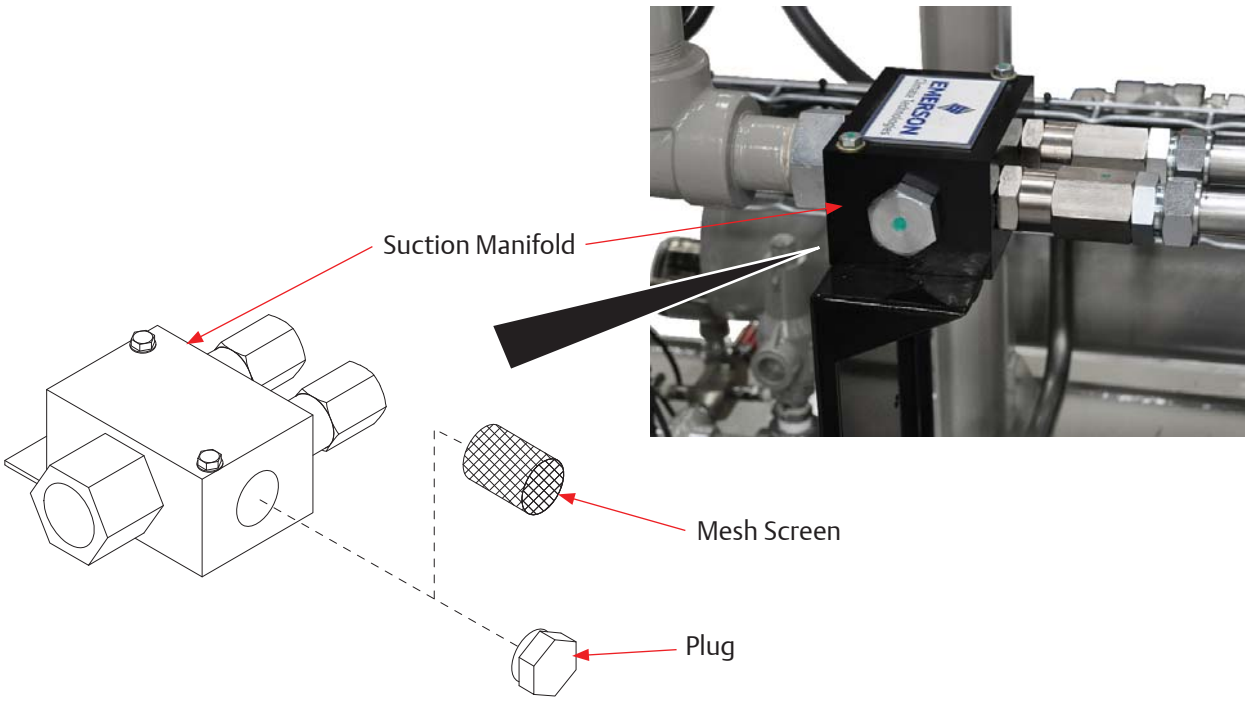



Figure 5-5. Suction Manifold Block, Plug, O-ring and Mesh Screen

## Compressor Filter Element Replacement

### NOTE

**This procedure applies to both the dual and quad units, but only the dual unit is shown.**

#### PARTS

- Oil, Vilter Methane PAO 100 (Qty. 0.25 oz.) (VPN 3143A)
- Oil Filter Element (VPN 013-0205-00)

#### TOOLS AND EQUIPMENT

- Maintenance Tool Kit (VPN 998-0063-00)
- Drain Pan, 5 gallon

#### REMOVAL

*(Reference Figure 5-6)*

### WARNING

**When working with LFG, NG or other dangerous or flammable gases, ensure there are adequate ventilation and vapor detectors. Refer to national fire and building codes. Failure to comply may result in serious injury or death.**

### WARNING

**Avoid skin contact with any condensate or oil. Wear rubber gloves and a face shield when working with condensate or oil. Failure to comply may result in serious injury or death.**

### WARNING

**Follow local lockout/tagout procedure. Failure to comply may result in serious injury, death and/or damage to equipment.**

1. Shutdown and isolate SVM unit from all power sources.
2. Isolate SVM unit from gas supply by closing suction inlet and discharge outlet valves.
3. Vent system to atmosphere.

**NOTE**

The bowl will be filled with oil.

4. Remove oil filter bowl from oil filter manifold.
5. Remove filter element from inlet flange of oil filter manifold. Discard filter element.
6. Clean oil filter bowl with lint free cloth.

#### INSTALLATION

7. Apply clean oil to O-ring on new filter element.
8. Install filter element on inlet flange of oil filter manifold. Ensure filter element is fully seated.
9. Install oil filter bowl on oil filter manifold.
10. Check oil level, see Checking Oil Level in Section 4.
11. Add oil as required, see Oil Charge/Drain During Operation.
12. Return SVM unit to service.
13. Check replaced components for leaks and at all fittings that have been disturbed.

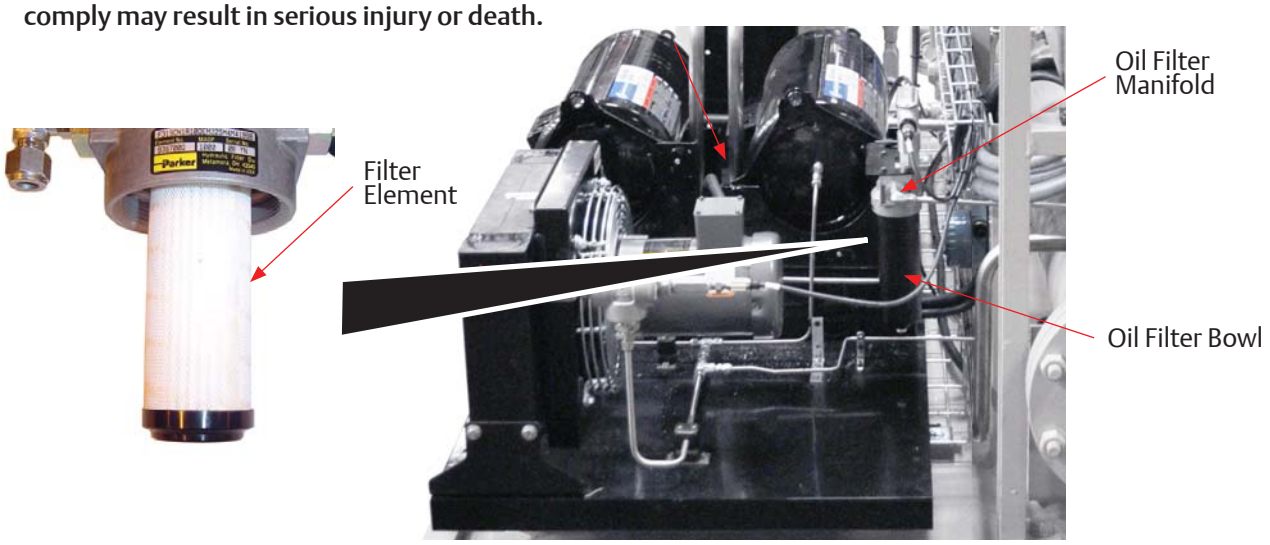



Figure 5-6. Oil Filter Bowl and Element

## Suction Scrubber Filter Element Replacement

### PARTS

- Oil, Vilter Methane PAO 100 (Qty. 0.25 oz.) (VPN 3143A)
- Element, Suction Scrubber Filter (O-ring Included) (VPN 3560KA)
- Gasket, Suction Scrubber Cover (VPN 1548FA)

### REMOVAL

*(Reference Figure 5-7)*

**WARNING**

**When working with LFG, NG or other dangerous or flammable gases, ensure there are adequate ventilation and vapor detectors. Refer to national fire and building codes. Failure to comply may result in serious injury or death.**

**WARNING**

**Avoid skin contact with any condensate or oil. Wear rubber gloves and a face shield when working with condensate or oil. Failure to comply may result in serious injury or death.**

**WARNING**

**Follow local lockout/tagout procedure. Failure to comply may result in serious injury, death and/or damage to equipment.**

1. Shutdown and isolate SVM unit from all power sources.
2. Isolate SVM unit from gas supply by closing suction inlet and discharge outlet valves.
3. Vent system to atmosphere.
4. Remove nuts and studs securing cover and gasket to suction scrubber. Remove cover and gasket. Discard gasket.
5. Remove nut, flat washer and filter element cover securing filter element to inner filter element

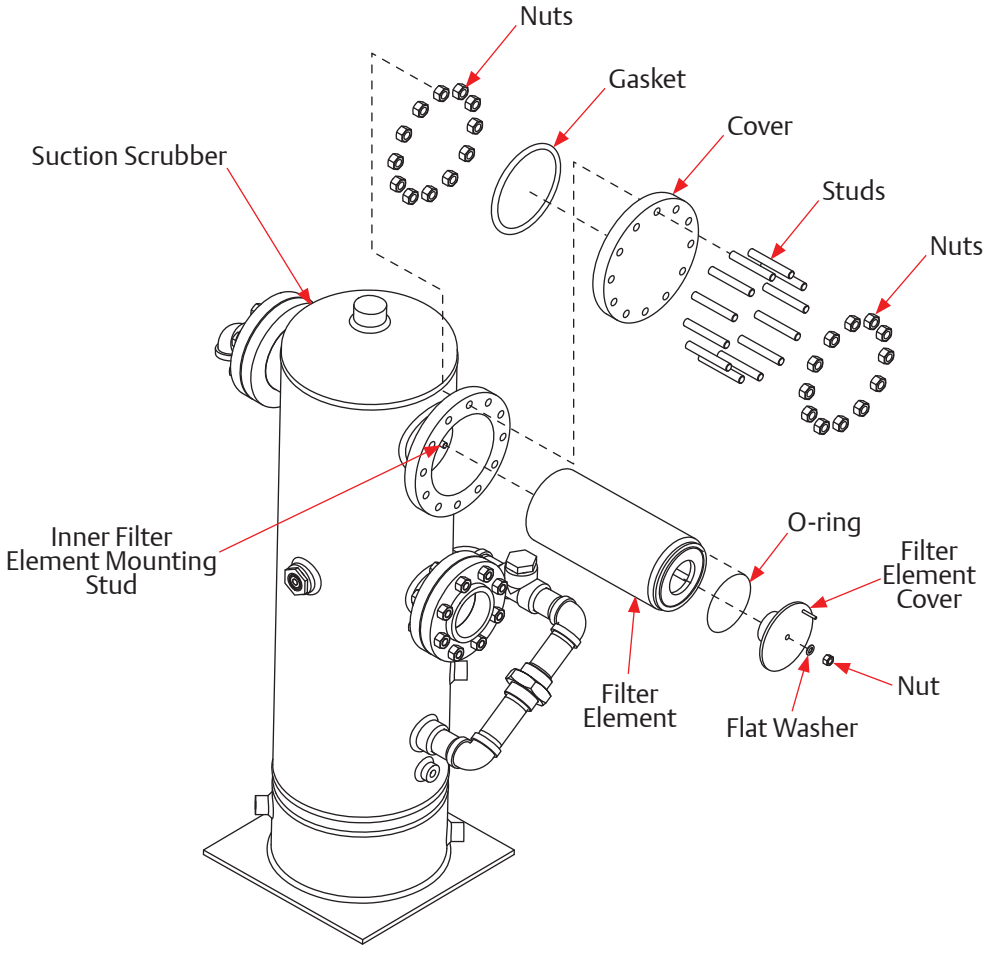



Figure 5-7. Suction Scrubber Filter Element Replacement

mounting stud.

6. Remove filter element cover, filter element and O-ring. Discard O-ring.

INSTALLATION

7. Position filter element (with O-ring groove facing outwards) in suction scrubber. Ensure filter element is fully seated on suction inlet flange.
8. Apply clean oil to new O-ring.
9. Install O-ring on filter element.
10. Install flat washer, nut and filter element cover on inner filter element mounting stud to secure filter element in suction scrubber.
11. Install studs and nuts to secure new gasket and cover to suction scrubber.
12. Tighten nuts, see Torque Table in Appendix.
13. Return SVM unit to service.

## Oil Stabilizer Filter Element Replacement

**NOTE**

**This procedure applies to both the dual and quad units, but only the dual unit is shown.**

PARTS

- Oil, Vilter Methane PAO 100 (Qty. 0.25 oz.)
- Element, Oil Stabilizer Filter (O-ring Included) (VPN 3569A)
- Gasket, Oil Stabilizer Filter Cover (VPN 1548G)

REMOVAL

*(Reference Figure 5-8)*

**WARNING**

**When working with LFG, NG or other dangerous or flammable gases, ensure there are adequate ventilation and vapor detectors. Refer to national fire and building codes. Failure to comply may result in serious injury or death.**

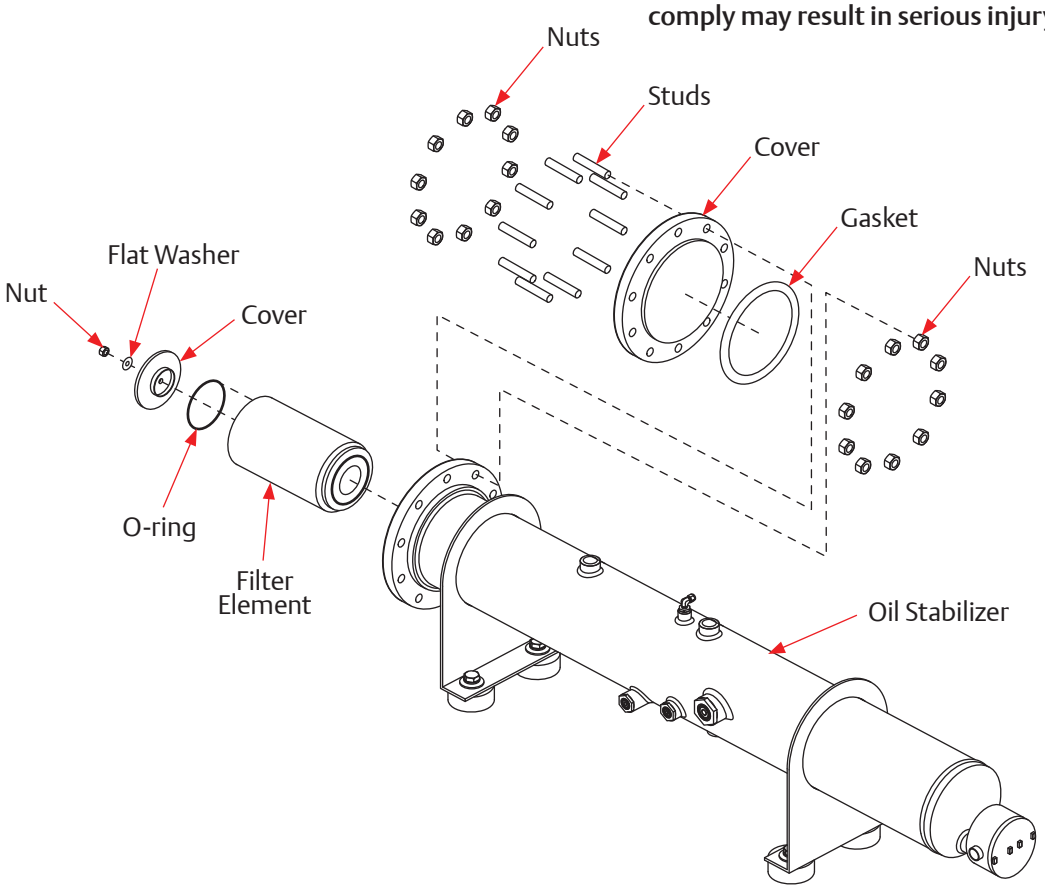



Figure 5-8. Oil Stabilizer Filter Element Replacement

**WARNING**

**Avoid skin contact with any condensate or oil. Wear rubber gloves and a face shield when working with condensate or oil. Failure to comply may result in serious injury or death.**

**WARNING**

**Follow local lockout/tagout procedure. Failure to comply may result in serious injury, death and/or damage to equipment.**

1. Shutdown and isolate SVM unit from all power sources.
2. Isolate SVM unit from gas supply by closing suction inlet and discharge outlet valves.
3. Vent system to atmosphere.
4. Remove nuts and studs securing cover and gasket to oil stabilizer. Remove cover and gasket. Discard gasket.
5. Remove nut, flat washer and filter element cover and filter element to inner filter element mounting stud.
6. Remove filter element cover, filter element and O-ring. Discard O-ring.

INSTALLATION

7. Position filter element (with O-ring groove facing outwards) in oil stabilizer. Ensure filter element is fully seated on outlet flange.
8. Apply clean oil to new O-ring.
9. Install O-ring on filter element.
10. Install flat washer, nut and filter element cover on inner filter element mounting stud to secure filter element in oil stabilizer.
11. Install studs and nuts to secure new gasket and cover to suction scrubber.
12. Tighten nuts, see Torque Table in Appendix.
13. Return SVM unit to service.
14. Check replaced components for leaks and at all fittings that have been disturbed.

## Compressor Replacement

PARTS

- Kit, Rubber Grommet (VPN 027-0186-00)
- Kit, Pad, Compressor Rest (VPN 020-1297-00)
- Compressor
    - SVM-44 / SVM-88 (VPN ZNH22C2A-KXX-265P)
    - SVM-56 / SVM-112 (VPN ZNH28C2A-KXX-265P)
- O-ring, Oil Injection (VPN 536-0161-00)

REMOVAL

*(Reference Figure 5-9)*

**WARNING**

**When working with LFG, NG or other dangerous or flammable gases, ensure there are adequate ventilation and vapor detectors. Refer to national fire and building codes. Failure to comply may result in serious injury or death.**

**WARNING**

**Avoid skin contact with any condensate or oil. Wear rubber gloves and a face shield when working with condensate or oil. Failure to comply may result in serious injury or death.**

**WARNING**

**Follow local lockout/tagout procedure. Failure to comply may result in serious injury, death and/or damage to equipment.**

**NOTE**

This procedure is to replace one compressor only. Repeat procedure to replace second compressor, if equipped.

**NOTE**

For SVM Quads, if required, remove first compressor to gain access to second compressor. Remove additional piping (i.e. suction pipes) to gain clearance for compressor removal and installation.

1. Shutdown and isolate SVM unit from all power sources.

2. Turn off gas supply.
3. Vent system to atmosphere.
4. Remove insulation blanket, if equipped.
5. Drain oil from compressor, see Drain Procedure in Section 3.
6. Remove suction and discharge lines from compressor.
7. Remove oil injection line from oil injection fitting.
8. Remove oil injection fitting from compressor.
9. Remove O-ring from oil injection fitting. Discard O-ring.
10. Remove screw securing compressor junction box cover.
11. Remove silicone from junction box cover to aid in removal.
12. Remove compressor junction box cover.

**NOTE**

Note location of wires to aid in installation.

13. Remove wires from connections in compressor junction box.
14. Remove cable grommet and wires from compressor junction box.

**NOTE**

Note orientation of discharge and suction fittings to aid in installation.

15. Remove discharge fitting from compressor.
16. Remove suction fitting from compressor.

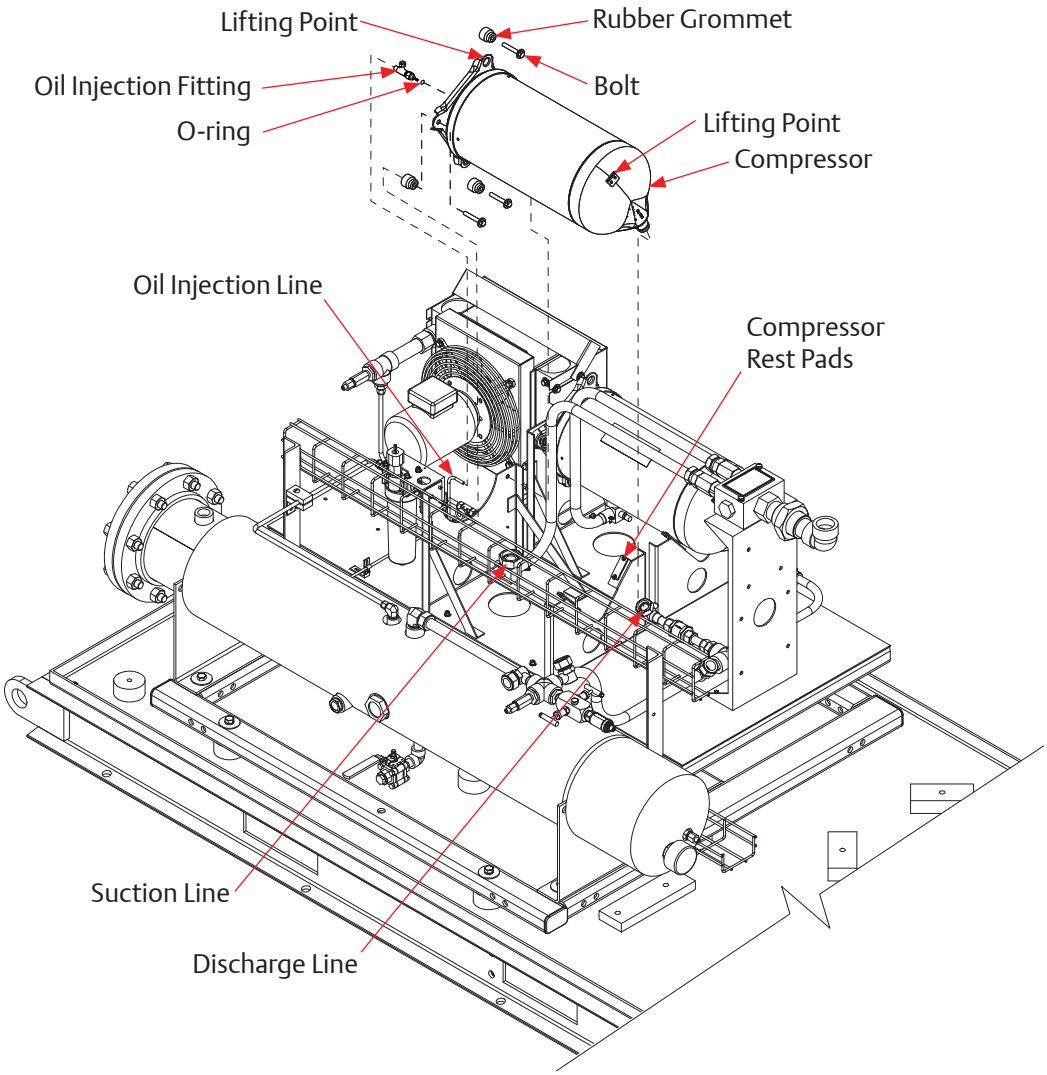



**Figure 5-9. Compressor Replacement**

## NOTE

Compressor weighs approximately 150 lbs (68 kg).

17. With assistance of second person and/or aid of lifting device capable of lifting weight of compressor, loosen compressor mounting bolts. Remove compressor.
18. Remove rubber grommets from compressor.
19. Inspect rubber grommets, if damaged or worn, replace as required.
20. Inspect compressor rest pads, if damaged or worn, replace as required.

### INSTALLATION

21. Install rubber grommets on compressor.
22. With assistance of second person and/or aid of lifting device capable of lifting weight of compressor, position compressor on module frame and install bolts to secure compressor.
23. Tighten bolts, see Torque Table in Appendix.
24. Install suction fitting on compressor as noted during removal.
25. Install discharge fitting on compressor as noted during removal.
26. Install new O-ring on oil injection fitting.
27. Install oil injection fitting on compressor.
28. Install oil injection line on oil injection fitting.
29. Install suction and discharge lines on compressor.
30. Connect wires in compressor junction box as noted during removal.
31. Install cable grommet on compressor junction box.
32. Install compressor junction box cover and secure with screw.
33. Apply silicone to all opening edges around compressor junction box cover.
34. Charge compressor with 1 gallon of oil, see Charge Procedure in Section 3.
35. Install insulation blanket on compressor, if equipped.
36. Return SVM unit to service.
37. Check replaced components for leaks and at all fittings that have been disturbed.

Table 6-1. Typical Problems

| Problem | Recommended Actions |
|---|---|
| Low Inlet Gas Pressure Fault | • Closed gas inlet valve.<br>• Restricted or insufficient gas supply.<br>• Blocked inlet filter/screen (located internally on the Compressor Module inlet block). |
| High Oil Temperature Fault | • Blocked air flow across oil cooler.<br>• Ensure cooling fans are operating when the unit is running and up to temperature; at approximately 180°F (82°C), fans should start to run at minimum speed.<br>• Ensure adequate oil level in first-stage separator (see Checking Oil Level in Section 4). |
| High Discharge Pressure Fault | • Restricted discharge and bypass valve fault. |
| VFD Fault | • The drive LED will display the specific fault |

Table 6-2. Motor Winding Resistance

| Compressor Model | Motor Winding Resistance |
|---|---|
| C2A | Phase-to-phase = 0.7 ohms |

Table 6-3. Platform System Diagnosis

| Problem | Recommended Actions |
|---|---|
| Low Gas Flow | Low inlet pressure |
| | Insufficient gas supply |
| | Low Compressor Speed |
| | Restricted suction scrubber filter |
| | Restricted compressor suction screen |
| High Oil Carryover | Saturated or dirty oil separator element |
| | High oil level |
| | Insufficient back pressure |
| | Oil Dilution |
| Compressors Don't Run | Determine drive status |
| | Is inhibit circuit closed? |
| | Is run signal present? |
| | Does the VFD indicate a fault code? |
| | Are all PLC run permissives met? |
| Incorrect Compressor Speed | Low inlet pressure |
| | High discharge pressure |
| | High temperature, fan, low oil, oil cooler |
| | Problem with pressure transducer or pressure control loop |
| High Temperature | Low oil level |
| | Restricted oil filter |
| | Blocked oil cooler air flow |
| | Oil cooler fan not operating |
| | Problem with RTD or temperature control loop |
| | Compressor isolation solenoids are closed |
| | Oil stabilizer temperature is too high |
| | Operation conditions outside of SVM unit specifications |

## Warranty Claim Processing

This section explains how the warranty claim is processed and to help clear any questions that may arise prior to contacting customer service.

1. The warranty process starts with contacting Distributor or Service Provider. *Ensure to have the original sales order number for the equipment available to better assist you.*
2. Your Distributor or Service Provider will confirm if the equipment is within the warranty time frame as described in the warranty statement.

If the equipment (Part or Compressor) is within the warranty time frame, proceed to the following section regarding the type of equipment:

**PART**

1. Submit a Purchase Order (PO) to procure the replacement part:
   - The correct part number and the quantity.
   - The original sales order for the equipment.
2. Request a Return Material Authorization (RMA) number:
   - Please provide as much information describing the mode of failure to be recorded on the RMA document. This will assist us with providing a quicker review once we have received the warranty part (ex. Part does not calibrate, part does not read correct temperature, etc.).
   - Any additional parts returned on the RMA that is not listed, will be returned freight collect or scrapped. The RMA is valid for 60 days from the RMA request date.
3. After replacing the warranty part:
   - Ship the part to your Distributor or Service Provider per the instructions on the RMA document.
   - Please include a copy of the RMA document in the box for identification purposes when the part is received.
4. Part to be evaluated.
5. Warranty Consideration:
   - Acceptance – A credit will be provided for the customer part sales order.
   - Denial – Notification of denial will be provided to the customer.

**COMPRESSOR**

- Due to the site specific nature of compressor warranty, all warranty responses must be mitigated through your Distributor or Service Provider.

## On Site Service Support

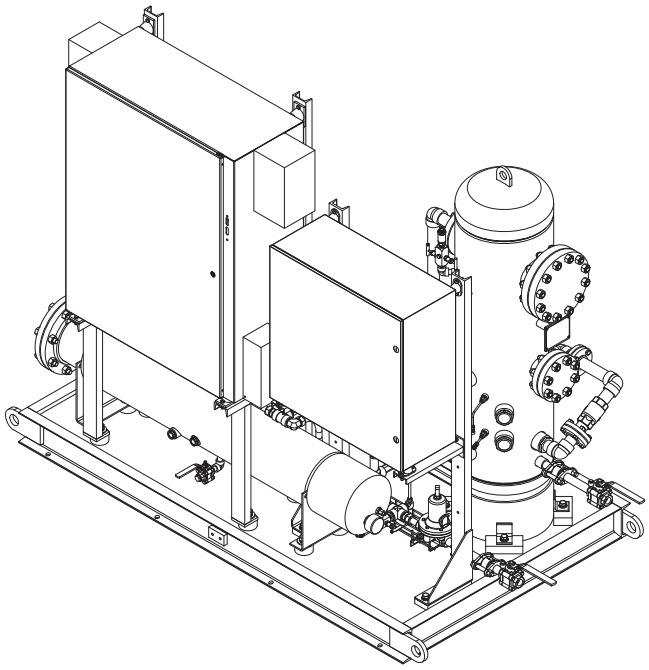
If on-site support is required, contact your Distributor or Service Provider to start this process.

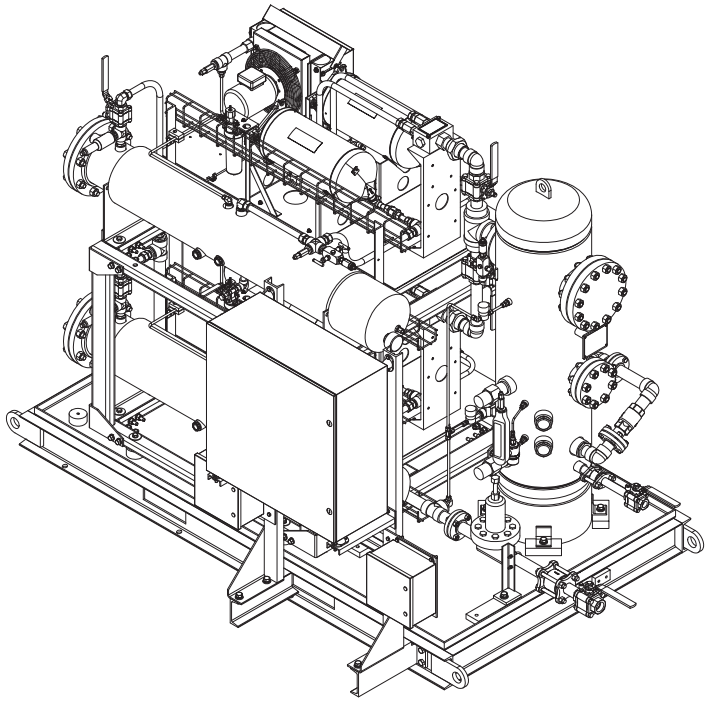
1. A quote, a service rate sheet, and the service terms and conditions will be provided.
2. Submit a PO.
3. Schedule the service visit.

**NOTE**

***Warranty does not cover labor or expenses.***

## SVM Unit Spare Parts





**For parts, contact your distributor or service provider.**

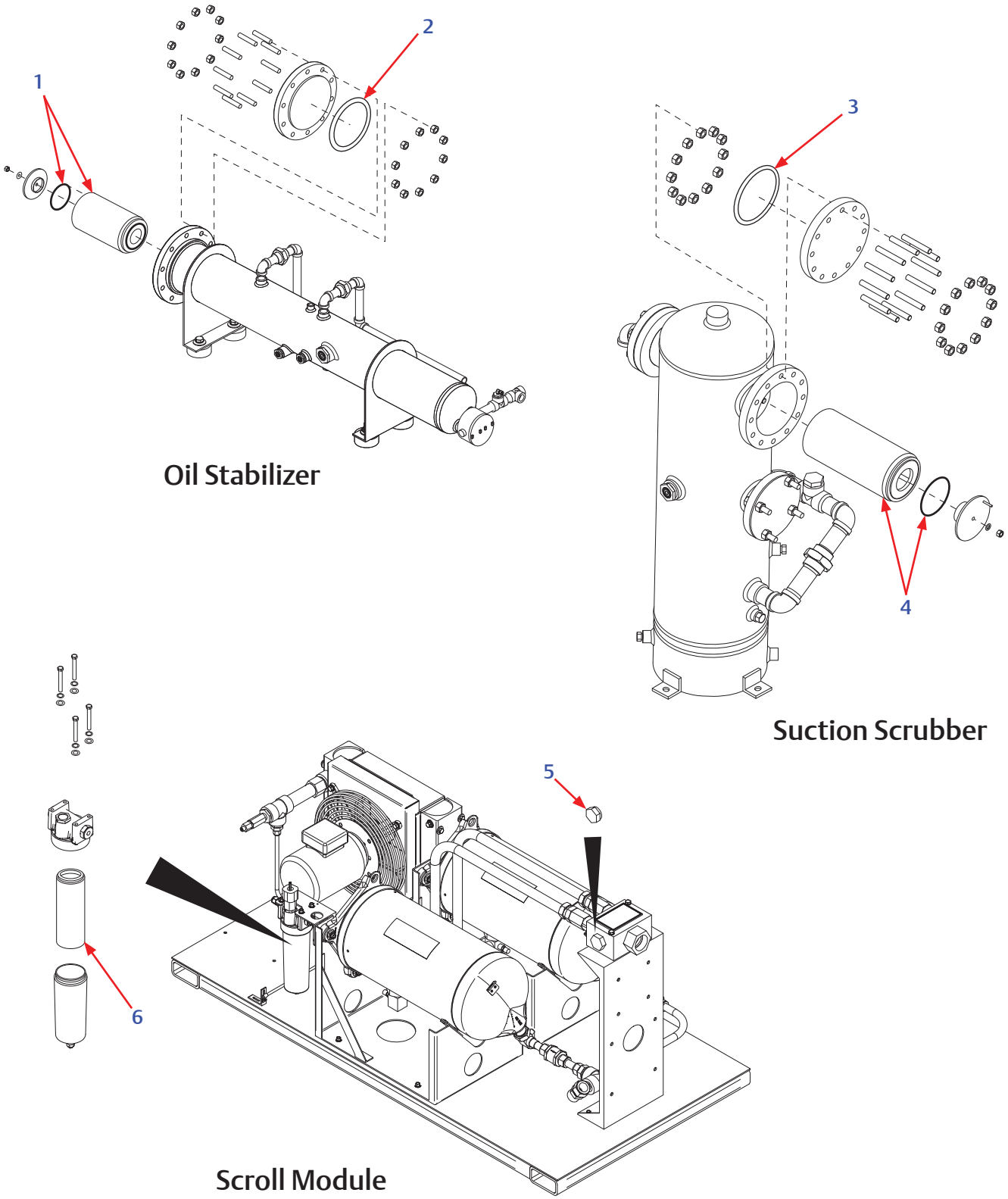



Figure 8-1. Maintenance Components

## Maintenance Components

| Item Number | Vilter Part Number (VPN) | Part Description | Quantity |
|---|---|---|---|
| 1 | 3569A | Element, Oil Stabilizer Filter (O-ring Included) | 1 |
| 2 | 1548G | Gasket, Oil Stabilizer Filter Cover | 1 |
| 3 | 1548FA | Gasket, Suction Scrubber Cover | 1 |
| 4 | 3560KA | Element, Suction Scrubber Filter (O-ring Included) | 1 |
| 5 | 036-0853-00 | Plug, Suction Manifold (O-ring Included) | 1 |
| 6 | 013-0205-00 | Element, Lube Oil Filter | 1 |

## Lubricants

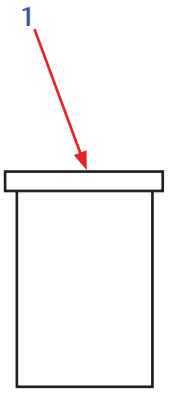
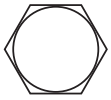
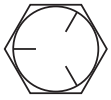



**Figure 8-2. Lubricants**

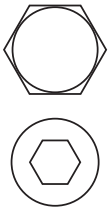
| Item Number | Vilter Part Number (VPN) | Part Description | Quantity |
|---|---|---|---|
| 1 | 3143A | Oil, Vilter Methane PAO 100 (5 Gallon Pail) | 1 |

| Torque Specifications (ft-lbs) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Type Bolt | Head Markings | Nominal Size Numbers or Inches | | | | | | | | | |
| | | #10 | 1/4 | 5/16 | 3/8 | 7/16 | 1/2 | 9/16 | 5/8 | 3/4 | 7/8 |
| SAE Grade 2 Coarse (UNC) |  | - | 5 | 10 | 18 | 29 | 44 | 63 | 87 | 155 | 150* |
| SAE Grade 5 Coarse (UNC) |  | - | 8 | 16 | 28 | 44 | 68 | 98 | 135 | 240 | 387 |
| SAE Grade 5 Coarse (UNF) |  | - | - | 18 | - | - | - | - | - | - | - |
| SAE Grade 8 Coarse (UNC) |  | - | 11 | 22 | 39 | 63 | 96 | 138 | 191 | 338 | 546 |
| Socket Head Cap Screw (ASTM A574) Coarse (UNC) |  | 5 | 13 | 26 | 46 | 73 | 112 | 115 | 215 | 380 | 614 |

1) Torque values in this table are not to override other specific torque specifications when supplied.

2) When using loctite, torque values in this table are only accurate if bolts are tightened immediately after loctite is applied.

* The proof strength of Grade 2 bolts is less for sizes 7/8 and above and therefore the torque values are less than smaller sizes of the same grade.

| Torque Specifications for 17-4 Stainless Steel Fasteners (ft-lbs) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Type Bolt/Nut | Head Markings | Nominal Size Numbers or Inches | | | | | | | | |
| | | #10 | 1/4 | 5/16 | 3/8 | 7/16 | 1/2 | 9/16 | 5/8 | 3/4 |
| Hex & Socket Head Cap Screws |  | 3 | 8 | 14 | 25 | 40 | 60 | 101 | 137 | 245 |
| Nut |  | - | 8 | - | 25 | - | - | - | - | - |

NOTE: Continue use of red loctite #271 (VPN 2205E) on currently applied locations. Use blue loctite #243 (VPN 2205F or 2205G) on all remaining locations.

OIL SERVICES LABORATORIES
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## PRODUCT ANALYSIS REPORT

**No Action Required**

| | |
|---|---|
| Report Date: | 3/4/2013 |
| Report Number: | ********* |
| Customer | Customer |
| Comp. Mfr. | Vilter |
| Oil Type | VILTER METHANE 100 |
| Serial Number | ****-*** |
| Model Number | VRU-56 |
| Hrs. on Fluid | 6049 |
| Hrs. on Machine | 11239 |
| Sample Date | Feb 21, 2013 |
| Receive Date | Mar 01, 2013 |
| I.D. # | ********* |

Customer Name
Customer Address

## Evaluation:

The fluid is in good condition. Sample again in 6 months.

## Physical Properties Results *

| Sample Date (Lube Hours) | Feb 21, 2013 (6049) | Oct 19, 2012 (4809) | Jul 26, 2010 (5190) |
|---|---|---|---|
| Water by Karl Fischer (ppm) | 19.5 | 147.7 | 41.4 |
| Viscosity 40 C (cSt) | 64.23 | 64.47 | 66.00 |
| TAN Total Acid # | 0.077 | 0.106 | 0.080 |
| ISO Code | 21/20/16 | 21/19/16 | 21/19/14 |

## Spectrochemical Analysis

| Wear Metals (ppm) | | | |
|---|---|---|---|
| Silver (Ag) | 0 | 0 | 0 |
| Aluminum (Al) | 0 | 0 | 0 |
| Chromium (Cr) | 0 | 0 | 0 |
| Copper (Cu) | 0 | 0 | 0 |
| Iron (Fe) | 0 | 0 | 0 |
| Nickel (Ni) | 0 | 0 | 0 |
| Lead (Pb) | 0 | 0 | 0 |
| Tin (Sn) | 0 | 0 | 0 |
| Titanium (Ti) | 0 | 0 | 0 |
| Vanadium (V) | 0 | 0 | 0 |
| Contaminant/Additive Metals (ppm) | | | |
| Barium (Ba) | 0 | 0 | 0 |
| Calcium (Ca) | 0 | 0 | 0 |
| Magnesium (Mg) | 0 | 0 | 0 |
| Molybdenum (Mo) | 0 | 0 | 0 |
| Sodium (Na) | 0 | 0 | 0 |
| Phosphorus (P) | 0 | 0 | 0 |
| Silicon (Si) | 0 | 0 | 0 |
| Zinc (Zn) | 0 | 0 | 0 |

**Thank you for this opportunity to provide technical assistance to your company. If you have any questions about this report, please contact us at 1-800-637-8628, or fax 1-989-496-2313 or email us at tslab@oil-services-lab.com**

**CC List**

Accuracy of recommendations is dependent on representative oil samples and complete correct data on both unit and oil

* Property values should not be construed as specifications

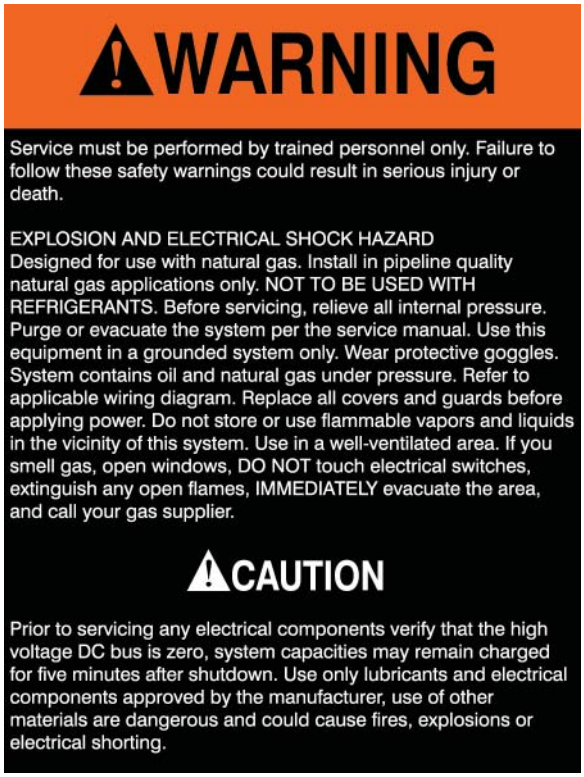
1. For the ATEX/IECEx version of the compressor, the viewing window and the Schrader valve are not available options.
2. The bearing lubricant material is Vilter Methane PAO100 and it is rated for the temperature range -29°C to 121°C (-20°F to 250°F).
3. SVM unit certification number:

   ATEX Cert. number: **DEMKO 14 ATEX 1408U**

   IECE Cert. number: **IECEx UL 14.0111U**

   Following protection string:

   **II 3 G Ex nA IIC Gc**




4. Warnings located near or on plastic case (see below):

   WARNING - POTENTIAL ELECTROSTATIC CHARGING HAZARD

   WARNING - ONLY SEPARATE IN A NON-HAZARDOUS AREA OR WHEN NOT ENERGIZED.

5. This SVM unit satisfies the following standards:
   i. EN 60079-0:2012 + A11:2013
   ii. EN 60079-15:2010
   iii. IEC 60079-0 6th Ed.
   iv. IEC 60079-15 4th Ed.

6. Schedule of Limitations:
   i. Compressor has been evaluated for use in temperatures between -23°C to 60°C (-9°F to 140°F)
   ii. Maximum compressor top cap temperature measured was 127°C (261°F).
   iii. Caution must be used not to cause electrostatic buildup on the plastic cover, only clean with damp cloth.
   iv. Securement of the electrical connector has to be evaluated when used in end-product application.
   v. Ingress protection for the power plug must be evaluated when used in end-product application.

7. The gas provided to the compressor may be:
   - Inlet Temperature range: -28°C to 46°C (-20°F to 115°F)
   - Inlet Pressure range: -0.052 barg to 1.72 barg (-0.75 psig to 25 psig)
   - Composition (may contain but not limited to): Methane, Ethane, Propane, Nitrogen, Carbon Dioxide, N-Butane, Isobutane, N-Pentane, Isopentanre, Hexane, Heptane, Octane, Helium, Oxygen, Hydrogen Sulfide (up to 500 PPM).