Quincy
COMPRESSOR

an EnPro Industries company

QSVI Series

Rotary Screw Vacuum Pump

Instruction Manual

This manual contains important safety information and should be made available to all personnel who operate and/or maintain this product. Carefully read this manual before attempting to operate or perform maintenance on this equipment.

Manual No. 50093-103

March 1997 Edition

Table of Contents

Section 3 - Installation

Section 4 - Procedures

Section 5 – Maintenance or Service Preparation

Section 6 - Servicing

Section 7 – Service Adjustments

Section 8 – Troubleshooting

Section 9 – Maintenance Schedule

Standard Warranty

Quincy Compressor Division
Industrial Screw Products
QSVI Packaged Vacuum Pumps, Airends, Remanufactured Airends and Vacuum Pump Parts

Seller warrants products of its own manufacture against defects in workmanship and materials under normal use and service, as follows:

QSVI Packaged Units
Twelve (12) months from date of start-up or twenty-four (24) months from date of shipment from the factory, whichever occurs first.

Basic Vacuum Pump
Twenty-four (24) months from date of start-up or thirty-six (36) months from date of shipment from the factory, whichever occurs first.

Remanufactured Basic Vacuum Pump
One (1) year from date of shipment from factory.

Parts
Ninety (90) days from date of Distributor sale or one (1) year from date of factory shipment, whichever occurs first.

With respect to products not manufactured by Seller, Seller will, if practical, pass along the warranty of the original manufacturer.

Notice of the alleged defect must be given to Seller in writing with all identifying details including serial number, model number, type of equipment and date of purchase, within thirty (30) days of the discovery of same during the warranty period.

Seller's sole obligation on this warranty shall be, at its option, to repair, replace or refund the purchase price of any product or part thereof which proves to be defective. If requested by Seller, such product or part thereof must be promptly returned to Seller, freight collect for inspection.

Seller warrants factory repaired or replaced parts of its own manufacture against defects in material and workmanship under normal use and service for ninety (90) days or for the remainder of the warranty on the product being repaired, whichever is longer.
This warranty shall not apply and Seller shall not be responsible nor liable for:

(a) Consequential, collateral or special losses or damages;
(b) Equipment conditions caused by fair wear and tear, abnormal conditions of use, accident, neglect or misuse of equipment, improper storage or damages resulting during shipment;
(c) Deviation from operating instructions, specifications, or other special terms of sales;
(d) Labor charges, loss or damage resulting from improper operation, maintenance or repairs made by person(s) other than Seller or Seller's authorized service station.
(e) Improper application of product.

In no event shall Seller be liable for any claims, whether arising from breach of contract or warranty of claims of negligence or negligent manufacture, in excess of the purchase price.

THIS WARRANTY IS THE SOLE WARRANTY OF SELLER AND ANY OTHER WARRANTIES, EXPRESS, IMPLIED IN LAW OR IMPLIED IN FACT, INCLUDING ANY WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR USE, ARE HEREBY SPECIFICALLY EXCLUDED.

SAFETY HAZARD SYMBOLS

Important!

Throughout this manual we have identified key hazards. The following symbols identify the level of hazard seriousness.

! DANGER !

Immediate hazards which will result in severe personal injury or death.

! WARNING !

Hazards or unsafe practices that could result in personal injury or death.

! CAUTION !

Hazards or unsafe practices that could result in minor personal injury, product or property damage.

! WARNING !

Read this manual and follow all instructions prior to installing or operating this compressor.

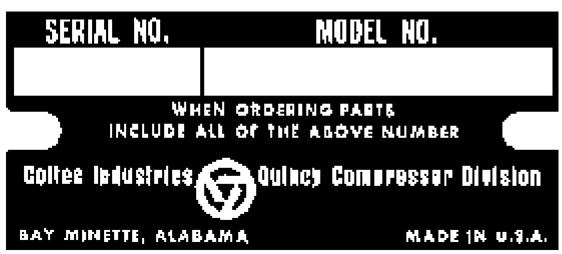
NOTICE

These instructions, precautions and descriptions cover standard Quincy manufactured QSVI series direct drive air compressors.

As a service to our customers, we often modify or construct packages to the customers' specifications. This manual may not be appropriate in those cases.

NOTE:
Every effort has been taken to ensure complete and correct instructions have been included in this manual, however, possible product updates and changes may have occurred since this printing. Quincy Compressor reserves the right to change specifications without incurring any obligation for equipment previously or subsequently sold. Not responsible for typographical errors.

Reference to the machine MODEL, SERIAL NUMBER and DATE OF ORIGINAL START-UP must be made in all communication relative to parts orders or warranty claim. The model/serial number plate is located on the vacuum pump base.



Spare Parts Ordering Information

Coltec Industries, Quincy Compressor Division maintains replacement parts for Quincy compressors. A repair parts list is shipped with all new machines. Order parts from your Authorized Quincy distributor. Use only genuine Quincy replacement parts. Failure to do so may void warranty.

Technical Data Sheet - QSVI 25

General Specifications

Drive Motor	25 HP
Drive System	Direct
Inlet Capacity	365 ACFM
Maximum Operating Pressure (Continuous)	10" HgV (506 torr)
Minimum Operating Pressure (Continuous)	29.9" HgV (0.5 torr)
Base Pressure	29.9" HgV (0.5 torr)
Maximum Ambient Temperature	110°F
Minimum Ambient Temperature	35°F
Inlet Connection	4" NPT
Discharge Connection	4" NPT
Rotor Diameter	204 mm
Rotor Length	316 mm
Rotor Speed – Male	1,760 RPM
Rotor Speed – Female	1,174 RPM
Tip Speed	18.8 meters/sec.
Intake Male Bearings	Cylindrical Roller Bearings (x 1)
Discharge Male Bearings	Tapered Roller Bearings (x 3)
Intake Female Bearings	Cylindrical Roller Bearings (x 1)
Discharge Female Bearings	Tapered Roller Bearings (x 2)
Displacement at Operating Speed	398 CFM
Volumetric Efficiency	91.7%

Electrical Data

Full Load Package BHP (Air-cooled)	16.2 BHP
Package Electrical Consumption – Air	14.4 KW
Full Load Package BHP (Water-cooled)	15.8 BHP
Package Electrical Consumption – Water	14.1 KW
Drive Motor Service Factor	1.15
Drive Motor Speed	1,760 RPM
Fan Motor BHP	0.4 BHP
Specific Power - Air-cooled	4.4 BHP/100
Specific Power - Water-cooled	4.3 BHP/100

Fluid System

Method of Lubrication ....Pump
Fluid Flow..5.1 GPM
Total Fluid Capacity..15 Gallons
Reservoir Fluid Capacity...14 Gallons
Discharge Temperature Range..170 to 245°F
HAT Shutdown Temperature ....250°F
Fluid Carryover Rate (unloaded, 29" HgV)...2 PPM
Standard Fluid...QUINSYN®

Air-cooled Data

Maximum Heat Rejection...423 BTU/min.
Cooling Fan Static Pressure..0.13" H_2O
Fan Motor...0.5 HP
Fan RPM 3,450
Fan Flow ....800 CFM

Water-cooled Data

Water Flow – 50°F..1 gal./min.
Water Flow – 70°F..1.5 gal./min.
Water Flow – 90°F..2 gal./min.
Maximum Water Temp. Rise @ 1 GPM ....50.7°F
Recommended Water Pressure ....40 to 100 psig
Water Pressure Drop @ Max. Flow...0.1 psi
Water Connections...1" NPT

Sound Level

Unenclosed – Air ....78 dB (A)
Unenclosed – Water...N/A
Standard Enclosure – Air...71 dB (A)
Standard Enclosure – Water..N/A

Maximum Dimensions

Length..79"
Width ....48"
Height..58.5"
Weight ....2,362 lbs.

Technical Data Sheet - QSVI 40

General Specifications

Drive Motor..40 HP
Drive System..Direct
Inlet Capacity...550 ACFM
Maximum Operating Pressure (Continuous)...10" HgV (506 torr)
Minimum Operating Pressure (Continuous)...29.9" HgV (0.5 torr)
Base Pressure...29.9" HgV (0.5 torr)
Maximum Ambient Temperature ....110°F
Minimum Ambient Temperature ....35°F
Inlet Connection...4" NPT
Discharge Connection..4" NPT
Rotor Diameter...204 mm
Rotor Length..316 mm
Rotor Speed – Male ....2,640 RPM
Rotor Speed – Female ....1,760 RPM
Tip Speed..28.2 meters/sec.
Intake Male Bearings...Cylindrical Roller Bearings (x 1)
Discharge Male Bearings...Tapered Roller Bearings (x 3)
Intake Female Bearings..Cylindrical Roller Bearings (x 1)
Discharge Female Bearings..Tapered Roller Bearings (x 2)
Displacement at Operating Speed...610 CFM
Volumetric Efficiency..90%

Electrical Data

Full Load Package BHP (Air-cooled)..32.9 BHP
Package Electrical Consumption – Air...27.7 KW
Full Load Package BHP (Water-cooled)...32.5 BHP
Package Electrical Consumption – Water...27.4 KW
Drive Motor Service Factor...1.15
Drive Motor Speed...1,760 RPM
Fan Motor BHP...0.4 BHP
Specific Power - Air-cooled 6 BHP/100
Specific Power - Water-cooled...5.9 BHP/100

Fluid System

Method of Lubrication ....Pump
Fluid Flow..6.5 GPM
Total Fluid Capacity...15 Gallons
Reservoir Fluid Capacity..14 Gallons
Discharge Temperature Range..170 to 245°F
HAT Shutdown Temperature ....250°F
Fluid Carryover Rate (unloaded, 29" HgV)...2 PPM
Standard Fluid..QUINSYN®

Air-cooled Data

Maximum Heat Rejection...792 BTU/min.
Cooling Fan Static Pressure...0.13" H_2O
Fan Motor...0.5 HP
Fan RPM 3,450
Fan Flow ....800 CFM

Water-cooled Data

Water Flow – 50°F...1.5 gal./min.
Water Flow – 70°F...2 gal./min.
Water Flow – 90°F...3 gal./min.
Maximum Water Temp. Rise @ 1 GPM ....95°F
Recommended Water Pressure ....40 to 100 psig
Water Pressure Drop @ Max. Flow..0.2 psi
Water Connections...1" NPT

Sound Level

Unenclosed – Air ....87 dB (A)
Unenclosed – Water...N/A
Standard Enclosure – Air...80 dB (A)
Standard Enclosure – Water..N/A

Maximum Dimensions

Length...78"
Width ....48"
Height...58.5"
Weight ....2,434 lbs.

Technical Data Sheet - QSVI 50

General Specifications

Drive Motor	50 HP
Drive System	Direct
Inlet Capacity	730 ACFM
Maximum Operating Pressure (Continuous)	10" HgV (506 torr)
Minimum Operating Pressure (Continuous)	29.9" HgV (0.5 torr)
Base Pressure	29.9" HgV (0.5 torr)
Maximum Ambient Temperature	110°F
Minimum Ambient Temperature	35°F
Inlet Connection	5" NPT
Discharge Connection	4" NPT
Rotor Diameter	204 mm
Rotor Length	316 mm
Rotor Speed – Male	3,525 RPM
Rotor Speed – Female	2,350 RPM
Tip Speed	37.6 meters/sec.
Intake Male Bearings	Cylindrical Roller Bearings (x 1)
Discharge Male Bearings	Tapered Roller Bearings (x 3)
Intake Female Bearings	Cylindrical Roller Bearings (x 1)
Discharge Female Bearings	Tapered Roller Bearings (x 2)
Displacement at Operating Speed	796 CFM
Volumetric Efficiency	91.7%

Electrical Data

Full Load Package BHP (Air-cooled)	49.5 BHP
Package Electrical Consumption – Air	41.7 KW
Full Load Package BHP (Water-cooled)	49.1 BHP
Package Electrical Consumption – Water	41.4 KW
Drive Motor Service Factor	1.15
Drive Motor Speed	3,525 RPM
Fan Motor BHP	0.4 BHP
Specific Power - Air-cooled	6.8 BHP/100
Specific Power - Water-cooled	6.7 BHP/100

Fluid System

Method of Lubrication ....Pump
Fluid Flow..8.7 GPM
Total Fluid Capacity..15 Gallons
Reservoir Fluid Capacity...14 Gallons
Discharge Temperature Range..170 to 245°F
HAT Shutdown Temperature ....250°F
Fluid Carryover Rate (unloaded, 29" HgV)...2 PPM
Standard Fluid...QUINSYN®

Air-cooled Data

Maximum Heat Rejection...1,279 BTU/min.
Cooling Fan Static Pressure...0.13" H_2O
Fan Motor...0.5 HP
Fan RPM 1,725
Fan Flow ....1,500 CFM

Water-cooled Data

Water Flow – 50°F...3.5 gal./min.
Water Flow – 70°F...4.5 gal./min.
Water Flow – 90°F...9 gal./min.
Maximum Water Temp. Rise @ 1 GPM ....153.3°F
Recommended Water Pressure ....40 to 100 psig
Water Pressure Drop @ Max. Flow...0.5 psi
Water Connections ....1" NPT

Sound Level

Unenclosed – Air ....90 dB (A)
Unenclosed – Water...N/A
Standard Enclosure – Air...82 dB (A)
Standard Enclosure – Water...N/A

Maximum Dimensions

Length...78"
Width ....48"
Height...58.5"
Weight ....2,434 lbs.

Technical Data Sheet - QSVI 75

General Specifications

Drive Motor	75 HP
Drive System	Direct
Inlet Capacity	980 ACFM
Maximum Operating Pressure (Continuous)	10" HgV (506 torr)
Minimum Operating Pressure (Continuous)	29.9" HgV (0.5 torr)
Base Pressure	29.9" HgV (0.5 torr)
Maximum Ambient Temperature	110°F
Minimum Ambient Temperature	45°F
Inlet Connection	5" NPT
Discharge Connection	4" NPT
Rotor Diameter	255 mm
Rotor Length	286 mm
Rotor Speed – Male	3,600 RPM
Rotor Speed – Female	2,400 RPM
Tip Speed	48.1 meters/sec.
Maximum Safe Speed	5,500 RPM
Intake Male Bearings	Cylindrical Roller Bearings (x 1)
Discharge Male Bearings	Tapered Roller Bearings (x 2)
Intake Female Bearings	Cylindrical Roller Bearings (x 1)
Discharge Female Bearings	Tapered Roller Bearings (x 2)
Displacement at Operating Speed	1,132 CFM
Volumetric Efficiency	86.6%

Electrical Data

Full Load Package BHP (Air-cooled)	66.7 BHP
Package Electrical Consumption – Air	55.1 KW
Full Load Package BHP (Water-cooled)	64 BHP
Package Electrical Consumption – Water	52.9 KW
Drive Motor Service Factor	1.15
Drive Motor Speed	3,600 RPM
Fan Motor BHP	2.7 BHP
Specific Power - Air-cooled	6.8 BHP/100
Specific Power - Water-cooled	6.5 BHP/100
Typical Standard Motor Efficiency	90.2%
Typical High Efficiency Motor	91%
Typical Premium Efficiency Motor	94.5%

Fluid System

Method of Lubrication	Pump
Fluid Flow	25 GPM
Total Fluid Capacity	38 Gallons
Reservoir Capacity	34 Gallons
Reservoir Volume	20.8 Cubic Feet
Normal Discharge Temperature	190°F
HAT Shutdown Temperature	250°F
Fluid Carryover Rate (unloaded)	2 PPM
Standard Fluid	QUINSYN®

Air-cooled Data

Maximum Heat Rejection	2,387 BTU/min.
Cooling Fan Static Pressure	0.125" wc
Fan Motor	3 HP
Fan RPM	1,200
Fan Flow	10,000 CFM

Water-cooled Data

Water Flow – 50°F	5 gal./min.
Water Flow – 70°F	7 gal./min.
Water Flow – 90°F	12 gal./min.
Maximum Water Temp. Rise @ 1 GPM	57.2°F
Recommended Water Pressure	100 psig
Water Pressure Drop @ Max. Flow	7 psi
Water Connections	1" NPT

Sound Level

Unenclosed – Air	93 dB (A)
Unenclosed – Water	88 dB (A)
Standard Enclosure – Air	87 dB (A)
Standard Enclosure – Water	85 dB (A)
Low Sound Enclosure	86 dB (A)

Maximum Dimensions

Length	96"
Width	56"
Height	73"
Weight	3,975 lbs.

Technical Data Sheet - QSVI 100

General Specifications

Drive Motor	100 HP
Drive System	Direct
Inlet Capacity	1,500 ACFM
Maximum Operating Pressure (Continuous)	10" HgV (506 torr)
Minimum Operating Pressure (Continuous)	29.9" HgV (0.5 torr)
Base Pressure	29.9" HgV (0.5 torr)
Maximum Ambient Temperature	110°F
Minimum Ambient Temperature	45°F
Inlet Connection	8" NPT
Discharge Connection	6" NPT
Rotor Diameter	255 mm
Rotor Length	434 mm
Rotor Speed – Male	3,600 RPM
Rotor Speed – Female	2,400 RPM
Tip Speed	48.1 meters/sec.
Maximum Safe Speed	4,500 RPM
Intake Male Bearings	Cylindrical Roller Bearings (x 1)
Discharge Male Bearings	Tapered Roller Bearings (x 2)
Intake Female Bearings	Cylindrical Roller Bearings (x 1)
Discharge Female Bearings	Tapered Roller Bearings (x 2)
Displacement at Operating Speed	1,718 CFM
Volumetric Efficiency	86%

Electrical Data

Full Load Package BHP (Air-cooled)	93.6 BHP
Package Electrical Consumption – Air	76.1 KW
Full Load Package BHP (Water-cooled)	90.9 BHP
Package Electrical Consumption – Water	73.9 KW
Drive Motor Service Factor	1.15
Drive Motor Speed	3,600 RPM
Fan Motor BHP	2.7 BHP
Specific Power - Air-cooled	6.3 BHP/100
Specific Power - Water-cooled	6.1 BHP/100
Typical Standard Motor Efficiency	91.7%
Typical High Efficiency Motor	92.4%
Typical Premium Efficiency Motor	94.5%

Fluid System

Method of Lubrication	Pump
Fluid Flow	42 GPM
Total Fluid Capacity	45 Gallons
Reservoir Capacity	40 Gallons
Reservoir Volume	25.2 Cubic Feet
Discharge Temperature Range	170 to 245°F
HAT Shutdown Temperature	250°F
Fluid Carryover Rate (unloaded)	2 PPM
Standard Fluid	QUINSYN®

Air-cooled Data

Maximum Heat Rejection	3,183 BTU/min.
Cooling Fan Static Pressure	0.125" wc
Fan Motor	3 HP
Fan RPM	1,200
Fan Flow	10,000 CFM

Water-cooled Data

Water Flow – 50°F	6 gal./min.
Water Flow – 70°F	8 gal./min.
Water Flow – 90°F	13.3 gal./min.
Maximum Water Temp. Rise @ 1 GPM	63.5°F
Recommended Water Pressure	100 psig
Water Pressure Drop @ Max. Flow	7 psi
Water Connections	1.5" NPT

Sound Level

Unenclosed – Air	94 dB (A)
Unenclosed – Water	89 dB (A)
Standard Enclosure – Air	88 dB (A)
Standard Enclosure – Water	86 dB (A)
Low Sound Enclosure	86 dB (A)

Maximum Dimensions

Length	108"
Width	60"
Height	85"
Weight	6,300 lbs.

Technical Data Sheet – QSVI 200

General Specifications

Drive Motor	200 HP
Drive System	Direct
Inlet Capacity	3,000 ACFM
Maximum Operating Pressure (Continuous)	10" HgV (506 torr)
Minimum Operating Pressure (Continuous)	29.9" HgV (0.5 torr)
Base Pressure	29.9" HgV (0.5 torr)
Maximum Ambient Temperature	110°F
Minimum Ambient Temperature	45°F
Inlet Connection	8" NPT
Discharge Connection	8" SAE Flange
Rotor Diameter	321 mm
Rotor Length	546 mm
Rotor Speed – Male	3,600 RPM
Rotor Speed – Female	2,400 RPM
Tip Speed	60.5 meters/sec.
Maximum Safe Speed	4,500 RPM
Intake Male Bearings	Cylindrical Roller Bearings (x 1)
Discharge Male Bearings	Tapered Roller Bearings (x 2)
Intake Female Bearings	Cylindrical Roller Bearings (x 1)
Discharge Female Bearings	Tapered Roller Bearings (x 2)
Displacement at Operating Speed	3,377 CFM
Volumetric Efficiency	88.8%

Electrical Data

Full Load Package BHP (Air-cooled)	190.7 BHP
Package Electrical Consumption – Air	152.3 KW
Full Load Package BHP (Water-cooled)	186.2 BHP
Package Electrical Consumption – Water	149.3 KW
Drive Motor Service Factor	1.15
Drive Motor Speed	3,600 RPM
Fan Motor BHP	4.5 BHP
Specific Power - Air-cooled	6.4 BHP/100
Specific Power - Water-cooled	6.3 BHP/100
Typical Standard Motor Efficiency	93.1%
Typical High Efficiency Motor	93.6%
Typical Premium Efficiency Motor	94.1%

Fluid System

Method of Lubrication .... Pump
Fluid Flow .... 42 GPM
Total Fluid Capacity .... 45 Gallons
Reservoir Capacity .... 40 Gallons
Reservoir Volume .... 25.2 Cubic Feet
Discharge Temperature Range .... 170 to 245°F
HAT Shutdown Temperature .... 250°F
Fluid Carryover Rate (unloaded) .... 2 PPM
Standard Fluid .... QUINSYN®

Air-cooled Data

Maximum Heat Rejection .... 3,183 BTU/min.
Cooling Fan Static Pressure .... 0.125" wc
Fan Motor .... 3 HP
Fan RPM 1,200
Fan Flow .... 10,000 CFM

Water-cooled Data

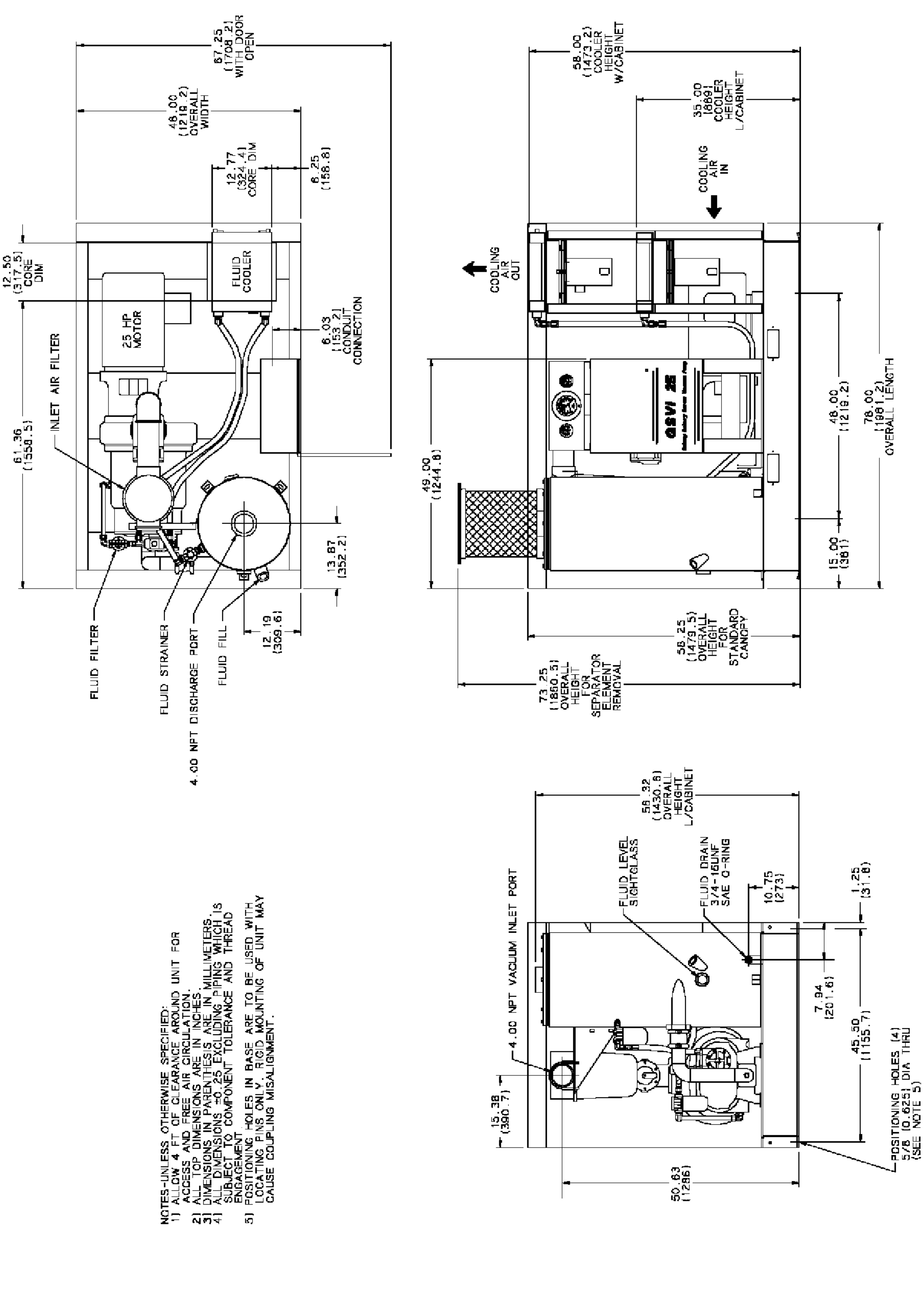
Water Flow – 50°F .... 6 gal./min.
Water Flow – 70°F .... 8 gal./min.
Water Flow – 90°F .... 13.3 gal./min.
Maximum Water Temp. Rise @ 1 GPM .... 63.5°F
Recommended Water Pressure .... 100 psig
Water Pressure Drop @ Max. Flow .... 7 psi
Water Connections .... 1.5" NPT

Sound Level

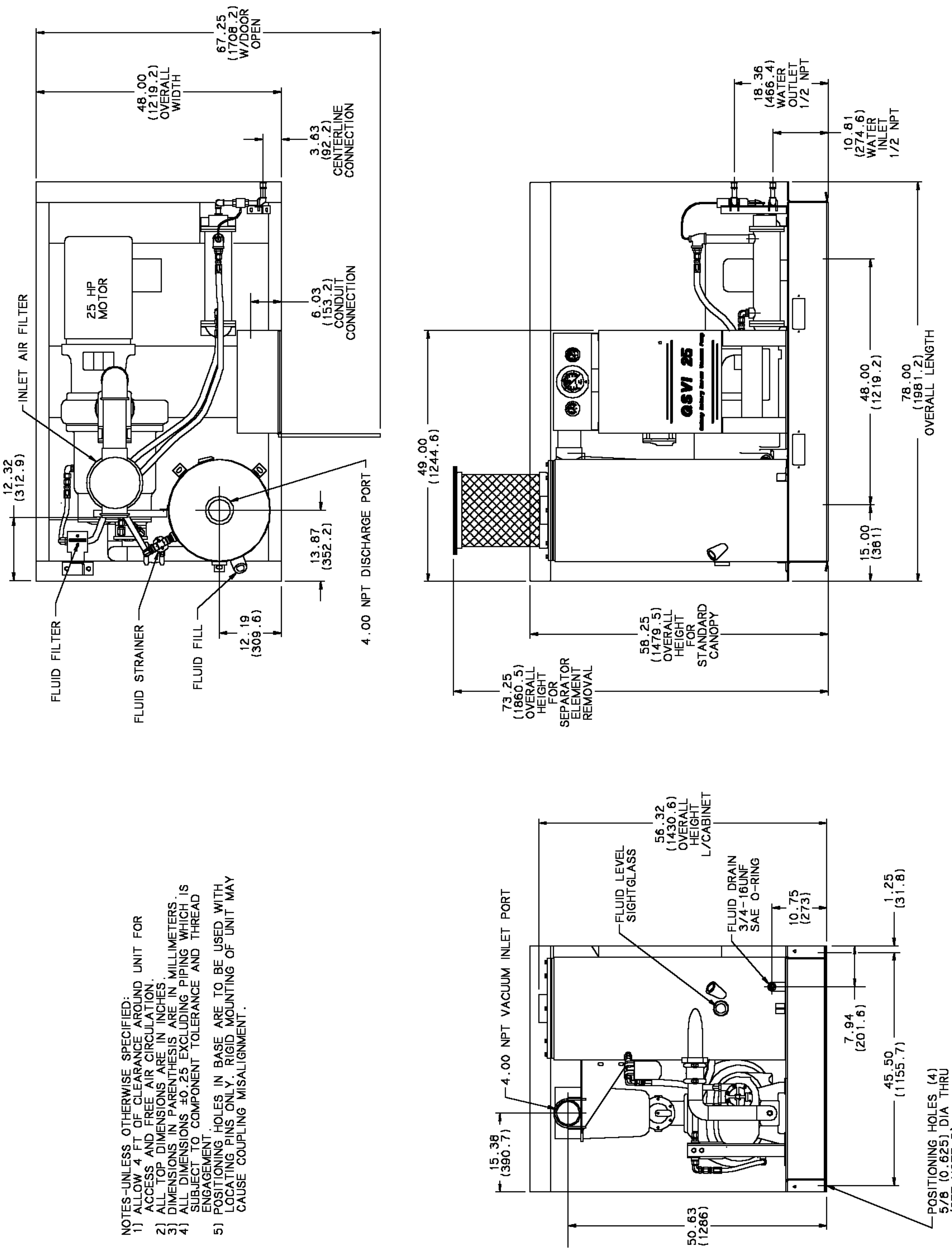
Unenclosed – Air .... 94 dB (A)
Unenclosed – Water .... 89 dB (A)
Standard Enclosure – Air .... 88 dB (A)
Standard Enclosure – Water .... 86 dB (A)
Low Sound Enclosure .... 86 dB (A)

Maximum Dimensions

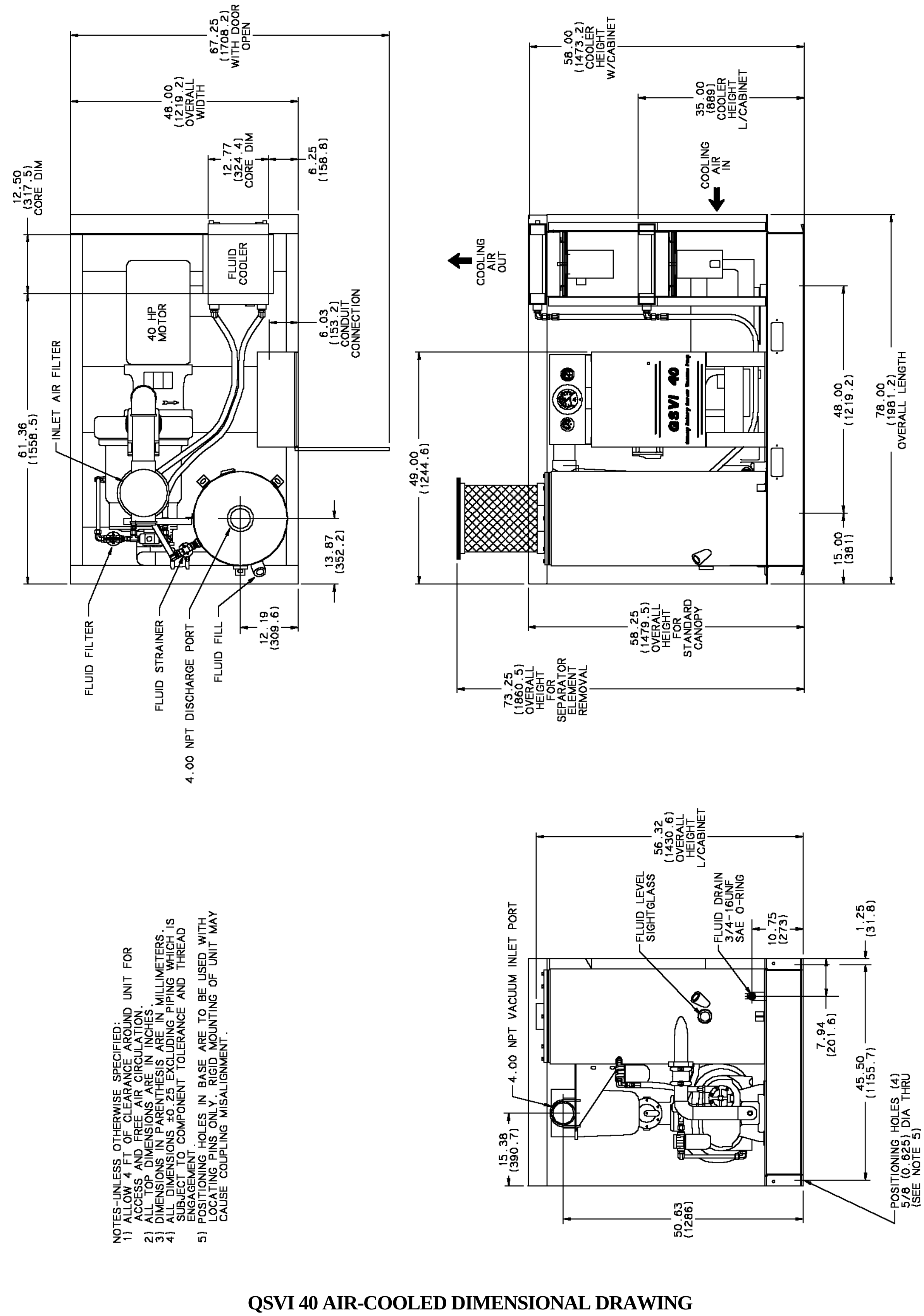
Length .... 108"
Width .... 60"
Height .... 85"
Weight .... 6,300 lbs.



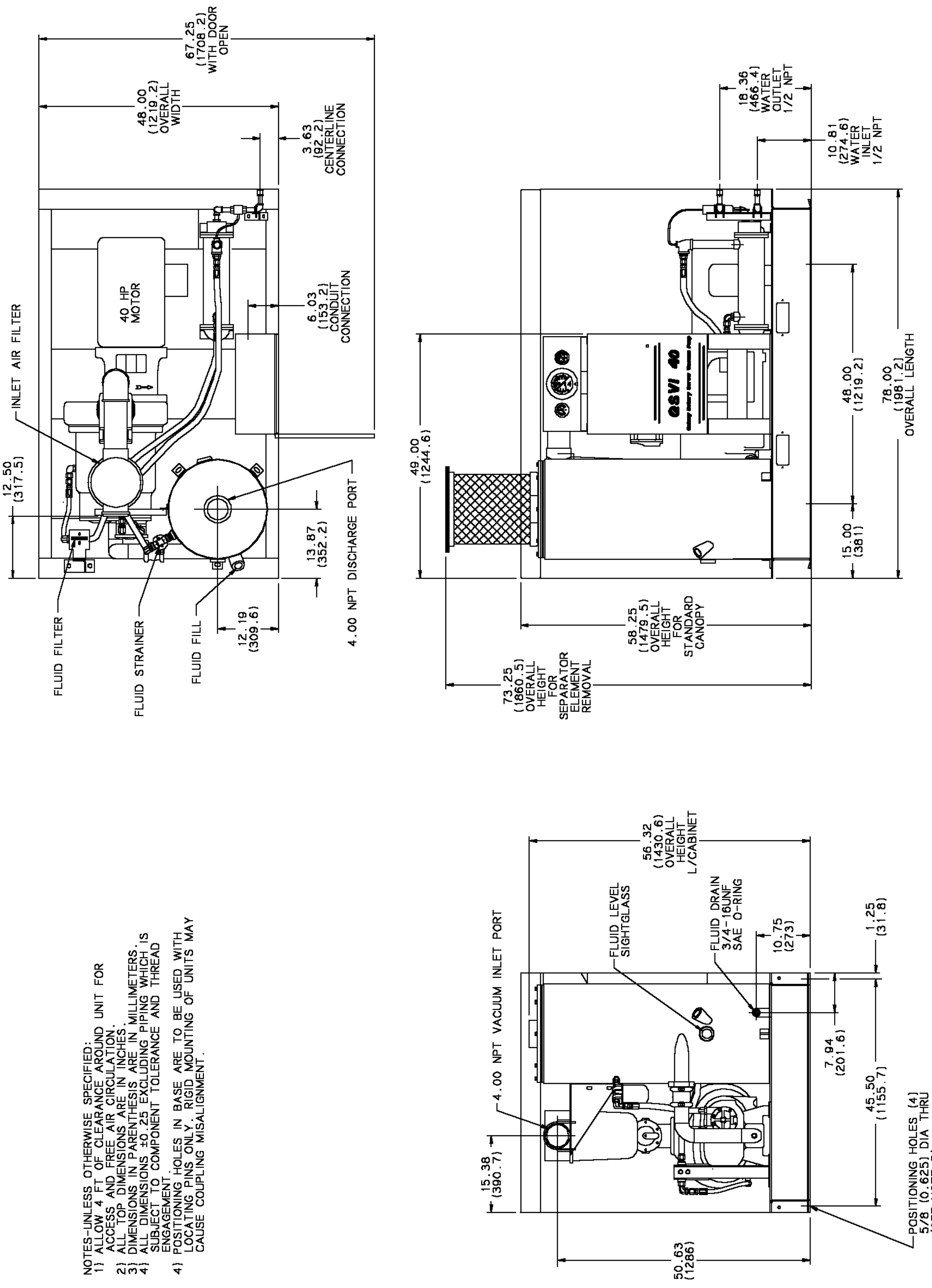
QSVI 25 AIR-COOLED DIMENSIONAL DRAWING



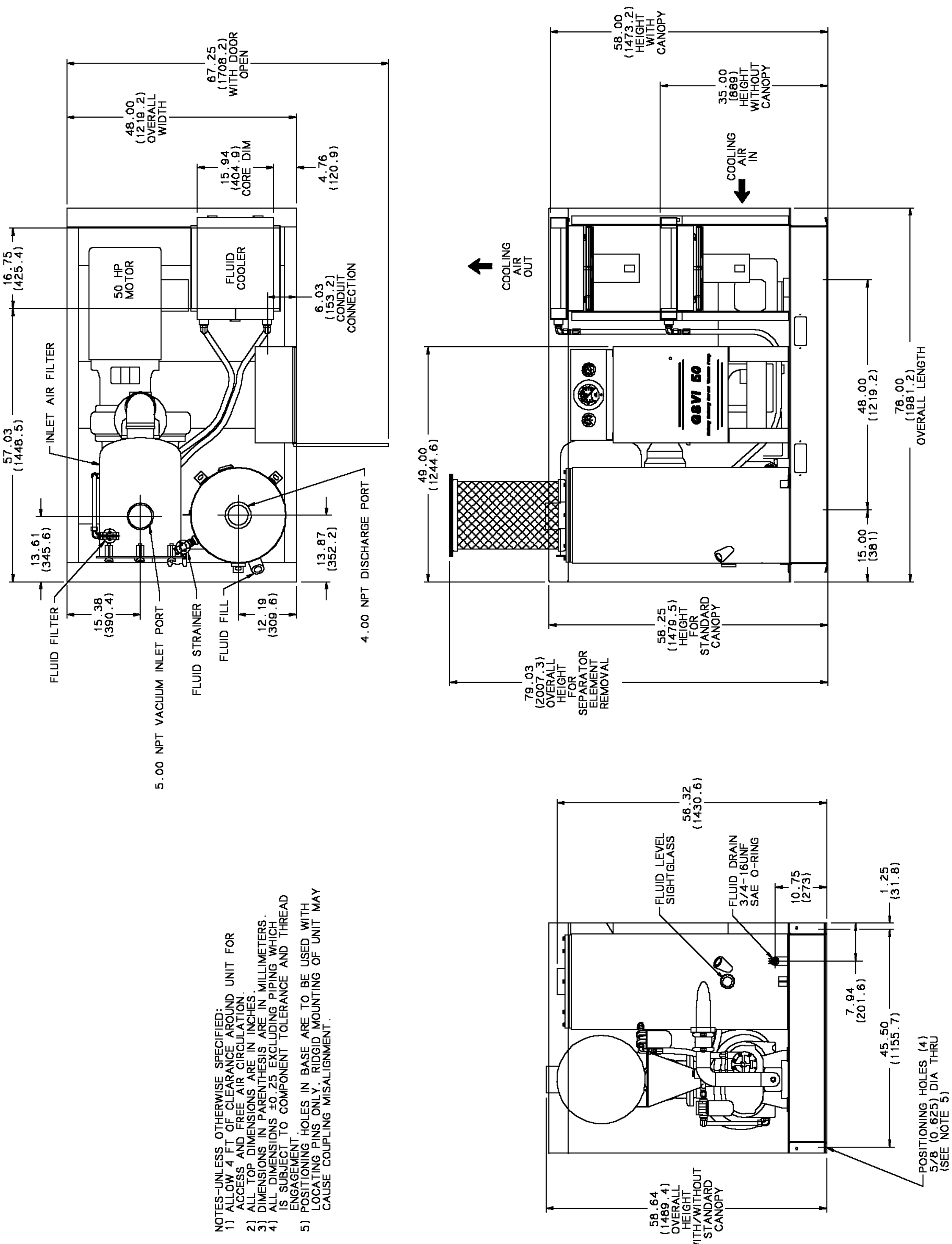
QSVI 25 WATER-COOLED DIMENSIONAL DRAWING



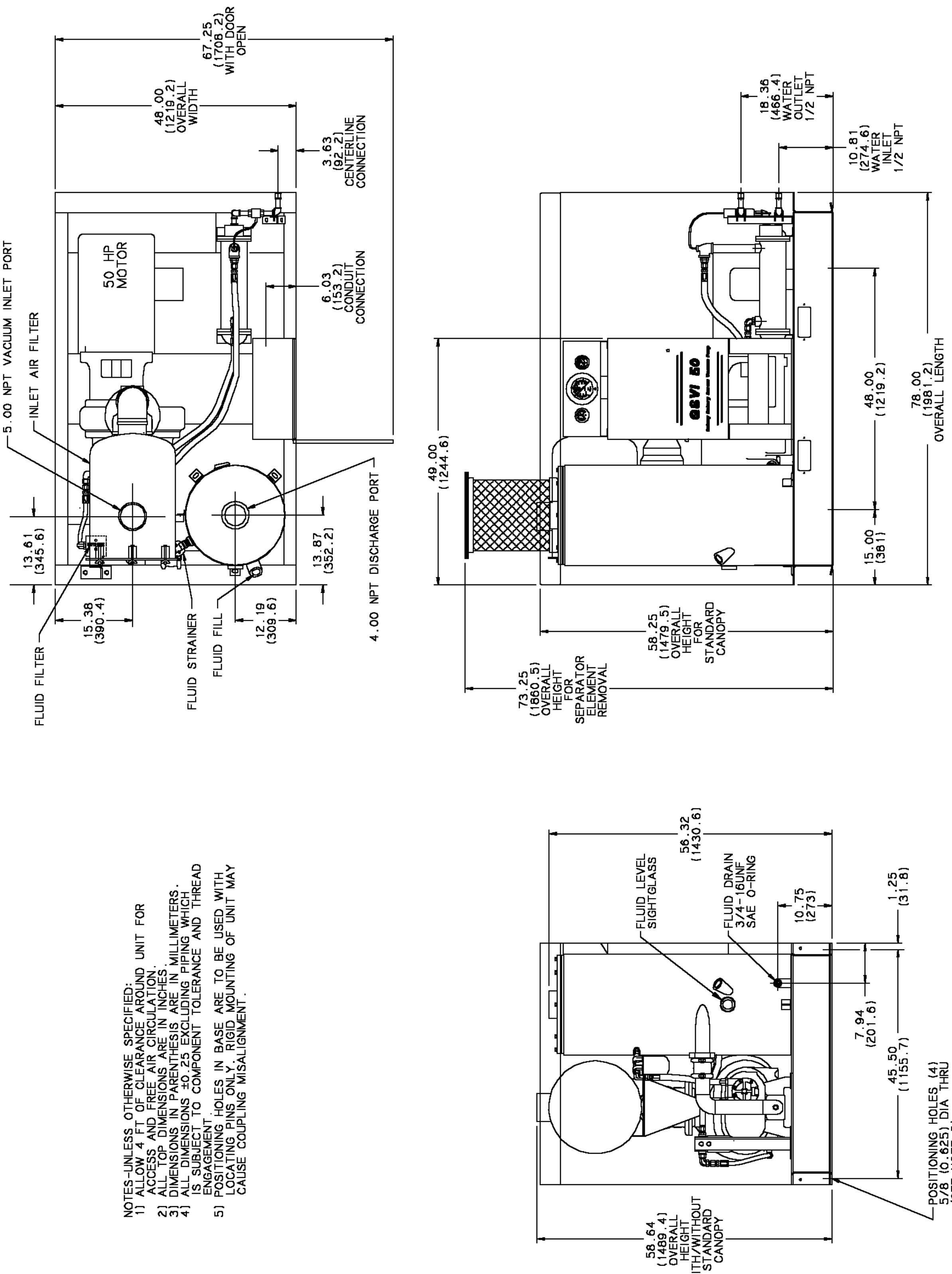
QSVI 40 AIR-COOLED DIMENSIONAL DRAWING



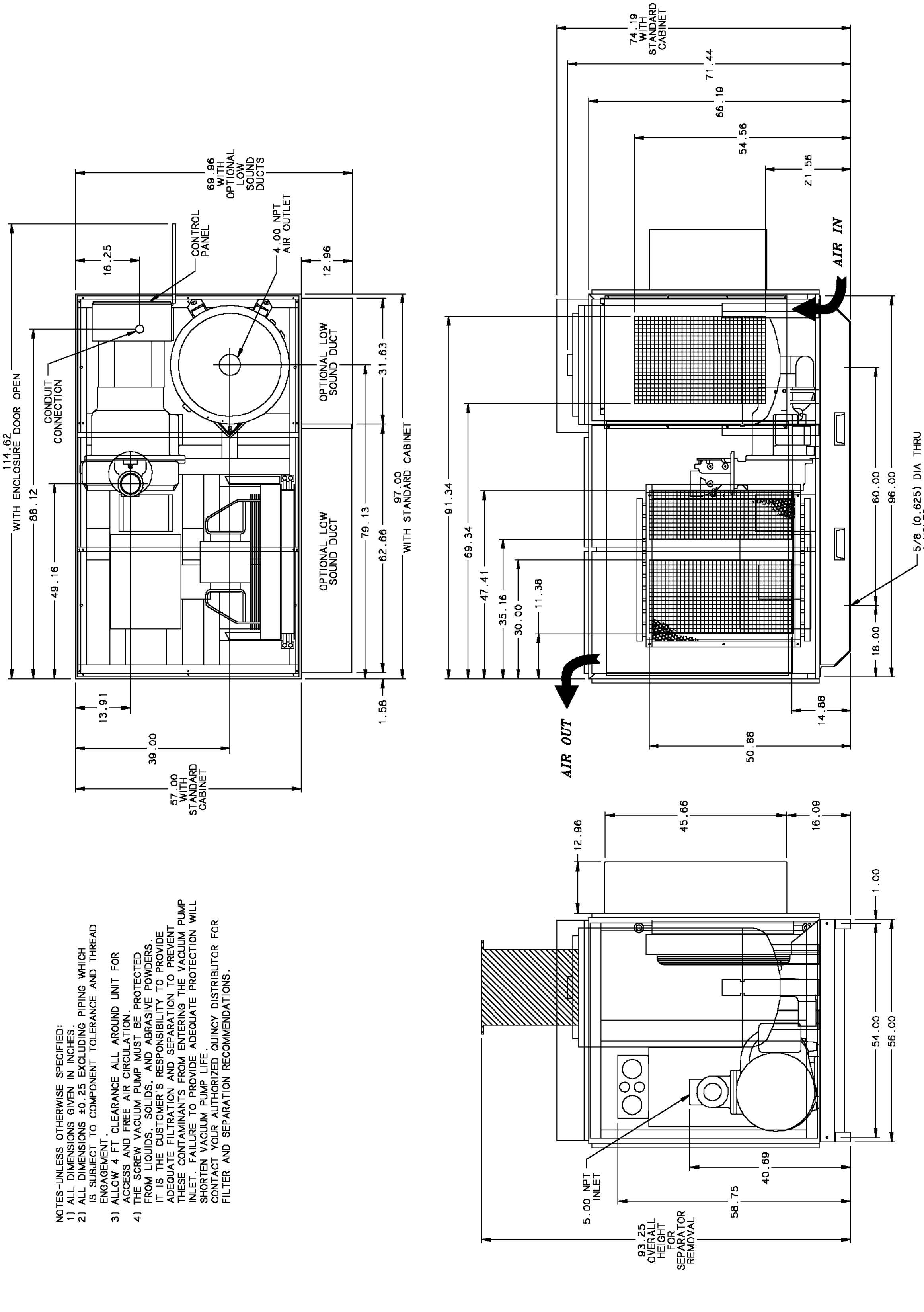
QSVI 40 WATER-COOLED DIMENSIONAL DRAWING



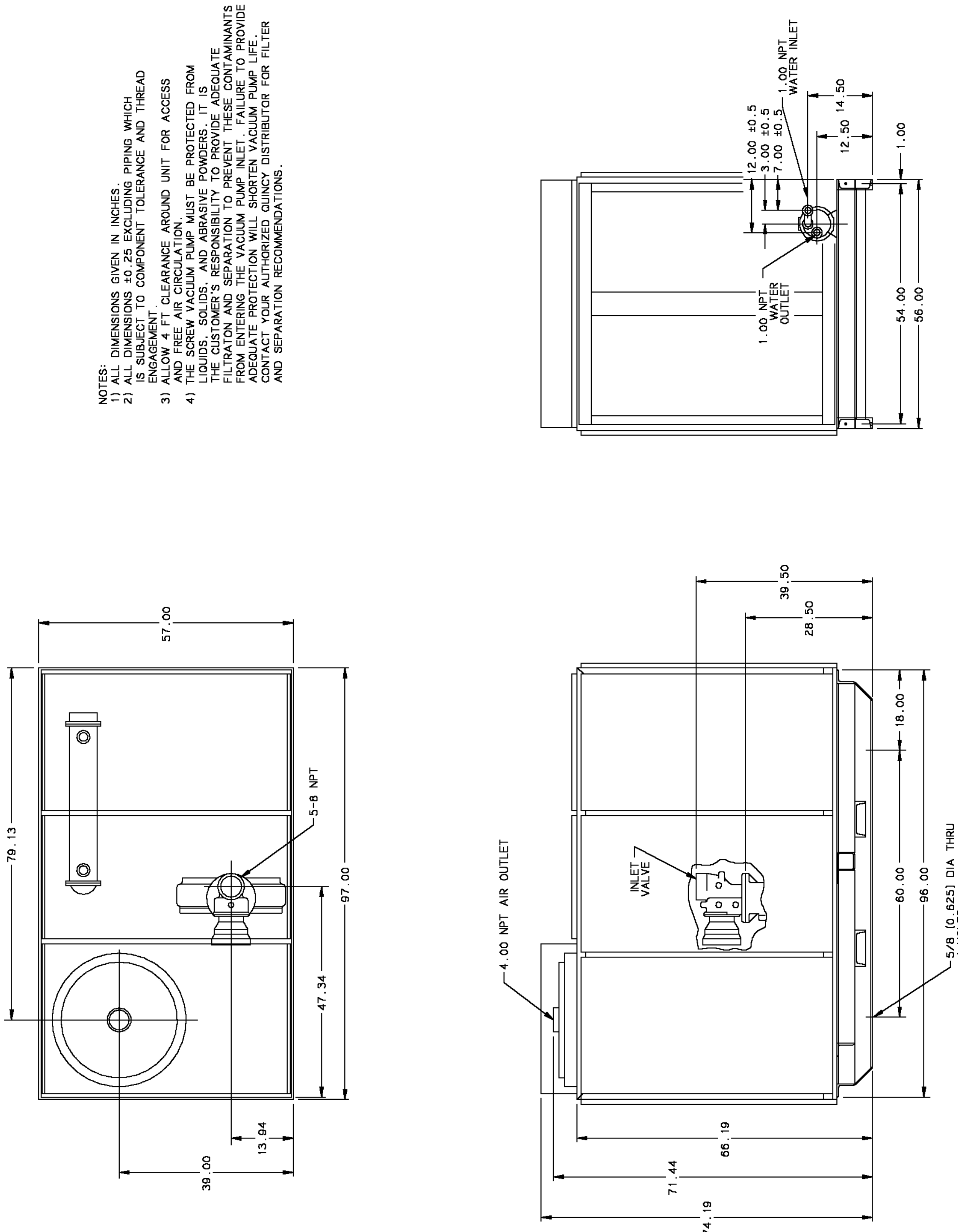
QSVI 50 AIR-COOLED DIMENSIONAL DRAWING



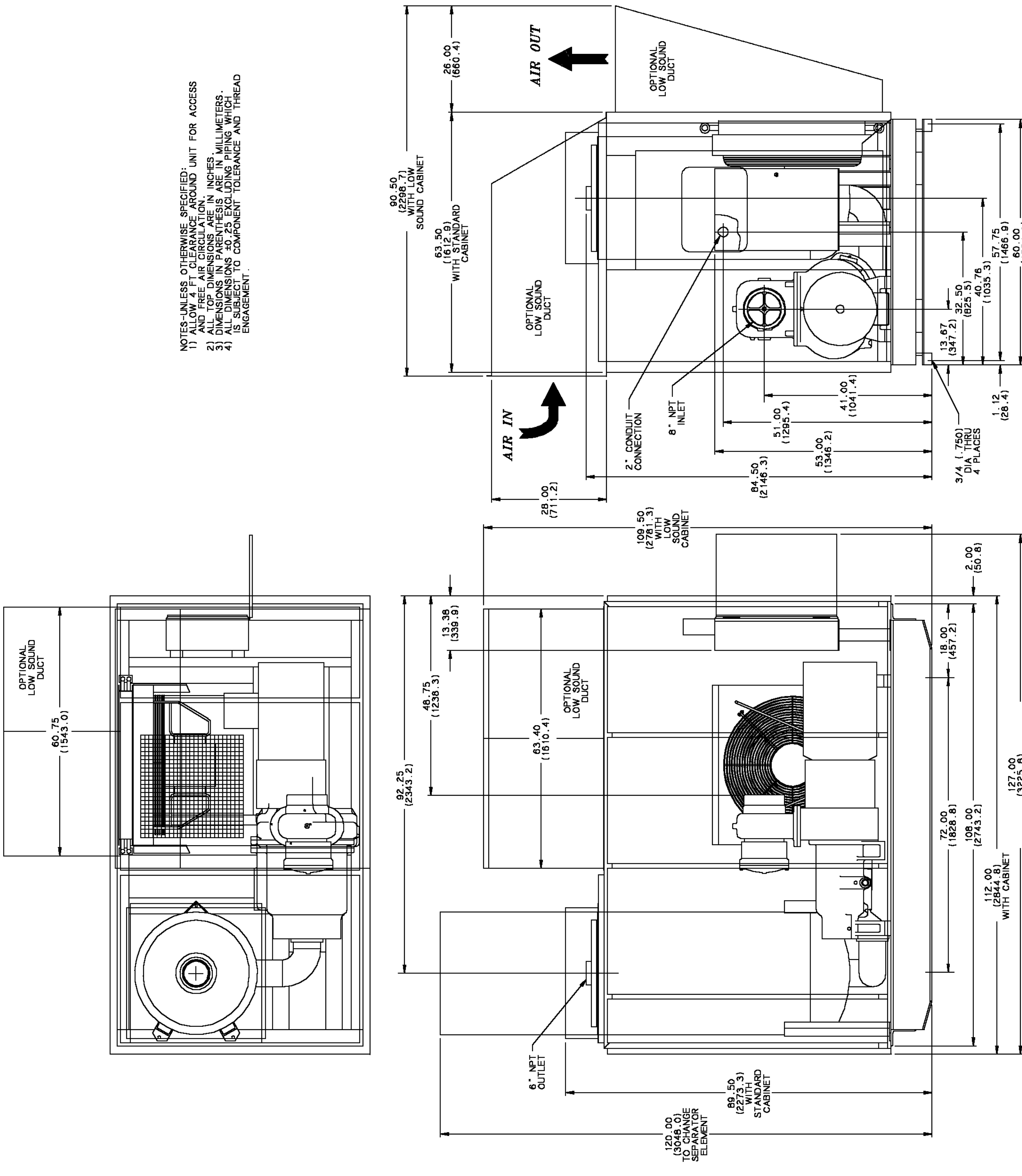
QSVI 50 WATER-COOLED DIMENSIONAL DRAWING



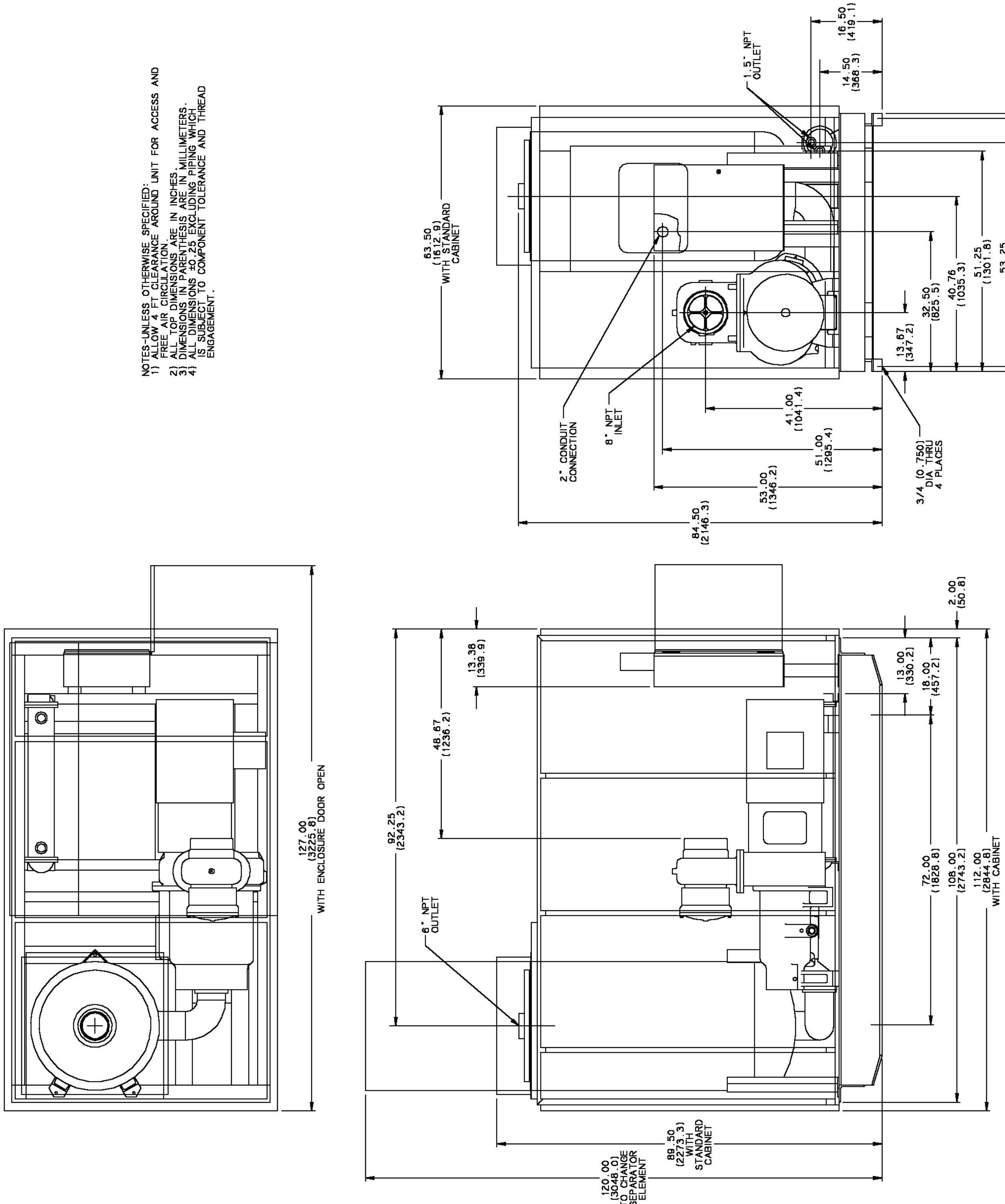
QSVI 75 AIR-COOLED DIMENSIONAL DRAWING



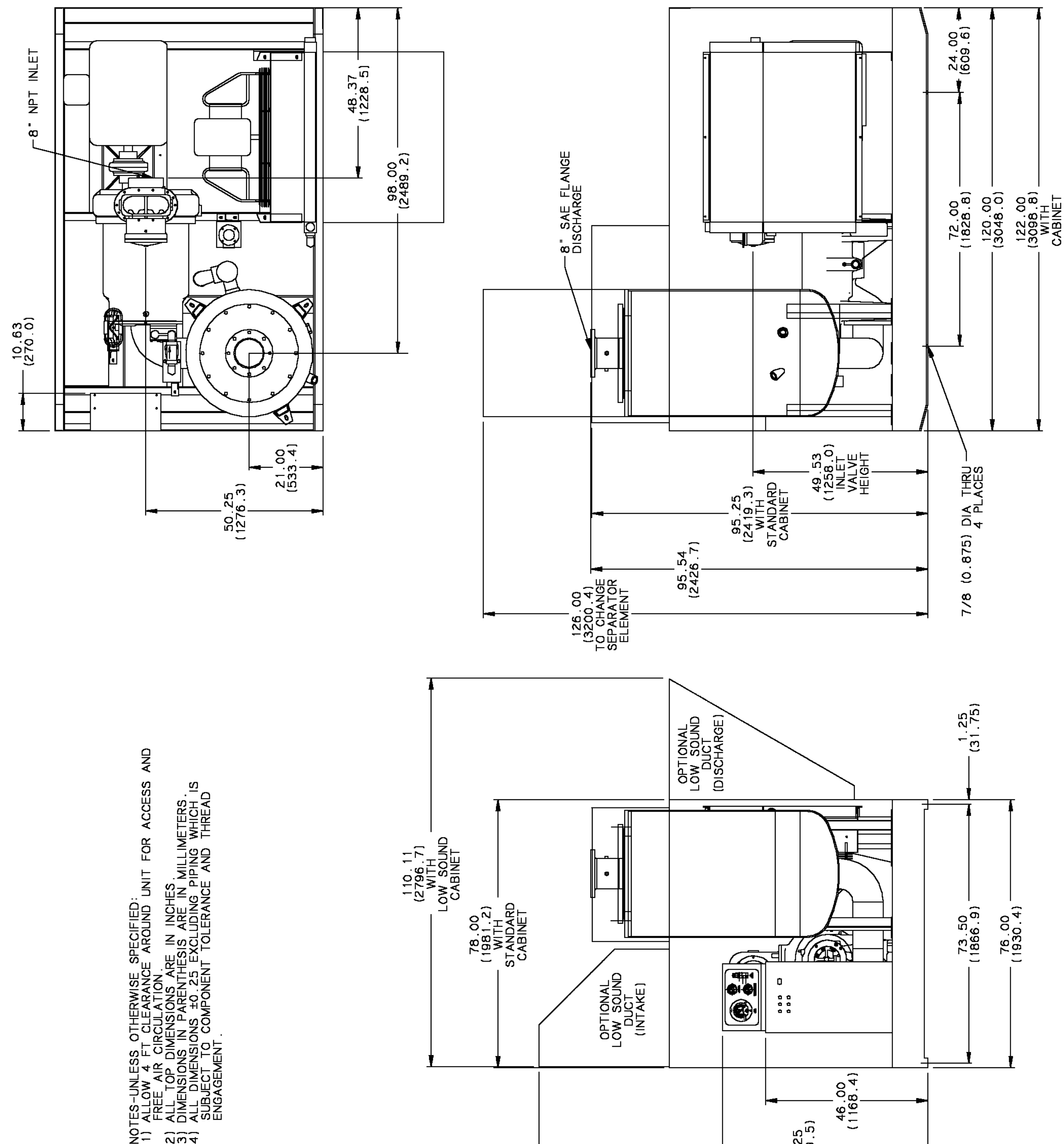
QSVI 75 WATER-COOLED DIMENSIONAL DRAWING



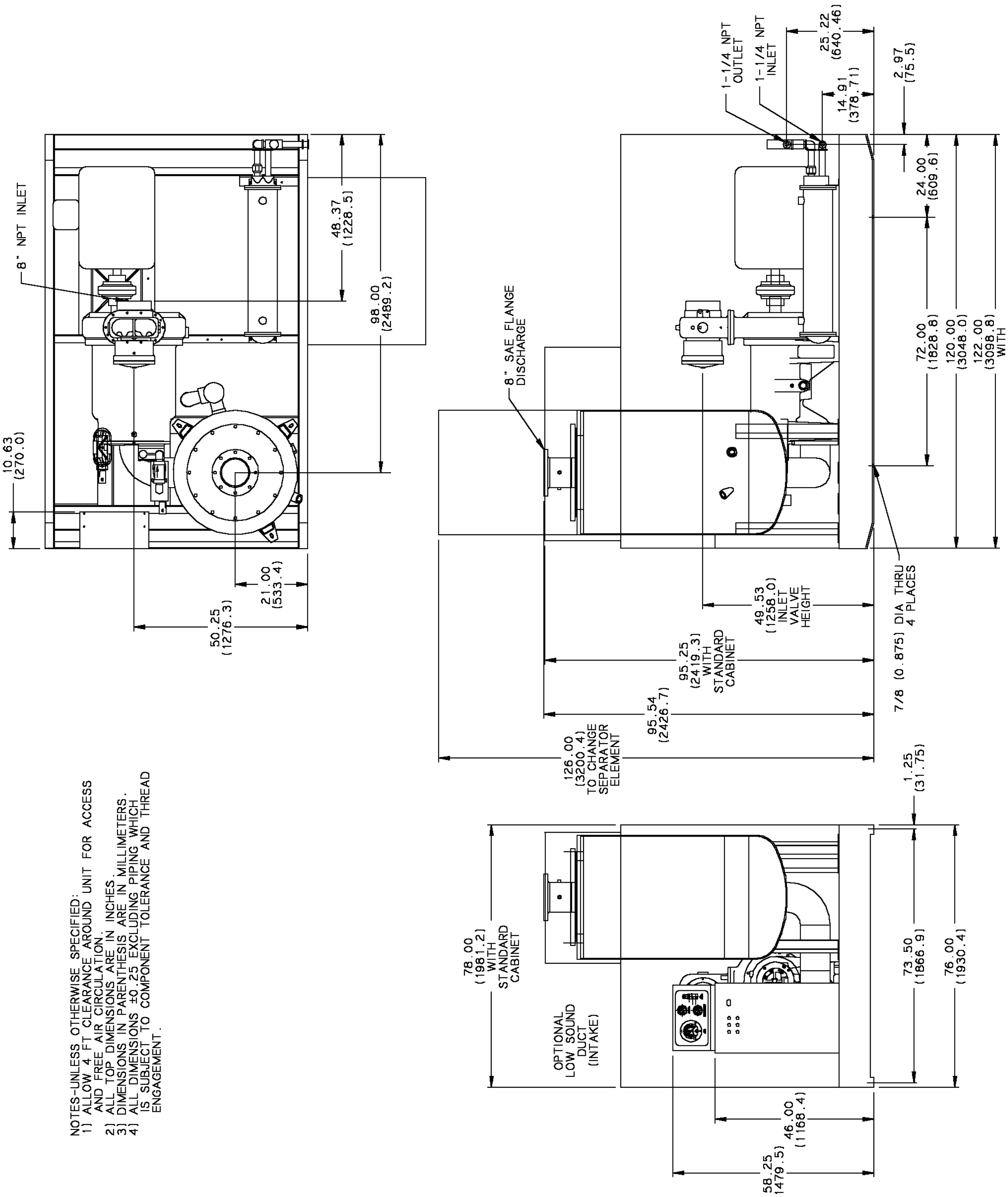
QSVI 100 AIR-COOLED DIMENSIONAL DRAWING



QSVI 100 WATER-COOLED DIMENSIONAL DRAWING



QSVI 200 AIR-COOLED DIMENSIONAL DRAWING



QSVI 200 WATER-COOLED DIMENSIONAL DRAWING

Section 1

* **Safety Precautions**
* **Installation Hints**

Safety Precautions and Warnings

Listed are some, but not all, cautions that must be observed with vacuum pumps and compressed air systems . **Failure to follow any of these warnings may result in death, serious injury and property damage and/or vacuum pump damage.**

- This vacuum pump is designed for use in the compression of normal atmospheric air only. No other gases, vapors or fumes should be exposed to the vacuum pump intake or processed through the vacuum pump.
- Disconnect and lock out all power supplies to the vacuum pump plus any remote controllers prior to servicing the unit.
- Relieve all pressure internal to the vacuum pump prior to servicing.
- Do not change the pressure setting of the relief valve, restrict the function of the relief valve or replace the relief valve with a plug. Over pressurization of system or vacuum pump component can occur, resulting in death, serious injury and property damage.
- Never use a flammable or toxic solvent for cleaning the air filter or any parts.
- Do not attempt to service any part while the vacuum pump is operating.
- Do not remove any guards or canopy panels while the vacuum pump is operating.
- Observe gauges daily to ensure vacuum pump is operating properly.
- Follow all maintenance procedures and check all safety devices on schedule.
- Never disconnect or tamper with the high air temperature (HAT) switch.
- Use the correct fluid at all times.
- Take extreme care in selecting the proper inlet filtration system for the vacuum pump. Liquids, solids and abrasive powders must be prevented from entering the vacuum pump to prevent mechanical failure or reduced life.
- Alterations must not be made to this vacuum pump without Quincy Compressor approval. Use of parts other than those approved by Quincy for alterations, repair or servicing may create hazardous conditions and will void the warranty.

Installation Hints for Vacuum Service

- The following items should be used as a guide for the installation of QSVI vacuum pumps. The list is not inclusive of every variable possible in the placement of a vacuum pump. Every vacuum pump installation is unique and cm must be exercised in the placement of each pump. If you are unsure of any installation variable, please consult the factory before start-up.
- Make sure all connections in piping from the pump to the chamber or use point are leak tight and secure. Leaks add load to the vacuum pump and decrease both available pump capacity and attainable base pressure.
- All piping should be as straight as possible with non-restrictive diameters. Elbows, bends, tees, and tapers should be used only as absolutely necessary.
- As a rule of thumb, the inlet diameter of the pump should be maintained as far into the process as possible. Consult the factory for piping recommendations.
- Keep plumbing and system free of fluids, water, dirt, and debris that are not part of the process. These can cause obstructions in the vacuum flow through the piping and can reduce available pumping capacity.
- All welds should be vacuum compatible.
- The work chamber should be clean, dry and empty of contamination not process related.

- **The fluid in the vacuum pump is the most critical component.** Most vacuum pump failures are the result of contaminated or deteriorated fluid. Follow recommended fluid change schedules in normal applications (air) and watch closely the condition and appearance of the fluid in chemical or harsh applications. Use the Quincy fluid analysis program to monitor the condition of the fluid. Leak check the system by pumping down to the lowest attainable pressure and then valve off the vacuum pump. Monitor the pressure rise over a period of five or ten minutes and record this rate of rise for future reference. This value is a good toot to have if you believe there are pump or system problems. Compare new value with the original.

- **Inlet filtration should be installed an every pump.** The potential for particulate contamination in rough vacuum applications is significant. The particle micron retention of the filter element should be smaller than the smallest possible particle load. Also, the inlet filter should be mounted in such a way as to prevent particulate from falling into the inlet of the vacuum pump during cleaning or changing of the filter element.

- Be sure there is no back pressure on the exhaust line of the vacuum pump. Vacuum pumps are not specifically designed to compress exhaust gas above atmospheric pressure, although they can be adapted to do so with some modification. Significant back pressure can overheat the pump and cause motor overloading.

- When pumping condensable vapors and particulates, more frequent fluid changes are required to maintain pump life. **Consult factory about types and styles of filtration units.**

- Maintain system seals on a regular basis. Tom 0-ring and gaskets should be replaced immediately. All flange faces should be free of dirt, lubricant, and scratches.

- Do not use collapsible tubing to plumb the vacuum system. Any restrictions in line diameter caused by tube collapse will reduce available pumping capacity.

- In applications where auxiliary exhaust demisters are used, back pressure in the reservoir should not exceed 3 psig under normal operating conditions.

- Vacuum rated isolation valves should be used for vacuum applications. Compressed air valves and vacuum valves differ in their sealing characteristics and compressed air valves may leak in vacuum applications.

- In multiple pump installations, check valves should be installed in the inlet piping. This will prevent fluid from being drawn from an 'off' unit into an operating unit. Check valves should be properly sized so as not to "chatter" during operation. Spring loaded, elastomer seated check valves are recommended. These should be mounted in a horizontal flow orientation.

- If there is a potential for liquids to be occasionally drawn into the vacuum system, a receiver can and should be used to separate these liquids from the incoming air stream. In applications where there is significant amounts of liquid, consult the factory.

- Vacuum gauge ports and gauges should be installed in each log of central vacuum piping. This provides a diagnostic tool for troubleshooting both the application and any pump related problems.

- Continuous operation from atmospheric pressure to 10" HgV in not recommended for QSVI vacuum pumps. In this vacuum range, there is not enough differential pressure to scavenge the separated fluid from the separator element back to the inlet valve. This results in high fluid carryover. There are modifications that can be made to the vacuum pump to partially alleviate this condition. Please consult the factory for details. Intermittent operation in this vacuum range is acceptable.

- Any applications involving gases or vapors other than air should be approved by Quincy prior to start-up. These gases or vapors can react with the fluid or materials of construction of the vacuum pump and cause premature failures.

- Any vacuum pump placed in an application with inlet gas stream temperatures above 120° should be approved by Quincy prior to start-up.

- Quincy QSVI Rotary Screw Vacuum Pumps, with or without enclosures, are designed for indoor installation only.

Section 2 - Description

* **QSVI Vacuum Pumps**
* **Principles of Vacuum Pump Operation**
* **Air Flow**
* **Fluid Flow & Cooling System**
* **Fluid Coolers**
* **Air/Fluid Reservoir & Air/Fluid Separator Element**
* **Auto Dual with Modulation**
* **Auto Demand – Optional**
* **Electrical System**
* **Indicators & Gauges**

QSVI Series Vacuum Pumps

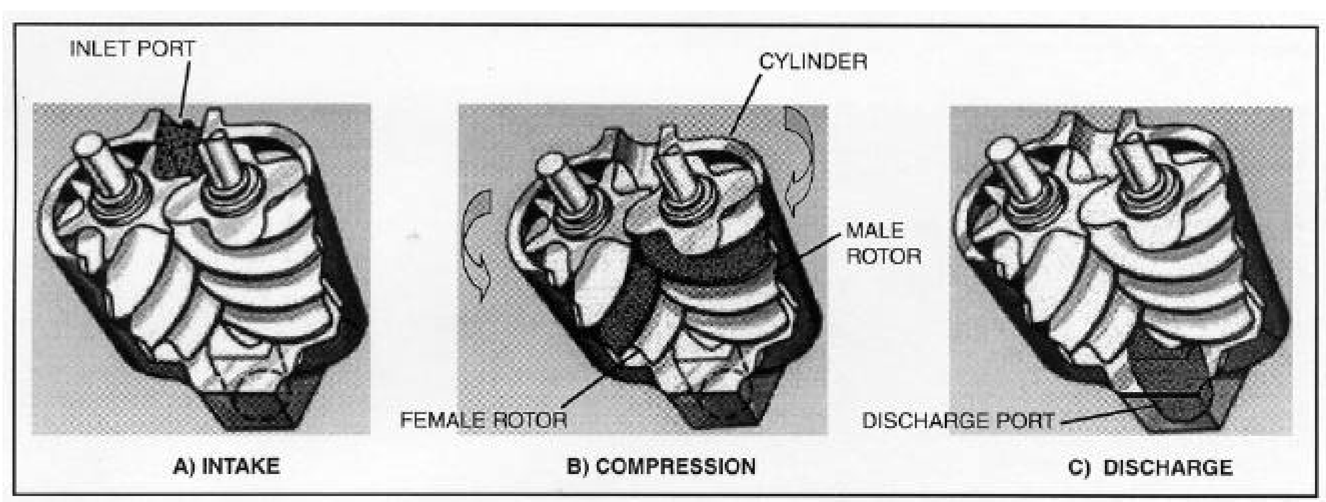
The QSVI line of rotary screw vacuum pumps are single stage, positive displacement, fluid flooded, rotary screw type units. They consist essentially of two rotors that resemble worm gears. The male rotor is direct driven through a flexible coupling on all QSVI's except the QSVI 40. The male rotor has four lobes that mesh with six grooves in the female rotor. Both rotors are contained in a rotor housing that has two parallel axis and adjoining bores. There is an air inlet part located at the power input end of the vacuum pump and a discharge port located at the opposite end. Both rotors are mounted in anti friction bearings at both the suction and discharge ends. The electric motor, airend and associated equipment are mounted on a welded structural frame.

Radial loads are carried on cylindrical roller bearings on the power or suction end of the vacuum pump. Radial and axial loads are carried on tapered roller bearings at the discharge end of the vacuum pump.

Fluid circulation is maintained by an external fluid pump directly driven by the rotor.

Principles of Vacuum Pump Operation

As the rotors turn, air is drawn into the rotor housing through the inlet port. This volume of trapped air extends the entire length of the two rotors initially and is prevented from escaping by the unported area of the rotor housing wall. As rotation continues, the air at the inlet side is carried to the discharge side and forced out the discharge port, the discharge pipe, and into the air/fluid reservoir where it is discharged to the atmosphere through a fluid separator element. The compression cycle of a rotary vacuum pump is a continuous process from intake to discharge. The airend consists of two rotors in constant mesh, housed in a cylinder with two parallel adjoining bores. All parts are machined to exacting tolerances.



Compression Cycle

Air Flow

During pump operation, a vacuum is produced at the pump inlet. Air entering flows through the air inlet valve into the rotor housing where it is compressed, then discharged within the air/fluid reservoir. The air discharged from the pump contains fluid which is separated from the air as it passes through a fluid separator located within the air/fluid reservoir. The gas, now at near atmospheric pressure, is exhausted through the discharge port on the reservoir housing. The air/fluid reservoir is equipped with a safety valve to protect the system in the event of excessive restriction to the air flow in the separator element or the discharge system.

Fluid Flow & Cooling System

The fluid in the system serves three functions: it lubricates the bearings and the rotors, it seals rotor clearances to improve efficiency, and it removes heat from the gas as the gas is being compressed, thus lowering the discharge temperature.

Fluid is pumped out of the air/fluid reservoir through a fluid filter and then into the airend. In the airend, some of the fluid is diverted directly to the bearings through internal passages to insure positive lubrication to the bearings, the remainder of the fluid is injected into the early stage of the evacuation cycle to seal clearances and lubricate the rotors.

Fluid Coolers

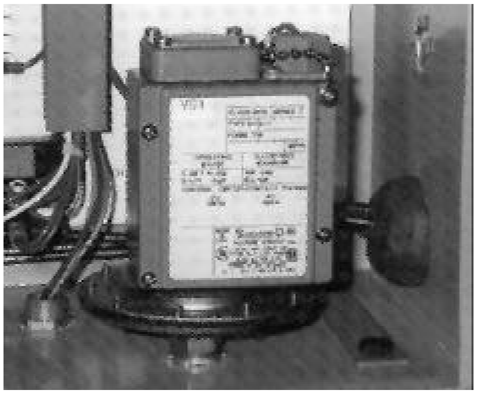
Removal of the heat from the fluid is achieved with either an air-cooled or a water-cooled heat exchanger. The air-cooled fluid cooler is a finned tube unit. A continuous supply of cool air is forced across the fins and tubes by a fan mounted on a separate drive motor. Minimum fluid injection temperature is controlled by a thermal mixing valve which permits a controlled amount of hot fluid to mix with the cooled fluid before entering the vacuum pump. The water-cooled fluid cooler is of shell and tube construction. Minimum fluid injection temperature is controlled by a water regulating valve which senses the fluid temperature entering the vacuum pump and regulates the cooling water flowing through the fluid cooler.

Air/Fluid Reservoir & Air/Fluid Separator Element

The air/fluid reservoir serves as a fluid reservoir and contains the air/fluid separator element. The discharge pipe from the vacuum pump enters the reservoir at a point below the normal fluid level and then turns upward inside the reservoir. The air/fluid mixture is discharged into the reservoir above the fluid level and impinges on the underside of the separator element. The air/fluid reservoir is provided with a fluid filler opening and fluid level gauge.

As the air/fluid mixture impinges on the bottom of the fluid separator element, most of the fluid separates from the air and drops to the bottom of the reservoir. The remaining fluid, suspended in the air stream, passes through the media of the separator element and is removed from the discharge air stream. The fluid is then returned to the vacuum pump by means of a scavenging line connected from the bottom of the air/fluid separator element to the inlet housing.

It should be noted that the separator element is sized larger for a vacuum pump than it would be for the equivalent displacement compressor, and only Quincy approved separator elements should be used.



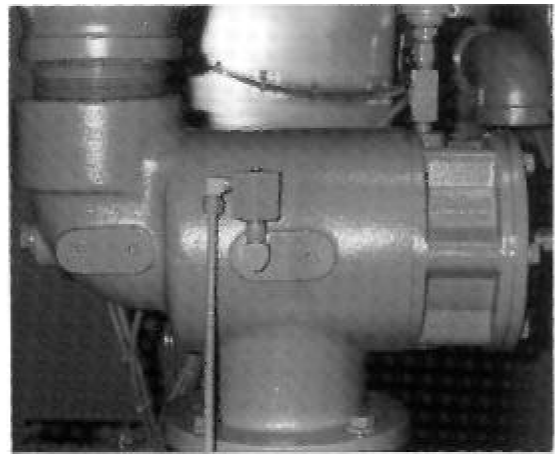
Vacuum Control System

Assume the control system is set to operate between 20" to 23" HgVand is in the power-off state. When the start button on the vacuum pump is activated, two operations occur. First, electric power is routed through normally closed contacts on the vacuum switch to the normally open solenoid valve causing it to shift closed. Second, the inlet valve permits air to flow from the vacuum system to the vacuum pump inlet where it is compressed to atmospheric pressure and discharged through the air/fluid reservoir.

The control system remains in this state until the vacuum level in the plant system increases to 20” HgV, at which point the vacuum regulator permits more vacuum to be applied to the inlet valve air cylinder causing it to gradually close the inlet valve until the amount of air permitted into the vacuum pump is equal to the amount of air being leaked into the plant vacuum system through use. If vacuum system usage continues to decrease causing the level to increase to 23” HgV, the vacuum switch trips, opening the normally closed contacts and stopping power flow to the solenoid. This causes the solenoid to shift to the normally open position. This permits enough air flow (regulated by a 0.033" orifice) from the inlet valve air cylinder through the solenoid to the vacuum pump inlet to close the inlet valve completely and keeps the vacuum level in the system from rising above the maximum set point of 23”HgV.

The 0.025" orifice is sized to permit the air cylinder to open when the vacuum signal from the vacuum regulator or solenoid valve ceases, while still restricting air flow into the control piping network to a level such that the vacuum regulator remains effective during operation. The 0.033" orifice is sized to work together with the 0.025" orifice such that when the solenoid valve opens, only enough vacuum is provided at the air cylinder to close it. This enhances the responsiveness of the control system. The 0.078" orifice keeps the air cylinder from oscillating.
The vacuum pump is now running with a fully closed inlet valve. When vacuum level in the system drops to the lower set point, 20" HgV in this case, the switch closes, shifting the solenoid valve to the closed position and permitting the inlet valve to open. This cycle continues as required by vacuum system usage, and a vacuum level of 20" to 23" HgV is maintained in the vacuum system.
If the vacuum pump stops during operation, either manually from the panel, or automatically due to a high temperature condition, the *inlet valve will not act as a check valve* to prevent air from entering the vacuum system through vacuum pump.

What has been described here is the operation of the control system over a 20" to 23 ' HgV vacuum range, with lower set point of 20' HgV, an upper set point of 23' HgV, and a 3' HgV differential The control system is designed to operate with an upper set point of 10" HgV to 29.6" HgV at sea level barometer (29.92 in. Hg).



Auto Dual with Modulation

The Auto/Dual system offers two choices of controlling the Quincy QSVI Vacuum pump. With the selector switch in the “Continuous Run” position, the vacuum pump operates continuously matching demand with a differential pilot valve controlling the position of the inlet valve. When maximum system vacuum is reached, the vacuum switch opens, closing the inlet valve and, although the vacuum pump continues to run, no more vacuum will be produced. When the Auto Dual mode is selected, the vacuum pump will also perform as above, however, a solid state timer is activated when the vacuum switch contacts open. This timer is adjustable within a ten (10) minute range. When the timer reaches the end of its delay, the vacuum pump will automatically shut down and assume a "stand-by" mode. Upon a drop in vacuum pressure, the vacuum switch contacts close, restarting the vacuum pump automatically. The timer should be set, during unit start-up, for a minimum of ten (10) minutes.

Should the plant vacuum level drop causing the vacuum switch contacts to close during the unloaded/timing mode, the vacuum pump will continue to operate, resetting the timer and instructing the inlet valve to re-open.

When operation in the Auto mode allows the vacuum pump to start and stop more than five (5) time per hour, select the Continuous Run mode and allow the unit to operate continuously. Excessive motor starts will shorten motor life.

! WARNING !

Never assume it is safe to work on the unit because it is not operating. It may be in the automatic stand-by mode and could restart at any time. Follow all safety instructions in the "Preparing for Maintenance" or "Service" chapters.

Auto/Demand - Optional

The QSVI vacuum pump with Auto/Demand controls accommodate external control signals from an optional Quincy Demand-A-Matic multiple vacuum pump controller. With the selector switch in the Local mode, the vacuum pump will operate exactly as described in the previously mentioned Auto Dual description.

In the Remote mode, the vacuum pump's vacuum switch is bypassed in favor of the Demand-A-Matic multiple vacuum pump controller. The vacuum pump will start, draw vacuum, unload and shutdown on time delay as determined by the Demand-A-Matic controller.

Electrical System

A wiring diagram is included in the control panel on all Quincy QSVI vacuum pumps.

NOTE:
Due to continuing product improvements and updates, it is suggested that the wiring diagram included in the control panel be used when servicing the electrical controller.

NOTE:
Standard drive motors are open drip proof with a maximum ambient temperature rating of 104°F. They are not suitable for salt laden, corrosive, dirty, wet or explosive environments.

The QSVI series vacuum pumps utilize 460V incoming power through an across-the-line magnetic starter. A transformer in the control panel reduces this voltage to 120 VAC for the various controls on the unit. These controls include the selector switch, vacuum switch, timer, high air temperature safety switch, solenoid and indicator lights. Other incoming line voltages are available as options. The vacuum pump is provided with a NEMA 1 enclosure. Optional enclosures include NEMA 4.

Indicators and Gauges

Main Power on Light - Indicates when power from the main disconnect switch has been turned on and there is live power at the vacuum pump control panel. This light will remain on as long as there is power to the unit, regardless of the position of the control selector switch.

! WARNING !

Always check power supply disconnect. The Power-on light may be inoperable.

High Air Temperature Light - Indicates when the unit has sensed an unusually high temperature in the discharge air/fluid mixture. Unit has shut down. **NEVER** turn the unit back on until the problem has been corrected.

Hourmeter - Indicates actual hours of operation. Used to determine maintenance intervals.

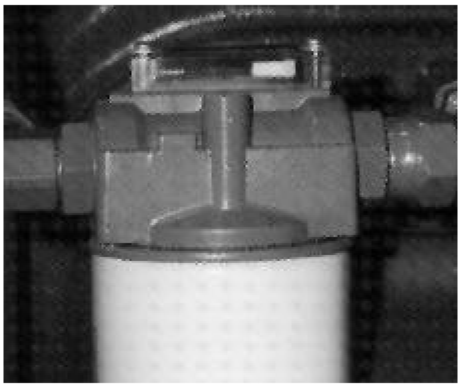
Vacuum Gauge - Indicates the system vacuum in inches of mercury (In. HgV) below atmospheric pressure surrounding the vacuum pump.

Air Outlet Temperature Gauge - Indicates the temperature of the air/fluid mixture as it discharges from the vacuum pump. Normal reading is 180°F to 220°F.

Air/Fluid Separator Differential Gauge - Indicates pressure differential across the air/fluid separator element. Used to determine separator element change intervals.

Fluid Level Indicator - The fluid level indicator is a sight gauge located on the air/fluid reservoir and continually monitors the fluid level in the air/fluid reservoir.

Vacuum Pump Fluid Filter Maintenance Indicator - Indicates when the fluid filter element should be replaced. When the white indicator piston moves from the green zone into the red zone, the fluid filter should be serviced.



High Air temperature Safety Switch - A high air temperature **(HAT)** switch is standard on the QSVI units. This switch protects the unit by sensing unusually high temperatures and shutting the unit down.

! WARNING !

Never remove, bypass or tamper with this safety HAT switch. Failure to provide this safety feature could cause death, serious injury and/or property damage. If the vacuum pump is shutting down due to high discharge temperature, contact a qualified service technician immediately.

Section 3 – Installation

- **Receiving**
- **Moving the unit to the Installation Site**
- **Location**
- **Piping Connections**
- **Safety Relief Valves**
- **Coupling Alignment – See Section 7 Adjustment**
- **Electrical**
- **Pneumatic Circuit Breakers or Velocity Fuses**
- **Guards**
- **Water Piping**
- **Cooling Water**
- **Safety Labels/Decals**
- **Instruction Manual**
- **Induction System**
- **Fluid Level**
- **Vacuum Pump Rotation**
- **Phase Monitor**

Receiving

Upon receipt, immediately inspect the vacuum pump for any damage which may have occurred in shipment. If visible damage is found at the time of delivery, be sure a notation is made on the freight bill by the delivering carrier and request a damage report. If the shipment is accepted and it is later found that the vacuum pump has been damaged, this is classified as concealed damage. If concealed damage is found, report it within 15 days of delivery to the delivering carrier, who must prepare a damage report. Itemized supporting papers are essential to filing a claim.

Read the vacuum pump nameplate to be sure the vacuum pump is the model and size ordered and that optionally ordered items are included.

Moving the Unit to the Installation Site

When a forklift is used to move the unit to it's installation site, use forklift slots provided on the side of the main frame. Use of chains and slings should be limited to the main frame. Do not attempt to lift the unit by attachment to any components.

! CAUTION !

Improper lifting may result in component system damage or personal injury. Follow good shop practices and safety procedures when moving the unit.

Location

Locate the vacuum pump on a level surface that is clean, well lit and well ventilated. Allow sufficient space (four feet of clearance on all sides and top of the vacuum pump) for safe and proper daily inspection and maintenance. The entire length of the frame base must be supported. Shim where necessary but do not use wood.

Ambient temperature should not exceed temperatures listed on the QSVI specifications. (Failure to heed this may result in a high air temperature shutdown.) All models are intended for indoor installation.

Do not locate the unit where the hot exhaust air from other vacuum pumps or heat generating equipment may be drawn into the unit. Never restrict the flow of exhaust air from the fluid cooler. The heated exhaust air must be exhausted to the outside to prevent high ambient conditions in the room. If the room is not properly ventilated, the vacuum pump operating temperatures will increase and cause the high temperature switch to activate.

In high humidity areas, avoid placing the vacuum pump in a basement or other damp locations. Control the vacuum pump temperatures and monitor vacuum pump fluid for signs of water contamination. Fluid and filter changes may need to be increased in high humidity areas. Increased operating temperatures may be required.

! NOTICE !

Removal or modification of sound insulation will result in high sound levels which may be hazardous to personnel.

The Quincy QSVI models are essentially vibration free, however, some customers may choose to bolt the unit to the floor to prevent the accidental breakage of piping or electrical connections as a result of being bumped. Only use lag bolts to locate the unit. Do not pull the bolts down tight as this may, under certain circumstances, place the frame in a twist or bind causing eventual breakage of fluid coolers, piping and reservoirs.

! WARNING !

Under no circumstances should a vacuum pump be installed in an area that may be exposed to toxic, volatile or corrosive atmosphere, nor should toxic, volatile or corrosive agents be stored near the vacuum pump.

Piping Connections

The vacuum distribution and piping system, including the vacuum pump and all related components, must be designed in accordance with generally accepted engineering practices. Improperly designed distribution systems can cause damage to the vacuum pump. Exhaust piping should be installed in such a manner as to not create additional back pressure on the vacuum pump. Also, the exhaust piping should be installed with a drip leg to prevent condensate from falling back into the fluid reservoir. (See figure below)

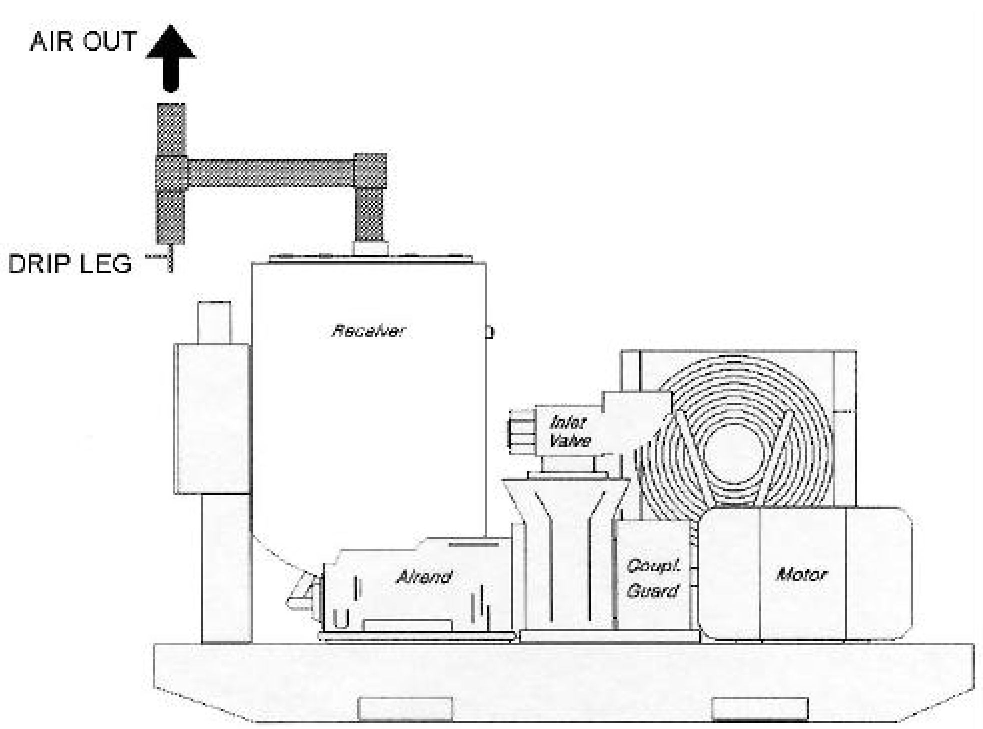
Piping Fit-up

Care must be taken to avoid assembling the piping in a strain with the vacuum pump. Piping should line up without having to be sprung or twisted into position. Adequate expansion loops or bends should be installed to prevent undue stress at the vacuum pump resulting from the changes between hot and cold conditions. Pipe supports should be mounted independently of the vacuum pump and anchored, as necessary, to limit vibration and prevent expansion strains. In no case should the piping be of smaller size than the connection on the vacuum pump unit.

Pressure Relief Valves

! DANGER !

Relief valves are to protect system integrity in accordance with ANSI/ASME B19 safety standards. Failure to provide properly sized relief valves will result in death or serious injury.



Recommended Exhaust Piping

Pressure relief valves are sized to protect the system. Never change the pressure setting or tamper with the valve. Only the relief valve manufacturer or an approved representative is qualified to make such a change.

Relief valves are to be placed ahead of any potential blockage point that includes, but is not limited to, such components as shut-off valves, heat exchangers, and discharge silencers. Ideally, the relief valve should be threaded directly into the pressure point it is sensing, not connected with tubing or pipe, and pointed away from any personnel. Always direct discharge from relief valves to a safe area away from personnel.

Electrical

Before installation, the electrical supply should be checked for adequate wire size and transformer capacity. During installation, a suitable fused or circuit breaker disconnect switch should be provided. Where a 3-phase motor is used to drive a vacuum pump, any unreasonable voltage unbalance between the legs must be eliminated and any low voltage corrected to prevent excessive current draw.

Connect incoming 3-phase power to the power block supplied inside the electrical enclosure and tighten to the torque specified on the side of the power block. The installation, electric motor, wiring and all electrical controls must be in accordance with NFPA 70-1992 National Electric Code, and all state and local codes. All electrical work should be performed by a qualified electrician. **This unit must be grounded in accordance with applicable codes.** See control panel for the proper wiring diagram.

! WARNING !

High voltage may cause severe personal injury or death. Disconnect all power supplies before opening the electrical enclosure for servicing.

! CAUTION !

NEMA electrical enclosures and components must be appropriate to the area in which they are installed.

Guards

All mechanical action or motion is hazardous in varying degrees and needs to be guarded. Guarding shall comply with OSHA Safety and Health Standards 29 CFR 1910.219 and any state or local codes.

! WARNING !

Cabinet panels and drive guards must be fastened in place before starting the machine and never removed before tag and lock out of the main power supply.

Water Piping

Water piping must be of adequate size to flow the required amount of coolant at minimum coolant head conditions, maximum coolant temperature and maximum operating horsepower conditions. Failure to adequately cool can result in short life, restrictions in filter elements, reduced heat transfer and fires.

Cooling Water

Cooling water should be clean and cool. Scale forming or corrosive water will shorten the life of water-cooled coolers. If there is any doubt about the condition of the water, have it analyzed. It may be necessary to add a water treatment system and/or revise the cooling system. Under some conditions the life of the water-cooled cooler can be extended by changing to a water-cooled cooler of different material.

Safety Labels/Decals

! CAUTION !

Removal or painting over safety labels will result in uninformed conditions. This could result in personal injury or property damage. Warning signs and labels shall be provided with enough light to read, conspicuously located and maintained for legibility. Do not remove any warning, caution or instructional material attached.

Instruction Manual

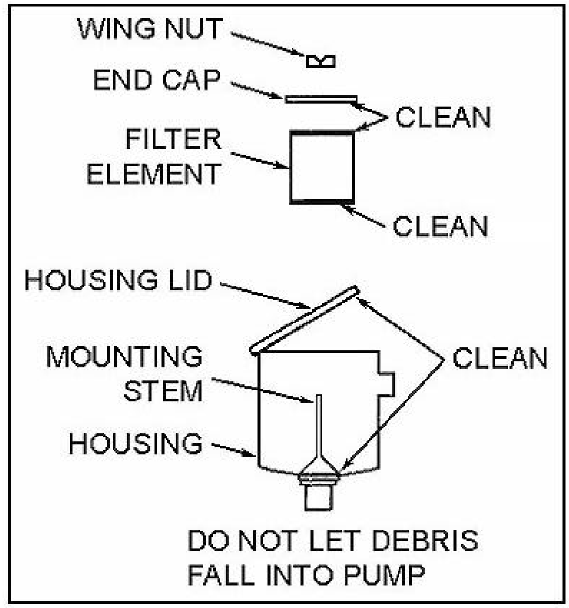
!WARNING!

Provisions should be made to have the instruction manual readily available to the operator and maintenance personnel If, for any reason, any part of the manual becomes illegible or if the manual is lost, have it replaced immediately. The instruction manual should be periodically read to refresh one's memory-it may prevent a serious accident.

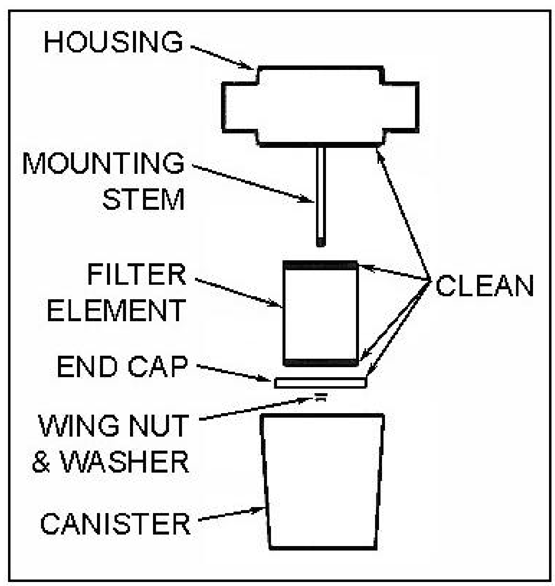
Induction System

Extreme care must be taken in selecting a proper induction filtration system for the vacuum pump. Liquids, solids, and abrasive powders can result in short life or mechanical failure of the bearings, erosion of the rotors, plugged fluid filter and/or separator element, short life of the fluid seal, corrosion of internal parts and motor overload. Use a vibration isolator and support all piping correctly. Piping should be at least as large as the inlet valve opening. The piping must be leak free and absolutely clean after fabrication.

All connections to the vacuum pump must be tight. Air leakage into the vacuum system lessens the vacuum pumps ability to draw down to a base level of vacuum and increases energy consumption.



Clean Out Schematic: "L" Type Filter



Clean Out Schematic: "L" Type Filter

Fluid Level

The vacuum pump is filled at the factory with the correct amount of QUINSYN® fluid. The fluid level is monitored by a fluid level indicator located on the side of the air/fluid reservoir tank while in operation. Fluid level should completely fill the sight gauge while the vacuum pump is in operation. Should the fluid level drop, and air is seen in the sight glass, add fluid. DO NOT OVER FILL as the excess fluid will carry over into the discharge piping system.

Vacuum Pump Rotation

Vacuum pump rotation must be checked prior to start-up. Proper rotation on the QSVI 25, 50, 75, 100 and 200 is clockwise as viewed from facing the drive shaft. The QSVI 40 rotation is counter-clockwise as viewed from facing the drive shaft. The power-input end of the vacuum pump is marked with an arrow noting the proper rotation. Failure to operate the vacuum pump in correct rotation will result in extreme damage to the vacuum pump and warranty coverage will be voided.

Phase Monitor

QSVI vacuum pumps may be equipped with an optional phase monitor device to protect against low voltage, loss of phase to any power leg and an imbalance of incoming power between any two legs.

The phase monitor contains a relay. The relay contacts close when all voltages and the phase sequence are correct. Low voltage and voltage unbalance must be sensed for a continuous trip delay before the relay is de-energized. The trip delay is a fixed 10 seconds. The voltage unbalance trip point is a fixed 6% and the low voltage trip point is a fixed minus 10%. If the relay is de-energized, it will automatically re-energize upon correction of the fault condition.

If the phase monitor relay will not energize at star-up, make the following checks:

(1) Check all electrical connections to the phase monitor.
(2) Check, and change if required, the phase rotation of the incoming power.

Check the leg to leg voltage of the incoming power for low voltage condition or voltage imbalance. (This may require power company assistance to correct.)

NOTE:
When service is required on the motor, contactor or overloads it is critical that wire reconnections are correct. Starting the vacuum pump with reverse rotation will cause damage and void warranty.

Section 4 - Procedures

- **Prior to Starting**
- **Starting the Vacuum Pump**
- **Stopping the Vacuum Pump – Normal Operation**
- **Stopping the Vacuum Pump – Emergency Operation**

Prior to Starting

Before starting the unit, review Sections II and III of this manual and be certain that all installation requirements have been met and that the purpose and use of each of the controls, warnings and gauges are thoroughly understood. The following checklist shall be adhered to before placing the vacuum pump into operation:

! WARNING !

Be sure the vacuum pump is grounded.

- Remove all loose items and tools from around the vacuum pump installation.
- Check fluid level in the air/fluid reservoir.
- Check the fan and fan mounting for tightness.
- Manually rotate the vacuum pump through enough revolutions to be certain there are no mechanical interferences.
- Check all connections for tightness.
- Check to make sure all relief valves are in place.
- Check to make sure all panels and guards are in place and securely mounted.
- Check fuses, circuit breakers and thermal overloads for proper size.
- Open all manual shut-off valves (block valves) beyond the air/fluid reservoir.
- Check the inlet filter element to see that it is securely mounted.

After all the above conditions have been satisfied, close the main power disconnect switch, jog the starter switch button to check the rotational direction of the vacuum pump. The vacuum pump and fan must rotate clockwise when facing the vacuum pump from the shaft end on the QSVI 25, 50, 75, 100 and 200. On QSVI 40, the rotation is counter-clockwise.

Starting the Vacuum Pump

Be sure that the exhaust line is open on the dry side of air/fluid reservoir to ensure that no back pressure is added to the pumping system.

Start the vacuum pump and watch for excessive vibration or strange noises. If either is observed, stop the pump immediately and correct. See stopping instructions.

Control System - The control system vacuum settings are factory set, however, they should be checked at the startup as noted previously. Following is a discussion of checking and adjusting the vacuum control system.

In order to make the discussion clear, certain terms need to be understood. Range is that region of vacuum levels desired in the system. The range has a maximum value above which the system vacuum level should not rise, and a minimum level below which the system vacuum level should not fall. A typical range would be from 23" HgV vacuum to 20" HgV vacuum. The differential for this range is 3" HgV which is the difference between the maximum and minimum settings of the range. Range and differential are interchangeable. Upper set point and upper trip point both refer to the maximum value of the range (23" HgV). Lower set point and lower trip point both refer to the minimum value of the range (20' HgV). The vacuum regulator is usually set to operate at the lower set point, and that is where it will be set if this adjustment is followed.

The three items to be checked and adjusted, if necessary, are:

1.) The vacuum switch differential 2.)
The vacuum switch range
3.) The vacuum regulator set point

In order to make these adjustments an easy means of varying air flow into the vacuum pump is required, so that even when the vacuum pump is running at fall capacity the system vacuum level can be lowered below the lower set point. If this is not possible, the plant vacuum system must be disconnected from the vacuum pump inlet and a hand valve screwed into the 3" pipe tap in the vacuum pump inlet.

! CAUTION !

Any piping, valves etc. which are attached to the vacuum pump inlet must be clean so as to prevent debris from entering the vacuum pump inlet and causing damage.

Adjustments begin and proceed as follows:

1.) Check the fluid level in the air/fluid reservoir.

2.) Be certain that the discharge piping is unobstructed.

3.) Turn the regulator adjustment screw completely into the regulator body.

4.) Open the hand valve at the vacuum pump inlet completely.

5.) Start the vacuum pump.

6.) Gradually close the hand valve at the vacuum pump inlet until 10" HgV is showing on the vacuum gauge in the vacuum pump control panel.

7.) Allow the vacuum pump to come up to operating temperature (180°F – 210°F).

8.) Continue to gradually close the inlet hand valve until the vacuum switch trips on increasing vacuum. The trip point is most easily detected by placing the hand on the solenoid valve and feeling when the solenoid valve snaps open.

9.) Without changing the hand valve setting, the vacuum pump inlet valve should open and close as activated by the solenoid which receives its signal from the vacuum pressure switch. As the inlet valve opens and closes read the maximum and minimum vacuum levels on the vacuum gauge and figure the differential as explained above.

10.) If the differential is to be increased, the differential screw in the vacuum switch must be turned in and vice versa if the differential is to be reduced. Note that in making the differential adjustment the minimum vacuum level point (lower set point) does not change, only the maximum level point (upper set point). When increasing the differential it may be necessary to further close the inlet hand valve to maintain better control of the cycling of the inlet valve.

11.) Adjust the range in which the vacuum pump is to operate by turning the range adjustment nut in the vacuum switch, this will not change the differential set in the previous steps. Tightening the nut against the spring "I increase the range (raise the vacuum level) or loosening the nut will decrease the range (lower the vacuum level). It may be necessary to open the hand inlet valve until a vacuum level below the lower trip point (lower set point) is obtained.

Adjust the vacuum regulator as follows:

a.) Adjust the hand inlet valve to hold the lower set point without the vacuum pump cycling.

b.) Remove the 0.078' orifice from the inlet valve air cylinder.

c.) Carefully insert a blunt probe into the hole where the 0.078" orifice was, being certain that the probe can move in and out freely, and insert to a depth where the blunt end of the probe lightly makes contact with the diaphragm in the air cylinder.

d.) Back out the vacuum regulator adjustment screw until the diaphragm in the air cylinder begins to move which will be detected by the probe starting to move in as light contact is maintained with the diaphragm.

e.) Hold the vacuum regulator adjustment screw so that it does not move from step "D' and tighten the locknut on the adjustment screw.

f.) Cycle the vacuum pump above and below the lower set point with the hand inlet valve to assure the vacuum regulator setting is correct.

g.) Reinstall the 0.078" orifice.

12.) Observe temperature, vacuum and pressure gauges closely for the first hour of operation and frequently for the next seven hours. After the first eight hours, temperature, vacuum, pressure, and general vacuum pump operation should be monitored at least once in every eight hour period. If any abnormal conditions are observed, stop the vacuum pump and correct the condition.

Stopping the Vacuum Pump - Normal Operation

All that is normally necessary for stopping the vacuum pump is to push the "stop" button. It is advisable to install a manual shutoff ahead of the inlet valve and close it prior to turning the vacuum pump off. **If for any reason the inlet valve did not close tightly, the manual shutoff valve would prevent fluid from being sucked back into the vacuum system.**

Stopping the Vacuum Pump - Emergency

Push the stop button or turn the power off at the main disconnect switch or panel.

Section 5 – Maintenance or Service Preparation

Preparing for Maintenance or Service

! WARNING !

Never assume the vacuum pump is ready for maintenance or service because it is stopped. The automatic control could start the vacuum pump at any time. Death or serious injury may result.

The following procedure should be used for maximum safety when preparing for maintenance or service:

- Per OSHA regulation 1910.147: The control of Hazardous Energy Source (Lockout/Tagout), disconnect and lockout the main power switch and tag the switch of the unit being serviced.
- Close shut-off valve ahead of the inlet valve and after the air/fluid reservoir (if so equipped) to prevent any air flow through or pressure build up in the vacuum pump. **Never depend on a check valve to isolate the system.**
- Manually vent the vacuum system to atmospheric pressure.
- Shut off water and pressurization system (if water-cooled).

Section 6 - Servicing

Safety

NOTE:
Only trained and qualified technicians should perform maintenance.

Safety procedures performed while servicing the vacuum pump are important to both the service personnel at the time of servicing and to those who may be around the vacuum pump and the system it serves. Listed below are some, but not all, procedures that should be followed:

- Wait for the unit to cool before starting service. Temperatures at 120°F can burn the skin, some surfaces may exceed 200°F when the vacuum pump is working.

- Clean up fluid spills immediately to prevent slipping.

- Loosen, but do not remove, flange or component bolting, then carefully pry apart to be sure there is no residual pressure or vacuum before removing bolting.

- Never use a flammable solvent such as gasoline or kerosene for cleaning air filters or vacuum pump parts.
- Safety solvents are available and should be used in accordance with their instructions.

- Improper assembly will result in damage to the vacuum pump or injure personnel. Use the correct tools, torque bolts to their correct value and utilize good shop practices.

! CAUTION !

Unusual noise or vibration indicates a problem. Do not operate the vacuum pump until the source has been identified and corrected.

Lubrication

Each unit comes equipped with a fluid level gauge, a fluid fill opening located on the side of the air/fluid reservoir and a fluid drain located on the bottom of the reservoir. Each unit is factory filled with QuinSyn® synthetic fluid or QuinSyn® F (food grade) synthetic fluid.

! DANGER !

Hot fluid under pressure could cause death or serious injury. Do not remove the fluid fill plug and attempt to add fluid to the air/fluid reservoir while the vacuum pump is in operation. Be sure that the vacuum pump's red mushroom stop button is pushed in and locked, and that the main power disconnect switch is in the off position and locked out to assure that the vacuum pump will not start automatically or by accident.

QUINSYN® fluid can be used between 1,000 and 8,000 hours depending upon the application. If the application has gases or vapors other than dry air, consult the factory before operation. QUINSYN F® food grade can be used between 2,000 and 4,000 hours under good operating conditions.

Draining of the fluid should be done while the fluid is hot to carry away more impurities. **It is strongly suggested that Quincy's lubrication analysis be followed to establish fluid change intervals.** Fluid should be completely drained from the reservoir and fluid cooler using drain petcocks.

Fluid Specifications

We recommend that all Quincy rotary screw vacuum pumps be filled with QuinSyn® synthetic fluid. QuinSyn® is available from any authorized Quincy distributor. For applications requiring a food grade fluid, we recommend QuinSyn F®. Failure to follow the above could void your warranty.

Fluid Life

A free service provided with the use of QuinSyn® products is a fluid analysis. This analysis provides you with important information regarding the performance of the fluid and in detecting any special problems that might arise. Fluid samples should be taken at the time of fluid filter changes, at 1,000 hour intervals or as indicated on the analysis report. Fluid sample bottles, labels and instructions are provided with the vacuum pump package at the time of shipment. Additional sample bottles may be purchased through your distributor.

!CAUTION!

Do not mix QUINSYN® with any other fluid. Failure to follow these recommendations will cause severe fluid breakdown, resulting in the formation of heavy varnish and sludge throughout the system. This will result in clogged fluid separators, coolers and internal fluid passages in the vacuum pump. Warranty will be void.

Understanding the Analysis Report

Figure 6-1 is a representative of the fluid analysis report returned after a sample has been submitted for analysis. Figure 6-2 is a list of the parameters of the fluid tested.

a.) REPORT DATE - The date that the fluid was analyzed.

b.) REPORT NUMBER - The assigned number to this report.

c.) CUSTOMER ADDRESS - The name and address of person that this report is being mailed to. This information is being taken from the sample bottle as it is received.

d.) CUSTOMER - The owner of the unit that sample came from.

e.) VACUUM PUMP MANUFACTURER - Brand of vacuum pump sample taken from.

f.) FLUID TYPE - This should always be QuinSyn® or QuinSyn® F.

g.) SERIAL NUMBER - The unit serial number of the Quincy vacuum pump the fluid sample was taken from.

h.) MODEL NUMBER - The model number of the Quincy vacuum pump that the fluid sample was taken from.

i.) HOURS ON FLUID - These are the actual hours that the fluid has been in the unit since the last fluid change.

j.) HOURS ON MACHINE - This is the total hours on the vacuum pump hourmeter.

k.) SAMPLE DATE - The date that the sample was taken from the vacuum pump.

NOTE:
Items (c through k) are information provided by the service person supplying the fluid for analysis. Incomplete or incorrect information will affect the report's accuracy.

l.) EVALUATION - This is a brief statement made by the technician performing the actual fluid analysis. This statement addresses the condition of the fluid and filter. This statement will also note any problems that need attention.

m.) PHYSICAL PROPERTIES RESULTS - Particle size is measured in microns.

n.) SPECTROCHEMICAL ANALYSIS - See fluid parameters.

Quincy
Compressor Fluid Analysis
2300 James Savage Road, Midland, MI 48642

Quincy Quality

UNDENIABLY THE WORLD'S FINEST COMPRESSORS

PRODUCT ANALYSIS REPORT

(a)

(b)

(c)

Customer (d)
Comp. Mfr. (e)
Fluid Type (f)
Serial Number (g)
Model Number (h)
Hrs. on Fluid (i)
Hrs. on Machine (j)
Sample Date (k)
I.D. #

Evaluation: (1)

Physical Properties* Results (m)

Water by Karl Fischer (ppm)	Viscosity 40° C (cSt)	TAN Total Acid #	Particle Count								ISO Code	Antioxidant Level
			5 um	10 um	15 um	20 um	25 um	30 um	35 um	40 um		

* Property values, not to be construed as specifications

Spectrochemical Analysis (n)

Sample Date (Fluid Hours)	Values below are in parts per million (ppm)																
	Silver (Ag)	Alum. (Al)	Chrom (Cr)	Copp. (Cu)	Iron (Fe)	Nickel (Ni)	Lead (Pb)	Tin (Sn)	Titan (Ti)	Vanad (V)	Bari (Ba)	Calc. (Ca)	Mag. (Mg)	Mol. (Mo)	Sod. (Na)	Phos. (P)	Sili. (Si)	Zinc (Zn)

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 1-517-496-2313.

*means this parameter not tested

Accuracy of recommendations is dependant on representative fluid samples and complete correct data on both unit and fluid.

CC List

QUINSYN® /QUINSYN F® Specifications

Property	Units	ASTM-Method	New Lubricant	Marginal	Unacceptable
Viscosity @ 40°C	Cst	D-445	42-48	38-42 or 48-52	<38 or >52
Antioxidant Level	% Remaining	Liquid Chromatography	100	15	<5
Filtration Time	Minutes	CPI	2-3	>15 & >25	>25
Acid Number	Mg KOH/g	D-974	0.1	0.8	>1.0
Phosphorus	PPM	Plasma Emission	0	0-40	>40
Zinc	PPM	Plasma Emission	0	0-40	>40
Calcium	PPM	Plasma Emission	0	0-40	>40
Barium	PPM	Plasma Emission	0	0-40	>40
Iron	PPM	Plasma Emission	0	5-10	>10
Copper	PPM	Plasma Emission	0	5-10	>10
Lead	PPM	Plasma Emission	0	5-10	>10
Tin	PPM	Plasma Emission	0	5-10	>10
Aluminum	PPM	Plasma Emission	0	5-10	>10
Silicon	PPM	Plasma Emission	0	10-15	>15
Molybdenum	PPM	Plasma Emission	0	0-40	>40
Water	PPM	Plasma Emission	<50	300-400	>400

Vacuum Pump Fluid Filter

The fluid filter is a spin on, full flow unit with a high efficiency, micro-fiberglass media. Replacement of the filter requires spinning off the complete cartridge and replacing it with a new one. USE GENUINE QUINCY REPLACEMENT FILTERS ONLY.

The initial filter cartridge change should occur after the first 100-200 hours of operation. During normal service, the filter cartridge should be replaced under the following conditions, **whichever occurs first:**

- Every 1,000 hours.
- Every fluid change.
- After each fluid analysis sample is taken.

Vacuum Pump Air/Fluid Separator Element

The element is a one piece construction that coalesces the fluid mist, as it passes through the filtering media, into droplets that fall to the bottom of the separator element to be picked up by a scavenging tube and returned to the vacuum pump. Care must be taken in handling the separator element to prevent it from being damaged. Any denting may destroy the effectiveness of the filtering media and result in excessive fluid carryover. Even a very small hole punctured through the element will result in a very high carryover of fluid.

The vacuum pump air/fluid separator element must be changed for any of the following conditions, **whichever occur first:**

- As indicated by the differential pressure indicator for the separator element.
- When excessive fluid carryover is noted and it has been determined the scavenging system is functioning properly, the fluid temperature is normal, the running fluid level is correct and the vacuum pump is not cycling rapidly between load and unload.
- Every 8,000 hours.
- Any time the pressure gauge on the instrument panel reads greater than 7 psig. Periodic checks should be made when the fluid is up to operating temperature, the inlet valve is full open and the system to be drawn down is at 10 " HgV, this condition requires the maximum horsepower input under strict vacuum pump operating conditions. Cold fluid or pressure in the discharge line from the air/fluid reservoir will result in an overly high reading.

Failure to change the separator element before it exceeds the pressure given above will result in blown or tripped overload fuses and/or shortened electric motor life. The pressure given above has nothing to do with the collapsing point of the separator element but pertains only to the motor overload limit.

In an emergency, operation can temporarily be continued with a clogged separator by restricting the inlet to the vacuum pump. Install a hand valve in the vacuum pump inlet downstream of the inlet filter and adjust it until the pressure reading on the gauge is in the green. Lock the hand valve setting in place to prevent it from being changed. This temporary fix will permit continued operation but will increase the length of time it takes to draw down the system. If steps 1 or 2 above are noted the separator element will have to be changed.

If the unit is designed for vacuum-compressor operation and it is to be operated this way, the factory should be consulted for the limiting pressure levels at which the separator element should be changed.

Fluid Scavenging System

Fluid from inside the fluid separator element is returned to the system side of the vacuum pump rotor housing by way of a scavenger tube positioned inside the air/fluid separator element, through a filter screen and orifice contained in a straight fitting mounted in the top plate of the air/fluid reservoir and through a nylon tube to the inlet valve. Failure to keep the orifice clean will result in excessive fluid carryover.

Cleaning of the filter screen and orifice should be performed for any of the following conditions, which ever occurs first:

- When no fluid is seen moving through the nylon scavenging tube and the vacuum gauge reads between 1 to 20" HgV. The nylon tubing will also feel cool to the touch if there is no flow through it.
- When excessive fluid carryover is detected.
- Every fluid change.

NOTE: Do not ream or change the orifice size.

Inlet Air Filter

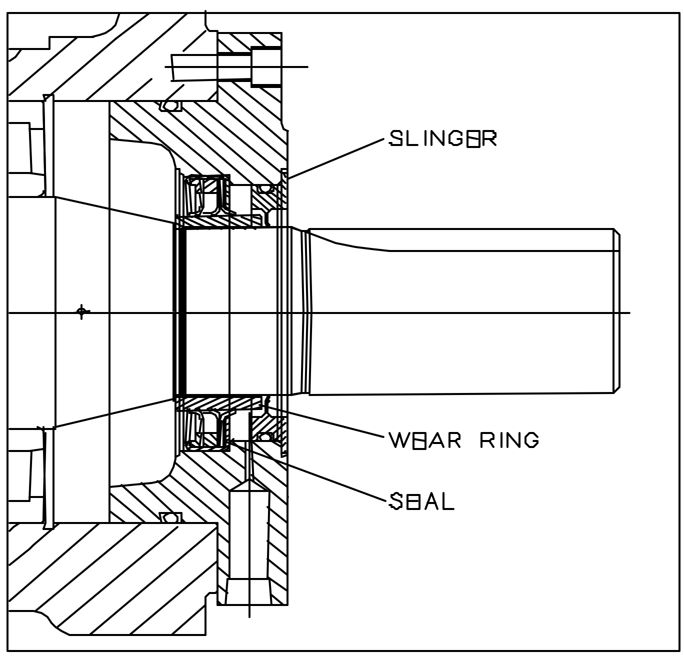
Servicing of the induction filtration system shall be as recommended by the supplier of the particular system selected for your application. The periods of servicing should be established by checking at regular intervals until a pattern is found. Daily maintenance is not uncommon in many applications.

Each time a service operation is performed, inspect the filtered side of the system, including the vacuum pump inlet valve, for solids, dirt and/or liquids. If any is found determine the cause and correct. If not corrected, reduced life or complete failure of the vacuum pump and/or any of its components can be expected. Always make certain all gaskets, threaded connections, flange connections, and hose or pipe connections are absolutely tight. Do not allow particulate to fall into the inlet of the vacuum pump when replacing the element. Most inlet filters can be installed horizontally to prevent this.

Vacuum Pump Shaft Fluid Seal

The QSVI vacuum pump shaft seal is a scavenged triple lipped shaft seal assembly, consisting of a wear ring, fluid slinger, shaft seal and scavenge cavity with return line. The wear ring rotates with the shaft, against the lips of the seal and both parts are considered normal maintenance items. Shaft seals must be replaced when excessive fluid leakage is detected or when rebuilding the vacuum pump. The original seal is warranted for 12 (twelve) months.

Shaft seals are wear items that will eventually have to be replaced. A complete understanding of the installation procedure and special tools are required for a successful seal replacement. Should you decide to replace the seal yourself, be certain to ask your Quincy distributor for the complete illustrated instructions (available as a Service Alert) at the time you order the seal and special tools. If your distributor does not have a copy of these instructions, ask him to order a copy from Quincy Compressor Division at no charge.



QSVI compressor units incorporate a fluid scavenge system to complement the use of the triple lip seal assembly. Any complaint of shaft seal leakage requires that the scavenge system be inspected for proper operation prior to the replacement of the shaft seal. Proper inspection consists of the following:

1.) Check to assure that the scavenge line fitting at the bottom of the scavenge line cavity is open and clear.

2.) Assure that the scavenge line itself is not plugged.

3.) Inspect the performance of the scavenge line check valve for sticking. If the check valve is stuck in the open position, lubricant can back flush from the air end into the seal cavity and appear as a leak. If the check valve is stuck closed the seal cavity will not scavenge if needed.

4.) Shaft seal replacement on QSVI models require the removal or relocation of the drive motor to allow use of the wear sleeve removal and installation tools.

5.) Remove the drive coupling guards and coupling halves. Remove the drive coupling hub and woodruff key from the compressor shaft.

6.) Remove the four bolts and lock washers that secure the seal adapter to the suction housing.

7.) Insert two of the seal adapter retaining bolts into the seal adapter jack holes and tam clockwise pushing the seal adapter away from the suction housing.

8.) After the seal adapter outer o-ring has cleared the seal adapter bore, the adapter can be removed for inspection. Disassemble the seal adapter for inspection or service by taking the following steps:

    a.) With the face of the seal adapter up, insert two small, flat screwdrivers under the outer lip of the fluid slinger and pop the slinger from the seal adapter bore.

    b.) Using a brass drift, tap the shaft seal assembly from the seal bore.

    c.) Inspect both seal lips for excessive wear or lip flaws or damage.

    d.) Inspect the outer o-ring on the fluid slinger for cuts or nicks.

    e.) Inspect the outer o-ring on the seal adapter for cuts and nicks.

    f.) Use the tools listed in the Parts Manual for your specific machine needs.

    g.) To remove the seal wear sleeve, slide the wear sleeve removal tool over the end of the shaft and allow the jaws of the tool to snap on the backside of the wear sleeve. Tighten the outer shell of the tool down over the inner jaws. Using a ratchet and socket, turn the puller jackscrew clockwise in against the end of the rotor shaft.

! CAUTION !

Do not use an impact wrench with this tool.

Preparation for New Seal Installation

1.) Inspect the rotor shaft for burrs or deep scratches at the wear sleeve area. Using a 100-grit emery cloth, lightly sand horizontally any rust or LOCTITE that was between the wear sleeve and rotor shaft. Using a fine file or emery cloth, deburr the woodruff key area of the rotor shaft and cover the keyway with masking tape to prevent any damage to the new seal during installation.

2.) Clean the seal adapter with clean, fast drying solvent Assure that the scavenge line fitting and cavity is clean and open. Place the outer face of the seal adapter on a flat, hard surface. Remove the new triple lip seal from the package and inspect for damage or imperfections on the seal lips. With the adapter sitting on the outer face, the mechanic would be looking down on the two lips that face the same direction facing toward the rotor and the single lip facing the scavenge cavity and drive motor.

3.) With the lips of the seal facing the correct direction, apply a thin coat of LOCTITE 290® to the outer steel case of the seal and position the seal in the seal adapter bore. Insert the proper seal driver over the seal. See Parts Manual for tool list for your specific machine needs. Insert the proper wear sleeve driver in the seal driver and tap the new seal into the bore with a medium sized hammer.

4.) Preheat the seal wear sleeve to 350°F in a small oven. Do not preheat in warm oil. Apply a thin film of LOCTITE to the inner diameter of the wear sleeve and immediately install on the compressor shaft using the proper wear sleeve driver. Drive the wear sleeve on the shaft until the driver bottoms on the shaft shoulder.

Seal Installation

1.) Apply a thin coat of compressor fluid to the outer face of the seal wear sleeve and seal lip.

2.) Cover the keyway in the compressor shaft with masking tape so there is no chance of damage occurring to the seal face during installation.

3.) Slide the proper seal installation sleeve against the wear sleeve with the taper toward the end of the rotor shaft. Install a new o-ring on seal adapter and lubricate with compressor fluid. Carefully slide the seal adapter with the new seal installed over the end of the rotor shaft and up against the adapter bore.

4.) Using care not to damage the o-ring, evenly draw the adapter into the bore and install the four retaining bolts and tighten to the specified torque. Remove the installation sleeve.

5.) Apply a thin film of compressor fluid to the o-ring and seal lip of the outer lubricant slinger. Install the outer slinger over the end of the rotor shaft and push into the scavenge bore using both thumbs.

6.) Reinstall the scavenge system and drive coupling. Reinstall the coupling guards before starting the compressor.

Section 7 - Service Adjustments

Differential Pilot Valve

Open a manual vent valve on the inlet to the vacuum pump and start the unit. By manual regulation slowly close the valve, allowing the system pressure to reach the desired vacuum level. Adjust the screw on the bottom of the differential pilot valve so that a slight vibration can be detected at the point of desired system modulation. When this vibration is felt, air is beginning to pass through the pilot valve to the air cylinder on the inlet valve, causing the valve to modulate toward its closed position, thereby, reducing the volume of air being drawn in to the pump.

To raise pressure, turn the adjusting screw in (clockwise). To lower pressure, turn the screw out (counterclockwise). Maximum vacuum under modulation is 29.6' HgV. for the QSVI vacuum pumps (29.9" HgV without modulation).

Vacuum Switch

The vacuum switch determines at what pressure the vacuum pump will load and unload. Standard factory settings are listed in the QSVI Specifications. If a lower setting is desired, adjust the differential pilot valve first and set the pressure switch cut-out point to no less than 2" HgV differential. That adjustment is made by turning the wheel clockwise to increase the cut-in/cut-out pressure and counterclockwise to lower the cut-in/cut-out pressure. The vacuum switch should unload the vacuum pump by the time it reaches the 20% load point.

Water Temperature Regulating Valve (water-cooled units)

The water temperature regulating valve senses fluid temperature and opens or closes, regulating water flow from the unit. It is factory set to maintain 160°F fluid injection temperature as shown by the fluid inlet temperature gauge. Due to different incoming water temperatures and/or pressures at the customer location, valve adjustment should be checked during start-up to maintain 160°F fluid inlet temperature. To increase fluid temperature, decrease water flow by turning the adjustment screw clockwise. To decrease fluid temperature, increase water flow by turning the adjustment screw counterclockwise.

Coupling Alignment

Compressor and motor bearing life can be maximized only when both components are in alignment to each other. Prior to new unit start-up or after any vacuum pump or motor change the drive alignment must be checked. If the vacuum pump is ever accidentally knocked out of place or relocated, the drive alignment must be checked. **Note! Some QSVI models are permanently aligned and the above statement will not apply to those models. Check your machine for alignment type.**

Drive Coupling Specifications

Model	Angular Alignment	Specifications Parallel	Element Bolt Size	Element Bolt Torque
QSVI 75, 100 & 200	0.004	0.008	3/8"	30 ft./ lbs.

See instruction section prior to start up.

The Quincy QSVI series vacuum pumps utilize a 2 piece flexible element bolted to steel hubs on the pump motor shafts. The following steps will insure a properly aligned coupling:

1.) Disconnect all power to the unit. Lockout the main power switch and hang a sign **at** the switch of the unit being serviced.

2.) Remove the drive guard.

3.) Unbolt and remove one-half (1/2) of the flexible element. Leave the remaining half, bolted to both steel hubs.

4.) Using one of the existing 3/8" bolt holes in the vacuum pump hub, screw a dial indicator mounting stud or bolt in firmly.

5.) Attach a dial indicator to the mount with the necessary hardware to allow the indicator plunger to contact the motor hub.

NOTE: Four viewpoints need to be checked. Angular and Parallel as viewed from the top. Angular and Parallel as viewed from the side.

Correcting Angular Misalignment (side view)

1.) With the indicator point on the face of the motor half, zero the indicator.

2.) Rotate the entire assembly 180° or one-half (1/2) turn. Note the indicator reading. This reading is referred to as "C" in the formula and example below.

3.) Measure the distance from center to center between the motor feet. This will be referred to as "A".

4.) Measure the OD of the coupling. This will be referred to as "B".

5.) Divide measurement "A" by measurement 'B".

6.) Multiply the result from step 5 by the indicator reading "C" to determine the amount of shim to be placed under either the front feet or the rear feet of the motor to correct the misalignment.

EXAMPLE
A = 5", B = 4", C = +0.028. Because "C" is a positive reading, the distance between the coupling halves is greater at the top.

A/B x C = Required shims

5/4 x 0.028 =0.035 shims needed

In this case, shims should go under the rear motor feet. The formula eliminates a lot of trial and error when determining number of shims to use.

Parallel Misalignment Viewed from the Side

1.) Mount the dial indicator on the vacuum pump coupling half so that it will read from the outside surface of the motor coupling half.

2.) Position the indicator at the top of the coupling.

3.) Rotate the coupling halves together, 180° in the direction of vacuum pump rotation. The indicator reading is twice the amount of shim which must be added or subtracted from the motor mounts to achieve proper alignment. Loosen the motor mounting bolts and shim all feet an amount equal to half the indicator reading.

Angular Misalignment Viewed From the Top

1.) Mount the dial indicator on the compressor coupling half so that it reads from the face of the motor coupling half.

2.) Position the indicator on side of the coupling.

3.) Rotate the coupling halves together, 180° in the direction of the vacuum pump rotation. The indicator reading in this position is the amount of angular misalignment.

4.) Loosen the motor mounting bolts and move the motor slightly with a pry bar or soft hammer so that when step 3 is performed, the indicator reading is within machine specifications.

NOTE: Always recheck all measurements since one alignment procedure may effect another.

Reinstall the other element half and torque all mounting bolts. Before placing the unit in operation, replace the drive guard and clear the area of all tools.

! CAUTION !

Do not operate the unit without both the coupling halves and guards in place.

NOTE: Do not lubricate capscrew threads. If capscrews are reused, apply thread-locking adhesive. **These are special bolts, do not substitute!**

Water-cooled Heat Exchangers

Most fluid/water heat exchanger problems are due to underestimating the importance of water treatment and heat exchanger maintenance. Efficient, long service life can be obtained only when clean, soft and/or treated water is used and the exchanger tubes are cleaned on a regular basis. **HEAT EXCHANGER GUARANTEES DO NOT COVER FAILURES CAUSED BY CORROSION OR PLUGGING.**

In many instances, the cooling water supply for the heat exchanger will contain impurities dissolved in solution and/or in suspension. These substances can cause scale formations, corrosion and fouling (plugging) of any water-cooled heat exchanger equipment. Disregarding the possibility that one or more of these conditions exist may result in increased maintenance and operation expense, reduced equipment life and emergency shutdown. In some cases, what is normally considered plain drinking water can contain corrosive substances that will impact the heat exchanger life.

It is strongly recommended that a reputable, local water treatment concern be engaged to establish the corrosion, scale-forming and fouling tendency of the cooling water and take steps necessary to remedy the situation if a problem does exist. The need for water treatment may only involve filtration (screening) to remove debris, sand and/or silt in the cooling water supply. However, chemical treatment methods may be necessary in certain instances to inhibit corrosion and/or remove suspended solids to alter the water's tendency to form scale deposits, or prevent growth of microorganisms. The normal maintenance program for the unit should include periodic cleaning on the tube side (water side) of the heat exchanger to remove deposits which enhance fouling and corrosion.

Use of water-glycol mixtures will reduce heat exchange or performance and result in increased or excessive operating temperatures. The standard heat exchanges are sized for water use only.

If overheating or fluid leakage to the water side develops, remove the end caps and inspect for scale and corrosion. If present, this is usually the source of trouble. In the case of a closed system, the entire system, cooling tower, cooler inlet and outlet lines should be inspected and cleaned as necessary.

Except for outright mechanical failure, the solution to most heat exchanger problems lies at the point of use. It is the, user's responsibility to provide the proper quality of water and to keep the exchanger clean. No heat exchanger made will resist plugging and corrosion if the basic rules of clean water and regular maintenance are disregarded.

WARRANTY DOES NOT COVER HEAT EXCHANGER FAILURE, DUE TO PLUGGING OR CORROSION.

Section 8 – Troubleshooting

FAILURE TO START

PROBABLE CAUSE	CORRECTION
Power not turned "ON"	Turn the power "ON" by closing the main disconnect switch or circuit breaker.
Blown control circuit fuse	Replace fuse. Find and correct cause.
Safety circuit shutdown resulting from high discharge air temperature	Correct the situation in accordance with the instruction in the "High Discharge Air Temperature and/or High Fluid Injection Temperature" section of this troubleshooting guide. Restart the vacuum pump.
Thermal overload relays tripping	Correct the cause of the overloaded condition, reset overload relay and press the start button.
Low voltage	Ask the power company to make a voltage check at your entrance meter, then compare that reading to a reading taken at the motor terminals. Use these two readings as a basis for locating the source of low voltage.
Faulty start switch	Check the switch for malfunction or loose connections.
Faulty control relay	Replace the relay.
Loose wire connections	Check all wiring terminals for contact and tightness.
Faulty High Air Temperature Switch	Check HAT switch. Contact a qualified service technician for repairs.
Faulty transformer	Check secondary voltage on transformer.

UNSCHEDULED SHUTDOWN

PROBABLE CAUSE	CORRECTION
High air discharge temperature	Correct the situation in accordance with the instruction in the "High Discharge Air Temperature and/or High Fluid Injection Temperature" section of this troubleshooting guide. Restart the vacuum pump.
Thermal overload relays tripping	Correct the cause of the overloaded condition, reset the overload relay and press the reset button
Power failure	Check the power supply to the unit.
Faulty HAT switch	Contact qualified service technician.
Loose wire connections	Check all wiring terminals for contact and tightness.
Faulty control relay	Replace relay.

THERMAL OVERLOAD RELAYS TRIPPING

PROBABLE CAUSE	CORRECTION
Excessive discharge pressure	Check exhaust piping for restrictions. Check separator element for condition.
Low voltage	Check voltage and amperages while operating the unit at full load and full pressure.
Loose overload connection	Tighten mounting screws on "Thermal Overload".
Phase Fault	Could be caused by low voltage, phase unbalance, or loss of phase. This may be an intermittent problem and you may only need to press the "Start" button to resume operation. But if problem repeats, the power company will need to check the incoming power.
Incorrect thermal overload relay setting	Check motor name plate and compare to overload relay setting.
Faulty motor	Remove and have tested at motor manufacturer repair center.

POOR PROCESS PRESSURE

PROBABLE CAUSE	CORRECTION
Leak	Leak check system and compare to original rate of rise pressure test. Look for damaged gaskets and leaks in check/isolation valves- Check for leaks in inlet valve, and piping to airend.
Pump is cold	Allow adequate warm-up time for pump to reach operating temperature.
Low fluid level	Fill fluid reservoir to proper level.
Condensation or contamination in fluid	Replace pump fluid.
Shaft seal leak	Replace shaft seal.
Drive motor RPM too low	Check and replace motor as necessary.
Excessive back pressure/separator clogged	Replace separator element-keep exhaust at atmospheric pressure.
Temperature of system or process gas increasing	Increases in temperature translate into ACFM load. Keep temperatures constant.
Vapor load being generated	Possible leak in water cooling jacket or water piping in vacuum system. Leak check.
Materials of construction	Materials not compatible with vacuum service. Observe all vacuum engineering conventions.
Clogged inlet filter	Replace inlet filter element.
Inlet valve not opening fully	Correct the situation in accordance with the instructions in "Inlet Valve Not Opening or Closing in Relation to Demand" section of the trouble-shooting guide.
Differential pilot valve not set correctly	Readjust differential pilot valve to achieve desired modulation range.
Vacuum switch not set correctly	Readjust the vacuum switch to the desired cut-in and cut-out pressures.
Faulty vacuum gauge	Replace vacuum gauge.
Wrong fluid	Replace with recommended fluid.

POOR PUMPING SPEED (Capacity)

PROBABLE CAUSE	CORRECTION
Clogged inlet filter	Replace inlet filter element.
Intake line is narrow or contains restrictions or debris	Re-plumb sections of line that are narrow or sections with sharp turns. Maintain pump inlet diameter as far into the process as possible. Check for obstructions in plumbing.
Problem in lubrication system	Check for adequate fluid flow rate and for restrictions in fluid piping.
Excessive back pressure/separator clogged	Replace separator element-keep exhaust at atmospheric pressure.
Low fluid level	Fill fluid reservoir to proper level.
Condensation or contamination in fluid	Replace pump fluid.
Pump is cold	Allow adequate warm-up time for pump to reach operating temperature.
Shaft seal leak	Replace shaft seal.
Leak	Leak check system and compare to original rate of rise pressure test. Look for damaged gaskets and leaks in check/isolation valves. Check for leaks in inlet valve, and piping to airend.
Vapor load being generated	Possible leak in water cooling jacket or water piping in vacuum system. Leak check.
Materials of construction	Materials not compatible with vacuum service. Observe all vacuum engineering conventions.
Temperature of system or process gas increasing	Increases in temperature translate into ACFM load. Keep temperatures constant.
Inlet valve not opening fully	Correct the situation in accordance with the instructions in "Inlet Valve Not Opening or Closing in Relation to Demand" section of the troubleshooting guide.

HIGH DISCHARGE TEMPERATURE AND/OR HIGH FLUID TEMPERATURE

PROBABLE CAUSE	CORRECTION
Cabinet panels removed	Replace all panels, ensure all sealing surfaces and materials are satisfactory.
Cooling water temperature is too high	Check and adjust as necessary.
Cooling radiator is dirty	Clean to ensure adequate air flow across fins.
Low fluid level	Add fluid to required level on reservoir
Operating pressure is too high	Rotary screw pumps are designed to operate in the 10" to 29.9" HgV range. Any operating pressure over 10" may cause the pump to overheat.
Excessive pressure in exhaust line	Clear restrictions in exhaust line to ensure atmospheric pressure at discharge.

FREQUENT AIR/FLUID SEPARATOR CLOGGING

PROBABLE CAUSE	CORRECTION
Faulty inlet filter or inadequate filter for the environment	If faulty inlet filter elements, replace them.
Faulty fluid filter	Replace fluid filter element
Fluid breakdown	Correct in accordance with the instruction in “Fluid Breakdown” section of the troubleshooting guide
Incorrect fluid separator element	Use genuine Quincy replacement elements only
Extreme operating conditions such as high vacuum pump discharge temperatures, high ambient temperature and high reservoir pressure	Operate vacuum pump at recommended reservoir pressure and air discharge temperature
Fluid contamination	Change fluid. Service inlet filter element and fluid filter promptly in accordance with the recommended maintenance schedule.
Too high fluid level in reservoir	Bring fluid level to recommended level by draining the reservoir. Use the fluid level gauge as a guide.

INLET VALVE NOT OPENING OR CLOSING IN RELATION TO SYSTEM DEMAND

PROBABLE CAUSE	CORRECTION
Improper setting of vacuum pressure switch or faulty switch	Adjust vacuum pressure switch to proper setting or replace switch, if faulty.
Improper functioning of inlet valve piston	Check piston and cylinder bore. Repair or replace as needed.
Jammed air inlet valve assembly	Check air inlet valve bushing and shaft. Check piston and cylinder bore. Repair or replace as needed.
Faulty differential pilot valve	Repair or replace as necessary.
Broken spring in air inlet valve	Replace spring.
Faulty solenoid valve	Repair or replace as necessary.
Faulty shuttle valve	Repair or replace as necessary.
Loose wiring connections at solenoid valve/pressure switch	Check and tighten wiring terminals.
Incorrect vacuum switch setting	Adjust pressure switch to proper setting.
Faulty vacuum switch	Replace switch.
Leaks in control lines	Check all control line fittings and tubing.

VACUUM PUMP DOES NOT LOAD WHEN VACUUM LINE PRESSURE RISES

PROBABLE CAUSE	CORRECTION
Faulty vacuum pressure switch	Repair or replace as necessary.
Loose wiring connection	Check and tighten wiring terminals.
Jammed air inlet valve assembly	Check and repair air inlet valve.
Faulty solenoid	Repair or replace as necessary.
Faulty timer	Check and replace timer.
Faulty differential pilot valve	Orifice plugged. Clean or replace as necessary

VACUUM PUMP WILL NOT TIME-OUT OR SHUT DOWN WHEN UNLOADED

PROBABLE CAUSE	CORRECTION
Faulty timer	Check and replace as necessary.
Loose wire connections	Check all wiring terminals for contact and tightness.
Leaks in control lines	Check and repair leaks.

TOO RAPID CYCLING BETWEEN LOAD AND UNLOAD

PROBABLE CAUSE	CORRECTION
Too small system volume	Provide sufficient volume by adding additional piping or a receiver to vacuum system. CAUTION: Volume adds time to cyclic applications, be sure to consult with factory.
Leaks in control lines	Check and repair leaks.
Faulty vacuum switch	Repair or replace as necessary.

FREQUENT FLUID FILTER CLOGGING

PROBABLE CAUSE	CORRECTION
Faulty indicator	Replace indicator assembly.
Incorrect fluid filter	Use genuine Quincy replacements only.
Faulty, incorrect or inadequate air filter	Replace filter element. Consult factory if necessary
Fluid breakdown	Correct the situation in accordance with the instructions in "Fluid Breakdown" section of this troubleshooting guide.
System contamination	Check and clean system of all dirt, corrosion and varnish.
Inadequate circulation of cooling air at the cooler	Check the location of the cooler to make sure that there is no restriction to free circulation of cooling air. Also check fins at the cooler and if dust laden, clean them with air while the machine is not running.

UNIT OPERATING WITH HIGH DISCHARGE TEMPERATURES

PROBABLE CAUSE	CORRECTION
Clogged fluid cooler	Check fluid cooler for varnishing and rust deposits. If this condition exists, clean cooler thoroughly in accordance with recommended procedures of the heat exchanger manufacturer.
Excessive ambient temperatures	Maximum ambient for proper operation is 110°F.
Incorrect fan rotation	Correct rotation with the fan pushing the air up through the coolers.
Improper fluid	Use recommended fluids only - see fluids section.
Clogged air filter	Clean and replace as necessary.
Faulty thermal valve	Repair or replace as necessary.
Faulty gauges	Check and replace.
Airend failure	Contact a Quincy authorized distributor.

EXCESSIVE FLUID CONSUMPTION

PROBABLE CAUSE	CORRECTION
Too high fluid level in the receiver	Bring fluid level down to the recommended level by draining the receiver. Use the fluid level gauge as a guide.
Plugged scavenger line	Clean scavenger line orifice and tube.
High fluid injection temperature	Correct the situation in accordance with the instructions in "High Discharge Air Temperature and/or High Fluid Temperature" section of this guide.
Too high inlet pressure	Operate continuously at 10" HgV and above.
Faulty or damaged separator	Change air/fluid separator.
Leak in fluid lines	Check for leaks and repair.
Seal failure, leaks	Replace seat assembly.
Incorrect fluid	Use recommended fluids only - see fluids section.
Rapid cycling	Consult factory.

FLUID SURGES INTO VACUUM LINE AFTER SHUT-DOWN

PROBABLE CAUSE	CORRECTION
Inlet valve not closing properly	Check and repair. Install auxiliary check valve.
Excessive exhaust pressure	Check condition and resolve.

FLUID IS CLOUDY AND PUMP RUNS HOT

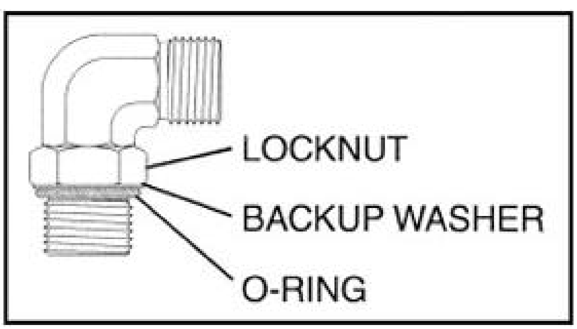
PROBABLE CAUSE	CORRECTION
Condensable in the fluid	Change fluid.

O-RING FITTINGS

Some QSVI models are equipped with some o-ring style fittings. These fittings are located at:
* Either end of the lubricant cooler supply and return hoses.
* Either end of the airend lubricant injection tube.
* Either end of the air/lubricant discharge tube from the airend.

! CAUTION !

Never screw o-ring style fittings into NPT pipe fittings or ports, or screw NPT pipe nipples or fittings into ports with SAE straight threads intended for o-ring style fittings. Severe damage to threads, leaks or blow out will occur.

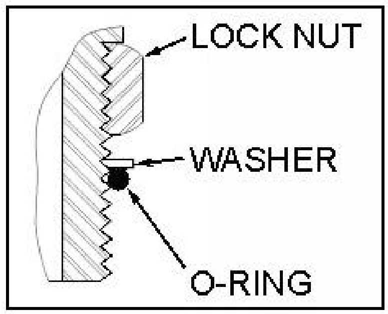


SAE Straight Thread O-ring Fitting (Adjustable)

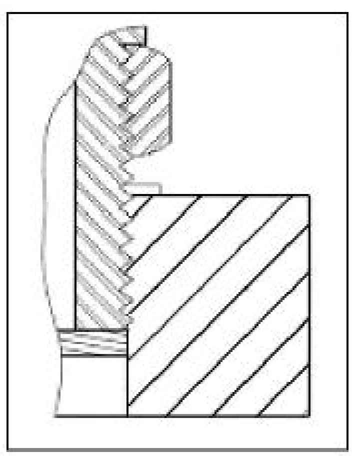
INSTALLATION INSTRUCTIONS

SAE Straight Thread O-Ring Fitting (Adjustable)

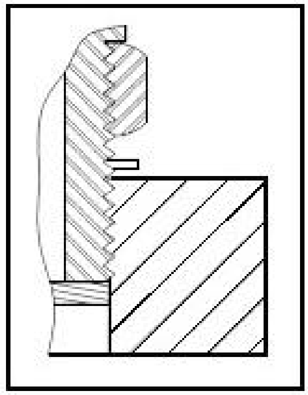
1. Inspect all mating surfaces for burrs, nicks, scratches or any foreign particles.
2. Lubricate O-Ring with light coat of QLTINSYN 'fluid.
3. Block lock nut until it makes contact with fitting. (See drawing below)



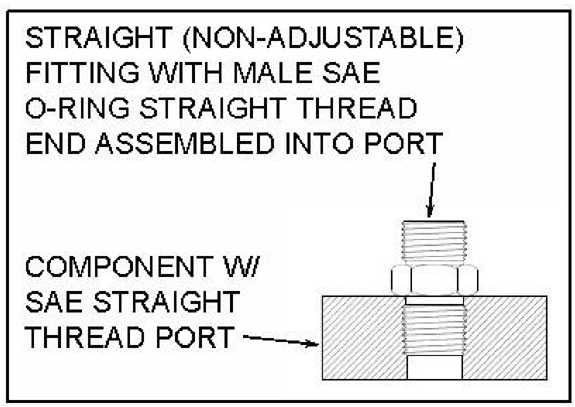
4. Hand tighten fitting until back-up washer contacts face of the port and is pushed all the way toward the flange. (See drawing below)



5. Back fitting off to desired position. Do not turn fitting more than one turn. (See drawing below)



SAE Straight Thread O-Ring Fitting (Nonadjustable)



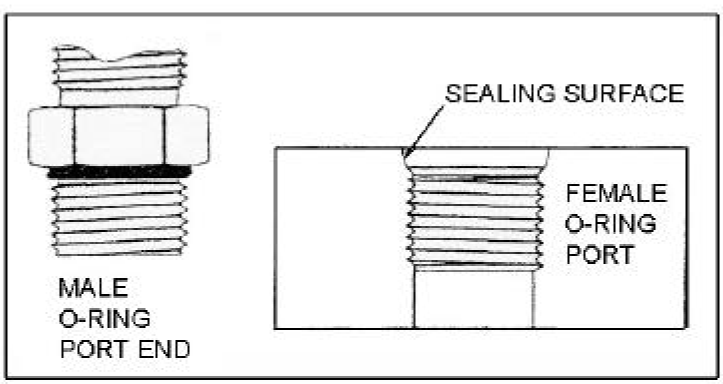
Installation Instructions

1. Install SAE o-ring on port end of fitting.
2. Make sure both threads and scaling surfaces are free of burrs, nicks and scratches, or any foreign material,
3. Lubricate 0-ring with light coating of QUINSYN.
4. Tighten fitting securely to port.

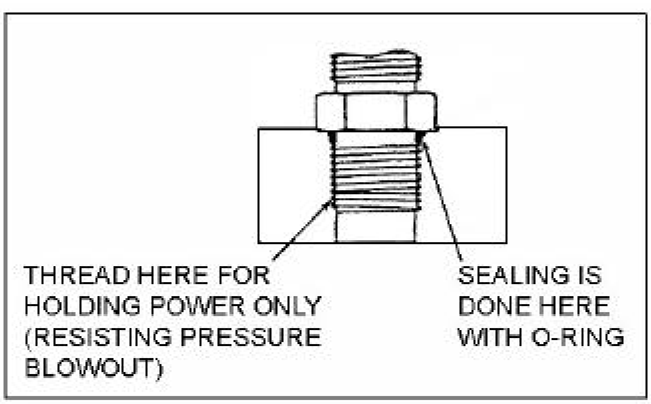
NOTE:

1. For steel fittings in aluminum, cast iron, or steel housings.
2. Restrain fitting body on adjustables if necessary in installation.

SAE Straight Thread O-ring Fitting (Adjustable).
Assembly, Fitting to Port



1. Install o-ring on fitting. DO NOT nick the o-ring.
2. Inspect both mating surfaces for burrs, nicks, scratches or any foreign particles.
3. Lubricate o-ring with light coat of QUINSYN.



4. Back off look nut as far as possible. Make sure back-up washer is not loose and is pushed up as far as possible.
5. Screw fitting. Hand tighten until back-up washer contacts faces of the port.
6. To position the fitting, unscrew by required amount, but not more than one full turn.
7. Use two wrenches, hold fitting in desired position, tighten lock nut securely.

Section 9 - Maintenance Schedule

INTERVAL	ACTION
Periodically/Daily - 8 hours maximum	Monitor all gauges and indicators for normal operation. Check fluid level. Observe for fluid leaks. Observe for unusual noise or vibration. Drain water from air/fluid reservoir.
Weekly	Check pressure relief valve operation.
Monthly	Service inlet filter as needed (daily or weekly if extreme conditions exist). Clean fluid cooler fins. Wipe entire unit down to maintain appearance.
6 months or every 1000 hours	Change fluid filter and fluid strainer.
Periodically/yearly	Go over unit and check all bolts for tightness. Change air/fluid separator element. Change inlet filter element. Lubricate motors. Check safety shutdown system. Contact a qualified serviceman. Check pressure relief valve for pressure setting.
Every two years	Change cooler hoses.

Quincy COMPRESSOR

an EnPro Industries company

Quincy Compressor Products: 217.222.7700
E-mail: info@quincycompressor.com
Website: www.quincycompressor.com