



QSVB 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.

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Added 09/2010

MODEL IDENTIFICATION: QSVB

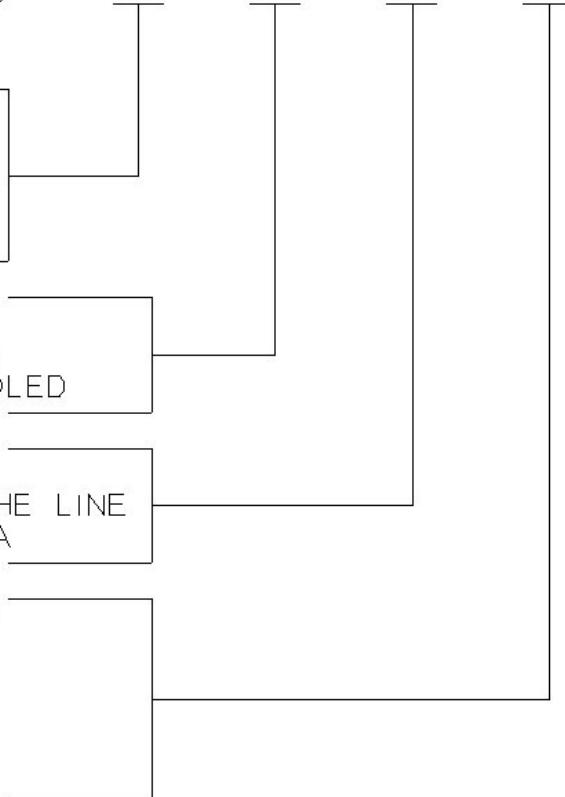
MQSVB

07 = 7.5
10 = 10
15 = 15
20 = 20
25 = 25

COOLER:
A = AIRCOOLED
W = WATERCOOLED

UNIT TYPE:
A = ACROSS THE LINE
Y = WYE-DELTA

DESIGN VERSION:
A = 1ST
B = 2ND
C = 3RD
D = 4TH
E = 5TH



STANDARD WARRANTY
QUINCY VACUUM PUMP DIVISION
INDUSTRIAL SCREW PRODUCTS
QSVB - PACKAGED VACUUM PUMPS - AIR ENDS
REMANUFACTURED AIRENDS AND PARTS

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

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

Airend on Packaged Vacuum Pumps - 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 Airend - 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.

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.

SECTION I

SAFETY CAUTIONS 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 depend on check valves to hold system vacuum.

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 operate the vacuum pump at sump pressures in excess of its rating.

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) sensors.

Use the correct fluid at all times.

NOTE:

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

These instructions, precautions and descriptions cover standard Quincy manufactured QSVB series air vacuum pumps.

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

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.



 **DANGER**

Air from this vacuum pump will cause death or serious injury if used for breathing or food processing (if non-food grade fluid is used). Air used for these processes must meet OSHA 29CFR1910.134 regulations or FDA21CFR178.3570 regulations.

IMPORTANT

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




Hazards or unsafe practices that will result in death or serious injury.



Immediate hazards which could result in death or serious injury.



Hazards or unsafe practices which may result in minor injury or product or property damage.



Bay Minette, Alabama
quincycompressor.com
217.222.7700

S/N P/N

MODEL DATE

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. A model/serial number plate is located on the frame and in the upper right corner inside of the control panel door.

SPARE PARTS ORDERING -- Coltec Industries, Quincy Compressor Division maintains replacement parts for Quincy vacuum pumps. 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 use genuine Quincy parts may void your warranty.

SECTION II

DESCRIPTION

1. General Description of Quincy QSVB Series Vacuum Pumps

The QSVB line of rotary screw vacuum pumps covers the horsepower range of 7.5 to 25 horsepower. The vacuum pump is a single stage, positive displacement, and fluid-flooded rotary screw type unit. The vacuum pump consists of two precision machined rotors. The drive rotor is driven through a "V" belt arrangement.

An external fluid pump directly driven by the female rotor maintains fluid circulation. All components are attached to a heavy-duty steel frame. Controls and indicators are arranged on a control panel.

2. Principles of Vacuum Pump Operation

The compression cycle of a rotary vacuum pump is a continuous process from intake to discharge with no reciprocating mechanisms starting and stopping as found in reciprocating vacuum pumps. The vacuum pump consists of two rotors in constant mesh, housed in a cylinder with two parallel adjoining bores. The male drive rotor has four lobes that mesh with six flutes in the female rotor. All parts are machined to exact tolerances.

As the rotors rotate, (clockwise as viewed from the power-input end) air is drawn into the cylinder through the inlet port located at the power-input end. A volume of air is trapped as the rotor lobes pass the inlet cut off points in the cylinders. Compression occurs as the male rotor rolls into the female flute, progressively reducing the space thereby raising the pressure. Compression continues until the lobe and flute pass the discharge port. The air is then discharged into the air/fluid reservoir where it is discharged to the atmosphere through the fluid separator element. There are four complete compression cycles for each complete rotation of the male rotor. (Figure 2-1).

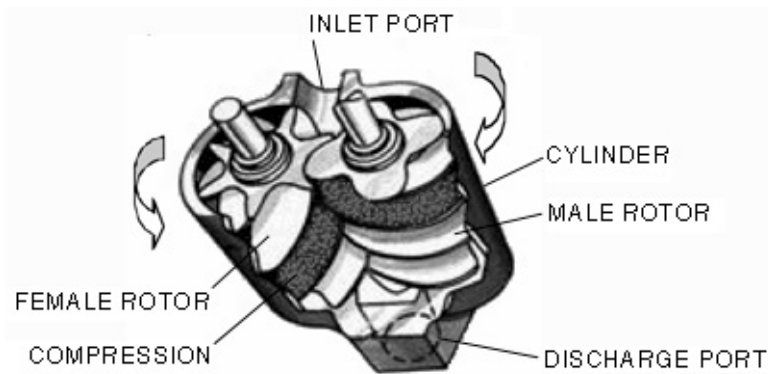


Figure 2-1

3. Description of Air Flow

With the vacuum pump operating, a vacuum is produced at the pump inlet. Air entering via the vacuum pump air filter flows directly into the rotor housing where it is compressed. Compressed air passes through the complete system and is discharged through the discharge port on the reservoir housing. The air/fluid reservoir is equipped with a safety valve to protect the system in case of excessive restriction to the airflow in the separator element or the discharge system.

4. Description of Fluid Flow and Vacuum Pump Cooling System

The fluid serves three functions: it lubricates the bearings and rotors; it removes heat from the air as the air is being compressed thus lowering the compressed air discharge temperature; it also seals the rotor clearances.

Fluid Coolers

Removal of the heat from the fluid is achieved with either an air-cooled heat exchanger or a water-cooled heat exchanger. The air-cooled fluid cooler is of the finned aluminum tube design. Ambient air is forced through the fins by a motor driven fan, cooling the fluid in the tubes. To maintain proper vacuum pump operation, the temperature of the ambient air should not exceed the temperatures listed in the QSVB specifications. The cooler fins must be kept clean at all times. Fluid leaving the receiver passes through a thermal mixing valve before traveling on to the cooler. The purpose of the thermal valve is to maintain a minimum fluid discharge temperature at the vacuum pump of approximately 180°F. The water-cooled fluid cooler is of a shell and tube design. Minimum fluid injection temperature is controlled by a water regulating valve which senses the fluid temperature entering the vacuum pump and regulate the cooling water flowing through the fluid cooler. Fluid is circulated through the cooler, fluid filter, and into the vacuum pump. In the vacuum pump, some fluid is diverted directly through internal passages to ensure positive lubrication of the bearings, gears and shaft seal. The remainder of the fluid is injected into the early stage of the compression cycle to seal clearances and cool and lubricate the rotors.

5. Vacuum Control System

To gain a better understanding of how a Quincy Vacuum Pump operates, let's assume the Quincy vacuum pump is set to operate from 20" to 23" Hg vacuum, with a lower set point of 20" Hg and an upper set point of 23"Hg differential.

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/lubricant reservoir.

The control system remains in this state until the vacuum level in the plant system increases to 20" Hg. At this 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 usage continues to decrease causing the level to increase to 23" Hg, 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 action allows enough air flow from the inlet valve air cylinder through the solenoid to the vacuum pump inlet to close the inlet valve completely and allows the vacuum level in the system from rising above the maximum set point of 23"Hg. This cycle continues as required by the system usage and the vacuum level is maintained between 20"Hg. to 23"Hg. If the vacuum pump stops during operation, either manually by pressing the stop button or automatically due to a high temperature condition, a check valve feature in the inlet valve prevents air from entering the system through the vacuum pump.

Do not operate the pump continuously at inlet vacuum levels of 0 – 10" HgV as excessive fluid carryover can occur. Consult the factory if operating within 0 – 10" HgV.

6. Auto Dual with Modulation

The Auto/Dual system offers two choices of controlling the Quincy QSVB 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.

During the unloaded/timing mode, if plant pressure should drop causing the vacuum switch contacts to close, 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.

7. Auto/Demand - Optional

The QSVB 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 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 shut down on time delay as determined by the Demand-A-Matic controller.



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.

8. Electrical System Description

A diagram of the electrical system is shown in the parts manual sent with the vacuum pump. A wiring diagram is also included in the control panel on all Quincy QSVB 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 control.

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 QSVB 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 probe, solenoid and the various 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.



High voltage could cause death or serious injury. Disconnect all power supplies before opening the electrical enclosure or servicing.

9. Safety Sensors

One high air temperature (**HAT**) switch is standard on the QSVB units. This switch protects the unit by sensing unusually high temperatures and shutting the unit down.. The switch is located in the discharge line from the vacuum pump. These sensors are set to trip at approximately 250°F. The probe is non-adjustable.



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.

10. Indicators

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.



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

High Discharge Air Temperature Light

Indicates when the unit has sensed an unusually high discharge temperature, approximately 250°F.

11. Gauges

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 190°F to 210°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.

SECTION III

INSTALLATION

1. Receiving

Upon receipt of the vacuum pump, immediately inspect the vacuum pump for any visible 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 unit 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.

2. Moving the Unit to the Installation Site

When a forklift is used to move the unit to its 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.

NOTE:

See technical data for detailed technical information and dimensions.



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

3. 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 104°F. (Failure to heed this may result in a high air temperature shutdown.) Careful consideration of room size and shape must be done so that hot exhaust air from the cooling fan does not recirculate within the room, causing the operating temperatures to rise. High temperature shutdown may result. All models are intended for indoor installation; however, it is possible, with certain modifications, to accommodate some outdoor locations. Cabinet models are water-resistant but not watertight. Sheltering from rain, snow and freezing temperatures is mandatory.

 **CAUTION**

This vacuum pump should not be operated in temperatures below 32°F or above the limits outlined in the technical data section.

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. Exhaust piping should be installed in such a manner as to not create additional backpressure on the vacuum pump. Also, the exhaust piping should be installed with a drip leg to prevent condensate from falling back into the fluid receiver. If the room is not properly ventilated, the vacuum pump operating temperatures will increase and cause the high temperature probe to shut the unit off.

 **CAUTION**

Clean, fresh air, insufficient quantity, is required for proper vacuum pump operation.

 **WARNING**

Never locate the vacuum pump inlet system where it can ingest toxic, volatile or corrosive vapors, air temperatures exceeding 110°F, water, or extremely dirty air. Taking in any of the above could jeopardize the performance of the equipment or pose a health hazard to all personnel exposed to the total compressed air system.

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.

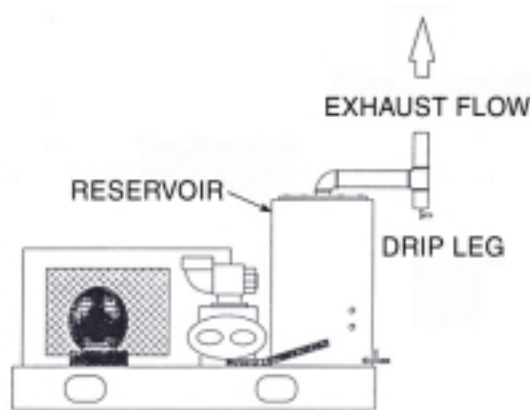
! CAUTION

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

The Quincy QSVB 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.

4. 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)



5. 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.

6. Relief Valves

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 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.

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.



Relief Valve

7. Electrical

Before installation, the electrical supply should be checked for adequate wire size and capacity. During installation, a suitable fused disconnect switch or circuit breaker should be provided. Where a 3-phase motor is used to drive a vacuum pump, any unreasonable voltage unbalance (5%) between the legs must be eliminated and any low voltage corrected to prevent excessive current draw. The installation must be in accordance with 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.

Quincy would like to emphasize the importance of providing adequate grounding for vacuum pumps. The common practice of grounding units to building structure steel may not actually provide adequate grounding protection, as paint and corrosion build-up may exist.



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

8. 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 in OSHA manual 2206 Revised November 7, 1978 and any state or local codes.



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.



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.

9. Water and Sewer Facilities at the Installation Site (Water-cooled models only)

Make sure the water supply is connected and open. Piping supplied by the user should be at least equal to the connections provided on the vacuum pump. 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. Sewer facilities should be readily accessible to the installation site and meet all the requirements of local sewer codes, plus those of the vacuum pump. **Make absolutely sure water inlet and discharge connections are correct.**

NOTE:

The water temperature-regulating valve is located in the discharge water line.



Relieve vacuum pump and system vacuum by opening the appropriate manual relief valve prior to servicing. Failure to relieve all system pressure could result in death, serious injury and property damage.

10. Induction Filtration 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.

11. Fluid Level

The vacuum pump is filled at the factory with the correct amount of fluid. A fluid tag is provided with the information concerning the initial fill of fluid. Fluid level is monitored by sight glass while in operation. Fluid level should be between the maximum and minimum level while in operation. **DO NOT OVER FILL.** The fluid level should be checked during operation and maintained in the run zone.



Fluid Level Sight Gauge

12. Vacuum Pump Rotation

The vacuum pump rotation must be checked prior to start-up. Proper rotation is 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. Briefly jog the starter button allowing the motor to turn two or three revolutions. Observe the drive element for correct direction. If incorrect rotation is observed, lock out power supply, reverse electrical leads L_1 and L_3 at the motor starter. Re-check for correct rotation.

13. Fan Rotation

Fan air flow should be outward, that is, pushing the air through the coolers.

14. Phase Monitor (Optional)

QSVB 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. If the phase monitor does not allow the unit to start, 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.
- (3) 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 IV

OPERATING PROCEDURES



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

1. 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 are thoroughly understood. The following checklist shall be adhered to before placing the vacuum pump into operation:

- 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.
- 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.

NOTE:

Read detailed instructions in Section III prior to start-up. Failure to follow instructions may void warranty.

2. Starting the Vacuum Pump

- Select the mode of operation and start the vacuum pump.
- Watch for excessive vibration, unusual noises, or air/fluid leaks. If anything unusual develops, stop the vacuum pump immediately and correct the condition.
- Control settings have been adjusted at the factory; however, they should be checked during start-up and readjusted, if necessary. Some applications may require a slightly different setting than those provided by the factory. Refer to the Section VII (Service Adjustments).
- Observe vacuum pump operation closely for the first hour of operation and frequently for the next seven hours. Stop and correct any noted problems.
- Do not operate the pump continuously at inlet vacuum levels of 0 – 10” HgV as excessive fluid carryover can occur. Consult the factory if operating within 0 – 10” HgV.

3. 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.

It will prevent the system's vacuum pressure from leaking back into the reservoir if, for any reason, the inlet valve did not close tightly. This also prevents fluid from being pulled back into the vacuum system.

4. Stopping the Vacuum Pump - Emergency

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

SECTION V

PREPARING FOR MAINTENANCE OR SERVICE



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.

1. Disconnect and lockout the main power switch and tag the switch of the unit being serviced.
2. Close shut-off valve (block valve) between receiver and plant vacuum system to prevent any back up of vacuum pressure in the vacuum pump area to be serviced.

NOTE:

Never depend on a check valve to isolate the system.

3. Open the manual vent valve and wait for the vacuum in the system to be completely relieved before starting service.
4. Shut off water and pressurization system (if water-cooled).

SECTION VI

SERVICING

NOTE:

Only trained and qualified technicians should perform maintenance.

1. Safety

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 may exceed at 180°F when the vacuum pump is working.
- Clean up fluid spills immediately to prevent slipping.
- 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.



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

2. Lubrication

Each unit comes equipped with a fluid level sight gauge, fluid fill opening, and a fluid drain located in the reservoir. Each unit is factory filled with QuinSyn[®] synthetic fluid or QuinSyn[®] F (food grade) synthetic fluid. Mineral oil can be requested and used in specific applications. The use of other brands or types of fluid may reduce the design life of the vacuum pump or cause problems with filtration or carryover. Consult the Quincy factory before changing brands of fluid.



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.

3. Fluid Specifications

We recommend that all Quincy rotary screw vacuum pumps be filled with QuinSyn[®] synthetic fluid. QuinSyn[®], QuinSyn[®] F or QuinSyn[®] IV is available from any authorized Quincy distributor. For applications requiring a food grade fluid, we recommend QuinSyn[®] F. Sustained (3 hours or more) discharge temperatures over 210°F require the use of QuinSyn[®] HP fluid.

NOTE:

Failure to follow the above recommendation will adversely affect your warranty.

4. Fluid Life

QuinSyn[®] fluid can be used between 4,000 - 8,000 hours depending upon application and recommendations from the fluid analysis. QuinSyn[®] F (food grade) and QuinSyn[®] IV can be used between 2,000 and 3,000 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 a reputable fluid analysis program be followed to establish fluid change intervals.

A free service provided with the use of QuinSyn[®] products is a fluid analysis. This analysis provides the end user 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 or at 1,000 hour intervals or sample as directed by 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. Drain off all water prior to taking fluid sample.

5. Water Removal

Water vapor may condense in the separator reservoir and must be removed. The frequency with which water must be removed is determined by the inlet vapor conditions. To drain water from the reservoir, turn the vacuum pump off and let set for at least 15 minutes. Then open the drain valve. Water is heavier than the vacuum pump fluid and will collect at the bottom of the reservoir. When the drain is first opened some fluid may come out before the water starts to flow. Close the valve when the water flow changes to fluid. Make certain that there is no pressure in the reservoir before opening the drain valve.

6. Understanding the Analysis Report

- 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[®], QuinSyn[®] IV 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 (page 27)

Fluid levels should fill the sight level gauge while the vacuum pump is in operation. **DO NOT OVERFILL.** Operating over full will result in high fluid carryover.



Quincy

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

UNDENIABLY THE WORLD'S FINEST COMPRESSORS

PRODUCT ANALYSIS REPORT

(a)

(b)

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. #

(c)

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

FLUID PARAMETERS
Quinsyn[®], Quinsyn[®] IV & Quinsyn[®] F

Property	Units	Test Method	New Fluid	Marginal	Unacceptable
Viscosity 40°C	cSt	ASTM D-445	42-48	38, 52	<38, >52 (1)
Acid No. TAN	mg KOH/gm	ASTM D-947	0.1	0.8-0.9	>1 (1)
ADDITIVE METALS					
Barium	PPM	Plasma Emission	0	5-20	>20
Calcium	PPM	Plasma Emission	0	5-20	>20
Magnesium	PPM	Plasma Emission	0	5-20	>20
Molybdenum	PPM	Plasma Emission	0	5-20	>20
Sodium	PPM	Plasma Emission	0	5-20	>20
Phosphorus	PPM	Plasma Emission	0	5-20	>20
Zinc	PPM	Plasma Emission	0	100-200	>200
WEAR METALS					
Silver	PPM	Plasma Emission	0	5-10	>10
Aluminum	PPM	Plasma Emission	0	5-10	>10
Chromium	PPM	Plasma Emission	0	5-10	>10
Copper	PPM	Plasma Emission	0	5-10	>10
Iron	PPM	Plasma Emission	0	5-10	>10
Nickel	PPM	Plasma Emission	0	5-10	>10
Lead	PPM	Plasma Emission	0	5-10	>10
Tin	PPM	Plasma Emission	0	5-10	>10
Titanium	PPM	Plasma Emission	0	5-10	>10
Vanadium	PPM	Plasma Emission	0	5-10	>10
OTHER					
Silicion	PPM	Plasma Emission	0	10-15	>15
Water	PPM	Karl Fisher	<75	200	>200
Particle Count	Microns	Hiac Royco		ISO CODE X/20	
Antioxidant	%	Liquid Chromatography	100	NOT REPORTED	

NOTE:

(1) The fluid will be condemned based on these parameters.

WARNING

Do not mix different grades or types of fluid. Do not use inferior grades of fluids. Failure to follow these recommendations could cause serious fluid breakdown, resulting in the information of heavy varnish and sludge throughout the system. This could result in clogging the fluid separators, coolers and internal fluid passages. Warranty will be voided.

7. Fluid Filter

The fluid filter is a spin on, full flow unit. 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 change should occur after the first 500 hours of operation. During normal service, the filter cartridge should be replaced under the following conditions, **whichever occurs first**:

- As indicated by the fluid filter maintenance indicator when the fluid is up to its operating temperature.
- Every 1,000 hours.
- Every fluid change.

NOTE:

The fluid filter maintenance indicator may read high upon start up on cool mornings due to sluggish fluid creating higher than normal differential pressures. Monitor indicator after the fluid warms up. Do not confuse the fluid filter with the strainer located before the fluid pump.



Spin-On Fluid Filter

8. 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. Replace the fluid strainer along with the separator element.

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.



Do not remove the staples from the separator element. Their function is to prevent an electrostatic build-up, which could spark a fire. Use genuine Quincy replacement separators.

9. Continuity Testing of Separator Elements

NOTE:

Electrical continuity between all separator element metal surfaces must be checked prior to replacing any separator element. Do not install if continuity is not present. Return the separator element to your Quincy Distributor for replacement.

Use the following procedure prior to installation:

- 1) Locate a continuity test light or a volt-ohm-meter (v-o-m) capable of reading 20 ohms.
- 2) Assure that battery has proper charge. Touch the probe leads together to assure the light works or to zero calibrate the meter.
- 3) Contact the grounding staple on the separator element gasket or the grounding spring clip on the separator element (elements without gaskets) with the ground probe of the test indicator.
- 4) Touch the top cap of the separator element with the other probe. The indicator light should illuminate on the test or the v-o-m test must read no more than 20 ohms.
- 5) Touch the bottom cap of the separator element. The indicator light should illuminate on the test or the v-o-m test must read no more than 20 ohms.

- 6) Touch the outside wire mesh. The indicator light should illuminate on the test or the v-o-m test must read no more than 20 ohms.
- 7) Touch the inside wire mesh (do not puncture the element media). The indicator light should illuminate on the test or the v-o-m test must read no more than 20 ohms.
- 8) If the separator element has a gasket on each side of the flange, repeat steps 3 through 7.
- 9) If the separator element is the type that does not require a grounding staple in the gasket (QSVB stage one only), the ground probe should be attached to the cap with the bolt circle flange repeat steps 4 through 7.
- 10) If the separator element fails any of the above test, return it to a Quincy Distributor for replacement.
- 11) Make sure the vacuum pump is bonded (wired) to an earth ground to dissipate static electricity.

10. Fluid Scavenging System

Fluid from inside the fluid separator element is returned to the inlet valve or airend by way of a scavenger tube positioned inside the fluid separator element, through an orifice and via a tube to the vacuum pump. Failure to keep the orifice clean will result in excessive fluid carryover. Cleaning of the orifice should be performed as shown below or, **which ever occurs first:**

- **When no fluid is seen moving through the sight glass.**
- **When excessive fluid carryover is detected.**
- **Every fluid change.**
- **Once per year.**

NOTE:

Do not ream the orifice or change the orifice size. Do not install the orifice reversed.

11. Air Filter

The air filter is a single stage, dry type element attached to the inlet valve. The filter media is pleated and will stop particles of 10 microns in size. This element is replaceable and should not be cleaned.

Service intervals of the air filter element depends on ambient conditions and should be established by checking regular intervals until a pattern for servicing is found. Daily maintenance of the filter element is not uncommon in dirty conditions.

Each time the filter is serviced, inspect the filtered air side of the air cleaner canister and the suction manifold for dirt. If dirt is found, determine the cause and correct. Always make sure all gaskets, threaded connections, flange connections, and hose connections between the air filter and air vacuum pump are absolutely air tight.

Dirty filters result in reduced air flow and can distort the element and allow dirt to by-pass the filter element.

NOTE:

Intake filtration equipment supplied from the factory may not be adequate for some vacuum applications or some forms of dust or vapors. It is the customer's responsibility to provide adequate filtration for those conditions. Warranty will be void if a failure is determined to be caused by inadequate filtration.

12. Vacuum Pump Shaft Fluid Seal

The QSVB vacuum pump shaft fluid seal is a triple lip and seal wear ring design. Service of the shaft seal requires replacement of the seal and seal wear ring. The shaft and wear ring rotate against the lips of the stationary seal. Both the seal and the wear ring are maintenance items. The original seal is warranted for twelve (12) months.

To control any seal seepage QSVBs are equipped with an outboard dyna-lip seal and related scavenge line. The scavenge line should be kept free of any debris.

Seal Removal

1. Lock out and tag out the main power supply.
2. Remove vacuum pump drive belts and pulley.
3. Remove the faceplate on the basic vacuum pump.
4. Remove seal wear ring using tool part number 129231. Note: Shaft seal replacement tool kit, part number 129216, can be purchased through your local Quincy Distributor.
5. Remove the triple lip seal from the faceplate.

New Seal Installation

1. Thoroughly clean seal bore and shaft with 120-150 grit emery cloth.
2. Remove seal bore scavenge line fitting at bottom outside of seal cavity and clean.
3. Align bearing retaining ring gap with oil supply hole at the 7:00 o'clock position.
4. Preheat seal wear ring to 300°F. Apply thick coat of Loctite® 290 to inner diameter of wear ring.
5. Install wear ring on shaft. Allow wear ring to cool completely.
6. Apply LOCTITE® 290 to entire outer circumference of shaft seal.
7. Do not remove seal from insertion tool. Slide seal and insertion tool over shaft and up against wear ring.
NOTE: Seal must have two lips facing inward and one lip facing outward.
8. Install dyna-lip seal and pulley. Note: Do not block scavenge hole with dyna-lip seal.

SECTION VII

SERVICE ADJUSTMENTS



Read all safety cautions and warnings in Section I prior to attempting any service.

1. Differential Pilot Valve

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 stream of air can be felt coming from the orifice adjacent to the adjustment screw.

When this air is felt, air is beginning to pass through the pilot valve, causing the valve to modulate toward its closed position, thereby, reducing the volume of air being compressed.

To raise pressure turn the adjusting screw in (clockwise), to lower pressure turn screw out (counter clockwise). Maximum vacuum under modulation is 29.6" HgV. for the QSVB vacuum pumps.

2. Vacuum Pressure Switch

The vacuum pressure switch determines at what pressure the vacuum pump will load and unload. Standard factory settings are listed in the QSVB Specifications. Never exceed these pressures. If a lower setting is desired, adjust the differential pilot valve first and set the pressure switch cut-out point to no more than 2" HgV differential. The adjustment is made by turning the wheel clockwise to increase the cut-in/cut-out pressure and counter-clockwise to lower the cut-in/cut-out pressure. The pressure switch should unload the vacuum pump by the time it reaches the 20% load point. Consult your parts book for proper sheave and belt part numbers.

3. Water Regulating Valve (water-cooled units only)

The water regulating valve senses fluid temperature and opens or closes, regulating water flow from the unit. It is factory set to maintain 190°F air discharge temperature. Due to different incoming water temperatures and/or pressures at the customer location, valve adjustment should be checked during start-up to maintain 190°F discharge 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 counter clockwise. **Water pressure should be 40 PSI minimum/100 PSI maximum. Water temperature should be 50°F minimum/90°F maximum.**

4. Belt Adjustment

The QSVB is equipped with an automatic belt-tensioning device and requires no adjustments between belt replacements.

NOTE:

Belts must be replaced when automatic belt tensioning indicator dowel pin has reached full length of travel in its groove.

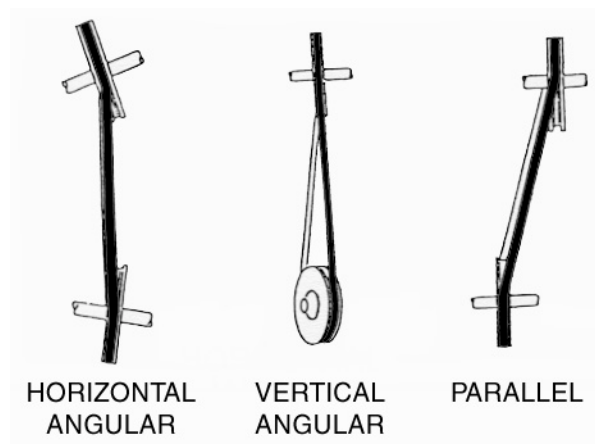
5. Belt Drive Inspection Procedure

1. Inspect sheave grooves for nicks.
2. Thoroughly inspect the tapered bore of the sheave and the tapered surface of the bushing. Any paint, dirt, metal chips, fluid or grease **MUST** be removed.
3. Position bushing and sheave assemblies and rough align with a metal straight edge. Mount sheaves as close to the vacuum pump and/or motor housing as practical to avoid excessive bearing and shaft loads. Tighten dry capscrews evenly and alternately. Use no lubricants in this installation. Excessive capscrew tightening can cause sheave and/or bushing breakage. Rotate pulleys to check for sheave runout wobble) or a bent shaft. Hand tighten setscrew over keyway, if required.

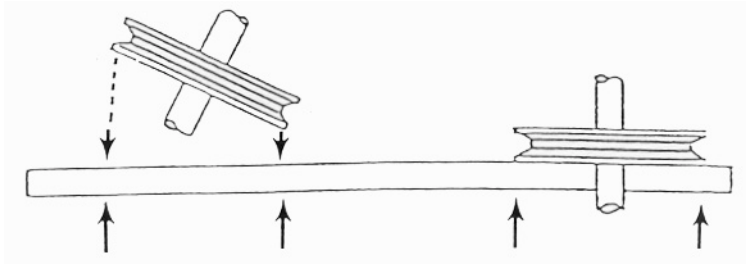
NOTE:

After tightening, there should be a 1/8" to 1/4" gap between the mating part hub and the bushing flange. Misalignment of the sheaves will reduce belt life by increasing wear and increase the probability of belt turnover by decreasing stability. Misalignment comes in three varieties: Horizontal angular, vertical angular and parallel. Sheave alignment should be within 0.07" per foot of shaft center distance. This is the total of all parallel and angular misalignment. Check sheave misalignment in at least three places (rotating one of the sheaves 120° after each check) to locate the position of maximum misalignment.

Types of Misalignment

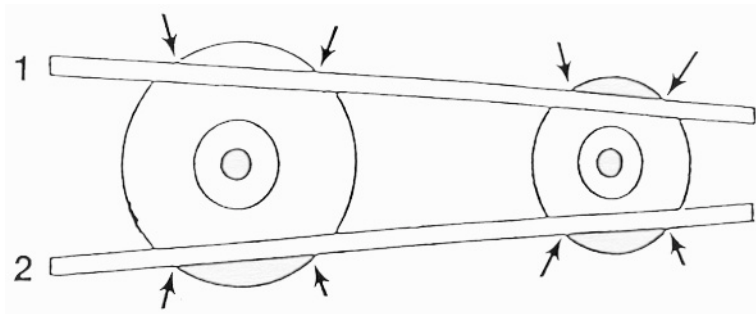


Horizontal Angular (Shafts in same horizontal plane but not parallel)



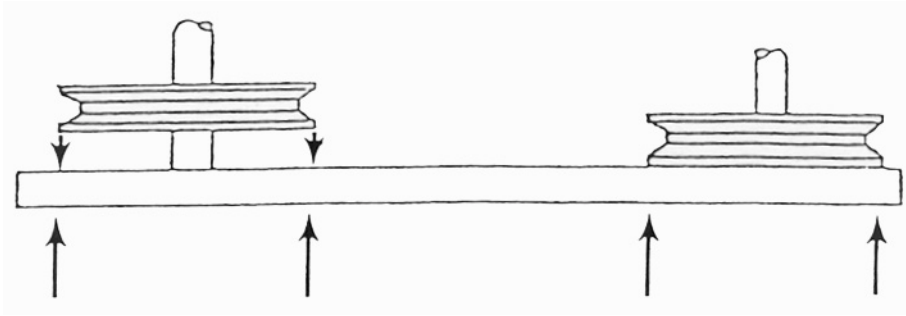
1. To check, use straightedge or string near sheave centers.
2. To correct, loosen motor mounting bolts and rotate motor until all four points touch straightedge.

Vertical Angular (Shafts in same vertical plane but not parallel)



1. To check, place straightedge 1/4 radius from the outside diameter of both sheaves as shown:
 - a) Repeat on opposite side of shaft.
 - b) Straightedge should touch four points indicated in each position.
2. To correct, loosen sheave so it slides easily on shaft until all four points touch straightedge. Tighten sheave in position. **IMPORTANT: Sheave should be mounted as close to bearing as possible to reduce overhung load on bearing. Relocate equipment, if necessary.**

Parallel (Shafts are parallel, sheaves are not in line)



1. To check, use straightedge or string near sheave centers.
2. To correct, loosen sheave and relocate on shaft until all four points touch straightedge. Tighten sheave in position. **IMPORTANT: Sheave should be mounted as close to bearing as possible to reduce overhung load on bearing. Relocate equipment, if necessary.**

NOTE:

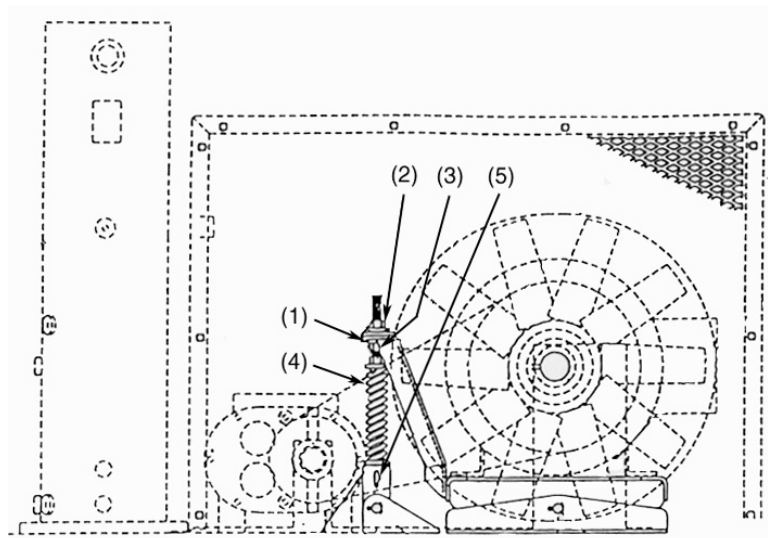
Never “pry” the belts into the sheave grooves. This can damage the belt cords and lead to belt turnover, short life or actual breakage.

6. Belt Replacement

Below are the instructions for replacing belts. These instructions must be followed to provide proper installation and proper tensioning. Complete Belt Drive Inspection Procedure as outlined in Part 5 of this section.

Belt Drive Replacement Procedure (reference illustration below)

1. Lock out and tag out the electrical power supply.
2. Remove panels and guards to gain access to belt drive area.
3. **Do not change the location of nut (1) or nut (2).** If nut (1) or nut (2) have been tampered with, refer to motor base instructions on page 38.
4. Loosen nut (3) and lower motor plate until nut (3) contacts nut (1).
5. Remove existing belts by rolling off drive sheaves.
6. Install new belts by rolling into position on the sheaves. NOTE: The spring (4) will compress to allow the belts to cross into the grooves in the sheaves.
7. Raise the motor into position by adjusting nut (3) until the pin (5) just reaches the bottom of the groove.
8. Check belt tension – Lock the height adjustment with nut (2).
9. Operate vacuum pump to check adjustment.
10. Operate the vacuum pump for a few minutes to seat the belts to the groove. Observe the operation of the drive during start-up and full load operation (highest load conditions). Immediately upon shut-down, check temperature of belts by hand. If belts cannot be comfortably touched (heat build-up is an indication of misalignment) refer to Part 5 of this section (Belt Drive Inspection Procedure) and correct prior to operating unit.



6. Belt Tension Check

The automatic belt-tensioning device is designed to maintain proper tension throughout belt life. It is recommended, however, that belt tension be checked periodically and confirmed to be within tension requirements. If belt tension is not within the limits described, contact an authorized Quincy Distributor for service. On 3V belt sections, new belt tension should read between 6.5 - 7.5 pounds deflection force and the run-in belt tension should have a reading between 4-5 pounds deflection force for 3V belt sections. On 5V belt sections, new belt tension should read 10 pounds deflection force and the run-in belt tension should have a reading of 8 pounds deflection force. Without exception, the most important factor in the successful operation of a V-belt drive is proper belt tensioning. Too little tension results in slippage, causing rapid belt and sheave wear. Too much tension can result in excessive stress on belts, bearings and shafts.

After installing new belts operate the unit for two hours to run-in the belts. To measure belt tension, refer to illustration on page 39.

1. Measure the span length (t)
2. Position the lower of the two o-rings using either of the following methods:
 - a) On the scale reading "Deflection Inches", set the o-ring to show a deflection equal to 1/64" per inch of span length (t).
 - b) On the scale reading "Inches of Span Length", set the o-ring to show a deflection equal to the inches of measured span length (t). Read scales at the bottom edge of o-ring. Leave the upper o-ring in maximum up position.

Always rotate pulleys a minimum of 2 revolutions before taking belt tension measurements. At center of span (t) apply force, with Tension Tester perpendicular to the span, large enough to deflect one belt on the drive until the bottom edge of the lower o-ring is even with the tops of the remaining belts. A straight edge across the belt tops will assure accuracy of positioning. Use belt tension gauge P/N 142645 to measure the deflection force halfway between the pulleys as shown.

Find amount of deflection force on upper scale of Tension Tester. The sliding rubber o-ring slides down scale as tool compresses – stays down for accurate reading of pound pressure. Read at top edge of ring. (Slide ring up before re-using.)

Compare deflection force with range of forces stated above. If less than minimum recommended deflection force, belts should be tightened. If more than the maximum recommended deflection force, drive is tighter than necessary. Check tension of all belts on the drive as described above.

Check the ride height. All the belts in each set must ride at the same height in the pulley groove within 0.030" total of each other.

Recheck for pulley misalignment and correct as necessary.

Operate the drive a few minutes to seat the belts in the sheave grooves. Observe the operation of the drive during start-up and full load operation (highest load conditions). A slight bowing of the slack side of the drive indicates adequate tension. Excessive bowing or slippage indicates insufficient tension. If the slack side remains taut during the highest load, the drive is too tight.

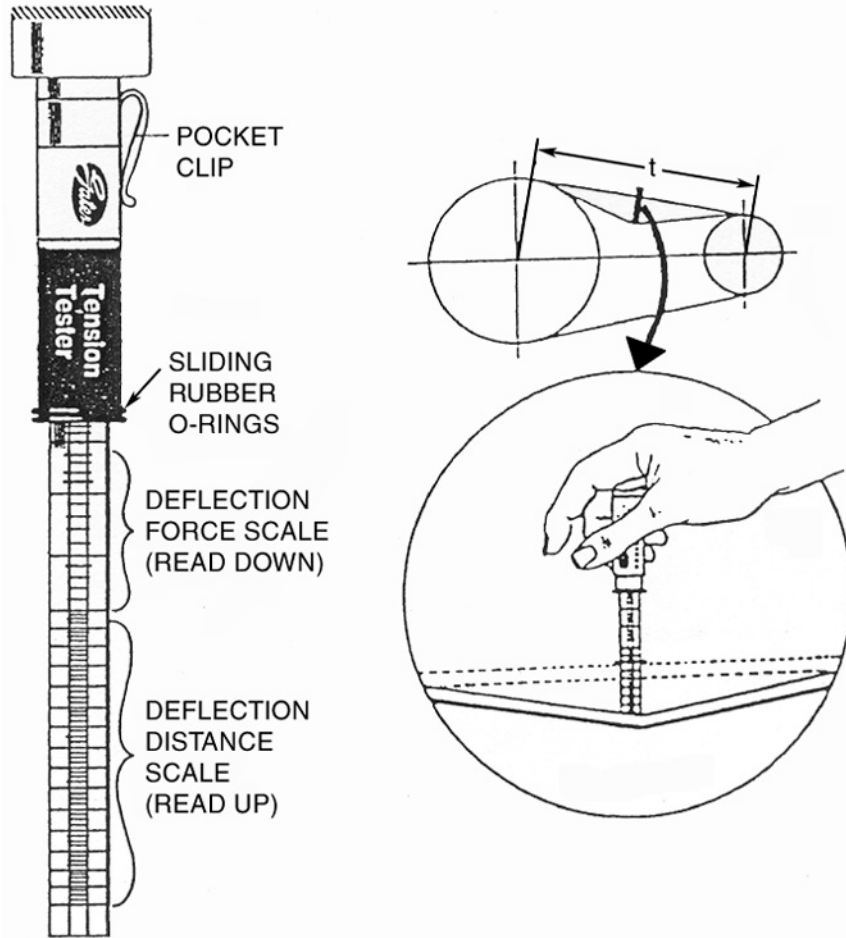
Check and assure the motor base plate is level when belts are at initial tension. If motor base is level, belt tensioning is complete. If not level refer to motor base instructions on page 38.

NOTE:

If problems are noted with belts, refer to Section VIII for troubleshooting procedures.

Leveling Motor Base (reference illustration on page 36)

1. Move motor base to lengthen or shorten the belt center distance, recheck alignment, then re-adjust the automatic belt tensioner spring.
2. Screw nut (1) down to compress spring (4) in $\frac{1}{4}$ inch over solid height. **NOTE: This measurement must be taken before all spring coils touch.**
3. Screw nut (3) down until it touches nut (1).
4. Install new belts by rolling into position on the sheaves. **NOTE: The spring (4) will compress to allow belts to cross into the grooves in the sheaves.**
5. Raise motor platform arm by turning nut (3) until the slack has been removed from the belt.
6. Release spring (4) by turning nut (1) until the pin is at the midpoint location in the slot. Do not exceed the recommended initial belt tension of 7.5 pounds deflection force for 3V section belts or 10 pounds deflection force for 5V section belts.
7. Alternately adjust nut (3) then nut (1) until the belts are at the recommended tension and pin (5) is just above the bottom of the slot. Assure motor base is level.



Belt Tension Tester
Quincy Part # 142645 or Gates # 7401-0076

Section VIII

TROUBLESHOOTING

PROBABLE CAUSE

CORRECTIVE ACTION

Failure To Start

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 " 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
Power failure	Check power supply to the unit
Faulty control relay	Replace the relay
Loose wire connections	Check all wiring terminals for contact and tightness
Faulty High Air Temperature Switch	Check H A T switch. Contact a qualified service technician for repairs.
Faulty transformer	Check secondary voltage on transformer

Unscheduled Shutdown

High air discharge temperature	Correct the situation in accordance with the instruction in the "High Discharge Air 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 sensors	Contact qualified service technician
Loose wire connections	Check all wiring terminals for contact and tightness
Faulty control relay	Replace relay
Excessive discharge pressure	Lower full load pressure setting at control panel
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
Incorrect thermal overload relay setting	Check motor nameplate and compare to overload relay setting
Loose motor or starter wiring	Check all connections for tightness
Faulty motor	Check motor starter wiring before removing motor. Remove motor and have tested at motor manufacturer repair center

PROBABLE CAUSE

CORRECTIVE ACTION

Low Vacuum Delivery

Plugged intake filter element	Clean filter element or replace with new element.
Excessive leaks in the service lines	Check service lines for leaks with soap suds
Inlet valve not fully open	Check for build up or gumming of shaft
Excessive vacuum demand	Re-evaluate vacuum demand. Add additional vacuum pumps as needed
Excessive leaks in service lines	Check service for leaks using soap suds and repair as needed
Inlet valve not fully open	Correct in accordance with the instructions in “Inlet valve not opening or closing in relation top air demand” section of troubleshooting guide
Plugged intake filter	Replace filter element
Differential pilot valve not set correctly	Adjust differential pilot valve to achieve desired modulation range
Vacuum pressure switch not set correctly	Adjust vacuum pressure switch to achieve desired cut-in and cut-out pressure
Faulty vacuum pressure gauge	Check and replace as necessary

High Discharge Air Temperature

Cabinet panels removed	Replace all panels, ensure all sealing surfaces and materials are satisfactory
Faulty thermal valve	Replace thermal valve element
Cooler plugged	Clean cooler, find and correct cause of contamination
Cooling water temperature is too high	Check and adjust as necessary
Low fluid level	Add fluid to required level on reservoir
Excessive pressure in exhaust line	Clear restrictions in exhaust line to ensure atmospheric pressure at discharge

Frequent Air/Fluid Separator Clogging

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
Mixing different grades or types of fluids	DO NOT MIX DIFFERENT GRADES OR TYPES OF FLUID. DO NOT MIX FLUIDS FROM DIFFERENT MANUFACTURERS
Incorrect fluid	Follow vacuum pump fluid specifications as described in lubrication section of this manual

PROBABLE CAUSE

CORRECTIVE ACTION

Frequent Air/Fluid Separator Clogging (continued)

Incorrect fluid filter	Use genuine Quincy replacement filters only
Fluid breakdown	See 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 location of cooler and assure there is no restriction to free circulation of cooling air. Check fins at cooler and clean as necessary while machine is not running
Low fluid level in reservoir	Add fluid to recommended level. Check fluid distribution system for leaks
Clogged fluid filter	Replace fluid filter element
Clogged fluid cooler	Check fluid cooler for varnishing and rust deposits. If condition exists, clean cooler thoroughly and contact Quincy service technician for instructions
Excessive ambient temperatures	Maximum ambient for proper operation is listed in data sheet. Ventilate room or relocate vacuum pump
Incorrect fan rotation	Correct rotation is with the fan pushing the air through the cooler. Reverse motor starter leads L1 and L2
Improper fluid	Use recommended fluids only. Refer to lubrication section of manual
Clogged air filter	Clean or replace as necessary
Faulty thermal valve	Repair or replace as necessary
Faulty gauges	Check and replace as necessary
Airend failure	Contact a Quincy authorized distributor

Excessive Fluid Consumption

Too high fluid level in the receiver	Adjust fluid level to recommended fluid level by draining the reservoir. Use fluid level gauge as a guide
Plugged scavenger line	Clean scavenger line orifice and tube
High discharge temperature	Correct in accordance with the instructions in “High discharge air temperature” section of this troubleshooting guide
Faulty or damaged separator	Change air/fluid separator
Leak in fluid lines	Check for leaks and correct
Seal failure, leaks	Replace seal assembly and o-rings
Cycling too often between load and unload	Correct in accordance with the instructions in “Too rapid cycling between load and unload” section of this troubleshooting guide
Incorrect fluid	Use recommended fluids only. See lubrication section

Frequent Inlet Filter Clogging

Inlet filter not adequate for conditions	Use specialized inlet filter. Contact an Authorized Quincy Distributor
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PROBABLE CAUSE**CORRECTIVE ACTION****Inlet Valve Not Opening Or Closing In Relation To System Demand**

Improper setting of vacuum pressure switch or faulty switch	Adjust vacuum pressure switch to proper setting or replace switch, if faulty
Excessive moisture in control air line at air cylinder	Service control air line filter daily
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 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

Vacuum pump Does Not Unload When There Is No System Demand

Incorrect vacuum pressure switch setting	Adjust to proper setting
Faulty vacuum pressure switch	Replace switch
Faulty solenoid valve	Repair or replace as necessary
Faulty differential pilot valve	Repair or replace as necessary
Leaks in control lines	Check all control line fittings and tubings

Vacuum pump Does Not Revert To Load When Service Line Pressure Rises To Reset Pressure

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 (Optional Auto/Dual Units Only)

Faulty timer	Check and replace as necessary
Leaks in control lines	Check and repair any leaks
Leaks in service lines	Check vacuum distribution system for leaks
Faulty air pressure switch	Repair or replace as necessary
Faulty air pressure sensors	Replace as necessary

PROBABLE CAUSE

CORRECTIVE ACTION

Excessive Water Content in Fluid

Water drain intervals	Drain water as needed to reduce water content in fluid below 200 PPM
Discharge temperature too low	Check operation of thermostatic valve or water regulating valve. If condition continues, consult factory service department

Premature Belt Failure/Broken Belts

Object falling into drive	Provide adequate guard or drive protection
Tampering	Provide adequate guard or drive protection

Belts Fail To Carry Load For No Visible Reason

Damaged tensile member	Follow correct installation procedure
Worn sheave grooves	Check groove for wear, replace as necessary
Center distance movement	Check drive for center distance movement during operation

Edge Cord Failure

Sheave misalignment	Check alignment and correct as necessary
Damaged tensile member	Follow correct installation procedure

V-Belts Turn Over Or Come Off Drive

Foreign material in grooves	Shield grooves and drive
Misaligned sheaves	Realign sheaves
Worn sheave grooves	Replace sheaves
Damaged tensile member/belts pried on	Follow correct installation procedure and belt storage procedure
Mismatched belt set	Replace with new set of matched belts. (Do not mix old and new belts)

Belt Stretches Beyond Available Take-up

Misaligned belts	Realign sheaves
Debris in sheaves	Clean sheaves
Broken tensile member or cord damage	Replace all belts
Mismatched belt set	Use correct installation procedure and belt storage procedure

PROBABLE CAUSE

CORRECTIVE ACTION

Belt Noise (Belt squeals or chirps)

Belt contamination	Clean belts and sheaves
Loose belts	Check automatic tensioning device
Mismatched set	Install matched belt set
Misaligned belts	Realign sheaves

Belt Noise (Rubbing sound)

Guard interference	Repair or replace guard
Incorrect belts	Use correct belt size
Worn sheaves	Replace sheaves as necessary
Debris in sheaves	Clean sheaves and improve shielding

Belt Noise (Belts flopping)

Incorrect belts	Use correct belt size
Mismatched belts	Install new matched belt set
Sheave misalignment	Align sheaves as necessary

Unusual or Excessive Vibration

Incorrect belts	Use correct belt size
Sheave out of round	Replace sheaves as necessary
Loose drive components	Check machine components and guards, motor mounts, motor pads, bushings, brackets and framework for stability, proper maintenance and proper installation
Bent shaft	Check and replace motor/vacuum pump
Sheave not flat	Replace sheaves as necessary

Section IX

MAINTENANCE SCHEDULE

<u>Interval</u>	<u>Action</u>
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
Monthly	Service inlet filter as needed (daily or weekly if extreme conditions exist) Clean fluid cooler fins Wipe entire unit down to maintain appearance Check belt condition and position of belt tensioning indicator roll pin in slot. Replace belts as necessary
6 months or every 1000 hours	Take fluid Sample Change fluid filter element
Every 2000 hours	Check roll pin indicator position in slot and replace V-belts if at or near allowable travel
Every 4000 hours	Change fluid and fluid filter element/ sooner if indicated by lubricant sample analysis
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 Change fluid strainer element

Addendum 1 - Shell and Tube Heat Exchanger Installation and Service Recommendations

Installation:

The satisfactory use of this heat exchanger equipment is dependent upon precautions which must be taken at the time of the installation.

1. Connect and circulate the hot fluid in the shell side (over small tubes) and the cooling water in the tube side (inside the small tubes). Note piping diagrams.
2. If an automatic water regulating valve is used, place it on the INLET connection of the cooler. Arrange the water outlet piping so that the exchanger remains flooded with water, but at little or no pressure. The temperature probe is placed in the hydraulic reservoir to sense a system temperature rise. Write the factory for water regulating valve recommendations.
3. There are normally no restrictions as to how this cooler may be mounted. The only limitation regarding the mounting of this equipment is the possibility of having to drain either the water or the oil chambers after the cooler has been installed. Both fluid drain plugs should be located on the bottom of the cooler to accomplish the draining of the fluids. Drains are on most models.
4. It is possible to protect your cooler from high flow and pressure surges of hot fluid by installing a fast-acting relief valve in the inlet line to the cooler.
5. It is recommended that water strainers be installed ahead of this cooler when the source of cooling water is from other than a municipal water supply. Dirt and debris can plug the water passages very quickly, rendering the cooler ineffective. Write the factory for water strainer recommendation.
6. Fixed bundle heat exchangers are generally not recommended for steam service. For steam applications, a floating bundle exchanger is required. Note: When installing floating bundle unit, secure one end firmly and opposite end loosely to allow bundle to expand and contract. Consult factory for selection assistance.
7. Piping must be properly supported to prevent excess strain on the heat exchanger ports. If excessive vibration is present, the use of shock absorbing mounts and flexible connectors is recommended.

Addendum 1 - Shell and Tube Heat Exchanger Installation and Service Recommendations

Service:

Each heat exchanger has been cleaned at the factory and should not require further treatment. It may be well to inspect the unit to be sure that dirt or foreign matter has not entered the unit during shipment. The heat exchanger should be mounted firmly in place with pipe connections tight.

CAUTION!

If sealant tape is used on pipe threads, the degree of resistance between mating parts is less, and there is a greater chance for cracking the heat exchanger castings. Do not over tighten. When storing the unit, be sure to keep the oil and water ports sealed. If storage continues into cold winter months, the water chamber must be drained to prevent damage by freezing.

Performance information should be noted and recorded on newly installed units so that any reduction in effectiveness can be detected. Any loss in efficiency can normally be traced to an accumulation of oil sludge, or water scale.

Addendum 1 - Shell and Tube Heat Exchanger Installation and Service Recommendations

Recommendations:

Replace gaskets when removing end castings. It is recommended that gaskets be soaked in oil to prevent corrosion and ensure a tight seal.

Salt water should not be used in standard models. Use salt water in special models having 90/10 copper-nickel tubes, tube sheets*, bronze bonnets and zinc anodes on the tube side. Brackish water or other corrosive fluids may require special materials of construction.

When zinc anodes are used for a particular application, they should be inspected two weeks after initial startup.

At this time, by visual inspection of the anode, determination of future inspection intervals can be made based on the actual corrosion rate of the zinc metal.

The zinc anodes must be replaced when 70% of the zinc volume has been consumed. It may be necessary to drain the water chambers of the exchanger to protect it from damage by freezing temperatures. Drains are provided in most standard models.

The oil chamber of the exchanger may become filled with sludge accumulation and require cleaning. It is recommended that the unit be flooded with a commercial solvent and left to soak for one-half hour. Back flowing with the solvent or regular oil will remove most sludge. Repeated soaking and back flowing may be required, depending on the degree of sludge build-up.

It may be necessary to clean the inside of the cooling tubes to remove any contamination and/or scale build up. It is recommended that a fifty-fifty percent solution of inhibited muriatic acid and water may be used. For severe problems, the use of a brush through the tubes may be of some help. Be sure to use a soft bristled brush to prevent scouring the tube surface causing accelerated corrosion. Upon completion of cleaning, be certain that all chemicals are removed from the shell side and the tube side before the heat exchanger is placed into service.

QUINCY COMPRESSOR AND ORTMAN FLUID POWER DIVISIONS

STANDARD TERMS AND CONDITIONS

LEGAL EFFECT: Except as expressly otherwise agreed to in writing by an authorized representative of Seller, the following terms and conditions shall apply to and form a part of this order and any additional and/or different terms of Buyer's purchase order or other form of acceptance are rejected in advance and shall not become a part of this order.

The rights of Buyer hereunder shall be neither assignable nor transferable except with the written consent of Seller.

This order may not be canceled or altered except with the written consent of Seller and upon terms which will indemnify Seller against all loss occasioned thereby. All additional costs incurred by Seller due to changes in design or specifications, modification of this order or revision of product must be paid for by Buyer.

In addition to the rights and remedies conferred upon Seller by this order, Seller shall have all rights and remedies conferred at law and in equity and shall not be required to proceed with the performance of this order if Buyer is in default in the performance of such order or of any other contract or order with seller.

TERMS OF PAYMENT: Unless otherwise specified in the order acknowledgment, the terms of payment shall be net cash within thirty (30) days after shipment. These terms shall apply to partial as well as complete shipments. If any proceeding be initiated by or against Buyer under any bankruptcy or insolvency law, or in the judgment of Seller the financial condition of Buyer, at the time the equipment is ready for shipment, does not justify the terms of payment specified, Seller reserves the right to require full payment in cash prior to making shipment. If such payment is not received within fifteen (15) days after notification of readiness for shipment, Seller may cancel the order as to any unshipped item and require payment of its reasonable cancellation charges.

If Buyer delays shipment, payments based on date of shipment shall become due as of the date when ready for shipment. If Buyer delays completion of manufacture, Seller may elect to require payment according to percentage of completion. Equipment held for Buyer shall be at Buyer's risk and storage charges may be applied at the discretion of Seller.

Accounts past due shall bear interest at the highest rate lawful to contract for but if there is no limit set by law, such interest shall be eighteen percent (18%). Buyer shall pay all cost and expenses, including reasonable attorney's fees, incurred in collecting the same, and no claim, except claims within Seller's warranty of material or workmanship, as stated below, will be recognized unless delivered in writing to Seller within thirty (30) days after date of shipment.

TAXES: All prices exclude present and future sales, use, occupation, license, excise, and other taxes in respect of manufacture, sales or delivery, all of which shall be paid by Buyer unless included in the purchase price at the proper rate or a proper exemption certificate is furnished.

ACCEPTANCE: All offers to purchase, quotations and contracts of sales are subject to final acceptance by an authorized representative at Seller's plant.

DELIVERY: Except as otherwise specified in this quotation, delivery will be F. O. B. point of shipment. In the absence of exact shipping instruction, Seller will use its discretion regarding best means of insured shipment. No liability will be accepted by Seller for so doing. All transportation charges are at Buyer's expense. Time of delivery is an estimate only and is based upon the receipt of all information and necessary approvals. The shipping schedule shall not be construed to limit seller in making commitments for materials or in fabricating articles under this order in accordance with Seller's normal and reasonable production schedules.

Seller shall in no event be liable for delays caused by fires, acts of God, strikes, labor difficulties, acts of governmental or military authorities, delays in transportation or procuring materials, or causes of any kind beyond Seller's control. No provision for liquidated damages for any cause shall apply under this order. Buyer shall accept delivery within thirty (30) days after receipt of notification of readiness for shipment. Claims for shortages will be deemed to have been waived if not made in writing within ten (10) days after the receipt of the material in respect of which any such shortage is claimed. Seller is not responsible for loss or damage in transit after having

received "In Good Order" receipt from the carrier. All claims for loss or damage in transit should be made to the carrier.

TITLE & LIEN RIGHTS: The equipment shall remain personal property, regardless of how affixed to any realty or structure. Until the price (including any notes given therefore) of the equipment has been fully paid in cash, Seller shall, in the event of Buyer's default, have the right to repossess such equipment.

PATENT INFRINGEMENT: If properly notified and given an opportunity to do so with friendly assistance, Seller will defend Buyer and the ultimate user of the equipment from any actual or alleged infringement of any published United States patent by the equipment or any part thereof furnished pursuant hereto (other than parts of special design, construction, or manufacture specified by and originating with Buyer), and will pay all damages and costs awarded by competent court in any suit thus defended or of which it may have had notice and opportunity to defend as aforesaid.

STANDARD WARRANTY: Seller warrants that products of its own manufacture will be free from defects in workmanship and materials under normal use and service for the period specified in the product instruction manual. Warranty for service parts will be ninety (90) days from date of factory shipment. Electric Motors, gasoline and diesel engines, electrical apparatus and all other accessories, components and parts not manufactured by Seller are warranted only to the extent of the original manufacturer's warranty.

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

Seller's sole obligation on this warranty shall be, at its option, to repair or 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 prepaid, for inspection.

Seller warrants repaired or replaced parts of its own manufacture against defects in materials and workmanship under normal use and service for ninety (90) days or for the remainder of the warranty on the product being repaired.

This warranty shall not apply and Seller shall not be responsible or 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 damage resulting during shipping;
- (c) Deviation from operating instructions, specifications or other special terms of sale;
- (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.

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

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

LIABILITY LIMITATIONS: Under no circumstances shall the Seller have any liability for liquidated damages or for collateral, consequential or special damages or for loss of profits, or for actual losses or for loss of production or progress of construction, whether resulting from delays in delivery or performance, breach of warranty, negligent manufacture or otherwise.

ENVIROMENTAL AND OSHA REQUIREMENTS: At the time of shipment of the equipment from the factory, Quincy Compressor / Ortman Fluid Power will comply with the various Federal, State and local laws and regulations concerning occupational health and safety and pollution. However, in the installation and operation of the equipment and other matters over which the seller has no control, the Seller assumes no responsibility for compliance with those laws and regulations, whether by the way of indemnity, warranty or otherwise.



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



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