TriScroll™ 300 Inverter Dry Scroll Vacuum Pump

TriScroll is a trademark of Varian, Inc.
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Declaration of Conformity

We, Varian, Inc., 121 Hartwell Avenue, Lexington, MA, 02421-3133 USA declare under our sole responsibility that the product, TriScroll Inverter Vacuum Pumps (PTS03001INV, PSS06001INV), to which this declaration relates is in conformity with the following standard(s) or other normative documents.

98/37/EEC, Machinery Directive
- EN 1012-2:1996 Compressors and vacuum pumps safety reqmts; Part 2 vacuum pumps
- EN 1050:1996 Safety of machinery - principles for risk assessment
- EN 60204-1 Electrical equipment of industrial machines; general requirements

73/023/EEC, Low Voltage Directive
- EN 60034 part 1 Rotating electrical machines - Part 1: Rating and performance
- EN 61010-1:2001 Safety requirements for electrical equipment for measurement, control and laboratory use

89/336/EEC, Electromagnetic Compatibility Directive
- EN 61000-4-2 Testing and measurement techniques - Electrostatic discharge immunity test
- EN 61326:1997/A3:2003 Electrical equipment for measurement, control and laboratory use

John Ehmam
Operations Manager
Varian, Inc.
Lexington, Massachusetts, USA

March 2003

CE
Warranty

Products manufactured by Seller are warranted against defects in materials and workmanship for twelve (12) months from date of shipment thereof to Customer, and Seller's liability under valid warranty claims is limited, at the option of Seller, to repair, to replace, or refund of an equitable portion of the purchase price of the Product. Items expendable in normal use are not covered by this warranty. All warranty replacement or repair of parts shall be limited to equipment malfunctions which, in the sole opinion of Seller, are due or traceable to defects in original materials or workmanship. All obligations of Seller under this warranty shall cease in the event of abuse, accident, alteration, misuse, or neglect of the equipment. In-warranty repaired or replaced parts are warranted only for the remaining unexpired portion of the original warranty period applicable to the repaired or replaced parts. After expiration of the applicable warranty period, Customer shall be charged at the then current prices for parts, labor, and transportation.

Reasonable care must be used to avoid hazards. Seller expressly disclaims responsibility for loss or damage caused by use of its Products other than in accordance with proper operating procedures.

Except as stated herein, Seller makes no warranty, express or implied (either in fact or by operation of law), statutory or otherwise; and, except as stated herein, Seller shall have no liability under any warranty, express or implied (either in fact or by operation of law), statutory or otherwise. Statements made by any person, including representatives of Seller, which are inconsistent or in conflict with the terms of this warranty shall not be binding upon Seller unless reduced to writing and approved by an officer of Seller.

Warranty Replacement and Adjustment

All claims under warranty must be made promptly after occurrence of circumstances giving rise thereto, and must be received within the applicable warranty period by Seller or its authorized representative. Such claims should include the Product serial number, the date of shipment, and a full description of the circumstances giving rise to the claim. Before any Products are returned for repair and/or adjustment, written authorization from Seller or its authorized representative for the return and instructions as to how and where these Products should be returned must be obtained. Any Product returned to Seller for examination shall be prepaid via the means of transportation indicated as acceptable by Seller. Seller reserves the right to reject any warranty claim not promptly reported and any warranty claim on any item that has been altered or has been returned by non-acceptable means of transportation. When any Product is returned for examination and inspection, or for any other reason, Customer shall be responsible for all damage resulting from improper packing or handling, and for loss in transit, notwithstanding any defect or non-conformity in the Product. In all cases, Seller has the sole responsibility for determining the cause and nature of failure, and Seller’s determination with regard thereto shall be final.

If it is found that Seller’s Product has been returned without cause and is still serviceable, Customer will be notified and the Product returned at its expense; in addition, a charge for testing and examination may be made on Products so returned.

3/1/00
Instructions for Use

General Information
This equipment is designed for use by professionals. The user should read this instruction manual and any other additional information supplied by Varian before operating the equipment. Varian will not be held responsible for any events that occur due to non-compliance with these instructions, improper use by untrained persons, non-authorized interference with the equipment, or any action contrary to that provided for by specific national standards.

The TriScroll™ 300 is a dry, scroll vacuum pump. This pump is suitable for pumping air or inert gases. The pump is not intended to pump toxic, corrosive, explosive, or particulate-forming gases.

The following paragraphs contain all the information necessary to guarantee the safety of the operator when using the equipment. Detailed information is supplied in “Technical Information” on page 5.

This manual uses the following standard safety protocol:

**WARNING**
- The warning messages are for attracting the attention of the operator to a particular procedure or practice which, if not followed correctly, could lead to serious injury.

**CAUTION**
- The caution messages are displayed before procedures, which if not followed, could cause damage to the equipment.

**NOTE**
- The notes contain important information taken from the text.

Unpacking and Inspection
The shipping container is a double carton.

1. After opening the outer box, remove the foam packing.
2. Slit open the inner box.
3. Lift the pump with the plywood base out of the inner box.
4. Remove the four bolts securing the pump frame to the plywood base.
5. Locate the NW16 exhaust fitting and set it aside.
6. Inspect the pump for damage.
   - If there is shipping damage, contact the freight carrier and your local Varian sales office immediately.
7. Save the carton and packing materials.

Total weight of the package, including the pump, is approximately 33.6 kg (74 lbs).

**WARNING**
- When unpacking the pump, be sure not to drop it, and avoid any kind of sudden impact or shock vibration to it.

**WARNING**
- The TriScroll 300 weighs 26 kg (57 lbs). To avoid injury, use proper lifting techniques when moving the pump.

**NOTE**
- Normal exposure to the environment cannot damage the pump. Nevertheless, it is advisable to keep the pump inlet closed until the pump is installed in the system.

Storage
When transporting and storing the pump, the following environmental requirements should not be exceeded:

Temperature: -20 °C to 60 °C (-4 °F to 140 °F)
Relative humidity: 0 to 95% (non-condensing)
Installation Requirements

Safety

Do not remove or modify any safety or insulating equipment from the pump. To do so may create a serious safety hazard and may void the warranty.

**WARNING**

- This pump is designed to pump air and inert gases only; it is not designed to pump explosive, flammable, toxic, or corrosive gases. They can cause bodily injury, explosion, or fire.
- Install in an area that is not exposed to rain, steam, or excessive humidity. They can cause electric shock, short circuits, and severe bodily injury.
- Before inspecting or servicing the pump, be sure the electrical supply is disconnected.
- Consult a qualified electrician whenever wiring the pump.

**CAUTION**

- Although the pump can pump trace particulates normally found in the atmosphere, it is not designed for process solids, chemicals, powders, solvents, condensates, or other particulates. They can damage the equipment, degrade its performance, or shorten its useful life.

- Single and three phase pumps operate in a clockwise direction when viewed from the motor end. (Note the arrow on the pump frame.) Improper rotation can cause permanent damage to the pump.

During operation, the following environmental conditions should not be exceeded:

Temperature: +5 °C to +40 °C (+41 °F to +104 °F)
Relative humidity: 0 to 95% (non-condensing)

**CAUTION**

- Do not block the fan ducts because the pump can become overheated. A pump surface temperature in excess of 55 °C (131 °F) is potentially damaging. If such conditions are observed, turn pump off and allow to cool. Disassemble, inspect for damage, and repair if necessary.

**CAUTION**

- To reduce the risk of electric shock, do not expose to rain; store indoors.
Power Cord
Several power cord options are available from your Varian dealer. Descriptions of the available power cords and their ordering numbers are given in Table 1.

NOTE The pump must be connected to the power supply using a high voltage IEC-320 type power cord of at least 10 A capacity.

Table 1 Power Cord Selection

<table>
<thead>
<tr>
<th>Country</th>
<th>Power Cord Specification</th>
<th>Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>10 A / 220-230 VAC, 2.5 m</td>
<td>656494220</td>
</tr>
<tr>
<td>Denmark</td>
<td>10 A / 220-230 VAC, 2.5 m</td>
<td>656494225</td>
</tr>
<tr>
<td>Switzerland</td>
<td>10 A / 230 VAC, 2.5 m</td>
<td>656494235</td>
</tr>
<tr>
<td>UK/Ireland</td>
<td>13 A / 230 VAC, 2.5 m</td>
<td>656494250</td>
</tr>
<tr>
<td>India</td>
<td>10 A / 220-250 VAC, 2.5 m</td>
<td>656494245</td>
</tr>
<tr>
<td>Israel</td>
<td>10 A / 230 VAC, 2.5 m</td>
<td>656494230</td>
</tr>
<tr>
<td>North America</td>
<td>10 A / 230 VAC, 2.5 m</td>
<td>656494255</td>
</tr>
</tbody>
</table>

Grounding Instructions
This product should be grounded. In the event of an electrical short circuit, grounding reduces the risk of electric shock by providing an escape wire for the electric current. This pump is equipped with a power cord that has a grounding wire with an appropriate grounding plug. The plug must be inserted into an outlet that is properly installed and grounded in accordance with all local codes and ordinances.

WARNING Check with a qualified electrician or serviceman if the grounding instructions are not completely understood, or if you are in doubt as to whether the product is properly grounded.

Do not modify the plug provided; if it does not fit the outlet, have the proper outlet installed by a qualified electrician.

Connect the product only to an outlet that has the same configuration as the plug.

Do not use an adapter with this product.

Extension Cords
If you must use an extension cord with this product:
- Varian recommends using only extension cords with a minimum of 16-gauge wire and a maximum length of 25' (7.6 m).
- Use only a 3-wire extension cord that accepts the plug.
- Ensure the extension is in good condition.

Ensure the extension cord is rated high enough to carry the current the products draws. An undersized cord causes a drop in line voltage, resulting in loss of power and overheating.

Circuit Breakers

WARNING Protect against short circuits by installing a circuit breaker of the proper capacity.

Table 2 lists the circuit breaker capacity required for the pump. Locate the switch or circuit breaker near the pump.

Table 2 Circuit Breaker Requirements

<table>
<thead>
<tr>
<th>PTS03001INV</th>
<th>200-240 VAC 50/60 Hz</th>
<th>100-115 VAC 50/60 Hz*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breaker capacity</td>
<td>10 A</td>
<td>20 A</td>
</tr>
</tbody>
</table>

* Inverter with P/N S4897001 only
**Operation**

In order to reach ultimate vacuum, the pump must be left running for about one hour with the inlet sealed. Unlike conventional oil-sealed pumps, Varian's dry scroll pumps do not have fluid to cleanse them of accumulated dust and debris. Run the pump periodically at atmosphere for a minute or two to flush out the pump. Flush the pump regularly and adjust this schedule according to your specific conditions.

**Startup Procedure**

1. Be sure that the vacuum system isolation valve is closed.
2. Turn on power to the pump.
   
   **NOTE**
   
   Pump operation is interlock dependent. The provided mating connector must be plugged into P1 to start the pump.

3. Open the isolation valve.

**Shutdown Procedure**

1. Close the vacuum system isolation valve.
   This prevents debris in pump from being transported into the vacuum system.
2. Turn off power to the pump.

**Maintenance**

Personnel responsible for pump operation and maintenance must be well-trained and aware of the accident prevention rules.

**WARNING**

- Death may result from contact with high voltages. Always take extreme care and observe the accident prevention regulations in force.
- When the machine is powered up, be careful of moving parts and high voltages.
- If you have to perform maintenance on the pump after a considerable time in operation, allow the pump to cool as the temperature of the outer surface may be in excess of 55 °C (131 °F).
- Always disconnect your power supply to the pump before beginning maintenance work.

**NOTE**

When the controller is switched on, an electronic self-test occurs, during which an orange LED illuminates for one second and the turns off for two seconds. During this time, the pump will not start.

This self-test time is not required if the pump is already powered, as when remotely or serially operated.

Before returning the pump to the factory for repair, the “Health and Safety” sheet attached to this instruction manual must be completed and sent to the local sales office. A copy of the sheet must be inserted in the pump package before shipping.

If a pump is to be discarded, it must be disposed of in accordance with specific national and local standards.
### Technical Information

#### Table 3  Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>TriScroll™ 300 Inverter Dry Scroll Vacuum Pump (PTS03001INV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface dimensions</td>
<td>See Figure 1 on page 6</td>
</tr>
<tr>
<td>Peak pumping speed</td>
<td>250 l/m, 15m³/hr (8.9 cfm)</td>
</tr>
<tr>
<td>Media</td>
<td>Clean air. No toxic, corrosive, explosive or particulate forming gases</td>
</tr>
<tr>
<td>Ultimate pressure (Torr)</td>
<td>$1.0 \times 10^{-2}$ Torr ($1.3 \times 10^{-2}$ mbar)</td>
</tr>
<tr>
<td>Maximum inlet pressure</td>
<td>1.0 atmosphere (0 psig)</td>
</tr>
<tr>
<td>Maximum outlet pressure</td>
<td>1.1 atmosphere (1.5 psig)</td>
</tr>
<tr>
<td>Inlet connection</td>
<td>NW25</td>
</tr>
<tr>
<td>Exhaust connection</td>
<td>Female 1/4” National Pipe Thread (NW16 adapter provided)</td>
</tr>
<tr>
<td>Gas ballast</td>
<td>Female 1/4” National Pipe Thread (40 Micron sintered filter provided)</td>
</tr>
<tr>
<td>Ambient operating temperature</td>
<td>5 °C to 40 °C (41 °F to 104 °F)</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>–20 °C to 60 °C (–4 °F to 140 °F)</td>
</tr>
<tr>
<td>Motor rating</td>
<td>0.67 HP (0.5 kW)</td>
</tr>
<tr>
<td>Operating voltage</td>
<td>50-60 Hz: 200-240 VAC Single-phase / 100-120 VAC Single Phase* ±10%</td>
</tr>
<tr>
<td><em>Inverter with P/N of S4897001 ONLY</em></td>
<td></td>
</tr>
<tr>
<td>Motor line current</td>
<td>200 VAC; 5 A</td>
</tr>
<tr>
<td>Motor thermal protection</td>
<td>Automatic</td>
</tr>
<tr>
<td>Operating speed</td>
<td>35-65 Hz Factory setting: 62 Hz, 1800 RPM</td>
</tr>
<tr>
<td>Cooling system</td>
<td>Air-cooled</td>
</tr>
<tr>
<td>Weight</td>
<td>Pump only: 26 kg (57 lbs)</td>
</tr>
<tr>
<td>Shipping weight</td>
<td>33.6 kg (74 lbs)</td>
</tr>
<tr>
<td>Noise level (per ISO 11201)</td>
<td>Variable with frequency, 55-68 dB(A)</td>
</tr>
<tr>
<td>Vibration level at inlet (per ISO 10816-1)</td>
<td>Variable with frequency</td>
</tr>
<tr>
<td>Main fuse</td>
<td>Type H; 10 A, 250 V (Littlefuse 0216010.HxP or equivalent)</td>
</tr>
<tr>
<td>Installation and storage</td>
<td>Installation category 2, indoor usage and storage</td>
</tr>
<tr>
<td>Pollution degree</td>
<td>2</td>
</tr>
<tr>
<td>CSA/CUS compliance</td>
<td>CAN/CSA-C22.2 No. 61010-1-04 U/L 61010-1, second edition</td>
</tr>
<tr>
<td>Altitude</td>
<td>2000 m</td>
</tr>
</tbody>
</table>
TriScroll 300 Inverter Vacuum Pump

Figure 1  Interface Drawing with Dimensions

Figure 2  Pumping Speed Curves
TriScroll 300 Inverter Vacuum Pump

1. Cowling Screws; M5 (3)
2. Cowling
3. Inlet (NW25)
4. Inlet Screen
5. NW16 Exhaust Adapter (Not shown)
6. Bearing Purge Port (1/4" National Pipe Thread)
7. Pump Frame
8. Frame Screws; M6 (4)
9. Gas Ballast Port (1/4" National Pipe Thread)
10. Mounting Holes; 11 mm diameter thru (8)
11. Rubber Feet (4)

Figure 3 TriScroll 300 Inverter Vacuum Pump

1. Power Connector (IEC 320)
2. On/Off Switch
3. Serial Port J2
4. Interlock Port P1

Figure 4 Inverter Interface
Pump Electrical Controller

The pump is powered by an inverter that converts single phase line power into 3-phase power that drives an induction motor at a user selectable frequency.

Several operational variables are modifiable through the J2 serial port when using Varian T-Plus software. A number of additional system variables are also viewable.

Pump operation is interlocked through the P1 connector. Pins 4 and 5, and Pins 8 and 9, must be connected together to enable operation. A prewired connector is supplied with the pump and should be plugged into P1.

If the pump requires more than 750 Watts to run at the set frequency, the pump will be power limited and the output frequency will be reduced. This mode is known as autotuning.

At pump start, the drive frequency is ramped up over several seconds. This provides for smooth starting and eliminates large in-rush currents.
TriScroll 300 Inverter Vacuum Pump

Technical Specifications

- Input voltage: 200-240 V/100-120 V*, 50 - 60 Hz
  * Inverter with P/N S4897001 only
- Max frequency: 65 Hz, factory set @ 62 Hz
- Normal Operation maximum power: 750 W
- Protection level: IP 20

Table 4  P1 Interlock

<table>
<thead>
<tr>
<th>PIN #</th>
<th>SIGNAL NAME</th>
<th>IN/OUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VPI relay contact 1</td>
<td>Out</td>
</tr>
<tr>
<td>2</td>
<td>0-10 V remote control</td>
<td>In</td>
</tr>
<tr>
<td>3</td>
<td>No Connection</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Start (-) - Connect to Pin 5</td>
<td>In</td>
</tr>
<tr>
<td>5</td>
<td>Groundout</td>
<td>Out</td>
</tr>
<tr>
<td>6</td>
<td>VPI relay contact 2</td>
<td>Out</td>
</tr>
<tr>
<td>7</td>
<td>No Connection</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Start (+) - Connect to Pin 9</td>
<td>In</td>
</tr>
<tr>
<td>9</td>
<td>24 V</td>
<td>Out</td>
</tr>
</tbody>
</table>

Remote speed setting allows you to control rotational speed using a 0-10 V analog input:
- \( V_{in} > 9 \text{ V} \): Driving frequency will be the full speed (factory set @ 62 Hz)
- \( V_{in} <1 \text{ V} \): Driving frequency will be the minimum speed (35 Hz)

Pump operation is interlock dependent. The provided mating connector must be plugged into P1 to start the pump.
## Serial Interface Specification RS485 and RS232

**Table 5  J2 - Serial Port**

<table>
<thead>
<tr>
<th>PIN #</th>
<th>SIGNAL NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+ 5 V out</td>
</tr>
<tr>
<td>2</td>
<td>TX (RS232)</td>
</tr>
<tr>
<td>3</td>
<td>RX (RS232)</td>
</tr>
<tr>
<td>4</td>
<td>Spare</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
</tr>
<tr>
<td>6</td>
<td>A+ (RS485)</td>
</tr>
<tr>
<td>7</td>
<td>Spare</td>
</tr>
<tr>
<td>8</td>
<td>B- (RS485)</td>
</tr>
<tr>
<td>9</td>
<td>Spare</td>
</tr>
</tbody>
</table>

Physical level: RS232 or RS485  
Maximum baud: 9600, 8 data bit, no parity, 1 stop bit.

<table>
<thead>
<tr>
<th>WIN</th>
<th>TYPE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>000</td>
<td>Logical</td>
<td>Start/Stop (1=START; 0=STOP)</td>
</tr>
<tr>
<td>001</td>
<td>Logical</td>
<td>Low Speed [0=OFF / 1=ON]</td>
</tr>
<tr>
<td>008</td>
<td>Logical</td>
<td>Remote/Serial Configuration (1=REMOTE; 0=SERIAL)</td>
</tr>
<tr>
<td>102</td>
<td>Numerical</td>
<td>Set Point Value (Hz)</td>
</tr>
<tr>
<td>105</td>
<td>Numerical</td>
<td>Set Point Hysteresis(%) [0-100]</td>
</tr>
<tr>
<td>108</td>
<td>Numerical</td>
<td>Baud Rate (0-4) [600-1200-2400-4200-9600]</td>
</tr>
<tr>
<td>117</td>
<td>Numerical</td>
<td>Low Speed Adjust (Hz)</td>
</tr>
<tr>
<td>120</td>
<td>Numerical</td>
<td>Rotational Frequency Setting [Hz] (High speed adjust)</td>
</tr>
<tr>
<td>200</td>
<td>Numerical</td>
<td>Bus Current [mA]</td>
</tr>
<tr>
<td>201</td>
<td>Numerical</td>
<td>3 Phase Voltage [Vrms]</td>
</tr>
<tr>
<td>202</td>
<td>Numerical</td>
<td>Power [W]</td>
</tr>
<tr>
<td>203</td>
<td>Numerical</td>
<td>Driving Frequency [Hz]: (current driving frequency)</td>
</tr>
</tbody>
</table>
| 205 | Numerical | Status:  
- 0=stop  
- 2=ramp  
- 3=autotuning  
- 5=normal  
- 6=fail |
Using T-Plus Software To Change The Target Frequency

1. Install T-Plus software on your PC by running setup.exe.
2. Using a 9-pin serial cable, connect your PC to the J2 serial port on the inverter (Figure 4).
3. Start the pump using the On/Off switch. The provided Interlock Connector must be installed in P1.
4. Start the T-Plus software and Figure 6 appears.
5. Click Open Control Panel and Figure 7 appears.

### Table 6  T-Plus Software Variables (Continued)

<table>
<thead>
<tr>
<th>WIN</th>
<th>TYPE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
</table>
| 206 | Numerical | Error Code:  
|     |        | - Bit 7: motor block  
|     |        | - Bit 6: short circuit  
|     |        | - Bit 5: undervoltage  
|     |        | - Bit 4: spare  
|     |        | - Bit 3: power fail  
|     |        | - Bit 2: controller overt  
|     |        | - Bit 1: pump overt  
|     |        | - Bit 0: spare  
| 211 | Numerical | Controller Temperature [°C]  
| 216 | Numerical | Environment Temperature [°C]  
| 300 | Numerical | Cycle Time [min]  
| 301 | Numerical | Cycle Number  
| 302 | Numerical | Pump Life [h]  
| 319 | Alphanumeric | Controller Model  
| 323 | Alphanumeric | Controller Serial Number  
| 325 | Alphanumeric | Electrical Modification Level  
| 500 | Logical | Monitor Mode (write only)  
| 503 | Numerical | RS485 Serial Address Setting [0-31]  
| 504 | Logical | Serial Type Select (0=RS323; 1=RS485)  

### Table 7  Status LEDs

<table>
<thead>
<tr>
<th>LED STATUS</th>
<th>CONTROLLER STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Stop</td>
</tr>
<tr>
<td>Green flashing</td>
<td>Ramp or Autotuning</td>
</tr>
<tr>
<td>Green</td>
<td>Normal Operation</td>
</tr>
<tr>
<td>Red</td>
<td>Fail</td>
</tr>
<tr>
<td>Orange + Off</td>
<td>Reset + selftest</td>
</tr>
</tbody>
</table>

**NOTE**
When the controller is switched on, an electronic self-test occurs, during which an orange LED illuminates for one second and the turns off for two seconds. During this time, the pump will not start.
This self-test time is not required if the pump is already powered, as when remotely or serially operated.
6. Open the Speed Settings directory, and click **Target Frequency**.

7. Enter the desired operating frequency into **Insert New Value**. This must be an integer between 35 and 65.

8. Click **Send**. The pump immediately tries to change to the new target frequency. If the pump requires more than 750 Watts to attain the target frequency, the pump is power limited and will run at a lower frequency (auto-tuning mode). This condition will continue until the power required drops below 750 Watts.

   The target frequency is stored in the inverter even when power to the pump is removed.

---

**Gas Ballast**

The pump incorporates an automatic gas ballast to prevent water and other condensates from accumulating within the pump. The standard configuration is a sintered filter installed in the 1/4" National Pipe Thread gas ballast port (item 9 on Figure 3 on page 7). This allows enough atmospheric air to enter the pump in order to purge condensates while not effecting pump ultimate pressure or pumping speed.

For applications where the ingress of atmospheric air is undesirable, dry nitrogen at a flow rate of ≈5 lpm can be bled into the gas ballast port. See “Purge Kit” below. Blocking of the gas ballast port is not recommended.

**Bearing Purge**

A 1/4" National Pipe Thread bearing purge port (item 6 on Figure 3 on page 7) protects the main crankshaft bearings in applications where large amounts of water are being pumped. In the standard configuration, this port is sealed. To enable the bearing purge, dry nitrogen at a flow rate of ≈5 lpm can be bled into the bearing purge port. This gas supply should be maintained at 2 psig or less and must be kept below 5 psig. See “Purge Kit” below.

**Purge Kit**

A purge kit (Varian part number PTSPURGEKIT) to properly purge either the bearing purge or the gas ballast is available. This kit contains a flow meter and all necessary valving and tubing.

---

**Isolation Valve Kit**

Scroll pumps return to atmospheric pressure quickly when shut off. Thus, the installation of a fast acting, automatic, normally closed isolation valve is strongly recommended to prevent pump debris from being transported back into the vacuum chamber when the pump is turned off:

- The opening of this valve must occur ≥ 350 ms after pump startup.
- Valve closing must occur ≤ 250 ms after pump shut off.

Use an NW25 or an NW40 valve and mount it as close as possible to the pump inlet. Mounting to the pump inlet is ideal.

Varian offers a variety of manual, electromagnetic and electropneumatic controlled vacuum valves for vacuum applications. The Varian Vacuum Pump Isolation (VPI) Valve is highly recommended for vacuum pump isolation applications (Figure 8).
When used with the TriScroll inverter pump, the VPI Valve status is controlled by motor operation. The VPI Valve:
- Opens when the pump is running and
- Closes when it is stopped due to switch off or overload protection.

This VPI kit includes a 24 VDC VPI valve, a communication cable, a 24 VDC power supply, and a splitter cord. The order numbers for NW25 and NW40 inlets are VPI25INV24DC and VPI40INV24DC, respectively.

**NOTE**

Use the provided VPI valve kit only with Varian TriScroll inverter pumps using inverters with part numbers S4896001Z and/or S4897001.

See manual (P/N 699912117) for installation details.

*Figure 8 Isolation Valve Position*
CT-100 Speed Control Kit

Varian offers an optional speed control kit (P/N#: PTSCNTRLKIT1 for an NW25 port, and PTSCNTRLKIT2 for an NW40) for use with the TriScroll inverter pumps (P/N#: TS0X00INVXX), which allows automatic switching from full pumping speed to a lower speed. Operation at lower speed reduces noise and can extend maintenance intervals.

This speed control kit consists of a CT-100 Active Rough Vacuum Gauge, a communication cable, a 24 VDC power supply, a power splitter cord, a tee, a centering ring, and a clamp.

Two set points can be set on the CT100 gauge. When the pressure is:

- Over the high set point (SP1), the inverter drives the pump at full speed*.
- Below the lower set point value (SP2), the scroll is driven at minimum speed**.
- Higher than set point 2, but lower than set point 1, the driving frequency is: (full speed + minimum speed)/2.

Set points are user-selected. For a faster pumpdown, lower SP1 and the pump can stay longer at full speed. For quieter operation, increasing SP2 and the pump runs longer at the lower frequency.

* Full speed: customized frequency setting via Varian T-plus software if used. Factory setting is 62 Hz.
** Minimum speed: 35 Hz

Pumping speed changes compared with factory setting, but the effect is less at lower inlet pressures. Figure 9 shows the pumping speed percentage drop at peak pumping speed and at 100 mTorr inlet pressure.

![Figure 9 Pumping Speed Percentage Drop](image)

Please refer to manual (P/N 699904375) for installation and operation details.
VPI and CT100 Speed Control Kit

Varian’s combination VPI and CT100 speed control kit (Varian P/N PTSCNTRLKIT3 for NW25 and PTSCNTRLKIT4 for NW40), consists of the CT-100 Active Rough Vacuum Gauge, Communication Cable, 24 VDC Power Supply, Power Splitter Cord, Tee, Centering Ring(s), Clamp(s), and a VPI valve (Figure 10).

![Figure 10 VPI and CT100 Kit](image)

For the speed control kit with a VPI valve, the pump inverter serial number starts with an A (Figure 11).

![Figure 11 Serial Number Location](image)

Refer to manual (P/N 699904375) for installation and operation details.
Exhaust Silencer Kit

In certain applications it is desired to lower the noise level emitted by the pump. For these cases, Varian offers Exhaust Silencer Kits (P/N EXSLRTRISCROLL, Manual P/N: 699904380), which breaks up noise pulsation in the discharge line.

The Exhaust Silencer Kits contain two basic components, as well as installation hardware. A cylindrical resonator chamber has been selected to attenuate the frequencies associated with the exhaust gas pulsation noise. The resonator is then plumbed to an exhaust muffler/filter. This muffler provides the majority of the actual noise reduction. It also contains an integral 5-micron paper filter element to capture any tip seal debris. This paper filter is replaceable; the recommended service interval is whenever the pump tip seal or module maintenance is performed.

Replacement polyester filter element rated 99% efficient at the 5-micron particle size, P/N : REPLSLR FILTER,

Vibration Isolation Kit

A set of vibration isolation mounts (P/N PTSVIBISOKIT, Manual P/N: 699904385) are available for Varian scroll pumps. These are used in place of the standard feet installed on the pump for applications that require minimal vibration transmission from the pump to the installation. They can be used alone, or with inlet flexible bellows to provide pump isolation.

The vibration isolation mounts in the Vibration Isolation Kit have been designed to ensure the lowest vibration level transmitted at the base of the pump.

Vibration level in every direction (axis), transmitted to the surface the pump sits on, is reduced by a significant amount. Typical vibration reduction levels are 86% for the TriScroll 300 pump.

The TriScroll Vibration Isolation Kit consists of (4) vibration isolation mounts. They have a M6 metric threaded screw to attach to the TriScroll frame; the screw is provided.

These mounts increase the height of the TriScroll pumps by 0.75” compared to the standard mounting feet.

HEPA Inlet filter

Varian now offers inlet filters for the scroll pumps, which protect the pump from ingested particles, and keep particles from migrating out of the pump. These HEPA filters provide a rated 99.97% efficiency in trapping particles > 0.3 microns.

NW 25 Inlet Trap with HEPA filter insert: P/N #: #SCRINTRPNW25.

Replacement HEPA filter element (NW25 or NW40): P/N #: #RPLHEPAFILTER1.
### Troubleshooting

Table 8 contains a list of possible problems, their probable causes, and corrective actions.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Probable Cause</th>
<th>Corrective Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump won’t start</td>
<td>P1 interlock missing</td>
<td>Plug in connector (provided).</td>
</tr>
<tr>
<td></td>
<td>Wrong input voltage</td>
<td>Plug inverter into 200-240 VAC 50/60 Hz</td>
</tr>
<tr>
<td></td>
<td>Circuit breaker open</td>
<td>Close breaker. Identify cause of overload.</td>
</tr>
<tr>
<td></td>
<td>Motor thermal protector open</td>
<td>Allow motor to cool. Identify cause of overload.</td>
</tr>
<tr>
<td></td>
<td>Main fuse open</td>
<td>Inspect and replace fuse (Type H, 10 A, 250 V (Littlefuse 0216010.H.xP or equivalent)).</td>
</tr>
<tr>
<td></td>
<td>Wiring loose or cut</td>
<td>Repair or replace.</td>
</tr>
<tr>
<td></td>
<td>Excessive voltage drop</td>
<td>Check size and length of power supply cable.</td>
</tr>
<tr>
<td></td>
<td>Defective motor</td>
<td>Inspect. Contact Varian.</td>
</tr>
<tr>
<td>Poor ultimate pressure</td>
<td>System leak</td>
<td>Locate and repair leak.</td>
</tr>
<tr>
<td></td>
<td>Water in pump</td>
<td>Flush pump with air or dry nitrogen.</td>
</tr>
<tr>
<td></td>
<td>Gas ballast plugged</td>
<td>Replace breather vent. Contact Varian.</td>
</tr>
<tr>
<td></td>
<td>Solvent in pump</td>
<td>Flush pump with air or dry nitrogen. Install trap or filter.</td>
</tr>
<tr>
<td></td>
<td>Seals worn out</td>
<td>Replace tip seals. (Table 10 and Table 11 on page 19 list maintenance kits and service options.)</td>
</tr>
<tr>
<td></td>
<td>Poor conductance to pump</td>
<td>Replumb with shorter and/or larger diameter tubing.</td>
</tr>
<tr>
<td>Pump makes hammering noise</td>
<td>Pump overheated</td>
<td>Check ambient temperature. Check ventilation to pump.</td>
</tr>
<tr>
<td></td>
<td>Debris in pump</td>
<td>Check inlet screen. Flush pump. Disassemble pump and inspect. (Table 10 and Table 11 on page 19 list maintenance kits and service options.)</td>
</tr>
</tbody>
</table>
Maintenance

General Information
Varian TriScroll 300 Inverter pumps are designed to provide years of trouble-free service if maintenance procedures and intervals are observed. Bearing grease replenishment and tip seal replacement is recommended when pump base pressure has risen to an unacceptably high level for your application. Bearings, rotary seals and o-rings should also be replaced if the pump exhibits humming or grinding noises from the bearings. Main bearing life may be shortened if your application requires the pumping of high quantities of water vapor. Use of the bearing purge kit (PTSPURGEKIT) mentioned earlier will keep this water from impacting bearing life.

Maintenance should be performed in accordance with procedures, tooling and materials specified in the manuals listed below.

Related TriScroll Manuals
Other manuals related to tip seal replacement, pump module replacement, and major maintenance of the TriScroll 300 Inverter pumps are listed in Table 9.

Table 9 Other Related Manuals

<table>
<thead>
<tr>
<th>Title</th>
<th>Applicable TriScroll Model</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tip Seal Replacement Manual</td>
<td>All TriScroll 300 Series models</td>
<td>699904280</td>
</tr>
<tr>
<td>Pump Module Replacement Manual</td>
<td>All TriScroll 300 Series models</td>
<td>699904285</td>
</tr>
<tr>
<td>Major Maintenance Manual</td>
<td>All TriScroll 300 Series models</td>
<td>699904260</td>
</tr>
</tbody>
</table>
Maintenance and Tooling Kits

Material and tooling required to perform maintenance on TriScroll pumps is provided in kit form. A description of each kit and ordering information is provided in Table 10.

### Table 10 Maintenance and Tooling Kits

<table>
<thead>
<tr>
<th>Description</th>
<th>Contents</th>
<th>Applicable TriScroll Model</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major Maintenance Kit</td>
<td>All bearings, bearing seals, bearing lubricant, O-rings, and tip seals required to rebuild TriScroll 300 series pumps.</td>
<td>All TriScroll 300 Series models</td>
<td>PTSS0300MK</td>
</tr>
<tr>
<td>Maintenance Tool Kit</td>
<td>All fixtures and tools required to perform any maintenance on TriScroll 300 Series pumps.</td>
<td>All TriScroll 300 Series models</td>
<td>PTSS0300TK</td>
</tr>
<tr>
<td>Tip Seal Tool Kit</td>
<td>All tools required to change the tip seals on the TriScroll 300 Series pumps.</td>
<td>All TriScroll 300 Series models</td>
<td>PTSTSTKIT</td>
</tr>
<tr>
<td>Replacement Tip Seal Set</td>
<td>Replacement tip seals and static O-rings for TriScroll 300 Series pumps.</td>
<td>All TriScroll 300 Series models</td>
<td>PTSS0300TS</td>
</tr>
</tbody>
</table>

**NOTE** After tip seal replacement, the TriScroll 300 Inverter pump may require up to 24 hours run time to achieve full rotational speed.
TriScroll 300 Inverter Vacuum Pump

Factory Service Options
Table 11 lists the service options that Varian offers for the TriScroll 300 Inverter pump.

<table>
<thead>
<tr>
<th>Factory Service Options</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advance Exchange TriScroll 300 Pump Module Only</td>
<td>EXPTS0300SC</td>
</tr>
<tr>
<td>Service/Rebuild TriScroll 300 Inverter Pump</td>
<td>PTS0300KMA</td>
</tr>
</tbody>
</table>

Accessories
The accessories listed in Table 12 are available for use with the TriScroll 300 Inverter pump. Contact your local Varian office to place an order. A list of offices is included on the rear cover of this manual.

<table>
<thead>
<tr>
<th>Accessories</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purge Kit</td>
<td>PTSPURGEKIT</td>
</tr>
<tr>
<td>Exhaust Extension</td>
<td>S4707002</td>
</tr>
<tr>
<td>Exhaust Filter Kit</td>
<td>PTS300EXFIL</td>
</tr>
<tr>
<td>Isolation Valve Kit</td>
<td>VPI25INV24DC</td>
</tr>
<tr>
<td>CT100 Speed Control Kit</td>
<td>PTSCNTRLKIT1</td>
</tr>
<tr>
<td>Exhaust Silencer Kit</td>
<td>EXSLRTRISCROLLER</td>
</tr>
<tr>
<td>Vibration Isolation Kit</td>
<td>PTSVIBISOKIT</td>
</tr>
<tr>
<td>HEPA Inlet Filters</td>
<td>SCRINTRPNW25</td>
</tr>
</tbody>
</table>

Contacting Varian
In the United States, you can contact Varian Customer Service at 1-800-8VARIAN. See the back cover of this manual for a listing of our sales and service offices.

Internet users:
- Send email to Customer Service & Technical Support at vpl.customer.support@varianinc.com
- Visit our web site at www.varianinc.com/vacuum
- Order on line at www.evarian.com
Dear Customer,

Please follow these instructions whenever one of our products needs to be returned:

1. Complete the Request for Return form on our website (www.varianinc.com) and send it to Varian (see below), taking particular care to identify all products that have pumped or been exposed to any toxic or hazardous materials.

2. After evaluating the information, Varian will provide you with a Return Authorization (RA) number via email or fax, as requested.

   **Note:** Depending on the type of return, a Purchase Order may be required at the time the Request for Return is submitted. We will quote any necessary services (evaluation, repair, special cleaning, e.g.).

3. **Important steps for the shipment of returning product:**
   - Remove all accessories from the core product (e.g. inlet screens, vent valves).
   - Prior to shipment, drain any oils or other liquids, purge or flush all gasses, and wipe off any excess residue.
   - If ordering an Advance Exchange product, use the packaging from the Advance Exchange to return the defective product.
   - Seal the product in a plastic bag, and package the product carefully to avoid damage in transit. You are responsible for loss or damage in transit.
   - Varian, Inc. is not responsible for returning customer provided packaging or containers.
   - **Clearly label package with the RA number.** Using the shipping label provided ensures the proper address and RA number are on the package. Packages shipped to Varian without an RA clearly written on the outside cannot be accepted and will be returned.

4. Return only products for which the RA was issued.

5. **Product being returned under an RA must be received within 15 business days.**

6. **Ship to the location specified on the printable label, which will be sent, along with the RA number, as soon as we have received all of the required information.** Customer is responsible for freight charges on returning product.

7. Return shipments must comply with all applicable Shipping Regulations (IATA, DOT, etc.) and carrier requirements.

   Return the completed request for return form to your nearest location:

**North America:**
- FAX: 1-781-860-9252
- Toll Free: 800-8VARIAN (800-882-7426)
- vtl.ra@varianinc.com

**Europe:**
- FAX: 00 39-011-9979125
- Fax Free: 00 800 345 345 00
- Toll Free: 00 800 234 234 00
- vtt.ra@varianinc.com

**Pacific Rim:**
- Please visit our website for individual office information.

http://www.varianinc.com/vacuum
Sales and Service Offices

Canada
Central coordination through: Varian, Inc.
121 Hartwell Avenue
Lexington, MA 02421
USA
Tel.: +1 781 861 7200
Toll-Free: +1 800 882 7426
Fax: +1 781 860 5437

China
Varian Technologies China, Ltd.
Room 1648
Central Tower South Wing
Beijing Junefield Plaza
No. 10 XuanWuMenWai Street
Beijing 100052
P. R. China
Tel.: +86 (10) 6310 8550
Toll-Free: 800 820 6556
Fax: +86 (10) 6310 0141

France
Varian s.a.
7 avenue des Tropiques
Z.A. de Courtaboeuf - B.P. 12
91941 Les Ulis cedex
France
Tel.: +33 (0) 1 69 86 38 84
Fax: +33 (0) 1 69 86 29 88

Benelux
Varian Vacuum Technologies
Herculesweg 8
4338 PL Middelburg
The Netherlands
Tel.: +31 118 671570
Fax: +31 118 671569

Germany & Austria
Varian Deutschland GmbH
Alsfelder Strasse 6
Postfach 11 14 35
64289 Darmstadt
Germany
Tel.: +49 (0) 6151 703 353
Fax: +49 (0) 6151 703 302

India
Varian India Pvt. Ltd.
205-A, “A” wing of Galleria
2nd floor, Hiranandani Gardens
Powai, Mumbai-400 076
India
Tel.: +91 22 2570 8595/8597
Fax: +91 22 2570 8599
Mobile: +91 98 679 55969

Italy
Varian, Inc.
via F.lli Varian 54
10040 Leini, (Torino)
Italy
Tel.: +39 011 997 9111
Toll-Free: 00 800 234 234 00
Fax: +39 011 997 9350

Japan
Varian Technologies Japan, Ltd.
8th Floor
Sumitomo Shibaura Building
4-16-36 Shibaura Minato-ku
Tokyo 108
Japan
Tel.: +81 3 5232 1253
Toll-Free: 0120 655 040
Fax: +81 3 5232 1710

Korea
Varian Technologies Korea, Ltd.
Shinsa 2nd Bldg. 2F
966-5 Daechi-dong
Kangnam-gu, Seoul
Korea 135-280
Tel.: +82 2 3452 2451
Toll-Free: 080 222 2452
Fax: +82 2 3452 2451

Mexico
Varian, S. de R.L. de C.V.
Concepcion Beistegui No 109
Col Del Valle
C.P. 03100
Mexico, D.F.
Tel.: +52 5 523 9465
Fax: +52 5 523 9472

Taiwan
Varian Technologies Asia, Ltd.
14F-6, No. 77, Hsin Tai Wu Road, Sec. 1
Hsi chih, Taipei Hsien
Taiwan, R.O.C.
Tel.: +886 2 2698 9555
Toll Free: 0800 051 342
Fax: +886 2 2698 96782

United States
Varian, Inc
121 Hartwell Avenue
Lexington, MA 02421
USA
Tel.: +1 781 861 7200
Toll-Free: +1 800 882 7426
Fax: +1 781 860 5437

Other Countries
Varian Vacuum Technologies
via F.lli Varian 54
10040 Leini, (Torino)
Italy
Tel: (39) 011 997 9 111
Fax: (39) 011 997 9 350

Customer Support and Service:

North America
Tel: (800) 882-7426 (toll-free)
vtl.technical.support@varianinc.com

Europe
Tel: (800) 234 234 00 (toll-free)
vtl.technical.support@varianinc.com

Japan
Tel: (81) 3 5232 1253 (dedicated line)
vjt.technical.support@varianinc.com

Korea
Tel: (82) 2 3452 2452 (dedicated line)
vtk.technical.support@varianinc.com

Taiwan
Tel: (800) 051 342 (toll-free)
vtw.technical.support@varianinc.com

Worldwide Web Site,
Catalog and On-line Orders:
www.varianinc.com

Representatives in most countries

04/08