
*vacuum technologies*

# *TriScroll™ 600 Series Dry Scroll Vacuum Pump*

*TIP SEAL REPLACEMENT MANUAL*

Manual No. 699904310
Revision G
December 2004

# TriScroll™ 600 Series
# Dry Scroll Vacuum Pump

# Table of Contents

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**Declaration of Conformity**
**Konformitätserklärung**
**Déclaration de Conformité**
**Declaración de Conformidad**
**Verklaring de Overeenstemming**
**Dichiarazione di Conformità**

declare under our sole responsibility that the product,
erklären, in alleniniger Verantwortung, daß dieses Produkt,
déclarons sous notre seule responsabilité que le produit,
declaramos, bajo nuestra sola responsabilidad, que el producto,
verklaren onder onze verantwoordelijkheid, dat het product,
dichiariamo sotto nostra unica responsabilità, che il prodotto,

**TriScroll Series Vacuum Pump**

to which this declaration relates is in conformity with the following standard(s) or other normative documents.
auf das sich diese Erklärung bezieht, mit der/den flogenden Norm(en) oder Richtlinie(n) übereinstimmt.
auquel se réfère cette déclaration est conforme à la (auz) norme(s) ou au(x) document(s) normatif(s).
al que se refiere esta declaración es conforme a la(s) norma(s) u otro(s) documento(s) normativo(s).
waamaar deze verklaring verwijst, aan de volende norm(en) of richtlijn(en) beantwoodt.
a cui se rifersce questa dichiarazione è conforme alla/e sequente/I norma/o documento/I normativo/i.

**98/37/EEC, Machinery Directive**

| | |
|---|---|
| EN 1012-2:1996 | |
| | 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 |

**89/336/EEC, Electromagnetic Compatibility Directive**

| | |
|---|---|
| EN 61000-4-2 | Testing and Measurement Techniques - Electrostatic Discharge Immunity Test |

# Preface

This manual provides the information you need to successfully perform tip seal replacement on your Vacuum Technologies TriScroll™ Dry Vacuum Pump. Tip seal replacement is generally is recommended when the pump base pressure has risen to an unacceptably high level for your application. If you have questions that are not addressed in this manual, please contact the nearest Vacuum Technologies service facility listed on the rear cover of this manual.

## Safety Considerations

READ THE FOLLOWING INSTRUCTIONS. TAKE ALL NECESSARY PRECAUTIONS.

The following format is used in this manual to call attention to hazards:

**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.*

Maintenance personnel must be aware of all hazards associated with this equipment. They must know how to recognize hazardous and potentially hazardous conditions, and know how to avoid them. The consequences of work performed by unskilled or improperly trained maintenance personnel, or careless operation of the equipment employed in the specified maintenance procedures can be serious. Every maintenance person must read and thoroughly understand the materials discussed and the instructions provided in this manual, as well as any additional information provided by Vacuum Technologies.

All warnings and cautions must be read carefully, fully understood, and strictly observed. Consult local, state/province, and national agencies regarding specific requirements and regulations. Address any safety, operation, and/or maintenance questions to the nearest Vacuum Technologies location.

**WARNING**

*Disconnect power from the TriScroll 600 before performing any maintenance procedure.*

*Allow the pump to cool before performing any maintenance procedure. Approximate cool-down time is one to two hours.*

**CAUTION**

*Wipe all O-rings clean with a lint-free cloth before installation to ensure that no foreign matter is present to impair the seal.*

*Do not use alcohol, methanol or other solvents on O-rings. To do so causes deterioration and reduces their ability to hold a vacuum.*

*If applicable, apply a small amount of Krytox® GPL 224 grease and wipe the O-rings "shiny" dry.*

**NOTE**

*Vacuum Technologies recommends replacing all O-rings during routine maintenance or during any maintenance procedure requiring that O-rings be removed.*

**WARNING**

*The TriScroll 600 weighs 32 kg (70 lbs). To avoid injury, use proper lifting techniques when moving the pump.*

## Related TriScroll Manuals

Manuals related to the installation and operation, pump module replacement, and major maintenance for the TriScroll 600 series pumps are listed in the following table:

| Title | Applicable TriScroll Model | Part Number |
|---|---|---|
| Major Maintenance Manual | All TriScroll 600 Series Models | 699904300 |
| Pump Module Replacement | All TriScroll 600 Series Models | 699904305 |
| Installation and Operation Manual | All TriScroll 600 Series Models | 699904290 |

## Maintenance and Tool 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 the following table:

| Description | Contents | Applicable TriScroll Model | Part Number |
|---|---|---|---|
| Major Maintenance Tool Kit | All bearings, bearing seals, bearing lubricant, O-rings, and tip seals required to rebuild TriScroll 600 Series pumps. | All TriScroll 600 Series models | PTSS0600MK |
| Maintenance Tool Kit | All fixtures and tools required to perform any maintenance on TriScroll 600 Series pumps. | All TriScroll 600 Series models | PTSS0600TK |
| Tip Seal Tool Kit | All tools required to change the tip seals on any TriScroll Series pump. | All TriScroll Series pumps | PTSTSTKIT |
| Replacement Tip Seal Set | Replacement tip seals and static O-rings for TriScroll 600 Series pumps. | All TriScroll 600 Series models | PTSS0600TS |

| Factory Service Options | Part Number |
|---|---|
| Advance Exchange TriScroll 600 Single Phase | EXPPTS06001 |
| Advance Exchange TriScroll 600 Three Phase | EXPPTS06003 |
| Advance Exchange TriScroll 610 Single Phase | EXPPTS06101 |
| Advance Exchange TriScroll 610 Three Phase | EXPPTS06103 |
| Advance Exchange TriScroll 600 Pump Module Only | EXPTS0600SC |
| Advance Exchange TriScroll 610 Pump Module Only | EXPTS0610SC |
| Service/Rebuild TriScroll 600 Pump (Single or Three Phase) | PTS0600KMA |
| Service/Rebuild TriScroll 610 Pump (Single or Three Phase) | PTS0610KMA |
| Service/Rebuild TriScroll 600 Pump Module Only | PTS0600SCRP |
| Service/Rebuild TriScroll 610 Pump Module Only | PTS0610SCRP |

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# Tip Seal Replacement

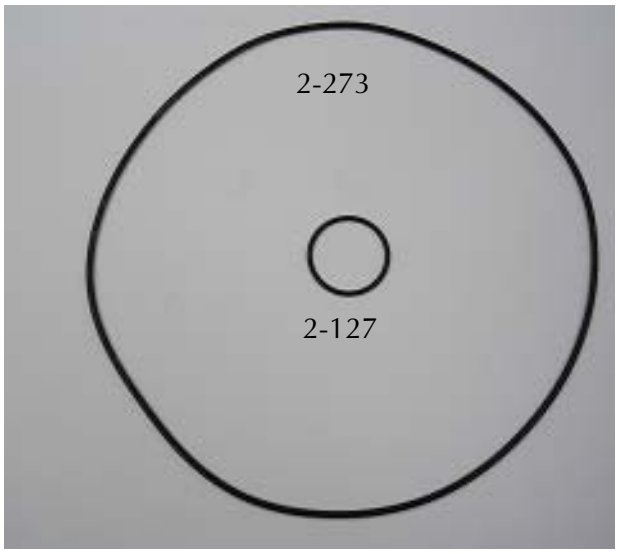
## General Information

Vacuum Technologies TriScroll 600 series pumps will provide years of trouble-free service if maintenance procedures and intervals are observed. Bearing grease replenishment and tip seal replacement is recommended when the pump base pressure rises to an unacceptably high level for your application. Replace bearings, rotary seals and O-rings if the pump bearings exhibit humming or grinding noises. Main bearing life may be shortened if your application requires the pumping of high quantities of water vapor. Use bearing purge to keep this water from impacting bearing life.

### Required Equipment

- **Tip Seal Replacement Kit:** PTSS0600TS (“Tip Seal Replacement Kit” on page 2)
- **Tip Seal Tool Kit:** PTSTSTKIT (“Tip Seal Tool Kit” on page 3; customer can supply metric Allen wrench set and chisel).
- **Vacuum Measuring Gauge:** Capable of measuring pressures of 5 to 20 mTorr with an accuracy of ± 1 mTorr. A capacitance manometer or Pirani gauge is recommended.

**Tip Seal Replacement Kit**




Tip Seal

Krytox GPL 224 Grease

**Tip Seal Tool Kit**

Chisel

Metric Hex Key Set

# TriScroll 600 Disassembly


## Remove the Intake Fitting

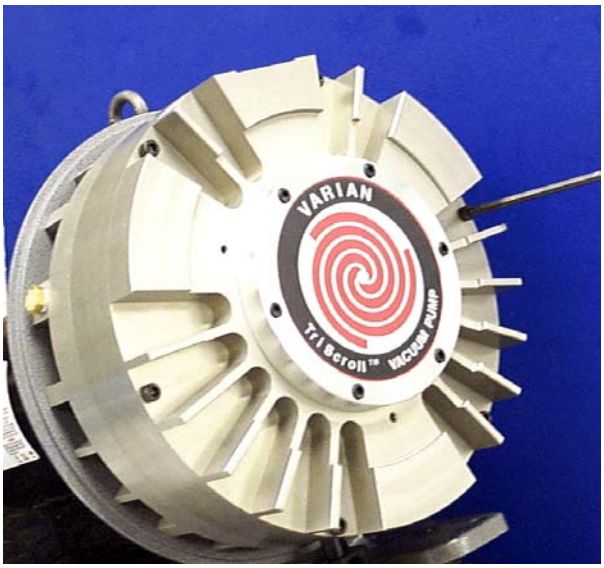
1. Remove the two M5x16 screws from the intake assembly.
2. Remove the intake assembly from the top of the pump.

3. Remove and discard the O-ring from the groove on the underside of the intake fitting.

# TriScroll 600 Disassembly (Continued)

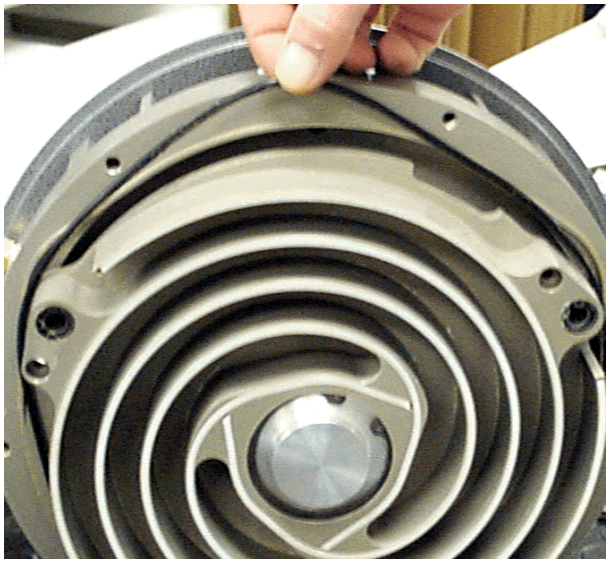

## Remove the Outboard Housing

1. Remove the three M5x16 screws that attach the cowling to the module.
2. Remove the cowling.

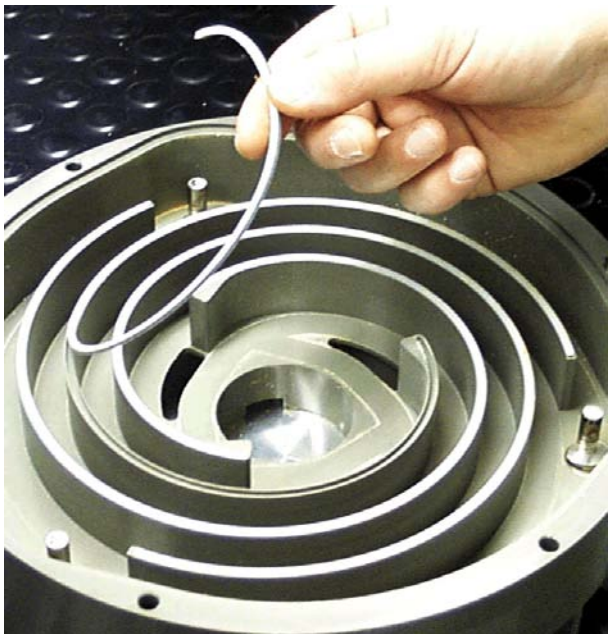



3. Remove the six M6x55 screws that attach the outboard housing to inboard housing.
4. Remove the outboard housing.

# TriScroll 600 Disassembly (Continued)



5. Remove and discard the O-ring.

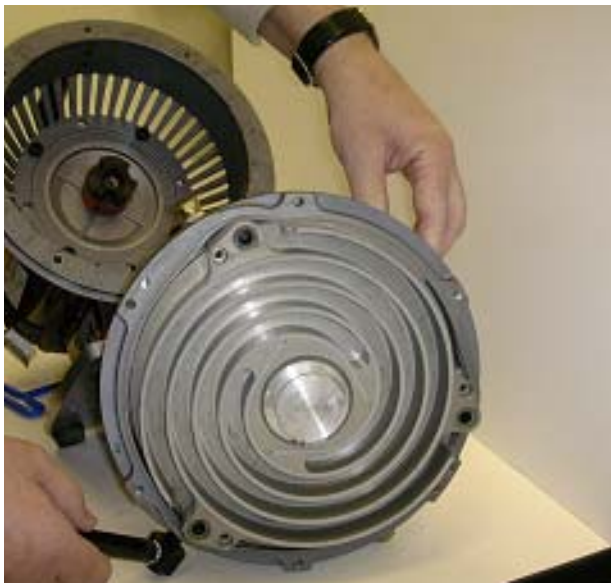


6. Remove and discard the tip seals from the outboard housing.

# TriScroll 600 Disassembly (Continued)

## Remove the Inboard Housing and Orbiting Plate Assembly

1. Remove the four M5x15 screws that attach the inboard housing to the frame.



2. Remove the inboard housing from the frame.

   Locate the rubber spider that mounts between the motor shaft coupling and the inboard housing assembly.

**CAUTION** *The inboard housing assembly weighs 22 lbs.*

# TriScroll 600 Disassembly (Continued)


### Disassemble the Inboard Housing and the Orbiting Plate Assembly

1. Remove the M8x12 screw and washer that attaches the counterweight to the inboard housing.

2. Lift the counterweight off of the inboard housing.

   The counterweight is keyed to the crankshaft. Locate the key after removal of the counterweight from the inboard housing

# TriScroll 600 Disassembly (Continued)

3. Remove the inboard housing from the crankshaft and orbiting plate.

4. Remove and discard the tip seals from the inboard housing.

# TriScroll 600 Disassembly (Continued)

5. Remove and discard the tip seals from both sides of the orbiting plate.

# TriScroll 600 Disassembly (Continued)

## Scroll Cleaning

1. Carefully scrape with a chisel to loosen the tip seal dust from the:
   - ❑ Orbiting plate
   - ❑ Inboard housing
   - ❑ Outboard housing

**CAUTION** *Do not scratch or gouge any surface.*

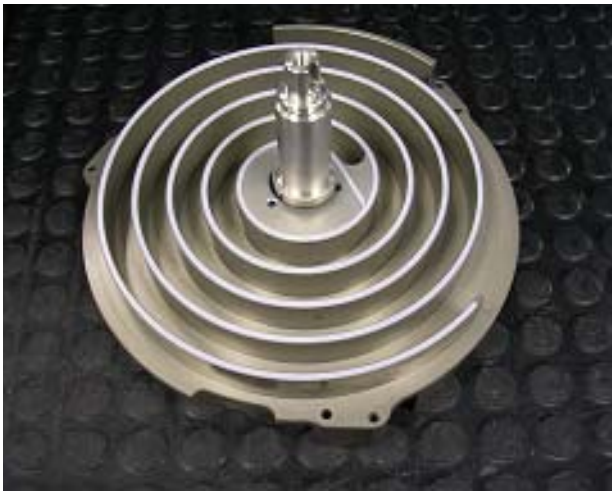
If seal debris is attached to the sides of the scroll walls, use a razor blade or Exacto knife to scrape this debris off.

2. Use dry compressed air to remove the tip seal debris from the scroll parts.

**CAUTION** *Do not blow compressed air or debris into exposed bearings.*

3. Wipe the scroll parts with isopropyl alcohol and a clean lint free cloth to remove any remaining tip seal debris.

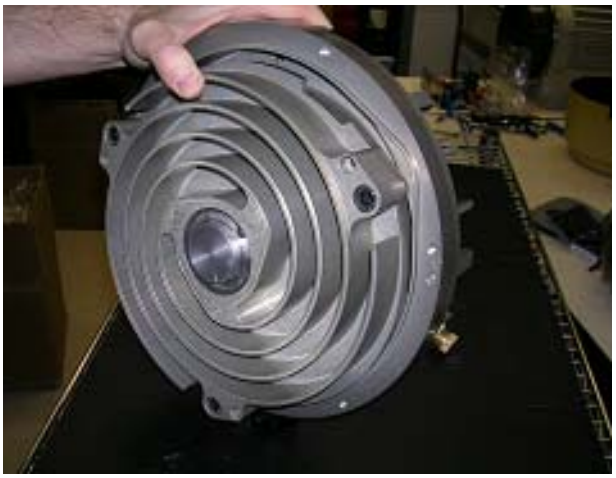
# TriScroll 600 Reassembly



1. Insert the new tip seal into the scroll tip grooves on the inboard housing side of the orbiting plate.
2. Cut the seal to the correct length at the end of each groove. Leave a gap of 1/4" (6 mm) from the outer end to allow for thermal growth.

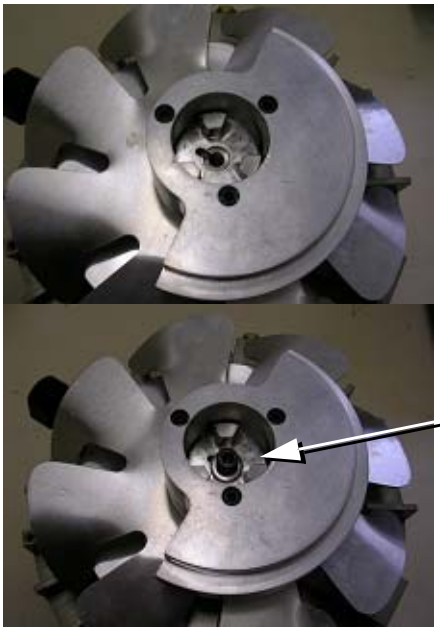
3. Insert the new tip seal into the scroll tip grooves on the inboard housing.
4. Cut the seal to the correct length at the end of each groove. Leave a gap of 1/4" (6 mm) from the outer end to allow for thermal growth.

# TriScroll 600 Reassembly (Continued)



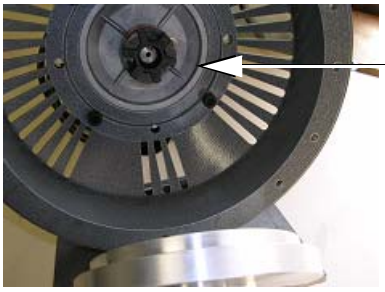
5. Place the scroll in the vertical position and reinstall the inboard housing onto the crankshaft.

   Placing the scroll in the vertical position keeps the tip seals from falling out of the grooves during reassembly.
6. Ensure that the scroll walls are properly aligned to allow full engagement of the two parts.

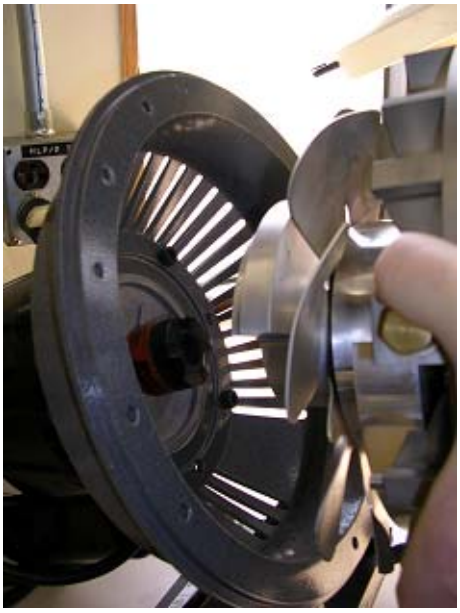



7. Reinstall the counterweight onto the crankshaft.
8. Align the keyways in the counterweight and crankshaft and install the key.
9. Secure the counterweight to the crankshaft using the M8x12 screw and washer.

# TriScroll 600 Reassembly (Continued)



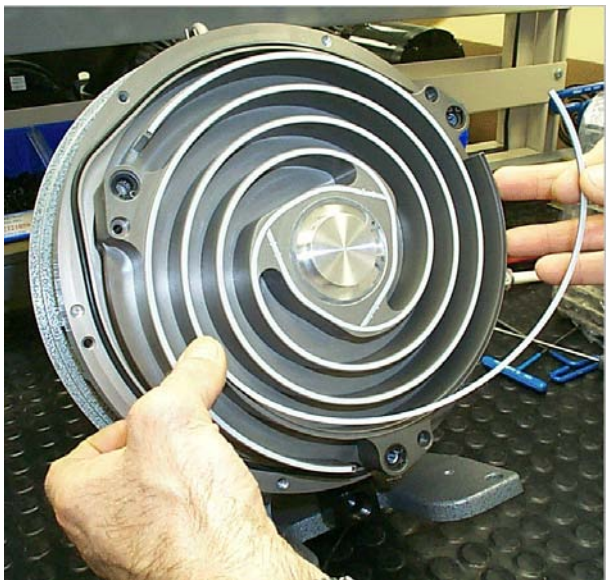

10. Install the rubber spider into motor shaft coupling.



11. Align the motor coupling to properly mate with the fan hub coupling.
12. Install the inboard housing onto the frame.

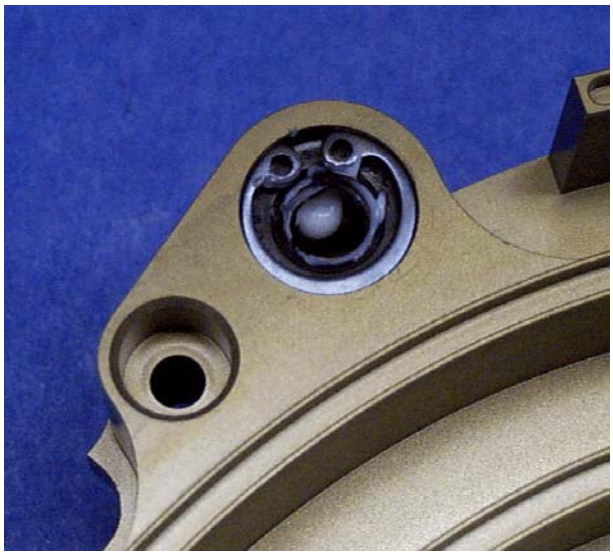
# TriScroll 600 Reassembly (Continued)

13. Secure the inboard housing assembly to the frame using the four M5x15 screws.

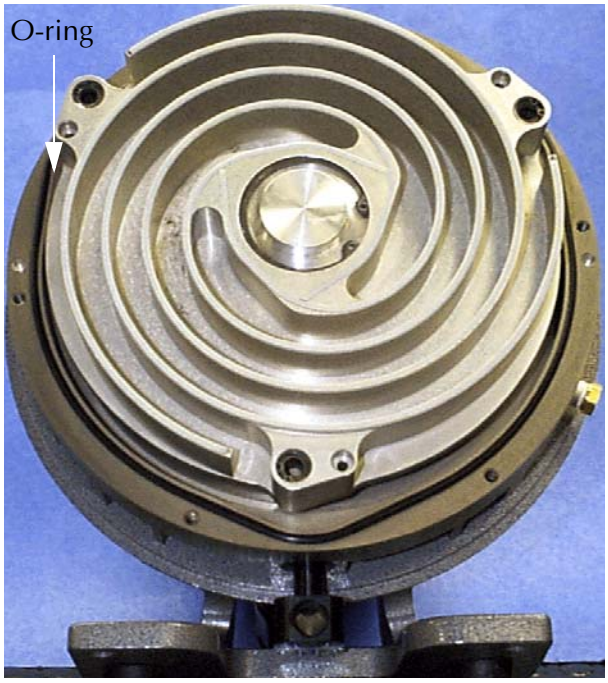


14. Insert the tip seal into the scroll tip grooves on the orbiting plate.
15. Cut the seal to the correct length at the end of each groove. Leave a gap of 1/8" (3mm) from the outer end to allow for thermal growth.

# TriScroll 600 Reassembly (Continued)



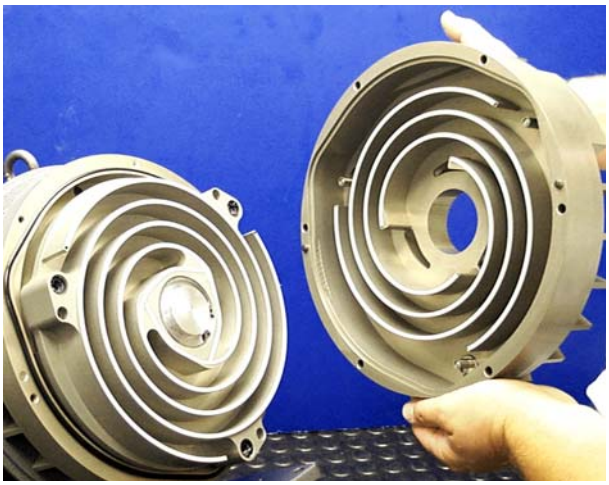
16. Squeeze a dot of Krytox GPL 224 grease into each of the three needle bearings.
17. Smear grease over the needles.
18. Coat the lips of all three seals with grease.




19. Lightly grease the new 2-273 O-ring (large) and install it around the lip on the inboard housing.

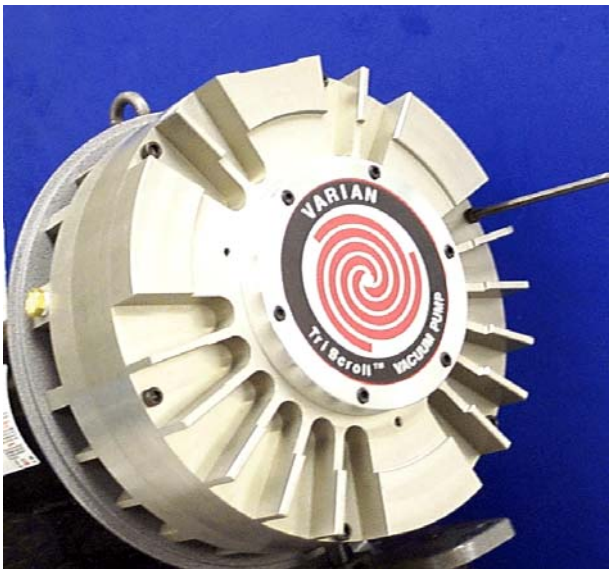
# TriScroll 600 Reassembly (Continued)

20. Insert the tip seals into the grooves on the outboard housing.
21. Cut the seal to the correct length at the end of each groove. Leave a gap of 1/8" (3mm) from the outer end to allow for thermal growth.



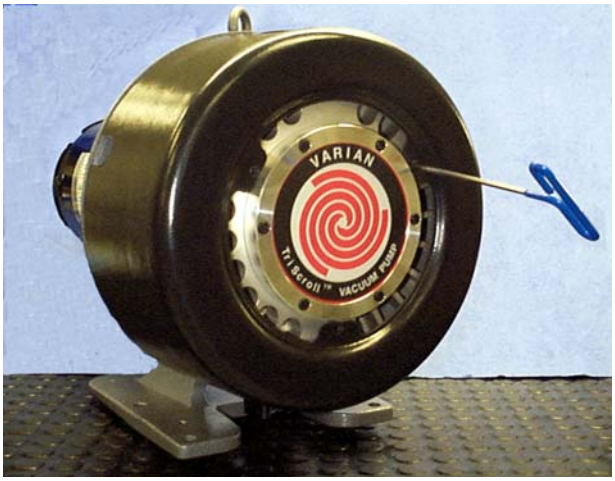
22. Install the outboard housing over the orbiting plate and against the inboard housing, engaging the dowel pins and all the sync cranks.

**NOTE** *Orient the sync cranks and the orbiting plate in the downward position before installing the outboard housing.*




23. Secure the outboard housing to the inboard housing with the six M6x55 screws.

# TriScroll 600 Reassembly (Continued)




24. Install the cowling over the pump module.
25. Secure with the three M5x16 screws.

# TriScroll 600 Reassembly (Continued)

26. Lightly grease the new 2-127 O-ring and insert it into the groove on the intake fitting.
27. Place the intake fitting assembly into the outboard housing.


28. Secure the fitting with the two M5x16 screws.

# TriScroll 600 Reassembly (Continued)


This figure illustrates a fully reassembled TriScroll 600 Series Pump.

## Put the Pump Back into Service

The TriScroll 600 pump can be placed into service immediately after maintenance is complete. However, 24 hours of run time is required before base pressure of 7 mTorr can be achieved.

**NOTE**

*The 24 hour run time does not have to be continuous. If your application requires a low base pressure, it is wise to run the pump for the 24-hour period for optimum performance.*

# *Request for Return*
# *Health and Safety Certification*

ISO 9001 REGISTERED

1. Return authorization numbers (RA#) **will not** be issued for any product until this Certificate is completed and returned to a Varian, Inc. Customer Service Representative.
2. Pack goods appropriately and drain all oil from rotary vane and diffusion pumps (for exchanges please use the packing material from the replacement unit), making sure shipment documentation and package label clearly shows assigned Return Authorization Number (RA#) VVT cannot accept any return without such reference.
3. Return product(s) to the nearest location:

4. If a product is received at Varian, Inc. in a contaminated condition, **the customer is held responsible** for all costs incurred to ensure the safe handling of the product, and **is liable** for any harm or injury to Varian, Inc. employees occurring as a result of exposure to toxic or hazardous materials present in the product.

*CUSTOMER INFORMATION*

Company name: .....

Contact person: Name: ..... Tel:.....

Fax: ..... E-mail: .....

Ship method: Shipping Collect #: ..... P.O.#: .....

Europe only: VAT Reg Number: ..... *USA only:* ❒Taxable ❒Non-taxable

Customer ship to: ..... Customer bill to: .....

..... .....

..... .....

*PRODUCT IDENTIFICATION*

| Product Description | Varian, Inc. Part Number | Varian, Inc. Serial Number |
|---|---|---|
| | | |
| | | |
| | | |

*TYPE OF RETURN (check appropriate box)*

| | | | | |
|---|---|---|---|---|
| ❒ Paid Exchange | ❒ Paid Repair | ❒ Warranty Exchange | ❒ Warranty Repair | ❒ Loaner Return |
| ❒ Credit | ❒ Shipping Error | ❒ Evaluation Return | ❒ Calibration | ❒ Other |

*HEALTH and SAFETY CERTIFICATION*

**VACUUM TECHNOLOGIES CANNOT ACCEPT ANY BIOLOGICAL HAZARDS, RADIOACTIVE MATERIAL, ORGANIC METALS, OR MERCURY AT ITS FACILITY. CHECK ONE OF THE FOLLOWING:**

❒ I confirm that the above product(s) has (have) **NOT** pumped or been exposed to any toxic or dangerous materials in a quantity harmful for human contact.

❒ I declare that the above product(s) has (have) pumped or been exposed to the following toxic or dangerous materials in a quantity harmful for human contact (Must be filled in):

Print Name..... Signature ..... Date .....

**PLEASE FILL IN *THE FAILURE REPORT SECTION* ON THE NEXT PAGE**

Do not write below this line

Notification (RA) #: ..... Customer ID #: ..... Equipment #: .....

# *Request for Return*
# *Health and Safety Certification*

ISO 9001 REGISTERED

*FAILURE REPORT*
(Please describe in detail the nature of the malfunction to assist us in performing failure analysis):

**TURBO PUMPS AND TURBOCONTROLLERS**

| **Claimed Defect** | | **Position** | **Parameters** | |
|---|---|---|---|---|
| ❒ Does not start | ❒ Noise | ❒ Vertical | Power: | Rotational Speed: |
| ❒ Does not spin freely | ❒ Vibrations | ❒ Horizontal | Current: | Inlet Pressure: |
| ❒ Does not reach full speed | ❒ Leak | ❒ Upside-down | Temp 1: | Foreline Pressure: |
| ❒ Mechanical Contact | ❒ Overtemperature | ❒ Other ..... | Temp 2: | Purge flow: |
| ❒ Cooling defective | ❒ Clogging | | Operation Time: | |
| Describe Failure: | | | | |
| Turbocontroller Error Message: | | | | |

**ION PUMPS/CONTROLLERS**

| | |
|---|---|
| ❒ Bad feedthrough | ❒ Poor vacuum |
| ❒ Vacuum leak | ❒ High voltage problem |
| ❒ Error code on display | ❒ Other ..... |
| Describe failure: | |
| Customer application: | |

**VALVES/COMPONENTS**

| | |
|---|---|
| ❒ Main seal leak | ❒ Bellows leak |
| ❒ Solenoid failure | ❒ Damaged flange |
| ❒ Damaged sealing area | ❒ Other ..... |
| Describe failure: | |
| Customer application: | |

**LEAK DETECTORS**

| | |
|---|---|
| ❒ Cannot calibrate | ❒ No zero/high background |
| ❒ Vacuum system unstable | ❒ Cannot reach test mode |
| ❒ Failed to start | ❒ Other |
| Describe failure: | |
| Customer application: | |

**INSTRUMENTS**

| | |
|---|---|
| ❒ Gauge tube not working | ❒ Display problem |
| ❒ Communication failure | ❒ Degas not working |
| ❒ | Error code on display .....❒ |
| Describe failure: | |
| Customer application: | |

**ALL OTHER VARIAN, INC.**

| | |
|---|---|
| ❒ Pump doesn't start | ❒ Noisy pump (describe) |
| ❒ Doesn't reach vacuum | ❒ Overtemperature |
| ❒ Pump seized | ❒ Other ..... |
| Describe failure: | |
| Customer application: | |

**DIFFUSION PUMPS**

| | |
|---|---|
| ❒ Heater failure | ❒ Electrical problem |
| ❒ Doesn't reach vacuum | ❒ Cooling coil damage |
| ❒ Vacuum leak | ❒ Other ..... |
| Describe failure: | |
| Customer application: | |