VS PD03 Scroll Pump and Components Replacement

FIELD INSTALLATION INSTRUCTIONS
VARIAN

VS PD03 Scroll Pump and Components Replacement

Preface

Documentation Standards

This manual uses the following documentation standards:

**NOTE**

Notes contain important information.

**CAUTION**

Cautions appear before instructions, which if not followed, could cause damage to the equipment or data loss.

**WARNING**

Warnings appear for a particular procedure or practice which, if not followed correctly, could lead to serious injury or death.

Hazard and Safety Information

The common international symbols used in this manual and on the equipment are defined below.

- OFF Supply (Power)
- Earth (Ground) Terminal
- ON Supply (Power)
- Caution, Hot Surface
- AC – Alternating Current
- Caution, Risk of Electrical Shock
- Warning, Risk of danger
- Protective Conductor Terminal
- Frame or chassis Terminal
Operators and service 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 unskilled, improper, or careless operation of the equipment can be serious. Every operator or service person must read and thoroughly understand operation/maintenance manuals and any additional information provided by Varian. All warnings and cautions must be read carefully and strictly observed. Consult local, state, and national agencies regarding specific requirements and regulations. Address any safety, operation, and/or maintenance questions to your nearest Varian office.

**Solvents**

**WARNING**

The mechanical components of leak detectors may be cleaned with one of the recommended solvents. When heated, sprayed, or exposed to high-temperature equipment, these solvents become flammable and explosive, causing serious injury or death. Do not use these solvents near a high-temperature source. Ventilate the working area with a blower and work in a large, well-ventilated room.

Solvents are irritants, narcotics, depressants and/or carcinogens. Their inhalation and/or ingestion may produce serious side effects. Prolonged or continued contact with the skin results in absorption through the skin and moderate toxicity. Always ensure that cleaning operations are carried out in large, well-ventilated rooms, and wear eye shields, gloves, and protective clothing.

Due to the effective cleaning nature of VacuSolv solvent and its residue-free properties, Varian’ Component and Spectrometer Cleaning Kit (Part Number 670029096), used in accordance with the kit instructions, is recommended for cleaning spectrometer components. The kit can also be used for fine cleaning of other parts in the leak detector’s vacuum system such as valves and fittings. No rinsing steps or high-temperature drying is required following cleaning with VacuSolv. Although appropriate precautions are advised, VacuSolv is compatible with most materials and does not contain toxic chemicals or CFCs (chlorofluorocarbons). Other acceptable solvents are isopropyl alcohol (IPA) or Dow Corning® OS-20.

To clean the leak detector plastic enclosure, the LCD display and Front Panel buttons, use only a soft cloth slightly dampened with water or a mild soap. Do NOT use excess water or cleaning solvents of any kind.

Avoid splashing any cleaning solvents into the unit through the ventilation openings or Front Panel buttons. Wipe the surface with a dry lint-free cloth.

**Vacuum Equipment and Cleanliness**

Cleanliness is vital when servicing the leak detector or any vacuum equipment. There are some techniques that are more important in leak detector servicing than in general vacuum work:

**CAUTION**

Wear non-powdered, ESD-safe Nitride or equivalent gloves to prevent skin oils from getting on spectrometer internal components.
O-ring Care

When removing, checking or replacing O-rings, keep in mind the following:

NOTE

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

CAUTION

Remove O-rings carefully with your fingers. Do not use metal tools for this task; this prevents scratching of any sealing surfaces.

- 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 grease or any other substance on O-rings that will come in contact with the vacuum surfaces.
- Do not use alcohol, methanol or other solvents on O-rings. Doing so causes deterioration and reduces their ability to hold a vacuum.
- Varian does not recommend the use of vacuum grease. If applicable, apply a small amount of Apiezon® L grease and wipe the O-rings shiny dry.

Metal Seal Care

CAUTION

Metal Seals must be replaced any time a spectrometer is opened. All fasteners must be installed and torqued per assembly procedure specifications. Remove Metal Seals carefully with your fingers or a soft tool. Metal tools scratch sealing surfaces.

- Metal Seals are supplied in pre-cleaned condition. No cleaning is required. If necessary, Metal Seals can be cleaned using the recommended solvents. Wipe Metal Seals clean with a lint-free cloth before installation to ensure that no foreign matter impairs the seal.
- Do not use grease or any other substance on Metal Seals that will come in contact with the spectrometer.

Spectrometer

CAUTION

Store the Ion Source/Preamplifier sub-assembly in a cool, dry area in a tightly sealed, ESD protected container. Wear non-powdered, ESD-safe Nitride or equivalent gloves when handling the spectrometer. Wash hands thoroughly after handling the spectrometer filaments and especially before smoking or eating.

The spectrometer and PCB’s are static sensitive devices. Wear a grounding strap when performing any maintenance on these units and especially when performing maintenance of static sensitive parts.

CAUTION

The spectrometer operates at a very high vacuum produced by the high vacuum turbomolecular pump. Service of the spectrometer requires that this vacuum be vented to the atmosphere.
Scroll Pump Replacement

**Equipment Required**
- Extended Length M5 Allen Wrench
- Metric Allen Wrench Set
- M3 Phillips Head Screw Driver

For clarity, some items have been omitted from views.

**WARNING**
Disconnect power from the unit before performing any maintenance procedure that requires physically disconnecting any part of the system.

1. Turn off the power switch located on the back of the unit and unplug.
2. Wait 30 seconds for the high voltage to dissipate.
3. Using an extended length M5 Allen wrench, remove the four screws holding the rear plastic cover (Figure 1: Rear and Front Cover Screws) and detach the rear plastic cover from the unit.

![Rear and Front Cover Screws](image)

**Figure 1: Rear and Front Cover Screws**
4. Disconnect the NW 16 connection (Figure 2: NW 16 Connection).

![Figure 2: NW 16 Connection](image)

5. Tilt the unit and unscrew the four connections underneath that hold the pump (Figure 3: Scroll Pump Mounting Connections). Place the unit flat again and remove the whole pump assembly.

![Figure 3: Scroll Pump Mounting Connections](image)
6. Disconnect the exhaust hose (Figure 4: Exhaust Hose).

7. Disconnect the diaphragm, fan and motor power connectors.

8. Remove the fan assembly bracket and lay it aside (Figure 5: Fan Assembly Mounts).
9. Unscrew the four M2 screws and remove the manifold block (Figure 6: Manifold Block Connections).

12. Mount the new scroll pump using the four connections seen in “Figure 3: Scroll Pump Mounting Connections” on page 5.
15. Reattach the four M2 screws to remount the manifold block.
16. Reattach the fan assembly.
17. Reconnect the diaphragm, fan and motor power connectors.
18. Reconnect the exhaust hose.
19. Attach the front cover and secure to the frame using existing hardware.
20. Connect the power cord and power up the unit.
21. Watch the home screen to verify the Spectube Pressure Wait message progresses to Stabilization Wait and System Ready within ten minutes.
22. Refer to the operator's manual if the system fails to reach the System Ready mode.
   Varian recommends a full calibration of the unit prior to leak test operations.
Clippard Valve Replacement

**Equipment Required**
- Extended Length M5 Allen Wrench
- Metric Allen Wrench Set
- M3 Phillips Head Screw Driver

For clarity, some items have been omitted from views.

**WARNING**
Disconnect power from the unit before performing any maintenance procedure that requires physically disconnecting any part of the system.

1. Turn off the power switch located on the back of the unit and unplug.
2. Wait 30 seconds for the high voltage to dissipate.
3. Using an extended length M5 Allen wrench, remove the four screws holding the rear plastic cover (Figure 7: Rear and Front Cover Screws) and detach the rear plastic cover from the unit.

![Figure 7: Rear and Front Cover Screws](image-url)
4. Disconnect the two spade connectors (red arrow in Figure 8: Spade Connectors):
   • Red/black
   • Black/black

5. Use an Allen wrench to loosen valve from housing (blue arrow in Figure 8: Spade Connectors).
6. Mount the new valve and tighten.
7. Reconnect the two spade connections.
8. Attach the front cover and secure to the frame using existing hardware.
9. Attach the rear cover and secure to the unit using existing hardware.
10. Connect the power cord and power up the unit.
11. Watch the home screen to verify the Spectube Pressure Wait message progresses to Stabilization Wait and System Ready within ten minutes.
   Refer to the operator’s manual if the system fails to reach the System Ready mode.
Exhaust Valve Replacement

**Equipment Required**
- Extended Length M5 Allen Wrench
- Metric Allen Wrench Set
- M3 Phillips Head Screw Driver

For clarity, some items have been omitted from views.

**WARNING** Disconnect power from the unit before performing any maintenance procedure that requires physically disconnecting any part of the system.

1. Turn off the power switch located on the back of the unit and unplug.
2. Wait 30 seconds for the high voltage to dissipate.
3. Using an extended length M5 Allen wrench, remove the four screws holding the rear plastic cover (Figure 9: Rear and Front Cover Screws) and detach the rear plastic cover from the unit.

![Figure 9: Rear and Front Cover Screws](image-url)
4. Unscrew the black cover using the Philips head screw, pull up the cover and disconnect (red arrow in Figure 10: Unit Screws)

5. Unscrew the two Philips head screws (blue arrow in "Figure 10: Unit Screws" on page 11) and pull the complete black/grey body up and out.

6. Mount new unit and replace the three Philips screws.

7. Attach the front cover and secure to the frame using existing hardware.

8. Attach the rear cover and secure to the unit using existing hardware.

9. Connect the power cord and power up the unit.

10. Watch the home screen to verify the Spectube Pressure Wait message progresses to Stabilization Wait and System Ready within ten minutes.

   Refer to the operator's manual if the system fails to reach the System Ready mode.

11. Varian recommends a full calibration of the unit prior to leak test operations.
Diaphragm Pump Replacement

Equipment Required

- Extended Length M5 Allen Wrench
- Metric Allen Wrench Set
- M3 Phillips Head Screw Driver
- Adjustable Wrench

For clarity, some items have been omitted from views.

WARNING Disconnect power from the unit before performing any maintenance procedure that requires physically disconnecting any part of the system.

1. Turn off the power switch located on the back of the unit and unplug.
2. Wait 30 seconds for the high voltage to dissipate.
3. Using an extended length M5 Allen wrench, remove the four screws holding the rear plastic cover (Figure 11: Rear and Front Cover Screws) and detach the rear plastic cover from the unit.

Figure 11: Rear and Front Cover Screws
4. Disconnect the R3359-301 Molex connector to the Clippard valve (Figure 12: Molex Connector).

![Figure 12: Molex Connector](image1)

5. Remove the ground connection to the system body (red arrow in Figure 13: Ground Connection).

![Figure 13: Ground Connection](image2)

6. Disconnect the two M4 screws mounting the plate to the scroll pump assembly (blue arrow in Figure 13: Ground Connection).
7. Remove the diaphragm pump assembly, turn it over and unscrew the four M2 screw holding the pump to the plate (Figure 14: Pump to Plate Connections - two shown).

![Figure 14: Pump to Plate Connections](image)

8. Reattach the new pump to the plate.
9. Reattach the plate to the scroll pump.
10. Reattach the ground and Molex connections.
11. Attach the front cover and secure to the frame using existing hardware.
12. Attach the rear cover and secure to the unit using existing hardware.
13. Connect the power cord and power up the unit.
14. Watch the home screen to verify the *Spectube Pressure Wait* message progresses to *Stabilization Wait* and *System Ready* within ten minutes.
   Refer to the operator's manual if the system fails to reach the *System Ready* mode.
15. Varian recommends a full calibration of the unit prior to leak test operations.
Diaphragm and Seal Replacement

*Equipment Required*

- Extended Length M5 Allen Wrench
- M3 Phillips Head Screw Driver
- Felt Tip Pen
- Metric Allen Wrench Set
- Phillips Head Screw Driver, #1

For clarity, some items have been omitted from views.

**WARNING**

Disconnect power from the unit before performing any maintenance procedure that requires physically disconnecting any part of the system.

1. Turn off the power switch located on the back of the unit and unplug.
2. Wait 30 seconds for the high voltage to dissipate.
3. Using an extended length M5 Allen wrench, remove the four screws holding the rear plastic cover (Figure 15: Rear and Front Cover Screws) and detach the rear plastic cover from the unit.

![Figure 15: Rear and Front Cover Screws](image)

**NOTE**

Always change the valve plates, diaphragm and sealing rings at the same time.
4. Remove the pump head by (Figure 16: Pump Head Removal):

   a. Making a mark (M) on the head plate (3), intermediate plate (2), and housing (1) with a felt-tip pen.
   b. Undoing the 4 screws (4) in the head plate and lifting the head plate, with the intermediate plate, off the pump housing.
   c. For models with:
      • DC motors (no cooling fan): Removing the cover (6) from the pump housing (1) by inserting a screwdriver into the slots on the sides, and prying the cover off (with care the adhesive gasket between cover and housing may be reused).
      • No fan: Reference is made to turning or holding the cooling fan, the necessary operations must be carried out by turning or holding the counterweight (16).

5. Change the diaphragm by (see Figure 16: Pump Head Removal):
   a. Turning the fan to bring the structured diaphragm (9) to top dead center.
   b. Lifting the edge of the diaphragm and, gripping it on opposite sides, unscrewing it by turning counterclockwise.

   CAUTION

   Ensure that the disc s spring (12) and diaphragm spacers (11) on the threaded portion of the diaphragm do not fall into the housing.

   c. Taking the disc spring (12), diaphragm spacer(s) (11), and diaphragm support (10) off the threaded portion of the diaphragm and retaining them.
   d. Ensuring that all parts are free from dirt and clean them, if necessary.
   e. Placing the diaphragm support, diaphragm spacer(s), and disc spring, in that order, on the thread part of the new diaphragm. The concave side of the disc spring must be towards the diaphragm.
f. Turning the fan until the connecting rod (13) is at top dead center.
g. Screwing the diaphragm, complete with diaphragm support, diaphragm spacer(s), and disc spring, into the connecting rod (clockwise) and tightening it by hand.

6. Change the valve plates by (see Figure 16: Pump Head Removal):
   a. Separating the head plate (3) from the intermediate plate (2).
   b. Removing the valve plates (7) and sealing rings (8) from the intermediate plate.
   c. Checking that the valve seats in the head plate and the intermediate plate are clean. If scratches, distortion, or corrosion are evident, replace that part.
   d. Laying the new valve plates in the intermediate plate recesses. The valve plates for suction and pressure sides are identical, as are upper and lower sides of the plates.
   e. Ensuring the valve plates are not deformed by moving them gently sideways in their recesses.
   f. Laying the sealing rings on the intermediate plate.

7. Refit the pump heads by (see Figure 16: Pump Head Removal):
   a. Turning the fan to bring the diaphragm to top dead center.
   b. Placing the intermediate plate (2), with valve plates (7), sealing rings (8), and head plate (3) on the housing, in the position indicated by the (M).
   c. Checking that the head plate is centered by moving it gently sideways.
   d. Gently tightening the screws (4), evenly and diagonally.
   e. Turning the fan to check that the pump rotates freely.
   f. Turning the fan again to bring the diaphragm to top dead center.
   g. Tightening the screws (4).
   h. For DC versions (no cooling fan): Reattaching the cover (6) to housing (1).

8. Attach the front cover and secure to the frame using existing hardware.
9. Attach the rear cover and secure to the unit using existing hardware.
10. Connect the power cord and power up the unit.
11. Watch the home screen to verify the Spectube Pressure Wait message progresses to Stabilization Wait and System Ready within ten minutes.
    Refer to the operator's manual if the system fails to reach the System Ready mode.
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 Trophiques
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

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 2452
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

UK & Ireland
Varian Ltd.
6 Mead Road
Oxford Industrial Park
Yarnton, Oxford OX5 1QU
UK
Tel.: +44 (0) 1865 291570
Fax: +44 (0) 1865 291571

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: 1 (800) 882-7426 (toll-free)
vctarningservice@varianinc.com

Europe
Tel: 00 (800) 234 234 00 (toll-free)
vctarningservice@varianinc.com

Japan
Tel: (81) 3 5232 1253 (dedicated line)
vctarningservice@varianinc.com

Korea
Tel (82) 2 3452 2452 (dedicated line)
vctarningservice@varianinc.com

Taiwan
Tel: 0 (800) 051 342 (toll-free)
vctarningservice@varianinc.com

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

Representatives in most countries