

Technical Note

*i*Series Instrument Platform of Gas Analyzers Vacuum Pumps

Bulletin #11111P1

Rev 12/2011

Introduction

The Thermo Scientific *i*Series of gas analyzers have incorporated several different internal vacuum pumps. In order to aid in identifying the correct vacuum pump and its corresponding rebuild kit, the following guide has been developed.

*i*Series Vacuum Pump and Rebuild Kit Matrix

Model	Active Pump	Shim'd	Rebuild Kit for Active Pump	Discontinued "New Technology" Pump	Shim'd	Rebuild Kit "New Technology" Pump	Discontinued "Old Style" Pump	Shim'd	Rebuild Kit for "Old Style" Pump
146i	111553-01		108002-00	101426-00	✓	108002-00	101426-00		8606
410i	111553-01		108002-00	101426-00	✓	108002-00	101426-00		8606
42i	101011-01	✓	107751-00	101011-00	✓	107751-00	101011-00		9267
42i-D	101011-01	✓	107751-00	101011-00	✓	107751-00	101011-00		9267
42i-LS	101011-01	✓	107751-00	101011-00	✓	107751-00	101011-00		9267
42i-J	101011-01	✓	107751-00	101011-00	✓	107751-00	101011-00		9267
42i-Y	111553-01		108002-00	101426-00	✓	108002-00	101426-00		8606
43i	111553-01		108002-00	101426-00	✓	108002-00	101426-00		8606
43i-HL	101011-01	✓	107751-00	101011-00	✓	107751-00	101011-00		9267
43i-TL	111553-01		108002-00	101426-00	✓	108002-00	101426-00		8606
450i	111553-01		108002-00	101426-00	✓	108002-00	101426-00		8606
46i	111553-01		108002-00	101426-00	✓	108002-00	101426-00		8606
46i-HL	111553-01		108002-00	101426-00	✓	108002-00	101426-00		8606
48i	111553-01		108002-00	101426-00	✓	108002-00	101426-00		8606
48i-HL	111553-01		108002-00	101426-00	✓	108002-00	101426-00		8606
48i-TLE	111553-01		108002-00	101426-00	✓	108002-00	101426-00		8606
49i	111553-01		108002-00	101426-00	✓	108002-00	101426-00		8606
49i-PS	111553-01		108002-00	101426-00	✓	108002-00	101426-00		8606
5020i	111553-01		108002-00	101426-00	✓	108002-00	101426-00		8606

Comments:

Please note Rebuild Kit P/N 108002-00 is common to P/N's 111553-01, 111553-00 and 101426-00 and includes replacement Shims.

P/N's 111553-01 and 111553-00 are designed as a low vibration "Shim-less" pumps. Shims included in rebuild kit 108002-00 should be discarded.

P/N 101426-00 is "Shim-less" in its "Old Style" and "Shim'd" in its "New Technology" design. Shims included with rebuild kit 108002-00 could be discarded for "Old Style" pumps and can be used as replacements for those incorporated in the "New Technology" pump.

P/N's which end in "-01" include the replacement pump (101011-00 and 111553-00) and a Shock Bumper Kit (P/N 112021-00). P/N's 101011-00 and 111553-00 are not available for sale therefore please order P/N 111553-01 or 101011-01.

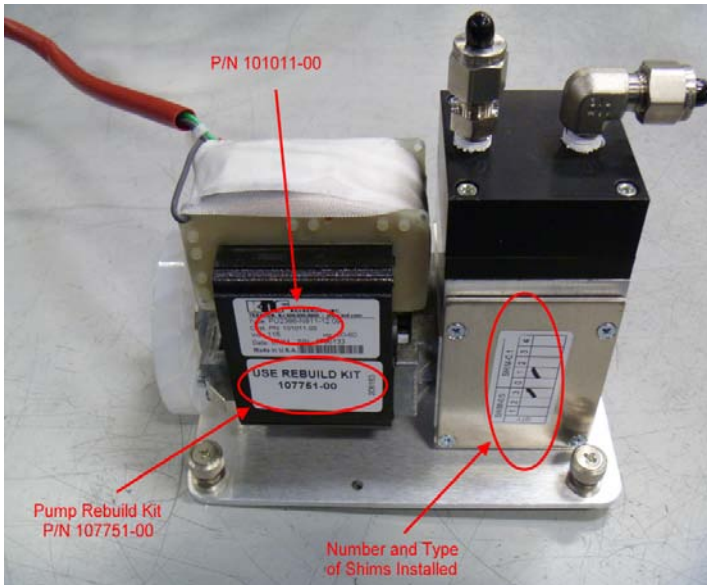
Additional guidance can be found within this document.

Models: 42i, 42i-J, 42i-LS, 42i-D, 42i-D and 43i-HL

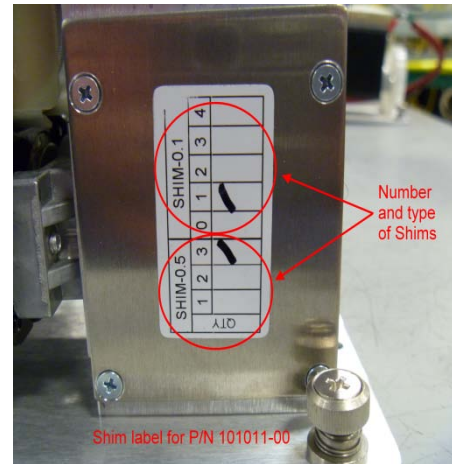
Active Pump - P/N 101011-01 "New Technology"

Active Rebuild Kit - P/N 107751-00

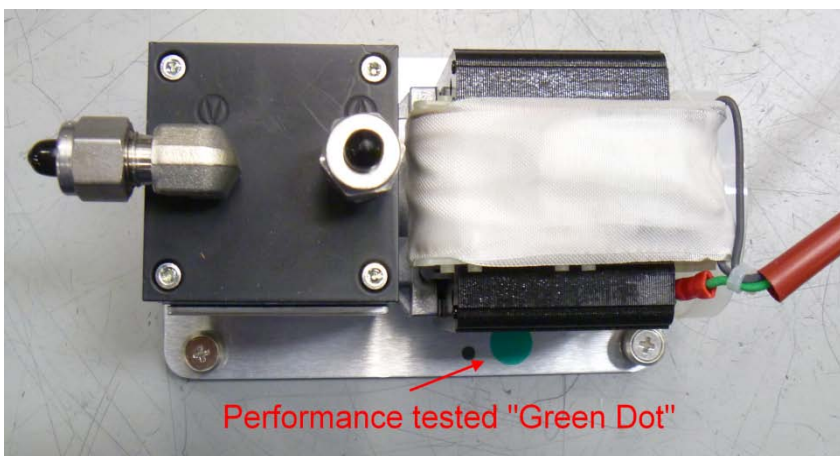
*Note: P/N 101011-00 does not include Shock Bumper kit and is not available for sale



P/N 101011-01 Side View



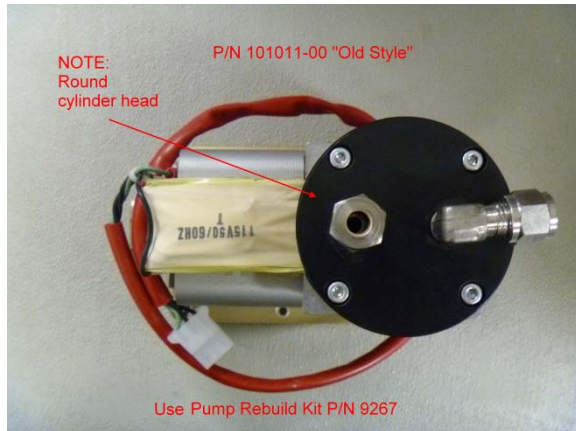
P/N 101011-01 Shim Label
(added to pumps manufactured after August 2011)



P/N 101011-01 Top View

Models: 42i, 42i-J, 42i-LS, 42i-D, 42i-D and 43i-HL

Discontinued Pumps - P/N 101011-00 "Old Style"
Active Rebuild Kit - P/N 9267



P/N 101011-00 "Old Style"



P/N 101011-01 "New Technology"

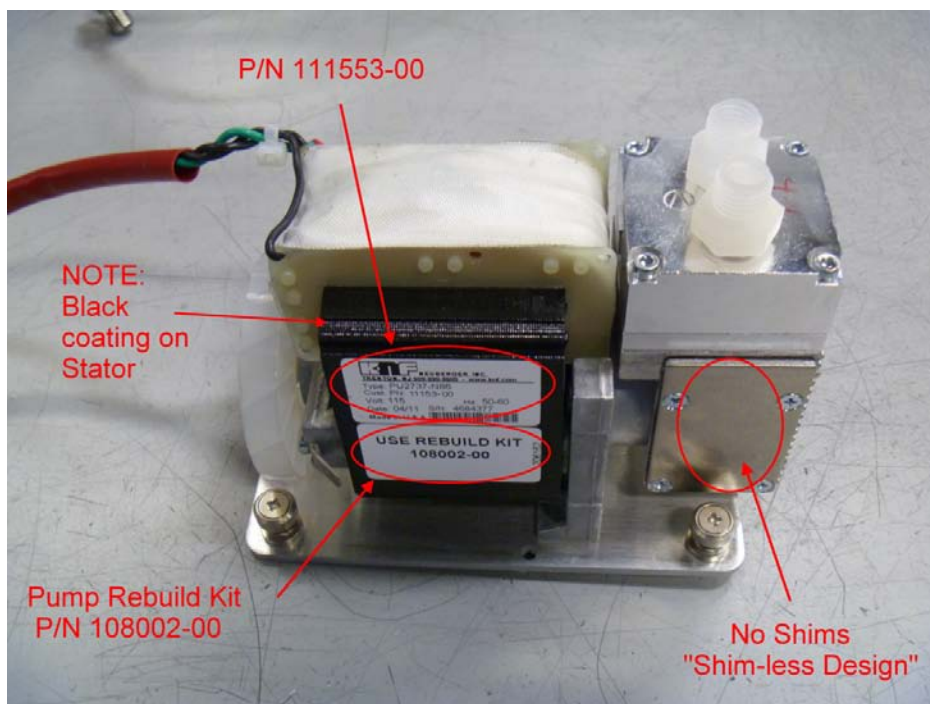
NOTE: Some "Old Style" and "New Technology" pumps may be labeled with the raw pump motor of part number of 102639-00 which is not commercially available.

Models: 42i-Y, 43i, 43i-TL, 48i, 48i-HL, 48i, 48i-HL, 48i-TLE, 49i, 49i-PS, 146i, 410i, 450i and 5020i

Active Pump* – P/N 111553-01
Active Rebuild Kit – P/N 108002-00

* Effective October 2011

** Note: P/N 111553-00 does not include Shock Bumper kit and is not available for sale

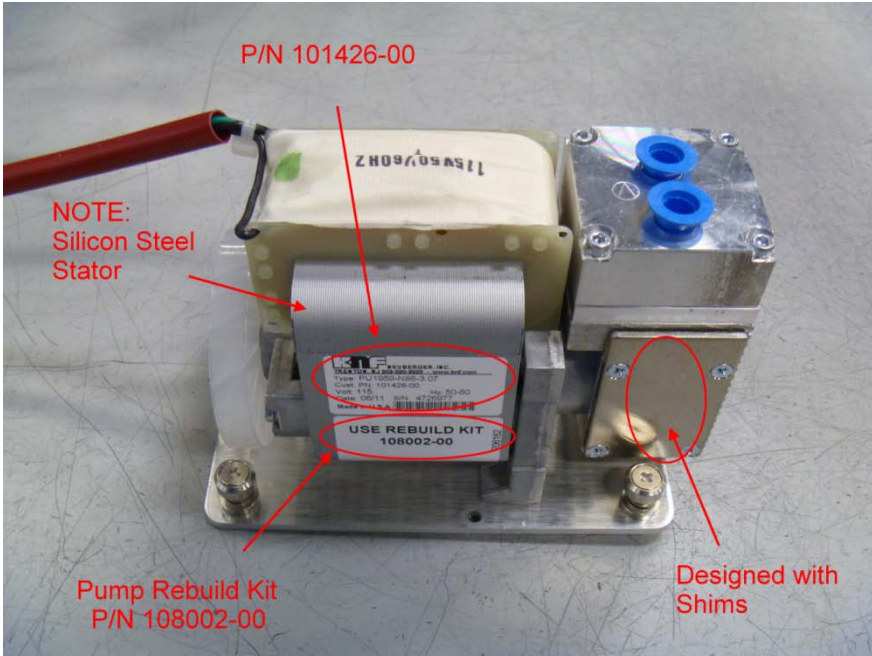


P/N 111553-01 Side View

Models: 42i-Y, 43i, 43i-TL, 48i, 48i-HL, 48i, 48i-HL, 48i-TLE, 49i, 49i-PS, 146i, 410i, 450i and 5020i

Discontinued Pump* – P/N 101426-00 “New Technology”
Active Rebuild Kit – P/N 108002-00

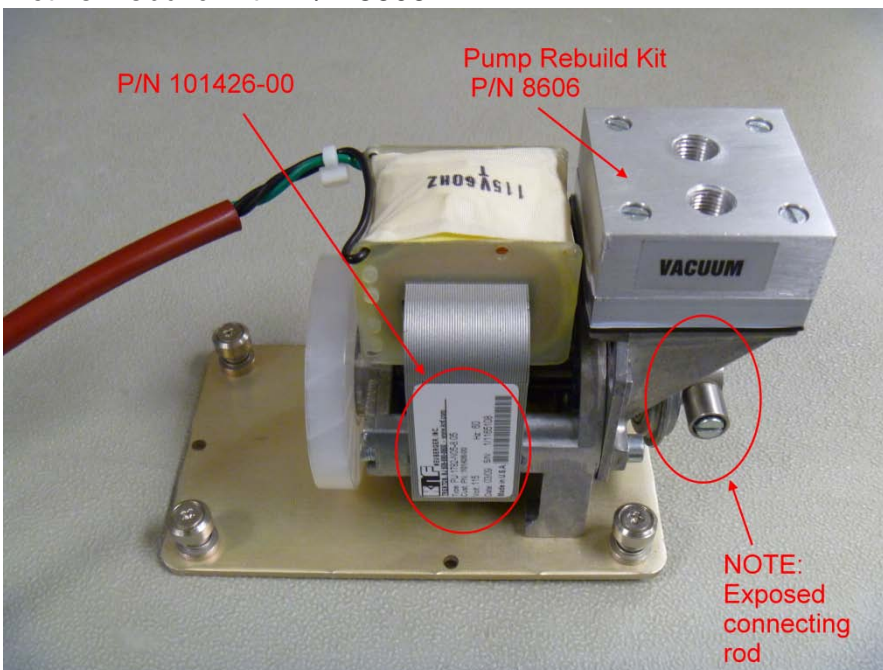
* Effective October 2011



P/N 101426-00 “New Technology” Side View

Models: 42i-NOY, 43i, 43i-TL, 46i, 46i-HL, 48i, 48i-HL, 48i-TLE, 49i, 49i-PS, 146i, 410i, 450i and 5020i

Discontinued Pump – P/N 101426-00 “Old Style”
Active Rebuild Kit – P/N 8606



P/N 101426-00 “Old Style” Side View

Diaphragm and Valve Replacement Procedure for
Thermo Scientific # 101011-00 and 101011-01

SHIMS UNDER DIAPHRAM SUPPORT CUP ARE REQUIRED

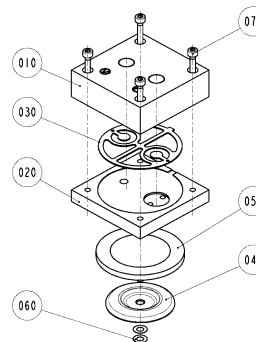
(KNF # PU2386-N811-3.07 or PU 1961-N811-3.07)

Tools and Materials required:

- Thermo Scientific Pump Rebuild Kit #107751-00
- #1 Phillips head screwdriver
- Marking pencil or marker
- 2.5 mm Allen Wrench

Seq.	Description
010	Headplate
020	Intermediate plate
030	Valveplate
040	Diaphragm support cup
050	Diaphragm
060	Shim ring
070	Socket cap screw

Exploded View of Pump Head:



Disassembly:

1. Disconnect the pump from electrical power. Make a sketch of the position of any tubes and fittings for ease of re-assembly later.
2. Mark the position of the pump headplate (010), intermediate plate (020) and compressor housing relative to each other by drawing a line on the edges with a pencil or marker to insure proper re-assembly.
3. One of the aluminum compressor housing covers must be removed to gain access to the inside of the compressor housing. Remove the four screws and then remove the cover. Re-use any gasketing. Remove any debris that may have accumulated in the bottom of the compressor housing.
4. Remove the four screws (070) with the 2.5 mm allen wrench and remove the headplate (010). Note the positioning of the valveplate (030) relative to the valve ports on the headplate (010) and intermediate plate (020). Lift off the valveplate (030).
5. Remove the intermediate plate (020).
6. Check that all parts are free from dirt and clean as necessary. DO NOT scratch the parts.
7. Removal of the old diaphragm (050): Rotate the fan so that the diaphragm is positioned at the top dead center. This will help unseat the edge of the diaphragm. If required, push up from underneath the diaphragm or use a **non-metallic** tool to pry up the diaphragm from the housing groove. Do not scratch the head components. Unscrew the old diaphragm (050) by turning it counterclockwise using both hands. Lift up and grip the edges of the diaphragm at 10 and 4 o'clock. High initial force may be required to break the diaphragm loose. **DO NOT use tools!** (Note: - Take care not to lose any shim ring(s) (060) positioned between the diaphragm support cup (040) and connecting rod, as the exact number of shim ring(s) must be used during re-assembly.) While unscrewing the diaphragm with one hand, use your other hand to secure the support cup and shim ring(s) onto the diaphragm stud. Lift the diaphragm (050), support cup (040) and shim ring(s) (060) from the pump. The compressor housing cover must be removed to gain access to and secure the support cup and shim ring(s) onto the stud. Note: the quantity and thickness of shim ring(s) will vary from pump to pump. Parts removed must be replaced exactly as found. If repairing multiple pumps, take care not to mix parts.

Assembly with new diaphragm and valveplate:

1. Place the parts removed in step 7 above onto the threaded stud of the new diaphragm. Carefully screw the new diaphragm (050) into the connecting rod. Secure the support cup and small parts onto the diaphragm stud using a technique similar to that used during removal. It is helpful to hold the connecting rod at a slight angle until the threads are started. Spin the diaphragm on until it is snug. Lift and grip the edges of the diaphragm at 7 and 2 o'clock and tighten firmly using both hands. DO NOT use tools!
(TIP: If the pump is loose and not mounted, position and hold the pump with the motor shaft vertical when starting the threaded diaphragm stud into the connecting rod. This helps to prevent the small parts from falling off the stud.)
2. Turn the fan until the diaphragm is flat across (mid-point of the stroke). With the diaphragm centered over the compressor housing, firmly seat the diaphragm edge into the compressor housing groove.
3. Place the clean intermediate plate (020) onto the compressor housing using the reference mark made earlier to insure the correct orientation. Then place the new valveplate (030) on top of the intermediate plate.
4. Place the clean headplate (010) on top of the intermediate plate (020) using the reference mark made earlier to insure the correct orientation. Tighten the four head screws (070) snugly in a diagonal pattern and then tighten to a maximum torque of 6-7 inch-lbs. Turn the fan by hand to confirm that the pump turns freely.
5. Replace the compressor housing cover and gasket. Install the four cover screws. Do not over-tighten.
6. If the fittings are removed from the headplate: Remove any old Teflon® tape from all fittings. Carefully apply two layers of Teflon® tape around any fittings before reinstalling into the pump head. Install the tubing and fittings as previously sketched in step 1 above.
7. Do not apply tape beyond threads, as excess tape may tear off and lodge in the valves. Do not substitute any other type of tape. Do not over-tighten metal fittings.

Diaphragm and Valve Replacement Procedure for Thermo Scientific # 101426-00

SHIMS UNDER DIAPHRAGM ARE REQUIRED

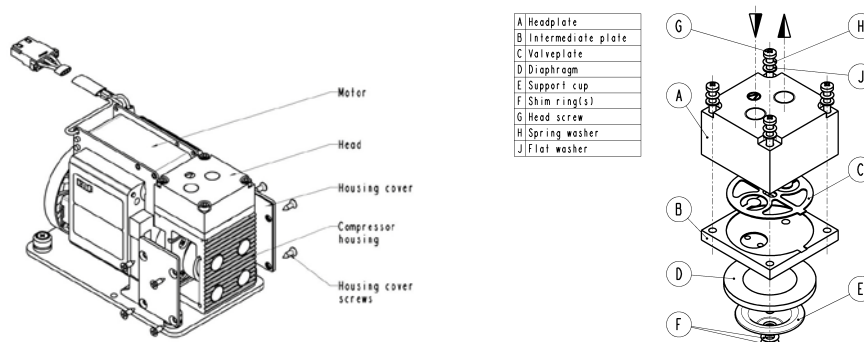
(KNF # PU1959-N86-3.07)

Tools and Materials required:

- Thermo Scientific Pump Rebuild Kit #108002-00
- #1 Phillips head screwdriver
- Marking pencil or marker
- 2.5 mm Allen Wrench

Exploded View of Compressor Housing:

Exploded View of Pump Head:



Disassembly:

1. Disconnect the pump from electrical power. Make a sketch of the position of any tubes and fittings for ease of re-assembly later.
2. Mark the position of the pump head plate (A), intermediate plate (B) and compressor housing relative to each other by drawing a line on the edges with a pencil or marker to insure proper re-assembly.
3. The aluminum compressor housing cover must be removed to gain access to the inside of the compressor housing. Remove the four screws and then remove the cover. Re-use any gasketing. Remove any debris that may have accumulated in the bottom of the compressor housing.
4. Remove the four screws (G), spring washers (H) and flat washers (J) and remove the head plate (A). Note the positioning of the valve plate (C) relative to the valve ports on the head plate (A) and intermediate plate (B). Lift off the valve plate (C).
5. Remove the intermediate plate (B).
6. Check that all parts are free from dirt and clean as necessary. **DO NOT** scratch the parts.
7. Removal of the old diaphragm (D): Rotate the fan so that the diaphragm is positioned at the top dead center. This will help unseat the edge of the diaphragm. If required, push up from underneath the diaphragm or use a **non-metallic** tool to pry up the diaphragm from the housing groove. Do not scratch the head components. Unscrew the old diaphragm (D) by turning it counterclockwise using both hands. Lift up and grip the edges of the diaphragm at 10 and 4 o'clock. High initial force may be required to break the diaphragm loose. **DO NOT use tools!** (Note: - Take care not to lose any shim ring(s) (F) positioned between the diaphragm support cup (E) and connecting rod, as the exact number of shim ring(s) must be used during re-assembly.) While unscrewing the diaphragm with one hand, use your other hand to secure the support cup and shim ring(s) onto the diaphragm stud. Lift the diaphragm (D), support cup (E) and shim ring(s) (F) from the pump. The compressor housing cover must be removed to gain access to and secure the support cup and shim ring(s) onto the stud. Note: the quantity and thickness of shim ring(s) will vary from pump to pump. Parts removed must be replaced exactly as found. If repairing multiple pumps, take care not to mix parts.

Assembly with new diaphragm and valve plate:

1. Place the parts removed in step 7 above onto the threaded stud of the new diaphragm. Carefully screw the new diaphragm (D) into the connecting rod. Secure the support cup and small parts onto the diaphragm stud using a technique similar to that used during removal. It is helpful to hold the connecting rod at a slight angle until the threads are started. Spin the diaphragm on until it is snug. Lift and grip the edges of the diaphragm at 7 and 2 o'clock and tighten firmly using both hands. **DO NOT use tools!**
(TIP: If the pump is loose and not mounted, position and hold the pump with the motor shaft vertical when starting the threaded diaphragm stud into the connecting rod. This helps to prevent the small parts from falling off the stud.)
2. Turn the fan until the diaphragm is flat across (mid-point of the stroke). With the diaphragm centered over the compressor housing, firmly seat the diaphragm edge into the compressor housing groove.
3. Place the clean intermediate plate (B) onto the compressor housing using the reference mark made earlier to insure the correct orientation. Then place the new valve plate (C) on top of the intermediate plate.
4. Place the clean head plate (A) on top of the intermediate plate (B) using the reference mark made earlier to insure the correct orientation. Tighten the four head screws (G) snugly in a diagonal pattern and then tighten to a maximum torque of 6-7 inch-lbs. Turn the fan by hand to confirm that the pump turns freely.
5. Replace the compressor housing cover and gasket. Install the four cover screws. Do not over-tighten.
6. Remove any old Teflon® tape from all fittings. Carefully apply two layers of Teflon® tape around any fittings before reinstalling into the pump head. Install the tubing and fittings as previously sketched in step 1 above.
7. Do not apply tape beyond threads, as excess tape may tear off and lodge in the valves. Do not substitute any other type of tape. Do not over-tighten metal fittings.

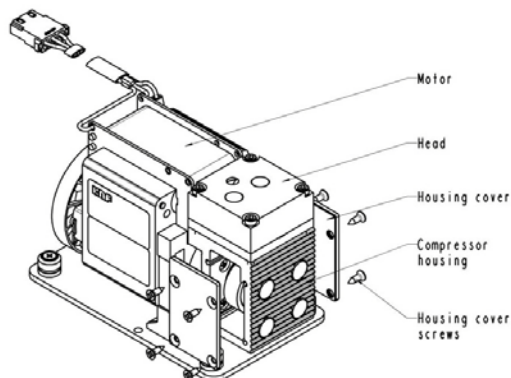
Diaphragm and Valve Replacement Procedure for
Thermo Scientific # 111553-00 and 111553-01

NO SHIMS REQUIRED
(KNF # PU2737-N86)

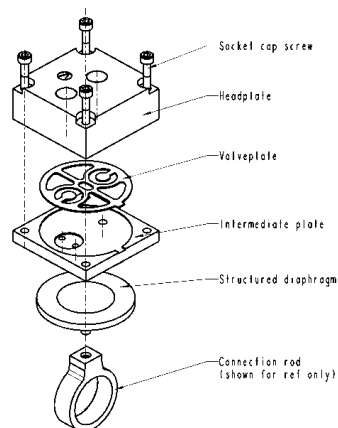
Tools and Materials required:

- Thermo Scientific Pump Rebuild Kit #108002-00
- #1 Phillips head screwdriver
- Marking pencil or marker
- 2.5 mm Allen Wrench

Exploded View of Compressor Housing:



Exploded View of Pump Head:



Disassembly:

1. Disconnect the pump from electrical power. Make a sketch of the position of any tubes and fittings for ease of re-assembly later.
2. Mark the position of the pump headplate, intermediate plate and compressor housing relative to each other by drawing a line on the edges with a pencil or marker to ensure proper re-assembly.
3. The aluminum compressor housing covers must be removed to gain access to the inside of the compressor housing. Remove the screws and then remove the covers. Re-use the gasket material. Remove any debris that may have accumulated in the bottom of the compressor housing.
4. Remove the four socket cap screws and remove the headplate. Note the positioning of the valve plate relative to the valve ports on the head plate and intermediate plate. Lift off the valve plate.
5. Remove the intermediate plate.
6. Check that all parts are free from dirt and clean as necessary. Remove any Teflon® tape from the head plate ports. **DO NOT** scratch the parts.
7. Removal of the old structured diaphragm: Rotate the fan so that the diaphragm is positioned at the top dead center. This will help unseat the edge of the diaphragm. If required, push up from underneath the diaphragm or use a **non-metallic** tool to pry up the diaphragm from the housing groove. Do not scratch the head components. Lift up and grip the edges of the diaphragm at 10 and 4 o'clock. Unscrew the old diaphragm by turning it counterclockwise using both hands. High initial force may be required to break the diaphragm loose. **DO NOT use tools!** Lift the diaphragm from the pump. Parts removed must be replaced exactly as found. If repairing multiple pumps, take care not to mix parts.

Assembly with new diaphragm and valve plate:

1. Carefully screw the new diaphragm (no shims are needed) into the connection rod. It is helpful to hold the connecting rod at a slight angle until the threads are started. Spin the diaphragm on until it is snug. Secure the diaphragm stud using a technique similar to that used during removal. Lift and grip the edges of the diaphragm at 7 and 2 o'clock and tighten firmly using both hands. **DO NOT use tools!**
2. Turn the fan until the diaphragm is flat across (mid-point of the stroke). With the diaphragm centered over the compressor housing, firmly seat the diaphragm edge into the compressor housing groove.
3. Place the clean intermediate plate onto the compressor housing using the reference mark made earlier to ensure the correct orientation. Then place the new valve plate on top of the intermediate plate.
4. Place the clean head plate on top of the intermediate plate using the reference mark made earlier to ensure the correct orientation. Tighten the four socket cap screws snugly in a diagonal pattern and then tighten to a maximum torque of 6-7 inch-lbs. Turn the fan by hand to confirm the pump turns freely.
5. Replace the compressor housing covers with gasket and install the cover screws. Do not over-tighten.
6. Remove any old Teflon® tape from all fittings. Carefully apply two layers of Teflon® tape around any fittings. Do not apply tape beyond threads, as excess tape may tear off and lodge in the valves. Do not substitute any other type of tape.
7. Reinstall fittings into the pump head. Do not over-tighten fittings.

P/N 112021-00 Shock Bumper Kit Installation Instructions

Remove adhesive backing from the Shock Bumpers (P/N TR101RP) and locate them on the floor plate approximately at the locations called out below on Figures 1 and 2. Five (5) Shock Bumpers are required per each installation.

PUMP P/N'S 101426-00 & 111553-00 and 111553-01

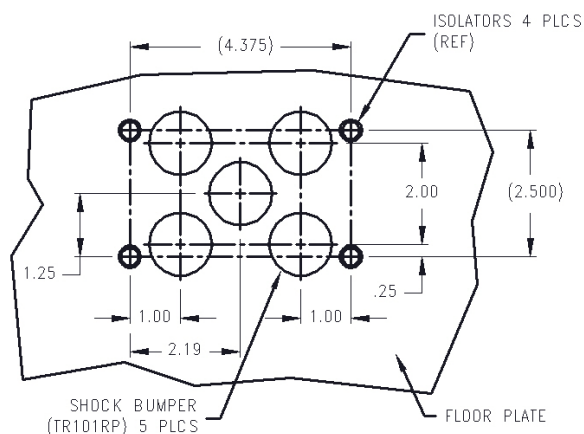


FIGURE 1

PUMP P/N'S 102639-00 & 101011-00 and 101011-01

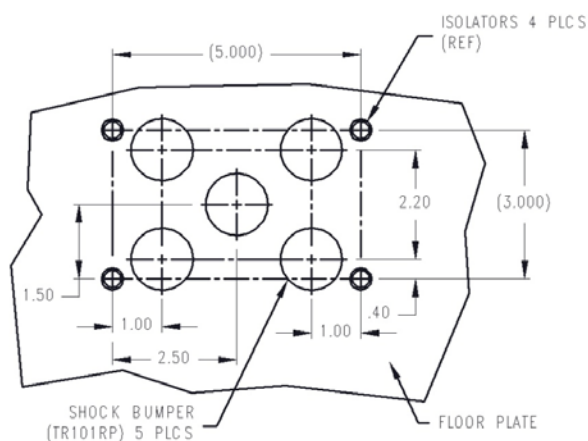


FIGURE 2

If you have any questions about this bulletin or require technical assistance, please contact your local distributor or our Technical Support team via telephone at (508) 520-0430 or by e-mail at AQService@thermofisher.com.