

KM Diamond Exhaust Regulator Maintenance and Testing

⚠ WARNING

This module is our effort to explain the maintenance and testing of the KM Diamond sub-assemblies and the helmet as a complete unit. WE DO NOT HEREIN MAKE ANY EFFORT TO TEACH or REPLACE the recommended KMDSI/ Dive Lab, Inc. Technician training for the KM Diamond Deep Sea Diving Helmet. It is our assumption the reader has experience and is familiar with the operation, inspection and repair process of Kirby Morgan Diving Systems. We highly recommend that all divers should receive proper training, under controlled conditions, in the use of any model of commercial diving helmet that they have not previously used or trained in, prior to use on the job.

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1.1 KM Diamond Exhaust Regulator

To perform a complete, disassemble, reassemble and test for proper operation a Diamond Set Up and Test Kit P/N DL-D00 is REQUIRED. Contact Dive Lab, Inc for specifications at divelab@divelab.com (850) 235-2715 Panama City Beach, Florida USA.

All lubrication is with Christo-Lube® or Equivalent UNLESS NOTED.

1.2 Disassembly of the Diamond Exhaust Assembly

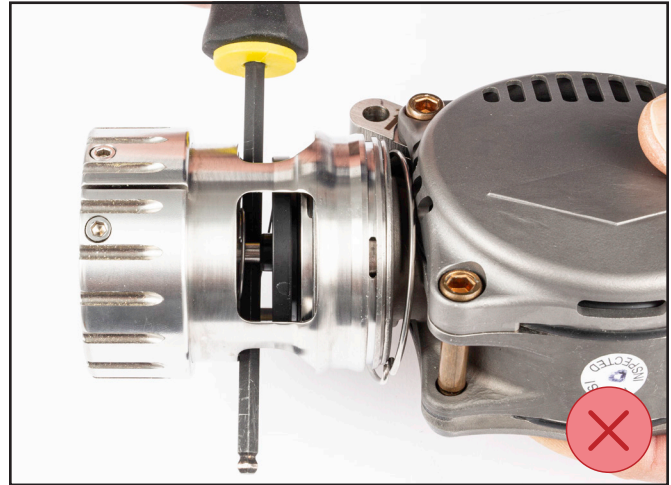
Tools Required

- ¼" and ⅜" Allen Wrench
- ⅝" Open Ended Wrench
- Flat Head Screwdriver
- Diamond Set Up & Test Kit P/N DL-D00

If the Diamond Exhaust Regulator has not been removed from the helmet: Refer to section "1.6.4 Removal of the Diamond Exhaust Assembly" on page DIAMD-14 in the KM Diamond modular manual.

1) Remove the Diamond Exhaust Regulator shroud. See "1.6.12.1 Removal of the Diamond Valve Shroud" on page DIAMD-21.

2) Remove the Housing Retainer Ring and push lose end toward main body once free.



DO NOT put wrench straight through the housing. Tool should not press on the puck stem.

NOTE

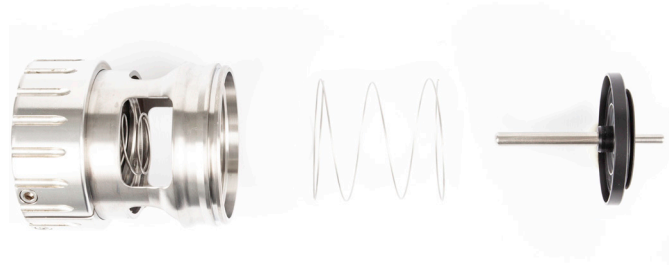
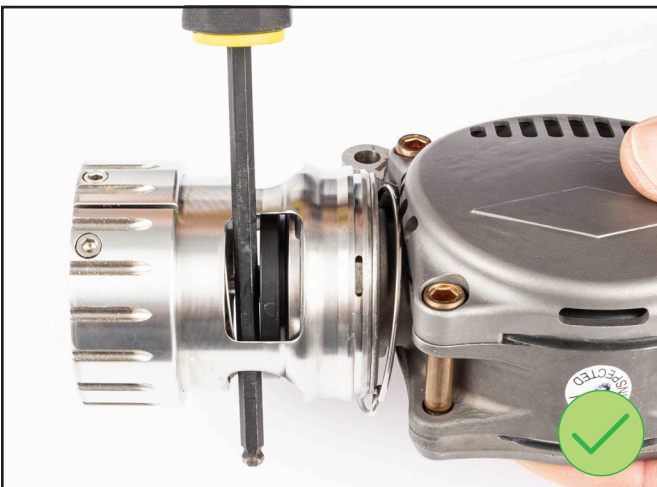
4) Separate Retainer Housing from main body.



3) Use $\frac{3}{16}$ " Allen Wrench to rotate counter clock-wise the retainer housing.



5) Remove Puck with Pin and large spring and set aside.



6) Use $\frac{3}{4}$ " Allen key to remove cap screws and Split Retainer.



8) Unscrew Exhaust Control Body and separate from housing.



7) Remove valve from puck assembly.



9) Turn Spring clockwise and slightly apply pull pressure to separate from body.

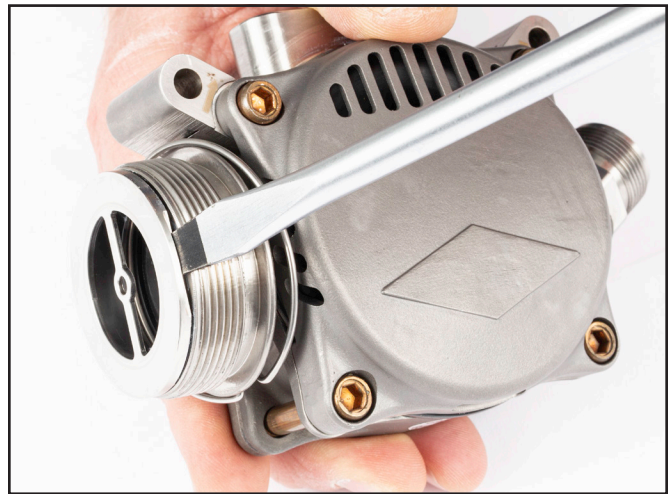




10) Be sure to remove O-ring that is pressed into the Exhaust Control Body.



11) Use large flat blade screwdriver and **remove with an even pull outward**.



12) Remove O-ring from Puck Seal.



Puck Seal Insert

Note recessed leading edge on the Puck Seal Insert



13) Remove Housing Retainer Ring.



Care must be taken not to damage the exhaust valve insert.

NOTE



14) Remove OPRV components from Diamond Exhaust body. Use jeweler's type screwdriver to remove Retaining Ring first.



15) Remove O-ring.

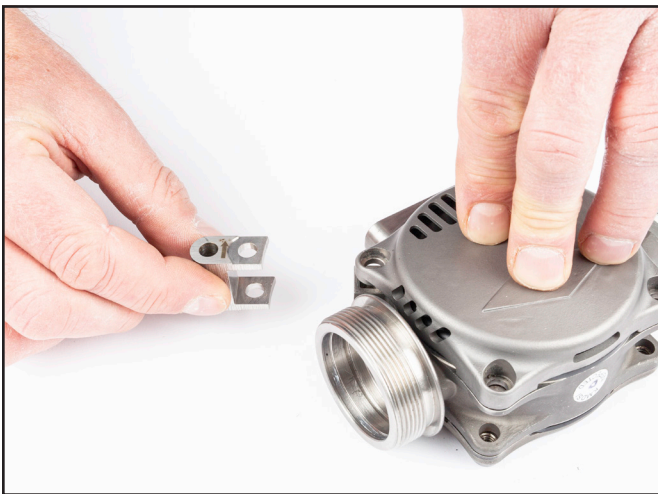




16) Use $\frac{3}{16}$ " Allen Wrench and remove four caps screws.



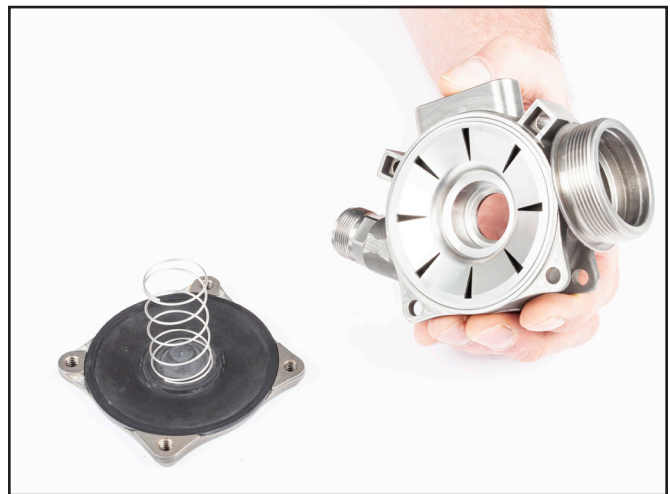
17) Remove Mount Blocks. Note arrow direction for future reinstall.



18) Remove Top Diaphragm Cover and First Stage Diaphragm Assembly.



19) Complete disassembly of exhaust regulator—Bottom cover, 2nd Stage Diaphragm and Spring.



Always be careful with the large face of the valve seat. Scratches or other surface damage may cause the system to leak and not function properly.



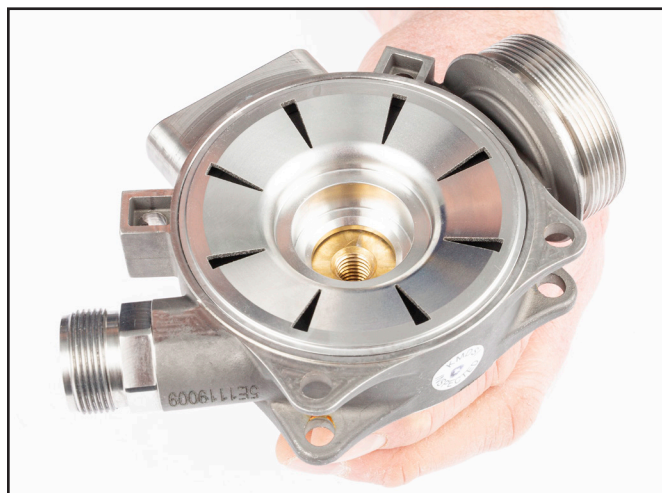
- Tool Handle for Valve Seat Insert (Pie Plate) Removal Tool
- ¾" Open Ended Wrench

1) Push Valve Seat Insert Removal Tool into notches found on screen side (second stage) of the regulator.



2) Position assembly so the large brass removal tool is down with the slotted Valve Seat facing up.

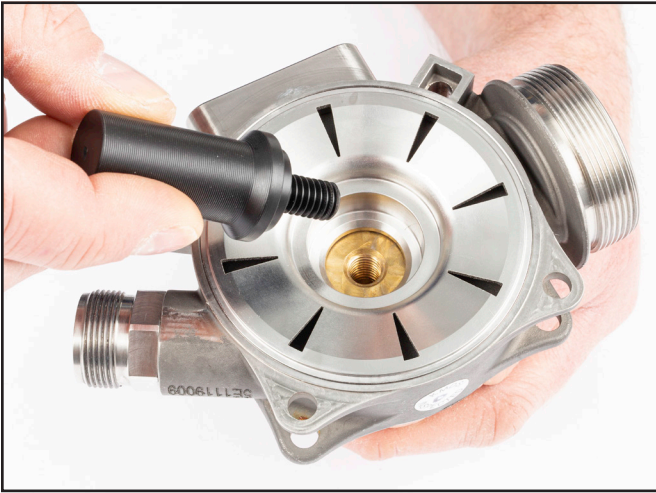
1.3 Removing Valve Seat (Pie Plate)



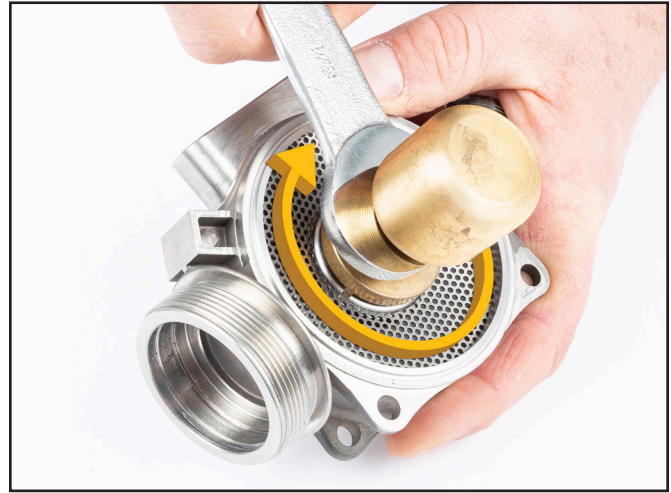
3) Thread the BLACK tool handle into the brass removal tool.

Tools Required

- Valve Seat Insert (Pie Plate) Removal Tool



The threaded end of the tool will go through the hole and mate to removal tool that is secured from the screen side (second stage) of the exhaust regulator.

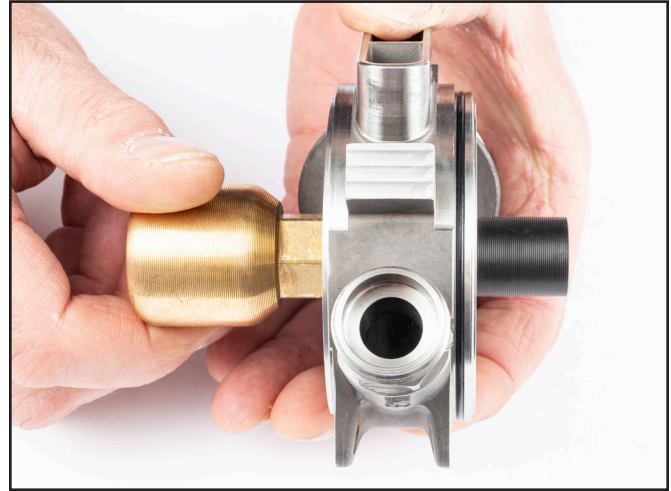


LOOSEN – TURN CLOCKWISE

5) Once Valve Seat is unseated, rotate by hand to remove from exhaust regulator body.

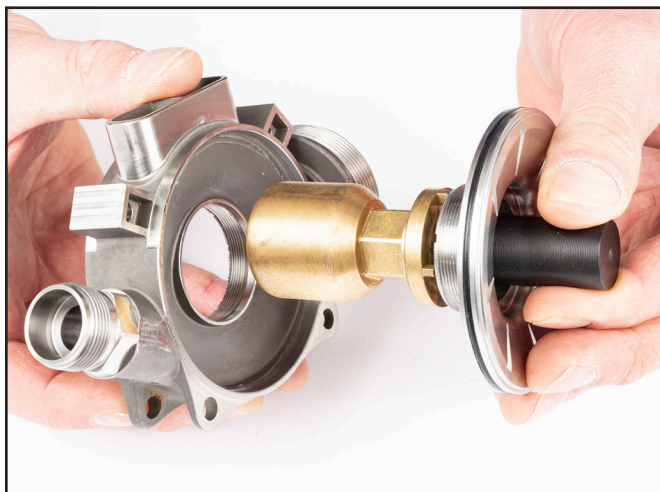


4) Once tools are secured use $\frac{3}{4}$ " wrench to turn large bronze handle clockwise to loosen.



Care MUST be taken to safe guard Valve Seat from damage.

6) Remove Valve Seat with tools attached through and away from regulator body



7) Unthread handle and remove tools from Valve Seat.



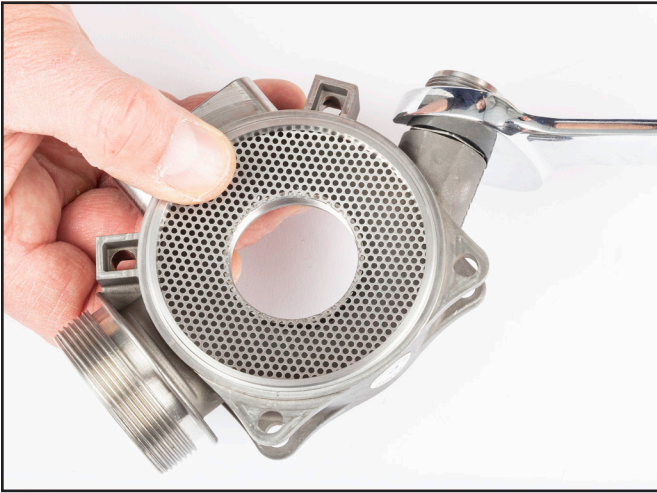
8) Use push pull method to remove large outer O-ring.



9) Carefully use a pic to remove smaller O-ring.



Adapter Outlet (exhaust hose side)
10) Using a 7/8" wrench, remove Adapter Outlet from DEA main body.



11) Remove O-ring.

1) Lubricate O-ring Install onto Adapter Outlet.



2) Install Adapter Outlet to specified Torque.

3) Lubricate both Valve Seat O-rings with Dow Corning® 111 or equivalent

4) Install O-rings onto Valve Seat.



1.4 Reassembly Valve Seat (Pie Plate)

Tools Required

- Valve Seat Insert (Pie Plate) Removal Tool
- Tool Handle for Valve Seat Insert (Pie Plate) removal tool
- Vacuum/Pressure Test Fitting
- Hand Pump
- Valve Seat Insert (Pie Plate) Test Fixture with O-rings
- $\frac{7}{8}$ " & $\frac{3}{4}$ " Open Ended Wrench
- Dow Corning® 111 Silicone Grease or Equivalent (For Use on Pie Plate Seal O-rings.)
- Christo-Lube® or Equivalent



Apply a generous amount of lubricant to 2nd stage O-ring seal

NOTE

5) Using Dow Corning® 111 silicone or equivalent lubricate recessed edge found near the center of the regulator exhaust main body.



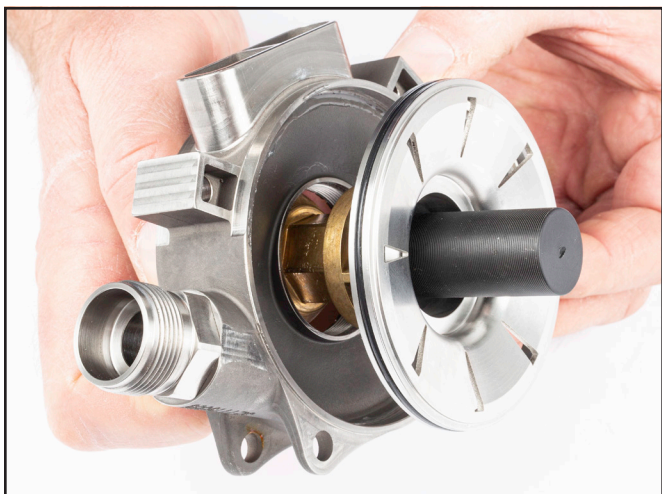
6) Push Valve Seat Insert Removal Tool into notches found on underside of Valve Seat.



7) Thread the BLACK tool handle into the brass removal tool.



8) Once tools are secured guide large brass handle into the hole of the regulator body.

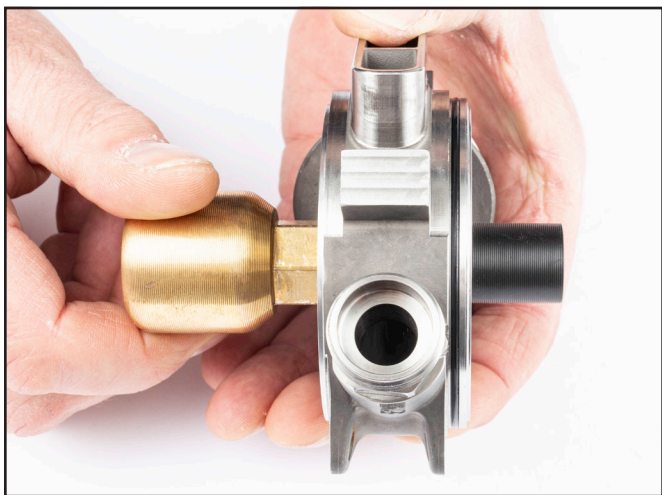
**NOTE**

The brass end of the tool will exit the screen side of the regulator body.

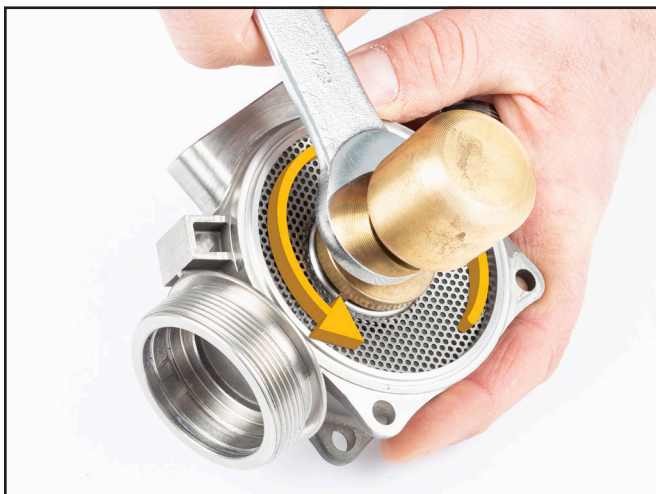
9) By hand rotate large brass tool counter clockwise to engage threads. Continue to tighten by ensuring proper seating of Valve Seat into regulator body.

**NOTE**

These fine threads can become crossed, so extra care must be used to ensure proper engagement.



10) Use $\frac{3}{4}$ " wrench to turn large bronze handle counter clockwise to tighten.



Tighten– TURN Counter clockwise
Only tighten until the Valve Seat bottoms out.

1.5 Leak Test

Once Valve Seat 8 (Pie Plate) is installed a leak test must be performed.

Tools Required

- Valve Seat Inert (Pie Plate) Test Fixture with O-rings
- Hand Pump
- Vacuum/Pressure Test Fitting
- Tool Handle For Valve Seat Insert (Pie Plate) Removal Tool
- Dow Corning® 111 Silicone Grease or Equivalent
- Christo-Lube® or Equivalent

1) Lightly lubricate O-rings on the Valve Seat Inert test fixture.

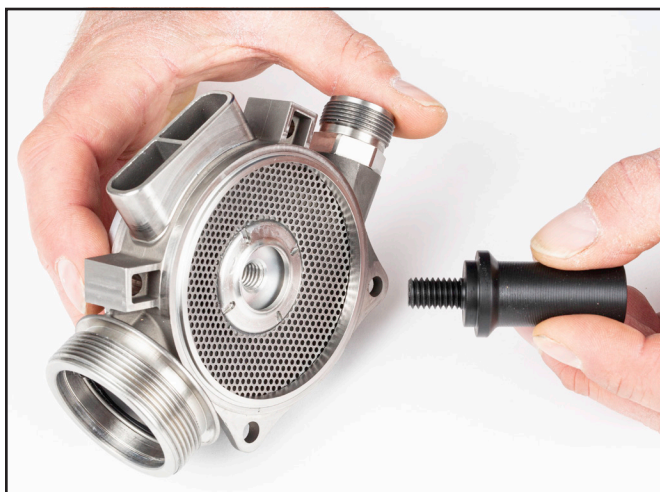


2) Install test pieces ensuring fixture is seated properly.



Tool handle is hand tight only

NOTE



3) Install test fitting onto regulator.



4) Positive pressure test for 10 seconds @ 5 PSI – NO loss of pressure equals a pass on the pressure test.

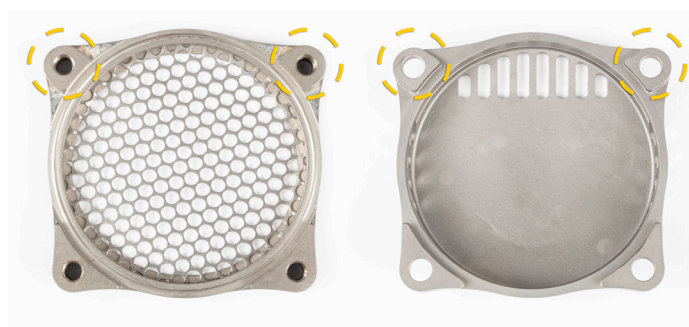


If test fails submerge in water to observe leak.

NOTE



5) Remove test fixtures and lay out Diaphragm Covers.



**NOTE**

Observe the smaller steps versus the larger steps found around the cap screw holes. The small steps on the diaphragm covers should face the diver/helmet side of Diamond exhaust assembly and the larger steps should face away from the diver or outside edge of the regulator.

BUILD the exhaust regulator from the 2nd stage Diaphragm up. To align components properly the body of the OPRV should hang over an edge. This position will allow the bottom cover to remain level during the build UP process and assist in correct assembly.

6) Insert Spring onto 2nd Stage Diaphragm. With down ward force turn Spring clockwise to engage Spring with the raised bump on the diaphragm.



7) Center Diaphragm with Spring onto bottom (screen) cover with even gaps all around the leading edge.

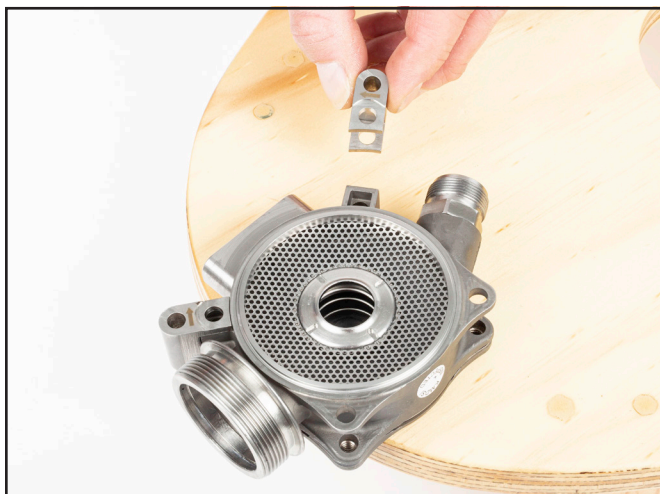


8) Lower regulator body onto the bottom diaphragm cover with diaphragm and spring in place.



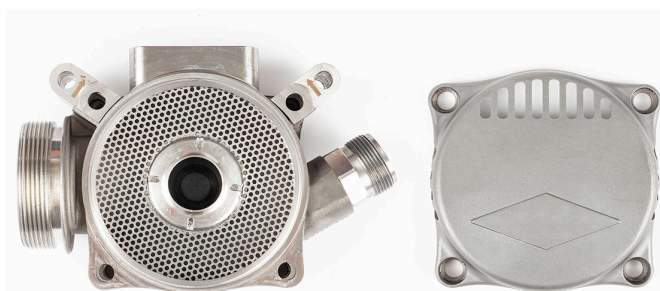
1.5.1 Mount Blocks

1) Use arrows to ensure correct placement of mount blocks. Both arrows should point inward towards mounting tube.



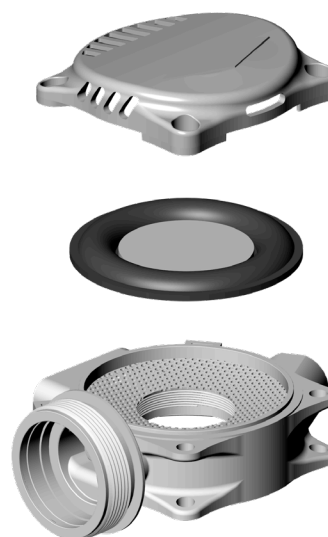
- $\frac{3}{16}$ " Allen wrench

Position cover as shown to mate with main body.



1.5.2 1st Stage Diaphragm

1) Fit so the metal disk faces up and away from the main exhaust body.



1) Place top cover onto regulator body.



1.5.3 Diaphragm Covers

Tools Required



The large slots located on top cover face the diver and are above the mount tube. Insert cap screws into holes.



2) Rotate screws counter clockwise until a click is heard or felt to ensure threads are correctly engaged, then rotate right clockwise to tighten.



2) Exhaust Valve is secured to the insert with valve stem exiting the finned side of the insert.



3) Torque to specific torque.



The large slots located on top cover face the diver and are above the mount tube.

NOTE

1.5.4 OPRV

Tools Required

- $\frac{7}{64}$ ", $\frac{3}{8}$ " and $\frac{3}{16}$ " Allen Wrenches
- Dow Corning® 111 Silicone Grease or Equivalent
- Christo-Lube® or Equivalent

1) Install O-ring into OPRV body DO NOT lubricate.



Valve should open out and away from SBV body, valve stem exits the finned side of the insert.

NOTE

3) Trim the valve stem.



4) Install Exhaust Valve Insert with valve into OPRV body.



Finned side of valve goes into OPRV body.

NOTE



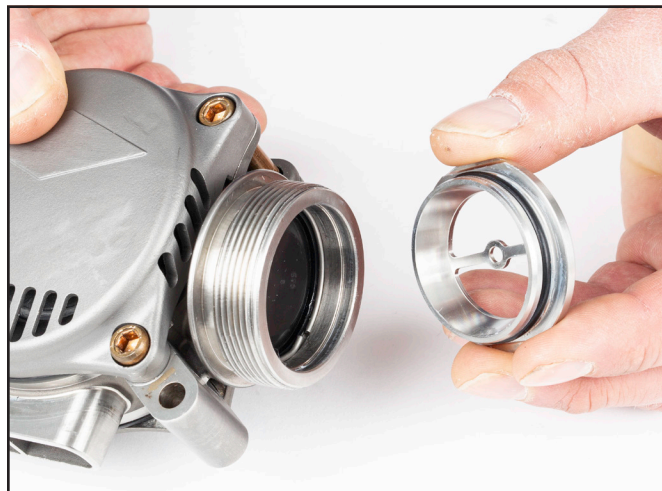
5) Insert Retainer Ring into OPRV body.



6) Lubricate O-ring and install onto Puck Seal.



7) Insert evenly into exhaust valve body.



8) Insert Housing Retainer Ring over OPRV body so it rests on the assembly, but away from the OPRV threads.



Lightly pull on the spring to be certain it is installed correctly. It is important for these parts to remain together to allow proper function.



Spring should lock into place with light pressure while turning knob clockwise.

1.5.5 OPRV Control Knob

1) Install O-ring into Exhaust Control Body. DO NOT LUBRICATE.



3) Lubricate internal threads found inside Retainer Housing.

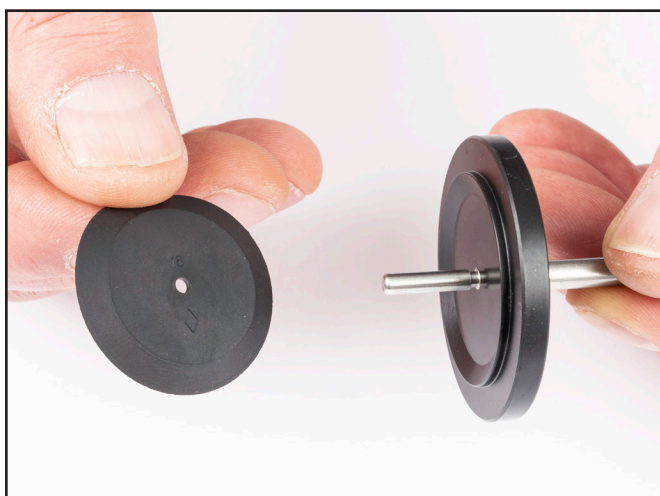


2) Insert Spring into groove and turn clockwise while pushing down.

4) Thread Exhaust Control body with Spring into Retainer Housing.



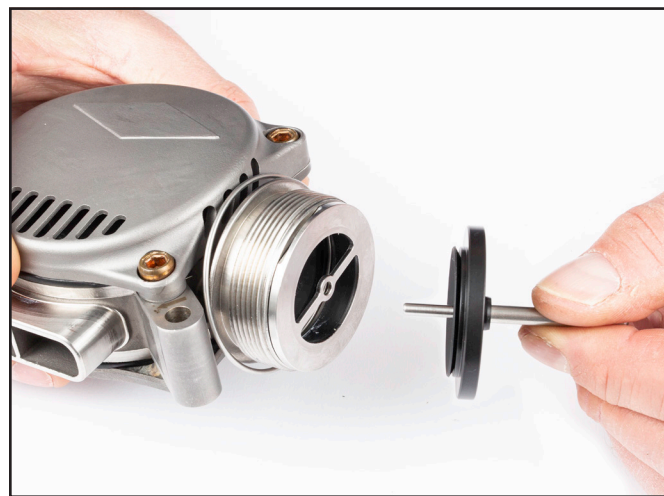
5) Slide valve onto stem with the cup facing up until it is secured into the groove cut in the stem.



6) Insert the Puck with Pin and valve into the Puck Seal Insert.



Longer portion of the stem should stick out of insert, shorter end goes into Puck Seal.

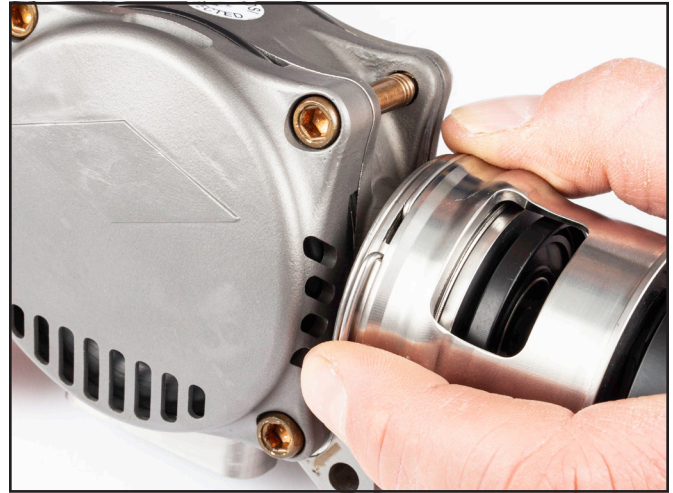


7) Orientate exhaust assembly so stem is pointing up and exhaust body, as shown.



8) Place larger spring onto puck with pin assembly.

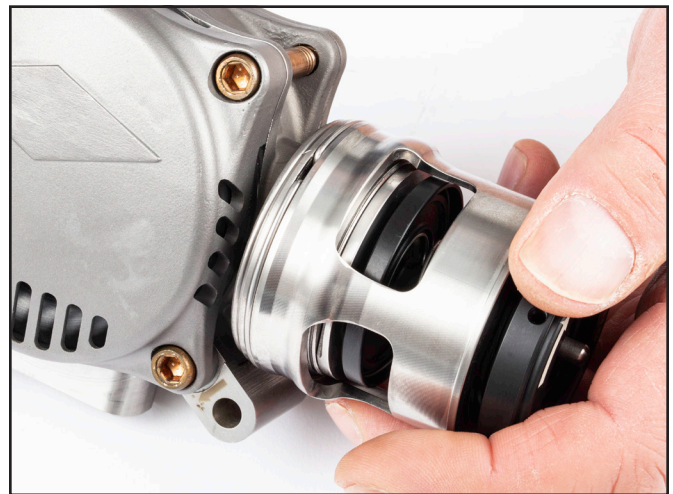
9) Thread Retainer Housing onto main body.



12) Rotate Control Knob out slightly to make room for adjustment knob halves.



10) Use 3/16" Allen wrench to snug housing onto body.



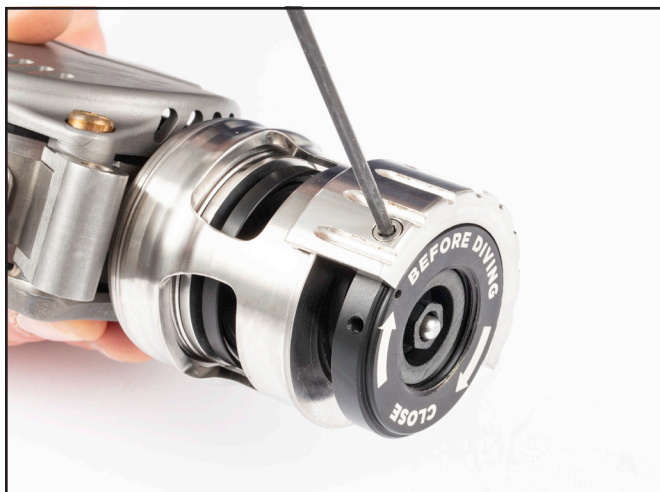
13) Place Split Retainer onto control Control Knob, aligning the holes.



11) Secure housing Retainer Ring onto Retainer Housing, one hook end at a time, using your fingers to work the ring around the housing until the other hook end is secure.



14) Tighten hex screws until the top of the screw is just barely below the outer surface of the knob.



1.6 Final Exhaust Assembly Test

- 1) Rotate OPRV to the closed position.
- 2) Attach testing components as shown.



- 3) Pull 20 inches of vacuum, must hold for 10 seconds to pass test.

Upon successful completion of final test, the Diamond Exhaust regulator is ready to install.