

KM Diamond Surface Bypass Valve 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 Surface Bypass Valve (SBV)

Valve body is made of Titanium to reduce weight. **Bypass Equalizer Tube must be installed for proper SBV operation at ALL TIMES.**

See "Torque Specs" module to confirm correct torque.

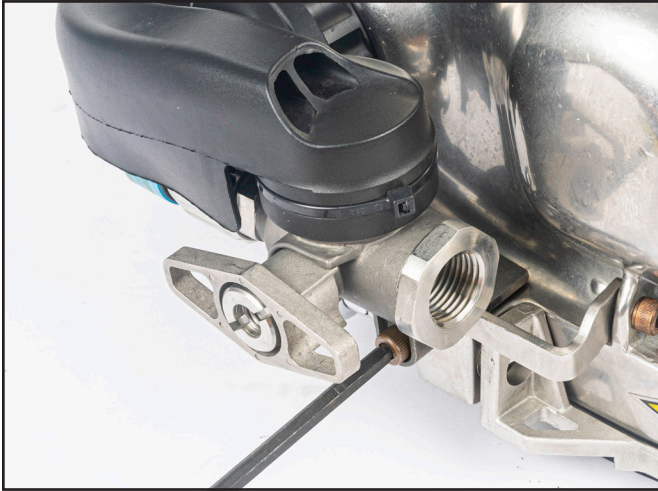
1.2 Disassembly

1.2.1 Removing SBV from Bracket

Tools Required

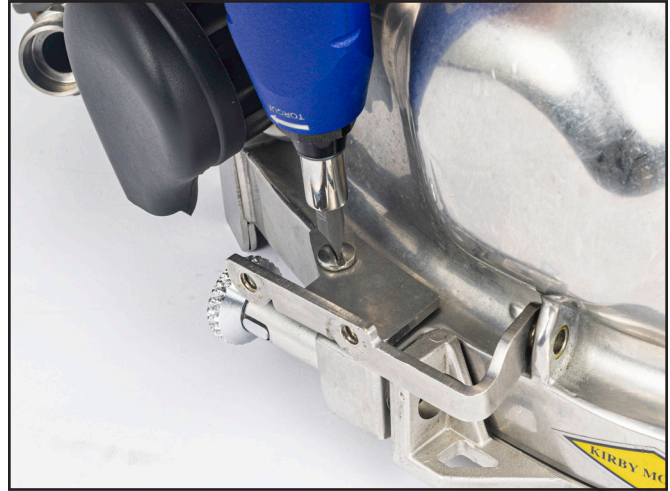
- $\frac{3}{16}$ " Allen Wrench

1. Use a $\frac{3}{16}$ " Allen wrench to remove the screws that secure the SBV to the bracket.

**NOTE**

Screws are secured to the bracket with Loctite® 248 and must be removed before reinstallation and applying new medium-strength thread locker.

2. Use a flathead screwdriver to remove the screw on the top flat face of the bracket.

**NOTE**

Be careful not to lose the washer under the bracket.

1.2.2 Removing SBV Bracket

Tools Required

- Flat Head Screwdriver
- $\frac{3}{16}$ " Allen Wrench

1. Use a $\frac{3}{16}$ " Allen wrench to remove the screw located at the outer end of the bracket.



1.2.3 Removing Bypass Equalizer Tube and Surface Bypass Hose

Tools Required

- $\frac{7}{8}$ " & $1\frac{1}{4}$ " Open Ended Wrenches
- Hooked Pick
- $\frac{3}{16}$ " Allen Wrench
- Flat Head Screwdriver
- KMDSI Wrench (Included in Helmet Tool Kit)

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

1. Cut tie wrap and remove Bypass Equalizer Tube.



2. Remove hose.

1.2.4 Surface Bypass Hose



NOTE

Exhaust Hose Fitting should be broken free and loosened up from the main body **WHILE STILL ATTACHED TO THE HELMET.**

1. Remove the two O-rings located in both ends of the hose.



2. Clean and inspect assembly.

1.2.5 Retaining Cap

1. Use KMDSI wrench to unscrew Retaining Cap and set aside.



1.2.6 Butterfly Valve

1. Lift valve away from valve body and use hooked pick to remove Butterfly Valve Seat with valve installed.

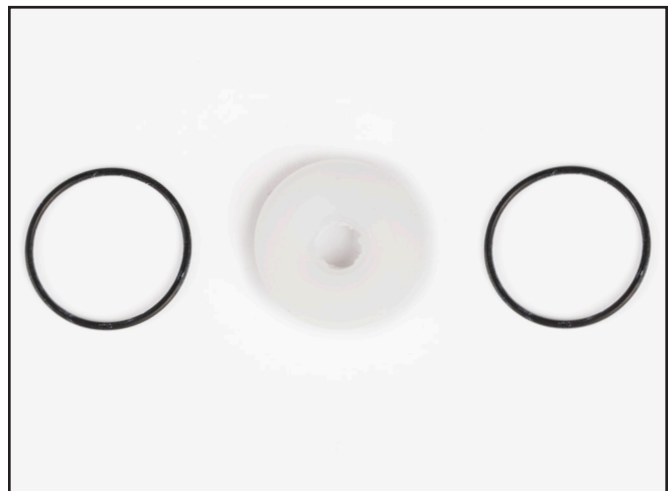




2. Remove O-ring from valve seat.



3. Place tip of a hooked pick into groove found on leading edge of Exhaust Port Seal.



1.2.7 Removing Exhaust Hose Fitting Adapter



Exhaust Hose Fitting should be broken free and loosened up from the main body **WHILE STILL ATTACHED TO THE HELMET.**

1. The SBV comes standard with a ½ NPT female



Same O-ring is used above and below the Exhaust Port Seal

adapter. Use a 1 ¼" open ended wrench to remove adapter.



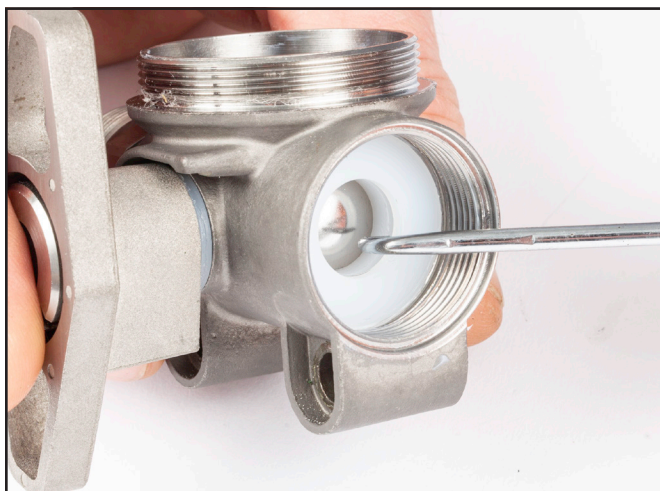
3. Ensure control handle is in the following position.



2. Insert tipped end of pick into recessed edge of Ball Seal and remove.



Control Handle must be in the parallel position. The handle must be in this position to let the ball come loose from the stem and body. Any deviation from this position might prevent the ball from being removed.



4. Tilt, then tap the Control Ball out of the SBV Body.



5. Use Flat blade screw driver to disassembly Control handle.



6. Be sure to clean thread locker off of stem threads prior to reassembly.



7. Remove the O-ring from the SBV body.



8. Use $\frac{7}{8}$ " open ended wrench to remove Adapter Nipple from SBV body.



9. Remove sealing O-ring from fitting.



1.2.8 Ball Seat



STEM MUST BE REMOVED

NOTE

Last, the Ball Seat can be removed with dowel or similar tool. Care must be taken to prevent damage to Ball sealing surface.

1. Push tool into body so seal exits out the larger opening of the SBV body.





1.3 Reassembly

1.3.1 Adapter Nipple and Ball Seat

Tools Required

- Christo-Lube® or Equivalent
- 7/8" & 1 1/4" open ended wrenches
- Flat Blade screwdriver

1. Lubricate both O-rings; Hose Fitting Adapter 1/2" NPT & Adapter Nipple and install onto fittings.

2. Set aside Hose Fitting Adapter 1/2" NPT

3. Install Adapter Nipple to SBV Body. Final torque to specified value once installed or held by a table vise.



4. Lubricate Ball Seat and outer ball seal surface. The concave end should face toward the center of the SBV body. Seal will fit snug and must be pushed in as far as possible into the body.

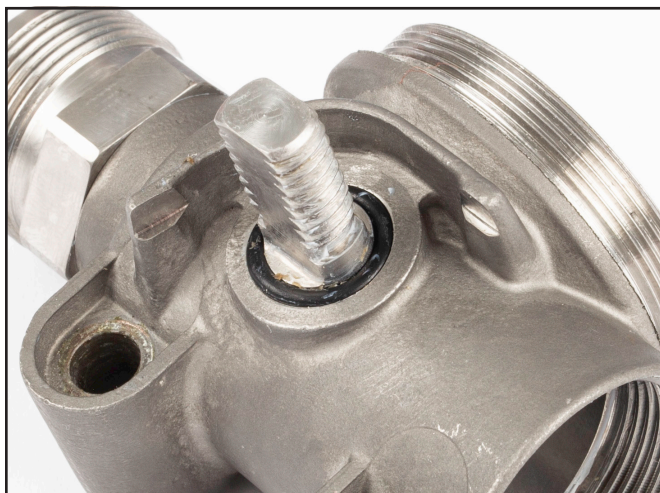
1.3.2 Control Handle

1. Ensure threads of stem are clean.
2. Lubricate washer.
3. Insert white Teflon® washer onto Stem.



4. Insert stem into SBV body.

5. Lubricate O-ring and fit over stem and into groove found on SBV body.



Stem threads **MUST** be clean and free of residual thread locker or dirt.

NOTE

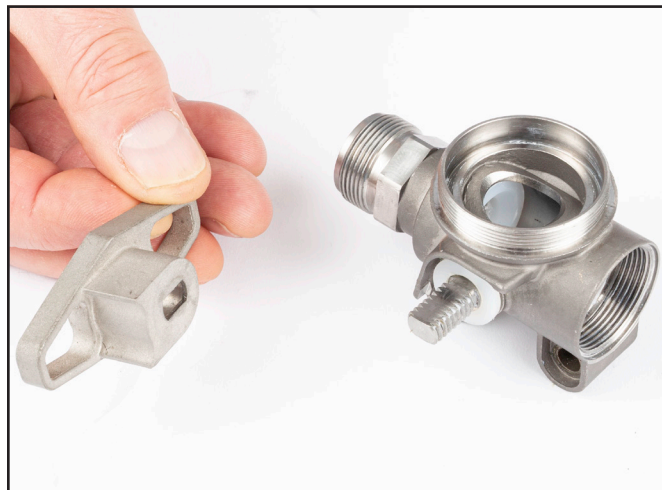
6. Insert the washer onto the stem.



7. Apply medium strength thread locker on the stem threads.



8. Assembly the remainder of the control handle components.





10. Ensure Control handle is in the parallel position.



The Control Ball has a lower step on one side of the recessed groove. This side must enter the SBV body first.



9. Tighten nut until bottomed out and back $\frac{1}{4}$ turn.



Control Ball can be installed with no tools or aided by using a short piece of ½" clear tubing or rubber hose.

NOTE

11. Install Control Ball into SBV body and onto Stem. As noted this can be done by slightly rolling or aided by use of semi flexible tubing.

12. Ensure Control Ball is seated properly in valve body and has correct orientation. With the handle in the parallel position there should be a straight path through the ball from one end of the body to the other.



After Ball Seat is installed make sure female threads are CLEAN and FREE of LUBRICATE.

NOTE

13. Lubricate and insert Ball Seat with concave edge facing into the body. The flat surface of the Ball Seat faces towards the hose fitting adapter.



Verify correct orientation -
Parallel - OPEN to the exhaust hose. Bypass port
will be CLOSED.



Vertical - CLOSED to the exhaust hose. Bypass
port will be OPEN.



1.3.3 Hose Fitting Adapter

Valve MUST BE in the open position.

1. Clean threads and apply medium strength
thread locker to hose fitting adapter threads.



2. Make sure the control handle is in the parallel position and is securely fastened. If it isn't, there is a risk of damaging the seat when torquing the adapter. Thread the adapter onto the main body. FINAL TORQUE must be applied with SBV secured in a table vise, see "1.3.6 Final Torque" on page KMSBV-15



NOTE

Final torque is only achieved when the SBV Body is secured to helmet or locked into a table vise.





1.3.4 Exhaust Port Seal

1. Lubricate and install O-ring into groove.



2. Lubricate exposed ball surface and cycle valve handle several times.



3. Push the Exhaust Port Seal **FIRMLY DOWN** into the body.



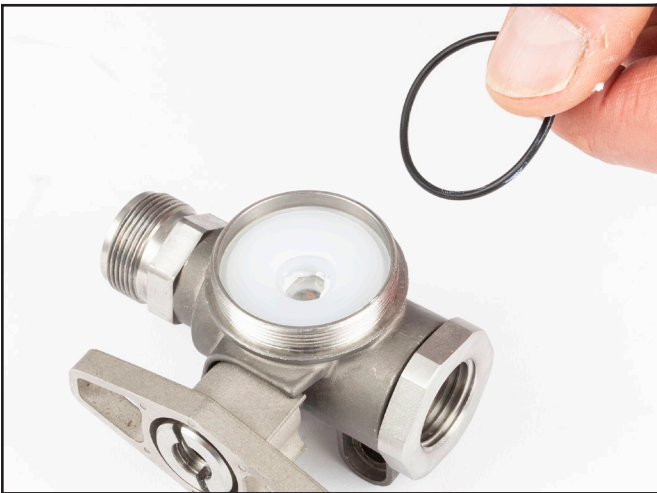
The seat should be contacting the ball. This seat has a very close tolerance fit and proper installment should be confirmed before moving to the next step. Make certain the seat is firmly against the ball



4. Lubricate and install O-ring on top of Exhaust Port Seal.



8. Ensure Valve is opening away from body.



5. Install Butterfly Valve Seat onto correct side of seat.

6. Lubricate O-ring and install into Valve Seat groove.

9. Use KMDSI wrench to bottom out Retaining Cap onto valve body. Extreme care should be used to avoid cross threading and over tightening.



Blue sleeve indicates direction of the hose. Blue Sleeve secures to SBV body. AWAY from the exhaust regulator.

1.3.6 Final Torque

1. Torque Adapter Nipple to final torque.

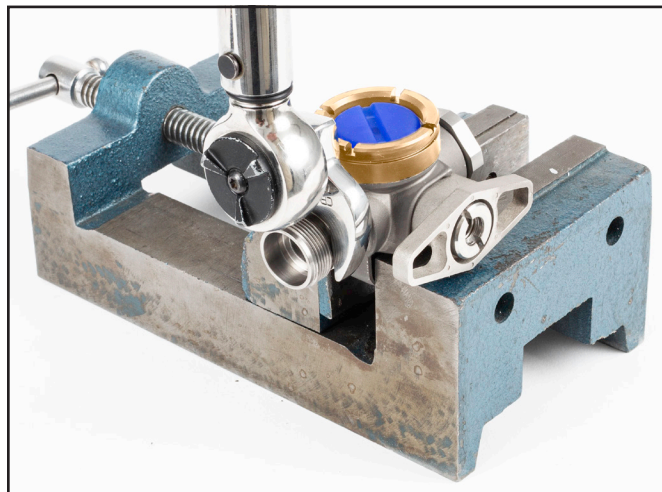


10. Cycle the handle to make sure it moves smoothly.

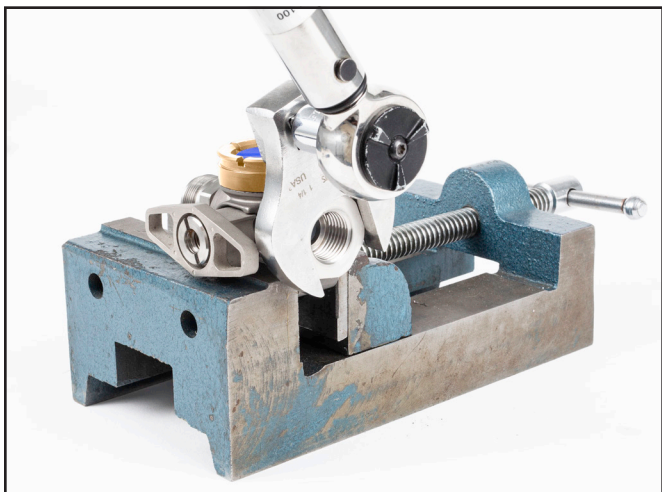
1.3.5 Surface Bypass Hose

SBV hose should always be installed by hand and not with tools.

1. Lubricate and install O-rings.



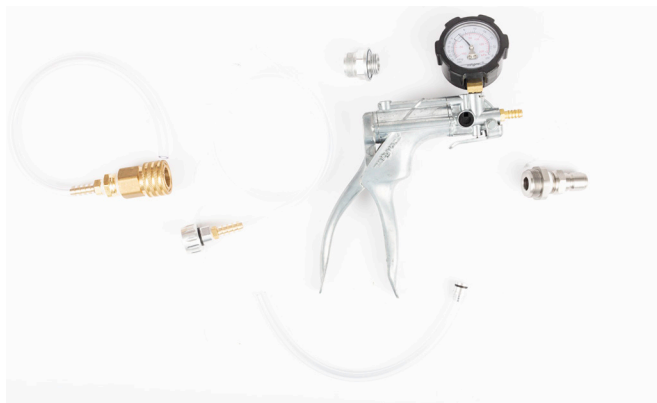
2. Torque Hose Fitting Adapter to final torque.



1.4 SBV Vacuum Test

1.4.1 Exhausting side of SBV

ALL tests should be performed with the control in the vertical position.



1. Secure tubing to vacuum pump.

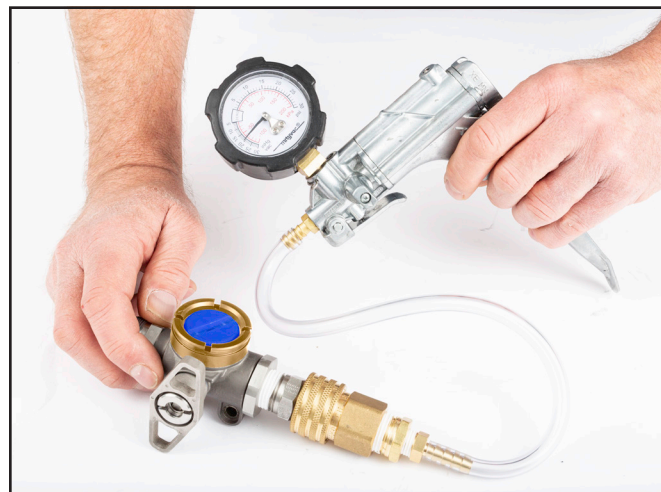


2. Thread test adapter and secure test fixture to the exhausting side of the SBV.





QD may be used if Male QD is available.



3. Perform Vacuum tests for 10 seconds:

@7 inHg
@10 inHg
@20 inHg

NO loss of pressure equals a pass on the vacuum test

1.4.2 Nipple Adapter side of SBV

1. Install test adapter to Nipple Adapter (side that is fed from exhaust regulator) to vacuum pump.



2. Perform vacuum tests for 10 seconds.



@7 inHg
 @10 inHg
 @20 inHg

NO loss of pressure equals a pass on the vacuum test.

1.4.3 SBV Hose Vacuum Test

1. SBV vacuum test fitting is pressed in with O-ring seal.



2. Attach the hose assembly to the surface by-

pass valve assembly (locate blue indicator on hose as show).



3. Perform vacuum tests for 10 seconds.



@7 inHg
 @10 inHg
 @20 inHg

NO loss of pressure equals a pass on the vacuum test.

4. Reinstall SBV to Bracket with medium strength thread locker on all 3 screws.

5. Torque Nipple and Hose Adapter to specified torque.

1.5 Attaching SBV Bracket

1.5.1 Attaching SBV Bracket to Helmet

Tools Required

- Medium Strength Thread Locker

- Torque Screwdriver with Flathead and $\frac{3}{16}$ " Allen attachments

1. Make sure to remove any old thread locker from the bracket and screws.



2. Position the SBV bracket on the port side of the helmet so the receiving holes are aligned.



The rear receiving hole is located forward of the mounting point on the helmet.

3. Align the washer with the helmet ring's receiving hole.



4. Apply medium-strength thread locker on the screw threads, then use a flat head screwdriver to secure the screw through the SBV bracket,

washer, and into the helmet ring. Do not torque yet.



5. Apply medium strength thread locker to the screw threads of the Allen screw and tighten with a $\frac{3}{16}$ " Allen wrench.





6. FINAL TORQUE must be applied to both screws. Reference "Torque Specs" module.



- Torque Screwdriver with $\frac{3}{16}$ " Allen attachment



NOTE

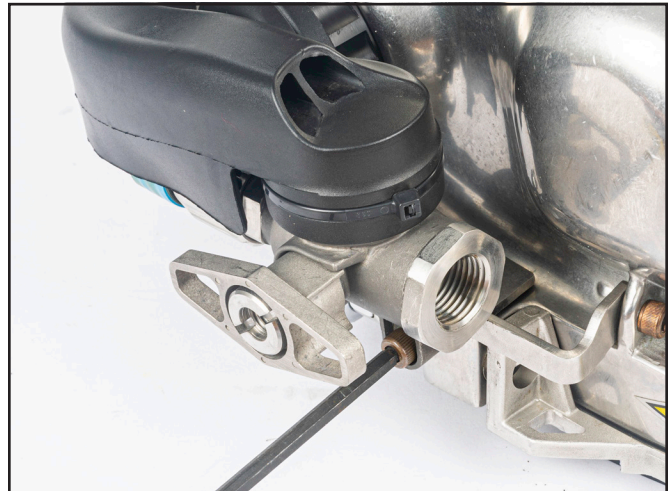
The SBV can be attached to the bracket either with or without the SBV hose connected, with the hose connected to both the SBV and Diamond Exhaust Regulator, or without any subassemblies attached.

1. Apply a medium-strength thread locker to the two screw threads.



2. Align the SBV with the bracket so all the receiving holes line up.

3. Secure with the $\frac{3}{16}$ " Allen.



4. FINAL TORQUE must be applied to both screws. Reference "Torque Specs" module

1.5.2 Attaching SBV to SBV Bracket

Tools Required

- Loctite 248 Medium Strength Thread Locker or equivalent