BOP Rear Main Seal Instructions

BOP Engineering Viton® Rear Main Crankshaft Seal Instructions for RMS01 (3"main) & RMS02 (3.25"main) with Crankshaft Removed

Thank you for choosing the BOP Engineering Viton® Rear Main Seal, which is a direct replacement for the stock rope seal. The seal may ride on the serrated area of the stock crankshaft. We have not found this to cause any problems. The serrations on some non-GM cranks may be more aggressive than the stock crank. If the seal rides on an area of aggressive serrations, we recommend polishing this area prior to installation. Remove no more than .003 " during polishing. If you have questions during installation please call, or contact us through our website.

For longevity of the seal please follow these instructions carefully.

1. Prior to final installation of the crankshaft in the block, make sure the block and main cap seal cavities are clean and free of obstructions.
2. Place one half of the seal in the block seal cavity noting correct orientation of seal (Figure 1). With the seal fully seated in cavity, square up one end of the seal with the block/cap parting line and measure the amount of the seal that is protruding on the opposite end using a caliper or feeler gauge. The amount protruding should be 0.020 ± 0.005". This equates to 0.0075 to 0.0125" per side. If it is more, remove material from the end of the seal with a file while keeping the ends square, until it measures the correct amount. Repeat for the main cap assembly.

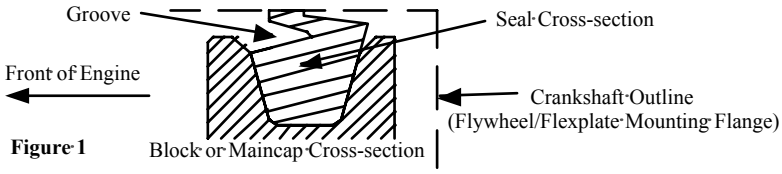

Figure 1

3. Remove seal from block and main cap. Fill only the bottom of the four anti-rotation holes with a high temperature silicone sealer or equivalent (Figure 2). This will help prevent any unwanted movement of the seal during operation. **Do not coat the back of the seal, the groove area or the seal cavities!** This will cause excessive compression and wear on the lip, causing premature failure of the seal.

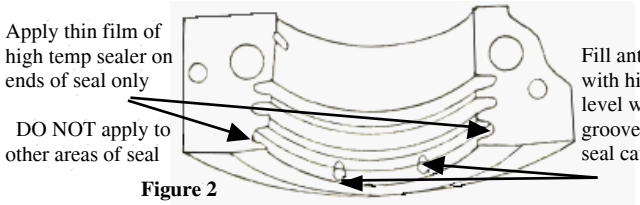

Figure 2

4. Reinstall the seal halves noting correct orientation of seal (Figure 1). Position with an equal amount of protrusion on each end. Place a thin film of high temperature red silicone sealer only on the ends of the seal halves (Figure 2). We have not found it necessary to offset the parting line but it can be done if desired.
5. Lightly coat the crankshaft mating surfaces of the seals with oil or equivalent. Install crankshaft and torque all main cap bolts to manufacturer specifications.
6. Allow assembly to sit overnight to permit undisturbed curing of sealer.

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BOP Rear Main Seal Instructions

BOP Engineering Viton® Rear Main Crankshaft Seal Instructions for RMS01 (3"main) without Crankshaft Removed

Attention! DO NOT install RMS02 (3.25"main) using this Procedure.
When using the RMS02, the crankshaft must be removed to fill the anti-rotation holes in **both** block and main cap with RTV to prevent oil seepage behind the seal at those locations. They do not need to be filled in the block when using the RMS01.

1. Remove oil pan, oil pump and windage tray per factory service manual.
2. Remove rear main cap. Loosen, but do not remove the other main caps. Pull the rear of the crankshaft slightly away from the block to remove pressure on the rope seal.
3. Remove the stock rope seal from the main cap. The block-mounted rope seal may be removed by grasping one end firmly with needle-nose pliers and pulling it out.
4. Make sure seal cavities are clean and free of obstructions. Place the BOP Engineering seal in the block noting correct orientation of seal (Figure 1).
5. With the seal fully seated in cavity, square up one end of the seal with the block/cap parting line and measure the amount of the seal that is protruding on the opposite end using a caliper or feeler gauge. The amount protruding should be 0.020 ± 0.005". This equates to 0.0075 to 0.0125" per side. If it is more, remove material from the end of the seal with a file while keeping the ends square, until it measures the correct amount. Repeat for the main cap assembly.
6. Remove seal only from the main cap. **Fill only the bottom of the two anti-rotation holes in the cap** with a high temperature red silicone sealer (Figure 2). This will help prevent any unwanted movement of the seal during operation. It is not necessary to fill the two anti-rotation holes in the block.
   Do not coat the back of the seal, the groove area, or the seal cavities!
   This will cause excessive compression and wear on the lip, causing premature failure of the seal.
7. Reinstall the seal in the main cap, noting correct orientation of seal (Figure 1). Position with an equal amount of protrusion on each end. Place a thin film of high temperature red silicone sealer only on the ends of the seal halves (Figure 2).
8. Lightly coat the crankshaft mating surfaces of the seals with oil or lithium grease. Install crankshaft and rear main cap. Torque all main cap bolts to manufacturer specifications.
9. Allow assembly to sit overnight to permit undisturbed curing of sealer.
10. Install oil pump, windage tray, and oil pan.

Installation Notes:
Theses instructions are written for part numbers RMS01 & RMS02 for Pontiac. Part numbers RMS02 for Buick, RMS03, and RMS04 use as reference only.

Specifications:
RMS01 Sealing Diameter 3.188" +/- .003" Groove Diameter 3.812" +/- .005"
RMS02 Sealing Diameter 3.437" +/- .003" Groove Diameter 4.012" +/- .005"
Call for further instruction if your groove of crankshaft does not meet specifications or if an excessive (> .050") amount of seal trimming is required

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Instructions For Calculating Compression Ratio

Compression Ratio (CR) is defined as the ratio between the total volume above the piston at BDC, and the clearance volume above the piston at TDC.

To Determine Compression Ratio You Need To Know:

1. Cylinder volume (V) or cylinder displacement, determined by cylinder bore and stroke (indicated by movement of piston from BDC to TDC).

The formula for cylinder volume in cu. in. is:
Bore x Bore x Stroke x .7854

2. Clearance Volume (VCL) is the volume above the piston (actually above the top piston ring) at TDC. It consists of several small volumes which are measured in cubic centimeters or C.C.'s. as follows.

The formula for Deck Clearance Volume is:
Bore x Bore x Depth of Piston @ TDC x 12.87
The formula for Gasket Volume is: *refer to chart
Bore of Gasket x Bore of Gasket x Thickness x 12.87

Valve Notch Volume:
Available from your piston MFG, or must be C.C.'d using a burette. This figure must be added to clearance volume.

Piston Dome Volume:
Available from your piston MFG, or must be C.C.'d using a burette. This figure must be subtracted from clearance volume.

Combustion Chamber Volume:
Available from your Cyl, Head MFG, or must be C.C.'d using a burette.

3. To Convert Total Clearance Volume in C.C.'s to cu. inches multiply by .06102.
4. Add the two volumes together, (V + VCL) then divide by VCL.

The formula is:

CR= V + VCL
------VCL

Engine Preparation

A. Clean flat surfaces are essential to seal any performance engine. A solvent such as brake cleaner should be used on the block and head prior to assembly.

B. The new SCE TITAN self sealing copper head gasket requires no sealant, however if you are using a conventional copper head gasket we recommend an anaerobic sealer such as Hylomar or copper coat. Always allow the sealant to tack up for 15 to 20 minutes before assembly.

C. O-rings are generally required to make a copper gasket system work to potential. SCE sells stainless steel O-ring wire in a kit to do one V-8 engine or spools for the engine builder. SCE stainless steel O-ring wire is preferred over copper wire that can flatten or dent to form a leak path.

D. O-ring grooves may be cut in either the block or cylinder head. When using copper head gaskets thinner than .050, O-ring height should be no more than 25% of gasket thickness. For instance, the proper dimensions for an .043 thick gasket using .041 wire would be; a .038 to .040 groove width (provides a .001 interference fit), and a .032 groove depth (leaves .008-.010 of the wire protruding above the deck). This machining can be done at most high performance machine shops

E. When receiver grooves are necessary, alignment of O-ring and receiver groove is critical, as is the depth and width of the receiver groove. Generally receiver groove depth should be 75% of the O-ring protrusion and the receiver groove should be 1.5 times the wire width. Example: If the O-ring is .041 wide and .015 above the deck; receiver groove should be .012 deep and .060 wide.

F. While the machining of O-ring and receiver grooves must be done by a machinist, the installation of the O-ring wire can be done by anyone, using common hand tools. When tapping O-ring wire into the groove, use care to avoid denting the wire. SCE provides an O-ring installation kit, (SCE PART #31542) which includes instructions, an installation tool and O-ring wire. When cutting stainless O-ring wire, file the ends square to provide the tightest possible seal.

G. Head gaskets should be re-torqued after initial run-in regardless of type, solid copper or composition. SCE recommends using factory torque specs. Do not over torque. Allow the heads and block to cool for accurate torque readings. Always use a torque wrench and have it calibrated often. Premium grade head bolts or studs, with hardened washers are recommended.

H. SCE copper gaskets can be reused 4 to 5 times simply by cleaning in common solvent. DO NOT use a torch or household oven to re-anneal copper gaskets. The annealing process requires special vacuum ovens to achieve satisfactory results. These installation tips may seem like a lot of information for head gaskets, however, installing a copper head gasket and O-ring system is really easier than degreeing a cam, and just as important.