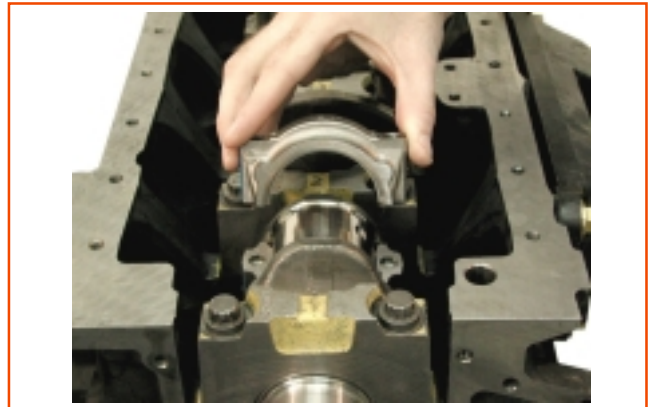


**► CRANKSHAFT****Removal**

1. Remove engine.
2. Remove cylinder head and push rods.
3. Remove accessories support.
4. Remove oil pan.
5. Remove timing housing and camshaft.
6. Remove flywheel housing and flywheel.
7. Remove pistons and connecting rods.

**Disassembly**

1. To disassembly, position engine topside down. Remove rear oil seal housing and gasket.
2. Remove connecting rod caps and shells.



3. Remove main bearing caps and shells.



4. Remove crankshaft and shells.
5. Position crankshaft in vertical fitted in the flywheel in order to avoid warping.



### **Cleaning and inspection**

1. Remove remains of gasket from rear seal housing and from engine block.
2. Clean main journals and crankpins, checking for risks and damages.
3. With micrometer, measure main journals and crankpins diameter and out of roundness in 4 places.
4. Check crankshaft main journals maximum eccentricity with dial indicator gauge. Main journals nr. 1 and 5: Supported.
5. Check for cracks with Magnaflux. Demagnetize crankshaft in case of cracks, the part must be replaced..



### **Machining and inspection**

1. Machine main journals and crankpins to the immediately lower undersize than the obtained measure. Check main journals rugosity and fillets. Main journals/crankpins rugosity, see TECHNICAL SPECIFICATIONS.
2. Remove sharp chamfers from lubrication holes.
3. After the machining, wash crankshaft with chemical solvent in immersion bathing. Dry with compressed air.

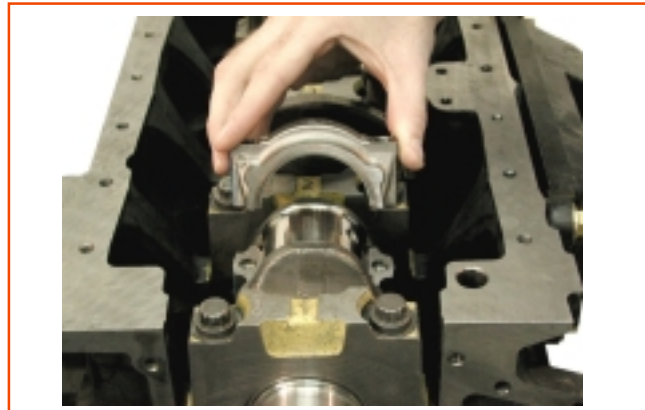
4. Check for cracks and remove crankshaft magnetization.
5. Clean the lubrication holes.
6. Check with micrometer main journals and crankpins length, see TECHNICAL SPECIFICATIONS - Crankshaft.
7. Check again crankshaft main journals eccentricity.
8. Check main journals and crankpins fillets with caliper.
9. To balance, remove material from crankshaft arm sides. In case of part stock, apply antioxidant oil immersion.
10. Before assembly, wash crankshaft with water at 80 °C (176 °F) in agitation immersion bathing and dry with air.

#### Assembly

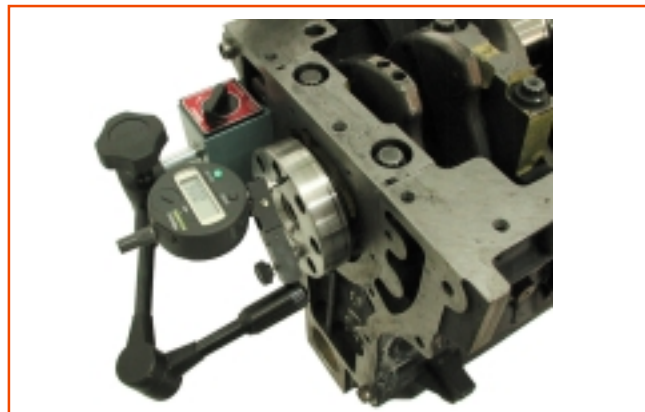
1. Clean shells housing on the block and bearings caps. Check if engine block lubrication galleries are not obstructed.
2. Assembly upper and lower shells on engine block and bearing caps, correctly positioning locks.



3. Lubricate upper shells and crankshaft main journals and crankpins,
  4. Lubricate the two upper thrust washers, positioning lubrication channels to crankshaft and slip them in their block housing.
  5. Assembly crankshaft. Do not turn crankshaft before bearing caps fixation.
  6. Lubricate lower shells.
- 
7. Assembly bearing caps correctly positioning them.
  8. After 5th cap assembly, apply Loctite 5900 on bearing side grooves.



9. Fix bearings from the ends to the center and tighten bolts according to specification. Manually turn crankshaft after final tightening of each bearing cap, see TIGHTENING SPECIFICATIONS.
10. Check crankshaft axial clearance using a dial indicator gauge. If clearance checked is over than specified, replace thrust washers.



### Rear seal

#### Assembly

1. Carefully clean engine block surface and crankshaft flange and remove all existent residues.
2. Apply a fillet of Loctite 5900 in all rear seal housing edge.



3. Install a new housing with seal rear in crankshaft flange and free seal lip protection (plastic - disposable).

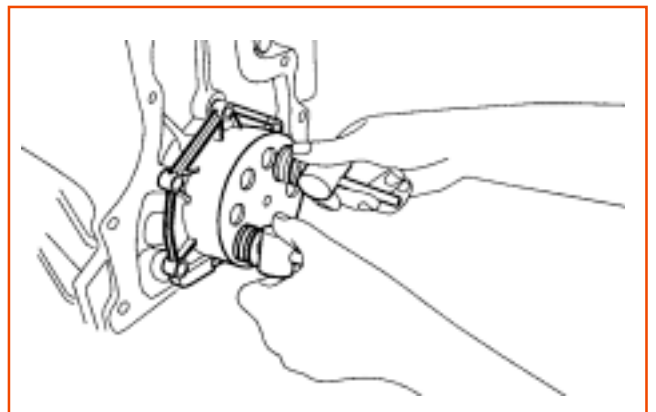


**Note:** Check seal lip positioning uniformity in crankshaft flange, avoiding edges bit.

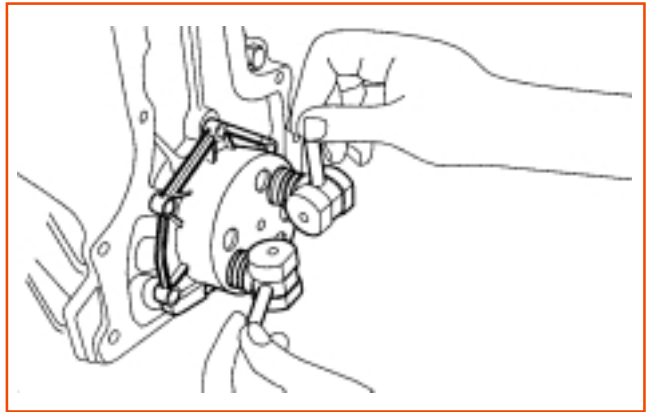
4. Point housing fixation bolts in the block.



5. Install tool nr. 8130648 and turn the two rods, clockwise, fix in holes located in crankshaft flange.

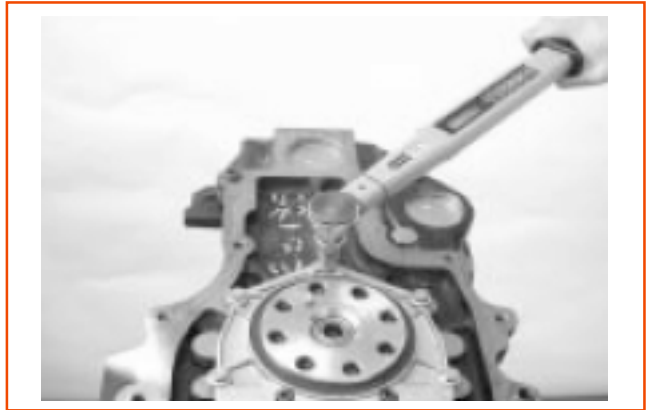


6. Flex side rods of tool nr. 8130648, pressing against crankshaft flange.



**Note:** This procedure will guarantee perfect seal housing concentricity in relation to crankshaft flange.

7. Fix bolts, following tightening - torque sequence, see TIGHTENING SPECIFICATIONS.



8. Carefully remove tool nr. 8130648 and check the perfect accommodation of the seal lip.

**Note:** In case of seal lip bite, install a new seal, repeating previous procedures.