

**SHERCO**  
*Motorcycles*



**ENGINE ASSEMBLY**  
**MANUAL**  
**450i**

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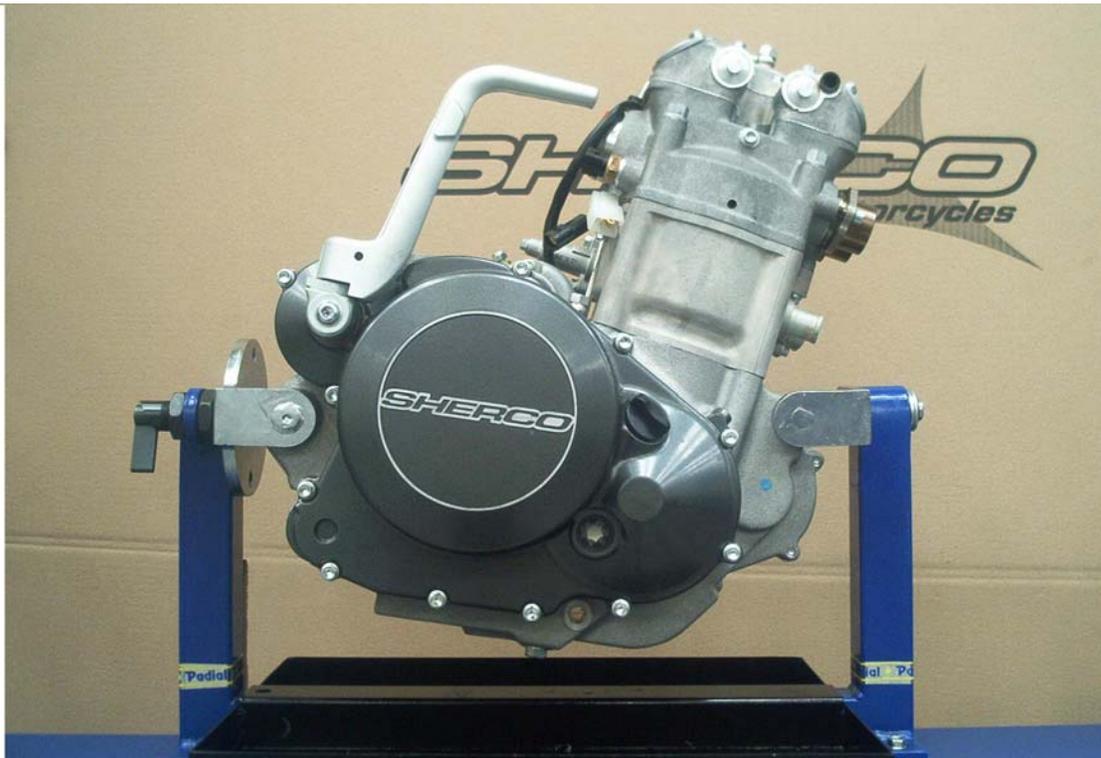


- R464
- R447
- R449
- R448
- R458
- R454
- R462
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- R460
- R472
- R456
- R483
- R463
- R461
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## INDEX OF SPECIAL TOOLS USED IN THIS MANUAL

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## ENGINE REPAIR STAND - 450i

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This technical publication is intended to be used by SHERCO dealers and technicians. Any one using this publication should have a good knowledge of motorcycle mechanics, especially SHERCO products. SHERCO recommends that any time the engine is worked on the following should be replaced: gaskets, seals, circlips, cotter pins etc. SHERCO recommends the use of IPONE R4000 motor oil and IPONE engine coolant.

## ENGINE ASSEMBLY PROCEDURE

In the right hand crankcase assembly, install the crankshaft and align the mark on the crankshaft and the mark on the balance gear as shown in the insert.

- Install the primary and the secondary shafts as an assembly in the Right Hand case.
- Install: 1-The shift fork C on the primary shaft.
  - 2- The shift fork R on the secondary shaft.
  - 3- The shift fork L on the upper part of the secondary shaft.
- Install the shifter drum.
- Insert the shift fork C in the shift drum.
- Insert the shift fork R in the shift drum.
- Insert the shift fork L in the shift drum.
- Install the dowels, the oil passage spacer with its o-ring, the gearbox oil jet and the crankcase gasket on the RH crankcase. (Note: The gasket is steel and can cause injuries)



- Install the Left Hand Case. Tap with a nylon hammer if necessary. Tighten the screws to **11Nm.**

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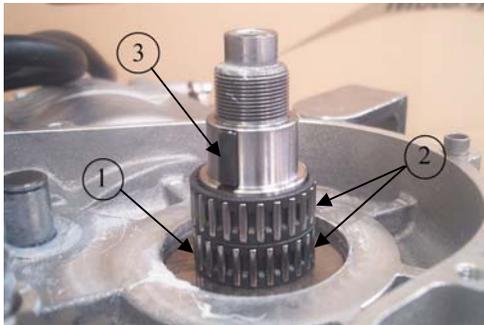
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## ASSEMBLY OF THE ENGINE CLUTCH SIDE COMPONENTS:

### ○ INSTALLATION OF THE PRIMARY GEAR ASSEMBLY

- Install the washer (1), the two needle bearings (2), and the key (3), then install the primary gear assembly, aligning it with the key.



- Apply thread locking material to the threads, install the crankshaft nut and tighten to **150 Nm**.

### ○ INSTALLATION OF THE OIL PUMP :

- Install the oil pump assembly, the chamfer on the rotor should be towards the engine. Apply thread locking material to the threads, install the fixing nut and tighten to **11Nm**. Make sure that the oil pump turns freely.

- On each of the appropriate shafts install :

1 – The intermediate double gear, the washer, and the circlip.

2 – The oil pump drive gear, the washer, and the circlip.

3 – The electric starter intermediate gear, the washer and the circlip.

4 – The needle bearings, the electric starter double gear, the washer and the circlip.

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## ○ INSTALLING THE SHIFT DRUM ASSEMBLY :

- Install the shift drum trigger assembly, apply thread locking material to the screw, install the screw along with its washer and tighten to **11 Nm**.
- Using tool #R448 to keep the trigger assembly open, install the shift drum. Apply thread locking material to the screw, install the screw and tighten to 11 **Nm**.

Tool #R448



## ○ INSTALLING THE KICKSTARTER RATCHET ASSEMBLY :

- Install the ratchet assembly on the kickstarter shaft (with a washer on each end), make sure that the mark on the pawl is in alignment with the mark on the shaft.

Marks



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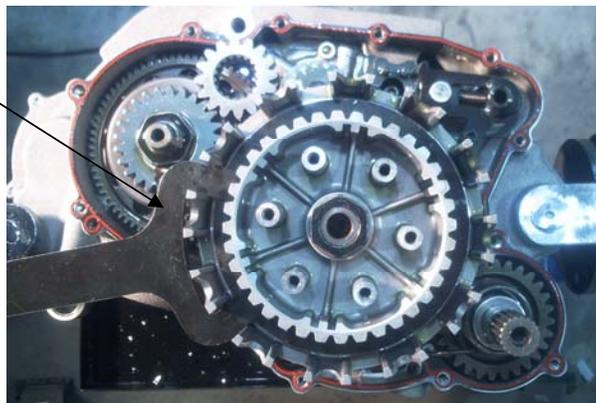
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## ○ INSTALLING THE CLUTCH :

- Install the bronze bushing, the clutch basket, the spacer washer and the clutch hub. Install the conical washer, apply thread locking material to the threads and install the nut. Use tool #R447 to hold the assembly and tighten the nut to **150 Nm**.
- Soak the friction discs in engine oil prior to installation. Alternatively install a friction disc followed by a metal disc until they are all installed, the last disc to be installed will be a friction disc. Install the clutch actuating rod, the clutch lifter piece, the needle thrust bearing and the thrust washer. Install the pressure plate, the six springs, the six washers and the six screws. Tighten the screws to **11 Nm**.

Tool #R447

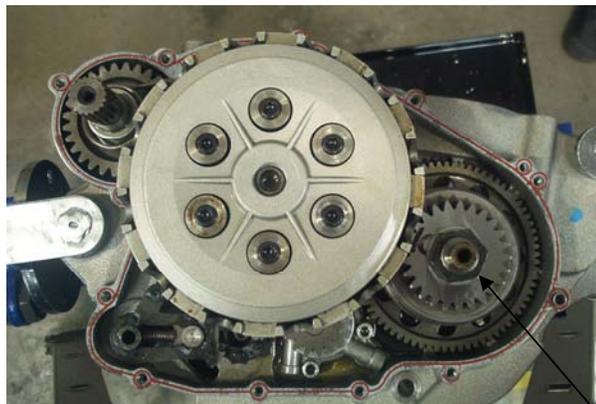


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- Install the two locating dowels, install a new gasket, and note that Sherco uses a special gasket with an integrated silicone bead. Do not use gasket sealer on the mating surfaces as the sealer could plug the oil passages. Install the clutch cover and tighten the twelve screws to **11 Nm**.



Use care to avoid damage to the end of the crankshaft.

## ○ INSTALLING THE CAM CHAIN DRIVE GEAR ON THE LEFT HAND SIDE OF THE CRANKSHAFT:

- Using a thermal heat gun, heat the cam chain drive gear to **≈100°C**, install the gear on the LH side of the crankshaft after installing the key, install the circlip.



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## ○ INSTALLATION OF THE CYLINDER :

- Use a sharp chisel to remove any of the metal gasket that protrudes above the cylinder mounting surface.



- Install the two cylinder locating dowels; using tool #R454 (Photo 1) install one of the circlips in the groove in the piston (Photo 2), lubricate the piston pin and install it in the piston and the connecting rod, again using tool #R454 install the remaining circlip.



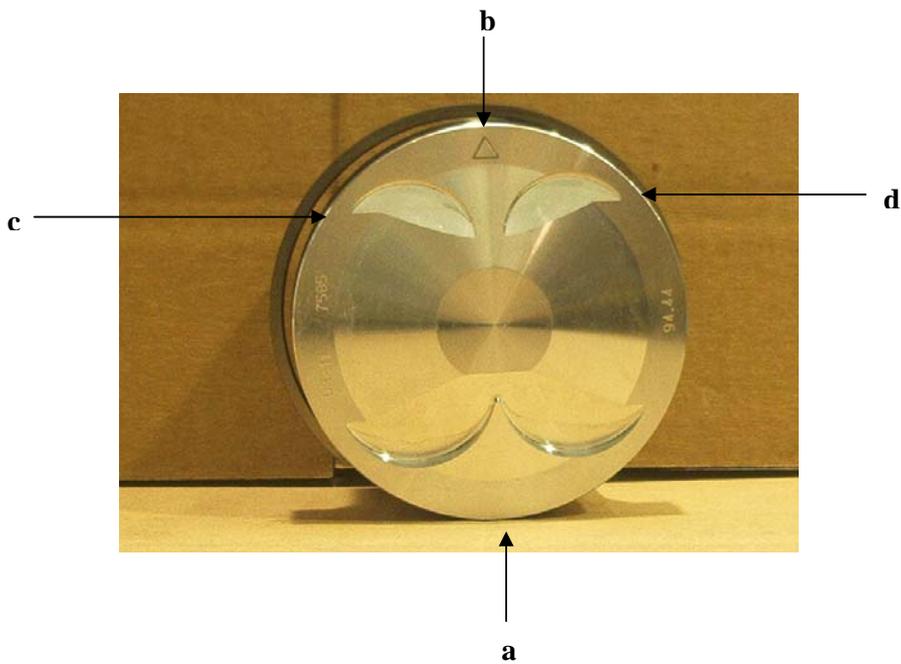
Photo 1



Photo 2



❖ LOCATION OF THE PISTON RING END GAPS:



- A: Compression ring end gap
- B: Oil control ring expander end gaps
- C: Large oil control ring end gap
- D: Small oil control ring end gap

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- Lubricate the piston rings and the piston skirt; install the rings on the piston, use tool #R449 to compress the rings. Install the cylinder over the piston; remove tool #R449 as the cylinder is installed. Remove any surplus lubrication from the top of the piston.



## ○ INSTALLATION OF THE CYLINDER HEAD :

- Install the two locating dowels and the head gasket.
- Install the cylinder head. Apply anti-seize grease to the cylinder head bolts. Tighten the bolts using a crisscross pattern, first to **40 Nm** and finally to **60 Nm**.

**! ATTENTION! Starting with motor number 520 the two front bolts have an overall length of 169mm.**

- Install the three 6mm diameter screws and tighten to **11 Nm**.  
**! ATTENTION! The Ø6 models have different length screws.**



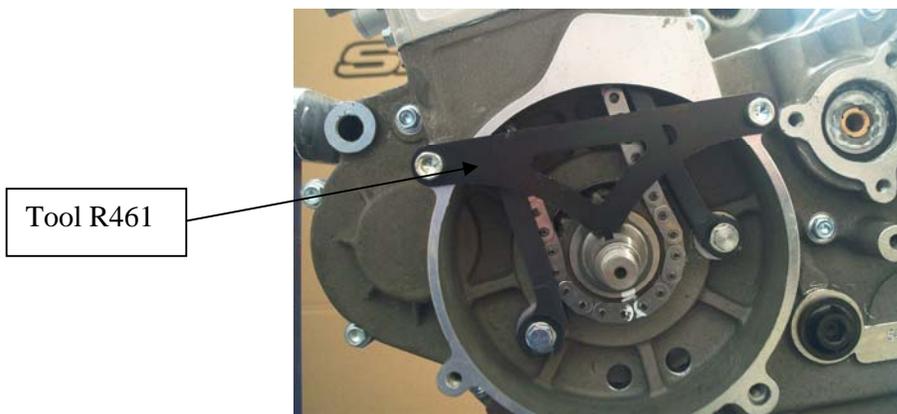
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## ○ INSTALLATION OF THE CAM CHAIN :

- Place the piston in the top dead center position, use tool #R461 to keep it there. Install the cam chain up through the engine, install the cam chain guides and tighten their mounting screws to **11 Nm**.



- Install the camshaft with the cam lobes downward. The marks on the drive gear should align with the valve cover mounting surface.

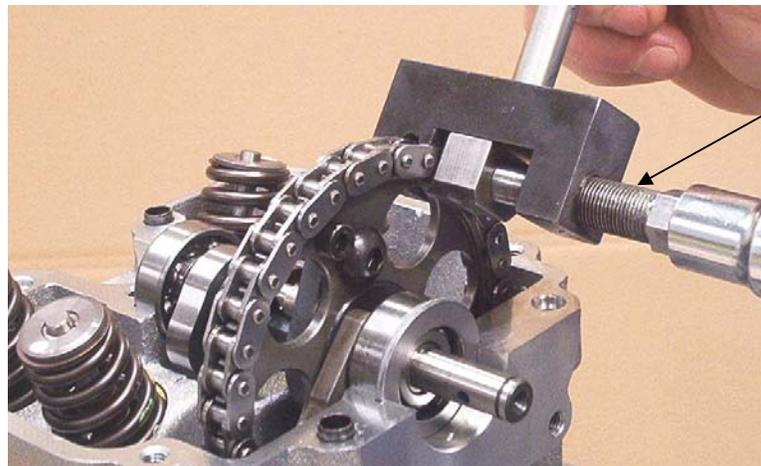


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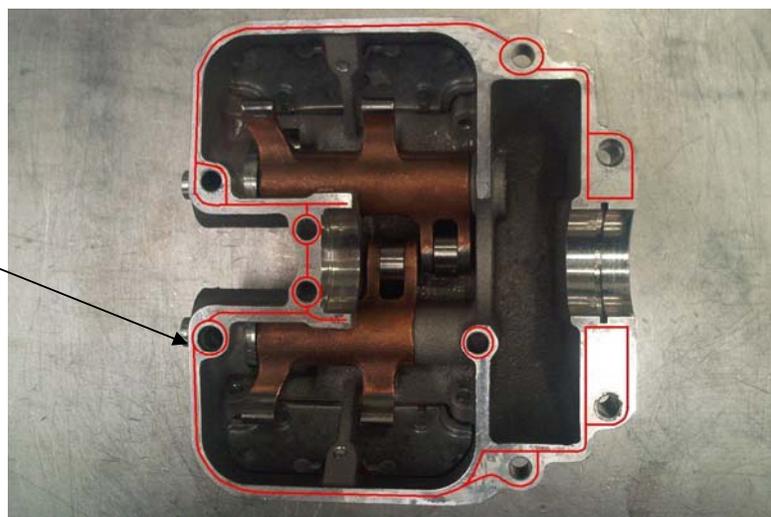
- Install the cam chain connecting link using tool #R463, tighten to **20 Nm**.



Tool R463

## ○ INSTALLING THE VALVE COVER ASSEMBLY :

- Degrease the valve cover mounting surfaces and apply silicone seal to the valve cover as shown, install the valve cover and tighten the mounting bolts to **11 Nm**.
- Adjust the valve clearance to the correct setting. (See page 22 and 23)



This photo shows the correct application of the silicone gasket sealant

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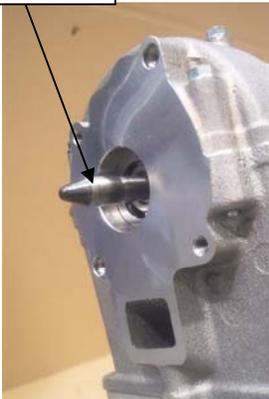
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## ○ INSTALLING THE WATER PUMP DRIVE SHAFT SEAL SUB ASSEMBLY :

- Use tool #R460 to protect the water pump shaft seal during assembly. Use tool #R484 and install the sub assembly with the previously installed water pump shaft seal. Install the assembly with the mark “down”, the two threaded holes facing out and parallel with the cylinder head. (Note: use new o-ring seals on the adapter)

Tool R460



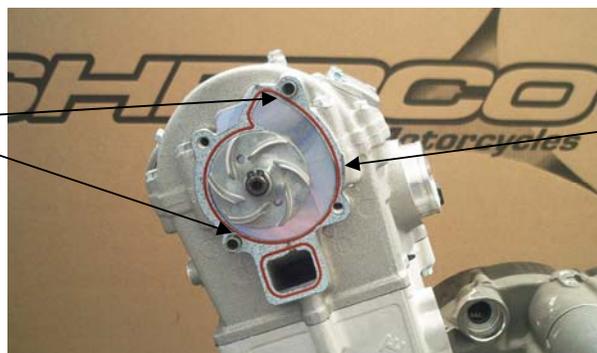
Tool R484



## ○ INSTALLING THE WATER PUMP :

- Install the drive pin, the turbine, the circlip, the two locating dowels, a new gasket and the water pump cover. Tighten the four mounting screws to **8 Nm**.

Locating dowels



Gasket

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## ○ INSTALLING THE CAM CHAIN TENSIONER ASSEMBLY:

- Install the cam tensioner assembly and the gasket; tighten the two mounting bolts to **11 Nm**. Using a pair of needle nose pliers release the spring tension on the automatic adjuster, install the screw and the aluminum gasket, tighten the screw to **6 Nm**.



## ○ INSTALLING THE OIL SUPPLY TUBE ASSEMBLY:

- Install the oil supply tube. (Note the longest banjo fitting should be installed on the valve cover, be sure to install a copper gasket on each side of the oil tube fittings, see photos below.) Tighten the banjo fittings to **14 Nm**.



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Install the rubber anti-vibration block on the oil supply tube as shown

- Apply anti-seize lube to the sparkplug threads and tighten to **15 Nm**.  
**Use: NGK CR8EK Sparkplug**
- **INSTALLING THE ENGINE FLYWHEEL :**
- Install the half moon key on the crankshaft, install the flywheel. Apply thread locking material to the threads and using tool #R458 to retain the flywheel, tighten the fixing nut to **70 Nm**.

Tool R458



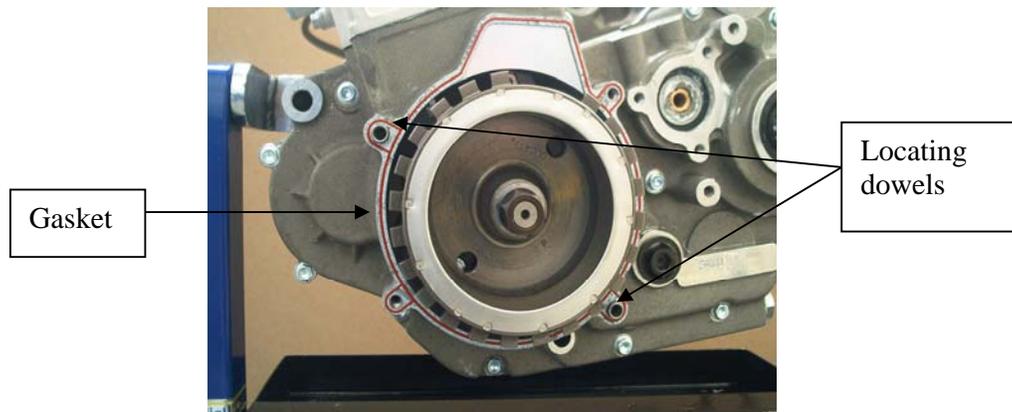
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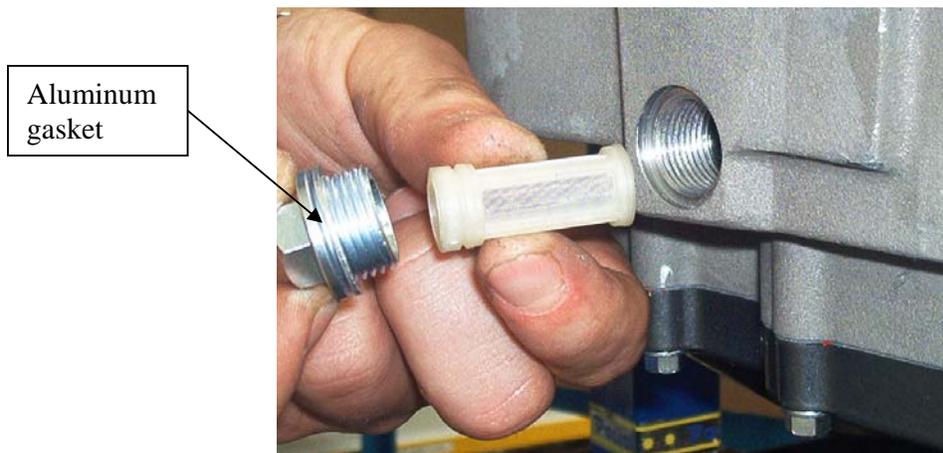
## ○ INSTALLING THE IGNITION ROTOR COVER ASSEMBLY :

- Install the two locating dowels, the gasket and the ignition cover. Install the four mounting screws and tighten to **11 Nm**.



## ○ INSTALLING THE PREFILTER ASSEMBLY :

- Install the prefilter, the aluminum gasket and the magnetic drain plug. Tighten the drain plug to **20 Nm**. (Note: the prefilter should be installed as shown in the photo below)



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## ○ INSTALLING THE GEAR SELECTOR SHAFT SEAL :

- Using tool #R456 to protect the seal, use tool #R450 to install the gear shift selector shaft seal.



## ○ INSTALLING THE TRANSMISSION DRIVE SPROCKET :

- Install the drive sprocket on the transmission output shaft. Install the sprocket with the bevel towards the case and the name **SHERCO** facing out. Install the washer and apply thread locking material to the threads, tighten the fixing nut to **150 Nm**.



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## SPECIFIC DISASSEMBLY INSTRUCTIONS

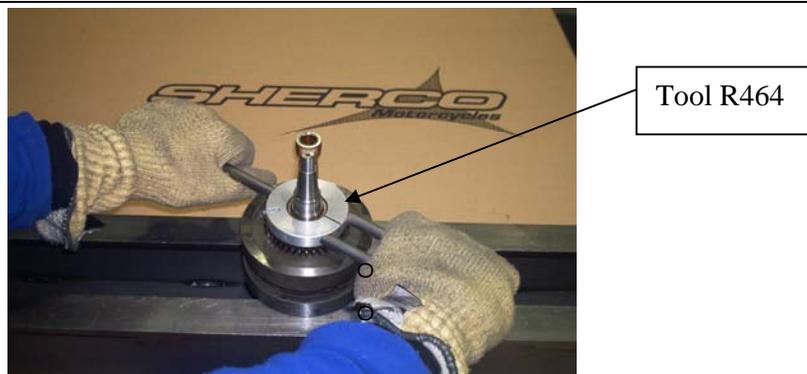
### ○ ADJUSTING THE IGNITION ROTOR PICK-UP GAP :

- Remove the ignition rotor using tool #R462.
- To adjust the rotor pick-up gap, install tool #R459 and adjust the pick-up so that it contacts tool #R459 as shown in the photo.



### ○ REMOVING THE CRANKSHAFT BEARINGS :

- In order to remove the crankshaft bearings, heat tool #R464 to a minimum temperature of 200 C. Place the tool on the bearing as shown and using a pulling/twisting motion remove the bearing, repeat on the opposite side of the crankshaft. (It is recommended that heat resistant gloves be used for this operation, to prevent the possibility of being burned by the hot tool.)



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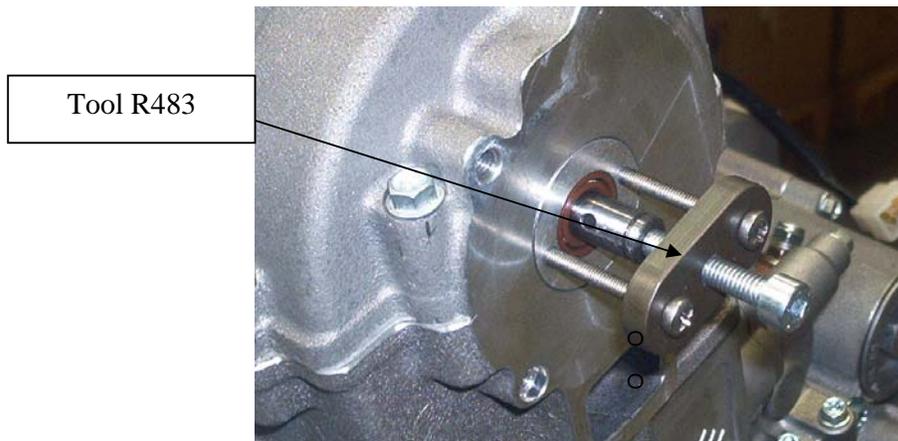
## ○ REMOVING THE CRANKSHAFT BALANCER DRIVE GEAR :

- Once the RH crankshaft bearing has been removed, install two bolts in the threaded holes in the gear; use the bolts to extract the gear.



## ○ REMOVING THE WATER PUMP SEAL ADAPTER ASSEMBLY :

- In order to provide access to the water pump shaft seal and the adapter seals, use tool #R483 to remove the assembly as shown in the photo below.



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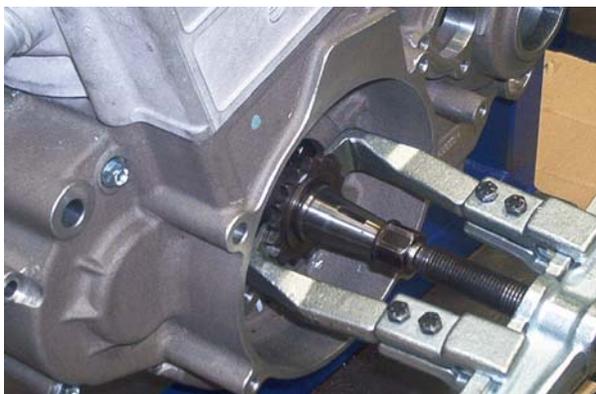
## ○ REMOVING THE PRIMARY DRIVE GEAR ASSEMBLY :

- To remove the primary drive gear assembly, use a universal gear puller with narrow legs, as shown in the photo below.



## ○ REMOVING THE CAM CHAIN DRIVE GEAR :

- To remove the cam chain drive gear, use a universal gear puller with two legs, as shown in the photo below.



- **NOTE:** To remove the cam chain use tool #R463.

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## ○ CHECKING AND ADJUSTING THE ENGINE VALVE CLEARANCE :

- Remove the sparkplug.
- Remove the inspection covers.
- Remove the ignition cover.
- Position the piston at TDC on the compression stroke.
- Using the flywheel rotate the engine clockwise to obtain the maximum intake valve clearance. Measure the valve clearance and compare it to the specifications in the table.
- Attach tool R482 in place of the valve inspection cover, attach the tool using the valve inspection cover screws. (See Photo)



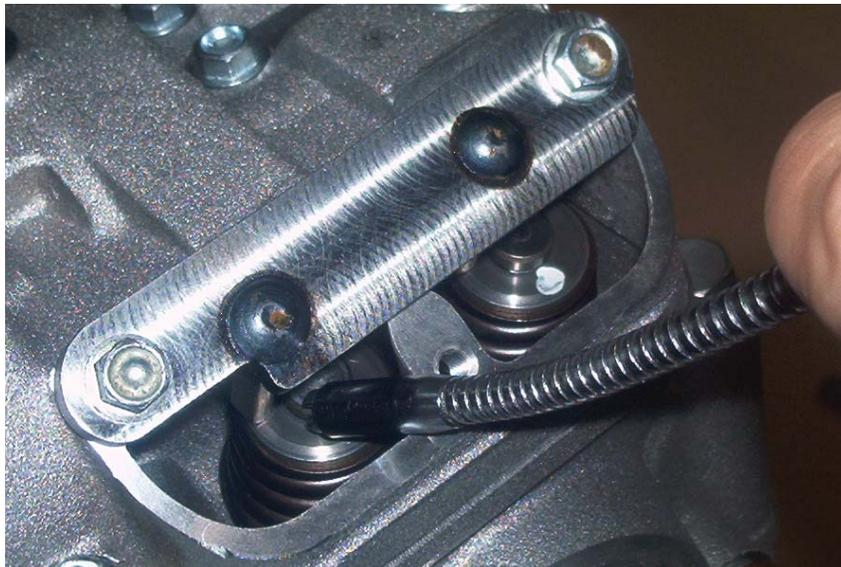
- Rotate the engine in the opposite direction to release the shims.

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- Using a magnet, remove the old shims and replace them with the correct ones (consult the table). Refer to the photo for proper placement.



❖ **Note:** To determine the thickness of the shim required, measure the shim and subtract 2mm.

**Example:** If the shim measures 3.65 mm, its actual value is 1.65 mm from the table.

- Rotate the engine clockwise in order to fully open the valves.
- Remove tool R482 and reposition the engine in the TDC position on the compression stroke.

➤ **VALVE CLEARANCE TABLE:**  
**Intake : 0.15 mm to 0.20 mm**  
**Exhaust: 0.20 mm to 0.25 mm**

- Perform the exact same operation for the exhaust valves. **The engine is rotated in the counterclockwise direction** to adjust the exhaust valves.
- Reinstall the valve inspection covers and tighten the bolts to **5 Nm**.

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## ENGINE BOLT TORQUES :

<b>BOTTOM ASPIRATION FILTER</b>	<b>M6</b>	<b>6 Nm+ loct 243</b>
<b>CYLINDER HEAD</b>	<b>M10</b>	<b>40Nm / 60Nm</b>
<b>CENTER CRANKCASE BOLTS</b>	<b>M6</b>	<b>11 Nm</b>
<b>SHIFT DRUM</b>	<b>M6</b>	<b>11 Nm + loct 243</b>
<b>PREFILTER DRAIN PLUG</b>	<b>M18</b>	<b>20 Nm</b>
<b>MAGNETIC DRAIN PLUG</b>	<b>M12</b>	<b>20 Nm</b>
<b>TOP PAWL – SHORT SCREW</b>	<b>M6</b>	<b>6 Nm + loct 243</b>
<b>TOP PAWL – LONG SCREW</b>	<b>M6</b>	<b>11 Nm + loct 243</b>
<b>CLUTCH COVER</b>	<b>M6</b>	<b>11 Nm</b>
<b>OIL PUMP COVER</b>	<b>M6</b>	<b>11 Nm</b>
<b>WATER TEMPERATURE SENDER</b>	<b>M12</b>	<b>20 Nm</b>
<b>OIL SUPPLY TUBE</b>	<b>M8</b>	<b>14 Nm</b>
<b>SPARKPLUG (NGK CR8EK)</b>	<b>M10</b>	<b>15 Nm</b>
<b>IGNITION COVER</b>	<b>M6</b>	<b>11 Nm</b>
<b>WATER PUMP COVER</b>	<b>M6</b>	<b>8 Nm</b>
<b>PRESSURE RELIEF VALVE</b>	<b>M16</b>	<b>20 Nm</b>
<b>CAM CHAIN TENSIONER ADJUSTER - SHORT SCREW</b>	<b>M6</b>	<b>6 Nm</b>
<b>CAM CHAIN TENSIONER ADJUSTER - LONG SCREW</b>	<b>M6</b>	<b>11 Nm</b>
<b>TRANSMISSION DRIVE SPROCKET</b>	<b>M20</b>	<b>150 Nm</b>
<b>CAM SHAFT GEAR - SHORT SCREW</b>	<b>M5</b>	<b>6 Nm</b>
<b>CAM SHAFT GEAR - LONG BOLT</b>	<b>M8</b>	<b>24 Nm</b>

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<b>IGNITION ROTOR</b>	<b>M12</b>	<b>70 Nm</b>
<b>OIL FILTER COVER</b>	<b>M45</b>	<b>15 Nm</b>
<b>PRIMARY GEAR</b>	<b>M20</b>	<b>150 Nm+ loct 243</b>
<b>CLUTCH HUB</b>	<b>M20</b>	<b>150 Nm+ loct 243</b>

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## TABLE OF TOLERANCES

<b>TOLERANCES</b>	
<b>CYLINDER TAPER</b>	<b>0.05 mm</b>
<b>CYLINDER OVALIZATION</b>	<b>0.05 mm</b>
<b>PISTON/CYLINDER CLEARANCE</b>	<b>0.06 mm to 0.08 mm (Limit 0.15 mm)</b>
<b>PISTON RING END GAP</b>	
<b>Compression ring</b> <b>Oil control ring</b>	<b>0.3 mm to 0.4 mm (Limit 0.7 mm)</b> <b>0.3 mm to 0.5 mm</b>
<b>VALVE TO VALVE GUIDE CLEARANCE</b>	<b>0.05 mm</b>
<b>CRANKSHAFT RUNOUT LIMIT</b>	<b>0.03 mm</b>
<b>CONNECTING ROD LATERAL PLAY</b>	<b>1 mm maximum</b>
<b>TRANSMISSION SHAFT PLAY</b>	
<b>Primary shaft</b> <b>Secondary shaft</b>	<b>0.5 mm maximum</b> <b>1.5 mm maximum</b>
<b>CLUTCH DISC</b>	
<b>Fiber disc : thickness</b> <b>Metal : limit of deformation</b>	<b>2.68 mm minimum</b> <b>0.05 mm maximum</b>
<b>CLUTCH SPRING LENGTH</b>	<b>Minimum length 45 mm</b>