

CRANKSHAFT & GEARBOX

Thoroughly clean and check all machined surfaces for any damages or deterioration.

By using compressed air; thoroughly clean the oil duct from the oil pump to the oil filter housing (Fig. 10M-1) and the duct from the oil screen housing (Fig. 10M-2) to the pump in both directions.

This also goes for the hole from the oil filter to the crankshaft housing (Fig. 10M-3). Blow from the crankshaft side towards the filter since the hole is more narrow at the crankshaft end.

Check the two rear flange bushings (Fig. 10N-1) and the four front flange bushings (Fig. 10N-2) for any signs of damage or deterioration.

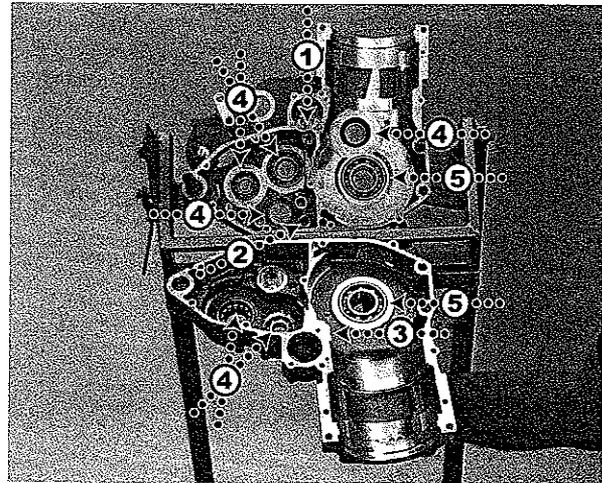


Fig.
10M

Check the crankshaft bearings (Fig. 10M-5/10N-3) and the six other bearings (Fig. 10M-4) in the crankcase halves for any signs of damage or deterioration. Crank shaft has ball bearings for models 2001-2002 (Fig. 10N) and roller bearings for model 2003 (Fig. 10M). If a replacement is needed; heat up the crankcase half to 200°C and space out the bearings by tapping gently on the backside of the bearings and the crankcase half. The new bearings should be installed while the crankcase half still is hot and thus easy to fit into the adequate bottom positions. Check all sealings for any damages or deterioration.

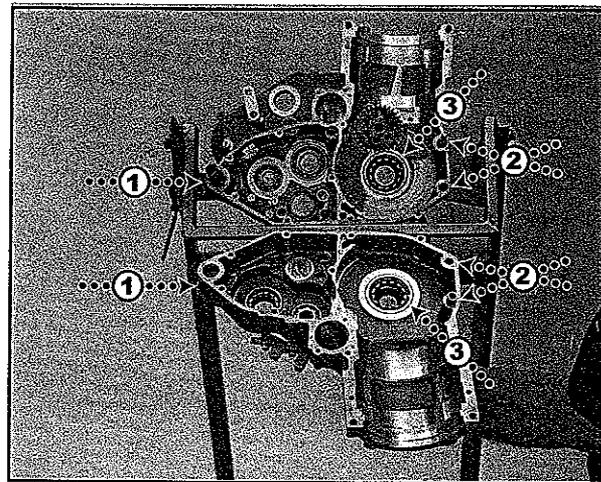


Fig.
10N

The transmission has been modified with different tooth profile between 2001 and 2002. The easiest way to determine how an engine is built is to look at the counter balancers' drive shaft. The early shaft (left) has a straight surface and the newer (right) has a diameter change between the position for the timing sprocket and the drive gear.

Following gears are *not* interchangeable between 2001 and 2002/2003.

Counter balancer, balance drive shaft, drive gears on balancer drive shaft and crank shaft, and also the outer clutch basket.

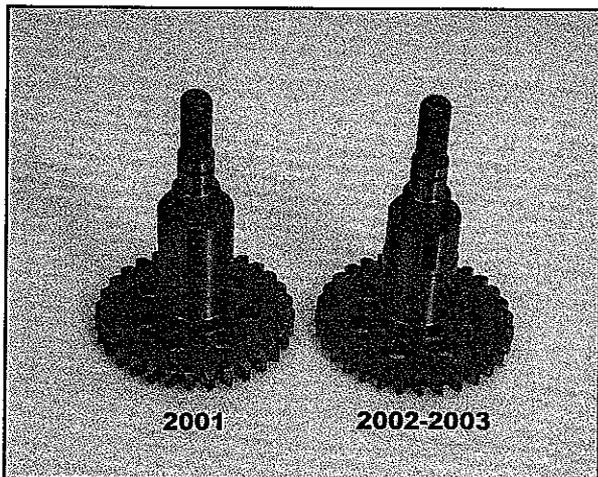


Fig.
10O

Counter balancers has also been subject to changes. Part from tooth profile the bearings has changed during the model year 2002. The left balancer is fitted with a single bearing and the right balancer has two bearings next to each other.

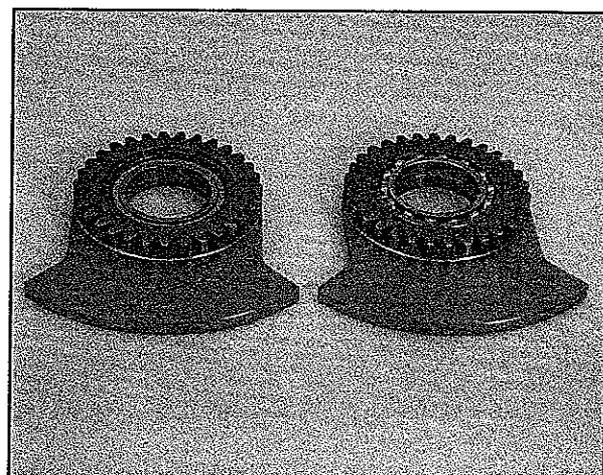


Fig.
10P

10-B CRANKSHAFT & GEARBOX

Dismantle the crankshaft by using a hydraulic press onto the crank pin (Fig. 10Q-1). Always press the crankpin (Fig. 10Q-2) out of the crankshaft counter weight from the outer side of the weight.

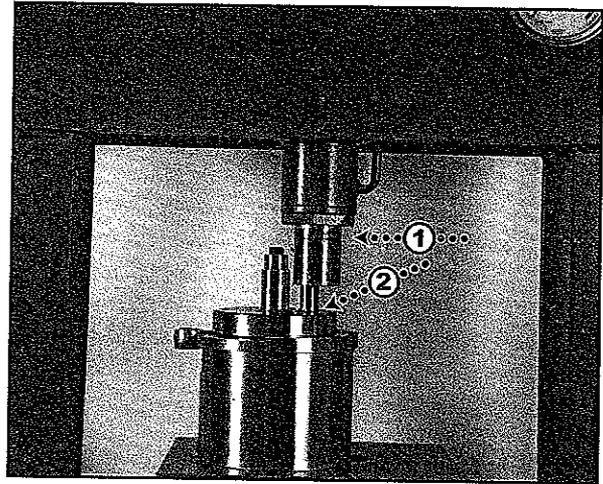


Fig. 10Q

Check the inner surface of the connecting rod (Fig. 10R-1) for any signs of damages or deterioration. The surface should be totally without any edges or level differences.

Check the crank pin (Fig. 10R-2) for any damage or deterioration. The surface should be totally flat without any edges or level differences.

Always install a new connecting rod bearing (Fig. 10R-3) whenever the crankshaft has been dismantled.

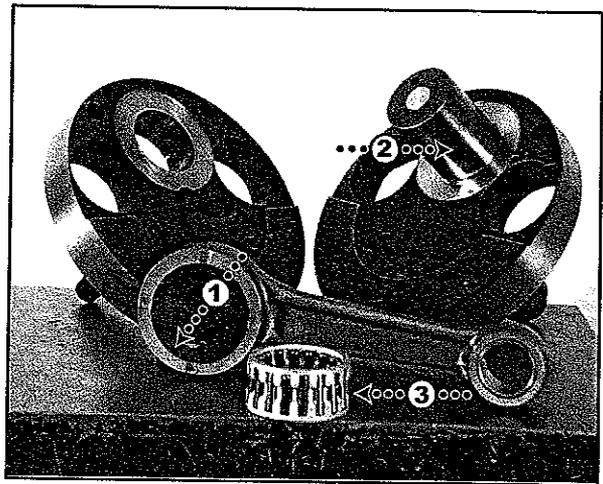


Fig. 10R

Assemble the crankshaft by using a hydraulic press. Press the crank pin into the counter weight as shown. Make sure that the counter weights are aligned (Fig. 10S-1) before pressing the crank pin into position (Fig. 10S-2).

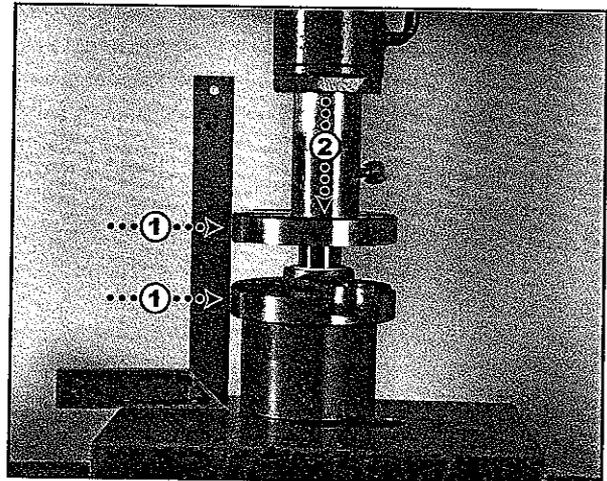


Fig. 10S

Measure the width (Fig. 10T-1) of the crankshaft during the operation to avoid pressing to a too narrow width. Make sure the width is measured on the bearing seat (Fig. 10T-2). The width shall be as follows.

01-02: Ball bearings. One balance bearing $62,5^{+0}_{-0,15}$

01-02: Ball bearings. Two balance bearings $62,3^{+0}_{-0,15}$

03: Roller bearings. Two balance bearings $62,3^{+0,1}_0$

Before installing the 2003 crankshaft, make sure it gets a clearance of 0,25-0,30mm on 400-550cc engines and 0,30-0,35mm on 650cc engines. Measure between the bearings in the block prior to assembly.

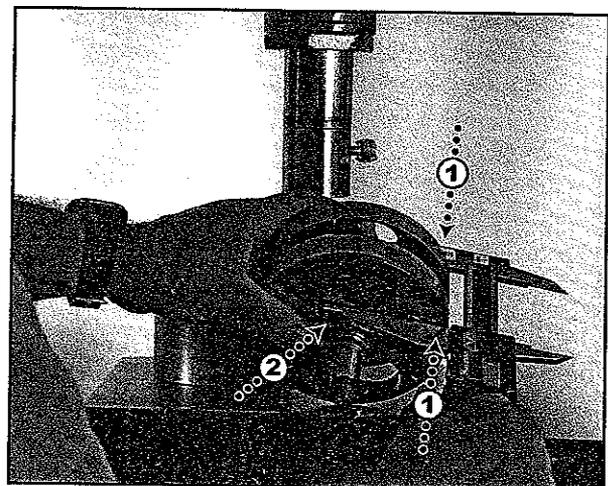


Fig. 10T

10

10-B CRANKSHAFT & GEARBOX

Put the crankshaft onto the measuring jig. While rotating the crankshaft (Fig. 10U-1) the two dial test indicators together (Fig. 10U-2, 3) should not show a variation larger than 0,03 mm.

If the limit of tolerance is passed the crankshaft has to be adjusted according to normal procedures.

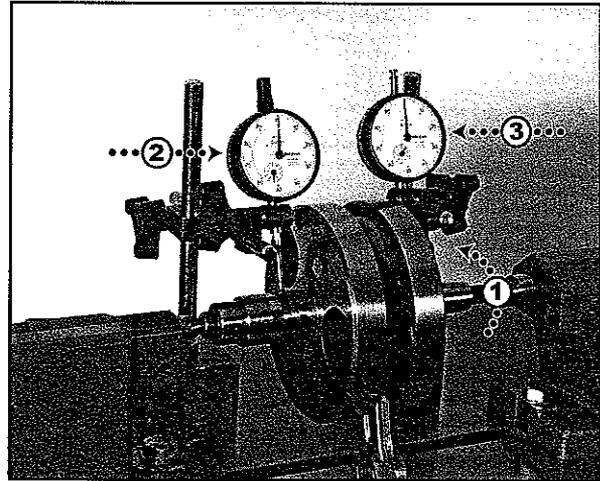


Fig.
10U

ASSEMBLY OF CRANKCASE

Lubricate the bearing for the counter balancer drive shaft and put the driveshaft into the bearing. A slight tapping with a mallet might be required.

Lubricate the crankshaft bearing including the surface of the inner ring and the bearing surfaces of the transmission/left end of the crankshaft.

When fitting the balancer to the crankshaft, make sure the balancer bearings are secured with threadlock to the crankshaft surface.

Make sure that the marked dot on the balancer drive shaft (Fig. 10V-1) corresponds to the marking on the gear of the balancer (Fig. 10V-2).

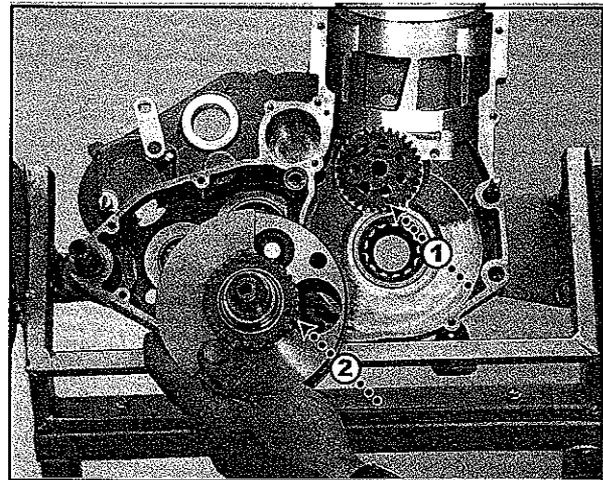


Fig.
10V

With the connecting rod facing up, slip the complete piston/liner-unit (Fig. 10X-1) over the rod. The cylinder liner must have its machined opening facing up. Press the gudgeon pin (Fig. 10X-2) to the circlip on the far side and put in the remaining circlip on the near side.

Lubricate the two machined positions of the shift shafts (Fig. 10X-3).

Lubricate the bearings of the main shaft, of the secondary shaft and of the shift drum (Fig. 10X-4).

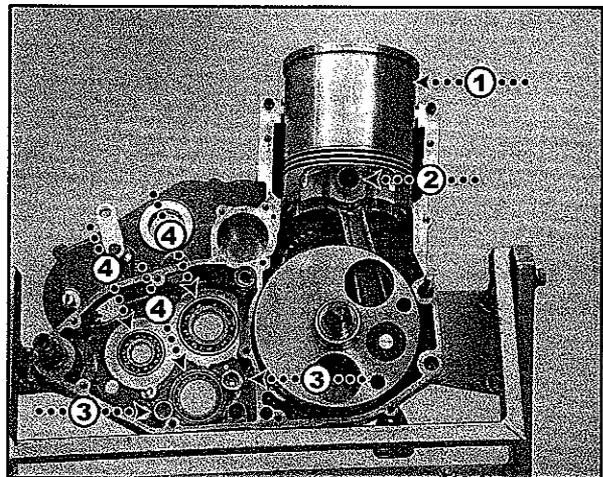


Fig.
10X

Before pressing the liner to its bottom position, turn it 180 degrees and make sure that the opening is straight to the left. The front and rear edges (Fig. 10Y-1) can be aligned with reinforcements in the casting of the left crankcase half. Then press the liner so that the rim bottoms in it seat.

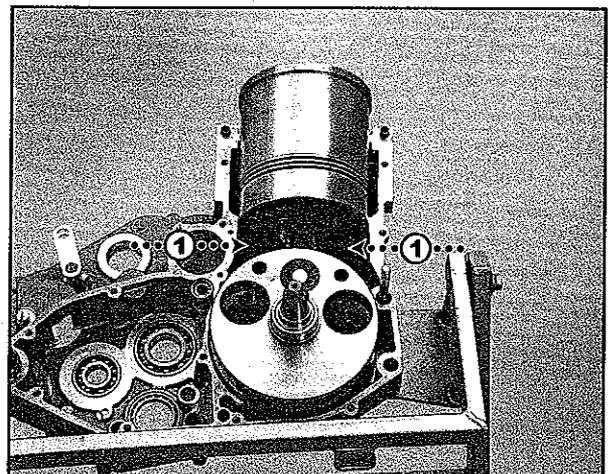


Fig.
10Y

10-B CRANKSHAFT & GEARBOX

While holding the shafts, aligned (Fig. 10Z-1), put in the main shaft and the secondary shaft into their positions in the crankcase half. Gently tap, alternately, onto the shafts until the accurate position is reached.

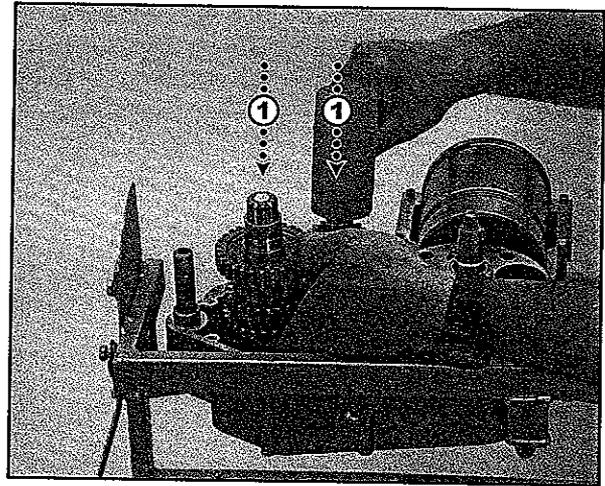


Fig.
10Z

6-speed gearbox: Slide the shift fork of the main shaft (Fig. 10AA-1) into the spline of the double/3-4th gear wheel.

4 & 6-speed gearboxes: Slide the lower shift fork of the secondary shaft (Fig. 10AA-2) into the spline of the second gearwheel from the bottom and the upper shift fork (Fig. 10AA-3) into the spline of the second gear wheel from the top.

Slide the shift drum (Fig. 10AA-4) into the bearing and gently tap it into position towards the bearing.

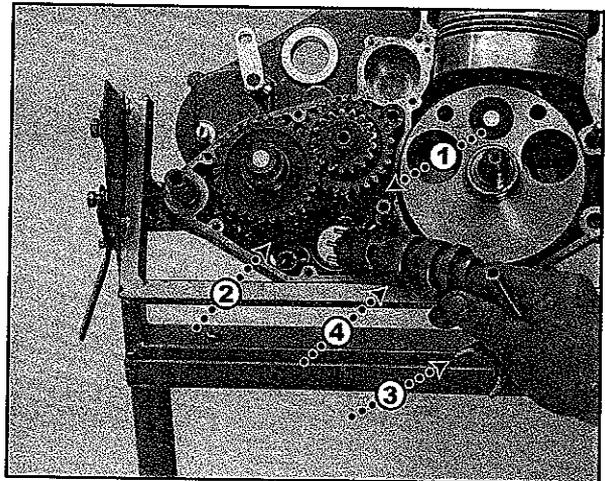


Fig.
10AA

Slide the shift fork shaft of the secondary shaft (Fig. 10AB-1) into the shift forks and by turning the shift drum (Fig. 10AB-A) and by lifting the gear wheels in question (Fig. 10AB-B) position the two shift forks into the splines of the shift drum and the shift shaft into the crankcase.

6-speed gearbox: Repeat the operation with the shift fork shaft and the shift fork of the main shaft (Fig. 10AB-2).

Lubricate the o-ring of the oil screen and push it into position in the crankcase half.

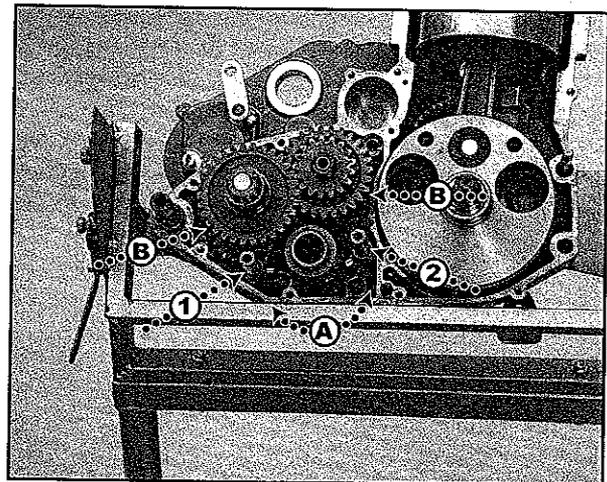


Fig.
10AB

Thoroughly clean the sealing surfaces of the crankcase half and add a thin layer of silicone or gasket paste (Fig. 10AC-1). Make sure that both the rear dowl and the front dowl are in a firm and straight position into the left crankcase half.

Thoroughly clean the sealing surfaces of the right crankcase half.

Lubricate all bearings and positions of shafts in the right crankcase half.

In order to prevent any damages to either the bearing or the sealing of the secondary shaft; a thin tube, or likewise, could be placed into the bearing and the sealing before putting the right crankcase half onto the left one.

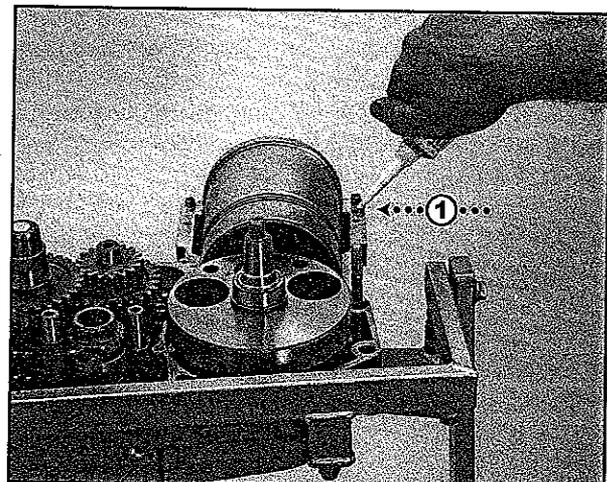


Fig.
10AC

10-B CRANKSHAFT & GEARBOX

When the crankcase halves are fully installed towards each other; put the o-ring of the secondary shaft (Fig. 10AD-1) onto the shaft, place the spacer of the sprocket (Fig. 10AD-2), the groove towards the o-ring, onto the shaft and slide the spacer onto the o-ring and fully towards the bearing of the secondary shaft.

Attach the thirteen screws (Fig. 10AD-3) into the crankcase half and, crosswise, tighten the screws, torque 10 Nm.

Install the alternator/ignition (see Section 5) and the oil drain plug (see Section 6A).

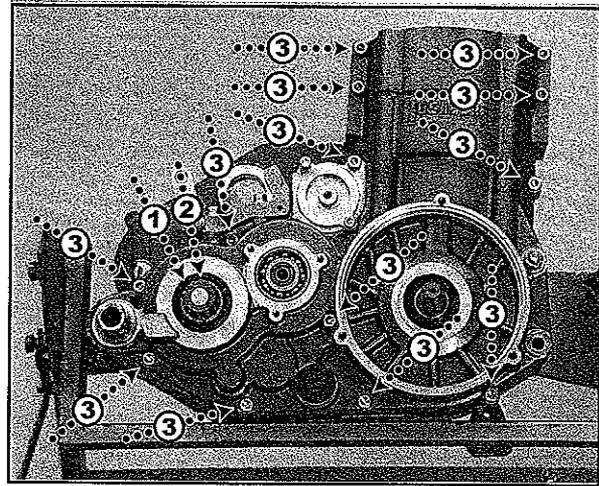


Fig.
10AD

Warm the lower timing sprocket (Fig. 10AE-1) to 200°C and slide it onto the crankshaft (Fig. 10AE-2). Use a socket, or likewise, with a center hole just wider than the crankshaft and the woodruff key and an outer diameter fit to the center of the sprocket, and a suitable rubber mallet in order to position the sprocket onto and towards the crankshaft.

Slide the timing chain through the return guide (Fig. 10AE-3), around the sprocket and up through into the channels of the crankcase half, the chain guide and the tensioner (Fig. 10AE-3).

Install the cylinder head (see Section 9D), the kick-start mechanism (see Section 7C), the gearshift mechanism (see Section 7B) and the clutch (see Section 7A).

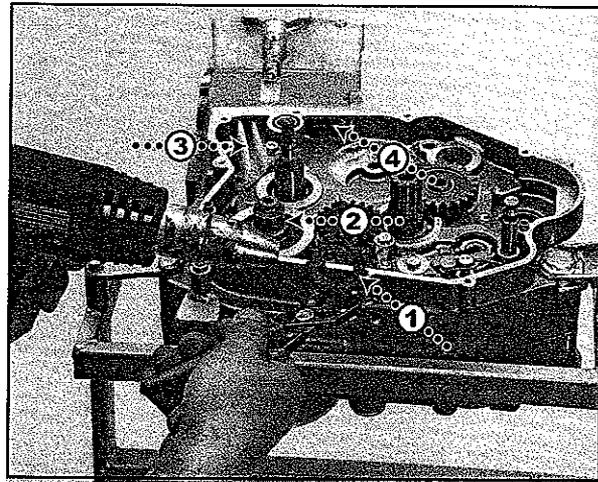


Fig.
10AE

Put the primary gear wheel (Fig. 10AF-1) onto the crankshaft, screw on the nut (Fig. 10AF-2) slightly. Turn the crankshaft to a position where the marking dots (Fig. 10AF-3) faces the balancer drive shaft. Put the balancer drive gear (Fig. 10AG-4) onto the balancer drive shaft. Before entering the woodruff key, turn the shaft so the marking dot (Fig. 10AF-5) is placed between the dots on the primary gear. Screw on the nut (Fig. 10AF-6) slightly to secure the gear.

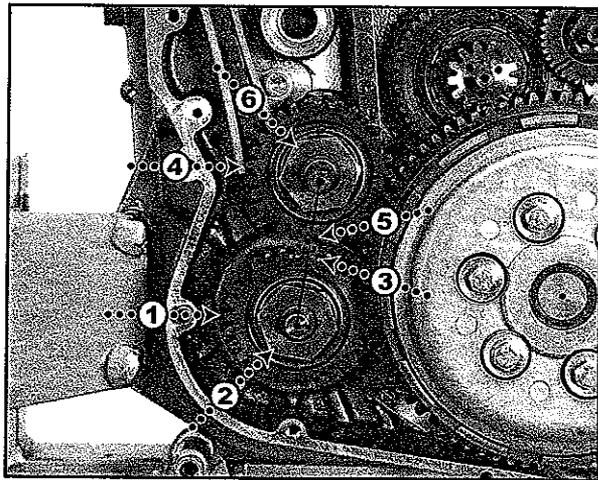


Fig.
10AF

Tighten the nut, thus pushing the primary gear wheel (Fig. 10AG-1) onto the crankshaft and into position, torque 110 Nm. Use a separate gear, or segment thereof (Fig. 10AG-2) as counterforce. Also tighten the counter balancer gearwheel (Fig. 10AG-3), torque 80 Nm.

Install the transmission cover, the kickstart lever and the gearshift lever (see Section 7A).

Install the engine into the frame.

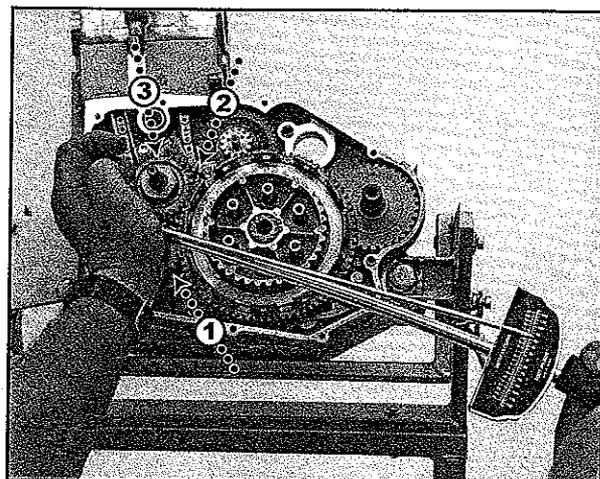


Fig.
10AG

Cover: Büro 3 Communication, Photos: Florian Jaenicke, 07/2002

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