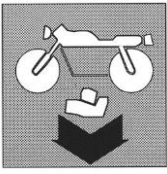




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ENGINE DIASSEMBLY

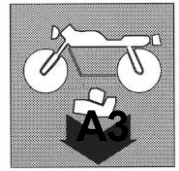


ENGINE DISASSEMBLY

Regina^{EVO}

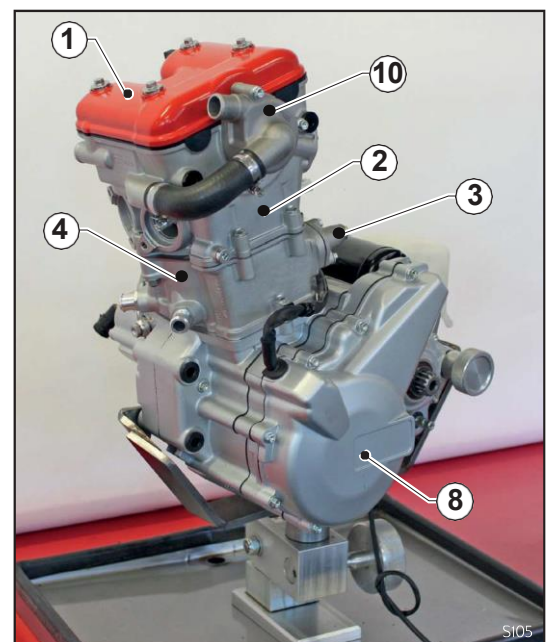
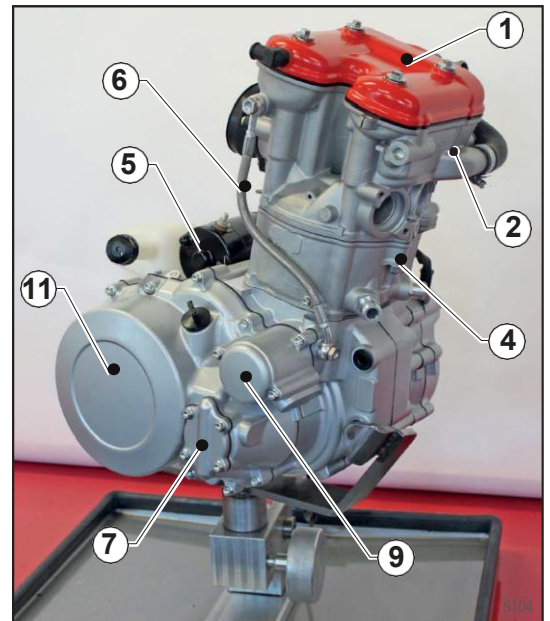
Layout of engine components	A3
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Camshaft removal	A4
Water pump body removal	A8
Water pump disassembly	A8
Cylinder head removal	A9
Valve removal	A12
Cylinder removal	A14
Piston removal	A15
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Starter motor removal	A23
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Crankshaft components removal	A33
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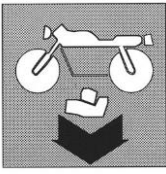




Layout of engine components

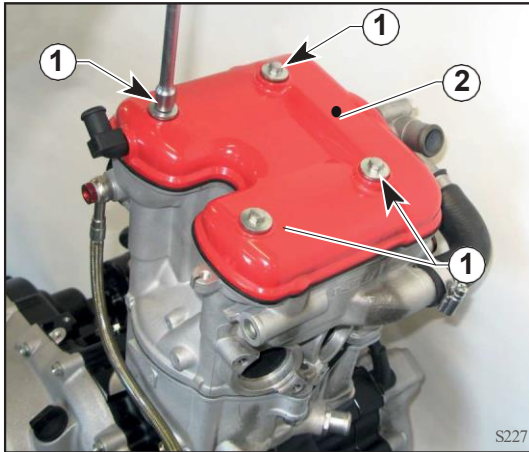
- Cylinder head cover
- 2 Cylinder head
- 3 Chain tensioner
- 4 Cylinder
- 5 Starter motor
- 6 Head lubrication pipe
- 7 Oil pump
- 8 Clutch cover
- 9 Oil Filter
- 10 Water pump
- 11 Ignition cover





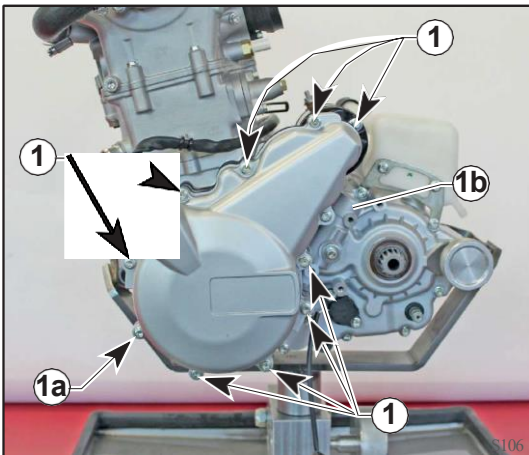
ENGINE DISASSEMBLY

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Cylinder head cover removal

Remove the Four retaining screws (1) (8 mm wrench) and remove the head cover (2) with its gasket.



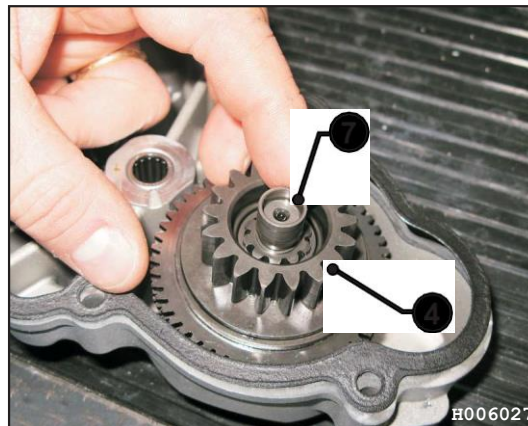
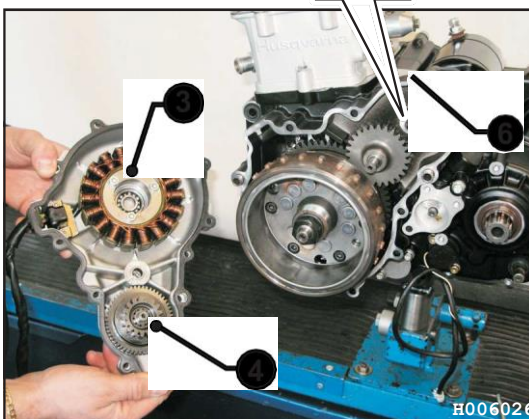
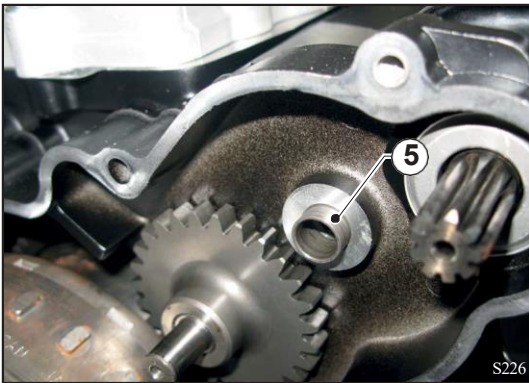
Camshaft removal

Remove the head cover as described in the relevant paragraph.

Remove the eight screws (1) securing the ignition cover (2) (8 mm wrench - 0.31 in.) and remove the cover together with stator (3), timing drive gears (4) and gasket.

The two longer screws (1a and 1b) (L=65mm (2.559 in.)) must be refitted in their original positions.

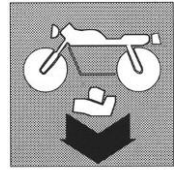
Make sure to collect the starter drive bushing (5); remove it from the Flange (6) and fit it on the shaft (7) of starter drive gear (4).



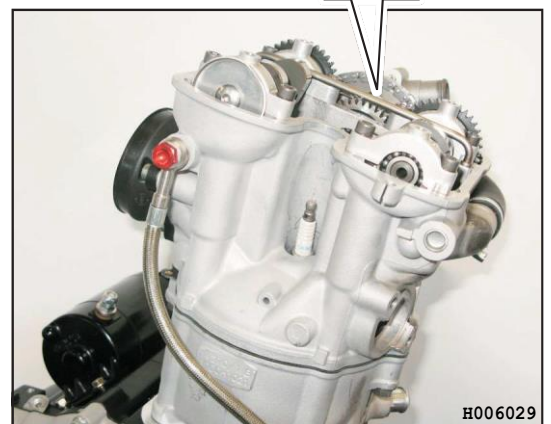
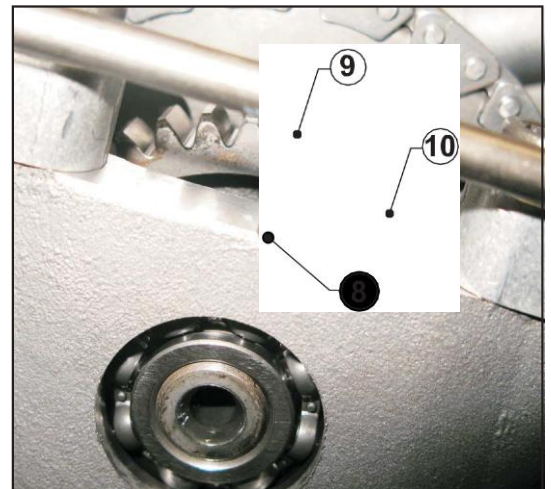
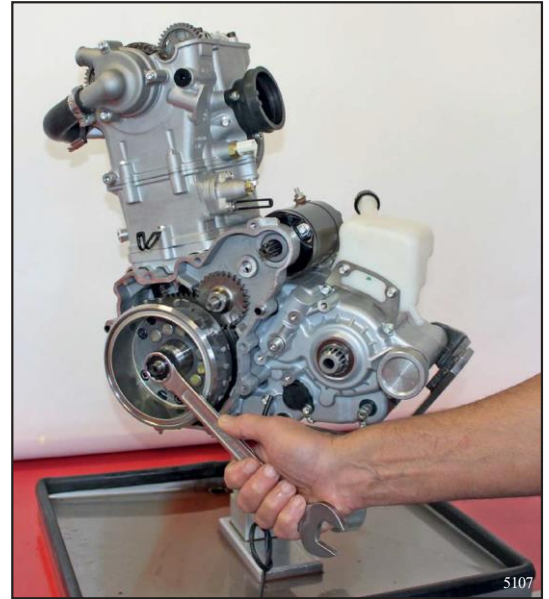


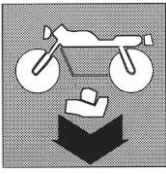
ENGINE DISASSEMBLY

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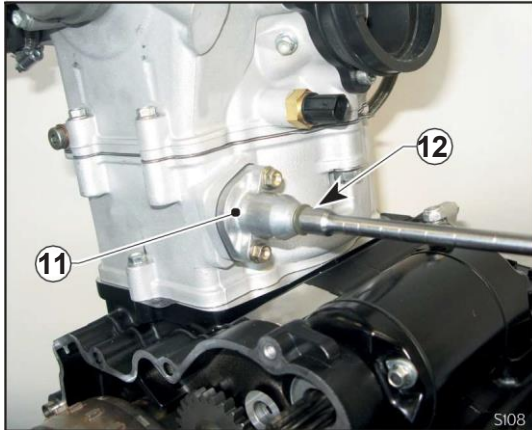
- Using a 24 mm wrench, bring the piston to T.D.C. at the end of the compression stroke. In this condition, the mark (8) on the head will be lined with the mark (9) on camshaft drive gear (10).





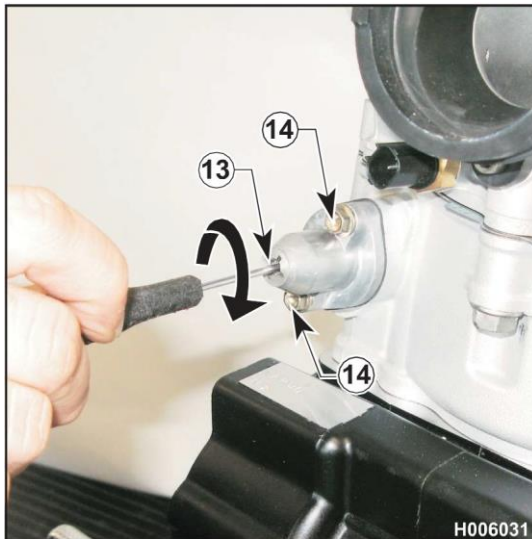
ENGINE DISASSEMBLY

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- Remove the chain tensioner (11) as Follows:

Loosen the screw (12) with an 8 mm wrench.



Use a Flat head screwdriver to release spring tension turning screw (13) Fully clockwise.

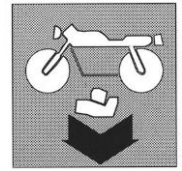
Loosen the two screws (14) using an 8 mm wrench and remove the chain tensioner (11).



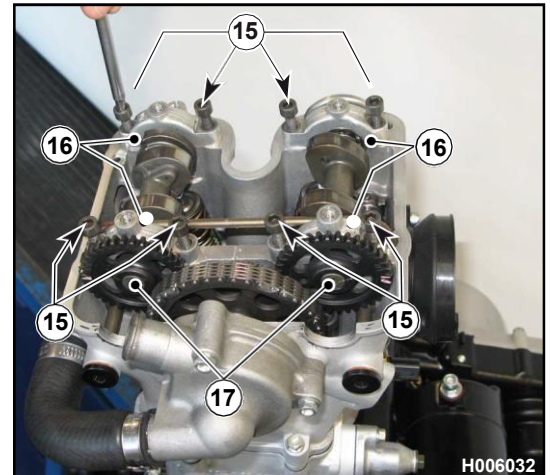


ENGINE DISASSEMBLY

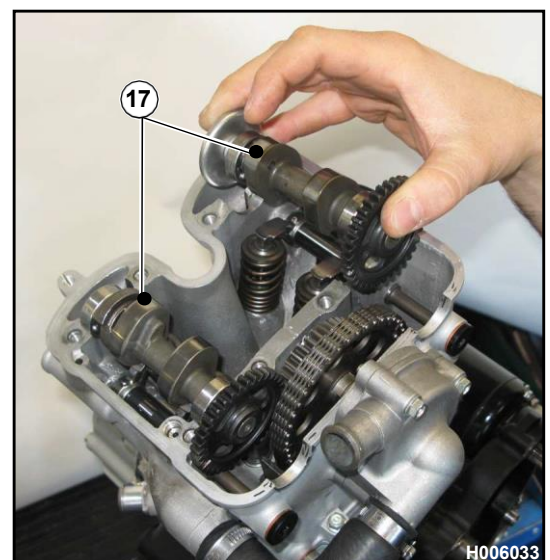
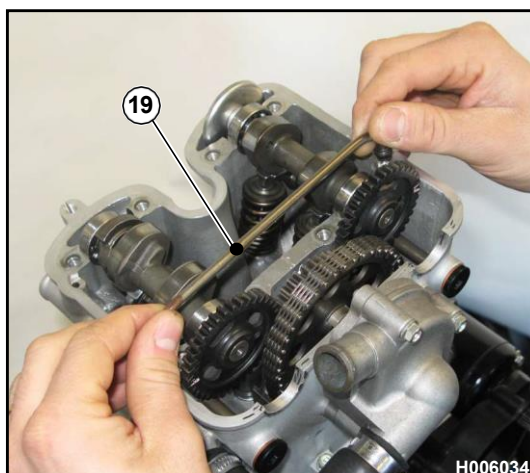
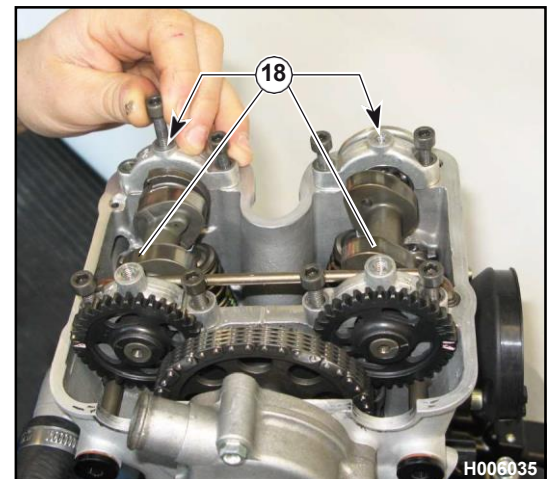
Regina^{EVO}

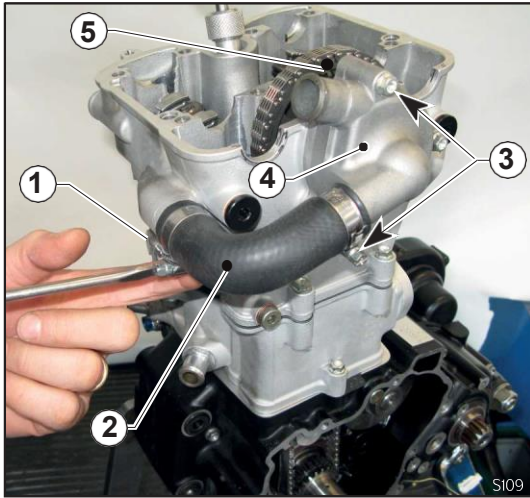
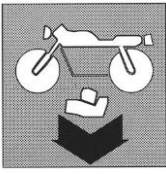


- Remove the eight screws (15) securing the camshaft (17) caps (16) (S mm - 0.19 in. Allen wrench) and remove the camshafts tightening one of the screws you have removed into the threaded holes (18).



- Remove the oil pipe (19) and the camshafts (17).



**Water pump body removal**

Remove head cover, camshafts and chain tensioner as described in the relevant paragraph.

Loosen the clamp (1) securing the water pump to cylinder head tube (2) and take the tube out of the head.

Remove the two screws (3) securing pump body (4) to head (8 mm wrench - 0.31 in.) and remove pump body and timing drive gear (5).

**Check the seal (8) For wear on assembly;
replace if damaged.**

Water pump disassembly

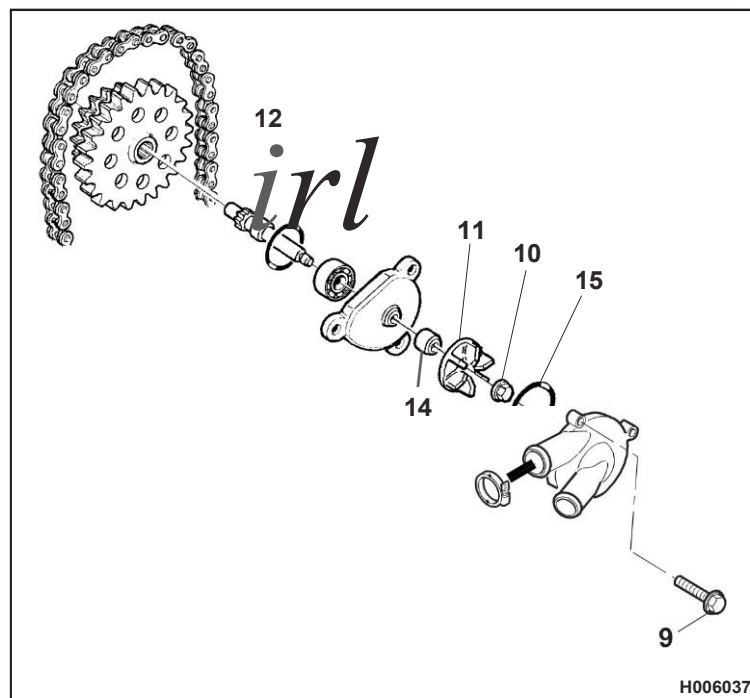
Loosen the screw (9) with an 8 mm (0.31 in.) wrench to take pump body apart.

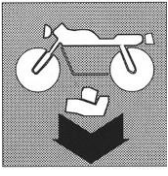
Loosen the nut (10) to remove the impeller (11).

Remove shaft (12) to replace bearing (13) and seal (14).

**Check the seal (15) For wear on assembly;
replace if damaged.**

Reassemble all parts in the reverse order compared to disassembly and tighten nut (10) to 4.9 Nm/ 0.5 Kgm/ 3.6 Ft/lb+LOCTITE 648).

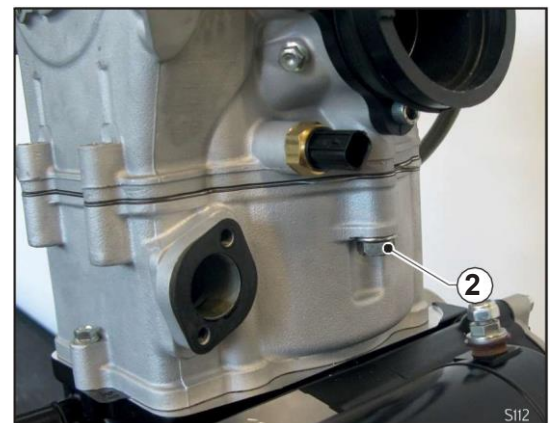
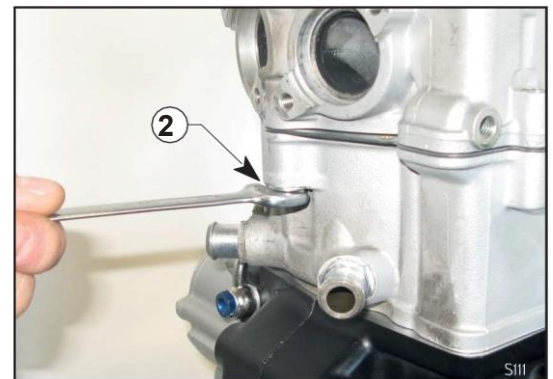


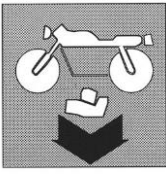


Cylinder head removal

Remove head cover, camshafts, chain tensioner and water pump as described in the relevant paragraph.

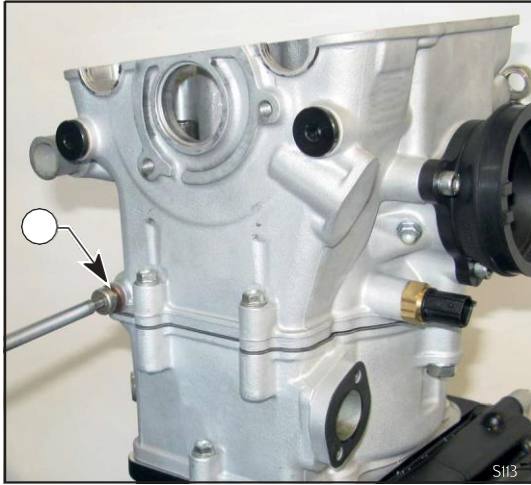
Remove the two screws (1) on the left side (8 mm wrench - 0.31 in.) and the nuts (2) located up Front and at the rear under the head (13 mm wrench - 0.51 in.).



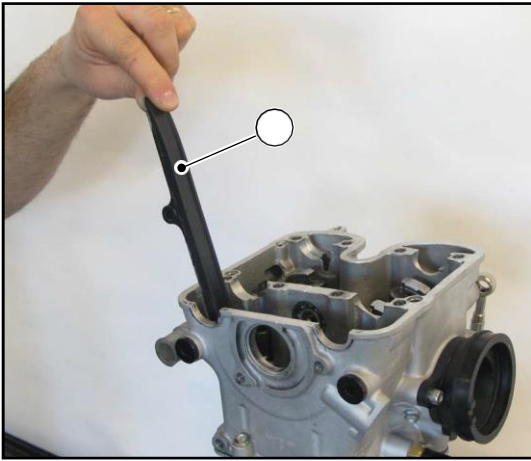


ENGINE DISASSEMBLY

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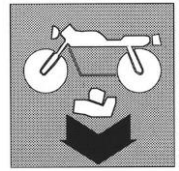
- Use a 5 mm Allen wrench to loosen the screw (3) and remove the chain slider (4).



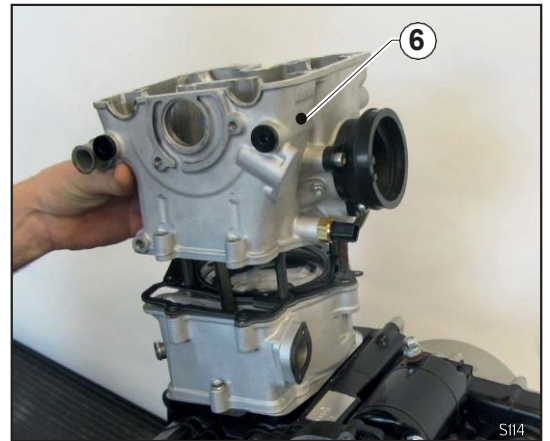
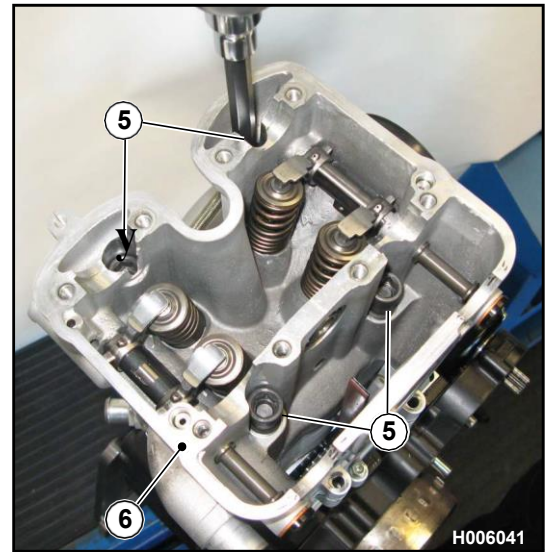


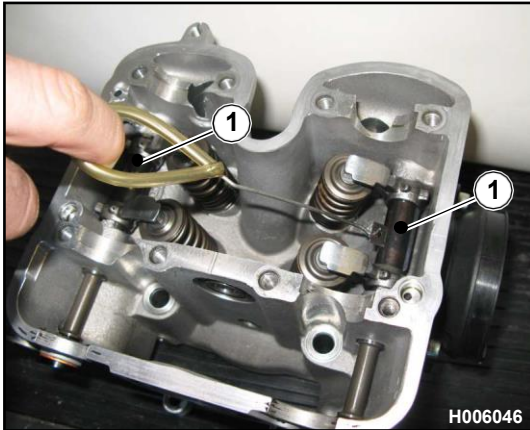
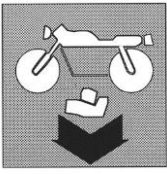
ENGINE DISASSEMBLY

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- Remove the Four stud bolts (5) inside cylinder head (6) (10 mm Allen wrench - 0.39 in.) in a cross pattern.
Remove the cylinder head and its gasket (7).





H006046

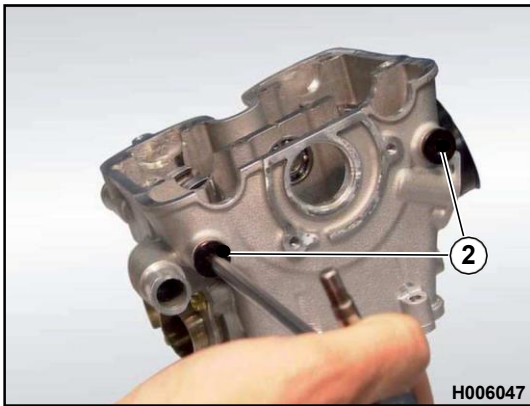
Valve removal

Remove the cylinder head as described in the relevant paragraph.

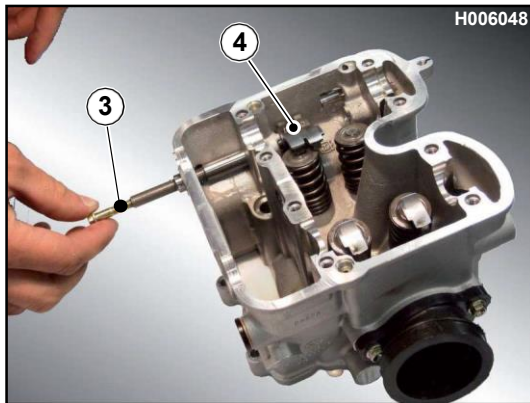
Remove the rocker arm spring spacers (1) using a hook.

Remove the rocker arm shaft screws (2) (6 mm Allen wrench) and then remove rocker arm shafts (3) and rocker arms (4).

Mark the valves and their components so as to refit in their original positions on assembly.



H006047



H006048



S229

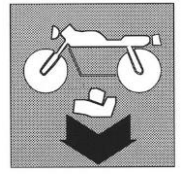
Remove the shims (5) using a small magnet.

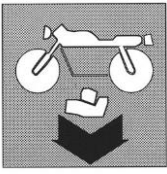




ENGINE DISASSEMBLY

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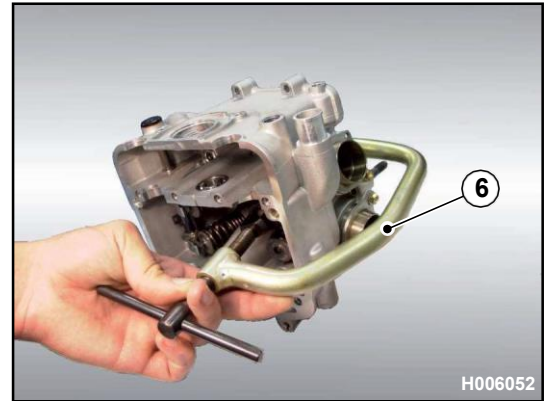




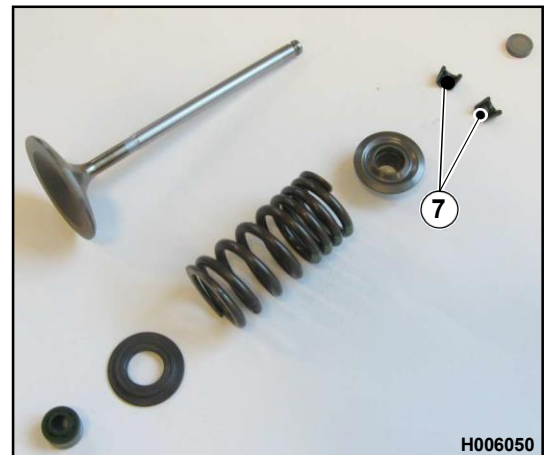
ENGINE DISASSEMBLY

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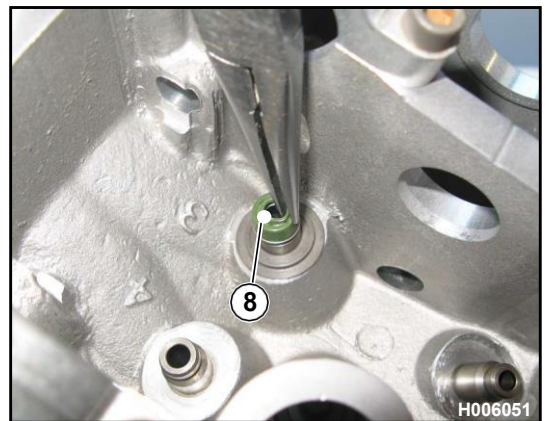
Use a valve spring compressor (6) to compress the valve springs. Be careful not to damage the mating surfaces that contact the gasket or those of the combustion chamber. Make sure the valve spring compressor is aligned straight on the spring, or you might bend the valve stem. Do not compress the springs too much or they will weaken.

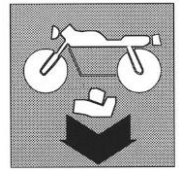


Mark all parts to ensure that they are refitted in their original positions on assembly. If the valve collets (7) have caused burrs on the valve stems, remove them before removing the valves.



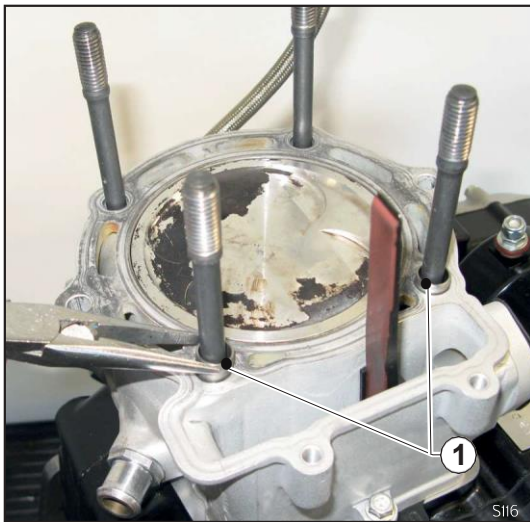
Remove the seals (S) from the valve guides.
Remember that seals must be replaced on assembly.



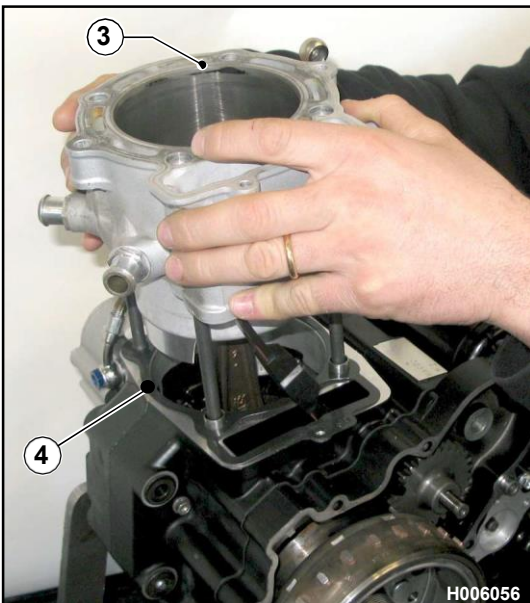
**Cylinder removal**

Remove the head as described in the relevant paragraph.

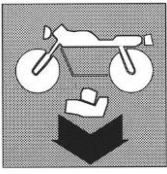
- Loosen the cylinder retaining screw (1) using an 8 mm (0.31 in.) wrench.



- Remove the centring bushings (2).

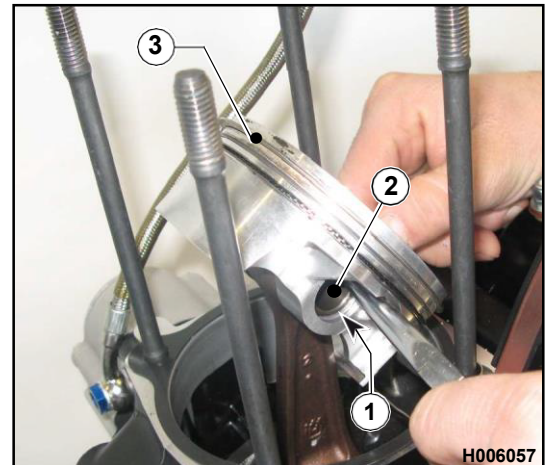


- Remove the cylinder (3) with its gasket (4).



Piston removal

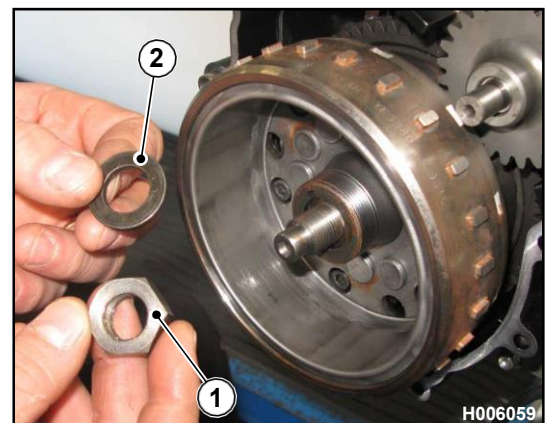
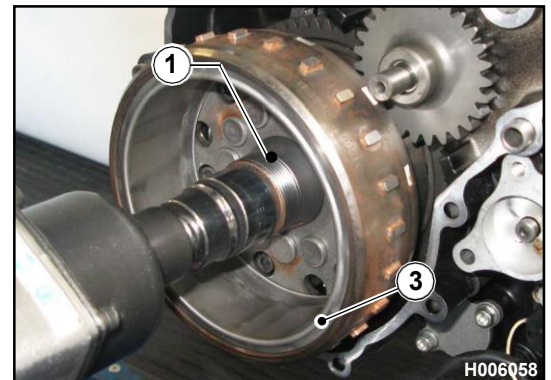
- Remove the piston pin retaining rings (1), slide out the piston pin (2) and remove the piston (3).



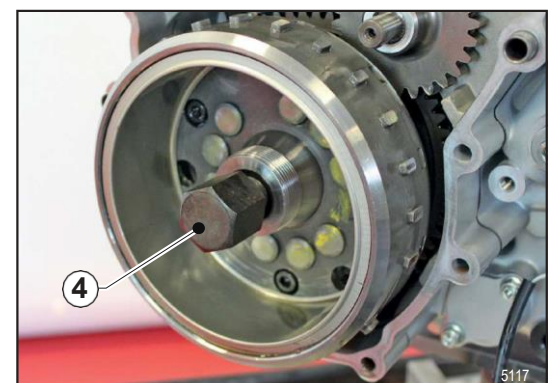
Flywheel removal

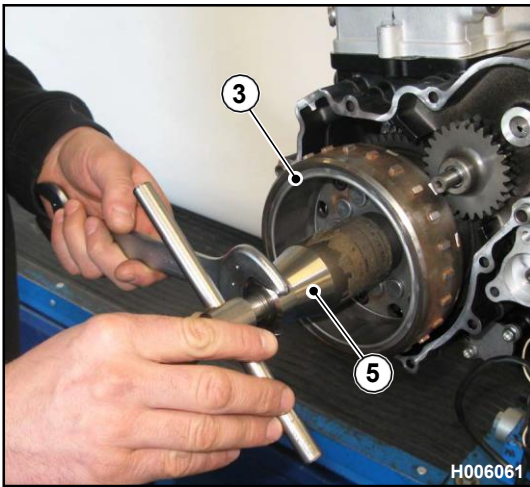
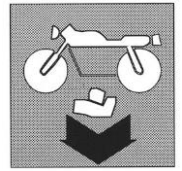
Remove the ignition cover as described in the relevant paragraph.

- Loosen the nut (1) and washer (2) securing the rotor (3) (24 mm wrench - 0.94 in.).

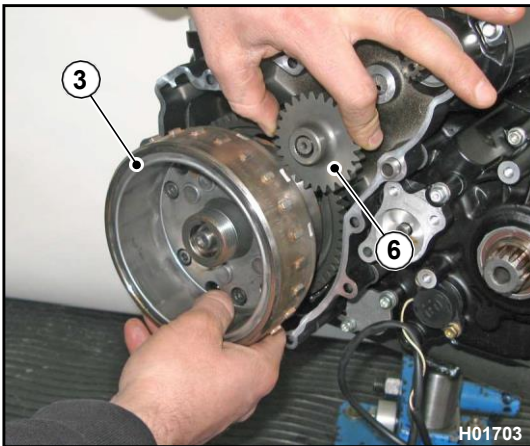


- Fit guard (4) to the crankshaft.

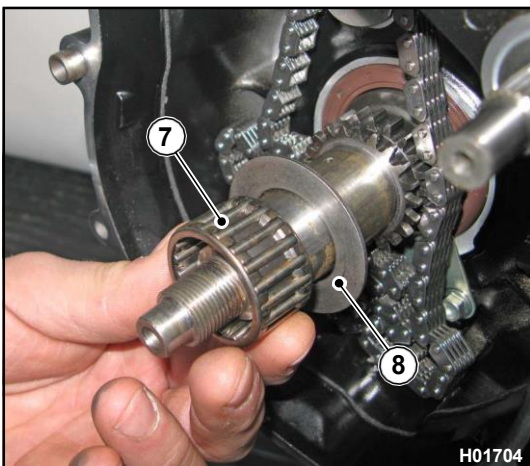




- Remove the rotor (3) using the puller (5).

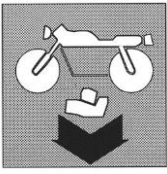


- Remove the flywheel (3) together with freewheel and idler gear (6).



- Remove the roller cage (7) and the washer (8);

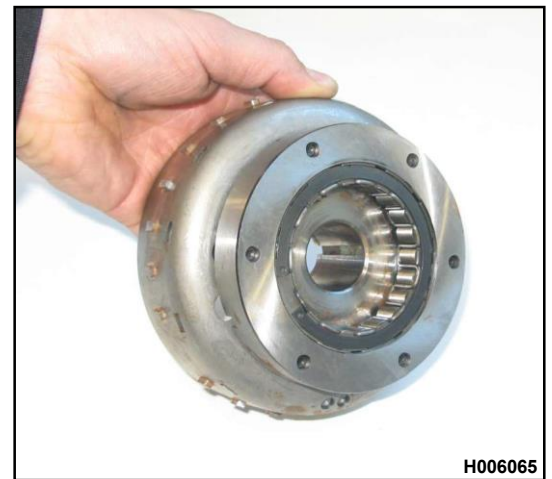
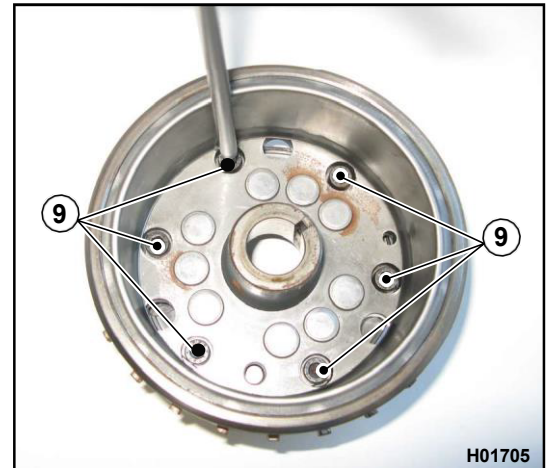


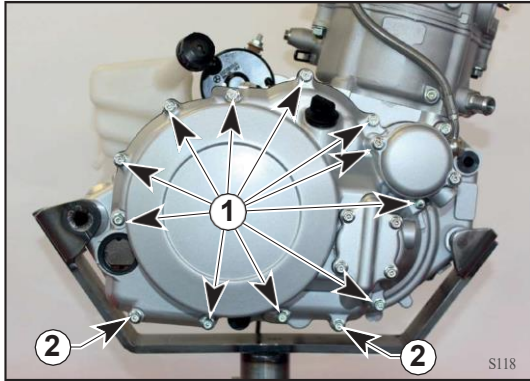
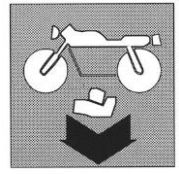


ENGINE DISASSEMBLY

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- Heat and remove the screws (9) (5 mm - 0.19 in. Allen screws) and check the Freewheel status: the rollers courses of action must not be worn or damaged. Ensure that all gears are in good condition.

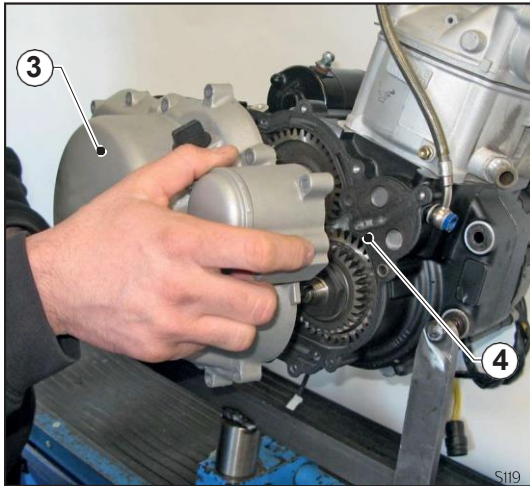




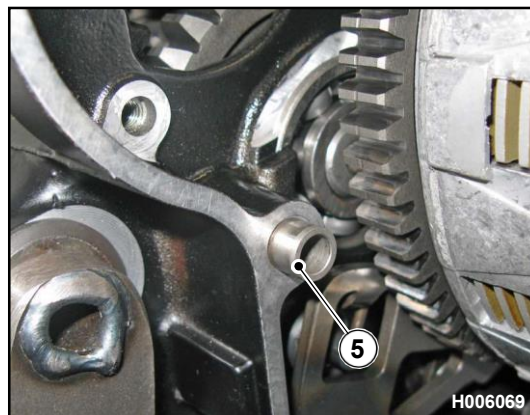
Clutch cover removal

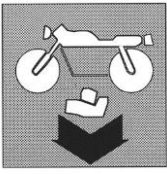
Before removing the clutch cover, drain engine oil as described in the relevant Section.

- Remove the eleven M6x30 screws (1) and the two M6x40 screws (2) M6x40 which fix the cover (3) (8 mm wrench); remove the cover (3) with the related seal (4).



- Remove the bushings (5).





Oil filters removal

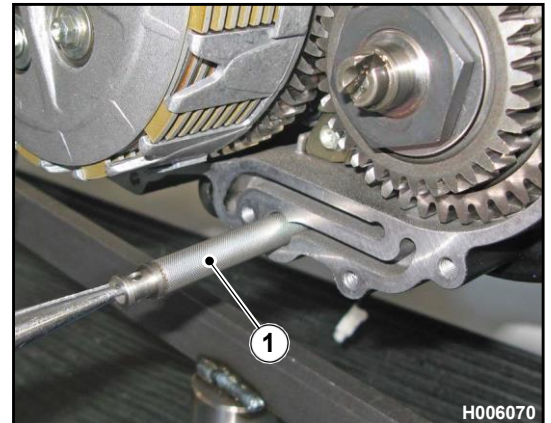
Mesh filter

Remove the clutch cover as described in the relevant paragraph.

Extract mesh Filter (1) From its seat using long nose pliers.

- Wash Filter with petrol and blow with compressed air; refit Filter with the short pin Facing outside.

Reassemble all parts, in the reverse order compared to disassembly.

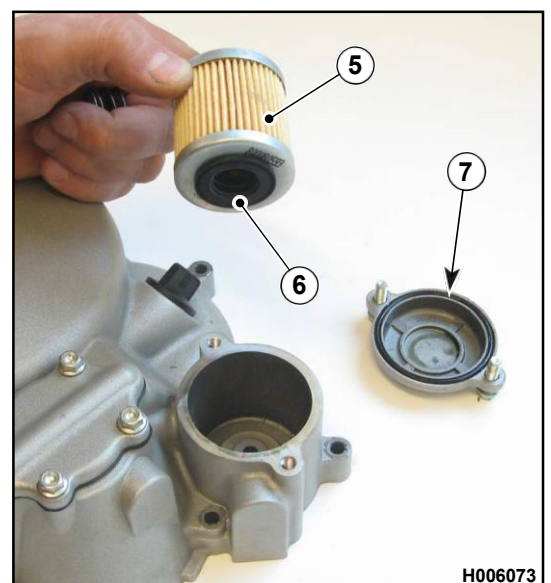
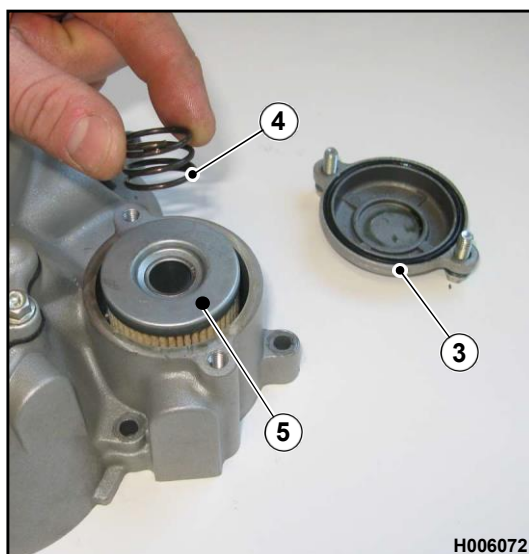
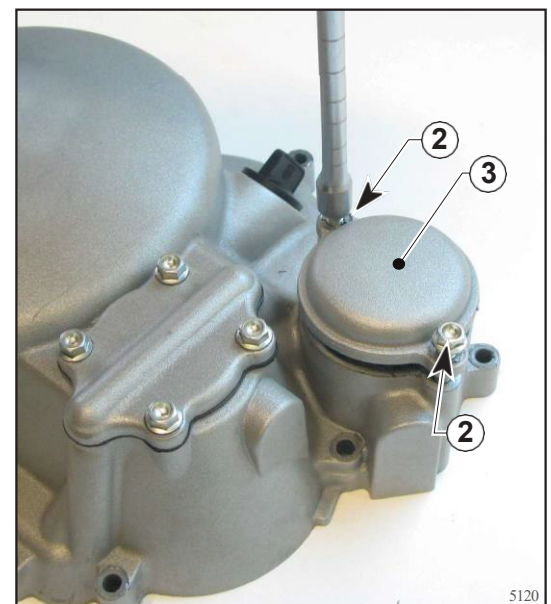


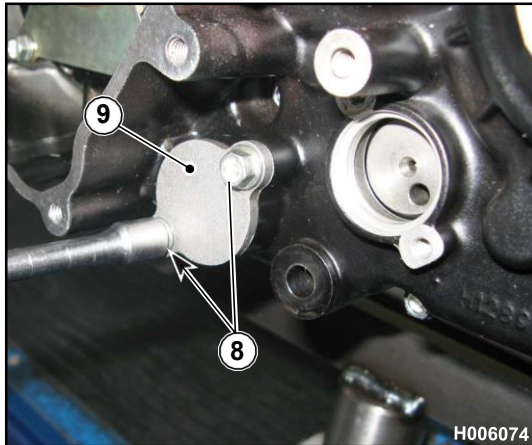
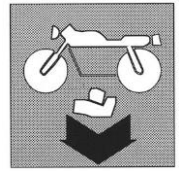
Cartridge Filter

Loosen the screws (2) (8 mm wrench) and remove cover (3), spring (4) and Filter (S).

Replace the Filter (S) and make sure to Fit it with the rubber end (6) Facing into the engine.

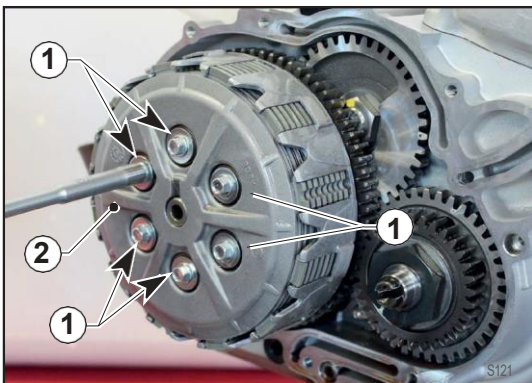
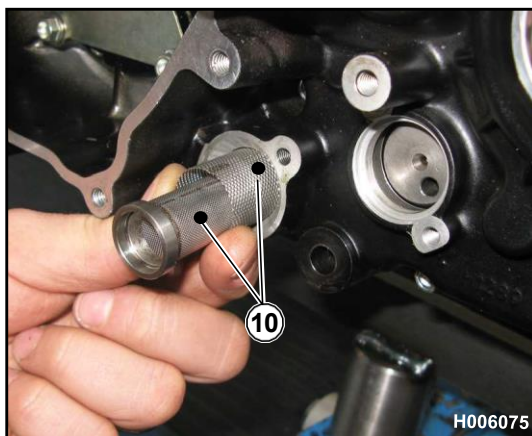
- Check the O-ring (7) and replace it if damaged.





Mesh Filters on Flywheel side

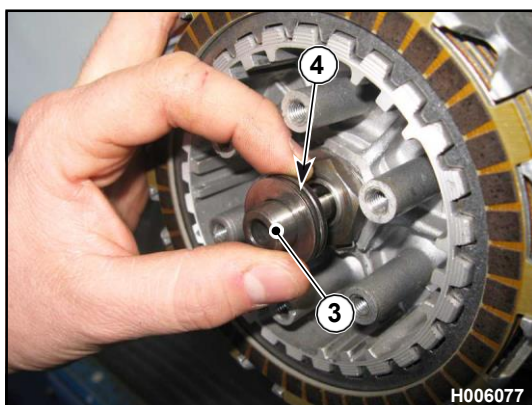
Loosen the screws (8) (8 mm wrench - 0.31 in.) and remove cover (9).
Extract the two mesh Filters (10), wash them with petrol and blow with compressed air.
Reassemble all parts, in the reverse order compared to disassembly. Check cover seal
For damage.

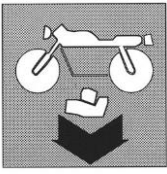


Clutch disassembly

Remove the clutch cover as described in the relevant paragraph.

- Using an 8 mm (0.31 in.) wrench, unscrew the six screws (1) securing the clutch springs.
Remove springs, pressure plate (2) with actuator (3) bearing (4) and shim.

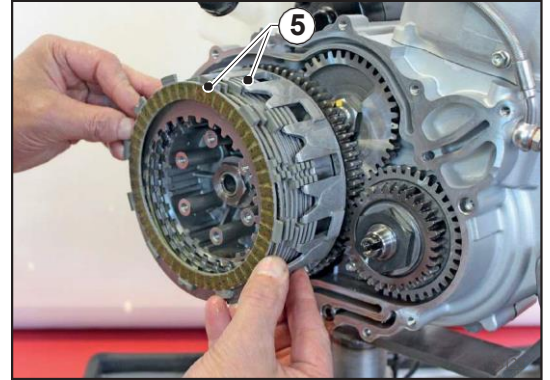




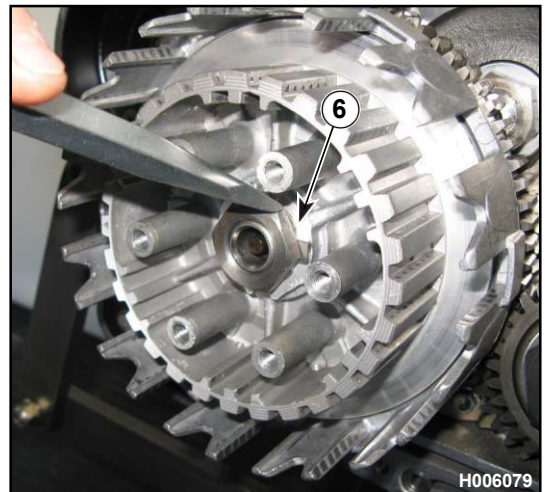
ENGINE DISASSEMBLY

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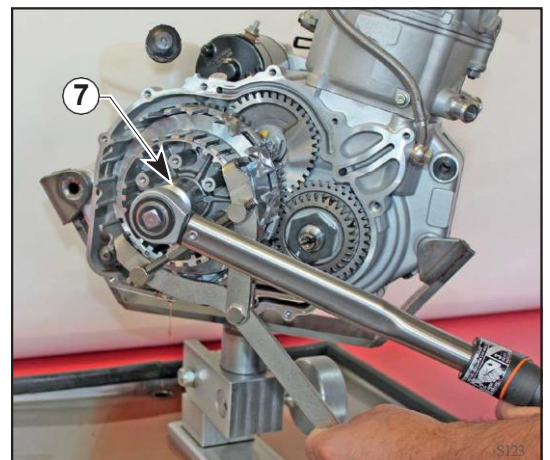
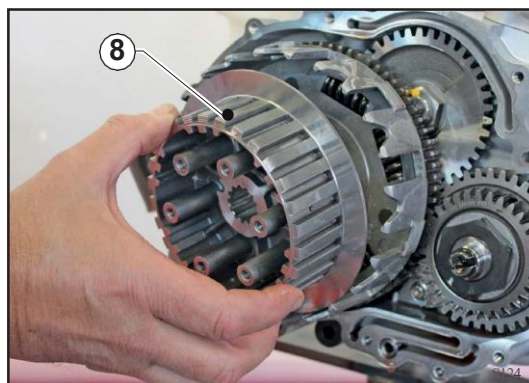
- Extract the plates (5).

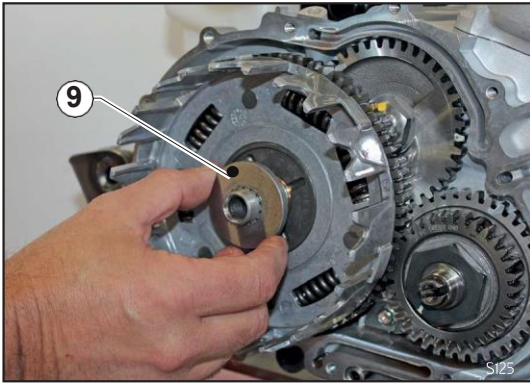
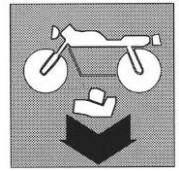


- Straighten the tab of the lock washer (6).

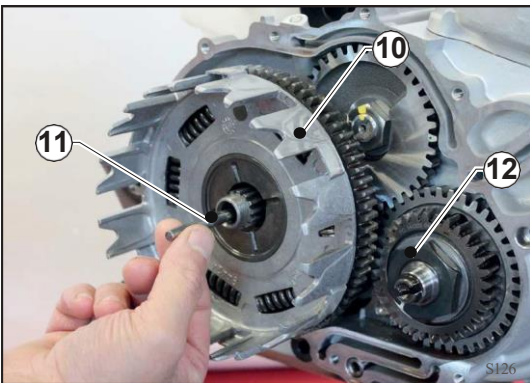


- Remove the nut (7) with its lock washer (27 mm wrench - 1.06 in.) using the clutch removal tool (A).
- Remove the hub (8).



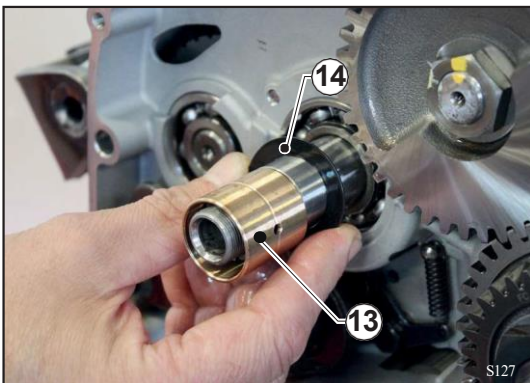


- Remove the splined spacer (9).



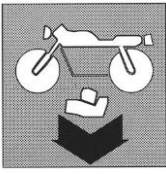
- Remove clutch housing (10) and clutch pushrod (11).

Clutch housing and drive gear (12) must always be replaced as a set.



- Remove the compass (13) with the related shim (14).





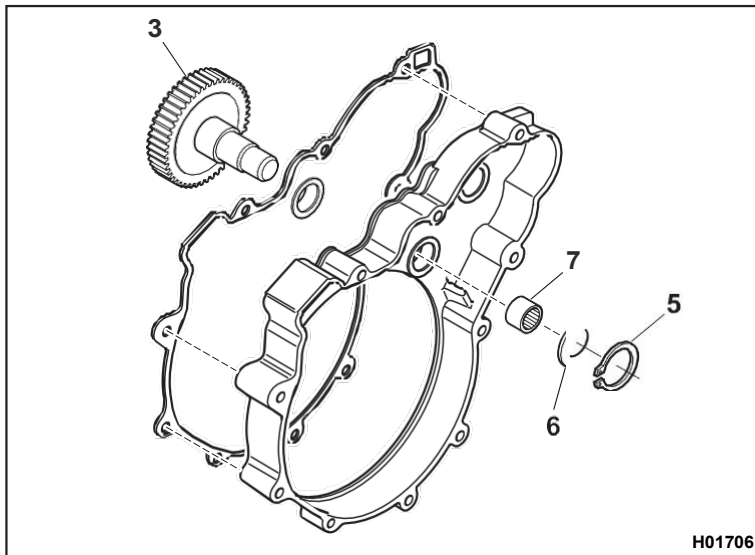
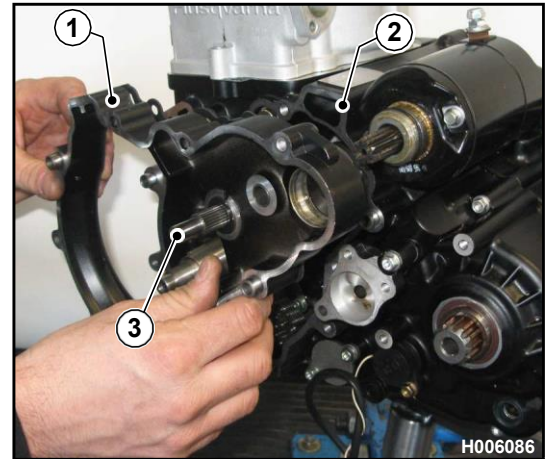
Starter motor flange removal

Remove the ignition cover together with starter drive gear as described in the relevant paragraph.

Remove the flywheel with its drive gear;

Remove the Flange (1) (tapping gently on the projections with a rubber hammer) with its gasket (2), the second drive gear (3) and the centring bushings (4).

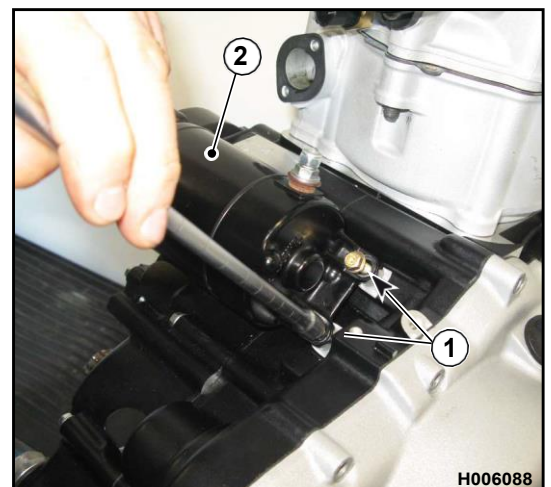
- To remove the drive unit (3), remove snap ring (5), washer (6) and seal (7), and then slide off the drive unit (3) From the opposite end.

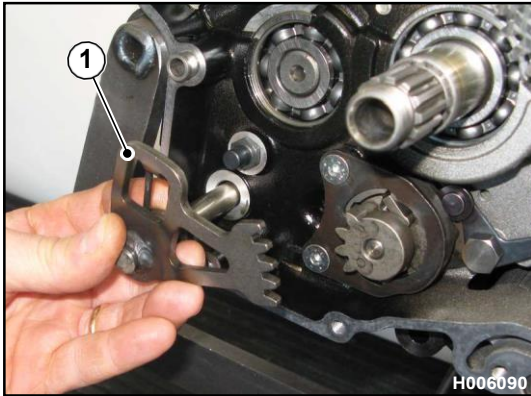
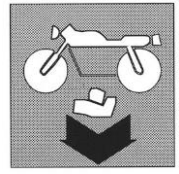


Starter motor removal

Remove the starter motor Flange as described in the relevant paragraph.

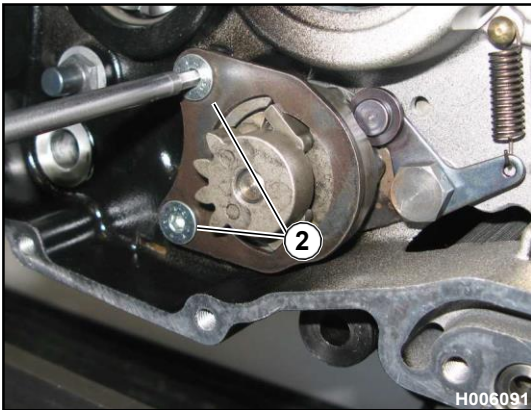
Loosen the two screws (1) and remove the starter motor (2).





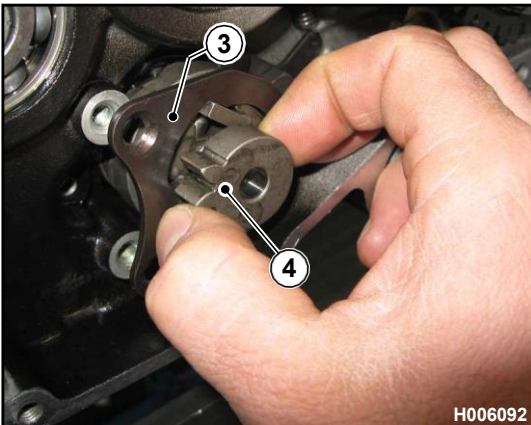
Gearbox drive shaft removal

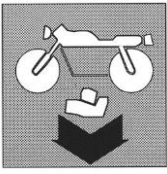
- Pull out the selector shaft (1).



- Loosen the two 4 mm (0.157 in.) socket head screws (2) and remove plate (3) and selector sector gear (4).

■ Be careful not to lose sector gear assembly components.

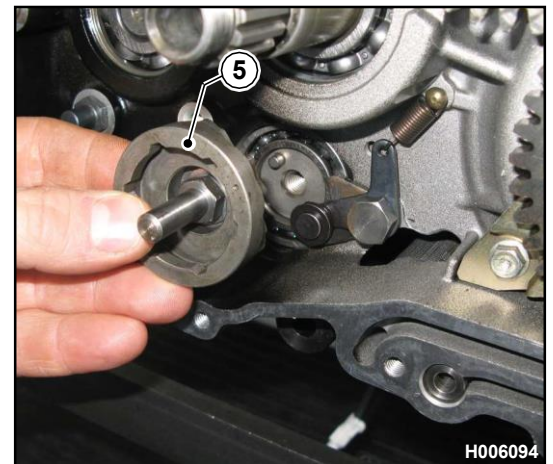
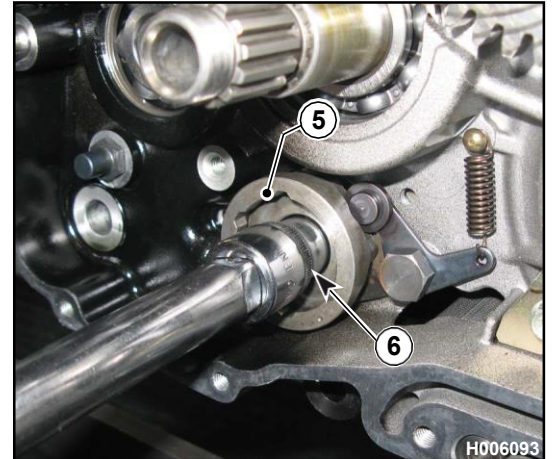




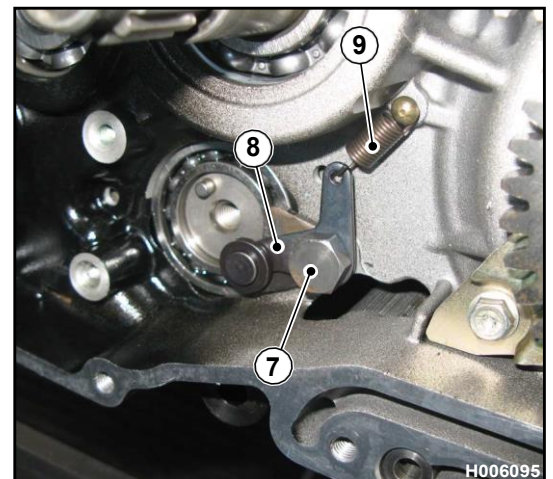
ENGINE DISASSEMBLY

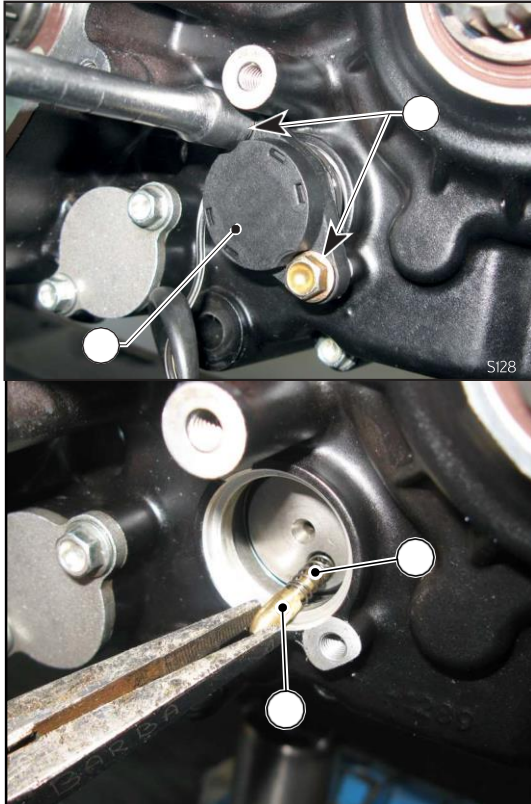
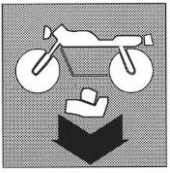
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- Remove the drum (5) loosening the central shaft (6) with a 12 mm Allen wrench.



- Use a 13 mm (0.51 in.) socket wrench to loosen the retaining screw (7) of the ratchet (8) and remove ratchet and spring (9).



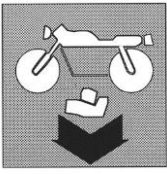


Gear sensor removal

- Loosen the screws (1) using an 8 mm Allen wrench and remove the sensor (2).

- Remove pushrod (3) and spring (4).

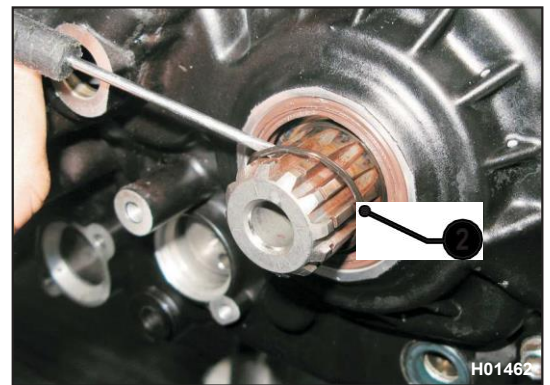
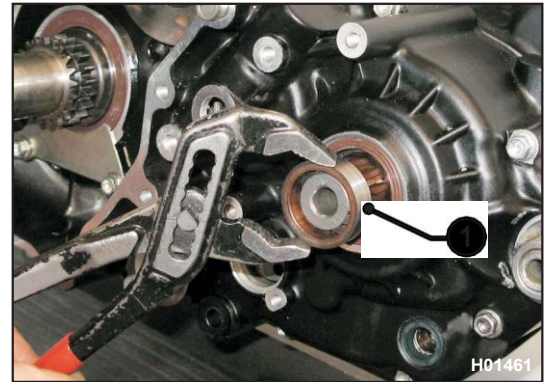




Crankcase, crankshaft and countershaft disassembly

Remove head, cylinder, piston, right and left crankcase, starter motor flange with starter motor, filters on flywheel side and gear sensor, as described in the relevant paragraphs.

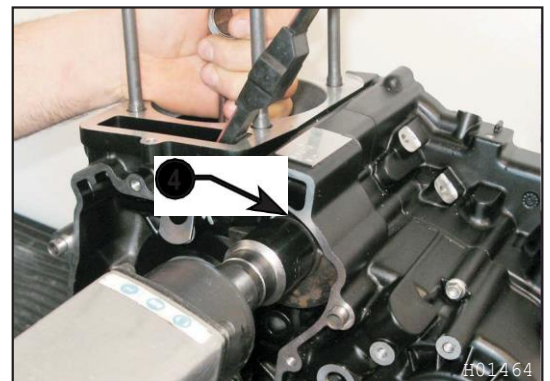
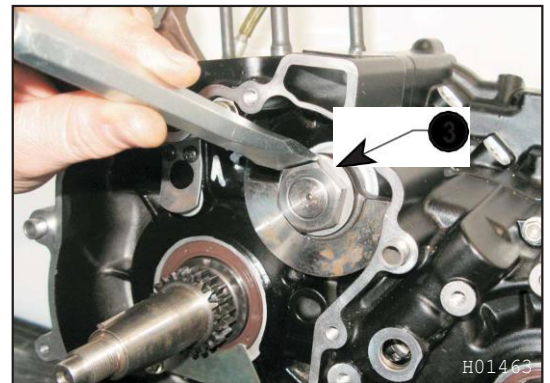
Remove bushing (1) on the sprocket shaft and extract the O-ring (2) using a small screwdriver.

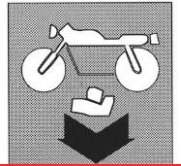


Lift the tab of the lock washer (3) using a chisel.

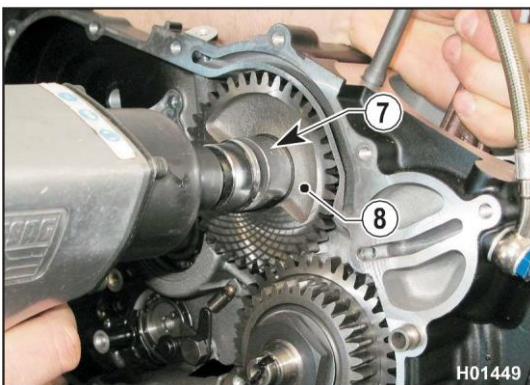
Place the engine in the dead center.

Loosen the countershaft nut (4) using an impact screwdriver (27 mm key - 1.06 in.) and remove counterweight (5) and washer (3).

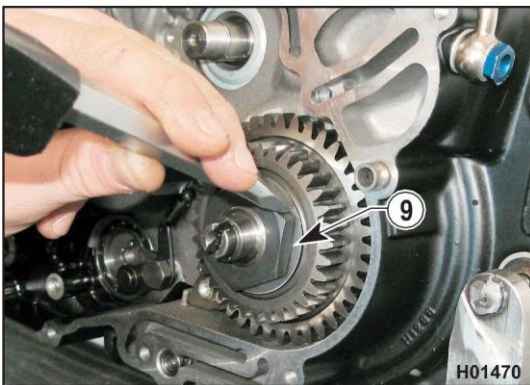
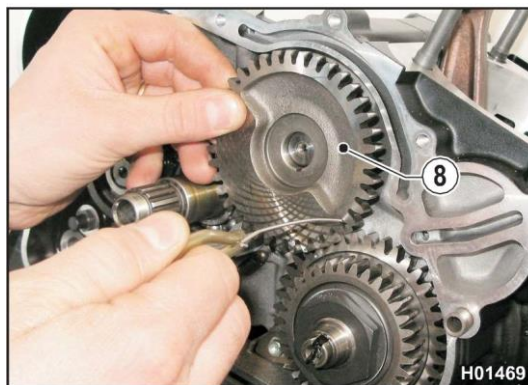




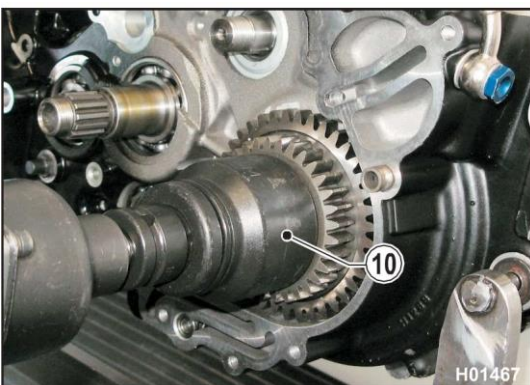
Turn the engine over and lift the tab of lock washer (6) using a chisel.



Loosen the countershaft nut (7) using an impact screwdriver (24 mm key - 0.94 in.) and remove gear (8) and washer (6).

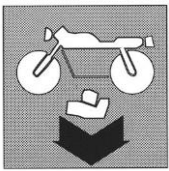


Lift the tab of the lock washer (9) using a chisel.



Hold the connecting rod with one hand and loosen the crankshaft gear nut (10) using an impact screwdriver (38 mm key - 1.49 in.).

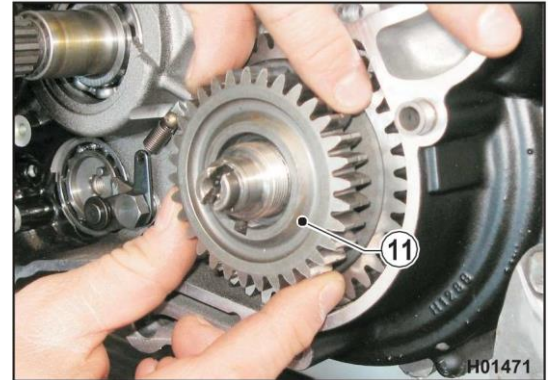
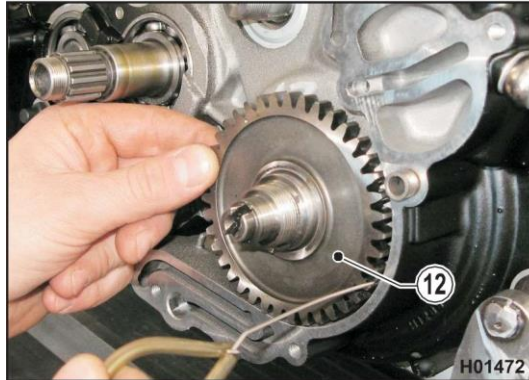




ENGINE DISASSEMBLY

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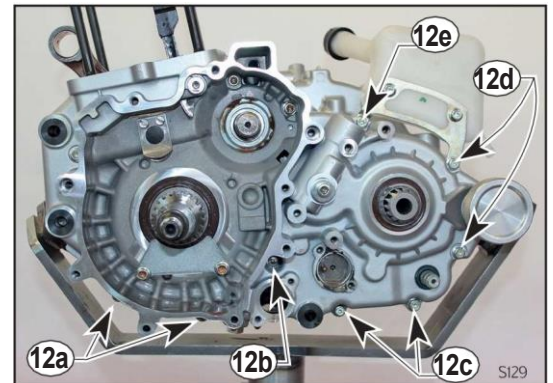
Remove clutch housing drive gear (11) and countershaft drive gear (12).



Turn the engine over.

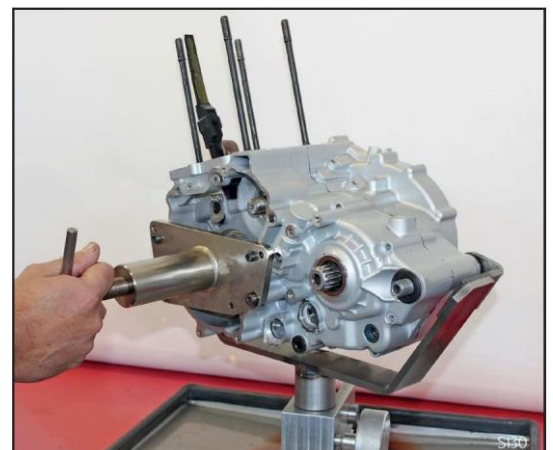
Loosen the crankcase screws (12) using an 8 mm (0.31 in.) socket wrench;

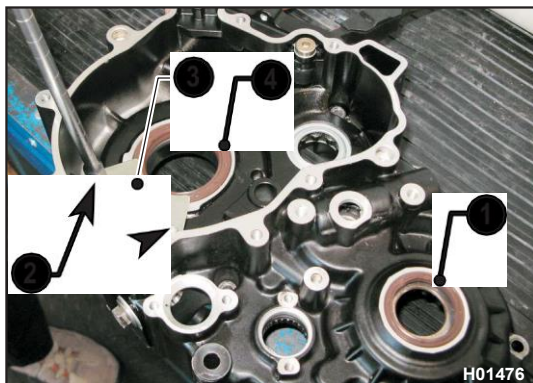
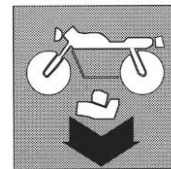
WARNING: The screws are not all the same length, mark them so as to refit them in their original positions on assembly; the central screws has a copper washer.



- 12a= M6 x 55 mm (2.165 in.)
- 12b= M6 x 55 mm (2.16 in.)+ copper washer
- 12c= M6 x 55 mm (2.165 in.)
- 12d= M6 x 65 mm (2.559 in.)

Secure the puller to the left crankcase and separate the two crankcase halves.



**Left crankcase seal replacement**

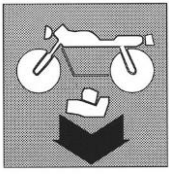
- Remove the sprocket seal (1) with a screwdriver.

WARNING: On assembly, position the seal flush with the crankcase.

- Loosen the screws (2) using an 8 mm (0.31 in.) wrench and remove the plate (3) retaining the crankshaft seal (4).



- Remove the seal (4) with a screwdriver.



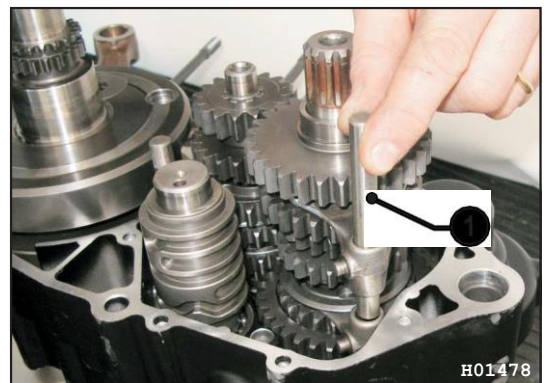
Countershaft removal

- Tap the countershaft (1) with a rubber hammer and *remove* it from the crankcase.

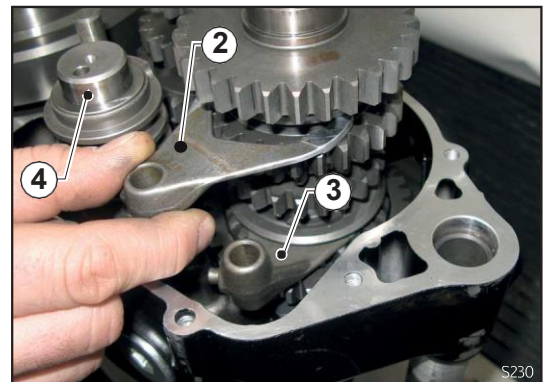


Gearbox disassembly

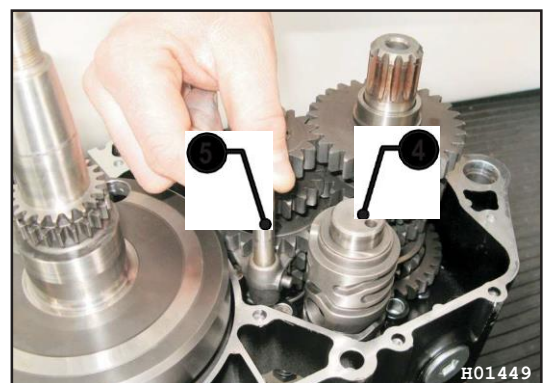
- Remove the shaft (1) of the output shaft shifter forks.

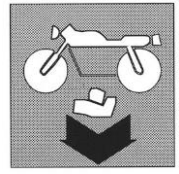


- Release the Forks (2) and (3) from the drum (4) and *remove* them.

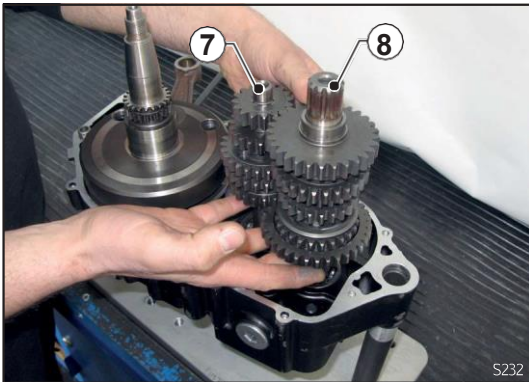


- Remove the input shaft Fork shaft (5) and *remove* the drum (4).

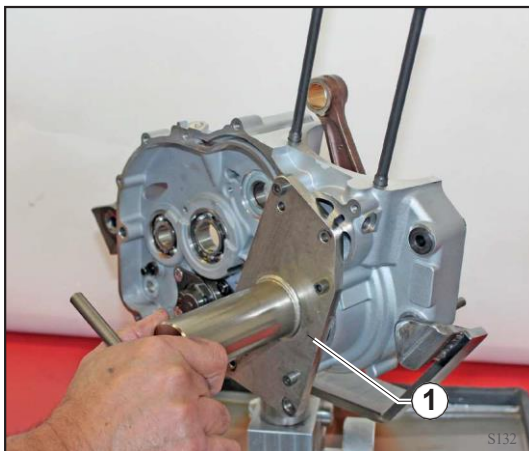




- Remove the input shaft Fork (6).

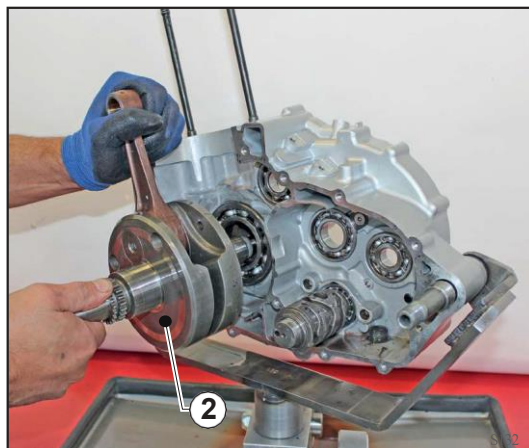


- Remove input shaft (7) and output shaft (S) being careful not to lose any shims (if Fitted).

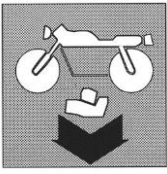


Crankshaft removal

- Slide the puller (1) over the right end of the crankshaft.



- Secure the puller to the crankcase half and remove the crankshaft (2) From the opposite side.



Crankshaft components removal

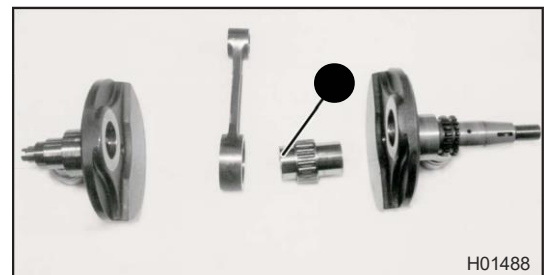
- Insert a plate (1) between the two flywheel halves.

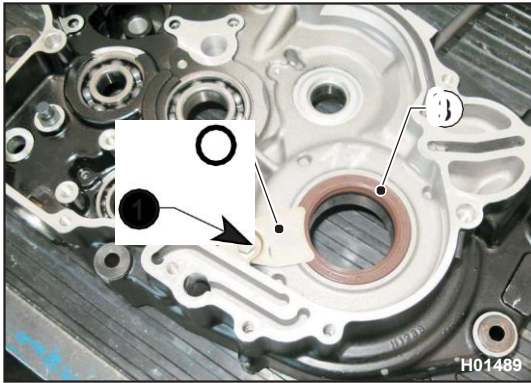
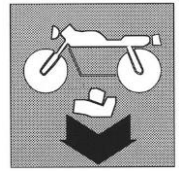


- Remove the crank pin from one of the flywheel halves using a press. Remove connecting rod and needle roller bearing.



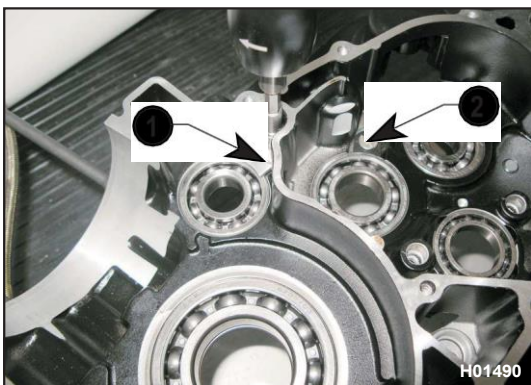
- Turn the shaft and remove the crank pin (2).
Remove the threaded cap and clean the crank pin.



**Right crankcase crankshaft seal removal**

Loosen the screw (1) with an 8 mm (0.31 in.) wrench and remove the plate (2).

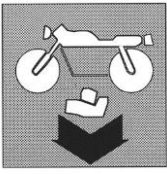
Remove the seal (3) with a screwdriver.

**Crankcase bearings removal**

Remove the retaining plates (1) and (2) from the crankcase halves.

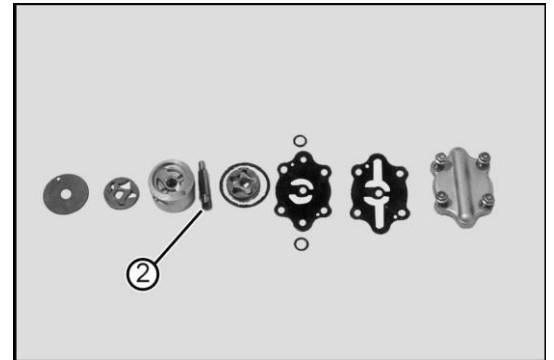


Heat up the crankcase halves to around 125 °C in a Furnace and extract the bearings using a suitable driver tool.



Oil pump disassembly

- Take the clutch cover (which you have removed previously) and remove the Four screws (1) (8 mm wrench- 0.31 in.) securing the small cover; remove all components until getting to the oil pump drive shaft (2).



Stator removal

- Take the ignition cover (which you have removed previously) and remove the five Allen screws [three 6 mm (0.236 in.) screws (1) and two 4 mm (0.157 in.) screws (2)]; remove stator (3) and pick-up sensor (4) From the left cover.

