


13.1 COMPLETE ENGINE REMOVAL

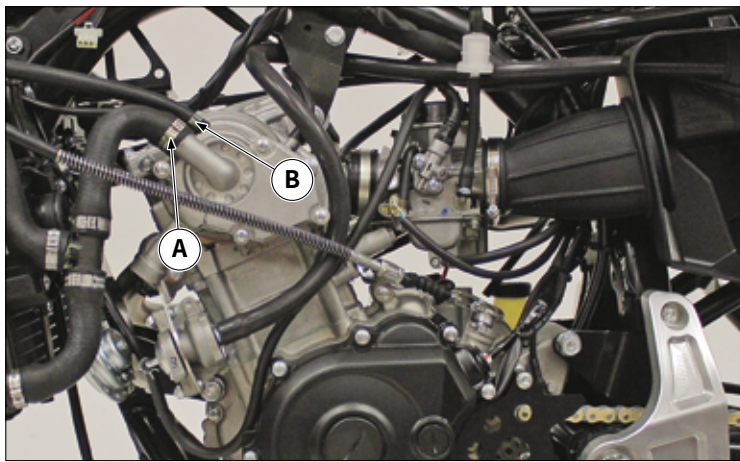
 **Position the vehicle on a central stand and support its rear weight with straps and hoist.**

Remove:

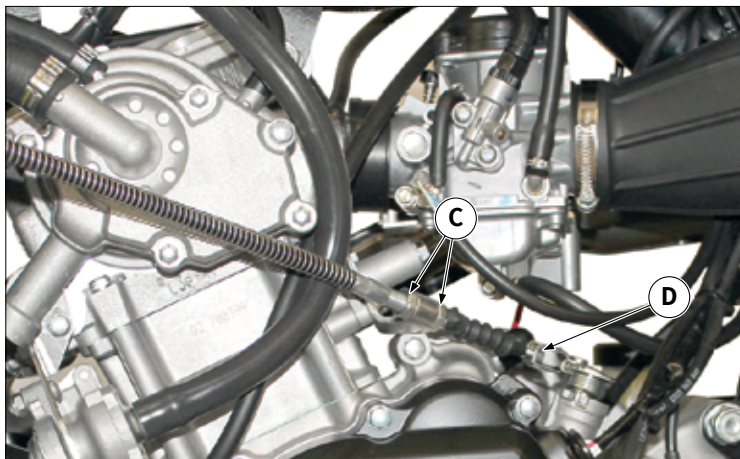
- Seat, refer to “12.1 Seat removal” on page 117;
- Tank, refer to “12.8 Fuel tank removal” on page 123;
- Exhaust system, refer to “12.20 Exhaust system removal” on page 151;
- Chain, refer to “12.14 Chain removal” on page 134;
- SAS Valve, refer to “12.20.2 SAS valve removal” on page 151;
- Conveyors, refer to “12.7 Underbody and conveyors removal” on page 122,
- Refer to “12.5 Side panel removal” on page 121;

- Radiator, refer to “12.21.2 Radiator removal” on page 152.

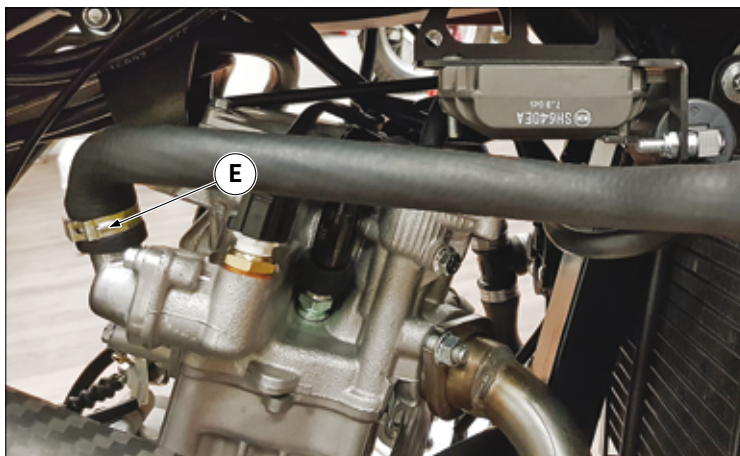
Remove the clamp and tube “A” and clamp and tube “B”.

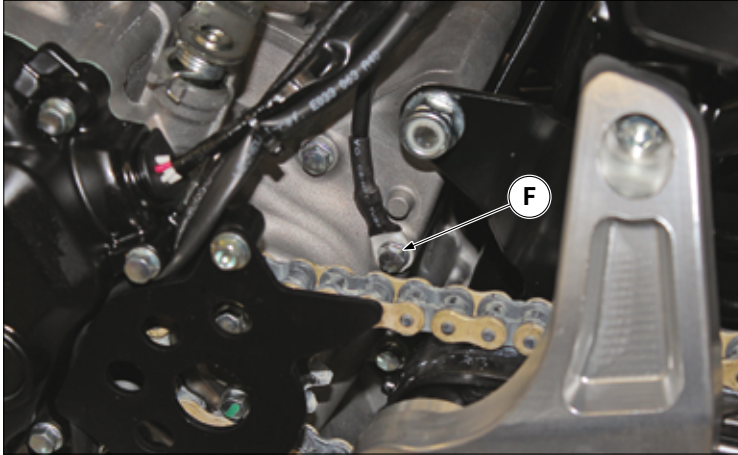


Loosen the nuts “C” of the clutch adjuster and disconnect the clutch cable from connection “D”.

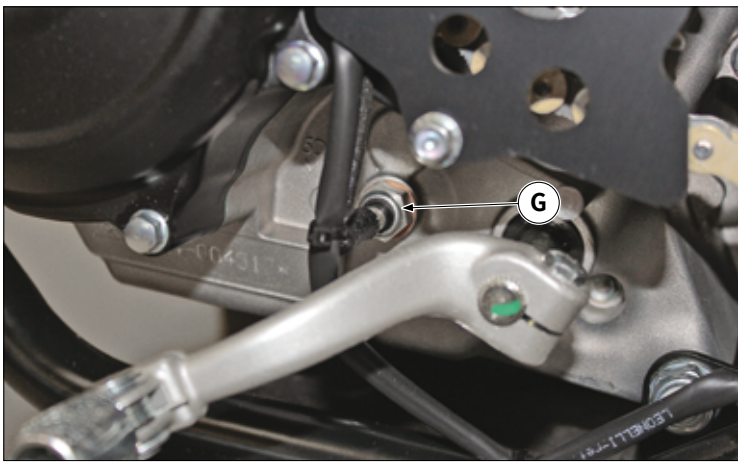


Remove the clamp and the tube “E”.

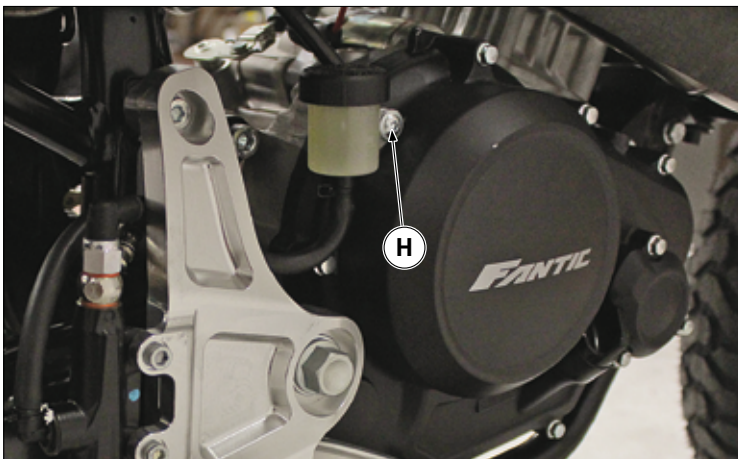




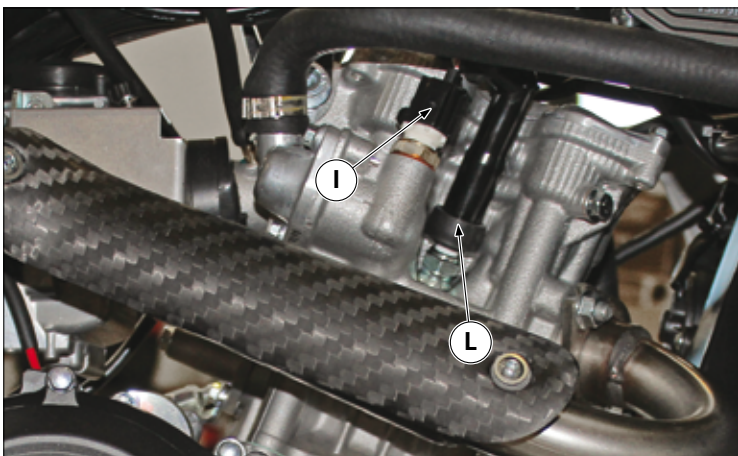
Remove the "F" ground cable.



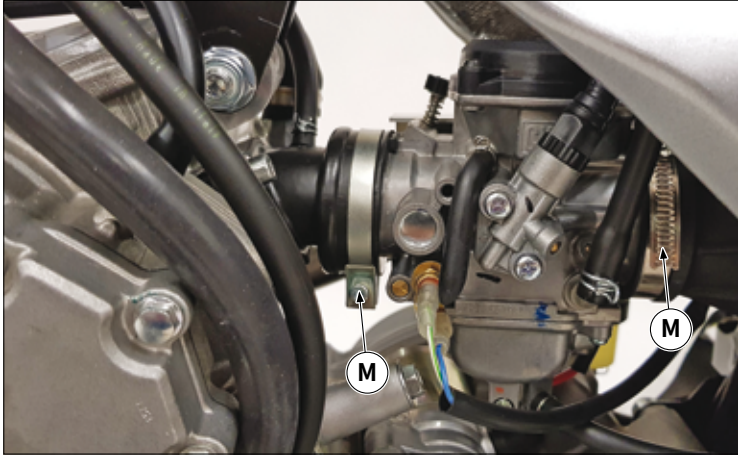
Remove the neutral sensor "G".



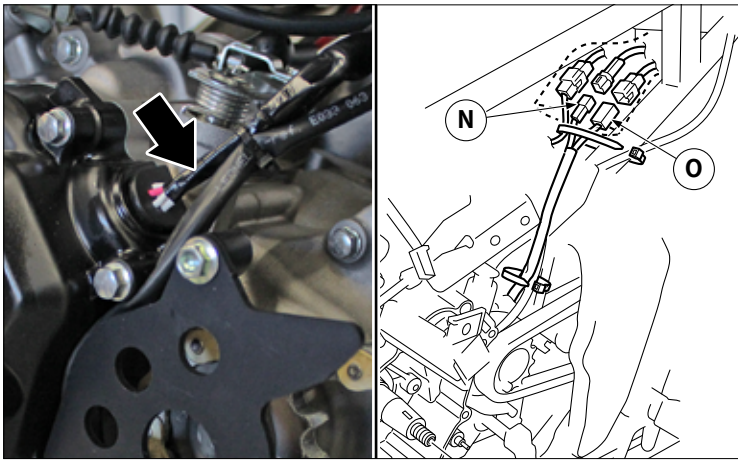
Remove the rear brake fluid reservoir "H".



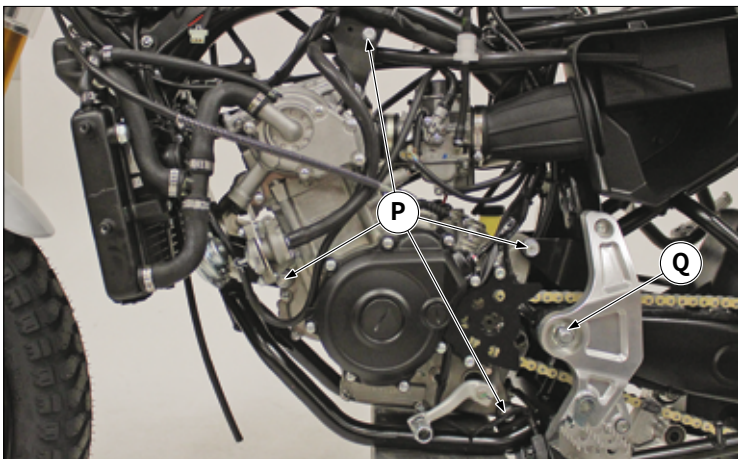
Remove the engine temperature sensor connector "I" and the "L" pipe.



Loosen the metal clamps “M” on the cylinder-carburettor and carburettor-filter casing fitting, then disconnect the carburettor from the fittings.




Remove the clamps and disconnect the crankshaft position sensor connector “N “ and the stator coil connector “O”.

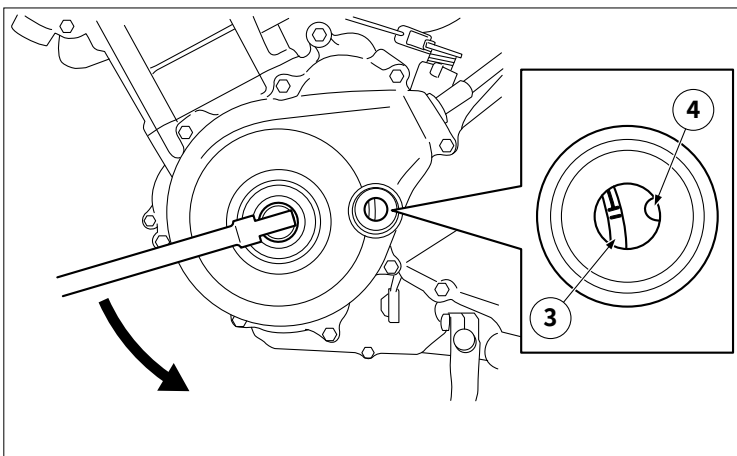
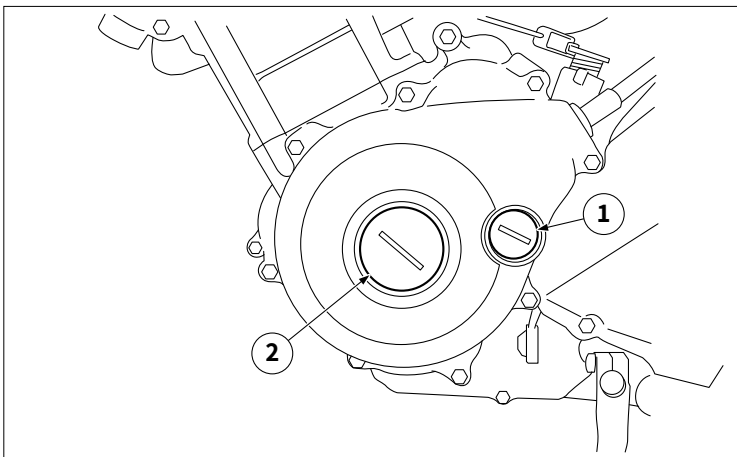
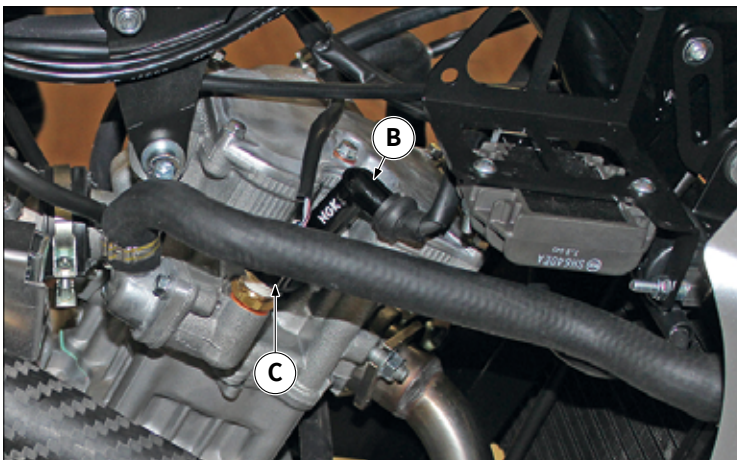
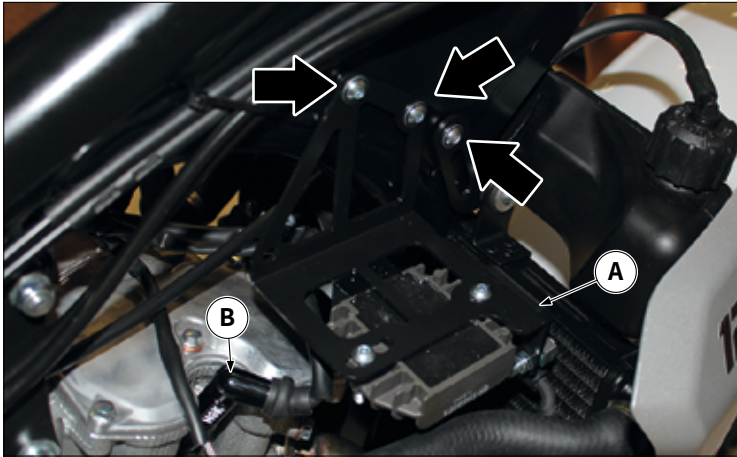


Remove the engine mountings on the frame “P” and the swingarm pivot “Q”.

Remove the engine from the vehicle.

-  **Tightening torques:**
- M10 screws: 50 Nm (5.0 m•kg, 36 ft•lb)
 - M8 screws: 27 Nm (2.7 m•kg, 20 ft•lb)

 **Proceed in the reverse order for reassembling.**



13.2 VALVE CLEARANCE ADJUSTMENT

The following procedure applies to all valves.

- i** The valve clearance adjustment must be performed with the engine cold, at room temperature.
- ⚠** When it is necessary to measure or adjust the valve clearance, the piston must be at the top dead center (TDC) of the compression phase.

Remove the complete fuel tank. Refer to “12.8.2 Complete tank removal” on page 123.

Remove the tension regulator support bracket “A”, unscrewing the three support screws, disconnect the voltage regulator and the starting coil.

- ⚠** Before removing the spark plug, remove the impurities, if any, accumulated in the sump, using compressed air, to prevent them from entering the cylinder.

Disconnect the spark plug cap “B” and the engine water temperature sensor “C” and remove the spark plug;

Remove:

- Cylinder head cover;
- Cylinder head cover gasket. Refer to “13.5 Cylinder head” on page 171.

- i** Remove the cylinder head cover pulling it out of the frame tubes.

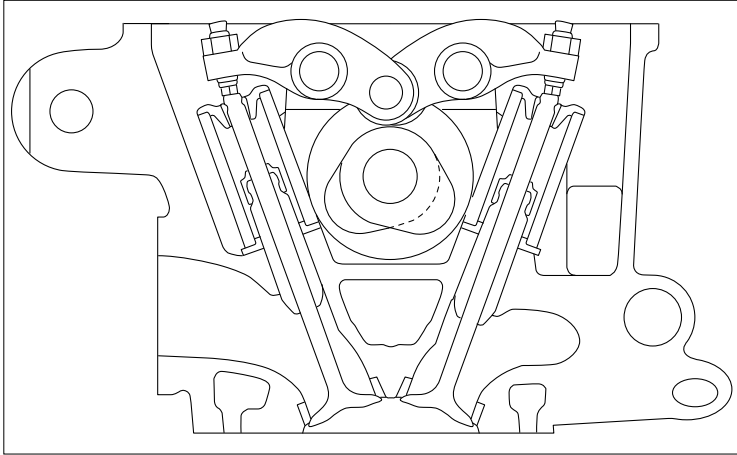
Remove the access screw to the timing mark “1” and the crankshaft end access screw “2”.

Measure the valve clearance and if it does not comply with the specifications, adjust it appropriately.

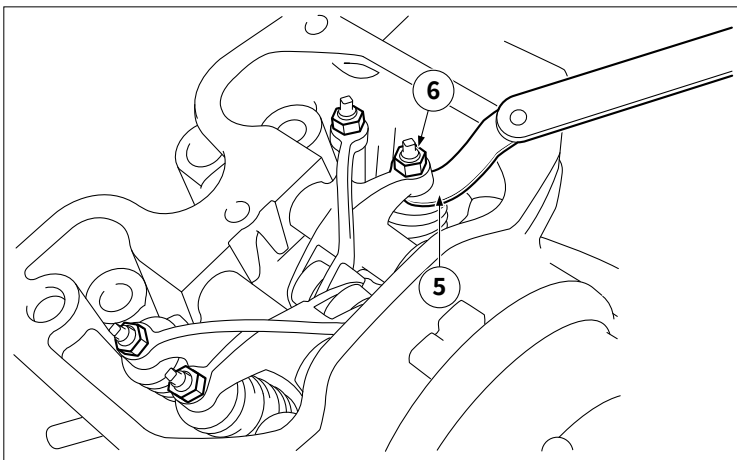
- ⚠** Valve clearance (cold):
 - 0.10 - 0.14 mm (0.0039 - 0.0055 in)
 - 0.20 - 0.24 mm (0.0079 - 0.0094 in)

Turn the crankshaft counter-clockwise.

Align the TDC reference mark “3” on the generator rotor to the stationary reference mark “4” on the generator cover.

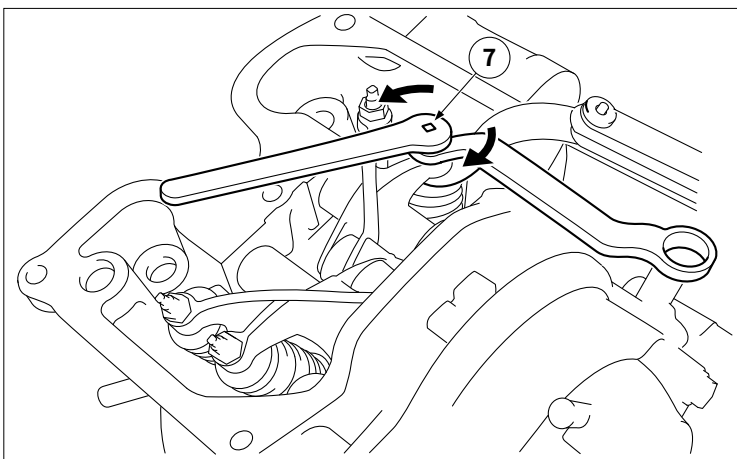


Check that the camshaft lobes are positioned as shown in the figure.



Measure the valve clearance with a "5" thickness gauge.
If the clearance does not comply with the prescribed values, adjust.
To adjust the valve clearance:

- Loosen the locknut "6";
- Insert a thickness gauge "5" between the end of the adjustment screw and the tip of the valve.



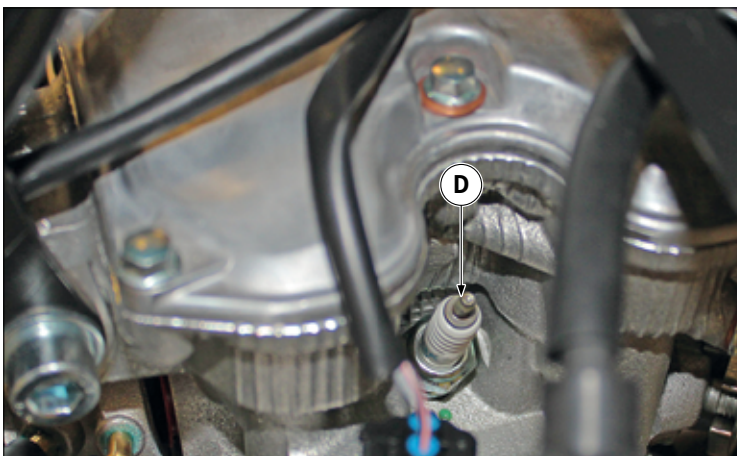
- Turn the adjustment screw "7" clockwise or counter-clockwise until the prescribed valve clearance is obtained.

✖ • Tappet adjustment tool
• 3 mm and 4 mm valve adjustment device

- Hold the adjustment screw to stop it from moving and tighten the locknut as prescribed.

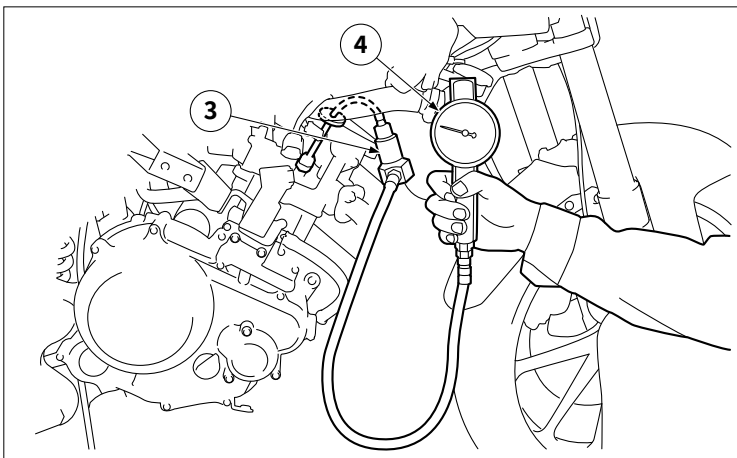
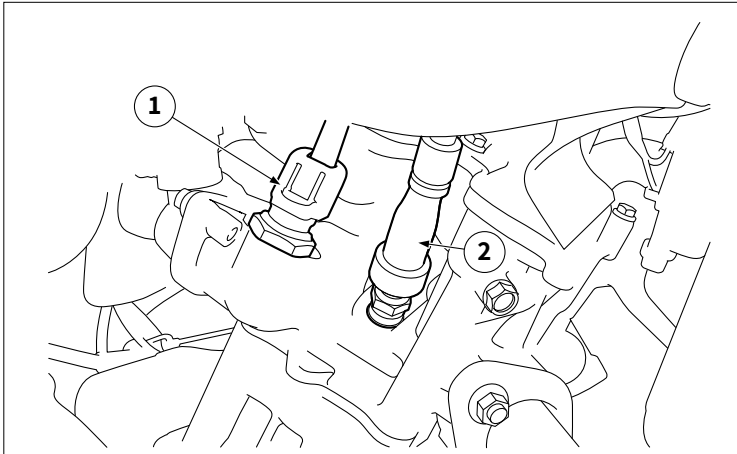
🔧 Tightening torque
Adjustment screw locknut: 7 Nm (0.7 m•kg, 5.1 ft•lb)

- Measure the valve clearance again.
- If the valve clearance still does not comply with the prescribed values, repeat all the valve clearance adjustment operations until the prescribed clearance is achieved.



Install the crankshaft end access screw (together with a new O-ring) and the timing reference access screw (together with a new O-ring)
Install a new cylinder head cover gasket and cylinder head cover.
Refer to "13.5 Cylinder head" on page 171.
Install and tighten the spark plug "D".

✖ Tightening torque
Spark plug: 13 Nm (1.3 m•kg, 9.4 ft•lb)



13.3 COMPRESSION PRESSURE MEASUREMENT

i An insufficient compression pressure affects performance.

Measure the valve clearance and if it does not comply with the specifications, adjust it. Refer to “13.2 Valve clearance adjustment” on page 167.

Start the engine, warm it up for a few minutes, then turn it off.

Disconnect the coolant temperature sensor connector “1” and the spark plug cap “2”.

Remove the spark plug.

! Before removing the spark plug, remove the impurities, if any, accumulated in the sump, using compressed air, to prevent them from entering the cylinder.

- ✂** • Extension
- Compression gauge
- Engine compression tester

Install the extension “3” and the “4” compression pressure gauge
Measure the compression pressure and if it does not comply with the specifications refer to operations C and D.

✂ **Standard compression pressure (above sea level):**
550 kPa/600 rpm
(5.5 kgf/cm²/600 rpm, 78.2 psi/600 rpm)
Minimum-maximum:
480-620 kPa (4.8-6.2 kgf/cm², 68.3-88.2 psi)

- A. Turn the ignition switch to ON.
- B. With the throttle fully open, start the engine until the pressure indicated on the compression pressure gauge stabilizes.
- C. If the compression pressure is higher than the prescribed maximum value, check that there are no carbon deposits on the cylinder head, on the valve surfaces and on the piston rim.

! Remove the carbon deposits, if any.

- D. If the compression pressure is lower than the minimum value prescribed, pour a teaspoon of engine oil into the spark plug hole and repeat the measurement. Refer to the following table.

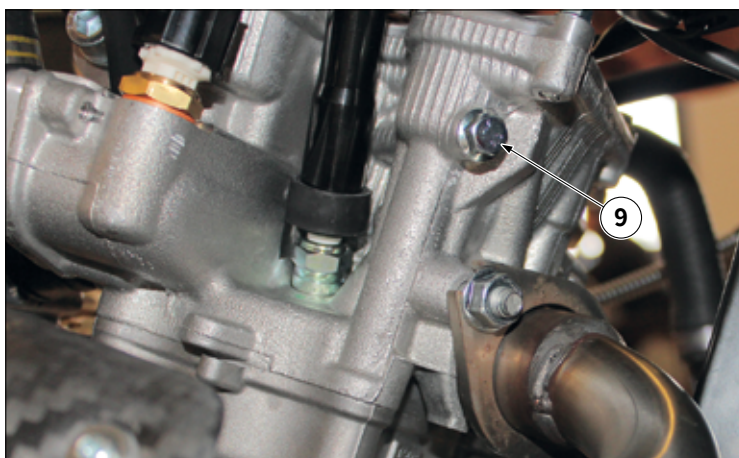
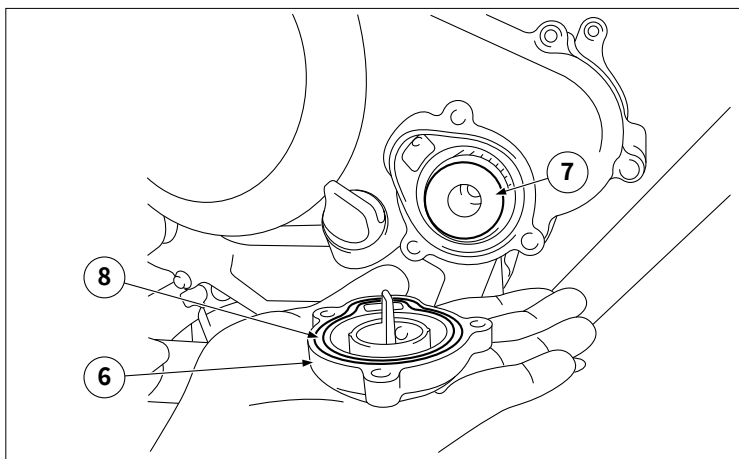
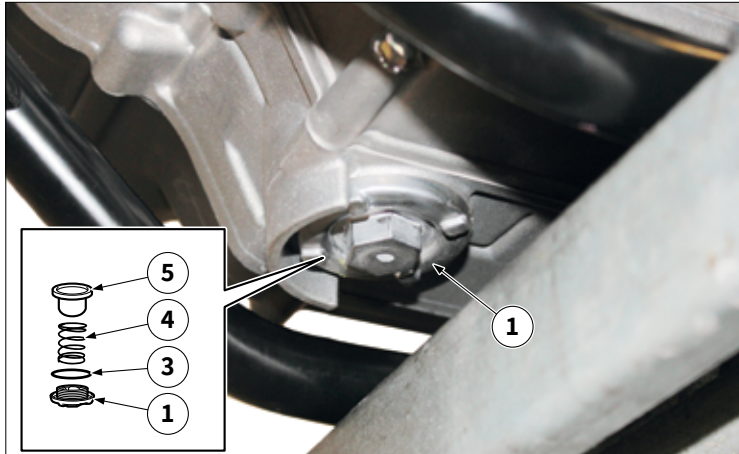
Compression pressure (with diagnosis application)	
Reading	Diagnosis
Value greater than the value measured without oil	Worn and/or damaged segment(s). Repair.
Value equal to the value measured without oil	Head gasket, cylinder head and valves or piston probably defective. Repair.

Remove the extension and the compression gauge

Install the spark plug.

🔧 **Tightening torque: Spark plug 13 Nm (1.3 m•kg, 9.4 ft•lb)**

Connect the spark plug cap and the coolant temperature sensor connector.



13.4 ENGINE OIL CHANGE

Start the engine, warm it up for a few minutes, then turn it off.
Place a container under the oil drain bolt "1".

Remove the engine oil filler plug "2" (dipstick) and then the engine oil drain plug "1".


Remove:

- O-ring gasket "3";
- Spring "4";
- Engine oil filter "5".


Completely drain the engine oil from the crankcase.

If also the oil filter element must be replaced, perform the following procedure:


- A. Remove the oil filter element cover "6" and the oil filter element "7";
- B. Install a new O-ring gasket "3";
- C. Install the new oil filter element "8" and the oil filter element cover "6".

 **Tightening torque**
Oil filter element cover bolt:
10 Nm (1.0 m·kgf, 7.2 ft·lbf).

Check the engine oil strainer and clean it if there are impurities.
Install the engine oil strainer, the spring, a new O-ring gasket and the oil drain plug.

 **Tightening torque**
Oil drain plug: 32 Nm (3.2 m·kgf, 23 ft·lbf)

Fill the crankcase with the prescribed amount of recommended engine oil.

-  **Amount of engine oil**
- **Quantity (disassembled):**
1.15 L (1.22 US qt, 1.01 Imp.qt).
 - **Without replacement of the oil filter element:**
0.95 L (1.00 US qt, 0.84 Imp.qt)
 - **With replacement of the oil filter element:**
1.00 L (1.06 US qt, 0.88 Imp.qt)

Install the engine oil filler cap.

Start the engine, warm it up for a few minutes, then turn it off.

Check the engine for any engine oil leaks

Check the engine oil level. Refer to "9.1 Engine oil level check" on page 26.

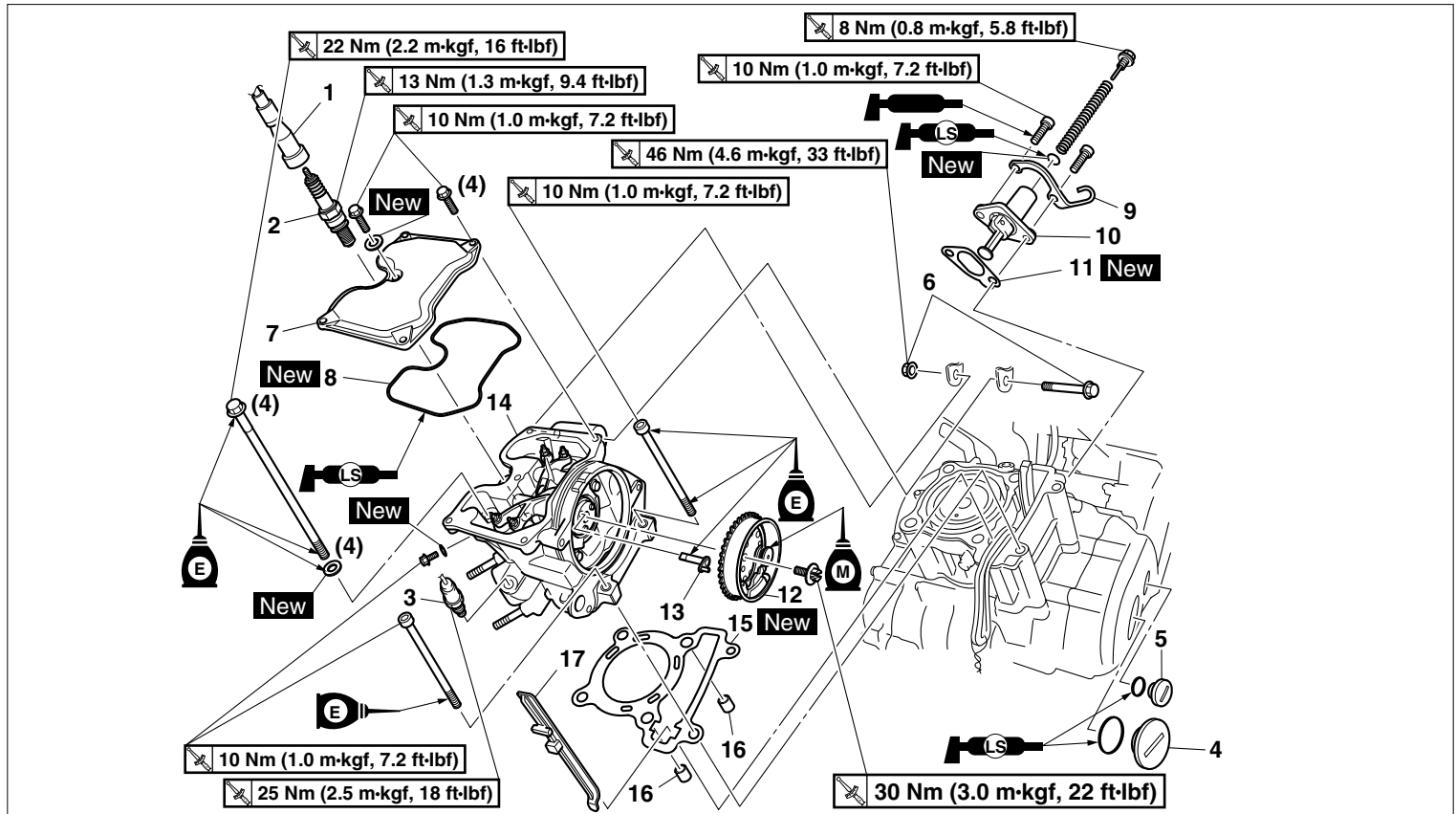
Check the engine oil pressure:

- A. Slightly loosen the oil level inspection cap "9".
- B. Start the engine and let it idle until the engine oil begins to seep from the oil level inspection plug. If the engine oil does not come out after a minute, switch off the engine so that it does not lock.
- C. Check the engine oil passages, the oil filtering element and the oil pump for damage or leakage. Refer to "13.14.2 Oil pump check" on page 214.
- D. Start the engine after solving the problem and check the engine oil pressure again.
- E. Tighten the oil level inspection cap as prescribed.

 **Tightening torque**
Oil level inspection plug: 10 Nm (1.0 m·kgf, 7.2 ft·lbf).

13.5 CYLINDER HEAD

Cylinder head removal sequence.

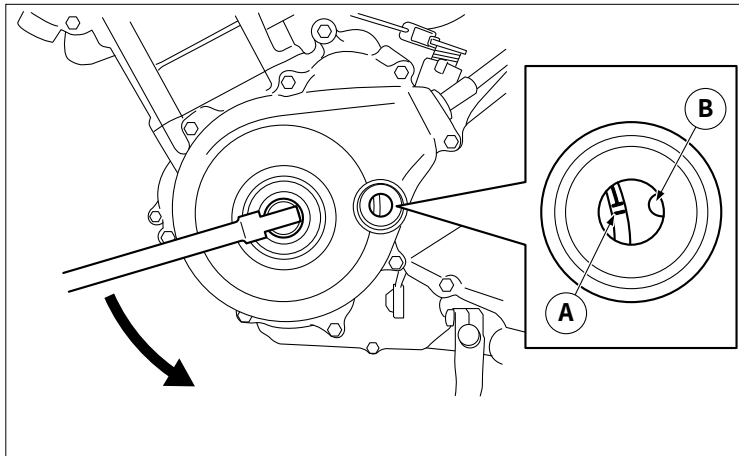


Preliminary operations:

- Remove the seat. Refer to "12.1 Seat removal" on page 117;
- Remove the complete fuel tank. Refer to "12.8 Fuel tank removal" on page 123;
- Remove the voltage regulator together with the ignition coil and the support bracket

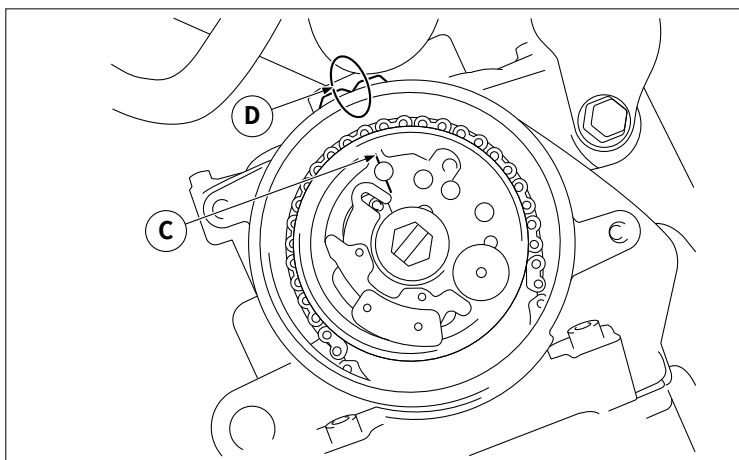
Sequence	Operation/Components to remove	Quantity	Remarks
1	Spark plug cap	1	Disconnect the cap from the spark plug.
2	Spark plug	1	
3	O2 sensor	1	The sensor is not active for this motorcycle.
4	Crankshaft end access screw	1	
5	Access screw to the reference for timing	1	
6	Engine/nut mounting bolt (front side)	1/1	
7	Cylinder head cover	1	
8	Cylinder head cover gasket	1	
9	Clutch cable support	1	
10	Timing chain tensioner	1	
11	Timing chain tensioner gasket	1	
12	Camshaft sprocket	1	
13	Decompression cam	1	
14	Cylinder head	1	
15	Cylinder head gasket	1	
16	Centering pin	2	
17	Timing chain guide (exhaust side)	1	

For installation, reverse the removal procedure.

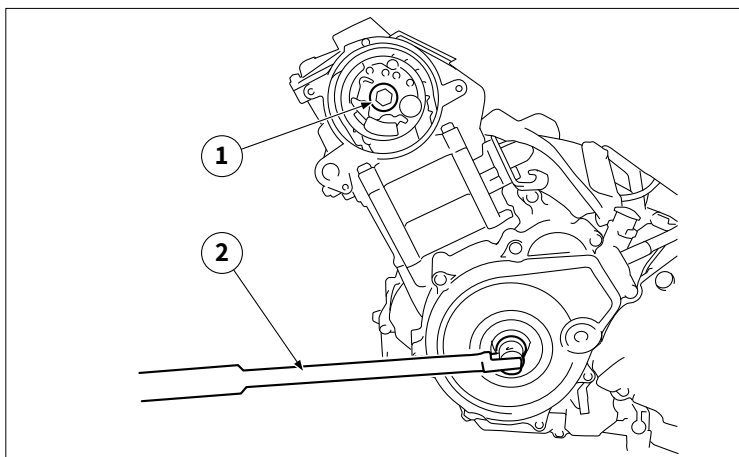


13.5.1 Cylinder head removal

Align the reference mark "A" printed on the generator rotor with the stationary reference mark "B" on the generator cover. Turn the crankshaft counter-clockwise.

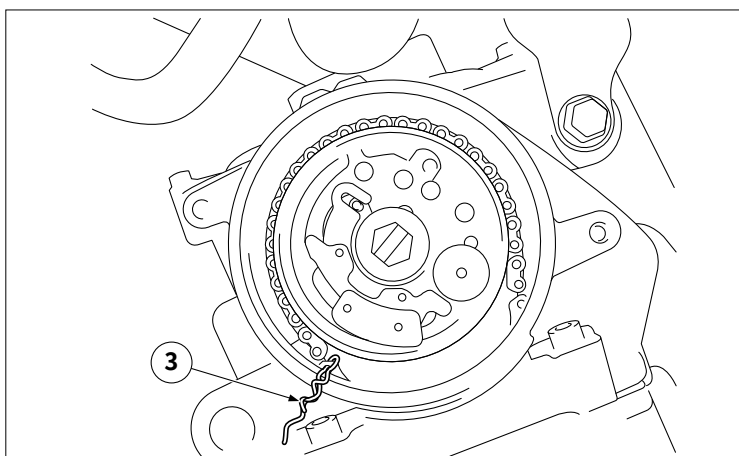


With the piston at the TDC compression phase, align the reference mark "C" printed on the camshaft sprocket to the reference mark "D" on the cylinder head.



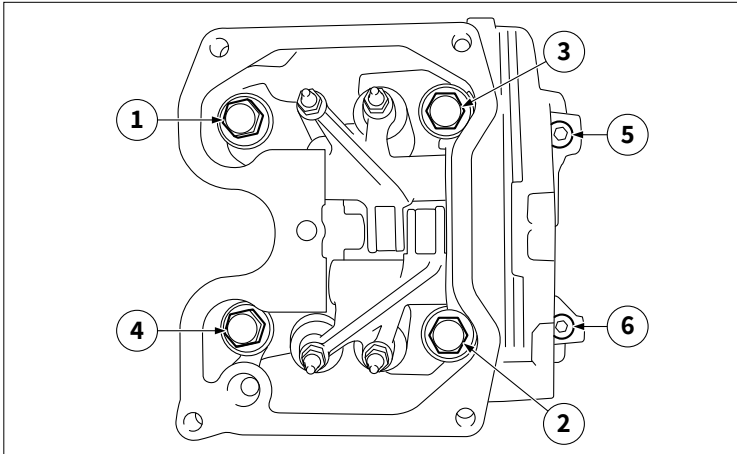
Loosen the camshaft sprocket bolt "1".

i Keeping the generator rotor nut pressed with a wrench "2", loosen the camshaft sprocket bolt.



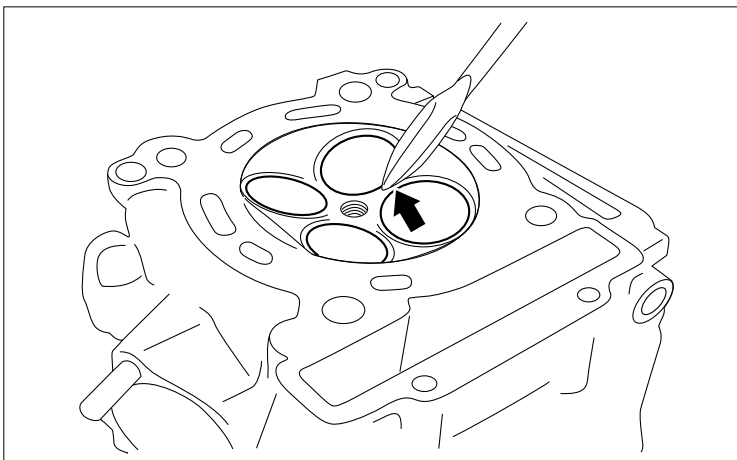
Remove the camshaft sprocket.

i To prevent the timing chain from falling into the crankcase, fix it with an iron wire "3".



Remove the cylinder head.

- i** • Loosen the bolts in the appropriate sequence indicated.
- Loosen each bolt 1/2 turn at a time. Once all the bolts have been completely loosened, remove the bolts 1, 2, 4 and 6, then remove the cylinder head with the bolts 3 and 5 inserted in the relevant holes.

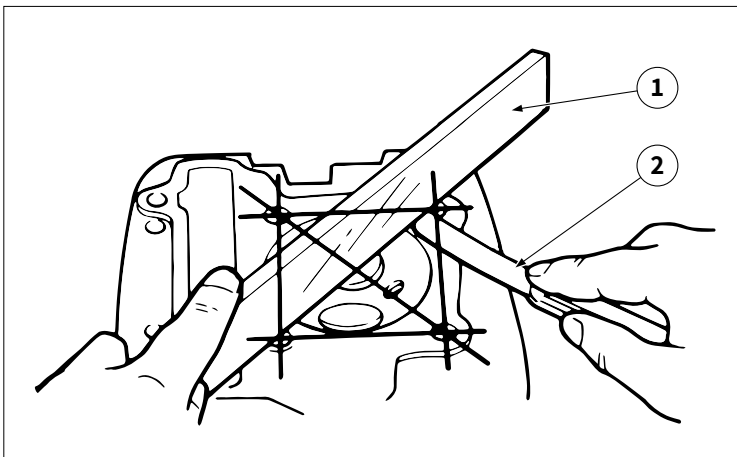


13.5.2 Cylinder head check

Remove the carbon deposits from the combustion chamber using a rounded scraper.

- !** Do not use a very sharp tool to avoid damaging or scratching the thread of the spark plug hole and valve seats.

Check that there are no obvious damage or scratches on the surface of the cylinder head: in this case, replace it. Check the presence of mineral deposits and/or rust on the surface of the water jacket of the cylinder head: if present, eliminate them.

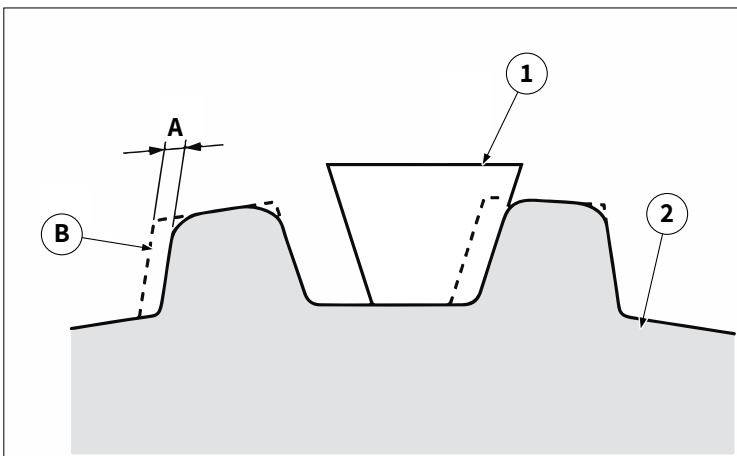


Measure the deformation of the cylinder head. If it does not comply with the specifications, resurface the cylinder head.

✂ Deformation limit: 0.03 mm (0.0012 in)

- Place a calibration rod "1" and a thickness gauge "2" transversely on the cylinder head.
- Measure the deformation.
- If the limits are exceeded, flatten the cylinder head as follows.
- Place 400-600 grit wet sandpaper on a countertop and flatten the cylinder head in an eight movement.

- i** To obtain a uniform surface, rotate the cylinder head several times.

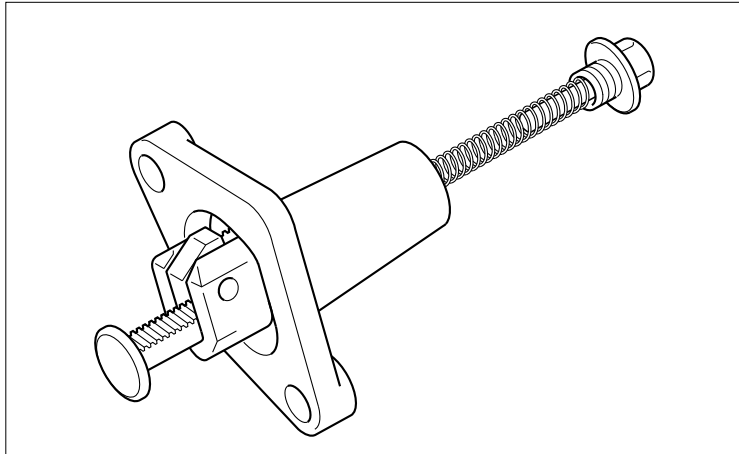


13.5.3 Camshaft sprocket and timing chain guide check

Check the camshaft sprocket: if there is a tooth with more than 1/4 "A" wear, replace the camshaft sprocket, the timing chain and the crankshaft.

- "A": 1/4 of a tooth;
- "B": Correct measurement;
- "1": Timing chain roller;
- "2": Camshaft sprocket.

Check the timing chain guide (exhaust side): if there is damage and/or wear, replace it.



13.5.4 Timing chain tensioner check

Check the timing chain tensioner: if there are any cracks and/or damage, replace it.

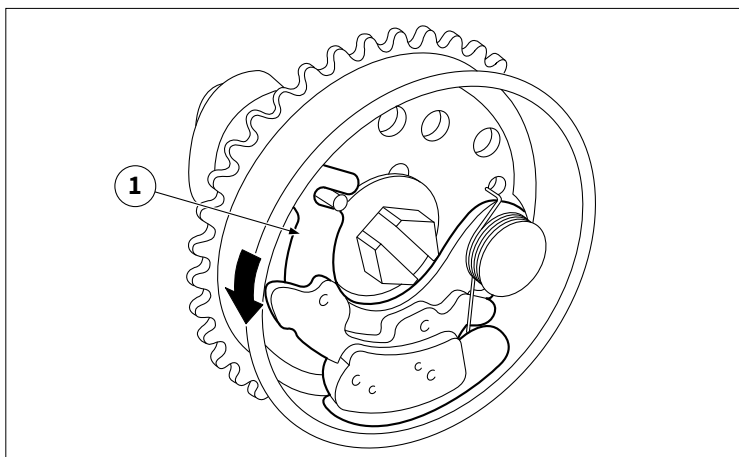
Check the operation of the unidirectional cam: if the movement is difficult, replace the timing chain tensioner.

Check the following components, and if they show damage or signs of wear, replace them:

- Cover bolt;
- O-ring;
- Spring;
- Unidirectional cam;
- Gasket;
- Timing chain tensioner rod.

Proceed as follows to remove the tensioner:

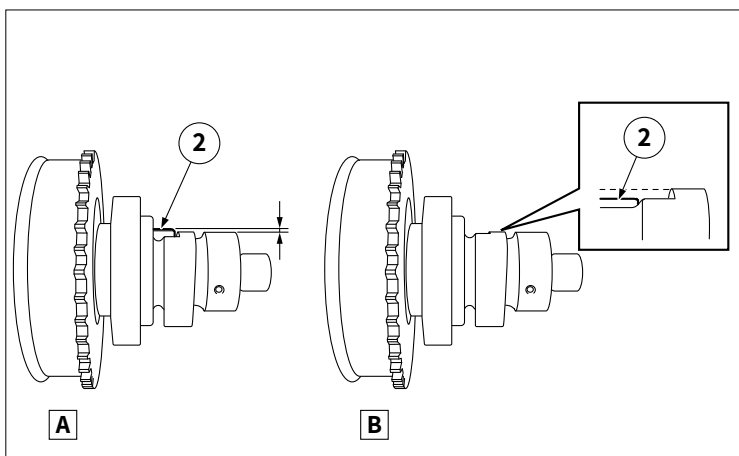
- Remove the cover bolt and the spring;

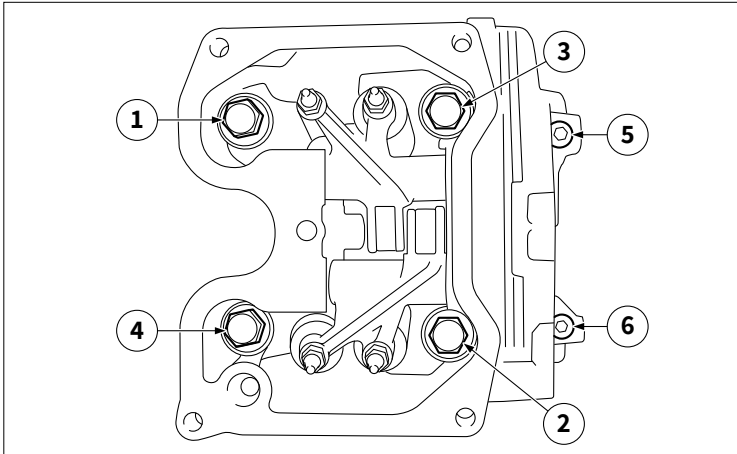


13.5.5 Decompression system check

To check the decompression system, proceed as follows:

- Check the decompression system with the camshaft sprocket and the decompression cam installed in the camshaft;
- Check that the decompressor lever "1" moves smoothly;
- Without activating the decompressor lever, check that the decompressor cam "2" protrudes from the camshaft (exhaust cam) as shown in figure "A";
- Move the decompressor lever "1" in the direction of the arrow and check that the decompression cam does not protrude from the camshaft (exhaust cam) as shown in figure "B".





13.5.6 Cylinder head installation

Reassemble the cylinder head in its seat.

i Pass the timing chain through the timing chain recess.

Tighten the cylinder head bolts “1”, “2”, “3” and “4”.

Tightening torque Cylinder head bolt 1-4:
22 Nm (2.2 m·kgf, 16 ft·lbf)

Tighten the cylinder head bolts “5” and “6”.

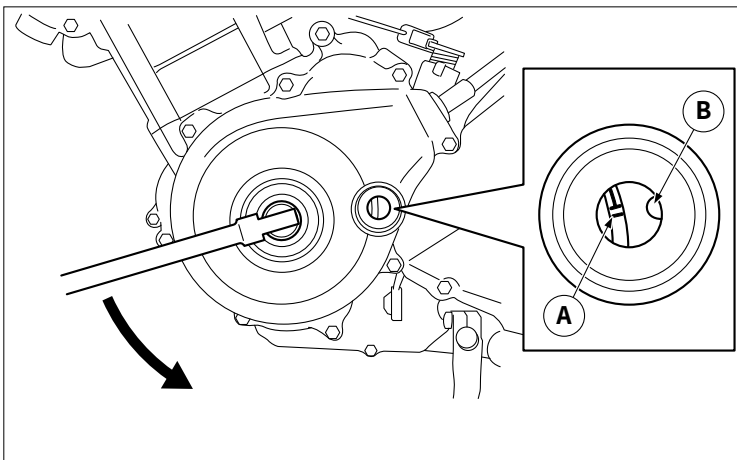
Tightening torque Cylinder head bolt 5-6:
10 Nm (1.0 m·kgf, 7.2 ft·lbf)

i Lubricate the cylinder head bolts and washers with engine oil.

i Tighten the cylinder head bolts in two stages, following the correct tightening sequence shown in the figure.

Install the camshaft sprocket as described below:

- Turn the crankshaft counter-clockwise;
- Align the reference mark “A” printed on the generator rotor with the stationary reference mark “B” on the generator cover;

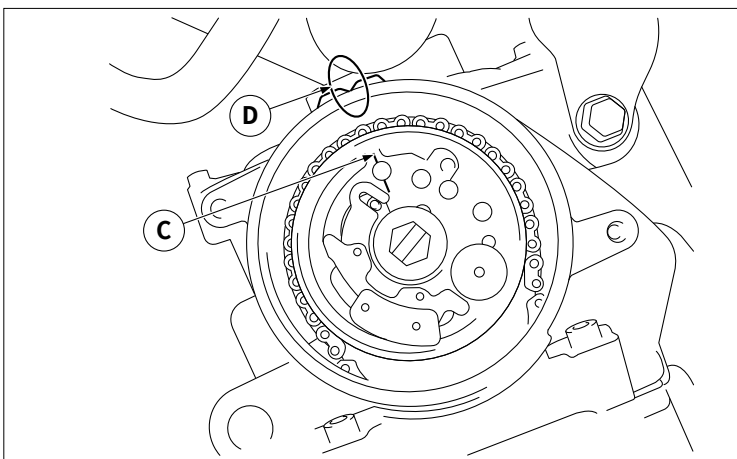


- Align the reference mark “C” printed on the camshaft sprocket with the stationary reference mark “D” on the cylinder head;
- Install the timing chain on the camshaft sprocket, then install the camshaft sprocket on the camshaft;

! When installing the camshaft sprocket, be sure to keep the timing chain as tight as possible on the exhaust side.

! Do not turn the crankshaft when installing the shaft/camshafts to avoid damage or incorrect valve adjustment.

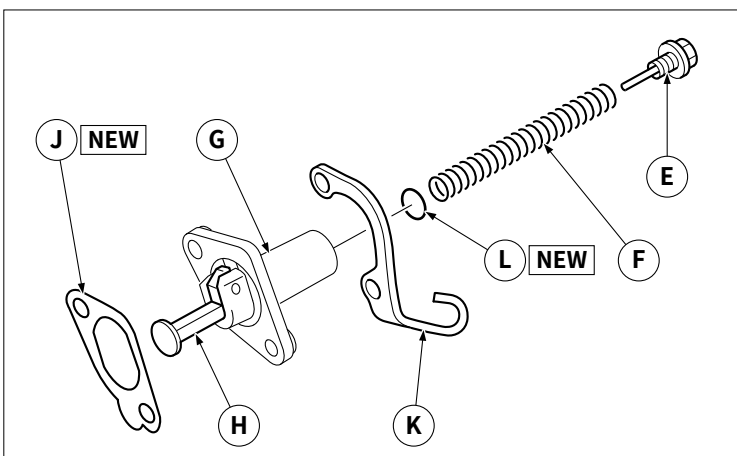
- Holding the camshaft locked, temporarily tighten the camshaft sprocket bolt;
- Remove the wire from the timing chain.

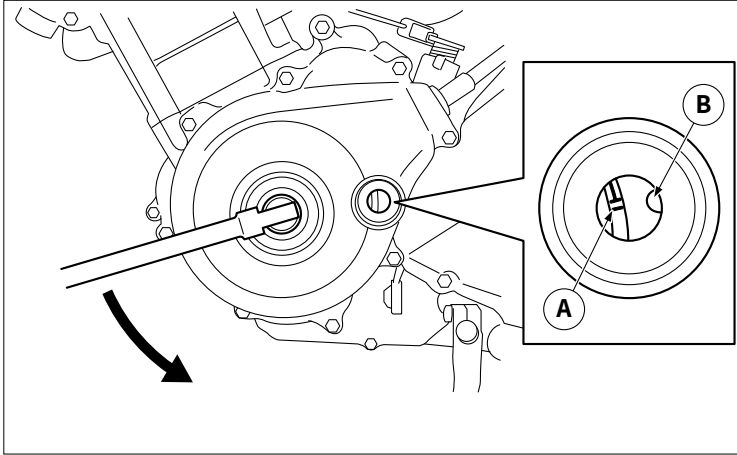


Install the timing chain tensioner as described below:

- Remove the cover bolt “E” and the spring “F”;
- Release the unidirectional cam of the timing chain tensioner “G” and push the timing chain tensioner rod “H” completely inside the timing chain tensioner housing;
- Install the timing chain tensioner, a new gasket “J” and the clutch cable support “K” on the cylinder;
- Install the spring, a new o-ring gasket “L” and the cover bolt.

Tightening torques
Chain tensioner bolt:: 10 Nm (1.0 m·kgf, 7.2 ft·lbf)
Cover bolt: 8 Nm (0.8 m·kgf, 5.8 ft·lbf)

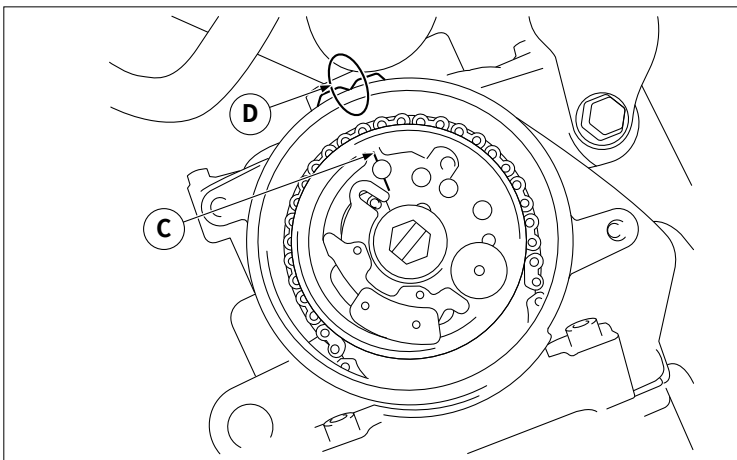




i Apply sealant to the timing chain tensioner bolt threads.

Turn the crankshaft (make several rotations counter-clockwise, as required).

Check and if necessary align the reference mark printed on the generator rotor "A" with the stationary reference mark "B" on the generator cover.



Check and if necessary Align the reference mark "C" printed on the camshaft sprocket to the stationary reference mark "D" on the cylinder head.

Tighten the camshaft sprocket bolt.

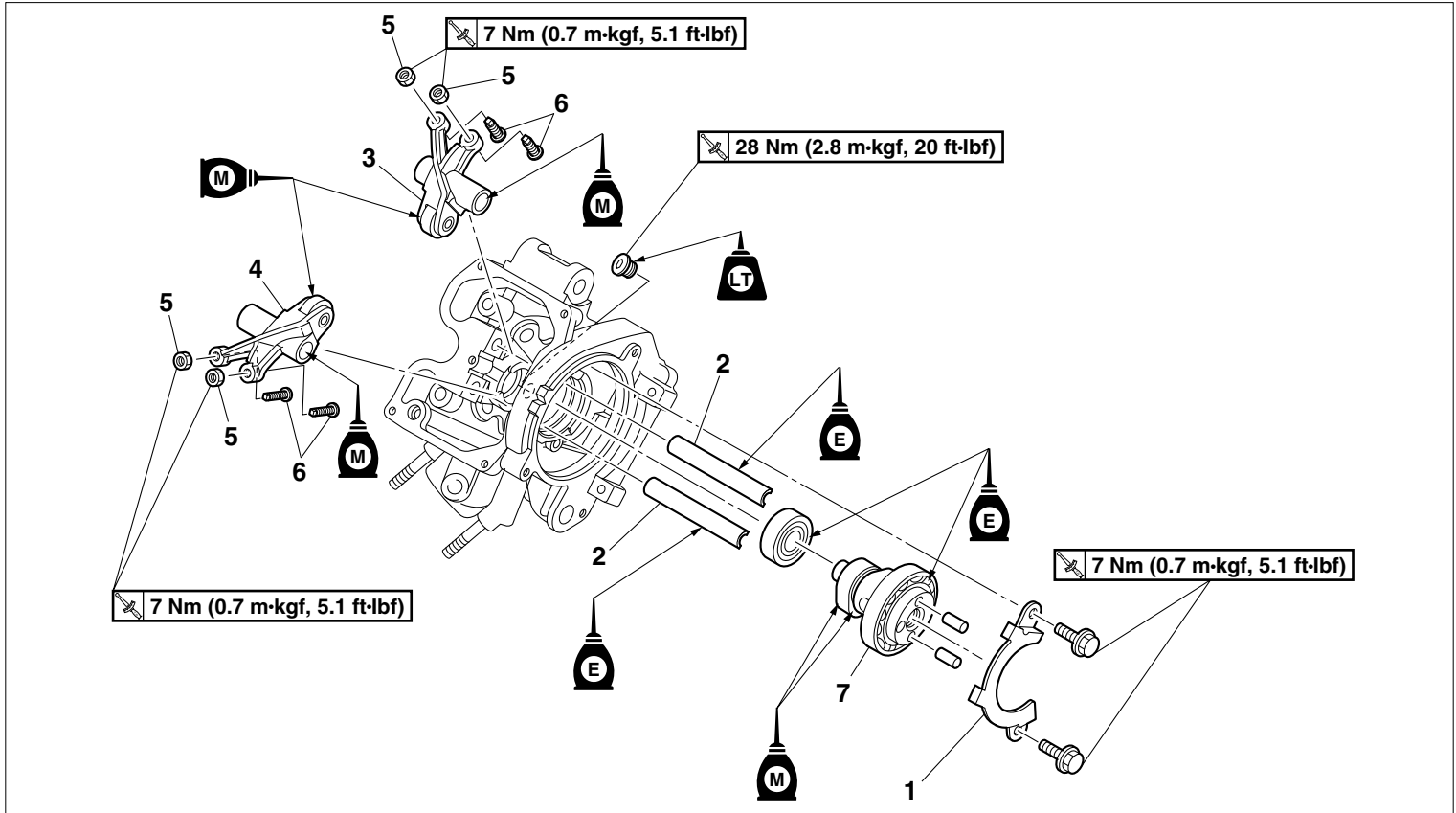
Tightening torque Camshaft sprocket bolt:
30 Nm (3.0 m·kgf, 22 ft·lbf)

⚠ Check the correct tightening of the camshaft sprocket bolt to the specified torque, to prevent the bolt from loosening and damaging the engine.

Measure the valve clearance: if it does not comply with the prescribed values, adjust it. Refer to "13.5 Cylinder head" on page 171.

13.6 CAMSHAFT

Rocker arms and camshaft removal sequence.

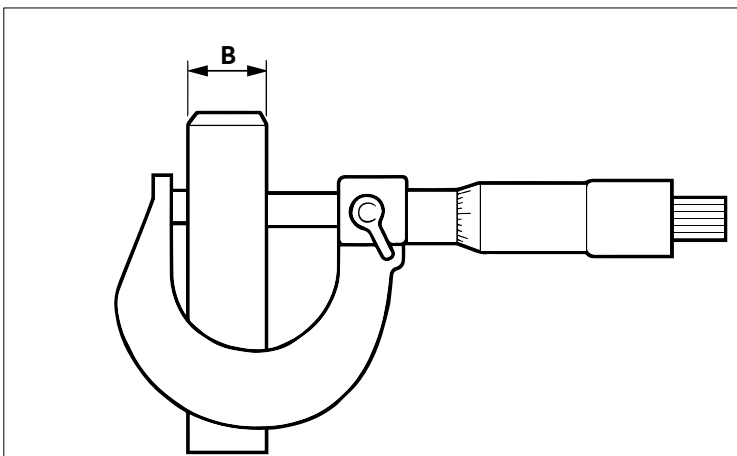
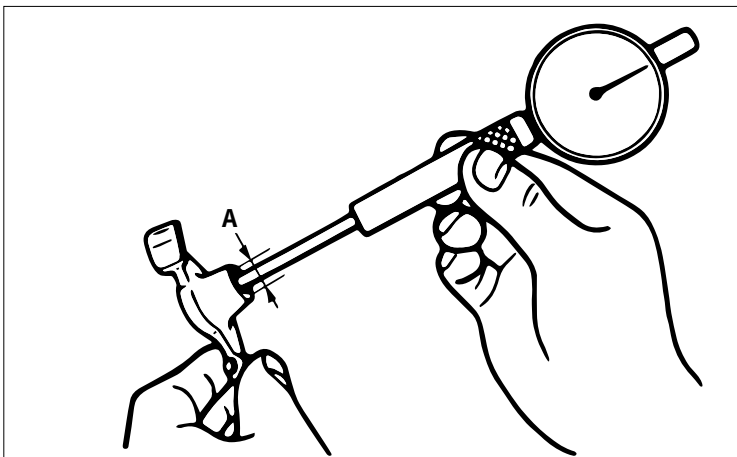
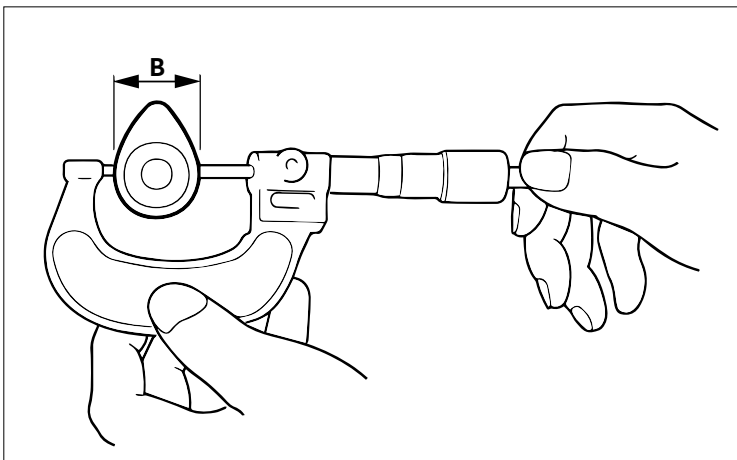
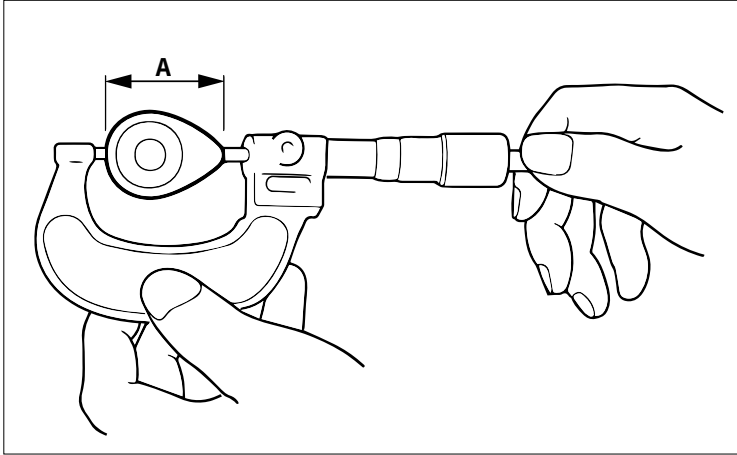


Preliminary operations:

– Cylinder head, refer to “13.5 Cylinder head” on page 171.

Sequence	Operation/Components to remove	Quantity	Remarks
1	Camshaft retainer	1	
2	Rocker arm shaft	2	
3	Intake rocker arm	1	
4	Exhaust rocker arm	1	
5	Locknut	4	
6	Adjustment screw	4	
7	Camshaft	1	

i For installation, reverse the removal procedure.





13.6.1 Camshaft check


Check the camshaft lobes: if there is discolouration of the blue, pitting and/or scratches, replace the camshaft.


Measure the dimensions "A" and "B" of the camshaft: if they do not comply with the prescribed values, replace the camshaft.

Camshaft lobe dimensions

 **Lobe height "A" (intake):**
30.225–30.325 mm (1.1900–1.1939 in)

 **Primitive circle diameter "B" (intake):**
25.064–25.194 mm (0.9868–0.9919 in)
Limit: 24,964 mm (0.9828 in)

 **Lobe height "A" (exhaust):**
30.261–30.361 mm (1.1914–1.1953 in)
Limit: 30,161 mm (1.1874 in)

 **Primitive circle diameter "B" (exhaust):**
25.121–25.221 mm (0.9890–0.9930 in)
Limit: 25,021 mm (0.9851 in)

Check the camshaft oil line: if clogged, clean with compressed air.


13.6.2 Rocker arms and rocker arm shafts check

 **The following procedure applies to all rocker arms and rocker arm shafts.**


Check the rocker arm: if there are any damages and/or signs of wear replace it.

Check the rocker arm shaft: if blue discolouration, excessive wear, pitting and/or scratches are present, replace or check the lubrication system.


Measure the inside diameter of the rocker arm "A": if it does not comply with the specifications, replace the rocker arm.


 **Rocker arm "A" inside diameter:**
9.985–10.000 mm (0.3931–0.3937 in)
Limit: 10,015 mm (0.3943 in)

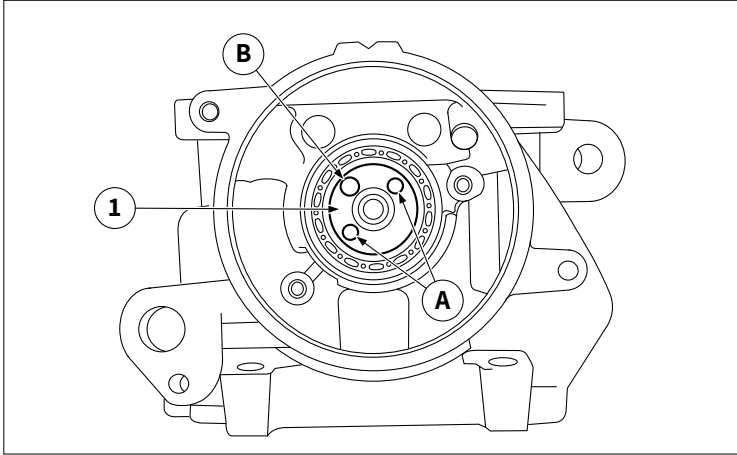
Measure the outside diameter of the rocker arm shaft "B": if it does not comply with the specifications, replace the shaft.

 **Outside diameter of the rocker arm shaft "B":**
9.966–9.976 mm (0.3924–0.3928)
Limit 9.941 mm (0.3914 in)

Calculate the **clearance between the rocker arm and the rocker arm shaft.**

 **Calculate the clearance subtracting the outside diameter of the rocker arm shaft from the inside diameter of the rocker arm.**

 **If the clearance value does not comply with the specifications, replace the defective part or parts.**



13.6.3 Installation of camshaft and rocker arms

Lubricate rocker arms and rocker arm shafts.



Recommended lubricants:

- Internal rocker surface: molybdenum disulphide oil.
- Rocker shaft: engine oil.

Lubricate the camshaft.



Recommended lubricants:

- Camshaft: molybdenum disulphide oil.
- Camshaft bearing: engine oil.

Install the camshaft "1".



Make sure that the protrusions of the camshaft "A" and the hole "B" are positioned as shown in the figure.

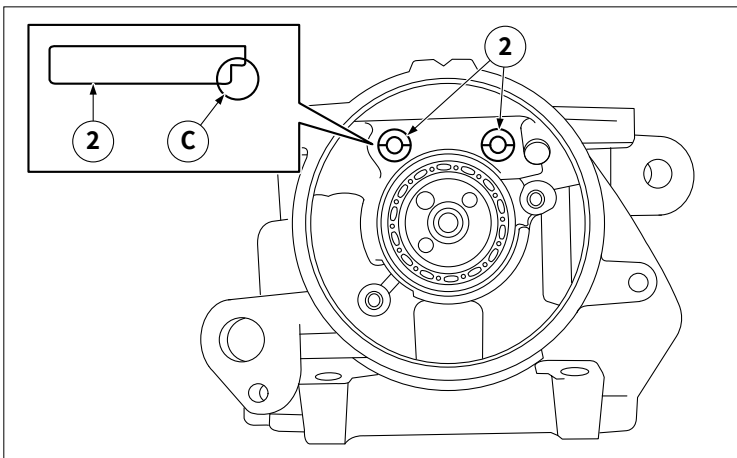
Install the rocker arms and rocker arm shafts "2".



Make sure that the cut-out "C" of each rocker shaft is facing down as shown in the figure.

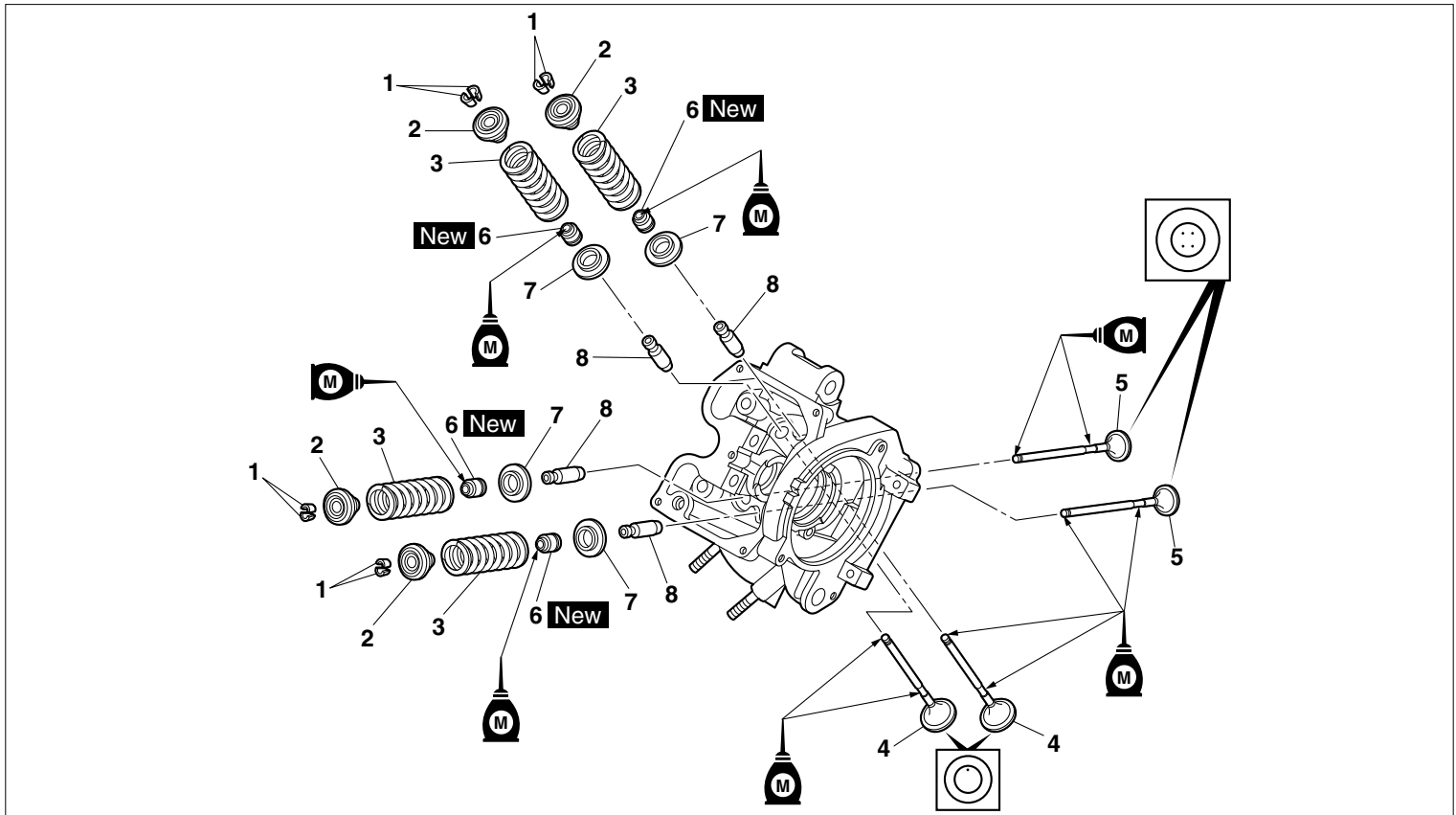


Make sure that the rocker arms (intake and exhaust) are completely inserted into the cylinder head.



13.7 VALVES AND VALVE SPRINGS

Removal sequence of valves and valve springs.

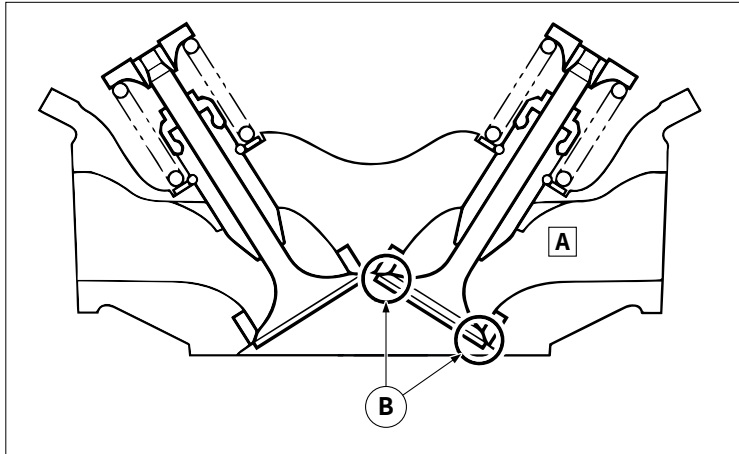


Preliminary operations:

- Cylinder head, refer to “13.5 Cylinder head” on page 171;
- Rocker arms/Camshaft, refer to “13.6 Camshaft” on page 177.

Sequence	Operation/Components to remove	Quantity	Remarks
1	Valve cotters	8	
2	Upper spring seat	4	
3	Valve spring	4	
4	Intake valve	2	
5	Exhaust valve	2	
6	Valve stem gasket	4	
7	Lower spring seat	4	
8	Valve guide	4	

i For installation, reverse the removal procedure.



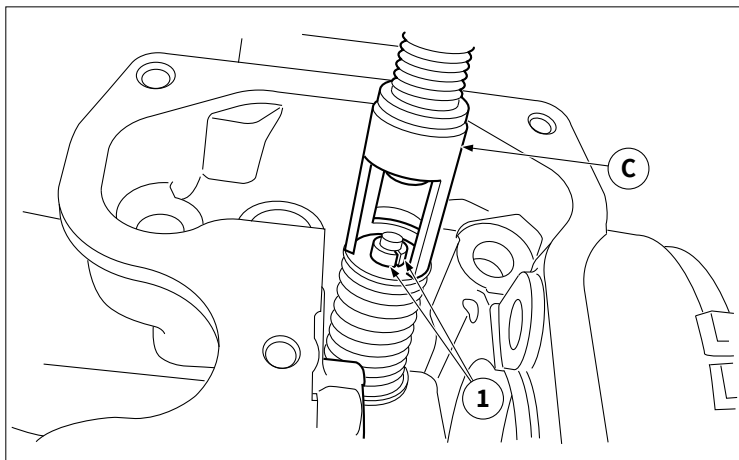
13.7.1 Valve removal

i The following procedure applies to all valves and related components.

! Before removing the internal components of the cylinder head (e.g. valves, valve springs and valve seats), check the valves correct tightness.

Check the valve tightness: if leakage occurs from the valve seat, check the valve face, valve seat and valve seat width. Refer to "13.7.3 Valve seats check" on page 183.

Pour a clean solvent into the intake and exhaust ports "A" and check the valves correct tightness.

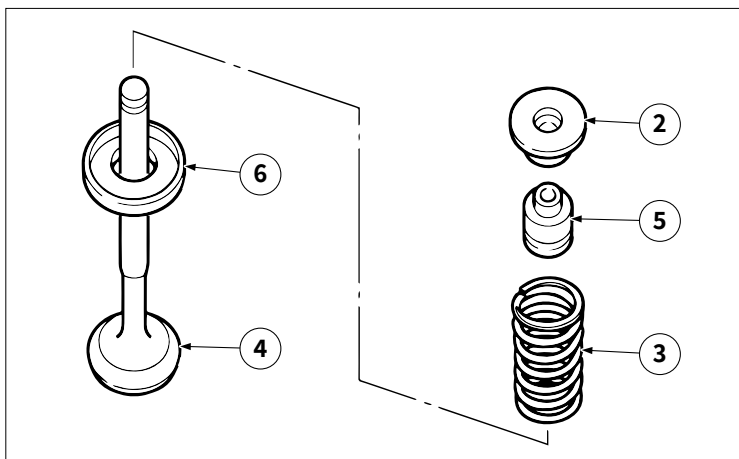


! There must be no leakage from the valve seat "B".

Remove the valve cotters "1".

i To remove the valve cotters, compress the valve spring with the appropriate compressor "C" fitted with the correct adapter.

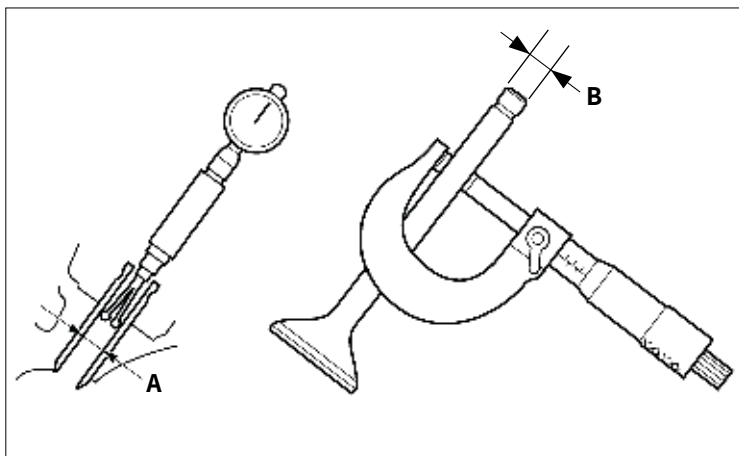
- ✘** • Compressor for valve springs.
- Adapter for 22mm valve springs compressor.



Remove:

- Upper spring seat "2";
- Valve spring "3";
- Valve "4";
- Valve stem gasket "5";
- Lower spring seat "6"

i Identify the position of each component very carefully, so that it can be installed again in its original location.



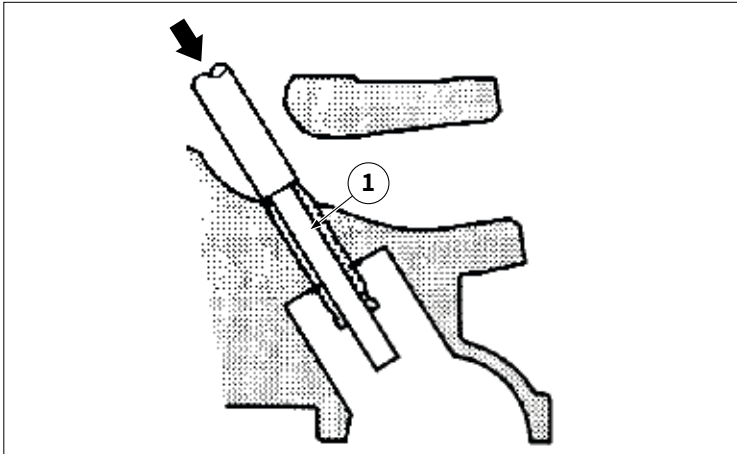
13.7.2 Valves and valve guides check

i The following procedure applies to all valves and valve guides.

Measure the valve stem-valve guide clearance: if it does not comply with the prescribed values, replace the valve guide.

i The valve stem-valve guide clearance corresponds to the difference between the inside diameter of the valve guide "A" and the diameter of the valve stem "B".

- ✘** Valve stem-valve guide clearance:
 - Intake: 0.010-0.037 mm (0.0004-0.0015 in), limit 0.080 mm (0.0032 in).
 - Exhaust: 0.025-0.052 mm (0.0010-0.0020 in).

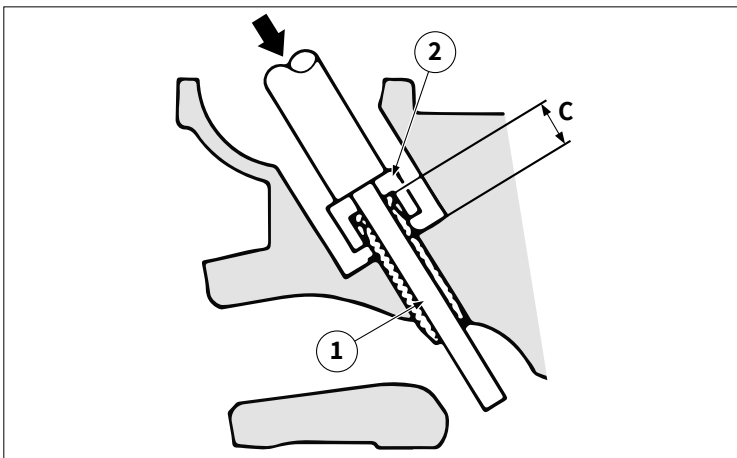


Replace the valve guide.

i To facilitate removal and installation of the valve guide and to maintain proper coupling, heat the cylinder head in an oven at 100 °C (212 °F).

Remove the valve guide with the appropriate extractor "1".

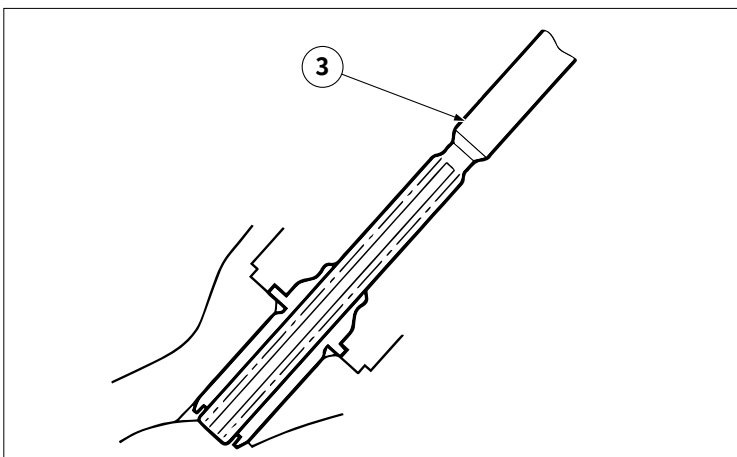
✂ Valve guide remover (ø4.5)



Install the new valve guide with the appropriate installer "2" and remover "1", respecting the valve guide position "C" at the prescribed values.

✂ Valve guide position (intake):
17.0–17.4 mm (0.669–0.685 in)
Valve guide position (exhaust):
14.0–14.4 mm (0.551–0.567 in)

✂ Valve guide installer (ø4.5)



After installing it, bore the valve guide with the appropriate reamer "3" to obtain the correct valve stem-valve guide clearance.

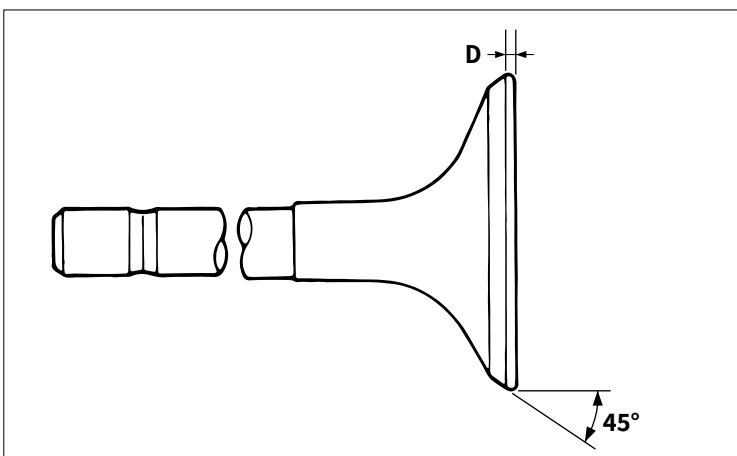
✂ Valve guide reamer (ø4.5)

After replacing the valve guide, grind the valve seat.

Eliminate, if present, carbon deposits from the valve face and valve seat.

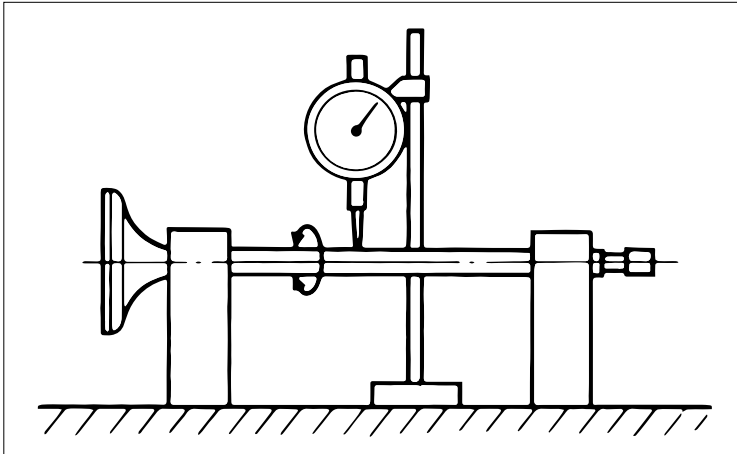
Check the valve face: if pitting and/or signs of wear are present, bore the valve face.

Check the end of the valve stem: if it has a mushroom shape or a larger diameter than the valve stem body, replace the valve.



Measure the valve margin thickness "D": if it does not comply with the prescribed values, replace the valve.

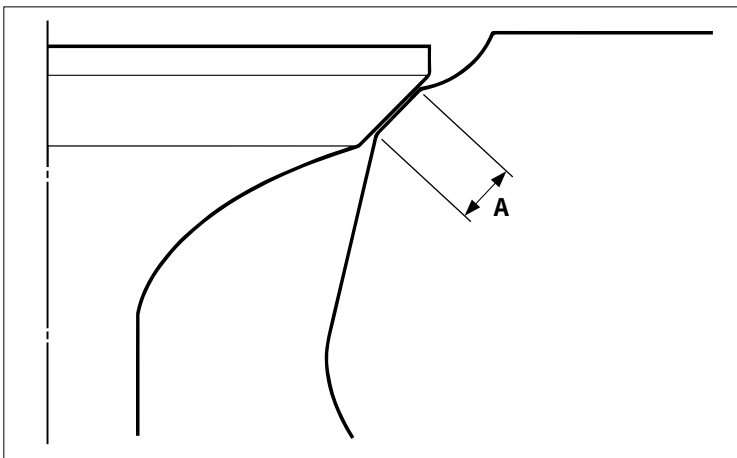
✂ Valve margin thickness (intake)
0.50–0.90 mm (0.0197–0.0354 in)
Valve margin thickness (exhaust)
0.50–0.90 mm (0.0197–0.0354 in)



Measure the valve stem misalignment: if it does not comply with the prescribed values, replace the valve.

- i** When installing a new valve, always replace the valve guide.
- i** If the valve is removed or replaced, always replace also the valve stem gasket.

✂ Valve stem misalignment: 0,010 mm (0.0004 in)



13.7.3 Valve seats check

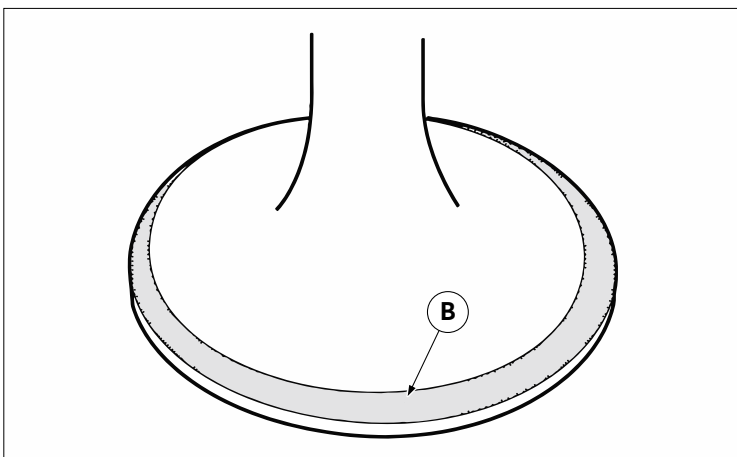
- i** The following procedure applies to all valves and valve seats.

Remove carbon deposits from the valve face and valve seat.

Check the valve seat: if there are pitting or signs of wear, replace the cylinder head.

Measure the contact width of the valve seat "A": if it does not comply with the prescribed values, replace the cylinder head.

- ✂** Valve seat contact width (intake)
0.90–1.10 mm (0.0354–0.0433 in)
- Valve seat contact width (exhaust)
0.90–1.10 mm (0.0354–0.0433 in)



Apply Blue Layout Fluid to the valve face "B".

Install the valve in the cylinder head.

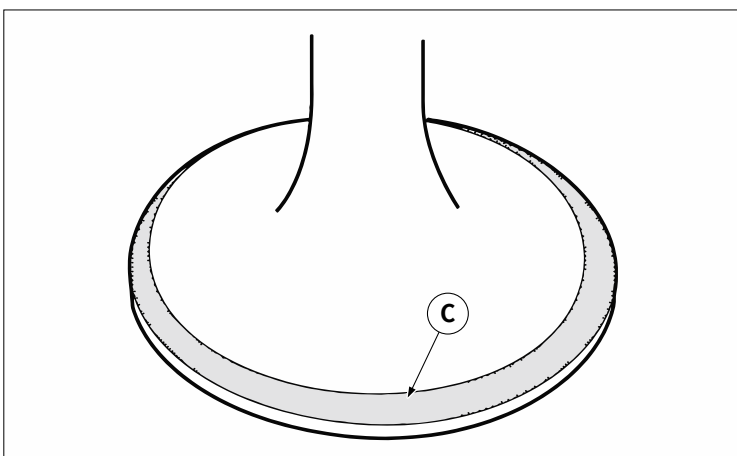
Press the valve through the valve guide and on the valve seat to produce a clear impression.

Measure the valve seat width.

- i** Where the valve seat and valve face touched, the Blue Layout Fluid has been removed.

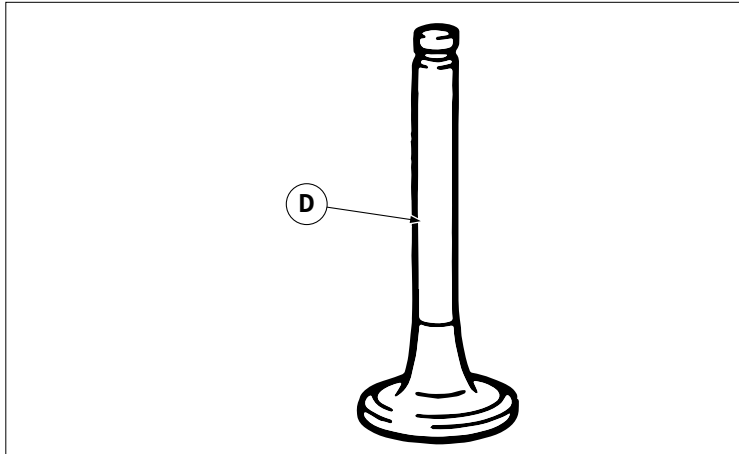
Lap the valve face and seat

- i** After replacing the cylinder head or valve and valve guide, the valve seat and valve face must be lapped.



Apply a coarse-grained abrasive lapping agent "C" on the valve face.

- ⚠** Do not allow the penetration of the abrasive lapping agent into the clearance between valve stem and valve guide.

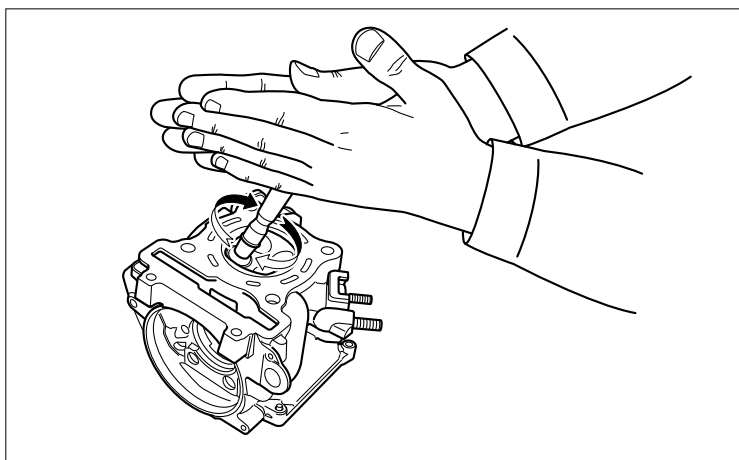


Apply molybdenum disulphide oil to the valve stem “D”.



Recommended lubricant:

- Valve stem: molybdenum disulphide oil.



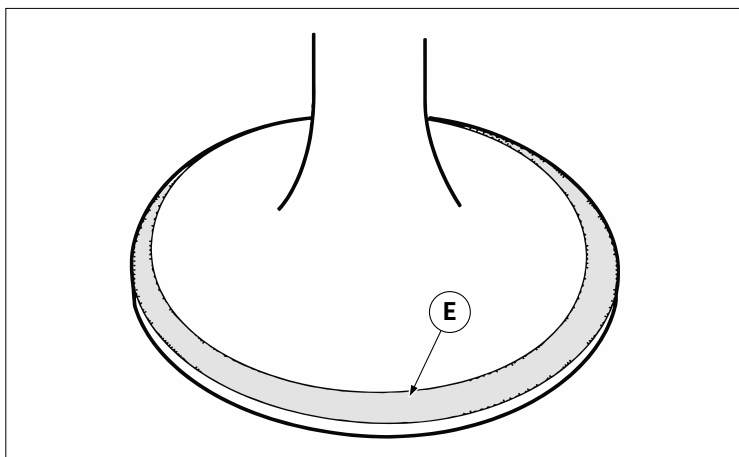
Turn the valve until the valve face and valve seat are smoothed out homogeneously, then remove all the abrasive lapping agent.



To obtain an excellent lapping, lightly tap the valve seat turning the valve back and forth between the hands.

Apply a fine-grained lapping abrasive agent to the valve face and repeat the above steps.

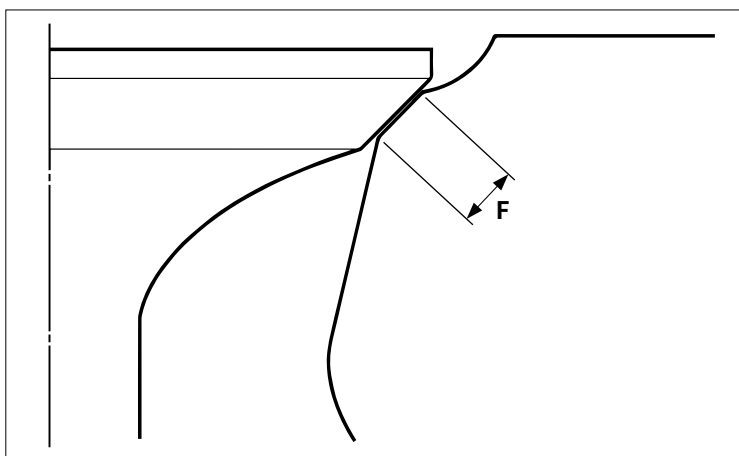
After each lapping process, be sure to remove all the abrasive lapping agent from the valve face and valve seat.



Apply Blue Layout Fluid “E” to the valve face.

Install the valve in the cylinder head.

Press the valve through the valve guide and on the valve seat to produce a clear impression.



Measure the valve seat width “F” again. If the valve seat width does not comply with the prescribed values, rectify and lap the valve seat.

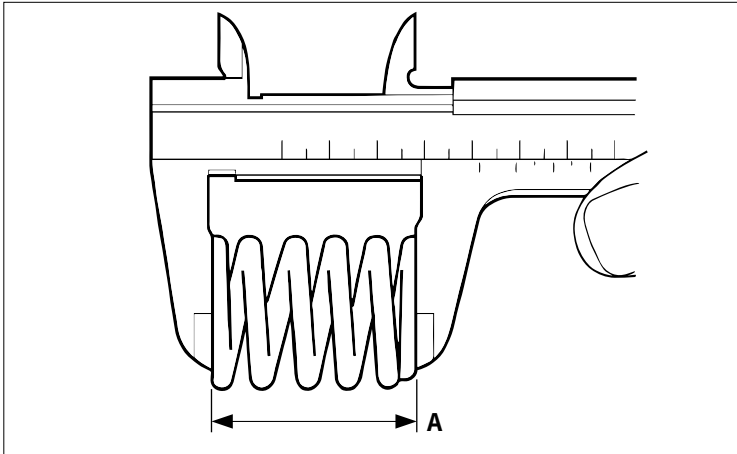


Valve seat contact width (intake)

0.90–1.10 mm (0.0354–0.0433 in)

Valve seat contact width (exhaust)

0.90–1.10 mm (0.0354–0.0433 in)

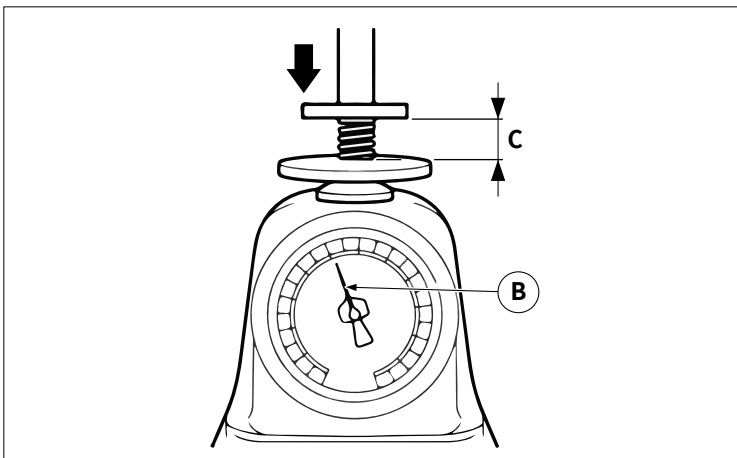


13.7.4 Valve springs check

(i) The following procedure applies to all valve springs.

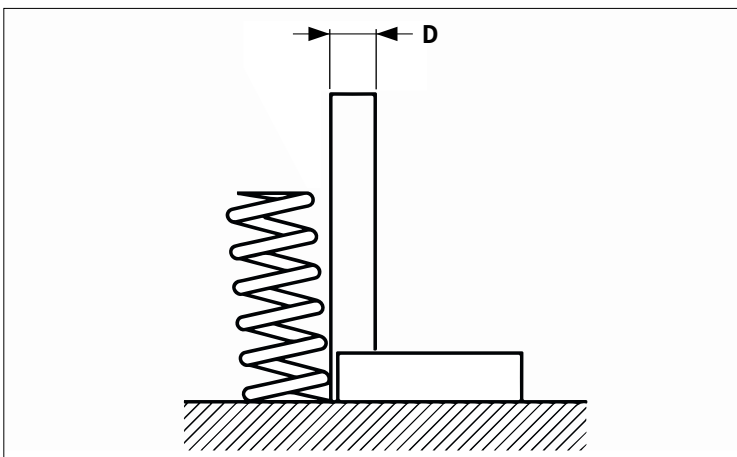
Measure the free spring length of valve "A": it does not comply with the specifications, replace the valve spring.

- ✂ Free length (intake):**
41.71 mm (1.64 in), limit 39.62 mm (1.56 in)
- Free length (exhaust):**
41.71 mm (1.64 in), limit 39.62 mm (1.56 in)



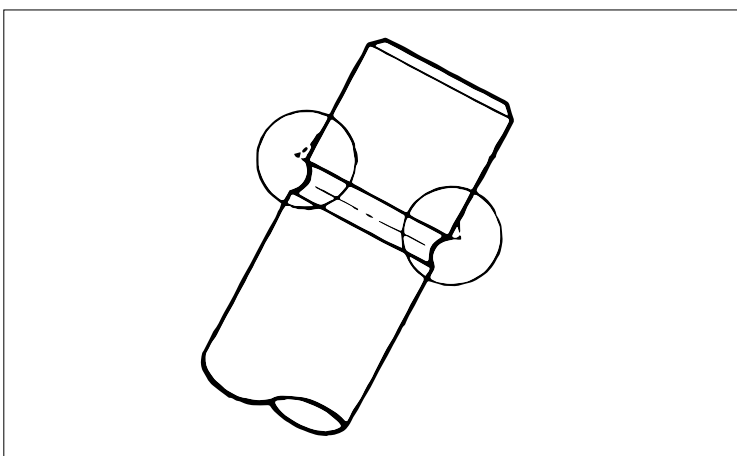
Measure the spring force of the compressed valve "B" at the installed length "C": if it does not comply with the specifications, replace the valve spring.

- ✂ Installed compression spring pressure (intake):**
140.00–162.00 N (14.28–16.52 kgf, 31.47–36.42 lbf)
- Installed compression spring pressure (exhaust):**
140.00–162.00 N (14.28–16.52 kgf, 31.47–36.42 lbf)
- ✂ Installed length (intake):**
35.30 mm (1.39 in)
- Installed length (exhaust):**
35.30 mm (1.39 in)



Measure the valve spring "D" inclination: if it does not comply with the specifications, replace the valve spring.

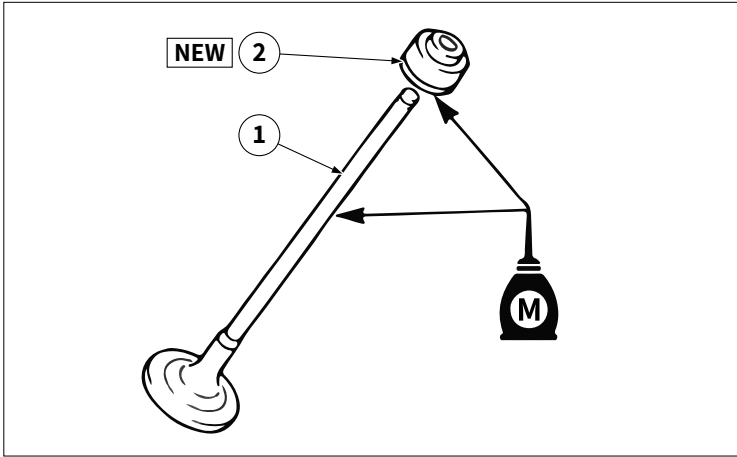
- ✂ Spring inclination (intake):**
1.8 mm (0.07 in)
- Spring inclination (exhaust):**
1.8 mm (0.07 in)



13.7.5 Valves installation

(i) The following procedure applies to all valves and related components.

Deburr the valve stem ends, shown in the figure, with the appropriate stone for sharpening.

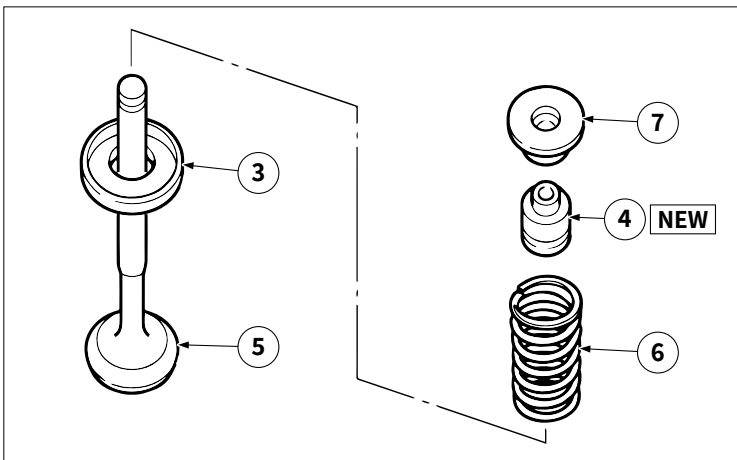


Lubricate the valve stem “1” and a new gasket for the valve stem “2” using the recommended lubricant.



Recommended lubricant:

- Valve stem gasket: molybdenum disulphide oil.

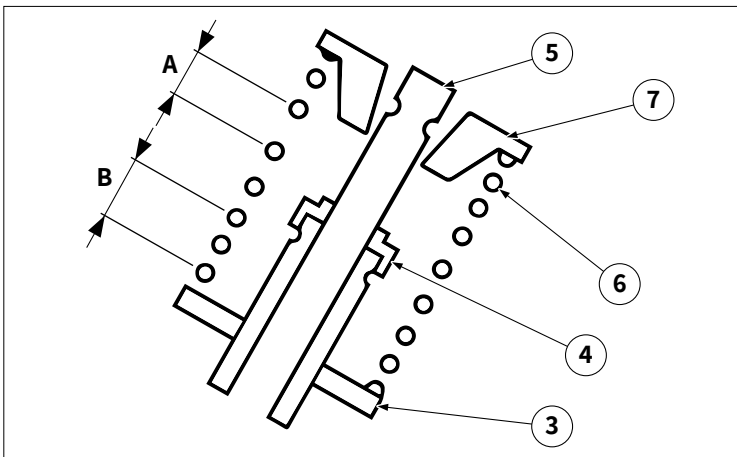


Install:

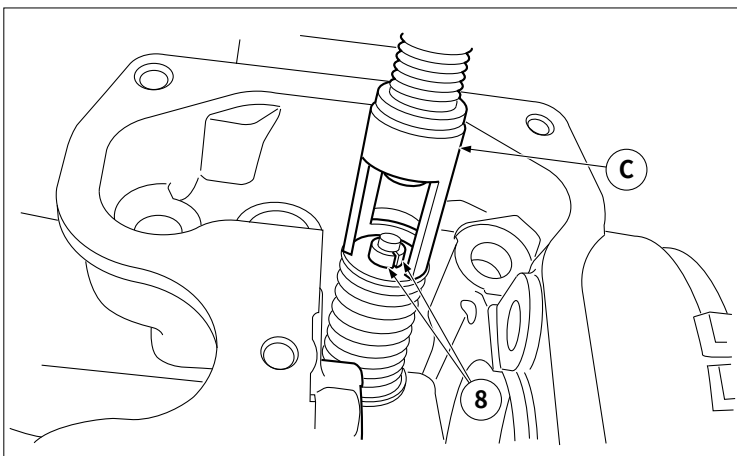
- Lower spring seat “3”;
- A new gasket for the valve stem “4”;
- Valve “5”;
- Valve spring “6”;
- Upper spring seat “7”, to be installed on the cylinder head.



Make sure that each valve is installed in its original position.



Install the valve springs with the larger pitch “A” facing up and the smaller pitch “B” facing down.



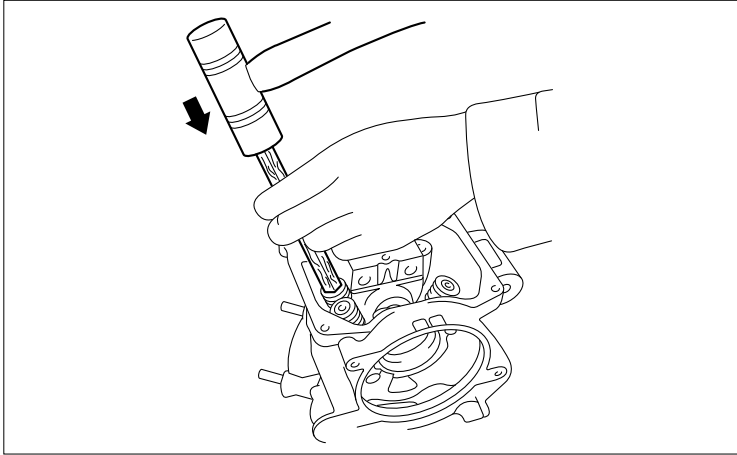
Install the valve cotters “8”.



To install the valve cotters, compress the valve spring with the appropriate compressor “C” fitted with the correct adapter.



- Compressor for valve springs.
- Adapter for 22mm valve springs compressor.

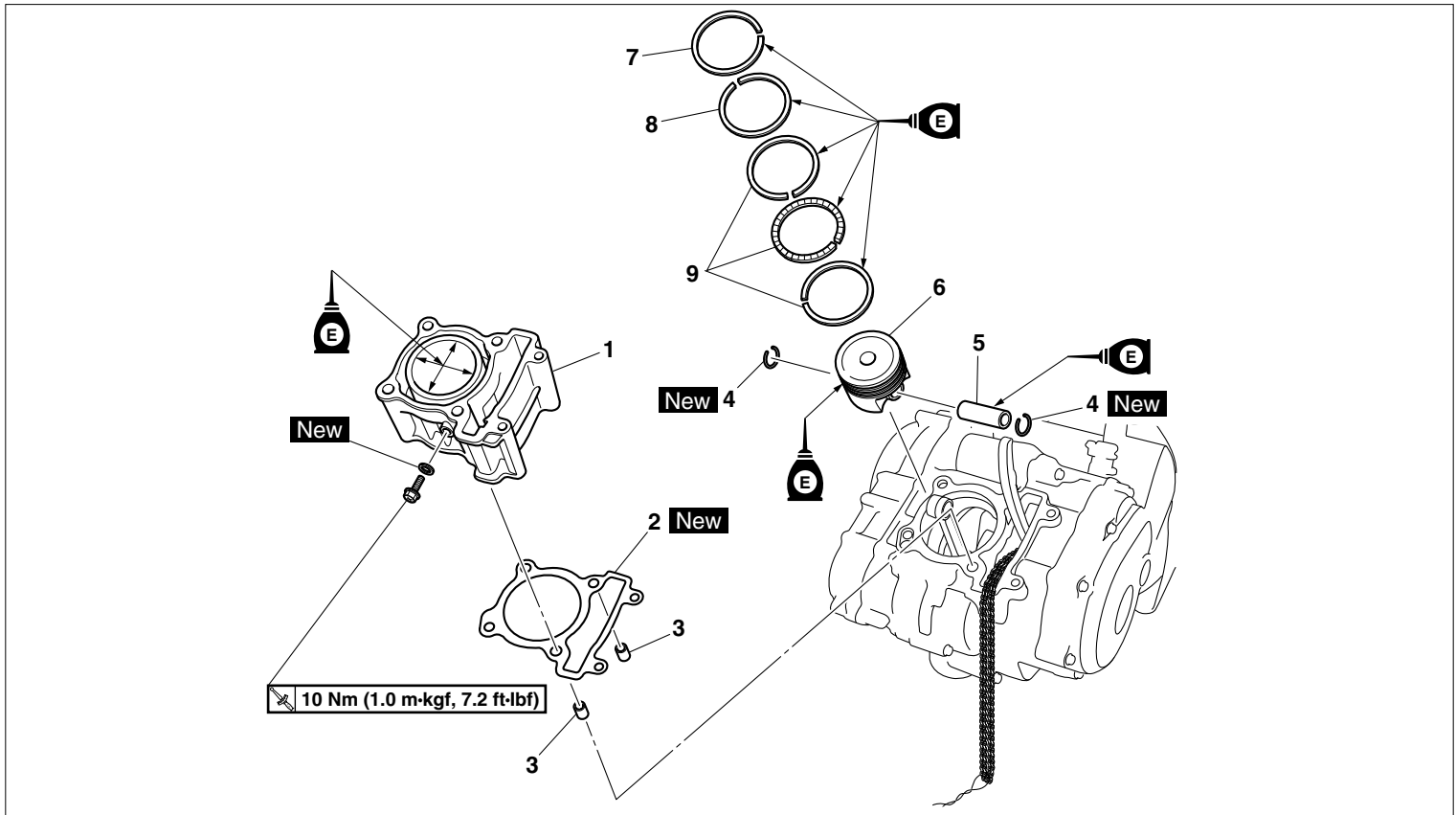


To fasten the valve cotteners on the valve stem, lightly tap with a soft hammer on the valve tip.

⚠ If valve tip is hit with too much force, there is a risk of damaging the valve.

13.8 CYLINDER AND PISTON

Cylinder and piston removal sequence.

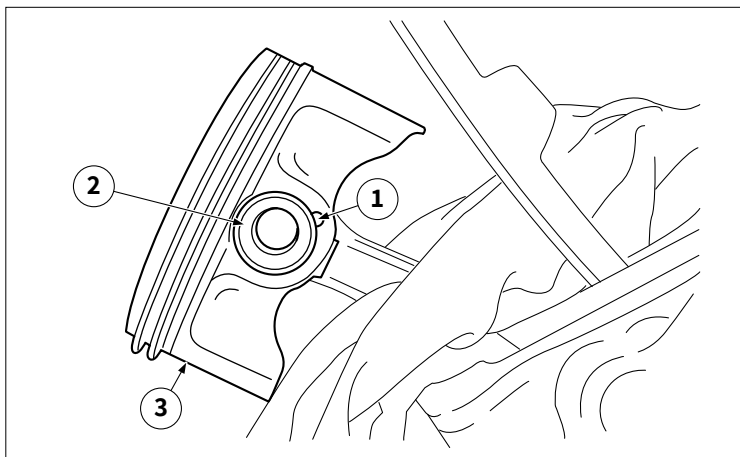


Preliminary operations:

– Cylinder head, refer to “13.5 Cylinder head” on page 171.

Sequence	Operation/Components to remove	Quantity	Remarks
1	Cylinder	1	
2	Cylinder gasket	1	
3	Centering pin	2	
4	Piston pin spring	2	
5	Piston pin	1	
6	Piston	1	
7	Upper piston ring	1	
8	Second piston ring	1	
9	Oil scraper ring	1	

i For installation, reverse the removal procedure.



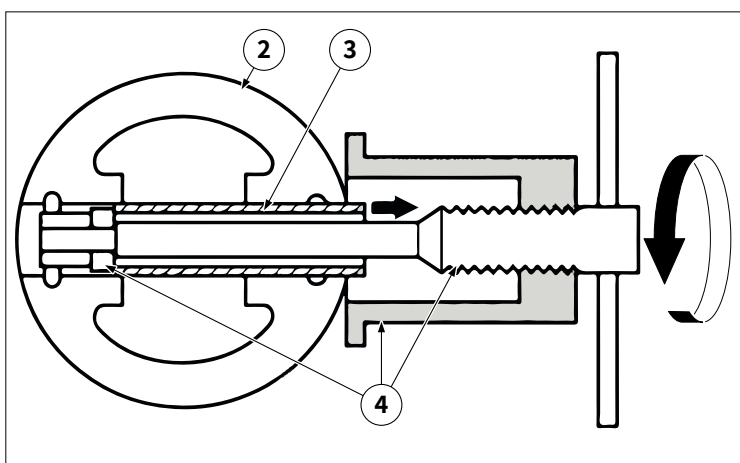
13.8.1 Piston removal

Remove:

- Piston pin springs "1";
- Piston pin "2";
- Piston "3".

⚠ Do not use a hammer to release the piston pin.

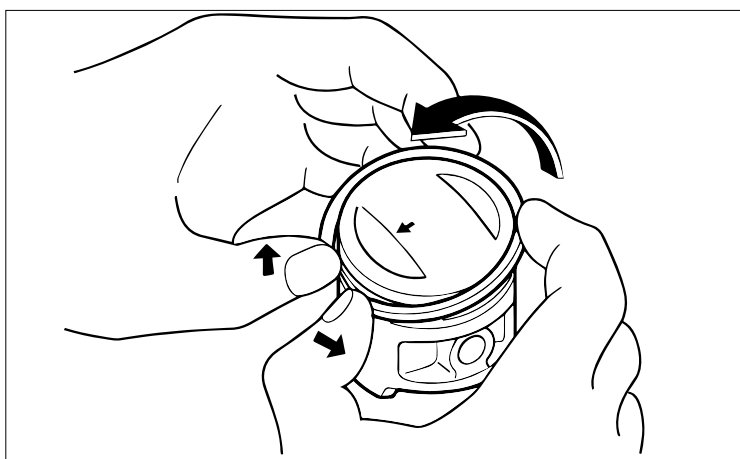
i Before removing the piston pin spring, cover the crankcase opening with a clean cloth to prevent the small pin from falling into the crankcase.



Before removing the pin, deburr the piston pin spring groove and the piston pin hole area.

If both areas have been deburred and the removal of the pin is still difficult, remove it using the special piston pin puller kit "4".

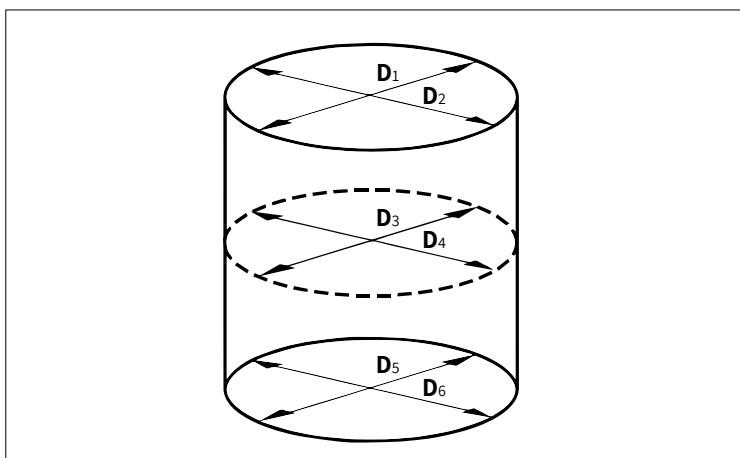
✂ Piston pin puller kit.



Remove:

- Upper piston ring;
- Second piston ring;
- Oil scraper ring.

i To remove a segment, widen the clearance between the ends with the fingers and lift the other side of the segment over the piston rim.



13.8.2 Cylinder and piston check

Check the piston wall and the cylinder wall: if there are any vertical scratches, replace the cylinder, the piston and the segments.

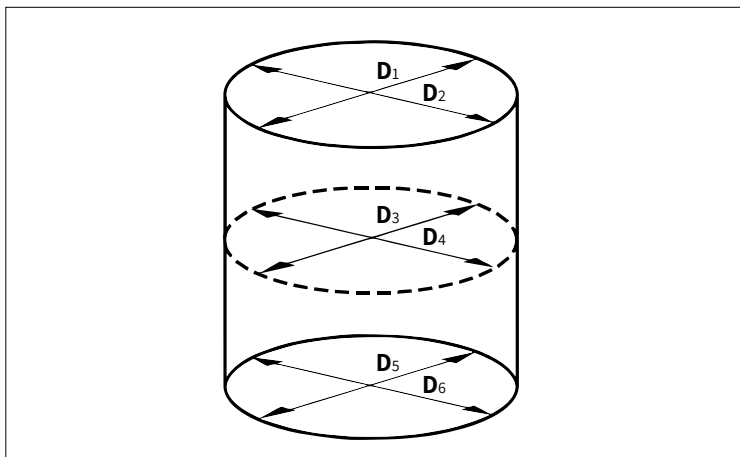
Measure the clearance between the piston and the cylinder.

Measure the cylinder boring "C" with a bore meter.

i To measure the boring of the cylinder "C" at a point, measure the cylinder from side to side and from front to back. Then, calculate the average of the measurements.

Boring value "C" = maximum value between D_1 and D_2 .

✂ Boring: 52.000–52.010 mm (2.0472–2.0476 in)



Calculate the taper limit "T" and the ovality limit "R".

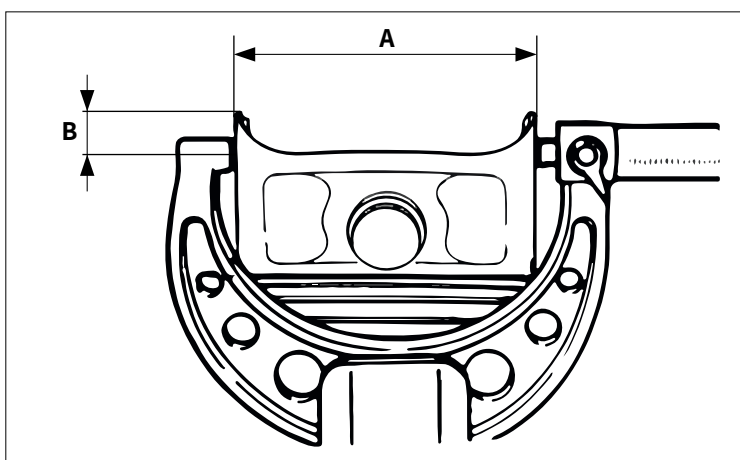
Value of "T" = maximum value between D₁ and D₂ - maximum value between D₅ or

D₆.

Value of "R" = maximum value between D₁, D₃ or D₅ - minimum value between D₂, D₄ or D₆

- ✂ • Taper limit: 0.050 mm (0.0020 in)
- ✂ • Ovality limit: 0,050 mm (0.0020 in)

If the values obtained do not comply with the prescribed values, replace the cylinder and replace the piston and the segments as a set.



Measure the diameter of the skirt "D" of the piston "A", positioning the micrometer at the distance "B" from the lower edge of the piston.

- ⓘ The distance "B" is between the lower edge of the piston and the axis of the micrometer measuring cylinder.

- ✂ Distance "B":
5.0 mm (0.20 in) from the lower edge of the piston.

- ✂ Piston diameter "A":
51.962–51.985 mm (2.0457–2.0466 in)

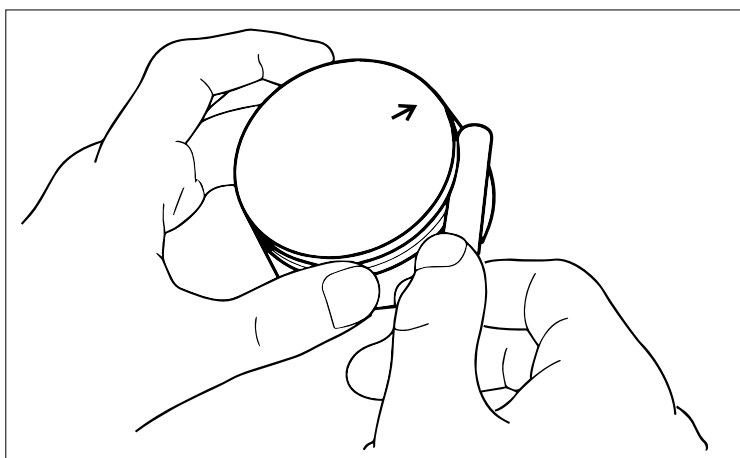
If the value measured does not comply with the prescribed values, replace the piston and the segments as a set.

Calculate the clearance between piston and cylinder with the following formula:

Clearance between piston and cylinder = Cylinder boring "C" - Piston skirt diameter "D".

- ✂ Cylinder - piston clearance:
0.015–0.048 mm (0.0006–0.0019 in)

If the value of the clearance between piston and cylinder does not comply with the prescribed values, replace the cylinder and replace the piston and the segments as a set.

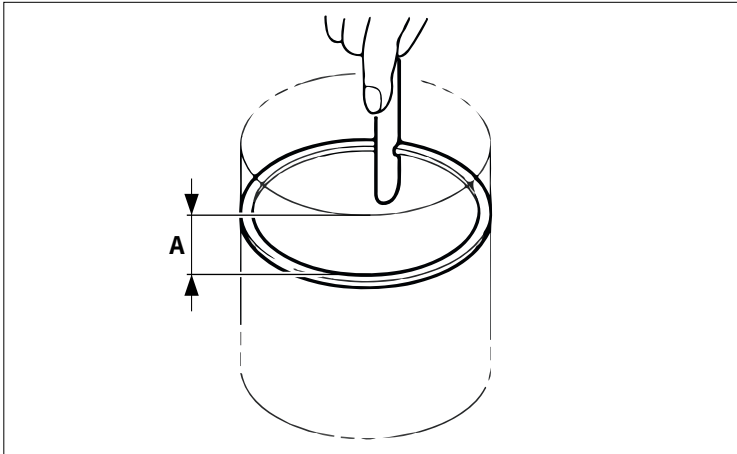


13.8.3 Segments check

Measure the lateral clearance of the segments: if it does not comply with the specifications, replace the piston and the segments as a set.

- ⓘ Before measuring the lateral clearance of the segments, remove the carbon deposits from the segment grooves and from the segments.

- ✂ Segments lateral clearance
 - Upper piston ring segment:
0.030–0.065 mm (0.0012–0.0026 in)
Limit: 0.100 mm (0.0039 in)
 - Second piston ring segment:
0.020–0.055 mm (0.0008–0.0022 in)
Limit: 0,100 mm (0.0039 in)



Install the segment in the cylinder: place the segment in the cylinder, level with the piston rim.

✖ Position of segment "A": 40 mm (1.57 in)

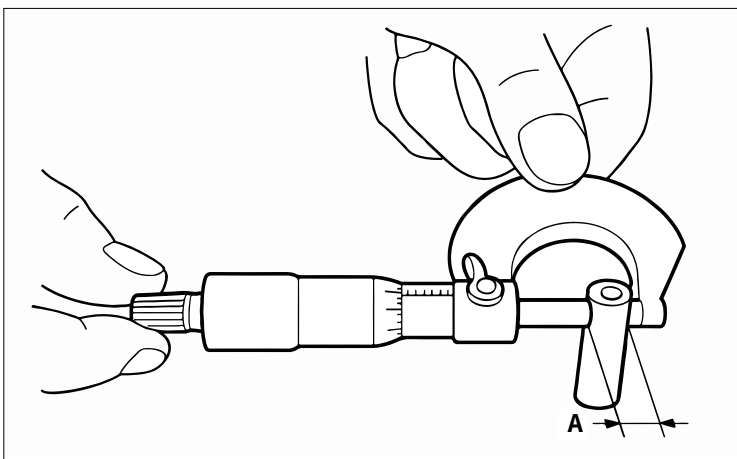
Measure the clearance between the ends of the segment: it does not comply with the specifications, replace the segment.

⚠ It is not possible to measure the clearance between the ends of the expander spacer of the oil scraper ring.

If oil scraper ring element clearance is excessive, replace all three segments.

✖ Clearance between the ends of the segment installed

- Upper piston ring segment:
0.10–0.25 mm (0.0039–0.0098 in)
Limit 0.50 mm (0.0197 in)
- Second piston ring segment:
0.10–0.25 mm (0.0039–0.0098 in)
Limit: 0.60 mm (0.0236 in)
- Oil scraper ring segment:
0.20–0.70 mm (0.0079–0.0276 in)

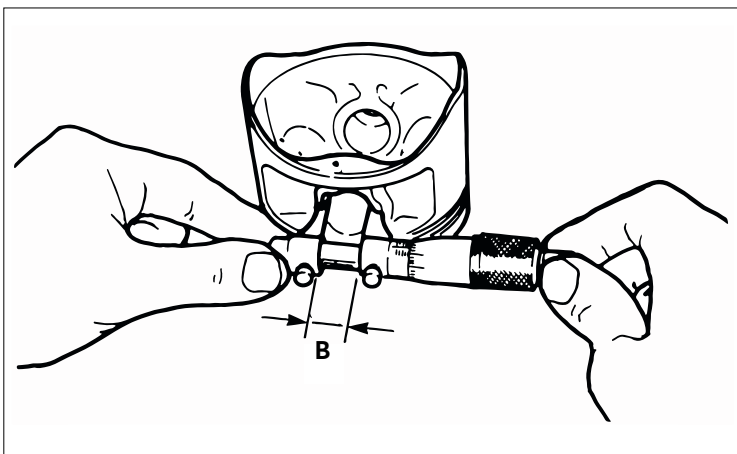


13.8.4 Piston pin check

Check the piston pin: if it shows blue discolouration or groove marks, replace the piston pin and check the lubrication system.

Measure the outside diameter of piston pin "A": if it does not comply with the specifications, replace the piston pin.

✖ Piston pin external diameter
13.995–14.000 mm (0.5510–0.5512 in)
Limit: 13,975 mm (0.5502 in)



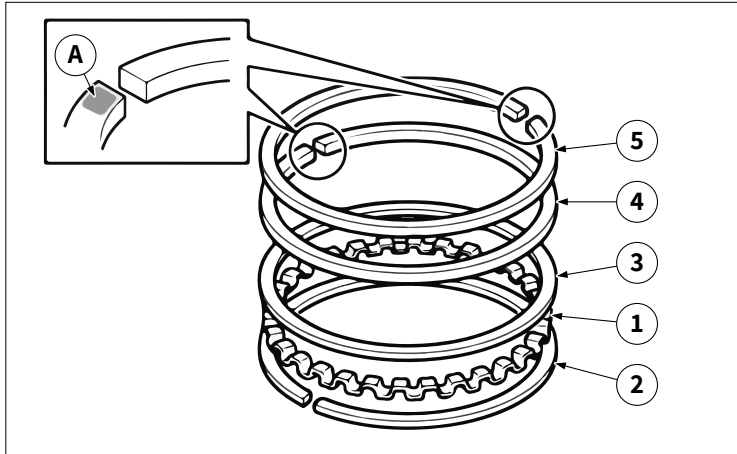
Measure the piston pin hole diameter "B": it does not comply with the specifications, replace the piston.

✖ Piston pin hole internal diameter
14.002–14.013 mm (0.5513–0.5517 in)
Limit: 14,043 mm (0.5529 in)

Calculate the clearance between the piston pin and the piston pin hole: if it does not comply with the specifications, replace the piston pin and piston as a set.

i Piston pin/piston pin hole clearance =
Piston pin "B" hole diameter - Piston pin "A" outside diameter

✖ Piston pin clearance - piston pin hole
0.002–0.018 mm (0.0001–0.0007 in)
Limit: 0,068 mm (0.0027 in)

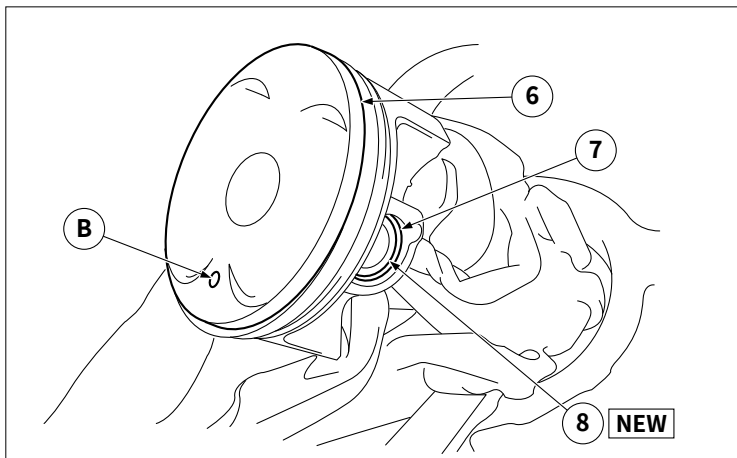


13.8.5 Piston and cylinder installation

Install:

- Oil scraper ring expander "1";
- Lower oil scraper ring clearance "2";
- Upper oil scraper ring clearance "3";
- Second piston ring "4";
- Upper piston ring "5".

⚠ Make sure that the segments are installed with the manufacturer's references or numbers "A" facing up.



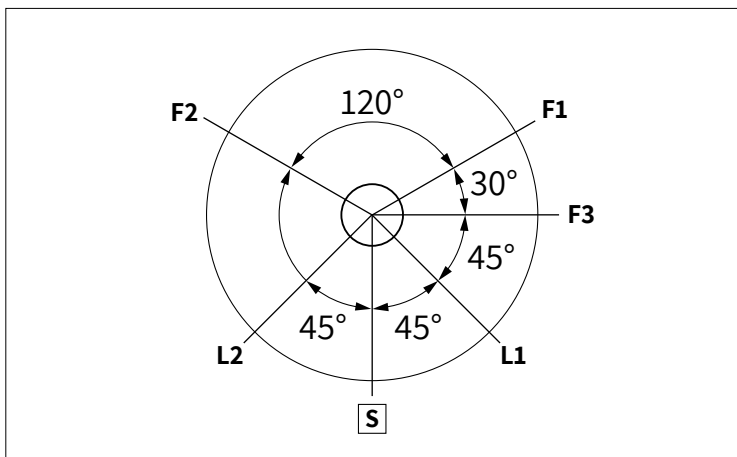
Install:

- Piston "6";
- Piston pin "7";
- Piston pin springs "8".

i Apply engine oil to the piston pin.

⚠ Make sure that the reference arrow "B" on the piston faces the exhaust side of the cylinder.

⚠ Before installing the piston pin springs, cover the crankcase opening with a clean cloth to prevent the spring from falling into the casing.

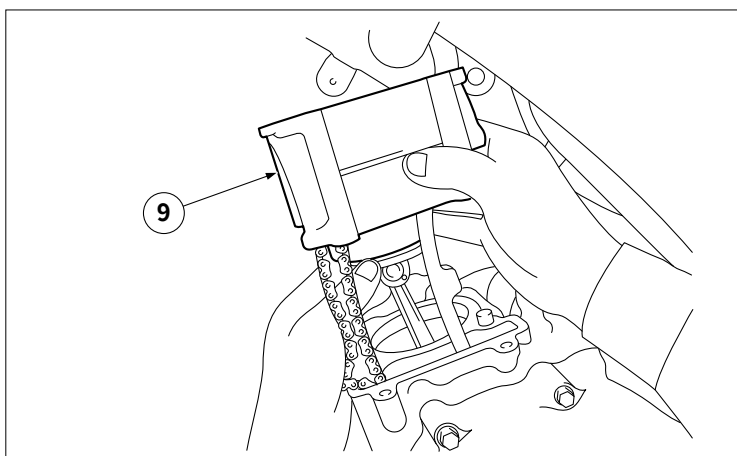


Lubricate the piston, the segments and the cylinder with the recommended lubricant.

♻ Recommended lubricant: Engine oil.

Misalignment of the clearances between the ends of the segments:

- F1. Upper piston ring
- F2. 2nd piston ring
- L1. Upper oil scraper ring clearance
- F3. Oil scraper ring expander
- L2. Lower oil scraper ring clearance
- S. Exhaust side



Install:

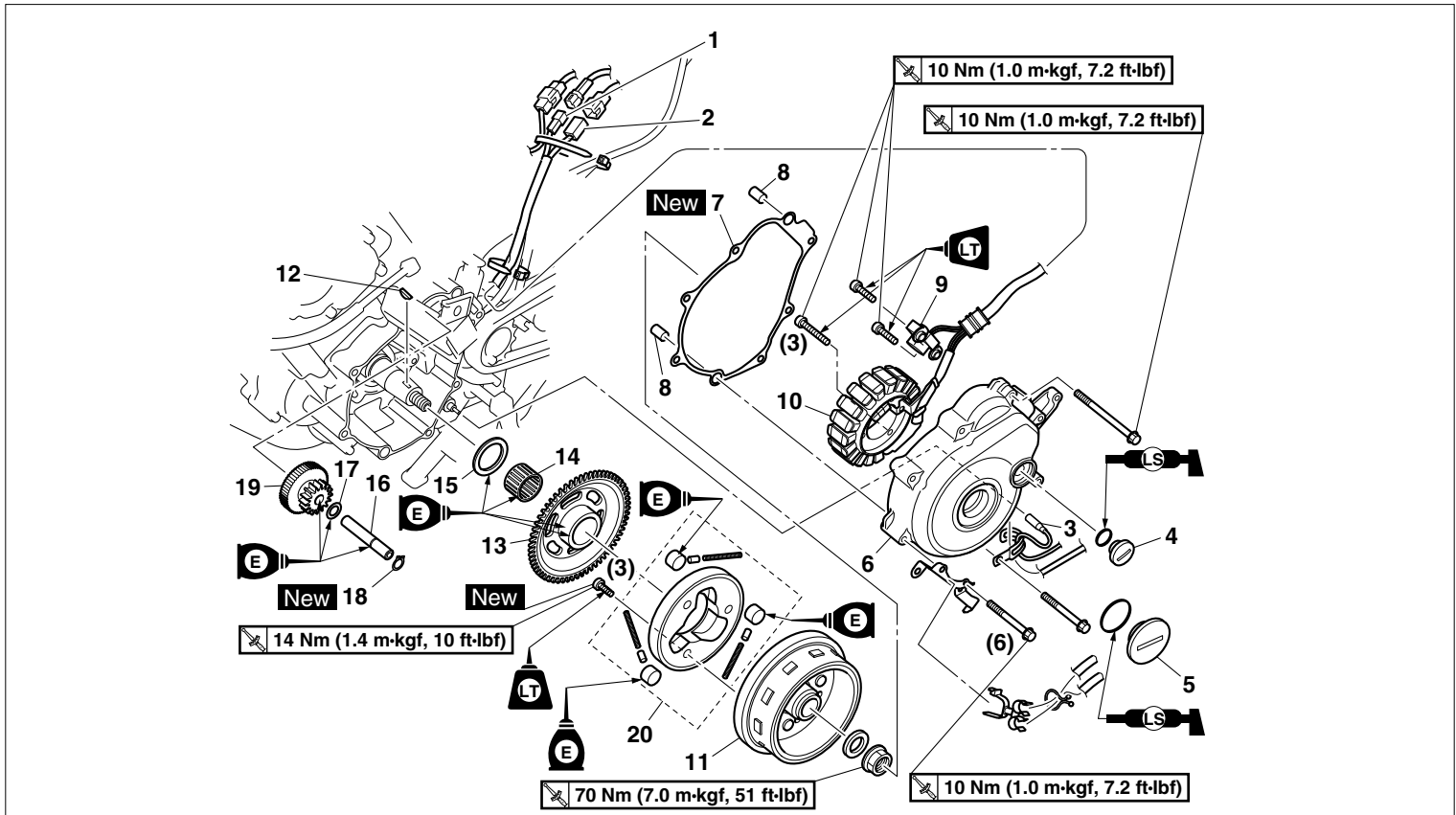
- Centering pins;
- Cylinder head gasket;
- Cylinder "9".

i Compressing the segments with one hand, install the cylinder with the other.

i Pass the timing chain and the timing chain guide (intake side) in the timing chain notch.

13.9 UNIDIRECTIONAL STARTER GENERATOR

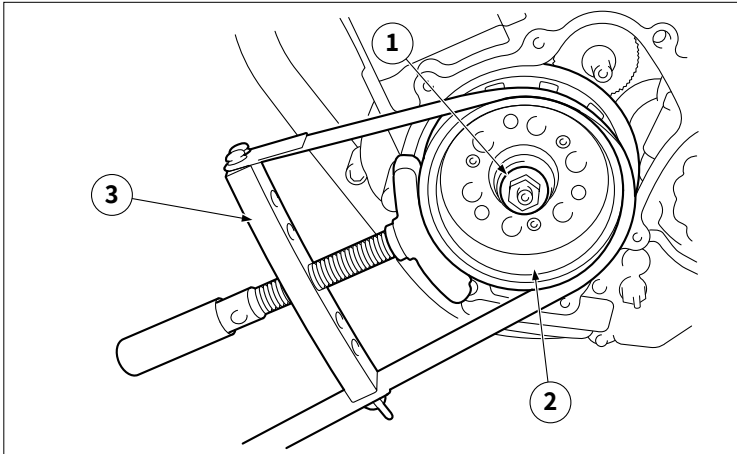
Generator and unidirectional starter removal sequence.



Preliminary operations: drain the engine oil, refer to “13.4 Engine oil change” on page 170.

Sequence	Operation/Components to remove	Quantity	Remarks
1	Crankshaft position sensor connector	1	Disconnect.
2	Stator coil connector	1	Disconnect.
3	Neutral switch cable connector	1	Disconnect.
4	Access screw to the reference for timing	1	
5	Crankshaft end access screw	1	
6	Generator cover	1	
7	Generator cover gasket	1	
8	Centering pin	2	
9	Crankshaft position sensor	1	
10	Stator coil	1	
11	Generator rotor	1	
12	Woodruff key	1	
13	Unidirectional starter gear	1	
14	Bearing	1	
15	Washer	1	
16	Unidirectional starter idler gear shift shaft	1	
17	Washer	1	
18	Retaining ring	1	
19	Unidirectional starter idler gear	1	
20	Unidirectional starter group	1	

i For installation, reverse the removal procedure.



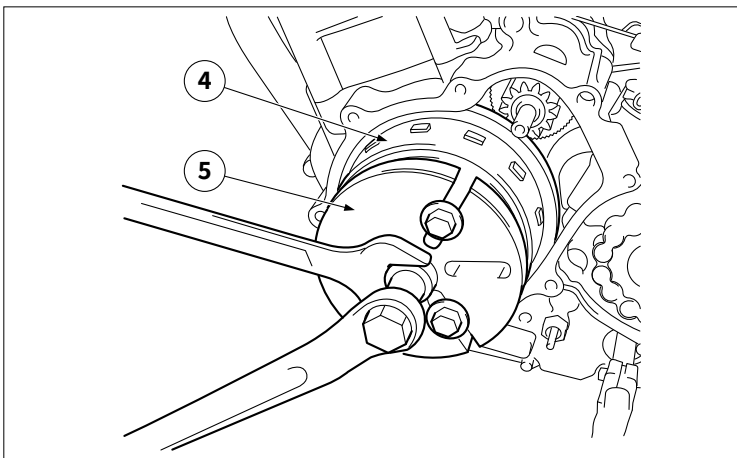
13.9.1 Generator removal

Remove the generator rotor nut “1” and the washer.

Holding the generator rotor “2” locked with the pulley support “3”, loosen the generator rotor nut.

⚠ Do not allow the pulley support to come into contact with the projection on the generator rotor.

- ✂** • Pulley locking tool;
- Primary clutch locking tool.

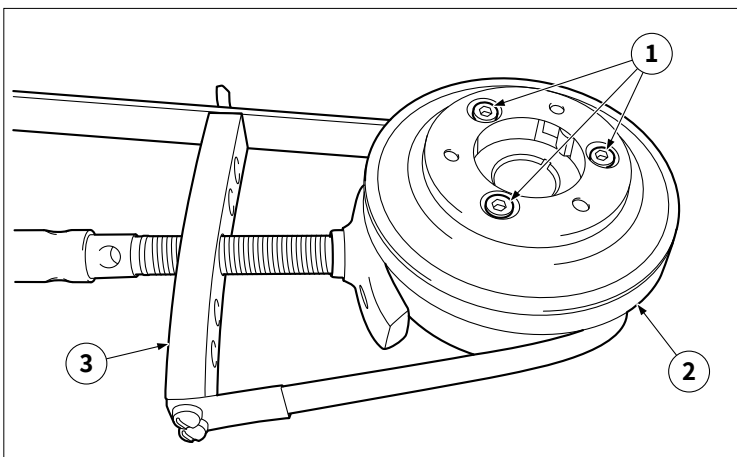


Remove the generator rotor “4” using the flywheel extractor “5” and remove the Woodruff key from the crankshaft.

⚠ To protect the end of the crankshaft, place a suitably sized socket wrench between the flywheel puller centering bolt and the crankshaft.

⚠ Make sure that the flywheel puller is centered over the generator rotor.

- ✂** • Flywheel puller;
- Puller for heavy work.

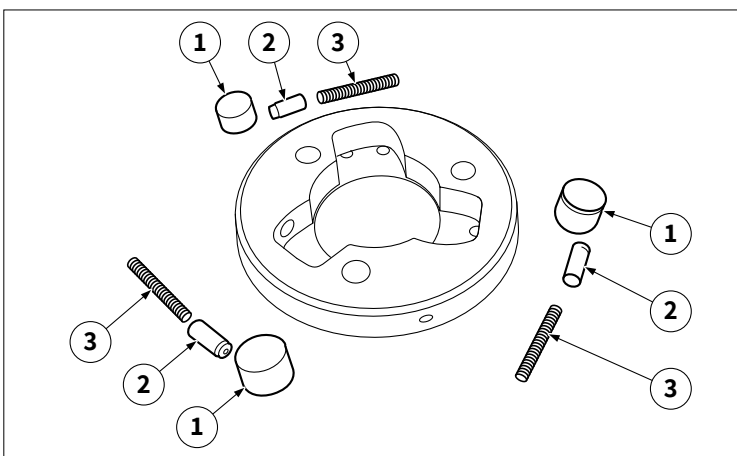


13.9.2 Unidirectional starter removal

Remove the three bolts “1” of the unidirectional starter, keeping the generator rotor “2” locked with the pulley support “3”.

⚠ Do not allow the pulley support to come into contact with the projection on the generator rotor.

- ✂** • Pulley locking tool;
- Primary clutch locking tool.



13.9.3 Unidirectional starter gear check

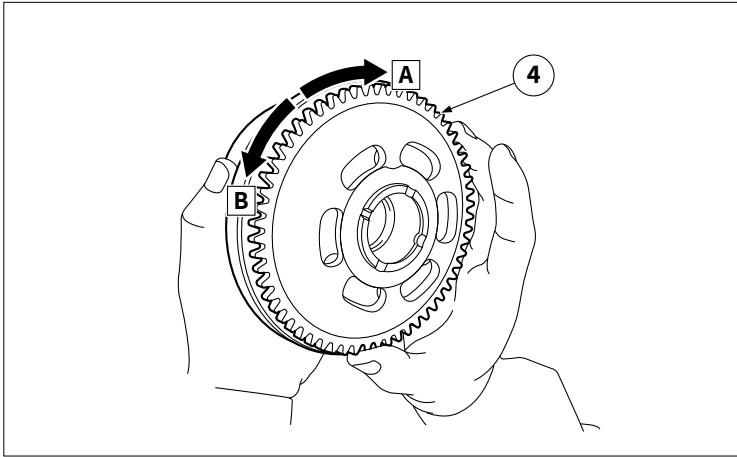
Check:

- Unidirectional starter rollers “1”;
- Unidirectional starter spring caps “2”;
- Unidirectional starter spring “3”.

If damage and/or signs of wear are present, replace the unidirectional starter unit.

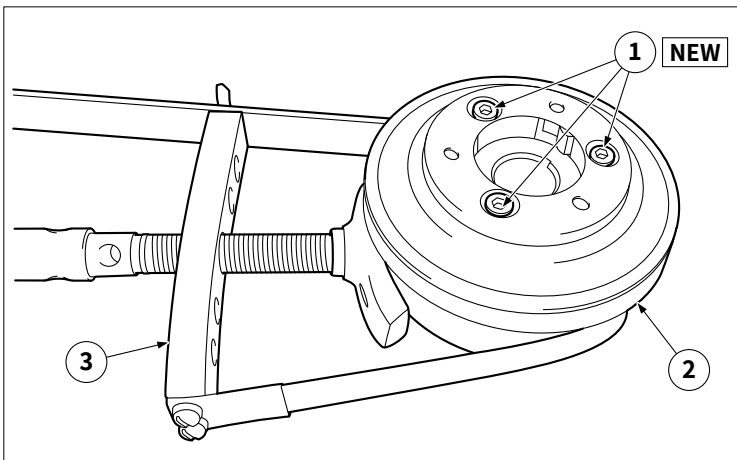
Check the unidirectional starter idler gear and the unidirectional starter gear: if there are burrs, chipping, roughness or signs of wear, replace the defective part or parts.

Check the unidirectional starter gear contact surfaces: if there are damages, pitting or signs of wear, replace the unidirectional starter gear.



Check the unidirectional starter operation:


- Install the unidirectional starter gear “4” on the unidirectional starter and lock the generator rotor;
- When turning the unidirectional starter gear “A” clockwise, it must mesh with the unidirectional starter, otherwise the unidirectional starter is defective and must be replaced;
- When turning the unidirectional starter gear “B” counter-clockwise, it must rotate freely, otherwise the unidirectional starter is faulty and must be replaced.



13.9.4 Unidirectional starter installation

Install:

- Unidirectional starter group;
- New bolts for fastening the unidirectional starter “1”.

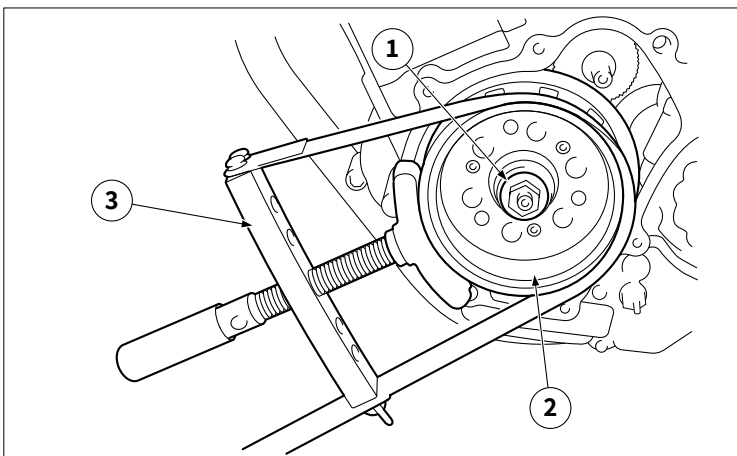
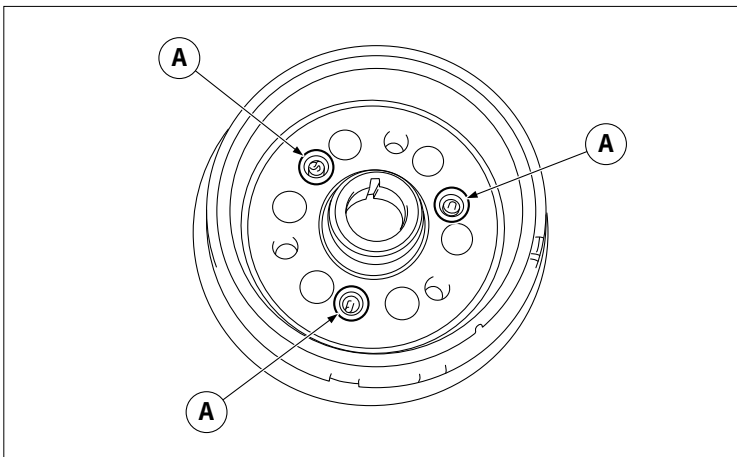
 **Tightening torque: Unidirectional starter bolt**
14 Nm (1.4 m·kgf, 10 ft·lbf)
LOCTITE®

Holding the generator rotor “2” steady with the pulley support “3”, tighten the unidirectional starter bolts.

 **Do not allow the pulley support to come into contact with the projection on the generator rotor.**


Connect the end “A” of each unidirectional starting bolt by force fitting.

-  • Pulley locking tool:
- Clutch locking tool.




13.9.5 Generator installation

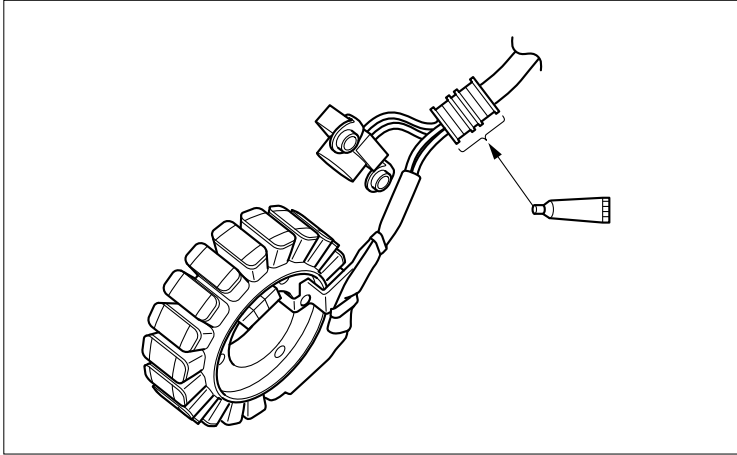
Install the Woodruff key on the crankshaft, the generator rotor, the washer and secure the generator rotor nut.

 **Clean the tapered part of the crankshaft and the generator rotor hub.**

When installing the generator rotor, make sure that the Woodruff tab is properly secured in the keyway of the drive shaft.

Tighten the generator rotor nut “1”.

 **Tightening torque: generator rotor nut**
70 Nm (7.0 m·kgf, 51 ft·lbf)



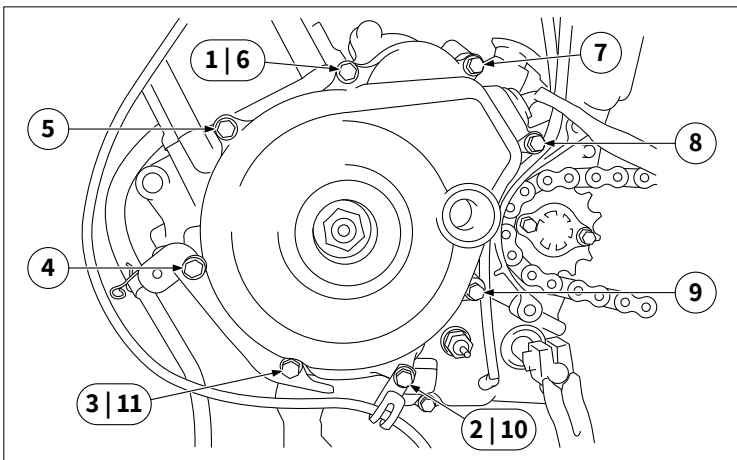
Holding the generator rotor “2” locked with the pulley support “3”, tighten the generator rotor nut.

⚠ Do not allow the pulley support to come into contact with the projection on the generator rotor.

- ✂ • Pulley locking tool;**
- Primary clutch locking tool.**

Apply the sealant on the stator group cable grommet/crankshaft position sensor.

♻ Sealant: Three bond No.1215®



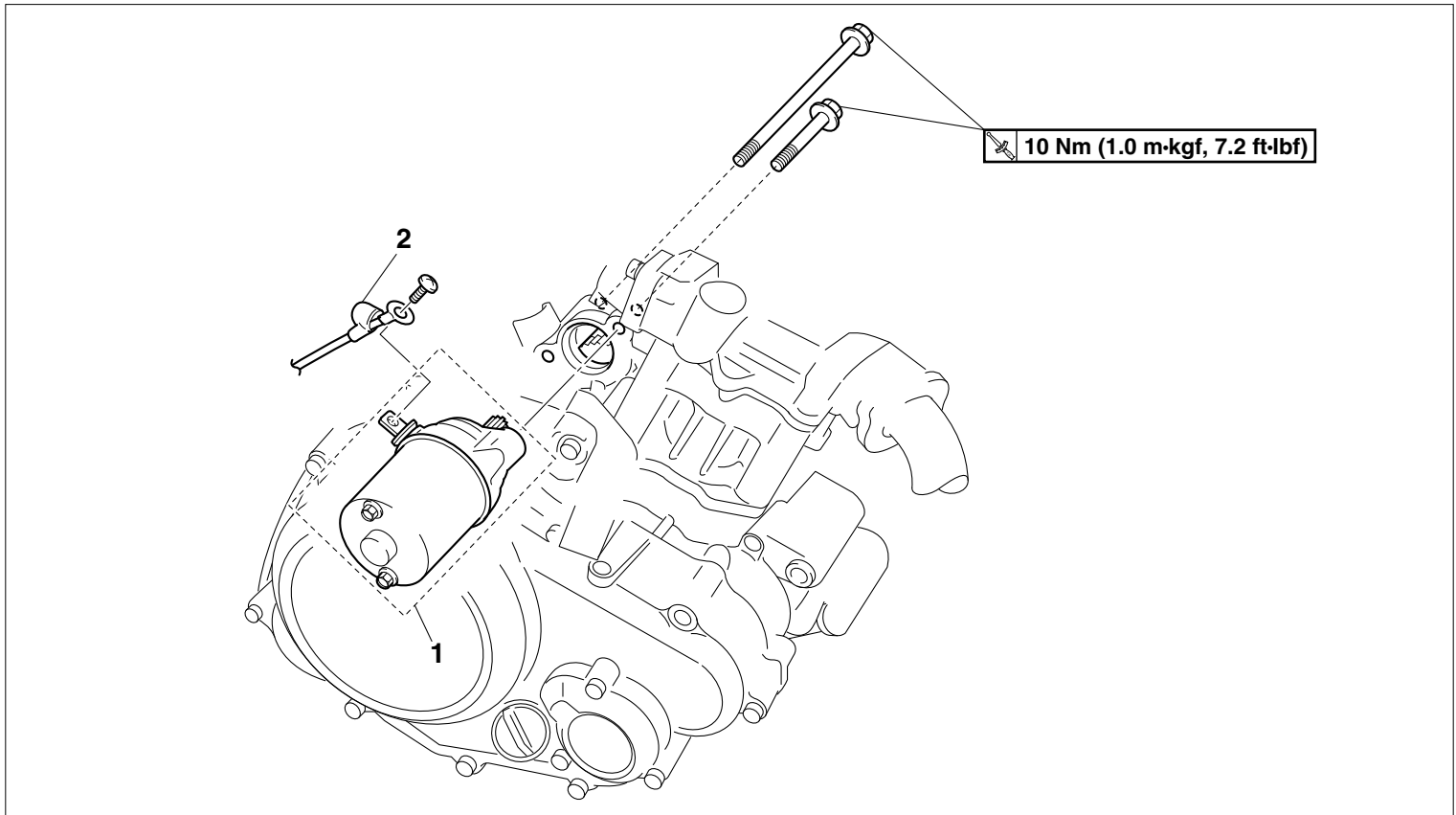
zInstall the generator cover.

**🔧 Tightening torque: Generator cover bolt
10 Nm (1.0 m·kgf, 7.2 ft·lbf)**

Tighten the generator cover bolts in the appropriate sequence as shown in the figure.

13.10 ELECTRIC STARTER

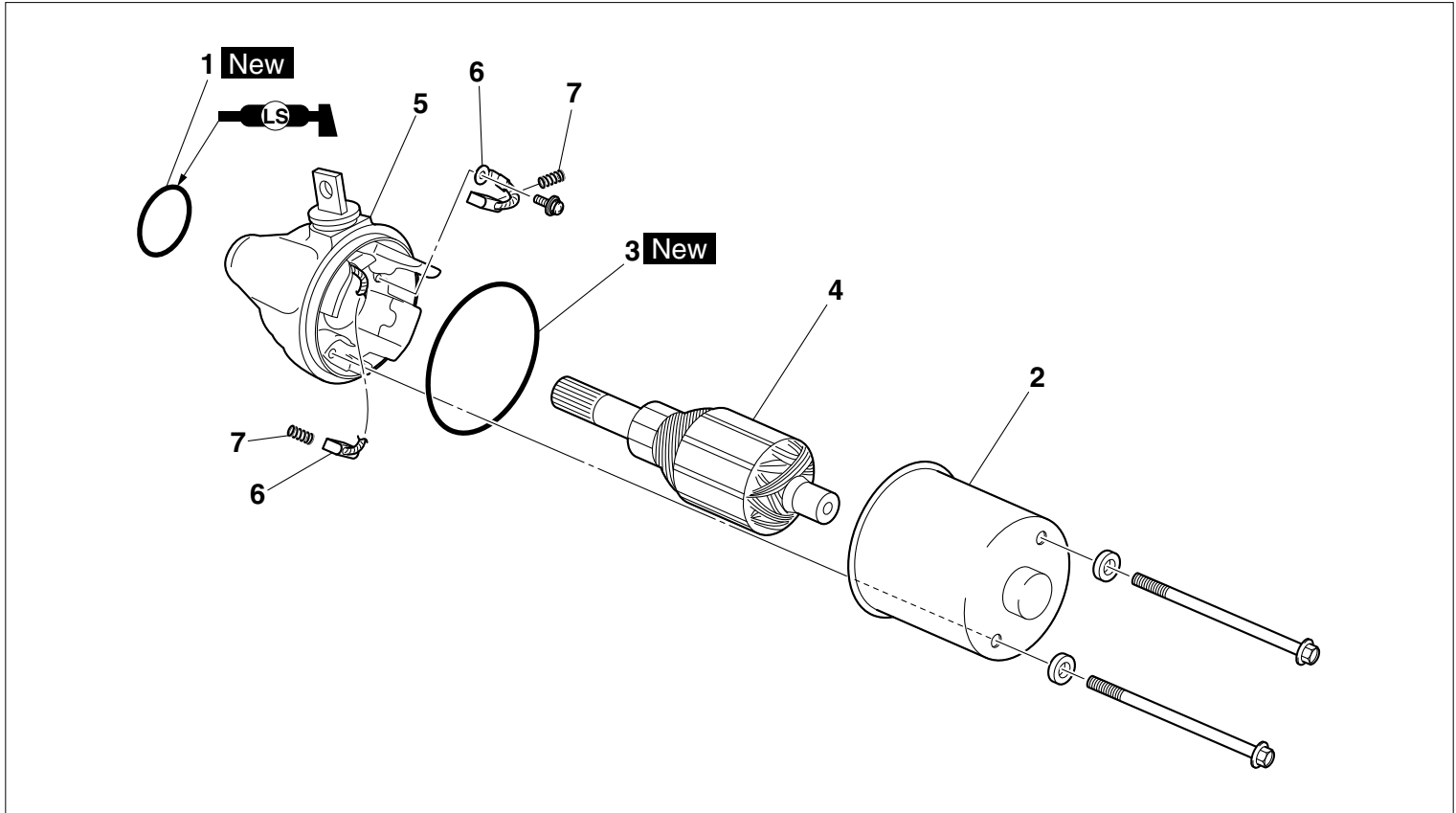
Starter motor removal sequence.



Sequence	Operation/Components to remove	Quantity	Remarks
1	Starter motor	1	
2	Starter motor cable	1	Disconnect.

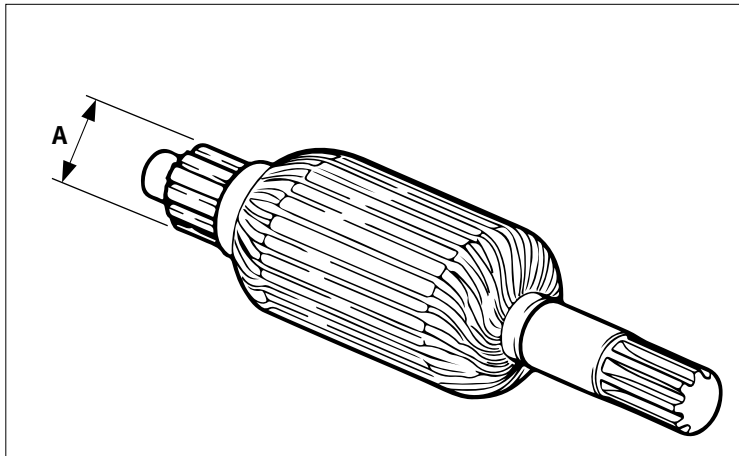
i For installation, reverse the removal procedure.

Starter motor disassembling sequence.



Sequence	Operation/Components to remove	Quantity	Remarks
1	O-ring	1	
2	Starter motor fork	1	
3	O-ring	1	
4	Commutator	1	
5	Front cover of the starter motor/brush holder set	1	
6	Brush	2	
7	Brush spring	2	

i For assembly, reverse the disassembly procedure.

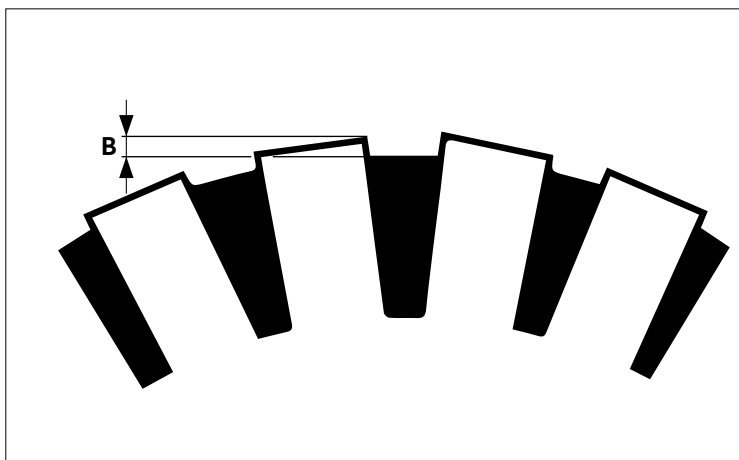


13.10.1 Starter motor check

Check the commutator: if there are impurities, clean with sandpaper with 600-grit number.

Measure the diameter of the commutator "A": if it does not comply with the prescribed values, replace the starter motor.

Limit: 16.6 mm (0.65 in)

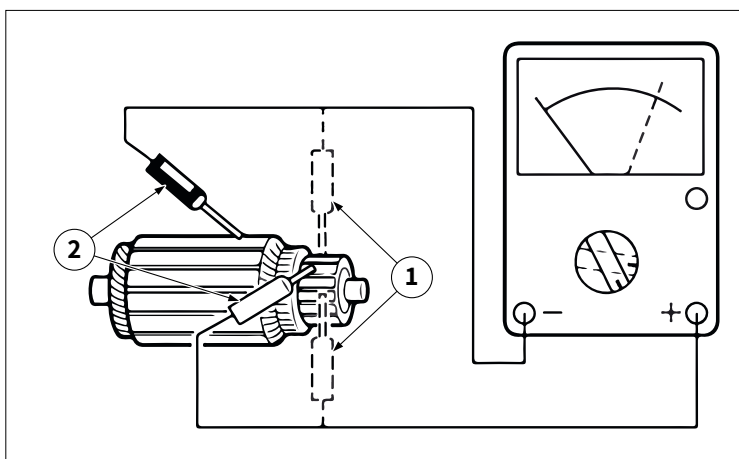


Measure the mica coating "B": if it does not comply with the prescribed values, scrape the mica coating until it reaches the appropriate measurement with a saw blade connected to ground to adapt it to the commutator .

The mica coating of the commutator must be thinned to ensure proper operation of the commutator.

Mica coating (depth): 1.35 mm (0.05 in)

The mica coating of the commutator must be thinned to ensure proper operation of the commutator.



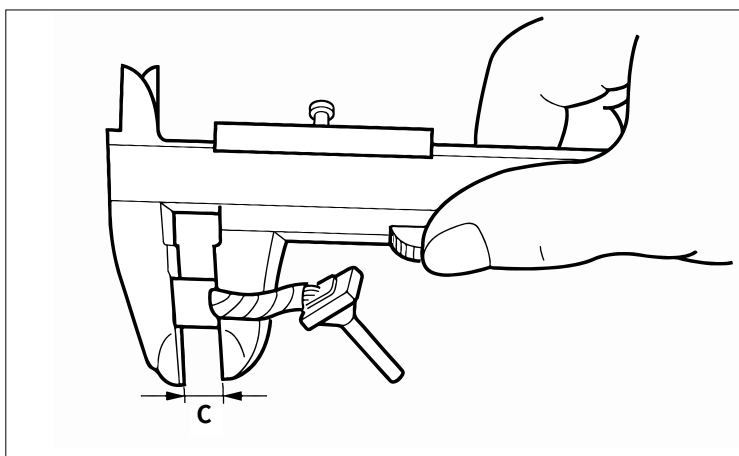
Measure the resistances of the induced group (commutator "1" and insulation "2"): if it does not comply with the prescribed values, replace the starter motor.

Measure the resistances of the induced group with a pocket tester.

Analogue pocket tester

If any of the resistors does not comply with the prescribed values, replace the starter motor.

Induced winding:
 • **Commutator "1" resistance:**
 0.0315-0.0385 Ω
 • **Resistance "2" insulation:**
 Greater than 1 MΩ



Measure the length of the brush "C": if it does not comply with the specifications, replace the front cover of the starter motor/brush holder set.

Limit: 3.50 mm (0.14 in)

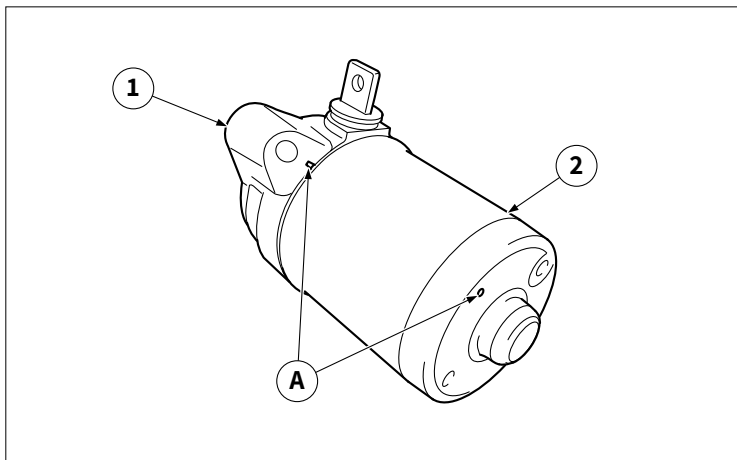
Measure the brush spring pressure: if it does not comply with the specifications, replace the brush springs as a set.

Measure the brush spring pressure: if it does not comply with the specifications, replace the brush springs as a set.

Brush spring pressure:
 3.92-5.88 N (400-600 gf, 14.11-21.17 oz)

Check the gear teeth: if there are any damages and/or signs of wear, replace the gear.

Check the bearing and oil seal: if damage and/or signs of wear are present, replace the front cover of the starter motor/brush holder set.



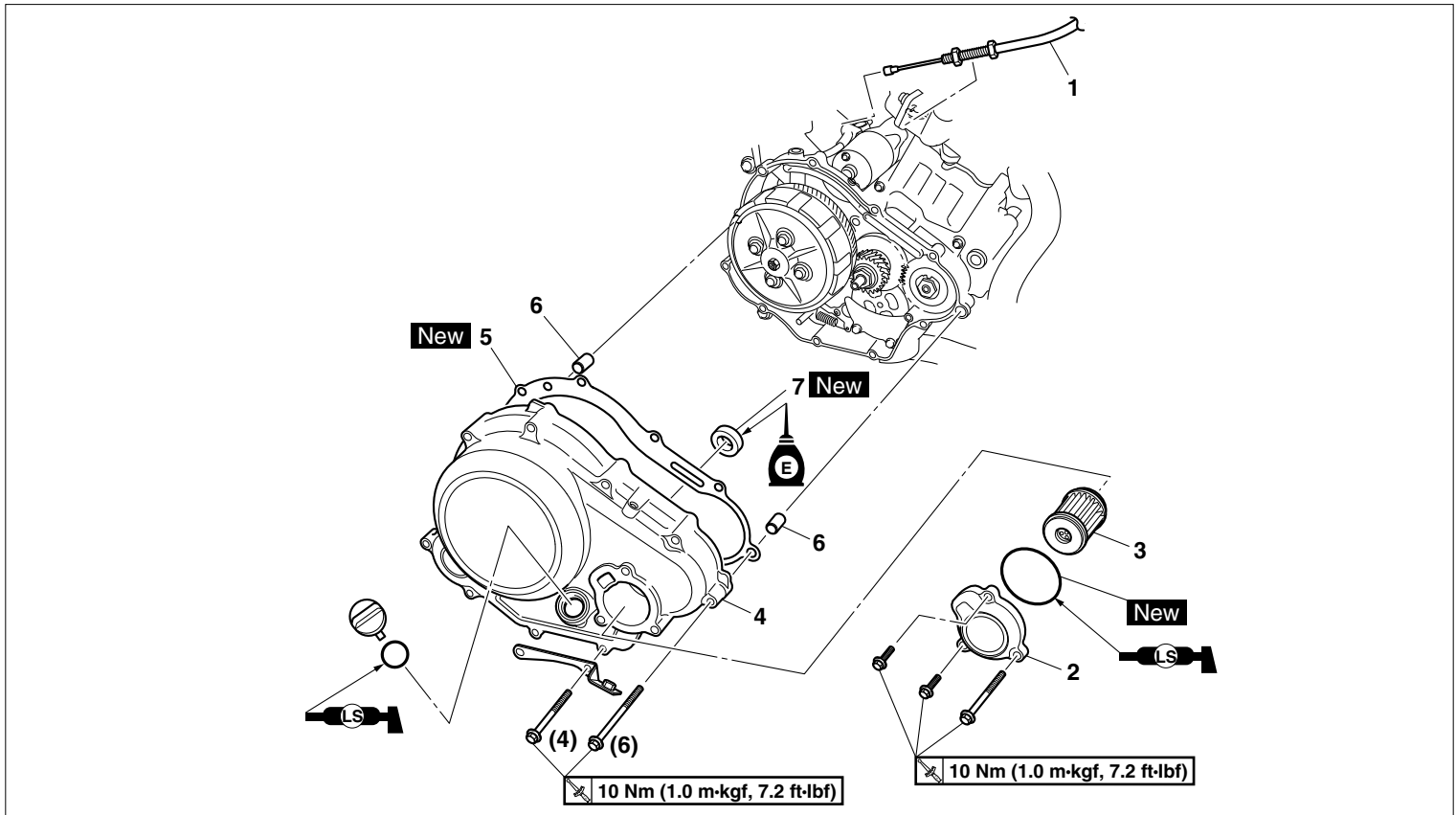
13.10.2 Starter motor assembling

Install the starter motor/brush holder set front cover “1” and the starter motor fork lever “2”.

- ⓘ **Align the reference marks “A” on the starter motor fork lever and on the front cover of the starter motor/brush holder set.**

13.11 CLUTCH

Clutch housing removal sequence.



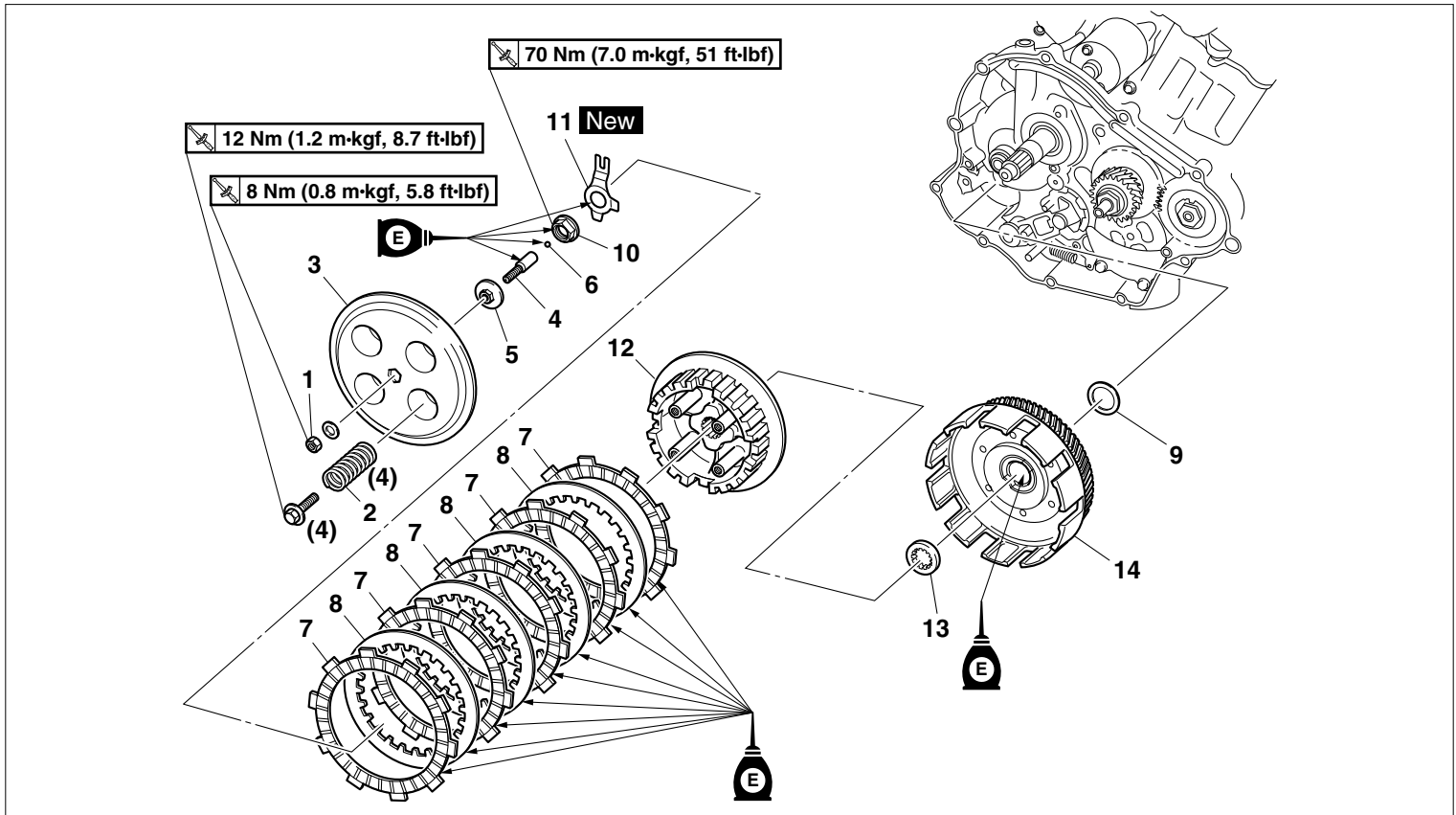
Preliminary operations:

– Engine oil, refer to “13.4 Engine oil change” on page 170.

Sequence	Operation/Components to remove	Quantity	Remarks
1	Clutch cable	1	Disconnect.
2	Oil filter element cover	1	
3	Oil filter element	1	
4	Clutch crankcase	1	
5	Clutch crankcase gasket	1	
6	Centering pin	2	
7	Oil seal	1	

i For installation, reverse the removal procedure.

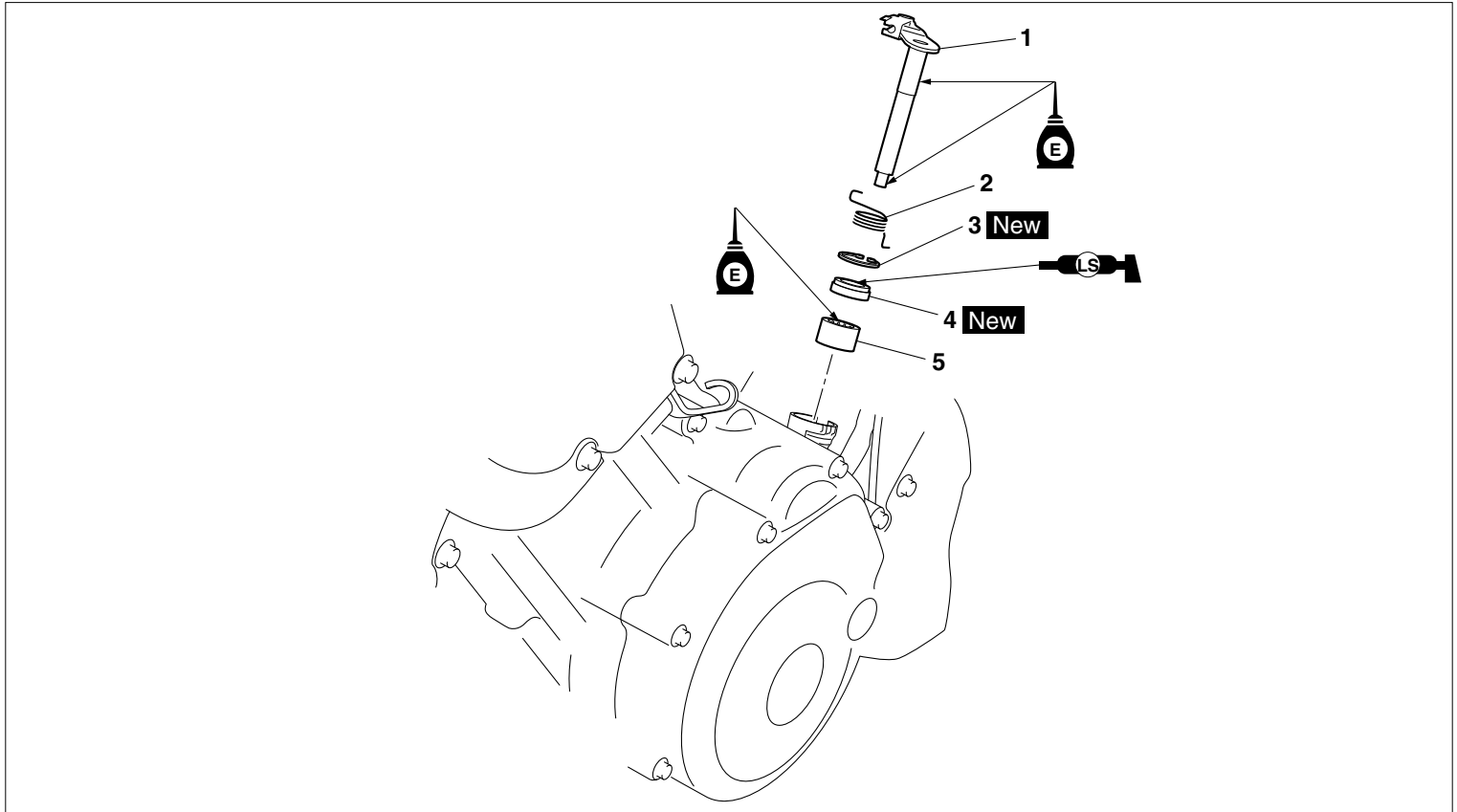
Clutch removal sequence.



Sequence	Operation/Components to remove	Quantity	Remarks
1	Locknut	1	
2	Clutch spring	4	
3	Pressure plate	1	
4	Short clutch control rod	1	
5	Clutch control rod support	1	
6	Ball	1	
7	Driving friction disc	5	
8	Driven friction disc	4	
9	Spring washer	1	
10	Clutch hub nut	1	
11	Locking washer	1	
12	Clutch hub	1	
13	Thrust washer	1	
14	Clutch housing	1	

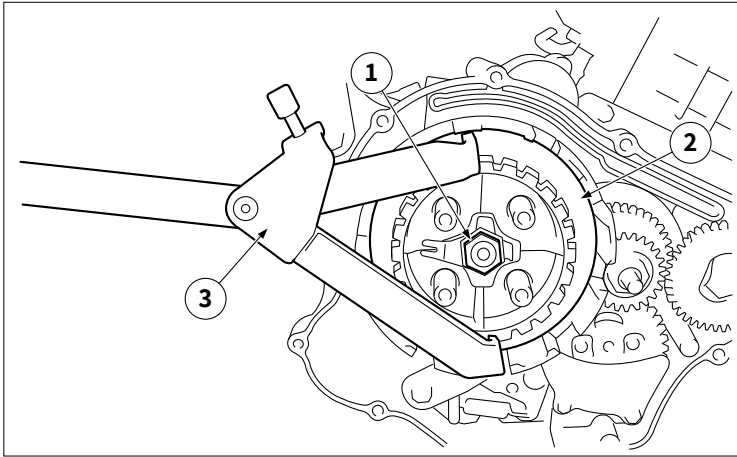
i For installation, reverse the removal procedure.

Control lever removal sequence.



Sequence	Operation/Components to remove	Quantity	Remarks
1	Clutch control lever	1	
2	Clutch control lever spring	1	
3	Retaining ring	1	
4	Oil seal	1	
5	Bearing	1	

i For installation, reverse the removal procedure.

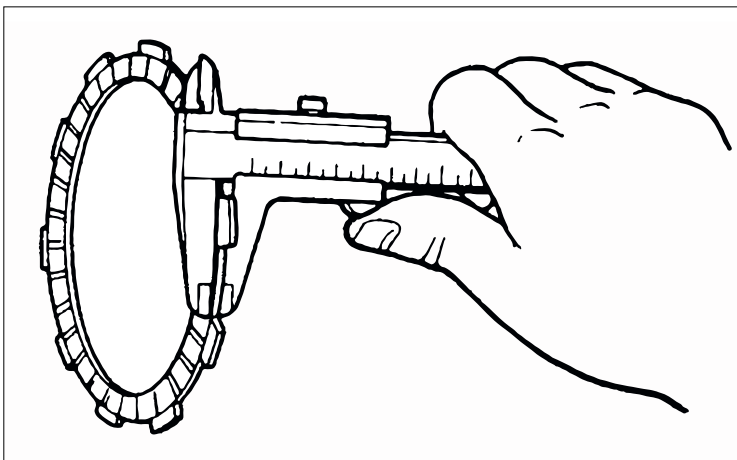


13.11.1 Clutch removal

Flatten the locking washer tab.

Loosen the clutch hub nut "1", keeping the clutch hub "2" locked with the universal clutch holder "3".

 **Universal clutch locking tool.**

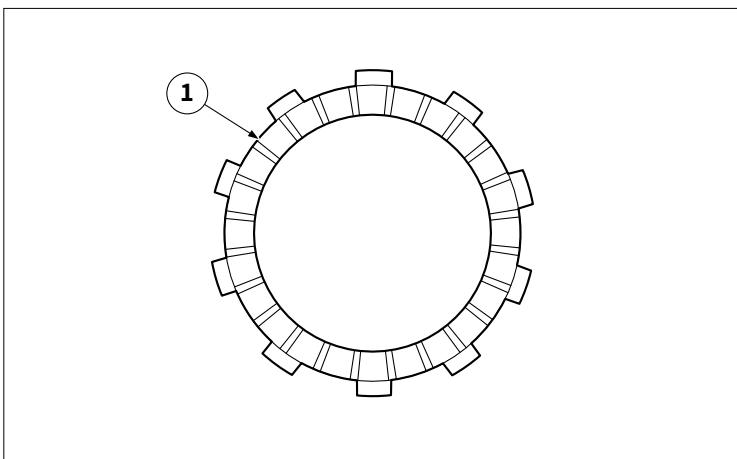


13.12 DRIVING FRICTION PLATES CHECK


 **The following procedure applies to all driving plates.**

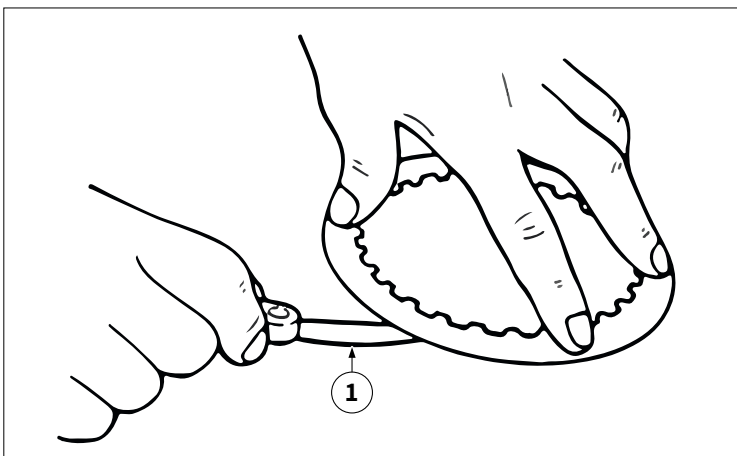
Check the driving friction plate: if there are any damages and/or signs of wear, replace the clutch plates as a set.

Measure the thickness of the driving plate: if it does not comply with the prescribed values, replace the friction plates as a set.



Measure the driving friction plate "1" in four different positions.

 • **Driving friction plate thickness:**
2.90–3.10 mm (0.114–0.122 in)
Wear limit: 2.80 mm (0,110 in)




13.13 DRIVEN FRICTION PLATES CHECK

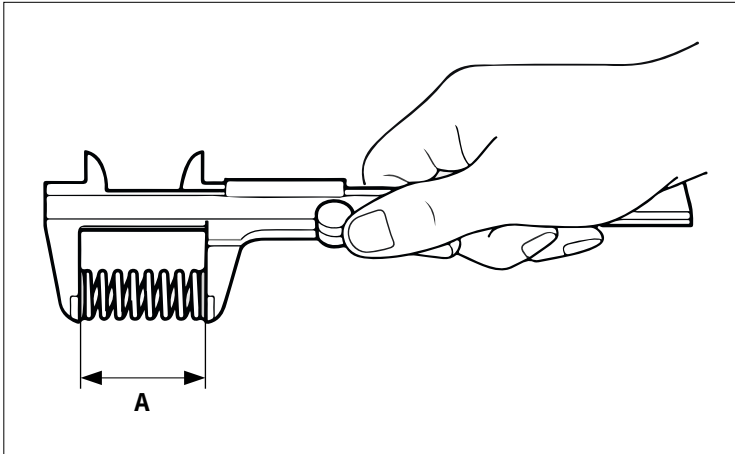
 **The following procedure applies to all driven plates.**

Check the driven friction plate: if there are any damages, replace the clutch plates as a set.

Measure the deformation of the driven friction plate with a reference plane and a thickness gauge "1": if it does not comply with the specifications, replace the friction plates as a set.

 **Thickness gauge set**

 **Thickness of the driven plate:**
1.90–2.10 mm (0.075–0.083 in)
Deformation limit: 0.20 mm (0.0079 in)




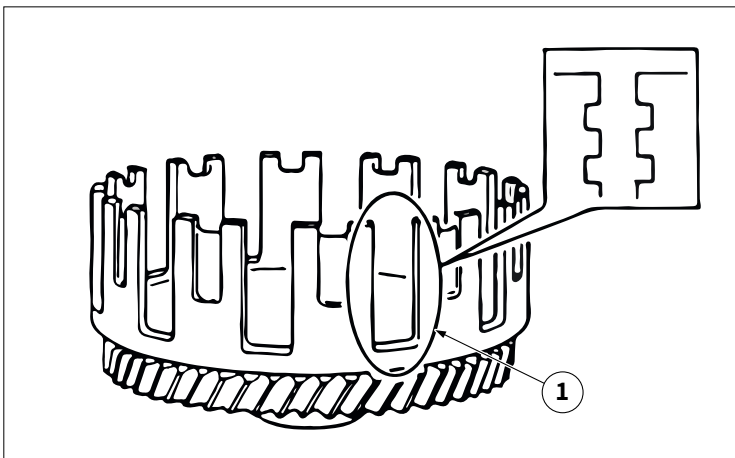
13.13.1 Clutch springs check

The following procedure applies to all clutch springs.

Check the clutch spring: if there are any damages, replace the clutch springs as a set.

Measure the free length of the valve spring "A": if it does not comply with the specifications, replace the clutch springs as a set.

-  **Clutch spring free length**
40.48 mm (1.59 in)
Limit: 36.80 mm (1.45 in).

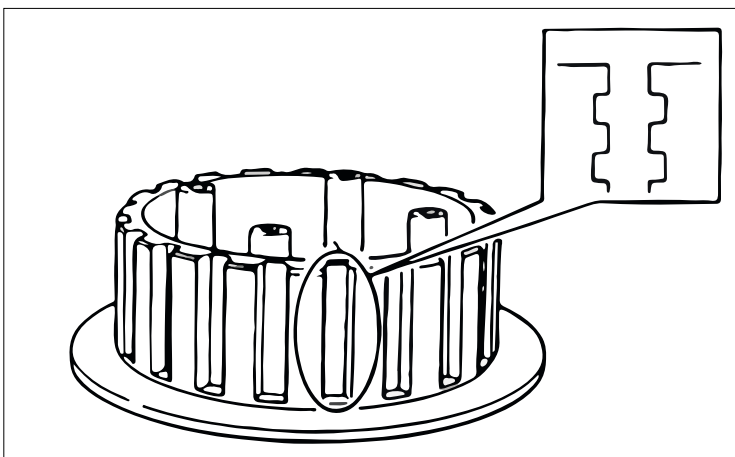


13.13.2 Clutch housing check

Check the teeth of the clutch housing "1": if there are any damage, pitting or signs of wear, deburr the clutch housing teeth or replace the clutch housing.


-  **The presence of pitting on the teeth of the clutch housing will cause an irregular operation of the clutch.**

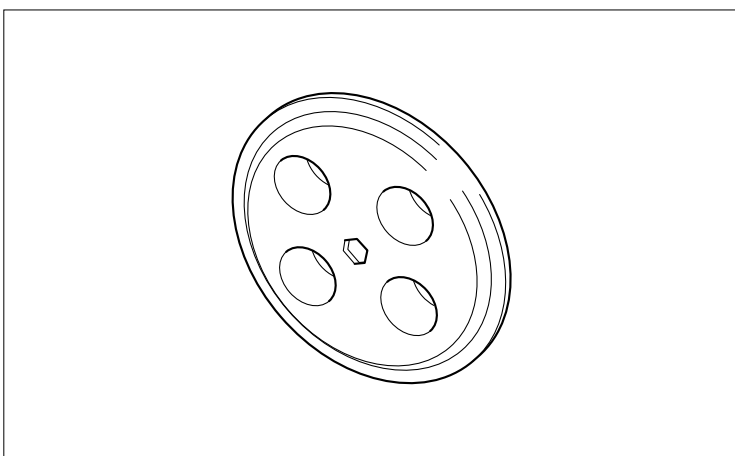
Check the bearing: if there are any signs of wear or damage, replace the bearing housing and the clutch housing.



13.13.3 Clutch hub check

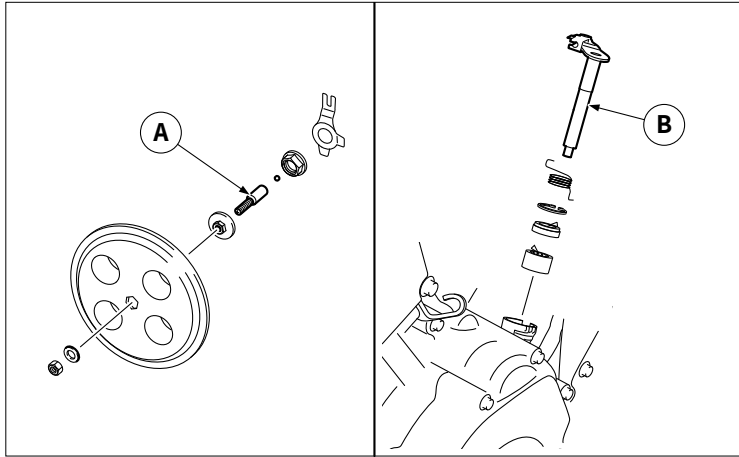
Check the clutch hub splines: if there are damages, pitting or signs of wear, replace the clutch hub.

-  **The presence of pitting on the clutch hub splines will cause the clutch malfunction.**



13.13.4 Pressure plate check

Check the pressure plate: if there are any cracks and/or damage, replace it.

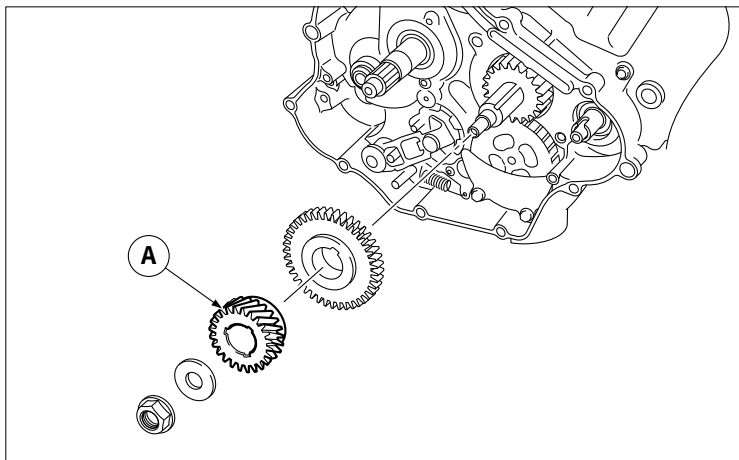


13.13.5 Clutch control lever control and short clutch control rod check

Check:

- Clutch control lever “B”;
- Short clutch control rod “A”.

If damage and/or signs of wear are present, replace the defective part or parts.



13.13.6 Primary drive driving gear check

Remove the drive gear “A” of the primary drive.

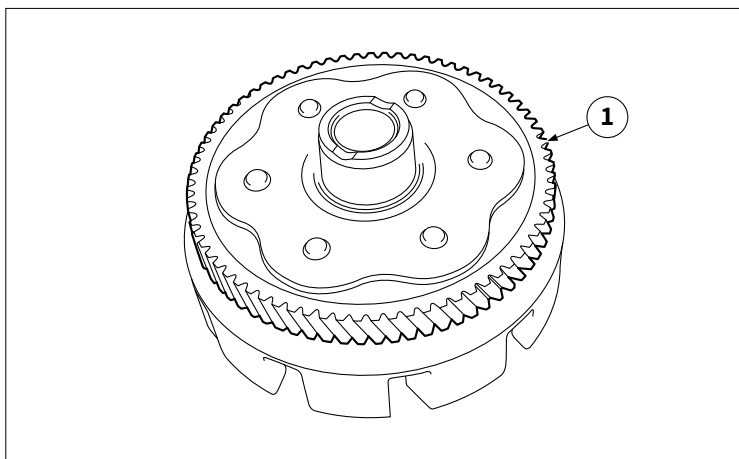
Refer to “13.16 Balancer gear” on page 217.

Check the primary drive driving gear: if there are any damage or signs of wear, replace the primary drive driving gear and the clutch housing as a set.

In case of excessive noise during operation, replace the primary drive driving gear and the clutch housing as a set.

Install the primary drive driving gear.

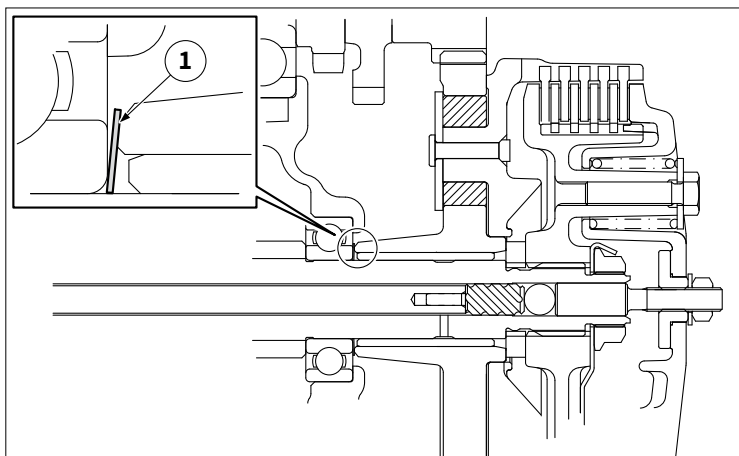
Refer to “13.16 Balancer gear” on page 217.



13.13.7 Primary drive driven gear check

Check the primary drive driven gear “1”: if there are any damage and/or signs of wear, replace the primary drive driving gear and the clutch housing as a set.

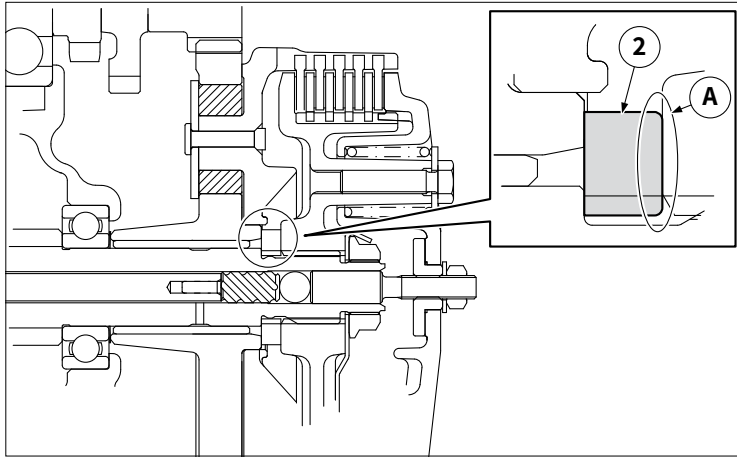
In case of excessive noise during operation, replace the primary drive driving gear and the clutch housing as a set.



13.13.8 Clutch installation

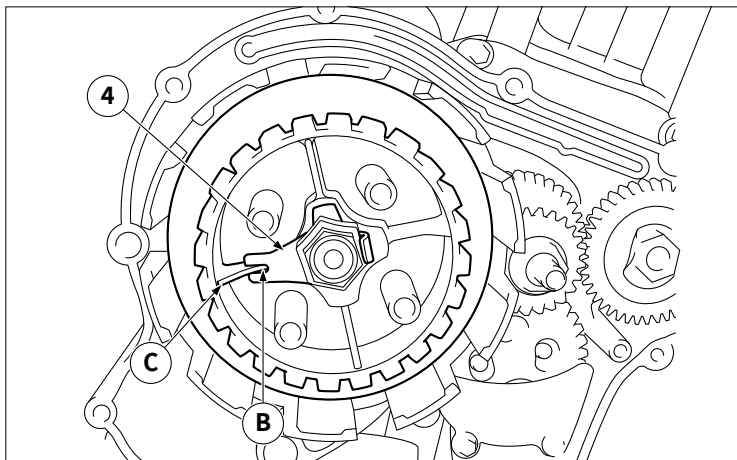
Install the spring washer “1”.

⚠ Install the spring washer as shown in the figure.



Install the clutch housing and thrust washer "2".

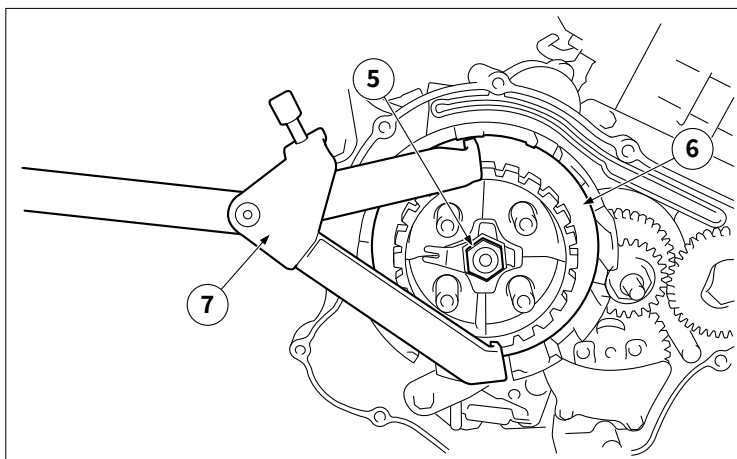
⚠ Install the thrust washer with the rounded side "A" facing the clutch hub.



Install the clutch hub "3", the lock washer "4" and the clutch hub nut.

i Lubricate the clutch hub nut threads and the damping surfaces of the lock washer with engine oil.

Align the notch "B" in the lock washer with a thread "C" on the clutch hub.



Tighten the clutch hub nut "5", keeping the clutch hub "6" locked with the universal clutch holder "7".

**🔧 Tightening torque: Clutch hub nut
70 Nm (7.0 m·kgf, 51 ft·lbf)**

🔧 Universal clutch locking tool.

Bend the locking washer tab along one of the flat sides of the nut. Lubricate the friction plates and the clutch plates with engine oil.

♻ Recommended lubricant for the plates: Engine oil.

Install:

- Driving plate;
- Driven plates.

⚠ First install a driving plate and then alternate a driven plate and a driving plate.

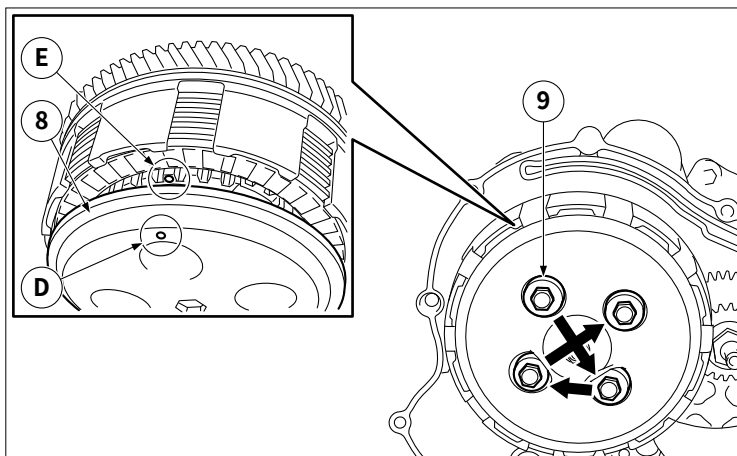
Install:

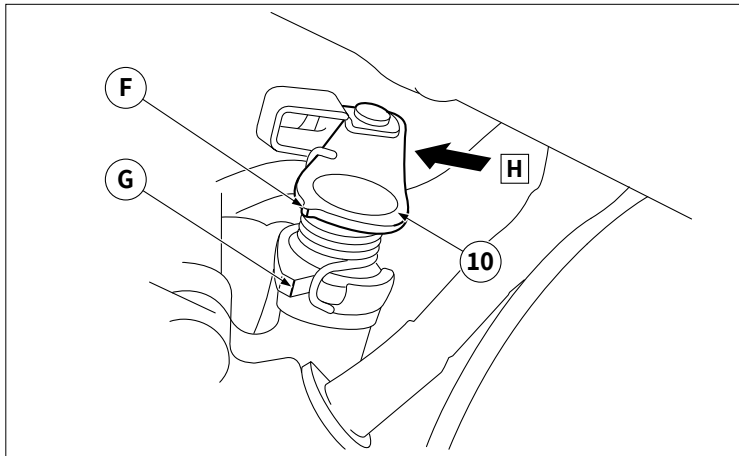
- Pressure plate "8";
- Clutch springs;
- Clutch spring bolts "9".

**🔧 Tightening torque: Clutch spring bolt
12 Nm (1.2 m·kgf, 8.7 ft·lbf)**

Align the punch mark "D" on the pressure plate with the punch mark "E" on the clutch hub.

⚠ Tighten the clutch spring bolts gradually and in a crossed pattern.





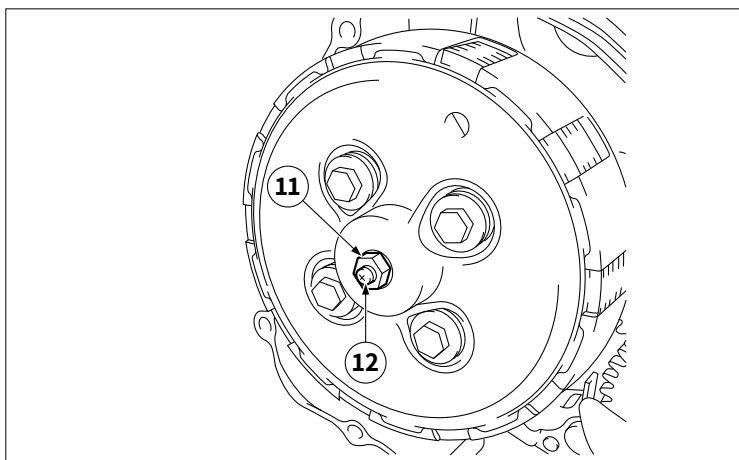
Adjust the clutch mechanism clearance.

Check that the projection “F” on the clutch control lever “10” is aligned with the reference mark “G” on the crankcase as shown in the figure, pushing the clutch control lever manually in the direction “H” until it stops.

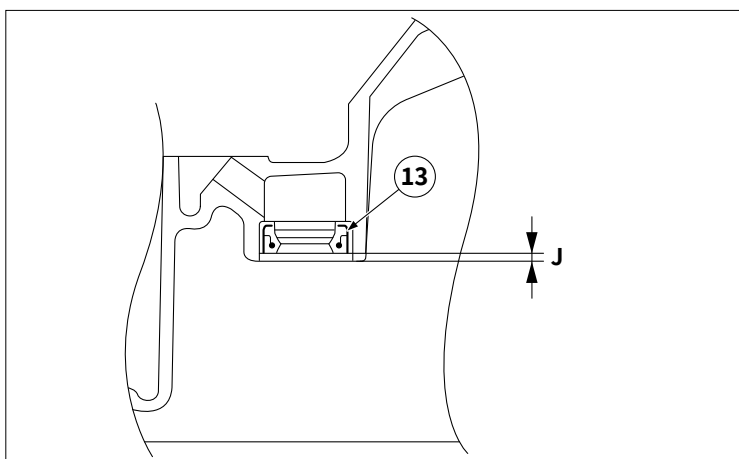
If the projection “F” is not aligned with the reference mark “G”, proceed with the alignment.

Align proceeding as follows:

- Loosen the locknut “11”;
- With the clutch control lever fully pressed in direction “H”, rotate the short clutch control rod “12” inward or outward until the mark “F” is aligned with the mark “G”.
- Stop the short clutch control rod to prevent it from moving and then tighten the locknut according to the specifications.



Tightening torque:
Short clutch control rod locknut
8 Nm (0.8 m·kgf, 5.8 ft·lbf)

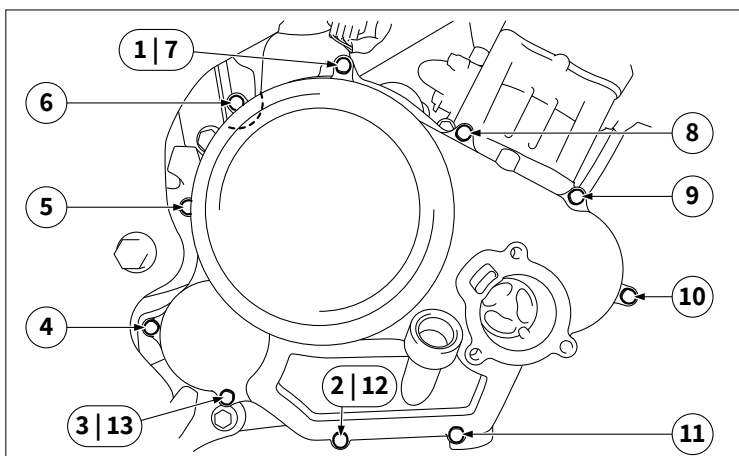


Install the oil seal “13” to the correct depth position “J”.

Oil seal “J” installation depth
1.4–1.9 mm (0.055–0.075 in)

Install the clutch crankcase.

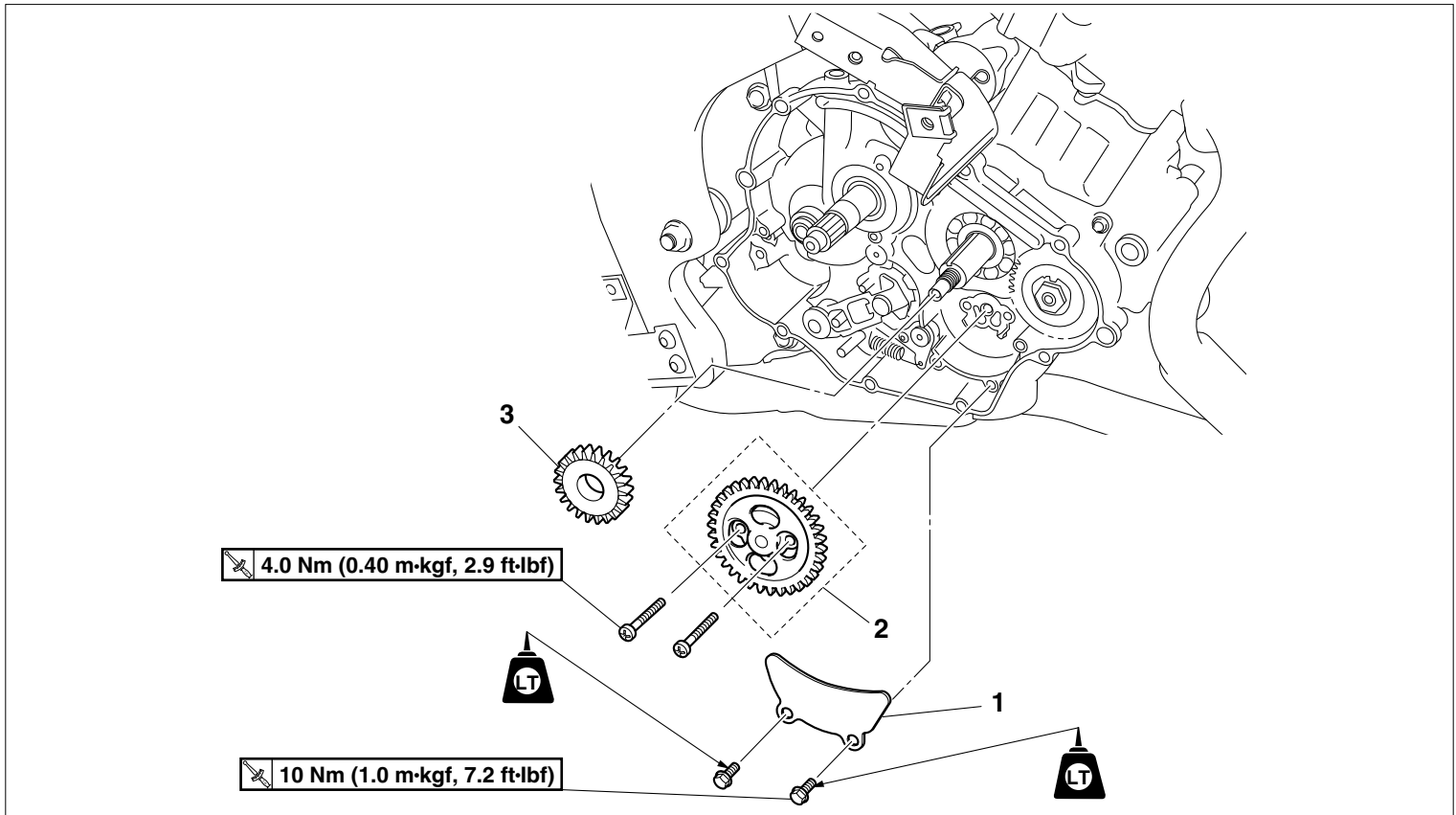
Tightening torque: Clutch crankcase bolt
10 Nm (1.0 m·kgf, 7.2 ft·lbf)



Tighten the clutch crankcase bolts in the correct sequence as shown. Adjust the clutch lever clearance. Refer to “9.9 Clutch lever clearance adjustment” on page 29.

13.14 OIL PUMP

Oil pump removal sequence.



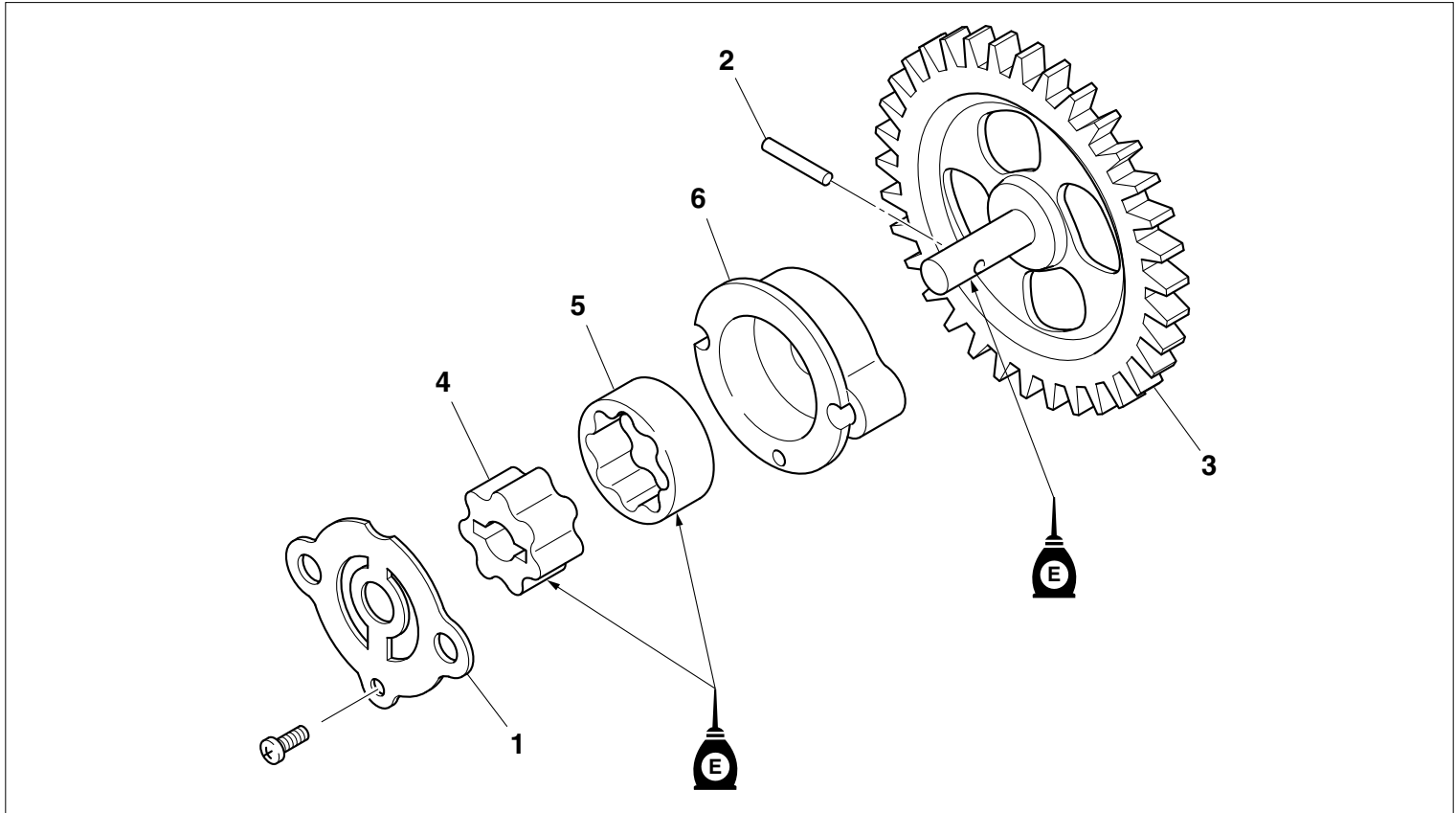
Preliminary operations:

- Clutch housing, refer to “13.1 Complete engine removal” on page 164 “13.11 Clutch” on page 203;
- Balancer driving gear, refer to “13.6 Camshaft” on page 177.

Sequence	Operation/Components to remove	Quantity	Remarks
1	Oil deflector	1	
2	Oil pump unit	1	
3	Oil pump driving gear	1	

i For installation, reverse the removal procedure.

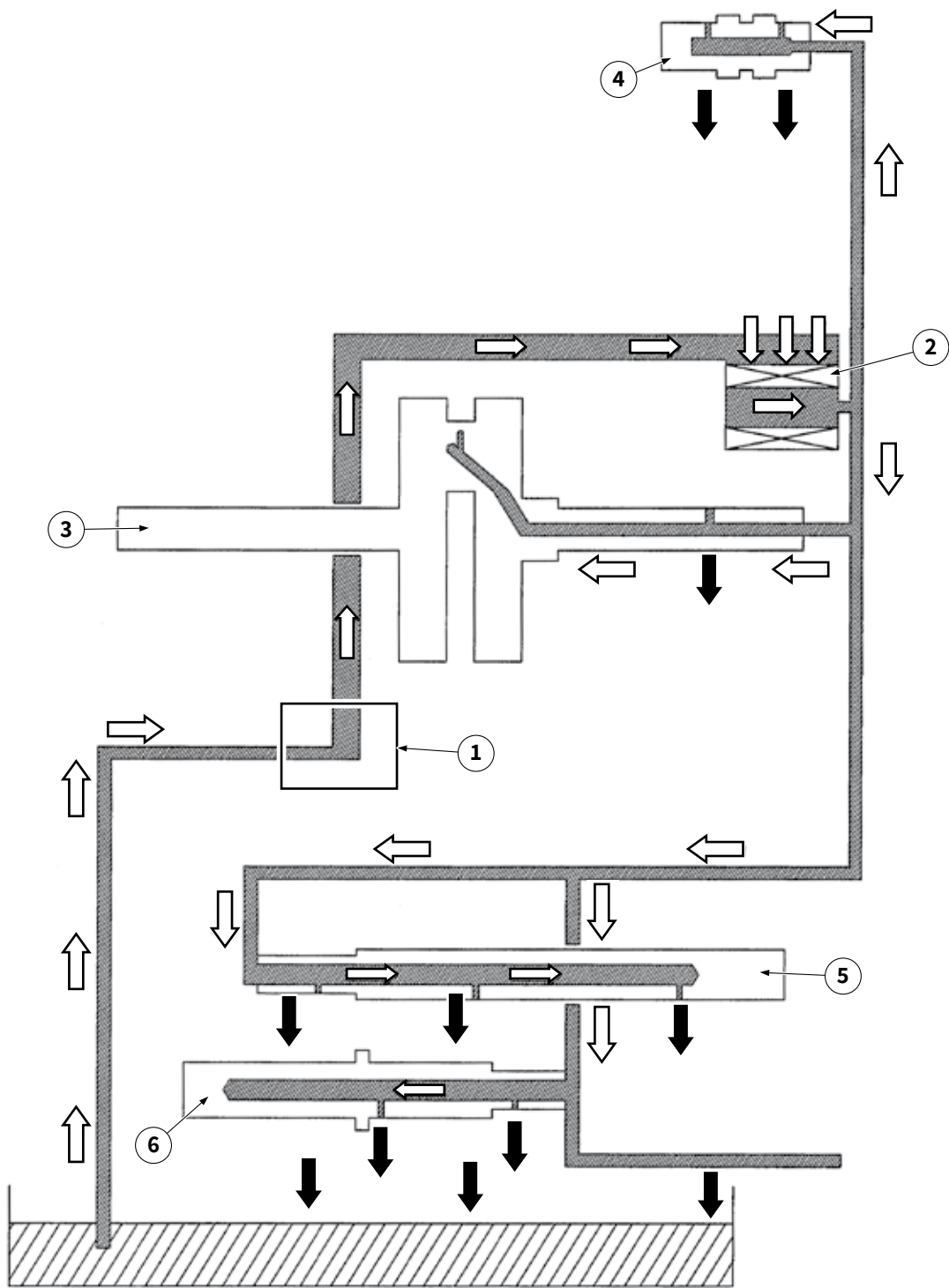
Oil pump disassembling sequence.



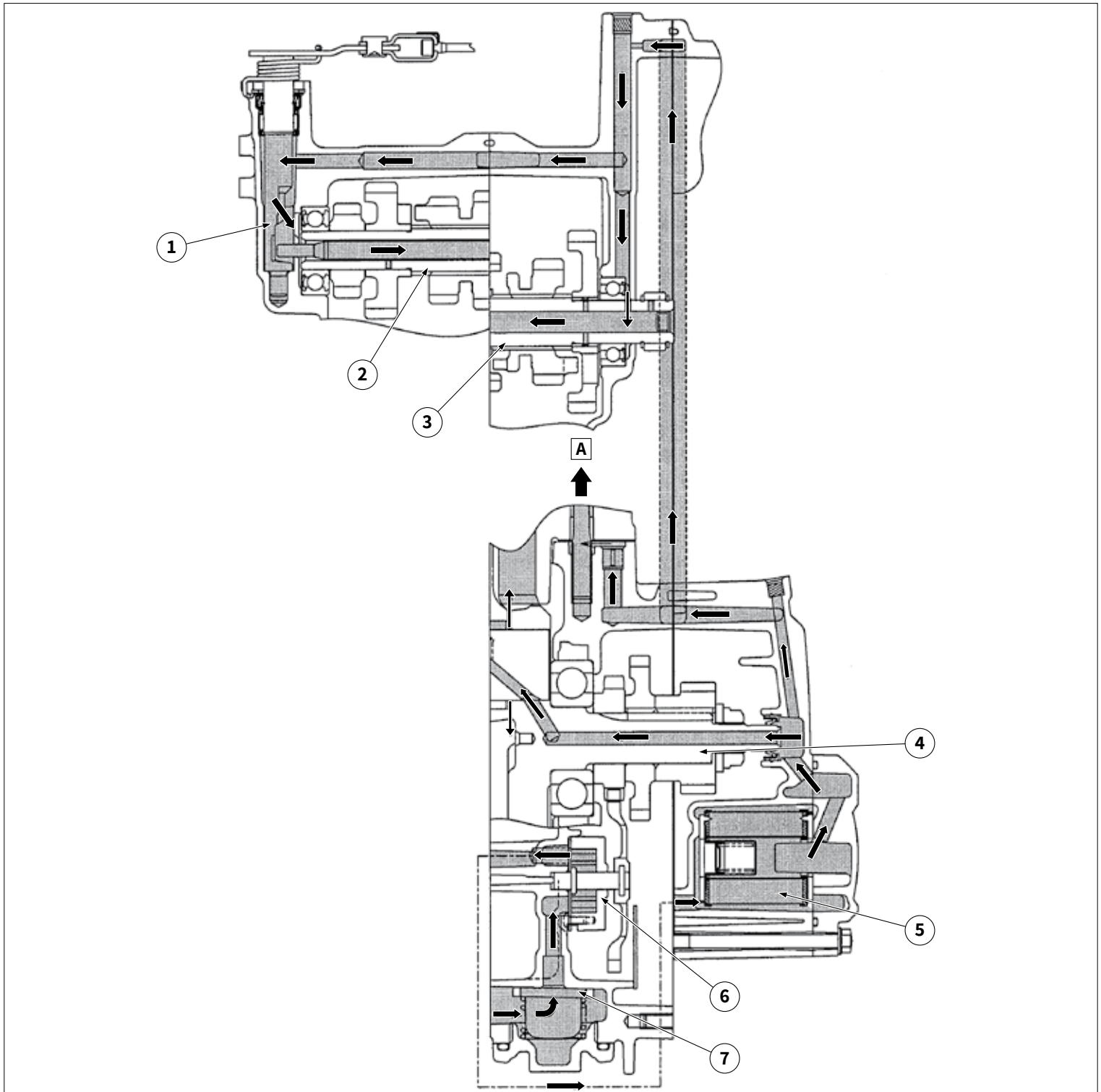
Sequence	Operation/Components to remove	Quantity	Remarks
1	Oil pump housing cover	1	
2	Pin	1	
3	Oil pump driven gear	1	
4	Oil pump internal rotor	1	
5	Oil pump external rotor	1	
6	Oil pump housing	1	

i For assembly, reverse the disassembly procedure.

13.14.1 Lubrication system diagrams and tables

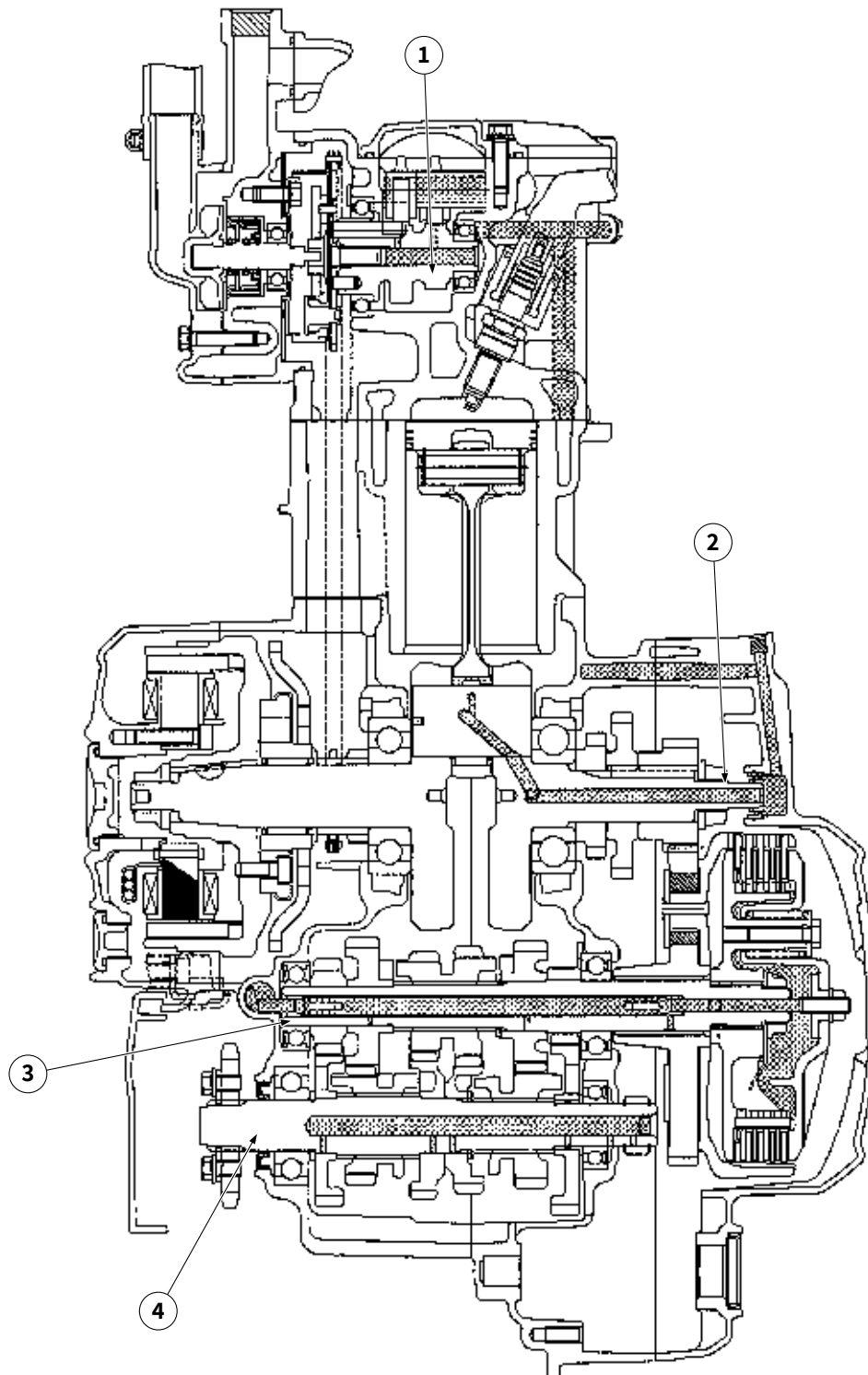


- 1. Oil pump
- 2. Oil filter element
- 3. Crankshaft
- 4. Camshaft
- 5. Primary gear shift shaft
- 6. Secondary gear shift shaft

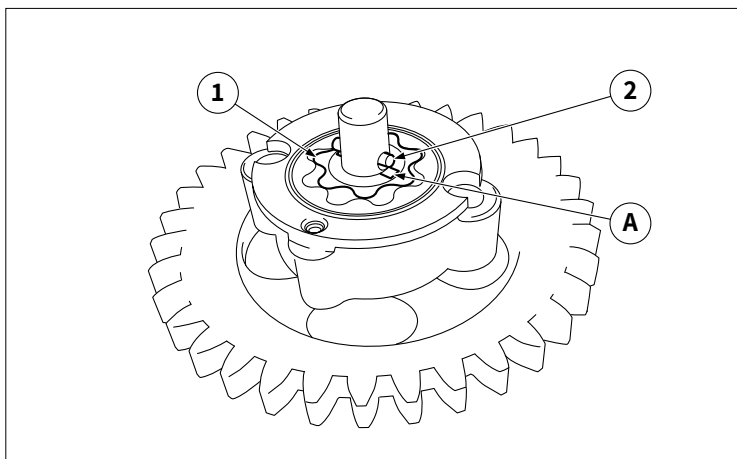
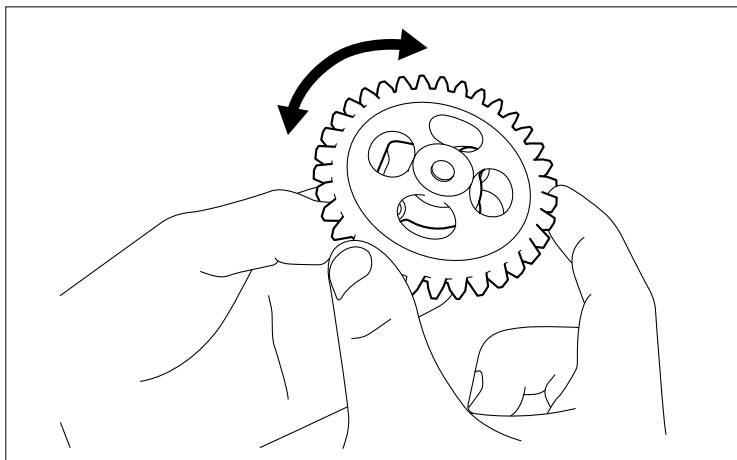
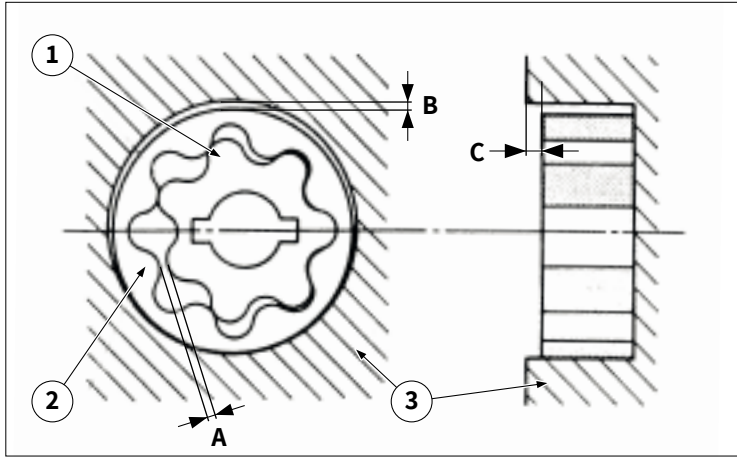


- 1. Clutch control lever
- 2. Primary gear shift shaft
- 3. Secondary gear shift shaft
- 4. Crankshaft
- 5. Oil filter
- 6. Oil pump unit
- 7. Oil filter

A. At the cylinder head



1. Camshaft
2. Crankshaft
3. Primary gear shift shaft
4. Secondary gear shift shaft



13.14.2 Oil pump check

Check:

- Oil pump driving gear;
- Oil pump driven gear;
- Oil pump housing;
- Oil pump housing cover.

If there are any cracks, damage and/or signs of wear, replace the defective part or parts.

Measure:

- Clearance between internal rotor - external rotor end "A";
- Clearance between external rotor - oil pump housing "B";
- Clearance between oil pump housing - internal and external rotor "C".

If it does not comply with the specifications, replace the oil pump.

1. Internal rotor
2. External rotor
3. Oil pump housing

- ✂ **• Clearance between internal rotor - external rotor end**
Lower than 0.15 mm (0.0059 in)
Limit: 0.23 mm (0.0091 in)
- ✂ **• Clearance between external rotor - oil pump housing**
0.13–0.18 mm (0.0051–0.0071 in)
Limit: 0.25 mm (0.0098 in)
- ✂ **• Clearance between oil pump housing - internal and external rotor:** **0.06–0.11 mm (0.0024–0.0043 in)**
Limit: 0.18 mm (0.0071 in)

Check the operation of the oil pump: if the movement is difficult, repeat the check and measurement operations or replace the defective part or parts.

13.14.3 Oil pump assembling

Lubricate:

- Oil pump internal rotor;
- Oil pump external rotor;
- Oil pump driven gear.

♻ **Recommended lubricant: Engine oil**

Install:

- Oil pump external rotor;
- Oil pump internal rotor "1";
- Oil pump driven gear;
- Pin "2".

When installing the internal rotor, align the pin "2" of the oil pump shaft with the groove "A" of the internal rotor "1".

Check the operation of the oil pump.

Refer to "13.14.2 Oil pump check" on page 214.

13.14.4 Oil pump installation

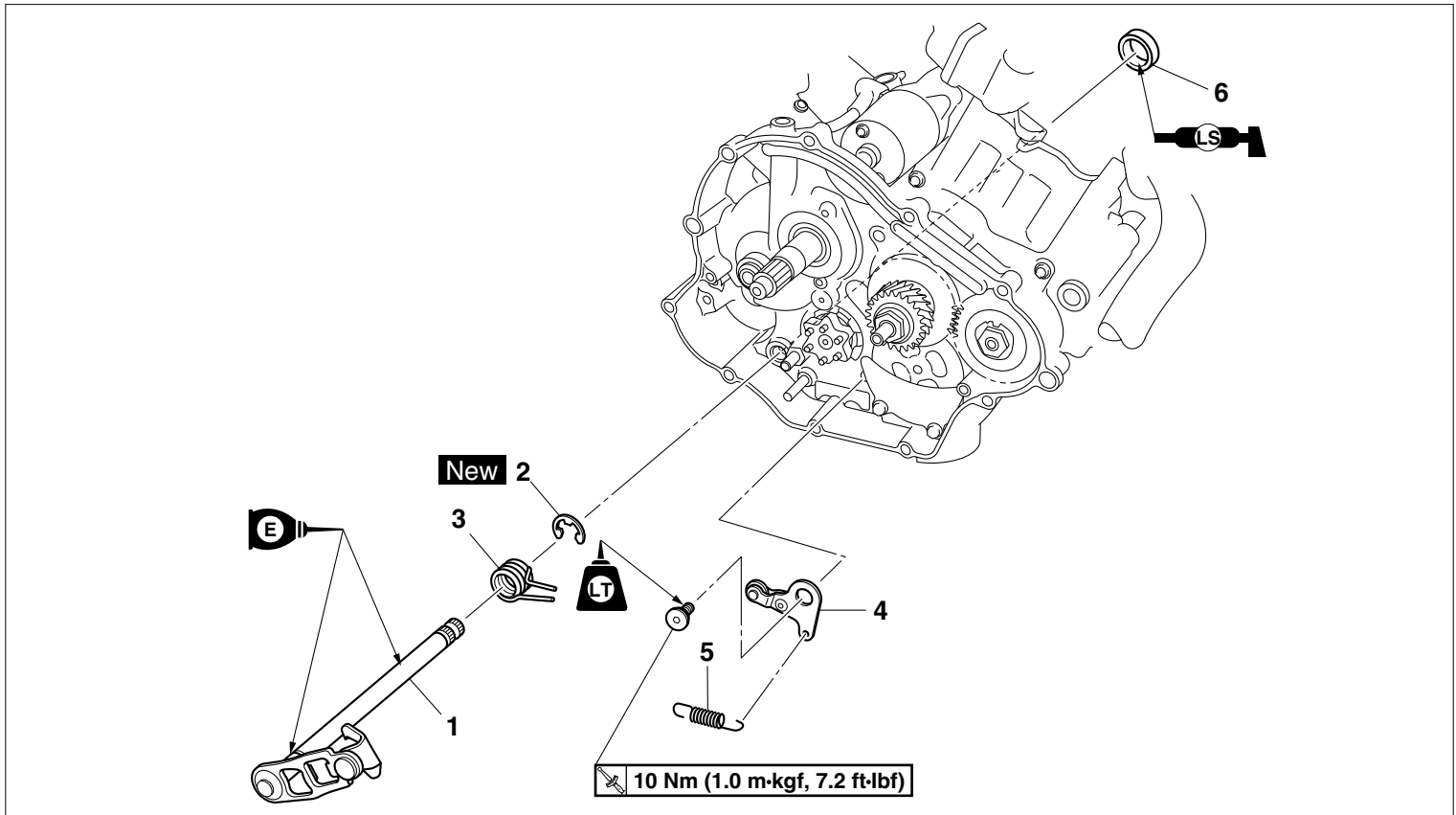
Install the oil pump unit

🔧 **Tightening torque: Oil pump unit screw**
4 Nm (0.4 m·kgf, 2.9 ft·lbf)

⚠ **After tightening the screws, make sure that the oil pump rotates smoothly.**

13.15 GEAR SHIFT SHAFT

Gear shift shaft and cut off lever removal sequence.

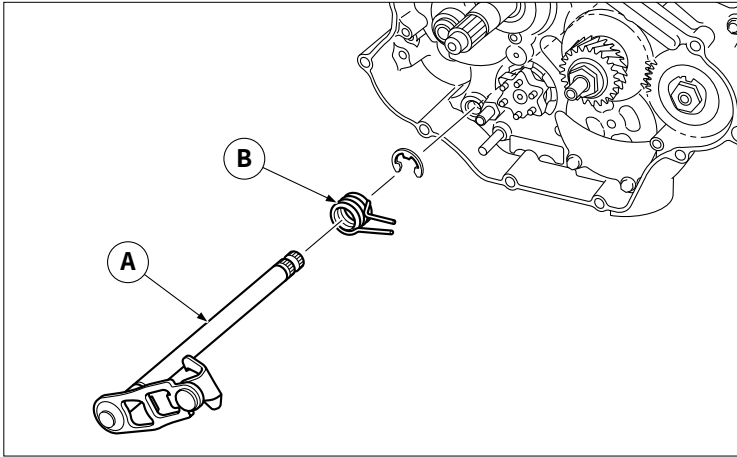


Preliminary operations:

- Clutch housing, refer to “13.11 Clutch” on page 201;
- Gear shift pedal, refer to “13.1 Complete engine removal” on page 164.

Sequence	Operation/Components to remove	Quantity	Remarks
1	Gear shift shaft	1	
2	Retaining ring	1	
3	Gear shift shaft spring	1	
4	Cut off lever	1	
5	Stop lever spring	1	
6	Oil seal	1	

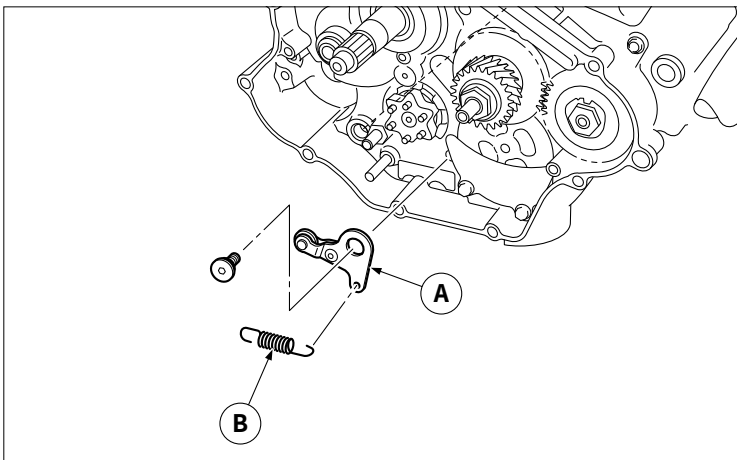
i For installation, reverse the removal procedure.



13.15.1 Gear shift shaft check

Check the gear shift shaft “A”: if there are flexing, damage and/or signs of wear, replace it.

Check the gear shift shaft spring “B”: if there are damages and/or signs of wear, replace it.

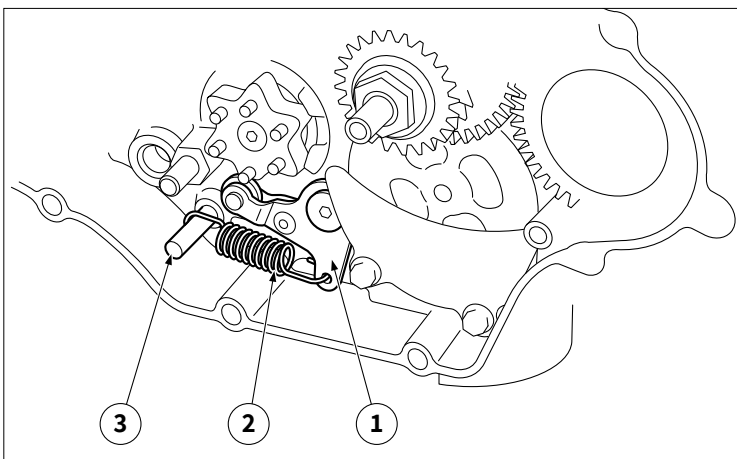


13.15.2 Cut off lever check

Check the cut off lever “A”: if there are bends and/or damage, replace it.

If the roller rotation is difficult, replace the cut off lever.

Check the stop lever spring “B”: if there are any damages and/or signs of wear, replace it.



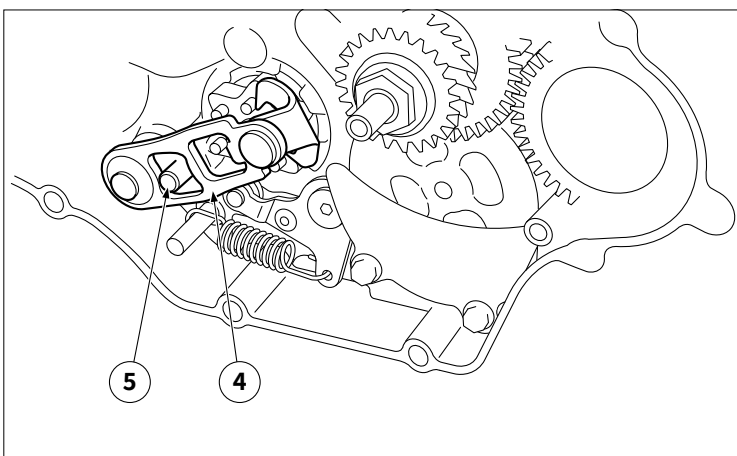
13.15.3 Gear shift shaft installation

Install the cut-off lever “1” and the stop lever spring “2”

⚠ Install the cut-off lever spring as shown in the figure.

Hook the ends of the cut-off lever spring onto the cut-off lever and the crankcase hub “3”.

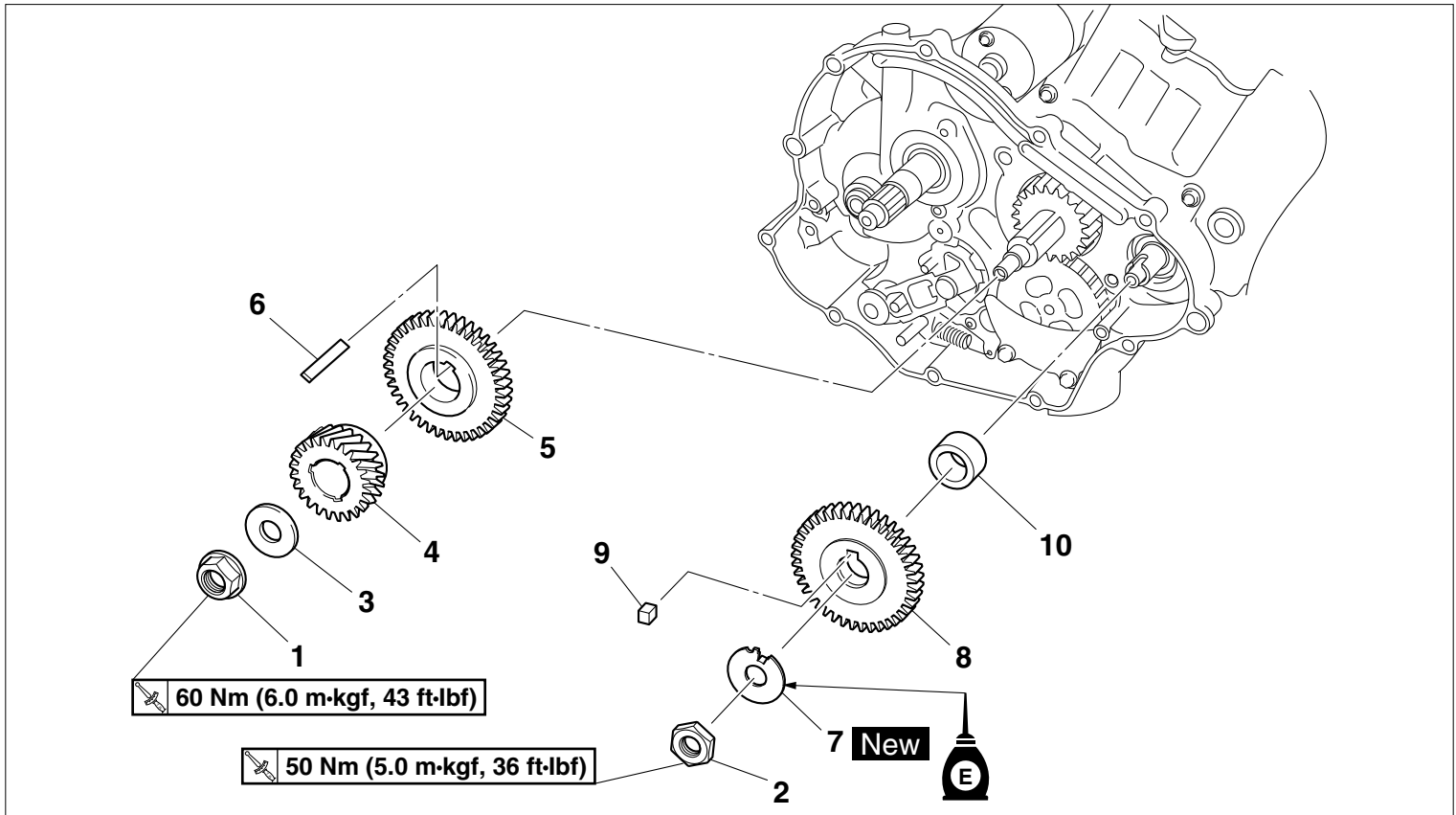
Engage the cut-off lever in the gear selector drum segment assembly. Install the gear shift shaft “4”.



Hook the end of the gear shift shaft spring onto the gear shift shaft spring retainer “5”.

13.16 BALANCER GEAR

Sequence of removal of the driving gear of the primary transmission and of the balancer gears.

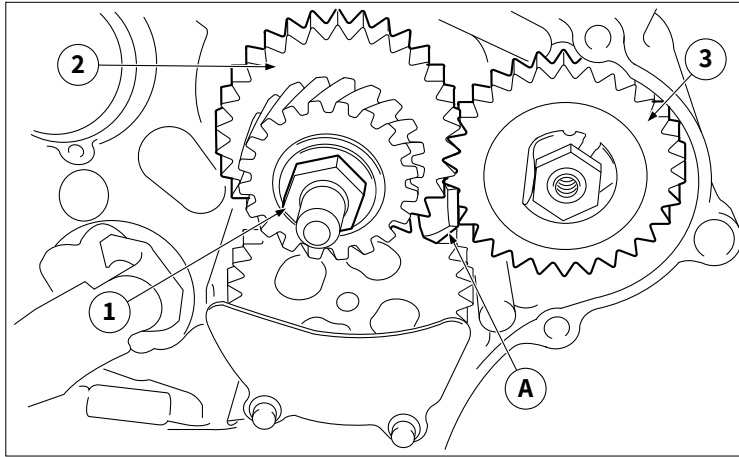


Preliminary operations:

- Clutch housing, refer to “13.11 Clutch” on page 201.

Sequence	Operation/Components to remove	Quantity	Remarks
1	Primary drive driving gear nut	1	
2	Balancer driven gear nut	1	
3	Washer	1	
4	Primary drive driving gear	1	
5	Balancer driving gear	1	
6	Straight key	1	
7	Locking washer	1	
8	Balancer driven gear	1	
9	Straight key	1	
10	Spacer	1	

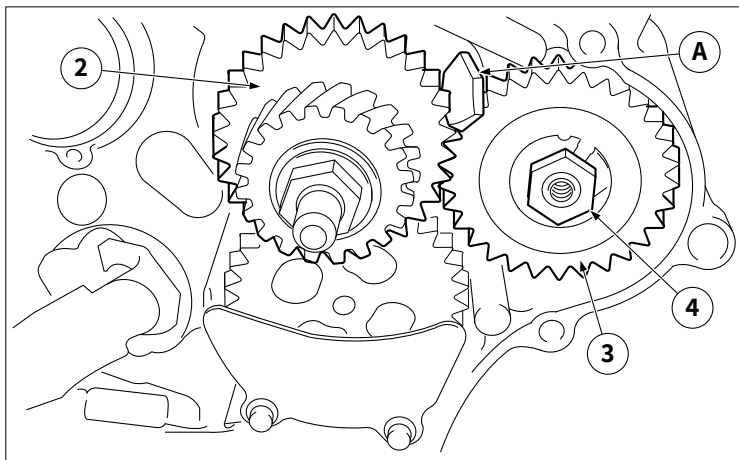
i For installation, reverse the removal procedure.



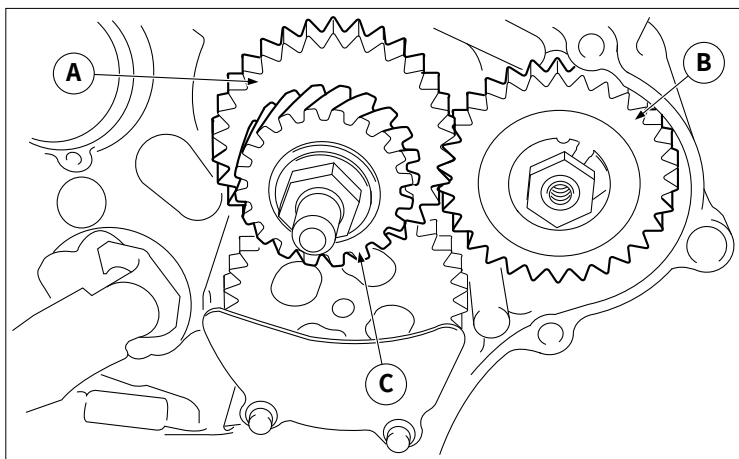
13.16.1 Primary drive driving gear and balancer gears removal

Loosen the primary drive driving gear nut “1” and place the aluminium plate “A” between the balancer driving gear “2” and the balancer driven gear “3”, then loosen the primary drive driving gear nut.

Flatten the locking washer tab.



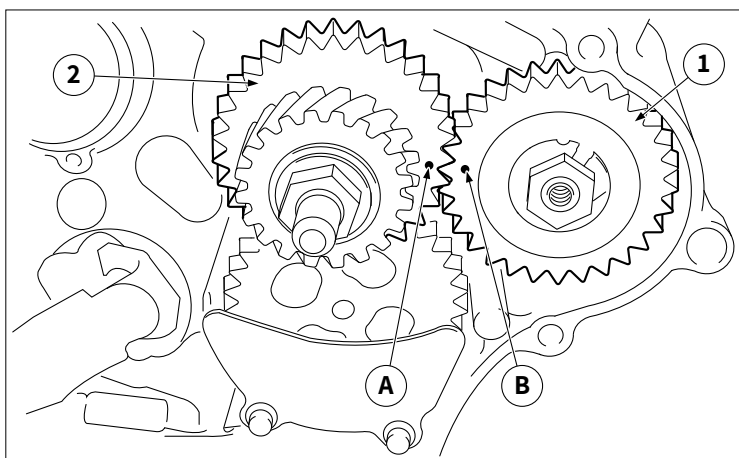
Loosen the balancer driving gear nut “4” and place the aluminium plate “A” between the balancer driving gear “2” and the balancer driven gear “3”.



13.16.2 Primary drive driving gear and balancer gears check

Check the balancer driven gear “A” and the balancer driving gear “B”: if there are cracks, damage and/or signs of wear, replace it.

Check the primary drive driving gear “C”.

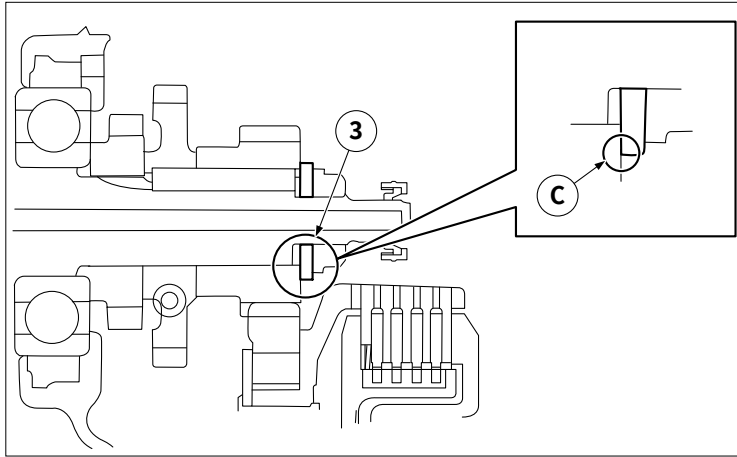


13.16.3 Primary drive driving gear and balancer gears installation

Install:

- Balancer driven gear “1”;
- Locking washer;
- Balancer driving gear “2”;
- Primary drive driving gear.
- Washer “3”;
- Balancer driven gear nut;
- Primary drive driving gear nut.

• Align the punching “A” of the balancing drive gear “1” to the punching “B” of the driven balancing gear “2”.

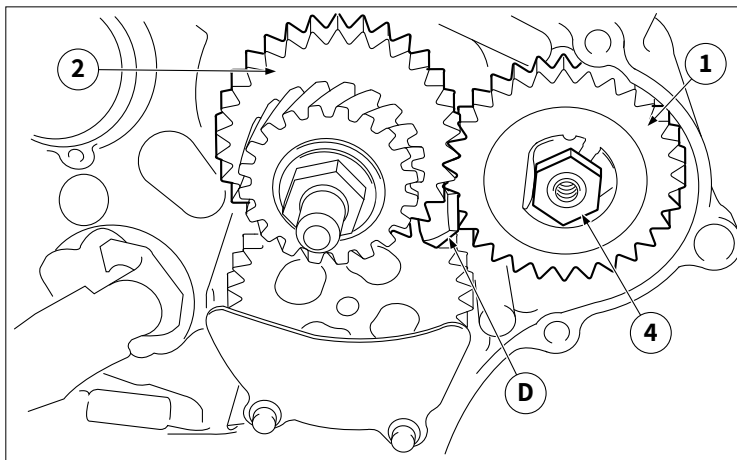


Be sure to install the washer “3” so that the sharpened side “C” faces the primary drive driving gear.

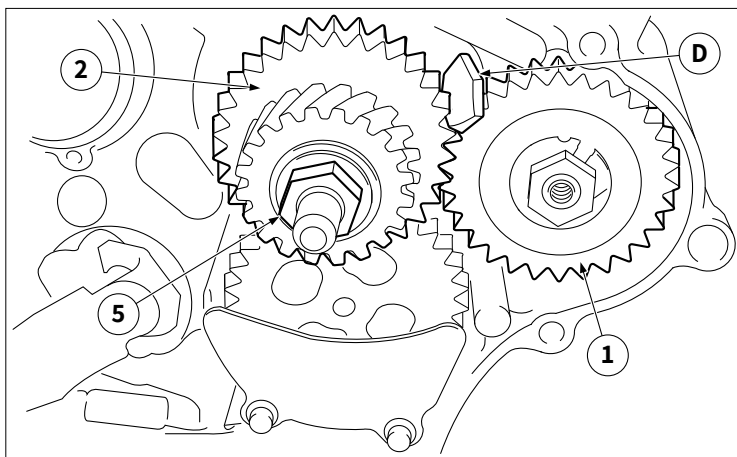
Tighten the balancer driven gear nut “1” and the primary drive driving gear nut “2”.

Tightening torques

- Balancer driven gear nut: 50 Nm (5.0 m·kgf, 36 ft·lbf)
- Primary drive driving gear nut: 60 Nm (6.0 m·kgf, 43 ft·lbf)



Place the aluminium plate “D” between the balancer driving gear “2” and the balancer driven gear “1”, then tighten the balancer driven gear nut “4”.

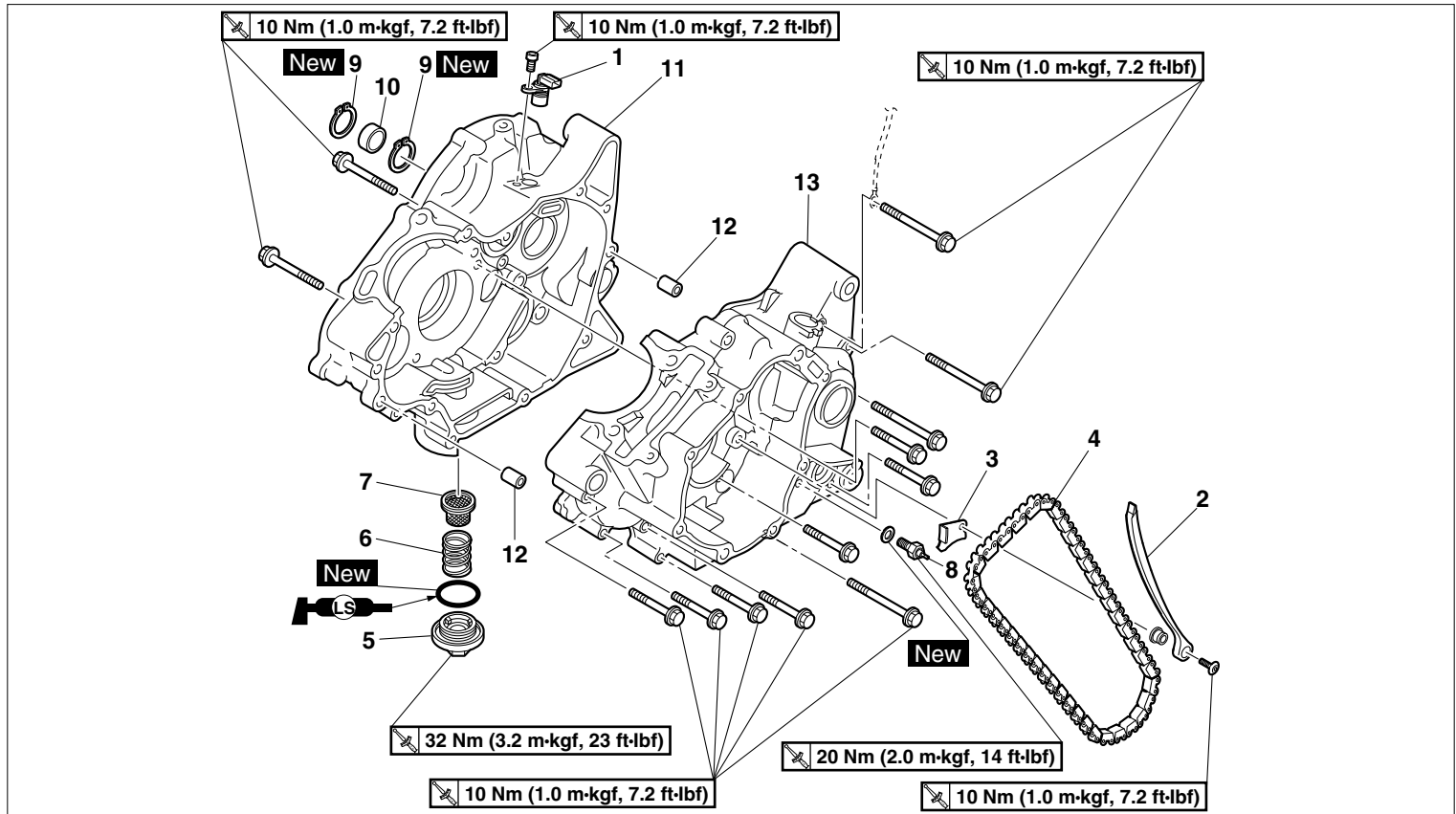


Place the aluminium plate “D” between the balancer driving gear “2” and the balancer driven gear “1”, then tighten the primary drive driving gear nut “5”.

Bend the locking washer tab along one of the flat sides of the nut.

13.17 CRANKCASE

Crankcase separation sequence.



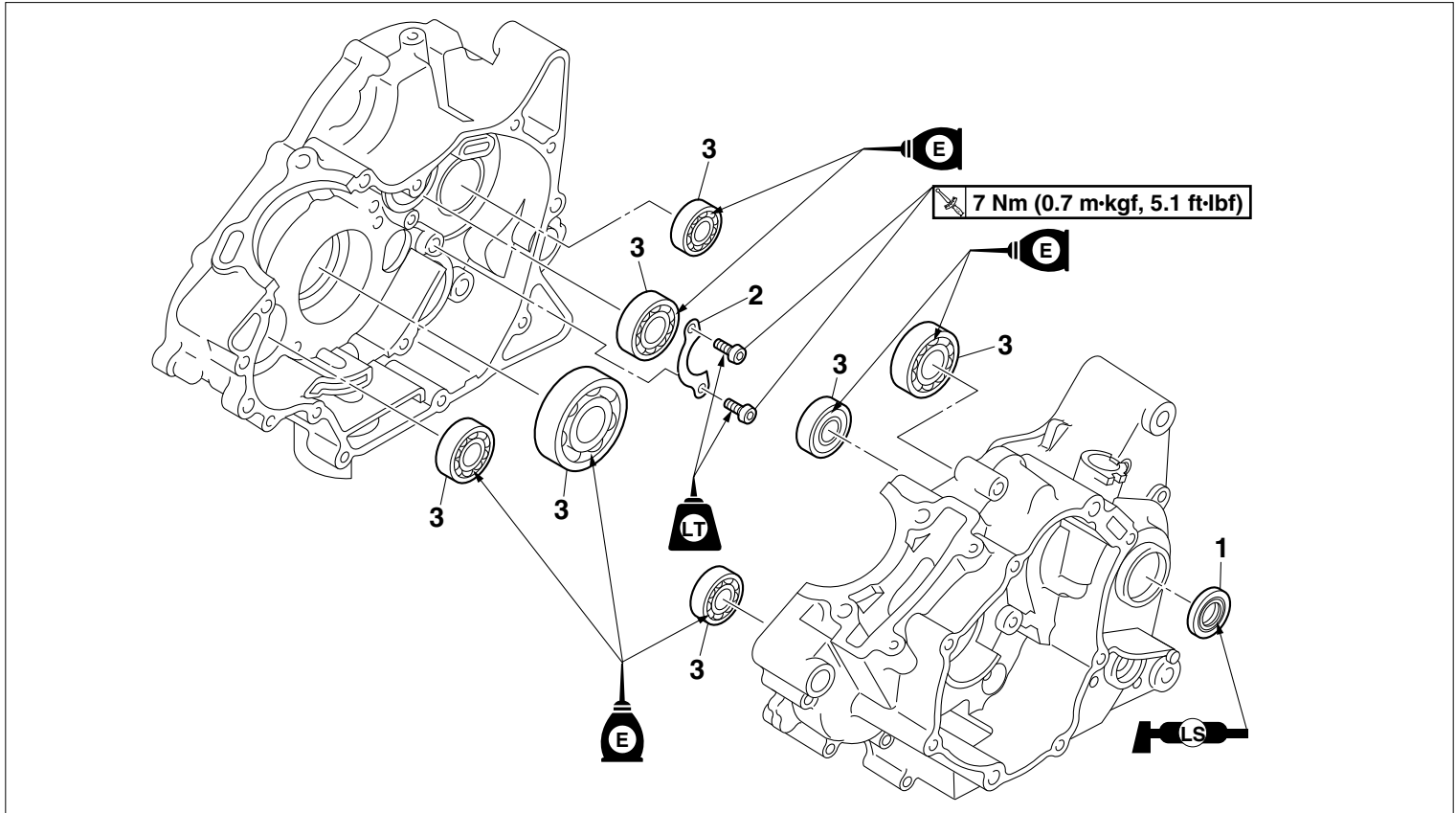
Preliminary operations:

- Engine, refer to “13.1 Complete engine removal” on page 164;
- Cylinder head, refer to “13.5 Cylinder head” on page 171;
- Cylinder/Piston, refer to “13.8 Cylinder and piston” on page 188;
- Clutch housing, refer to “13.11 Clutch” on page 201;
- Oil pump unit, refer to “13.14 Oil pump” on page 209;
- Gear shift shaft, refer to “13.15 Gear shift shaft” on page 215;
- Starter motor, refer to “13.10 Electric starter” on page 197;
- Balancer gears, refer to “13.16 Balancer gear” on page 217;
- Generator rotor, refer to “13.9 Unidirectional starter generator” on page 193.

Sequence	Operation/Components to remove	Quantity	Remarks
1	Speed sensor	1	The sensor is not active for this motorcycle.
2	Timing chain guide (intake side)	1	
3	Chain cover	1	
4	Timing chain	1	
5	Oil drain plug	1	
6	Spring	1	
7	Filter engine oil	1	
8	Neutral gear switch	1	
9	Retaining ring	2	
10	Spacer	1	
11	Right crankcase	1	
12	Centering pin	2	
13	Left crankcase	1	

For installation, reverse the removal procedure.

Oil seal and bearings removal sequence.

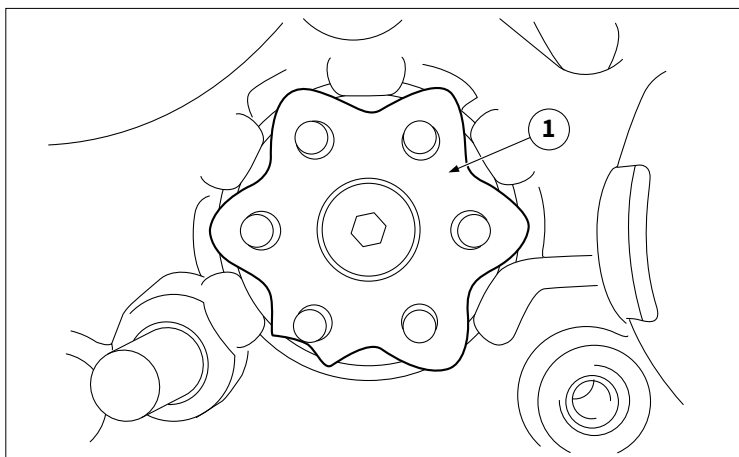
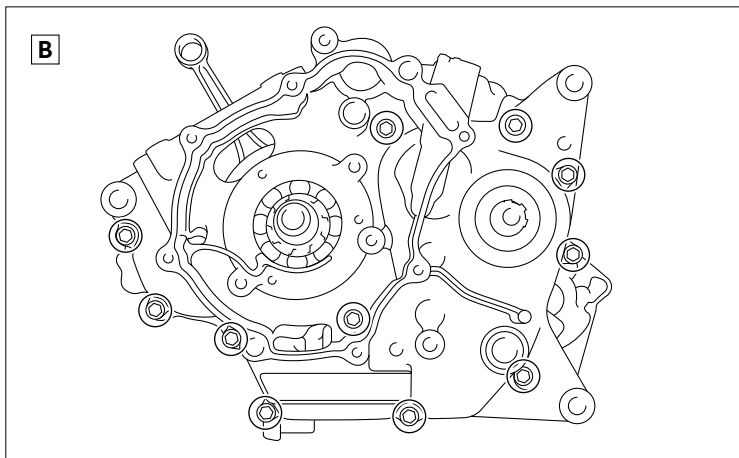
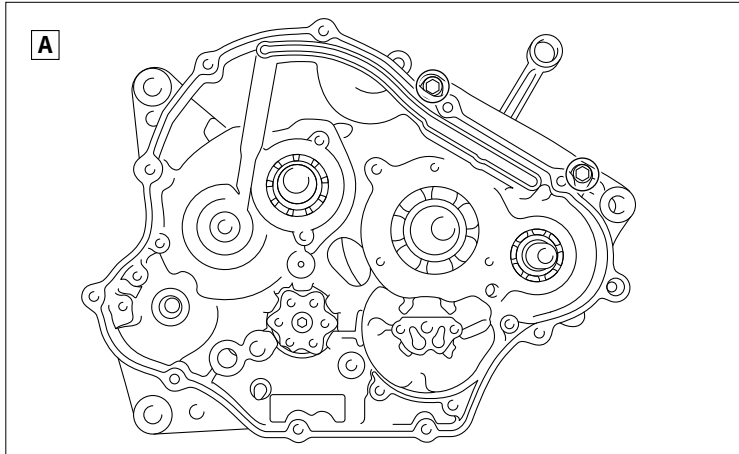


Preliminary operations:

- Crankshaft/Balancer, refer to “13.18 Crankshaft” on page 225;
- Drive, refer to “13.19 Drive” on page 228.

Sequence	Operation/Components to remove	Quantity	Remarks
1	Oil seal	1	
2	Bearing retainer	1	
3	Bearing	7	

i For installation, reverse the removal procedure.



13.17.1 Crankcase separation

Remove the crankcase bolts from the right side (figure “A”) and from the left side (figure “B”).

- i** Loosen each bolt 1/4 of a turn at a time, gradually and in a crossed way. After completely loosening all the bolts, remove them.

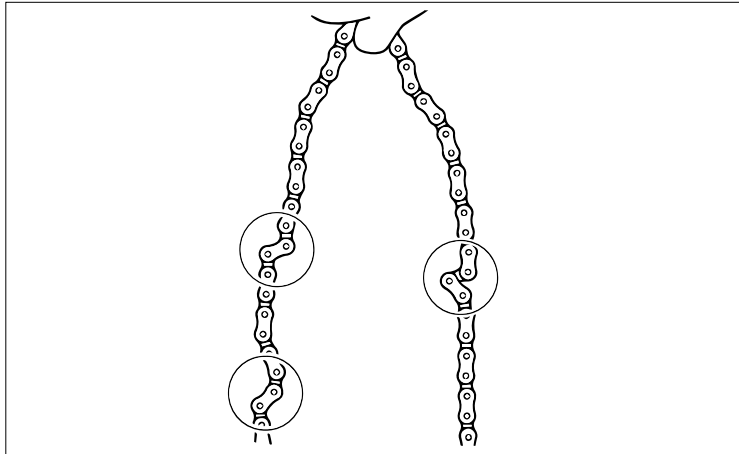
Turn the gear selector drum segment “1” to the position shown in the figure. In this position, the teeth of the gear selector drum segment do not come into contact with the crankcase during the crankcase separation.

Remove the right crankcase “A”.

- !** Tap on one side of the crankcase with a soft mallet. Only tap on the reinforced parts of the crankcase, not on the crankcase mating surfaces. Work slowly and carefully and make sure that the two half-crankcases are evenly separated.

13.17.2 Crankcase check

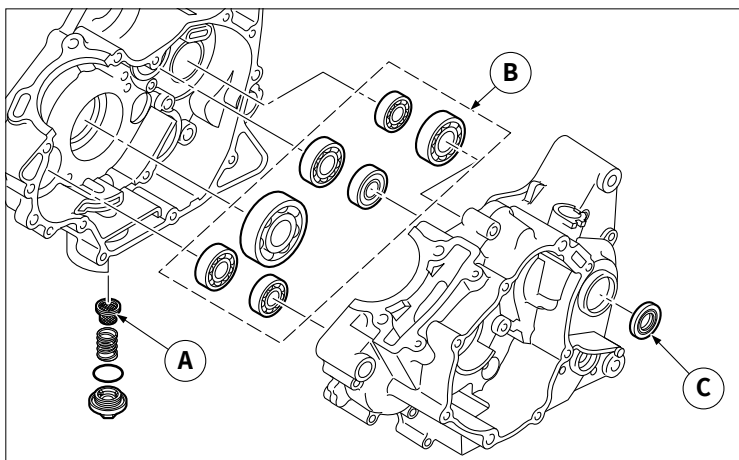
1. Wash the half-crankcase carefully with a non-aggressive solvent;
2. Carefully wash all gasket surfaces and crankcase mating surfaces;
3. Check the crankcase: if there are any cracks and/or damage, replace it;
4. Check the oil delivery lines: if they are clogged, clean with a jet of compressed air.



13.17.3 Timing chain and timing chain guide check

Check the timing chain: if there is any damage and/or stiffness, replace the timing chain and the camshaft sprocket as a set.

Check the timing chain guide (intake side): if there are any damages and/or signs of wear, replace it.



13.17.4 Oil filter check

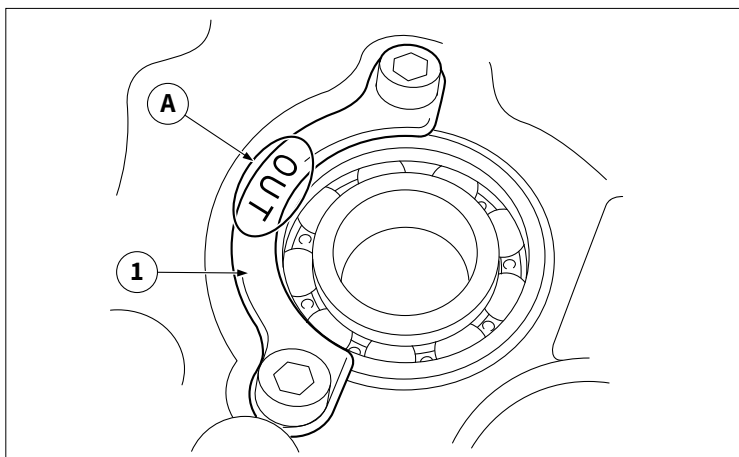
Check the oil filter “A”: if there are any damages, replace it.

In case of contamination, clean with a solvent.

13.17.5 Bearings and oil seal check

Check the bearings “B”. Clean and lubricate the bearings, then rotate the inner track manually: if the movement is difficult, replace it.

Check the oil seal “C”: if there are damages and/or signs of wear, replace it.

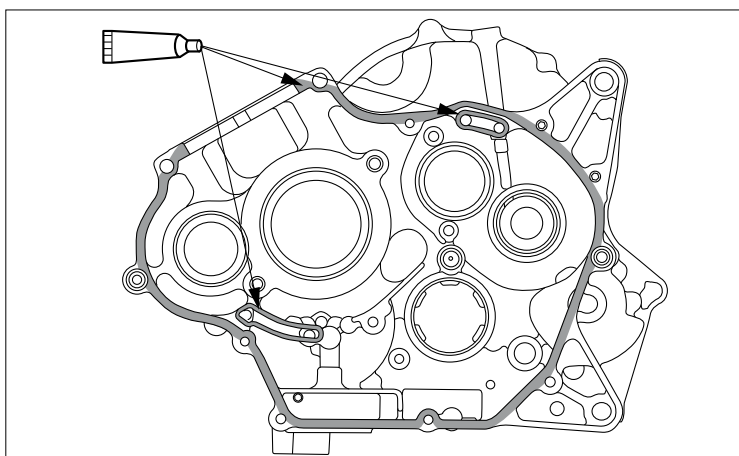


13.17.6 Bearing fastener installation

Install the bearing fastener “1” with “OUT” reference (EXTERNAL) “A” facing outward.

⚠ Apply the threadlocker (LOCTITE®) to the threads of the bearing retainer bolt.

**🔧 Tightening torque: bearing retainer bolt
7 Nm (0.7 m·kgf, 5.1 ft·lbf)**



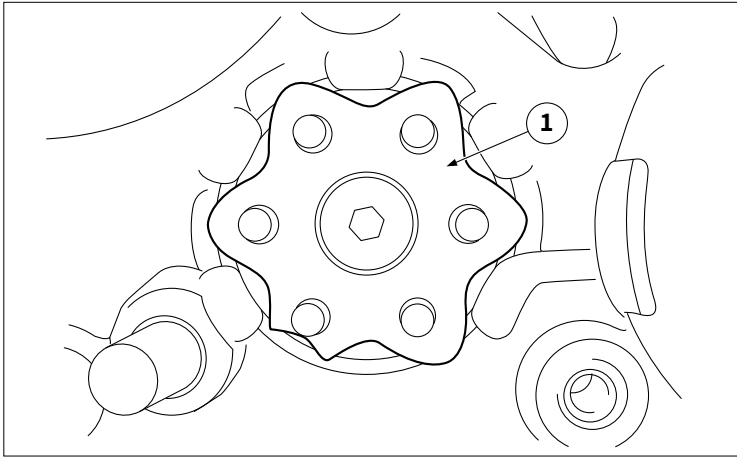
13.17.7 Crankcase assembling

Thoroughly clean all the gasket mating surfaces and the crankcase mating surfaces.

Apply sealant to the crankcase mating surfaces.

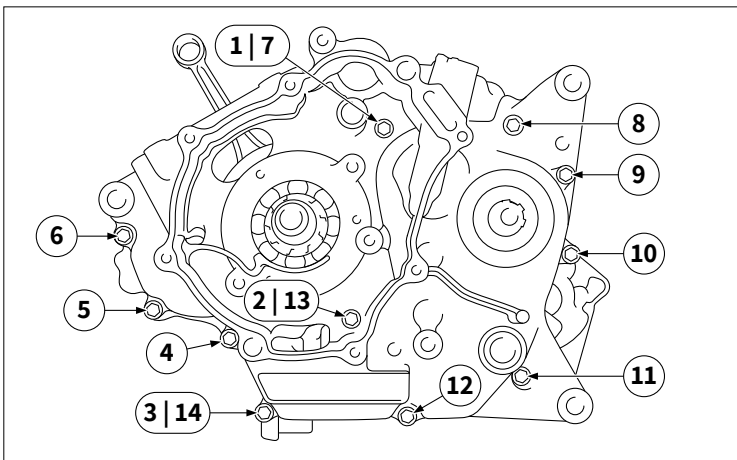
♻ Binder n. 1215 (Three bond No.1215®)

⚠ Do not allow the sealant to come in contact with the oil passage.



Install the right crankcase.

Turn the gear selector drum segment “1” to the position shown in the figure. In this position, the teeth of the gear selector drum segment do not come into contact with the crankcase during crankcase installation.



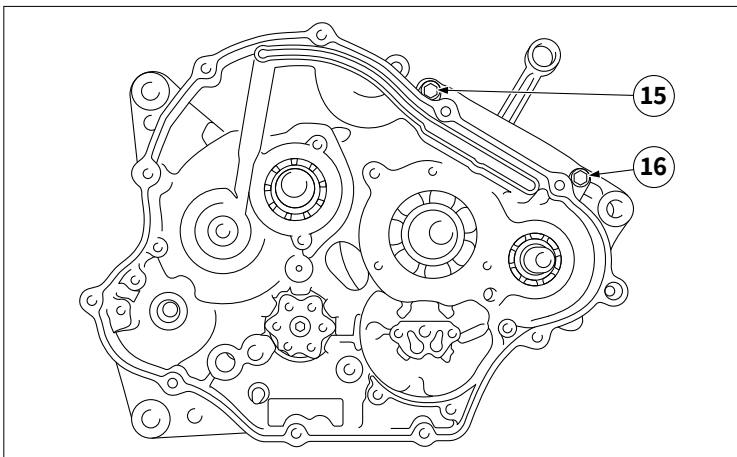
Install the crankcase bolts.

 **Tightening torque: Crankcase bolt**
10 Nm (1.0 m·kgf, 7.2 ft·lbf)

i Tighten each bolt 1/4 of a turn at a time, gradually and according to the sequence shown in figure “A” on the right side of the crankcase and in figure “B” on the left side of the crankcase.

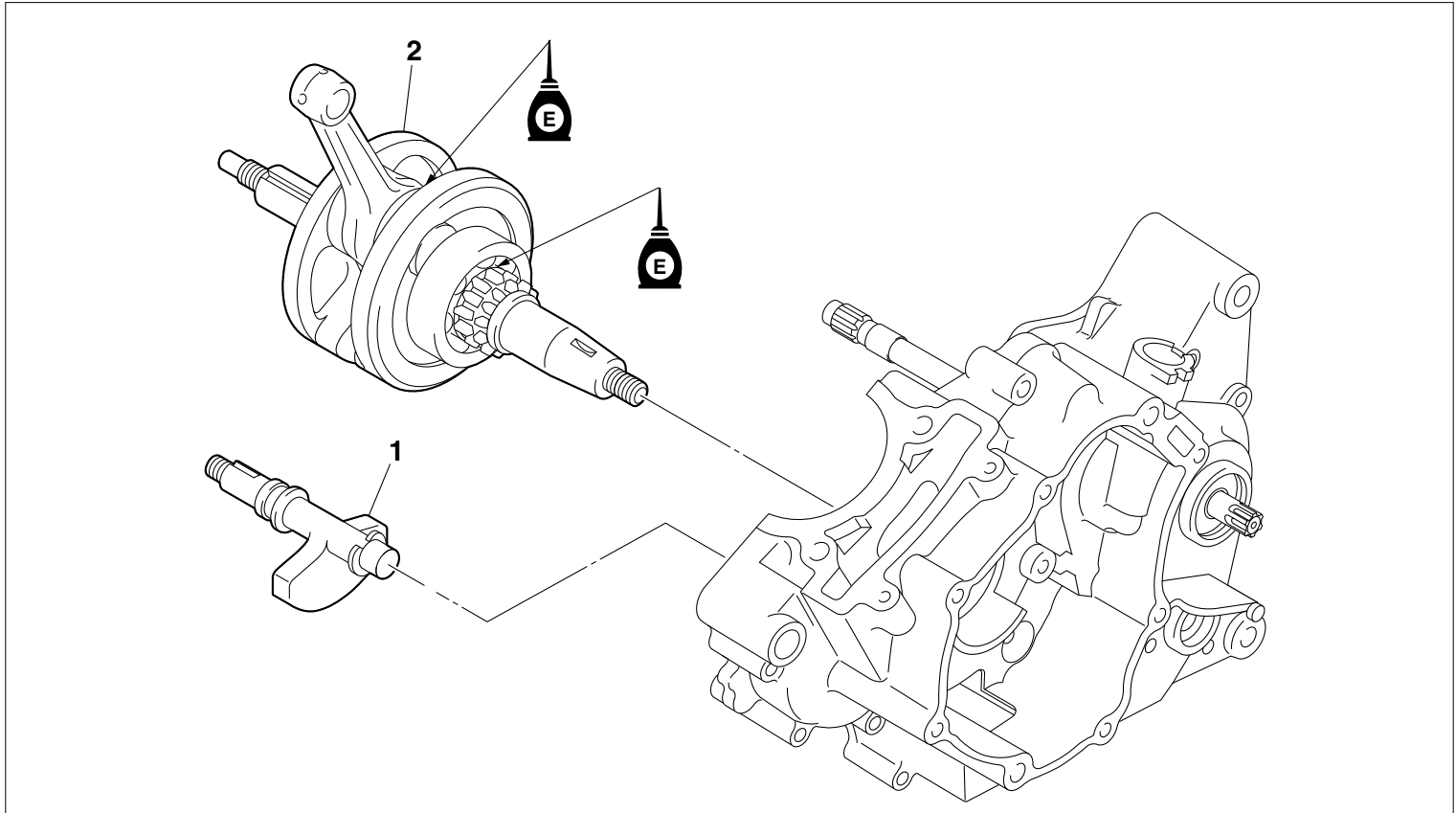
The bolt sizes are as follows:

- M6 × 70 mm: references “8-10”, “12”;
- M6 × 55 mm: references “15”, “16”;
- M6 × 45 mm: references “1-6”, “11”.



13.18 CRANKSHAFT

Crankshaft and the balancer removal sequence.

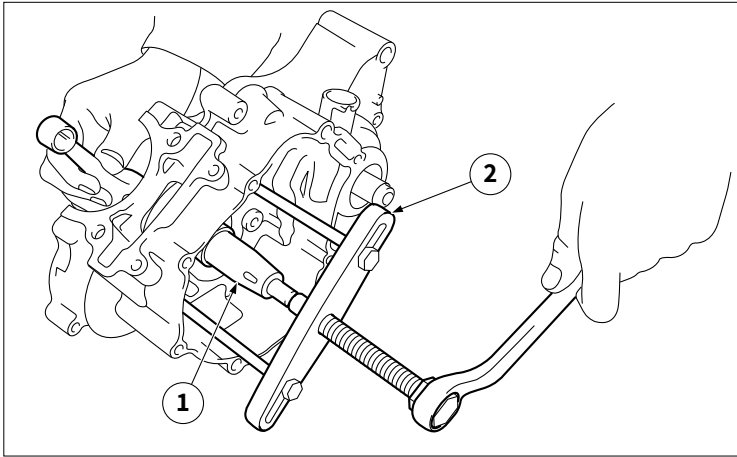


Preliminary operations:

– Crankcase, refer to “13.17 Crankcase” on page 220.

Sequence	Operation/Components to remove	Quantity	Remarks
1	Balancer	1	
2	Crankshaft	1	

i For installation, reverse the removal procedure.



13.18.1 Crankshaft removal

Remove the crankshaft "1".

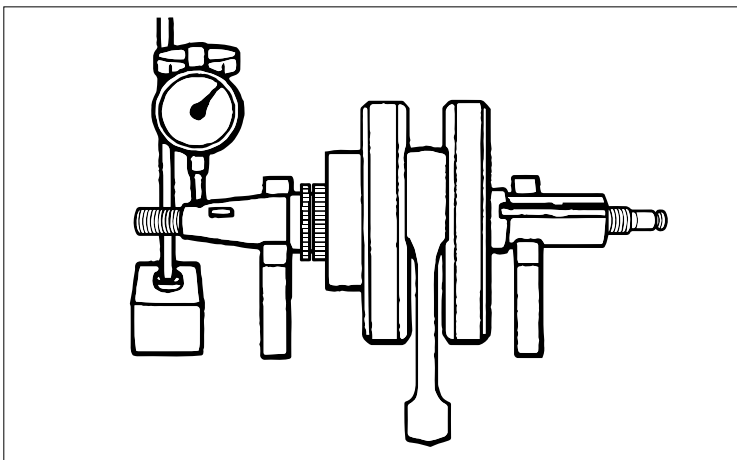
Remove the crankshaft with the crankcase separator "2".

i Make sure the crankcase separator is centered on the crankshaft.

! To protect the end of the crankshaft, place a suitably sized socket wrench between the crankcase separator bolt and the crankshaft.

! Do not tap on the crankshaft.

✘ Crankshaft separator



13.18.2 Crankshaft check

Measure the misalignment of the crankshaft: if it does not comply with the prescribed values, replace the crankshaft, the bearing or both.

i Turn the crankshaft slowly.

✘ Misalignment limit: 0,030 mm (0.0012 in)

Measure the connecting-rod big end lateral clearance: if it does not comply with the prescribed values, replace the crankshaft.

✘ Connecting-rod big end lateral clearance:
0.110-0.410 mm (0.0043-0.0161 in)

Measure the crankshaft width: if it does not comply with the prescribed values, replace the crankshaft.

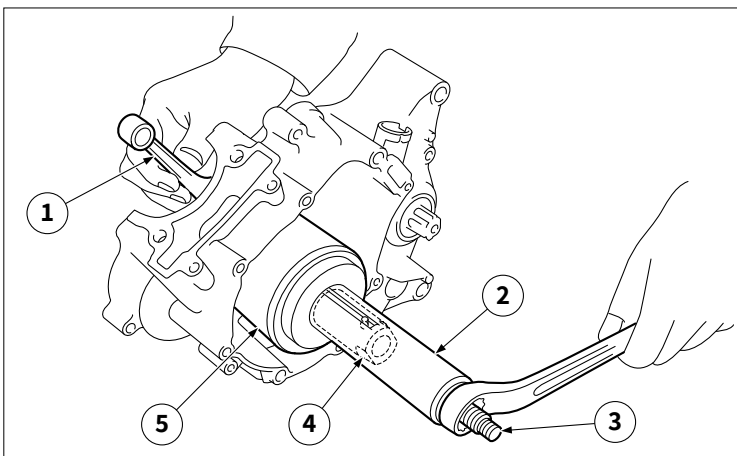
✘ Crank group width:
47.95-48.00 mm (1.888-1.890 in)

Check the crankshaft pinion: if there are any damages and/or signs of wear, replace the crankshaft.

Check the bearing: if there are any cracks, damage and/or signs of wear, replace the crankshaft.

Check the crankshaft pin: if there are scratches and/or signs of wear, replace the crankshaft.

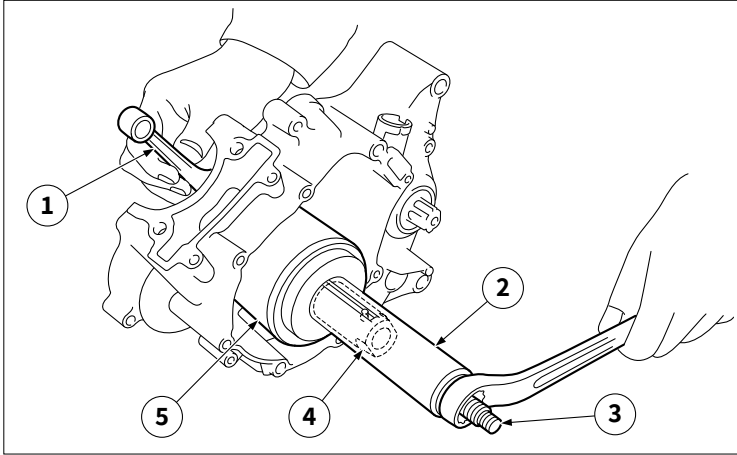
Check the crankshaft journal oil duct: if it is clogged, clean with compressed air.



13.18.3 Crankshaft installation

Install the crankshaft "1" using the crankshaft installation tool "2", the crankshaft installation bolt "3", the adapter (M12) "4" and the spacer (crankshaft installer) "5".

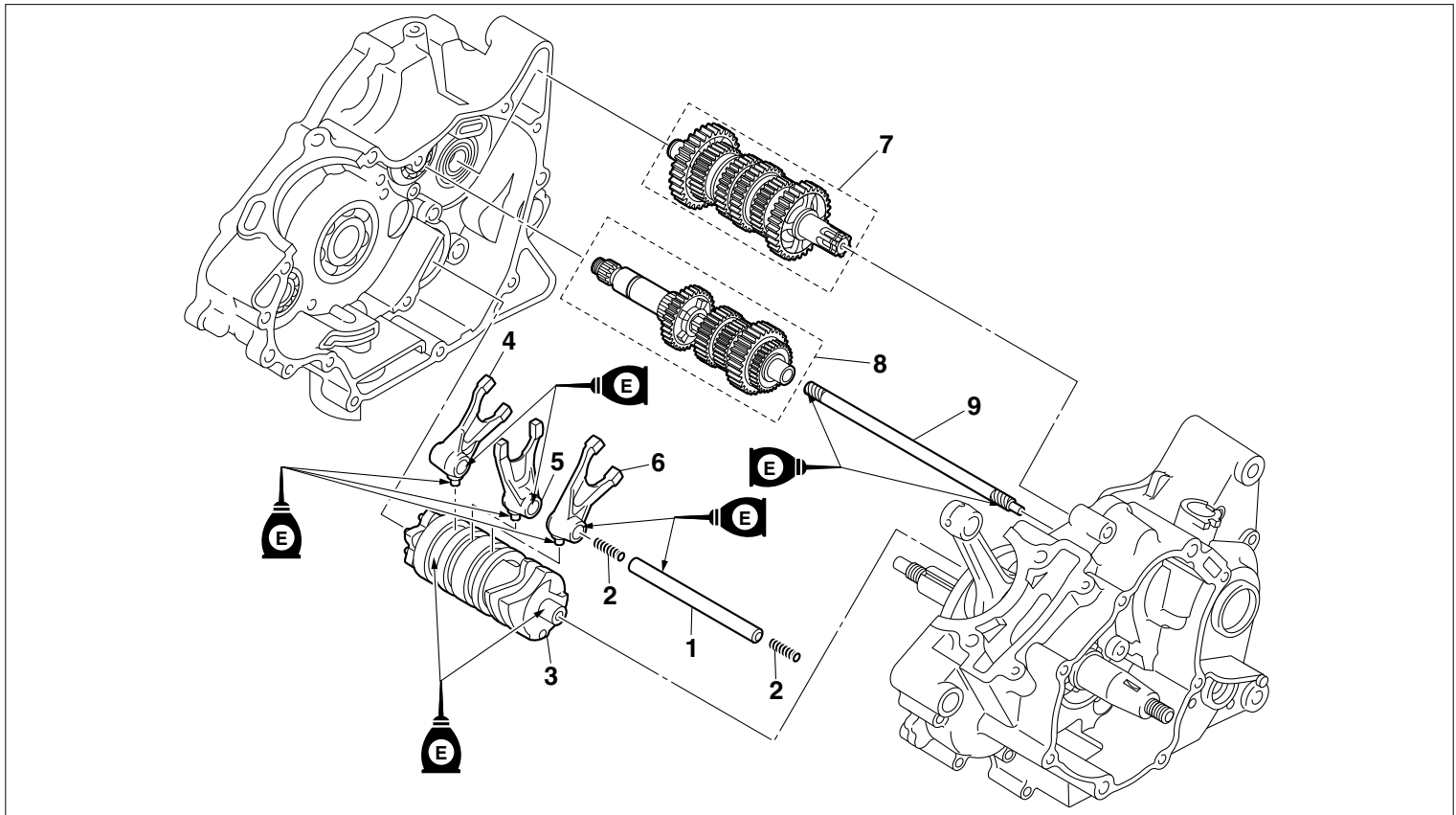
- ✘** • Crankshaft installer guide;
- Installation guide;
- Crankshaft installer bolt;
- Adapter (M12);
- Adapter 3;
- Spacer (crankshaft installer);
- Guide spacer.



- ⚠ To avoid scratching the crankshaft and simplifying the assembly procedure, lubricate the oil seal lips with lithium soap-based grease and each bearing with engine oil.
- ⓘ Lock the connecting rod to the top dead center (TDC) with one hand and at the same time rotate the nut of the crankshaft installer bolt with the other. Turn the crankshaft installer bolt until the lower part of the crankshaft assembly reaches the bearing.

13.19 DRIVE

Drive, gear selector drum unit and gear shift forks removal sequence.



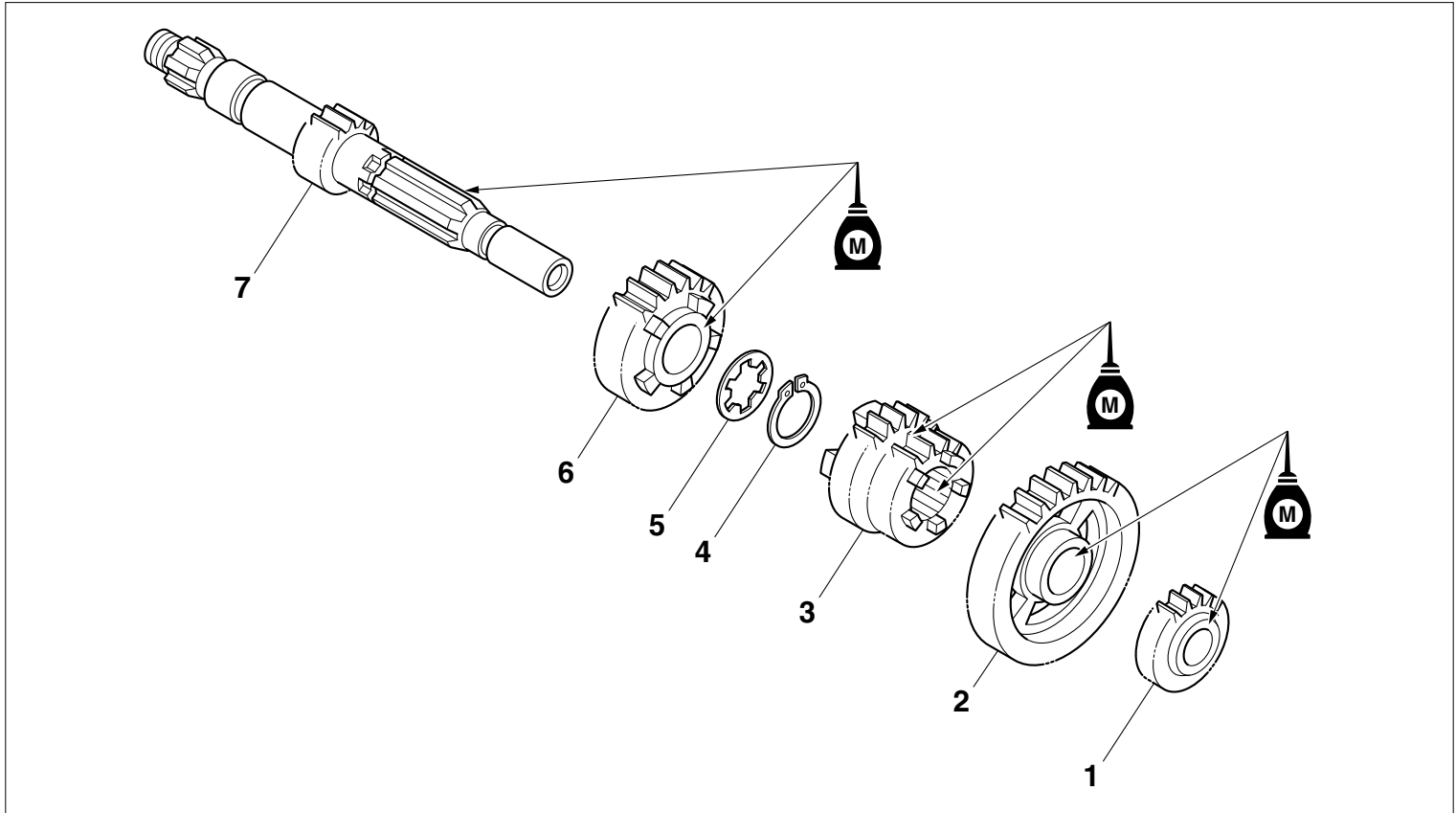
Preliminary operations:

– Crankcase, refer to “13.17 Crankcase” on page 220.

Sequence	Operation/Components to remove	Quantity	Remarks
1	Gear fork guide bar	1	
2	Spring	2	
3	Gear selector drum unit	1	
4	Gear shift fork-R	1	
5	Gear shift fork-C	1	
6	Gear shift fork-L	1	
7	Secondary gear shift shaft	1	
8	Primary gear shift shaft	1	
9	Long clutch control rod	1	

i For installation, reverse the removal procedure.

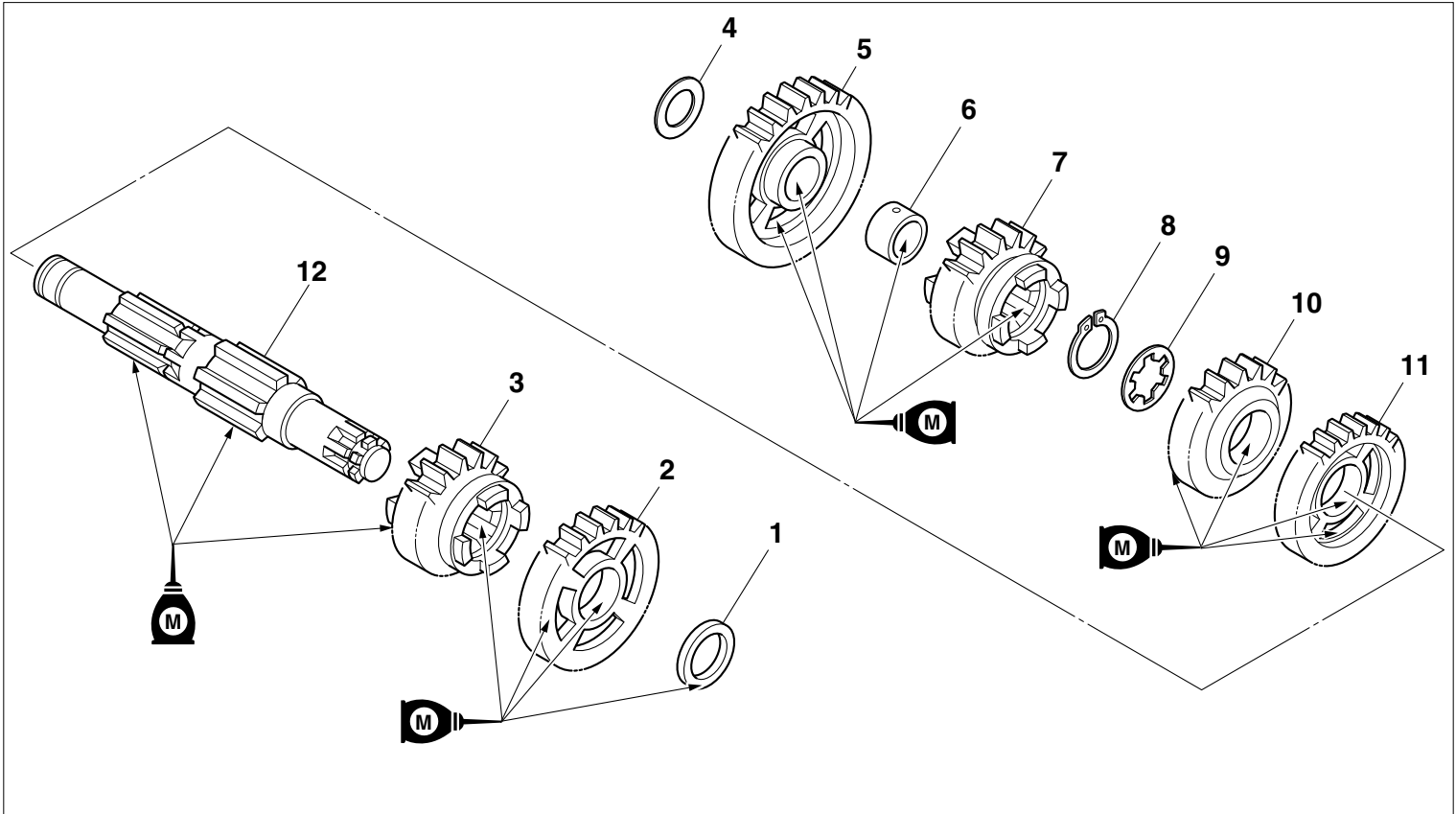
Primary shaft disassembling procedure.



Sequence	Operation/Components to remove	Quantity	Remarks
1	2nd gear sprocket	1	
2	6th gear sprocket	1	
3	3rd/4th gear sprocket	1	
4	Retaining ring	1	
5	Toothed washer	1	
6	5th gear sprocket	1	
7	1st gear primary shaft/pinion	1	

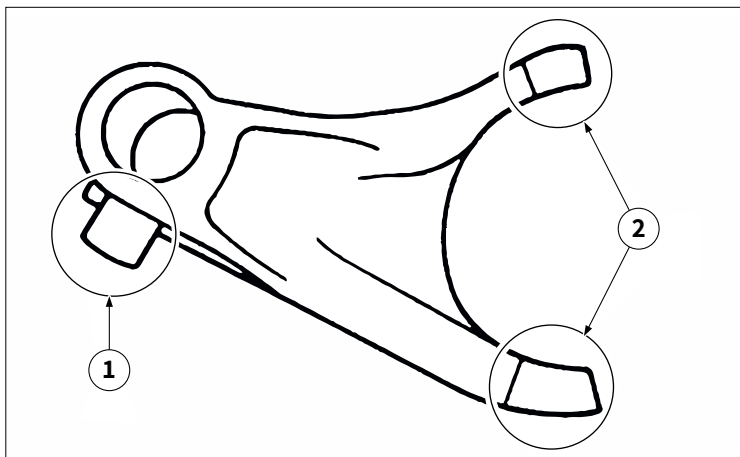
i For assembly, reverse the disassembly procedure.

Secondary shaft disassembling sequence.



Sequence	Operation/Components to remove	Quantity	Remarks
1	Washer	1	
2	2nd gear shift	1	
3	6th gear shift	1	
4	Washer	1	
5	1st gear shift	1	
6	Spacer	1	
7	5th gear shift	1	
8	Retaining ring	1	
9	Toothed washer	1	
10	4th gear shift	1	
11	3rd gear shift	1	
12	Secondary shaft	1	

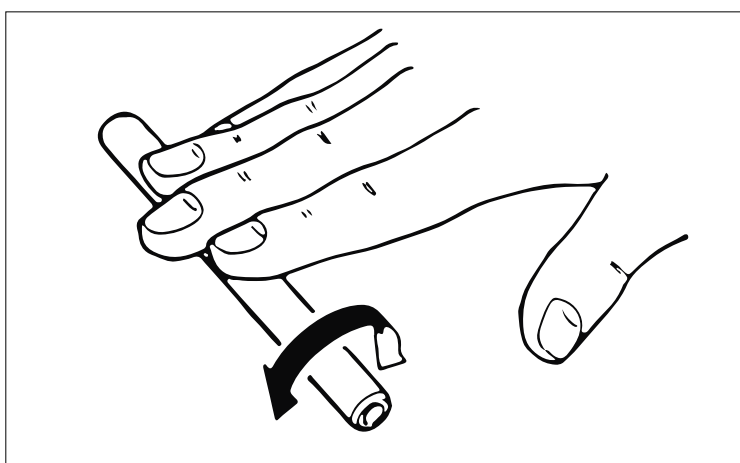
i For assembly, reverse the disassembly procedure.



13.19.1 Gear shift forks check

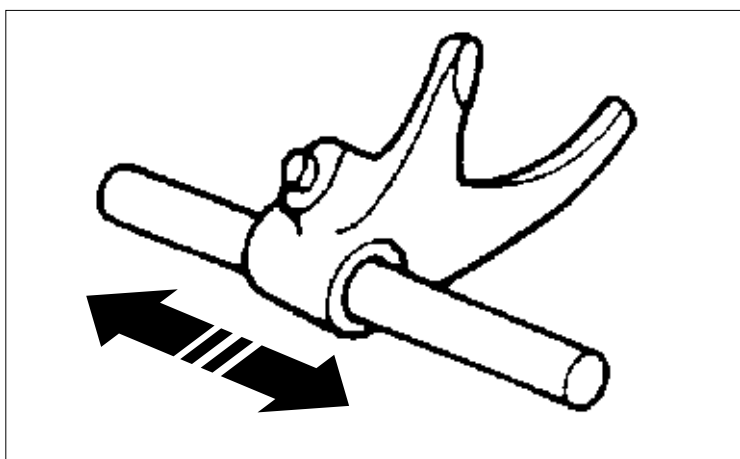
i The following procedure applies to all gear shift forks.

Check the gear shift fork cam roller “1” and the gear shift fork tooth “2”: if there are deformations, damages, scratches and/or signs of wear, replace the gear shift fork.

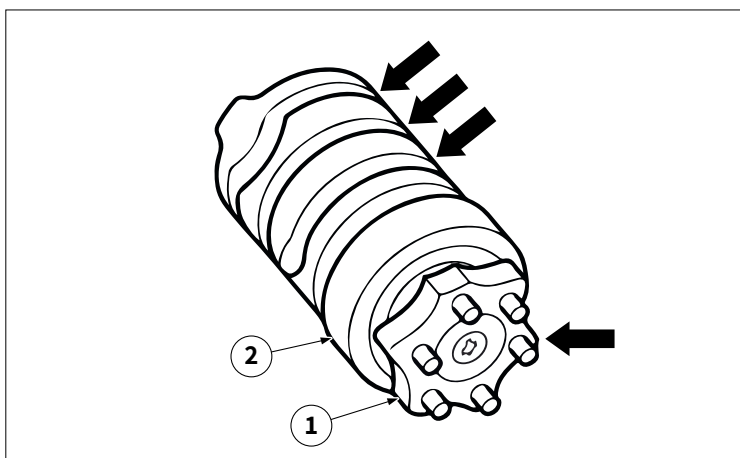


Check the gear fork guide bar; roll the bar on a flat surface: if there are deformations, replace it.

! Do not try to straighten the gear fork guide bar if it is deformed.



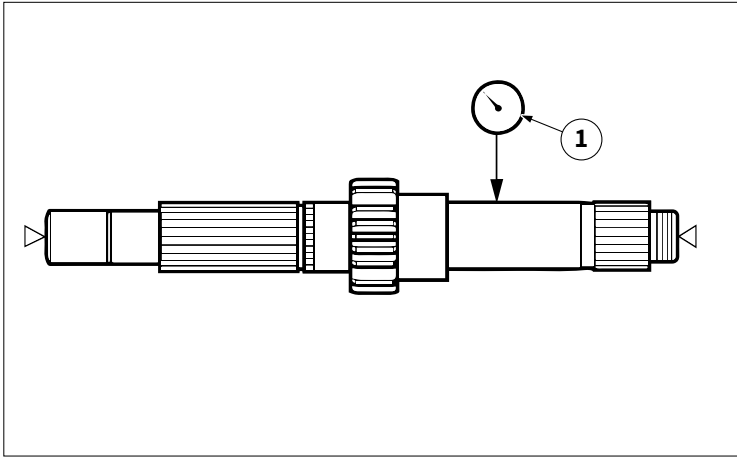
Check the gear shift fork movement, on the gear fork guide bar: if the movement is difficult, replace the gear shift forks and the gear shift fork guide bar as a set.



13.19.2 Gear selector drum unit check

Check:

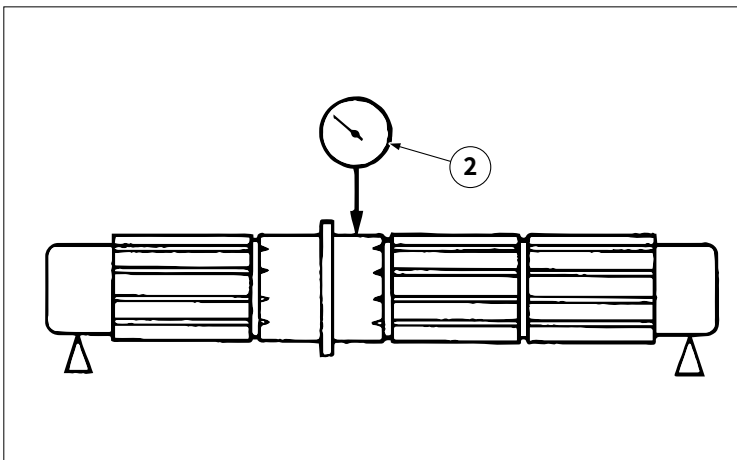
- Gear selector drum groove: if there are damages, scratches and/or signs of wear, replace the gear selector drum unit;
- Gear selector drum segment “1”: if there are damages and/or signs of wear, replace the gear selector drum unit;
- Gear selector drum bearing “2”: if there are damages and/or pitting, replace the gear selector drum unit.



13.19.3 Drive check

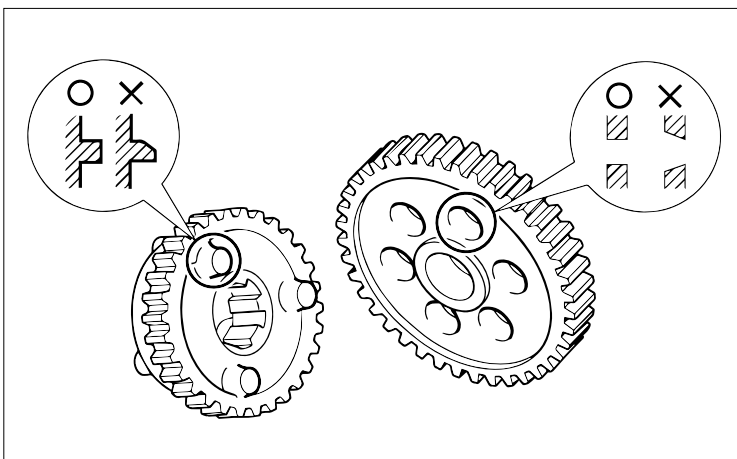
Measure the misalignment of the primary shaft using a centering device and a comparator "1": if it does not comply with the specifications, replace the primary shaft.

Primary shaft misalignment limit:
0.08 mm (0.0032 in)



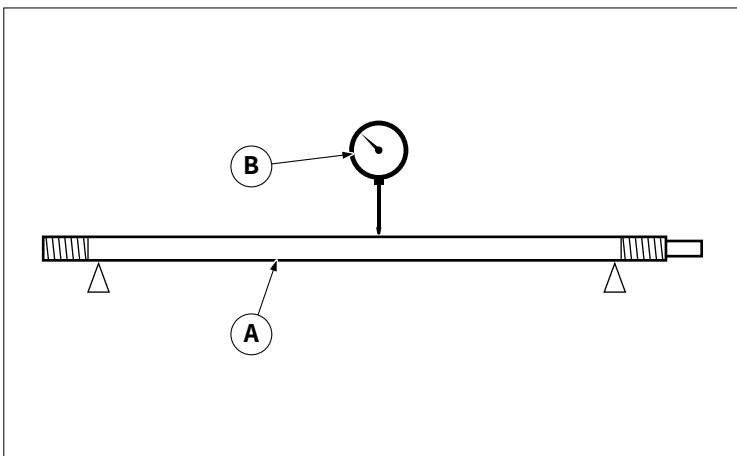
Measure the misalignment of the secondary shaft using a centering device and a comparator "2": if it does not comply with the specifications, replace the secondary shaft.

Secondary shaft misalignment limit:
0.08 mm (0.0032 in)



Check:

- Drive gears: if there is discoloration of blue, pitting and/or signs of wear, replace the defective gear or gears;
- Drive gear teeth: if there are any cracks, damage and/or rounded edges, replace the defective gear or gears;
- Correct engagement of the gears for each sprocket with respect to its gear: if not correct, reassemble the drive axes units;
- Drive gears movement: if it is difficult, replace the defective part or parts.

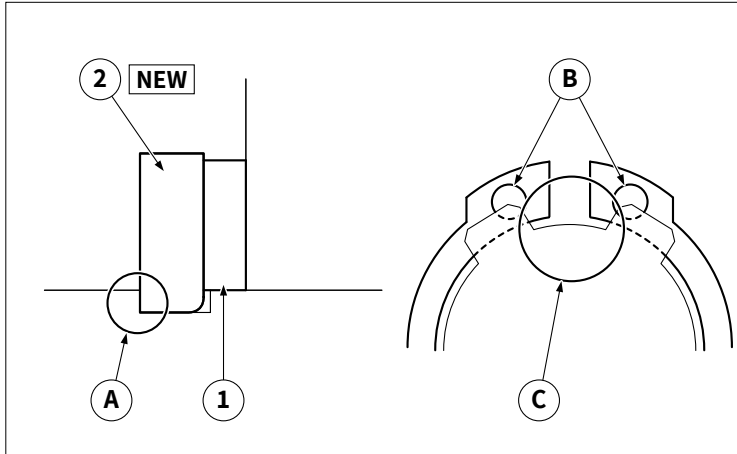


13.19.4 Clutch control rods check

Check the long clutch control rod "A": if there are any cracks, damage and/or wear, replace the long clutch control rod.

Measure the bending limit of thrust rod "B": if it does not comply with the specifications, replace the long clutch control rod.

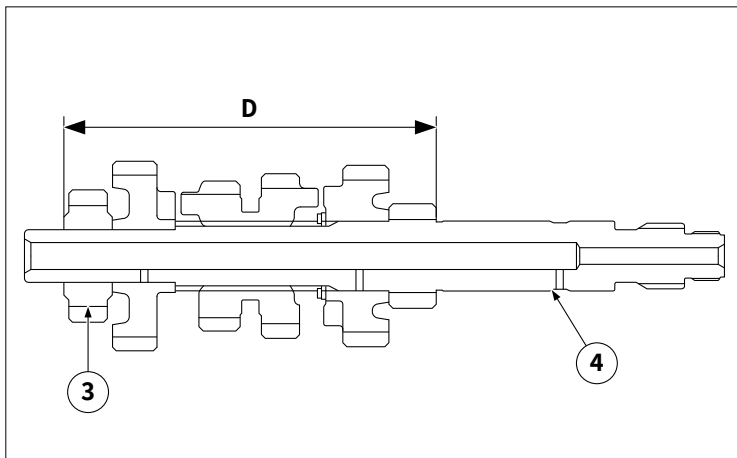
Thrust rod bending limit:
0,500 mm (0.0197 in)



13.19.5 Primary shaft and secondary shaft installation

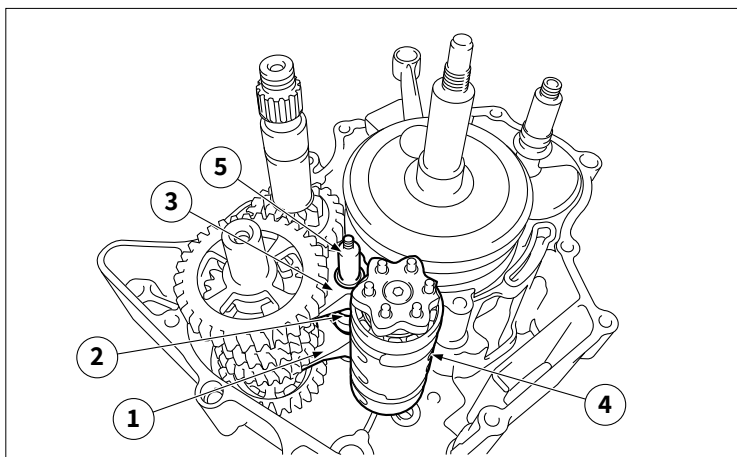
Install the toothed washer "1" and a new retaining ring "2".

- ⚠ Be sure to install a retaining ring so that the sharpened side "A" faces the opposite direction to the toothed washer and gear.
- ⚠ Make sure that the ends of the retainer ring "B" are positioned in correspondence with the groove of the spines of shaft "C".



Install the 2nd gear sprocket "3".

- i Push the second sprocket inside the primary shaft "4", as shown in the figure.
- ✂ Installation depth "D":
106.85–107.05 mm (4.207–4.215 in)

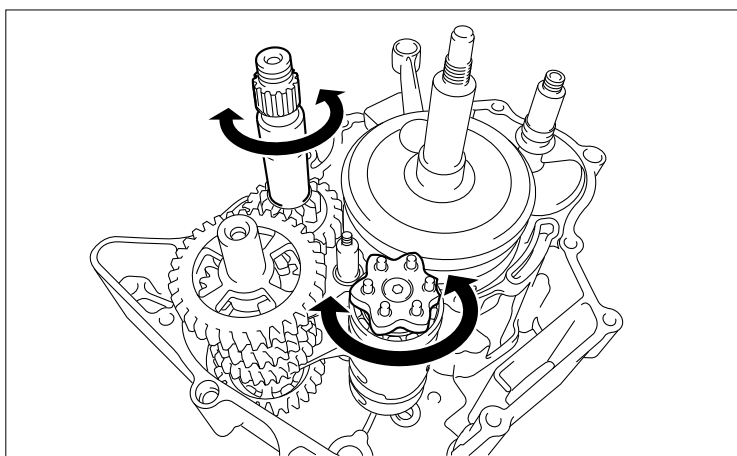


13.19.6 Installation of gear shift forks and gear selector drum unit

Install:

- Gear shift fork-L "1";
- Gear shift fork-C "2";
- Gear shift fork-R "3";
- Gear selector drum unit "4";
- Springs;
- Gear shift fork guide bar "5".

- i The reference projections on the gear shift forks must point towards the right side of the engine and be in the indicated sequence: "R", "C", "L".

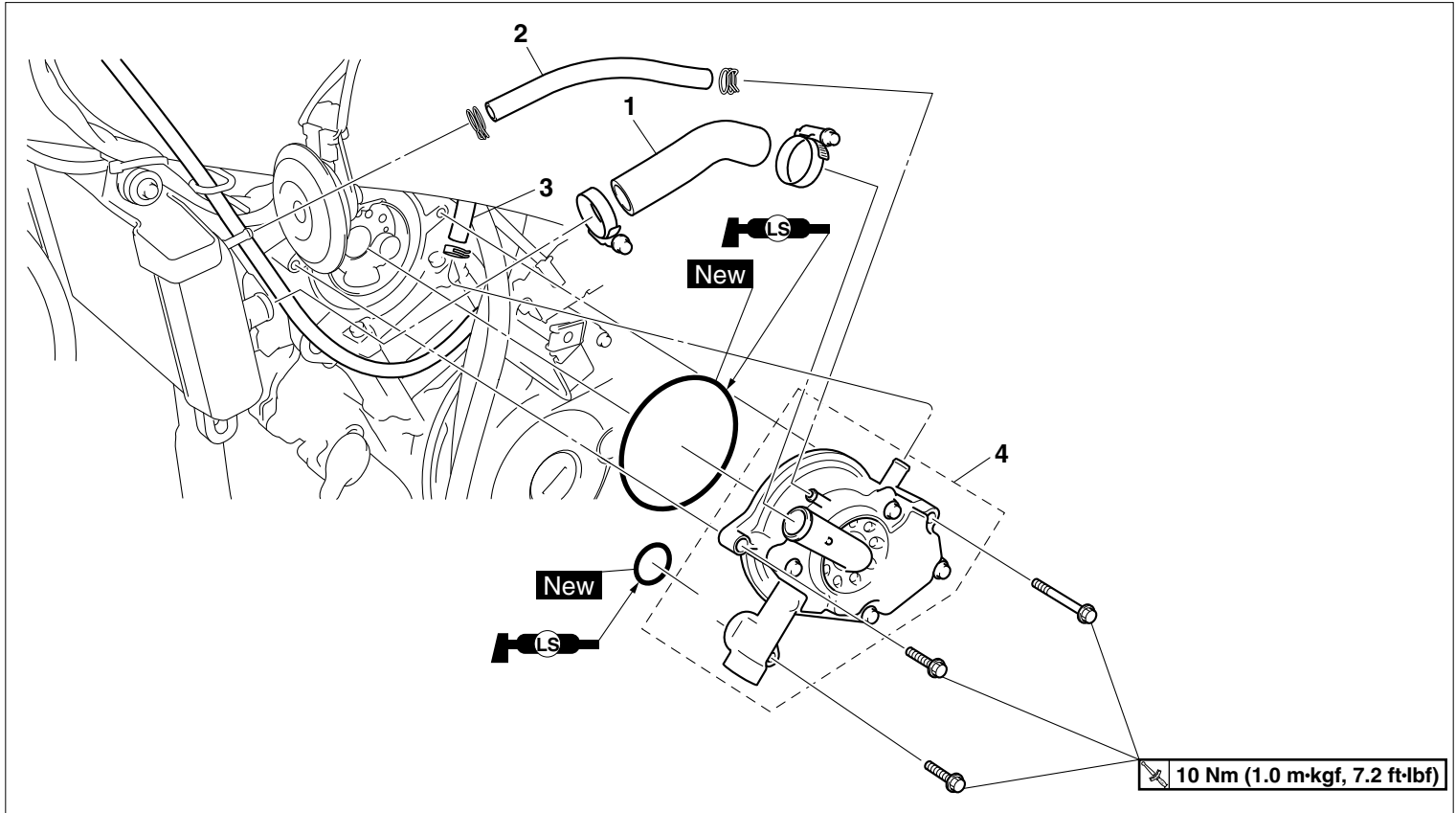


Check the movements of the drive: if there are irregular movements, repair them.

- i Apply engine oil fully to each gear and bearing.
- i Before assembling the crankcase, make sure that the drive is in the neutral position and that the gears rotate freely.

13.20 WATER PUMP

Water pump removal sequence.



Preliminary operations:

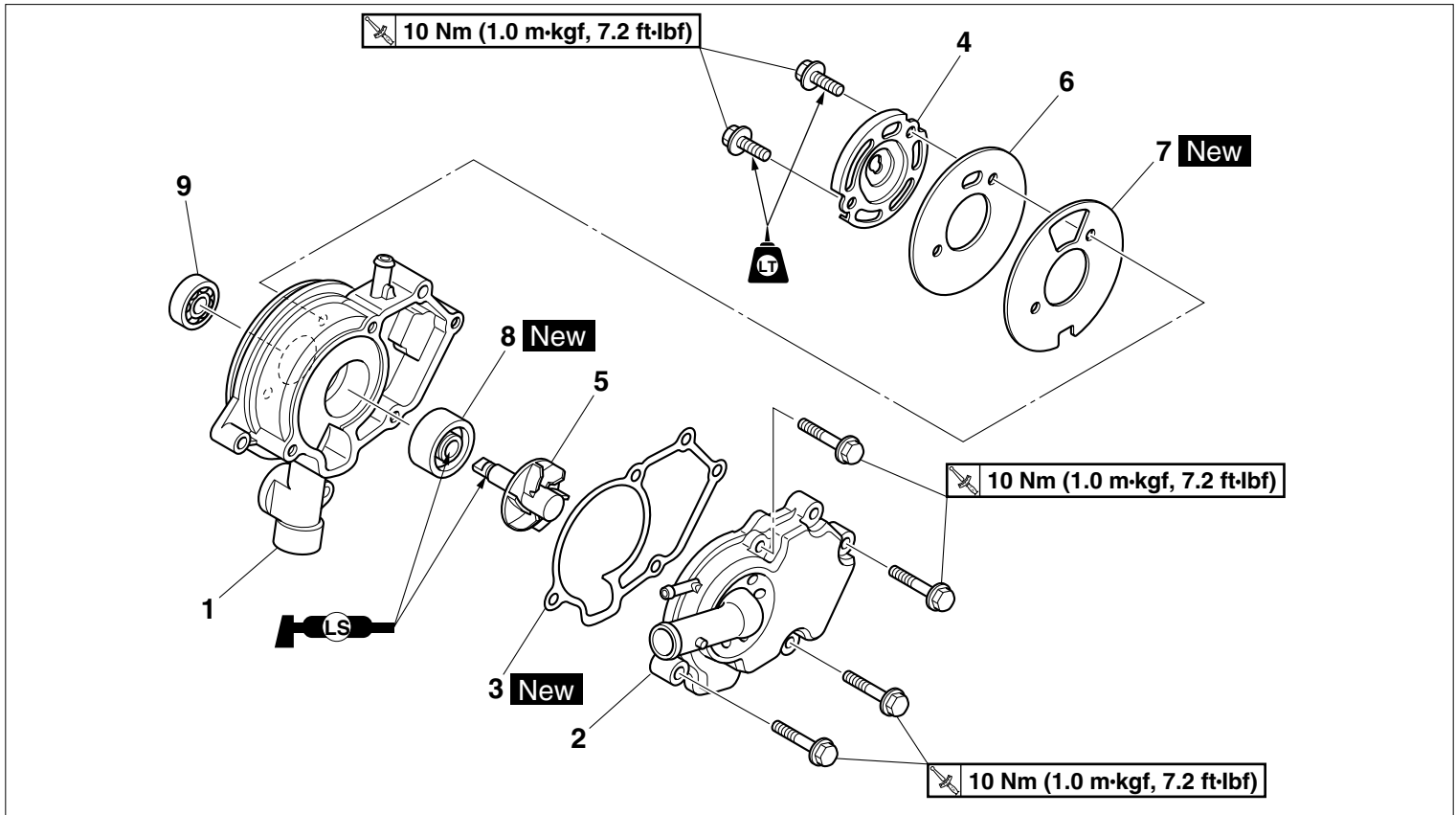
- Drain the coolant.

Sequence	Operation/Components to remove	Quantity	Remarks
1	Radiator outlet coupling	1	
2	Water pump breather hose	1	
3	Cylinder head breather pipe	1	Disconnect.
4	Water pump unit	1	

i For installation, reverse the removal procedure.

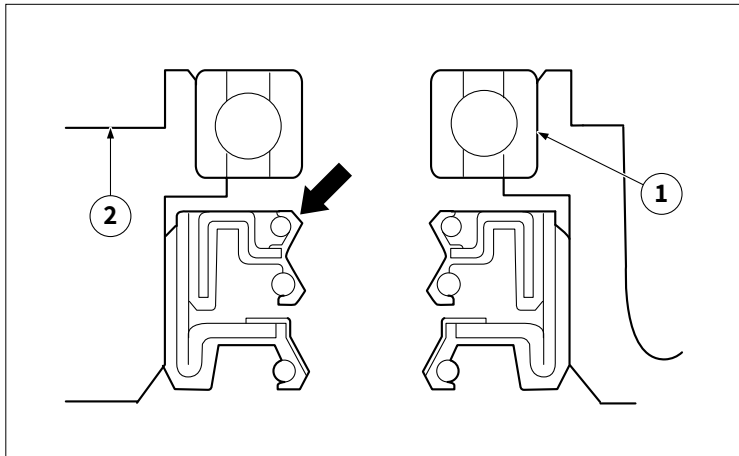
! It is not necessary to remove the water pump, unless the coolant level is extremely low or the coolant contains engine oil.

Water pump disassembly sequence.



Sequence	Operation/Components to remove	Quantity	Remarks
1	Water pump housing	1	
2	Water pump housing cover	1	
3	Water pump housing cover gasket	1	
4	Impeller shaft retainer	1	
5	Impeller shaft	1	
6	Water pump housing plate	1	
7	Water pump housing gasket	1	
8	Water pump gasket	1	
9	Bearing	1	

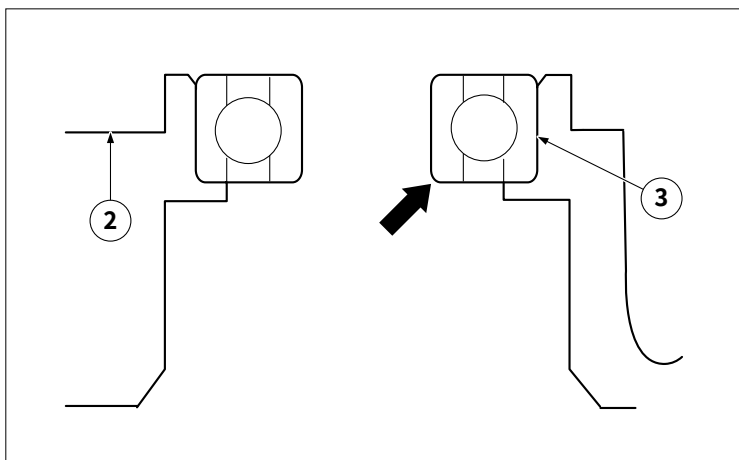
i For assembly, reverse the disassembly procedure.



13.20.1 Water pump disassembling

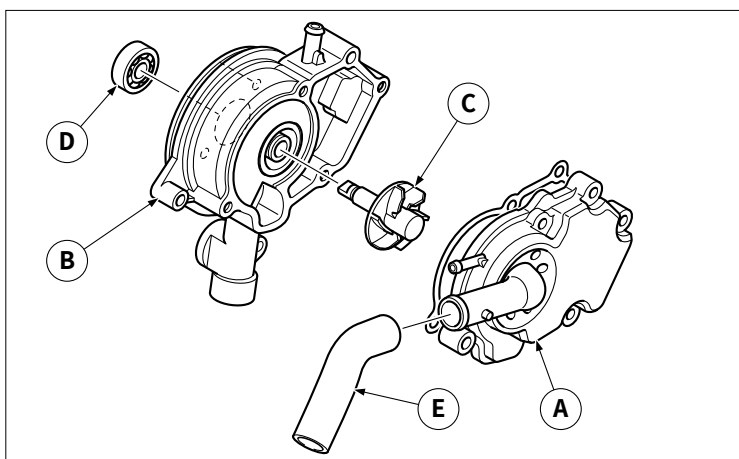
Remove the water pump gasket "1".

- i** Remove the water pump gasket from inside the water pump housing "2".



Remove the bearing "3"

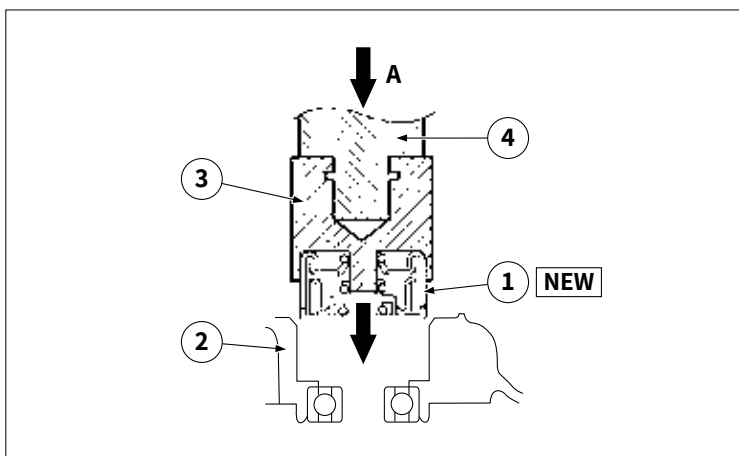
- i** Remove the bearing from the outside of the water pump housing "2".



13.20.2 Water pump check

Check:

- Water pump housing cover "A";
- Water pump housing "B": if there are any cracks and/or damage, replace;
- Impeller shaft "C": if there are cracks, damages and/or signs of wear, replace;
- Bearing "D": if the movement is difficult, replace;
- Radiator outlet sleeve "E": if there are cracks and/or damage, replace it.

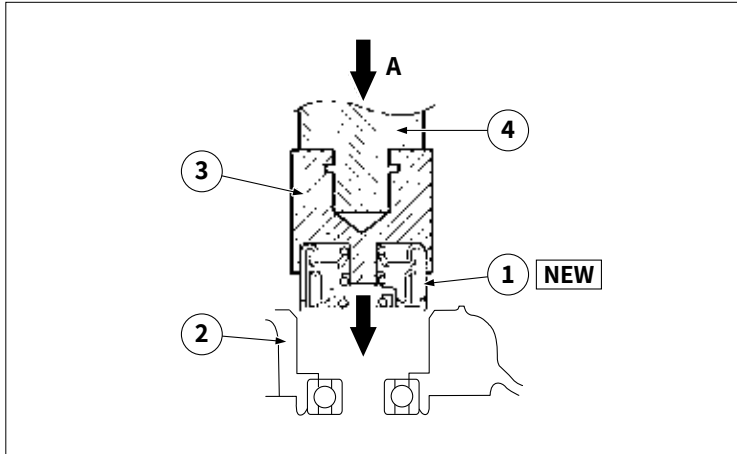


13.20.3 Water pump assembling

Install the water pump gasket "1" in the water pump housing "2".

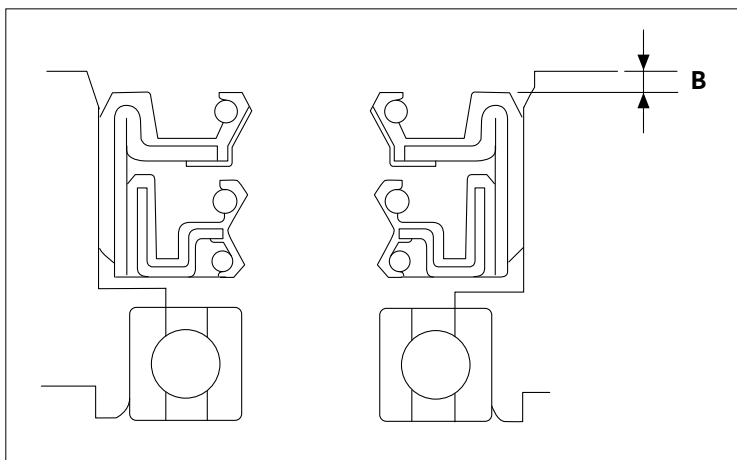
- !** Never lubricate the surface of the water pump gasket with oil or grease.

- i** Install the water pump gasket with special tools.



- ✂ • Mechanical gaskets installer;
- Central driven shaft bearings installer;
- Central driving bearing installer 40 & 50 mm.

To install the water pump, push the pump downwards (direction "A"), using the mechanical gaskets installer "3" and the central duct shaft bearing installer "4".

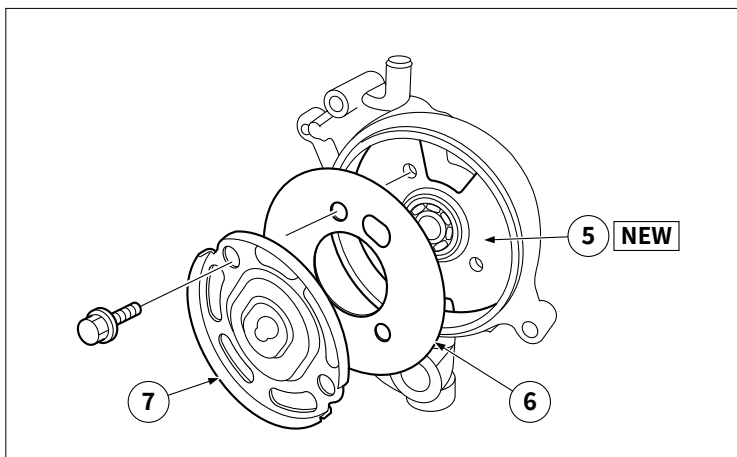


- ⓘ Install the water pump gasket with special tools at the specified depth "B" as shown in the figure.

- ✂ Water pump "B" installation depth:
0-0.5 mm (0-0.02 in)

Lubricate the lip of the water pump gasket.

- ♻ Recommended lubricant: Lithium soap based grease.

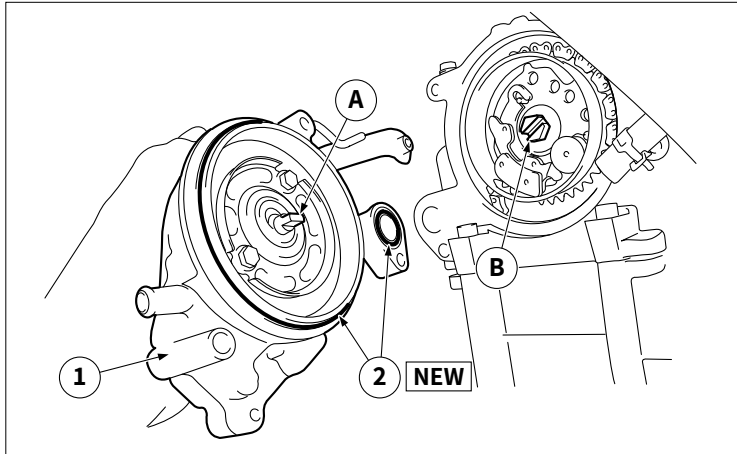


Install:

- Water pump housing gasket "5";
- Water pump housing plate "6";
- Impeller shaft;
- Impeller shaft retainer "7".

- ✂ Tightening torque: Impeller shaft retaining bolt
10 Nm (1.0 m·kgf, 7.2 ft·lbf)

- ⓘ Before installing the impeller shaft retainer, lubricate the slit on the end of the impeller shaft with a thin layer of lithium soap grease.
- ⓘ Install the water pump housing gasket, the water pump housing plate and the impeller shaft retainer as shown in the figure.
- ⓘ After the installation, check that the impeller shaft rotates smoothly.



13.20.4 Water pump installation

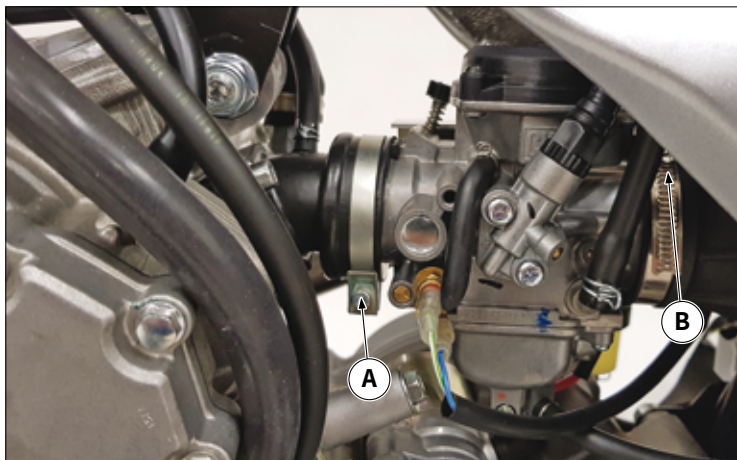
Install the water pump assembly “1” and the O-ring “2”.

- i** Align the projection “A” on the impeller shaft with the slot “B” on the camshaft sprocket bolt.
- i** Lubricate the O-rings with a light layer of lithium soap-based grease.

Fill the cooling system with the prescribed amount of recommended coolant.

Check the cooling system: if there are leaks, repair or replace the defective part.

Measure the radiator cap opening pressure: if it is below the prescribed pressure, replace the radiator cap.

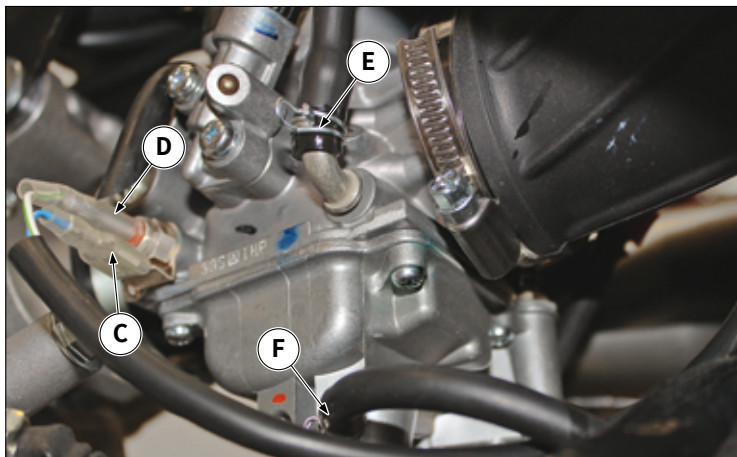


13.21 CARBURETTOR REMOVAL

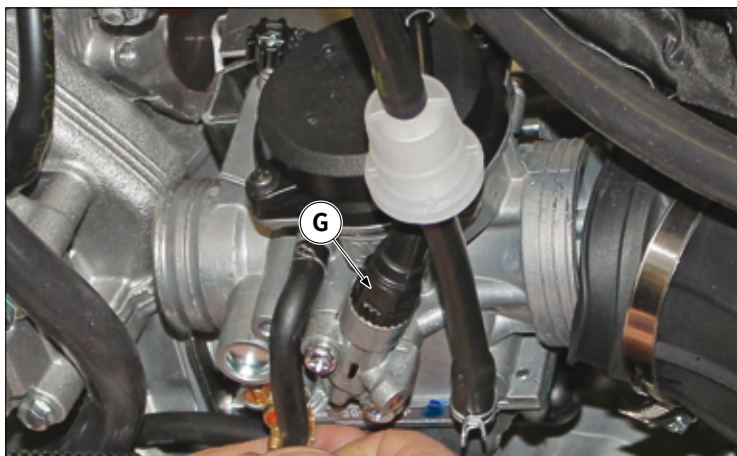
13.21.1 Carburettor removal

⚠ Close the fuel tap beforehand.

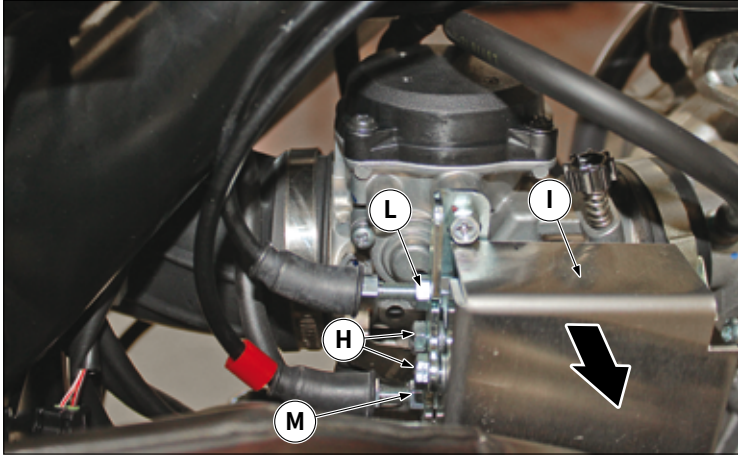
Remove the metal clamps of the cylinder/carburettor fitting “A” and of the carburettor/filter casing “B”.



Disconnect the connectors “C” and “D” from the minimum circuit heater, remove the elastic clamps and the tubes “E” and “F”.



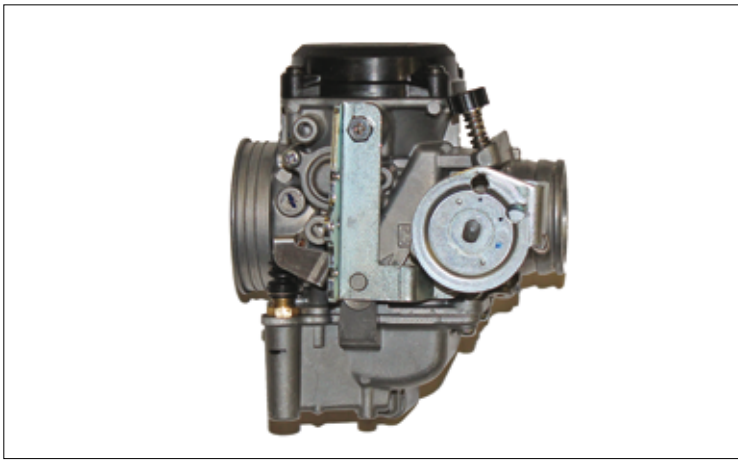
Disconnect the starter cable “G”.



Remove the screws “H” and extract the protection “I”, remove the fuel control cables “L” and “M”.

Remove the carburettor from the vehicle.

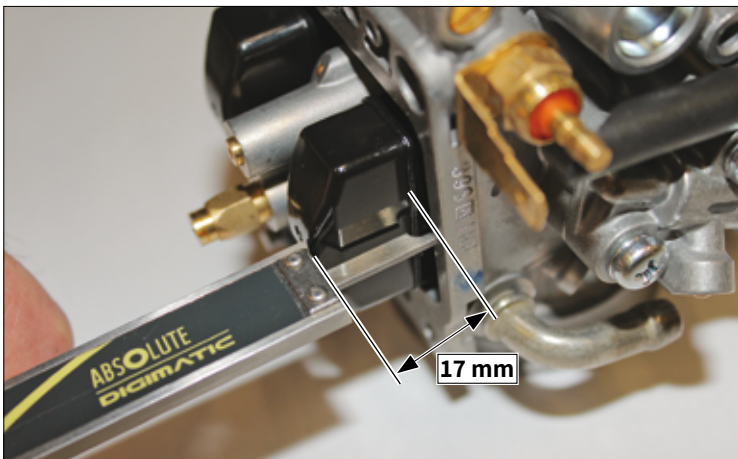
i Proceed in the reverse order for reassembling.



FACTORY DEFAULT SETTINGS

Keihin CVK 30

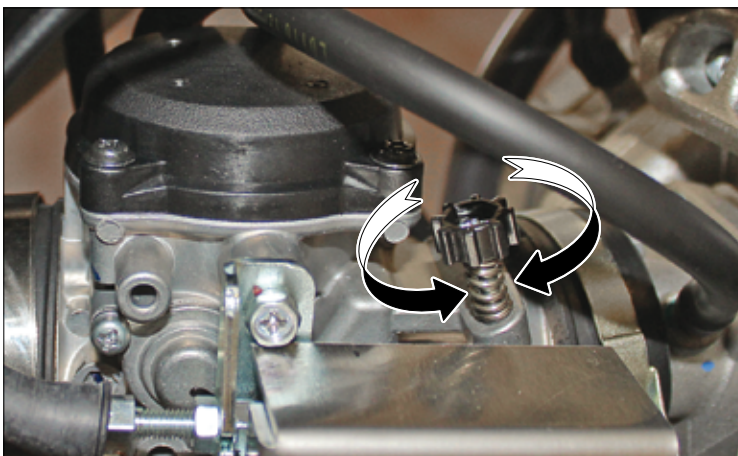
- Minimum jet: 35
- Maximum jet: 122
- Air screw adjustment: 2 ¼ turns from all closed.



- Float regulation: 17 mm. from the float lower edge at the contact edge between the carburettor and the tank.

✂ Float height = 17 mm.

⚠ Measure and adjust the float placing the carburettor on a flat surface on the side of the air filter.



13.21.2 Idle adjustment

Start the engine and adjust the adjustment screw until the engine idling speed is reached.

- Turning clockwise the engine rpm decrease.
- Turning counter-clockwise the engine rpm increase.