



Workshop Manual



4 STROKE ENGINE

MX - EN - SMX

SMR-SMM-2016

250-300

Foreword

This publication, to be used by TM Racing workshops, has been drawn-up to assist authorised personnel in the maintenance and repair of motorcycles handled. Perfect knowledge of the technical data stated herein is decisive for the most complete professional training of the operator.

In order to make it easier to understand, the paragraphs have been distinguished by schematic illustrations, which highlight the topic in question.

Always operate in compliance with the accident-prevention regulations in force, using suitable PPE.

COOLANT LIQUID

DANGER

FIRE RISK: IN SOME CONDITIONS, THE COOLANT IS FLAMMABLE. ITS FLAMES ARE INVISIBLE, BUT CAN CAUSE BURNS.

DO NOT POUR COOLANT ONTO EXHAUST SYSTEM COMPONENTS OR ONTO ENGINE COMPONENTS, SINCE THEY COULD BE HOT AND IGNITE THE COOLANT, WITH THE RISK OF BURNS. KEEP IN MIND THAT THE FLAMES ARE INVISIBLE.

COOLANT MAY IRRITATE THE SKIN AND IS TOXIC IF SWALLOWED.

KEEP COOLANT OUT OF THE REACH OF CHILDREN

COOLANT IS HIGHLY POLLUTANT. THEREFORE, AFTER USE, IT MUST BE DISPOSED OF AT SPECIAL COLLECTION CENTRES IN COMPLIANCE WITH THE REGULATIONS IN FORCE IN THE COUNTRY IN WHICH THE MOTORCYCLE IS USED.

USED ENGINE OIL AND GEARBOX OIL

DANGER

KEEP OUT OF THE REACH OF CHILDREN.

ENGINE OIL AND GEARBOX OIL CAN SERIOUSLY DAMAGE SKIN IF HANDLED REGULARLY OVER LONG PERIODS OF TIME.

WASH YOUR HANDS THOROUGHLY AFTER HANDLING THE OIL.

WEAR LATEX GLOVES OR EQUIVALENT DURING MAINTENANCE WORK ON THE MOTORCYCLE.

OIL IS HIGHLY POLLUTANT. THEREFORE, AFTER USE, IT MUST BE DISPOSED OF AT SPECIAL COLLECTION CENTRES IN COMPLIANCE WITH THE REGULATIONS IN FORCE IN THE COUNTRY IN WHICH THE MOTORCYCLE IS USED.

DO NOT POUR USED OIL INTO DRAINS OR RIVERS. DISPOSE OF FILTERS AT SPECIAL COLLECTION CENTRES IN COMPLIANCE WITH REGULATIONS IN FORCE IN THE COUNTRY IN WHICH THE MOTORCYCLE IS USED.

Useful advice

In order to prevent problems on reaching an excellent final result, **TM Racing srl** recommends that the following generic regulations are complied with:

- in the event of any repair, assess the impressions of the Customer reporting the operating anomalies of the motorcycle and formulate appropriate questions in order to clarify the symptoms of the problem;
- clearly diagnose the cause of the anomaly. From this manual it is possible to assimilate the essential theoretical bases, which, moreover, must be integrated by personal experience:
- plan the repair rationally, in order to prevent downtimes, receiving spare parts, preparation of tools etc.;
- reach the item to repair, limiting to the essential operations.

In this regard, consulting the disassembly sequence shown in this manual, will be of great help.

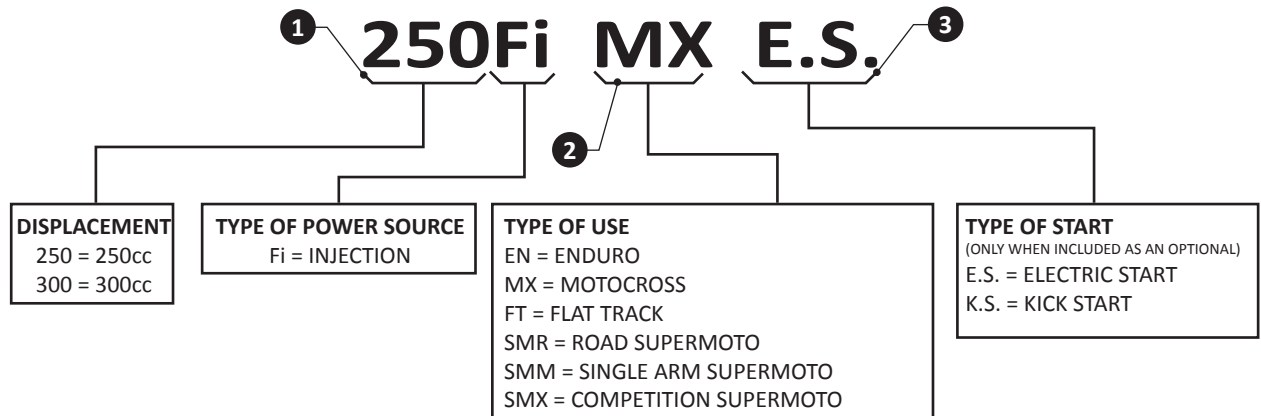
General repair-related regulations

- 1 Always replace the gaskets, sealing rings and the cotter pins with new parts.
- 2 When loosening/tightening nuts or screws, always start with the largest ones or from the centre. Lock at the coupling torque prescribed, following a crosswise pathway.
- 3 Always mark all parts or positions that could be exchanged on re-mounting.
- 4 Use original spare parts and recommended lubricants.
- 5 Use special tools, where specified.
- 6 Consult official Technical Memos, since they could contain more updated state adjustment data and methods of intervention, with respect to this manual.

TM Racing SPA, declines all liability for any errors in the compilation of this manual, and reserves the right to make any modifications required for the development of its products. Illustrations shown are approximate and, in some cases, may not precisely correspond with the part referred to. Reproduction of this publication, even partial, without written authorisation is prohibited.

RECOGNIZING TM RACING MOTORCYCLE MODELS

EXAMPLE OF MOTORCYCLE MODEL



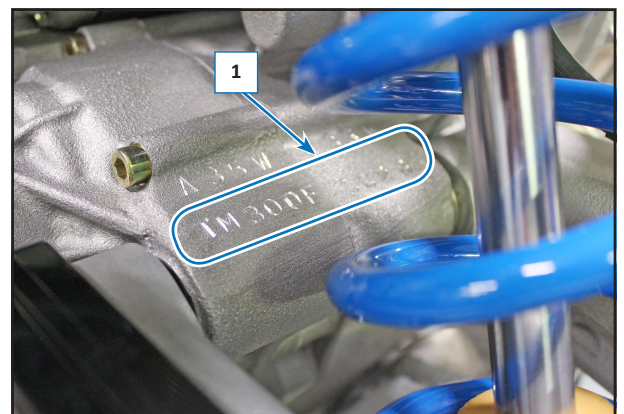
The displacement, type of power source and type of use define the motorcycle model and engine of each TM Racing motorcycle. The combination of codes 1 and 3 identifies the standard engine type. The combination of the three codes fully identifies the motorcycle model. All 3 codes are usually used in this Manual, to specify the motorcycle model to which certain information refers. If only codes 1 and 3 are indicated, followed by the word "ALL", it means that the information relates to all motorcycles with standard engine, regardless of the type of use. Code 2 (Type of Use) used alone means that the information refers to all motorcycles with that type of use, regardless of displacement and power source. All EN/SMR/SMM models are equipped as standard with electric start (E.S.) as well as kick start (K.S.). MX/SMX models have K.S. as standard and may be equipped with E.S. as an option.

Please make a note of your motorcycle's serial numbers in the boxes below. When it is necessary to contact TM for spare parts, updates or to report any issues, always quote the model, displacement, year of manufacture and, above all, the frame serial number and engine serial number.

ENGINE SERIAL NUMBER

The engine serial number (1) is embossed into the rear part of the engine, near to the shock absorber.

Make a note of this number in the relevant space at the beginning of the manual.





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ENGINE TECHNICAL DATA 250Fi-300Fi EN EU4 250Fi-300Fi		
ENGINE MODEL	250	300
Type	4-stroke single cylinder twin cam, liquid-cooled	
Displacement	249 cm ³	291 cm ³
Bore x stroke	77x53.6 mm	81x56.5 mm
Compression	14: 1	13.7: 1
Fuel	RON 95 unleaded super fuel (ethanol allowed <10%)	
Distribution	4 overhead valve twin cam driven by silenced chain	
A / S camshafts	FA14 / FS4	FA4 / FS4
Suction valve diameter	32 mm Ti	
Exhaust valve diameter	26.8 mm Ti	
Cold suct. valve play	0.10 mm	
Cold exh. valve play	0.15 mm	
Engine shaft supports	1 ball + 1 roller bearing	
Connection rod bearing	Bushing	
Pin coating	DLC	
Piston	Forged light alloy	
Segments	1 segment + 1 oil scraper	
Lubrication	2 oil pumps (1 for delivery +1 for recovery)	
Engine oil	SAE 10W/50	
Engine oil amount (oil change/ engine overhaul)	1.25/1.35 litres	
Straight tooth gear primary transmission	18 / 59	20 / 59
Clutch	with multiple discs in oil bath	
Gearbox (with front couplings)	6 gears	
Gearbox ratios	(250)	(300)
1 st	14:30	13:31
2 nd	16:28	15:27
3 rd	20:29	16:23
4 th	22:27	20:24
5 th	24:25	20:21
6 th	20:19	22:20
Generator	12V 180W	
NGK spark plug	CR 9EIX	
Electrode distance	0.8 mm	
Cooling	fluid, 40% antifreeze, 60% water (up to -25°C) - forced circulation with pump	
Fluid amount	1 litre	
Start up	E.S. + K.S.	

Key:
E.S. = Electric Start

K.S. = Kick start

⚠ WARNING
TM reserves the right to make modifications to its products for technical improvements without prior notice.

MAINTENANCE TABLE

	After 1 hour	Every 15 hours	Every 30 hours (after every ride)	Every 45 hours	Every 135 hours (75 hours of sports use)	Every year
Change engine oil and cartridge oil filter	•	•	•			
Clean mesh oil filter					•	
Clean exhaust screw magnet		•	•			
Check engine fixing screw tightness	•	•	•			
Replace spark plug and cap check					•	
Check valve play			•			
Check distribution chain					•	
Replace distribution chain					•	
Check cylinder and piston wear					•	
Replace piston completely					•	
Check head					•	
Check camshafts and rocker arms					•	
Replace valves, springs, half cones and plates					•	
Replace piston rod completely					•	
Check clutch discs				•		
Check clutch springs				•		
Check transmission and gearbox					•	
Check oil pumps and lubrication circuit					•	
Replace engine bearings completely					•	
Replace engine oil seal completely					•	

⚠ WARNING

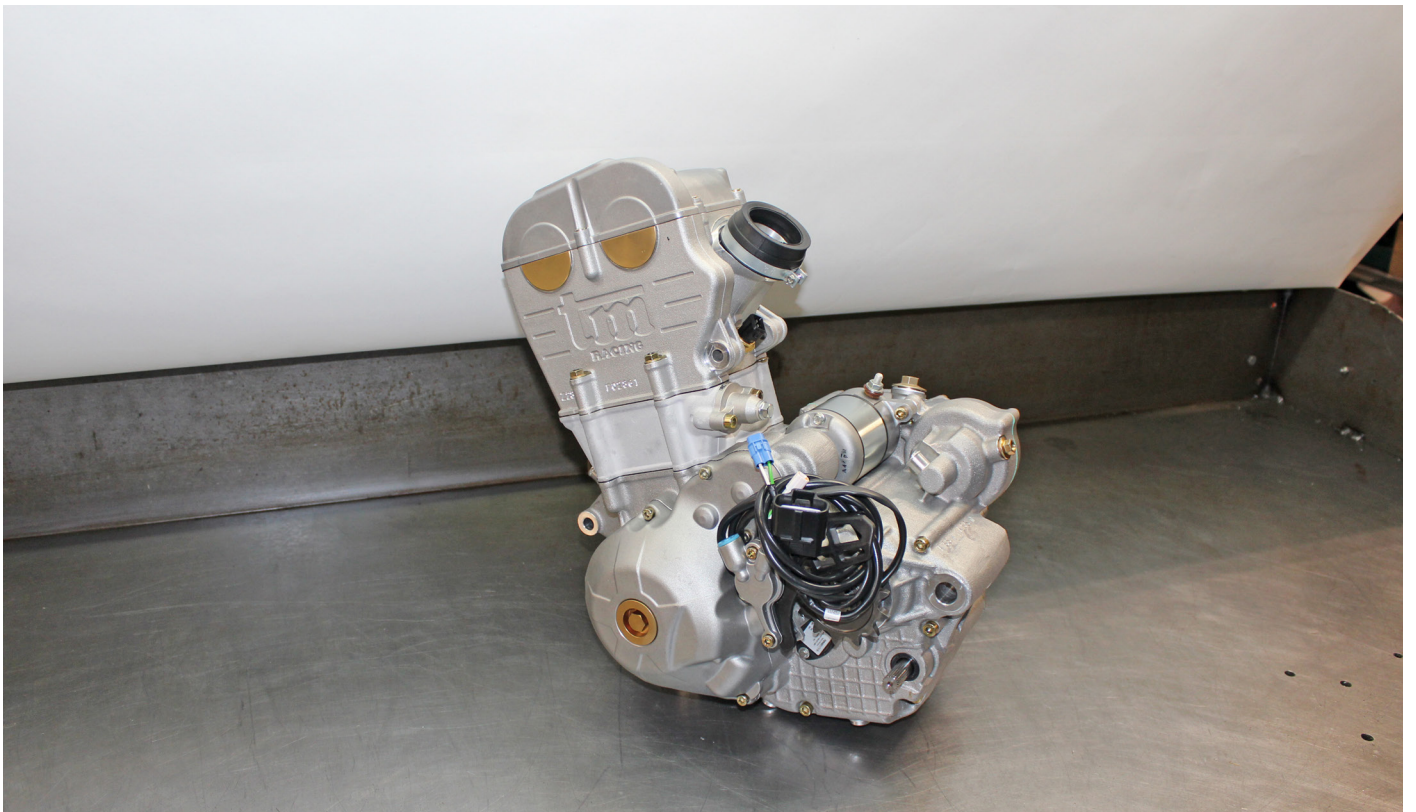
Components must be replaced if a defect is detected or wear limit values are exceeded at the check.

The afore-mentioned operations must be performed by an authorised TM workshop or by specialised personnel.

ENGINE

Problem	Cause	Solution
The engine does not start or struggles to start	Insufficient compression	
	<ol style="list-style-type: none"> 1. Piston seizing 2. Rod head or foot seizing 3. Worn piston segments 4. Worn cylinder 5. Insufficient cylinder head tightening 6. Insufficient head gasket sealing 7. Spark plug loosened 8. Incorrect valves play 9. Valves springs weakened or seized 10. Valves seized 	Replace Replace Replace Replace Tighten Replace Tighten Adjust Replace Replace
	Spark weak or non-existent	
	<ol style="list-style-type: none"> 1. Faulty spark plug 2. Spark plug encrusted or wet 3. Excessive distance between spark plug electrodes 4. Apertures or short circuits in the high-voltage cables 5. Faulty ECU 	Replace Clean or dry Adjust Check Replace
The engine stops easily	<ol style="list-style-type: none"> 1. Spark plug encrusted 2. Faulty ECU 3. Low idle speed 	Clean Replace Adjust
The engine is noisy	The noise seems to come from the piston	
	<ol style="list-style-type: none"> 1. Excessive play between cylinder and piston 2. Segments or their housing in the piston worn 3. Excessive accumulation of carbon deposits in the combustion chamber or on the piston crown 4. Rocker arm worn 5. Excessive valves play. 6. Valves springs weakened or seized 7. Distribution chain worn 8. Distribution chain tension not correct 	Replace Replace Clean Replace Adjust Replace Replace Adjust
	The noise seems to come from the crankshaft	
	<ol style="list-style-type: none"> 1. Bench bearings worn 2. Rod head radial or axial play high 3. Crankshaft gear damaged 4. Crankshaft fix. nut loosened 	Replace Replace Replace Tighten
	The noise seems to come from the clutch	
	<ol style="list-style-type: none"> 1. Discs worn 2. Excessive play between clutch bell and drive discs 	Replace Replace
	The noise seems to come from the gearbox	
	<ol style="list-style-type: none"> 1. Gears worn 2. Brake grooves consumed 	Replace Replace
The clutch slips	<ol style="list-style-type: none"> 1. Weakened clutch springs 2. Clutch discs worn 	Replace Replace
The clutch opposes resistance	<ol style="list-style-type: none"> 1. Spring load not even 2. Clutch discs bent 	Replace Replace
The gears do not engage	<ol style="list-style-type: none"> 1. Gearbox fork bent or seized 2. Gear ratchets worn 3. Forks command pins damaged 	Replace Replace Replace

Problem	Cause	Solution
The shift control pedal does not go back into position	1. Selector switch recall spring weakened or broken	Replace
	2. Gear forks worn	Replace
The gears disengage	1. Sliding gears couplings consumed	Replace
	2. Brake grooves worn	Replace
	3. Housings for couplings on the gears worn	Replace
	4. Grooves on the forks command shaft worn	Replace
	5. Forks command pins worn	Replace
INSUFFICIENT ENGINE POWER	1. Air filter dirty	Clean
	2. Low fuel quality	Replace
	3. Intake coupling loosened	Tighten
	4. Excessive distance between spark plug electrodes	Adjust
	5. Insufficient compression	Check the cause
	6. Incorrect valves play	Adjust
	7. Valve seats or guides faulty	Replace
	8. Valves springs weakened or seized	Replace
The engine overheats	1. Combustion chamber and/or piston crown encrusted with carbon residues	Clean
	2. Insufficient amount of oil in the engine or use of oil that is not recommended	Top-up or replace
	3. Obstructions to the air flow on the radiator	Clean
	4. Cylinder head gasket sealing faulty	Replace
	5. The clutch slips	Adjust
ELECTRIC PART		
Problem	Cause	Solution
The spark plug electrodes overheat	1. Insufficient distance between electrodes	Adjust
	2. Heat rating too high	Replace with recommended spark plug
The starter motor does not start or slips	1. Faulty starter motor	Repair or replace
	2. Starter gears worn	Replace
	3. Free wheel rolls worn or damaged	Replace the free wheel



1. ADJUSTMENTS/REPLACEMENTS

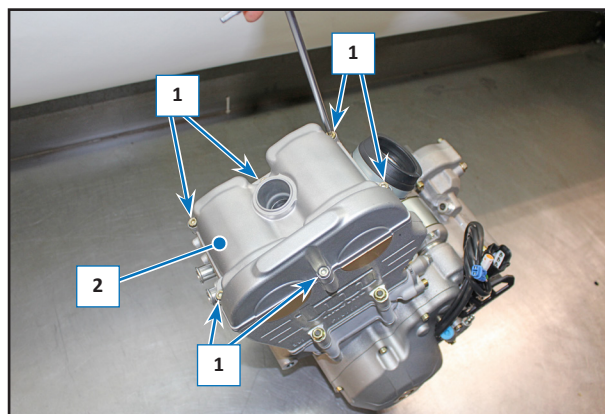
1.1 ADJUSTING VALVES PLAY (WITH COLD ENGINE)

The valve play can be adjusted with the engine mounted on the vehicle or with engine on the bench.

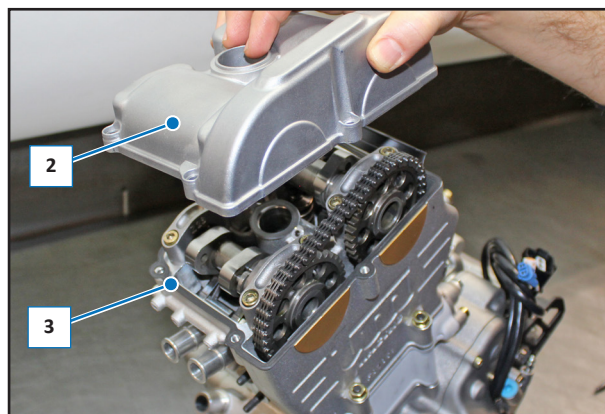
NOTE: If the engine is mounted on the motorcycle, the airbox must be removed in order to access disassembly of the head cover.

For the sake of convenience, the images shown below refer to an engine positioned on a workbench.

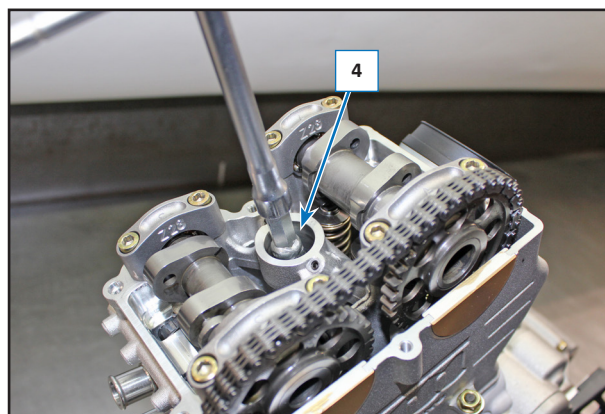
Unscrew the screws (1) from the head cover (2).



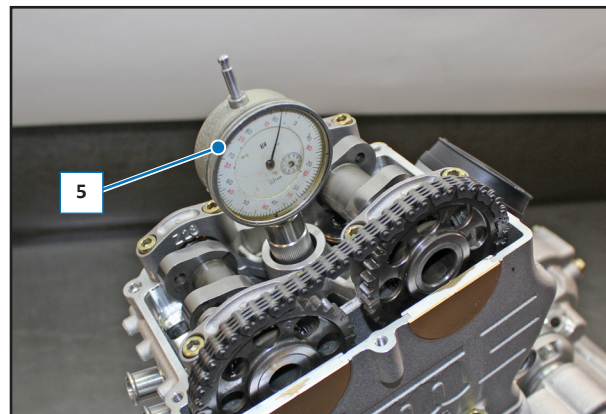
Remove the cover (2) with the relative gasket (3).



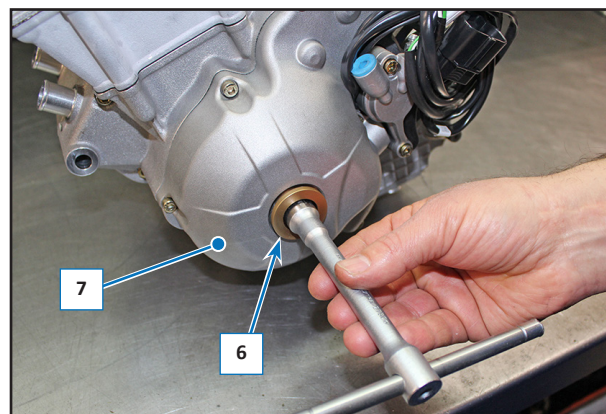
If not already performed, remove the spark plug (4).



Mount a comparator (5) on the head.

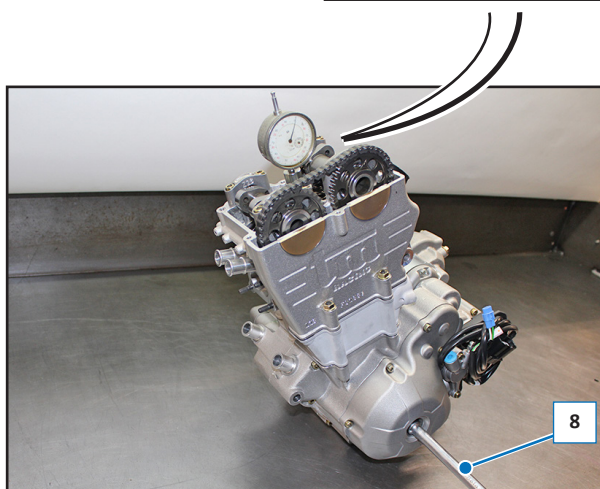
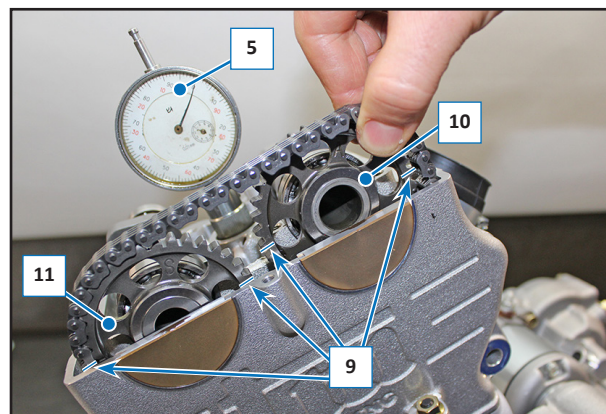


Remove the cap (6) from the generator cover (7).
Position the gearbox in neutral.



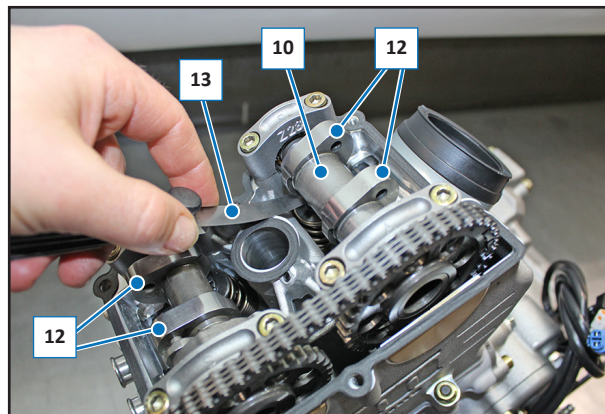
Using a socket wrench (8), turn the crankshaft to position the piston at top dead centre, as indicated by the timing lines (9) parallel to the edge of the head present on the intake (10) and exhaust (11) camshaft gear and from the comparator (5).

Remove the comparator (5).



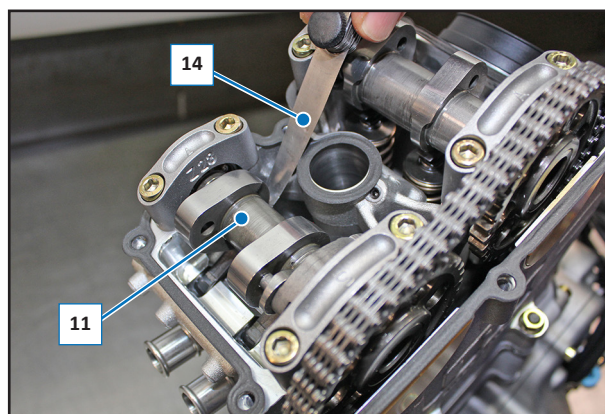
Check that the cams (12) are in rest position; the concave part must be positioned at approx. 45° from the head surface.

Use a thickness gauge (13) to check the play between the intake camshaft (10) and the valve pad is 0.15mm (0.006 in.).

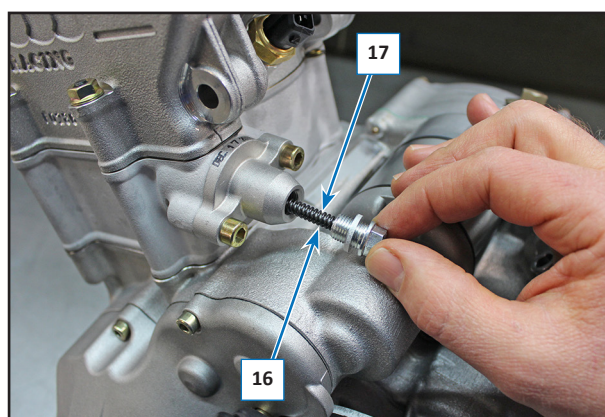
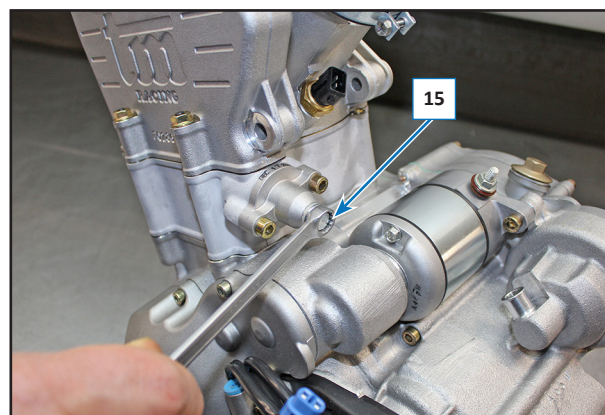


Use a thickness gauge (14) to check the play between the exhaust camshaft (11) and the valve pad is 0.20 mm (0.008 in.).

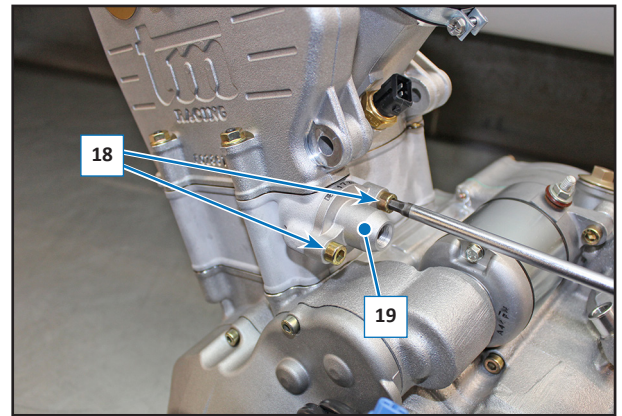
Otherwise the pads positioned on the valve stem head must be replaced, as follows:



Loosen the central screw (15) and remove the spring (16) with the pin (17).

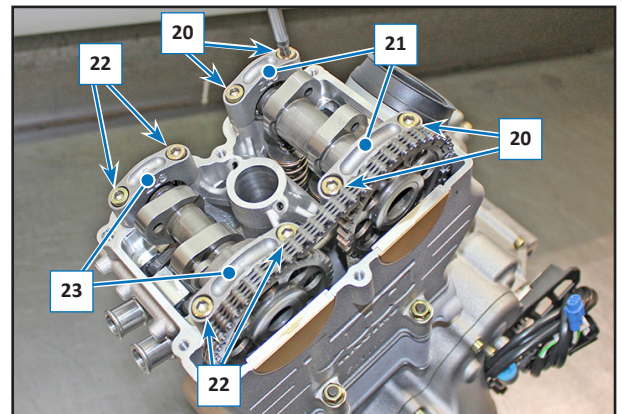


Unscrew the two screws (18) and remove the chain tensioner (19).

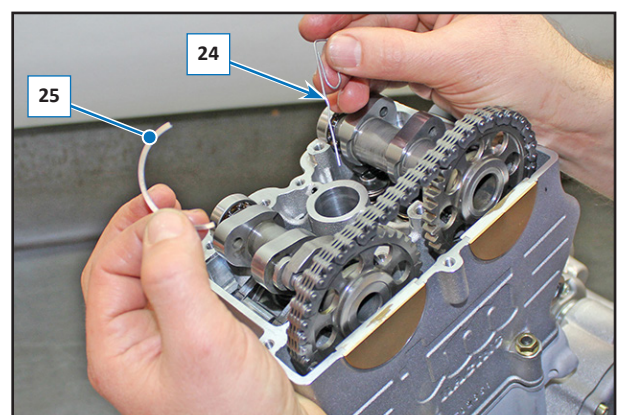
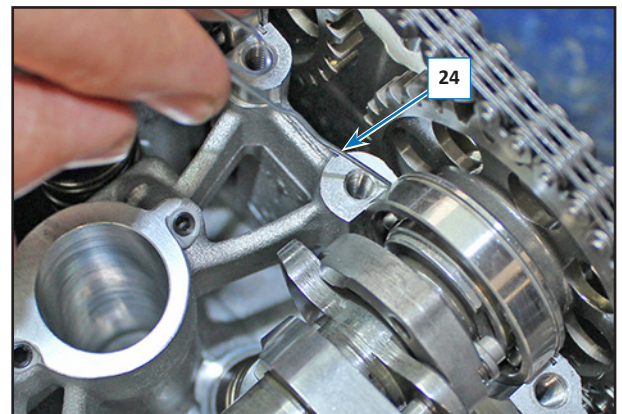


Tighten the screws (20) of the intake camshaft clamps (21) and remove them.
Tighten the screws (22) of the exhaust camshaft clamps (23) and remove them.

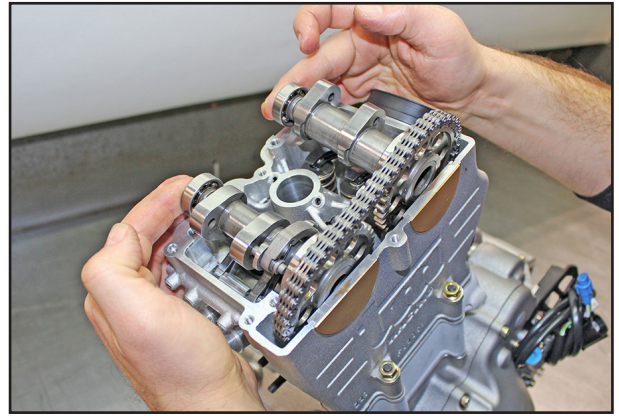
NOTE: The intake clamps are marked with "A" embossed on the clamp itself.
The exhaust clamps are marked with "S" embossed on the clamp itself.
Do not invert on re-mounting.



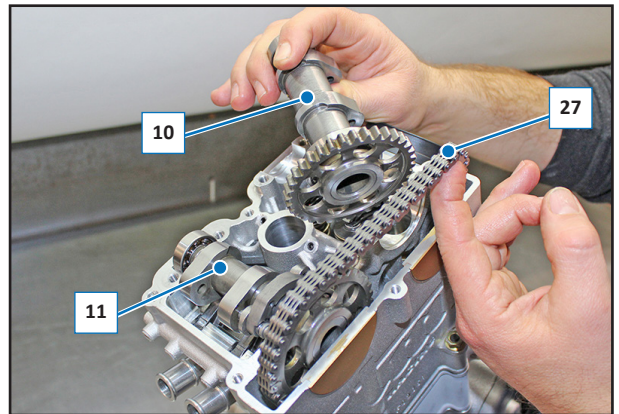
Using iron wire (24), push the exhaust shaft and intake shaft bearing safety washer (25) and remove it from both shafts.



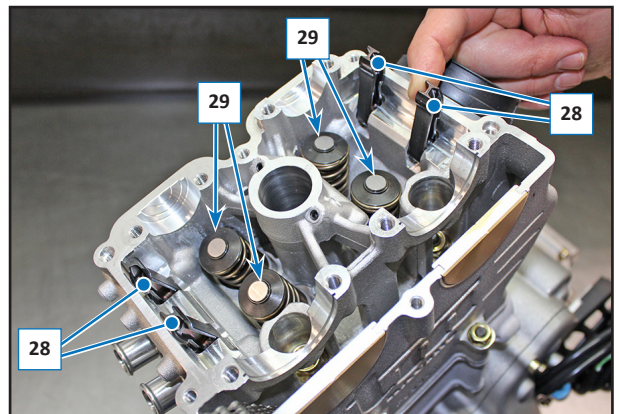
First remove the intake camshaft (10) and then the exhaust camshaft (11).



NOTE: support the chain (27) so that it doesn't fall inside the engine. Mark the pads removed even if they are not to be replaced, so that they can be re-mounted in the exact same position.

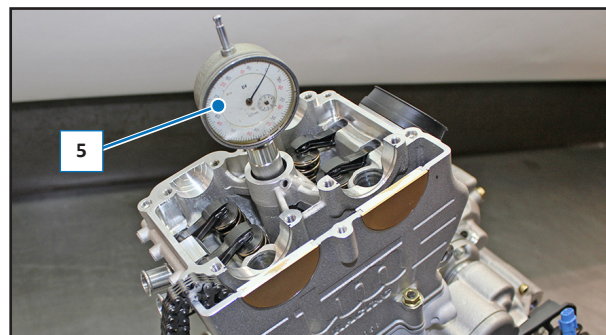


Lift the rockers (28) and remove the pads (29).

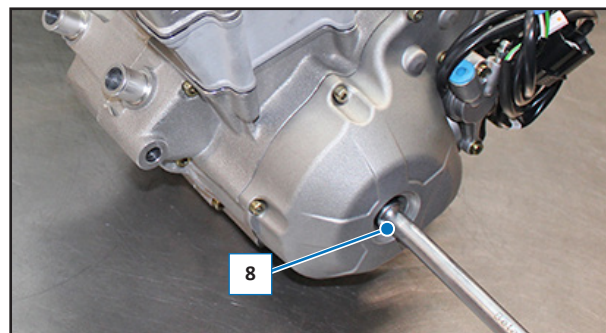


1.2 CAMSHAFTS RE-MOUNTING

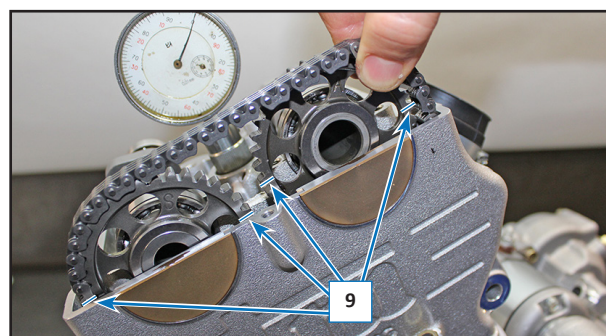
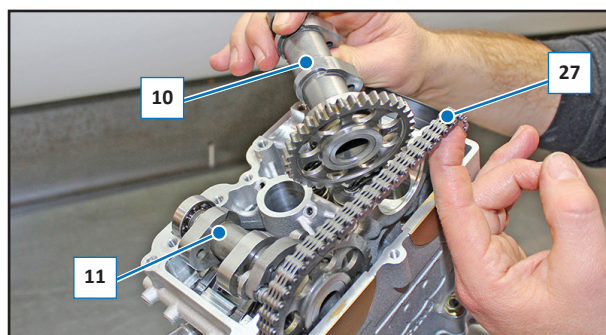
Mount a comparator (5) on the head and position the piston at top dead centre, rotating the crankshaft via the closed-end spanner (8).



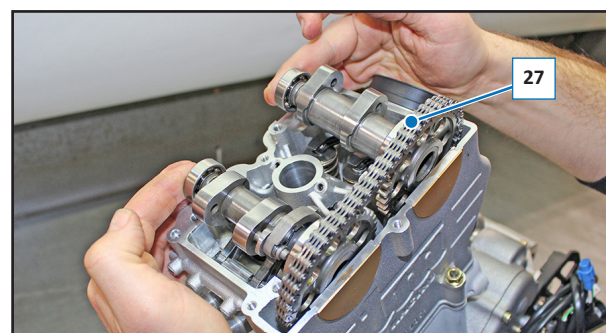
NOTE: Before re-mounting the camshafts, check that the bearings, gears and chain are not worn and replace if necessary.



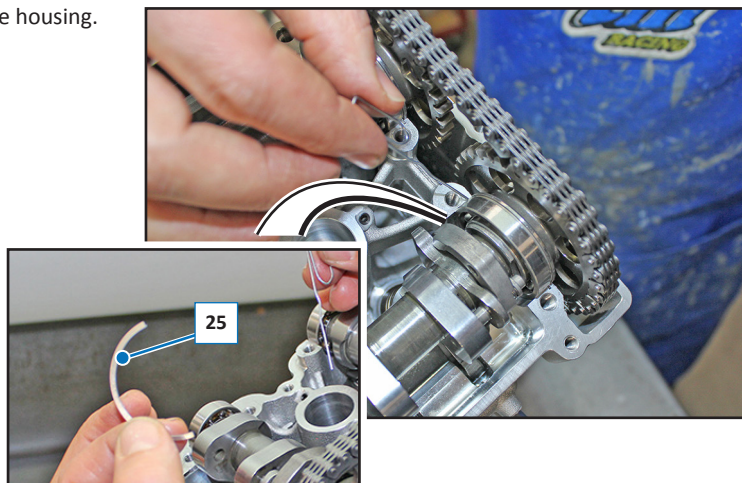
Retrieve the timing chain (27) and mount the exhaust camshaft (11) first, followed by the intake camshaft (10), taking care to make sure that the timing lines (9) are parallel with the head's upper surface.



NOTE: For re-mounting, tilt both the camshafts after having positioned the chain (27) and re-position them on the relative housing.

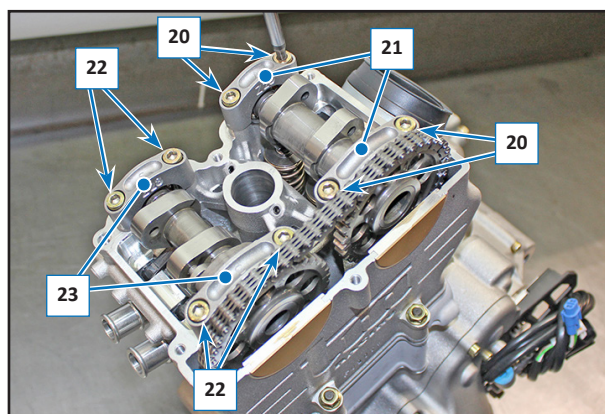


Insert the camshafts bearing safety washer (25) into the relative housing.

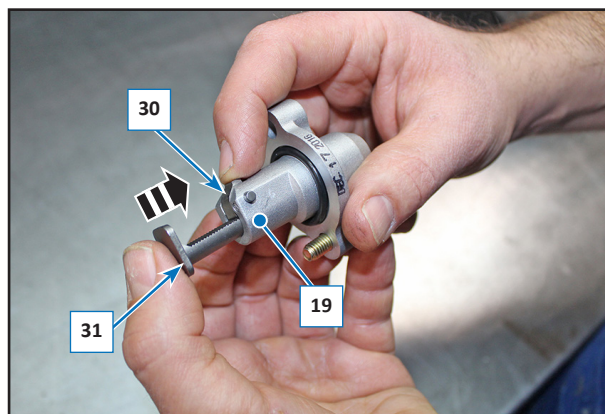


Mount the camshafts clamps (21) and (23), making reference to the embossing present on the same:
Intake shaft clamps marked with "A".
Exhaust shaft clamps marked with "S".

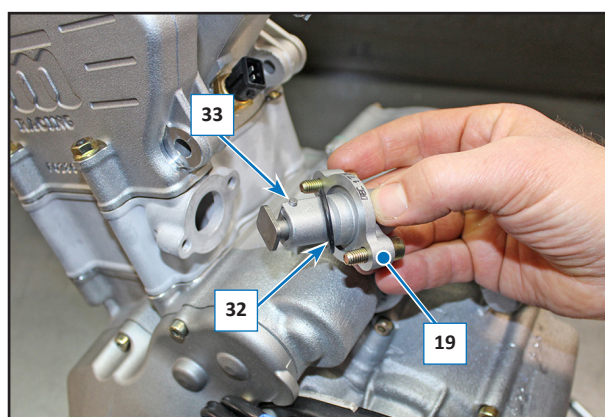
Screw the screws (20) and (22) without tightening them and then check that the clamps are correctly placed at the bearings of the camshafts; tighten the screws with a torque of 12 Nm (1.2 kgm, 8.85 ft/lb).



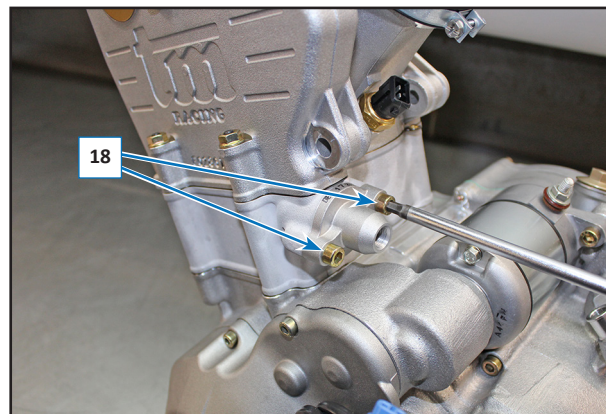
Press the block (30) and push the ratchet (31) of the tensioner (19), until it enters into the body.



Check gasket wear (32) and replace if ruined. Re-mount the tensioner (19), paying attention that the pin (33) is positioned upwards.

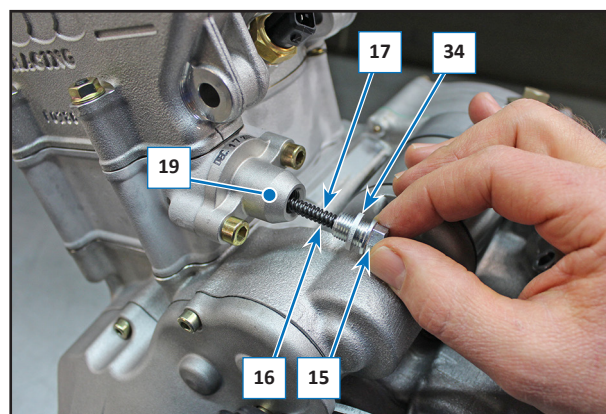


Tighten the two screws (18) with a torque of 10 Nm (1.0 kgm/ 7.23 ft/lb)



Insert the pin (17) and the spring (16) inside the chain tensioner (19) and then tighten the screw (15) fully home.

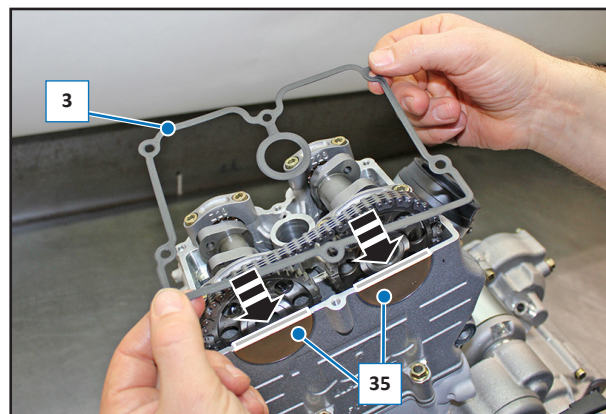
NOTE: Before tightening the screw (15), check that the aluminium washer (34) is not ruined, replace if necessary.



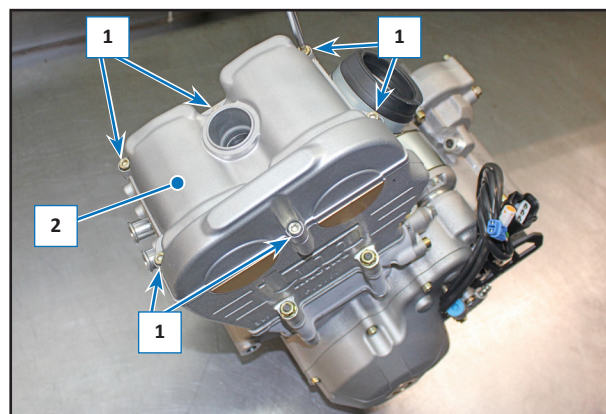
Check that valves play is correct (see “Valves play check” paragraph)

Spread some “Tree Bond 1215” sealing paste onto the surfaces of the two crescents (35).

Check that the gasket (3) is not ruined, otherwise replace it, and then position it on the head.



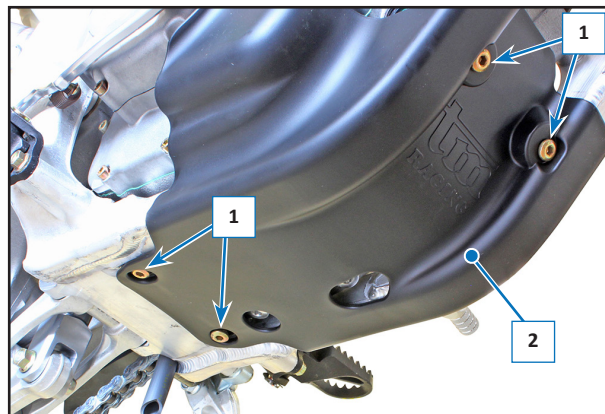
Mount the head cover (2) by screwing the screws (1) crosswise and then tightening them with a torque of 8 Nm (0.8 kgm/ 5.9 ft/lb).



1.3 ENGINE OIL AND FILTER CHANGE

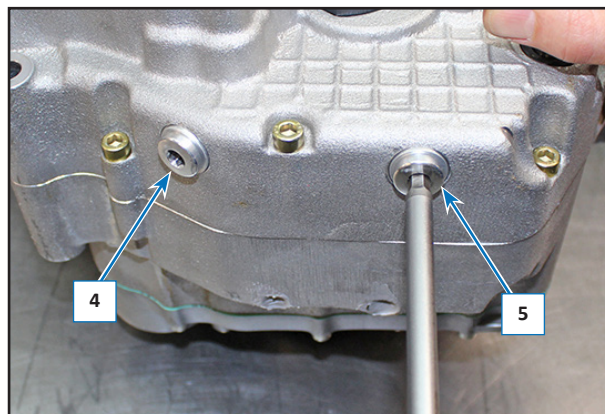
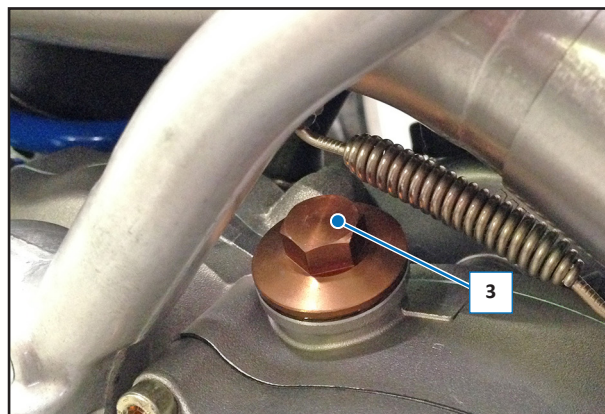
The oil must be changed with the engine off but still warm enough to allow the waste oil to flow out easily.

Unscrew the four screws (1) and remove the skid plate (2).

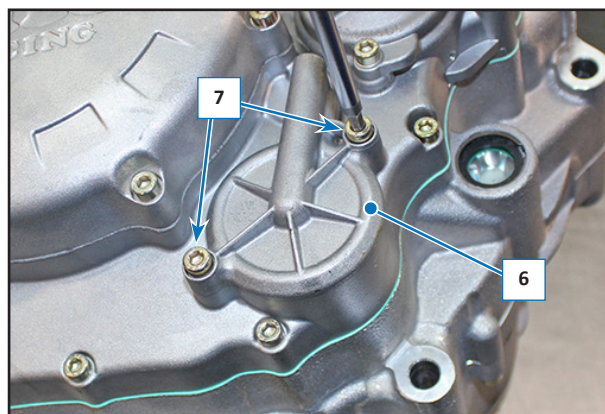


Position the motorcycle on a flat surface and prepare a suitable recipient under the same.

Loosen the introduction cap (3) positioned on the right side of the engine (clutch cover) and the drain caps (4 and 5) positioned on the lower side of the engine; allow the oil to flow out into the recipient.

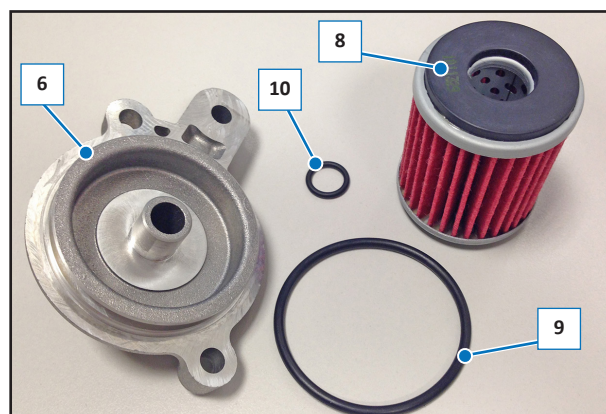
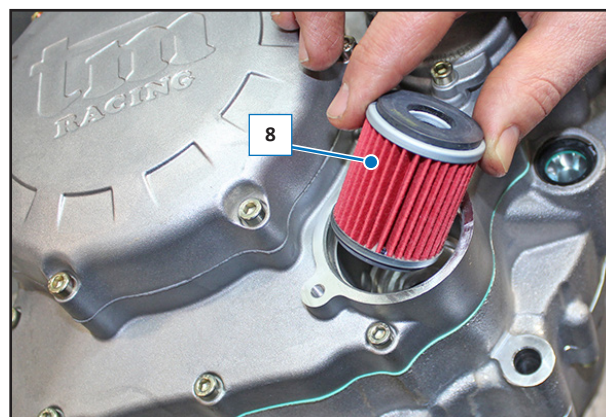


In the meantime, remove the filter cover (6) situated on the right side of the engine, loosening the relative screws (7) and paying attention to collect the oil escaping.



Extract the cartridge filter (8) and clean the surfaces of the guard and filter cover, check the seal O-rings (9 and 10) and replace them if necessary. Insert the original new TM Racing filter in a way to have the open side towards the outside of the engine. The filter must be inserted completely into its housing.

Re-mount the O-rings and the filter cover, tightening the screws (7) to 8 Nm (0.8 kgm, 5.9 ft/lb).



Wait for the oil to drain completely through the holes, clean the sealing surfaces, replace the aluminium washers, remove any magnetic debris (11) of the draining caps (4 and 5) and screw the caps back on, tightening to 20 Nm (2 kgm, 14.75 ft/lb).

Prepare a measure with the amount of the prescribed engine oil necessary (see table) and pour from the introduction hole.

Repeat the oil level check operation.

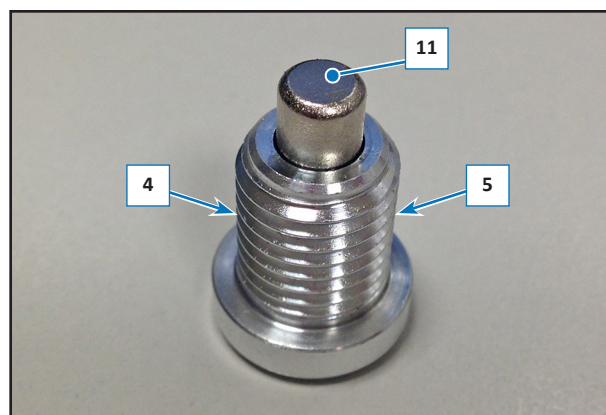
Check sealing of the filter cover introduction and drain caps.

⚠ DANGER

- **PAY ATTENTION TO THE HOT OIL AND PARTS OF THE ENGINE; THERE IS A BURNS HAZARD.**

⚠ WARNING

- A level that is too low, poor quality oil or maintenance intervals longer than those prescribed, cause serious damage to the engine. Do not introduce an excessive amount of oil into the engine. If this should happen, drain it as described previously.
- Always replace the filter when changing the oil. If there is no new filter, remove the one used to inspect it and drain the waste oil from the housing. Re-mount it according to the procedure described.
- Do not attempt to clean a used filter.

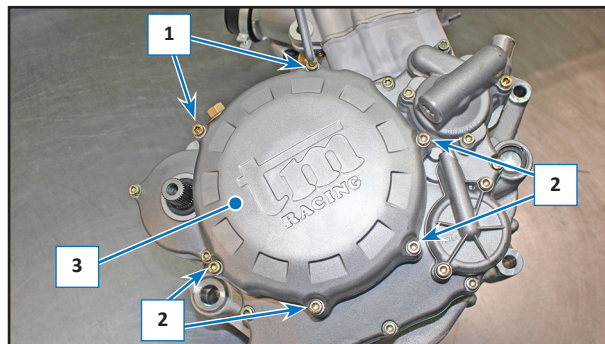


ENGINE OIL QUANTITY TABLE

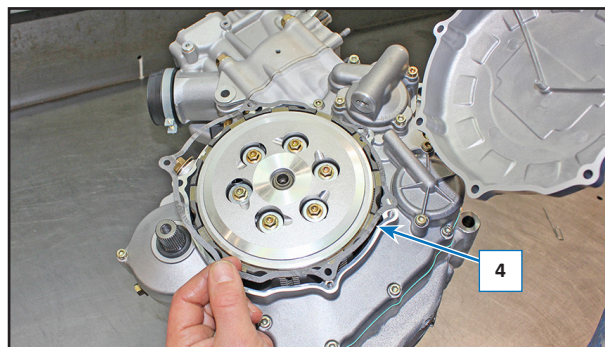
Change oil and filter	1.25 l
Change oil and inspect filter	1.25 l
Engine overhaul.....	1.35 l

1.4 STANDARD CLUTCH REPLACEMENT

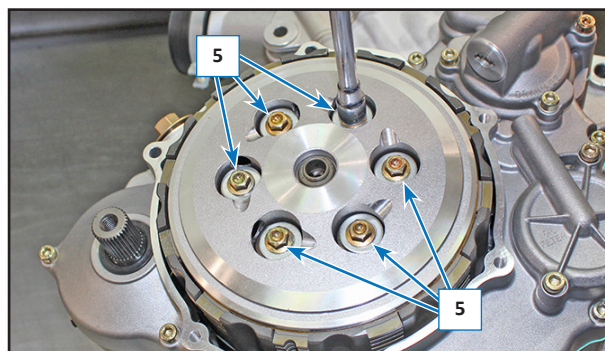
Drain the engine oil as described in the relative paragraph.
Unscrew the M5-L65 (1) and M5-L25 (2) screws, then remove the clutch cover (3).



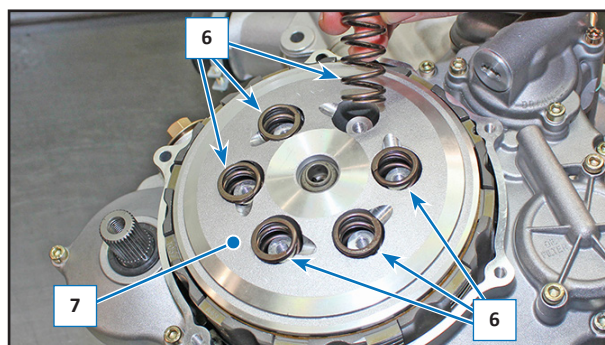
Remove the gasket (4).



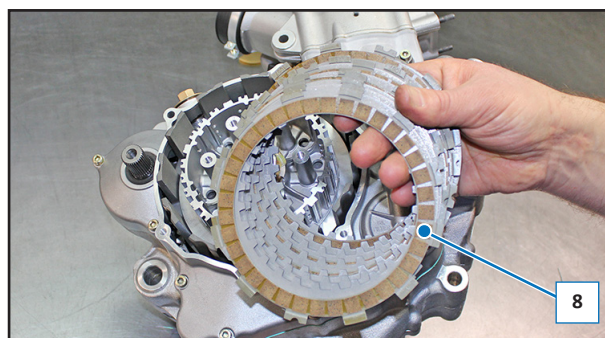
Unscrew the screws (5) of the clutch pack.



Remove the spring (6) and the pressure plate (7).

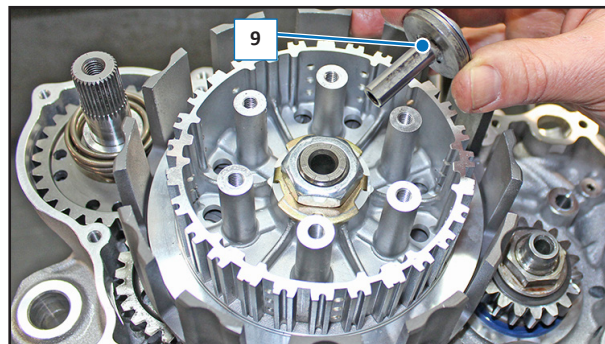


Remove the discs (8).

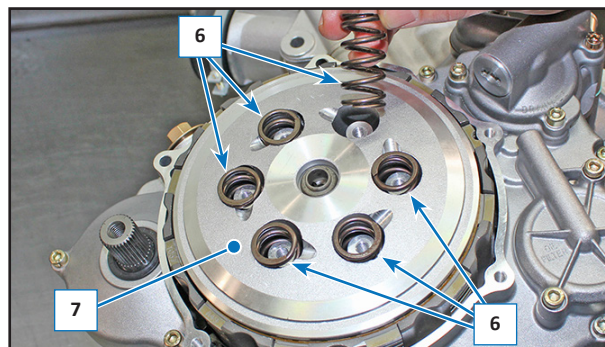


Check that the pressure plate (9) is present.

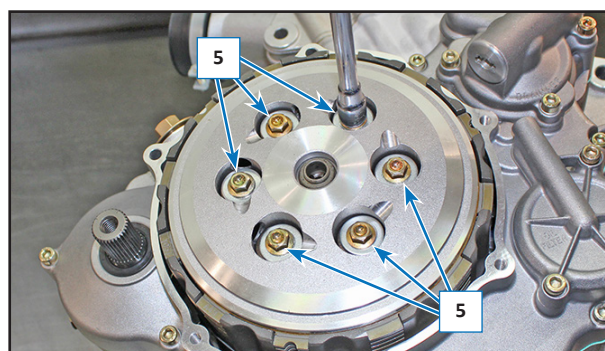
NOTE: On re-mounting the new discs, lubricate them with engine oil and make sure that the first disc mounted is lined, and that the first two smooth discs have thickness of 1.8 mm (the other discs have thickness of 1.5 mm).



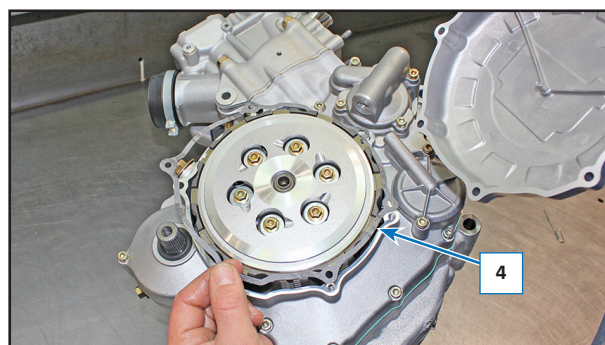
Remount the pressure plate (7) with the relative springs (6).



Re-mount the screws (5) and tighten them crosswise and gradually with a torque of 8 Nm (0.8 kgm/ 5.9 ft/lb).

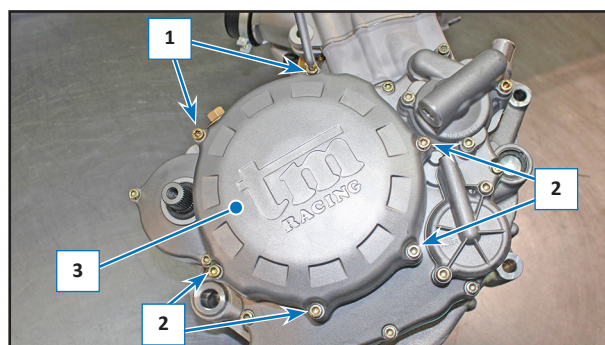


Check that the gasket (4) is not ruined, otherwise replace it, and mount it on the guard.



Mount the clutch guard (3) and tighten the screws (1) and (2) gradually with a torque of 8 Nm (0.8 kgm/ 5.9 ft/lb)

Introduce oil into the engine oil as described in the relative paragraph.

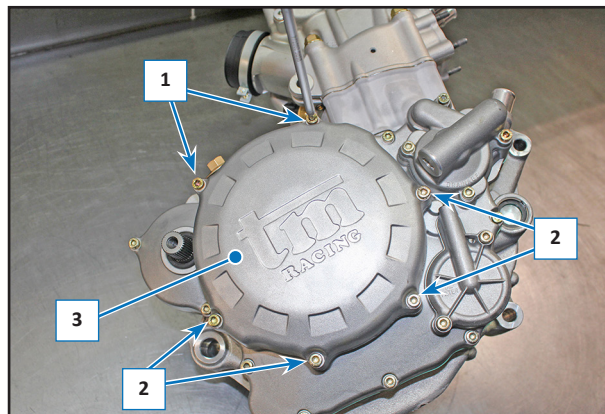


1.5 SLIPPER CLUTCH REPLACEMENT

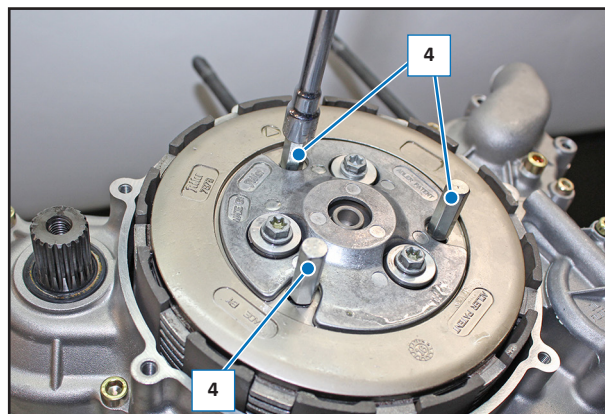
1.5.1 Disc pack removal

Drain the engine oil as described in the relative paragraph.

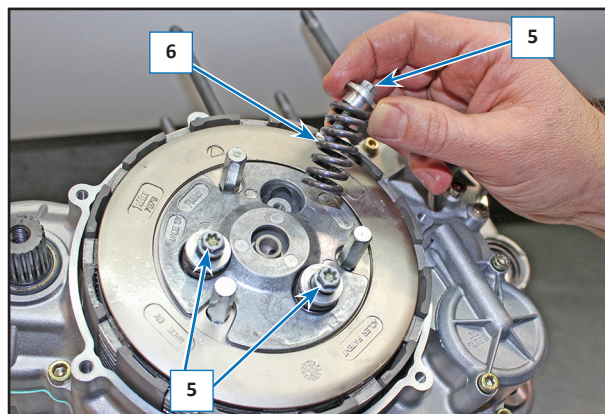
Unscrew the M5-L65 (1) and M5-L25 (2) screws, then remove the clutch cover (3).



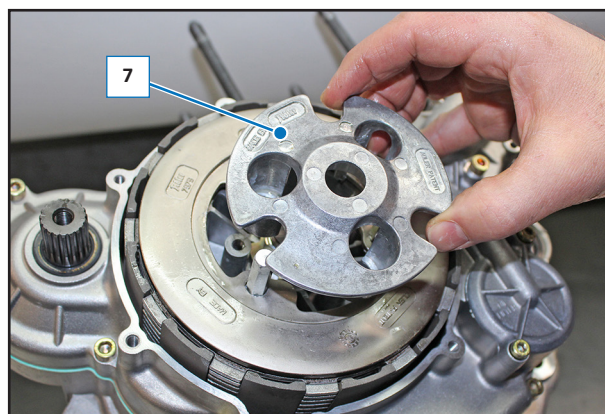
Tighten the columns (4) supplied.



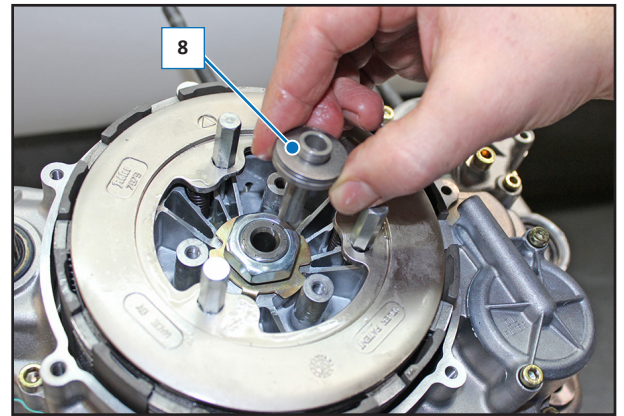
Loosen the screws (5) and remove the springs (6).



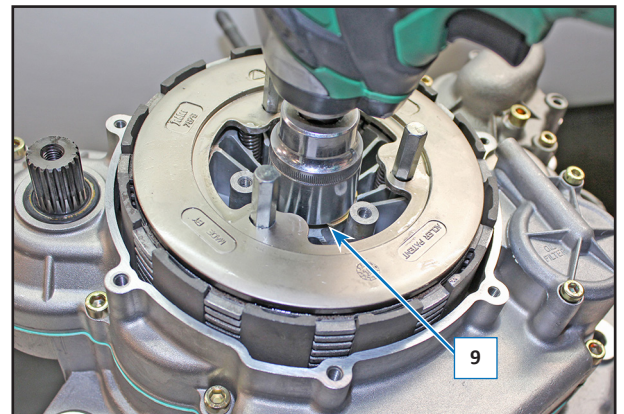
Remove the upper plate (7).



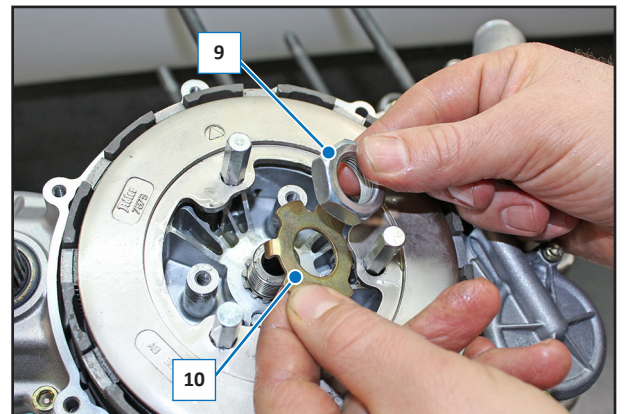
Remove the pressure plate (8).



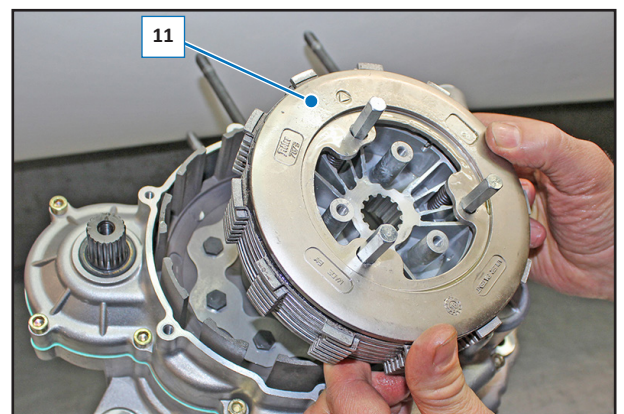
Unscrew the nut (9).



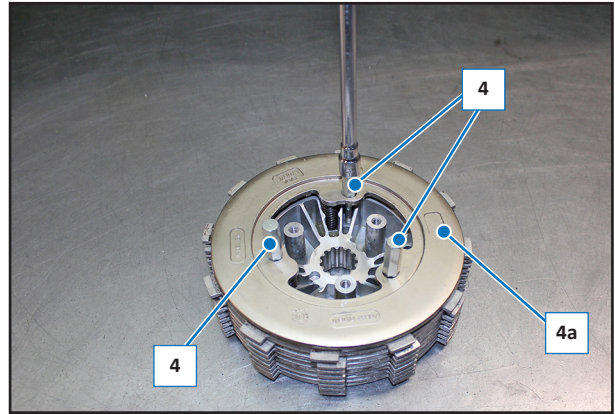
Remove the nut (9) and the washer (10).



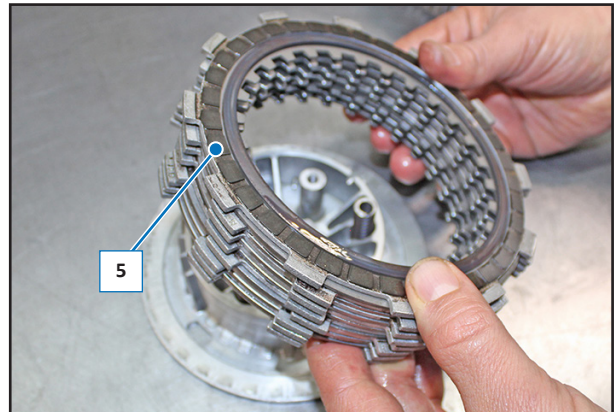
Remove the complete clutch pack (11).



Unscrew the columns (4) and remove the upper drum (4a).

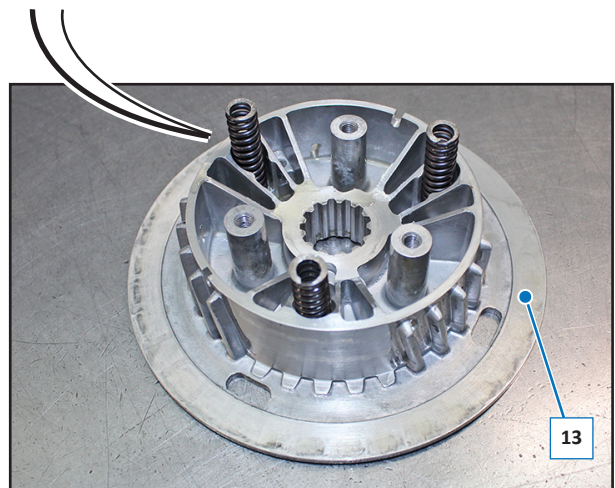
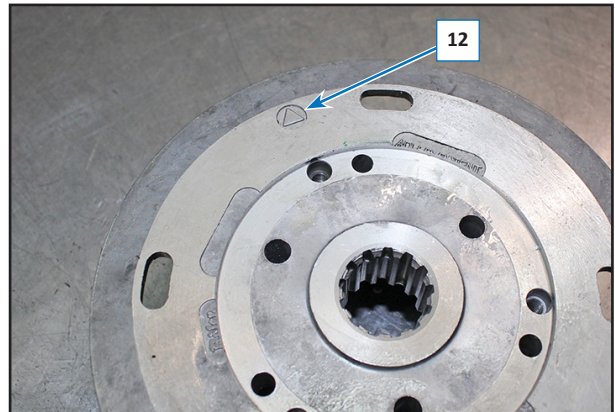


Extract the disk pack (5).

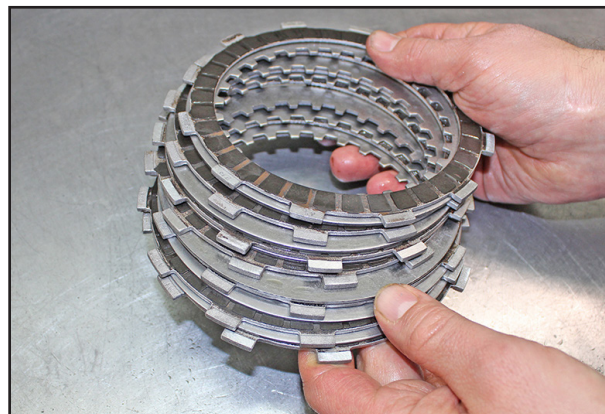


1.5.2 Discs replacement and re-mounting of clutch

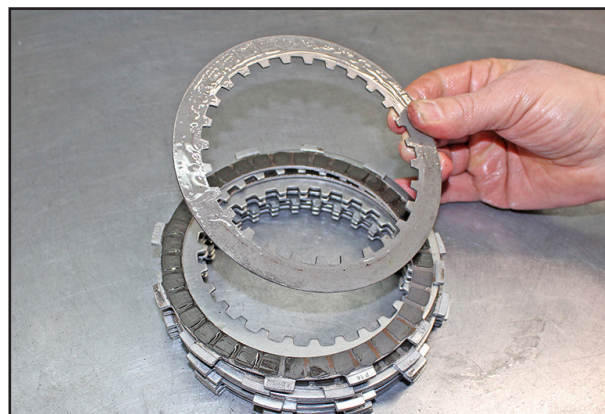
Mark the position of the arrow (12) on the lower drum (13), which must coincide with the position of the arrow embossed on the upper drum of the clutch pack.



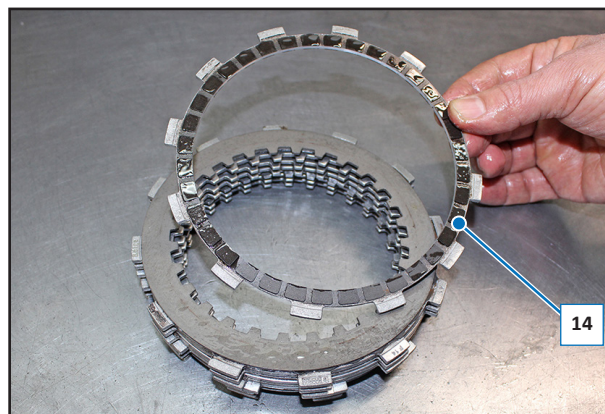
NOTE: On re-mounting the new discs, lubricate them with engine oil and make sure that the first disc mounted is lined, and that the first two smooth discs have thickness of 1.5 mm (the other discs have thickness of 2 mm).



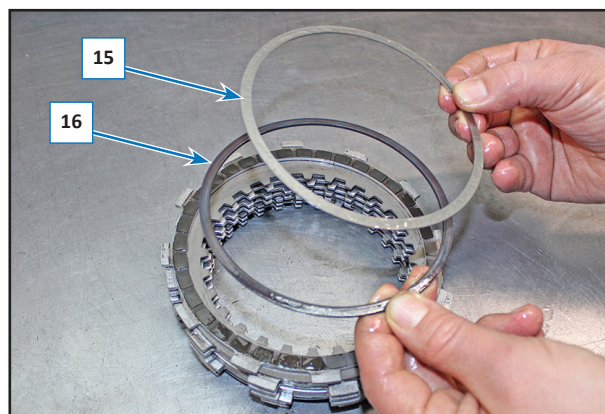
The clutch pack must finish with a smooth disc.



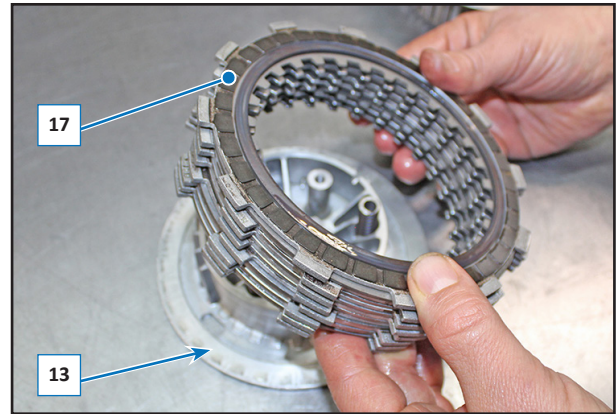
Mount the lined disc (14) with smaller lining than the others.



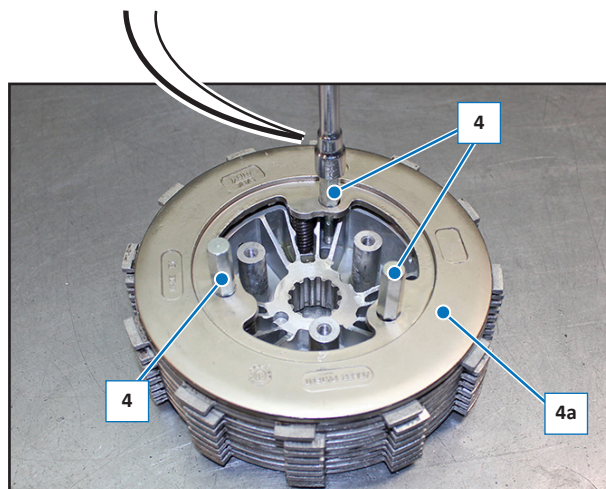
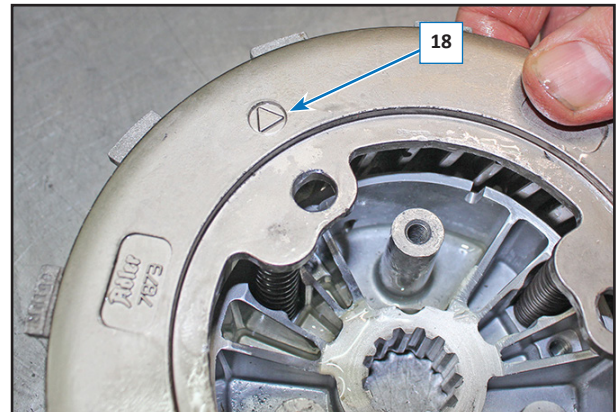
Mount the washer (15) and the Belleville washer (16), which are not supplied with disc spare parts; therefore those present must be re-used.



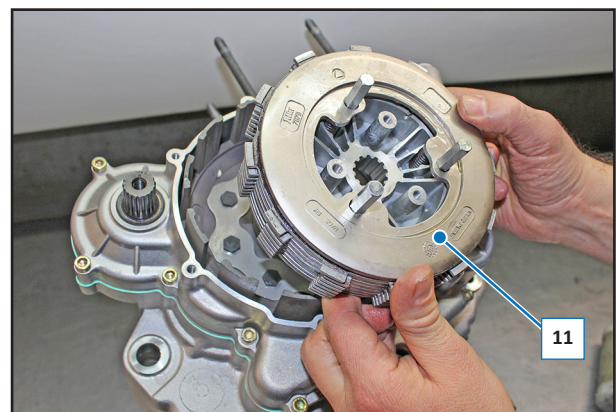
Mount the disk pack (17) on the lower drum (13).



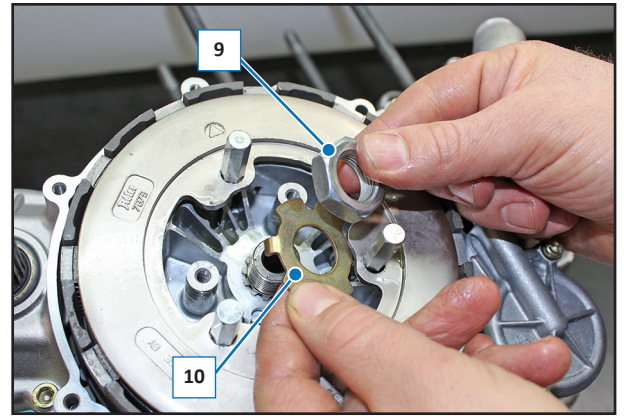
Mount the upper drum (4a), making the arrow (18) coincide with arrow (12) of the lower drum and then tighten the columns (4).



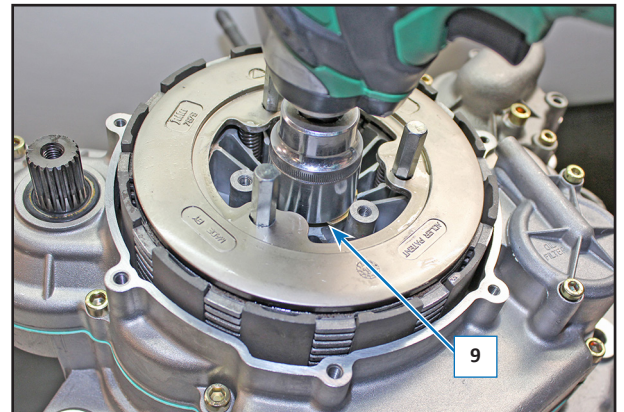
Mount the clutch pack (11).



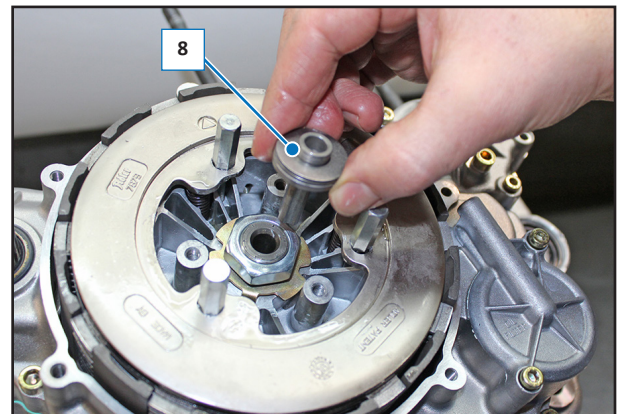
Insert the safety washer (10) and the nut (9).



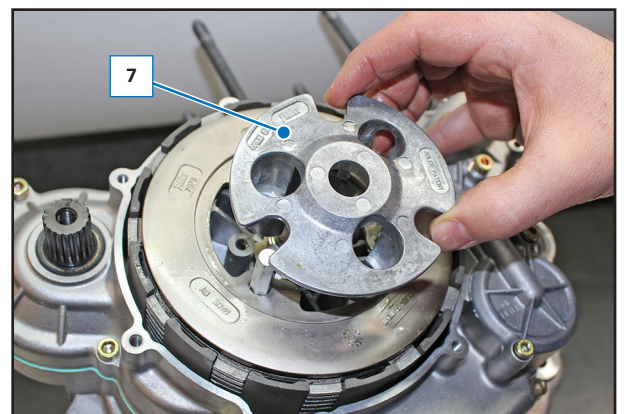
Tighten the nut (9) with a torque of 100 Nm/ 10 kgm/ 73.75 ft/lb + Loxeal 82-33.



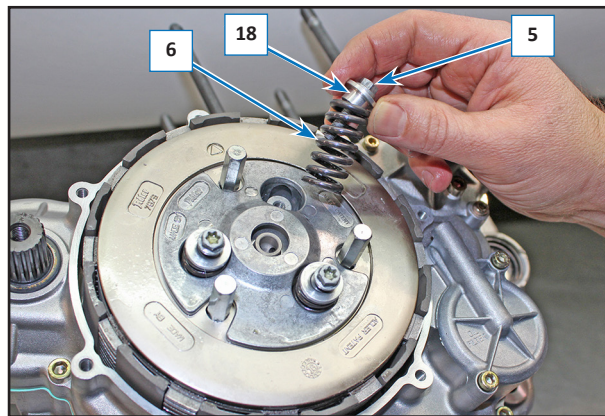
Mount the pressure plate (8).



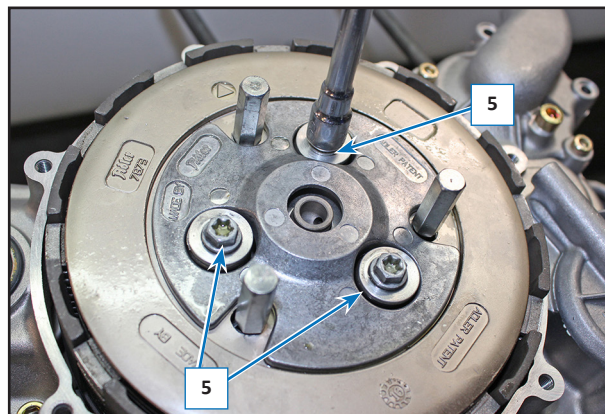
Mount the upper plate (7).



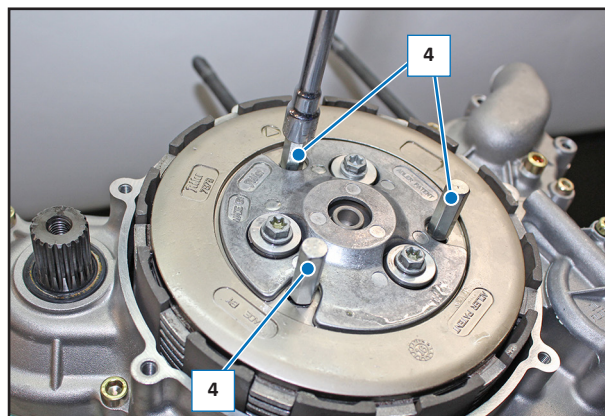
Mount the screw (5) with the relative springs (6) and bushes (18).



Tighten the screws (5) with a torque of 8 Nm (0.8 kgm/ 5.9 ft/lb).

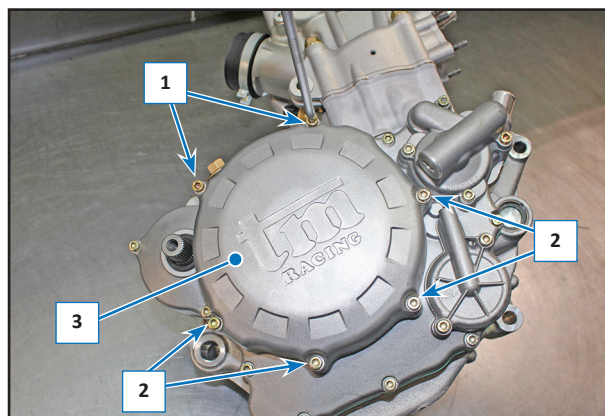


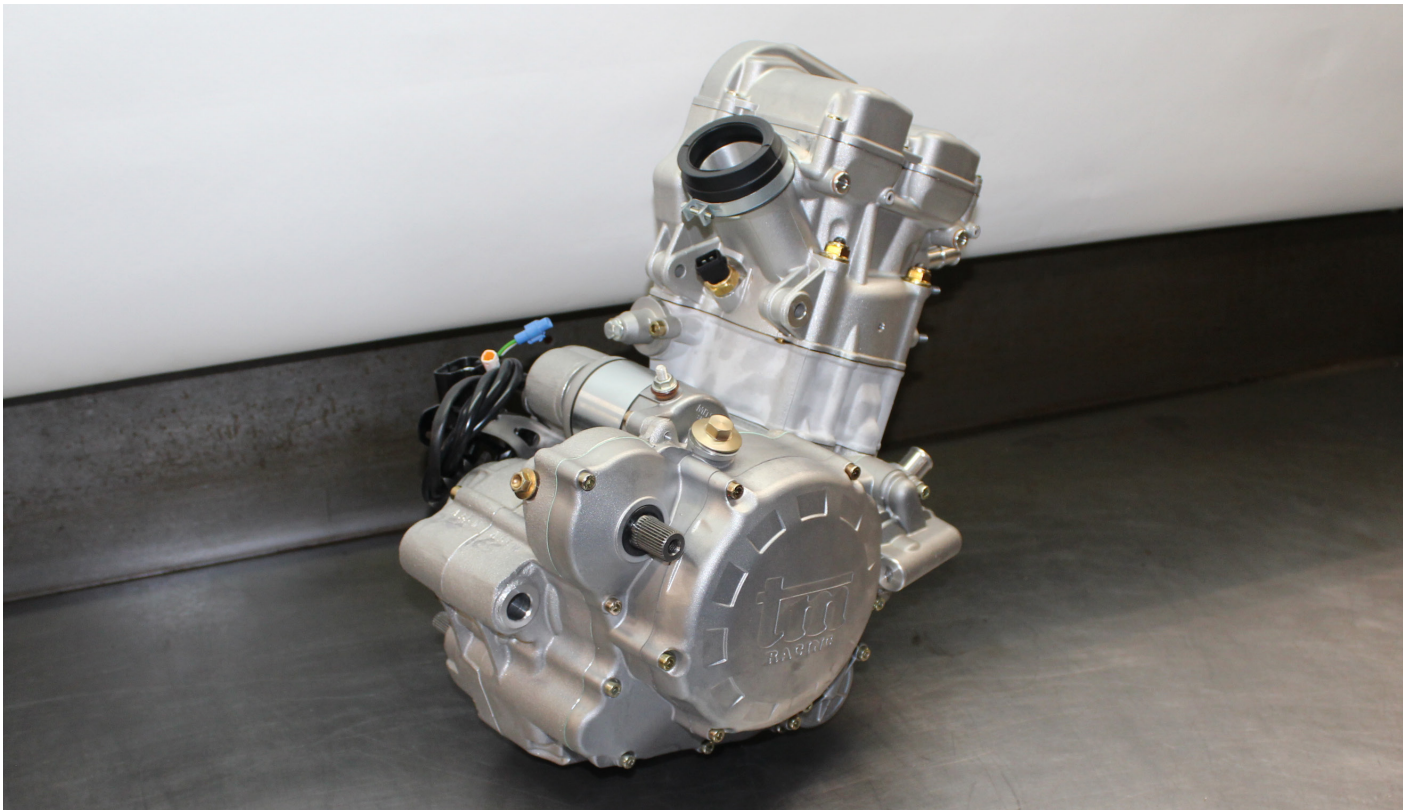
Remove the columns (4) supplied.



Mount the clutch guard (3) and relative gasket and tighten the screws (1) and (2) gradually with a torque of 8 Nm (0.8 kgm/ 5.9 ft/lb).

Introduce oil into the engine oil as described in the relative paragraph.

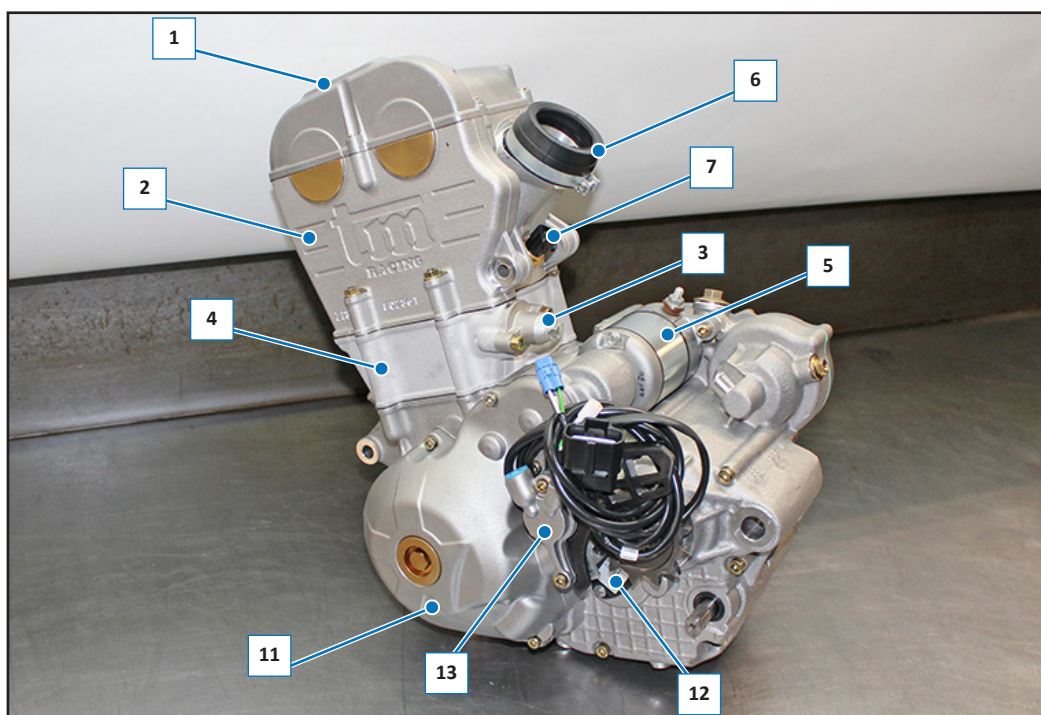
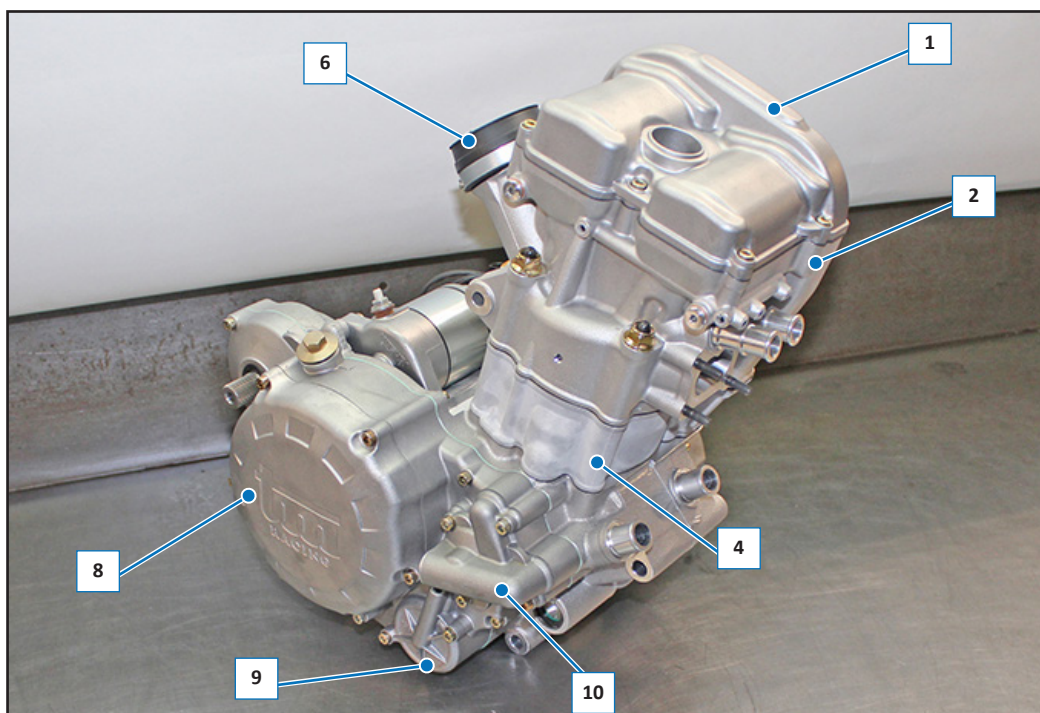




2. ENGINE DISASSEMBLY

2.1 ENGINE COMPONENTS LAYOUT

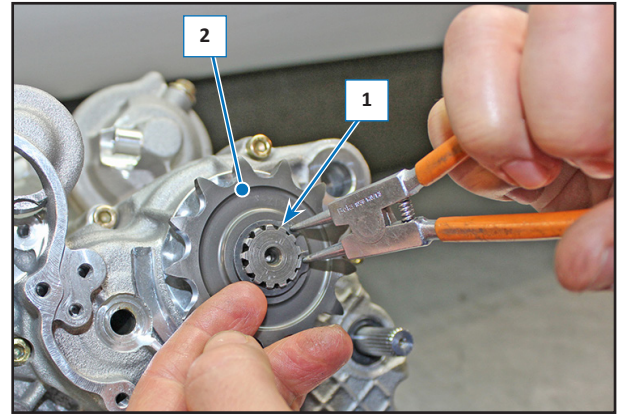
- 1 Cylinder head cover
- 2 Cylinder head
- 3 Chain tensioner
- 4 Cylinder
- 5 Starter motor
- 6 Throttle body connection coupling
- 7 Temperature sensor
- 8 Transmission cover
- 9 Oil filter
- 10 Water pump
- 11 Ignition cover
- 12 Gear sensor
- 13 Clutch actuator



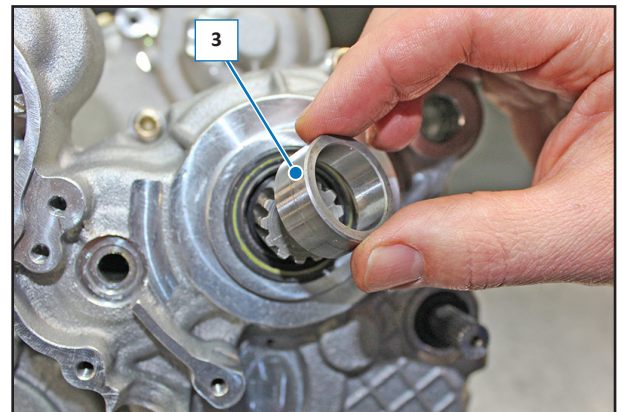
2.2 PINION REMOVAL

Remove the clutch actuator with the pinion cover casing, as described in the relative paragraph.

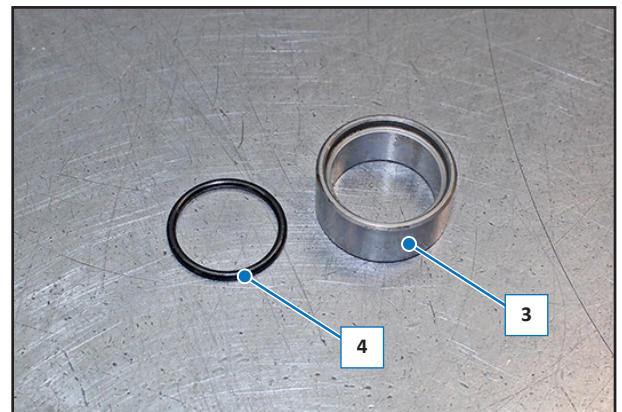
Remove the seeger ring (1) and the pinion (2).



Slide the bushing (3) out.



NOTE: On re-mounting the bush (3), check the status of the O-ring gasket (4) and replace it if worn. Lubricate the bush (3) and the gasket (4) with engine oil before remounting it.

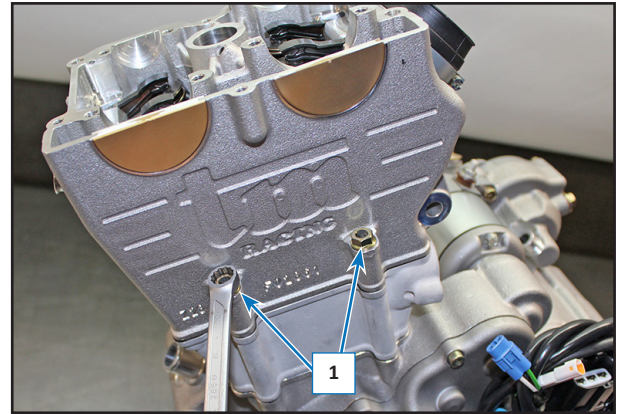


2.3 HEAD

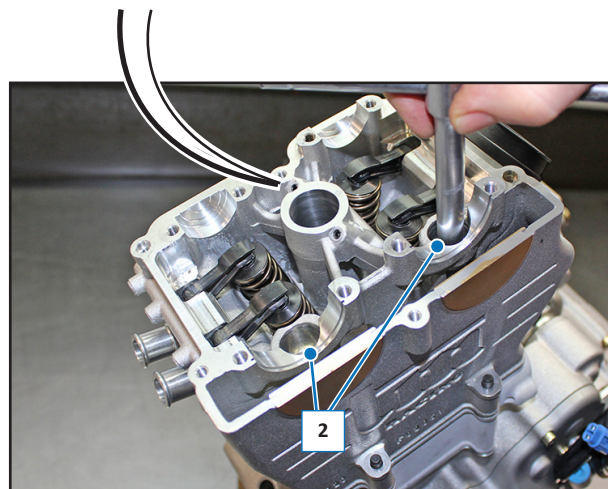
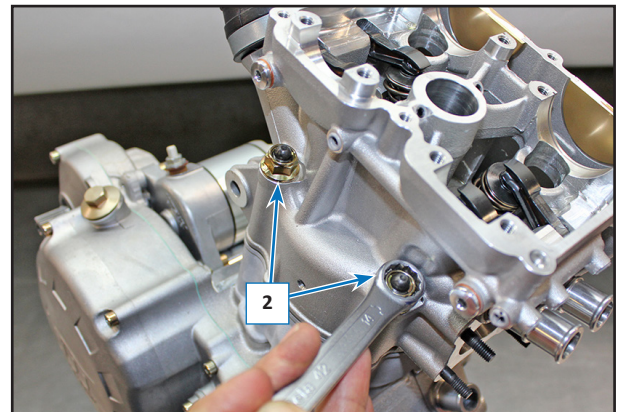
2.3.1 Head removal

Remove the head cover and the camshafts, as described in the relative paragraphs.

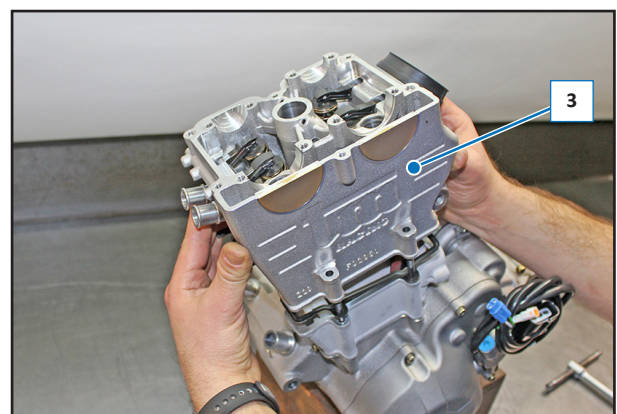
Loosen the two lateral nuts (1) at the left of the head.



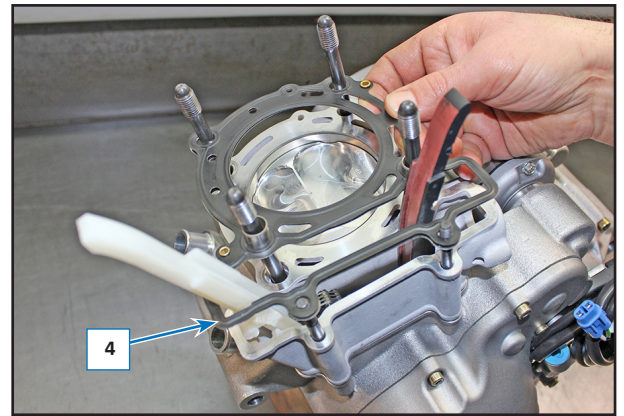
Loosen the nuts (2) of the head studs.



Lift the head (3) and remove it.



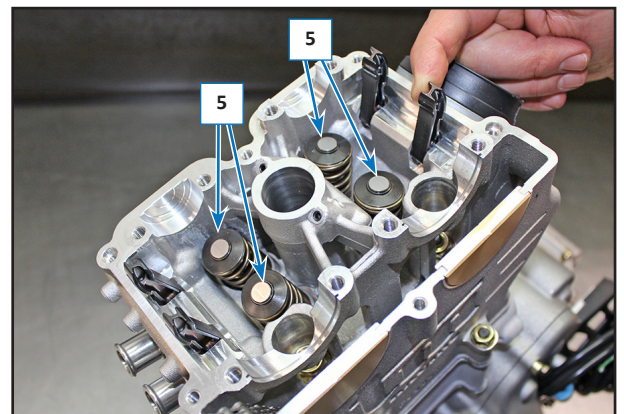
Remove the gasket (4).



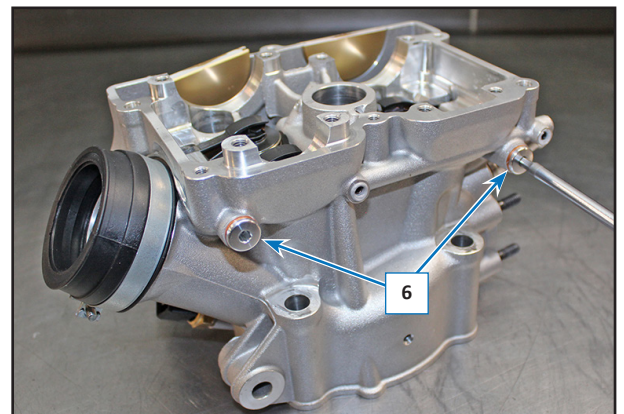
2.3.2 Head dismantling

NOTE: Mark all components in a way to re-mount the exactly in the same place from where they were removed.

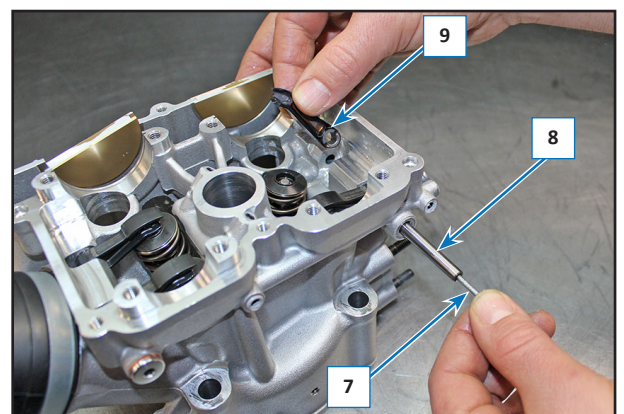
Retrieve the pads (5).



Unscrew the screws (6) of the rocker pins.

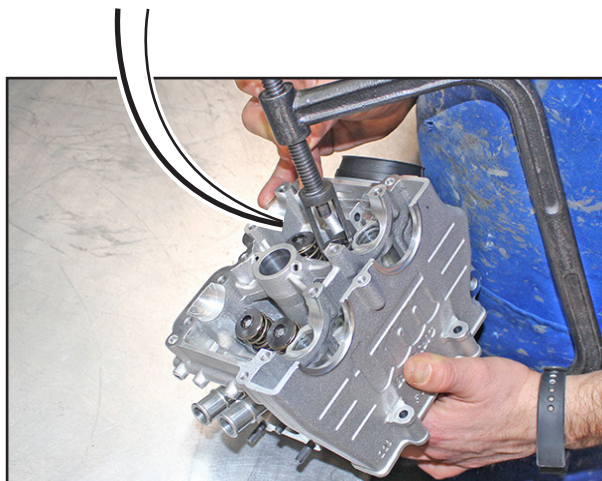
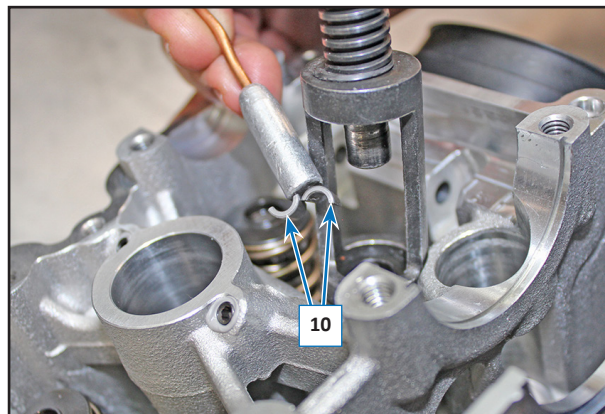


Loosen the M4 screw (7) and slide the pin out (8) and retrieve the rockers (9).



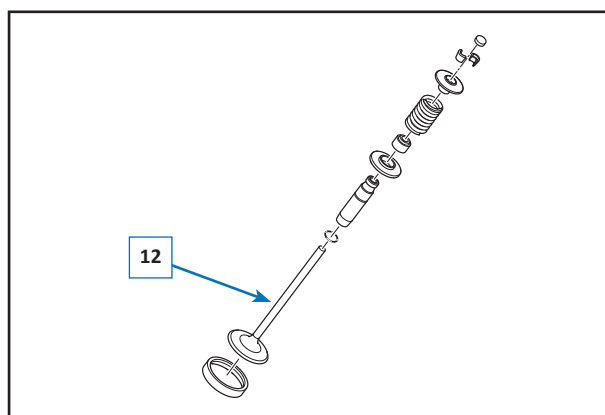
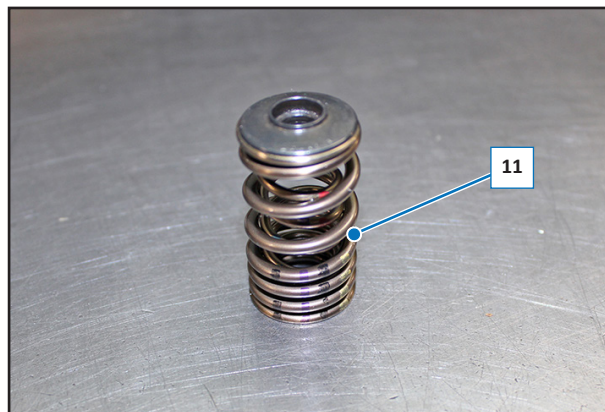
Using the relevant tool, compress the valves and use a magnet to remove the two half cones (10).

NOTE: Pay attention not to damage the support surfaces of the gaskets or of the combustion chamber. Make sure that the separator tool is upright, otherwise the valve stem may bend.



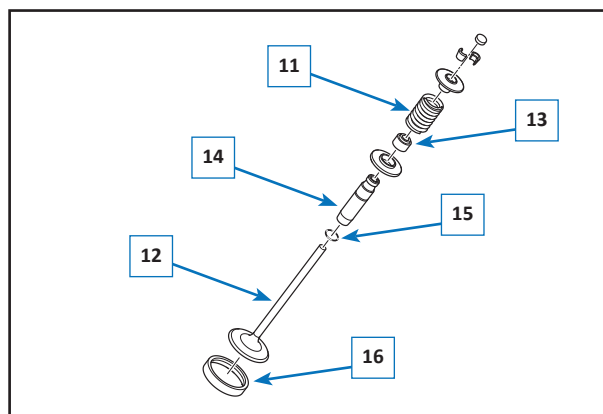
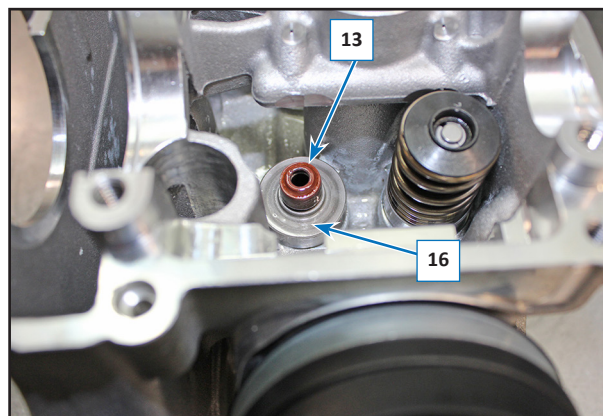
Remove the tool and remove the double spring (11) and the relative valve (12).

NOTE: Before sliding the valve out, check that there are no burrs on the stem, so that the valve-guide and relative oil seal are not ruined. If this is not the case, sand lightly to remove the burrs.



If ruined, remove the oil seal (13), the valve-guide (14), the relative OR gasket (15) and the valve seat (16).

NOTE: The valve seats and the valves are different regarding intake and exhaust.
Do not invert. Mark them before disassembling them in order to re-mount them correctly.



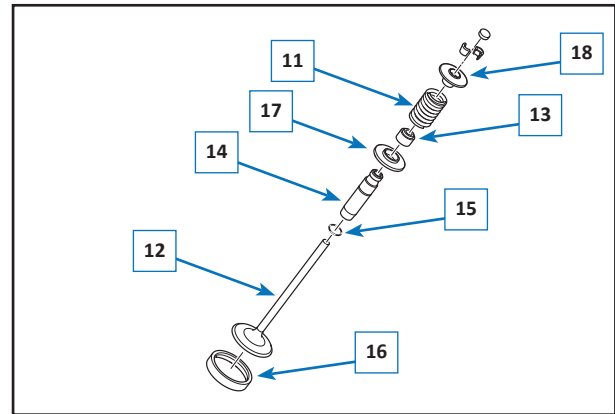
2.3.3 Head re-assembly

If disassembled, re-mount the valve seat (16), the valve-guide (14) and the OR gasket (15) and the oil seal (13). Lubricate the components with engine oil.

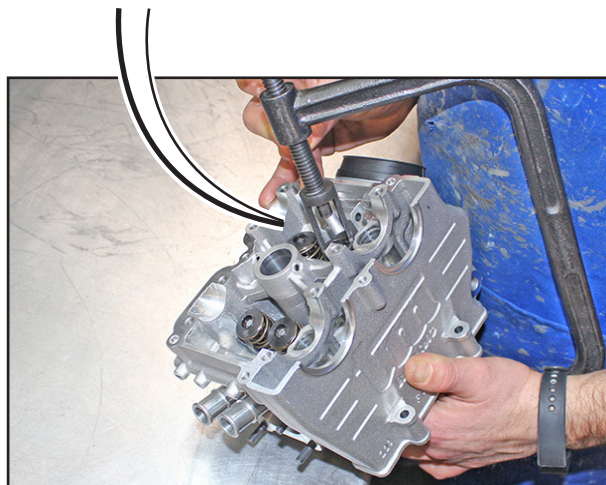
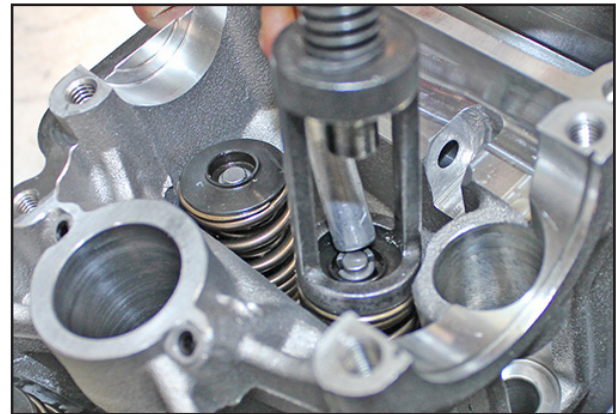
Use engine oil to lubricate the valve stem (12) and insert it into the valve-guide, paying attention not to pinch the oil seal (13).

Mount the double spring (11) with relative plates (17) and (18).

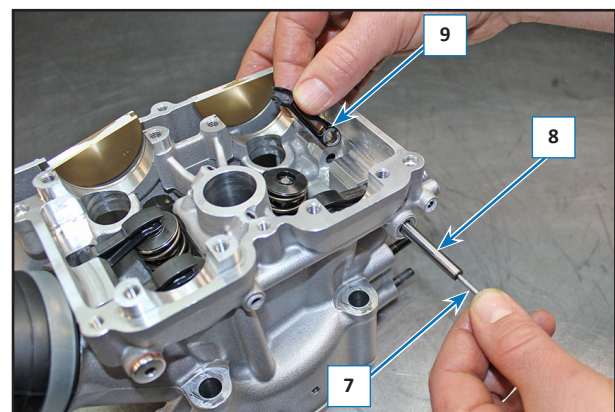
NOTE: Pay attention on re-mounting since the upper and lower plates are not the same.



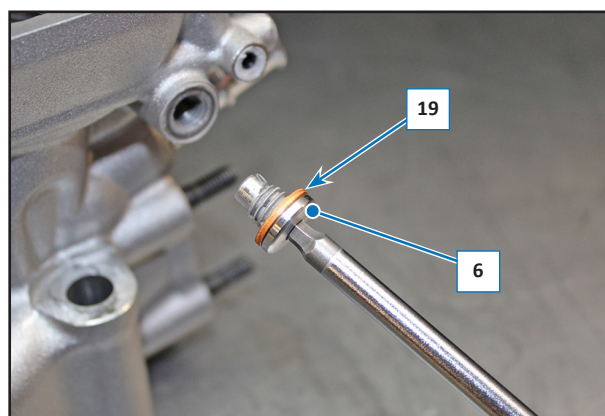
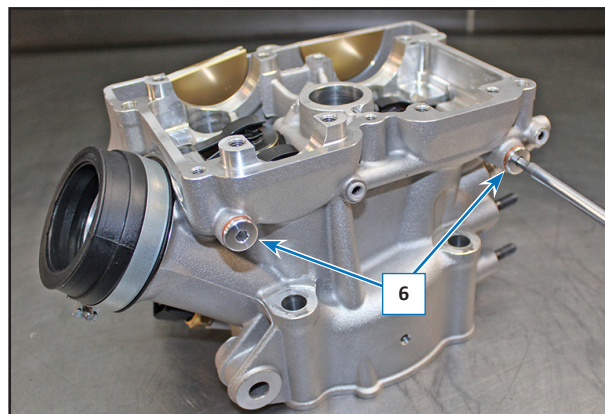
Using the relevant tool, compress the double spring (11) and insert the two half cones onto the valve stem; release the double spring and remove the tool. Check that the half cones are positioned correctly on the stem using a rubber hammer to tap the upper valve stem to position it correctly.



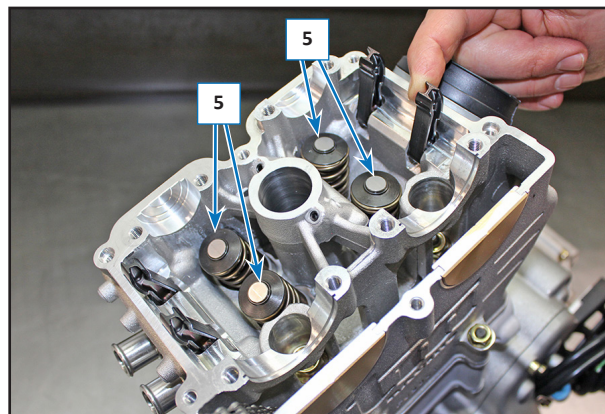
Lubricate the pins (8) of the rockers (9) with engine oil. Re-mount them in exactly the same position and loosen the (7) M4 screw.



Tighten the screws (6), controlling the status of the copper gasket (19). Replace, if ruined (coupling torque 45 Nm, 4.5 kgm 33.19 ft/lb) plus Loctite 243.

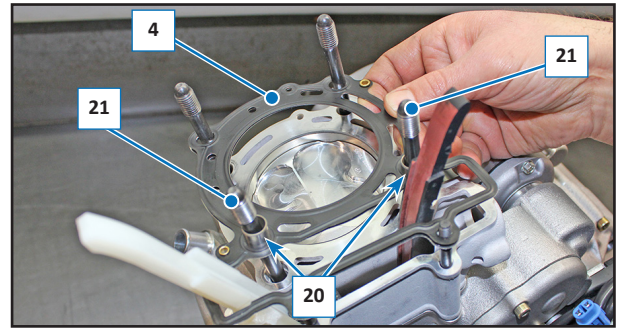


Re-mount the pads (5).

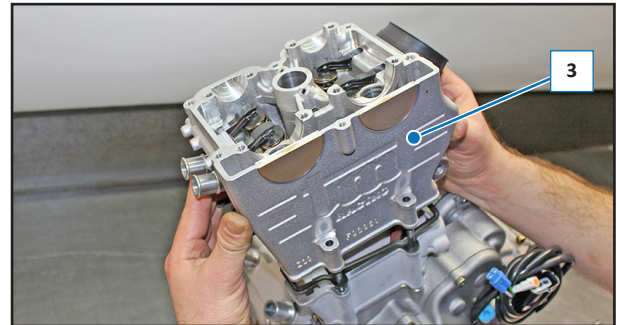


2.3.4 Head re-mounting

Replace the gasket (4) at every disassembly, and then mount it on the cylinder, positioning the centring bushes (20) in correspondence with the two studs (21).



Insert the head (3) on the studs.

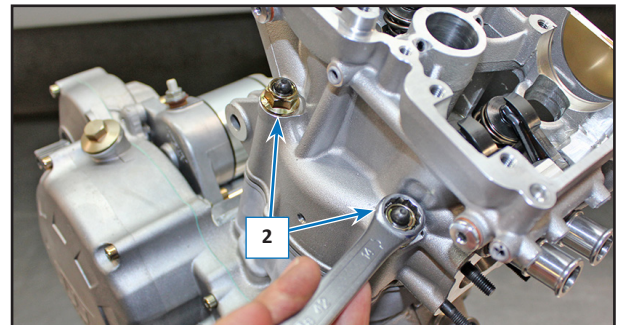


Tighten the self-locking nuts (2) crosswise, pulling them and blocking them in 3 steps:

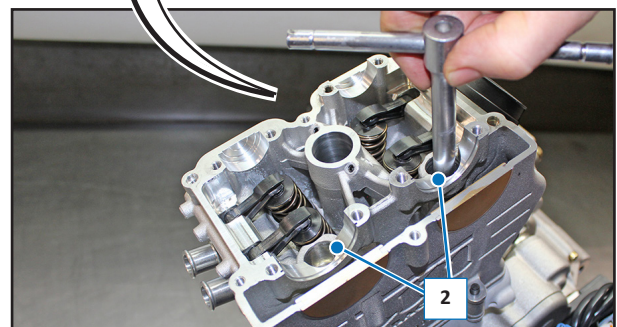
Step one: tighten them with a torque of 10 Nm (1.0 kgm/ 7.23 ft/lb).

Step two: tighten with a torque of 30 Nm (3 kgm/ 22.12 ft/lb).

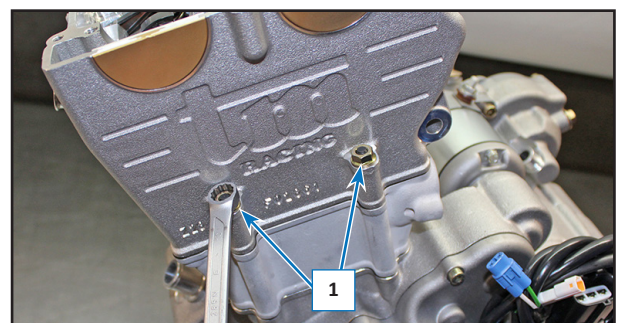
Step three: tighten with a torque of 45 Nm (4.5 kgm/ 33.19 ft/lb).



NOTE: It is recommended to replace the self-locking nuts (2) to guarantee the head is perfectly sealed.



Tighten the two nuts (1) positioned on the left side of the head with torque of 12 Nm (1.2 kgm, 8.85 ft/lb)

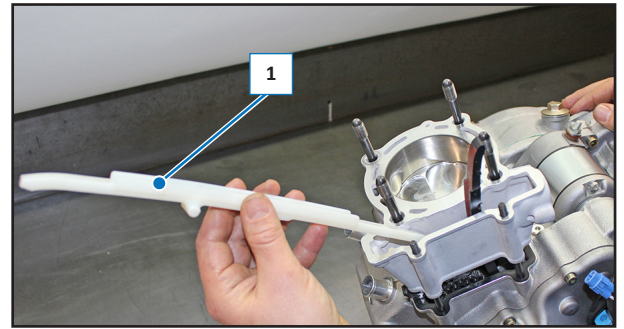


2.4 CYLINDER AND PISTON

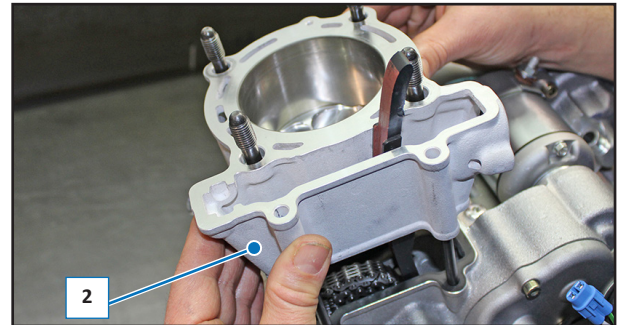
2.4.1 Cylinder and piston removal

Remove the head as described in the relative section.

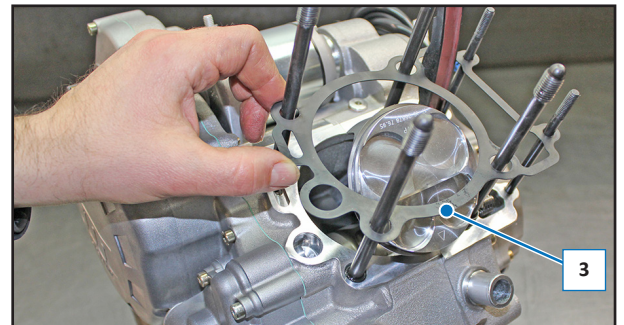
Remove the fixed plate (1), sliding it upwards.



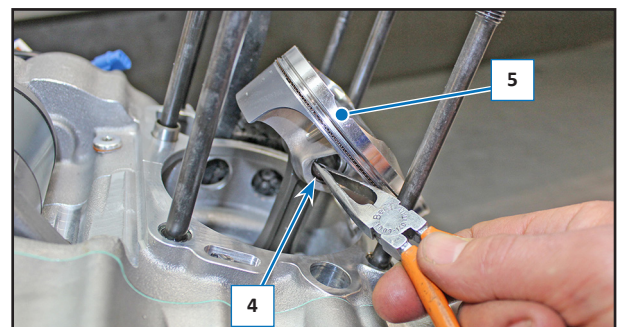
Remove the cylinder (2) by sliding it from the stud bolts.



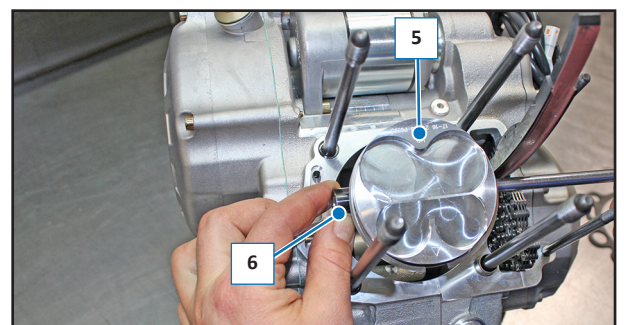
Remove the gasket (3).



Remove the lock ring (4) of the piston (5)



Extract the pin (6) and remove the piston (5).



2.4.2 Strap and oil scraper replacement and mounting

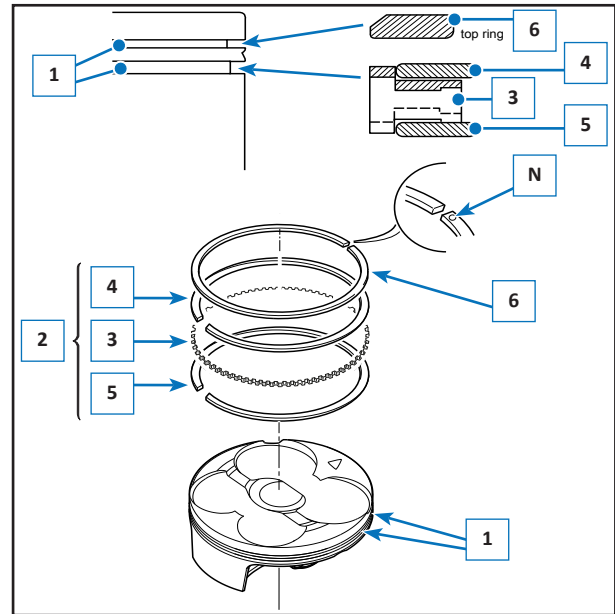
Clean the housing (1) of the straps on the piston from any carbon deposits.

NOTE: Apply engine oil on the straps before mounting them on the piston.
 Be careful not to scratch the piston when re-mounting.
 Do not widen the straps excessively during mounting, so that they are not damaged.

First, install the oil scraper (2), inserting the spacer (3) and the two rings (4) and (5) in a way that they go fully home onto the edge of the spacer. Install the upper strap (6), positioning the face engraved with "N" on the upper part.

Check that the strap and the oil scraper rotate freely around the piston and are not obstructed.

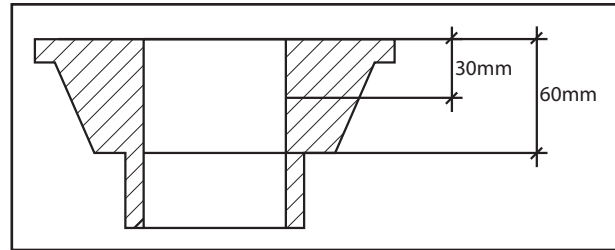
Position the open part of the strap (6), of the spacer (3) and of the rings (4) and (5) as indicated in the figure, before re-mounting the piston in the cylinder.



2.4.3 Cylinder and piston coupling

If the piston must be replaced, for correct coupling, it is necessary to take the crosswise measurement of the internal diameter of the cylinder at a distance from the upper part of 30 mm and 60 mm. Use a relevant micrometer for internal diameters to take the measurement.

Cylinder piston coupling play is 0.05 mm +/- 0.005 mm.

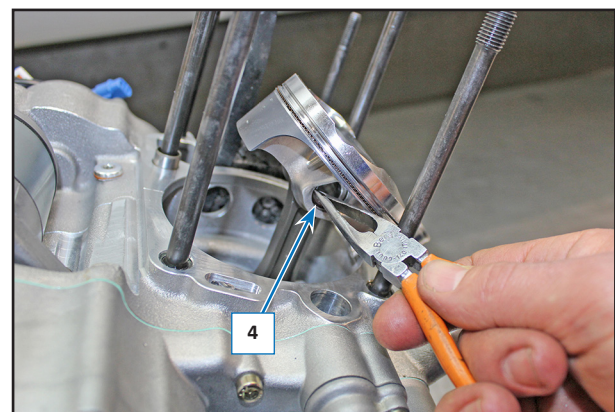
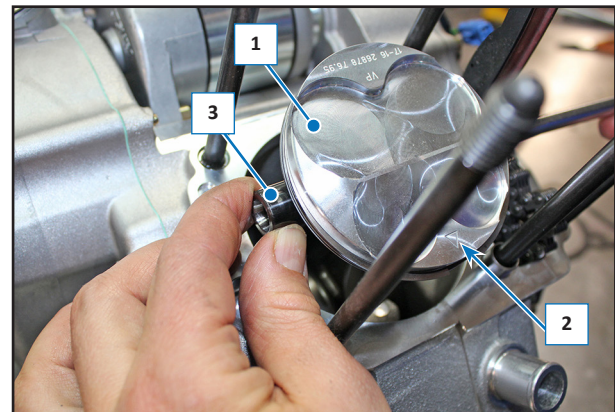


2.4.4 Cylinder and piston re-mounting

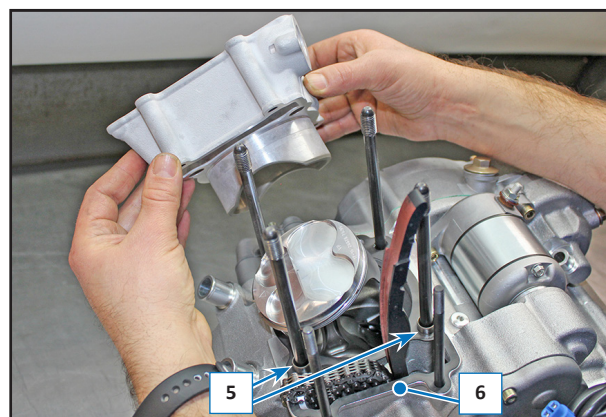
Re-mount the piston (1) on the rod, paying attention that the arrow (2) is positioned towards the exhaust and then insert the pin (3) and relative lock ring (4).

Check that the strap and the oil scraper are positioned as indicated in the "Strap and oil scraper replacement and mounting" paragraph.

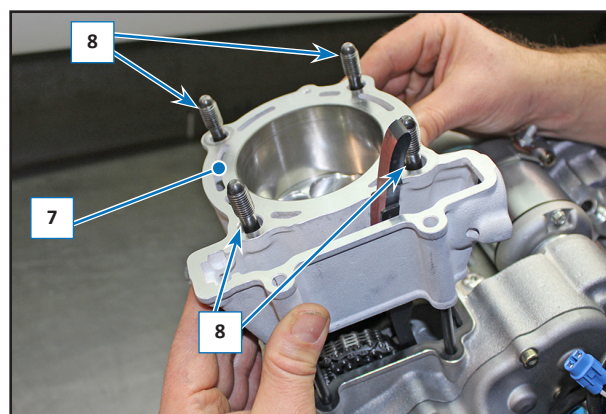
Oil the cylinder barrel with engine oil.



Insert the two centring bushes (5) and the metal gasket (6).



Insert the cylinder (7) onto the studs (8).

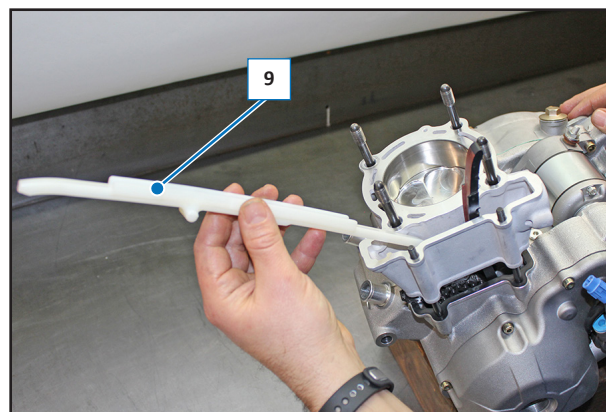


Mount the plate (9) in the relative housing.

Mount the head as described in the relative section.

NOTE: If the cylinder has been replaced, the compression must be checked, operating as described in the "Compression check" paragraph.

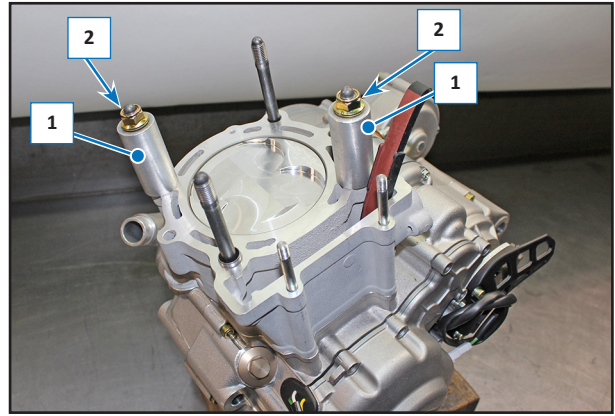
Re-mount the head as described in the relative section.



2.4.5 Compression check

With replacement of the cylinder, it is necessary to check that the distance between the piston crown and the upper surface of the cylinder is in within correct tolerance.

After having mounted the cylinder, insert the relevant spacers (1) and tighten the nuts (2) with a torque of 25 Nm 2.5 kgm, 18.43 ft/lb .



Position the piston at the top dead centre.

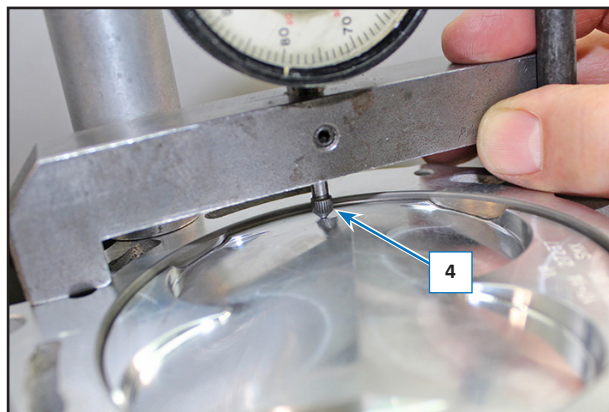
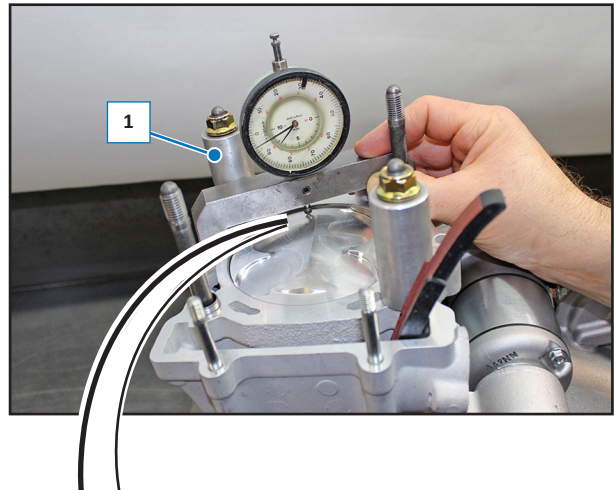
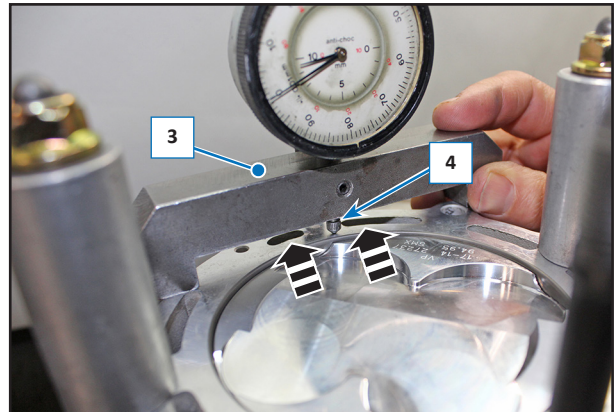
Position the tool (3) with relative micrometer on the upper surface of the cylinder and zero. Move the tip (4) of the micrometer onto the upper flat part of the piston and take the measurement.

Correct compression:

250 cc = 0.85 ± 0.05 mm

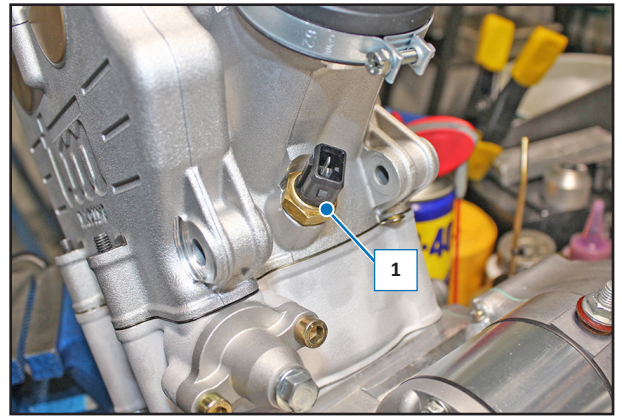
300 cc = 0.85 ± 0.05 mm

If the measurement does not lie within the tolerance established, the metal gasket (6) of the spacer must be purchased as a spare part, suitable to return within tolerance.



2.5 TEMPERATURE SENSOR REPLACEMENT

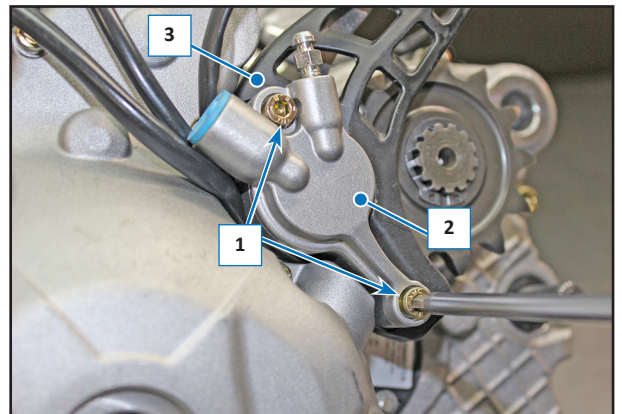
Unscrew the sensor (1) and replace it by tightening a new sensor with torque of 30 Nm, 3.0 kgm, 22.12 ft/lb plus three bond 1215 sealant paste.



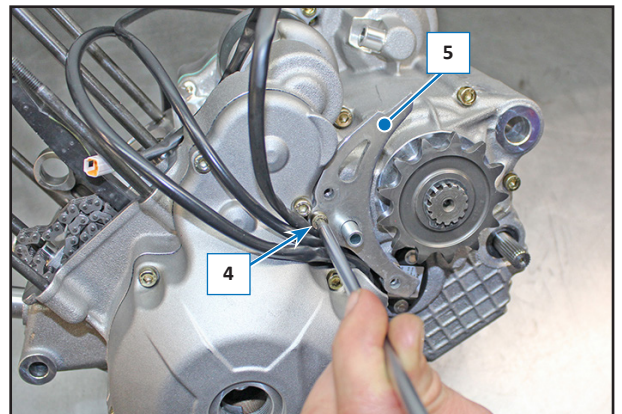
2.6 CLUTCH

2.6.1 Clutch actuator removal with relative command rod

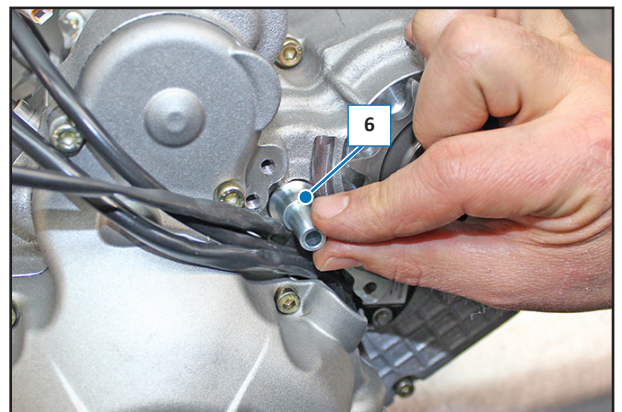
Unscrew the screws (1) and remove the actuator (2) and the pinion protection (3).



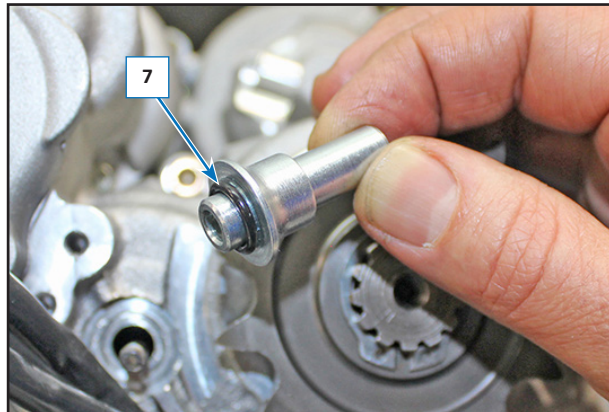
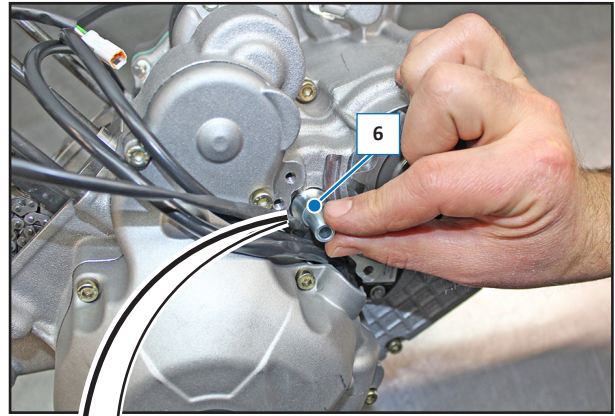
Unscrew the screw (4) and remove the bracket (5).



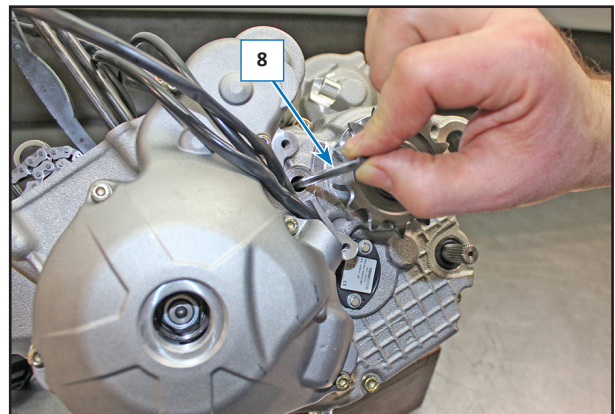
Slide the mushroom (6) out.



NOTE: On re-mounting, check the status of the gasket (7), replace it if ruined.



Slide the clutch rod (8) out.



2.6.2 Actuator dismantling

Separate the two parts of the actuator and remove the piston (9).

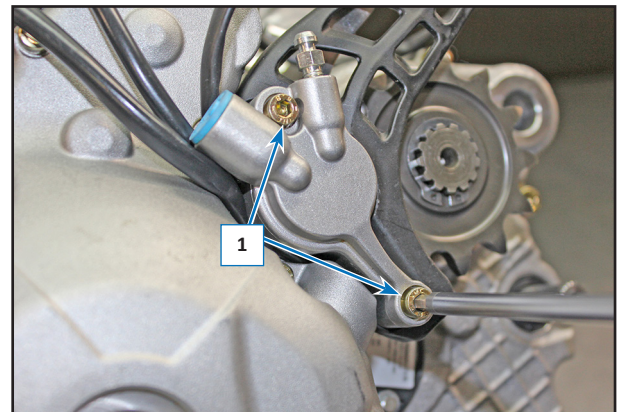
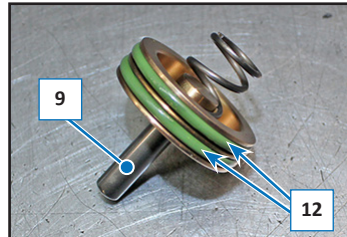
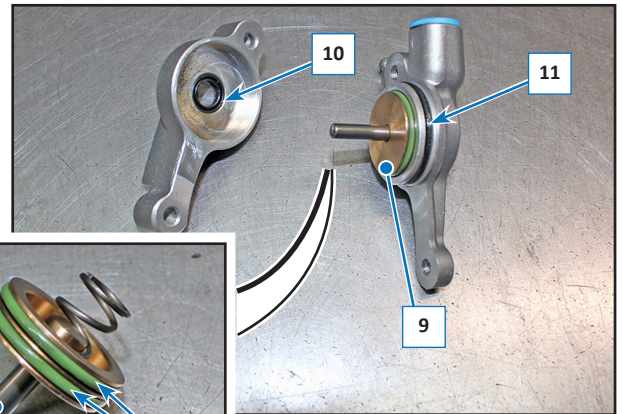
Check the conditions of the seal (10) and the OR gasket (11); replace them if ruined.

Check the status of the OR gaskets (12), and replace if ruined.

NOTE: On re-mounting, lubricate the gaskets and seal with clutch oil.

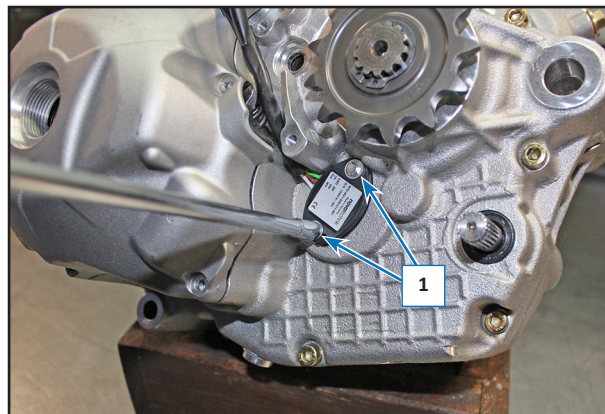
Re-mount everything, proceeding in the opposite order to disassembly.

Tighten the screws (1) with a torque of 8 Nm 0.8 kgm/ 5.9 ft/lb.

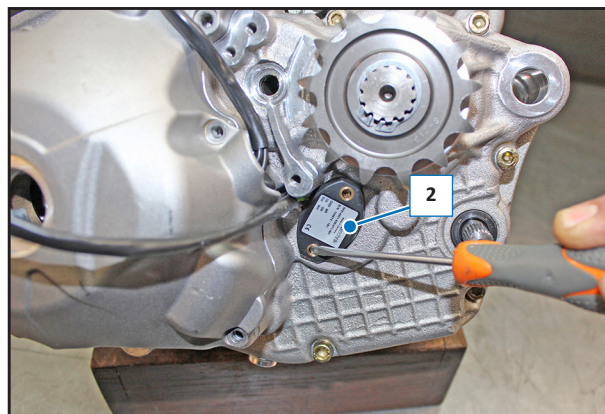


2.7 GEAR SENSOR

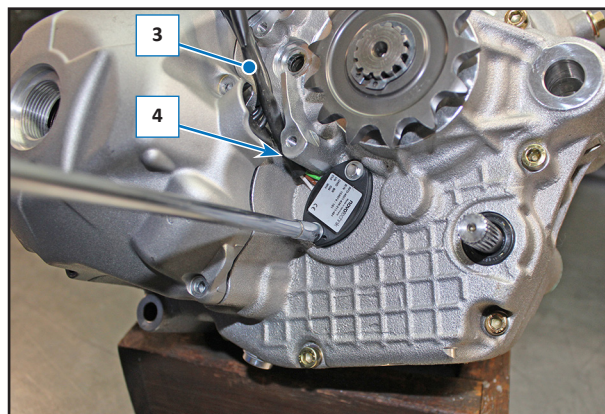
Remove the clutch actuator as described in the relative paragraph.
Unscrew the two screws (1).



Use a screwdriver to lever and remove the gears sensor (2).



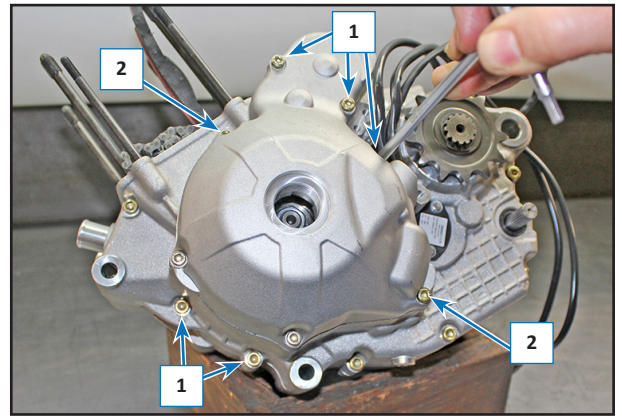
NOTE: Re-mount everything in reverse order to disassembly, paying attention to position the cabling (3) of the sensor in the hollow (4).



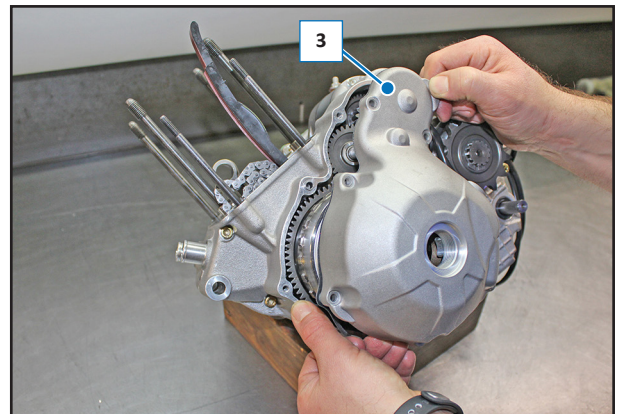
2.8 FLYWHEEL REMOVAL

2.8.1 Flywheel cover

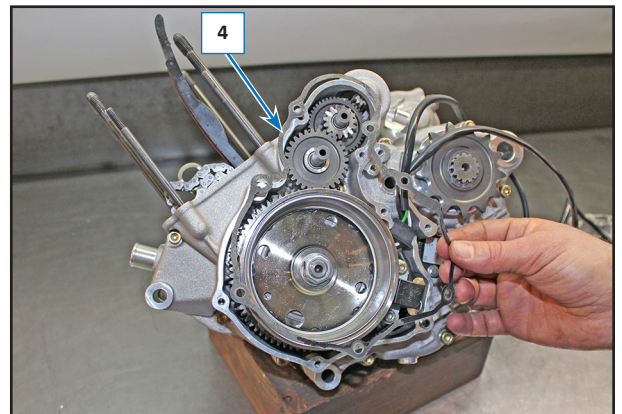
Unscrew the M5-L20 screws (1) and M5-L25 screws (2).



Remove the flywheel cover (3).

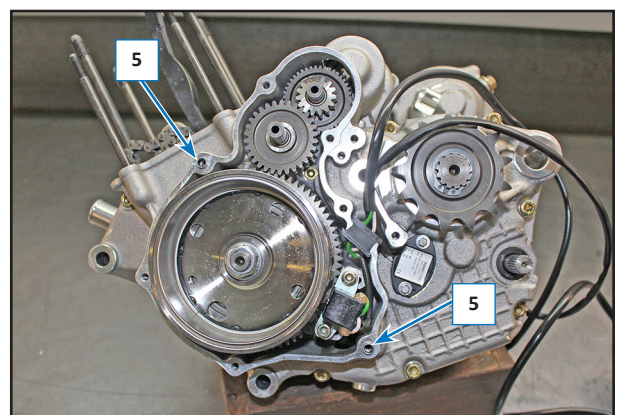


Remove the gasket (4).



Retrieve the two centring bushes (5).

NOTE: On re-mounting, check that the two centring bushes (5) are positioned correctly and that the gasket (4) is not ruined, otherwise replace.
Tighten the screws (1) and (2) with a torque of 8 Nm (0.8 kgm/ 5.9 ft/lb).



2.8.2 Stator

Disassembly

Remove the flywheel cover as described in the relative section.

Unscrew the screws (1) that secure the stator (2).

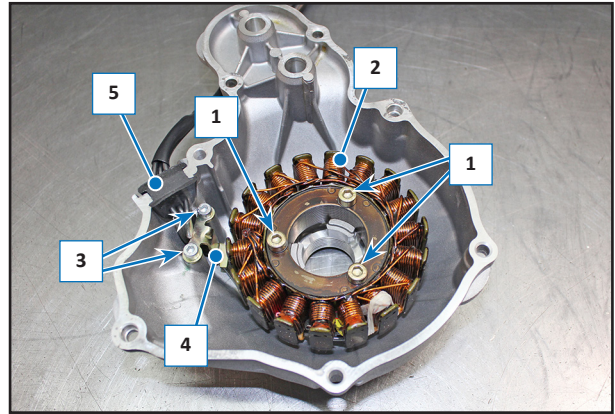
Unscrew the screws (3) and remove the stop plate (4).

Remove the stator (2) with the relative cabling.

Mounting

Re-mount the stator (2), tightening the screws (1) to a torque value of 5 Nm (0.5 Kgm - 3.68 ft/lb + Loxeal 82-33).

Make sure the rubber cap (5) is fitted correctly on the cover and then tighten the two screws (3) of the stop plate (4) with a torque of 4 Nm (0.4 kgm, 2.95 ft/lb).



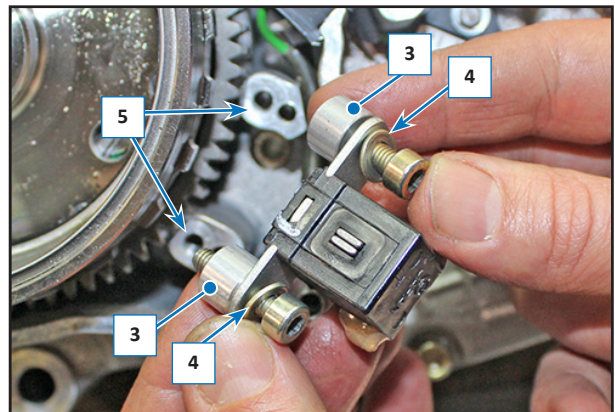
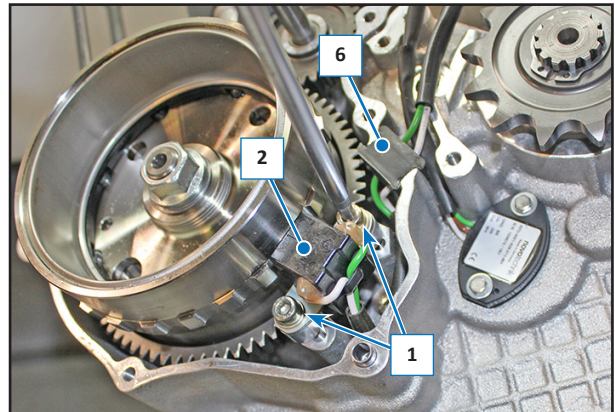
2.8.3 Pick-up

Unscrew the two screws (1) and remove the pick-up (2).

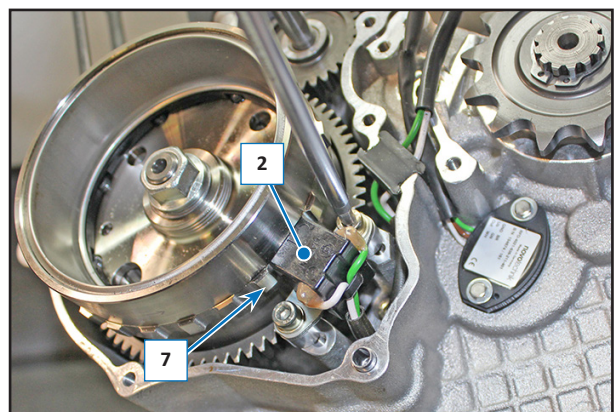
On re-mounting, check that the bushes (3) and the washers (4) are positioned correctly.

Tighten the two screws (1) with a torque of 8 Nm (0.8 kgm, 5.9 ft/lb) positioning the pick-up (2) on the threaded holes (5) nearest to the rotor.

Make sure the rubber cap (6) is fitted correctly on the guard.



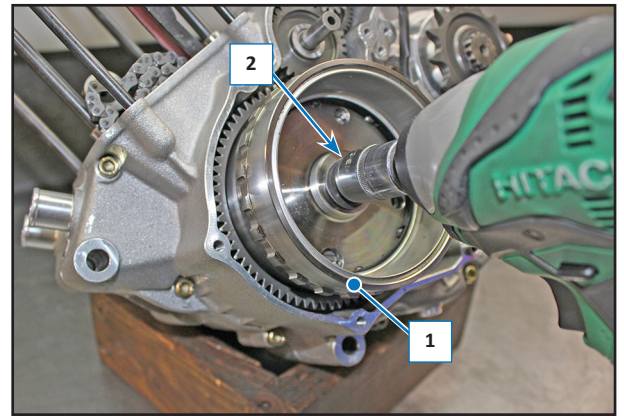
NOTE: On re-mounting, check the distance between the pick-up (2) the reference notch (7) of the flywheel is between 0.7-1.0 mm.



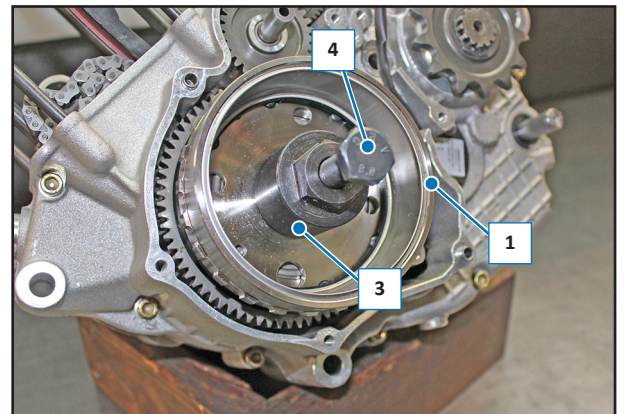
2.8.4 Rotor

Disassembly

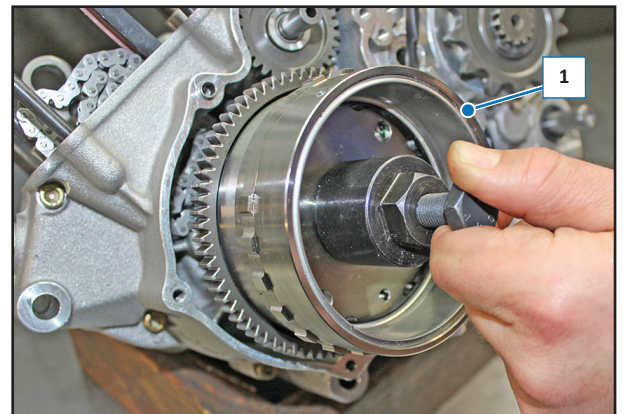
Block rotor rotation (1) and use an impact gun to loosen the nut (2) with relative curve washer.



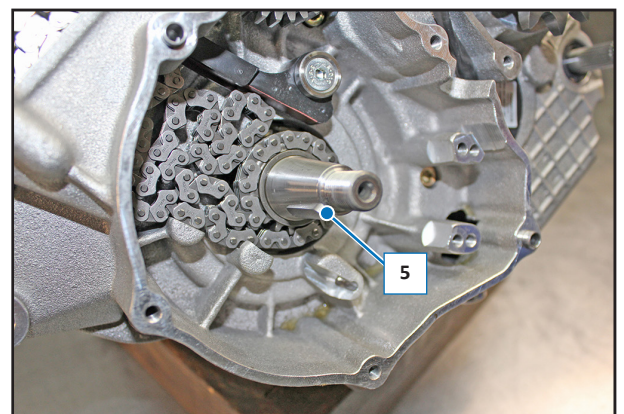
Screw the extractor (3) onto the thread of the rotor (1) and tighten the screw (4) to detach the rotor (1) from the crankshaft.



Remove the complete rotor (1).



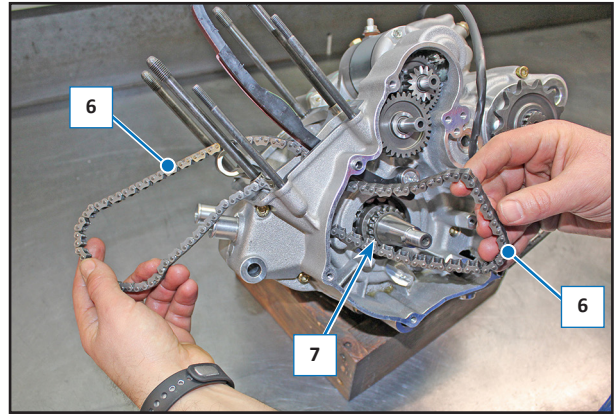
Retrieve the key (5).



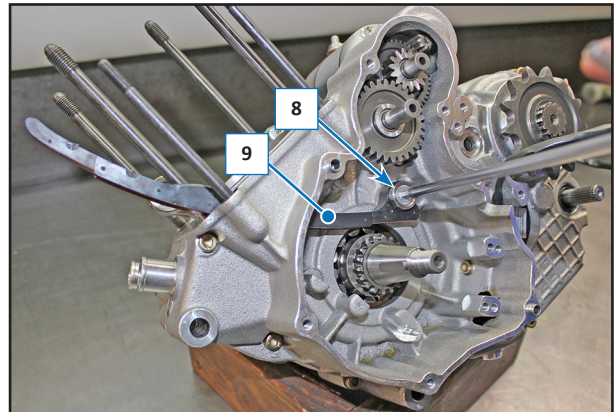
Remove the distribution chain (6).

NOTE: Check that the distribution chain (6) and the relative gear (7) on the crankshaft are not worn, otherwise replace (refer to the relative paragraph for replacement of the crankshaft).

NOTE: In order to replace the chain (6), the camshafts must be removed, as described in the relative paragraph.



Unscrew the screw (8) and remove the mobile block (9).

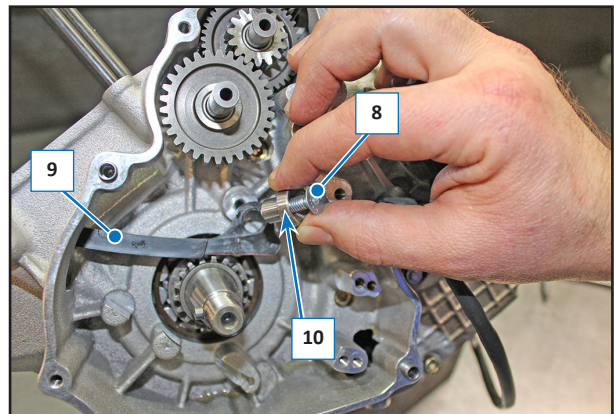


Re-mounting

Re-mount everything, proceeding in the opposite order to disassembly, making sure to: Re-mount the runner (9) with relative spacer (10), tightening the screws (8) with a torque value of 10 Nm (0.1 Kgm - 0.72 ft/lb) +Loxal 82-33.

Position the distribution chain (6) correctly.

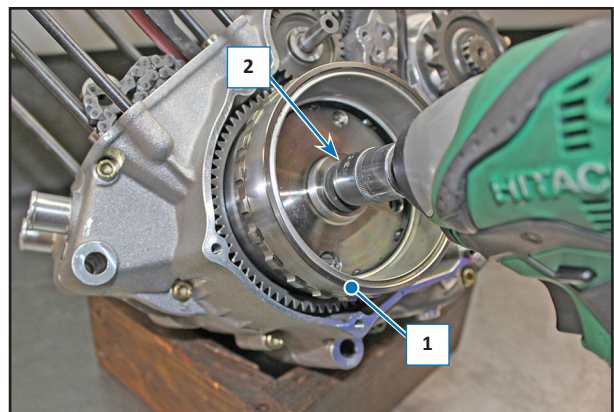
Make sure the key (5) is properly positioned in its housing.



Re-mount the fly wheel (1).

Tighten the nut (2) with relative curve washer with a torque of 60 Nm (6 kgm/ 44.2 ft/lb).

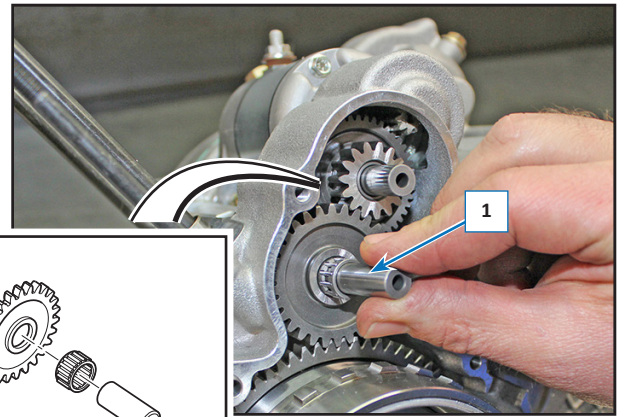
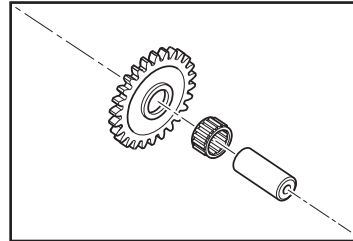
NOTE: Put medium threadlocker (blue) on the rotor fixing thread.



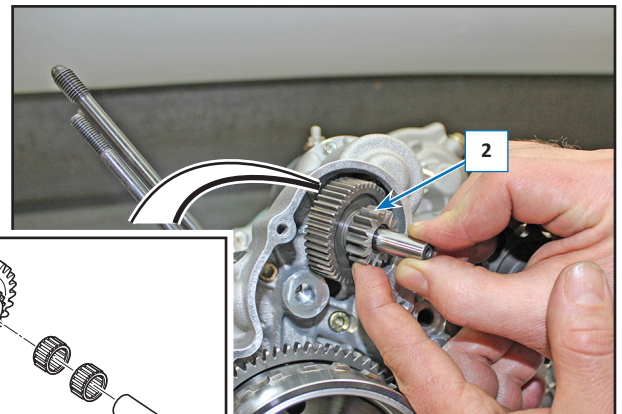
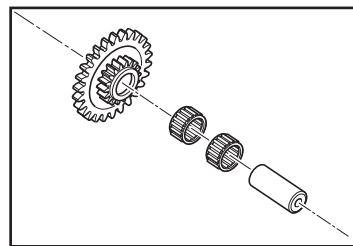
2.9 STARTER MOTOR

2.9.1 Disassembly

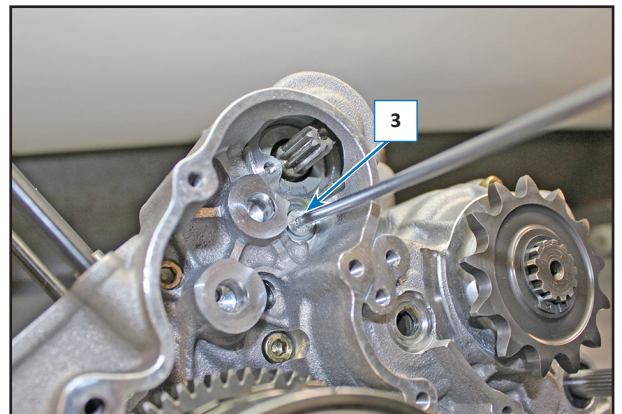
Remove the flywheel cover as described in the relative section.
Remove the idler (1) with the relative roller bearing cage.



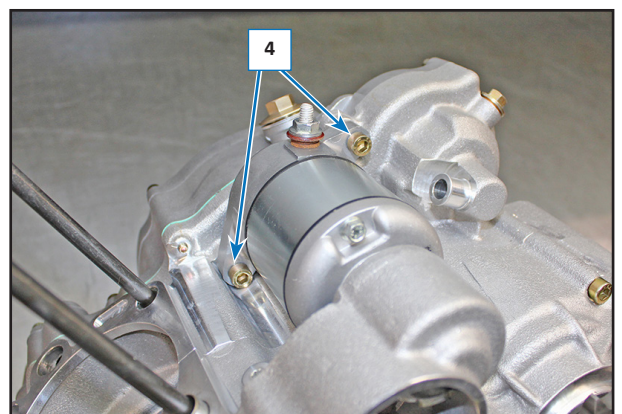
Remove the idler (2) with the relative roller bearing cages.



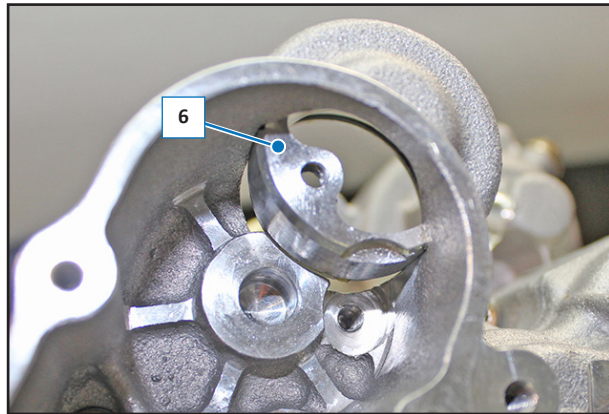
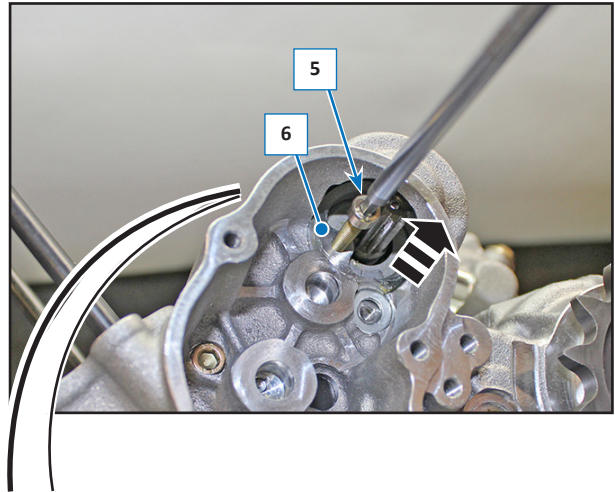
Unscrew the screw (3) and remove it with the relative washer.



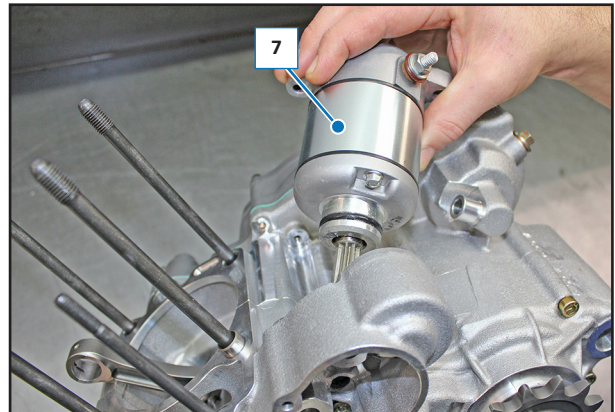
Unscrew the two starter motor fastening screws (4).



Tighten the M5 screw (5) onto the bush (6) and tighten until the bush (6) moves forward.

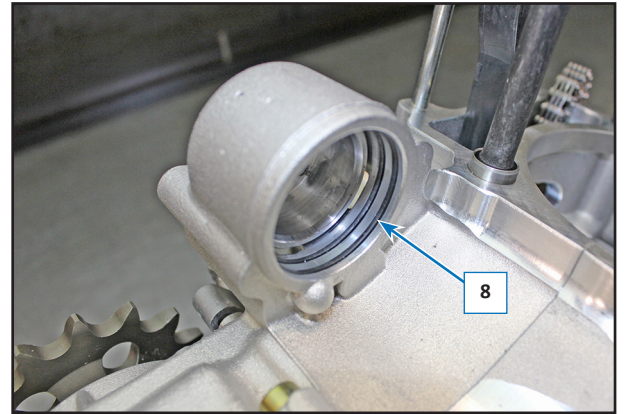


Remove the starter motor (7).



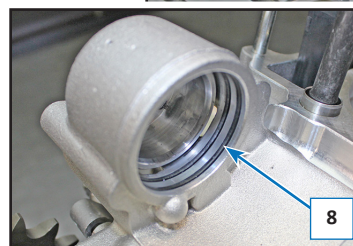
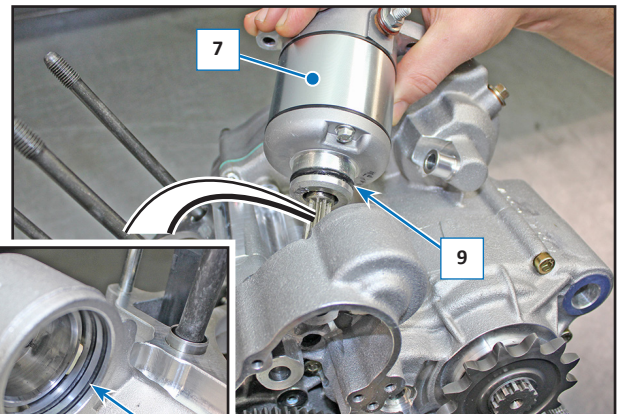
2.9.2 Re-mounting

Make sure the “OR” gaskets (8) are not ruined and, if so, replace them.



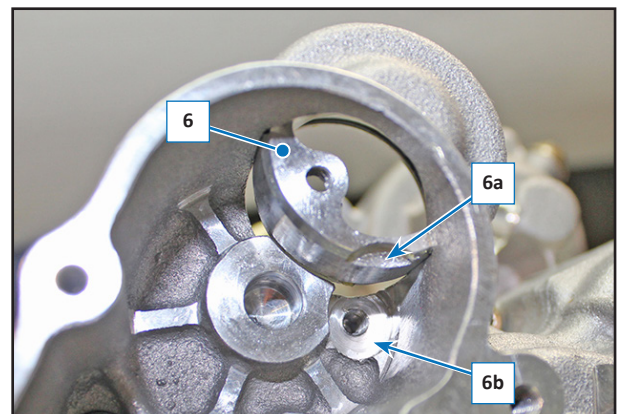
Check the status of the “OR” gasket (9) positioned on the starter motor (7); replace it if ruined.

Lubricate the gasket (9) and the gaskets (8) with engine oil and then mount the starter motor (7).

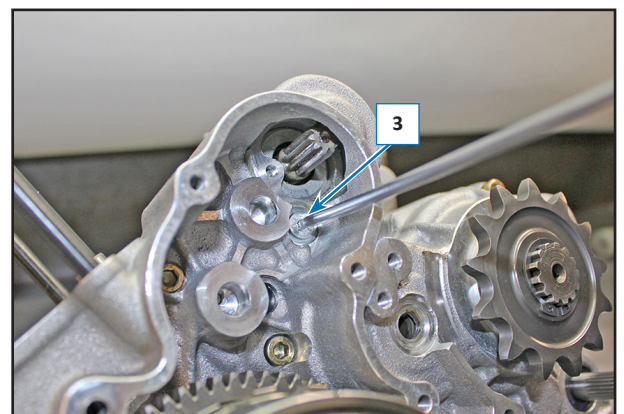


Use an aluminium or brass punch to push the bush (6) towards the inside of the engine, making the milled part coincide (6a) with the screw housing (6b).

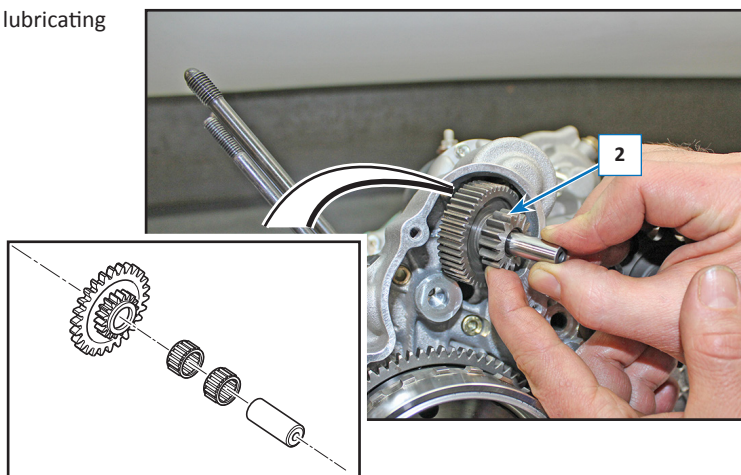
NOTE: If the bush (6) is forced, grease abundantly.



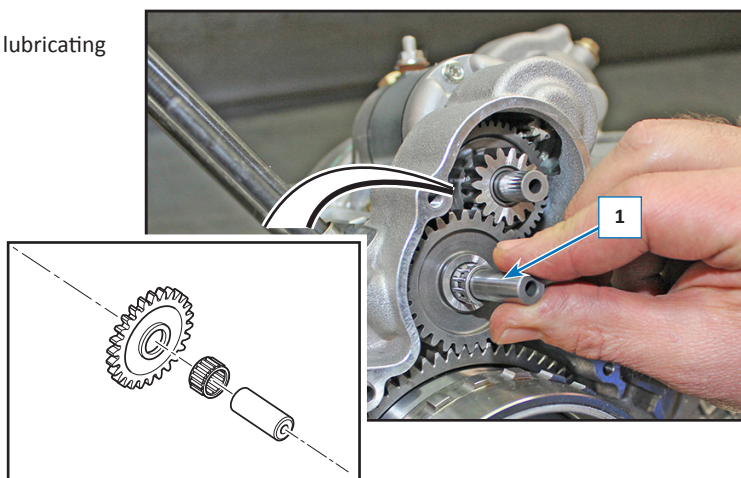
Tighten the screw (3) with relative washer to a torque value of 6 Nm (0.6 Kgm - 4.42 ft/lb) + Loxeal 82-33.



Re-mount the idler (2) with the relative roller bearing cages and lubricating with engine oil.

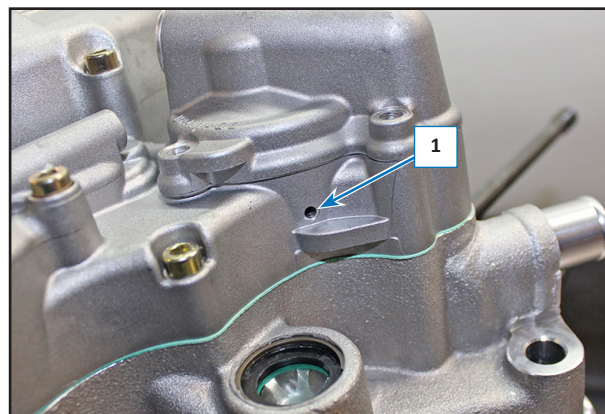


Re-mount the idler (1) with the relative roller bearing cage and lubricating with engine oil.

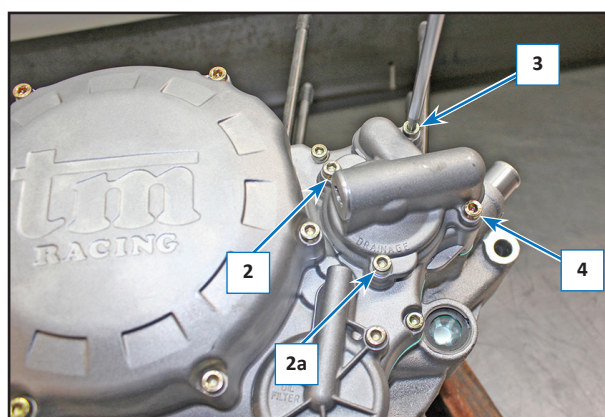


2.10 WATER PUMP

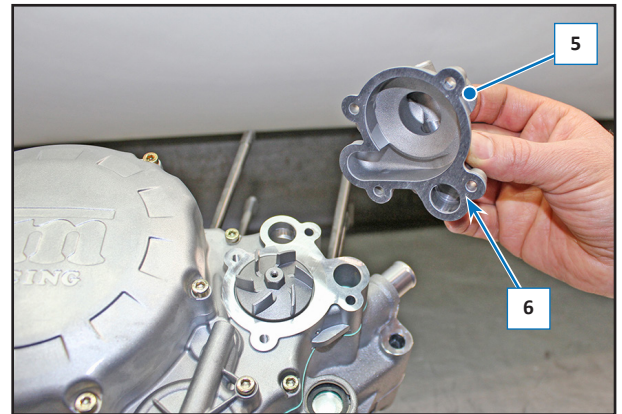
NOTE: If water escapes from the little hole (1), the pump seal must be replaced.



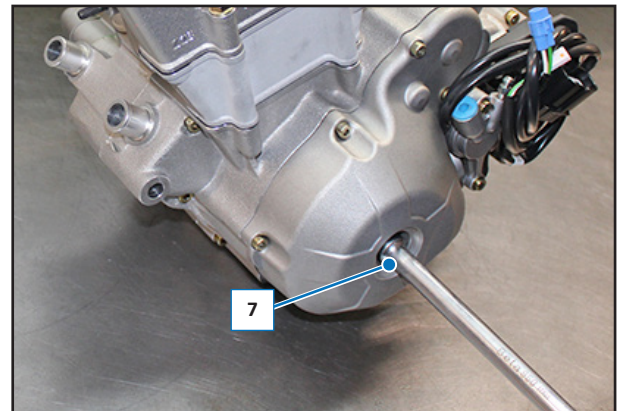
Loosen the screws (2) and (2a) M5-L20, screw (3) M5-L45 and screw (4) M5-L50.



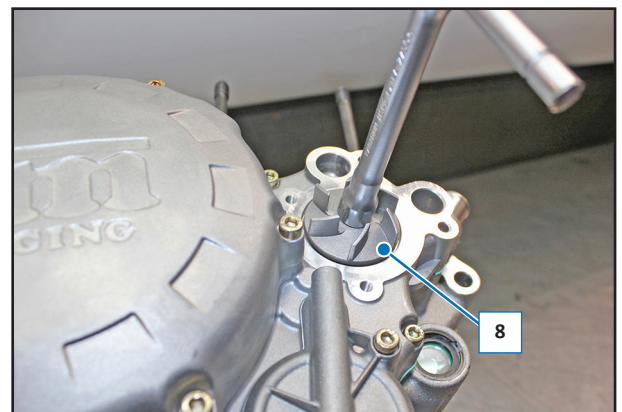
Remove the cover (5) with the relative gasket (6).



Insert a "T"-shaped wrench (7) through the flywheel cover to block crankshaft rotation.



Loosen the pump impeller (8).



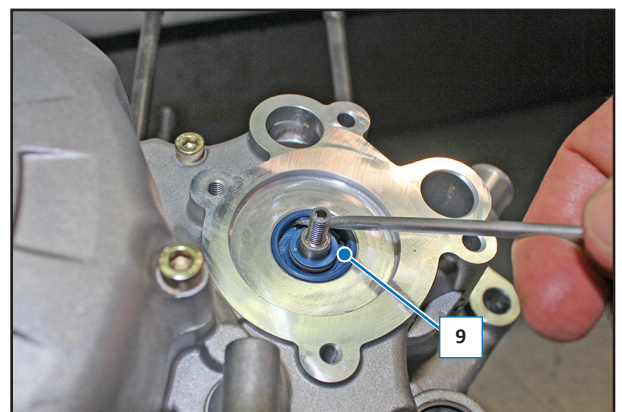
Use a screwdriver to remove the seal (9).

NOTE: Lubricate the seal (9) with engine oil before mounting it.

Re-mount the impeller (8) tightening with a torque of 6 Nm (0.6 kgm/ 4.42 ft/lb), greasing the thread.

Re-mount the pump cover (5) checking that the gasket (6) is not ruined; replace it if necessary.

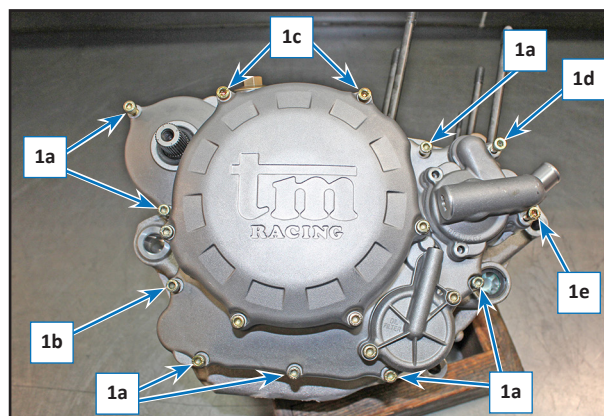
Tighten the screws (2), (3), (4) with a torque of 8 Nm (0.8 kgm/ 5.9 ft/lb), replacing the aluminium washer of the screw (2a).



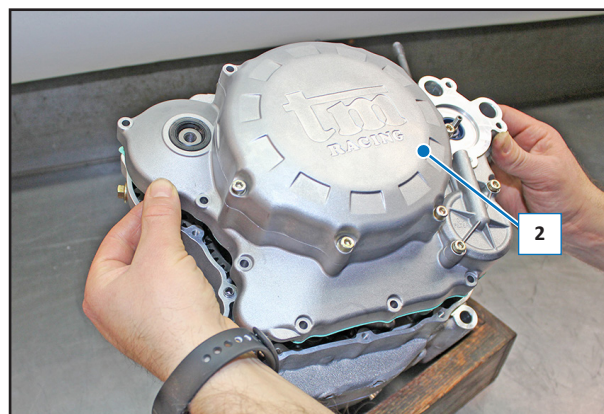
2.11 TRANSMISSION GUARD

Unscrew the screws (1):

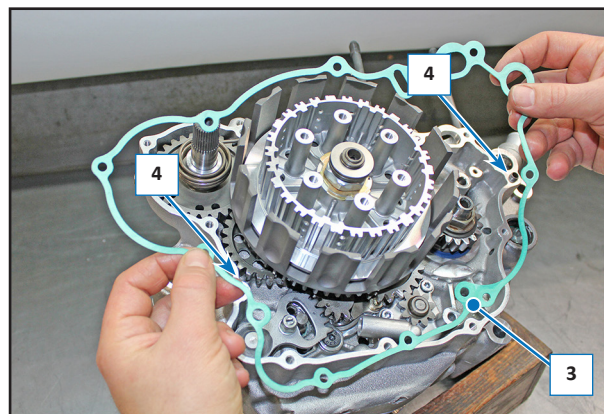
- 1a) M5-L25 screw
- 1b) M5-L30 screw
- 1c) M5-l65 screw
- 1d) M5-L45 screw
- 1e) M5-L50 screw



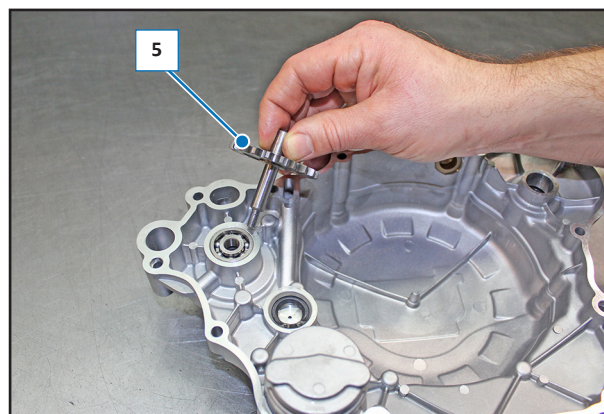
Remove the guard (2), with the aid of a rubber hammer.



Remove the gasket (3) and recover the two centring bushes (4).



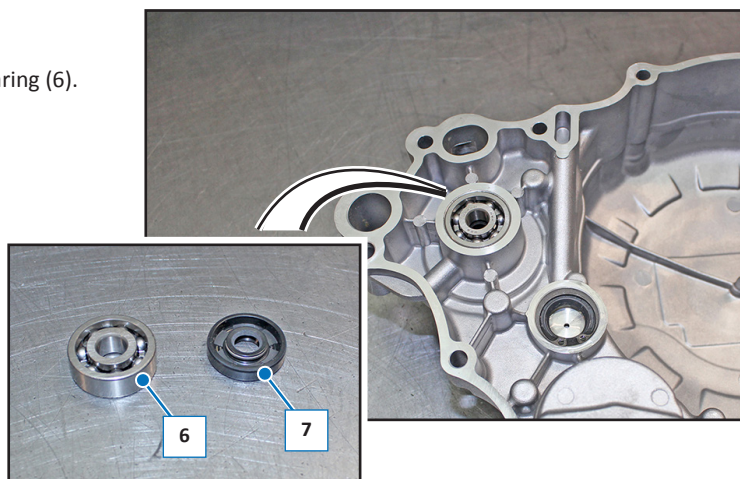
Remove the water pump return (5).



2.11.1 Bearing and water pump oil seal removal

Heat the bearing to a temperature of 50°C and remove the bearing (6).

WARNING: Use suitable personal protection equipment;
Burns hazard.



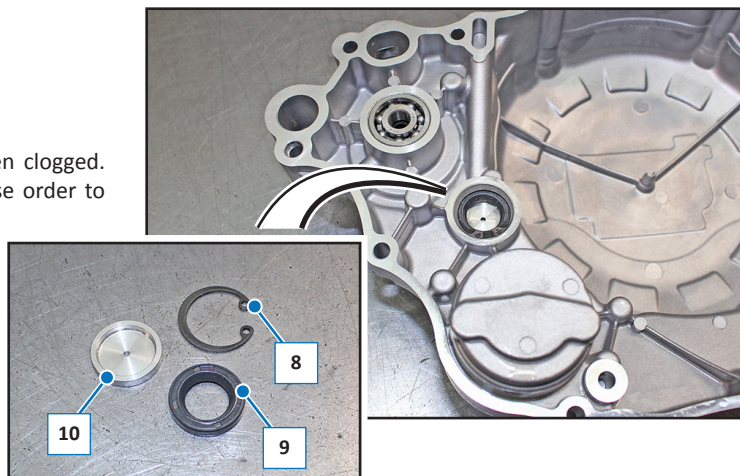
Remove the oil seal (7), operating from the external part of the guard with water pump disassembled.

NOTE: On re-mounting, first mount the bearing (6) and then the seal (7), lubricating it with engine oil.

2.11.2 Seal and oil passage bored disc removal

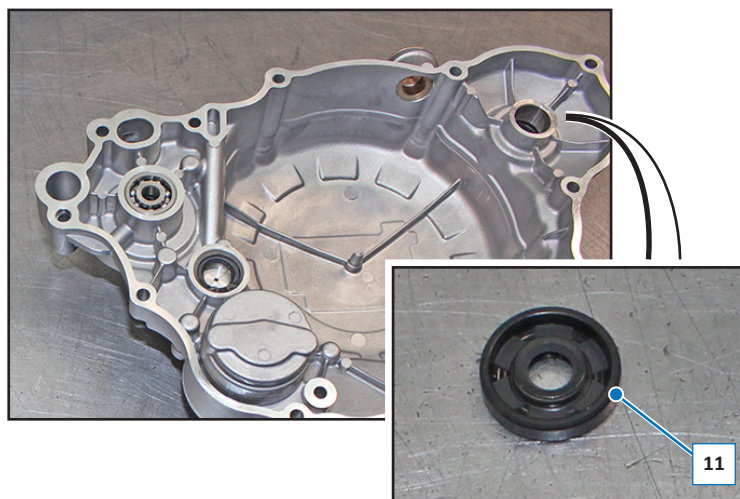
Remove the seeger (8), the seal (9) and the bored disc (10).

Check that the little hole in the bored disc (10) has not been clogged. If this is the case, clean it and re-mount everything in reverse order to disassembly and replace the seal (9).



2.11.3 Kick start seal removal

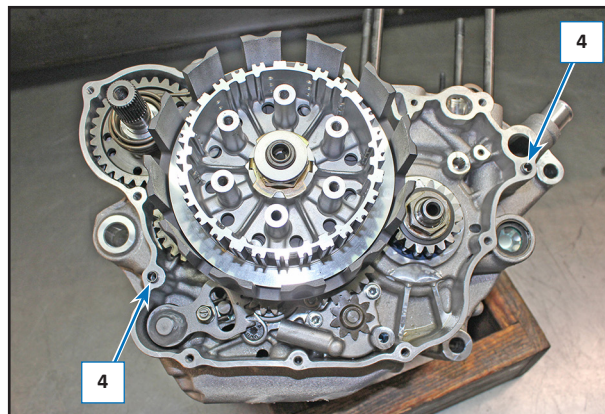
Use a screwdriver to remove the seal (11) and replace it.



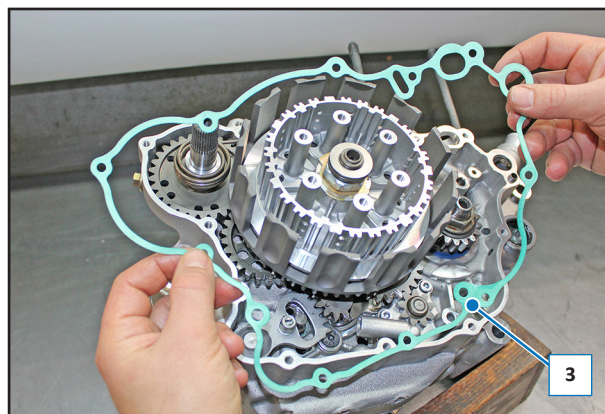
2.11.4 Transmission cover re-assembly

Clean the surface of the lid and the semicase from any residues.

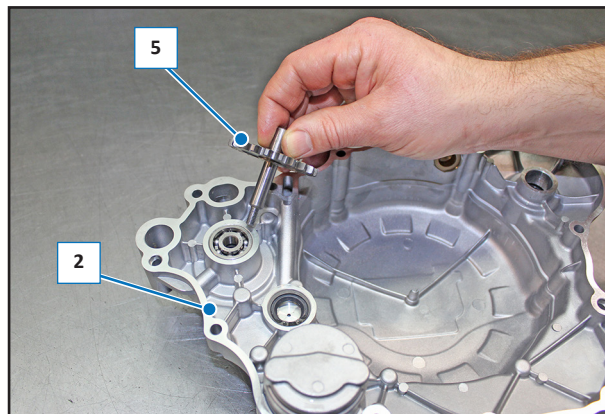
Check that the two centring bushes (4) are in their respective housing.



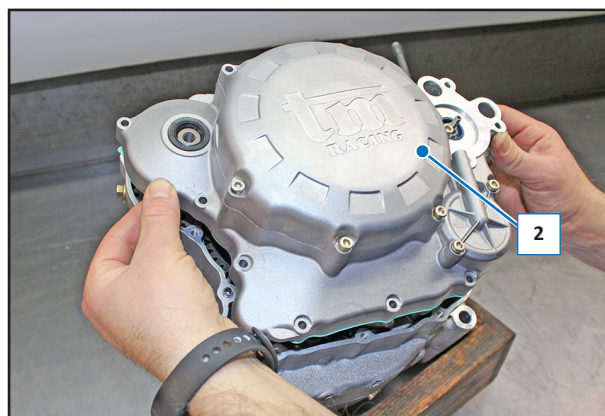
Replace and re-mount the gasket (3).



Mount the water pump return (2) on the cover (5).



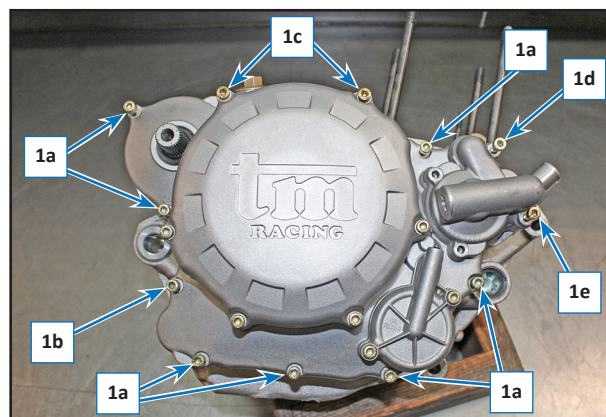
Mount the cover (2), centring it on the bushes (4), paying attention not to ruin the seals.



Tighten the screws (1) crosswise, positioning them in the relative housing, depending on their length.

- 1a) M5-L25 screw
- 1b) M5-L30 screw
- 1c) M5-L65 screw
- 1d) M5-L45 screw
- 1e) M5-L50 screw

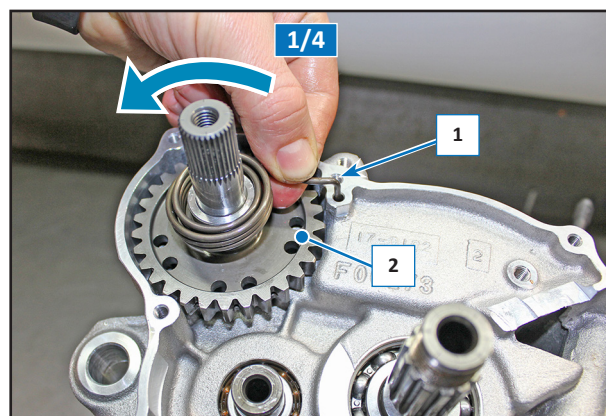
First screw without tightening with a torque of 8 Nm (0.8 kgm/ 5.9 ft/lb).



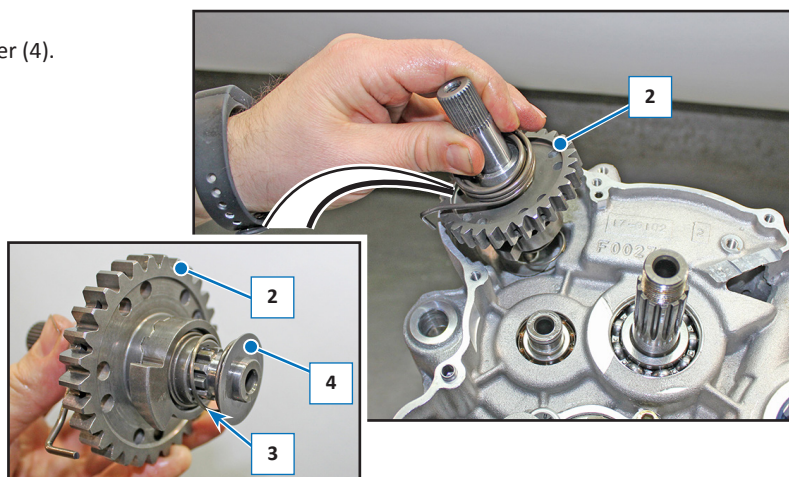
2.12 IDLE KICK STARTER REMOVAL (ONLY K.S.)

Remove the transmission cover and the clutch bell as described in the relative paragraphs.

Release the spring (1) from the relative housing, turn the starter (2) anti-clockwise by 1/4 of a turn.



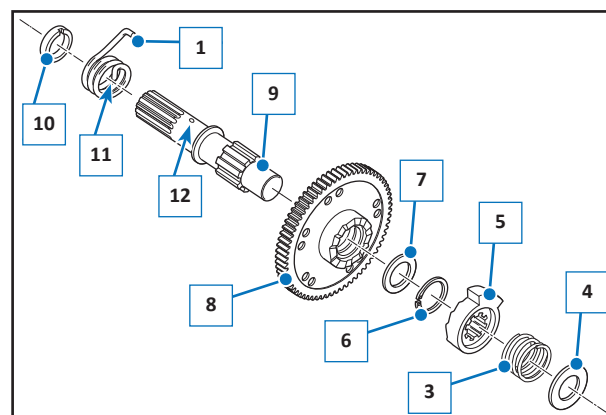
Remove the starter (2) complete with spring (3) and washer (4).



2.12.1 Starter dismantling

In sequence, remove the washer (4), spring (3), bush and ratchets (5), the seeger (6), shim (7), gear (8), shaft (9), bush (10) and the spring (1).

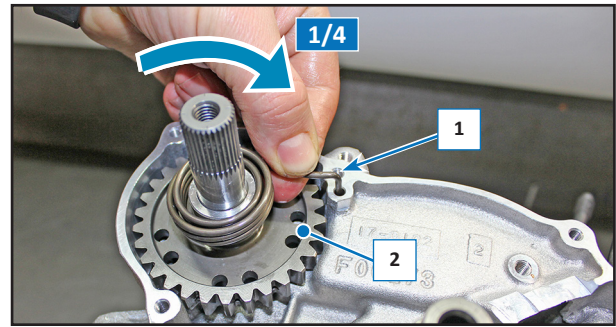
Re-assemble in reverse order to dismantling, paying attention to positioning the pin (11) of the spring (1) in the relative hole (12) on the shaft (9).



2.12.2 Re-mounting

Re-mount the idle kick start in the relative housing and then turn the starter (2) clockwise by 1/4 of a turn and insert the pin (1) in the hole in the guard.

NOTE: Lubricate the fitting hole abundantly with graphite grease.



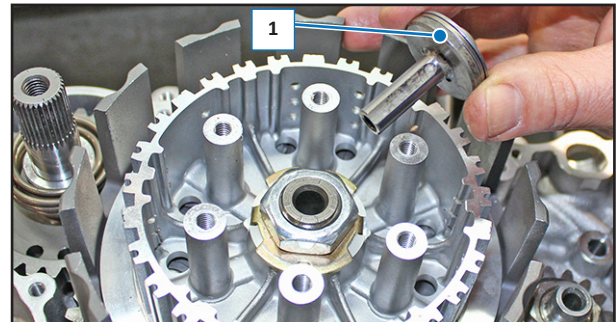
2.13 DRUM AND CLUTCH BELL

2.13.1 Disassembly

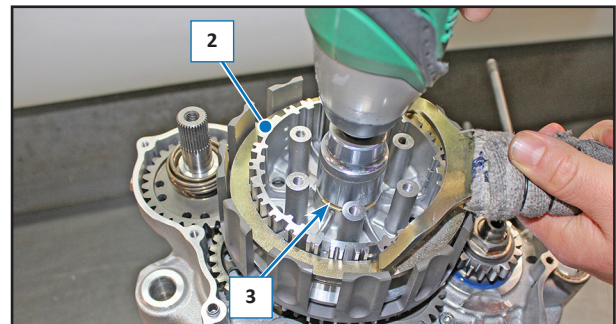
Remove the transmission cover as described in the relative paragraph.

Remove the clutch discs as described in the relative paragraph.

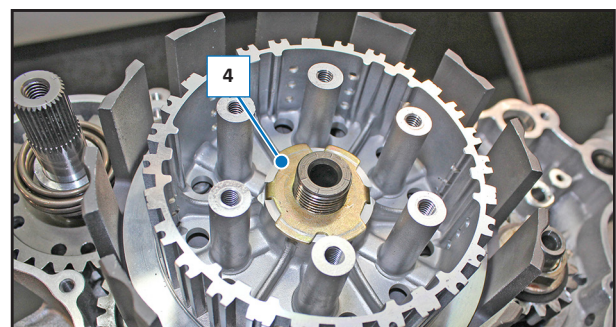
Remove the clutch mushroom (1).



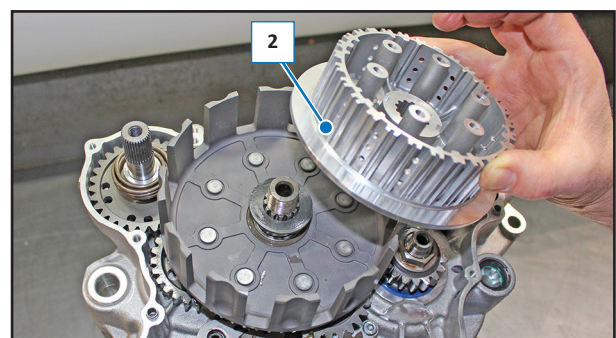
Use a spanner to block rotation of the clutch drum (2) and tighten the nut (3).



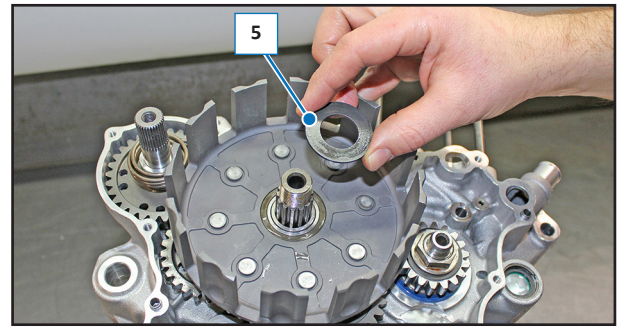
Remove the safety washer (4).



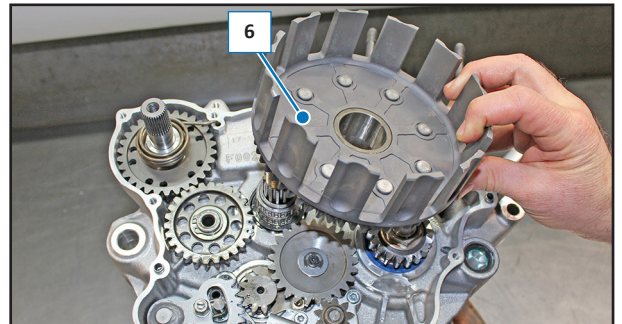
Remove the drum (2).



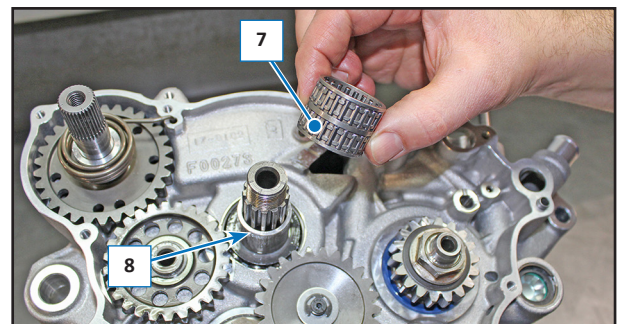
Remove the washer (5).



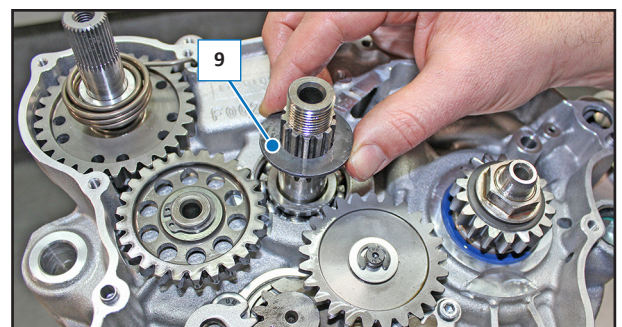
Remove the bell (6).



Remove the two roller bearings (7) and the spacer (8).



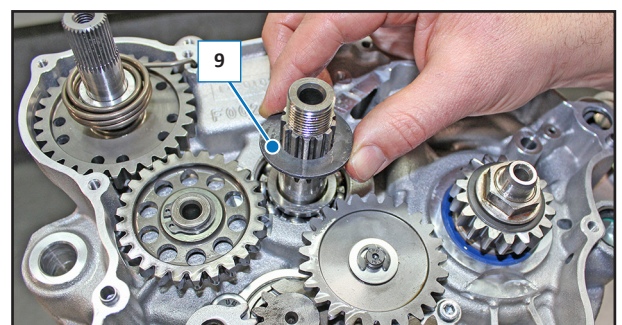
Remove the washer (9).



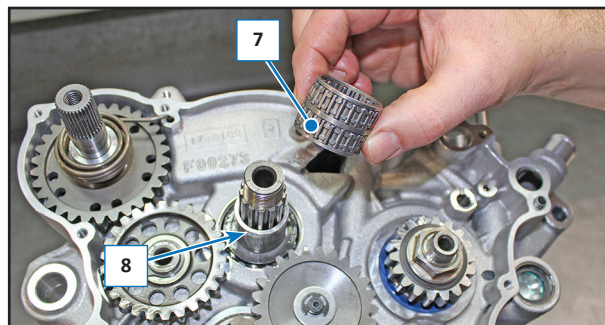
2.13.2 Re-mounting

Insert the washer (9).

Re-mount everything, proceeding in the reverse order to disassembly.

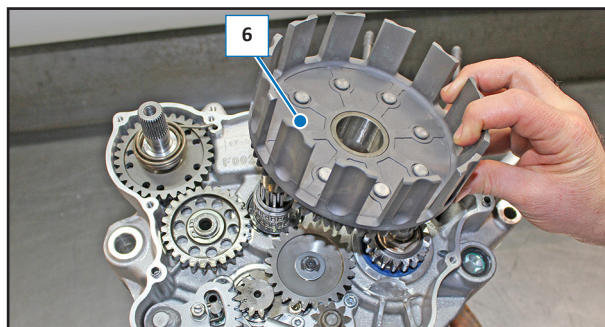


Make sure that the spacer (8) and ball bearings cage (7) are re-mounted correctly and lubricate them with engine oil.

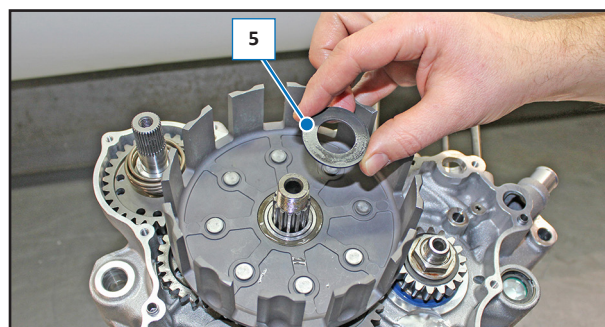


Proceed exactly with the reverse procedure.

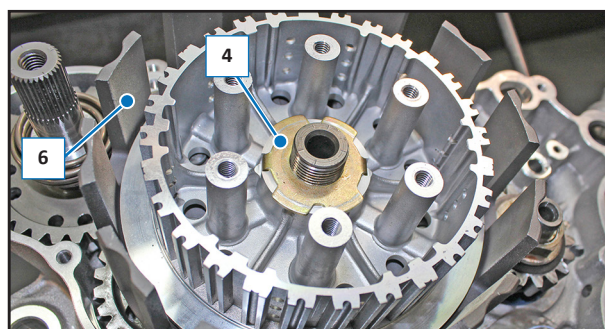
Re-mount the bell (6).



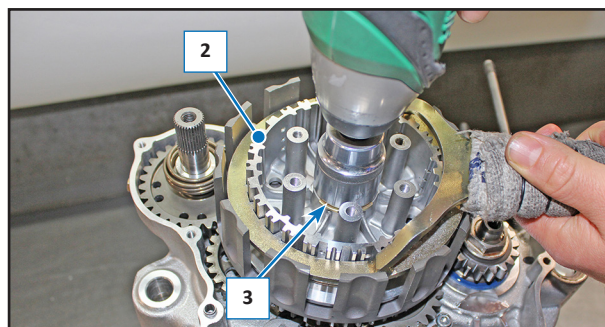
Insert the washer (5).



After having re-mounted the bell (6) and the drum (2), make sure the safety washer (4) has been positioned correctly.



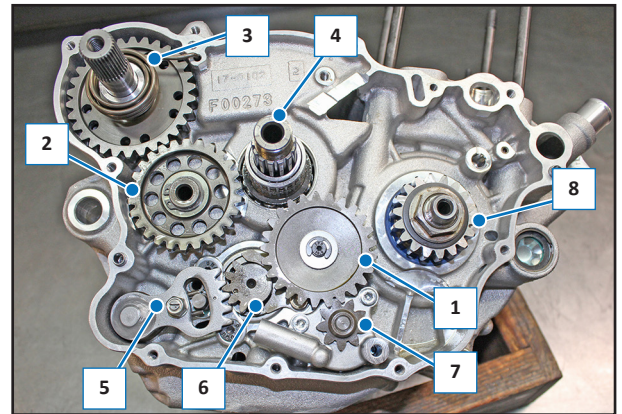
Screw the nut (3), blocking drum rotation with a spanner, with torque of 100 Nm 10.0 kgm 73.75 ft/lb + strong threadlocker (green).



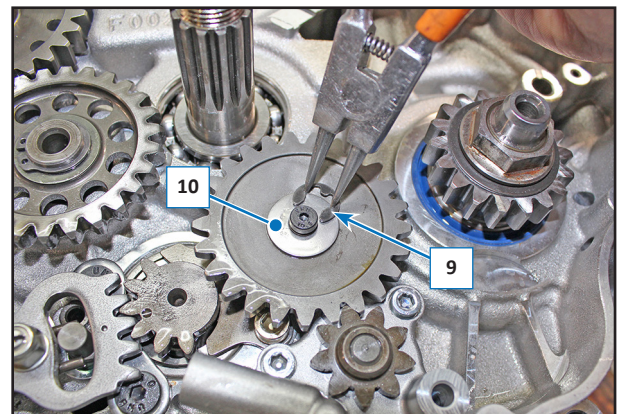
2.14 TRANSMISSION SIDE COUNTER GEARS

Components layout:

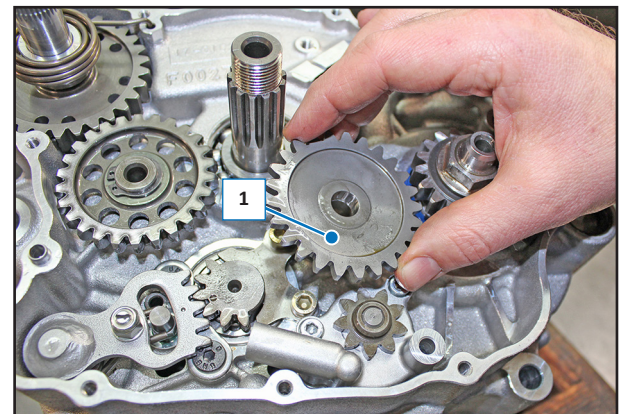
- 1) Oil pump return gear.
- 2) Idle gear kick starter removal.
- 3) Kick starter (only for K.S.).
- 4) Gearbox primary shaft.
- 5) Gearbox command shaft.
- 6) Ratchet-holder gear.
- 7) Oil pump.
- 8) Crankshaft gear.



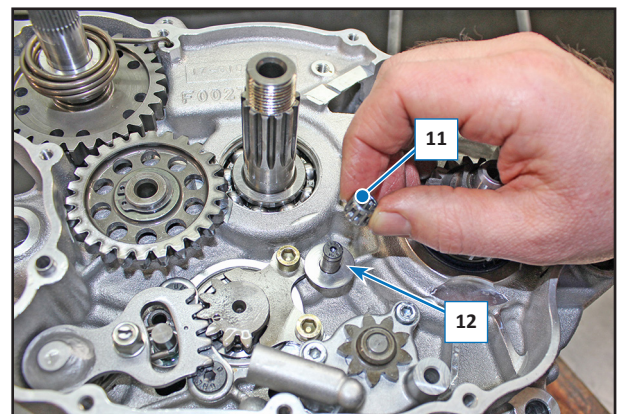
Remove the seeger (9) and the washer (10).



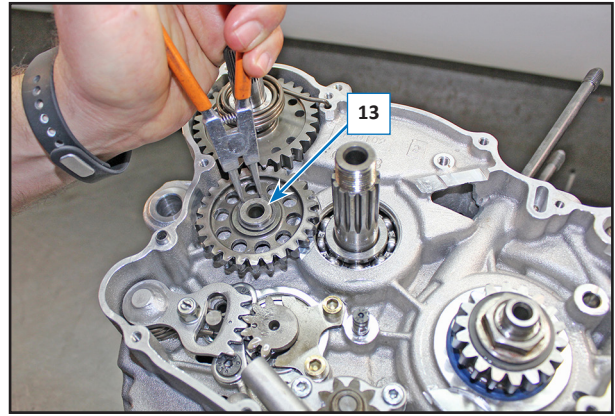
Remove the oil pump return gear (1).



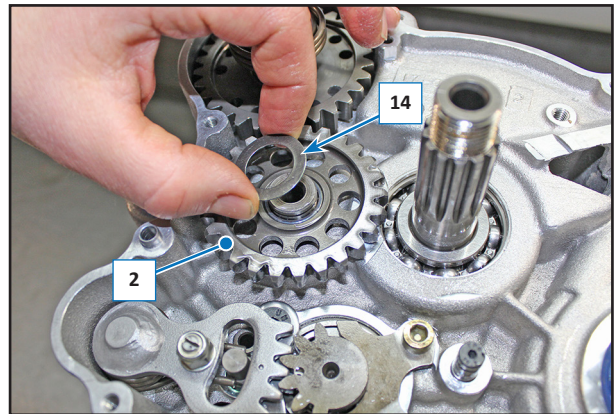
Remove the roller bearing cage (11) and the washer (12).



Remove the seeger (13).

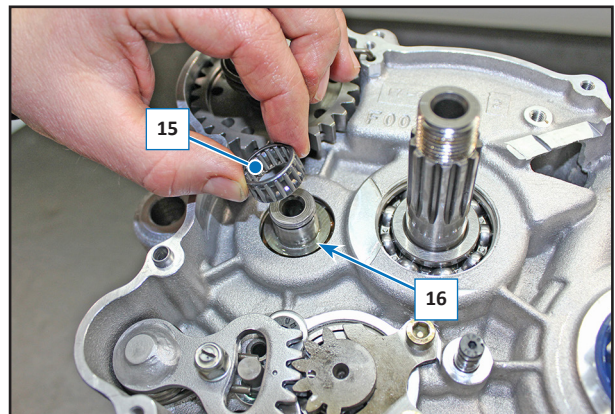


Remove the shim (14) and the gear (2).



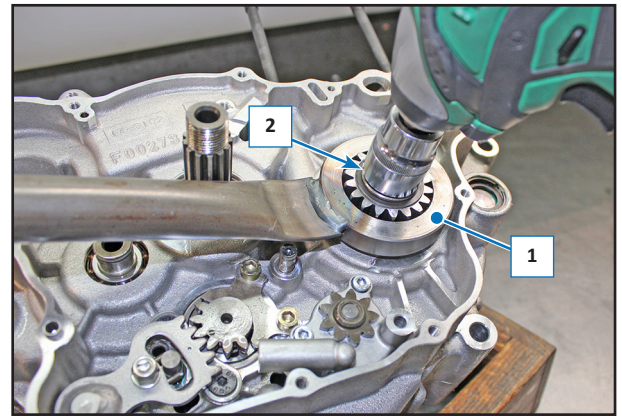
Remove the roller bearing cage (15) and the shim (16).

NOTE: To re-mount the gears and relative roller bearing cages, proceed in reverse order to disassembly and lubricate with engine oil.

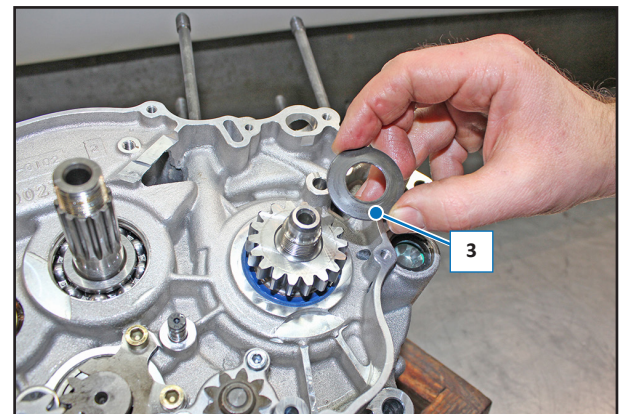


2.15 CRANKSHAFT GEAR REMOVAL

Insert the tool (1) to block rotation of the crankshaft and unscrew the nut (2).

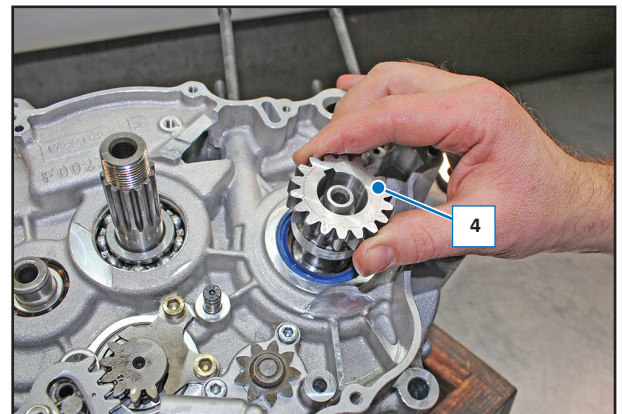


Remove the washer (3).



Remove the gear (4), recovering the relative key.

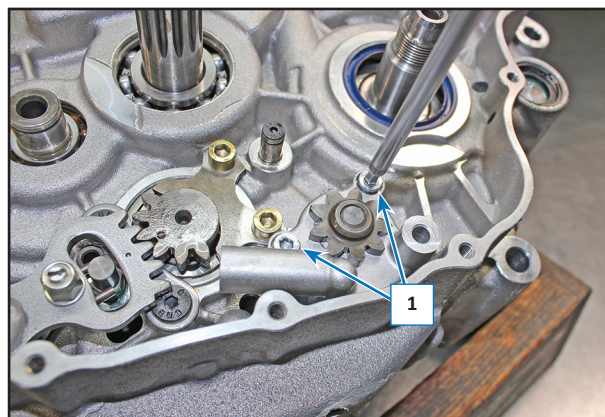
NOTE: On re-mounting the gear (4), tightening the nut (2) to a torque value of 100 Nm (10 Kgm - 73.75 ft/lb) + Loxeal 82-33. Blocking crankshaft rotation with the relevant tool (1).



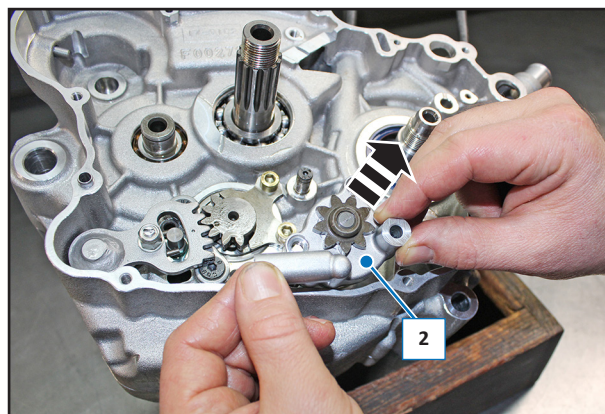
2.16 OIL PUMP REMOVAL

Remove the clutch bell and the oil pump return gear, as described in the relevant paragraphs.

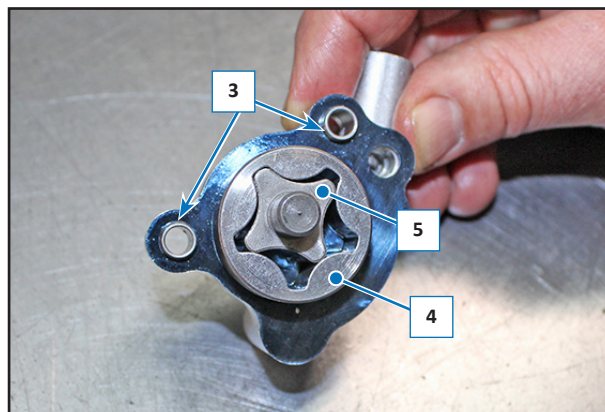
Unscrew the screws (1).



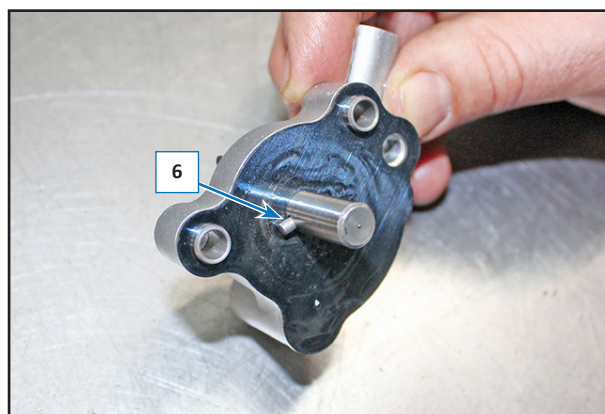
Remove the pump (2) by lifting it.



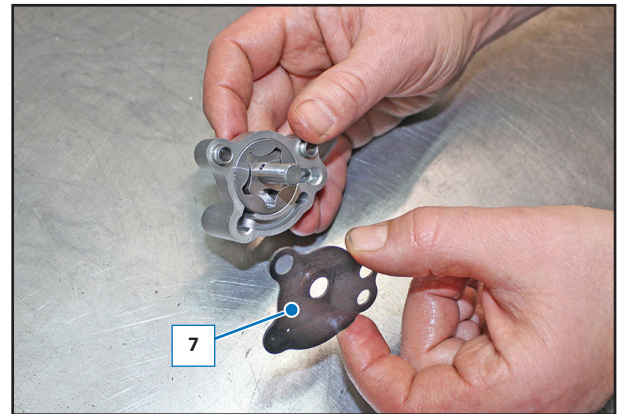
Recover the two centring bushes (3) and remove the two external sectors (4) and (5).



Remove the dragging pin (6).

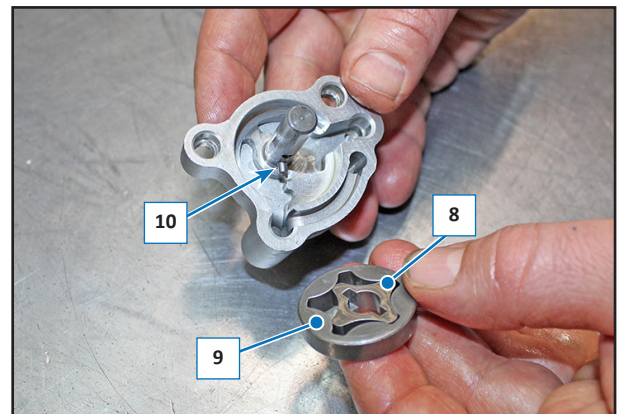


Remove the separation plate (7).



Remove the two internal sectors (8), (9) and the dragging pin (10).

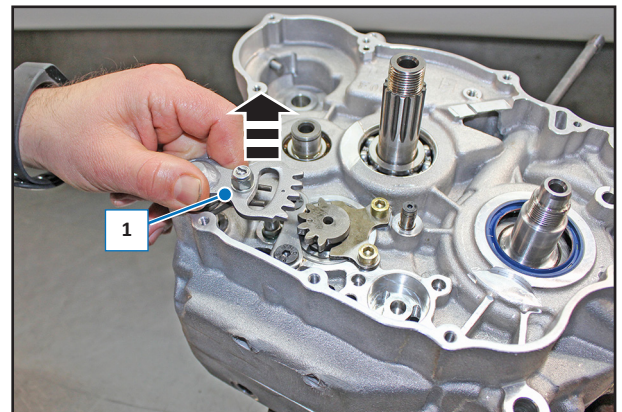
NOTE: On re-mounting, lubricate with engine oil and check that the dragging pins are correctly mounted and tighten the screws (1) with torque of 8 Nm (0.8 Kgm, 5.79 ft/lb).



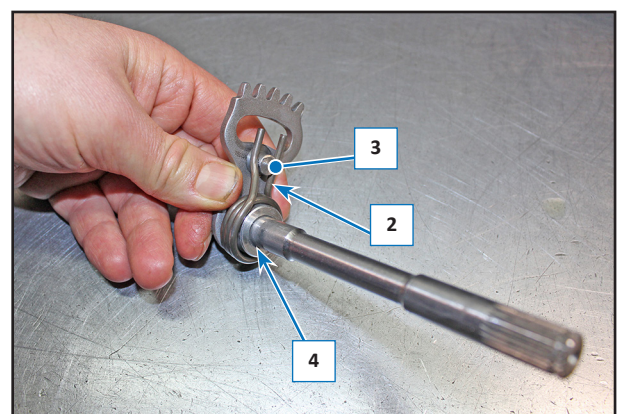
2.17 GEARBOX COMMAND SHAFT REMOVAL

Remove the transmission guard as described in the relative paragraph.

Lift the shaft (1) and extract it from the engine.

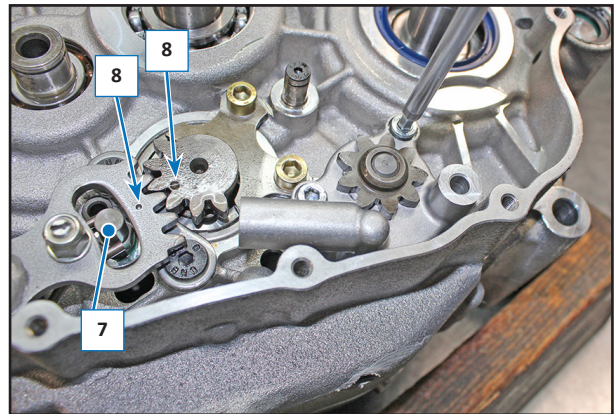
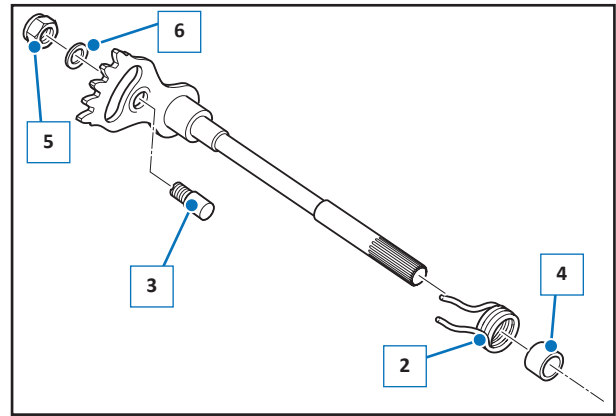


If it must be dismantled, release the spring (2) from the contrast pin (3) and remove it with the relative bush (4).



To remove the pin (3) loosen the nut (5) with relative washer (6).

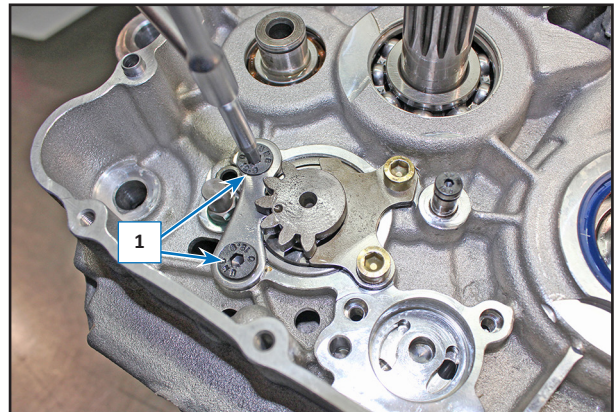
NOTE: To re-mount, proceed in reverse order to the disassembly operations, paying attention that the spring (2) inserts correctly into the pin (7) fixed on the engine guard and that the two timing bolts (8), one on the shaft and the other on the ratchet-holder gear, are aligned.



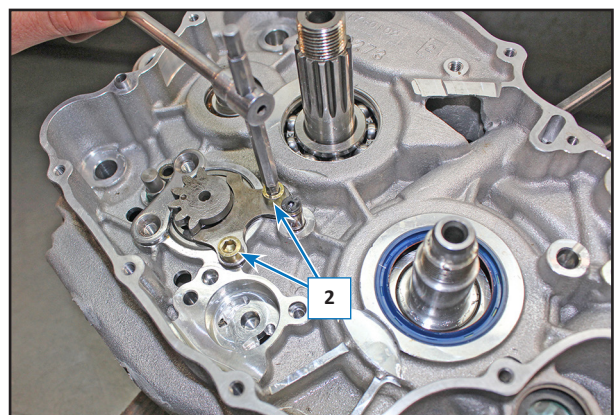
2.18 RATCHET-HOLDER GEAR REMOVAL

Remove the gearbox command shaft and the oil pump return gear, as described in the relevant paragraphs.

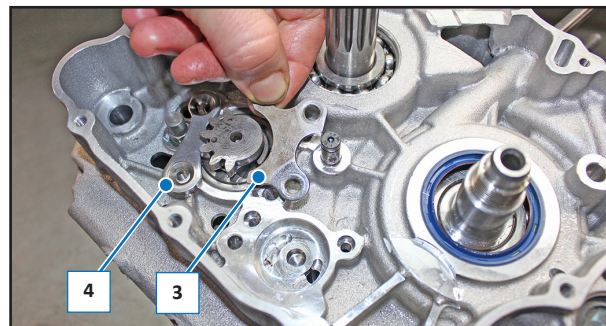
Unscrew the two screws (1).



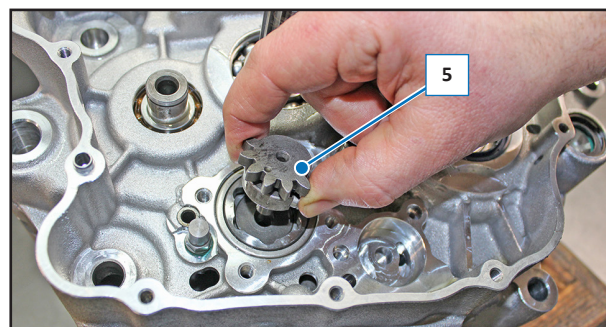
Unscrew the two screws (2).



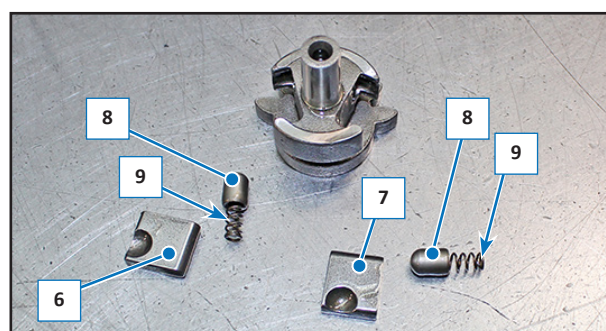
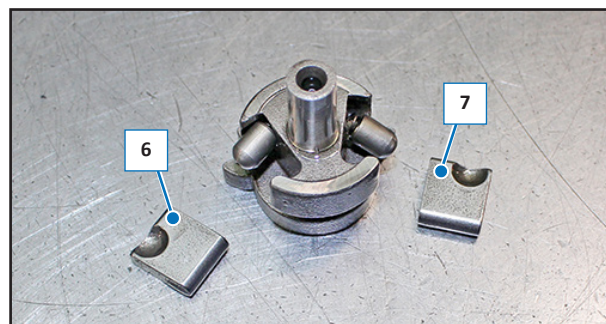
Remove the plate (3) and the plate (4).



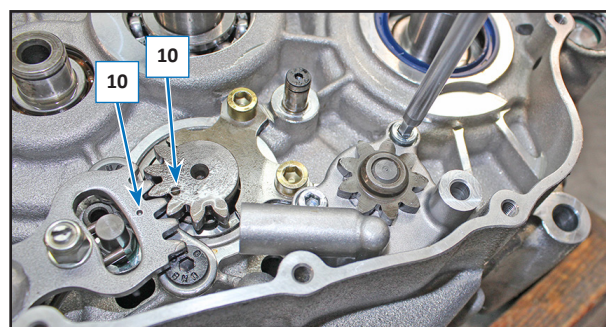
Lift and remove the Ratchet-holder gear (5).



Dismantle the ratchets (6) and (7) with the relative tips (8) and springs (9).



NOTE: On re-mounting, make sure the ratchets (6) and (7) are inserted correctly in the relative housing; they cannot be inverted. Re-mount everything in reverse order to the disassembly operations, checking that the two timing bolts (10), one on the shaft and the other on the ratchet-holder gear, are aligned. Tighten the screw (1) with a torque of 10 Nm (1.0 kgm, 7.37 ft/lb) and screws (2) with a torque of 10 Nm (1.0 kgm, 7.37 ft/lb) + medium threadlocker (blue).



2.19 SEMICASE

Remove the heating unit as described in the relevant paragraph.

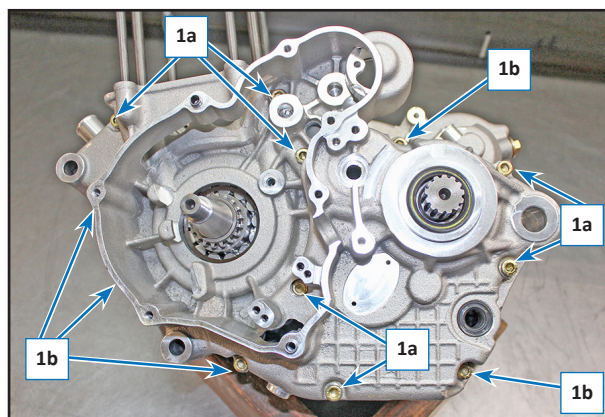
Remove all parts on the flywheel side and transmission side as described in the relative paragraphs.

2.19.1 Aperture

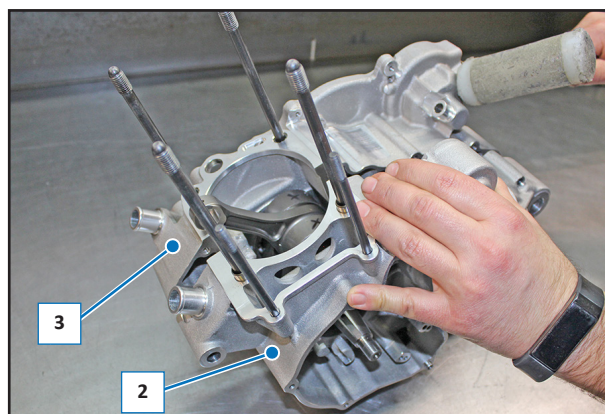
Unscrew the screws (1):

1a) M6-L55 screw

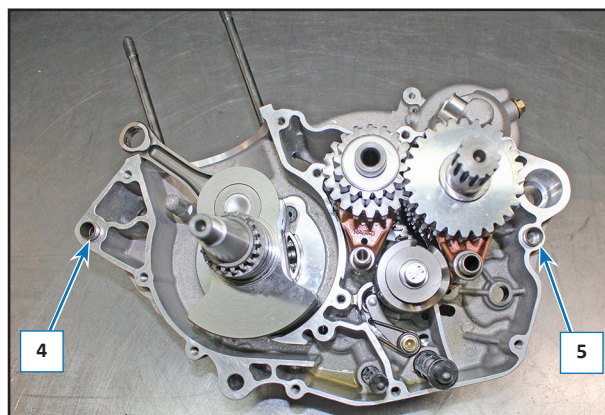
1b) M6-L35 screw



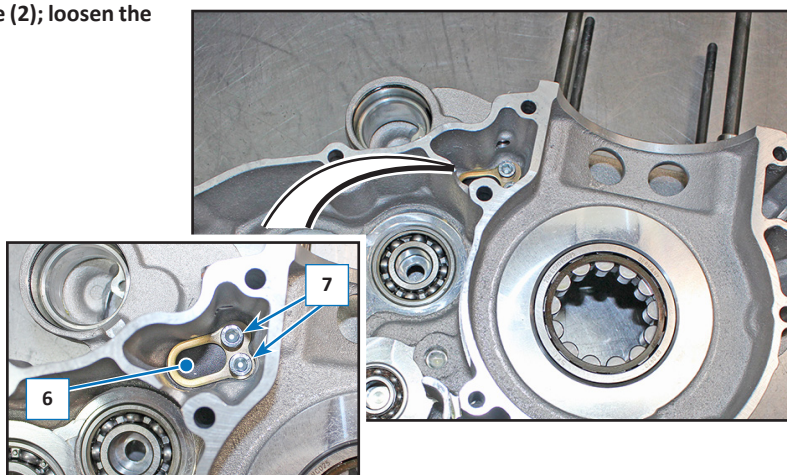
Use a rubber hammer to open the two semicases (2) and (3).



Retrieve the two bushes (4) and (5).



NOTE: There is a lamella (6) positioned on the semicase (2); loosen the screws (7) to remove it.



2.19.2 RE-ASSEMBLY

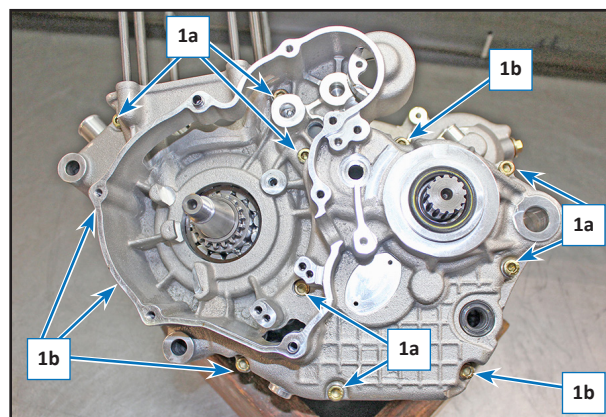
Check that all components are correctly positioned in their housing and that the centring bushes (4) and (5) are mounted.

Clean the contact surface from any residual sealant paste and then spread a Treebond type sealing paste.

Re-position the screws (1) in the relative housing depending on their length and tighten them with torque of 12 Nm (1.2 kgm, 8.68 ft/lb):

1a) M6-L55 screw

1b) M6-L35 screw

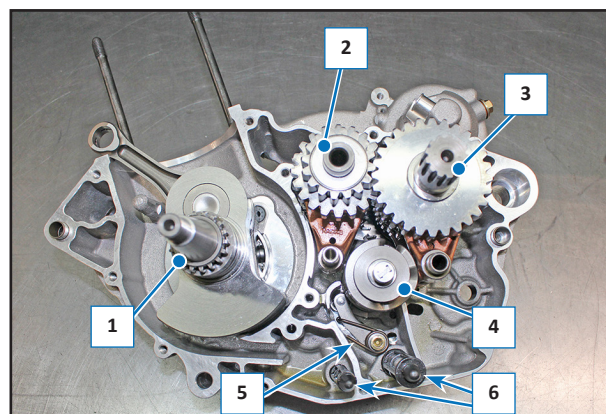


2.20 CRANKSHAFT, GEARBOX, GEARS DRUM

Open the guards as indicated in the relative section.

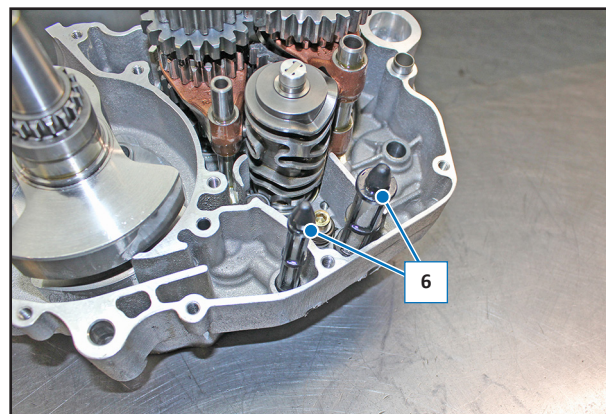
2.20.1 COMPONENTS POSITION

- 1) Crankshaft
- 2) Gearbox primary shaft
- 3) Gearbox secondary shaft
- 4) Gears selector drum
- 5) Ratchet
- 6) Mesh oil filters



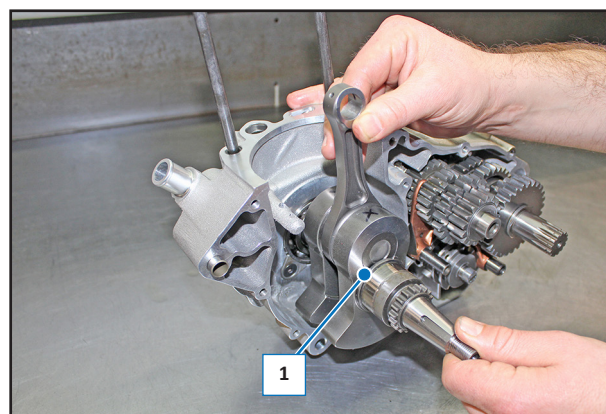
2.20.2 Oil filter removal

Lift and remove the filters (6) from the semicase; if they are very dirty or ruined, replace them on re-mounting.



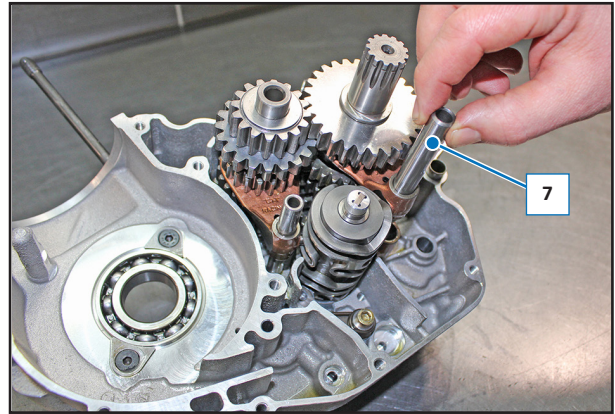
2.20.3 Crankshaft removal

Slide the complete crankshaft (1) from the semicase. If necessary, heat the bearing to facilitate removal of the crankshaft.

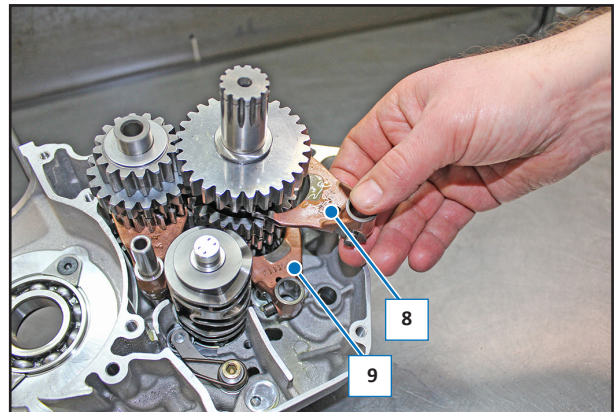


2.20.4 Gear shafts removal

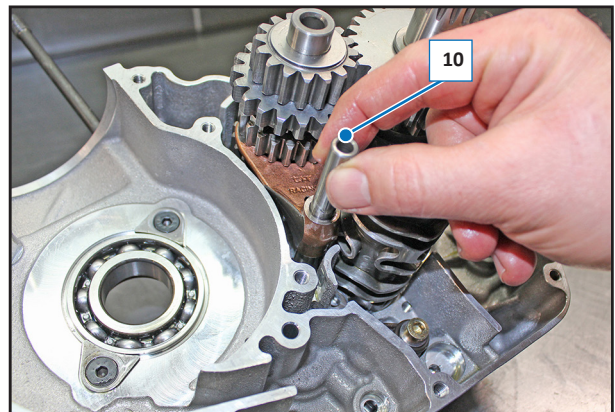
Extract the secondary shaft fork pin (7).



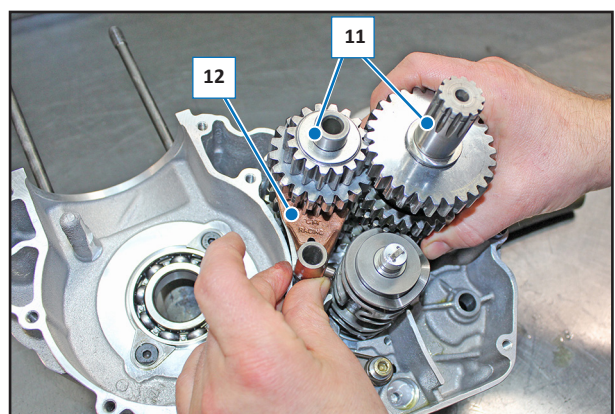
Release the forks (8) and (9) of the secondary shaft from the selector drum and remove them.



Slide the primary shaft fork pin (10) out.

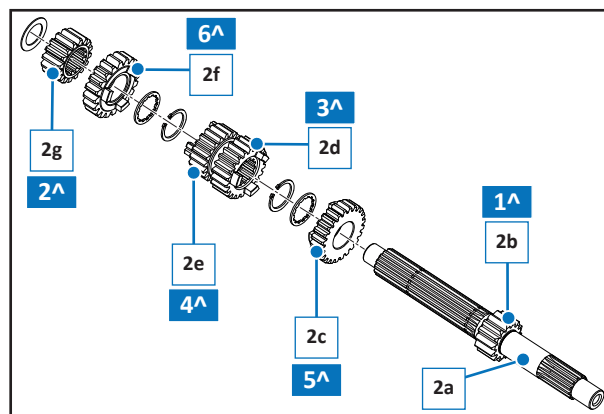


Remove the complete gear assy (11) with the fork (12) inserted.



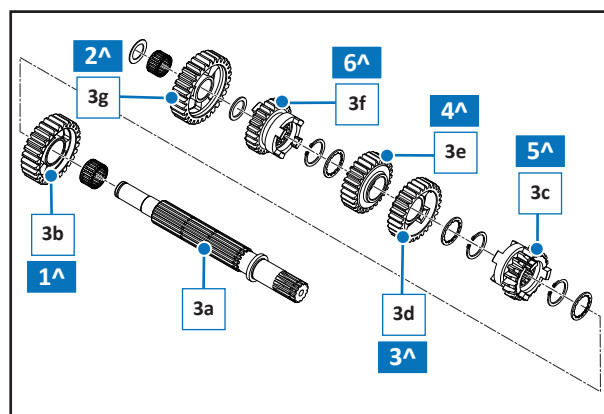
2.20.5 Primary shaft, gear sequence

- 2a) Primary shaft
- 2b) First
- 2c) Fifth
- 2d) Third
- 2e) Fourth
- 2f) Sixth
- 2g) Second



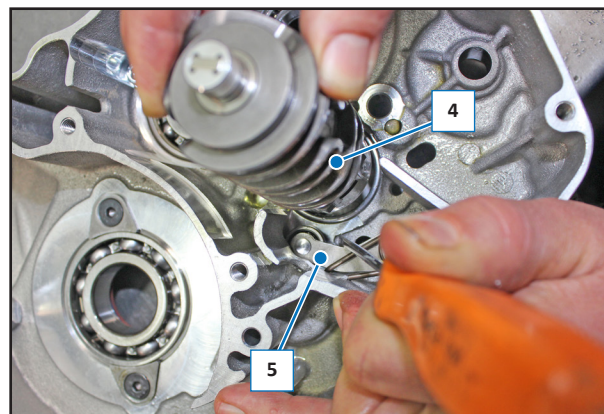
2.20.6 Secondary shaft, gear sequence

- 3a) Primary shaft
- 3b) First
- 3c) Fifth
- 3d) Third
- 3e) Fourth
- 3f) Sixth
- 3g) Second



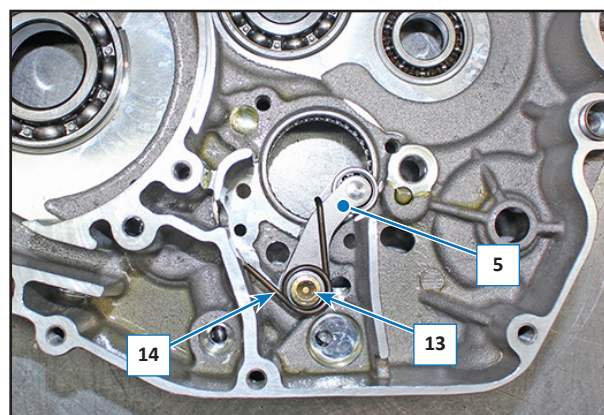
2.20.7 Gears drum removal

Use a screwdriver to move the ratchet (5), releasing the drum (4), and then remove the drum from the semicase.



2.20.8 Ratchet removal

Unscrew the screw (13) and remove the ratchet (5) with the relative spring (14).



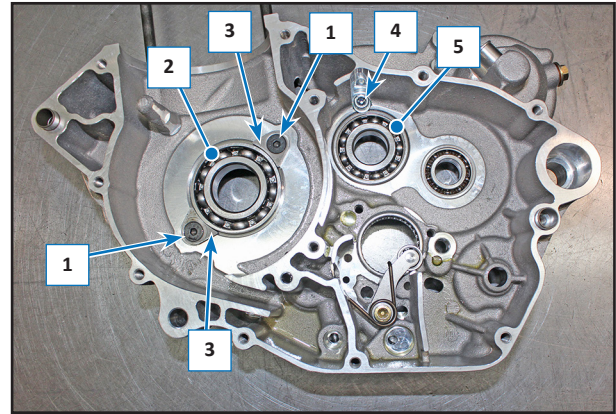
2.20.9 Bearings replacement

Unscrew the screws (1) that block the crankshaft bearing (2) and remove the plates (3).

Unscrew the screw (4) with relative primary shaft bearing safety washer (5).

Heat the guards and remove the bearings.

NOTE: After having replaced the bearings, re-position the safety washers and tighten the screws again and applying Loxal 82-33 on the thread.



2.20.10 Components re-mounting

Re-mount the components, proceeding in reverse order to disassembly, lubricating with engine oil and, when re-mounting the gearbox unit, paying attention to correctly position the forks (7) and (10) in the relevant positions:

Fork (7) between the 5th and 3rd gear.

Fork (7a) between the 4th and 6th gear.

Fork (10) between the 3rd and 4th gear.

Check that the fork rollers are correctly inserted in the relative hollows on the drum (4).

