

MY2018-2019

2-STROKE
250_{cc} - 300_{cc}



WORKSHOP MANUAL





INTRODUCTION	2
TECHNICAL FEATURES OF ENGINE	4
SPECIAL EQUIPMENT	5
1 REMOVAL OF ENGINE FROM VEHICLE	6
2 ENGINE DISASSEMBLY	15
2.1 CLUTCH/GEAR OIL DRAIN	15
2.2 REMOVAL OF CLUTCH CONTROL ROD AND PINION SPACER	15
2.3 REMOVAL OF PISTON, CYLINDER AND HEAD	16
2.4 REMOVAL OF IGNITION UNIT	19
2.4.1 REMOVAL OF FLYWHEEL COVER	19
2.4.2 REMOVAL OF STATOR	19
2.4.4 REMOVAL OF PICK-UP UNIT	20
2.4.3 REMOVAL OF FLYWHEEL	20
2.5 REMOVAL OF ELECTRIC IGNITION	21
2.5.1 REMOVAL OF START MOTOR	22
2.5.2 REMOVAL OF BENDIX COUPLING	22
2.6 REMOVAL OF COOLANT LIQUID PUMP, CLUTCH UNIT, MAIN GEAR, CENTRIFUGAL UNIT, GEARSHIFT ORGANS, KICKSTART	23
2.6.1 REMOVAL OF COOLANT LIQUID PUMP	26
2.6.2 REMOVAL OF CENTRIFUGAL UNIT AND LEVERAGE	27
2.6.3 CLUTCH UNIT DISASSEMBLY	30
2.6.4 PEDAL KICKSTART - OPTIONAL	33
2.6.5 EXTERNAL GEARSHIFT UNIT	35
2.7 INTAKE SYSTEM	36

2.8 CRANKSHAFT, GEARBOX UNIT AND INTERNAL GEARSHIFT	37
2.8.1 OPENING THE CRANKCASE	37
2.8.2 CRANKSHAFT	38
2.8.3 INTERNAL GEARSHIFT UNIT AND COMPLETE GEARBOX	38
2.9 DISASSEMBLY OF PARTS FROM CRANKCASES	40
2.9.1 RIGHT CRANKCASE HALF	40
2.9.2 LEFT CRANKCASE HALF	42

3 ENGINE CHECKS AND ASSEMBLY	43
3.1 CRANKCASE HALF	43
3.1.1 APPLICATION OF RIGHT CRANKCASE HALF PARTS	44
3.1.2 APPLICATION OF LEFT CRANKCASE HALF PARTS	46
3.2 CONNECTING ROD AND ENGINE SHAFT CHECK	47
3.3 ASSEMBLY OF COMPLETE CRANKSHAFT	48
3.4 GEAR UNIT: CHECKS AND REASSEMBLY	49
3.4.1 CHECK ON GEARBOX UNIT	49
3.4.2 ASSEMBLY OF PRIMARY UNIT	50
3.4.3 ASSEMBLY OF SECONDARY UNIT	51
3.4.4 CHECKING THE FORKS, FORK PINS AND DESMODROMIC DEVICE	52
3.4.5 ASSEMBLY OF GEARBOX AND INNER CONTROL	54
3.5 CLOSING THE ENGINE CRANKCASE	57
3.6 EXTERNAL GEARSHIFT	58
3.6.1 CHECKING THE COMPLETE DRIVE SHAFT	58
3.6.2 ASSEMBLY OF EXTERNAL GEARSHIFT	60
3.7 KICKSTARTER DEVICE - OPTIONAL	61
3.7.1 CHECK ON KICKSTART SHAFT UNIT AND ASSEMBLY	61
3.7.2 ASSEMBLY OF KICKSTARTER DEVICE	62
3.8 MAIN GEAR AND CLUTCH UNIT	64
3.8.1 CHECK OF PRIMARY GEAR	64
3.8.2 PRIMARY GEAR APPLICATION	64
3.8.3 CHECKING THE CLUTCH CASE, ROLLER BEARING AND INTERNAL CENTRE BEARING	65
3.8.4 CHECKING THE CLUTCH DISCS	66
3.8.5 CHECKING THE SPRINGS	66
3.8.6 CHECKING THE CLUTCH DRUM AND CAP	67
3.8.7 CHECKING THE THRUST BEARING DEVICE	67
3.8.8 CLUTCH UNIT ASSEMBLY	68
3.9 COOLANT LIQUID PUMP AND CENTRIFUGAL UNIT	71
3.9.1 CHECKING THE PUMP UNIT AND DISASSEMBLY, CENTRIFUGAL UNIT AND IDLER UNIT	72
3.9.2 CENTRIFUGAL UNIT ASSEMBLY	73
3.9.3 PUMP UNIT ASSEMBLY	76
3.9.4 ASSEMBLY OF COMPLETE CLUTCH COVER AND PUMP UNIT	76
3.10 ELECTRIC IGNITION UNIT	79
3.10.1 BENDIX COUPLING CHECKS	79



3.10.2	IGNITION UNIT COUPLING TO ENGINE	79
3.11	IGNITION SYSTEM	80
3.11.1	CHECKING THE IGNITION SYSTEM	81
3.11.2	COUPLING OF IGNITION SYSTEM TO CRANKCASE.....	81
3.12	THERMAL UNIT	84
3.12.1	CHECKING THE PISTON AND ELASTIC BANDS	84
3.12.2	CYLINDER CHECK.....	85
3.12.3	PISTON CYLINDER COUPLING PLAY	86
3.12.4	CHECKS AND EXHAUST VALVE UNIT DISASSEMBLY	86
3.12.5	EXHAUST VALVE	88
	UNIT ASSEMBLY.....	88
3.12.6	PISTON, PIN BOLT, ELASTIC BANDS AND CYLINDER ASSEMBLY	90
3.12.7	CHECK OF CRANKCASE/CYLINDER GASKET THICKNESS.....	92
3.12.8	HEAD APPLICATION.....	93
3.12.9	EXHAUST VALVE	94
	ADJUSTMENT	94
3.13	CHECK ON INTAKE UNIT AND ASSEMBLY	98
3.14	INSERTION OF CLUTCH ROD AND PINION SPACER..	100
4	REASSEMBLY OF ENGINE IN THE VEHICLE	101
	TABLE OF ENGINE COMPONENTS FASTENING TORQUES	109
	TABLE OF FRAME/ENGINE FASTENING TORQUES	111
	TABLE OF SUPERSTRUCTURE FASTENING TORQUE VALUES	111
	RECOMMENDED ENGINE MAINTENANCE	112
	LUBRICANTS AND LIQUIDS	112

INTRODUCTION

This publication is intended for workshops specialised in repairing motorbikes and motorcycles. Where prescribed, use special Betamotor tools.

Use Betamotor spare parts only. For their codes refer to the spare parts manual for the specific vehicle or version.

The warranty and liability on vehicle safety lapses when maintenance or repairs:

- Are **NOT** performed by workshops specialised repairing motorbikes and motorcycles.
- Are **NOT** carried out carefully following the requirements contained in the technical documentation;
- Are **NOT** carried out using special Betamotor tools, where required;
- Are **NOT** carried out using Betamotor official spare parts.

Carefully read this manual in its entirety before operating the engine. Good knowledge of the components forming the engine and all the procedures to be followed for inspection and maintenance help lengthen the life of the engine.

The paragraphs have been enhanced with schematic illustrations highlighting each subject in order to make the text immediately understandable.

Informative note

Betamotor S.p.A. is committed to a policy of ongoing improvement on its products. This is why you might notice slight differences between the content of this document and the vehicle which you are carrying out repairs and/ or maintenance. Betamotor S.p.A. models are exported to a number of countries where there are different rules concerning Highway Codes and vehicle type-approval procedures. Betamotor S.p.A. therefore reserves the right to modify its products and technical documentation at any time without prior notice, thank you for understanding.

We respect and defend the environment

Everything we do has an impact on the whole Planet and its Resources. To safeguard the interests of the entire Community, Betamotor S.p.A. would like to inform customers and technical operators of ways of using the vehicle and disposing of its parts entirely in accordance with standards in force in terms of environmental pollution, waste disposal and recycling.

SAFETY

Carbon monoxide

- Exhaust gases contain carbon monoxide, which is poisonous. Carbon monoxide can cause loss of conscience and lead to death. When starting the engine, make sure the place you are in is well-ventilated. Never start the engine in a closed place.
- The engine can be started in a closed place only if provided with the relevant exhaust gas evacuation devices.

Petrol

- Petrol is extremely flammable and can be explosive under some conditions.
- Keep sources of heat, sparks and flames away from the work area.
- Always work in a well-ventilated area.
- Never use petrol as a solvent for cleaning. Do not handle it unless absolutely necessary.
- Never use petrol to clean components by means of compressed air.
- Keep out of the reach of children.

Engine oil

- Motor oil can cause skin conditions if carried often and for prolonged periods in contact with skin.
- If you touch motor oil, clean the parts with soap and water as soon as possible.
- In case of contact with eyes, rinse them with plenty of water and seek medical advice.
- If swallowed, do not induce vomiting in order to avoid breathing the product into the lungs; seek immediate medical advice. If you believe the product has been breathed into the lungs, take the concerned person urgently to the hospital.
- Used oil contains dangerous substances that are harmful for the environment. When changing it, you must be equipped to dispose of it in compliance with existing law.
- Do not discard used oil into the environment.
- Keep out of the reach of children.



Coolant liquid

- In some situations, the ethylene glycol contained in the coolant is flammable and its flame is invisible. Should ethylene glycol catch fire, it can cause burns even though its flame is invisible.
- Do not bring the coolant into contact with hot parts. These parts could be hot enough to cause the liquid to ignite.
- The coolant (ethylene glycol) can irritate skin and is poisonous if swallowed.
- Should the coolant come into contact with the skin, immediately remove contaminated clothing or footwear and wash with soap and water. In case of contact with eyes, rinse with plenty of clean water and seek medical advice immediately. Should it be swallowed, do not induce vomiting in order to avoid breathing the product into the lungs. Administer clean water and take the concerned person immediately to hospital, showing this product to hospital staff.
- In the event of exposure to a high concentration of vapours, move the concerned person to an area with an uncontaminated atmosphere and seek medical advice if necessary.
- Do not remove the radiator cap when the engine is still hot. As the coolant is pressurised, it can spurt out violently and cause burns.

- The coolant contains dangerous substances that are harmful for the environment. When changing it, you must be equipped to dispose of it in compliance with existing law.
- Do not disperse coolant into the environment.
- Keep out of the reach of children.

Hot parts

- The engine and the exhaust system get very hot and stay at that temperature for a long time, even after the engine has been turned off. Wait for them to cool down before handling these parts or carrying out work on areas around them. Use insulated gloves.

WARNINGS

The information contained in this paragraph is important to ensure that the operations carried out on the engine can be performed without causing damage.

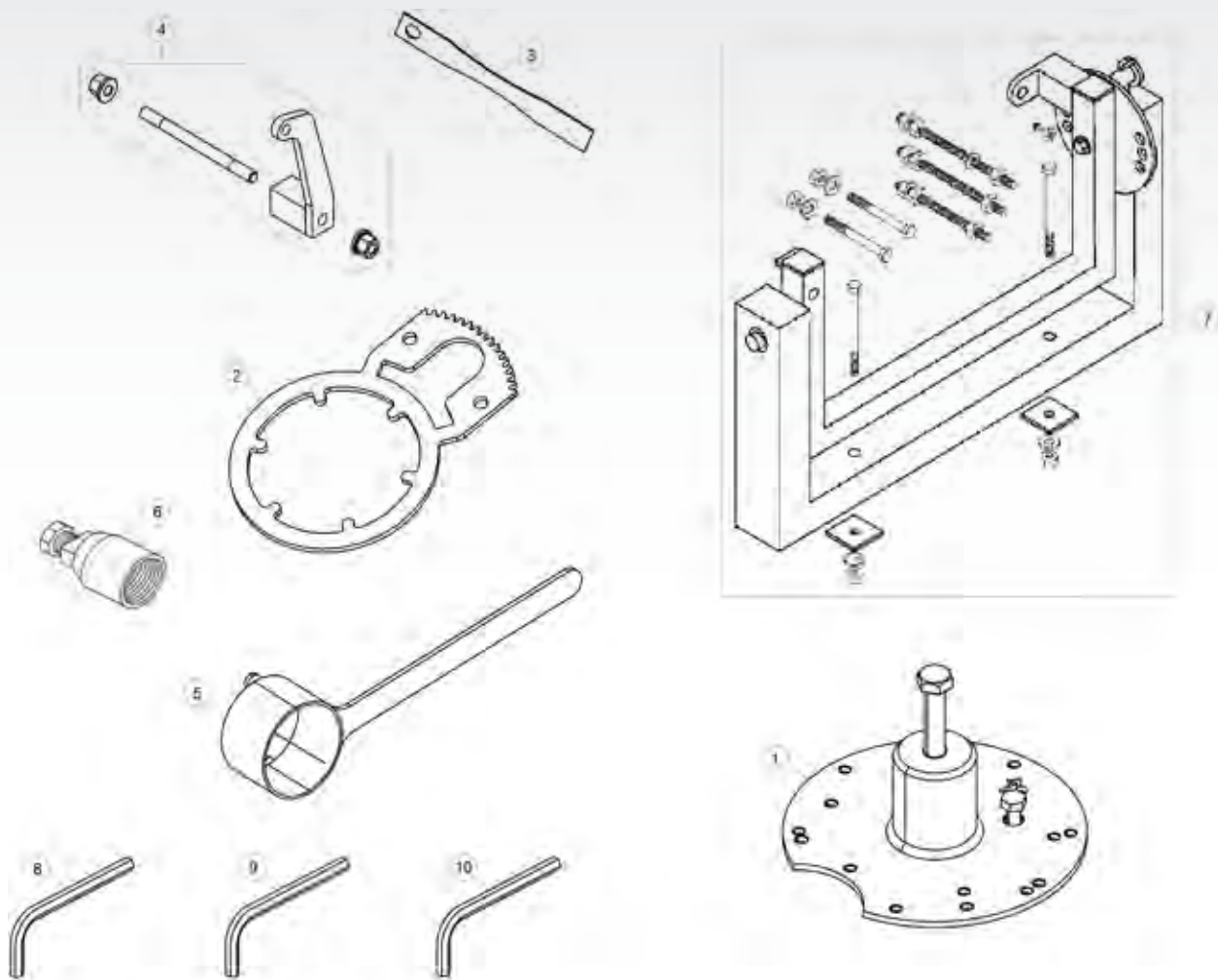
- Before disassembly, thoroughly clean the motorcycle.
- While you are disassembling it, clean all the parts and place them in containers by accurately following the order of disassembly.
- Always use special tools wherever necessary and when required.
- Always use glues, sealant and lubricants wherever required. Follow the indications concerning their technical features.
- Always replace parts such as gaskets, O-rings and safety washers with newly supplied parts.
- When loosening or tightening nuts or screws, always start with the larger ones or from the centre. Always follow the specified tightening torques.
- Use only Betamotor original spare parts.



TECHNICAL FEATURES OF ENGINE

CHARACTERISTIC DATA		ENGINE	
	RR250	RR300	
Bore [mm]/Stroke [mm]	66.4/72	72/72	
Displacement [cm ³]	249	293	
Compression ratio	13.2:1	11.9:1	
TRANSMISSION			
	RR250	RR300	
Primary	27/72	27/72	
1st gear ratio	12/31	12/31	
2nd gear ratio	15/28	15/28	
3rd gear ratio	19/28	19/28	
4th gear ratio	20/24	20/24	
5th gear ratio	27/27	27/27	
6th gear ratio	28/24	28/24	

SPECIAL EQUIPMENT



1. Crankcase uncoupler code 007.14.010.80.00
2. Clutch drum nut/Main tool code Special wrench
3. Crankcase/Cylinder gasket check plate code 026.14.010.00.00
4. Front bracket code 026.14.003.00.00 to fix engine to stand code 36.25132.000
5. Flywheel blocking tool code 026.14.005.50.00
6. Flywheel extractor code 36.25173.000
7. Engine support stand code 36.25132.000
8. Special wrench code 026.44.029.00.00
9. Special wrench code 026.44.028.00.00
10. Special wrench code 007.44.035.00.00

Symbols

	6Nm
	Value Fastening torque
	Medium-resistance threadlocker
	High-resistance threadlocker
	Silicone paste
	Grease

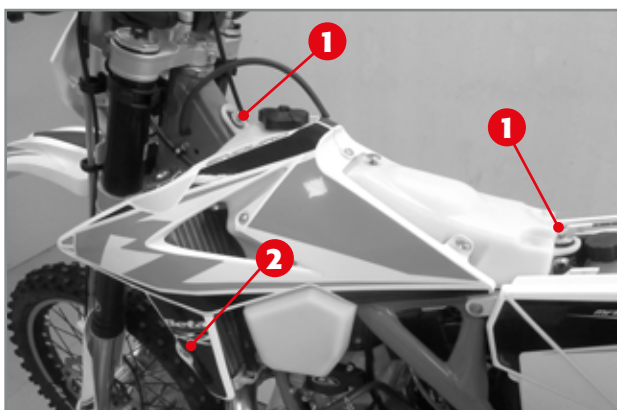
1 REMOVAL OF ENGINE FROM VEHICLE



- Carefully wash the vehicle;
- Remove the engine guard plate;
- Place the vehicle on an adequate stand.



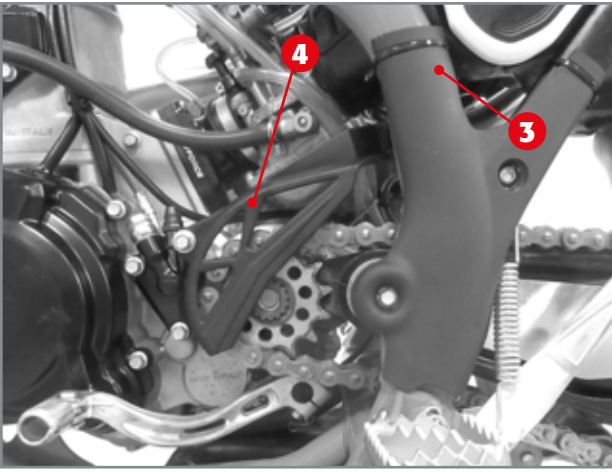
- Disconnect the tank ventilation pipe.
- Set the fuel valve to OFF and disconnect the fuel pipe from the valve.



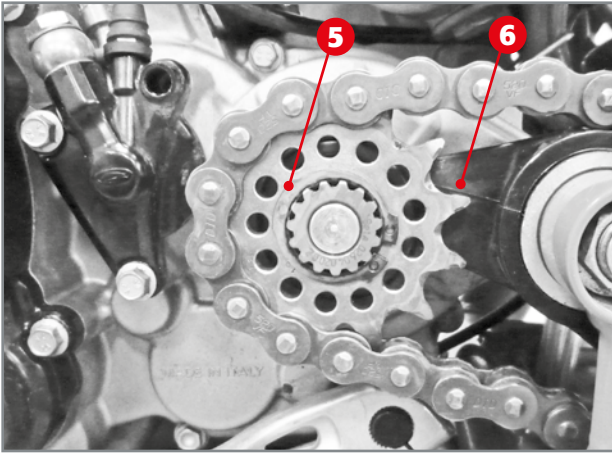
- Remove the seat.
- Remove the two screws **1** fastening the tank to the frame and the screw **2** (one on each side) fastening the side panel to the radiator.



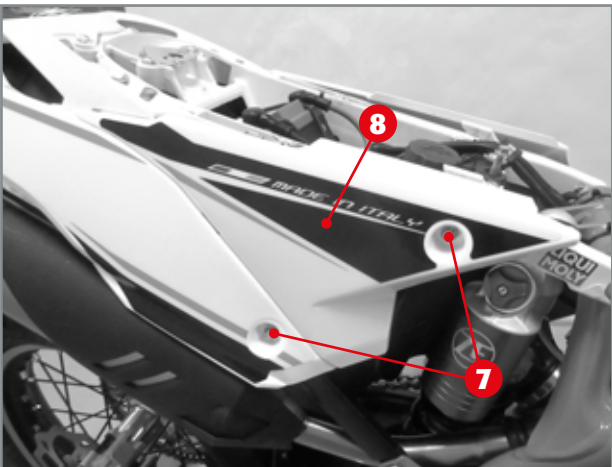
- Remove the tank along with the sides.



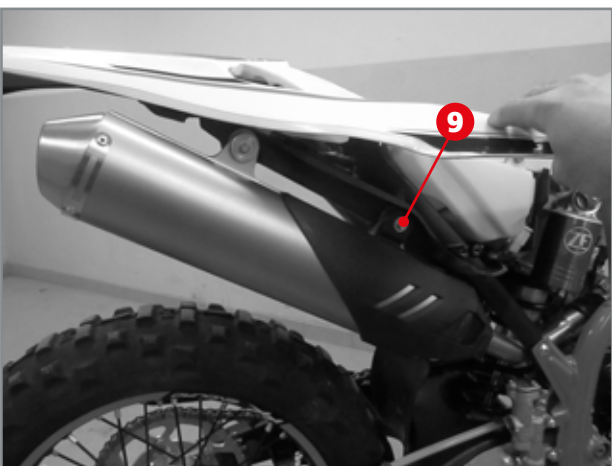
- Remove the frame guards **3** (one on each side) and the pinion guard **4**.



- Remove the circlip **5** and extract the pinion. Rest the chain against the upper wedge **6**.

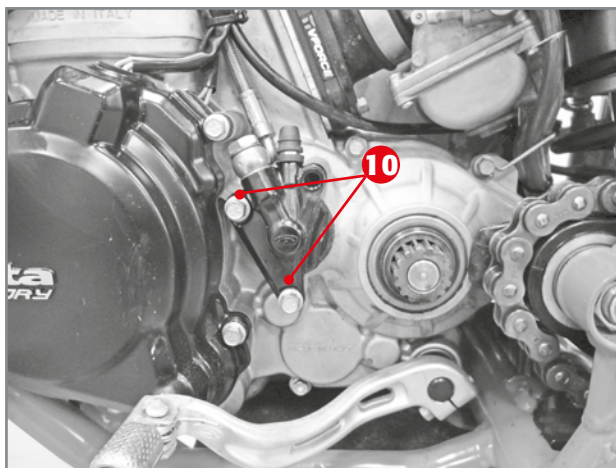


- Remove the screws **7** and the side panel **8**.
- This provides easy access to the silencer screw **9**.



- Remove the exhaust expansion and the silencer.

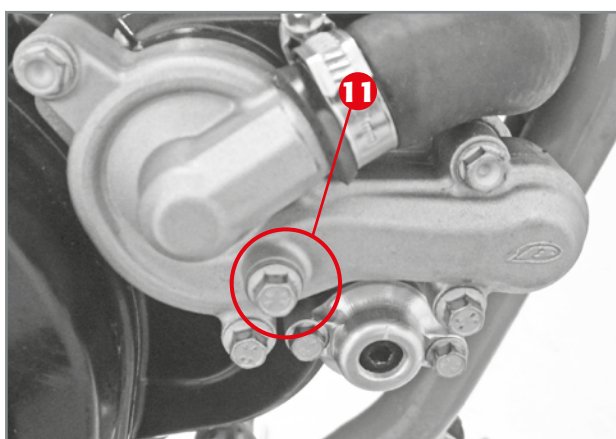




- Remove the screws **10** fixing the clutch actuator to the crankcase half.

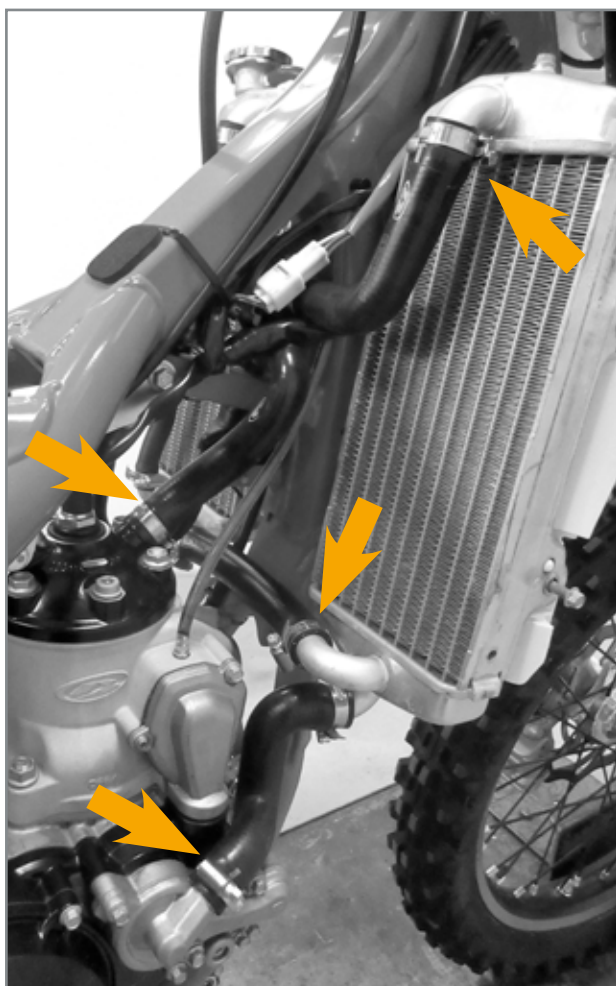
ATTENTION!

Do not activate the clutch lever with the actuator uncoupled from the engine.

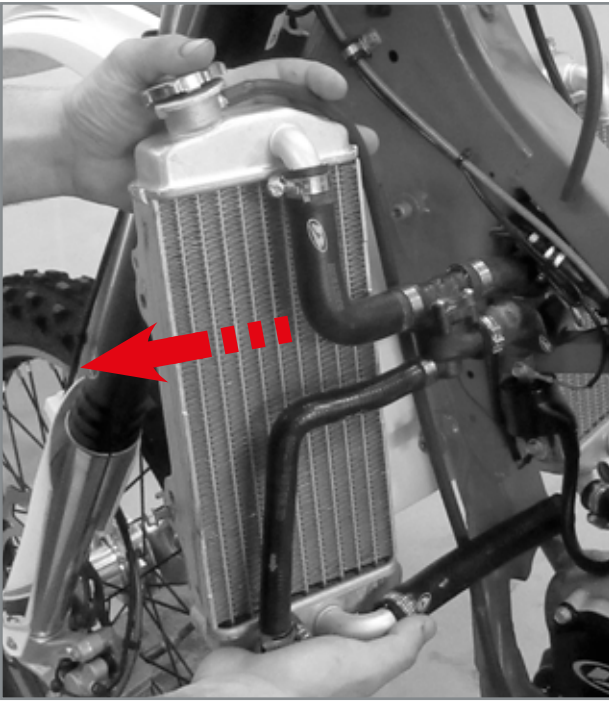


- Drain the cooling system by means of the screw **11** and let the liquid outflow into a container (the cooling circuit contains 1.3l of liquid). Remove the radiator cap.

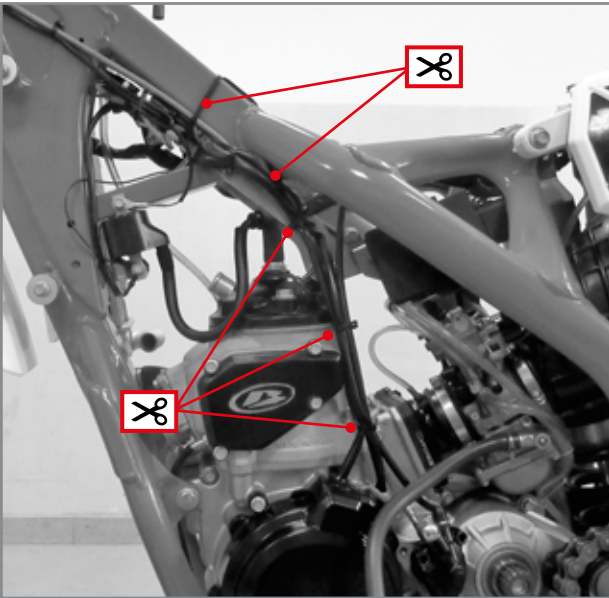
NOTE: *To make the circuit easier to empty, it is advisable to slightly tilt the vehicle on the left side.*



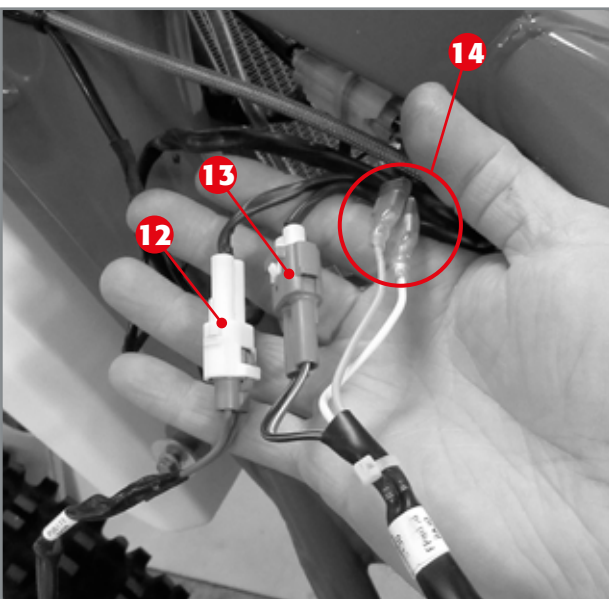
- Disconnect the water hoses from the engine and from the right radiator.
- Remove the right radiator.



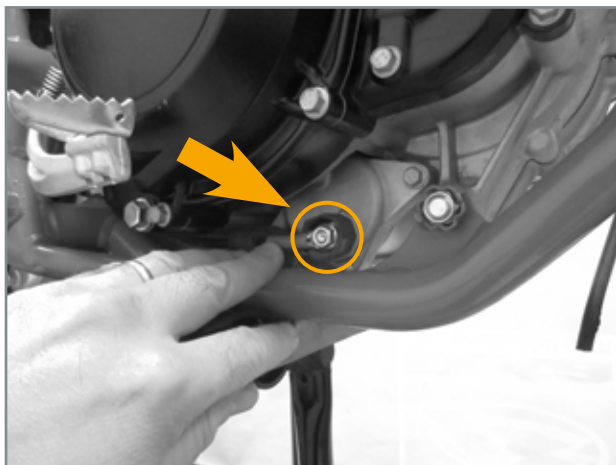
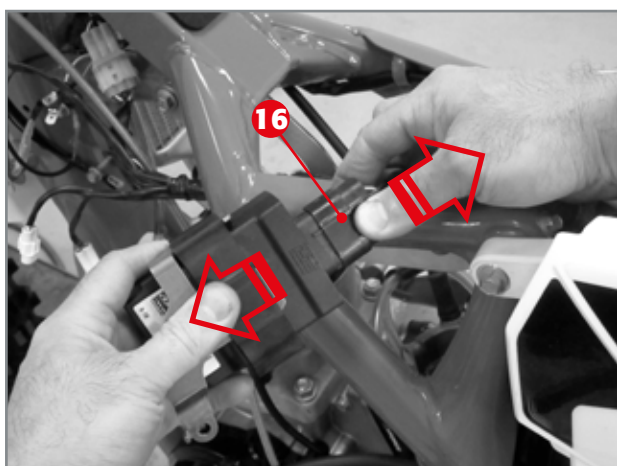
- Remove the left radiator with pipes.



- Disconnect the spark plug cap, the connectors from the coil and remove the coil itself.
- Cut all straps binding the engine's electric system to the clutch pipe and to the frame.

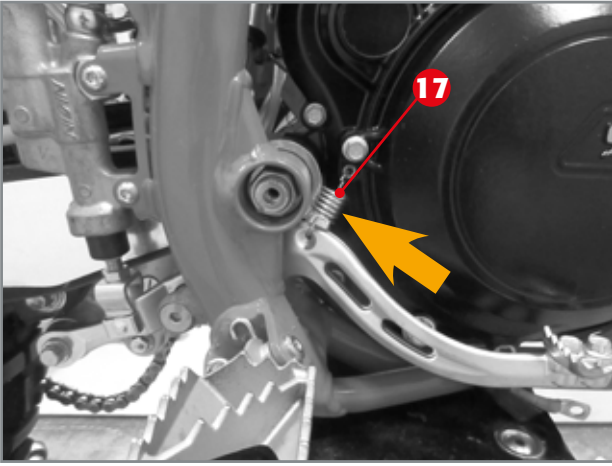


- Release the connectors **12**, **13** and **14** of the engine ignition unit and disconnect them from the electrical system.

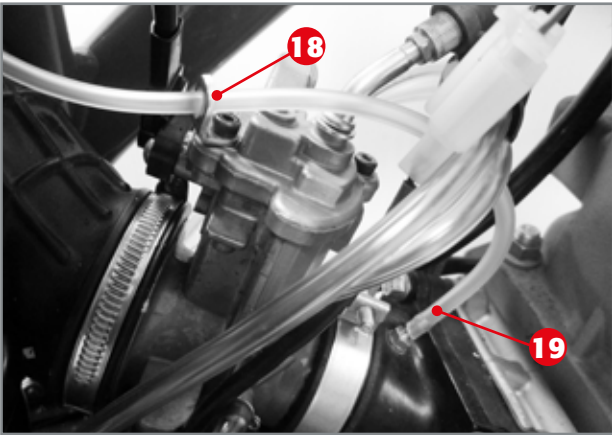


- Remove the screw **15**: this way the control unit is released, with the support, from its fixing.
- Press the flap **16** and release the connector from the control unit.
- Remove the start motor cable fixing nut.
- Remove the head connections and spark plug.

NOTE: It is advisable to insert a clean cloth into the spark plug housing in order to prevent accidental introduction of dirt into the cylinder.



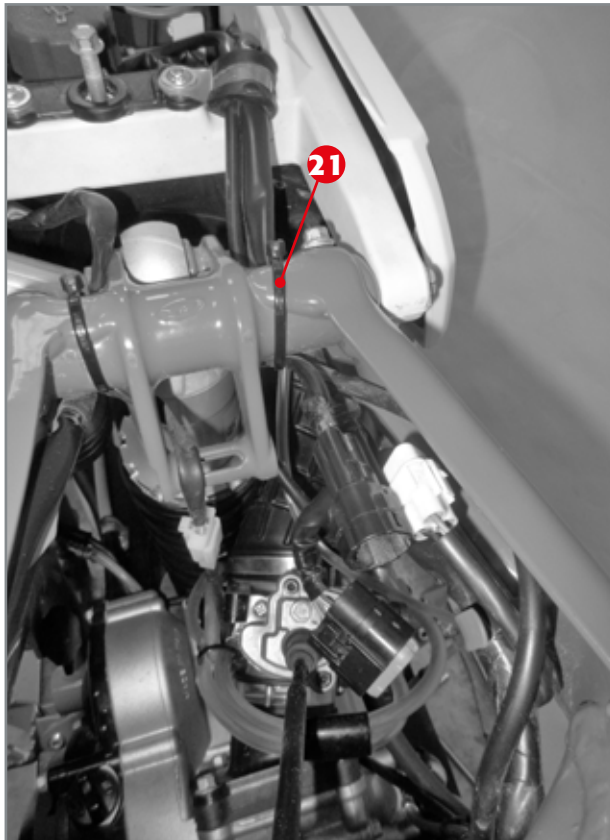
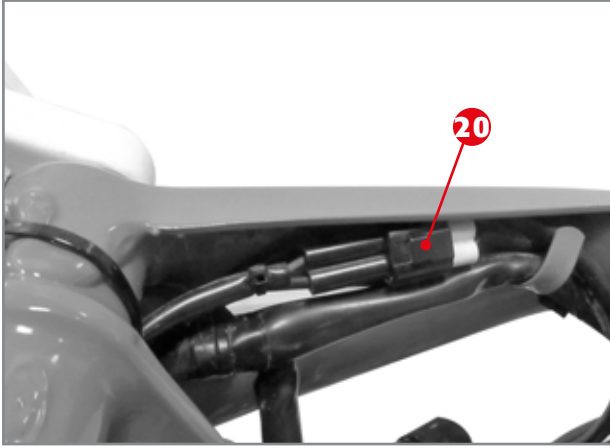
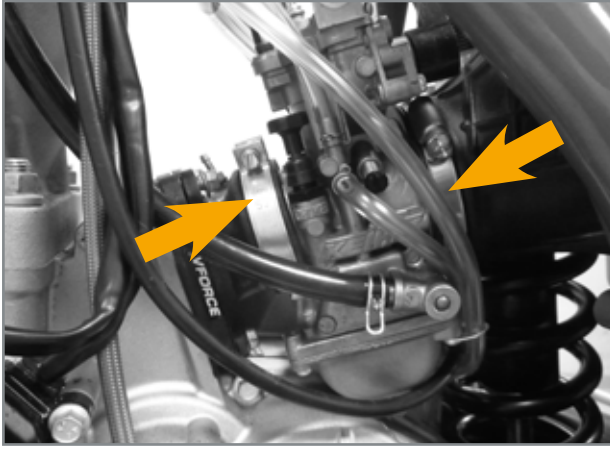
- Release and remove the brake pedal return spring **17**. Remove the kickstarter lever (optional).
- Remove the gear lever.



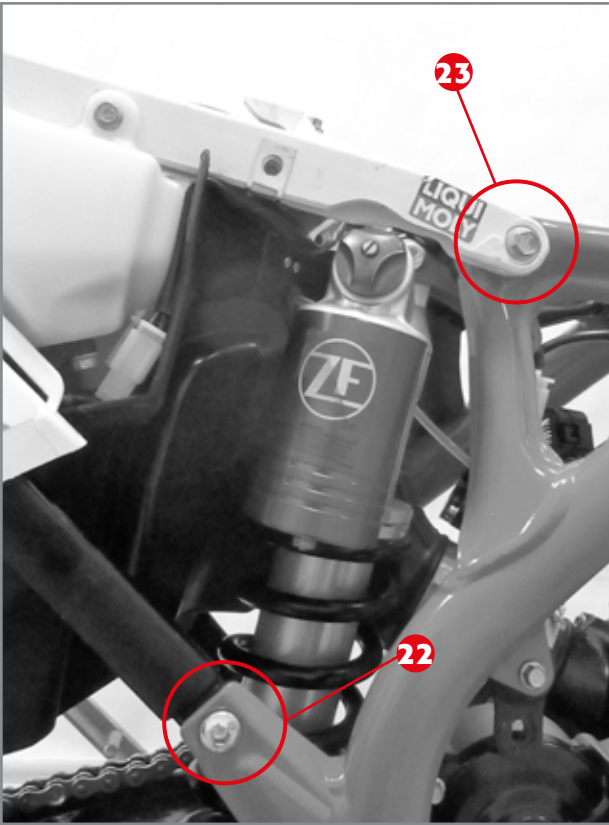
- Pull out the mixer tube **18** from the intake manifold and tube hold **19**.

**ATTENTION!**

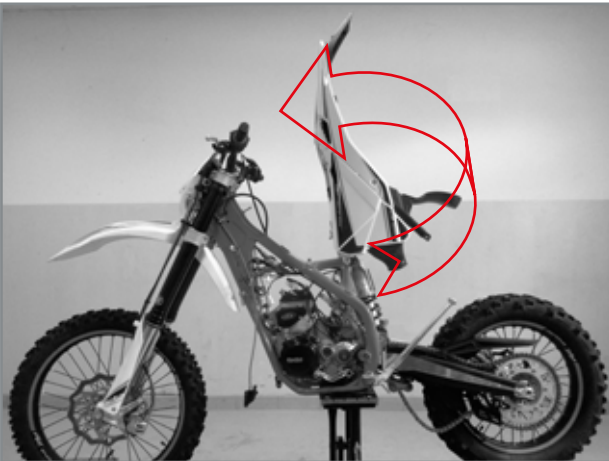
When the mixer tube has been disconnected, plug it to prevent emptying.



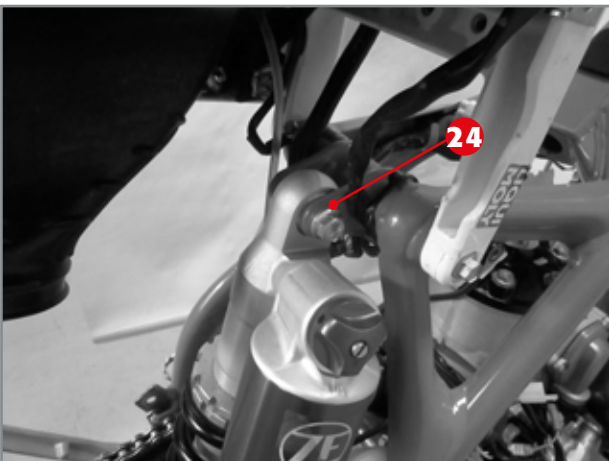
- Loosen the carburetor straps from the air filter sleeve and from the manifold.
- Disconnect the connector 20.
- Cut the strap 21.



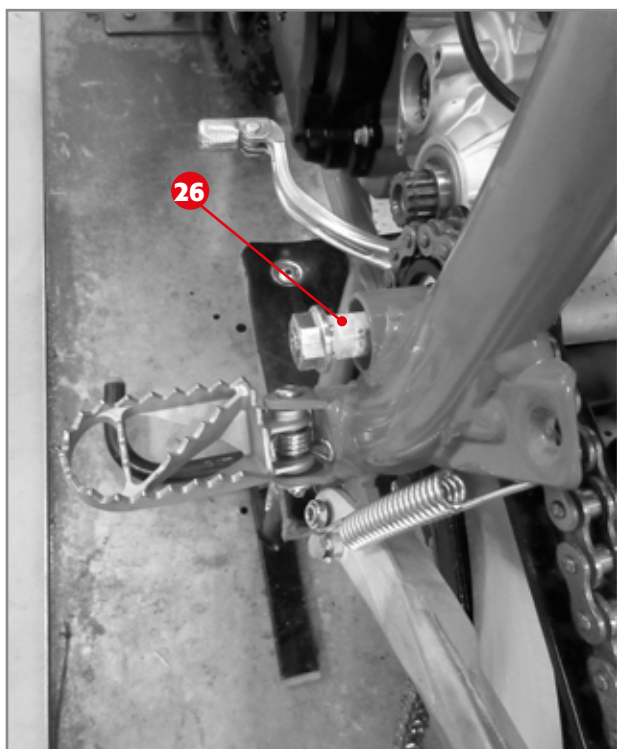
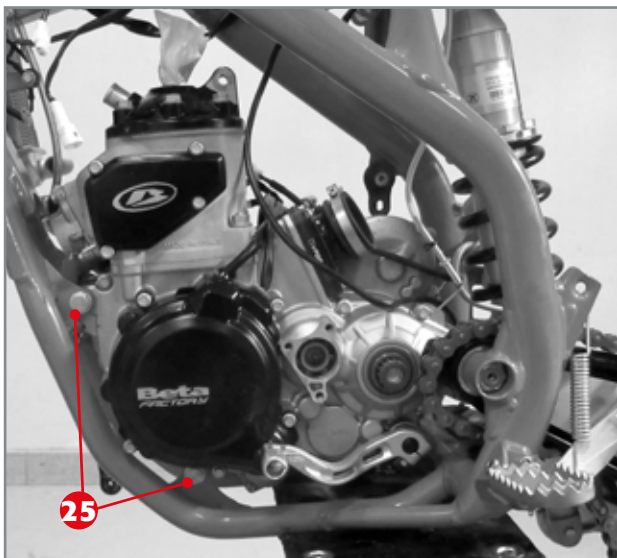
- Remove the frame lower fixing screws **22** (one on each side) and loosen the upper screws **23** (one on each side).



- Rotate the entire filter box unit.
- Remove the carburettor, leaving it connected to the gas cable.



- Remove the shock-absorber pin **24**.

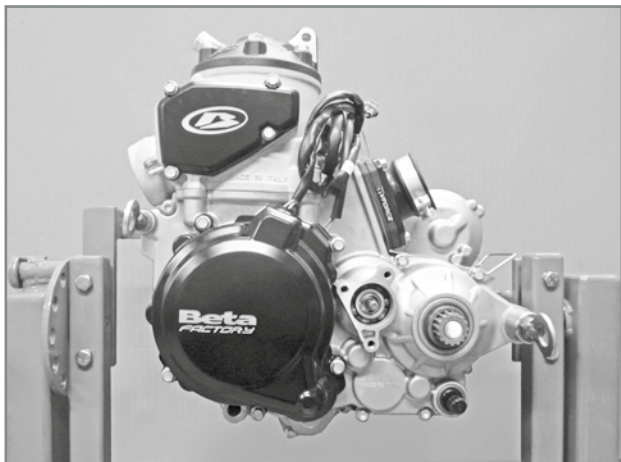


- Loosen the engine pins **25**.
- Remove the swingarm pin **26**.
- Then the engine pins (the shot-peened ones above **25**).
- Extract the engine from the frame and apply it to the specific stand, code 3625132 000, using the specific front fixing bracket, code 026140030 000.

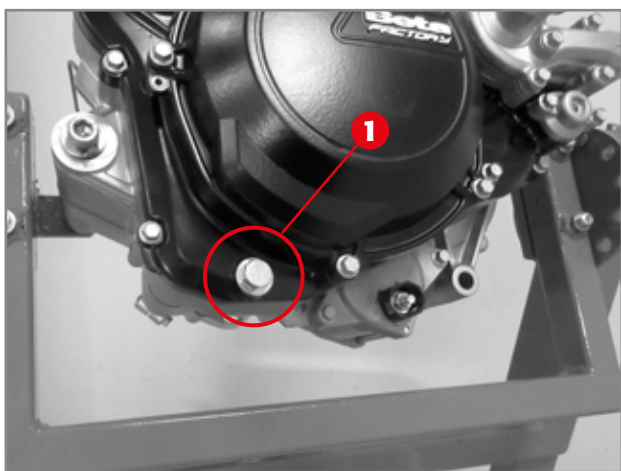
2 ENGINE DISASSEMBLY

2

ENGINE DISASSEMBLY

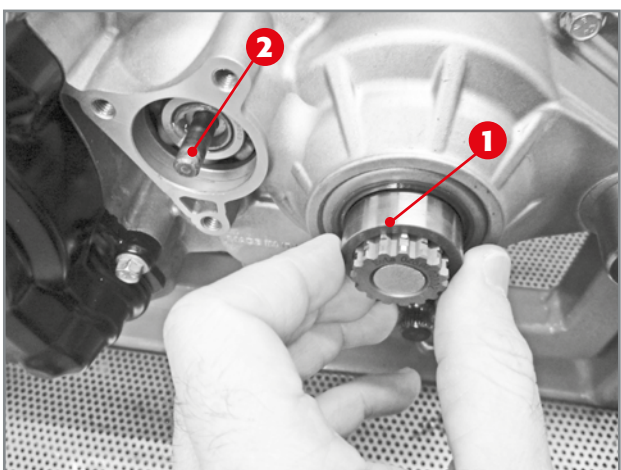


Secure the engine to the specific support stand *code 3625132000* by means of the front fixing *code. 026140030 000*, in order to work comfortably and safely. Then proceed as follows.



2.1 CLUTCH/GEAR OIL DRAIN

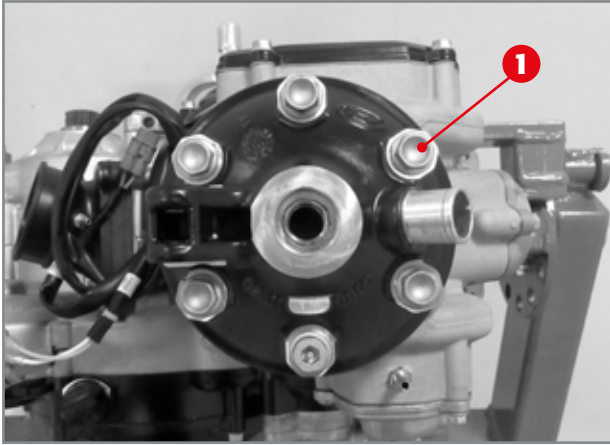
Remove screw **1** and let the oil drain.



2.2 REMOVAL OF CLUTCH CONTROL ROD AND PINION SPACER

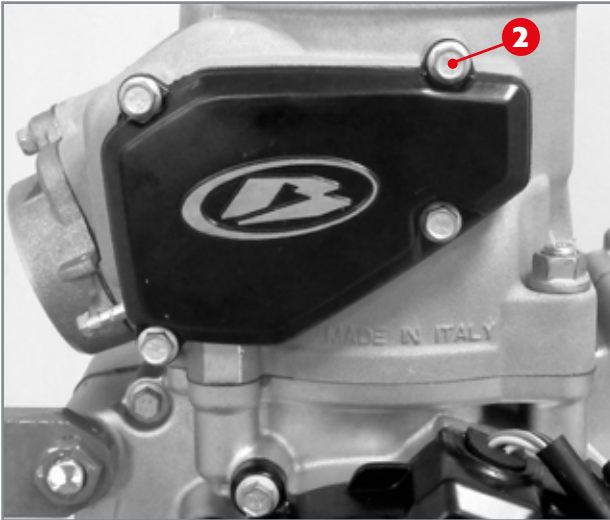
Take out the spacer **1**.
Take out the clutch control rod **2**.



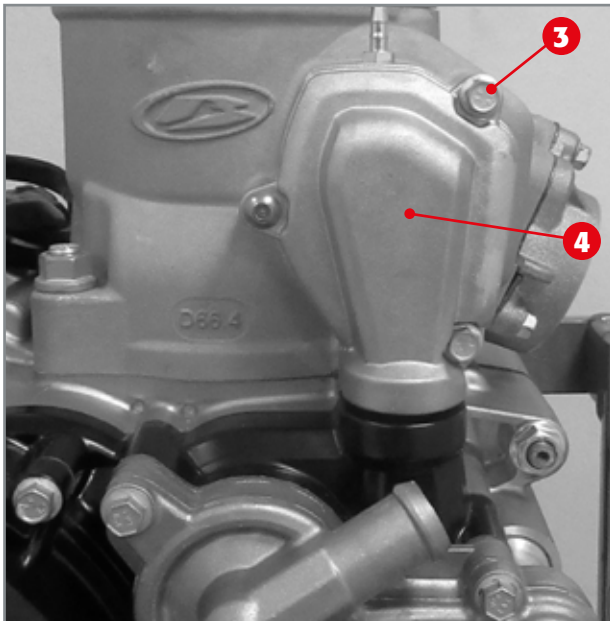


2.3 REMOVAL OF PISTON, CYLINDER AND HEAD

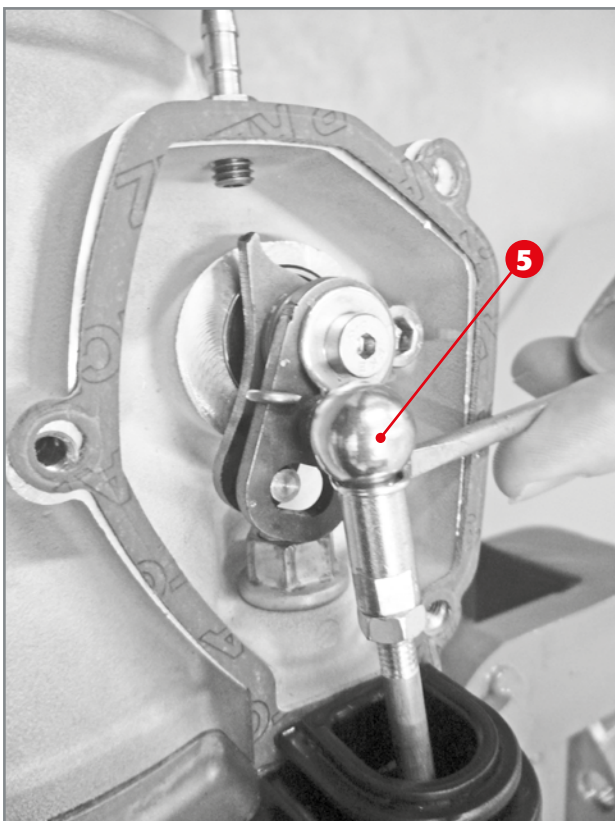
Remove the spigot screws **1** together with the copper washers. Remove the head and the two O-rings.



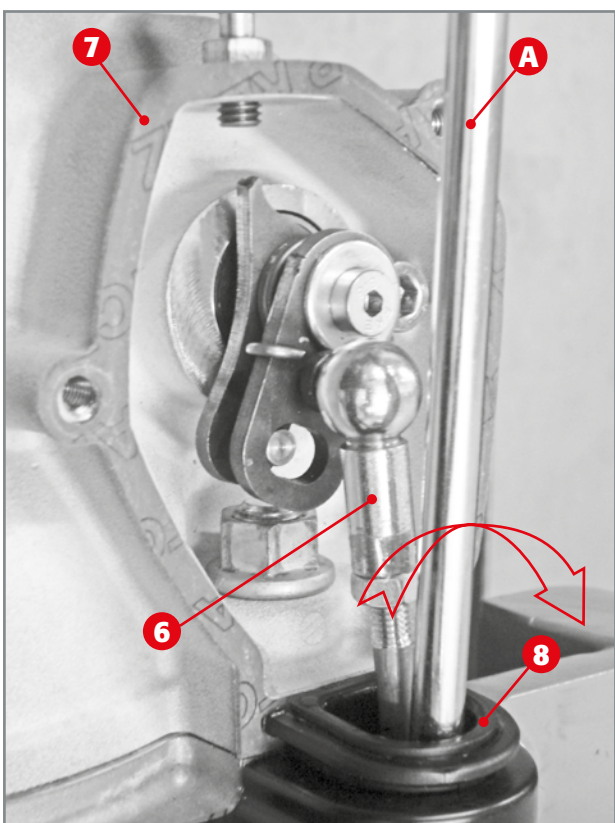
Remove the four screws **2**.



Remove the three screws **3** and cover **4**.



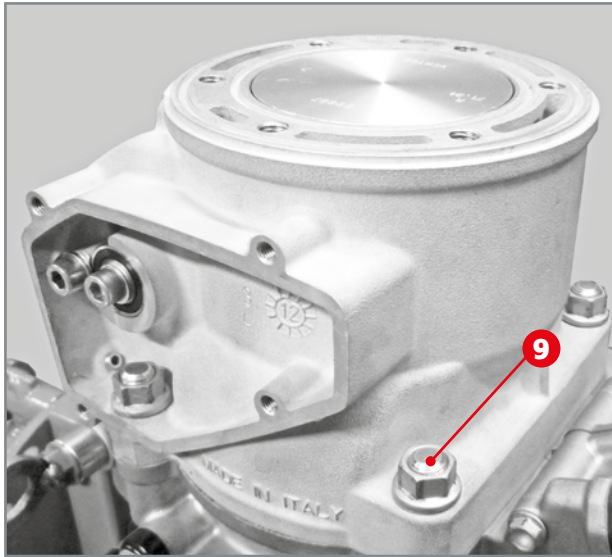
Release the lock **5** and remove it.



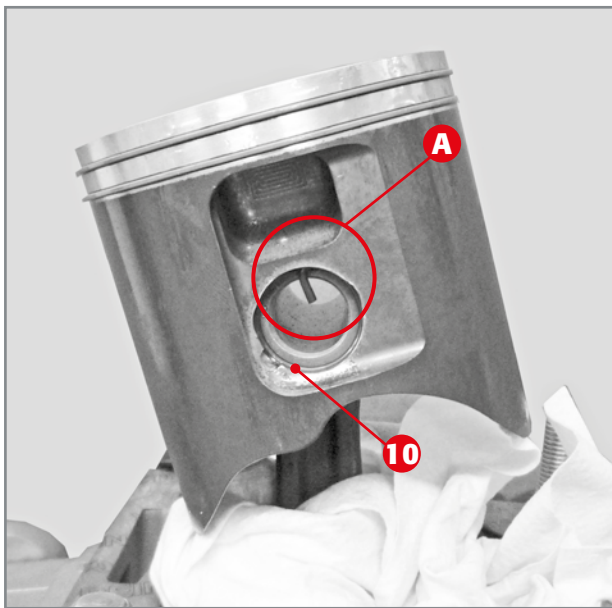
Release the control rod **6**.

Remove the gasket **7**. It may be necessary to slightly force the rubber gasket **8**; place a metal pin **A** between the lever and the gasket **8** and slightly force it outwards.

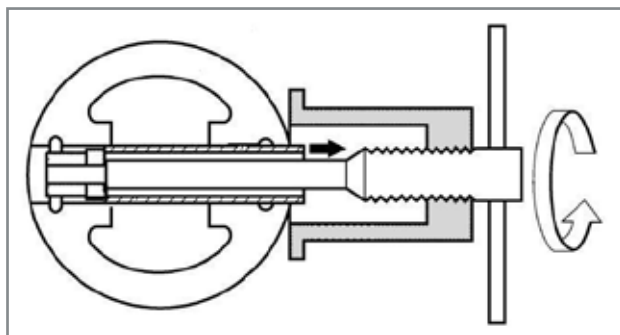
Removal of gasket 7.



Extract the cylinder and base gaskets.



Removal of piston circlip.



Removal of pin bolt.

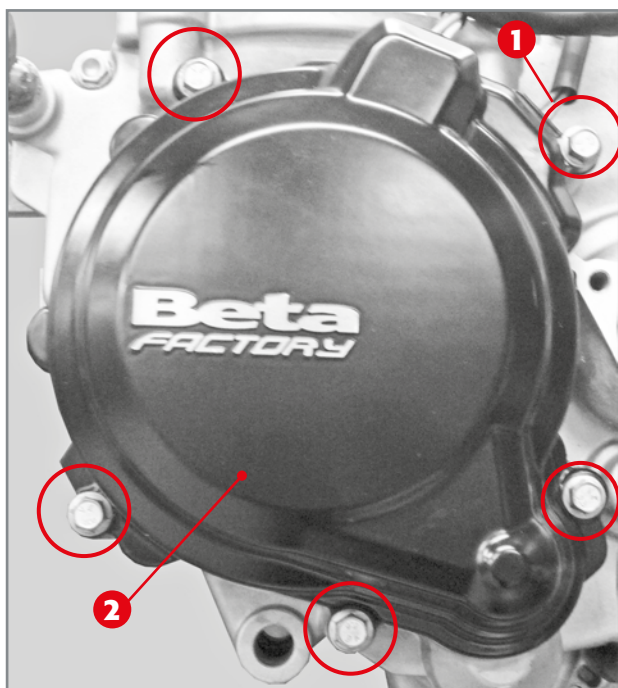
Remove the four collar nuts **9**.

ATTENTION!

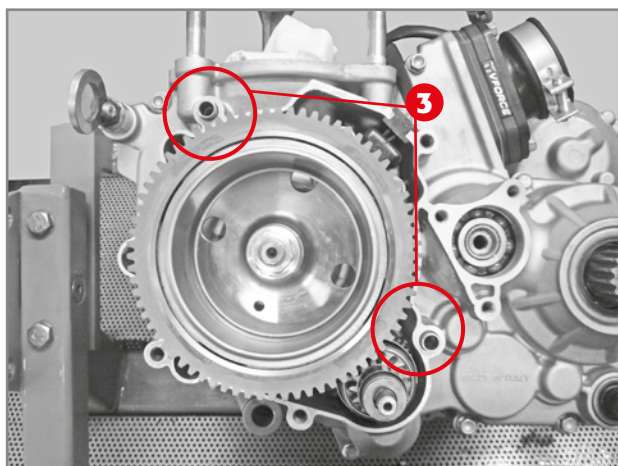
Place a clean cloth between the piston and the crankcase to keep foreign objects or simple solid residues from falling inside the base.

Remove the circlip **10** by gripping it with a pair of fine nose pliers **A**.

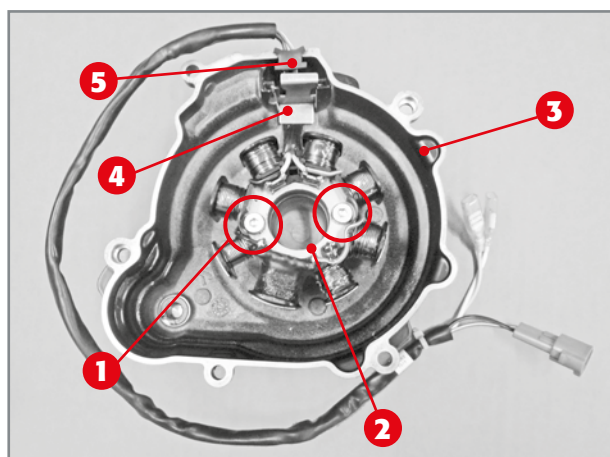
Remove the pin bolt using a universal extractor for pin bolts.
Remove the piston, the pin bolt and the bearing from the connecting rod foot.



Fixing screws 1 of flywheel cover 2.



The two references pins (3) dedicated to the flywheel cover.



Disassembly of stator from cover.

2.4 REMOVAL OF IGNITION UNIT

The ignition unit is made up of the flywheel (or rotor), the pick-up unit and the stator, which is one with the flywheel cover.

2.4.1 Flywheel cover plate removal

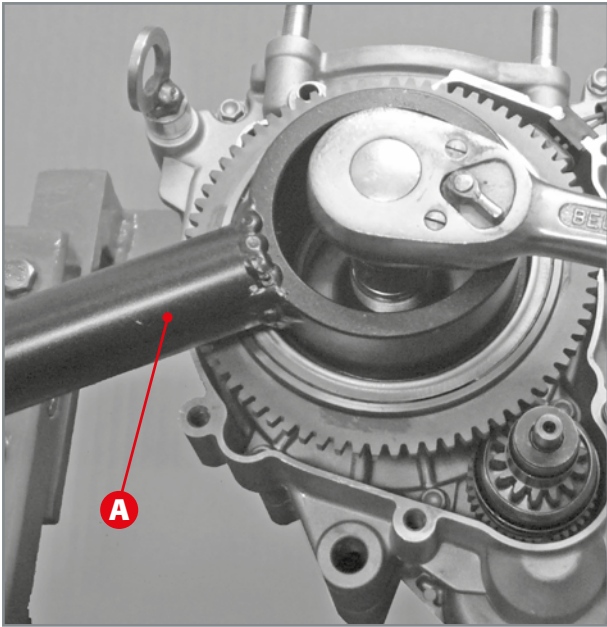
Remove the five screws 1 fastening the flywheel cover 2 to the left crankcase.

Remove the flywheel cover and the gasket placed between the crankcase and the cover.

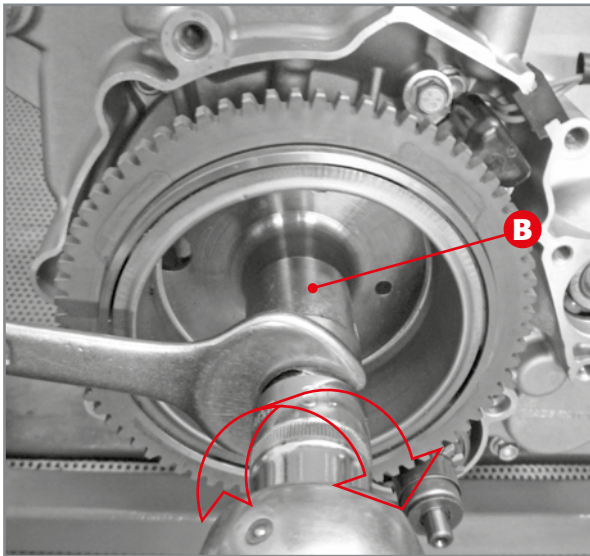
Pay attention to the two centring pins 3 on the crankcase.

2.4.2 Stator removal

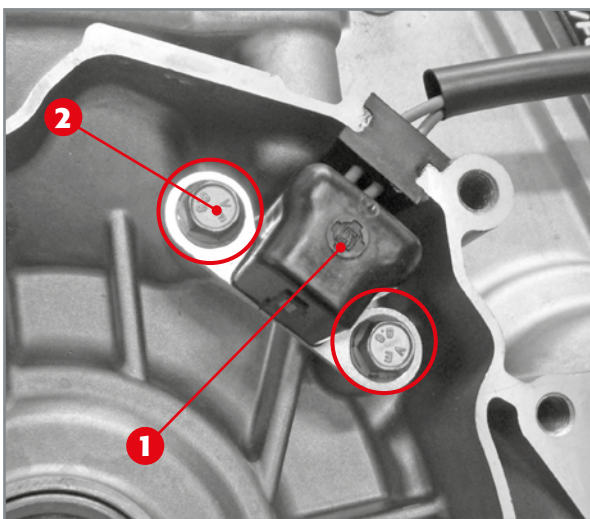
Remove the two screws 1 fixing the stator 2 to the flywheel cover 3. Extract the plate 4 and the cable gland 5 from the cover and take out the stator.



Removal of flywheel nut.



Release of flywheel using special tool B.



Removal of pick-up unit.

2.4.3 Flywheel removal

Block the flywheel using special tool **A** (code 026140040 000) and remove the fastening nut securing the flywheel to the crankshaft.

NOTE: Once the nut has been unscrewed, pay attention to the special elastic washer placed between the nut and the flywheel.

To remove the flywheel, tighten the extractor **B** (code 3625173) onto the threaded part on the flywheel.
Keep the extractor blocked with a spanner and tighten the screw on the extractor using a box spanner.

2.4.4 Removal of pick-up unit

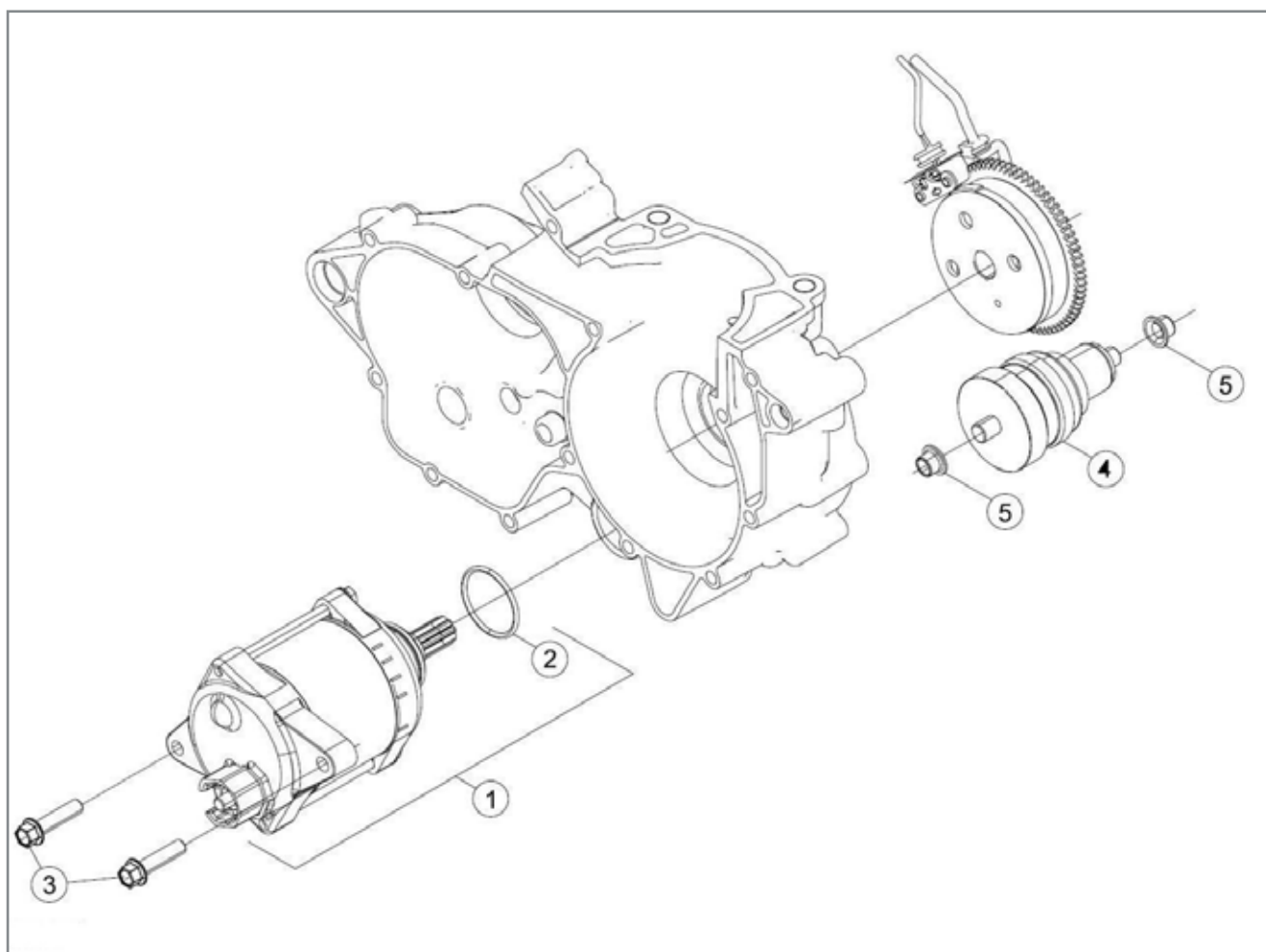
Remove pick-up unit **1** by loosening the two fixing screws **2**.

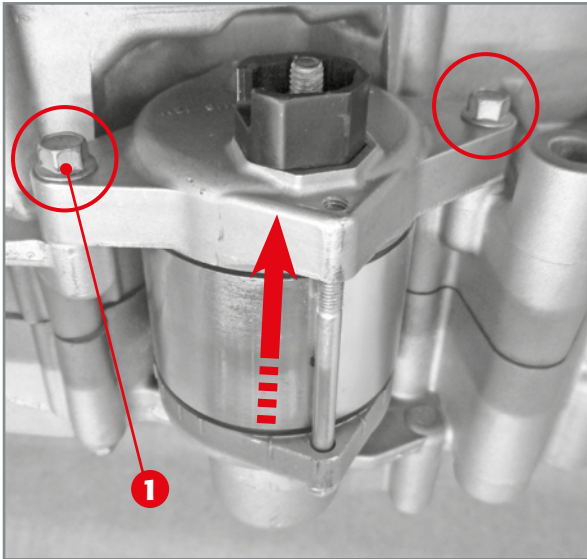
2.5 REMOVAL OF ELECTRIC IGNITION

The electric ignition is carried out by means of start motor **1** that meshes on the Bendix coupling **4**. The coupling gear axially shifts and meshes onto the ring gear, which is one with the flywheel, due to the start motor rotation. The coupling gear retracts to its rest position, once the motor action ends.

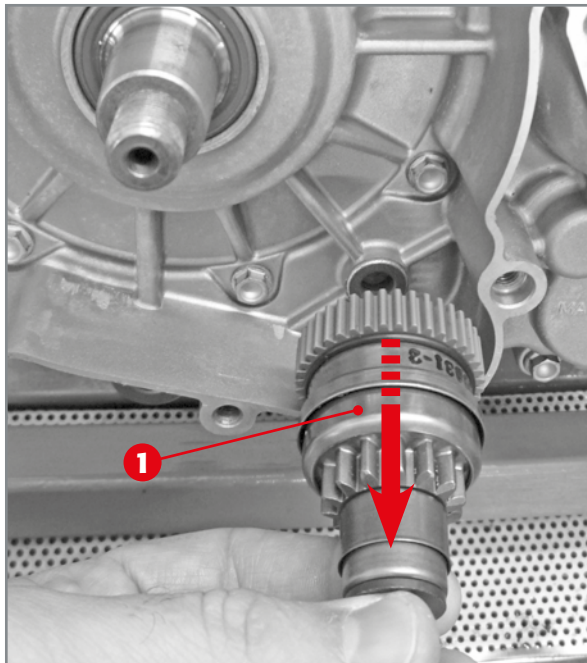
EXPLODED VIEW OF ELECTRIC KICKSTARTER:

- 1) Start motor;
- 2) O-ring;
- 3) Screws;
- 4) Bendix coupling;
- 5) Bush with collar.





Removal of start motor.



Removal of Bendix coupling.

2.5.1 Start motor removal

Remove the two screws 1 and extract the motor itself.

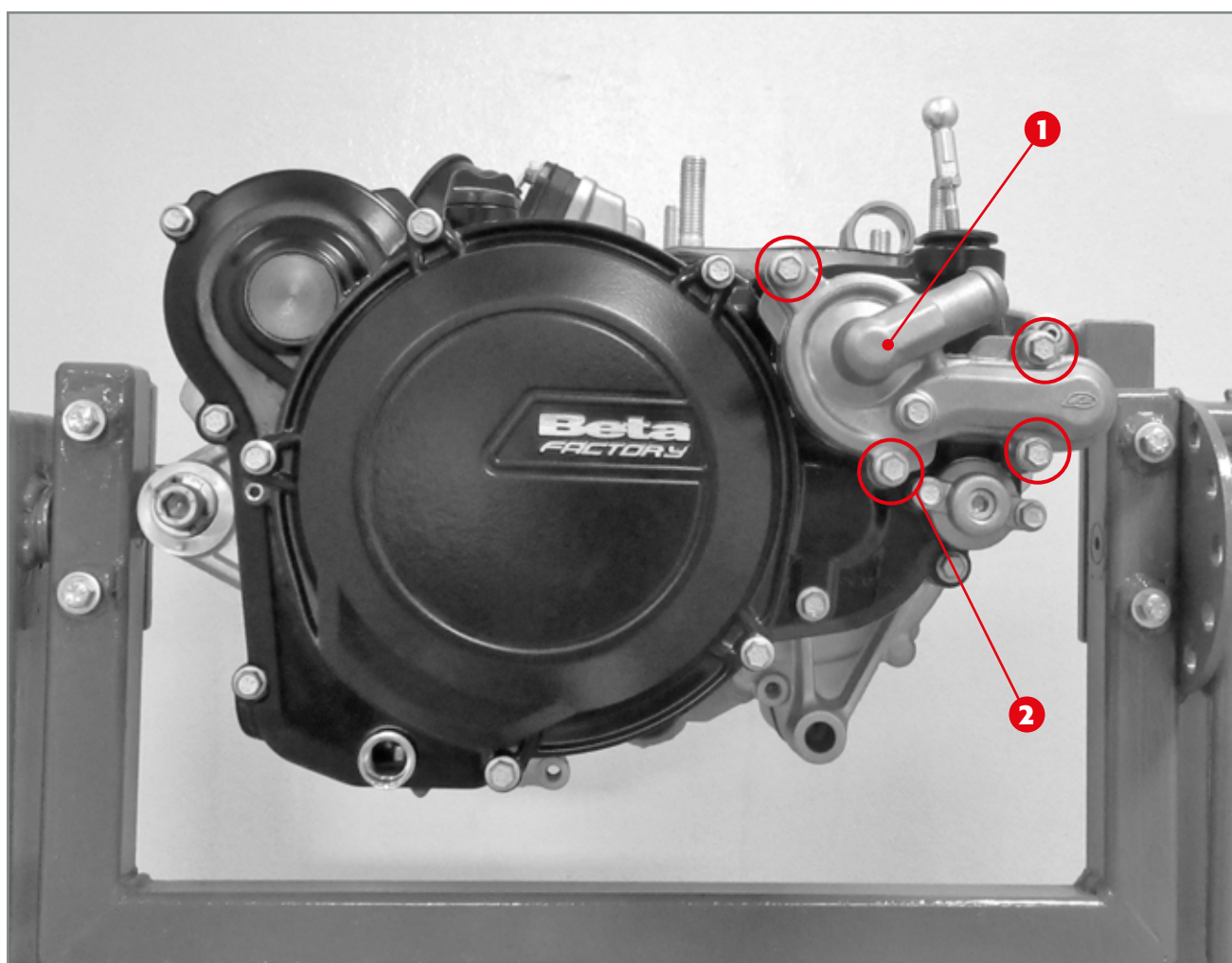
2.5.2 Removal of Bendix coupling

Extract the Bendix coupling 1 once the complete flywheel cover and flywheel itself (see par. 2.4.1) have been removed.

2.6 REMOVAL OF COOLANT LIQUID PUMP, CLUTCH UNIT, MAIN GEAR, CENTRIFUGAL UNIT, GEAR-SHIFT ORGANS, KICKSTART

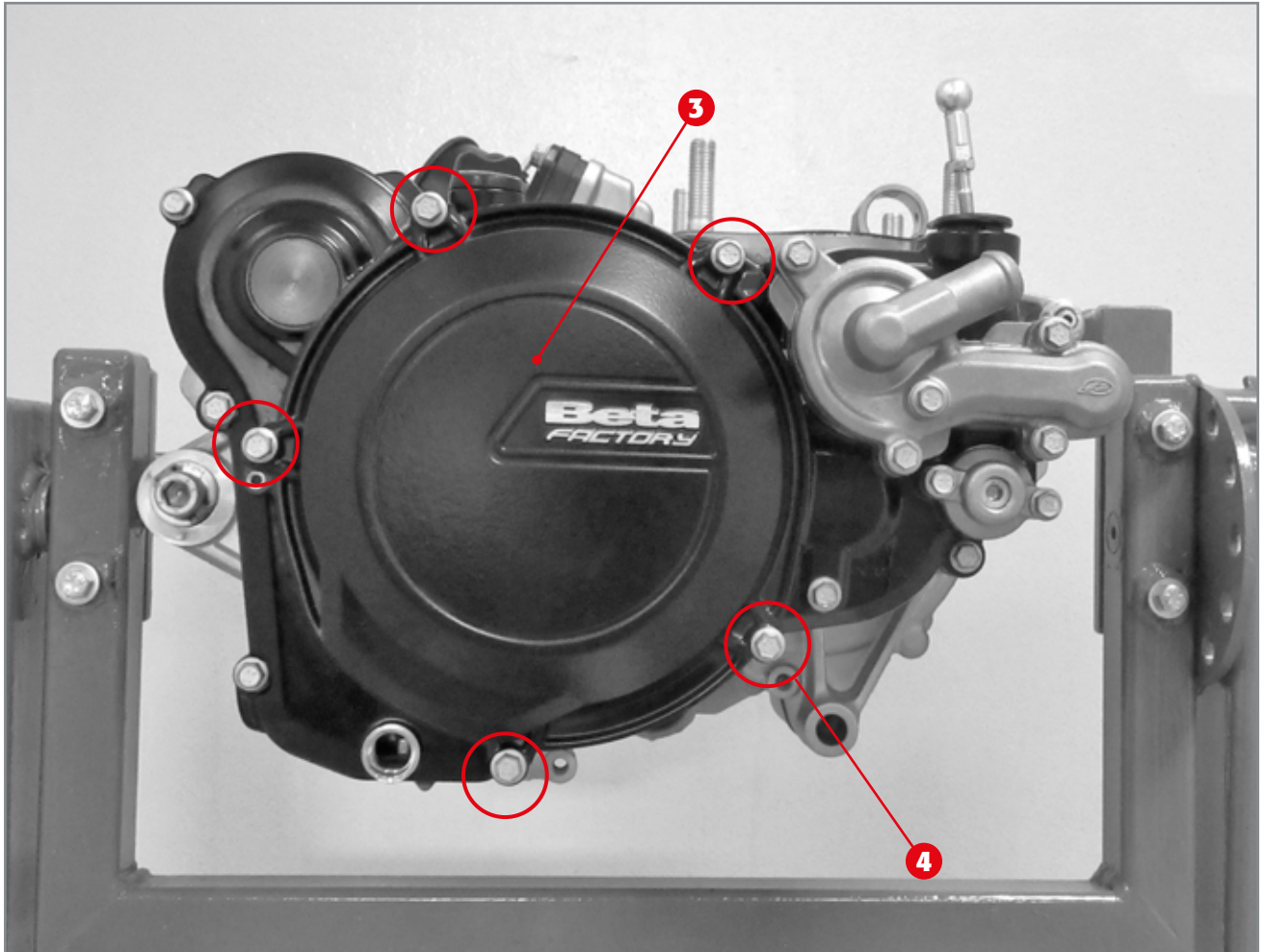
Remove the cover 1 by loosening the screws 2 to access the coolant liquid pump.

Note: remove the coolant liquid pump impeller if you have to intervene on the centrifugal unit.



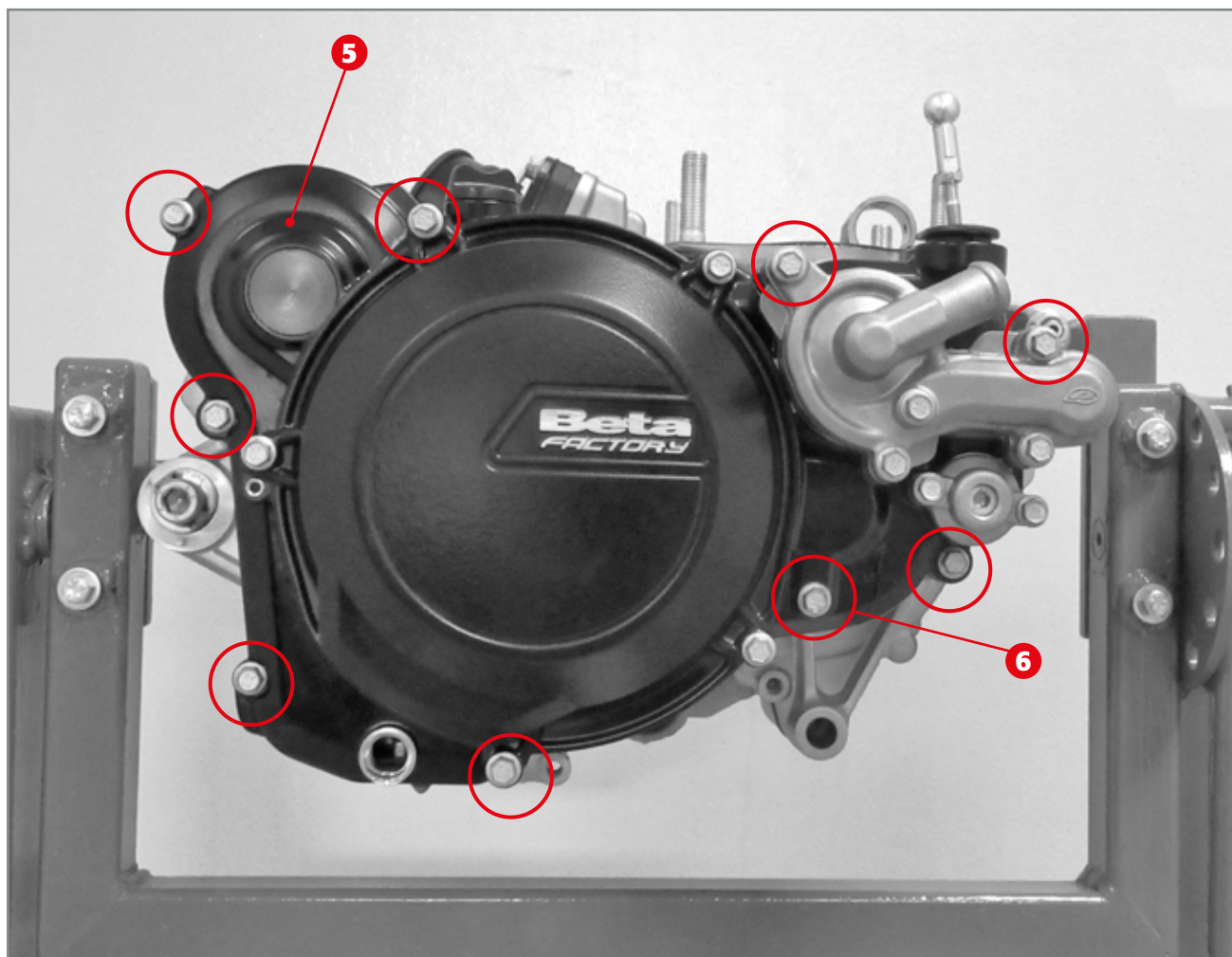
Coolant liquid pump cover screws.

In order to only access the clutch unit, the outer clutch cover **3** must be removed by loosening the screws **4**.

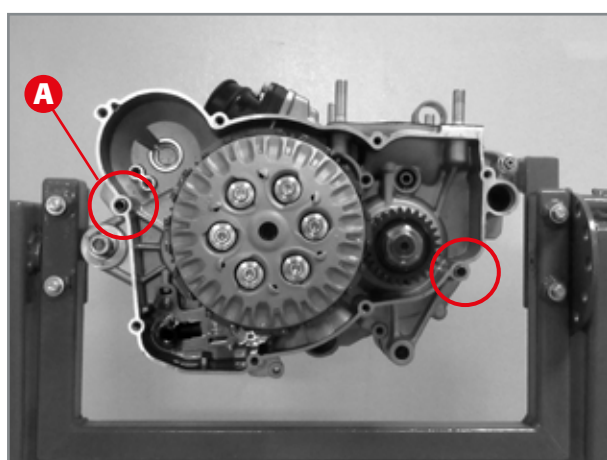


Outer clutch cover screws.

When doing a complete overhaul of the engine or of gearshift organs, kickstart, primary transmission or centrifugal unit, the inner clutch cover **5** must be removed by loosening the nine screws **6**.

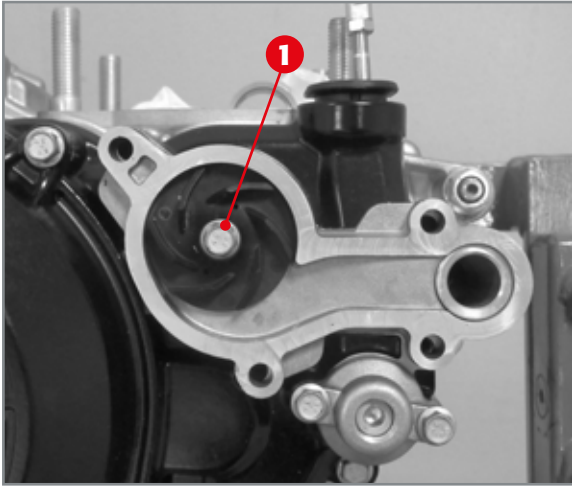


Inner clutch cover screws.

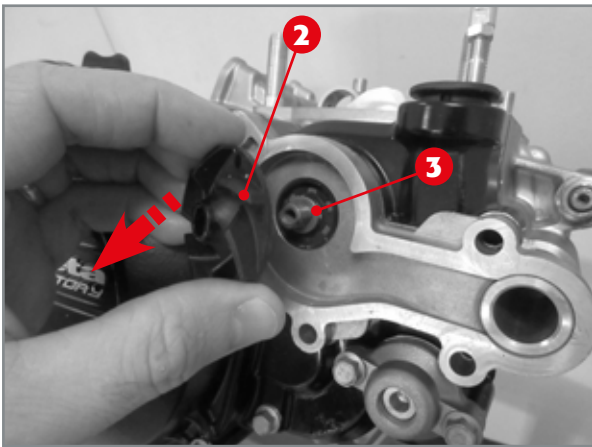


Two centring pins A for inner clutch cover coupling.

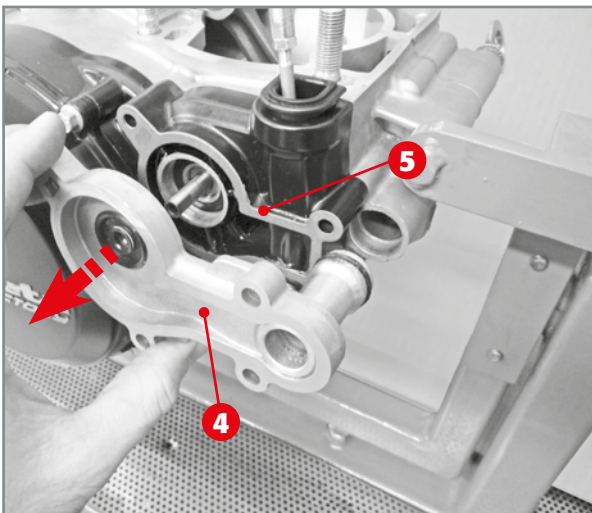
Pay attention to the two reference pins **A** placed between the right crankcase half and the inner clutch cover while disassembling.



Cooling pump fixing screw.



Removal of impeller.



Removal of pump body and gasket.

2.6.1 Cooling liquid pump removal

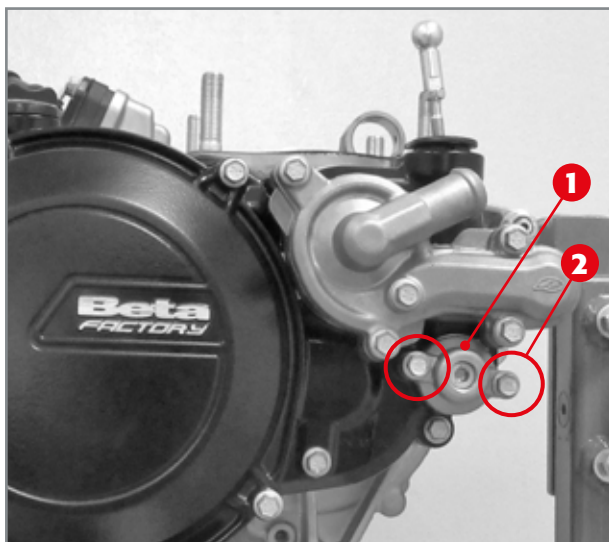
Loosen fixing screw 1 once the coolant liquid pump cover has been removed.

Extract the impeller 2 and the thrust washer 3.

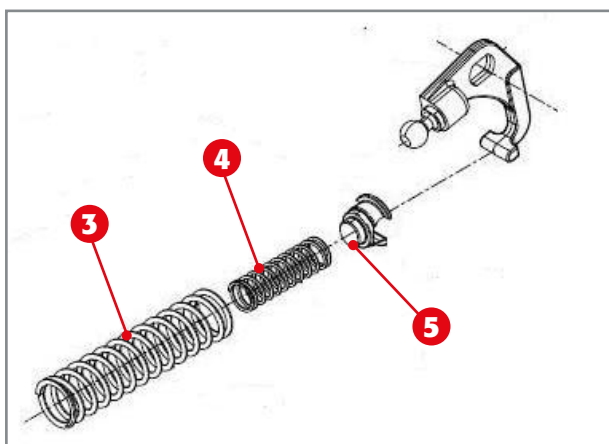
Extract the complete pump body 4 and remove gasket 5.

2.6.2 Removal of centrifugal unit and leverage

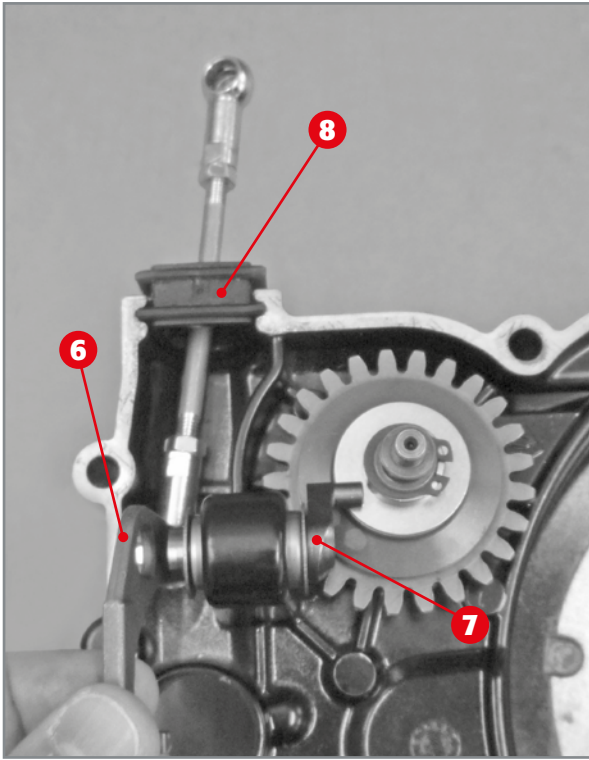
Access the centrifugal unit and leverage by removing the inner clutch cover. Disassemble the adjustment cover **1** by removing the two screws **2**, once the pump impeller has been removed (par. 2.6.1).



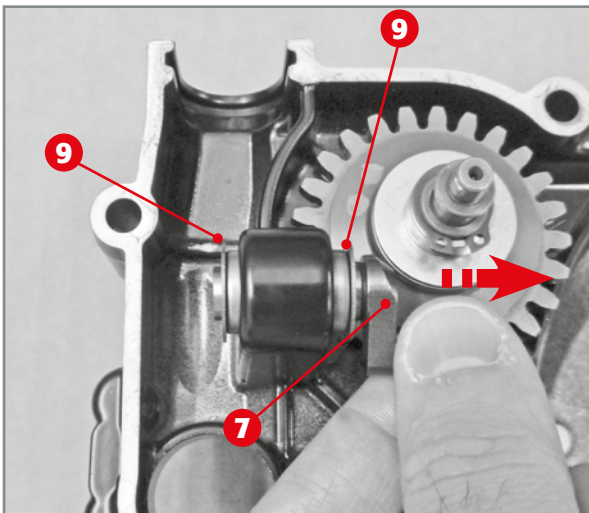
Removal of centrifugal adjustment cover.



Remove the unit consisting of adjusting springs **3**, auxiliary springs **4** and the spring guide **5**.



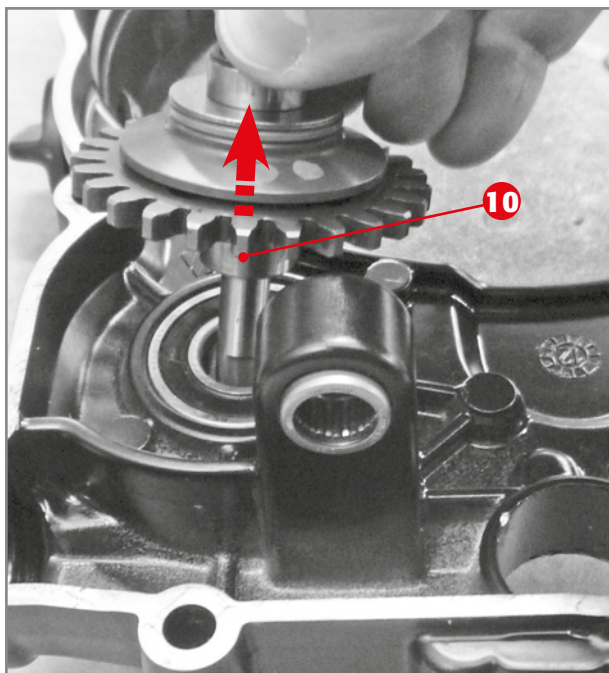
Disassembly of control rod-rocker arm unit.



Removal of centrifugal control lever.

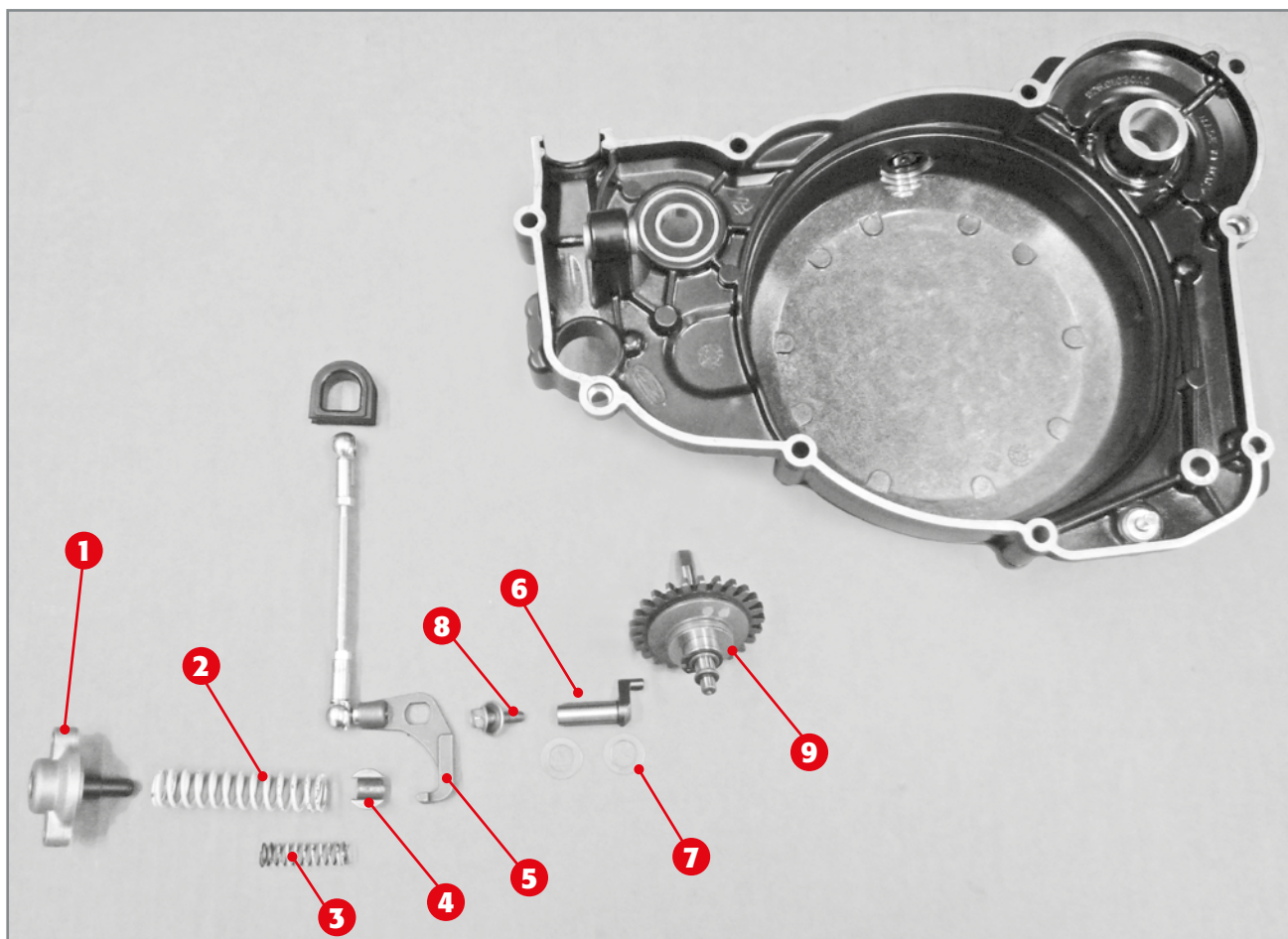
Extract the rocker arm complete of control rod and gasket **8**, once the screw fixing the rocker arm **6** to the centrifugal control lever **7** has been removed.

Extract the centrifugal control lever **7** together with the two thrust washers **9**.



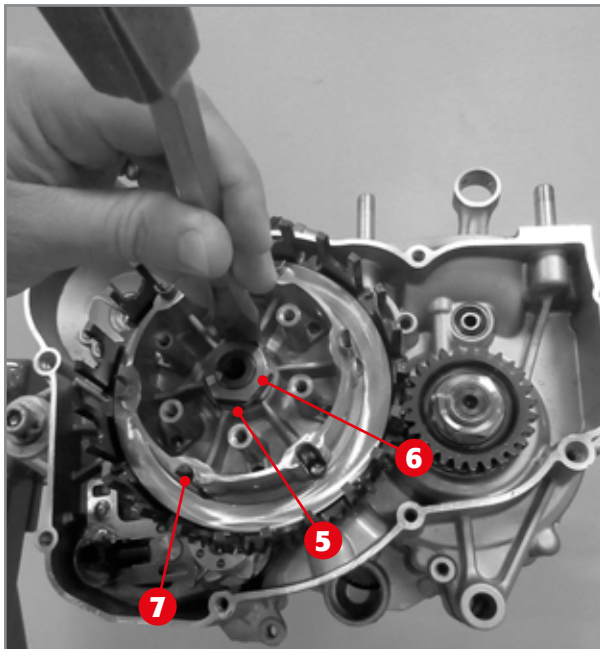
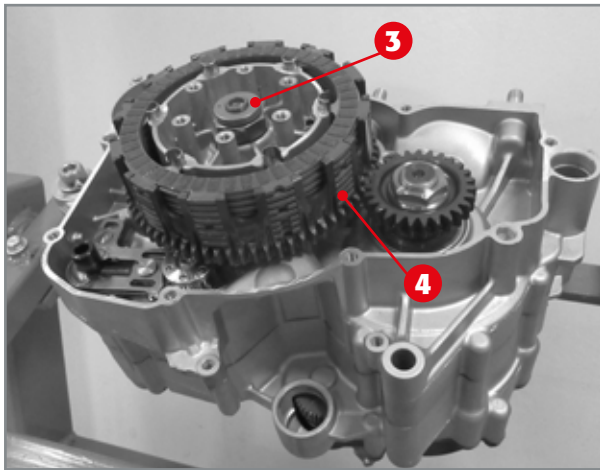
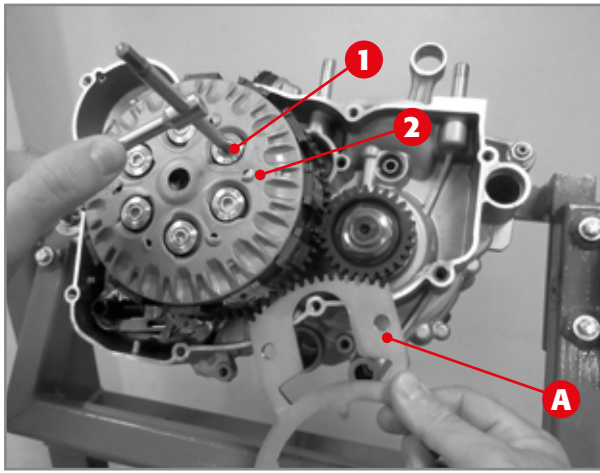
Extraction of centrifugal unit.

Extract the complete centrifugal unit 10.



- 1) Control cover;
- 2) Adjusting spring;
- 3) Auxiliary spring (if applicable);
- 4) Spring guide;
- 5) Rocker arm;
- 6) Centrifugal control lever;
- 7) Thrust washers;
- 8) Screw;
- 9) Centrifugal unit.





2.6.3 Clutch unit disassembly

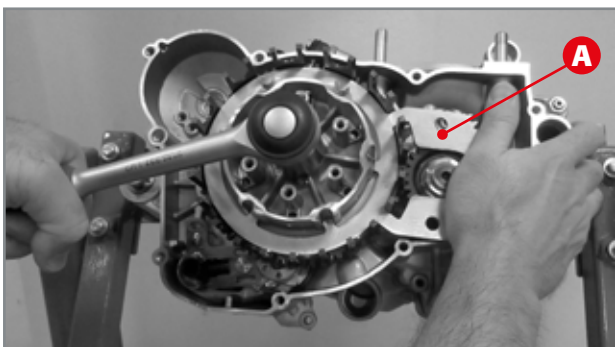
Keep the clutch unit blocked by using the special tool **A** (code 029.14.002.50.00), remove the screws **1** which fasten clutch cap **2** to the clutch drum. Remove the clutch cap together with the washers and relative springs.

Extract the complete pressure plate unit **3** and the clutch disc pack **4**.

In order to complete the disassembly of the clutch unit, open the safety washer **5** by using a chisel and remove the nut **6**.

ATTENTION!

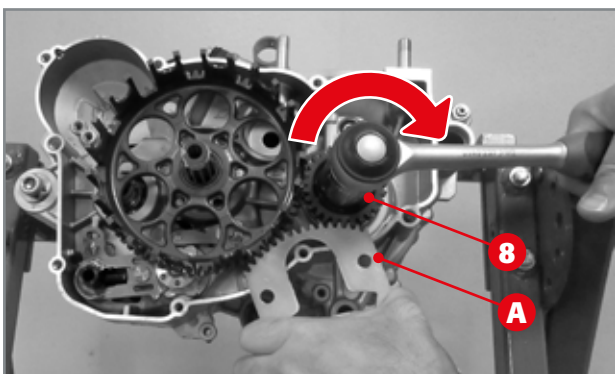
*Do not remove the sliding pins **7**.*



To unscrew nut **6**, the clutch drum must be blocked with a suitable tool **A** (code 029.14.002.50.00). Then remove the nut and relative safety washer.

ATTENTION!

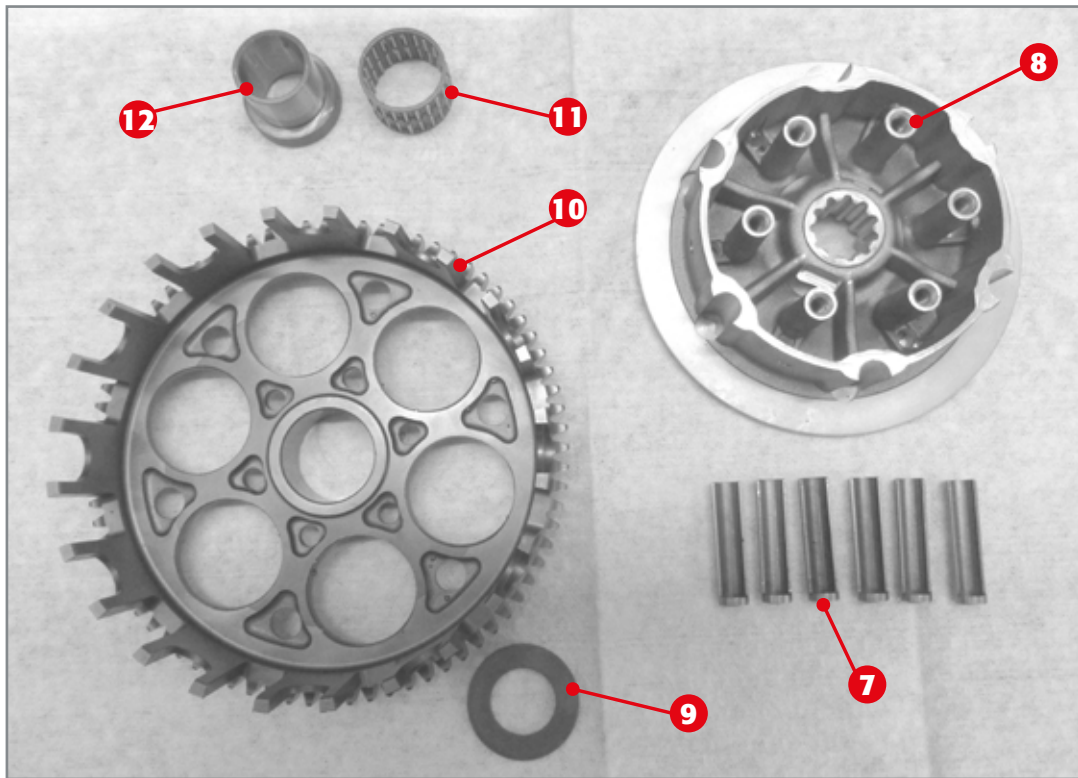
Do not use the pneumatic gun.



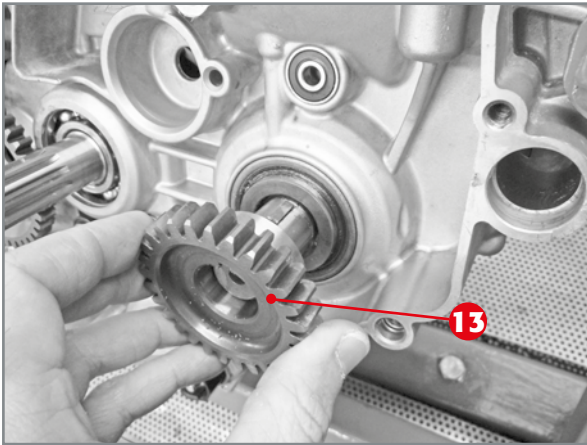
Using the special primary tool **A** (code 029.14.002.50.00), disassemble the nut that tightens the primary gear **8** onto the crankshaft.

ATTENTION!

The nut must be turned clockwise.



Extract the clutch drum **8**, the washer **9**, the case **10**, the roller cage **11** and the centre bearing **12**. It is possible to remove the sliding pins **7**.

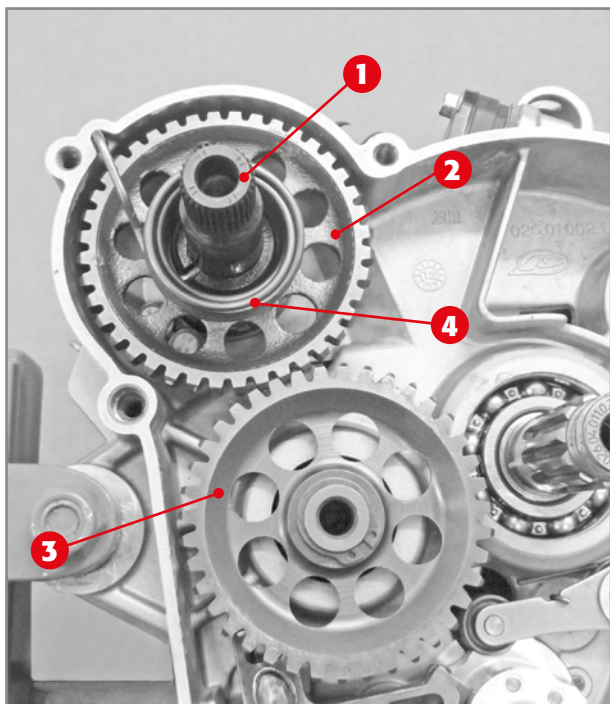


Removal of primary gear.

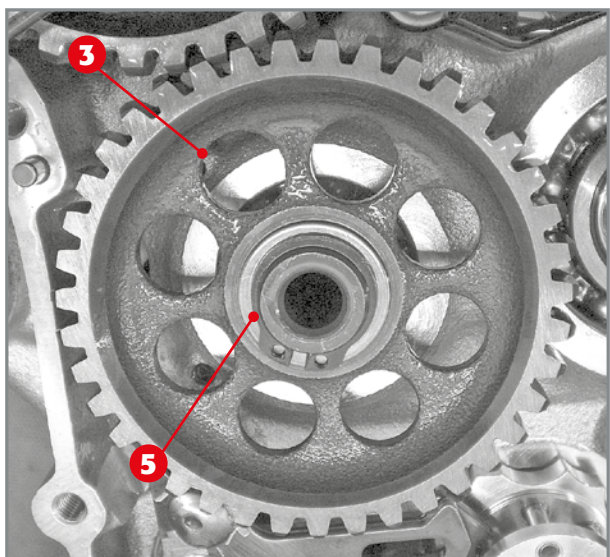
Extract the primary gear **13**. Removal can be facilitated by using a universal extractor.

2.6.4 Pedal kickstart - Optional

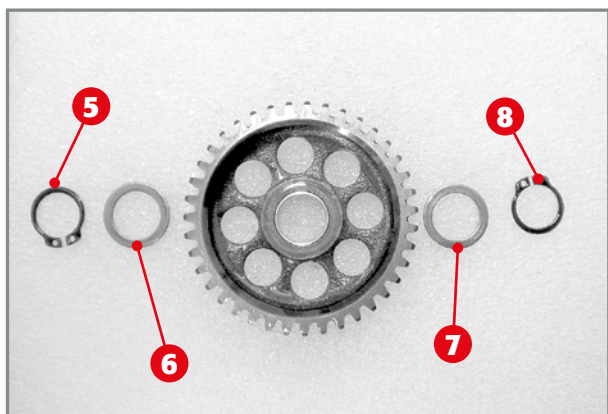
The kickstarter is made up of the pedal which, attached to the kickstarter shaft 1, moves the kickstarter gear 2. This gear moves the idler wheel 3, which then engages with the clutch case. The device moves back thanks to the spring 4.



The pedal kickstart.

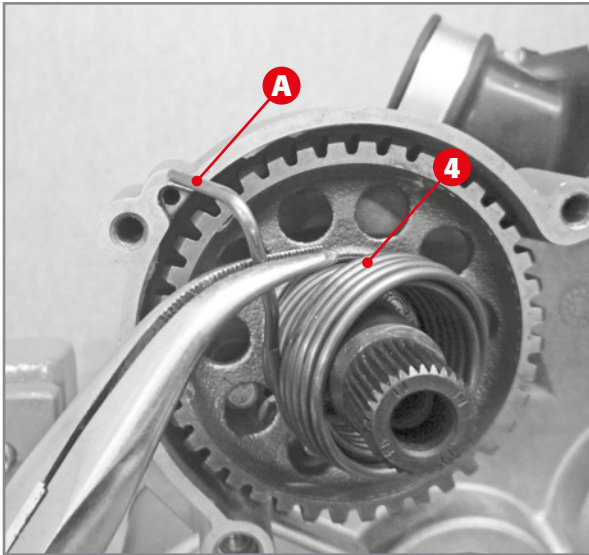


Removal of circlip 5 of idler gear 3.



Two circlips 5 and 8 and thrust washers 6 and 7.

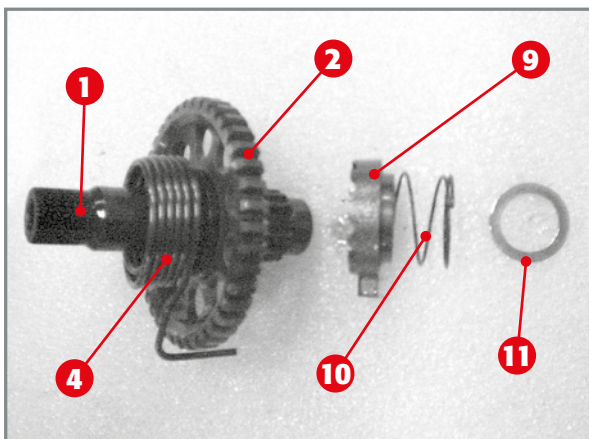
Remove the external circlip 5 and pull off the external thrust washer 6, the idler gear 3, the internal thrust washer 7 and the second circlip 8. The circlips and thrust washers are interchangeable.



Release of spring from crankcase.



Extraction of shaft from crankcase.



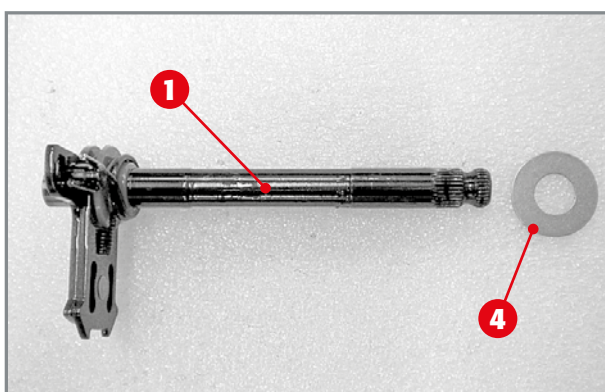
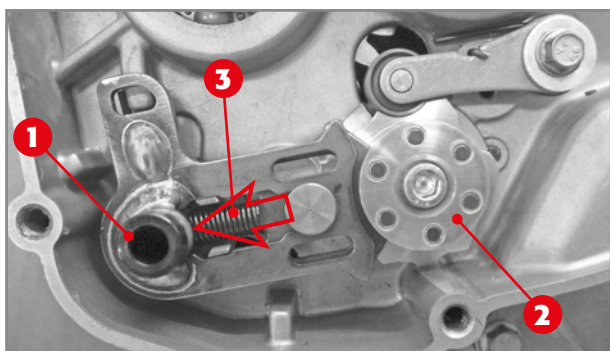
Complete pedal kickstart shaft.

Using a pair of pliers, pull the end **A** of the spring **4** from the hole on the crankcase and bring it to a standby position by turning it anti-clockwise.

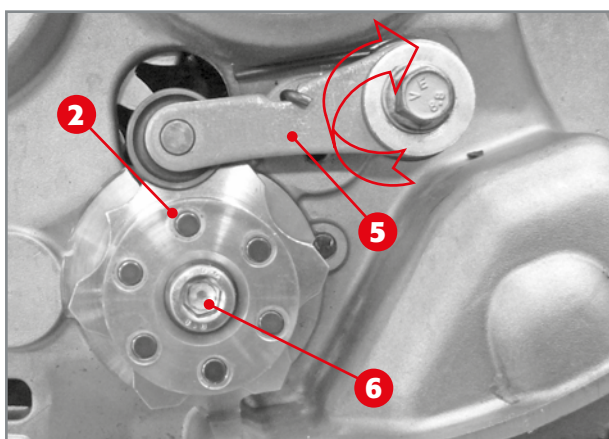
Turn the shaft anti-clockwise and pull it off together with the sleeve **9**, the spring **10** and the thrust washer **11**.

2.6.5 External gearshift unit

The external gearshift is made up of the drive shaft **1** on which the movable and fixed pawls are applied. The fixed pawl is the guide of the movable pawl, which has the task of engaging the stop cam **2**. In turn, this is fastened to the internal gearshift and is kept in the fixed position by the cam stop lever. In order to disassemble the drive shaft, just keep the movable pawl return spring **3** pressed and extract the shaft together with the specific washer **4**.

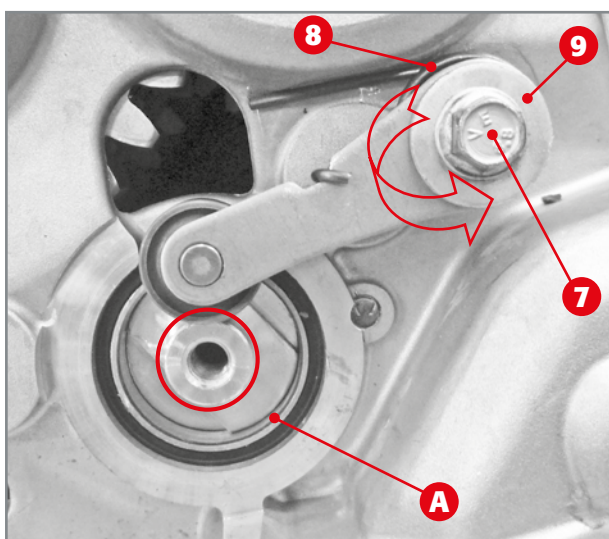


Gearshift with washer.



Disassembly of stop cam.

In order to disassemble the stop cam **2**, keep the cam stop lever moved **5**, loosen the screw **6** and pull out the stop cam **2**.



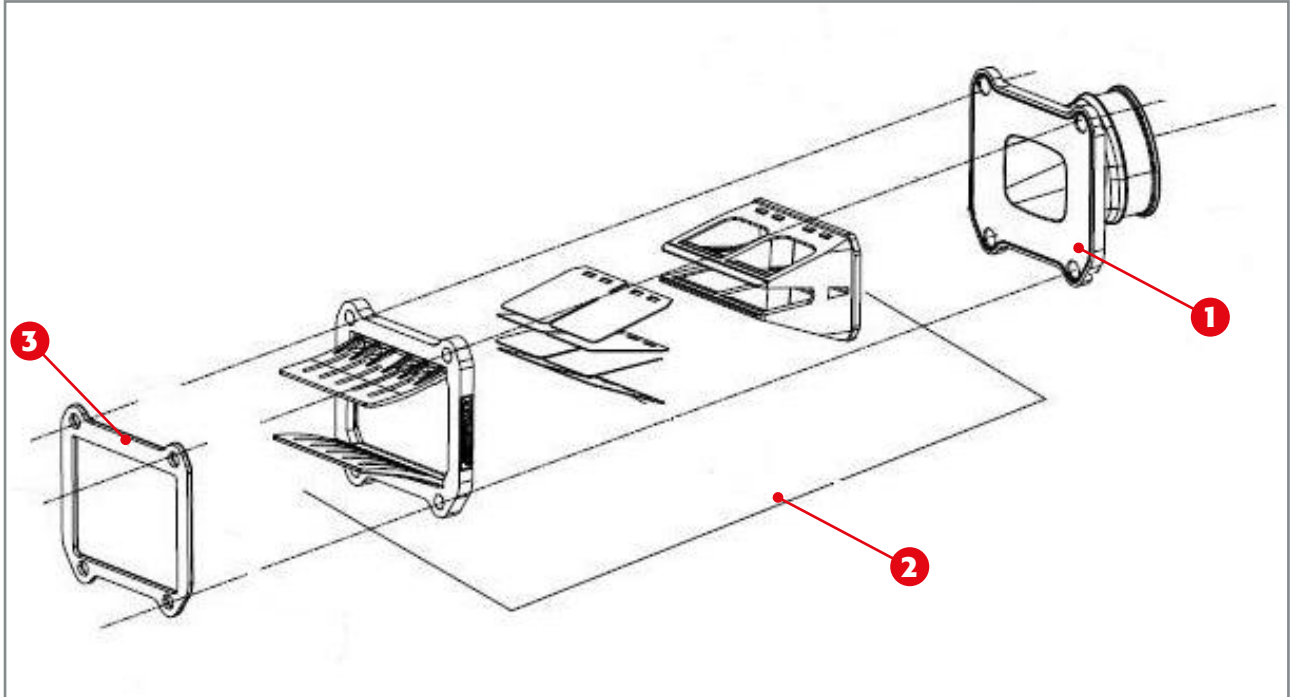
Disassembly of cam stop lever.

In order to disassemble the stop lever, loosen the screw **7** enough to allow the lever to move axially and overcome the cylinder segment **A** of the desmodromic device. Bring the return spring **8** to the rest position and remove the screw, the washer **9**, the spring together with the spacer (not shown in the image) and finally the cam stop lever.

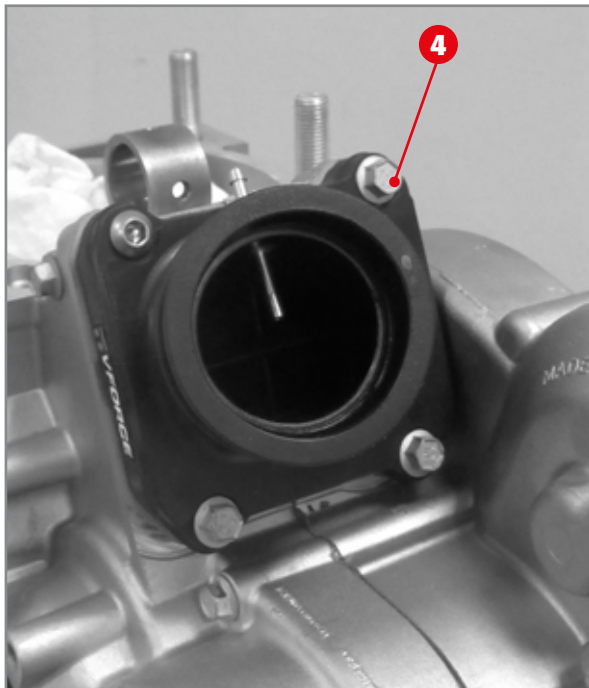


2.7 INTAKE SYSTEM

The intake system mainly consists of the intake manifold **1** and reed valve **2** and the spacer **3**.



- 1) Intake manifold;
- 2) Complete reed valve;
- 3) Gasket.



Fixing screws.

Disassemble by removing the screws **4** fastening the intake manifold and the reed valve to the crankcases.

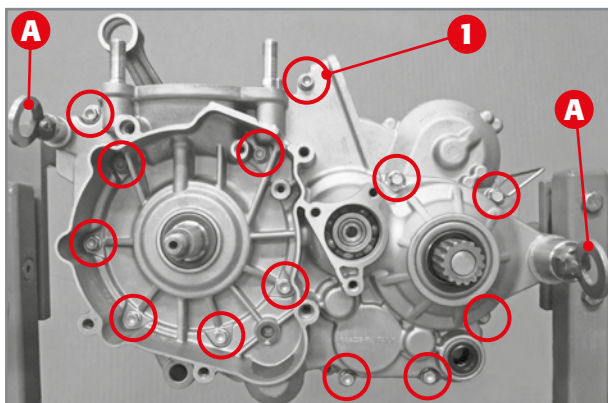
2.8 CRANKSHAFT, GEAR-BOX UNIT AND INTERNAL GEARSHIFT

To access the crankshaft, gearbox unit and internal gearshift, the left and right crankcases must be detached. Here are the instructions required.

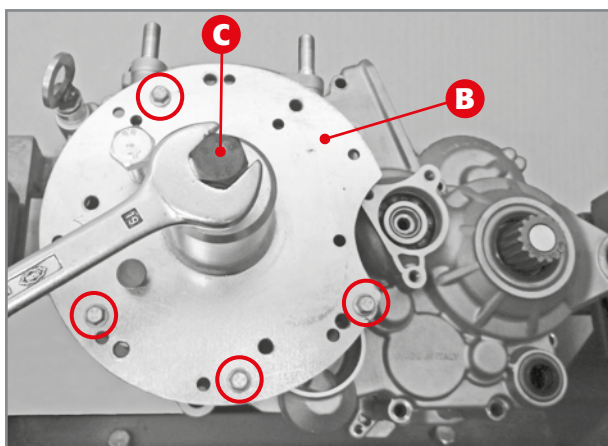
2.8.1 Opening the crankcase

Remove the thirteen screws **1** fastening the crankcases.

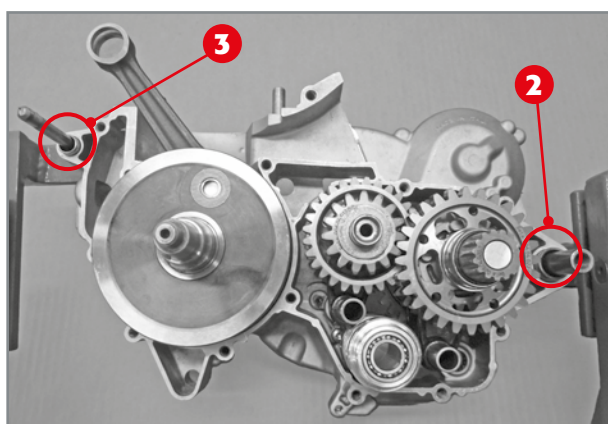
Attention! Loosen the two equipment fixing screws **A**.



Removal of crankcase screws.



Crankcase uncoupling phase.

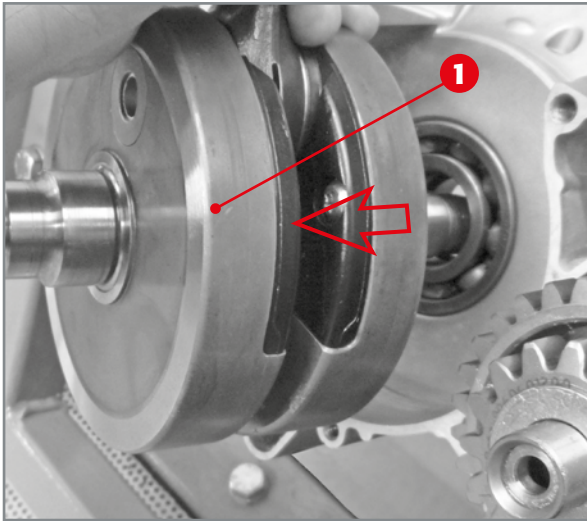


Crankcase half reference pins.

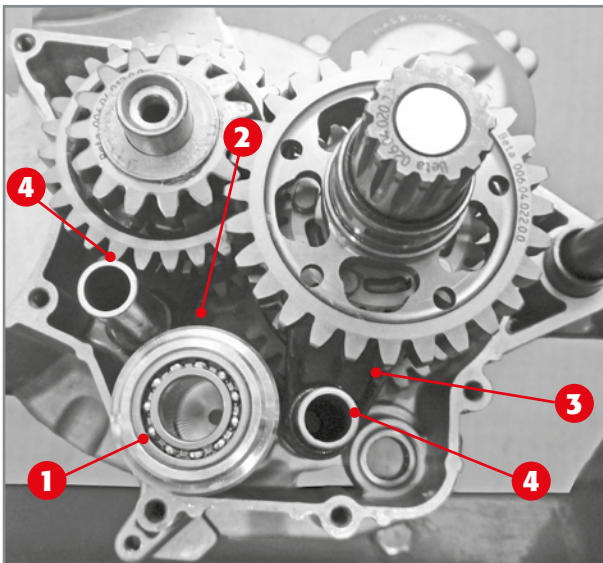
Apply special tool **B** to the right crankcase half following the punching on the tool itself. Fix the tool with the four M6x20 screws (maximum torque 10Nm). Tighten screw **C** on the special tool. Slightly hit the gear secondary with a rubber mallet during said operation.

Once the crankcases have been detached, remove the two fixing screws to the equipment **A** and remove the left crankcase.

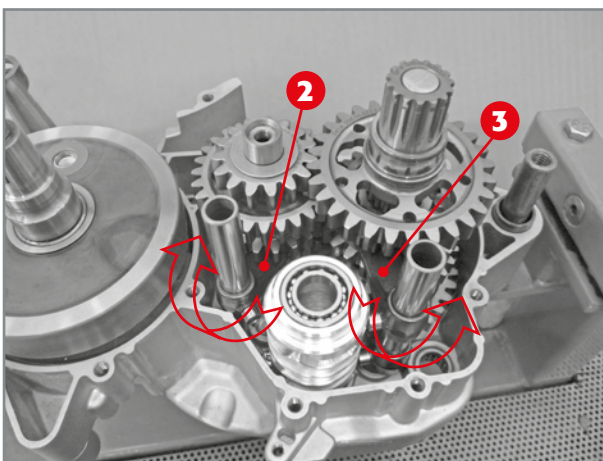
Remove the two rear **2** and front **3** reference pins. Remove the coupling gasket to the two crankcases.



Removal of crankshaft.



Removal of fork support pins 1.



Disengaging the drive forks from the desmodromic device.

2.8.2 Crankshaft

The crankshaft **1** can be pulled out manually. Gently hit the right end of the crankshaft in case of resistance.

2.8.3 Internal gearshift unit and complete gearbox

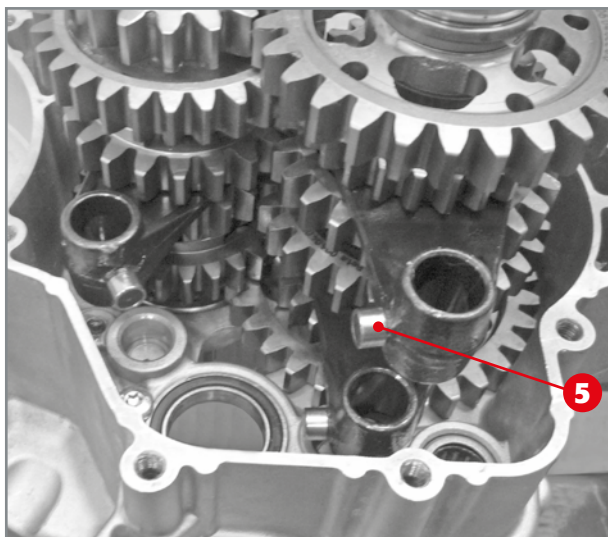
The internal gearshift unit is made up of the desmodromic device **1** on which the fork **2** and two forks **3** are engaged. The forks, supported by the pins **4**, drive the sliding wheels of the gearbox, allowing for the engagement of the desired ratio. The desmodromic device is controlled by the stop cam located in the external gearshift unit.

Manually extract the two pins **4** so that the forks can be released and removed.

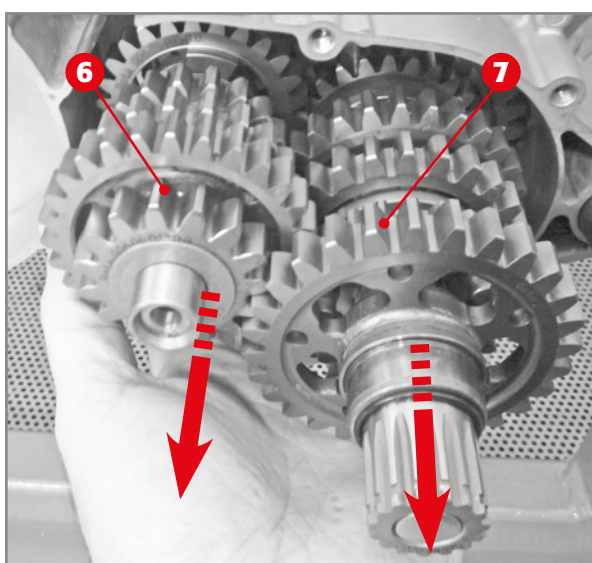
Turn the fork **2** which drives the sliding gear on the primary unit clockwise to release it from the desmodromic control.

Carry out the same steps, though in the opposite direction, on the forks **3** driving the sliding gears on the secondary shaft.

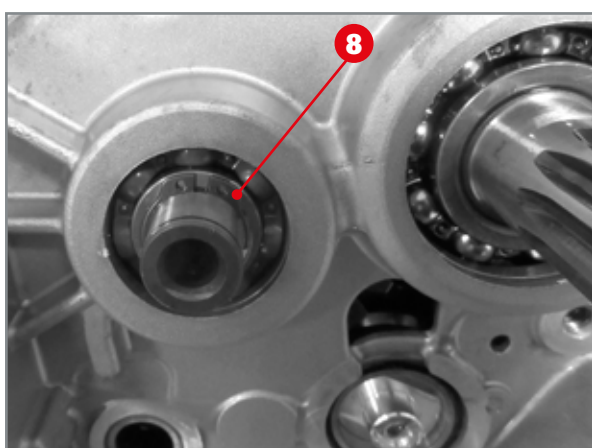
Extract the desmodromic device.



Extraction of forks from gearbox unit.



Extraction of complete gearbox unit: 6 primary unit, 7 secondary unit.



Extract the forks together with the drive bushes 5.

Extract the whole gearbox unit consisting of primary 6 and secondary 7.

Note: Make sure you have removed circlip 8 on the clutch side gearbox secondary.

2.9 DISASSEMBLY OF PARTS FROM CRANKCASES

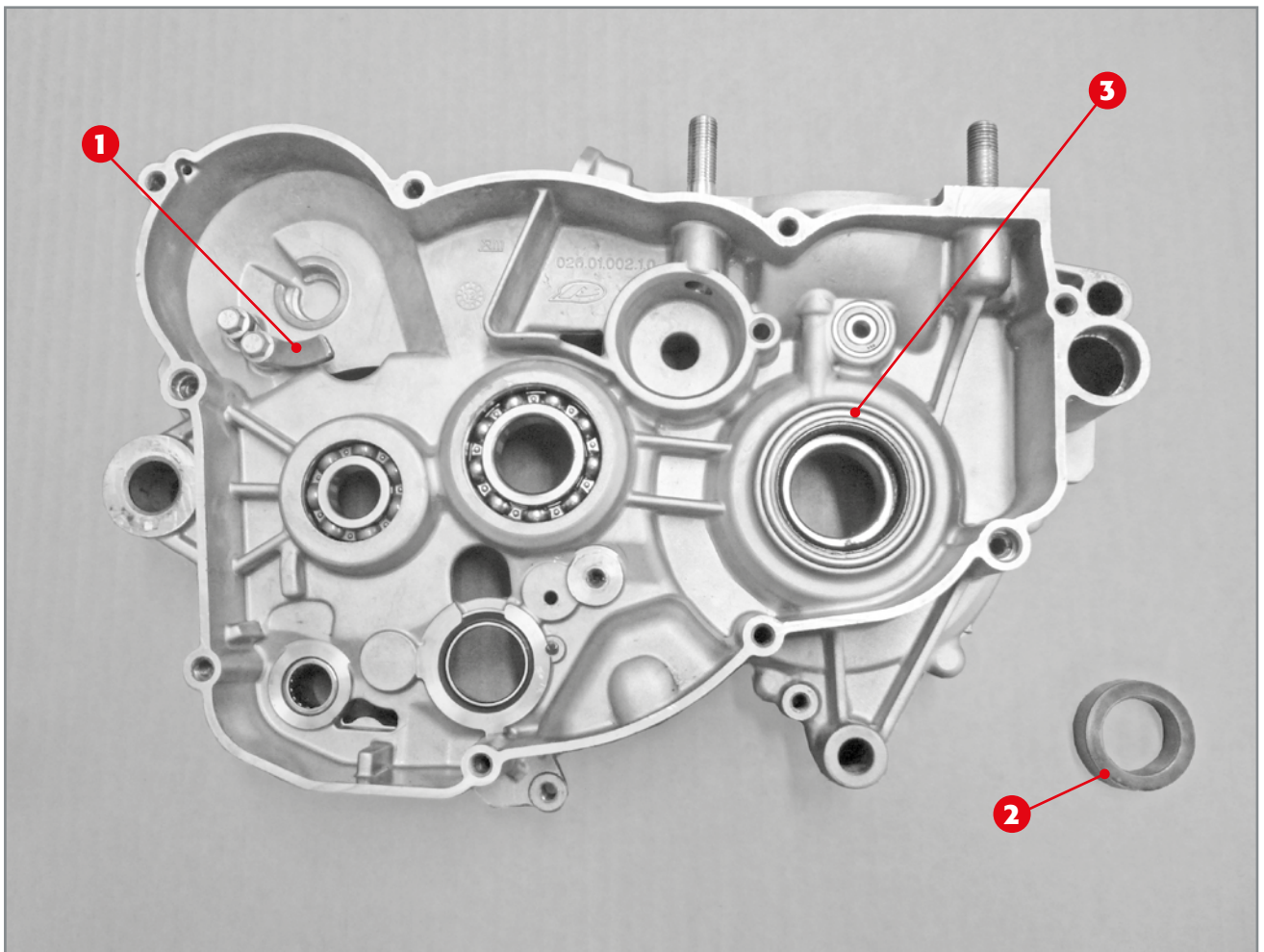
Once the crankcases have been detached, it is necessary to remove the various components attached to them.

The bearings must be replaced if they play or get jammed during rotation. For removal, oven heat the crankcase halves for 20 minutes at about 150°C.

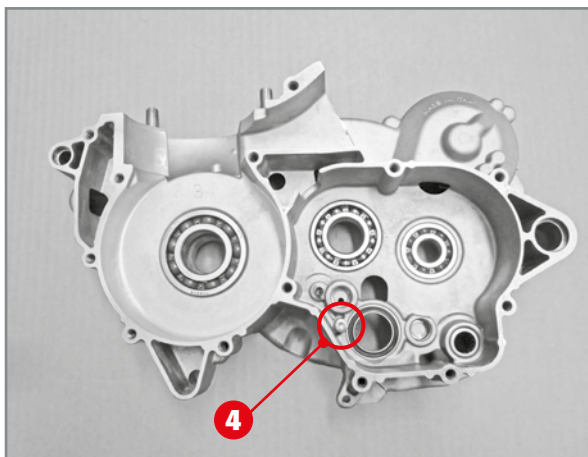
Place the crankcase halves on a large surface where their whole seal surface can rest. Remove the bearings by following the indications below.

2.9.1 Right crankcase half

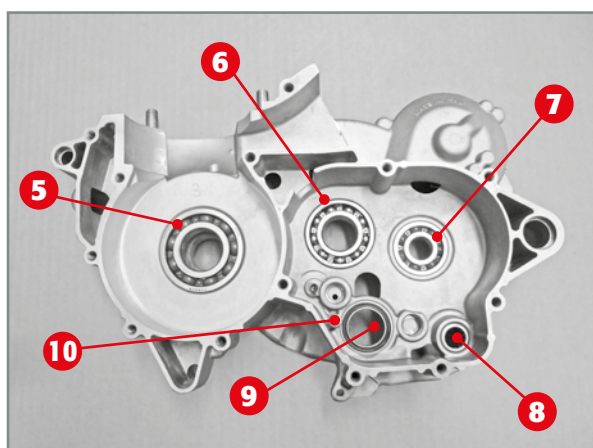
On the external side, remove the kickstart ramp 1 (optional), the crankshaft spacer 2 and relative O-ring and crankshaft oil seal 3.



Kickstart ramp 1), crankshaft spacer 2) (and relative O-ring), oil seal 3).

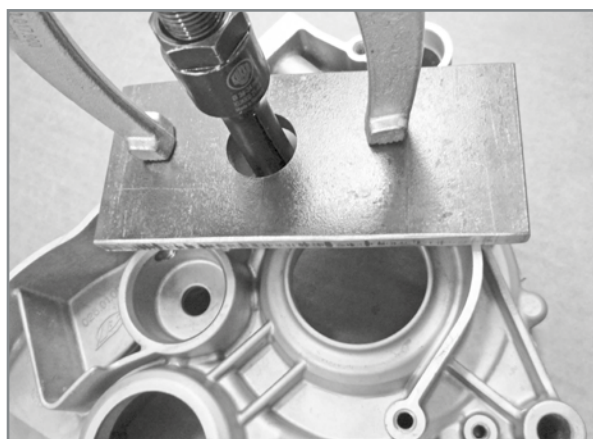


Bearing safety screw.



Remove the desmodromic control bearing seal screw **4** from the inner side.

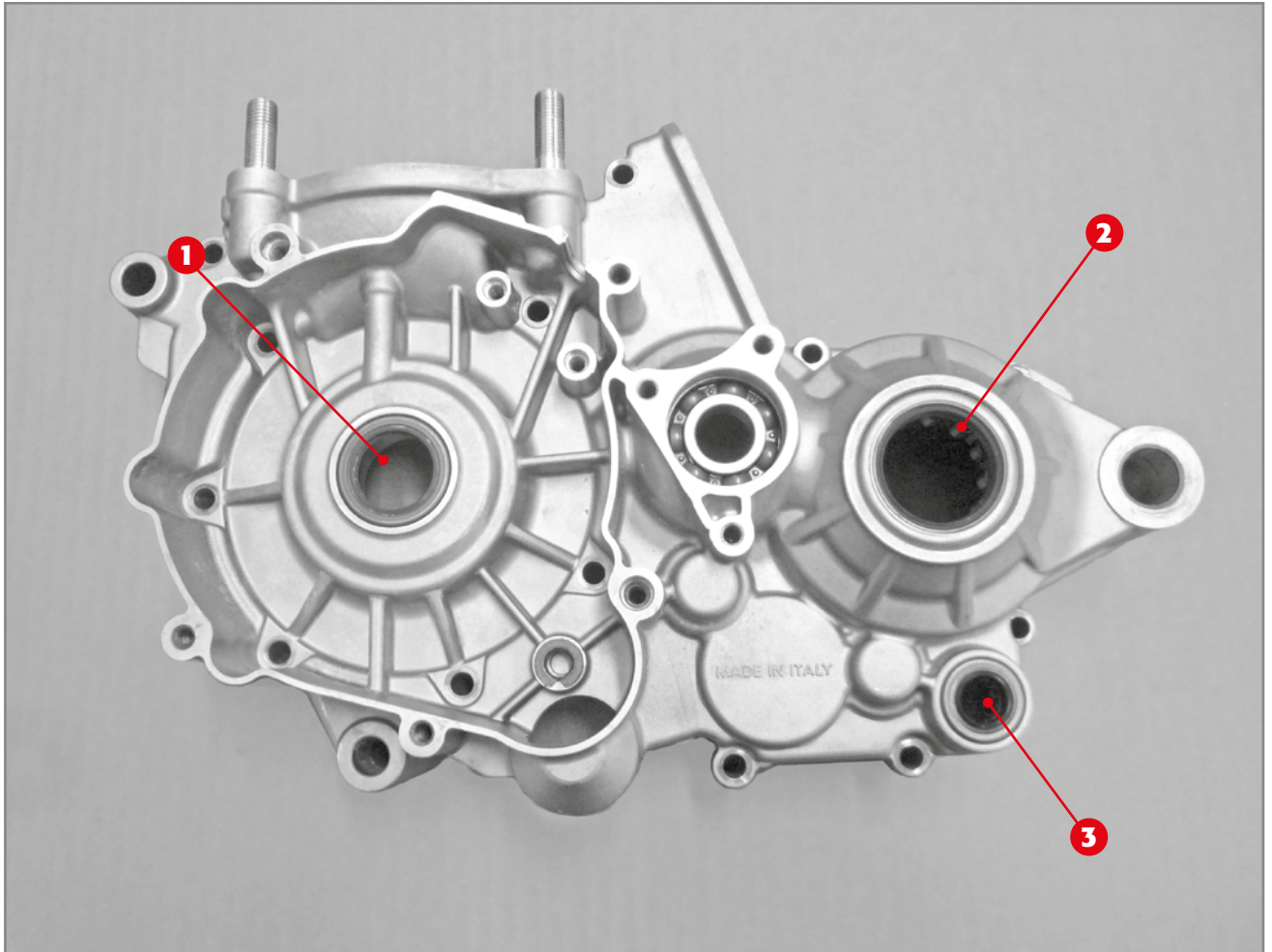
The bearings **5, 6, 7, 8** and **9** are removed from the outside to the inside.
Remove the fixing screw **10** to disassemble bearing **9**.



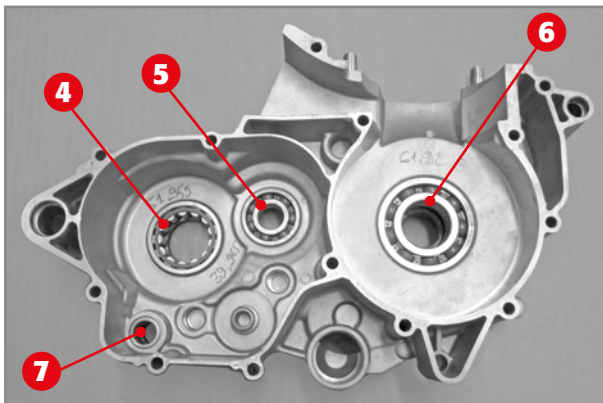
The centrifugal shaft bearing can be removed by using a universal extractor that must rest onto a metal plate specifically created for this purpose.

2.9.2 Left crankcase half

Remove the crankshaft oil seal **1**, the secondary shaft oil seal **2** and the gearshift shaft oil seal **3** from the external side.



Removal of outer side left crankcase half oil seal.



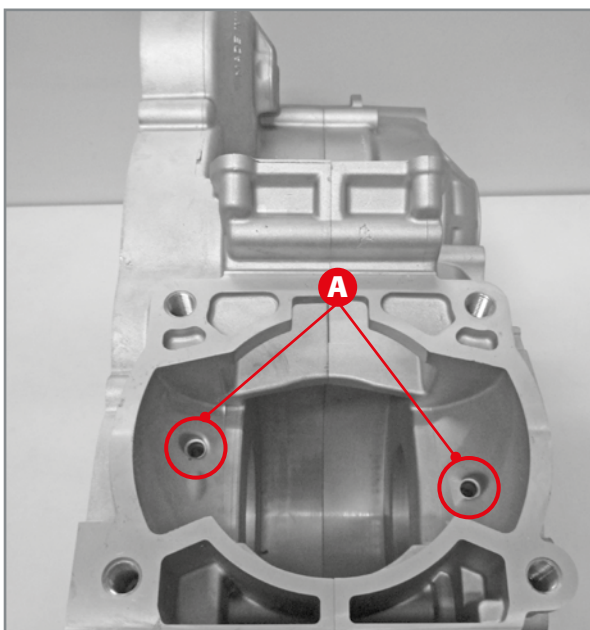
Removal of left crankcase half bearings.

The bearings **4**, **5**, **6** and **7** are removed from the outside to the inside.

Before reassembling the engine, a series of important checks must be carried out to ensure the engine is in good working order.

In order to insert the bearings into the crankcase halves, bring the crankcase halves to a temperature of 150°C and keep them at that temperature for 20 minutes.

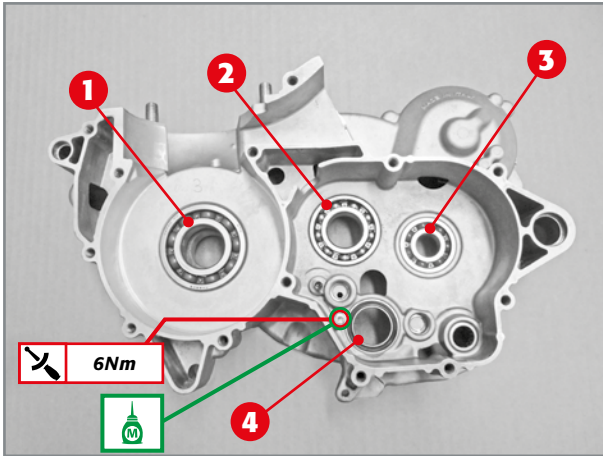
Place the crankcase halves on a large surface where their whole seal surface can rest. When the bearings cool down, they drop into their seats on their own.



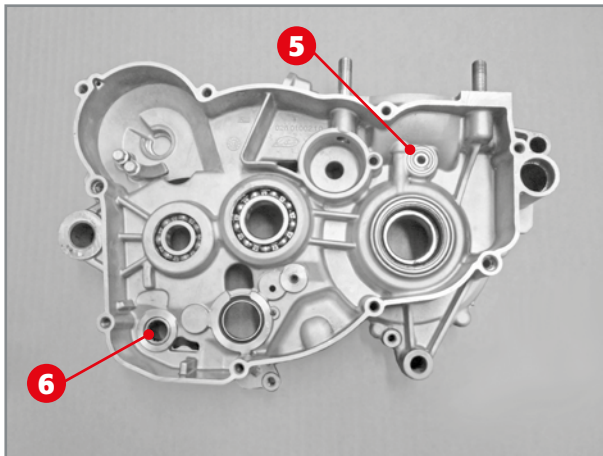
Crankshaft bearings lubrication holes.

3.1 CRANKCASE HALF

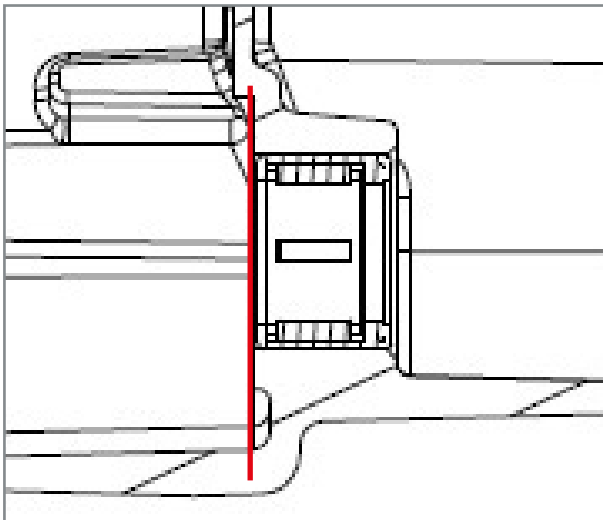
The crankcase halves have some elements that need to have their integrity and state of use checked. Hereafter the checks and assembly operations of the individual elements coupled to the crankcases will be described. Clean the threading and oil passages **A** thoroughly by using a degreaser and compressed air.



Positioning of the right crankcase half bearings.



Application of bearings from the right crankcase half external side.



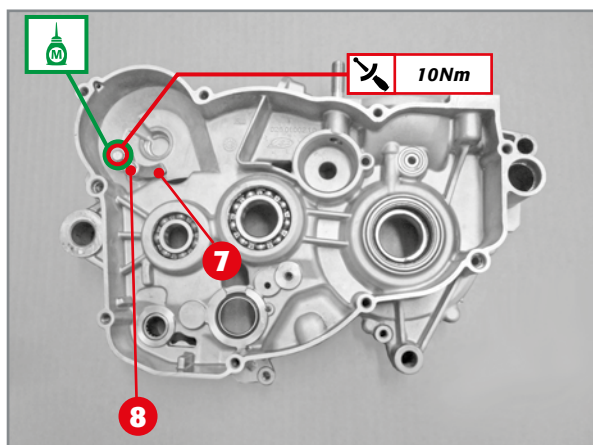
Position of right crankcase half gearshift shaft bearing.

3.1.1 Application of right crankcase half parts

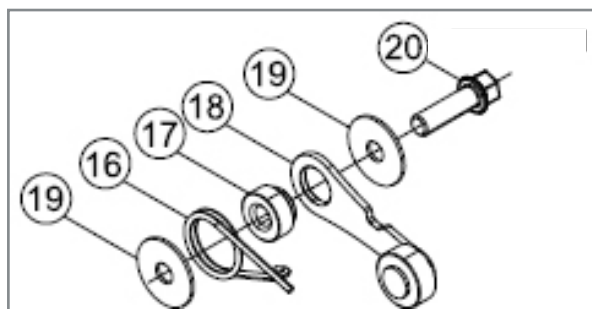
Apply the bearings 1, 2, 3 and 4 until flush. Block bearing 4 with the specific screw by depositing the threadlockers. Tighten to the specified torque.

Apply the bearing 5 from the crankcase half external side, until it is flush, and bearing 6 as shown in the drawing.

Apply new oil seals, to be pressed all the way home.

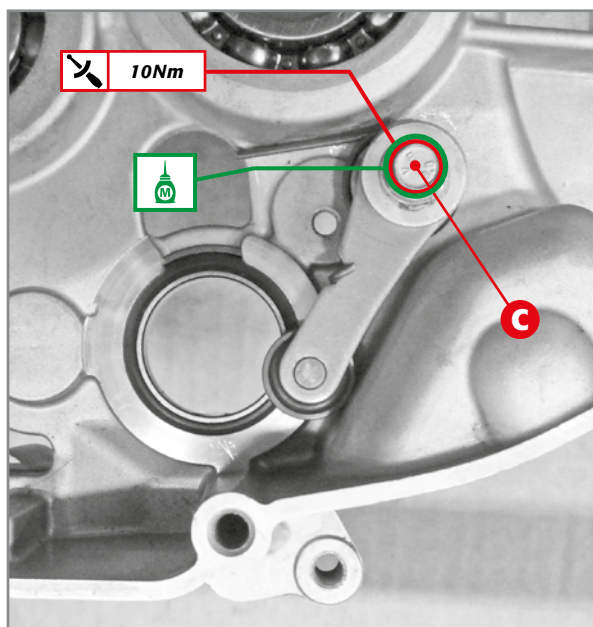


Application of the kickstart ramp.



EXPLODED VIEW OF STOPPING DEVICE:

- 18) Lever;
- 16) Spring;
- 17) Spacer;
- 19) Washer 6x20x1;
- 20) Screw M6x20.



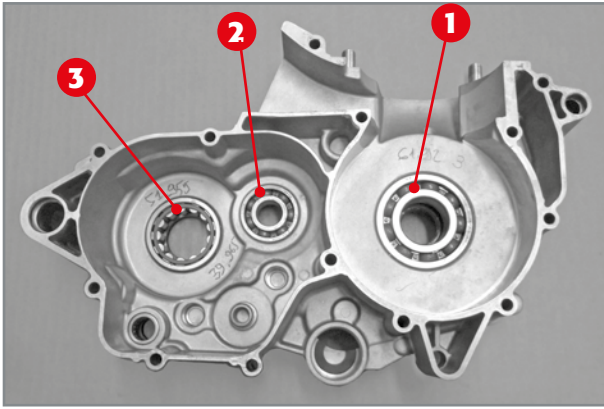
Application of cam stop lever.

If present (optional), apply the kickstart ramp **7** and fasten screws **8** at 10Nm, by depositing a medium strength threadlocker.

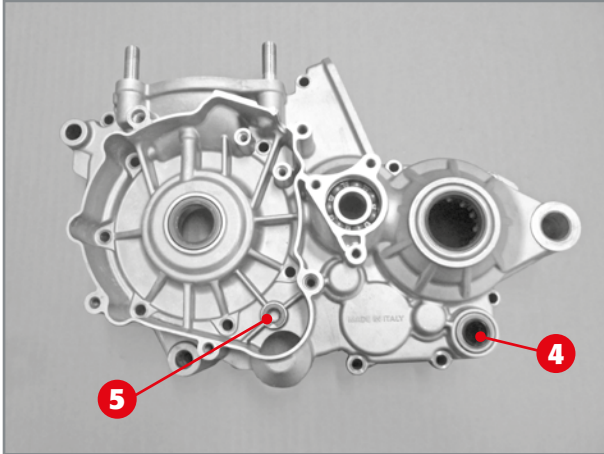
Apply the stopping device as follows.

Keeping the tightener on the lever **18** facing towards the crankcase half, apply the spacer **17** onto it, by inserting the smaller diameter segment in the lever. Apply the spring **16** so that the hook fits into the groove on the lever **18** and then apply the washers **19** and the screw **20** M6x20, covering its thread with medium strength threadlocker on the thread.

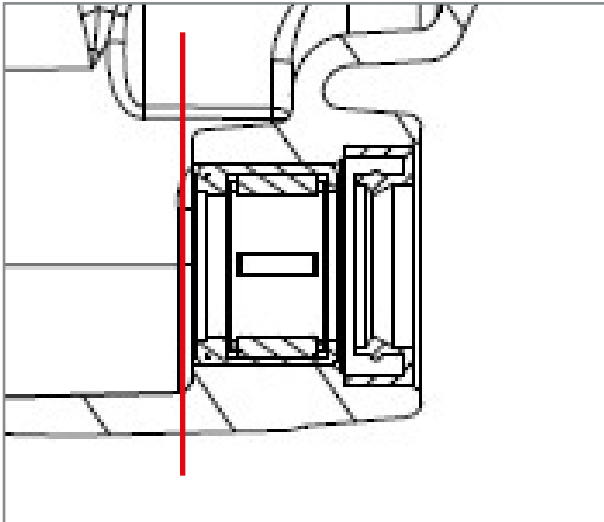
Apply the entire device on the crankcase half so that the straight segment of the spring rests on the bearing seat. Tighten the screw to the indicated torque.



Application of left crankcase half bearings.



Application of left crankcase half parts.



Position of left crankcase half gearshift shaft bearing.

3.1.2 Application of left crankcase half parts

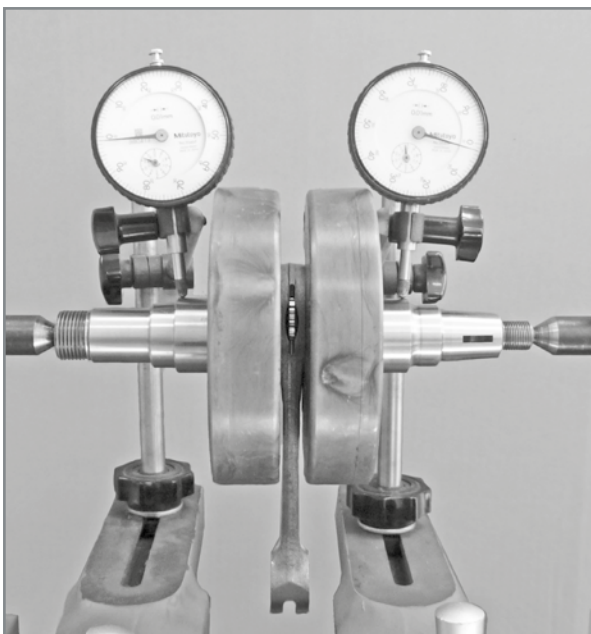
Apply the bearings 1, 2 and 3 from the crankcase half internal side, until flush.

Apply the bearing 4 from the crankcase half external side, as shown in the drawing.

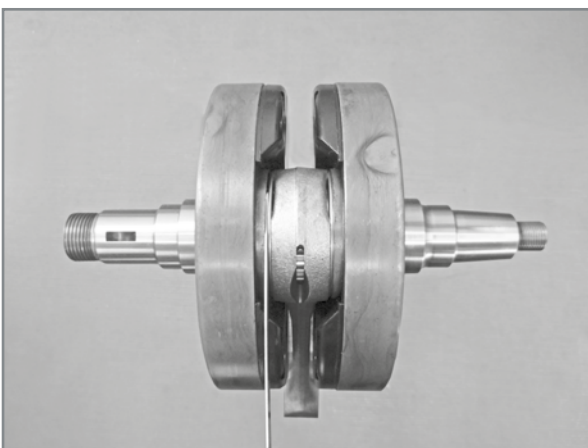
Apply the crankshaft oil seal, gear secondary shaft and gearshift shaft.

Apply the bush with collar 5.

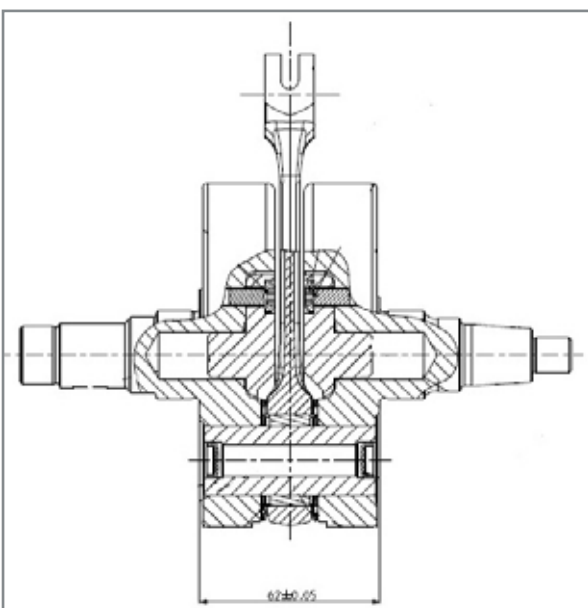
Apply new oil seals, to be pressed all the way home. Apply new oil seals, to be pressed all the way home.



Deflection/Off-centring of crankshaft.



Connecting rod axial play.



3.2 CONNECTING ROD AND ENGINE SHAFT CHECK

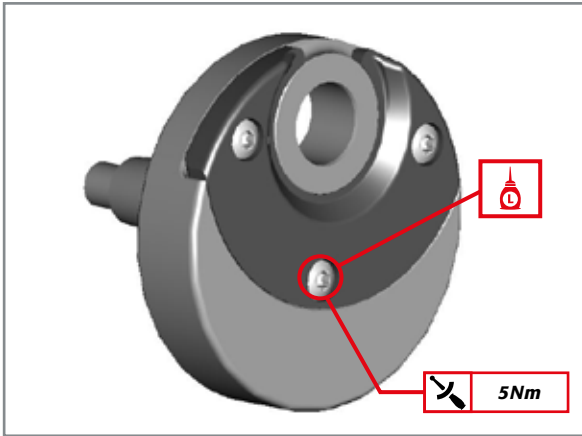
After having checked the state of wear of the coupling surfaces, check the offset of the half shaft axes (by measuring the radial oscillation) by placing the crankshaft in between two tailstocks or similar instrument. Verify the maximum measurement variation during a complete turn, using comparators positioned on the coupling surfaces with the crankshaft bearings.

Allowed limit value: 0.02mm

Check the axial play between the connecting rod head and the half shafts.

**Recommended play:
0.39÷0.72mm**

The distance between the two shoulders must be: 62 ± 0.05 .

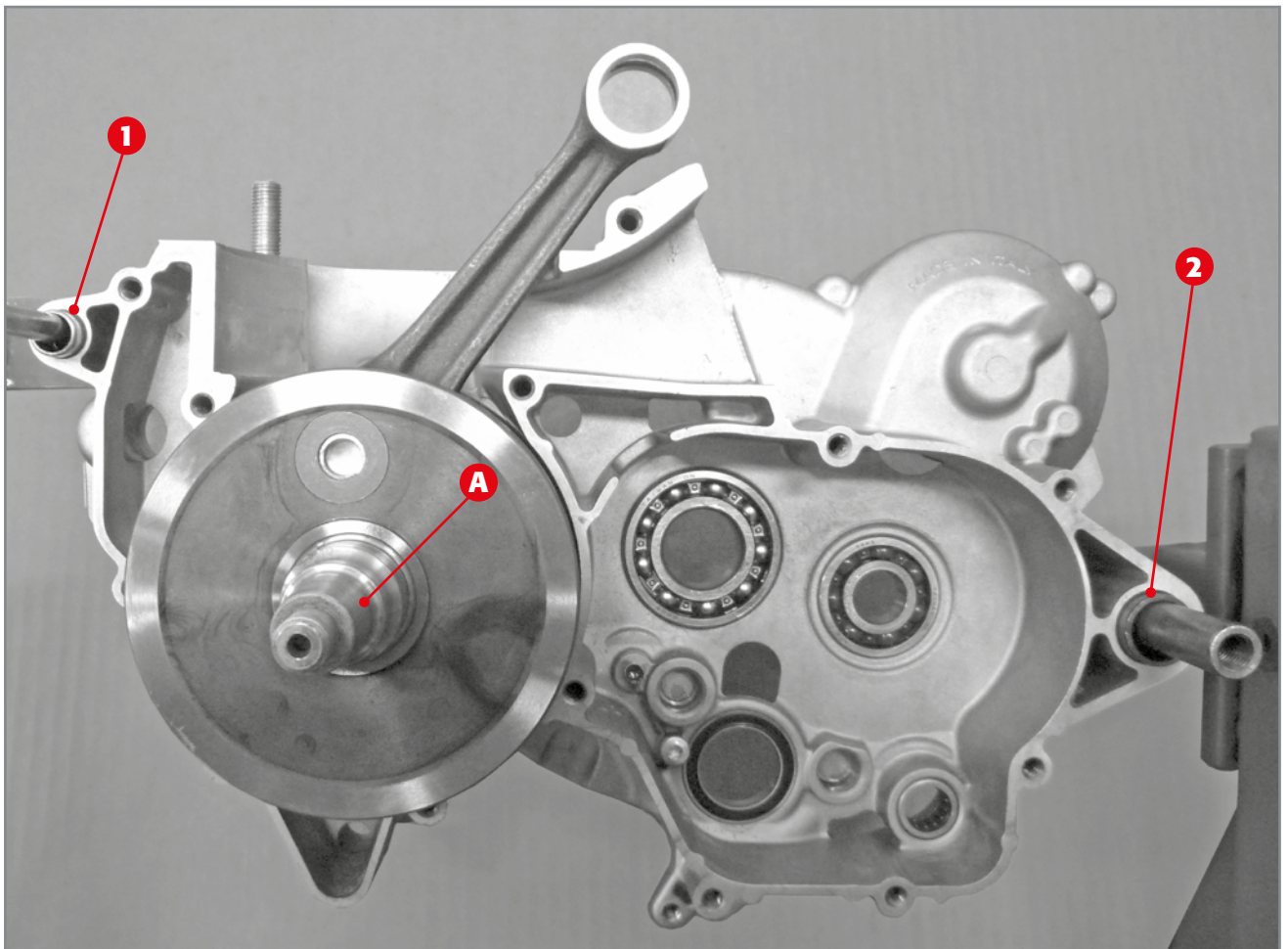


Half-shoulder

If replacing the inserts, apply the screws with a high-resistance threadlocker and tighten to the specified torque.

3.3 ASSEMBLY OF COMPLETE CRANKSHAFT

When all the aforementioned checks have been carried out and the worn parts replaced, grease the crankshaft oil seal on the right crankcase half and couple the crankshaft to the left crankcase half. Keep the conical part **A** on the crankshaft facing you. In order to carry out this operation, you must just push the shaft axially towards the crankcase. Apply the two centring bushes **1** and **2**.



Insertion of the crankshaft in the right crankcase half.

3.4 GEAR UNIT: CHECKS AND REASSEMBLY

The gearbox unit is made up of the gearshift and of the gearbox itself. The gearshift is then divided into external and internal gearshift.

The following are the checks and procedures for checking and reassembling these units to the engine.

3.4.1 Check on gearbox unit

Use protective jaws to clamp the main shaft and secondary shaft.

Use a thickness gauge to check the axial play between the gearshift forks and the gearwheels. The play detected must not exceed the service limit indicated below:

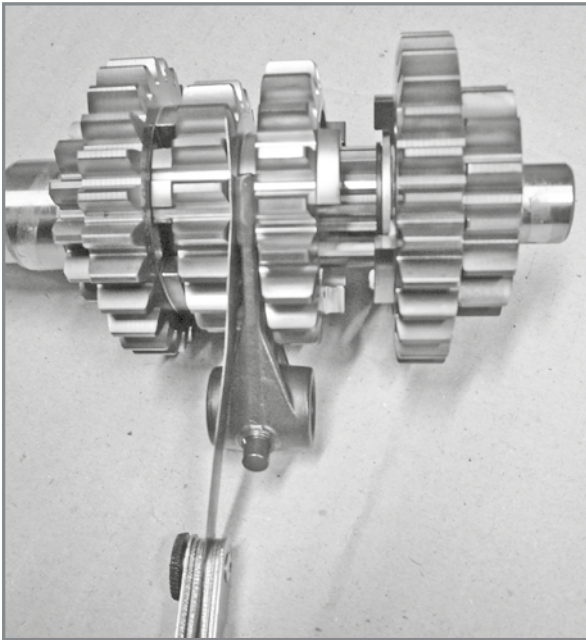
service limit: 0.5mm

If the detected axial play is greater, before replacing either the gearwheels or the forks, check their state of wear (par. 3.4.4)

Remove the various elements and check that:

- the support surfaces of the main shaft and secondary shaft have no abnormal wear or signs of seizure;
- the sides of the teeth are free from chipping or abnormal wear;
- the sliding areas of the gearwheels have no from abnormal wear or traces of seizure;
- the front claw clutches of the gearwheels are not chipped or rounded;
- the roller bearings are intact and efficient;
- none of the thrust washers show traces of abnormal wear or meshing.

Should any of these defects be found, replace the concerned parts.

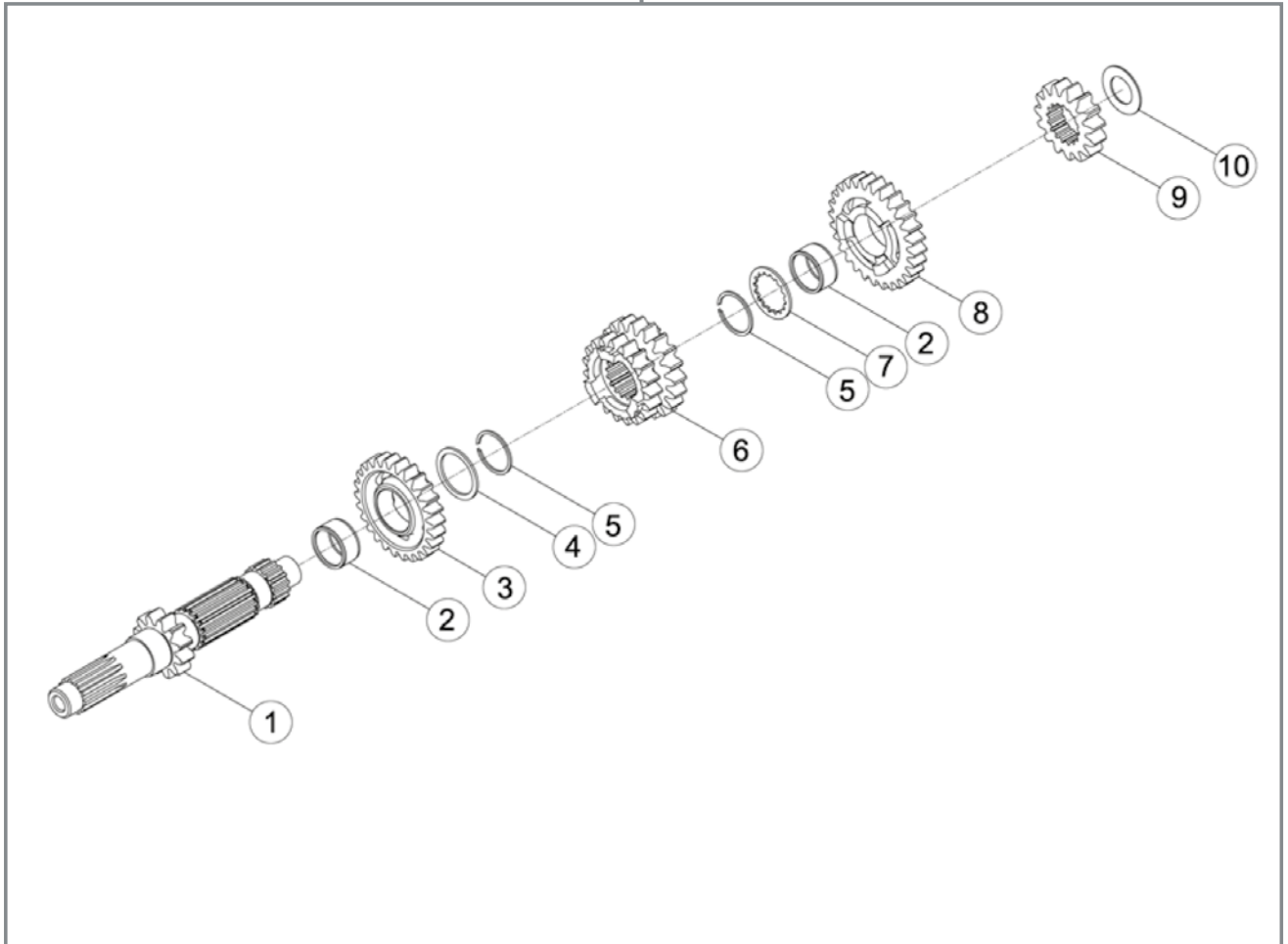


Check of wear of forks and gearwheels.

3.4.2 Assembly of primary unit

Before proceeding with reassembly, clean all the elements thoroughly and oil them with gear oil. Always replace the circlips.

Clamp the main shaft **1** (using protective jaws), so that the grooved end faces downwards.



EXPLODED VIEW OF PRIMARY UNIT:

- 1) Main shaft;
- 2) Roller cage 22x26x13;
- 3) Fifth on primary;
- 4) Thrust washer;
- 5) Circlip sw15;
- 6) Third and fourth on primary;
- 7) Thrust washer;
- 8) Sixth on primary;
- 9) Second on primary;
- 10) Thrust washer 17x30x1.

Insert onto the lower cylinder part of the shaft: the roller cage **2**, the 5th gear **3** turning the front claw clutches upwards, the 26x32x1.5 thrust washer **4** and the circlip **5**.

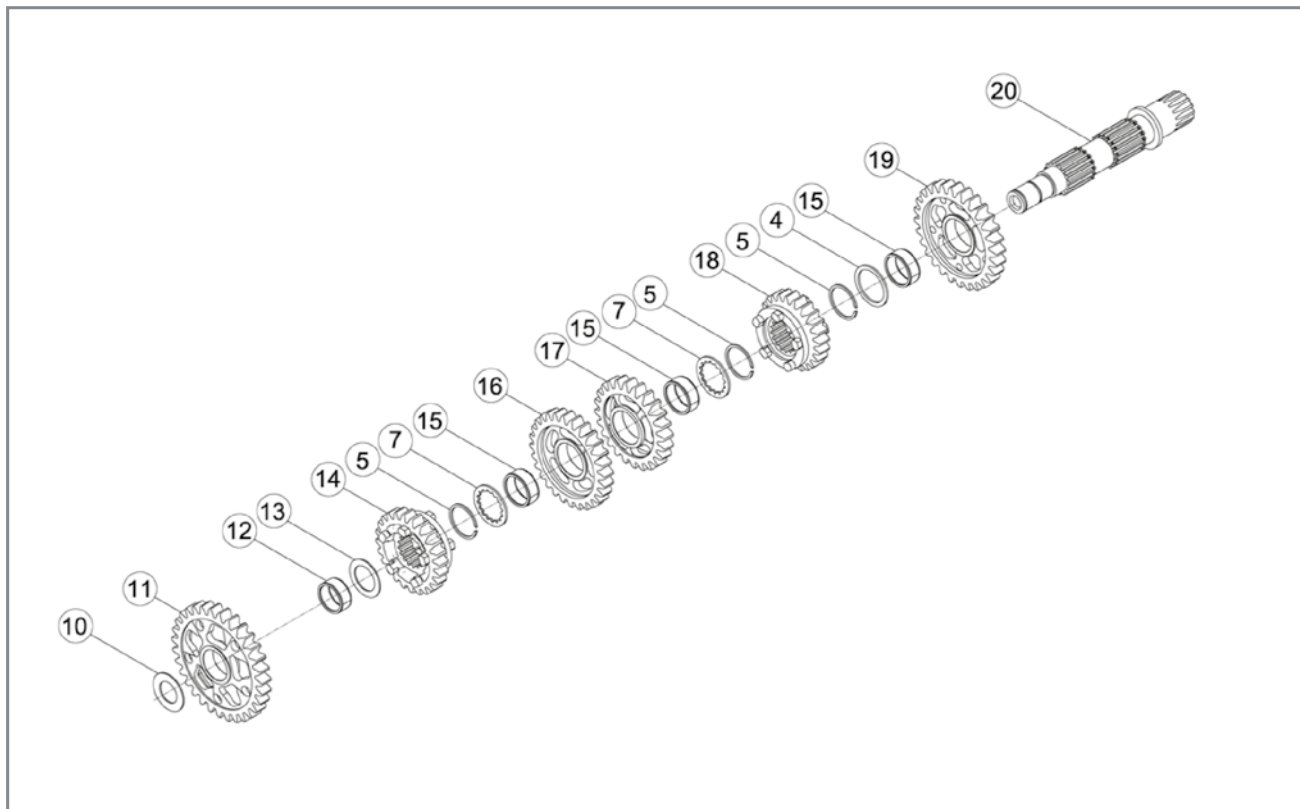
Insert the III – IV sliding gear **6** so that the smaller gear faces downwards, and then insert circlip **5**.

Insert the 23x32x1.5 thrust washer **7**, the roller cage **2**, the 6th gear **8** with the front claw clutch facing downwards, the 2nd gear **9** with the cavity facing upwards and finally the 17x30x1 thrust washer **10**.

3.4.3 Assembly of secondary unit

Before proceeding with reassembly, clean all the elements thoroughly and oil them with gear oil. Always replace the circlips.

Clamp the secondary shaft **20** (using protective jaws), so that the grooved end faces downwards.



EXPLODED VIEW OF SECONDARY UNIT:

- 4) Thrust washer;
- 5) Circlip sw15;
- 7) Thrust washer;
- 10) Thrust washer 17x30x1;
- 11) First on secondary;
- 12) Roller cage 20x24x10;
- 13) Thrust washer 20x30x1;
- 14) Fifth on secondary;
- 15) Roller cage;
- 16) Third on secondary;
- 17) Fourth on secondary;
- 18) Sixty on secondary;
- 19) Second on secondary;
- 20) Secondary shaft.

Insert onto the lower cylinder part: the roller cage **15**, the 2nd gear **19** so that the front claw clutches face downwards, the 26x32x1.5 thrust washer **4** and the circlip **5**. Insert the 6th gear **18** so that the fork seat faces upwards and circlip **5**.

Insert the 23x32x1.5 thrust washer **7**, the two roller cages **15**, the 4th gear **17** with the front claw clutches facing upwards, the 3rd gear **16** with the front claw clutches facing downwards, the 23x32x1.5 thrust washer **7** and the circlip **5**.

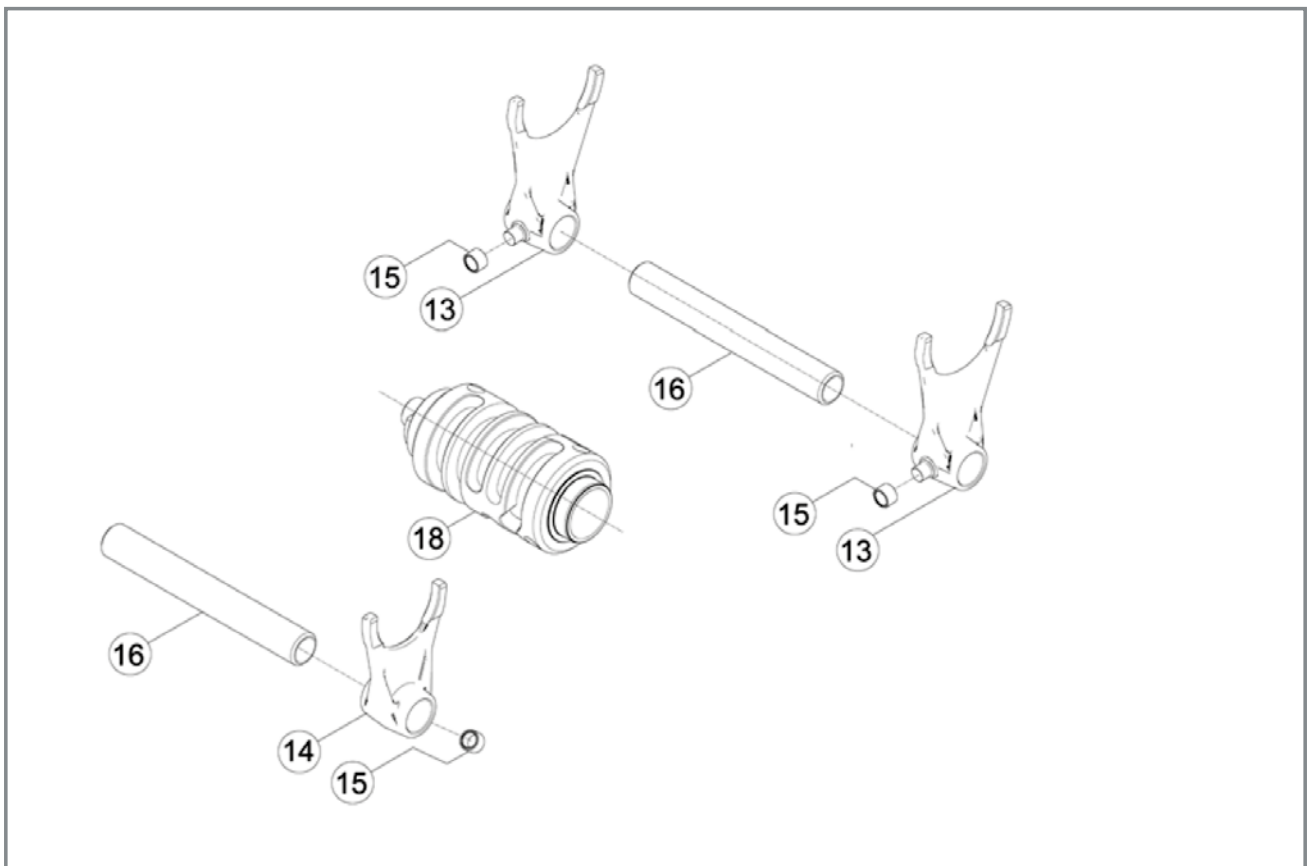
Insert the 5th gear **14** with the fork seat facing downwards the 20x30x1 thrust washer **13** the roller cage **12**, the 1st gear **11** with the front claw clutches facing upwards and finally the 17x30x1 thrust washer **10**.



3.4.4 Checking the forks, fork pins and desmodromic device

The internal gearshift is made up of:

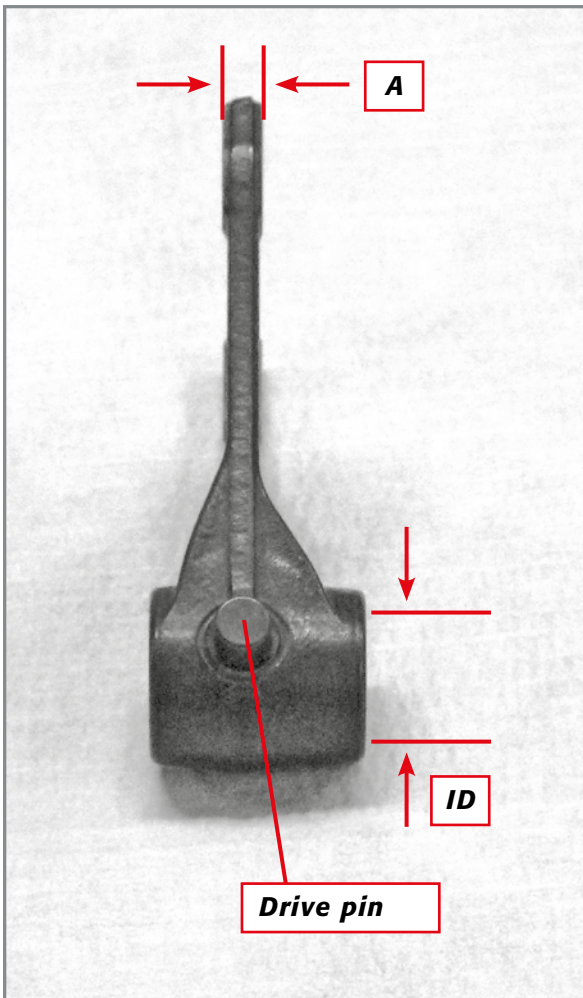
- two forks **13** which drive two gears on the secondary unit;
- one fork **14** which drives one gear on the primary unit;
- three drive pin bushes **15**;
- two fork pins **16**;
- desmodromic gearshift **18** through whose rotation the forks are driven thus selecting the desired gear.



EXPLODED VIEW OF INTERNAL GEARBOX CONTROL UNIT:

- 13) I - IV fork;
- 14) V - VI fork;
- 15) bush;
- 16) fork pin;
- 18) desmodromic control.

Check to make sure that the drive pins that support the bushes **15** have no traces of meshing or abnormal wear and that the bushes themselves are not worn.



Make sure the distance **A** between the outer faces of the fork is not less than the value indicated below:

Minimum acceptable distance: 4.25mm

Check to make sure that the inside diameter **D** of the fork pin seats is below the limit:

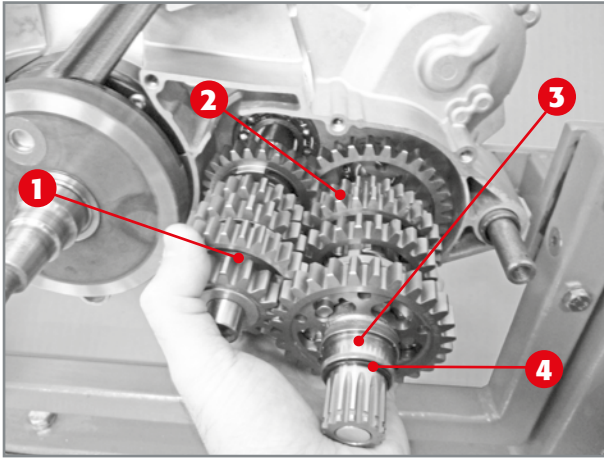
Fork inside diameter limit: 13.83mm

Make sure that the fork pins on which they slide have an outside diameter above the limit (to be measured in the sliding areas of the forks and in the housing areas of the crankcases):

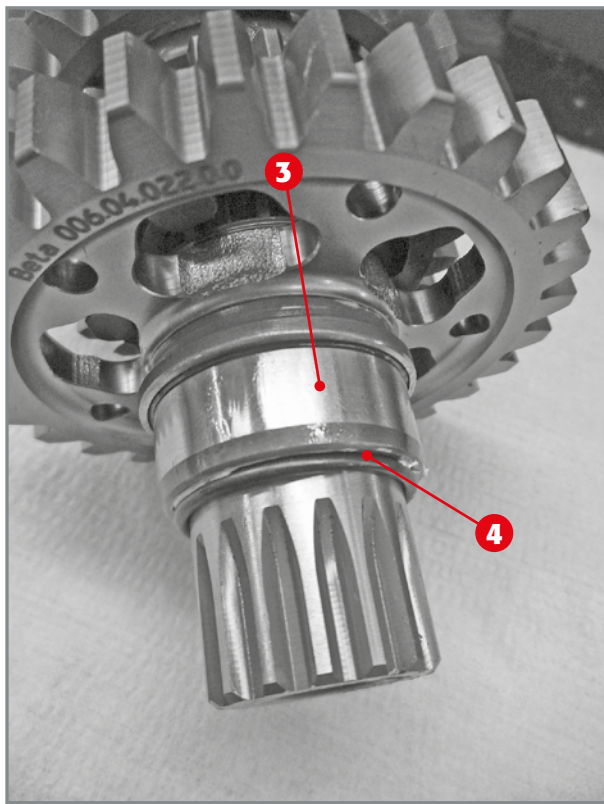
Fork pin outside diameter limit: 13.75mm

Make sure that the desmodromic control device has no corroded or worn areas especially in the grooves in which the drive pins of the forks are engaged.

Check the bearing on the desmodromic. Replace it in the event of signs of meshing or jams during motion.



Insertion of the gearbox in the left crankcase half.

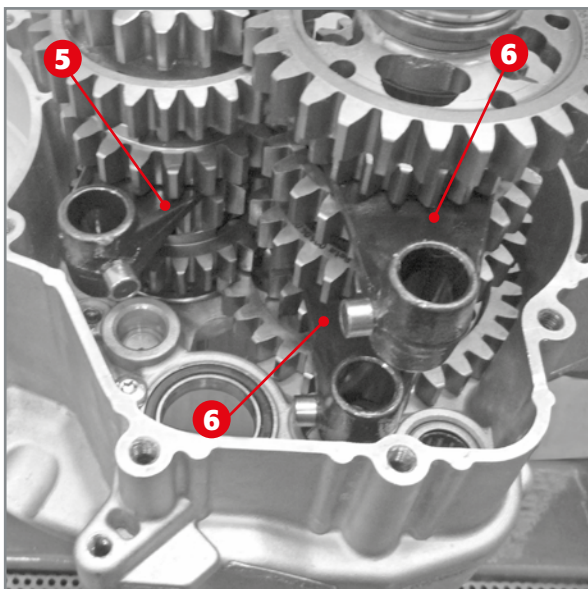


Detail of centre bearing 3 and O-ring 4 coupled to the secondary shaft.

3.4.5 Assembly of gearbox and inner control

Insert the entire primary 1 and secondary unit 2 into the respective seats on the left crankcase half simultaneously. Remember to oil the gears abundantly with gear oil and to grease the shafts supporting them in the areas where they are coupled with the bearing with graphitic grease. Make sure that all the parts slide properly.

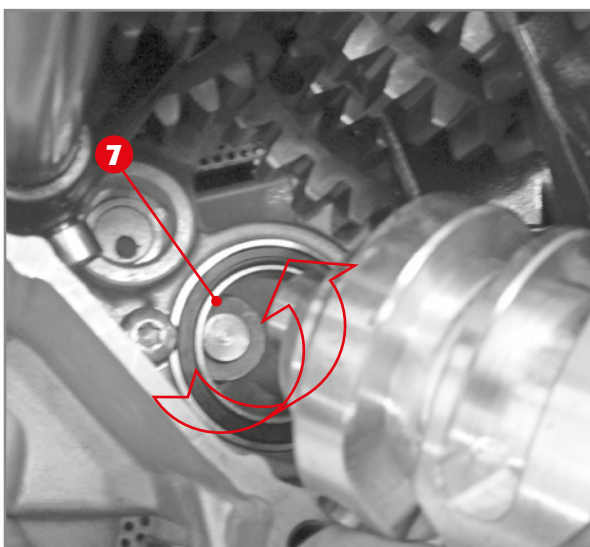
Insert the centre bearing 3 and the O-ring 4 on the secondary unit.



Application of forks to gearwheels.

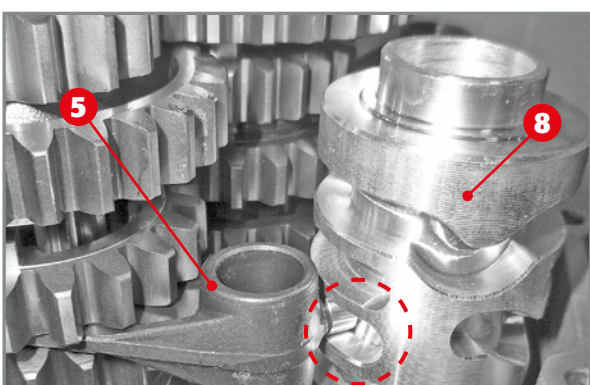
Introduce the forks together with the drive bushes on the gear tracks. Namely: the smaller fork **5** drives the sliding gear on the primary unit, while the other two (**6**) drive the sliding gears on the secondary unit.

Note: the two forks **6** are interchangeable and their positioning is univocal, since the drive pin must face the desmodromic device. Place the forks in their original positions if none of the components are replaced.



Insertion of desmodromic device in specific bearing. Note the rotation of the stop lever.

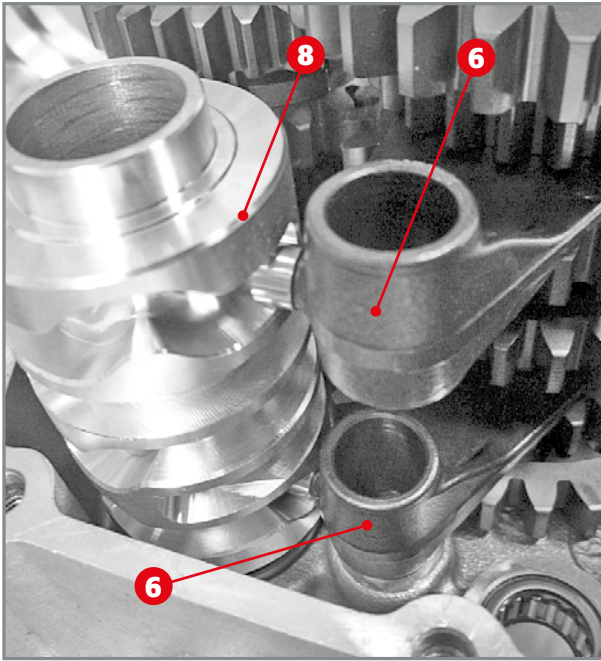
Insert the desmodromic device in the specific bearing. In order to do this, it is necessary to rotate cam stop lever **7** towards the top part of the engine.



Place fork 5 of the primary unit in the central guide of desmodromic device 8.

Position the fork **5** of the primary unit in the central guide of the desmodromic device **8**, insert the fork pin inside the fork itself and insert the pin in its proper seat in the crankcase half.

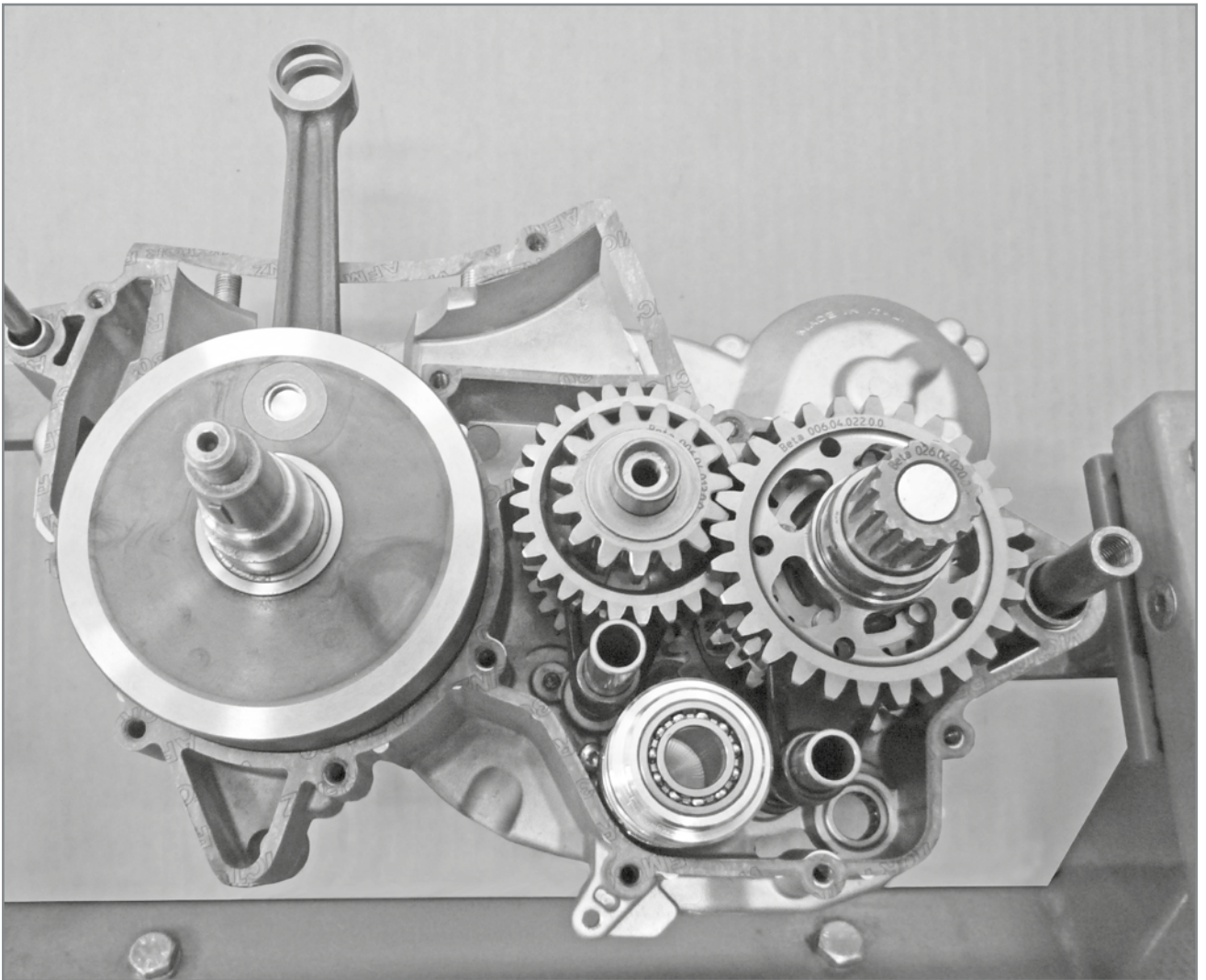




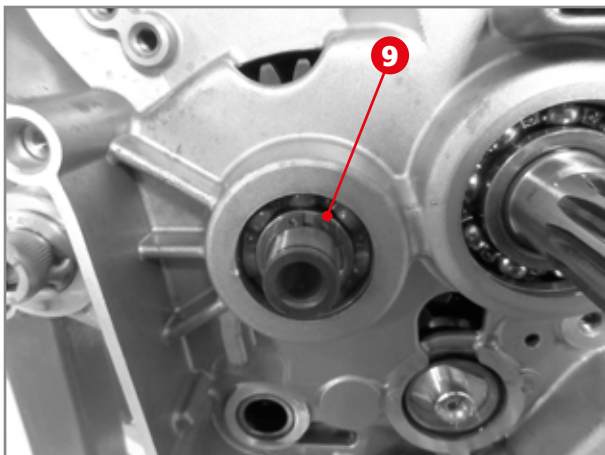
Positioning of the secondary unit forks 6. In the external guides of desmodromic device 8.

Position the two forks 6 of the secondary unit in the external guides of the desmodromic device 8 and, just like the primary unit fork, insert the fork pin first in the pins and then in its dedicated seat. Remember to oil the shafts, forks and the desmodromic device with plenty of gear oil.

Apply some grease on the crankcase edge in the coupling area with the gasket and rest a new gasket.



View inside the right crankcase with crankshaft, gearbox shafts complete with wheels, internal gearshift and gasket.



Apply circlip **9** on the clutch side gearbox secondary.

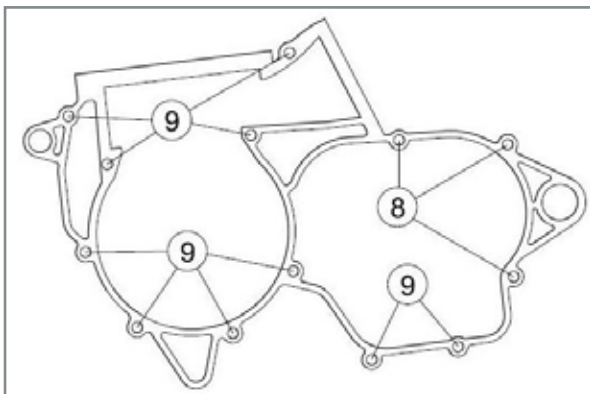
3.5 CLOSING THE ENGINE CRANKCASE

Apply a thin layer of grease on all oil seals. Heat up the engine shaft bearing on the left crankcase half, being careful not to burn the oil seal. Press the right crankcase half towards the left, making sure that the shafts and pins on the crankcase fit into the respective housings and that the crankcase half is not upside-down.

By heating the bearing it will be possible to manually move it close to the right crankcase half.

Put the clamping screws in place based on the length, as illustrated in the figure. The table below contains indications for applying these screws.

Tighten according to a cross sequence.

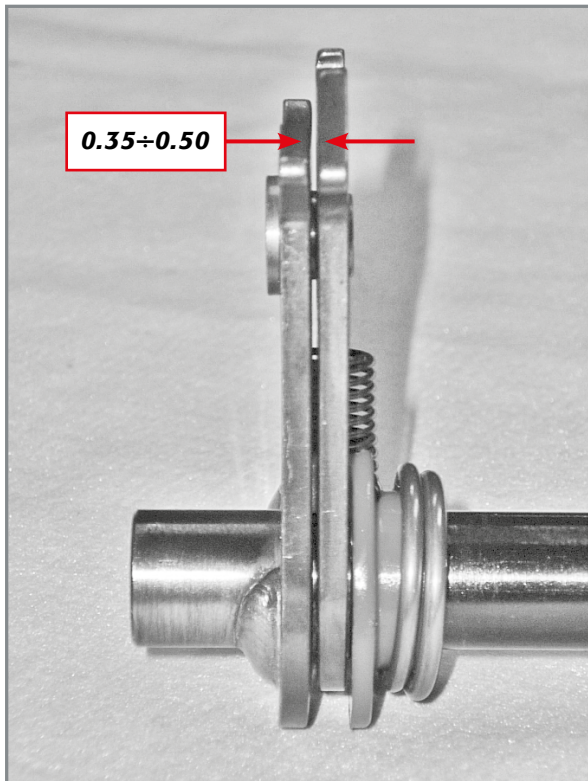


Positioning of crankcase coupling screws.

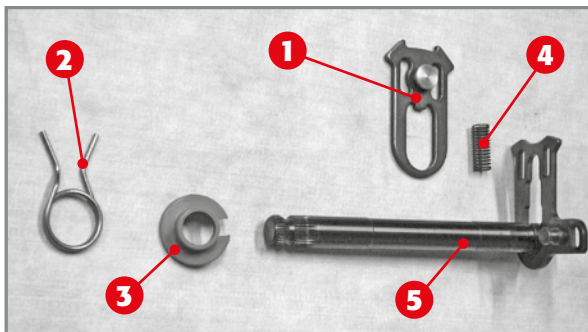
Screw number	Screw dimensions		Threadlocker application	Fastening torque [Nm]
	Threading diameter	Threading length		
8	M6	40	NO	10
9	M6	50	NO	10

Cut the extra piece of gasket between the two crankcase halves in the area of the cylinder and reed valve.





Allowed distance between shaft and pawl.



Complete drive shaft: 1) Movable pawl; 2) Gearshift return spring; 3) Spring guide; 4) Spring; 5) Gearshift drive shaft.

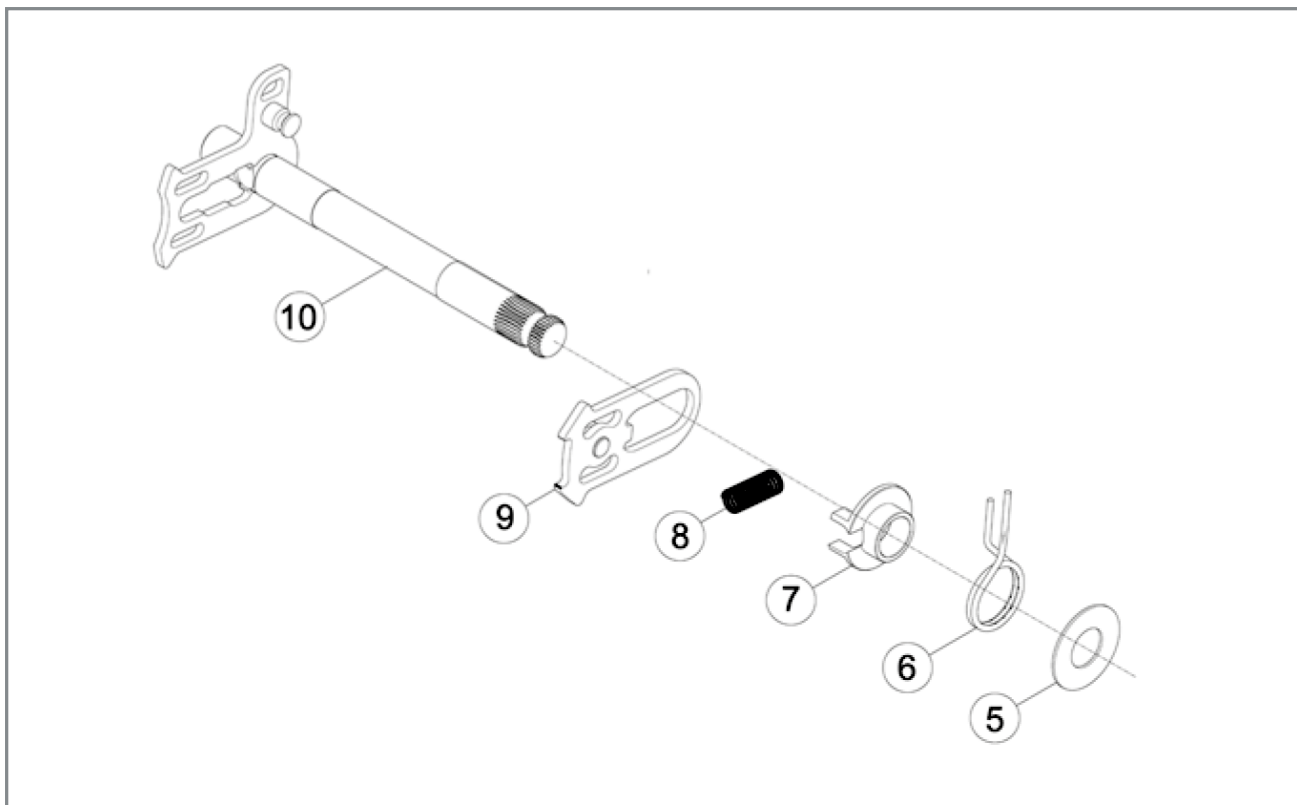
3.6 EXTERNAL GEARSHIFT

Before reassembling the external gearshift, check its state of use. While for the stop cam it is enough to make sure it is free from abnormal wear or meshing, the gearshift drive shaft needs more in-depth inspections.

3.6.1 Checking the complete drive shaft

With the device complete, make sure that the distance between the movable pawl and the drive shaft is between $0.35\div 0.80\text{mm}$. Should the distance be greater, replace the movable pawl.

In order to replace the movable pawl **1**, disassemble the return spring of the gearshift **2**, the spring guide **3**, the spring **4** (which must be compressed and pulled out of its seat) and the pawl, moving it completely towards the shaft **5**.

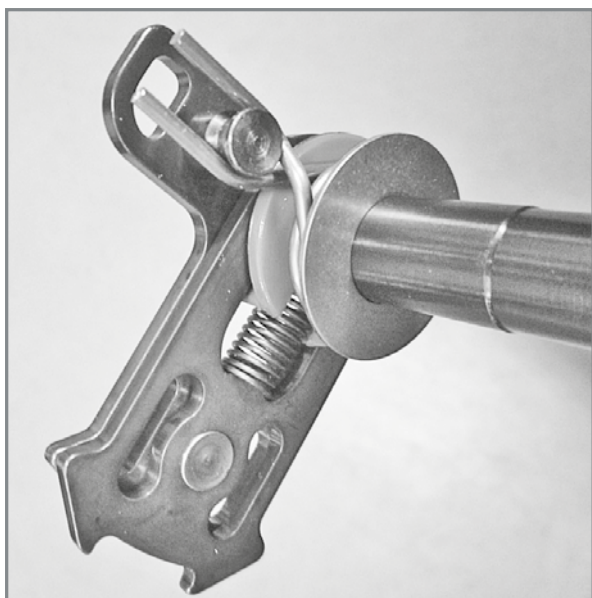


Exploded view of gearshift.

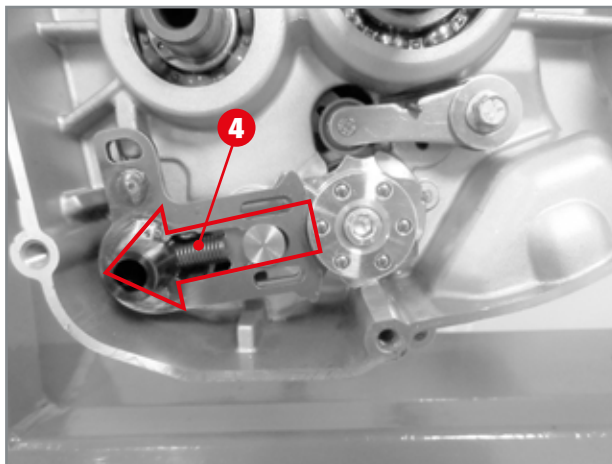
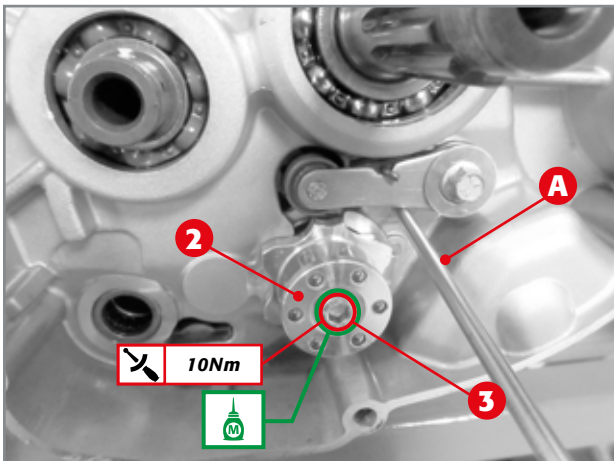
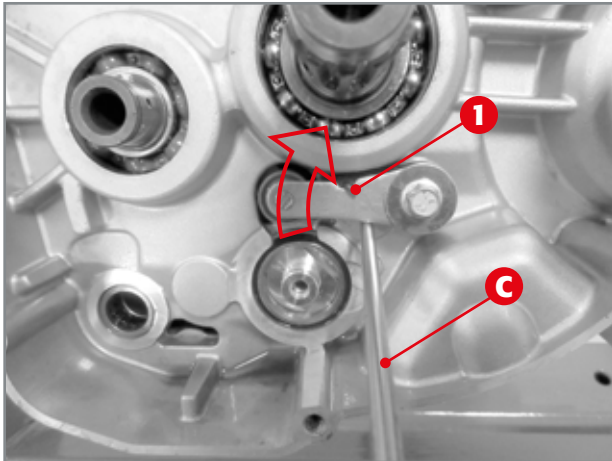
- 5) Thrust washer 14x30x1;
- 6) Gearshift return spring;
- 7) Spring guide;
- 8) Pawl return spring;
- 9) Movable pawl;
- 10) Gearshift shaft.

For reassembly, couple the movable pawl **9** to the drive shaft **10** and, while compressing it, insert the spring **8** between the movable pawl and the drive shaft. Then apply the spring guide **7**, the gearshift return spring **6** and finally the 14x30x1 thrust washer **5**.

The gearshift return spring must be positioned as in the figure to be able to carry out its function.



Gearshift drive shaft: note the gearshift return spring position.



3.6.2 Assembly of external gear-shift

Rotate the gear stop lever **1** clockwise so that the spring is compressed. To keep the lever in this position, an aluminium rod **A** can be inserted into the small hole, as shown in the figure.

Apply the gear stop cam **2** to the protruding end of the desmodromic control. The stop cam has only one correct position, which is determined by the specific shape of the end of the desmodromic device and of the bottom part of the stop cam. Proceed by mounting the tightening screw **3** M6x30 between the stop cam and the desmodromic gearshift, after having applied medium-resistance threadlocker: fasten to the indicated torque.

Remove the rod **A**.

Insert the drive shaft together with the washer in its seat whilst keeping the return spring **4** of the movable pawl pressed.

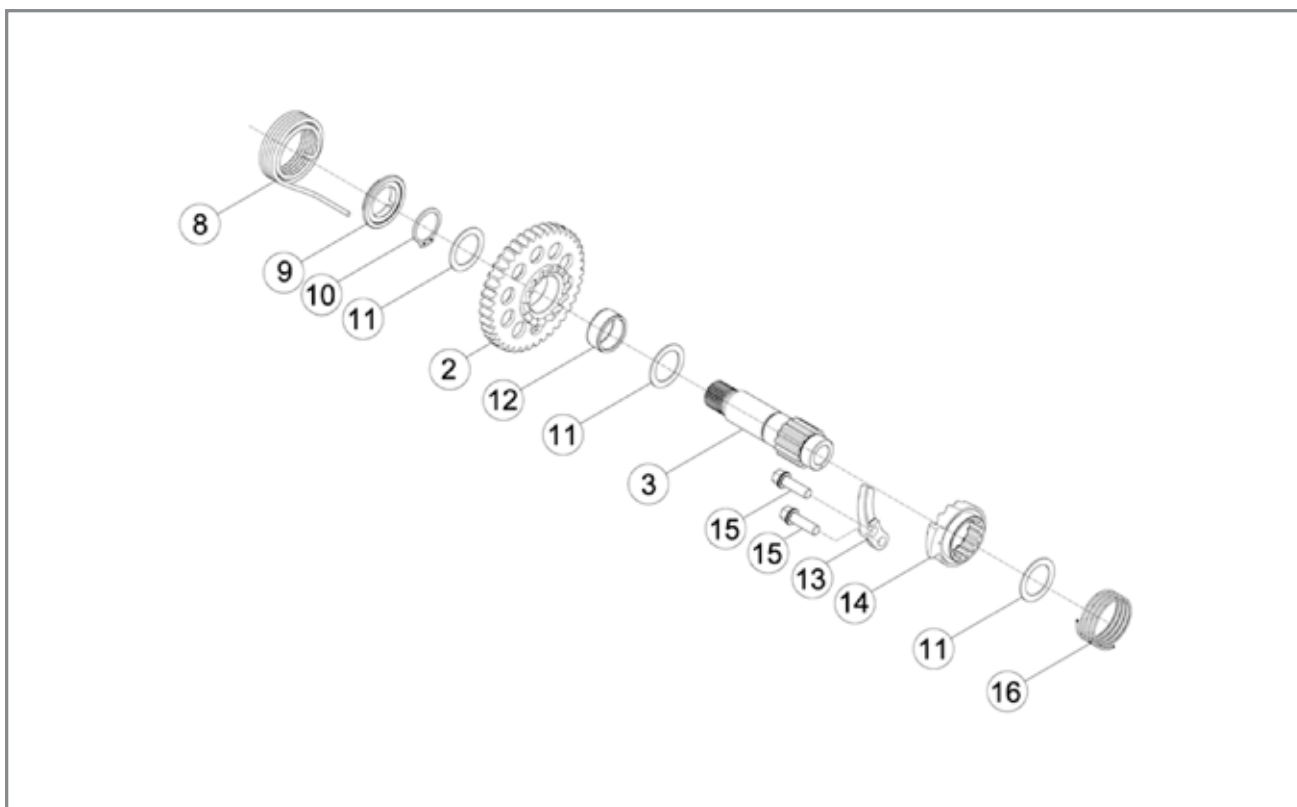
If you want to test the correct operation of the entire unit, you just need to temporarily couple the external gearshift lever and to simulate the operation of changing gears, by lifting and lowering the gearshift lever and having the main shaft of the gear unit rotate. The whole device works properly if abnormal jamming does not occur. If the unit runs without oil, the device makes more noise than usual.

3.7 KICKSTARTER DEVICE - OPTIONAL

Before coupling the kickstarter to the crankcase half, some checks must be carried out.

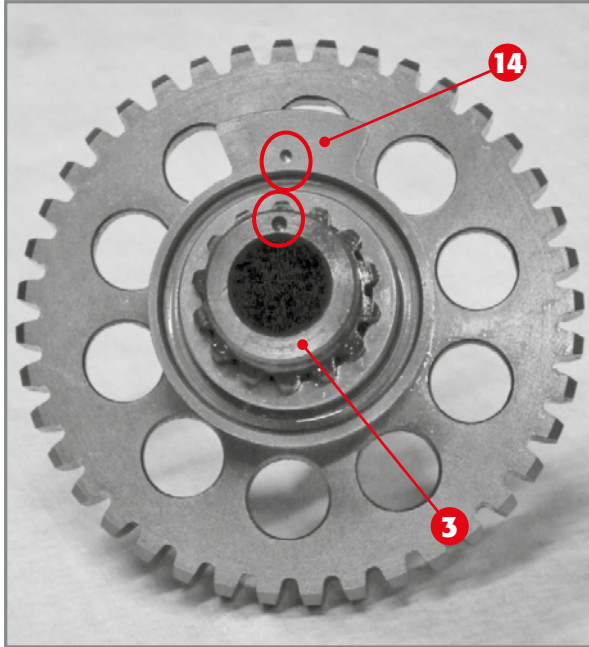
3.7.1 Check on kickstart shaft unit and assembly

In order to disassemble all the parts of the kickstart shaft, pull off the washer **11** at the end of the shaft (on the side of the spring **16**), the spring **16**, the kickstart sleeve **14**, and the lever return spring **8**, which must be pulled in the radial direction so that it is extracted from its hole to be unfastened from the shaft.

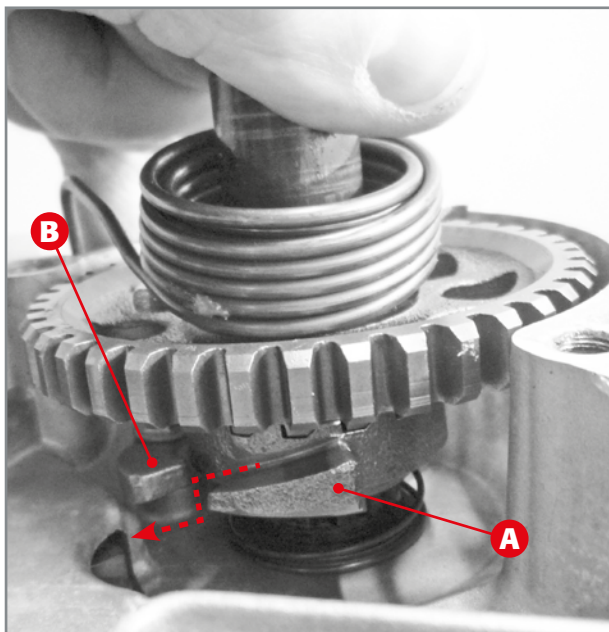


EXPLODED VIEW OF COMPLETE KICKSTART SHAFT:

- 2) Kickstart gear;
- 3) Kickstart shaft;
- 8) Kickstart return spring;
- 9) Kickstart spacer;
- 10) Circlip 20E;
- 11) Washer thickness 20x28x1 DIN 988;
- 12) Roller bearing K20x24x10;
- 14) Kickstart sleeve;
- 16) Spring.



Positioning of sleeve on small shaft.



Positioning of sleeve A below ramp B.

Remove the kickstart spacer 9, expand the circlip 10, allowing for the removal of washer 11, of kickstart gear 2 together with roller bearing 12 and washer 11. This frees the kickstart shaft 3 from all other elements.

Make sure that the side of the kickstart gear teeth 2 have no signs of meshing or superficial wear. Make sure that the front teeth (sleeve side 14) are not chipped. Replace any element that has the aforementioned defects.

Make sure that the front teeth of the sleeve 14 are not chipped and that the spring 16 is capable of putting enough pressure on the sleeve 14 so that this can pull the wheel 2.

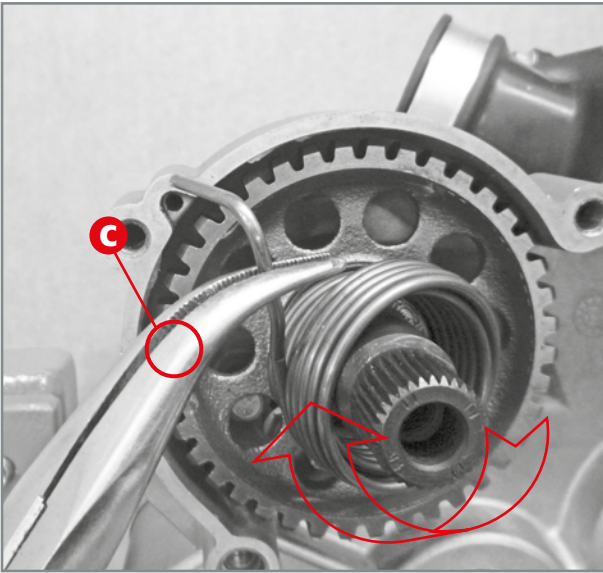
Also check to make sure that the washers have no abnormal or excessive wear. If so, have them replaced. Make sure that the spring 8 has no cracks or abnormal deformation. Have it replaced if it is not able to bring the external kickstart lever back to the rest position.

For reassembly, follow the above disassembly procedures in reverse order.

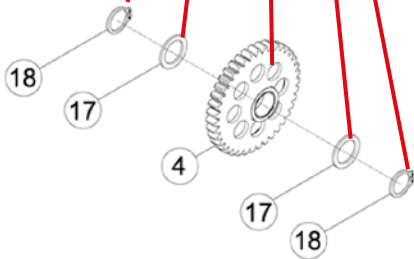
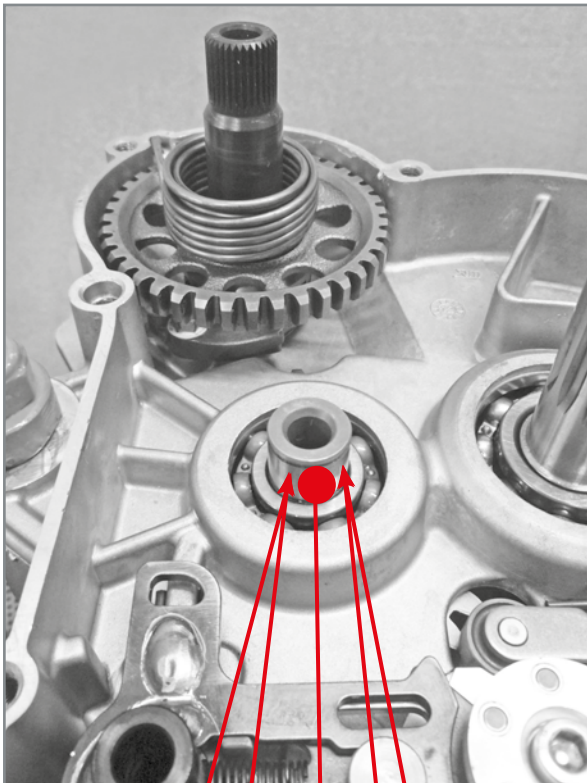
Pay attention to the correct positioning of the sleeve 14 respect to the shaft 3. The front of the shaft has a reference sign, just as the sleeve 14 does: the two references must match.

3.7.2 Assembly of kickstarter device

Insert the complete kickstart shaft in its housing, keeping the thin-striped facing outwards and making sure that the ramp A on the kickstart sleeve is positioned below the ramp B bolted onto the right crankcase half (external side).



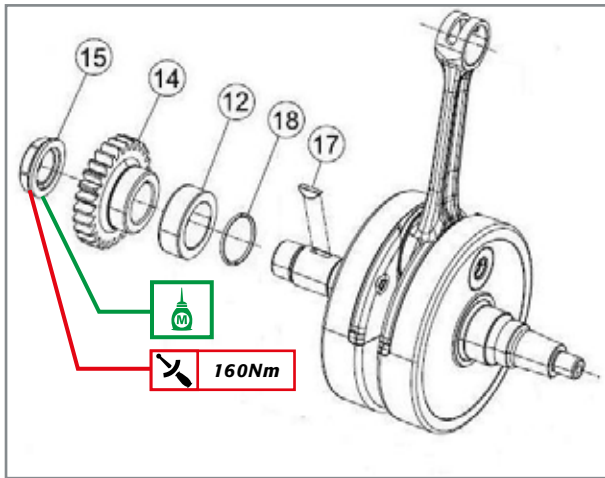
Insertion of kickstart return spring.



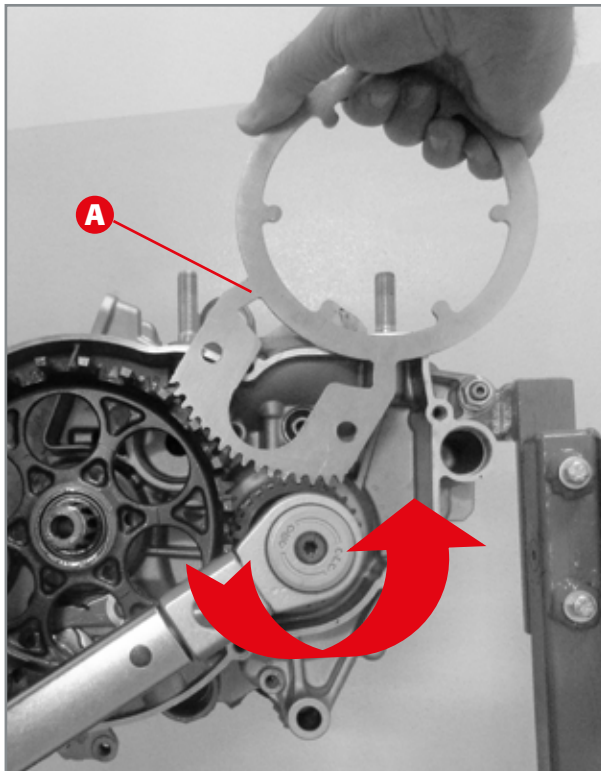
Kickstart device unit coupled to the crankcase.

Turn the spring clockwise until it fits into the specific hole **C**.

Insert in the slot on the protruding segment of the secondary shaft: the circlip **18**, the rose-petal **17**, the idler wheel **4** followed by the rose-petal **17** and the circlip **18** as shown in the figure.



Exploded view of pinion unit.



Fastening of the primary gear nut.

3.8 MAIN GEAR AND CLUTCH UNIT

Before reassembling the clutch unit, carry out some checks on the various components described below.

3.8.1 CHECK OF PRIMARY GEAR

Check teeth of primary gear is without nicks or abnormal wear. If so, replace it.

3.8.2 PRIMARY GEAR APPLICATION

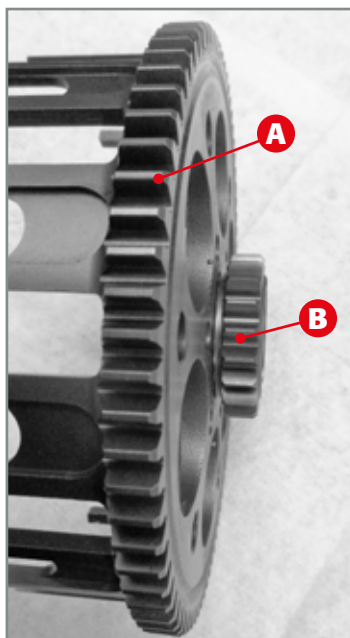
Apply the O-ring **18**, the spacer **12** and gear **14** on the right half shaft so the appropriate groove inserts inside the Woodruff key **17**. Apply lock nut **15** by depositing a medium strength threadlocker. The fastening torque must be 160Nm.

This is possible once the clutch case is inserted using primary special tool **A** (code 029.14.002.50.00). See Par. 3.8.3 to apply the clutch case.

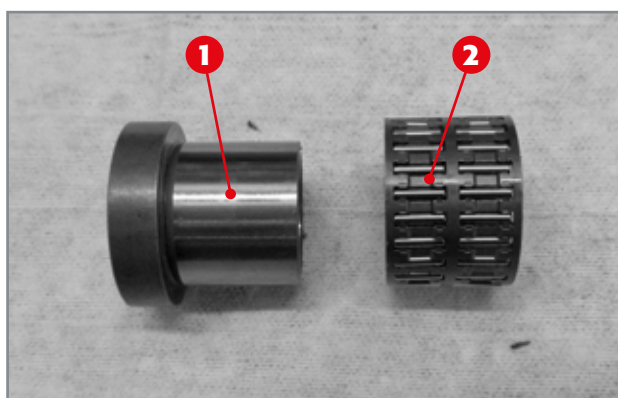
Attention! The nut is fastened anti-clockwise.

3.8.3 Checking the clutch case, roller bearing and internal centre bearing

Before reassembling the clutch case, make sure that the sides of the teeth **A**, dedicated to main transmission and **B** dedicated to meshing with the kickstart idler gear and oil pumps, have no superficial nicks or abnormal wear.

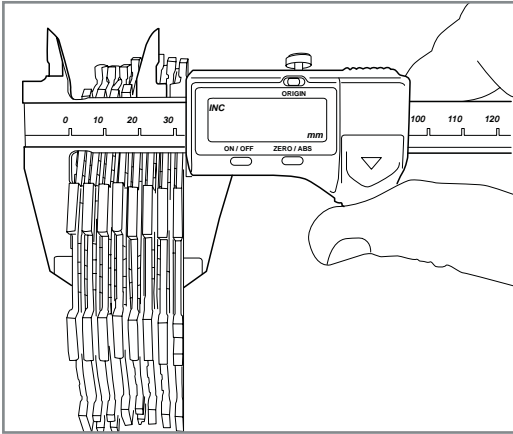


Case gears

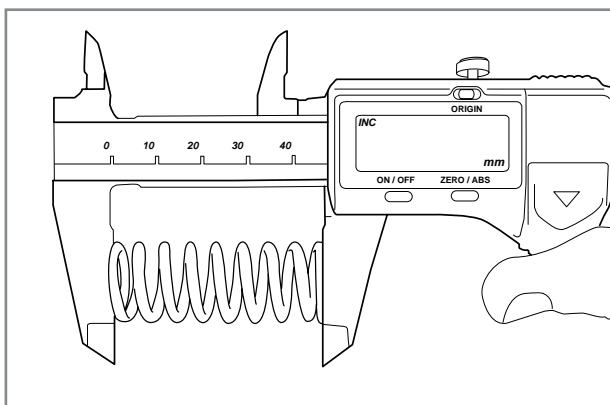
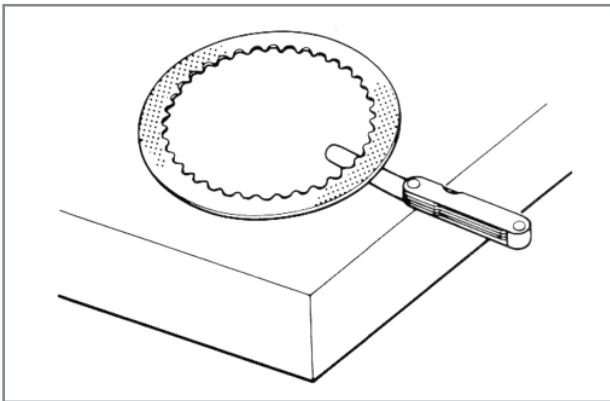
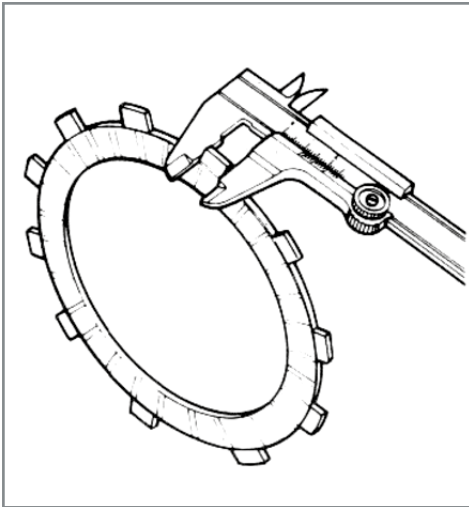


Centre bearing and roller bearing.

Check the state of use of the internal centre bearing **1** which must have no traces of meshing or abnormal wear. Check the state of use of the roller bearing **2**. If it is worn, have it replaced.



Clutch pack measurement



3.8.4 CHECKING THE CLUTCH DISCS

The clutch discs are divided into driving and driven: eight driving discs and seven driven discs.

The driving discs have cork inserts on both sides which wear out due to the driven discs sliding on them. It is necessary to check that the thickness of the clutch pack (driven and driving discs) is not lower than a minimum set value equal to:

minimum thickness of complete disc pack: 31.6mm

The other value that needs to be checked is the thickness of the teeth of each driving disc. They must not be less than the minimum value fixed at:

minimum driving disc tooth thickness: 13.3mm

Also check the distortion of the driving discs. This operation is carried out by placing the driving discs on a perfectly flat surface and using a thickness gauge to check that the gap between the disc and the surface is not greater than:

allowable distortion of driven discs: 0.10mm

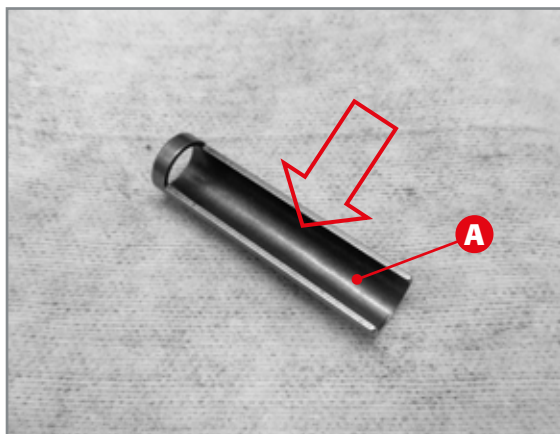
3.8.5 CHECKING THE SPRINGS

To ensure the correct pressure between the clutch discs, the state of the springs must be checked. The minimum acceptable length must be:

minimum clutch spring length: 45mm

3.8.6 CHECKING THE CLUTCH DRUM AND CAP

The clutch drum engages with the driven clutch discs by means of the sliding pins **a**: make sure that the area shown in the figure has no meshing or abnormal wear. If so, replace the sliding pins.



Drive pin



Bare clutch drum

Check that the disc friction area is free from scratches, meshing or abnormal wear. If so, replace the clutch drum

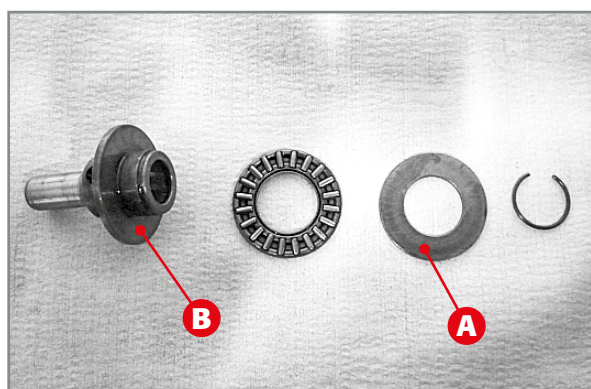
Also control that the radial holes on the clutch drum are not obstructed and are free from sediments.

3.8.7 CHECKING THE THRUST BEARING DEVICE

Check the state of use of the thrust bearing and the surfaces upon which it rests.

In order to check the thrusting bearing, just see if it slides. When the device is assembled, simulate rotation of the front centre bearing **A** with respect to the rear one **B**.

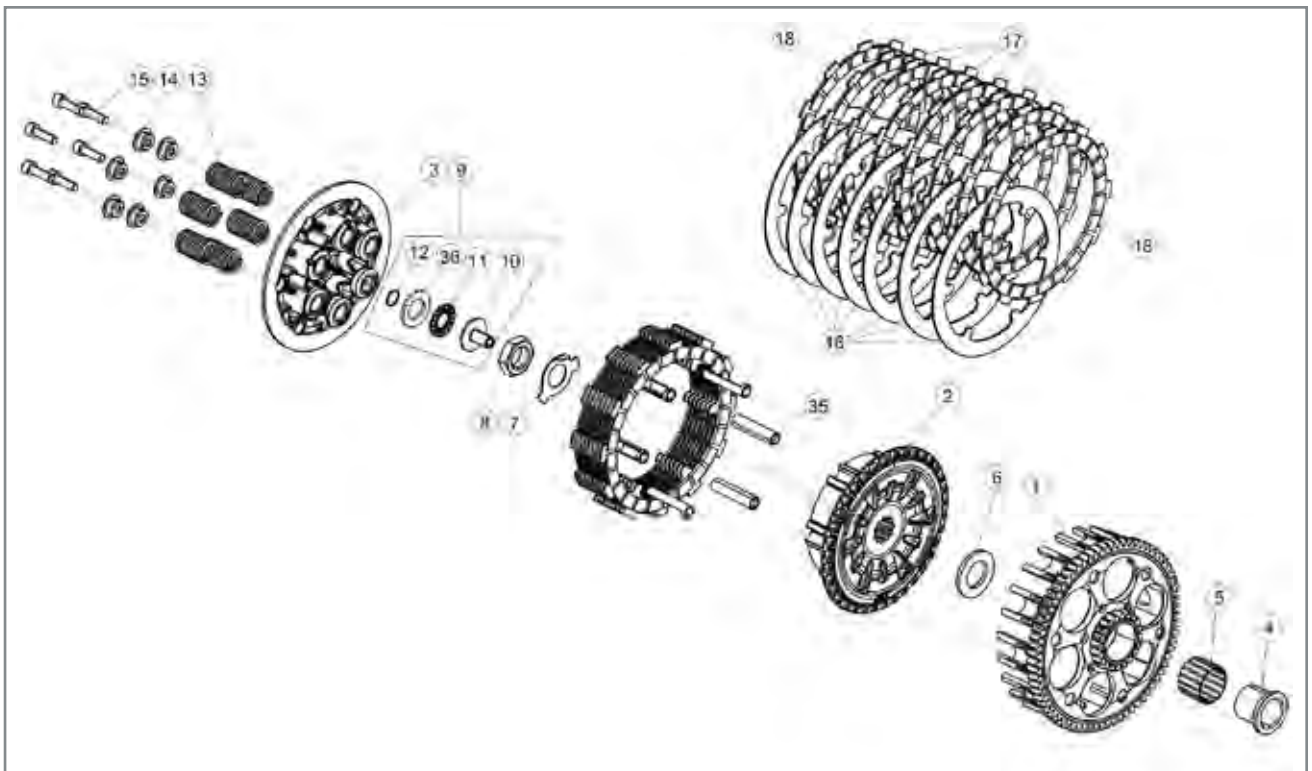
Pay attention to the presence of traces of meshing or wear on the sliding surfaces. In the event of signs of deterioration, replace the entire unit.



Thrust bearing device.

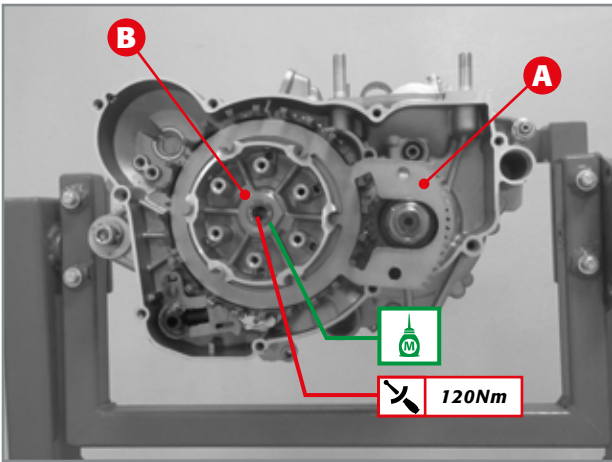
3.8.8 CLUTCH UNIT ASSEMBLY

Lubricate the end of the primary gearbox shaft, the internal centre bearing **4** and the roller bearing **5**. Fit the roller bearing **5** and the centre bearing **4** on the clutch case **1**. Mount the unit on the primary shaft; in order to facilitate the insertion of the clutch case, slightly turn the kickstart idler gear (optional), the idler gear for oil pump control and the case itself, thus facilitating meshing. Mount the washer **6**, which the clutch drum **2** rests against. Fit the sliding pins **35** on the drum. Put on the safety washer **7** and, after having applied the medium strength threadlocker, couple the lock nut **8**.

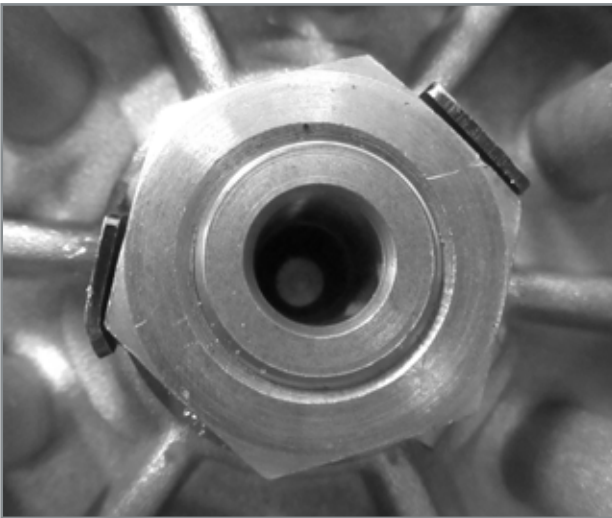


EXPLODED VIEW OF CLUTCH UNIT:

- 1) Complete case;
- 2) Clutch drum;
- 3) Clutch pressure cap;
- 4) Internal centre bearing;
- 5) Roller bearing 26x30x22;
- 6) Washer;
- 7) Safety washer;
- 8) Nut M18x1.5;
- 9) Full thrust bearing;
- 10) Clutch body rod coupling;
- 11) Thrusting bearing;
- 12) Circlip RB14;
- 13) Clutch spring;
- 14) Clutch spring retainer;
- 15) Hexagonal hollow cylindrical head screw;
- 16) Driven discs;
- 17) Driving discs - GREEN edge;
- 18) Driver disc - BLUE edge;
- 35) Drive pin;
- 36) Thrust bearing washer.



To unscrew the nut **8** the clutch drum must be blocked with a relevant tool **A** (code 029.14.002.50.00). Tighten to the specified torque.



Having tightened the nut, bend the two blocking flaps on the safety plate.

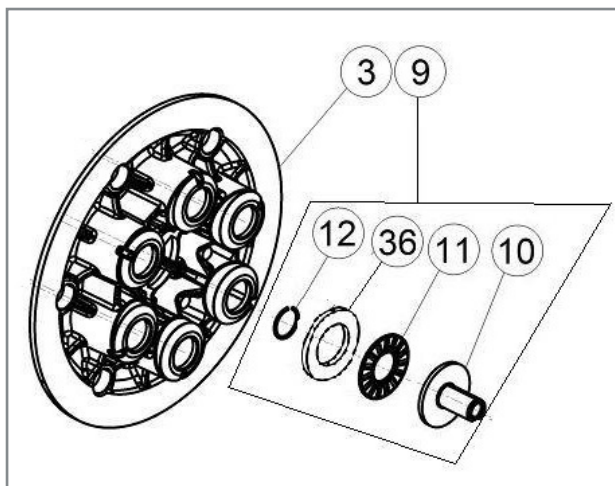
Safety washer folding



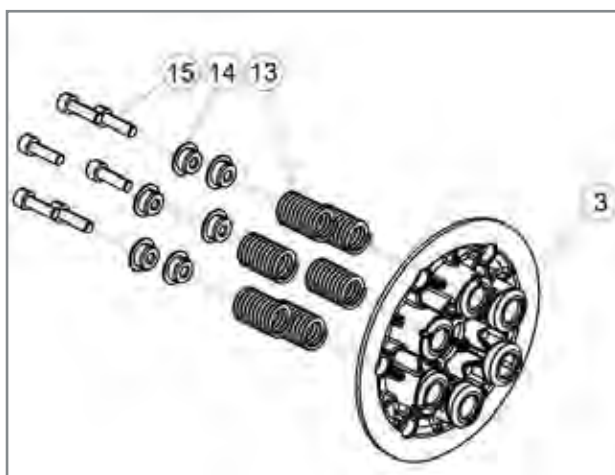
Lubricate the clutch discs with gear oil and apply the driving disc with BLUE edge and a driven disc. Then alternate the driving discs with GREEN edge and the driven discs. The other BLUE driving disc will close the disc pack.

Disc layout

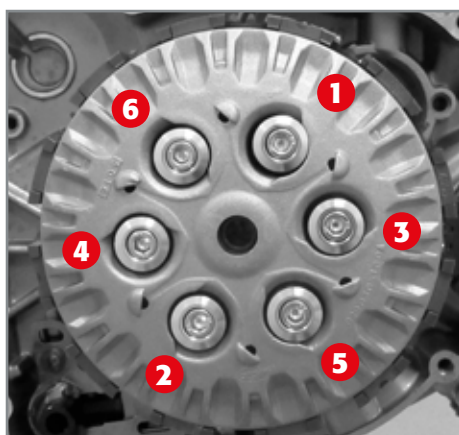
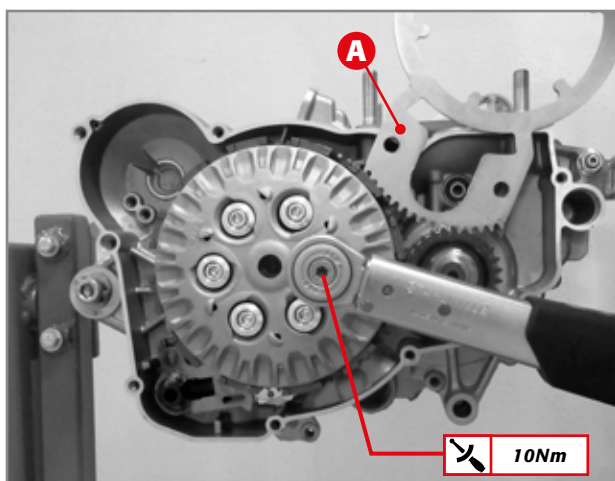
Please note that the driven discs must be inserted so that the radius on the teeth faces inwards towards the engine.



Thrust bearing assembly



Clutch cap assembly



Insert the overall thrust bearing **9** (after having lubricated it with transmission oil) in the hole on the gearbox main shaft and check its free axial sliding.

Close the clutch unit with the clutch cap **3**, the springs **13**, the four spring retainers **14** and the screws **15**.

Close the clutch unit with the clutch cap **3**, the springs **13**, the four spring retainers **14** and the screws **15**.

3.9 COOLANT LIQUID PUMP AND CENTRIFUGAL UNIT

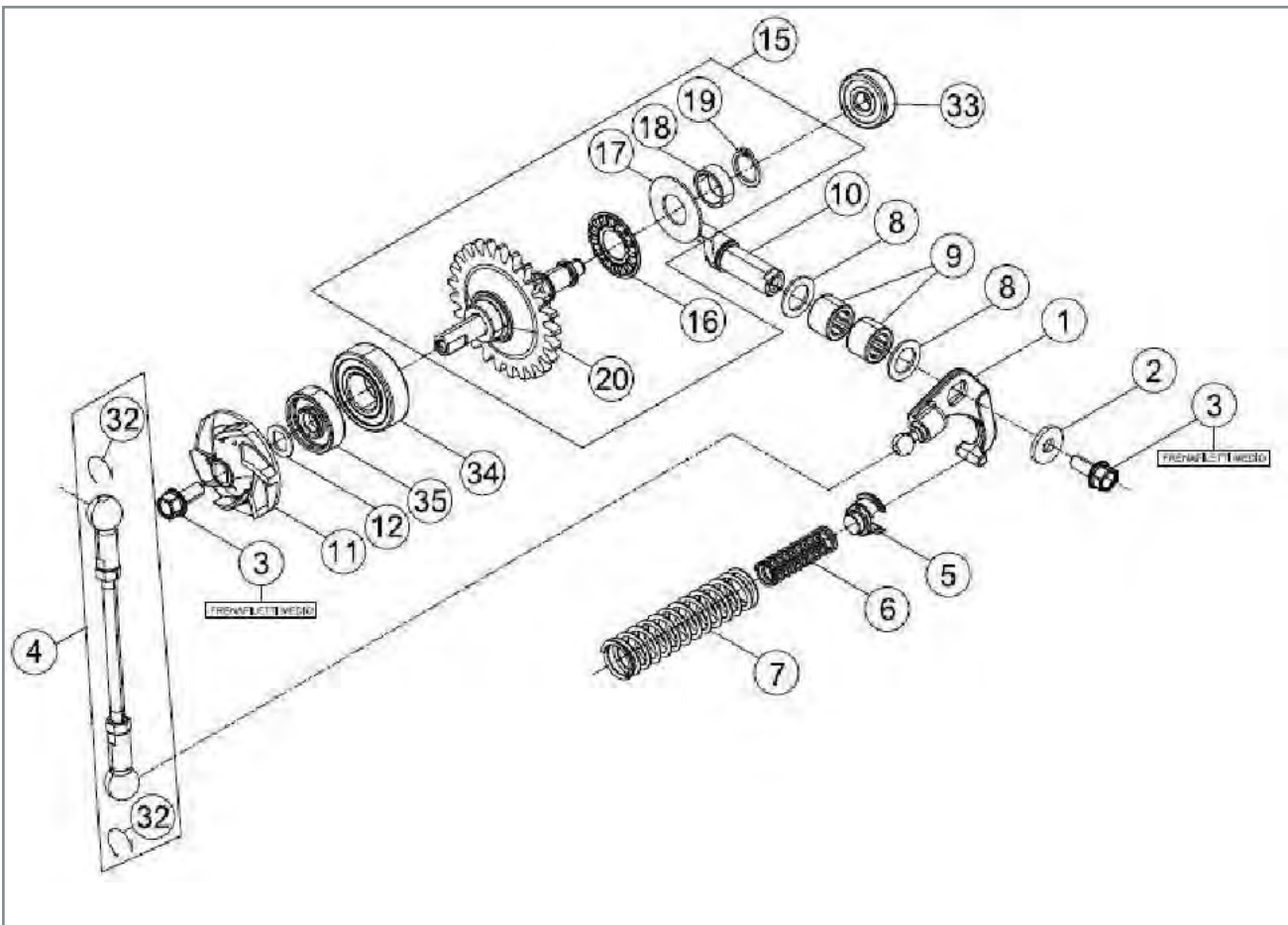
The water pump must guarantee, depending on the set rotation speed, the correct flow rate of the coolant in order to extract the needed amount of heat from the thermal unit. The centrifugal unit activates the whole exhaust valve control lever based on the engine rotation speed, while springs 6 and 7 give the correct contrast to the centrifugal action caused by 20, in order to guarantee excellent supply of torque and power.

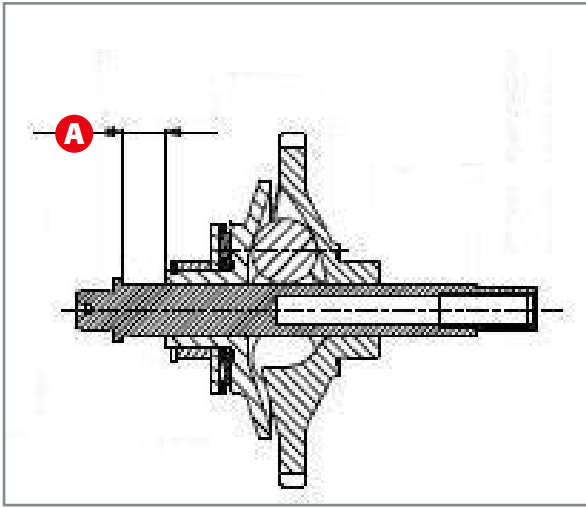
The impeller 11 is fastened to shaft 20 and coupling is ensured by tightening nut 3 on shaft 20.

The centrifugal unit 20 shaft is supported by bearing 34 present on the internal clutch cover and by bearing 33 on the external side right crankcase half. The seal is guaranteed by oil seal 35.

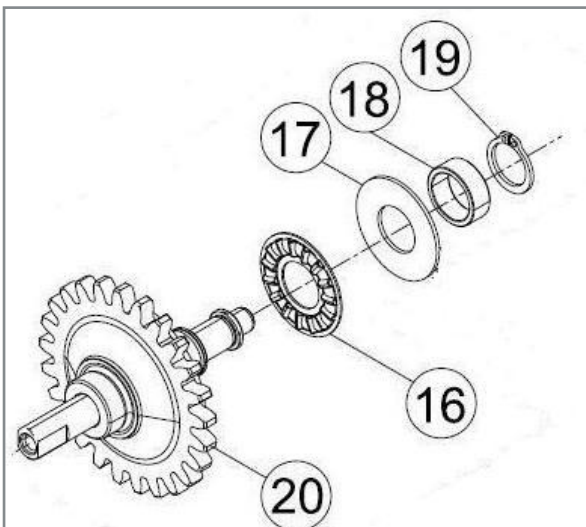
EXPLODED VIEW OF CENTRIFUGAL UNIT AND WATER PUMP UNIT

- 1) Rocker arm;
- 2) 5x15x2;
- 3) Screw M5x12;
- 4) Complete valve control rod;
- 5) Spring guide;
- 6) Auxiliary spring;
- 7) Adjusting spring;
- 8) Washer 10x16x1;
- 9) Roller bush;
- 10) Centrifugal control lever;
- 11) Water pump impeller;
- 12) Water pump washer;
- 15) Complete centrifugal unit;
- 16) Roller axle cage;
- 17) Centre bearing;
- 18) Spacer;
- 19) Circlip;
- 20) Complete centrifugal shaft;
- 32) Ball joint retainer ring;
- 33) Bearing 6x19x6;
- 34) Bearing 15x32x9;
- 35) Oil seal.

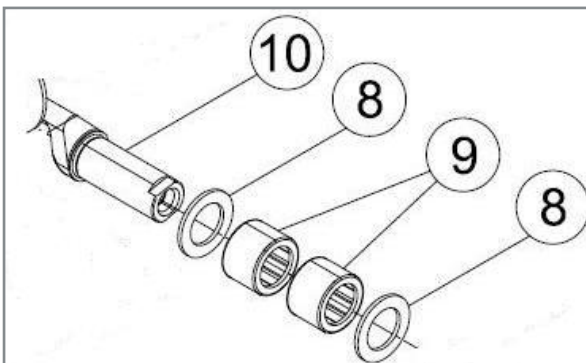




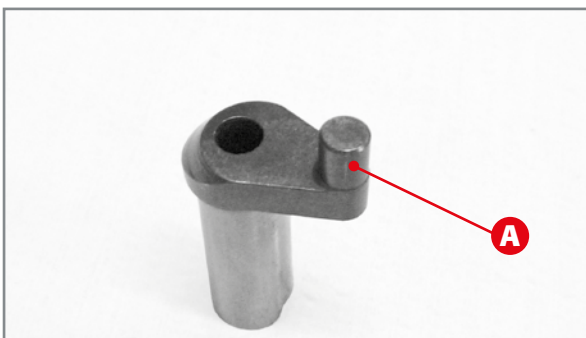
View in centrifugal unit section: stroke A.



Exploded view of centrifugal unit.



Exploded view of bearings and centrifugal control lever.



Check of centrifugal control lever A area.

3.9.1 Checking the pump unit and disassembly, centrifugal unit and idler unit

Refer to par. 2.6.1 to disassemble the entire pump unit.

Check oil seal use status. Replace if worn.

Check centrifugal unit shaft use status. Replace the entire centrifugal unit if dented in the area in contact with the oil seal.

Check the device's axial stroke **A** is between 6.4-6.6mm.

If so, replace the unit.

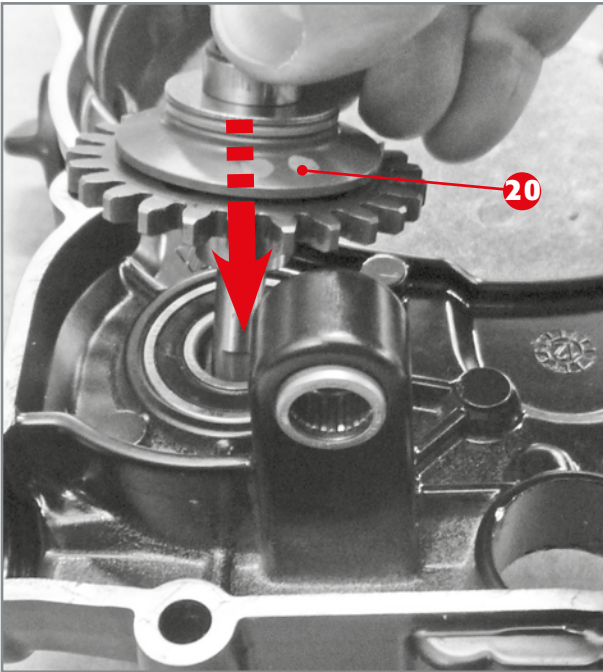
Remove circlip **19** and check use status of the roller axial cage **16**. Replace it in case of anomalies.

Check the roller bushes **9** do not jam during their operation and check the centrifugal control lever **10** moves correctly.

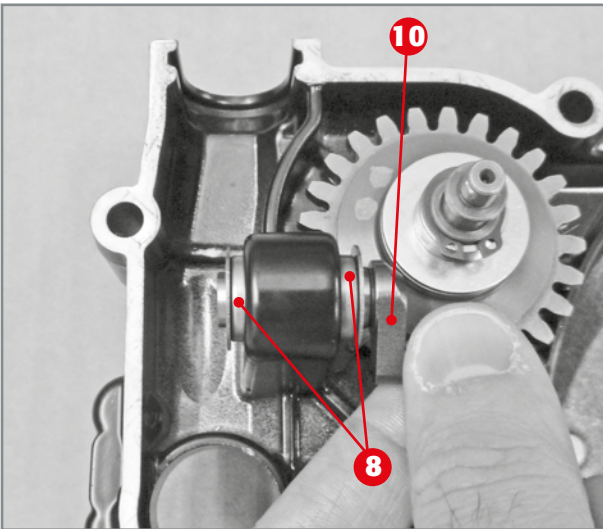
Also check area **A** of lever **10** is not worn.

3.9.2 Centrifugal unit assembly

Insert the centrifugal unit **20** in inner clutch cover.

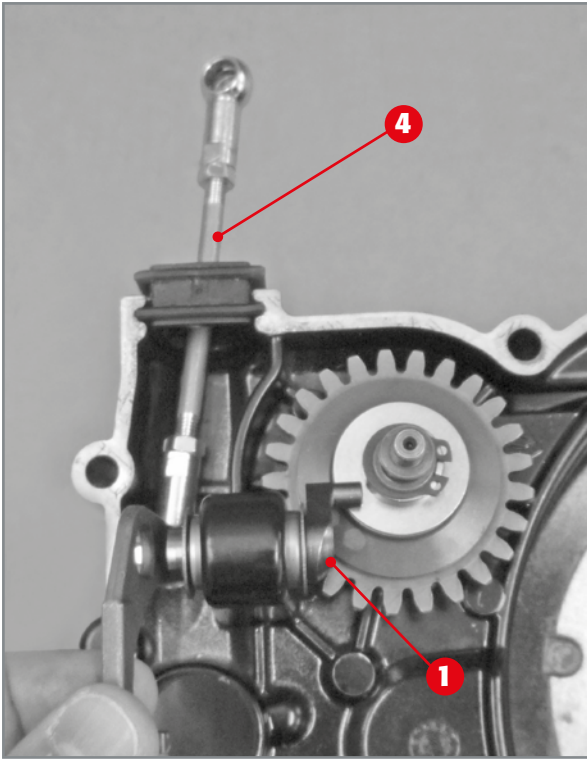


Insertion of centrifugal.

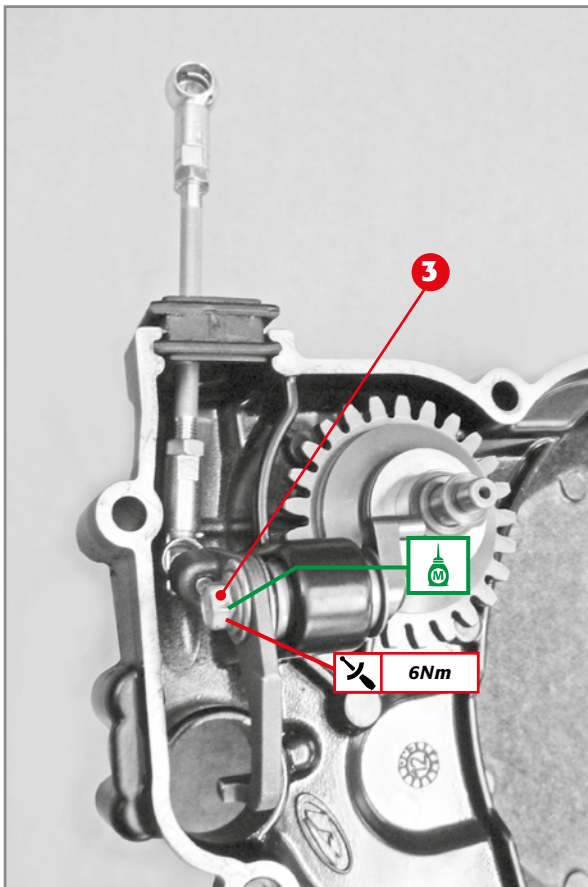


Insertion of centrifugal control lever.

Insert the centrifugal control lever **10** together with the washers **8**.



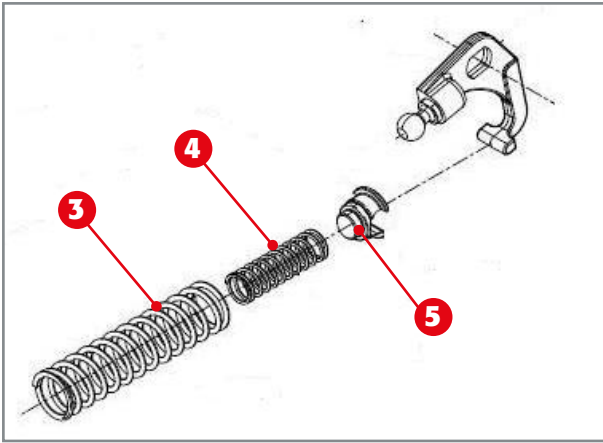
Application of valve control and rocker arm unit.



Centrifugal unit.

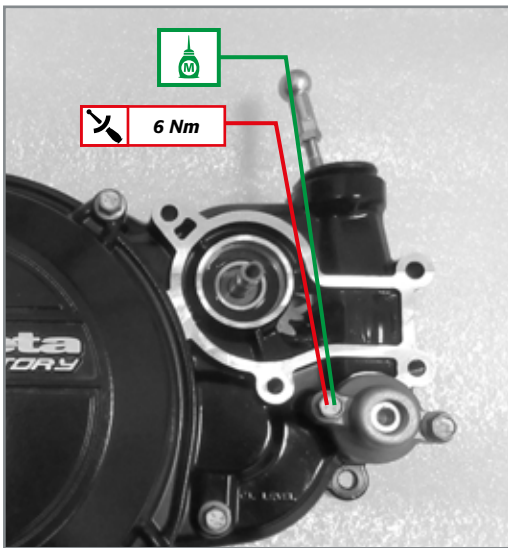
Apply the valve control rod gasket and the rocker arm unit **1** - valve control rod **4**.

Apply blocking screws **3** prior depositing of medium strength threadlocker. Tighten to the specified torque.



Spring guide and springs unit.

Apply the auxiliary 4 and adjusting 3 springs to the spring guide 5.



Fastening of adjusting cover.

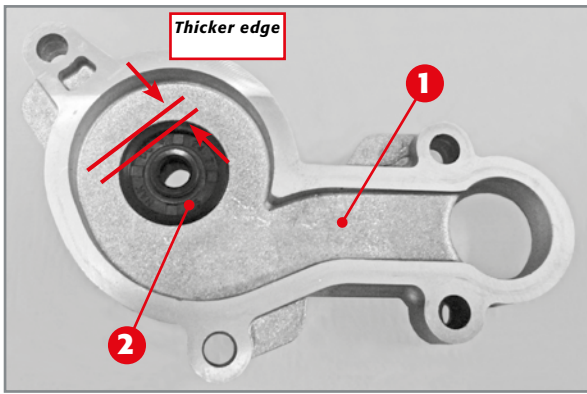
Apply the complete regulator cover to the inner clutch cover. Apply the blocking screw prior application of medium strength threadlocker and fasten to the indicated torque.

The vehicles are fitted with the following auxiliary and adjusting springs.

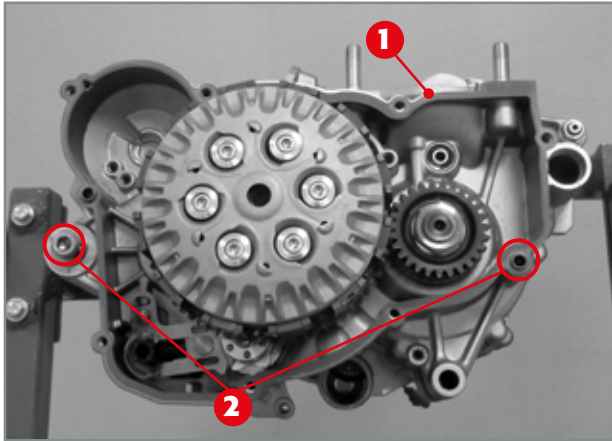
Displacement [cm ³]	MY	Adjusting spring	Auxiliary spring
		Colour	Colour
250	2018	White	White
	2019	White	White
300	2018	Green	White
	2019	Yellow	*

* *Optional*





Application of the oil seal to pump body.



Positioning of gasket and reference pins.

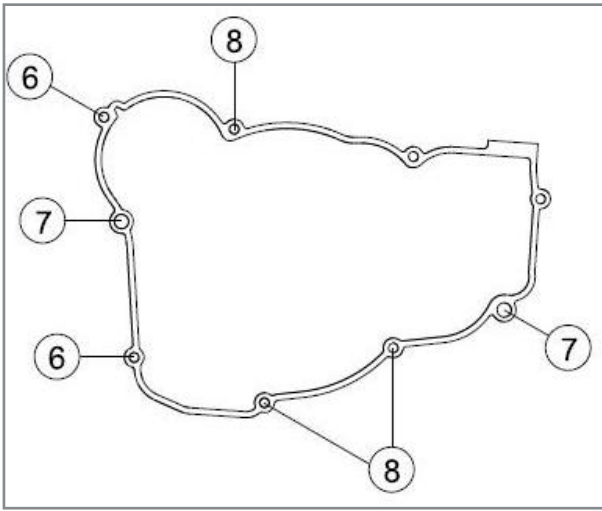
3.9.3 Pump unit assembly

Grease the oil seal housing on the pump body 1. Position the oil seal 2 so that the thicker edge faces the outside of the pump body. Insert the oil seal, having it enter the seat very slowly to keep it from deteriorating. The oil seal edge must be at the same height of the pump body (outer side).

3.9.4 Assembly of complete clutch cover and pump unit

Apply a new gasket 1 placed between the right crankcase half and the inner clutch cover using the two reference pins 2 to keep it in place.

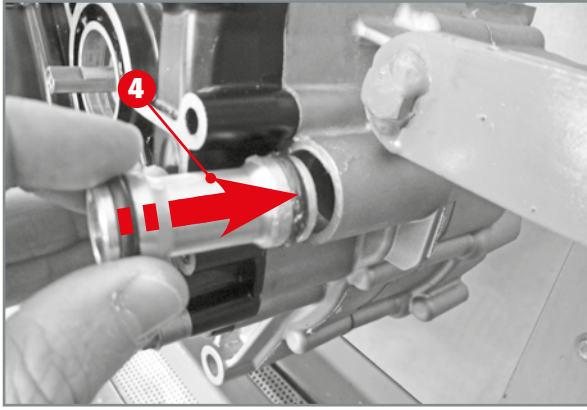
Couple the inner clutch cover to the right crankcase half and rotate the centrifugal shaft until the shaft meshes in the main gear.



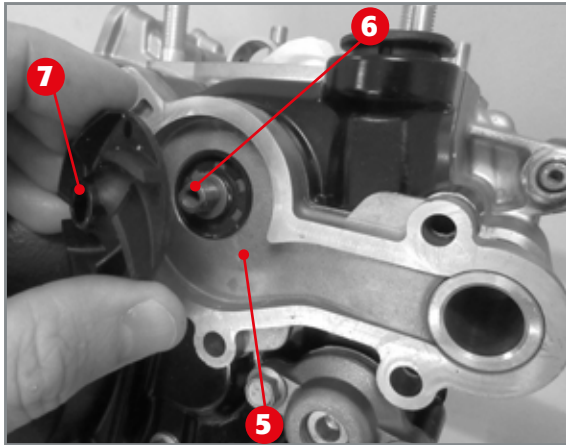
Screws positioning.

Apply the seven screws as shown in figure, fastening them at 10Nm with a criss-cross pattern.

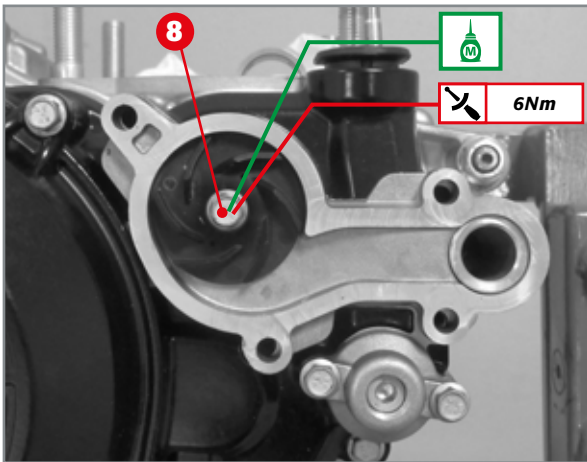
Number screw	Screw dimensions		Threadlocker application	Fastening torque [Nm]
	Threading diameter	Threading length		
6	M6	20	NO	10
7	M6	30	NO	10
8	M6	50	NO	10



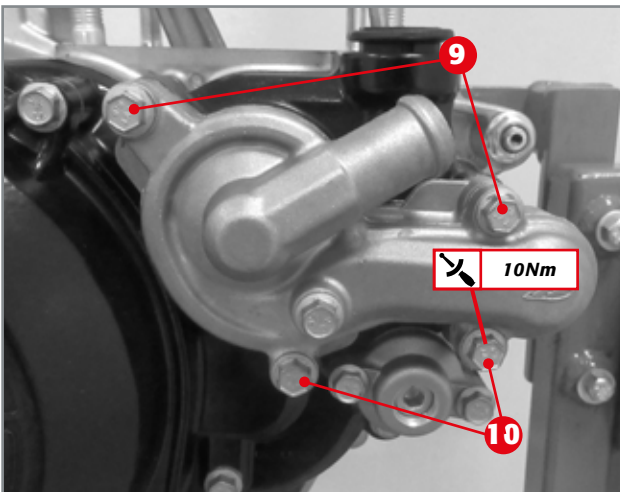
Insertion of water hose.



Application of water pump impeller.



Complete water pump.



Pump cover.

Grease the O-rings on the water hose and insert the hose 4 in the right crankcase half.

Apply the gasket between the pump body and clutch cover. Grease the inner diameter of the oil seal on the pump body 5 and apply the body to the clutch cover.

Apply washer 6 and water pump impeller 7.

Apply screw 8 prior application of the medium strength threadlocker and fasten at 6Nm.

Couple the water pump cover to the pump body by applying the two M6x60 screws 9 and the two M6x30 screws 10. Fasten all screws at a torque of 10Nm following a criss-cross pattern.

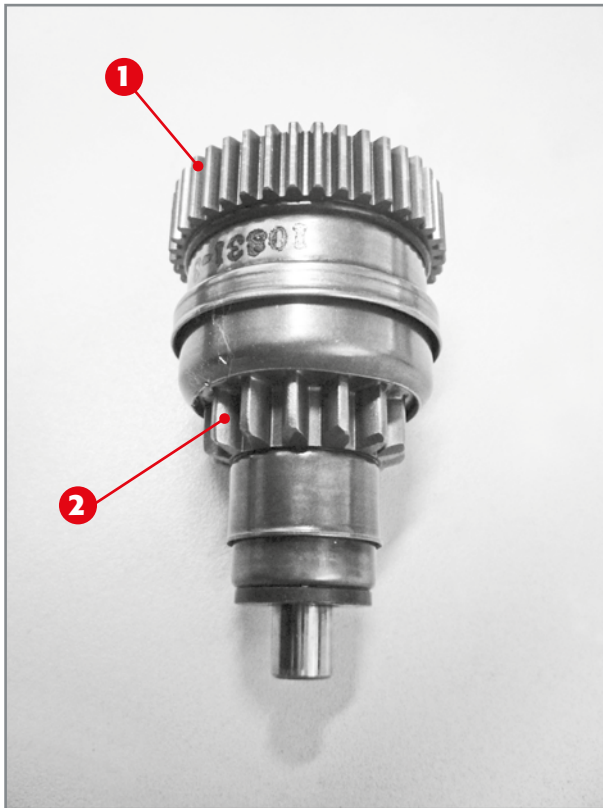
Apply the oil drain plug and tighten to 15Nm.

3.10 ELECTRIC IGNITION UNIT

Carry out the following checks before assembly.

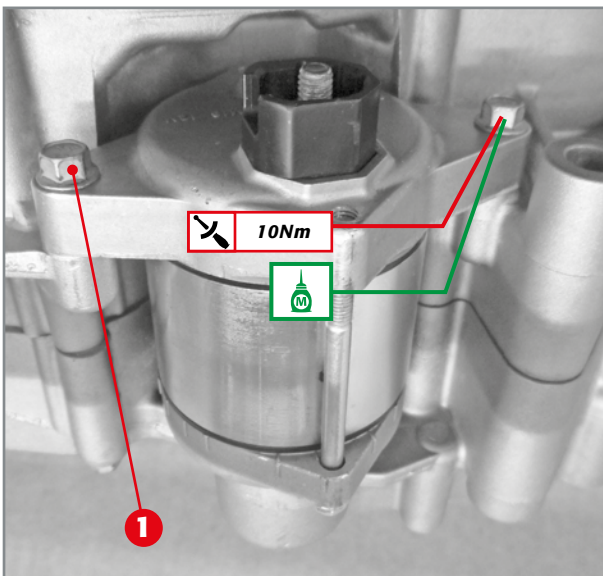
3.10.1 Bendix coupling checks

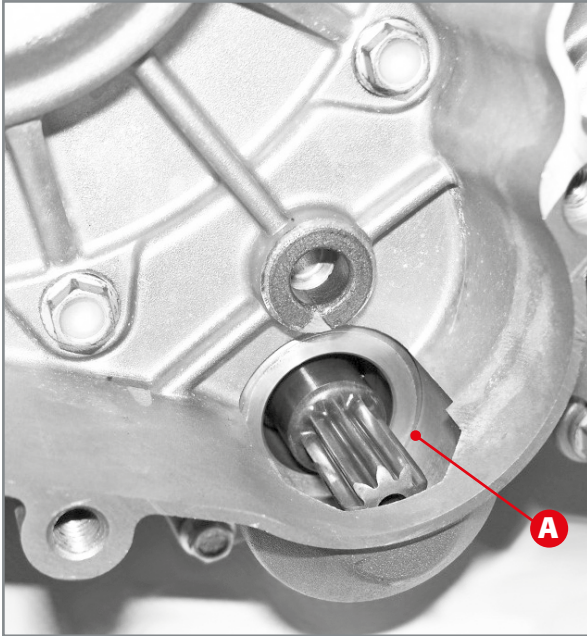
Check wear of the gearwheels present on the unit. Replace the whole coupling in case of abnormal wear and signs of chipping of the wheels. Keep wheel **1** fixed and rotate the mobile coupling **2** anti-clockwise; this must slide without jams. By releasing the mobile coupling, this must go back to rest position without jams. Replace the whole unit if anomalies are detected during these two checks.



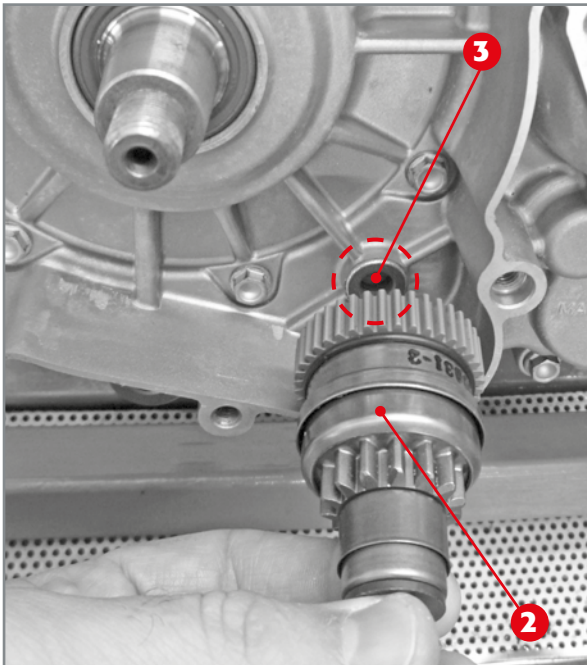
3.10.2 Ignition unit coupling to engine

Apply a thin layer of grease on the O-ring located on the start motor. Insert the start motor in its seat and block it with the two screws **1**, prior application of medium strength threadlocker. Tighten to the specified torque.





Application of oil.



Insertion of Bendix coupling.

Pour about 7cc of gear oil (for specifications refer to the recommended lubricants and liquids table) in area **A**.

Insert Bendix coupling **2** in bush with collar **3** present on the outer side left crankcase half.

3.11 IGNITION SYSTEM

Before reassembling the ignition system, it is recommended to make sure it is in good working order.

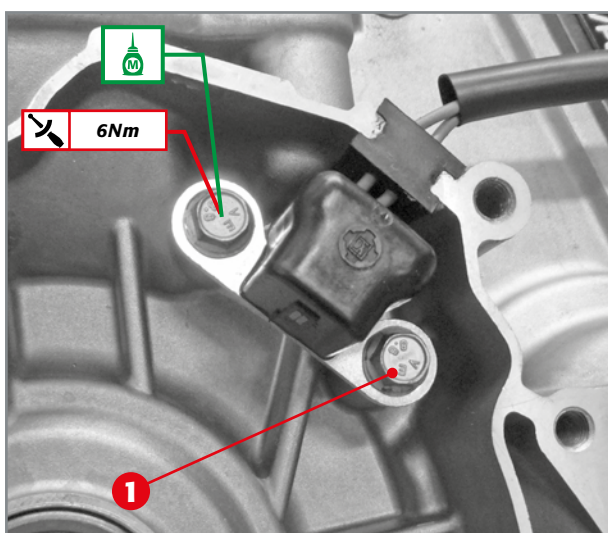
The ignition system is made up of the magnetic pick-up unit, the stator unit and the flywheel. The system is completed by the ignition coil and the spark plug, which are not dealt with in this text.

3.11.1 Checking the ignition system

Accurately degrease the various elements and carry on with the checks.

The main check is the one concerning the electrical verification which can be done by using a standard tester. The detected strength values must respect those in the table.

Element	Cables	Strength values
Pick up	Red – Green	$100\Omega \pm 20\%$
Stator	Red/Black – White/Red	$14,7\Omega \pm 15\%$
	Yellow – Mass	$0.61\Omega \pm 15\%$
	Yellow – White	$0.18\Omega \pm 15\%$

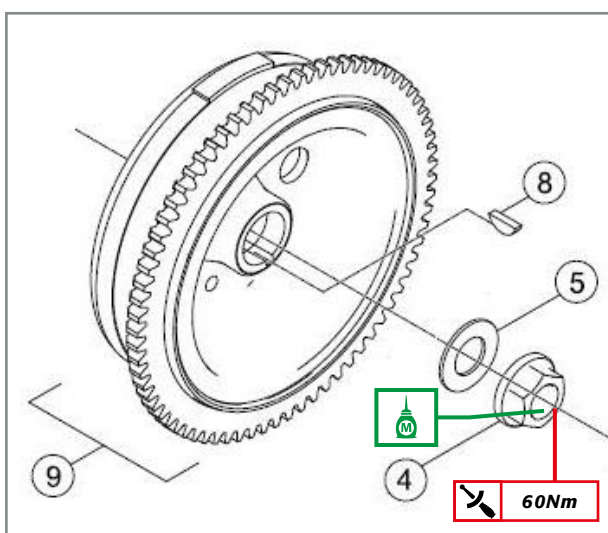


Coupling of pick up to crankcase.

3.11.2 Coupling of ignition system to crankcase

Apply the pick up to the crankcase by inserting the gasket in the specific seat, prior application of the isolating silicone paste.

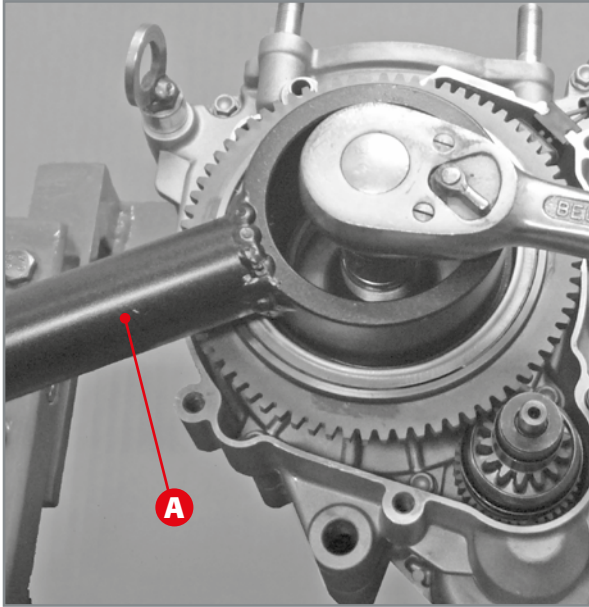
Cover the threading of the two screws **1** with medium strength threadlocker and tighten them at a torque of 6Nm.



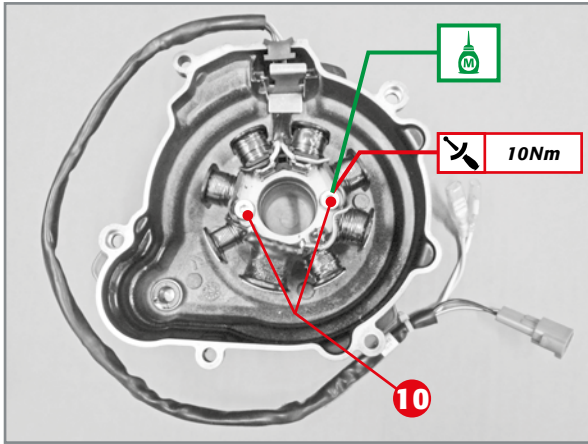
Exploded view of flywheel. 4) Nut M12x; 5) Elastic washer; 8) Woodruff key; 9) Flywheel.

Thoroughly degrease the crankshaft conical section, apply the Woodruff key **8** in the appropriate groove present on the crankshaft, couple the flywheel **9**, the elastic washer **5** and the nut **4**, after having spread the threading with medium strength threadlocker.

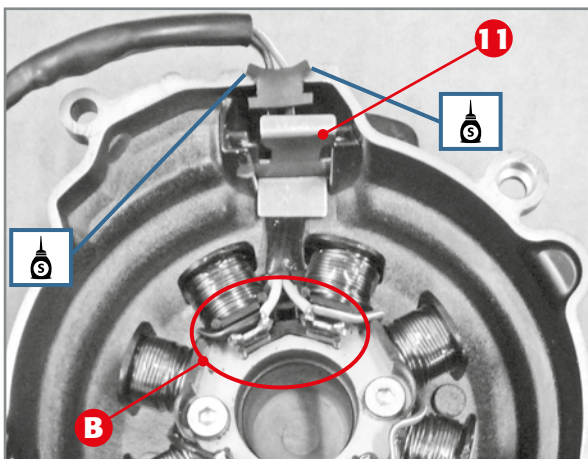




Flywheel fastening.



Stator coupling to the flywheel cover.

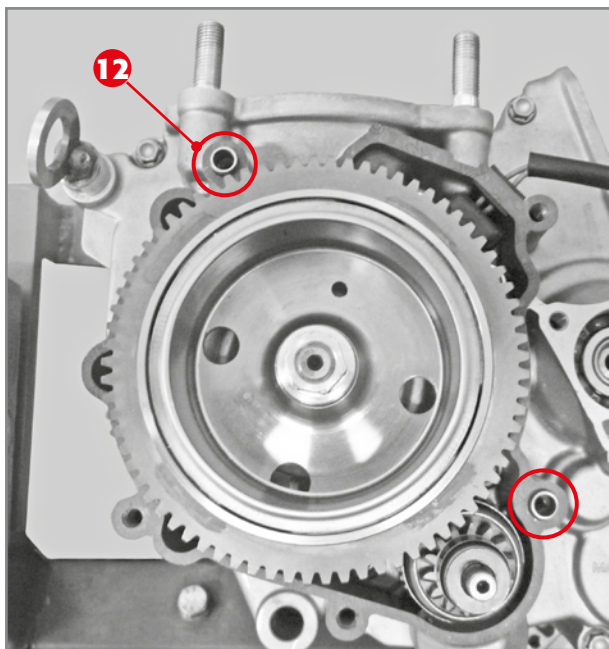


Application of stator plate.

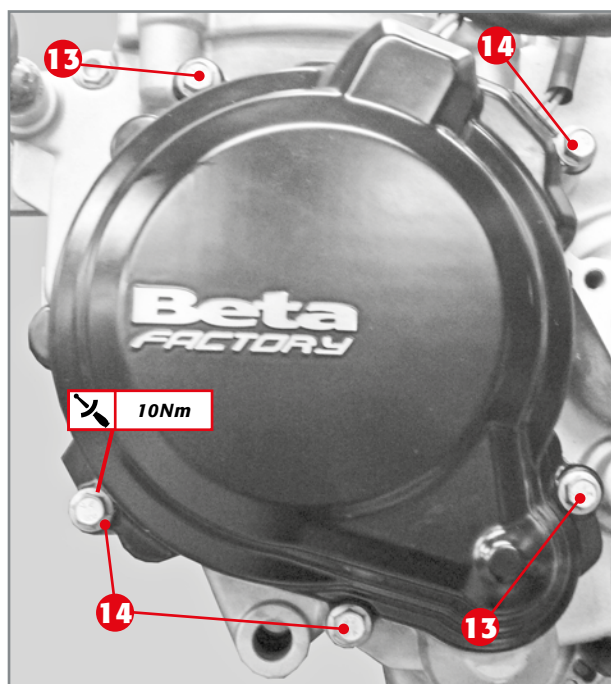
Fasten the nut to torque 60Nm, keeping the flywheel blocked with special tool **A** (code 026140040 000).

Couple the stator to the flywheel cover by means of the two screws **10**. Cover the threading with medium strength threadlocker and tighten them at a torque of 10Nm. Insert the cable gland in its specific seat and check its perfect sealing.

Apply a few drops of silicone in the guides for housing the plate **1**. Apply the plate **11** to be inserted in its guides and pressed. When coupling it to the left crankcase half, apply a drop of gasket paste (code 3625000000) in area **B**.



Application of flywheel cover centring pins.



Flywheel cover coupled to crankcase.

Insert the centring pins **12** on the crankcase and fasten a new gasket.

Apply the flywheel cover, the two M6x25 screws **13** and the three M6x20 screws **14**. Tighten in a criss-cross pattern at a torque of 10Nm.

Note: When performing a complete overhaul of the engine or intervening on the thermal unit, do not apply the cover as it has to be removed to find the Top Dead Centre.



Quota at which to measure the outside diameter of the piston.

3.12 THERMAL UNIT

Before assembling the thermal unit, thorough checks must be carried out on the cylinder, piston, pin bolt, elastic bands described hereafter.

3.12.1 Checking the piston and elastic bands

Eliminate carbonaceous sediment from the top of the piston and wash the entire piston with specific degreasing agent.

Do not use sharp points or tools for cleaning.

Then carry out a careful analysis of the piston which must be free from forcing, scratches, cracks or any type of damage.

Analyse the external diameter of the piston.

The diameter must be measured at a distance X from the inner edge of the skirt, perpendicularly to the axis of the pin bolt.

Refer to the following table for the piston's selection classes.

Displacement [cm ³]	Value X [mm]	Bore [mm]		
		A	B	C
250	18	66.345÷66.355	66.355÷66.365	66.365÷66.375
300	18	71.945÷71.955	71.955÷71.965	71.965÷71.975



First check of elastic bands.

In order to check the state of use of the elastic bands, the band must be inserted in the cylinder so that its axis is aligned with the axis of the cylinder. Then measure the distance between the two opposite edges.

The elastic bands must be positioned at about 31 mm from the cylinder's upper edge.

The respective service limits are carried in the table below.

Displacement [cm ³]	Service limit of elastic band [mm]
250 - 300	0.4

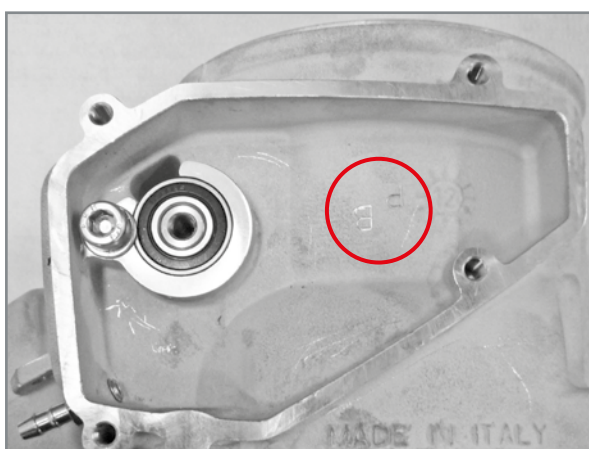
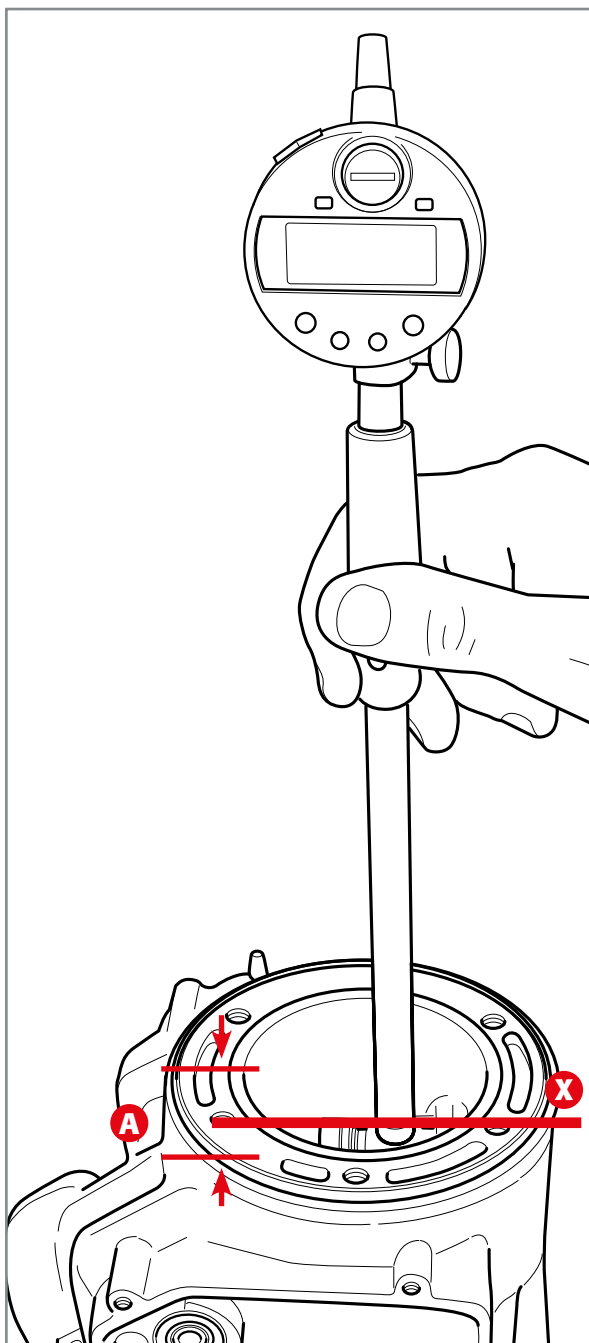
3.12.2 Cylinder check

Check the cylinder is without signs of seizure. If so, replace it.

Measure the bore at a distance **A** from the top face of the cylinder (surface between cylinder and head). Take the correct measurement by following direction **X**.

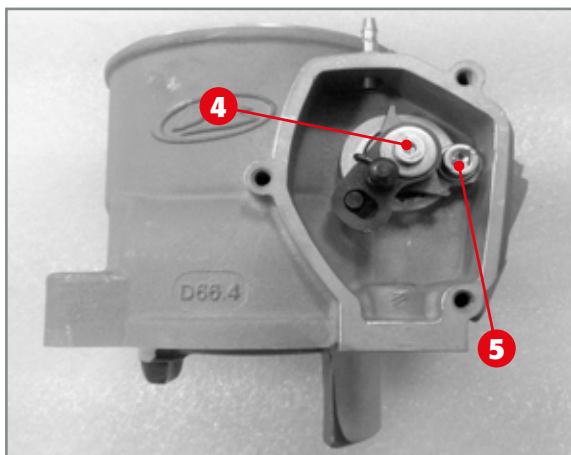
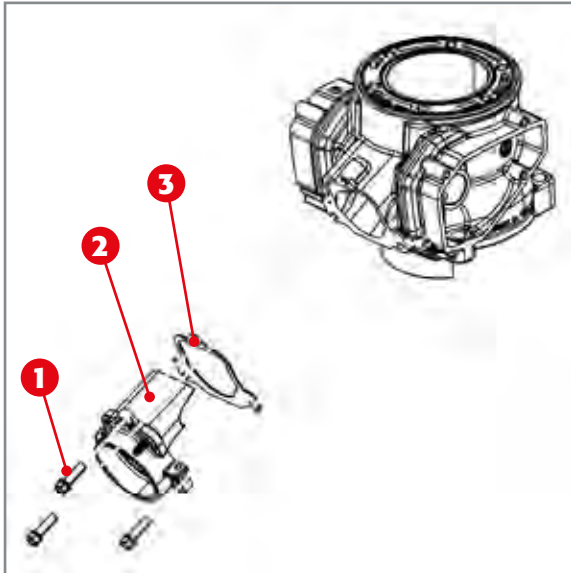
<i>Displacement [cm³]</i>	<i>Value A [mm]</i>
250	31
300	31.5

Bore measurement is required to know the coupling play between cylinder and piston.



Punching of cylinder class.

The cylinder's specific class is punched inside the resonance chamber compartment.



3.12.3 Piston cylinder coupling play

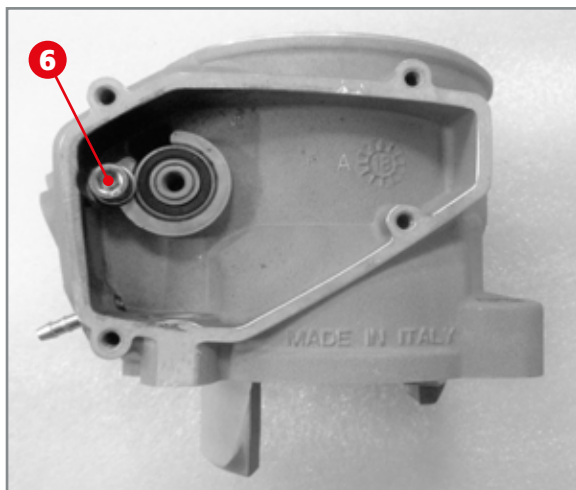
The following table carries the coupling play between the cylinder and piston. In order to calculate the coupling play between the cylinder and the piston, a subtraction must be carried out between the diameter of the cylinder and that of the piston.

<i>Displacement [cm³]</i>	<i>Maximum play of piston cylinder</i>
250 - 300	0.1

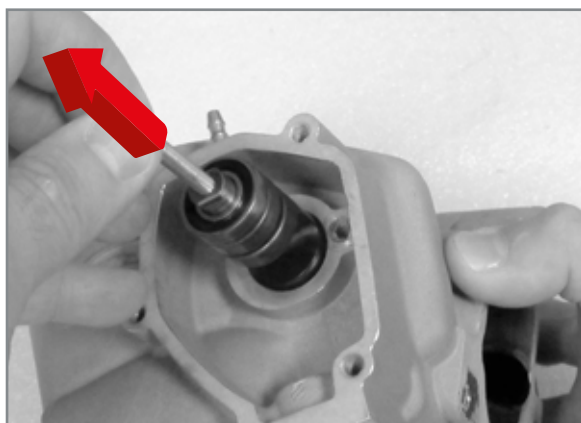
3.12.4 Checks and exhaust valve unit disassembly

Remove screws **1** to allow for the disassembly of the exhaust flange **2** and its gasket **3**.

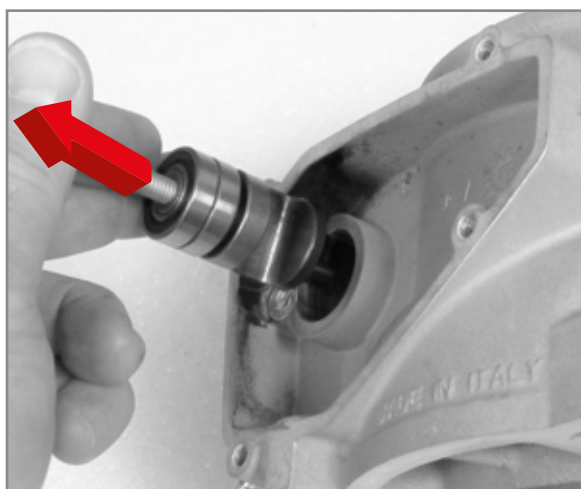
Remove screw **4** fastening the valve control unit to the booster; then remove screw **5** fixing the bearings.



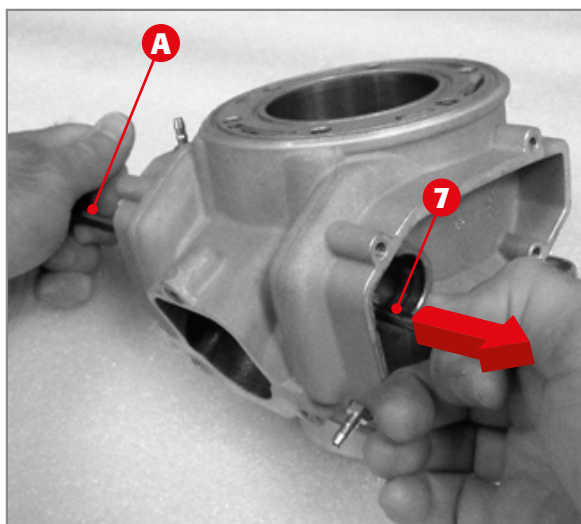
Remove screw **6** that keeps the left side bearings and the booster in their housing.



Apply one control unit side M5 screw and pull externally.

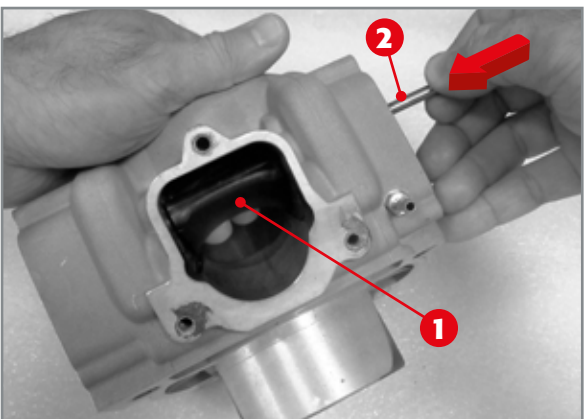
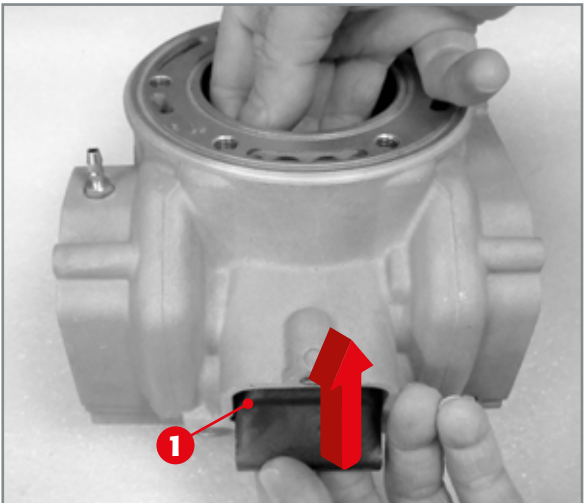
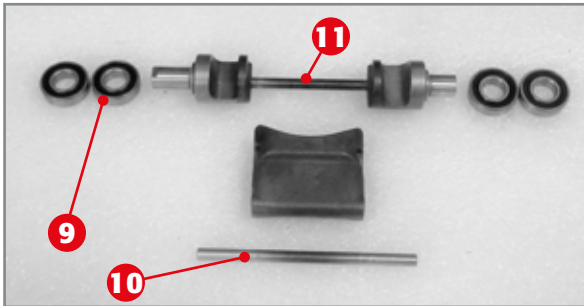
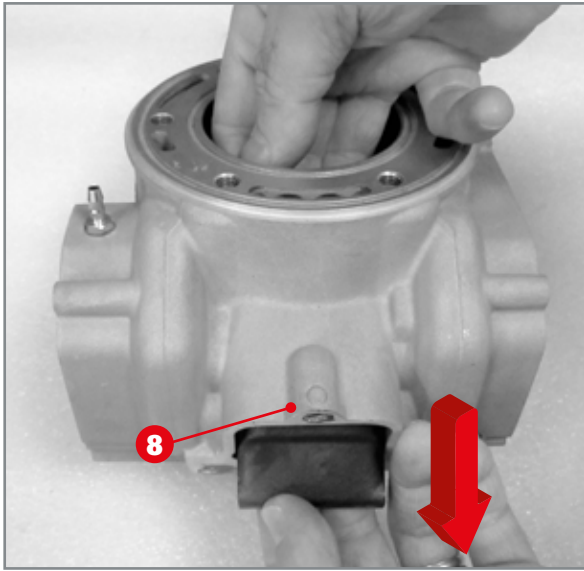


Repeat the operation from the opposite side using one M6 screw.



After extracting the boosters and relevant pin, extract the valve pin **7** by pushing it with a metal cylinder **A** and then extract valve **8**.





Check the bearings **9** supporting the booster are efficient, without jams during functioning or excessive play, once the unit has been cleaned and descaled. If so replace.

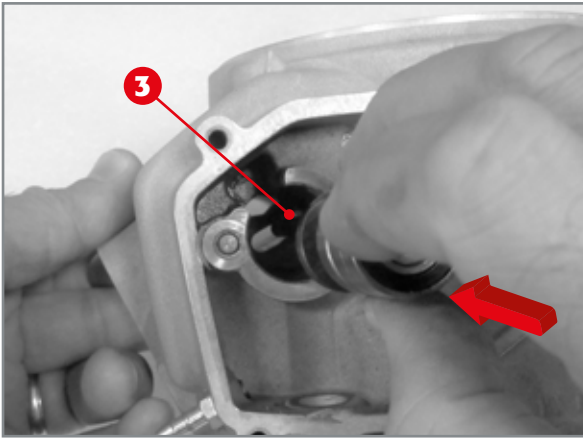
Check pins **10**, **11** and relative seats are not abnormally worn. If so, replace the worn parts.

Descalce all passages involved in the exhaust. Absolutely avoid the use of abrasives.

3.12.5 Unit assembly exhaust valve

Insert valve **1** in its seat with the back facing upwards.

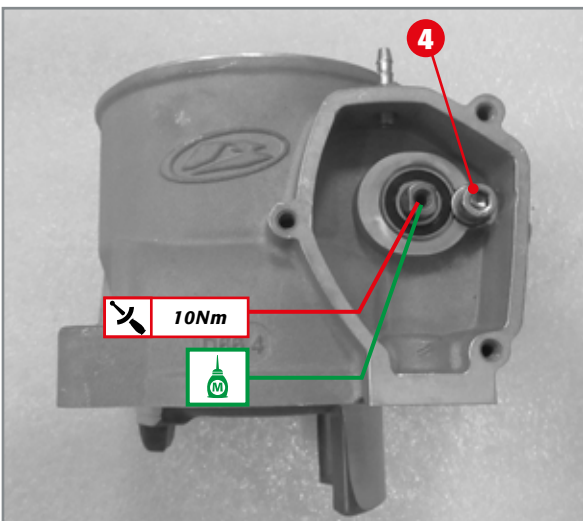
Insert pin **2** while keeping valve **1** in position.



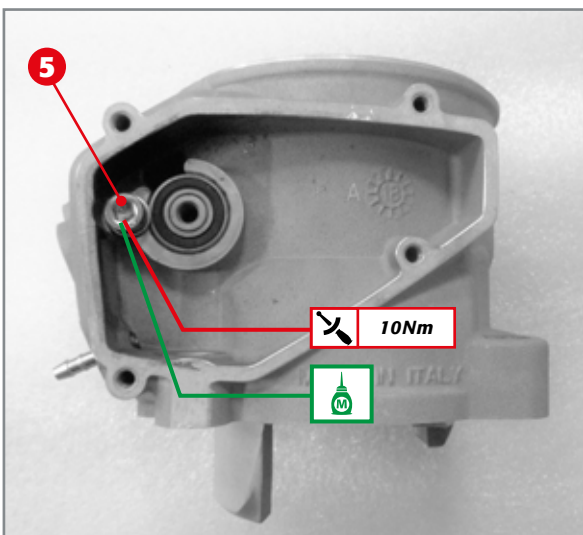
Apply the left side booster unit complete with pin and bearings in its seat: pin **3** must be inserted in the specific slot in the valve.

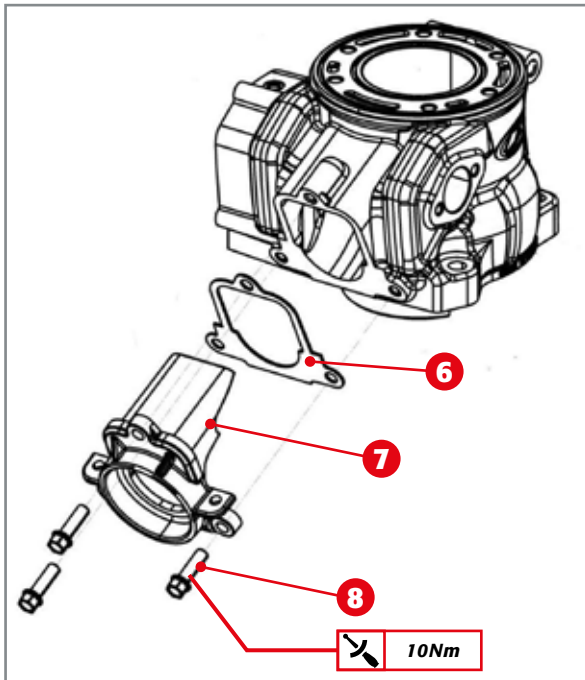
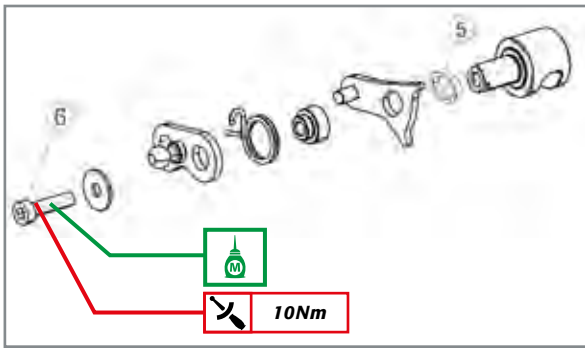


Apply the right side booster unit in its seat.



Apply screws **4** and **5** complete with the washer after applying medium-resistance threadlocker and tighten at the specified torque.





Apply spacer **5** to the control side.

Then apply all other parts.

Screw **6** must be covered with medium strength threadlocker and fastened to the indicated torque. Try moving the unit and check the entire mechanism perfectly slides, once assembly is completed.

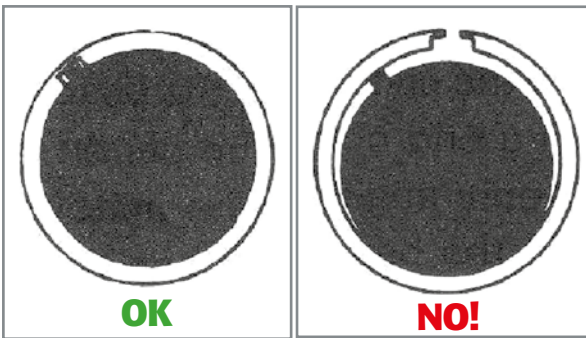
3.12.6 Piston, pin bolt, elastic bands and cylinder assembly

Insert a circlip for pin bolt retaining in one of the seats on the piston's side, placing the circlip's open part upwards or downwards.

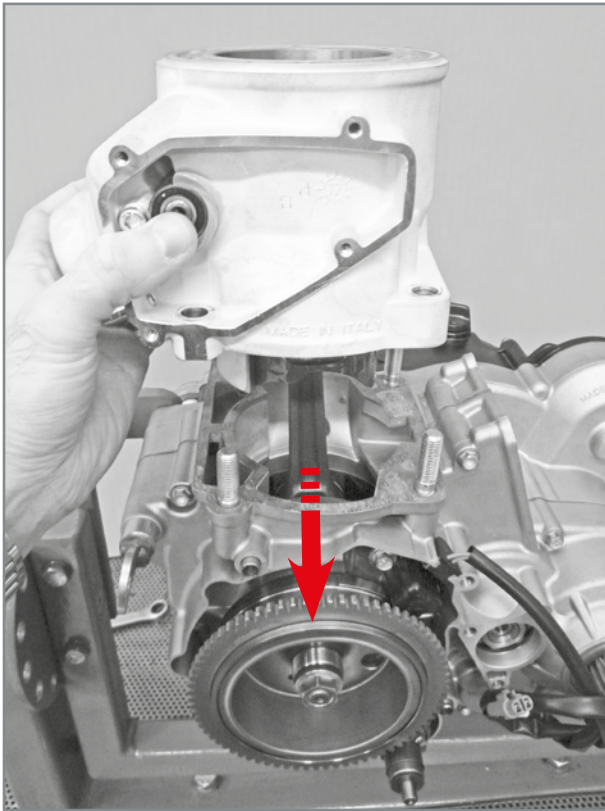
Apply the roller cage in the connecting rod's foot, and lubricate it.

Oil pin bolt and seat in piston. Insert the pin bolt in the piston from opposite side where the circlip was inserted, leaving enough space to allow for the coupling of the connecting rod to the piston. Place a piston so that the arrow stamped on the crown is facing the front of the engine (outlet port). Couple the piston to the connecting rod by fully pushing the pin bolt until flush with the previously inserted circlip. It may be helpful to use an aluminium cylinder (or similar tool) during this phase.

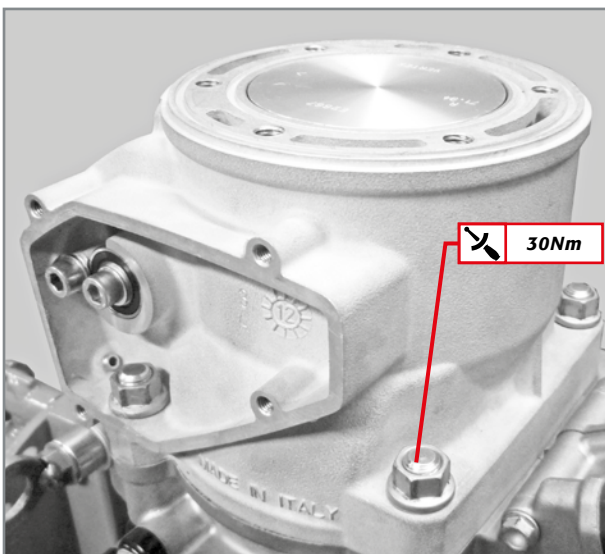
Attention! Place a clean cloth between the piston and the crankcase to keep foreign objects from falling inside the base.



Positioning of elastic bands on the piston.



Coupling of cylinder to piston and crankcase-



Fastening of cylinder nuts.

Introduce the second circlip in the specific seat by placing the open part upwards or downwards. Remove the previously inserted cloth. Abundantly oil the skirt of the piston with engine oil and insert the elastic bands, which edges must face the area with the stop pin.

Apply the gasket between crankcase and cylinder.

NOTE: keep the silicone edge facing down.

Accurately oil the entire cylinder using engine oil and insert the piston in the cylinder. The piston must be inserted in the cylinder fastening the elastic bands between the fingers. The cylinder must be positioned so that the outlet port is facing the front of the engine. Push the cylinder towards the base.

Apply the four collar nuts and fasten them at 30Nm, following the criss-cross pattern.



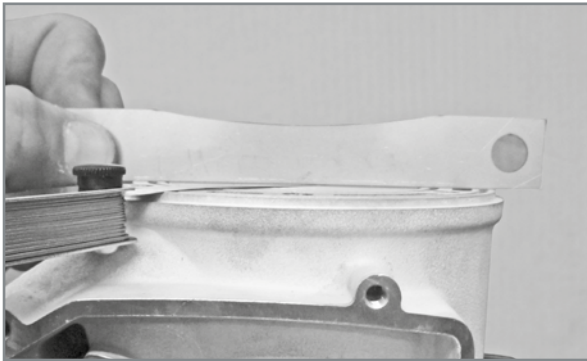
3.12.7 Check of crankcase/cylinder gasket thickness

The thickness of the gasket between the cylinder and crankcase must be checked every time the following are replaced:

- Cylinder;
- Piston;
- Crankshaft;
- Connecting rod;
- Crankcase.

The check is necessary as such thickness affects the engine performances. This check must be carried out using specific calibrated plates set-out in the table.

<i>Displacement [cm³]</i>	<i>Model Year</i>	<i>Code</i>	<i>Side</i>
250	2018 - 2019	026.14.010.00.00	B
300			A



If the plate and piston do not touch: check distance between plate and piston.

The use of the plates is described below.

- Rest the specific plate making sure it comes into contact with the cylinder's upper surface.
- Bring the piston to top dead centre and, using a thickness gauge, check play between the piston and plate is between 0÷0.05mm.

If play between piston and plate is higher than preset, reduce the cylinder/crankcase gasket thickness and carry out the test again.



If the piston pushes the plate failing contact cylinder/plate

Measure the play with a gauge if the piston pushes the plate upwards, causing contact to be lost between the plate and cylinder: if the play is greater than 0.05 mm, the thickness of the cylinder/casing gasket must be increased and the test run again.

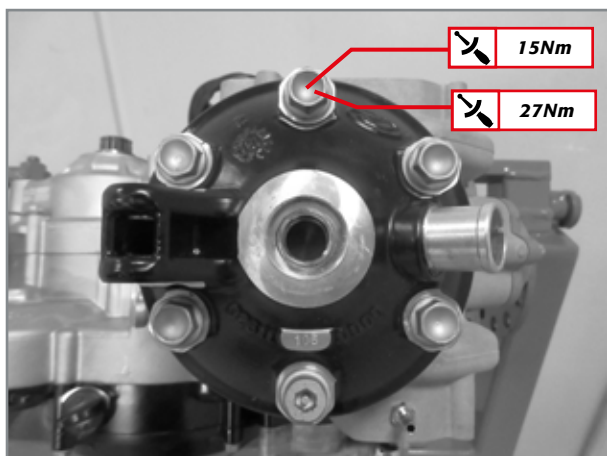
The gaskets are supplied in four different thicknesses. that can also be stacked, thus obtaining the necessary height for the right thickness.

Note: the above-described check must be carried out once all four crankcase cylinder coupling nuts have been fastened at the set torque (30Nm).

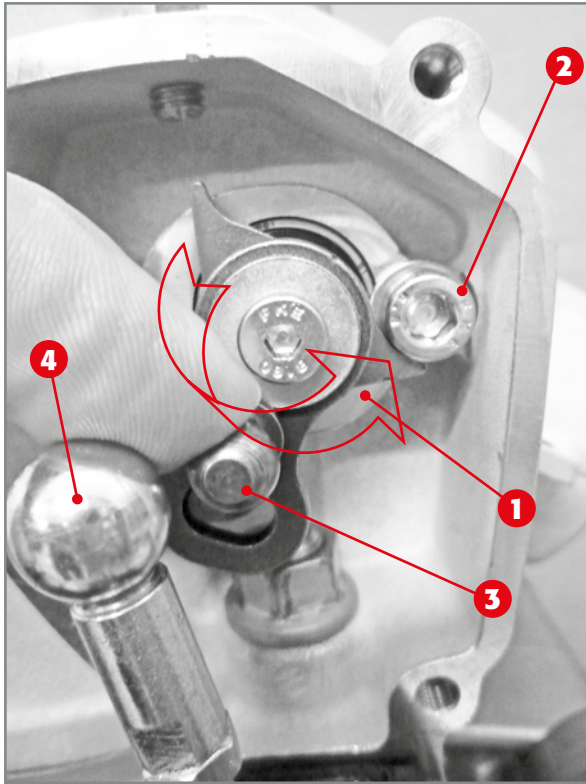
3.12.8 Head application

Apply the two O-rings to the cylinder. Rest the head so that water hose is facing the front of the engine. Grease the screws and apply them to the head, together with the copper washers. Following a criss-cross pattern, fasten in two phases:

1. 15Nm;
2. 27Nm



Fastening of head.

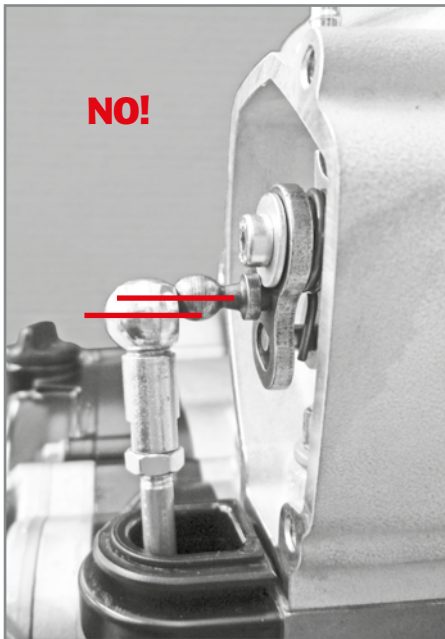


Positioning of valve control.

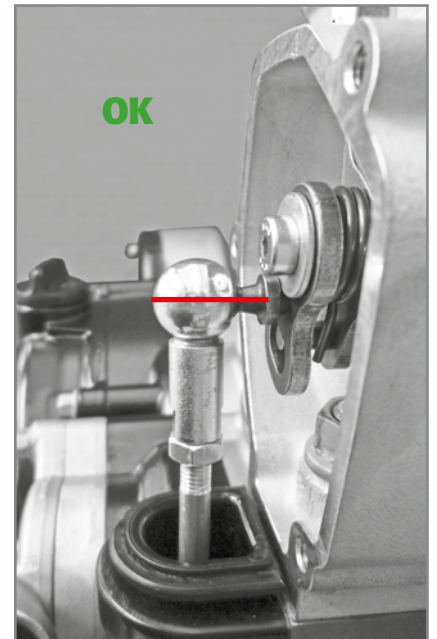
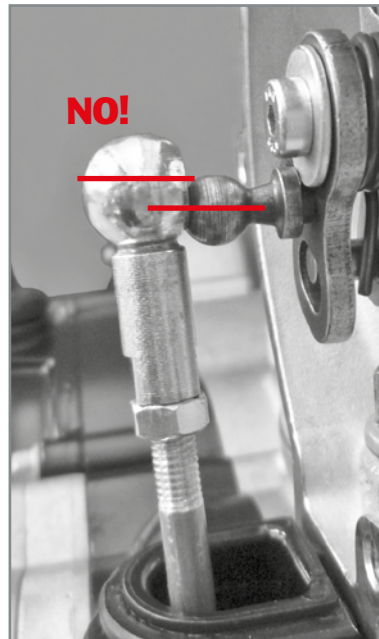
3.12.9 Exhaust valve adjustment

Bring the valve control unit **1** in the fully closed position, so the stroke end lever is flush with screw **2** fixing the booster bearings.

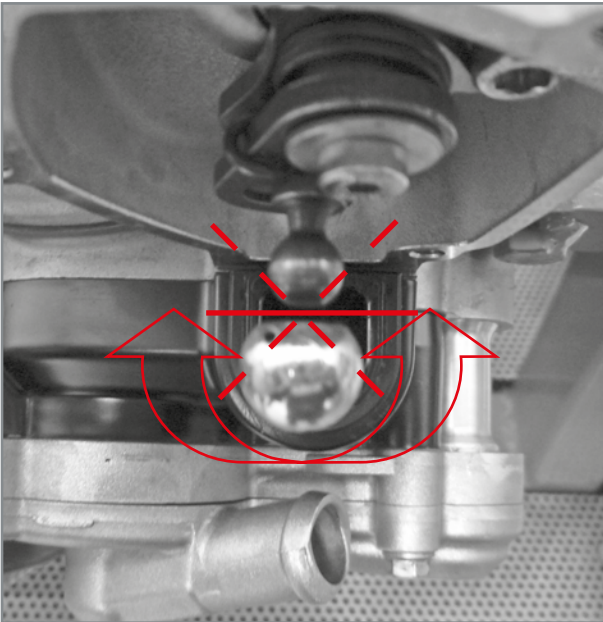
Check the ball head **3** and the seat **4** are perfectly aligned.
If so, loosen the lock nut, adjust the seat and fasten the lock nut.



Incorrect positions of the control rod seat.

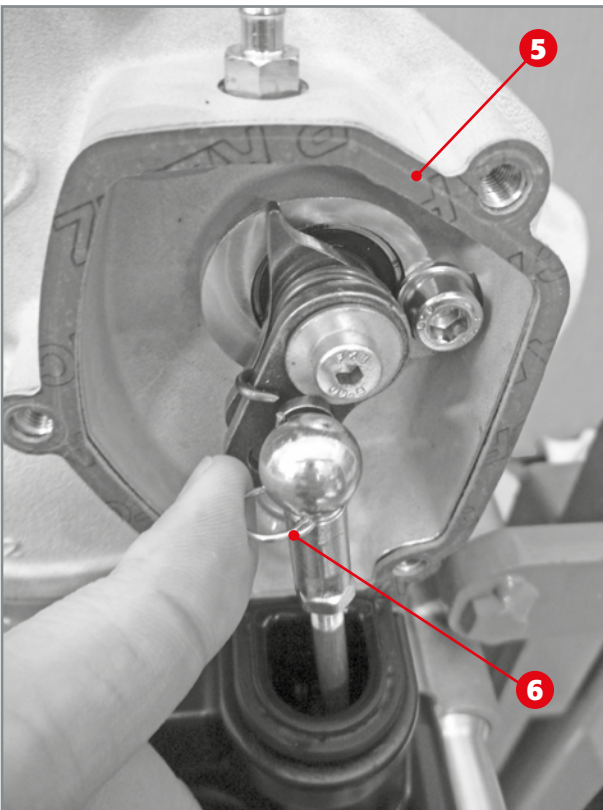


Correct position of the control rod seat.



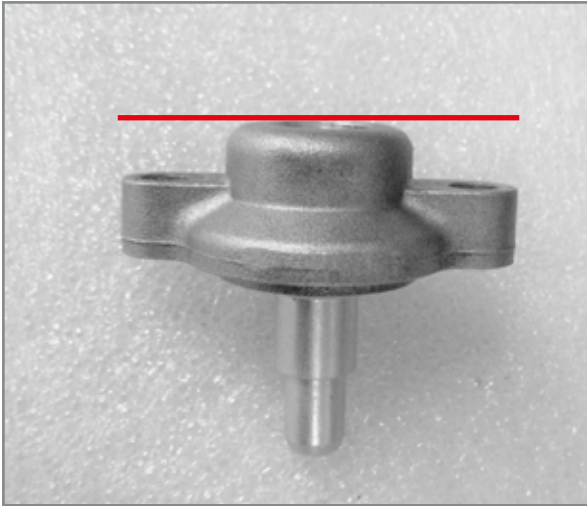
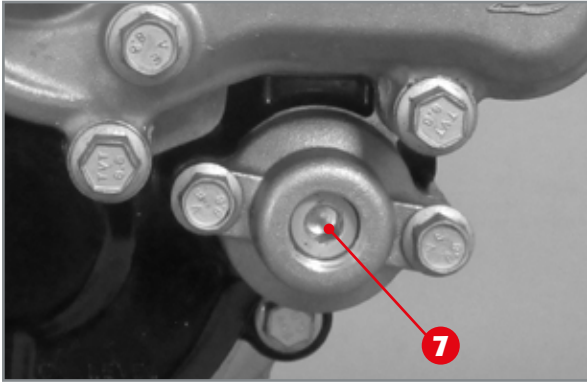
Check of control rod rotation.

The control rod is able to rotate around its axis, making equal angles respect to the ball head axis.



Insertion of control rod and application of stop.

Apply gasket **5** and insert the control rod.
Apply the stop **6**.



Fully open reference.

Intervene on screw **7** for the dynamic adjustment of the exhaust valve unit, thus modifying the characteristic curve of the engine.

The positions indicated in the below table are those considered excellent for engine functioning.

Model Year	Displacement [cm³]	Regulation of adjustment screw (from all open)
2018	250	3
	300	1 + 1/2
2019	250	3
	300	1

The "fully open" position corresponds to the perfect alignment between adjustment screw head and adjustment cover.

Adjustment must, therefore, be carried out as follows.

- Bring the screw to the "fully open" position;
- Tighten the number of turns indicated in the table.

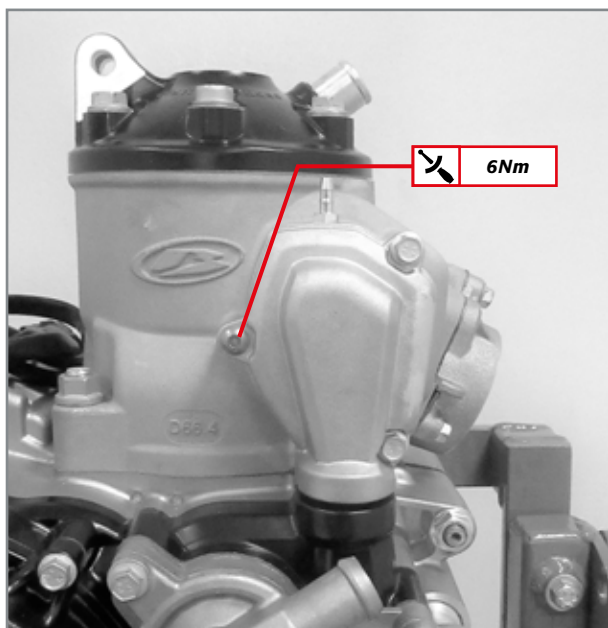
The effects obtained from modifying the position of the adjustment screw respect to the positions in the above table, are shown in the table.

Clockwise rotation of adjustment screw	Anti-clockwise rotation of adjustment screw
Softer flow-rate and less over-rev	Greater acceleration and lower torque at low speeds

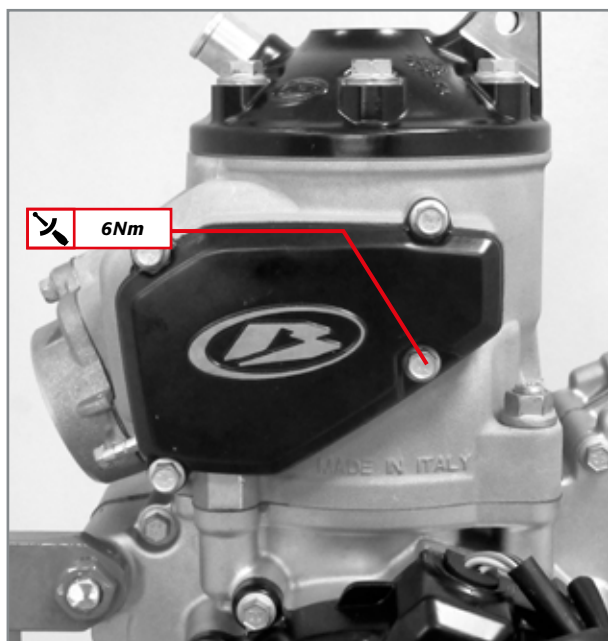
Attention! Do not tighten the adjustment screw for more than three and a half turns from the fully open position.

3.12.10 Cover plate application

Apply the valve control unit cover and relative screws. Tighten to the specified torque.



Application and fastening of valve control unit cover screws.

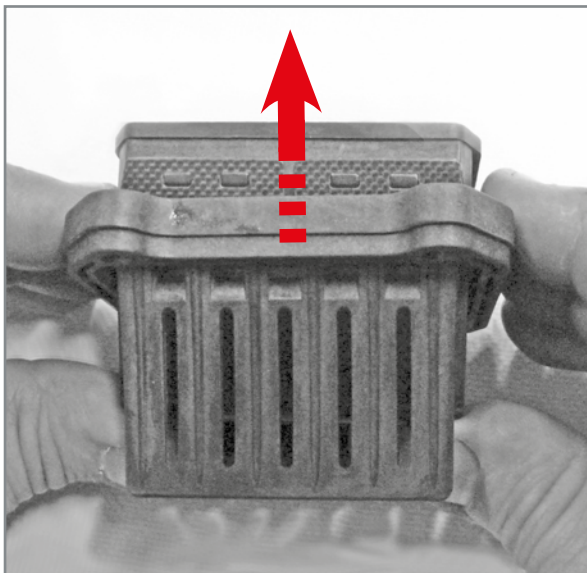
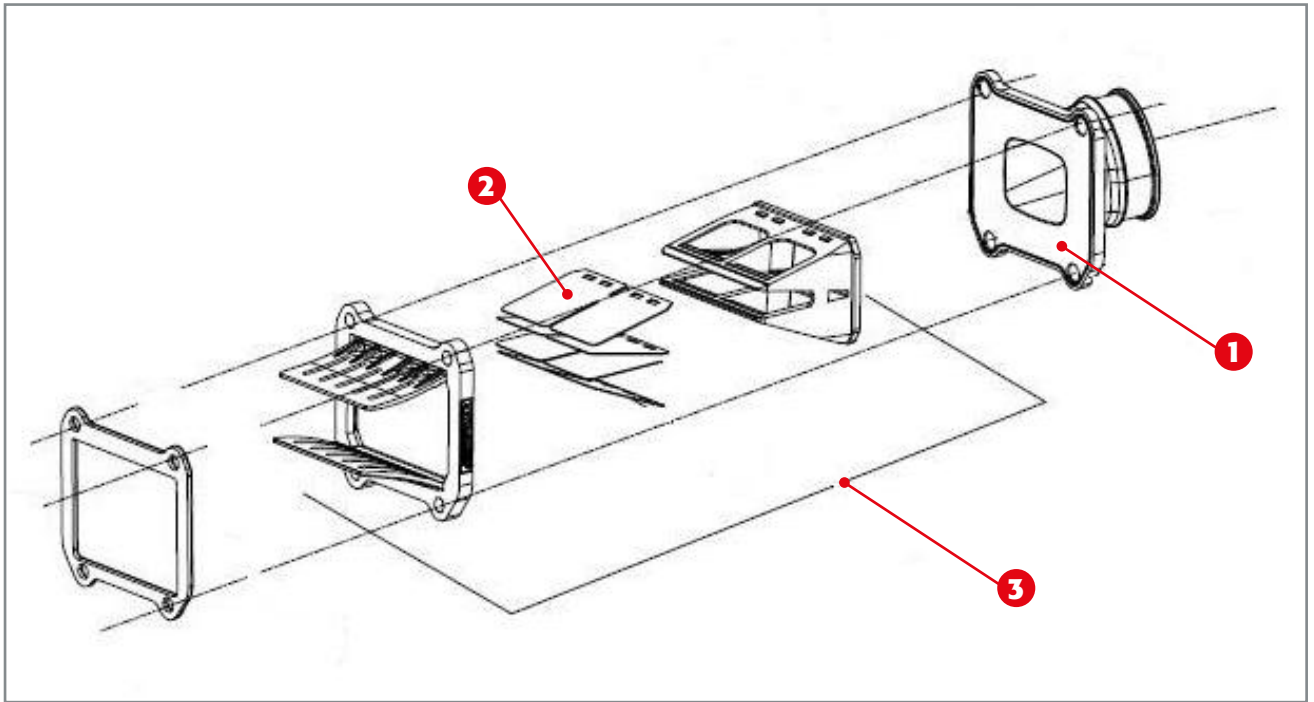


Application of resonance chamber cover and relative screws.

Apply the resonance chamber side gasket and cover. Apply the screws and tighten them to the specified torque.

3.13 CHECK OF INTAKE UNIT AND ASSEMBLY

Check the manifold **1** is intact and without cracks. If so, replace it.
Check that the multiflap **2** of the reed valve **3** are intact and not deformed. If so, replace them.

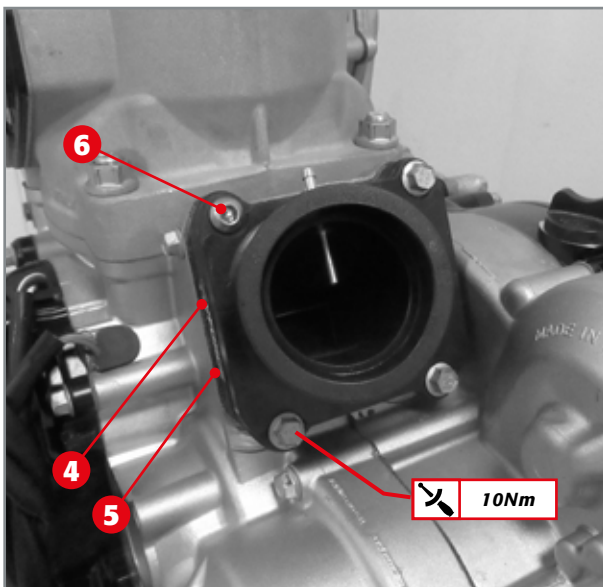


Disassembly of reed valve body.

Remove the multiflap by pressing the central body as shown in figure and remove the outer multiflap.



Disassembly of central wedges. The extraction of only one is shown in figure.



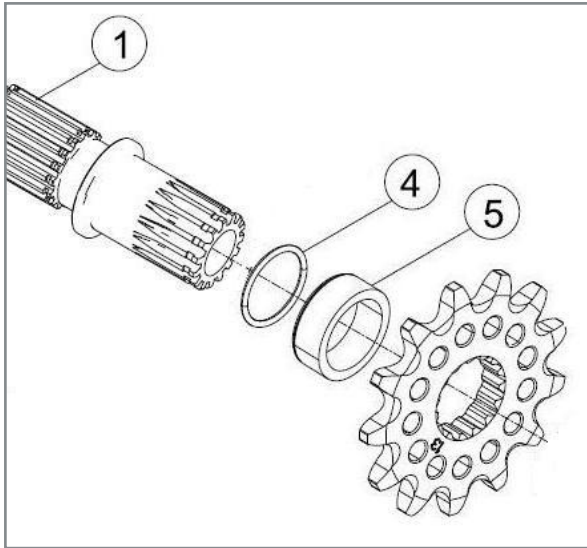
Application of reed valve.

Remove the two central wedges and remove the multiflap.

Assemble the multiflap by following the just described procedure, in reverse order.

For assembly of the entire intake system, apply the manifold to the reed valve, the gasket **4**, the spacer **5** and another gasket.

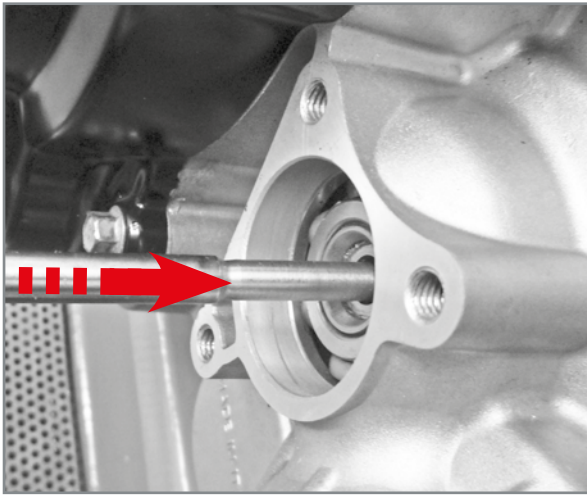
Tighten the screws **6** to the indicated torque.



3.14 INSERTION OF CLUTCH ROD AND PINION SPACER

Apply the pinion spacer 5 to the secondary of the gearbox 1, so that the groove is facing inside the engine.

Note: check the O-ring 4 is present. If so, apply it.



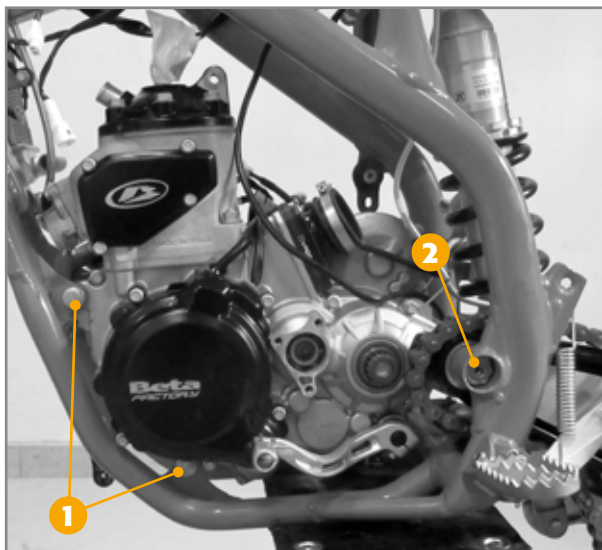
Insertion of clutch rod.

Insert the gearbox rod in seat from the lower diameter side.

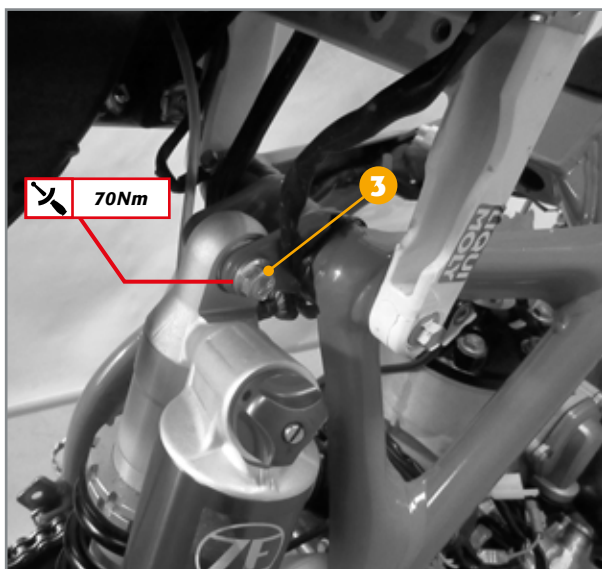
4 REASSEMBLY OF ENGINE IN THE VEHICLE

4

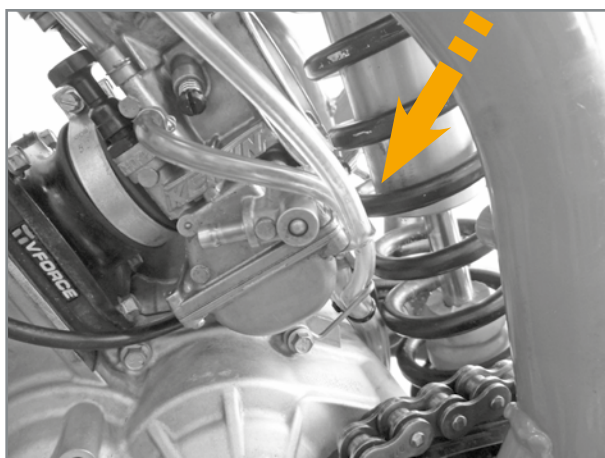
REASSEMBLY OF ENGINE IN THE VEHICLE



- Insert the engine in the frame. We recommend insertion from the frame's left side.
- Insert the engine pins **1** and the swingarm pin **2**.



- Insert the upper shock-absorber pin **3**. Fasten the shock absorber pin to the indicated torque.
- Apply the spark plug and fasten it at 28Nm.



- Apply the carburettor to the manifold making the breather tubes pass in the appropriate metal cable gland.

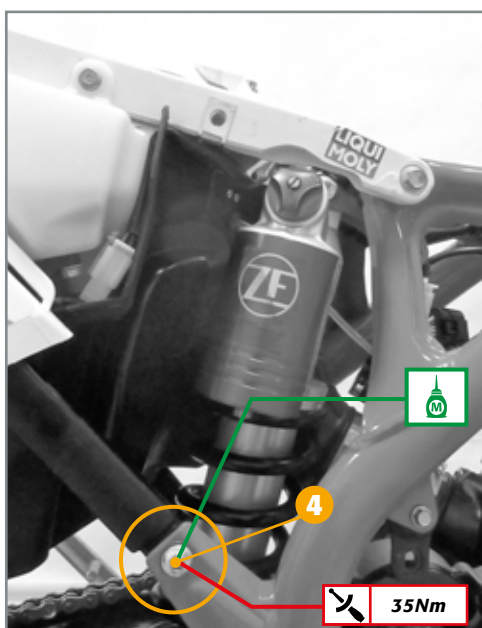




- Apply the head connections by passing the gas cable and part of the electrical system, as shown in the figure.

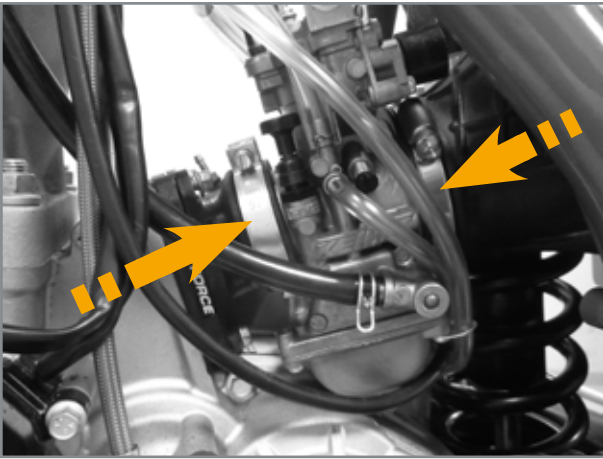
- Fasten the nuts and bolts following the table below.

<i>Fixing</i>	<i>Screw</i>	<i>Torque [Nm]</i>	<i>Threadlocker</i>
<i>Head connection bracket to frame. Front fixing</i>	<i>M8 x 16</i>	<i>35</i>	<i>Medium-resistance</i>
<i>Head connection bracket to frame. Rear fixing</i>	<i>M8 x 60</i>	<i>35</i>	
<i>Head connection brackets to engine</i>	<i>M8 x 65</i>	<i>35</i>	
<i>Engine pins</i>	<i>Special</i>	<i>45</i>	
<i>Swingarm pin</i>	<i>M16 x 245</i>	<i>125</i>	

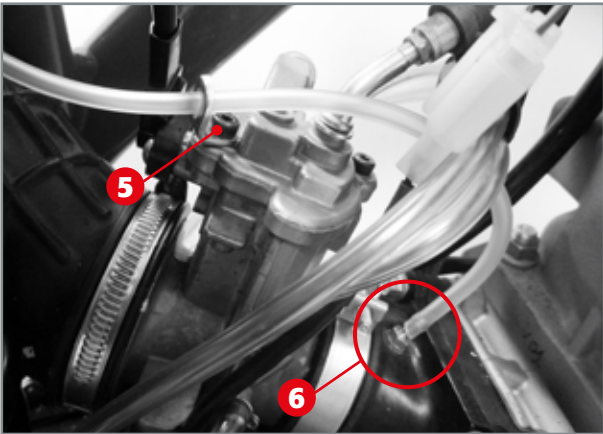


- Rotate the filter box in its normal position. Apply the lower fixing screws **4** (one each side) after applying a medium-resistance threadlocker. Tighten to the specified torque.

Note: We recommend removing the upper screws (one each side) and apply a medium strength threadlocker.

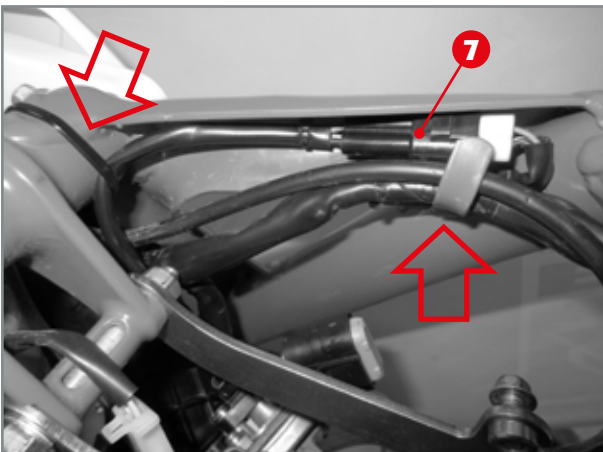


- Make sure the filter box sleeve is correctly inserted inside the carburettor, fasten the two filter box side and manifold side straps.

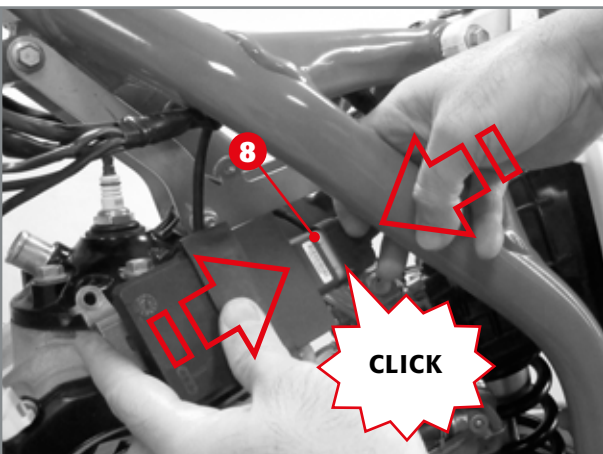


- Remove the cap applied to the mixer tube (see page 9).
- Slide the tube through the tube hole **5** and connect it to the nozzle **6** on the intake manifold.

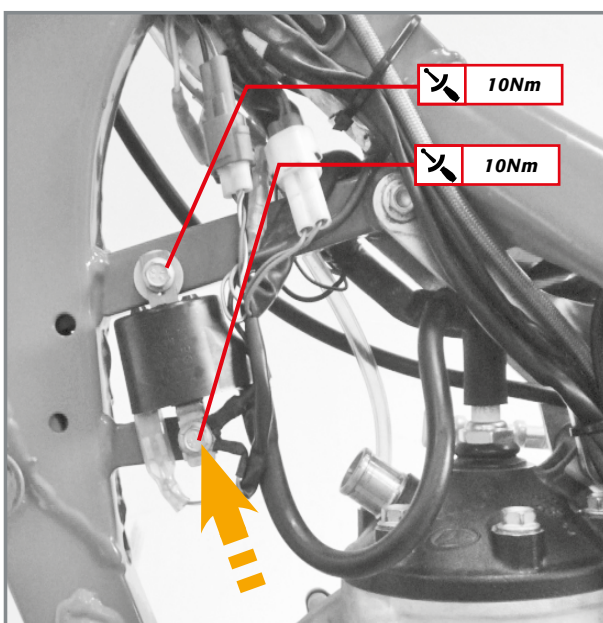
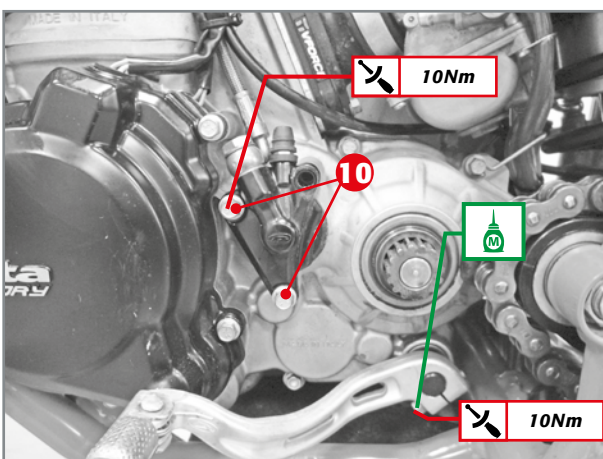
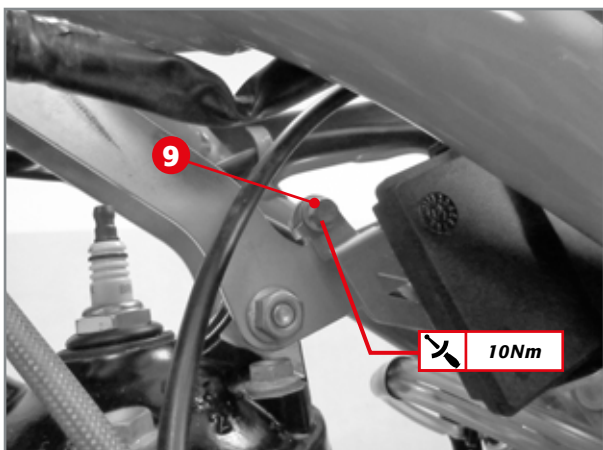
ATTENTION! Ensure that the tube is fitted all the way onto the nozzle.



Connect the connector **7** to the electrical system and secure the cable as shown in the figure.



Connect the control unit to the connector **8**. Push the control unit in the connector until a "click" is heard.



Position the control unit so that the hole on the support is aligned with the hole on the head connection.

Apply the screws **9** and tighten at the specified torque.

Connect the engine ignition unit to the electrical system.

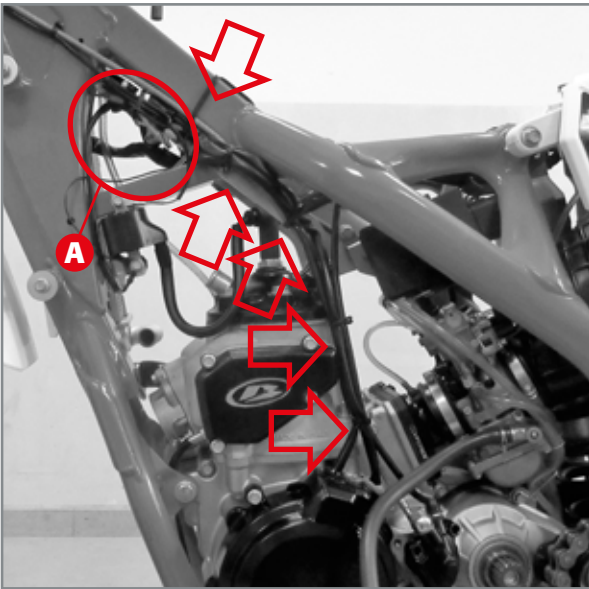
The Faston connectors must be connected according to the corresponding colours (white cable with white cable, yellow cable with yellow cable).

- Apply the unit clutch actuator to the two **10** fixing screws. Tighten to 10Nm.
- Apply the gearbox lever and fasten the screw at 10Nm by applying a medium strength thread-locker.

- Apply the coil by means of the relative screws and tighten to the indicated torque.
- Connect the connector to the coil.

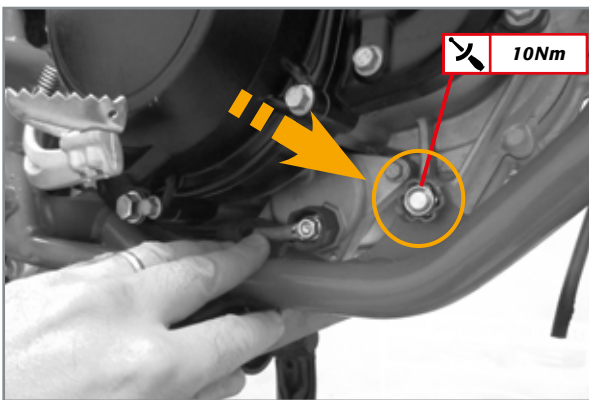
Note: the two loop connectors on the electric system must be secured to the coil using the lower fixing screw.

- Connect the coil to the spark plug

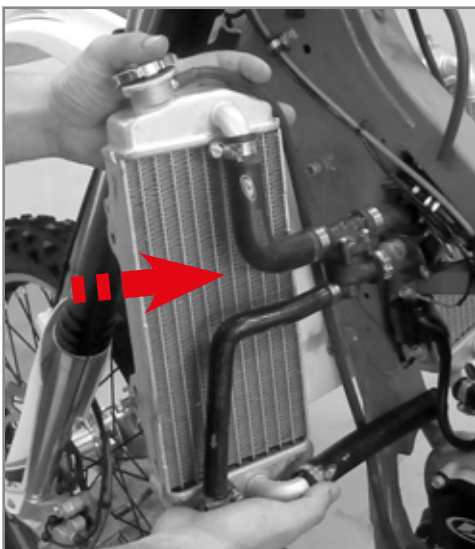


Secure the electrical system to the clutch pipe and frame as shown in the figure using plastic clamps.

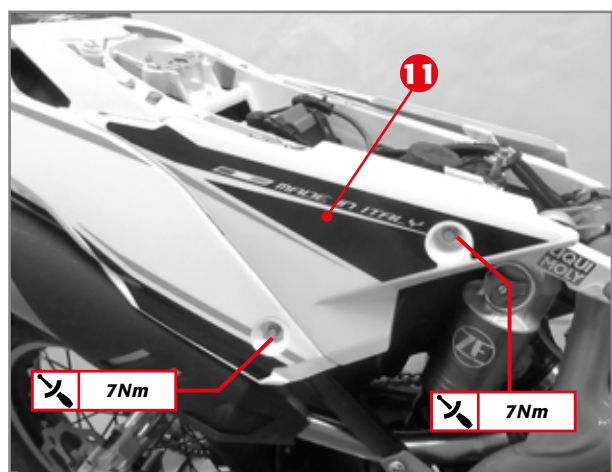
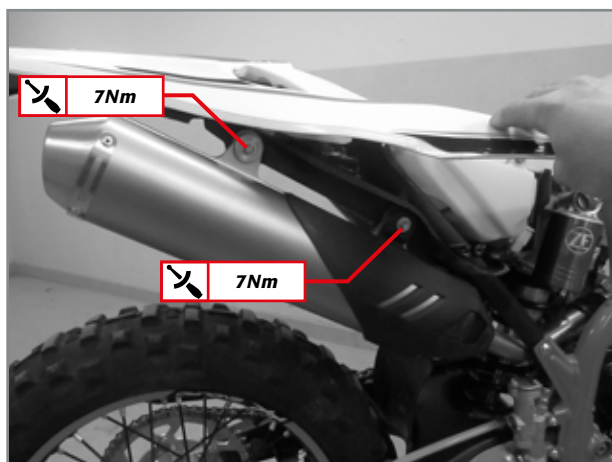
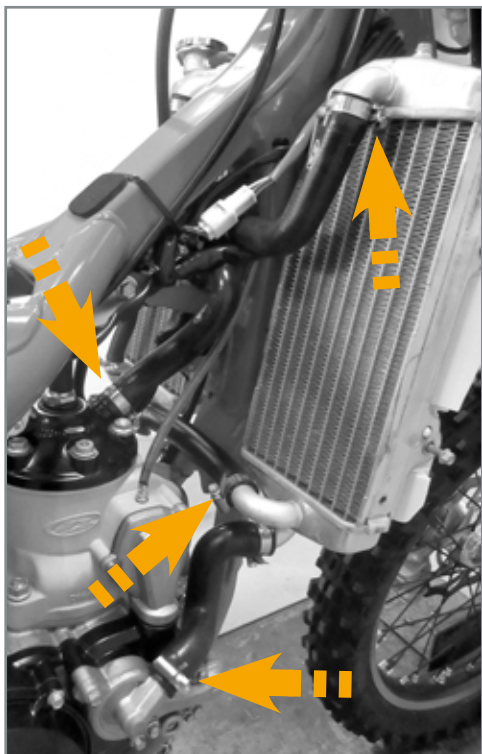
Gather the connector unit connected in zone **A** by grouping together and securing the connectors to the electrical system.



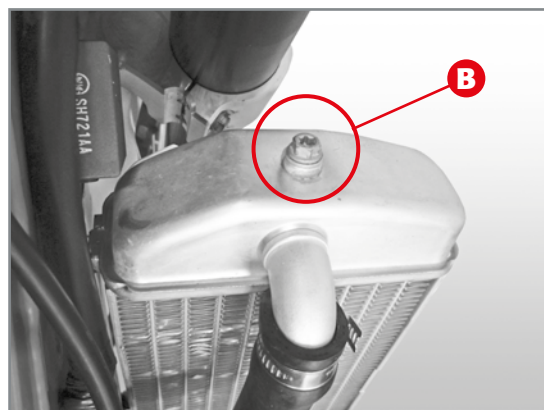
- Apply the start motor cable and tighten the nut to the indicated torque. Cover the connection using the specific protective cap.



- Connect the ventilation pipes to the engine
- Apply the left radiator to the frame. Apply the screws and fasten at 10Nm. Apply the protective grid.

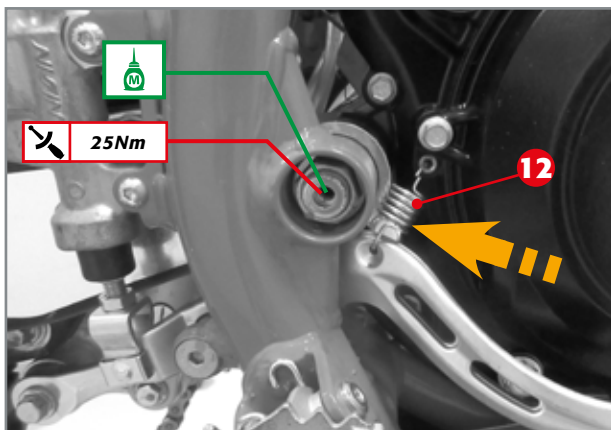


- Connect the radiators to the engine. Fasten the clamp straps and introduce the coolant liquid, letting the air bleed through the screw cap **B**.

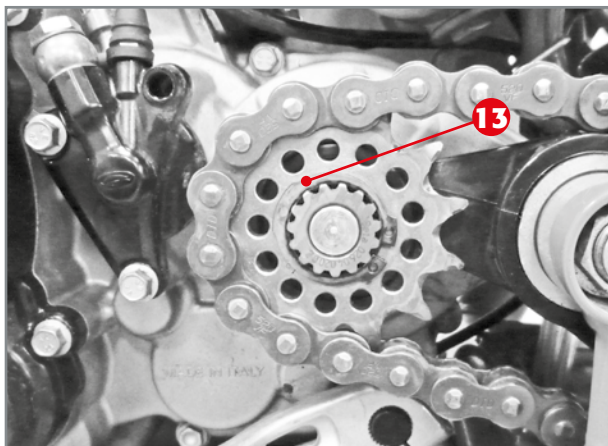


- Apply the exhaust expansion by first assembling the front springs and then applying the two fixing screws.
- Apply the silencer and fasten the two fixing screws to the indicated torque. Fasten the expansion fixing screws to the frame at 7Nm.

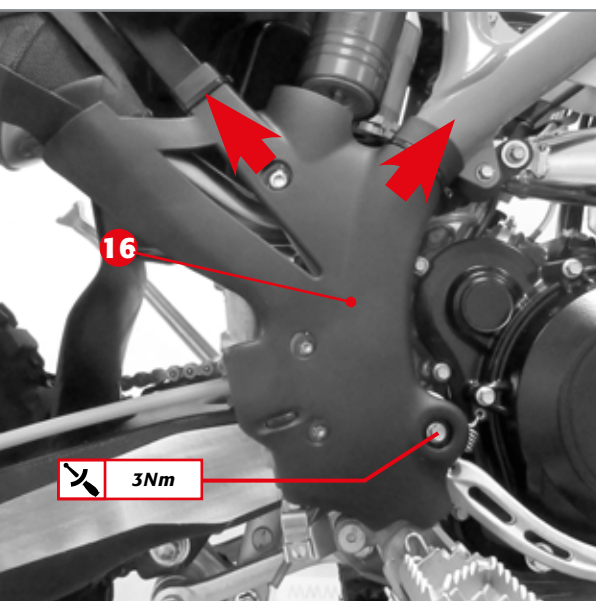
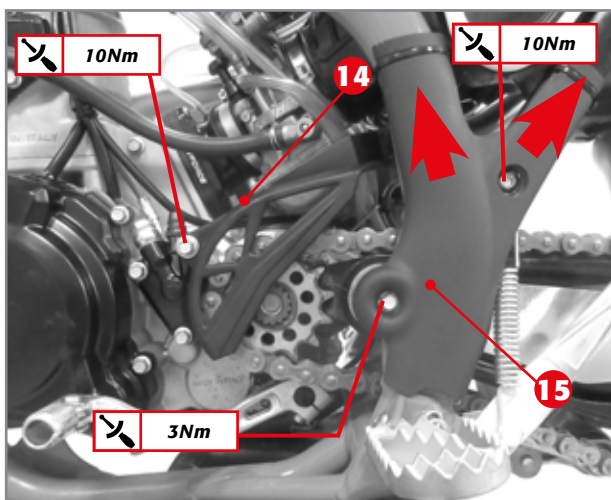
- Apply the side panel **11**.
- Tighten to the indicated torque.



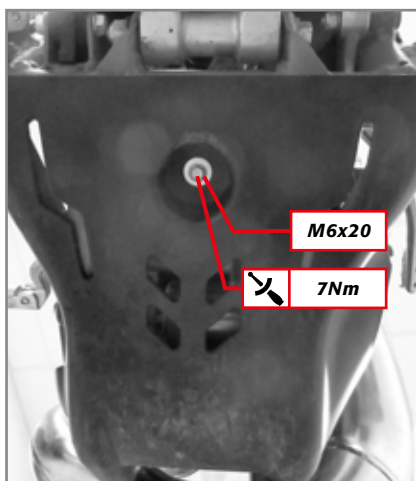
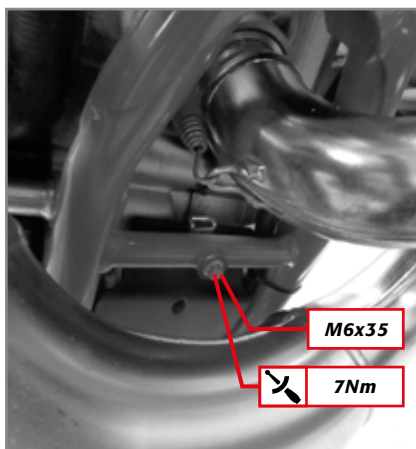
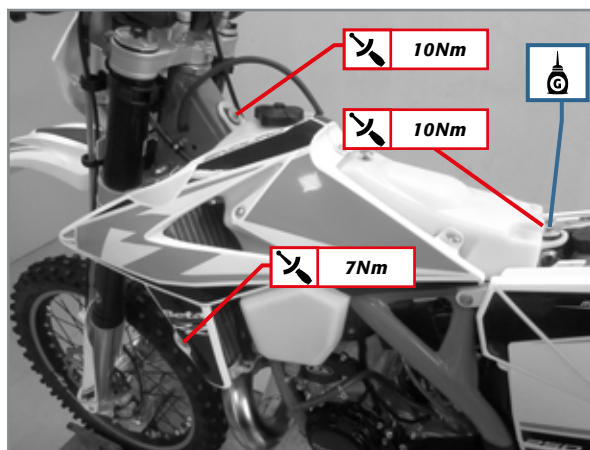
- Apply the Kickstart lever (optional). Apply the medium-resistance sealant threading on the screw and fasten at 25Nm. Apply the brake pedal return spring 12.



- Insert the pinion in the chain and fasten it onto the gearbox outlet shaft. Assemble the relative circlip 13, checking that it is in its seat.



- Apply the pinion guard 14 and the frame side guards 15 and 16. Fasten the screws to the indicated torque and apply the fixing straps between the side guards and frame.



- Apply the tank making sure the gas cable is between the tank and frame.

- Grease the rear fastener and tighten the screws at the indicated torque values.

- Apply the seat.

Attention! Disconnecting the mixer tube from the intake manifold could cause air to get into the tube itself. To avoid any lubrication problems with the thermal unit and crankshaft, use fuel with a 1% blend for the first fill-up. Use the oil recommended on page 112 in the "Recommended lubricants and liquids" table.

- Reconnect the tank to carburettor, fastening the tube by using the specific clamp straps.
- Apply the seat.
- Reapply the engine guard plate with the two fixing screws, once the motorcycle is removed from the stand. Tighten to the specified torque.

TABLE OF ENGINE COMPONENTS FASTENING TORQUES

<i>Fixing</i>	<i>Diameter x Length</i>	<i>Quantity</i>	<i>Threadlocker</i>	<i>Torque [Nm]</i>	<i>Notes</i>
Outer side right crankcase half					
<i>Kickstart ramp</i>	<i>M6 x 20</i>	<i>2</i>	<i>Medium-resistance threadlocker</i>	<i>10</i>	<i>Optional</i>
Inner side right crankcase half					
<i>Desmodromic control bearing fixing</i>	<i>M5 x 8</i>	<i>1</i>	<i>Medium-resistance threadlocker</i>	<i>6</i>	
Crankshaft					
<i>Securing the half-shoulders</i>	<i>M6 x 12</i>	<i>1</i>	<i>High-resistance threadlocker</i>	<i>5</i>	
Gearshift					
<i>Stop cam</i>	<i>M6 x 30</i>	<i>1</i>	<i>Medium-resistance threadlocker</i>	<i>10</i>	
<i>Stopping device lever</i>	<i>M6 x 20</i>	<i>1</i>	<i>Medium-resistance threadlocker</i>	<i>10</i>	
<i>Gearshift lever</i>	<i>M6 x 25</i>	<i>1</i>	<i>Medium-resistance threadlocker</i>	<i>10</i>	
Electric kickstarter device					
<i>Start motor</i>	<i>M6 x 25</i>	<i>2</i>	<i>Medium-resistance threadlocker</i>	<i>10</i>	
Kickstarter - Optional					
<i>Securing the lever</i>	<i>M8 x 26</i>	<i>1</i>	<i>Medium-resistance threadlocker</i>	<i>25</i>	
<i>Kickstart ramp</i>	<i>M6 x 12</i>	<i>2</i>	<i>Medium-resistance threadlocker</i>		
Clutch primary transmission					
<i>Main transmission pinion nut</i>		<i>1</i>	<i>Medium-resistance threadlocker</i>	<i>160</i>	
<i>Drum nut and clutch case</i>		<i>1</i>	<i>Medium-resistance threadlocker</i>	<i>120</i>	<i>Do not use the pneumatic device</i>
<i>Clutch cap</i>	<i>M6 x 25</i>	<i>6</i>		<i>10</i>	
<i>Clutch actuator</i>	<i>M6 x 20</i>	<i>2</i>		<i>10</i>	
<i>Clutch actuator</i>	<i>M6 x 30</i>	<i>1</i>		<i>10</i>	
<i>Outer clutch cover</i>	<i>M6 x 20</i>	<i>2</i>		<i>10</i>	
<i>Outer clutch cover</i>	<i>M6 x 50</i>	<i>3</i>		<i>10</i>	<i>In common with inner clutch cover</i>
<i>Inner clutch cover</i>	<i>M6 x 20</i>	<i>2</i>		<i>10</i>	
<i>Inner clutch cover</i>	<i>M6 x 30</i>	<i>2</i>		<i>10</i>	
<i>Inner clutch cover</i>	<i>M6 x 50</i>	<i>3</i>		<i>10</i>	<i>In common with outer clutch cover</i>
<i>Inner clutch cover</i>	<i>M6 X 60</i>	<i>2</i>		<i>10</i>	<i>In common with water hose cover</i>



<i>Fixing</i>	<i>Diameter x Length</i>	<i>Quantity</i>	<i>Threadlocker</i>	<i>Torque [Nm]</i>	<i>Notes</i>
Water pump					
<i>Cover</i>	<i>M6 x 60</i>	<i>2</i>		<i>10</i>	<i>In common with inner clutch cover</i>
<i>Cover</i>	<i>M6 x 30</i>	<i>2</i>		<i>10</i>	
<i>Impeller</i>	<i>M5 x 12</i>	<i>1</i>	<i>Medium-resistance threadlocker</i>	<i>6</i>	
Exhaust valve control					
<i>Flange</i>	<i>M6 x 20</i>	<i>3</i>	<i>Medium-resistance threadlocker</i>	<i>10</i>	
<i>Cover</i>	<i>M5 x 20</i>	<i>2</i>	<i>Medium-resistance threadlocker</i>	<i>6</i>	
<i>Complete control rocker arm</i>	<i>M5 x 12</i>	<i>1</i>	<i>Medium-resistance threadlocker</i>	<i>6</i>	
<i>Control lever</i>	<i>M5 x 20</i>	<i>1</i>	<i>Medium-resistance threadlocker</i>	<i>6</i>	
<i>Booster bearings</i>	<i>M6 x 16</i>	<i>2</i>	<i>Medium-resistance threadlocker</i>	<i>10</i>	
<i>Right cover</i>	<i>M5 x 16</i>	<i>3</i>		<i>6</i>	
<i>Left cover</i>	<i>M5 x 16</i>	<i>4</i>		<i>6</i>	
Ignition system					
<i>Spark plug</i>	<i>M14 x 1.25</i>	<i>1</i>		<i>28</i>	
<i>Pick-up unit</i>	<i>M5 x 12</i>	<i>2</i>	<i>Medium-resistance threadlocker</i>	<i>6</i>	
<i>Stator</i>	<i>M6 x 25</i>	<i>2</i>	<i>Medium-resistance threadlocker</i>	<i>10</i>	
<i>Flywheel nut</i>		<i>1</i>	<i>Medium-resistance threadlocker</i>	<i>60</i>	
<i>Cover</i>	<i>M6 x 20</i>	<i>2</i>		<i>10</i>	
<i>Cover</i>	<i>M6 x 25</i>	<i>3</i>		<i>10</i>	
Cylinder					
<i>Cylinder nuts</i>		<i>4</i>		<i>30</i>	
Head					
<i>Head screws</i>	<i>M8 x 35</i>	<i>6</i>		<i>27</i>	
Crankcase half					
<i>Crankcase half screws</i>	<i>M6 x 50</i>	<i>10</i>		<i>10</i>	
<i>Crankcase half screws</i>	<i>M6 x 40</i>	<i>3</i>		<i>10</i>	
Intake					
<i>Reed valve</i>	<i>M6 x 25</i>	<i>4</i>		<i>10</i>	
Oil drain					
<i>Cap</i>		<i>1</i>		<i>15</i>	



TABLE OF FRAME/ENGINE FASTENING TORQUES

<i>Fixing</i>	<i>Diameter x Length</i>	<i>Quantity</i>	<i>Threadlocker</i>	<i>Torque [Nm]</i>	<i>Notes</i>
<i>Engine pins</i>	<i>Special</i>	<i>2</i>		<i>45</i>	
<i>Swingarm pin</i>	<i>M16 x 245</i>	<i>1</i>		<i>125</i>	
<i>Head connection bracket to frame. Front fixing</i>	<i>M8 x 16</i>	<i>2</i>	<i>Medium-resistance threadlocker</i>	<i>35</i>	
<i>Head connection bracket to frame. Rear fixing</i>	<i>M8 x 60</i>	<i>1</i>		<i>35</i>	
<i>Head connection brackets to engine</i>	<i>M8 x 65</i>	<i>1</i>		<i>35</i>	

TABLE OF SUPERSTRUCTURE FASTENING TORQUE VALUES

<i>Fixing</i>	<i>Threading diameter x worm [mm]</i>	<i>Length [mm]</i>	<i>Quantity</i>	<i>Threadlocker</i>	<i>Torque [Nm]</i>	<i>Notes</i>
<i>Tank to the frame (front fixing)</i>	<i>M6 x 1</i>	<i>25</i>	<i>1</i>		<i>10</i>	
<i>Tank to the frame (rear fixing)</i>	<i>M6 x 1</i>	<i>30</i>	<i>1</i>		<i>10</i>	<i>Application of grease</i>
<i>Tank side panel to the radiator</i>	<i>M6 x 1</i>	<i>20</i>	<i>2</i>		<i>7</i>	



RECOMMENDED ENGINE MAINTENANCE

The requested engine maintenance only depends on the level of use and respect of the periodical inspections. The following intervals refer to normal use, as long as the engine has not worked in extraordinary conditions and that periodical inspections and interventions have been correctly carried out.

	30h	60h	90h
Coated clutch discs	I	-	S
Clutch springs length	I	-	S
Gearbox bearings	-	-	S
Case / clutch hub	I	-	-
Cylinder	-	I	-
Piston and segments	-	S	-
Connecting rod	-	-	S
Crankshaft bearings	-	-	S
Gearbox superficial look	-	-	I
Water hose oil seal	-	-	S
Exhaust valve	-	I/P	-
Reed valve shims	-	I	-
Spark plug	-	S	-

I = INSPECT AND REPLACE IN CASE OF NECESSARY **S** = REPLACE **P** = Cleaning

RECOMMENDED LUBRICANTS AND LIQUIDS

APPLICATION	PRODUCT	QUANTITY
Gearbox and clutch	Liqui Moly racing 10W50	850ml*
Coolant liquid	Liqui Moly coolant ready mix raf12 plus	1300ml*
Mixer tank	Liqui Moly 2-STROKE MOTOR OIL, SELF-MIXING	550ml*
Fuel tank (only for running-in)	Liqui Moly 2-STROKE MOTOR OIL, SELF-MIXING	1% blend

* Refer to Use and Maintenance Manual for levels.





Beta
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