RR 2025 RACE

RR X-PRO

125 / 200

2 Stroke




# 2026
# WORKSHOP MANUAL

Beta motorcycles

www.betamotor.com

# TABLE OF CONTENTS





**INTRODUCTION** 2

**ENGINE TECHNICAL SPECIFICATIONS** 4

**SPECIAL EQUIPMENT** 5

**1 ENGINE REMOVAL FROM VEHICLE** 6

**2 ENGINE DISASSEMBLY** 16

**2.1 CLUTCH/GEARSHIFT OIL DRAIN** 16
**2.2 REMOVAL OF PINION SPACER** 16
**2.3 REMOVAL OF PISTON, CYLINDER AND HEAD** 17
**2.4 REMOVAL OF IGNITION UNIT** 19
2.4.1 FLYWHEEL COVER PLATE REMOVAL 19
2.4.2 STATOR REMOVAL 20
2.4.3 FLYWHEEL REMOVAL 20
2.4.4 REMOVAL OF PICK-UP UNIT 21
**2.5 REMOVAL OF ELECTRIC IGNITION - ONLY RR200** 22
2.5.1 REMOVAL OF START MOTOR 23
2.5.2 BENDIX COUPLING REMOVAL 23
**2.6 REMOVAL OF COOLANT LIQUID PUMP, CLUTCH UNIT, MAIN GEAR, CENTRIFUGAL UNIT, GEARSHIFT DRIVE PARTS, KICKSTART** 24
2.6.1 COOLING LIQUID PUMP REMOVAL 28
2.6.2 REMOVAL OF CENTRIFUGAL UNIT AND LEVERAGE 29
2.6.3 CLUTCH DISASSEMBLY AND REMOVAL 31
2.6.3.1 CLUTCH DISASSEMBLY 33
2.6.3.2 CLUTCH ACTUATOR DISASSEMBLY 36
2.6.4 PRIMARY PINION REMOVAL 37
2.6.5 PEDAL KICK STARTER - OPTIONAL RR200 38
2.6.6 EXTERNAL GEARSHIFT DRIVE UNIT 40
**2.7 INTAKE SYSTEM** 41
**2.8 CRANKSHAFT, GEARSHIFT UNIT AND INTERNAL GEARSHIFT CONTROL** 42
2.8.1 OPENING THE CRANKCASE 42
2.8.2 CRANKSHAFT 43
2.8.3 INTERNAL GEARSHIFT DRIVE UNIT AND COMPLETE GEARSHIFT 43
**2.9 DISASSEMBLY OF PARTS FROM CRANKCASES** 44
2.9.1 RIGHT CRANKCASE HALF 45
2.9.2 LEFT CRANKCASE HALF 47

**3 ENGINE CHECKS AND ASSEMBLY** 48

**3.1 CRANKCASE HALF** 48
3.1.1 APPLICATION OF RIGHT CRANKCASE HALF PARTS 49
3.1.2 SPECIAL APPLICATIONS FOR LEFT CRANKCASE HALF 51
**3.2 CONNECTING ROD AND ENGINE SHAFT CHECK** 52
**3.3 ASSEMBLY OF COMPLETE CRANKSHAFT** 53
**3.4 GEARSHIFT UNIT: CHECKS AND REASSEMBLY** 54
3.4.1 CHECK OF GEARSHIFT UNIT 54
3.4.2 ASSEMBLY OF PRIMARY UNIT 55
3.4.3 SECONDARY UNIT ASSEMBLY 58
3.4.4 CHECK OF THE FORKS, FORK PINS AND DESMODROMIC DEVICE 62
3.4.5 ASSEMBLY OF GEARSHIFT AND INNER CONTROL 64
**3.5 CLOSING THE ENGINE CRANKCASE** 67
**3.6 EXTERNAL GEARSHIFT DRIVE** 68
3.6.1 CHECK OF THE WHOLE GEARSHIFT SHAFT 68
3.6.2 ASSEMBLY OF EXTERNAL GEARSHIFT DRIVE 70
**3.7 KICKSTARTER DEVICE - OPTIONAL RR200** 72
3.7.1 CHECK OF STARTER SHAFT UNIT AND ASSEMBLY 72
3.7.2 ASSEMBLY OF KICK STARTER DEVICE - OPTIONAL RR200 74
**3.8 PRIMARY GEAR AND CLUTCH UNIT** 75
3.8.1 CHECK OF PRIMARY GEAR 75
3.8.2 PRIMARY GEAR APPLICATION 75
3.8.3 CHECK OF CLUTCH CASE, ROLLER BEARING AND INTERNAL CENTRE BEARING 76
3.8.4 CLUTCH DISC CHECK 77
3.8.5 CHECK OF SPRINGS 78
3.8.6 CHECK OF CLUTCH DRUM AND PRESSURE PLATE 78
3.8.7 CHECK OF THRUST BEARING DEVICE AND CLUTCH ACTUATOR 79
3.8.8 ASSEMBLY OF CLUTCH UNIT AND CLUTCH ACTUATOR 80
**3.9 COOLANT LIQUID PUMP AND CENTRIFUGAL UNIT** 85
3.9.1 CHECKING THE PUMP UNIT AND DISASSEMBLY, CENTRIFUGAL UNIT AND IDLER UNIT 86
3.9.2 CENTRIFUGE UNIT GROUP ASSEMBLY 87
3.9.3 PUMP UNIT ASSEMBLY 89
3.9.4 ASSEMBLY OF COMPLETE CLUTCH COVER AND PUMP UNIT 90
**3.10 OUTER CLUTCH COVER COUPLING** 92
**3.11 ELECTRIC IGNITION UNIT - ONLY RR200 -** 93
3.11.1 BENDIX COUPLING CHECKS 93
3.11.2 IGNITION UNIT COUPLING TO ENGINE 93
**3.12 IGNITION SYSTEM** 95
3.12.1 CHECK OF IGNITION SYSTEM 95
3.12.2 COUPLING OF IGNITION SYSTEM TO CRANKCASE 95
**3.13 POWER UNIT** 98
3.13.1 CHECK OF THE PISTON AND ELASTIC BANDS 98
3.13.2 CYLINDER CHECK 99
3.13.3 PISTON CYLINDER COUPLING PLAY 100
3.13.4 EXHAUST VALVE UNIT DISASSEMBLY AND CHECKS 100

3.13.5 EXHAUST VALVE UNIT ASSEMBLY ..... 102
3.13.6 PISTON, ELASTIC BANDS, PIN BOLT AND CYLINDER ASSEMBLY ..... 105
3.13.7 CHECK OF CRANKCASE/CYLINDER GASKET THICKNESS ..... 107
3.13.8 HEAD APPLICATION ..... 108
3.13.9 EXHAUST VALVE ADJUSTMENT ..... 108
**3.14 CHECK OF INTAKE UNIT AND ASSEMBLY ..... 112**
**3.15 INSERTION OF PINION SPACER AND APPLICATION OF THE OIL EXHAUST CAP ..... 115**

**4 ENGINE REASSEMBLY IN THE VEHICLE 116**

**TABLE OF ENGINE COMPONENTS TIGHTENING TORQUES 126**

**TABLE OF FRAME/ENGINE FASTENING TORQUES 129**

**TABLE OF SUPERSTRUCTURE TIGHTENING TORQUES 129**

**RECOMMENDED ENGINE MAINTENANCE 130**

## INTRODUCTION

This publication is intended for workshops specialised in repairing motorbikes and motorcycles. Where required, 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 repair:
- Are **NOT** performed by workshops specialised in repair of motorbikes and motorcycles;
- Are **NOT** carried out carefully by following the requirements contained in the technical documentation;
- Are **NOT** carried out by using special Betamotor tools, where required;
- Are **NOT** carried out by using Betamotor official spare parts.

Carefully read this manual in its entirety before working on the engine. Sufficient knowledge of the components that make up the engine and of all the procedures to be followed for inspection and maintenance contribute to lengthen the life of the engine.
The paragraphs feature schematic illustrations highlighting each topic in order to make the text immediately understandable.

### Informative note

Betamotor S.p.A. is committed to a policy of ongoing improvement of its products. This is why you might notice slight differences between the content of this document and the vehicle on which you are about to carry out repairs and/or maintenance. Betamotor S.p.A. models are exported to a number of countries where there are different rules concerning the Highway Code 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 your understanding.

***We respect and defend the environment***

*All that we do has an impact on the whole Planet and its resources. Betamotor S.p.A., wishing to safeguard the interests of the entire Community, would like to make customers and technical operators aware of ways of using the vehicle and of disposal of its parts in total compliance 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 may cause loss of consciousness and lead to death. If the engine needs to be started, make sure the location is well-ventilated. Never start the engine indoors.*
- *The engine can be started indoors only if fitted with the appropriate exhaust gas extraction devices.*

### *Petrol*

- *Petrol is extremely flammable and can be explosive under certain 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 strictly 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 it remains in contact with the skin often and for prolonged periods.*
- *In case of contact with engine oil, wash with soap and water as soon as possible.*
- *In case of contact with the eyes, rinse them with plenty of water and seek medical advice.*
- *If swallowed, do not induce vomiting in order to prevent the product from entering into the lungs; seek immediate medical advice. If you believe the product has entered the lungs, take the person concerned to hospital immediately.*
- *Waste oil contains dangerous substances that are harmful for the environment. In order to change it one must be equipped for disposal, in compliance with applicable laws.*
- *Do not discard waste 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) may irritate the 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 the event of contact with the eyes, rinse with plenty of clean water and seek medical advice immediately. Should it be swallowed, do not induce vomiting in order to prevent the product from entering the lungs. Administer clean water, immediately take the person concerned to hospital, and show this product to hospital staff.*
- *In the event of exposure to a high concentration of vapours, move the person concerned to an uncontaminated area and seek medical advice if necessary.*
- *Do not remove the radiator cap when the engine is still hot. Since the coolant is pressurised, it may spurt out violently and cause burns.*
- *The coolant contains dangerous substances that are harmful for the environment. In order to change it one must be equipped for disposal in compliance with applicable laws.*
- *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 remain 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. Wear insulated gloves.*

### WARNINGS

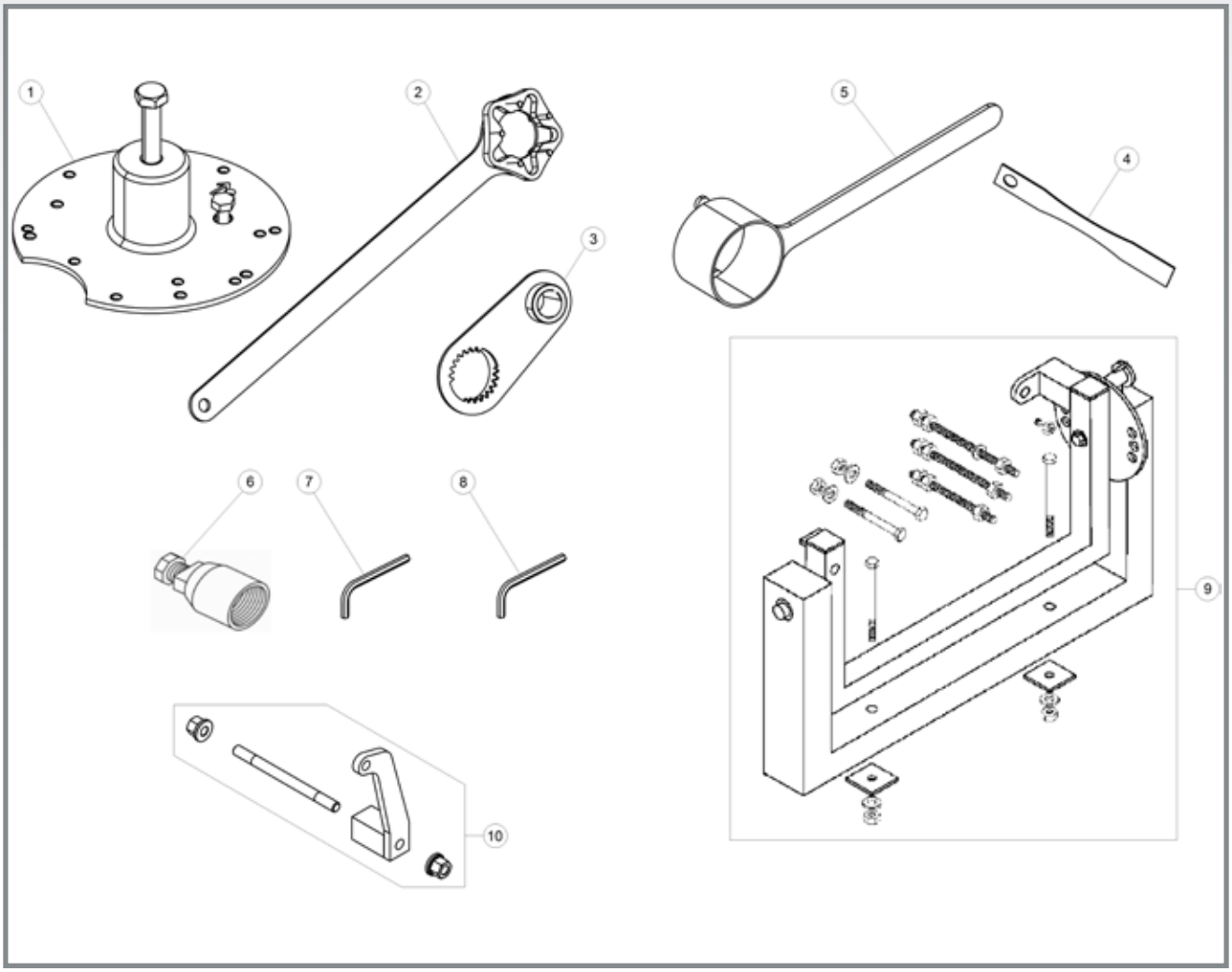
*The information contained in this paragraph is important to ensure the operations carried out on the engine are performed without causing damage.*

- *Before disassembly, thoroughly clean the motorcycle.*
- *While disassembling it, clean all the parts and place them in containers 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 adhere to the specified tightening torques.*
- *Use only Betamotor original spare parts.*

# ENGINE TECHNICAL SPECIFICATIONS

| CHARACTERISTIC DATA | ENGINE | |
|---|---|---|
| | RR125 | RR200 |
| Bore [mm]/Stroke [mm] | 54 x 54.5 | 62 x 63 |
| Displacement [cm³] | 124.8 | 190 |
| Compression ratio | 15:1 | 13,6:1 |
| | TRANSMISSION | |
| | RR125 / RR200 | |
| Primary | 23/73 | |
| 1st gear ratio | 12/33 | |
| 2nd gear ratio | 15/31 | |
| 3rd gear ratio | 17/28 | |
| 4th gear ratio | 19/26 | |
| 5th gear ratio | 21/25 | |
| 6th gear ratio | 20/20 | |

# SPECIAL EQUIPMENT




1. *Crankcase uncoupler code 007.14.010.80.00*
2. *Clutch blocking tool code 035.14.000.80.00*
3. *Primary blocking tool code 035.14.006.50.00*
4. *Crankcase/Cylinder gasket check plate RR125 code 007.44.010.00.00*
4. *Crankcase/Cylinder gasket check plate RR200 code 035.14.009.00.00*
5. *Flywheel blocking tool code 026.14.005.50.00*
6. *Flywheel extractor code 36.25173.000*
7. *Special wrench code 026.44.029.00.00*
8. *Special wrench code 007.44.035.00.00*
9. *Engine universal tool code 36.25132.000*
10. *Engine support code 035.14.008.80.00*

***Symbols***




*Value*
*Tightening torque*




*Medium-strength thread locker*




*High-strength thread locker*




*Silicone paste*




*Grease*

# 1 ENGINE REMOVAL FROM VEHICLE



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



To dismantle the tank from the vehicle it is necessary to remove the seat, disconnect the tank ventilation pipe, position the fuel valve on OFF and disconnect the fuel pipe from the valve.

***ATTENTION!***
*Perform the operation with the engine cold and in a well-ventilated area.*

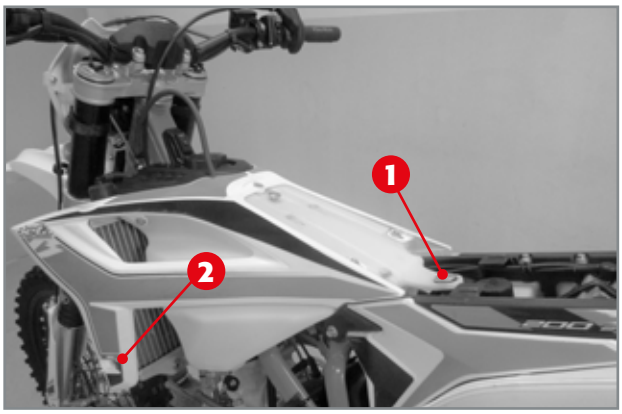
***ATTENTION!***
*Fire hazard! Fuel is easily flammable.*



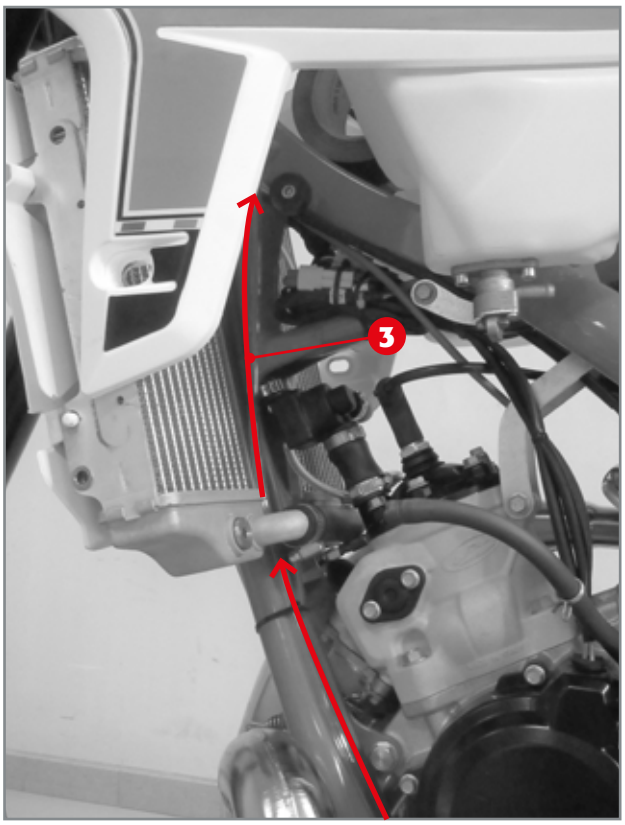
Do not carry out the operation near open flames or lit cigarettes and always turn off the engine.



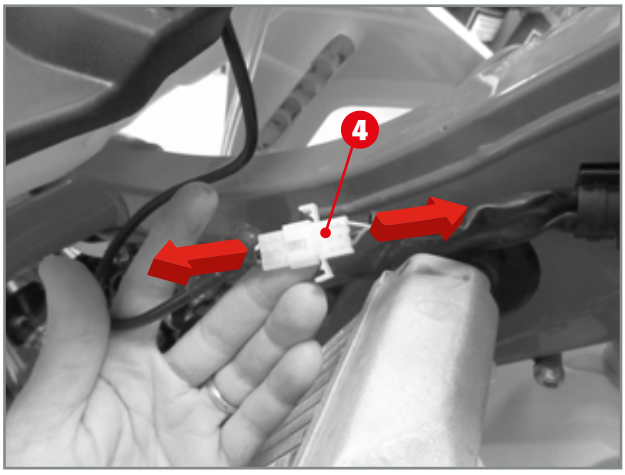
Wipe off any traces of spilled fuel immediately.



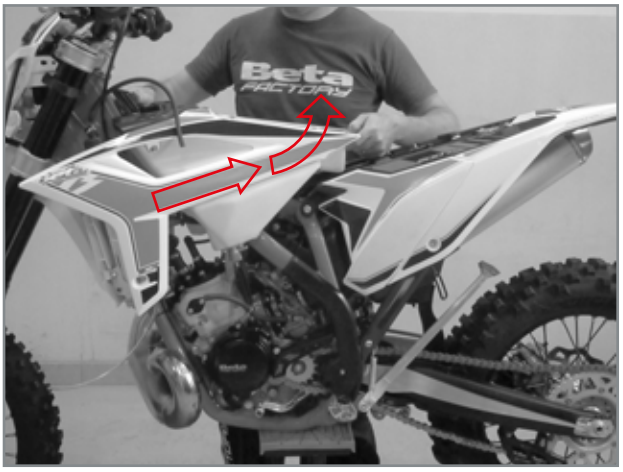

Remove the screw **1** fastening the tank to the frame, and the screws **2** (one per side) fastening the side panel to the radiator.



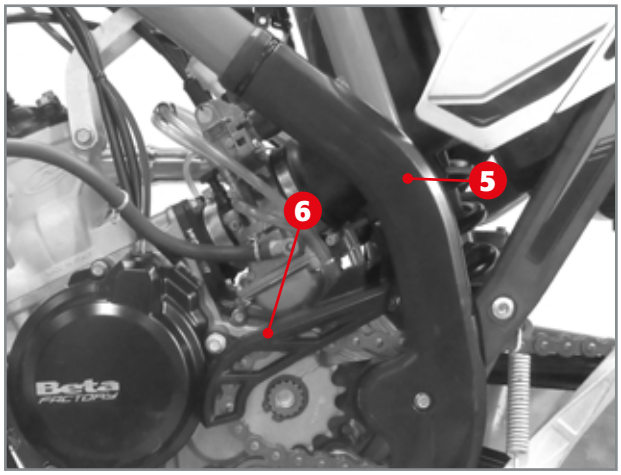

Lift the tank slightly and:
- remove the pipe **3**;



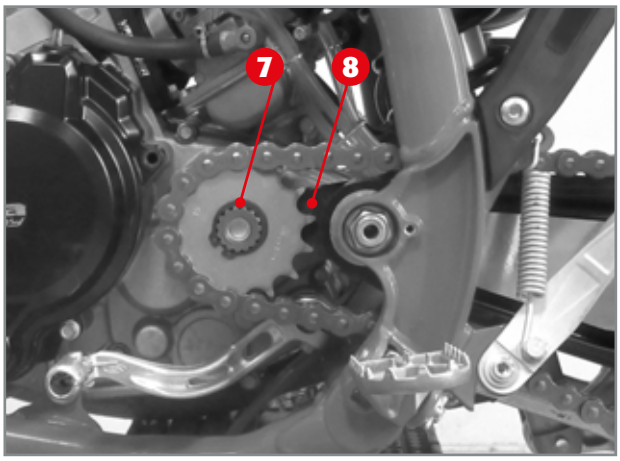

- disconnect the connector **4**;



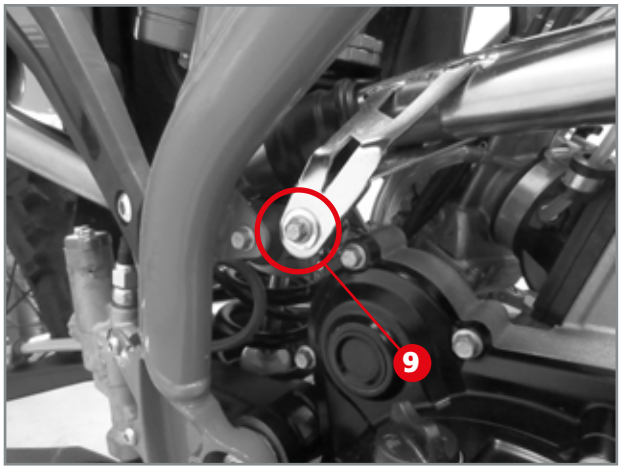

Lift the tank from the back and remove it backwards.



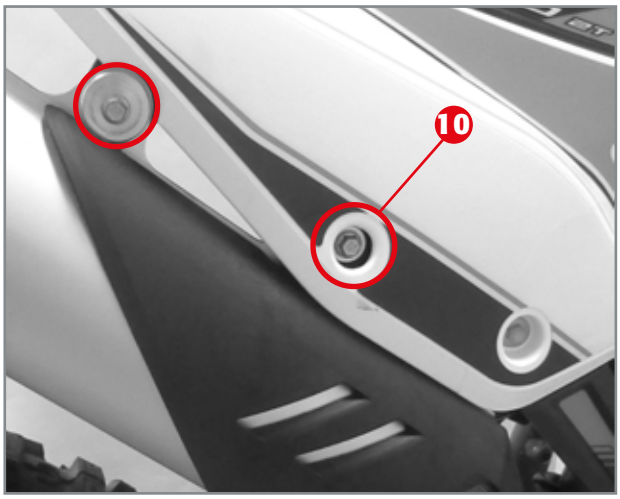

- Remove the frame guards **5** (one on each side) and the pinion guard **6**.



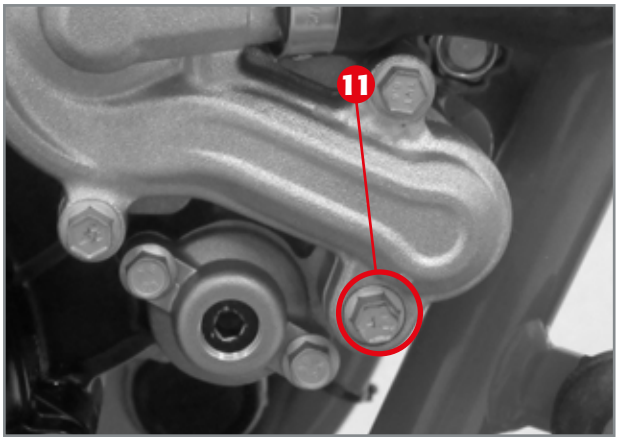

- Remove the circlip **7** and extract the pinion. Rest the chain against the upper wedge **8**.



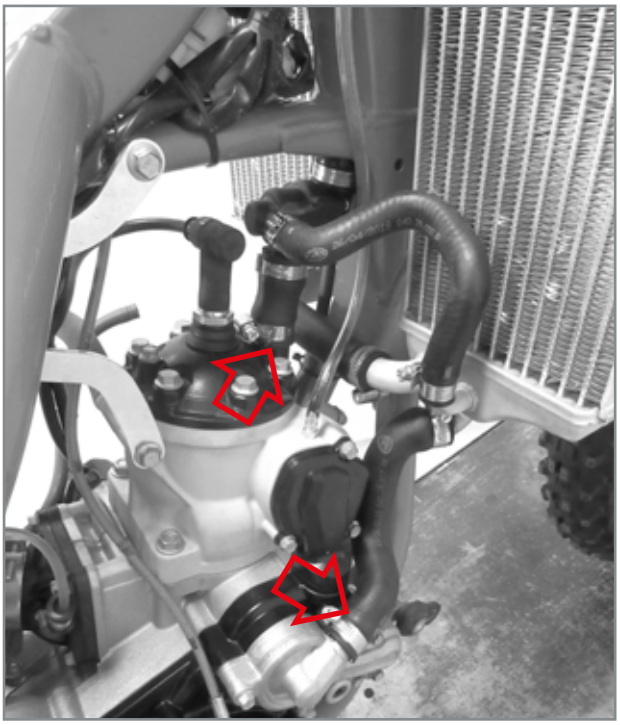

- Remove the screw **9**.



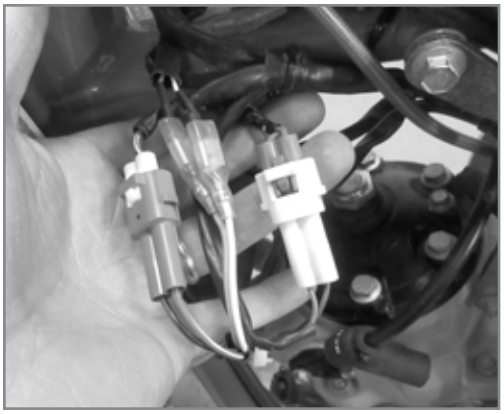

- Remove the screws **10**.
- Remove the silencer from the vehicle.
- Remove the exhaust pipe.




- 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.



- Disconnect the water pipes from the engine.



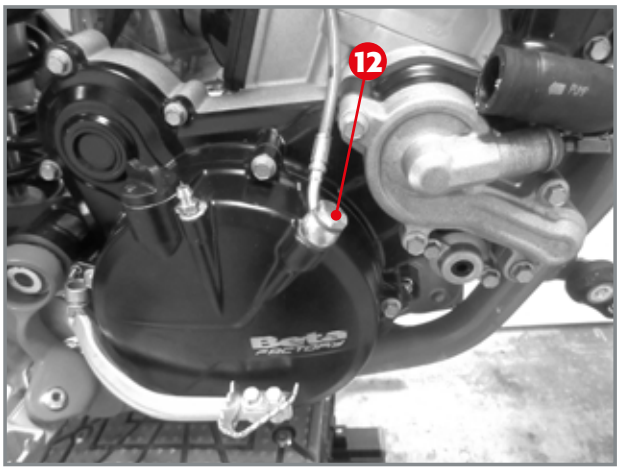
- Disconnect the spark plug cap, disconnect the engine electrical system connectors from the central system. Cut all straps binding the engine's electric system to the vehicle.
- Disconnect the engine ventilation pipes.



- ONLY RR200 Remove the start motor cable fixing nut.



- Pull the clutch lever and hold it in position, for example by using a plastic clamp.




- Remove the threaded fitting **12**.

***ATTENTION!***



*The clutch fluid is highly corrosive, therefore be careful not to drop any of it on the painted parts of the vehicle.*

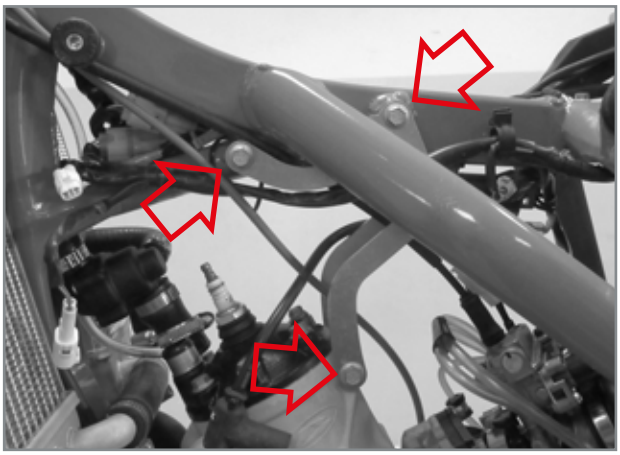


*Protective gloves must be worn to perform this operation.*

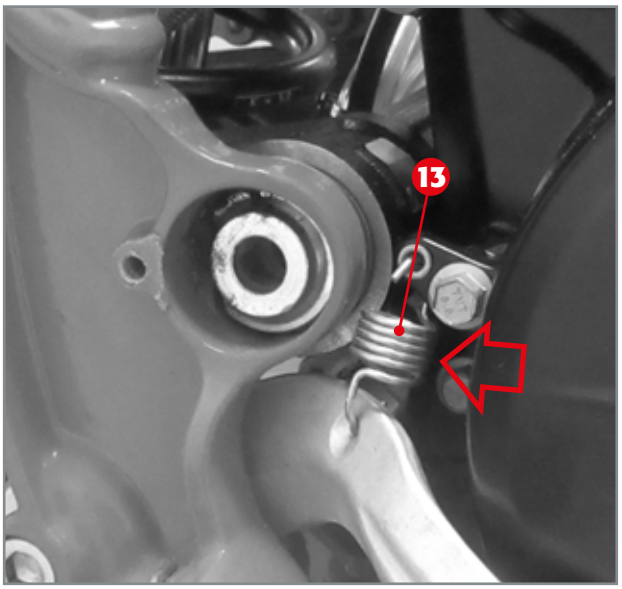
***ATTENTION!***



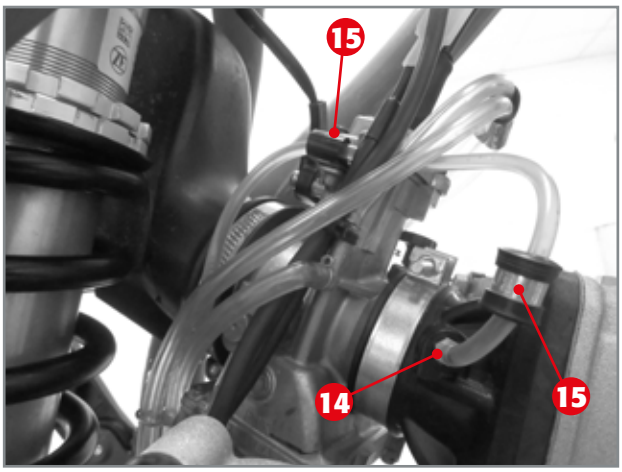
*Do not bring the liquid in contact with skin, eyes or clothing.*
*In case of contact:*
*- with eyes, rinse them immediately with water and week medical advice.*
*- with skin, clean the concerned areas immediately with soap and water. Change the clothing that came into contact with the liquid.*



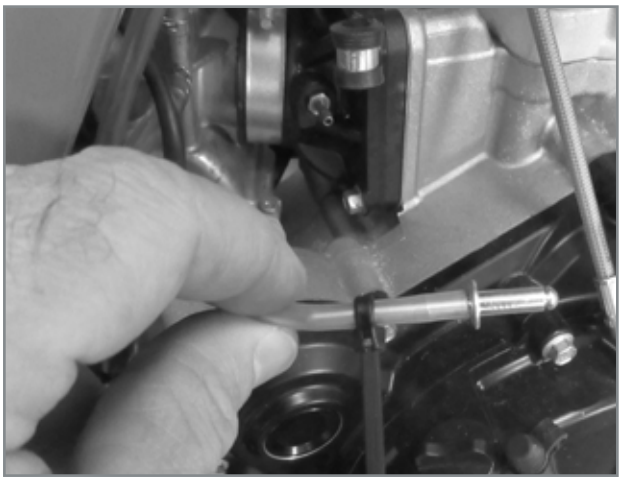
- Remove the head connections.



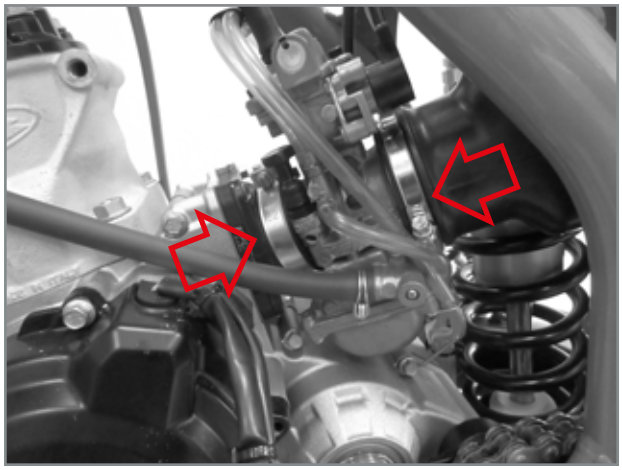

- Release and remove the brake pedal return spring **13**. Remove the kick starter lever.



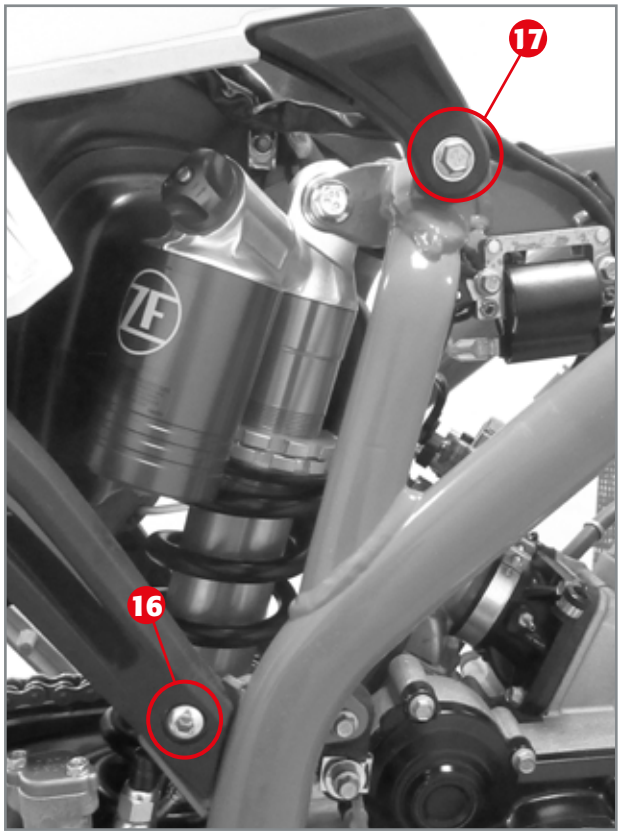

- ONLY RR 200 Pull out the mixer tube **14** from the intake manifold and tube holes **15**.



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



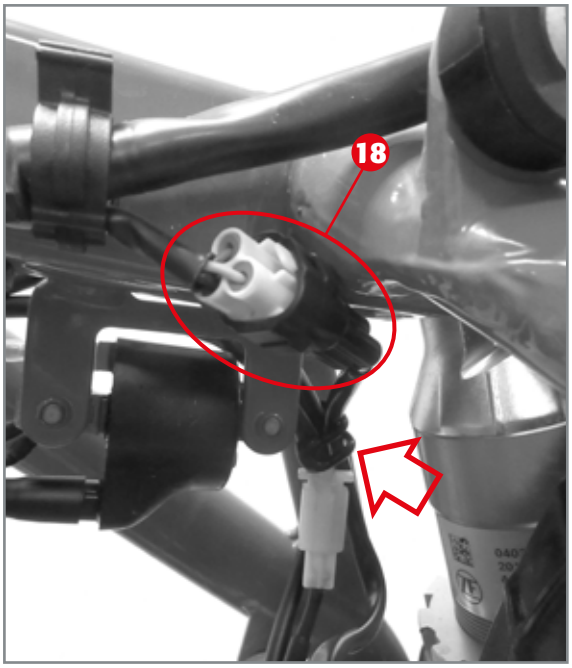
- Loosen the carburettor straps from the air filter sleeve and from the manifold.



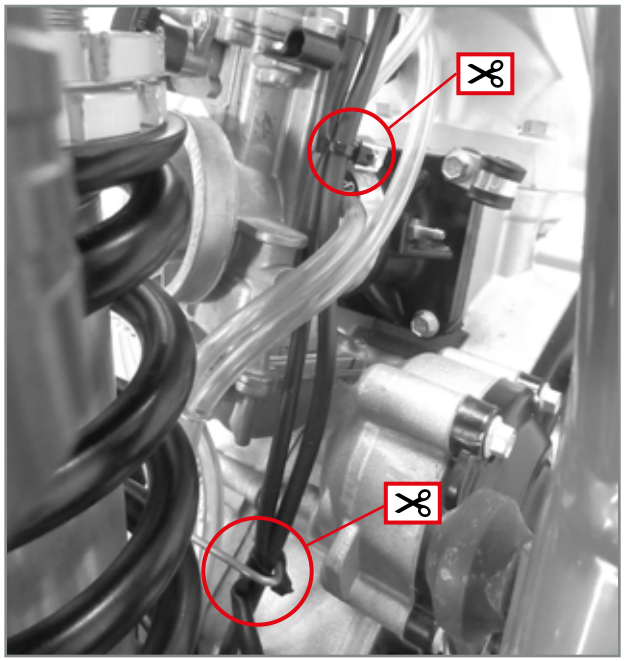

- Remove the subframe lower fixing screws **16** (one on each side) and loosen the upper screws **17** (one on each side).



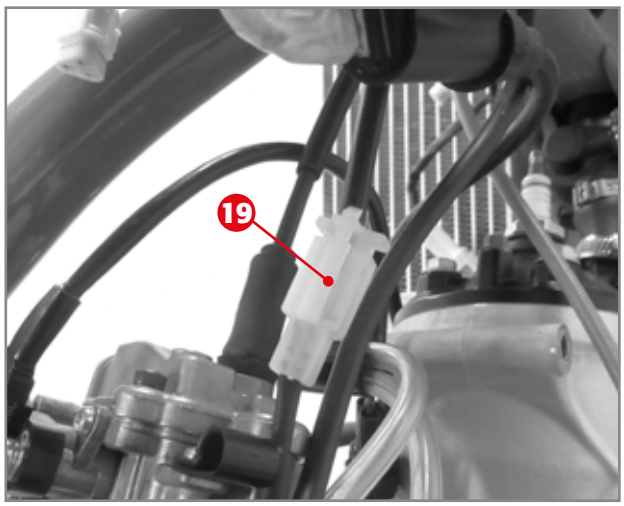
- Rotate the entire filter box unit.




- Disconnect the connector **18** and open the metal clamp indicated.

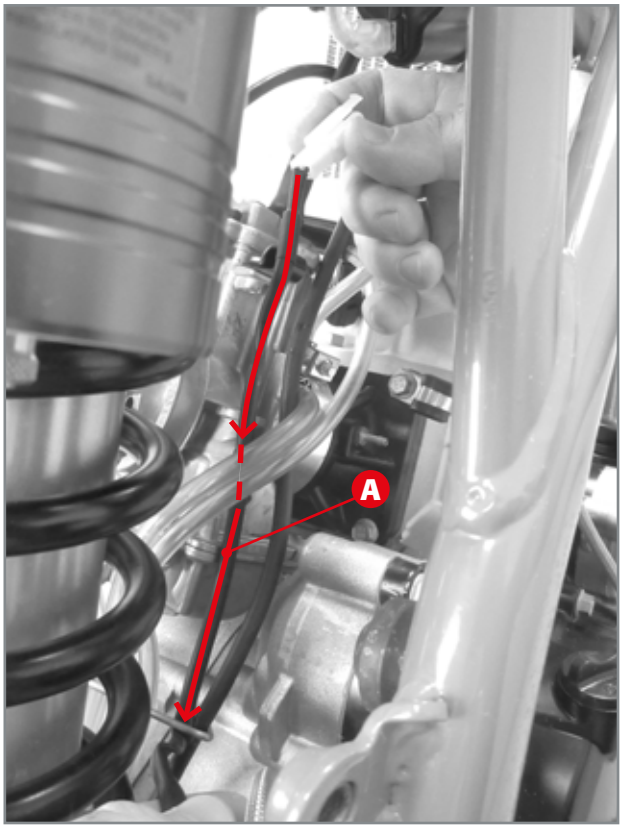


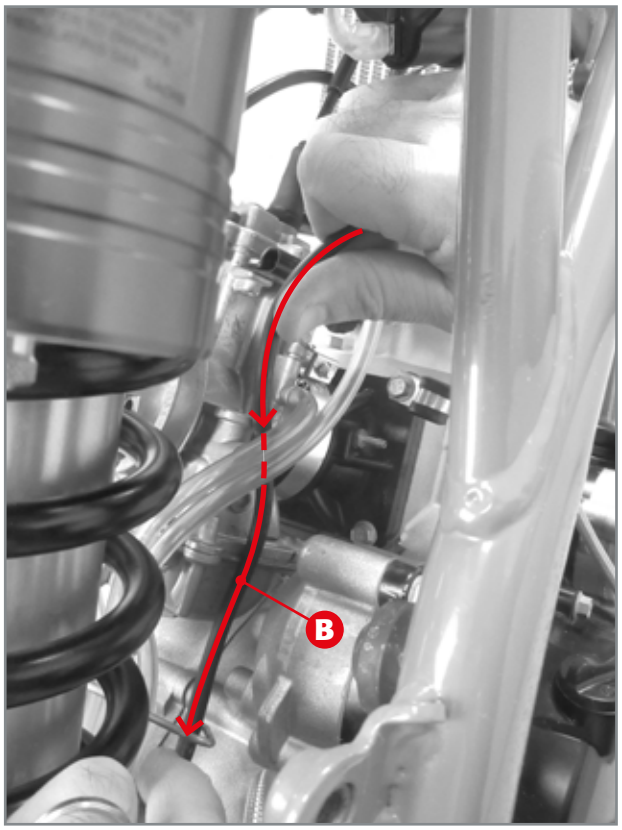
- Only on RR 200, cut all the indicated straps.



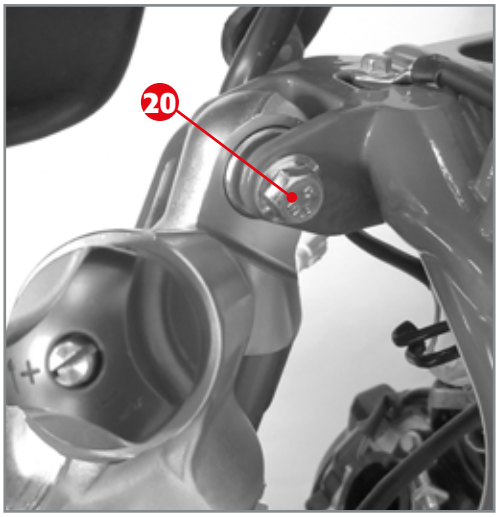

- Disconnect the connector **19**.

- Remove the carburettor, leaving it connected to the gas cable.

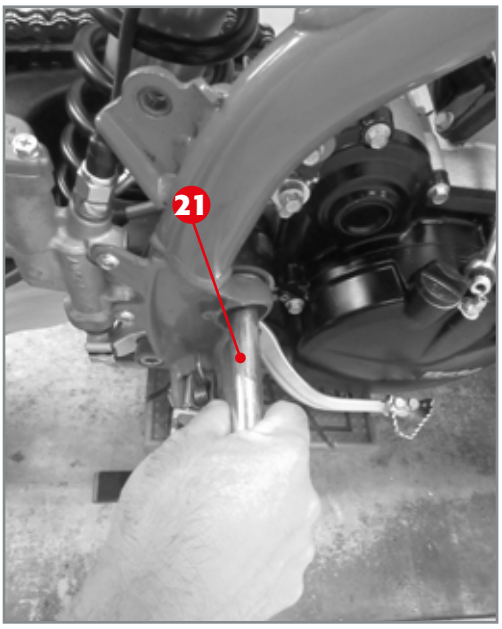


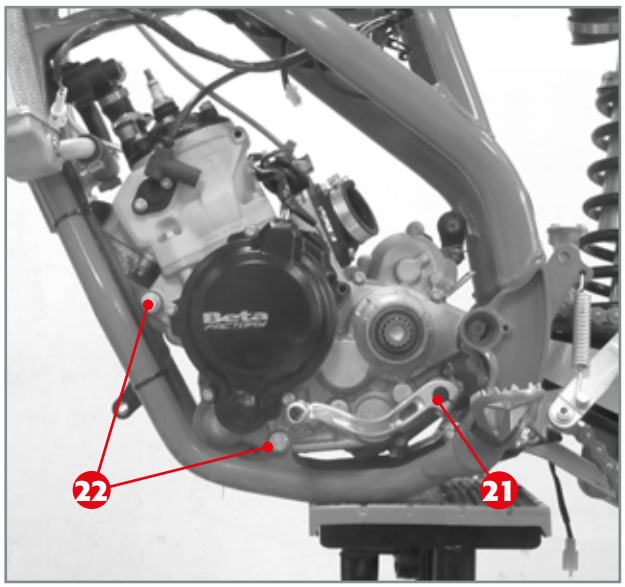

- Remove the brake light wiring **A** and starter motor cable **B** from the carburettor.




- Remove the upper shock-absorber pin **20**.

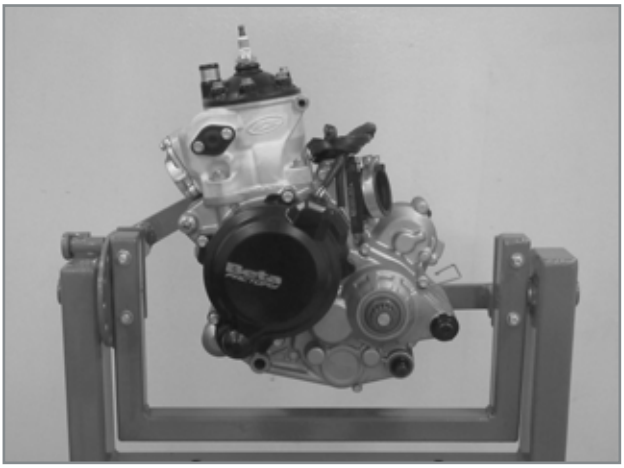



- Remove the swingarm pin **21**. Pull the entire wheel/swingarm unit outwards.

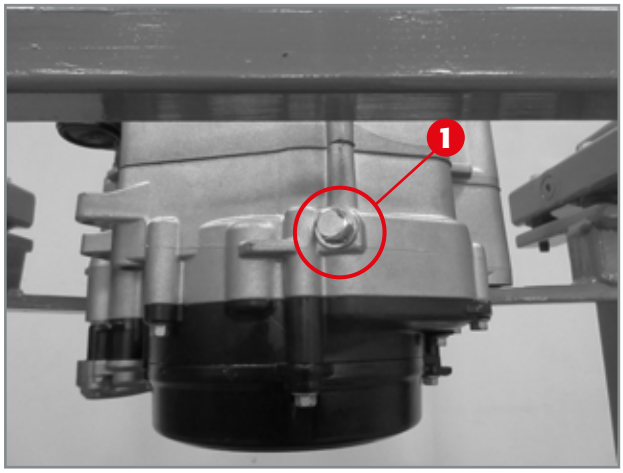



- Remove the gear lever **21** and the engine pins **22**.

# 2 ENGINE DISASSEMBLY

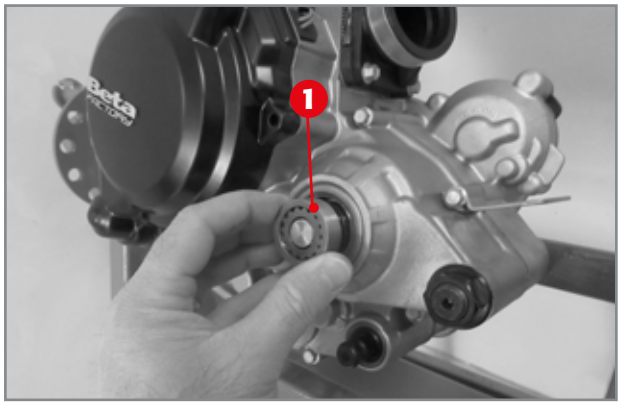


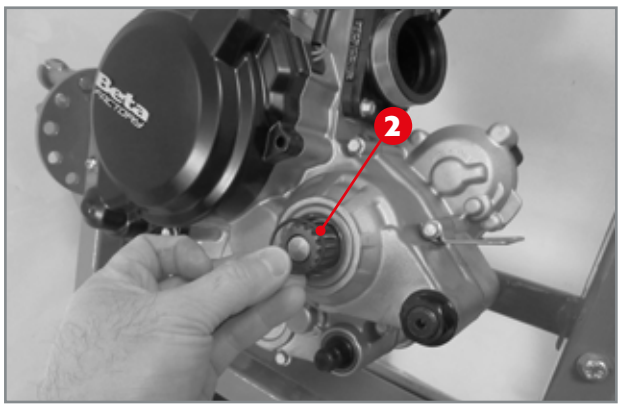
Secure the engine to the specific support stand *code 3625132000* by means of front fixing *035.14.008.80.00*, in order to work in comfort and safety. Then proceed as follows.




## 2.1 CLUTCH/GEARSHIFT OIL DRAIN

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

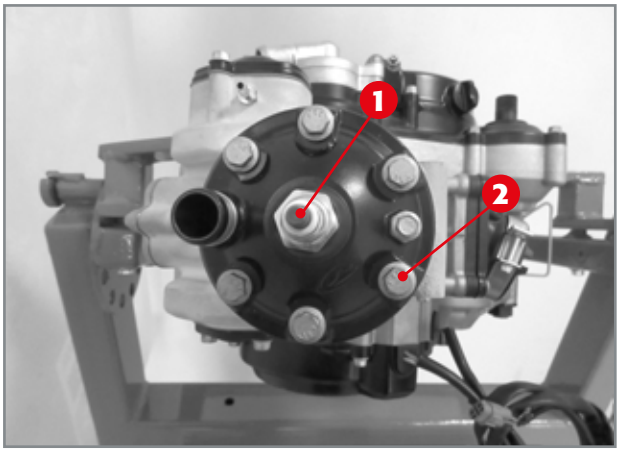


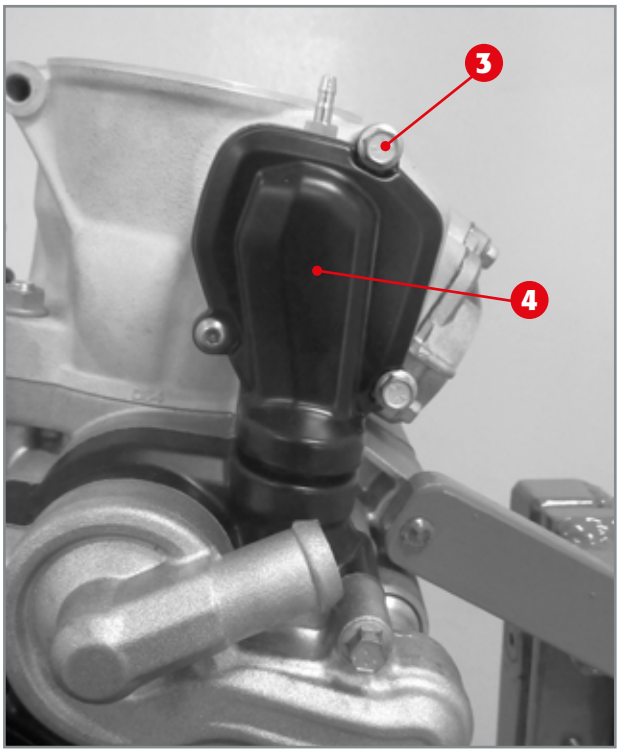

## 2.2 REMOVAL OF PINION SPACER

Take out the spacer **1.**
Remove the O-ring **2**.

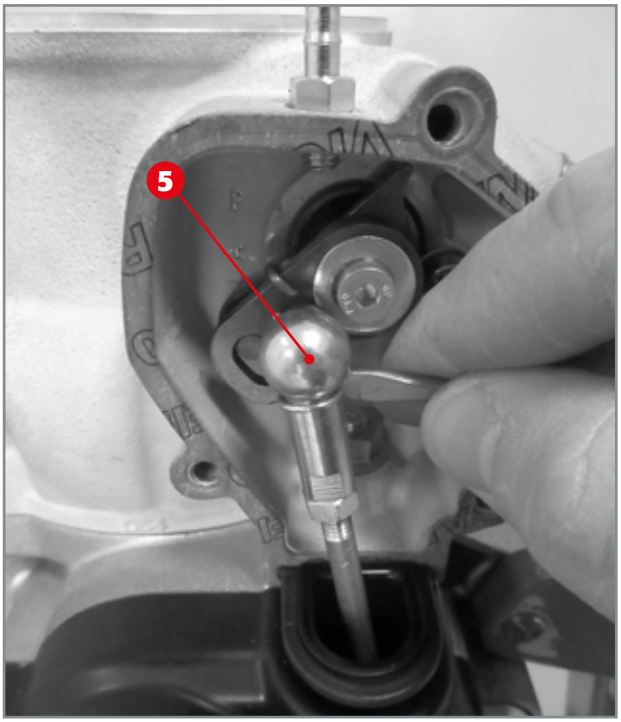
## 2.3 REMOVAL OF PISTON, CYLINDER AND HEAD



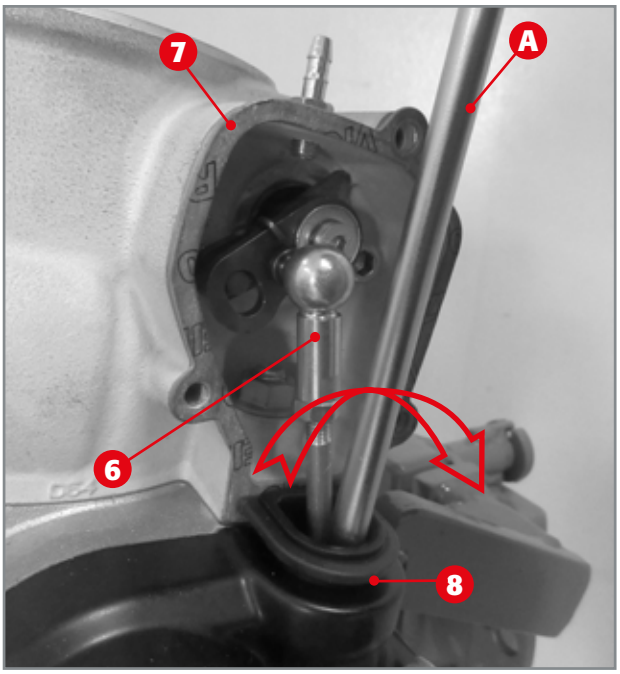

Remove the spark plug **1** and the spigot screws **2** together with the copper washers. Remove the head and the two O-rings.




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



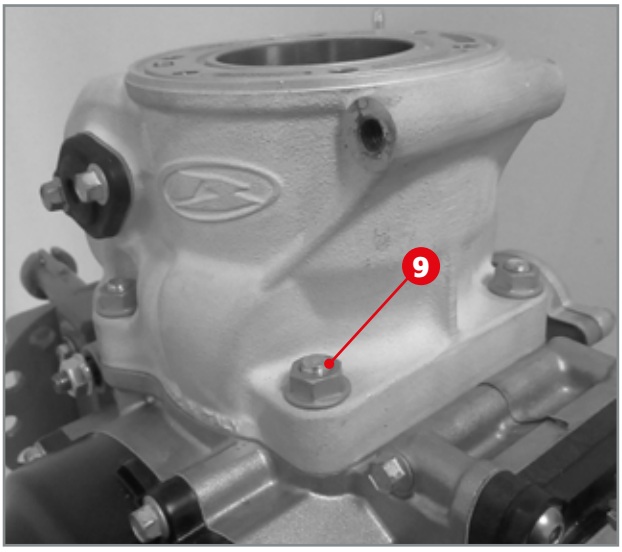

Release the lock **5** and remove it.




***Removal of gasket 7.***

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.



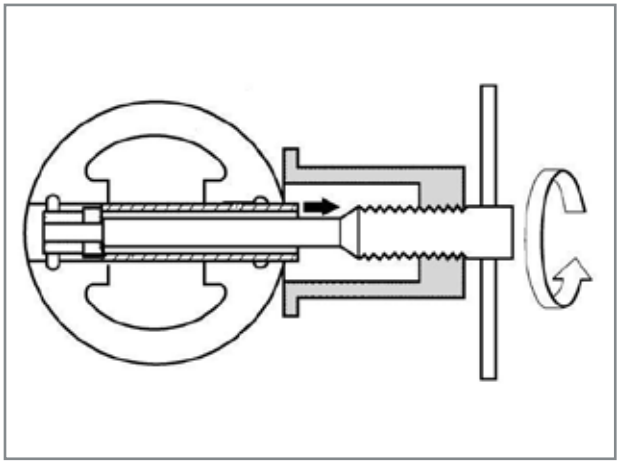

Remove the four collar nuts **9**.
Extract the cylinder and the base gaskets.




***Removal of piston circlip.***

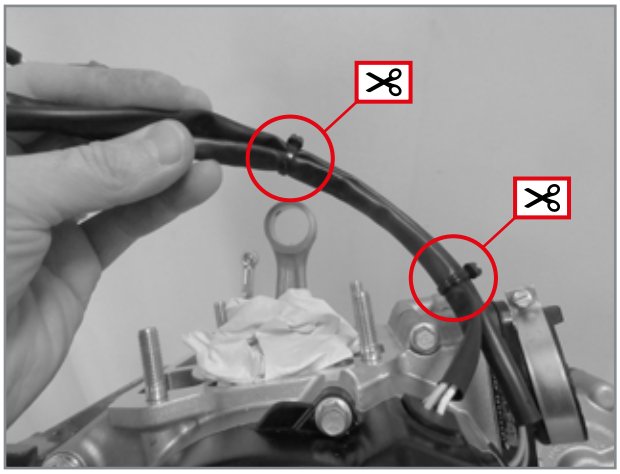
***ATTENTION!***
*Place a clean cloth between the piston and the crankcase to keep foreign objects or simple solid residues from falling inside the base.*

Using a suitable tool to insert the specific seat **A**, remove the elastic ring **10**.



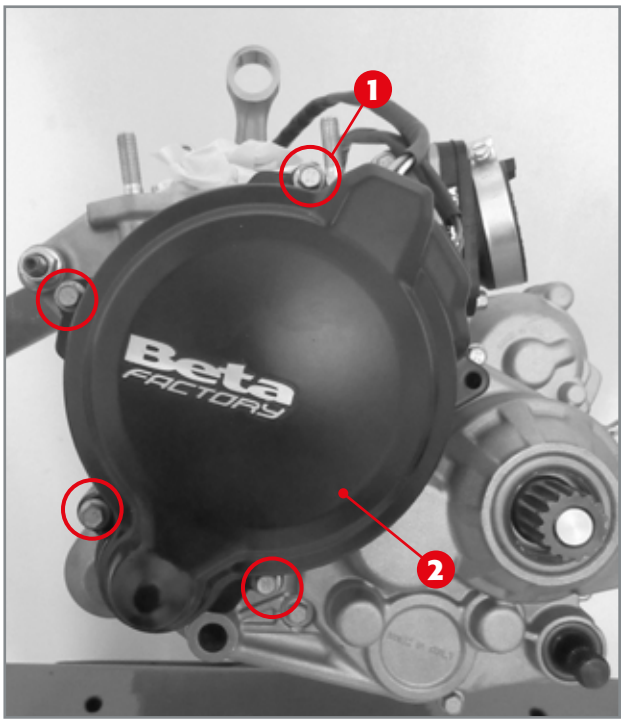
*Disassembling the piston pin bolt.*

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.



## 2.4 REMOVAL OF IGNITION UNIT

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

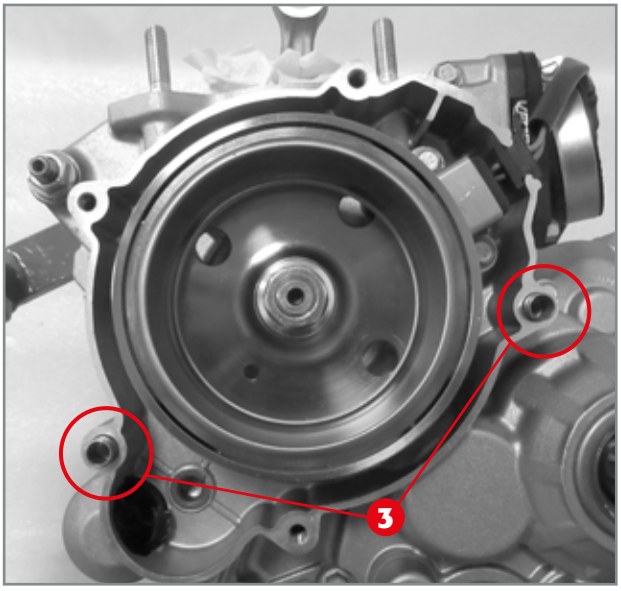



*Fixing screws 1 of flywheel cover 2.*

### 2.4.1 Flywheel cover plate removal

Remove the plastic straps that join the stator and pick-up wiring.

Remove the four 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.

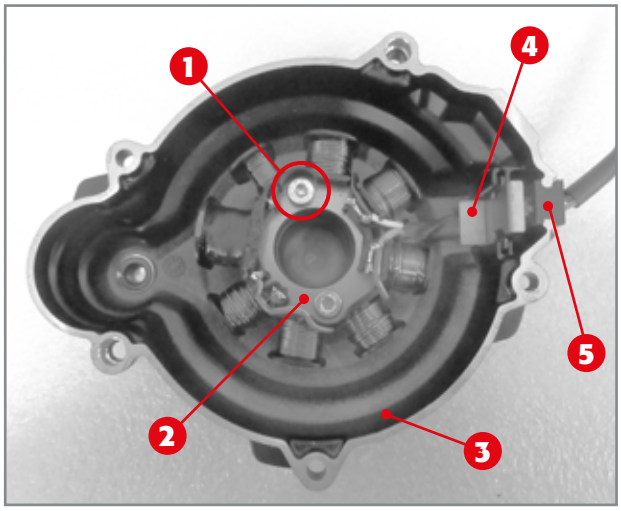



*The two designated references pins (3) for the flywheel cover.*

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.

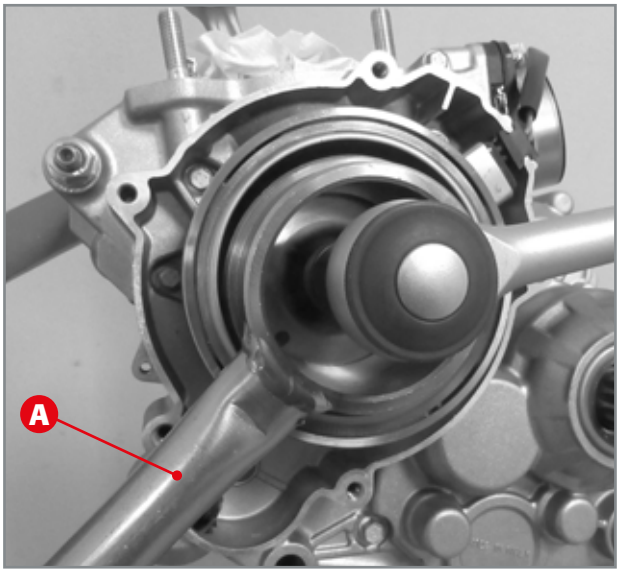



*Disassembly of stator from cover.*

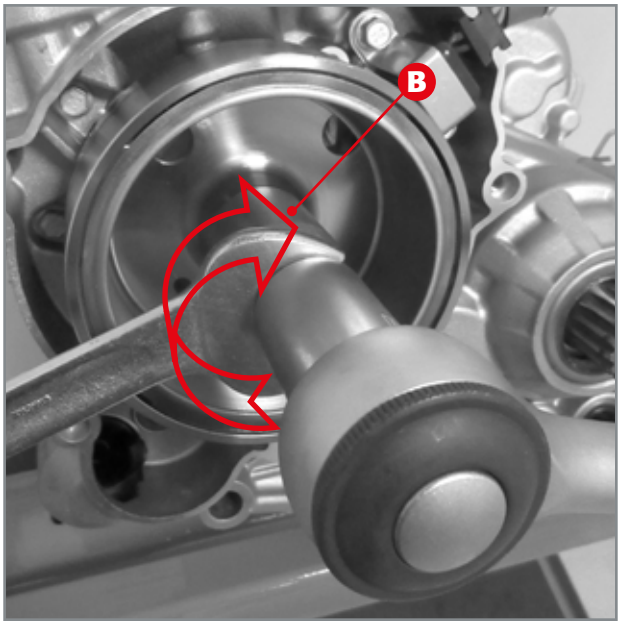
## 2.4.3 Flywheel removal

Block the flywheel using the special tool **A** (*code 026140040000*) and remove the tightening 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 flywheel.*

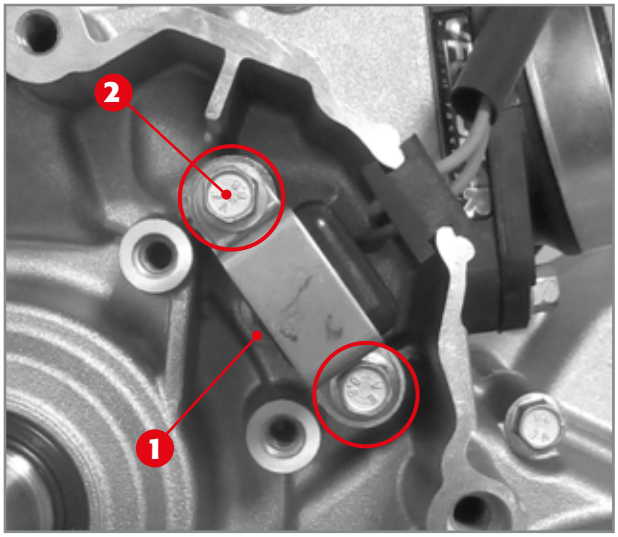



*Removal of flywheel nut.*




*Release of flywheel using special tool B.*

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.



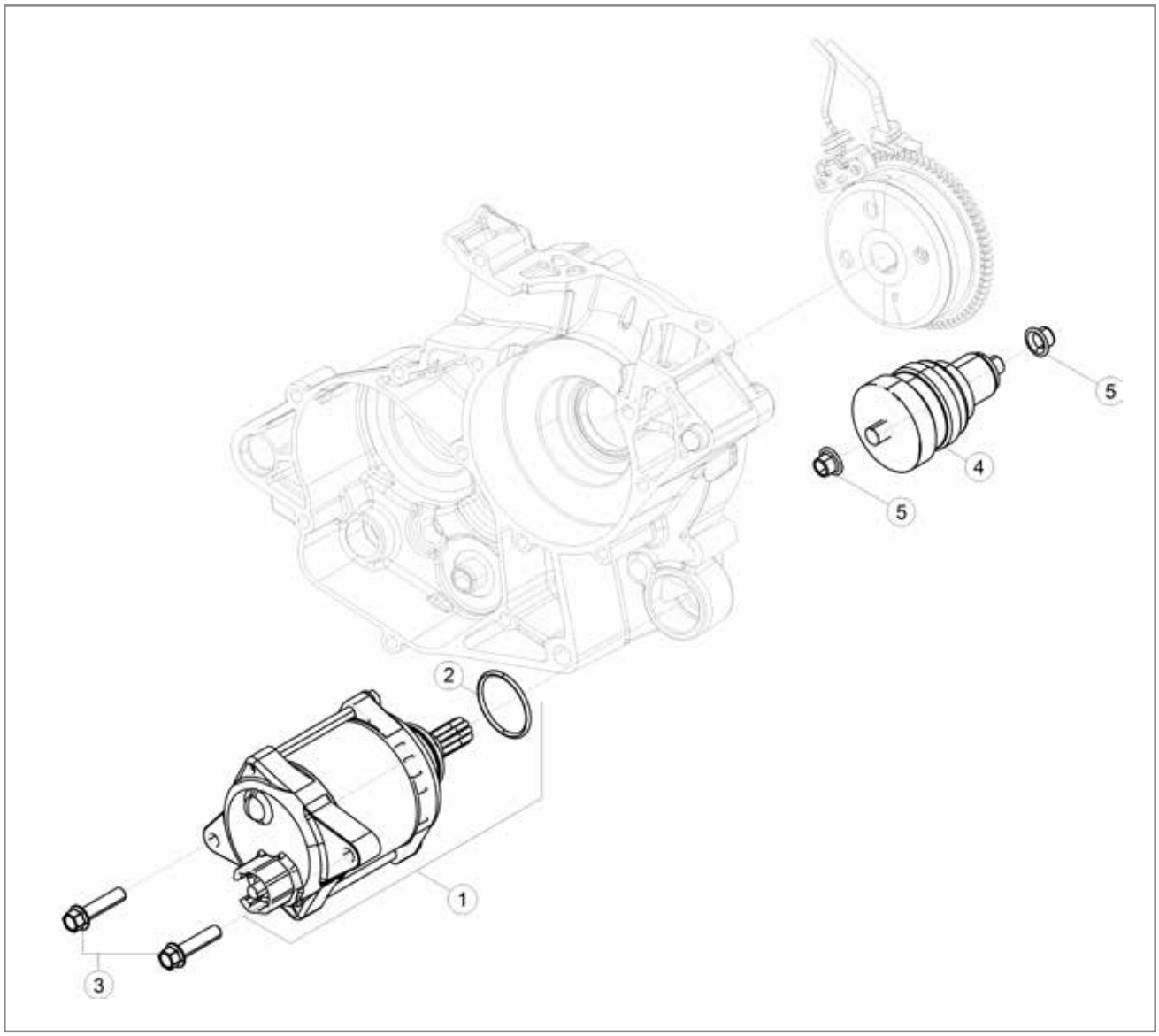

*Pick-up removal.*

## 2.4.4 Removal of pick-up unit

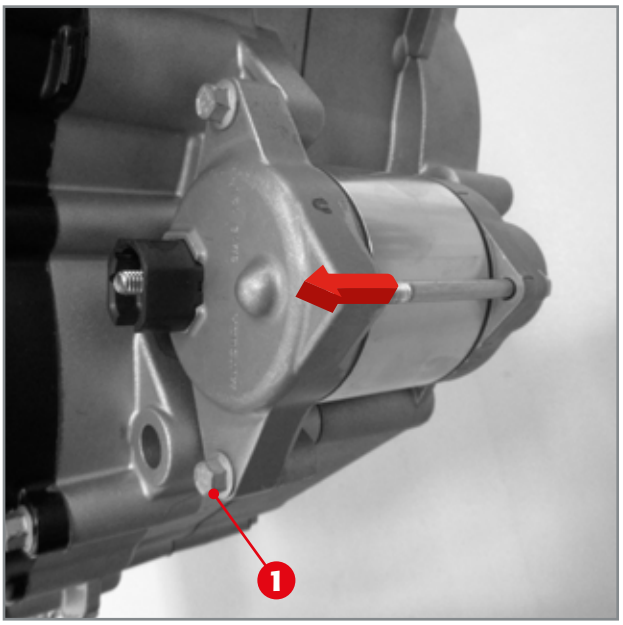
Remove the pick-up unit **1** by loosening the two fixing screws **2**.

## 2.5 REMOVAL OF ELECTRIC IGNITION - ONLY RR200

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.

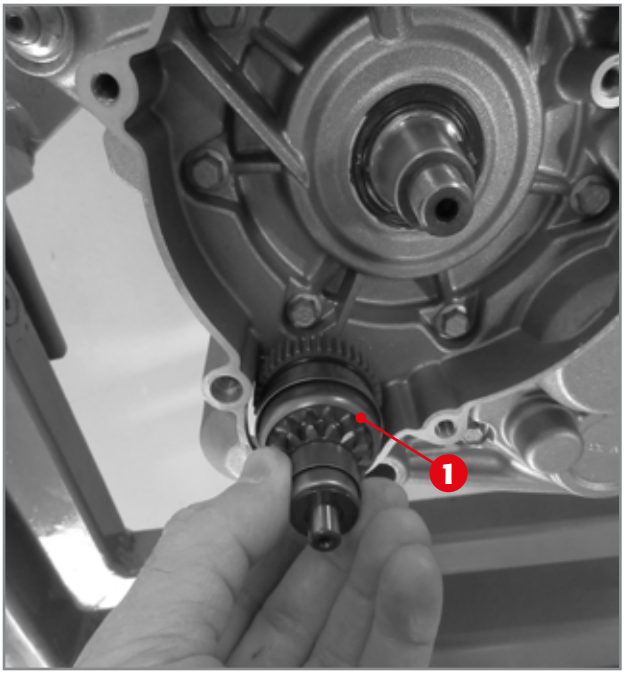



***EXPLODED VIEW OF ELECTRIC KICKSTART***
***1) Start motor;***
***2) O-ring;***
***3) Screws;***
***4) Bendix coupling;***
***5) Bush with collar.***




## 2.5.1 Removal of start motor

Remove the two screws **1** and extract the motor.



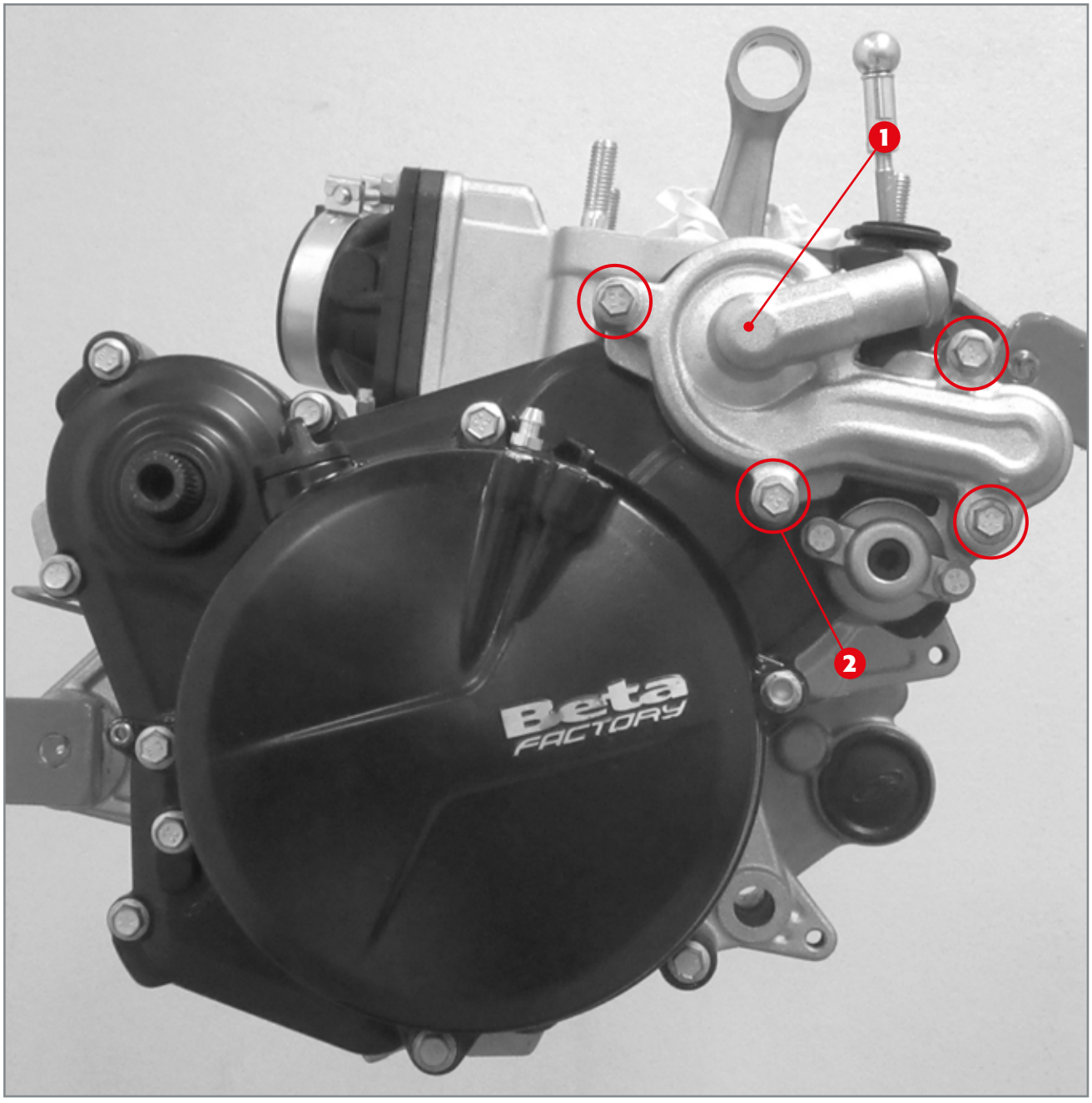

## 2.5.2 Bendix coupling removal

Extract the Bendix coupling **1** once the complete flywheel cover and flywheel have been removed (see par. 2.4).

## 2.6 REMOVAL OF COOLANT LIQUID PUMP, CLUTCH UNIT, MAIN GEAR, CENTRIFUGAL UNIT, GEAR-SHIFT DRIVE PARTS, KICK-START

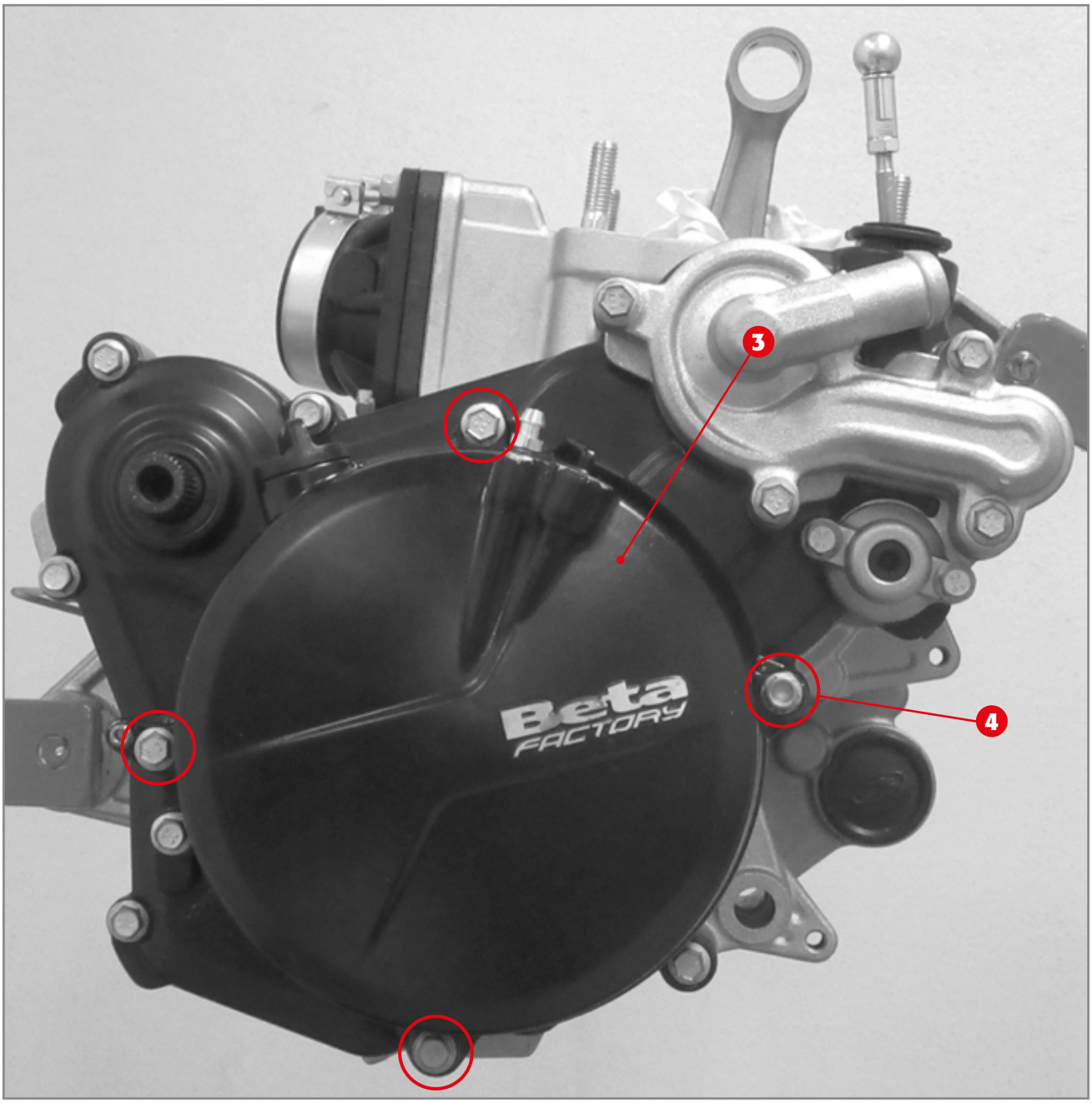
Remove the cover **1** by loosening the four screws **2**, to access the coolant liquid pump.

***Note:*** *remove the coolant liquid pump impeller if work needs to be done on the centrifugal unit.*



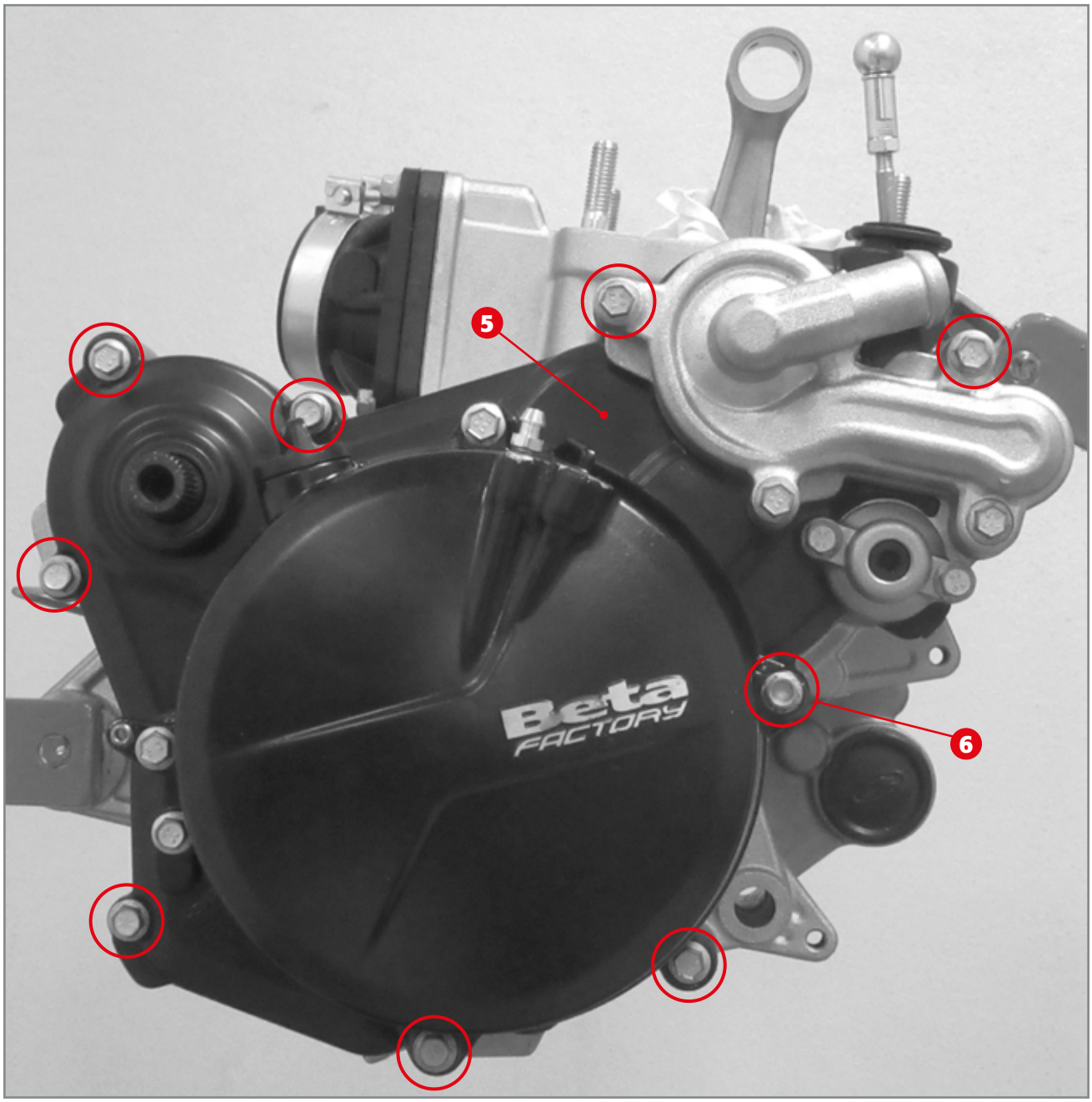

***Coolant liquid pump cover screws.***

Remove the outer clutch cover **3** by loosening the four screws **4** to access the clutch unit only.

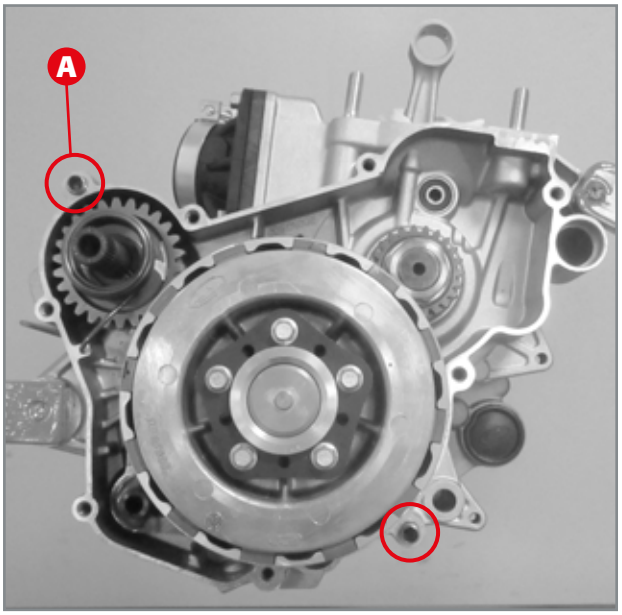



***Outer clutch cover screws.***

When doing a complete overhaul of the engine or of gearshift drive parts, kickstart, primary transmission or centrifugal unit, the inner clutch cover **5** must be removed by loosening the nine screws **6** after draining the gear oil (Par.2.1).




***Inner clutch cover screws.***

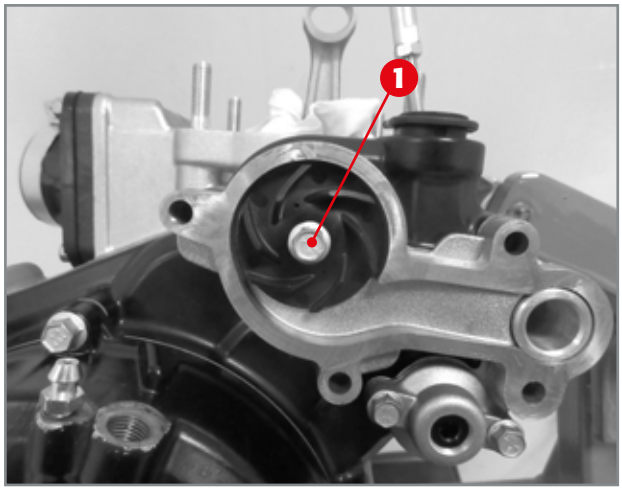



*Two centring pins A for inner clutch cover coupling.*

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

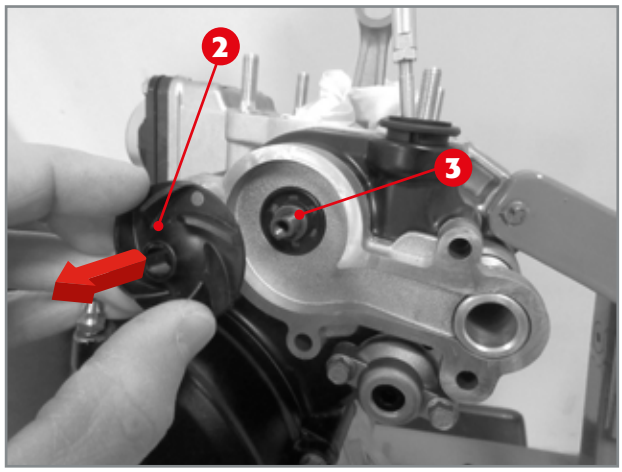
## 2.6.1 Cooling liquid pump removal

Loosen the fixing screw **1** once the coolant liquid pump cover has been removed (Par.2.6).



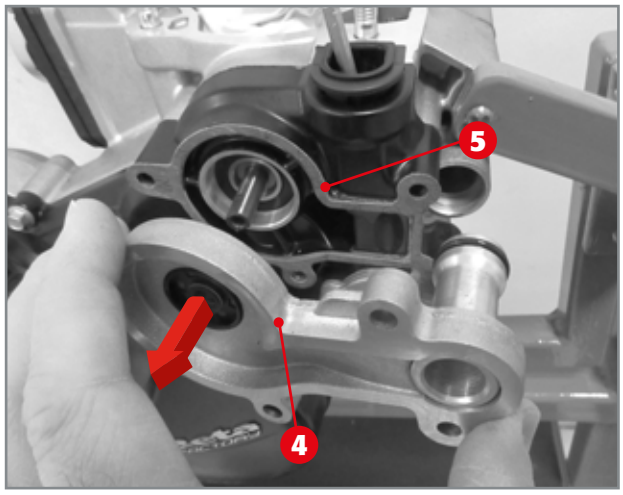

*Cooling pump fixing screw.*

Extract the impeller **2** and the thrust washer **3**.




*Removal of impeller.*

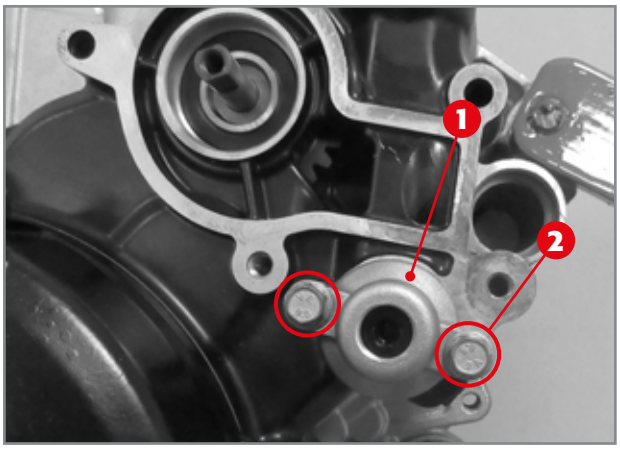
Extract the complete pump body **4** and remove gasket **5**.




*Removal of pump body and gasket.*

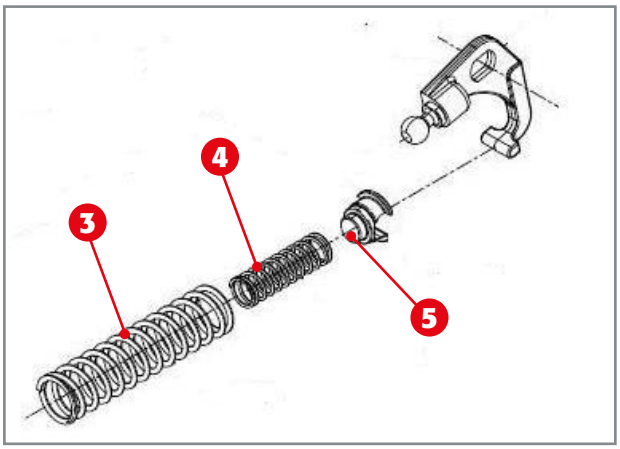
## 2.6.2 Removal of centrifugal unit and leverage

Access the centrifugal unit and linkage 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).

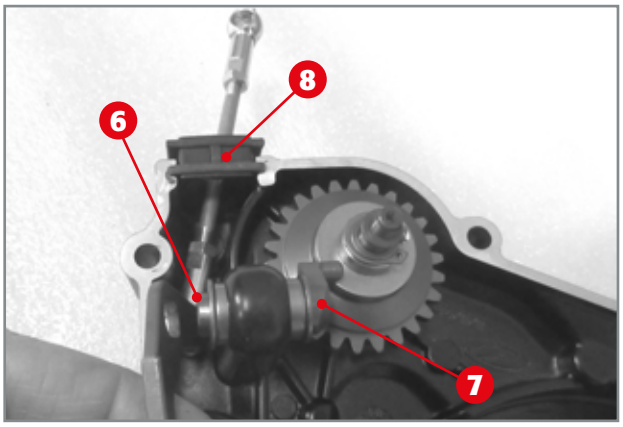



***Removal of centrifugal adjustment cover.***

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

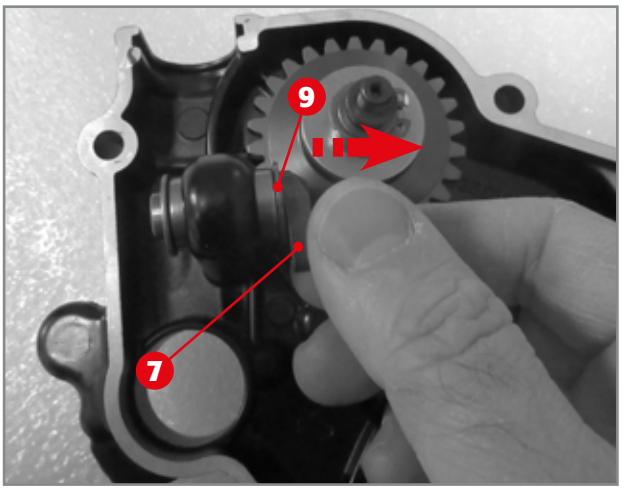



After removing the screw fixing the rocker arm **6** to the centrifugal control lever **7**, extract the rocker arm with control rod and gasket **8**.

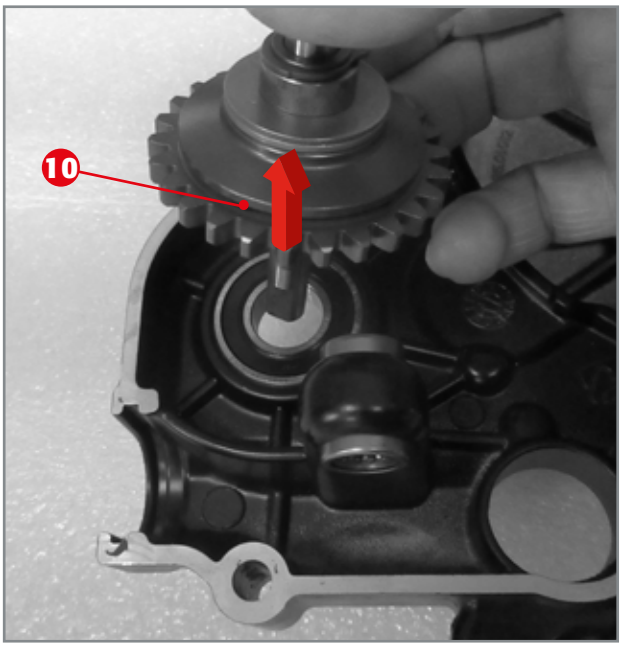



***Disassembly of control rod-rocker arm unit.***

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

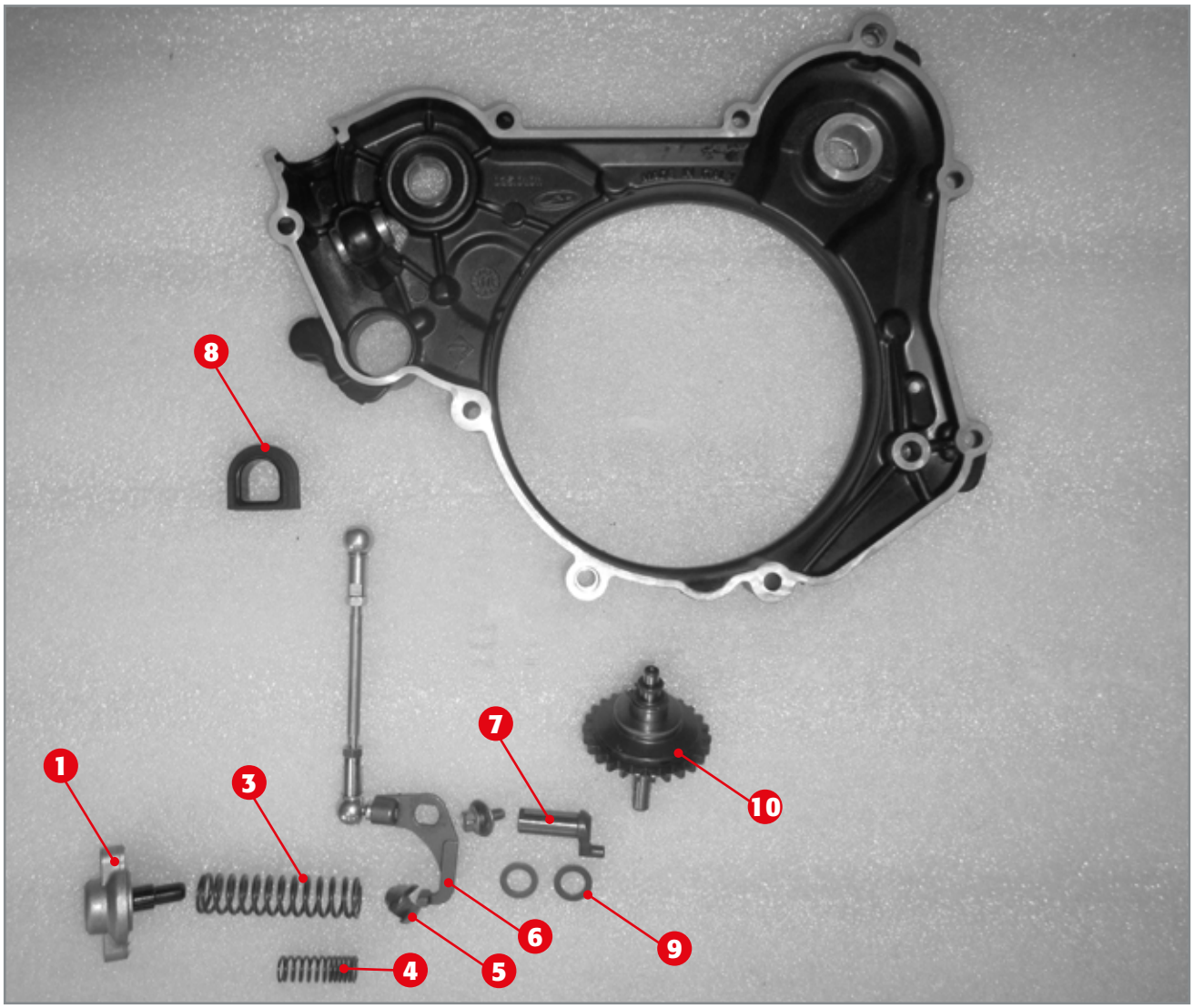



***Removal of centrifugal control lever.***



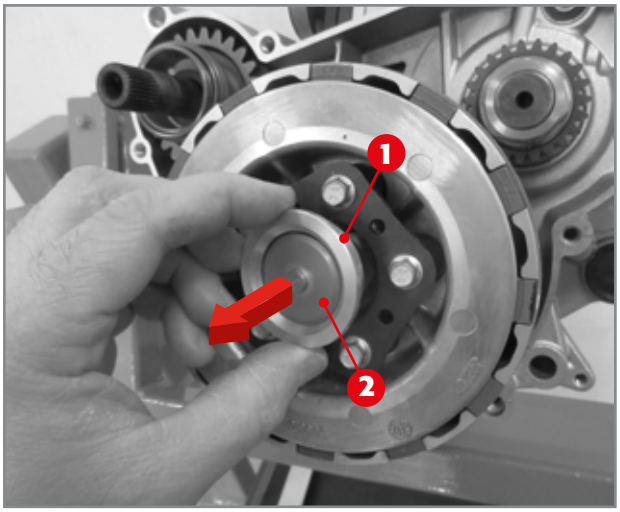

*Extraction of centrifugal unit.*

Extract the complete centrifugal unit **10**.

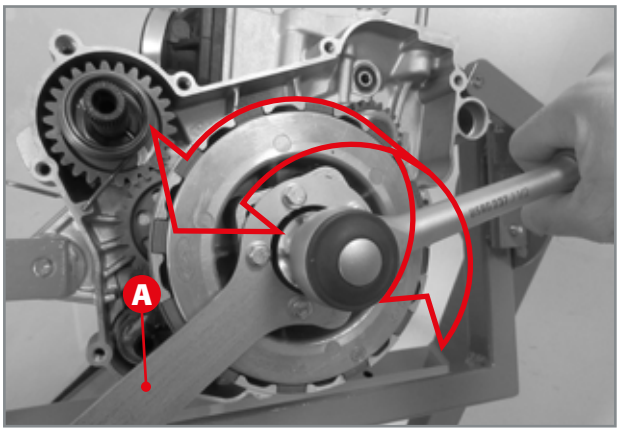



*1) Adjustment cover;*
*3) Adjusting spring;*
*4) Auxiliary spring;*
*5) Spring guide;*
*6) Rocker arm;*
*7) Centrifugal control lever;*
*8) Gasket;*
*9) Thrust washers;*
*10) Centrifugal unit.*

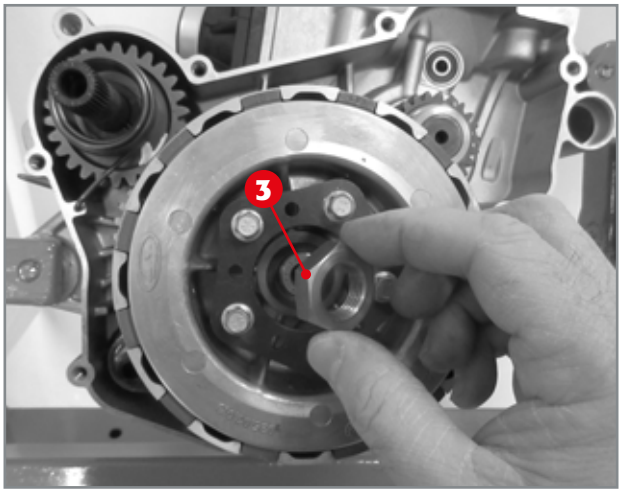
## 2.6.3 Clutch disassembly and removal



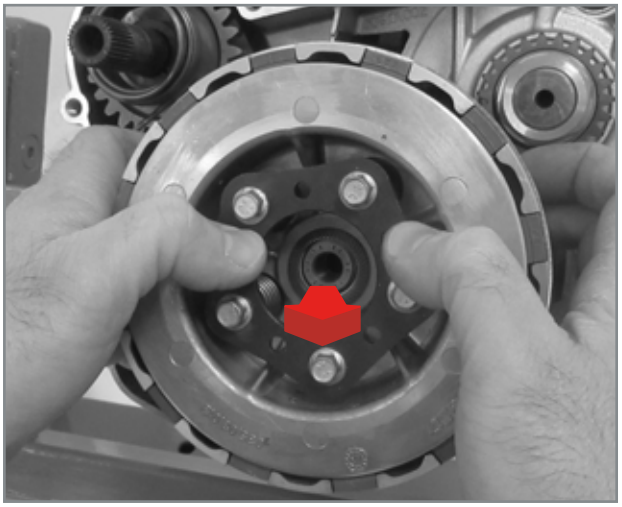

Remove the clutch coupling plate **1** together with the thrusting bearing **2**.



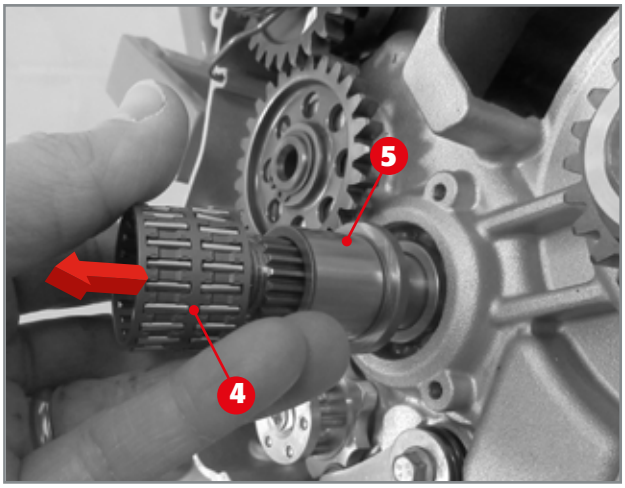

Block the entire clutch unit using the special tool **A** (*code 035.14.000.80.00*) as shown in the figure and loosen the clutch locking nut.



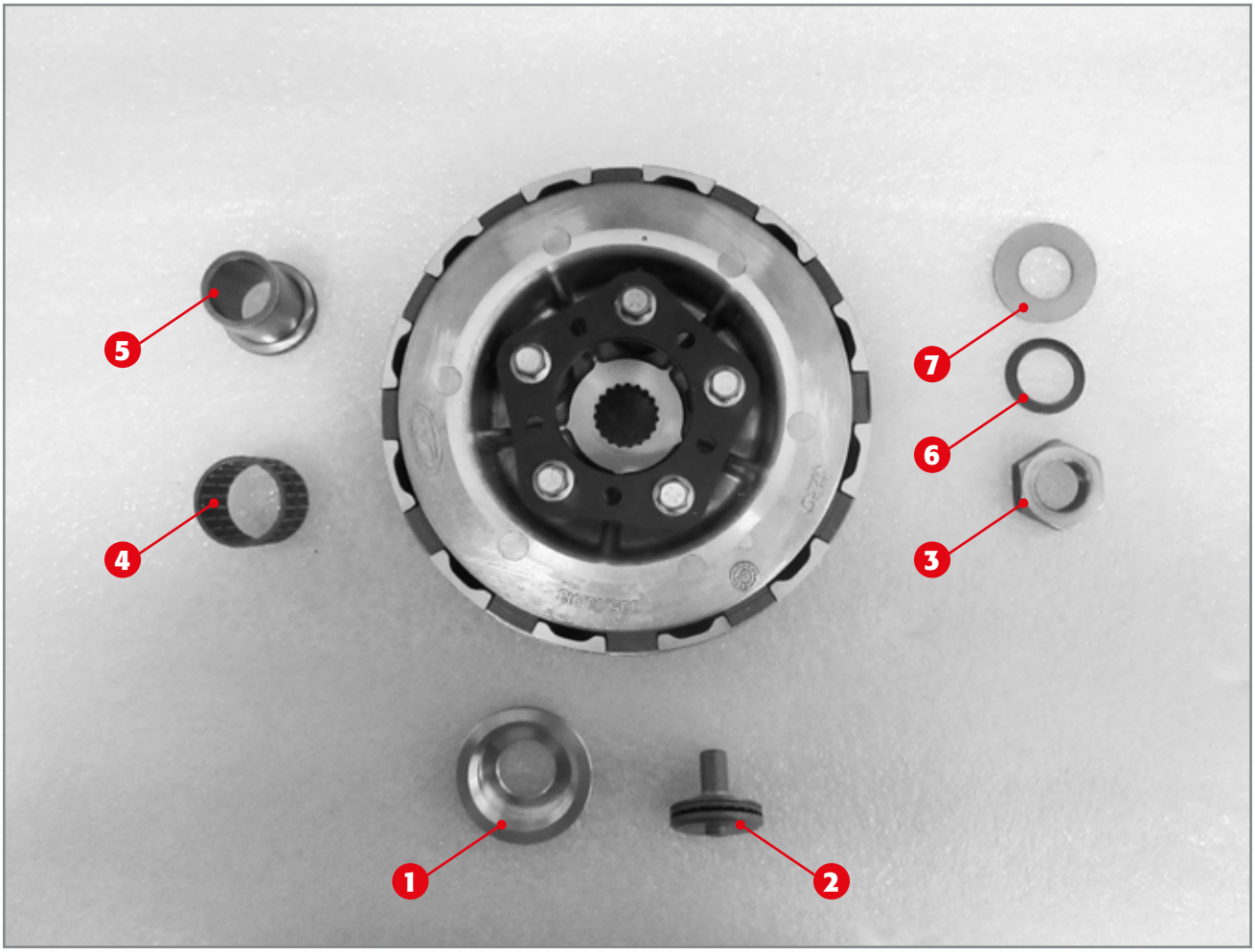

Remove the clutch locking nut **3**.



Grasp the entire clutch unit and pull it towards you.

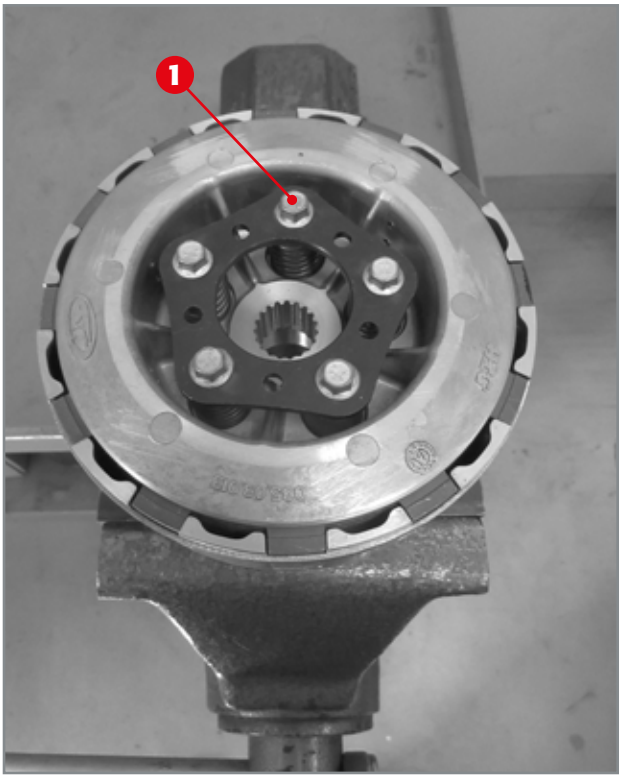



Remove the roller cage **4** and the centre bearing **5**.

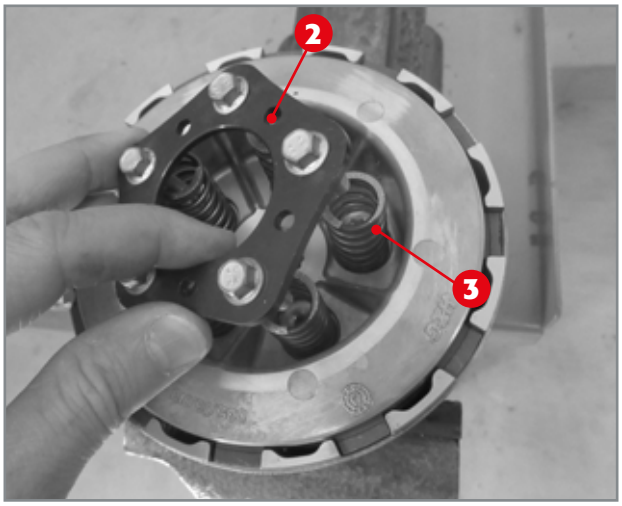



*1) Clutch coupling plate;*
*2) Thrusting bearing;*
*3) Clutch locking nut;*
*4) Roller bearing;*
*5) Centre bearing;*
*6) Schnorr washer;*
*7) Washer.*

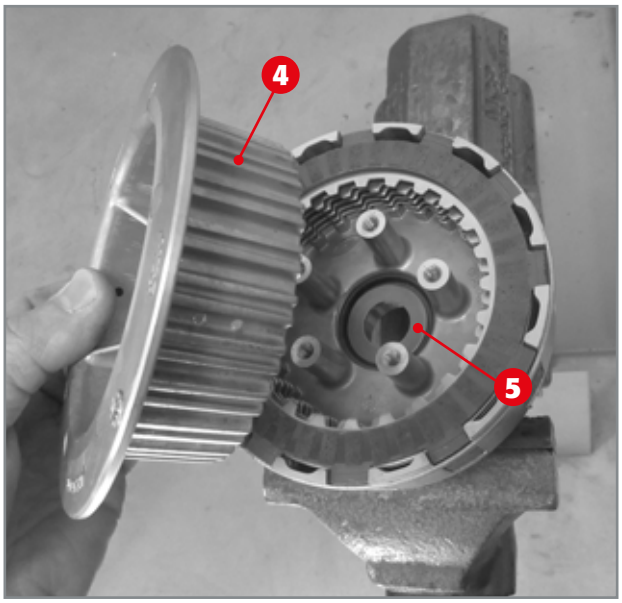
## 2.6.3.1 Clutch disassembly



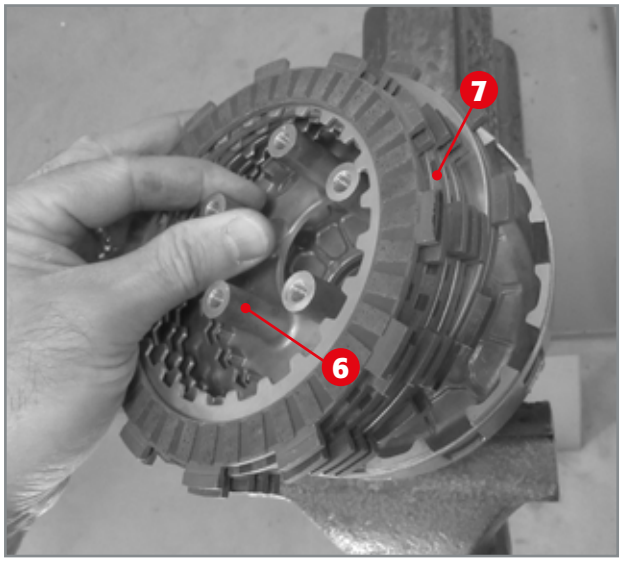

Block the clutch case using the soft jaws vice. Progressively loosen the screws **1** until they are disengaged from their seat.




Remove the spring plate **2** and the springs **3**.

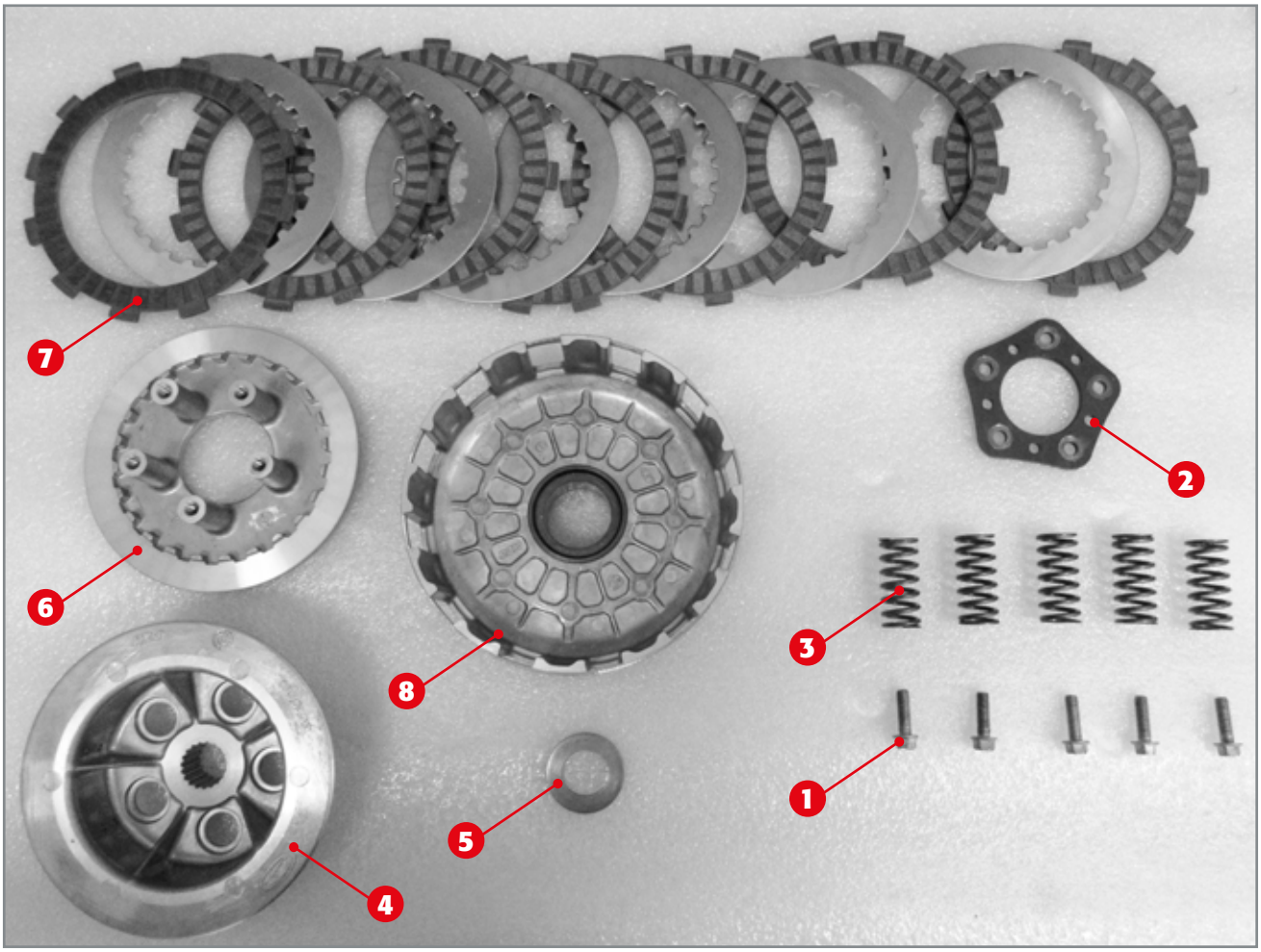



Remove the clutch hub **4** and the washer **5**.

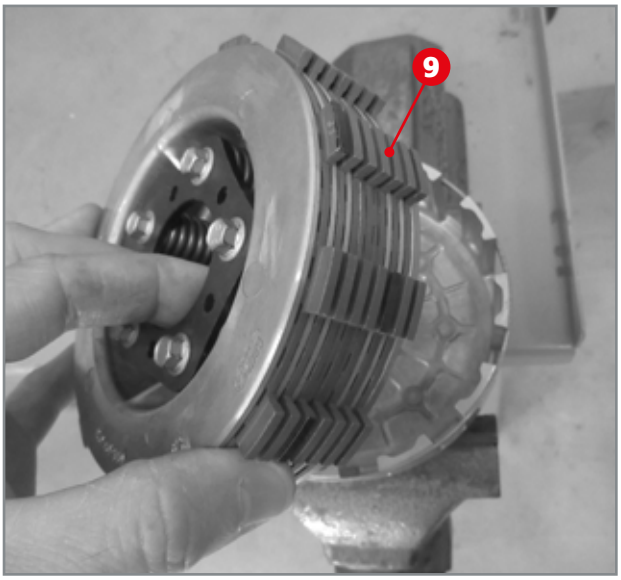



Remove the disc thrust plate **6** together with the disc unit **7**.
After extracting these last parts, the bare clutch case **8** remains.

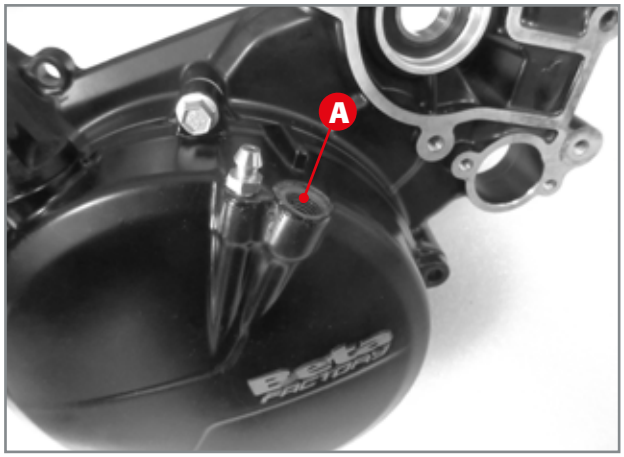
The entire clutch unit is disassembled.




***1) Screws;***
***2) Spring plate;***
***3) Springs;***
***4) Hub;***
***5) Washer;***
***6) Pressure plate;***
***7) Clutch discs;***
***8) Clutch case.***




***Note:*** *if you want to check the wear of the case only, you can disengage it from the clutch pack* ***9*** *by simply lifting the clutch pack.*




## 2.6.3.2 Clutch actuator disassembly

To disassemble the clutch actuator, simply blow compressed air from the clutch connection duct **A**.

***ATTENTION!***

*During this phase, hold the piston with one hand to allow its slow release.*

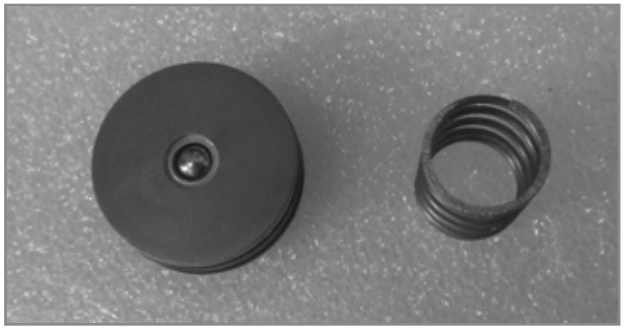
***ATTENTION!***

*The clutch fluid is highly corrosive, therefore be careful not to drop any of it on the painted parts of the vehicle.*

*Protective gloves must be worn to perform this operation.*

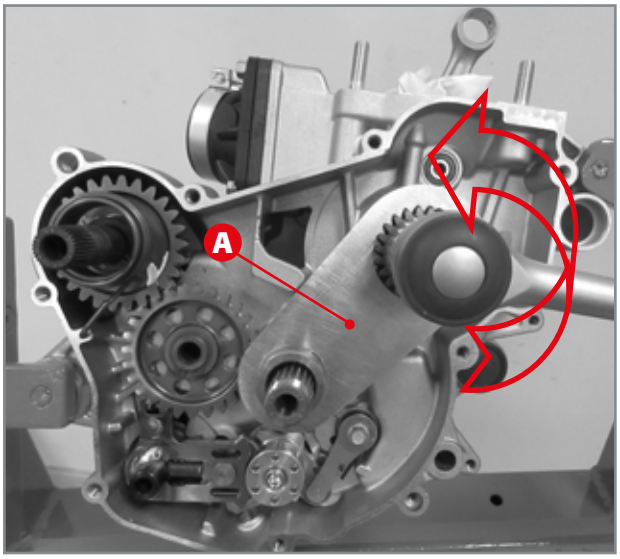
***ATTENTION!***

*Do not bring the liquid in contact with skin, eyes or clothing.*
*In case of contact:*
*- with eyes, rinse them immediately with water and week medical advice.*
*- with skin, clean the concerned areas immediately with soap and water. Change the clothing that came into contact with the liquid.*

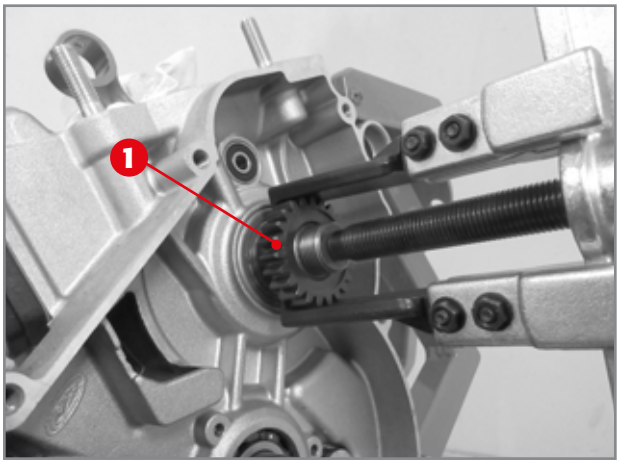


Remove the complete piston and its spring.

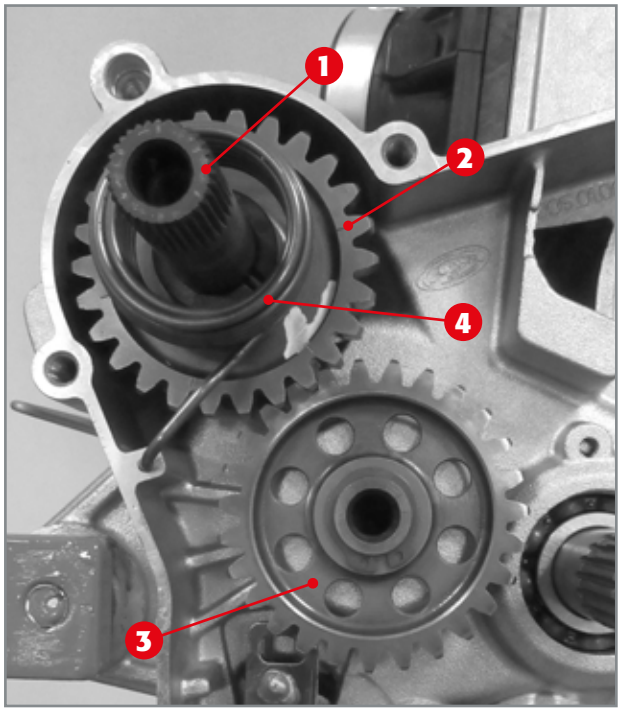
## 2.6.4 Primary pinion removal




After removing the entire clutch unit (Par. 2.6.3), apply the special tool **A** *(code 035.14.006.50.00)* as shown in the figure.
Loosen the primary pinion nut by turning clockwise.



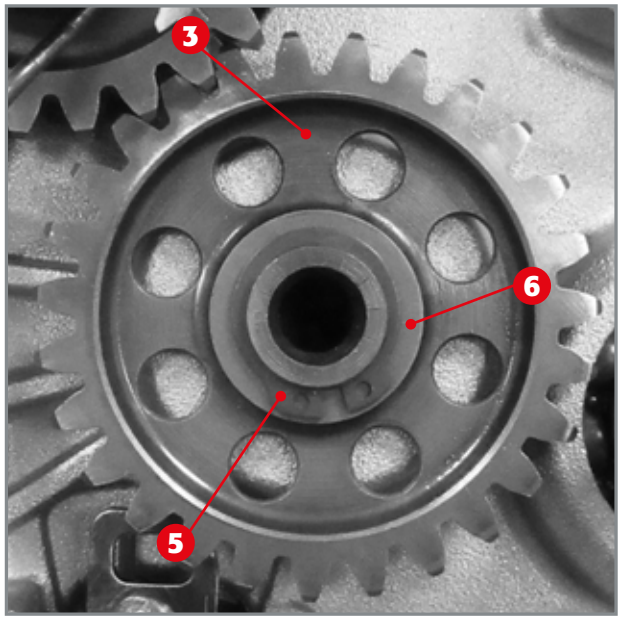

Remove the pinion **1**. Removal can be facilitated by using a universal extractor.




*The pedal kickstart.*

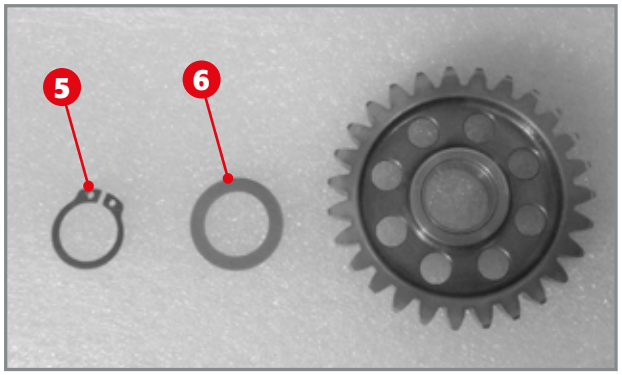
## 2.6.5 Pedal kick starter - OPTIONAL RR200

The kick starter is made up of the pedal which, attached to the kick starter shaft **1**, moves the gear **2**. This gear moves the idler wheel **3**, which engages in its turn with the clutch case.
The device recoils thanks to the spring **4**.

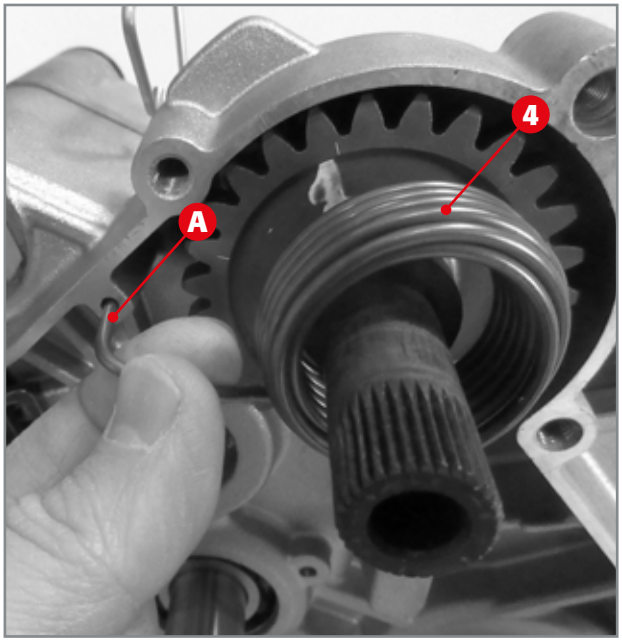



*Removal of circlip 5, thrust washer 6 and idler gear 3.*

Remove the circlip **5**, the thrust washer **6** and the idler gear **3**.

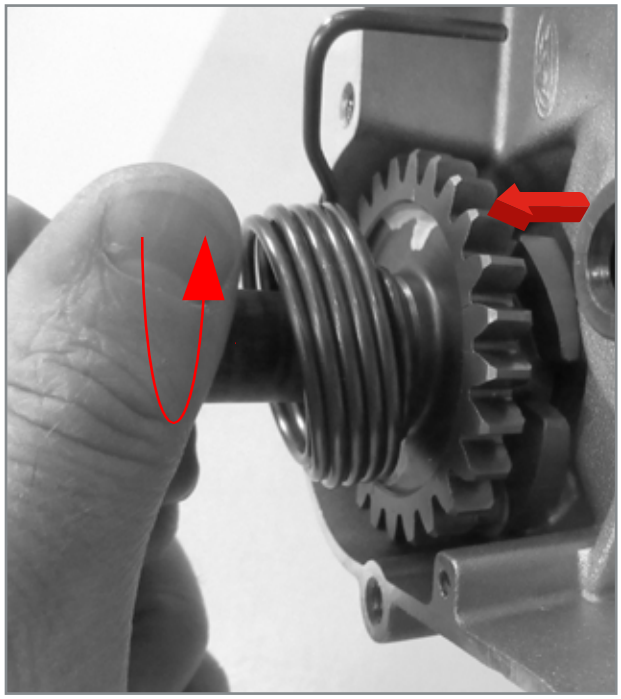



*Circlip 5 and thrust washer 6.*



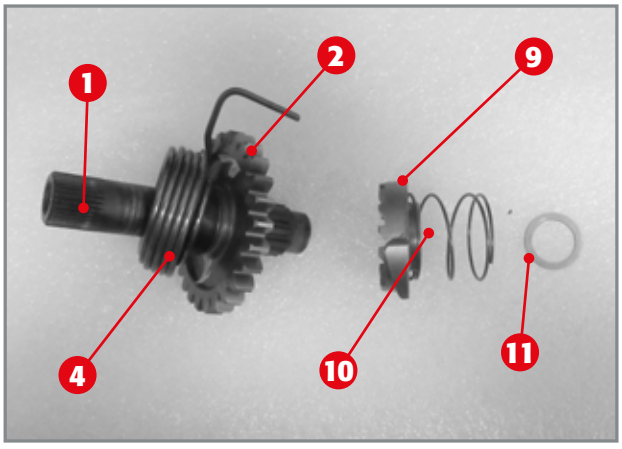

*Releasing spring from crankcase.*

Pull the end **A** of the spring **4** from the hole on the crankcase and bring it to a rest position having it turn anti-clockwise.

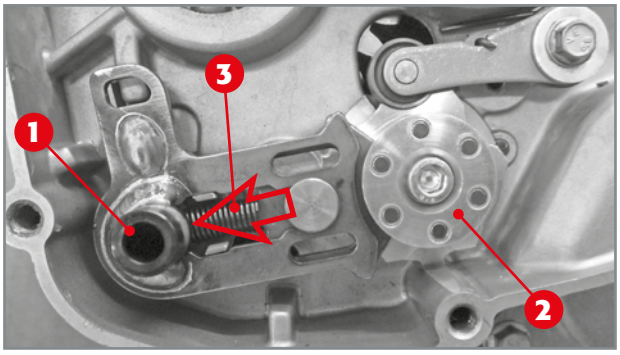


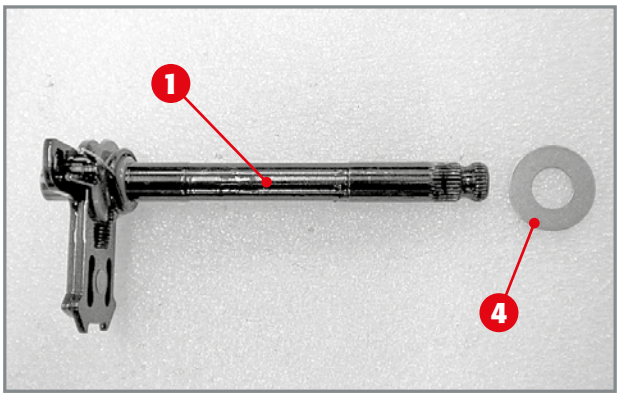
*Extraction of shaft from crankcase.*

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




*Complete pedal kick starter shaft.*

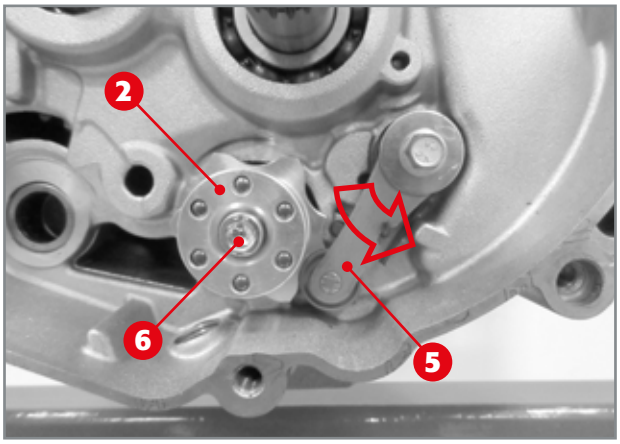



***Gearshift drive complete with washer.***

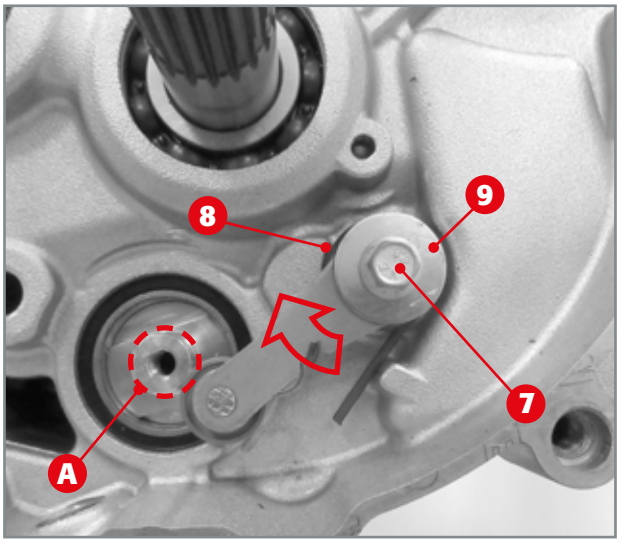
## 2.6.6 External gearshift drive unit

The external gearshift drive consists of 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 its turn, this is fastened to the internal gearshift drive 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** compressed and extract the shaft together with the specific washer **4**.




***Disassembly of gear 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**.

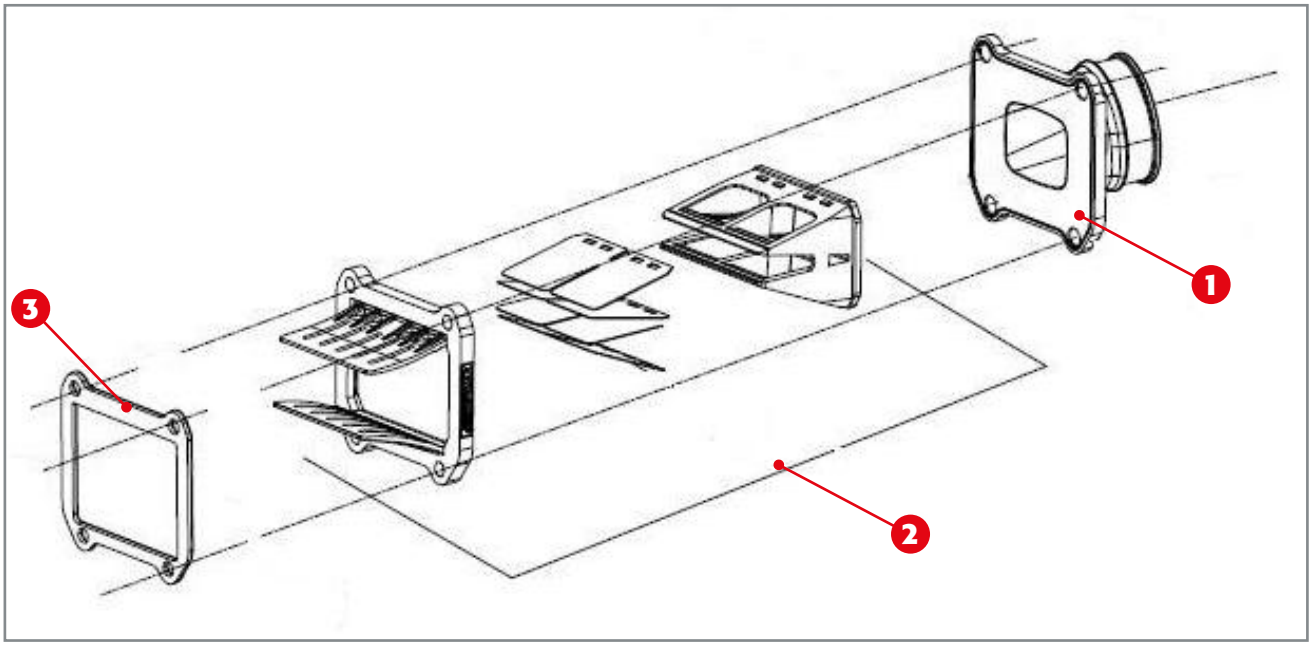



***Disassembly of cam stop lever.***

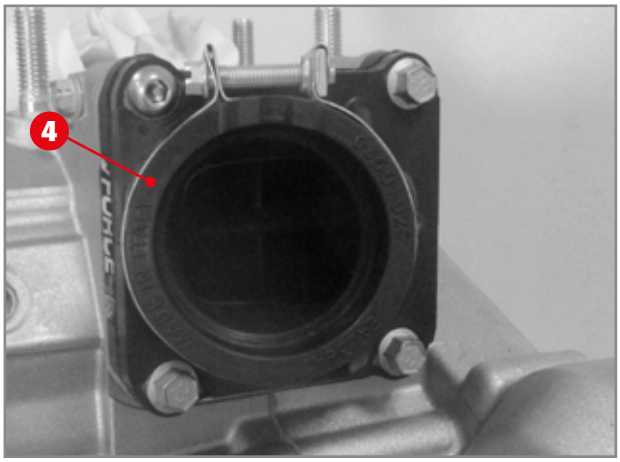
In order to disassemble the stop lever, loosen the screw **7** enough to allow the lever to move axially and go over the cylinder segment **A** of the desmodromic device. Move the return spring **8** to the resting position and remove the screw, the washer **9**, the spring together with the spacer,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

## 2.7 INTAKE SYSTEM

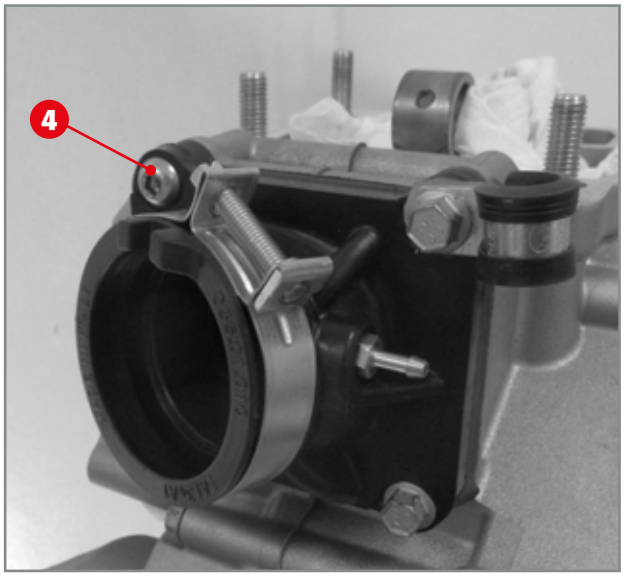
The intake system mainly consists of the intake manifold **1** and reed valve **2** and the spacer **3**.




***1) Intake manifold;***
***2) Complete reed valve;***
***3) Spacer.***




***Fixing screws RR125***




***Fixing screws RR200***

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

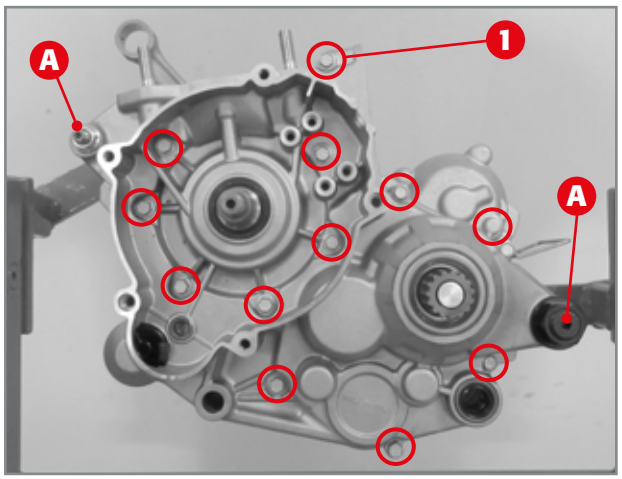
## 2.8 CRANKSHAFT, GEARSHIFT UNIT AND INTERNAL GEARSHIFT CONTROL

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

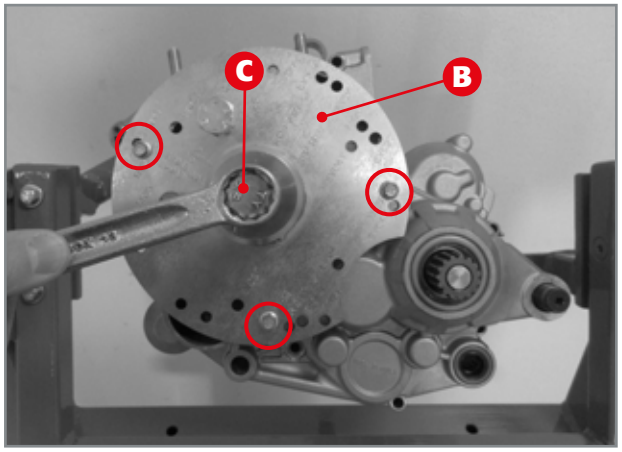
### 2.8.1 Opening the crankcase

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

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

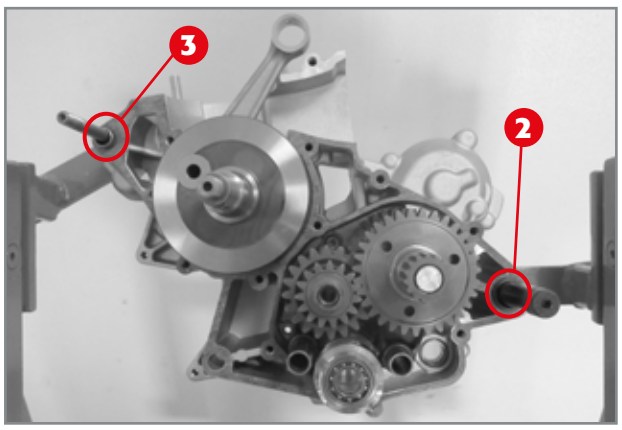



***Removal of crankcase screws.***



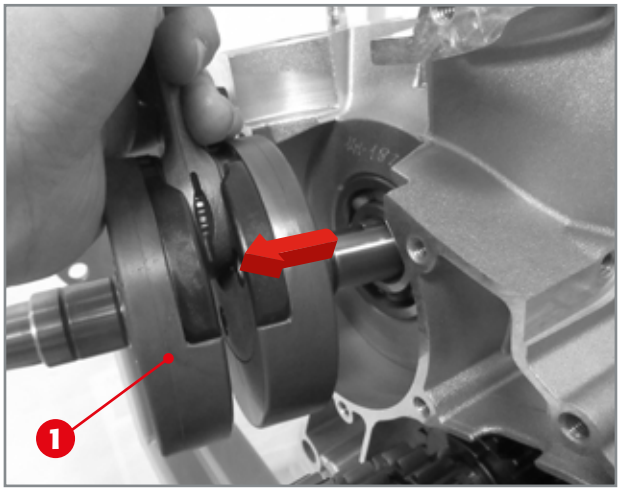

***Crankcase uncoupling stage.***

Apply the special tool **B** *(Code 007.14.010.80.00)* to the left crankcase half following the punching on the tool. Fix the tool with the three M6x15 screws (maximum torque 10Nm). Tighten screw **C** on the special tool. Slightly hit the gearshift secondary with a rubber mallet during said operation.
Once the crankcases have been detached, remove the fixing screws to the equipment **A** and remove the left crankcase.




***Crankcase half reference pins.***

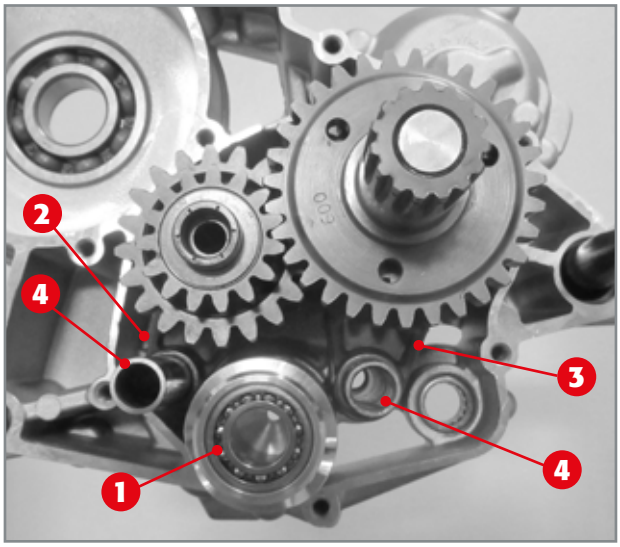
Remove the two rear **2** and front **3** reference pins. Remove the coupling gasket to the two crankcases.




*Removal of crankshaft.*

## 2.8.2 Crankshaft

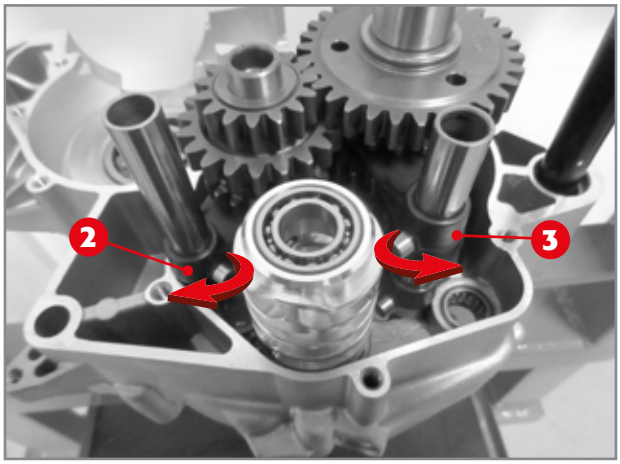
The crankshaft **1** can be pulled out manually. Gently hit the right end of the crankshaft in case of resistance.




*Removal of fork support pins 1.*

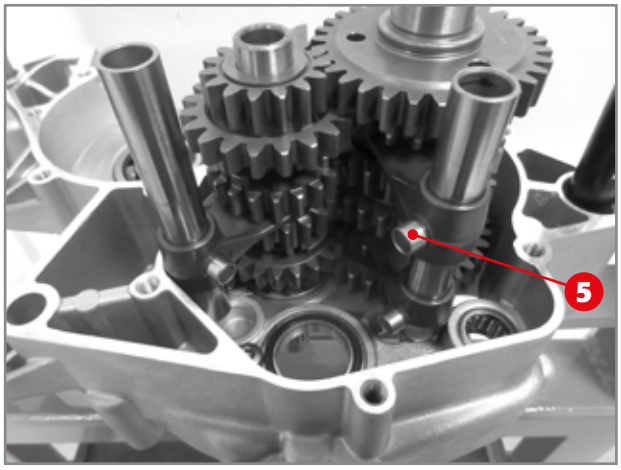
## 2.8.3 Internal gearshift drive unit and complete gearshift

The internal gearshift drive unit consists of 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 gearshift, allowing the desired ratio to be engaged. The desmodromic device is controlled by the stop cam located in the external gearshift drive unit.
Extract the two pins **4** by hand enough to disengage them from the crankcase half.




*Disengaging the drive forks from the desmodromic device.*

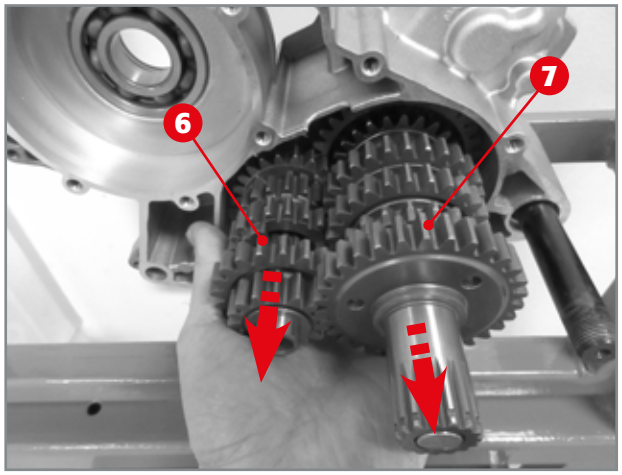
Rotate the fork **2** clockwise and fork **3** anti-clockwise.
Extract the desmodromic device.




*Extraction of forks from gearshift unit.*

Extract the forks together with the guide bushes **5**.

***Note:*** *it is recommended to mark the two forks that act on the secondary so that they can be repositioned in their original position in case it is not necessary to replace them or sliding gears.*




*Extraction of complete gearshift unit: 6 primary unit, 7 secondary unit.*

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

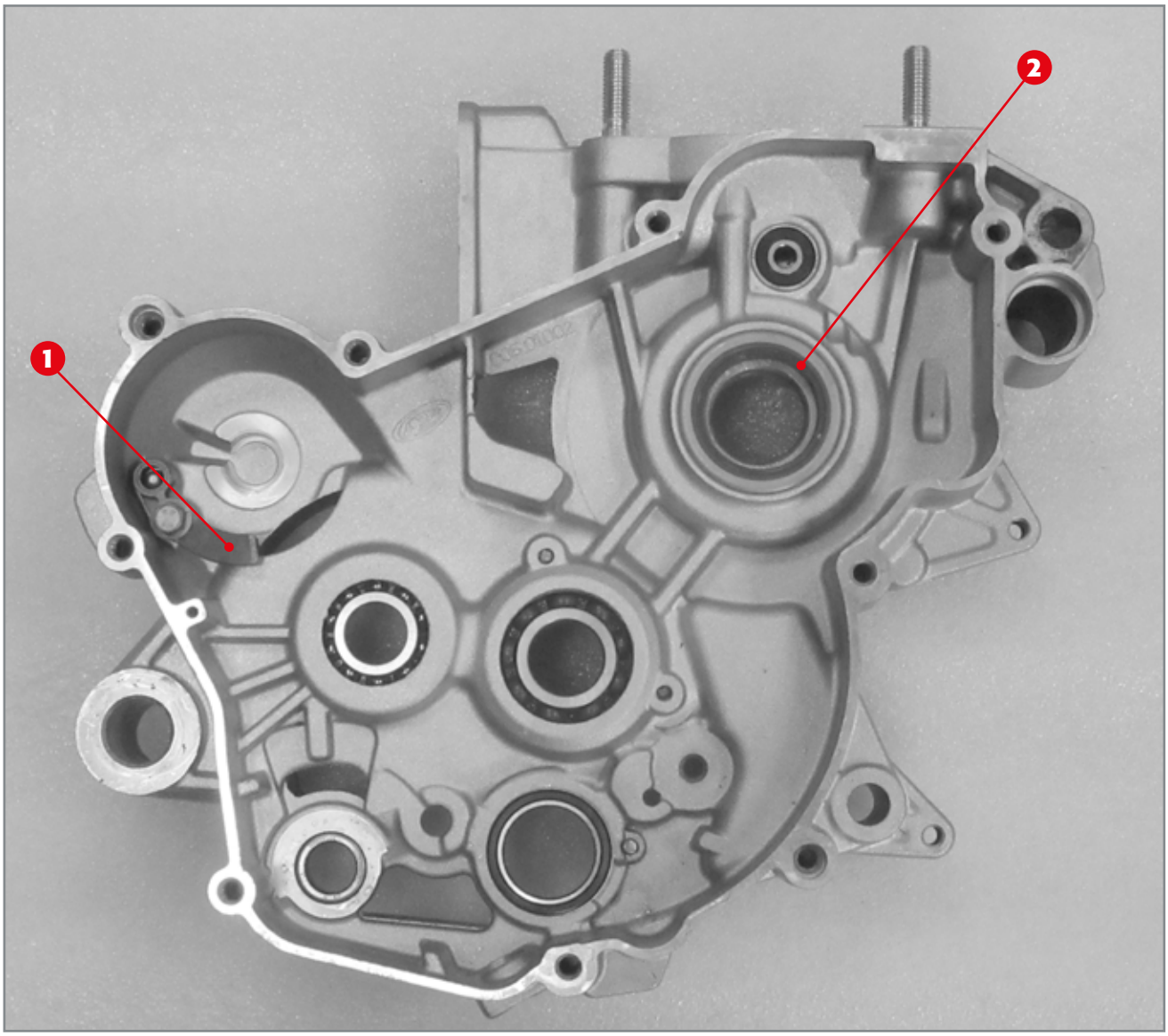
## 2.9 DISASSEMBLY OF PARTS FROM CRANKCASES

Once the crankcases have been detached, it may be required to remove the various components attached to them.

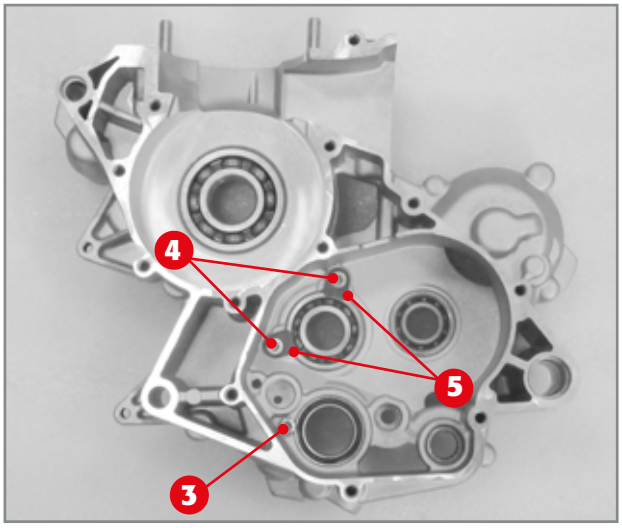
The bearings must be replaced if there is any play or jamming during rotation. For removal, heat the crankcase halves for 20 minutes at about 150°C.
Place the crankcase halves on a large surface where their whole seal surface can rest. Remove the bearings by following the indications below.

## 2.9.1 Right crankcase half

On the external side, remove the kickstart ramp **1** and the oil seal **2**.

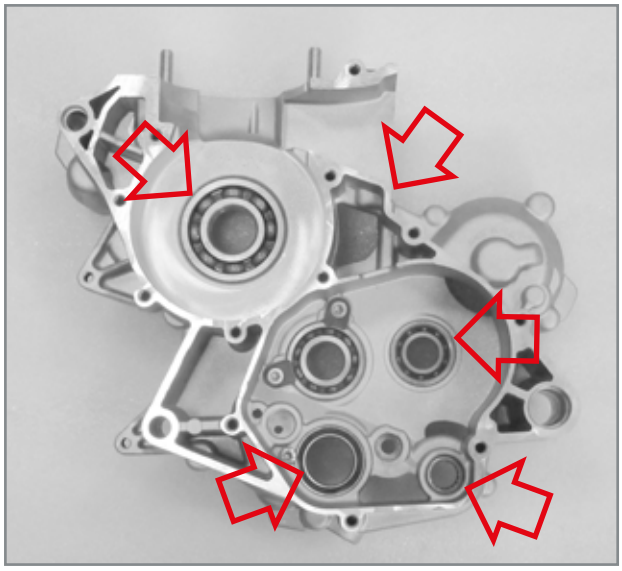



***Kickstart ramp 1), oil seal 2).***

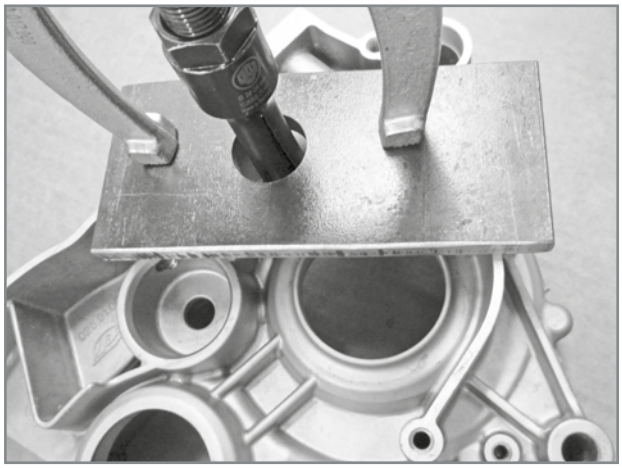



***Bearing safety screw.***

Remove the desmodromic control bearing seal screw **3**, the screws **4** and the relative primary bearing seal plates **5** from the inner side.



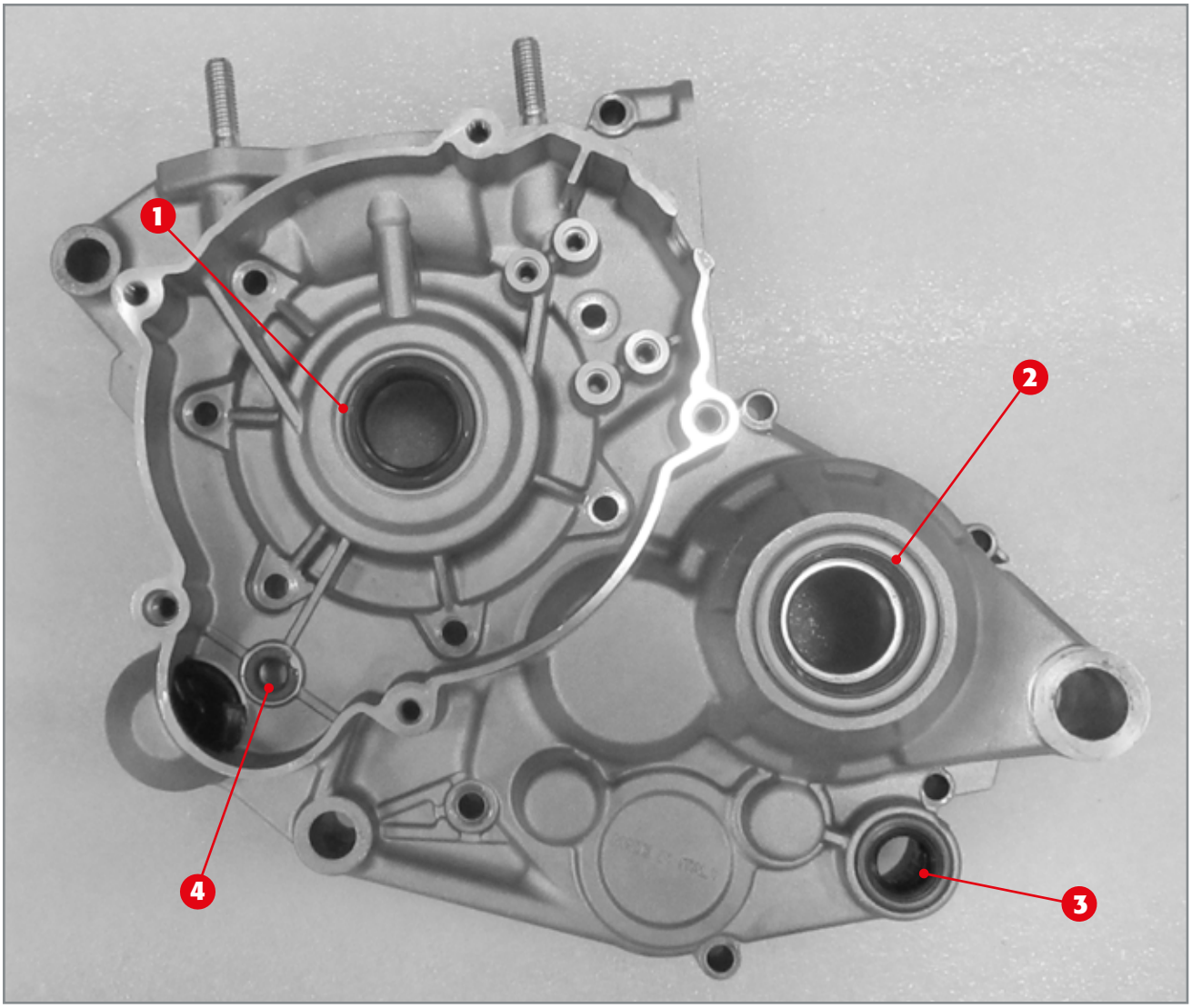
All bearings shown in the figure are removed from the outside to the inside.
Where necessary, removing the safety devices **3** and **4** seen above.



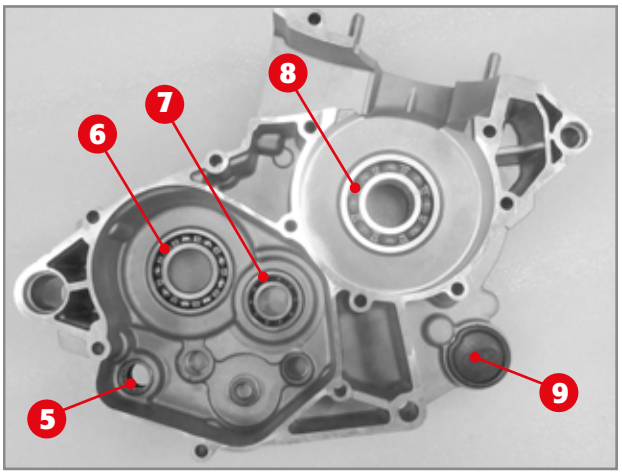
The centrifugal shaft bearing can be removed by using a universal extractor that must rest onto a purposely created metal plate.

## 2.9.2 Left crankcase half

Remove the crankshaft oil seal **1**, the secondary shaft oil seal **2**, the gearshift drive shaft oil seal **3** and the bush **4** from the external side.




***Removal of outer side left crankcase half details.***

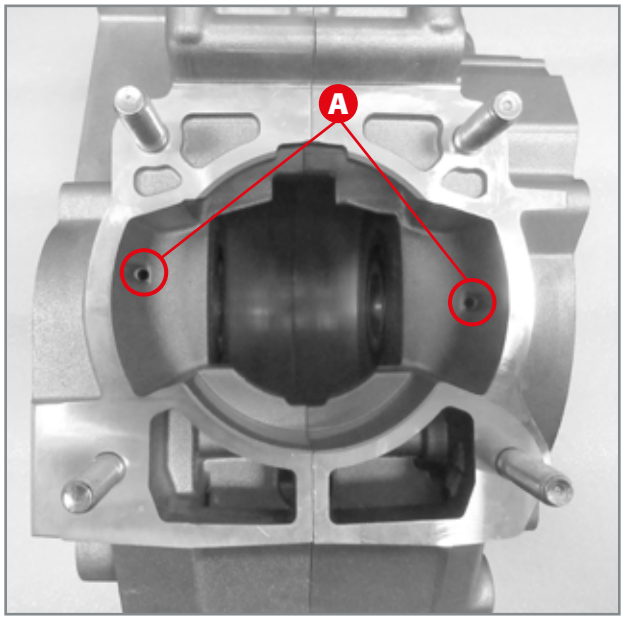



***Removal of left crankcase half bearings.***

The bearings **5, 6, 7** and **8** are removed from the outside inwards.
Remove cap **9**.

# 3 ENGINE CHECKS AND ASSEMBLY

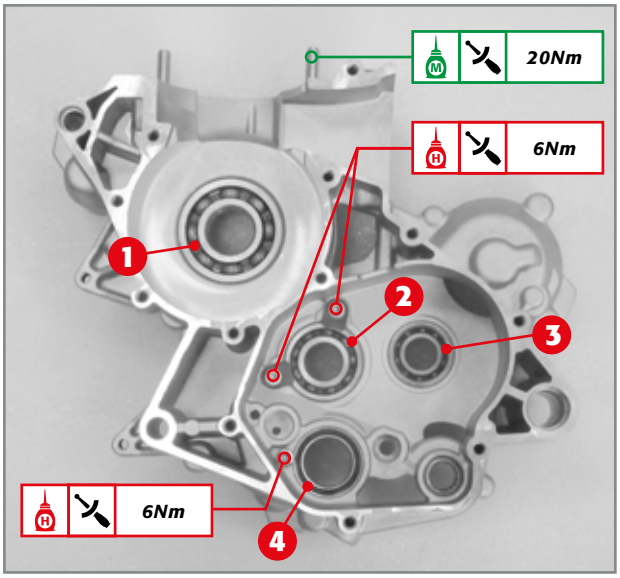
Before reassembling the engine, a series of crucial checks must be carried out to ensure the engine is in good working order.
In order to insert the bearings in the crankcase halves, bring the crankcase halves to a temperature of 150°C and keep them at that temperature for 20 minutes.
Place said crankcase 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

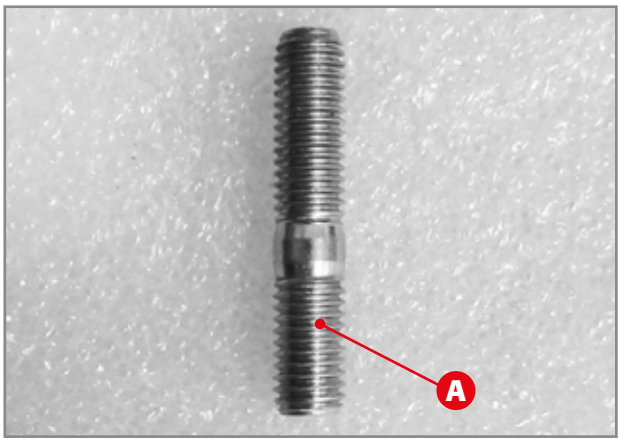
The crankcase halves have some parts that require care, and their integrity and condition must be checked. The checks and assembly operations of the individual parts coupled to the crankcases are described below. Clean the threading and oil passages **A** thoroughly by using a degreaser and compressed air.




*Positioning of the right crankcase half bearings.*

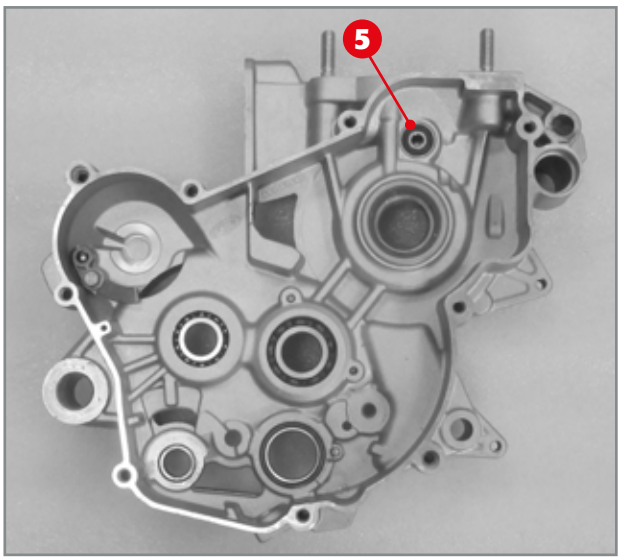
## 3.1.1 Application of right crankcase half parts

Apply the bearings **1, 2, 3** and **4** until flush.
Block the bearings **2** and **4** using the specific safety devices. Apply the high-strength thread locker threads and tighten the screws to the indicated torques.



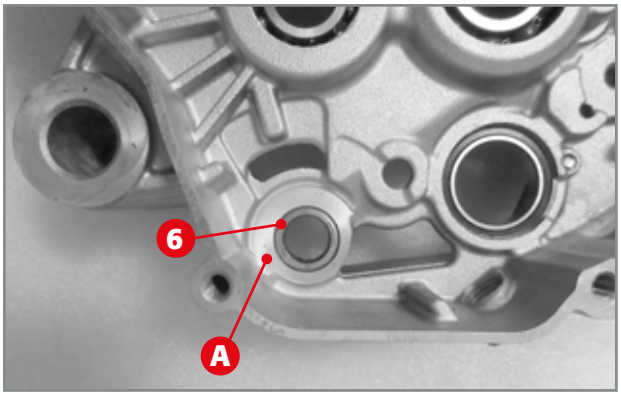

The studs must be mounted after applying the medium strength thread locker and tightened to the indicated torque.

***ATTENTION!***
*The part of root **A** of the stud must be mounted in the crankcase half.*



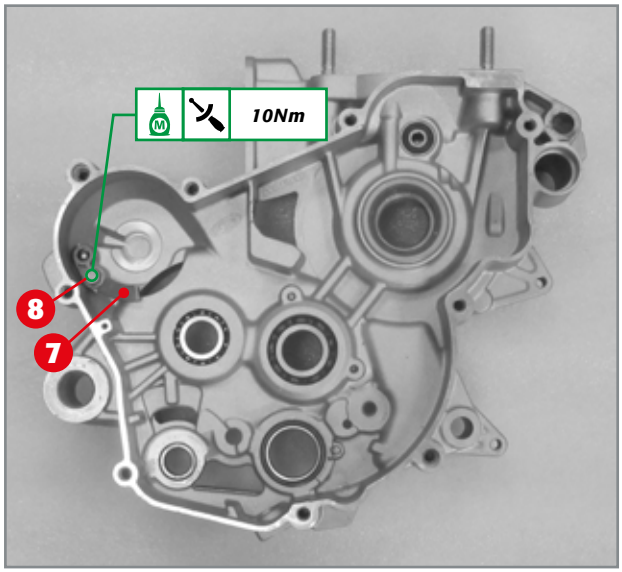

*Application of bearing from right crankcase half external side.*

Apply the bearing **5** from the crankcase half external side, until flush.



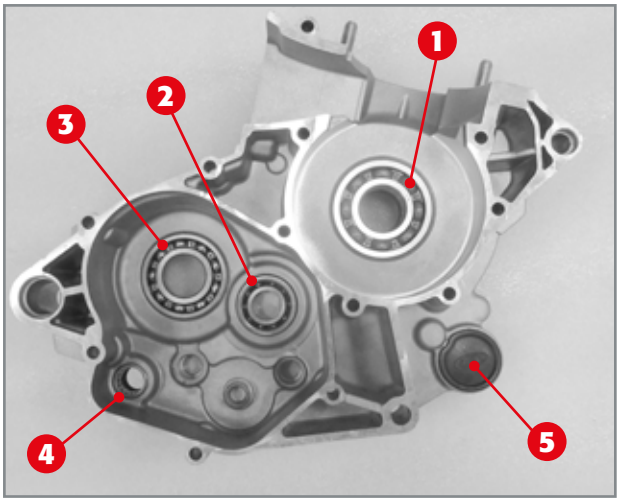

***Position of right crankcase half gearshift drive shaft bearing.***

Apply the bearing **6** and insert it so that the outer surface is aligned with surface **A.**
Apply new oil seals, to be pressed in seat until they are flush.




***Application of kickstart ramp.***

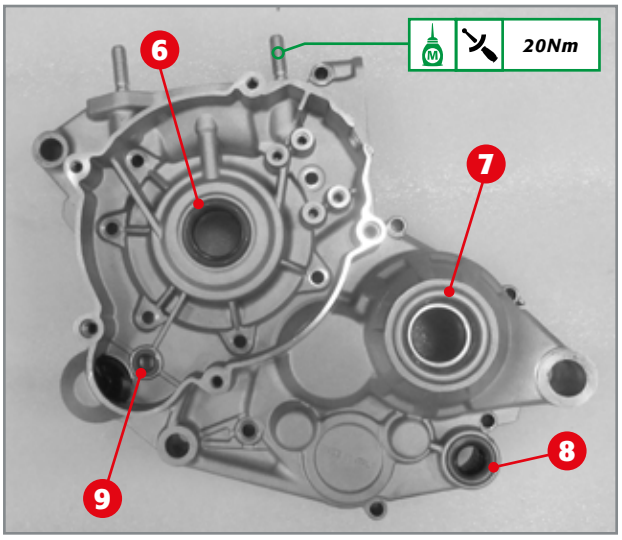
Apply the kickstart ramp **7** and fasten screws **8** to the torque indicated, prior depositing of medium strength thread locker.




*Application of left crankcase half bearings.*

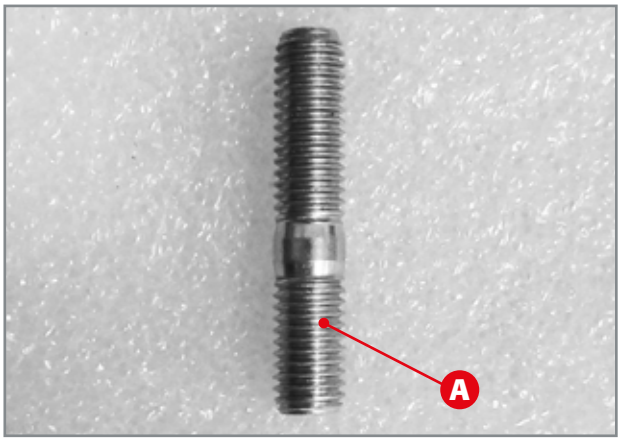
## 3.1.2 Special applications for left crankcase half

Apply the bearings **1, 2, 3** and **4** from the crankcase half internal side, until flush.
Apply the cap **5** (ONLY RR125).



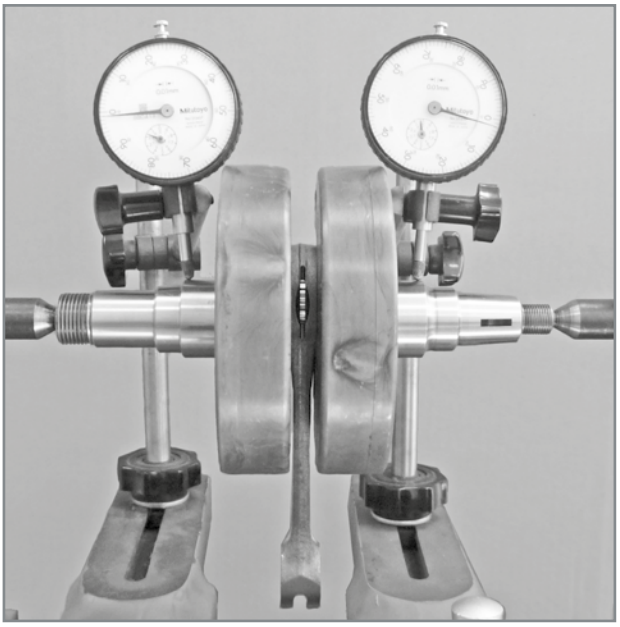

*Application of left crankcase half parts.*

Apply the new oil seals **6, 7** and **8** from the crankcase half external side, until flush.
Apply the bush with collar **9** (ONLY RR200).




Apply the studs prior depositing of medium strength thread locker.
Tighten to the specified torque.

***ATTENTION!***
*The part of root **A** of the stud must be mounted in the crankcase half.*

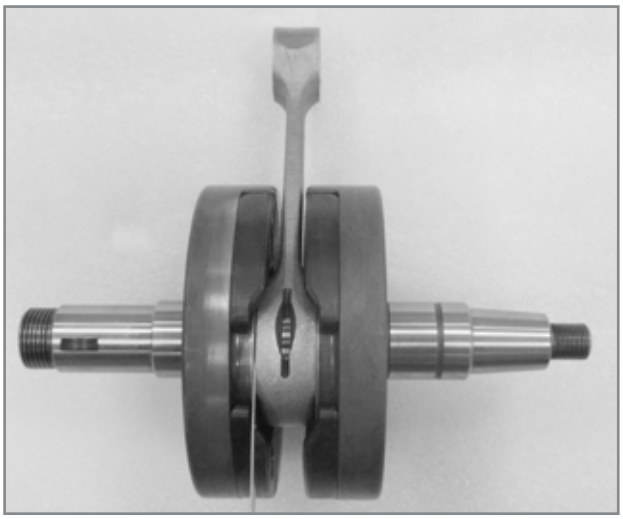


*Deflection/Off-centring of crankshaft.*

## 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.

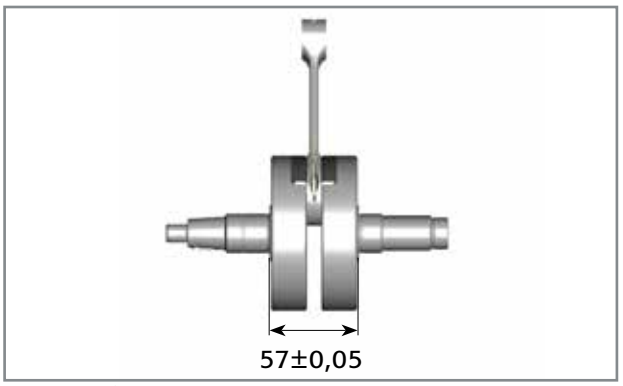
**Allowed limit value: 0.02mm**



*Connecting rod axial play.*

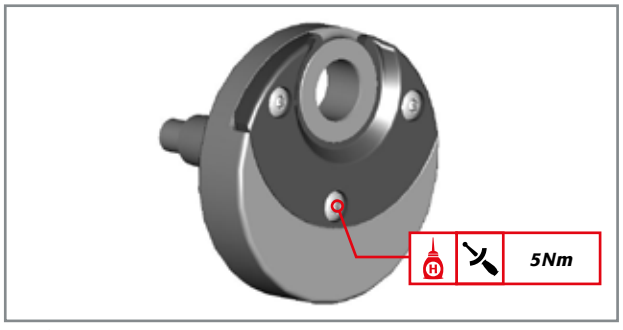
Check the axial play between the connecting rod head and the half shafts.

**Recommended play:**
**0.4-0.7mm**




*Crankshaft pack.*

The distance between the two shoulders must be: 57±0,05.

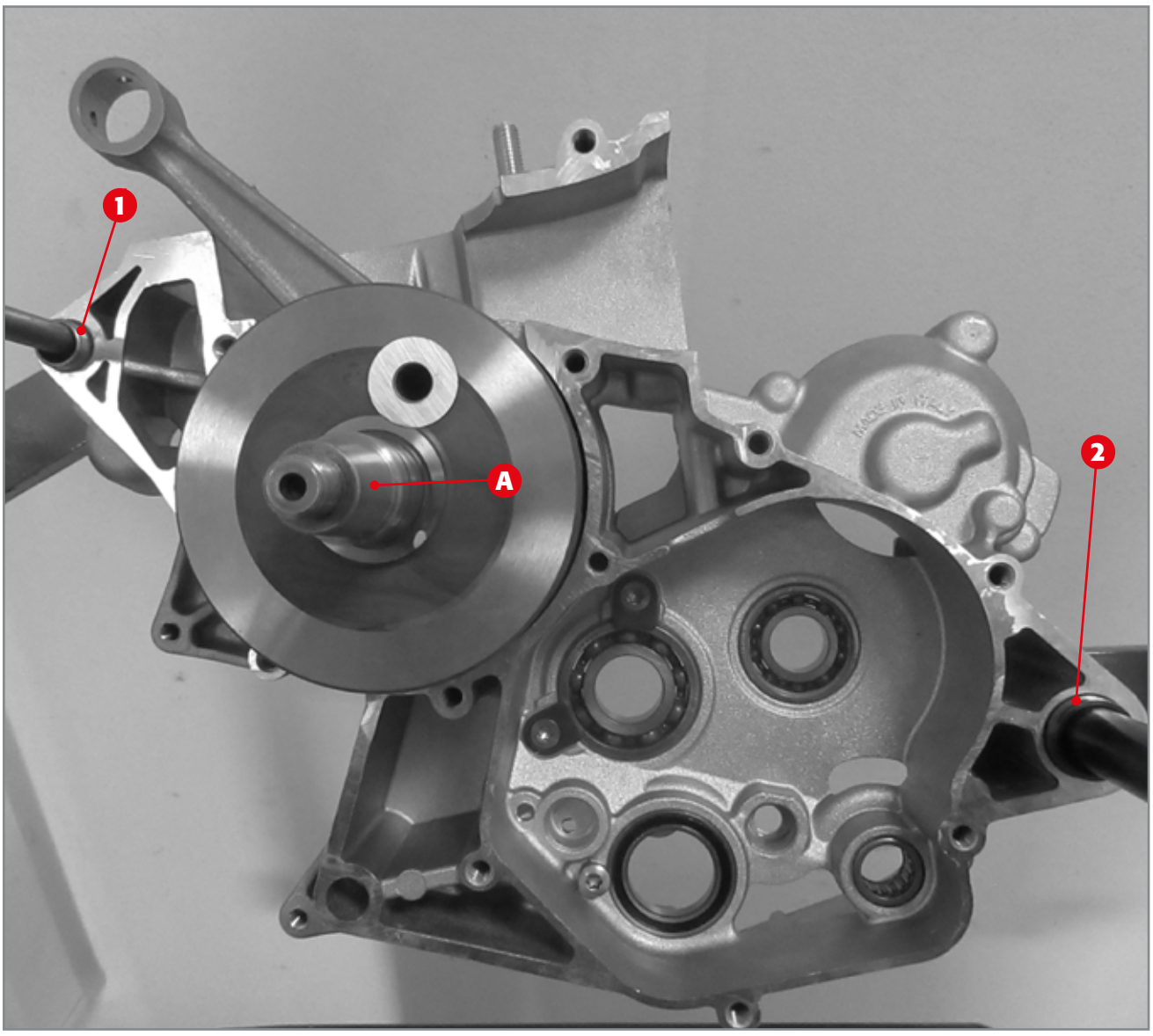



*Half-shoulder.*

If replacing the inserts, apply the screws with high-strength thread locker and tighten at 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** present on the crankshaft towards yourselves. 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 GEARSHIFT UNIT: CHECKS AND REASSEMBLY

The gearshift unit is made up of a control and of the gearshift itself. The gearshift in its turn is divided into external and internal gearshift.
The checks and procedures for inspecting and reassembling these units to the engine are set out below.

### 3.4.1 Check of gearshift unit

While holding the gearshift units horizontal, use a thickness gauge to check the axial play between the gearshift forks and the gearwheels. The measured play must not exceed the service limit indicated below:

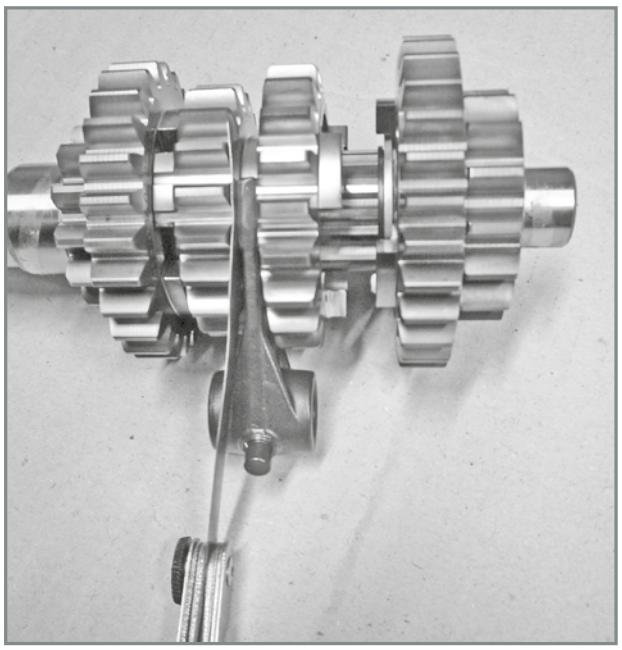
**service limit: 0.4mm**

If the detected axial play is greater, before replacing either the gearwheels or the forks, check their state of wear (Par. 3.4.4)
Use protective jaws to clamp the main shaft and secondary shaft.

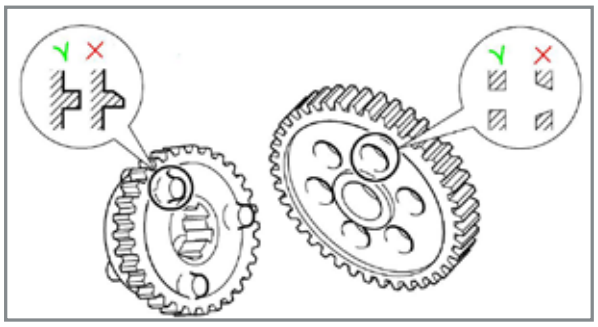
Remove the various elements and check that:

- the support surfaces of the main shaft and secondary shaft show 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 show no 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.*

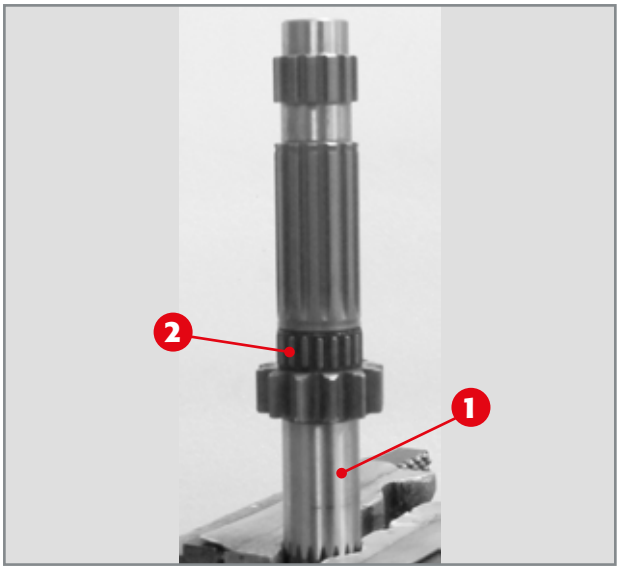


*Check gear couplings.*

## 3.4.2 Assembly of primary unit

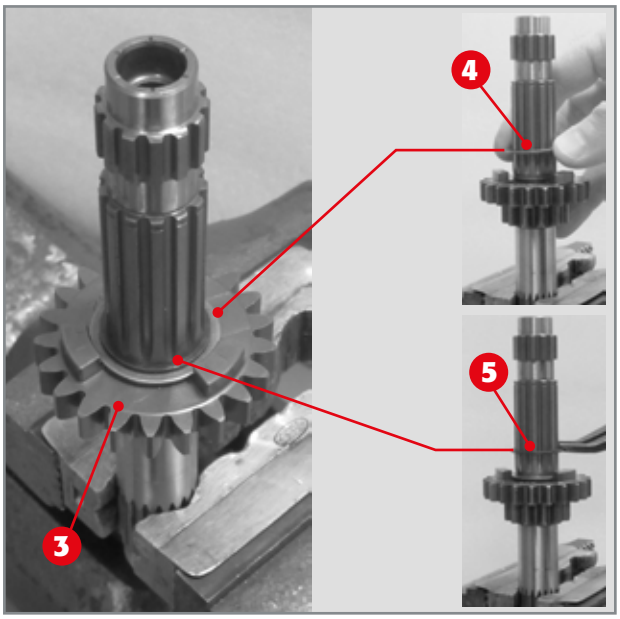
Before proceeding with reassembly, clean all the elements thoroughly and oil them with gear oil. Always replace the circlips.

Clamp the main shaft **1** (using protective jaws), as shown in the figure.

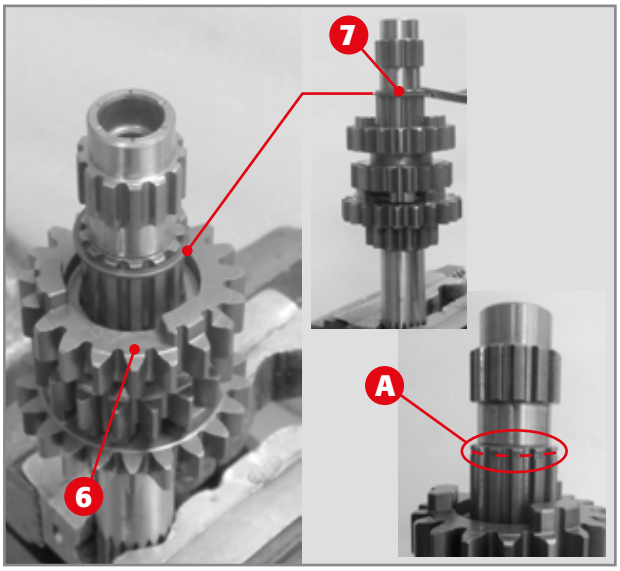


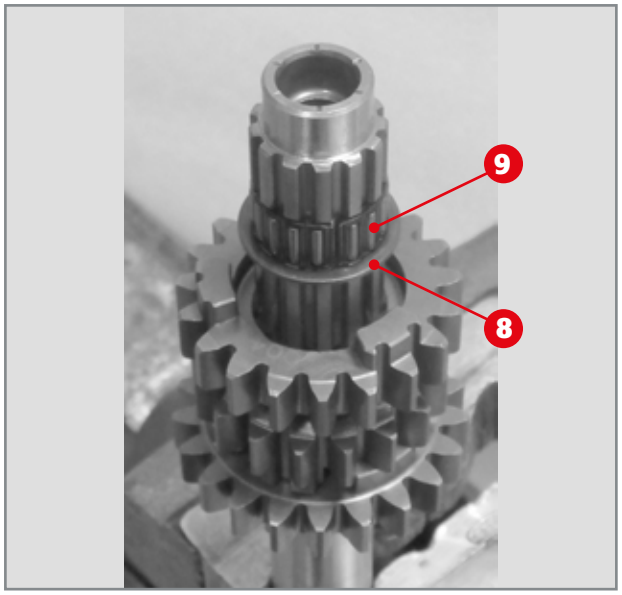

Apply the roller bearing **2**.

Apply gear **3** (V gear), washer **4** and circlip **5**.

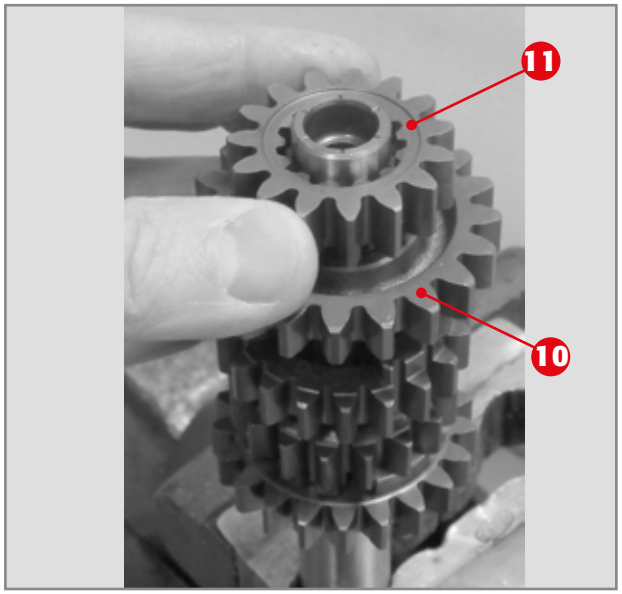



Insert gear **6** (III – IV gear) and circlip **7**, taking care to place it in groove **A**.

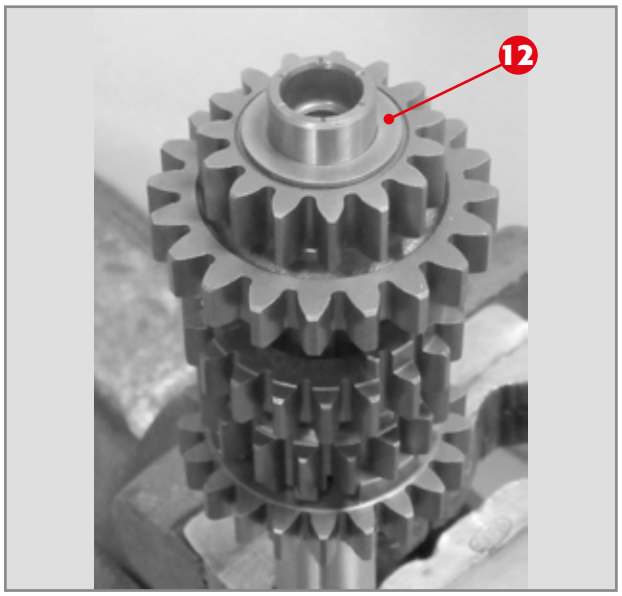




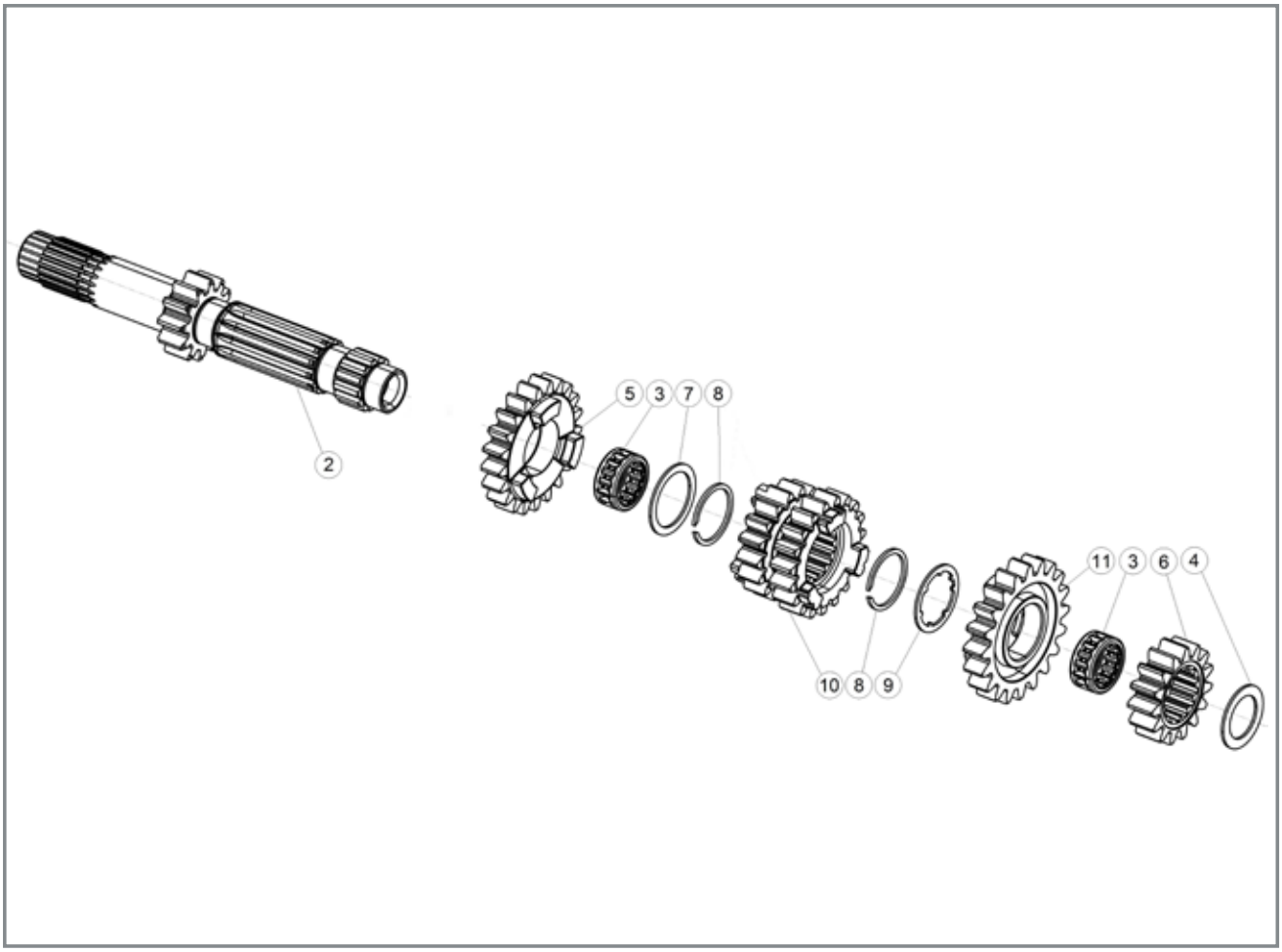

Apply the toothed washer **8** so that it engages in the broaching and the roller cage **9.**




Insert the gears **10** (VI gear) and **11** (II gear).




Insert the washer **12**.

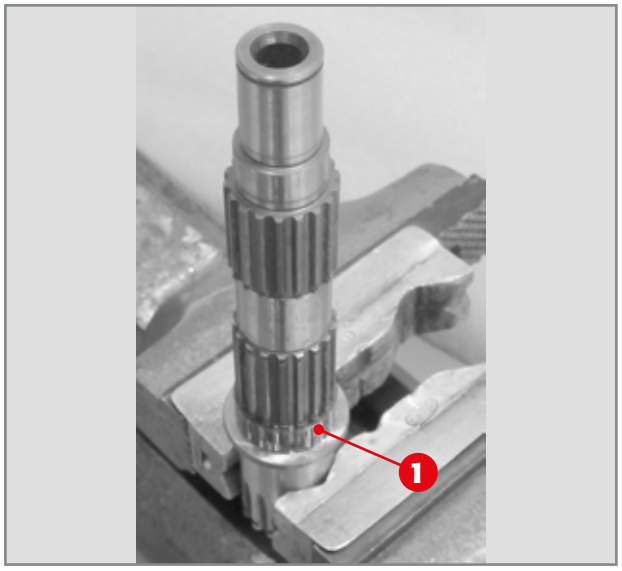



***EXPLODED VIEW OF PRIMARY UNIT:***

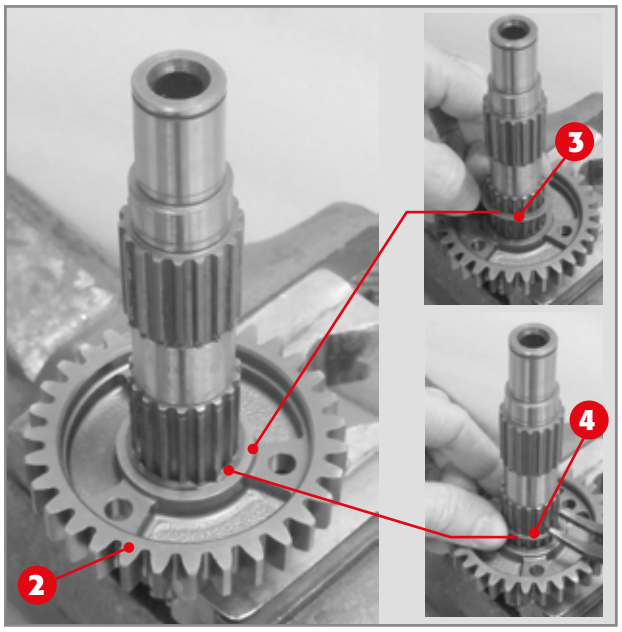
***2) Gearshift main shaft;***
***3) Roller cage 18x22x10;***
***4) Thrust washer 17.25.1;***
***5) Fifth gear on primary;***
***6) Second gear on primary;***
***7) Washer 22.28.1;***
***8) Circlip SW 22.1,2;***
***9) Washer 22.26.1;***
***10) Third and fourth gear on primary;***
***11) Sixth gear on primary;***

## 3.4.3 Secondary unit assembly

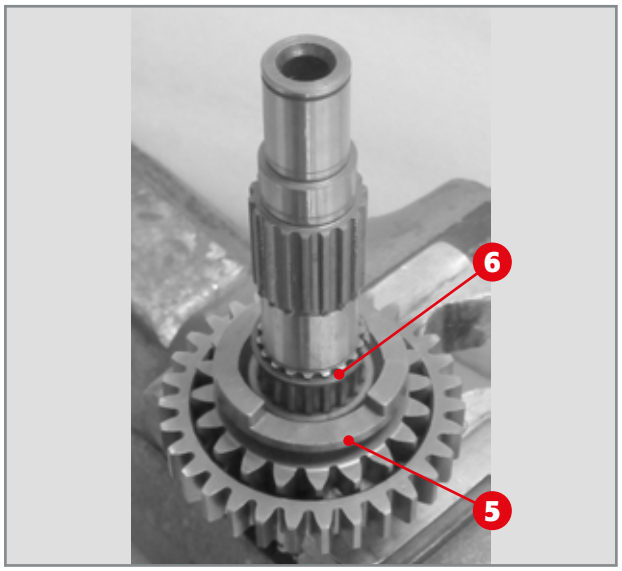
Before proceeding with reassembly, clean all the parts thoroughly and oil them by using gear oil. Always replace the circlips.
Clamp the secondary shaft (using protective jaws), as shown in the image.



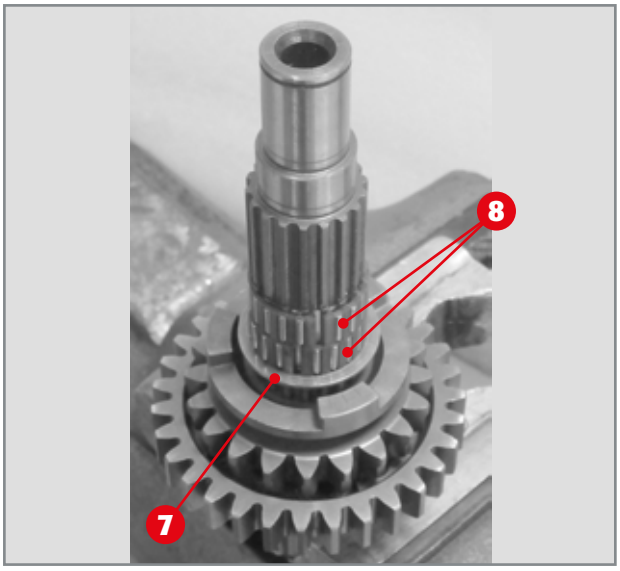

Apply the roller cage **1.**



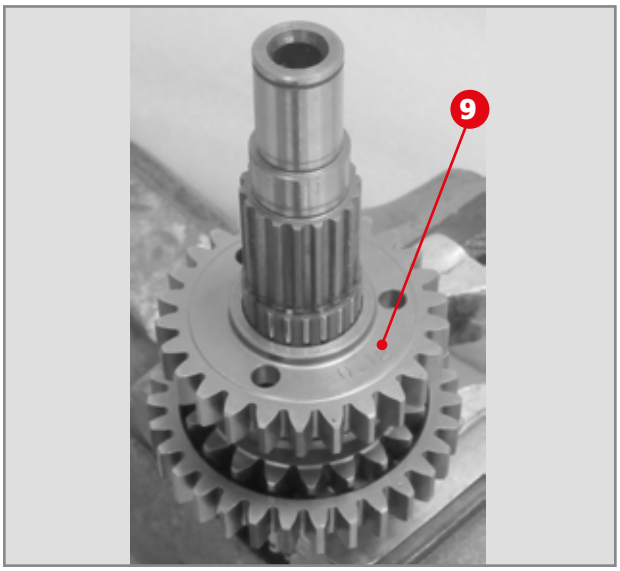

Insert gear **2** (II gear), washer **3** and circlip **4**.



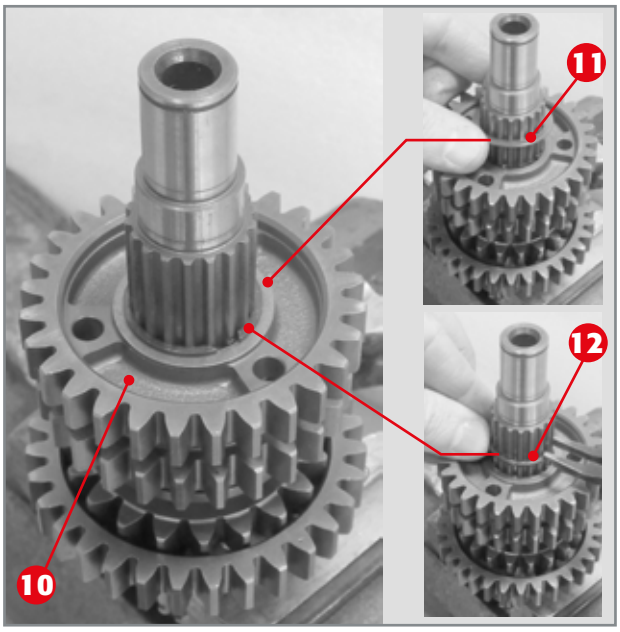

Insert the gear **5** (VI gear) and circlip **6.**



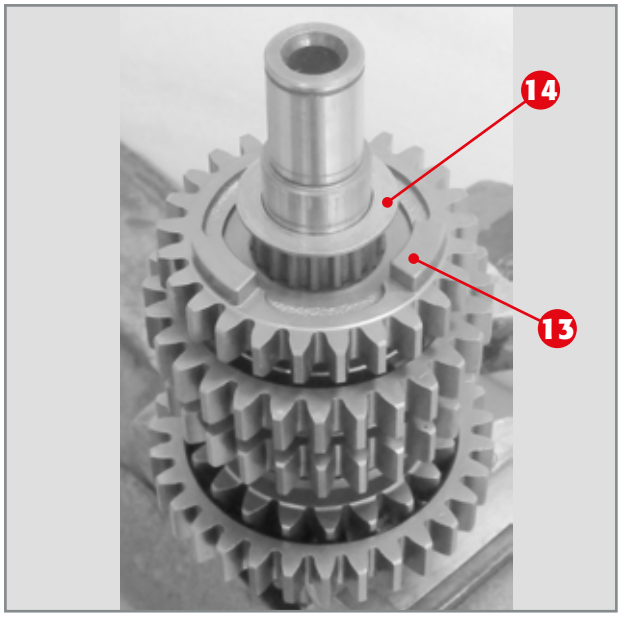

Insert washer **7** and the two roller cages **8**.



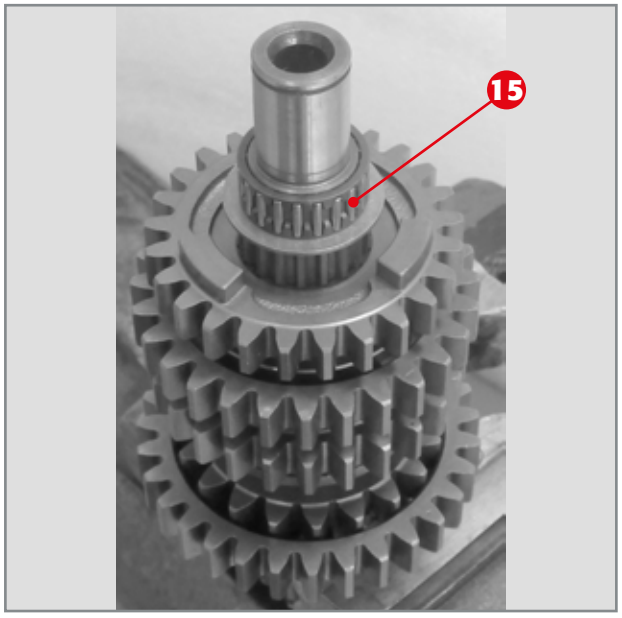

Insert gear **9** (IV gear).



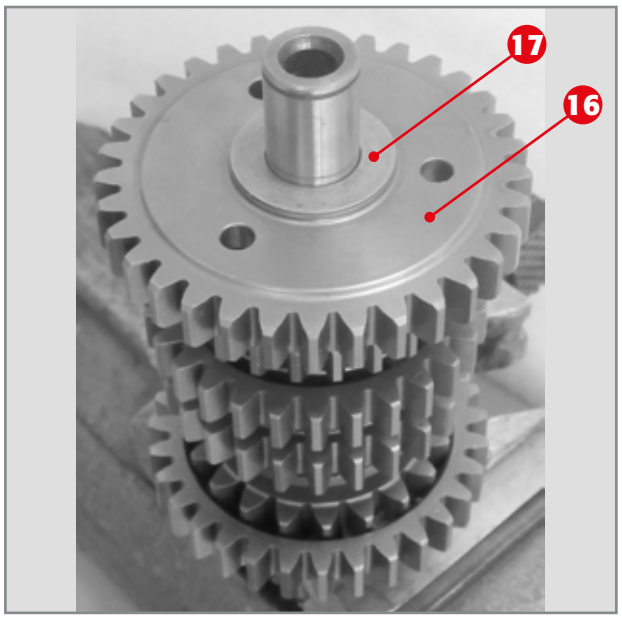

Insert gear **10**, washer **11** and circlip **12**.

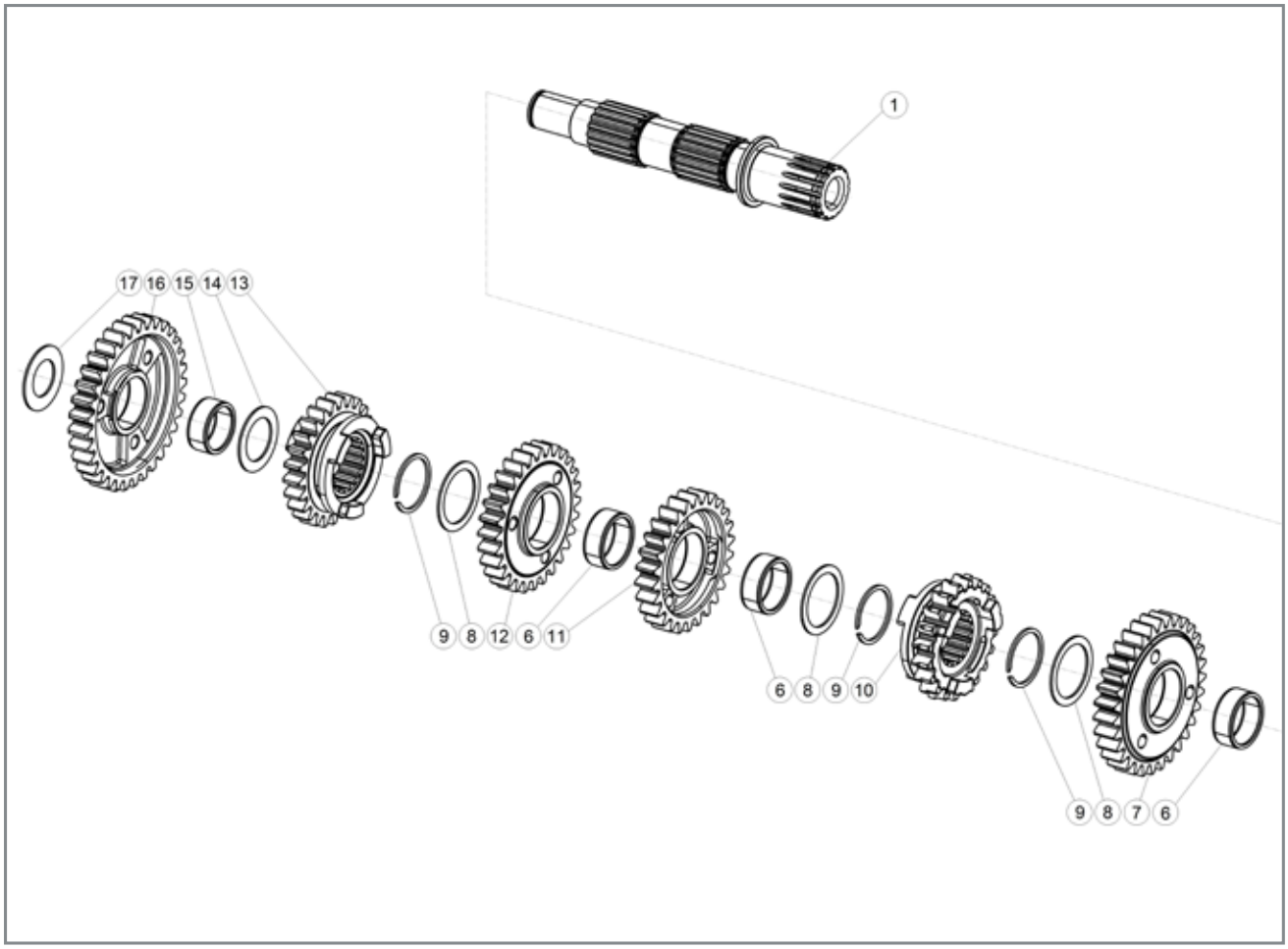



Insert the gear **13** (V gear) and washer **14.**




Insert roller cage **15** followed by gear **16** (I gear) and washer **17**.





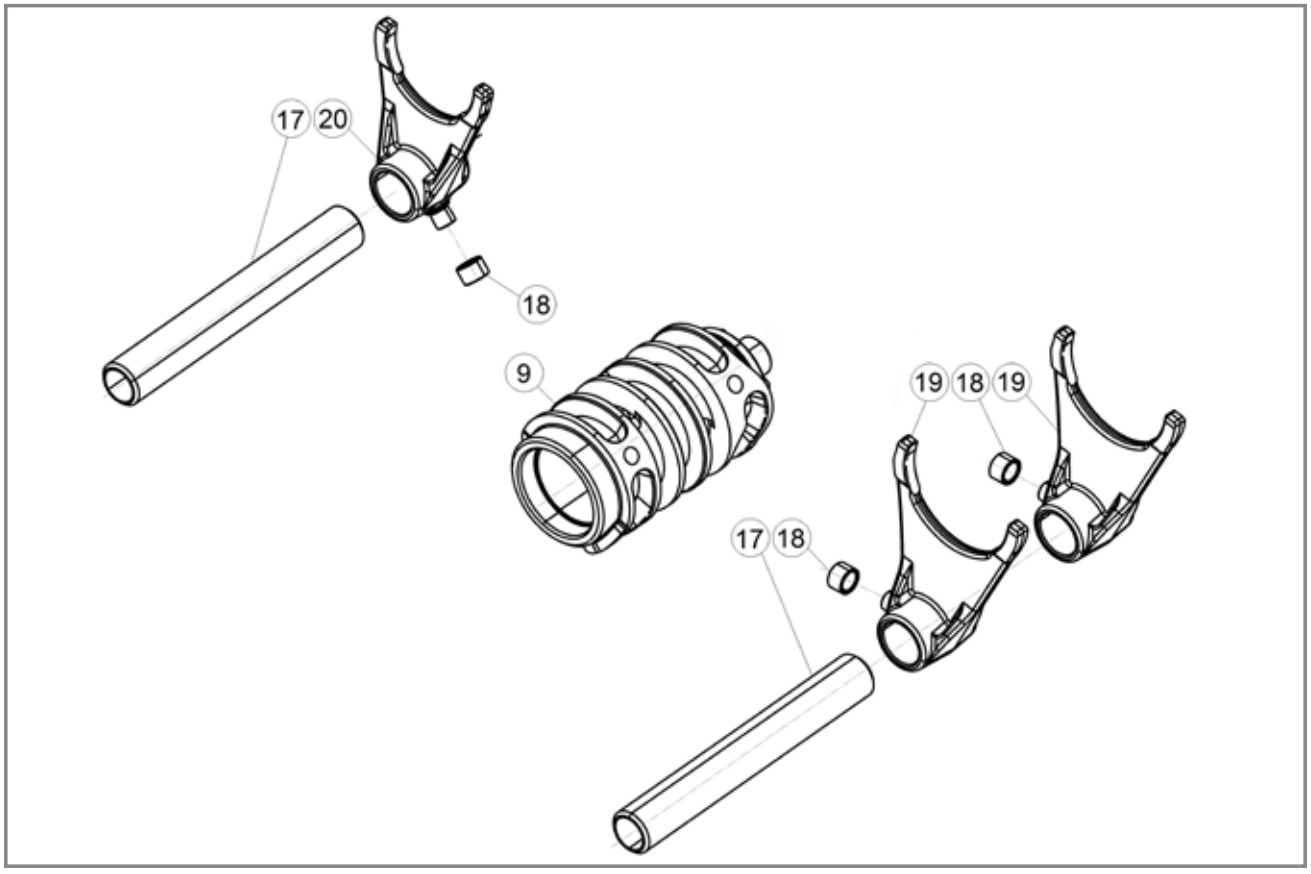

***EXPLODED VIEW OF SECONDARY UNIT:***

***1) Secondary shaft;***
***6) Roller cage 22x26x10;***
***7) Second gear on secondary;***
***8) Washer thickness;***
***9) Circlip 24 SW;***
***10) Sixth gear on secondary;***
***11) Fourth gear on secondary;***
***12) Third gear on secondary;***
***13) Fifth gear on secondary;***
***14) Washer thickness C72 20.30.1;***
***15) Roller cage 20x24x10;***
***16) First gear on secondary;***
***17) Thrust washer 17x30x1***

### 3.4.4 Check of the forks, fork pins and desmodromic device

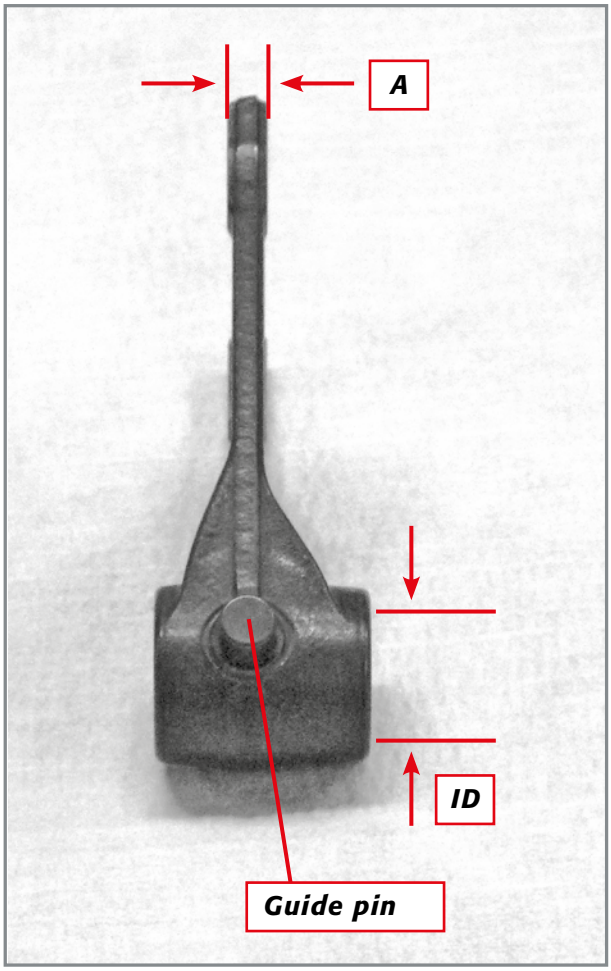
The internal gearshift is made up of:

- two gearshift drive forks **19** which drive two gears on the secondary unit;
- one gearshift drive fork **20** which drives one gear on the primary unit;
- three drive pin bushes **18**;
- two gearshift drive fork pins **17**;
- desmodromic drive **9** through whose rotation the gearshift forks are driven thus selecting the desired gear.




***EXPLODED VIEW OF INTERNAL GEARBOX CONTROL UNIT:***
***19) gearshift drive fork;***
***20) gearshift drive fork;***
***18) bush;***
***17) gearshift drive fork pin;***
***9) desmodromic control***

Make sure that the guide pins that support the bushes **18** have no traces of meshing or abnormal wear and that the bushes are not worn.




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

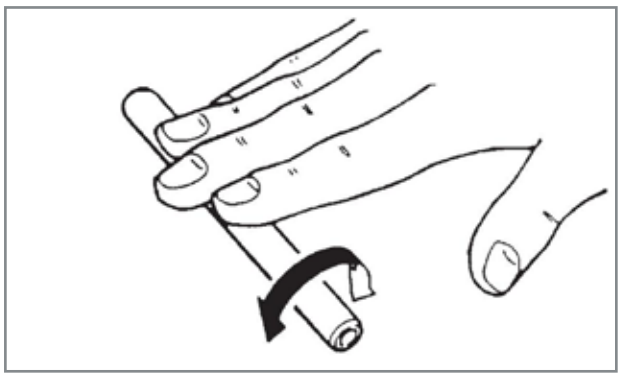
**Minimum acceptable distance: 4.95mm**

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

**Fork inside diameter limit: 13.83mm**

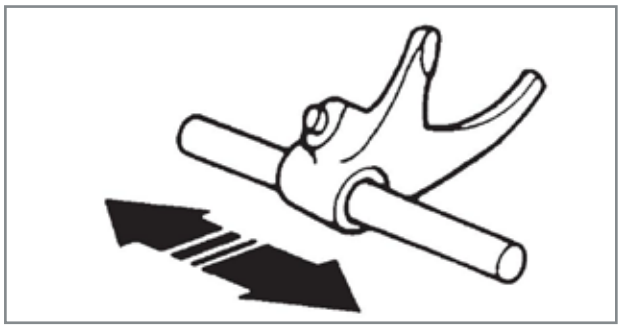
Make sure that the fork pins on which they slide have an outside diameter above the limit (to be measured in the sliding areas of the forks and in the housing areas with the crankcases):

**Fork pin outside diameter limit: 13.75mm**



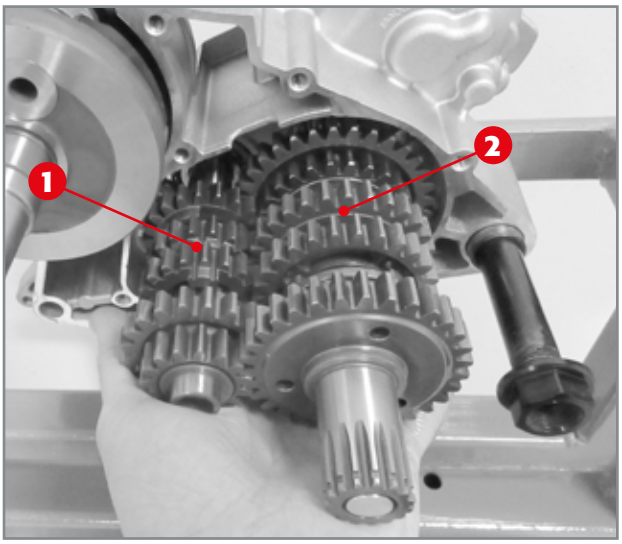
*Fork pin check.*

Roll the fork pin on a perfectly flat surface: if deformations are present, proceed with replacement.
Slide the gearshift drive forks on the respective pins: if the movement is difficult and jamming occurs, replace both the fork and the pin.



*Check fork sliding on pin.*

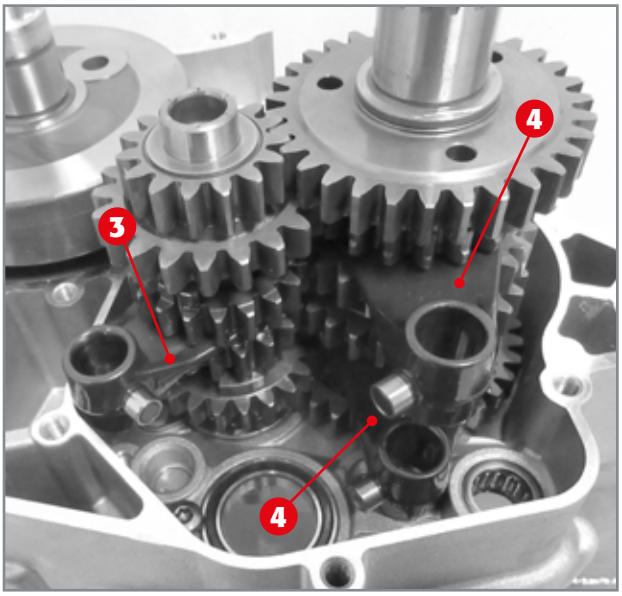
Make sure that the desmodromic control device has no corroded or worn areas especially in the grooves in which the guide pins of the forks are engaged.
Check the bearing on the desmodromic device. Replace it in the event of signs of meshing or jams during motion.




*Insertion of the gearshift in the left crankcase half.*

## 3.4.5 Assembly of gearshift and inner control

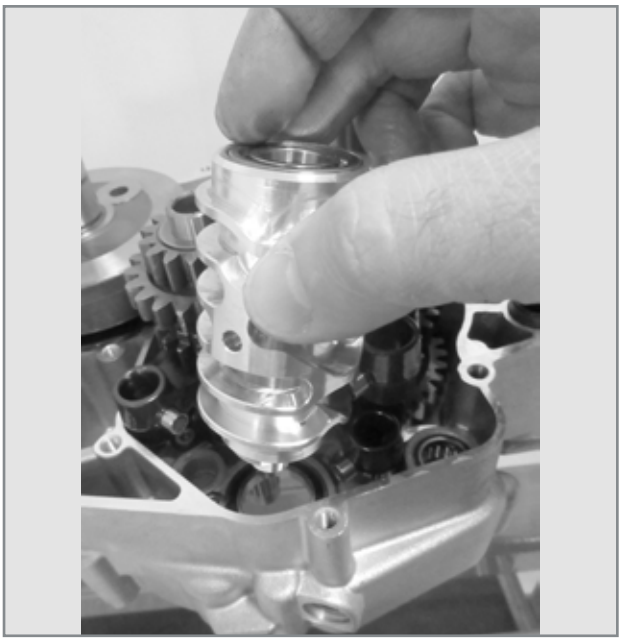
Insert the entire primary **1** and secondary unit **2** into the respective seats on the left crankcase half simultaneously. Remember to oil all components with plenty of gear oil.




*Application of forks to gearwheels.*

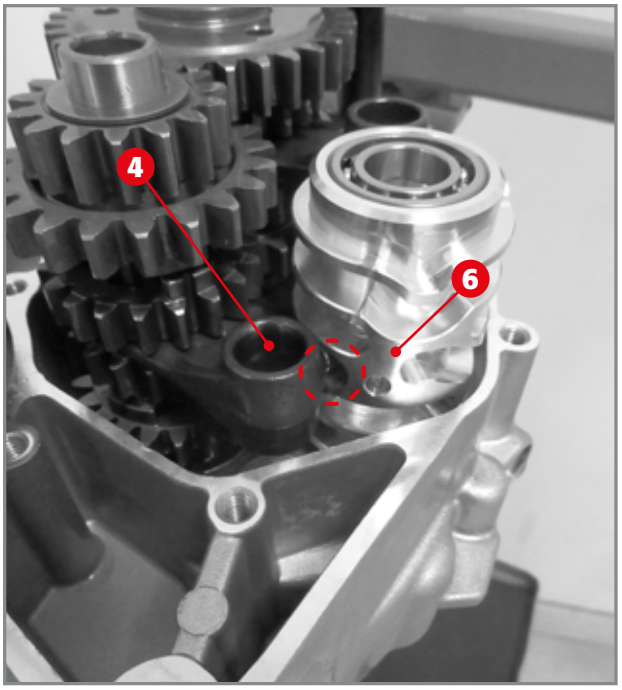
Introduce the gearshift drive forks together with the drive bushes on the gear tracks. To be precise; the smaller fork **3** drives the sliding gear on the primary unit, while the other two (**4**) drive the sliding gears on the secondary unit.

***Note:*** *the two forks 4 are interchangeable and their positioning is univocal, since the guide pin must face the desmodromic device. Place the forks in their original positions if none of the components are replaced.*



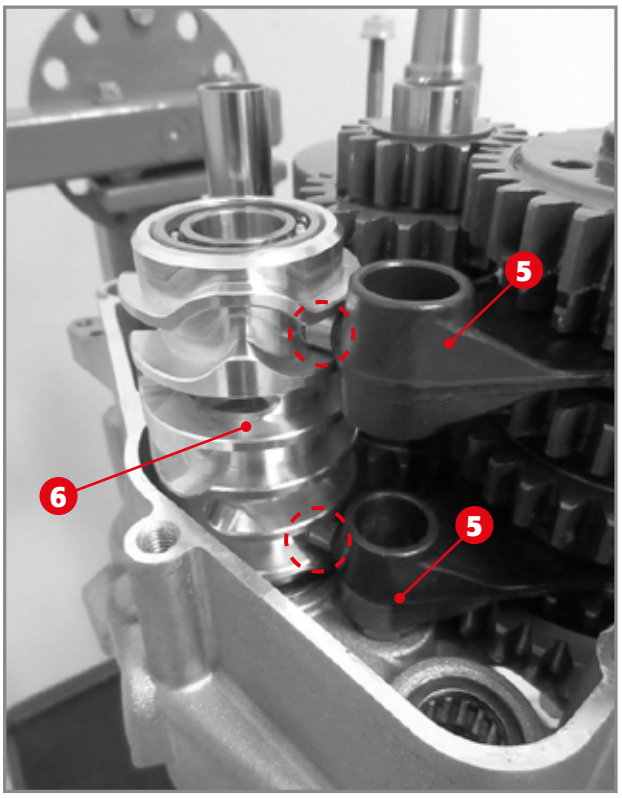
*Insertion of desmodromic device in the specific bearing.*

Insert the desmodromic device in the specific bearing.




*Place fork 4 of the primary unit in the central guide of desmodromic device 6.*

Position the fork **4** of the primary unit in the central guide of the desmodromic device 6, insert the fork pin inside the fork and insert the pin in its specific seat in the crankcase half.




*Positioning of the secondary unit forks 5. In the external guides of desmodromic device 6.*

Position the two forks **5** of the secondary unit in the external guides of the desmodromic device **6** and, just like the primary unit fork, insert the fork pin first in the pins and then in its proper 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 mating area with the gasket and place a new gasket.

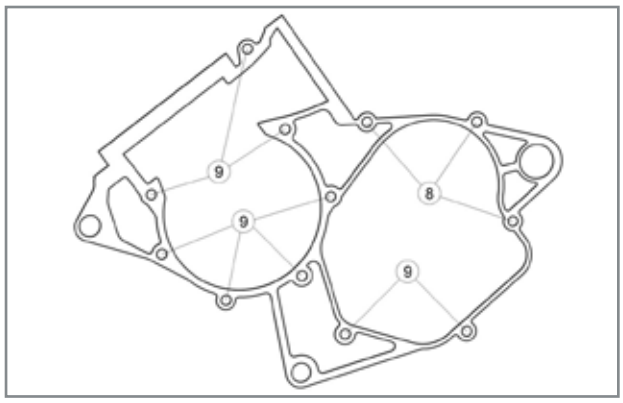


*View inside the right crankcase with crankshaft, gearshift shafts complete with wheels, internal gearshift drive and gasket.*

## 3.5 CLOSING THE ENGINE CRANKCASE

Apply a thin layer of grease on all oil seals.
Warm up the crankshaft bearing on the left crankcase half.

***ATTENTION!***
*Take care not to burn the oil seal.*
*To avoid this, protect it with paper or metal buffer with an outer diameter of 24mm.*



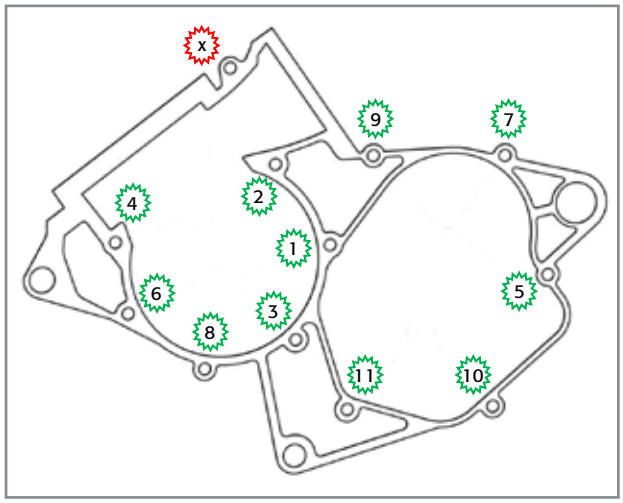

***Positioning of crankcase coupling screws.***

Press the left crankcase half towards the right, making sure that the shafts and pins on the crankcases fit into the respective housings and that the crankcase half is not offset.

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

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

| Screw number | Screw size | | Thread locker application | Tightening torque [Nm] |
|---|---|---|---|---|
| | Threading diameter | Threading length | | |
| 8 | M6 | 40 | NO | 10 |
| 9 | M6 | 50 | NO | 10 |




***Crankcase half tightening order.***

Proceed with tightening according to the order in the figure.
Attention: screw "X" must be tightened later in conjunction with the assembly of the cylinder (Par.3.13.7).

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

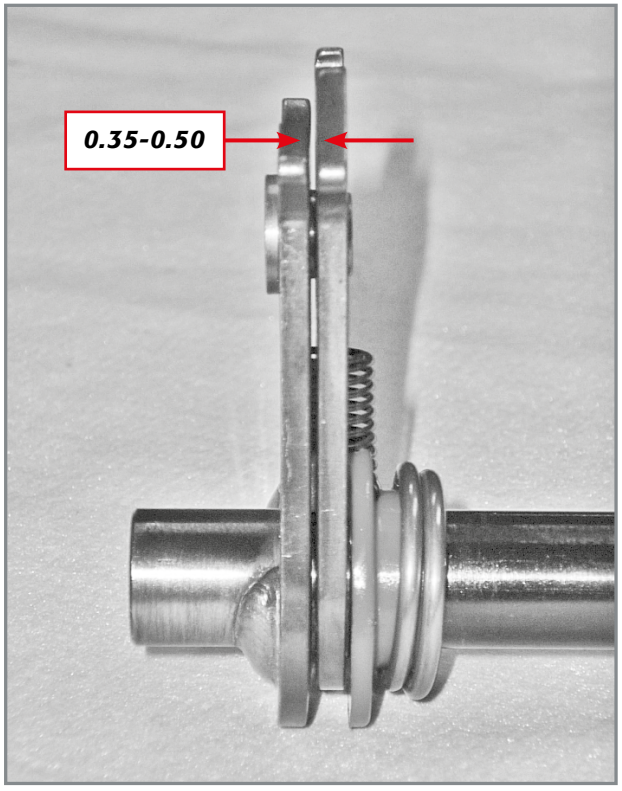
At the end of the operation, use a rubber mallet to position the crankshaft by striking both the right and left half shafts until the shaft rotates freely.

## 3.6 EXTERNAL GEARSHIFT DRIVE

Before reassembling the external gearshift drive, 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.

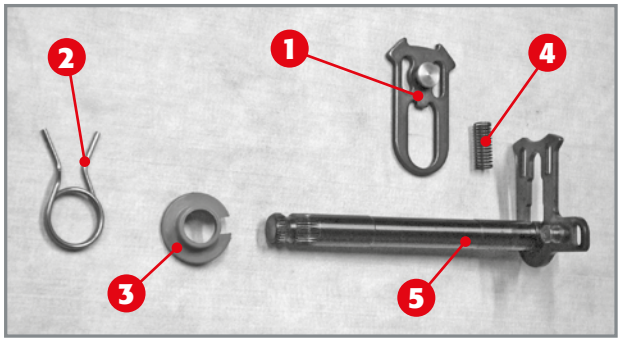
### 3.6.1 Check of the whole gearshift shaft

With the device complete, make sure that the distance between the movable pawl and the drive shaft is between **0.35-0.60mm**.
Should the distance be greater, replace the movable pawl.

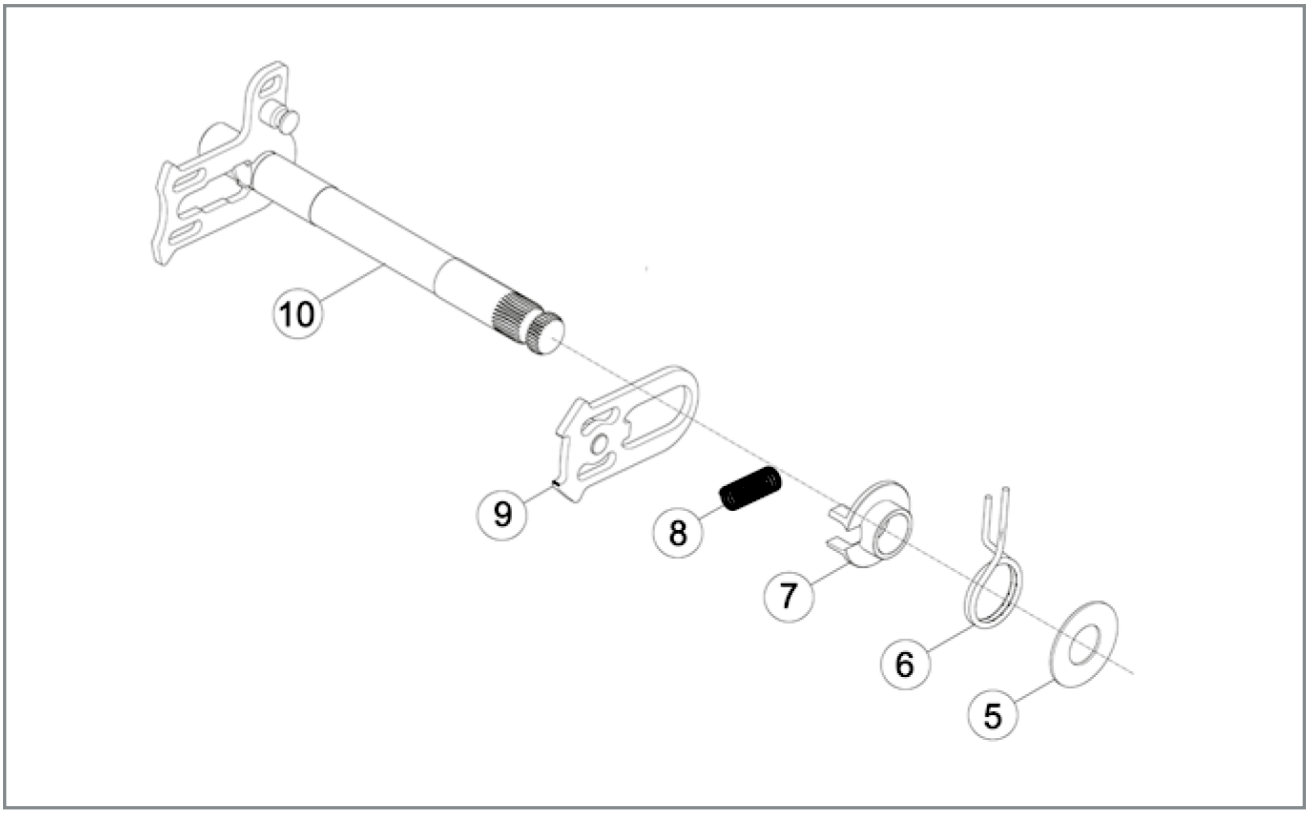



*Allowed distance between shaft and pawl.*

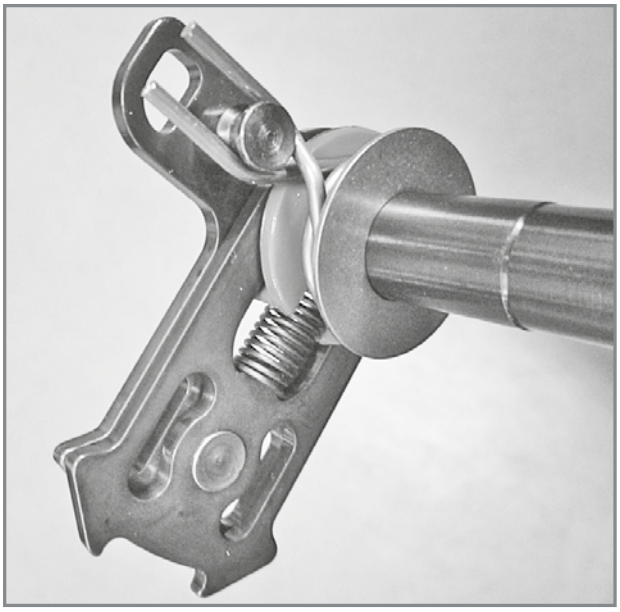
In order to replace the movable pawl **1**, disassemble the return spring of the gearshift drive **2**, the spring guide **3**, the spring **4** (which must be compressed and pulled out of its seat) and the pawl, moving it completely towards the shaft **5**.




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




***Exploded view of gearshift drive.***
***5) 14x30x1 thrust washer;***
***6) Gearshift drive return spring;***
***7) Spring guide;***
***8) Pawl return spring;***
***9) Movable pawl;***
***10) Gearshift drive shaft.***



***Gearshift drive shaft: note the gearshift return spring position.***

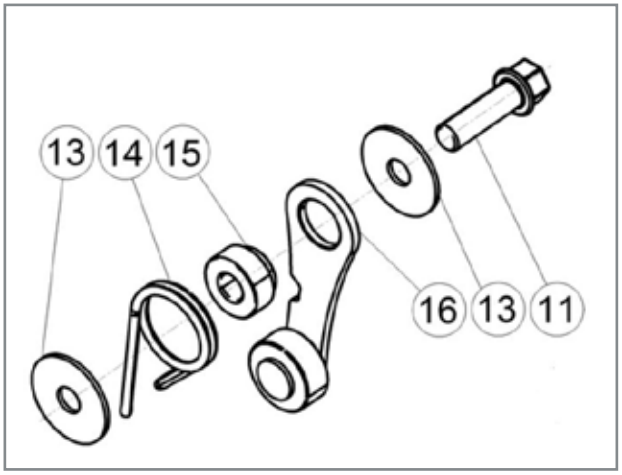
For reassembly, couple the movable pawl **9** to the drive shaft **10** and, while compressing it, insert the spring **8** between the movable pawl and the drive shaft. Then apply the spring guide **7**, the gearshift drive return spring **6** and finally the thrust washer **5** (14x30x1).

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

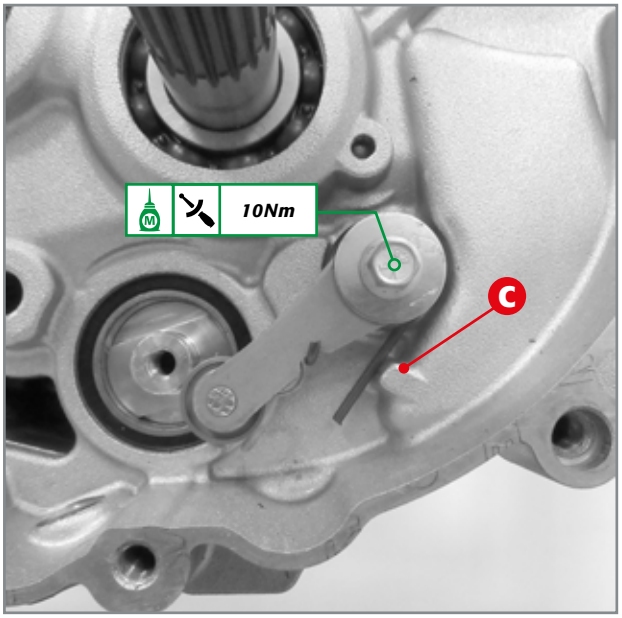
## 3.6.2 Assembly of external gear-shift drive

Apply the gear stopping device as follows.

Keeping the tightener on the lever **16** facing towards the crankcase half, apply the spacer **15** onto it, by inserting the smaller diameter segment in the lever. Apply the spring 14 so that the hook fits into the groove on the lever **16** and then apply the washers **13** and the screw **11** M6x20, spreading with medium strength thread locker on the thread.

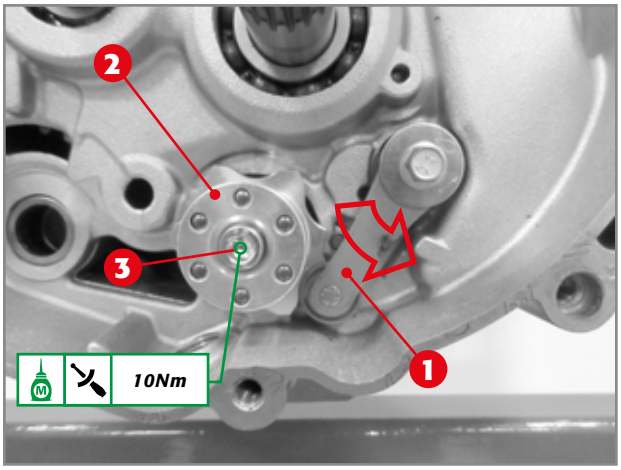



***Stopping device.***



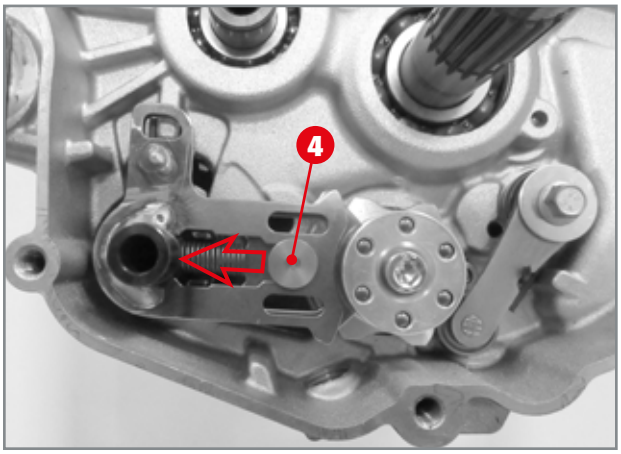

Apply the entire device on the crankcase half so that the straight segment of the spring rests on **C**. Tighten the screw to the indicated torque.

At the end of the assembly, check that the lever can rotate freely. If it is blocked, repeat the assembly as described above.




Keeping the stop lever moved **1** in such a way that the spring is compressed, position the stop cam **2** on 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.

Fit the screw after having applied medium-strength thread locker: tighten to the indicated torque.




***Positioning of external gearshift device components.***

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

Should you wish to test correct operation of the entire gear unit, just temporarily couple the external gearshift lever and simulate the operation of changing gears, by lifting and lowering the gearshift lever and having the main shaft of the gearshift unit rotate. The whole device works properly if no abnormal jamming occurs.

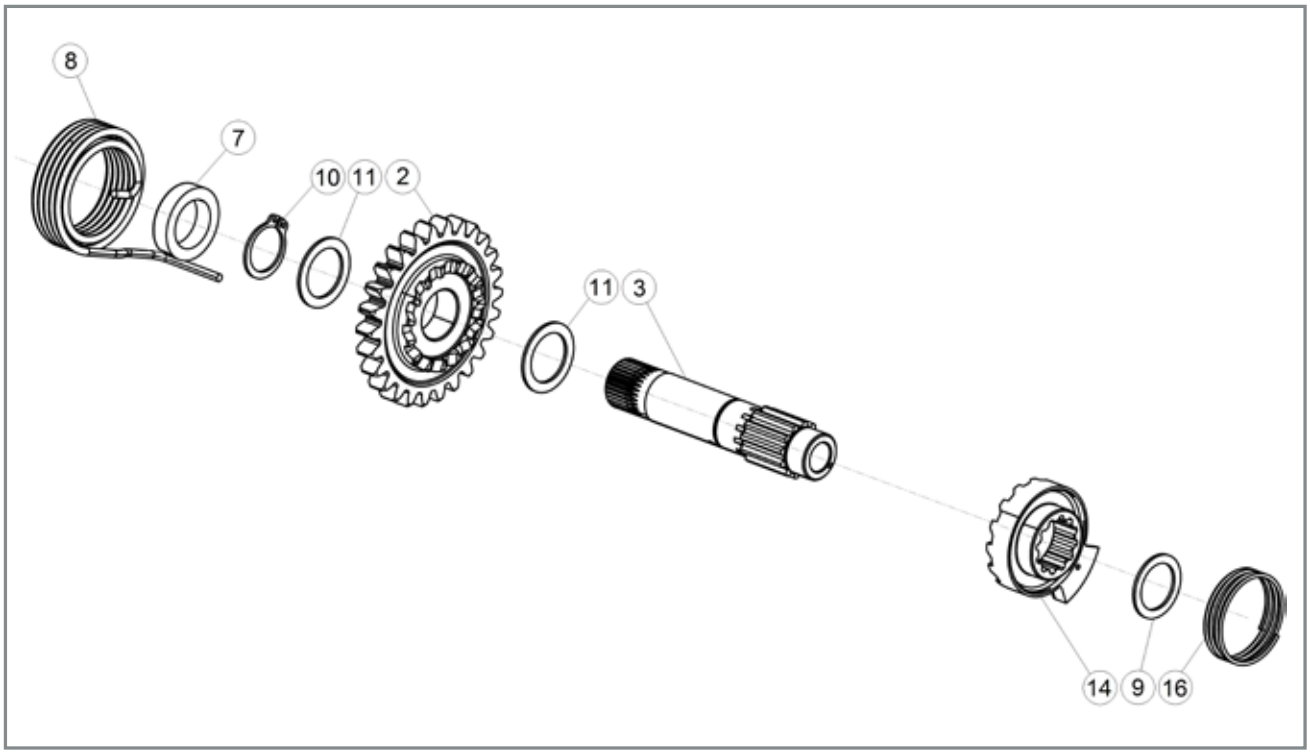
Please note that if the unit operates without oil, the device is noisier than usual.

## 3.7 KICKSTARTER DEVICE - OPTIONAL RR200

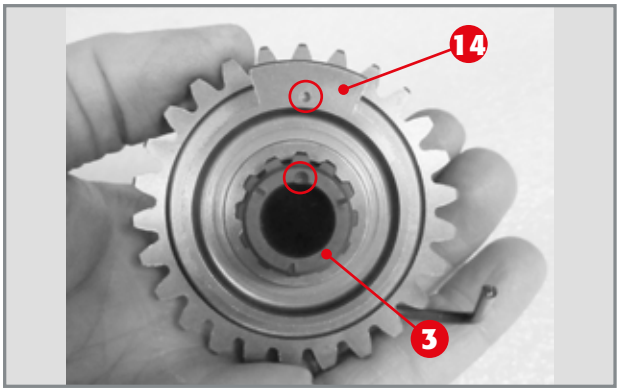
Before coupling the kick starter to the crankcase half, some important checks must be carried out.

### 3.7.1 Check of starter shaft unit and assembly

In order to disassemble all the parts of the kick-start shaft, pull off the washer **9** 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.



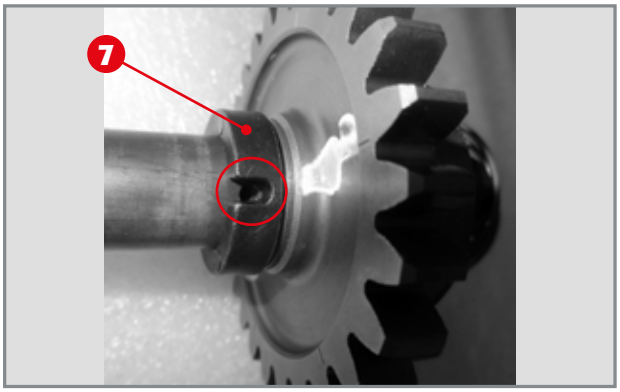

***EXPLODED VIEW OF COMPLETE KICKSTART SHAFT:***
***2) Kickstart gear;***
***3) Kickstart shaft;***
***8) Kickstart return spring;***
***7) Kickstart spacer;***
***10) Retainer ring 17x1;***
***11) Washer;***
***14) Kickstart sleeve;***
***16) Spring.***



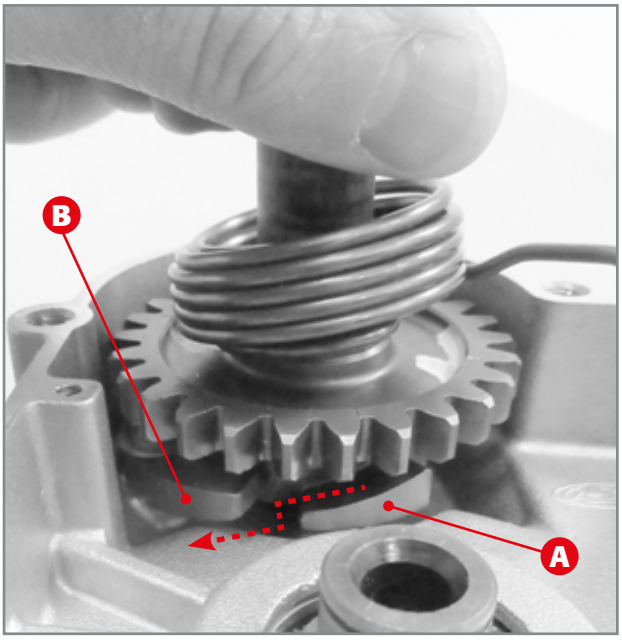

***Positioning of sleeve on small shaft.***

Remove the kickstart spacer **7**, expand the circlip **10**, allowing removal of washer **11**, of kickstart gear **2** and washer **11**. This frees the kickstart shaft **3** from all other parts.
Make sure that the side of the kickstart gear teeth 2 has no signs of meshing or notable superficial wear. Make sure that the front teeth (sleeve side 14) are not chipped. Replace any part that shows the aforementioned defects.

Make sure that the front teeth of the sleeve **14** are not chipped and that the spring **16** is capable of exerting enough pressure on the sleeve **14** so that this can pull the wheel **2**.
Also check to make sure that no washers have any abnormal or excessive wear. If so, replace them. Make sure that the spring 8 has no cracks or abnormal deformation. Replace if it is not able to bring the external kickstart lever back to the rest position.
For reassembly, follow the above disassembly procedure in reverse order.



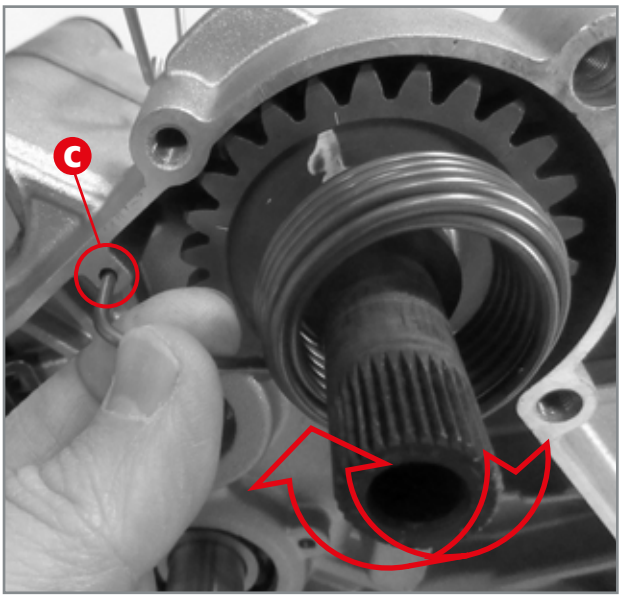

Pay attention:
- to the correct positioning of the spacer **7** (the area with the groove must go outwards);
- to the alignment of the reference between shaft **3** and sleeve **14**.




*Positioning of sleeve A below lever B.*

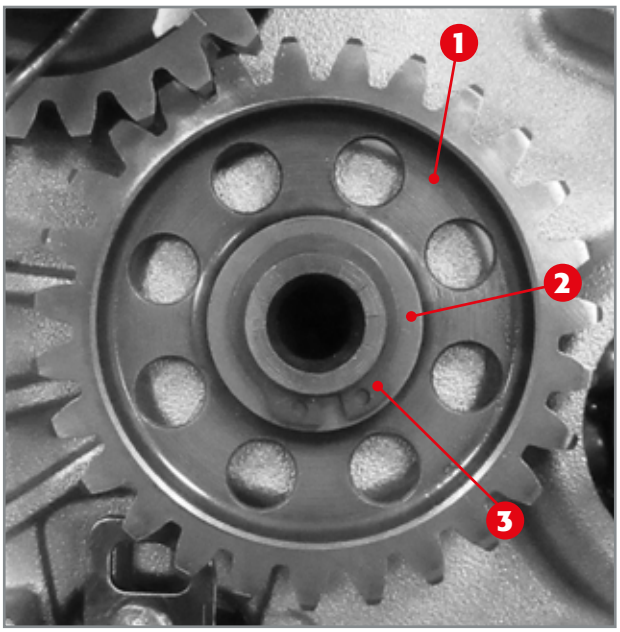
## 3.7.2 Assembly of kick starter device - OPTIONAL RR200

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




*Insertion of kickstart return spring.*

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




*Kickstart device unit coupled to the crankcase.*

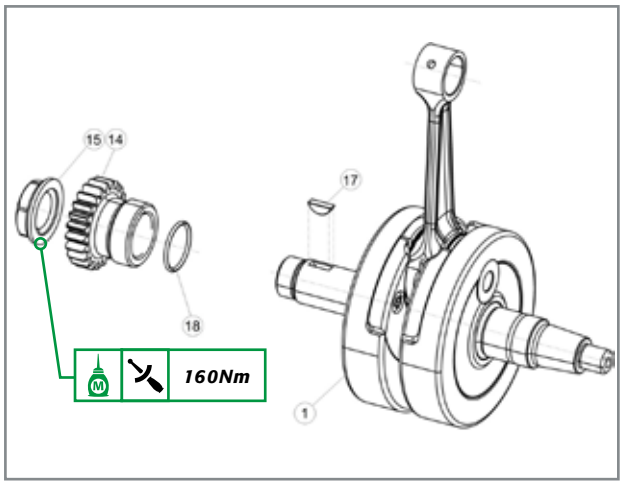
Insert in the slot on the protruding segment of the secondary shaft: the idler wheel **1** followed by the washer **2** and the circlip **3** as shown in the figure.

## 3.8 PRIMARY 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

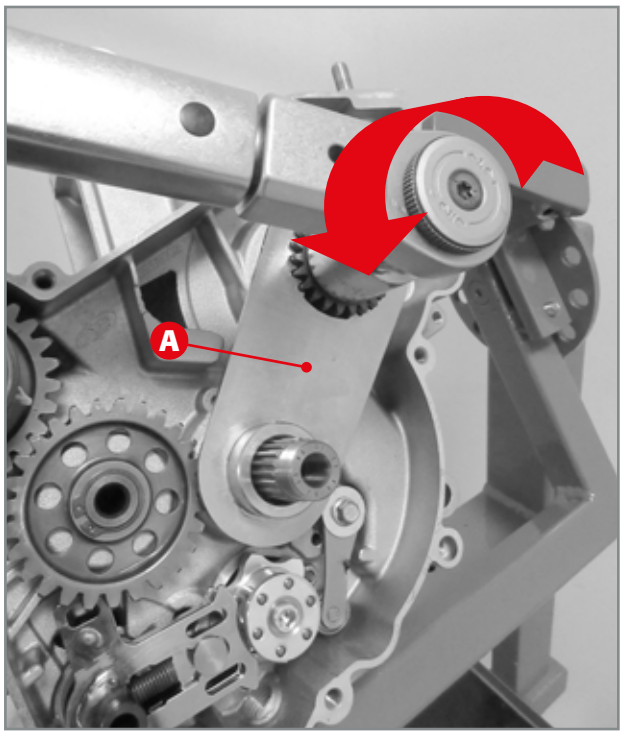
Check teeth of primary gear is without nicks or abnormal wear. If so, replace it




*Exploded view of pinion unit.*

### 3.8.2 PRIMARY GEAR APPLICATION

Apply the O-ring **18**, and gear **14** on the right half shaft so the appropriate groove inserts inside the Woodruff key **17**. Apply lock nut **15** after applying medium strength thread locker. Fastening torque must be as shown in the figure.




*Tightening of the primary gear nut.*

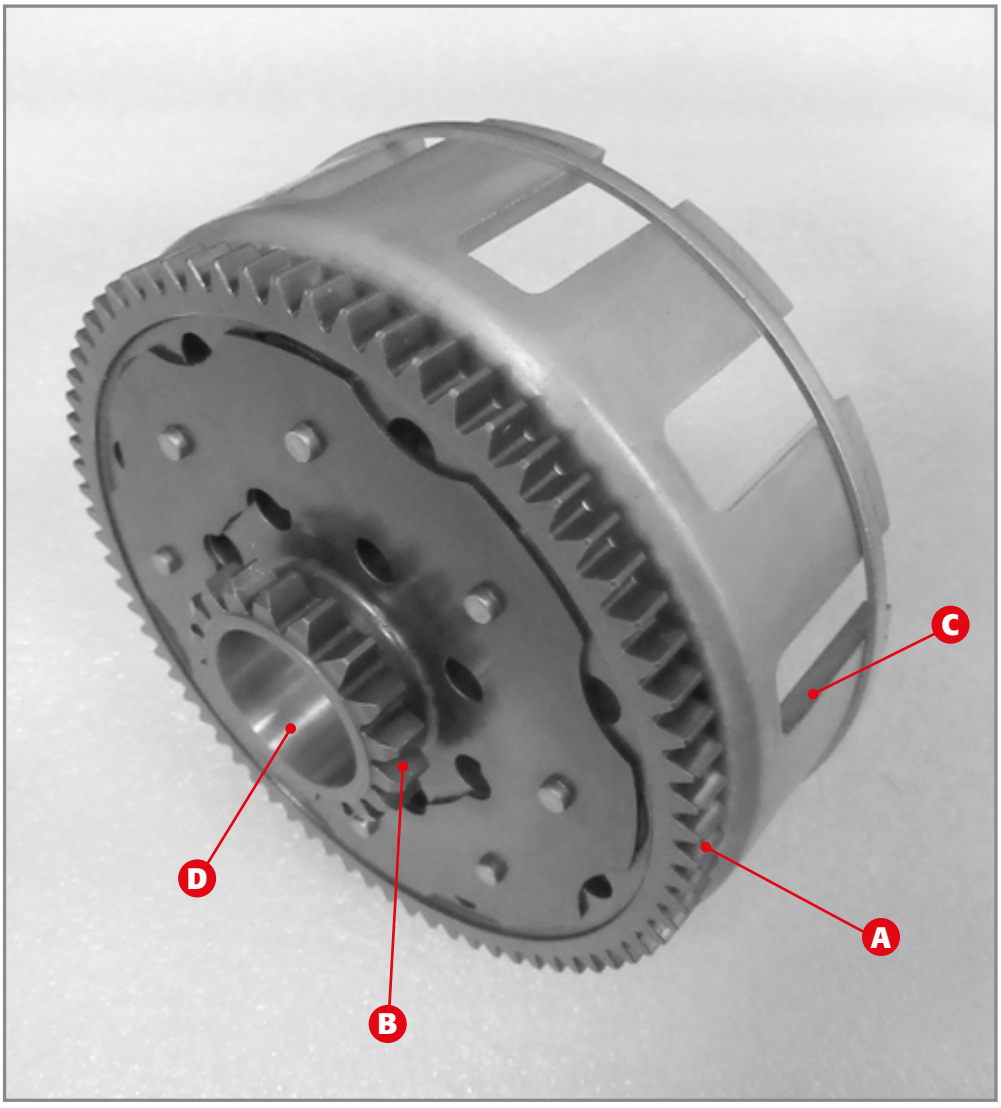
This operation is possible using the special primary tool **A** *(code 035.14.006.50.00).*

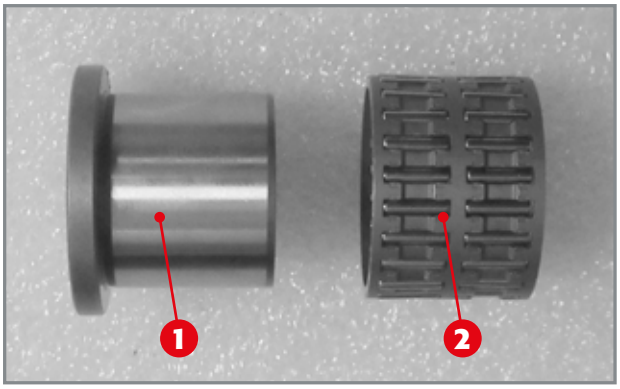
***ATTENTION!***
*The nut is fastened anti-clockwise.*

### 3.8.3 Check of clutch case, roller bearing and internal centre bearing

For complete disassembly, see Par. 2.6.3.
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.
Also closely check that the teeth **C**, upon which the driving discs engage, are not chipped or deeply cut.
Check the external surface **D** does not show traces of meshing or abnormal wear.
If any damage is found, have the piece replaced.

***CLUTCH CASE:***
***A. Teeth meshing with primary gear;***
***B. Teeth meshing with kickstart idler gear;***
***C. Teeth meshing with driving discs;***
***D. External washer.***

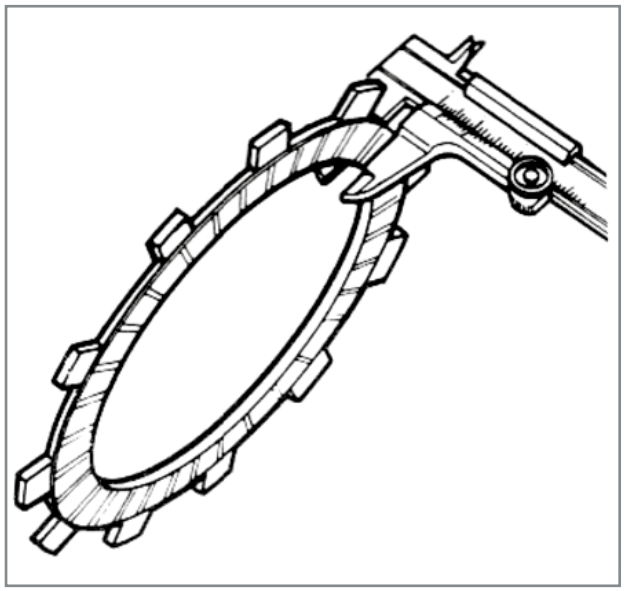





*Internal centre bearing and roller bearing of clutch case.*

Check the state of use of the silent-blocks as follows. Clamp gear **B** using protective elements and impose a rotation to the clutch case. If there is play between the case and the gear unit, replace the clutch case.
Check the condition of the internal centre bearing **1** which must show no traces of meshing or abnormal wear.
Check the condition of the roller bearing **2**. If worn, it must be replaced.

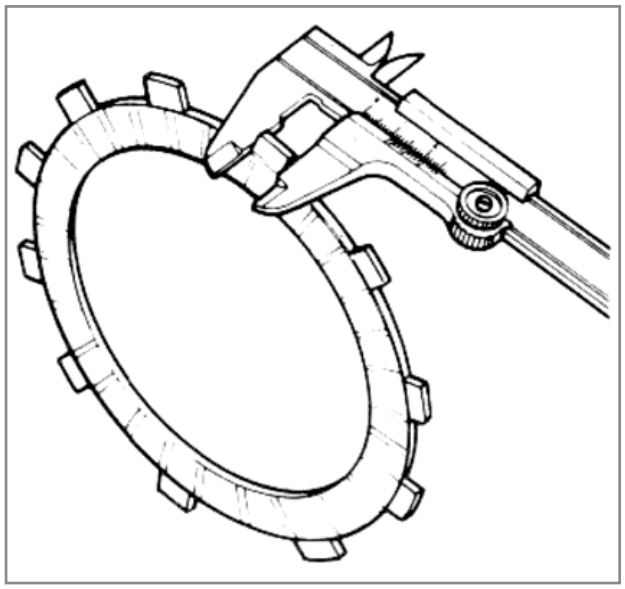
## 3.8.4 Clutch disc check



*Minimum distance between two opposite inserts.*

The clutch discs are divided into driving and driven: seven driving discs and six driven discs of which four in aluminium and two in steel.
The driving discs have cork inserts on both sides which wear out due to the driven discs sliding on them.
Make sure that the thickness between the two inserts positioned on the opposite faces of each driving disc is not below the minimum value fixed at:

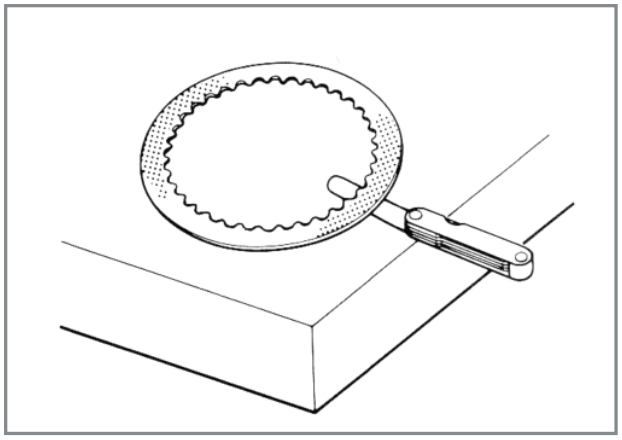
**minimum distance between two opposite inserts: 2.8mm**



*Minimum driving disc tooth thickness.*

The other measurement that needs to be checked is the thickness of the teeth of each driving disc, which must not be less than the minimum set at:

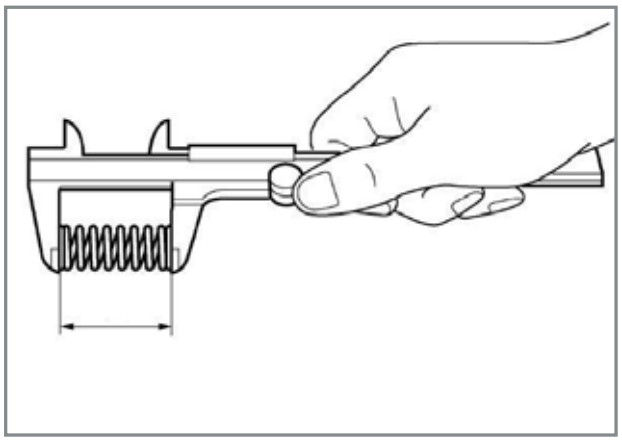
**minimum driving disc tooth thickness: 13.3mm**



*Measuring driven disc distortion.*

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

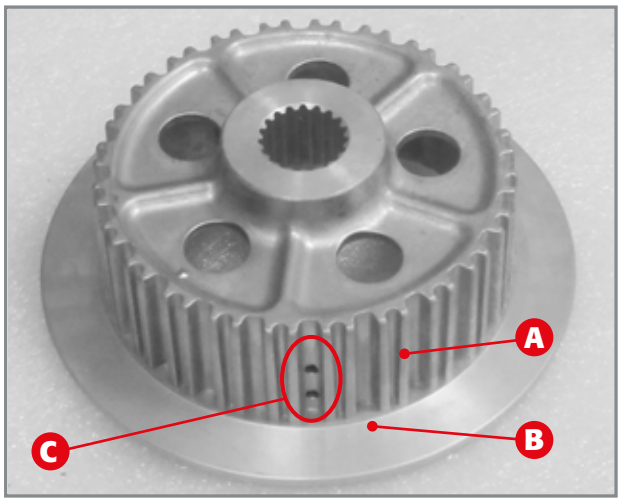
**allowable distortion**
**driven discs: 0.10mm**

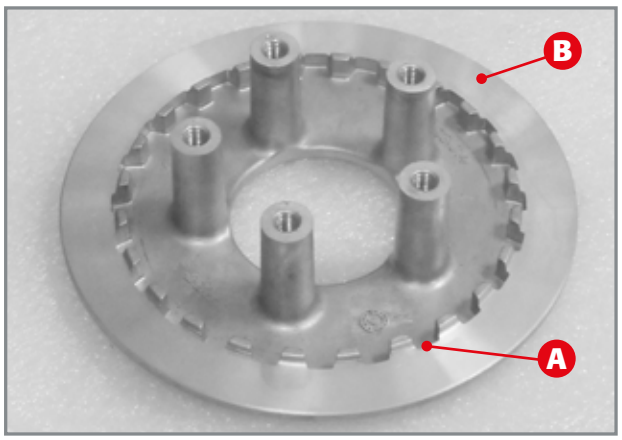


*Clutch spring length measurement.*

## 3.8.5 Check of springs

To assure the correct pressure between the clutch discs, the condition of the springs must be checked. The minimum acceptable length must be: **38mm**.




*Check of clutch drum teeth.*

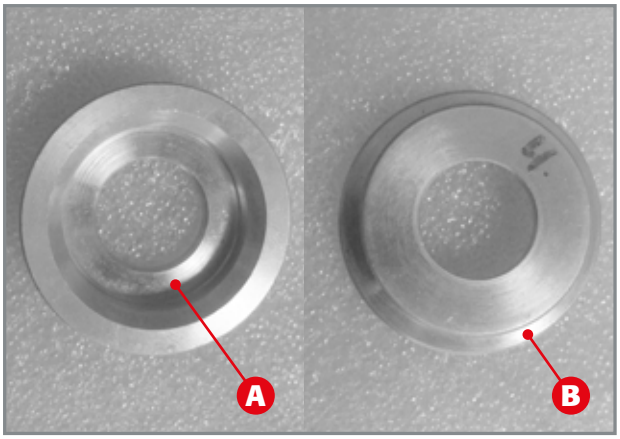
## 3.8.6 Check of clutch drum and pressure plate

The clutch drum and pressure plate mesh with the clutch discs driven by means of teeth **A** and with the driving discs by means of surfaces **B.**
Check that:

- The teeth **A** and the surfaces **B** do not have abnormal gears or wear shapes. If so, replace the worn details;
- The radial holes **C** on the clutch drum are not clogged and are free from sediments.

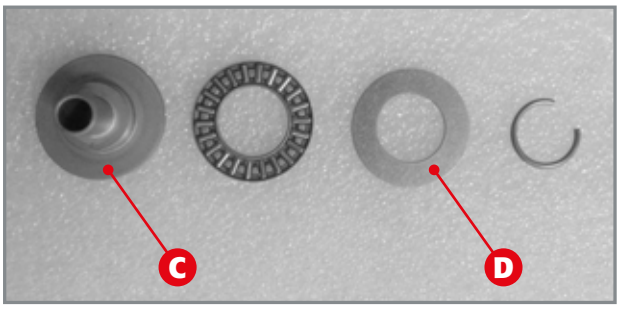
## 3.8.7 Check of thrust bearing device and clutch actuator

Check the state of use of the thrust bearing and the surfaces **A** and **B**.

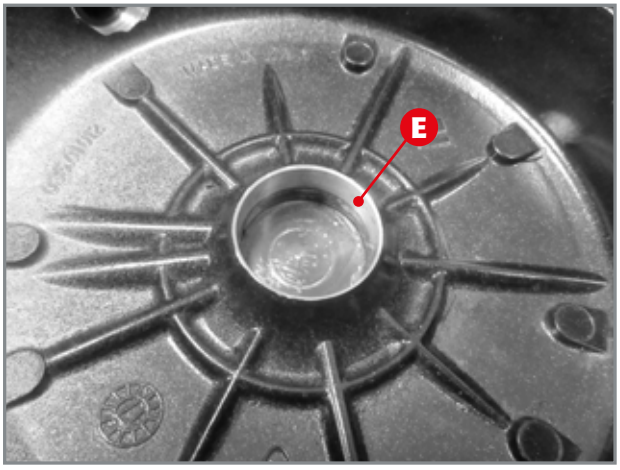



***Thrust bearing device.***

In order to check the thrusting bearing, just see if it slides. When the device is assembled, simulate rotation of the front centre bearing **C** with respect to the rear one **D**.
Pay attention to the presence of traces of meshing or wear on the sliding
surfaces.

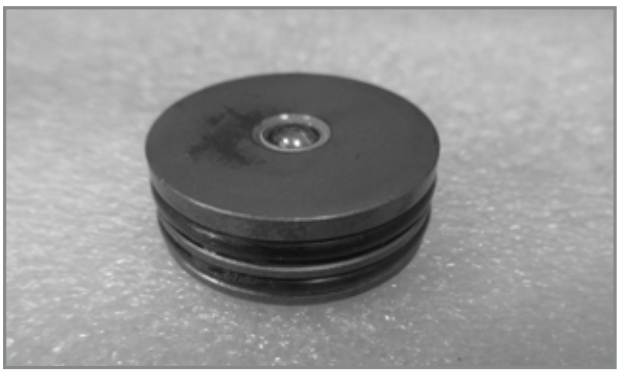


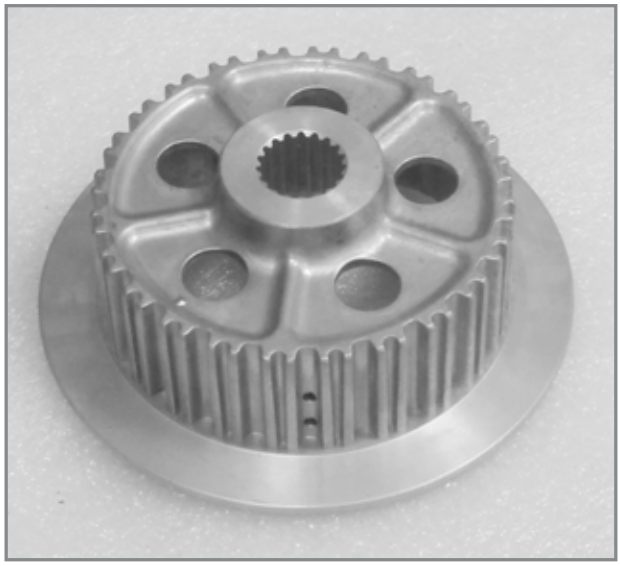

Check that the actuator cylinder walls **E** are free from traces of meshing or abnormal wear. If worn, replace the clutch outer cover.

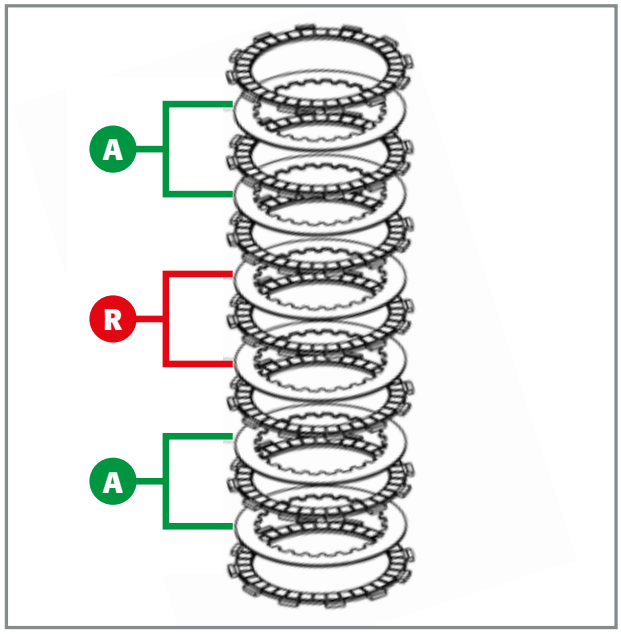



Make sure that the piston is intact and free from abnormal wear: otherwise, replace the piston with the OR.

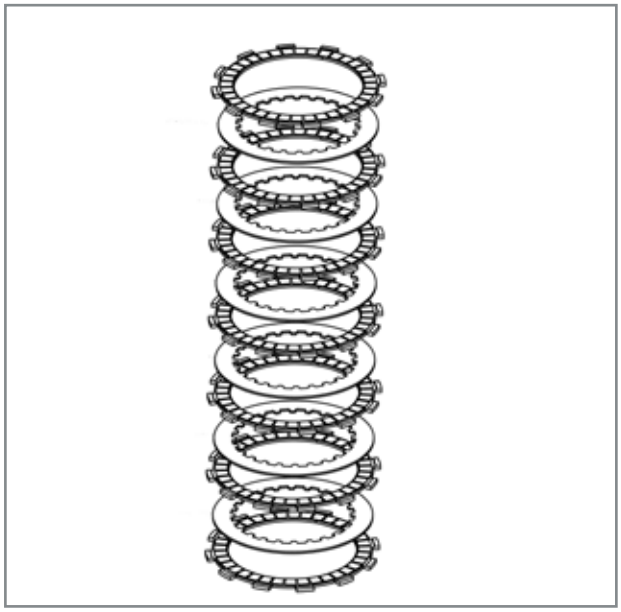
Check that the sealing ORs are intact and not pinched: otherwise, replace them.








***Clutch disc assembly RR125***
***Key:***
***A - Aluminium;***
***S - Steel.***



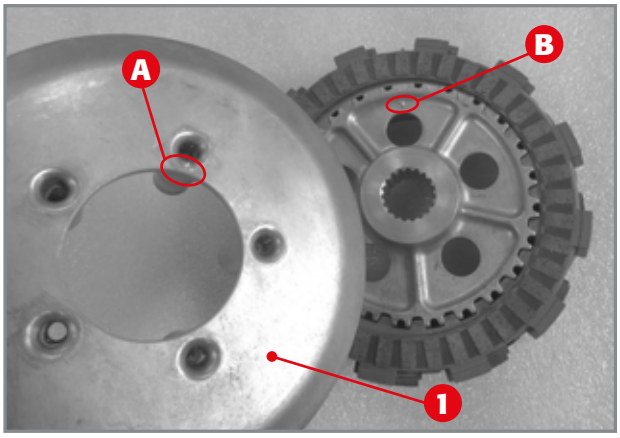
***Clutch disc assembly RR200.***

## 3.8.8 Assembly of clutch unit and clutch actuator

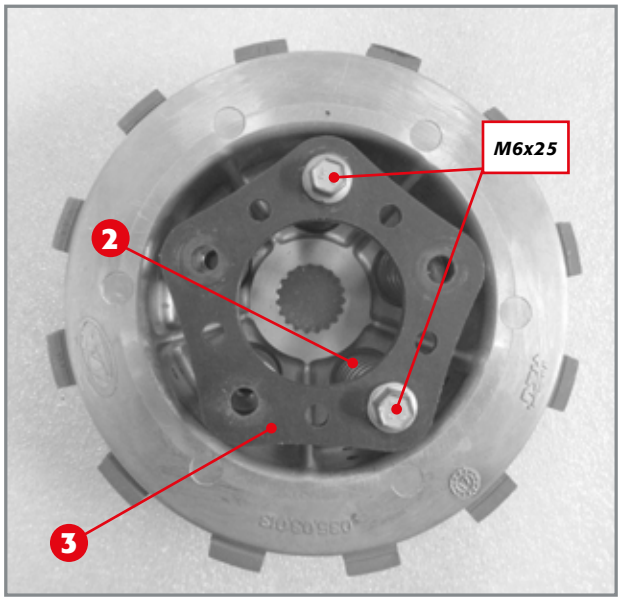
Place the clutch drum as shown in the figure.

Lubricate the clutch discs with gear oil and apply to the clutch drum by alternating a driving disc with a driven disc, according to the diagram in the figure.

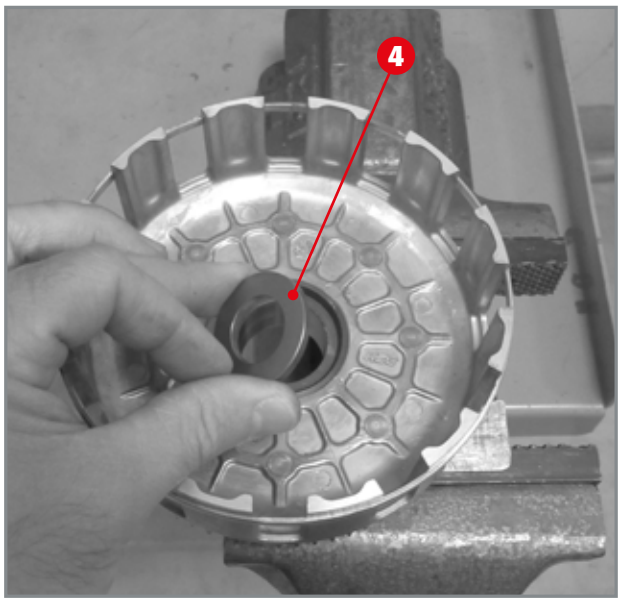
***Note:*** *the driven discs must be inserted so that the radius on the teeth faces inwards towards the engine.*



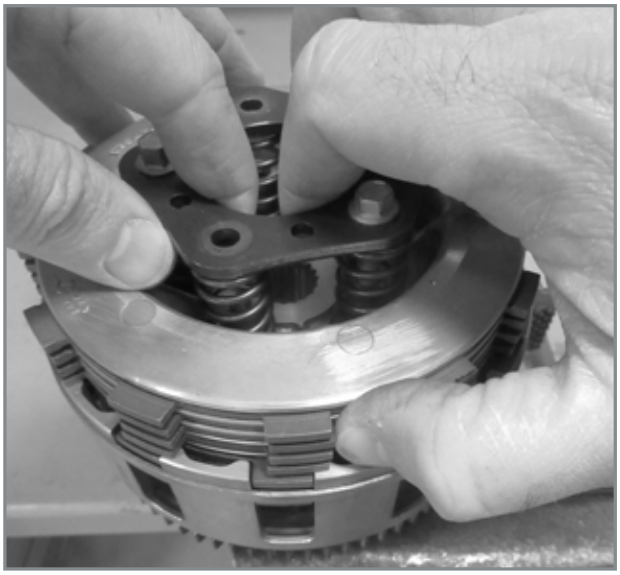

Apply pressure plate **1** so that reference **A** and reference **B** match.



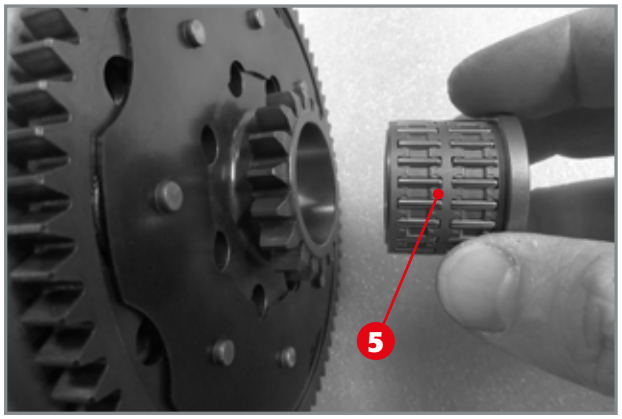

Overturn the assembled unit and apply springs **2**, spring plate **3** and two screws **M6x25** to be removed at a later stage: tighten the latter enough to slightly compress the springs.



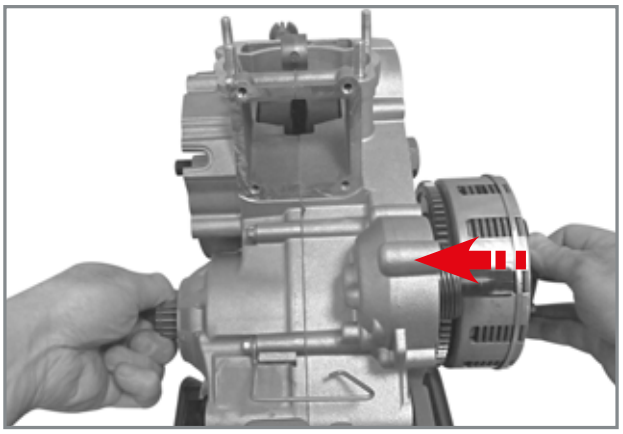

Apply the washer **4** as shown in the figure.



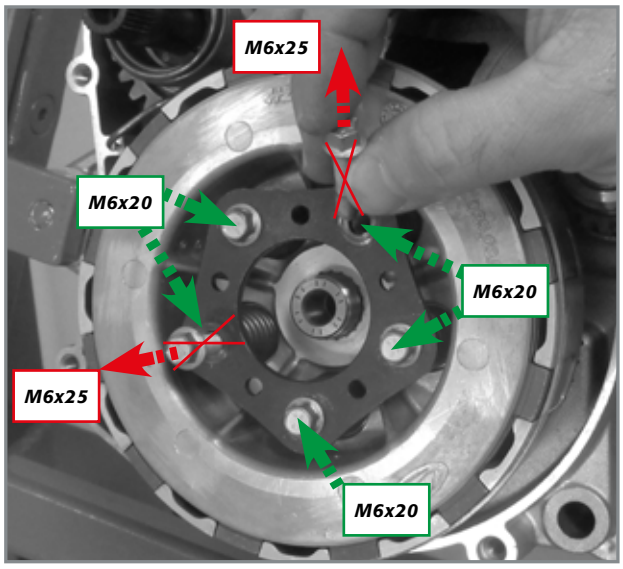
Insert the assembled clutch drum unit as above, proceeding to align the teeth of the driving discs to the respective slots on the clutch case.



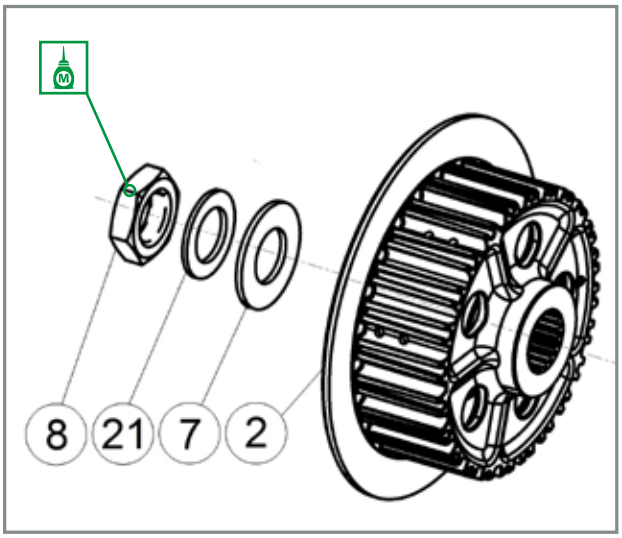

Lubricate and apply roller bearing **5** with the centre bearing to the clutch base.



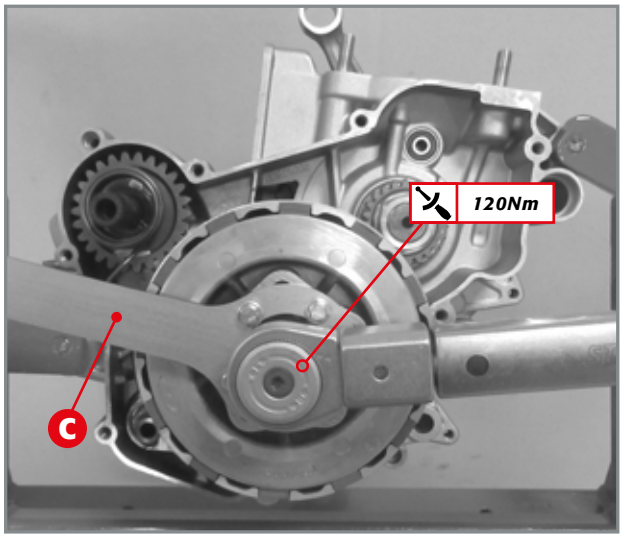
Insert the entire clutch unit on the secondary shaft of the gearshift. To facilitate insertion, it is advisable to engage a gear and have the outlet shaft make small rotations and, if necessary, to the idle gear of the kick starter.



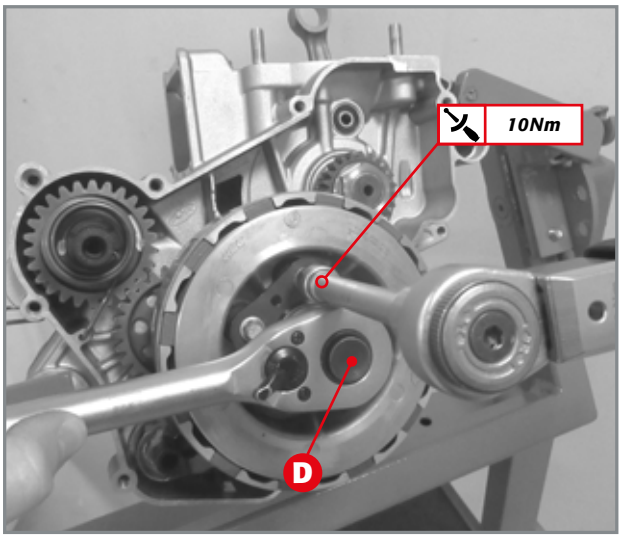

Apply the three screws **M6x20** and tighten them with a cross pattern, until the spring plate is flush. Remove the two previously applied screws **M6x25** and replace them with the other two **M6x20**.



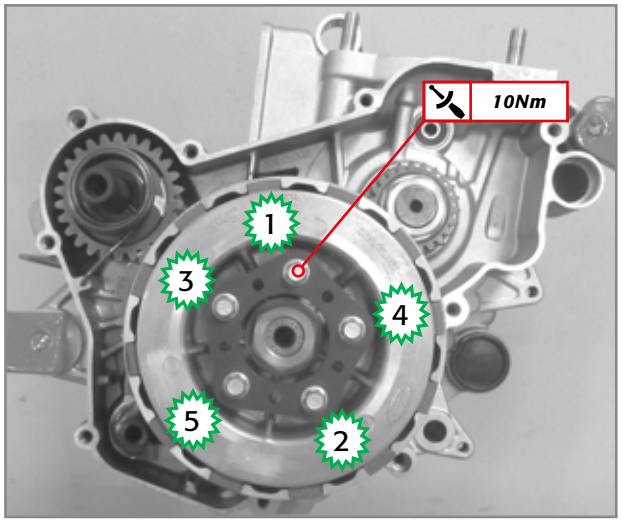

Apply washer **7**, a new Schnorr washer **21** and nut **8** after having applied the medium strength thread locker.

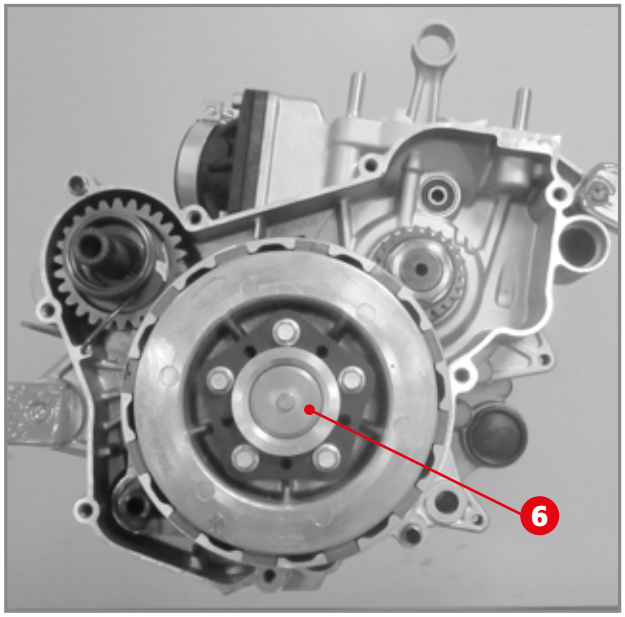



Keep the clutch unit blocked using the special tool **C** *(Code 035.14.000.80.00)* and tighten to the specified torque.

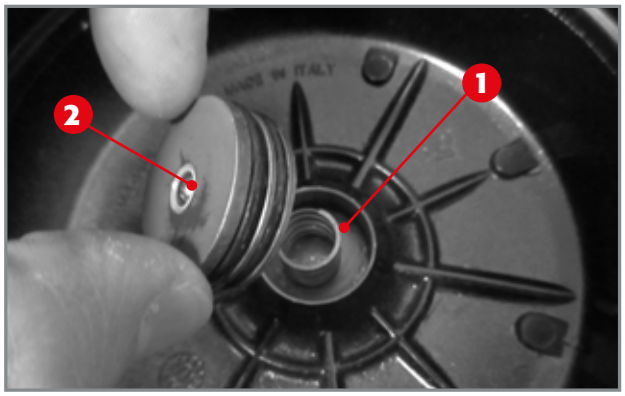



Keep the clutch nut blocked by using the socket or pipe wrench **D** and tighten the spring plate screws with a cross pattern to the indicated torque.



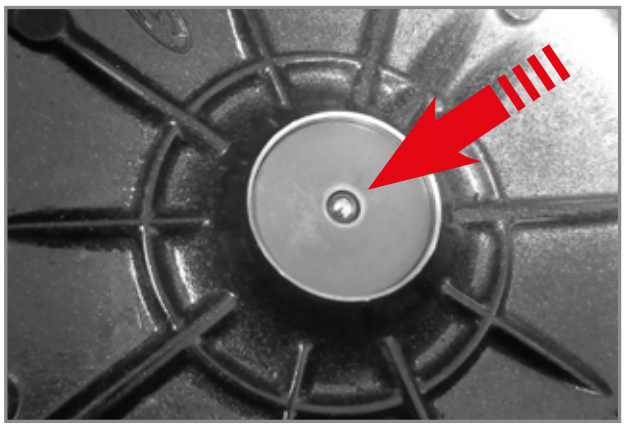




Lubricate and apply the entire pressure plate unit **6**.




Proceed as follows to reassemble the actuator unit:

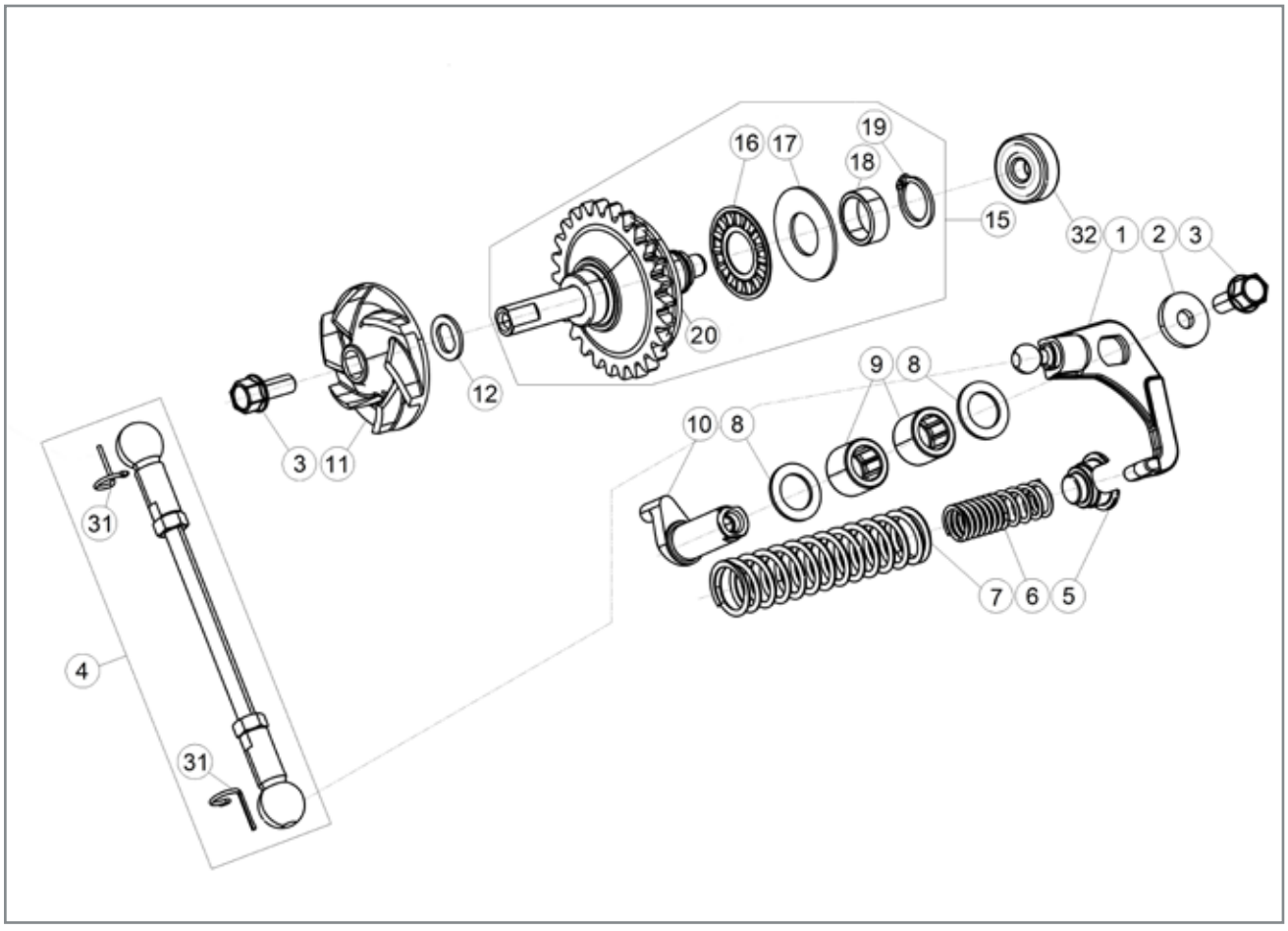
- Apply a very light layer of silicone grease on the piston complete with OR;
- Apply spring **1** in the cylinder and then the complete piston **2;**
- Push the piston inside the cylinder.

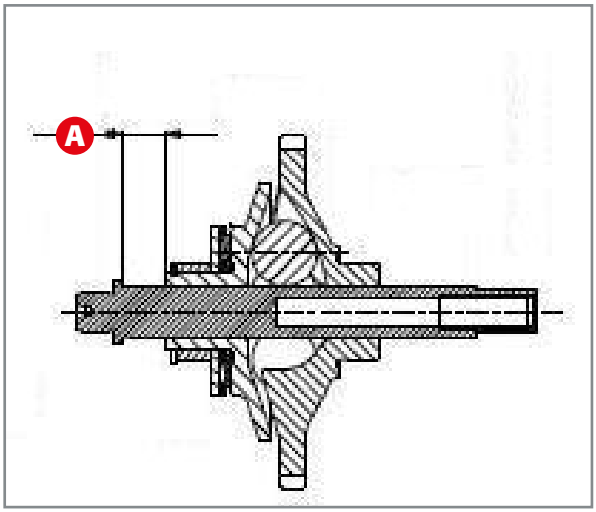


## 3.9 COOLANT LIQUID PUMP AND CENTRIFUGAL UNIT

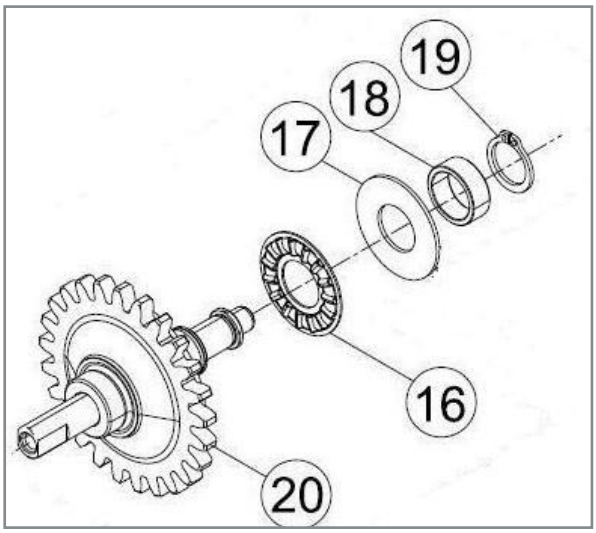
The water pump must assure the correct flow rate of coolant, depending on the set rotation speed, in order to remove the required amount of heat from the power unit. The centrifugal unit activates the whole exhaust valve control linkage based on the engine rotation speed, while springs **6** and **7** provide the appropriate resistance to the centrifugal action generated by **20**, in order to assure optimal supply of torque and power.
The impeller **11** is keyed onto shaft **20** and coupling is assured by tightening nut **3** on shaft **20**.

***EXPLODED VIEW OF CENTRIFUGAL UNIT AND WATER PUMP UNIT***
***1) Rocker arm;***
***2) Washer 5x15x2;***
***3) M5x12 screw;***
***4) Complete valve control rod;***
***5) Spring guide;***
***6) Auxiliary spring;***
***7) Adjustment spring;***
***8) 10x16x1 washer;***
***9) Roller bush;***
***10) Centrifugal control lever;***
***11) Water pump impeller;***
***12) Water pump washer;***
***15) Complete centrifugal unit;***
***16) Axial roller cage;***
***17) Centre bearing;***
***18) Spacer;***
***19) Circlip;***
***20) Complete centrifugal shaft;***
***31) Ball joint retainer ring;***
***32) Bearing 6x19x6.***

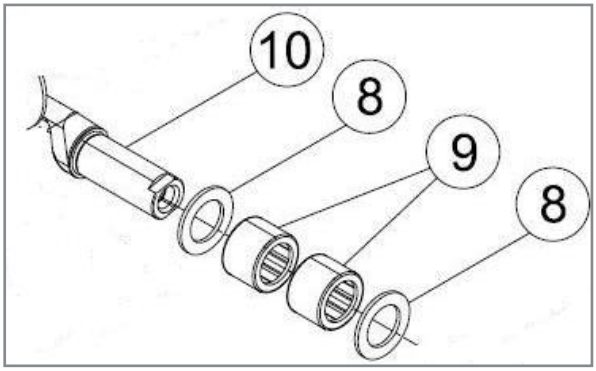




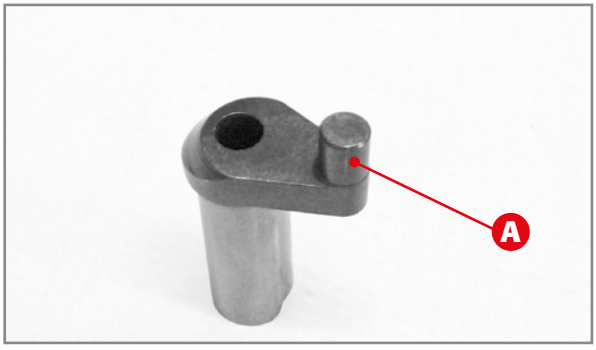

*View in centrifugal unit section: stroke A.*




*Exploded view of centrifugal unit.*




*Exploded view of bearings and centrifugal control lever.*




*Check of centrifugal control lever area A.*

## 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 condition. Replace if worn.

Check centrifugal unit shaft condition. 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 4.2-4.4mm.

Otherwise replace the unit.

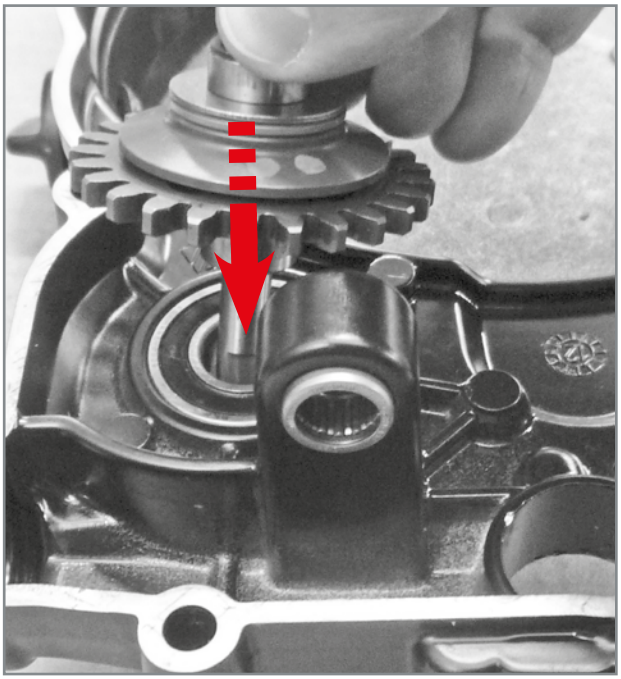
Remove circlip **19** and check use status of the roller axial cage **16**. Replace it in case of anomalies.

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.

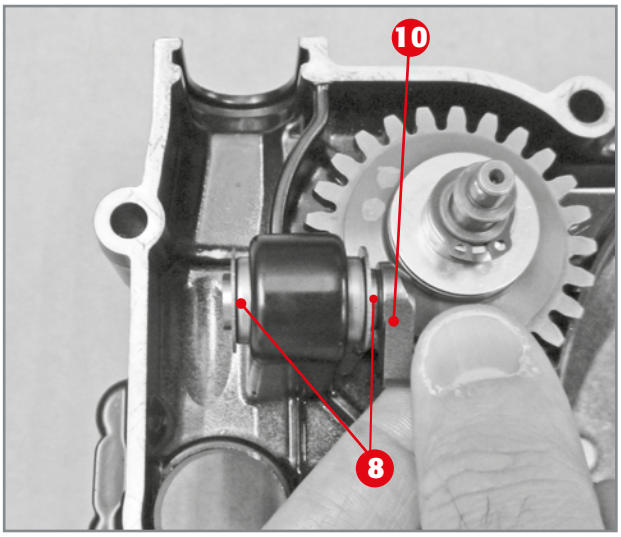
## 3.9.2 Centrifuge unit group assembly

Insert the centrifugal unit in the inner clutch cover.



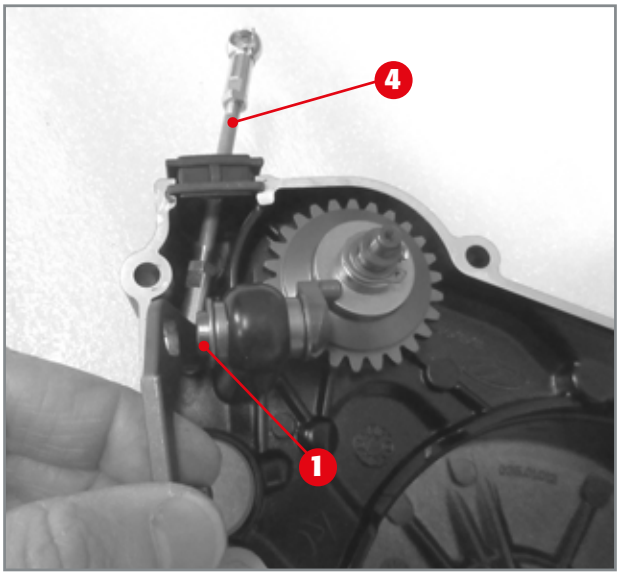
*Insertion of centrifugal.*

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

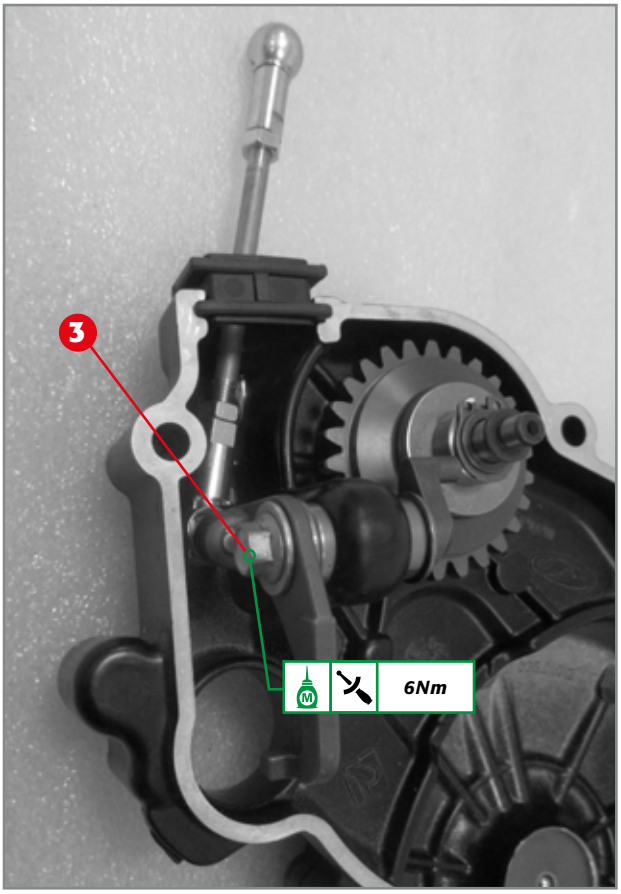



*Insertion of centrifugal control lever.*

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

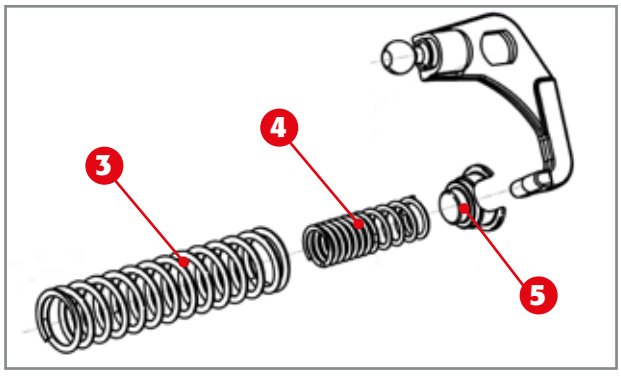



*Application of valve control and rocker arm unit.*



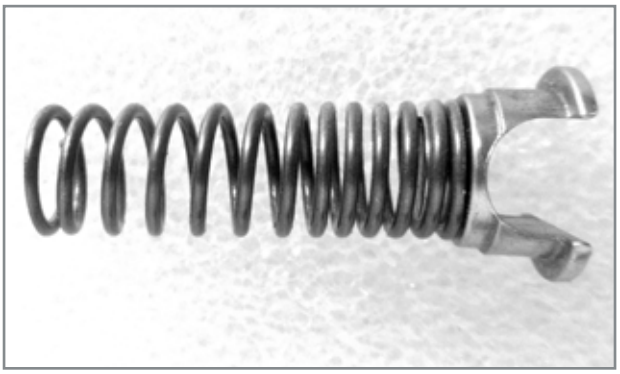

*Centrifugal unit assembly.*

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

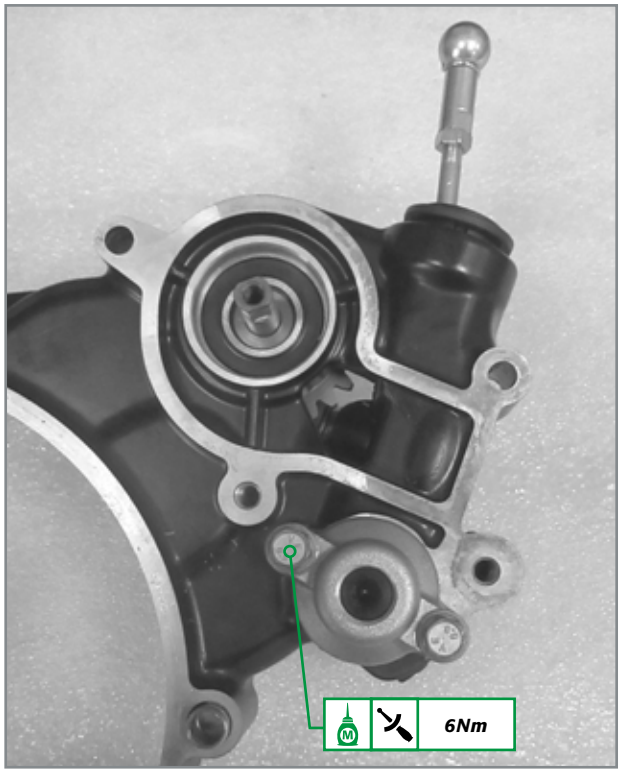



*Valve control lever and spring unit.*

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

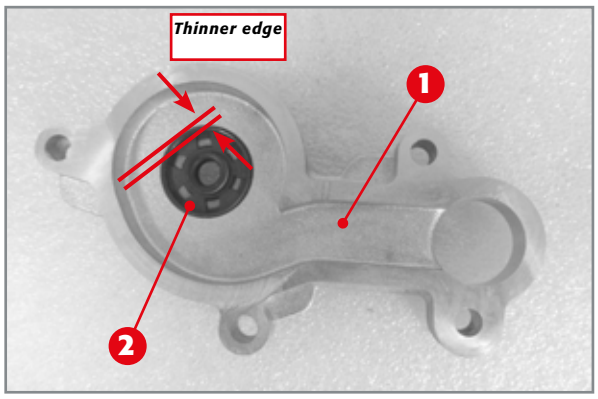


***WARNING!***
*Auxiliary spring **4** has a variable pitch and must be assembled as shown in the figure.*




*Fastening of adjusting cover.*

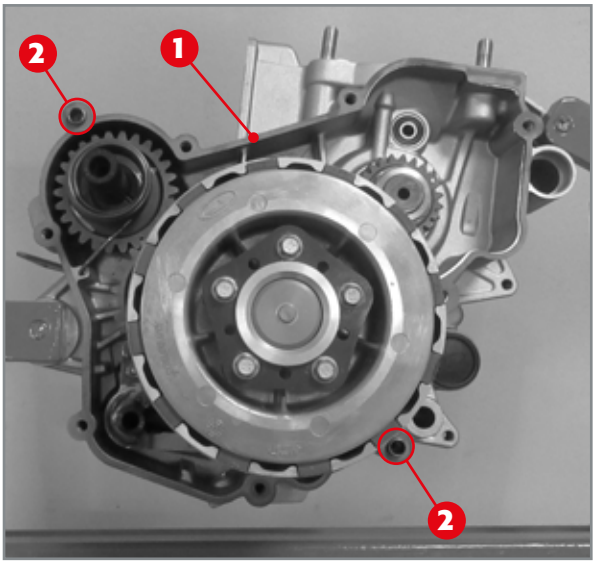
Apply the complete adjustment cover to the inner clutch cover. Apply the blocking screw prior application of medium strength thread locker and fasten to the indicated torque.




*Application of the oil seal to the pump body.*

### 3.9.3 Pump unit assembly

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

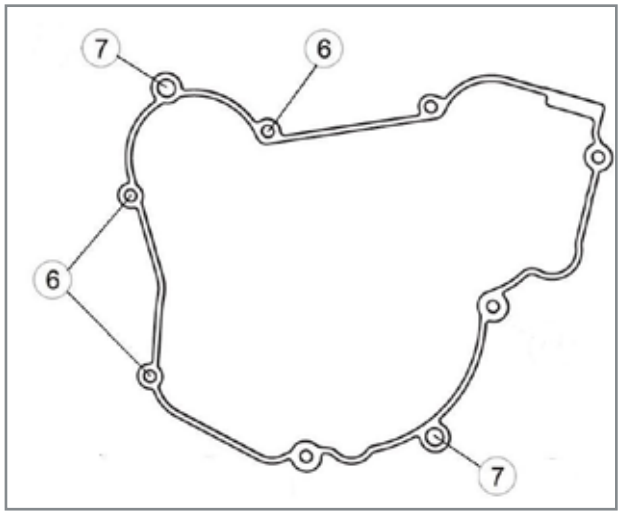



*Positioning of gasket and reference pins.*

## 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.

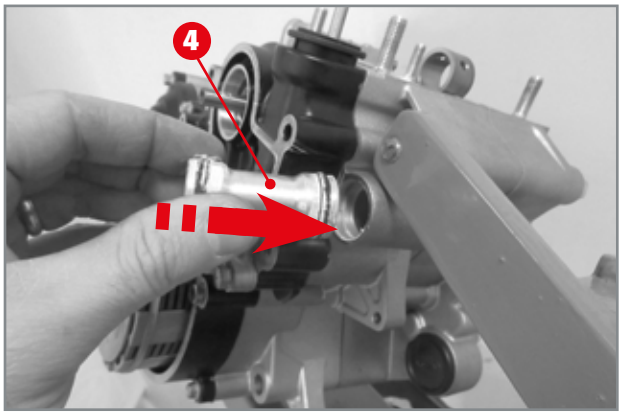
Couple the inner clutch cover to the right crankcase half and rotate the centrifugal shaft until the shaft meshes in the main gear.




*Positioning of screws.*

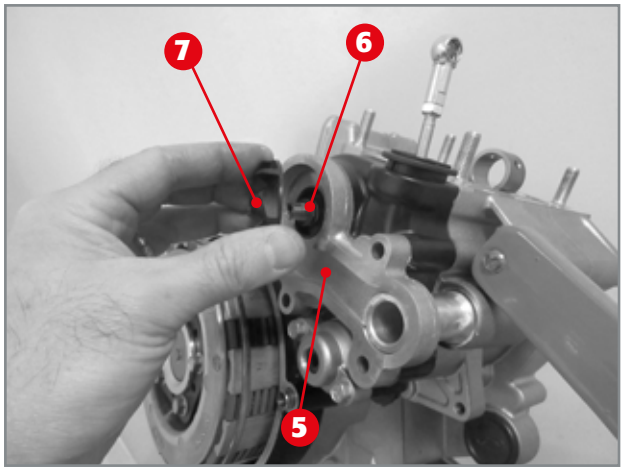
Apply the seven screws as shown in figure, fastening them at the torque indicated in the table, with a criss-cross pattern.

| Number screw | Screw size | | Thread locker application | Tightening torque [Nm] |
|---|---|---|---|---|
| | Threading diameter | Threading length | | |
| 6 | M6 | 20 | NO | 10 |
| 7 | M6 | 25 | NO | 10 |



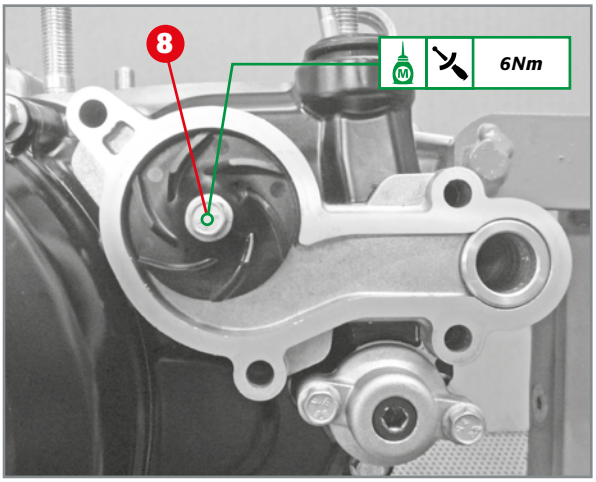

*Insertion of water hose.*

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




***Application of water pump impeller.***

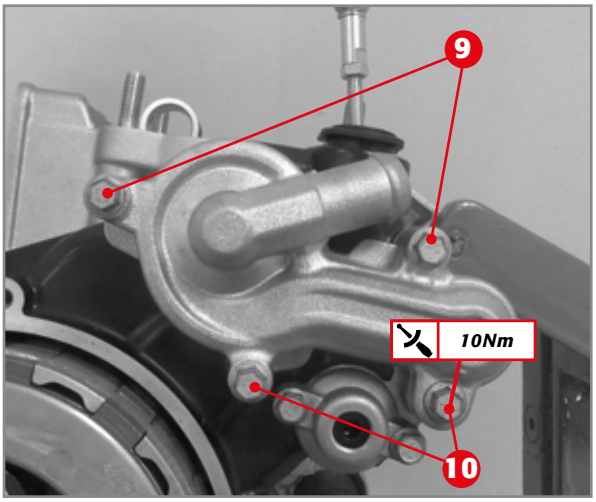
Apply the gasket between the pump body and clutch cover. Grease the inner diameter of the oil seal on the pump body **5** and apply the body to the clutch cover.
Apply washer **6** and water pump impeller **7**.




***Complete water pump.***

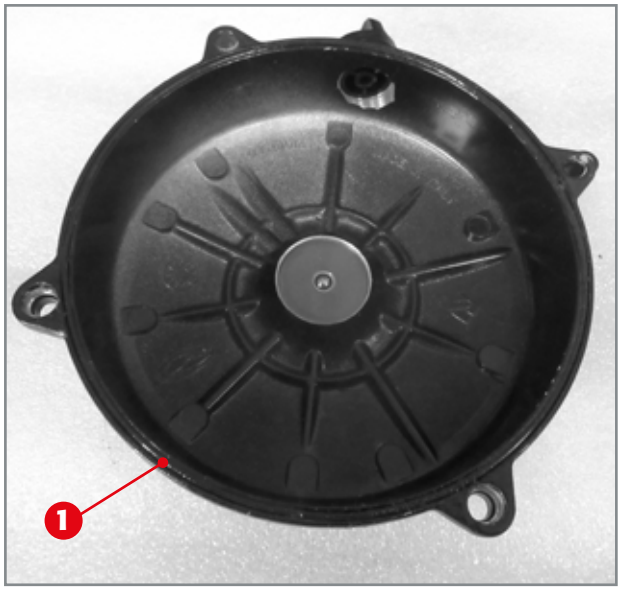
Apply screw **8** prior application of the medium strength thread locker and fasten to the indicated torque.

> ***Note**: to facilitate the tightening, keep the clutch unit blocked using the special tool **A** (code 035.14.000.80.00).*



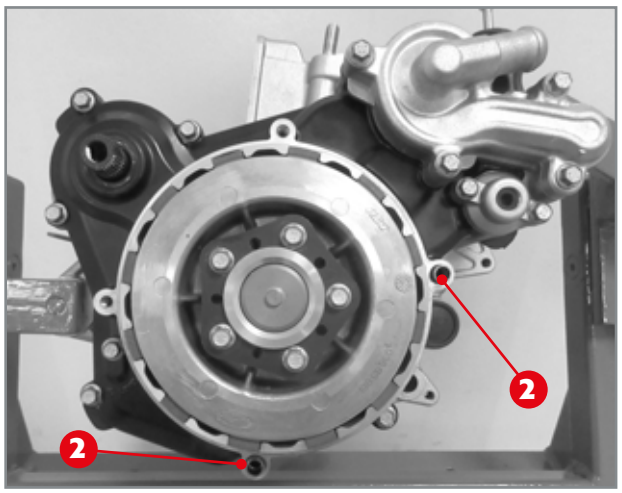

***Pump cover.***

After checking the correct insertion of the seal on the water pump cover, couple the water pump cover to the pump body by applying the two M6x60 **9** screws and the two M6x30 **10** screws. Fasten all screws at the indicated torque following a criss-cross pattern.

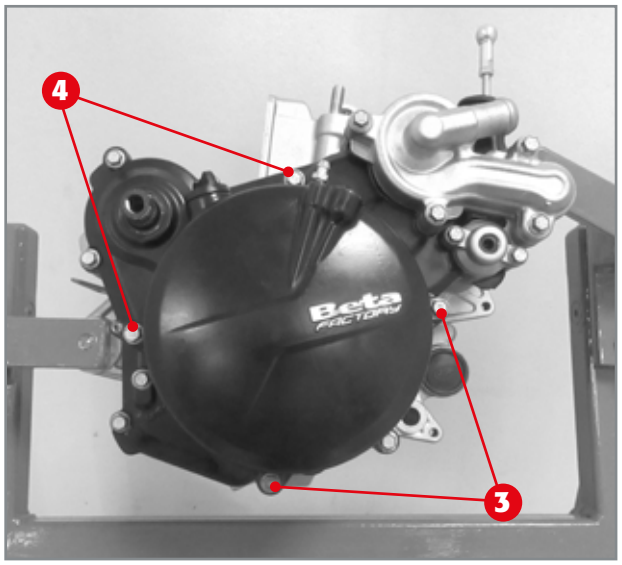



## 3.10 OUTER CLUTCH COVER COUPLING

Check the correct insertion of the sealing O-ring **1**.




Ensure the presence of the centring pins **2**.




Apply the outer clutch cover, screws **3** and **4** and tighten, with a criss-cross pattern, to the torque indicated in the table.

| Number screw | Screw size | | Thread locker application | Tightening torque [Nm] |
|---|---|---|---|---|
| | Threading diameter | Threading length | | |
| 3 | M6 | 50 | NO | 10 |
| 4 | M6 | 25 | NO | 10 |

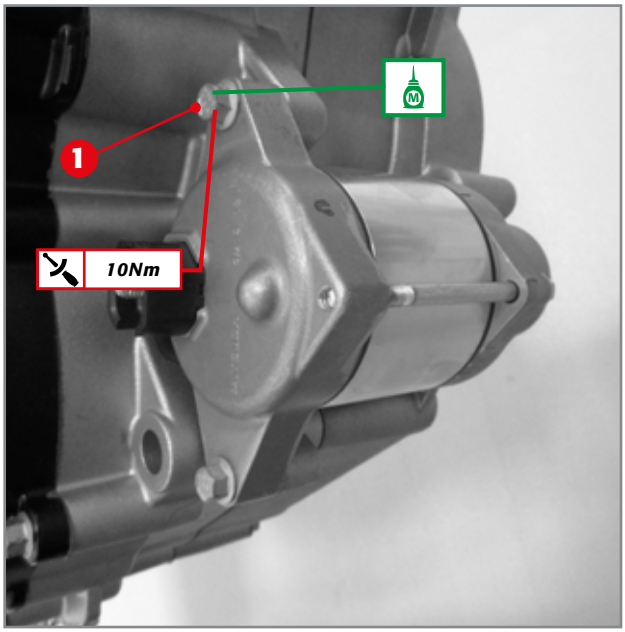
## 3.11 ELECTRIC IGNITION UNIT - ONLY RR200 -

Carry out the following checks before assembly.



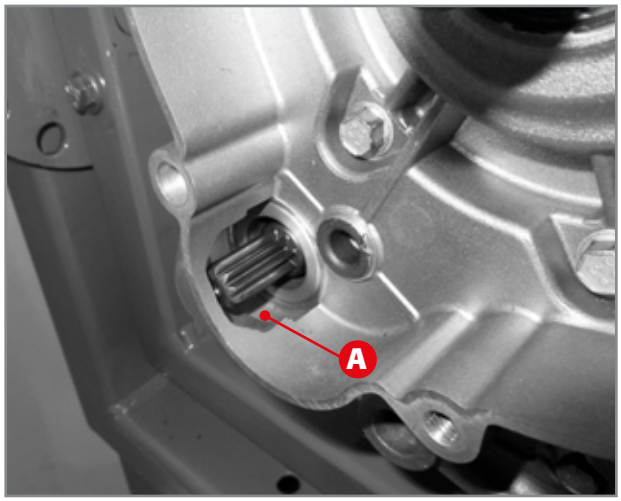

### 3.11.1 Bendix coupling checks

Check wear of the gearwheels found 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 seizing.
When releasing the mobile coupling, it must go back to rest position without seizing.
Replace the whole unit if abnormalities are observed during these two checks.

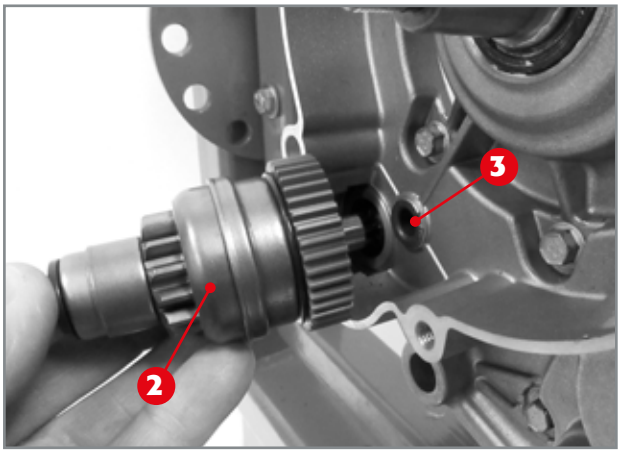



### 3.11.2 Ignition unit coupling to engine

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




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** found on the outer side left crankcase half.

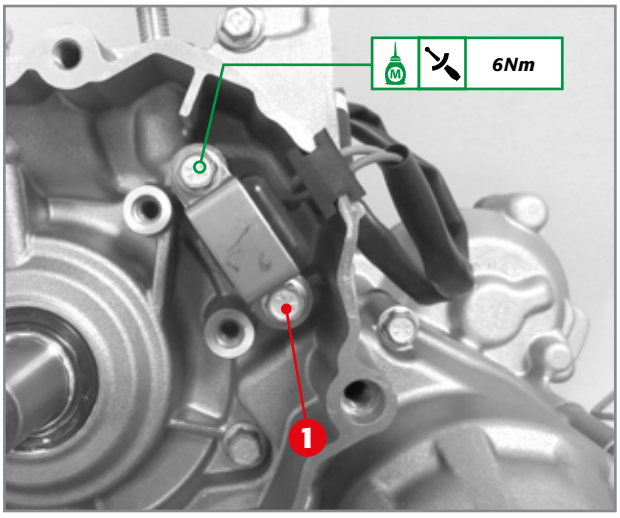
## 3.12 IGNITION SYSTEM

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

### 3.12.1 Check of ignition system

Accurately degrease the various elements and carry out the checks.
The main check is the one concerning the electrical inspection which can be done by using a standard tester. The measured strength values must comply with those in the table.

| Element | Cables | strength values |
|---|---|---|
| Pick-up unit | Red – Green | 100Ω ± 20% |
| Stator | Red/Black – White/Red | 14.7Ω ±15% |
| | Yellow – Mass | 0.61Ω ±15% |
| | Yellow – White | 0.18Ω ±15% |

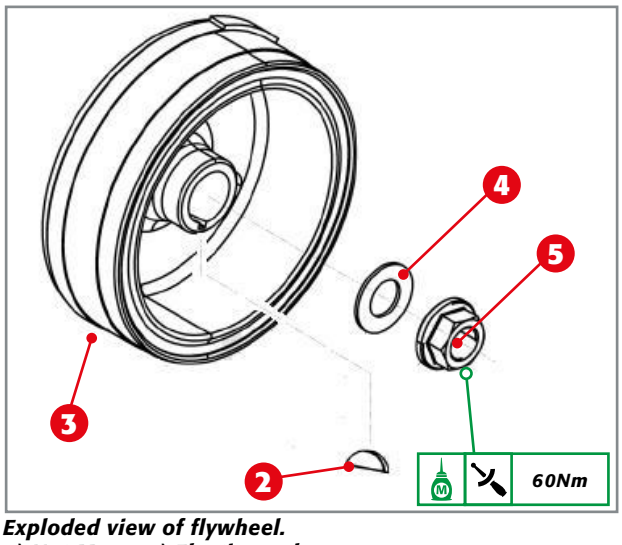


*Coupling of pick-up to crankcase.*

### 3.12.2 Coupling of ignition system to crankcase

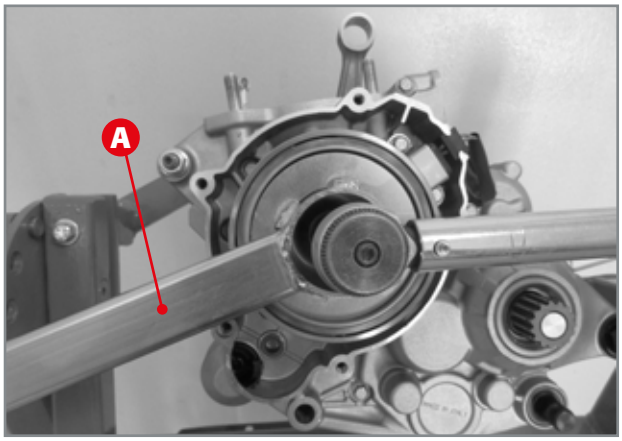
Apply the pick-up to the crankcase by inserting the gasket in the specific seat, prior application of the isolating silicone paste.

Cover the two screws **1** with medium strength thread locker and tighten them at the torque indicated.



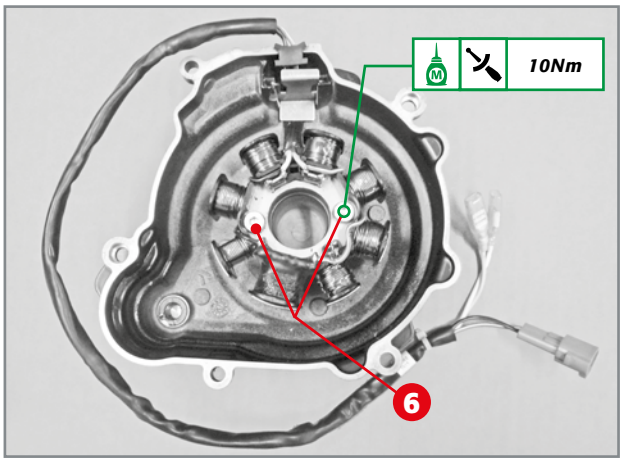
*Exploded view of flywheel.*
*5) Nut M12x; 4) Elastic washer;*
*2) Woodruff key; 3) Flywheel.*

Thoroughly degrease the crankshaft conical section, apply the Woodruff key **2** in the appropriate groove on the crankshaft, couple the flywheel **3**, the elastic washer **4** and the nut **5**, after spreading the threading with medium strength thread locker.



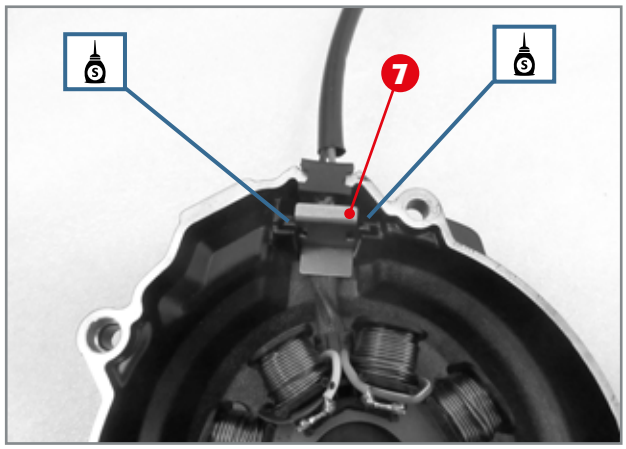

*Flywheel fastening.*

Fasten the nut to the torque indicated, keeping the flywheel blocked with special tool **A** *(code026.14.005.50.00)*.



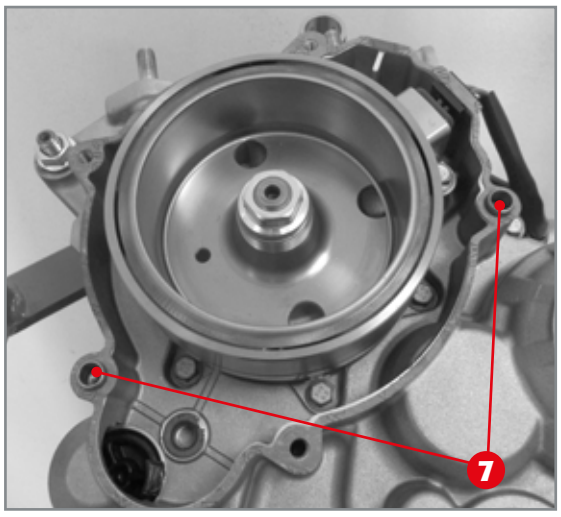

*Stator coupling to the flywheel cover.*

Couple the stator to the flywheel cover by means of the two screws **6**. Cover the threading with medium strength thread locker and tighten them at the torque indicated.
Insert the cable gland in its specific seat and check its perfect tightness.



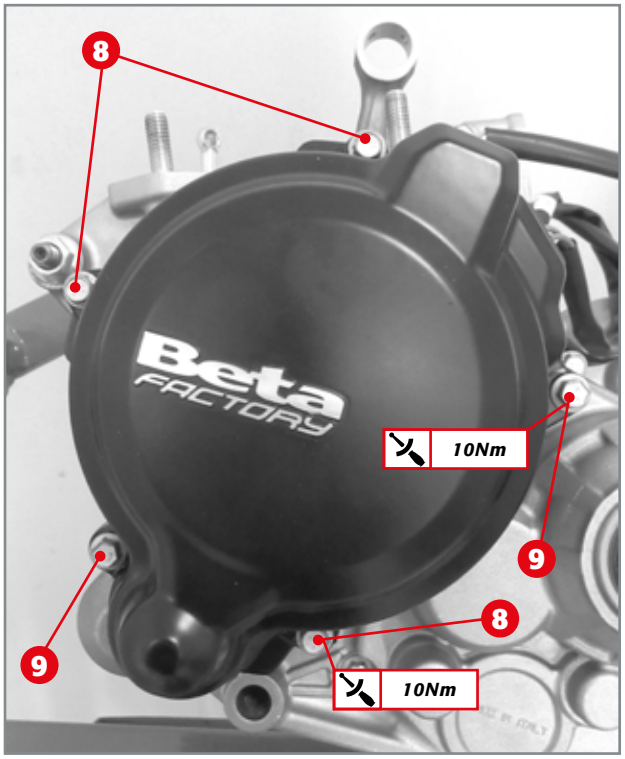

*Application of stator plate.*

Apply a few drops of silicone in the guides for housing the plate **7**. Apply the plate **7** to be inserted in its guides and pressed.




*Application of flywheel cover centring pins.*

Insert the centring pins **7** on the crankcase and fasten a new gasket.




***Flywheel cover coupled to crankcase.***

Apply the flywheel cover, the three M6x20 screws **8** and the two M6x25 screws **9**. Tighten in a criss-cross pattern to the torque indicated.

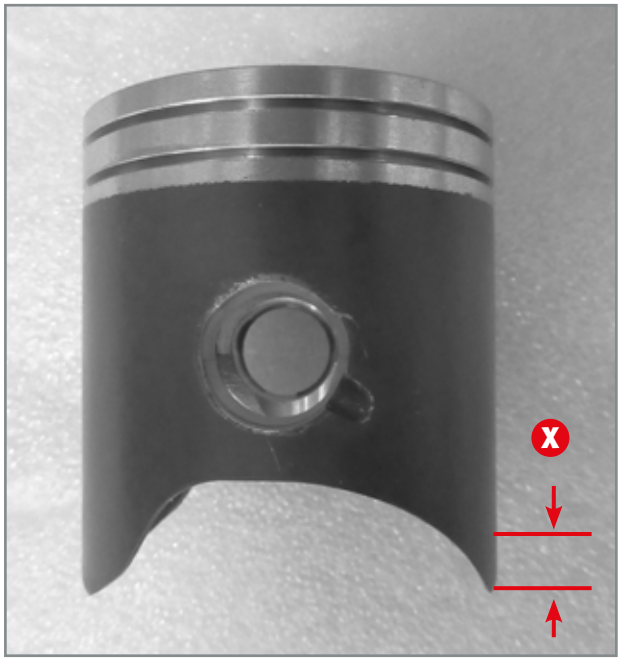
> ***Note:*** *When performing a complete overhaul of the engine or intervening on the thermal unit, do not apply the cover as it has to be removed to find the Top Dead Centre.*

## 3.13 POWER UNIT

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

### 3.13.1 Check of the piston and elastic bands

Remove carbon 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.




*Position to measure the outside diameter of the piston.*

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

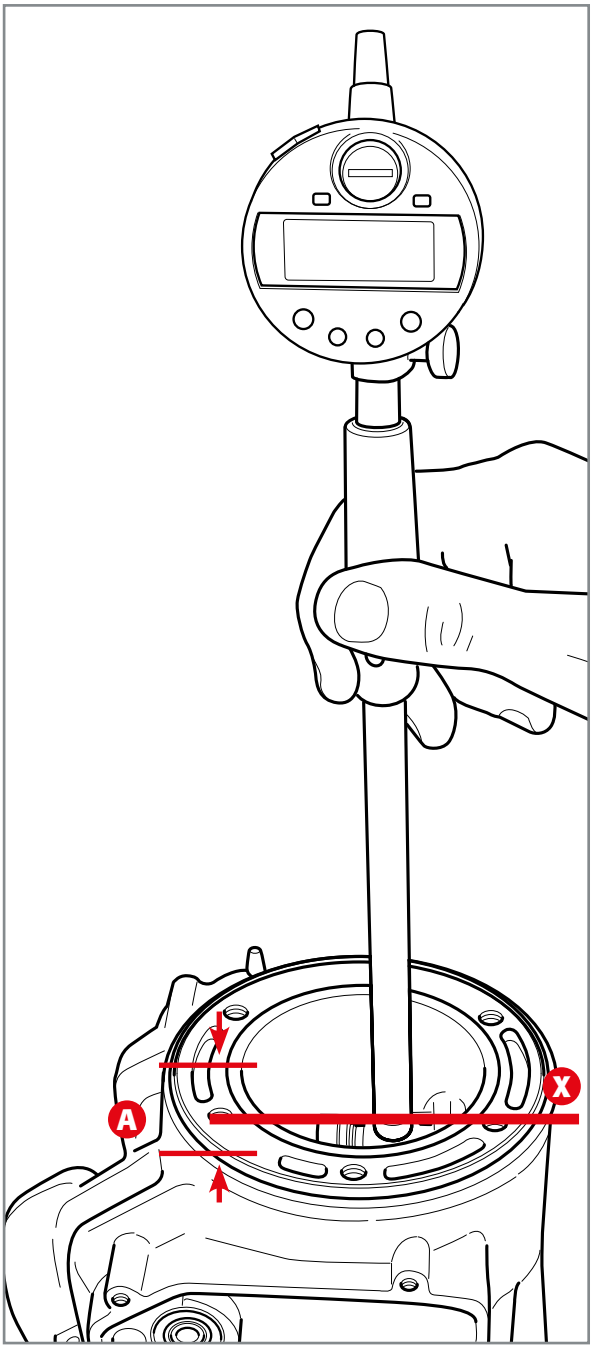
| Displacement [cm³] | Measurement X [mm] | Bore [mm] | | |
|---|---|---|---|---|
| | | A | B | C |
| 125 | 18 | 53.945-53.954 | 53.955-53.964 | 53.965-53.975 |
| 200 | 21 | 61.965-61.974 | 61.975-61.984 | 61.985-61.995 |



*First check of elastic bands.*

In order to check the condition 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 ends.
The elastic bands must be positioned at about 6mm from the cylinder's upper edge.
The respective service limits are set out in the table below.

| Displacement [cm³] | Service limit of elastic band [mm] |
|---|---|
| 125 - 200 | 0.2 |




## 3.13.2 Cylinder check

Check the cylinder is without signs of seizure. Otherwise 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**.

| *Displacement [cm³]* | *Measurement A [mm]* |
|---|---|
| *125* | *24,3* |
| *200* | *35* |

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



*Cylinder class punching.*

The cylinder's specific class is punched inside the valve control compartment.

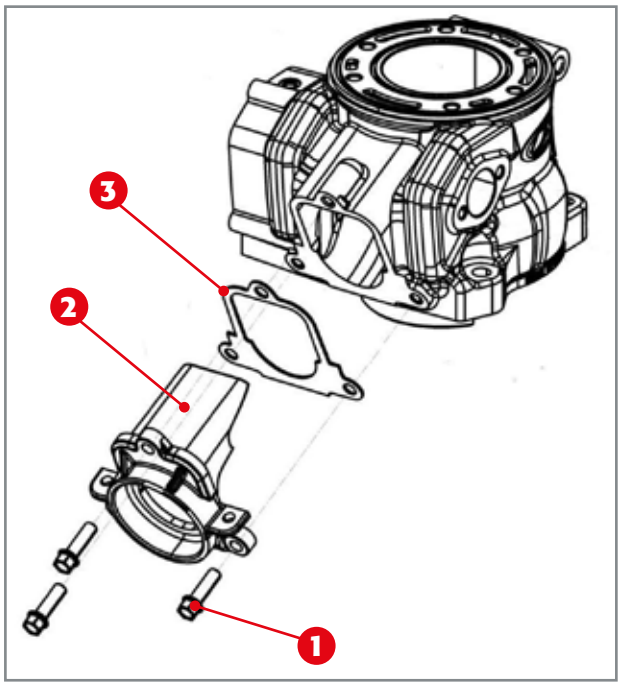
## 3.13.3 Piston cylinder coupling play

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

| Displacement [cm³] | Maximum piston/cylinder play [mm] | Minimum cylinder/piston play [mm] |
|---|---|---|
| 125 | 0.08 | 0.045 |
| 200 | 0.08 | 0.035 |

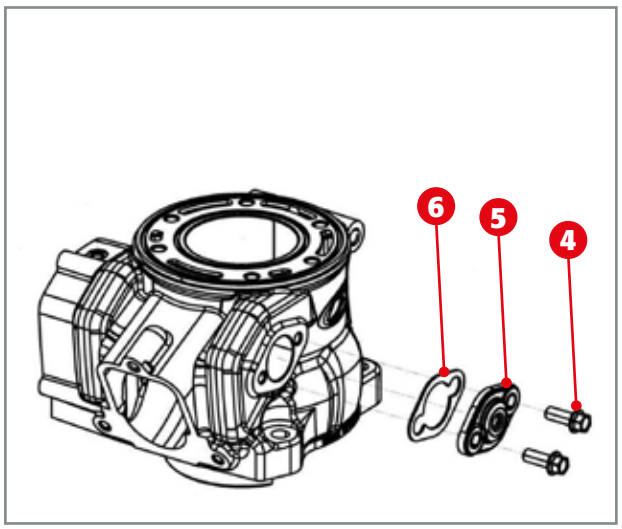
## 3.13.4 Exhaust valve unit disassembly and checks

Remove screws **1** to allow the exhaust flange 2 and its gasket **3** to be disassembled.

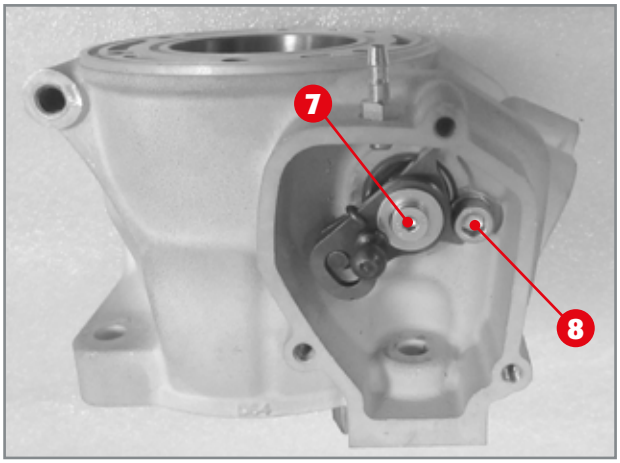



*Flange.*

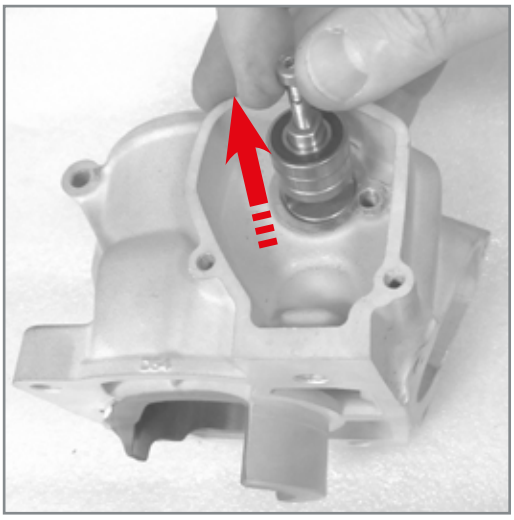
Remove screws **4**, cover **5** and related gasket **6**.




*Left side valve cover.*



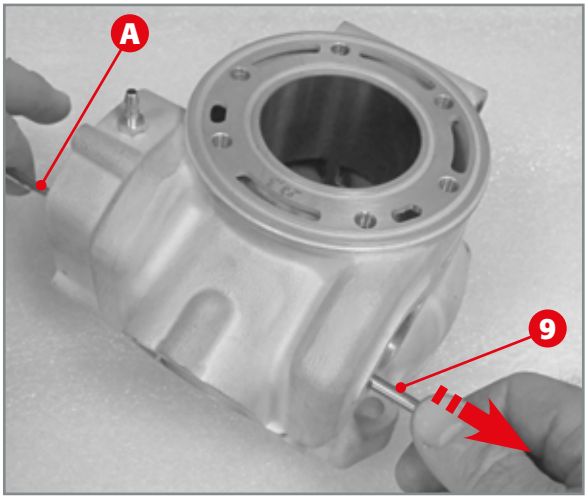

Remove screw **7** fastening the valve control unit to the booster; then remove screw **8** fixing the bearings.



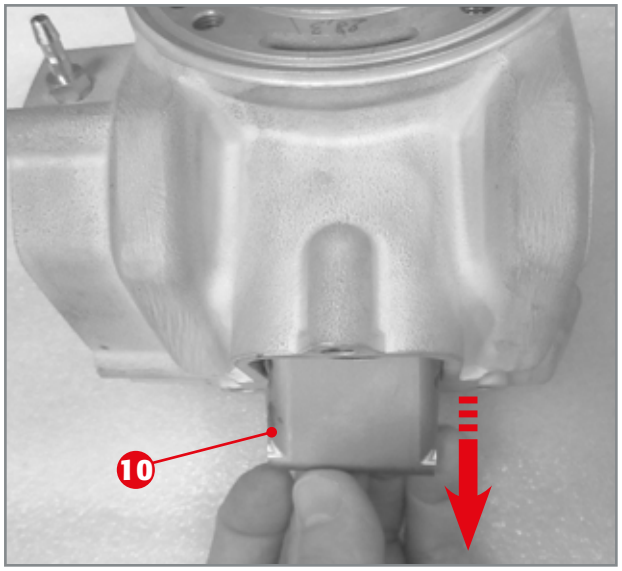
Apply one control unit side **M5** screw and pull externally.

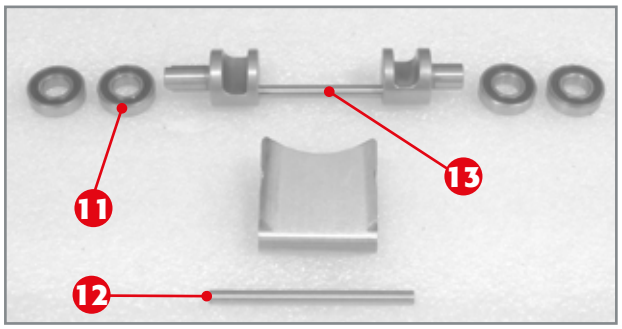


Repeat the operation from the opposite side using one **M6** screw.



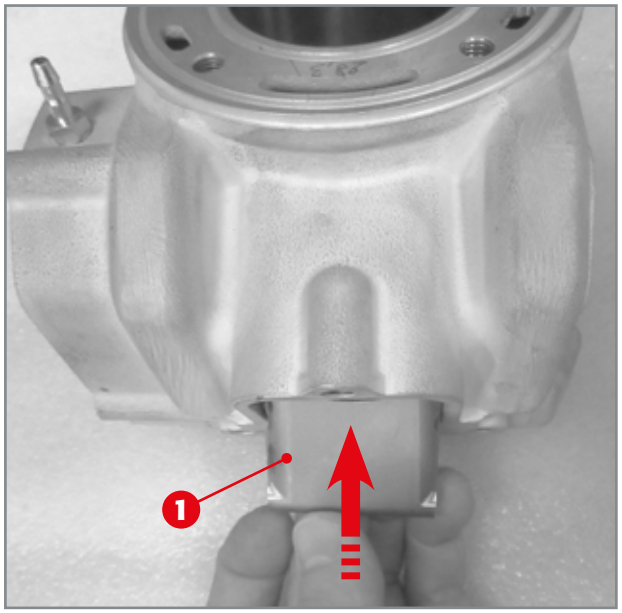

After extracting the boosters and related pin, extract the valve pin **9** by pushing it with a metal cylinder **A** and then extract valve **10**.



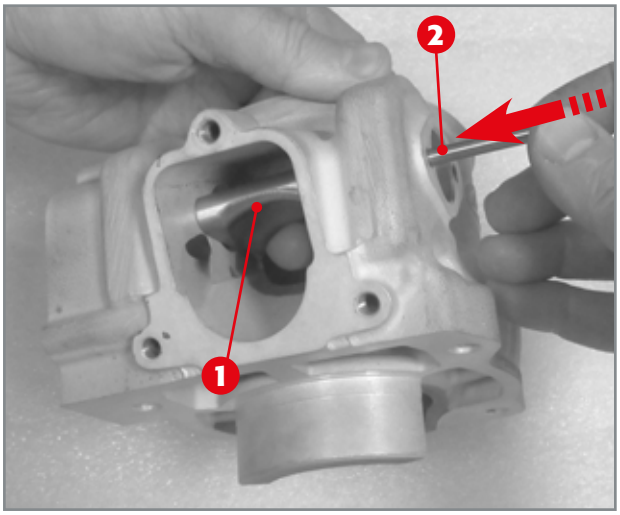

Check the bearings **11** supporting the booster are efficient, without seizing during operation or excessive play, once the assembly has been cleaned and descaled. Otherwise replace.
Check pins **12, 13** and their seats are not abnormally worn. Otherwise replace the worn parts.

Descale all passages involving the exhaust. Absolutely avoid the use of abrasives.

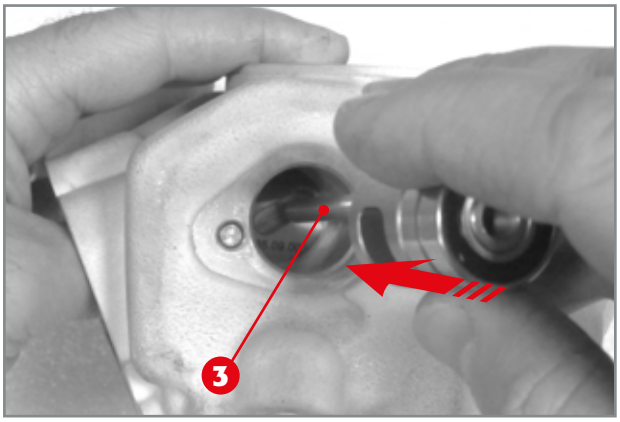



### 3.13.5 Exhaust valve unit assembly

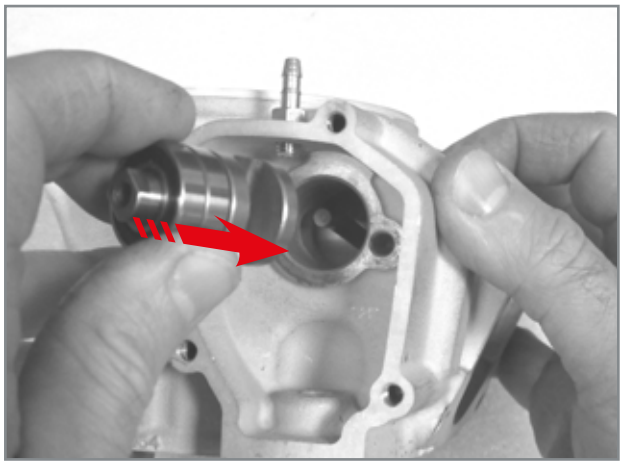
Insert valve **1** in its seat with the back facing upwards.



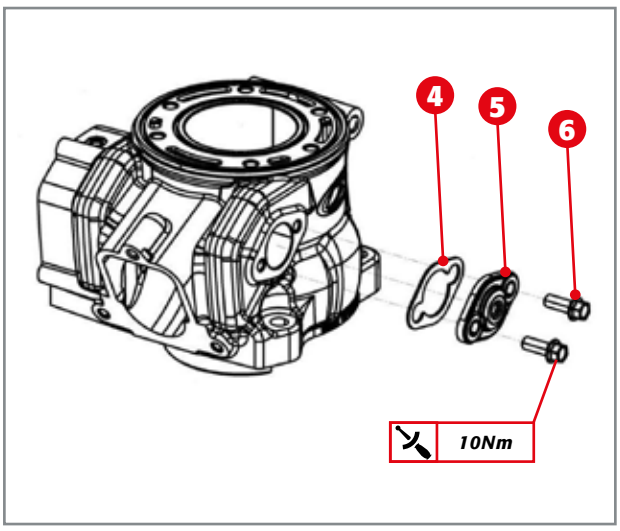

Insert pin **2** while holding valve **1** in position.



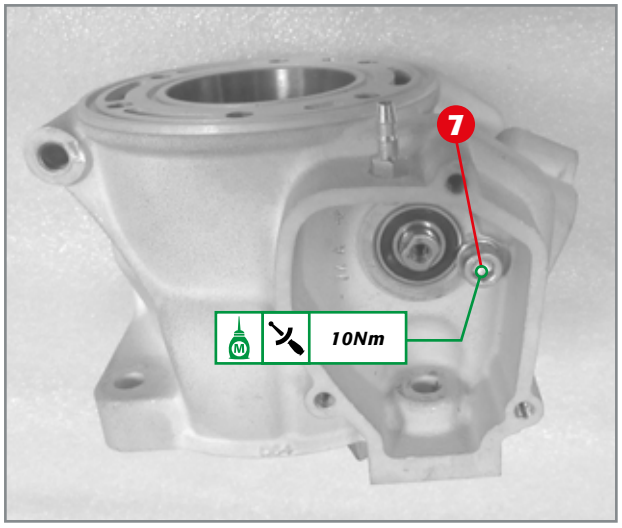

Apply the left side booster unit complete with pin and bearings in its seat: pin **3** must be inserted in the specific slot in the valve.



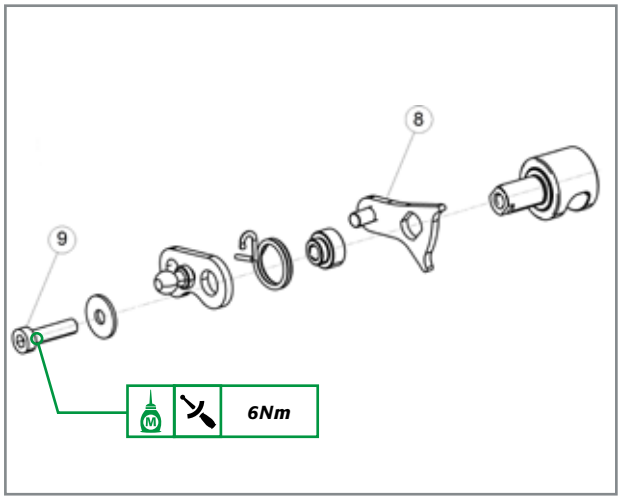
Apply the right side booster unit in its seat.




Apply gasket **4**, cover **5** and screws **6**. Tighten to the specified torque.

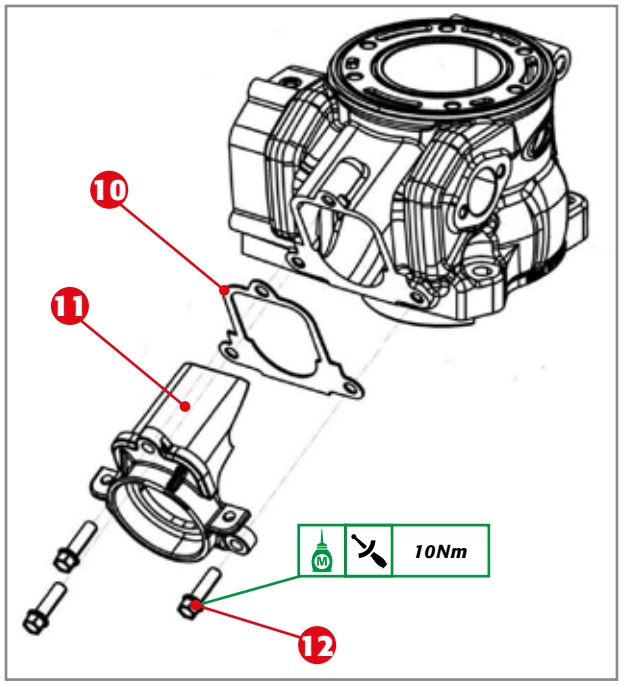



Apply screw **7** complete with the washer after applying medium-intensity thread locker and tighten at the specified torque.




*Valve control.*

Apply the stroke end lever **8** on the control side. Then apply all other parts.
Screw **9** must be covered with medium strength thread locker and fastened to the indicated torque.
Try moving the assembly and check the entire mechanism slides perfectly, once assembly is completed.



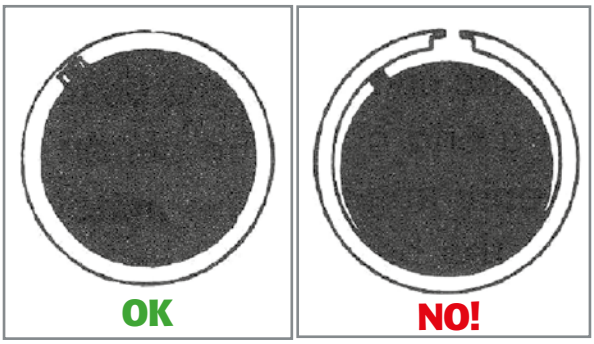

*Flange.*

Apply gasket **10**, flange **11** and screws **12**. Tighten to the specified torque.

## 3.13.6 Piston, elastic bands, pin bolt and cylinder assembly

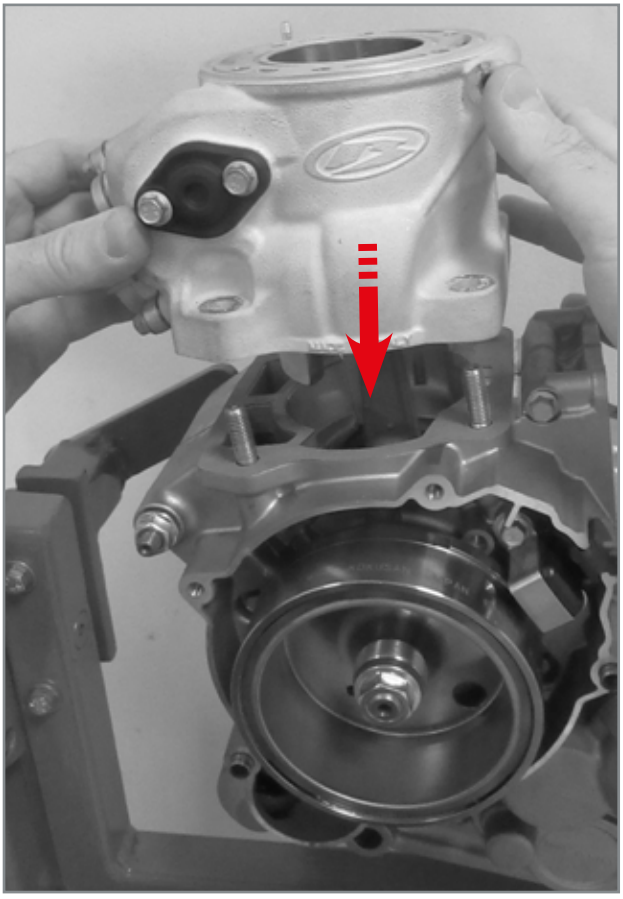
Insert a circlip for retaining the pin bolt in one of the seats on the piston's side, placing the circlip open part either upwards or downwards.
Apply the roller cage in the connecting rod's foot, and lubricate it.
Oil pin bolt and seat in piston. Insert the pin bolt in the piston from the side opposite where the circlip was inserted, leaving enough space to allow the connecting rod to mate with the piston.
Place the piston so that the arrow stamped on the crown is facing the front of the engine (exhaust opening). 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.

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



***Positioning of elastic bands on the piston.***

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

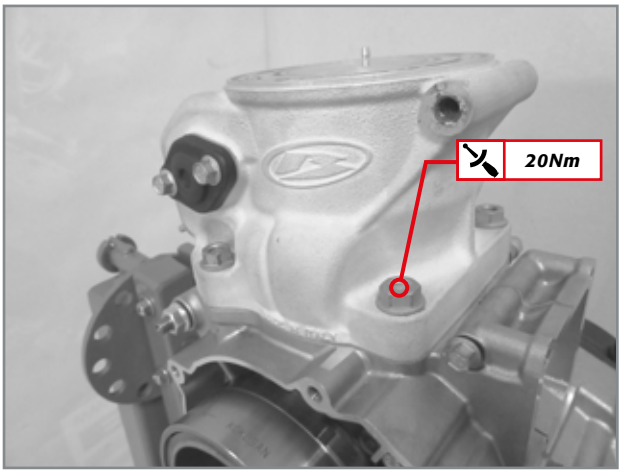


*Coupling of cylinder to piston and crankcase.*

Apply the gasket between crankcase and cylinder.

> ***Note:*** *keep the silicone edge facing the crankcases.*

Accurately oil the entire cylinder using engine oil and insert the piston in the cylinder. The piston must be inserted in the cylinder while holding the elastic bands with one's fingers tightly. The cylinder must be positioned so that the exhaust gap is facing the front of the engine.
Push the cylinder towards the crankcase.




*Tightening of cylinder nuts.*

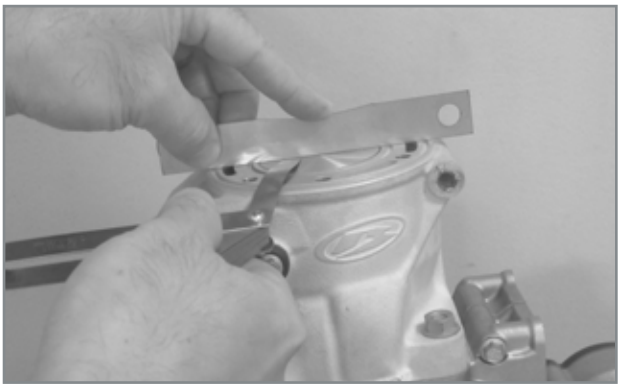
Apply the four collar nuts and fasten them to the indicated torque, following the cross pattern.

## 3.13.7 Check of crankcase/cylinder gasket thickness

The thickness of the gasket between cylinder and crankcase must be checked every time the following are replaced:
- Cylinder;
- Piston;
- Crankshaft;
- Connecting rod;
- Crankcase.

The check is necessary as said thickness affects engine performance. The check must be carried out using the specific calibrated plates set out in the table.
For this check, it is necessary:
- to remove the flywheel cover (Par. 2.4.1)
- to move the piston to the top dead centre, using the flywheel.

| Displacement [cm³] | Model Year | Code | Side |
|---|---|---|---|
| 125 | 2020 | 007.44.010.00.00 | B |
| 200 | 2020 | 035.14.009.00.00 | A |



*Case where the plate and piston do not touch: check distance between plate and piston.*

The use of the plates is described below.
- Place the specific plate making sure it comes into contact with the cylinder's upper surface.
- Move the piston to top dead centre and, using a thickness gauge, check the play between piston and plate is between 0-0.025mm.

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

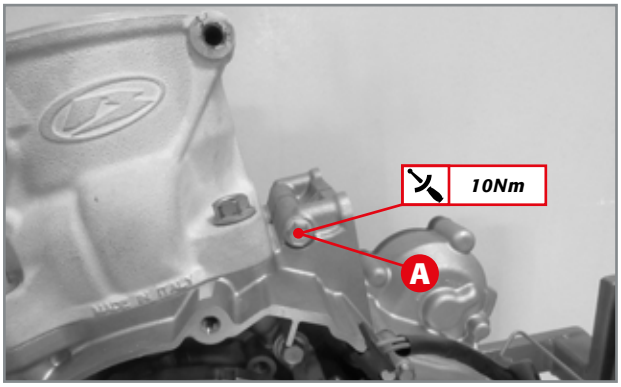


*Case where the piston pushes the plate causing cylinder/plate contact to be lost*

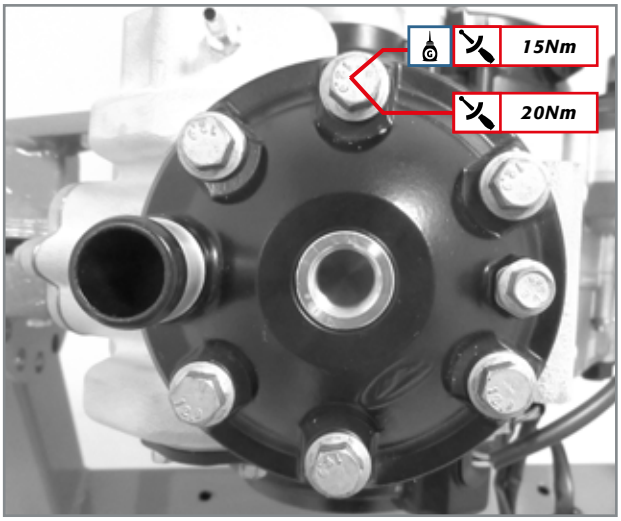
Measure the play with a thickness gauge if the piston pushes the plate upwards, causing contact to be lost between plate and cylinder: if the play is greater than 0.025, the thickness of the cylinder/casing gasket must be increased and the check must be done again.

The gaskets are supplied in different thicknesses that can also be stacked, thus obtaining the required 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.*




At the end of the operation:
-tighten the crankcase screw **A** to the indicated torque;
-reassemble the flywheel cover *(*Par. 3.12.2*).*

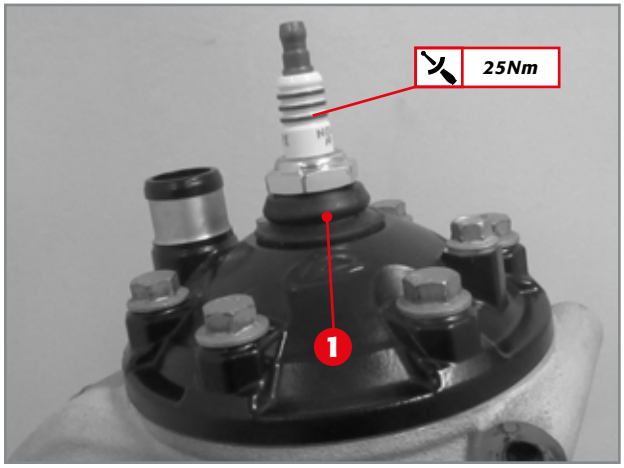



*Tightening of head.*

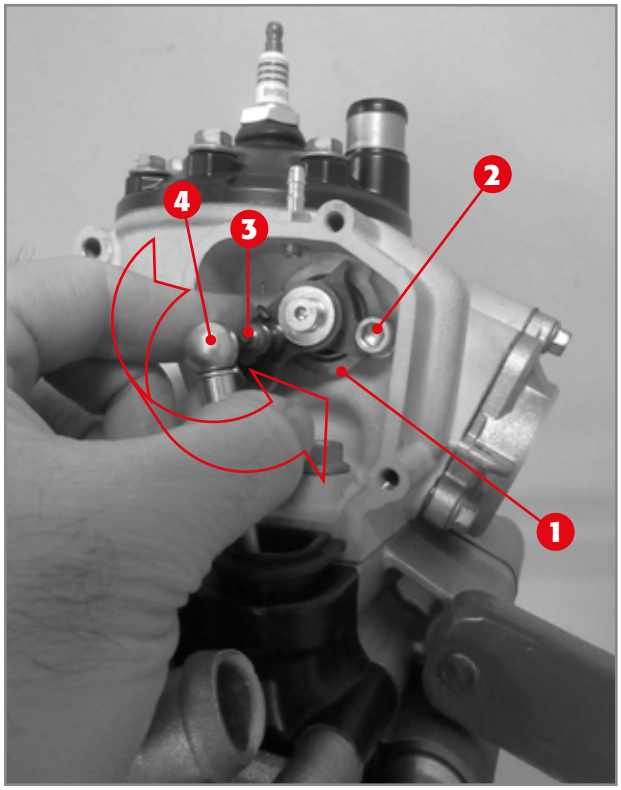
## 3.13.8 Head application

Apply the two O-rings to the cylinder. Place the head so that the 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 cross pattern, tighten in two steps:

1. 15Nm;
2. 20Nm




Apply the spark plug complete with gasket **1** and tighten to the indicated torque.

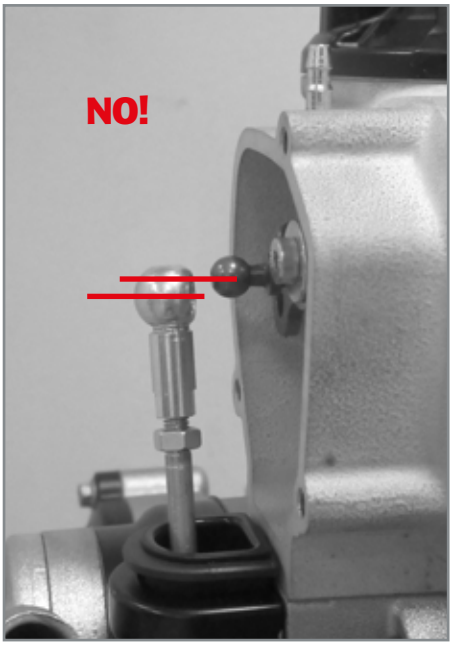


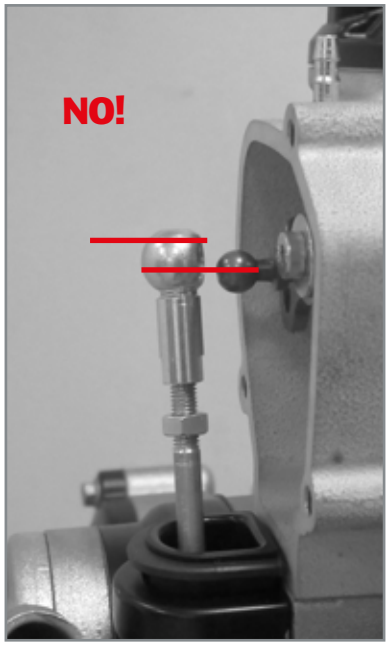

*Positioning of valve control.*

## 3.13.9 Exhaust valve adjustment

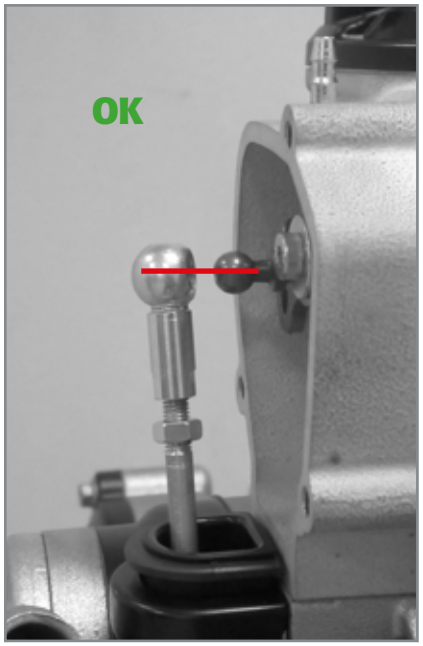
Bring the valve control unit **1** in the fully closed position, so the stroke end lever is flush with screw **2** fixing the booster bearings.

Check that 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.

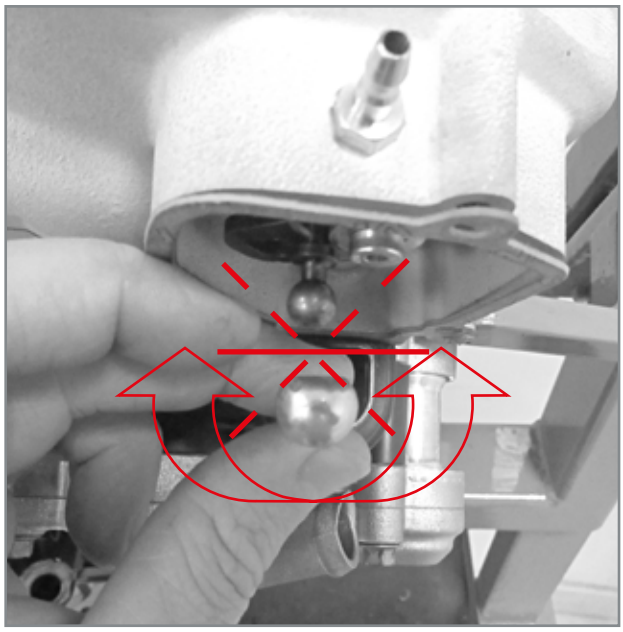



*Incorrect positions of the control rod seat.*

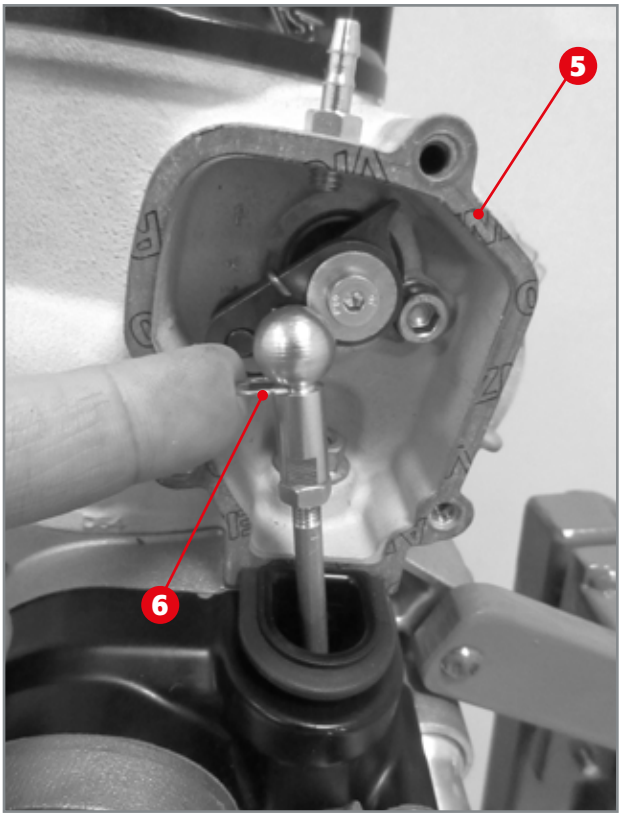



*Correct position of the control rod seat.*



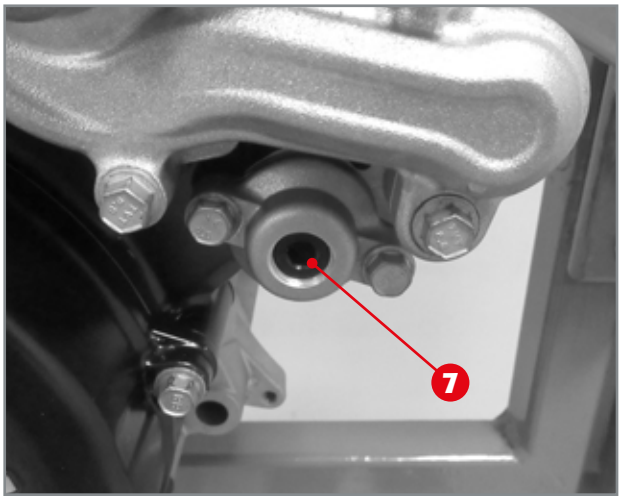
*Check of control rod rotation.*

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



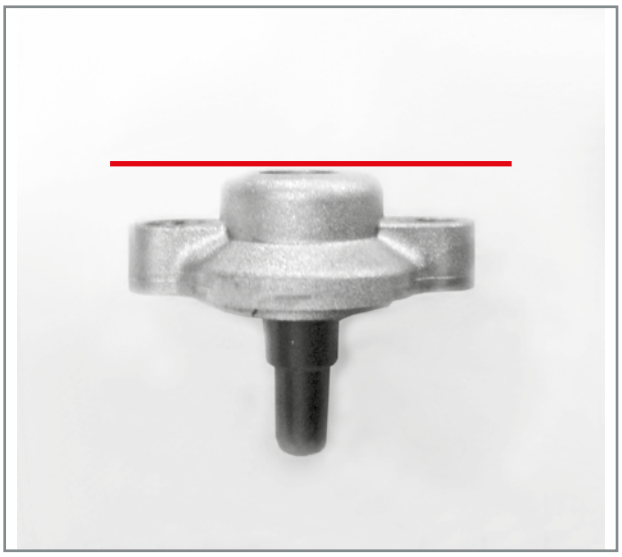

*Insertion of control rod and application of stop.*

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




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 table below are those considered optimal for engine operation.

| *Displacement [cm³]* | *Setting the adjustment screw (from all open)* |
|---|---|
| *125* | *1+3/4* |
| *200* | *1* |



*Fully open reference.*

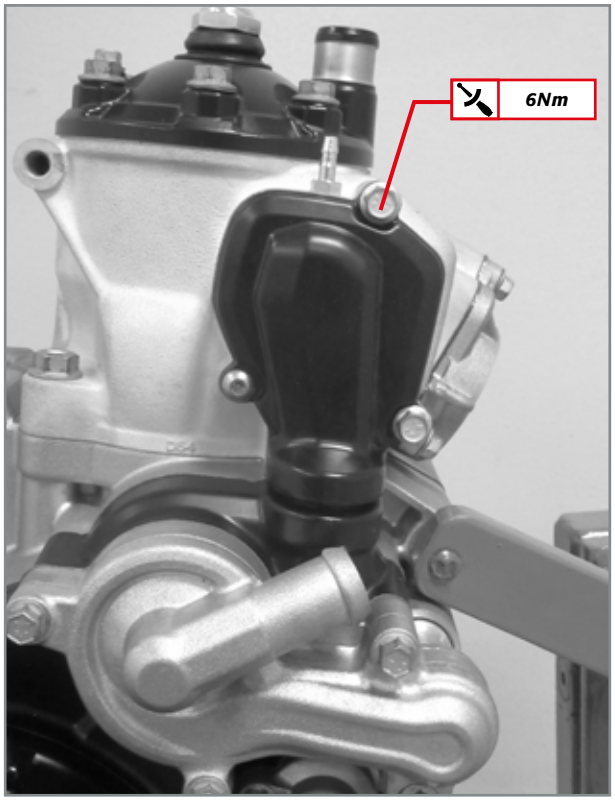
The "fully open" position is for perfect alignment between adjustment screw head and adjustment cover.
Adjustment must, therefore, be carried out as follows.

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

The table shows the effects obtained from modifying the position of the adjustment screw with respect to the positions in the above 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 |

***WARNING!***
*Do not tighten the adjustment screw for more than three and a half turns from the all open position.*



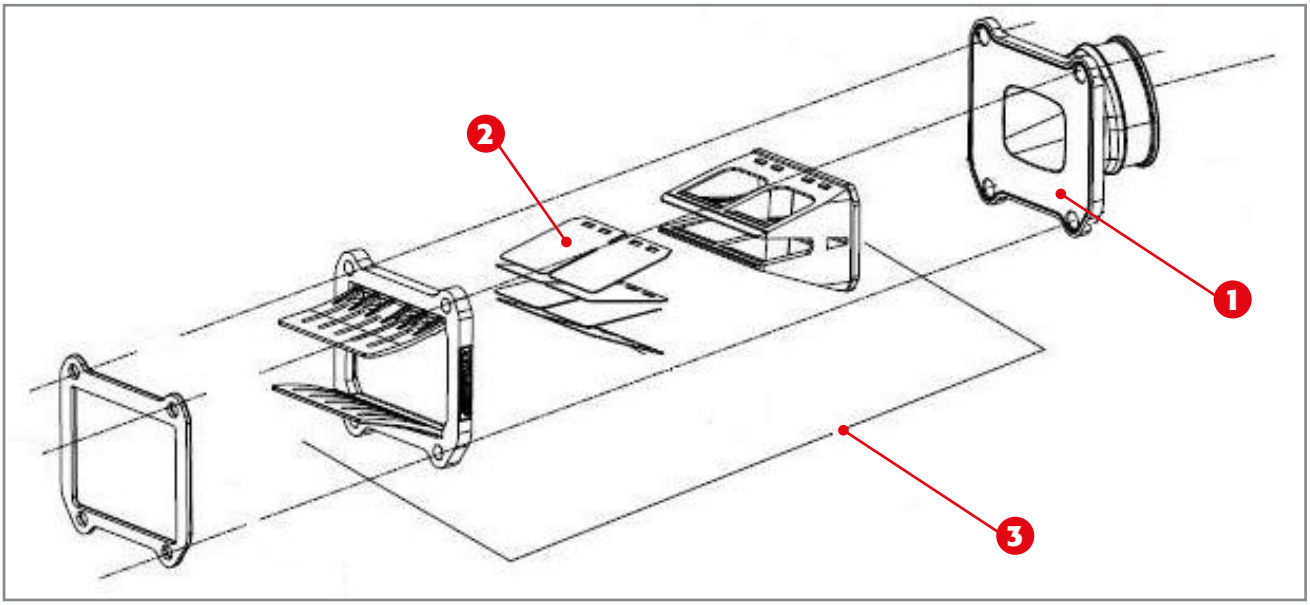

***Application and tightening of valve control unit cover screws.***

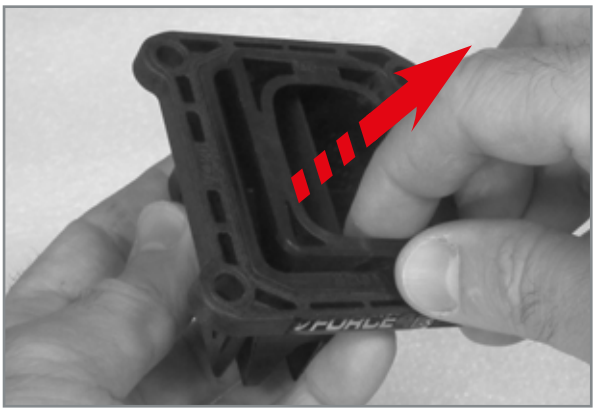
## 3.13.10 Cover plate application

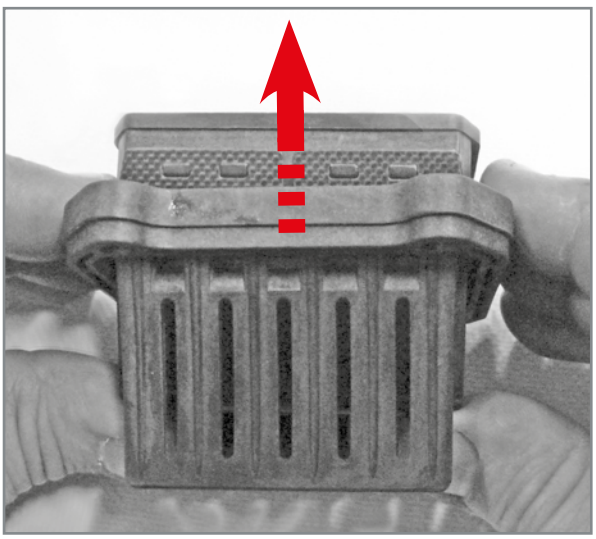
Apply the valve control unit cover and relative screws. Tighten to the specified torque.

## 3.14 CHECK OF INTAKE UNIT AND ASSEMBLY

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

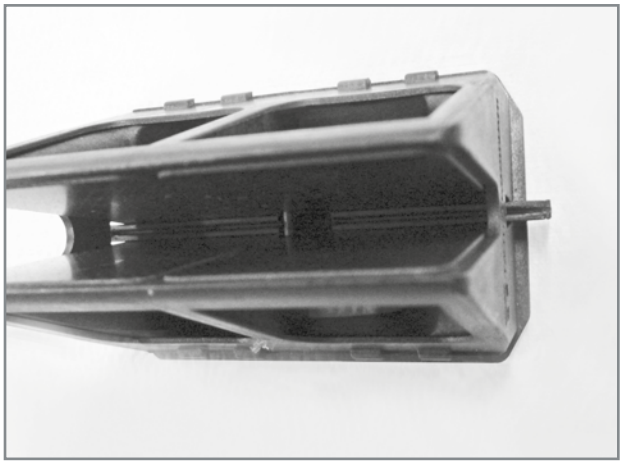




***Disassembly of reed valve body.***

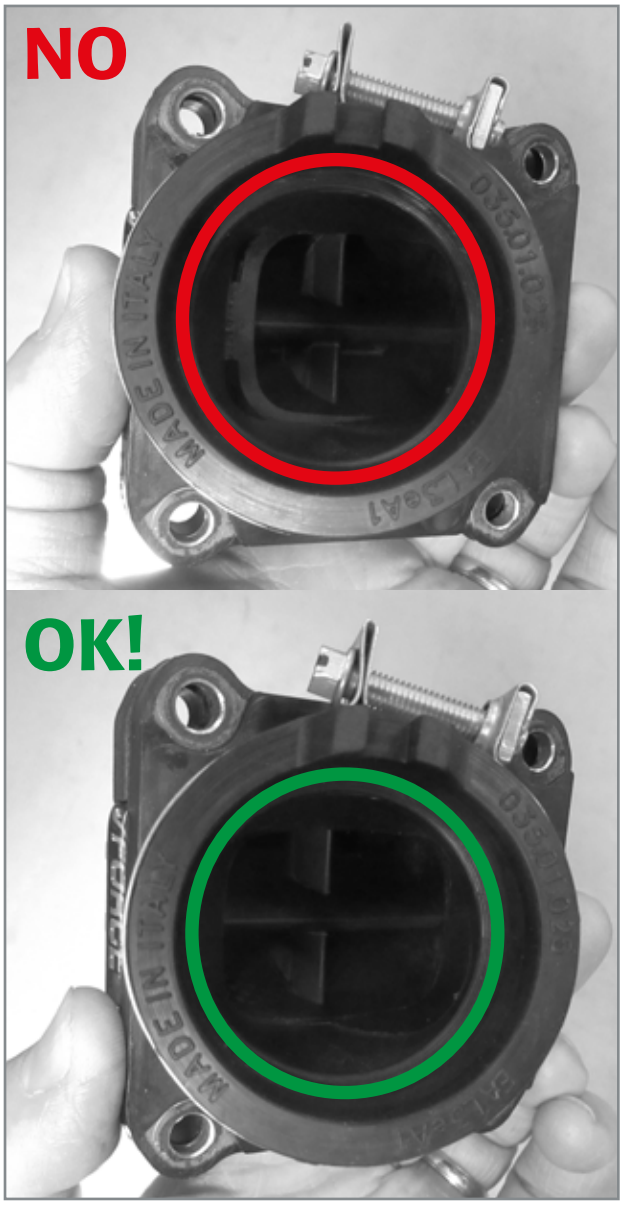
To disassemble the multiflap:
-remove the flow guide;
-press the central body as shown in the figure;
-remove the outer multiflap.



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

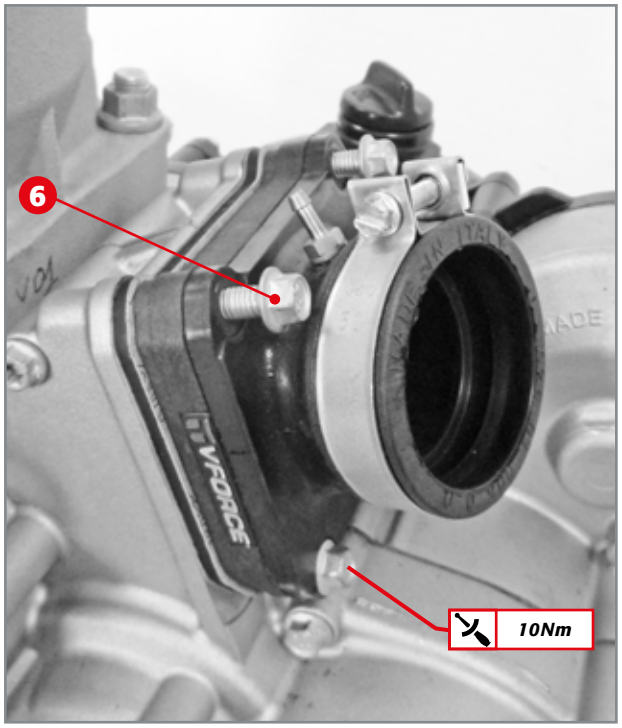
Remove the two central wedges and remove the multiflap.

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

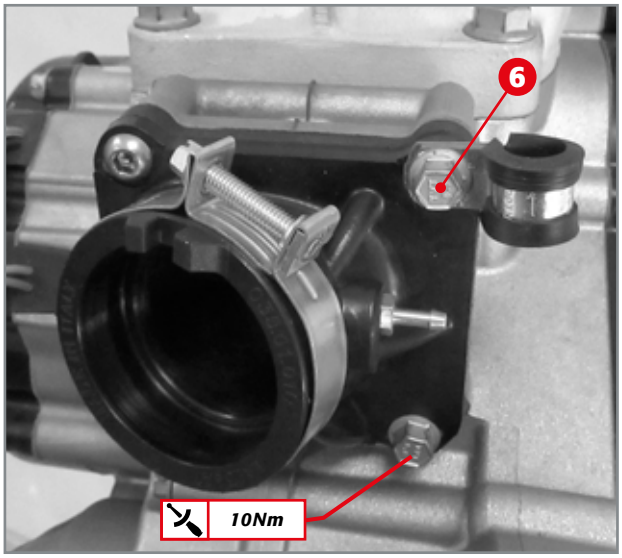



***Flow guide positioning.***

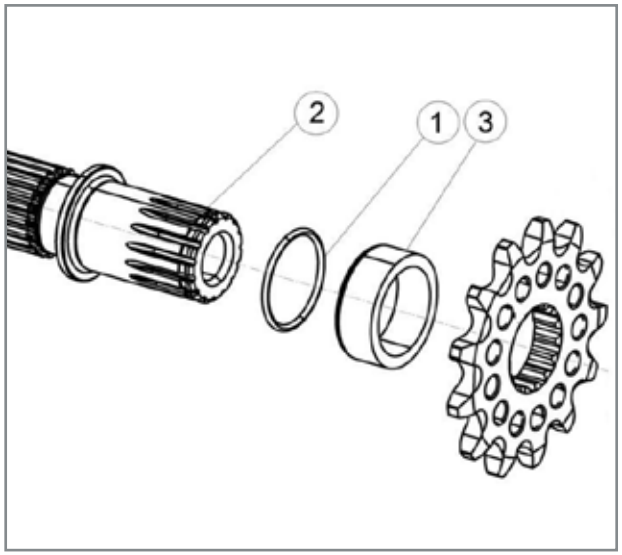
***ATTENTION!***
*The flow guide is asymmetrical. When reassembling, make sure that the flow guide, once coupled with the manifold, is centred.*




*Application of reed valve.*



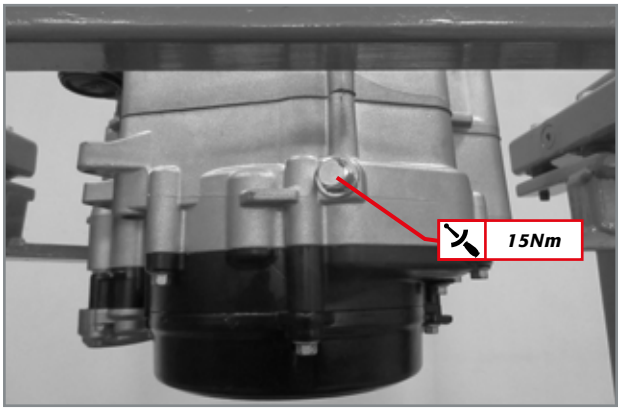

To assemble the whole intake system, apply the manifold to the reed valve, the gasket.
Tighten the screws **6** to the indicated torque.




## 3.15 INSERTION OF PINION SPACER AND APPLICATION OF THE OIL EXHAUST CAP

Apply the O-ring **1** on the secondary shaft of the gearshift **2**, followed by spacer **3** so that the groove is facing inside the engine.

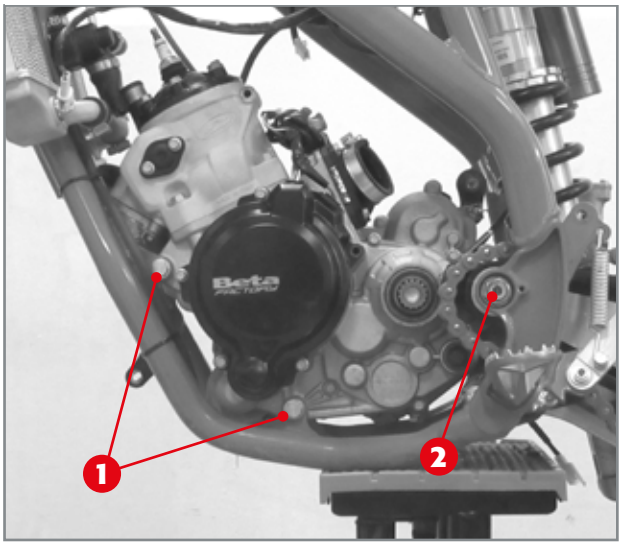
***Note:*** *remember to apply grease on the oil seal.*



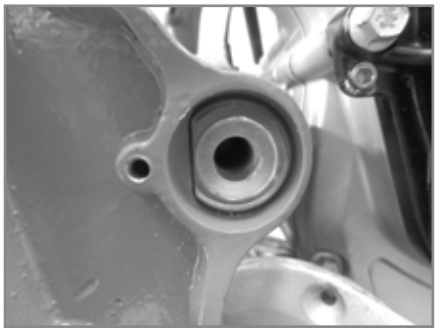

***Insertion of clutch rod.***

Apply the oil exhaust cap, making sure the related O-ring is present.
Tighten to the specified torque.

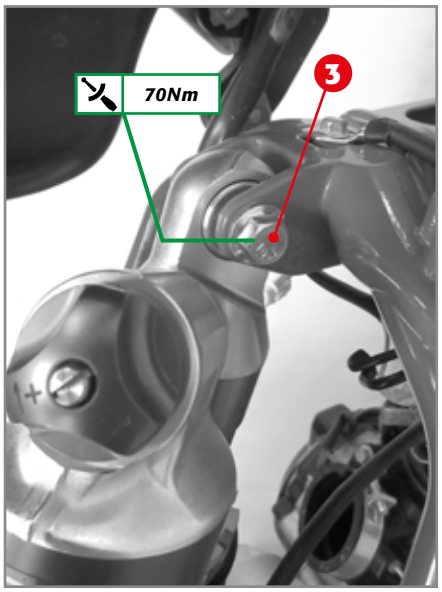
# 4 ENGINE REASSEMBLY IN THE VEHICLE



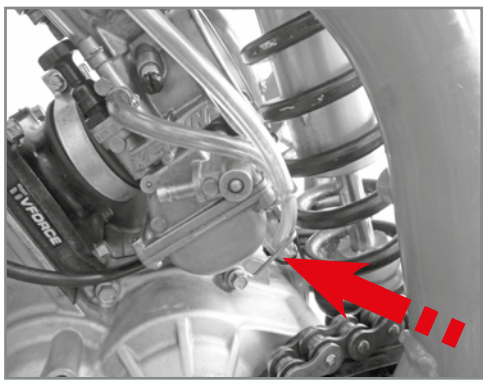

- Insert the engine in the frame. We recommend insertion from the frame's left side.
- Insert the engine pins **1** and the swingarm pin **2**.



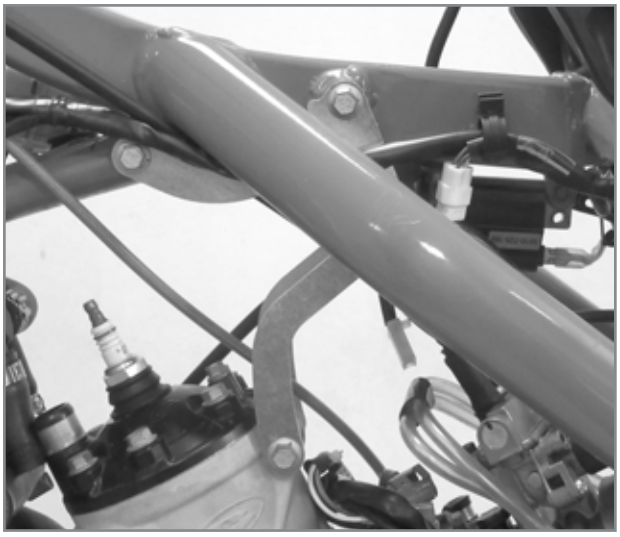
***Note:*** *pay attention that the notch on the pin head is aligned with the notch on the frame.*




- Insert the upper shock-absorber pin **3**. Fasten the shock absorber pin to the indicated torque.

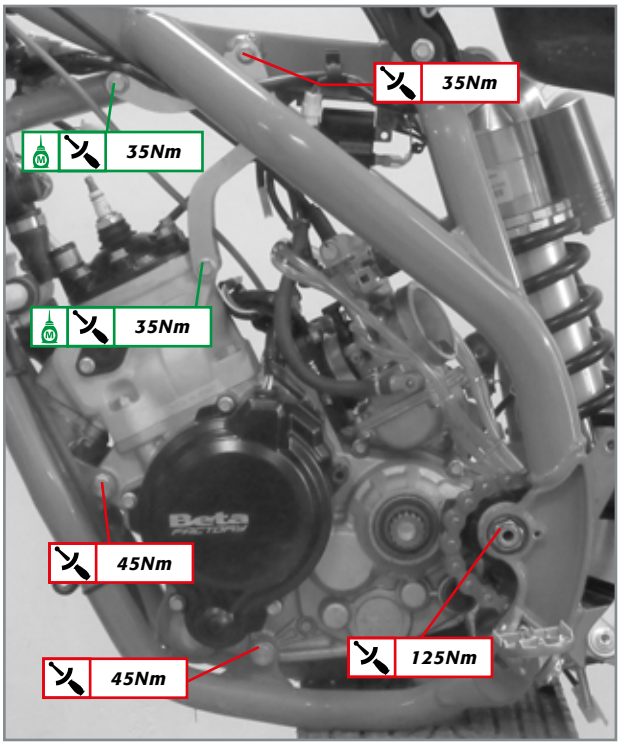


- Apply the carburettor to the manifold making the breather tubes pass in the appropriate metal cable gland.

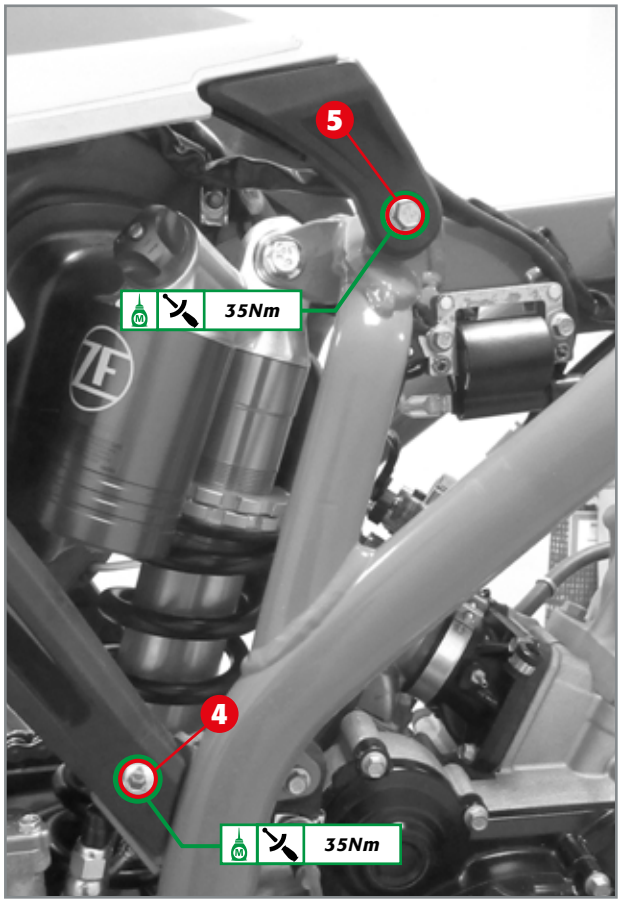




- Apply the head connections paying attention to feed the cables and clutch pipe as indicated in the figures.

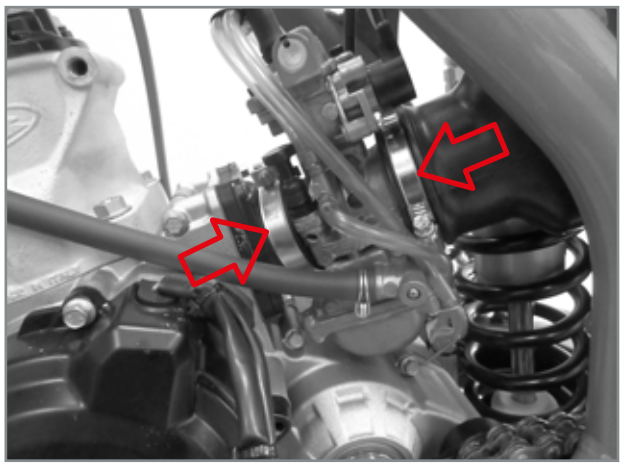



- Tighten the nuts and bolts as indicated in the figure, applying medium strength thread locker where indicated.

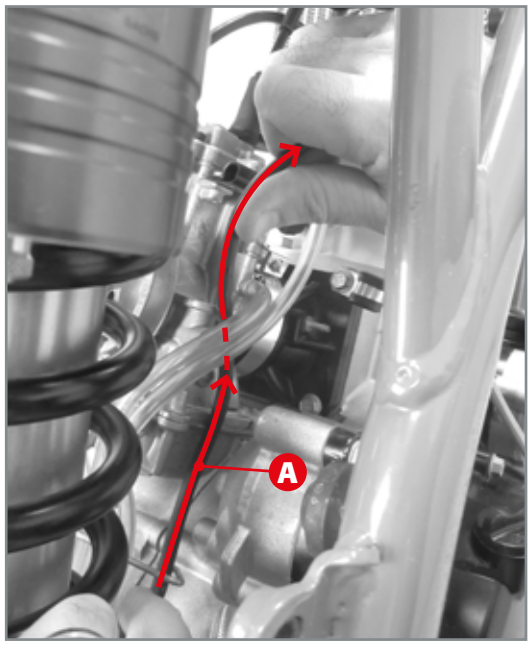



- Rotate the filter box in its normal position. Apply the lower fixing screws **4** (one each side) prior application of medium strength thread locker and fasten to the indicated torque. Tighten the upper screws **5** to the indicated torque.

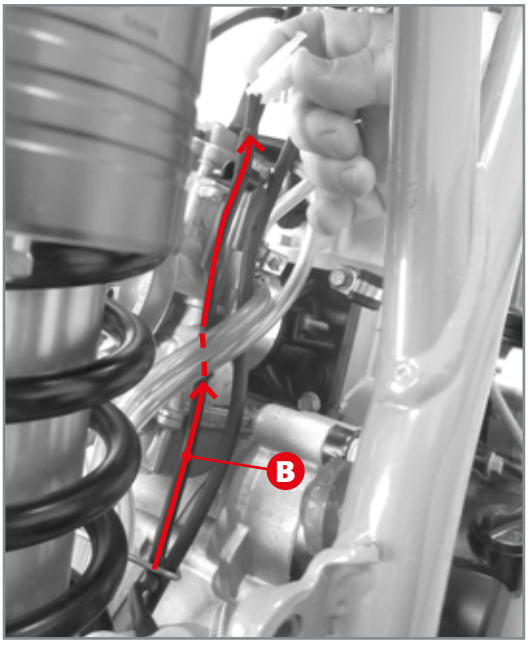
***Note:*** *We recommend removing the upper screws (one each side) and apply a medium strength thread locker.*



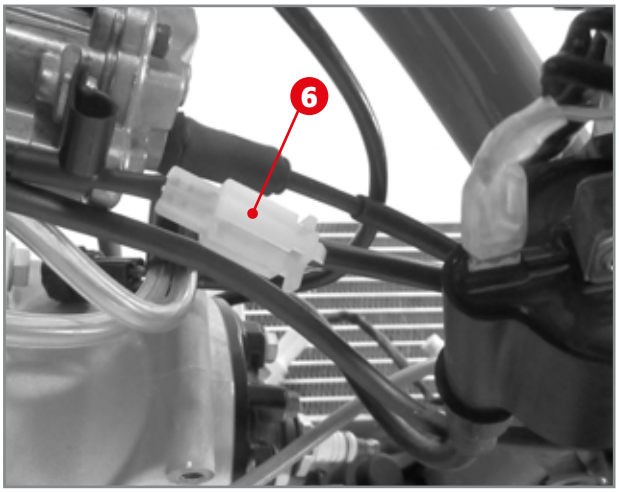
- Make sure the filter box sleeve is correctly inserted inside the carburettor, fasten the two filter box side and manifold side straps.



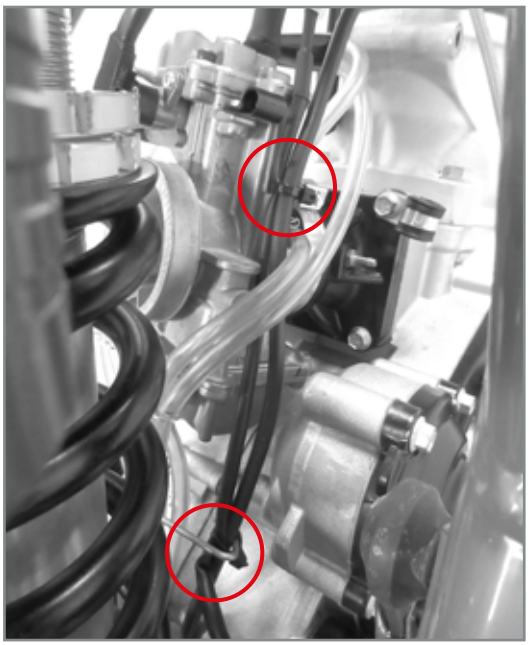

- Only on 200 feed through the starter motor cable **A** behind the carburettor breather tubes as shown in the figure.



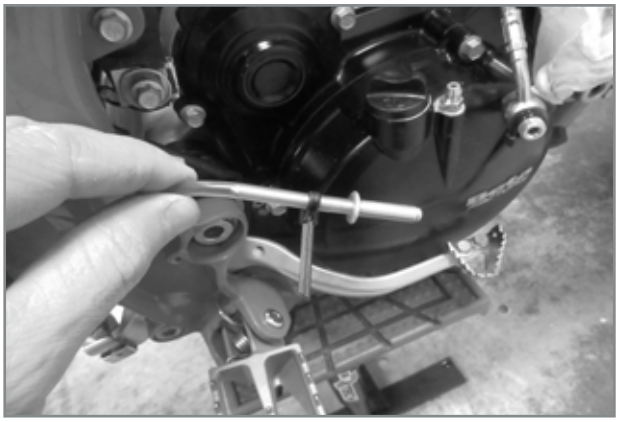

- Then feed through the brake light wiring **B** behind the carburettor vents.



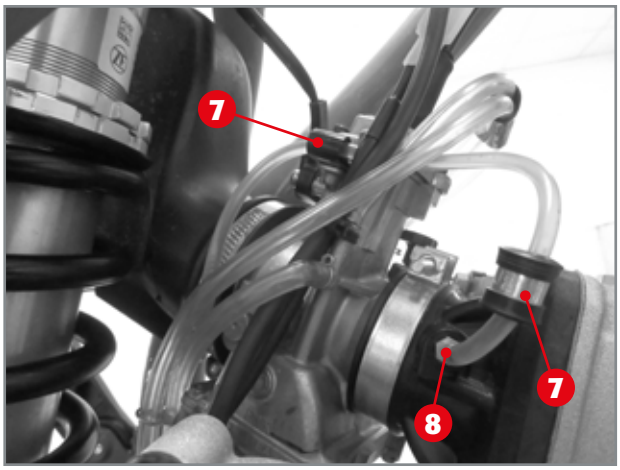

- Connect the connector **6**.



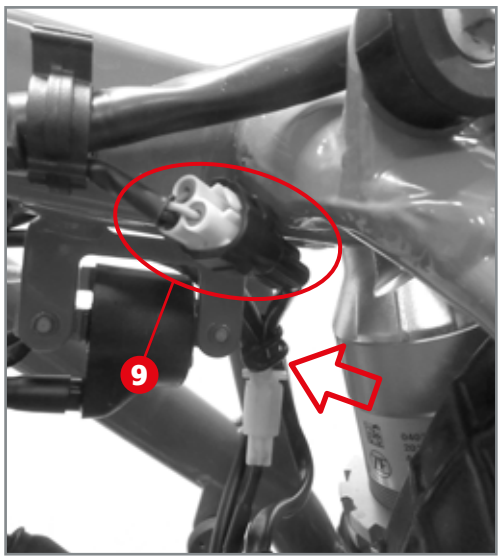
- Feed through the cables as shown; secure them to the metal cable gland as shown in the figure.



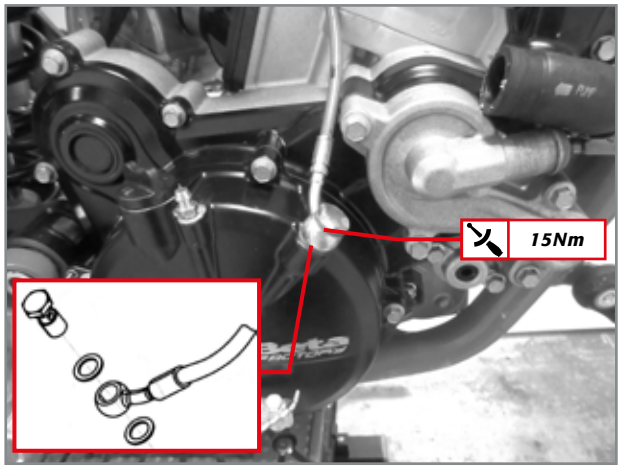
- ONLY RR200 Remove the cap applied to the mixer tube (see page 11).




- Insert the tube through the tube hole **7** and connect it to the nozzle **8** on the intake manifold.




- Connect the connector **9**.




- Apply the clutch pipe and position it as shown in the figure. Replace the two copper gaskets to be applied above and below the fitting. Apply the threaded fitting and tighten to 15Nm.

***ATTENTION!***



*The clutch fluid is highly corrosive, therefore be careful not to drop any of it on the painted parts of the vehicle.*

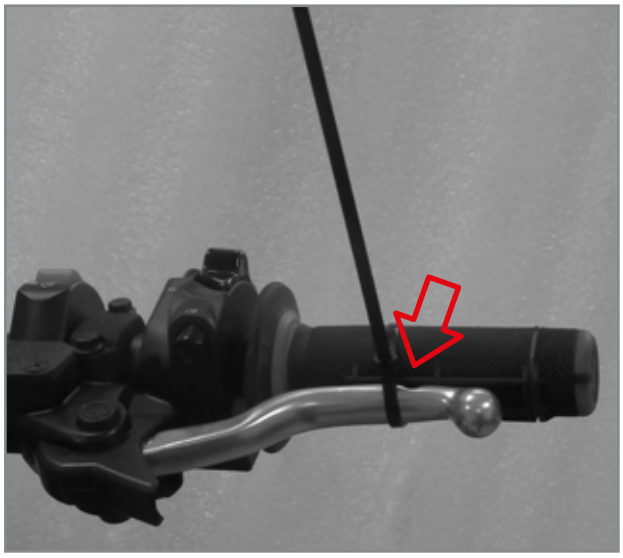


*Protective gloves must be worn to perform this operation.*

***ATTENTION!***

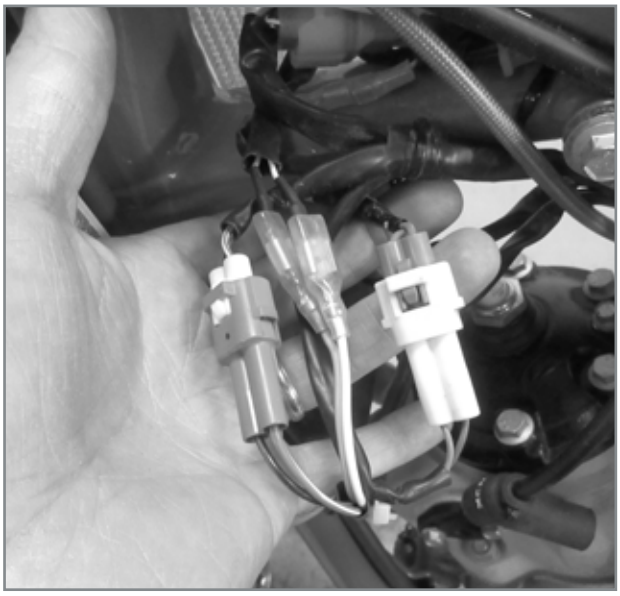


*Do not bring the liquid in contact with skin, eyes or clothing.*
*In case of contact:*
*- with eyes, rinse them immediately with water and week medical advice.*
*- with skin, clean the concerned areas immediately with soap and water.*
*Change the clothing that came into contact with the liquid.*

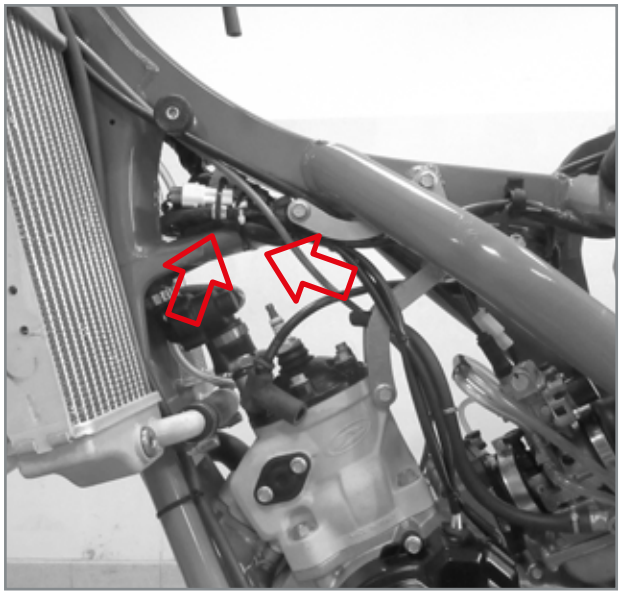


- Remove the device to hold the clutch lever pulled.

- Check that the entire clutch actuator hydraulic control is purged.

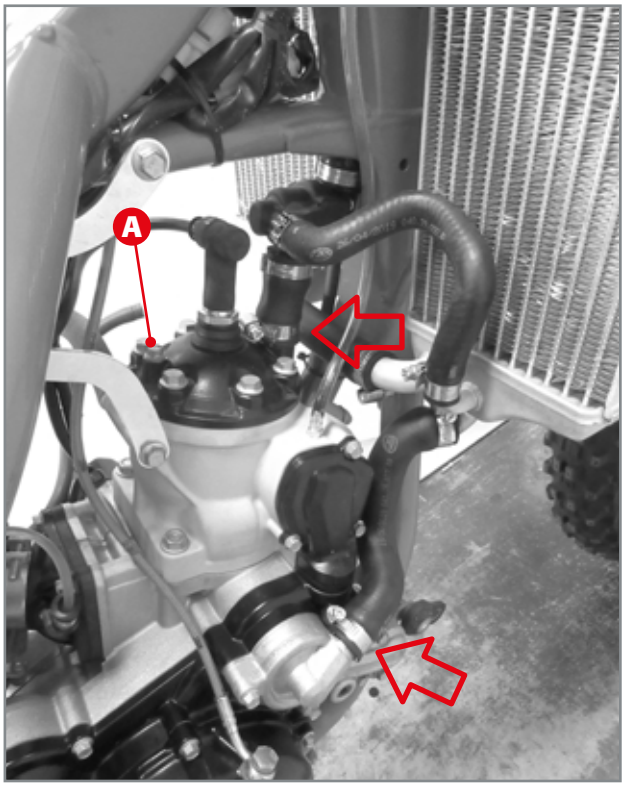


- Connect the engine's electrical system to the central system.



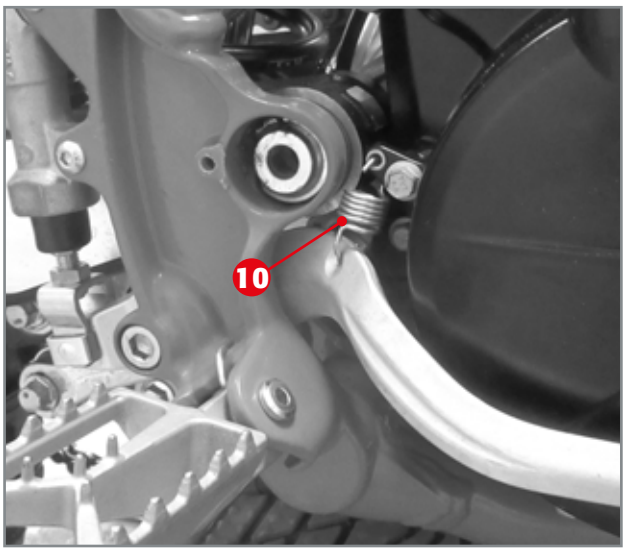
- Fasten everything to the frame as shown in the figure.

- Connect the coil to the spark plug.

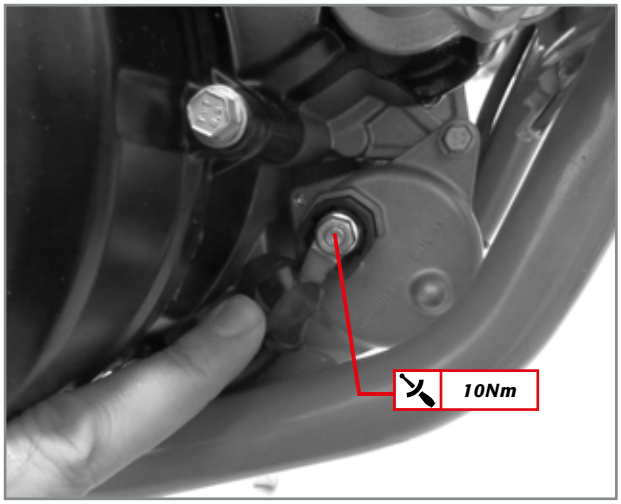



- Connect the engine vent pipe.
- Connect the cooling system to the engine. Tighten the hose clamps and introduce the coolant.

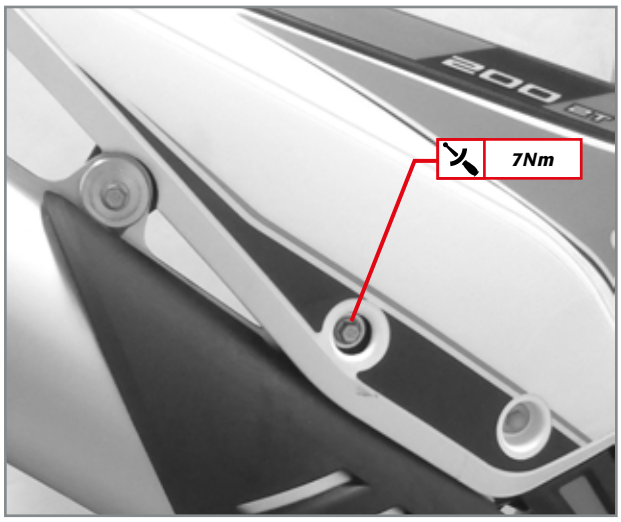
- After the filling, purge the engine unit using screw **A**. After the purging, check the liquid level and top-up if necessary.



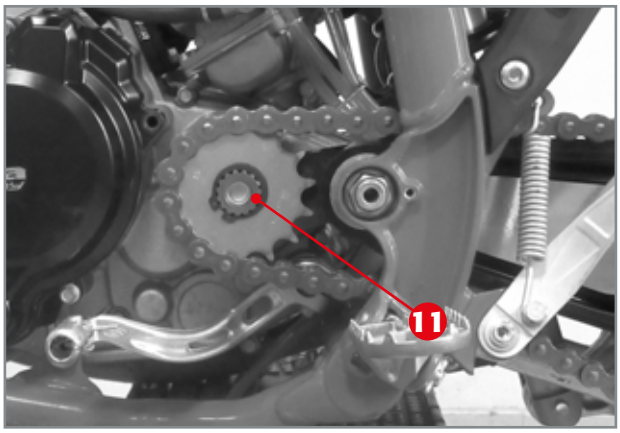

- Apply the Kickstart lever (Optional RR200). Apply the medium-strength thread locker on the screw and tighten at 25Nm. Apply the brake pedal return spring **10**.



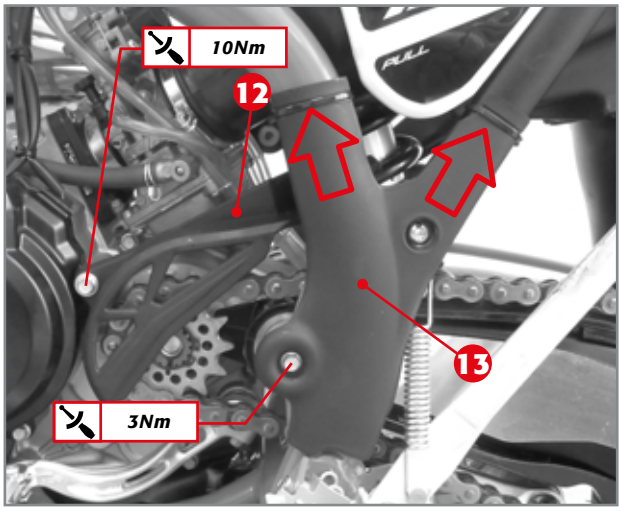

- Apply the start motor cable and tighten the nut to the indicated torque.
- Cover the connection using the specific protective cap.



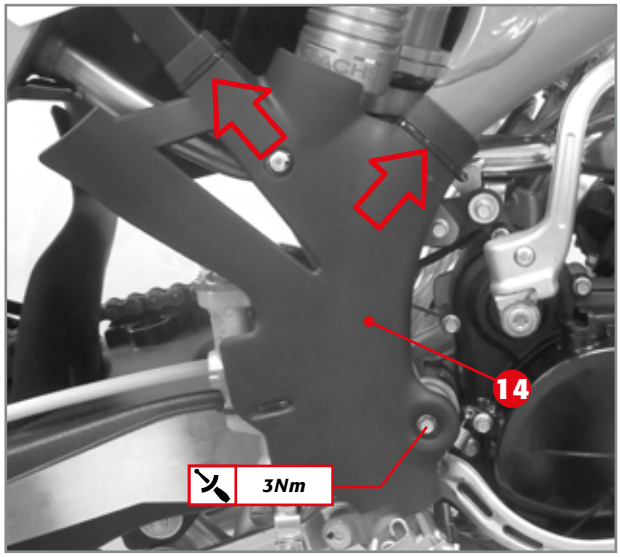

- Apply the exhaust expansion by first assembling the front springs and then applying the two fixing screws.
- Apply the spacer and fasten the two fixing screws to the indicated torque. Fasten the expansion fixing screws to the frame at 7Nm.

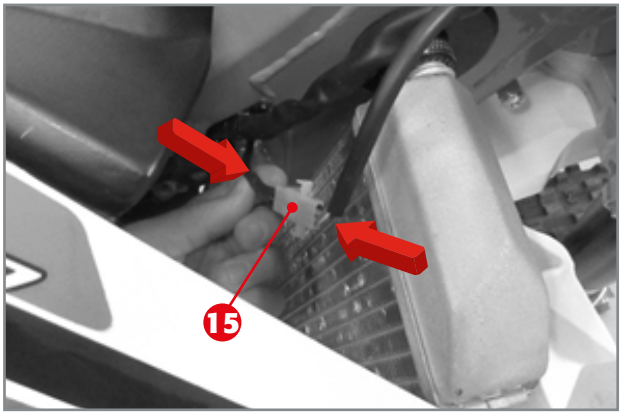



- Apply the gearshift pedal and fasten the screw at 10Nm prior thread locker application.
- Insert the pinion in the chain and fasten it onto the gearshift outlet shaft. Assemble the relative circlip **11**, checking it is in its seat.

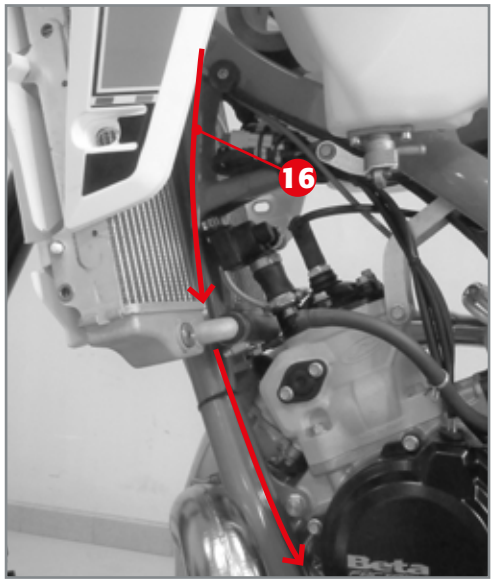



- Apply the pinion guard **12** and the frame side guards **13** and **14**. Fasten the screws at 3Nm and apply the fixing straps between the side guards and frame.

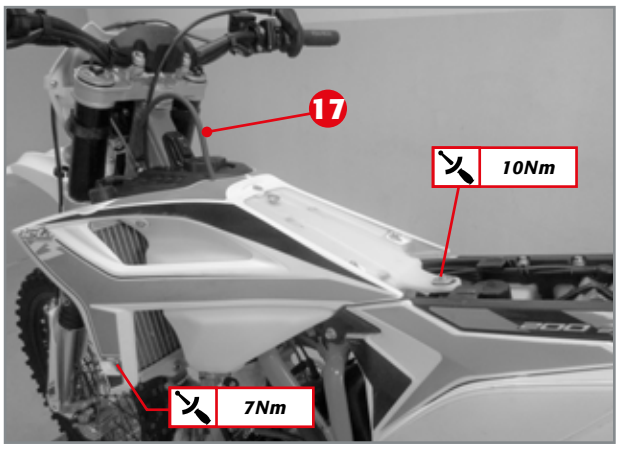



- Place the tank on the vehicle and connect connector **15**.



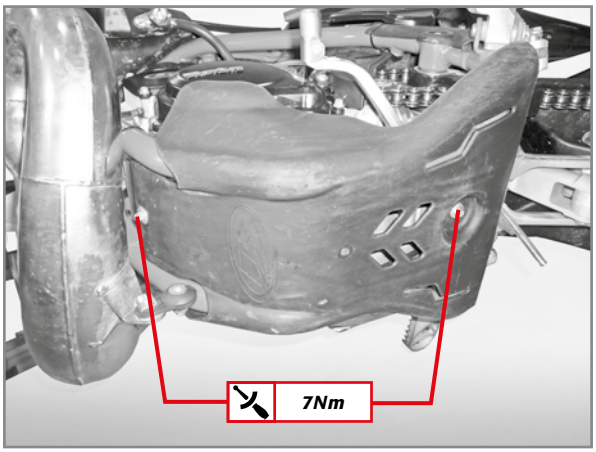

- Insert the pipe **16** observing its path as shown in the figure.
- Push the tank towards the front and downwards.




- Tighten the tank screws to the indicated torque.
- Reconnect pipe **17** to the tank.



- Reconnect the tank to the carburettor and secure the tube using the specific tube straps.




***ATTENTION!***
*(ONLY RR200)*
*Disconnecting the mixer tube from the intake manifold could cause air to get into the tube itself. To avert any lubrication problems with the power unit and crankshaft, use fuel with 1% mix for the first fill-up.*
*Use the oil recommended on page 132 in the "Recommended lubricants and liquids" table.*

- Reconnect the tank to the carburettor and secure the tube using the specific tube straps.

- Apply the seat.

- Reapply the paramotor plate with the two fixing screws, once the motorcycle is removed from the stand. Tighten to the specified torque.

# TABLE OF ENGINE COMPONENTS TIGHTENING TORQUES

| Fixing | Diameter x Length | Quantity | Thread locker | Torque [Nm] | Notes |
|---|---|---|---|---|---|
| **Outer side right crankcase half** | | | | | |
| Kickstarter lever | M6 x 20 | 1 | Medium-strength thread locker | 10 | |
| **Inner side right crankcase half** | | | | | |
| Main shaft fixing | M5 x 10 | 2 | High-strength thread locker | 6 | |
| Desmodromic control bearing fixing | M5 x 8 | 1 | High-strength thread locker | 6 | |
| **Crankshaft** | | | | | |
| Securing the half-shoulders | M6 x 12 | 6 | High-strength thread locker | 5 | |
| **Gearshift drive** | | | | | |
| Stop cam | M6 x 30 | 1 | Medium-strength thread locker | 10 | |
| Gear stopping device lever | M6 x 20 | 1 | Medium-strength thread locker | 10 | |
| Gearshift lever | M6 x 25 | 1 | Medium-strength thread locker | 10 | |
| **Electric kick starter device - only RR 200** | | | | | |
| Starter motor | M6 x 25 | 2 | Medium-strength thread locker | 10 | |
| **Pedal kick starter device - OPTIONAL RR200** | | | | | |
| Securing the lever | M8 x 26 | 1 | Medium-strength thread locker | 25 | |
| **Clutch - primary transmission** | | | | | |
| Primary transmission pinion nut | | 1 | Medium-strength thread locker | 160 | |
| Drum nut and clutch case | | 1 | Medium-strength thread locker | 120 | Do not use pneumatic device |
| Clutch cap | M6 x 20 | 6 | | 10 | |
| Outer clutch cover | M6 x 25 | 2 | | 10 | |
| Outer clutch cover | M6 x 50 | 2 | | 10 | In common with inner clutch cover |
| Inner clutch cover | M6 x 20 | 3 | | 10 | |
| Inner clutch cover | M6 x 25 | 2 | | 10 | |
| Inner clutch cover | M6 x 60 | 2 | | 10 | In common with outer clutch cover |
| Clutch actuator pipe | M10 X 1 | 1 | | 15 | |

# TABLE OF ENGINE COMPONENTS TIGHTENING TORQUES

| Fixing | Diameter x Length | Quantity | Thread locker | Torque [Nm] | Notes |
|---|---|---|---|---|---|
| **Water pump** | | | | | |
| Cover | M6 x 60 | 2 | | 10 | In common with inner clutch cover |
| Cover | M6 x 30 | 2 | | 10 | |
| Impeller | M5 x 12 | 1 | Medium-strength thread locker | 6 | |
| **Exhaust valve control** | | | | | |
| Flange | M6 x 20 | 3 | Medium-strength thread locker | 10 | |
| Complete control rocker arm | M5 x 12 | 1 | Medium-strength thread locker | 6 | |
| Control lever | M5 x 20 | 1 | Medium-strength thread locker | 6 | |
| Booster bearings | M6 x 15 | 2 | Medium-strength thread locker | 10 | |
| Right cover | M5 x 16 | 3 | | 6 | |
| Left cover | M5 x 16 | 2 | | 6 | |
| Control cover | M5 X 20 | 2 | Medium-strength thread locker | 6 | |
| **Ignition system** | | | | | |
| Spark plug | M14 x 1.25 | 1 | | 25 | |
| Pick-up unit | M5 x 12 | 2 | Medium-strength thread locker | 6 | |
| Stator | M6 x 25 | 2 | Medium-strength thread locker | 10 | |
| Flywheel nut | | 1 | Medium-strength thread locker | 60 | |
| Cover | M6 x 20 | 3 | | 10 | |
| Cover | M6 x 30 | 2 | | 10 | |
| **Cylinder** | | | | | |
| Studs | M8 | 4 | Medium-strength thread locker | 20 | |
| Cylinder nuts | | 4 | | 20 | |
| **Head** | | | | | |
| Head screws | M8 x 35 | 6 | | 20 | Pre-tightening threading greasing 15Nm |
| **Crankcase half** | | | | | |
| Crankcase half screws | M6 x 50 | 9 | | 10 | |
| Crankcase half screws | M6 x 40 | 3 | | 10 | |

# TABLE OF ENGINE COMPONENTS TIGHTENING TORQUES

| Fixing | Diameter x Length | Quantity | Thread locker | Torque [Nm] | Notes |
|---|---|---|---|---|---|
| **Intake** | | | | | |
| Reed valve | M6 x 25 | 3 | | 10 | |
| Reed valve | M6 x 25 | 1 | | 10 | Screw tamper-proof |
| **Oil drain** | | | | | |
| Cap | | 1 | | 15 | |

# TABLE OF FRAME/ENGINE FASTENING TORQUES

| Fixing | Diameter x Length | Quantity | Thread locker | Torque [Nm] | Notes |
|---|---|---|---|---|---|
| Front and lower engine connections | M10 x 1.25 | 2 | | 45 | |
| Swingarm pin | M16 x 1.5 | 1 | | 125 | |
| Head - frame connection bracket (front fixing) | M8 x 16 | 2 | Medium-strength thread locker | 35 | |
| Head - frame connection bracket (rear fixing) | M8 x 60 | 1 | | 35 | |
| Head connection brackets to engine | M8 x 16 | 2 | Medium-strength thread locker | 35 | |
| Shock absorber upper fixing | M10 x 45 | | Medium-strength thread locker | 70 | |

# TABLE OF SUPERSTRUCTURE TIGHTENING TORQUES

| Fixing | Diameter x length [mm] | Quantity | Thread locker | Torque [Nm] | Notes |
|---|---|---|---|---|---|
| Tank to the frame (front fixing) | M6 x 25 | 1 | | 10 | |
| Tank to the frame (rear fixing) | M6 x 30 | 1 | | 10 | Application of grease |
| Tank side panel to the radiator | M6 x 20 | 2 | | 7 | |
| Frame arms to the frame | M8 x 20 | 2 | Medium-strength thread locker | 35 | |
| Frame to the frame | M8 x 30 | 2 | Medium-strength thread locker | 35 | |
| Silencer | M6 x 45 | 1 | | 7 | Front fixing |
| | M6 x 30 | 1 | | 7 | Rear fixing |
| Right side filter box side panel | M6 x 16 | 2 | | 7 | |
| Pinion protection | M6 x 45 | 1 | | 7 | Front fixing |
| | M6 x 30 | 1 | | 7 | Rear fixing |
| Frame protection | M6 x 20 | 2 | | 3 | |
| Engine protection | M6 x 20 | 2 | | 7 | |

# 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 | 40h | 60h | 90h |
|---|---|---|---|---|
| Driving and driven clutch discs | C | - | R | C |
| Clutch springs length | C | - | C | R |
| Gearshift bearings | - | - | - | R |
| Case / clutch hub | C | - | C | C |
| Cylinder | - | - | C | - |
| Piston and segments | - | R | - | - |
| Connecting rod | - | - | R | - |
| Crankshaft bearings | - | - | R | - |
| Gearshift superficial appearance | - | - | - | C |
| Water pump oil seal | - | - | - | R |
| Exhaust valve | - | - | C/P | - |
| Reed valve shims | - | - | C | - |
| Spark plug | C | - | R | - |

**C** = *INSPECT AND REPLACE IF NECESSARY* **S** = *REPLACE* **C** = *Cleaning*



# RECOMMENDED LUBRICANTS AND LIQUIDS

| APPLICATION | PRODUCT | QUANTITY |
|---|---|---|
| Gearshift and clutch | LIQUI MOLY RACING 10W-50 | 720ml* |
| Coolant liquid | LIQUI MOLY COOLANT READY MIX RAF12 PLUS | 1300ml* |
| Fuel tank (RR125) | LIQUI MOLY RACING SYNTH 2T | 2.5% blend |
| Fuel tank (only for running-in RR200) | Liqui Moly 2-STROKE MOTOR OIL, SELF-MIXING | 1% |
| Mixer tank (RR200) | Liqui Moly 2-STROKE MOTOR OIL, SELF-MIXING | 550ml* |

** Refer to Use and Maintenance Manual for levels*




BETAMOTOR S.P.A.
PIAN DELL'ISOLA, 72
50067 RIGNANO SULL'ARNO (FIRENZE) ITALIA
INFO@BETAMOTOR.COM WWW.BETAMOTOR.COM