



# Workshop Manual **2018**

ENDURO SERIES

ENDURO 2T 200 -250 -300CC

2017 GAS GAS

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Edition 01/08/2017

## INTRODUCTION

This manual was created by TORROT ELECTRIC EUROPA S.L. to be used by official services of the GAS GAS brand (GG). It is mainly aimed at workers with a basic knowledge of the principles of mechanics and repair techniques. It contains precise instructions for carrying out all repairs, as well as the necessary technical data to perform maintenance on the motorcycles.

It also has extensive information about special GG tools that will be of great help to optimise each repair process.

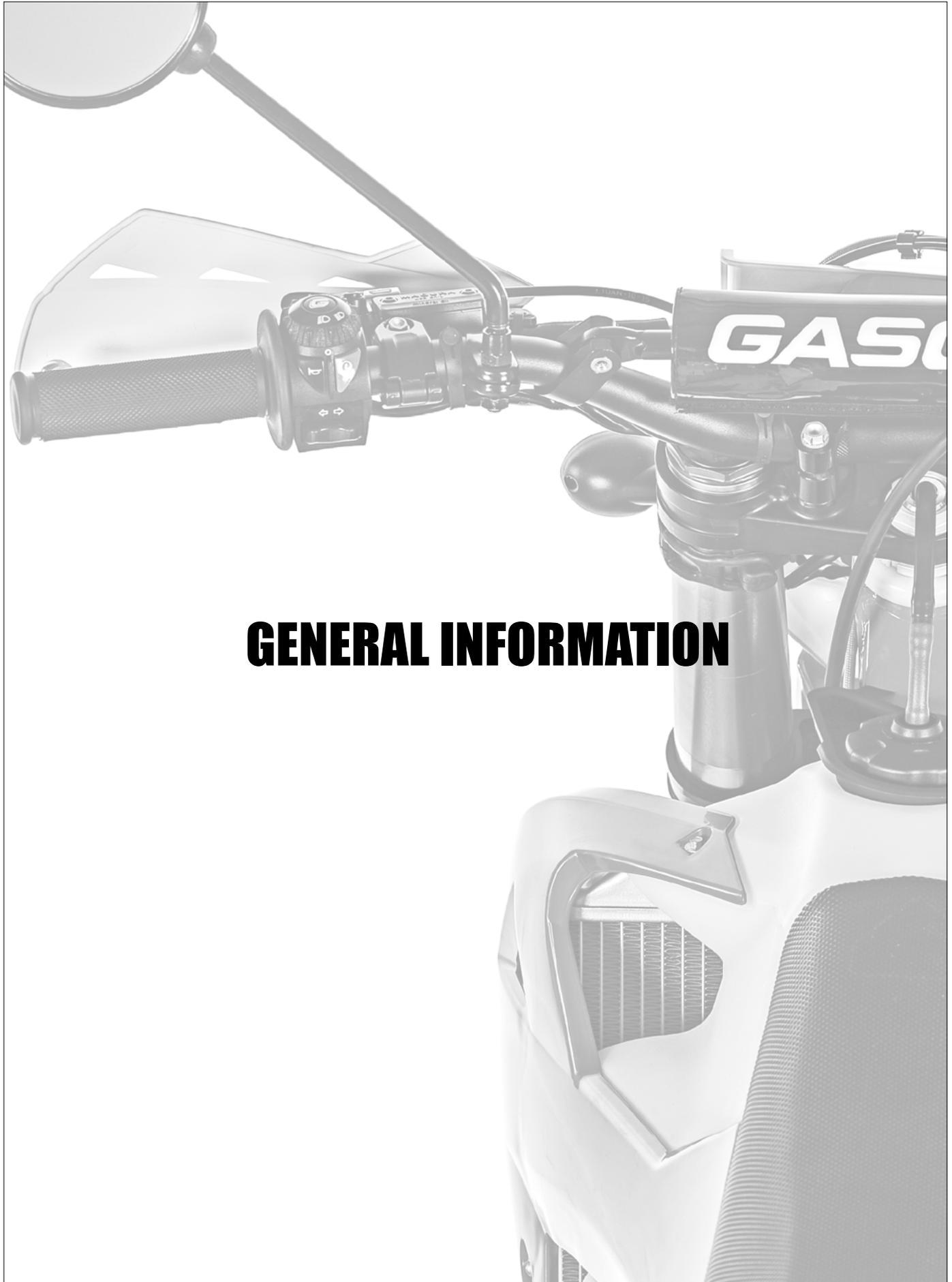
Through successive editions, we will keep it updated with all upgrades and evolutions of the engines of this family.

Particularly important information in this manual is preceded by the following signs:

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## **GENERAL INFORMATION**

## GENERAL INFORMATION

It is necessary to follow certain safety and maintenance rules when doing repair work on vehicles.

Here are some of the most important:

### SAFETY

- Do not smoke or cause sparks or flames in the work area. Petrol is extremely flammable and can be explosive under certain conditions.
- Use appropriate cleaning products for each task, making sure that they are approved.
- Wear eye protection whenever using electric tools such as drills, sanders or rectifiers.
- Use a protective cream on the hands before starting disassembly work to protect the skin from infections and make subsequent cleaning easier. Make sure hands are not slippery.
- Remember that prolonged contact of engine oil with the skin may be harmful to health.
- Keep loose clothing away from moving parts.
- Do not wear rings, wristwatches, etc., while performing tasks on the engine, especially the electrical system.
- Keep the work area tidy to prevent tripping over objects left on the floor.
- Do not allow oils, grease or other fluids to remain on the floor of the work area as they are a slipping hazard.
- Use appropriate tools to compress or decompress springs to prevent them from violently recoiling.
- Take special precautions to avoid breathing dust from parts containing asbestos (e.g. clutch discs), as this product is extremely harmful to health.
- Avoid breathing vapours from petrol or cleaning fluids, as these can be extremely toxic. Make sure that the work area is ventilated.

### MAINTENANCE

- Always use original GG spare parts and lubricants recommended by the manufacturer. Non-original spare parts can damage the engine.
- Only use tools specifically designed for this vehicle.
- Always replace gaskets, seals and O-rings during servicing and assembly.
- After disassembly, clean the components with non-flammable solvents.
- Lubricate all work surfaces prior to assembly, excluding conical couplings.
- Apply oil to all pairs of parts and bearings during assembly.
- Only use tools with metric measurements during disassembling, servicing and assembling operations. Metric screws, nuts and bolts are not interchangeable with connecting elements with English measurements.
- All surfaces that receive gaskets, seals and O-rings must be cleaned with special care.
- Carefully examine all retaining rings prior to assembly and replace any deformed ones. Always replace piston pin retaining rings after each use.
- After assembly, check that all components have been properly fitted and that all mechanisms work correctly.

### GENERAL TIGHTENING TORQUES

The following table specifies tightening torques for nuts or screws with ISO threads.

Tightening torques for special components or assemblies are indicated in the respective repair processes of this manual.

To prevent deformation, tighten the assemblies with several nuts or screws progressively and in a diagonal or alternating sequence until the specified torque is reached.

Threads have to be clean and dry to apply the tightening torques described below. Components should be at room temperature.

## GENERAL INFORMATION

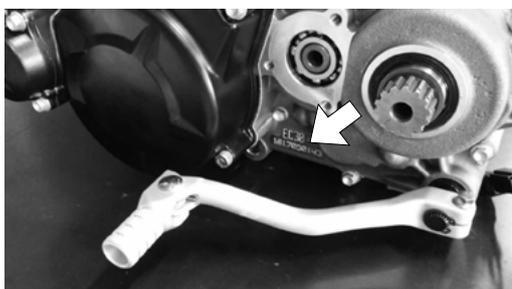
*(A) NUT	*(B) SCREW	GENERAL TIGHTENING TORQUES		
		Nm	Kgf.m	Ft.lb
10 mm	6 mm	6	0.6	4.3
12 mm	8 mm	15	1.5	11
14 mm	10 mm	30	3.0	22
17 mm	12 mm	55	5.5	40
19 mm	14 mm	85	8.5	61
22 mm	26 mm	130	13.0	94

\*A: Distance between the planes of the nut.

\*B: External diameter of the screw thread.

### ENGINE IDENTIFICATION

- The engine serial number is stamped on the bottom of the left-hand semi-crankcase.



- Always quote the engine serial number when ordering an original GG spare part for the engine.



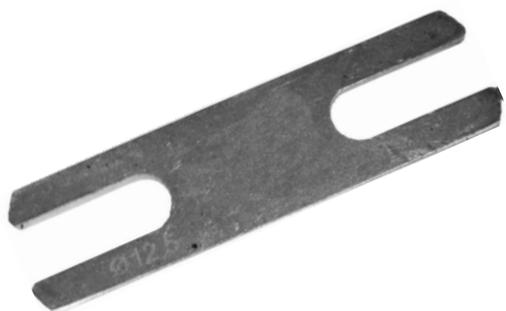
## GENERAL INFORMATION



- This tool will be needed to tighten or loosen the fork bars.  
Ref: **BE21105GG-CLJ-1**



- These tools are used to fit the fork seal and dust cover.  
Ref: **BE20225GG-CLJ-1**



- This tool is used to remove the fork cartridge.  
Ref: **BE21106GG-CLJ-1**



- This tool will be needed to fit the fork seal and dust cover.  
Ref: **BE20235GG-CLJ-1**

## GENERAL INFORMATION



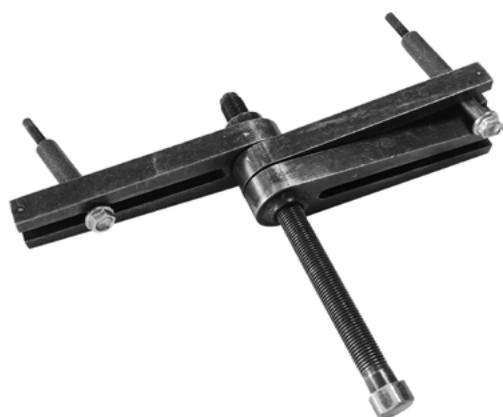
- This tool is used to hold the clutch hub.  
Ref: **ME250450014**



- This tool will be needed to remove the stator.  
Ref: **ME25634045**



- This tool is used to fit the crankshaft into the crankcase.  
Ref: **ME25950000**



- This tool is used to separate the crankcases and open the engine.  
Ref: **ME25950005**



- With this tool, the spokes can be tightened or loosened.  
Ref: **BE55100CT2509**

## TECHNICAL DATA TABLE

<b>ENGINE</b>	<b>Cycle</b>		2-stroke		
	<b>Number of cylinders</b>		Mono-cylindrical		
	<b>Cooling</b>		Liquid cooled		
	<b>Capacity</b>		199.4 cc	249.3 cc	299.3 cc
	<b>Bore</b>		62.5 mm	66.4 mm	72.0 mm
	<b>Stroke</b>		65.0 mm	72.0 mm	72.0 mm
	<b>Carburettor</b>		Dell'Orto PHBG 21 (Keihin PWKS 38 competition model)		
	<b>Intake type</b>		V-Force 4 reed valve system		
	<b>Lubrication system</b>		Fuel mix		
	<b>Starter system</b>		Kick-starter/Electric starter on E-START models		
	<b>Ignition system</b>		Digital CDI-Euro 4		
	<b>Pre-ignition set-up</b>				
	<b>Spark plug</b>		DENSO W24ESR-U and NGK BR8EG		
	<b>Distance between electrodes</b>		0.7/0.8 mm		
<b>TRANSMISSION</b>	<b>Primary reduction</b>		3.31 (63/19)		
	<b>Gearbox</b>		6 speeds, cascade		
	<b>Gear ratio</b>	1 <sup>a</sup>	2.07 (14/29)		
		2 <sup>a</sup>	1.63 (16/26)		
		3 <sup>a</sup>	1.33 (18/24)		
		4 <sup>a</sup>	1.10 (20/22)		
		5 <sup>a</sup>	0.91 (23/21)		
		6 <sup>a</sup>	0.79 (24/19)		
	<b>Secondary transmission</b>		By chain		
	<b>Secondary reduction</b>		3.67 (13/49) EC 200-250 // 3.69 (13/48) EC300 Competition models only	3.30 (13/42) EC 200-250-300	
	<b>Chain</b>		110 Links // 5/8 "x 1/4" with seals (112 links) competition model only		
<b>Type of clutch</b>		Multi-disc oil bath with hydraulic drive			
<b>Clutch drive</b>		Hydraulic			
<b>Lubrication</b>	Medium	Oil			
	Capacity	900cc			
<b>FRAME</b>	<b>Type</b>		Central backbone frame in 25 CrMo 4 steel, aluminium alloy subframe		
	<b>Tyre and rim measurements</b>	Front	Excel 1.6 x 21 - 90/90 - 21 M/C 54R MICHELIN ENDURO MEDIUM F TT		
		Rear	Excel 2.15 x 18 - 140/80 - 18 70R MICHELIN ENDURO MEDIUM R TT		
	<b>Tyre pressure</b>	Front	1.0 bar		
		Rear	1.0 bar		
	<b>Suspension</b>	Front	KYB fork ø48 mm AOS System (Air Oil Separated), closed cartridge, with spring and compression and rebound		
		Rear	Progressive system with KYB single shock absorber with adjustable high and low speed compression and rebound		
<b>Suspension travel</b>	Front	300mm (KYB)			
	Rear	131 mm (KYB)			

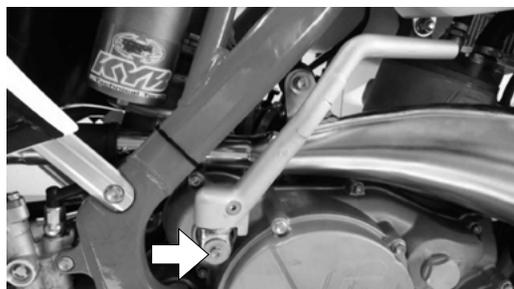
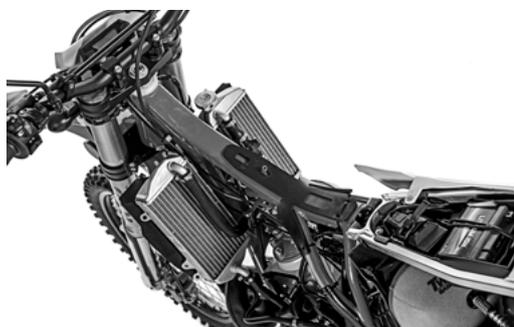
## REMOVING THE ENGINE FROM THE FRAME



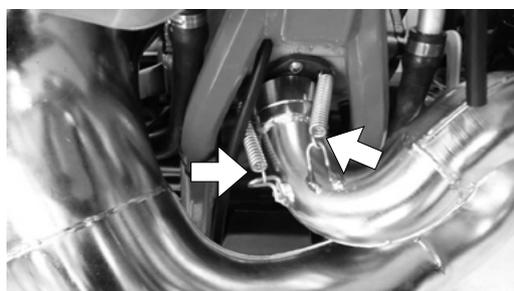
Note:

The cylinder head, cylinder, clutch and ignition can be detached without needing to remove the engine from the frame.

- Thoroughly clean the motorcycle before beginning the removal.
- Place the motorcycle on a suitable support to enable work to be carried out on it.
- Remove the fuel tank together with the two side covers, seat and frame side guards.



- Remove the kick-start pedal lever (arrow)



- Loosen the springs that hold the exhaust pipe to the cylinder piping.



- Remove the entire exhaust system.

## REMOVING THE ENGINE FROM THE FRAME

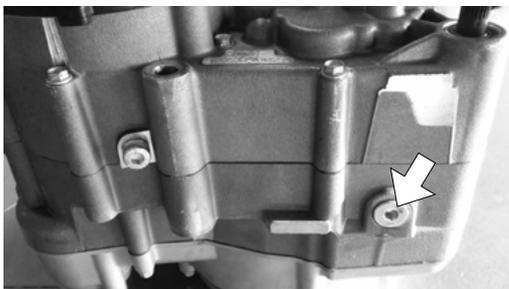


- Remove the tailpipe (it is not necessary to detach the side covers for this).



**Note:**

*Oil should never be poured down the drain or discharged into the environment.*



- Extract the drain plug (arrow) and remove the transmission fluid.



**Danger:**

*Make sure that the coolant is not at a high temperature before opening the cooling circuit.*

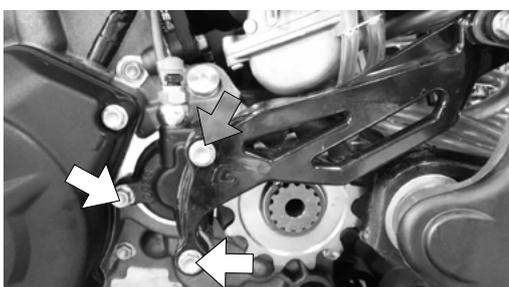


**Note:**

*Drain the coolant into a clean container for later use.*

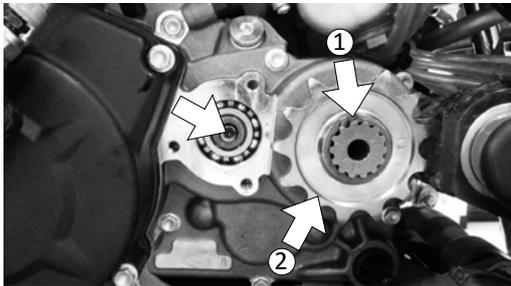


- Remove the radiator cap.
- Unscrew the coolant drain screw on the water pump and allow the fluid to drain into a container.
- Wipe away any fluid that falls on the engine, frame or wheels.
- Detach the spark plug connector (arrow) and disconnect the coolant pipes on both sides of the engine.
- Remove the rear brake pedal and the rear brake pump guard and set to one side.



- Remove the screws (arrows) and detach the output sprocket guard and the hydraulic clutch clamp with the gasket.
- Loosen the chain.

## REMOVING THE ENGINE FROM THE FRAME



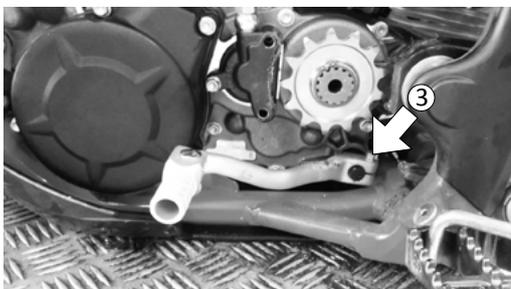
- Completely remove the clutch rod (arrow).



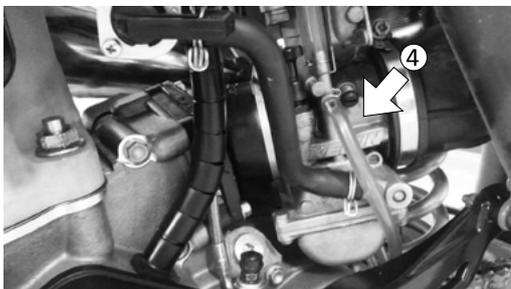
**Note:**

*Oil should never be poured down the drain or discharged into the environment.*

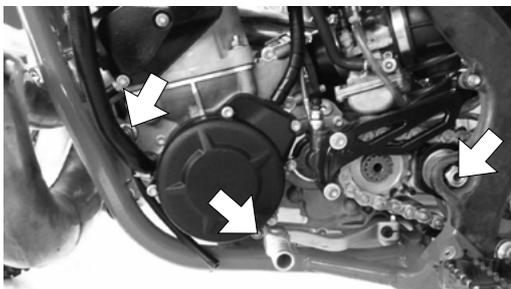
- Detach the retaining ring (1) from the output sprocket using retaining ring pliers.
- Remove the output sprocket (2) from the secondary shaft.



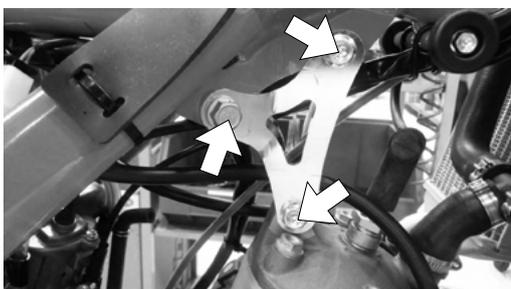
- Detach the gear lever (3).
- Release the wiring of the magnetic flywheel from its attachments to the frame and uncouple the connector on the control unit (CDI) and the other wiring connectors.



- Remove the carburettor (4)

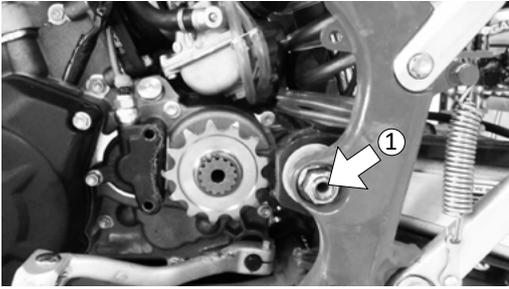


- Extract the screws (arrows) that secure the engine to the frame.



- Loosen the 3 screws (arrows) that secure the cylinder head bracket to the frame.

## REMOVING THE ENGINE FROM THE FRAME



- Extract the screws (arrows) that secure the engine to the frame at the bottom.
- Extract the nut (1), remove the shaft from the swinging arm and move it backwards.
- Properly position the engine for extraction and remove it.

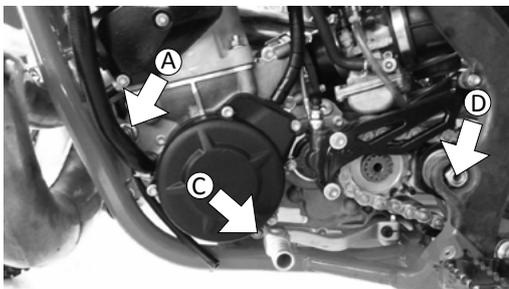
## FITTING THE ENGINE TO THE FRAME

- Fit the engine to the frame and position it correctly on the brackets.
- Align the swinging arm with the engine and frame, grease the swinging arm shaft and fit it.
- Fasten the engine fixing screws to their brackets.



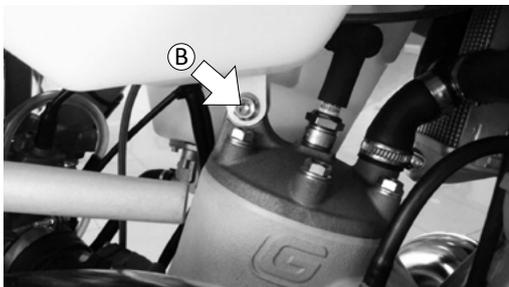
**Note:**

*The self-locking nuts that hold the engine must be replaced with new ones.*

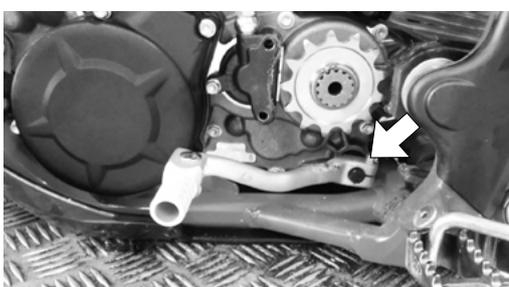


- Lightly tighten all of the nuts and then to the specified torque:

Nuts	Tightening torque
A	60 Nm
B	25 Nm
C	60 Nm
D	80 Nm



- Fit the carburettor.
- Fit the magnetic flywheel wiring to the frame and fix correctly.
- Attach the control unit connector and the other wiring connectors.



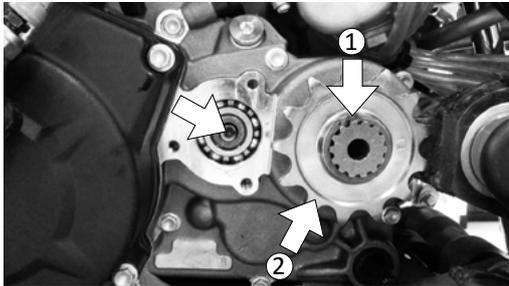
- Fit the gear change lever.
- Tightening torque: 15 Nm.



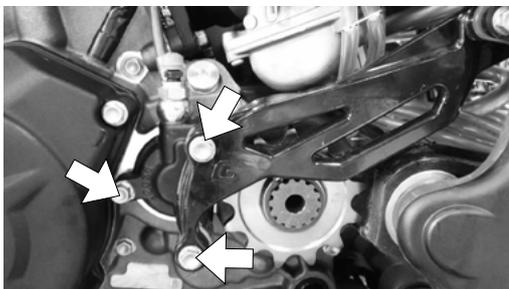
**Note:**

*The output sprocket must be placed in the same position from where it was removed to achieve the same wear direction.*

## FITTING THE ENGINE TO THE FRAME



- Position the output sprocket (2) on the secondary shaft and fit the retaining ring (1).
- Insert the clutch rod (arrow).



- Position the hydraulic clutch clamp with a new gasket, fit the output sprocket guard and tighten the screws (arrows).
- Tightening torque: 6 Nm.
- Tense the chain.
  - Fit the rear brake pedal and the rear brake pump guard.
- Tightening torque: 29 Nm.



**Note:**

***Check that the coolant pipes are not cut or damaged.***



- Attach the spark plug connector (arrow) and connect the coolant pipes on both sides of the engine.



**Note:**

***- Make sure that the coolant drain screw on the water pump is tight and has a new gasket.***

Tightening torque: 9 Nm.

- Disconnect the coolant recirculation tube.
  - Refill the coolant system through the left-hand radiator cap.
- Mixture of antifreeze and distilled water: 1:1 (antifreeze 50%, distilled water 50%).  
Capacity: 1.1 litres.

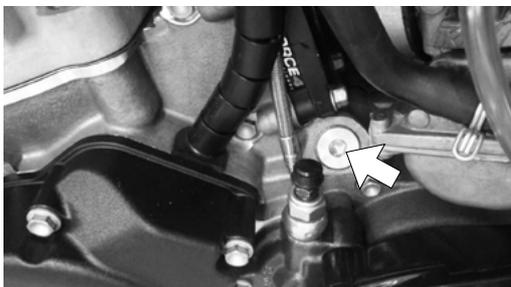


**Note:**

***- Make sure that the transmission oil drain plug is tight and has a new gasket.***

Tightening torque: 20 Nm.

## FITTING THE ENGINE TO THE FRAME



- Remove the oil filler cap (arrow) and refill with new transmission oil.

Viscosity: 5W40

Capacity: 900 cc

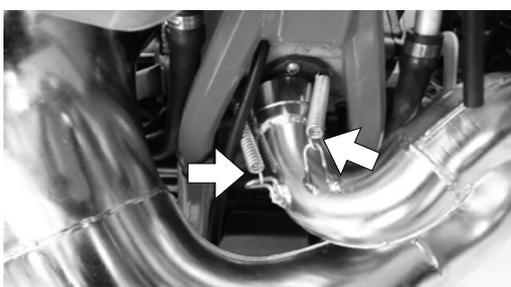
- Fit the oil filler cap with a new gasket and tighten.



- Activate the kick-start pedal 3 or 4 times and check the oil level with the gauge (arrow).



- Position the entire exhaust system and lightly tighten the screws.



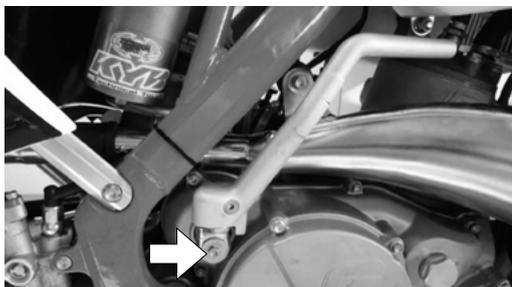
- Check the condition of the O-rings on the exhaust pipe and replace any that are damaged.

- Correctly position the springs that hold the exhaust pipe to the cylinder piping.

- Tighten the exhaust system screws.

Tightening torque: 6 Nm.

## FITTING THE ENGINE TO THE FRAME



- Fit the kick-start pedal lever, apply Loctite 243 to the screw (arrow) and then tighten it.
- Tightening torque: 20 Nm.
- Fit the fuel tank and breather pipe.
- Check the condition of the air filter. If damaged, replace it with a new one. If not damaged, clean and reattach it (see user manual).



- Fit the fuel tank together with the two side covers, seat and frame side guards.



**Note:**

***After carrying out a first phase of breaking-in, check the oil and coolant levels, chain tension and perform a general inspection.***

- Check that there is no leakage of coolant through the radiator pipes.

## Dismantling the engine

Preliminary instructions:



**Note:**

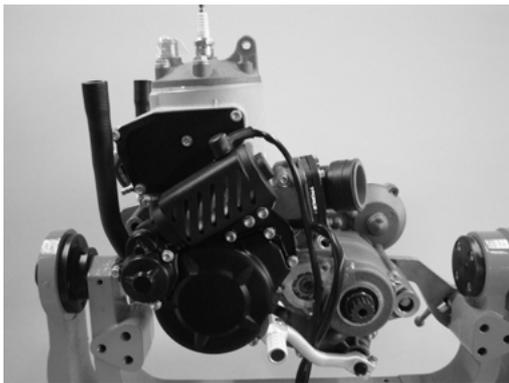
*When dismantling the engine, keep pairs of parts together. This includes gears, cylinders, pistons and other parts subjected to natural wear in their pairs.*

*Pairs of parts should always be replaced together.*

*During dismantling, clean all parts and place them in trays in order of disassembly. This will speed up reassembly and ensure that all parts are properly fitted.*

*Parts should be kept away from any fire source.*

*All gaskets, seals and O-rings must be replaced every time the engine is partially or completely dismantled.*

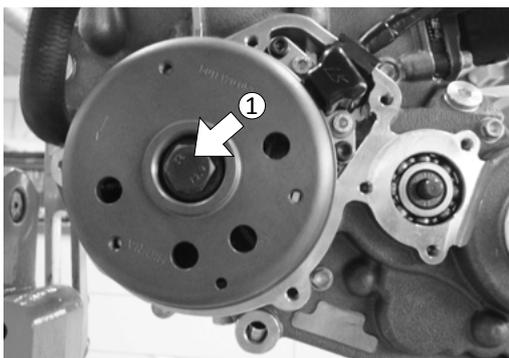


- Thoroughly clean the engine before placing it on the bedplate.
- Place the engine on the bedplate.
- Remove the spark plug from the cylinder head.



### DISMANTLING THE IGNITION

- Remove the screws (arrows) from the ignition cover.



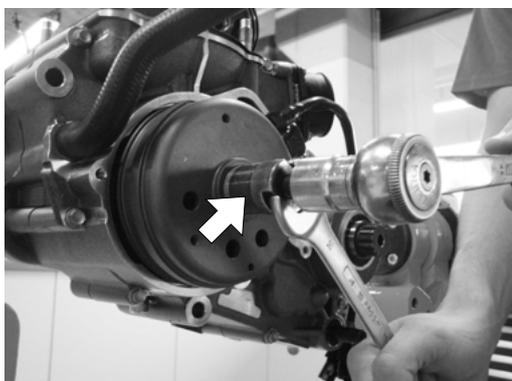
- Block the rotation of the magnetic flywheel.
- Remove the nut (1).



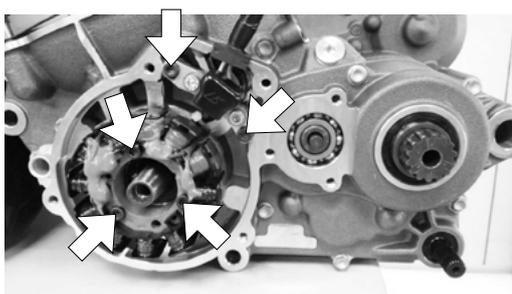
**Attention:**

*The magnetic flywheel nut loosens to the left!*

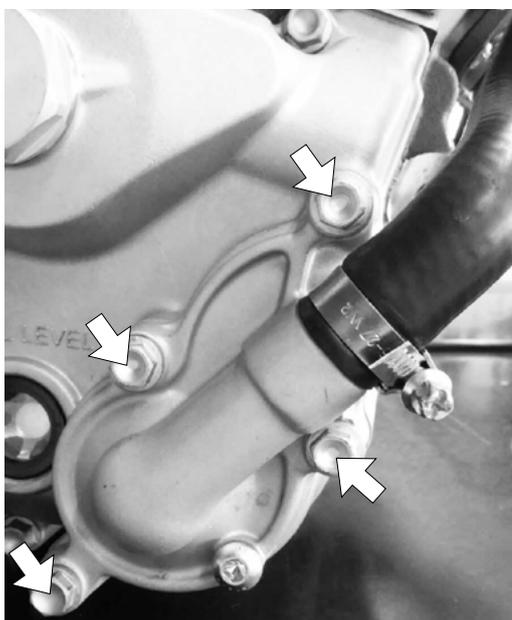
## Dismantling the engine



- Insert extractor ref. ME25634045 into the internal thread of the magnetic flywheel.
- Remove the magnetic flywheel by holding the extractor with a spanner while turning the screw.
- Remove the cotter pin from the cone of the crankshaft.



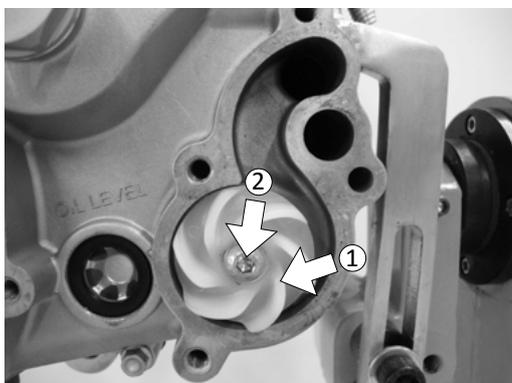
- Extract the screws (arrows) from the ignition stator and remove it together with the wiring.



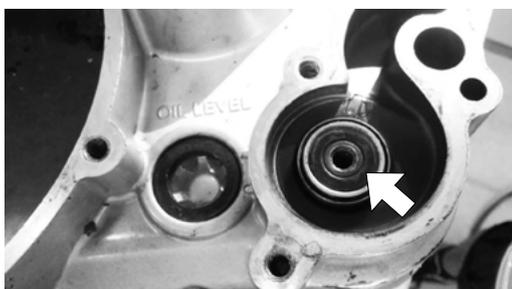
### REMOVING THE WATER PUMP

- Extract the screws (arrows) from the water pump cover.

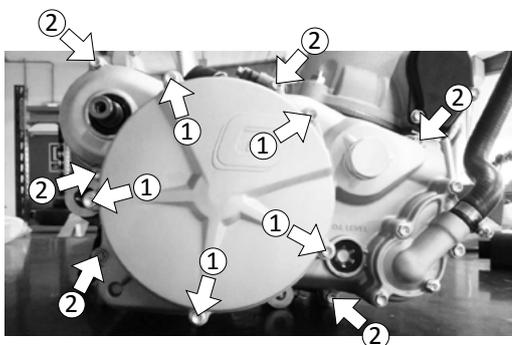
## Dismantling the engine



- Block the rotation of the water pump turbine (1).
- Extract the fixing screw (2) and remove the water pump turbine.



- Extract the entire water pump seal (arrows).



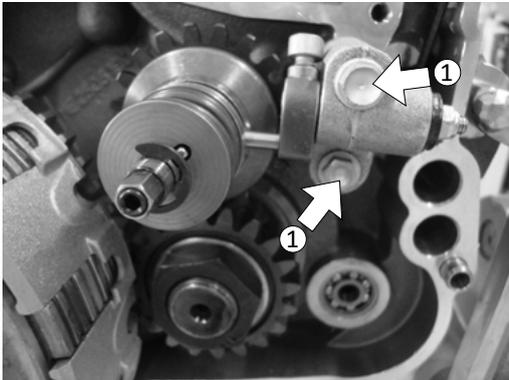
### REMOVING THE CYLINDER HEAD AND CYLINDER

- Extract the screws (1) from the clutch disc cover and remove it.
- Extract the screws (2) from the clutch cover and remove it.
- Remove the gasket from the clutch cover.



- Extract the screws (arrows) from the exhaust valve cover.

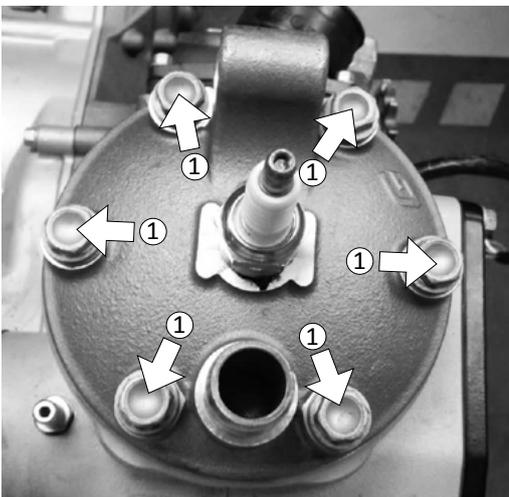
## Dismantling the engine



- Extract the fixing screws (1) from the centrifuge cam holder.



- Extract the exhaust valve ball joint pin clip (2).



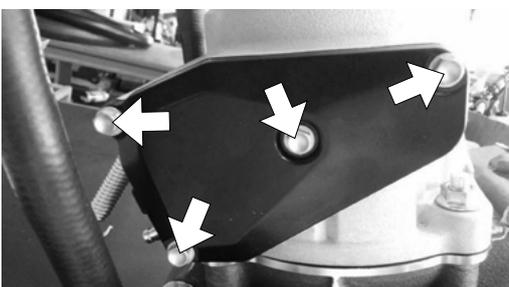
- Loosen the screws of the cylinder head (1) in a diagonal sequence and remove it from the cylinder.



**Note:**

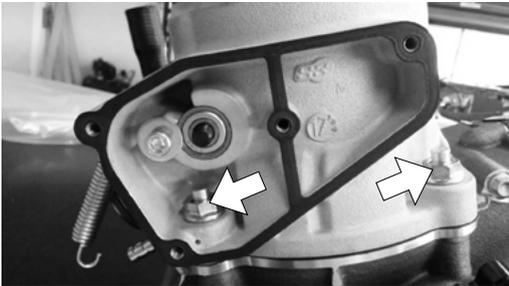
*If the cylinder head does not come out easily, tap it with a plastic mallet.*

- Remove the inner and outer O-rings from the cylinder head.



- Extract the screws (arrows) from the left-hand exhaust valve cover.

## Dismantling the engine



- Remove the nuts (arrows) that fix the cylinder to the semi-crankcases on both sides of the engine.
- Detach the cylinder by moving it upwards.
- Remove the gasket from the cylinder.



**Note:**

***There may be more than one gasket.***

- Mark the orientation of the piston towards the exhaust port using an indelible marker.
- Place a clean cloth at the base of the cylinder to prevent the retaining ring from falling into the crankcase.



- Remove one retaining ring from the piston pin by pushing it from the opposite side.

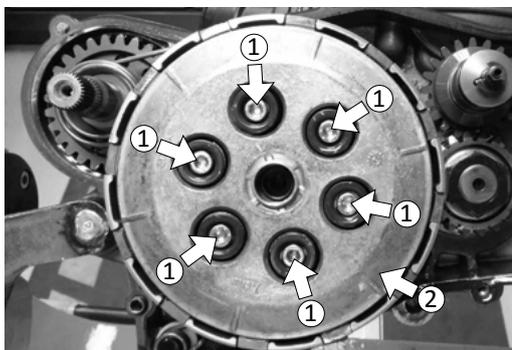
## REMOVING THE CLUTCH



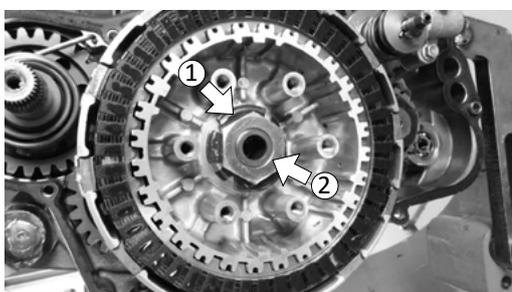
**Note:**

***If the clutch is to be removed in order to replace the discs, for example, it is not necessary to detach the entire clutch cover. To access the clutch discs, simply remove the clutch disc cover.***

## Dismantling the engine



- Extract the screws (1) by loosening them in a diagonal sequence.
- Remove the clutch springs and pusher bushings.
- Detach the clutch press (2)
- Extract the clutch disc assembly from the basket.



- Open the safety (1) on the fixing nut of the clutch hub (2).
- Loosen the nut by holding the clutch hub.

**Attention:**



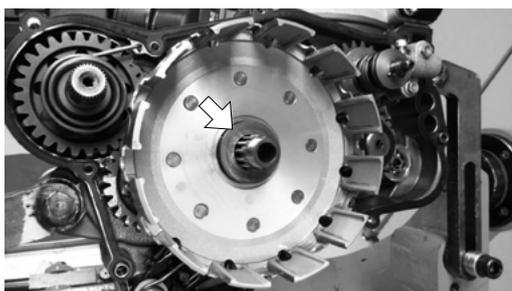
**The clutch hub nut loosens to the left!**

- Remove the sealing washer and detach the clutch hub.

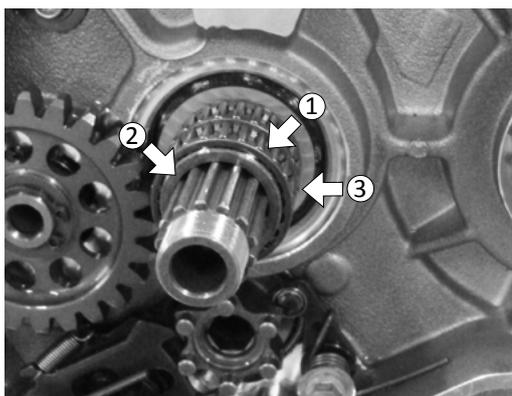
**Note:**



**The clutch hub has a fitting position relative to the primary shaft.  
Mark this position with an indelible marker on the greasing point.**

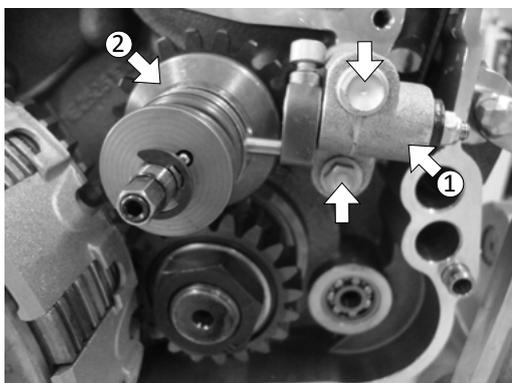


- Remove the washer from the clutch basket.
- Detach the clutch basket.



- Remove the bearings from the clutch basket (1), bushing (2) and washer (3).

## Dismantling the engine



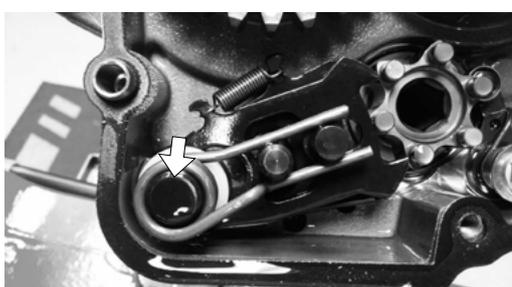
### REMOVING THE EXHAUST VALVE CENTRIFUGAL DRIVE SYSTEM

- Extract the screws (arrows) and remove the bracket (1) from the exhaust valve control shaft.
- Detach the exhaust valve centrifugal drive (2).



### REMOVING THE KICK-START SPROCKET ASSEMBLY

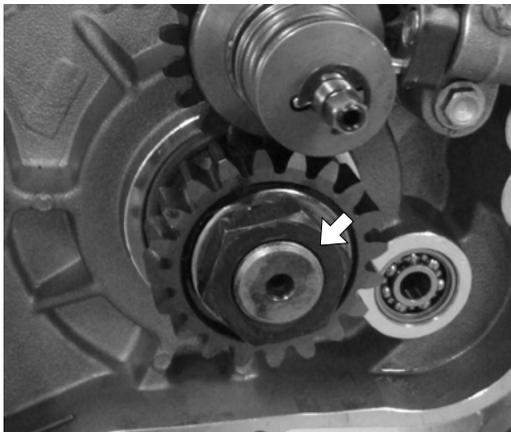
- Remove the spring (1) with a pair of pliers and detach the kick-start sprocket assembly.
- Extract the retaining ring (2), remove the spacer washer and detach the inner starter sprocket.



### REMOVING THE GEAR SELECTOR ASSEMBLY

- Remove the entire selector shaft (arrow) by pulling it outwards.

## Dismantling the engine



### REMOVING THE CRANKSHAFT SPROCKET

**Attention:** 

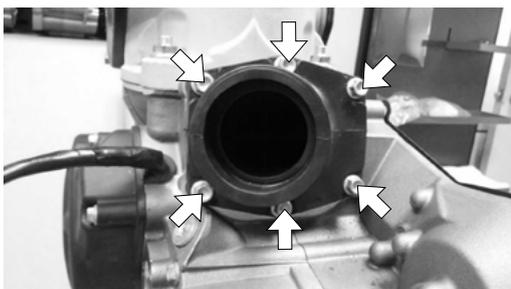
*The crankshaft locking nut loosens to the right!*

- Block the rotation of the crankshaft sprocket and loosen the nut (arrow) (the 200 cc engine features a hexagon screw).

**Note:** 

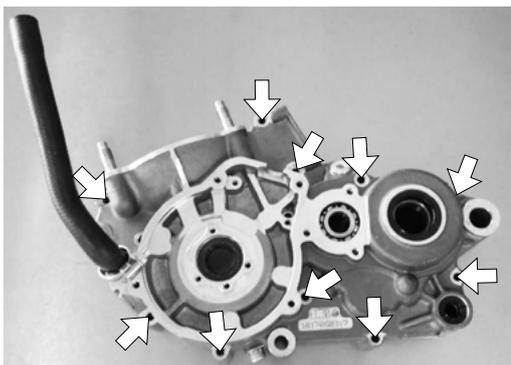
*The 200 cc engine does not feature an inertial flywheel.*

- Remove the nut, bevelled washer, crankshaft sprocket, flywheel and crankshaft cotter pin.



### REMOVING THE REED BLOCK

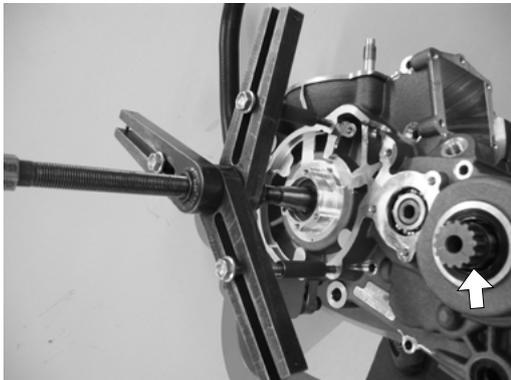
- Remove the screws (arrow) and detach the reed block.



### SEPARATING THE SEMI-CRANKCASES

- Remove the screws (arrow) that join the semi-crankcases.
- Turn the bedplate so that the left-hand semi-crankcase is facing upwards and remove the nut that fixes the engine to the bedplate.

## Dismantling the engine



- Install extractor ref. ME25950000 by turning the legs in the housing openings of the ignition stator as shown in the picture.



**Note:**

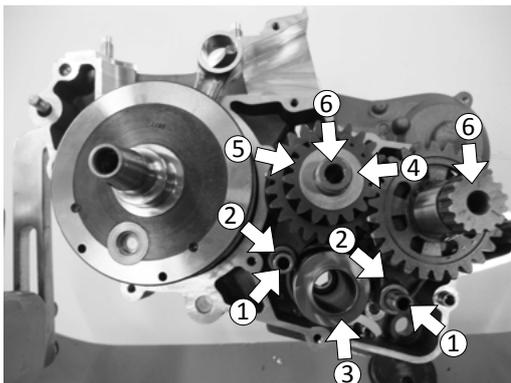
*The extractor legs can be height adjusted; they must be parallel to the surface of the semi-crankcase.*

- Use the extractor to completely separate the left-hand semi-crankcase from the right-hand semi-crankcase.
- During separation, detach the spacer bushing from the output sprocket (arrow) located on the shaft.



**Attention:**

*Do not use screwdrivers or levers to separate the semi-crankcases!*



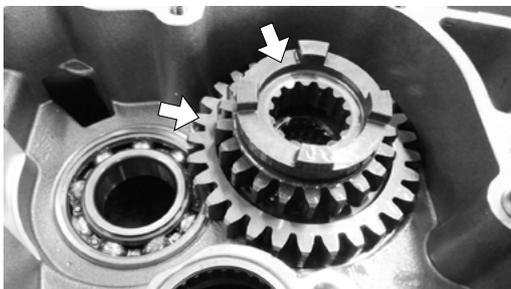
### REMOVING THE GEAR SELECTOR AND ASSEMBLY

- Remove the fork shafts (1) and forks (2).
- Mark the position of the desmodromic valve (3) with respect to the semi-crankcase and then remove it.
- Remove the adjusting washer (4) and the 2nd gear sprocket (5).
- Remove the gear shafts (6) by carefully pulling them upwards.



**Note:**

*The 5th and 1st gear sprockets do not come out with the gear shafts.*



- Remove the 5th and 1st gear sprocket (arrows), needle roller bearing and adjusting washers.

## Dismantling the engine



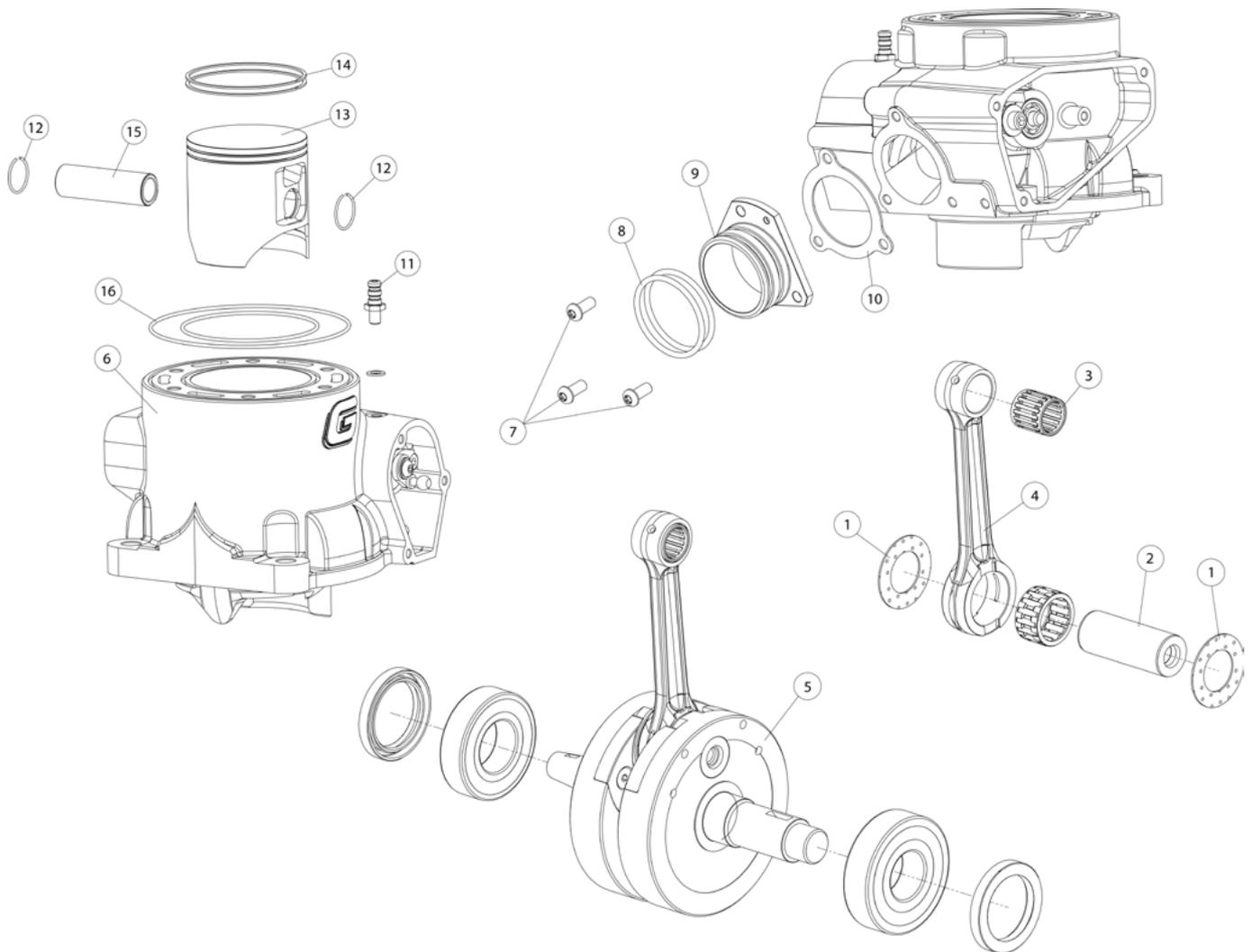
### REMOVING THE CRANKSHAFT

- Remove the crankshaft assembly (arrow) by pulling it upwards.



**Note:**

*If the crankshaft does not come out easily, tap it with a plastic mallet alternately on both shafts.*



1. Washer
2. Connecting rod pin
3. Connecting rod end bearing
4. Connecting rod
5. Crankshaft assembly
6. Cylinder
7. Hexagon screw with washer 6x14
8. Viton exhaust duct O-ring 44x3
9. Exhaust duct
10. Exhaust gasket
11. Breather
12. Piston pin retaining ring
13. Piston
14. Ring set
15. Piston pin
16. Cylinder head O-rings

## SERVICING AND REPAIRING THE ENGINE'S COMPONENTS

### CONNECTING ROD



**Note:**

*The bearing of the connecting rod head should be replaced along with the crankshaft stump, connecting rod and spacer washers.*

- Check the connecting rod end bearing and housing for jamming marks, grooves and gaps.

- Measure the clearance of the connecting rod head by pushing it to one side and inserting a thickness gauge on the opposite side.



Connecting rod head clearance	STD: 0.80 mm. Limit: 1.00 mm.
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### PISTON

- Check the piston for scratches, jamming marks and deformation due to overheating.
- Check the grooves of the rings (cleanliness, absence of deposits of carbon, breakage, etc.). If necessary, clean them with a wire brush that does not damage the surface of the piston.
- Check that the locking pins of the rings are in their housing and that they are firmly fixed.
- Check that there is no excess clearance between the rings and the piston grooves.

Piston: fitting clearance

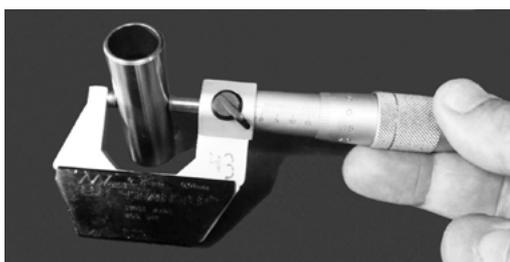
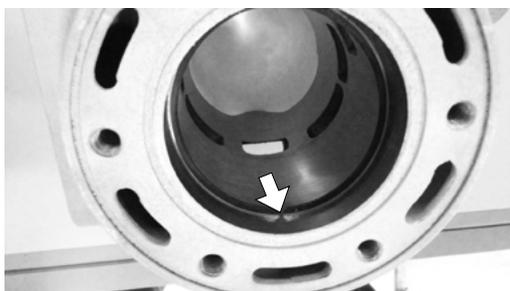


**Note:**

*The piston fitting clearance is determined by subtracting the smallest cylinder bore measurement from the largest piston bore measurement.*

Piston fitting clearance	200 cc:	STD: 0.05 mm Limit: 0.10 mm.
	250 cc:	STD: 0.055 mm Limit: 0.10 mm.
	300 cc:	STD: 0.06 mm Limit: 0.10 mm.

## SERVICING AND REPAIRING THE ENGINE'S COMPONENTS



### Piston: ring end opening

- Insert a piston ring into the cylinder approximately 20 mm from the upper end.
- Using a thickness gauge, measure the distance between the ends of ring -A-

Ring end opening	200 cc:	STD: 0.3 mm Limit: 0.6 mm.
	250 cc:	STD: 0.4 mm Limit: 0.7 mm.
	300 cc:	STD: 0.5 mm Limit: 0.8 mm.

### PIN

- Check the pin for jamming marks, grooves and overheating.

- Measure the pin bore with a micrometre at three different points.

Pin bore	STD: 17.994 mm Limit: 17.98 mm.
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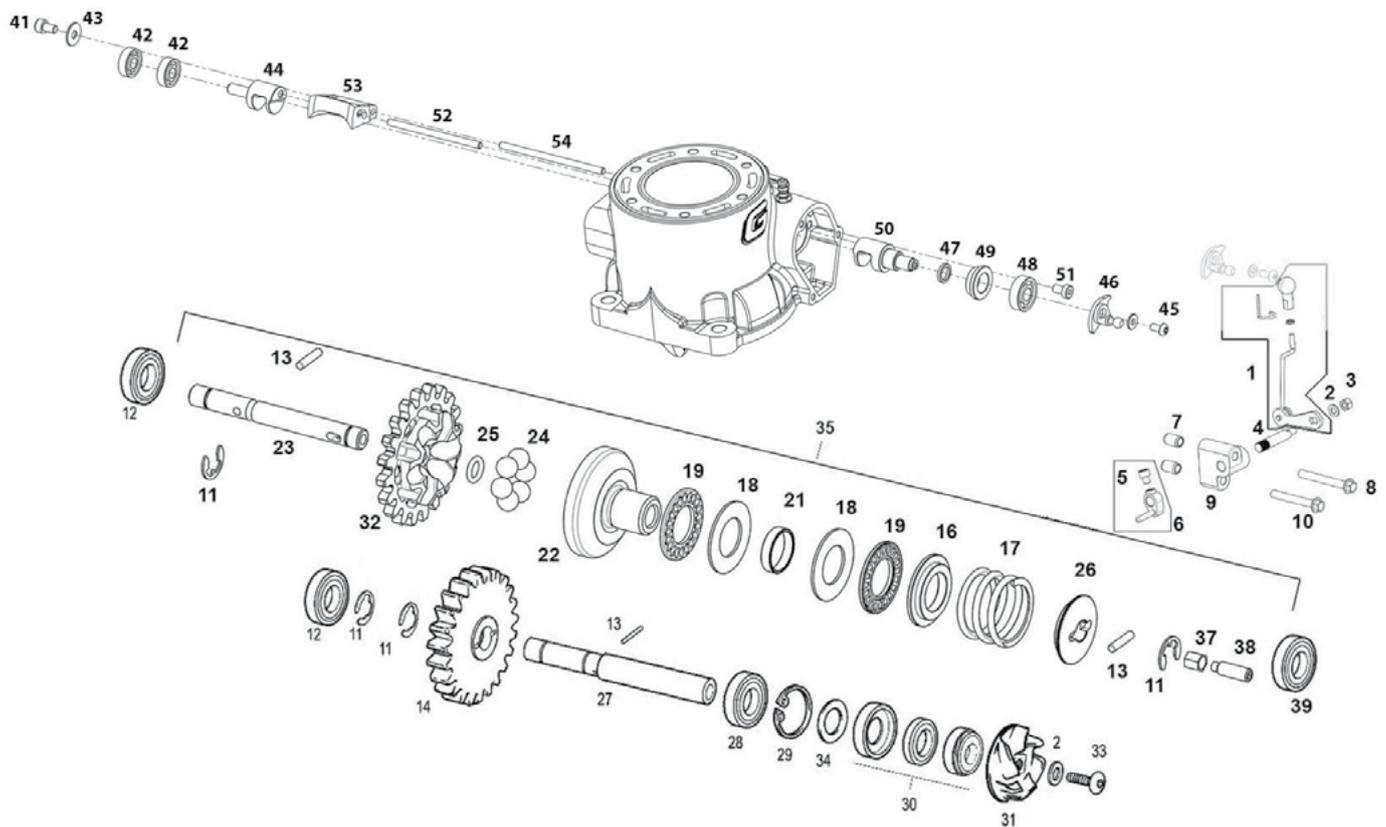
### CYLINDER

#### Cylinder: internal measurement

- Check the cylinder for scratches, jamming marks, notches or breakages in the intake and exhaust ports.

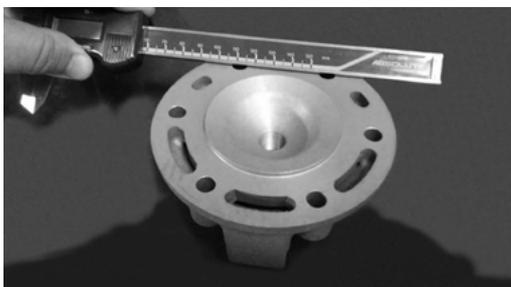
- Measure the cylinder bore approximately 20 mm from the upper end and at different points to check for possible ovaling.

Cylinder bore	200 cc:	STD: 62.50 mm Limit: 62.60 mm.
	250 cc:	STD: 66.38 mm Limit: 66.50 mm.
	300 cc:	STD: 71.99 mm Limit: 72.10 mm.



- |                                |                                     |
|--------------------------------|-------------------------------------|
| 1. Lever assembly              | 30. Water pump gaskets              |
| 2. Washer 5x12x1.5             | 31. Water pump impeller             |
| 3. Self-locking nut            | 32. Impeller sprocket               |
| 4. Impeller lever shaft        | 33. Screw M6x16                     |
| 5. Screw M5x6                  | 34. Water pump washer 25.8x17.5x0.5 |
| 6. Impeller external lever     | 35. Impeller assembly               |
| 7. Bearing                     | 37. Hexagon nut M5                  |
| 8. Screw                       | 38. Hexagon inner screw             |
| 9. Valve shaft bracket         | 39. Bearing 8x19x6                  |
| 10. Screw                      | 40. Screw                           |
| 11. Seeger DIN.6799E7          | 41. Bearings                        |
| 12. Water pump shaft bearing   | 42. Washer                          |
| 13. Water pump needle impeller | 43. Left-hand exhaust valve         |
| 14. Water pump gear            | 44. Screw                           |
| 16. Centrifugal spring seal    | 45. Exhaust valve lever             |
| 17. Exhaust valve spring       | 46. Exhaust valve bearing separator |
| 18. Washer                     | 47. Bearings                        |
| 19. Exhaust valve needles      | 48. Exhaust valve bearing spacer    |
| 21. Spacer                     | 49. Right-hand exhaust valve        |
| 22. Impeller cap               | 50. Screw                           |
| 23. Impeller shaft             | 51. Short exhaust valve shaft       |
| 24. Impeller balls             | 52. Central exhaust valve           |
| 25. O-ring                     | 53. Long exhaust valve shaft        |
| 26. Adjustable spring seal     |                                     |
| 27. Water pump sprocket shaft  |                                     |
| 28. Water pump bearing         |                                     |
| 29. Seeger water pump          |                                     |

## SERVICING AND REPAIRING THE ENGINE'S COMPONENTS



### CYLINDER HEAD

- Check that the cylinder head support surface is not deformed with respect to the cylinder.
- Carefully clean the inside of the cylinder head; it must be free of carbon.

### REMOVE

- Remove the screws
- Extract the bearings with an extractor along with the washer and the left-hand exhaust valve.
- Remove the long exhaust valve shaft.
- Through the housing of the left-hand exhaust valve, dislodge the right-hand exhaust valve, spacer and bearing -8- by tapping gently with a hammer.
- Remove the shaft from the short exhaust valve by tapping gently with a hammer inside the screw hole.
- Remove the central exhaust valve through the exhaust port of the cylinder.



**Note:**

*To remove the centrifuge, simply compress spring -19- to the pin and remove it.*

### CHECK

#### Centrifugal shaft

- Check that the centrifugal shaft does not show signs of jamming or oxidation. The hood must slide smoothly over the shaft.

#### Centrifugal sprocket

- Check that the sprocket does not show signs of wear in the toothed contact area.

#### Exhaust valve needle cages

- Check that the needle cages do not show signs of jamming or hardness when rotating and that the plates have no grooves.

#### Centrifugal balls

- Check the condition of the centrifugal balls. They must remain spherical in shape and show no signs of wear or contact marks.

Diameter of the centrifugal balls	8 mm
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#### Needle

- Check that it is firmly attached to the centrifugal outlet lever.
- If it is necessary to remove it, mark its position with respect to the centrifugal lever shaft, e.g. with an indelible marker.

## SERVICING AND REPAIRING THE ENGINE'S COMPONENTS

### Valve control shaft bracket

- Check that the centrifugal lever shaft moves freely inside the bracket.

### Exhaust valve bearings

- Check that the exhaust valve bearings show no signs of jamming or hardness when rotating.



**Note:**

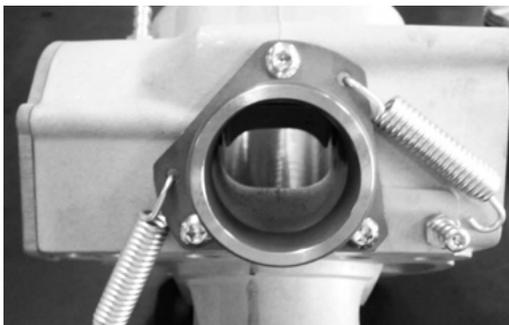
***All of the exhaust valve bearings must be replaced***

### Left-hand, central and right-hand exhaust valves

- Check the valves for cracks, jamming marks or deformation due to overheating.
- Clean the valves to remove any carbon deposits with a wire brush that does not damage their surface.

### Short and long exhaust valve shaft

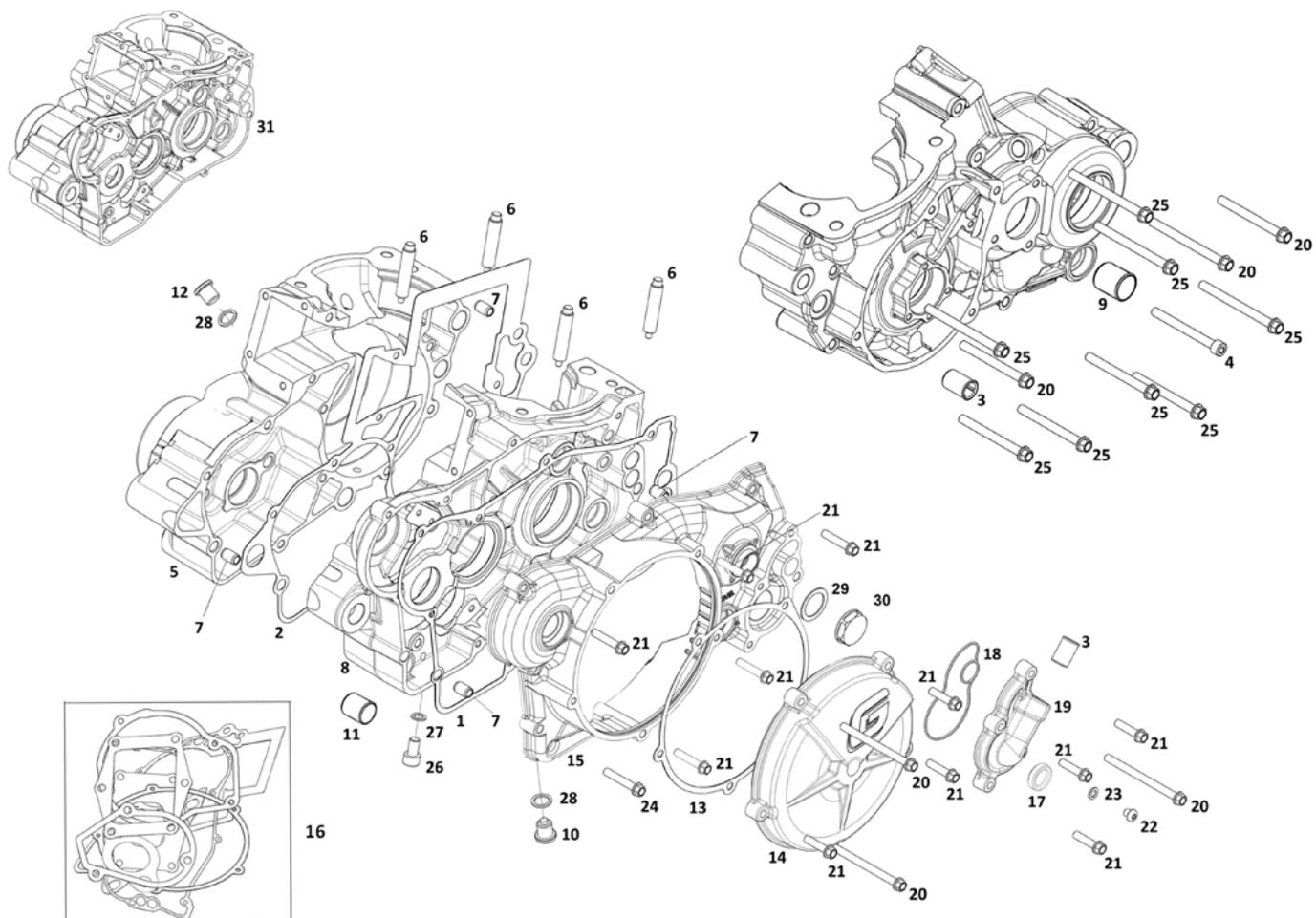
- Check that the shafts show no signs of jamming marks or deformation due to overheating.
- Clean the shafts to remove any carbon deposits with a wire brush that does not damage their surface.



### Central exhaust valve fitting position

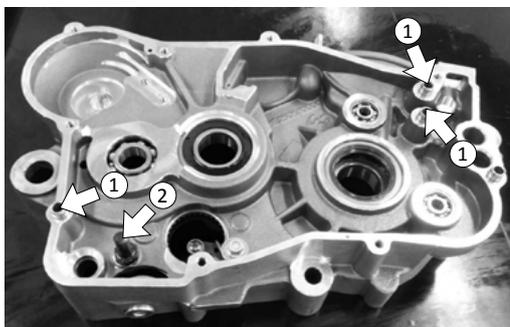
- Fit the central exhaust valve with the curved surface facing the inside of the exhaust port.

## SERVICING AND REPAIRING THE ENGINE'S COMPONENTS



- |                             |                                |
|-----------------------------|--------------------------------|
| 1. Clutch cover gasket      | 21. Screw                      |
| 2. Central crankcase gasket | 22. Screw ULS                  |
| 3. Water inlet valve        | 23. Washer 6x10x1.5            |
| 4. Hollow head screw        | 24. Screw                      |
| 6. Cylinder bolt            | 25. Screw                      |
| 7. Crankcase bushing        | 26. Allen screw                |
| 9. Friction bushing         | 27. Copper washer              |
| 10. Oil drain plug          | 28. Washer                     |
| 11. Glacier 1212            | 29. O-ring                     |
| 12. Oil filler cap          | 30. Centrifugal regulating cap |
| 13. Cover gasket            | 31. Crankcase assembly         |
| 14. Clutch disc cover       |                                |
| 15. Clutch cover            |                                |
| 16. Gasket set              |                                |
| 17. Oil level cap           |                                |
| 18. Water pump gasket       |                                |
| 19. Water pump cover        |                                |
| 20. Screw                   |                                |

## SERVICING AND REPAIRING THE ENGINE'S COMPONENTS



### RIGHT-HAND SEMI-CRANKCASE, INNER SIDE

- Remove centring bushings -1- and selector spring centring screw -2-



- Before performing any repairs to the right-hand semi-crankcase, check for any deformation around its circumference with a thickness gauge, both inside and outside.

Maximum semi-crankcase deformation	0.05 mm.
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**Note:**

*To remove the bearings from the right-hand semi-crankcase, it is necessary to heat it to approximately 150°C using a heating plate, stove or similar. Once it is hot, simply use an ordinary extractor tool or a soft metal or wooden pusher to remove the bearings completely. In exceptional cases, it may be necessary to use a press to dislodge the bearings.*

- Remove the seals from the right-hand semi-crankcase using a seal extractor or by carefully prying with a screwdriver.



**Note:**

*All gaskets, seals and O-rings must be replaced every time the engine is partially or completely dismantled.*

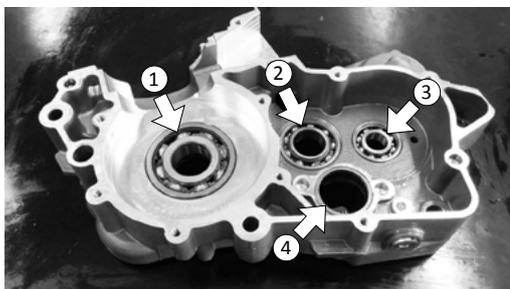
- Place the right-hand semi-crankcase on a heating plate and heat it to approximately 150°C.



**Danger:**

*When handling the semi-crankcase after heating it, heat-resistant gloves should be worn to protect the hands.*

## SERVICING AND REPAIRING THE ENGINE'S COMPONENTS



- Dislodge the bearings from the right-hand semi-crankcase.

Crankshaft bearing -1-

- Remove the ball bearing from the crankshaft by pressing from the outside of the semi-crankcase inwards.
- Place the new ball bearing in the semi-crankcase housing. The stamped side of the bearing must be orientated towards the inside of the semi-crankcase.
- Press on the new ball bearing until it is flush with the inner surface of the semi-crankcase.

Primary shaft bearing -2-

- Remove the ball bearing from the primary shaft by pressing from the outside of the semi-crankcase inwards.
- Place the new ball bearing in the semi-crankcase housing. The closed side of the bearing must be orientated towards the outside of the semi-crankcase.
- Press on the bearing until it is fully encased in the right-hand semi-crankcase housing.

**Attention:**



***When removing and fitting the ball bearing, be careful not to apply excessive pressure to the bearing housing area. If the pressure is excessive, the semi-crankcase may become damaged!***

Secondary shaft bearing -3-

- Remove the ball bearing from the secondary shaft by pressing from the outside of the semi-crankcase inwards.
- Place the new ball bearing in the semi-crankcase housing. The stamped side of the bearing must be orientated towards the inside of the semi-crankcase.
- Press on the bearing until it is fully encased in the right-hand semi-crankcase housing.

**Attention:**



***When removing and fitting the ball bearing, be careful not to apply excessive pressure to the bearing housing area. If the pressure is excessive, the semi-crankcase may become damaged!***

Desmodromic valve bearing -4-

- Remove the desmodromic valve needle roller bearing by pressing from the outside of the semi-crankcase inwards.
- Fit the new needle roller bearing to the semi-crankcase housing. The stamped side of the bearing must be orientated towards the inside of the semi-crankcase.

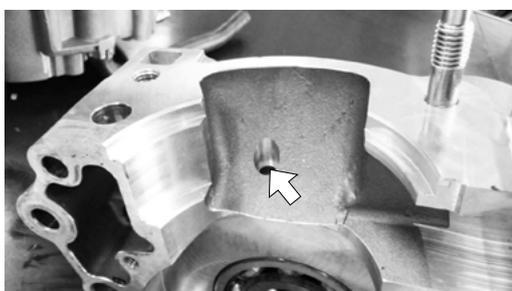
## SERVICING AND REPAIRING THE ENGINE'S COMPONENTS

- Press on the bearing until it is fully encased in the right-hand semi-crankcase housing.



**Attention:**

*When removing and fitting the needle roller bearing, be careful not to apply excessive pressure to the bearing housing area. If the pressure is excessive, the semi-crankcase may become damaged!*



- Check the lubrication hole of the crankshaft bearing (arrow). It should be clean and free of obstructions.

### RIGHT-HAND SEMI-CRANKCASE, OUTER SIDE



**Note:**

*To remove the bearings from the right-hand semi-crankcase, it is necessary to heat it to approximately 150°C using a heating plate, stove or similar. Once it is hot, simply use an ordinary extractor tool or a soft metal or wooden pusher to remove the bearings completely. In exceptional cases, it may be necessary to use a press to dislodge the bearings.*

- Remove the seals from the right-hand semi-crankcase using a seal extractor or by carefully prying with a screwdriver.



**Note:**

*All gaskets, seals and O-rings must be replaced every time the engine is partially or completely dismantled.*

- Place the right-hand semi-crankcase on a heating plate and heat it to approximately 150°C.

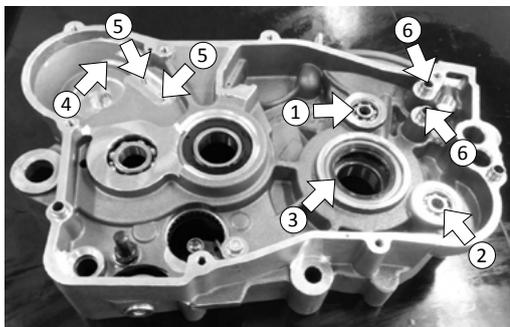


**Danger:**

*When handling the semi-crankcase after heating it, heat-resistant gloves should be worn to protect the hands.*

- Dislodge the bearings from the right-hand semi-crankcase.

## SERVICING AND REPAIRING THE ENGINE'S COMPONENTS



### Centrifugal bearing -1-

- Remove the ball bearing from the centrifugal shaft using a bearing extractor (maximum diameter 8 mm) from the outside of the semi-crankcase.
- Place the new ball bearing in the semi-crankcase housing. The closed side of the bearing must be orientated towards the inside of the housing opening.
- Press on the bearing until it is fully encased in the right-hand semi-crankcase housing.

### Water pump sprocket shaft bearing -2-

- Remove the ball bearing from the water pump sprocket shaft using a bearing extractor (maximum diameter 8 mm) from the outside of the semi-crankcase.
- Place the new ball bearing in the semi-crankcase housing. The closed side of the bearing must be orientated towards the inside of the housing opening.
- Press on the bearing until it is fully encased in the right-hand semi-crankcase housing.

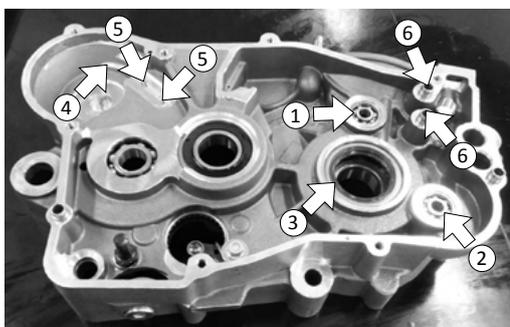
### Crankshaft seal -3-

- Place the new crankshaft seal in the semi-crankcase housing. The sealing lip must be orientated towards the outside of the semi-crankcase.
- Press on the seal until it is fully encased in the right-hand semi-crankcase housing.

**Attention:**   
*When fitting the seal, be careful not to damage the sealing lip!*

### Kick-start ratchet bracket -4-

- Remove the kick-start ratchet bracket by removing screws -5-.
- Fit the bracket by applying threadlocker to screws -5-.



### Centring bushings -6-

- Check that centring bushings -6- are present and in good condition.
- Replace any centring bushings that are missing.

**Note:**   
If any centring bushings are missing, proper watertightness cannot be guaranteed when the semi-crankcases are fitted.

## SERVICING AND REPAIRING THE ENGINE'S COMPONENTS



### LEFT-HAND SEMI-CRANKCASE, INNER SIDE

- Before performing any repairs to the left-hand semi-crankcase, check inside for any deformation around its circumference with a thickness gauge.

Maximum semi-crankcase deformation	0.05 mm
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**Note:**

*To remove the bearings from the left-hand semi-crankcase, it is necessary to heat it to approximately 150°C using a heating plate, stove or similar. Once it is hot, simply use an ordinary extractor tool or a soft metal or wooden pusher to completely remove the bearings. In exceptional cases, it may be necessary to use a press to dislodge the bearings.*

- Remove the seals from the left-hand semi-crankcase using a seal extractor or by carefully prying with a screwdriver.



**Note:**

*All gaskets, seals and O-rings must be replaced every time the engine is partially or completely dismantled.*

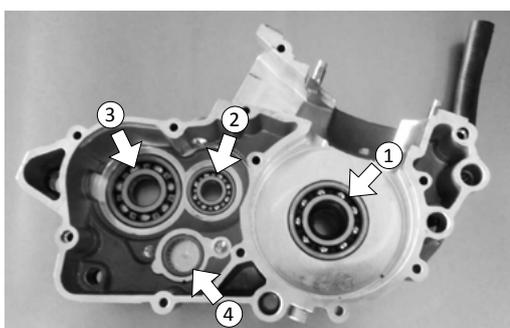
- Place the left-hand semi-crankcase on a heating plate and heat it to approximately 150°C.



**Danger:**

*When handling the semi-crankcase after heating it, heat-resistant gloves should be worn to protect the hands.*

- Dislodge the bearings from the left-hand semi-crankcase.



#### Crankshaft bearing -1-

- Remove the roller bearing from the crankshaft using a bearing extractor (maximum diameter 38 mm) from the inside of the semi-crankcase inwards.
- Place the new roller bearing in the semi-crankcase housing. The stamped side of the bearing must be orientated towards the inside of the semi-crankcase.
- Press on the new roller bearing until it is flush with the inside surface of the semi-crankcase.

#### Primary shaft bearing -2-

- Remove the ball bearing from the primary shaft by pressing from the outside of the semi-crankcase inwards.

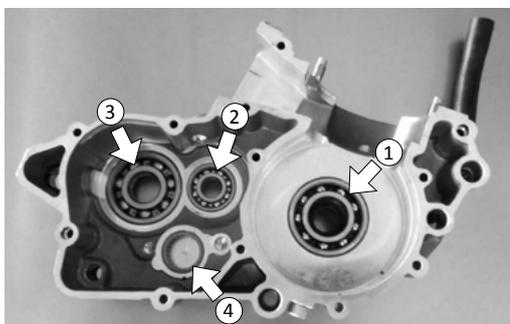
## SERVICING AND REPAIRING THE ENGINE'S COMPONENTS

- Place the new ball bearing in the semi-crankcase housing. The stamped side of the bearing must be orientated towards the outside of the semi-crankcase.
- Press on the bearing until it is fully encased in the left-hand semi-crankcase housing.

**Attention:**  **When removing and fitting the ball bearing, be careful not to apply excessive pressure to the bearing housing area. If the pressure is excessive, the semi-crankcase may become damaged!**

### Secondary shaft bearing -3-

- Remove the ball bearing from the secondary shaft by pressing from the outside of the semi-crankcase inwards.
- Place the new ball bearing in the semi-crankcase housing. The stamped side of the bearing must be orientated towards the inside of the semi-crankcase.
- Press on the bearing until it is fully encased in the right-hand semi-crankcase housing.



**Attention:**  **When removing and fitting the needle roller bearing, be careful not to apply excessive pressure to the bearing housing area. If the pressure is excessive, the semi-crankcase may become damaged!**

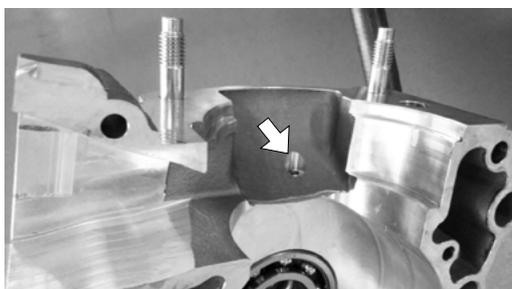
### Desmodromic valve bearing -4-

- Remove the needle roller bearing from the desmodromic valve using a bearing extractor (maximum diameter 25 mm) from the inside of the semi-crankcase inwards.
- Fit the new needle roller bearing to the semi-crankcase housing. The stamped side of the bearing must be orientated towards the inside of the housing opening.
- Press on the bearing until it is fully encased in the left-hand semi-crankcase housing.

**Attention:**  **When removing and fitting the ball bearing, be careful not to apply excessive pressure to the bearing housing area. If the pressure is excessive, the semi-crankcase may become damaged!**

- Check the lubrication hole of the crankshaft bearing (arrow). It should be clean and free of obstructions.

## SERVICING AND REPAIRING THE ENGINE'S COMPONENTS



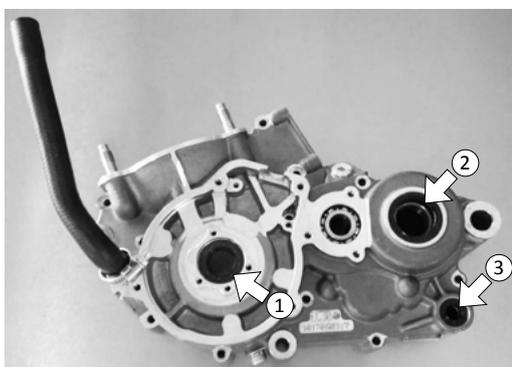
- Check the lubrication hole of the crankshaft bearing (arrow). It should be clean and free of obstructions.

### LEFT-HAND SEMI-CRANKCASE, OUTER SIDE



**Note:**

**All gaskets, seals and O-rings must be replaced every time the engine is partially or completely dismantled.**



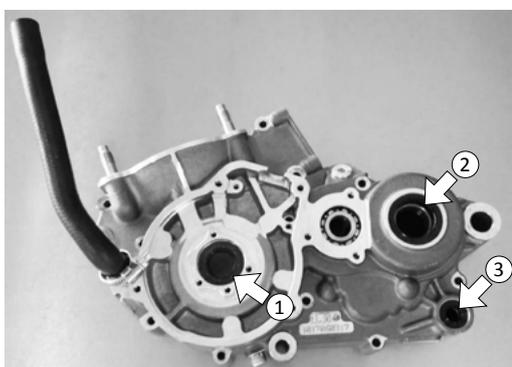
#### Crankshaft seal -1-

- Place the new crankshaft seal in the semi-crankcase housing. The sealing lip must be orientated towards the outside of the semi-crankcase.
- Press on the seal with a pusher until it is fully encased in the left-hand semi-crankcase housing.



**Attention:**

**When fitting the seal, be careful not to damage the sealing lip!**



#### Output shaft seal -2-

- Place the new crankshaft seal in the semi-crankcase housing. The sealing lip must be orientated towards the outside of the semi-crankcase.
- Press on the seal with a pusher until it is flush in the left-hand semi-crankcase housing.



**Attention:**

**When fitting the seal, be careful not to damage the sealing lip!**

#### Selector shaft seal -3-

- Fit the new selector shaft seal to the semi-crankcase housing. The sealing lip must be orientated towards the outside of the semi-crankcase.
- Press on the seal with a pusher until it is fully encased in the left-hand semi-crankcase housing.



**Attention:**

**When fitting the seal, be careful not to damage the sealing lip!**

## SERVICING AND REPAIRING THE ENGINE'S COMPONENTS



### CLUTCH COVER

- Before performing any repairs to the clutch cover, check inside for any deformation with a thickness gauge.

Maximum clutch cover deformation	0.05 mm
----------------------------------	---------



**Note:**

*To remove the bearings from the clutch cover, it is necessary to heat it to approximately 150°C using a heating plate, stove or similar. Once it is hot, simply use an ordinary extractor tool or a soft metal or wooden pusher to remove the bearings completely. In exceptional cases, it may be necessary to use a press to dislodge the bearings.*

- Remove the seals from the clutch cover using a seal extractor or by carefully prying with a screwdriver.



**Note:**

*All gaskets, seals and O-rings must be replaced every time the engine is partially or completely dismantled.*

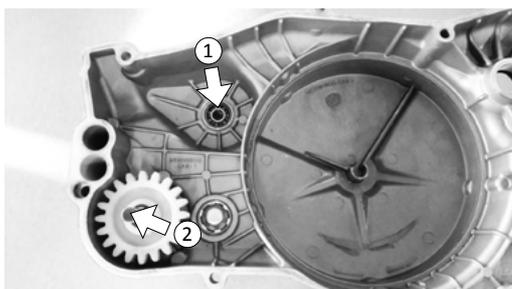
- Place the clutch cover on a heating plate and heat it to approximately 150°C.



**Danger:**

*When handling the semi-crankcase after heating it, heat-resistant gloves should be worn to protect the hands.*

- Remove the bearings from the clutch cover.



### Centrifugal shaft bearing -1-

- Remove the ball bearing from the centrifugal shaft using a bearing extractor (maximum diameter 8 mm) from the inside of the clutch cover.
- Place the new ball bearing in the clutch cover housing. The closed side of the bearing must be orientated towards the outside of the housing opening.
- Press on the bearing until it is fully encased in the clutch cover housing.

## SERVICING AND REPAIRING THE ENGINE'S COMPONENTS

### Water pump sprocket shaft bearing -2-

- Remove the ball bearing from the water pump sprocket shaft using a bearing extractor (maximum diameter 10 mm) from the inside of the clutch cover.
- Place the new ball bearing in the clutch cover housing. The closed side of the bearing must be orientated towards the outside of the housing opening.
- Press on the bearing until it is fully encased in the clutch cover housing.



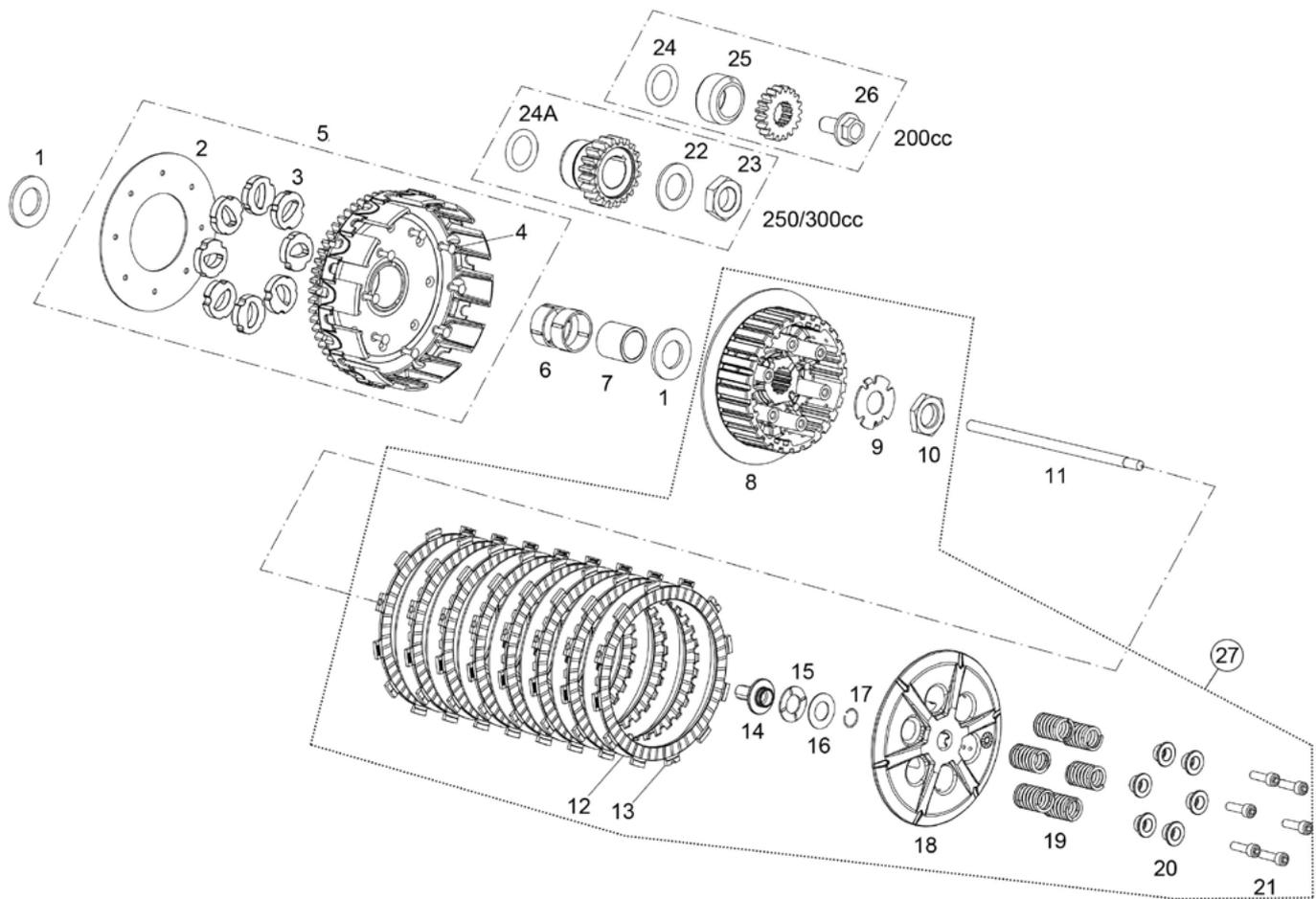
### Kick-start shaft seal -1-

- Fit the new kick-start shaft seal to the clutch cover housing. The sealing lip must be orientated towards the outside of the clutch cover.
- Press on the seal with a pusher until it is fully encased in the clutch cover housing.

**Danger:** 

**When fitting the seal, be careful not to damage the sealing lip!**

## SERVICING AND REPAIRING THE ENGINE'S COMPONENTS



1. Clutch basket washer 22.1x42x2.8
2. Clutch sprocket washer
3. Silentblock rubber
4. Clutch basket rivets
5. Complete clutch basket
6. Clutch basket bearing
7. Clutch basket bushing
8. Clutch hub
9. Clutch washer
10. Clutch nut
11. Clutch rod
12. Iron clutch disc
13. Lined clutch disc
14. Clutch press bushing
15. Clutch valve needle cage
16. Needle plate and clutch valve
17. Clutch press ring
18. Clutch press
19. Clutch spring
20. Aluminium clutch spring bushing

21. Allen screw M6x20
22. Bevelled washer 20/125
23. Crankshaft sprocket locking nut
24. Clutch primary sprocket O-ring
- 24 A. Clutch primary sprocket O-ring
25. Crankshaft bushing
26. Screw M12x25
27. Clutch hub assembly

## SERVICING AND REPAIRING THE ENGINE'S COMPONENTS

### Clutch spring

- Check the condition of the springs and their length.

Length of the springs	Min. 45.7 mm. Limit: 44 mm.
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**Note:**

***All of the clutch springs should be replaced.***

### Clutch press

- Check condition and clutch disc contact surface for scratches and excessive wear.

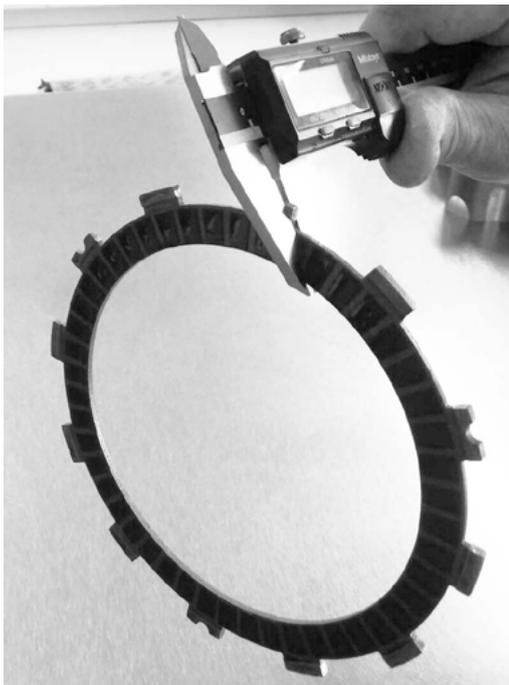
### Bearing and pusher

- Check the clutch bearing and pusher for jamming marks, grooves and gaps.

### Lined clutch discs

- Check the thickness of the lined clutch discs.

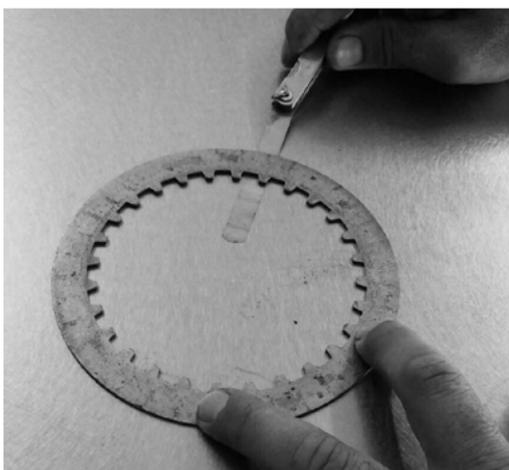
Lined clutch disc thickness	STD: 2.72 to 2.85 mm Limit: 2.68 mm.
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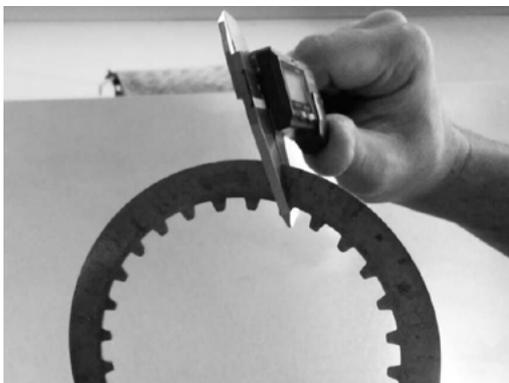
### Iron clutch discs

- Check the clutch disc for scratches and warping or deformation.

Maximum iron clutch disc deformation	0.05 mm
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## SERVICING AND REPAIRING THE ENGINE'S COMPONENTS



- Check the thickness of the iron clutch disc.

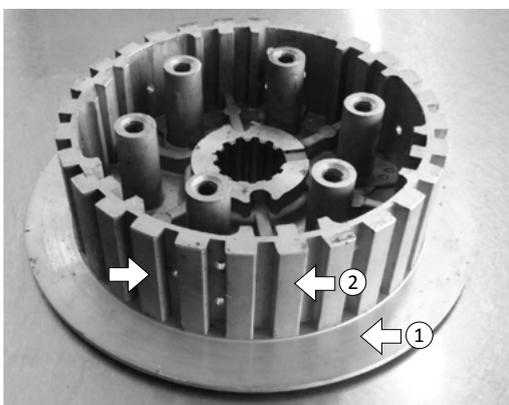
Clutch disc thickness	STD: 1.45 to 1.55 mm. Limit: 1.40 mm.
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Clutch rod

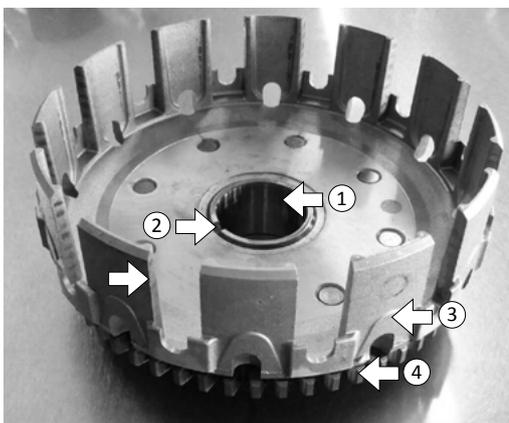
- Check the clutch rod for deformation.

Maximum clutch rod deformation	0.05 mm.
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Clutch hub

- Check that the clutch disc housings (arrow) are not misaligned due to excessive wear.
- Check condition and clutch disc contact surface -1- for scratches and excessive wear.
- Check that oil circulation holes -2- are free of dirt and metal particles.

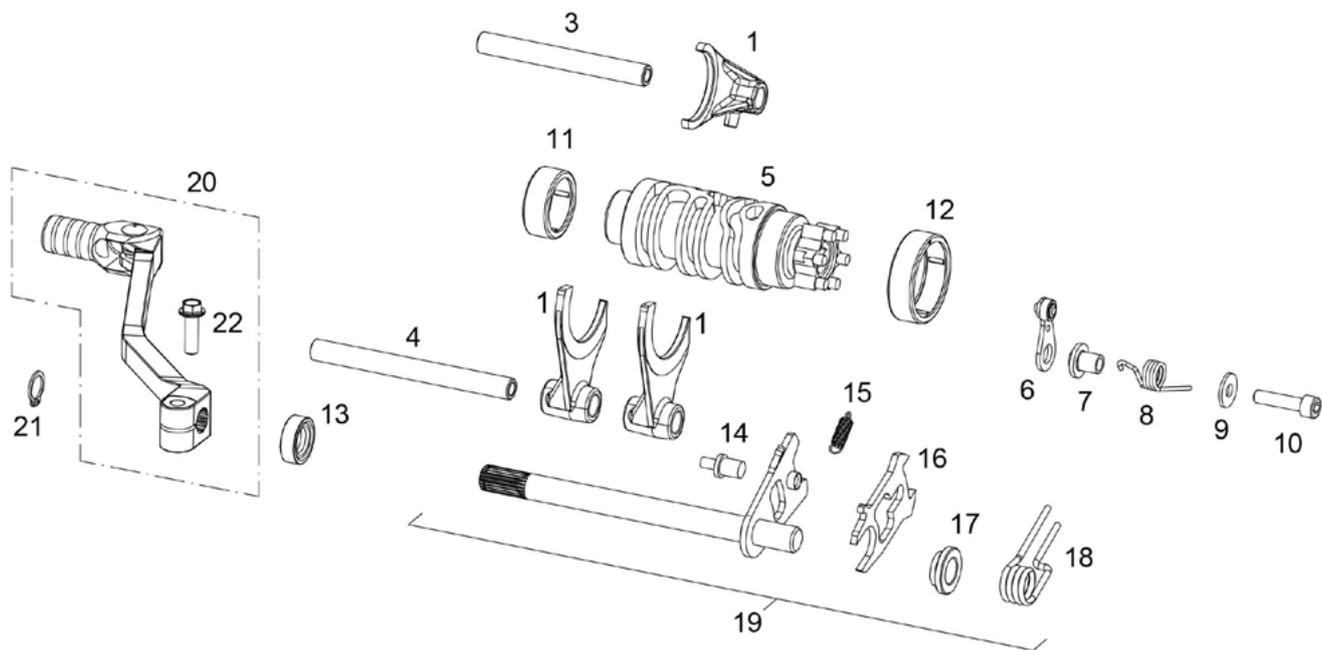


Clutch basket sprocket

- Check the contact surface of bearing -1- for jamming marks, grooves and gaps.
- Check on both sides that lubrication grooves -2- are free of dirt and metal particles.
- Check that there is no gap between basket -3- and sprocket -4-.
- Check that the clutch disc housings (arrow) are not misaligned due to excessive wear.

Clutch basket bearings

- Check the clutch basket bearing and selector shaft
- Check that the selector shaft shows no signs of excessive wear or contact marks.



1. Fork assembly
3. Short fork shaft
4. Long fork shaft
5. Desmodromic valve
6. Gear selector
7. Gear selector bushing
8. Gear selector spring
9. Flat washer 6x16x1.5
10. Special screw
11. Desmodromic valve bearing
12. Desmodromic valve bearing
13. Selector seal 12-22-7
14. Selector spring centring screw
15. Scorpion spring
16. Scorpion
17. Scorpion centraliser collar
18. Selector spring
19. Complete selector shaft
20. Gear change pedal assembly
21. Seeger 12x1
22. Screw M6x20

## SERVICING AND REPAIRING THE ENGINE'S COMPONENTS

- Check that the selector shaft bushing is in good condition and has no excess play.

### Scorpion guide bushing

- Check that the guide bushing is not excessively worn in the scorpion contact area.



### Assembling the selector shaft

- Fit the scorpion guide bushing to the end of the selector shaft.
- Fit the scorpion to the selector shaft guide.
- Place the selector spring in the shaft bracket and rest the lower leg (straight leg) on the stop.
- Using a pair of pliers, move the upper leg (curved leg) over the stop until it is supported on the side opposite the lower leg.
- Insert the ends of the scorpion spring into the selector shaft and scorpion brackets.

### Gear selector

- Check that the bearing on the end of the selector is in good condition, that it turns easily and that there is no excessive play.

### Desmodromic valve

- Check the rolling tracks of the desmodromic valve bearings for jamming marks, grooves and gaps.
- Check that there are no accumulations of dirt or debris inside the desmodromic valve channels and that they are not excessively worn.



### Short and long fork shaft

- Check the fork shafts for any deformation.
- Check that the shafts are free of any wear marks or grooves. The forks should be able to slide through them smoothly.

Maximum clutch rod deformation	0.05 mm
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### Forks

- Check that the fork is not deformed or bent.
- Check that the inside of the fork slide opening is free of any wear marks or grooves.

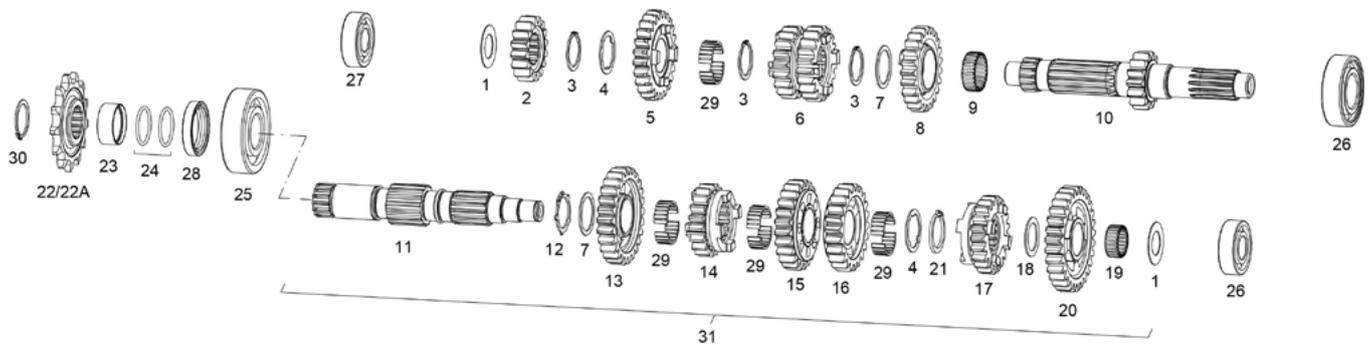
## SERVICING AND REPAIRING THE ENGINE'S COMPONENTS



- Check the clearance between the fork and its housing on the sprocket.

Clearance between the fork and its housing on the sprocket	STD: 0.15 mm. Limit: 0.25 mm.
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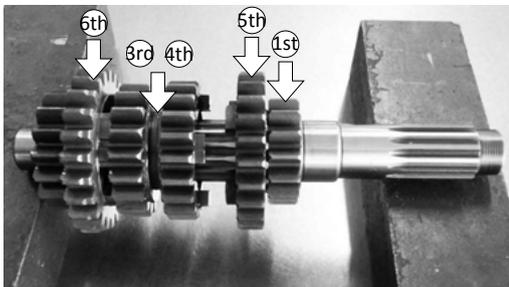
## SERVICING AND REPAIRING THE ENGINE'S COMPONENTS



- |                                     |                                  |
|-------------------------------------|----------------------------------|
| 1. Gear change washer 18x31.5x0.7   | 21. Circlip D.25 t=2             |
| 2. Primary 2nd sprocket             | 22. Output sprocket Z13          |
| 3. Circlip DIN 471                  | 23. Gear change seal collar      |
| 4. Grooved washer 31.5x1            | 24. O-ring 25x2 NBR              |
| 5. Primary 6th sprocket             | 25. Gear change bearing 6305     |
| 6. Primary 3rd and 4th sprocket     | 26. Gear change bearing 6203     |
| 7. Washer 25.2x31.5x1               | 27. Gear change bearing 6205ZC3E |
| 8. Primary 5th sprocket             | 28. Seal                         |
| 9. Needle roller bearing K25-29-10  | 29. Needle cage KD22X25X9.8      |
| 10. Primary 1st shaft               | 30. Circlip D.25                 |
| 11. Secondary shaft                 | 31. Complete gear change unit    |
| 12. Circlip D.25 DIN                |                                  |
| 13. Secondary 2nd sprocket          |                                  |
| 14. Secondary 6th sprocket          |                                  |
| 15. Secondary 3rd sprocket          |                                  |
| 16. Secondary 4th sprocket          |                                  |
| 17. Secondary 5th sprocket          |                                  |
| 18. Washer 20.8x29x1                |                                  |
| 19. Needle roller bearing K20x24x10 |                                  |
| 20. Secondary 1st sprocket          |                                  |

## SERVICING AND REPAIRING THE ENGINE'S COMPONENTS

- Check the bearing contact surface for jamming marks, grooves and gaps.
- Check the sprocket teeth for wear or breakage.
- Check for dirt on the sprockets and their movement grooves.
- Check that the lubrication grooves contained on some sprockets are free of dirt and metal particles.
- Once the shaft elements have been removed, clean them thoroughly and replace all of the retaining rings.



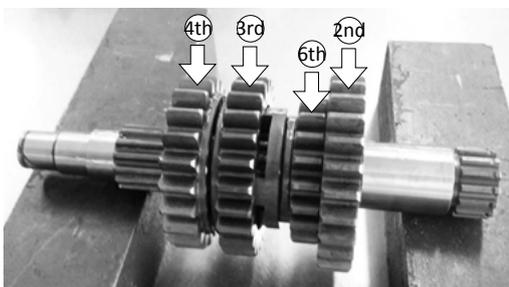
### Primary shaft

- Properly lubricate all of the bearings at the time of assembly.



**Note:**

**The order of placement of the sprockets is: 5th - 3rd / 4th - 6th gears.**



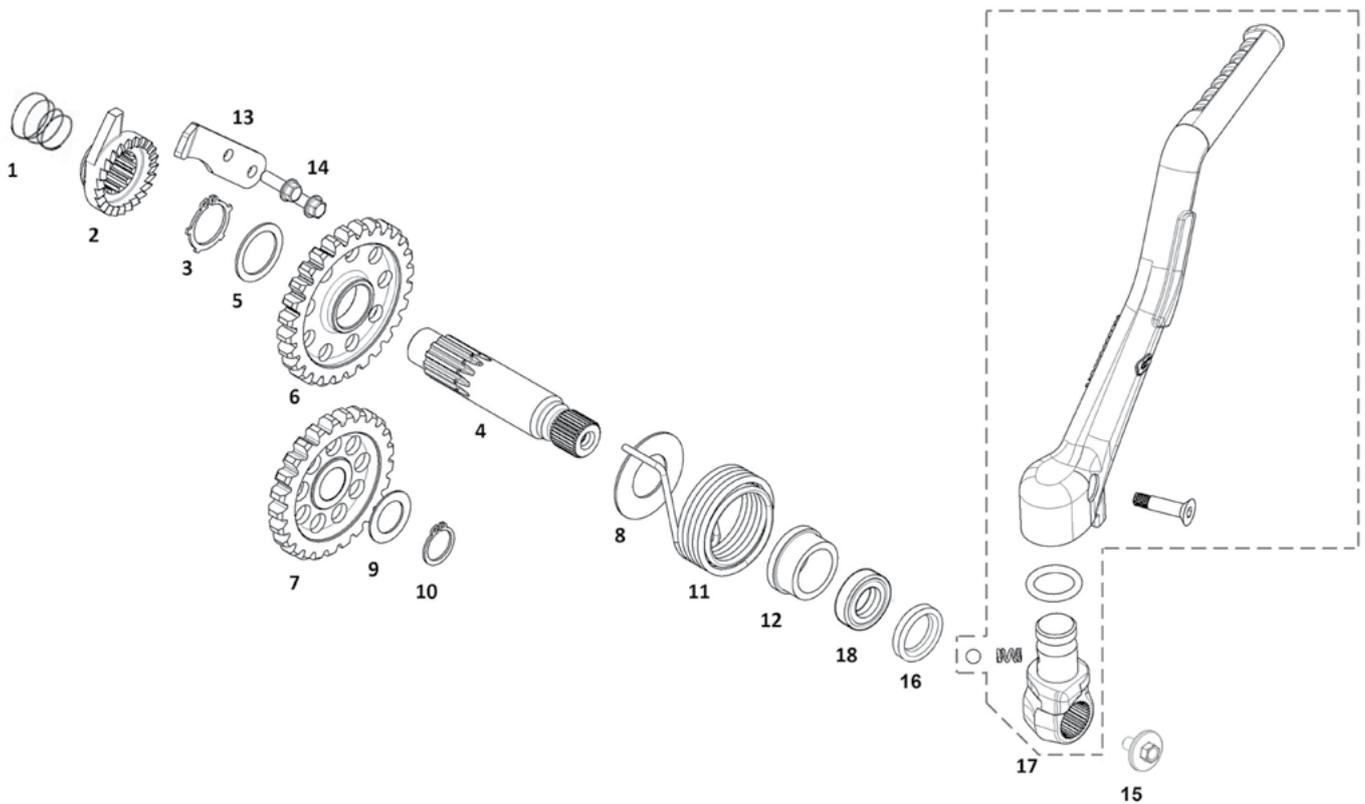
### Secondary shaft

- Properly lubricate all of the bearings at the time of assembly



**Note:**

**The order of placement of the sprockets is: 2nd - 6th - 3rd - 4th gears.**



1. Kick-start ratchet spring
2. Kick-start ratchet
3. Kick-start Seeger 20
4. Kick-start shaft
5. Washer 27x20.2x1
6. Kick-start sprocket
7. Kick-start intermediate sprocket
8. Kick-start washer 20x40x1
9. Kick-start sprocket washer 24x15.15x0.8
10. Clutch shaft Seeger 15
11. Kick-start spring
12. Kick-start spring centring bushing
13. Kick-start ratchet bracket
14. Special screw
15. Screw
16. Washer
17. Kick-start pedal assembly
18. Kick-start pedal seal 20x30x7

## SERVICING AND REPAIRING THE ENGINE'S COMPONENTS

### Kick-start shaft

- Check that the teeth of the kick-start shaft show no signs of excessive wear or contact marks.
- Check the clearance of the shaft in the casing housing.
- Check that the lubrication channels are clean and free of debris.

### Ratchet

- Check that the ratchet teeth show no signs of excessive wear.

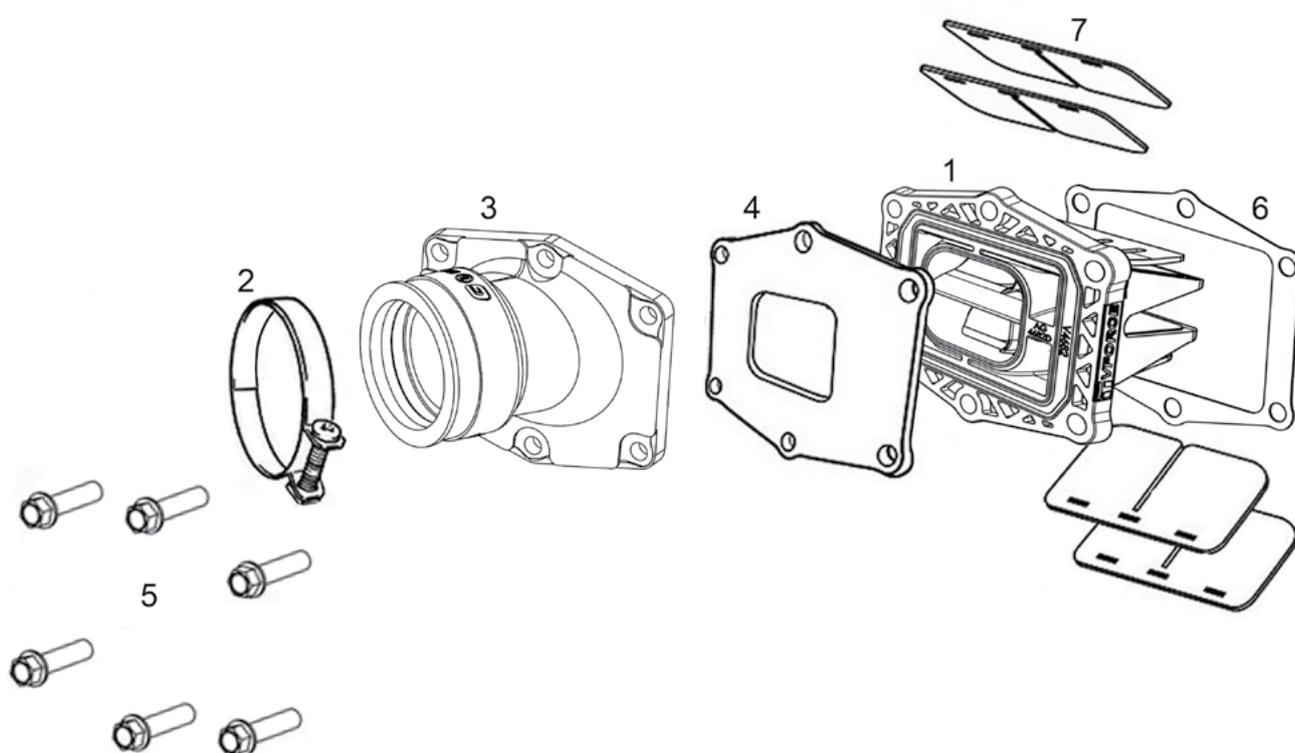
### Kick-start sprocket

- Check that the sprocket shows no signs of excessive wear or gaps.
- Check that the teeth of the kick-start sprocket show no signs of excessive wear or contact marks.

### Inner sprocket

- Check that the sprocket shows no signs of excessive wear or gaps.
- Check that the lubrication channels are clean and free of debris.
- Check that the inner bushing of the sprocket is not scratched or worn.

## SERVICING AND REPAIRING THE ENGINE'S COMPONENTS



1. Reed block assembly
2. Reed block clamp
3. Reed block rubber
4. Pipe
5. Special screw M6x25
6. Crankcase reed block gasket
7. Pipe reed block gasket
8. Intake reed set

## SERVICING AND REPAIRING THE ENGINE'S COMPONENTS

### Reeds

- Check that the reeds are free of cracks and signs of ageing.
- Check that the reeds are firmly laying on each other and are watertight.

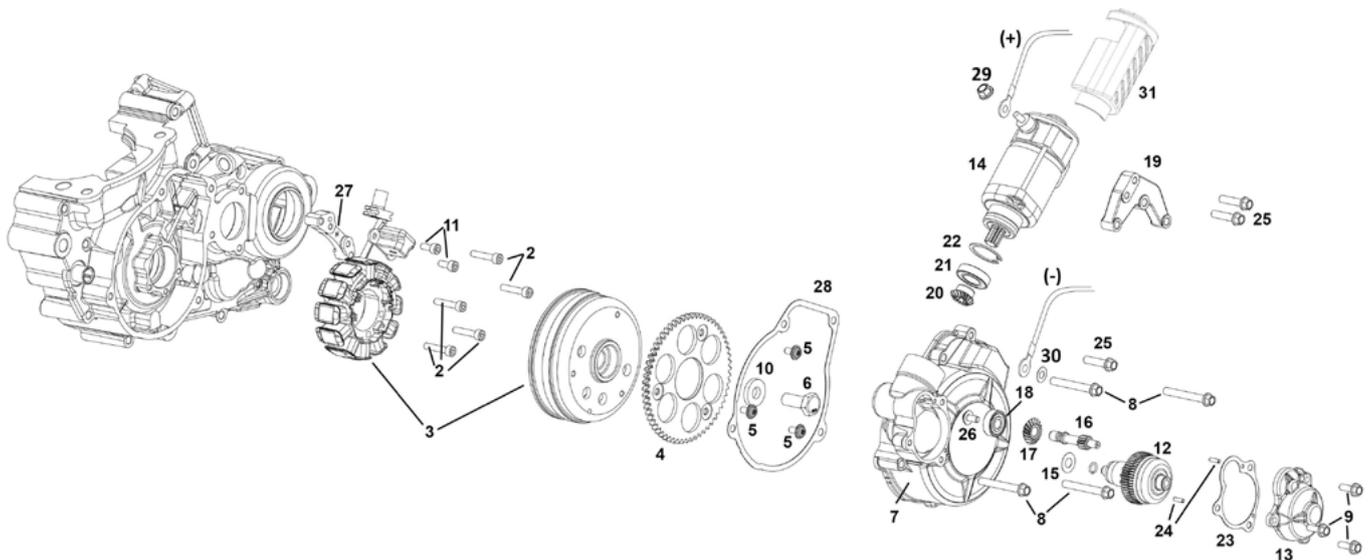
### Reed spacer bracket

- Check that none of the surfaces of the spacer are deformed.

### Reed block

- Check that the support surfaces of the reeds are in perfect condition.

## SERVICING AND REPAIRING THE ENGINE'S COMPONENTS



- |   |                            |
|---|----------------------------|
| 2. Screw UFK                                      | 21. Bearing 61902-2Z C4    |
| 3. Magnetic flywheel                              | 22. Seeger DIN 472 D28x1.2 |
| 4. Electric starter sprocket                      | 23. Bendix cover gasket    |
| 5. Screw ULS Torx M5x8                            | 24. Needle D3x9.8          |
| 6. Hexagon screw 10x25                            | 25. Screw M6x25            |
| 7. Ignition cover                                 | 26. Screw Torx M5x12       |
| 8. Hexagon screw 6x40                             | 27. Push-button adapter    |
| 9. Hexagon screw 5x15                             | 28. Flywheel cover gasket  |
| 11. Allen screw M5x10                             | 29. Nut M6                 |
| 12. Bendix  | 30. Washer 6x12x1.5        |
| 13. Bendix cover                                  | 31. Electric motor cover   |
| 14. Electric motor                                |                            |
| 15. Washer 08.1x17x0.2                            |                            |
| 16. Electric starter shaft Z10                    |                            |
| 17. Conical helical sprocket (shaft area)         |                            |
| 18. Bearing 608-2Z C3                             |                            |
| 19. Electric starter motor bracket                |                            |
| 20. Conical helical sprocket (starter motor area) |                            |

## SERVICING AND REPAIRING THE ENGINE'S COMPONENTS

Rubber ignition cap

- Check that the rubber ignition cap is in good condition.

Idria magnetic flywheel

- Perform the following checks using a multimeter.

Measurement	Wire colours	Resistance
Impulse coils	Red-green	100 +/- 20%
Exciter	Black/Red - Red/White	12.7 +/- 20%
Charging coil	Yellow - Earth	0.67 +/- 20%
	White - Yellow	0.16 +/- 20%



**Note:**

***All measurements should be taken at a temperature of 20°C. Otherwise, significant errors can be produced in the measurement values.***

Spark plug

- Check the spark plug for knocks and cracks
- Check that the spark plug is free of carbon and debris.
- Check that the electrode is not extremely worn or burnt.
- Check the electrode distance with a thickness gauge.

Electrode distance	0.7 to 0.8 mm.
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## ASSEMBLING THE ENGINE



**Note:**

*All engine parts must be completely clean and in optimum condition before beginning assembly. Before assembly, apply engine oil to all moving and sliding parts.*

- Place the right-hand semi-crankcase on the bedplate.

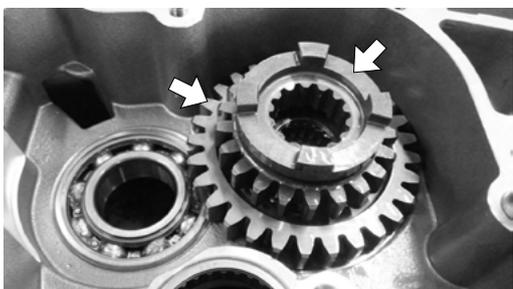
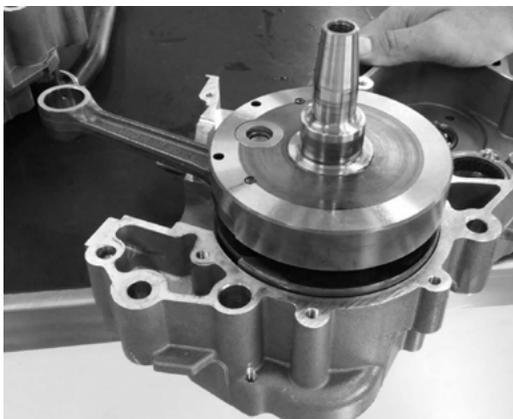
### FITTING THE CRANKSHAFT

- Lubricate the crankshaft bearing in the semi-crankcase.

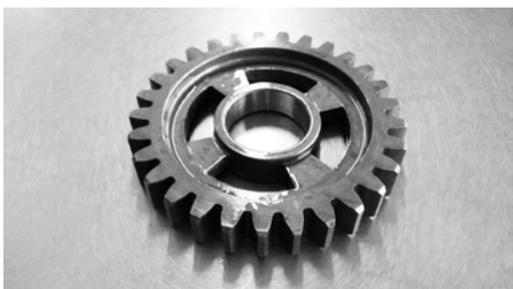
- Insert the crankshaft into the semi-crankcase bearing.
- On the opposite side of the semi-crankcase, fit the O-ring and then the crankcase seal bushing with the recessed side facing outwards.

### FITTING THE GEAR SELECTOR AND ASSEMBLY

- Lubricate the gear shaft bearings and the desmodromic valve in the semi-crankcase.



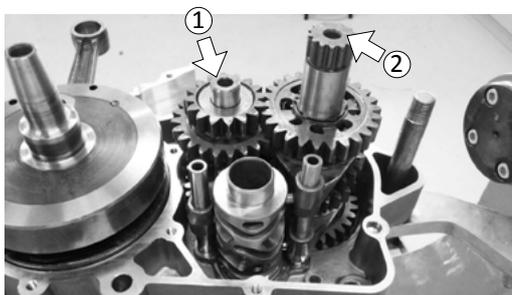
- Fit the 1st and 5th gear sprockets (arrows), needle roller bearing and adjusting washers to the semi-crankcase.



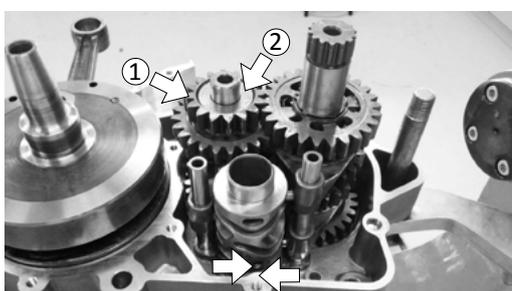
**Note:**

*The four recesses (arrows) on the 1st gear sprocket must be orientated towards the semi-crankcase.*

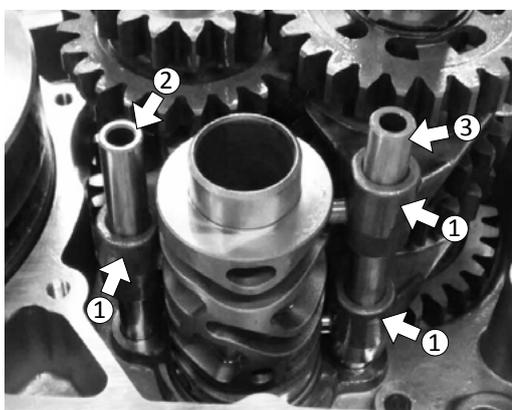
## ASSEMBLING THE ENGINE



- Carefully fit the gear shafts of primary shaft -1- and secondary shaft -2- at the same time.



- Fit 2nd gear sprocket -1- and adjusting washer -2- to the primary shaft.
- Fit the desmodromic valve to the semi-crankcase making sure that it is aligned with the marks (arrows) made during the dismantling.



- Place forks -1- into the grooves of the gears and in turn into the grooves of the desmodromic valve.
- Then slide shafts -2- (short) and -3- (long) through the forks to their housings on the semi-crankcase.



**Note:**

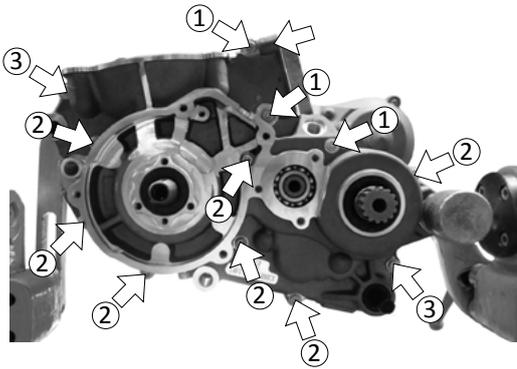
**Check that the transmission functions correctly by turning the desmodromic valve by hand.**

**Position the transmission gears in neutral.**

### JOINING THE SEMI-CRANKCASES

- Turn the bedplate so that the left-hand semi-crankcase is facing upwards and remove the nut that fixes the engine to the bedplate.
- Check that the contact surfaces of the left and right-hand semi-crankcases are completely clean.
- Fit the centring bushings to the left-hand semi-crankcase.
- Fit the new gasket.
- Fit the right-hand semi-crankcase and tap with a plastic mallet until the two surfaces are joined.

## ASSEMBLING THE ENGINE



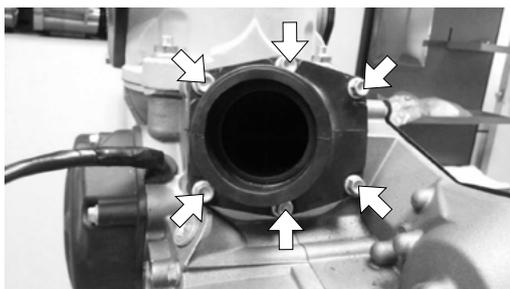
**Note:**

**Remember to position the small gasket on the top of the semi-crankcase (arrow).**

- Fit the screws in the position shown in the picture.
- Screws -1- : 70 mm.
- Screws -2- : 60 mm.
- Screws -3- : 65 mm.
- Slightly adjust all of the screws and then tighten them diagonally, starting at the centre.
- Tightening torque: 10 Nm.
- Check that the crankshaft and drive shaft rotate smoothly; if they do not, try freeing the rotation by tapping them with a plastic mallet.
- Fit the output sprocket hub to the shaft.
- Replace the nut that fixes the engine to the bedplate.
- Check that no semi-crankcase gasket debris is left on the support surface of the cylinder.

### FITTING THE REED BLOCK

- Remove any semi-crankcase gasket debris from the support surface of the reed block.
- Place the reed block into its housing with its new gaskets.
- Tighten the screws (arrows).
- Tightening torque: 10 Nm.



### FITTING THE CRANKSHAFT INERTIAL FLYWHEEL



**Note:**

The 200 cc engine does not feature an inertial flywheel. The crankshaft sprocket is fixed with a hexagon screw

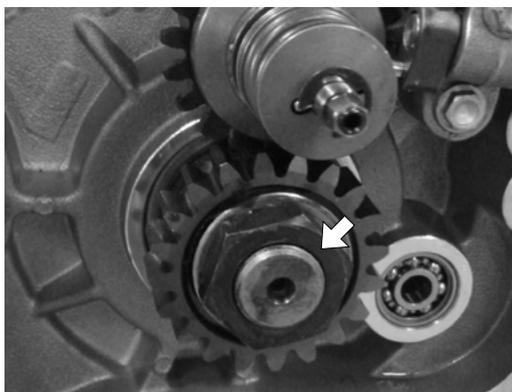
- Fit the crankshaft cotter pin, inertial flywheel, crankshaft sprocket, bevelled washer and nut to the crankshaft.



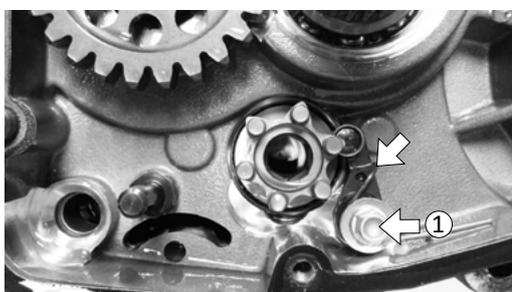
**Note:**

**The crankshaft locking nut tightens to the left!**

## ASSEMBLING THE ENGINE

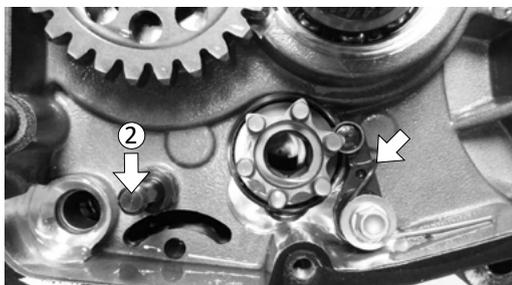


- Block the rotation of the crankshaft sprocket and tighten the nut (arrow).
- Tightening torque: 40 Nm.

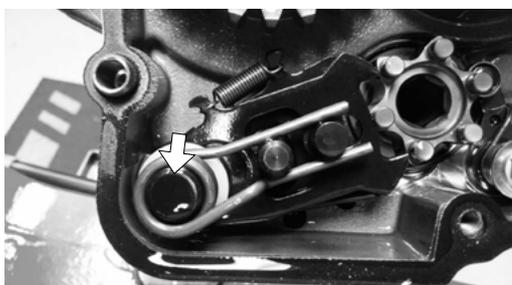


### FITTING THE GEAR SELECTOR ASSEMBLY

- Fit the gear selector assembly with the spring (arrow) untensioned and tighten screw -1-
- Use threadlocker.
- Tightening torque: 6 Nm.



- Position the spring (arrow) with a pair of pliers.
- Fit selector shaft centring screw -2-. Use threadlocker. Tightening torque: 15 Nm.



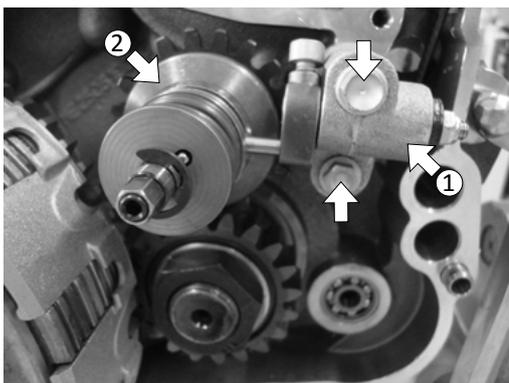
- Insert the selector shaft and fit the entire selector shaft (arrow).

## ASSEMBLING THE ENGINE



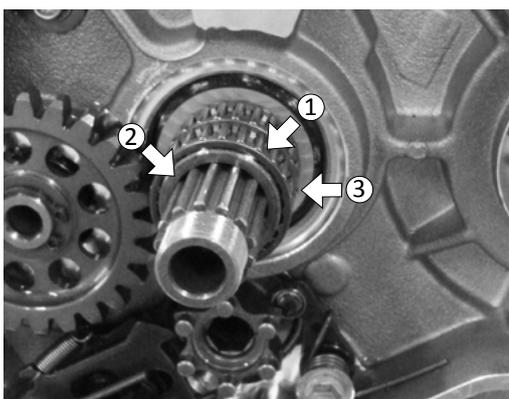
### FITTING THE KICK-START SPROCKET ASSEMBLY

- Lubricate the kick-start shaft housing on the semi-crankcase.
- Insert the kick-start assembly, making sure that the ratchet is located between the bracket and casing.
- Fit spring -1- into the semi-crankcase opening with pliers.
- Check that the kick-start spring centring bushing is in the correct position.
- Lubricate the kick-start inner sprocket bearing.
- Fit the kick-start inner sprocket, spacer washer and retaining ring -2-.



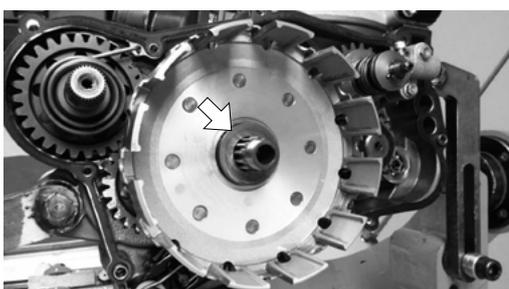
### FITTING THE EXHAUST VALVE CENTRIFUGAL DRIVE SYSTEM

- Lubricate the semi-crankcase centrifugal shaft bearing.
- Fit centrifugal drive -2- to the semi-crankcase.
- Fit bracket -1- making sure that the output lever is correctly located in the drive groove.
- Tighten the screws (arrows). Use threadlocker.  
Tightening torque: 10 Nm.
- Fit the shaft and water pump sprocket.



### FITTING THE CLUTCH

- Check that the primary shaft is clean and free of impurities.
- Fit washer -3-, bushing -2- and clutch basket bearings -1-.
- Lubricate the clutch basket bearings.



- Fit the clutch basket and then the washer (arrow).



**Note:**

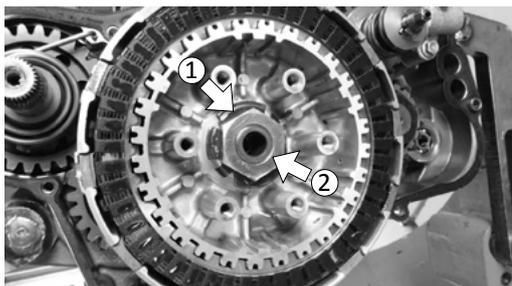
*When fitting the clutch hub, take into account the assembly position by observing the mark made during the dismantling.*

## ASSEMBLING THE ENGINE

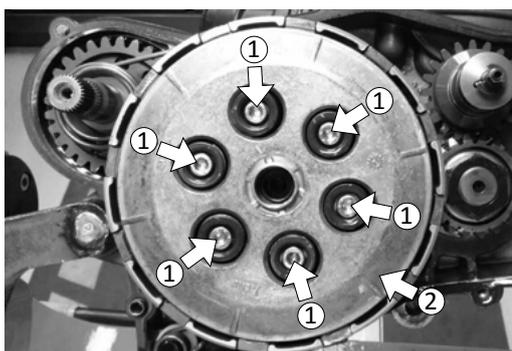
- Fit the clutch hub, new sealing washer and fixing nut.
- Hold the clutch hub and tighten the fixing nut.

Use threadlocker.

Tightening torque: 40 Nm.



- Close the safety of sealing washer -1-.
- Check that the clutch discs are completely clean and lubricate all of the discs.
- Insert the iron discs and lined discs alternately into the clutch hub, starting and ending with a lined disc.



- Lubricate the pusher bearing and fit clutch press -2-.
  - Position screws -1- with their bushings and springs and tighten them in stages diagonally. Use threadlocker.
- Tightening torque: 10 Nm

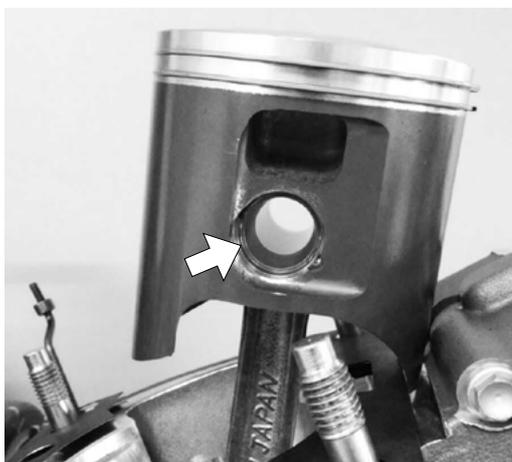
### FITTING THE CYLINDER AND CYLINDER HEAD

- Check that the piston and pin are clean.
- Lubricate the connecting rod end bearing.
- Position the piston with the arrow marked on the head towards the exhaust port.



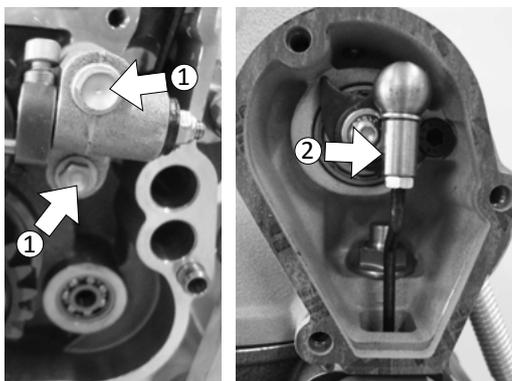
Note:

Before fitting the pin retaining ring, cover the crankcase opening with a clean cloth.



- Insert the pin through the piston and connecting rod end bearing and then fit the new retaining ring (arrow).
  - Fit the piston rings with the manufacturer markings facing upwards.
  - Fit the gaskets to the base of the cylinder.
  - Position the cylinder carefully, ensuring that the rings are centred with the locking pins of the piston grooves.
  - Position the four cylinder nuts and lightly tighten them.
  - Tighten the four nuts at the base of the cylinder diagonally.
- Tightening torque: 25 Nm.

## ASSEMBLING THE ENGINE



- Fit the centrifuge cam holder. Replace nuts -1- with new ones and tighten them.

Tightening torque: 8 Nm

- Fit exhaust valve ball joint pin clip -2-.

- Check the functioning of the entire exhaust valve system.

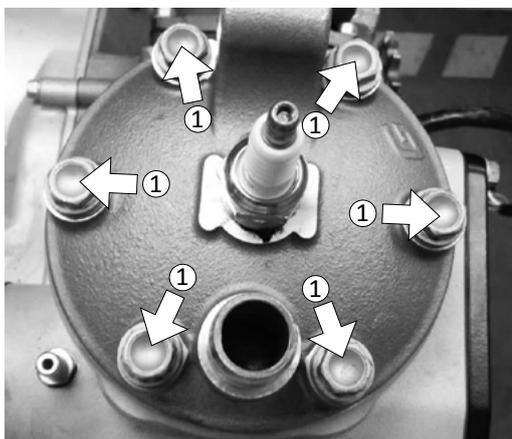


**Note:**

*If necessary, make adjustments, loosen the centrifugal drive lever screw and position the lever-rod assembly in the desired position.*

- Fit the new O-rings to the top of the cylinder.

- Check that the cylinder head support surface is completely clean.

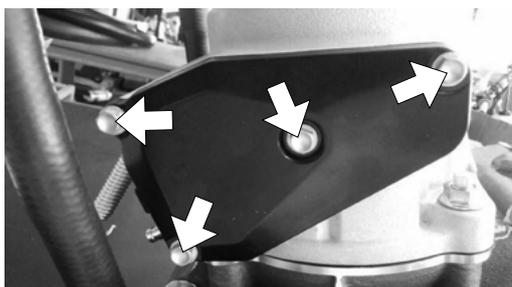


- Insert the cylinder head and tighten bolts -1- diagonally. Use threadlocker.

Tightening torque: 25 Nm.



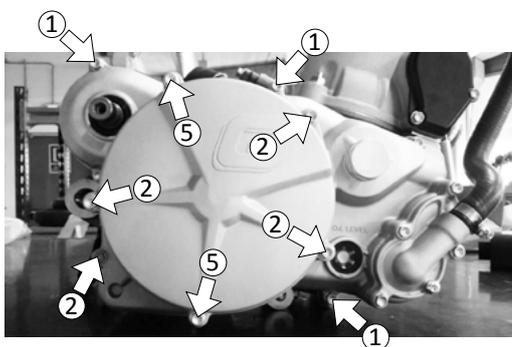
- Fit a new gasket to the right-hand exhaust valve cover and tighten the screws (arrows). Tightening torque: 8 Nm.



- Fit the left-hand exhaust valve cover and tighten the screws (arrows).

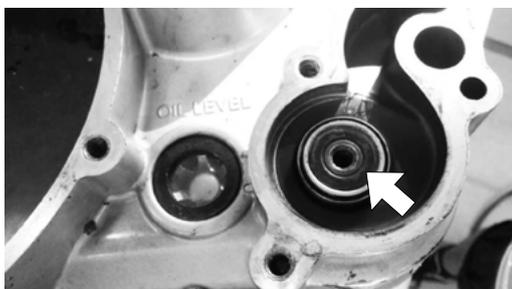
Tightening torque: 8 Nm.

## ASSEMBLING THE ENGINE



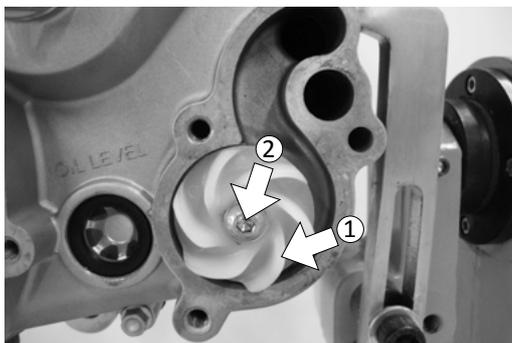
### FITTING THE CLUTCH COVER

- Fit the new clutch cover gasket.
  - Fit the clutch cover and tighten the screws diagonally.
- Screws -1- : 30 mm.  
Screws -2- : 35 mm.  
Screws -3- : 55 mm.  
Tightening torque: 10 Nm.
- Fit a new gasket to the clutch disc cover and tighten the screws diagonally.
- Screws 4: 25 mm.  
Screws 5: 75 mm.  
Tightening torque: 10 Nm.

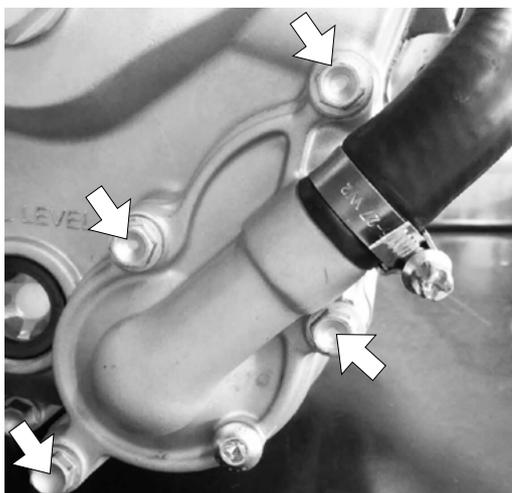


### FITTING THE WATER PUMP

- Fit the new water pump seal (arrow) to the clutch cover.

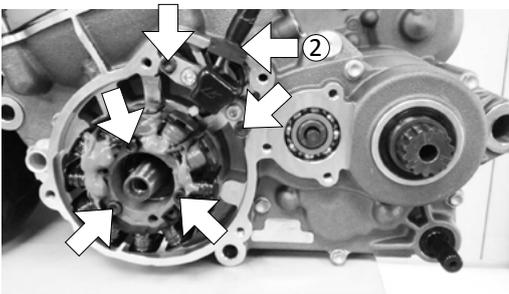


- Position water pump turbine -1- and insert fixing screw -2-.
  - Block the rotation of the turbine and tighten screw -2-. Use threadlocker.
- Tightening torque: 6 Nm.



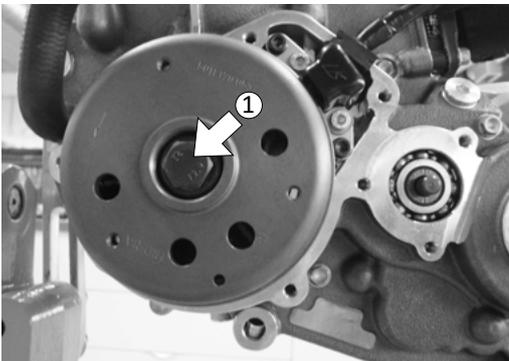
- Fit the water pump cover and tighten the screws (arrows).
- Tightening torque: 6 Nm.

## ASSEMBLING THE ENGINE

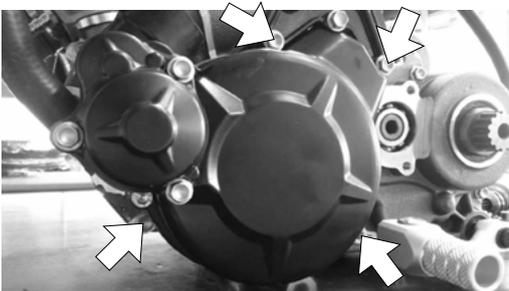


### FITTING THE IGNITION

- Fit the crankshaft cotter pin.
- Position the ignition stator and screws (arrows)
- Tighten the screws (arrows). Use threadlocker. Tightening torque: 8 Nm.
- Make sure rubber cap -2- is correctly positioned.



- Fit the magnetic flywheel and tighten nut -1-. Use threadlocker. Tightening torque: 40 Nm.



- Fit a new gasket to the ignition cover and tighten the screws (arrows).
- Fit the spark plug to the cylinder head.

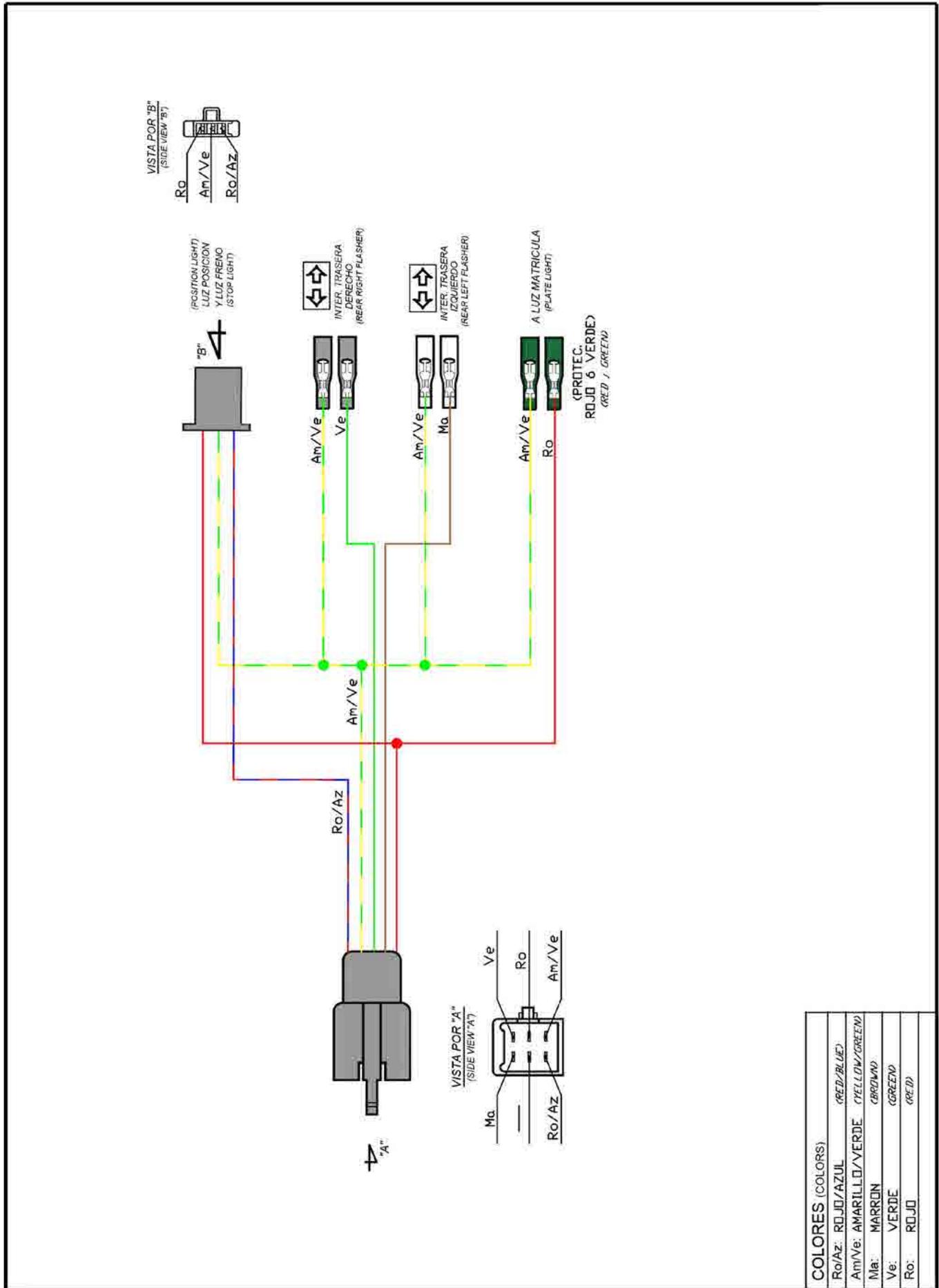
**Attention:** 

*The spark plug must always be screwed in by hand as far as it will go and then gently tightened with a spark plug spanner!*

**Tightening torque: 27 Nm.**







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**ENDURO SERIES**