

## INTRODUCTION

0

SUMMARY

0.1. INTRODUCTION ..... 3

0.1.1. FOREWORD ..... 3

0.1.2. REFERENCE MANUALS ..... 4

0.1.3. ABBREVIATIONS/SYMBOLS/CONVENTIONS ..... 5

## 0.1. INTRODUCTION

### 0.1.1. FOREWORD

This manual provides the information required for normal servicing.

This publication is intended for use by **aprilia** Dealers and their qualified mechanics; many concepts have been omitted on purpose as their inclusion would be superfluous. Since complete mechanical explanations have not been included in this manual, the reader must be familiar with basic notions of mechanics, as well as with basic repair procedures. Without such familiarity, repairs and checks could be ineffective and even hazardous. Since the repair and vehicle check instructions are not exhaustive, special care must be taken to avoid damage and injury. **aprilia Piaggio & C. S.p.A.** undertakes to constantly improve the design of its products and the relevant literature to ensure maximum customer satisfaction. The main technical modifications and changes in repair procedures are communicated to all **aprilia** dealers and agencies worldwide. Such modifications will be entered in subsequent editions of the manual. Should you need assistance or clarifications about the inspection and repair procedures, please contact the **aprilia** SERVICE DEPT., they will be glad to give you any information on the matter, or supply you with any detail on updates and technical changes applied to the vehicle.

**Piaggio & C. S.p.A.** reserves the right to make changes to its products at any time, barring any such changes as may alter the essential features of a product as specified in the relevant manual.

All rights of storage using electronic means, reproduction and total or partial adaptation, whatever the means adopted, are reserved in all countries.

Third parties' products are only mentioned for information purposes, and constitute no engagement.

**Piaggio & C. S.p.A.** is not liable in any way for the performance or use of these products.

First edition: June 2006

Produced and printed by:

#### **VALLEY FORGE DECA**

Ravenna , Modena, Torino

#### **DECA s.r.l.**

Registered Main Office  
Via Vincenzo Giardini, 11  
48022 Lugo (RA) - Italy -  
Tel. 0545-216611  
Fax 0545-216610  
[www.vftis.com](http://www.vftis.com)  
[deca@vftis.spx.com](mailto:deca@vftis.spx.com)

on behalf of:

#### **Piaggio & C. S.p.A.**

via G. Galilei, 1 - 30033 Noale (VE) - Italy  
Tel. +39 – (0)41 58 29 111  
Fax +39 – (0)41 58 29 190  
[www.aprilia.com](http://www.aprilia.com)  
[www.serviceaprilia.com](http://www.serviceaprilia.com)

## 0.1.2. REFERENCE MANUALS

## OWNER'S MANUALS

aprilia	part#	(description)
9100650	I	F D
9100651	E	UK
9100652	USA	

**0.1.3. ABBREVIATIONS/SYMBOLS/CONVENTIONS**

#	= number
<	= less than
>	= greater than
≤	= less than or equal to
≥	= more than or equal to
~	= approximately
∞	= infinity
°C	= degrees Celsius (centigrade)
°F	= degrees Fahrenheit
±	= plus or minus
a.c	= alternating current
A	= Ampere
Ah	= Ampere per hour
API	= American Petroleum Institute
AT	= high voltage
AV/DC	= Anti-Vibration Double Countershaft
bar	= pressure measurement unit (1 bar = 100 kPa)
d.c.	= direct current
cc	= cubic centimetres
CO	= carbon monoxide
CPU	= Central Processing Unit
DIN	= German industrial standards (Deutsche Industrie Norm)
DOHC	= Double Overhead Camshaft
ECU	= Electronic Control Unit
rpm	= revolutions per minute
HC	= unburnt hydrocarbons
ISC	= Idle Speed Control
ISO	= International Standardisation Organisation
kg	= kilograms
kgm	= kilograms per metre (1 kgm = 10 Nm)
km	= kilometres
km/h	= kilometres per hour
kΩ	= kilo Ohm
kPa	= kiloPascal (1 kPa = 0.01 bar)
KS	= clutch side (from the German "Kupplungsseite")
kW	= kilowatt
ℓ	= litres
LAP	= racetrack lap
LED	= Light Emitting Diode
LEFT	
SIDE	= left side
m/s	= metres per second
max	= maximum
mbar	= millibar (1 mbar = 0.1 kPa)
mi	= miles
MIN	= minimum
MPH	= miles per hour
MS	= flywheel side (from the German "Magnetoseite")
MΩ	= MegaOhm
N.A.	= Not Available
N.O.M.M.	= Motor Octane Number
N.O.R.M.	= Research Octane Number
Nm	= Newton metre (1 Nm = 0.1 kgm)
Ω	= ohm
PICK-UP	= pick-up
BDC	= Bottom Dead Centre
TDC	= Top Dead Centre
PPC	= Pneumatic Power Clutch

**RIGHT****SIDE** = right side**SAE** = Society of Automotive Engineers**TEST** = diagnostic check**T.B.E.I.** = crown-head Allen screw**T.C.E.I.** = cheese-head Allen screw**T.E.** = hexagonal head**T.P.** = flat head screw**TSI** = Twin Spark Ignition**UPSIDE-****DOWN** = inverted fork**V** = volt**W** = watt**Ø** = diameter

GENERAL INFORMATION

1

**SUMMARY**

1.1.	STRUCTURE OF THE MANUAL.....	3
1.1.1.	CONVENTIONS USED IN THE MANUAL .....	3
1.1.2.	SAFETY WARNINGS.....	4
1.2.	GENERAL RULES.....	5
1.2.1.	BASIC SAFETY RULES.....	5
1.3.	DANGEROUS ELEMENTS .....	8
1.3.1.	WARNINGS .....	8
1.4.	RUNNING-IN .....	12
1.4.1.	RUNNING-IN.....	12

## 1.1. STRUCTURE OF THE MANUAL

### 1.1.1. CONVENTIONS USED IN THE MANUAL

- This manual is divided in sections and subsections, each covering a set of the most significant components. Refer to the index of sections when consulting the manual.
- Unless expressly specified otherwise, assemblies are reassembled by reversing the dismantling procedure.
- The terms "right" and "left" are referred to the rider seated on the vehicle in the normal riding position.
- Motorcycle operation and basic maintenance are covered in the "OWNER'S MANUAL".

In this manual any variants are identified with these symbols:

**OPT** optional

**\*** catalytic version

- all versions

**MP** national certification

**SF** European certification (EURO 2 limits)

#### VERSION:

<b>I</b> Italy	<b>GR</b> Greece	<b>MAL</b> Malaysia
<b>UK</b> United Kingdom	<b>NL</b> Holland	<b>RCH</b> Chile
<b>A</b> Austria	<b>CH</b> Switzerland	<b>HR</b> Croatia
<b>P</b> Portugal	<b>DK</b> Denmark	<b>AUS</b> Australia
<b>SF</b> Finland	<b>J</b> Japan	<b>USA</b> United States of America
<b>B</b> Belgium	<b>SGP</b> Singapore	<b>BR</b> Brazil
<b>D</b> Germany	<b>SLO</b> Slovenia	<b>RSA</b> South Africa
<b>F</b> France	<b>IL</b> Israel	<b>NZ</b> New Zealand
<b>E</b> Spain	<b>ROK</b> South Korea	<b>CDN</b> Canada

**1.1.2. SAFETY WARNINGS**

The following precautionary warnings are used throughout this manual in order to convey the following messages:



**Safety warning.** This symbol appears, whether in the manual or on the vehicle itself, to indicate a personal injury hazard. Non-compliance with the indications given in the messages preceded by this symbol may result in grave risks for your and other people's safety and for the vehicle!

**DANGER**

Indicates a potential hazard which may result in serious injury or even death.

**WARNING**

Indicates a potential hazard which may result in minor personal injury or damage to the vehicle.

**NOTE** The word "NOTE" in this manual precedes important information or instructions.

## 1.2. GENERAL RULES

### 1.2.1. BASIC SAFETY RULES

#### CARBON MONOXIDE

Should it be necessary to perform some operations with the vehicle running, make sure to work outdoors or in a well-aerated room.

Avoid starting the engine indoors.

In case you are working indoors, use a gas exhaust system.



#### **DANGER**

**Exhaust gases contain carbon monoxide, which is extremely toxic if inhaled and may cause loss of consciousness or even lead to death.**

#### FUEL



#### **DANGER**

**The fuel used to operate engines is highly flammable and becomes explosive under particular conditions.**

**Refuelling and engine service should take place in a well-ventilated area with the engine stopped.**

**Do not smoke when refuelling or in the proximity of sources of fuel vapours, avoid flames, sparks and any element that could ignite fuel or provoke explosions.**

**DO NOT DISPOSE OF FUEL IN THE ENVIRONMENT.**

**KEEP AWAY FROM CHILDREN.**

#### HIGH-TEMPERATURE COMPONENTS

The engine and the components of the exhaust system become very hot and remain hot for some time after the engine has been stopped.

Before handling these components, wear insulating gloves or wait until the engine and the exhaust system have cooled down.

#### USED GEARBOX AND FORK FLUIDS



#### **DANGER**

**Wear latex gloves when servicing.**

**Gearbox fluid may cause serious damage to the skin if handled daily and for long periods.**

**Wash your hands carefully after use.**

**Take it to the filling station where you usually buy it or to an oil salvage centre.**

**Wear latex gloves when servicing.**

**DO NOT DISPOSE OF FLUID IN THE ENVIRONMENT**

**KEEP AWAY FROM CHILDREN.**

#### BRAKE FLUID



#### **WARNING**

**When handling the brake fluid, take care not to spill it on the plastic, rubber or painted parts, since it can damage them. When carrying out the maintenance operations on the braking system, use a clean cloth to cover these parts.**

**Always wear safety goggles when working on the braking system.**

**The brake fluid is highly irritant. Avoid contact with your eyes.**

**If the brake fluid gets in contact with your eyes, carefully wash them with fresh water and immediately seek medical advice.**

**KEEP AWAY FROM CHILDREN.**

#### COOLANT

Coolant contains ethylene glycol that is flammable, under certain conditions. When ignited, ethylene glycol produces invisible flames that might cause burns.

**DANGER**

Take care not to spill coolant onto hot engine parts and exhaust system. It may ignite and produce invisible flames.

Wear latex gloves when servicing.

Although toxic, it has a sweet taste that might attract animals. Never leave coolant in open container or in a position easily reachable by animals.

**KEEP AWAY FROM CHILDREN.**

Do not remove radiator cap when engine is still hot. Coolant is under pressure and might cause burns.

**HYDROGEN GAS AND BATTERY ELECTROLYTE****DANGER**

The battery electrolyte is a toxic, caustic substance containing sulphuric acid and thus able to cause severe burns in case of contact with the skin.

Always wear tight gloves and protective clothes when handling this fluid.

In case of contact with skin, rinse with plenty of fresh water.

Always use a protection for your eyes since even a very small amount of the battery fluid can cause blindness. In the event of contact with your eyes, carefully wash them with water for fifteen minutes and then consult immediately an eye specialist.

Should you accidentally drink some fluid, drink abundant water or milk, then drink magnesia milk or vegetable oil and immediately seek medical advice.

The battery gives off explosive gases and must be kept away from flames and sources of ignition or heat; do not smoke near the battery.

**KEEP AWAY FROM CHILDREN.**

Battery fluid is corrosive.

Do not spill it, especially on plastic parts.

Make sure that the electrolyte acid is suitable for the type of battery used.

**GENERAL PRECAUTIONS AND INFORMATION**

Follow these instructions closely when repairing, disassembling or reassembling the motorcycle or its components.

**DANGER**

Using bare flames is strictly forbidden when working on the motorcycle. Before servicing or inspecting the motorcycle: stop the engine and remove the key from the ignition switch; allow for the engine and exhaust system to cool down; where possible, lift the motorcycle using adequate equipment placed on firm and level ground. Be careful of any parts of the engine or exhaust system which may still be hot to the touch to avoid scalds or burns.

Do not put any vehicle parts into your mouth: vehicle components are not edible and some of them are harmful or even toxic.

Unless expressly specified otherwise, assemblies are reassembled by reversing the dismantling procedure. Where a procedure is cross-referred to relevant sections in the manual, proceed sensibly to avoid disturbing any parts unless strictly necessary. Do not polish matt-painted surfaces with polishing paste.

Never use fuel instead of solvent to clean the motorcycle.

Do not clean any rubber or plastic parts or the seat with alcohol, petrol or solvents. Clean with water and mild detergent.

Always disconnect the battery negative (-) lead before soldering any electrical components.

When two or more persons service the same motorcycle together, special care must be taken to avoid personal injury.

**BEFORE DISASSEMBLING ANY COMPONENTS**

- Clean off all dirt, mud, and dust and clear any foreign objects from the vehicle before disassembling any components.
- Use the model-specific special tools where specified.

**DISASSEMBLING THE COMPONENTS**

- Never use pliers or similar tools to slacken and/or tighten nuts and bolts. Always use the suitable spanner.
- Mark all connections (hoses, wiring, etc.) with their positions before disconnecting them. Identify each connection using a distinctive symbol or convention.
- Mark each part clearly to avoid confusion when refitting.
- Thoroughly clean and wash any components you have removed using a detergent with low flash point.
- Mated parts should always be refitted together. These parts will have seated themselves against one another in service as a result of normal wear and tear and should never be mixed up with other similar parts on refitting.
- Certain components are matched-pair parts and should always be replaced as a set.
- Keep away from heat sources.

**REASSEMBLING THE COMPONENTS****DANGER**

**Never reuse a circlip or snap ring. These parts must always be renewed once they have been disturbed.**

**When fitting a new circlip or snap ring, take care to move the open ends apart just enough to allow fitment to the shaft.**

**Make it a rule to check that a newly-fitted circlip or snap ring has located fully into its groove.**

**Never clean a bearing with compressed air.**

**NOTE** All bearings must rotate freely with no hard spots or noise. Replace any bearings that do not meet these requirements.

- Use ORIGINAL **aprilia** SPARE PARTS only.
- Use the specified lubricants and consumables.
- Where possible, lubricate a part before assembly.
- When tightening nuts and bolts, start with the largest or innermost nut/bolt and observe a cross pattern. Tighten evenly, in subsequent steps until achieving the specified torque.
- Replace any self-locking nuts, gaskets, seals, circlips or snap rings, O-rings, split pins, bolts and screws which have a damaged thread.
- Lubricate the bearings abundantly before assembly.
- Make it a rule to check that all components you have fitted are correctly in place.
- After repairing the motorcycle and after each service inspection, perform the preliminary checks, and then ride the motorcycle in a private estate area or in a safe area away from traffic.
- Clean all mating surfaces, oil seal edges and gaskets before assembly. Apply a thin layer of lithium grease along the edges of oil seals. Fit oil seals and bearings with the marking or serial number facing outwards (in view).

**ELECTRICAL CONNECTORS**

To disconnect the electrical connectors, follow the procedures below. Failure to comply with these procedures may lead to irreparable damage to the connector and the wiring as well.

If present, press the special safety hooks.

**WARNING**

**Do not pull cables to disconnect the two connectors.**

- Grasp the two connectors and disconnect them by pulling them in the two opposite directions.
- In case of dirt, rust, moisture, etc., thoroughly clean the inside of the connectors with compressed air.
- Make sure that the cables are correctly fitted inside the connector terminals.

**NOTE** The two connectors have just one correct positioning. Make sure to position them in the right direction.

- Then fit the two connectors. Make sure they are correctly coupled (a click will be heard if hooks are present).

**TIGHTENING TORQUE SETTINGS****DANGER**

**Always remember that the tightening torque settings of all wheel, brake, wheel shaft and other suspension parts play a fundamental role to ensure vehicle safety. Make sure that these values are always within the specified limits.**

**Check fastening parts tightening torque settings at regular intervals. Upon reassembly, always use a torque wrench.**

**Failure to comply with these recommendations could lead to the loosening and detachment of one of these parts with a consequent locking of the wheel or other serious troubles affecting the vehicle manoeuvrability, and thus the risk of falls and serious injuries or death.**

### 1.3. DANGEROUS ELEMENTS

#### 1.3.1. WARNINGS

##### FUEL

**DANGER**

The fuel used to operate engines is highly flammable and becomes explosive under particular conditions.

Refuelling and engine service should take place in a well-ventilated area with the engine stopped.

Do not smoke when refuelling or in the proximity of sources of fuel vapours, avoid flames, sparks and any element that could ignite fuel or provoke explosions.

Take care not to spill fuel out of the filler, or it may ignite when in contact with hot engine parts.

In the event of accidental fuel spillage, make sure the affected area is fully dry before starting the engine. Fuel expands from heat and when left under direct sunlight.

Never fill the fuel tank up to the brim. Tighten the filler cap securely after each refuelling.

Avoid contact with skin. Do not inhale vapours. Do not swallow fuel. Do not transfer fuel between different containers using a hose.

**DO NOT DISPOSE OF FUEL IN THE ENVIRONMENT.**

**KEEP AWAY FROM CHILDREN.**

Use only premium grade unleaded petrol, min. O.N. 95 (RON) and 85 (MON).

##### LUBRICANTS

**DANGER**

A good lubrication ensures the vehicle safety.

Failure to keep the lubricants at the recommended level or the use of a non-suitable new and clean type of lubricant can lead to the engine or gearbox seizure, thus causing serious accidents, personal injury or even death.

Gear fluid may cause serious damage to the skin if handled daily and for long periods.

Wash your hands carefully after use.

Do not dispose of oil in the environment.

Take it to the filling station where you usually buy it or to an oil salvage centre.

**WARNING**

When filling the vehicle with this oil, take care not to spill it out. Immediately clean spilt oil, or it might damage the vehicle paintwork.

In case of contact with oil, the tyres surface will become very slippery, thus becoming a serious danger for your safety.

In case of leaks, do not use the vehicle. Check and trace the cause of leaks and proceed to repair.

##### ENGINE OIL

**DANGER**

Engine oil may cause serious damage to the skin if handled daily and for long periods.

Wash your hands carefully after use.

Do not dispose of oil in the environment.

Dispose of gearbox fluid through the nearest waste oil reclamation firm or through the supplier.

Wear latex gloves when servicing.

##### FRONT FORK FLUID

**DANGER**

Front suspension response can be modified to a certain extent by changing damping settings and/or selecting a particular grade of oil. Standard oil viscosity: SAE 20 W. Different oil grades can be selected to obtain a particular suspension response (choose SAE 5W for a softer suspension, 20W for a stiffer suspension).

The two grades can also be mixed in varying solutions to obtain the desired response.

**BRAKE FLUID**

**NOTE** This vehicle is fitted with front and rear disc brakes. Each braking system is operated by an independent hydraulic circuit. The information provided below applies to both braking systems.

**DANGER**

Do not use the vehicle in case brakes are worn out or do not work properly. The brakes are the parts that most ensure your safety and for this reason they must always be perfectly working. Failure to comply with these recommendations will probably lead to a crash or an accident, with a consequent risk of personal injury or death.

A wet surface reduces brakes efficiency.

**DANGER**

In case of wet ground the braking distance will be doubled, since both brakes and tyre grip on the road surface are extremely reduced by the water present on the road surface.

Any water on brakes, after washing the vehicle or driving on a wet road surface or crossing puddles or gips, can wet brakes so as to greatly reduce their efficiency.

Failure to comply with these recommendations may lead to serious accidents, with a consequent risk of severe personal injuries or death.

Brakes are critical safety components. Do not ride the vehicle in case brakes are not working at their best.

Check for brakes proper operation before every trip.

Brake fluid is an irritant. Avoid contact with eyes or skin.

In the event of accidental contact, wash affected body parts thoroughly. In the event of accidental contact with eyes, contact an eye specialist or seek medical advice.

**DO NOT RELEASE BRAKE FLUID INTO THE ENVIRONMENT.**

**KEEP AWAY FROM CHILDREN.**

When handling brake fluid, take care not to spill it onto plastic or paint-finished parts or they will damage.

**DANGER**

Do not use any brake fluids other than the specified type. Never mix different types of fluids to top up level, as this will damage the braking system.

Do not use brake fluid from containers which have been kept open or in storage for long periods.

Any sudden changes in play or hardness in the brake levers are warning signs of problems with the hydraulic circuits.

Ensure that the brake discs and brake linings have not become contaminated with oil or grease. This is particularly important after servicing or inspections.

Make sure the brake lines are not twisted or worn.

Prevent accidental entering of water or dust into the circuit.

Wear latex gloves when servicing the hydraulic circuit.

**DISC BRAKES****DANGER**

The brakes are the parts that most ensure your safety and for this reason they must always be perfectly working; check them before every trip.

A dirty disc soils the pads.

Dirty pads must be replaced, while dirty discs must be cleaned with a high-quality degreaser.

Perform the maintenance operations with half the indicated frequency if the vehicle is used in rainy or dusty areas, on uneven surfaces or for racing.

Check brake pads for wear.

When the brake pads wear out, the level of the fluid decreases to automatically compensate for their wear.

The front brake fluid reservoir is located on the right handlebar, near the front brake lever.

The rear brake fluid reservoir is located under the right fairing.

Do not use the vehicle if the braking system leaks fluid.

## COOLANT

**DANGER**

Coolant is toxic when ingested, contact with eyes or skin may cause irritation. In the event of contact with your skin or eyes, rinse repeatedly with abundant water and seek medical advice. In the event of ingestion, induce vomiting, rinse mouth and throat with abundant water and seek medical advice immediately.  
**DO NOT RELEASE INTO THE ENVIRONMENT.**  
**KEEP AWAY FROM CHILDREN.**

**DANGER**

Take care not to spill coolant onto hot engine parts. It may ignite and produce invisible flames. Wear latex gloves when servicing. Do not ride when coolant is below the minimum level.

Coolant mixture is a 50% solution of water and antifreeze. This is the ideal solution for most operating temperatures and provides good corrosion protection.

This solution is also suited to the warm season, as it is less prone to evaporative loss and will reduce the need for top-ups.

In addition, less water evaporation means fewer minerals salts depositing in the radiator, which helps preserve the efficiency of the cooling system.

When the temperature drops below zero degrees centigrade, check the cooling system frequently and add more antifreeze (up to 60% maximum) to the solution, if needed.

Use distilled water in the coolant mixture. Tap water will damage the engine.

Refer to the chart given below and add water with the quantity of antifreeze to obtain a solution with the desired freezing point:

Freezing point °C	Coolant % of volume
-20°	35
-30°	45
-40°	55

**NOTE** Coolants have different specifications. The protection degree is written on the label.

**WARNING**

Use nitrite-free coolant only, with a protection until at least -35°C.

## DRIVE CHAIN

Check drive chain operation, wear, slack and lubrication at regular intervals.

The vehicle is equipped with an endless chain with a joint link.

**WARNING**

If too slack, the chain can come off the front or rear sprockets thus leading to serious accidents and damage to the vehicle, with consequent serious personal injury or death.

Do not use the vehicle if the chain slack has not been correctly adjusted.

To check the chain, take it with your hand where it turns on the rear sprocket and pull it as to separate it from the sprocket itself.

If you can move the chain apart of the front sprocket for more than 3 mm (0.125 in), change chain, front and rear sprocket.

**DANGER**

If not properly maintained, chain can early wear out and lead to the damage of both front and rear sprockets.

Perform chain maintenance operations more frequently if the vehicle is used on dusty or muddy areas.

## TYRES

**WARNING**

If tyres are excessively inflated, the vehicle will be hard, difficult and uncomfortable to ride. In addition, the roadworthiness, mainly on wet surfaces and during cornering, will be impaired. Flat tyres (insufficient pressure) can slip on the rim and make you lose the control of the vehicle. In this case too, both vehicle roadworthiness, manoeuvrability and brake efficiency will be impaired. Tyres changing, repair, maintenance and balancing must be carried out by specialised technicians using suitable equipment. When new, tyres can have a thin slippery protective coating. Drive carefully for the first kilometres (miles). Never use rubber treating substances on tyres. In particular, avoid contact with fluid fuels, leading to a rapid wear. In case of contact with oil or fuel, do not clean but change the tyres.

**DANGER**

Some of the factory-assembled tyres of this vehicle are provided with wear indicators. There are several kinds of wear indicators. For more information on how to check the wear, contact your Dealer. Visually check if the tyres are worn and in this case have them changed. If a tyre deflates while driving, stop immediately. Avoid hard brakings or moves and do not close throttles too abruptly. Slowly close the throttle grip, move to the edge of the road and use the engine brake to slow down until coming to a halt. Failure to comply with these recommendations may lead to accidents, with a consequent risk of personal injuries or death. Do not install tyres with air tube on rims for tubeless tyres and vice versa.

## 1.4. RUNNING-IN

### 1.4.1. RUNNING-IN

Correct engine running-is essential to ensuring proper performance and durability.

If possible, drive on hilly roads and/or roads with many bends, so that the engine, the suspensions and the brakes undergo a more effective running-in. During running-in, change speed. In this way the components are first "loaded" and then "relieved" and the engine parts can thus cool down. Even if it is important to stress the engine components during running-in, take care not to exceed.

#### Keep to the following indications:

- Do not open the throttle completely if the speed is low, both during and after running-in.
- for the first 3 hours of operation, never open throttles more than half their way and never go beyond 8000 rpm,
- for the following 12 hours never open throttles more than 75% of their travel.

**NOTE** Even after running-in, avoid riding at such rpm as to have the rpm limiter trip, i.e.:

- **SXV 450** 12000 rpm
- **SXV 550** 11500 rpm
- **RXV 450** 11500 rpm
- **RXV 550** 11000 rpm



#### **WARNING**

Limiter warning light (not the CPU limiter) is set in-house to 8000 rpm, see INSTRUMENT PANEL for its final setting.

TECHNICAL INFORMATION

2

**SUMMARY**

2.1.	TECHNICAL INFORMATION .....	3
2.1.1.	TECHNICAL DATA .....	3
2.1.2.	LUBRICANT TABLE .....	6
2.1.3.	TIGHTENING TORQUE SETTINGS .....	7
2.1.4.	SPECIAL TOOLS .....	9
2.1.5.	ASSEMBLING ENGINE TO PLATE .....	11
2.1.6.	LIMIT VALUES .....	12
2.1.7.	COUPLING: MAIN BEARINGS - CONNECTING ROD .....	13
2.2.	ADJUSTMENTS .....	14
2.2.1.	CYLINDER SYNCHRONISATION .....	14
2.2.2.	AXONE .....	17

## 2.1. TECHNICAL INFORMATION








## 2.1.1. TECHNICAL DATA

ENGINE 450	
ENGINE	
Model (SXV 450)	45SX
Model (RXV 450)	45RX
Type	Twin-cylinder, 4-stroke with 4 valves, single overhead camshaft
Number of cylinders	2
Total displacement	449 cu. cm (27.40 cu in).
Bore/stroke	76 mm x 49.5 mm (2.99 in x 1.95 in)
Compression ratio	(13 ÷ 1) ± 0.5
Idling speed	(1800 ÷ 2000) ± 100 rpm
Valve timing (SXV 450)	
Intake opens at	18° BTDC
Intake closes at	48° ABDC
Exhaust opens at	49° BBDC
Exhaust closes at	15° ATDC
Valve timing (RXV 450)	
Intake opens at	18° BTDC
Intake closes at	30° ABDC
Exhaust opens at	31° BBDC
Exhaust closes at	19° ATDC
Intake valve clearance	0.07 ÷ 0.12 mm (0.0027 ÷ 0.0047 in)
Exhaust valve clearance	0.17 ÷ 0.22 mm (0.0067 ÷ 0.0087 in)
Ignition	Digital, electronic
Starting	Electric starter
Spark advance	Variable, controlled by CDI
Air filter	With dry filter cartridge
Clutch	
Type	Multiplate, wet clutch with control on the left side of the handlebar
Driving plates 1	# plates: 2
	Thickness: 1.5 mm (0.059 in)
Driving plates 2	# plates: 5
	Thickness: 2 mm (0.079 in)
Clutch plates	# plates: 8
	Thickness: 2.75 mm (0.108 in)
Clutch springs	Uncompressed length: xxxx mm (xxx in)
	# springs: 6
Lubricating system	
Type	Gearbox splash lubrication with special fluid; engine forced lubrication with scavenge pump and external reservoir
Oil filter	Paper type
Engine oil quantity	After overhaul, 1400 cu.cm (0.37 gal) (0.31 UKgal)
	Periodic oil change: 1300 cu.cm (0.34 gal) (0.28 UKgal)
Cooling system	
Type	Liquid
Water pump	Centrifugal pump with single intake
	Reduction ratio: 44/22

SXV450 TRANSMISSION				
Gear ratios				
Ratio	Primary	Secondary	Final ratio	Total ratio
1st	22/56 = 1: 2.545	12/30 = 1: 2.307	15/48 = 1: 3.067	1 : 18.013
2nd		15/27 = 1: 1.800		1 : 14.050
3rd		16/23 = 1: 1.437		1 : 11.221
4th		20/23 = 1: 1.150		1 : 8.897
5th		21/21 = 1: 1.000		1 : 7.806
RXV450 TRANSMISSION				
Gear ratios				
Ratio	Primary	Secondary	Final ratio	Total ratio
1st	22/56 = 1: 2.545	12/31 = 1: 2.583	15/48 = 1: 3.200	1 : 21.042
2nd		13/25 = 1: 1.923		1 : 15.664
3rd		15/23 = 1: 1.533		1 : 12.489
4th		19/24 = 1: 1.263		1 : 10.288
5th		21/22 = 1: 1.047		1 : 8.533
FUEL SYSTEM				
Type	Electronic injection			
Throttle	Ø 38 mm (1.49 in)			
FUEL				
Fuel	Premium-grade unleaded petrol, minimum octane rating 95 (RON) and 85 (MON), as per DIN 51 607.			
SPARK PLUGS				
Standard	NGK CR8EB			
Spark plug electrode gap	0.7 – 0.8 mm (0.028 – 0.031 in.)			
Resistance	5 KΩ			
ELECTRIC SYSTEM				
Generator (with permanent magnet)	12 V – 350 W			
Starter motor	12 V – 480 W			
ENGINE 550				
ENGINE				
Model (SXV 550)	55SX			
Model (RXV 550)	55RX			
Type	Twin-cylinder, 4-stroke with 4 valves, single overhead camshaft			
Number of cylinders	2			
Total displacement	553 cu. cm (33.75 cu in).			
Bore/stroke	80 mm x 55.0 mm (3.15 in x 2.16 in)			
Compression ratio	(12.5 ÷ 1) ± 0.5			
Idling speed	(1800 ÷2000) ± 100 rpm			
Valve timing (SXV 550)				
Intake opens at	18° BTDC			
Intake closes at	48° ABDC			
Exhaust opens at	49° BBDC			
Exhaust closes at	15° ATDC			
Valve timing (RXV 550)				
Intake opens at	18° BTDC			
Intake closes at	30° ABDC			
Exhaust opens at	31° BBDC			
Exhaust closes at	19° ATDC			
Intake valve clearance	0.07 ÷ 0.12 mm (0.0027 ÷ 0.0047 in)			
Exhaust valve clearance	0.17 ÷ 0.22 mm (0.0067 ÷ 0.0087 in)			
Ignition	Digital, electronic			
Starting	Electric starter			
Spark advance	Variable, controlled by CDI			
Air filter	With dry filter cartridge			

Clutch				
Type		Multiplate, wet clutch with control on the left side of the handlebar		
Driving plates 1		# plates: 2		
		Thickness: 1.5 mm (0.059 in)		
Driving plates 2		# plates: 5		
		Thickness: 2 mm (0.079 in)		
Clutch plates		# plates: 8		
		Thickness: 2.75 mm (0.108 in)		
Clutch springs		Uncompressed length: 46 mm (1.81 in)		
		# springs: 6		
Lubricating system				
Type		Gearbox splash lubrication with special fluid; engine forced lubrication with scavenge pump and external reservoir		
Oil filter		Paper type		
Engine oil quantity		After overhaul, 1400 cu.cm (0.37 gal) (0.31 UKgal)		
		Periodic oil change: 1300 cu.cm (0.34 gal) (0.28 UKgal)		
		After overhaul, 1400 cu.cm (0.37 gal) (0.31 UKgal)		
Cooling system				
Type		Liquid		
Water pump		Centrifugal pump with single intake		
		Reduction ratio: 44/22		
SXV550 TRANSMISSION				
Gear ratios				
Ratio	Primary	Secondary	Final ratio	Total ratio
1st	22/56 = 1: 2.545	12/30 = 1: 2.307	15/48 = 1: 2.875	1 : 16.888
2nd		15/27 = 1: 1.800		1 : 13.172
3rd		16/23 = 1: 1.437		1 : 10.519
4th		20/23 = 1: 1.150		1 : 8.415
5th		21/21 = 1: 1.000		1 : 7.318
RXV550 TRANSMISSION				
Gear ratios				
Ratio	Primary	Secondary	Final ratio	Total ratio
1st	22/56 = 1: 2.545	12/31 = 1: 2.583	15/48 = 1: 3.200	1 : 21.042
2nd		13/25 = 1: 1.923		1 : 15.664
3rd		15/23 = 1: 1.533		1 : 12.489
4th		19/24 = 1: 1.263		1 : 10.288
5th		21/22 = 1: 1.047		1 : 8.533
FUEL SYSTEM				
Type		Electronic injection		
Throttle		Ø 40 mm (1.57 in)		
FUEL				
Fuel		Premium-grade unleaded petrol, minimum octane rating 95 (RON) and 85 (MON), as per DIN 51 607.		
SPARK PLUGS				
Standard		NGK CR8EB		
Spark plug electrode gap		0.7 – 0.8 mm (0.028 – 0.031 in.)		
Resistance		5 KΩ		
ELECTRIC SYSTEM				
Generator (with permanent magnet)		12 V – 350 W		
Starter motor		12 V – 480 W		

2.1.2. LUBRICANT TABLE

ENGINE 450 - 550	
LUBRICANT	PRODUCT
Engine oil	RECOMMENDED  <b>Agip</b> RACING 4T, SAE 10W – 60. As an alternative use top brand oils meeting or exceeding CCMC G-4, A.P.I. SG. SAE 10W-60 specifications.
Gearbox fluid	RECOMMENDED:  <b>Agip</b> GEAR SINTH 75W – 90.
Coolant	RECOMMENDED:  <b>Agip</b> ANTIFREEZE PLUS.
Brake fluid	RECOMMENDED:  <b>Agip</b> BRAKE FLUID DOT 4 PLUS.
Bearings and other lubrication points	RECOMMENDED:  <b>Agip</b> MP GREASE As an alternative to recommended grease, use top brand rolling bearing grease that will resist a temperature range of -30°C to +140°C (-22 °F to +284°F), with dripping point 150°C to 230 °C (302°F to 446°F), high corrosion protection, good resistance to water and oxidation.
Forks	RECOMMENDED:  <b>Agip</b> FORK 7.5W and  <b>Agip</b> FORK 10W.

## 2.1.3. TIGHTENING TORQUE SETTINGS

DESCRIPTION	SCREW / NUT	TIGHTENING TORQUE SETTINGS	NOTES
		Nm (Lbft)	
ENGINE			
Nut securing engine to frame	M10	54 (39.82)	
Screw securing throttle body to head	M6	12 (8.85)	loctite 243
Screw securing control unit to plate	M4	4.4 (3.24)	loctite 243
Screw securing voltage regulator and control unit to frame	M6	12 (8.85)	
Coil screw	M6	12 (8.85)	
Screw securing sprocket cover and chain guide plate	M6	12 (8.85)	
Engine oil drain cap	M12x1.5	18 (13.28)	
Gearbox fluid drain cap	M10X1.5	18 (13.28)	
Oil filter cover	M56x1.5	25 (18.44)	
Piston mounting hole plug	M30x2	30 (22.13)	
Spark plug	M10X1.25	12 (8.85)	
Gearbox fluid check screw	M6x1	9.8 (7.23)	
Water pump impeller	M7x1	12 (8.85)	
Head cover screw	M6x1	9.8 (7.23)	
Water pump cover screw	M6x1	9.8 (7.23)	
Clutch cover screw	M6x1	9.8 (7.23)	
Right casing cover screw	M6x1	9.8 (7.23)	
Casing jointing bolt	M6x1	12 (8.85)	
Casing jointing bolt	M7x1	15 (11.06)	
Ignition cover screw	M6x1	9.8 (7.23)	
Pick-up screw	M5x0.8	8 (5.90)	loctite 270
Stator fixing screw	M5x0.8	8 (5.90)	loctite 270
Chain tensioner sliding shoe screw	M6x1	9.8 (7.23)	loctite 270
Timing chain tensioner screw	M6x1	10 (7.37)	
Cable guide ring screw	M6x1	10 (7.37)	
Oil lines mounting plate screw	M6x1	9.8 (7.23)	loctite 270
Blow-by breather union	M12x1	18 (13.28)	Use sealant
Flywheel nut	M14x1	98 (72.28)	
Starter motor screw	M6x1	9.8 (7.23)	
Chain guide plate screw	M6x1	12 (8.85)	
Screw securing primary shaft bearing	M6x1	12 (8.85)	loctite 270
Screw securing lay shaft bearing	M6x1	12 (8.85)	loctite 270
Desmo bearing screw	M5x0.8	8 (5.90)	loctite 270
Gear indicator screw	M5x0.8	6 (4.43)	loctite 270
Gear change pedal screw	M6x1	12 (8.85)	
Head bolt (pre-torque)	M10X1.25	30 (22.13)	Smear screws and washers with oil
Head bolt	M10X1.25	50 (36.88)	
Head bolt	M6x1	12 (8.85)	
Timing gear nut	M12x1	50 (36.88)	
Timing cover screw	M5x0.8	6 (4.42)	loctite 243
Primary sprocket nut	M18x1.25	160 (118.00)	
Gear selector stop plate screw	M6x1	12 (8.85)	loctite 270
Oil collector plate screw	M6x1	12 (8.85)	loctite 270
Gear selector shaft stop screw	M10X1.25	25 (18.44)	loctite 270
Gear ratchet rotation screw	M6x1	12 (8.85)	loctite 243
Selector shaft	M8x1.25	22 (16.23)	loctite 270
Clutch hub nut	M18x1.25	75 (55.32)	
Clutch spring screw	M6x1	12 (8.85)	
Pressure reducing valve	M14x1.5	20 (14.75)	
Feed pump retaining screw	M6x1	9.8 (7.23)	
Scavenge pump retaining screw	M6x1	9.8 (7.23)	
Head lubricating nozzle	M7x1	2.5 (1.84)	
Valve lift block screw	M5x0.8	9 (6.64)	loctite 270
Water union plate screw	M5x0.8	9 (6.64)	

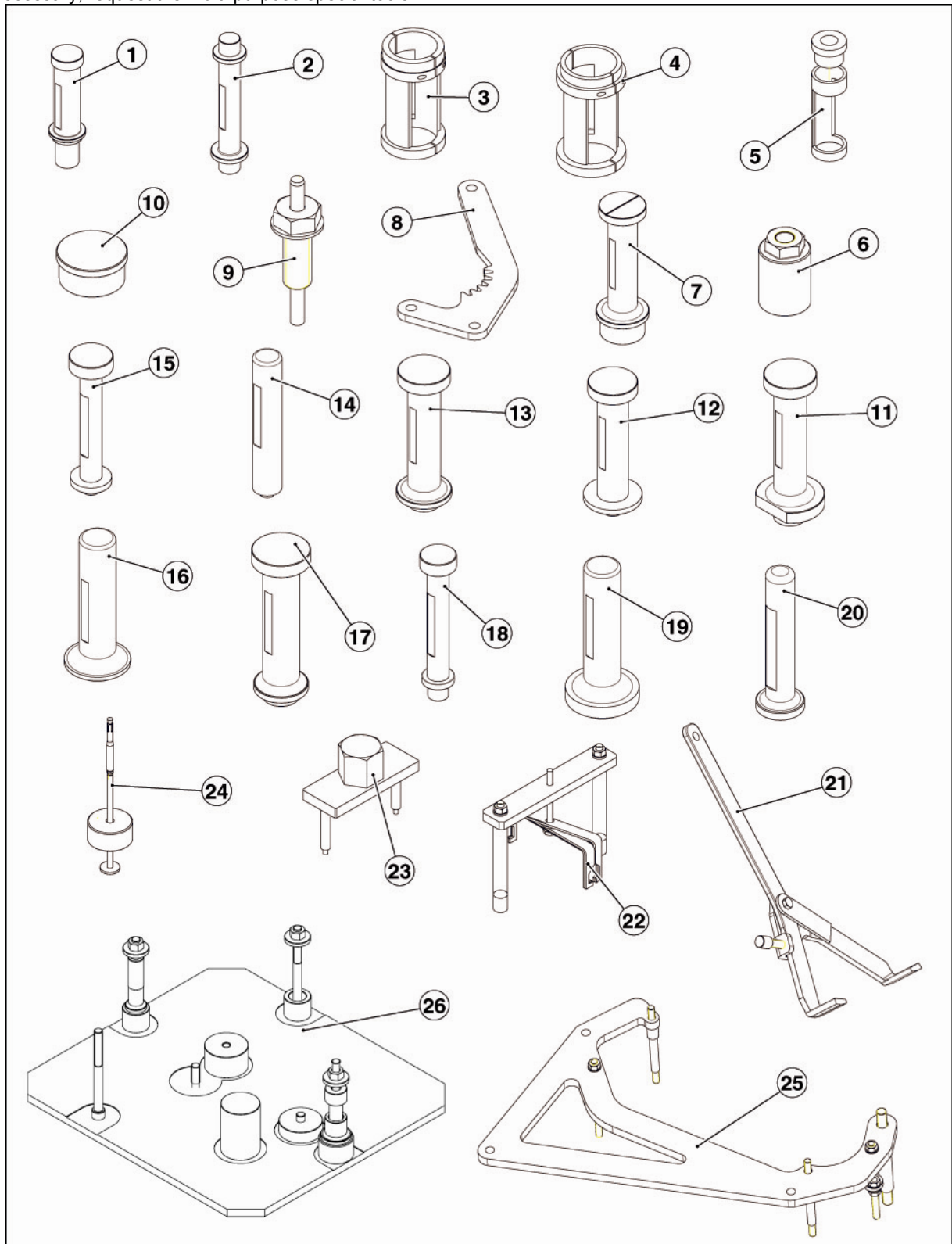
DESCRIPTION	SCREW / NUT	TIGHTENING TORQUE SETTINGS	NOTES
		Nm	
Crankshaft stop screw	M8x1.25	22 (16.23)	loctite 270
Freewheel outer ring screws	M6x1	13 (9.58)	loctite 270
Throttle body screws	M6x1	13 (9.58)	loctite 243
Camshaft gear retaining screw	M16x1	35 (25.82)	
Con-rod cap screw	M8x1	15+(48°÷50°) 11.06+(48°÷50°)	Molicote G-N Plus

### 2.1.4. SPECIAL TOOLS

In order to perform assembly, reassembly and settings correctly, special tools suitable for the task must be used. The use of special tools avoids the potential risk of damage as a result of inappropriate tools and/or improvised methods.

Below is a list of the special tools designed especially for this specific vehicle.

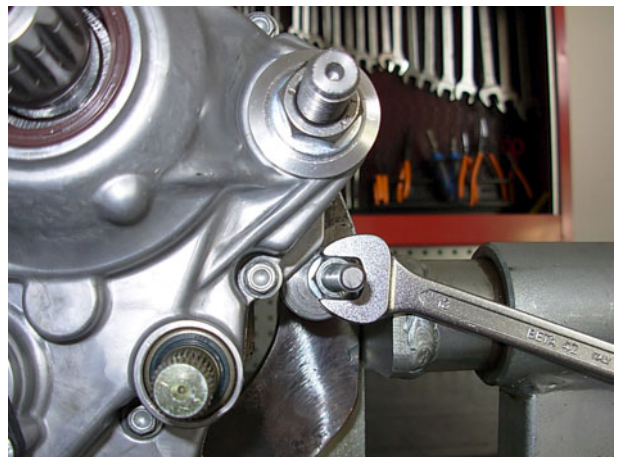
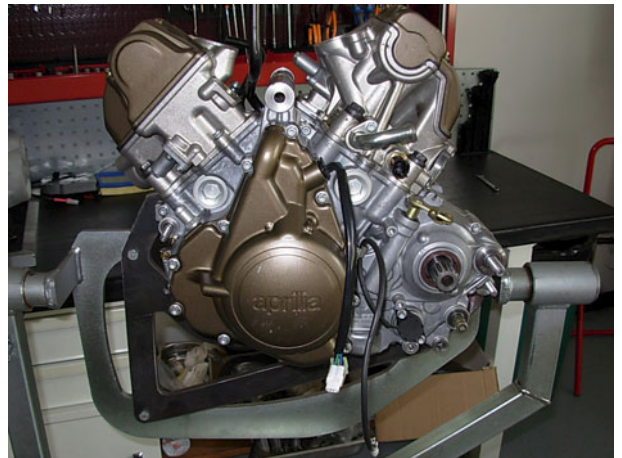
If necessary, request the multi-purpose special tools.



Pos.	Description	Part number
1	Swinging arm cages drift	9100898
2	Drift for swinging arm levers cages	9100900
3	Oil seal - Marzocchi fork d.45	9100903
4	Oil seal - Sachs fork d.48	9100904
5	Valve spring compression tool	9100838
6	Flywheel puller	9100839
7	Crankshaft bearings tool	9100840
8	Crankshaft sprocket locking tool	9100843
9	Crankshaft locking tool (timing pin)	9100844
10	Crankshaft bearings removal tool	9100884
11	Gearbox primary/rh – secondary/lh	9100885
12	Gearbox secondary/rh – primary/lh	9100886
13	Right casing desmo tool	9100887
14	Oil pump oil seal tool	9100888
15	Timing transm.crankshaft tool	9100889
16	Crankshaft oil seal tool	9100890
17	Lh casing Desmo + wheel hub	9100892
18	Lh timing transm. tool	9100893
19	Secondary shaft oil seal tool	9100894
20	Water pump oil seal tool	9100895
21	Clutch housing locking tool	9100896
22	Cylinder barrel extractor	9100897
23	Pump impeller tool	9100938
24	Piston gudgeon pin extractor	9100943
25	Engine support	9100841
26	Crankcase support	9100942

**2.1.5. ASSEMBLING ENGINE TO PLATE**

- Fit the engine support part no. 9100841 on the aprilia engine support stand.
- Assemble the engine on the support using the provided pin holes.
- Secure the engine by means of the proper check nuts.
- Make sure that retaining eccentric of clutch-side crankcase is properly fixed as it is used to open the two crankcase halves.



2.1.6. LIMIT VALUES

LIMIT VALUES CHART	
Description	Limit value (mm)
Max. head deformation	0.05
Maximum camshaft out of round	0.05
Rocker arm inner diameter	12.04
Rocker arm shaft outer diameter	11.96
Rocker arm-rocker arm shaft clearance	0.08
Valve wear limit	4.96
Valve-valve guide clearance (intake)	0.08
Valve-valve guide clearance (exhaust)	0.08
Thickness on seal side - intake valve	2.2
Thickness on seal side - exhaust valve	2.5
Valve stem out of round	0.01
Width of intake valve-seat mating surface	1.3
Width of exhaust valve-seat mating surface	1.5
Bucket diameter	25.96
Bucket seat diameter on head	26.04
Intake spring uncompressed length	37.8
Exhaust spring uncompressed length	35.7
Valve spring max. inclination	2.5° -1.8
Cylinder barrel inner diameter	76.02/80.02
Piston outer diameter	75.94/79.94
Piston pin bore inner diameter	16.02 / 17.02
First piston ring end clearance	0.45
Con-rod small end inner diameter	16.04 / 17.04
Clutch plates deformation	0.2
Clutch pack limit value	34
Clutch spring length	45.1

**2.1.7. COUPLING: MAIN BEARINGS - CONNECTING ROD**

Before selecting the right spare bearing, please verify the relevant class of original parts and check the correct bearing on the table.

Part classes are laser-printed the component.

**WARNING**

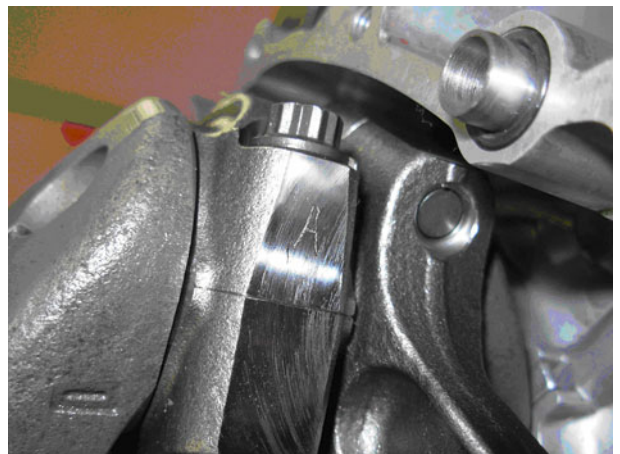
Crankcase class is printed on both crankcase halves.

**CONNECTING ROD - CRANKSHAFT**

		CONNECTING ROD CLASS	
		<b>A</b> 38.000 – 38.012	<b>B</b> 38.013 – 38.025
CRANKSHAFT CLASS	<b>A</b> 34.984 – 34.991	BLUE	YELLOW
	<b>B</b> 34.992 – 35.000	GREEN	BLUE

**CRANKCASE / CRANKSHAFT**

		CRANKCASE CLASS	
		<b>A</b> 41.000 – 41.007	<b>B</b> 41.008 – 41.016
CRANKSHAFT CLASS	<b>A</b> 37.984 – 34.991	BLUE	YELLOW
	<b>B</b> 37.992 – 38.000	GREEN	BLUE



## 2.2. ADJUSTMENTS

### 2.2.1. CYLINDER SYNCHRONISATION

- Release the special hook to remove the seat.
- Lift the tank and secure it with the special retainer.



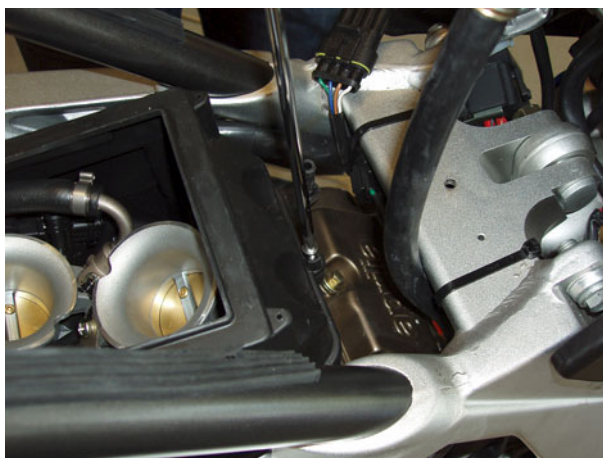
- Release the two plastic snap-on fasteners to remove the airbox cover and take the filter out.



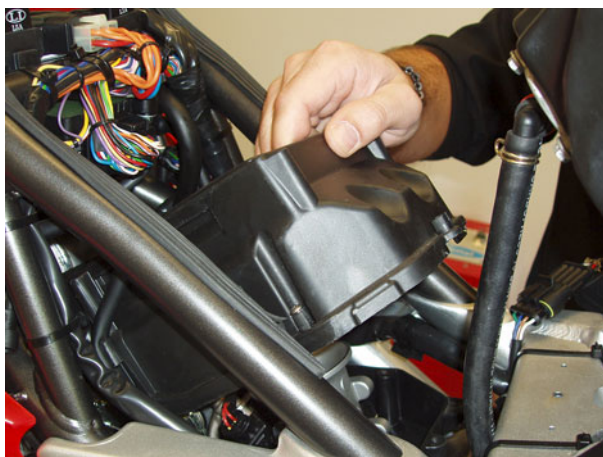
#### **WARNING**

**When disassembling the components, pay special attention and prevent any screw or dirt from falling as once the filter has been removed the two throttles are without protection.**

- Loosen and remove the five screws from airbox top cover.



- Remove airbox top side.



## Engine 450 - 550

- Working on the right side, release the tie from oil breather hose.



- Take the oil breather hose out.
- Remove the atmospheric pressure pickup hose.
- Working on the left side release plug cable from rear cylinder.



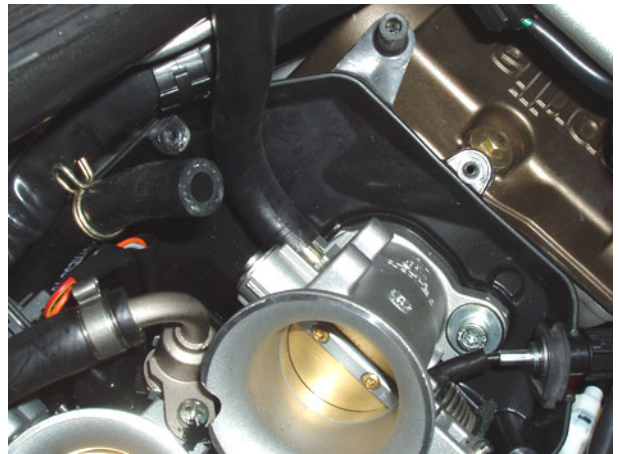
- Release the by-pass hose tie from rear cylinder throttle body.
- Take by-pass hose out from rear cylinder throttle body.



- Have another by-pass hose available and connect it to the free fitting.

**WARNING**

The new by-pass hose shall have same diameter and length of by-pass hose connected to front cylinder throttle body.



- Connect a differential vacuum meter to both by-pass hoses.
- Lower tank gently avoiding to squash vacuum meter hoses.



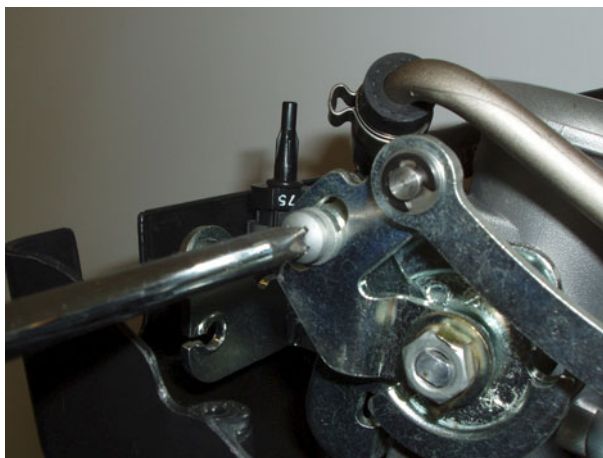
**WARNING**

**As the vehicle is without air filter, the working area and tank lower side shall be accurately cleaned.**







- Start the vehicle and check synchronisation of cylinders vacuum reading.



- If synchronisation is not achieved, loosen the adjusting screw and position the slot so as to balance vacuum.
- Once synchronisation is achieved, tighten the adjusting screw.



## 2.2.2. AXONE

SYMBOL	SCREEN PAGE
	ISO
	ENGINE PARAMETER READING
	DEVICE STATUS (usually "On – Off" values)
	DEVICES ACTIVATION
	ERRORS DISPLAY
	ADJUSTABLE PARAMETERS
	FROZEN FRAME

SCREEN PAGE	DESCRIPTION	APPROXIMATE VALUES	MEASURE UNIT	NOTES
ISO				
	Firmware version	C1APR_09	-	ECU firmware version
	Chassis number	ZD4VS	-	Vehicle frame
	Engine number		-	Engine number
	Programming date	11/24/2005	-	Date the ECU has been initialized in production
	Mapping	14001	-	Mapping code present in ECU

SCREEN PAGE	DESCRIPTION	APPROXIMATE VALUES	MEASURE UNIT	NOTES
<b>ENGINE PARAMETER READING</b>				
	Engine rpm	-	rpm	
	Atmospheric pressure	1010	mbar	
	Front cylinder injection time	-	ms	
	Rear cylinder injection time		ms	
	Front cylinder ignition advance	-	°	
	Rear cylinder ignition advance		°	
	Throttle position	4.6	%	At idle, value should be 5° +/- 1°
	Intake air temperature	-	°C	
	Engine temperature		°C	
	Battery voltage		V	
	Gear engaged			Engaged gears are displayed (neutral = 0) (unspecified = 10)
	Vehicle speed	2	Km/h	Vehicle speed (caution: this parameter is not working at the moment)
	Operation time	12:25	hhmm	Engine operation time (at rpm higher than zero) in hours and minutes
	Throttle self-learning, min. position	30		Reference value with throttle fully home at 0°. This value is stored by means of the "Throttle self-learning, min. position" procedure in the adjustable parameters screen page
	Throttle self-learning, max. position	210		Reference value with throttle fully open. This value is stored by means of the "Throttle self-learning, max. position" procedure in the adjustable parameters screen page
	CO adjustment at idle	1.00		'CO rate adjustment trimmer value: if equal to 1.00, it has not been changed yet. To change it, go to Adjustable parameters screen page
	Wheel diameter		cm	
	Wheel signals			
	Injection time correction	1.00		Injection time adjustment value outside idle range: if equal to 1.00, it has not been changed yet. To change it, go to Adjustable parameters screen page
<b>DEVICE STATUS</b>				
	Fall sensor	Normal/Tip over/Disconnected	-	Indicates bank angle sensor state

SCREEN PAGE	Description	APPROXIMATE VALUES	MEASURE UNIT	NOTES
<b>ERRORS DISPLAY</b>				
	Engine temperature sensor short-circuit			Error detected on indicated sensor/actuator circuit. Displayed error state is always MEM: look at the EFI light on the instrument panel to understand if error is live (light on) or memorised (light off)
	Engine temperature sensor open circuit			Error detected on indicated sensor/actuator circuit. Displayed error state is always MEM: look at the EFI light on the instrument panel to understand if error is live (light on) or memorised (light off)
	Faulty barometric pressure sensor			Error detected on indicated sensor/actuator circuit. Displayed error state is always MEM: look at the EFI light on the instrument panel to understand if error is live (light on) or memorised (light off)
	Throttle position sensor short-circuit			Error detected on indicated sensor/actuator circuit. Displayed error state is always MEM: look at the EFI light on the instrument panel to understand if error is live (light on) or memorised (light off)
	Throttle position sensor open circuit			Error detected on indicated sensor/actuator circuit. Displayed error state is always MEM: look at the EFI light on the instrument panel to understand if error is live (light on) or memorised (light off)
	Main relay control to gnd/open circ.			Error detected on indicated sensor/actuator circuit. Displayed error state is always MEM: look at the EFI light on the instrument panel to understand if error is live (light on) or memorised (light off)
	Main relay control 12V			Error detected on indicated sensor/actuator circuit. Displayed error state is always MEM: look at the EFI light on the instrument panel to understand if error is live (light on) or memorised (light off)
	Light relay activation			Error detected on indicated sensor/actuator circuit. Displayed error state is always MEM: look at the EFI light on the instrument panel to understand if error is live (light on) or memorised (light off)
	Front injector			Error detected on indicated sensor/actuator circuit. Displayed error state is always MEM: look at the EFI light on the instrument panel to understand if error is live (light on) or memorised (light off)

SCREEN PAGE	Description	APPROXIMATE VALUES	MEASURE I UNIT	NOTES
<b>ERRORS DISPLAY</b>				
	Rear injector			Error detected on indicated sensor/actuator circuit. Displayed error state is always MEM: look at the EFI light on the instrument panel to understand if error is live (light on) or memorised (light off)
	Front coil			Error detected on indicated sensor/actuator circuit. Displayed error state is always MEM: look at the EFI light on the instrument panel to understand if error is live (light on) or memorised (light off)
	Rear coil			Error detected on indicated sensor/actuator circuit. Displayed error state is always MEM: look at the EFI light on the instrument panel to understand if error is live (light on) or memorised (light off)
<b>DEVICES ACTIVATION</b>				
	Error clearing			Press "enter" to transfer errors from the memory (MEM) to the historical record (STO). The next time Axone is connected to the ECU, the errors in the historical record (STO) will no longer be displayed
<b>ADJUSTABLE PARAMETERS</b>				
	Throttle self-learning, min. position			Allows storage of reference value for throttle fully home at 0°: before performing the operation, loosen the idle screw until Axone reading for Throttle position is 0°
	Throttle self-learning, max. position			Allows storage of reference value for throttle fully open by completely turning the throttle twistgrip open
	CO adjustment at idle	'1.00		Allows modification of injection times within idle range to change the CO rate
	Wheel diameter		cm	
	Wheel signals			
	Injection time correction	'1.00		Allows modification of injection times at any rpm (maximum adjustment is +/- 5% with respect to injection times set inside mapping)

## LUBRICATION

3

**SUMMARY**

3.1.	REMOVING AND REFITTING THE ENGINE .....	3
3.1.1.	REMOVING THE ENGINE .....	3
3.1.2.	REFITTING THE ENGINE .....	14
3.1.3.	REMOVING ENGINE ACCESSORIES .....	25
3.2.	WATER PUMP .....	27
3.2.1.	REMOVING THE WATER PUMP .....	27
3.2.2.	INSTALLING THE WATER PUMP .....	29
3.3.	CYLINDER HEAD .....	31
3.3.1.	REMOVING THE CYLINDER HEAD .....	31
3.3.2.	REMOVING THE ROCKER ARMS AND CAMSHAFT .....	33
3.3.3.	REMOVING THE VALVES AND VALVE SPRINGS .....	35
3.3.4.	CHECK .....	36
3.3.5.	INSTALLING THE VALVES AND VALVE SPRINGS .....	41
3.3.6.	INSTALLING THE CAMSHAFT AND ROCKER ARMS .....	43
3.3.7.	INSTALLING THE HEAD .....	45
3.4.	CYLINDER AND PISTON .....	47
3.4.1.	REMOVAL .....	47
3.4.2.	CHECKING THE LIMIT VALUES .....	49
3.4.3.	INSTALLATION .....	50
3.5.	CLUTCH .....	51
3.5.1.	REMOVAL .....	51
3.5.2.	CHECK .....	55
3.5.3.	REASSEMBLY .....	57
3.6.	OIL PUMP .....	61
3.6.1.	LUBRICATION SYSTEM DIAGRAM .....	61
3.6.2.	REMOVING THE EXTERNAL PUMP .....	62
3.6.3.	REMOVING THE INTERNAL PUMP .....	64
3.6.4.	INSTALLING THE INTERNAL PUMP .....	65
3.6.5.	INSTALLING THE EXTERNAL PUMP .....	66
3.7.	PRIMARY TRANSMISSION GEAR .....	68
3.7.1.	REMOVING THE PRIMARY GEAR .....	68
3.7.2.	INSTALLING THE PRIMARY GEAR .....	69
3.8.	GEAR SHIFT SELECTOR .....	70
3.8.1.	REMOVAL, INSPECTION, REFITTING .....	70
3.9.	GENERATOR SIDE .....	73
3.9.1.	REMOVAL .....	73
3.9.2.	CHANGING BEARINGS AND OIL SEALS .....	76
3.10.	ENGINE CRANKCASES .....	82
3.10.1.	HOW TO TAKE THE ENGINE CRANKCASES APART .....	82
3.10.2.	CHECK .....	85
3.10.3.	CHANGING BEARINGS AND OIL SEALS .....	86
3.10.4.	ASSEMBLING THE CRANKCASES .....	92
3.11.	TIMING .....	95
3.11.1.	CAM TIMING .....	95

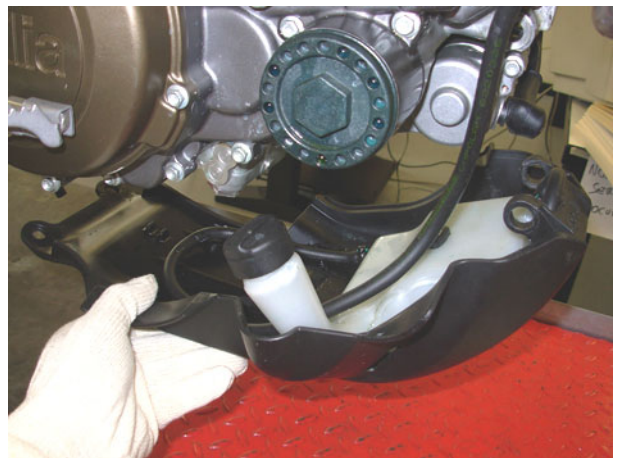
### 3.1. REMOVING AND REFITTING THE ENGINE

#### 3.1.1. REMOVING THE ENGINE

- Set the engine support stand.
- Working on either side, loosen and remove the three side body panel screws.
- Remove the side body panels.



- Remove sump guard and expansion tank.



- Prepare a container of suitable capacity under the hose.
- Release the clamp.



- Remove the hose.
- Drain the fluid in the container.
- Open radiator plug to drain all fluid.



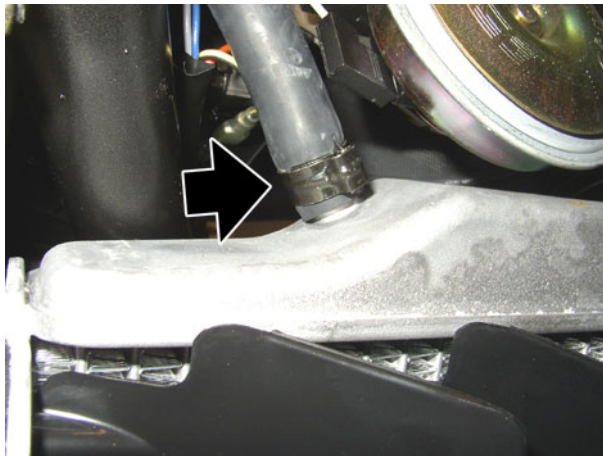
- Working on either side, release the clamps.



- Remove the right and left delivery hoses.



- Working on the left side, release the clamp and disconnect the hose.



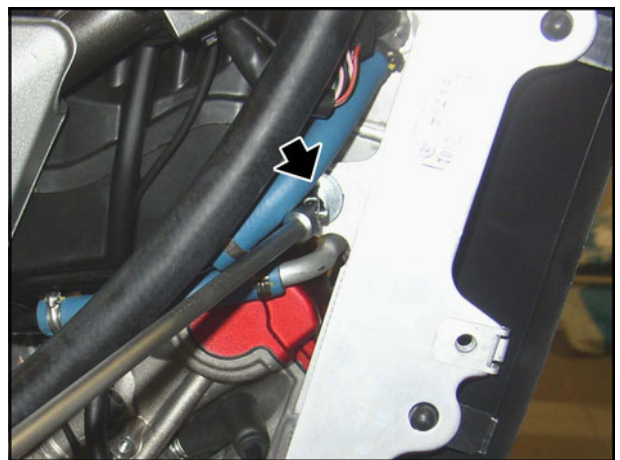
- Working on the right side, slide out the hose.



- Remove the radiator breather hose.



- Working on the right side, loosen the lower screw and collect the nut and washer on the left side.



- Working on the right side, loosen the upper screw and collect the nut and washer on the left side.



**WARNING**  
Before removing the screw, support the cooling fan or it will fall down.



- Slide out the radiators in a downward motion.

**WARNING**

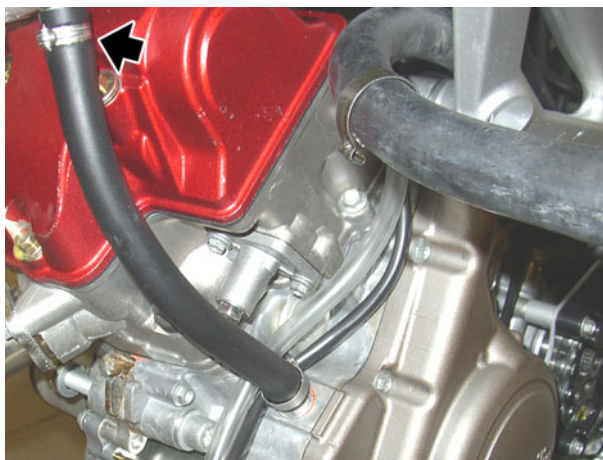
The radiators are connected one to the other by means of the lower hose.



- Prepare a container of suitable capacity under the oil tank plug.
- Loosen and remove oil drain cap.



- Remove the top clamp.
- Slide out the blow-by hose.



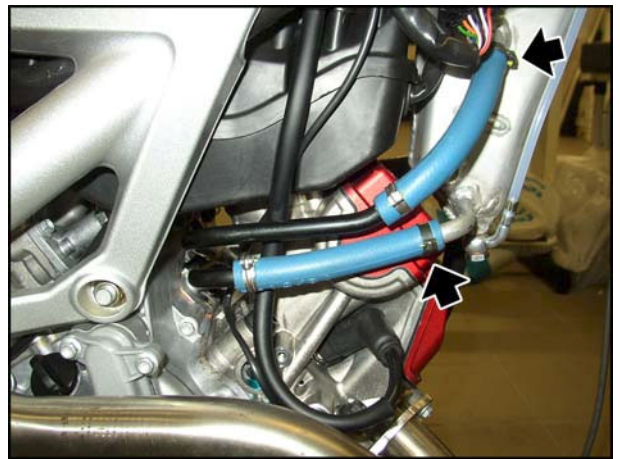
- Release the clamp.



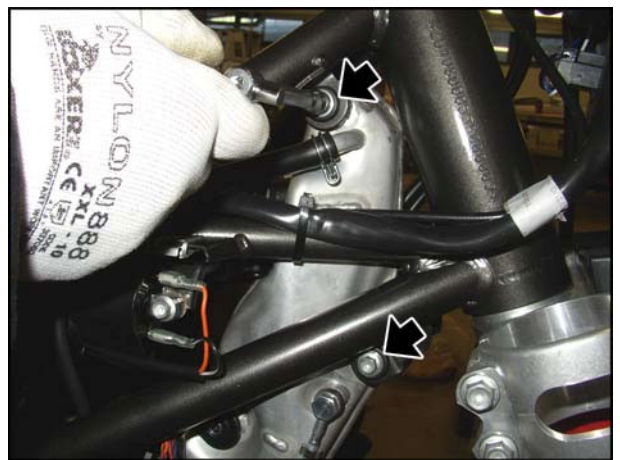
- Remove the hose.



- Release the two clamps.
- Remove the two hoses.



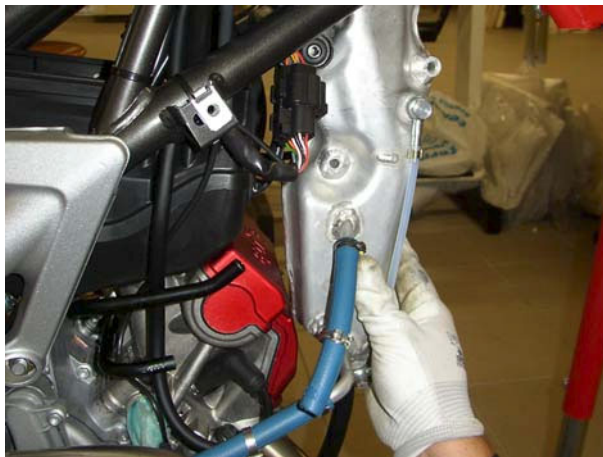
- Working on the right side, loosen and remove the two screws.
- Working on the left side, remove the two nuts.



- Remove oil filler plug.



- Remove the oil tank from below.



- Loosen and remove the two screws on sprocket protection and remove protection; collect two screws and washers (one on enduro RXV, two on motard SXV)
- Remove the ground cable.



- Loosen and remove the securing screw from the ground cable.
- Remove the ground cable.



- Undo and remove the nut and collect the washer.





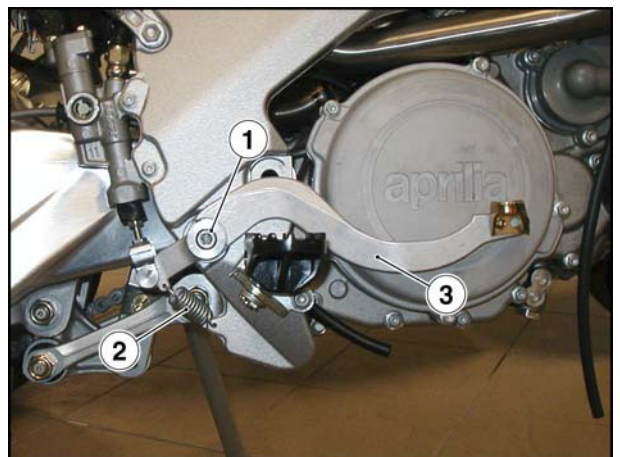
- Working on either side, loosen adjuster.
- Remove the chain.



- Unscrew and remove the swinging arm shaft nut.



- Unscrew and remove the threaded pin (1).
- Release the spring (2).
- Remove the rear brake pedal (3).



- Remove swinging arm shaft.



- Grasp and release the handles on either sides to release the air box cover.
- Slide the cover from the rear end completed with air filter.

**NOTE** Please ensure the air box is clean before refitting. Remove any dirt that might have entered during the removal procedure.

When refitting, pay attention to correctly refit the air scoops.

**WARNING**

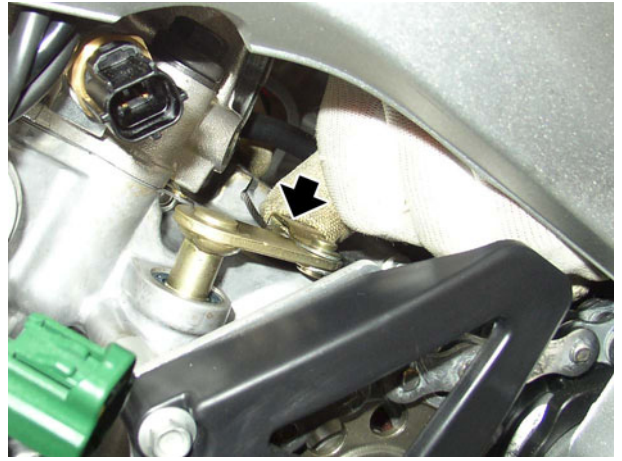
Ensure the tank retaining cord never touches the battery positive pole.



- Release the two throttle cables.



- Disconnect the clutch cable.



- Remove the sprocket circlip.
- Remove the chain from the sprocket.
- Remove the sprocket.



- Disconnect all connectors.





- Slide the protection along the starter motor power cable.
- Loosen and remove the securing screw.
- Remove the starter motor power cable.



- Unscrew and remove the lower rear pin nut.



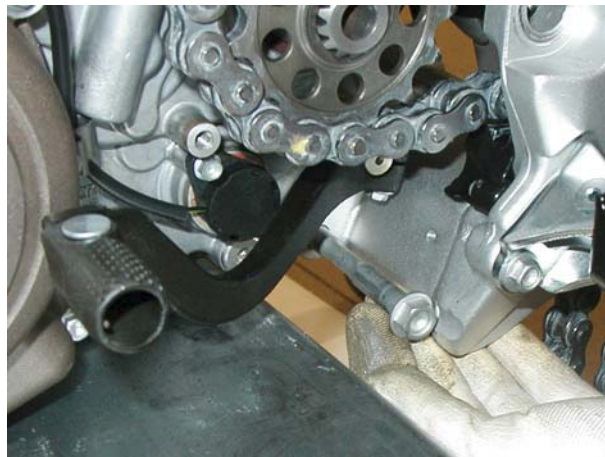
- Collect the washer.

**WARNING**

The number of washers can be different from one side to the other or from vehicle to vehicle: check number and position of washers when removing them.



- Slide off the lower rear pin.



- Loosen and remove the securing screw from the front pin.



- Remove the front pin.



- Collect the washer.
- Move down the engine.



**3.1.2. REFITTING THE ENGINE**

- Position the engine.
- Fit the washer.



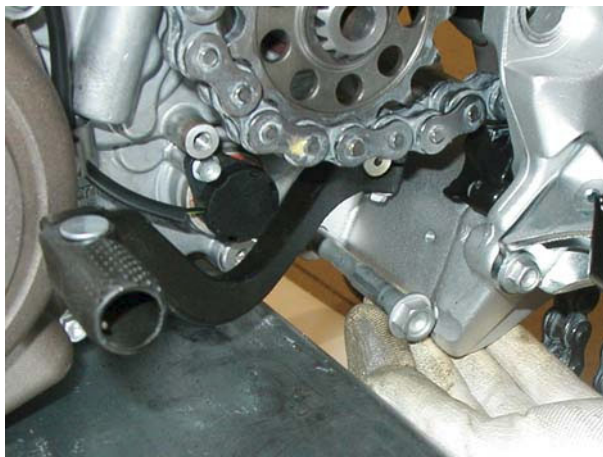
- Fit the front pin.



- Tighten the front pin securing screw.



- Fit the lower rear pin.



- Fit the washer.



**WARNING**  
Refit washers restoring their original number and position.



- Tighten the lower rear pin securing nut.



- Position the ground cable and tighten the screw.



- Fit the starter motor power cable.
- Tighten the fastening screw.
- Fit the protection element.



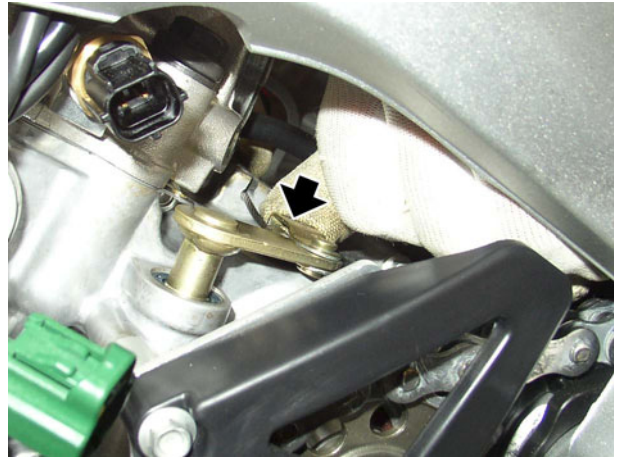
- Connect all connectors.



- Fit sprocket and chain.
- Fit the chain circlip.



- Fit the clutch cable.



- Fit the two throttle cables.



- Fit the air box cover.

**NOTE** Please ensure the air box is clean before refitting. Remove any dirt that might have entered during the removal procedure. When refitting, pay attention to correctly refit the air scoops.

**WARNING**

If it falls to the ground, carefully clean the air filter and the air box from oil coming from the oil tank via the oil breather hose.



- Fasten air box cover engaging the fastener on both sides.

**WARNING**

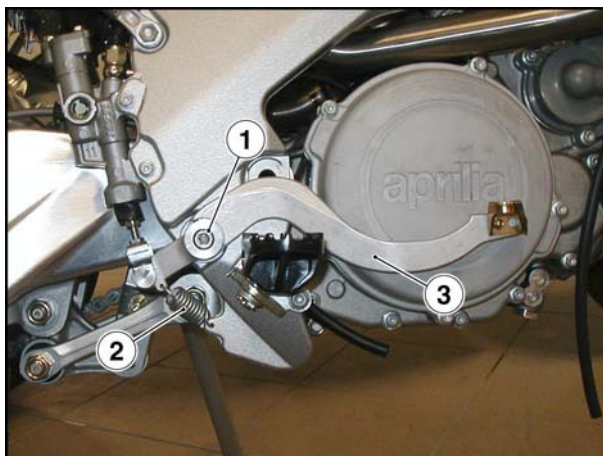
Ensure the tank retaining cord never touches the battery positive pole.



- Fit the swinging arm shaft.



- Fit the rear brake pedal (3).
- Fit the spring (2).
- Tighten the screw (1) retaining the rear brake pedal.



- Tighten the swinging arm shaft nut.



- Fit the rear wheel in its seat onto swinging arm.
- Wrap the drive chain onto rear sprocket.
- Adjust chain tension using the adjusters located on the swinging arm.



- Fit the washer.



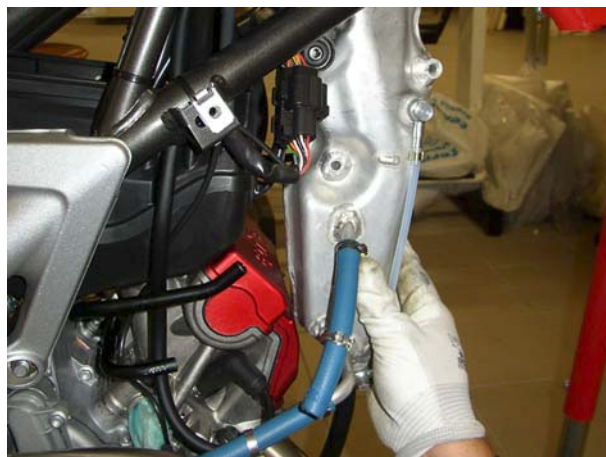
- Tighten the rear wheel shaft nut.



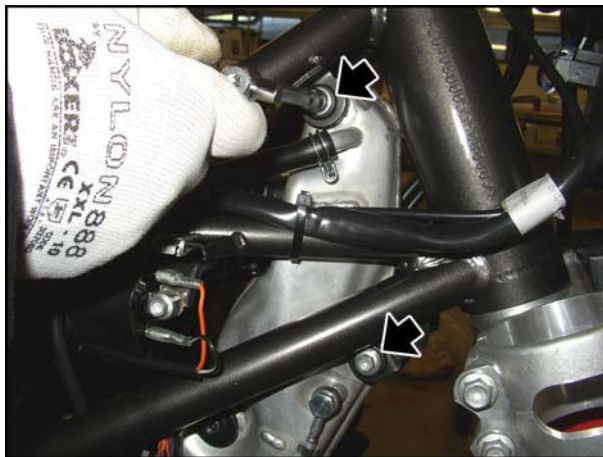
- Fit the sprocket guard together with the two spacers and tighten the two screws.



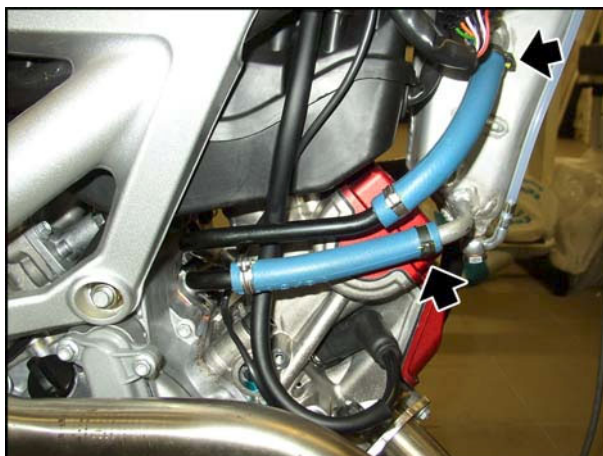
- Fit the engine oil tank.



- Working on the right side, fit the two pins.
- Working on the left side, tighten the two nuts.



- Fit the connection lines and fasten ties.



- Fit tube.

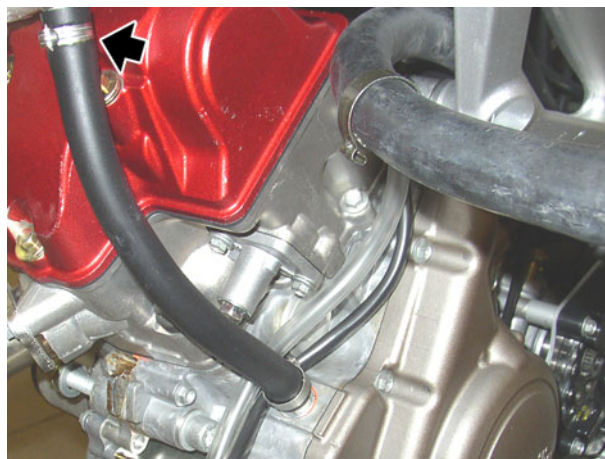


- Fasten tie.

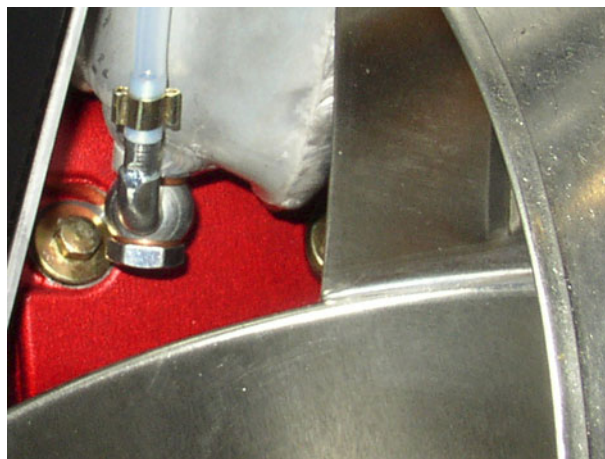


## Engine 450 - 550

- Fit the blow-by hose.
- Fasten tie.



- Tighten the oil drain nut.
- Fill the tank with engine oil from the top filler.



- Tighten oil plug.



- Fit the radiators from bottom up.

**WARNING**

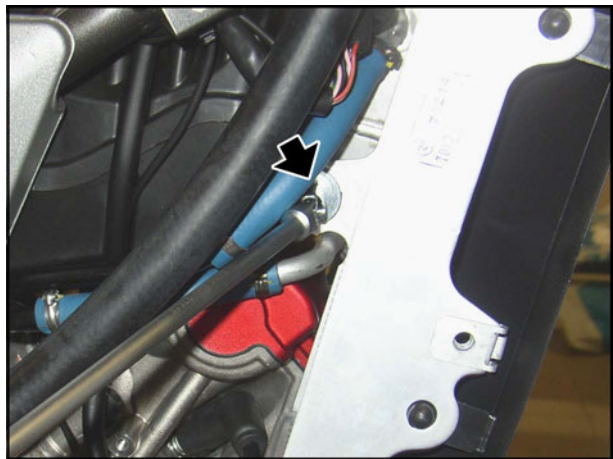
The radiators are connected one to the other by means of the lower hose.



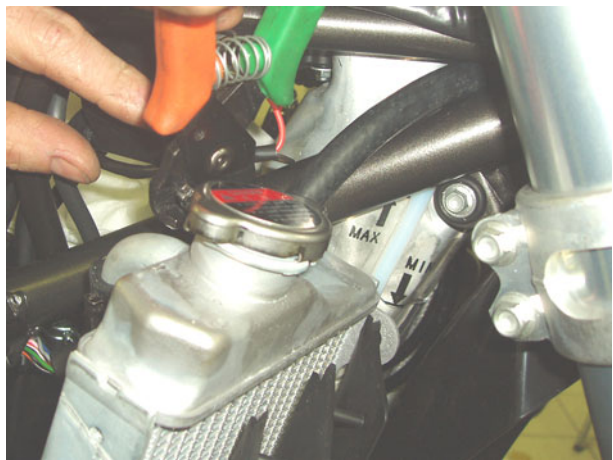
- Insert the pin, fit the washer and tighten the nut.



- Insert the pin, fit the washer and tighten the nut.



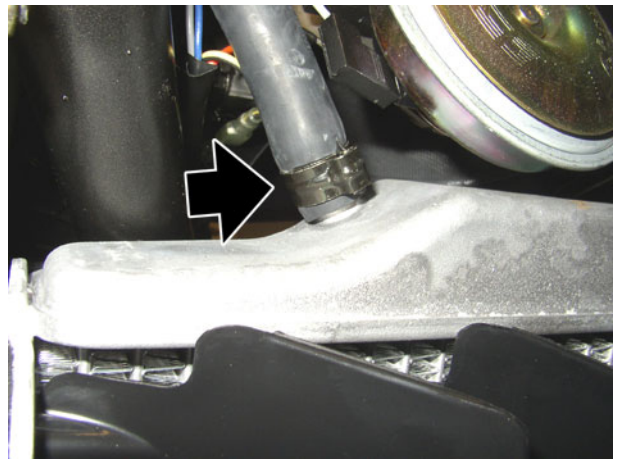
- Fit the radiator breather hose.



- Working on the right side, fit the hose.



- Working on the left side, fit the hose and clamp.



- Fit delivery hoses on either side.



- Fasten tie on either side.



- Fit the hose.



- Fasten tie.
- Fill the system through the radiator plug.



- Fit the side body panels.
- Tighten the three side body panel screws on either side.



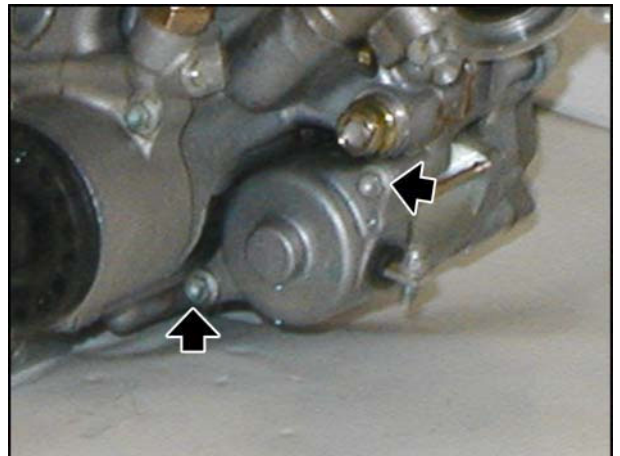
### 3.1.3. REMOVING ENGINE ACCESSORIES

- Position the engine on the engine support plate (part no. 9100841), see (ASSEMBLING THE ENGINE TO PLATE)

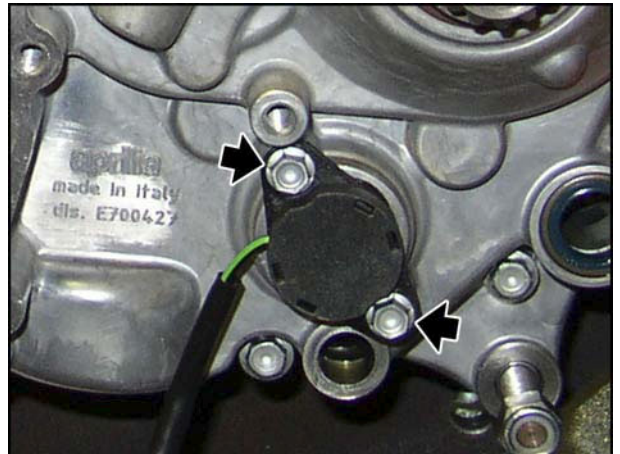
**NOTE** Before removing the accessories, drain all fluids from the engine and set a suitable collector under it.



- Loosen and remove the two screws securing the starter motor.
- Remove the starter motor.

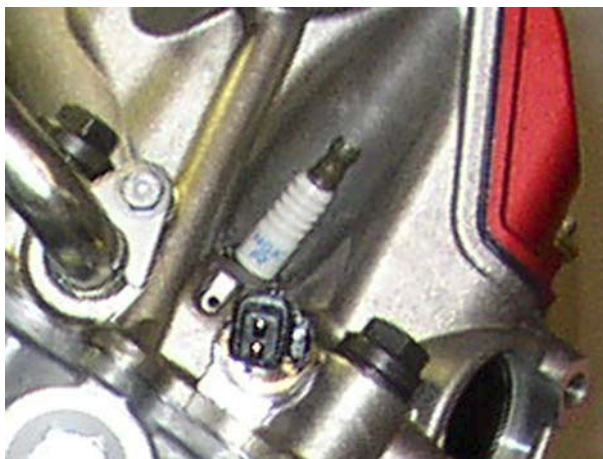


- Loosen and remove the two screws securing the gearbox position sensor.
- Remove the gearbox position sensor.
- Collect sensor cylinder and clip.





- Working on either piston-cylinder assy, remove the spark plug.



- Working on clutch side, loosen and remove engine oil filter plug, collect spring.
- Remove the oil filter.



### 3.2. WATER PUMP

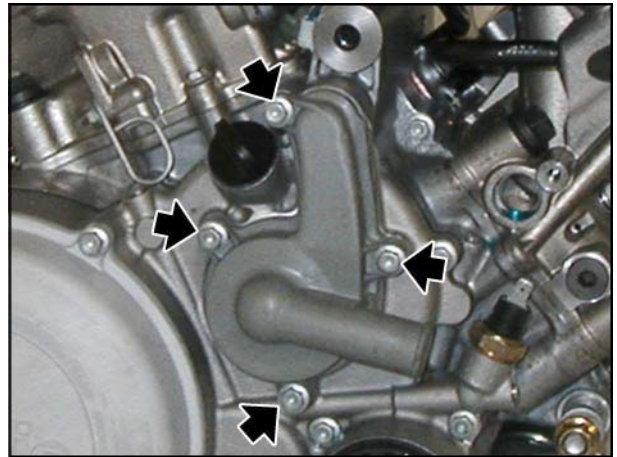
#### 3.2.1. REMOVING THE WATER PUMP

**WARNING**

Usually, it is not necessary to remove the water pump except in case the coolant level is extremely low or the coolant contains engine oil.

**NOTE** Before removing the components, set a rag under the pump.

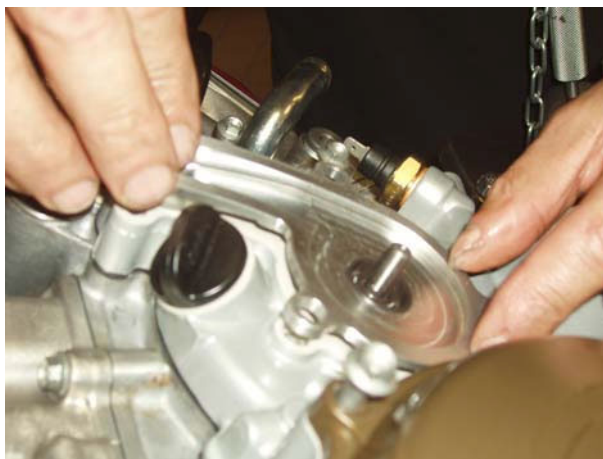
- Loosen and remove the five pump cover screws.
- Remove the water pump cover and the gasket.
- Remove pump impeller using tool no. 9100938.
- Remove the shim.



- Remove the two centring pins.



- Remove the water pump cover spacer.

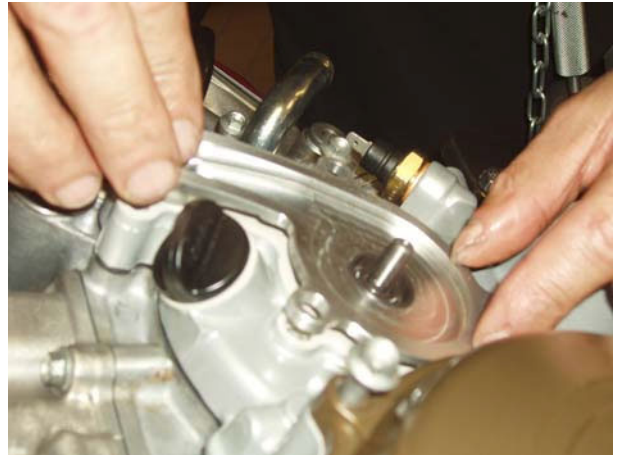


### 3.2.2. INSTALLING THE WATER PUMP

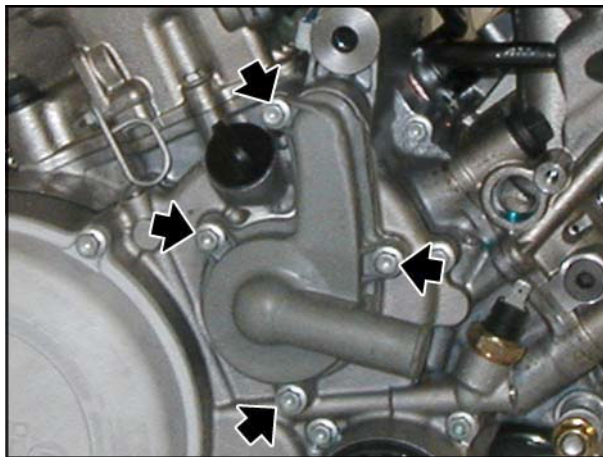
**WARNING**

When installing, only use new seals and clamps.

- Fit the water pump cover spacer.
- Fit the two centring pins.
- Fit shim.
- Fit and fasten water pump impeller
- Use tool no. 9100938 to tighten it to the specified torque.



- Fit the water pump cover and the gasket.
- Fit and tighten the five water pump cover screws.



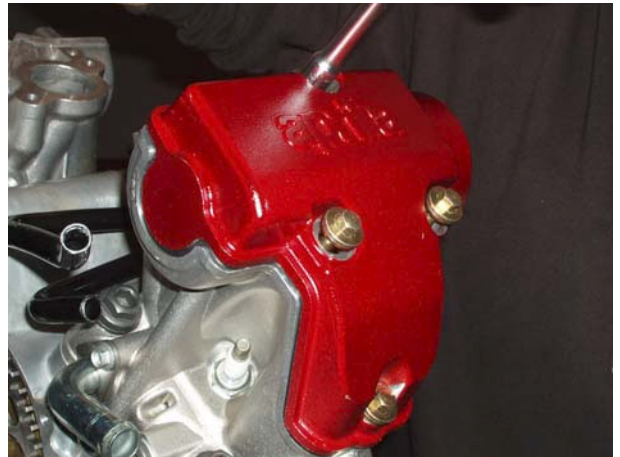
### 3.3. CYLINDER HEAD

#### 3.3.1. REMOVING THE CYLINDER HEAD

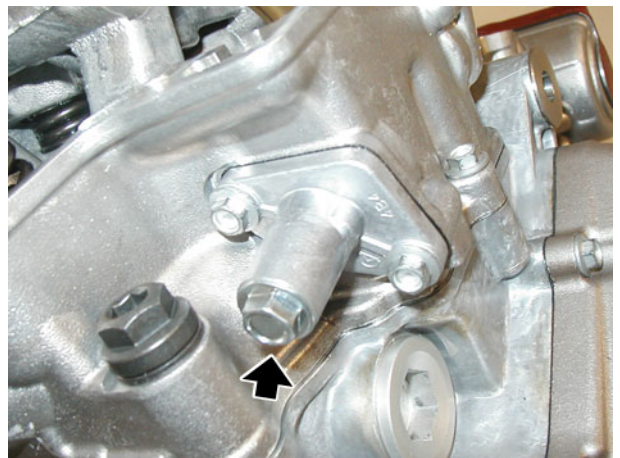
**NOTE** The following procedure applies to both cylinders.

**NOTE** Ensure that the piston of the cylinder you are working on is at TDC in the combustion stage, before removing the cylinder head.

- Loosen and remove the four screws from head cover and keep the O-rings.
- Remove the head cover complete with gasket.



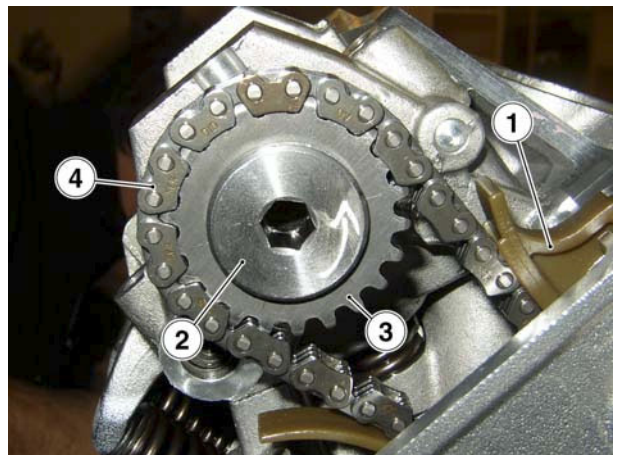
- Loosen and remove the chain tensioner spring retaining screw.



- Slide off the chain tensioner inner guide (1).
- Lock the camshaft with 6 mm pin (0.24 in) used for cam timing, see (CAM TIMING).
- Loosen and remove the nut retaining camshaft control gearwheel (2).

**NOTE** Front cylinder camshaft screw is left-handed, while rear cylinder camshaft screw is right-handed.

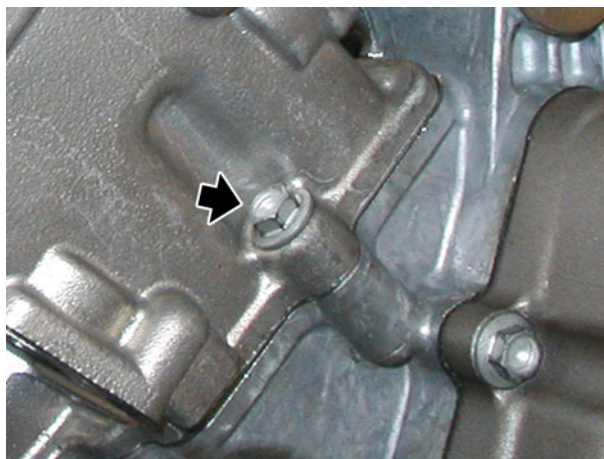
- Remove camshaft gear (3) and move accurately the timing chain (4).



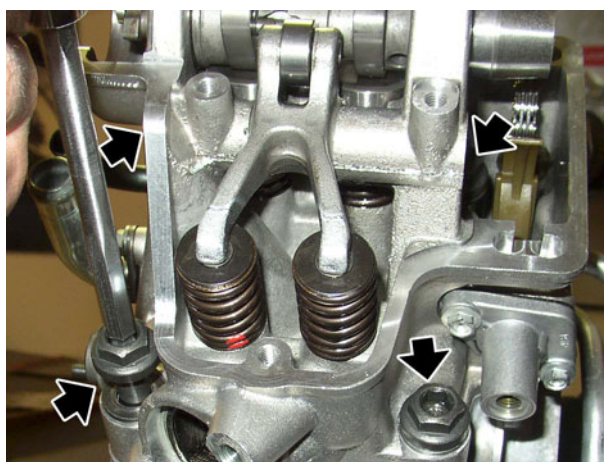
- Loosen and remove the head retaining screw on timing side.

**WARNING**

Remove this screw before removing the four main screws.



- Loosen and remove the four head retaining bolts, use an articulated spanner with rounded tip, if necessary.
- Remove the head, the head gasket and centring pins.

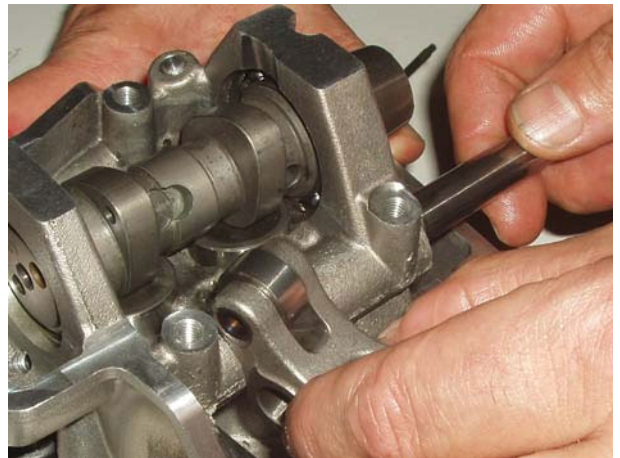


**3.3.2. REMOVING THE ROCKER ARMS AND CAMSHAFT**

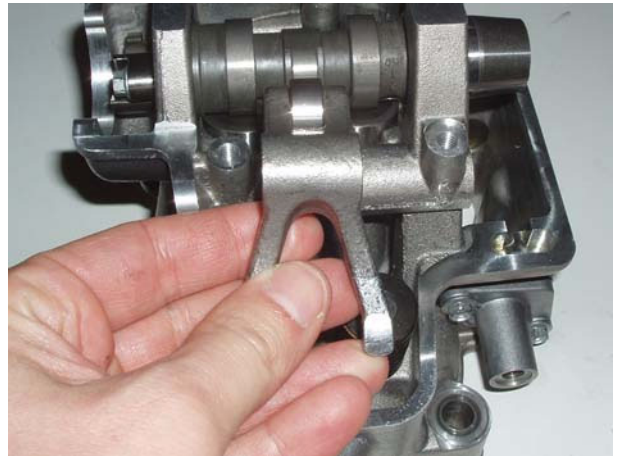
- Remove the head, see (REMOVING THE CYLINDER HEAD).
- Remove the exhaust valve rocker arm shaft snap ring.



- Remove the rocker arm shaft of exhaust valves from its seat.



- Remove the rear rocker arm.



- Lock the camshaft with 6 mm pin (0.24 in) used for cam timing, see (CAM TIMING).
- Loosen and remove the decompression chamber control retainer screw.



- Slide off the decompression system together with control spring.
- Working on timing side, remove the circlip securing camshaft bearing in place.
- Slide off the camshaft together with timing-side ball bearing.



### 3.3.3. REMOVING THE VALVES AND VALVE SPRINGS

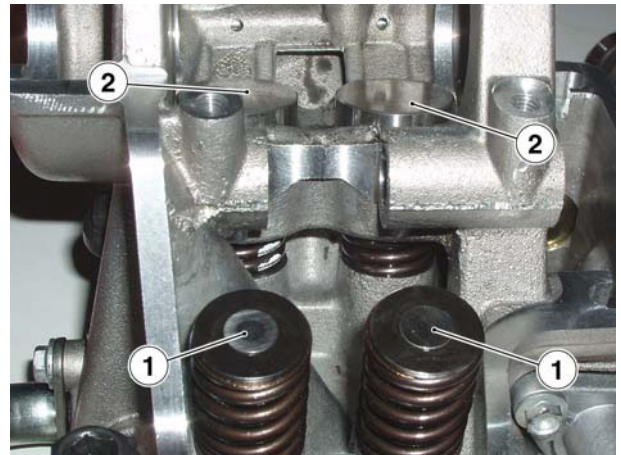
**NOTE** The following procedure applies to both cylinders.

- Remove the rocker arm controlling exhaust valves and remove the camshaft (REMOVING THE ROCKER ARMS AND CAMSHAFTS).

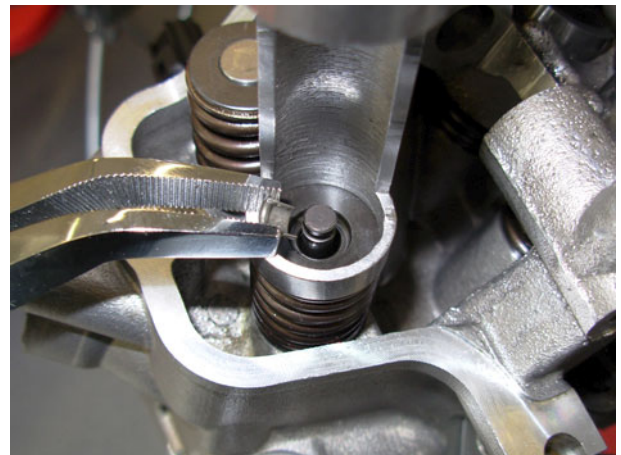
**NOTE** Before removing the cylinder head components (valves, valve springs, caps and buckets), ensure that the valves are closed and seal correctly.

**NOTE** While removing, carefully mark the position of each part to ensure installation in the correct position.

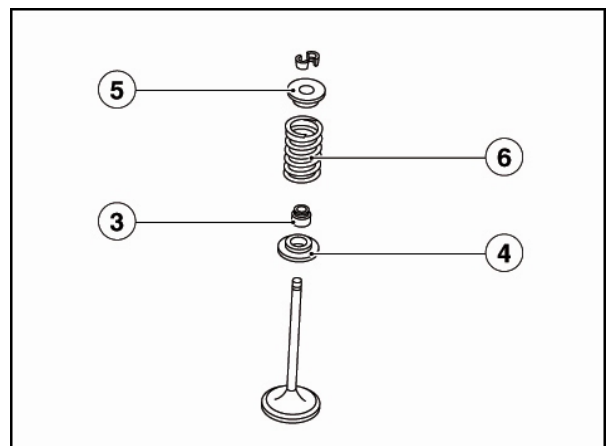
- Remove the two shims (1) on exhaust valves.
- Remove the two buckets (2) and the two shims below from both intake valves.



- Using valve spring compression tool (no. 9100838) and adapter (no. 8140179), remove the valve collets.



- Remove the valve spring (6) and upper cap (5).
- Remove the valve.
- Remove valve stem oil seal (3) and lower cap (4).



### 3.3.4. CHECK

#### CHECKING THE HEAD

- Check for damages or scratches in the head and change it, if necessary.
- Check for mineral deposits or rust in the head water jacket, eliminate them.

- Using a reference bar and a feeler gauge positioned transversally, measure head deformation.

**Maximum head deformation, see (LIMIT VALUES).**

#### CHECKING THE HEAD COVERS

- Check for damage or wear, change the faulty parts.



#### CHECKING THE TIMING CHAIN TENSIONER

- Check for damages and change the part, if necessary.
- Check single-direction cam operation: if movement is jamming, change chain tensioner housing.



**CHECKING THE CAMSHAFT GEARWHEEL**

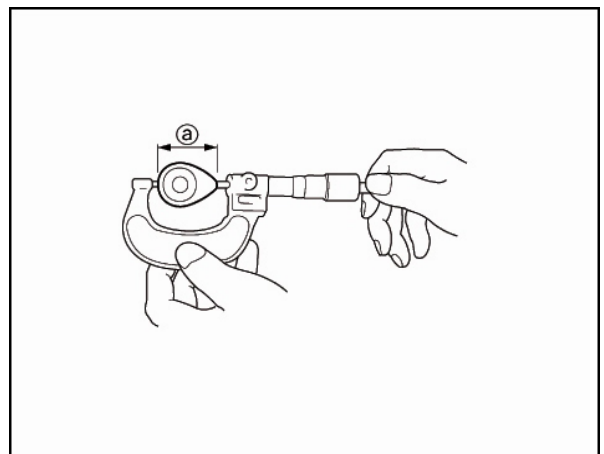
- Check camshaft gear for proper operation: change timing chain and camshaft gear as a set if you notice damages or hard spots.

**CHECKING THE CAMSHAFT****CAMSHAFT LOBES**

- Check for blueish stains, pitting, scratches and, if so, change camshaft, its gear and chain.

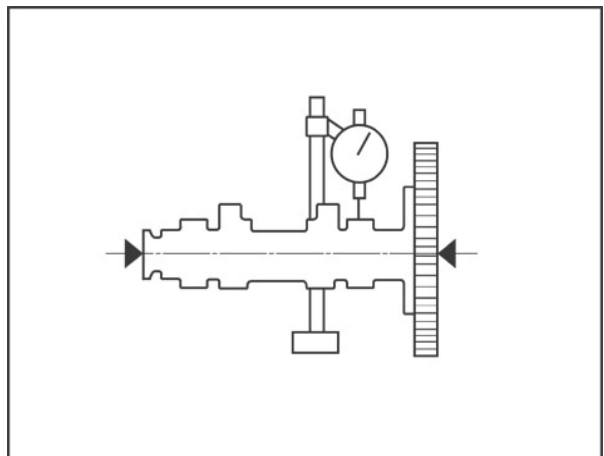
- Check with a micrometer camshaft lobes dimension (a):

**Camshaft lobes dimensions: limit value (a), see (LIMIT VALUES).**



- Secure the camshaft in horizontal position, as shown, turn it and check its out of round with a dial gauge; change the part, if needed.

**Maximum camshaft out of round, maximum value, see (LIMIT VALUES).**

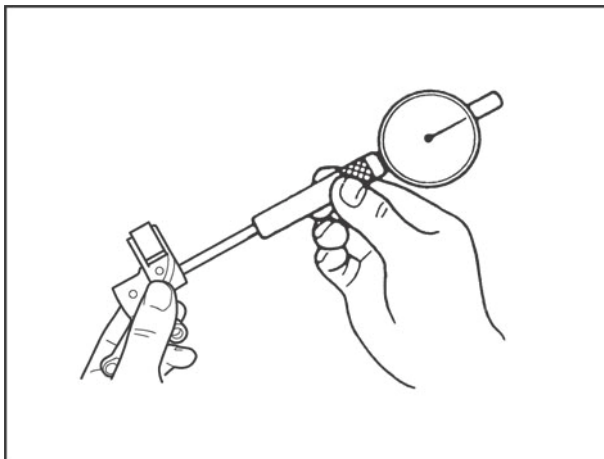


**CHECKING THE ROCKER ARMS AND ROCKER ARM SHAFTS**

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

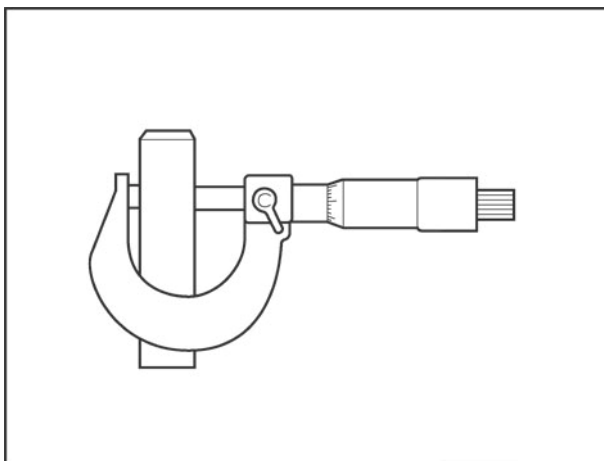
- Using an inside micrometer gauge, check rocker arm inner diameter and change, if necessary.

**Rocker arm inner diameter: max wear limit, see (LIMIT VALUES).**



- Check that the rocker arm shaft outer diameter does not show blueish stains, pitting, scratches and if so, change the part.
- Using a micrometer, check rocker arm shaft outer diameter and change, if necessary.

**Rocker arm-to-shaft outer diameter: max wear limit, see (LIMIT VALUES).**



- Calculate rocker arm to rocker arm shaft clearance.

**NOTE** Calculate clearance as follows: rocker arm inner diameter - rocker arm shaft outer diameter.

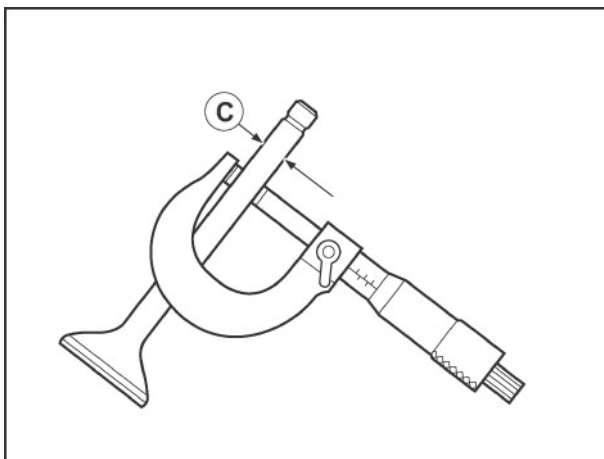
- Change the part if calculated clearance exceeds indicated limit value.

**Rocker arm-to-shaft clearance: max wear limit, see (LIMIT VALUES).**

**CHECKING VALVES AND VALVE GUIDES**

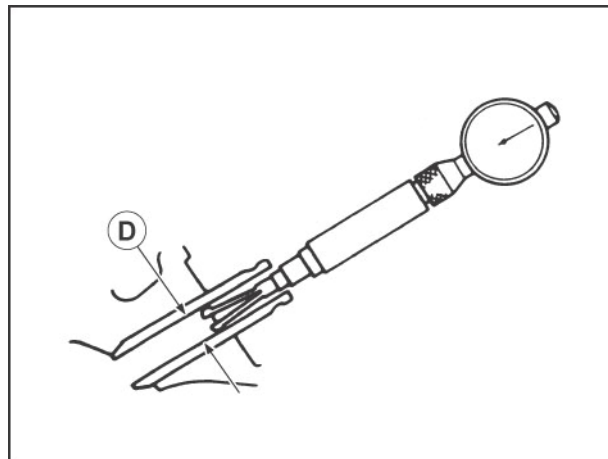
**NOTE** The following procedure applies to all valves and valve guides.

- Using a micrometer, measure valve stem diameter (C).



## Engine 450 - 550

- Using an inner micrometer gauge, measure valve guide inner diameter (D).



- Calculate valve stem to valve guide clearance (G) as follows:

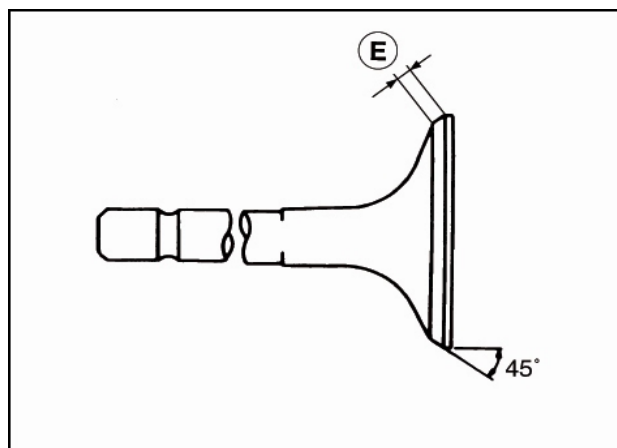
$$G = c - d$$

**Valve stem-to-valve guide clearance: max wear limit, see (LIMIT VALUES).**

- Change the valve guide if clearance is outside specified range.

- Carry on checking valves and valve guides by eliminating scale from valve face and seat.
- Ensure that the valve face does not show pitting or marks of wear; change valve if necessary.
- Check that valve stem end does not have a "mushroom" shape or has a larger diameter; if so, change the valve.
- Ensure that value (E) of valve edge mating surface complies with indicated values, change the valve if necessary.

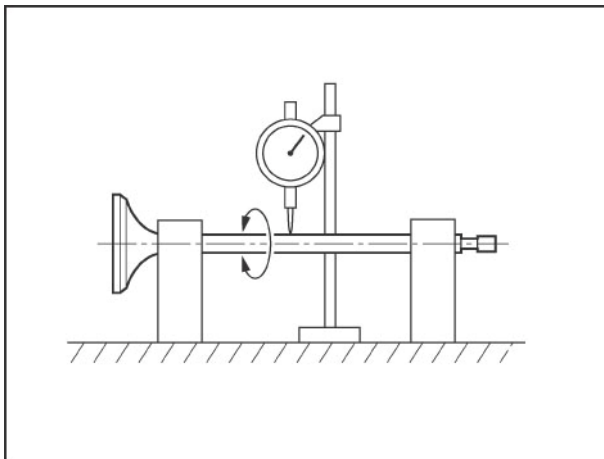
**Valve mating surface thickness:**  
**0.80 ÷ 1.20 mm (0.0315 ÷ 0.0472 in.)**



- Check that valve stem out of round falls within indicated values, change the valve if needed.
- Secure the valve in horizontal position, as shown, turn it and check its out of round with a dial gauge; change the part, if needed.

**NOTE** Change valve stem oil seal every time valve is disturbed (removed or changed).

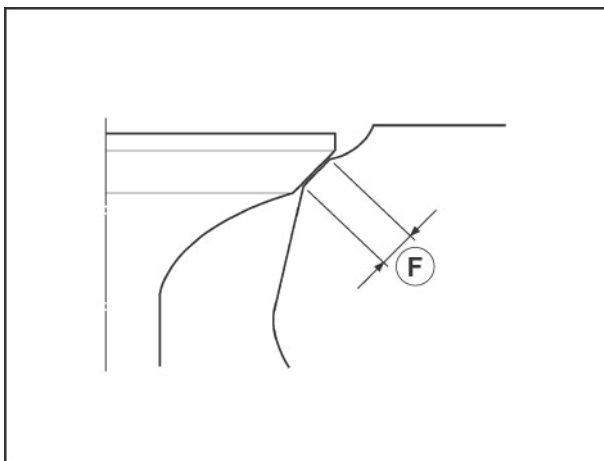
**Maximum valve stem out of round: see (LIMIT VALUES).**



### CHECKING VALVE SEATS

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

- Eliminate scale from valve face and valve seat.
- Ensure that the valve seat does not show pitting or marks of wear; grind seats if necessary.
- Check that valve seat complies with the indicated values and grind seats, if needed.

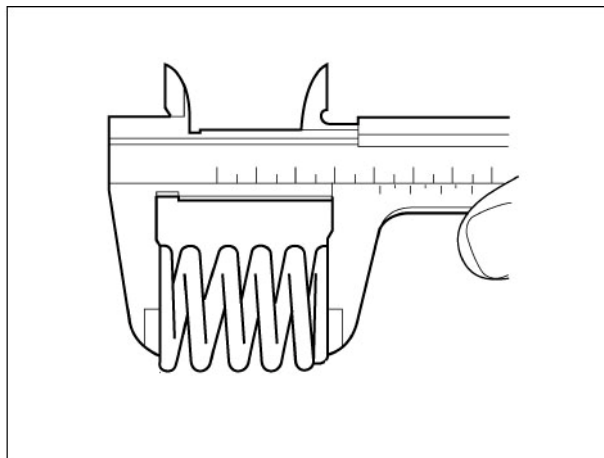


### CHECKING VALVE SPRINGS

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

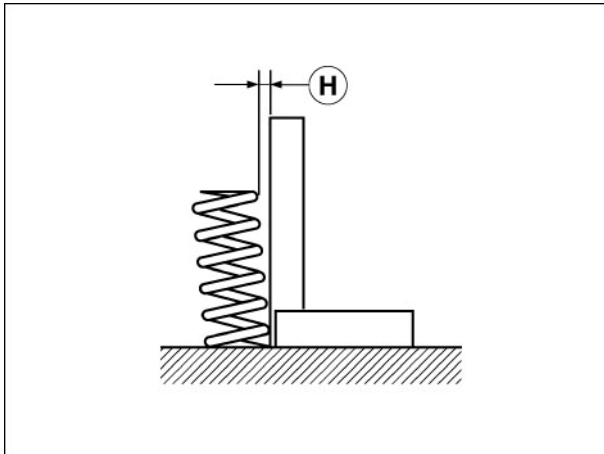
- Using a gauge, measure valve spring uncompressed length. In case reading is not within indicated values, change valve spring.

**Uncompressed length of valve spring, intake and exhaust, see (LIMIT VALUES).**



- Resting on a reference surface and using a square, measure valve spring inclination (H). In case reading is not within indicated values, change valve spring.

**Maximum spring inclination: see (LIMIT VALUES).**



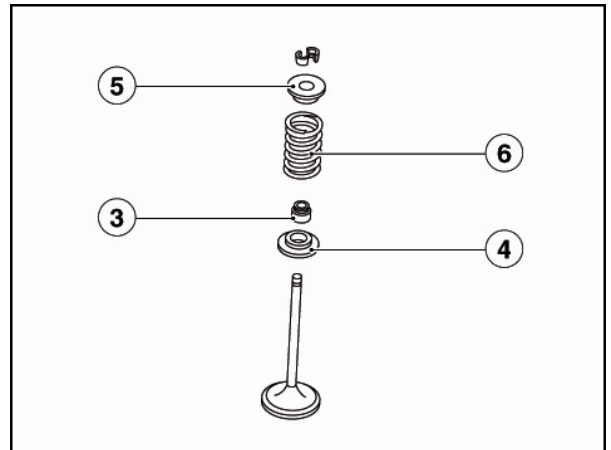
### 3.3.5. INSTALLING THE VALVES AND VALVE SPRINGS

**NOTE** The following procedure applies to all valves and their components.

- Lubricate the valve stem and the valve stem oil seal with oil, see (LUBRICANT TABLE).

- Install the valve, lower cap (4), and valve stem oil seal (3).
- Install valve spring (6) and upper cap (5).

**NOTE** Install the valve spring end with bigger pitch upward. Install spring with coloured end (red for exhaust, white for intake) facing down.



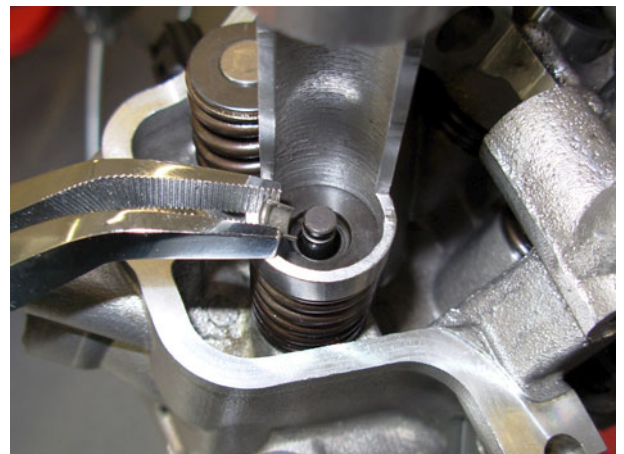
- Install the valve spring retainer.

- Compress the spring with suitable tool (no. 9100838) and install valve collets using adapter (no. 8140179).
- Lightly tap with a mallet onto valve tip to secure valve collets to valve stem.

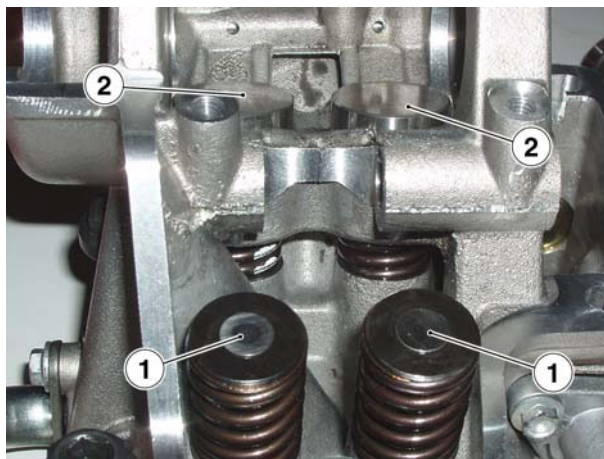


**WARNING**

Do not tap excessively hard on the valve or it might damage.



- Fit the two buckets (2) and the two shims below onto both intake valves.
- Fit the two shims (1) on exhaust valves.



### 3.3.6. INSTALLING THE CAMSHAFT AND ROCKER ARMS

**NOTE** Before refitting, smear bearing with engine oil; see (LUBRICANT TABLE).

- Fit bearing onto camshaft.
- Lubricate the camshaft (1), see (LUBRICANT TABLE), the spring controlling decompression system and the decompression system itself.
- Fit the decompression system together with control spring.
- Lock the camshaft with 6 mm pin (0.24 in) used for cam timing, see (CAM TIMING).
- Tighten the screw on decompression control.

**NOTE** Lubricate shafts and rocker arms before installing, see (LUBRICANT TABLE).

- Install the camshaft.

**NOTE** Carefully insert the camshaft, paying attention to the decompression control.

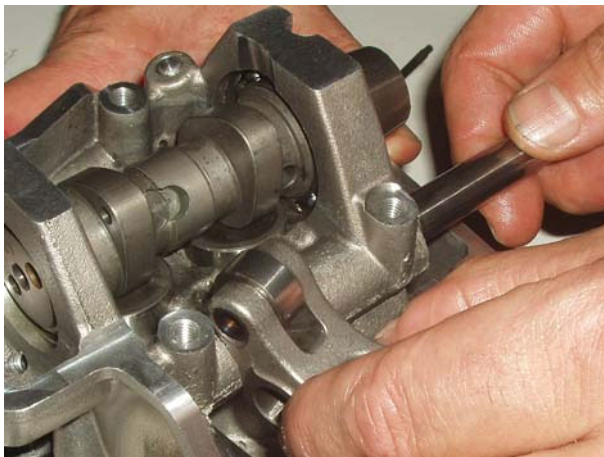
- Working on timing side, fit the circlip securing camshaft bearing in place.

- Install the exhaust rocker arm.

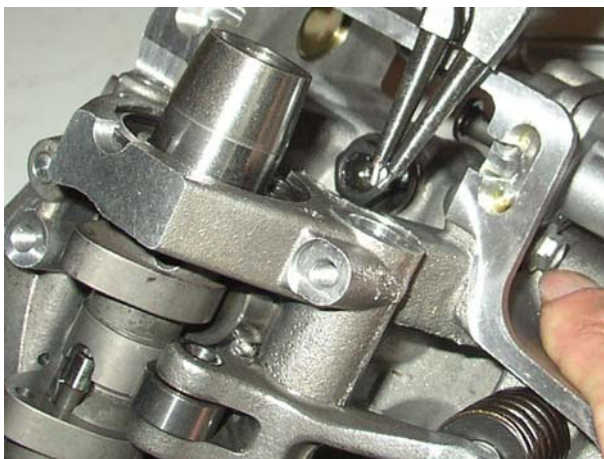


- Install exhaust rocker arm shaft.

**NOTE** Ensure the rocker arm shaft is fully home in the head.



- Fit the exhaust rocker arm shaft snap ring.



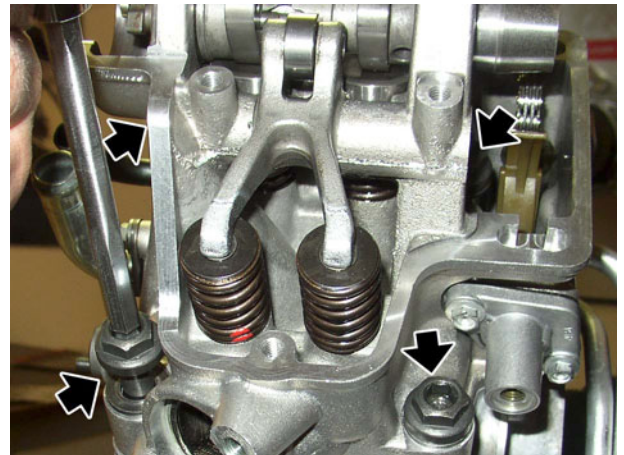
### 3.3.7. INSTALLING THE HEAD

- Install the centring pins.
- Install a new head gasket.
- Install the head.
- Insert the four head bolts with washers.

**NOTE** Lubricate head bolt threads and sealing surfaces with engine oil.

- Tighten the four head bolts proceeding in a cross pattern, use an articulated spanner with rounded tip, if necessary.

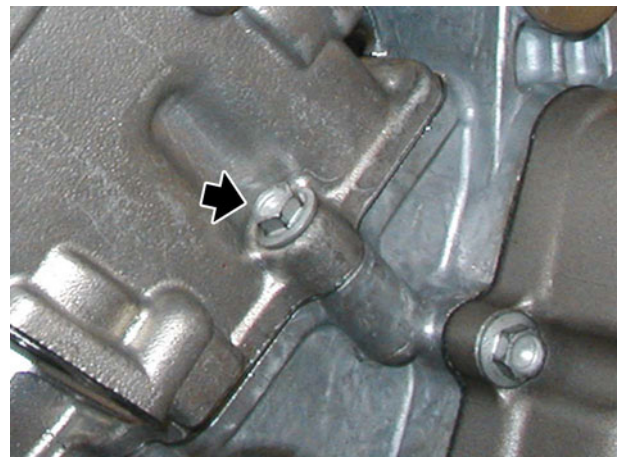
**NOTE** Tighten the head bolts following the tightening sequence shown and the correct torque, in two stages.



- Tighten head retaining screw on timing side to the specified torque.



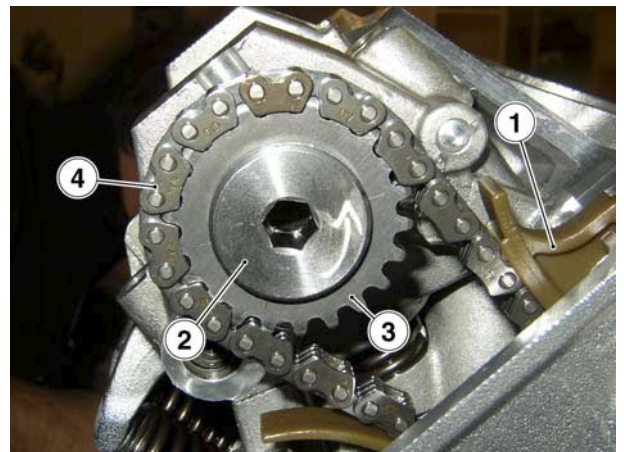
**WARNING**  
Carefully degrease camshaft taper end.



- Fit the timing gear completed with timing chain onto the camshaft.
- Screw in the camshaft control gearwheel screw, do not tighten yet.
- Position the chain tensioner slider (1).



**WARNING**  
Front cylinder camshaft screw is left-handed.



- Install the chain tensioner as follows:
- 1 – Release the chain tensioner single-direction cam and push its rod completely inside the chain tensioner housing.
- 2 – Install tensioner in its seat on head timing side and tighten both screws to the specified torque.
- 3 -- Install the spring and chain tensioner threaded plug, tighten plug to the specified torque.



- Proceed with cam timing, see (CAM TIMING).
- Fit the valve cover complete with gasket.
- Tighten the four screw with new O-rings.



### 3.4. CYLINDER AND PISTON

#### 3.4.1. REMOVAL

- Before removing the cylinder it is necessary to remove the head, see (REMOVING THE HEAD)
- Loosen and remove the inspection screw (2), remove O-ring (mind possible coolant spillage).



- Using special tool (no. 9100897), remove barrel (1) and keep O-ring.

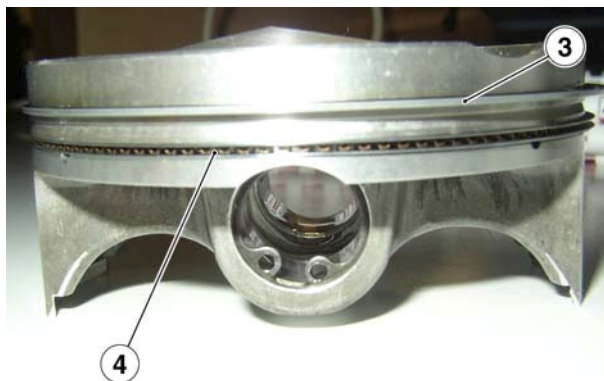


**NOTE** Before removing the gudgeon pin circlip, block off the casing opening with a clean cloth to prevent the circlip from falling inside the crankcases.

- Remove the gudgeon pin circlip.



- Using piston pin puller (no. 9100943), remove gudgeon pin.
- Remove the piston.
- Remove piston ring (3) and oil scraper ring (4).



**3.4.2. CHECKING THE LIMIT VALUES**

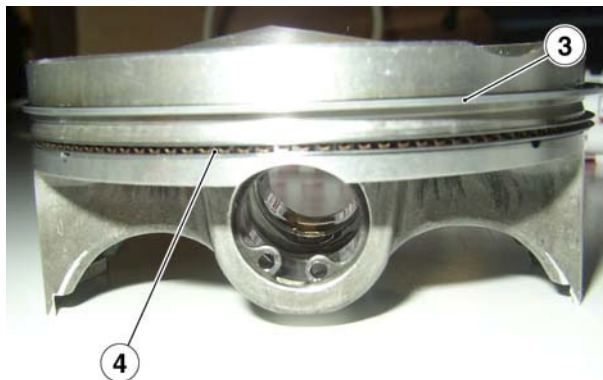
**NOTE** During inspection, check the specified parts for wear, referring to the following wear limit values and change any worn out part, if necessary.

DESCRIPTION	LIMIT VALUE (mm) (in)
Bucket diameter	25.96 (1.022)
Bucket seat diameter on head	26.04 (1.025)
Cylinder barrel inner diameter	76.02/80.02 (2.993/3.150)
Piston outer diameter	75.94/79.94 – (2.989/3.147)
Piston pin bore inner diameter	16.02 / 17.02 (0.631 / 0.670)
First piston ring end play	0.45 (0.018)
Con-rod small end inner diameter	16.04 / 17.04 (0.631 / 0.671)

### 3.4.3. INSTALLATION

**NOTE** When assembling the piston rings, ensure their reference faces up.

- Install piston ring (3) with gap facing the exhaust and oil scraper ring (4) gap facing the intake.



**NOTE** Ensure that piston marking is facing the cylinder exhaust side. Before fitting the gudgeon pin, lubricate it with engine oil.

- Fit piston into cylinder barrel (1).
- Fit cylinder barrel (1) to crankcase.
- Install the gudgeon pin.
- Fit the gudgeon pin circlip.



- Close the plug (2).



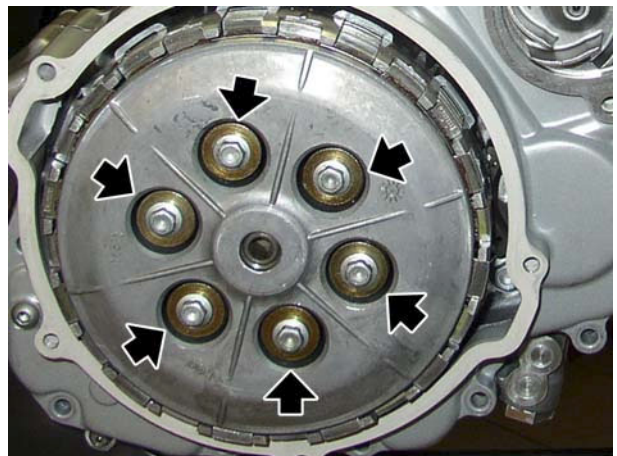
### 3.5. CLUTCH

#### 3.5.1. REMOVAL

- Working in a cross pattern, loosen the five screws on clutch cover by one fourth of a turn at a time until removing all five screws. When you have loosened all screws completely, remove them.
- Place a container of adequate capacity under the clutch.
- Remove clutch cover.



- Working in a cross pattern, loosen the six screws by one fourth of a turn at a time until removing all six screws. Keep washers and clutch springs.



- Remove the pusher plate.



- Remove the pushrod together with thrust bearing, shim and bearing support.



- Remove the plates.



- Straighten the lock washer, fit the clutch locking tool (no. 9100896), loosen and remove the clutch hub nut and collect the lock washer.





- Remove clutch hub.



- Collect the shim.



- Remove the clutch housing.



- Remove spacer and needle roller bearing.



**3.5.2. CHECK****CLUTCH PLATES**

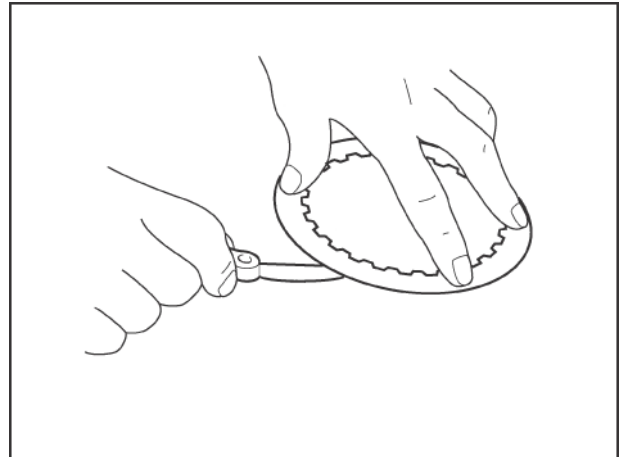
- Rest the friction plates and steel plates on a flat surface and check for cracks and deformation.

**Allowed deformation, see (LIMIT VALUES CHART).**

**NOTE** The steel plates should not be scratched or stained. Check the clutch plates for wear measuring the complete plate pack.

Do not measure the steel plates and the friction plates separately, since this value is unimportant for wear check.

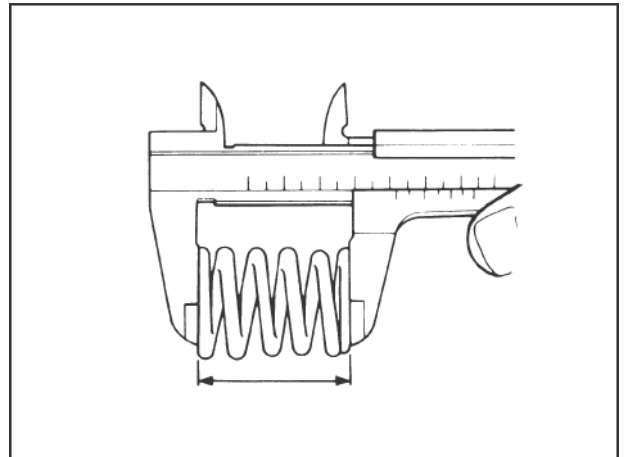
**Plate pack value, see (LIMIT VALUES CHART).**

**CLUTCH SPRINGS**

**NOTE** The following procedure applies to all clutch springs.

- Check the springs for damages and change all springs, if needed.
- Measure the spring uncompressed length and change all springs if necessary.

**Clutch spring uncompressed length, see (LIMIT VALUES CHART).**

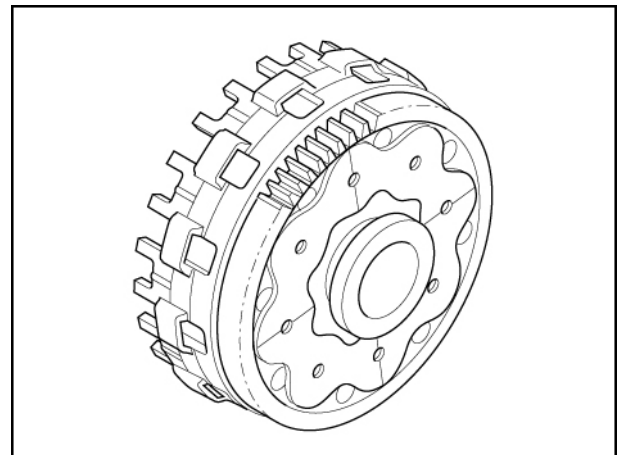
**CHECKING THE CLUTCH HOUSING**

Check the clutch housing for damages and wear that might affect clutch operation. Change the housing if necessary. Ensure that nail fastening between clutch housing and primary drive gear is solid and resistant.

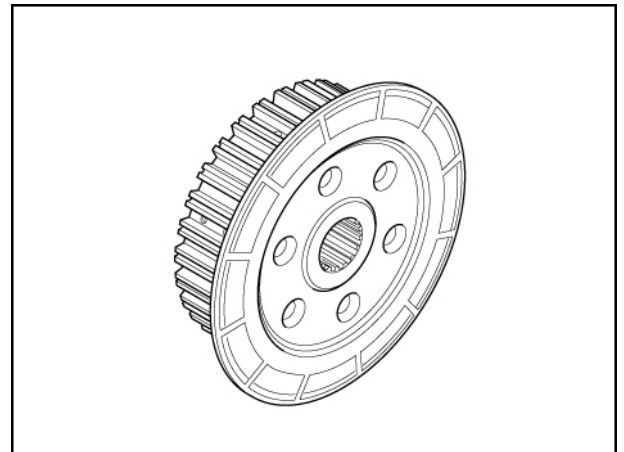
**CHECKING THE PRIMARY DRIVEN GEAR**

Check the primary driven gear for damages or wear and change the primary drive driving gear and the clutch housing as a set, if necessary.

Check that it is not excessively noisy during operation; change primary drive driving gear and the clutch housing as a set, if necessary.

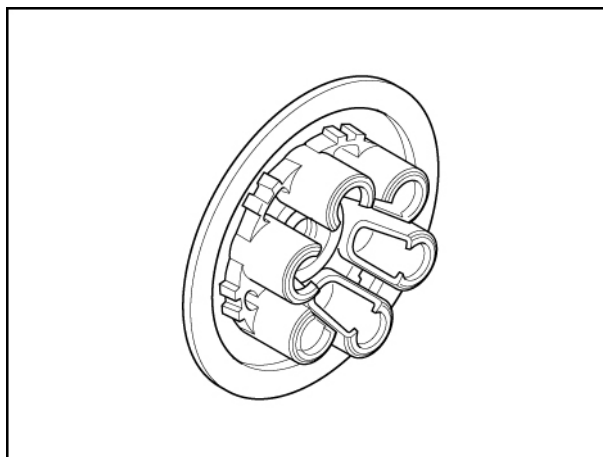
**CHECKING THE CLUTCH HUB**

Check the clutch hub for damages and wear that might affect clutch operation. Change the hub, if necessary.



**CHECKING THE PUSHER PLATE**

Check the pusher plate and bearing for damages and wear.  
Change the components, if necessary.



**3.5.3. REASSEMBLY**

- Insert needle roller bearing and spacer.



- Install the clutch housing.



- Fit shim.



- Install the clutch hub.



- Install the wing washer(s).

**WARNING**

Refit washers restoring their original number and position.



- Install the clutch hub nut.



- Using clutch locking tool (no. 9100896, special tool), tighten clutch hub nut to the specified torque.
- Bend the locking washer.



- Lubricate driving plates and driven plates with gearbox fluid, see (LUBRICANT TABLE).
- Install the first friction plate, the first metal 1.5 mm plate and then one friction plate with the reference tooth in the same groove as the first plate and a metal 2 mm plate continuing in this way. The metal 1.5 mm plate and the last friction plate are the top ones and the latter should be positioned with reference tooth offset by one groove with respect to other plates.



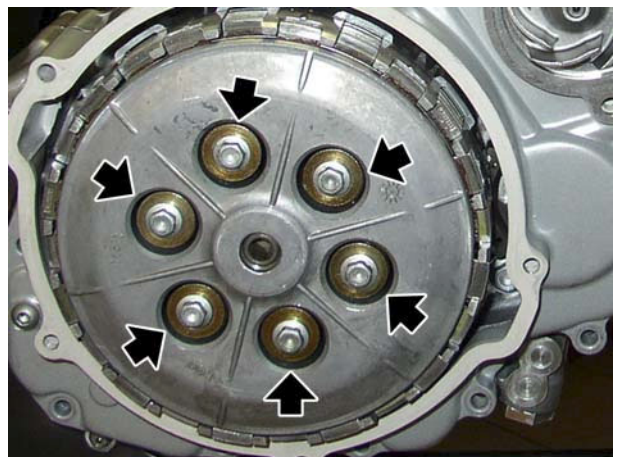
- Fit the pushrod with thrust bearing and shim.



- Fit the pusher plate.



- Install the clutch springs.
- Fit screw washers.
- Tighten the six screws in a cross pattern and in steps.

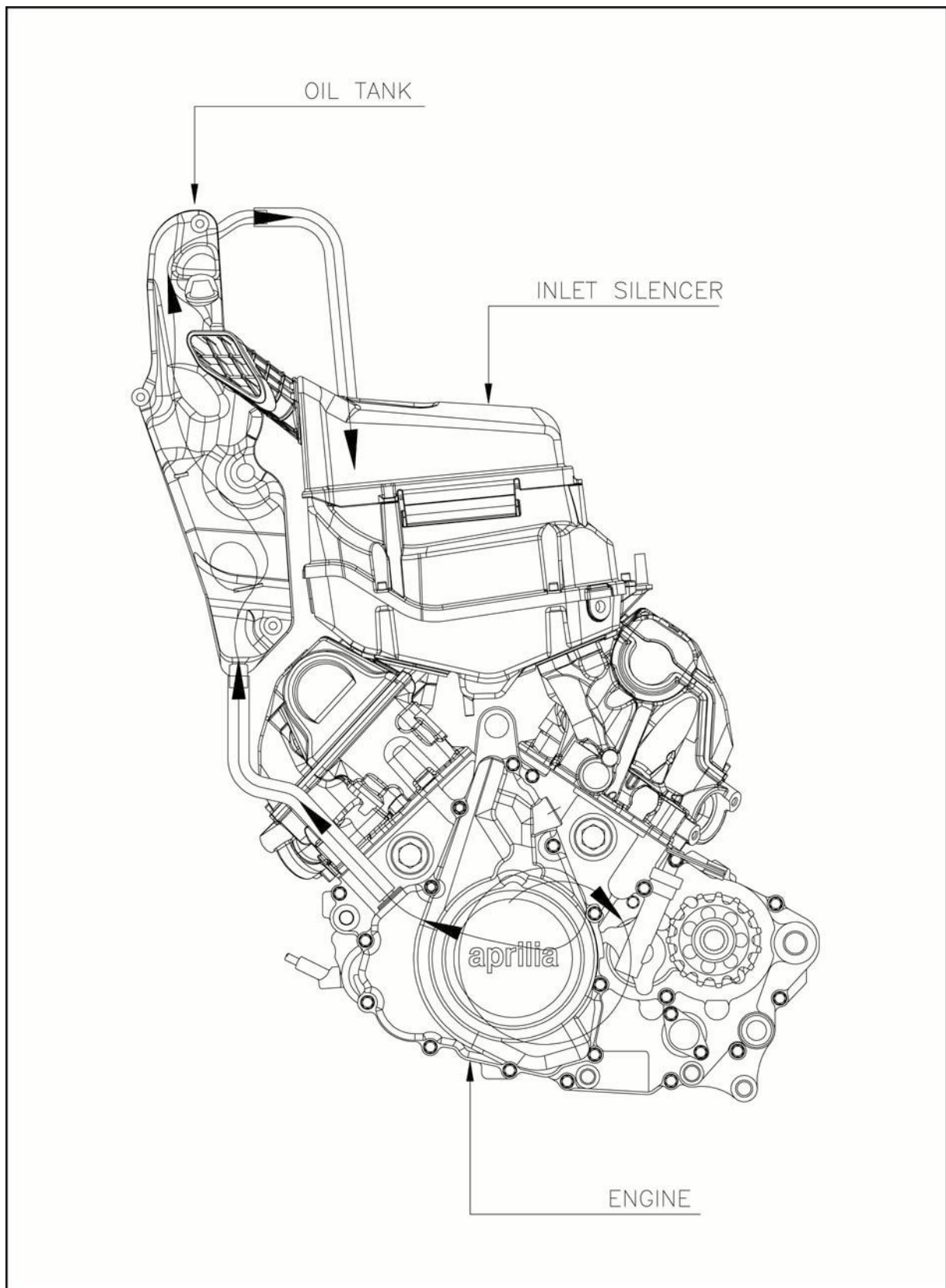


- Install the clutch cover.
- Tighten the five clutch cover screws, proceeding in a cross pattern.
- Check gearbox fluid level.



### 3.6. OIL PUMP

#### 3.6.1. LUBRICATION SYSTEM DIAGRAM



**3.6.2. REMOVING THE EXTERNAL PUMP**

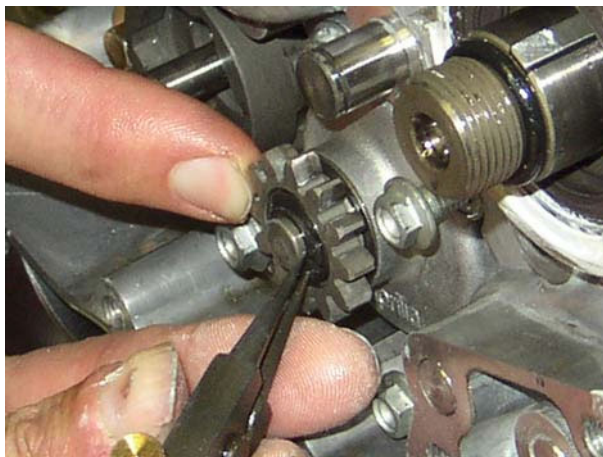
- Before removing any components, place a container of adequate capacity under the engine.
- Remove the clutch, see (REMOVING THE CLUTCH).
- Remove the right crankcase cover, see (HOW TO TAKE THE CRANKCASES APART).
- Remove circlip (1) retaining oil pump lay gear and remove shim.



- Remove oil pump lay gear paying attention to inner roller bearing.



- Remove the oil pump gear circlip, keep the shim.

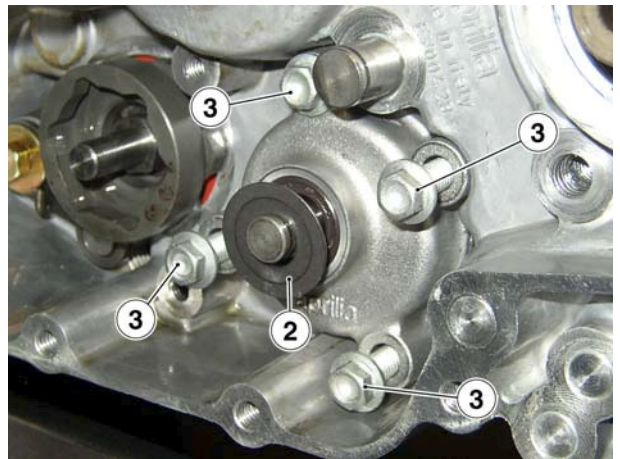


- Remove oil pump gear, keep the shim.

- Remove oil pump gear transmission roller.



- Remove the shim (2).
- Loosen and remove the four screws (3).



- Remove the complete oil pump.



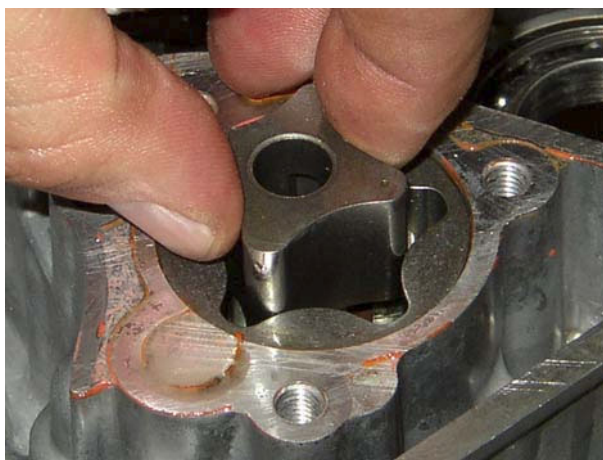
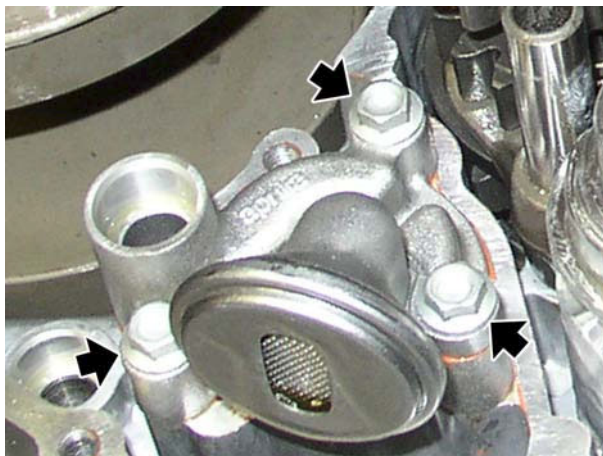
- Remove the oil pump inner transmission roller.



### 3.6.3. REMOVING THE INTERNAL PUMP

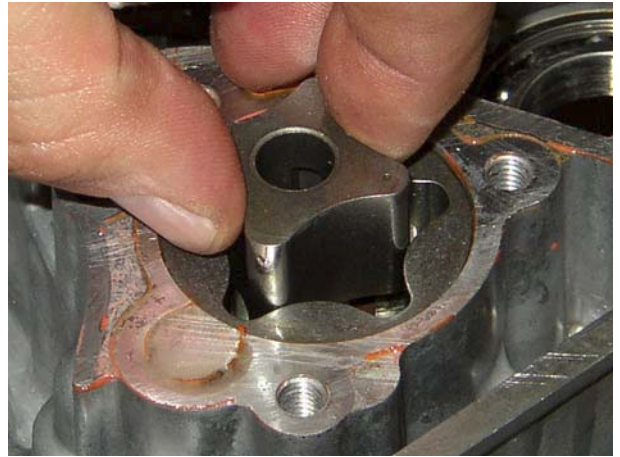
**NOTE** To disassemble the oil pump inner part, it is necessary to separate the crankcases, see (HOW TO TAKE THE CRANKCASES APART), and remove the external pump, see (REMOVING THE EXTERNAL PUMP).

- Loosen and remove the three screws.
  - Remove the cover and oil filter.
- 
- Remove pump impellers and slide off stator.
  - Remove transmission roller.



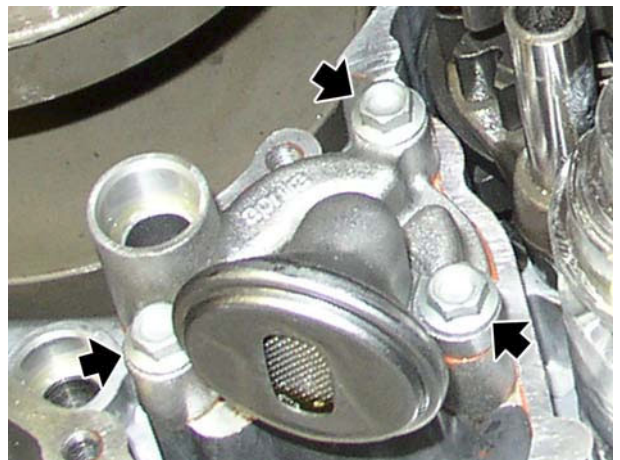
**3.6.4. INSTALLING THE INTERNAL PUMP**

- Fit transmission roller.
- Install pump impellers and slide off stator.



- Fit the oil filter and cover.
- Tighten the three retaining screws.

**NOTE** Close the crankcases, see (ASSEMBLING THE CRANKCASES).



**3.6.5. INSTALLING THE EXTERNAL PUMP**

- Refit the internal pump, see (INSTALLING THE INTERNAL PUMP).
- Fit the oil pump inner transmission roller.

**WARNING**

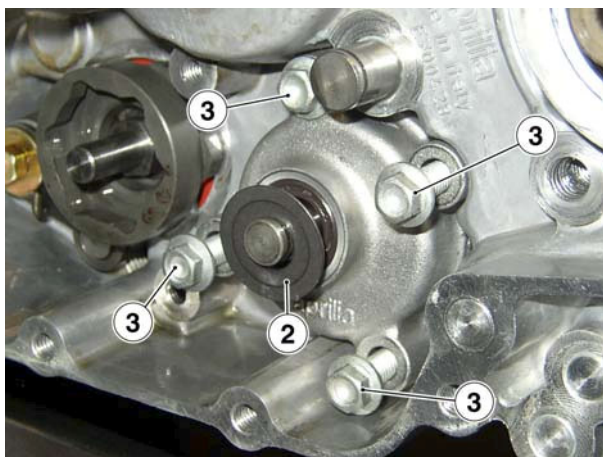
Internal and external pump impellers have a longer roller, while gear features a shorter roller.



- Fit the oil pump together with O-ring.



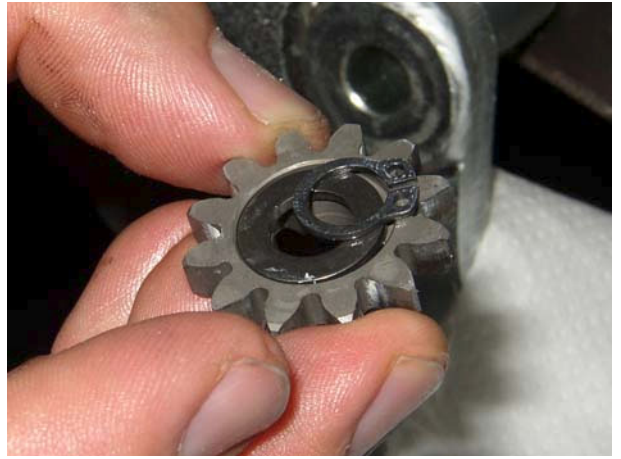
- Fit the shim (2) and tighten the four fastening screws (3).



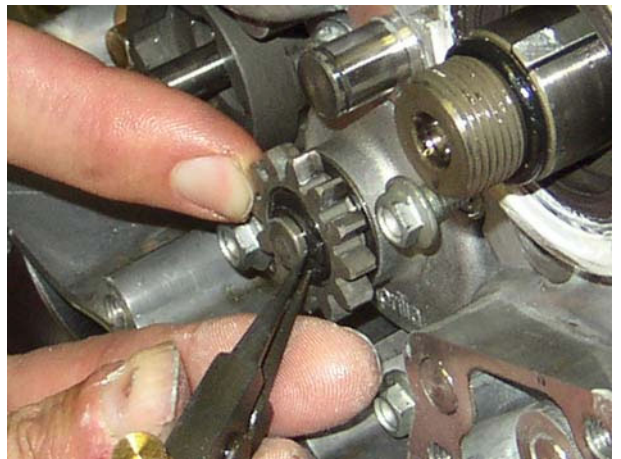
- Fit oil pump gear transmission roller.



- Fit oil pump gear with the shim.



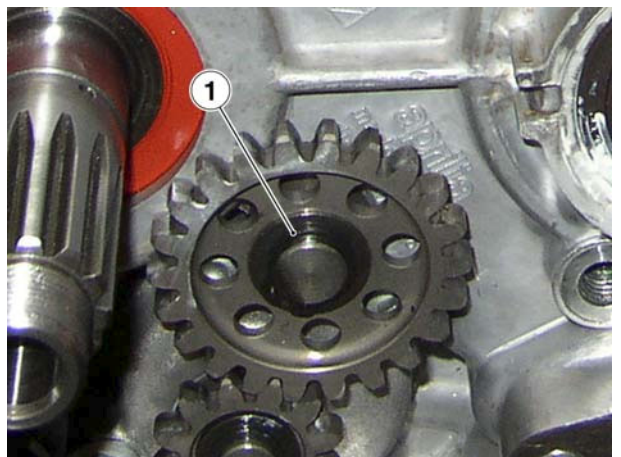
- Fit a new circlip to secure oil pump gear in place.



- Install oil pump control gearwheel paying attention to inner roller bearing.



- Fit a new circlip to secure the oil pump drive gear in place, install shim.



### 3.7. PRIMARY TRANSMISSION GEAR

#### 3.7.1. REMOVING THE PRIMARY GEAR

- Before removing any components, place a container of adequate capacity under the engine.
- Remove the clutch, see (REMOVING THE CLUTCH).
- Remove the right crankcase cover, see (HOW TO TAKE THE CRANKCASES APART).
- Unscrew and remove the primary gear nut.



- Use the special tool (no. 9100843) to remove primary gear nut.



**WARNING**  
Nut has a left-hand thread.

- Remove the sprocket.



- Remove the shim.



**WARNING**  
One side of the shim is galvanised (friction proof treatment) and it should be facing the sprocket.

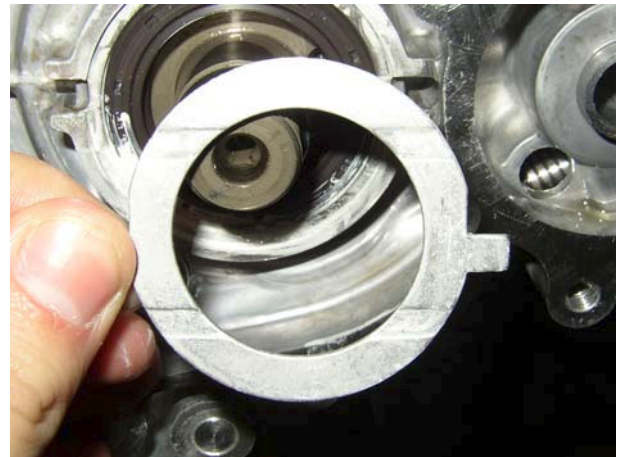


### 3.7.2. INSTALLING THE PRIMARY GEAR

**WARNING**

One side of the shim is galvanised (friction proof treatment) and it should be facing the sprocket.

- Install shim, ensure to fit it in the correct direction.
- Check O-ring on gearwheel shaft for wear, renew if necessary.



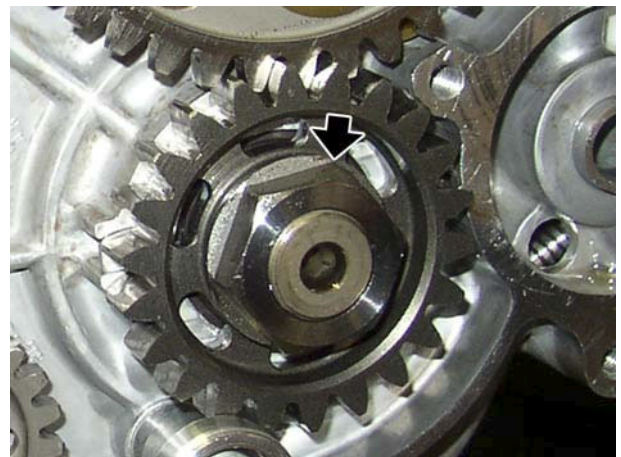
- Fit the primary gear.



- Tighten primary gear nut to the specified torque.

**WARNING**

Nut has a left-hand thread.

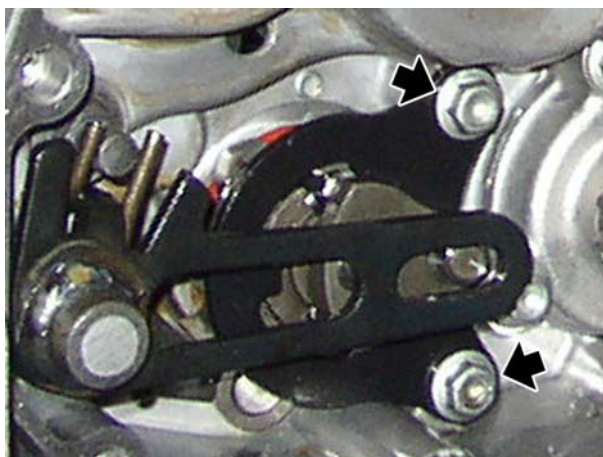


### 3.8. GEAR SHIFT SELECTOR

#### 3.8.1. REMOVAL, INSPECTION, REFITTING

##### REMOVAL

- Remove the clutch, see (REMOVING THE CLUTCH).
- Remove the right crankcase flange, see (HOW TO TAKE THE CRANKCASES APART).
- Working on clutch side, slide off gear selector control shaft.
- Loosen and remove the two screws securing the selector sprocket.



- Remove selector sprocket with plate.



- Loosen and remove the selector drum screw.



**Engine 450 - 550**

- Move down ratchet lever and slide off selector drum lower part.



- Remove ratchet, washer and spring.

**CHECK****CHECKING THE STOP LEVER**

Check the stop lever for damages or wear and ensure that roller can turn freely.  
Change the components, if necessary.

Check for gear selector spring damage or wear.  
Change the part, if necessary.

**CHECKING THE GEAR SELECTOR**

Check selector shaft and its teeth for damage or wear.  
Change the part, if necessary.

Check for lever spring damage or wear.  
Change the part, if necessary.

**CHECKING THE RATCHET**

Check clearance of washer and riveted pin passing through plate. If it is excessive, change the ratchet.

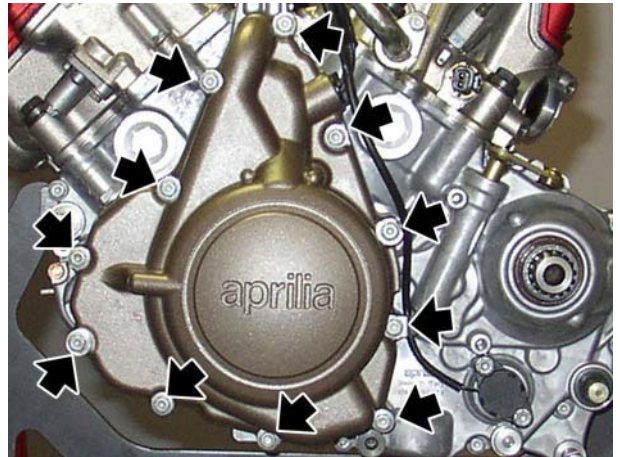
**REASSEMBLY**

- Lubricate and then reassemble following the disassembly procedure in the reverse order.

### 3.9. GENERATOR SIDE

#### 3.9.1. REMOVAL

- Loosen and remove the eleven screws.
- Mark the screws with different length.
- Remove flywheel-side cover together with generator, keep gasket and two pilot dowels.



- Remove the two gears connecting starter motor to flywheel.



- Using the suitable tool (no. 8140838), lock the flywheel rotor.
- Loosen and remove flywheel nut and remove washer.



- Using the suitable flywheel puller (no. 9100839), remove the flywheel.



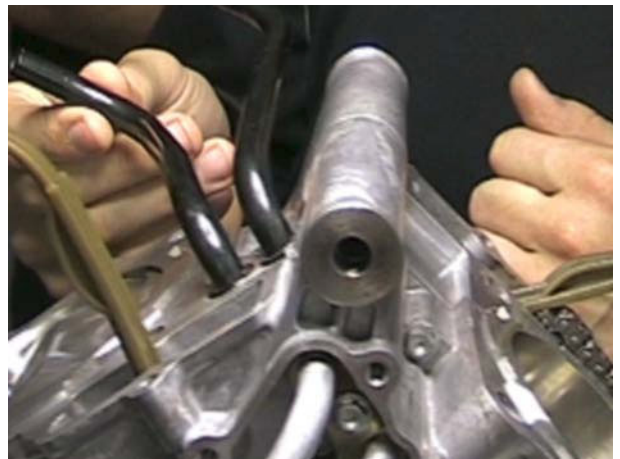
- Remove the roller cage.



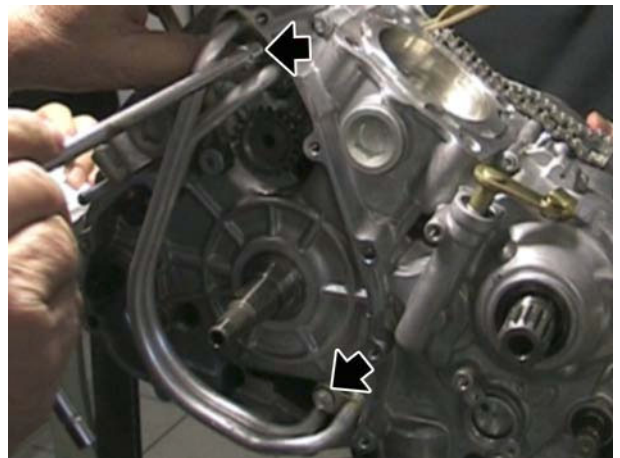
- Loosen and remove the screw on external oilways retaining plate.



- Remove the two external oilways.



- Loosen and remove the screws securing the two retaining plates for internal oilways.



- Slide off the oil delivery and return line.



### 3.9.2. CHANGING BEARINGS AND OIL SEALS

**WARNING**

before performing any removing/assembling operation, heat the crankcase with a heat gun in order to avoid any damage to the housings.

**WARNING**

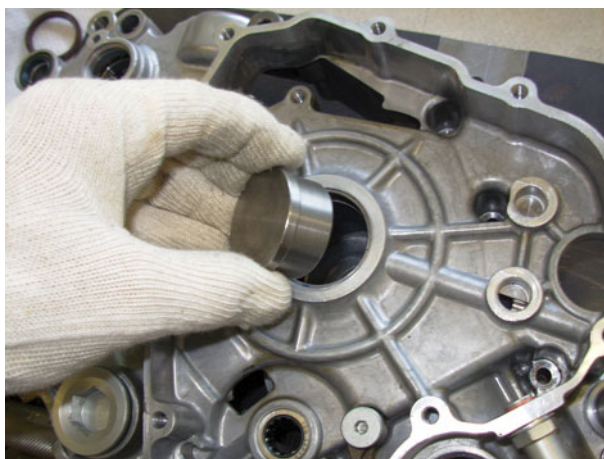
Secure the crankcase on the special support plate, part no. 9100841, before performing the described operations.

#### FLYWHEEL-SIDE CRANKCASE

#### MAIN BEARINGS

##### REMOVAL

- To remove the crankshaft bearings use the special tool, part no. 9100884, and a rubber mallet.



##### REASSEMBLY

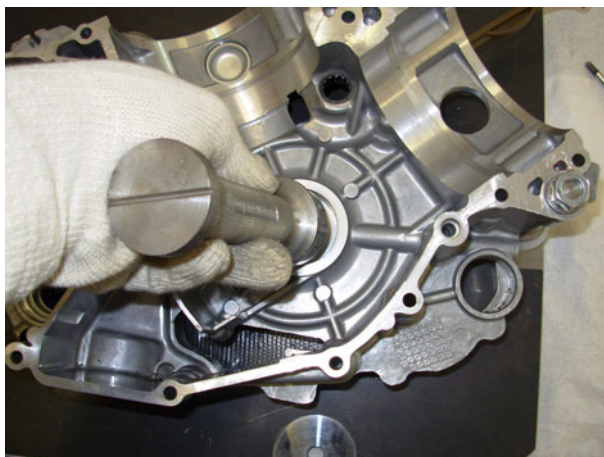
- During reassembly, use the special tool, part no. 9100840, and align the joints of both half-bearings with the tool notch. During assembly, align tool notch with the bearing oil line.
- Fit half-shells fully home using a rubber mallet.

**WARNING**

Check that plate adjustable support is fully home and warm coupling areas of the bearings properly.

**WARNING**

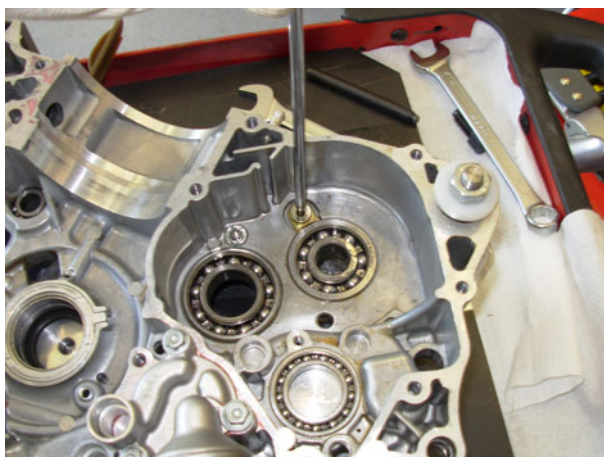
To select the proper bearing, see (COUPLING CLASSES OF MAIN BEARINGS - CONNECTING ROD.)



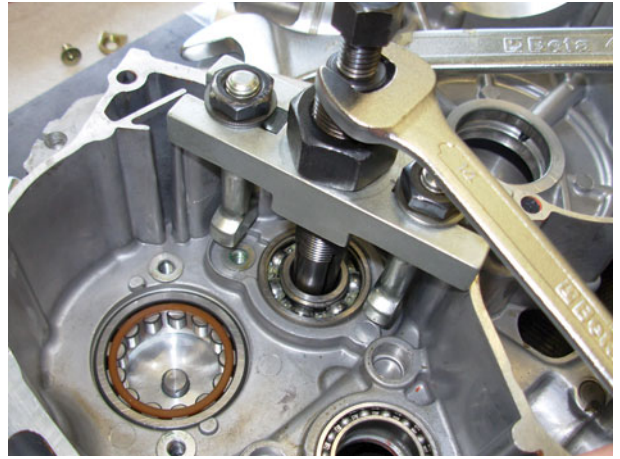
#### GEARBOX PRIMARY SHAFT BEARING

##### REMOVAL

Remove bearing retaining screws and relevant plate.



- Heat the crankcase.
- Remove the bearing using an internal puller.



#### REASSEMBLY

- Reassemble the bearing using the special tool, part no. 9100886
- Refit retaining screw with relevant plate.



#### DESMODROMIC SELECTOR DRUM BEARING

##### REMOVAL

- Heat the crankcase.
- Remove the bearing using an internal puller



##### REASSEMBLY

- Reassemble the bearing using the special tool, part no. 9100892.



**GEARBOX SECONDARY SHAFT BEARING****REMOVAL**

- Remove bearing retaining screws and relevant plate.
- Remove the circlip.
- Working on crankcase external side, remove oil seal, heat crankcase and remove the bearing using an internal puller.

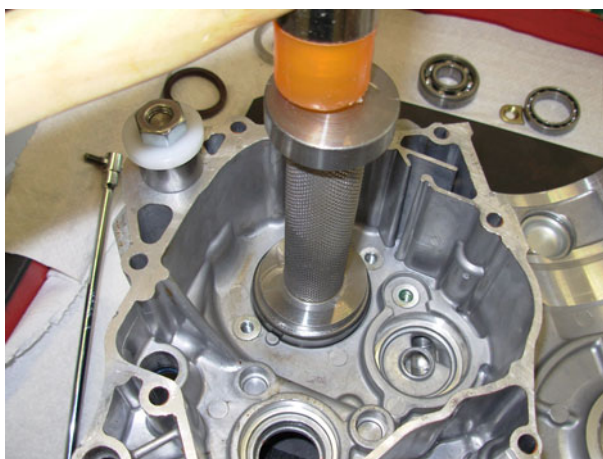
**REASSEMBLY**

- Reassemble the bearing using the special tool, part no. 9100885

**WARNING**

Check that plate adjustable support is fully home and warm coupling areas of the bearing properly.

- Refit circlip, plate and relevant screw.



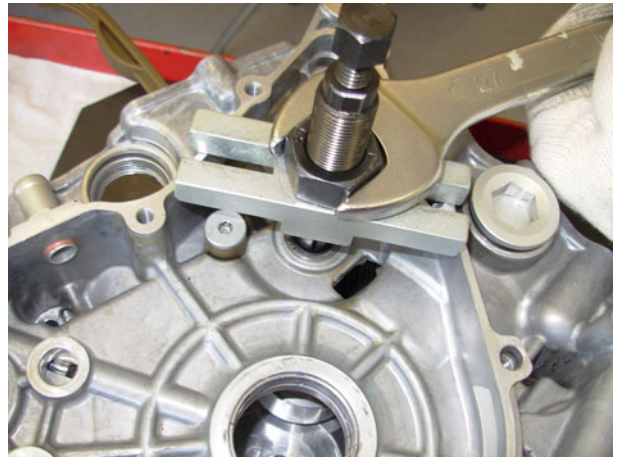
- Fit a new oil seal by means of the special tool, part no. 9100894



## LAYSHAFT BEARING

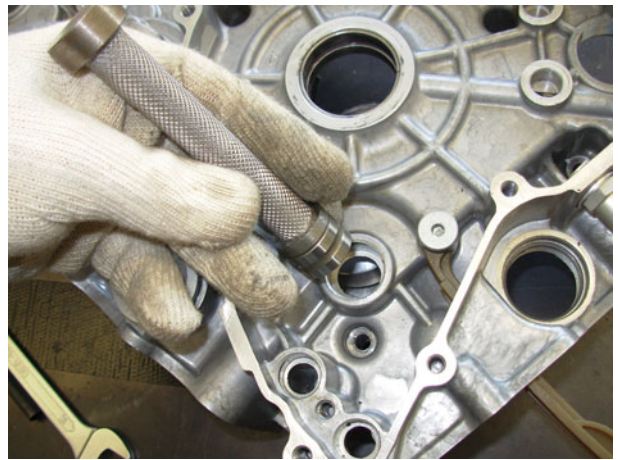
### REMOVAL

- Warm the crankcase and then remove the bearing using an internal puller.



### REASSEMBLY

Reassemble the bearing using the special tool, part no. 9100893



## CLUTCH-SIDE CRANKCASE

### MAIN BEARINGS

Proceed as described for the flywheel-side crankcase.

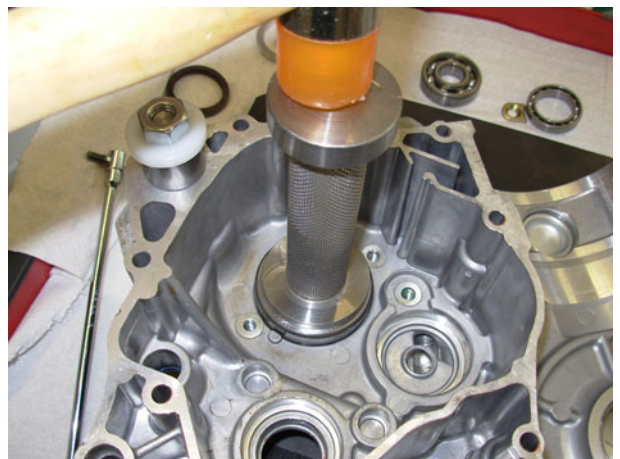


**WARNING**  
before performing any removing/assembling operation, heat the crankcase with a heat gun in order to avoid any damage to the housings.



**WARNING**  
Secure the crankcase on the special support plate, part no. 9100841, before performing the described operations.

- Fit a new oil seal by means of the special tool, part no. 9100890



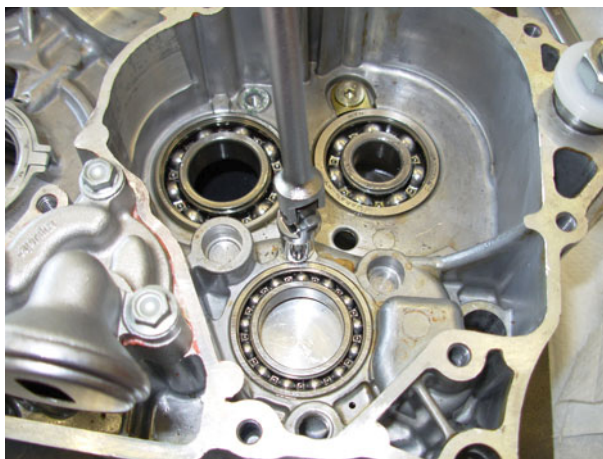


## GEARBOX BEARINGS

### REMOVAL

Proceed as described for the flywheel-side crankcase.

- Remove the three retaining screws.



- Heat the crankcase and then remove the bearings using an internal puller.



### REASSEMBLY

- Reassemble the bearings using the special tools.



#### **WARNING**

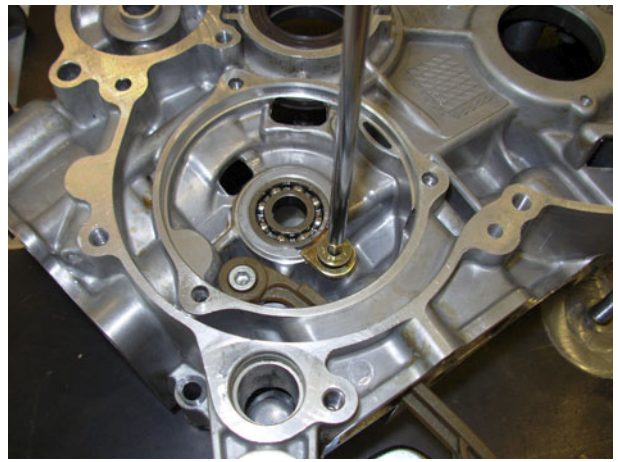
Check that plate adjustable support is fully home and warm coupling areas of the bearing properly.

- Refit retaining screws.



**LAYSHAFT BEARING****REMOVAL**

- Remove bearing retaining screws and relevant plate.



- Heat the crankcase.
- Remove the bearing using an internal puller.

**REASSEMBLY**

- Reassemble the bearing using the special tool, part no. 9100889.
- Refit retaining screw and relevant plate.

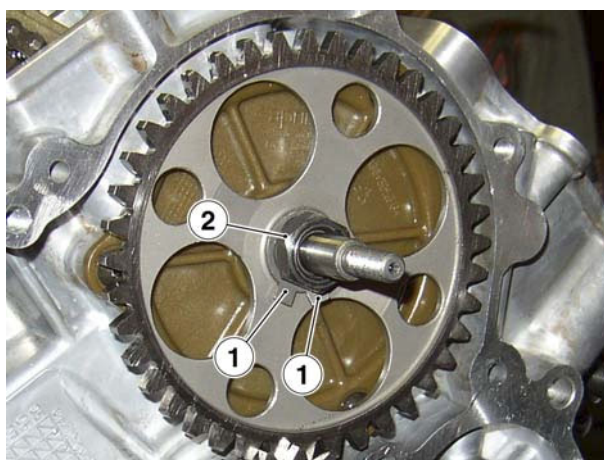


### 3.10. ENGINE CRANKCASES

#### 3.10.1. HOW TO TAKE THE ENGINE CRANKCASES APART

- Before removing any components, place a container of adequate capacity under the engine.
- Remove the accessories, see (REMOVING ENGINE ACCESSORIES)
- Disassemble parts on generator side, see (REMOVING GENERATOR SIDE)
- Remove the clutch, see (REMOVING THE CLUTCH).
- Remove the oil pump, see (REMOVING THE OIL PUMP).
- Remove the gear selector, see (REMOVAL, INSPECTION, REFITTING).
- Remove the heads, see (REMOVING THE HEADS).
- Remove the primary gear, see (REMOVING THE PRIMARY GEAR).

- Straighten washer tab (1).
- Loosen and remove the nut (2) from timing lay gear and remove the washer.
- Remove the timing lay gear.



- Loosen and remove the three screws from timing closure flange.
- Remove the timing closure flange.



- Slide out the rear cylinder timing gearwheel.



- Remove the timing chain.



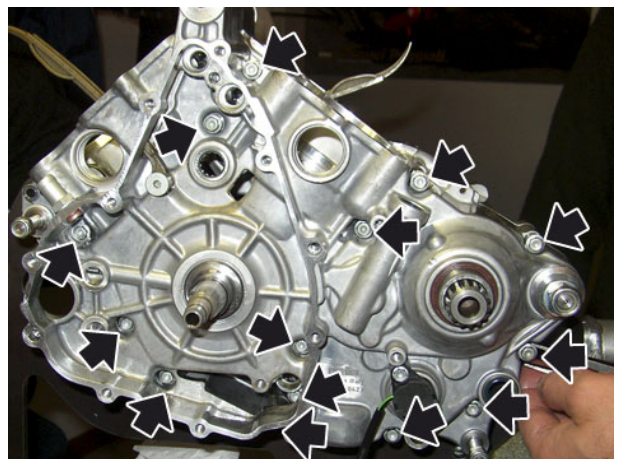
- Remove the key.
- From generator side, remove the timing lay shaft completed with front cylinder timing gearwheel.



- Loosen and remove the fifteen crankcase bolts, fourteen are on left side and one is on right side.

**WARNING**

Seven of the left side securing screws are M7 and seven are M6.





- Remove the gearbox fluid plug screw.



- Raise by 2-3 cm [(0.79-1.18) in] both cylinder barrels.
- Separate the crankcases using a mallet.
- Remove the generator side casing.



### 3.10.2. CHECK

#### CHECKING THE BEARINGS AND OIL SEALS

Carefully clean with a mild solvent the two crankcases, the ball bearings and all bearings seats. Clean the sealing surfaces and ensure they are not damaged.

**NOTE** Set the two crankcases on the suitable support plate (no. 9100942) to avoid damaging them.

Check that the casings are not cracked or damaged.

Ensure that all threads are in good condition.

Check that all oil seals that are in place are not worn or damaged.

Check play, smooth movement and deformation of all ball bearings.

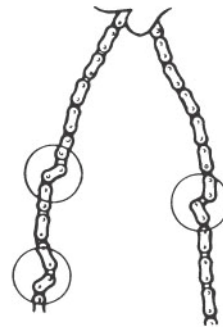
**NOTE** Lubricate the ball bearings with engine oil before checking.

In case the inner ring does not move smoothly and is noisy, it is faulty and should be changed.

#### CHECKING THE TIMING CHAIN AND GUIDES

Check timing chain for damage and hard spots.  
Change the timing chain and camshaft gears as a set, if necessary.

Check timing chain guides for damage.  
Change the components, if necessary.



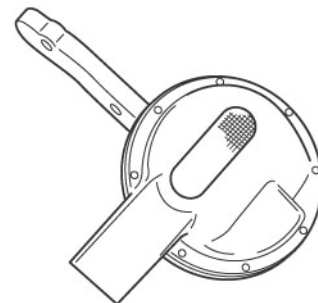
#### CHECKING THE OIL FILTER AND OIL DELIVERY TUBE

Check oil filter for damage.  
Change the part, if necessary.

Clean oil mesh with degreasing agent and check the mesh to ensure there are no damages.

Check oil delivery tube for damage.  
Change the part, if necessary.

Ensure that the oil delivery tube holes are not clogged and blow with compressed air to clean them, if necessary.



### 3.10.3. CHANGING BEARINGS AND OIL SEALS



**WARNING**  
before performing any removing/assembling operation, heat the crankcase with a heat gun in order to avoid any damage to the housings.



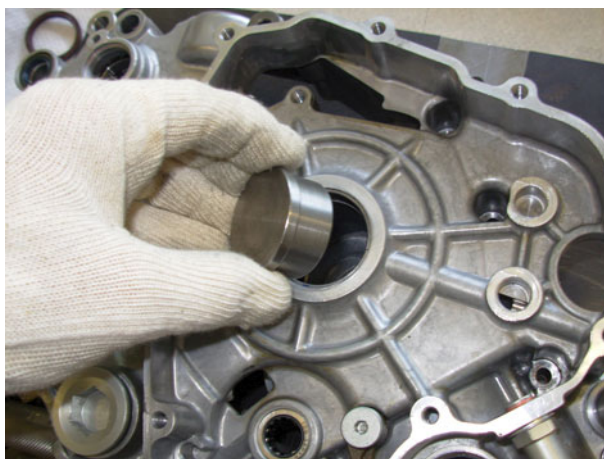
**WARNING**  
Secure the crankcase on the special support plate, part no. 9100841, before performing the described operations.

#### FLYWHEEL-SIDE CRANKCASE

#### MAIN BEARINGS

##### REMOVAL

- To remove the crankshaft bearings use the special tool, part no. 9100884, and a rubber mallet.



##### REASSEMBLY

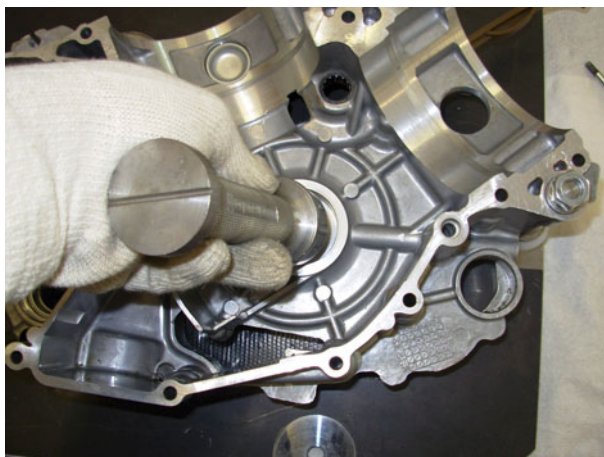
- During reassembly, use the special tool, part no. 9100840, and align the joints of both half-bearings with the tool notch. During assembly, align tool notch with the bearing oil line.
- Fit half-shells fully home using a rubber mallet.



**WARNING**  
Check that plate adjustable support is fully home and warm coupling areas of the bearings properly.



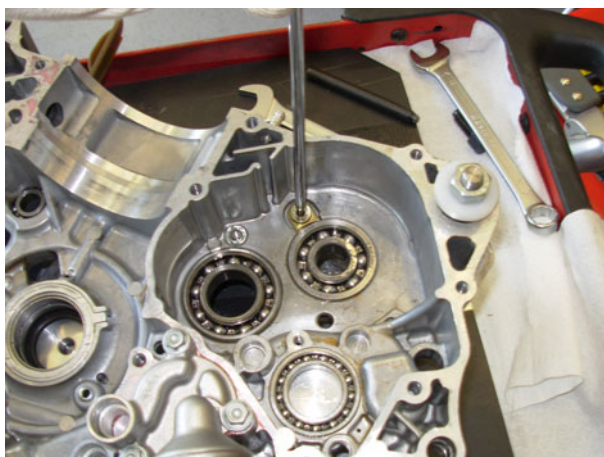
**WARNING**  
To select the proper bearing, see (COUPLING CLASSES OF MAIN BEARINGS - CONNECTING ROD.)



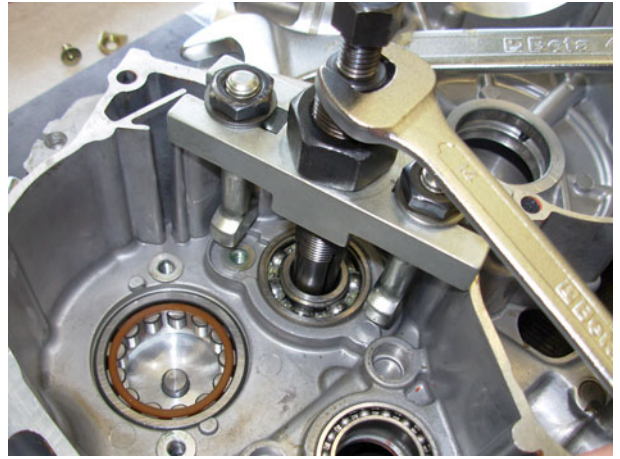
#### GEARBOX PRIMARY SHAFT BEARING

##### REMOVAL

Remove bearing retaining screws and relevant plate.



- Heat the crankcase.
- Remove the bearing using an internal puller.



#### REASSEMBLY

- Reassemble the bearing using the special tool, part no. 9100886
- Refit retaining screw with relevant plate.



#### DESMODROMIC SELECTOR DRUM BEARING

##### REMOVAL

- Heat the crankcase.
- Remove the bearing using an internal puller



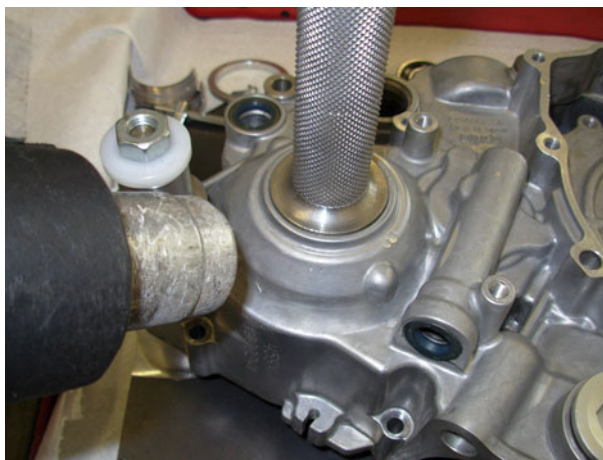
##### REASSEMBLY

- Reassemble the bearing using the special tool, part no. 9100892.



**GEARBOX SECONDARY SHAFT BEARING****REMOVAL**

- Remove bearing retaining screws and relevant plate.
- Remove the circlip.
- Working on crankcase external side, remove oil seal, heat crankcase and remove the bearing using an internal puller.

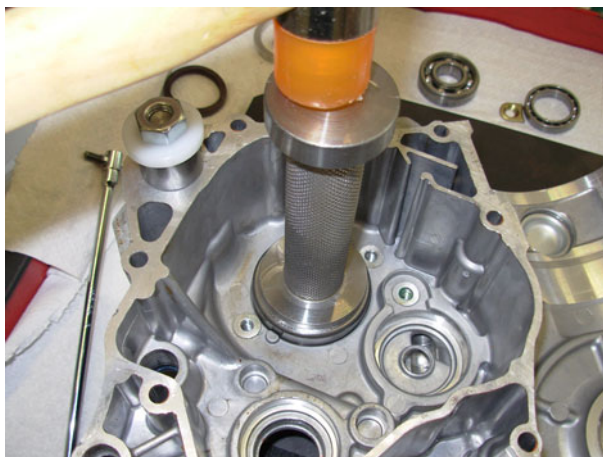
**REASSEMBLY**

- Reassemble the bearing using the special tool, part no. 9100885

**WARNING**

Check that plate adjustable support is fully home and warm coupling areas of the bearing properly.

- Refit circlip, plate and relevant screw.



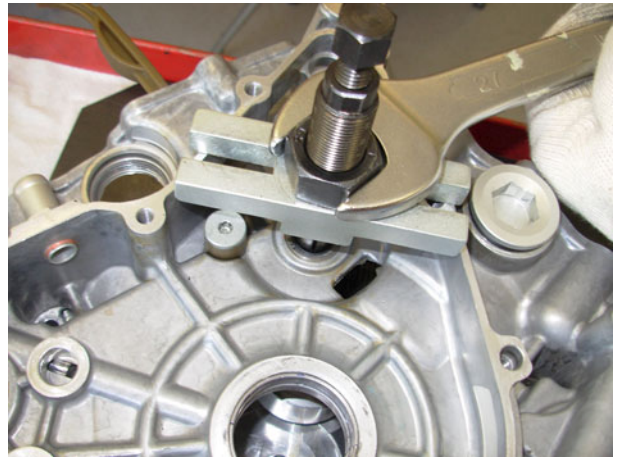
- Fit a new oil seal by means of the special tool, part no. 9100894



## LAYSHAFT BEARING

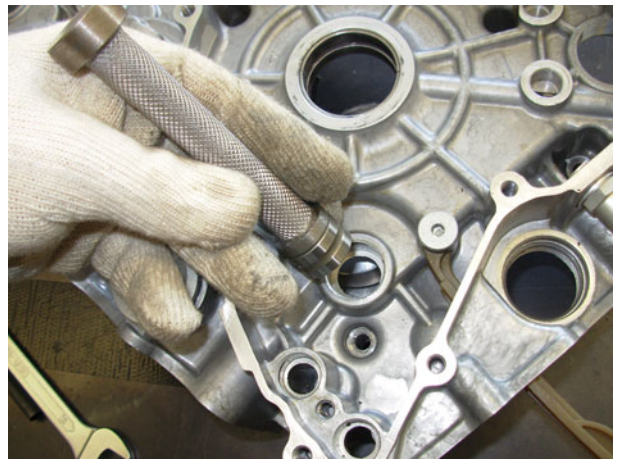
### REMOVAL

- Warm the crankcase and then remove the bearing using an internal puller.



### REASSEMBLY

Reassemble the bearing using the special tool, part no. 9100893



## CLUTCH-SIDE CRANKCASE

### MAIN BEARINGS

Proceed as described for the flywheel-side crankcase.

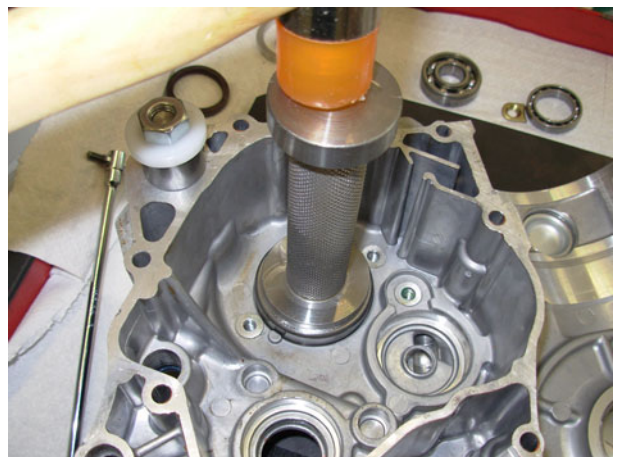


**WARNING**  
before performing any removing/assembling operation, heat the crankcase with a heat gun in order to avoid any damage to the housings.



**WARNING**  
Secure the crankcase on the special support plate, part no. 9100841, before performing the described operations.

- Fit a new oil seal by means of the special tool, part no. 9100890



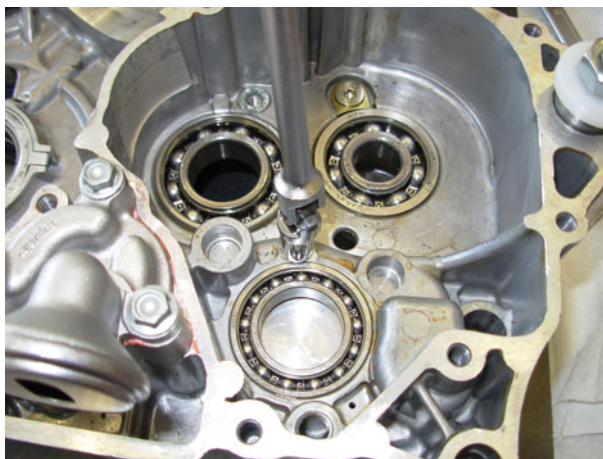


## GEARBOX BEARINGS

### REMOVAL

Proceed as described for the flywheel-side crankcase.

- Remove the three retaining screws.



- Heat the crankcase and then remove the bearings using an internal puller.



### REASSEMBLY

- Reassemble the bearings using the special tools.



#### **WARNING**

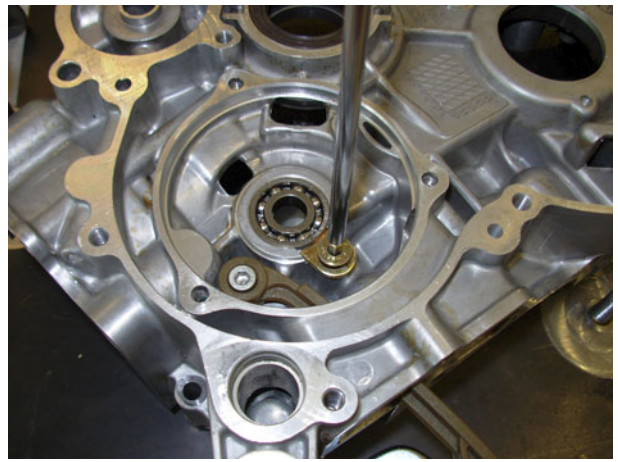
Check that plate adjustable support is fully home and warm coupling areas of the bearing properly.

- Refit retaining screws.

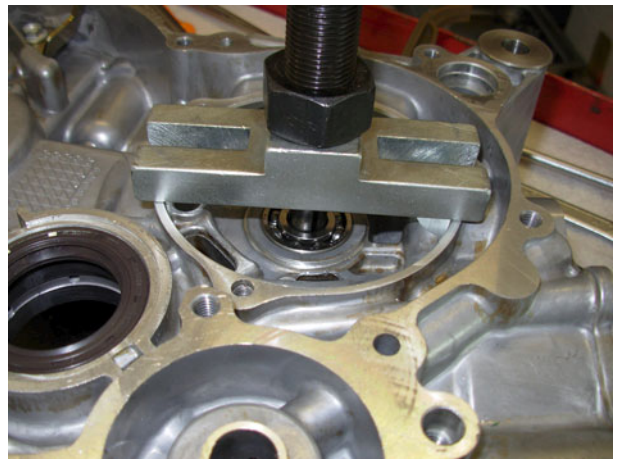


**LAYSHAFT BEARING****REMOVAL**

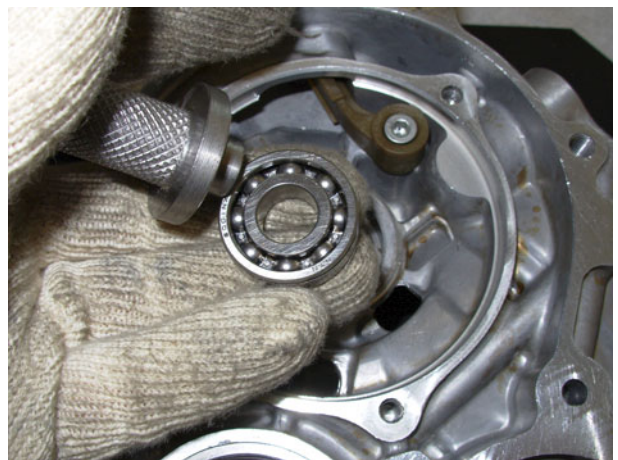
- Remove bearing retaining screws and relevant plate.



- Heat the crankcase.
- Remove the bearing using an internal puller.

**REASSEMBLY**

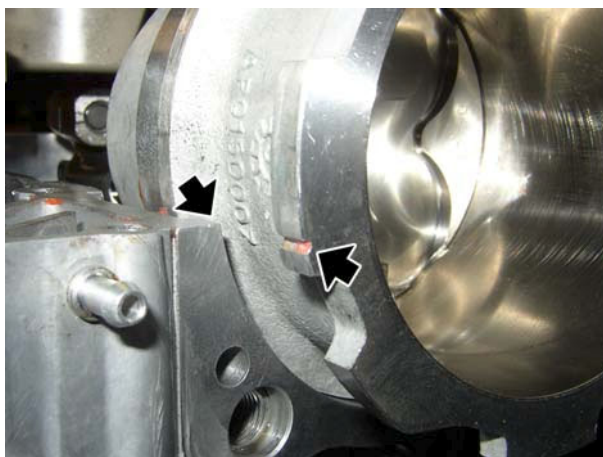
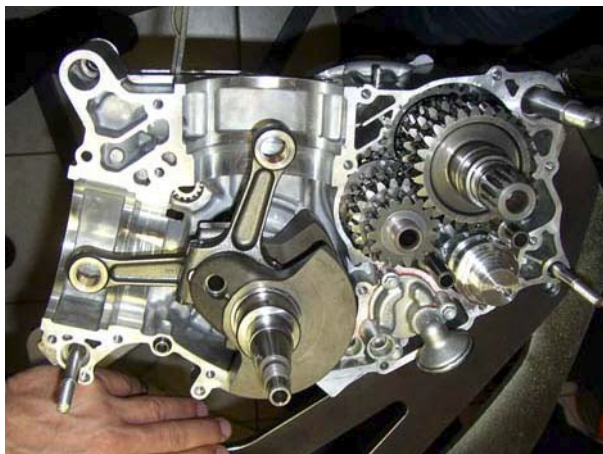
- Reassemble the bearing using the special tool, part no. 9100889.
- Refit retaining screw and relevant plate.



### 3.10.4. ASSEMBLING THE CRANKCASES

**NOTE** Before reassembling, change and lubricate the oil seals and lubricate the bearing balls.

- Install oil seals and bearings to the casings.
- Install the complete crankshaft in right casing.
- Fit primary and secondary gearbox shafts with drum and levers, see (REASSEMBLING THE GEARBOX).
- Fit cylinder barrels as outward as possible.
- Fit cylinder barrels with reference mark matching the crankcase jointing line.
- Apply the red sealant paste all along the crankcase perimeter.



- Join the crankcases.

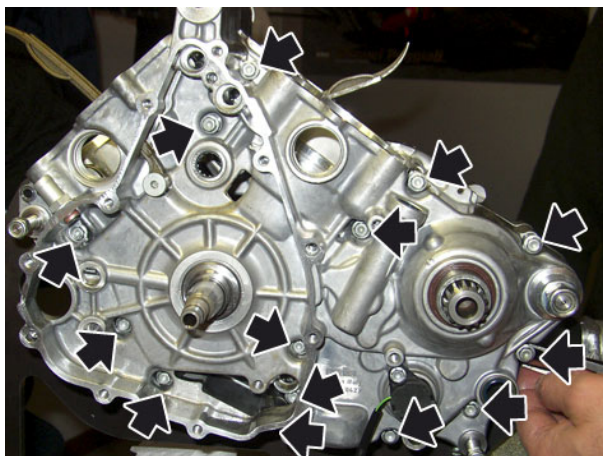


- Tighten the fifteen crankcase bolts, fourteen are on left side and one is on right side.



**WARNING**

Seven of the left side securing screws are M7 and seven are M6.





- Fit timing layshaft on generator shaft.
- Fit the key.



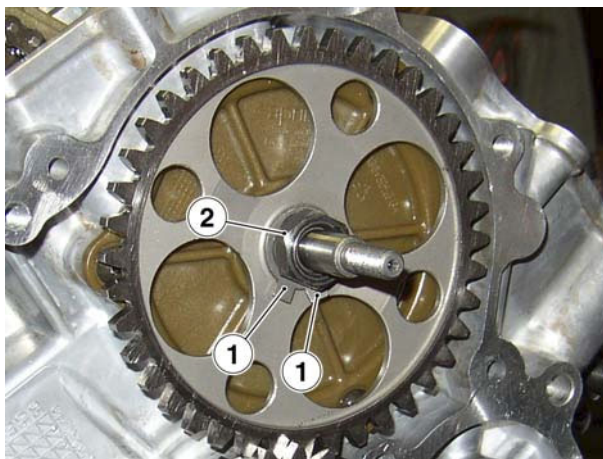
- Fit rear cylinder timing gear.
- Fit rear cylinder timing chain.



- Fit the timing closure flange.
- Tighten the three screws from timing closure flange.



- Fit primary gear, see (REMOVING THE PRIMARY GEAR).
- Use the suitable special tool (no. 9100843) to tighten primary gear nut.
- Fit timing driving gear, lining up reference mark with the one on primary gear.
- Fit the lock washer (1).
- Tighten nut (2) on timing driving gear.
- Bend washer tab (1).



### 3.11. TIMING

#### 3.11.1. CAM TIMING

- Ensure timing chains are correctly tight.
- Remove the blanking screw from timing hole.
- Fit special tool (no. 9100844) in its seat.



- Turn the crankshaft by turning primary transmission nut until front cylinder is at TDC.
- Fit pin into special tool (no. 9100844) so to lock out crankshaft rotation.

**WARNING**

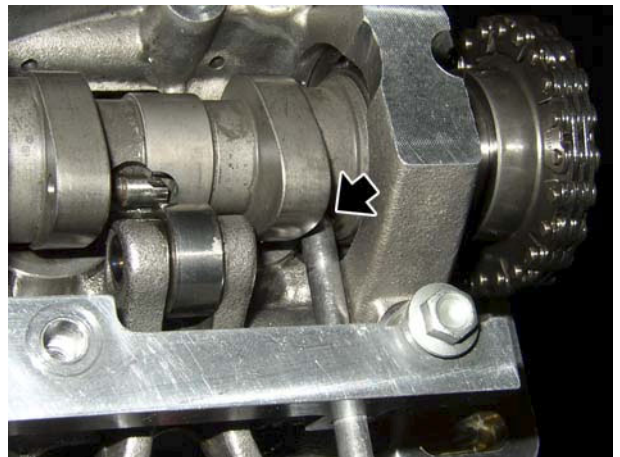
Special tool (no. 9100844) is only used to find crankshaft correct position.  
Do not use it for tightening.



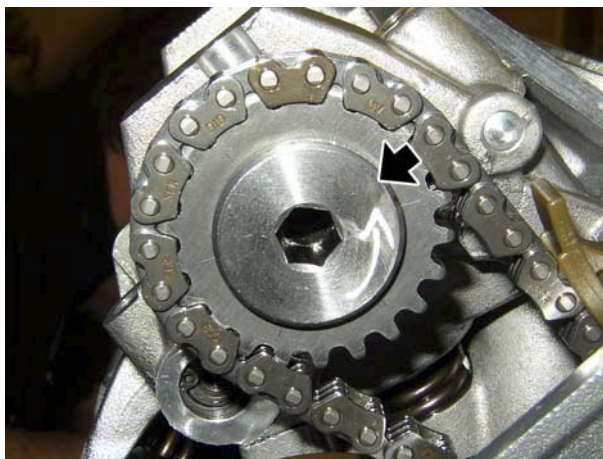
- Turn camshaft until camshaft hole and head hole match.
- Fit pin to lock front cylinder camshaft.

**WARNING**

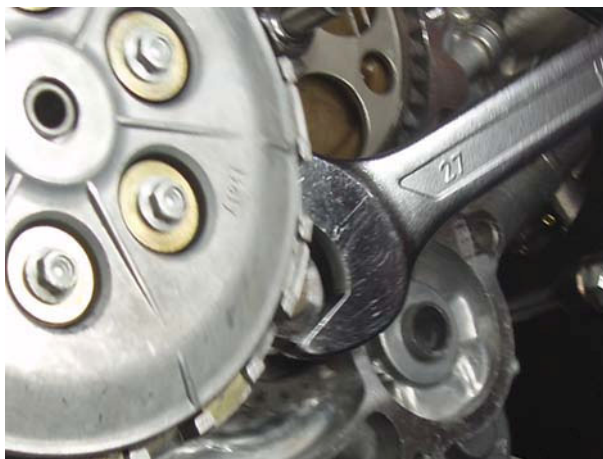
Ensure the camshaft is free and not resting onto buckets.



- Tighten front cylinder camshaft gear retaining nut.
- Remove front camshaft and crankshaft locking tools.



- Using the primary shaft nut, turn crankshaft clockwise over 283° taking the rear cylinder piston to TDC and repeat the procedure performed on front cylinder.



## GEARBOX

4

SUMMARY

4.1. GEARBOX SHAFTS ..... 3

4.1.1. DIAGRAM ..... 3

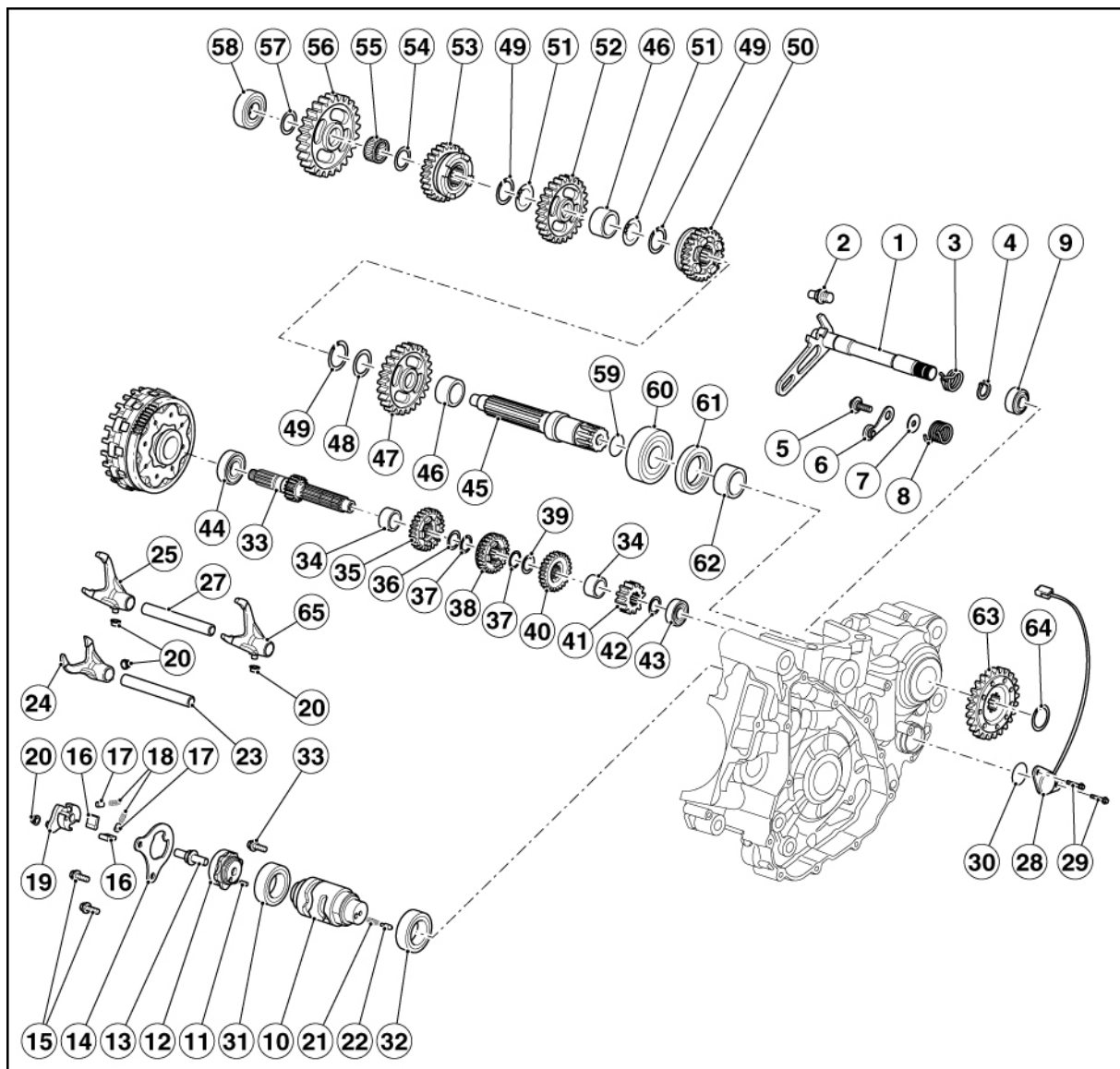
4.1.2. DISASSEMBLING THE GEARBOX ..... 5

4.1.3. CHECK..... 7

4.1.4. REASSEMBLING THE GEARBOX ..... 8

## 4.1. GEARBOX SHAFTS

### 4.1.1. DIAGRAM



**Key:**

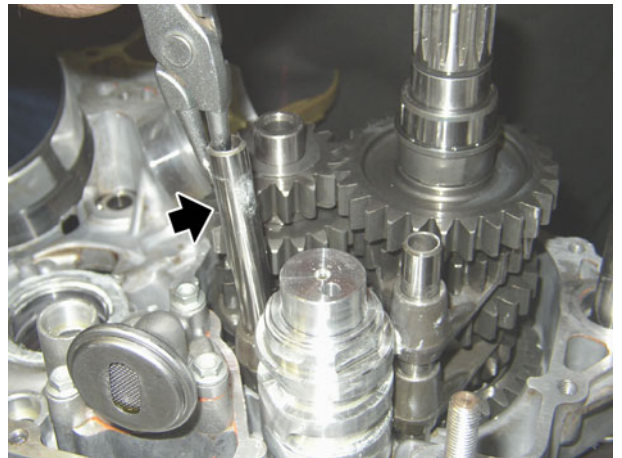
1. Selector shaft+pawls
2. Selector pin
3. Spring
4. Circlip
5. Flanged hex.head screw
6. Complete index lever
7. Washer
8. Spring
9. Oil seal
10. Complete Desmodromic unit
11. Roller
12. Gear selector drum
13. Threaded pin M8x1.25
14. Gear selector stop plate
15. Flanged hex.head screw M6x12
16. Ratchet for selector sprocket
17. Spring pin
18. Spring
19. Selector sprocket
20. Bush
21. Spring
22. Spring pin
23. Fork shaft
24. 4<sup>th</sup> - 5<sup>th</sup> speed fork
25. 1<sup>st</sup> - 3<sup>rd</sup> speed fork (same as 2<sup>nd</sup> speed fork)
26. Fork shaft
27. Neutral light switch
28. Flanged hex.head screw M5x12
29. O-ring
30. Ball bearing
31. Ball bearing
32. Flanged hex.head screw M5x12
33. Primary shaft (**SXV** Z=13) (**RXV** Z=12)
34. Bush
35. 5<sup>th</sup> speed gear on primary Z=21
36. Plain washer
37. Circlip for shaft Ø 25 mm (0.98 in)
38. 3<sup>rd</sup> speed gear on primary (**SXV** Z=16) (**RXV** Z=15)
39. Special washer
40. 4<sup>th</sup> speed gear on primary (**SXV** Z=20) (**RXV** Z=19)
41. 2<sup>nd</sup> speed gear on primary (**SXV** Z=15) (**RXV** Z=13)
42. Washer
43. Ball bearing
44. Ball bearing
45. Secondary shaft
46. Bush
47. 2<sup>nd</sup> speed gear on secondary (**SXV** Z=27) (**RXV** Z=25)
48. Plain washer
49. Circlip for shaft Ø 25 mm (0.98 in)
50. 4<sup>th</sup> speed gear on secondary (**SXV** Z=23) (**RXV** Z=24)
51. Special washer
52. 3<sup>rd</sup> speed gear on secondary Z=23
53. 5<sup>th</sup> speed gear on secondary (**SXV** Z=21) (**RXV** Z=22)
54. Washer
55. Roller cage
56. 1<sup>st</sup> speed gear on secondary (**SXV** Z=30) (**RXV** Z=31)
57. Washer
58. Ball bearing
59. O-ring
60. Ball bearing
61. Oil seal
62. Spacer (**SXV** 25x32x22) (**RXV** 25x32x14)
63. Sprocket (**SXV** Z=15) (**RXV** Z=16)
64. Circlip for shaft Ø 25 mm (0.98 in)
65. 2<sup>nd</sup> speed fork (same as 1<sup>st</sup>-3<sup>rd</sup> speed fork)

#### 4.1.2. DISASSEMBLING THE GEARBOX

- To gain access to gearbox, it is necessary to remove generator-side casing, see (HOW TO TAKE THE ENGINE CRANKCASES APART).



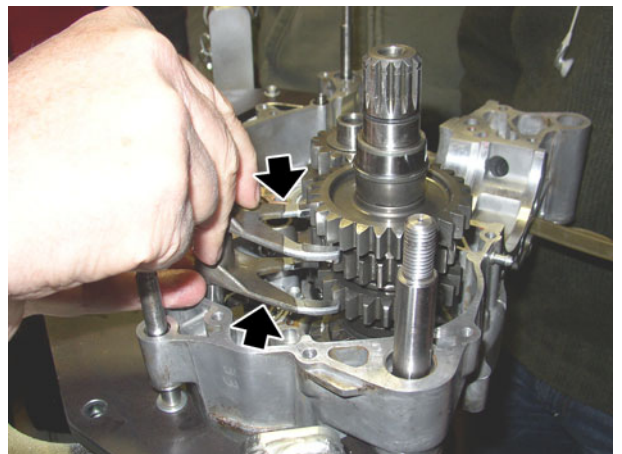
- Remove the fork shafts.
- Turn the selector forks outward and remove the selector drum



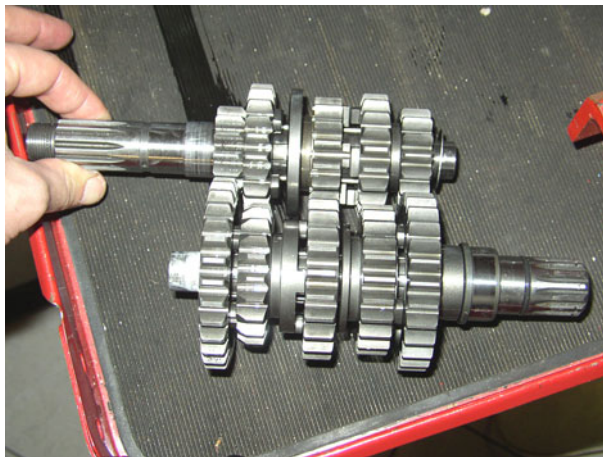
- Remove desmodromic gear selector drum.



- Slide off 4<sup>th</sup> and 5<sup>th</sup> speed fork.
- Slide off 1<sup>st</sup> and 3<sup>rd</sup> speed fork and 2<sup>nd</sup> speed fork.

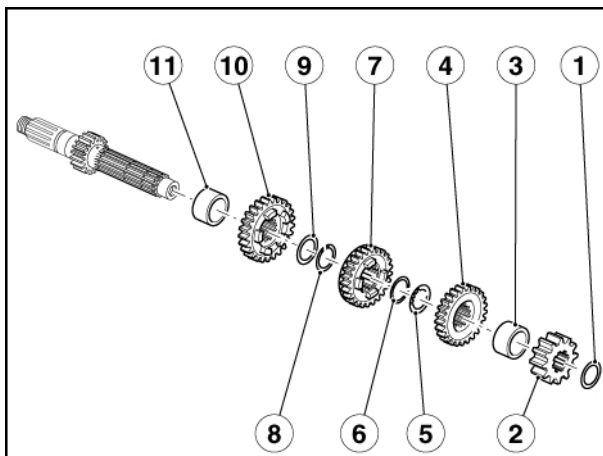


- Slide off primary and secondary shafts at the same time.



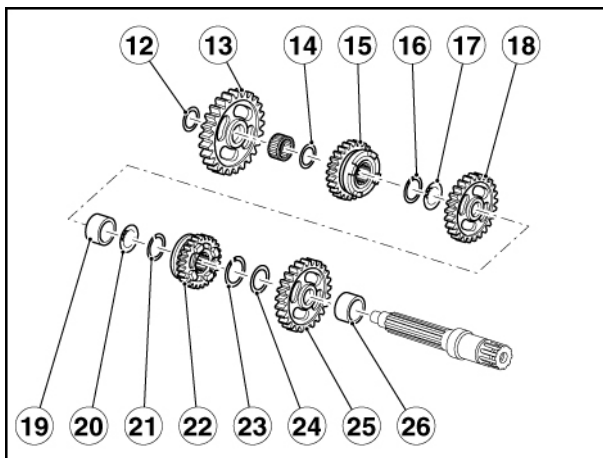
#### DISASSEMBLING THE PRIMARY SHAFT

- Remove the shim (1) from the generator side.
- Slide off 2<sup>nd</sup> speed gear (2).
- Remove the bush (3).
- Slide off 4<sup>th</sup> speed gear (4).
- Remove the special washer (5).
- Remove the circlip (6).
- Slide off 3<sup>rd</sup> speed gear (7).
- Remove the circlip (8).
- Remove the plain washer (9).
- Slide off 5<sup>th</sup> speed gear (10).
- Remove the bush (11).



#### DISASSEMBLING THE SECONDARY SHAFT

- Remove the shim (12) from the clutch side.
- Remove the 1<sup>st</sup> speed gear (13) complete with roller cage.
- Remove the plain washer (14).
- Slide off 5<sup>th</sup> speed gear (15).
- Remove the circlip (16).
- Remove the special washer (17).
- Slide off 3<sup>rd</sup> speed gear (18).
- Remove the bush (19).
- Remove the special washer (20).
- Remove the circlip (21).
- Slide off 4<sup>th</sup> speed gear (22).
- Remove the circlip (23).
- Remove the plain washer (24).
- Slide off 2<sup>nd</sup> speed gear (25).
- Remove the bush (26).

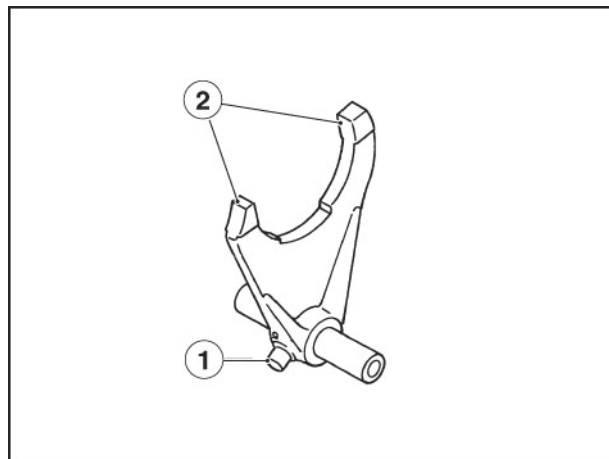


**4.1.3. CHECK****CHECKING THE GEARBOX FORKS**

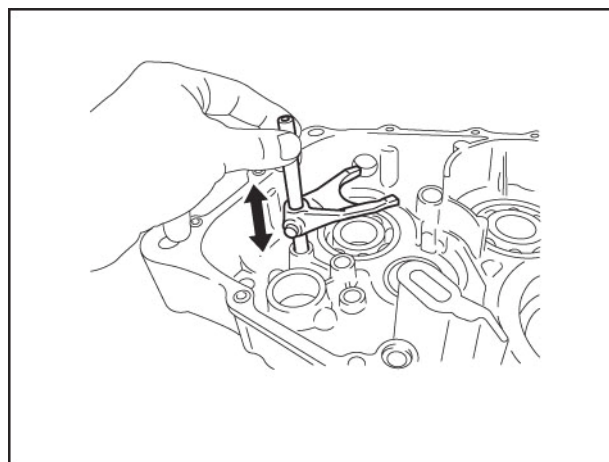
**NOTE** The following procedure applies to all gearbox forks.

Check selector fork cam bush (1), selector fork tooth (2) for damage, deformation and wear.

Change the selector fork, if needed.



Ensure that selector fork slides on the shaft, change the forks if movement is not smooth.

**CHECKING THE DESMODROMIC SELECTOR DRUM**

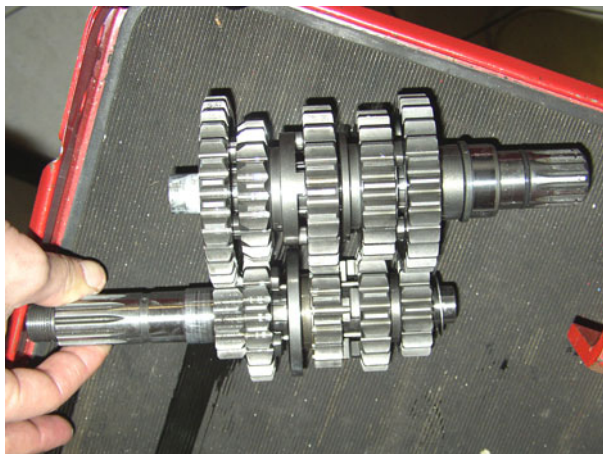
Check selector drum for damage, scratches and wear; change the unit if necessary.

#### 4.1.4. REASSEMBLING THE GEARBOX

- Correctly couple gearbox primary and secondary shafts and insert them into clutch-side crankcase.

**WARNING**

Use grease to ensure secondary shaft shim stays in place.

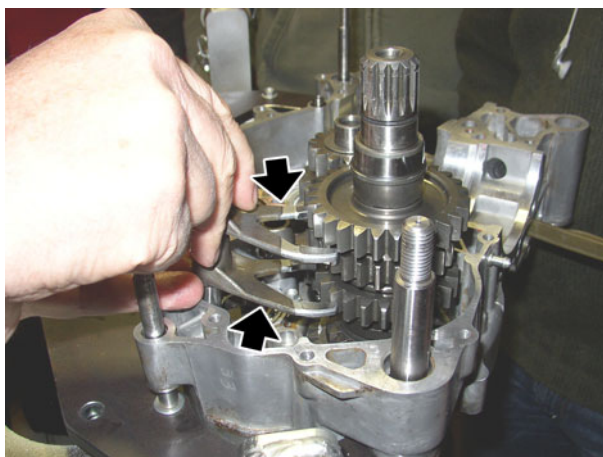


**NOTE** Ensure every selector fork is fitted with the small sliding bush.

- Grease the small bushes.



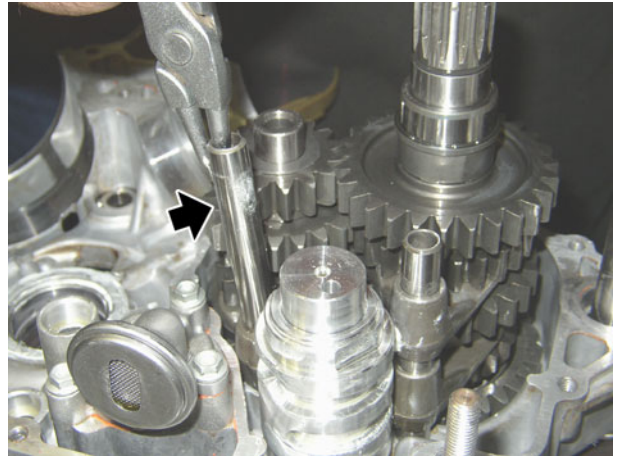
- Slide in 1<sup>st</sup> and 3<sup>rd</sup> speed fork and 2<sup>nd</sup> speed fork.
- Slide in 4<sup>th</sup> and 5<sup>th</sup> speed forks.



- Install desmodromic gear selector drum.



- Install the fork shafts.



- Refit generator-side crankcase, see (ASSEMBLING THE CRANKCASE).



**ELECTRICAL SYSTEM**

**5**

SUMMARY

5.1. ELECTRIC COMPONENTS ..... 3

5.1.1. INSTRUMENT PANEL ..... 3

## 5.1. ELECTRIC COMPONENTS

### 5.1.1. INSTRUMENT PANEL

#### INSTRUMENT PANEL SET-UP

The set-up function allows you to select and enter values relevant to monitoring symbols and units of measurement:

- Measure unit for speed and distance,
- Hours before next oil change,
- Km or hours before next service coupon.

When instrument panel is off, press SCROLL on handlebar, or MODE on odometer, and keep it pressed.

Turn the key on, if any, or connect the battery if the vehicle is without key.

After about 7" the symbol WS will be displayed on the bottom right corner, as shown in fig. 1; after releasing the button, the wording End will appear .

There are two different conditions:

- A) change of measure units and/or monitoring parameters.
- B) resetting of monitoring parameters.

#### **Changing measure unit (Km/h or Mph) and monitoring parameters (scheduled oil change hours and service coupon hours/km)**

Press SCROLL briefly to display the data on the picture beside.

Monitoring parameters may be changed only if the monitoring symbol to be changed is not active (i.e. the set limit value has not been reached).

Once changes are over, End is displayed.

When End is displayed, press SCROLL briefly to show the previous menu

Hold SCROLL pressed until dashes - - - - are displayed and release it to activate the test.

The same result can be achieved by switching the instrument off and then on again.



**Resetting the monitoring parameters**

Activate set-up when monitoring symbols are activated because their set value has been reached (symbols are displayed on LCD).

Follow the set-up procedure until the relevant symbol is displayed on LCD.

When the symbol is on, hold SCROLL pressed until dashes - - - are displayed  
when it is released, the wording NO will be displayed.



Press SCROLL briefly to shift to wording YES.



Hold SCROLL pressed until WS appears on the bottom right corner and release it: the symbol with the flashing values that have been previously set is displayed.

To make changes, proceed as described in paragraph 30.3.1 After confirming, wait until the symbol goes off.

Counter is reset automatically and the symbol goes off.

Press SCROLL briefly to shift to WRENCH symbol for service warning.

When relative symbol is on, hold SCROLL pressed until dashes - - - are shown and Wrench NO symbol is displayed when button is released.



Press SCROLL briefly to shift to Wrench YES.



Hold SCROLL pressed until WS appears on the bottom right corner and release it to show symbol and selected measure unit.

Press SCROLL briefly to toggle between CLK or Km/h.

**Engine 450 - 550**

Select the measure unit and press SCROLL until it goes off. The newly set value will be displayed after releasing the button; to change it, proceed as described under "Changing the values". After confirming, wait until the symbol goes off. Counter is reset automatically and the symbol goes off. Press SCROLL briefly and End is displayed. When End is displayed, press SCROLL briefly to go back to the starting page. Hold SCROLL pressed until dashes - - - - are displayed and release to activate the test. The same result can be achieved by turning the instrument off and on again.

**Changing the values**

Values can be set when the first digit on the left is flashing. Press SCROLL within 2" to start setting. Each time SCROLL is pressed, value increased by one unit. If SCROLL is not operated within 2", the second digit will be flashing. Set it within 2" using SCROLL and proceed likewise for remaining digits. Once change is completed, the last digit on the left flashes for 2", then the value is stored and will not be displayed any more. If SCROLL is not operated, it will go off after the last digit on the right has been flashing for 2". If necessary, setting operation can be repeated.