



SERVICE STATION MANUAL

AP8181026



SPORTCITY 250 i.e.



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SERVICE STATION MANUAL SPORTCITY 250 i.e.

- This manual provides the main information to carry out regular maintenance operations on your vehicle.
- This manual is intended to **aprilia Dealers** and their qualified mechanics; several concepts have been deliberately omitted as they are considered unnecessary. As it is not possible to include complete mechanical notions in this manual, users should have basic mechanical knowledge or minimum knowledge about the procedures involved when repairing scooters. Without this knowledge, repairing or checking the vehicle may be inefficient or even dangerous. As the vehicle repair and check procedures are not described in detail, be extremely cautious so as not to damage components or injure individuals. In order to optimise customer satisfaction when using our vehicles, aprilia s.p.a. commits itself to continually improve its products and the relative documentation. The main technical modifications and changes in repair procedures are communicated to all **aprilia Sales Outlets and its International Subsidiaries**. These changes will be introduced in the subsequent editions of the manual. In case of need or further queries on repair and check procedures, consult **aprilia CUSTOMER DEPARTMENT**, which will be prepared to provide any information on the subject and any further communications on updates and technical changes related to the vehicle.

NOTE Provides key information to make the procedure easier to understand and carry out.

CAUTION Refers to specific procedures to carry out for preventing damages to the vehicle.

WARNING Refers to specific procedures to carry out to prevent injuries to the repairer.



Personal safety Failure to completely observe these instructions will result in serious risk of personal injury.



Safeguarding the environment Sections marked with this symbol indicate the correct use of the vehicle to prevent damaging the environment.



Vehicle intactness The incomplete or non-observance of these regulations leads to the risk of serious damage to the vehicle and sometimes even the invalidity of the guarantee.



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GENERAL PRECAUTIONS AND INFORMATION

When repairing, dismantling and reassembling the vehicle, follow the recommendations given below carefully.

CAUTION

USE OF NAKED FLAMES IS FORBIDDEN DURING ALL TYPES OF OPERATION. BEFORE STARTING ANY MAINTENANCE OPERATION OR INSPECTION ON THE VEHICLE, SWITCH OFF THE ENGINE AND REMOVE THE KEY. WAIT UNTIL THE ENGINE AND THE EXHAUST SYSTEM ARE COLD, IF POSSIBLE, RAISE THE VEHICLE USING A SUITABLE TOOL ON FIRM AND LEVEL GROUND. TO AVOID BURNS PAY SPECIAL CARE WITH HOT ENGINE AND EXHAUST SYSTEM PARTS.

DO NOT HOLD ANY MECHANICAL OR OTHER SCOOTER PARTS WITH YOUR MOUTH: SCOOTER COMPONENT ARE NOT EDIBLE, ON THE CONTRARY SOME OF THEM ARE HARMFUL AND EVEN TOXIC.

CARBON MONOXIDE

If you need to keep the engine running in order to carry out any procedure, please ensure that you do so in an open or very well ventilated area.

Never let the engine run in an enclosed area.

If you do work in an enclosed area, make sure to use a smoke-extraction system.

CAUTION



EXHAUST EMISSIONS CONTAIN CARBON MONOXIDE, A POISONOUS GAS WHICH CAN CAUSE LOSS OF CONSCIOUSNESS AND EVEN DEATH.

FUEL

CAUTION



FUEL USED TO DRIVE EXPLOSION ENGINES IS HIGHLY FLAMMABLE AND CAN BECOME EXPLOSIVE UNDER SPECIFIC CONDITIONS.

IT IS THEREFORE RECOMMENDED TO CARRY OUT REFUELLING AND MAINTENANCE PROCEDURES IN A VENTILATED AREA WITH THE ENGINE SWITCHED OFF.

DO NOT SMOKE DURING REFUELLING AND NEAR FUEL VAPOURS, AVOIDING ANY CONTACT WITH NAKED FLAMES, SPARKS OR OTHER SOURCES WHICH MAY CAUSE THEM TO IGNITE OR EXPLODE.

CAUTION



DO NOT DISPOSE OF FUEL INTO THE ENVIRONMENT.

CAUTION



KEEP OUT OF THE REACH OF CHILDREN

HIGH-TEMPERATURE COMPONENTS

The engine and the components of the exhaust system can get very hot and remain hot for some time even after the engine has been switched off.

Before handling these components, make sure that you are wearing insulating gloves or wait until the engine and the exhaust system have cooled down.

TRANSMISSION OIL AND USED FORK OIL

CAUTION



IT IS ADVISABLE TO WEAR LATEX GLOVES WHEN CARRYING OUT SERVICE WORK.

THE TRANSMISSION OIL MAY CAUSE SKIN DAMAGE IF HANDLED FREQUENTLY AND FOR LONG PERIODS.

WASH YOUR HANDS CAREFULLY AFTER HANDLING OIL.

HAND THE OIL OVER TO OR HAVE IT COLLECTED BY THE NEAREST USED OIL RECYCLING COMPANY OR THE SUPPLIER.

IT IS ADVISABLE TO WEAR LATEX GLOVES WHEN SERVICING THE VEHICLE.

CAUTION



DO NOT DISPOSE OF OIL INTO THE ENVIRONMENT.

CAUTION



KEEP OUT OF THE REACH OF CHILDREN

BRAKE FLUID

CAUTION



THE BRAKE FLUID MAY DAMAGE PAINTED, PVC OR RUBBER SURFACES. WHEN SERVICING THE BRAKE SYSTEM, PROTECT THESE COMPONENTS WITH A CLEAN CLOTH.

ALWAYS WEAR PROTECTIVE GOGGLES WHEN SERVICING THE BRAKE SYSTEM.

THE BRAKE FLUID IS EXTREMELY DANGEROUS TO THE EYES.

IN THE EVENT OF ACCIDENTAL CONTACT WITH THE EYES, RINSE THEM IMMEDIATELY WITH ABUNDANT COLD, CLEAN WATER AND SEEK MEDICAL ADVICE.

CAUTION

KEEP OUT OF THE REACH OF CHILDREN

HYDROGEN GAS AND BATTERY ELECTROLYTE

CAUTION

THE BATTERY ELECTROLYTE IS TOXIC, CORROSIVE AND AS IT CONTAINS SULPHURIC ACID, IT CAN CAUSE BURNS WHEN IN CONTACT WITH THE SKIN.

WHEN HANDLING THE BATTERY ELECTROLYTE, WEAR TIGHT-FITTING GLOVES AND PROTECTIVE APPAREL.

IF THE ELECTROLYTIC FLUID GETS INTO CONTACT WITH THE SKIN, WASH WITH ABUNDANT COOL WATER.

IT IS PARTICULARLY IMPORTANT TO PROTECT THE EYES BECAUSE EVEN TINY AMOUNTS OF BATTERY ACID MAY CAUSE BLINDNESS. IF IT COMES INTO CONTACT WITH THE EYES, RINSE THEM CAREFULLY WITH WATER FOR FIFTEEN MINUTES, THEN SEE AN OPHTHALMOLOGIST AS SOON AS POSSIBLE.

IF IT IS ACCIDENTALLY SWALLOWED, DRINK LARGE QUANTITIES OF WATER OR MILK, FOLLOWED BY MILK OF MAGNESIA OR VEGETAL OIL, AND SEEK MEDICAL ADVICE IMMEDIATELY.

THE BATTERY RELEASES EXPLOSIVE GASES. KEEP IT AWAY OF FLAMES, SPARKS, CIGARETTES OR ANY OTHER HEAT SOURCE.

ENSURE ADEQUATE VENTILATION WHEN SERVICING OR RECHARGING THE BATTERY.

CAUTION

KEEP OUT OF THE REACH OF CHILDREN

CAUTION



BATTERY FLUID IS CORROSIVE.

DO NOT POUR OR SPREAD IT ESPECIALLY ON PLASTIC PARTS.

ENSURE THAT THE ELECTROLYTIC ACID IS COMPATIBLE WITH THE BATTERY TO BE ACTIVATED.

Maintenance rules

GENERAL PRECAUTIONS AND INFORMATION

When repairing, dismantling and reassembling the vehicle, follow the recommendations given below carefully.

CAUTION

UNLESS OTHERWISE INDICATED, REFIT THE UNIT FOLLOWING THE REMOVAL STEPS BUT IN REVERSE ORDER. THE POSSIBLE OVERLAPPING OF OPERATIONS REFERRED TO IN THE OTHER CHAPTERS MUST BE CARRIED OUT LOGICALLY, AVOIDING ANY UNNECESSARY REMOVAL OF COMPONENTS. DO NOT POLISH MATT PAINTWORK WITH ABRASIVE PASTES.

NEVER USE FUEL AS SOLVENT FOR CLEANING THE SCOOTER.

DO NOT USE ALCOHOL, PETROL OR SOLVENTS TO CLEAN RUBBER AND PLASTIC PARTS AND THE SADDLE. USE ONLY WATER AND NEUTRAL SOAP INSTEAD.

DISCONNECT THE NEGATIVE CABLE (-) OF THE BATTERY IF YOU INTEND TO CARRY OUT ELECTRICAL WELDING WORK.

BEFORE REMOVING COMPONENTS

- Before dismantling components, remove dirt, mud, dust and foreign bodies from the vehicle.
- Use the special tools designed for this scooter, as required.

REMOVAL OF COMPONENTS

- Do not loosen and/or tighten screws and nuts using pliers or other tools than the specially designed wrench.
- Mark positions on all connection joints (pipes, cables etc.) before separating them, and identify them with distinctive symbols.
- Each component needs to be clearly marked in order to be identified during reassembly.
- Clean and wash the dismantled components carefully using a low-flammability detergent.
- Keep coupled parts together since they have "adjusted" to each other due to normal wear

and tear.

- Some components must be used together or replaced altogether.
- Keep away from heat sources.

REASSEMBLING COMPONENTS

CAUTION



NEVER REUSE A CIRCLIP; IF A CIRCLIP HAS BEEN REMOVED, IT MUST BE REPLACED WITH A NEW ONE. WHEN INSTALLING A CIRCLIP, ENSURE THAT ITS ENDS ARE NOT STRETCHED MORE THAN IS NECESSARY TO FIT IT ONTO THE SHAFT.

AFTER INSTALLING THE CIRCLIP, CHECK THAT IT IS FULLY AND CLEANLY INSTALLED IN ITS SEAT.

DO NOT USED COMPRESSED AIR TO CLEAN BEARINGS.

NOTE

THE BEARINGS MUST BE ABLE TO ROTATE FREELY, WITHOUT BINDING AND/OR NOISE, OTHERWISE THEY NEED REPLACING.

- Use only ORIGINAL aprilia SPARE PARTS.
- Comply with lubricant and consumables usage guidelines.
- Lubricate parts (whenever possible) before reassembling them.
- When tightening nuts and screws, start from the ones with the largest section or from the internal ones, moving diagonally. Tighten nuts and screws in successive steps before applying the tightening torque.
- Always replace self-locking nuts, washers, sealing rings, circlips, O-rings, split pins and screws with new ones if their thread is damaged.
- When assembling the bearings, make sure to lubricate them well.
- Check that each component is assembled correctly.
- After a repair or routine maintenance procedure, carry out pre-ride checks and test the vehicle on private grounds or in an area with low traffic density.
- Clean all junction planes, oil guard rims and washers before refitting them. Smear a light layer of lithium-based grease on the oil guard rims. Reassemble the oil guards and the bearings with the brand or lot number facing outward (visible side).

ELECTRIC CONNECTORS

Electric connectors must be disconnected as described as follows as non-compliance with the procedure described below causes irreparable damages to both the connector and the cable harness:

Press the relevant safety hooks, if any.

CAUTION

TO DISCONNECT THE TWO CONNECTORS, DO NOT PULL THE CABLES.

- Grip the two connectors and disconnect them by pulling them in opposite directions.
- In presence of dirt, rust, humidity etc., clean the connector's internal parts carefully, using a pressurised air jet.
- Make sure that the cables are correctly linked to the connector's internal terminal ends.

NOTE

THE TWO CONNECTORS CONNECT ONLY FROM ONE SIDE; CONNECT THEM THE RIGHT WAY ROUND.

- Then fit the two connectors making sure that they couple correctly (if the relevant hooks are provided, you will hear them "click" into place).

TIGHTENING TORQUE**CAUTION**

DO NOT FORGET THAT TIGHTENING TORQUES OF ALL FASTENING ELEMENTS ON WHEELS, BRAKES, WHEEL SPINDLES AND OTHER SUSPENSION COMPONENTS PLAY A KEY ROLE IN ENSURING THE VEHICLE'S SAFETY AND MUST COMPLY WITH SPECIFIED VALUES.

CHECK THE TIGHTENING TORQUES OF FASTENING PARTS ON A REGULAR BASIS AND ALWAYS USE A TORQUE WRENCH TO REASSEMBLE THESE COMPONENTS.

IF THESE RECOMMENDATIONS ARE NOT COMPLIED WITH, ONE OF THE COMPONENTS MAY BECOME LOOSE AND EVEN DETACHED, THUS BLOCKING A WHEEL, OR OTHERWISE COMPROMISING THE VEHICLE'S MANOEUVRABILITY. THIS CAN LEAD TO FALLS, WITH THE RISK OF SERIOUS INJURY OR DEATH.

BRAKE FLUID**CAUTION**

DO NOT USE FLUIDS OTHER THAN THOSE PRESCRIBED AND DO NOT MIX DIFFERENT LIQUIDS WHEN TOPPING UP IN ORDER NOT TO DAMAGE THE BRAKE SYSTEM.

DO NOT USE BRAKE FLUID TAKEN FROM OLD CONTAINERS OR FROM CONTAINERS THAT HAVE BEEN OPEN FOR A PROLONGED TIME.

SUDDEN CHANGES IN THE PLAY OR ELASTIC RESISTANCE IN THE BRAKE LEVERS ARE DUE TO FAULTS IN THE HYDRAULIC CIRCUIT.

MAKE ESPECIALLY SURE THAT BRAKE DISCS AND THE FRICTION MATERIAL ARE NOT SMEARED OR GREASY, PARTICULARLY AFTER CARRYING OUT MAINTENANCE AND INSPECTION OPERATIONS.

CHECK THAT BRAKE WIRES ARE NOT TWISTED OR WORN.

ENSURE THAT WATER OR DUST DO NOT INGRESS INADVERTENTLY INTO THE CIRCUIT.

IT IS ADVISABLE TO WEAR LATEX GLOVES WHEN SERVICING THE HYDRAULIC CIRCUIT.

DISC BRAKE

CAUTION

ANY OIL OR OTHER LIQUIDS ON A DISC WILL SOIL THE BRAKE PADS.

SOILED PADS MUST BE REMOVED AND REPLACED. A SOILED DISC OR A DISC WITH TRACES OF OIL MUST BE CLEANED WITH A TOP QUALITY DEGREASING AGENT.

IF THE SCOOTER IS USED CLOSE TO WATER OR ON DUSTY OR UNSURFACED ROADS, OR IF IT IS USED FOR SPORTS APPLICATION, HALVE THE SERVICE INTERVALS.

COOLANT

Coolant liquid solution is 50% water and 50% antifreeze. This is the ideal mixture 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.

Thus, mineral salt deposits formed in the radiator by evaporated water are also minimised and the efficiency of the cooling system is not affected.

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

Use distilled water in the coolant mixture to avoid damaging the engine.

Depending on the freezing temperature of the coolant mixture you wish to achieve, add the percentage of coolant indicated in the following table to the water:

FREEZING POINT C° (-°F)

Specification	Desc./Quantity
-20° (-4)	Coolant 35% by volume
-30° (-22)	Coolant 45% by volume
-40° (-40)	Coolant 55% by volume

NOTE

THE DIFFERENT ANTIFREEZE LIQUIDS HAVE DIFFERENT CHARACTERISTICS. THE DEGREE

OF PROTECTION GUARANTEED CAN BE FOUND ON THE LABEL OF THE PRODUCT.

CAUTION

USE ONLY ANTIFREEZE AND CORROSION INHIBITORS WITHOUT NITRITE THAT ENSURE A PROTECTION OF AT LEAST -35°C (-31°F).

TYRES

CAUTION

CHANGING, REPAIR, MAINTENANCE AND BALANCING ARE IMPORTANT OPERATIONS THAT ARE CARRIED OUT BY QUALIFIED PERSONNEL USING SUITABLE TOOLS.

THE NEW TYRES MAY BE COVERED WITH A THIN LAYER OF PROTECTIVE COATING THAT IS SLIPPERY. DRIVE CAREFULLY FOR THE FIRST FEW KILOMETRES (MILES).

NEVER USE RUBBER TREATMENT AGENTS OF ANY KIND ON THE TYRES.

IN PARTICULAR ENSURE THAT THE TYRES DO NOT COME INTO CONTACT WITH LIQUID FUEL THAT WOULD CAUSE A RAPID DETERIORATION OF THE RUBBER.

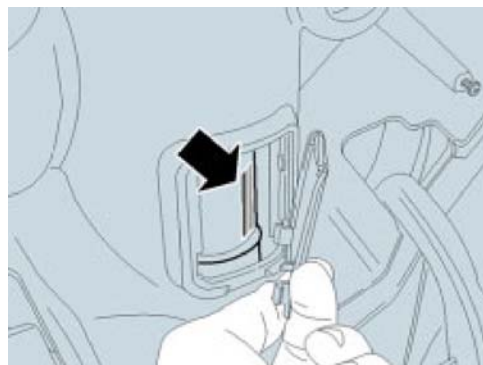
A TYRE THAT HAS BEEN IN CONTACT WITH OIL OR PETROL MUST BE REPLACED AND NOT SIMPLY CLEANED.

DO NOT FIT TYRES WITH INNER TUBES ON RIMS FOR TUBELESS TYRES AND VICE VERSA.

Vehicle identification

Chassis number

The chassis number is stamped on the chassis central bar. Remove the indicated cap placed inside the front glove-box in order to read this number.

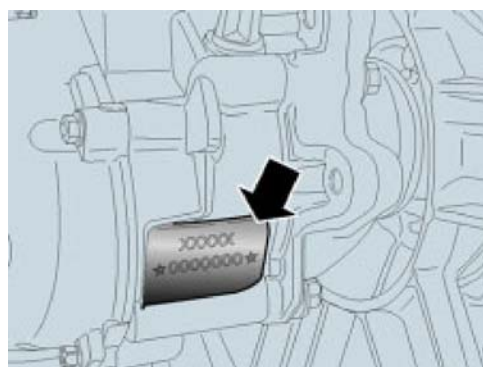


Engine number

The engine number is stamped near the rear shock absorber lower support.

CAUTION

ALTERING IDENTIFICATION NUMBERS CAN BE SERIOUSLY PUNISHED BY LAW, PARTICULARLY MODIFYING THE CHASSIS NUMBER WILL IMMEDIATELY INVALIDATE THE WAR-



RANTY.

Dimensions and mass

DIMENSIONS

Specification	Desc./Quantity
Max. length	1965 mm (77.36 in)
Max. width	730 mm (28.74 in)
Max. height (to windshield)	1130 mm (44.49 in)
Saddle height	790 mm (31.10 in)
Wheelbase	1360 mm (53.54 in)
Minimum ground clearance	130 mm (5.11 in)
Kerb weight	148 kg (328.28 lb)

Engine

ENGINE TECHNICAL DATA

Specification	Desc./Quantity
Engine model	M288M
Engine type	Single-cylinder, 4-stroke, 4 valves, wet sump forced lubrication system, overhead camshaft.
Overall engine capacity	244.29 cm ³
Bore / stroke	72 mm / 60 mm
Compression ratio	11.0 ± 0.5 : 1
Start-up	Electric
Engine revs at idle speed	1600 ± 100 rpm
Clutch	Automatic centrifugal dry clutch
Transmission	Automatic
Cooling	Forced-circulation air cooling driven by a centrifugal pump
Valve clearance	Inlet: 0.10 Outlet: 0.15
Throttle body diffuser (throttle body Ø)	Electronic injection Ø 32 mm
Supply	Vacuum pump
Fuel	Use premium unleaded petrol only, with minimum octane rating of 95 (NORM) and 85 (NOMM).
Ignition	Capacitive discharge ignition, variable advance
Spark plug	CHAMPION RG4 - PHP

Specification	Desc./Quantity
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Transmission

TRANSMISSION

Specification	Desc./Quantity
Transmission	continuous and automatic variator
Main transmission	V belt
Secondary transmission	Gear reduction unit
Engine/wheel total ratio	- minimum: 1:2.3 - maximum: 1:0.815

Capacities

CAPACITY

Specification	Desc./Quantity
Fuel (reserve included)	9 l
Fuel reserve	1.5 l
Engine oil change to service engine	1150 cm ³ (70.18 cu.in3)
Engine oil and engine oil filter change	1100 cm ³ (67.12 cu.in)
Transmission oil	250 cm ³ (15.25 cu.in)
Fork oil	135 ± 1 cm ³ (8.24 ± 0.06 cu.in) for each stem
Coolant	1.5 litres (0.39 gal) (50% water + 50% ethylene glycol antifreeze solution)
Seats	2
Scooter max. load (rider + passenger + luggage)	210 kg (463 lb)

Electrical system

ELECTRICAL SYSTEM

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuses	20- 15- 7.5 A
3	(Permanent magnet) Generator	12V - 300W
4	Low-/ high-beam light	12 V - 55 W - H7
5	Tail light	12V - 3 W
6	Turn indicator lights	12V - 10W

	Specification	Desc./Quantity
7	Rear tail light /stop light	12V - 5W / 21W
8	License plate light	12V - 5W
9	Instrument panel lighting	LED
10	Turn indicator warning light	LED
11	High-beam warning light	LED
12	Low fuel warning light	LED
13	Spark plug	CHAMPION RG4 PHP
14	Spark plug electrode gap	0.7 ± 0.8 mm (0.027 in - 0.031 in)
15	Ignition type	Capacitive discharge ignition, variable advance
16	Ignition advance	Variable managed by control unit. 5th minimum . 15°> 6000/8000 rpm.

Frame and suspensions

CHASSIS AND SUSPENSIONS

	Specification	Desc./Quantity
	Chassis type	High-strength steel tubular chassis, single spar at the front, superimposed double cradle at the rear.
	Steering inclination angle	25.5°
	Front suspension	Hydraulic action telescopic fork
	Front suspension - travel	100 mm (3.94 in)
	Rear suspension	hydraulic action double-acting shock absorber, adjustable preloading
	Rear suspension - travel	80 mm (3.15 in)

Brakes

BRAKES

	Specification	Desc./Quantity
	Front brake	Ø 260 mm (10.236 in) disc brake with hydraulic transmission
	Rear brake	Ø 220 mm (8.6 in) disc brake with hydraulic transmission

Wheels and tyres

WHEELS AND TYRES

Specification	Desc./Quantity
Wheel rims	Made of light alloy
Front wheel rim	2.75 x 15"
Rear wheel rim	3.00 x 15"
Tyres	Without inner tube (Tubeless)
Front tyre	120/70 - 15" 56P
Rear tyre	130/80 - 15" 63P
Rear tyre standard inflation pressure	200 kPa (2.0 bar)
Front tyre standard inflation pressure	200 kPa (2.0 bar)
Front tyre standard inflation pressure with passenger	200 kPa (2.0 bar)
Rear tyre standard inflation pressure with passenger	230 kPa (2.3 bar)

Tightening Torques

LUBRICATION

Name	Torque in Nm
Hub oil drainage plug	15÷17 (11.1 ÷ 12.5 ftlb)
Oil filter fitting on crankcase	27÷33 (19.9÷24.4 ftlb)
engine oil drainage plug/mesh filter	24÷30 (17.7÷22.1 ftlb)
Oil filter	4÷6 (3÷4.4 ftlb)
Oil pump cover screws	7÷9 (5.2÷6.6 ftlb)
Screws fixing the oil pump to the crankcase	5÷6 (3.7÷4.4 ftlb)
oil pump driving crown gear screw	10÷14 (7.4÷10.3 ftlb)
Oil pump cover plate screws	4÷6 (3÷4.4 ftlb)
Oil sump screws	10÷14 (7.4÷10.3 ftlb)
Minimum oil pressure sensor	12÷14 (8.9÷10.3 ftlb)

CYLINDER HEAD

Name	Torque in Nm
Spark plug	12÷14 (8.9÷10.3 ftlb)
Cylinder head cover screws	6÷7 (4.4÷5.2 ftlb)
Head to cylinder retaining nuts	7±1 + 10±1 + 270° (5.2±0.7 + 7.4±0.7 ftlb + 270°)
Head side fixing screws	11÷12 (8.1÷8.9 ftlb)
Starter ground screw	7÷8.5 (5.2÷6.3 ftlb)
Tappet set screw lock nut	6÷8 (4.4÷5.9 ftlb)

Name	Torque in Nm
Inlet manifold screws	11÷13 (8.1÷9.6 ftlb)
Timing chain tensioner pad screw	10÷14 (7.4÷10.3 ftlb)
Starter ground bell screw	11÷15 (8.1÷11.1 ftlb)
Timing chain tensioner support screw	11÷13 (8.1÷9.6 ftlb)
Timing chain tensioner central screw	5÷6 (3.7÷4.4 ftlb)
Camshaft retention plate screw	4÷6 (3÷4.4 ftlb)

TRANSMISSION

Name	Torque in Nm
Belt support roller screw	11÷13 (8.1÷9.6 ftlb)
Clutch assembly nut on driven pulley	45÷50 (33.2÷36.9 ftlb)
Driving pulley nut	75÷83 (55.4÷61.3 ftlb)
Transmission cover screws	11÷13 (8.1÷9.6 ftlb)
Driven pulley shaft nut	54÷60 (39.9÷44.3 ftlb)
Rear hub cover screws	24÷27 (17.7÷19.9 ftlb)

FLYWHEEL

Name	Torque in Nm
Flywheel cover screw	11÷13 (8.1÷9.6 ftlb)
Stator unit screws	3÷4 (2.2÷3 ftlb) (Apply LOCTITE 242 medium-strength threadlock)
Flywheel nut	94÷102 (69.4÷75.3 ftlb)
Pick-Up fixing screws	3÷4 (2.2÷3 ftlb)
Screws fixing the freewheel to the flywheel	13÷15 (9.6÷11.1 ftlb)

CRANKCASE AND CRANKSHAFT

Name	Torque in Nm
Screws for engine crankcase internal bulkhead (transmission-side half shaft)	4÷6 (3÷4.4 ftlb)
Engine crankcase coupling screws	11÷13 (8.1÷9.6 ftlb)
Starter motor screws	11÷13 (8.1÷9.6 ftlb)
Crankcase timing system cover screw	3.5÷4.5 (2.6÷3.3 ftlb) (Apply LOCTITE 242 medium-strength threadlocker)

HANDLEBAR

Name	Torque in Nm
Handlebar to fork retainer	48±20% (35.52 ftlb)
Safety screw	20±20% (14.8 ftlb)

Name	Torque in Nm
Steering set nut	15±20% (11.1 ftlb)
Steering series fixing lock nut	110±20% (81.4 ftlb)

CHASSIS

Name	Torque in Nm
License plate holder support to chassis retainer	25±20% (18.5 ftlb)
Passenger grab handle to chassis retainer	25±20% (18.5 ftlb)
Horn to chassis retainer	10±20% (7.4 ftlb)
Regulator to chassis retainer	10±20% (7.4 ftlb)
Switch to chassis retainer	10±20% (7.4 ftlb)
Control unit to chassis retainer	10±20% (7.4 ftlb)
Fuel tank to chassis retainer	10±20% (7.4 ftlb)
Helmet compartment to chassis retainer	5±20% (3.7 ftlb)
Air deflector to chassis retainer	5±20% (3.7 ftlb)
Coil to chassis retainer	5±20% (3.7 ftlb)

ELECTRICAL SYSTEM

Name	Torque in Nm
Starter motor cable retainer	5±20% (3.7 ftlb)
Battery to relay retainer	4±20% (2.96 ftlb)
Starter motor on relay retainer	4±20% (2.96 ftlb)
Battery cable harness ground lead retainer	10±20% (7.4 ftlb)

SADDLE

Name	Torque in Nm
Hinge on saddle retainer	7±20% (5.18 ftlb)

LOCKS

Name	Torque in Nm
Glove-box lock on cover retainer	4±20% (2.96 ftlb)
Saddle lock on right and left half-tail sections re- tainer	3±20% (2.22 ftlb)
Saddle lock on helmet compartment retainer	5±20% (3.7 ftlb)

INSTRUMENT PANEL

Name	Torque in Nm
Right handlebar cover to left handlebar cover re- tainer	1±20% (0.74 ftlb)
Windshield on handlebar cover retainer	1±20% (0.74 ftlb)

Name	Torque in Nm
Instrument panel on instrument panel support retainer	2±20% (1.48 ftlb)
Instrument panel support on internal handlebar cover retainer	1±20% (0.74 ftlb)
Internal handlebar cover on handlebar retainer	3±20% (2.22 ftlb)
External handlebar cover on windshield retainer	3±20% (2.22 ftlb)

REAR BODYWORK

Name	Torque in Nm
Retroreflector to license plate holder retainer	1.5±20% (1.11 ftlb)
License plate to license plate holder retainer	1±20% (0.74 ftlb)
Rear taillight to right and left half-tail sections retainer	1±20% (0.74 ftlb)
Right and left half-tail sections on helmet compartment retainer	4±20% (2.96 ftlb)
Rear light cover on license plate holder retainer	1±20% (0.74 ftlb)
License plate holder on right and left half-tail sections retainer	3±20% (2.22 ftlb)
License plate holder on rear mudguard chassis retainer	5±20% (3.7 ftlb)
Luggage carrier cover on luggage carrier retainer	1±20% (0.74 ftlb)
Right and left half-tail sections on helmet compartment retainer	1±20% (0.74 ftlb)
Fuel probe lid on helmet compartment retainer	1±20% (0.74 ftlb)
Retainer for lower lock of right and left half-tail sections on right and left half-tail sections	3±20% (2.22 ftlb)

CENTRAL BODYWORK

Name	Torque in Nm
Central inspection cover on helmet compartment retainer	1±20% (0.74 ftlb)
Central inspection cover on right and left fairings retainer	3±20% (2.22 ftlb)
Left side inspection cover retainer	3±20% (2.22 ftlb)
Right side inspection cover retainer	3±20% (2.22 ftlb)
Battery cover retainer	3±20% (2.22 ftlb)
Footrest retainer	3±20% (2.22 ftlb)
Right and left lower shield retainer	3±20% (2.22 ftlb)
Glove-box lid on front internal shield retainer	1±20% (0.74 ftlb)

Name	Torque in Nm
Front internal shield to front external shield retainer	1±20% (0.74 ftlb)
Glove-box net on front internal shield retainer	1±20% (0.74 ftlb)
Glove-box lid reinforcing retainer	1±20% (0.74 ftlb)
Bag hook retainer	1±20% (0.74 ftlb)
Air intake on front internal shield retainer	1±20% (0.74 ftlb)

FRONT AND REAR BRAKE

Name	Torque in Nm
Calliper on fork retainer	25±20% (18.5 ftlb)
Calliper on muffler plate retainer	25±20% (18.5 ftlb)
Pipe cable guide on link rod retainer	10±20% (7.4 ftlb)
Pipe cable guide on air deflector retainer	5±20% (3.7 ftlb)
Right and left pump on handlebar retainer	10±20% (7.4 ftlb)
Rear calliper support to muffler plate retainer	25±20% (18.5 ftlb)
Rear calliper support on muffler plate retainer	25±20% (18.5 ftlb)
Front pipe cable guide on fork retainer	10±20% (7.4 ftlb)

FRONT BODYWORK

Name	Torque in Nm
Right and left air intake on front internal shield retainer	1±20% (0.74 ftlb)
Right and left turn indicators on front external shield retainer	1±20% (0.74 ftlb)
Front headlamp on front external shield retainer	1±20% (0.74 ftlb)
Front external shield on cover retainer	1±20% (0.74 ftlb)
Front external shield on lower shield retainer	1±20% (0.74 ftlb)
Front mudguard clamp on fork retainer	1±20% (0.74 ftlb)
Front external shield on under-footrest retainer	3±20% (2.22 ftlb)
Front mudguard on clamps retainer	5±20% (3.7 ftlb)
Case on front internal shield retainer	2±20% (1.48 ftlb)

FILTER HOUSING

Name	Torque in Nm
Sleeve on carburettor retainer	2±20% (1.48 ftlb)
Sleeve on filter housing retainer	2±20% (1.48 ftlb)
Filter housing on engine retainer	8±20% (5.92 ftlb)

COOLING UNIT

Name	Torque in Nm
Thermal switch retainer	20±20% (14.8 ftlb)
Head pipe on radiator retainer	2±20% (1.48 ftlb)
Pump pipe on radiator retainer	2±20% (1.48 ftlb)
Radiator on bulkhead retainer	7±20% (5.18 ftlb)
Electric fan on radiator retainer	1±20% (0.74 ftlb)
Expansion tank on air deflector retainer	4±20% (2.96 ftlb)

FRONT WHEEL

Name	Torque in Nm
Pin retainer	50±20% (37 ftlb)
Safety screw retainer	10±20% (7.4 ftlb)

LINK ROD

Name	Torque in Nm
Connecting rod to chassis retainer	60±20% (44.4 ftlb)
Connecting rod to engine retainer	40±20% (29.6 ftlb)
Chassis connecting rod on engine connecting rod retainer	60±20% (44.4 ftlb)
Silent-block on chassis retainer	50±20% (37 ftlb)

EXHAUST

Name	Torque in Nm
Manifold to engine retainer	15±20% (11.1 ftlb)
Muffler to manifold retainer	16±20% (11.84 ftlb)
Muffler on plate retainer	25±20% (18.5 ftlb)
Protection on muffler retainer	7±20% (5.18 ftlb)

REAR WHEEL

Name	Torque in Nm
Rear wheel retainer	110±20% (81.4 ftlb)
Speed sensor screw retainer	10±20% (7.4 ftlb)
Speed sensor on muffler plate retainer	10±20% (7.4 ftlb)

STAND

Name	Torque in Nm
Stand to engine retainer	27±20% (19.98 ftlb)

ENGINE

Name	Torque in Nm
Muffler plate on engine	25±20% (18.5 ftlb)
Fuel breather pipe cable guide on crankcase	10±20% (7.4 ftlb)

REAR SUSPENSION

Name	Torque in Nm
Right and left shock absorber to chassis retainer	40±20% (29.6 ftlb)
Shock absorber on engine bracket retainer	40±20% (29.6 ftlb)
Shock absorber on muffler plate retainer	40±20% (29.6 ftlb)
Shock absorber bracket on engine retainer	25±20% (18.5 ftlb)

FUEL SUPPLY SYSTEM

Name	Torque in Nm
Probe to tank retainer	1.5±20% (1.11 ftlb)
Fuel coupling clamp retainer	1±20% (0.74 ftlb)
Tank to helmet compartment retainer	2±20% (0.74 ftlb)
Petrol pump on helmet compartment retainer	2±20% (1.48 ftlb)

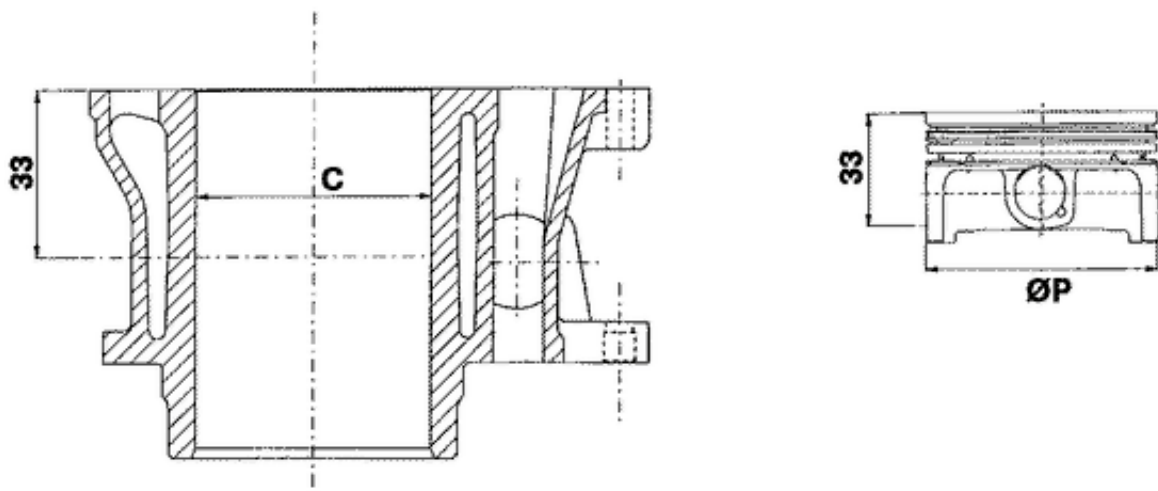
Overhaul data

Assembly clearances

Cylinder - piston assy.

Piston: the category marking is on the piston crown.

Cylinder: the category marking is on the external side of the cylinder.



CYLINDER - PISTON COUPLING CATEGORY

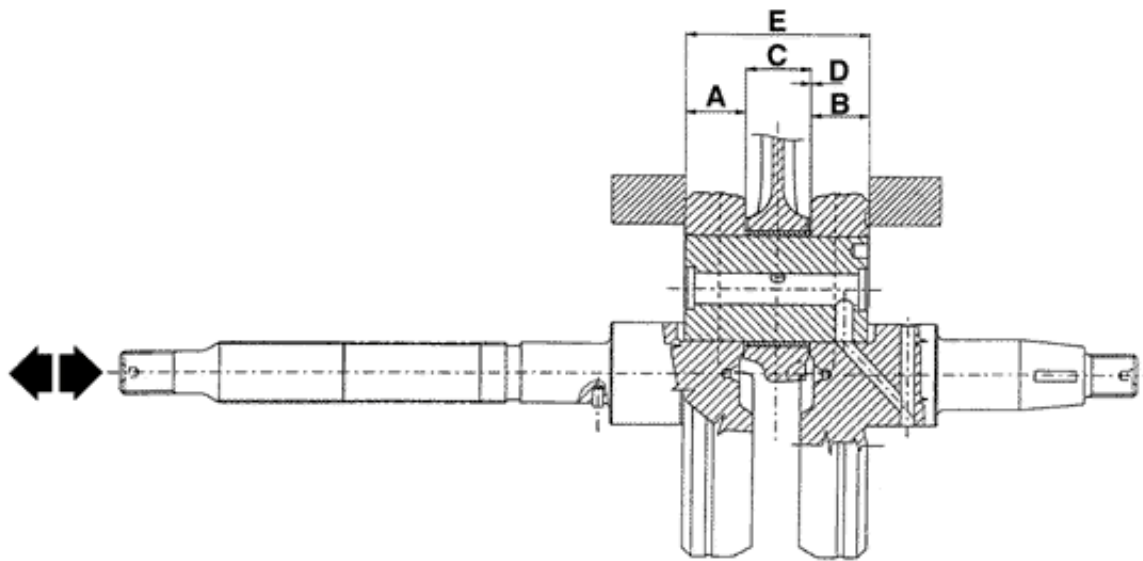
Name	Initials	Cylinder	Piston	Play on fitting
Cylinder - Piston	M = 1	72.01 ÷ 72.017	71.953 ÷ 71.960	0.050 ÷ 0.064
Cylinder - Piston	N = 2	72.017 ÷ 72.024	71.960 ÷ 71.967	0.050 ÷ 0.064
Cylinder - Piston	O = 3	72.024 ÷ 72.031	71.967 ÷ 71.974	0.050 ÷ 0.064
Cylinder - Piston	P = 4	72.031 ÷ 72.038	71.974 ÷ 71.981	0.050 ÷ 0.064

If only the piston is replaced, check the cylinder category taking into account the CYLINDER - PISTON COUPLING CATEGORY table.

CAUTION

THERE IS ONLY ONE CYLINDER CODE IN THE SPARE PART CATALOGUE AND IT IS SUPPLIED TOGETHER WITH THE PISTON.

Crankcase - crankshaft - connecting rod



CRANKSHAFT / CRANKCASE AXIAL CLEARANCE

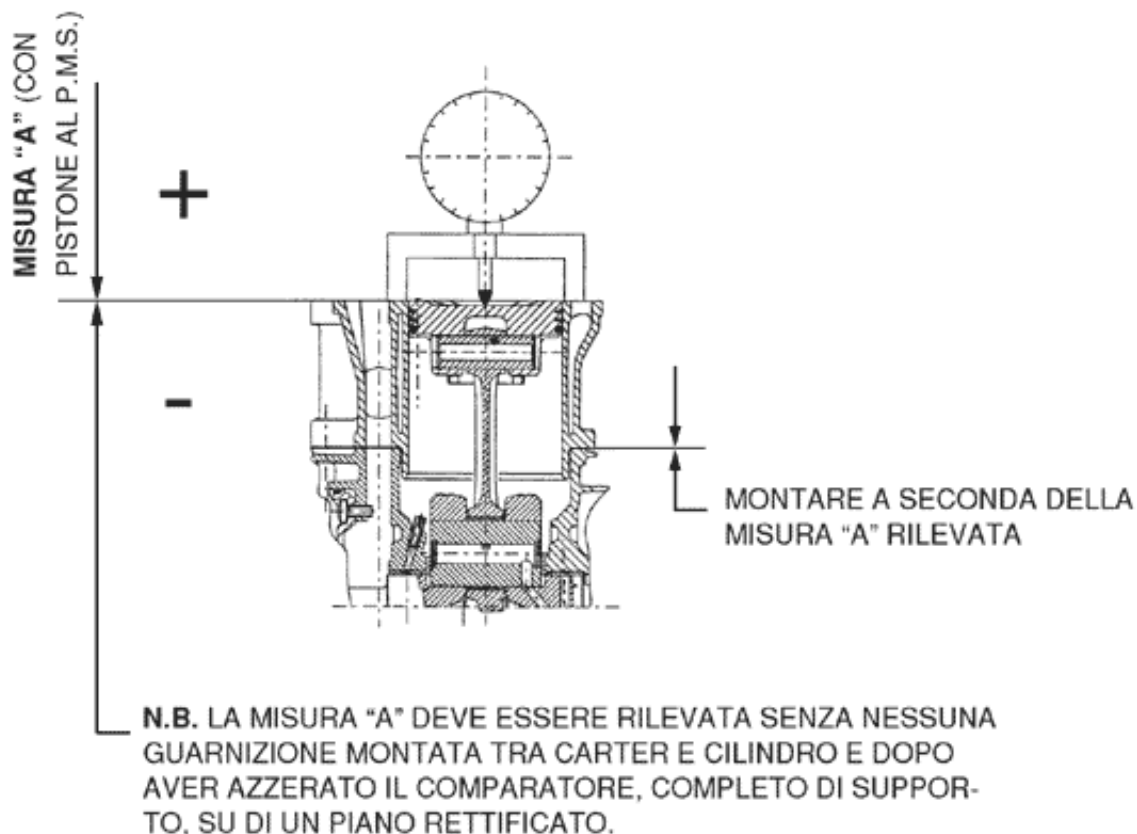
Name	Description	Dimensions	Initials	Quantity
Half shaft, transmission side		16.6 +0-0.05	A	D = 0.20 ÷ 0.50
Half shaft, flywheel side		16.6 +0-0.05	B	D = 0.20 ÷ 0.50
Connecting rod		18 -0.10 -0.15	C	D = 0.20 ÷ 0.50
Spacer tool		51.4 +0.05	E	D = 0.20 ÷ 0.50

Slot packing system

Characteristic

Compression ratio

10.5 ÷ 11.5 : 1



Distance "A" to be measured is a value of piston recess, it indicates by how much the piston crown descends below the plane formed by the cylinder crown. The further the piston enters into the cylinder, the thinner the base gasket to be used should be (to compensate the compression ratio) and vice versa.

NOTE

DISTANCE «A» SHOULD BE MEASURED WITH NO GASKET FITTED BETWEEN THE CRANKCASE AND THE CYLINDER AND AFTER RESETTING THE DIAL GAUGE, WITH SUPPORT, ON A GROUND PLANE

SHIMMING FOR 250 ENGINES

Name	Measure A	Thickness
shimming	3.70 - 3.60	0.4 ± 0.05
shimming	3.60 - 3.40	0.6 ± 0.05
shimming	3.40 - 3.30	0.8 ± 0.05

Products
RECOMMENDED PRODUCTS TABLE

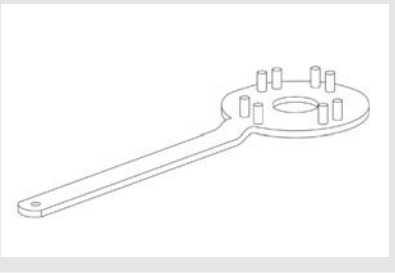
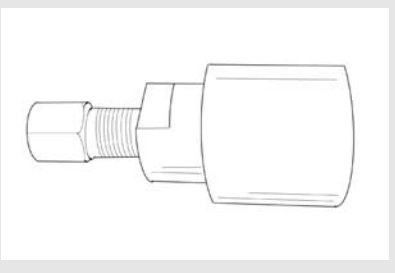


Product	Description	Specifications
AGIP CITY HI TEC 4T	Engine oil	API SL, ACEA A3, JASO MA
AGIP GEAR SYNTH SAE 75W-90	Gearbox oil	API GL4, GL5
AGIP FORK 7.5W	Fork oil	-
AGIP GREASE SM2	Lithium grease with molybdenum for bearings and other points needing lubrication	NLGI 2
AGIP BRAKE 4	Brake fluid	FMVSS DOT4+
AGIP PERMANENT PLUS	Coolant	CUNA NC 956-16

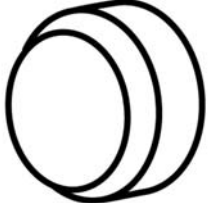
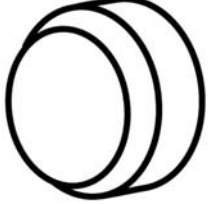
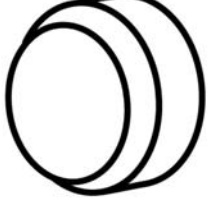
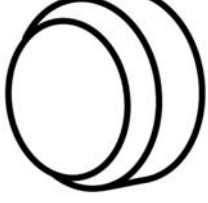

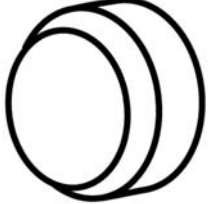
INDEX OF TOPICS

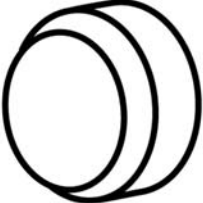
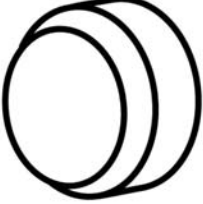
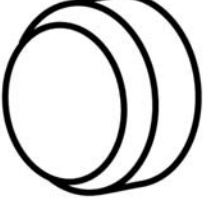
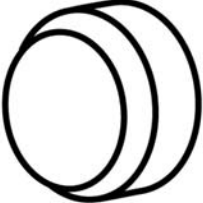
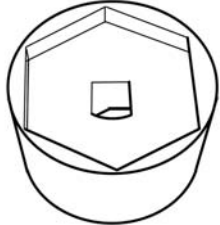
TOOLING


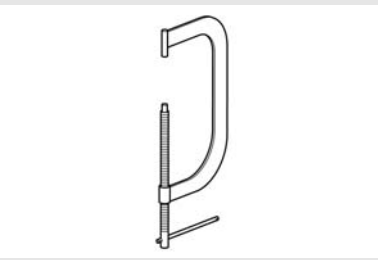

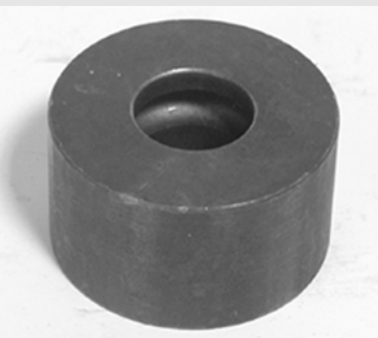
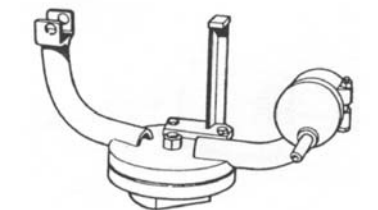
TOOL


SPECIAL TOOLS

Stores code	Description	
AP8140259	Universal tool for clutch assemblies	
AP8140665	Adapter for clutch assembly removal	
AP8140535	Front pulley fitting/removal	
AP8140181	Fuel pressure check tool	
AP8140266	Comparator door	
AP8140729	Chain cover fitting/removal	
AP8140301	Flywheel extractor	
AP8140659	Valve oil seal punch	
AP8140662	Punch for roller casing	
020425Y	Shaft oil seal punch	
020376Y	Punch adaptor	
020455Y	10mm guide for oil seal in water pump shaft	

Stores code	Description	
020412Y	Clutch oil seal punch D 15 mm	
020439Y	Shaft 2 oil seal punch 17 mm	
020359Y	42 x 47 mm punch	
020363Y	Crankshaft oil seal punch D 20 mm	
020456Y	Ø 24 mm punch	
020364Y	25 mm punch	

Stores code	Description	
020414Y	28 mm punch	
020357Y	32x35 mm punch	
020375Y	28x30 mm punch	
020360Y	52x55 mm punch	
AP8140917	Tool for valve pressure plate	
AP8140661	Lock wrench for clutch bell	
AP8140300	55 mm wrench	

Stores code	Description	
020627Y	Flywheel lock wrench	 A black metal tool consisting of a circular ring with a central hole, a long handle, and a smaller cylindrical component.
AP8140179	Support for valve fitting/removal	 A technical line drawing of a U-shaped metal support with a threaded rod and a small pin attached to its base.
AP8140660	Piston fitting ring	
AP8140664	Guide to mount the movable driven pulley	
020483Y	30 mm punch	 A cylindrical metal punch with a threaded rod protruding from its top surface.
020477Y	37 mm punch	 A large, thick cylindrical metal punch with a central hole.
002095Y	Engine support	 A technical line drawing of a complex engine support bracket with various mounting points and a central vertical rod.

Stores code	Description	
AP8140919	Valve oil seal extractor	
AP8140920	Tool for pin rings	
AP8140922	Crankcase splitting strip	
AP8140921	Oil seal punch	
001467Y035	Bell	
020481Y	Adaptor cable harness	
AP8140915	Crankcase check	
AP8140916	Hub cover support	
AP8140252	Multipurpose wrench	
AP8140595	Axone + battery charger (230V 50Hz)	
AP8202311	Axone + battery charger (110V 60Hz)	

INDEX OF TOPICS

MAINTENANCE

MAIN

Maintenance chart
EVERY 2 YEARS**Action**

Coolant - Check

Brake fluid - Change

1,000 KM**Action**

Safety locks - check

Throttle lever - adjustment

Oil filter - Replacement

Electrical system and battery - Check

Coolant level - check

Brake fluid level - check

Engine oil - Replace

Brake pad wear - check

Tyre pressure and wear - check

Vehicle and brake test - test drive

Hub oil - Change

Steering - check up

5,000 KM - 25,000 KM - 35,000 KM - 55,000 KM - 65,000 KM**Action**

Engine oil - Level check/topping-up

Brake pad wear - check

10,000 KM - 50,000 KM - 70,000 KM**Action**

Safety locks - check

Throttle lever - adjustment

Air filter - cleaning

Air filter in belt compartment - Check

Engine oil filter - Replace

Electrical system and battery - Check

Coolant level - check

Brake fluid level - check

Engine oil - Replace

Action

Brake pad wear - check

Tyre pressure and wear - check

Vehicle and brake test - test drive

Hub oil - Check

Suspension - Check

Steering - check up

Sliding block/ variable speed rollers - Replacement

15,000 KM - 45,000 KM - 75,000 KM

Action

Engine oil - Level check/topping-up

Brake pad wear - check

20,000 KM - 40,000 KM - 80,000 KM

Action

Spark plug - Replace

Driving belt - Replacement

Throttle lever - adjustment

Air filter - cleaning

Air filter in belt compartment - Check

Engine oil filter - Replace

Valve clearance - check

Electrical system and battery - Check

Coolant level - check

Brake fluid level - check

Engine oil - Replace

Brake pad wear - check

Sliding block/ variable speed rollers - Replacement

Tyre pressure and wear - check

Vehicle and brake test - test drive

Hub oil - Change

Suspension - Check

Steering - check up

30,000 KM

Action

Safety locks - check

Action

Throttle lever - adjustment

Air filter - cleaning

Air filter in belt compartment - Check

Engine oil filter - Replace

Electrical system and battery - Check

Coolant level - check

Brake fluid level - check

Engine oil - Replace

Brake pad wear - check

Sliding block/ variable speed rollers - Replacement

Tyre pressure and wear - check

Vehicle and brake test - test drive

Hub oil - Check

Suspension - Check

Steering - check up

60,000 KM

Action

Spark plug - Replace

Driving belt - Replacement

Throttle lever - adjustment

Air filter - cleaning

Air filter in belt compartment - Check

Engine oil filter - Replace

Valve clearance - check

Electrical system and battery - Check

Coolant level - check

Brake fluid level - check

Engine oil - Replace

Brake pad wear - check

Sliding block/ variable speed rollers - Replacement

Tyre pressure and wear - check

Vehicle and brake test - test drive

Hub oil - Change

Suspension - Check

Action

Steering - check up

Spark plug

Check and/or replace the spark plug following the instructions in the scheduled maintenance table.

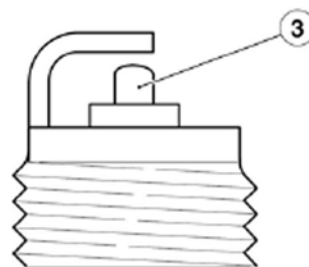
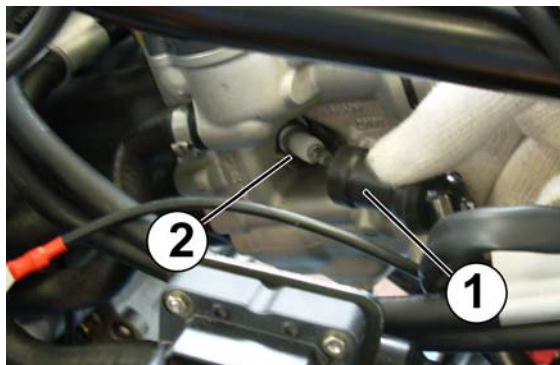
- Remove the spark plug regularly, clean off carbon scales, and replace spark plug if necessary.

To reach the spark plug:

- Remove the right inspection fairing.

For removal and cleaning:

- Remove the tube «1» of the spark plug «2».
- Clean off any trace of dirt from the spark plug base.
- Fit the special spanner supplied in the toolkit to the spark plug.
- Unscrew the spark plug and remove it from its seat, being careful not to let dust or any other substance into the cylinder.
- Check that the spark plug electrode and centre porcelain are free of carbon deposits or signs of corrosion. If necessary, clean using suitable spark plug cleaners and/or a metal brush.
- Replace the spark plug if its insulator is cracked, the electrodes show signs of corrosion or excessive deposits or the top of the central electrode «3» gets rounded.



WARNING



LET THE ENGINE COOL OFF TO AMBIENT TEMPERATURE.

CAUTION

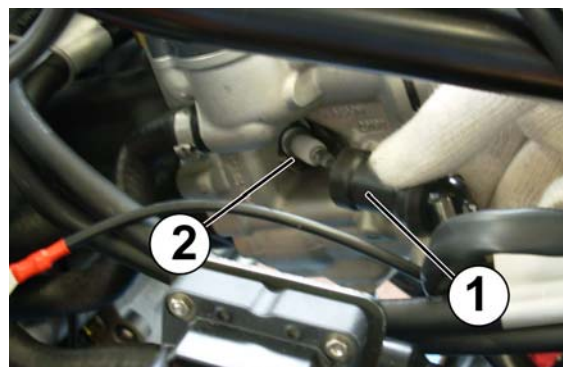
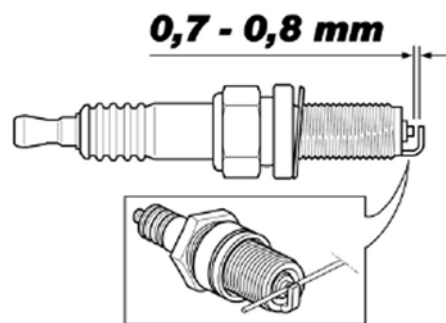


NEVER DISCONNECT THE SPARK PLUG TUBE WHILE THE ENGINE IS RUNNING. IT MAY RESULT IN A STRONG ELECTRIC DISCHARGE FROM THE IGNITION SYSTEM.

Locking torques (N*m)

Spark plug 12÷14 (8.9÷10.3 ftlb)

- Check the gap between the electrodes with a thickness feeler gauge.
- The gap should be 0.7 - 0.8 mm; adjust if necessary by carefully folding the earth electrode.
- Make sure the washer is in good conditions. Once the washer is fitted, manually screw the spark plug to avoid damaging the thread.
- Tighten to the prescribed torque using the spanner supplied in the tool kit; make the spark plug complete 1/2 a turn to press the washer.
- Refit the tube «1» of spark plug «2» adequately so that it does not get detached when exposed to engine vibration.



CAUTION

WHEN REPLACING A SPARK PLUG, CHECK THE PITCH AND LENGTH OF THE THREAD. IF THE THREADED SECTION IS TOO SHORT, CARBON DEPOSITS WILL BUILD UP ON THE

THREAD SEAT AND THUS THE ENGINE MAY GET DAMAGED WHEN THE SUITABLE SPARK PLUG IS REFITTED. USE SPARK PLUGS OF THE RECOMMENDED TYPE ONLY. OTHERWISE, ENGINE LIFE AND PERFORMANCE COULD BE COMPROMISED. CHECK THE GAP BETWEEN THE ELECTRODES WITH A THICKNESS FEELER GAUGE TO AVOID DAMAGING THE PLATINUM COATING.

CAUTION

TIGHTEN THE SPARK PLUG CORRECTLY, OTHERWISE THE ENGINE MAY OVERHEAT AND GET IRRETRIEVABLE DAMAGED.

CAUTION

MAKE SURE THE TUBE «1» ON THE SPARK PLUG «2» IS CORRECTLY POSITIONED.

Hub oil

Ride a few kilometres until the regular working temperature is reached, then shut off the engine.

NOTE

USE RECOMMENDED OIL ONLY. REFER TO THE RECOMMENDED PRODUCTS TABLE.

Check

- Park the vehicle on firm and level ground.
- Rest the vehicle on its centre stand.
- Unscrew and pull out the measuring cap-dipstick.
- Clean the area in contact with oil with a clean cloth.
- Screw the cap-dipstick fully down into its tube.
- Pull out the cap-dipstick again and



read the level the oil reaches on the dipstick.

- The level is correct when it is close to the first notch above the little round mark.
- Top up if required.

**CAUTION**

WAIT SOME MINUTES UNTIL THE ENGINE AND THE EXHAUST SYSTEM ARE COLD.

-
- Pour a small quantity of oil through the fill opening and wait about one minute so that the oil flows evenly into the crankcase.
 - Check the oil level and top-up, if required.
 - Top-up with small quantities of oil, until the recommended level is reached.
 - At the end of the operation, screw and tighten the cap-dipstick.

NOTE

RIDING THE VEHICLE WITH INSUFFICIENT LUBRICATION OR CONTAMINATED OR NOT RECOMMENDED LUBRICANTS ACCELERATES THE WEAR AND TEAR OF MOVING PARTS AND CAN CAUSE IRRETRIEVABLE DAMAGE

Replacement

- Park the vehicle on firm and level ground.
- Rest the vehicle on its centre stand.
- Stop the engine and let it cool down. This will allow the oil to settle into the crankcase and cool down.
- Remove the rear wheel.

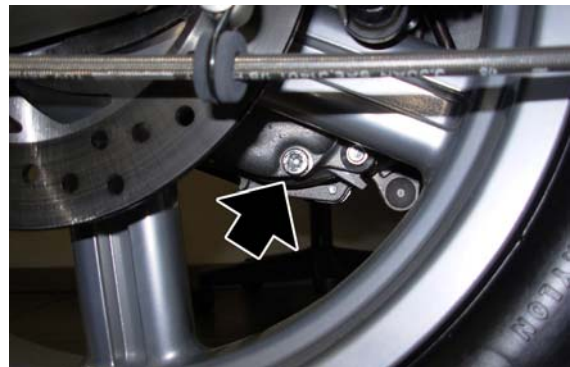
CAUTION

WAIT SOME MINUTES UNTIL THE ENGINE AND THE EXHAUST SYSTEM ARE COLD.

-
- Unscrew and pull out the measuring cap-dipstick.



- Place a +300 cm³ (18.3 cu.in) capacity container under the drain screw. Undo and remove the drain screw.
- Wait until all the oil drains out and screw and tighten the drain screw.
- Add oil through the transmission oil fill opening.
- Screw and tighten the measuring cap-dipstick.
- Start the engine, ride for some kilometres.
- Check the transmission oil level

**CAUTION**

USED OIL CONTAINS SUBSTANCES THAT ARE HARMFUL TO THE ENVIRONMENT. DISPOSE OF USED OIL ACCORDING TO THE REGULATIONS IN FORCE.

Air filter

Clean the air filter and check its condition following the indications specified in the scheduled maintenance table.

Carry out the maintenance procedures more frequently if the vehicle is used in wet or dusty areas, or off road. In this case, the air filter can be partially cleaned after travelling along this kind of

roads.

CAUTION

PARTIAL AIR FILTER CLEANING DOES NOT EXCLUDE NOR POSTPONE AIR FILTER REPLACEMENT.

DO NOT START THE ENGINE WITHOUT THE AIR FILTER.

DO NOT USE PETROL OR SOLVENTS TO CLEAN THE FILTERING ELEMENT; THE FUEL SUPPLY SYSTEM MAY CATCH FIRE POSING A GREAT RISK FOR PEOPLE AND THE VEHICLE ITSELF.



Cleaning

- Remove the filter.
- Wash the filtering element with clean non-inflammable or high volatility solvents and let it dry thoroughly.
- Apply filter oil over the whole surface.

CAUTION

PARTIAL AIR FILTER CLEANING DOES NOT EXCLUDE NOR POSTPONE AIR FILTER REPLACEMENT.

DO NOT START THE ENGINE WITHOUT THE AIR FILTER.

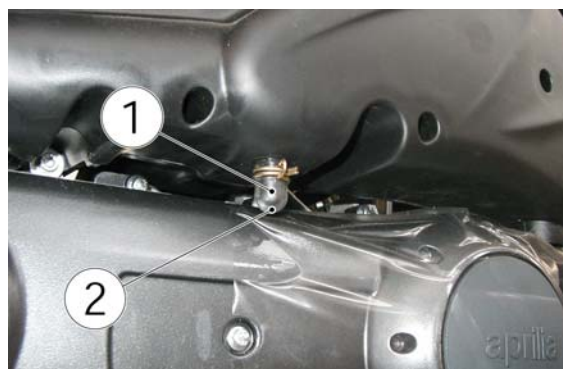
DO NOT USE PETROL OR SOLVENTS TO CLEAN THE FILTERING ELEMENT; THE FUEL SUPPLY SYSTEM MAY CATCH FIRE POSING A GREAT RISK FOR PEOPLE AND THE VEHICLE ITSELF.

- Check the lower part of the bleed pipe «1» for dirt.

CAUTION

REMOVE ANY DEPOSIT THAT MAY HAVE FORMED IN THE BLEED PIPE, COMING FROM THE FILTER HOUSING. PROCEED AS FOLLOWS:

- Remove the cover «2».



- Drain the content in a container; then, send it to a recycling bank.

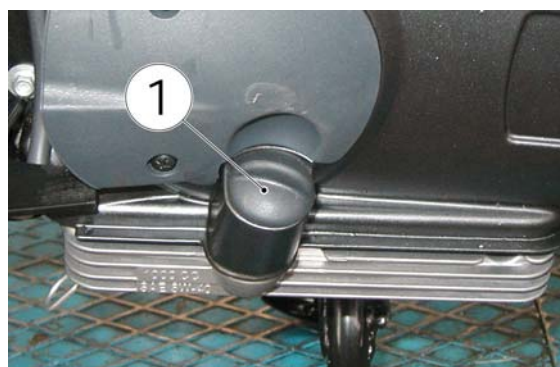
NOTE**NEVER REUSE A FILTER.**

- Replace the air filter with a new one of the same type.

Engine oil

Replacement

- Rest the vehicle on its centre stand.
- Shut off the engine and let it cool down, so that the crankcase oil drains out and cools off.
- Unscrew and pull out the cap-dipstick «1».
- Place a container under the filter to collect the engine oil.

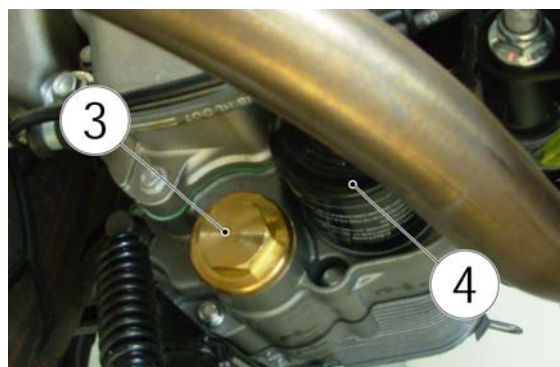
**NOTE**

PARK THE VEHICLE ON SAFE AND LEVEL GROUND.

CAUTION

WAIT SOME MINUTES UNTIL THE ENGINE AND THE EXHAUST SYSTEM ARE COLD.

- Unscrew and remove the cartridge engine oil filter «4».
- Unscrew and remove the oil drainage plug «3» and then drain all the engine oil into the collecting container.
- Fit a new oil cartridge filter «4» and take special care to lubricate the filter sealing O-rings with oil.
- Screw and tighten the engine oil drainage plug «3».



- Pour approx. 1100 cm³ (67.12 cu.in) through the fill opening.
- Screw and tighten the measuring cap-dipstick «1».
- Start the engine and let it run for several minutes.
- Stop the engine and let it cool down.
- Check the engine oil level.

CAUTION

USED OIL CONTAINS SUBSTANCES THAT ARE HARMFUL TO THE ENVIRONMENT. DISPOSE OF USED OIL ACCORDING TO THE REGULATIONS IN FORCE.

Check**ENGINE OIL CHECK**

- Park the vehicle on firm and level ground.
- Rest the vehicle on its centre stand.

CAUTION

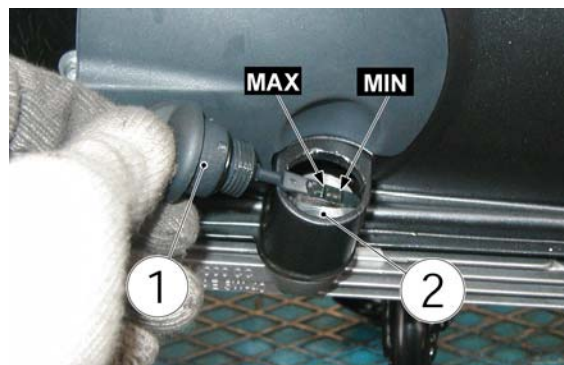
WAIT SOME MINUTES UNTIL THE ENGINE AND THE EXHAUST SYSTEM ARE COLD.

Stop the engine and let it cool down. This will allow the oil to settle into the crankcase and cool down.

NOTE

FAILURE TO FOLLOW THESE OPERATIONS MAY RESULT IN AN INCORRECT READING OF THE ENGINE OIL LEVEL.

- Unscrew and pull out the measuring cap-dipstick «1».
- Clean the area in contact with oil with a clean cloth.
- Screw the cap-dipstick «1» fully down into its tube «2».
- Pull out the cap-dipstick «1» again and read the level the oil reaches on the dipstick:



MAX = maximum level.

MIN = minimum level.

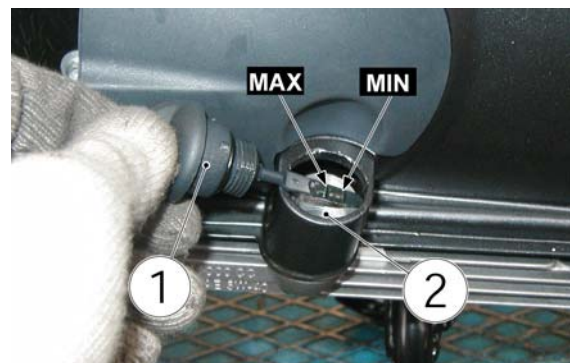
- The difference between the "MAX" and "MIN" levels is around 200 cm³ (12.2 cu.in).
- The level is correct when it is close to the "MAX" level marked on the measuring dipstick.
- Top-up if necessary.

WARNING

DO NOT GO BEYOND THE "MAX" OR BELOW THE "MIN" LEVEL MARKS TO AVOID SEVERE ENGINE DAMAGE.

ENGINE OIL TOP-UP

- Pour a small quantity of oil through the fill opening «2» and wait about one minute so that the oil flows evenly into the crankcase.
- Check the oil level and top-up , if required.
- Top-up with small quantities of oil, until the recommended level is reached.
- At the end of the operation, screw and tighten the cap-dipstick «1».



NOTE

RIDING THE VEHICLE WITH INSUFFICIENT LUBRICATION OR CONTAMINATED OR NOT RECOMMENDED LUBRICANTS ACCELERATES THE WEAR AND TEAR OF MOVING PARTS AND CAN CAUSE IRRETRIEVABLE DAMAGE.

NOTE

**DO NOT EXCEED THE "MAX" MARK WHEN
TOPPING-UP ENGINE OIL.**

Engine oil filter

Change the cartridge filter each time you change the oil. Use only the recommended type of oil to top-up and change.

Make sure the O-rings of the pre-filter and the drainage plug are in good conditions. Lubricate them and refit the mesh filter and the oil drainage plug. Tighten to the prescribed torque. Refit the new cartridge filter being careful to lubricate the O-ring before. Refill with engine oil.

Recommended products

AGIP CITY HI TEC 4T Engine oil

SAE 5W-40 Synthetic oil that exceeds the requirements of API SL, ACEA A3, JASO MA specifications

Oil pressure warning light

The vehicle has an icon on the display and a general alarm warning light, on the instrument panel, that light up when the key is turned to «ON». This light should however go off once the engine is started.

In case the icon and the telltale light turn on when braking, at idle speed or on a bend, check the oil level and the lubrication system.



Transmissions

THROTTLE GRIP REMOVAL

- Undo and remove the two screws.



- Remove the throttle grip cable.



- Remove the throttle grip.



THROTTLE GRIP REFITTING

- Carry out the operations but in the reverse order, making sure to match the hole (1) with the pin (2).



Checking the ignition timing

- Remove the plastic cap on the flywheel cover
- Turn the flywheel until the reference mark «T» on the rotor matches the reference mark on the flywheel cover as shown in the figure (TDC).

Make sure that the reference 4V on the camshaft control pulley is aligned with the reference point on the head, as shown in the second figure. If the reference mark is opposite the mark on the head, make the crankshaft turn once more.

To use this reference mark, remove the spark plug and make the engine spin opposite its normal direction of rotation applying a calliper spanner to the camshaft control pulley casing.



Cooling system

Radiator cleaning

- Remove the front case.
- Wash the radiator with a blast of pressure water.
- Blow the radiator with compressed air.

NOTE

IT IS NOT NECESSARY TO REMOVE THE RADIATOR

Level check

- Stop the engine and wait until it cools down.
- Remove the front case
- Make sure that the coolant level in the expansion tank «1» is between the "MIN" and "MAX" reference marks.

MIN = minimum level.

MAX = maximum level.

CAUTION



WAIT FOR THE ENGINE TO COOL DOWN BEFORE CHECKING OR TOPPING-UP THE COOLANT LEVEL.

NOTE

PARK THE VEHICLE ON SAFE AND LEVEL GROUND.

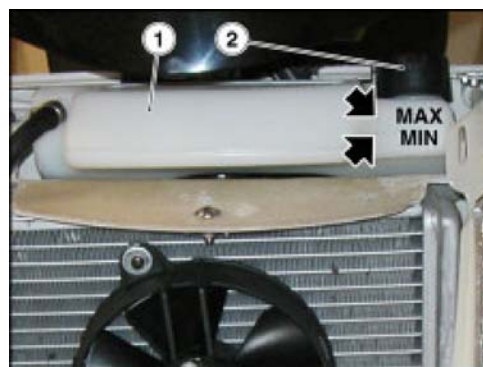
Otherwise:

- Loosen but do not remove the filler cap «2» (by rotating it twice anticlockwise).
- Wait for some seconds so that any pressure may be purged.
- Unscrew and remove the cap.

CAUTION

DO NOT ADD ADDITIVES OR OTHER SUBSTANCES TO THE FLUID.

- Top-up with recommended coolant until the fluid level is near the "MAX" reference mark.
- Do not exceed this level. Otherwise, the coolant will spill out when the engine is running.
- Refit the filler cap «2».



CAUTION

IF THERE IS AN EXCESSIVE CONSUMPTION OF COOLANT OR WHEN THE EXPANSION TANK REMAINS EMPTY, CHECK THAT THERE ARE NO LEAKS IN THE CIRCUIT. FOR REPAIRS, TAKE YOUR VEHICLE TO AN OFFICIAL APRILIA DEALER.

Recommended products

AGIP PERMANENT PLUS Coolant

CUNA NC 956-16

Top-up

- Top-up with coolant until the fluid level is near the "MAX" level.
- Refit the filler cap «2».

- Refit the front case.

CAUTION

DO NOT ADD ADDITIVES OR ANY OTHER SUBSTANCES TO THE FLUID. IF A FUNNEL IS USED, MAKE SURE IT IS PERFECTLY CLEAN.

CAUTION

IF THERE IS AN EXCESSIVE CONSUMPTION OF COOLANT OR WHEN THE EXPANSION TANK REMAINS EMPTY, CHECK THAT THERE ARE NO LEAKS IN THE CIRCUIT. FOR REPAIRS, TAKE YOUR VEHICLE TO AN OFFICIAL APRILIA DEALER.

Recommended products

AGIP PERMANENT PLUS Coolant

CUNA NC 956-16

Braking system

The following operations refer to both braking systems.

CAUTION

PURGE THE AIR IN THE SYSTEM IN CASE OF EXCESSIVE TRAVEL OF THE BRAKE LEVER, EXCESSIVE ELASTICITY OR AIR BUBBLES IN THE CIRCUIT.

DO NOT USE OR MIX DIFFERENT SILICON- OR PETROLEUM-BASED COOLANT TYPES.

PAY UTMOST ATTENTION THAT NO WATER OR DUST INADVERTENTLY GETS INTO THE CIRCUIT.

Level check**CAUTION**

PURGE THE AIR IN THE SYSTEM IN CASE OF EXCESSIVE TRAVEL OF THE BRAKE LEVER, EXCESSIVE ELASTICITY OR AIR BUBBLES IN THE CIRCUIT.

DO NOT USE OR MIX DIFFERENT SILICON- OR PETROLEUM-BASED COOLANT TYPES.

PAY UTMOST ATTENTION THAT NO WATER OR DUST INADVERTENTLY GETS INTO THE CIRCUIT.

NOTE

THE FOLLOWING OPERATIONS REFER TO BOTH BRAKING SYSTEMS.

Checking**NOTE**

PARK THE VEHICLE ON SAFE AND LEVEL GROUND.

- Park the vehicle on its centre stand on safe and level ground.
- Make sure that the fluid level in the reservoir is above the "MIN" mark.

If the fluid does not reach at least the "**MIN**" reference mark:

CAUTION**BRAKE FLUID LEVEL DECREASES GRADUALLY AS BRAKE PADS WEAR DOWN.**

- Check the brake pads for wear.
- Top-up fluid level if the break pads and/or disc are not to be replaced.

Top-up

- Undo and remove the two screws.

CAUTION

RISK OF BRAKE FLUID SPILLS. DO NOT PULL THE FRONT BRAKE LEVER WHEN THE SCREWS ARE LOOSE OR, MAINLY, WHEN THE BRAKE FLUID RESERVOIR COVER HAS BEEN REMOVED. PLACE A CLOTH UNDER THE BRAKE FLUID RESERVOIR TO PROTECT IT FROM ANY FLUID SPLASHES.



- Lift and remove the cover «1».
- Remove the gasket «2».
- Top-up the reservoir «3» with brake fluid up to the right level.
- Follow the reverse order for refitting the components.

**CAUTION**

DO NOT SHAKE THE VEHICLE TO AVOID BRAKE FLUID SPLASHING DURING TOP-UP.

CAUTION

AVOID PROLONGED AIR EXPOSURE OF THE BRAKE FLUID. BRAKE FLUID IS HYGRO-

SCOPIC AND ABSORBS MOISTURE WHEN IN CONTACT WITH AIR. LEAVE THE BRAKE FLUID RESERVOIR OPEN ONLY FOR THE TIME NEEDED TO COMPLETE THE TOPPING UP PROCEDURE.

CAUTION

DO NOT FILL UP THE TANK TO THE MAXIMUM, BUT JUST OVER THE "MIN" LEVEL. TOP-UP TO MAXIMUM LEVEL MARK ONLY WHEN BRAKE PADS ARE NEW. BRAKE LEVEL DECREASES GRADUALLY AS BRAKE PADS WEAR DOWN. IT IS ADVISABLE NOT TO TOP-UP TO THE MAX LEVEL MARK WHEN THE BRAKE PADS ARE WORN BECAUSE YOUR RISK SPILLING FLUID WHEN CHANGING THE BRAKE PADS.



System check

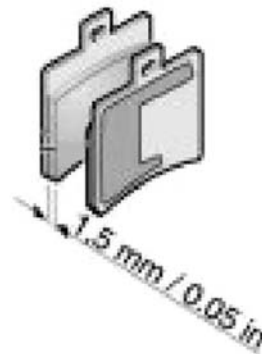
Rear brake calliper

To carry out a quick pad wear check:

- Rest the vehicle on its centre stand.
- Visually check with a light and a mirror between the calliper and the brake pads, in the following way:
- From the back top side for both brake pads.



When the friction material thickness (even if in one pad only) is worn to about 1.5 mm (0.05 in), replace both brake pads.



Front brake calliper

THIS OPERATION APPLIES TO BOTH FRONT
CALLIPERS

To check brake pad wear:

- Rest the scooter on its centre stand.
- Remove the front brake calliper.
- Carry out a visual inspection.



Replace both brake pads when the friction material (even if in one brake pad only) is worn to about 1.5 mm (0.05 in).

INDEX OF TOPICS

TROUBLESHOOTING

TROUBL

Engine

Excessive oil consumption/Exhaust smoke

EXCESSIVE WEAR

Possible Cause	Operation
Incorrect valve adjustment	Adjust valve clearance adequately
Overheated valves	Remove the head and the valves, grind or replace the valves
Deformed/worn valve seat	Replace the head unit
Worn cylinder, Piston ring worn or broken	Replace the cylinder piston unit or the piston rings
Piston rings worn, broken or not adequately fitted	Replace the cylinder piston unit or just the rings
Oil leakage from the couplings or the gaskets	Check and replace the gaskets or restore the coupling sealing
Valve oil seal worn	Replace the valve oil seal
Valve guides worn	Check the head unit and replace it, if required

Insufficient lubrication pressure

POOR LUBRICATION PRESSURE

Possible Cause	Operation
By-Pass remains open	Check the By-Pass and replace it, if required. Carefully clean the By-Pass area.
Oil pump with excessive clearance	Check the sizes of the oil pump components
Oil filter too dirty	Replace the cartridge filter
Oil level too low	Fill up to the correct level with recommended oil type

Clutch grabbing or performing inadequately

IRREGULAR CLUTCH PERFORMANCE OR SLIPPAGE

Possible Cause	Operation
Faulty clutch	Check that there is no grease on the masses. Check that the faying surface between the clutch masses and the clutch bell is mainly in the middle and with equivalent characteristics on the three masses. Check that the clutch bell is not scored or abnormally worn

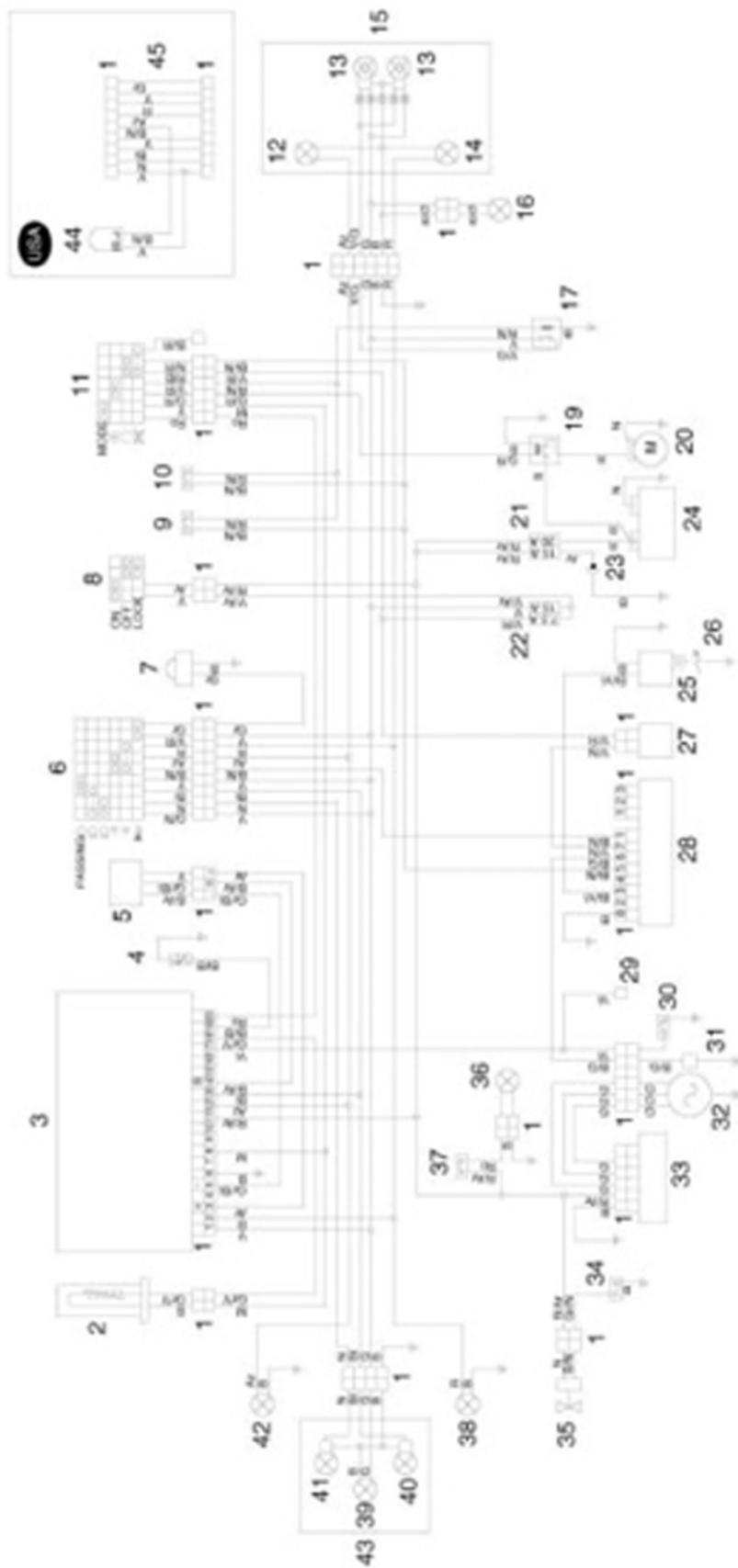
Suspension oil leakage**OIL LEAKAGE FROM SUSPENSION**

Possible Cause	Operation
Seals faulty or damaged	Replace the shock absorber. Check the wear conditions of the head set cups and the adjustments.

INDEX OF TOPICS

ELECTRICAL SYSTEM

ELE SYS



KEY:

1. Multiple connectors
2. Fuel sensor
3. Instrument panel
4. Water thermistor
5. Speed sensor
6. Left light switch
7. Horn
8. Key switch
9. Front stop switch
10. Rear stop switch
11. Right light switch
12. Rear left turn indicator
13. Tail light/stop light twin bulb
14. Rear right turn indicator
15. Complete rear light
16. License plate light
17. Stop lights/start-up enabling switch relay
18. -
19. Start-up relay
20. Starter motor
21. Main fuses
22. Auxiliary fuses
23. Plug socket
24. Battery
25. HV coil
26. Spark plug
27. Automatic starter
28. CDI control unit
29. Connector for oil sensor (only)
30. Oil pressure sensor
31. Pick up
32. Generator
33. Voltage regulator
34. Thermoswitch
35. Fan

- 36. Glove-box light
- 37. Glove-box light switch
- 38. Front right turn indicator
- 39. Front headlamp tail light
- 40. High-beam bulb
- 41. Low-beam bulb
- 42. Front left turn indicator
- 43. Complete front headlamp
- 44. Det. Blinker (only)
- 45. Kit for det. blinker (only)

CABLE COLOUR

Ar orange

Az sky blue

B blue

Bi white

G yellow

Gr grey

M brown

N black

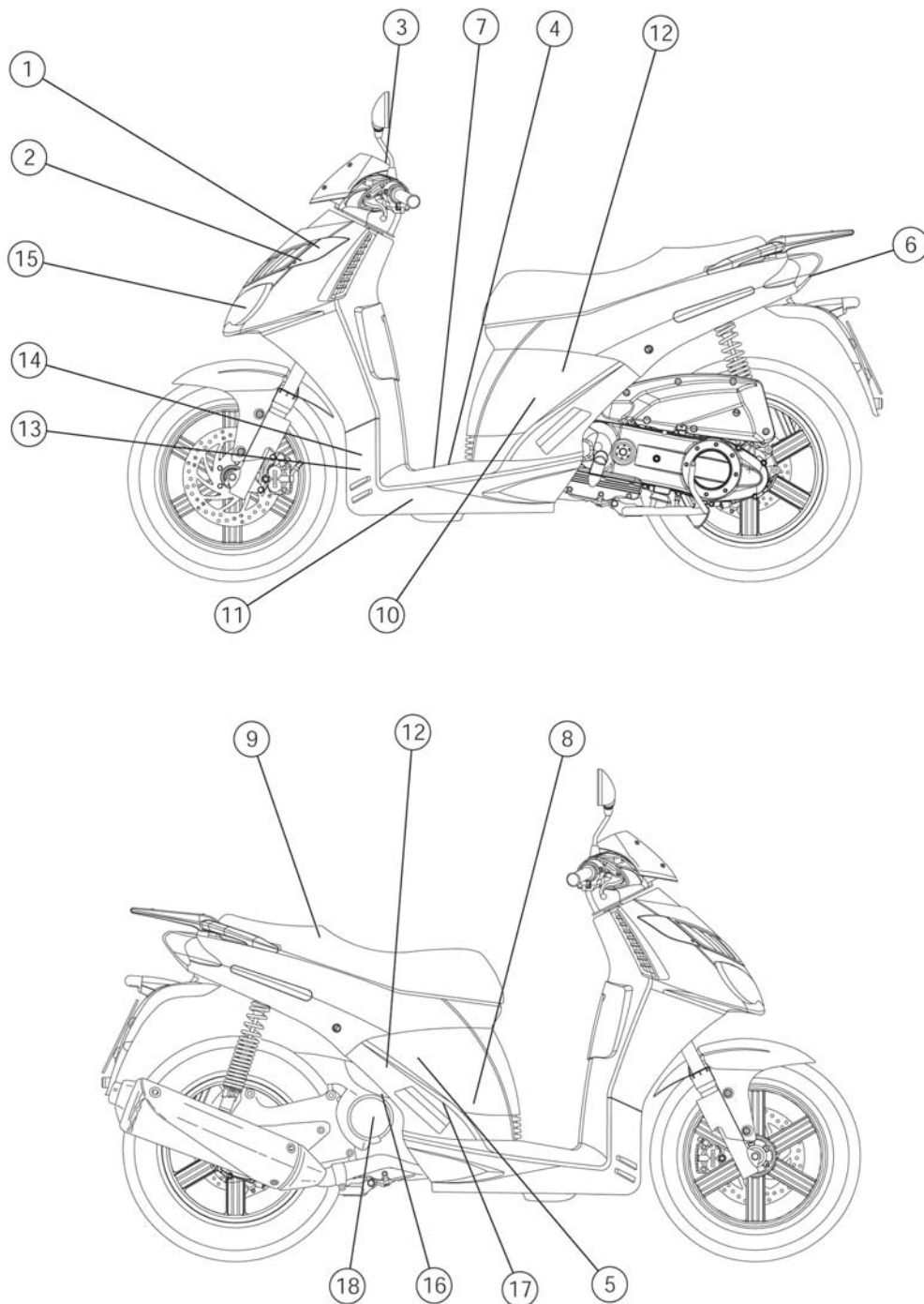
R red

V green

Vi purple

Ro pink

Components arrangement

**KEY:**

1. Front turn indicators
2. Electric fan
3. Instrument panel
4. Battery
5. Coil

-
6. Rear light unit
 7. Fuses
 8. Spark plug
 9. Fuel level sensor
 10. Automatic starter
 11. Voltage regulator
 12. Control unit
 13. Start-up relay
 14. Horn
 15. Front headlamp
 16. Pick-up sensor
 17. Water temperature sensor
 18. Generator
-

1 Front turn indicators

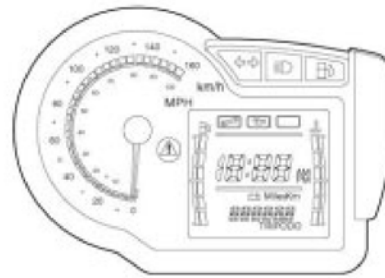
Turn indicator light: 12V - 10W



2 Electric fan

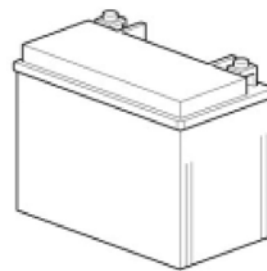


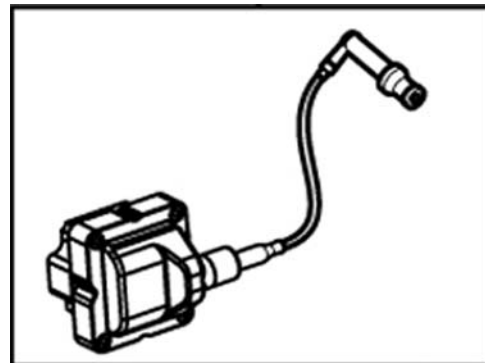
3 Instrument panel



4 Battery

12V - 10 Ah

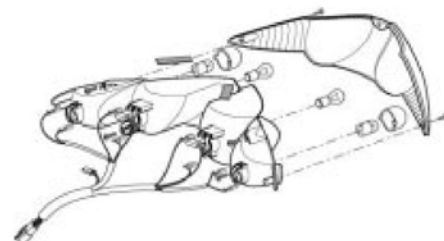


5 CoilPrimary resistance: $0.2 \pm 10\%$ Ohm at 20 °C (68 °F)Secondary resistance: $2.9 \pm 10\%$ Ohm at 20 °C (68 °F)

6 Rear light unit

Tail light / stop light: 12V - 5/21W

Turn indicator light: 12V - 10W



7 Fuses**Main Fuses:****20A fuse (1):**

From the battery to ignition switch, voltage regulator, electric fan.

15A fuse (2):

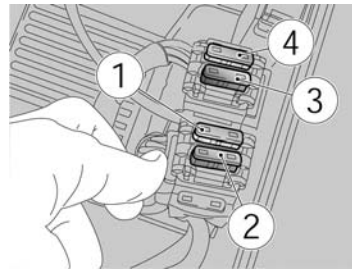
From the ignition switch to all light loads and horn.

Auxiliary fuses:**15A fuse (3):**

From the ignition switch to all light loads and horn.

15A fuse (4):

From the ignition switch to ignition.

**8 Spark plug**

NGK CR7EB, alternatively:

NGK CR8EB

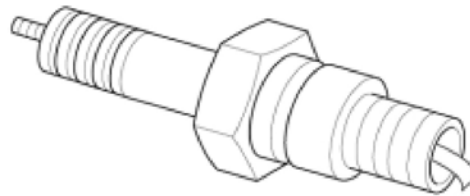
NGK CR9EB

CHAMPION RG6YC

CHAMPION RG4HC

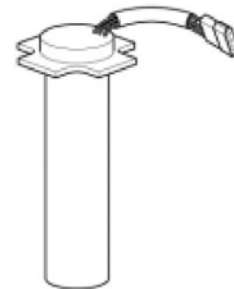
Spark plug electrode gap: 0.7. 0.8mm

Spark plug cap resistance: 5 K

**9 Fuel level sensor**

Full tank $100 \pm 10\%$ Ohm

Full tank $1200 \pm 10\%$ Ohm

**10 Automatic starter**

Approximately 30 Ohm at 20 °C (68 °F)

**11 Voltage regulator**

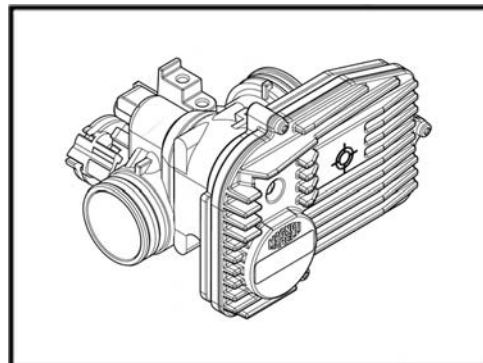
(SH640D)

Recharging voltage:

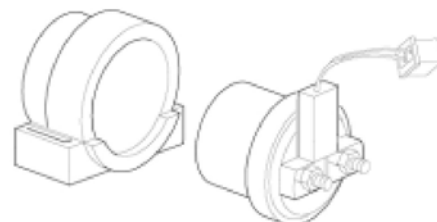
- to terminals, off-load: 13/15 V at 5000 RPM

**12 Control unit**

MARELLI

**13 Start-up relay**

12 V / 150 A

**14 Horn**

LEB 12 V 4A



15 Front headlamp

Low-/high-beam lights: 12 V - 55 W . H7

Front position light: 12V - 5W

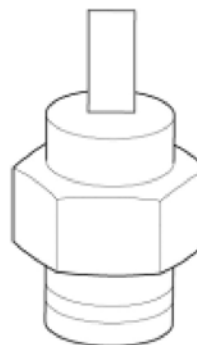
**16 Pick-up sensor**

Winding resistance: 105±10% Ohm at 20 °C (68 °F)

17 Water temperature sensor100 (°C) 212 (°F) 144 Ohm **80 (°C) 176 (°F) 262****Ohm**

60 (°C) 140 (°F) 512 Ohm

40 (°C) 104 (°F) 1090 Ohm

**18 Generator**

permanent magnet, 12 V - 300 W

Stator coil resistance:

0.1 - 1 Ohm at 20 °C (68 °F)

Off-load generated voltage:

> 50 V to 5000 RPM



CABLE COLOUR

Ar orange

Az sky blue

B blue

Bi white

G yellow

Gr grey

M brown

N black

R red

Ro pink

V green

Vi purple

NOTE

NUMBERS DISPLAYED ON THE SPECIFIED ELECTRICAL CIRCUIT DIAGRAMS CORRESPOND TO THE GENERAL ELECTRIC CIRCUIT DIAGRAM.

Disconnect the two electrical connectors strictly observing the following procedure:

- Press the relevant safety hooks, if any.

CAUTION

DO NOT PULL THE CABLES TO DISCONNECT THE TWO CONNECTORS.

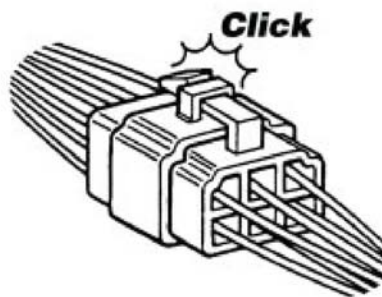
Grip the two connectors and disconnect them by pulling them in opposite directions.

- If there are signs of dirt, rust, humidity, etc., clean the connector internal parts carefully by using a pressurised air jet.
- Make sure that the cables are correctly linked to the connector internal terminal ends.

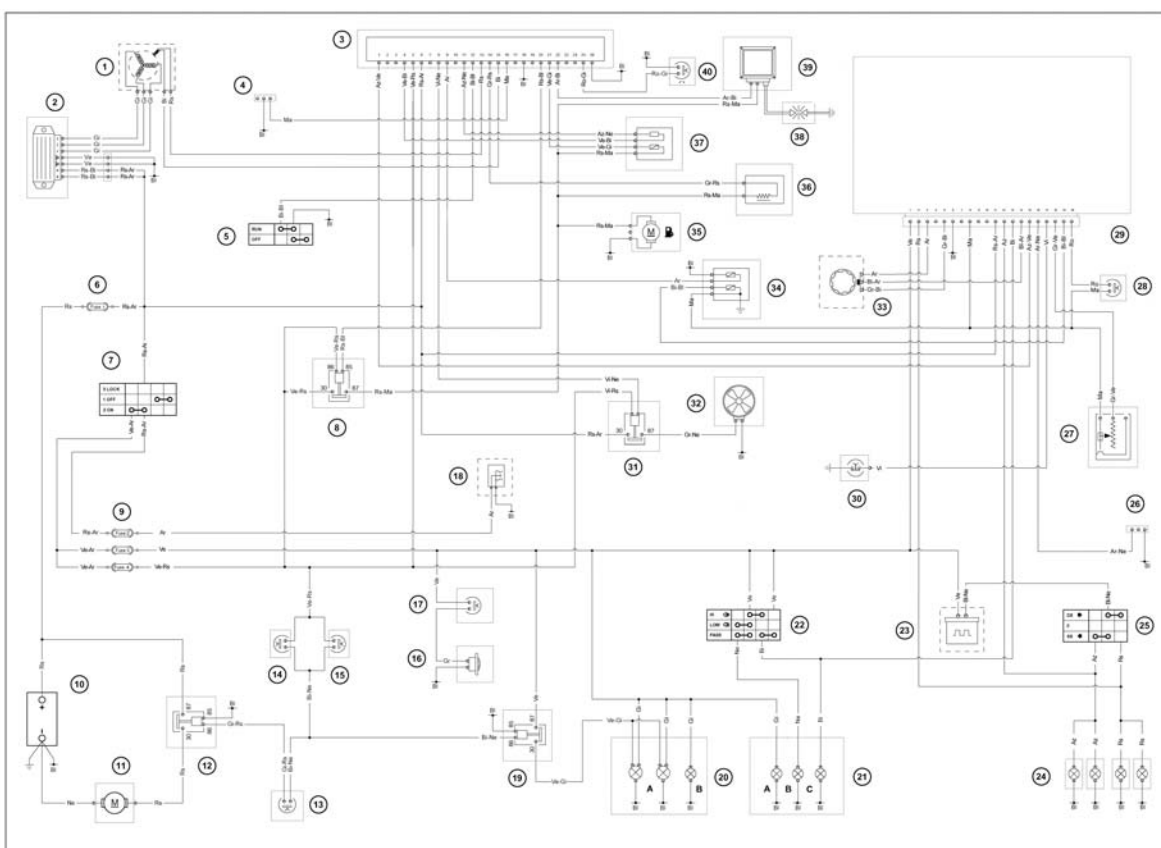
NOTE

THE TWO CONNECTORS CONNECT ONLY FROM ONE SIDE; CONNECT THEM THE RIGHT WAY ROUND

Then fit the two connectors making sure that they couple correctly (if the relevant safety hooks are provided, you will hear them "click" into place).



Conceptual diagrams



1. Magneto flywheel-Pick up
2. Voltage regulator
3. Injection electronic control unit
4. ECU Diag.
5. Engine stop switch
6. Main fuse
7. Key switch
8. Injection load remote control

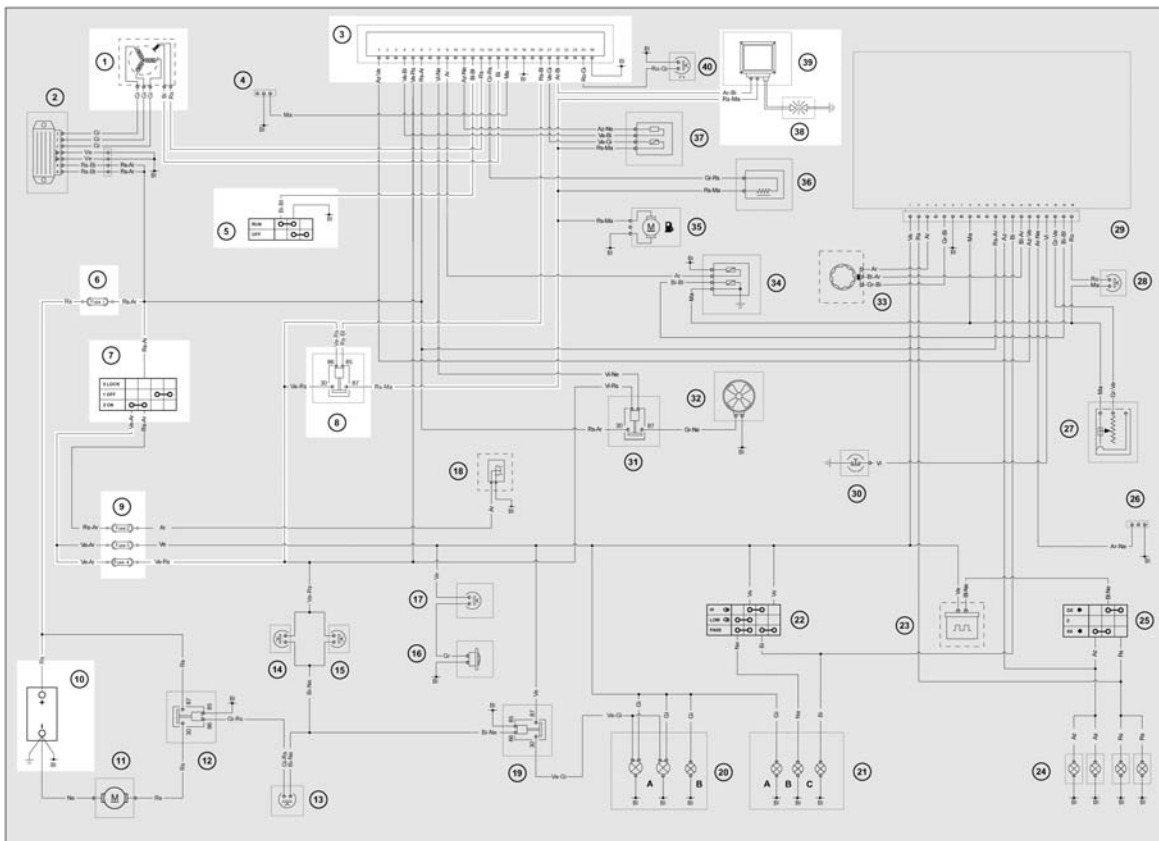
- 9. Auxiliary fuses
- 10. Battery
- 11. Starter motor
- 12. Start-up remote control switch
- 13. Starter button
- 14. Front stop switch
- 15. Rear stop switch
- 16. Horn
- 17. Horn button
- 18. Plug socket
- 19. Stop light remote control
- 20. Rear light unit
 - A. Tail light/stop light twin bulb
 - B. License plate light bulb
- 21. Front headlight assembly
 - A. Tail light
 - B. Low-beam headlight bulb
 - C. High-beam headlight bulb
- 22. Light switch
- 23. Turn indicator control device
- 24. Turn indicator bulbs
- 25. Turn indicator switch
- 26. Instrument panel diag.
- 27. Fuel level transmitter
- 28. Scroll switch
- 29. Instrument panel
- 30. Oil pressure sensor
- 31. Electric fan remote control
- 32. Electric fan
- 33. Speed sensor
- 34. Engine temperature sensor
- 35. Fuel pump
- 36. Fuel injector
- 37. Lambda probe
- 38. Spark plug

39. HV coil

40. Fall sensor

Key

Ar: Orange **Az:** Sky blue **Bi:** White **Bl:** Blue **Gi:** Yellow **Gr:** Grey **Ma:** Brown **Ne:** Black **Ro:** Pink **Rs:** Red **Ve:** Green **Vi:** Purple

Ignition

1. Magneto flywheel-Pick up

3. Injection electronic control unit

5. Engine stop switch

6. Main fuse

7. Key switch

8. Injection load remote control

9. Auxiliary fuses

10. Battery

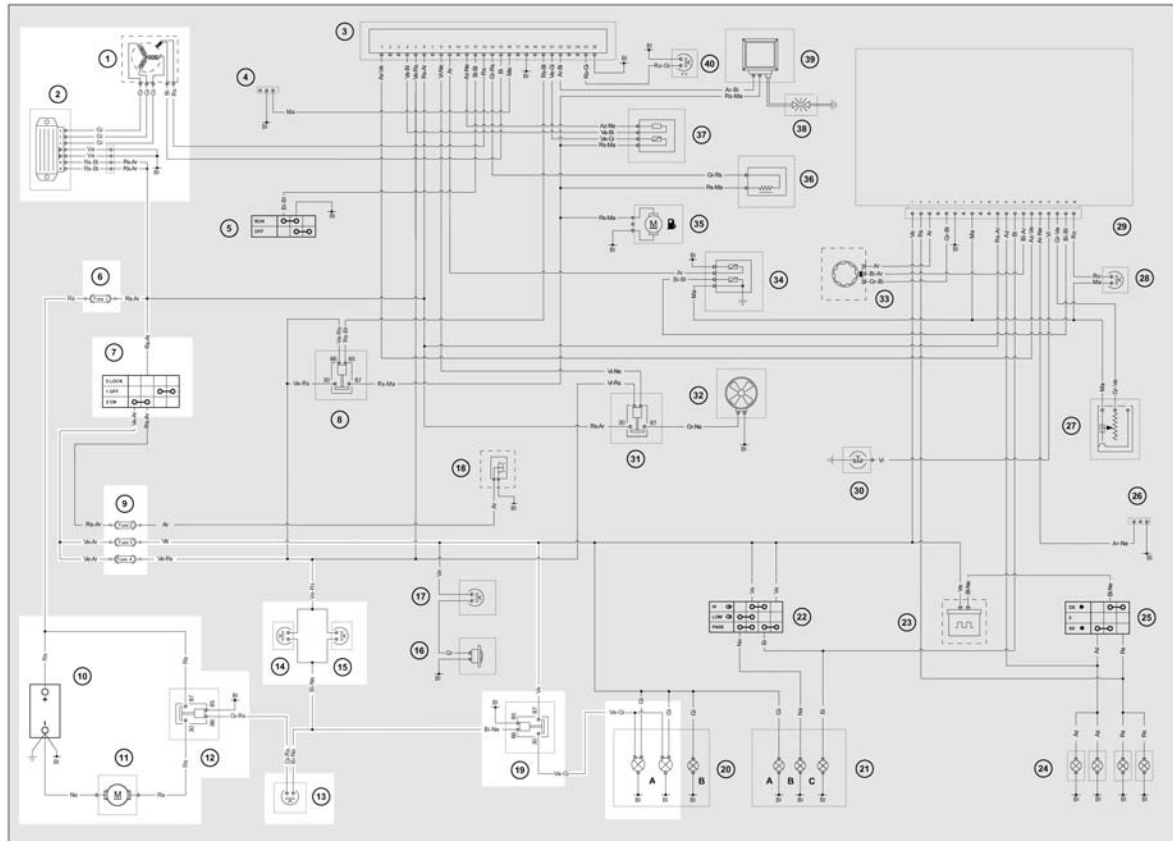
38. Spark plug

39. HV coil

Key

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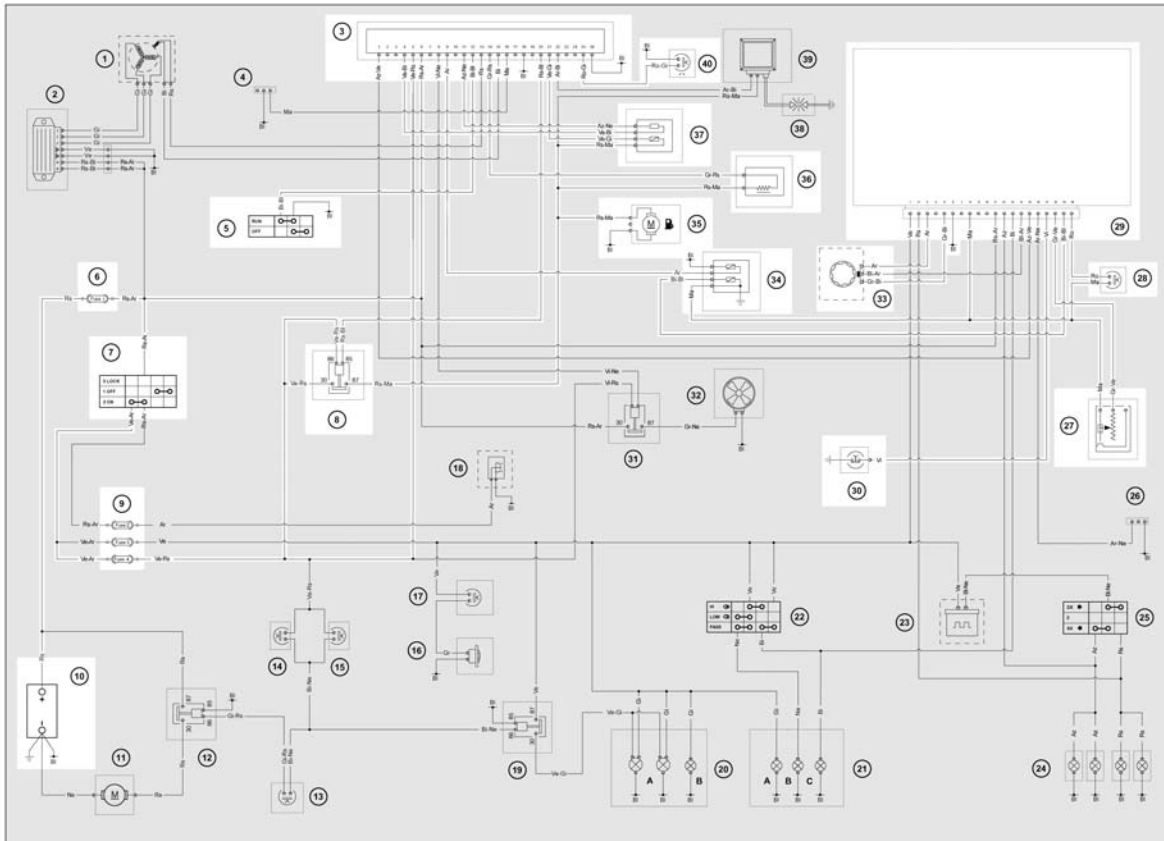
Battery recharge and starting



1. Magneto flywheel-Pick up
2. Voltage regulator
6. Main fuse
7. Key switch
9. Auxiliary fuses
10. Battery
11. Starter motor
12. Start-up remote control switch
13. Starter button
14. Front stop switch
15. Rear stop switch
19. Stop light remote control
20. Rear light unit
- A. Tail light/stop light twin bulb

Key

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Level indicators and enable signals section

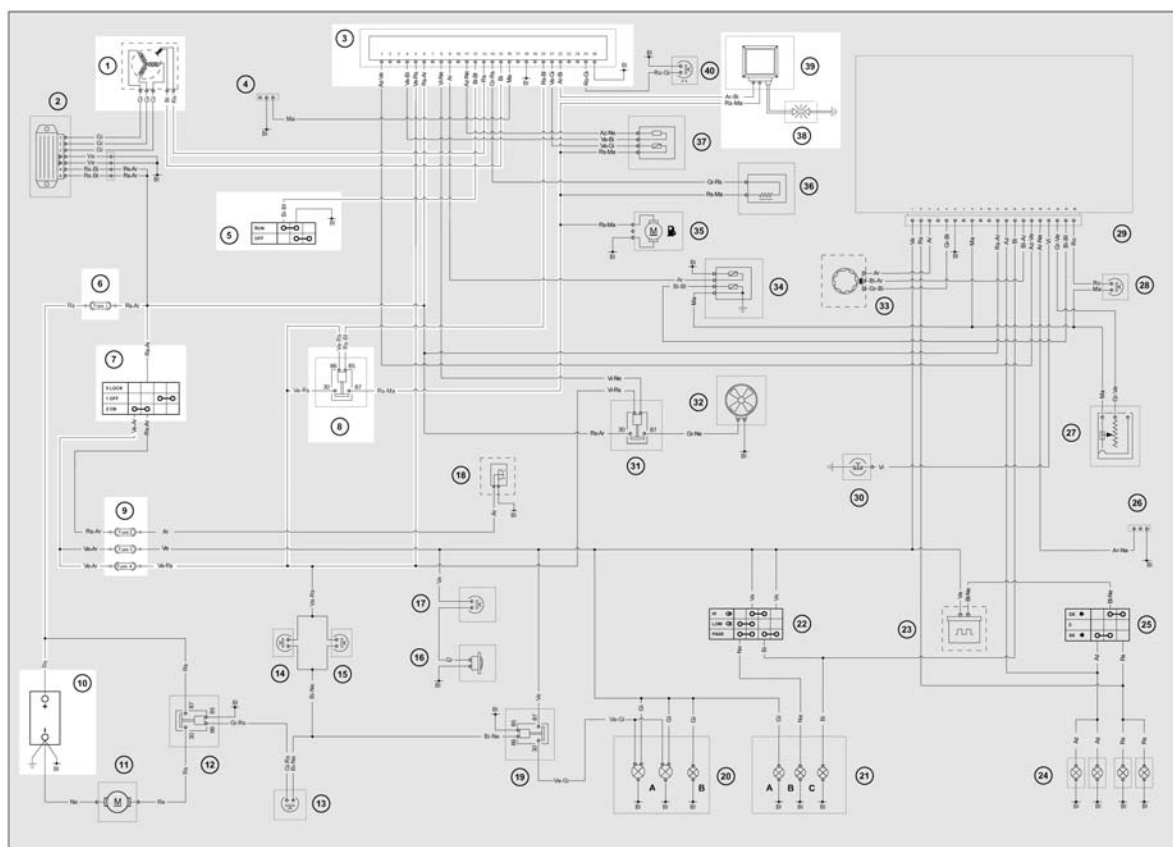
- 3. Injection electronic control unit
- 5. Engine stop switch
- 6. Main fuse
- 7. Key switch
- 8. Injection load remote control
- 9. Auxiliary fuses
- 10. Battery
- 27. Fuel level transmitter
- 28. Scroll switch
- 29. Instrument panel
- 30. Oil pressure sensor
- 33. Speed sensor
- 34. Engine temperature sensor

- 35. Fuel pump
- 36. Fuel injector
- 37. Lambda probe
- 40. Fall sensor

Key

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Devices and accessories



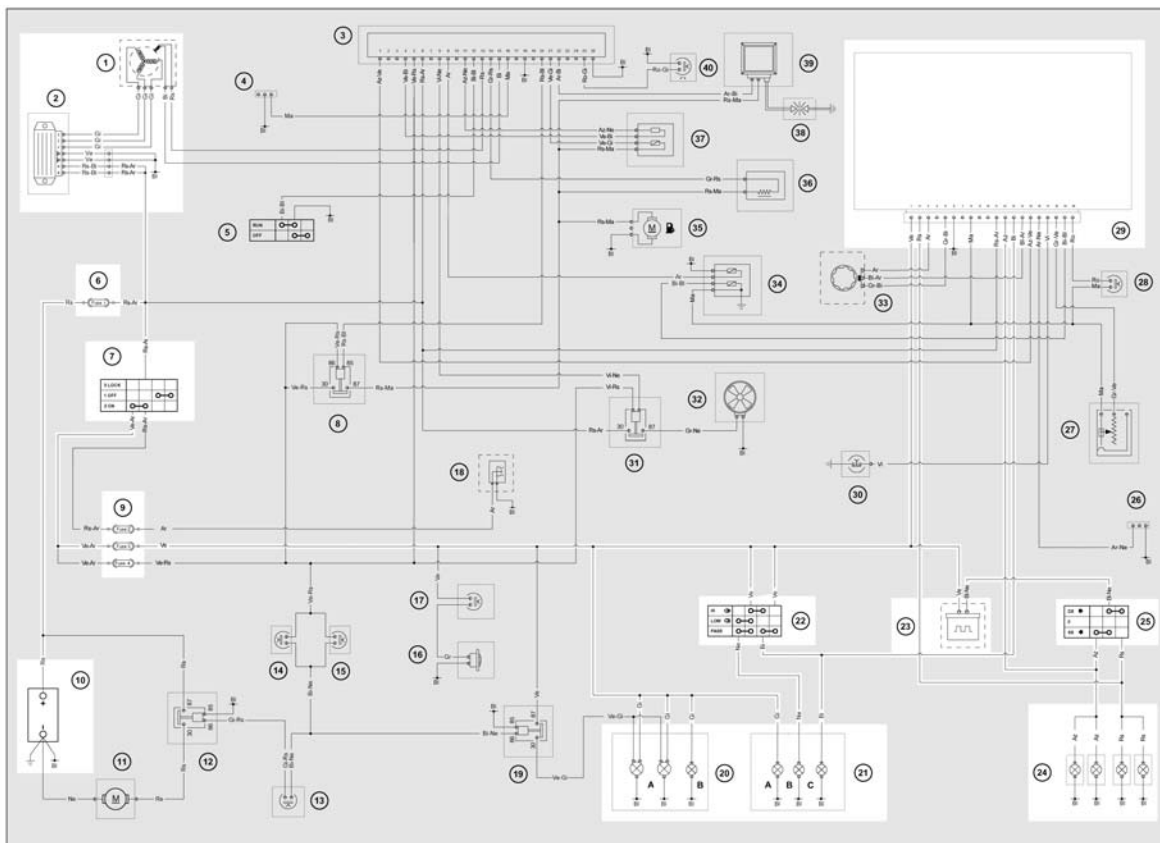
- 1. Magneto flywheel-Pick up
- 3. Injection electronic control unit
- 5. Engine stop switch
- 6. Main fuse
- 7. Key switch
- 8. Injection load remote control
- 9. Auxiliary fuses
- 10. Battery
- 38. Spark plug

39. HV coil

Key

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Lights and turn indicators



1. Magneto flywheel-Pick up
2. Voltage regulator
6. Main fuse
7. Key switch
9. Auxiliary fuses
10. Battery
20. Rear light unit
 - A. Tail light/stop light twin bulb
 - B. License plate light bulb
21. Front headlight assembly
 - A. Tail light
 - B. Low-beam headlight bulb

C. High-beam headlight bulb

22. Light switch

23. Turn indicator control device

24. Turn indicator bulbs

25. Turn indicator switch

29. Instrument panel

Key

Ar: Orange **Az:** Sky blue **Bi:** White **Bl:** Blue **Gi:** Yellow **Gr:** Grey **Ma:** Brown **Ne:** Black **Ro:** Pink **Rs:** Red **Ve:** Green **Vi:** Purple

Checks and inspections

Battery recharge circuit

- Remove the battery from the vehicle.
- Charge the battery with a slow charge (current rating equal to 1/10 of the battery capacity) for at least 10 hours: Refit battery to the motorcycle upon delivery to customer, that is to say, when a mileage is set.
- Install the battery on the motorcycle, connect the leads and the breather pipe.
- If the motorcycle is not used for a long period, it is necessary to recharge it periodically (at least once a month) for at least 10 hours (for instance, during the long winter break).

Electric characteristic

Battery

12V - 12 Ah

CHECK

- In case of malfunction, first check that the recharge system works properly,
- To check the battery,
- remove the battery from the vehicle as follows:

Visually check that :

- the container (outer casing) does not leak.

Charge the battery slowly for at least 10 hours.

- If the off-load voltage is lower than 12V, the battery should be certainly replaced.

COVERED BY WARRANTY

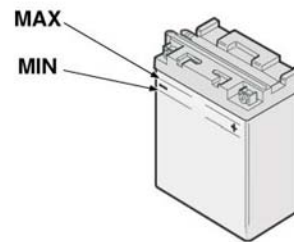
These batteries are not recognised by the warranty if they show:

- mechanical cracks (for example, container is damaged, poles bent, etc.);
- general sulphation (attributable to a wrong activation or use of the battery);
- low electrolyte level (to solve the shipping problem, just close the breather tube with the specific rubber cap).

SAFETY SPECIFICATIONS

CAUTION

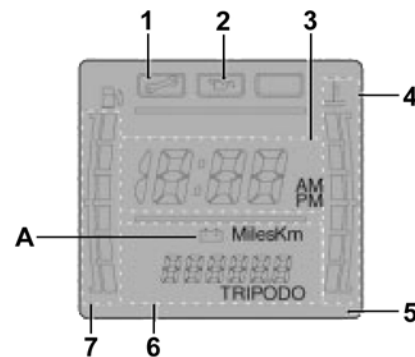
REMEMBER THAT THE ELECTROLYTIC FLUID CONTAINS SULPHURIC ACID. AVOID CONTACT WITH YOUR SKIN OR CLOTHES AND KEEP THE BATTERY AWAY FROM HIGH HEAT SOURCES OR SPARKS, ESPECIALLY WHEN THE BATTERY IS BEING CHARGED, BECAUSE THE HYDROGEN RELEASED CAN BE HIGHLY EXPLOSIVE.



Dashboard

KEY:

1. Service indicator
2. Oil pressure gauge
3. Digital clock
4. Coolant temperature gauge
5. Multifunction digital computer
6. Multifunction indicator: total odometer (ODO) / trip odometer (TRIP) / battery voltage «A»



USER INTERFACE

Multifunction indicator functions

Several functions can be selected with the MODE «2» button on the handlebar right side control: clock adjustment, the total odometer (ODO) function, the trip odometer (TRIP) function, battery voltage readings and trip odometer reset.

Total odometer (ODO) function

When the instrument panel lights on, the multifunction display «1» shows the odometer (ODO) function. Trip odometer (TRIP) function. When the odometer (ODO) function is displayed, press the

MODE «2» button once to view the TRIP function. Press the MODE «2» button longer than three seconds to reset the counter of the trip times stored.

Battery voltage

When the odometer (ODO) function is displayed, press the MODE «2» button twice to view the battery voltage.

Unit of measurement - km/mi conversion

When the battery voltage is shown on the multifunction display «1», the unit of measurement can be shifted from kilometres (km) to Miles (mi) by holding down the MODE «2» button longer than ten seconds. While the button is being pressed, the legend of the unit of measurement being used flashes. Unit conversion is cancelled if the button is not pressed within ten seconds.

Clock adjustment

- Press and hold the MODE «2» button longer than three seconds. The colon dividing hours-minutes starts flashing.
- Each time the MODE «2» button is pressed, the hour value is increased for adjustment.
- Pressing the MODE «2» button again longer than three seconds activates the minutes adjustment. The value displayed increases each time the MODE «2» button is pressed.

Press the MODE «2» button longer than three seconds to go back to the hour adjustment. If no button is pressed within three seconds, the display automatically exits the clock adjustment function.

NOTE

FOR SAFETY REASONS, ADJUST THE CLOCK ONLY WHEN YOUR VEHICLE IS STOPPED.

Data check function

SERVICE

When the vehicle is started, right after the initial check at ignition, when there are less than 300 km (200 mi) to the next Service, the specific icon flashes for 5 seconds.

When the Service mileage is reached, the icon remains steadily on until the Service is reset.

The warning light can be zero set even if the mileage is lower, up to 300 km (200 mi), compared with the Service

mileage. During the 300 km (200 mi) before the service warning light lights up, the light flashes 5 times

each time the key is turned to "ON".

The light should turn on first at 1000 km (625 mi). Successive times are strictly at 6000 km (3750 mi),

12000 km (7500 mi), etc.

RESET

Hold the MODE button down.



Turn the key to "ON" and wait 10 seconds.
During this operation the service icon flashes at a
1 Hz frequency.



When the battery is attached the software code is displayed on the instrument panel and the needle goes from 0 to the end of the scale and back to zero. With the key to "ON" for 3 seconds all the segments of the display will light up (except for the words Miles and Km) as well as all the foreseen warning lights. The instrument panel back-lighting is always lit up. The analogue instrument goes to zero. After the check all the instruments immediately show the values of the measurements detected.



Oil pressure sensor

This is a normally open contact; it signals an alarm in the oil pressure. In case of malfunction a ground signal is indicated, the general alarm warning light and the corresponding icon on the

display turn on.



Battery failure

If the battery voltage is below approx. 10.0 V or exceeds approx. 16 V the battery icon flashes at a 1Hz frequency. The general alarm warning light turns on.

Fuel level sensor

If the instrument panel detects an infinite resistance (interrupted circuit), the general alarm warning light turns on and the corresponding icon on the display flashes (the reserve warning light does not turn on).



If the instrument detects a null resistance (short circuit), all the segments light up but no other indication is shown.

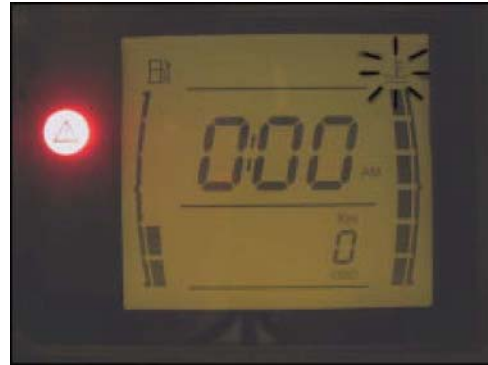


Temperature sensor

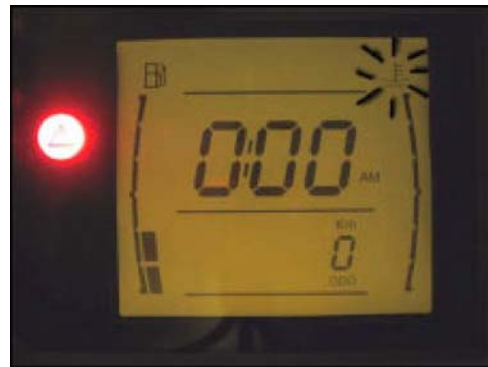
The general alarm warning light turns on when the temperature is above 115°C (approx. 25 Ohm).



If the instrument panel detects an infinite resistance (interrupted circuit), the general alarm warning light turns on and the corresponding icon on the display flashes.



If the instrument panel detects a null resistance (short circuit), all the segments light up, the general alarm warning light turns on and the corresponding icon on the display flashes.



1. Each time the battery is attached, the fuel gauge indicates full tank regardless of the quantity of fuel in the tank; it takes approximately 80 seconds to update. After that, the gauge indicates the correct value.

2. If the tank is emptied with the engine off (with an external pump), when the vehicle is started, the gauge shows the fuel level in the tank before the emptying. In this case, also wait 80 seconds to read the true level.

This happens because the multifunction digital computer has saved in its memory the fuel level in the tank at the moment the key was turned to "**OFF**"; when the battery is first attached, there is no level stored in the memory and the tank is emptied by means of an external pump, the computer is not able to detect it.

Connectors

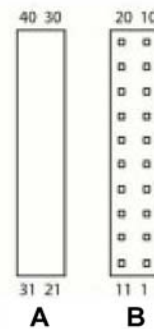
Dashboard

PINOUT

The connector diagram seen on the instrument

panel and the relevant pinout are shown in the figure.

The numbers are also stamped on the plastic part of the connectors and also on the connector body.



KEY:

A: Black

B: Grey

CONNECTOR PINOUT

	Specification	Desc./Quantity
1	Key Positive	
2	Right indicator input	
3	Speed sensor power supply	
4	RPM	
5	Speed sensor ground lead	
6	General grounding	
7	Neutral input	
8	Function grounding	
9	Function grounding (optional)	
10	Function grounding (optional)	
11	Battery Positive	
12	Left indicator input	
13	High-beam lights input	
14	Speed sensor input	
15	EFI input	
16	K Line	
17	Oil pressure sensor	
18	Fuel Level Sensor	
19	Water Temperature Sensor	
20	Mode	

INDEX OF TOPICS

ENGINE FROM VEHICLE

ENG VE

Exhaust assy. Removal

CAUTION

ALLOW ENGINE AND EXHAUST SILENCER TO COOL OFF COMPLETELY.

Silencer removal

- Rest the vehicle on its centre stand.
 - Loosen the clamp (1) fixing the exhaust silencer to the manifold.
 - Undo and remove the three fixing screws (2).
 - Remove exhaust silencer.
-

**CAUTION**

ALLOW ENGINE AND EXHAUST SILENCER TO COOL OFF COMPLETELY.

- Remove the rear central cover.
- Undo and remove the two fixing nuts of the exhaust manifold

CAUTION

ALLOW ENGINE AND EXHAUST SILENCER TO COOL OFF.



- Disconnect the lambda probe connector.
-



- Undo and remove the three fixing screws of the exhaust silencer.
- Remove the exhaust system.



Removal of the engine from the vehicle

Preventively remove:

- Helmet compartment.
- Rear central cover.
- Right and left fairings.
- Tail section.
- Muffler silencer.
- Rear brake calliper.
- Throttle body.
- Remove the footrest lower protection by sliding it upwards and turning it.

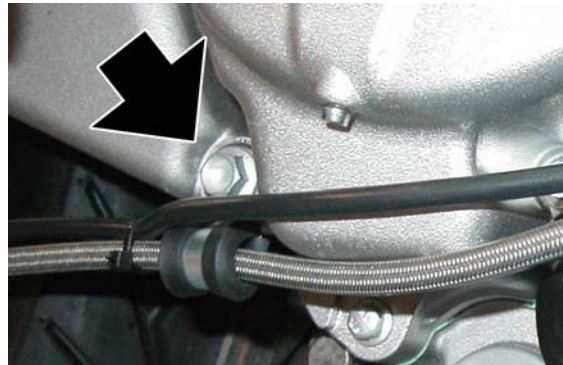


- Get a container of adequate capacity to collect the fluid and place it under the cooling system pump.
- Remove the expansion tank cap.
- Loosen the clamp and remove the ra-

diator - pump pipe and allow the coolant to drain into the collecting container.



- Undo the screw and remove the cable guide.



- Unscrew the spark plug tube and release its cable from any retainer.



- Disconnect the lambda probe connector.



- Remove the injector connector.



- Remove the fast-release fittings from the injector support.



- Remove the water temperature sensor connector.

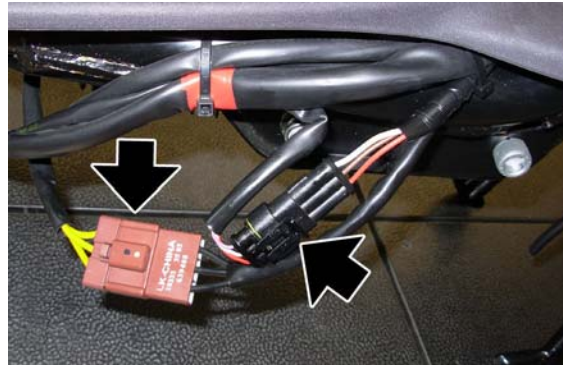


- Unscrew and remove the starter motor supply and ground nuts.
- Disconnect the starter motor supply and ground cables and leads.



- Working from the vehicle left side, remove the generator connectors.

- Cut any retaining straps.



- Remove the fuel breather pipe.



- Hold the vehicle chassis by means of a hoister.
- Working from the left side, unscrew and remove the nut and slide off the fixing pin of the shock absorber.



- Working from the left side, unscrew and remove the nut and slide off the fixing pin of the shock absorber.



- Working on the right side, unscrew and remove the nut.



- From the left side, slide off the pin and collect the washer and the spacer.
- Remove the engine by pulling it backwards.



INDEX OF TOPICS

ENGINE

ENG

This section describes the operations to be carried out on the engine and the tools required.

Automatic transmission

Transmission cover

- To remove the transmission cover, it is necessary to remove the plastic cover first by inserting a screwdriver in the slotted holes. Using the clutch bell lock wrench shown in the figure, remove the driven pulley shaft nut and washer.



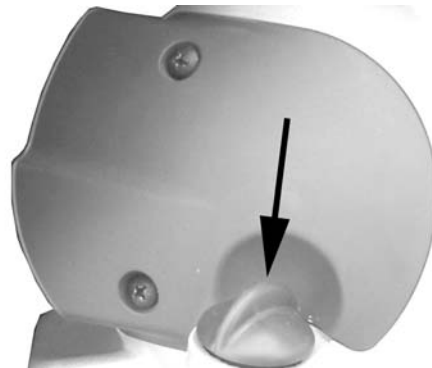
Specific tooling

AP8140661 Lock wrench for clutch bell

- Pull out the cap/dipstick from the engine oil filling tube.
- Remove the 10 screws.
- Now remove the transmission cover.

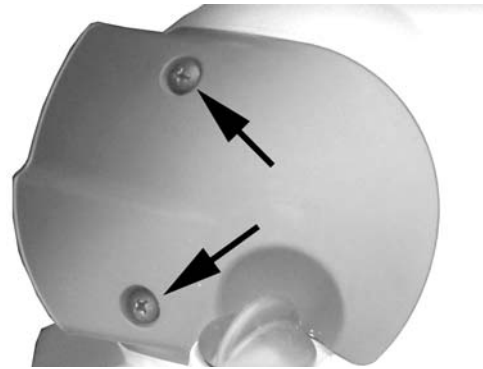
NOTE

WHEN REMOVING THE TRANSMISSION COVER, BE CAREFUL NOT TO DROP THE CLUTCH BELL.

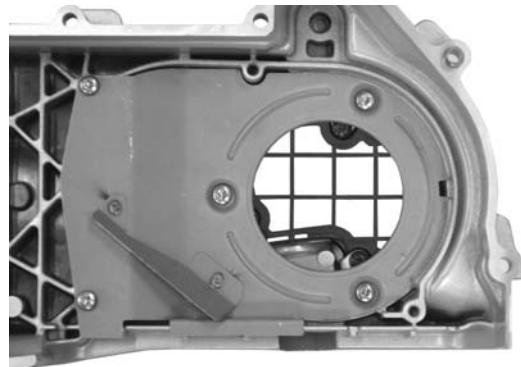


Air duct

- Remove the transmission compartment air intake cover shown in the photograph.

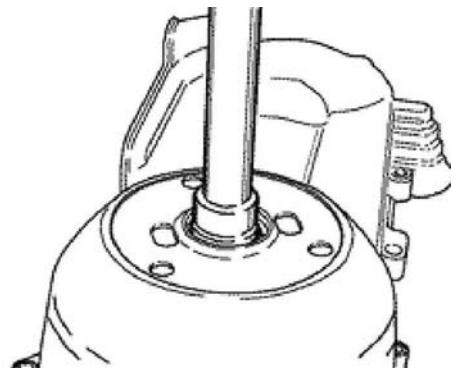


- Remove the 5 screws on the two different levels, as well as the small casing.



Removing the driven pulley shaft bearing

- Remove the seeger ring from the inside of the cover.
- Remove the bearing from the crankcase.



Specific tooling

020376Y Punch adaptor

020375Y 28x30 mm punch

020412Y Clutch oil seal punch D 15 mm

Refitting the driven pulley shaft bearing

- Slightly heat the crankcase internal side so as not to damage the coated surface.

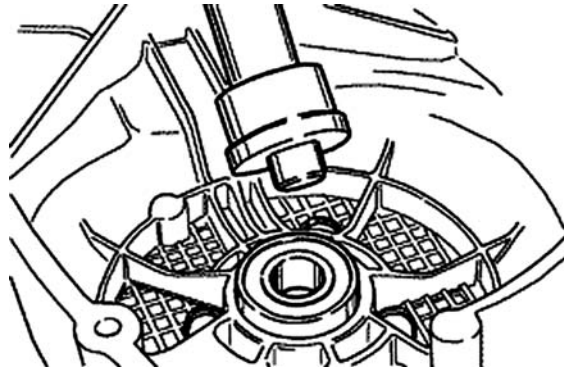
- Insert the bearing in its housing.
- Refit the seeger ring.

CAUTION

REST THE COVER ON A SUITABLE SURFACE TO AVOID DAMAGING THE COVER COAT.

NOTE

ALWAYS REPLACE THE BEARING WITH A NEW ONE AT EVERY REFIT

**Specific tooling**

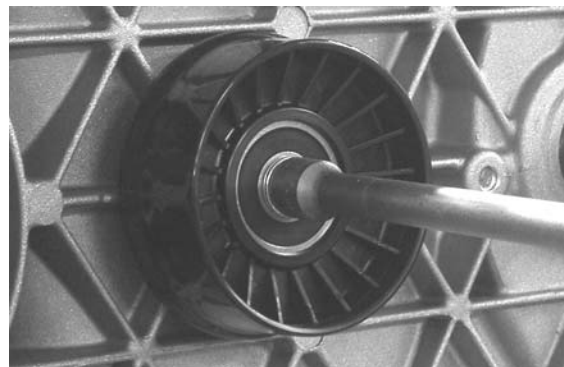
020376Y Punch adaptor

020357Y 32x35 mm punch

020412Y Clutch oil seal punch D 15 mm

Baffle roller**Plastic roller**

- Check that the roller shows no signs of abnormal wear and that it rotates freely.
- Remove the special fixing screws as indicated in the photograph



- Check the roller outside diameter does not have defects that could jeopardise belt functioning
- For refitting, place the roller with the belt containment edge on the engine crankcase side
- Tighten the screw to the prescribed torque.

**Locking torques (N*m)**

Belt support roller screw 11÷13 (8.1÷9.6 ftlb)

Removing the driven pulley

- Remove the clutch bell and the entire driven pulley assembly.

NOTE

THE ASSEMBLY CAN ALSO BE REMOVED EVEN IF THE DRIVING PULLEY IS MOUNTED.



Inspecting the clutch drum

- Make sure that the clutch bell is not worn or damaged.
- Measure the clutch bell inside diameter.

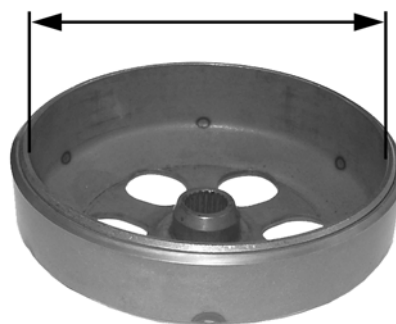
Caratteristiche tecniche

Valore max campana frizione

Valore max: Ø 135 mm

Clutch bell standard value

Standard value: Ø 134 ÷ 134.2 mm



Checking the bell working surface eccentricity

- Fit the bell on a driven pulley shaft with 2 bearings (inside diameter: 15 and 17 mm).
- Lock with the original spacer and nut.
- Place the bell/shaft assembly on the support to check the crankshaft alignment.



- Using a feeler pin gauge and the magnetic base, measure the bell eccentricity.
- Repeat the measurement at 3 positions (Central, internal, external).
- In case of anomalies, replace the bell.

Characteristic**clutch bell check : Limit eccentricity.**

Admissible limit eccentricity: 0.15 mm

**Specific tooling****AP8140915 Crankcase check****Removing the clutch**

Fit the special driven pulley spring compressor tool:

- Fit the driven pulley assembly on the tool by inserting the 3 pins in the ventilation holes on the mass holder support.
- Make sure that the clutch is perfectly inserted into the adapter ring before proceeding to tighten the clutch nut.
- Use the special multipurpose wrench to remove the nut fixing the clutch.
- Disassemble the driven pulley into its components (Clutch and spring with plastic fitting).

CAUTION

THE TOOL MUST BE FIRMLY FIXED IN THE VICE AND THE CENTRAL SCREW MUST TOUCH THE TOOL. EXCESSIVE TORQUE MAY DEFORM THE SPECIFIC TOOL.

Specific tooling**AP8140665 Adapter for clutch assembly removal****AP8140259 Universal tool for clutch assemblies****AP8140300 55 mm wrench****Inspecting the clutch**

- Check the thickness of the clutch mass friction material.
- The masses must exhibit no traces of lubricants; in that case, check the driven pulley unit seals.

NOTE

UPON RUNNING-IN, THE MASSES MUST EXHIBIT A CENTRAL FAYING SURFACE AND MUST NOT BE DIFFERENT FROM ONE ANOTHER.

DIFFERENT CONDITIONS MAY CAUSE CLUTCH TEARING.

CAUTION

DO NOT USE TOOLS OPEN THE MASSES TO AVOID VARIATION IN THE RETURN SPRING LOAD.

Characteristic

Check minimum thickness

1 mm



Pin retaining collar

- Simultaneously turn and pull the collar manually to remove it.

NOTE

USE 2 SCREWDRIVERS IN CASE OF ANY DIFFICULTY.

NOTE

BE CAREFUL NOT TO PUSH THE SCREWDRIVERS IN TOO FAR TO AVOID DAMAGING THE O-RING SEAL.



- Remove the 4 torque server pins and pull the half-pulleys apart.



Removing the driven half-pulley bearing

- Check there are no signs of wear and/or noise; otherwise, replace it.
- Remove the retaining ring using two flat blade screwdrivers.
- Place pulley bushing on the threaded side adequately on a wood support.
- Using a hammer and pin, knock the ball bearing out as shown in the figure.
- Support the pulley properly.



Specific tooling

001467Y035 Bell

-
- Remove the roller bearing using the specific punch.



Specific tooling

020376Y Punch adaptor

020456Y Ø 24 mm punch

020363Y Crankshaft oil seal punch D 20 mm

Inspecting the driven fixed half-pulley

250 Version

- Measure the outside diameter of the pulley bushing.
- Check the contact surface with the belt to make sure there are no signs of abnormal wear.
- Check the riveted joints are functional.

- Check the evenness of the belt contact surface.

Characteristic

Half-pulley minimum diameter

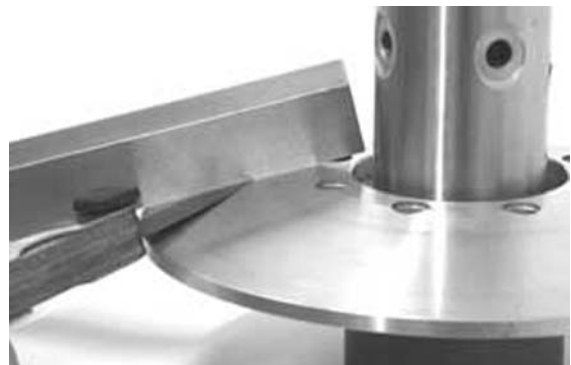
Minimum diameter admitted: \varnothing 40.96 mm

Half-pulley standard diameter

Standard diameter: \varnothing 40.985 mm

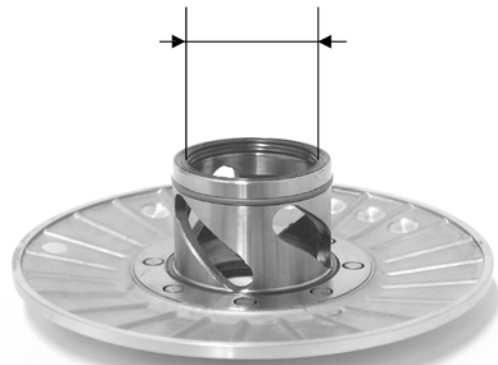
wear limit

0.3 mm



Inspecting the driven sliding half-pulley

- Remove the 2 inner sealing rings and the 2 O-rings;
- Measure the inside diameter of the movable half-pulley bushing.
- Check the contact surface with the belt to make sure there are no signs of abnormal wear.
- Check the riveted joints are functional.
- Check the evenness of the belt contact surface.



MOVABLE DRIVEN HALF-PULLEY DIMENSIONS

Specification	Desc./Quantity
wear limit	0.3 mm
standard diameter	Ø 41,000 ÷ 41,035
maximum diameter admitted	Ø 41.08 mm

Refitting the driven half-pulley bearing

- Place pulley bushing on the threaded side adequately on a wood support.
- Assemble a new roller casing as shown in the figure.
- To fit the new ball bearing, follow the example in the picture using a specific punch for roller casing.
- Assemble the seeger ring

NOTE

FIT THE BALL BEARING SO THAT THE SHIELD IS VISIBLE.



Specific tooling

020376Y Punch adaptor

020375Y 28x30 mm punch

AP8140662 Punch for roller casing

Refitting the driven pulley

- Insert the new oil seals and O-rings on the movable half-pulley.
- Lightly grease the O-rings (A) shown in the figure.
- Fit the half-pulley on the bushing.

Check that the pins are not worn and proceed to

refit them in the relative hollows.--

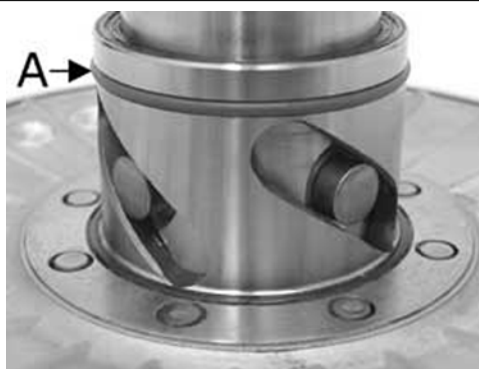
- Refit the torque server closing collar.
- Using a curved-spout grease gun, lubricate the driven pulley assembly with approximately 6 grams of grease. Apply the grease through one of the holes in the bushing until grease comes out through the hole on the opposite side. This procedure is necessary to prevent the presence of grease beyond the O-rings.

NOTE

THE TORQUE SERVER CAN BE GREASED WITH BEARINGS FITTED OR WHEN THEY ARE BEING REPLACED; IT MAY BE EASIER TO GREASE TORQUE SERVER WHEN THE BEARINGS ARE BEING SERVICED.

Recommended products

AGIP GREASE 30 Grease for steering bearings, pin seats and swinging arm



Specific tooling

AP8140664 Guide to mount the movable driven pulley

Inspecting the clutch spring

- Measure the length of the movable driven half-pulley spring, when unloaded.

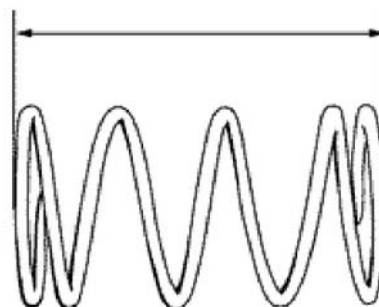
Characteristic

Standard length

123 mm

limit after use

118 mm



Refitting the clutch

- Assemble the spring, clutch and driven pulley.
- Fit the clutch body on the appropriate tool with the adaptor
- Insert the lever pin in the hole of the adaptor ring.
- Tighten the fixing nut to the prescribed torque.

NOTE

WHEN PRE-LOADING THE SPRING, BE CAREFUL NOT TO DAMAGE THE PLASTIC SPRING STOP AND THE BUSHING THREADING.

NOTE

FOR DESIGN REASONS, THE NUT IS SLIGHTLY ASYMMETRIC; THE FLATTEST SURFACE SHOULD BE MOUNTED CONTACTING THE CLUTCH.

Specific tooling

AP8140259 Universal tool for clutch assemblies

AP8140665 Adapter for clutch assembly removal

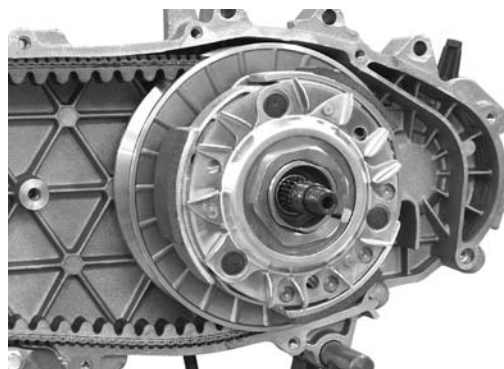
AP8140300 55 mm wrench

Locking torques (N*m)

Clutch assembly nut on driven pulley 45÷50 (33.2÷36.9 ftlb)

Refitting the driven pulley

- Refit the clutch bell.



Drive-belt

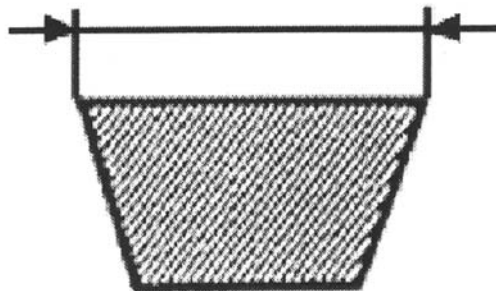
- Make sure that the driving belt is not damaged.
- Check belt for correct width.

Characteristic**Driving belt 250 4T - minimum width**

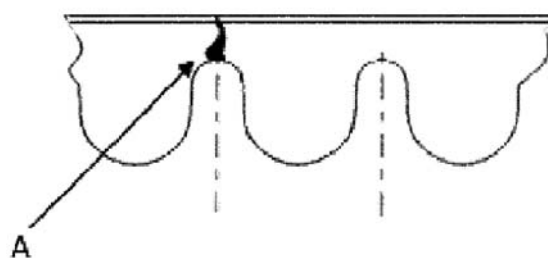
19.5 mm

Driving belt 250 4T - standard width

21.3 ± 0.2 mm



During the wear checks foreseen in the scheduled maintenance services, check that the rim bottom of the tothing does not show signs of incisions or cracking (see figure): the rim bottom of the tooth must not have incisions or cracking; if it does, change the belt.

**Removing the driving pulley**

- Turn the crankshaft until the slots of the pulley are on a horizontal axis



- With the specific tool remove the fixing nut, the Belleville spring and its washer
- Remove the stationary driving half-pulley and the steel washer in contact with it

Specific tooling**AP8140535 Front pulley fitting/removal****Inspecting the rollers case**

- Check that the internal bushing shown in the figure is not abnormally worn and measure inside

diameter.

- Measure the outside diameter of the pulley sliding bushing shown in the figure.
- Check that the rollers are not damaged or worn.
- Check the guide shoes for the variator roller contrast plate are not worn.
- Check that there is no wear in the roller housings or the surfaces in contact with the belt on both half-pulleys.
- Check that stationary driving pulley does not show signs of abnormal wear on the grooved edge and on the surface in contact with the belt.
- Check that the O-Ring is not deformed.

CAUTION

DO NOT LUBRICATE OR CLEAN SINTERED BUSHINGS

Characteristic

movable driving half-pulley bushing: Standard Diameter

26.000 ÷ 26.021 mm

movable driving half-pulley bushing: Max. diameter admitted

Ø 26.12 mm

sliding bushing: Standard Diameter

Ø 25.959 ÷ 25.98 mm

sliding bushing: Minimum diameter admitted

Ø 25.95 mm

roller: Standard Diameter

Ø 20.5 ÷ 20.7 mm

roller: Minimum diameter admitted

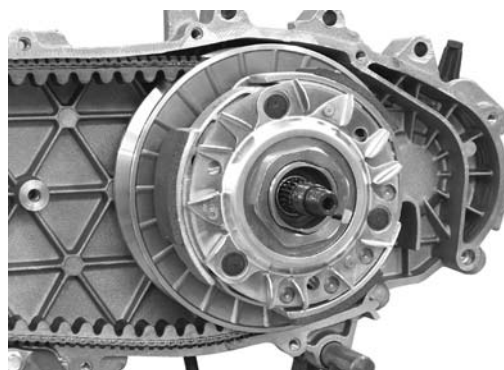
Ø 20 mm





Refitting the driving pulley

- Preassemble the movable half-pulley with the roller contact plate by placing the rollers in their housings with the larger support surface touching the pulley according to the direction of rotation.
- Check that the roller contact plate has flaws or is damaged on the grooved edge.
- Fit the entire bushing assembly on the crankshaft.
- Fit the driven pulley/Clutch/belt assembly to the engine.



- Fit the steel shim contacting the bushing and the stationary driving half-pulley.
- Install the appropriate tool as described in the removal phase.
- Tighten the nut and washer to the prescribed torque.

Specific tooling

AP8140535 Front pulley fitting/removal

Locking torques (N*m)

Driving pulley nut 75÷83 (55.4÷61.3 ftlb)

Refitting the transmission cover

- Check there are 2 centring dowels and that the sealing gasket for the oil sump has been adequately fitted on the transmission cover.
- Replace the cover by tightening the 10 screws to the prescribed torque.
- Refit the oil filling cap dipstick.
- Refit the steel washer and the driven pulley nut.
- Tighten the nut to the specified torque using the lock wrench and the torque wrench tools.
- Refit the plastic cover.



Specific tooling

AP8140661 Lock wrench for clutch bell

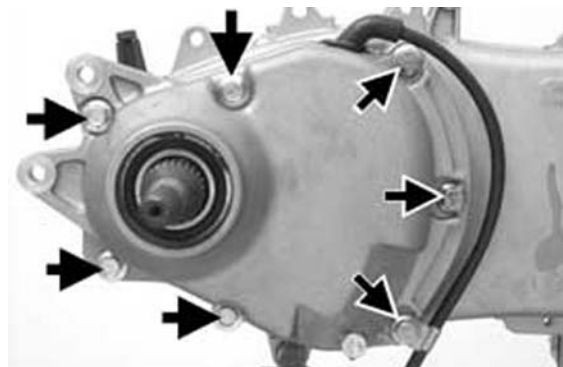
Locking torques (N*m)

Transmission cover screws 11÷13 (8.1÷9.6 ftlb) Driven pulley shaft nut 54÷60 (39.9÷44.3 ftlb)

End gear

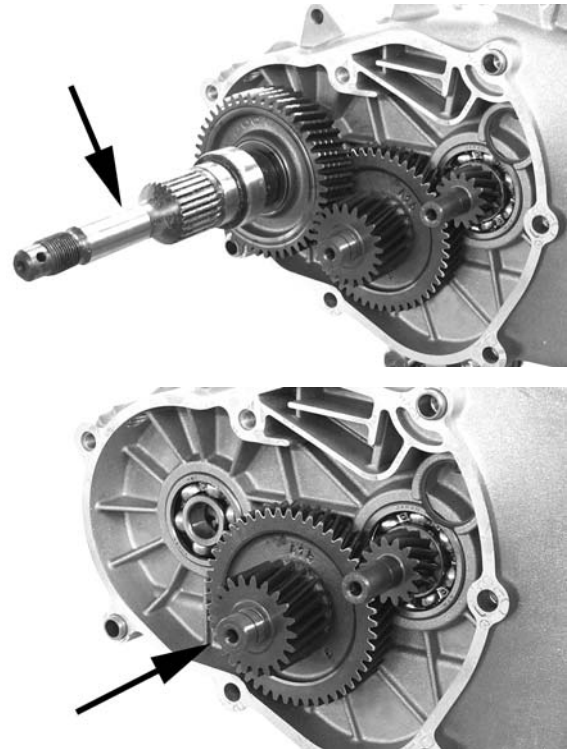
Removing the hub cover

- Empty the rear hub through the oil drainage plug.
- Remove the 7 flanged screws indicated in the figure.
- Remove the hub cover and the relevant gasket.



Removing the wheel axle

- Remove the wheel axle with gear.
- Remove the intermediate gear.

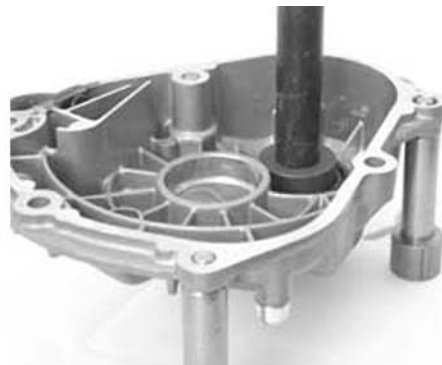


Removing the hub bearings

- Check the status of the bearings being examined (wear, clearance and noise).

Removing the wheel axle bearings

- Remove the seeger ring from the outside of the hub cover.
- Support the hub cover and expel the bearing.
- Remove the oil seal as shown in the figure using the specific tool.





Specific tooling

020376Y Punch adaptor

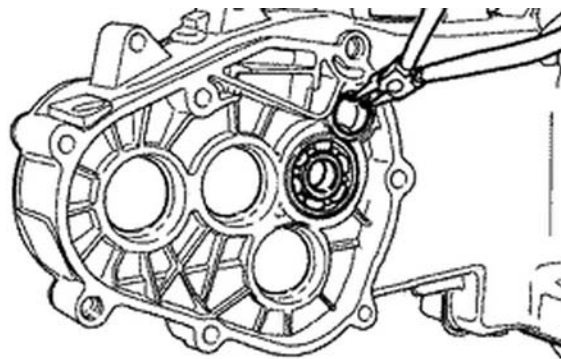
020477Y 37 mm punch

020483Y 30 mm punch

AP8140916 Hub cover support

Removing the driven pulley shaft bearing

- Should the driven pulley shaft, its bearing and oil guard be removed, take out the transmission cover and the clutch assembly as described above.
- Extract the driven pulley shaft from its bearing.
- Remove the oil guard using a screwdriver; working from inside the bearing and being careful not to damage the housing, make it come out on the belt transmission side.
- Remove the seeger ring indicated in the figure.



- Remove the driven pulley shaft bearing.



Specific tooling

020376Y Punch adaptor

020375Y 28x30 mm punch

020363Y Crankshaft oil seal punch D 20 mm

Inspecting the hub shaft

- Check the three shafts for wear or distortions on the toothed surfaces, the bearing housings and the oil seal housings.
- In case of faults, replace the damaged parts.



Inspecting the hub cover

- Check that the coupling surfaces are not dented or distorted.
 - Check the bearing capacity.
 - In case of faults, replace the damaged parts.
-

Refitting the wheel axle bearing

- Support the hub cover on a wooden surface.
- warm the cover crankcase with the specific heat gun.
- Fit the wheel shaft bearing with a modular punch as shown in the figure.
- Fit the seeger ring.
- Fit the oil guard with its sealing lip facing the hub internal side and place it flush with the internal surface using the specific tool used on the 52-mm side.



The 52-mm side of the adaptor should face the bearing.



Specific tooling

020376Y Punch adaptor

020360Y 52 x 55 mm punch

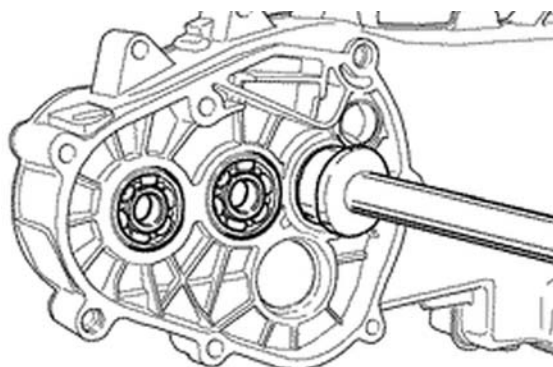
020483Y 30 mm punch

Refitting the hub cover bearings

To fit the hub box bearings, the engine crankcase and the cover should be heated with the specific heat gun.

- The three 15-mm bearings must be fitted using the appropriate tools:

The 42-mm side of the adaptor should face the bearing.



**Specific tooling****020150Y Air heater support****020151Y Air heater****020376Y Punch adaptor****020359Y 42 x 47 mm punch****020412Y Clutch oil seal punch D 15 mm****NOTE**

Use the stud bolt kit to support the cover adequately when fitting the bearing on the cover.

Refit the driven pulley shaft bearing with a modular punch as shown in the figure.

NOTE

IF A BEARING WITH AN ASYMMETRICAL BALL RETENTION CAGE IS USED, PLACE IT SO THAT THE BALLS ARE VISIBLE FROM THE HUB INTERNAL SIDE.

**Specific tooling****020376Y Punch adaptor****020359Y 42 x 47 mm punch****020363Y Crankshaft oil seal punch D 20 mm****NOTE**

WHEN FITTING THE BEARINGS ON THE ENGINE CRANKCASE, THE CRANKCASE SHOULD, AS FAR AS POSSIBLE, BE SUPPORTED ON A SURFACE TO ALLOW THE BEARINGS TO BE DRIVEN VERTICALLY.

Refit the seeger ring with the opening facing the bearing opposite and fit the new oil guard levelled with the crankcase on the pulley side.

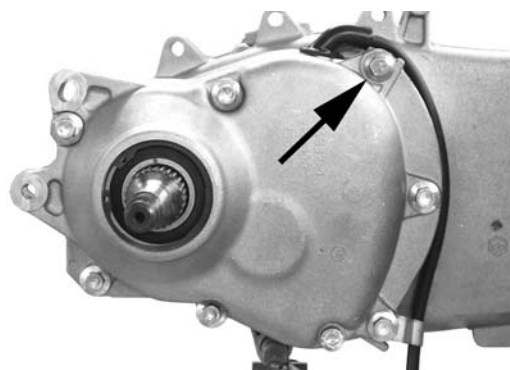
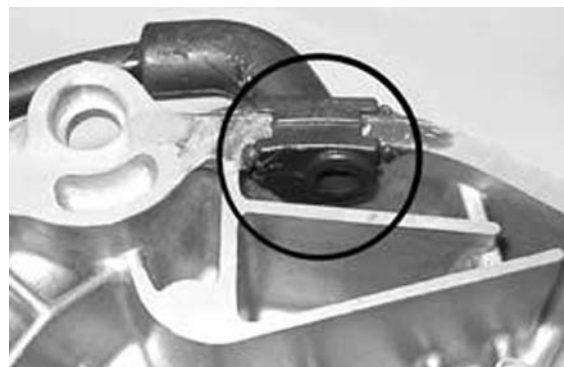
Refitting the hub bearings

- Assemble the 3 shafts in the engine crankcase as shown in the figure.



Refitting the hub cover

- Fit a new gasket together with the centring dowels.
- Seal the gasket of the breather pipe using black silicone sealant.
- Fit the cover making sure the breather pipe is in the correct position.
- Position the shorter screw, easily recognisable by its different colour, as shown in the figure.
- Fasten the breather pipe support bracket with the lower screw.
- Fit the remaining screws and tighten the 7 screws to the prescribed torque.



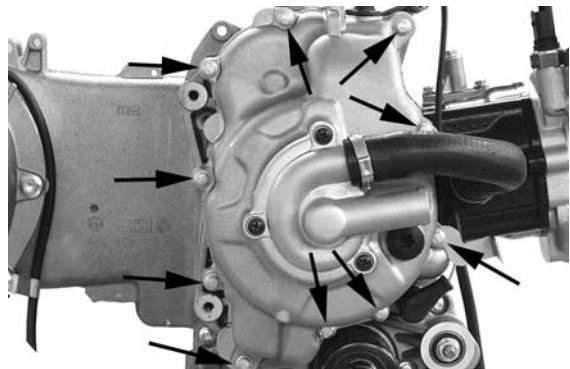
Locking torques (N*m)

Rear hub cover screws $24 \div 27$ (17.7 ÷ 19.9 ftlb)

Flywheel cover

Removing the hub cover

- Remove the clamp fixing the hose to the cylinder.
- Remove the 10 clamps
- Remove the flywheel cover.



Removing the stator

- Remove the 2 Pick-Up screws and the one for the wiring bracket as well as the 3 stator fixing screws shown in the figure.
- Remove the stator and its cable harness.



Locking torques (N*m)

Screws fixing the freewheel to the flywheel **13÷15 (9.6÷11.1 ftlb)**

Refitting the stator

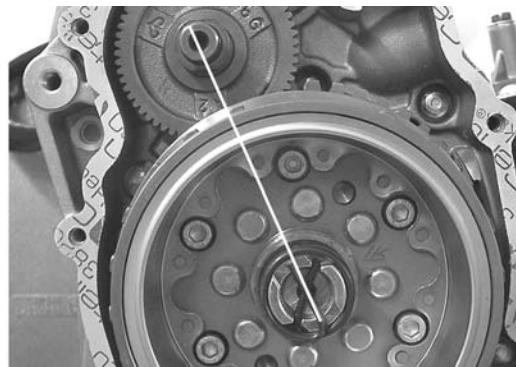
- Refit the stator and the flywheel carrying out the removal steps but in reverse order, tightening the retainers to the specified torque.

**Locking torques (N*m)**

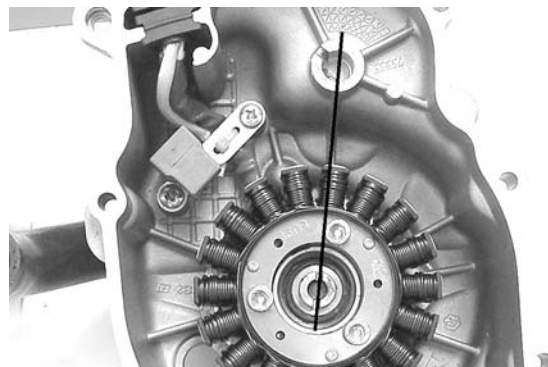
Stator unit screws 3÷4 (2.2÷3 ftlb) (Apply LOCTITE 242 medium-strength thread-lock)

Refitting the flywheel cover

- Position the keying clip on the crankshaft and orient the end as shown in the figure.



- Orient the water pump shaft taking as reference the transmission gear seat as shown in the photograph.



- Refit the cover over the engine and tighten the screws to the prescribed torque.
- Follow the removal procedure but in reverse order.

CAUTION

TAKE CARE TO CORRECTLY POSITION THE FLYWHEEL CONNECTOR. MAKE SURE THE CENTRING DOWELS ARE FITTED.

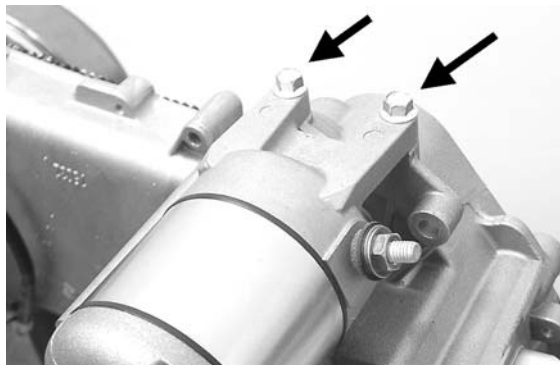
Locking torques (N*m)

Flywheel cover screw 11÷13 (8.1÷9.6 ftlb)

Flywheel and starting

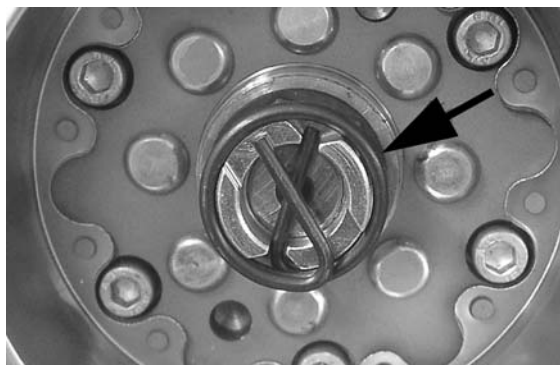
Removing the starter motor

- Remove the two screws indicated in the figure
- Take out the starter motor from its place

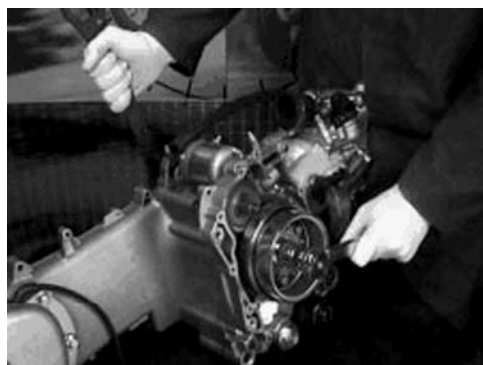


Removing the flywheel magneto

- Remove the keying clip of the water pump shaft and crankshaft



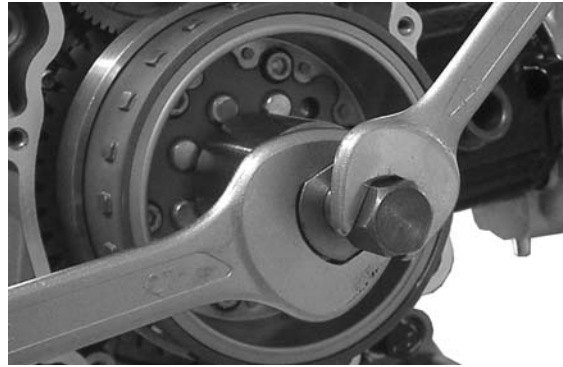
- Refit the driving half-pulley (if removed)
- Lock the crankshaft rotation with a multipurpose wrench
- Unscrew and remove the flywheel nut and its spacer



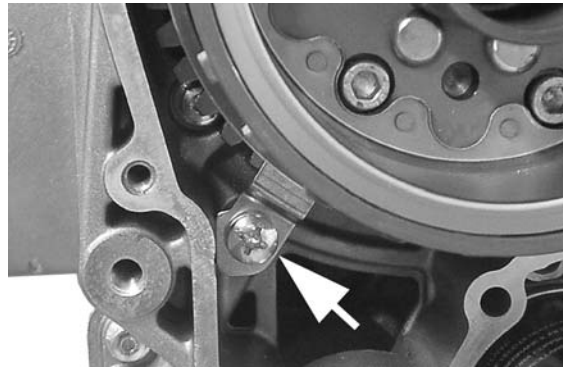
- Do up the flywheel nut by 3 or 4 threads so that the flywheel does not fall accidentally upon extraction.
- Screw the extractor onto the flywheel and ex-

tract it as shown in the photograph.

- Remove the tongue on the crankshaft.
- Remove the starter motor gear.



-
- Undo the screw and remove the crown gear bracket.
 - Remove the flywheel crown gear.



Specific tooling

AP8140252 Multipurpose wrench

AP8140301 Flywheel extractor

Inspecting the flywheel components

- Check that the internal plastic parts of the flywheel and the Pick-Up control plate are in good conditions.

Refitting the free wheel

- Make sure the freewheel faying surfaces are in good condition.
- Thoroughly clean the freewheel to remove any LOCTITE left.
- Degrease the threading of the freewheel holes and the fixing screws.
- Apply the recommended product to the end of the screws.

Recommended products

Loctite 243 Medium strength threadlock

-

-
- Fit the freewheel on the magneto flywheel, mak-

ing sure that the ground side is in contact with the flywheel, that is the wheel seeger ring should be visible.

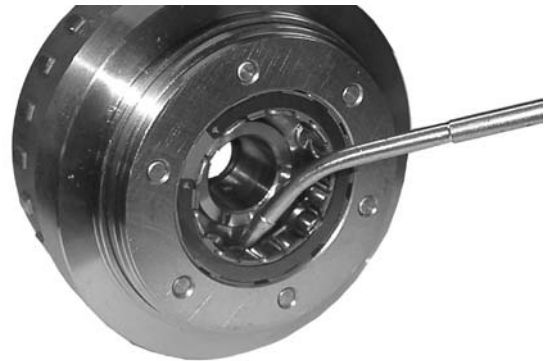
- Tighten the 6 fixing screws in a criss-cross sequence to the prescribed torque.



Locking torques (N*m)

Screws fixing the freewheel to the flywheel 13÷15 (9.6÷11.1 ftlb)

- Lubricate the freewheel «rollers».

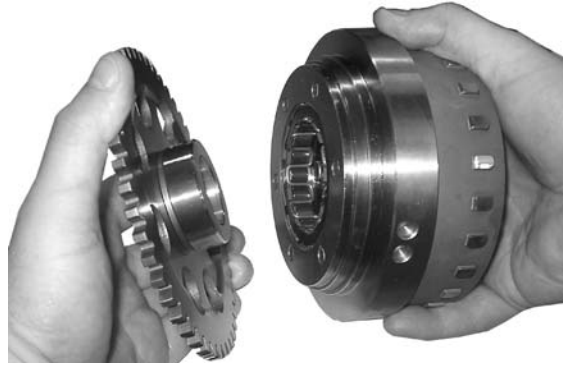


Refitting the flywheel magneto

- Remove the freewheel retention plate indicated in the photograph
- Remove the transmission gear and the freewheel



- Insert the freewheel on the flywheel as shown in the photo
- Then refit the flywheel together with the freewheel and transmission gear



- Tighten the flywheel fixing nut to the prescribed torque with a multipurpose wrench
- Refit the retention plate

Specific tooling

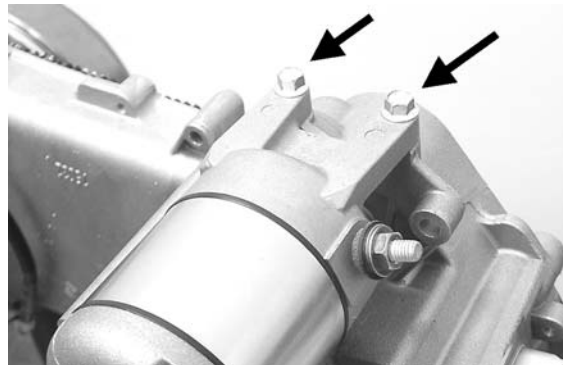
AP8140252 Multipurpose wrench

Locking torques (N*m)

Flywheel nut $94 \div 102$ (69.4 ÷ 75.3 ftlb)

Refitting the starter motor

- Fit and lubricate a new O-ring on the starter motor.
- Fit the starter motor on the crankcase and lock the 2 screws to the prescribed torque.



Locking torques (N*m)

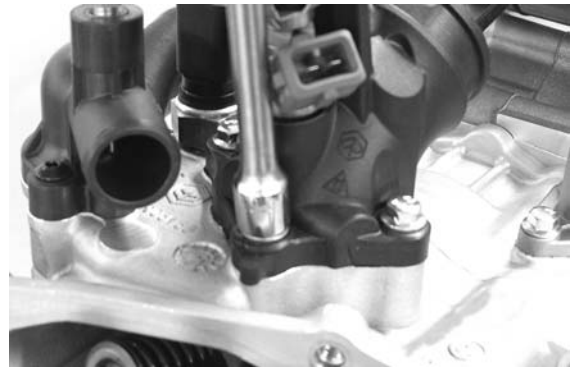
Starter motor screws $11 \div 13$ (8.1 ÷ 9.6 ftlb)

Cylinder assy. and timing system

Removing the intake manifold

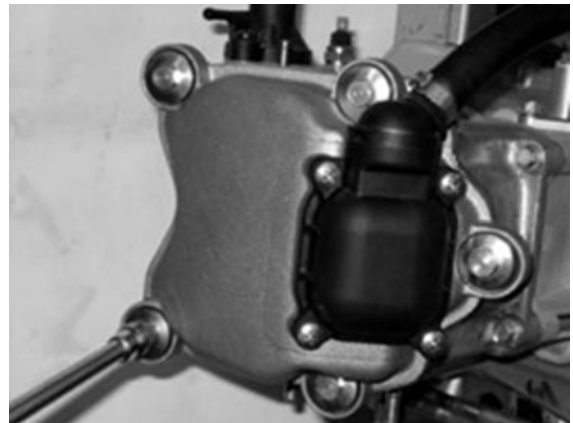
Loosen the 3 screws and remove the air intake manifold.

When refitting, tighten the screws to the prescribed torque.



Removing the rocker-arms cover

Remove the 5 screws indicated in the figure



Removing the timing system drive

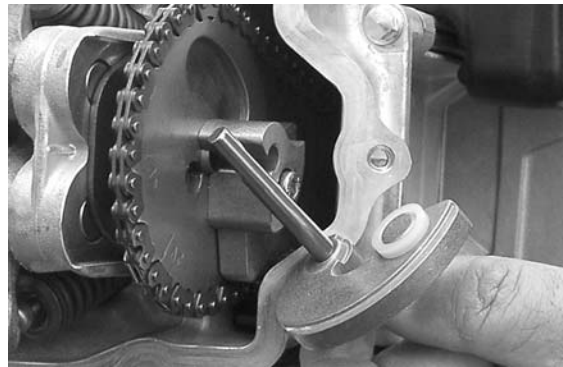
- First remove the parts listed below: transmission cover, driving pulley with belt, oil sump with spring and by-pass piston, oil pump pulley cover, O-ring on the crankshaft and the sprocket wheel separation washer.

- Remove the tappet cover.

- Remove the central screw fastener and the automatic valve-lifter retaining cover indicated in the figure.



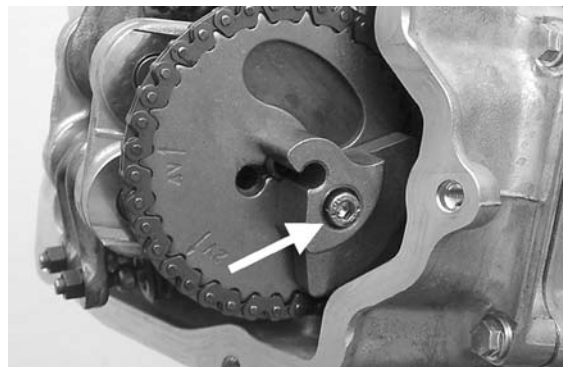
- Remove the return spring of the automatic valve-lifter assembly, the automatic valve-lifter assembly and its end of stroke washer.



- Loosen the central screw on the tensioner first.
- Remove the 2 clamps indicated in the figure.
- Remove the tensioner and its gasket.



- Remove the internal hex screw and the counter-weight shown in the figure.



- Remove the camshaft control pulley and its washer.



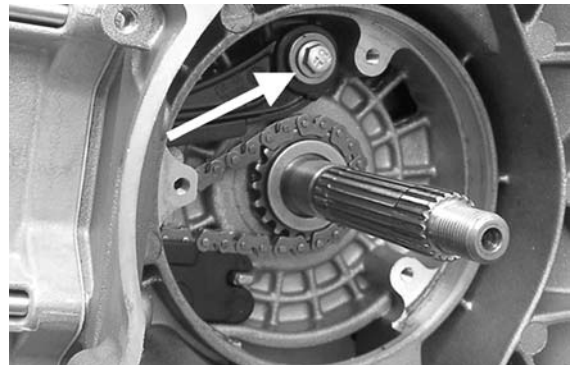
- Remove the command sprocket wheel and the timing chain.
- Remove the screw indicated in the figure, the

spacer and the tensioner pad.

The tensioner pad must be removed operating from the transmission side. The lower chain guide pad can only be removed after the head has been removed.

NOTE

IT IS ADVISABLE TO MARK THE CHAIN IN ORDER TO ENSURE THAT THE INITIAL DIRECTION OF ROTATION IS MAINTAINED

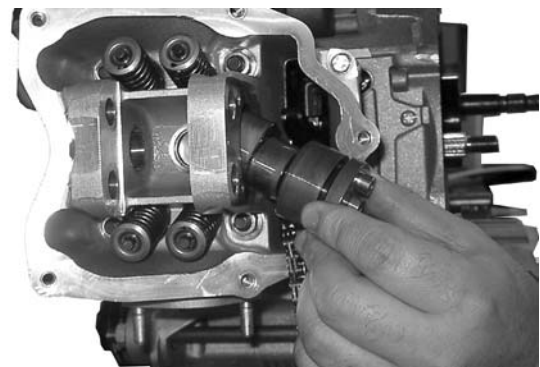
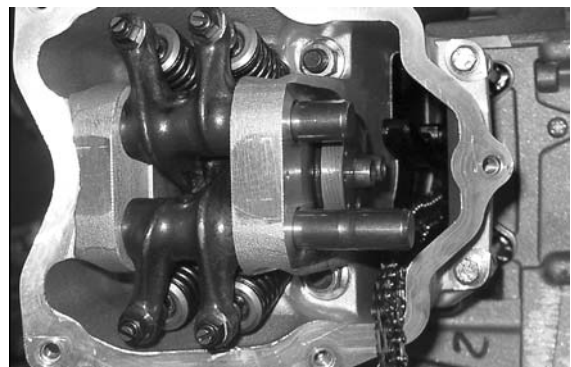
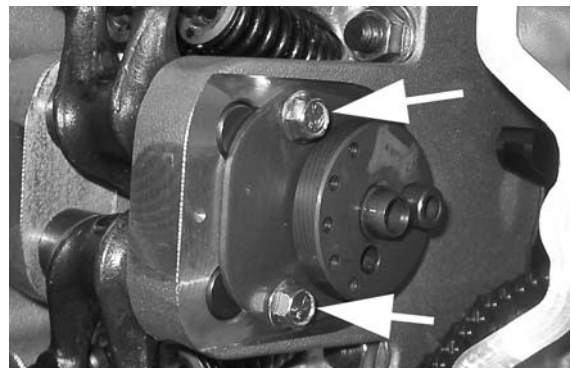


Removing the cam shaft

- Remove the 2 screws and the camshaft mounting bracket indicated in the figure.
- Remove the camshaft.
- Remove the pins and the rocking levers from the flywheel side holes.

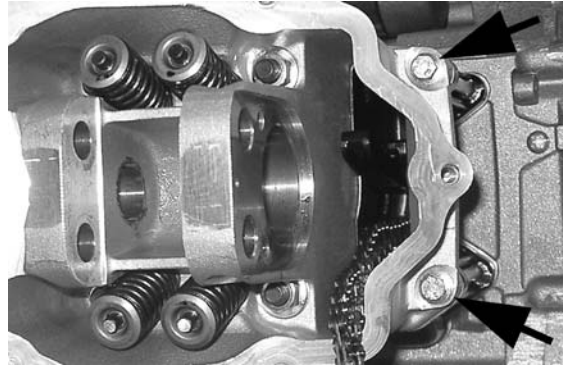
NOTE

IF NECESSARY, THE HEAD MAY BE REMOVED TOGETHER WITH THE CAMSHAFT, ROCKING LEVER PINS AND MOUNTING BRACKET. THE HEAD CAN ALSO BE REMOVED WITHOUT TAKING OUT THE CHAIN AND THE CHAIN TIGHTENER OF THE CRANKSHAFT.



Removing the cylinder head

- Remove the spark plug.
- Remove the 2 side clamps indicated in the figure.
- Loosen the 4 head-cylinder fixing nuts in two or three stages and in a criss-cross sequence.
- Remove the head, the 2 centring dowels and the gasket.



NOTE

IF NECESSARY, THE HEAD MAY BE REMOVED TOGETHER WITH THE CAMSHAFT, ROCKING LEVER PINS AND MOUNTING BRACKET. THE HEAD CAN ALSO BE REMOVED WITHOUT TAKING OUT THE CHAIN AND THE CHAIN TIGHTENER OF THE CRANKSHAFT.

Removing the valves

- Using the appropriate tool fitted with an adapter, remove the cotter pins, plates, springs and valves.
- Remove the oil seals with the specific tool
- Remove the spring lower supports.

CAUTION

Arrange the valves so as to recognise their original position on the head.



Specific tooling

AP8140179 Support for valve fitting/removal

AP8140917 Tool for valve pressure plate

AP8140919 Valve oil seal extractor

Removing the cylinder - piston assy.

Cylinder and piston removal

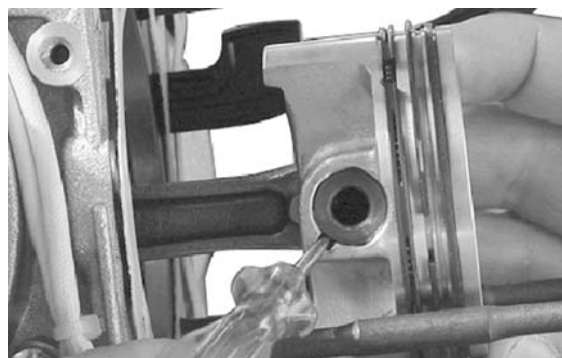
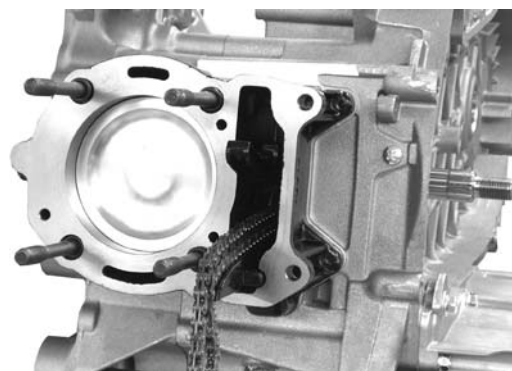
- Remove the chain guide pad.
- Remove the 4 O-rings on the stud bolts
- Slide off the cylinder.
- Remove the gasket on the cylinder base.
- Remove the 2 seeger rings, the pin and piston.
- Remove the piston sealing rings.

CAUTION

TO AVOID DAMAGING THE PISTON, KEEP IT FIRM WHILE REMOVING THE CYLINDER.

NOTE

BE CAREFUL NOT TO DAMAGE THE SEALING RINGS DURING REMOVAL.

**Inspecting the small end**

- Measure the inside diameter of the small end using a specific micrometer.

NOTE

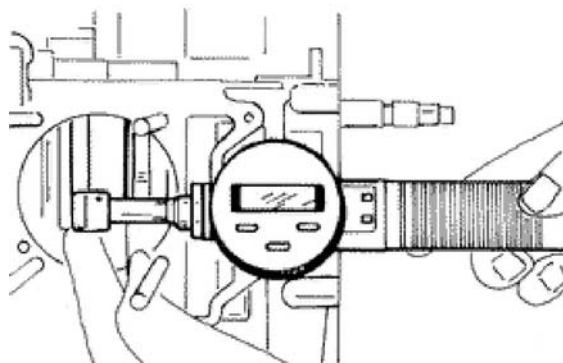
Replace the crankshaft if the rod small end diameter exceeds the standard diameter, shows signs of wear or overheating

Characteristic

Checking the rod small end: Max. diameter

15.030 mm

Checking the rod small end: Standard diamet-



er

15+0.015 +0.025mm

Inspecting the wrist pin

- Check the pin outside diameter
- Calculate the rod small end - gudgeon pin coupling clearance.

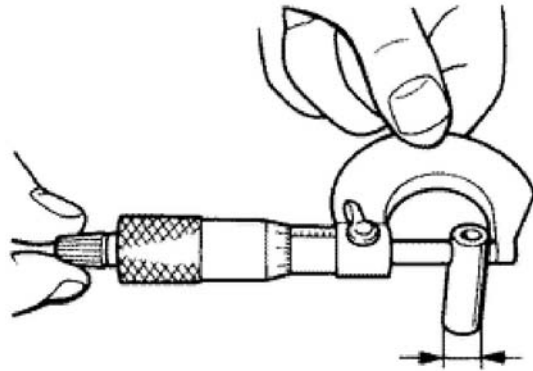
Characteristic

Pin diameter : Standard clearance

0.015 ÷ 0.029 mm

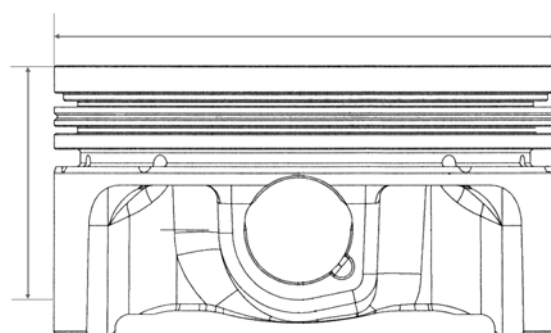
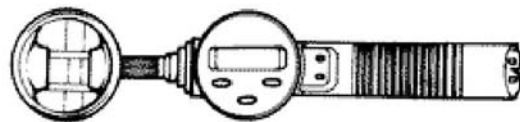
Pin diameter : Standard diameter

14.996 ÷ 15.000 mm



Inspecting the piston

- Measure the pin seat diameter on the piston.
- Calculate the pin - piston coupling clearance.
- Measure the piston outside diameter, perpendicular to the pin axis.
- Take the measurement at 5 mm from the base, at the position shown in the figure.
- Carefully clean the sealing rings housings.
- Measure the sealing rings - grooves coupling clearance using suitable sensors, as shown in the diagram
- If clearances measured exceed the limits specified in the table below, the piston should be replaced by a new one.



NOTE

MEASURE CLEARANCE BY INSERTING THE BLADE OF THE THICKNESS GAUGE FROM THE 2nd SEALING RING SIDE.

NOTE

THE PIN HOUSINGS HAVE TWO LUBRICA-

TION CHANNELS FOR THIS REASON MEASURE THE DIAMETER ACCORDING TO THE PISTON AXIS.

Characteristic

Pin seat diameter on piston : Standard diameter

15.001 ÷ 15.006 mm

Pin seat diameter on piston : Standard clearance

0.001 ÷ 0.010 mm

piston diameter

71.953 ÷ 71.981 mm



Fitting clearance

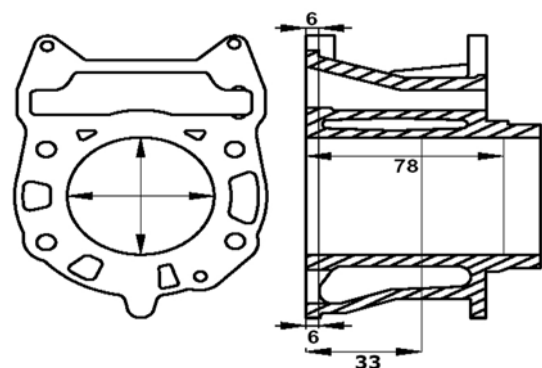
1st compression ring - standard coupling clearance 0.015 ÷ 0.06 mm **1st compression ring - maximum clearance allowed after use** 0.07 mm **2nd compression ring - standard coupling clearance** 0.015 ÷ 0.06 mm **2nd compression ring - maximum clearance allowed after use** 0.07 mm **oil scraper - standard coupling clearance** 0.015 ÷ 0.06 mm **oil scraper - maximum clearance allowed after use** 0.07 mm

Inspecting the cylinder

-Using a bore meter, measure the cylinder inside diameter at three different points according to the directions shown in the figure.

- Check that the coupling surface with the head is not worn or misshapen.

- Pistons and cylinders are classified according to their diameter. The coupling is carried out in pairs (M-M, N-N, O-O, P-P).



Characteristic

cylinder: standard diameter

71.990 ÷ 72.018 mm (to 33 mm)

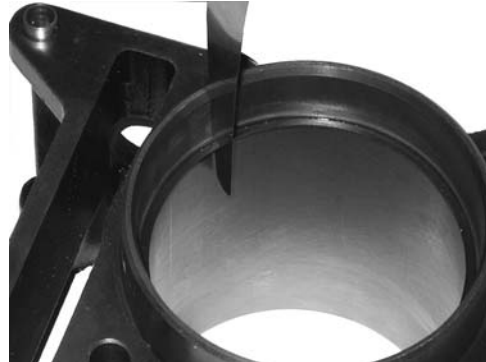
Maximum run-out allowed:

0.05 mm

Inspecting the piston rings

Sealing rings

- Alternately insert the 3 sealing rings in the cylinder in the area where it keeps its original diameter. Using the piston, insert the rings perpendicularly to the cylinder axis.
- Measure the opening of the sealing rings using a thickness gauge (see picture).
- Replace the piston rings if values higher than those prescribed are measured.



NOTE

BEFORE REPLACING ONLY THE PISTON RINGS, MAKE SURE THAT THE PISTON RINGS-PISTON RING GROOVES COUPLING CLEARANCE AND THAT BETWEEN THE PISTON AND THE CYLINDER ARE AS SPECIFIED. IN ANY CASE, NEW PISTON SEALING RINGS USED IN COMBINATION WITH A USED CYLINDER MAY HAVE DIFFERENT BEDDING CONDITIONS THAN THE STANDARD ONES.

Characteristic

1st compression ring

Standard opening: 0.15 ÷ 0.30 mm

2nd compression ring

Standard opening: 0.20 ÷ 0.40 mm

oil scraper

Standard opening: 0.20 ÷ 0.40 mm

Removing the piston

- Install piston and pin onto the connecting rod, with the piston arrow aligned facing the exhaust.
- Fit the pin stop ring onto the appropriate tool

- With the opening in the position indicated on the tool

S = left

D = right

- Set the stop ring into its position with the punch.

- Fit the pin stop ring using the plug as shown in the figure.



NOTE

THE TOOL FOR INSTALLING THE STOP RINGS MUST BE USED MANUALLY.

CAUTION

USING A HAMMER MAY DAMAGE THE RINGS HOUSINGS.



Specific tooling

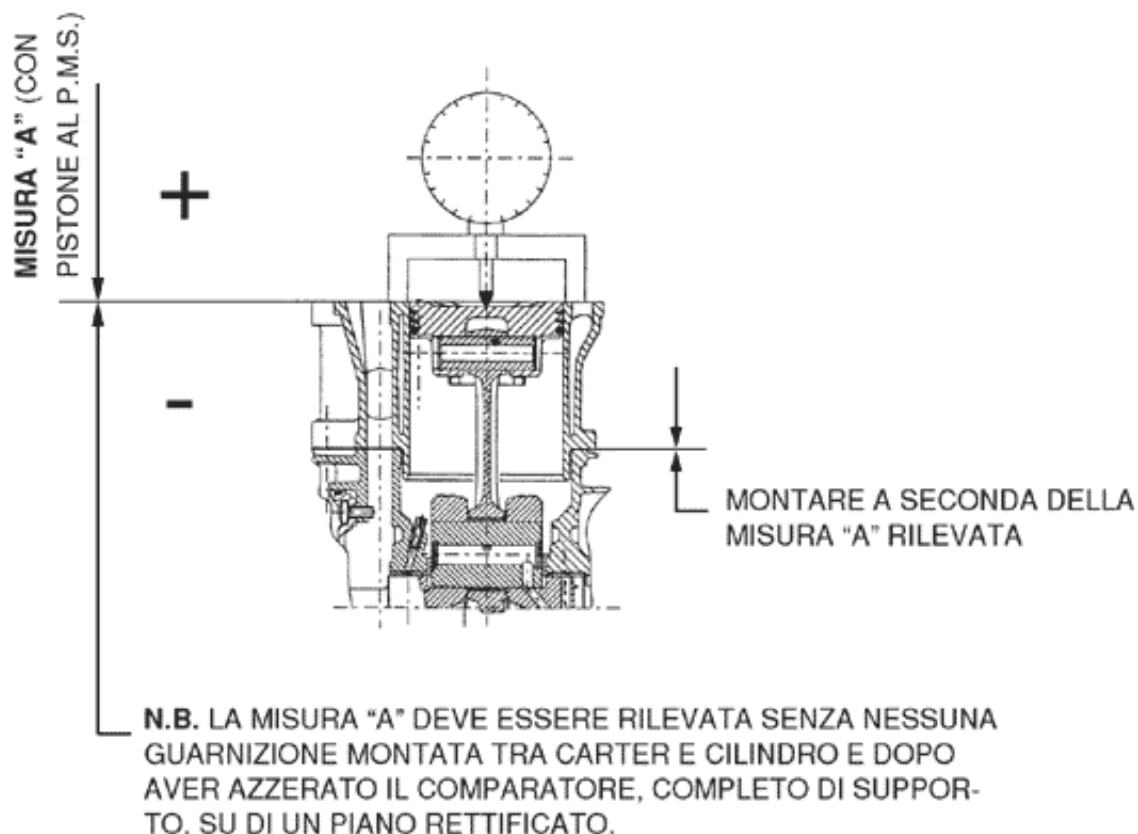
AP8140920 Tool for pin rings

Choosing the gasket

Characteristic

Compression ratio 250 version

CR: 10.5 ÷ 11.5 : 1

**NOTE**

DISTANCE «A» TO BE MEASURED IS A VALUE OF PISTON RECESS, IT INDICATES BY HOW DEEP THE PISTON CROWN FALLS BELOW THE PLANE FORMED BY THE CYLINDER CROWN. THE FURTHER THE PISTON ENTERS INTO THE CYLINDER, THE THINNER THE BASE GASKET TO BE USED SHOULD BE (TO COMPENSATE THE COMPRESSION RATIO) AND VICE VERSA.

SHIMMING FOR 250 ENGINES

Name	Measure A	Thickness
shimming	3.70 - 3.60	0.4 ± 0.05
shimming	3.60 - 3.40	0.6 ± 0.05
shimming	3.40 - 3.30	0.8 ± 0.05

Refitting the piston rings

Sealing rings fitting

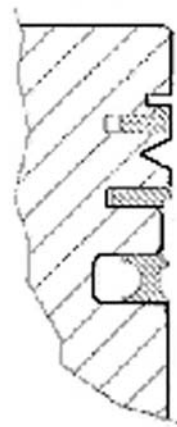
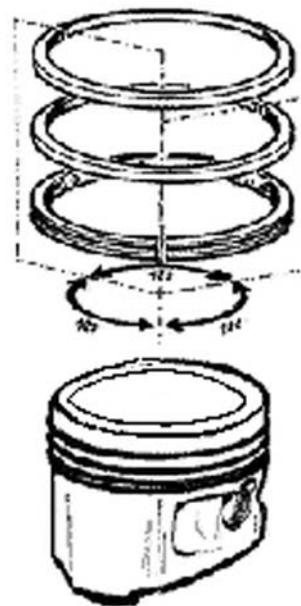
- Place the oil scraper spring on the piston.
- Fit the oil scraper ring keeping the gap opposed to the spring union and the word "top" facing the

piston crown. In any case, the chamfered side of the must be facing the piston crown.

- Fit the middle piston ring with the identification letter or the word "top" facing the piston crown. In any case, the tapered side of the ring must be facing opposite the piston crown.
- Fit the top piston ring with the word "top" or the reference mark facing the piston crown.
- Offset the piston ring gaps on the three rings by 120° as shown in the figure.
- Lubricate the components with engine oil.
- 250 engines are fitted with top ring with an L section.

NOTE

THE 2 PISTON RINGS ARE MADE WITH A TAPERED CYLINDRICAL CONTACT SECTION. THIS IS TO OBTAIN A BETTER BEDDING.

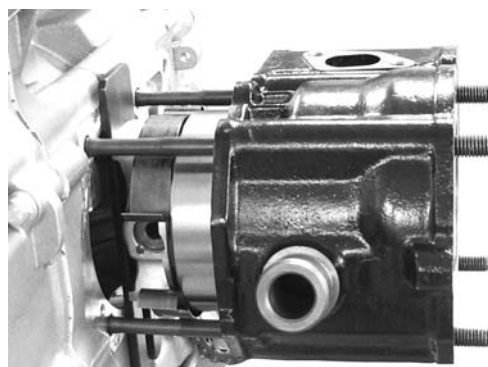


Refitting the cylinder

- Fit the cylinder base gasket of the chosen thickness.
- Using the fork support and the retaining clamp, fit the cylinder as shown in the figure.

NOTE

BEFORE FITTING THE CYLINDER, CAREFULLY BLOW AIR INTO THE LUBRICATION DUCT AND LUBRICATE THE CYLINDER LINER.



Specific tooling**AP8140921 Oil seal punch****AP8140660 Piston fitting ring**

Inspecting the cylinder head

- Using a trued bar and a thickness gauge, check that the cylinder head surface is not worn or distorted.

Maximum run-out allowed: 0.05 mm

- Check that the camshaft and the rocker pin bearings show no signs of wear.

- Check that the cylinder head cover surface, the intake manifold and exhaust manifold are not worn.

Characteristic bearing "A"

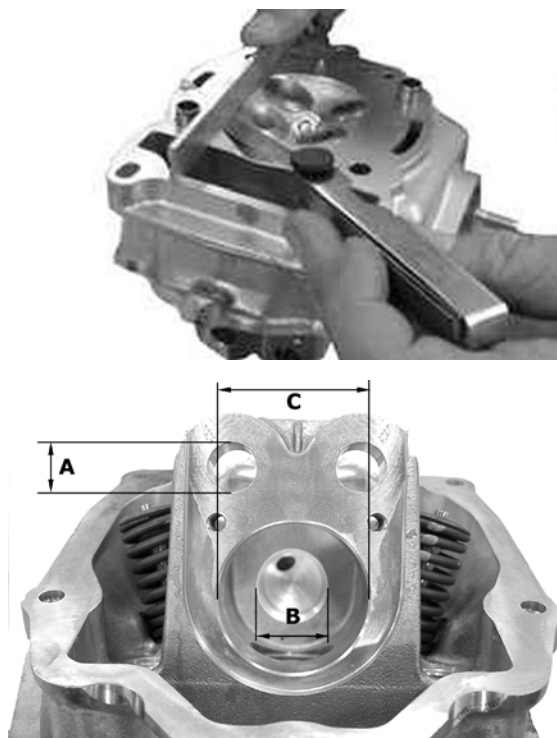
Ø 12.000 ÷ 12.018

bearing "B"

Ø 20.000 ÷ 20.021

bearing "C"

Ø 37.000 ÷ 37.025



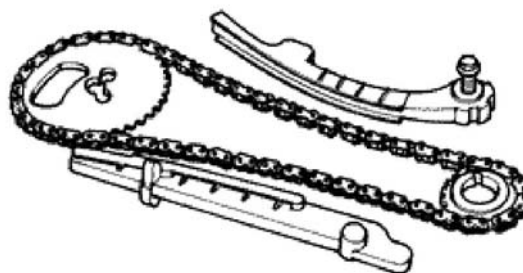
Inspecting the timing system components

- Check that the guide pad and the tensioner pad are not excessively worn.

- Check that the chain assembly, the camshaft driving pulley and the sprocket wheel are not worn.

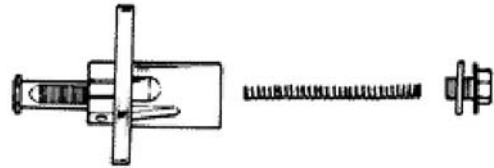
- If signs of wear are found, replace the parts; if the chain, pinion or pulley are worn, replace the whole assembly.

- Remove the central screw with the washer and



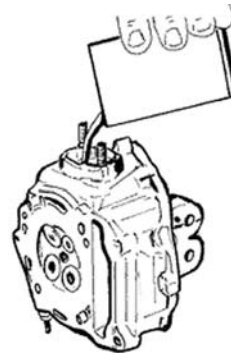
the tensioner spring. -Check that the one-way mechanism is not worn.

- Check the condition of the tensioner spring.
- If signs of wear are found, replace the whole assembly.



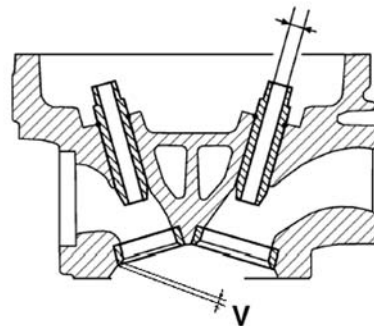
Inspecting the valve sealings

- Fit the valves into the cylinder head.
- Alternatively test the intake and outlet valves.
- The test should be carried out by filling the manifold with fuel and checking that the head does not ooze through the valves when they are just pressed by the fingers.



Inspecting the valve housings

- Check the width of the mark on the seat of valve «V». Max. wear: 1.6 mm.
- Remove any carbon deposits from the valve guides.
- Measure the inside diameter of each valve guide.
- Measure according to the rocker thrust direction at three different heights.
- If the width of the mark on the valve seat or the diameter of the valve guide exceed the specified limits, replace the cylinder head.



Characteristic

Valve seat wear: Intake guide

admissible limit: 5.022

Valve seat wear: Intake guide

Standard diameter: 5.000 ÷ 5.012 mm

Valve seat wear: Outlet guide

Admissible limit: 5.022

Valve seat wear: Outlet guide

Standard diameter: 5.000 ÷ 5.012 mm

Inspecting the valves

- Measure the width of the sealing surface on the valve seats and on the valves themselves.

Sealing surface width: After use: Intake and outlet: 1.6 mm

- If the sealing surface on the valve is wider than the specified limit, damaged in one or more points or curved, replace the valve with a new one.



CAUTION

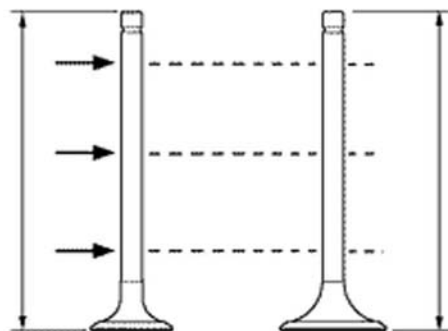
DO NOT CHANGE THE VALVE FITTING POSITION (RH - LH).

Characteristic

Valve wear check: Standard: intake and outlet:

0.99 ÷ 1.27 mm

- Measure the diameter of the valve stem at the three positions indicated in the diagram.
- Calculate the clearance between the valve and its guide.
- Check that there are no signs of wear on the faying surface with the set screw articulated terminal.
- If no anomalies are found during the above checks, the same valves can be reused. For better sealing results, it is advisable to grind the valves. Grind the valves gently with fine-grained lapping compound. Upon grinding, keep the cylin-



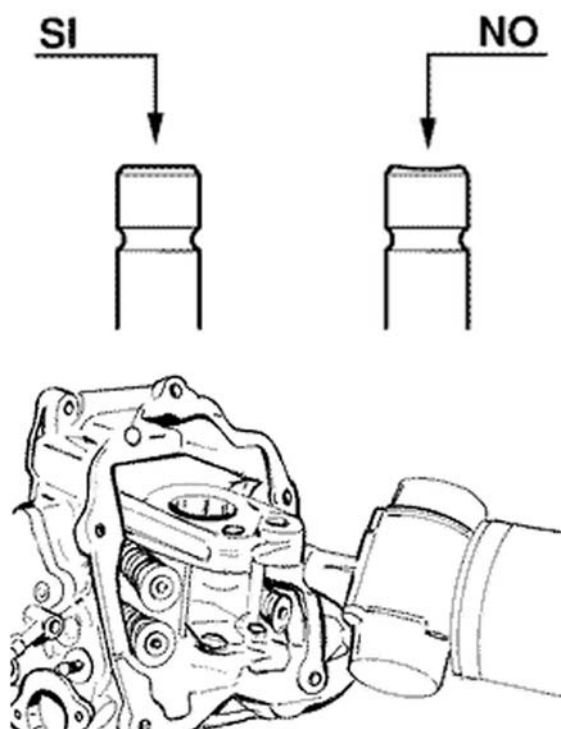
der head in horizontal position. This will prevent the lapping compound residues from penetrating between the valve stem and the guide (see figure).

CAUTION

TO AVOID SCORING THE FAYING SURFACE, DO NOT ROTATE THE VALVE WHEN NO LAPPING COMPOUND IS LEFT. CAREFULLY WASH THE CYLINDER HEAD AND THE VALVES WITH A SUITABLE PRODUCT FOR THE TYPE OF LAPPING COMPOUND BEING USED.

NOTE

DO NOT CHANGE THE VALVE FITTING POSITION

**Characteristic**

Valve check: standard length

Outlet: 94.4 mm

Valve check: standard length

Inlet: 94.6 mm

Valve check: maximum clearance allowed:

Outlet: 0.072 mm

Valve check: maximum clearance allowed

Inlet: 0.062 mm

Valve check: standard clearance:

Outlet: 0.025 ÷ 0.052 mm

Valve check: standard clearance:

Inlet: 0.013 ÷ 0.040 mm

Valve check: Minimum diameter admitted:

Outlet: 4.95 mm

Valve check: Minimum diameter admitted:

Inlet: 4.96 mm

Valve check: Standard diameter:

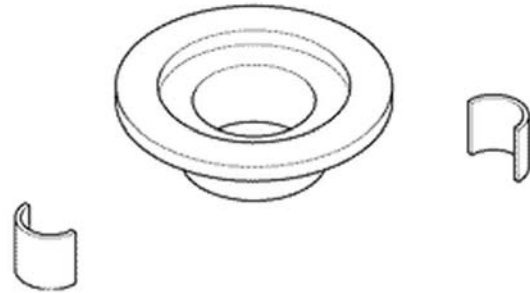
Inlet: 4.972 ÷ 4.987 mm

Valve check: Standard diameter:

Outlet: 4.96 ÷ 4.975 mm

Inspecting the springs and half-cones

- Check that the spring upper caps and the cotters show no signs of abnormal wear.



Refitting the valves

- Lubricate the valve guides with engine oil.
- Place the valve spring supports on the head.
- Using the specified punch, fit the 4 sealing rings.
- Fit the valves, the springs and the caps. Using the specified tool with the appropriate adaptor, compress the springs and insert the cotters in their seats.

NOTE

DO NOT CHANGE THE VALVE FITTING POSITION. FIT THE VALVE SPRINGS WITH THE REFERENCE COLOUR ON THE COTTERS SIDE (TURNS WITH GREATER PITCH).



Specific tooling

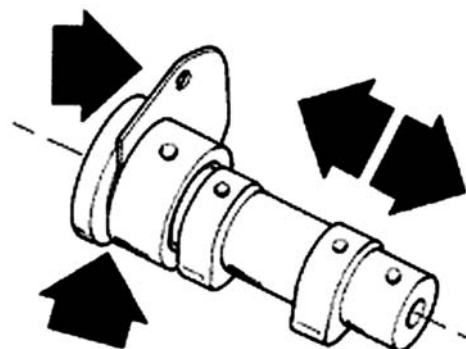
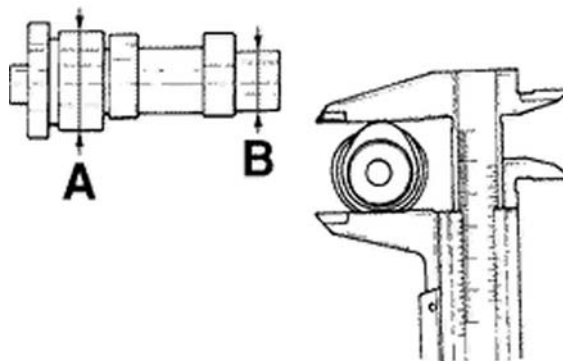
AP8140179 Support for valve fitting/removal

AP8140659 Valve oil seal punch

AP8140917 Tool for valve pressure plate

Inspecting the cam shaft

- Check the camshaft bearings for signs of abnormal wear.
- Check the cam height.
- Check there is no wear on the camshaft groove and related retention plate.
- If values measured are not within the specified limits or there are signs of excessive wear, replace the defective components with new ones.
- Check there are no signs of wear on the automatic valve-lifter cam, or the end-of-stroke roller, or the rubber buffer on the automatic valve lifter retaining cover.
- Check the automatic valve-lifter return spring is not deformed by over-stretching.
- Replace any defective or worn component.
- Check there are no signs of wear or scoring on the rocker pins.
- Check the internal diameter of each rocker arm.
- Check there are no signs of wear on the contact pads with the cam and on the jointed adjustment plate.



Characteristic

Rocking levers inside diameter: Standard diameter

$\varnothing 12.000 \div 12.011$ mm

Rocking lever pins diameter: Standard diameter

$\varnothing 11.977 \div 11.985$ mm

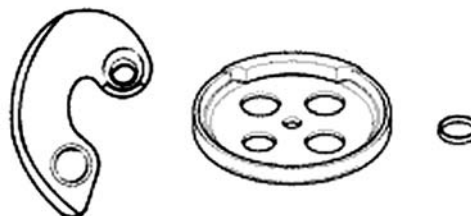
Camshaft check: Maximum axial clearance admitted:

0.42 mm

Camshaft check: Standard axial clearance:

0.11 \div 0.41 mm

Camshaft check: Standard height



Outlet: 29.209 mm

Camshaft check: Standard height

Inlet: 30.285 mm

Camshaft check: Minimum diameter admitted

Bearing B Ø: 19.950 mm

Camshaft check: Minimum diameter admitted

Bearing A Ø: 36.94 mm

Camshaft check: Standard diameter

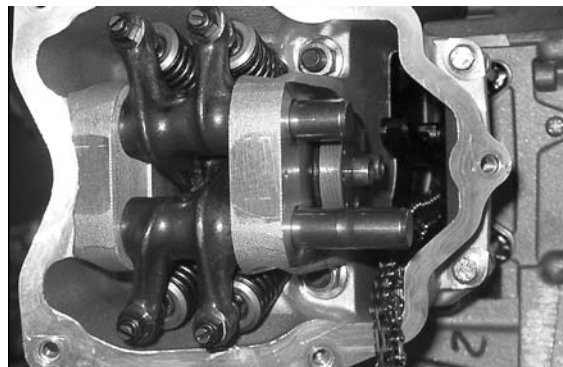
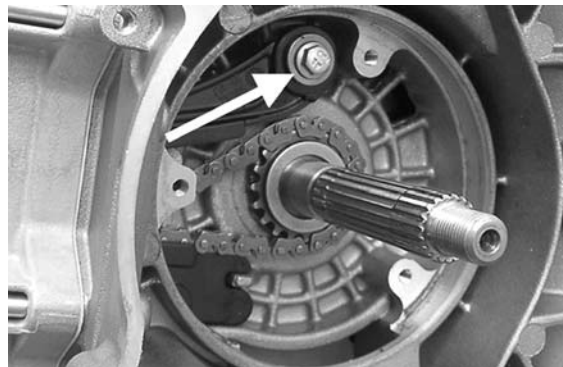
Bearing B Ø: 19.959 ÷ 19.98 mm

Camshaft check: Standard diameter

Bearing A Ø: 36.95 ÷ 36.975 mm

Refitting the head and timing system components

- Fit the timing chain sprocket wheel on the crankshaft, with the chamfer facing the insertion side.
- Loop the timing chain around the sprocket on the crankshaft.
- Fit the chain tensioner pad from the cylinder head side.
- Fit the spacer and the fixing screw.
- Tighten the screw to the prescribed torque.
- Fit the pins and rocker levers.
- Lubricate the 2 rocking levers through the holes at the top.
- Lubricate the 2 bearings and insert the camshaft in the cylinder head with the cams opposed to the rocking levers.
- Insert the retention plate and tighten the two screws shown in the picture to the prescribed torque.
- Refit the spacer on the camshaft.
- Rotate the engine so that the piston is at top dead centre, using the reference marks on the flywheel and the crankcase.

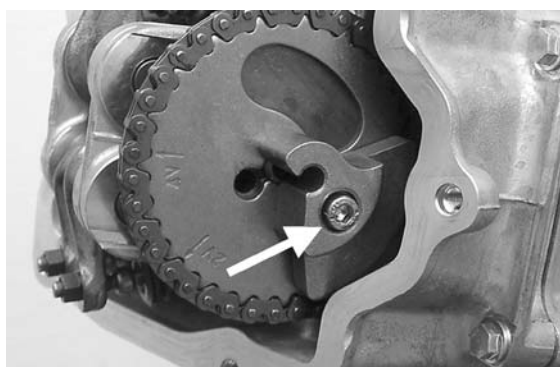


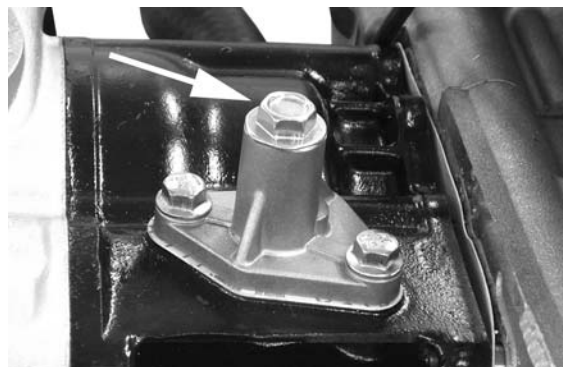
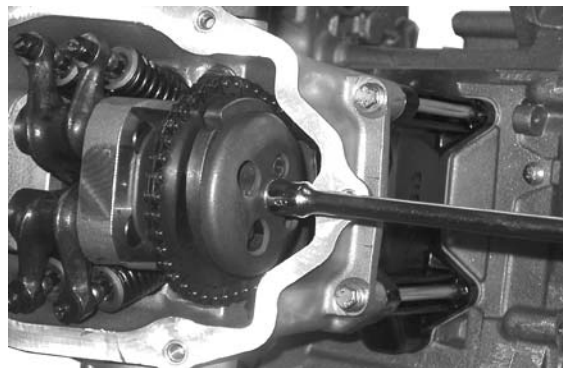
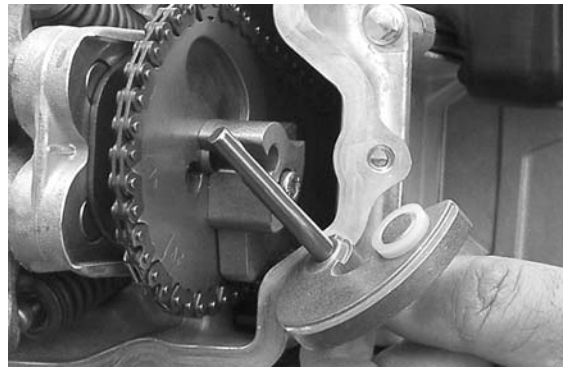
- In this position, fit the chain onto the camshaft control pulley.
 - Insert the pulley on the camshaft while keeping the reference **4V** matching the reference mark on the head.
 - Fit the counterweight and tighten the fixing screw to the prescribed torque..
 - Fit the end-stop ring on the automatic valve-lifter assembly and fit the automatic valve-lifter cam to the camshaft.
 - Fit the automatic valve-lifter return spring.
- During this operation the spring must be loaded approximately 180°.
- Fit the automatic valve-lifter retaining dish, using the counterweight fixing screw as reference.
 - Tighten the central fixing screw to the prescribed torque.
 - Set the tensioner cursor to the rest position.
 - Fit the chain tensioner on the cylinder using a new gasket, and tighten the two screws to the prescribed torque.
 - Insert the chain tensioning spring, together with the central screw and washer, and tighten the cap to the prescribed torque.
 - Adjust valve clearance
 - Fit the spark plug.

Electrode gap: 0.8 mm

NOTE

GREASE THE END-STOP RING TO PREVENT IT COMING OUT AND FALLING INTO THE ENGINE.



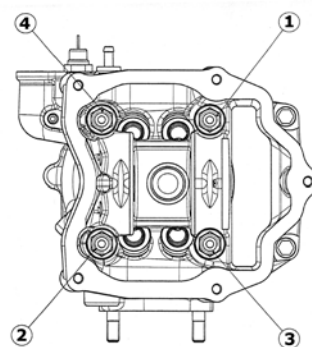


Locking torques (N*m)

Timing chain tensioner support screw 11÷13 (8.1÷9.6 ftlb) Spark plug 12÷14 (8.9÷10.3 ftlb) Starter ground screw 7÷8.5 (5.2÷6.3 ftlb) Timing chain tensioner pad screw 10÷14 (7.4÷10.3 ftlb) Starter ground bell screw 11÷15 (8.1÷11.1 ftlb) Timing chain tensioner central screw 5÷6 (3.7÷4.4 ftlb) Camshaft retention plate screw 4÷6 (3÷4.4 ftlb)

- Fit the timing chain guide pad.
- Insert the centring dowels between the cylinder head and the cylinder, fit the cylinder head gasket and the cylinder head.
- Lubricate the stud bolt threading.
- Tighten up the nuts to an initial pre-torque of 7±1 Nm

- Tighten up the nuts to a second pre-torque of 10 ± 1 Nm
- Rotate by an angle of 270°
- To carry out the operations described above, follow the tightening sequence indicated in the figure.
- Fit the two screws on the timing chain side and tighten them to the prescribed torque.

**NOTE**

BEFORE INSTALLING THE HEAD, MAKE SURE THAT THE LUBRICATION CHANNEL IS CLEAN USING A JET OF COMPRESSED AIR.

**Locking torques (N*m)**

Timing chain tensioner support screw $11 \div 13$ (8.1 ÷ 9.6 ftlb)

Refitting the rocker-arms cover

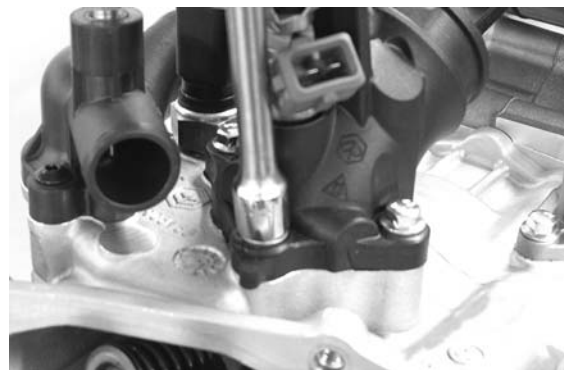
- Refit the head cover by tightening the 5 screws to the prescribed torque.
- Take care to correctly position the gasket.

**Locking torques (N*m)**

Cylinder head cover screws 6÷7 (4.4÷5.2 ftlb)

Refitting the intake manifold

- Assemble the inlet manifold and tighten the 3 screws.

**Locking torques (N*m)**

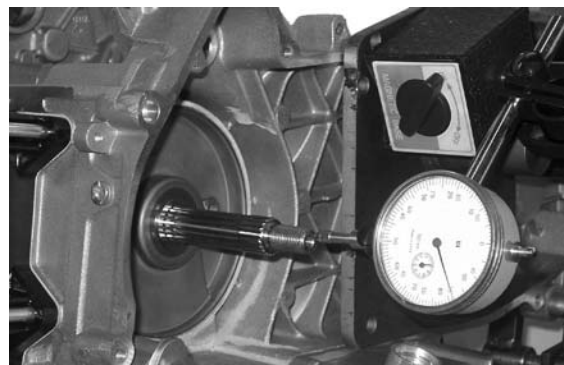
Inlet manifold screws 11÷13 (8.1÷9.6 ftlb)

Crankcase - crankshaft

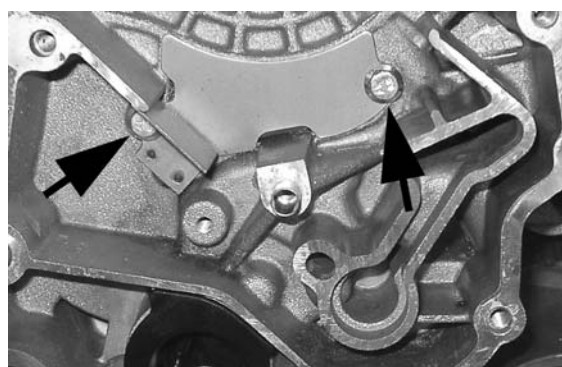
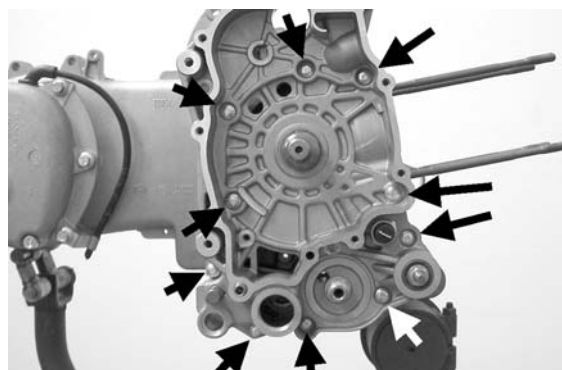
Splitting the crankcase halves

- Before opening the crankcase, it is advisable to check the axial clearance of the crankshaft. To do this, use a plate and a support with a specific tool dial gauge.

- Higher clearances are signs of wear on the supporting surfaces of the crankshaft on the crankcase.



- Remove the ten crankshaft coupling screws.
- Separate the crankcase while keeping the crankshaft in one of crankcase half.
- Remove the crankshaft.
- Remove the crankshaft halves coupling gasket.
- Remove the two screws and the internal cover shown in the figure.
- Remove the flywheel side oil seal.
- Remove the oil filter fitting shown in the figure.
- Check the connecting rod axial clearance.
- Check the connecting rod radial clearance.
- Check that the surfaces that limit the axial clearance are not scored and with the aid of a gauge measure the crankshaft width as shown in the figure.
- If the crankshaft-crankcase axial clearance exceeds what specified and the crankshaft does not show any defect, the problem must be due to either excessive wear or wrong machining on the crankcase.
- Check the diameters of both crankshaft bearings according to the axes and surfaces shown in the figure. Half-shafts are classified in two categories, Cat 1 and Cat 2, as shown in the chart below. The half-shaft category markings are stamped on the outer side of the counterweight crankwebs.

**CAUTION**

THE CRANKSHAFT CAN BE REUSED WHEN ITS WIDTH IS WITHIN THE STANDARD VALUES AND THE SURFACES SHOW NO SIGNS OF SCORING.

CAUTION

WHEN OPENING THE CRANKCASES AND REMOVING THE CRANKSHAFT, CHECK THAT THE THREADED SHAFT ENDS DO NOT IN-

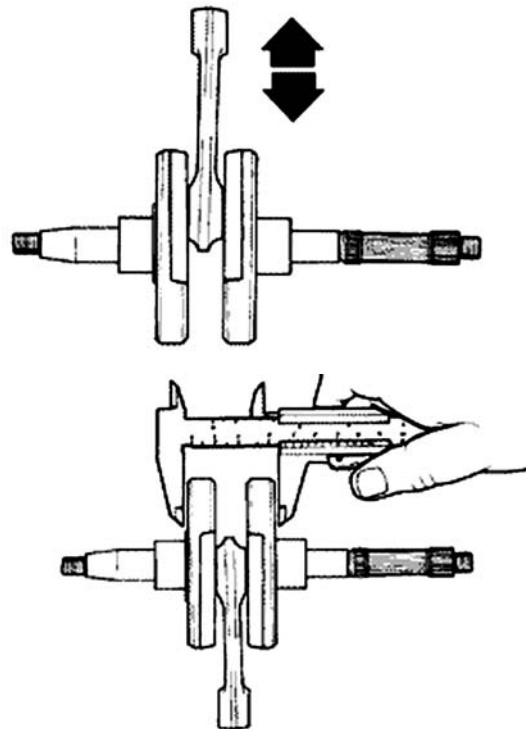
INTERFERE WITH THE MAIN BUSHINGS. FAILURE TO OBSERVE THIS PRECAUTION CAN DAMAGE THE MAIN BUSHINGS.

CAUTION

WHEN SEPARATING THE CRANKCASE KEEP THE CRANKSHAFT IN ONE OF THE CRANKCASE HALF. THE CRANKSHAFT MIGHT ACCIDENTALLY FALL IF THIS RULE IS NOT OBSERVED.

NOTE

WHEN MEASURING THE CRANKSHAFT WIDTH, MAKE SURE THAT THE MEASUREMENTS ARE NOT MODIFIED BY THE COUPLING SPOKES WITH THE CRANKSHAFT BEARINGS.



Characteristic

Crankshaft - crankcase axial clearance: Standard clearance

0.15 ÷ 0.40 mm (when cold)

Crankshaft - connecting rod axial clearance: Standard clearance

0.20 ÷ 0.50 mm

Crankshaft - connecting rod radial clearance: Standard clearance

0.036 ÷ 0.054 mm

Crankshaft width with integral washers: standard sizes

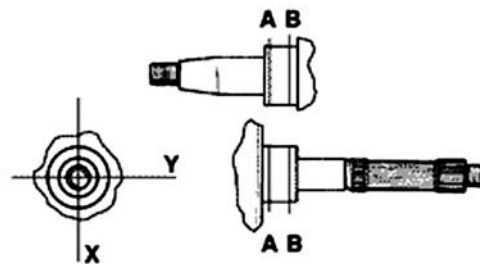
55.67 ÷ 55.85 mm

Camshaft bearings: Standard diameter: Cat. 1

28.994 ÷ 29.000

Camshaft bearings: Standard diameter: Cat. 2

29.000 ÷ 29.006



Specific tooling

AP8140922 Crankcase splitting strip

AP8140266 Comparator door

Inspecting the crankshaft alignment

- Install the crankshaft on the support and measure the misalignment at the 4 points indicated in figure.

- Check that the crankshaft cone, the tab fitting, the oil seal flow, the knurling and the threaded tangs are in good working order.

- In case of failure, replace the crankshaft.

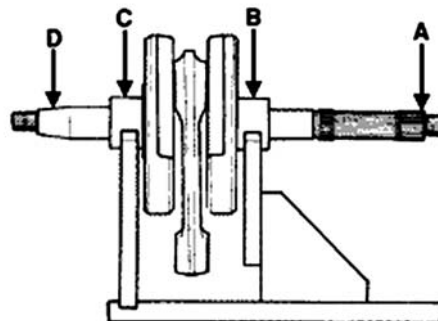
The rod head bushings cannot be replaced.

Therefore, the connecting cannot be replaced either and, when cleaning the crankshaft, be very careful that no impurities get in through the shaft lubrication holes.

In order to prevent damaging the connecting rod bushings, do not attempt cleaning the lubrication duct with compressed air.

- Make sure that the 2 buffers on the crankpin are properly fitted.

- A wrong installation of a buffer can seriously affect the bushing lubrication pressure.



NOTE

CRANKCASE BEARINGS ARE NOT GRIND-ABLE.

Characteristic

Maximum off-line allowed:

A = 0.15 mm

B = 0.01 mm

C = 0.01 mm

D = 0.10 mm

Specific tooling

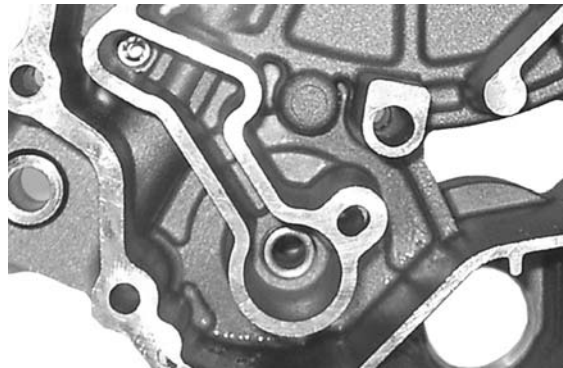
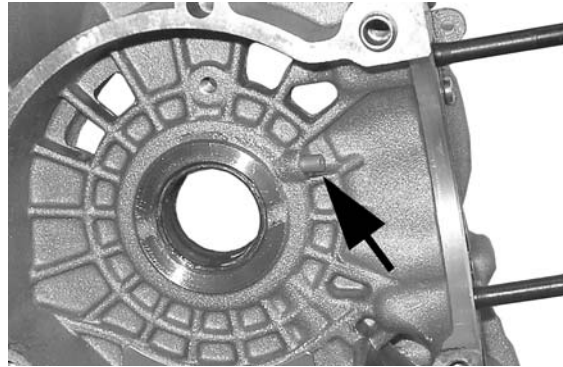
AP8140915 Crankcase check

Inspecting the crankcase halves

- Before checking the crankcase halves, thoroughly clean all the surfaces and oil pipes.
- For the crankcase half on the transmission side, take particular care cleaning the housing and oil pipes of the oil pump, the duct and the by-pass valve, the main bushings and the cooling nozzle on the transmission side (see figure).

As already described in the lubrication chapter, it is especially important that the by-pass valve housing shows no wear that may impair the proper sealing of the lubrication pressure adjustment piston.

- For the flywheel side crankcase half, take particular care cleaning the oil ducts for the main bushings, the oil duct for the jet that lubricates the cylinder head and the oil drainage duct at the flywheel side oil seal.
- Check the coupling surfaces for scratches or deformation, paying special attention to the cylinder - crankcase surfaces and the crankcase halves coupling surfaces.
- Defects in the crankcase coupling gasket or the surfaces indicated in the figure can cause a drop in oil pressure and thus affect the lubricating pressure for the main bushings and the connecting rod.
- Check that the surfaces limiting the crankshaft axial clearance show no signs of wear. To measure and check sizes follow the procedure described previously for checking crankshaft axial clearance and dimensions.



NOTE

THE JET IS FED THROUGH THE MAIN BUSHINGS. PROPER OPERATION OF THIS COMPONENT IMPROVES PISTON CROWN COOL-

ING. CLOGGING HAS EFFECTS THAT ARE DIFFICULT TO DETECT (PISTON TEMPERATURE INCREASE). FAILURE OR LEAKAGE CAN CONSIDERABLY CAUSE A DROP IN LUBRICATION PRESSURE FOR THE MAIN BUSHINGS AND CONNECTING ROD.

NOTE

THE HEAD LUBRICATION CHANNEL IS PROVIDED WITH A SHUTTER JET: THIS GIVES A "LOW PRESSURE" HEAD LUBRICATION; THIS CHOICE HAS BEEN MADE TO REDUCE OIL TEMPERATURE. JET CLOGGING IMPAIRS HEAD LUBRICATION AND THE TIMING MECHANISMS. A JET FAILURE CAUSES A DROP IN LUBRICATION PRESSURE FOR THE MAIN BUSHINGS AND CONNECTING ROD.

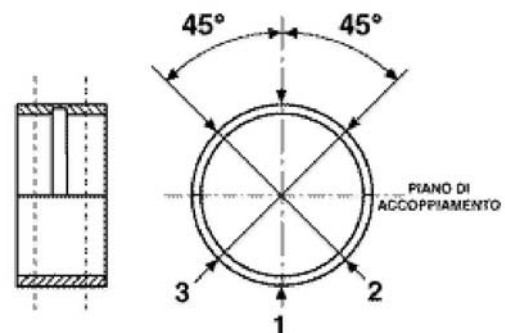
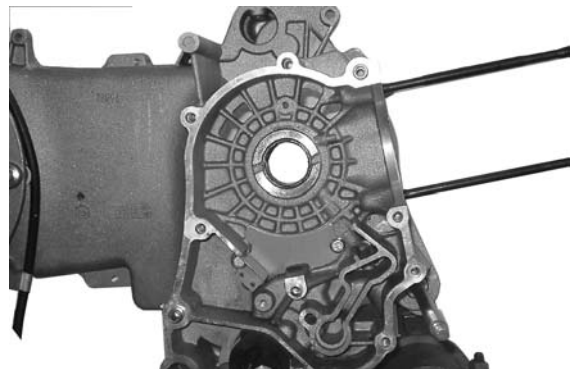
Inspecting the crankshaft plain bearings

- In order to obtain proper bushing lubrication, it is necessary to have both an outstanding lubricating pressure (3.2 bar) and a good oil flow rate. Therefore, the bushings must be correctly positioned so as not to obstruct the oil supply channels.

- The main bushings are comprised of 2 half-bearings, one with holes and channels for lubrication while the other is solid.

- The solid half-bearing is intended to stand the thrusts caused by combustion, and for this reason, it is arranged opposed to the cylinder.

- So as not to obstruct the oil supply channels, the coupling surface of the two half-bearings must be perpendicular to the cylinder axis as shown in the figure.



-
- The oil supplying channel section is also influenced by the depth to which the bushings are driven compared with the crankshaft axial clearance of the limiting surface.
 - Measure the bushings diameter at the 3 positions indicated in the figure.
 - Repeat the measurements for the other half of the bushing. See figure.
 - To obtain a proper lubrication of the brasses, it is necessary to have an optimum lubrication pressure (3,2 bar) and a good oil rate; to this purpose, the brasses must be placed properly, so as to not have shuttering in the oil feeding channels.
 - Bench brasses are realised with 2 half-bearings, one of which is solid while the other has holes and seats for lubrication.
 - The solid half-bearing is intended to stand the thrusts caused by combustion, and for this reason it is arranged opposed the cylinder.
 - To prevent shutters in the oil feeding channels, the matching surface of the two half-bearings must be perfectly orthogonal to the cylinder axis, as shown in the figure.
 - The oil feeding channel section is also affected by the brass driving depth relative to the driving shaft axial clearance containment plane.
 - Check the brass diameter in the 3 directions shown in the figure.
 - Repeat the measurements for the other half of the brass. See figure.
 - The crankcase is supplied in three setup versions: with RED brasses, with BLUE brasses and with YELLOW brasses.
 - The brass housing hole is in the only category reported below.

- The standard brass diameter after driving is variable on the basis of a coupling selection.
- The brass seats into the crankcases are classified into 2 categories as for the driving shaft Cat. 1 and Cat. 2.
- Brasses are divided into 3 categories according to their thickness. See the table below:

TYPE		IDENTIFICATION	
A		RED	
B		BLUE	
C		YELLOW	

	Type "A" - RED	Type "B" - BLUE	Tipo "C" - YELLOW
Bench half-bearing	1,970 ÷ 1,973	1,9703 ÷ 1,976	1,976 ÷ 1,979

Brass category	Half-crankcase category	Brass inside diameter after reassembly	Possibility of assembly
A	1	29,025 ÷ 29,040	Original
B	1	29,019 ÷ 29,034	Original and spare
	2	29,028 ÷ 29,043	
C	2	29,022 ÷ 29,037	Original

Match the shaft with two category 1 shoulders with category 1 crankcase (or cat. 2 with cat. 2). A spare crankcase cannot be combined with a driving shaft with mixed categories. Spare shafts have half-shafts of the same category.

Half-crankcase	Engine half-shaft	Brass
----------------	-------------------	-------

Cat.1	Cat.1	B
Cat.2	Cat.2	B
Cat.1	Cat.2	A
Cat.2	Cat.1	C

Refitting the crankcase halves

Crankcase halves are classified, as are crankshafts, into two categories: Cat. 1 and Cat. 2.

CAUTION

THERE ARE NO STAMPED MARKINGS ON THE ENGINE CRANKCASE HALVES. CRANK-SHAFT CATEGORY MATCHES THE ONE FOR THE ENGINE HALF-SHAFT.

Combine a Cat. 1 shaft with two crankwebs with a Cat. 1 crankcase (or Cat. 2 with Cat. 2).

CAUTION

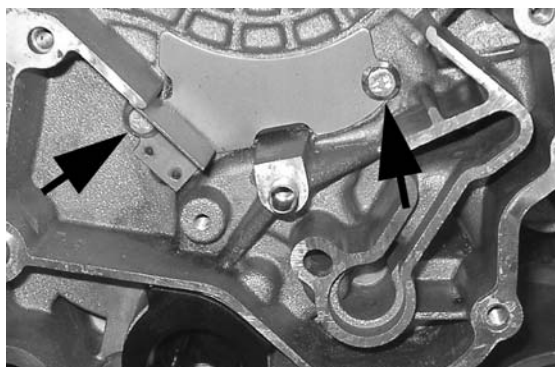
SHOULD THE ENGINE CRANKCASE OR THE CRANKSHAFT BE REPLACED, MAKE SURE THE STAMPED MARKING IS CAT, 1 OR CAT. 2 BEFORE ORDERING, SO THAT YOU WILL RECEIVE THE SUITABLE MATERIAL FOR A CORRECT COUPLING.

A spare crankcase cannot be combined with a crankshaft with mixed categories. Spare shafts have half-shafts of the same category.

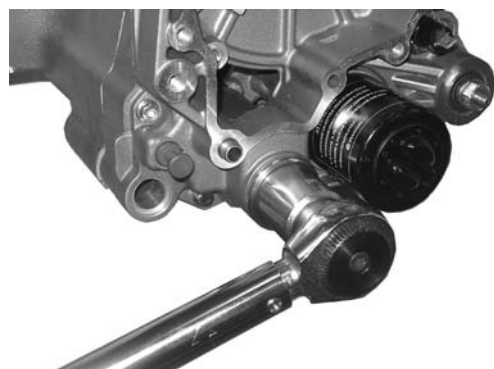
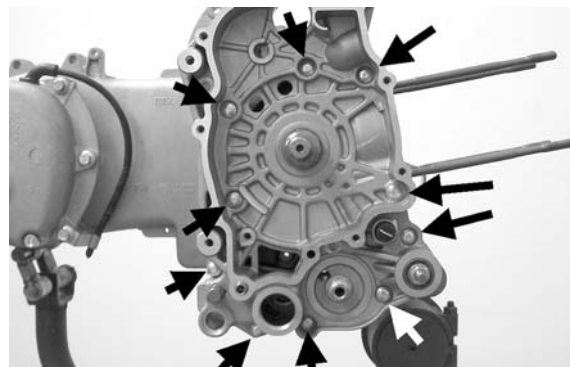
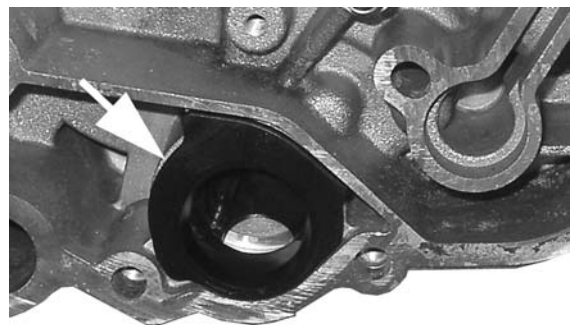
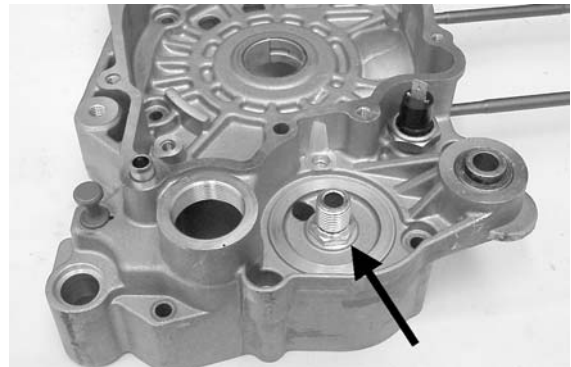
NOTE

SPARE CRANKCASES ARE CHOSEN WITH HALF-SHAFTS OF THE SAME CATEGORY.

- Fit the internal bulkhead by locking the 2 screws to the prescribed torque.
- Fit the oil filter fitting and tighten it to the prescribed torque.
- Position the oil pre-filter element as shown in the photograph.
- Place a new gasket on one of the crankcase half, preferably on the transmission side, together with the centring dowels.
- Lubricate the main bushings and insert the crankshaft in the transmission side crankcase half.



- Couple the 2 crankcase halves.
- Fit the 10 screws and tighten them to the pre-scribed torque.
- Fit and lubricate a new O-ring on the pre-filter.
- Insert the pre-filter and its cover on the engine. Tighten to the specified torque.



Locking torques (N*m)

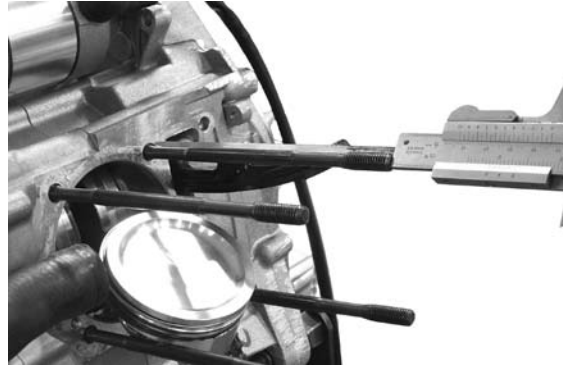
Screws for engine crankcase internal bulkhead (transmission-side half shaft) 4÷6 (3÷4.4 ftlb) Engine crankcase coupling screws 11÷13 (8.1÷9.6 ftlb) engine oil drainage plug/ mesh filter 24÷30 (17.7÷22.1 ftlb) Oil filter fitting on crankcase 27÷33 (19.9÷24.4 ftlb)

Studs

Check that the stud bolts have not worked loose from their seats in the crankcase.

Check the depth of stud bolt driving with a gauge, as indicated in the photograph. If its driving depth varies significantly from that indicated, it means that the stud bolt has yielded.

Should this occur, replace it.



By working on two cylinder head fixing nuts fitted, nut and lock nut, remove the stud bolt from its seat as shown in the photograph.

Thoroughly clean the threaded seat on the crankcase.

Refit a new stud bolt and apply the special product on the crankcase side thread.

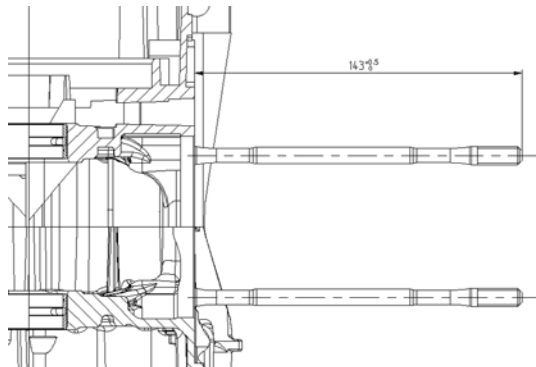
Tighten up to the driving depth indicated.



Recommended products

Loctite Quick Set Loctite 270 threadlocker, maximum strength

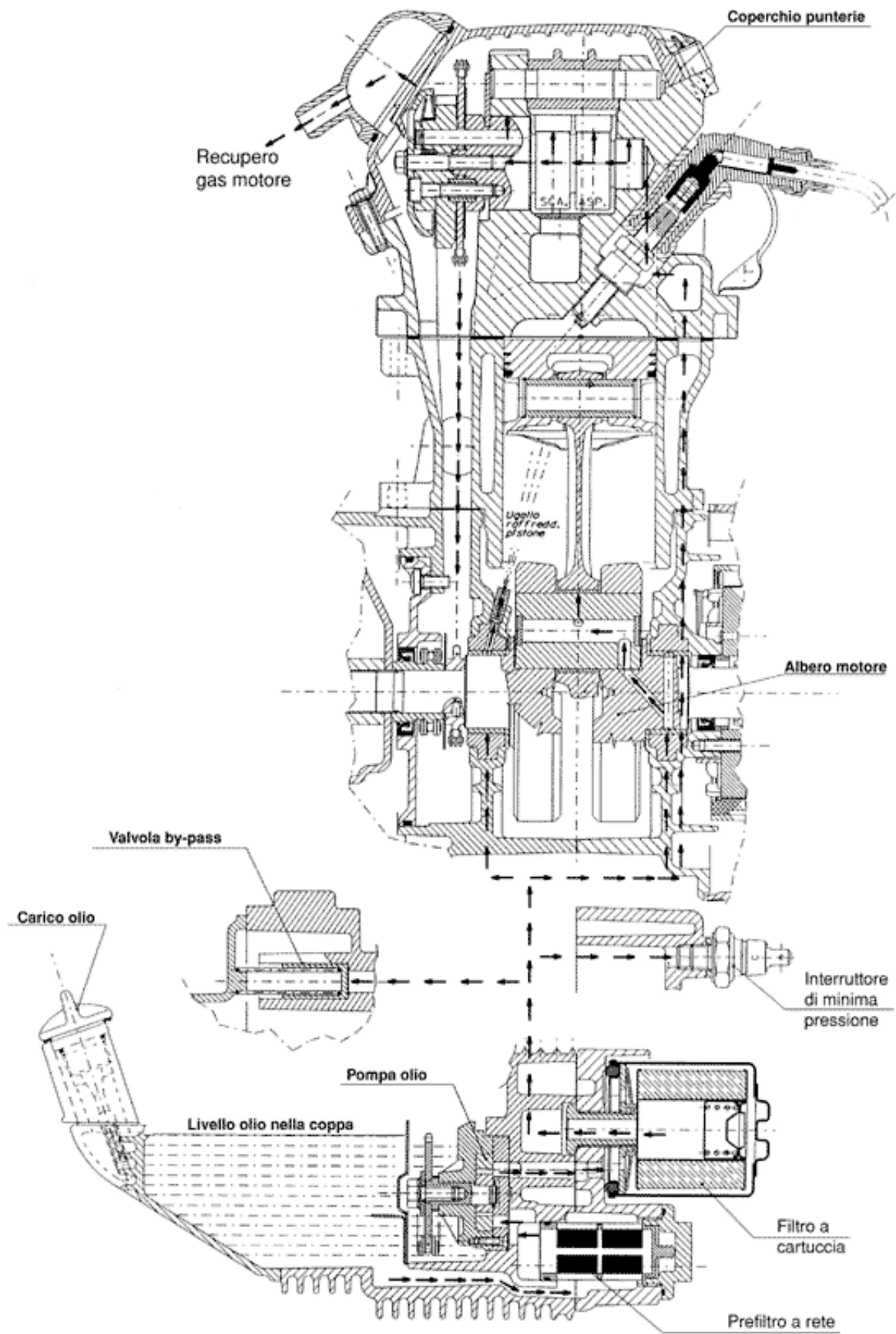
Loctite 270 threadlocker, maximum strength



Lubrication

Conceptual diagrams

LUBRICATION CIRCUIT



Oil pressure check

- Disconnect the electrical connection of the minimum oil pressure switch and then remove the switch.
- Check that the oil pressure reading is between $0.5 \div 1.2$ atm with engine idling at 1650 rpm and oil at the required temperature (wait for at least one electric ventilation).
- Check that the oil pressure reading is between $3.2 \div 4.2$ atm with engine idling at 6000 rpm and oil at the required temperature.
- Remove the specific tools on the engine once the measurement is complete. Refit the oil pressure switch and washer, tightening it to the prescribed torque, and fit the flywheel cover.
- If oil pressure reading are not within the specified limits, check in the following order: the oil filter, the oil by-pass valve, the oil pump and the crankshaft seals.



NOTE

THIS CHECK MUST BE CARRIED OUT WITH OIL AT THE CORRECT LEVEL AND WITH AN OIL FILTER IN GOOD CONDITION.

Characteristic

Oil pressure

Minimum pressure admitted at 6000 rpm: 3.2 atm.

Locking torques (N*m)

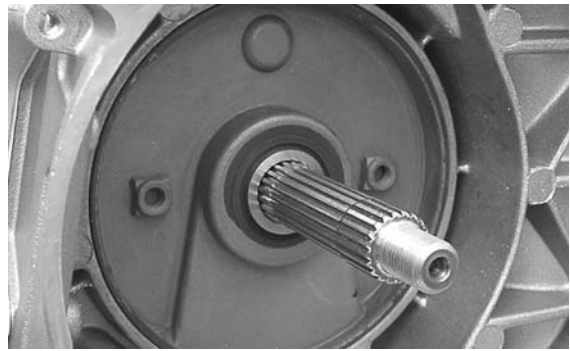
Minimum oil pressure sensor **12÷14 (8.9÷10.3 ftlb)**

Crankshaft oil seals

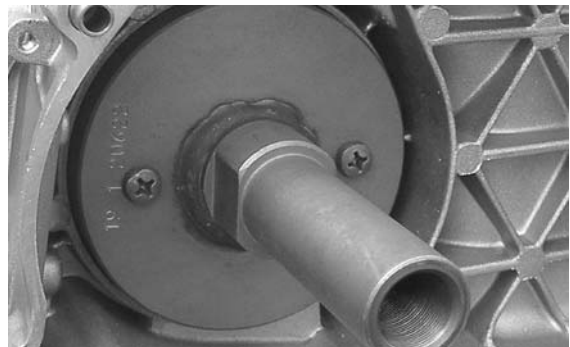
Removal

- First remove the transmission cover and the en-

tire driving pulley



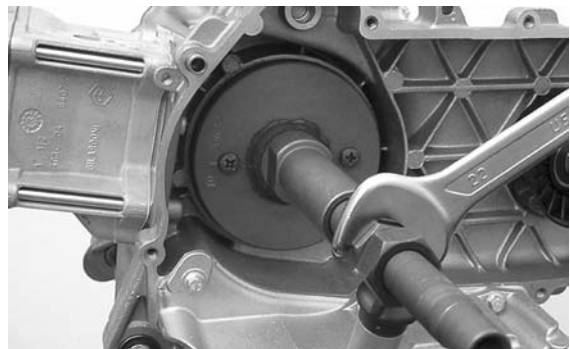
- Install the base of the appropriate tool on the oil guard using the screws supplied



Specific tooling

AP8140729 Chain cover fitting/removal

- Screw the threaded bar onto the base of the tool and extract the oil guard



Specific tooling

AP8140729 Chain cover fitting/removal

Refitting

- Always use a new oil guard when refitting
- Prepare the new oil guard by lubricating its sealing lip.
- Preassemble the oil guard with the appropriate tool, positioning the screws.

- Place the sheath over the crankshaft
- Insert the tool with the oil seal on the crankshaft until it comes into contact with the crankcase
- Insert the adaptor bushing of the tool in the hole on the crankcase.
- Position the oil guard by inserting the bracket which is part of the appropriate tool
- Tighten the threaded bar onto the crankshaft up to the end of travel
- Use the nut to move the base of the tool until you can feel the end of the stroke of the oil seal driving
- Remove all of the tool components following the procedure in reverse order.

CAUTION

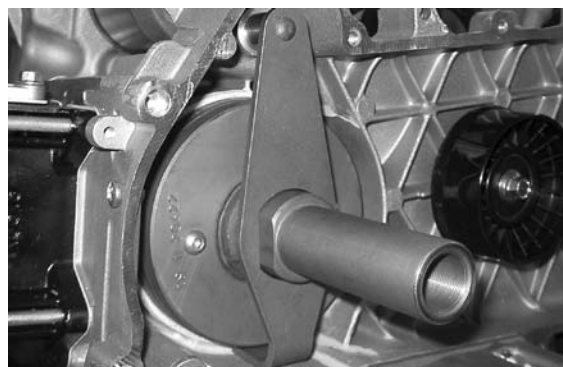
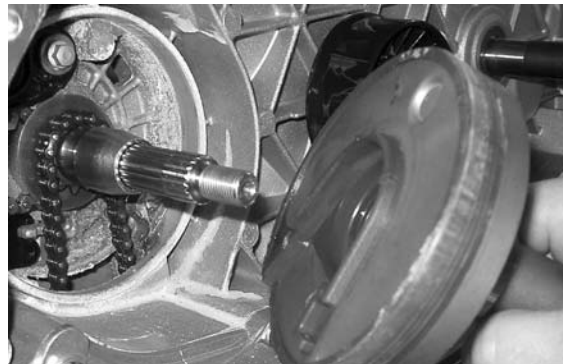
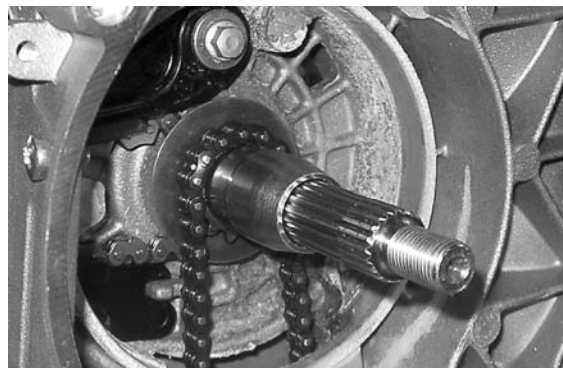
DO NOT LUBRICATE THE KEYING SURFACE ON THE ENGINE CRANKCASE

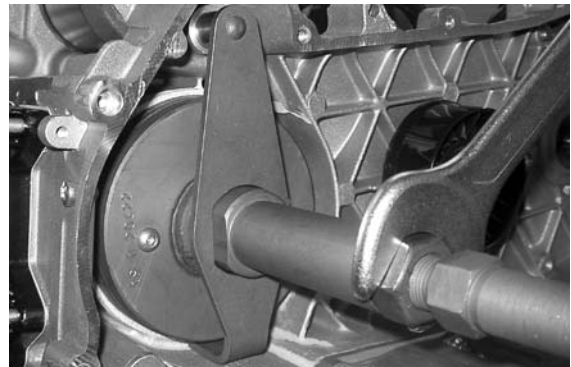
CAUTION

ORIENT THE OIL GUARD BY POSITIONING THE CHAIN HOUSING CHANNEL FACING DOWNWARDS. ONCE THE POSITION IS REACHED, DO NOT RETRACT THE OIL GUARD. FAILURE TO COMPLY WITH THIS RULE CAN CAUSE A WRONG POSITIONING OF THE OIL GUARD COUPLING SHEATH.

CAUTION

FAILURE TO COMPLY WITH THIS ASSEMBLY PROCEDURE CAN SERIOUSLY DAMAGE THE ENGINE DUE TO THE WRONG TENSIONING OF THE OIL PUMP DRIVING CHAIN





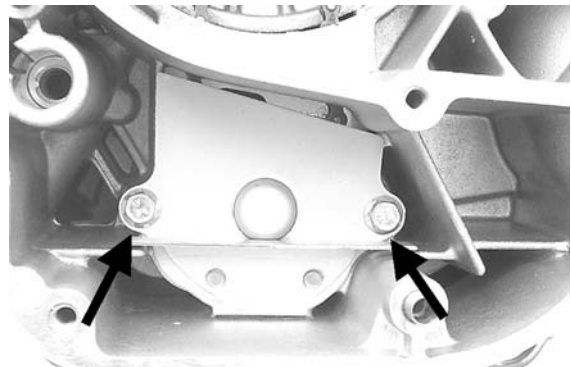
Specific tooling

AP8140729 Chain cover fitting/removal

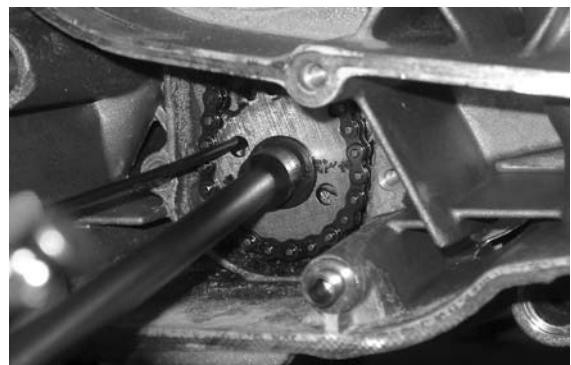
Oil pump

Removal

- Undo the 2 clamping screws in the figure and remove the cover over the pump control crown gear.

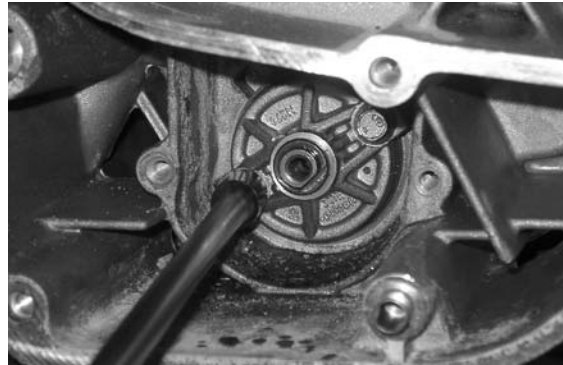


- Block the rotation of the oil pump driving pulley by inserting a screwdriver through one of its holes.
- Remove the central screw with Belleville washer indicated in the figure.
- Remove the chain and the crown gear.
- Remove the control sprocket wheel and its O-ring.
- Remove the oil pump by unscrewing the 2 screws indicated in the figure.
- Remove the sealing gasket.



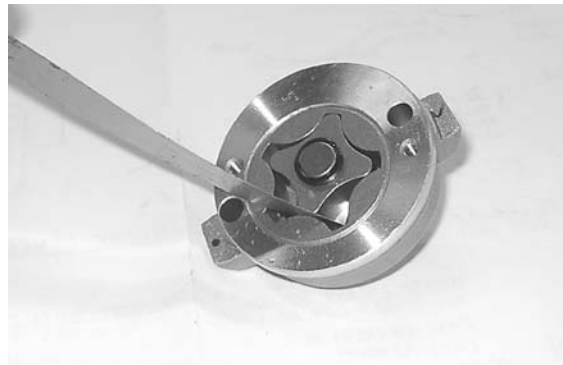
NOTE

IT IS ADVISABLE TO MARK THE CHAIN IN ORDER TO ENSURE THAT THE INITIAL DIRECTION OF ROTATION IS MAINTAINED



Inspection

- Remove the two screws and the oil pump cover.
- Remove the circlip fixing the inner rotor.
- Remove and wash the rotors thoroughly with petrol and compressed air.
- Reassemble the rotors in the pump body, keeping the 2 reference marks visible. Fit the seeger ring.
- Measure distance between rotors with a thickness gauge at the position shown in the picture.
- Measure the distance between the outer rotor and the pump body (see figure).
- Check the axial clearance of the rotors using a trued bar as shown in the figure.



Characteristic

Rotor axial clearance:

Limit value admitted: 0.09 mm

Distance between outer rotor and pump body

limit clearance allowed: 0.20 mm

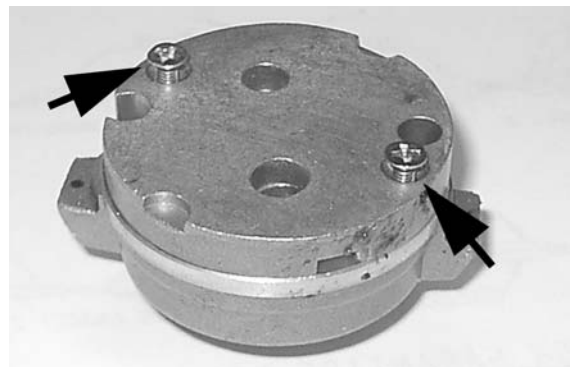
Distance between rotors

limit clearance allowed: 0.12 mm



Refitting

- Check there are no signs of wear on the oil pump shaft or body.
- Check there are no signs of wear or scoring on the oil pump cover.
- If non-conforming values or signs of wear are found, replace the faulty parts or the assembly.
- Fit the pump cover so positioned that the holes for the crankcase fixing screws are aligned.
- Make sure the gasket is the correct position and refit the pump on the engine crankcase. The pump can only be fitted in one position. Tighten the screws to the prescribed torque.
- Fit a new O-ring on the pinion.
- Assemble the chain.
- Fit the pulley, the central screw and the Belleville washer. Tighten to the specified torque.
- Assemble the oil pump cover by tightening the two screws to the prescribed torque.



NOTE

FIT THE BELLEVILLE WASHER SO THAT ITS OUTER RIM TOUCHES THE PULLEY. MAKE SURE THAT THE PUMP TURNS FREELY.

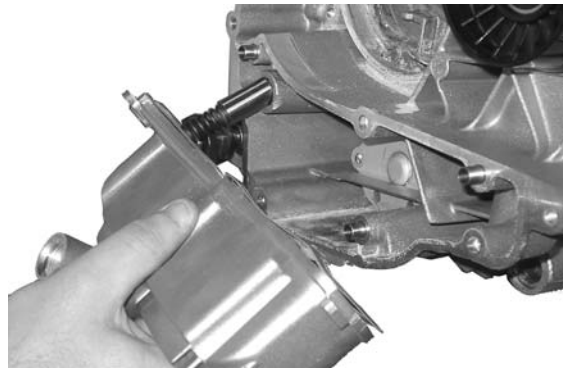
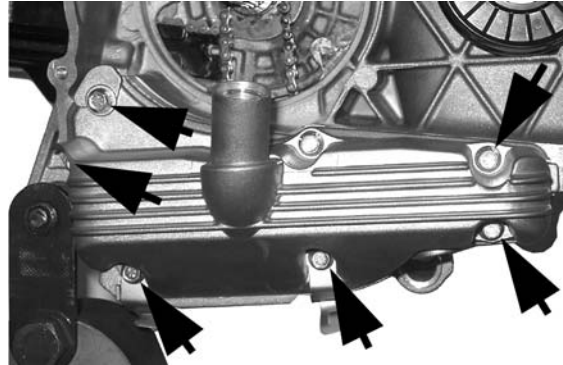
Locking torques (N*m)

Screws fixing the oil pump to the crankcase 5÷6 (3.7÷4.4 ftlb) oil pump driving crown gear

screw 10÷14 (7.4÷10.3 ftlb) Oil pump cover screws 7÷9 (5.2÷6.6 ftlb)

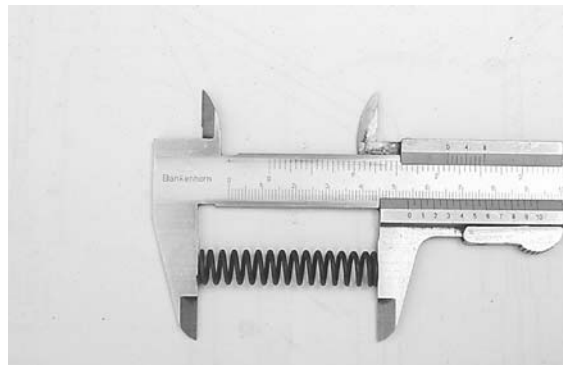
Removing the oil sump

- Remove the oil filler plug, the transmission cover, the complete driving pulley assembly with belt and sprocket wheel, as described in the Transmission chapter.
- Drain the oil from the sump as described above.
- Remove the 7 screws, shown in the figure, and the 2 brackets fixing the rear brake fluid pipe.
- Remove the spring, the by-pass piston, the gasket and the centring dowels shown in the figure.



Inspecting the by-pass valve

- Check the free length of the spring.
- Check that the plunger is not scored.
- Make sure that it slides freely on the crankcase and that it guarantees a good seal.
- Otherwise, eliminate any impurities or replace defective parts.



Characteristic

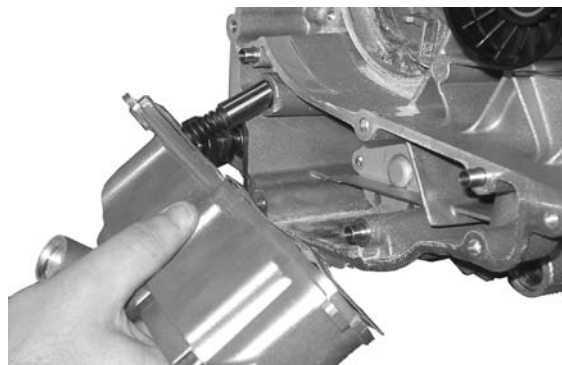
By-pass check : Standard length

54.2 mm

Refitting the oil sump

- Refit the by-pass valve plunger in its housing.
- Insert the pressure-regulating spring.

-
- Fit a new sump seal.
 - Refit the two centring dowels.
 - Refit the sump, taking care to locate the spring in the appropriate piece found in the sump.
 - Refit the screws and supporting brackets of the rear brake pipes in the reverse order followed for removal.
 - Tighten the screws to the prescribed torque.
 - Refit the driving pulley assembly, the belt, the pinion and the transmission cover as described in the "Transmissions" chapter.
 - **When testing the lubrication system, refer to the "Crankcase and Crankshaft" chapter regarding lubrication of the crankshaft and connecting rod.**



Locking torques (N*m)

Oil sump screws 10÷14 (7.4÷10.3 ftlb)

INDEX OF TOPICS

INJECTION

INJEC

MIU injection system

This is an integrated ignition and injection system.

Injection is indirect in the manifold through an electro-injector.

Injection and ignition are timed on the 4-stroke cycle using a tone wheel keyed onto the crankshaft (24-2 teeth) and a reluctant variation (pick-up) sensor.

Carburetion and ignition are managed on the basis of the engine revs and throttle valve opening. Further corrections are made according to the following parameters:

- Coolant temperature
- Intake air temperature
- Lambda probe value

The system implements an idle supply correction with cold engine through a Stepper motor on a by-pass circuit of the throttle valve. The electronic control unit manages the stepper motor and the injector opening time, thereby ensuring idle steadiness and proper carburetion.

In all conditions of use, carburetion is controlled by modifying the injector opening time.

Fuel delivery pressure is kept constant based on the ambient pressure.

The **fuel supply circuit** consists of:

- Fuel pump
- Fuel filter
- Injector
- Pressure regulator

Pump, filter and regulator are placed into the fuel tank using a single support.

The injector is connected by two pipes provided with fast-release fittings. This results in a continuous circulation, thereby avoiding the risk of fuel boiling. The pressure regulator is at the end of the circuit.

The fuel pump is controlled by the MIU control unit; therefore the scooter's safety is enhanced.

The **ignition circuit** consists of:

- HV coil
- HV cable
- Shielded cap
- MIU control unit
- Spark plug

The MIU control unit manages the ignition with the best advance ensuring 4-stroke timing (ignition only in the compression stroke) at the same time.

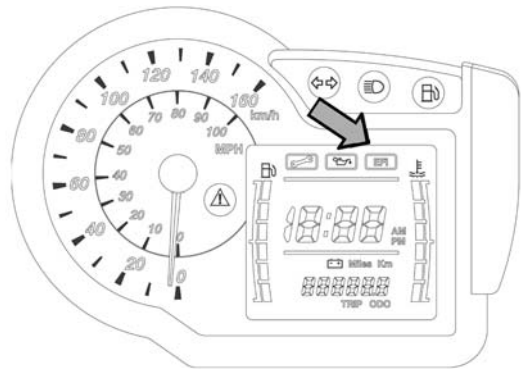
The MIU injection-ignition system controls engine functions by means of a pre-set program.

Should any input signals fail, an acceptable working order of the engine is ensured to allow the user to reach a service station.

Obviously, this cannot happen when the rev counter signal is missing, or when the failure concerns the control circuits:

- Fuel pump
- HV coil
- Injector

The control unit is fitted with a self-diagnosis system connected to the EFI icon in the instrument panel display.



Failures are detected and restored by the diagnostic tester.

In any case, when the fault is no longer present, data storage is automatically wiped clean after 16 cycles of use (cold start, running at regular engine temperature, stop).

The diagnostic tester is also required for adjusting idle speed carburetion.

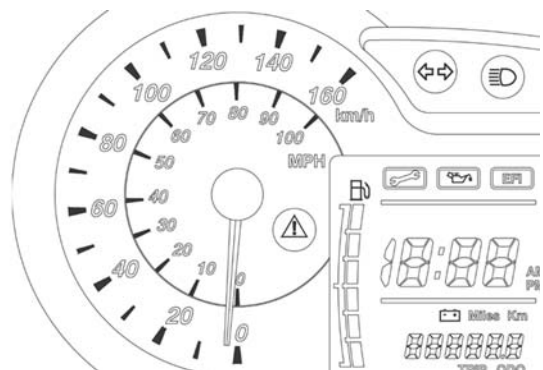


Specific tooling

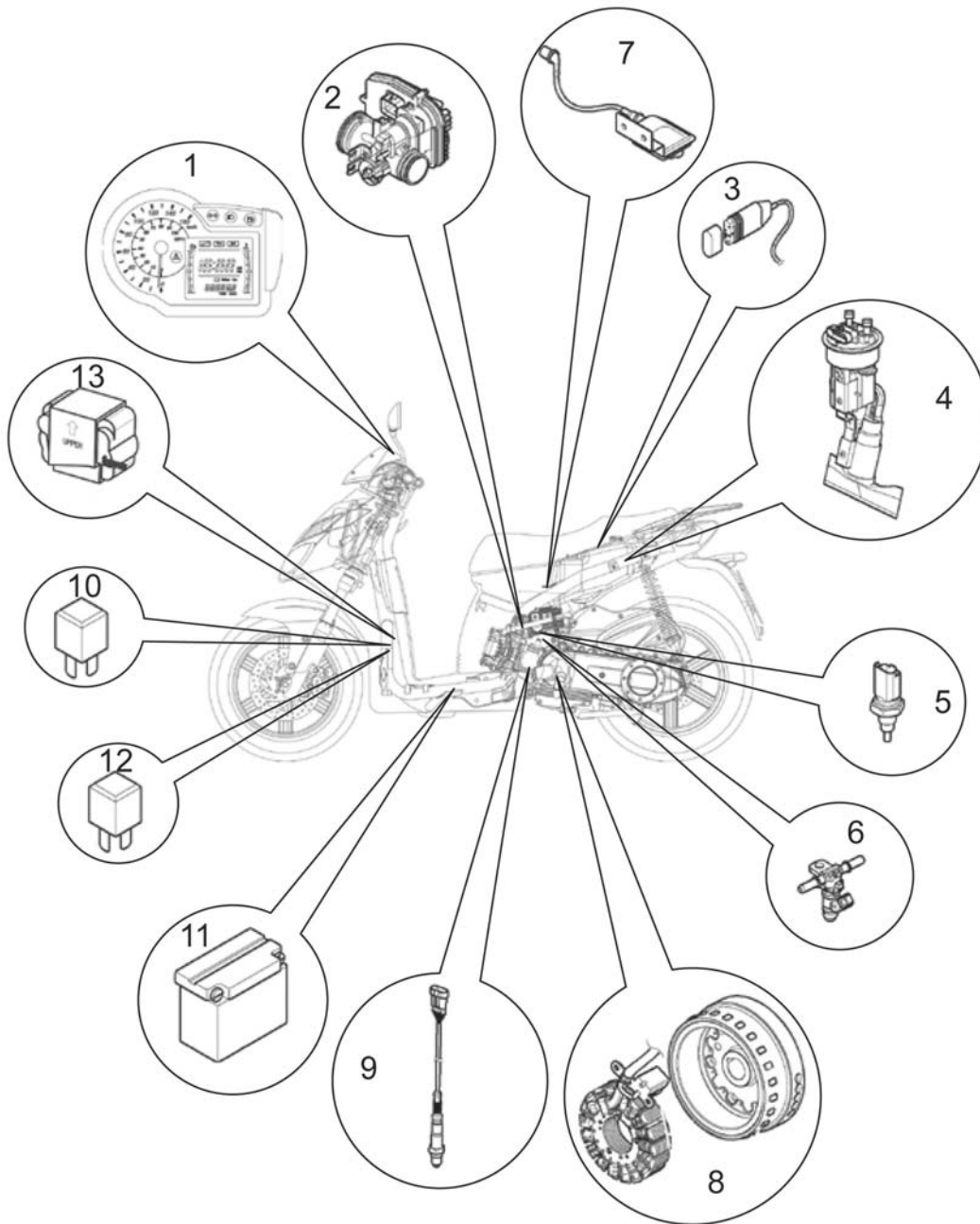
AP8140595 Axone + battery charger (230V 50Hz)

AP8202311 Axone + battery charger (110V 60Hz)

The MIU injection-ignition system carries out checks on the rpm indicator and the radiator cooling electric fan.



The MIU control unit power supply is further controlled by the emergency switch to further enhance vehicle safety.



TRANSPARENCY

	Specification	Desc./Quantity
1	Instrument panel	

	Specification	Desc./Quantity
2	Throttle body and injection electronic control unit (MIU)	
3	Connector for diagnosis	
4	Fuel pump	
5	Water temperature sensor	
6	Fuel injector	
7	HV coil	
8	Flywheel - revolution timing sensor	
9	Lambda probe	
10	Injection load remote control	
11	Battery	12V - 12 Ah
12	Electric fan remote control	
13	Fall sensor	

Precautions

Troubleshooting tips

1 A failure of the MIU system is more likely to be due to the connections rather than the components.

Before searching the MIU system for failures, check:

A: Power supply

- a. Battery voltage
- b. If a fuse is blown
- c. Remote controls
- d. Connectors

B: Chassis earth connection

C: Fuel supply

- a. If the fuel pump is broken
- b. If the fuel filter is dirty

D: Ignition system

- a. If the spark plug is faulty
- b. If the coil is broken
- c. If the shielded cap is broken

E: Intake circuit

- a. If the air filter is dirty
- b. If the by-pass circuit is clogged

c. If the stepper motor is failing

F: Others

a. If the timing system is not correctly adjusted

b. If the idle carburetion is not correct

c. If the throttle valve position sensor is not correctly reset

2 MIU system failure may be caused by loose connectors. Make sure that all connections are properly implemented.

Check the connectors as follows:

A check that the terminals are not bent.

B check that the connectors have been properly connected.

C see whether the malfunction can be fixed by slightly shaking the connector.

3 Check the entire system carefully before replacing the MIU control unit. If the fault is still present after the MIU control unit is replaced, install the original control unit again and check whether the fault occurs again.

4 Use a multimeter with an internal resistance over 10K Ohm /V when troubleshooting. Do not use unsuitable instruments as they may damage the MIU control unit. Instruments with definitions over 0.1V and 0.5 W must be used. Precision must be greater than 2%.

1. Before fixing any part of the injection system, check to see if there are any registered faults. Check for faults before disconnecting the battery.

2. The fuel supply system is pressurised at 250 kPa (2.5 BAR). Before disconnecting the fast-release fitting of a fuel supply pipe, check that there are no naked flames. Do not smoke. Act with caution to prevent spraying fuel in your eyes.

3. When fixing electric components, operate with battery connected only when strictly required.

4. When checking functions, make sure that the battery voltage is over 12V

5. Before trying to start-up, check to make sure there is at least 2 litres of fuel in the tank. Failure to observe this procedure can damage the fuel pump.

6. If the scooter is not going to be used for a long time, refill the tank to a little over half its capacity. This ensures that the pump will be covered by fuel.

7. When washing the vehicle, do not press the electric components and wiring.

8. When an ignition fault is detected, proceed to check the battery and the injection system connections first.

9. Before disconnecting the MIU control unit connector, follow these steps respecting the order shown:

- Set the switch to «OFF»

- Disconnect the battery

Failure to observe this rule can damage the electronic control unit.

10. Do not invert the polarity when fitting the battery.

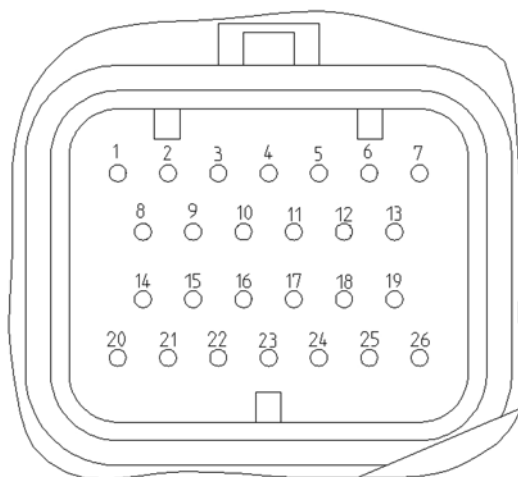
11. In order to prevent damages, disconnect and reconnect the MIU system connectors only if actually required. Before restoring the connections, check that they are perfectly dry.

12. When carrying out electric inspections, do not force the tester probes into the connectors. Do not take measurements not specifically required by the manual.

13. At the end of every check carried out with the diagnostic tester, protect the system connector with the specific cap. Failure to observe this rule can damage the MIU electronic control unit.

14. Before reconnecting the fast-release fittings of the power supply system, check that the terminals are perfectly clean.

Terminals setup

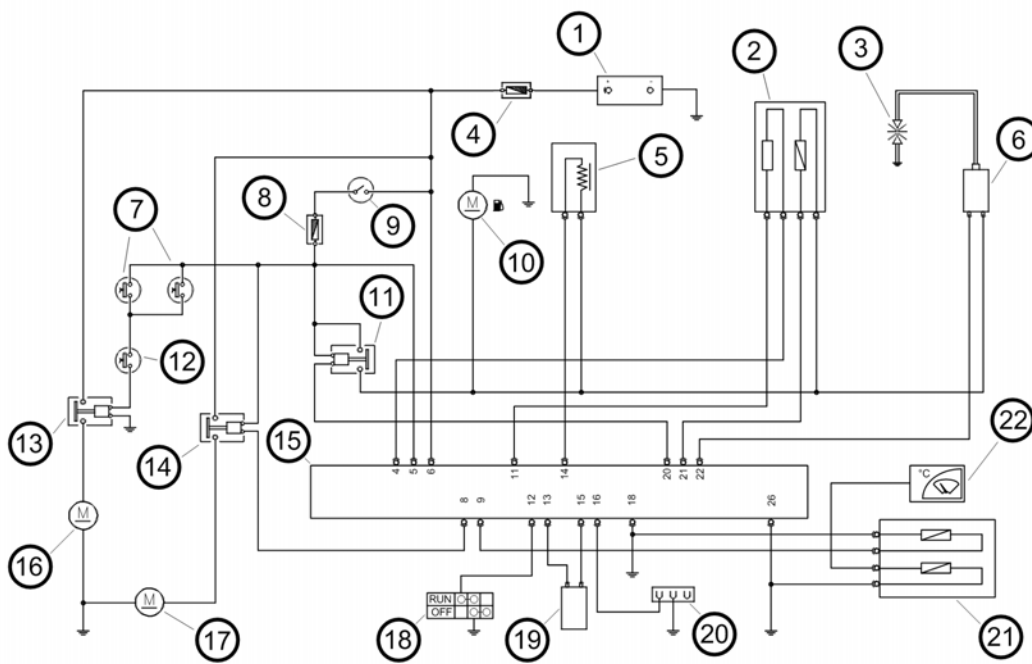


TERMINAL LAYOUT

	Specification	Desc./Quantity
1	Injection warning light	
2	-	
3	-	
4	lambda probe (-)	
5	permanent battery power supply (+)	
6	Battery (+)	
7	-	
8	Electric fan remote control	
9	Water temperature sensor	
10	-	

	Specification	Desc./Quantity
11	lambda probe (+)	
12	Engine stop switch	
13	Engine revolution sensor (+)	
14	Fuel injector	
15	Engine revolution sensor (-)	
16	Diagnosis output	
17	-	
18	Earth connection	Connected to: water temperature sensor, engine stop.
19	-	
20	Injection load remote control	
21	Lambda probe heater	
22	HV coil	
23	-	
24	Start-up enabling	
25	Rollover protection switch	
26	Earth connection	

EMS circuit diagram



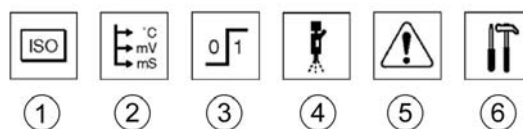
SYSTEM DIAGRAM

	Specification	Desc./Quantity
1	Battery	
2	Lambda probe	
3	Spark plug	
4	Fuse	15 A
5	Fuel injector	
6	HV coil	
7	Front/ rear stop switches	
8	Fuse	15 A
9	Key switch contacts	
10	Fuel pump	
11	Injection load remote control	
12	Starter button	
13	Start-up remote control	
14	Electric fan remote control	
15	Injection electronic control unit	
16	Starter motor	
17	Electric fan	
18	Engine stop switch	
19	Engine revolution sensor	
20	Connector for diagnosis	
21	Water temperature sensor	
22	Water temperature gauge	

Menu de l'ordinateur de poche

HANDHELD COMPUTER MENU SYMBOLS

1. ISO
2. Engine parameter reading
3. Device status (in general, values are ON - OFF)
4. Devices activation
5. Errors display
6. Adjustable parameters/Fixed parameters



ISO

Specification	Desc./Quantity
aprilia hardware (XXXXXX000)	This is the mapping code with the numbers inverted. If there are only zeros, this means that the central unit is blank (no mapping): the suitable mapping should be remotely reloaded (see the note related to the mapping parameter)
aprilia software	Not relevant field
Service number (XX)	
Engine (250 cc)	Single-cylinder engine, 250 cc
Produced (dd/mm/yy)	Electronic control unit production date
Mapping (XXXXXX)	Indicates the code of the configuration present on the control unit
Programming date (dd/mm/yy)	Date of last mapping downloading: day/month/year
Person in charge of last programming (XXXXX)	Identification code of the PC or Axone that has loaded the last mapping. In this 5.0.2 version, the code displayed is not right: in order to view it correctly, go to the ISO screen page that is displayed when selecting RESETTING

ENGINE PARAMETER READING

Specification	Desc./Quantity
Water temperature (°C)	Detected by the sensor placed on the engine
Air temperature (°C)	Temperature measured when entering the engine (sensor in the throttle body). Caution! the instrument panel temperature is read by a different sensor
Engine revs (rpm)	Measured by the crankshaft rpm detection sensor
Target idle revs (1600 rpm)	Target revs saved to the electronic control unit memory (they vary according to engine temperature)
Ignition advance	Ignition advance in relation to TDC
TPS Trimmer	
Idle motor (50 steps)	Idle motor position, example value measured with warm engine
Battery voltage (V)	Voltage measured at battery leads
Number of engine strokes in which more than a tooth have been lost since the beginning of the trip (0/1)	Shows 1 if it detects that more than one tooth is missing in the crown
Number of engine strokes in which one single tooth has been lost since the beginning of the trip (0/1)	Shows 1 if it detects that one tooth is missing in the crown

Specification	Desc./Quantity
Difference between actual and target steps (steps)	Difference between target steps and actual steps of the idle motor
Lamba correction (1)	Value that must be close to 1 when the control unit is using the lambda probe signal to keep the stoichiometric combustion
Lambda probe (100-900 mV)	Lambda probe signal voltage, fixed value if the circuit is interrupted
Injection time (ms)	Injector activation time
Atmospheric pressure (760 mmHg)	Air atmospheric pressure (for mapping adjustment)
Partial load self-adjustment (mg/cc)	Parameter for lambda probe self-adjustment for partial loads
Value adaptability at idle (mg/cc)	Parameter for lambda probe self-adjustment at idle speed
Gain value adaptability (%)	Parameter for lambda probe self-adjustment at full load

DEVICE STATUS

Specification	Desc./Quantity
Engine status (Off/running)	Engine off or running
Rpm sensor (Synchronised/Not synchron.)	Synchronised if the control unit detects a correct synchronisation (by means of the crankshaft rpm detection sensor)
Idle/full load (on/off)	ON if idle functioning
Active lambda probe (on/off)	ON if the control unit is using the lambda probe signal to keep the stoichiometric combustion

ADJUSTABLE PARAMETERS

Specification	Desc./Quantity
Throttle position self-learning	Just press the ENTER button to save the throttle closed position
Self-adjustable parameters reset	Lambda probe self-adaptability parameters reset (if a new engine, a new lambda probe or a new injector is installed)

DEVICES ACTIVATION

Specification	Desc./Quantity
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

Specification	Desc./Quantity
Fuel pump	The device is activated: if it is not correctly activated, this will be immediately shown in the Axone screen page
Coil	The device is activated: if it is not correctly activated, this will be immediately shown in the Axone screen page
Rpm indicator	The device is activated: if it is not correctly activated, this will be immediately shown in the Axone screen page
Injectors	The device is activated: if it is not correctly activated, this will be immediately shown in the Axone screen page
Electric fan	The device is activated: if it is not correctly activated, this will be immediately shown in the Axone screen page
Idle motor	The device is activated: if it is not correctly activated, this will be immediately shown in the Axone screen page

ERRORS DISPLAY

Specification	Desc./Quantity
Throttle	If the throttle position sensor signal is interrupted
Pressure	If the atmospheric pressure sensor signal is interrupted
Lambda probe	Displayed if the probe signal circuit is interrupted
Water temperature	Sensor, circuit or relevant connectors interrupted
Air temperature (°C)	Sensor, circuit or relevant connectors interrupted
Battery voltage	
Injector	Sensor, circuit or relevant connectors interrupted
Coil	Sensor, circuit or relevant connectors interrupted
Idle motor	Sensor, circuit or relevant connectors interrupted
Fuel pump relay	
Electric fan	Sensor, circuit or relevant connectors interrupted
Self-adjustable parameters	
RAM memory	Control unit internal error
ROM memory	Control unit internal error
EEPROM	Control unit internal error
Microprocessor	Control unit internal error
Rpm sensor	If the crankshaft rpm detection sensor is discon-

Specification	Desc./Quantity
	nected, this error is not shown

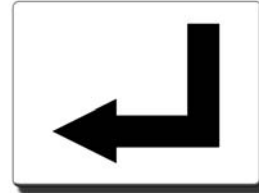
The adjustable parameters screen page is used:

- to align the throttle position sensor.

Throttle position sensor alignment

Align the throttle position sensor if the throttle body and/or the control unit should be replaced.

- Select the function: "throttle position self-learning".
- Make sure the left throttle is fully in.
- Press the "ENTER" key.
- Turn the key to "OFF" and leave it for at least 30 seconds.



Troubleshooting procedure

Engine does not start

ENGINE DOES NOT START EVEN IF PULLED

Possible Cause	Operation
Faults detected by self-diagnosis	Pump relay HV coil Injector Revolution timing sensor
Fuel supply	Fuel present in the tank Fuel pump activation Fuel pressure (low) Injector flow (low)
Power to the spark plug	Spark plug Shielded cap HV Coil (secondary insulation)
Parameter reliability	Coolant temperature Distribution timing - injection start Intake air temperature

Starting difficulties

ENGINE START-UP PROBLEMS

Possible Cause	Operation
Faults detected by self-diagnosis	Pump relay

Possible Cause	Operation
	HV coil Injector Revolution timing sensor Air temperature Coolant temperature
Start-up speed	Starter motor and remote control Battery Earth connections
Power to the spark plug	Spark plug Shielded cap HV coil Revolution timing sensor Ignition advance
Fuel supply	Fuel pressure (low) Injector flow (low) Injector seal (poor)
Correctness of the parameters	Coolant temperature Intake air temperature Stepper throttle valve position (steps and actual opening) Cleaning the auxiliary air pipe and air filter efficiency throttle valve

Engine stops at idle

ENGINE DOES NOT HOLD IDLING/ IDLING IS UNSTABLE/ IDLING TOO LOW

Possible Cause	Operation
Faults detected by self-diagnosis	Pump relay HV coil Injector Revolution timing sensor Air temperature Coolant temperature
Ignition efficiency	Spark plug Ignition timing
Correctness of the parameters	Throttle valve position sensor Stepper Coolant temperature sensor Intake air temperature sensor
Intake system cleaning	Air filter Diffuser and throttle valve Supplementary air pipe and stepper
Intake system seal (seepage)	Intake manifold - head Throttle body - manifold Intake manifold Filter housing

Possible Cause	Operation
Fuel supply (low pressure)	Fuel pump Pressure regulator Fuel filter Injector flow

Engine does not rev down

ENGINE DOES NOT RETURN TO IDLING/IDLING TOO HIGH

Possible Cause	Operation
Faults detected by self-diagnosis	Pump relay HV coil Injector Revolution timing sensor Air temperature Coolant temperature
Ignition efficiency	Ignition timing
Correctness of the parameters	Throttle valve position sensor Stepper Coolant temperature sensor Intake air temperature sensor
Intake system seal (seepage)	Intake manifold - head Throttle body - manifold Intake manifold Filter housing
Fuel supply (low pressure)	Fuel pump Pressure regulator Fuel filter Injector flow

Exhaust backfires in deceleration

EXHAUST BACKFIRING WHEN DECELERATING

Possible Cause	Operation
Faults detected by self-diagnosis	Pump relay HV coil Injector Revolution timing sensor Air temperature Coolant temperature Lambda probe
Correctness of the parameters	Throttle valve position sensor Stepper Coolant temperature sensor Intake air temperature sensor

Possible Cause	Operation
Intake system seal (seepage)	Intake manifold - head Throttle body - manifold Intake manifold Filter housing
Fuel supply (low pressure)	Fuel pump Pressure regulator Fuel filter Injector flow
Exhaust system seal (seepage)	Manifold - head Manifold - muffler Muffler welding

Engine revs irregularly

REGULAR ENGINE PROGRESS WITH VALVE SLIGHTLY OPEN

Possible Cause	Operation
Intake system cleaning	Air filter Diffuser and throttle valve Supplementary air pipe and stepper
Intake system seal	Intake manifold Filter housing
Ignition system	Spark plug wear check
Parameter reliability	Throttle valve position signal Coolant temperature signal Intake air temperature signal Ignition advance
TPS reset successful	TPS reset successful
Faults detected by self-diagnosis	Pump relay HV coil Injector Revolution timing sensor Air temperature Coolant temperature Lambda probe

Poor performance at full throttle

POOR ENGINE PERFORMANCE AT FULL POWER/ IRREGULAR ENGINE PROGRESS ON ACCELERATION

Possible Cause	Operation
Faults detected by self-diagnosis	Pump relay HV coil Injector

Possible Cause	Operation
	Revolution timing sensor Air temperature Coolant temperature Lambda probe
Power to spark plug	Spark plug Shielded cap HV Cable HV Coil
Intake system	Air filter Filter housing (seal) Intake sleeve (seal)
Parameter reliability	Throttle valve position signal Coolant temperature signal Intake air temperature signal Ignition advance
Fuel supply	Fuel level in the tank Fuel pressure Fuel filter Injector flow

Engine knocking

PRESENCE OF KNOCKING (COMBUSTION SHOCKS)

Possible Cause	Operation
Faults detected by self-diagnosis	Pump relay HV coil Injector Revolution timing sensor Air temperature Coolant temperature Lambda probe
Ignition efficiency	Spark plug
Parameter reliability	Throttle valve position signal Coolant temperature signal Intake air temperature signal Ignition advance
Intake system seal	Intake manifold Filter housing
TPS reset successful	TPS reset successful
Fuel supply	Fuel pressure Fuel filter Injector flow Fuel quality
Selecting the thickness for the cylinder base gas-	Selecting the thickness for the cylinder base gas-

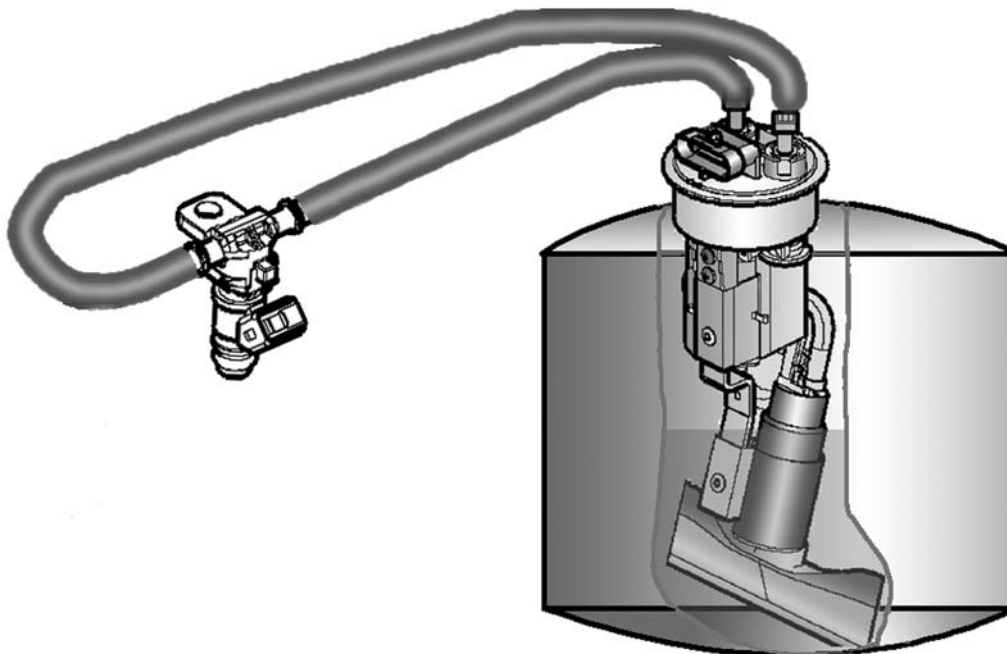
Possible Cause	Operation
ket	ket

Fuel supply system

The fuel supply circuit includes the electric pump, the filter, the pressure regulator, the electro-injector and the delivery and return pipes.

The electrical pump is located in the tank from which the fuel is pumped and sent to the injector through the filter.

The pressure is controlled by the pressure regulator situated in the pump assembly in the tank.



Removing the injector

Preventively remove:

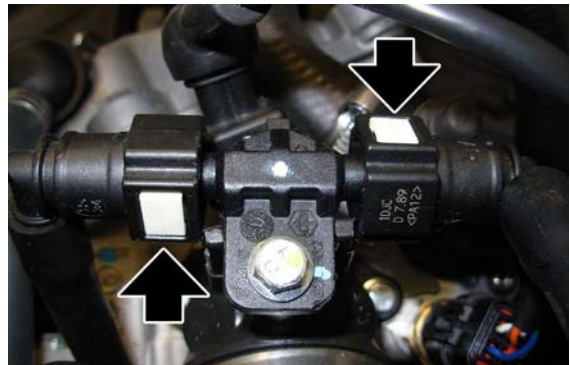
- Helmet compartment.
- Rear central cover.
- Remove the footrest lower protection by sliding it upwards and turning it.



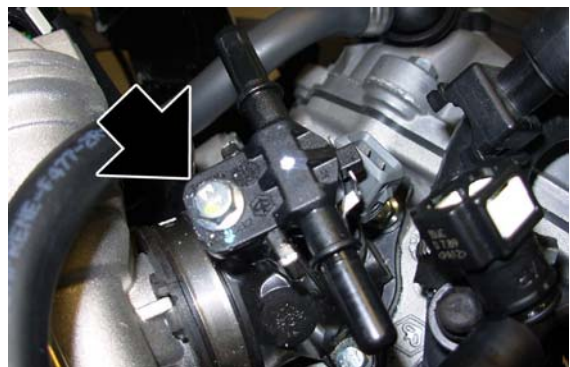
- Remove the injector connector.



- Remove the fast-release fittings from the injector support.



- Undo and remove the screw.



Refitting the injector

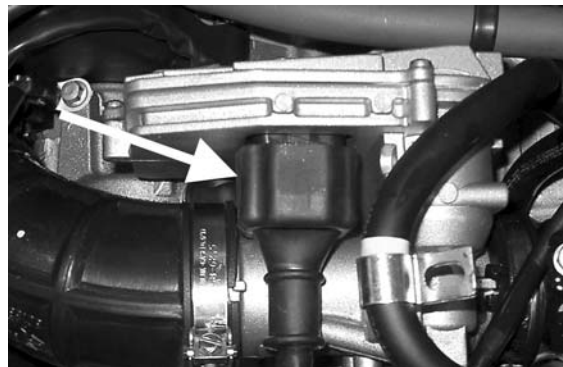
To refit, carry out the removal operations but in reverse order and observe the tightening torques.

Removing the butterfly valve

- Remove the screws fixing the control unit cable harness support.



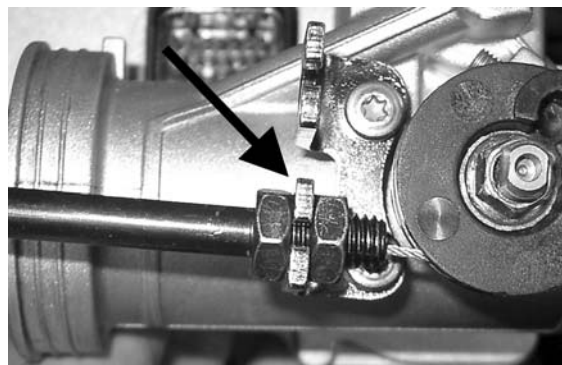
- Remove the MIU control unit connector



- Unscrew the throttle body / sleeve fastening clamp.
- Remove the sleeve.

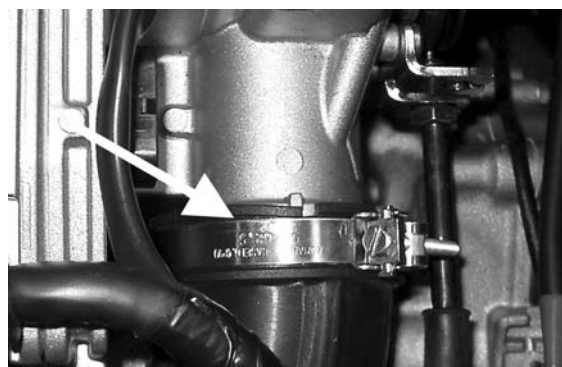


- Remove throttle control retainer.

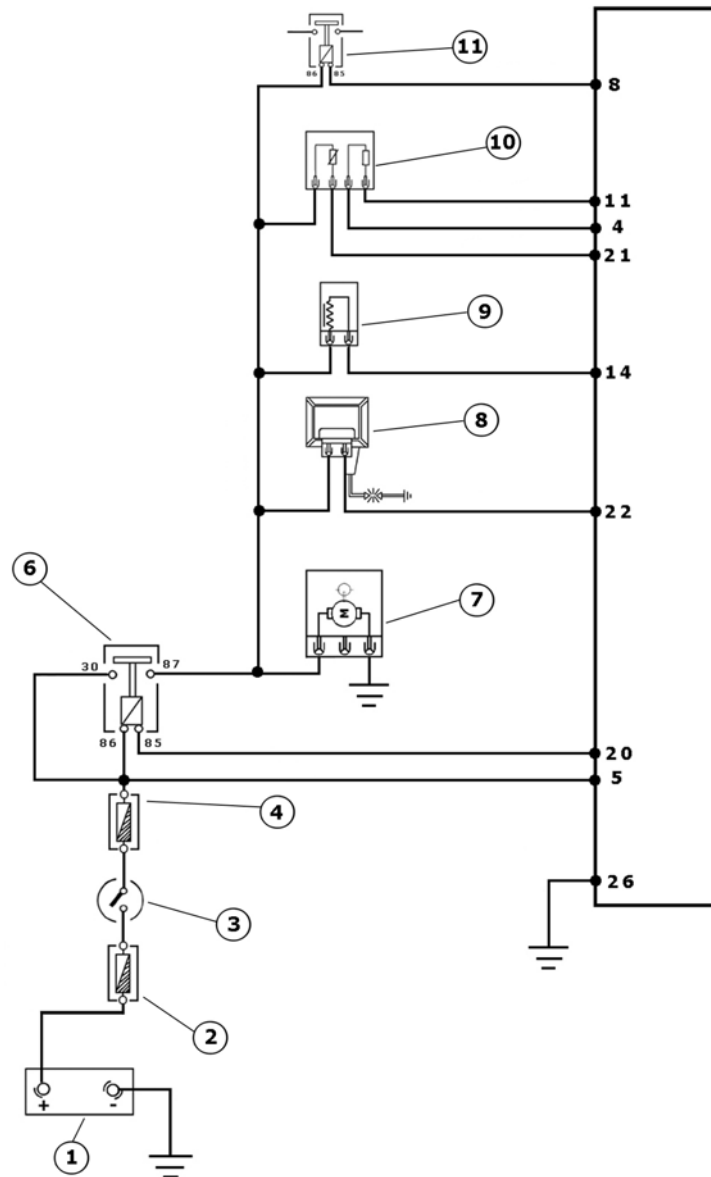


Refitting the butterfly valve

To refit, follow the removal steps but in reverse order, being careful to position the clip fixing the throttle body to the air filter bellows at 45° as shown in the photograph.



Pump supply circuit



COMPONENTS

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse	20 A
3	Key switch contacts	
4	Fuse	15 A
5	-	-
6	Injection load remote control	
7	Fuel pump	
8	HV coil	
9	Fuel injector	

	Specification	Desc./Quantity
10	Lambda probe	
11	Electric fan remote control	

When switched to "ON", the fuel pump starts to rotate for 2 seconds and then stops. With engine on and when a revolution timing signal is displayed, the pump is continuously supplied.

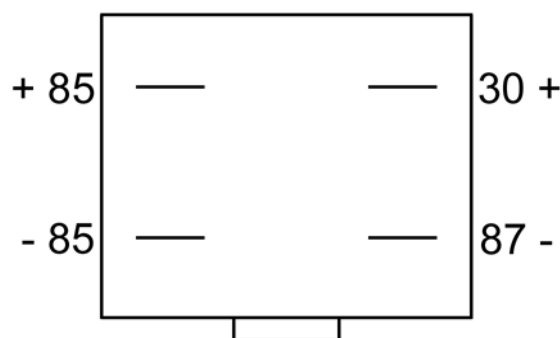
ELECTRICAL DATA

- Pump winding resistance ~ 1.5 Ohm
- Input current during regular operation 1.4 ÷ 1.8 A
- Input current to the closed hydraulic circuit ~ 2 A (to be checked with appropriate tool for fuel pressure control choking the circuit on the return pipe)

Check that the 20A main fuse No. 2 and the injection load 15A No. 4 fuse are in good conditions.

Check the efficiency of the injection load remote control: Check the resistance of the energising coil between pins 86 and 85: 80 ÷ 120 Ohm.

Apply a voltage of 12V to pins 86 and 85; make sure that there is continuity between pins 30 and 87 of the remote control.



Check the power supply line of the injection load remote control energising coil: after switching the line "ON", make sure there is battery voltage for two seconds between the Green-Brown cable and the Blue-Red cable of the remote control base. If there is none, check the continuity of the Green-Red cable between the fuse box in the battery compartment and the remote control base and of the Red-Blue cable between pin 20 of the control unit and the remote control base.

NOTE

CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED.

(REMOTE CONTROLS, ELECTRONIC CONTROL UNIT, FUSES, ETC.).

Check there is fixed voltage between the Green-Red cable of the remote control base and the earth connection. If there is none, check the continuity of the Green-Red cable between the fuse box (No. 4 15A) and the remote control base.

NOTE**CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED.****(REMOTE CONTROLS, ELECTRONIC CONTROL UNIT, FUSES, ETC.).**

Upon switching to "ON", check that there is battery voltage for about two seconds between the Red-Brown cable of the pump connector and earth connection, with pump connector disconnected. Otherwise, check the continuity of the Red-Brown cable between the pump connector and the injection relay.

Check the efficiency of the earth line of the fuel pump by measuring the continuity between the pump connector blue cable, system side, and the earth connection.

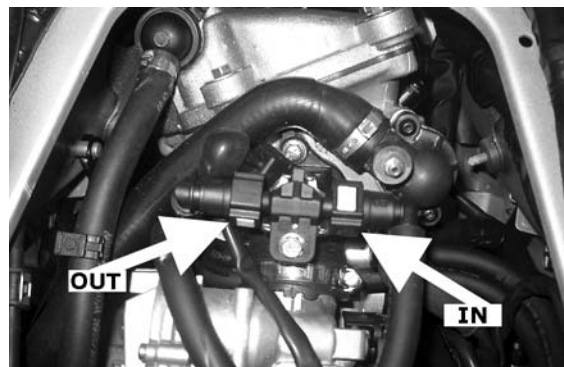
If, when switching to "ON", the pump continues to turn two seconds after activation, check, with the control unit disconnected and the injection load remote control disconnected, that the Red-Blue cable (pin 20 on the interface wiring) is insulated from the earth connection.

Specific tooling

* Digital multimeter

Circuit leak test

Fit the specific tool for fuel pressure control with the pipe fitted with the pressure gauge on the delivery pipe.



Checking under regular functioning by placing the specific tool between the pump and the injector.

With >12V battery voltage, check that the fuel pressure is 2.5 BAR and that the input current is 1.4 ÷ 1.8A



With the >12V battery voltage, check the pump flow rate by disconnecting the pipe fitted with the pressure gauge of the appropriate tool from the injector. Place a graded burette with a flow rate of approximately 1 L. Make the pump turn with the active diagnosis on the palm top computer. Using a pair of long flat needle-nose pliers, choke the fuel pipe stabilising the pressure at approx. 2.5 BAR. Check that, within 15 seconds, the pump has a flow rate of around 110 cm³.



Specific tooling

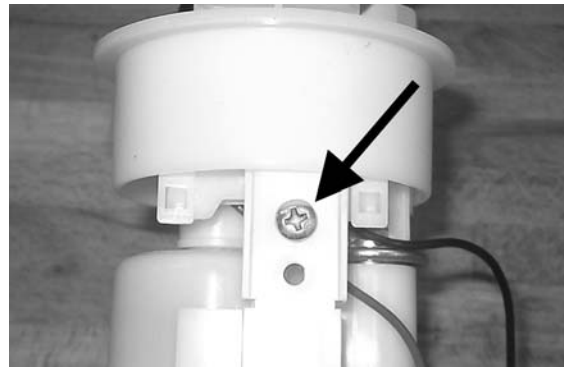
AP8140181 Fuel pressure check tool

Fuel filter check

Disconnect the terminals of the electrical pump



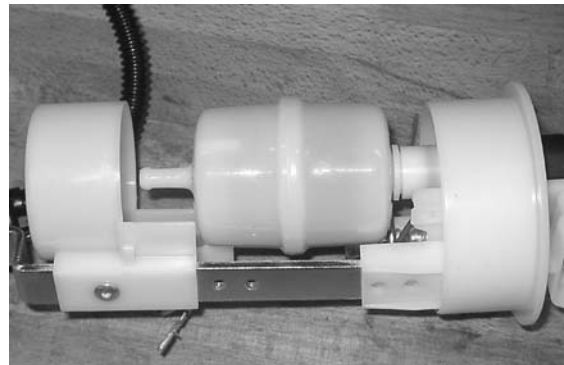
Remove the screw indicated in the photograph



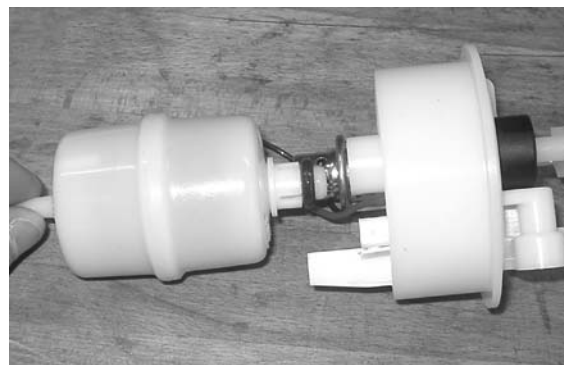
Remove the clip fixing the piping to the filter shown in the photograph



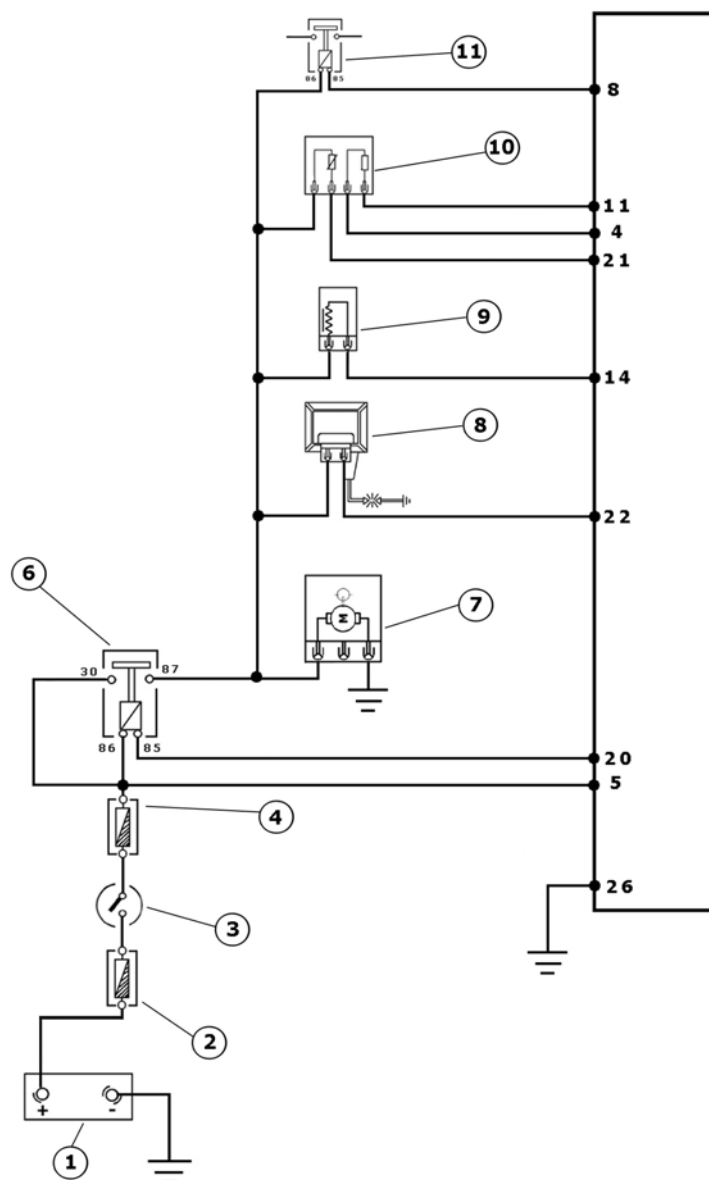
Separate the lower part of the pump support as shown in the photograph.



Remove the filter from the pump support



Inspecting the injector circuit



COMPONENTS

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse	20 A
3	Key switch contacts	
4	Fuse	15 A
5	-	-
6	Injection load remote control	
7	Fuel pump	
8	HV coil	
9	Fuel injector	

	Specification	Desc./Quantity
10	Lambda probe	
11	Electric fan remote control	

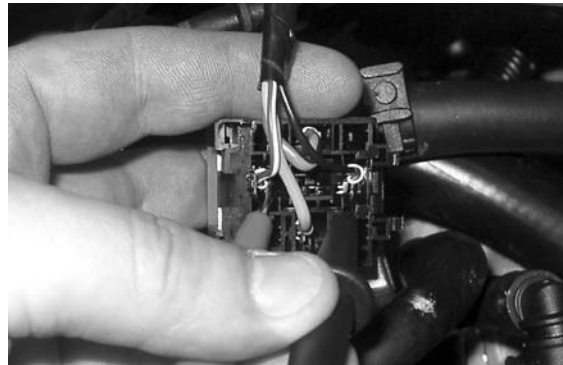
Checking the resistance at the injector ends: $14.5 \pm 5\%$ Ohm

Check the efficiency of 15A fuse No.4 of the injection load.

Check the efficiency of the injection load remote control: Check the resistance of the energising coil between pins 86 and 85: $80 \div 120$ Ohm. Apply a voltage of 12V to pins 86 and 85; make sure that there is continuity between pins 30 and 87 of the remote control.

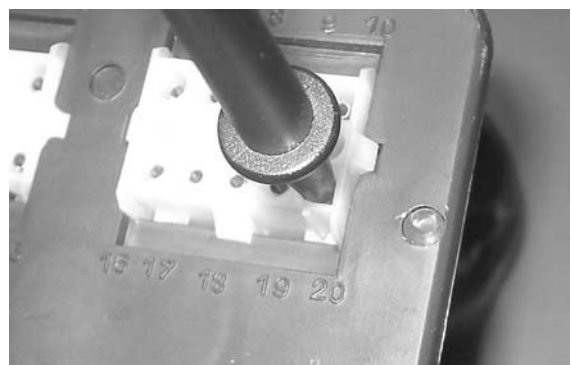
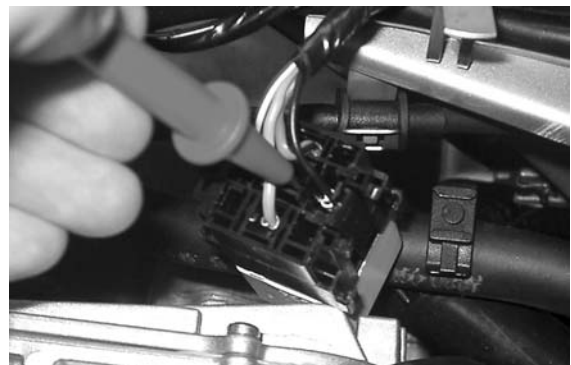
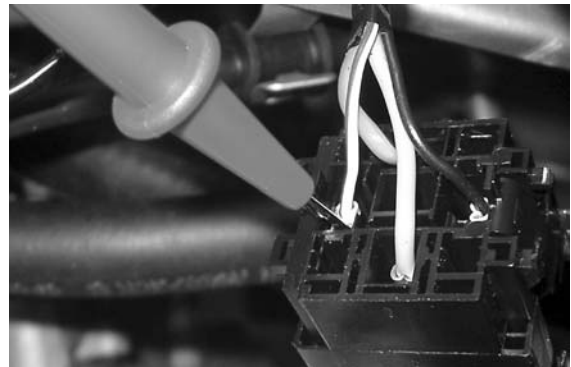


Check the power supply line of the injection load remote control energising coil: after switching the line "ON", make sure there is battery voltage for two seconds between the Green-Red cable and the Black-Purple cable of the remote control base. If there is none, check the continuity of the Green-Red cable between the fuse box in the battery compartment and the remote control base and of the Black-Purple cable between pin 8 of the control unit and the remote control base.



NOTE

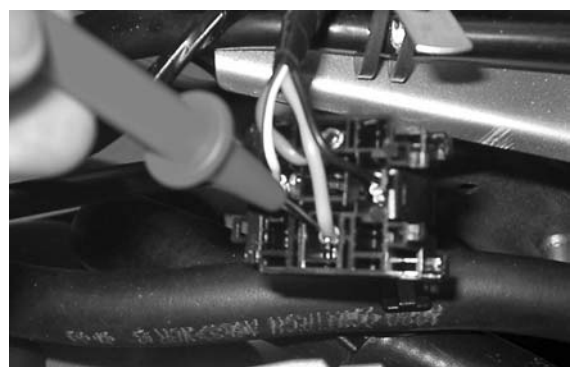
CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (REMOTE CONTROLS, ELECTRONIC CONTROL UNIT, FUSES, ETC.).

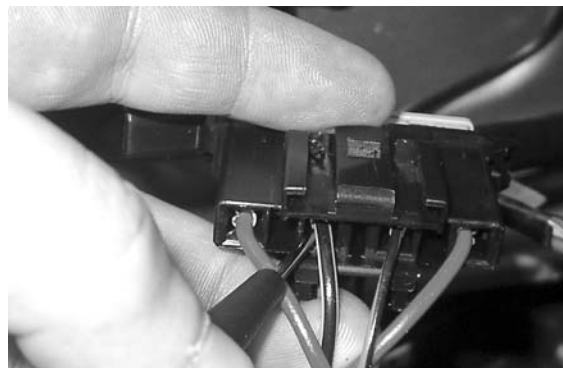
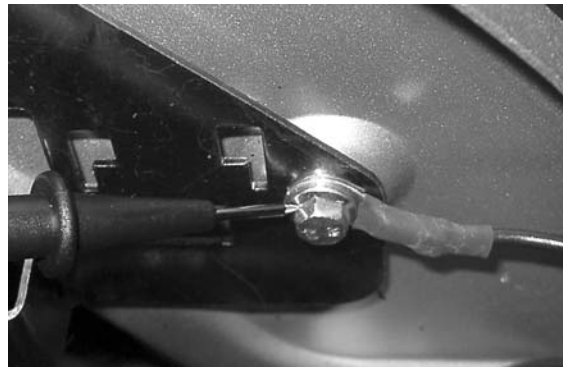


Check there is fixed voltage between the Green-Red cable of the remote control base and the earth connection. If there is none, check the continuity of the Green-Red cable between the fuse box (No. 4 15A) and the remote control base.

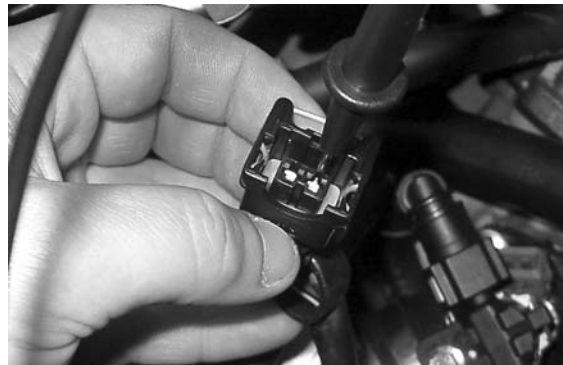
NOTE

CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (REMOTE CONTROLS, ELECTRONIC CONTROL UNIT, FUSES, ETC.).

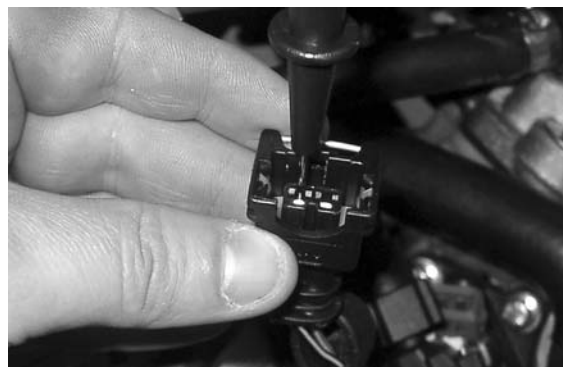




With both the control unit and the injector disconnected, check the continuity of the Grey-Red cable between pin 14 of the interface wiring and the injector connector



Switch to "ON" and check there is voltage, with injector disconnected and control unit connected, between the Red-Brown cable of the injector connector and the earth connection



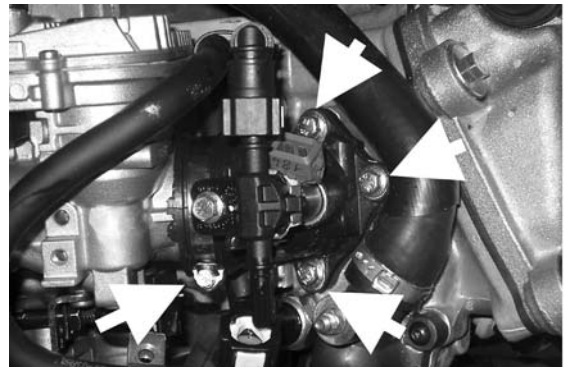
With injector disconnected and the injector load remote control disconnected, check the continuity of the Red-Brown cable between the injector con-

jector and remote control base.



Inspecting the injector hydraulics

To check the injector, remove the intake manifold by removing the three fixing screws at the head and the clip connecting the control unit to the manifold



Fit the appropriate tool to check fuel pressure check and position the manifold over a scaled container at least 100 cm³. Connect the injector with the cable that is part of the elements supplied for the injection tester. Connect the cable terminals to an auxiliary battery. Activate the fuel pump with the active diagnosis. Check that, within 15 seconds, approximately 40 cm³ of fuel is delivered with a regulation pressure of about 2.5



BAR.

Specific tooling

AP8140181 Fuel pressure check tool

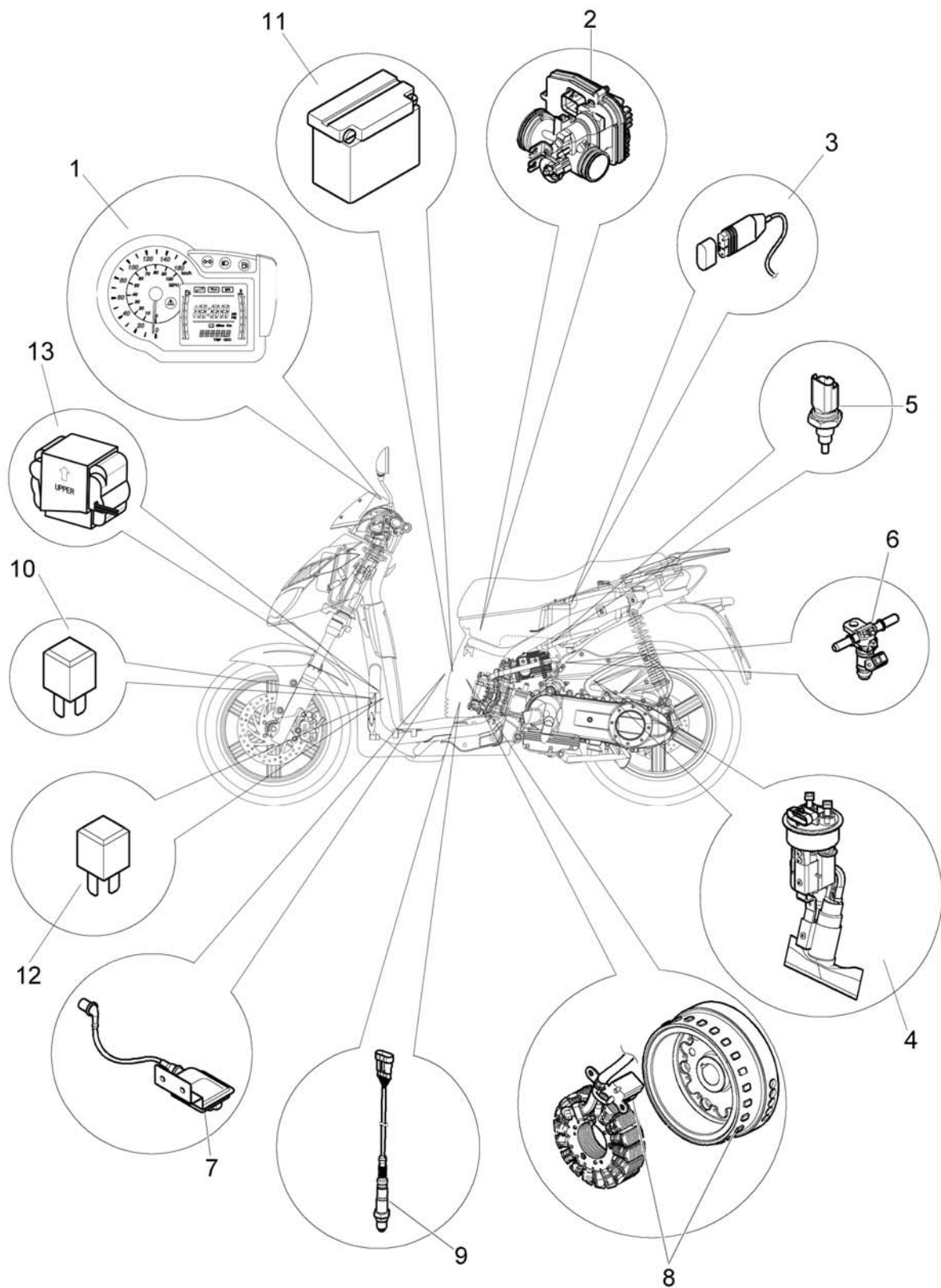
Carry out the injector sealing test

Dry the injector outlet with a blast of compressed air. Activate the fuel pump. Wait for one minute and make sure there are no leaks coming from the injector. Slight oozing is normal.

Limit value = 1 drop per minute



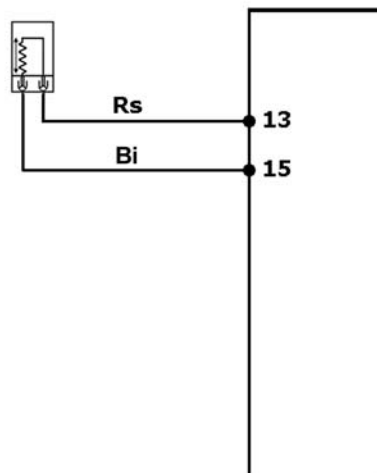
Components location



COMPONENTS LAYOUT

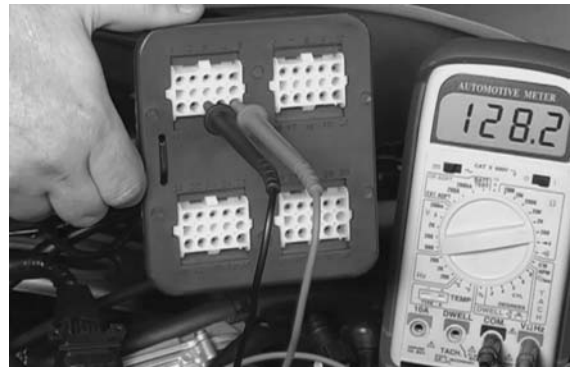
	Specification	Desc./Quantity
1	Instrument panel	
2	Throttle body and injection electronic control unit (MIU)	
3	Diagnosis socket	
4	Fuel pump	
5	Water temperature sensor	
6	Fuel injector	
7	HV coil	
8	Flywheel - revolution timing sensor	
9	Lambda probe	
10	Injection load remote control	
11	Battery	12V - 12 Ah
12	Electric fan remote control	
13	Fall sensor	

Tachometer



With interface wiring disconnected from the control unit and connected to the system, check that the sensor resistance between pins 13 - 15 is between 100 and 150 Ohm at an engine temper-

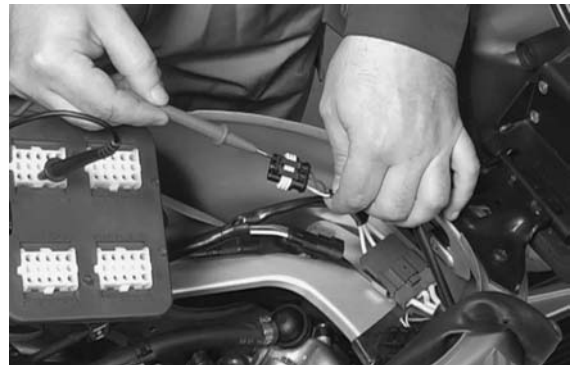
ature of about 20°



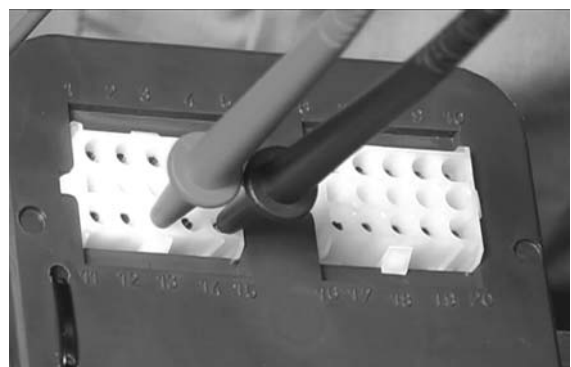
Disconnect the fuel pump connector. Start the engine and wait for it to stop. With the wiring connected to the control unit and the system, try to start-up the engine and check that the alternating voltage between pins 13 and 15 is over 2.5 V ~



With the interface cabling disconnected from the control unit, check the continuity of the rpm sensor connector red cable between pin 13 and pin 1 and the rpm sensor connector white cable between pin 15 and pin 2



With the interface wiring disconnected from the control unit and the rpm sensor connector also disconnected, check that the red and brown cables (pin 13 - 15) are insulated from each other and insulated from the earth connection.

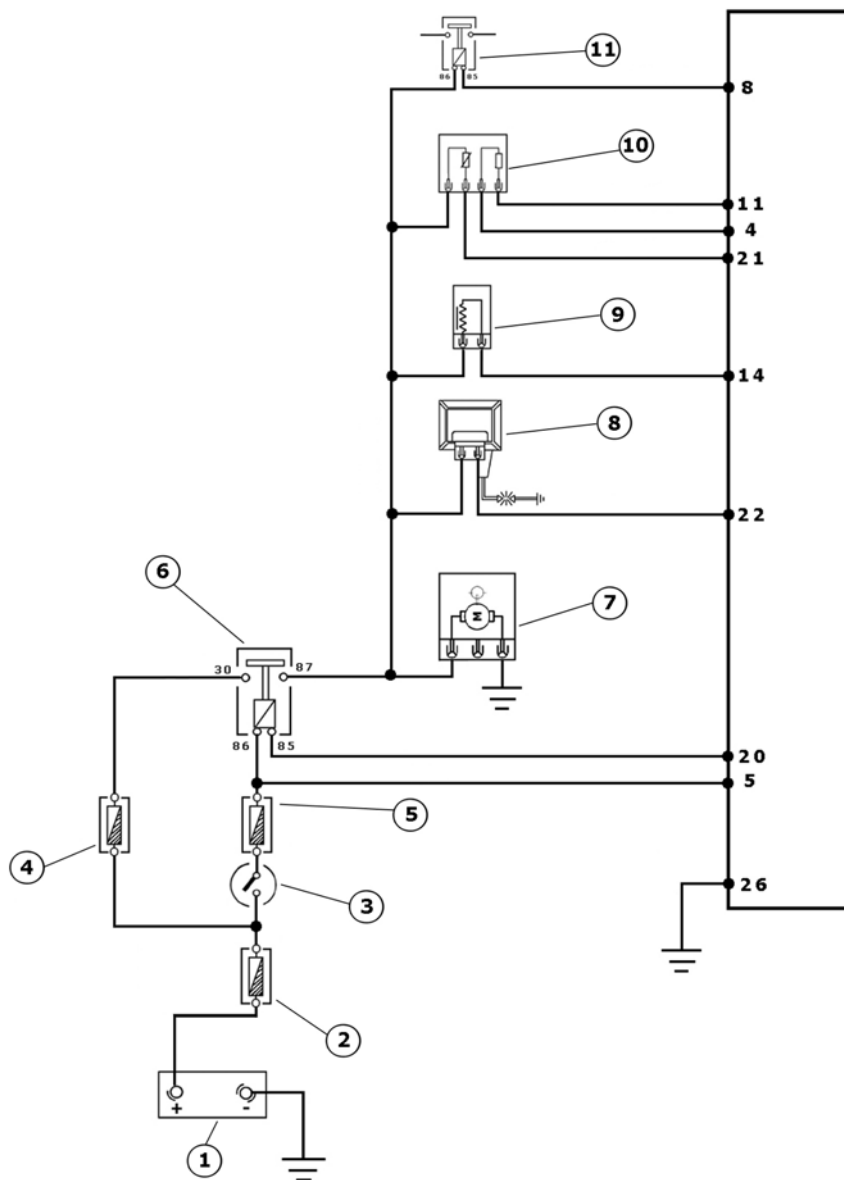


Specific tooling

AP81818059 Control unit interface wiring

* **Digital multimeter**

HT coil



COMPONENTS

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse	20 A
3	Key switch contacts	
4	Fuse	15 A
5	-	-
6	Injection load remote control	
7	Fuel pump	
8	HV coil	
9	Fuel injector	

	Specification	Desc./Quantity
10	Lambda probe	
11	Electric fan remote control	

The combined ignition/injection system is a high-efficiency induction system.

The control unit manages two significant parameters:

- Ignition advance

This is optimised at once according to the engine revs, engine load, temperature and ambient pressure.

With engine at idle speed, it is optimised to stabilise the speed at 1450 ± 50 rpm. - Magnetisation time

The coil magnetisation time is controlled by the control unit. The power of the ignition is increased during the engine start-up phase.

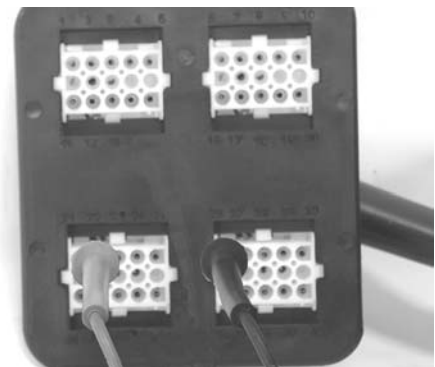
The injection system recognises the 4-stroke cycle so ignition is only commanded in the compression phase.

Specific tooling

* Digital multimeter

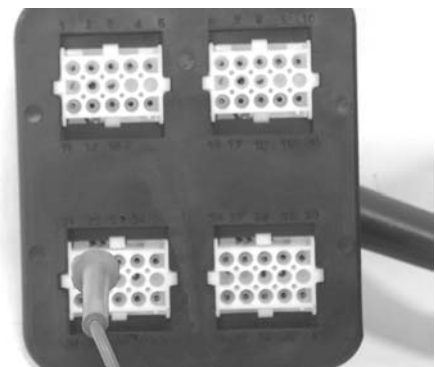
Check that the 20A main fuse No. 2 and the injection load 15A No. 4 fuse are in good conditions.

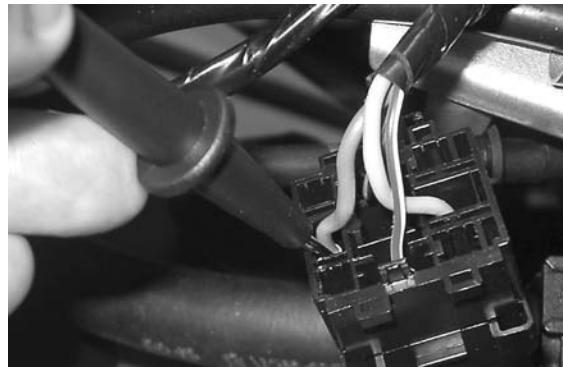
Check there is voltage between pins 22 and 26 of the interface wiring for around two seconds, switching to "ON"



Check the resistance of the coil primary between pin 22 of the interface wiring and the Red-Brown cable of the injection relay, with both the control unit and the remote control disconnected.

Primary resistance = $0.5 \pm 8\%$ Ohm





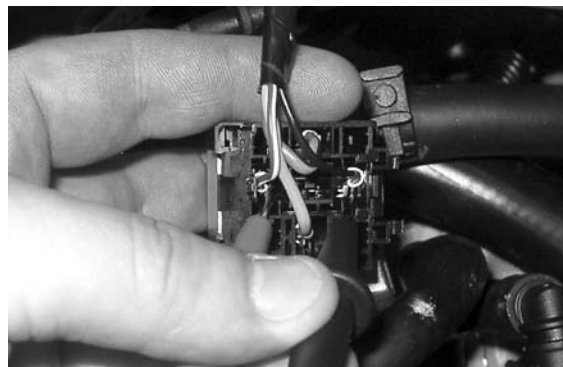
Check the efficiency of the injection load remote control: Check the resistance of the energising coil between pins 86 and 85: $80 \div 120$ Ohm. Apply a voltage of 12V to pins 86 and 85; make sure that there is continuity between pins 30 and 87 of the remote control.

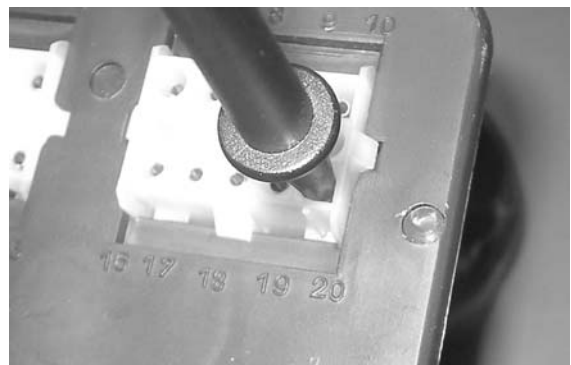
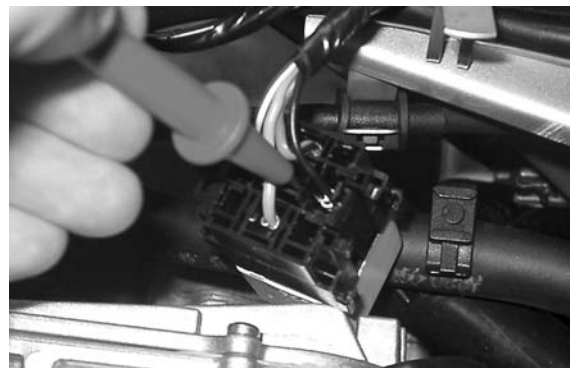
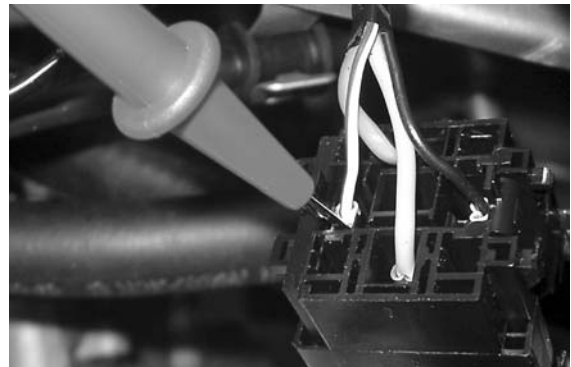


Check the power supply line of the injection load remote control energising coil: after switching the line "ON", make sure there is battery voltage for two seconds between the Green-Red cable and the Black-Purple cable of the remote control base. If there is none, check the continuity of the Green-Red cable between the fuse box in the battery compartment and the remote control base and of the Black-Purple cable between pin 8 of the control unit and the remote control base.

NOTE

CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (REMOTE CONTROLS, ELECTRONIC CONTROL UNIT, FUSES, ETC.).

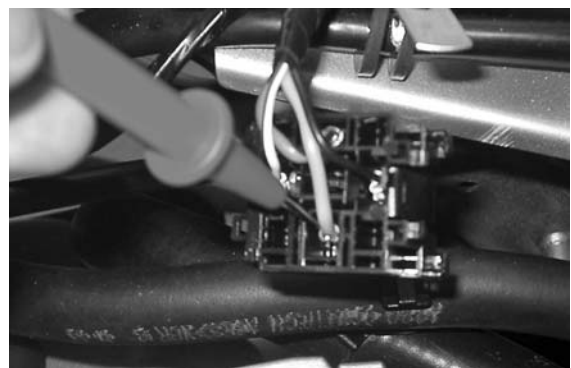


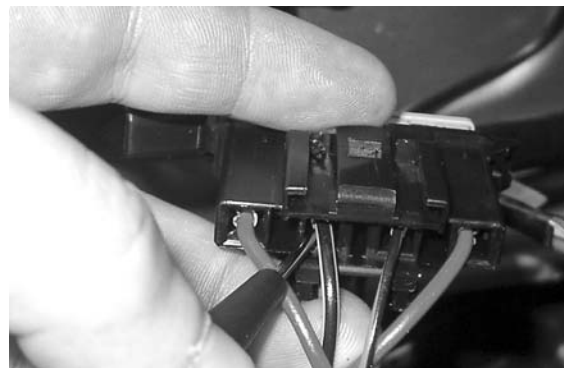
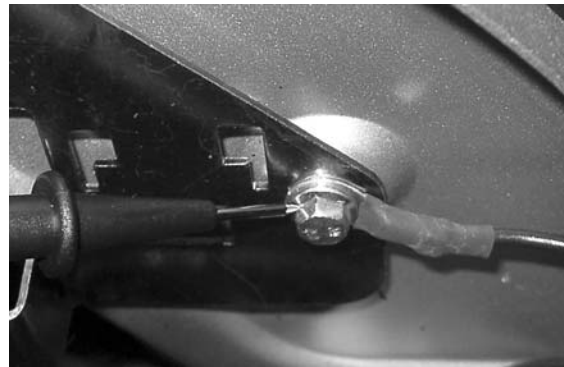


Check there is fixed voltage between the Green-Red cable of the remote control base and the earth connection. If there is none, check the continuity of the Green-Red cable between the fuse box (No. 4 15A) and the remote control base.

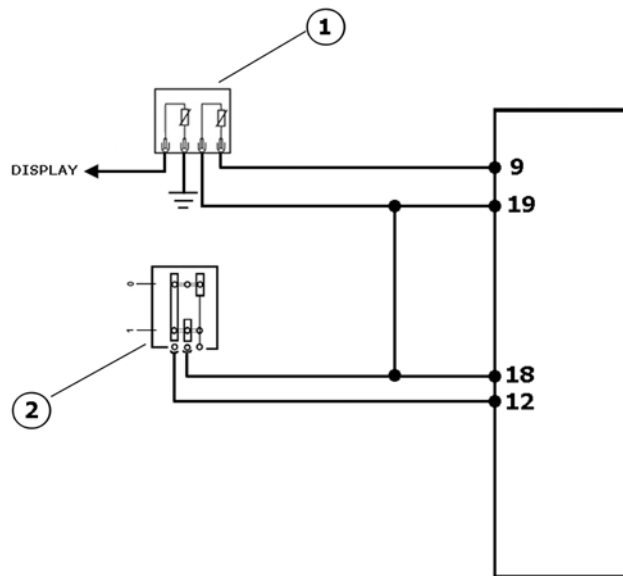
NOTE

CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (REMOTE CONTROLS, ELECTRONIC CONTROL UNIT, FUSES, ETC.).





Coolant temperature sensor



TEMPERATURE SENSOR 1

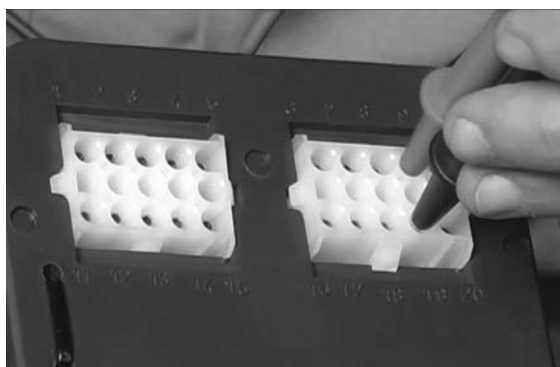
	Specification	Desc./Quantity
1	Water temperature sensor	
2	Engine stop switch	

On the interface wiring with the control unit side connector disconnected and the coolant temperature sensor connector connected, check the resistance values between pins 9 and 26 in relation to the engine temperature.

$$20^{\circ} = 2500 \pm 100 \Omega$$

$$80^{\circ} = 308 \pm 6 \Omega$$

With the control unit side connector disconnected and the coolant temperature connector disconnected, check the insulation between the two Sky Blue-Red and Blue-Green cables

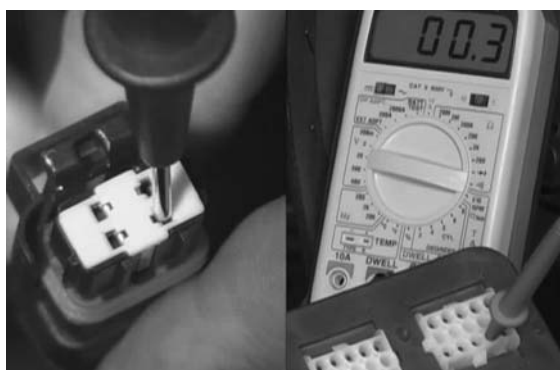


With the control unit side connector disconnected and the coolant temperature sensor connector disconnected, check the continuity of the Orange cable between pin 9 of the interface wiring and the pin 3 of sensor connector, and the continuity between pin 26 of the interface wiring and pin 1 of sensor connector



Specific tooling

AP8181059 Control unit interface wiring



Zeroing the throttle

Throttle valve position signal reset (TPS reset)

The MIU control unit is supplied with throttle valve position sensor and is pre-calibrated.

Pre-calibration entails regulating the minimum opening of the throttle valve to obtain a specific air flow under pre-set reference conditions.

Pre-calibration ensures optimal air flow for the control of the idle speed.

This regulation must not be tampered with in any way whatsoever.

The injection system will complete the management of the idling through the stepper and the variation of the ignition advance.

After the pre-calibration the throttle body has an open valve with a variable angle depending on the tolerances of the machining of the pipe and the valve itself.

The valve position sensor can also have various fitting positions. For these reasons the mVs of the sensor with the valve at idle can vary from one throttle body to another.

To obtain the optimum carburetion, especially at small openings of the throttle valve, it is essential to match the throttle body with the control unit following the procedure known as TPS resetting.

With this operation we inform the control unit, as a starting point, of the mV value corresponding to the pre-calibrated position.

To reset, proceed as follows.

Connect the Axone following the specific instructions.

Shift to «ON».

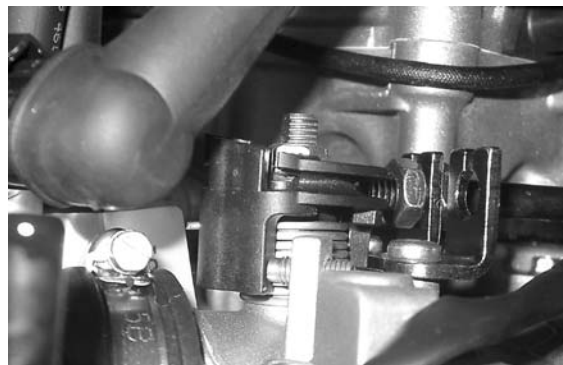
Press the + and - keys go to the adjustable parameters screen and select «TPS RESET» parameter.

Specific tooling

AP8140595 Axone + battery charger (230V 50Hz)

AP8202311 Axone + battery charger (110V 60Hz)

Make sure that the throttle valve control is in contact with the stop screw.



Guaranteeing that this position will be kept, give the confirmation for the TPS reset procedure.

Reset should be performed in the following cases:

- on first fitting.
- if the injection control unit is replaced.

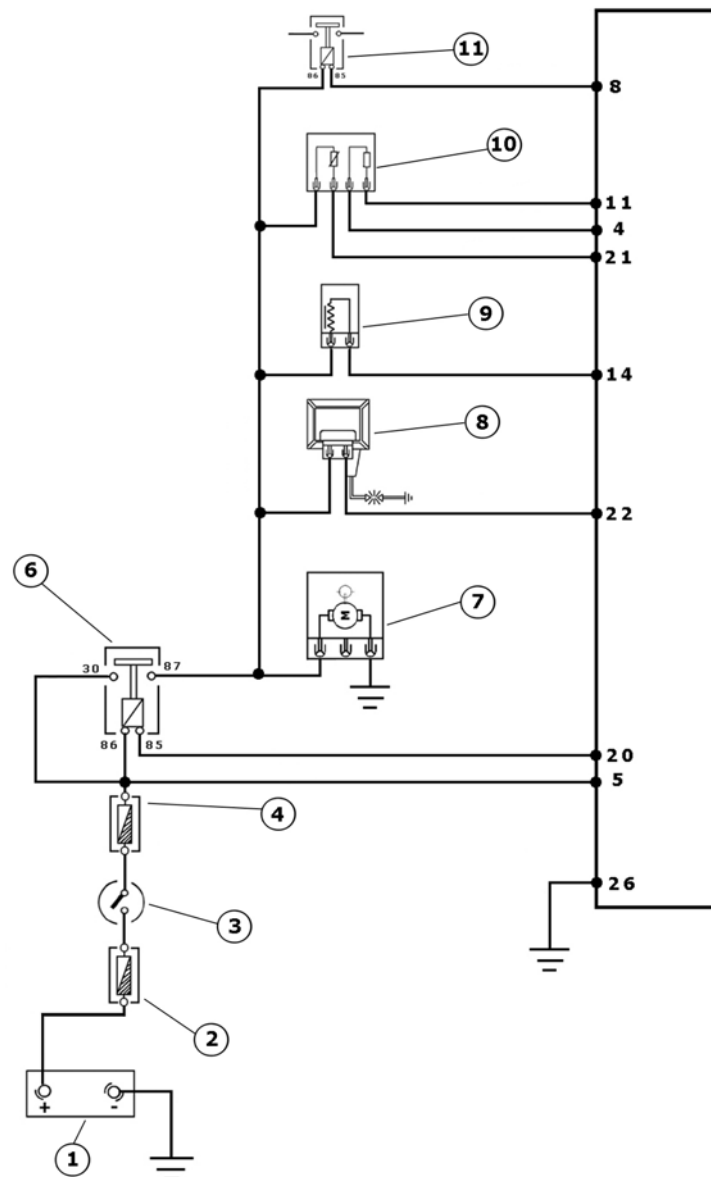
NOTE

THE TPS RESETTING PROCEDURE MUST NOT BE CARRIED OUT WITH A USED THROTTLE BODY BECAUSE POSSIBLE VALVE WEAR AND STOP WEAR FOR THE MINIMUM OPENING MAKE THE AIR FLOW DIFFERENT FROM THAT OF THE PRE-CALIBRATION.

Given that the TPS reset is also carried out when the control unit is replaced, place the control unit - filter box bellows fixing clip at 45° upon refitting as shown in the photograph.



Lambda probe



COMPONENTS

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse	20 A
3	Key switch contacts	
4	Fuse	15 A
5	-	-
6	Injection load remote control	
7	Fuel pump	
8	HV coil	
9	Fuel injector	
10	Lambda probe	
11	Electric fan remote control	

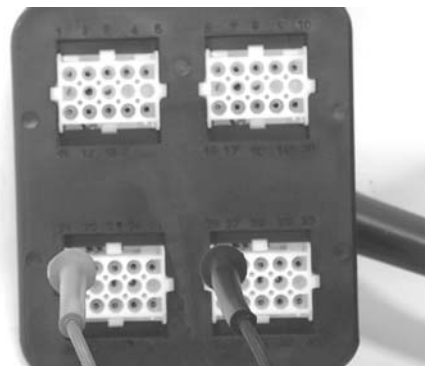
The lambda probe or oxygen sensor is a sensor which provides information about the oxygen content in the exhaust fumes. The signal generated is not of the proportional but of the ON/OFF type, i.e. whether there is oxygen or not. The probe is positioned on the exhaust manifold before the catalytic converter in an area where the gas temperature is always high. The temperature at which the probe works is at least 350°C at 600°C and it has a reaction time of just 50 milliseconds. The signal generated passes from a high value to a low one with a mixture with $\lambda = 1$. Since the probe only works at high temperatures, it has an electric preheating element inside, controlled by the control unit, to make it start operating quickly.

Specific tooling

AP8181059 Control unit interface wiring

Check that the 20A main fuse No. 2 and the injection load 15A No. 4 fuse are in good conditions.

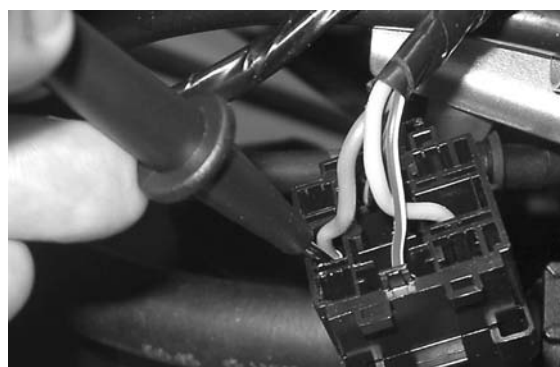
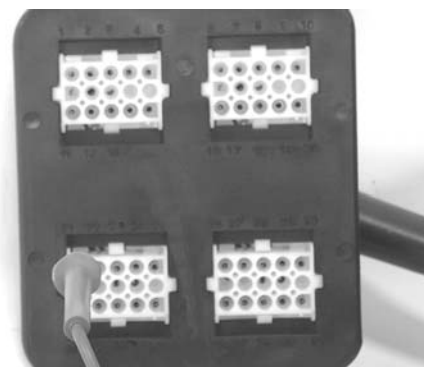
Check there is voltage between pins 21 and 26 of the interface wiring for around two seconds, switching to "ON"



With the engine cold, check the resistance of the lambda probe heater between pin 21 of the inter-

face wiring and the Red-Brown cable of the injection load remote control base, with both the control unit and the remote control disconnected.

Resistance of the heater at about 20° = 9 Ohm ± 20%

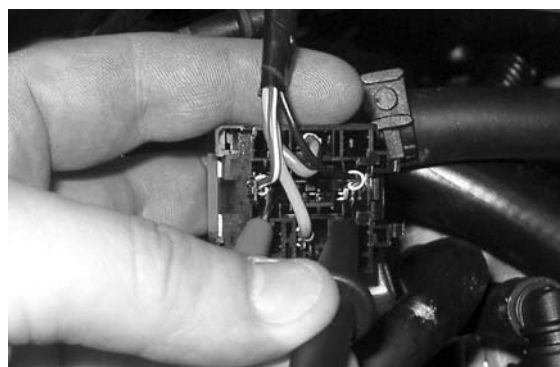


Check the efficiency of the injection load remote control: Check the resistance of the energising coil between pins 86 and 85: 80 ÷ 120 Ohm.

Apply a voltage of 12V to pins 86 and 85; make sure that there is continuity between pins 30 and 87 of the remote control.

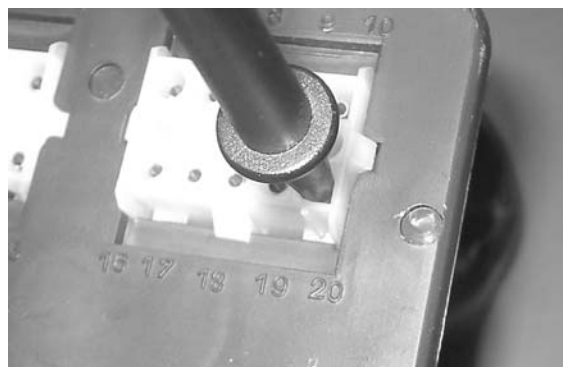
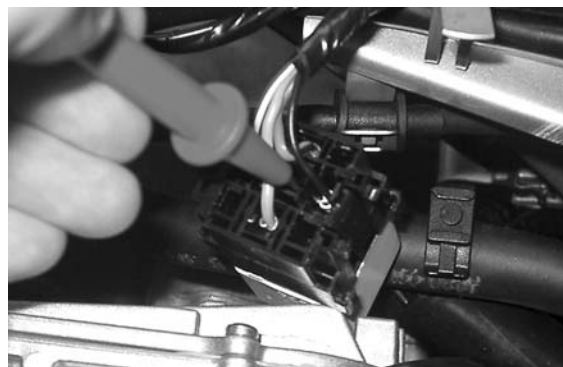
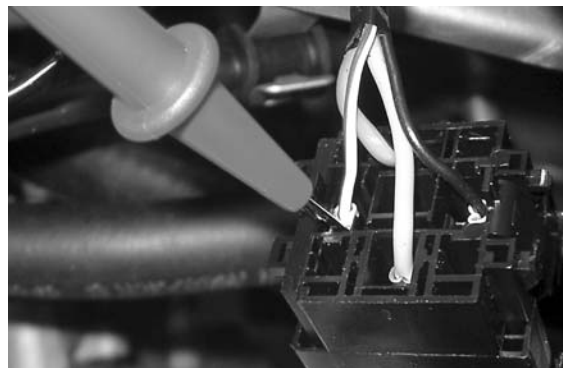


Check the power supply line of the injection load remote control energising coil: after switching the line "ON", make sure there is battery voltage for two seconds between the Green-Red cable and the Black-Purple cable of the remote control base. If there is none, check the continuity of the Green-Red cable between the fuse box in the battery compartment and the remote control base and of the Black-Purple cable between pin 8 of the control unit and the remote control base.



NOTE

CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (REMOTE CONTROLS, ELECTRONIC CONTROL UNIT, FUSES, ETC.).

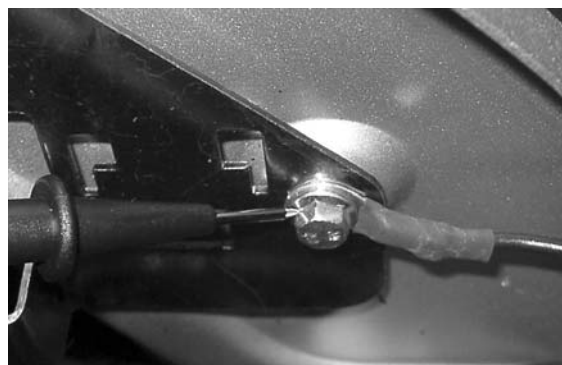
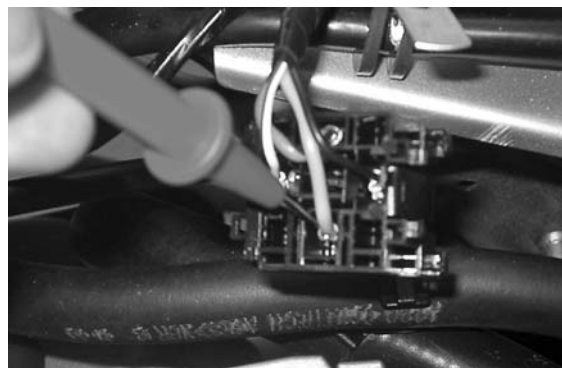


Check there is fixed voltage between the Green-Red cable of the remote control base and the earth connection. If there is none, check the continuity of the Green-Red cable between the fuse

box (No. 4 15A) and the remote control base.

NOTE

CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (REMOTE CONTROLS, ELECTRONIC CONTROL UNIT, FUSES, ETC.).

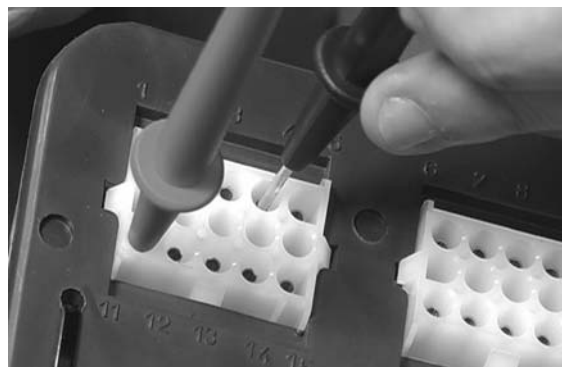


SIGNAL CHECK

Install the electronic control unit interface wiring. Start the engine and warm it up until the electric fan switches on.

Use an analogue multimeter with a direct voltage scale measuring down to 2V.

Place the multimeter probes between pins 4 (-) and 11 (+)

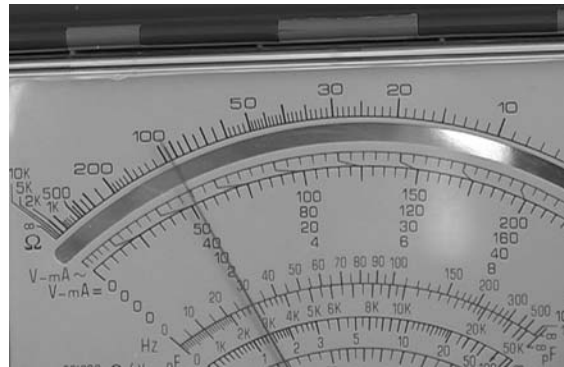


With the engine running at idle speed, check that the voltage oscillates between 0V and 1V

With the throttle valve fully open, the voltage is ~ 1V.

During the closing phase, the voltage is ~ 0V.

If the voltage remains constant, the sensor may be damaged. Remove the sensor and check that there are no oil or carbon deposits in it.

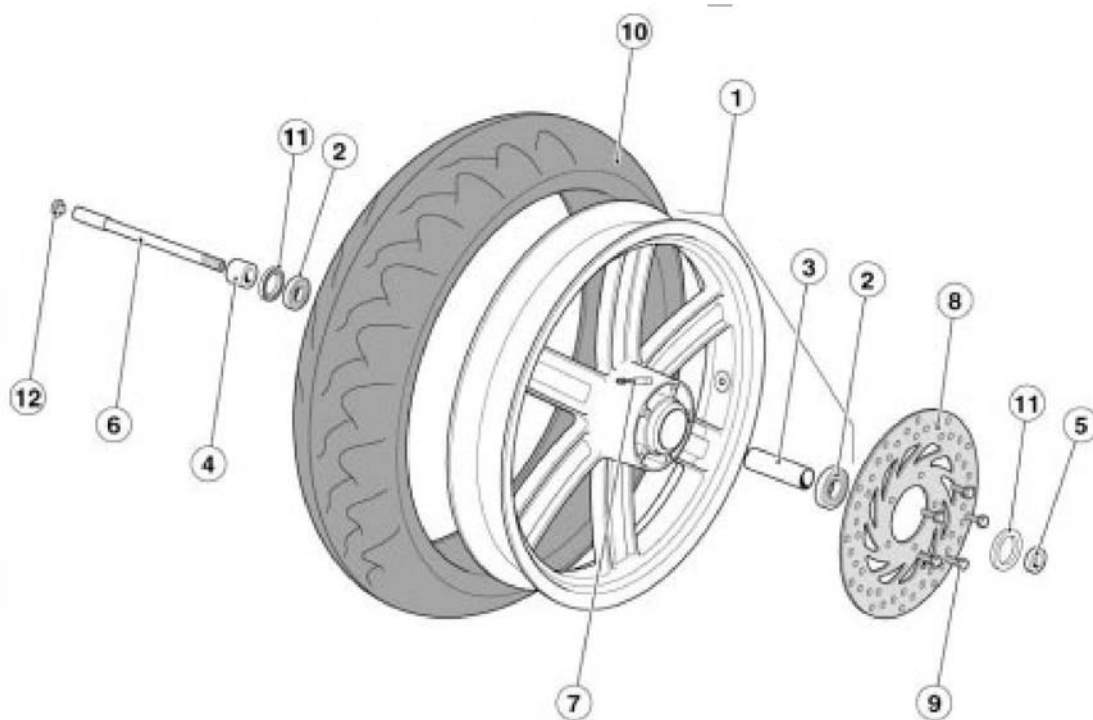


INDEX OF TOPICS

SUSPENSIONS

SUSP

Front

Removing the front wheel**KEY:**

1. Grey front wheel rim;
2. Bearing;
3. Spacer;
4. Front wheel left spacer;
5. Front wheel right spacer;
6. Front wheel pin;
7. Tubeless valve;
8. Front brake disc (Qty. 2);
9. TE flanged screw;
10. Front cover;
11. Oil seal;
12. Cap.

Rest the scooter on its centre stand.

- Place a support under the chassis.

- Remove the brake calliper.
- Loosen the pin locking screw.

CAUTION

UPON REMOVING/REFITTING, PAY ATTENTION NOT TO DAMAGE THE BRAKE HOSES, DISCS AND PADS.



- Unscrew and remove the wheel pin.
- Collect the spacers from the wheel left and right sides.

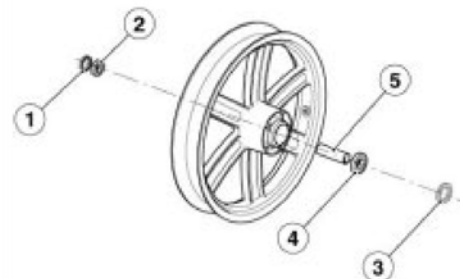


- Remove the wheel.

CAUTION

DO NOT ACTUATE ON THE FRONT BRAKE LEVER AFTER REMOVING THE WHEEL, OTHERWISE THE CALLIPER PLUNGER COULD GO OUT OF ITS SEAT, RESULTING IN BRAKE FLUID LEAKAGE.

- Remove the front wheel.
- Clean the two sides of the hub with a cloth.
- Remove the right oil seal «1».
- Remove the right bearing «2» with a suitable extractor.
- Remove the left oil seal «3».
- Remove the left bearing «4» with a suitable extractor.
- Carry out a thorough check of the bearings.
- Collect the internal spacer «5».



- Clean the inside of the hub thoroughly.
- Wash all the parts with clean detergent.

CAUTION

UPON REFITTING, USE A BUFFER WITH A DIAMETER EQUAL TO THE EXTERNAL RING OF THE BEARINGS TO INSERT THE BEARINGS. DO NOT HIT THE BALLS AND/OR THE INTERNAL RING. MAKE SURE THE FOLLOWING COMPONENTS ARE FITTED PERFECTLY IN:

- THE LEFT BEARING «4» ON THE HUB;
- THE SPACER «5» ON THE LEFT BEARING «4»;
- THE RIGHT BEARING «2» ON THE SPACER «5»;

Front wheel hub overhaul

BEARINGS

Manually rotate the internal ring «1» which must turn smoothly, without obstacles and/or noise. There must be no axial clearance. The bearings presenting these problems must be replaced.

CAUTION

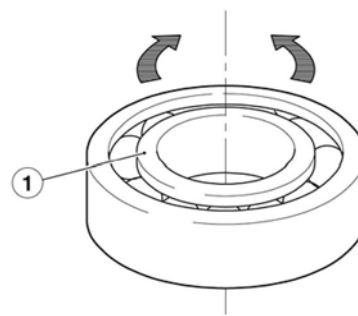
CHECK THAT ALL THE PARTS ARE IN GOOD CONDITIONS, SPECIALLY THE ONES BELOW.

GASKETS

Check that the gaskets are in good conditions; replace them if they show signs of damage or excessive wear.

WHEEL PIN

Using a dial gauge, check the wheel pin «2» ec-

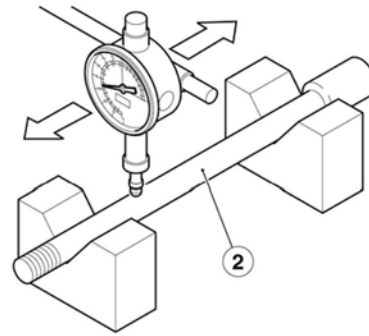


centricity. Replace the pin «2» if the eccentricity exceeds the limit value.

Characteristic

Maximum eccentricity:

0.25 mm

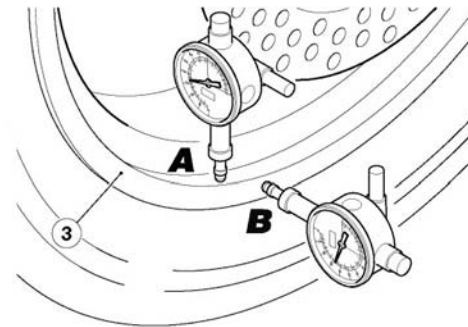


RIM

Using a dial gauge, check that the radial eccentricity «A» and the axial eccentricity «B» of the rim «3» do not exceed the limit value.

An excessive eccentricity is usually caused by worn or damaged bearings.

Replace the rim «3» if, after the bearings are replaced, the value is not within the specified limit.



Characteristic

Maximum radial and axial eccentricity:

2 mm

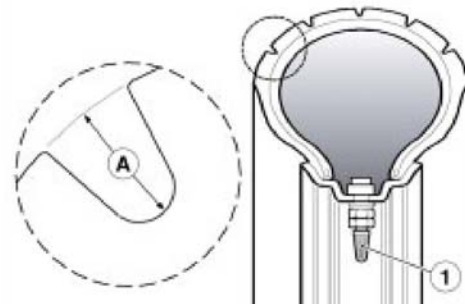
Check the tyre conditions.

CAUTION

CHECK TYRE TREAD FOR WEAR. BADLY WORN TYRES COMPROMISE TRACTION AND VEHICLE HANDLING.

REPLACE TYRES WHEN WORN OR IF THERE IS A PUNCTURE BIGGER THAN 5 MM IN THE TREAD. SOME TYRE TYPES HOMOLOGATED FOR THIS VEHICLE FEATURE WEAR INDICATORS. CHECK THAT THE INFLATION VALVES «1» HAVE THEIR CAPS FITTED IN ORDER TO AVOID UNEXPECTED FLAT TYRES.

BALANCE THE WHEEL AFTER A TYRE IS MENDED.



Refitting the front wheel

To refit, carry out the removal operations but in reverse order and observe the tightening torques.

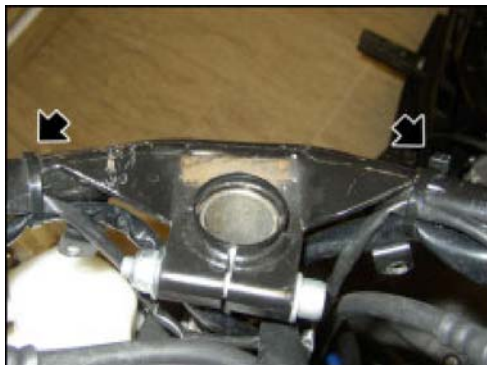
Handlebar

Removal

- Remove the front handlebar cover (SEE INSTRUMENT PANEL)
- Remove the rear handlebar cover (SEE INSTRUMENT PANEL)
- Remove the internal front shield
- Remove the clamps

NOTE

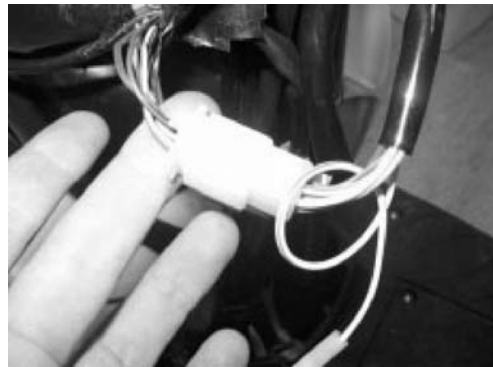
USE NEW CLAMPS FOR REFITTING.



- Undo and remove the two screws.
- Remove the U-bolt and slide off the rear brake pump; keep it connected to the oil pipe.



- Disconnect the handlebar electrical control connectors.



-
- Undo and remove the two screws.
 - Lower the brake pump U-bolt.



-
- Remove the brake pump; keep it connected to the brake pipe.



-
- Disconnect the throttle grip cable.
 - Remove the brake pump U-bolt.



-
- Remove the throttle grip.
 - Remove the safety screw «2».
 - Loosen the main screw «1».



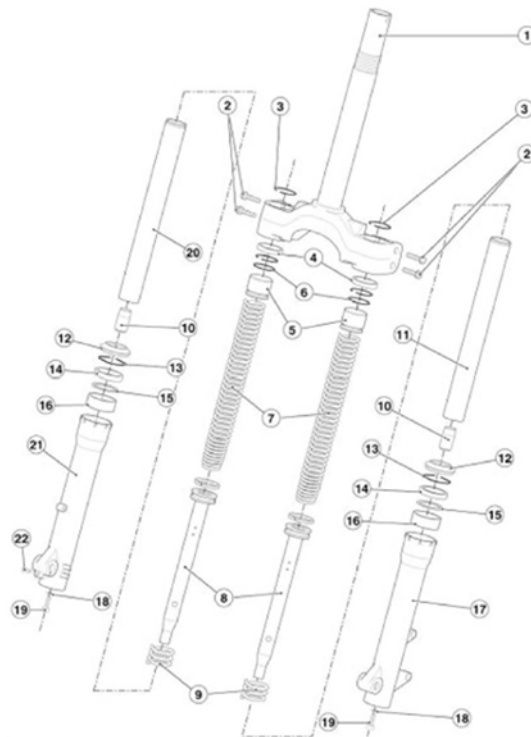
-
- Slide off the handlebar upwards.



Refitting

To refit, carry out the removal operations but in reverse order and observe the tightening torques.

Front fork

**KEY:**

1. Fork base
2. Fork clamp screws
3. Snap ring
4. Rubber cap
5. Sealing cap
6. O-Ring
7. Spring
8. Pumping member
9. Counter spring
10. End stop buffer
11. Left stem
12. Dust guard gasket
13. Safety circlip
14. Sealing gasket
15. Cap
16. Bushing
17. Left wheel holder
18. Sealing washer
19. Lower screw

- 20. Right stem
- 21. Right wheel holder
- 22. Locking screw

Removal

STEM REMOVAL

- Remove the front wheel.
- Remove the front mudguard.
- Undo and remove the two screws «1».



NOTE

THE FOLLOWING OPERATIONS REFER TO REMOVING ONLY ONE WHEEL HOLDER STEM - SLEEVE, BUT THEY APPLY TO BOTH.

- Remove the shield back plate.
- Remove the upper seeger ring «2».
- Remove the wheel holder stem - sleeve.



WHEEL HOLDER STEMS SLEEVES REMOVAL

- Drain off the oil.
- Place the stem in a vice fitted with protection jaws (aluminium).



- Undo and remove the lower screw «1».



- Remove the stem and collect the centring bushing.

NOTE

BE CAREFUL NOT TO DAMAGE THE SLEEVE INTERIOR WHEN REMOVING THE DIFFERENT COMPONENTS.



- Remove the pumping member «2» and the spring «3» from the stem.



- Remove the dust guard from the sleeve.



- Remove the seeger ring.



- Remove the oil seal.



- Remove the washer.



- If necessary, remove the spacer «4».



OIL EMPTYING

Place the sleeve in a vice fitted with protection

jaws (aluminium).

NOTE

GET A COLLECTING CONTAINER BEFORE CARRYING OUT THESE OPERATIONS.

CAUTION

THE WHEEL HOLDER STEM SLEEVE UNIT CONTAINS OIL. DO NOT TURN IT OVER OR TILT IT TOO MUCH WHEN REMOVING IT.



-
- Remove the upper closing cap.



-
- Lower the pumping element until the seeger ring «1» can be removed.
 - Remove the seeger ring «1».



-
- Remove the cap and the O-ring.

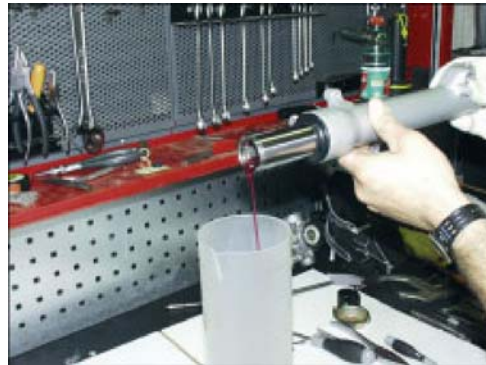


-
- Remove the spring and wait some minutes so that the oil deposited on it

drips off.



- Drain off the oil into the collecting container by pumping it out with the stem.



Overhaul

Components check

Check the sliding surface for scorings and/or scratches. These scorings can be eliminated by rubbing them with wet sandpaper (fine grain).

- If the scorings are deep, replace the stem.
- Use a dial gauge to check that the stem bending is below the limit value.
- If over the value, replace the stem.

CAUTION

A BENT STEM SHOULD NEVER BE STRAIGHTENED BECAUSE ITS STRUCTURE WOULD BE WEAKENED AND USING THE VEHICLE MAY BECOME DANGEROUS.

Characteristic

Bending limit:

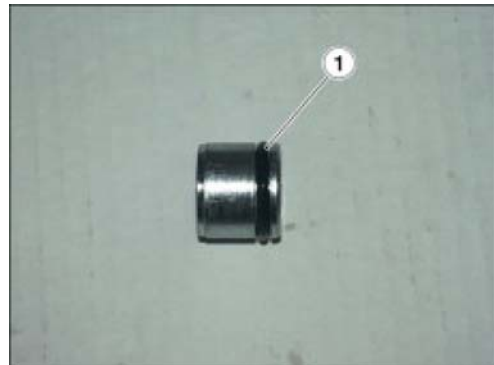
0.2 mm

- Check that there are no damages and/or cracks; otherwise, replace it.
- If there are signs of excessive wear or damage, replace the affected compon-

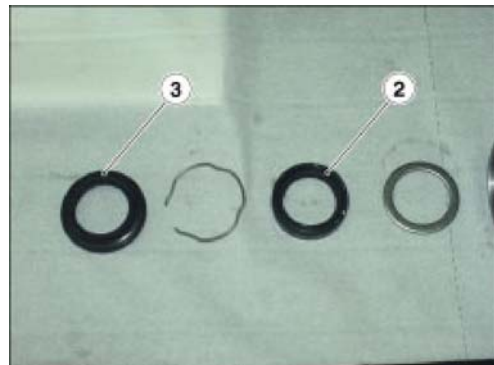
ent.

Replace the following components with new ones:

- O-ring gasket on the cap «1»;



- oil seal «2»;
- dust guard «3»;



OIL FILLING

- Place the wheel holder stem sleeve unit in a vice fitted with protection jaws (aluminium).



- Fit the spring.



- Pour fork oil into the wheel holder stem sleeve unit.

CAUTION**NEVER REUSE OIL.**

- Remove the cap with the O-ring.



- Fit the pumping member «1».



- Lower the pumping element until the seeger ring «2» can be fitted.
- Fit the seeger ring «2».



- Fit the upper closing cap.



Refitting

- Place the sleeve in the vice fitted with protection jaws (aluminium).
- Fit the spacer «1».

CAUTION

BE EXTREMELY CAREFUL SO THAT NO FOREIGN BODIES GET INTO THE SLEEVE OR THE WHEEL HOLDER STEM.



- Insert the washer.

NOTE

SPREAD A THIN LAYER OF FORK OIL ON GASKETS AND BUSHINGS BEFORE REFITTING THEM.



- Insert the oil seal.



- Fit the seeger ring.



- Fit the dust guard.



- Insert the pumping member and the spring in the stem.



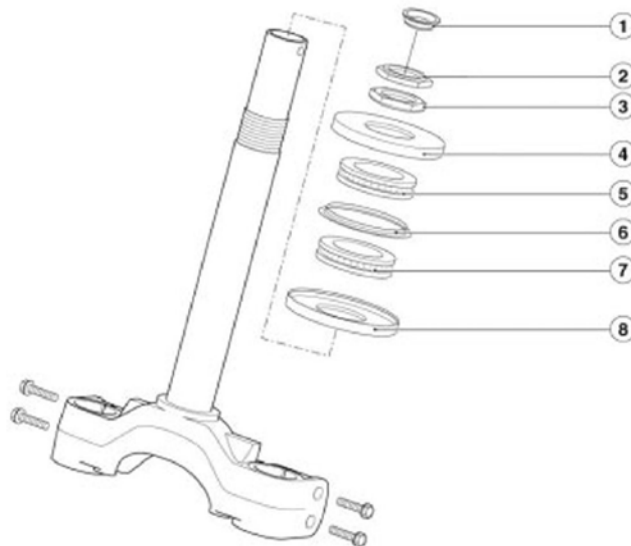
- Fit the components below on the sleeve in the following order: the centring bushing «2» and the stem.



- Tighten the lower screw «3».
- Refill with oil.



Steering column



KEY:

1. Cap;
2. Lock nut;
3. Adjusting nut;
4. Upper dust guard;
5. Upper bearing;
6. Separating ring;
7. Lower bearing;
8. Lower dust guard.

Steering bearing

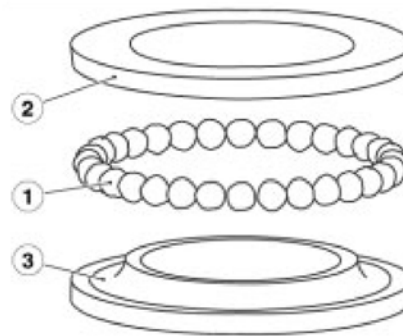
Check that the ball contact area «1» on the rotating seat «2» and on the fixed seat «3» is not damaged or too worn. Replace the whole bearing if necessary.

CAUTION

CHECK THAT THE COMPONENTS ARE IN GOOD CONDITIONS.

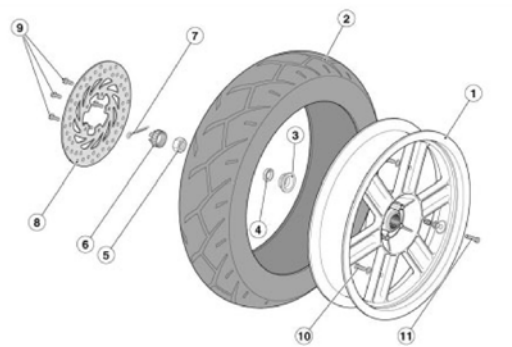
CAUTION

APPLY GREASE ON BALL CONTACT AREAS ON BOTH SEATS «2» AND «3».



Rear

Removing the rear wheel

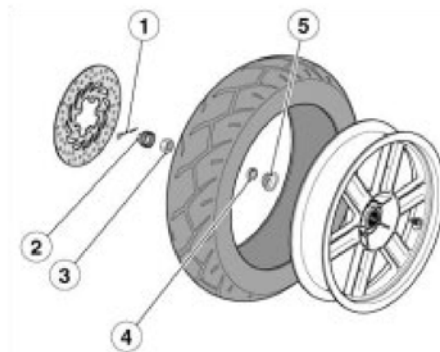


KEY:

1. Grey rear wheel rim;
2. Rear cover;
3. Internal wheel spacer;
4. External wheel spacer;
5. Nut;
6. Cover;
7. Split pin;
8. Brake disc;
9. TE flanged screw;
10. SPEED SENSOR screw;

11. Tubeless valve;

- Rest the vehicle on its centre stand.
- Remove the exhaust silencer.
- Remove the rear right shock absorber.
- Slide off the rear brake calliper and keep it connected to the oil pipe.
- Remove the split pin «1» placed on the wheel pin.
- Remove the nut cover «2».
- Unscrew and remove the wheel pin nut «3» and the shim washer «4».
- Undo and remove the two screws and remove the muffler support plate.
- Remove the spacer «5» placed on the wheel pin.
- Remove the rear wheel by sliding it off from the right side.

**CAUTION**

UPON REMOVING/REFITTING, PAY ATTENTION NOT TO DAMAGE THE BRAKE HOSES, DISCS AND PADS.

CAUTION

AFTER REMOVING THE PADS, DO NOT OPERATE THE BRAKE CONTROL LEVER; OTHERWISE, THE CALLIPER PLUNGER COULD GO OUT OF ITS SEAT RESULTING IN BRAKE FLUID LEAKAGE.

Refitting the rear wheel

To refit, carry out the removal operations but in reverse order and observe the tightening torques.

Shock absorbers

Removal

- Unscrew the upper nut and remove the screw.



- Lower the shock absorber.

- Unscrew and remove the nut «2» and collect the washer.
- Remove the screw «3».
- Slide off the left shock absorber.



- Unscrew and remove the nut «1».
- Slide off the right shock absorber.



Refitting

To refit, carry out the removal operations but in reverse order and observe the tightening torques.

Centre-stand

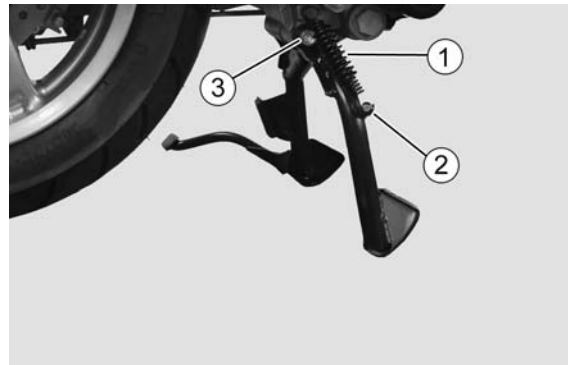
- Working from the scooter right side, disconnect the spring «1» from the stand hook «2».
- Undo and remove the screw «3» and

collect the self-locking nut.

- Remove the centre stand.

NOTE

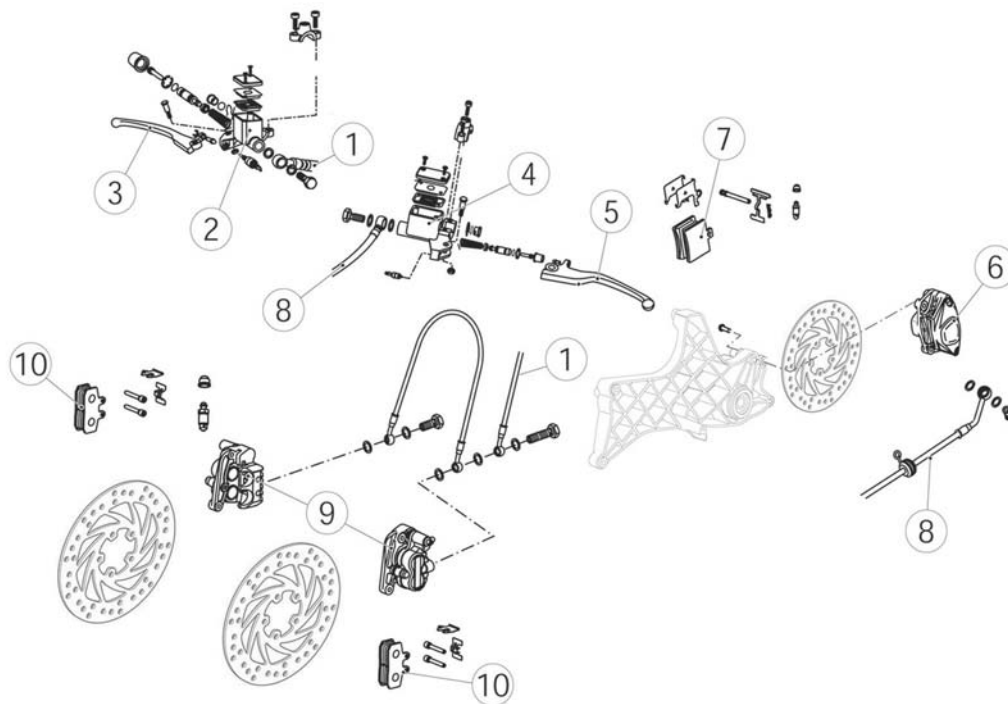
**CARRY OUT THE FOLLOWING OPERATIONS
FROM THE OPPOSITE SIDE OF THE STAND.**



INDEX OF TOPICS

BRAKING SYSTEM

BRAK SYS

**KEY:**

1. Front brake lever pipe, front brake calliper
2. Front brake pump /fluid reservoir
3. Front brake lever control
4. Rear brake pump/reservoir
5. Rear brake lever control
6. Rear brake calliper
7. Rear brake pads
8. Rear brake lever pipe, rear brake calliper
9. Front brake calliper
10. Front brake pads

Rear brake calliper

Removal

- Undo and remove the two fixing screws.
- Slide off the brake calliper from the disc.



Front brake calliper

OPERATIONS VALID FOR BOTH FRONT CALLIPERS

Removal

- Undo and remove the two fixing screws.
- Slide off the brake calliper from the disc.



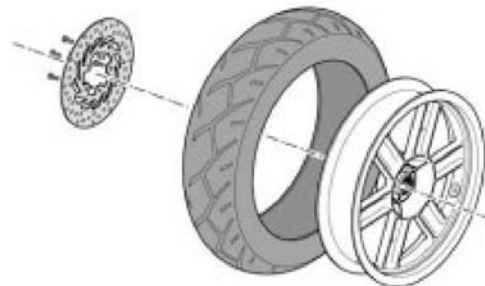
Rear brake disc

Removal

- Remove the rear wheel.
- Undo and remove the five brake disc screws.
- Remove the brake disc.

CAUTION

UPON REFITTING, APPLY THE RECOMMENDED PRODUCT ON THE THREADING OF THE BRAKE DISC SCREWS.



Recommended products**LOCTITE® 243 Loctite adhesive to assembly cylindrical pieces**

Loctite adhesive to assembly cylindrical pieces

Disc Inspection

- Carry out a visual inspection of brake disc surface. Replace the disc if scored or deteriorated.
- Check the brake disc for wear by measuring the minimum thickness with a micrometer at different points. Replace the disc if the minimum thickness, even at a single point of the disc, is less than the minimum value.

CAUTION**OPERATIONS TO BE CARRIED OUT WITH BRAKE DISC FITTED ON THE WHEEL.****Characteristic****Minimum value for brake disc thickness:**

3.8 mm

- Using a dial gauge, check that disc oscillation does not exceed the tolerance; otherwise, replace it.

**Characteristic****Brake disc oscillation tolerance:**

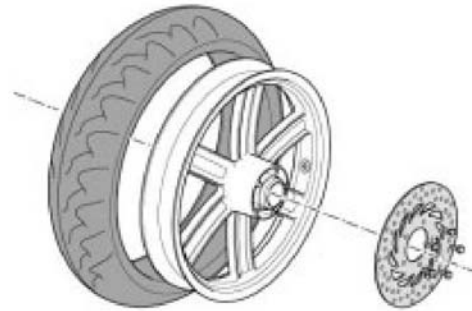
0.5 mm

Front brake disc**OPERATIONS VALID FOR BOTH FRONT BRAKE DISCS**

Removal

- Remove the front wheel.
 - Undo and remove the five brake disc screws.
-

- Remove the brake disc.



Refitting

To refit, carry out the removal operations but in reverse order and observe the tightening torques.

NOTE

SCREW ALL THE SCREWS MANUALLY AND TIGHTEN THEM OPERATING DIAGONALLY

CAUTION

UPON REFITTING, APPLY THE RECOMMENDED PRODUCT ON THE THREADING OF THE BRAKE DISC SCREWS.

Recommended products

LOCTITE® 243 Loctite adhesive to assembly cylindrical pieces

Loctite adhesive to assembly cylindrical pieces

Disc Inspection

- Carry out a visual inspection of brake disc surface. Replace the disc if scored or deteriorated.
- Check the brake disc for wear by measuring the minimum thickness with a micrometer at different points. Replace the disc if the minimum thickness, even at a single point of the disc, is less than the minimum value.

CAUTION

OPERATIONS TO BE CARRIED OUT WITH BRAKE DISC FITTED ON THE WHEEL.

Characteristic

Minimum value for brake disc thickness:

3.8 mm

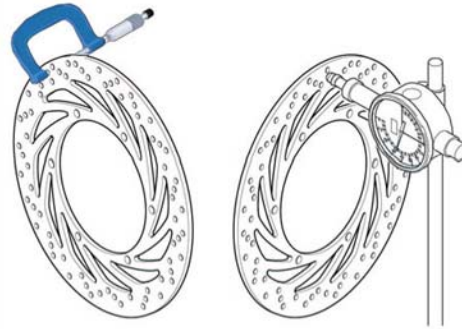
-
- Using a dial gauge, check that disc oscillation does not exceed the toler-

ance; otherwise, replace it.

Characteristic

Brake disc oscillation tolerance:

0.5 mm



Front brake pads

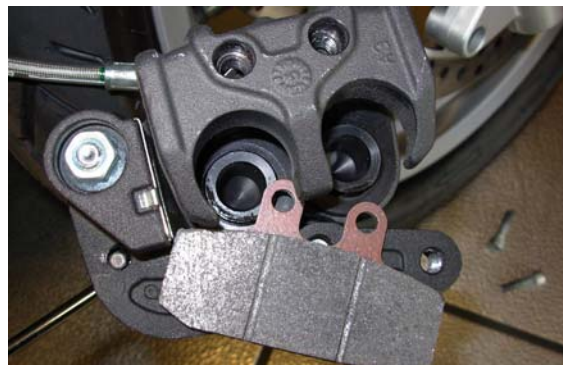
Removal

OPERATIONS VALID FOR BOTH FRONT CALLIPERS

- Remove the front brake calliper.
- Loosen and slide off both pins.



- Slide off the brake pads.



CAUTION

AFTER REMOVING THE PADS, DO NOT OPERATE THE BRAKE CONTROL LEVER; OTHERWISE, THE CALLIPER PLUNGER COULD GO OUT OF ITS SEAT RESULTING IN BRAKE FLUID LEAKAGE.

Refitting

OPERATIONS VALID FOR BOTH FRONT CALLIPERS

CAUTION

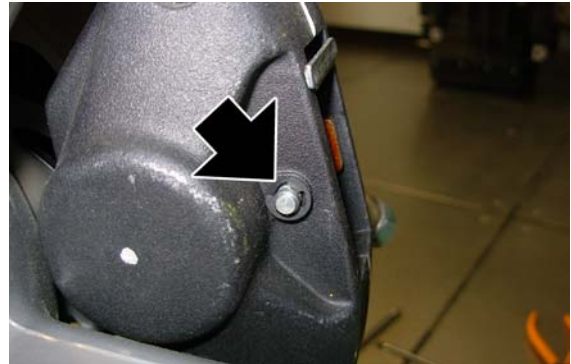
ALWAYS REPLACE BOTH PADS AND MAKE SURE THEY ARE CORRECTLY POSITIONED. INSIDE THE CALLIPER. UPON REFITTING, DO NOT INVERT THE POSITION OF THE LOCK.

To refit, carry out the removal operations but in reverse order and observe the tightening torques.

Rear brake pads

Removal

- Remove the seeger ring.



- Slide off the pin.



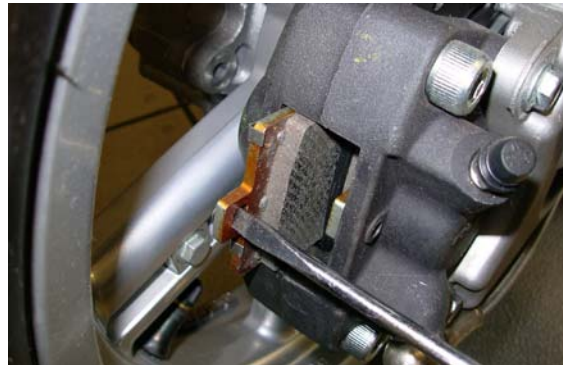
- Remove the spring.

CAUTION

THE ARROW STAMPED ON THE SPRING MUST ALWAYS BE TURNED IN THE RIDING DIRECTION.



- Slide off the brake pads.



Refitting

CAUTION

ALWAYS REPLACE BOTH PADS AND MAKE SURE THEY ARE CORRECTLY POSITIONED. INSIDE THE CALLIPER. UPON REFITTING, DO NOT INVERT THE POSITION OF THE LOCK.

To refit, carry out the removal operations but in reverse order and observe the tightening torques.

Fill - Bleeding the braking system

FILLING

NOTE

THESE OPERATIONS REFER TO ONE BRAKING CIRCUIT BUT APPLY TO BOTH.

- Remove the rubber protection cover from the bleed valve «4» and «5».
- Insert a transparent plastic pipe on the bleed valve «4» and «5» of the calliper and insert the other end of the pipe in a collecting container.
- Open the bleed valve «4» and «5» of approximately one turn.
- Undo and remove the two screws to open the brake fluid reservoir cap.

- Check the fluid flows out of the reser-

voir and, before the reservoir is empty, close the bleed valve «4» and «5».

- Top-up the fluid in the reservoir.
- Open the bleed valve «4» and «5» again approximately half a turn.
- Check that the fluid drains off through the pipe and when the fluid changes colour (from dark to light) , close the bleed valve «4» and «5» and remove the pipe.
- Refit the rubber protection cover.
- Top-up the oil in the reservoir up to the correct level.
- Close the brake fluid reservoir cap.



NOTE

DURING THIS OPERATION, CHECK THAT THERE IS ALWAYS FLUID IN THE RESERVOIR; OTHERWISE, IT WILL BE NECESSARY TO PURGE AIR AT THE END OF THE OPERATION.



AIR BLEEDING

If there is air in the hydraulic circuit, it acts as a bearing, absorbing a large quantity of the pressure from the brake pump and minimising calliper efficiency when braking. The presence of air is signalled by the "sponginess" of the brake control and poor braking efficiency.

WARNING

CONSIDERING THE DANGER FOR VEHICLE AND RIDER, IT IS STRICTLY NECESSARY THAT THE HYDRAULIC CIRCUIT BE AIR PURGED AFTER REFITTING BRAKES AND RESTORING THE BRAKING SYSTEM TO THE REGULAR USE CONDITIONS.

- Undo the two screws of the brake fluid reservoir «3».

- Remove the cover «1».

NOTE

TO AVOID SPILLING FLUID WHILE TOPPING-UP, KEEP THE FLUID IN THE RESERVOIR PARALLEL TO THE RESERVOIR EDGE (IN HORIZONTAL POSITION).



- Remove the gasket «2».
- Top-up with oil if required.
- Remove the rubber protection cover of the bleed valve «4» and «5».
- Connect a transparent pipe to the bleed valve «4» and «5».

NOTE

DO NOT SMEAR THE PADS OR THE DISC WITH BRAKE FLUID.

- Place the free end of the transparent pipe into a container.
- Operate the brake lever slowly and to the end of the stroke twice or three times and keep it pulled.
- Open the bleed valve «4» and «5», push the lever and, through the transparent pipe, check if the brake fluid flowing out contains air bubbles.

NOTE

BEFORE RELEASING THE BRAKE LEVER, TIGHTEN THE BLEED VALVE «4» AND «5», SO THAT AIR DOES NOT GET INTO THE BRAKING SYSTEM.

- When only brake fluid comes out, tighten the bleed valve «4» and «5» and release the brake lever.

- Refit the cover «1»

NOTE

AFTER REFITTING, PULL THE BRAKE LEVER REPEATEDLY AND CHECK THE CORRECT OPERATION OF THE BRAKING SYSTEM.

NOTE

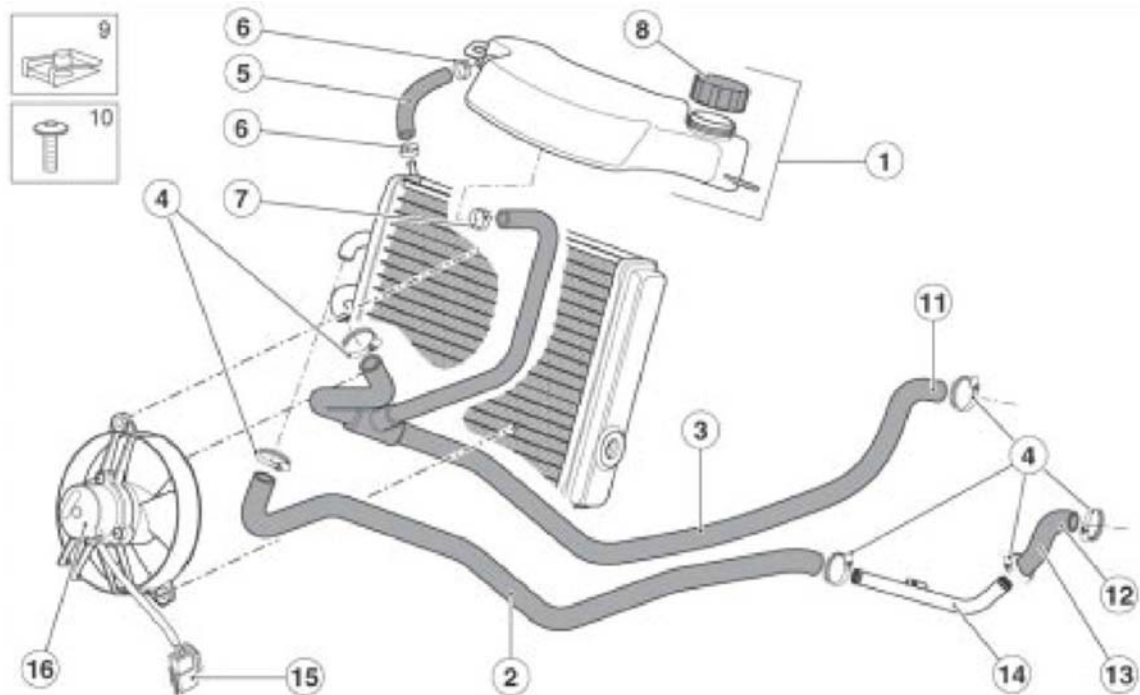
REPEAT THE THREE LAST OPERATIONS UNTIL THERE ARE NO MORE AIR BUBBLES.



INDEX OF TOPICS

COOLING SYSTEM

COOL SYS

Circuit diagram
**KEY:**

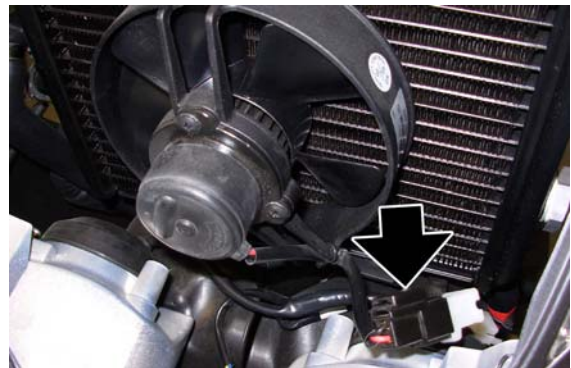
1. Expansion tank with cap;
2. Radiator / fitting pipe;
3. Radiator fitting / pump pipe;
4. Clamp;
5. Breather pipe;
6. White clic clamps;
7. White clic clamp;
8. Expansion tank cap;
9. Clip;
10. Flanged TBEI screw;
11. To the water pump;
12. From the head;
13. Fitting / head sleeve;
14. Fitting;
15. Electric fan connector;
16. Electric fan

Electric fan check

- Remove the front central cover.
- Disconnect the electric fan connector.

CAUTION

OPERATE WITH CAUTION SO AS NOT TO DAMAGE THE RADIATOR FINS.



- Connect the connector ends to the battery poles through two cables.

If the electric fan does not turn, check:

- Battery - connector connection;
- Battery charge;
- Free movement of rotor blades.

If the electric fan does not work after these checks, remove and replace it.

**ELECTRIC FAN REMOVAL**

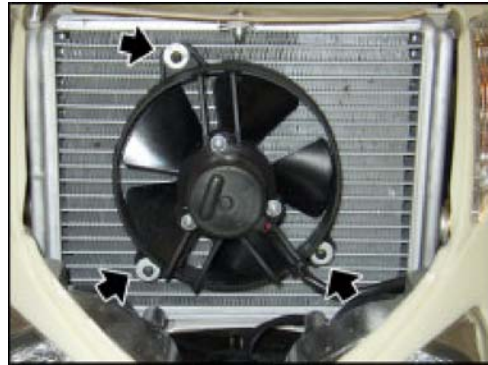
- Remove the front central cover.
- Disconnect the electric fan connector.

CAUTION

OPERATE WITH CAUTION SO AS NOT TO DAMAGE THE RADIATOR FINS.



- Undo and remove the three screws.
- Remove the electric fan.



Coolant replacement

Emptying

NOTE

USE A CONTAINER OF ADEQUATE CAPACITY TO COLLECT THE FLUID THAT MAY LEAK DURING OPERATION.

- Remove the front shield.
- Loosen the clamp.
- Slide off the pipe.
- Drain off the system.

NOTE

REMOVE THE EXPANSION TANK CAP TO FACILITATE THE COOLANT DRAINAGE.

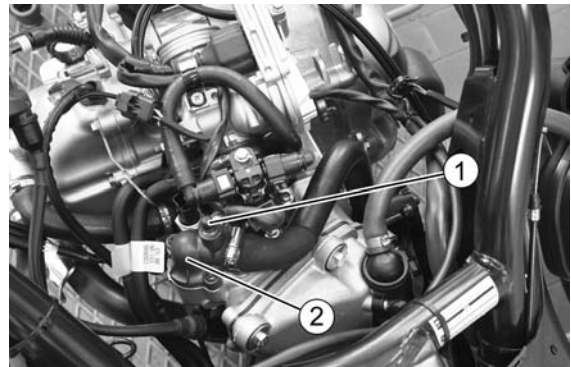


Filling

- Reposition the coolant delivery pipe and tighten with a clamp.
- Remove the central inspection cover (SEE TAIL).
- Remove the rubber cap «1» of the bleed screw of thermostat «2» and fit a hose. The other end of the hose should be fitted into in a container.
- Top-up the expansion tank with coolant until the fluid level reaches the "MAX" reference mark.



- Open the bleed valve so that air is released and coolant can be topped-up.
- Close the valve and continue refilling up to the "MAX" reference mark.
- Run the vehicle until it warms up.
- Shut off the engine, bleed again and top-up.
- Refit the central inspection cover.



Locking torques (N*m)

Fixing the radiator/pump hose clamps 3 (2.2 ftlb)

System bleed

- Start the engine until the operating temperature is reached
- Remove the bleed valve rubber cap
- Use a rubber hose of suitable length to connect the valve to the expansion tank
- Place one end of the hose on the bleed valve and the other in the expansion tank
- Loosen the screw by **two** turns until the communication hole (photo) with the head can be seen
- Wait until only coolant comes out through the rubber hose so as to eliminate any air bubbles inside the circuit.
- Tighten the bleed valve respecting the maximum torque.
- Refill with coolant up to the correct level inside the expansion tank



Locking torques (N*m)

Bleed screw: 3

Thermostat

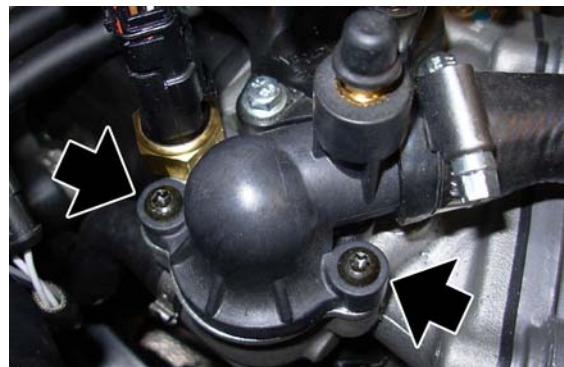
Removal

Preventively remove:

- Helmet compartment.
- Rear central cover.
- Remove the footrest lower protection by sliding it upwards and turning it.



- Remove the thermostat cover.



- Extract the thermostatic valve.



Check

- 1) Visually check that the thermostat is not damaged.
 - 2) Fill a metal container with approx. 1 litre of water.
- Immerse the thermostat, and keep it in the centre of the container.
- Immerse the multimeter thermometer probe, and



keep it close to the thermostat.

Heat up the container using the thermal gun.

Check the temperature when the thermostat starts to open:

Heat to obtain the thermostat full opening

3) Replace the thermostat if it is not working properly.

CAUTION

MAKE SURE NEITHER THE THERMOSTAT NOR THE THERMOMETER TOUCHES THE CONTAINER FOR A CORRECT TEST PERFORMANCE.

Specific tooling

020331Y Digital multimeter

020151Y Heat gun

Characteristic

Thermostat check: Opening start temperature

69.5 ÷ 72.5 °C

INDEX OF TOPICS

CHASSIS

CHAS

Seat

- Insert the key in the saddle lock.
- Turn the key anticlockwise.
- Lift the saddle.



- Undo and remove the four screws.
- Remove the saddle.



Rear rack

- Insert the key in the saddle lock.
- Turn the key anticlockwise.
- Lift the saddle.
- Undo and remove the four screws.



- Slide off the screw cap.



- Undo and remove the screw.



- Remove the luggage rack.



Driving mirrors

- Operating from both sides, unscrew the mirror.

CAUTION

THE RIGHT MIRROR SHOULD BE UNSCREWED CLOCKWISE.



Rear handlebar cover

- Operating from both sides, undo and remove the two screws.



- Undo and remove the screw.



- Disconnect the connector.



Instrument panel

- Remove the rear handlebar cover.
 - Undo and remove the four screws.
-



- Pull the instrument panel backwards.



- Undo the three screws.



- Slide off the instrument panel forwards.



Front handlebar cover

- Remove the rear handlebar cover.

- Remove the front handlebar cover.



Legshield

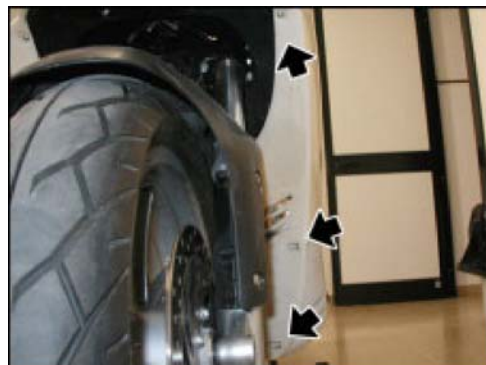
- Remove the front mudguard.
- Remove the front wheel.
- Remove the central front cover.
- Operating from both sides, undo and remove the five screws.

CAUTION

PLACE A SUPPORT UNDER THE CHASSIS SO THAT THE FRONT WHEEL DOES NOT TOUCH THE GROUND.



- Operating from both sides, undo and remove the three screws.



- Undo and remove the two screws.



-
- Move the external front shield forwards and disconnect front headlamp connector.



-
- Operating from both sides, undo the two screws and remove the front turn indicators from the back.



- Slide the external front shield off the front fork.

Knee-guard

- Remove the front central cover.
- Operating from both sides, undo and remove the screw.



- Remove the handlebar cover.
- Undo and remove the two screws.
- Slide off the bag hook.



- Insert the key in the glove-box lock, turn it clockwise and open the compartment.
- Undo and remove the four screws.



- Close the glove-box.
- Operating from both sides, undo and remove the four side screws.



- Disconnect the auxiliary plug socket in the glove-box.

- By making the handlebar rotate, pull forwards the internal front shield off the hooks being careful with the fitting slots.

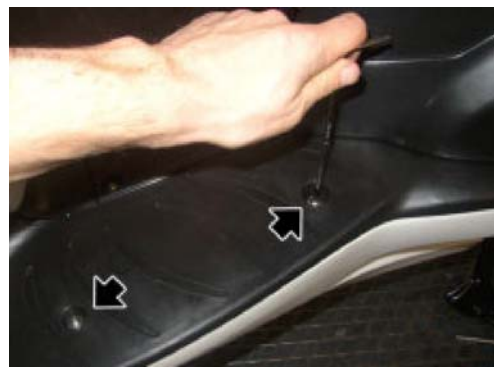


Footrest

- Remove the central inspection cover.
- Remove both side fairings.
- Operating on both sides, undo and remove the rear screw of the footrest.



- Operating on both sides, undo and remove the two screws of the footrest.



- Remove the battery.
- Unscrew and remove the bolt inside the battery compartment.
- Operating from both sides, undo and remove the lower screw fixing it to the internal front shield.
- Remove the footrest being careful with the tongues and the related fitting slots.



Left and right fairings removal

- Remove the rear central cover.
- Undo and remove the screw.

NOTE

THE FOLLOWING OPERATIONS ARE TO BE CONSIDERED VALID



- Undo the two screws and remove the passenger footrest rubber.



- Undo and remove the screw.



- Undo and remove the screw.



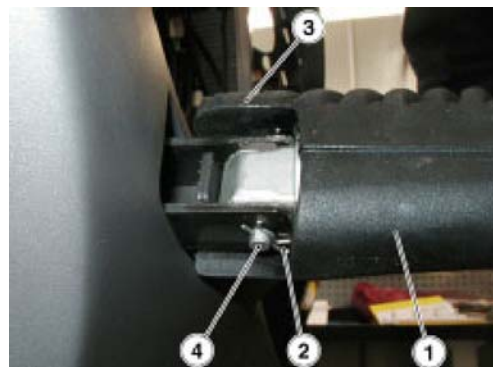
- Push aside the tail section.

- Remove the fairing by sliding it off the hooks, being careful with the tongues and related fitting slots.



Passenger footrest removal

- In riding position, rotate the passenger footrest «1».
- Lift the footrest upper rubber edge «3».
- Slide and remove the pin «4».
- Remove the passenger footrest «1».



NOTE

THESE OPERATIONS REFER TO ONLY ONE PASSENGER FOOTREST BUT THEY APPLY TO BOTH.

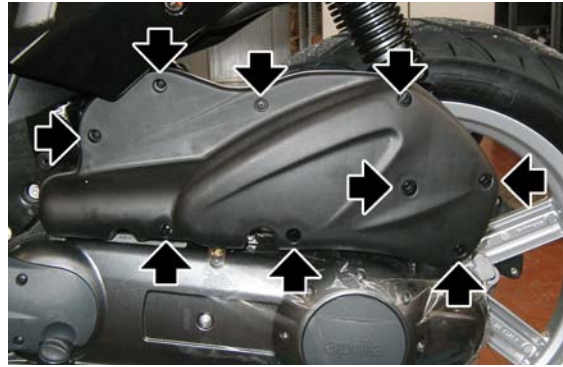
NOTE

THIS OPERATION IS NECESSARY ONLY TO REMOVE THE METAL PART OF THE FOOTREST. TO REMOVE FAIRINGS, JUST REMOVE THE PASSENGER FOOTREST RUBBER.

Air filter

Air filter removal

- Undo and remove the nine screws.



- Remove the filter casing cover.
- Remove the filter.



Filter casing removal

- Remove the helmet compartment.
- Remove the rear central cover.
- Remove the left under seat fairing.
- Loosen the intake manifold clamp.
- Slide off the intake manifold.



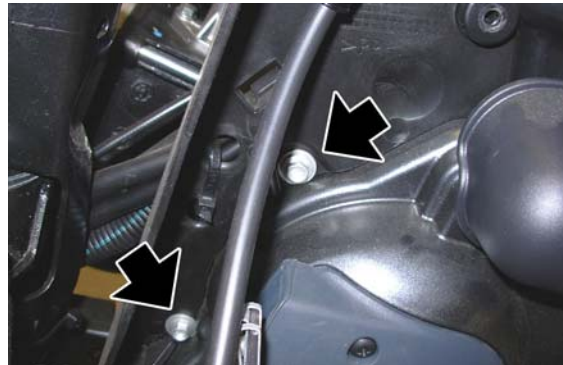
- Undo and remove the three screws keeping the related nuts locked.







- Undo and remove the two screws and remove the filter casing front locking.



- Move the filter housing leftwards.
- Release the clamp of the oil breather pipe.
- Remove the oil breather pipe.
- Remove the filter casing.

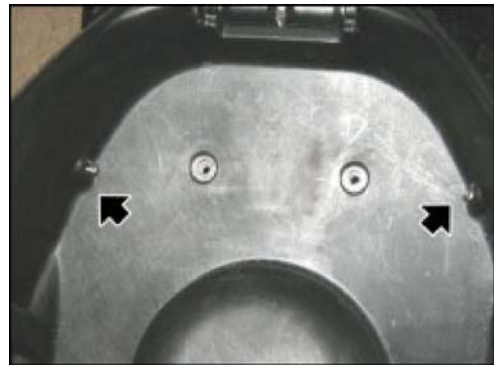


Tail guard

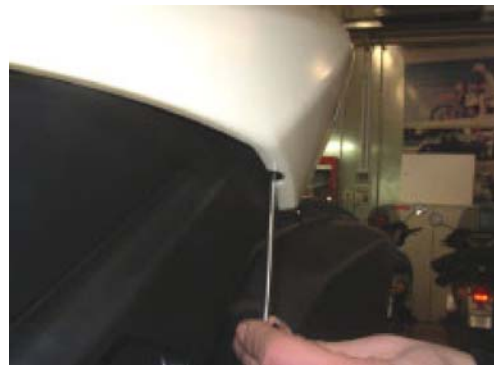
- Remove the rear central cover.
- Operating on both sides, undo and remove the four lower screws.



- Undo and remove the two screws inside the helmet compartment.



- Operating on both sides, undo and remove the screw.



- Undo and remove the three fixing screws.



- Remove the fairing of the tail light.



- Remove the tail section from its fittings with the side fairings.
- Move the tail section backwards and disconnect the tail light connector.



- Undo the two fixing screws and remove the seat lock.

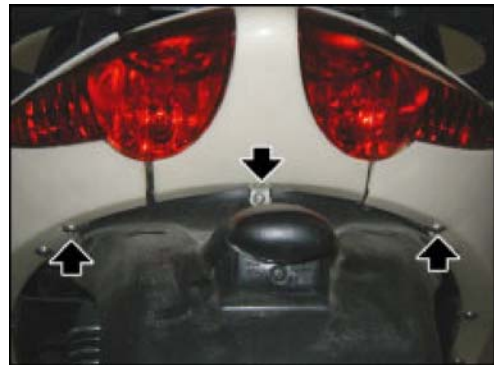


- Remove the tail section by sliding it backwards.



Rear mudguard

- Undo and remove the three screws.



- Undo the three screws and remove license plate.



- Undo and remove the screw.



- Undo and remove the screw.



- Undo the screw and slide off the license plate light backwards.



- Remove the bulb but keep it connected to the cables



- Remove the rear mudguard.



Should the rear mudguard holder frame be removed before taking out the rear mudguard proceed as follows:

- Undo and remove the two screws.

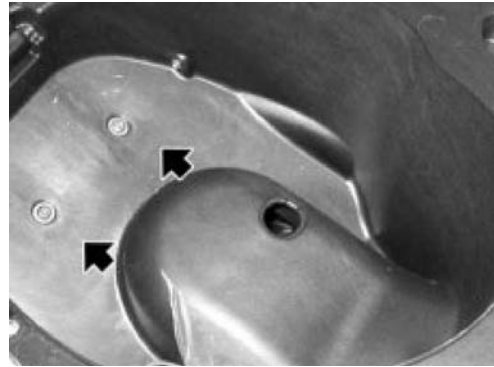


Helmet bay

- Remove the tail section.

- Remove the luggage rack.

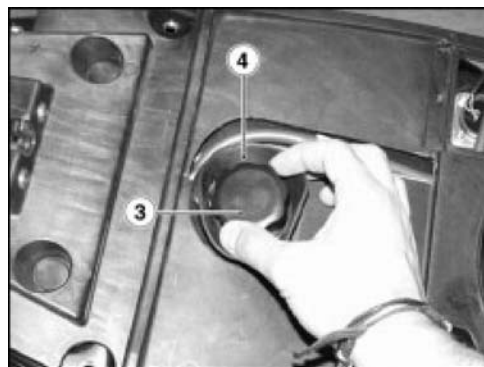
- Undo and remove the two screws.



- Operating on both sides, undo and remove the screw.



- Remove the fuel tank cap «3».
- Remove the gasket «4» and release it by sliding it off from the breather pipe «5».
- Screw the fuel tank cap «3».





- Slide off the helmet compartment forwards.



Front mudguard

- Operating from both sides, undo and remove the two screws.



- Slide off the front mudguard forwards.



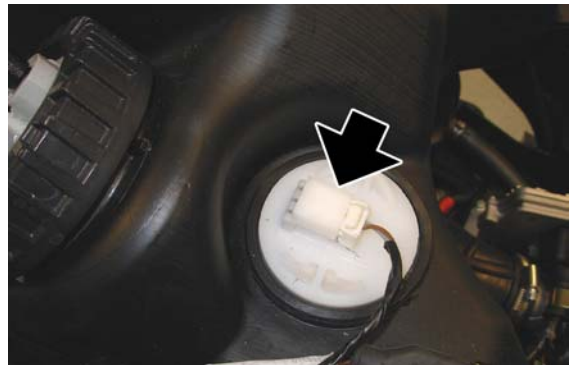
Fuel tank

Tank Removal

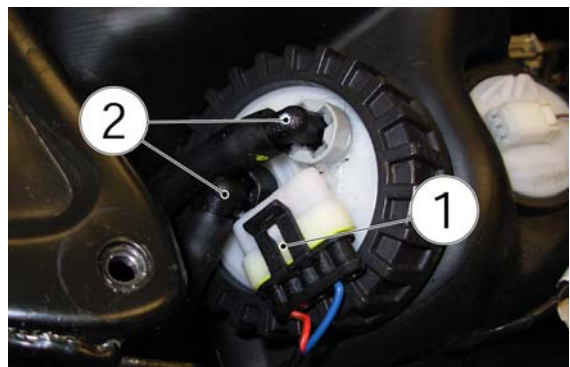
- Remove the helmet compartment.
- Operating on both sides, undo and remove the two screws and collect the washers.



- Disconnect the connector.



- Disconnect the connector 1.
- Disconnect the fuel pipe 2.
- Slide off the tank forwards.



Fuel Probe Removal

- Remove the helmet compartment.
- Disconnect the fuel probe.



- Unscrew and slide the probe off the tank.

NOTE

USE A CLOTH IN ORDER TO AVOID FUEL SPLASHES.

CAUTION

ONCE THE PROBE IS REMOVED FROM THE TANK, CLOSE THE PROBE ENTRY OPENING WITH A CLOTH TO AVOID INHALING THE PETROL BEING EVAPORATED FROM THE TANK.



Rear central cover

Right inspection cover removal

- Remove the right fairing.
- Remove the inspection cover by sliding it off its hooks, being careful with the tongues and related fitting slots.

- Lift the saddle.
- Undo and remove the two screws.



- Undo and remove the two screws.



- Remove the central inspection cover by sliding it off its hooks.



Radiator fan

- Drain off the system.
 - Remove the shield back plate.
 - Remove the front shield.
 - Disconnect the electric fan connector.
-



- Loosen the clamps and remove the three pipes.



- Undo and remove the screw.
- Slide off the radiator upwards.



Expansion tank

Drain off the cooling system:

- Remove the front central cover.
- Remove the shield back plate.
- Loosen and remove the clamp.



- Loosen and remove the clamp.

NOTE

UPON REFITTING, REPLACE THE REMOVED CLAMPS WITH NEW ONES.



- Operating from both sides, undo and remove the screw.
- Remove the expansion tank.

**Flyscreen**

- Remove the front handlebar cover.
- Operating from both sides, undo and remove the two rear screws.



- Slide off the windshield.



Fairing removal

- Operating from both sides, undo and remove the screw.



- Detach the front right handlebar cover from the left one.



Radiator cover

- Operating on both sides, undo and remove the screw.



- Remove the front case by sliding it off its hooks, being careful with the tongues and related fitting slots.



Lower cover

NOTE

THE FOLLOWING OPERATIONS REFER TO ONE SIDE OF THE VEHICLE, BUT APPLY TO BOTH.

- Undo and remove the rear screw.



- Undo and remove the two side screws.



- Undo and remove the two screws.



- Undo and remove the screw fixing it to the front shield on the front wheelhouse.
- Undo and remove the screw.



- Lift the footrest and slide the lower shield off its hooks being careful with the tongues and related fitting slots.



The lower shield can be split into right and left sections.

To do this, proceed as follows:

- Undo and remove the two screws.
- Slide off the lower shield to separate it into a right and a left section.

