



**PIAGGIO**

# **SERVICE STATION MANUAL**

## **• X9 500 cc**

Piaggio & C. S.p.A.  
Pontedera  
After Sales Service  
Dis. 594523 - 04/01

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# SERVICE STATION MANUAL X9 500 cc

This manual has been designed by Piaggio for use in authorized dealers' and subdealers' workshops. It is assumed that those who use this publication for maintaining and repairing Piaggio vehicles are familiar with the principles of mechanics and with vehicle repairing procedures and techniques. Any significant changes to the characteristics of the vehicles or to specific repairing procedures will be covered in updates of this manual. Since satisfactory results cannot be obtained without the necessary equipment and tooling, we recommend referring to the pages of this manual concerning the specific equipment required and to the catalogue of specific tools.

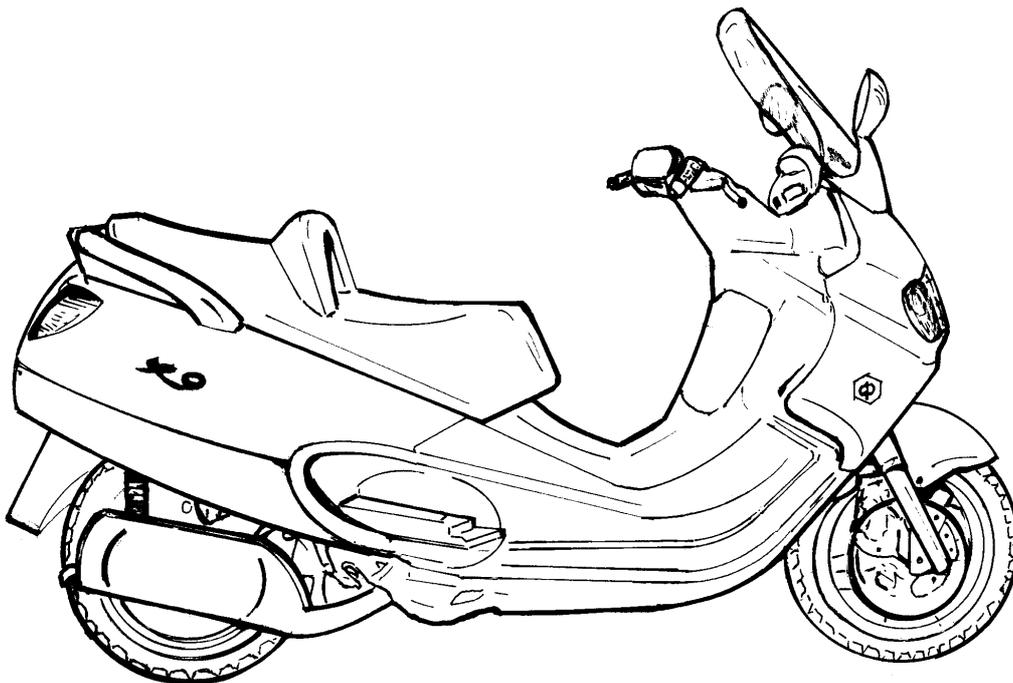
Pieces of particularly important information are identified as follows:

**Note:** Provides important information intended to simplify and clarify a procedure.

**Warning** - Denotes specific procedures to be used to avoid damaging the vehicle.

**Caution** - Identifies specific procedures to be followed to avoid injury to repairing personnel.

**NOTE** - For any intervention to the engine, refer to the "Service Station Manual" for 500 cc Engines.



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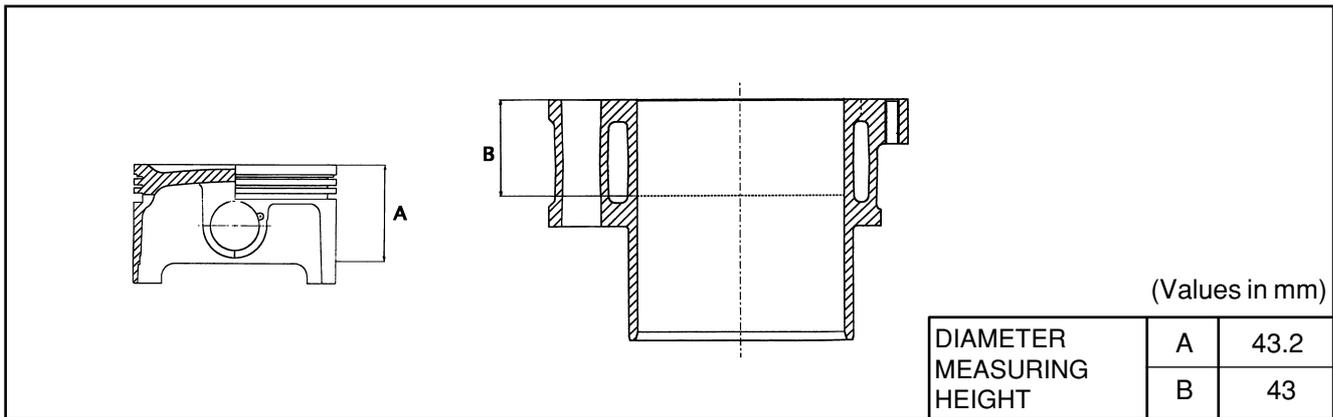
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Assembly plays



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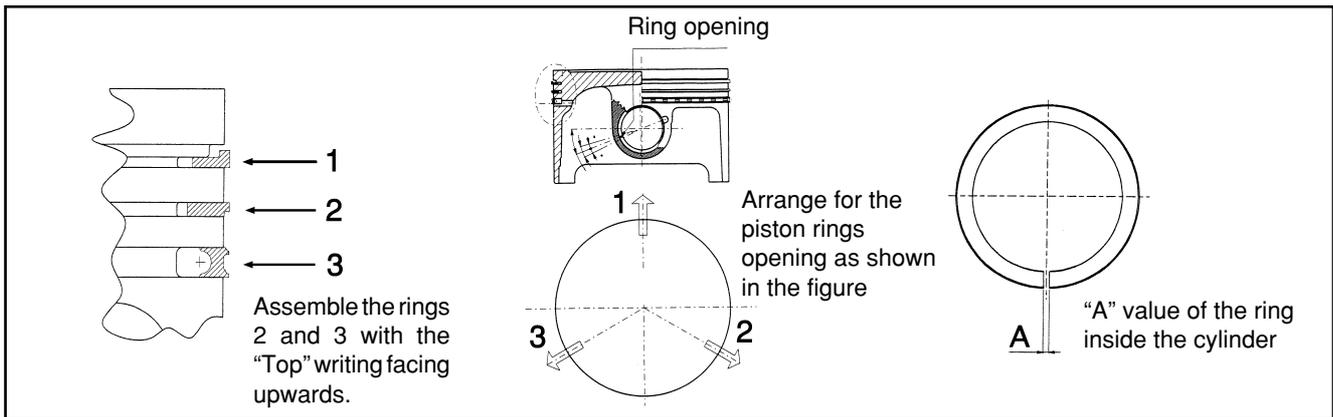
Mating between piston and cylinder

(Values in mm)

PART	DIMENSIONS	MATING CLASSES			ASSEMBLY CLEARANCE
		CODE	CYLINDER	PISTON	
Cylinder Ø C	$92 \begin{smallmatrix} -0.010 \\ +0.018 \end{smallmatrix}$	A	91.990 - 91.997	91.947 - 91.954	0.036
		B	91.997 - 92.004	91.954 - 91.961	
Piston Ø P	$91.961 \begin{smallmatrix} +0.014 \\ -0.014 \end{smallmatrix}$	C	92.004 - 92.011	91.961 - 91.968	0.050
		D	92.011 - 92.018	91.968 - 91.975	

The piston must be fitted so that the arrow faces the exhaust side. The piston rings must be fitted so that the marks face upwards.

Piston rings



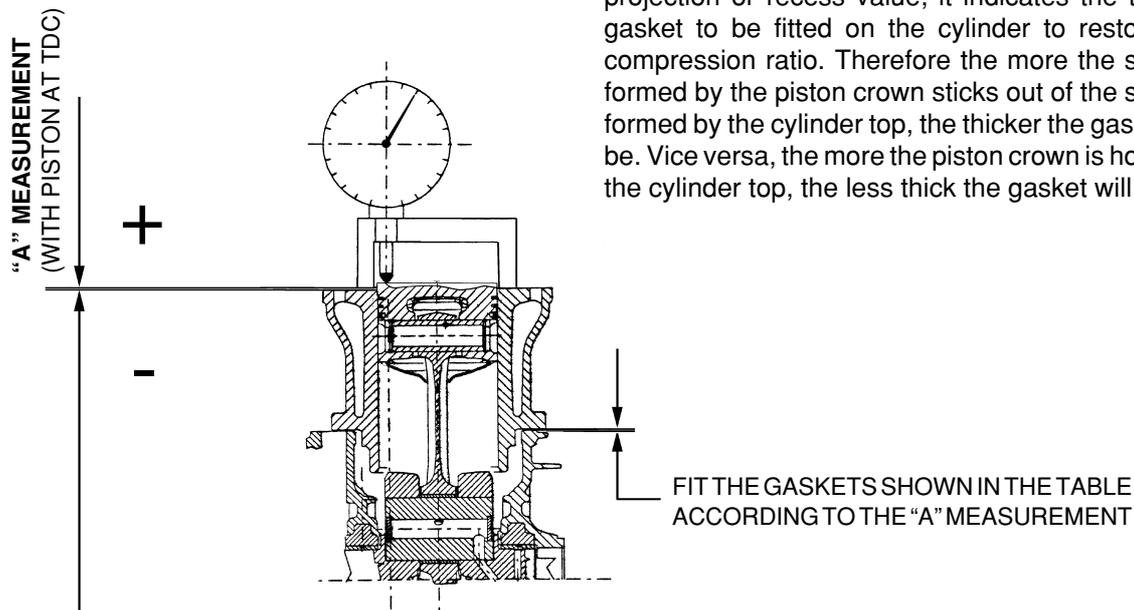
01\_005

(Values in mm)

PART	DIMENSIONS	CLEARANCE CODE	SEAT CLEARANCE	CLEARANCE AFTER USE
1st Compression ring	92 x 1.5	A	0.15 - 0.35	0.5
2nd Compression ring	92 x 1.25	A	0.25 - 0.50	0.65
Scrapper ring	92 x 2.5	A	0.25 - 0.50	0.65

**SHIMMING METHOD FOR LIMITING THE COMPRESSION RATIO: CR = 10.5 : 1**

**N.B.:** The "A" measurement is referred to the piston projection or recess value; it indicates the type of gasket to be fitted on the cylinder to restore the compression ratio. Therefore the more the surface formed by the piston crown sticks out of the surface formed by the cylinder top, the thicker the gasket will be. Vice versa, the more the piston crown is hollow to the cylinder top, the less thick the gasket will be.

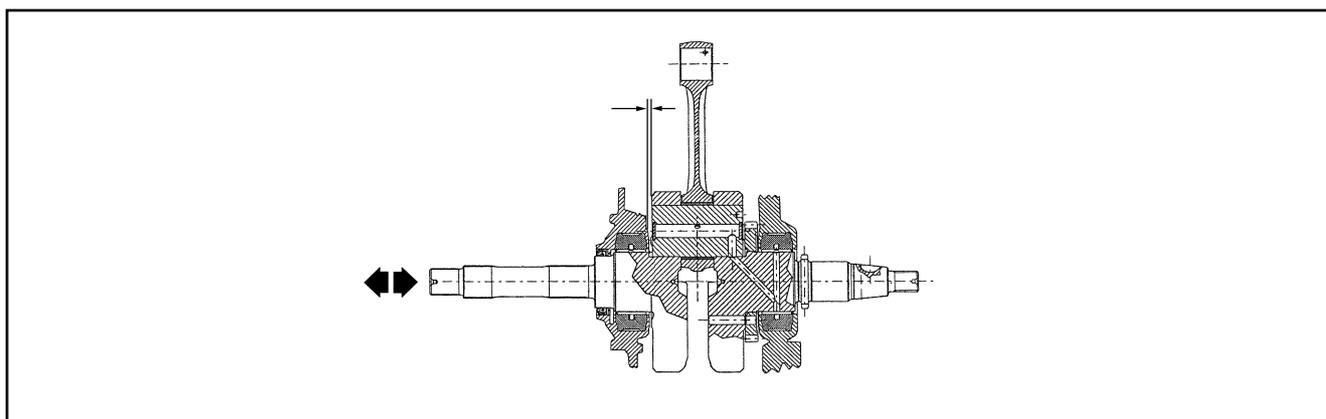


**NOTE:** THE "A" MEASUREMENT MUST BE TAKEN WITH NO GASKET FITTED BETWEEN CRANKCASE AND CYLINDER

01\_006

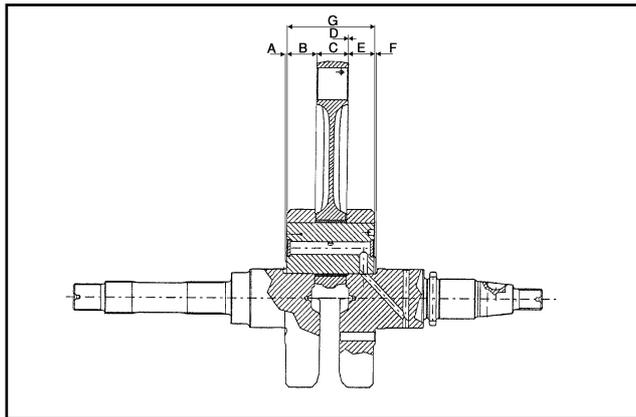
"A" MEASUREMENT	THICKNESS OF BASE GASKET
- 0.185 - - 0.10	0.4 ± 0.05
- 0.10 - + 0.10	0.6 ± 0.05
+ 0.10 - + 0.185	0.8 ± 0.05

**Crankshaft/crankcase axial clearance 0.1 - 0.5 mm (cold engine)**



01\_010

**Crankshaft/connecting rod axial clearance**



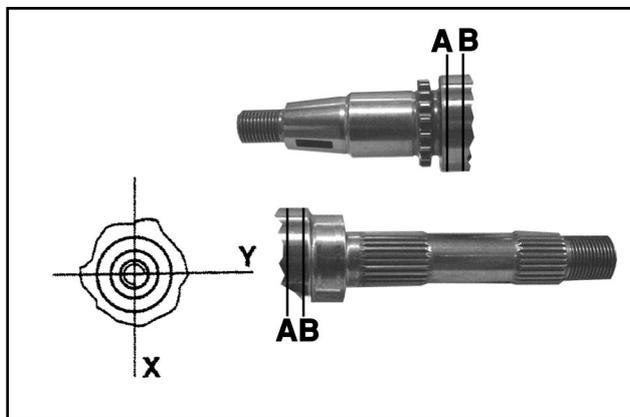
01\_007

PART	DIMENSIONS	CLEARANCE
Web, transmission side	$A = 0.8 \pm 0.025$	D = 0.20 - 0.40
Shaft section, transmission side	$B = 19.6 \begin{smallmatrix} +0.05 \\ 0 \end{smallmatrix}$	
Connecting rod	$C = 22 \begin{smallmatrix} -0.10 \\ -0.15 \end{smallmatrix}$	
Shaft section, flywheel side	$E = 19.6 \begin{smallmatrix} +0.05 \\ 0 \end{smallmatrix}$	
Web, flywheel side	$F = 13 \pm 0.025$	
Crankshaft assembly	$G = 63.5 \begin{smallmatrix} +0.1 \\ -0.05 \end{smallmatrix}$	

**Crankshaft alignment and diameters**

- Measure the housings on both axes x and y.

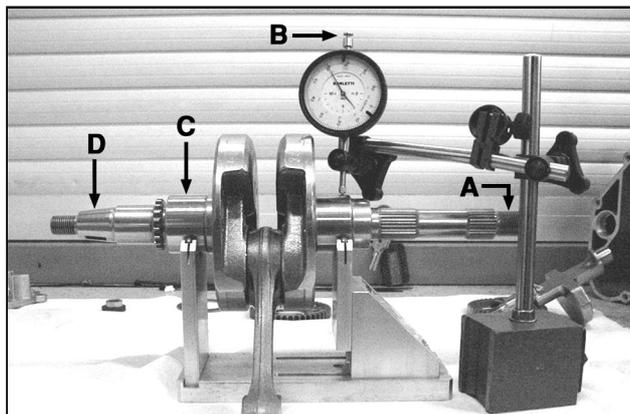
	Standard diameter
Class 1	40.010 - 40.016
Class 2	40.016 - 40.022



01\_008

Max. allowable runout:

- A = 0.15 mm
- B = 0.01 mm
- C = 0.010 mm
- D = 0.10 mm



01\_009

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**SPECIFIC TOOLING**

**2**



## Specific Tooling

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### Specific tools for Piaggio X9 500 cc 4-stroke 4-valve

RECOMMENDED TOOLS	
TOOL NAME	PART NO.
Circlip pliers	002465Y
Steering thrust ring removing drift	020004Y
Crankshaft aligning tool	020074Y
Support for "METABO HG 1500/2" air heater	020150Y
"METABO HG 1500/2" air heater	020151Y
Mityvac-type vacuum pump	020329Y
Stroboscopic gun for two- and four-stroke engines	020330Y
Digital multimeter	020331Y
Single battery charger	020333Y
Multiple battery charger	020334Y
Magnetic stand and dial gauge	020335Y
Engine support connection	020482Y
Engine mount base	020527Y
Engine mount revolving base	020604Y11

 = New tools

<b>NECESSARY TOOLS</b>	
<b>TOOL NAME</b>	<b>PART NO.</b>
STEERING SEAT FITTING TOOL, to be fitted with parts 9 - Lower bearing adaptor, 10 - Upper bearing adaptor	001330Y
Bell Ø 80 mm	001467Y002
20 mm pliers	001467Y006
Bell Ø 63 mm	001467Y007
18 mm pliers	001467Y008
Bell Ø 45 mm	001467Y017
Bell Ø 60 mm	001467Y031
15 mm pliers	001467Y034
Hub bearing extraction bell	001467Y035
Steering tube ring spanner	020055Y
Oil pressure gauge	020193Y
Valve seal rings assembly tool	020306Y
37x40 mm adaptor	020358Y
42x47 mm adaptor	020359Y
52x55 mm adaptor	020360Y
20 mm guide (Driven pulley bearings)	020363Y
25 mm guide (Driven pulley bearings)	020364Y
Ø 28x30 mm adaptor	020375Y
Adapter sleeve	020376Y
Bushing (valve removing tool)	020382Y012
15 mm guide	020412Y
Valve oil seal extractor	020431Y
Oil pressure gauge unio	020434Y
17 mm guide (countershaft bearings)	020439Y
Driven half pulley spring compressor	020444Y
46-55 mm spanner	020444Y009
Ø 24 mm adaptor	020456Y
Steering tube lower bearing extractor	020458Y
Drift for fitting bearing on steering tube	020459Y
Injection tester kit	020460Y
Flywheel extractor	020467Y
Piston fitting band	020468Y
Injection tester reprogramming kit	020469Y
Piston pin retainer fitting tool	020470Y
Countershaft timing peg	020471Y
Flywheel retaining tool	020472Y
Clutch bell housing retaining tool	020473Y
Drive pulley stop spanner	020474Y
Piston position comparator support	020475Y
Pillar kit	020476Y
Ø 37 mm adaptor	020477Y
Driven pulley needle roller drift	020478Y
Countershaft stop spanner	020479Y
Fuel pressure measuring kit	020480Y
Control unit interface wiring harness	020481Y
30 mm guide	020483Y
Piston stop fork	020512Y
Compass wrench (valve lifter bell stop)	020565Y
Exhaust gas analyser	494929

## Spark plug

### Check and replacement

**Warning** - Remove the spark plug when the engine is cold. Replace the spark plug every 12,000 km. The use of unsuitable ignition control units and spark plugs other than those specified can seriously damage the engine.

**Recommended spark plug: CHAMPION RG 6 YC  
NGK CR 7 EKB**

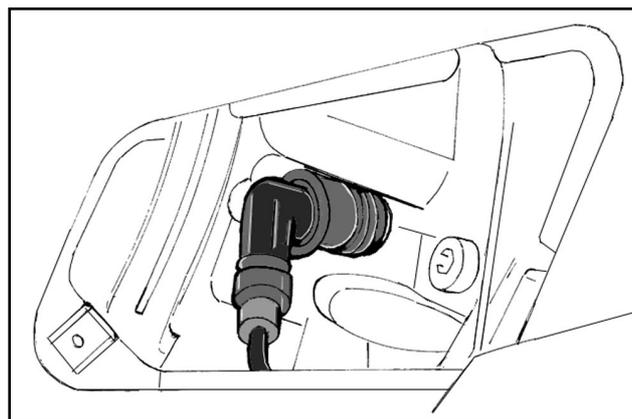
- Put the vehicle on the central stand.
- Open the door on the left side of the vehicle by levering in the recess in the lower part of the door after removing the screw.
- Disconnect the spark plug HV cable cap.
- Unscrew the spark plug with the spanner provided.
- Check the spark plug to see if the insulator is cracked, the electrodes are worn out or excessively sooty. Also check the condition of the seal washer and measure the spark gap with a suitable thickness gauge.

**Spark gap: 0,7 - 0,8 mm**

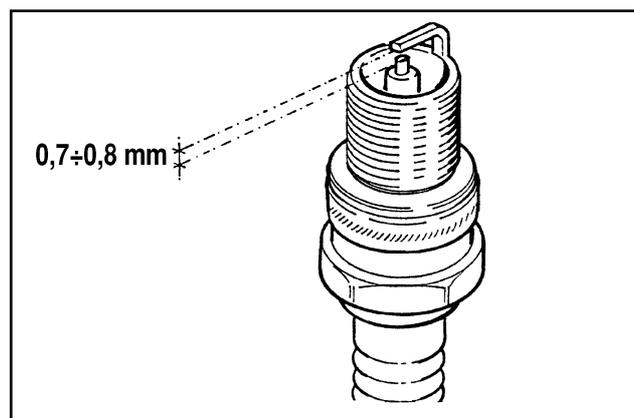
- If necessary adjust the spark gap by carefully bending the side electrode.
- If the spark plug has any of the defects mentioned above, replace it with a plug of the recommended type.
- Insert the plug into the hole with the proper inclination, screw it in fully by hand and then tighten it with the specially designed spanner.

**Tightening torque: 10 N·m (1 Kg·m)**

- Push the spark plug cap all the way down onto the spark plug and then proceed to the reassembly.



03\_001



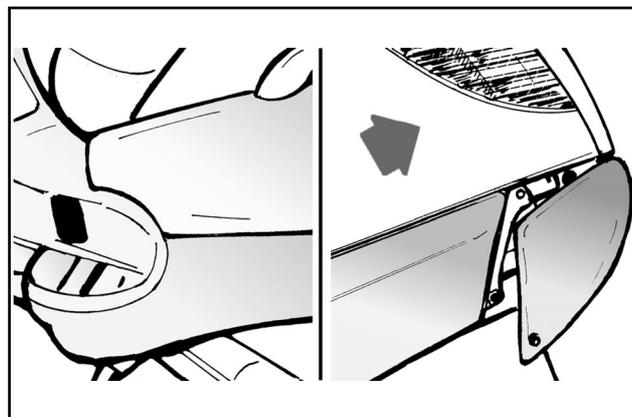
03\_002

3

### Air filter

- Remove the left-hand lower side panel as described in Chapter 8-Bodywork.
- Remove the cleaner cap after loosening the eight fixing screws, including one screw of the knob type.
- Pull out the filter element.
- Replace the air filter with a new one.

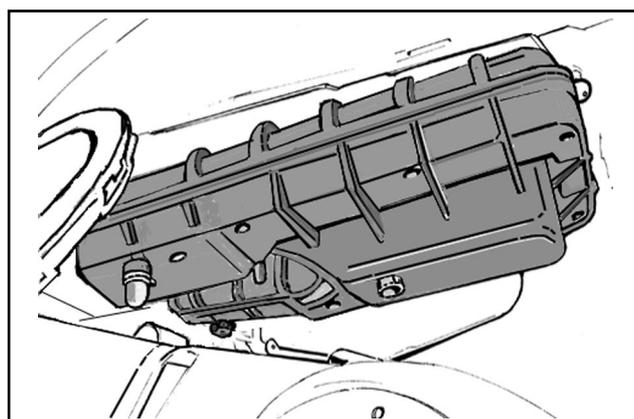
**Note:** Check and if necessary blow the air filter every 6,000 km. Direct the air jet from the inside to the outside of the filter (i.e. in the opposite direction to the air flow during normal engine operation).



03\_003

**Warning** - If the vehicle is mostly used on dusty roads, the air filter needs to be cleaned and replaced at shorter intervals than indicated in the Maintenance Schedule.

**Warning** - Do not run the engine if the air filter is not in place as this would result in excessive wear of the cylinder and piston as well as in damage to the throttle body.



03\_004

### Engine oil level

In four-stroke engines oil is used to lubricate the valve gear components, the crankshaft bearings and the power plant. **A lack of engine oil can cause serious damage to the engine.**

In all four-stroke engines, oil deterioration and consumption are, to some extent, normal, especially during running-in. Consumption partly depends on the riding style (for example, constantly riding at full throttle increases oil consumption).

### Checking the oil level

Perform this operation when the engine cold, as described below:

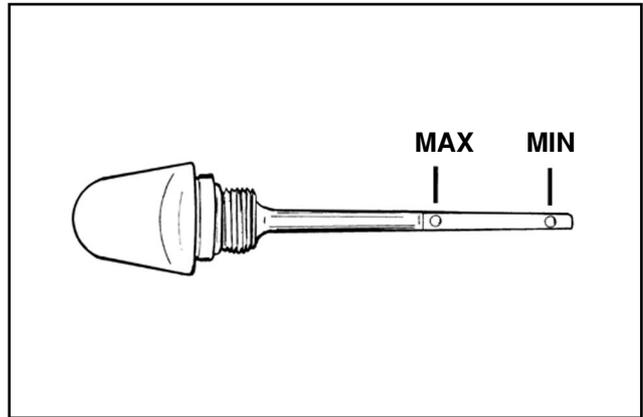
- 1) Put the vehicle on its central stand on a flat surface.
- 2) Unscrew dipstick «A», dry it with a clean cloth and **refit by screwing it completely.**
- 3) Remove the dipstick again and check that the oil level is between the MAX and MIN marks on the dipstick; top up if necessary.

The MAX level mark indicates an amount of about 1700 cc of engine oil.

The level will be lower if checked after using the vehicle (i.e. when the engine is hot). To obtain a correct indication of the oil level, wait for at least 10 minutes after switching off the engine.

Since a certain amount of oil remains in the circuit, the replenishment must be made by adding approximately 1,500 cc of fresh oil through cap «A». Subsequently start the engine, let it idle for a few minutes and then switch it off. After about 5 minutes, check the level and if necessary top up **without exceeding the MAX level.** The filter cartridge must be replaced every time the oil is changed. For top-ups and renewals use fresh oil of the **Selenia HI Scooter 4 Tech** type.

**Note:** Renew the oil when the engine is hot.



03\_005

### Topping up

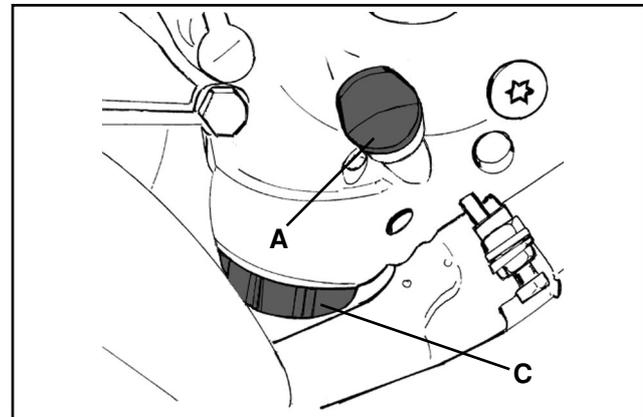
If the oil level is too low, top up by adding fresh oil **without exceeding the MAX level.**

**Approximately 400 cc** of oil are needed to restore the level between the **MIN** and **MAX** marks.

### Oil pressure warning light

A warning light on the instrument panel comes on when the ignition key is turned to the "ON" position. The light must go out after the engine has started.

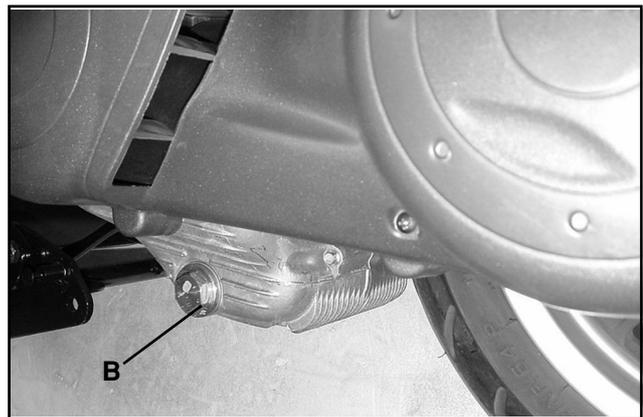
**Should the warning light come on while braking, idling or cornering, check the oil level and the lubrication system as soon as possible.**



03\_006

### Renewing the oil and the filter

The oil and the filter must be renewed every 6,000 km. Drain all the oil from the engine by removing gauze strainer drain plug «B» on the transmission side. To facilitate the outflow, also remove cap/dipstick «A». Once the oil has drained completely through the drain hole, unscrew oil filter cartridge «C» and remove it as described below.



03\_007

## Replacing the filter

**Warning** - Do not dispose of the oil in the environment. Carry out the disposal of the oil, the gasket and the filter in accordance with the law.

**Caution** - To avoid burns, take care not to touch hot engine parts.

- Remove the silencer.
- Remove filler plug «**A**».
- Remove and clean the drain plug gauze strainer with compressed air.
- Using a strap wrench for filters, remove cartridge filter «**C**».
- Ensure that the O-rings on the prefilter and the drain plug are in good condition.
- Lubricate the O-rings and then refit the gauze strainer and the oil drain plug. Tighten the drain plug with the prescribed torque.
- Fit a new cartridge filter after lubricating the O-ring. Turn in until the gasket makes contact and then tighten it with the prescribed torque.
- Reinstall the silencer.
- Add engine oil as previously described.

### Tightening torque:

**Tappo scarico olio motore Engine oil drain**

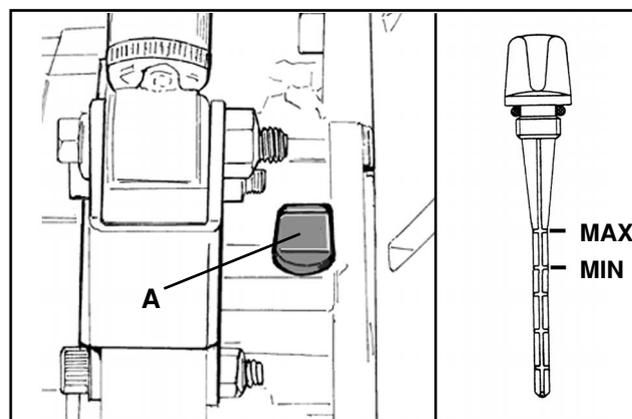
**plug: 24 - 30 N·m**

**Oil filter: 12 - 16 N·m**

**Oil type: Selenia HI Scooter 4 Tech**

## Checking the hub oil level

- Put the vehicle on the central stand on level ground.
- Unscrew oil dipstick «**A**», wipe it with a clean cloth, reinsert it and **then screw it in fully**.
- Pull out the dipstick again and check that the oil level is between the MIN and MAX marks (see figure); if the level is below the MIN mark, top up with oil.
- Reinsert the dipstick and screw it tight.



03\_008

## Renewing the hub oil

- Remove oil filler plug «**A**».
- Unscrew oil drain plug «**B**» and drain all the oil.
- Retighten the oil drain plug and then fill the hub with fresh oil.



03\_009

**Recommended oil: TUTELA ZC 90**

**Hub oil capacity: ~ 250 cc**

## Maintenance

### Engine cooling

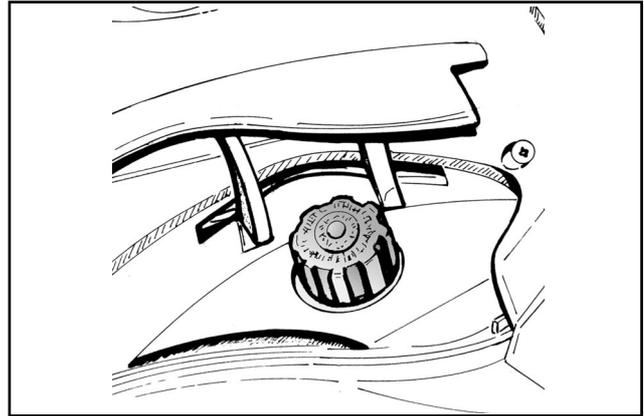
#### Adding coolant and bleeding air from the system

The level of the fluid must be checked every 6,000 km when the engine is cold.

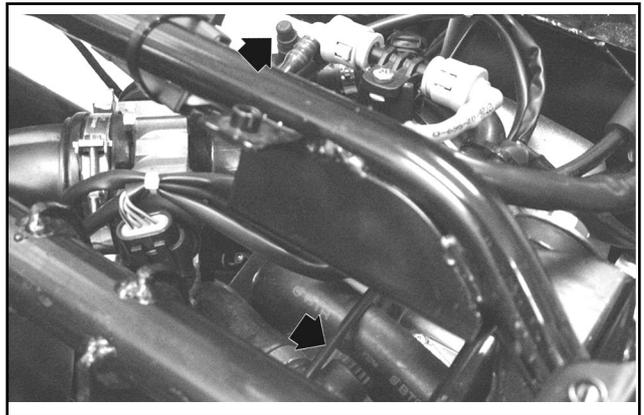
Follow these steps:

- Put the vehicle on the central stand on level ground.
- Remove the expansion tank cap and top up if the coolant is below or near the MIN level in the expansion tank. The level of the fluid should always be between the MIN and MAX marks.
- To have an indication of the coolant level, refer to the groove in the plastic strip that can be seen through the coolant filler hole. The upper and lower parts of the groove correspond to the MAX and MIN levels respectively.
- The coolant consists of a 50 percent mixture of demineralized water and antifreeze solution with a base of ethylene glycol and corrosion inhibitors. Total coolant capacity: ~ 1,8 lt
- To check the presence of air in the circuit follow the procedure described in Chapter 11-Cooling, in the manual of Engine 500 cc.
- Switch off the engine and allow it to cool down. After a few minutes, remove the expansion tank cap and check the level of the fluid.
- If necessary, top up by pouring fresh coolant into the expansion tank up to the correct level.

**Warning** - To prevent the coolant from leaking out of the expansion tank during use, be sure to never exceed the MAX level when refilling.



03\_010



03\_011

### Water pump

If the water pump becomes noisy or liquid leaks through the pump drain hole, check the water pump as described in Chapter 5-Flywheel cover of the manuale Engine 500 cc. Perform the following preliminary operations:

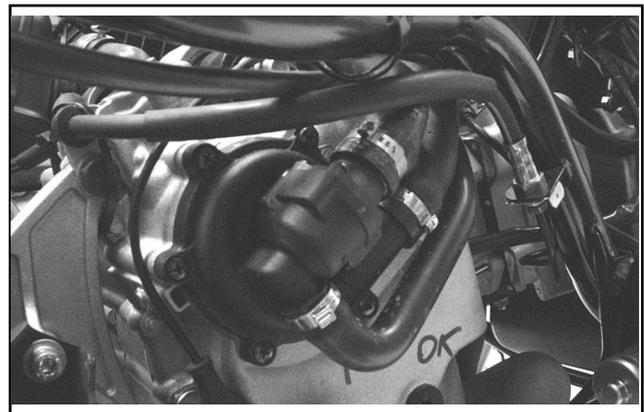
- Put the vehicle on the central stand on level ground.
- Remove the lower right-hand side panel and the right-hand footboard as described in Chapter 8-Bodywork.
- Remove the silencer to gain access to the flywheel cover as described in Chapter 5-Engine;
- Remove the sleeves from the water pump cover and the filler cap from the expansion tank and empty the cooling circuit.

**Warning** - Perform the operation when the engine is cold.

- Remove the water pump cover shown in the figure after loosening the six fixing screws.
- Cooling circuit capacity: ~ 1,8 lt.

- As described in the manual Engine 500cc, partially drain the system and overhaul the pump.
- After solving the problem and refitting all components, fill and bleed the cooling circuit again.

**N.B.:** Change the coolant as described in Chapter 11-Cooling of the Manual Engine 500 cc



03\_013

### Adjusting the play of the valves - Checking the valve gear timing

To adjust the play of the valves and to check the valve gear timing as described in Chapter 7-Thermal Unit and Timing system of the Engine manual, follow these preliminary steps:

- Put the vehicle on the central stand;
- Remove the relevant body sections to gain access to the pivot fixing the engine to the swingarm (refer to Chapter 8-Bodywork);
- Support the bottom of the engine, e.g. with a jack;
- Remove the engine from the frame as described in Chapter 5-Engine;
- Shift the engine backwards to make room for the removal of the cylinder head cover (until the swingarm cross member touches the starter motor).
- After adjusting the play of the valves, refit the components by following the reverse procedure to the removal.

**Warning** - Do not lower the engine too much to prevent it from touching the stop push button of the electrohydraulic stand.

**Note:** The checking areas are shown in the two figures at the right.

Play of valves:

Intake	0.15 mm cold engine
Exhaust	0.15 mm cold engine



03\_012



03\_012\_4

### Checking the level

To gain access to the front and rear brake fluid reservoirs, remove the covers on the handlebar cover.

Follow these steps:

- Put the vehicle on the central stand and turn the handlebar to the central position.
- Remove cap «A» after loosening fixing screw «B».
- Check the level of the fluid through the sight.

A certain decrease in the level of the fluid occurs as a result of pad wear.

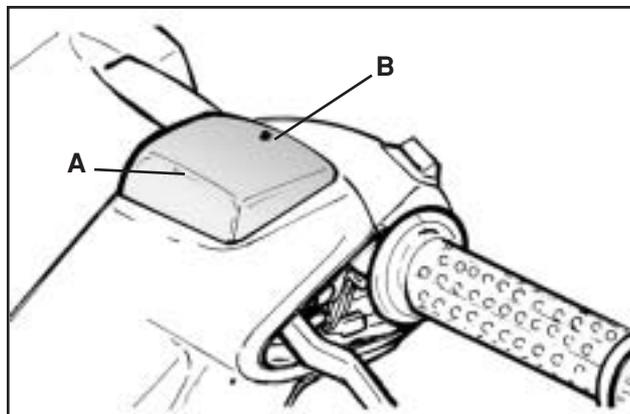
### Restoring the brake fluid level

**Warning** - Only use brake fluid classified as DOT 4.

Brake fluid type: TUTELA TOP 4

Use the following procedure:

Remove the «A», covers and the tank cap by unscrewing the two screws, remove the gasket and restore the brake fluid level with liquid of the recommended type, without exceeding the max. level.



03\_012\_1



03\_012\_2

## Maintenance

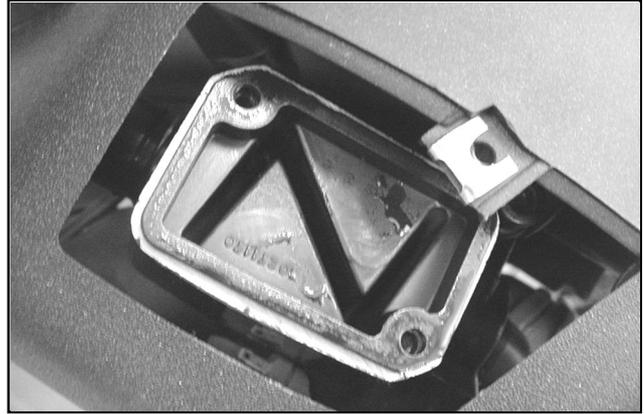
**Warning** - Keep the brake fluid away from the skin, the eyes and clothing. In case of contact, rinse generously with water.

**Warning** - The brake fluid is highly corrosive. Take care not to spill it on the paintwork.

**Warning** - The brake fluid is hygroscopic, i.e. it absorbs humidity from the air. If the humidity contained in the fluid exceeds a given concentration, the braking action becomes insufficient. Never draw the fluid from open or partly empty containers.

Under normal climatic conditions the fluid should be renewed every 20,000 km, or in any case every two years.

**N.B.:** Change the brake fluid and bleed the system as described in Chapter 7-Braking system.

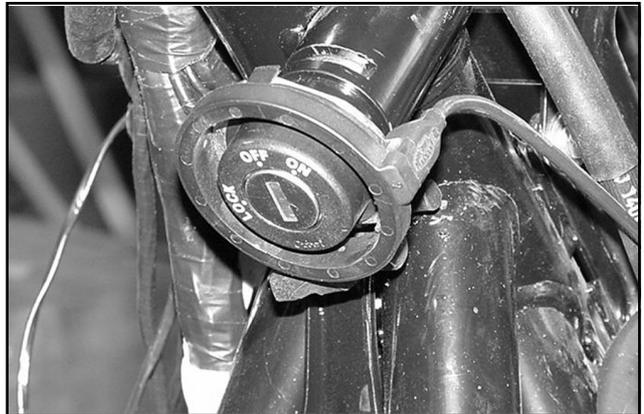


03\_012\_3

## Steering lock

### Disassembly with lock turned to "OFF"

- Remove the rear shield as described in Chapter 8-Bodywork.
- Remove the immobilizer aerial shown in the figure.



03\_014

- Disconnect the wiring.
- Pull out the retaining spring shown in the figure and remove the ignition switch.



03\_015

- Push the bolt lightly and extract the retainer from the milled part shown in the figure.
- Extract the bolt assembly from the lock body.
- To refit, follow the reverse procedure.

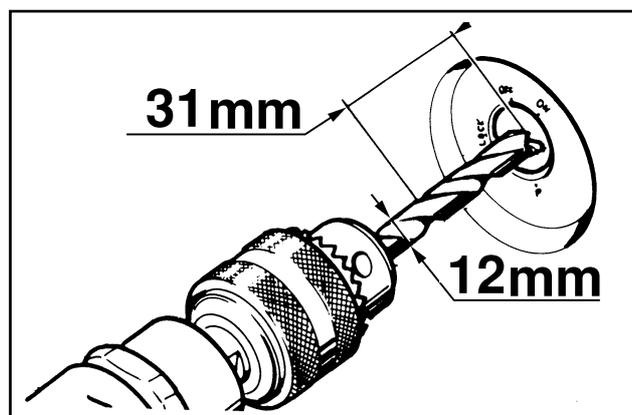


03\_016

### Removal with lock in LOCK position

The bolt retaining spring is not accessible in the LOCK position. It is then necessary to drill the bolt as show in the figure to eject it.

**Note:** To refit the bolt from this position, first disengage the steering lock by putting the lock body (inner and outer part) in the OFF position. Proceed as described in the previous paragraph.

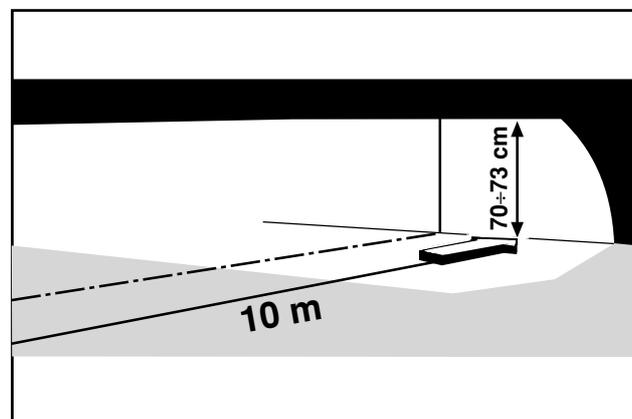


03\_017

3

### Adjusting the headlight

- Place the unloaded vehicle on a level surface, 10 metres from a half-lit white screen, with the tyres inflated to the prescribed pressure. Ensure that the axis of the vehicle is perpendicular to the screen.
- Draw a horizontal line on the screen 70-73 cm above the ground.
- Switch on the headlight, turn on the low beam and check that the horizontal line that divides the dark area from the lighted area is not above the line previously drawn on the screen. To shift the headlight, use the specially designed screw in the front shield (see figure).



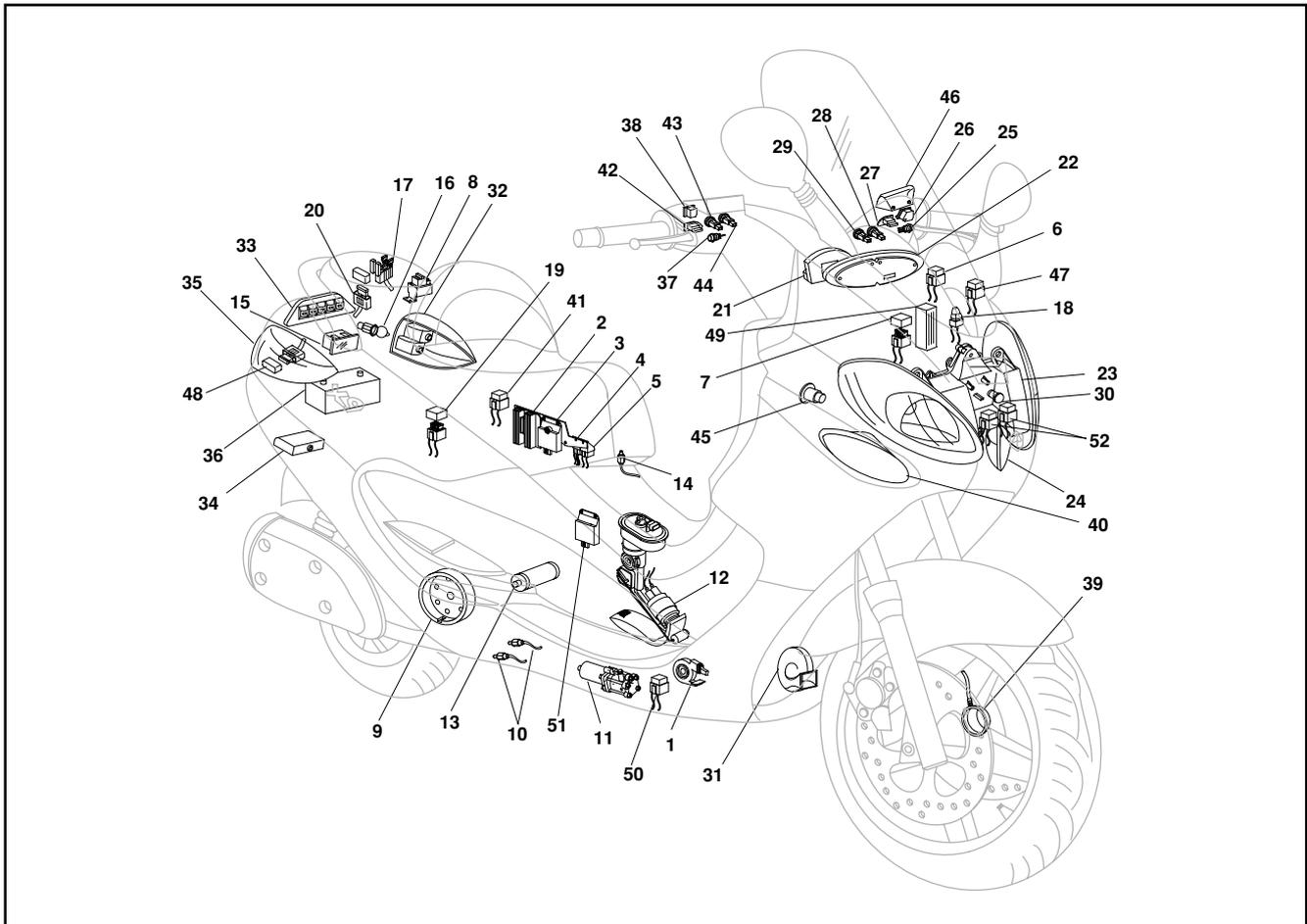
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**ELECTRICAL EQUIPMENT**

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# ELECTRICAL EQUIPMENT



1	SIDESTAND SWITCH	27	TURN INDICATOR SWITCH
2	VOLTAGE REGULATOR	28	HORN BUTTON
3	STAND CONTROL UNIT	29	HAZARD WARNING LIGHT BUTTON
4	ELECTRONIC CONTROL UNIT RELAY SWITCH	30	RESET BUTTON
5	ENGINE STOP RELAY SWITCH	31	TRUMPET HORN
6	SERVICES ELECTROMAGNETIC SWITCH	32	LH REAR LIGHT WITH 5W PARKING LIGHT BULB AND 10W TURN INDICATOR BULB
7	FUSE BOX (3 X 7.5A, 1 X 15A)	33	REAR BRAKE LIGHT, 5 X 2.3W BULB
8	NO. 2 SOLENOID STARTERS	34	NUMBER-PLATE LIGHT 12V-5W
9	375W FLYWHEEL MAGNETO	35	RH REAR LIGHT WITH 5W PARKING LIGHT BULB AND 10W TURN INDICATOR BULB
10	2 X STAND BUTTON	36	12V-14Ah BATTERY
11	STAND PUMP MOTOR	37	FRONT BRAKE LIGHT BUTTON
12	PUMP ASSEMBLY WITH LEVEL INDICATOR	38	ENGINE STOP SWITCH
13	STARTER MOTOR	39	WHEEL REVOLUTION SENSOR
14	HELMET COMPARTMENT LAMP BUTTON	40	RH FRONT TURN INDICATOR, 10W BULB
15	HELMET COMPARTMENT LAMP	41	MAIN RELAY SWITCH
16	12V SOCKET	42	LIGHTS SELECTOR SWITCH
17	2 X REAR FUSE BOX FOR CONTROL UNIT (1 X 3A, 1 X 5A, 1 X 10A, 1 X 3A)	43	START BUTTON
18	DIODE BOX (2 X 6 A AND 2 A DIODE)	44	STAND BUTTON
19	FUSE BOX (2 X 7.5A, 1 X 15A AND 5A)	45	IGNITION SWITCH
20	FUSE BOX WITH STRIP FOR STAND PUMP ELECTROMAGNETIC SWITCH (NO. 1 OF 70A)	46	RADIO DISPLAY
21	DIGITAL INSTRUMENT SET (11 WARNING LIGHTS AND LEDS)	47	ELECTRIC FAN RELAY SWITCH
22	ANALOG INSTRUMENT SET (5 LAMPS)	48	30A FUSE WITH SOLENOID STARTER
23	HEADLIGHT, 2 X PARKING LIGHT BULB, HIGH/LOW BEAM 55/55W BULB	49	RADIO CONTROL UNIT/INTERCOM/SPEAKERPHONE
24	LH FRONT TURN INDICATOR WITH 10W BULB	50	No. 2 PUMP ELECTROMAGNETIC SWITCHES
25	REAR BRAKE LIGHT BUTTON	51	RELAY SIGNALER GLUED
26	LIGHTS SWITCH WITH HEADLIGHT FLASH	52	No. 2 HEADLIGHT ELECTROMAGNETIC SWITCHES

**Electrical equipment devices**

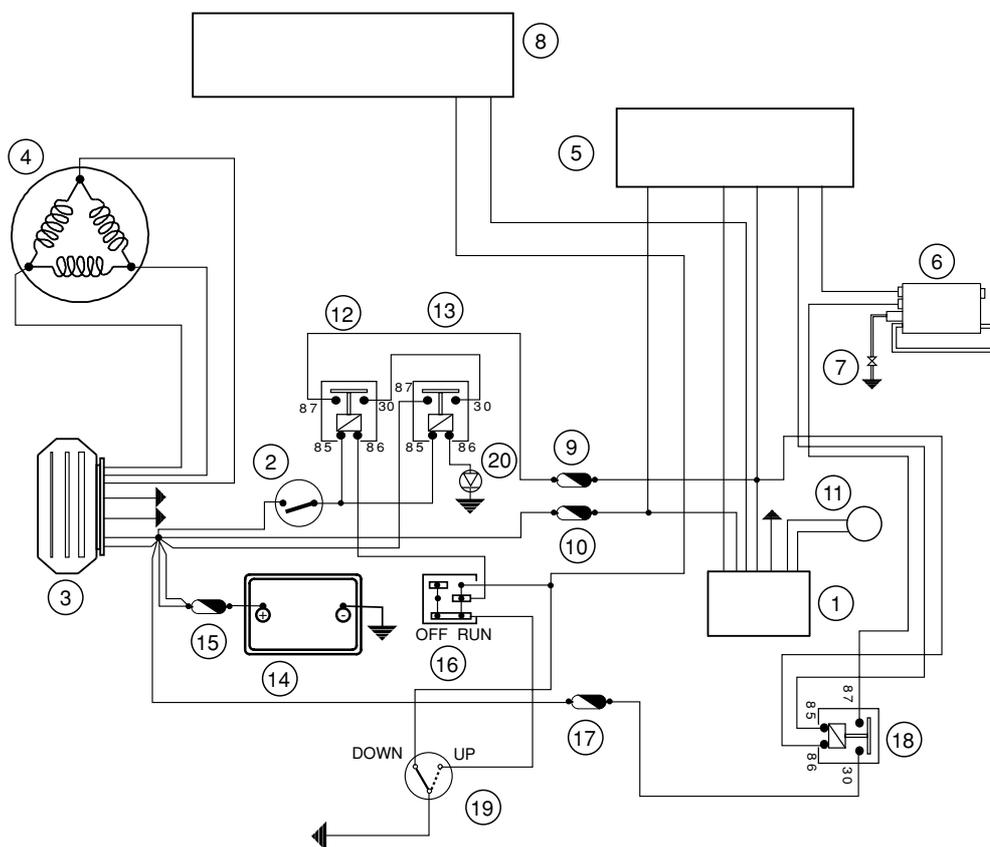
1. Digital instrument panel (11 LED indicators).
2. Analog instrument panel (5 bulbs).
3. Headlight (2 parking light bulbs, 55/55W low/high beam bulbs).
4. LH front turn indicators (10W bulb).
5. Rear brake light button.
6. Lights selector switch with headlight flash.
7. Turn indicator switch.
8. Horn button.
9. Hazard warning light button.
10. Reset button.
11. Trumpet horn.
12. Sidestand switch.
13. Voltage regulator.
14. Stand control unit.
15. Engine stop relay switch.
16. Electronic control unit relay switch.
17. Stand pump relay switches.
18. LH rear light (5W parking light bulb, 10W turn indicator bulb).
19. Rear brake light (5 x 2.3W bulbs).
20. Number-plate light with bulb.
21. RH rear light (5W parking light bulb, 10W turn indicator bulb).
22. 12V-14Ah battery.
23. Fuse box (3 x 7.5A fuse, 1 x 15A fuse).
24. Starting relay switch.
25. Flywheel magneto (375W).
26. Engine oil pressure sensor.
27. Coolant temperature sensor.
28. Engine rpm sensor.
29. Air temperature sensor.
30. Idle speed adjusting motor.
31. Throttle potentiometer.
32. Petrol injector.
33. 2 stand switches.
34. Stand pump motor.
35. Injection electronic control unit.
36. Decoder.
37. Front brake light button.
38. Engine stop switch.
39. Wheel revolution sensor.
40. RH front turn indicator (10W bulb).
41. Relay switch.
42. Lights switch.
43. Start button.
44. Stand button.
45. Immobilizer aerial.
46. Ignition switch.
47. Electric fan.
48. Electric fan relay switch.
49. Main relay switch.
50. HV coil.
51. Fuel gauge with pump.
52. Starter motor.
53. Helmet compartment lamp button.
54. Helmet compartment lamp.
55. 12V socket.
56. 2 rear fuse boxes for control unit (1 x 3A fuse, 1 x 5A fuse, 1 x 10A fuse, 1 x 3A fuse).
57. Radio display.
58. Relay switch.
59. Outside temperature sensor.
60. Diode box (2 x 6A/2A diodes).
61. Fuse box (2 x 7.5A fuse, 1 x 15A fuse, 1 x 5A fuse).
62. Fuse box with base for stand pump (1 x 70A fuse).
63. Intercom/radio control unit.
64. Intercom connectors.
65. Relay signaler glued.

**ELECTRICAL CABLES COLOUR:** B=White - BI=Blue - G=Yellow - Mr=Brown - N=Black - BV=White-Green - GN=Yellow-Black - Gr=Grey - Rs=Pink - R=Red - Vi=Violet - V=Green - VN=Green-Black - BN=White-Black - BBI=White-Blue - GV=Yellow-Green - Ar=Orange - Az=Azure - GrBI=Grey-Blue - GrN=Grey-Black.

**Warning** - When working on the electrical equipment, take special care to ensure that the leads that link up to the electronic control device are properly connected by observing the polarity and colour coding of the connectors.

# Schematic wiring diagrams

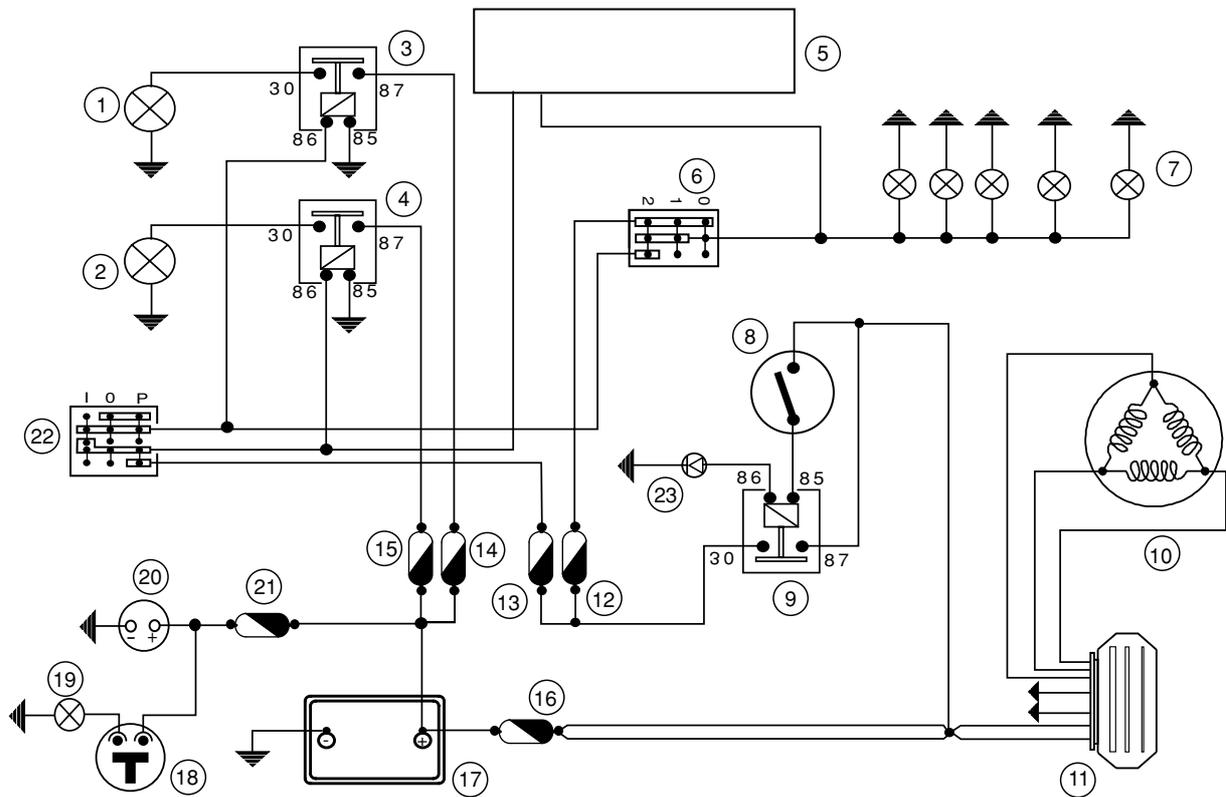
Ignition section



04\_002

1	IMMOBILIZER DECODER	11	IMMOBILIZER AERIAL
2	IGNITION SWITCH CONTACTS	12	ENGINE STOP RELAY SWITCH
3	VOLTAGE REGULATOR	13	MAIN RELAY SWITCH
4	FLYWHEEL MAGNETO	14	12V-14Ah BATTERY
5	INJECTION ELECTRONIC POWER UNIT	15	30A FUSE
6	HV COIL	16	ENGINE STOP SWITCH
7	SPARK PLUG	17	10A FUSE
8	DIGITAL INSTRUMENT SET	18	ELECTRONIC POWER UNIT ELECTROMAGNETIC SWITCH
9	5A FUSE	19	SIDE STAND SWITCH
10	3A FUSE	20	2A DIODE

Lights section

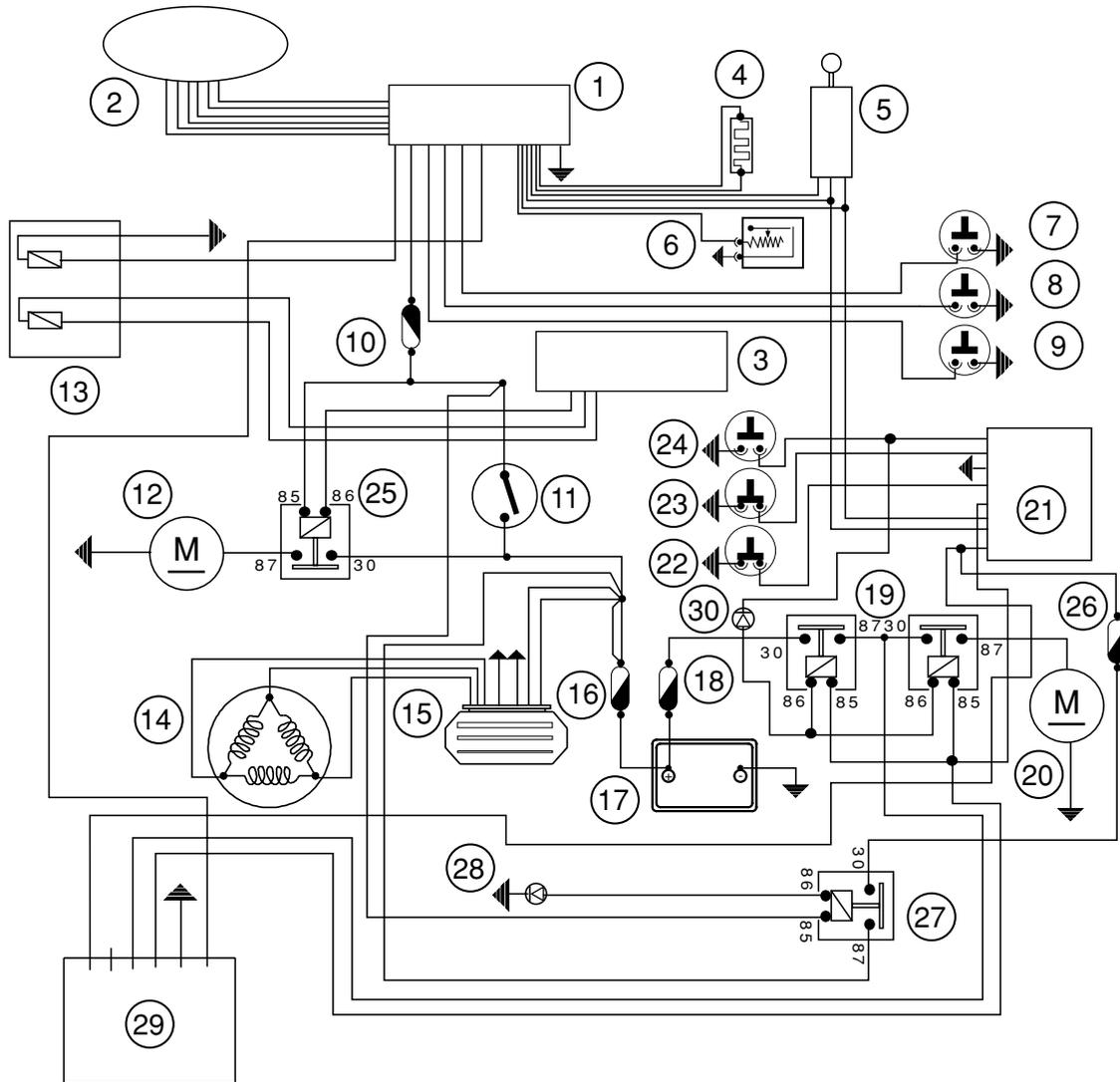


04\_003

1	12V-55W LOW BEAM BULB	12	7.5 A FUSE
2	12V-55W HIGH BEAM BULB	13	15 A FUSE
3	LOW BEAM RELAY SWITCH	14	7.5 A FUSE
4	HIGH BEAM RELAY SWITCH	15	7.5 A FUSE
5	DIGITAL INSTRUMENT SET	16	30 A FUSE
6	LIGHTS SWITCH	17	12V-14Ah BATTERY
7	2 x 12V-5W FRONT PARKING LIGHT BULB, 2 x 12V-5W REAR PARKING LIGHT BULB, 1 x 12V-5W NUMBER-PLATE LIGHT BULB	18	HELMET COMPARTMENT LAMP BUTTON
8	IGNITION SWITCH CONTACTS	19	12V-5W HELMET COMPARTMENT LAMP BULB
9	MAIN RELAY SWITCH	20	12V-180W SOCKET
10	FLYWHEEL MAGNETO	21	15A FUSE
11	VOLTAGE REGULATOR	22	LIGHTS SELECTOR SWITCH
		23	2A DIODE



Consent, electrohydraulic central stand device and level indicators section

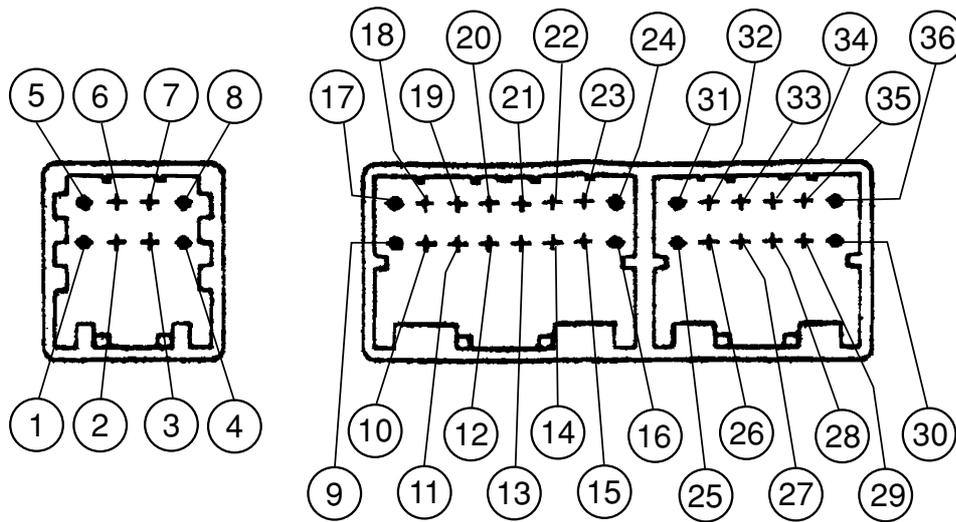


04\_005

1	DIGITAL INSTRUMENT	16	30A FUSE
2	ANALOG INSTRUMENT SET	17	12V-14Ah BATTERY
3	INJECTION ELECTRONIC CONTROL UNIT	18	70A FUSE
4	OUTSIDE TEMPERATURE SENSOR	19	STAND HYDRAULIC PUMP RELAY SWITCHES
5	WHEEL REVOLUTION SENSOR	20	STAND HYDRAULIC PUMP MOTOR
6	FUEL LEVEL THERMISTOR	21	STAND ELECTRONIC CONTROL UNIT
7	OIL PRESSURE SENSOR	22	STAND INHIBITOR SWITCH
8	RESET BUTTON	23	STAND LIMIT SWITCH
9	EMERGENCY BUTTON	24	BUTTON
10	7.5A FUSE	25	ELECTRIC FAN RELAY SWITCH
11	IGNITION SWITCH CONTACTS	26	5A FUSE
12	RADIATOR ELECTRIC FAN MOTOR	27	MAIN ELECTROMAGNETIC SWITCH
13	ENGINE TEMPERATURE SENSOR	28	2A DIODE
14	FLYWHEEL MAGNETO	29	RELAY SIGNALER GLUED
15	VOLTAGE REGULATOR	30	1A DIODE



Control panel, warning lights, instruments



04\_007

1	ANALOG CARD GND	19	MALFUNCTIONING BRAKE LIGHT WARNING LIGHT INPUT
2	BATTERY POSITIVE TERMINAL (+30) FOR ANALOG CARD	20	LH TURN INDICATOR OUTPUT
3	ANALOG CARD SERIAL CLOCK OUTPUT	21	TURN INDICATOR STOP BUTTON INPUT
4	ANTITHEFT DEVICE LED OUTPUT	22	RESET SERVICE BUTTON INPUT
5	ANALOG CARD SERIAL DATE OUTPUT	23	COOLANT TEMPERATURE SENSOR INPUT
6	LIGHTS-ON OUTPUT	24	FUEL LEVEL SENSOR INPUT
7	(NOT CONNECTED)	25	BATTERY POSITIVE TERMINAL (+30)
8	(NOT CONNECTED)	26	SENSOR POWER SUPPLY
9	INJECTION WARNING LIGHT INPUT	27	SPEEDOMETER SENSOR EARTH RETURN
10	RELAY ALARM WARNING LIGHT INPUT GLUED	28	RPM SENSOR INPUT
11	MALFUNCTIONING BRAKE LIGHT OUTPUT	29	BATTERY POSITIVE TERMINAL (+30)
12	RH TURN INDICATOR OUTPUT	30	ANTITHEFT DEVICE LED
13	RH TURN INDICATOR BUTTON INPUT	31	KEY POSITIVE TERMINAL (+15)
14	LH TURN INDICATOR BUTTON INPUT	32	SPEEDOMETER SENSOR INPUT
15	HIGH BEAM WARNING LIGHT INPUT	33	GND
16	AIR TEMPERATURE SENSOR INPUT	34	AIR TEMPERATURE SENSOR EARTH RETURN
17	ENGINE START DISABLED WARNING LIGHT INPUT	35	HAZARD WARNING LIGHT BUTTON INPUT
18	OIL PRESSURE WARNING LIGHT INPUT	36	LIGHTS-ON INPUT

## Electrical equipment

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### Battery recharge system

The battery recharge system includes a three-phase generator with a permanent-magnet flywheel.

The generator is directly connected to the voltage regulator.

The latter is in turn directly connected to earth and to the battery positive terminal via the 30A fuse.

Therefore, the system is not connected to the ignition switch.

The three-phase generator allows considerable re-charging power and a fair compromise between supplied power and slow running stability at low rpm.

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### Recharging system

#### Searching for leaks

- 1) Before measuring the output voltage, ensure that no electrolyte is leaking from the battery.
- 2) Turn the ignition key to the OFF position and connect the tester terminals between the battery negative pole (-) and the black cable.
- 3) Detach the black cable from the battery negative pole (-) while keeping the tester terminals connected.
- 4) With the ignition key still in the OFF position, the ammeter should read  $\leq 0,5$  mA.

#### Checking the charging voltage

**Warning** - Before performing the check, ensure that the battery is in good condition.

- 1) Put the vehicle on the central stand.
- 2) With the battery properly connected to the circuit, position the multimeter prods between the battery terminals.
- 3) Start the engine with all lights out and rev up while measuring the voltage.

**VOLTAGE: 14.0-15.0V at 5,000 rpm.**

### Checking the stator winding

**Warning** - The check can be performed with the stator in place.

- 1) Remove the undersaddle compartment door
- 2) Detach the connector between stator and regulator with the three yellow cables.
- 3) Measure the resistance between each of the yellow terminals and the other two.

**Resistance:** 0.2 - 1  $\Omega$

- 4) Check that each yellow wire is insulated from earth.
- 5) If the resistance is not as specified, replace the stator.

### Checking the peak current

- With the engine off and swithboard "ON", turn the vehicle lights on and let the battery tension set to 12V.
- Connect the amperometric pliers to the 2 outlet recharge positive poles of the regulator.
- With lights on, start the engine and read the value on the pliers with the engine running at high speed.

With efficient battery, the measured value is: > 20A

### Voltage regulator/rectifier

#### Specifications

ITEM		STANDARD VALUE
Voltage regulator/rectifier	Type	Transistorized, non-adjustable, three-phase
	Voltage	14 - 15V at 5000 rpm with lights off

## Electrical equipment

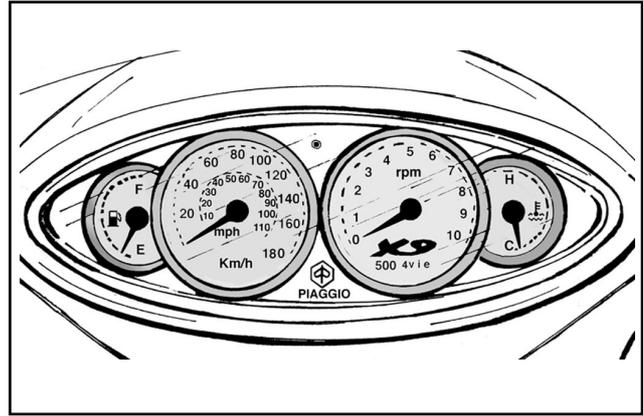
### Instrument panel

The X9 is equipped with a dual instrument panel consisting of an analog section installed in the front fairing and a digital section mounted on the handlebars.

The analog section includes:

- A dual-scale (km/h-mpg) speedometer controlled by the speed sensor by means of the digital section;
- A tachometer controlled by a signal coming from the power unit-injection;
- A fuel gauge controlled by a resistive sensor (in the fuel tank);
- A coolant temperature indicator controlled by a resistive sensor (on the cylinder head).

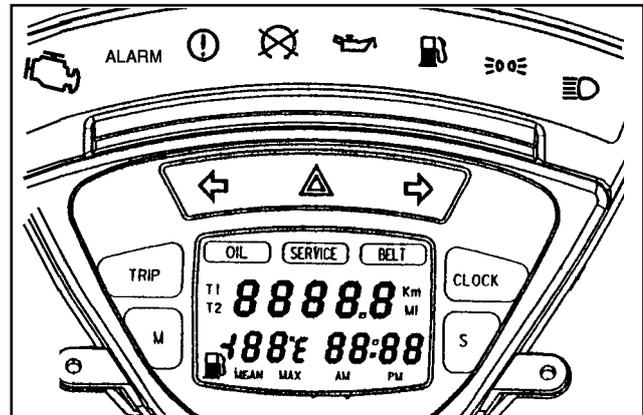
These instruments are of the electrical type, and are operated by step-by-step motors.



04\_009

The digital section includes the following indicators:

- Reserve fuel warning light: amber.
- Lights-on and low beam warning light: green.
- High beam warning light: blue.
- Left-hand turn indicator warning light: green.
- Right-hand turn indicator warning light: green.
- Hazard warning lights (four turn indicators): red
- Engine disabled: red.
- Brake light bulb burnt-out warning light: red.
- Oil pressure warning light: red;
- Injection warning light: amber;
- ALARM warning light (electrohydraulic cable): red.



04\_010

The reserve fuel, turn indicator and hazard warning lights are activated by the electronics of the instrument. For example, the fuel reserve warning light comes on only when the reserve fuel indication from the fuel tank lasts a minimum of 13.5 seconds. This prevents the warning light from blinking when the engine begins to run on reserve fuel.

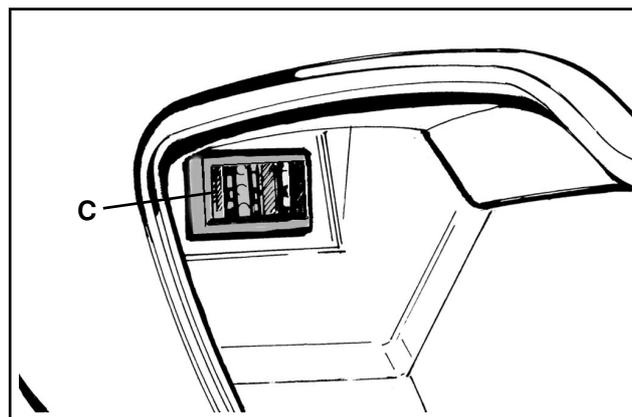
- The flashing function is built in the electronics of the instrument, which allows the hazard warning lights to work when the ignition switch is in the "OFF" position and the control switch is disabled. The control switch is active only when the instrument panel is on.

For greater riding safety, the "turn indicator control" function is connected to the mileometer. If the turn indicators are inadvertently left on, they are automatically switched off after 1 kilometre.

- The "engine start disabled" warning light is activated by the sidestand switch and the emergency switch on the right side of the handlebar.
- The indication "brake light bulb burnt-out" is activated when at least two of the five bulbs fail to operate.
- The warning light is controlled by a circuit that measures the absorption of the brake light bulb.
- The liquid crystal display shows a 5-digit total mileage count in either kilometres or miles. Naturally, this counter can never be reset. **To select the unit, with key turned to "OFF", press the "Trip" and "M" buttons at the same time and turn the ignition switch to the "ON" position. If the two buttons are depressed for longer than three seconds, the word "SET" is displayed and then the unit toggles between kilometres and miles.**

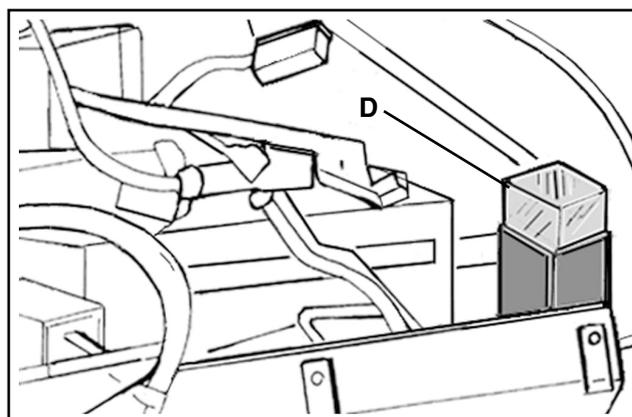
3 Four fuses «C» in the glove compartment, on the left side.

Fuse	Protected circuits
1 x 15 A	Flash, horn, accessories
1 x 7.5 A	Brake light buttons, start button, starter relay switch
1 x 7.5 A	Lights switch, parking lights, number-plate light
1 x 7.5 A	Digital instrument panel, PICS control unit power supply



04\_016

4 One fuse «D» of 30A (main fuse) located next to the battery on the solenoid starter. A spare fuse is also provided underneath.



04\_017

4

**List of bulbs**

Function	Type	Power
Low beam bulb	halogen	12V-55W
High beam bulb	halogen	12V-55W
Front parking light bulb	all-glass	12V-5W x 2
Front turn indicator bulb	spherical	12V-10W x 2
Rear parking light bulb	spherical	12V-5W x 2
Brake light bulbs	spherical	12V-2.3W x 5
Rear turn indicator bulb	spherical	12V-10W x 2
Instrument panel lighting bulb	all-glass	12V-2W x 5
Glove compartment lamp bulb	cylindrical	12V-5W
Number-plate light bulb	cylindrical	12V-5W

## Battery (12V - 14Ah)

**Caution** - The battery electrolyte causes severe burns as it contains sulphuric acid. Avoid contact with the eyes, the skin and clothing.

In case of contact with the eyes or the skin, rinse generously with water for about 15 minutes and immediately seek medical attention.

In case of ingestion, immediately drink large quantities of water or milk. Subsequently administer milk of magnesia, beaten eggs or vegetable oil. Immediately seek medical attention.

Batteries produce explosive gases. Keep them away from open flames, sparks and cigarettes. If the battery is charged in a closed place, ensure adequate ventilation.

Always protect the eyes when working close to batteries.

**Keep out of reach of children.**

### Installing charged-dry batteries:

- 1) - Remove the short closed tube and the plugs. Fill the cells to the upper level with accumulator sulphuric acid, specific weight 1.26, corresponding to 30° Bé at a temperature of at least 15°C.
- 2) - Leave at rest for at least two hours and then restore the level by adding sulphuric acid.
- 3) - Recharge within 24 hours by means of the specific charger 020333Y (single station) or 020334Y (multiple station) with intensity equal to about 1/10 of the battery rated power, until the acid density reaches the value of about 1,27, corresponding to 31 Bé, and until such values have stabilized.
- 4) - When the charging is over, level off the acid (by adding **distilled water**), put the plugs back into place and clean thoroughly.
- 5) - Proceed to install the battery on the vehicle, taking care to observe the connections described at item 3) of the paragraph **Recharging the battery**.

### Removing and installing the battery

- Lift the saddle;
- Remove the rear optical unit and the covering element;
- Disconnect the battery by detaching the negative (-) cable first and then the positive (+) cable.
- Remove the battery strap and then the battery itself.
- To install the battery, follow these steps:

- Fit the lower support shown in the figure on the battery compartment bottom.

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