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# SERVICE STATION MANUAL

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**V7 Classic**

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# SERVICE STATION MANUAL

## V7 Classic

### THE VALUE OF SERVICE

Only the mechanics of the official Moto Guzzi Service Network know this vehicle well, thanks to constant technical professional development and Moto Guzzi specific training programmes, and have the tools needed to carry out maintenance and repair operations correctly.

The reliability of the vehicle also depends on its mechanical conditions. Checking the vehicle before setting off, carrying out routine maintenance and using only Moto Guzzi Original Spare parts is fundamental!

For information about the nearest Official Dealer and/or Service Centre, consult the Yellow Pages or search directly on the inset map in our Official Website:

[www.motoguzzi.it](http://www.motoguzzi.it)

Only by purchasing Moto Guzzi Original Spare Parts will you get a product designed and tested during the bike designing phase. Moto Guzzi Original Spare Parts are subject to systematic quality control procedures so that their reliability and performance over time is guaranteed.

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# SERVICE STATION MANUAL

## V7 Classic

This manual provides the main information to carry out regular maintenance operations on your vehicle. This manual is intended to **Moto Guzzi 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, **Moto Guzzi 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 **Moto Guzzi 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 **Moto Guzzi 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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## Rules

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### Safety rules

#### 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 POWER INTERNAL COMBUSTION 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 SHUT OFF. DO NOT SMOKE DURING REFUELLING AND NEAR FUEL VAPOURS, AVOID ANY CONTACT WITH NAKED FLAMES, SPARKS OR OTHER SOURCES WHICH MAY CAUSE THEM TO IGNITE OR EXPLODE.**

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

**KEEP OUT OF THE REACH OF CHILDREN.**

#### Hot components

The engine and the exhaust system components get very hot and remain in this condition for a certain time interval after the engine has been shut 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.

#### Used engine oil and transmission oil

#### CAUTION



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

**ENGINE OR TRANSMISSION OIL MAY CAUSE SERIOUS INJURIES TO THE SKIN IF HANDLED FOR PROLONGED PERIODS OF TIME AND ON A REGULAR BASIS.**

**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.**

**DO NOT DISPOSE OF OIL INTO THE ENVIRONMENT**

**KEEP OUT OF THE REACH OF CHILDREN.**

#### Brake and clutch fluid



**BRAKE AND CLUTCH FLUIDS CAN DAMAGE THE PLASTIC OR RUBBER PAINTED SURFACES. WHEN SERVICING THE BRAKING SYSTEM OR THE CLUTCH SYSTEM, PROTECT THESE COMPONENTS WITH A CLEAN CLOTH. ALWAYS WEAR PROTECTIVE GOGGLES WHEN SERVICING THESE SYSTEMS. BRAKE AND CLUTCH FLUIDS ARE EXTREMELY HARMFUL FOR YOUR EYES. IN THE EVENT OF ACCIDENTAL CONTACT WITH THE EYES, RINSE THEM IMMEDIATELY WITH ABUNDANT COLD, CLEAN WATER AND SEEK MEDICAL ADVICE. KEEP OUT OF THE REACH OF CHILDREN.**

**Battery electrolyte and hydrogen gas**

**CAUTION**



**BATTERY ELECTROLYTE IS TOXIC, CORROSIVE AND AS IT CONTAINS SULPHURIC ACID, IT CAN CAUSE BURNS WHEN IN CONTACT WITH THE SKIN. WHEN HANDLING BATTERY ELECTROLYTE, WEAR TIGHT-FITTING GLOVES AND PROTECTIVE APPAREL. IF THE ELECTROLYTIC FLUID COMES INTO CONTACT WITH THE SKIN, RINSE WELL WITH ABUNDANT FRESH WATER. IT IS PARTICULARLY IMPORTANT TO PROTECT YOUR EYES AS EVEN TINY AMOUNTS OF BATTERY ACID MAY CAUSE BLINDNESS. IF THE FLUID GETS INTO CONTACT WITH YOUR EYES, WASH WITH ABUNDANT WATER FOR FIFTEEN MINUTES AND CONSULT AN EYE SPECIALIST IMMEDIATELY. IF THE FLUID IS ACCIDENTALLY SWALLOWED, DRINK LARGE QUANTITIES OF WATER OR MILK, FOLLOWED BY MILK OF MAGNESIA OR VEGETABLE OIL AND SEEK MEDICAL ADVICE IMMEDIATELY. THE BATTERY RELEASES EXPLOSIVE GASES; KEEP IT AWAY FROM FLAMES, SPARKS, CIGARETTES OR ANY OTHER HEAT SOURCE. ENSURE ADEQUATE VENTILATION WHEN SERVICING OR RECHARGING THE BATTERY.**

**KEEP OUT OF THE REACH OF CHILDREN**

**BATTERY LIQUID IS CORROSIVE. DO NOT POUR OR SPILL IT, PARTICULARLY ON PLASTIC COMPONENTS. ENSURE THAT THE ELECTROLYTIC ACID IS COMPATIBLE WITH THE BATTERY TO BE ACTIVATED.**

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## Maintenance rules

### GENERAL PRECAUTIONS AND INFORMATION

When repairing, disassembling and reassembling the vehicle, strictly follow the recommendations reported below.

### BEFORE DISASSEMBLING COMPONENTS

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

### COMPONENTS REMOVAL

- Do not loosen and/or tighten screws and nuts using pliers or other tools other than the especially 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 assembly.
- 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

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

- Only use ORIGINAL Moto Guzzi 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 tread is damaged.
- When fitting bearings, make sure to lubricate them well.
- Check that each component is fitted 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 surfaces, oil guard rims and washers before refitting them. Smear a light layer of lithium-based grease on the oil guard rims. Reassemble the oil guard and the bearings with the brand or lot number facing outward (visible side).

## ELECTRIC CONNECTORS

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

Press the relevant safety hooks, if any.

- Grip and disconnect the two connectors by pulling them in opposite directions.
- If there are signs of dirt, rust, humidity, etc., clean the connector internal parts carefully using a pressurised air jet.
- Make sure that the cables are correctly linked to the connector internal terminal ends.
- Then insert the two connectors making sure that they couple correctly (if the relevant hooks are provided, you will hear them "click" into place).

### CAUTION

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

### NOTE

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

## TIGHTENING TORQUE

### CAUTION

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**DO NOT FORGET THAT THE TIGHTENING TORQUE 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 TORQUE OF FASTENING PARTS ON A REGULAR BASIS AND ALWAYS USE A TORQUE WRENCH TO REASSEMBLE THESE COMPONENTS. FAILURE TO COMPLY WITH THESE RECOMMENDATIONS MAY CAUSE ONE OF THESE COMPONENTS TO GET LOOSE AND EVEN DETACHED, THUS BLOCKING A WHEEL, OR OTHERWISE COMPROMISE VEHICLE HANDLING. THIS CAN LEAD TO FALLS, WITH THE RISK OF SERIOUS INJURY OR DEATH.**

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## Running-in

Engine run-in is essential to ensure engine long life and correct operation. Twisty roads and gradients are ideal to run in engine, brakes and suspensions effectively. Vary your driving speed during run-in. In this way, you allow for the work of components to be "loaded" and then "unloaded", thus cooling engine parts.

### CAUTION

**THE CLUTCH MAY EMIT A SLIGHT BURNING SMELL WHEN FIRST USED. THIS PHENOMENON SHOULD BE CONSIDERED NORMAL AND WILL DISAPPEAR AS SOON AS THE CLUTCH PLATES GET ADAPTED.**

**IT IS IMPORTANT TO STRAIN ENGINE COMPONENTS DURING RUN-IN, HOWEVER, MAKE SURE NOT TO OVERDO THIS.**

### CAUTION

**ONLY AFTER THE SERVICE AT THE END OF THE RUN-IN PERIOD CAN THE BEST PERFORMANCE OF YOUR VEHICLE BE OBTAINED.**

Follow the guidelines detailed below:

- Do not twist the throttle grip abruptly and completely when the engine is working at a low revs, either during or after run-in.
- During the first 100 km (62 miles) operate the brakes with caution, avoid rough and long braking. That is to permit the adequate adjustment of the pad friction material to the brake discs.



**AFTER THE SPECIFIED MILEAGE, TAKE THE VEHICLE TO AN OFFICIAL Moto Guzzi DEALER FOR THE CHECKS INDICATED IN THE "AFTER-RUN" TABLE IN THE SCHEDULED MAINTENANCE SECTION TO AVOID INJURING YOURSELF, OTHERS AND /OR DAMAGING THE VEHICLE.**

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## Vehicle identification

### SERIAL NUMBER POSITION

These numbers are necessary for vehicle registration.

### NOTE

**ALTERING IDENTIFICATION NUMBERS CAN BE SERIOUSLY PUNISHED BY LAW, PARTICULARLY MODIFYING THE CHASSIS NUMBER WILL IMMEDIATELY INVALIDATE THE WARRANTY.**

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This number consists of numbers and letters, as in the example shown below.

**ZGULW00008MXXXXXX**

**KEY:**

**ZGU:** WMI (World manufacturer identifier) code;

**LW:** model;

**000:** version variation;

**0:** digit free

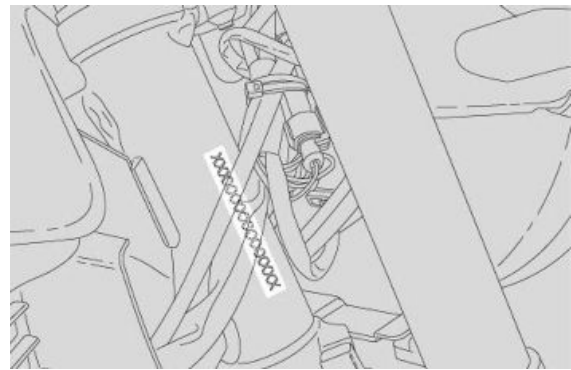
**8:** variable year of manufacture (8 - for 2008)

**M:** production plant (M= Mandello del Lario);

**XXXXXX:** progressive number (6 digits);

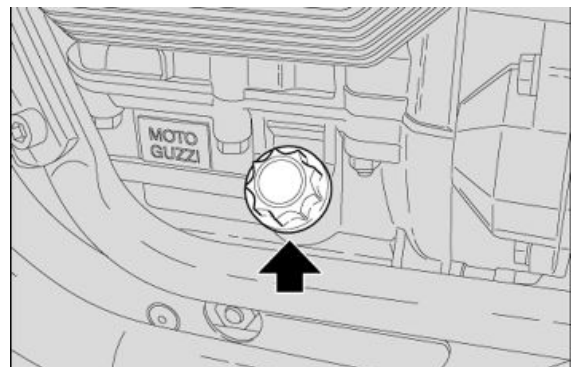
**CHASSIS NUMBER**

The chassis number is stamped on the right side of the headstock.



**ENGINE NUMBER**

The engine number is stamped on the left side, close to the engine oil level check cap.



**Dimensions and mass**

**WEIGHT AND DIMENSIONS**

Specification	Desc./Quantity
Max. length	2185 mm (86 in)
Max. width	800 mm (31.5 in)
Max. height	1115 mm (43.9 in)
Saddle height	805 mm (31.69 in)
Wheelbase	1435 mm (56.5 in)
Minimum ground clearance	182 mm (7.16 in)
Kerb weight	198 kg (436 lb)

**Engine**

**ENGINE**

Specification	Desc./Quantity
Type	90° transversal V-twin, four stroke
Number of cylinders	2
Cubic capacity	744 cm <sup>3</sup> (45.40 cu.in)
Bore / stroke	80x74 mm (3.14x2.91 in)
Compression ratio	9.6 : 1

Specification	Desc./Quantity
Starter	Electronic
Engine revs at idle speed	1100 +/- 100 rpm
Intake valve clearance	0.10 mm (0.0039 in)
Outlet valve clearance	0.15 mm (0.0059 in)
Clutch	dry single-disc clutch with anti-vibration buffers
Lubrication system	Pressure system regulated by valves and a trochoidal pump
Air filter	dry cartridge air filter
Cooling	air

## Transmission

### TRANSMISSION

Specification	Desc./Quantity
Gearbox / Type	mechanical, 5 speeds with foot lever on the left-hand side of the engine.
Main transmission	with gears, ratio: 16 / 21 = 1 : 1.3125
1st gear ratios	11 / 26 = 1 : 2.3636
2nd gear ratios	14 / 23 = 1 : 1.6429
3rd gear ratios	18 / 23 = 1 : 1.2778
4th gear ratios	18 / 19 = 1 : 1.0556
5th gear ratios	22 / 25 = 1 : 0.9
Final drive	with cardan shaft, ratio: 8 / 33 = 1 : 4.825

## Capacities

### CAPACITY

Specification	Desc./Quantity
Fuel (reserve included)	15 l (3.30 UKgal; 3.96 USgal)
Fuel reserve	2.5 l (0.55 UKgal; 0.66 USgal)
Engine oil	oil change and oil filter replacement: 1780 cm <sup>3</sup> (108.62 cu.in)
Gearbox oil	1 l (0.26 USgal)
Transmission oil	170 cm <sup>3</sup> (10.37 cu.in)
Seats	2
Vehicle maximum load	203 kg (447 lb) (rider + passenger + luggage)

## Electrical system

### ELECTRICAL SYSTEM

Specification	Desc./Quantity
Battery	12V - 12 Ah
Fuses	3- 15- 30 A
Generator (alternator + rectifier)	12V - 350 W

### SPARK PLUGS

Specification	Desc./Quantity
Standard	NGK BR8ES
Alternatively:	NGK BR9ES
Spark plug electrode gap	0.6 ÷ 0.7 mm (0.024 ÷ 0.027 in)
Resistance	5 kOhm

### BULBS

Specification	Desc./Quantity
Low-/ high-beam light (halogen)	12 V - 55 W / 60 W H4
Front daylight running light	12V - 5W
Turn indicator light	12 V - 10 W (orange RY 10 W bulb)
License plate light	12V - 5 W

Specification	Desc./Quantity
Rear tail light /stop lights	12 V - 5 / 21 W
Instrument panel lighting	LED

**WARNING LIGHTS**

Specification	Desc./Quantity
Gear in neutral	LED
Turn indicators	LED
Fuel reserve	LED
High-beam light	LED
Engine oil pressure	LED
Injection check warning light	LED

**Frame and suspensions**

**CHASSIS**

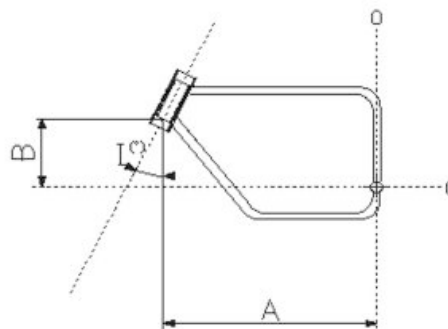
Specification	Desc./Quantity
Type	Modular double cradle, high strength steel tubular chassis
Steering inclination angle	27.5°
Trail	138 mm (5.43 in)

**SUSPENSIONS**

Specification	Desc./Quantity
Front	hydraulic telescopic fork, Ø 40 mm (1.57 in)
Travel	130 mm (5.12 in)
Rear	swinging arm in die-cast light alloy, 2 shock absorbers with adjustable spring preloading
Wheel travel	100 mm (3.93 in)

**SIZES A AND B**

Specification	Desc./Quantity
Size A	692 mm (27.24 in)
Size B	186 mm (7.32 in)



**Brakes**

**BRAKES**

Specification	Desc./Quantity
Front	stainless steel floating disc, Ø 320 mm (12.59 in), callipers with 4 different and counteracting plungers
Rear	stainless steel disc; Ø 260 mm (10.24 in)

## Wheels and tyres

### WHEEL RIMS

Specification	Desc./Quantity
Type	with spokes, for tyres with inner tubes
Front	2.5"x18"
Rear	3.50 x 17"

### TYRES

Specification	Desc./Quantity
Front tyre	METZELER LASERTEC
Front (size)	100 / 90 - 18 56H TL
Front (inflation pressure)	2.2 bar (220 kPa) (31.90 PSI)
Front (inflation pressure with passenger)	2.5 bar (250 kPa) (36.3 PSI)
Rear tyre	METZELER LASERTEC
Rear (size)	130 / 80 - 17 65H TL
Rear (inflation pressure)	2.2 bar (220 kPa) (31.90 PSI)
Rear (inflation pressure with passenger)	2.5 bar (250 kPa) (36.3 PSI)

## Supply

### FUEL SUPPLY

Specification	Desc./Quantity
Type	electronic injection (Weber - Marelli)
Diffuser	Ø 36 mm (1.42 in)
Fuel	Premium unleaded petrol, minimum octane rating of 95 (NORM) and 85 (NOMM)

## Tightening Torques

### CHASSIS

Name	Torque in Nm
Tank to chassis support rubber rings retainer - M8x14 (2)	25 Nm (18.44 lbf ft)
Cradle front retainer - M10x30 (2+2)	50 Nm (36.88 lbf ft)
Engine / gearbox to chassis retainer - M10 (1+1)	50 Nm (36.88 lbf ft)
Gearbox to chassis retainer - M12x55 (2)	50 Nm (36.88 lbf ft)
Stand to cradles transverse retainer - M10x260 (1)	50 Nm (36.88 lbf ft)
Stand to cradles transverse retainer - M8 (1+1)	25 Nm (18.44 lbf ft)
Battery housing plate retainer - M8x16 (4)	25 Nm (18.44 lbf ft)
Left and right rider footrest support to chassis retainer - M8x20 (2+2)	25 Nm (18.44 lbf ft) - Loctite 243
Left and right passenger footrest support to chassis retainer - M8x16 (2+2)	25 Nm (18.44 lbf ft) - Loctite 243

### FOOTRESTS AND LEVERS

Name	Torque in Nm
Footrest rubber retainer - M6x12 (8)	10 Nm (7.38 lbf ft)
Gear shift lever cable retainer (nut) - M6x1 (2)	10 Nm (7.38 lbf ft)
Gear transmission lever retainer - M6x20 (1)	10 Nm (7.37 lbf ft)
Preselector lever retainer - M6x20 (1)	10 Nm (7.38 lbf ft)

### SIDE STAND

Name	Torque in Nm
Side stand retainer bolt - M10x1.25 (1)	10 Nm (7.38 lbf ft)
Switch retainer - M5x16 (2)	6 Nm (4.42 lbf ft)
Pin lock nut - M10x1.25 (1)	30 Nm (22.13 lbf ft)

**SWINGARM**

Name	Torque in Nm
Swingarm on gearbox retainer - M20x1 (2)	0 Nm (0 lbf ft) - in support without preloading
Lock nut on pin retainer - M20x1 (2)	50 Nm (36.88 lbf ft) - keep the pin firmly in place
Swingarm to gearcase retainer - M8 (4)	25 Nm (18.44 lbf ft) - keep the pin firmly in place

**FRONT SUSPENSION**

Name	Torque in Nm
Fork stem on lower/upper plate retainer - M10x40 (2+2)	50 Nm (36.88 lbf ft)
Headstock nut - M23x1 (1)	50 Nm (36.88 lbf ft)
Headstock ring nut - M25x1 (1)	7 Nm (5.16 lbf ft) - the headstock should turn freely
Fork stem cap (1+1)	50 Nm (36.88 lbf ft)
Fork hub cap - M6x30 (2)	10 Nm (7.37 lbf ft)

**REAR SUSPENSION**

Name	Torque in Nm
Shock absorber to chassis upper retainer - M6x35 (1+1)	10 Nm (7.37 lbf ft) - Loctite 243
Left shock absorber to swingarm retainer - M10x1.5 (1)	35 Nm (25.81 lbf ft)
Right shock absorber stud bolt to housing retainer - M12x1.5 (1)	35 Nm (25.81 lbf ft)
Right shock absorber to stud bolt retainer - M6x16 (1)	10 Nm (7.37 lbf ft) - Loctite 243

**AIR FILTER CASING**

Name	Torque in Nm
Filter casing cover retainer (4)	3 Nm (2.21 lbf ft)
Filter casing to chassis retainer (3)	3 Nm (2.21 lbf ft)
Air temperature sensor retainer (2)	2 Nm (1.47 lbf ft)

**EXHAUST**

Name	Torque in Nm
Exhaust pipe to engine retainer - M6 (2+2)	10 Nm (7.37 lbf ft)
Exhaust pipe to compensator retainer (clamp) - M6 (2)	10 Nm (7.38 lbf ft)
Exhaust pipe to silencer retainer (clamp) - M6 (1+1)	10 Nm (7.37 lbf ft)
Lambda probe retainer - M18x1.5 (1)	38 Nm (28.03 lbf ft)
Mufflers to support retainer - M8x25 (4)	25 Nm (18.44 lbf ft) - Loctite 601
Right and left heat guard bulkhead retainer - M6x12 (2+2)	10 Nm (7.37 lbf ft) - Loctite 270
Muffler support to chassis retainer - M8 (1)	25 Nm (18.44 lbf ft)

**FRONT WHEEL**

Name	Torque in Nm
Brake disc retainer - M8x20 (6)	25 Nm (18.44 lbf ft) - Loctite 243
Wheel pin - M18x1.5 (1)	80 Nm (59 lbf ft)

**REAR WHEEL**

Name	Torque in Nm
Brake disc retainer - M8x25 (6)	25 Nm (18.44 lbf ft) - Loctite 243
Wheel bolt + nut - M16 (1)	120 Nm (88.51 lbf ft)
Screw + lock clamp nut - M10 (1)	30 Nm (22.13 lbf ft)

**FRONT BRAKING SYSTEM**

Name	Torque in Nm
Front calliper retainer - M10x30 (2)	50 Nm (36.88 lbf ft)

**REAR BRAKING SYSTEM**

Name	Torque in Nm
Rear calliper retainer - M8x35 (2)	25 Nm (18.44 lbf ft)
Calliper holding plate to swingarm retainer - M16x1 (1)	25 Nm (18.44 lbf ft)
Rear brake lever nut - M8 (1)	25 Nm (18.44 lbf ft)
Rear brake fluid reservoir retainer - M5x15 (1)	6 Nm (4.42 lbf ft)

Name	Torque in Nm
Lever lock spacer retainer - M6x16 (1)	10 Nm (7.37 lbf ft)
Rear brake rod lock nut - M6 (1)	manual
Brake pump retainer - M6x25 (2)	10 Nm (7.37 lbf ft)

### **HANDLEBAR AND CONTROLS**

Name	Torque in Nm
Retainer for handlebar support U-bolts on steering plate - M10x60 (2)	50 Nm (36.88 lbf ft)
Handlebar lock U-bolts retainer - M8x30 (2+2)	25 Nm (18.44 lbf ft)
Right and left light switch retainer - M5 (2)	1.5 Nm (1.11 lbf ft)
Retainer for clutch and brake pump U-bolts - M6 (2+2)	10 Nm (7.37 lbf ft)
Mirror - M10 (1+1)	Manual

### **ELECTRICAL SYSTEM**

Name	Torque in Nm
Voltage regulator retainer - M6x30 (2)	10 Nm (7.37 lbf ft)
Horn retainer (screw+nut) - M6x16 (1)	10 Nm (7.37 lbf ft)
Coil retainer - AT M4x25 (4)	3 Nm (2.21 lbf ft)
Fuse box bracket retainer - M5x12 (2)	4 Nm (2.95 lbf ft)
Control unit retainer (4)	3 Nm (2.21 lbf ft)
Battery housing bracket retainer (2)	3 Nm (2.21 lbf ft)
Odometer sensor to calliper holding plate retainer - M6x12 (1)	10 Nm (7.37 lbf ft)

### **INSTRUMENT PANEL AND LIGHTS**

Name	Torque in Nm
Instrument panel to light support retainer - M6 (3+3)	10 Nm (7.37 lbf ft)
Headlamp retainer - M8x30 (2)	15 Nm (11.06 lbf ft)
Front and rear turn indicator retainer (screw + nut) - M6 (2+2)	5 Nm (3.69 lbf ft)
Rear light support to mudguard retainer - M5x14 (3)	4 Nm (2.95 lbf ft)

### **FUEL PUMP FLANGE**

Name	Torque in Nm
Pump support to tank retainer - M5x16 (6)	6 Nm (4.42 lbf ft)

### **FUEL TANK**

Name	Torque in Nm
Cap flange to fuel tank retainer - M5x12 (5)	4 Nm (2.95 lbf ft)
Tank rear retainer - M8x45 (1)	25 Nm (18.44 lbf ft)

### **CHASSIS / FAIRINGS (FRONT)**

Name	Torque in Nm
Stabiliser plate to fork retainer - M8x40 (4)	15 Nm (11.06 lbf ft) - Loctite 243
Front mudguard to stabiliser plate retainer - M6x11 (4)	10 Nm (7.37 lbf ft) - Loctite 243
Headstock protection panel retainer - M5x12 (1)	4 Nm (2.95 lbf ft)

### **CHASSIS / FAIRINGS (CENTRE)**

Name	Torque in Nm
Right and left throttle body protection retainer - M5x14 (2)	4 Nm (2.95 lbf ft)
Right and left fairing retainer - M5x9 (1+1)	4 Nm (2.95 lbf ft)

### **CHASSIS/ FAIRINGS (REAR)**

Name	Torque in Nm
Rear mudguard front and central retainer - M6 (2+1)	10 Nm (7.37 lbf ft)
Rear mudguard rear retainer - M8x30 (2)	25 Nm (18.44 lbf ft)
Retroreflector to support retainer - M5 (1)	4 Nm (2.95 lbf ft)
Retroreflector support to license plate holder retainer - M5x10 (2)	4 Nm (2.95 lbf ft)
License plate holder to mudguard reinforcement retainer (3)	3 Nm (2.21 lbf ft)



**FINISHINGS**

Name	Torque in Nm
Ignition lock retainer - shear head screw - M8x15 (1)	at the point of failure
Ignition lock retainer - M8x16 (1)	25 Nm (18.44 lbf ft)
Saddle opening lock retainer - M6x25 (2)	10 Nm (7.37 lbf ft)

**HEADS**

Name	Torque in Nm
Screws fixing the engine head covers	10 Nm (7.37 lbf ft)
Ignition spark plug retainer	25 Nm (18.43 lbf ft)

**CRANKCASE**

Name	Torque in Nm
Heads - cylinders to crankcase fixing nut (M10)	40 - 42 Nm (29.50 - 30.97 lbf ft)
Heads - cylinders to crankcase fixing nut (M8)	28 - 30 Nm (20.65 - 22.12 lbf ft)
Nuts joining crankcase halves (M8)	22 - 25 Nm (16.22 - 18.43 lbf ft)
Nuts joining crankcase halves (M10)	40 - 42 Nm (29.50 - 30.97 lbf ft)
Timing system cover fixing screws	10 Nm (7.37 lbf ft)
Oil sump fixing screws	10 Nm (7.37 lbf ft)
Valve cover insert fixing screw	5 Nm (3.68 lbf ft)

**CRANKSHAFT - FLYWHEEL**

Name	Torque in Nm
Connecting rod screws	30 - 32 Nm (22.12 - 23.60 lbf ft)
Flywheel to crankshaft fixing screw	40 Nm (29.50 lbf ft)
Crown gear fixing screw	10 Nm (7.37 lbf ft)

**TIMING SYSTEM**

Name	Torque in Nm
Camshaft to crankcase retaining joint	30 Nm (22.12 lbf ft)
Gear on camshaft fixing screws	25 Nm (18.43 lbf ft)
Tone wheel fixing screw	25 Nm (18.43 lbf ft)

**ELECTRIC STARTING SYSTEM**

Name	Torque in Nm
Starter motor fixing screws	25 Nm (18.43 lbf ft)

**FUEL SUPPLY CONTROL UNIT**

Name	Torque in Nm
Injection cap fixing screws M5	4 Nm (2.95 lbf ft)
Screws fixing intake pipe to the heads	10 Nm (7.37 lbf ft)

**OIL PUMP**

Name	Torque in Nm
Oil pressure sensor	8 - 10 Nm (5.90 - 7.37 lbf ft)
Oil pump to crankcase fixing screws	10 Nm (7.37 lbf ft)
Filtering cartridge sealing cover fixing screw	25 Nm (18.43 lbf ft)

**GENERATOR**

Name	Torque in Nm
Generator stator fixing screws	5 Nm (3.68 lbf ft)
Generator rotor nut	80 Nm (59.00 lbf ft)

**GEAR**

Name	Torque in Nm
Clutch shaft fixing nut	100 Nm (73.75 lbf ft)
Main shaft lock nuts	65 Nm (47.94 lbf ft)

Name	Torque in Nm
Cover to gearbox fixing screws	10 Nm (7.37 lbf ft)
Gearbox to clutch bell cover fixing screws	10 Nm (7.37 lbf ft)
Index lever fixing nut	6 Nm (4.42 lbf ft)

### Recommended products chart

#### RECOMMENDED PRODUCTS

Product	Description	Specifications
AGIP RACING 4T 10W-60	Engine oil	SAE 10W - 60. As an alternative for recommended oils use top-branded oils that meet or exceed the requirements of CCMC G-4 API SG specifications.
AGIP GEAR MG SAE 85W-140	Transmission oil	-
AGIP GEAR MG/S SAE 85W-90	Gearbox oil	-
AGIP FORK 7.5W	Fork oil	SAE 5W / SAE 20W
AGIP GREASE SM2	Lithium grease with molybdenum for bearings and other points needing lubrication	NLGI 2
Neutral grease or petroleum jelly.	Battery poles	
AGIP BRAKE 4 / BRAKE 5.1	Brake fluid	As an alternative for recommended fluids use top-branded fluids that meet or exceed the requirements of SAE J1703, NHTSA 116 DOT 4, ISO 4925 Synthetic fluid specifications.

**NOTE**

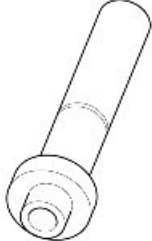

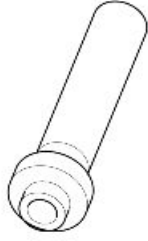
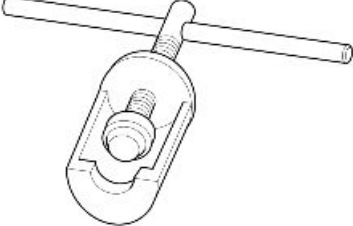
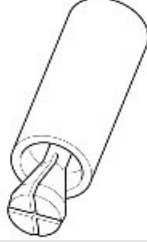

**USE ONLY NEW BRAKE FLUID. DO NOT MIX DIFFERENT BRANDS OR TYPES OF OIL WITHOUT CHECKING THEIR BASE COMPATIBILITY.**

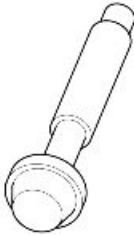
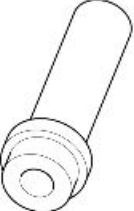
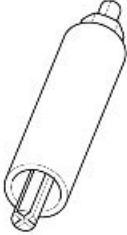
# INDEX OF TOPICS

**S**SPECIAL TOOLS

**S-TOOLS**

**SPECIAL TOOLS**

Stores code	Description	
19.92.61.00	Punch for sealing ring of bevel gear pair pinion	
19.92.88.00	Bevel gear pair alignment pre-fitting tool	
19.92.60.00	Punch for gearcase sealing ring	
19.90.70.00	Extractor for internal ring on drilled bolt	
19.92.75.00	Extractor for external ring of gearcase bearing	
19.92.62.00	Punch for bearing on bevel gear pair pinion	

Stores code	Description	
19.92.64.00	Punch for external ring of tapered bearing on bevel gear pair pinion holding body	
19.92.65.00	Punch for external ring of gearcase bearing	
19.92.76.00	Extractor for swinging arm holder bearing on gearbox cover	

# INDEX OF TOPICS

**MAINTENANCE**

**MAIN**

## Maintenance chart

### NOTE

**CARRY OUT MAINTENANCE OPERATIONS AT HALF THE INTERVALS SHOWN IF THE VEHICLE IS USED IN WET OR DUSTY AREAS, OFF ROAD OR FOR SPORTING APPLICATIONS.**

I: INSPECT AND CLEAN, ADJUST, LUBRICATE OR REPLACE IF NECESSARY

C: CLEAN, R: REPLACE, A: ADJUST, L: LUBRICATE

\* Check and clean, adjust or replace if necessary before every ride.

\*\* Replace every 2 years or 20000 km (12427 miles).

\*\*\* Replace every 4 years

\*\*\*\* At every start-up.

\*\*\*\*\* Check monthly.

### ROUTINE MAINTENANCE TABLE

km x 1,000	1	7,5	15	22,5	30	37,5	45	52,5	60
Spark plugs		R	R	R	R	R	R	R	R
Idle mixture (CO)		I	I	I	I	I	I	I	I
Transmission cables and controls	I	I	I	I	I	I	I	I	I
Steering bearings and steering clearance	I	I	I	I	I	I	I	I	I
Wheel bearings		I	I	I	I	I	I	I	I
Brake discs	I	I	I	I	I	I	I	I	I
Air filter		I	R	I	R	I	R	I	R
Engine oil filter	R	R	R	R	R	R	R	R	R
Fork	I		I		I		I		I
Light aiming operation		I	I	I	I	I	I	I	I
Vehicle general operation	I	I	I	I	I	I	I	I	I
Braking systems	I	I	I	I	I	I	I	I	I
Lights circuit	I	I	I	I	I	I	I	I	I
Safety switches	I	I	I	I	I	I	I	I	I
Brake fluid **	I	I	I	I	I	I	I	I	I
Gearbox oil	R	R	R	R	R	R	R	R	R
Fork oil / oil seals		R		R			R		
Engine oil	R	R	R	R	R	R	R	R	R
Final drive oil	R	R	R	R	R	R	R	R	R
Tyres - pressure / wear*****	I	I	I	I	I	I	I	I	I
Engine revs at idle speed	A	A	A	A	A	A	A	A	A
Valve clearance adjustment	A	A	A	A	A	A	A	A	A
Wheels	I	I	I	I	I	I	I	I	I
Bolts and nuts tightening	I	I	I	I	I	I	I	I	I
Battery terminals tightening	I								
Head screws tightening	A								
Cylinder synchronisation	I	I	I	I	I	I	I	I	I
Suspensions and setting	I		I		I		I		I
Engine oil pressure warning light ****									
Fuel pipes ***		I	I	I	I	I	I	I	I
Brake pipes ***		I	I	I	I	I	I	I	I
Clutch wear		I	I	I	I	I	I	I	I
Brake pads wear *									

## Transmission fluid

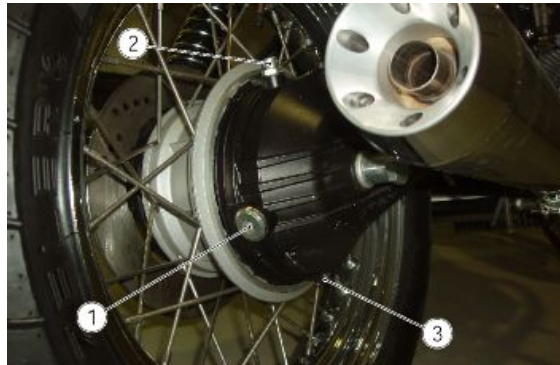
## Check

- Keep the vehicle upright with both wheels on the ground.
- Unscrew and remove the cap/dipstick (1).
- The level is correct if the oil is close to the hole of the cap/dipstick (1).
- If the oil is lower than specified, top-up until it reaches the cap/dipstick hole (1).

### CAUTION



DO NOT ADD ADDITIVES OR ANY OTHER SUBSTANCE TO THE FLUID. WHEN USING A FUNNEL OR ANY OTHER ELEMENT, MAKE SURE IT IS PERFECTLY CLEAN.



## Replacement

### CAUTION

THE UNIT MUST BE HOT WHEN THE OIL IS CHANGED AS UNDER SUCH CONDITIONS OIL IS FLUID AND THEREFORE EASY TO DRAIN.

### NOTE

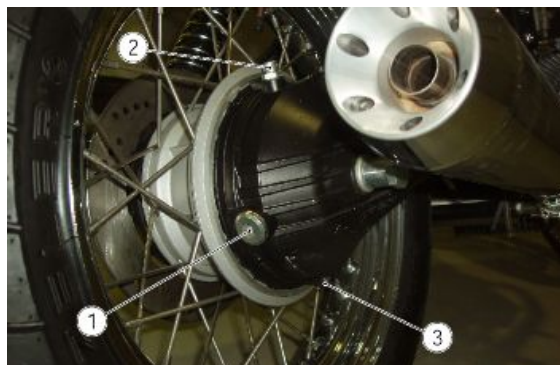
#### RIDE SOME km (miles) TO WARM UP ENGINE OIL

- Place a container with + 400 cm<sup>3</sup> (25 cu in) capacity under the drainage plug (3).
- Unscrew and remove the drainage plug (3).
- Unscrew and remove the breather cap (2).
- Drain the oil into the container; allow several minutes for oil to drain out completely.
- Check and if necessary, replace the sealing washer of drainage plug (3).
- Remove any metal scrap attached to the drainage plug (3) magnet.
- Screw and tighten the drainage plug (3).
- Pour new oil through the fill opening (1) until it reaches the cap/dipstick hole (1).

### CAUTION

DO NOT ADD ADDITIVES OR ANY OTHER SUBSTANCE TO THE FLUID. WHEN USING A FUNNEL OR ANY OTHER ELEMENT, MAKE SURE IT IS PERFECTLY CLEAN.

- Screw and tighten the caps (1 - 2).





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## Engine oil

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### Check

**CAUTION**

**ENGINE MUST BE WARM TO CHECK ENGINE OIL LEVEL**

**NOTE**

**DO NOT LET THE ENGINE IDLE WITH THE VEHICLE AT STANDSTILL TO WARM UP THE ENGINE AND REACH THE OPERATING TEMPERATURE OF ENGINE OIL. OIL IS BEST CHECKED AFTER RUNNING FOR ABOUT 15 KM (10 miles).**

- Shut off the engine.
- Keep the vehicle upright with the two wheels on the ground.
- Unscrew and remove the dipstick (1).
- Clean the dipstick (1).
- Reinsert the dipstick (1) into the opening but do not screw it.
- Remove the dipstick (1).
- Check oil level on the dipstick (1).
- The oil level is correct when it close to the "MAX" mark.

**MAX** = maximum level

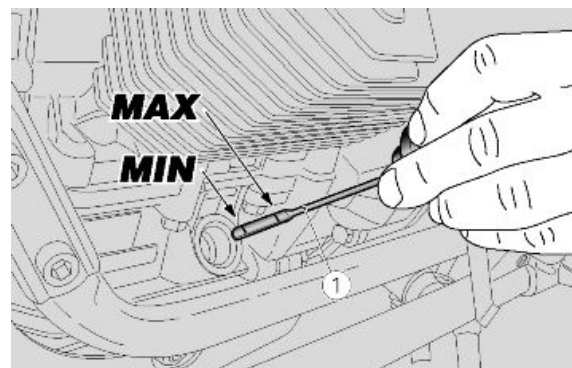
**MIN** = minimum level

Add engine oil if required:

- Unscrew and remove the dipstick (1).
- Top-up with engine oil until it goes above the minimum level marked "MIN".

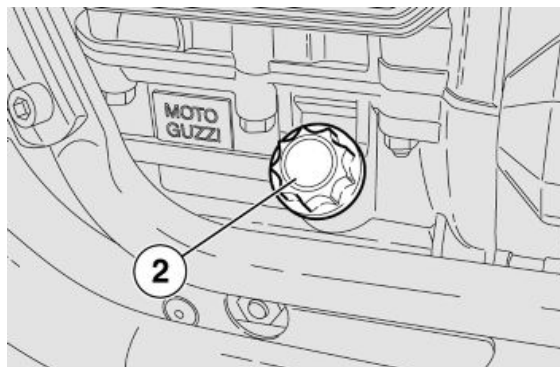
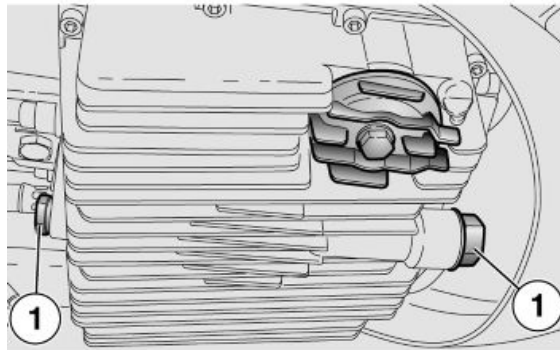
**CAUTION**

**DO NOT ADD ADDITIVES OR ANY OTHER SUBSTANCE TO THE OIL. WHEN USING A FUNNEL OR ANY OTHER ELEMENT, MAKE SURE IT IS PERFECTLY CLEAN.**



## Replacement

- Place a container with + 2000 cm<sup>3</sup> (122 cu.in) capacity under the drainage plugs (1).
- Unscrew and remove the drainage plugs (1).
- Unscrew and remove the filler cap (2).
- Drain the oil into the container; allow several minutes for oil to drain out completely.
- Check and if necessary, replace the sealing washers of drainage plugs (1).
- Remove any metal scrap attached to the magnet of drainage plugs (1).
- Screw and tighten the drainage plugs (1).



**Drainage plugs tightening torque (1): 12 Nm  
(1.2 kgm)**

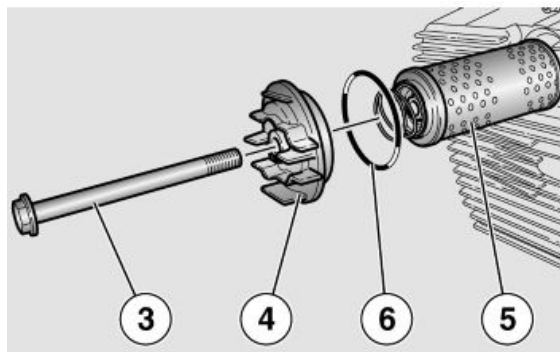


**DO NOT DISPOSE OF OIL INTO THE ENVIRONMENT.  
DISPOSE OF ENGINE OIL STORED IN A SEALED CONTAINER AND TAKE IT TO YOUR SUPPLIER OR TO THE NEAREST USED OIL RECLAMATION FIRM.**

## Engine oil filter

- Loosen the screw (3) and remove the cover (4).
- Remove the engine oil filter (5).

**NOTE**  
**NEVER REUSE A FILTER.**

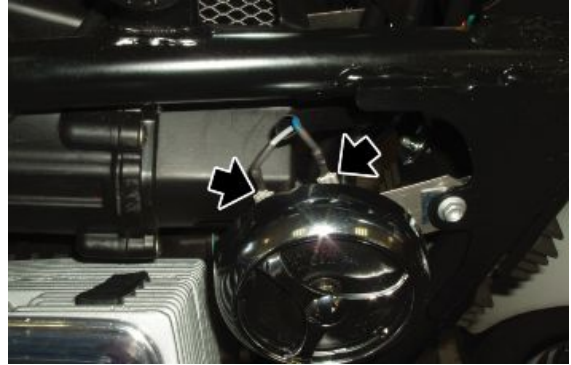


- Spread a thin layer of oil on the sealing ring (6) of the new engine oil filter.
- Fit the new engine oil filter with the spring facing downwards.
- Refit the cover (4), screw and tighten the screw (3)

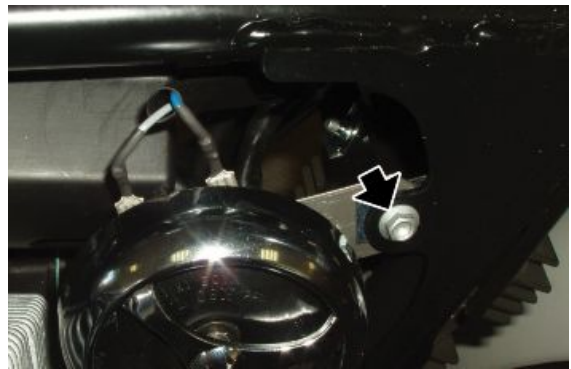
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## Air filter

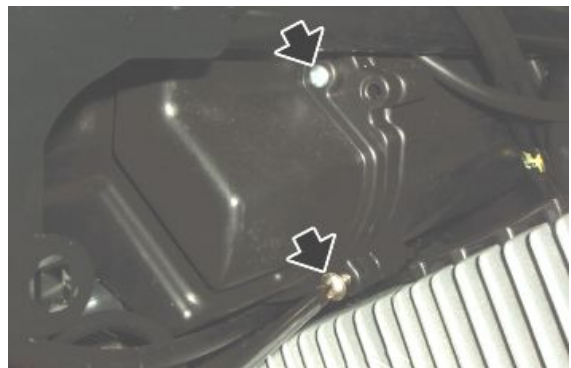
- Remove the fuel tank.
- Disconnect the two horn connectors.



- Undo and remove the horn fixing screw.



- 
- Working on both sides, undo and remove the two air filter casing cover screws.



- Remove the oil breather pipe.



- Slide off the air filter casing cover from the right side of the vehicle.



- Remove the air filter.



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## Braking system

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### Level check

#### Brake fluid check

- Place the vehicle on the service stand.
- For the front brake, turn the handlebar fully to the right.
- For the rear brake, keep the vehicle upright so that the fluid in the reservoir is at the same level with the plug.
- Make sure that the fluid level in the reservoir is above the "MIN" reference mark:

MIN = minimum level

**MAX** = maximum level

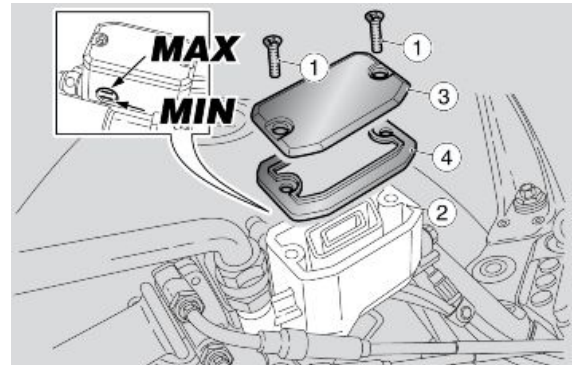
If the fluid does not reach at least the "**MIN**" reference mark:

- Check brake pads and disc for wear.
  - If the pads and/or the disc do not need replacing, top-up the fluid.
-

## Top-up

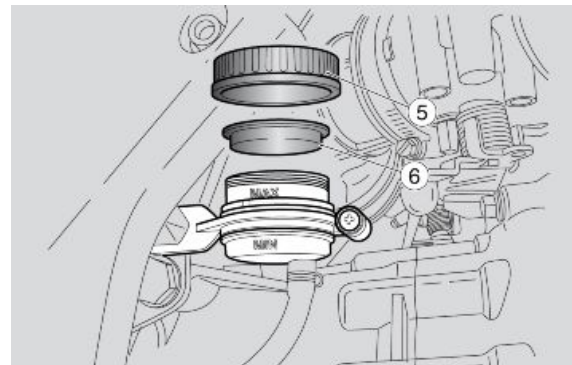
Front brake:

- Unscrew the two screws (1) of the brake fluid reservoir (2) using a Phillips screwdriver.
- Lift and remove the cover (3) and screws (1) as well.
- Remove the gasket (4).



Rear brake:

- Unscrew and remove the cap (5).
- Remove the gasket (6).
- Top-up the reservoir with brake fluid to the correct level, which is between the two "MIN" and "MAX" reference marks.



**RISK OF BRAKE FLUID SPILLS. DO NOT OPERATE THE BRAKE LEVER WITH BRAKE FLUID RESERVOIR CAP LOOSENED OR REMOVED.**

**CAUTION**



**AVOID PROLONGED AIR EXPOSURE OF THE BRAKE FLUID. BRAKE FLUID IS HYGROSCOPIC 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.**



**TO AVOID SPILLING FLUID WHILE TOPPING-UP, KEEP THE TANK PARALLEL TO THE RESERVOIR EDGE (IN HORIZONTAL POSITION).**

**DO NOT ADD ADDITIVES OR OTHER SUBSTANCES TO THE FLUID.**

**WHEN USING A FUNNEL OR ANY OTHER ELEMENT, MAKE SURE IT IS PERFECTLY CLEAN.**



**DO NOT EXCEED THE "MAX" LEVEL MARK WHEN TOPPING UP.**

**TOP-UP TO "MAX" LEVEL MARK ONLY WHEN BRAKE PADS ARE NEW. WHEN TOPPING UP DO NOT EXCEED THE "MAX" LEVEL MARK WHEN BRAKE PADS ARE WORN AS YOU RISK SPILLING FLUID WHEN CHANGING THE BRAKE PADS.**

**CHECK BRAKING EFFICIENCY. IN CASE OF EXCESSIVE TRAVEL OF THE BRAKE LEVER OR POOR PERFORMANCE OF THE BRAKING SYSTEM, TAKE YOUR VEHICLE TO AN Official Moto Guzzi Dealer, AS IT MAY BE NECESSARY TO PURGE THE AIR IN THE SYSTEM.**

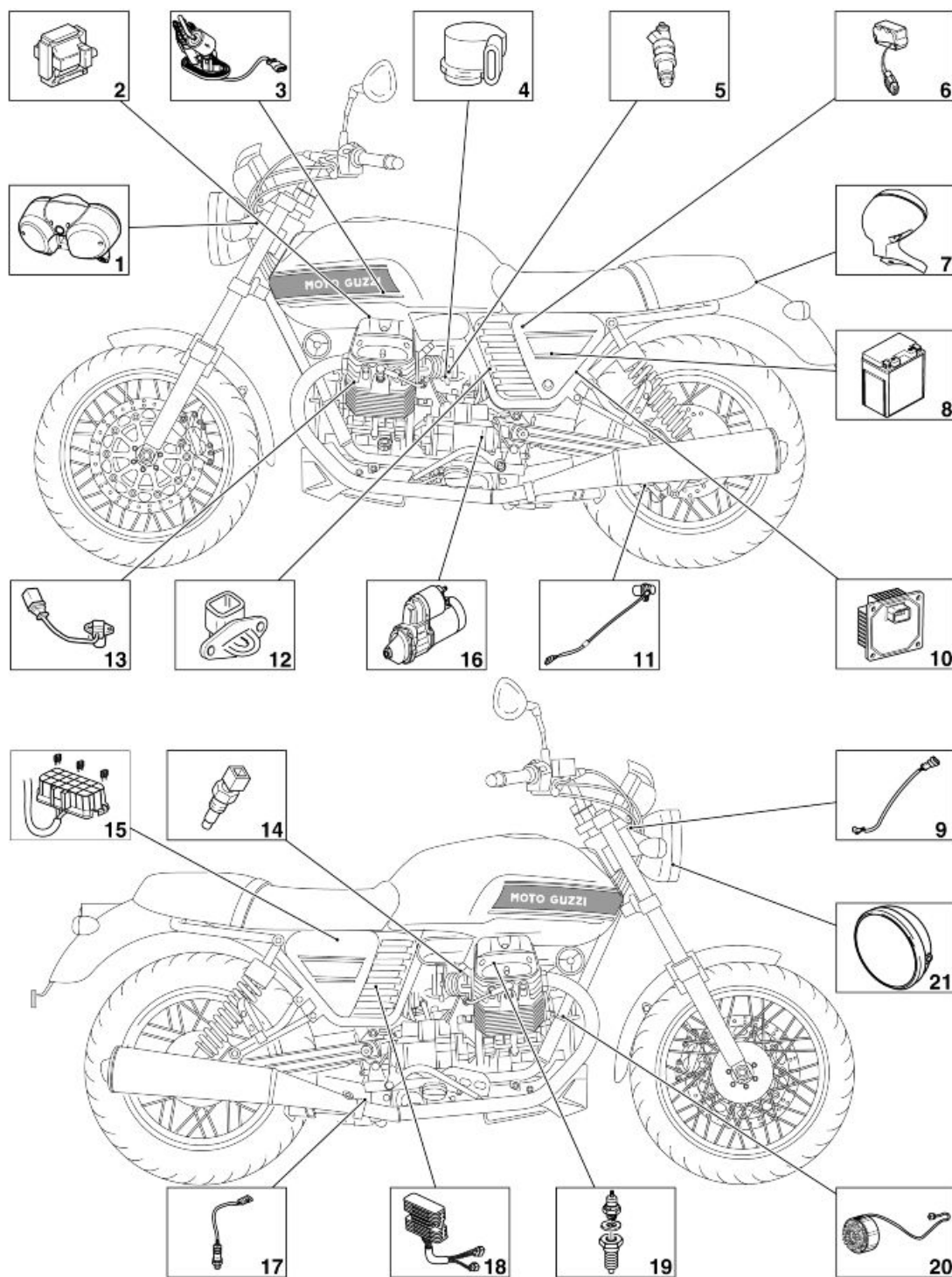


# INDEX OF TOPICS

ELECTRICAL SYSTEM

ELE SYS

Components arrangement



Key:

- 1. Instrument panel
- 2. Coil
- 3. Fuel pump



4. Throttle potentiometer (TPS)
5. Injector
6. Fall sensor
7. Rear light
8. Battery
9. Instrument panel air sensor
10. Control unit
11. Speed sensor
12. Intake air temperature sensor
13. Engine revolution sensor
14. Head temperature sensor
15. Auxiliary fuses
16. Starter motor
17. Lambda Probe
18. Voltage regulator
19. Oil pressure sensor
20. Generator
21. FRONT HEADLAMP

---

## **Electrical system installation**

### **INTRODUCTION**

#### **Scope and applicability**

The purpose of this document is to define cables laying, their fastening on the motorcycle and possible criticalities, special checks on connections and layouts, all this with the aim of obtaining vehicle reliability.

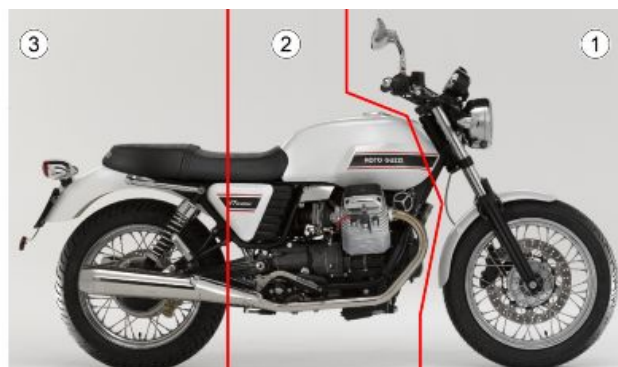
#### **Special checks for the correct connection and laying of cables**

The indicated connectors are considered critical in comparison with the others because the vehicle will stop if they are accidentally disconnected. Undoubtedly the connection of the rest of connectors is also important and essential for the correct operation of the vehicle.

#### **Vehicle sections**

The wiring distribution is subdivided in three essential sections, as indicated in the figure.

1. Front section
2. Central section
3. Rear section



## Front side

### CAUTION

**ONCE THE ELECTRICAL SYSTEM IS REFITTED, THE CONNECTORS RECONNECTED AND CLAMPS AND RETAINERS RESTORED, CARRY OUT THE CHECKS INDICATED UNDER "SPECIAL CHECKS FOR THE CORRECT CONNECTION AND LAYING OF CABLES" IN THE "ELECTRICAL SYSTEM INSTALLATION" SECTION.**

### FRONT SECTION

#### TABLE A

Connect the instrument panel to the main cable harness (1), passing it over the headlight support bracket (2).

Clamp the main cable harness to the headlight support bracket with a clamp (3).



#### TABLE B

Connect the turn indicators and the temperature sensor to the main system and clamp them as indicated.



**TABLE C**

Arrange the throttle control transmissions.

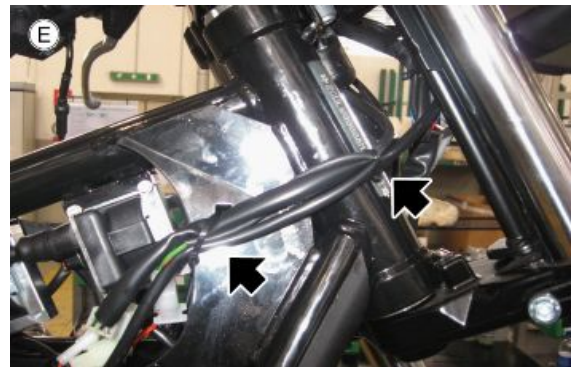
**TABLE D**

Insert the throttle control and starter transmissions through the cable guide on the steering pipe (4) and fasten them with a rubber clamp (5).

**TABLE E**

Turn the steering to the left, clamp the three cables of the front cable harness with two clamps:

- the first clamp fixed to the chassis in the opening;
- the second, near the headstock.



## Central part

### CAUTION

**ONCE THE ELECTRICAL SYSTEM IS REFITTED, THE CONNECTORS RECONNECTED AND CLAMPS AND RETAINERS RESTORED, CARRY OUT THE CHECKS INDICATED UNDER "SPECIAL CHECKS FOR THE CORRECT CONNECTION AND LAYING OF CABLES" IN THE "ELECTRICAL SYSTEM INSTALLATION" SECTION.**

### CENTRAL SECTION

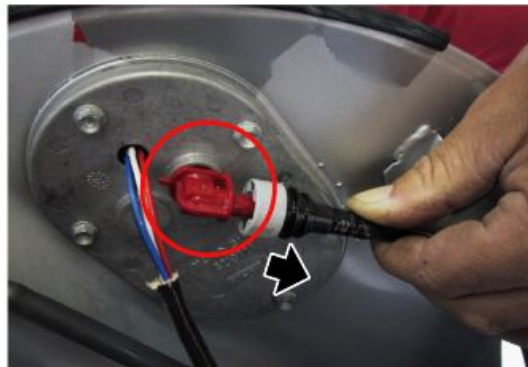
**TABLE A - TANK FITTING**

- Place the submersible pump and set the six screws, tightening them in a criss-cross sequence to the prescribed torque.
- Repeat the tightening sequence.

- After connecting the quick connectors to the pump, check that it has fitted correctly by pulling the connector in the opposite direction.

### Locking torques (N\*m)

#### Pump support to tank retainer - M5x16 (6) 6 Nm (4.42 lbf ft)



#### TABLE B

Clamp the tank drainage pipes to the ground with the oil scavenge pipes so that they do not touch the compensator.

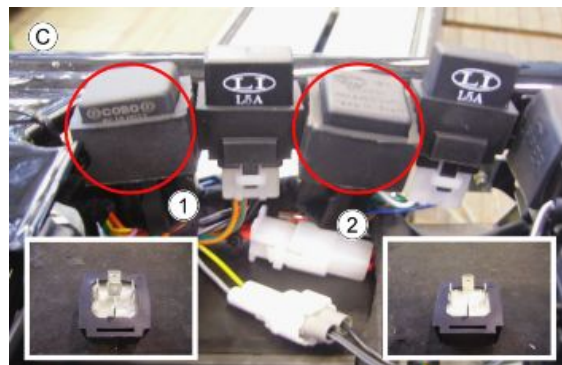
#### CAUTION

DO NOT SQUEEZE THE TWO TUBES WHILE FASTENING THE CLAMP.



#### TABLE C - RELAY POSITION

1. Relay with five pins (tank side)
2. Relay with four pins in third position.

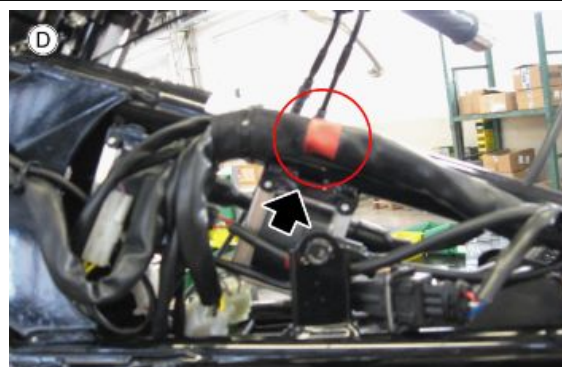


#### TABLE D - FASTENING THE ELECTRICAL SYSTEM TO THE CHASSIS

Position the electrical system on the chassis, holding the red strap at the centre of the rear coil, and fix with a clamp.

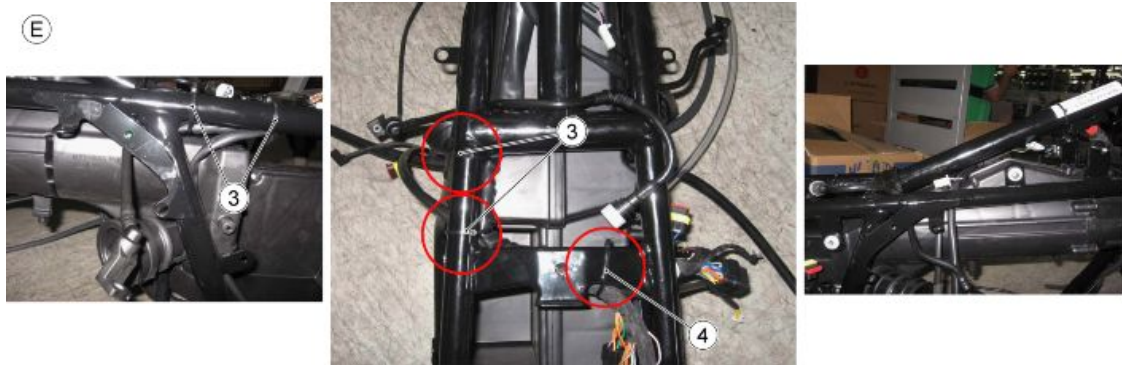
#### WARNING

THE CLAMP MUST BE POSITIONED BEHIND THE REAR COIL, SO THAT THE SYSTEM CANNOT SLIDE FORWARDS.



**TABLE E**

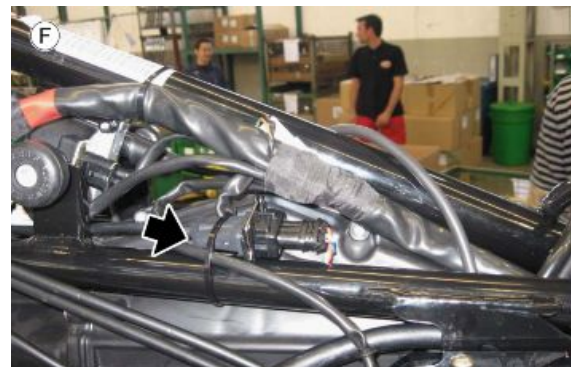
Clamp the main cable harness onto the central part of the left hand spar with two clamps (3) and on the pipe joining tube the tank attachment (right side) (4) with one clamp.

**TABLE F - TIMING SWITCH SYSTEM POSITION**

Clamp the timing sensor system to the generator system, regulator system, horn system and left cable of the chassis cross member.

**CAUTION**

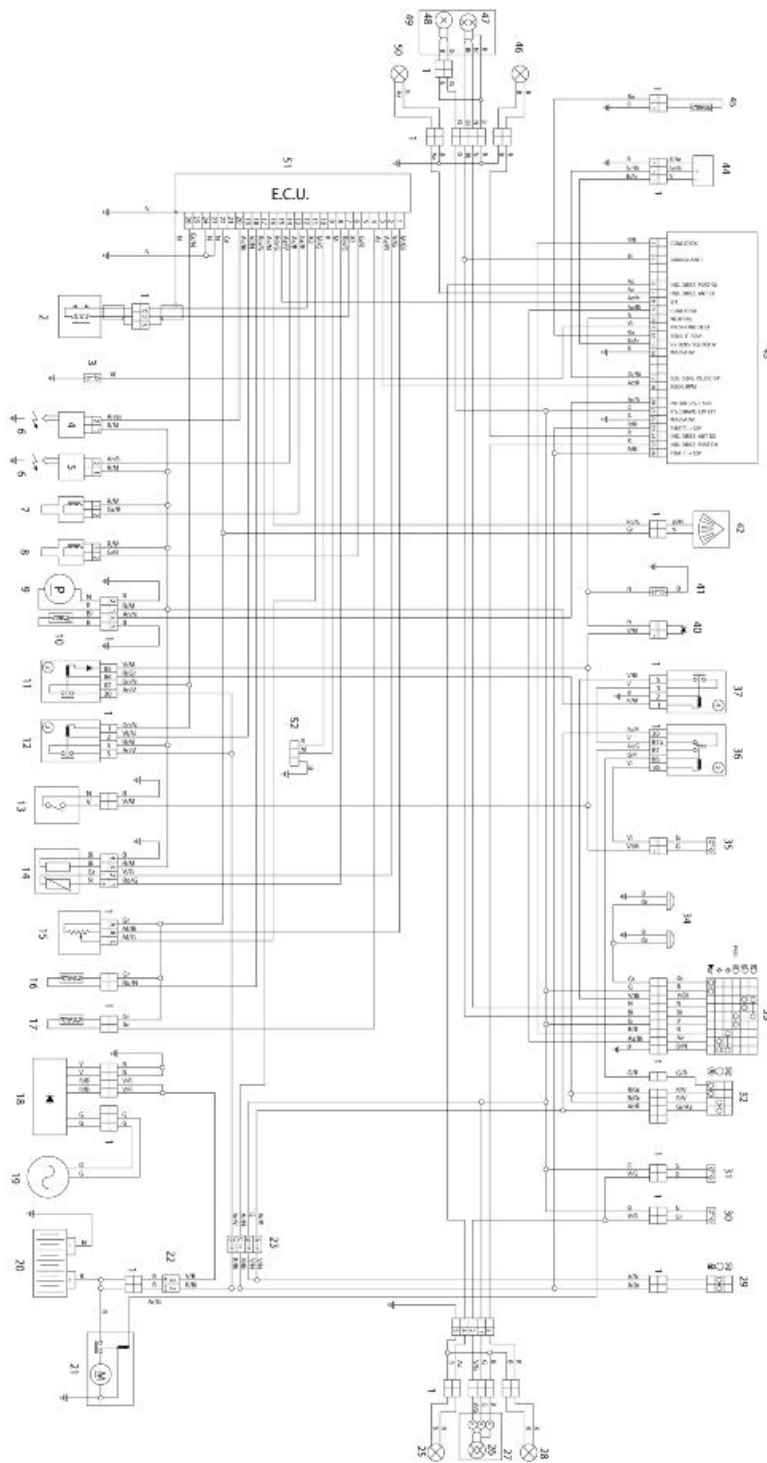
**DO NOT SQUEEZE THE TWO TUBES WHILE FASTENING THE CLAMP.**

**TABLE G - TIMING SWITCH SYSTEM POSITION**

Clamp the timing sensor connector to the left hand side of the chassis, positioning it as far as possible from the coil and the spark plug cables.



General wiring diagram



Key:

- 1. Multiple connectors
- 2. Revolution sensor
- 3. Oil pressure sensor
- 4. Left coil

5. Right coil
6. Spark plugs
7. Left injector
8. Right injector
9. Fuel pump
10. Fuel reserve sensor
11. Main injection relay (polarised)
12. Secondary injection relay
13. Side stand switch
14. Lambda Probe
15. Throttle sensor
16. Engine air thermistor
17. Head temperature sensor
18. Voltage regulator
19. FLYWHEEL
20. Battery
21. Starter motor
22. Main fuses
23. Auxiliary fuses
24. License plate light
25. Right rear turn indicator
26. Tail light - Stop bulb
27. Rear light
28. Right rear turn indicator
29. Key switch
30. Front stop switch
31. Rear stop switch
32. Right light switch
33. Left light switch
34. Horn
35. Clutch switch
36. Start-up relay
37. Light relay
- 38.-
- 39.-
40. Diode
41. Gear in neutral switch
42. Fall sensor

- 43. Instrument panel
- 44. Speed sensor
- 45. External air temperature thermistor
- 46. Right front turn indicator
- 47. High - low-beam bulb
- 48. Front tail light bulb
- 49. Front headlamp
- 50. Left front turn indicator
- 51. ECU
- 52. Diagnostics socket

**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

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## Checks and inspections

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### Dashboard

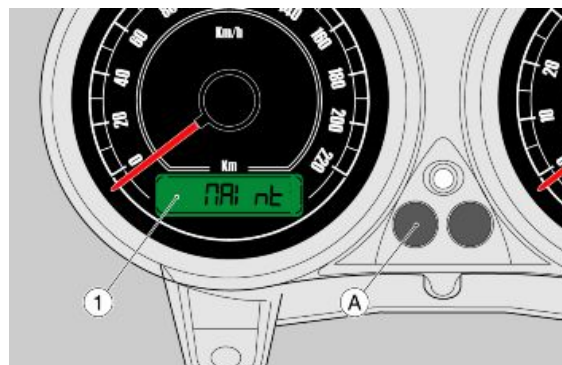
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#### Service warning light reset

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- The system displays the function as follows:

the word "MAInt" is shown on the left LCD Display (1) after the mileage corresponding to the first servicing or any subsequent servicing is exceeded.





- This is shown only after each start-up for 5 seconds; afterwards, it will shift to the standard view.

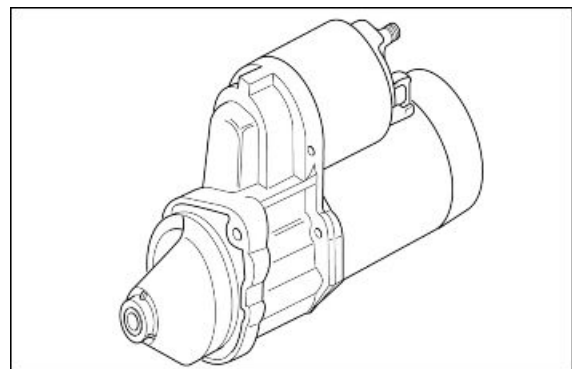
To reset Service proceed as follows:

- Hold down the key (A).
- Turn the ignition key to "ON".
- Wait for the Key OFF.

The next time the vehicle is started, the value will be reset and the word "MAInt" will not be displayed until the next mileage for which maintenance is foreseen.

### Start-up system check

pick-up input about 100 A



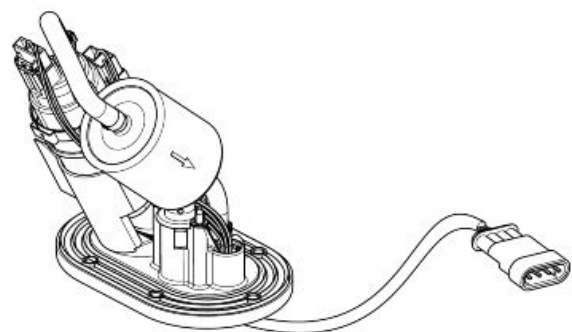
### level indicators

Petrol pump:

Input 4A (to be measured between pins 1 and 2 with 12V supply voltage)

Fuel level sensor:

Resistance 1.4 Ohm (to be measured between pins 3 and 4 with fuel level equal to 0 litres)

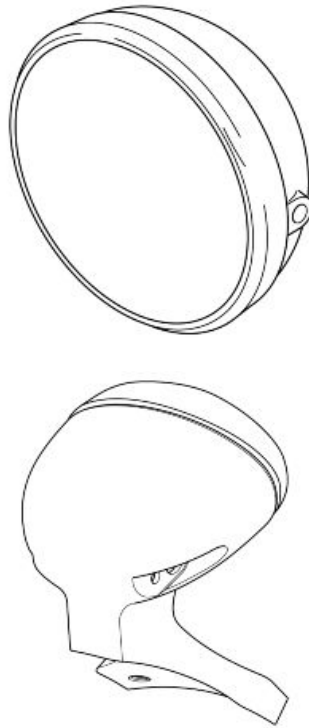


### Lights list

#### **BULBS**

Specification	Desc./Quantity
Low-/ high-beam light (halogen)	12 V - 55 W / 60 W H4

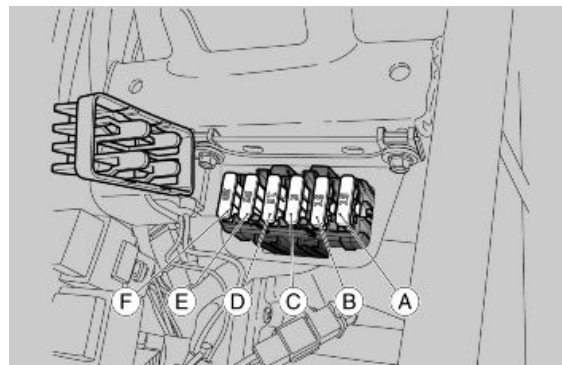
Specification	Desc./Quantity
Front daylight running light	12V - 5W
Turn indicator light	12 V - 10 W (orange RY 10 W bulb)
License plate light	12V - 5 W
Rear tail light /stop lights	12 V - 5 / 21 W
Instrument panel lighting	LED



## Fuses

### FUSE DISTRIBUTION

- A) High-beam / low-beam lights, start-up (15 A).
- B) Stop lights, tail lights, horn, turn indicators (15 A).
- C) From battery to injection permanent power supply (3 A).
- D) Injection services (15 A).
- E) Main fuse (30 A).
- F) Battery recharge (30 A).

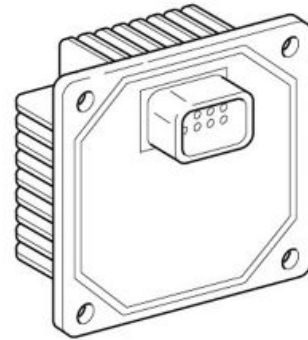


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## Control unit

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Magneti Marelli engine control unit 15 RC



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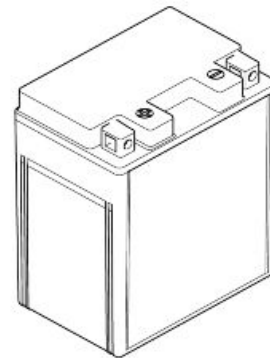
## Battery

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### Characteristic

#### Battery

12V - 12 Ah



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## Speed sensor

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### Function

To indicate the vehicle speed by reading the rear wheel rotation speed.

### Operation / Operating principle

Hall effect sensor: a square-wave pulse is generated with voltage between 12V and approximately 0.6 V.

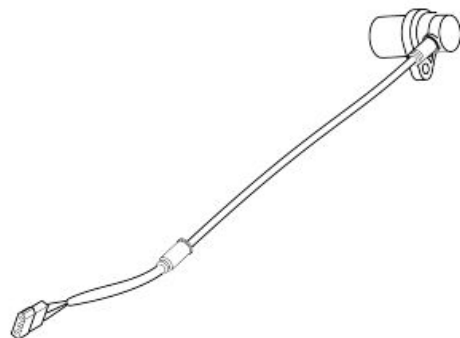
### Level in wiring diagram:

Speed sensor

### Location:

- Sensor: on the swingarm, left side, next to the rear brake calliper.
- connector: under right fairing, next to the Marelli control unit.

### Pin-out:



**PIN:**

- PINS 1-3 Voltage: approximately 12 V
- PINS 2-3 Voltage: between 0.6V-12V  
(turning the rear wheel)

1. Supply voltage (green - sensor side)
2. Output signal (grey/white - sensor side)
3. Ground (blue/orange - sensor side)

**DIAGNOSIS****Speed viewing problems on the instrument panel**

CARRY OUT THE CASCADE OPERATIONS UNTIL THE FAILURE IS FOUND

- Check correct position of the sensor in its fitting.
- Check voltage between PINS 1-3 of the sensor. If there is no voltage, check continuity between PIN 1 of the sensor and PIN 3 of the instrument panel connector.
- Check the instrument panel PIN 13 connector.
- Check continuity with the sensor PIN 13 ground lead.
- Check continuity of the grey/white cable harness (cable harness side) from PIN 2 of the sensor to PIN 17 of the instrument panel connector.
- Check instrument panel PIN 17. If there is no failure after all these checks, replace the sensor.

**Engine rpm sensor****Function**

It informs crankshaft position and speed to the Marelli control unit.

**Operation / Operating principle**

Inductive sensor: sinusoidal-type generated voltage; two teeth are missing on the flywheel for the reference position.

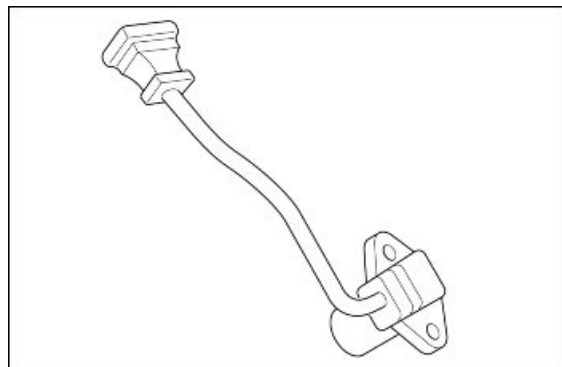
**Level in wiring diagram:** Revolution sensor

**Location:**

- Sensor: engine front left section, under the left cylinder.
- connector: under the fuel tank.

**Electrical characteristics:**

- Winding resistance  $650 \Omega \pm 15\%$  Output alternating voltage, value range: minimum 0.5 V - maximum 5V



**Pin-out:**

1. Engine revolution sensor positive signal
2. Engine revolution sensor negative signal
3. Revolution sensor anti-jamming cable

**AXONE: PARAMETERS****Target engine revs**

**Example value:**1100 +/- 100 rpm

Parameter valid at idle, setting depends especially on engine temperature: the ECU unit will try to keep the engine running at this revs, acting on the ignition advance.

**AXONE: STATUSES****Synchronisation**

**Example value:**Synchronised / Not synchronised

Indicates if the control unit detects the revolution sensor signal correctly

**DIAGNOSIS****ENGINE REVOLUTION SENSOR**

An interruption in the sensor circuit has been detected, from PIN 7 to PIN 12 of the control unit connector. Check the sensor connector and the injection ECU connector: if not OK, restore; if OK, check continuity of the two cables to PINS 7 and 12 of the control unit connector: if there is no continuity, restore the cable harness; if there is continuity, check the interruption on the sensor and replace it

**CAUTION** If the electric circuit is short-circuited, no error is displayed. Check the sensor electrical specifications: If it is not the correct one, replace the sensor. If it is the correct one, check supply insulation and ground connection insulation of both cables. Carry out the tests from the sensor connector to the sensor. If not OK, restore the cable harness or replace the sensor. If OK, perform the test from pins 7 and 12 of the Marelli control unit connector to the cable harness.

**Installation**

Place the sensor with the corresponding spacers, the air gap should be between 0.7 and 0.9 mm.

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## Throttle position sensor

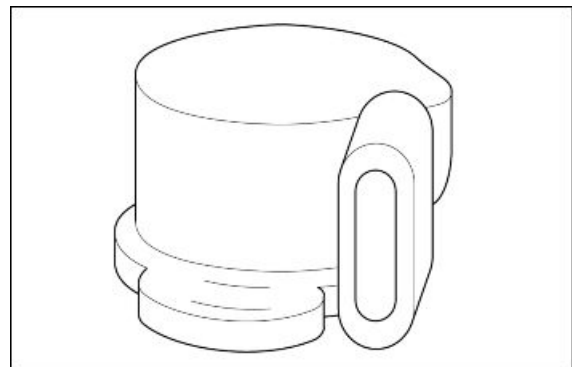
**Function**

It tells the control unit the position of the throttle.

**Operation / Operating principle**

The throttle position sensor works as a variable resistance according to the throttle rotation.

**Level in wiring diagram:**Throttle and idle motor

**Location:**

- sensor: on the right cylinder throttle body
- connector: on the potentiometer

**Electrical characteristics:**

PINS A-C: throttle closed approximately 1.7 kOhm; throttle open approximately 1.1 kOhm.

PINS A-B: approximately 1 kOhm.

**Pin-out:**

A: ground connection

B: supply voltage +5V

C: potentiometer signal (from 0.5 V with closed throttle to 4 V with open throttle)

**AXONE: PARAMETERS**

Potentiometer on throttle / 0.5 (minimum) - 4 (full load)

Correct throttle position / 3.1 (minimum) - 85 (full load)

**AXONE: STATUSES**

Minimum/full load - ON/OFF

If the throttle is at minimum, it indicates ON, if the throttle is out of minimum, it indicates OFF

**AXONE: ELECTRICAL ERRORS**

**Throttle** - open circuit, shorted to positive / shorted to negative.

Error cause

- If the circuit is open, shorted to positive: excessive voltage has been detected at PIN 11 of the control unit connector.
- If shorted to negative: voltage equal to zero has been detected.

Troubleshooting

- Circuit is open, shorted to positive: check the injection control unit connector and the sensor connector: if they are not OK, restore; if they are OK, check the continuity between PIN 11 of the control unit connector and PIN C of the sensor (brown/yellow cable): if there is not continuity, restore the cable harness; if there is continuity, check continuity of the sensor between PIN A and PIN C: if there is not continuity, replace the potentiometer; if there is continuity, measure the resistance. If resistance is over 2 kOhm, it indicates the brown/yellow cable is shorted to positive; therefore, it is necessary to restore cable harness
- if shorted to negative: disconnect the sensor connector and check the ground insulation of the brown/yellow cable (from throttle sensor connector or control unit connector): if there is continuity with the ground connection, restore the cable harness; if earth insulated, the resistance between PIN A and PIN C is below 1.3 kOhm; therefore, it is necessary to replace the throttle body.

**AXONE: ADJUSTABLE PARAMETERS****Self-adjustable parameters reset:**

Lambda probe: operation to be carried out after the throttle body is cleaned, or in the case a new engine, a new lambda probe or a new injector is fitted, or the correct operation of the injection system or the valves is restored.

**Throttle positioner autodetection:**

Allows the control unit to detect the closed throttle position: just press the enter button. The operation should be carried out when the throttle body of the throttle position sensor or the injection control unit is replaced

**RESET PROCEDURE:**

Once the throttle body or the injection control unit is replaced, it is necessary to connect to the diagnosis instrument selecting FUEL INJECTION and carry out the operation: Throttle positioner autodetection

---

**Engine temperature sensor****Function**

it informs the engine temperature to the control unit so as to optimise carburetion and idle check

**Operation / Operating principle**

NTC type sensor (resistance sensor, inversely variable with temperature).

**Level in wiring diagram:** Temperature sensors

**Location:**

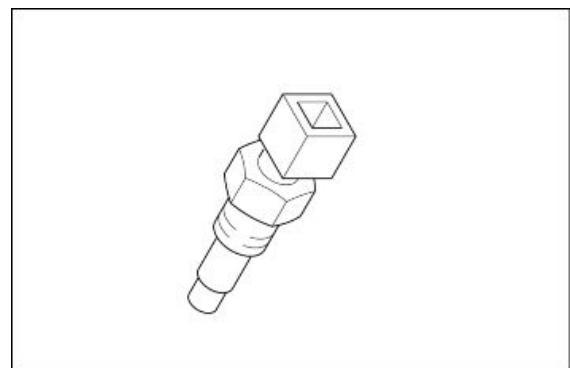
- on the right head, next to the throttle body
- connector: on the sensor

**Electrical characteristics:**

- Resistance at 0°C: 9.75 kΩ ± 5%
- Resistance at 20°C: 3.747 kΩ ± 5%
- Resistance at 40°C: 1.598 kΩ ± 5%
- Resistance at 60°C: 0.746 kΩ ± 5%
- Resistance at 80°C: 0.377 kΩ ± 5%
- Resistance at 100°C: 0.204 kΩ ± 5%

**Pin-out:**

- Grey (cable harness side): Ground connection



- Orange (cable harness side): 0-5 V signal

### **AXONE: PARAMETERS**

#### **Engine temperature**

In case of failure, the value read on Axone (20°C - 68°F) is set by the control unit, so it is not a real value.

### **AXONE: ELECTRICAL ERRORS**

**engine temperature sensor** - open circuit, shorted to positive / shorted to negative.

#### Error cause

- If the circuit is open, shorted to positive: excessive voltage has been detected at PIN 4 of the control unit connector.
- If shorted to negative: voltage equal to zero has been detected at PIN 4 of the control unit connector

#### Troubleshooting

- If the circuit is open, shorted to positive: check sensor connector and Marelli control unit connector; if not OK, restore cable harness; if OK, check sensor continuity; if it is not OK, replace the sensor; if it is OK, check continuity between PIN 4 of the control unit connector and the PIN marked by the orange cable of the sensor: restore cable harness if there is not continuity; if it is OK, reconnect the control unit connector and, with key set to ON, check continuity between the PIN marked by the grey cable of the sensor connector and the vehicle ground connection: if there is not continuity, restore cable harness; if there is continuity, it means that the error cause is a shorted-to-positive cable; therefore, restore cable harness between PIN 4 of the control unit and the PIN marked by the orange cable of the sensor. If the engine air temperature sensor error is displayed at the same time, it means that there is a short circuit to positive in the grey cable of both sensors.
  - If shorted to negative, check sensor correct resistance: if resistance = 0, replace the sensor; if resistance is correct, it means that the orange cable has ground connection: restore the cable harness.
-



## Air temperature sensor

### Function

It tells the control unit the intake air temperature in order to calculate oxygen presence so as to optimise the petrol quantity necessary for correct combustion.

### Operation / Operating principle

NTC type sensor (resistance sensor, inversely variable with temperature).

**Level in wiring diagram:** Temperature sensors

### Location:

- sensor: on the right side of the filter casing, next to the control unit
- connector: on the sensor

### Electrical characteristics:

- Resistance at 0°: 9.75 k $\Omega$   $\pm$  5%
- Resistance at 10°: 5.970 k $\Omega$   $\pm$  5%
- Resistance at 20°: 3.747 k $\Omega$   $\pm$  5%
- Resistance at 25°: 3.000 k $\Omega$   $\pm$  5%
- Resistance at 30°: 2.417 k $\Omega$   $\pm$  5%

### Pin-out:

- Grey (cable harness side): Ground connection
- Pink/black (cable harness side): 0-5 V signal

### AXONE:PARAMETERS

#### Air temperature

In case of failure, the value set by the control unit is 20 °C (68 °F)

### AXONE: ELECTRICAL ERRORS

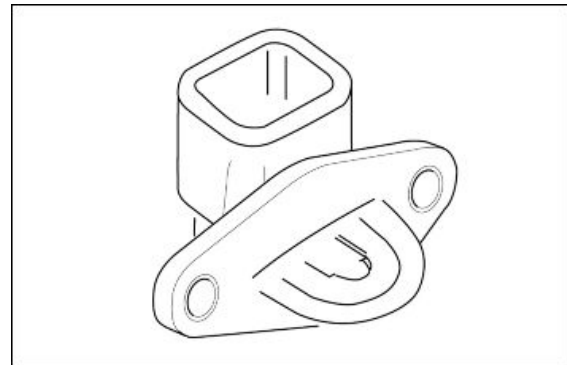
**air temperature sensor** open circuit, shorted to positive / shorted to negative.

#### Error cause

- If the circuit is open, shorted to positive: excessive voltage has been detected at PIN 18 of the control unit connector.
- If shorted to negative: voltage equal to zero has been detected at PIN 18 of the control unit connector

#### Troubleshooting

- If the circuit is open, shorted to positive: check sensor connector and Marelli control unit connector; if not OK, restore cable harness; if OK, check sensor continuity; if it is not OK, replace the sensor; if it is OK, check the continuity between PIN 18 of the control unit con-



nector and the PIN related to the pink/black cable (cable harness side) of the sensor: restore cable harness if there is not continuity; if it is OK, reconnect the control unit connector and, with key set to ON, check continuity between the PIN related to the grey cable (cable harness side) of the sensor and the vehicle ground connection: if there is not continuity, restore cable harness; if there is continuity, it means that the error cause is a shorted-to-positive cable; therefore, restore cable harness between PIN 18 of the control unit and the PIN related to the pink/black cable (cable harness side) of the sensor. If the engine temperature sensor error is displayed at the same time, it means that there is short circuit to positive in the grey cable of both sensors.

- If shorted to negative, check sensor correct resistance: if resistance = 0, replace the sensor; if resistance is correct, it means that the pink/black cable has ground connection: restore cable harness

**REMARKS** No error is detected if the sensor does not work correctly or the control unit connector or sensor terminals are rusty: then check through Axone if the temperature indicated is plausible in relation to the ambient temperature. Check also that the sensor electrical characteristics are observed: replace the sensor if not OK; if it is OK, check the sensor connector and the Marelli control unit connector

## Lambda sensor

### Function

It tells the control unit whether combustion is lean or rich.

### Operation / Operating principle

The Marelli injection control unit reads and interprets a voltage generated by the difference in oxygen content between the exhaust fumes and the ambient. It does not require an external supply source but, in order to work properly, it should reach a high operating temperature: that is why there is a heating circuit inside.

**Level in wiring diagram:** Lambda Probe

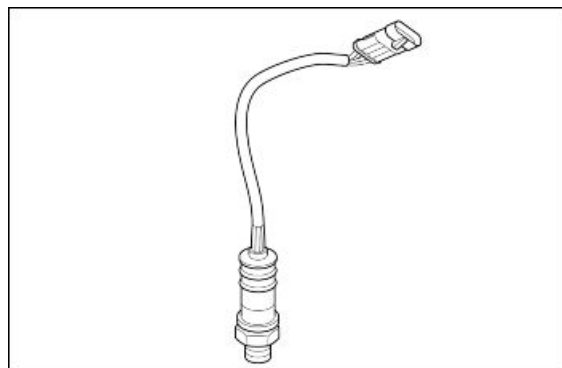
### Location:

- sensor: exhaust pipe
- connector: next to the starter motor

### Electrical characteristics:

Heater circuit: 12-14  $\Omega$  at 20 °C (68 °F)

### Pin-out:



1. Sensor signal + (black wire)
2. Sensor signal - (grey wire)
3. Heater ground connection (white)
4. Heater power supply (white)

**AXONE: PARAMETERS****Lambda probe**

Example value: 0 - 1000 mV

If there is a short circuit at + 5 V or higher, the read value is equal to approximately 1250 mV (the corresponding error will be displayed on the Axone). If there is a short circuit on ground connection, the read value is equal to 0 mV and the Lambda sensor correction parameter indicates 1.5: no error will be displayed.

**Lambda integrator**

Example value: 1.00

In closed loop, the value must be close to 1.0 (values not within the 0.7 - 1.3 interval indicate a fault). In an open circuit, the lambda probe signal is too low. Therefore, the control unit takes it as a lean combustion condition and will try to enrich it. The value read will be 1.5

**AXONE: STATUSES****Lambda check**

**Example value:** Open loop / Closed loop

Closed loop indicates that the control unit is using the lambda probe signal to keep the combustion as close as possible to the stoichiometric value.

**AXONE: ELECTRICAL ERRORS**

**Lambda probe** - Generic error.

Error cause

- If shorted to positive: excessive voltage (battery voltage) has been detected at PIN 8 or PIN 2 of the control unit connector.

Troubleshooting

- if shorted to positive: with key set to ON, disconnect the sensor connector and measure PIN 1 voltage (pink/yellow cable) on the cable harness side: if there is voltage (5 or 12 V), restore cable harness; if there is no voltage, measure voltage at PIN 2 on the cable harness side (green/yellow cable); and if there is voltage, restore cable harness; if there is no voltage, replace the lambda probe. After the cable harness has been restored or the probe replaced, the lambda probe error will remain active until an operation cycle is completed

**Lambda probe heating - Lambda probe that does not get into cycle**Error cause

- Short circuit/open circuit: lambda probe that does not get into cycle.

Troubleshooting

- Disconnect the connector and check that the heater resistance (on 2 white cables) is approximately 13 Ohm (at room temperature). If it is OK, check if there is ground connection on PIN 4 (blue cable) on the cable harness side; if OK, check if there is battery voltage on PIN 3 (red/brown cable) on the cable harness side for 2 seconds upon "key ON" and afterwards when the engine is started.

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## Injector

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### Function

To supply the correct amount of petrol at the right timing.

### Operation / Operating principle

Injector coil is excited for the petrol passage to open.

**Level in wiring diagram:** Coils and injectors

### Location:

- on the intake manifolds
- connector: on injector

**Electrical characteristics:** 14.8 Ohm +/- 5% (at 20 °C - 68 °F)

### Pin-out:

1. Ground connection
2. Power supply 12V

### AXONE: PARAMETERS

- Left cylinder injection time
- Right cylinder injection time

### AXONE: ACTIVATIONS

**Left injector:** Operation for 4 ms, 5 times

The auxiliary injection relay (No. 12 in the wiring diagram, placed under saddle, second relay starting from the front; CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the grey/red cable of the injector is closed to ground for 4 ms per second. Disconnect the 4-way connector of the fuel pump to be able to hear the relay and injector activation. The continuity of the wiring is necessary for correct activation: no error indications are displayed in case of lack of activation

### AXONE: ELECTRICAL ERRORS

**Left injector** - shorted to positive / shorted to negative / open circuit.

Error cause



- If shorted to positive: excessive voltage has been detected at PIN 13 of the control unit connector.
- If shorted to negative: no voltage has been detected.
- If the circuit is open: an interruption has been detected

#### Troubleshooting

- If shorted to positive: disconnect the injector connector, set the key to ON and check if there is voltage on the grey/red cable: if there is voltage, restore the cable harness; if there is not, replace the injector
- If shorted to negative: disconnect the injector connector, set the key to ON and check if there is continuity between the grey/red cable and the ground connection: if there is continuity with the ground connection, restore the cable harness; if there is not continuity, replace the injector
- The circuit is open: check the component correct electrical characteristic: if it is not the correct one, replace the component; if it is correct, check the connector on the component and the Marelli control unit connector: If it is not OK, restore; if it is OK, check continuity of the cable between PIN 13 of the control unit connector and PIN 1 of the component and restore the cable harness

#### **AXONE: ACTIVATIONS**

**Right injector:** Operation for 4 ms, 5 times

The auxiliary injection relay (No. 12 in the wiring diagram, placed under saddle, second relay starting from the front; CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the blue/red cable of the injector is closed to ground for 4 ms per second. Disconnect the 4-way connector of the fuel pump to be able to hear the relay and injector activation. The continuity of the wiring is necessary for correct activation: no error indications are displayed in case of lack of activation

#### **AXONE: ELECTRICAL ERRORS**

**Left injector** - shorted to positive / shorted to negative / open circuit.

#### Error cause

- If shorted to positive: excessive voltage has been detected at PIN 6 of the control unit connector.
- If shorted to negative: no voltage has been detected.
- If the circuit is open: an interruption has been detected.

#### Troubleshooting

- If shorted to positive: disconnect the injector connector, set the key to ON and check if there is voltage on the yellow/red cable: if there is voltage, restore the cable harness; if there is not, replace the injector.
- If shorted to negative: disconnect the injector connector, set the key to ON and check if there is continuity between the yellow/red cable and the ground connection: if there is continuity

with the ground connection, restore the cable harness; if there is not continuity, replace the injector.

- The circuit is open: check the component correct electrical characteristic: if it is not the correct one, replace the component; if it is correct, check the connector on the component and the Marelli control unit connector: If not OK, restore; if OK, check continuity between the cable of PIN 6 control unit connector and PIN 1 of the component and restore the cable harness.

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## Coil

### Function

It controls the ignition spark plug in order to generate the fuel ignition spark.

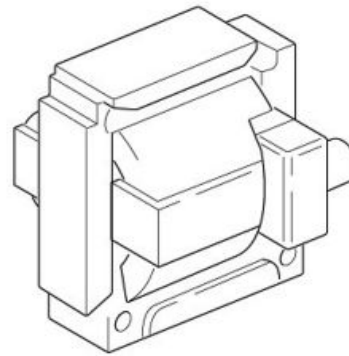
### Operation / Operating principle

Inductive discharge system.

**Level in wiring diagram:** Coils and injectors

### Location:

- centred under the fuel tank.
- connector: on the coils.



### Electrical characteristics:

- Primary winding resistance:  $550 \text{ k}\Omega \pm 10\%$
- Secondary winding resistance:  $3 \text{ k}\Omega \pm 10\%$
- Tube resistance  $5 \text{ k}\Omega$

### Pin-out:

1. Supply + batt V
2. Circuit ground connection

### AXONE: PARAMETERS

- Left coil ignition advance.
- Right coil ignition advance.

### AXONE: ACTIVATIONS

#### Left coil:

The auxiliary injection relay (No. 12 in the wiring diagram, placed under saddle, second relay starting from the front; CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the orange/white cable of the coil is closed to ground for 2 ms per second. Disconnect the 4-way connector of the fuel pump to be able to hear the relay and injector activation. The continuity

of the wiring is necessary for correct activation: no error indications are displayed in case of lack of activation.

### **AXONE: ELECTRICAL ERRORS**

**Left coil** - shorted to positive / open circuit, shorted to negative.

#### Error cause

- If shorted to positive: excessive voltage has been detected at PIN 20 of the control unit connector.
- If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 20 of the control unit connector

#### Troubleshooting

- if shorted to positive: disconnect the coil connector, set the key to ON, activate the coil with Axone and check voltage at connector PIN 2: if there is voltage, restore the cable harness; if voltage = 0, replace the coil
- if the circuit is open, short circuit to negative: check the coil connector and the Marelli control unit connector. If not OK, restore; if everything is OK, check cable continuity between the two cable terminals. If there is no continuity, restore the cable harness; if there is cable continuity, with key set to ON, check the cable earth insulation (from coil connector or control unit connector). If not OK, restore the cable harness.

### **Right coil:**

The auxiliary injection relay (No. 12 in the wiring diagram, placed under saddle, second relay starting from the front; CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the orange/blue cable of the coil is closed to ground for 2 ms per second. Disconnect the 4-way connector of the fuel pump to be able to hear the relay and injector activation. The continuity of the wiring is necessary for correct activation: no error indications are displayed in case of lack of activation.

**Right coil** - shorted to positive / open circuit, shorted to negative.

#### Error cause

- If shorted to positive: excessive voltage has been detected at PIN 14 of the control unit connector.
- If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 14 of the control unit connector

#### Troubleshooting

- if shorted to positive: disconnect the coil connector, set the key to ON, activate the coil with Axone and check voltage at connector PIN 2: if there is voltage, restore the cable harness; if voltage = 0, replace the coil.
- if the circuit is open, short circuit to negative: check the coil connector and the Marelli control unit connector. If not OK, restore; if everything is OK, check cable continuity between the

two cable terminals. If there is no continuity, restore the cable harness; if there is cable continuity, with key set to ON, check the cable earth insulation (from coil connector or control unit connector). If not OK, restore the cable harness.

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## Engine oil pressure sensor

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**Function:** it indicates the instrument panel if there is enough oil pressure 0.35 +/- 0.2 bar (5.1 +/- 2.9 PSI) in the engine.

**Operation / Operating principle:** normally closed switch. With oil pressure above 0.35 +/- 0.2 bar (5.1 +/- 2.9 PSI) open circuit.

**Level in wiring diagram:** petrol reserve and oil pressure.

**Location:**

- sensor: between the two heads, at the back.
- connector: on the sensor.

**Electrical characteristics:**

- With engine off: closed circuit (continuity).
- With engine on: open circuit (infinite resistance).

**Pin-out:** Voltage 12V

**Instrument panel**

**Warning light always off**

Troubleshooting

- Check the sensor connector and the instrument panel connector (PIN 17): If not OK, restore. If OK, check the continuity of the purple cable between the sensor connector and the instrument panel connector PIN 11: if not OK, restore the cable harness; if OK, replace the sensor

**Warning light always on**

Troubleshooting

- Disconnect the sensor connector and check the ground insulation of the purple cable: if there is continuity with the ground connection, restore the cable harness; if earth insulated, replace the switch. if the error remains, check oil pressure in the engine circuit with a pressure gauge





## Neutral sensor

### Function

it tell the gear position to the instrument panel: if it is in neutral or in gear.

### Operation / Operating principle

for neutral gear, the circuit is closed to ground connection: the instrument panel turns on the neutral warning light.

**Level in wiring diagram:**start-up enabling switches

### Location:

- sensor: rear / upper section of the gearbox
- connector: on the sensor

### Electrical characteristics:

- Gear in neutral: closed circuit (0 V on wire from instrument panel to sensor / switch in continuity).
- Gearshift: open circuit (12 V on wire from instrument panel to sensor) / open switch, infinite resistance

### Pin-out:

1. Voltage 12V

### DIAGNOSIS

NEUTRAL warning light always off: check black-green/brown cable (cable harness side): if it is no OK, restore cable harness; if it is OK, disconnect the connector and check, with gear in neutral, the continuity between the ground connection and the terminal on the sensor side: if there is not continuity, replace sensor (after checking cable harness continuity on the sensor side and correct mechanic position); if there is continuity, check continuity of the black-brown/green cable between sensor connector and main injection relay: if there is not continuity, restore the cable harness; if there is continuity, replace instrument panel if the vehicle operation is correct.

NEUTRAL warning light always on: disconnect the terminals from the sensor and check if there is continuity between the ground connection and the PIN towards the sensor, with gear engaged: if there is continuity, replace the sensor; if it is earth insulated, it means that the black-brown/green cable from the sensor PIN to the main injection relay is shorted to ground: restore the cable harness

---

## Clutch lever sensor

### Function

It tells the clutch lever position to the control unit.

### Operation / Operating principle

To start-up the engine, pull the clutch with gear in neutral.

**Level in wiring diagram:**Start-up enabling switches.

### Location:

- sensor: under clutch lever
- connector: under the fuel tank

**Electrical characteristics:**

- Clutch pulled: closed circuit (continuity)
- Clutch released: open circuit (infinite resistance)

**Pin-out:**

1. Ground connection
2. Voltage 12V

**DIAGNOSIS**

- Although the clutch lever is operated, the vehicle does not start. Check that if the gear is engaged, the stand is retracted; if it is OK, check continuity of the brown/green cable between the sensor connector (cable harness side) and the main injection relay: if still there is no continuity, restore the cable harness; if there is continuity, disconnect the sensor connector and check, with clutch pulled, if there is continuity between the 2 PIN of the connector on the sensor side. If there is not continuity, replace sensor; if there is continuity, check continuity of the purple cable between sensor (cable harness side) and start-up relay; otherwise, restore the cable harness.
- The vehicle starts without pulling the clutch lever: disconnect the terminals from the sensor and check if the released clutch sensor has continuity between the 2 PINS; if there is continuity, replace the sensor; if there is not continuity, it means that the purple cable from the sensor PIN to the start-up relay is shorted to ground.

---

**Side stand sensor****Function**

It tells the side stand position to the control unit.

**Operation / Operating principle**

If the gear is engaged and the side stand is unfolded, and therefore the circuit is open, the control unit does not enable vehicle start-up or shuts off the engine if it is rotating.

**Level in wiring diagram:** start-up enabling switches

**Location:**

- sensor: on side stand supporting plate
- connector: left side, near the starter motor

**Electrical characteristics:**

- Side Stand Up: closed circuit (continuity)
- Side Stand Down: open circuit (infinite resistance)

**Pin-out:**

- Blue (cable harness side): Ground connection
- Green/brown (cable harness side): voltage 12V

### DIAGNOSIS

- The vehicle with clutch pulled, gear engaged and side stand retracted does not start (side stand switch always open): check continuity of the green/brown cable between PIN 2 of diode 40 (wiring diagram) and the corresponding PIN of the sensor connector on the cable harness side. If there is not continuity, restore cable harness; if there is continuity, with side stand retracted, check continuity between the 2 PINS of the sensor. If there is not, replace the sensor; if there is continuity, check continuity to ground connection of the blue cable on the connector (cable harness side).
- The vehicle, with clutch operated and gear engaged, starts but with the side stand extended: disconnect the sensor connector and check that, with side stand extended, there is not continuity between the 2 PINS. If there is continuity, replace the sensor; if there is not continuity, disconnect diode 40 and check ground insulation of the green/brown cable between sensor and diode

## Bank angle sensor

### Function

it tells the vehicle position to the control unit.

### Operation / Operating principle

When the sensor is inverted, the circuit is closed to ground: when the Marelli control unit detects this ground, it deactivates the circuit of the fuel pump and the engine start-up circuit, via the injection relay.

**Level in wiring diagram:** Start-up enabling switches.

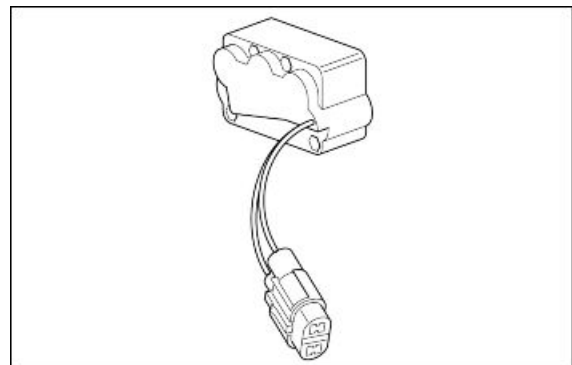
### Location:

- under the saddle, rear section
- connector: near the sensor

### Electrical characteristics:

- Sensor in vertical position: open circuit (resistance: 62 kOhm)
- Sensor inverted: closed circuit (resistance lower than 0.5 kOhm)

### Pin-out:



- Pink/yellow (cable harness side): Voltage 12V
- Grey (cable harness side): ground connection

### DIAGNOSIS

The vehicle starts, even if the sensor is inverted: disconnect the connector and, with sensor inverted, check if there is continuity between the two PINS of the sensor: if there is not continuity, replace the sensor; if there is, check the connector. If it is not OK, restore the cable harness; if it is OK, check ground connection continuity of the PIN marked by the grey cable on the cable harness side: if there is no continuity, restore the cable harness; if there is, with key set to ON, check if there is 12V voltage at the PIN marked by the red/yellow cable on the cable harness side. If there is not, check the PIN 16 of the Marelli control unit connector.

The vehicle does not start with the sensor in vertical position: disconnect the connector and check if there is continuity between the two PINS when the sensor is in vertical position: if there is continuity, replace the sensor; if there is not continuity, it means that, with key set to ON, there is not 12V voltage to the PIN marked by the pink/yellow cable: restore the cable harness whose pink/yellow cable will be shorted to ground

## Air temperature sensor - instrument panel

### Function

It tells the ambient air temperature to the instrument panel.

### Operation / Operating principle

NTC type sensor (resistance sensor, inversely variable with temperature).

**Level in wiring diagram:** Temperature sensors

### Location:

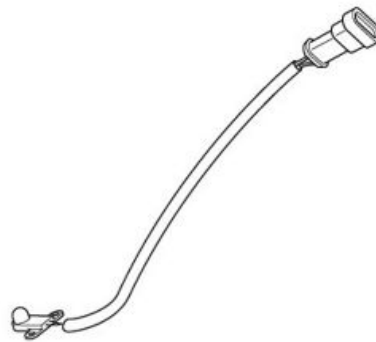
- under instrument panel supporting bracket
- connector: under the start-up lock

### Electrical characteristics:

- Resistance at 0°C: 32.5 kOhm +/- 5%
- Resistance at 25°C: 10.0 kOhm +/- 5%

### Pin-out:

1. Voltage 5V
2. Ground connection



### DIAGNOSIS

**"---" code that indicates an instrument panel error**

Air temperature sensor fault

Error cause

- An instrument panel temperature sensor failure is signalled when it is detected that the sensor circuit is open or shorted to positive/negative

Troubleshooting

- Check the sensor connector and the instrument panel connector (PIN 12): if it is not OK, restore; if it is OK, check the continuity of the pink cable between the sensor connector (cable harness side) and the PIN 12 of the instrument panel connector: if not OK, restore the cable harness; if OK, check the correct sensor resistance: if it is not OK, replace the sensor; if it is OK, with key set to ON, check if there is voltage at the sensor connector PIN 1: if there is no voltage, replace the instrument panel; if there is approximately 12V, restore the cable harness (there is a short circuit in the battery). If there is 5V voltage, connect a 10 kOhm resistance to PIN 1 of the sensor connector and to the vehicle ground connection: if, with key set to ON, the voltage measured upstream the resistance decreases, replace the instrument panel. If voltage continues to be approximately 5V, restore the pink cable (there is a short circuit at + 5V). In case there is a short circuit to ground connection of PIN 12 of the instrument panel connector: Check the earth insulation of the sensor connector pink cable: if there is a connection, restore the cable harness; if it is earth insulated, check that sensor resistance is correct: if not OK, replace the sensor; if it is OK, replace the instrument panel

---

**RUN/STOP switch****Function**

It tells the control unit if the driver wishes to enable engine start-up or to keep the engine running.

**Operation / Operating principle**

If the driver wants to shut off the engine or to disable engine start-up, the switch should be open, i.e. the Marelli control unit should not detect voltage at PIN 26 of the control unit connector.

**Level in wiring diagram:** Start-up enabling switches.

**Location:**

- sensor: right light switch
- connector: near the headstock, right side

**Electrical characteristics:**

- STOP position: the circuit is open
- RUN position: closed circuit (continuity)

**PIN:**

red/grey cable (watching the cable harness):

- voltage 0 V with engine kill in STOP;
- 12 V with engine kill in RUN.

Orange/red cable (cable harness side): always voltage 12 V (with key on)

### DIAGNOSIS

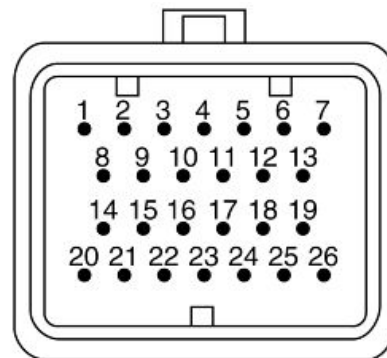
- Engine does not start: disconnect the connector and with switch set to RUN, check if there is continuity between the two grey/light blue and red/green cables (sensor side): if there is not continuity, replace the sensor; if there is continuity, check the connector. If it is not OK, restore cable harness; if it is OK, with key set to ON, check that there is voltage on the orange/red cable (cable harness side); if there is no voltage, restore cable harness; if there is voltage, check earth insulation of the red/grey cable (cable harness side). If there is continuity with ground connection, restore the cable harness; if it is OK, set the key to KEY OFF and check the control unit connector; if it is OK, replace the Marelli control unit
- Engine does not shut off with switch in "STOP": disconnect the connector and with switch in STOP, check if there is continuity between the two grey/light blue and red/green cables (sensor side); if there is continuity, replace the switch; if there is not continuity, it means that, with KEY ON, the red/grey cable (between switch and main injection relay) and/or the grey/black cable (between main injection relay and Marelli control unit) are in shorted to positive: restore the cable harness. If cable harness is OK, replace the Marelli control unit

## Connectors

### ECU

#### PIN:

1. Throttle position sensor supply - Power output
2. Lambda probe signal (ground) - Analogue input
3. Rpm indicator control - Frequency output
4. Cylinder head temperature sensor signal - Analogue input
5. -
6. Right injector control - Power output
7. Engine revolution sensor - Frequency input
8. Lambda probe signal (positive) - Analogue input
9. Diagnosis line (K) - Communication line



10. Diagnosis line (L) - Communication line
11. Throttle position signal - Analogue input
12. Engine revolution sensor - Frequency input
13. Right injector control - Power output
14. Right coil control - Power output
15. Injection telltale light control - Digital output
16. Fall sensor signal - Digital input
17. Control unit supply - Power input
18. Intake air temperature sensor signal - Analogue input
19. Injection relay control - Digital output
20. Left coil control - Power output
21. -
22. Sensors supply (ground) - Power output
23. Control unit supply (ground) - Power input
24. Control unit supply (ground) - Power input
25. -
26. Control unit supply (+15) - Power input

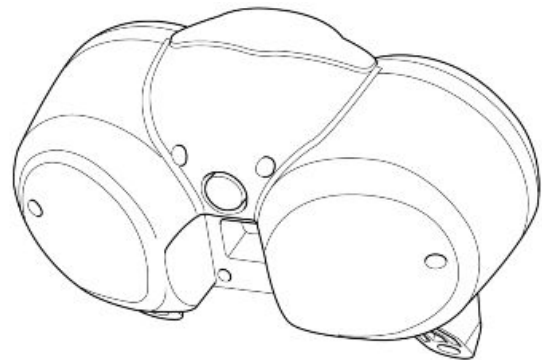
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## Dashboard

---

**PIN:**

1. Right arrow input
2. Set rework input
3. High-beam lights input
4. n.c.
5. n.c.
6. Rear left arrow output
7. Front left arrow output
8. EFI input
9. Left arrow input
10. Neutral input
11. Oil input
12. Air temperature input
13. Speed sensor power supply
14. Ground connection
15. K Line
16. n.c.



- 17.Speed input
  - 18.Engine revs input
  - 19.n.c.
  - 20.Reserve input
  - 21.Key
  - 22.Ground connection
  - 23.Battery
  - 24.Front right arrow output
  - 25.Rear right arrow output
  - 26.Battery
-



# INDEX OF TOPICS

ENGINE FROM VEHICLE

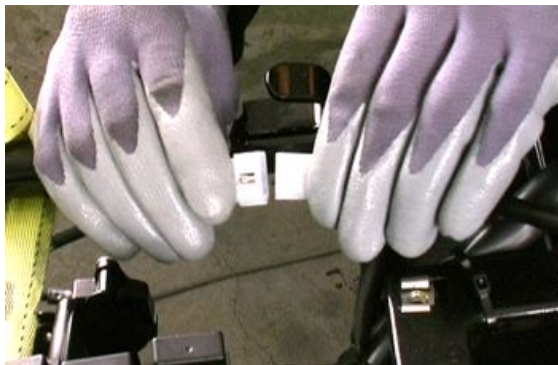
ENG VE

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## Vehicle preparation

---

- Before removing the engine block, remove the fuel tank, the battery, the exhaust pipes, the shock absorbers and the rear wheel.
- Disconnect the speed sensor connection and slide off the cable from the cable harness.



- Remove the swingarm and the bevel gear pair.



---

## Removing the engine from the vehicle

---

- Disconnect the electrical connections of the generator.



- Remove the revolution sensor but keep it connected to the cable harness.



- Slide the pin, with the split pin, fixing the linkage to the clutch to the engine block and then release the control cable.



- Remove the injectors lock and slide injectors off their seat on the inlet manifolds.



- Disconnect the spark plug cables from the coils and slide them off the chassis.



- Loosen the clamps on the intake manifolds.



- Disconnect the oil breather pipe on the cylinder heads.



- Remove the connection of the engine temperature sensor.



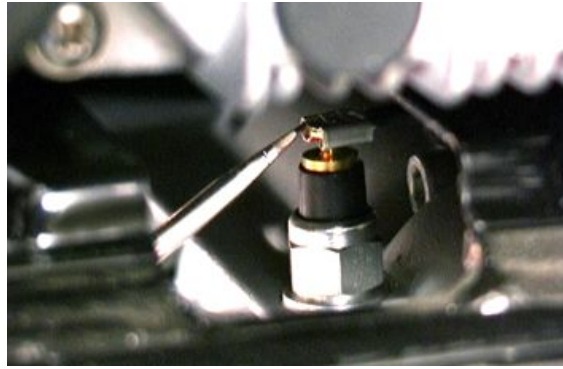
- Disconnect the starter motor and the lambda probe.



- Open the clamp and disconnect the oil breather pipe of the air filter casing.



- Disconnect the neutral indicator.



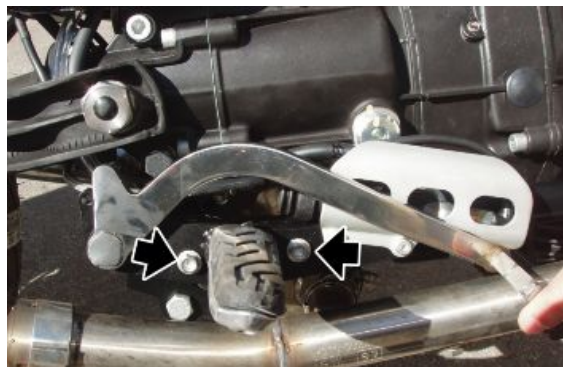
- Disconnect the connector of the side stand safety switch and slide off the cable harness from the chassis.



- Undo and remove the screw.
- Remove the gear transmission lever.



- Undo and remove the two right footrest screws, move the rear brake pedal that is still attached to the tank and to the calliper.



- Undo the screw fixing the ground eye-let on the engine block.



- Support the vehicle chassis by means of a hoister.
- Undo the four Allen head screws fixing the front arms of the chassis to the engine cradle.



- Remove the upper screws fixing the chassis to the gearbox cover.

- Remove the rod fixing the chassis to the gearbox .



- Remove the engine: check that during the removal operation, the throttle body sleeves slide off the inlet manifolds without getting damaged.



- Lower the engine checking that it gets correctly detached from the chassis.

- During this removal operation, disconnect the connection of the oil pressure transmitter.



## Installing the engine to the vehicle

- Secure the scooter chassis by fastening it with a hoister and lift the engine to place it in its position.
- During this operation, connect again the oil pressure transmitter connection and check that the throttle body sleeves are inserted correctly on the intake manifolds.
- With the engine in position, fit the rod fixing the chassis to the gearbox, tightening it to the prescribed torque.



- Tighten to the prescribed torque the upper screws fixing the chassis to the gearbox cover.



- Fasten the chassis front arms to the engine cradle using the four Allen head screws. Tighten them to the prescribed torque.





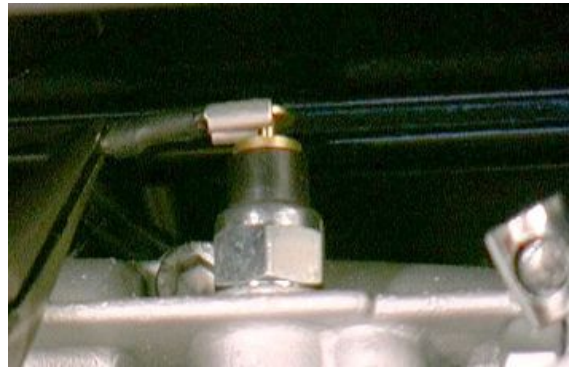
- Fit the screw fixing the ground eyelet on the engine block.



- Restore the connection of the side stand safety switch.



- Connect the neutral indicator.



- Insert the oil breather pipe in the air filter casing and lock it with the corresponding clamp.



- Connect the starter motor and the lambda probe.



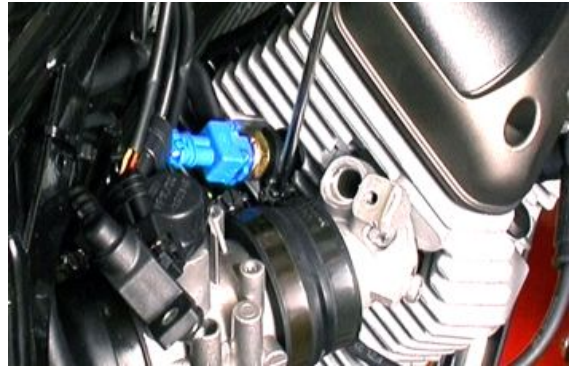
- Restore the connection of the engine temperature sensor.



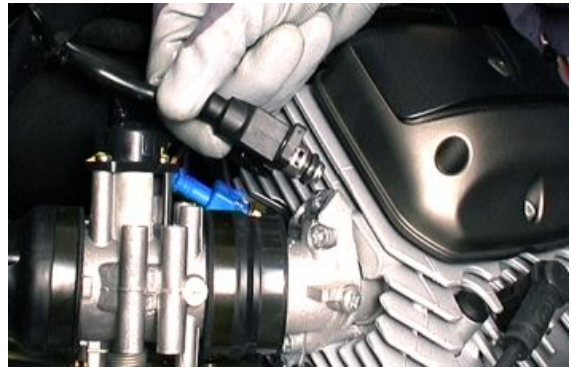
- Insert the breather pipes on the cylinder heads and lock them with the specific clamps.



- Tighten the clamps on the intake manifold.



- Insert the injectors in their positions and fit the locking ring, tightening the screw to the prescribed torque.



- Connect the spark plug cables on the ignition coils.



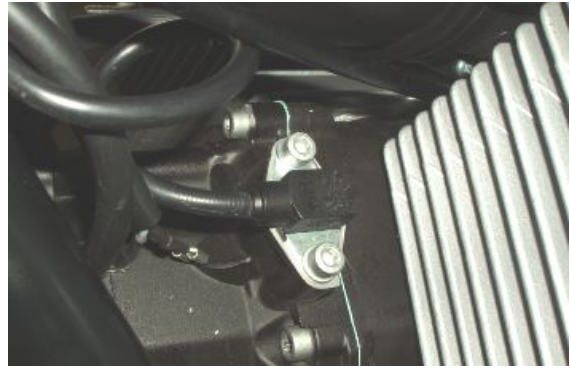
- Place the clutch linkage and insert the pin on the engine block, locking it with the corresponding split pin.



- Refit the swingarm and the bevel gear pair.



- Fit the revolution sensor by tightening the screws to the prescribed torque.



- Restore the electrical connections of the generator.



- Restore the connection of the vehicle speed sensor.

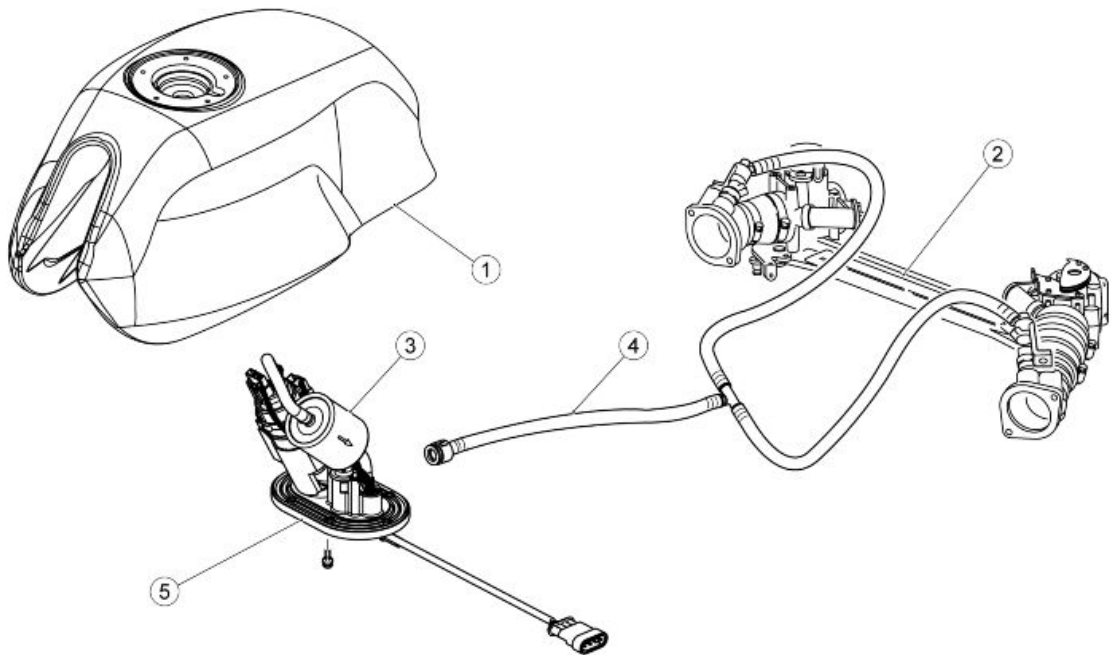


## INDEX OF TOPICS

**POWER SUPPLY**

**P SUPP**

---

**Circuit diagram****Key:**

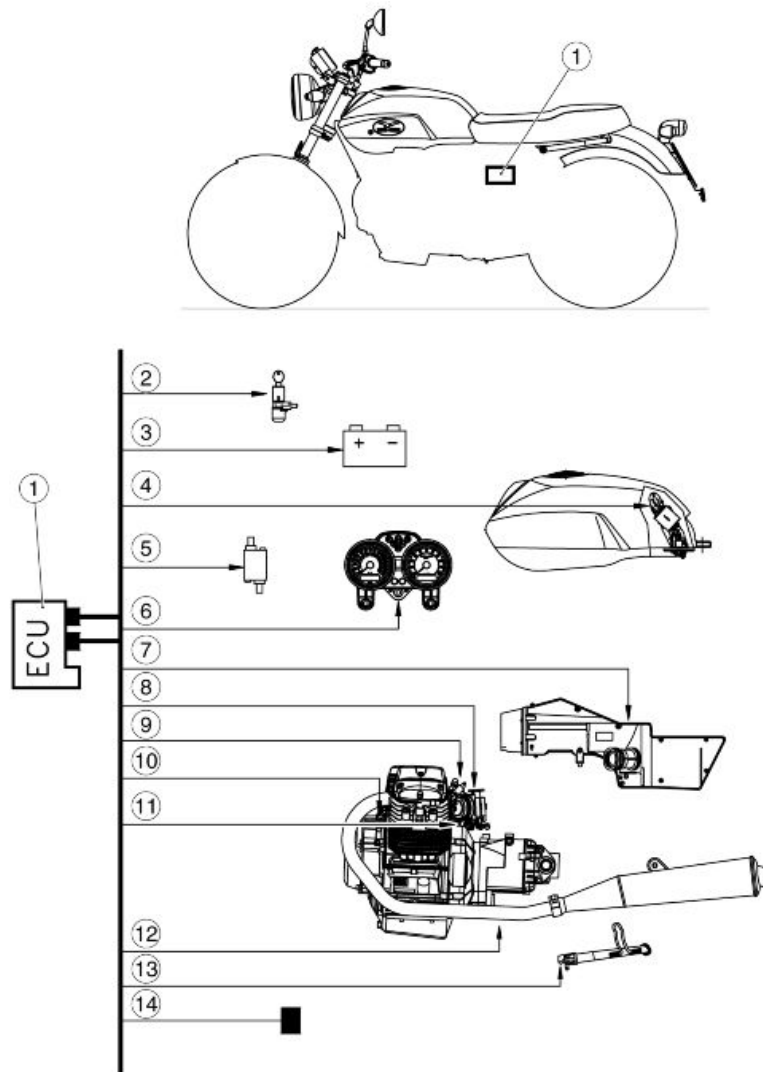
1. Fuel tank
2. Throttle body
3. Fuel filter
4. Fuel delivery pipe
5. Fuel pump unit

---

**Injection**

---

## Diagram

**Key:**

1. Control unit position
2. Ignition switch
3. Battery
4. Fuel pump
5. Coils
6. Instrument panel
7. Air temperature sensor
8. Throttle valve position sensor
9. Injectors
10. Crankshaft position sensor
11. Engine temperature sensor
12. Lambda Probe



13. Fall sensor

14. Side stand

## Cylinders synchronisation

- With engine off, connect the Axone 2000 tool to the diagnosis connector and to the vehicle battery.



- Turn on the scanner.
- Screw the joints connecting the vacuumometer pipes on the inlet pipe holes.
- Connect the vacuumometer pipes to the relative joints.



- The Axone should display the setting up adjustments screen page.
- Make sure the throttle valve is fully in.
- Autodetect the throttle position.



- Turn the key to "OFF" and leave it for at least 30 seconds.

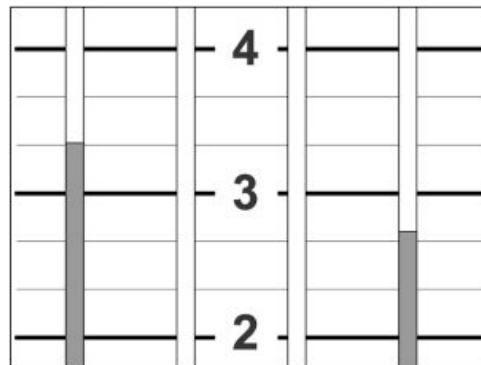


**DO NOT TOUCH THE THROTTLE ABUTMENT SCREW OR THE THROTTLE BODY MUST BE REPLACED. CHECK THAT THE THROTTLE RETURN CABLE IS NOT TAUT.**

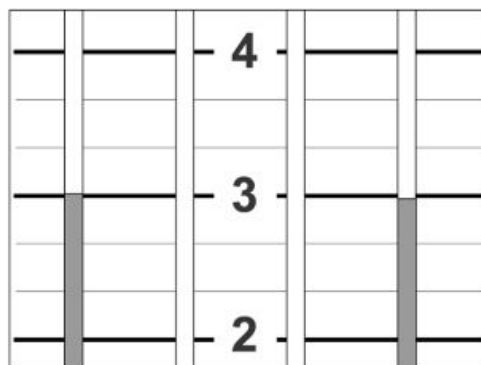
- Start the engine.
- Take the engine to the prescribed temperature: 50 °C (122 °F).
- Completely close the two by-pass screws on the throttle bodies.



- Take the engine to an out-of-idle speed: 2000 - 3000 rpm.
- Check cylinder compensation on the vacuummeter.



- To correct compensation use the set screw of the control rod of the throttle bodies, on the left side of the vehicle, until cylinders are compensated.



Now, it is necessary to adjust idle speed:

- Take the engine to the prescribed temperature: 70 - 80°C (158 - 176 °F).
- Operating the by-pass screws, adjust idle: 1100 ± 50 rpm.

## Co rate adjustment

It is not possible to adjust CO (time of injectors opening) but just resetting the self-adjustable parameters in case the throttle body is replaced because it is worn.

## Iso screen page

### ISO

This display shows general data regarding the control unit, for example software type, mapping, control unit programming date



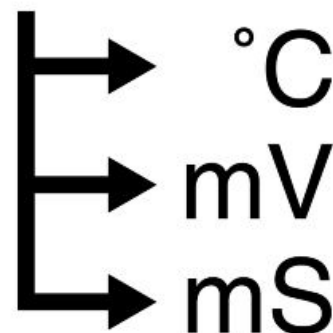
### ISO DISPLAY

Specification	Desc./Quantity
Mapping	-

## Engine parameter reading screen page

### ENGINE PARAMETER READING

This display shows the parameters measured by the several sensors (engine revs, engine temperature, etc.) or values set by the control unit (injection time, ignition advance, etc.)



### ENGINE PARAMETER READING SCREEN PAGE

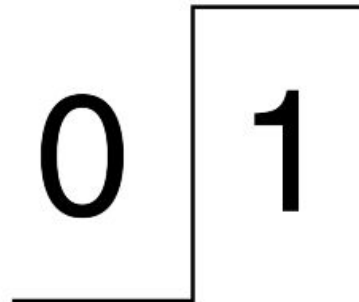
Specification	Desc./Quantity
Throttle	Value corresponding to the throttle when closed (approximate value between 4.5 and 4.9°) (left throttle supported by the end of stroke screw). If a different value is read, it is necessary to activate the parameter "Throttle positioner autodetection" and obtain this value.
TPS Trimmer	Supplementary parameter related to throttle keying in calibration.
Precise throttle position	Throttle opening angle in degrees: once the throttle position self-learning is carried out, it falls within the following value range: 3.1° ± 0.4°.
Lambda Probe	300 - 3000 mV (approximate values). Signal when energised that the control unit receives from the lambda probe: inversely proportional to the presence of oxygen.

Specification	Desc./Quantity
Lambda integrator	When the control unit uses the lambda probe signal (see the 'Lambda' parameter on the 'Device status' display) this value should be close to 0%
Partial load self-adjustment	Supplementary correction factor for the injection time, in out-of-idle condition.
Idle check self-adjustment	Supplementary correction factor for the injection time, in idle condition.
Rich multiplicative correction	Multiplicative correction factor for the injection time.
Not synchronised timing of a tooth	Number of engine timing steps during which the revolution timing sensor has lost the signal of a tooth.
Higher not synchronised timing of a tooth	Number of engine timing steps during which the revolution timing sensor has lost the signal of more than one tooth.
Engine rpm	Engine revolutions per minute: the minimum value is set by the control unit cannot be adjusted
Injection time	- ms
Ignition advance	- °
Atmospheric pressure	1015 mPa (approximate values) The sensor is inside the instrument panel
Air temperature	°C Temperature of the air taken in by the engine, measured by the sensor in the filter casing. This is not the temperature indicated by the instrument panel
Engine temperature	°C
Battery voltage	V

## Device status screen page

### DEVICE STATUS

This screen page shows the status (usually ON/OFF) of the vehicle devices or the operation condition of some vehicle systems (for example, lambda probe functioning status).



### DEVICE STATUS

Specification	Desc./Quantity
Engine status	ON/run/power-latch/stopped operation conditions
RPM sensor	Synchronised / Not synchronised.
Throttle position	Released / pressed indicates if the throttle potentiometer is open or closed
Lambda	Open loop / Closed loop Indicates if the control unit is using (CLOSED) the lambda probe signal to keep the stoichiometric combustion. At idle CLOSED only if: Air T over 20°C (68°F) and engine T over 30°C (86°F) and engine on for at least 2-3 minutes

## Devices activation screen page

### DEVICES ACTIVATION

This display is used to delete errors in the control unit memory and to activate some systems controlled by the control unit.



### DEVICES ACTIVATION

Specification	Desc./Quantity
Error clearing	By pressing the 'enter' button, the stored errors (MEM) become part of the historical data (STO). In the next connection between the Axone and the control unit, the historical errors (STO) are no longer shown
Fuel pump	Operation for 30"
Left coil	operation for 2.5 m, 5 times
Right coil	operation for 2.5 m, 5 times
Rpm indicator	Control at 125 Hz (3750 rpm) for 2 seconds.
Left injector	Operation for 2 ms per second for 5 times.
Right injector	Operation for 2 ms per second for 5 times.

## Errors display screen page

### ERRORS DISPLAY

This display shows potential errors detected in the vehicle (ATT) or stored in the control unit (MEM) and it allows to check error clearing (STO).



### ERRORS DISPLAY

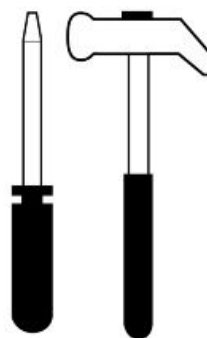
Specification	Desc./Quantity
Engine temperature	Possible short circuit in the earth lead, battery or open circuit.
Left coil	Possible short circuit in the earth lead, battery or open circuit. If both coils do not work, the engine does not work.
Right coil	Possible short circuit in the earth lead, battery or open circuit. If both coils do not work, the engine does not work.
Left injector	Possible short circuit in the earth lead, battery or open circuit. If both injectors do not work, the engine does not work
Right injector	Possible short circuit in the earth lead, battery or open circuit. If both injectors do not work, the engine does not work
Lambda Probe	Possible short circuit in the earth lead, battery or open circuit.
Air temperature	Possible short circuit in the earth lead, battery or open circuit.
Throttle	Possible short circuit in the earth lead, battery or open circuit.
Pressure	Possible short circuit in the earth lead, battery or open circuit.
Battery voltage	Battery voltage detected is too low (7V) or too high (16V) for a certain period

Specification	Desc./Quantity
Fuel pump relay	Possible short circuit in the earth lead, battery or open circuit: the engine does not start.
Self-adjustable parameters	-
RAM memory	Possible internal control unit error. Also check the control unit supply and earth connections
ROM memory	Possible internal control unit error. Also check the control unit supply and earth connections
Checksum EPROM	Possible internal control unit error. Also check the control unit supply and earth connections
Microprocessor	Possible internal control unit error. Also check the control unit supply and earth connections
RPM sensor	-

## Adjustable parameters screen page

### ADJUSTABLE PARAMETERS

This screen page is used to adjust some control unit parameters.



### ADJUSTABLE PARAMETERS

Specification	Desc./Quantity
Throttle positioner autodetection	Allows the control unit to detect the closed throttle position: just press the enter button
Self-adjustable parameters reset	Reset the self-adjustable parameters of the lambda check when important parts of engine (valves, cylinder, camshaft), exhaust system, control unit, supply system and lambda probe should be replaced. The three self-adjustable correction factors of the lambda check related to the injection time are reset electronically.

# INDEX OF TOPICS

**SUSPENSIONS**

**SUSP**

## Front

### Removing the front wheel

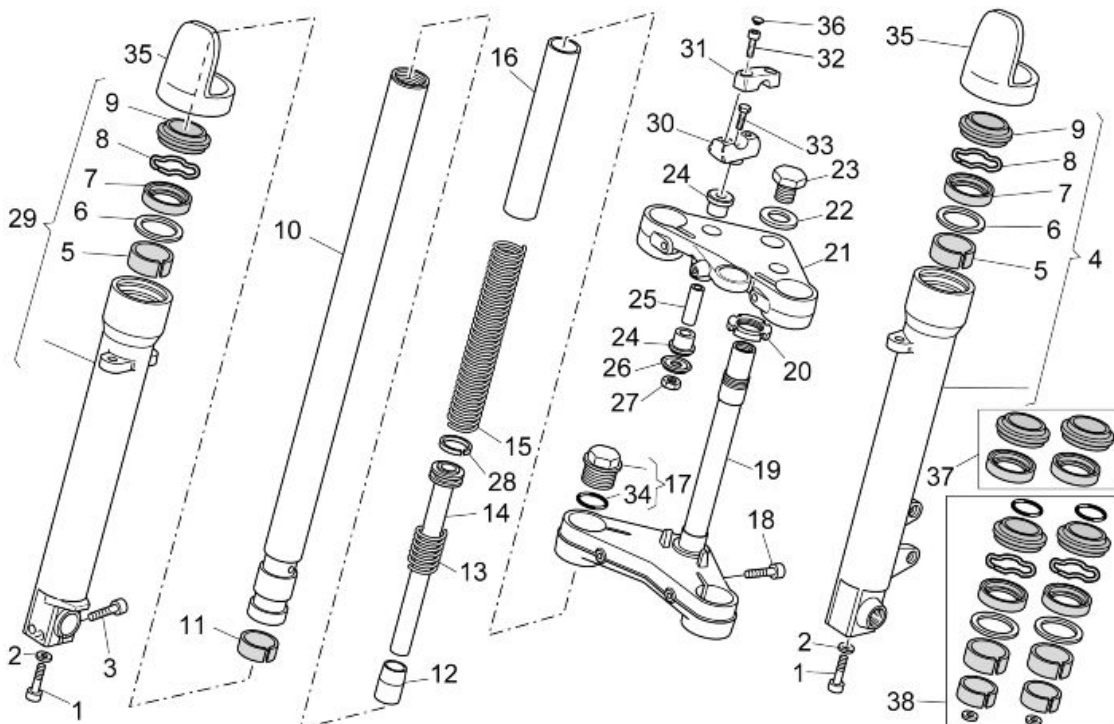
- Place the vehicle on a stable support so that the front wheel does not touch the ground.
- Remove the brake calliper without disconnecting the oil pipes



- Remove the front wheel.

### Front fork

### Diagram



#### Key:

1. Screw
2. Washer



3. Screw
  4. Complete left sleeve
  5. Upper bushing
  6. Washer
  7. Sealing ring
  8. Snap ring
  9. Dust guard
  10. Stem
  11. Lower bushing
  12. Buffer
  13. Counter spring
  14. Complete pumping member
  15. Spring
  16. Pipe
  17. Complete cap
  18. Screw
  19. Base with headstock
  20. Ring nut
  21. Fork upper plate
  22. Washer
  23. Nut
  24. Rubber ring
  25. Spacer
  26. Cap
  27. Nut
  28. Ring
  29. Complete right sleeve
  30. Lower U-bolt
  31. Upper U-bolt
  32. Screw
  33. Screw
  34. O-ring
  35. Stem protection
  36. Chrome-plated cap
  37. Gasket kit
  38. Oil seal kit
-

## Removing the fork legs

The vehicle is equipped with a non adjustable fork. The operations described below are valid for both stems.

### CAUTION

**DURING THE OPERATIONS DESCRIBED BELOW, THE STEMS AND THEIR INTERNAL COMPONENTS SHOULD BE TIGHTENED ON A VICE. MAKE SURE NOT TO DAMAGE THEM BY OVERTIGHTENING; ALWAYS USE ALUMINIUM JAW CAPS.**

- Remove the front wheel.
- Remove the front mudguard.



- Undo and remove the two screws and collect the washers.



- Move the instrument panel forwards.

- Undo the upper sealing screw.



- Undo the lower sealing screw.

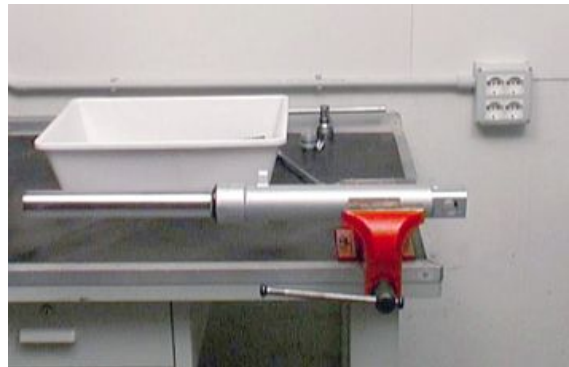


- Slide off the stem downwards by turning it slightly first in one direction then to the opposite direction.

## Draining oil

To drain out the oil follow these steps.

- Remove the fork stem.
- Tighten the removed stem in a vice fitted with aluminium jaw caps in order to avoid damaging them.



- Unscrew the upper closing cap. Pay attention to the possible thrust that the spring can cause to the loosened cap.



- Be careful not to damage the O-Ring during extraction.
- Press the bearing tube inside the wheel holder fork leg.
- Remove the preload tube and the spring.



- Drain out all the oil inside the stem.

**NOTE**

FOR EASY DRAINAGE OF THE OIL INSIDE THE PUMPING MEMBER ROD, PRESS THE STEM IN THE WHEEL HOLDER SLEEVE TO PUMP OIL OUT.



- Carefully check each part of the stem and make sure that there are no damaged elements.
- If there are no damaged or worn elements, refit the stem; otherwise, replace the damaged elements.

**NOTE**

FOR EASY DRAINAGE OF THE OIL INSIDE THE PUMPING MEMBER ROD, PRESS THE STEM IN THE WHEEL HOLDER SLEEVE TO PUMP OIL OUT.



## Disassembling the fork

- Drain all the oil from the stem.
- Block the wheel holder fork leg on the vice.
- Undo the bottom screw and remove it with the corresponding gasket.



- Remove the dust scraper using a screwdriver as a lever.

**CAUTION**

**BE CAREFUL NOT TO DAMAGE THE FORK LEG RIM AND THE DUST SCRAPER.**



- Slide the dust scraper off and upwards.



- Remove the locking ring inside the fork leg using a thin screwdriver.

**CAUTION**

**BE CAREFUL NOT TO DAMAGE THE FORK LEG RIM.**



- Slide off the bearing tube from the wheel holder fork leg together with the sealing ring, the cap, the upper bushing and lower bushings.

**NOTE**

**WHEN REMOVING THE PIPE FROM THE WHEEL HOLDER FORK LEG SOME PARTS MAY REMAIN INSIDE THE FORK LEG. IF THIS OCCURS, THESE PARTS MUST BE REMOVED AFTERWARDS, BEING CAREFUL NOT TO DAMAGE THE FORK LEG RIM AND THE UPPER BUSHING SEAT**



## Checking the components

- Check every component removed from the fork leg, specially: the sealing ring and the dust guard as they are elements that guarantee sealing; replace them if some of them are damaged.
- Check the bushing on the bearing tube; remove it and replace it if damaged or worn.
- Slide off the pumping member unit from the holding tube; if it is damaged, replace the counter spring and the ring.



## Reassembling the fork

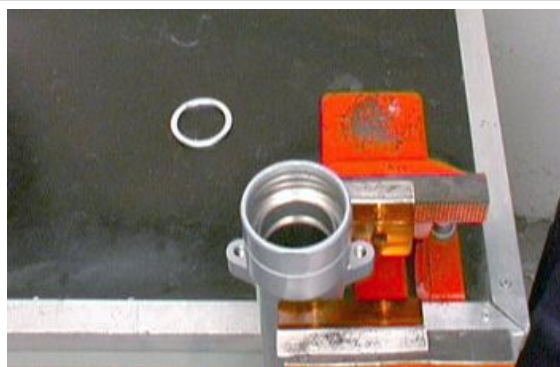
### CAUTION

**ALL COMPONENTS MUST BE CAREFULLY WASHED AND DRIED WITH COMPRESSED AIR BEFORE REFITTING.**

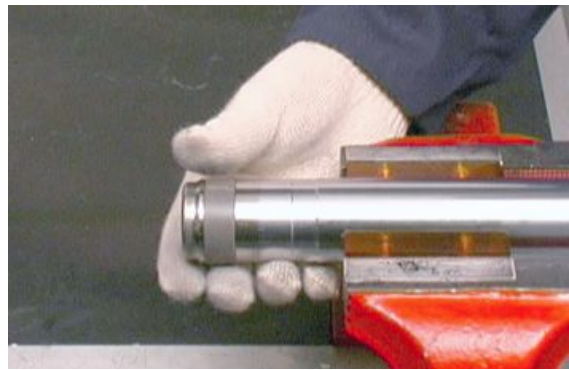
- Carry out any necessary service operation.
- Insert the pumping member unit with the counter spring and the ring in the bearing tube.



- Check that the upper guide bushing is fitted on the wheel holder fork leg.



- Insert the lower sliding bushing in its seat on the bearing tube.



- Reassemble the bearing tube in the wheel holder fork leg.



- Insert the bearing tube in the wheel holder and push it until it stops.



- Screw the bottom screw and tighten it to the prescribed torque.



- Insert the cap and the well-lubricated sealing ring on the bearing tube.
- Use a suitable inserting tool to push the sealing ring in the fork leg until it stops.



- Fit the locking ring.



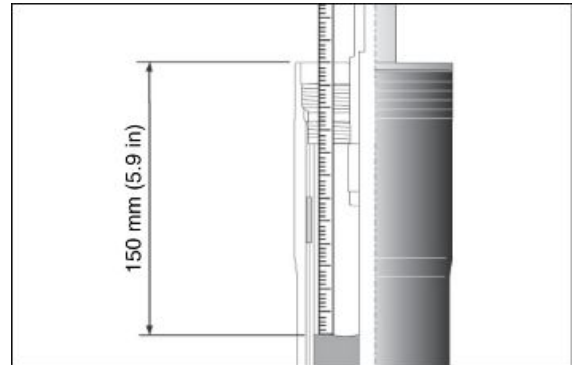
- Fit the dust scraper.
- Pour oil into the bearing tube so that it also fills the internal grooves of the pumping member rod.
- Pump with the bearing tube, making sure the oil has completely filled the pumping member rod.
- Introduce the spring and the preload tube.
- Place the cap on the bearing tube, taking care not to damage the O-ring. Then, tighten the cap to the prescribed torque.





## Filling oil

- Place the sleeve upright in a vice fitted with protection jaws.
- Compress the sleeve in the stem.
- Pour part of the fork oil into the sleeve.
- Wait some minutes until the oil fills all the ducts.
- Pour the remaining oil.
- Pump out oil a few times.
- Measure the air gap between the oil level and the rim.



**THE SLEEVE MUST BE PERFECTLY UPRIGHT IN ORDER TO MEASURE THE CORRECT OIL LEVEL. THE OIL LEVEL MUST BE THE SAME IN BOTH STEMS.**

### Characteristic

**Oil level (from sleeve rim, without the spring and with stem at the end of the stroke)**

150 mm (5.9 in)

- Introduce the spring and the preload tube.



- Place the cap on the bearing tube, taking care not to damage the O-ring.



- Then, tighten the cap to the prescribed torque.



## Installing the fork legs

- Insert the stem on the vehicle going through the lower plate and the upper plate.
- Tighten the screws to the prescribed torque.



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## Steering bearing

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### Adjusting play

---

- Undo and remove the screws and collect the U-bolt, holding the handlebar.
- Move the handlebar forward, be careful not to turn over the front brake fluid reservoir.
- Remove the instrument panel.



- Working from both sides, undo and remove the screw locking the upper plate to the front fork.



- Unscrew and remove the central nut.



- Remove the upper plate from the front fork.



- Adjust the ring nut.
- Fit the upper plate on the front fork.



- Tighten the central nut.



- Working from both sides, tighten the screw locking the upper plate to the front fork.
- Fit the handlebar.
- Fit the instrument panel.

---

## Rear

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## Shock absorbers

---

**Removing**

- Undo and remove the upper screw.



- Undo and remove the lower screw.



# INDEX OF TOPICS

**CHASSIS**

**CHAS**

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## Swinging arm

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### Removing

---

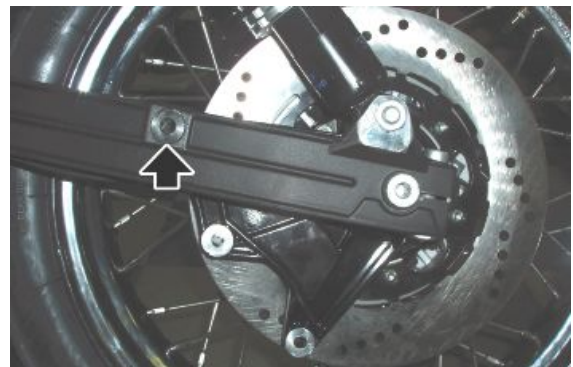
- Remove the left silencer.



- Remove the rear calliper, releasing the brake pipe from the retainers on the swingarm .



- Unscrew and remove the fixing screw of the calliper holder.



- Remove both rear suspensions.



- Unscrew and remove the nut and collect the washer.



- Loosen the wheel pin locking screw.



- Remove the wheel pin and collect the spacer.



- Remove the rear wheel.

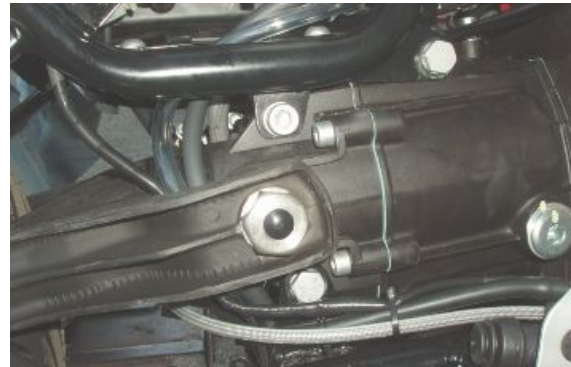




- Unscrew the seal clamp.
- Lift the bellows.



- Unscrew the nuts.



- Loosen the pins so that the oscillating swingarm can be removed from the gearbox.



- Remove the shimming washer between the swingarm right arm and the gearbox.



## Checking

- Check that the universal joint is not damaged, the gear teeth inserting in the sleeve grooves and the grooves on the joint are not deformed or damaged; otherwise, replace the joint.

- Check that the rubber bellows are not cut or pierced; otherwise, replace it.
- Check that the swingarm pin threads and the swingarm fixing nuts are not damaged, deformed or flattened; otherwise, replace them.
- Check that the sleeve grooves are not damaged, deformed or deteriorated; otherwise, replace the sleeve.
- Check that the spring is not deformed; otherwise, replace it.
- Check that the sealing ring (Seeger) is still flexible and is not deformed.
- Check that the sleeve outer tothing and internal grooves are not damaged.

## Installing

- Insert the swingarm on the gearbox cover.
- Tighten thoroughly the pin on the left side until the shimming washer on the right side rests on the bearing fitted on the gearbox cover.



- Tighten thoroughly the pin on the right side, without locking it.
- Operate the swingarm and make sure it oscillates freely without clearance.



- Screw in the lock nuts on the pins, locking them thoroughly.



- Screw the clamp.



- Fit the rear wheel.



## Bevel gears

### Removing

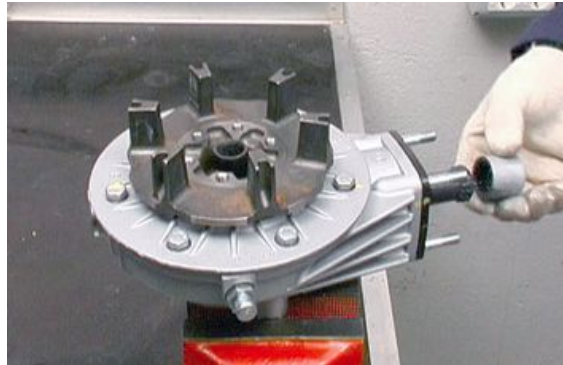
- Undo the four nuts and collect the washers.



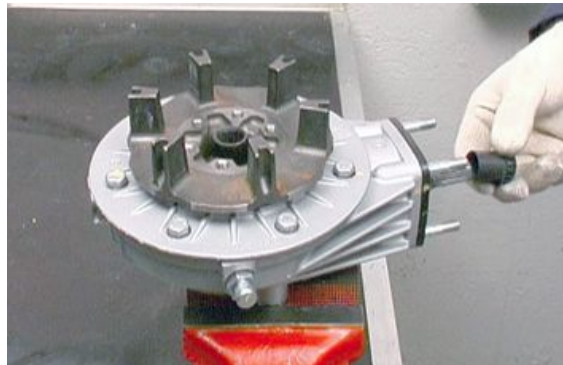
- Slide off the gearcase together with the swingarm.



- Slide off the sleeve from the pinion.
- Slide off the spring.
- Slide off the sealing ring.
- Slide off the base.



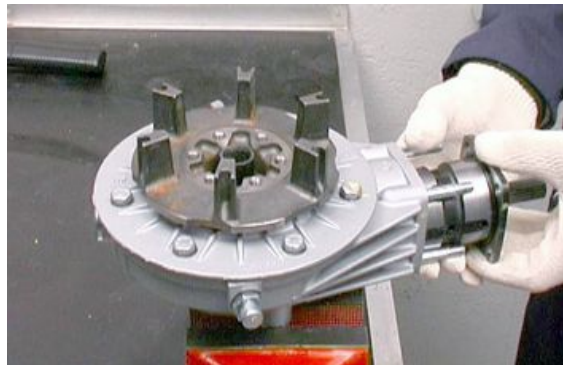
- Slide off the gear.



## Checking

### Pinion unit

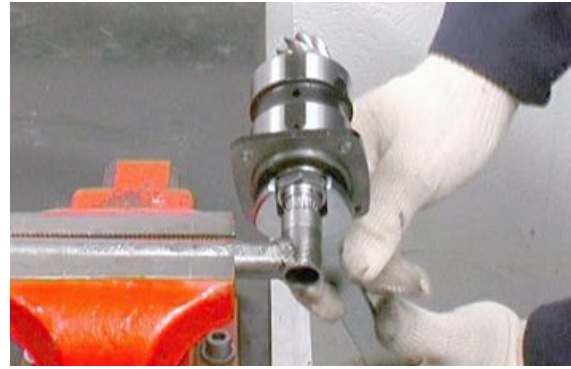
- Remove the housing of the swingarm .
- Slide the complete case of the gear-case.



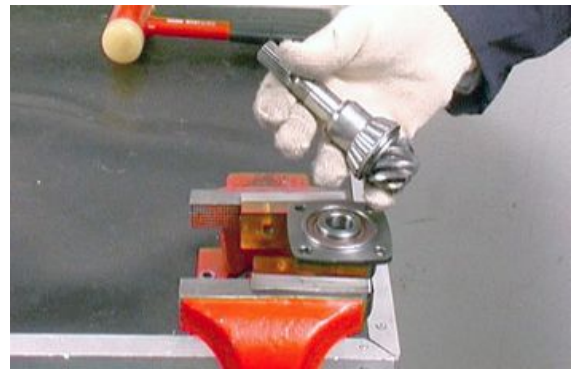
- Lock on the vice the sealing tool (19907100) of the bevel gear pair.



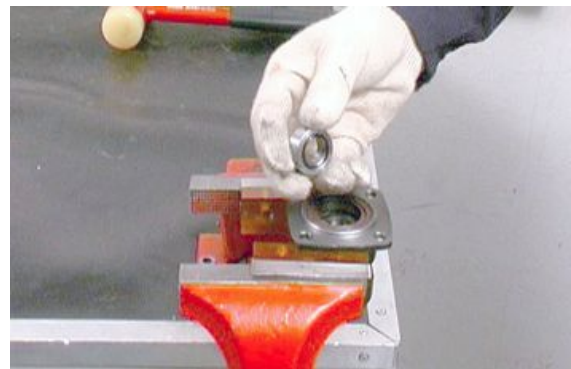
- Insert the grooved shank of the pinion on the tool and unscrew the nut.



- Slide off the spacer.
- Slide off the pinion.



- Slide off the shim adjustment washer.
- Slide off the O-ring.



- Slide off the oil seal.



- Slide of the tapered bearing from the case.
- Slide off the O-ring.
- Slide off the spacer.
- Slide off the two shim washers.



- Slide off the tapered bearing from the case.



### Checking

- Check that the pinion tothing is not damaged, worn or deformed; otherwise, replace the pair.
- Check that both tapered bearings are not damaged, that the rollers are not damaged or worn; otherwise, replace them.
- Check that the adjustment washers are not deformed or broken; otherwise, replace them.
- Check that the sealing rings are not shattered, spoiled or worn; otherwise, replace them.

### Fitting

- If the bevel pinion should be replaced, replace also the crown fitted on the housing. The pinion and the crown should have the same number stamped.





- Fit the external ring of the tapered bearings on the bevel pinion holder case using the suitable punch (19926400).



- Fit the adjustment shim washer.



- Fit the internal ring of the bearing on the pinion using the suitable punch (19926200).



- Fit both shim washers on the pinion.
- Fit the spacer on the pinion.
- Fit the O-ring.



- Fit the complete pinion on the case using the suitable punch (19926100).



- Fit the oil seal.
- Fit the O-ring.

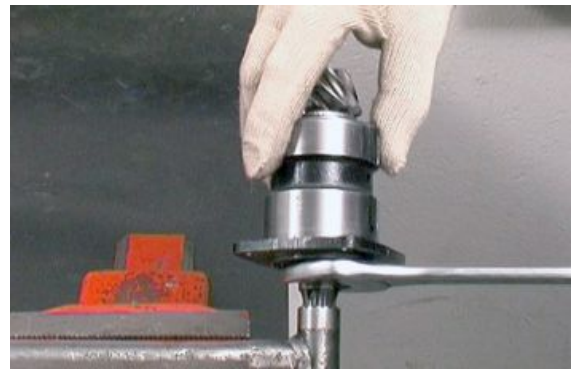


- Fit the spacer.





- Insert the grooved shank of the pinion on the tool (19907100) and tighten the nut.



### Casing unit removal

- Undo the screws and collect the washers.



- Remove the braking disc from the drilled bolt.
- Undo the screws and collect the plates and the wave washers.
- Slide off the complete cover.
- Slide off the gaskets.
- Slide off the shimming ring.



- Remove the O-ring from the groove on the drilled bolt.



From the cover, slide off:

- The needle bearing.
- Remove the internal ring of the needle bearing using a suitable punch (19907000).
- Remove the washer.
- Remove the washer.



- Undo the screws and collect the corresponding safety plates.



- Remove the conical crown.



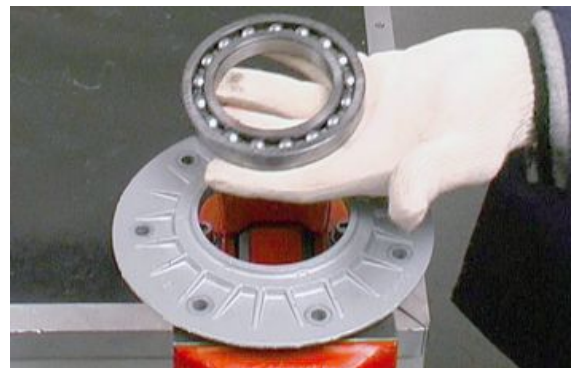
- Slide off the drilled bolt from the bearing.



- Remove the sealing ring.



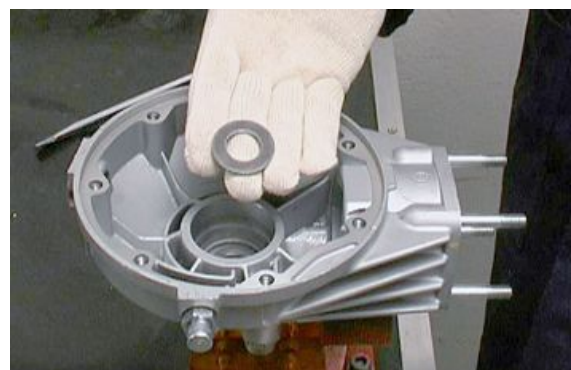
- Slide off the bearing from the cover using the suitable punch.



- Remove the external ring of the needle bearing from the housing using the suitable extractor (19927500).



- Remove the sealing ring and the washer.



## Checking

- Check that the drilled bolt tongues, where the anti-vibration rubbers operate, are not spoiled; that the surfaces of: the sealing ring; the bearing on the cover, the external ring of the bearing

on the housing; the groove for the circlip on the drilled bolt are not worn, deformed or spoiled; otherwise, replace them.

- Check that the sealing ring on the housing is not shattered or is still flexible; otherwise, replace it.
- That the needle bearing on the housing does not have flattened or worn rollers; otherwise, replace it.
- Check efficiency of every component and that the coupling surfaces of the housing and cover are not scored or distorted.

### Crown pinion coupling

For coupling, proceed as follows:

- Provisionally lock the complete pinion case on the housing with two nuts and appropriate spacers.
- Fit the corresponding tool on the crown (19928800).



- Insert the tool on the bearing cage in the housing.



- Check alignment between pinion teeth and the crown teeth.
- If alignment is not regular, properly vary the thickness of the ring between the pinion and the tapered bearing.
- Also check the contact area between the pinion teeth and the crown teeth, proceeding as follows:



- Apply suitable colours available in the market on the pinion teeth.



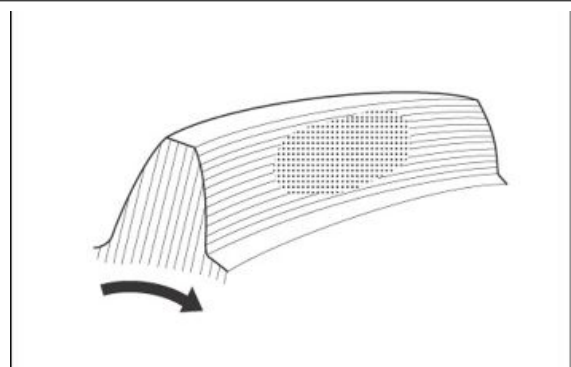
- Fit the drilled bolt-crown unit cover and their spacers and gaskets on the housing and provisionally tighten the screws.



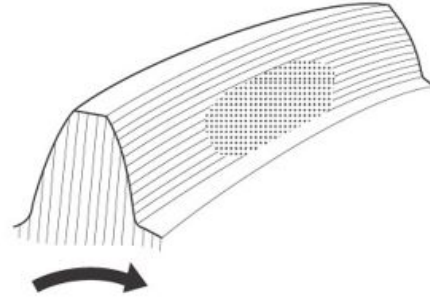
- On the crown holder drilled bolt, fit a "Universal" extractor that with appropriate central spacers slightly presses the crown towards the brake disc side.
- Turn the pinion in the riding direction, with the crown braked so that the rotation is carried out under load, and leaves a contact mark on the pinion surface.



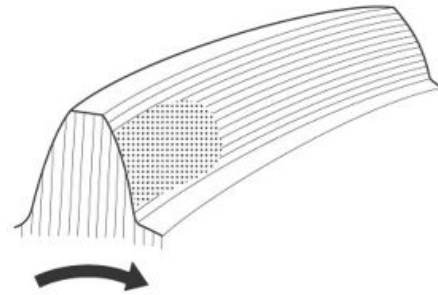
- If the contact is regular, the mark on the pinion teeth will be like this (the pinion is seen from the crankshaft side)



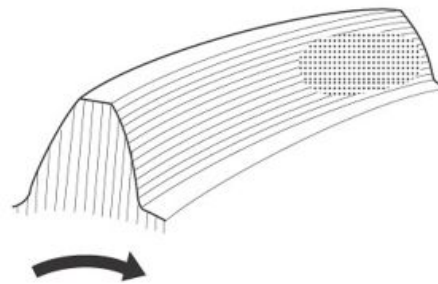
- If the contact is like this, the crown is too near the pinion rotation axis: detach the crown by increasing spacer thickness.



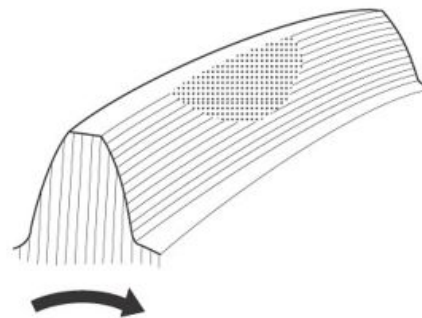
- If the contact is like this, the pinion is too near the rotation axis of the crown: detach the pinion by reducing spacer thickness



- If the contact is like this, the pinion is too far from the rotation axis of the crown: approach the pinion by increasing spacer thickness

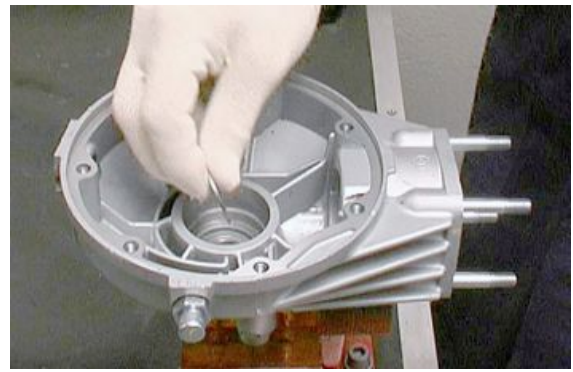


- If the contact is like this, the crown is too far from the pinion rotation axis: approach the crown by reducing spacer thickness.



### Casing unit fitting

- Fit the washer on the gearcase.



- Fit the sealing ring on the housing using the suitable punch (19926000).

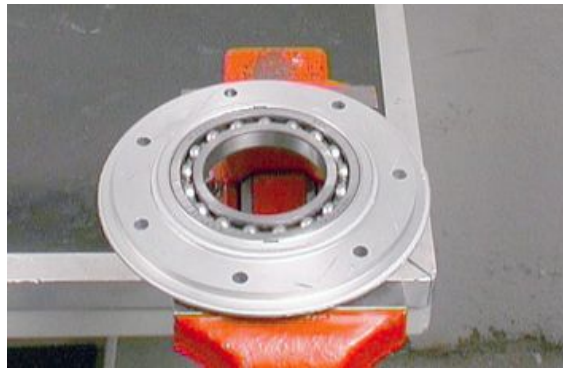


- Fit the external ring of the needle bearing on the housing using the suitable punch (19926500).



- Fit the bearing on the cover using the suitable punch.

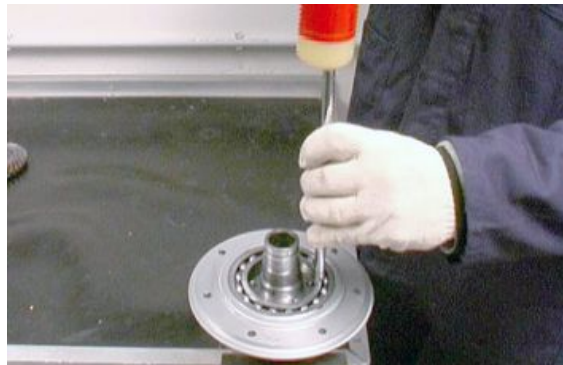




- Fit the internal ring of the needle bearing on the drilled bolt using the suitable punch (19927900).
- Insert the sealing ring in the drilled bolt.



- Fit the drilled bolt on the cover.



- Fit the crown.





- Fit the plates and tighten the screws.



- Insert the washer.



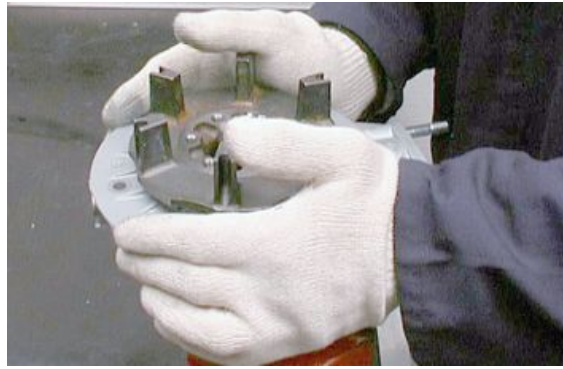
- Insert the washer.



- Fit the O-ring.
- Insert the gaskets and the shimming ring on the cover.
- Tighten the screws with plates and washers.



- Fit the braking disc on the drilled bolt by locking the screws with the washers using a torque wrench.

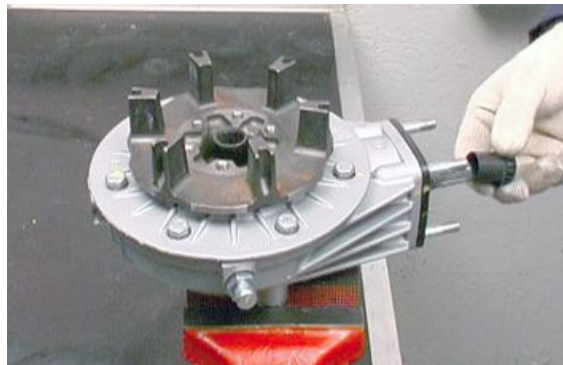


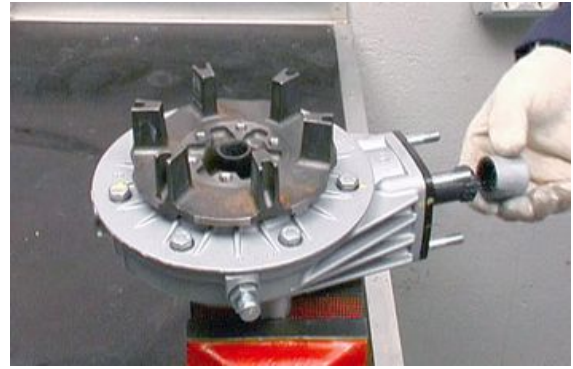
- When refitting the bevel pinion case on the transmission, bear in mind that the oil passage grooves with holes should be fitted vertically (observing the grooves, one should be facing upwards and the other facing the ground).



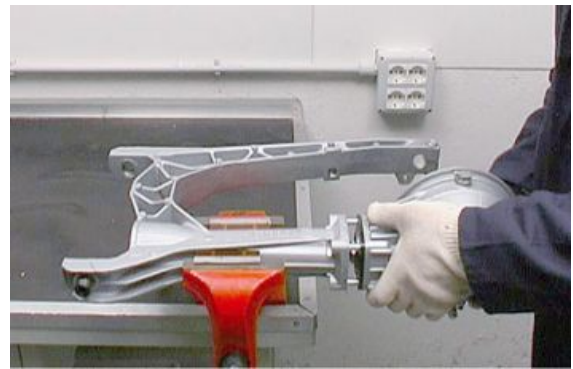
## Installing

- Insert the sleeve and base on the bevel pinion of the gearcase.

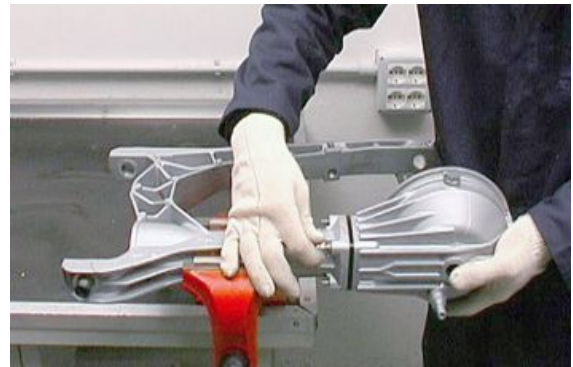




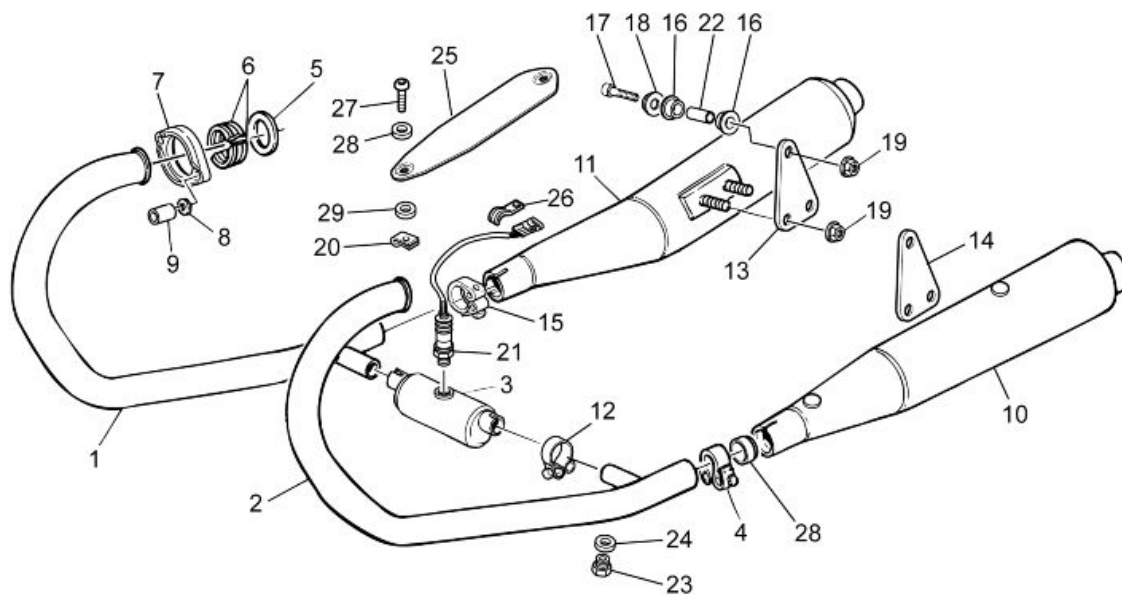
- Correctly insert the stud bolts of the gearcase in the holes of the swingarm .



- Screw the nuts with the washers without locking them.



## Exhaust



### Key:

1. Right exhaust pipe
2. Left exhaust pipe
3. Expansion chamber
4. Left silencer clamp
5. Gasket
6. Spacer
7. Ring nut
8. Washer
9. Nut
10. Left silencer
11. Right silencer
12. Clamp
13. Right plate
14. Left plate
15. Right silencer clamp
16. Muffler rubber ring
17. TCEI screw
18. Silencer fixing bushing
19. Nut

- 20.Clip
- 21.Lambda Probe
- 22.Spacer
- 23.Cap
- 24.Gasket
- 25.Protection
- 26.U-bolt
- 27.TBEI screw
- 28.Bushing
- 29.Insulating washer

---

## Removing the tail pipe

The engine and the exhaust system components get very hot and remain in this condition for a certain time interval after the engine has been shut 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.

- Loosen the clamp between the exhaust end and the catalytic converter.
- Unscrew and remove the silencer fixing nut and collect the screw and the bushing.
- Remove the exhaust end.



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## Removing the lambda sensor

- Disconnect the lambda probe connector.



- Unscrew and remove the lambda probe.



# INDEX OF TOPICS

**BODYWORK**

**BODYW**

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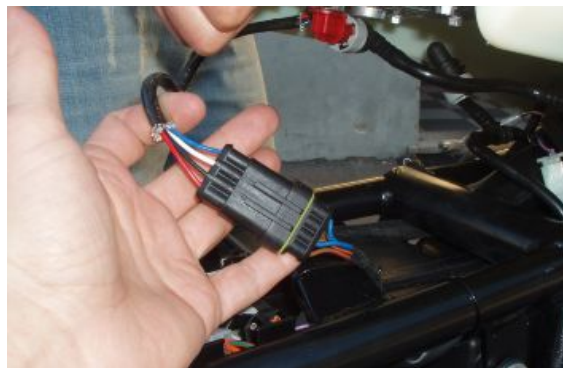
## Fuel tank

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- Unscrew and remove the rear screw.



- Disconnect the connector.



- Disconnect the fuel pipe.



- Remove the fuel bleeding pipe.



- Remove the fuel tank by sliding it off and back.
-



# INDEX OF TOPICS

**P**RE-DELIVERY

**PRE DE**

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Carry out the listed checks before delivering the vehicle.

**WARNING**



**BE EXTREMELY CAUTIOUS WHEN HANDLING FUEL.**

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## **Aesthetic inspection**

- Paintwork
  - Fitting of Plastic Parts
  - Scratches
  - Dirt
- 

## **Tightening torques inspection**

- Safety locks:
    - front and rear suspension unit
    - front and rear brake calliper retainer unit
    - front and rear wheel unit
    - engine - chassis retainers
    - steering assembly
  - Plastic parts fixing screws
- 

## **Electrical system**

- Main switch
  - Headlamps: high-beam lights, low-beam lights, tail lights (front and rear) and their warning lights
  - Headlight adjustment according to regulations in force
  - Front and rear stop light switches and their bulbs
  - Turn indicators and their warning lights
  - Instrument panel lights
  - Instrument panel: fuel and temperature indicator (if present)
  - Instrument panel warning lights
  - Horn
  - Electric start-up
  - Engine stop via emergency stop switch and side stand
  - Helmet compartment electrical opening switch (if present)
-

- Through the diagnosis tool, check that the last mapping version is present in the control unit/s and, if required, program the control unit/s again: consult the technical service website to know about available upgrades and details regarding the operation.

**CAUTION**

**TO ENSURE MAXIMUM PERFORMANCE, THE BATTERY MUST BE CHARGED BEFORE USE. INADEQUATE CHARGING OF THE BATTERY WITH A LOW LEVEL OF ELECTROLYTE BEFORE IT IS FIRST USED SHORTENS BATTERY LIFE.**

**CAUTION**

**UPON INSTALLING THE BATTERY, ATTACH THE POSITIVE LEAD FIRST AND THEN THE NEGATIVE ONE, AND PERFORM THE REVERSE OPERATION UPON REMOVAL.**

**WARNING**

**THE BATTERY ELECTROLYTE IS POISONOUS AS IT MAY CAUSE SERIOUS BURNS. IT CONTAINS SULPHURIC ACID. AVOID CONTACT WITH YOUR EYES, SKIN AND CLOTHING. IN CASE OF CONTACT WITH YOUR EYES OR SKIN, WASH WITH ABUNDANT WATER FOR APPROX. 15 MIN. AND SEEK IMMEDIATE MEDICAL ATTENTION. IF ACCIDENTALLY SWALLOWED, IMMEDIATELY DRINK LARGE QUANTITIES OF WATER OR VEGETABLE OIL. SEEK IMMEDIATE MEDICAL ATTENTION. BATTERIES PRODUCE EXPLOSIVE GASES; KEEP CLEAR OF NAKED FLAMES, SPARKS OR CIGARETTES. VENTILATE THE AREA WHEN RECHARGING INDOORS. ALWAYS WEAR EYE PROTECTION WHEN WORKING IN THE PROXIMITY OF BATTERIES. KEEP OUT OF THE REACH OF CHILDREN.**

**CAUTION**

**NEVER USE FUSES WITH A CAPACITY HIGHER THAN THE RECOMMENDED CAPACITY. USING A FUSE OF UNSUITABLE RATING MAY SERIOUSLY DAMAGE THE VEHICLE OR EVEN CAUSE A FIRE.**

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## Levels check

- Hydraulic braking system fluid level
- Clutch system fluid level (if present)
- Gearbox oil level (if present)
- Transmission oil level (if present)
- Engine coolant level (if present)
- Engine oil level
- Mixer oil level (if present)

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## Road test

- Cold start
- Instrument panel operation

- Response to throttle control
  - Stability when accelerating and braking
  - Front and rear brake efficiency
  - Front and rear suspension efficiency
  - Abnormal noise
- 

## Static test

### Static check after test drive:

- Restarting when warmed up
  - Starter operation (if present)
  - Minimum holding (turning the handlebar)
  - Uniform turning of the steering
  - Possible leaks
  - Radiator electric fan operation (if present)
- 

## Functional inspection

- Hydraulic braking system
- Stroke of brake and clutch levers (if present)
- Clutch - Check for correct operation
- Engine - Check for correct general operation and absence of abnormal noise
- Other
- Documentation check:
- Chassis and engine numbers check
- Supplied tools check
- License plate fitting
- Locks checking
- Tyre pressure check
- Installation of mirrors and any possible accessories



**NEVER EXCEED THE RECOMMENDED INFLATION PRESSURES AS TYRES MAY BURST.**

**CAUTION**

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**CHECK AND ADJUST TYRE PRESSURE WITH TYRES AT AMBIENT TEMPERATURE.**

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## **A**

Air filter: 27

## **B**

Battery: 43

Bulbs:

## **C**

Clutch: 57

Clutch lever: 57

## **D**

Display: 85

## **E**

Engine oil: 25, 56

## **F**

Fork: 88, 90, 92, 94, 98

Fuel: 128

Fuses: 42

## **I**

Identification: 10

Instrument panel: 60

## **M**

Maintenance: 8, 23

## **O**

Oil filter: 26

## **R**

Recommended products: 18

## **S**

Shock absorbers: 100

Spark plugs:

Stand: 58

Start-up: 41

## **T**

Tank: 128

Transmission: 12, 23

Tyres: 14

# W

Warning lights: