SERVICE STATION MANUAL

897237

Norge GT 8v

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This manual provides the main information to carry out regular maintenance operations on your scooter. 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.
2011

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.

INDEX OF TOPICS

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Rules

Safety rules

Carbon monoxide

If you need to keep the engine running while working on the vehicle, 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 fume 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 SWITCHED 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 DISPERSE FUEL IN THE ENVIRONMENT.
KEEP OUT OF THE REACH OF CHILDREN.

Hot components

The engine and the exhaust system components become very hot and remain hot for some time after the engine has been switched off. Before handling these components, make sure that you are wearing insulating gloves or wait until the engine and the exhaust system have cooled down.

Used engine oil and transmission oil

CAUTION

IT IS ADVISABLE TO WEAR LATEX GLOVES WHEN SERVICING THE VEHICLE.
THE ENGINE OR GEARBOX 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 IN 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 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 PLENTY OF COLD, CLEAN WATER AND SEEK MEDICAL ADVICE.
KEEP OUT OF THE REACH OF CHILDREN.

Battery electrolyte and hydrogen gas

CAUTION

THE BATTERY ELECTROLYTE IS TOXIC, CORROSIVE AND, AS IT CONTAINS SULPHURIC ACID, MAY CAUSE BURNING IF IT COMES INTO CONTACT WITH THE SKIN. WHEN HANDLING BATTERY ELECTROLYTE, WEAR TIGHT-FITTING GLOVES AND PROTECTIVE APPAREL. IN THE EVENT OF SKIN CONTACT WITH THE ELECTROLYTIC FLUID, RINSE WELL WITH PLENTY OF CLEAN WATER. IT IS PARTICULARLY IMPORTANT TO PROTECT YOUR EYES BECAUSE EVEN TINY AMOUNTS OF BATTERY ACID MAY CAUSE BLINDNESS. IN THE EVENT OF CONTACT WITH THE EYES, RINSE WITH PLENTY OF 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 SOURCES. ENSURE ADEQUATE VENTILATION WHEN SERVICING OR RECHARGING THE BATTERY.
KEEP OUT OF THE REACH OF CHILDREN.
BATTERY LIQUID IS CORROSIVE. DO NOT POUR IT OR SPILL IT, PARTICULARLY ON PLASTIC COMPONENTS. ENSURE THAT THE ELECTROLYTIC ACID IS COMPATIBLE WITH THE BATTERY BEING ACTIVATED.

Maintenance rules

GENERAL PRECAUTIONS AND INFORMATION

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

BEFORE DISASSEMBLING COMPONENTS

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

COMPONENTS REMOVAL

- Do not loosen and/or tighten screws and nuts using pliers or any other tools than the specific wrench.
- Mark the positions on all connection joints (pipes, cables, etc.) before separating them, and identify them with different distinctive symbols.
- Each component needs to be clearly marked to enable identification during reassembly.
- Clean and wash the dismantled components carefully using a low-flammability detergent.

- Keep mated parts together since they have "adjusted" to each other due to normal wear.
- Some components must be used together or replaced altogether.
- Keep away from heat sources.

REASSEMBLING COMPONENTS

CAUTION

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

- Only use ORIGINAL Moto Guzzi SPARE PARTS.
- Comply with lubricant and consumables use 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 (OR), split pins and screws with new ones if their tread is damaged.
- When assembling the bearings, make sure to lubricate them well.
- Check that each component is assembled correctly.
- After a repair or routine maintenance procedure, carry out pre-ride checks and test the vehicle on private grounds or in an area with low traffic density.
- Clean all coupling surfaces, oil guard rims and gaskets before refitting them. Smear a light layer of lithium-based grease on the oil guard rims. Reassemble oil guards and bearings with the brand or lot number facing outward (visible side).

ELECTRIC CONNECTORS

Electric connectors must be disconnected as described below; failure to comply with this procedure causes irreparable damage to both the connector and the wiring harness:

Press the relative safety clips, if applicable.

- Grip the two connectors and disconnect them by pulling them in opposite directions.
- If any signs of dirt, rust, moisture, etc. are noted, clean the inside of the connector carefully with a jet of compressed air.
- Ensure that the cables are correctly fastened to the internal connector terminals.
- Then connect the two connectors, ensuring that they couple correctly (if fitted with clips, you will hear them "click" into place).

CAUTION

DO NOT DISCONNECT CONNECTORS BY PULLING THE CABLES.

NOTE

THE TWO CONNECTORS CAN ONLY BE CONNECTED IN ONE DIRECTION: CONNECT THEM THE RIGHT WAY ROUND.

TIGHTENING TORQUES

CAUTION

REMEMBER THAT THE TIGHTENING TORQUES FOR ALL FASTENING ELEMENTS ON WHEELS, BRAKES, WHEEL AXLES AND ANY OTHER SUSPENSION COMPONENTS PLAY A KEY ROLE

IN ENSURING VEHICLE SAFETY AND MUST COMPLY WITH SPECIFIED VALUES. CHECK THE TIGHTENING TORQUES OF FASTENING ELEMENTS 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 LOOSEN OR EVEN DETACH, CAUSING A WHEEL TO LOCK OR COMPROMISING VEHICLE HANDLING. THIS MAY LEAD TO FALLS, WITH THE RISK OF SERIOUS INJURY OR DEATH.

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 riding speed during the run-in. This ensures that components operate under both "loaded" and "unloaded" conditions, allowing the engine components to cool.

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

CAUTION

THE FULL PERFORMANCE OF THE VEHICLE IS ONLY AVAILABLE AFTER THE SERVICE AT THE END OF THE RUN-IN PERIOD.

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) use the brakes gently, avoiding sudden or prolonged 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-IN" TABLE IN THE SCHEDULED MAINTENANCE SECTION TO AVOID INJURING YOURSELF, OTHERS AND /OR DAMAGING THE VEHICLE.

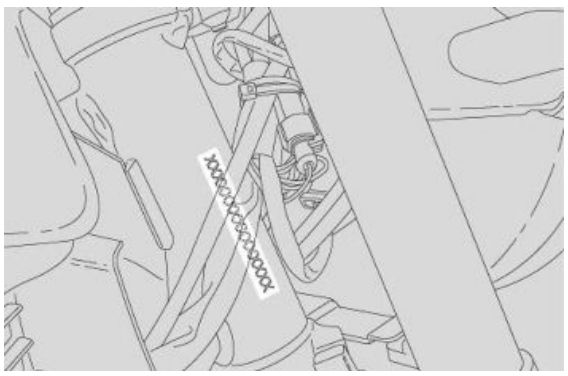
Vehicle identification

SERIAL NUMBER LOCATION

These numbers are necessary for vehicle registration.

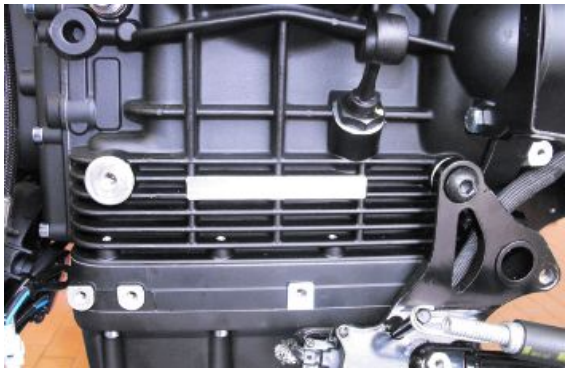
NOTE

ALTERING IDENTIFICATION NUMBERS MAY BE SERIOUSLY PUNISHABLE BY LAW. IN PARTICULAR, MODIFYING THE CHASSIS NUMBER IMMEDIATELY VOIDS THE WARRANTY.



ENGINE NUMBER

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



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

ZGULPS010YMXXXXXX

KEY:

ZGU: WMI (World manufacturer identifier) code;

LP: model;

S01: version variation;

0: free digit

Y year of manufacture

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

XXXXXX: serial number (6 digits);

CHASSIS NUMBER

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

Dimensions and mass

WEIGHT AND DIMENSIONS

Specification	Desc./Quantity
Max. length	2195 mm (86.4 in)
Max. width	880 mm (34.6 in)
Max. height (to the windshield)	1430 - 1480 mm (56.3 - 58.3 in)
Saddle height	810 mm (31.9 in)
Minimum ground clearance	185 mm (72.8 in)
Wheelbase	1495 mm (58.8 in)
Kerb weight	257 Kg (566.6 lb)

Engine

ENGINE

Specification	Desc./Quantity
Type	traverse-mounted twin-cylinder four-stroke V 90°
No. of cylinders	2
Cylinder arrangement	V of 90°
Bore / stroke	95 x 81.2 mm (3.74 x 3.20 in)
Engine capacity	1151 cm³ (70 cu.in.)
Compression ratio	10.8 : 1
Electric	starter
Engine idle speed	1100 ± 100 rpm

Specification	Desc./Quantity
Clutch	hydraulically controlled single-plate dry clutch with incorporated flexible coupling
Lubrication system	Pressure-fed, controlled by valves and trochoidal pump
Air filter	cartridge-type dry filter
Cooling	air and oil cooled with independent trochoidal pump and oil pressure control valve
Timing system	single overhead camshaft with bucket tappets and rocker-operated valves
Valve	Four valves for each cylinder
Values valid with control clearance between rockers and valve	intake: 0.15 mm (0.0059 in) exhaust: 0.20 mm (0.0079 in)

Transmission

TRANSMISSION

Specification	Desc./Quantity
Primary drive	with gears, ratio: 24/35 = 1:1.4583
Gearbox	Mechanical, 6 speeds with foot lever on the left hand side of the engine
Gear ratios, 1st gear	17/38 = 1:2.2353
Gear ratios, 2nd gear	20/34 = 1:1.7
Gear ratios, 3rd gear	23/31 = 1:1.3478
Gear ratios, 4th gear	26/29 = 1:1.1154
Gear ratios, 5th gear	31/29 = 1:0.9355
Gear ratios, 6th gear	30/24 = 1:0.8
Final drive	with U-joint
Ratio	12/44 = 1:3.6667

Capacities

CAPACITIES

Specification	Desc./Quantity
Engine oil	Oil and oil filter change: 3400 cm³ (207.48 cu.in)
Gearbox oil	500 cm³ (30.5 cu.in)
Transmission oil	380 cm³ (23.2 cu.in)
Fuel (reserve included)	23 litres (5.06 UK gal)
Fuel reserve	4 litres (0.88 UK gal)
Seats	2
Maximum weight limit	349 Kg (769.4 lb)
Olio forcella anteriore	400 +/- 2.5 cc (24.4 +/- 0.15 cu in) (per ogni stelo)

Electrical system

ELECTRICAL SYSTEM

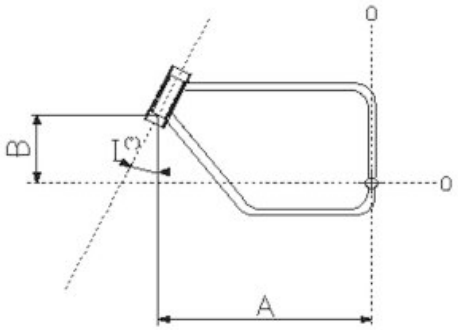
Specification	Desc./Quantity
Spark plug	NGK PMR8B (long life)
Alternative spark plug	NGK CR8EKB
Electrode gap	0.6 - 0.7 mm (0.024 - 0.028 in)
Battery	12 V - 18 Ampere/hour
Alternator (permanent magnet type)	12 V - 550 W
Main fuses	20A - 30A - 40A
Secondary fuses	3 - 10 - 15 A
Front daylight running light	12V - 5W
Rear daylight running light/stop light	LED
High beam light	12 V - 65 W H1
Low beam light	12 V - 55 W H3
Turn indicator light	12 V - 10 W (orange)
License plate light	12V - 5 W

Specification	Desc./Quantity
Dashboard lighting	LED
Turn indicator warning light	LED
Neutral gear warning light	LED
Side stand down warning light	LED
Low fuel warning light	LED
High beam warning light	LED
ABS warning light	LED
Gear shift warning light	LED
Antitheft device warning light	LED
Alarm warning light	LED

Frame and suspensions

CHASSIS

Specification	Desc./Quantity
Type	High strength tubular steel frame
Trail	120 mm (4.72 in)
Headstock angle	25° 30'
Steering angle	32°
Front	45 mm (1.77 in) telescopic hydraulic fork with adjustable spring preload.
Front wheel travel	120 mm (4.7 in)
Rear	single sided swingarm with progressive linkage and mono-shock absorber with adjustable rebound and with ergonomic hand grip for preloading adjustment.
Rear wheel travel	140 mm (5.5 in)



SIZES A AND B

Specification	Desc./Quantity
Size A	758.9 +/- 1 mm (29.88 +/- 0.04 in)
Size B	345.5 mm (13.60 in)

Brakes

BRAKES

Specification	Desc./Quantity
Front	Dual 320 mm (12.6 in) diam. stainless steel floating wavy disc with radial callipers with 4 differentiated, horizontally opposed pistons.
Rear	282 mm (11.1 in) diam. stainless steel disc, calliper with two parallel pistons

Wheels and tyres

WHEELS AND TYRES

Specification	Desc./Quantity
Wheel rims - type	hollow 3-spoke rim in chilled cast aluminium alloy
Wheel rims - front	3.5 " x 17"
Wheel rims - rear	5.5 " x 17"
Tyre type	DUNLOP Roadsmart - Pirelli Angel
Front tyre size	120/70 - ZR 17"
Front tyre pressure	2.5 bar (250 kPa) (36.26 PSI)
Front tyre pressure with passenger	2.5 bar (250 kPa) (36.26 PSI)
Rear tyre size	180 / 55 - ZR 17"
Rear tyre pressure	2.8 bar (280 kPa) (40.61 PSI)
Rear tyre pressure with passenger	2.8 bar (280 kPa) (40.61 PSI)

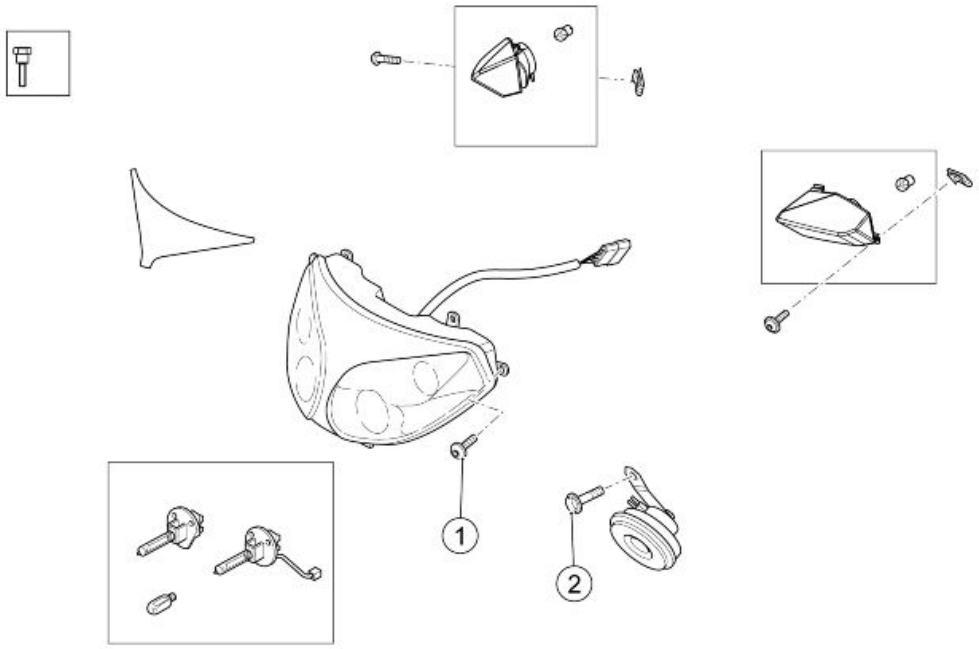
Supply

FUEL SYSTEM

Specification	Desc./Quantity
Fuel system	Electronic injection (Weber . Marelli) with stepper motor
Diffuser	diameter: 50 mm (1.97 in)
Fuel	Premium unleaded petrol, minimum octane rating 95 (NORM) and 85 (NOMM)

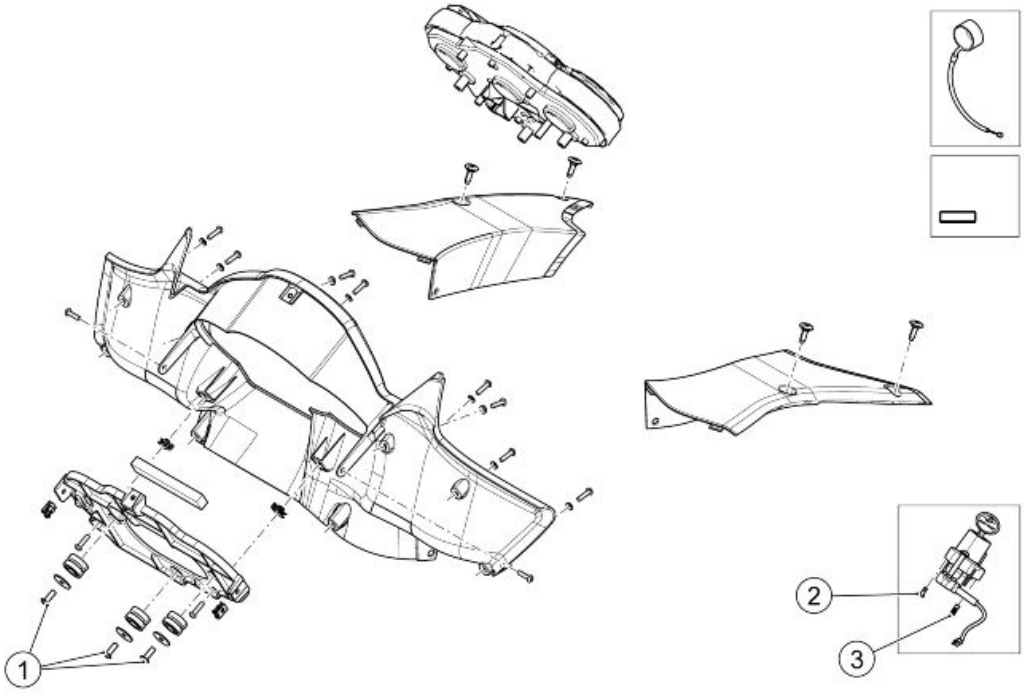
Tightening Torques

Front side



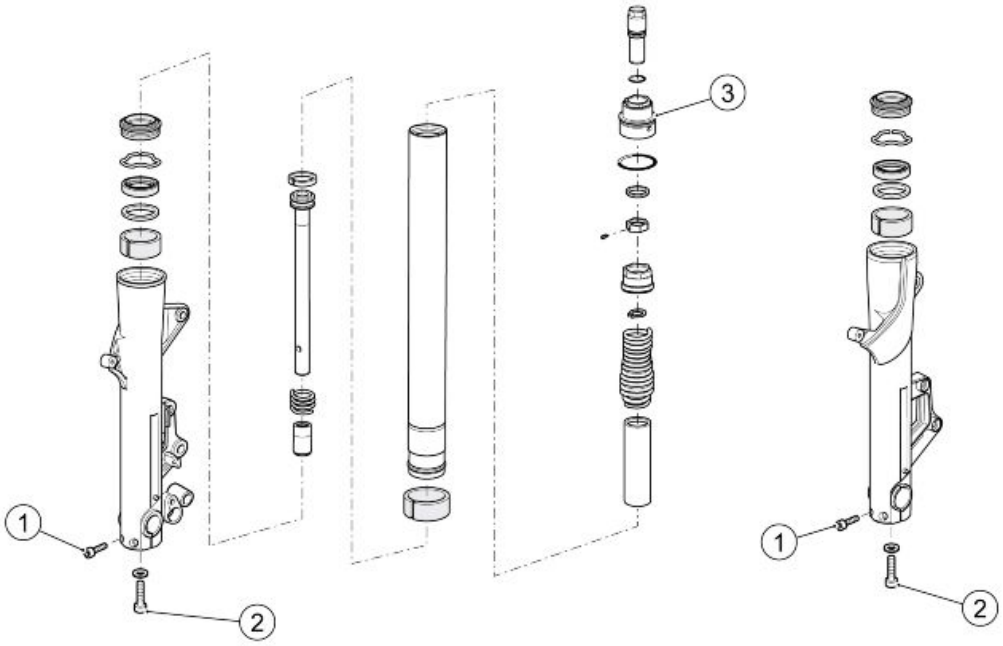
FRONT LIGHTS

pos.	Description	Type	Quantity	Torque	Notes
1	Headlamp fixing screw	M5	4	6 Nm (4.42 lbf ft)	-
2	Horn fixing screw	M6	1	10 Nm (7.37 lbf ft)	-



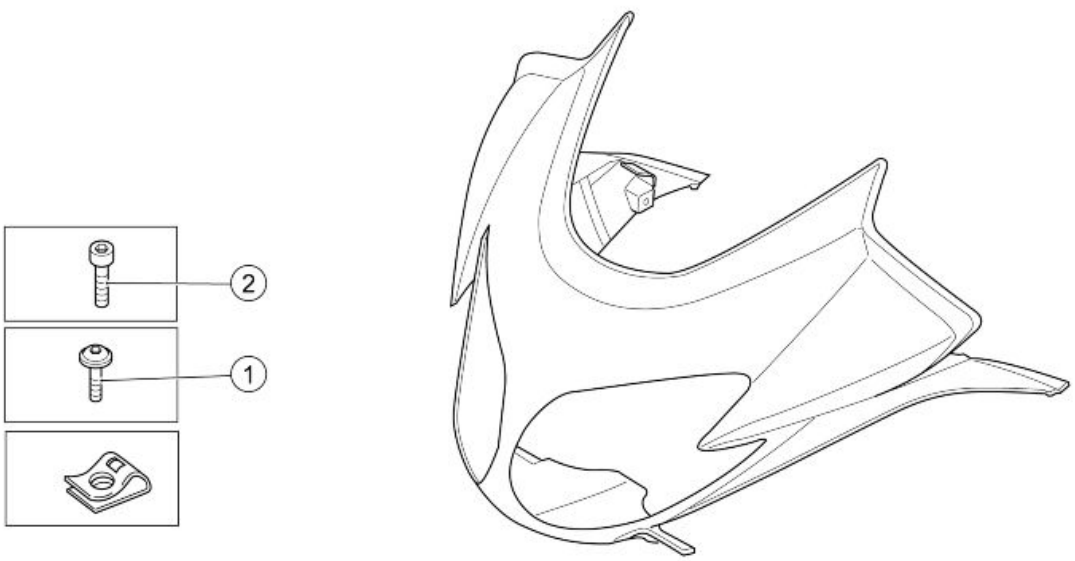
INSTRUMENT PANEL

pos.	Description	Type	Quantity	Torque	Notes
1	Instrument panel fixing screw	SWP M5x14	3	3 Nm (2.21 lbf ft)	-
2	Ignition lock fixing screw	M8x30	1	25 Nm (18.44 lbf ft)	-
3	Ignition lock shear head fixing screw	M8x28	1	-	At the point of failure



FRONT FORK

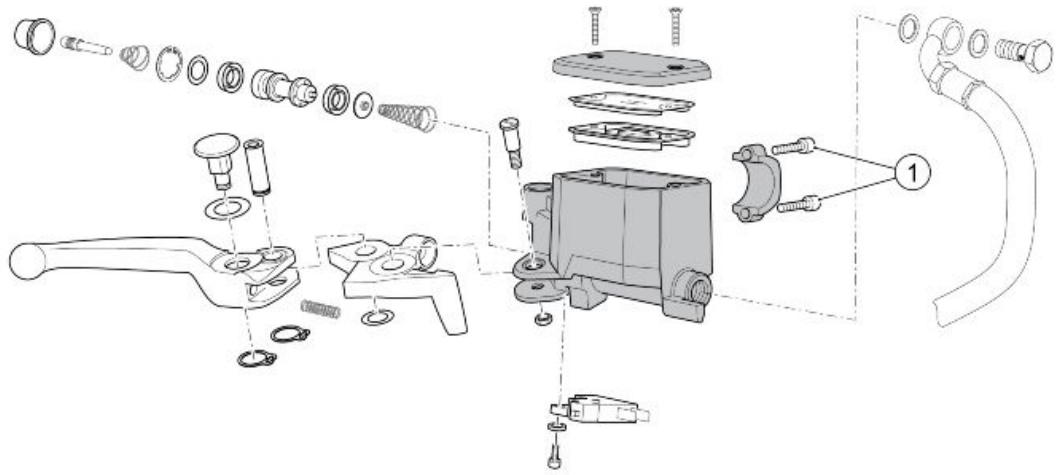
pos.	Description	Type	Quantity	Torque	Notes
1	Wheel axle locking screw on the fork leg	M6	4	10 Nm (7.37 lbf ft)	-
2	Piston fixing screw to the sleeve	M10x35	2	50 Nm (36.87 lbf ft)	-
3	Fork cap	-	2	20 Nm (14.75 lbf ft)	-



WINDSHIELD

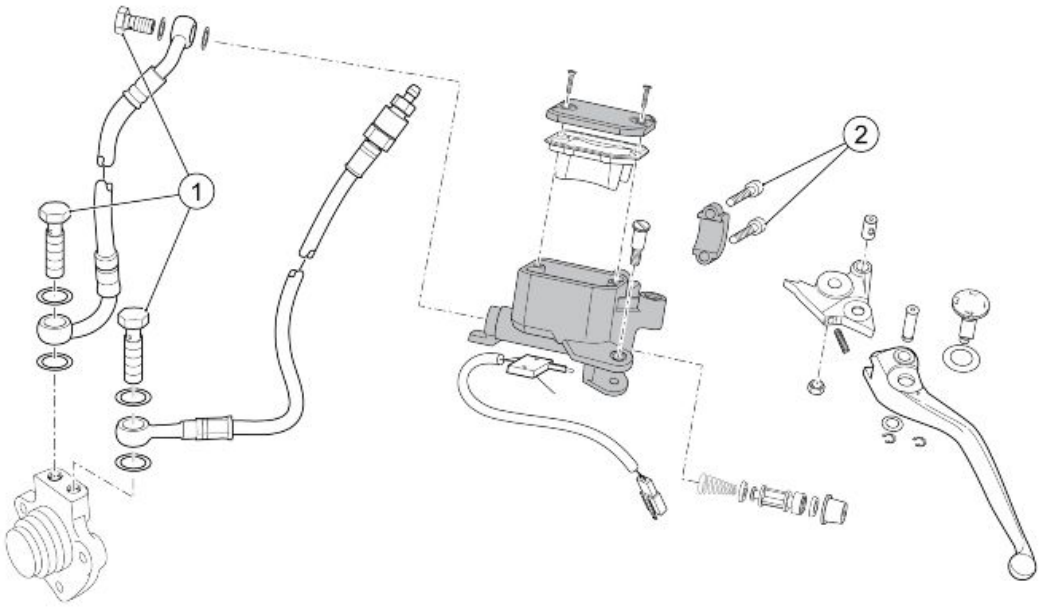
pos.	Description	Type	Quantity	Torque	Notes
1	Top fairing fixing screw	M5x9	8	4 Nm (2.95 lbf ft)	-

pos.	Description	Type	Quantity	Torque	Notes
2	Top fairing fixing screw	M5x16	2	4 Nm (2.95 lbf ft)	-



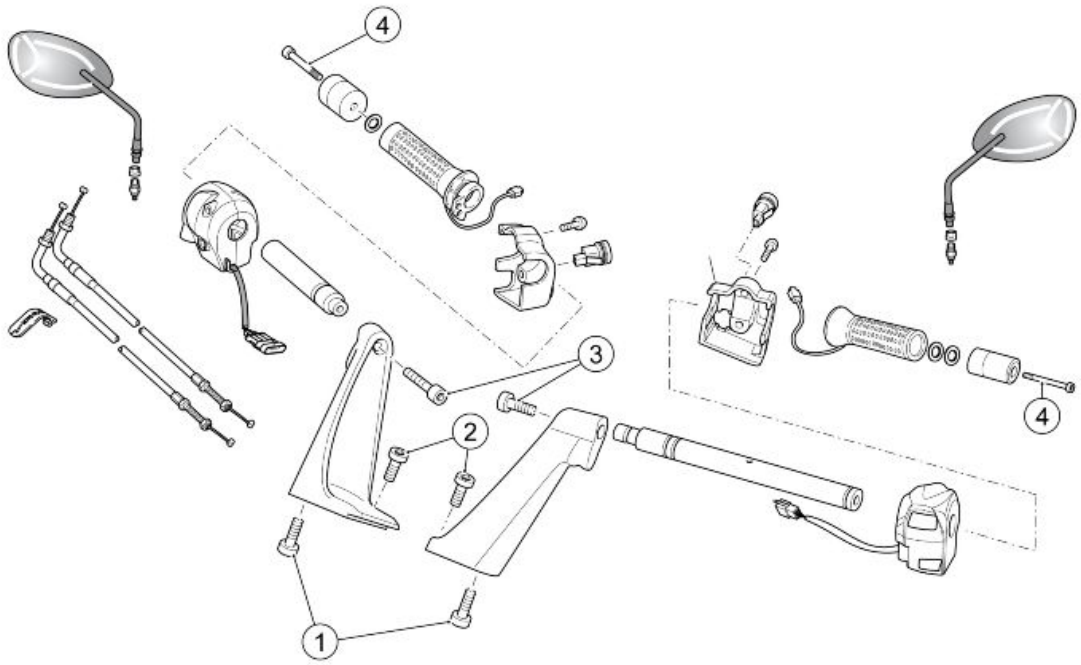
FRONT BRAKE LEVER

pos.	Description	Type	Quantity	Torque	Notes
1	Front brake pump U-bolt fixing screw	M6	2	10 Nm (7.37 lbf ft)	Sequence 1-2-1



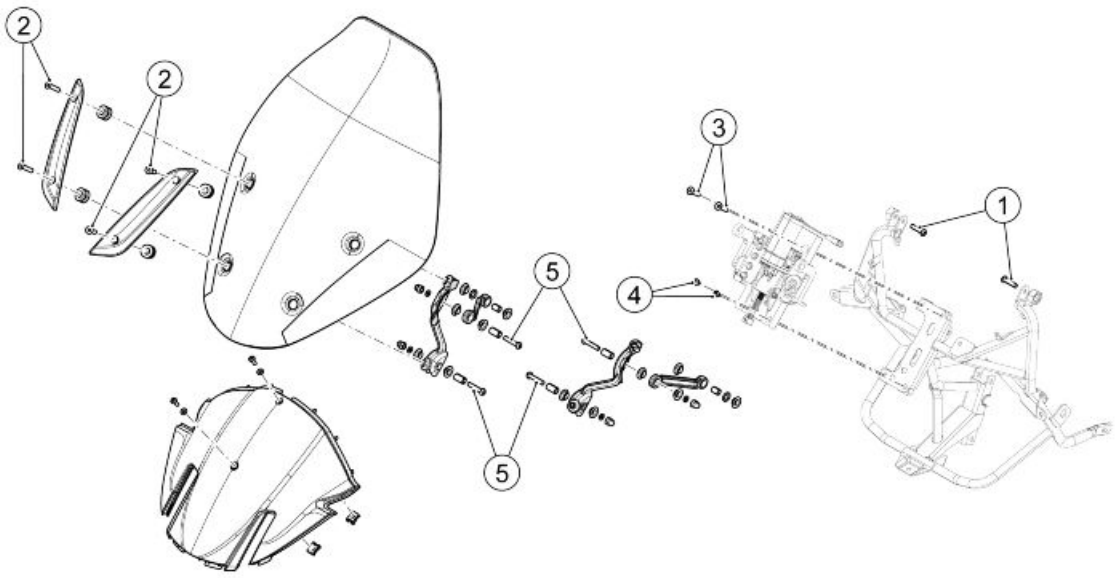
CLUTCH CONTROL

pos.	Description	Type	Quantity	Torque	Notes
1	Clutch pipe fixing slot screw	M10	3	10 Nm (7.37 lbf ft)	-
2	Clutch pump U-bolt fixing screw	M6	2	10 Nm (7.37 lbf ft)	Sequence 1-2-1



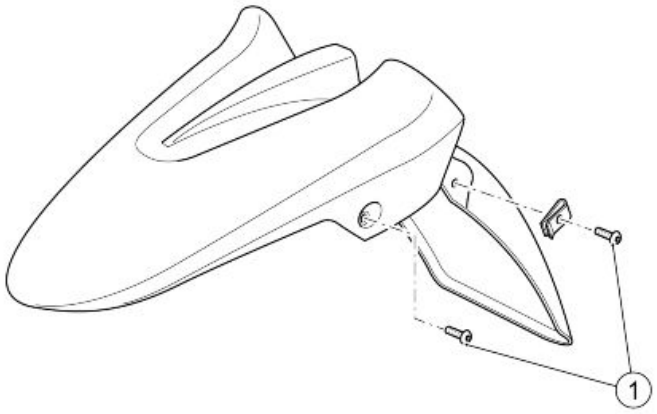
HANDLEBAR AND CONTROLS

pos.	Description	Type	Quantity	Torque	Notes
2	Half-handlebar lower fixing screw on the upper steering yoke	M8x25	2	25 Nm (18.44 lbf ft)	-
2	Half-handlebar upper fixing screw on the upper steering yoke	M8x25 STAINLESS STEEL	4	20 Nm (14.75 lbf ft)	Loctite 243
3	Handlebar pipe fixing screw on the half-handlebar	M8x30	2	18 Nm (13.27 lbf ft)	Loctite 243
4	Counterweight fixing screw	M6x70	2	10 Nm (7.37 lbf ft)	Loctite 243



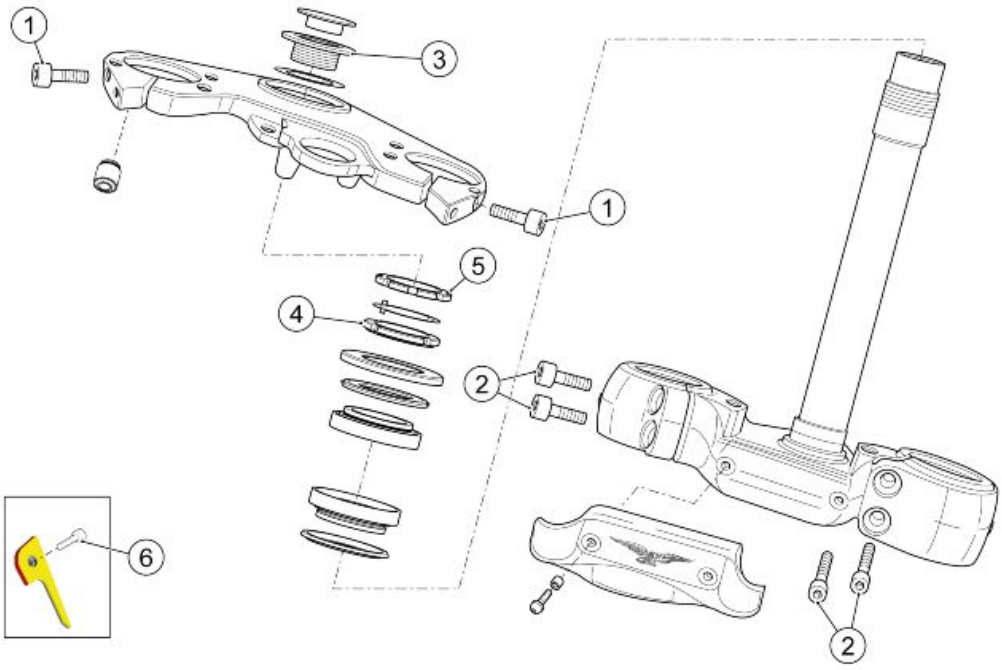
WINDSHIELD

pos.	Description	Type	Quantity	Torque	Notes
1	Windshield link rod fixing screw on the frame	M6x25	2	10 Nm (7.37 lbf ft)	-
2	Aesthetic support fixing screw	M5	4	4 Nm (2.95 lbf ft)	-
3	Engine guide lock to frame upper fixing screw	M6	2	10 Nm (7.37 lbf ft)	-
4	Engine guide lock to frame lower fixing screw	M6	2	10 Nm (7.37 lbf ft)	-
5	Windshield support fixing screw	M6	4	10 Nm (7.37 lbf ft)	-



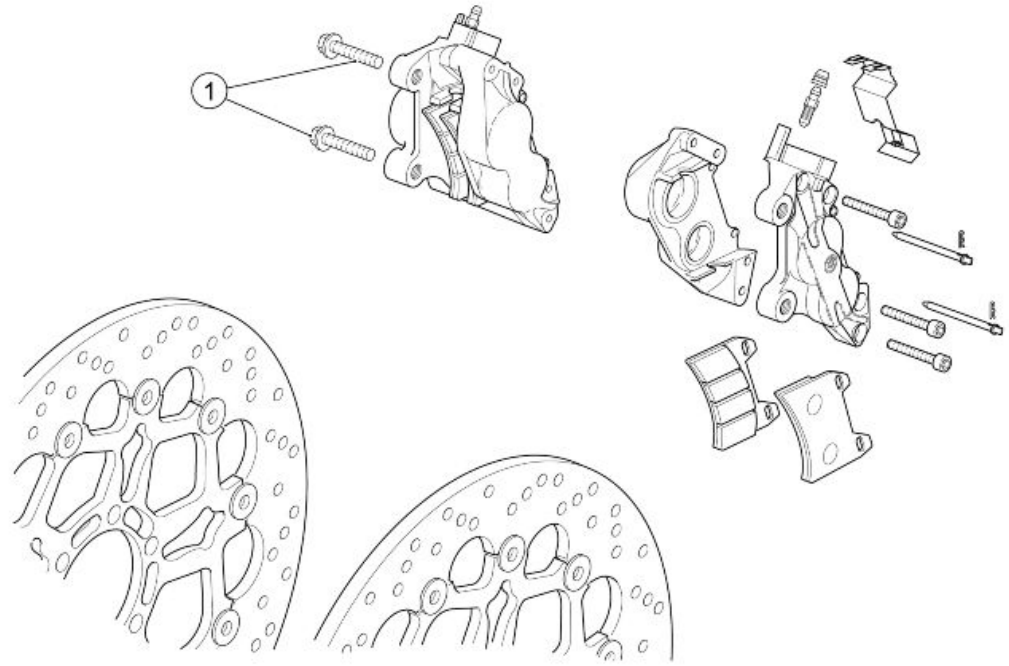
FRONT MUDGUARD

pos.	Description	Type	Quantity	Torque	Notes
1	Front mudguard fixing screw	M5x12	4	4 Nm (2.95 lbf ft)	-



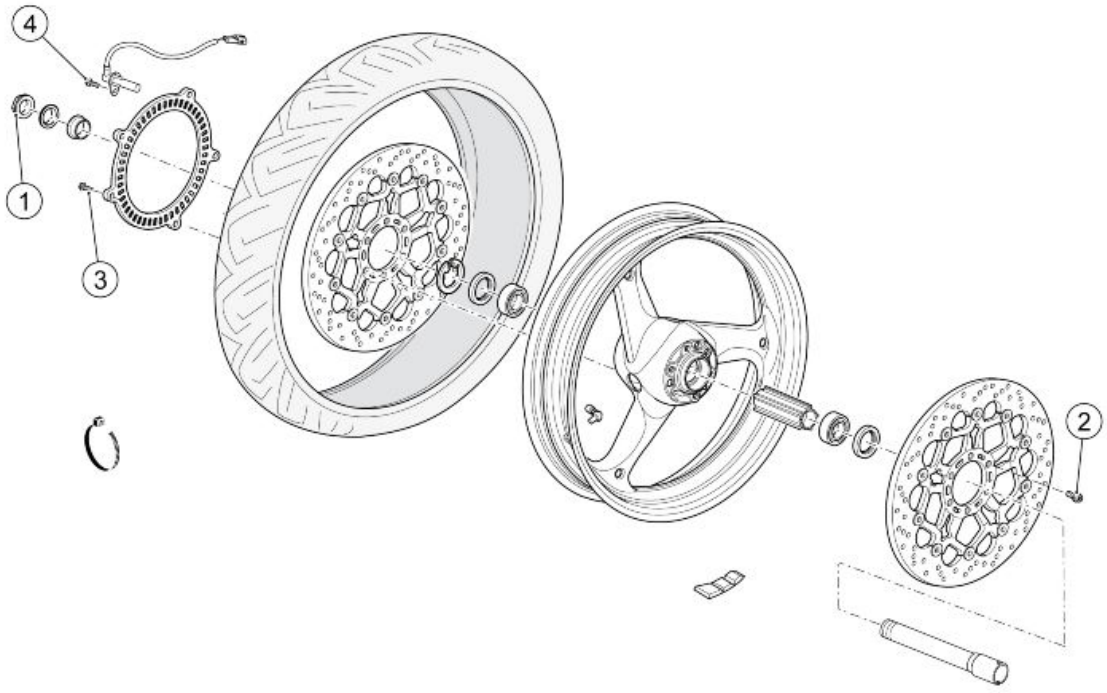
STEERING YOKE

pos.	Description	Type	Quantity	Torque	Notes
1	Fork stanchion fixing screw on the upper plate	M8x30	2	25 Nm (18.44 lbf ft)	-
2	Fork stanchion fixing screw on the lower plate	M8x25	4	25 Nm (18.44 lbf ft)	-
3	Upper yoke fixing cap	M29	1	100 Nm (73.76 lbf ft)	-
4	Headstock ring nut	M35	1	40 Nm (29.50 lbf ft)	-
5	Headstock counter-lock ring	M35	1	-	Manually screw
6	Pipe stop plate fixing screw to the steering base	M6x18	1	10 Nm (7.37 lbf ft)	-



FRONT BRAKE CALLIPERS

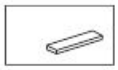
pos.	Description	Type	Quantity	Torque	Notes
1	Front brake calliper fixing screws	M10	4	50 Nm (36.87 lbf ft)	-

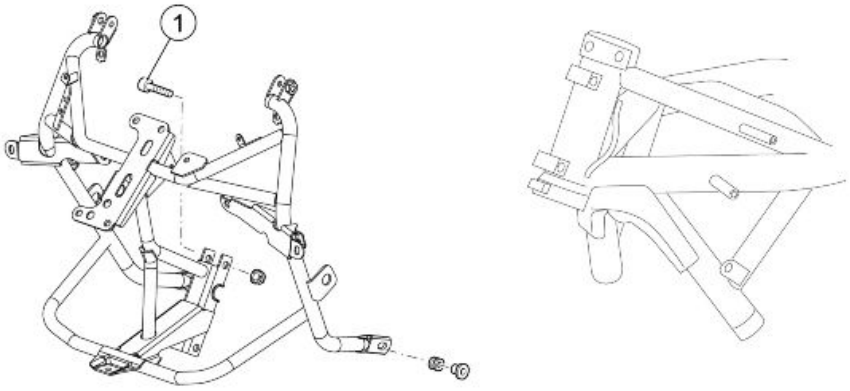


FRONT WHEEL

pos.	Description	Type	Quantity	Torque	Notes
1	Front wheel spindle nut	M25	1	80 Nm (59.00 lbf ft)	-
2	Front brake disc fixing screw	M8x20	12	25 Nm (18.44 lbf ft)	Loctite 243
3	Front tone wheel fixing screw	-	5	4 Nm (2.95 lbf ft)	Loctite 243

pos.	Description	Type	Quantity	Torque	Notes
4	Front ABS sensor fixing screw	M6	1	10 Nm (7.37 lbf ft)	-

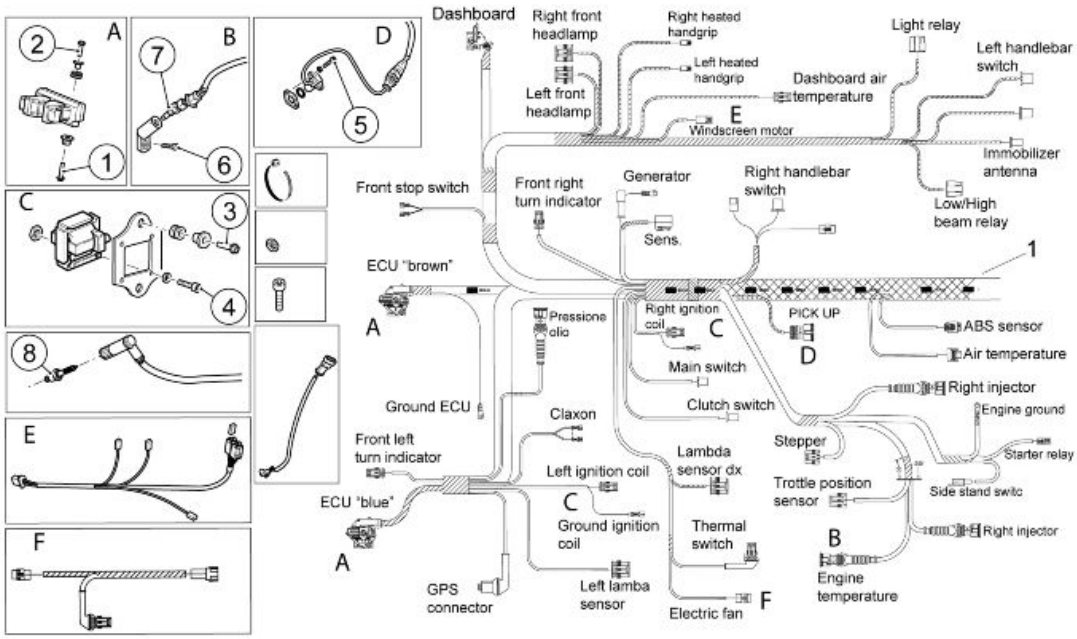




FRONT FRAME

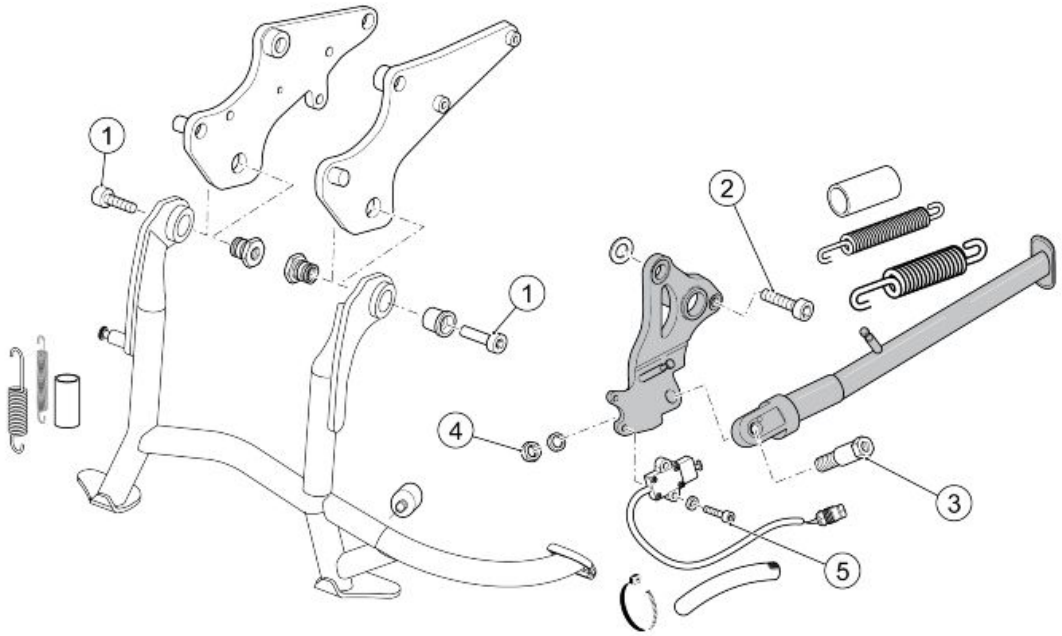
pos.	Description	Type	Quantity	Torque	Notes
1	Frame to chassis fixing screw	M8x40	2	10 Nm (7.37 lbf ft)	-

Central part



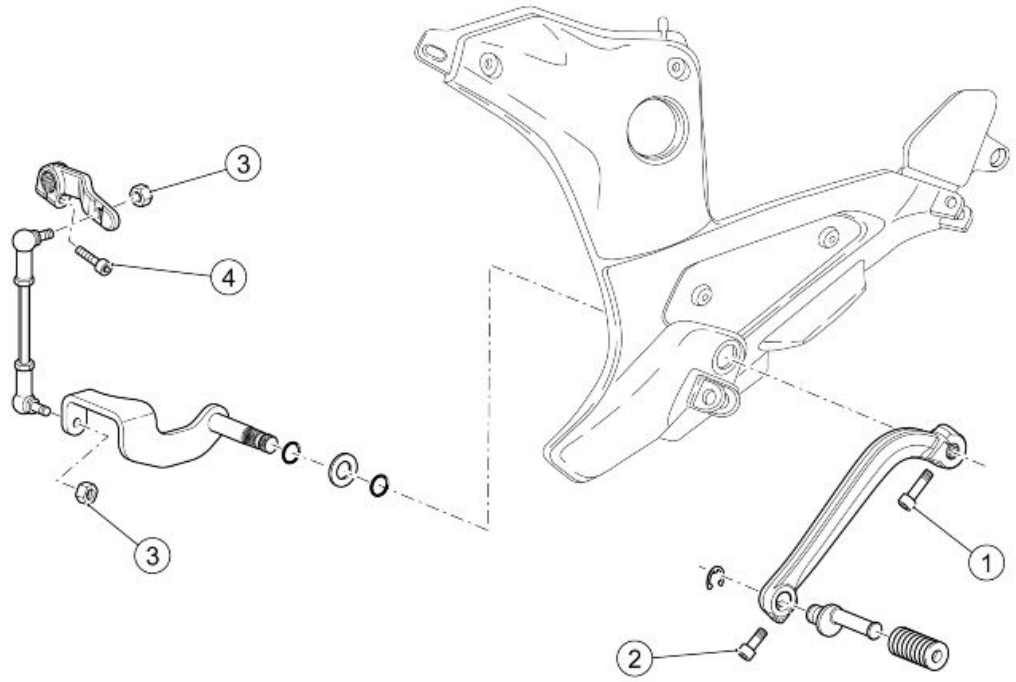
MAIN CABLE HARNESS

pos.	Description	Type	Quantity	Torque	Notes
1	Electronic control unit lower fixing screw	M6x20	4	10 Nm (7.37 lbf ft)	-
2	Electronic control unit upper fixing screw	M6x35	4	10 Nm (7.37 lbf ft)	-
3	Coil support plate fixing screw	M6x20	4	10 Nm (7.37 lbf ft)	-
4	Coil fixing screw to the support plate	M4x25	8	2 Nm (1.47 lbf ft)	-
5	Timing sensor fixing screw	M5x12	2	6 Nm (4.42 lbf ft)	-
6	Oil temperature sensor support fixing screw	M10x20	1	11 Nm (8.11 lbf ft)	Loctite 243
7	Oil temperature sensor	-	1	12 Nm (8.85 lbf ft)	Kluber Wolfacoat Grease
8	Spark plug	-	2	15 Nm (11.06 lbf ft)	-



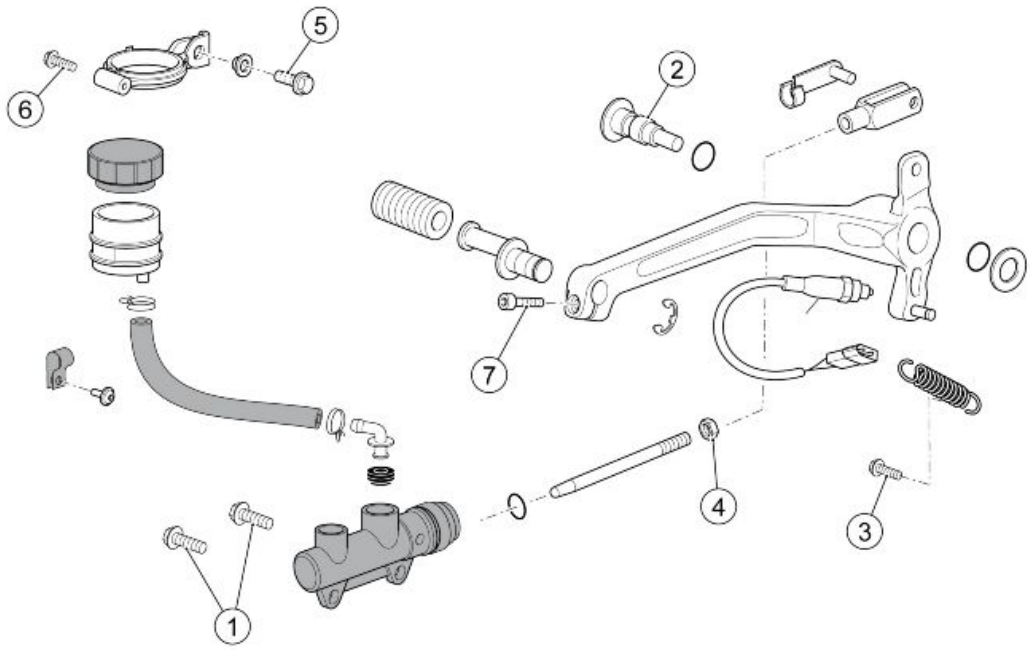
CENTRE AND SIDE STAND

pos.	Description	Type	Quantity	Torque	Notes
1	Centre stand on the plate fixing screw	M10x30	2	10 Nm (7.37 lbf ft)	Loctite 243
2	Side stand plate to chassis fixing screw	M12x35	2	80 Nm (59 lbf ft)	-
3	Side stand retainer pin	M10	1	10 Nm (7.37 lbf ft)	Loctite 270
4	Stand pin lower nut	M10x1.25	1	30 Nm (22.13 lbf ft)	Loctite 270
5	Side stand switch fixing screw	M5x16	2	6 Nm (4.42 lbf ft)	Loctite 243



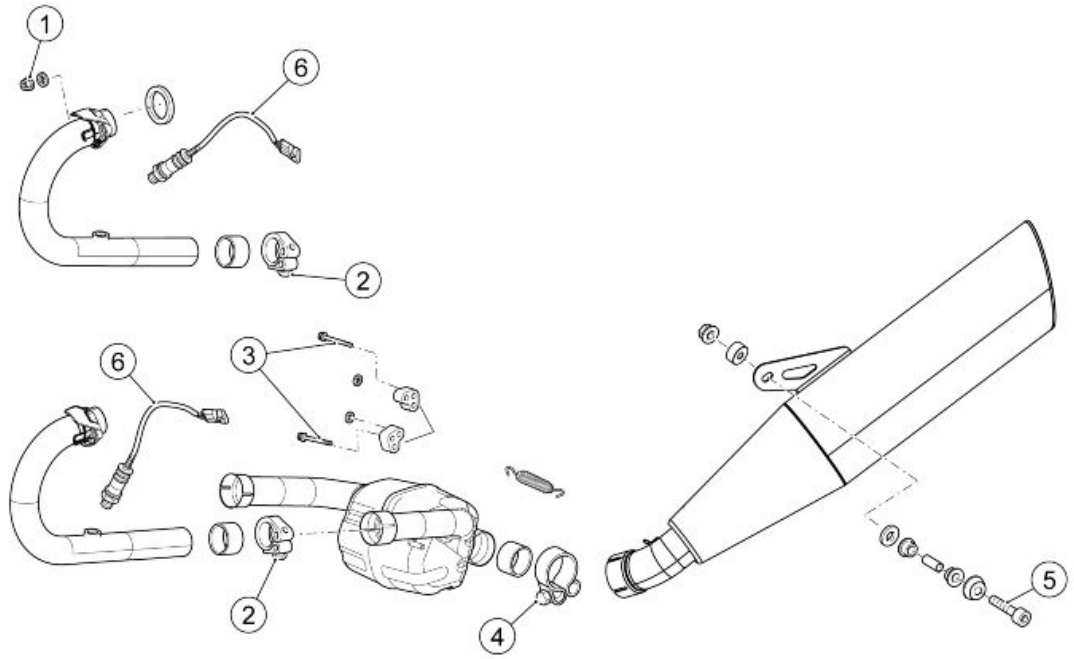
GEAR CONTROL

pos.	Description	Type	Quantity	Torque	Notes
1	Gearbox lever fixing screws	M6x20	1	10 Nm (7.37 lbf ft)	-
2	Peg to lever locking screw	M6x16	1	10 Nm (7.37 lbf ft)	-
3	Rod fixing nut	M6	2	10 Nm (7.37 lbf ft)	-
4	Transmission lever on the gear locking screw	M6x20	1	10 Nm (7.37 lbf ft)	-



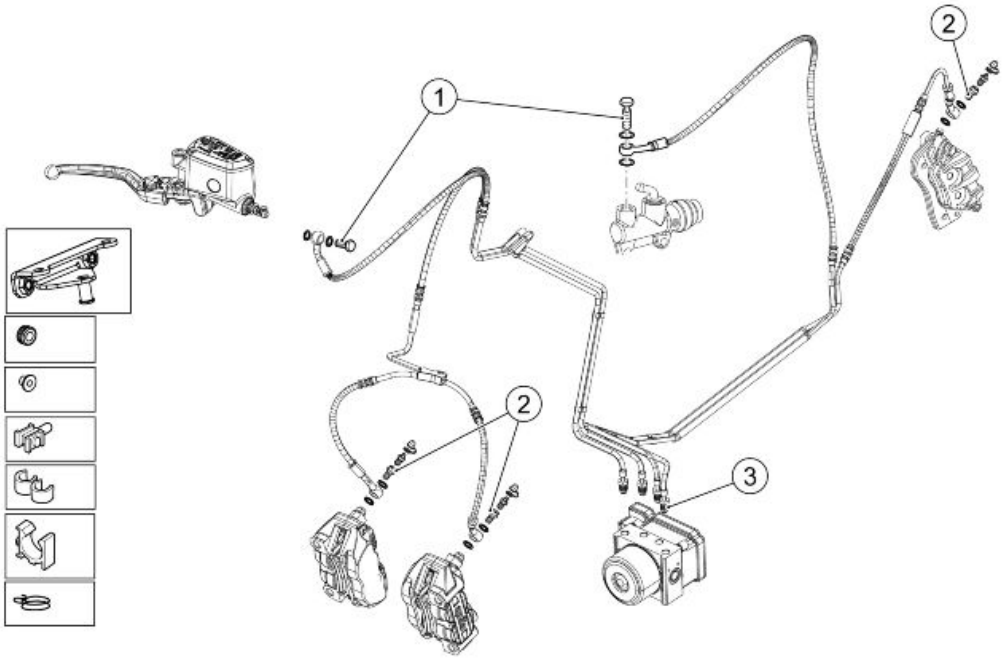
REAR BRAKE LEVER

pos.	Description	Type	Quantity	Torque	Notes
1	Rear brake pump fixing screw	M6x20	2	10 Nm (7.37 lbf ft)	Loctite 243
2	Rear brake pedal fixing screw	M8	1	15 Nm (11.06 lbf ft)	Loctite 243
3	Spring on the brake pedal return fixing screw	M5x16	1	6 Nm (4.42 lbf ft)	-
4	Lock nut on the rear brake pump rod	M6	1	-	Manually screw
5	Rear brake tank support fixing screw	M6	1	10 Nm (7.37 lbf ft)	-
6	Rear brake tank support clamping screw	SWP M5x20	1	3 Nm (2.21 lbf ft)	-
7	Peg to lever fixing screw	M6x16	1	10 Nm (7.37 lbf ft)	-



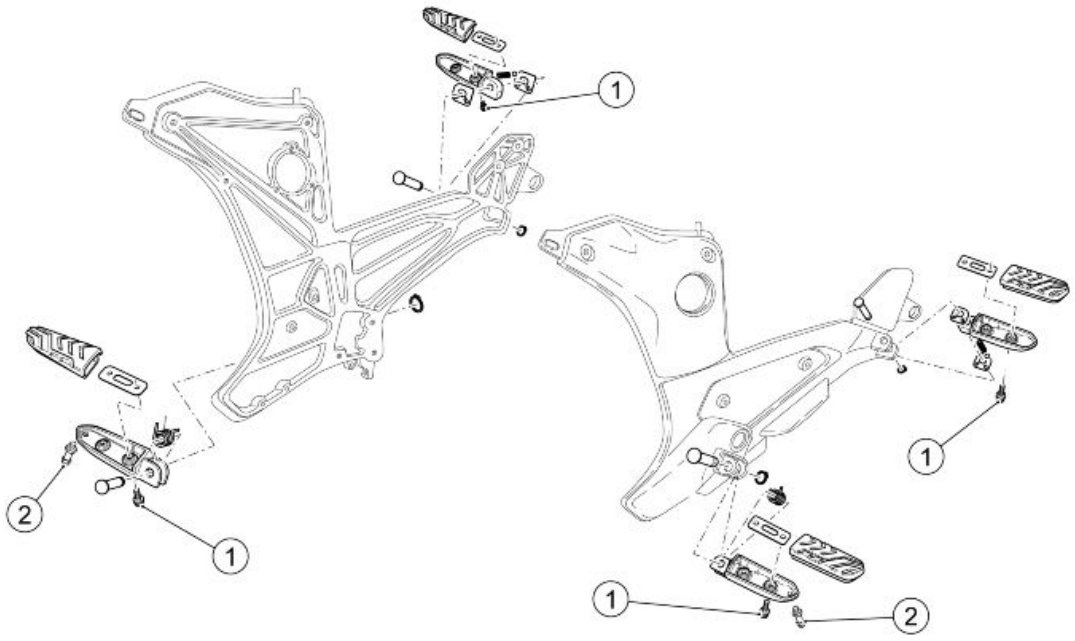
EXHAUST SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Exhaust pipe fixing nut to the engine	M8	4	25 Nm (18.44 lbf ft)	-
2	Exhaust pipe fixing clamp screw to the compensator	M6	2	20 Nm (14.75 lbf ft)	Clamp
3	Compensator fixing screw to the plate	M10	2	25 Nm (18.44 lbf ft)	-
4	Compensator fixing clamp screw to the muffler	M8	1	20 Nm (14.75 lbf ft)	Clamp
5	Muffler fixing screw to the support	M8x45	1	25 Nm (18.44 lbf ft)	-
6	Lambda sensor on the exhaust pipe	M18	2	38 Nm (28.03 lbf ft)	-



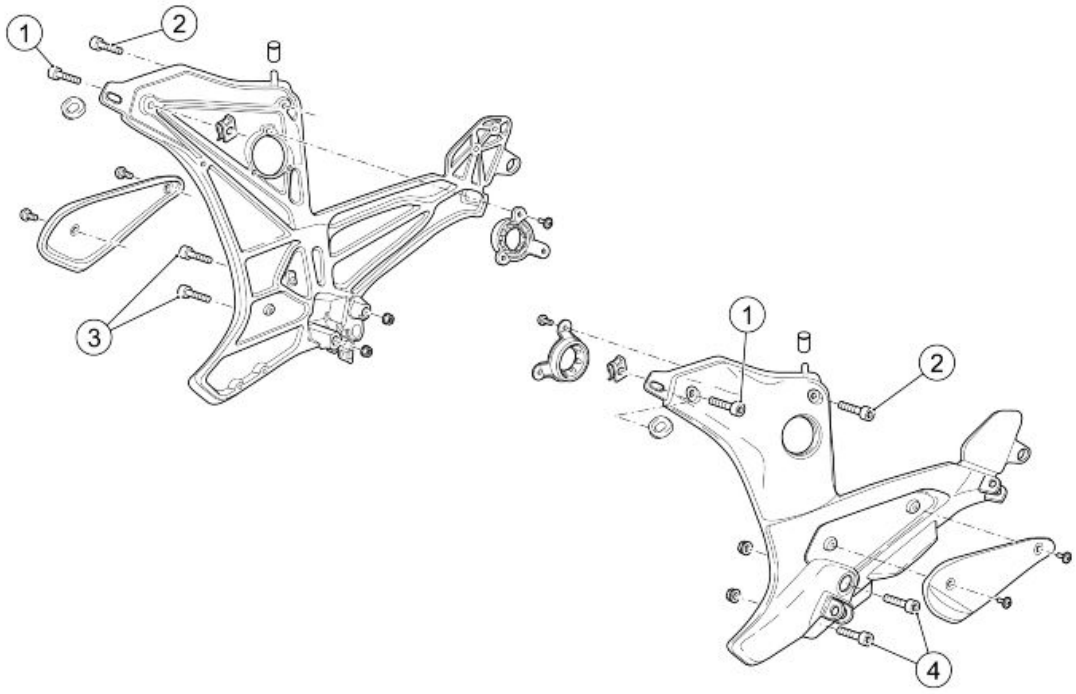
BRAKE SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Brake pipe slot screw on the pump	M10	2	25 Nm (18.44 lbf ft)	-
2	Joint with brake pipes retainer bleeding on the calliper	M10	3	25 Nm (18.44 lbf ft)	-
3	Brake pipes joint on the ABS hydraulic unit	-	4	25 Nm (18.44 lbf ft)	-



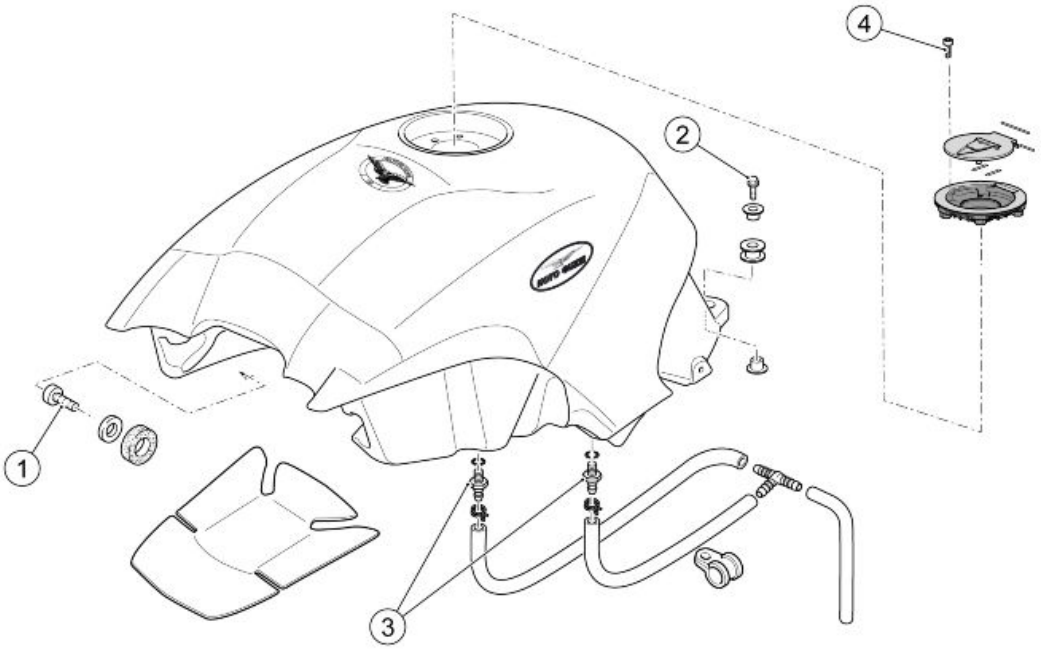
FOOTRESTS

pos.	Description	Type	Quantity	Torque	Notes
1	Rubber footrest fixing screw	M6	8	10 Nm (7.37 lbf ft)	Loctite 243
2	Rider footrest friction pin	M8	2	25 Nm (18.44 lbf ft)	Loctite 243



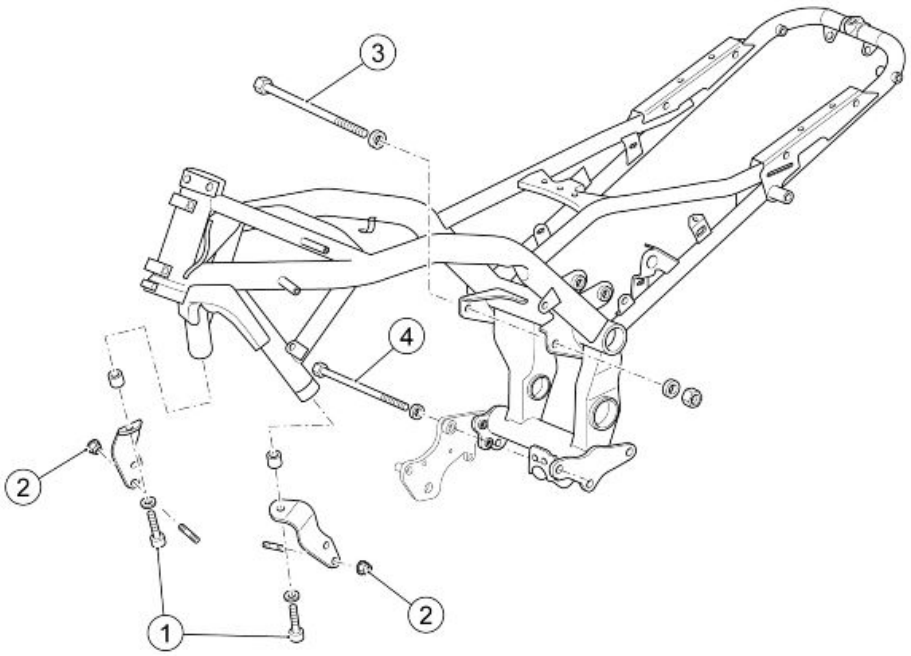
FOOTREST SUPPORT PLATE

pos.	Description	Type	Quantity	Torque	Notes
1	Footrest plate to chassis front upper fixing screw	M8x30	4	20 Nm (14.75 lbf ft)	Loctite 243
2	Footrest plate to chassis rear upper fixing screw	M8x25	4	25 Nm (18.44 lbf ft)	Loctite 243
3	Right footrest plate to chassis lower fixing screw	M8x40	2	25 Nm (18.44 lbf ft)	-
4	Left footrest plate to chassis lower fixing screw	M8x55	2	25 Nm (18.44 lbf ft)	-



FUEL TANK

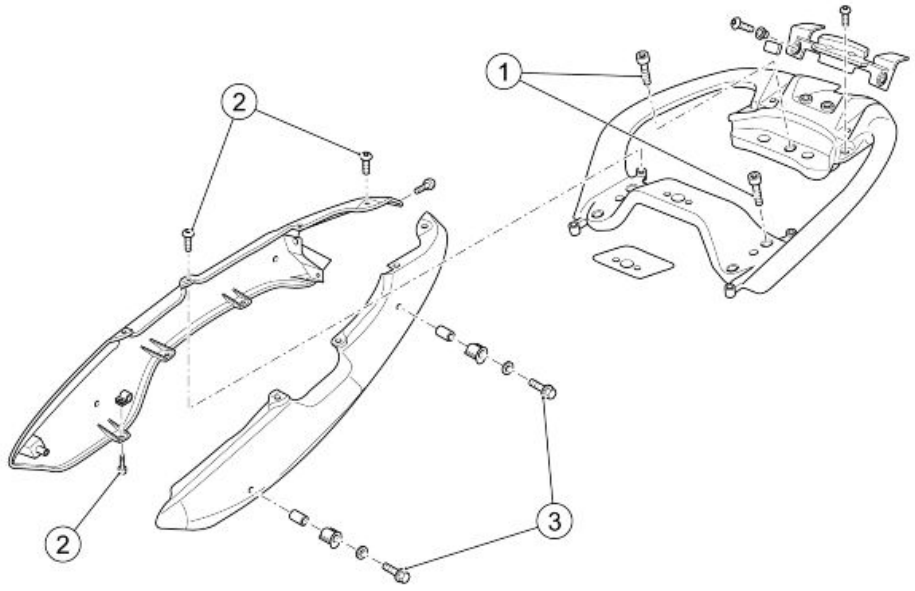
pos.	Description	Type	Quantity	Torque	Notes
1	Tank to chassis front fixing screw	M8	2	25 Nm (18.44 lbf ft)	-
2	Tank to chassis rear fixing screw	M8	1	25 Nm (18.44 lbf ft)	-
3	Tank breather joint	M6	2	6 Nm (4.42 lbf ft)	-
4	Filler to tank fixing screw	M5	4	4 Nm (2.95 lbf ft)	-



FRAME

pos.	Description	Type	Quantity	Torque	Notes
1	Plate to chassis fixing screw	M12x50	2	50 Nm (36.87 lbf ft)	-
2	Plate to engine fixing nut	M10	4	80 Nm (59 lbf ft)	-
3	Gear to chassis upper fixing pin	M12	1	80 Nm (59 lbf ft)	-
4	Gear to chassis lower fixing pin	M12x270	1	80 Nm (59 lbf ft)	-

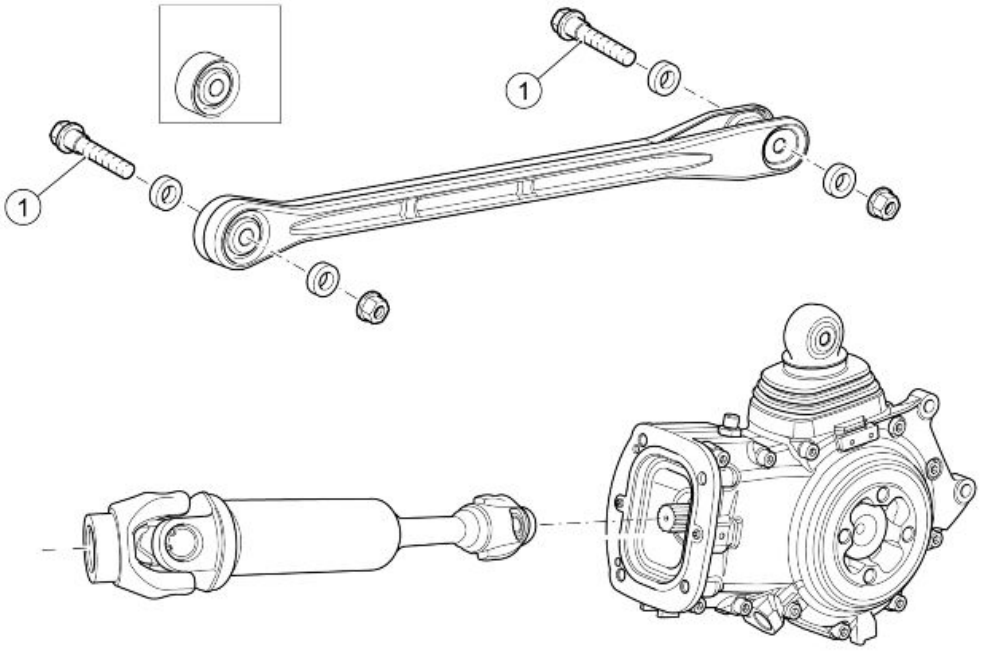
Back side



TAIL

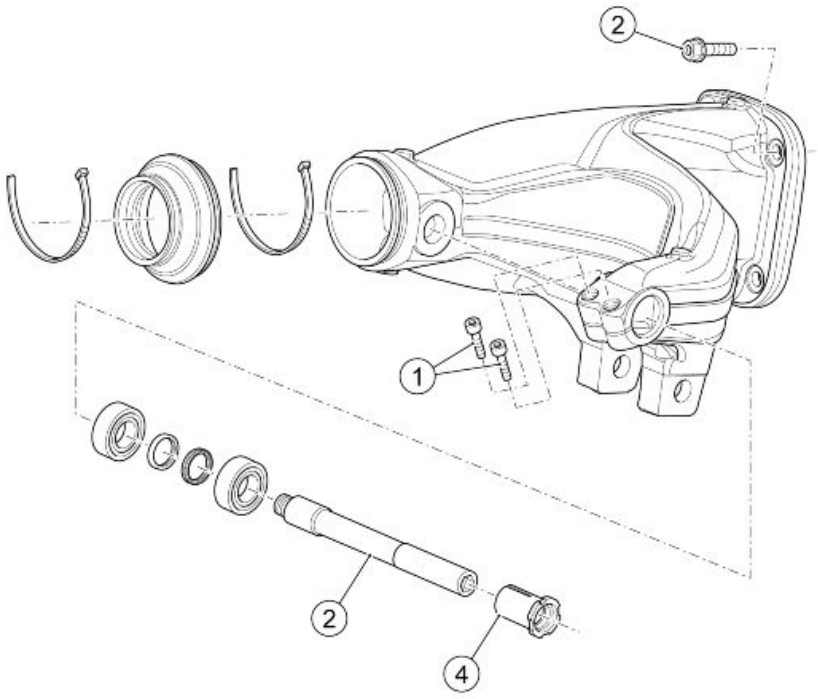
Tail

pos.	Description	Type	Quantity	Torque	Notes
1	Handgrip to chassis fixing screw	M8x25	5	25 Nm (18.44ft)	-
2	Tail to handgrip and to rear fairings fixing screw	M5x9	10	4 Nm (2.95 lbf ft)	-
3	Hooks and tail fairing to chassis fixing screw	M8	4	20 Nm (14.75 lbf ft)	-



TRANSMISSION CONNECTION - ENGINE

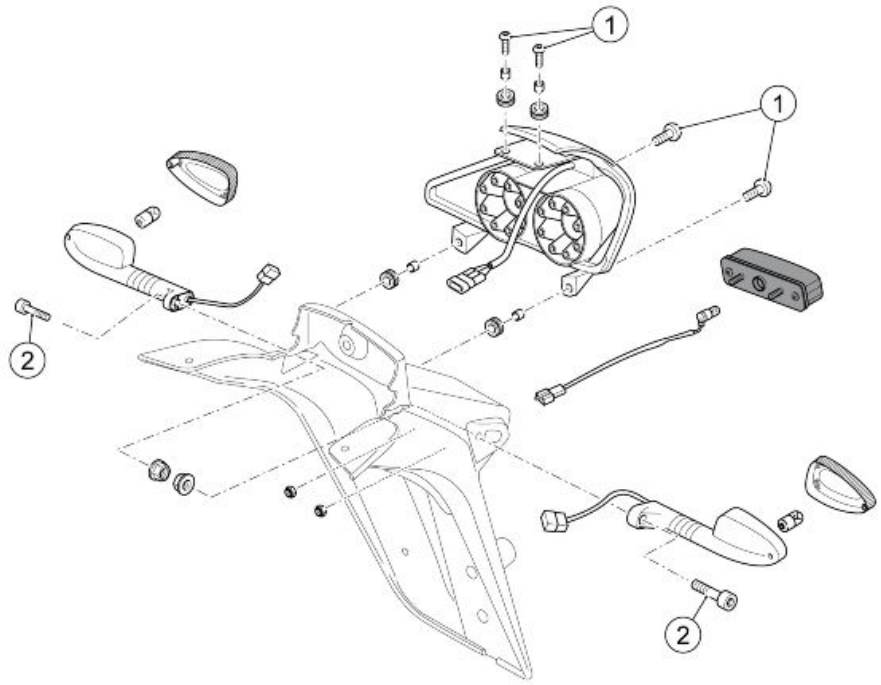
pos.	Description	Type	Quantity	Torque	Notes
1	Reaction rod fixing screw	M10x55	2	50 Nm (36.87 lbf ft)	-



REAR SWINGARM

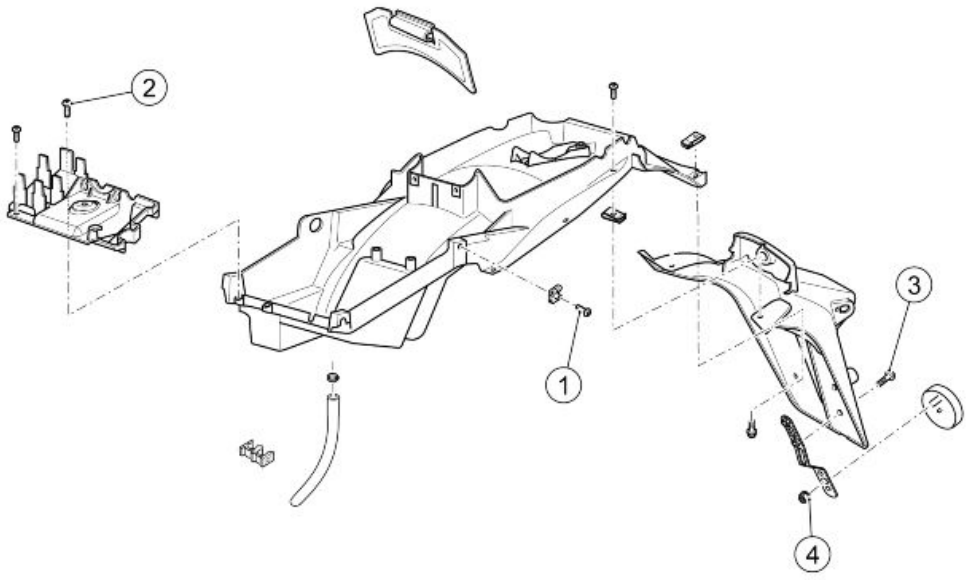
pos.	Description	Type	Quantity	Torque	Notes
1	Swingarm clamp fixing screw on the bushing	M6x25	2	10 Nm (7.37 lbf ft)	-

pos.	Description	Type	Quantity	Torque	Notes
2	2 - Swingarm fixing screw on the transmission housing	M10x35	4	50 Nm (36.87 lbf ft)	-
3	Swingarm pin on the swingarm	M12	1	60 Nm (44.25 lbf ft)	-
4	Preloading bushing to the swingarm pin	M25	1	10 Nm (7.37 lbf ft)	-



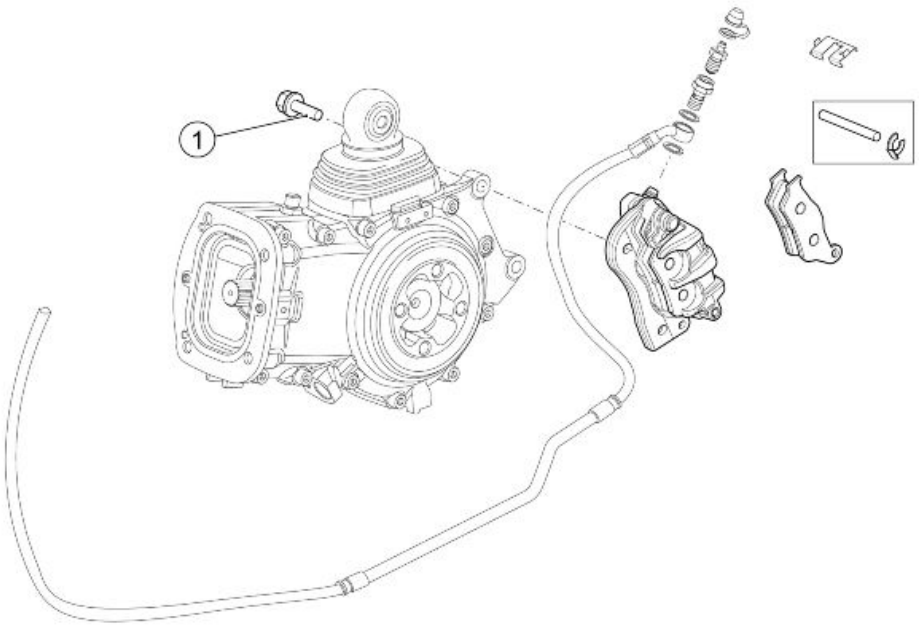
REAR LIGHTS

pos.	Description	Type	Quantity	Torque	Notes
1	Handgrip taillight fixing screw	M5x16	4	4 Nm (2.95 lbf ft)	-
2	Rear turn indicator fixing screw	M6	2	2 Nm (1.47 lbf ft)	-



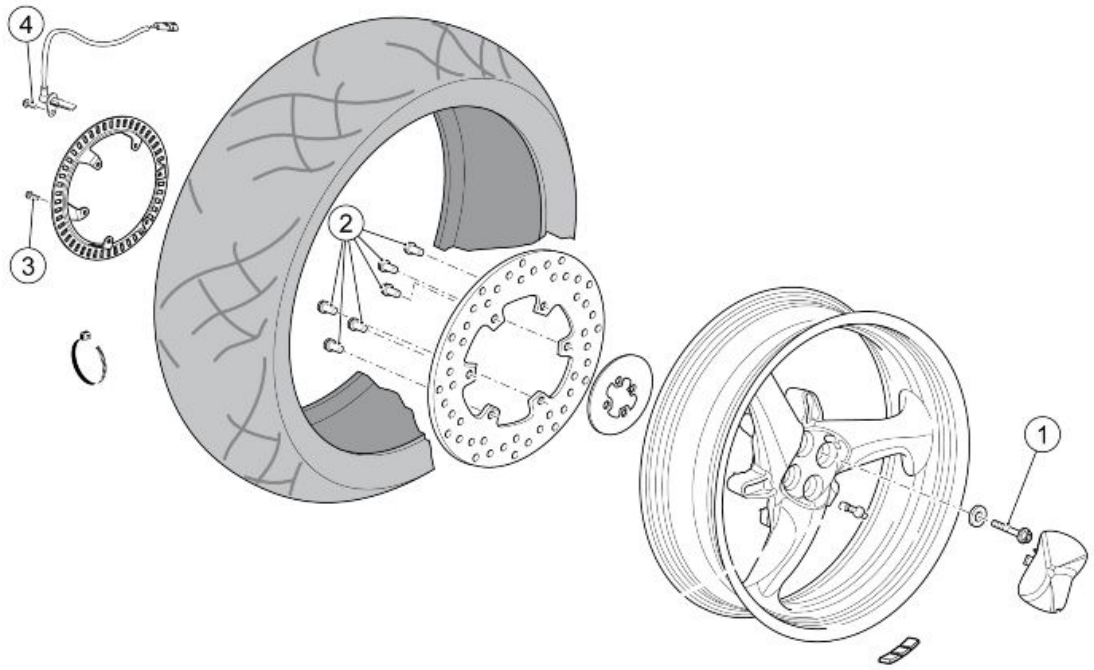
SPLASH GUARD

pos.	Description	Type	Quantity	Torque	Notes
1	Splash guard fixing screw to the chassis	M6	6	10 Nm (7.37 lbf ft)	Loctite 243
2	ABS support fixing screw to the splash guard	SWP M5x20	3	3 Nm (2.21 lbf ft)	-
3	Retroreflector support fixing screw to the license plate	M5x10	2	4 Nm (2.95 lbf ft)	-
4	Retroreflector fixing nut retainer to the support	M5	1	4 Nm (2.95 lbf ft)	-



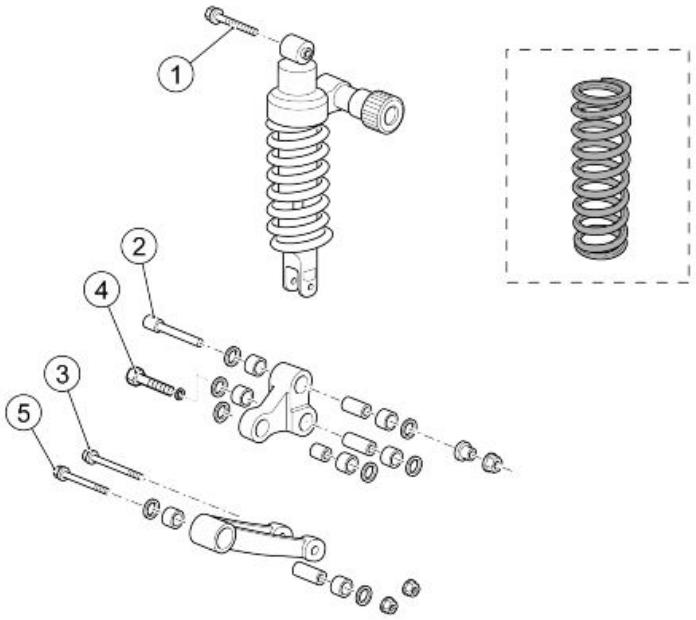
REAR BRAKE CALLIPER

pos.	Description	Type	Quantity	Torque	Notes
1	Rear brake calliper fixing screw	M10	2	50 Nm (36.87 lbf ft)	-



REAR WHEEL

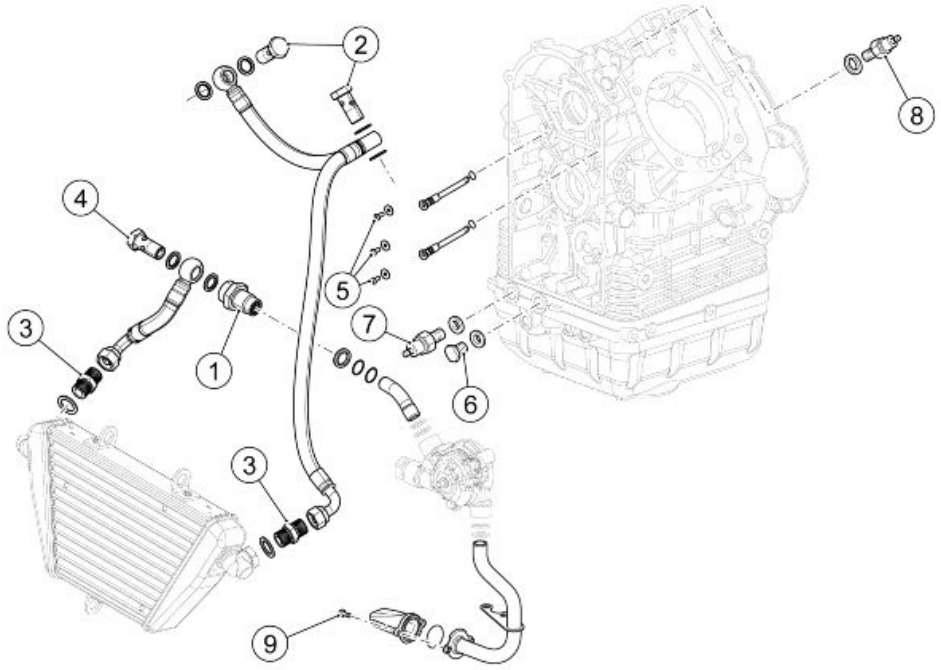
pos.	Description	Type	Quantity	Torque	Notes
1	Rear wheel fixing screw	M12x65	4	110 Nm (81.13 lbf ft)	-
2	Rear brake disc fixing screw	M8	6	25 Nm (18.44 lbf ft)	Loctite 243
3	Rear tone wheel fixing screw	M5x12	6	4 Nm (2.95 lbf ft)	Loctite 243
4	Rear ABS sensor fixing screw	M6	1	10 Nm (7.37 lbf ft)	-



REAR SUSPENSION

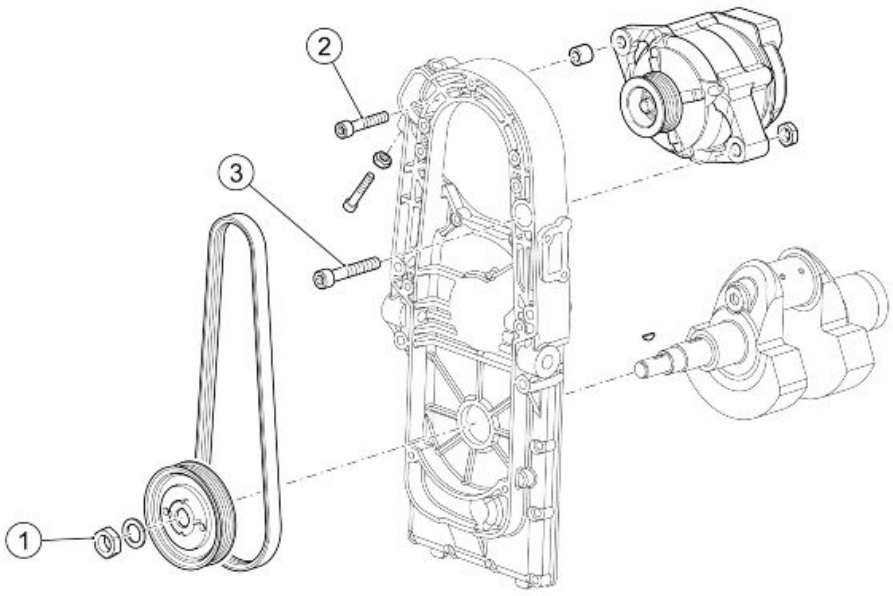
pos.	Description	Type	Quantity	Torque	Notes
1	Shock absorber to chassis fixing screw	M10x80	1	50 Nm (36.87 lbf ft)	-
2	Shock absorber to double connecting rod fixing screw	M10x82	1	40 Nm (29.50 lbf ft)	-
3	Shock absorber to single connecting rod fixing screw	M10x95	1	50 Nm (36.87 lbf ft)	-
4	Double connecting rod to swingarm fixing screw	M10x47	1	50 Nm (36.87 lbf ft)	-
5	Screw fastening single linkage to chassis	M10x85	1	50 Nm (36.87 lbf ft)	-

Engine



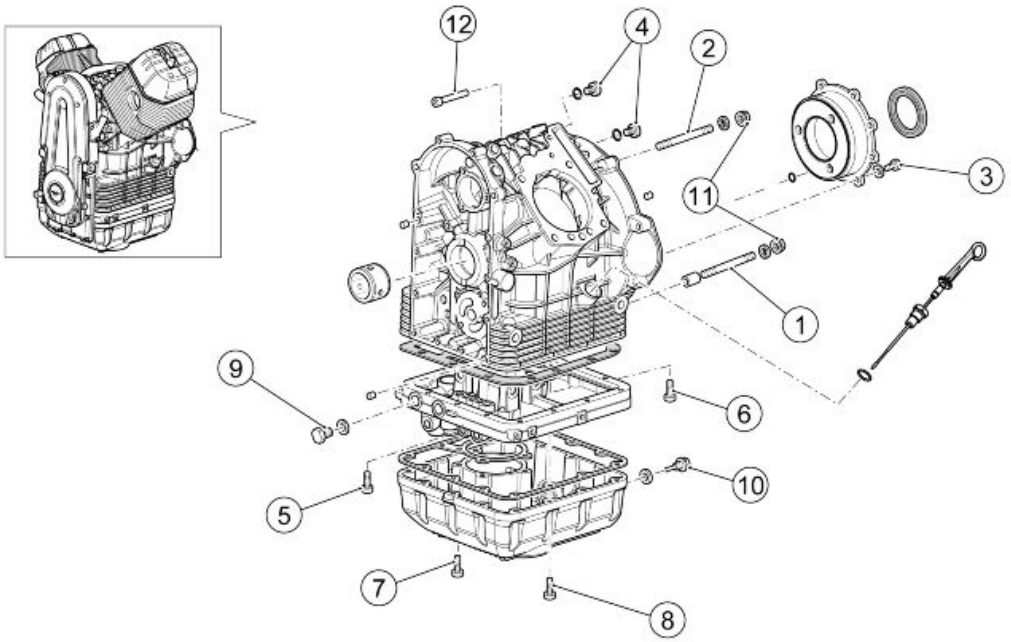
LUBRICATION SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Pump outlet oil pipe nipple	M14x1.5	1	40 Nm (29.50 lbf ft)	-
2	Slot screw for oil pipe on the cylinder head	M14x1.5	2	20 Nm (14.75 lbf ft)	-
3	Nipple on the radiator and the oil pipe	M16x1.5	2	20 Nm (14.75 lbf ft)	Apply vaseline oil
4	Oil delivery pipe to radiator slot screw	M14x1.5	1	35 Nm (25.81 lbf ft)	-
5	Jets fixing screw	-	3	Using a "T" spanner, close by hand	Loctite 243
6	Cover on the flange under the crankcase	-	1	20 Nm (14.75 lbf ft)	-
7	Thermal switch	-	1	20 Nm (14.75 lbf ft)	-
8	Minimum oil pressure sensor	M12	1	25 Nm (18.44 lbf ft)	-
9	Intake oil filter fixing screw	-	2	4 Nm (2.95 lbf ft)	-



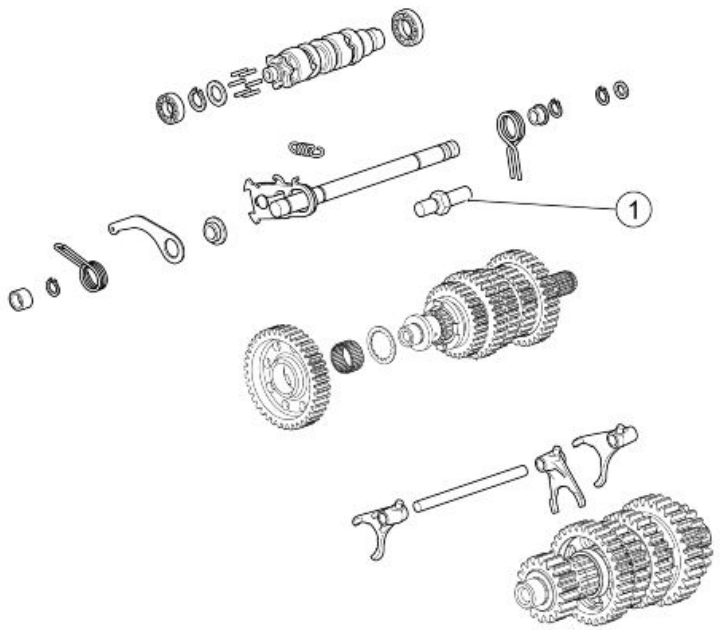
ALTERNATOR

pos.	Description	Type	Quantity	Torque	Notes
1	Generator control pulley locking nut	M16	1	80 Nm (59.00 lbf ft)	Loctite 243
2	Generator upper fixing screw	M8	1	22 Nm (16.23 lbf ft)	-
3	Generator lower fixing screw	M10x60	1	30 Nm (22.13 lbf ft)	-



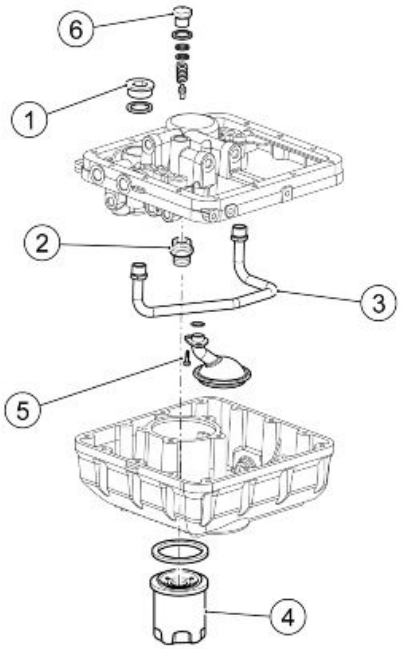
CRANKCASE AND OIL SUMP

pos.	Description	Type	Quantity	Torque	Notes
1	Stud bolt	M8x75	2	10 Nm (7.37 lbf ft)	-
2	Stud bolt	M8x66	3	10 Nm (7.37 lbf ft)	-
3	Crankshaft rear support flange fixing screw	M8x25	8	26 Nm (19.18 lbf ft)	-
4	Oil cap on the crankcase	-	2	25 Nm (18.44 lbf ft)	-
5	Flange fixing screw under the crankcase	M6x60	2	10 Nm (7.37 lbf ft)	-
6	Flange fixing screw under the crankcase	-	2	10 Nm (7.37 lbf ft)	-
7	Oil sump fixing screw (filter contour)	M6x35	4	10 Nm (7.37 lbf ft)	-
8	Oil sump fixing screw	M6	14	10 Nm (7.37 lbf ft)	-
9	Cover on the flange under the crankcase	-	2	20 Nm (14.75 lbf ft)	-
10	Magnetic oil drainage cap	-	1	20 Nm (14.75 lbf ft)	-
11	Gear to engine fixing nut	M8	5	20 Nm (14.75 lbf ft)	-
12	Gear to engine fixing screw	-	1	20 Nm (14.75 lbf ft)	Loctite 542



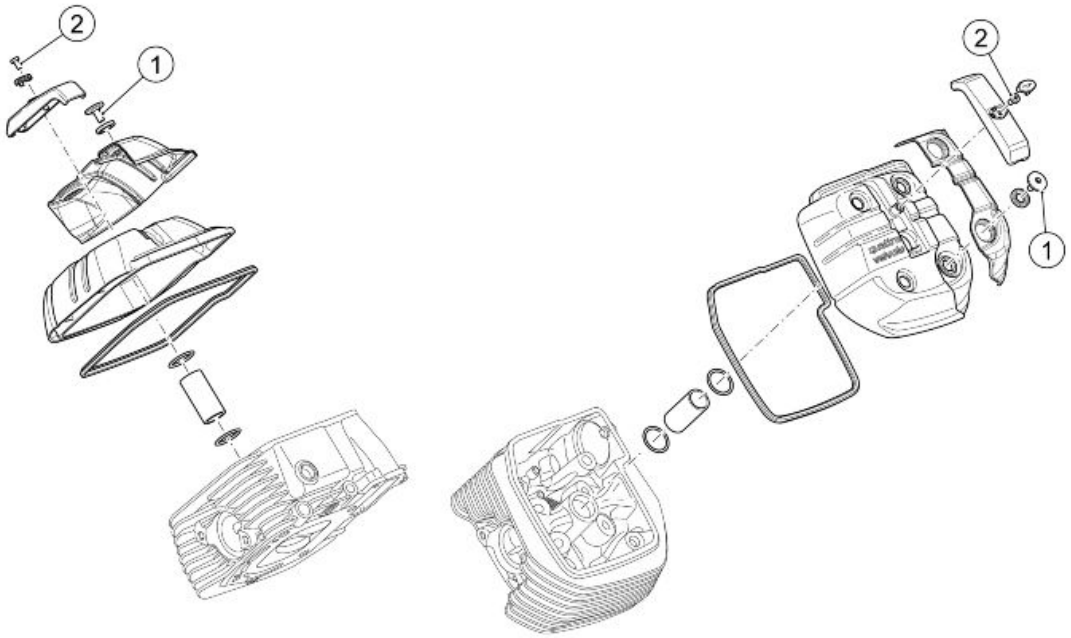
GEAR INTERNAL CONTROLS

pos.	Description	Type	Quantity	Torque	Notes
1	Spring guide pin	-	1	24 Nm (17.70 lbf ft)	Loctite 243



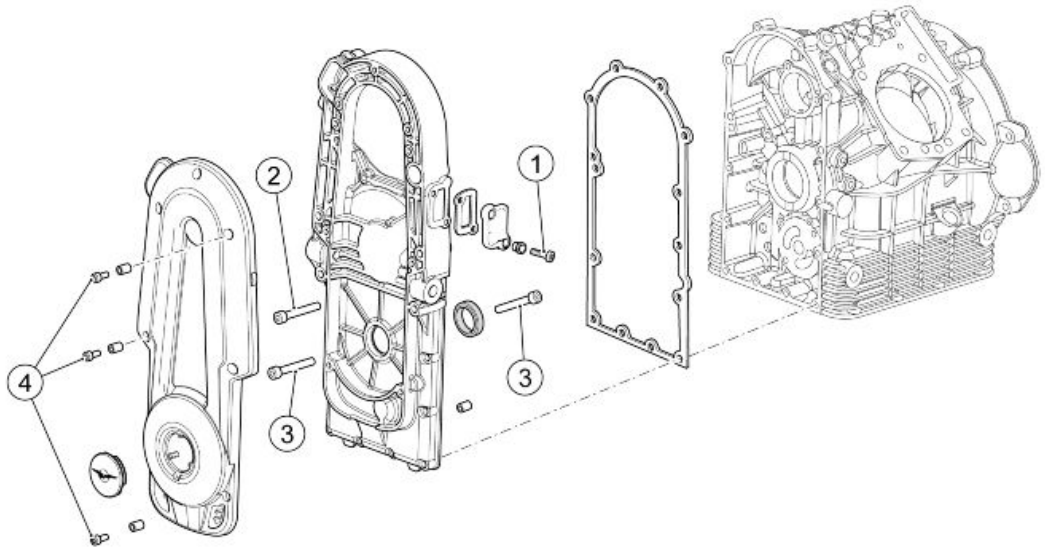
OIL SUMP COMPONENTS

pos.	Description	Type	Quantity	Torque	Notes
1	Cover on the flange under the crankcase	-	1	40 Nm (29.50 lbf ft)	-
2	Oil filter joint	-	1	10 Nm (7.37 lbf ft)	Loctite 243
3	Oil sump pipe	-	1	20 Nm (14.75 lbf ft)	Loctite 648
4	Oil filter	-	1	15 Nm (11.06 lbf ft)	Engine oil
5	Rose pipe fixing screw	M6	-	10 Nm (7.37 lbf ft)	-
6	Maximum pressure valve cover	M18	1	40 Nm (29.50 lbf ft)	-



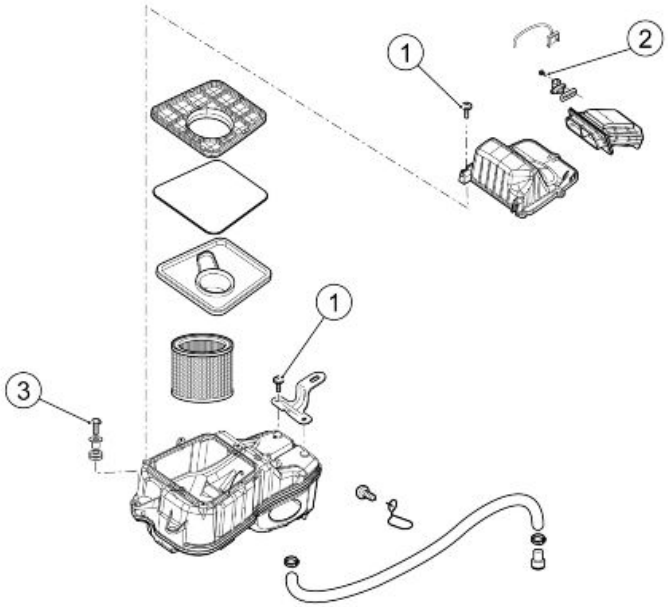
CYLINDER HEAD COVERS

pos.	Description	Type	Quantity	Torque	Notes
1	Special cylinder head fixing screw	-	8	8 Nm (5.90 lbf ft)	Locked with cross sequence
2	Spark plug cover fixing screw	M5x10	2	8 Nm (5.90 lbf ft)	-



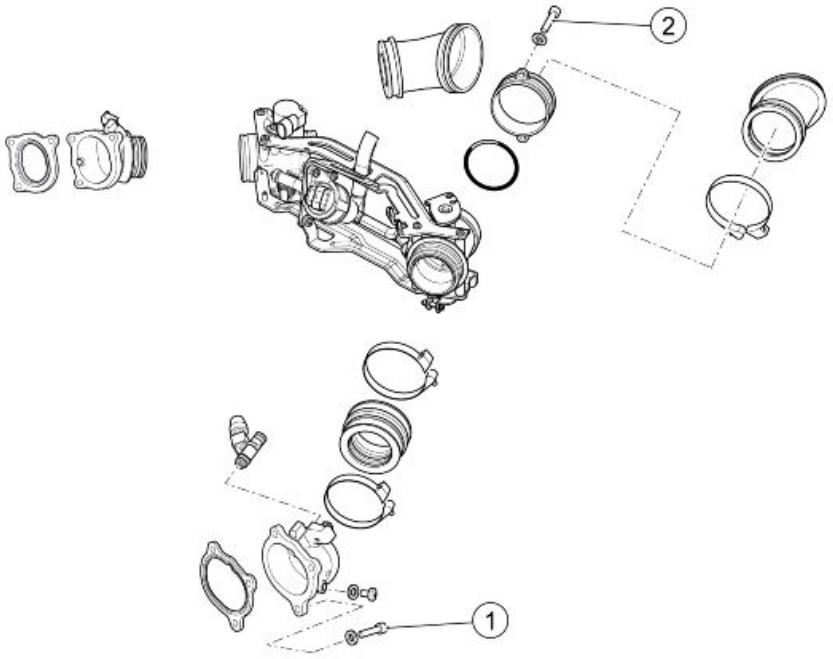
GENERATOR COVER

pos.	Description	Type	Quantity	Torque	Notes
1	Timing system cover cap fixing screw	M6x20	2	10 Nm (7.37 lbf ft)	Loctite 243
2	Timing system cover fixing screw	M8x55	4	25 Nm (18.44 lbf ft)	-
3	Timing system cover fixing screw	M6x30	9	12 Nm (8.85 lbf ft)	-
4	Generator cover fixing screw	M6x16	5	12 Nm (8.85 lbf ft)	-



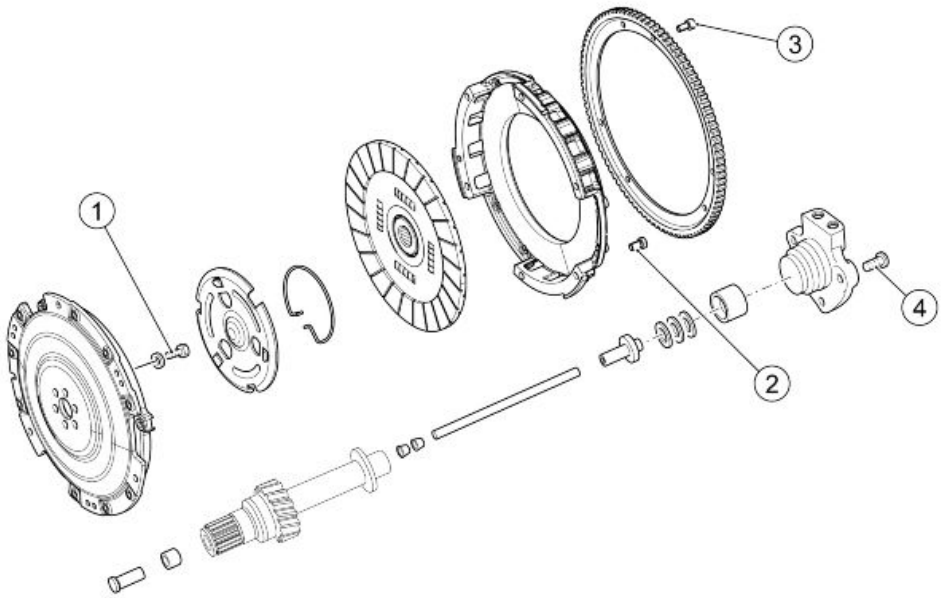
AIR FILTER

pos.	Description	Type	Quantity	Torque	Notes
1	Air filter box bracket and cover fixing screw	SWP 5x20	7	3 Nm (2.21 lbf ft)	-
2	Air temperature sensor fixing screw	SWP 2.9x12	2	2 Nm (1.47 lbf ft)	-
3	Air filter box front fixing screw	M6x20	2	4 Nm (2.95 lbf ft)	-



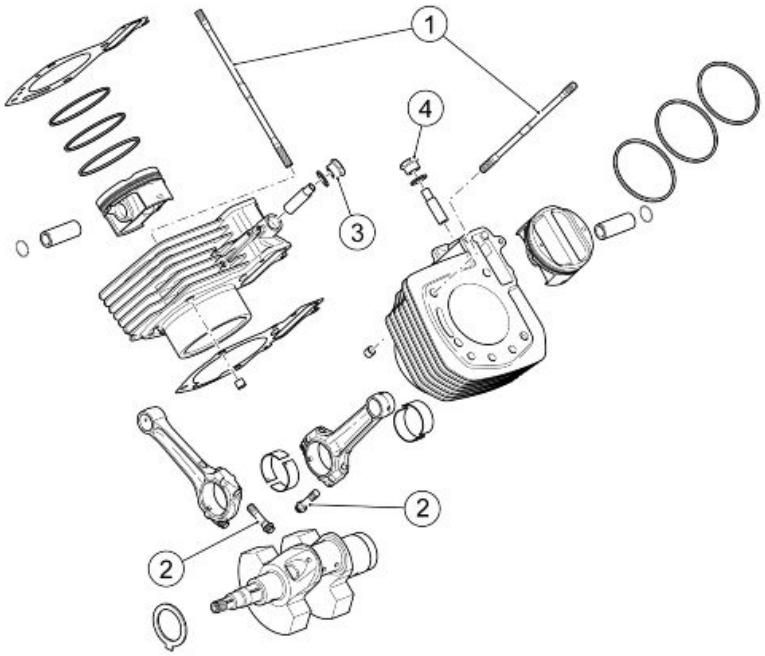
THROTTLE BODY

pos.	Description	Type	Quantity	Torque	Notes
1	Intake pipe fixing screw	-	6	10 Nm (7.37 lbf ft)	-
2	Flange fixing screw on the throttle body	M5x12	2	6 Nm (4.42 lbf ft)	-



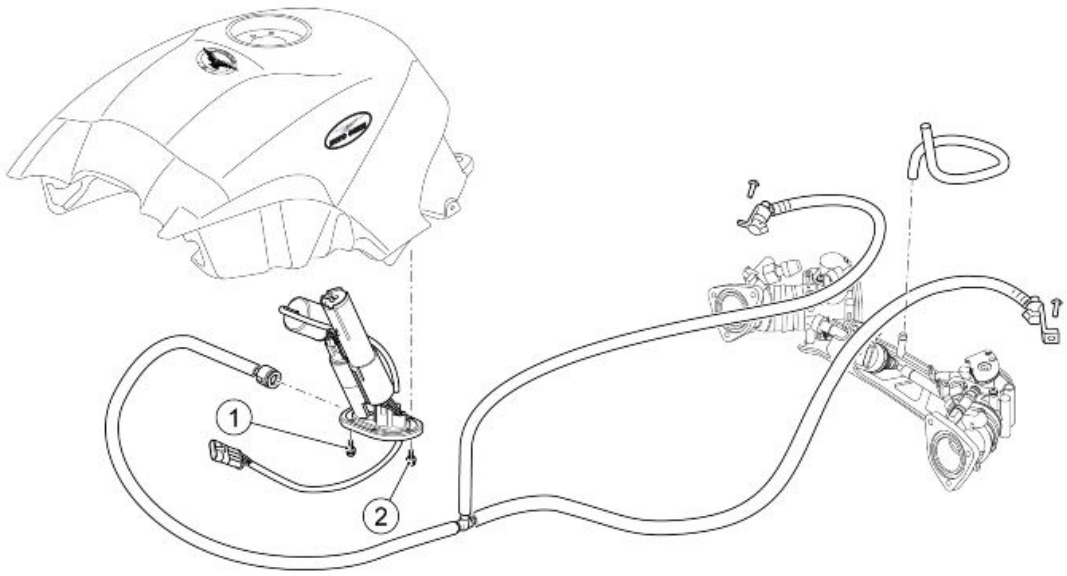
CLUTCH

pos.	Description	Type	Quantity	Torque	Notes
1	Clutch to crankshaft fixing screw	-	6	42 Nm (30.98 lbf ft)	Tighten with cross sequence
2	Clutch external flange fixing screw on flywheel	M7x16	6	20 Nm (14.75 lbf ft)	Loctite 243
3	Start-up crown fixing screw on flywheel	-	6	10 Nm (7.37 lbf ft)	Loctite 243
4	Clutch control cylinder fixing screw	-	3	10 Nm (7.37 lbf ft)	Loctite 243



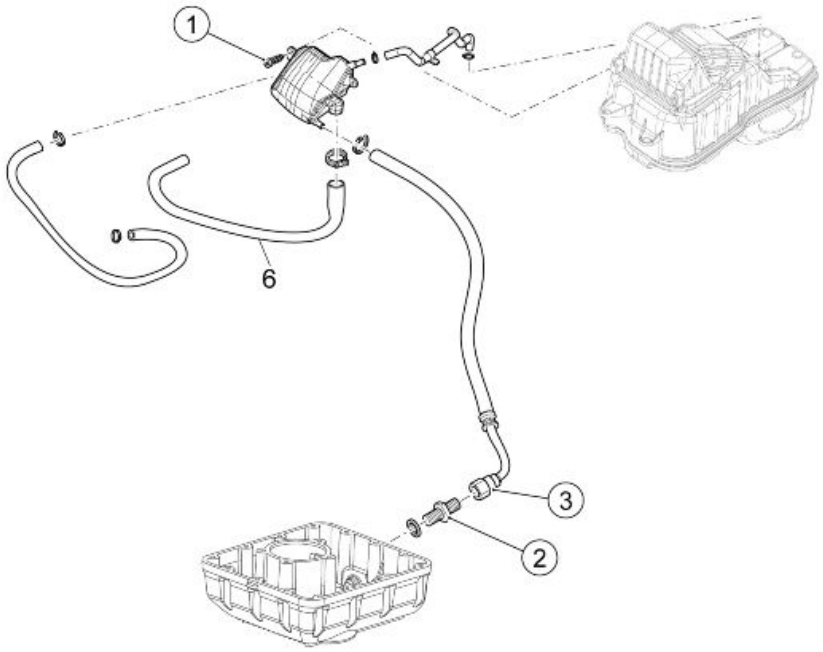
CONNECTING ROD ASSEMBLY - CYLINDERS

pos.	Description	Type	Quantity	Torque	Notes
1	Thermal group fixing stud bolt	M10x1.25	8	5 Nm (3.69 lbf ft)	Loctite 243
2	Connecting rod screws	-	4	40 Nm (29.50 lbf ft)	Pre-tightening
2	Connecting rod screws	-	4	80 Nm (59.00 lbf ft)	Final tightening
3	Right hydraulic tensioner cover	-	1	42 Nm (30.98 lbf ft)	-
4	Left hydraulic tensioner cover	-	1	30 Nm (22.13 lbf ft)	-



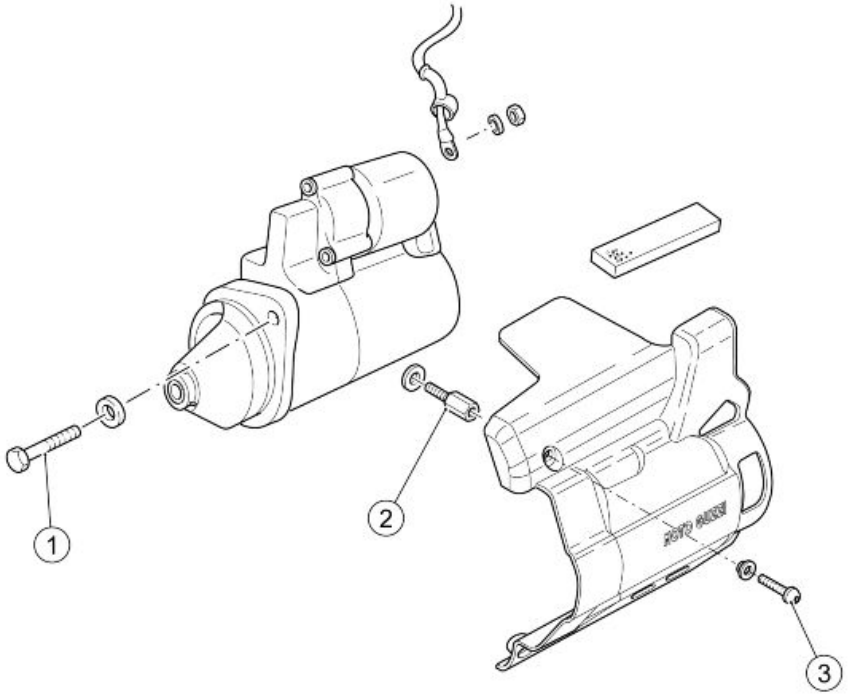
FUEL SUPPLY SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Fuel pump support fixing screw to the tank	M5x20	2	5 Nm (3.68 lbf ft)	-
2	Fuel pump support fixing screw to the tank	M5x16	4	6 Nm (4.42 lbf ft)	-



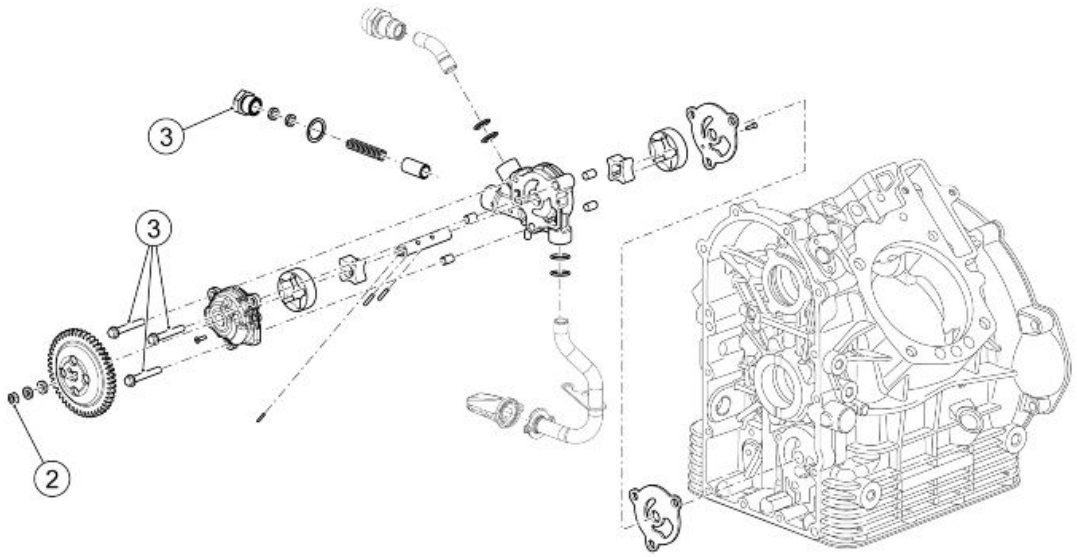
BLOW-BY SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Blow-By tank fixing screw	SWP M5x14	2	3 Nm (2.21 lbf ft)	-
2	Reduction joint for oil return pipe	-	1	20 Nm (14.75 lbf ft)	-
3	Oil return pipe (on sump)	-	1	20 Nm (14.75 lbf ft)	Vaseline oil



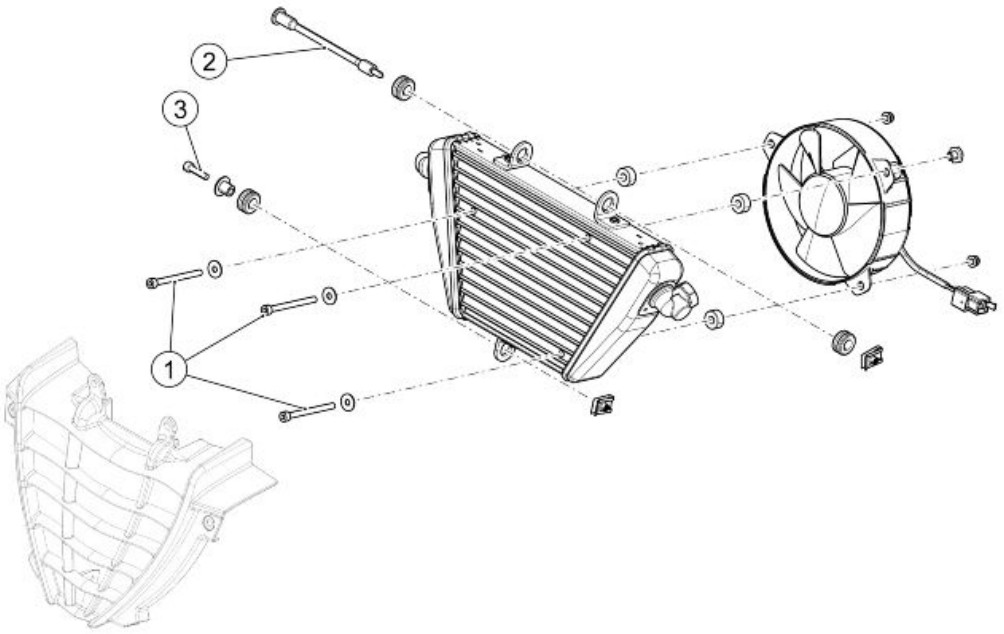
STARTER MOTOR

pos.	Description	Type	Quantity	Torque	Notes
1	Starter motor fixing screw	-	2	25 Nm (18.44 lbf ft)	-
2	Stud bolt	-	1	10 Nm (7.37 lbf ft)	-
3	Starter motor cover fixing screw	M6x10	2	8 Nm (5.90 lbf ft)	-



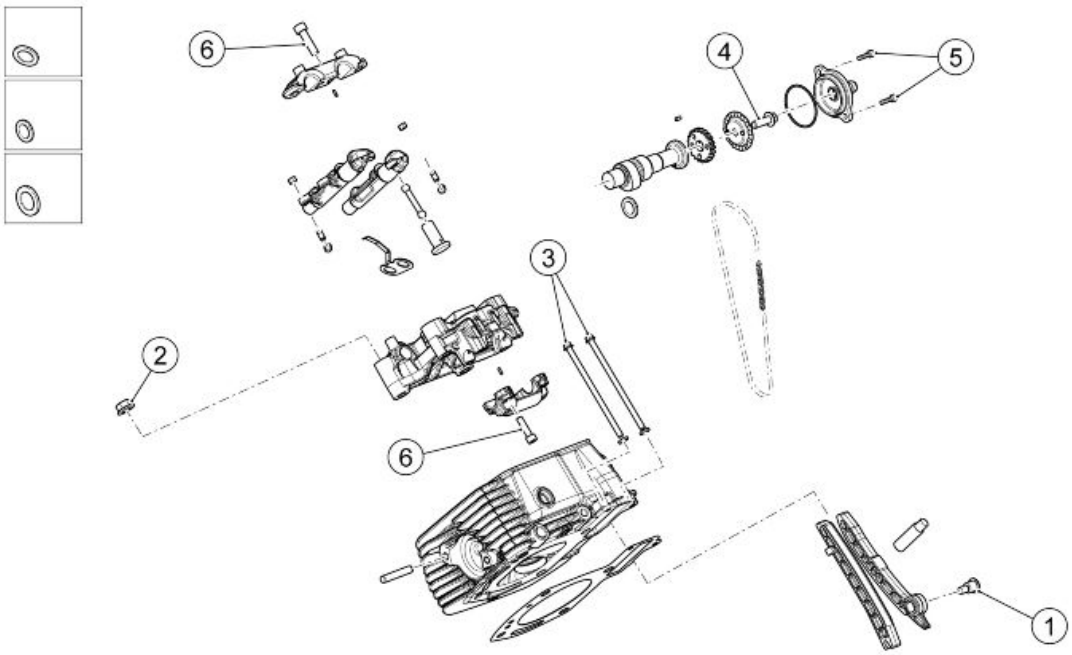
OIL PUMP

pos.	Description	Type	Quantity	Torque	Notes
1	Oil pump fixing screw	M6x45	3	10 Nm (7.37 lbf ft)	Loctite 243
2	Oil pump driven gear locking nut	M6	1	8 Nm (5.90 lbf ft)	Loctite 243
3	Oil pressure valve cap	-	1	40 Nm (29.50 lbf ft)	-



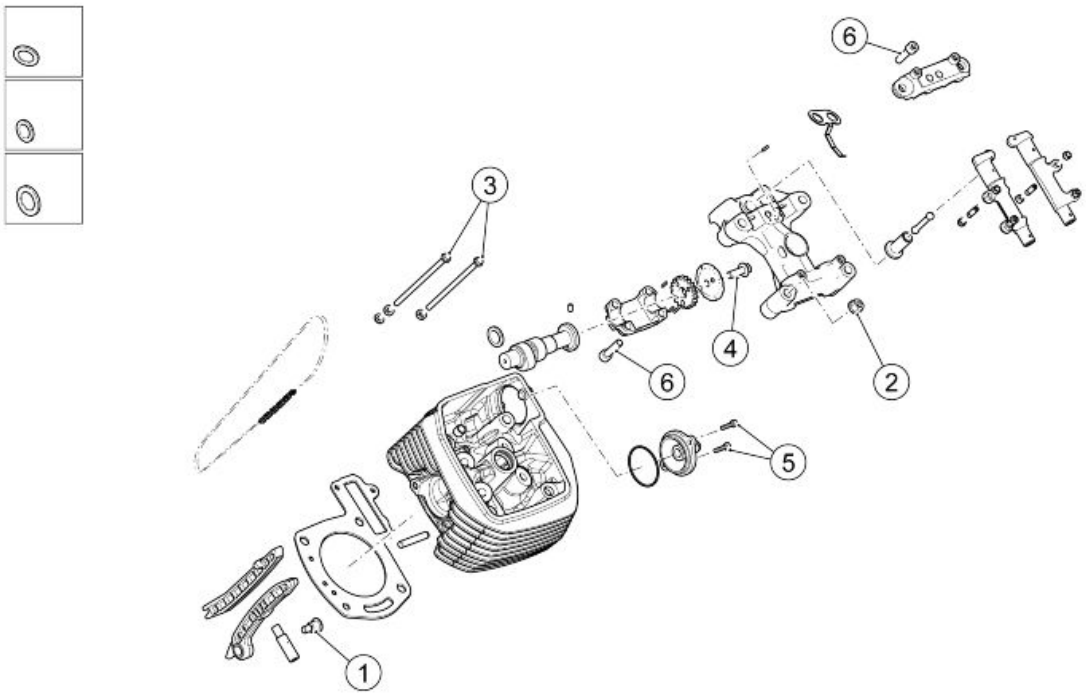
OIL RADIATOR

pos.	Description	Type	Quantity	Torque	Notes
1	Solenoid valve to radiator fixing screw	M5x60	3	4 Nm (2.95 lbf ft)	-
2	Radiator fixing pin on the grille	M5	1	4 Nm (2.95 lbf ft)	-
3	Radiator to grille fixing screw	M5	1	4 Nm (2.95 lbf ft)	-



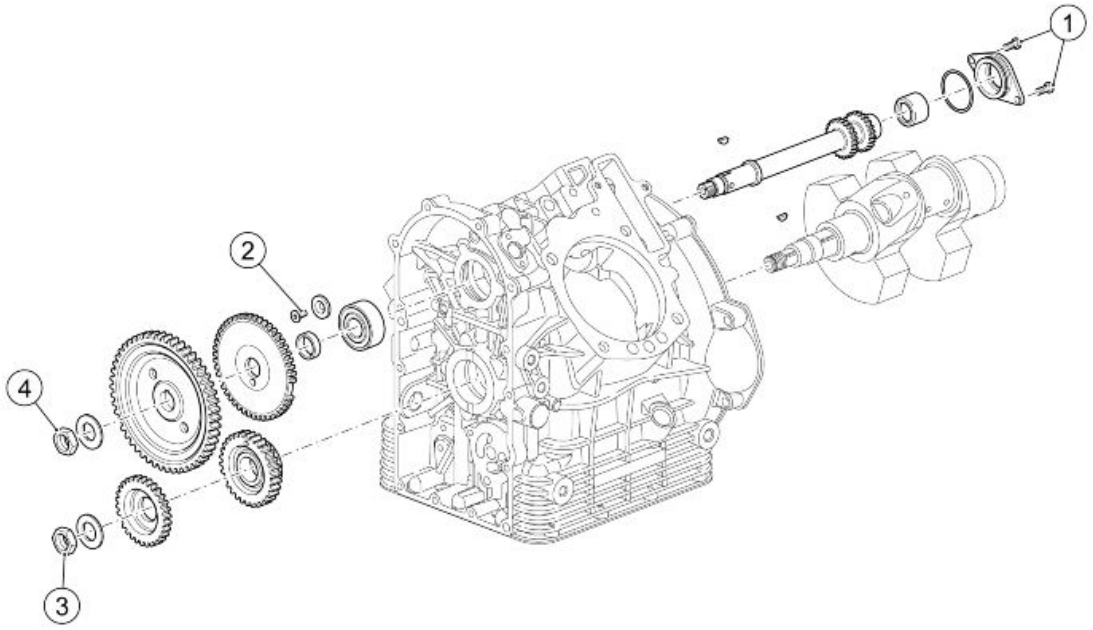
RIGHT CYLINDER HEAD

pos.	Description	Type	Quantity	Torque	Notes
1	Movable chain tensioner pad fixing screw	-	1	20 Nm (14.75 lbf ft)	Loctite 243
2	Head tightening nut	M10x1.25	4	15 Nm (11.06 lbf ft)	Engine Oil Pre-tightening
2	Head tightening nut	M10x1.25	4	42 Nm (30.98 lbf ft)	Final tightening
3	Head tightening screws (chain compartment)	M6x120	2	10 Nm (7.37 lbf ft)	-
4	Plate locking screw and timing gear	-	1	30 Nm (22.13 lbf ft)	Loctite 243
5	Timing cover fixing screw on the cylinder head	M5x10	2	8 Nm (5.90 lbf ft)	-
6	Camshaft support fixing screw	-	6	18 Nm (13.28 lbf ft)	-



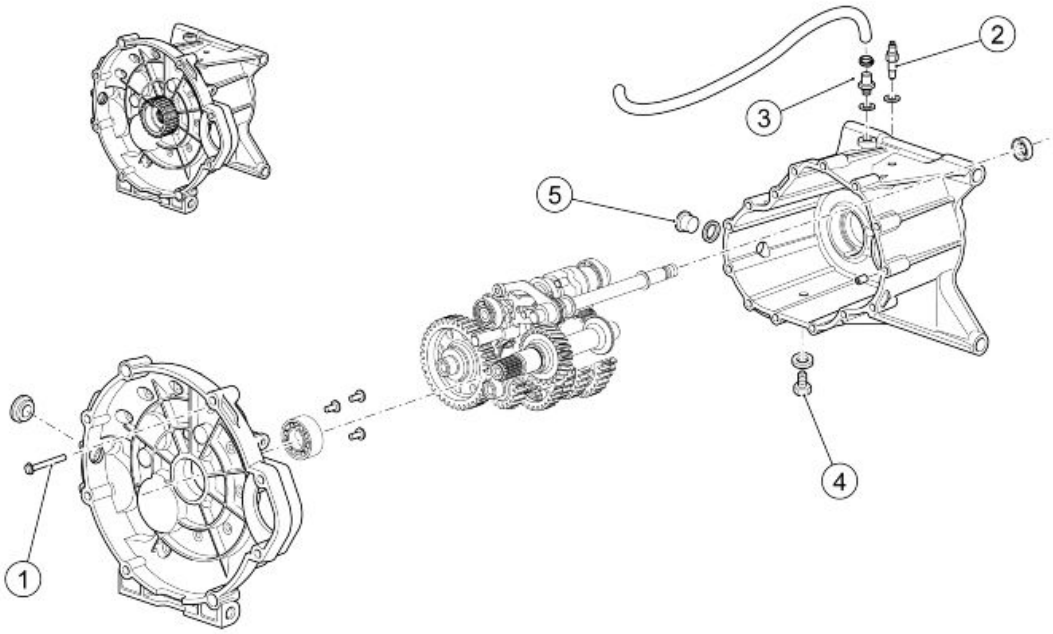
LEFT CYLINDER HEAD

pos.	Description	Type	Quantity	Torque	Notes
1	Movable chain tensioner pad fixing screw	-	1	20 Nm (14.75 lbf ft)	Loctite 243
2	Head tightening nut	M10x1.25	4	15 Nm (11.06 lbf ft)	Engine Oil Pre-tightening
2	Head tightening nut	M10x1.25	4	42 Nm (30.98 lbf ft)	Final tightening
3	Head tightening screws (chain compartment)	M6x120	2	10 Nm (7.37 lbf ft)	-
4	Plate locking screw and timing gear	-	1	30 Nm (22.13 lbf ft)	Loctite 243
5	Timing cover fixing screw on the cylinder head	M5x10	2	8 Nm (5.90 lbf ft)	-
6	Camshaft support fixing screw	-	6	18 Nm (13.28 lbf ft)	-



TIMING SYSTEM CONTROL

pos.	Description	Type	Quantity	Torque	Notes
1	Control, timing system, shaft support flange fixing screw	M6x14	2	8 Nm (5.90 lbf ft)	-
2	Bearing fixing screw	M6x16	1	10 Nm (7.37 lbf ft)	Loctite 243
3	Driving gears locking nut on the crankshaft	M25	1	200 Nm (147.51 lbf ft)	Loctite 601
4	Timing system driven gear locking nut	M18	1	25 Nm (18.44 lbf ft)	Pre-tightening
4	Timing system driven gear locking nut	M18	1	150 Nm (110.63 lbf ft)	Final tightening



GEARBOX

pos.	Description	Type	Quantity	Torque	Notes
1	Clutch housing to gearbox fixing screw	M6x55	14	13 Nm (9.59 lbf ft)	-
2	Neutral sensor	-	1	10 Nm (7.37 lbf ft)	-
3	Breather stud bolt	-	1	8 Nm (5.90 lbf ft)	Loctite 243
4	Gear oil magnetic drainage cap	-	1	24 Nm (17.70 lbf ft)	-
5	Oil filler cap	M18x1.5	1	28 Nm (20.65 lbf ft)	-

Overhaul data

Assembly clearances

Cylinder - piston assy.

Measurement of the cylinder diameter must be done at three heights, turning the dial gauge 90°.

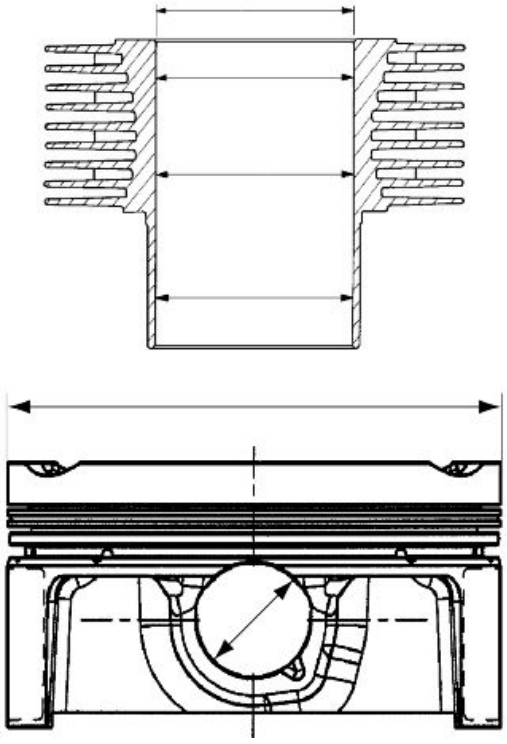
Check that cylinders and pistons are of the same selection types (D, E, F).

Check clearance between cylinders and pistons on the selected diameter; if it exceeds the value specified, it is necessary to replace cylinders and pistons.

The pistons of an engine must be balanced; a weight difference of up to 1.5 g (0.0033 lb) is allowed.

PISTON - CYLINDER SELECTION TYPES

Specification	Desc./Quantity
Piston diameter - selection D	94.935 - 94.945 mm (3.73759 - 3.73798 in)
Cylinder diameter - selection D	95.000 - 95.010 mm (3.74015 - 3.74054 in)
Piston diameter - selection E	94.945 - 94.955 mm (3.73798 - 3.73837 in)
Cylinder diameter - selection E	95.010 - 95.020 mm (3.74054 - 3.74093 in)
Piston diameter - selection F	94.955 - 94.965 mm (3.73837 - 3.73877 in)
Cylinder diameter - selection F	95.020 - 95.030 mm (3.74093 - 3.74133 in)



PIN - PISTON COUPLING

Specification	Desc./Quantity
Pin diameter	21.998 - 21.994 mm (0.86606 - 0.86590 in)
Pin hole diameter on piston	22.016 - 22.011 mm (0.86677 - 0.86657 in)
Clearance between pin and holes on piston	0.013 - 0.022 mm (0.00051 - 0.00087 in)

Piston rings

On each piston there are:

- 1 top piston ring;
- 1 middle piston ring;
- 1 oil scraper piston ring.

Turn the rings so that the coupling ends are 120 degrees from each other.

CLEARANCE BETWEEN PISTON RINGS AND SEATS ON PISTON

Specification	Desc./Quantity
Top ring	0.030 - 0.065 mm (0.00118 - 0.00256 in)
Middle ring	0.020 - 0.055 mm (0.00079 - 0.00216 in)
Oil scraper ring	0.010 - 0.045 mm (0.00039 - 0.00177 in)

Gap between the end of the piston rings inserted in the cylinder:

- Top and middle piston ring: 0.40 - 0.65 mm (0.00158 - 0.00255 in)
- Oil scraper piston ring: 0.30 - 0.60 mm (0.00118 - 0.00236 in).

Crankcase - crankshaft - connecting rod

CRANKSHAFT SEAT (TIMING SYSTEM SIDE)

Specification	Desc./Quantity
Diameter of crankshaft main journal, timing system side	37.975 - 37.959 mm (1.49507 - 1.49444 in)
Inside diameter of crankshaft bushing, timing system side	38.016 - 38.0 mm (1.49669 - 1.49606 in)
Clearance between bushing and main journal (timing system side)	0.025 - 0.057 mm (0.00098 - 0.00224 in)

CRANKSHAFT SEAT (CLUTCH SIDE)

Specification	Desc./Quantity
Diameter of crankshaft main journal, clutch side	53.97 - 53.961 mm (2.12480 - 2.12444 in)
Inside diameter of crankshaft bushing on clutch-side flange	54.019 - 54.0 mm (2.12673 - 2.12598 in)
Clearance between bushing and main journal (clutch side)	0.030 - 0.058 mm (0.00118 - 0.00228 in)

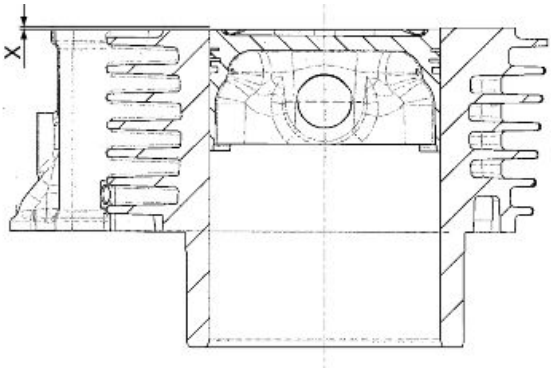
Slot packing system

- Fit both pistons on the connecting rods.
- Working from both sides, fit the gasket between the crankcase and the cylinder on the crankcase.
- Fit both cylinders.
- Take the left cylinder piston to TDC and lock crankshaft rotation.

Specific tooling

020675Y Service shaft gear lock

- Thoroughly clean the upper surface of both cylinders.
- Place the tool on the left cylinder to determine the "squish" (X).
- Fasten the tool with the nuts of the stud bolts.



Specific tooling

020676Y Comparator support for piston position checking

- Reset the micrometer on the cylinder rim.
- Move the tool so that the micrometer feeler reaches the top point of the piston crown.
- Take note of the measurement and, according to the values found, consult the chart at the bottom of the page to decide the thickness of the gasket to be fitted between cylinder and head.
- Unlock crankshaft rotation.
- Rotate the crankshaft by 90°until the right cylinder piston reaches the TDC.
- Lock crankshaft rotation.
- Place the tool on the right cylinder stud bolts to determine the "squish" (X).

Specific tooling

020676Y Comparator support for piston position checking

- Repeat the same operations to determine the thickness of the left cylinder gasket between cylinder and head also for the right cylinder.

CYLINDER GASKET THICKNESS - HEAD

Specification	Desc./Quantity
Value (X) -0.56 / -0.37 mm (-0.022 / -0.0146 in)	gasket thickness: 0.65 mm (0.0256 in)
Value (X) -0.37 / -0.19 mm (-0.0146 / -0.0075 in)	gasket thickness: 0.85 mm (0.0335 in)
Value (X) -0.19 / 0 mm (-0.0075 / 0 in)	gasket thickness: 1.05 mm (0.0413 in)

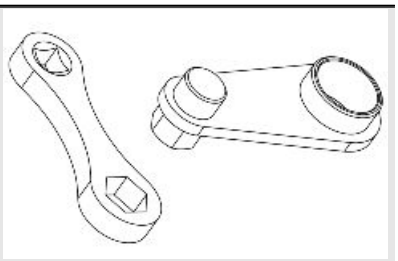
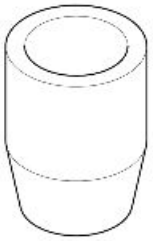
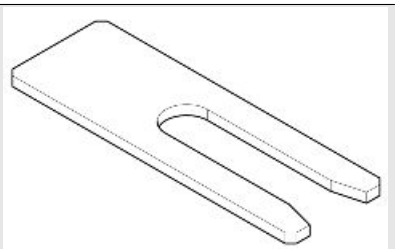
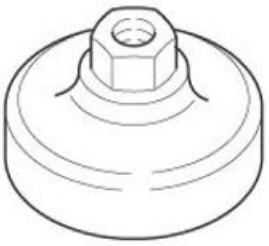
Recommended products chart

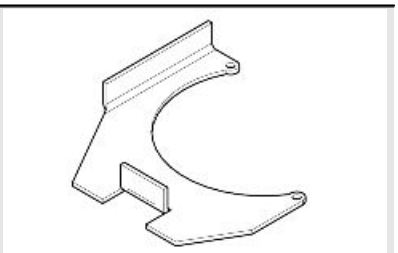
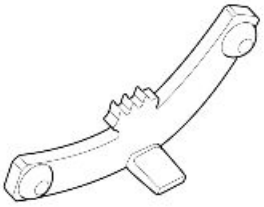
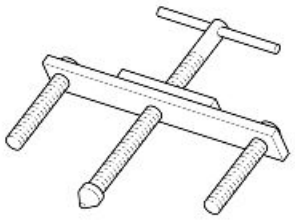
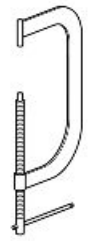
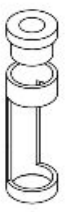
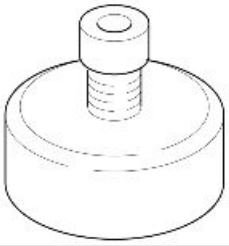
RECOMMENDED PRODUCTS

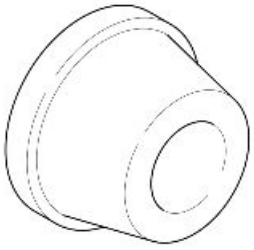
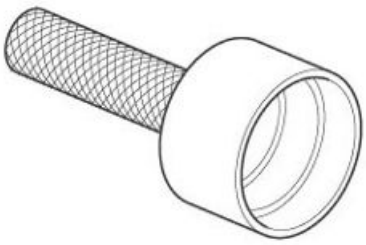
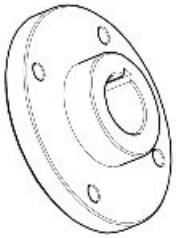
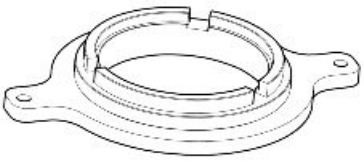
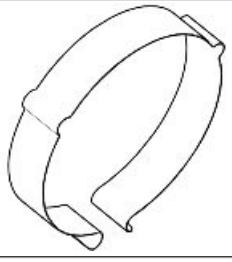
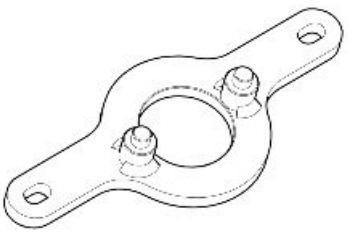
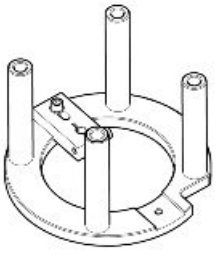
Product	Description	Specifications
AGIP RACING 4T 10W-60	Engine oil	SAE 10W - 60. As an alternative for recommended oils use top-branded oils that meet or exceed the requirements of CCMC G-<metricconverter productid="4 A" w:st="on" />4 A</metricconverter />PI SG specifications.
AGIP GEAR SAE 80 W 90	Transmission oil	-
AGIP GEAR MG/S SAE 85 W 90	Gearbox oil	-
AGIP FORK 15W	Fork oil	-
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.
AGIP BRAKE 4 / BRAKE 5.1	Clutch 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.

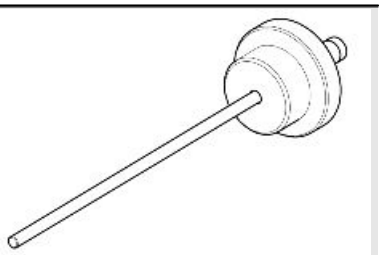
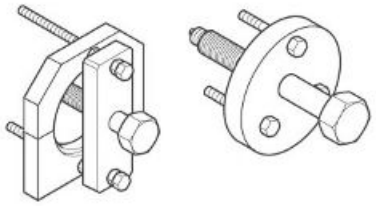
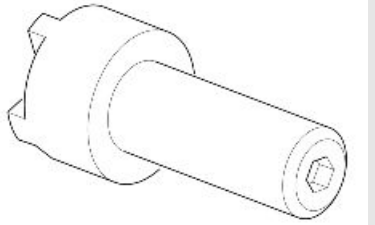
INDEX OF TOPICS

MOTORE

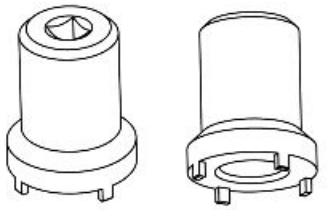
Stores code	Description	
020677Y	Generator belt tensioner, lever for belt tensioning	
05.91.17.30	Front cover insertion cone	
020716Y	Connecting rod locking	
020470Y	Pin snap ring fitting tool	
05.92.72.30	Timing system cover sealing ring punch	
01.92.91.00	Wrench for removing the cover on sump and filter	

Stores code	Description	
05.90.25.30	Gearbox support	
19.92.96.00	Graduated dial to control ignition timing	
12.91.18.01	Tool to lock the flywheel and the starting ring gear	
12.91.36.00	Tool to remove the flywheel-side flange	
AP8140179	Support for valve fitting/removal	
AP9100838	Tool for valve pressure plate	
14.92.71.00	Tool to fit the sealing ring on the flywheel-side flange	

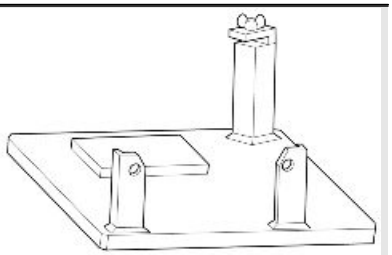
Stores code	Description	
12.91.20.00	Tool to fit the flywheel-side flange together with seal ring on the crankshaft	
19.92.71.00	Tool to fit the seal ring on the flywheel-side flange	
020673Y	Graduated dial hub	
020672Y	Clutch spring centre and pusher	
020674Y	Piston ring clamp	
020675Y	Service shaft gear lock	
020676Y	Comparator support for piston position checking	

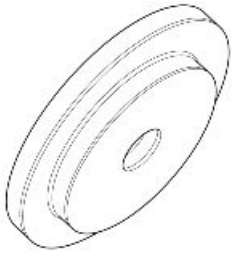
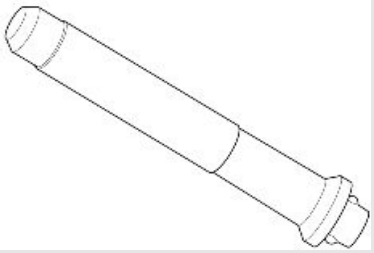
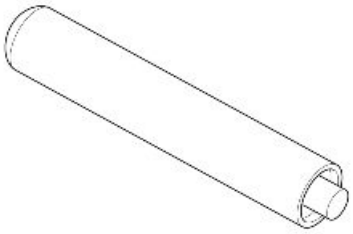
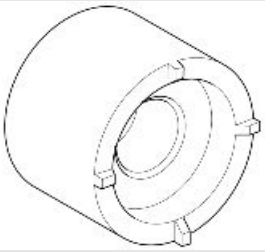
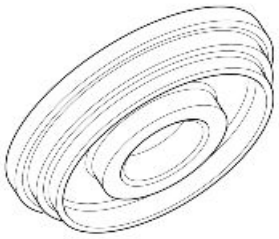
Stores code	Description	
020678Y	Tool for clutch rod checking	
05.91.25.30	Gearbox opening	
14.91.26.03	Hook spanner for fixing ring nut of the clutch shaft internal body	

CICLISTICA

Stores code	Description	
020884Y	46 mm wrench for steering ring nut	

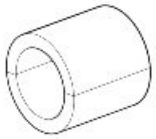
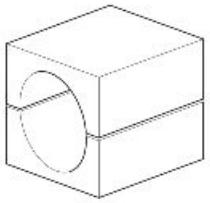
BEVEL GEAR SET

Stores code	Description	
05.90.27.30	Gearbox support	

Stores code	Description	
05.90.27.31	Gearbox oil seal buffer	
05.90.27.32	Buffer handgrip	
05.90.27.33	Ball joint sealing buffer	
05.90.27.34	Wrench for pinion ring nut	
05.90.27.35	Pinion oil seal buffer	

FORCELLA ANTERIORE

Stores code	Description	
9100903	Marzocchi fork oil seal; ø 45 mm (1.77 in)	

Stores code	Description	
AP8140146	Weight	
AP8140149	Protection for fitting operations	

INDEX OF TOPICS

Maintenance chart

Correct maintenance is fundamental for ensuring the longevity of your vehicle and maintaining optimum function and performance.

For this purpose, Moto Guzzi has formulated a series of checks and scheduled services (at the owner's expense), are summarised in the table given in the following page. We recommend having any minor faults resolved immediately by an **Authorised Moto Guzzi Dealer,** without waiting until the next scheduled service interval.

All scheduled services must be carried out at the specified intervals and mileage, as soon as the predetermined mileage is reached. Carrying out scheduled services on time is essential for the validity of your warranty. For further information regarding Warranty procedures and ''Scheduled Maintenance'', please refer to the ''Warranty Booklet''.

NOTE

CARRY OUT MAINTENANCE OPERATIONS AT HALF THE INTERVALS SPECIFIED IF THE VEHICLE IS USED IN PARTICULAR RAINY OR DUSTY CONDITIONS, OFF ROAD OR FOR TRACK USE.

ROUTINE MAINTENANCE TABLE

Km x 1000	1.5	10	20	30	40	50	60	70	80
Exhaust pipe flange bolts	I		I		I		I		I
Spark plugs (5)		R	R	R	R	R	R	R	R
Carburetion at idle (CO)		I	I	I	I	I	I	I	I
Throttle body			C		C		C		C
Transmission cables and controls	I	I	I	I	I	I	I	I	I
Alternator belt			A		A	R	A		A
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 (5)	R	R	R	R	R	R	R	R	R
Fork	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
Light circuit	I	I	I	I	I	I	I	I	I
Safety switches	I		I		I		I		I
Brake fluid (2)	I	I	R	I	R	I	R	I	R
Clutch fluid (2)	I	I	I	I	I	I	I	I	I
Gearbox oil	R	R	R	R	R	R	R	R	R
Engine oil (5)	R	R	R	R	R	R	R	R	R
Fork oil / oil seals		R		R		R		R	
Final drive oil	R	R	R	R	R	R	R	R	R
Clutch lever pin (7)	L	L	L	L	L	L	L	L	L
Tyres - pressure / wear (1)	I	I	I	I	I	I	I	I	I
Engine 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		I		I		I		I
Cylinder synchronisation	I	I	I	I	I	I	I	I	I
Suspension and setting	I		I		I		I		I
Engine oil pressure warning light (4)									
Filter housing oil drainage pipe draining (5)		C	C	C	C	C	C	C	C
Fuel lines (3)		I	I	I	I	I	I	I	I
Brake lines (3)		I	I	I	I	I	I	I	I
Clutch wear		I	I	I	I	I	I	I	I
Brake pad wear (1)	I	I	I	I	I	I	I	I	I

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

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

(1) Check and clean and adjust or replace, if necessary, before every journey.

(2) Replace every 2 years or 20000 Km (12427 mi).

(3) Replace every 4 years.

(4) Check at each engine start.

(5) Every 5000 Km if the vehicle is used for racing.

Transmission fluid

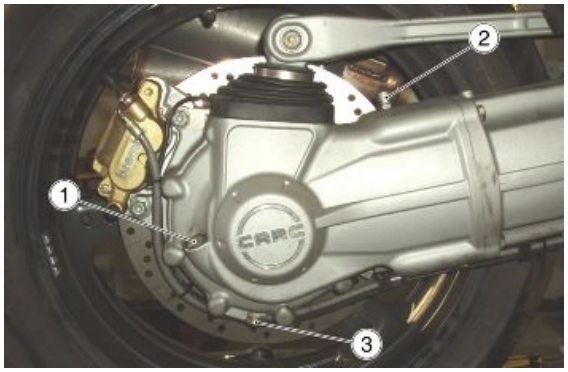
Check

• 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

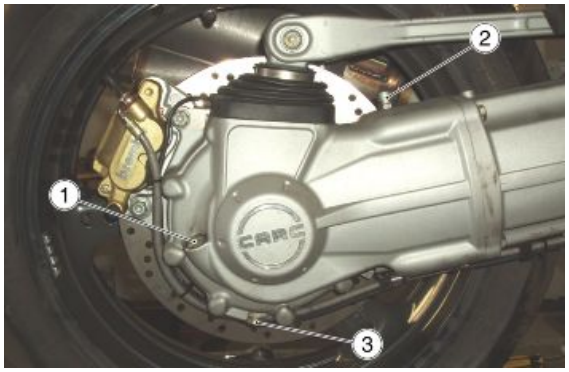
RIDE SOME km (miles) TO WARM UP ENGINE OIL

- Place a container with + 400 cm³ (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).



Engine oil

Check

Check the engine oil level frequently.

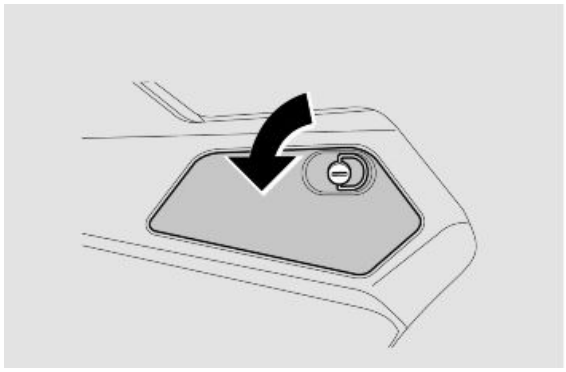
To check:

ENGINE OIL LEVEL MUST BE CHECKED WHEN THE ENGINE IS WARM.

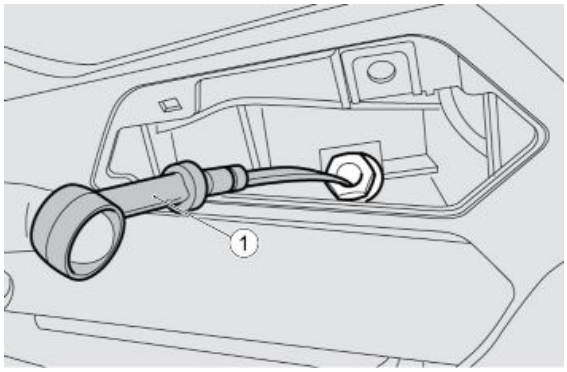
CAUTION

DO NOT LET THE ENGINE IDLE WITH THE VEHICLE AT STANDSTILL TO WARM UP THE ENGINE AND OBTAIN THE OPERATING TEMPERATURE OF ENGINE OIL.
OIL IS BEST CHECKED AFTER A TRIP OR AFTER TRAVELLING APPROXIMATELY 15 km (10 mi), OUT OF TOWN (ENOUGH TO WARM UP ENGINE OIL TO OPERATING TEMPERATURE).

- Switch off the engine and wait at least five minutes to allow the lubricant to drain back into the sump.
- Keep the vehicle upright with both wheels on the ground.
- Remove the oil level inspection cover on the left fairing.



- Pull the filler plug / oil level dipstick (1) straight out.
- Wipe the oil level dipstick (1) clean and reinsert it.
- Pull it out again and check the oil level.
- The oil level is correct when it is close to the "MAX" mark. Otherwise, top-up with engine oil.



Replacement

NOTE

HOT OIL IS LESS VISCOUS AND WILL DRAIN OUT MORE EASILY AND COMPLETELY.

- Remove the fairing lug
- Place a container with 4000 cm³ (244 cu.in) capacity under the drainage plug (2).
- Unscrew and remove the drainage plug.

- Remove the oil level inspection cover on the left fairing.
- Remove the dipstick for checking the oil level (1).
- 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 plug (2).
- Remove any metal scrap attached to the drainage plug (2) magnet.
- Screw and tighten the drainage plug (2).
- Pour new engine oil until it goes above the minimum level marked "MIN".
- Insert the dipstick for checking the oil level (1).

CAUTION

DO NOT DISPOSE OF OIL INTO THE ENVIRONMENT. DISPOSE OF ENGINE OIL IN A SEALED CONTAINER AND TAKE IT TO YOUR SUPPLIER OR TO THE NEAREST USED OIL COLLECTION CENTRE.

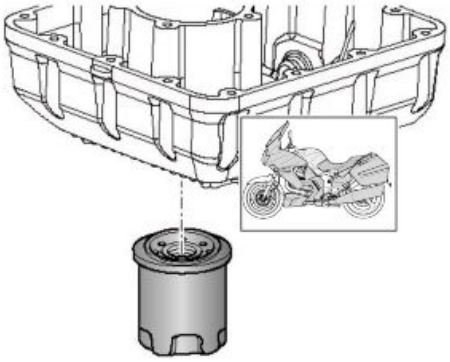
Engine oil filter

Replace the engine oil filter each time you change the engine oil.

- Drain the engine oil completely.
- Unscrew and remove the engine oil filter from its seat.

NOTE

NEVER REUSE AN OLD FILTER.



- Spread a thin layer of oil on the sealing ring of the new engine oil filter.
- Fit and screw the new oil filter in its seat.

See also

Replacement

Gearbox Oil

Inspection

CHECKING AND TOPPING UP

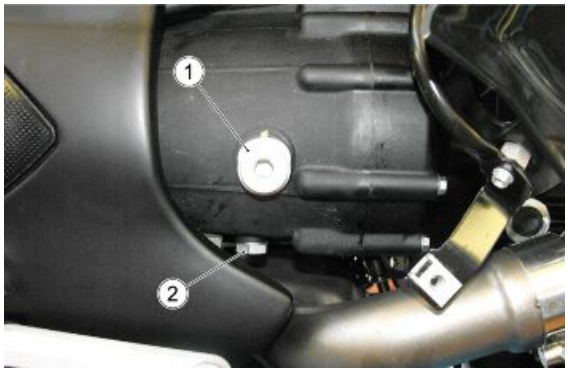
CAUTION

ENGINE MUST BE WARM TO CHECK GEARBOX 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).

- Stop the engine.
- Keep the vehicle upright with the two wheels on the ground.
- Remove the right fairing.
- Unscrew and remove the cap/dipstick (1) placed on the gearbox right side.
- The oil level is correct when it is close to the cap/dipstick (1) opening.



If necessary:

- Top-up with oil until it reaches the dipstick opening (1).

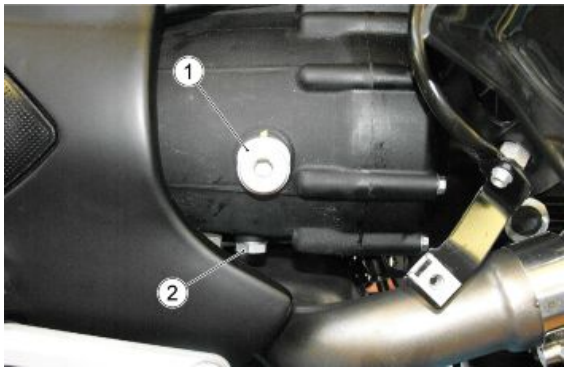
CAUTION

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

NOTE

HOT OIL IS MORE FLUID AND WILL DRAIN OUT MORE EASILY AND COMPLETELY.



• Place a container with suitable capacity under the drainage plug (2).
• Unscrew and remove the drainage plug (2).
• Unscrew and remove the filler cap (1).
• Drain the oil into the container; allow several minutes for oil to drain out completely.
• Check and replace, if necessary, the sealing washers of drainage plug (2).
• Remove any metal scrap attached to the drainage plug (2) magnet.
• Screw and tighten the drainage plug (2).
• Pour in new oil until it reaches the dipstick opening (1).
• Tighten the filler cap (1).

CAUTION

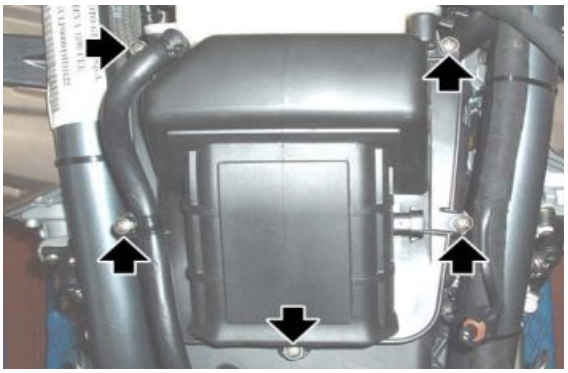
DO NOT ADD ADDITIVES OR ANY OTHER SUBSTANCE TO THE FLUID. WHEN USING A FUNNEL OR ANY OTHER ELEMENT, MAKE SURE IT IS PERFECTLY CLEAN.

Air filter

- Remove the fuel tank.
- Disconnect the connector from the air temperature sensor.

- Remove the oil breather pipe.

- Unscrew and remove the five screws.



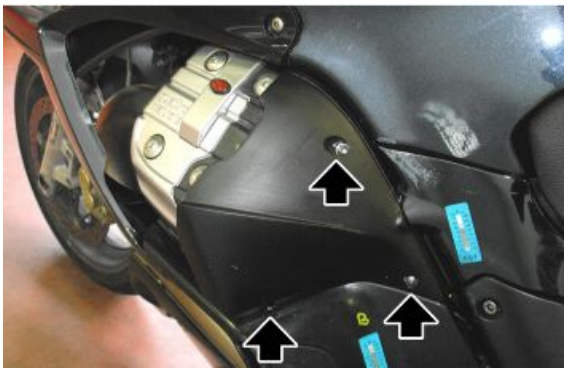
- Lift the filter casing cover.
- Remove the acoustic insulation panel.
- Remove the air filter.
- Cover the inlet duct with a clean cloth so that no foreign bodies could get into.

NOTE

DO NOT START THE ENGINE WITHOUT THE AIR FILTER. TO CLEAN THE FILTERING ELEMENT, USE A PRESSURE AIR JET FROM THE INSIDE TO THE OUTSIDE.

Checking the valve clearance

- Remove the fuel tank.
- Remove the side fairing, by unscrewing the three screws.



- Remove the Moto Guzzi logo using a screwdriver.
- Remove the spark plug protection.

If the timing system is very noisy, check the clearance between the valves and the rocking levers.

NOTE

ADJUST WITH COLD ENGINE, WITH PISTON AT TOP DEAD CENTRE (TDC) IN COMPRESSION STROKE (VALVES CLOSED).

- Disconnect both spark plug boots.

- Unscrew and remove the four head cover fixing screws and collect the sealing O-rings.
- Remove the head cover together with the gasket.

- Loosen the nut (1).
- Use a screwdriver to act on set screw (2) until the following clearances are obtained:

Technical specifications

Values valid with control clearance between rockers and valve

Inlet valve: 0.15 mm (0.0059 in)

Exhaust valve: 0.20 mm (0.0079 in)

- The measurement must be taken using a special thickness gauge.

CAUTION

IF CLEARANCE IS LARGER THAN RECOMMENDED, THE TAPPETS WILL BE NOISY. OTHERWISE, THE VALVES DO NOT CLOSE CORRECTLY, WHICH CAN LEAD TO PROBLEMS SUCH AS:

- PRESSURE DROP;
- ENGINE OVERHEAT;
- VALVE BURN OUT, ETC.

Braking system

Level check

Brake fluid check

- Rest the vehicle on its stand.
- For the front brake, hold the handlebar straight.
- 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

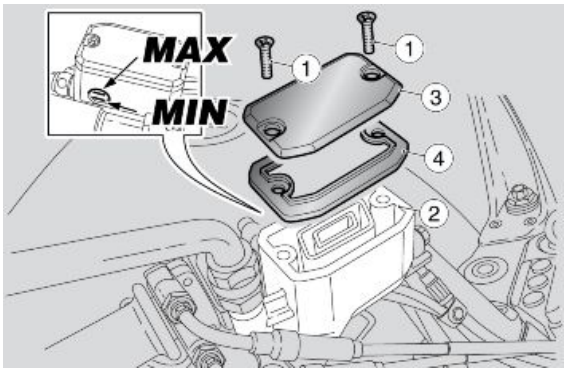
If the fluid does not reach at least the "**MIN**" reference mark:

- 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:

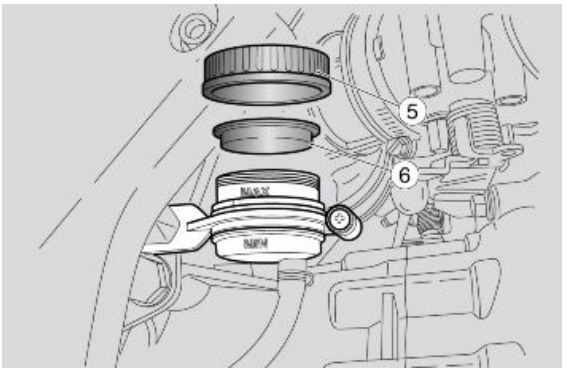
- Unscrew the two screws (1) of the brake fluid reservoir (2) using a Phillips screwdriver.
- Lift and remove the cover (3) and screws (1) as well.
- Remove the gasket (4).



Rear brake:

- Remove the right fairing.
- 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.

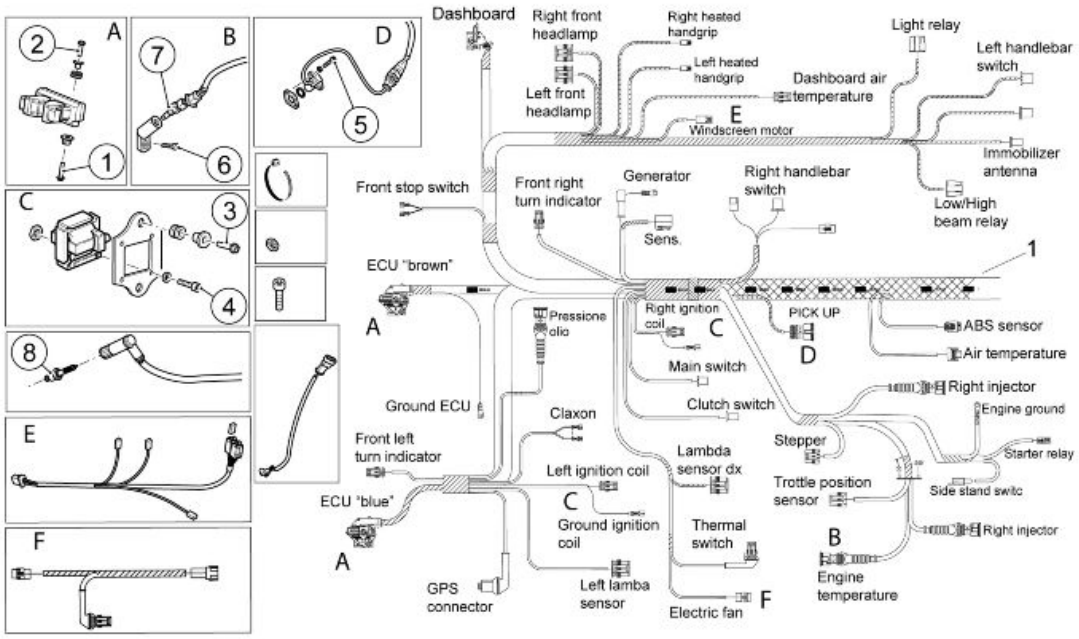
TO AVOID SPILLING FLUID WHILE TOPPING-UP, KEEP THE TANK PARALLEL TO THE RESERVOIR EDGE (IN HORIZONTAL POSITION).

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.

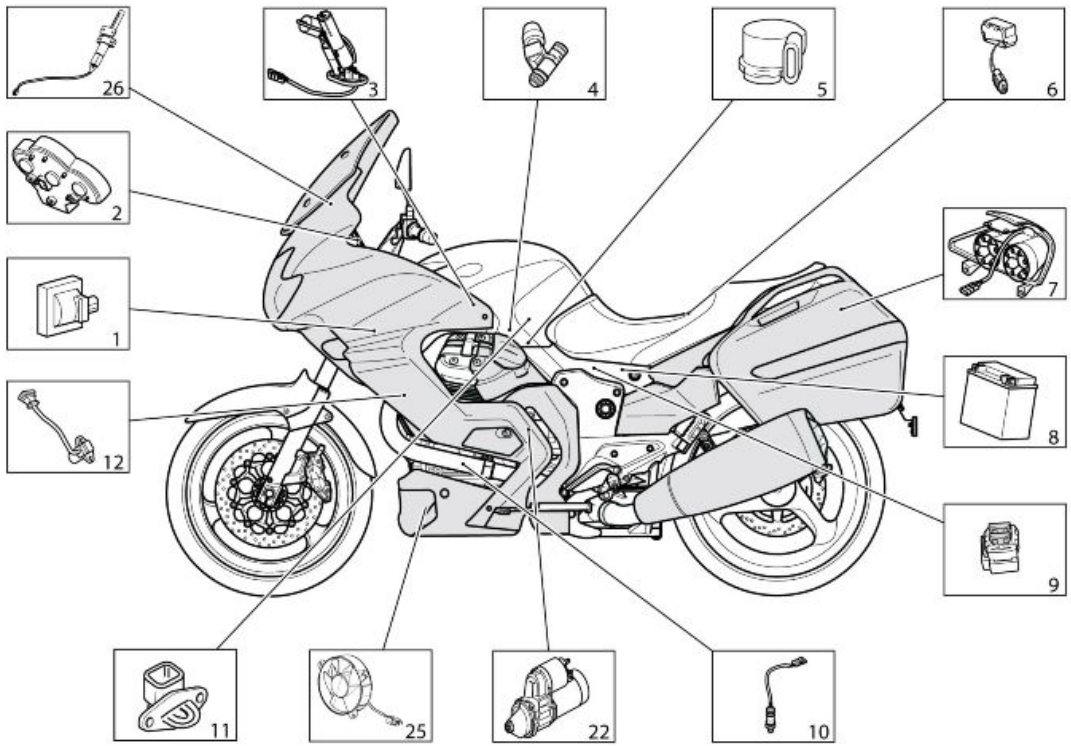
INDEX OF TOPICS

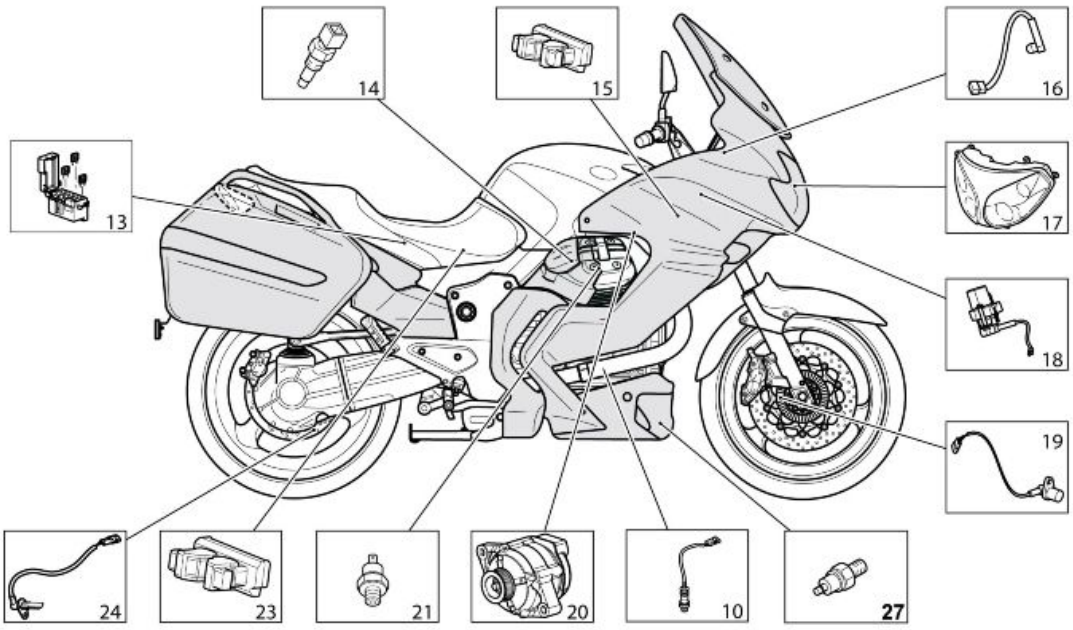


MAIN CABLE HARNESS

pos.	Description	Type	Quantity	Torque	Notes
1	Electronic control unit lower fixing screw	M6x20	4	10 Nm (7.37 lbf ft)	-
2	Electronic control unit upper fixing screw	M6x35	4	10 Nm (7.37 lbf ft)	-
3	Coil support plate fixing screw	M6x20	4	10 Nm (7.37 lbf ft)	-
4	Coil fixing screw to the support plate	M4x25	8	2 Nm (1.47 lbf ft)	-
5	Timing sensor fixing screw	M5x12	2	6 Nm (4.42 lbf ft)	-
6	Oil temperature sensor support fixing screw	M10x20	1	11 Nm (8.11 lbf ft)	Loctite 243
7	Oil temperature sensor	-	1	12 Nm (8.85 lbf ft)	Kluber Wolfacoat Grease
8	Spark plug	-	2	15 Nm (11.06 lbf ft)	-

Components arrangement





Key:

1 Coil

2 Instrument panel

3 Fuel pump

4 Injector

5 Throttle valve potentiometer

6 Fall sensor
7 Rear light
8 Battery
9 Main fuses
10 Lambda sensor
11 Intake air temperature sensor
12 Engine revolution sensor
13 Auxiliary fuses
14 Head temperature sensor
15 Engine control unit
16 Instrument panel air temperature sensor
17 Front headlamp
18 Key lock with integrated immobilizer aerial
19 Speed sensor
20 Alternator
21 Oil pressure sensor
22 Starter motor
23 ABS Control unit
24 Rear speed sensor
25 Engine oil radiator fan
26 Windshield height adjustment motor
27 Engine oil temperature sensor

Electrical system installation

INTRODUCTION

Scope and applicability

The purpose of this document is to define how cable harnesses are laid and fixed to the motorcycle and foresee potential problems (special checks on connections and layouts) in order to attain the vehicle reliability objectives.

Materials used and corresponding quantities

The electrical system consists of the following cable harnesses and parts:

- No.1 Main Cable Harness
- No.1 Driving Cable Harness
- No.1 Electric Fan Cable Harness
- No.1 Battery-Engine Ground Cable Harness
- No.1 License Plate Lamp Cable Harness

- No.1 ECU
- No.2 Coils
- No.2 Supports for coil
- No.2 Coil tongues
- No.2 Spark plug hoods together with H.V. cable
- No.2 NGK PMR8B Spark Plugs
- No.1 Oil pressure sensor
- No.1 Oil Temperature sensor
- No.1 Throttle Body
- No.2 Injectors
- No.1 Neutral switch
- No.1 Alternator
- No.1 Starter Motor
- No.2 Relay switch
- No.2 30 A Relay with diode
- No.2 30 A Relay
- No.4 Relay support rubber ring
- No.2 Relay support rubber ring
- No.1 Horn
- No.1 Fall sensor
- No.1 Fall sensor rubber ring
- No.1 External air temperature sensor
- No.1 Locks kit
- No.1 Front stop switch
- No.1 Rear stop switch
- No.1 Clutch switch
- No.1 Plug Socket
- No.1 Fuel pump and reserve sensor
- No.1 YTX20-BS battery
- No.1 Battery Cover
- No.1 Oil T. Fan
- No.1 Thermometric switch
- No.1 Left Device
- No.1 Right Device
- No.1 Left Bracelet
- No.1 Right Bracelet
- No.2 N.A. Button
- No.1 Front right turn indicator

- No.1 Front left turn indicator
- No.1 Rear right turn indicator
- No.1 Rear left turn indicator
- No.1 License plate lamp
- No.1 Taillight
- No.1 Front headlight
- No.1 Flexible headlamp panel
- No.1 Instrument panel
- No.1 Airbox air T. sensor
- No.1 Stand switch
- No.2 Lambda sensors
- No.1 Right heated hand grip
- No.1 Left heated hand grip
- No.1 Windshield motor
- No.1 ABS Control unit
- No.1 ABS Control unit support
- No.1 Front ABS sensor
- No.1 Rear ABS sensor

Small parts and mountings

- No. 3 large clamps (7.6x380)
- No.22 medium clamps (3.6X20.6)
- No. 1 small clamps (2.4x92)
- No. 2 Clips (2 different types)
- No. 1 Bracket
- No. 2 Bushings
- No. 2 TE FL M6x35 screws
- No. 7 Rubber rings (3 different types)
- No. 6 "T" Bushings (2 different types)
- No. 1 FL M6 self-locking nut
- No. 1 TE FL M6x12 screw
- No. 2 TE FL M6x20 screw
- No. 8 TCEI M4x25 screw
- No. 8 4.3X8X0.5 WASHER
- No. 4 M4X0.7 NUT
- No. 4 TE FL M6x20 screw
- No. 4 L 46 mm clamps
- No. 1 Fixing Stud Bolt

- No. 1 Ix 6.4x12x0.5 Ond Flexible Washer
- No. 1 EBFM IX M8X1.25 nut
- No. 1 Anti-vibration washer
- No. 2 Adhesive cable grommet
- No. 6 Cable grommets
- No. 1 M6x16 screw
- No. 2 TE FL M6x16 screws
- No. 1 Cables retainer plate
- No. 1 TCEI M6x18 screw
- No. 2 SWP T. cross FL M5x20 screws
- No. 1 Self-tapping screw for plastic 2.9x12

Motorcycle division

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

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

Special checks for the correct connection and laying of cables

Below is the list of connectors for which the operator in charge of assemble must verify the correct connection and tightening of any Secondary Lock, and "uncheck" the connector with a mark of indelible ink:

- Instrument Panel Connector.
- Immobilizer connector
- Pick-up connector
- Side Stand Switch Connector
- Right Cylinder and Left Cylinder Coil Connectors
- Right and Left Injector Connectors
- Stepper Connector and Throttle Sensor
- Starter Command Connector (on the starter engine)
- Starter Relays Connectors, Maintenance,1 Injection, 2 Injection
- Fall sensor connector
- Thermal Switch Connector, Electric Fan
- Main Cable Harness Connector
- Electric Fan Cable Harness
- Engine Control Unit and Control Unit Casing Ground Connectors

- Fuel pump connector
- Key Connector
- Right Light Switch Connectors
- Left Light Switch Connectors
- ABS Control Unit Connector and correct positioning of the cap
- Front and rear speed sensor connector
- Neutral Switch Connector
- Engine ground eyelet

The connectors listed 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.

It is also important and essential that the instructions regarding the routing and fixing of the cable harness in the various areas are followed meticulously in order to guarantee functionality and reliability.

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.

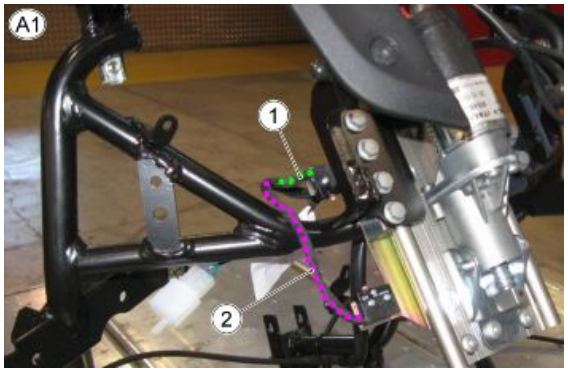
FRONT SECTION

TABLE A: DRIVING CABLE HARNESS PREPARATION

- Clamp the windshield engine cable.

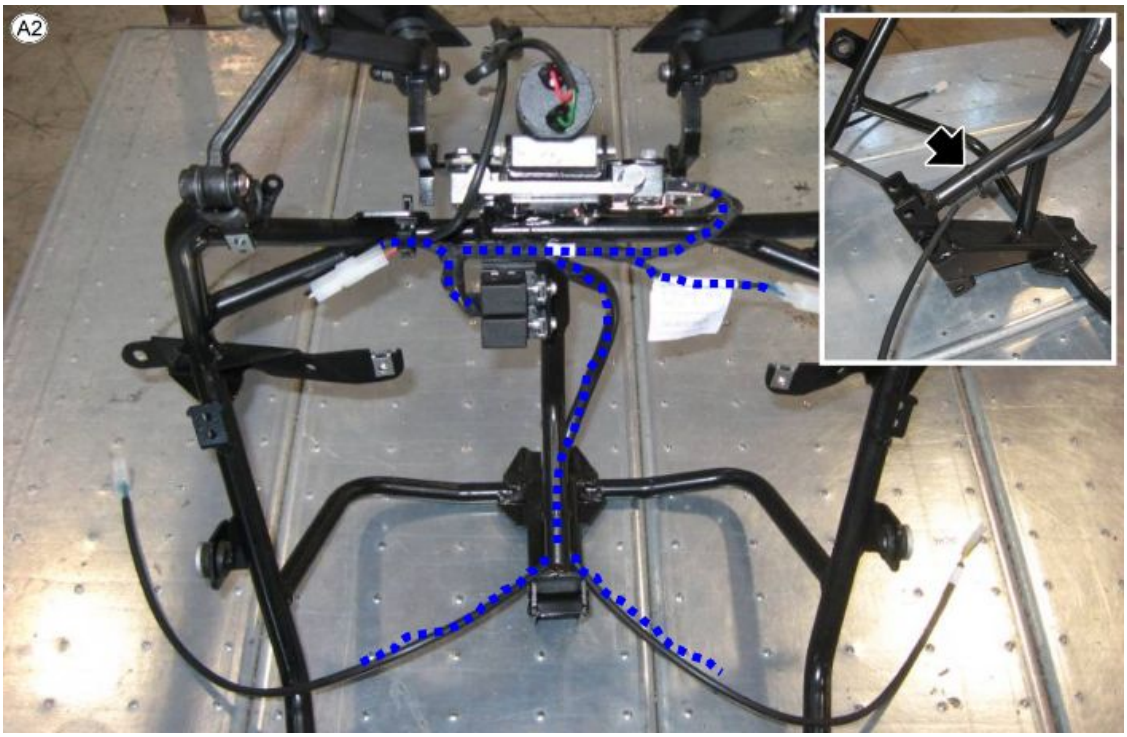
FRONT SECTION - TABLE A1: DRIVING CABLE HARNESS PREPARATION

1. Install the limit switch with a short cable harness branch on the upper support
2. Install the limit switch with a long cable harness branch on the lower support.



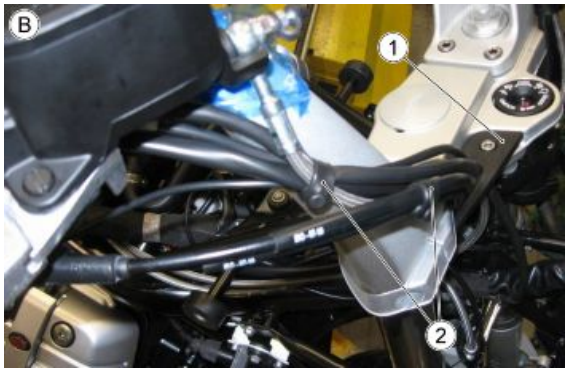
FRONT SECTION - TABLE A2: DRIVING CABLE HARNESS PREPARATION

- Clamp where indicated.



FRONT SECTION - TABLE B: RIGHT LIGHT SWITCH

1. Cable retainer plate, to stop the cable from: right device, down windshield button, stop switch, right heated hand grip e throttle grip.
2. Clamps.



FRONT SECTION - TABLE B1: RIGHT LIGHT SWITCH

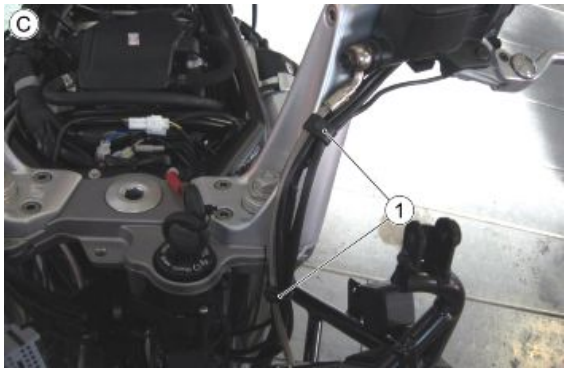
1. Connect the faston of the brake switch, taking care not to bend it.
2. Right heated hand grip cable.

FRONT SECTION - TABLE B2: RIGHT LIGHT SWITCH

1. Windshield right down button connection cable, recognisable by the white belt.

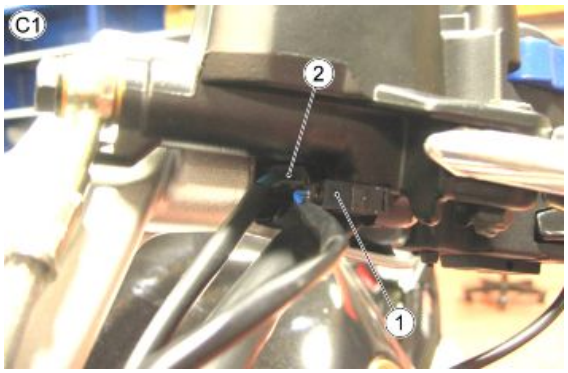
FRONT SECTION - TABLE C: LEFT LIGHT SWITCH

1. Clamps



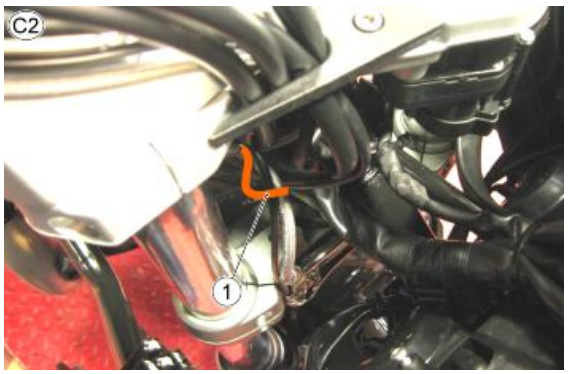
FRONT SECTION - TABLE C1: LEFT LIGHT SWITCH

1. Clutch switch (wired).
2. UP button connector (to be connect to N.A. button).



FRONT SECTION - TABLE C2: LEFT LIGHT SWITCH

1. The cable coming from the right half-handlebar pass through the forks present on the chassis.



FRONT SECTION - TABLE D: FRONT MAIN CABLE HARNESS

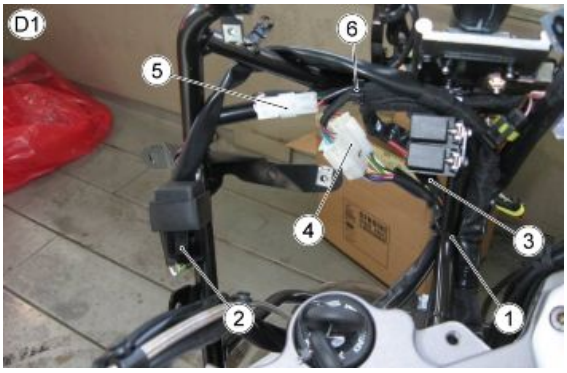
1. Lights relay cable harness.
2. Low-beam/high-beam light relay cable harness.
3. Instrument panel fixing clip.

The connectors of the left device and of the immobilizer must be above the fixing clip of the instrument panel.

FRONT SECTION - TABLE D1: FRONT MAIN CABLE HARNESS

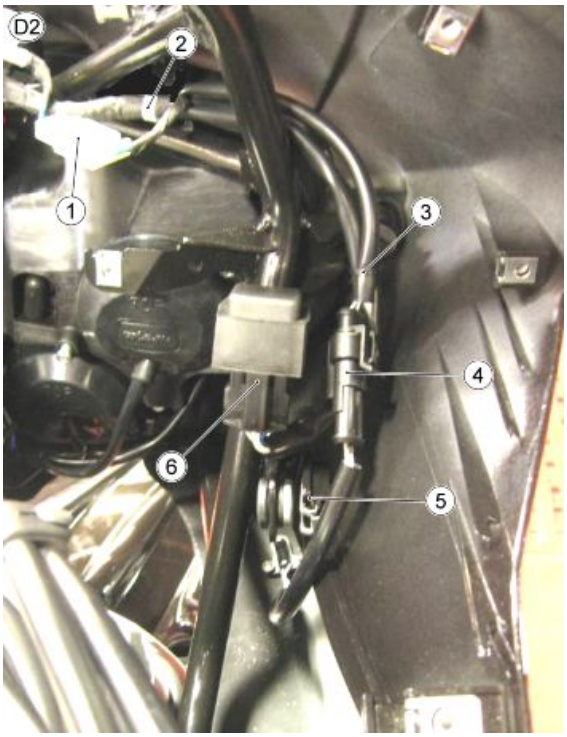
1. Clamp.
2. Lights relay connector.
3. Immobilizer connector.
4. Left light switch connectors.
5. Windshield driving engine connector.
6. Clip.

Connectors "3", "4", "5" must pass through clip "6"



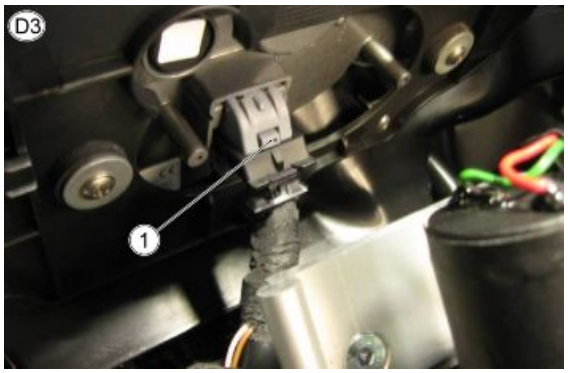
FRONT SECTION - TABLE D2: FRONT MAIN CABLE HARNESS

1. Main cable harness connection - driving cable harness.
2. Insert the clip on the cable harness lowest hole.
3. Clamp.
4. Instrument panel air temperature connector.
5. Instrument panel air temperature sensor (wired).
6. Low-beam/high-beam light relay connector



FRONT SECTION - TABLE D3: FRONT MAIN CABLE HARNESS

1. Instrument panel connector.



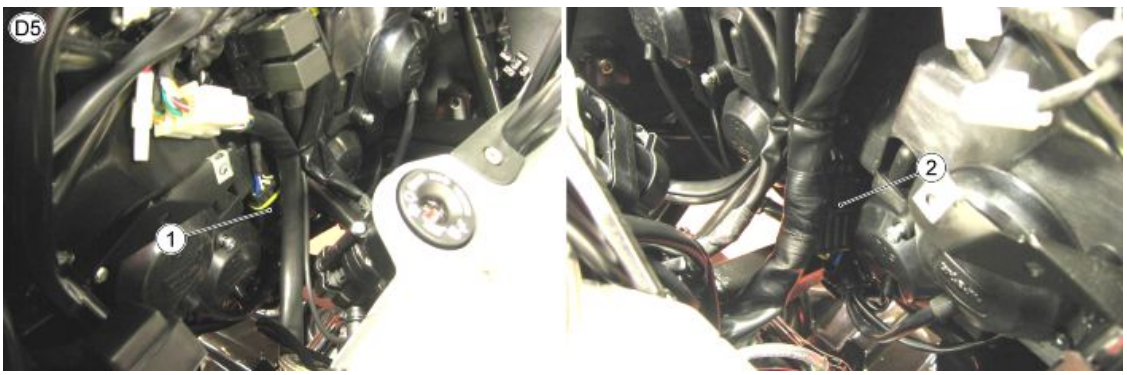
FRONT SECTION - TABLE D4: FRONT MAIN CABLE HARNESS

1. Immobilizer connector.

FRONT SECTION - TABLE D5: FRONT MAIN CABLE HARNESS

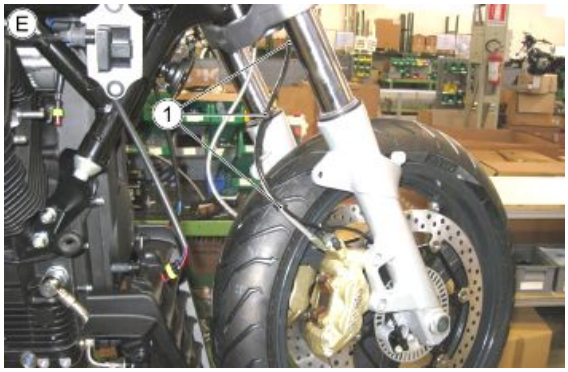
1. Right headlamp connector.
2. Left headlamp connector.

The connectors of the left and right front headlamp can be connected interchangeably without causing malfunctions and must be located behind the main cable harness branch.



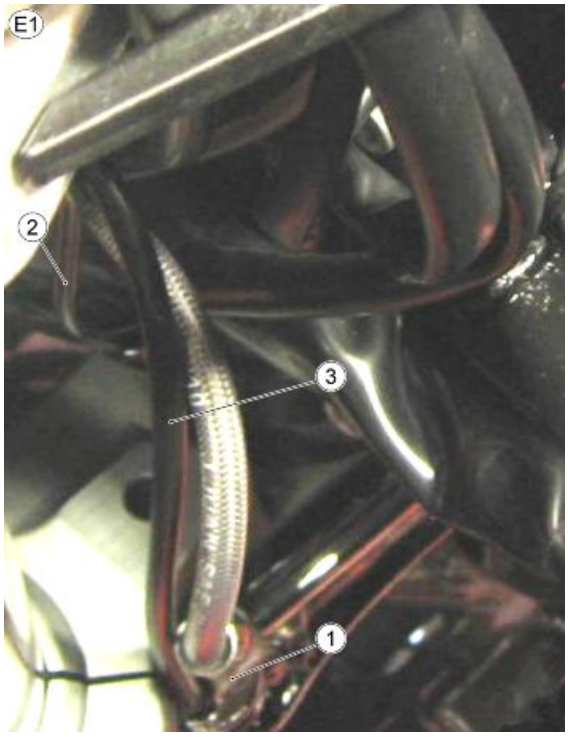
FRONT SECTION - TABLE E: FRONT ABS SENSOR

1. Cable grommets.



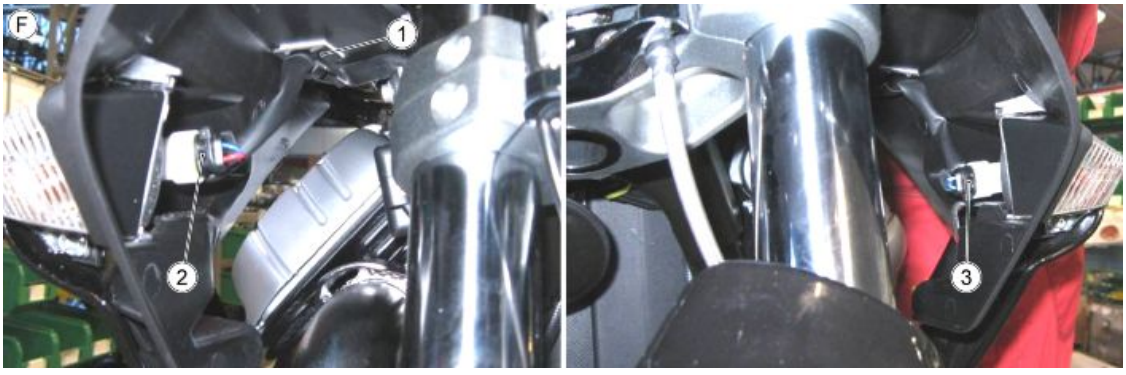
FRONT SECTION - TABLE E1: FRONT ABS SENSOR

1. Brake pipe fixing plate.
2. Chassis fork.
3. Front ABS sensor cable.



FRONT SECTION - TABLE F: TURN INDICATORS

1. Cable guide.
2. Right turn indicator connector.
3. Left turn indicator connector.



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: ELECTRIC FAN CABLE HARNESS

PREPARATION

1. Electric fan connector.
2. Clamps.
3. Clip.

TABLE A1: ELECTRIC FAN CABLE HARNESS

PREPARATION

1. Electric fan connector.

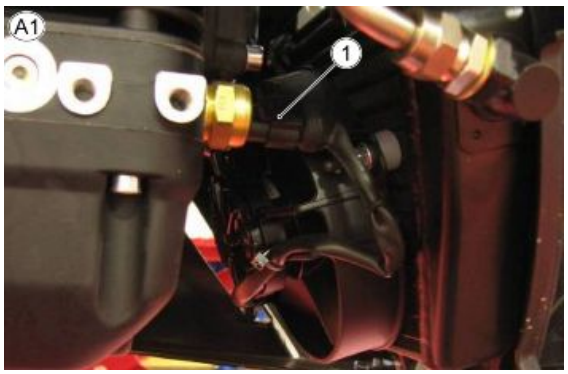


TABLE A2: ELECTRIC FAN CABLE HARNESS

PREPARATION

1. Electric fan connector.
2. Electric fan cable harness.

TABLE A3: ELECTRIC FAN CABLE HARNESS PREPARATION

1. Clamp.
2. Bracket.

TABLE B: MAIN CABLE HARNESS ON THE CHASSIS

1. Clamps.
2. Align the grey belt on the main cable harness with the pipe.

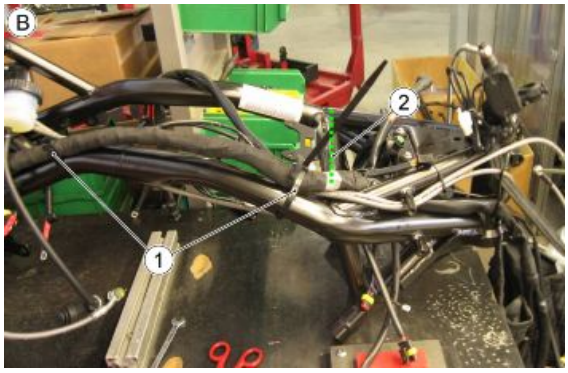


TABLE B1: MAIN CABLE HARNESS ON THE CHASSIS

1. Horn.
2. Clamp.
3. Faston Horn (x2)

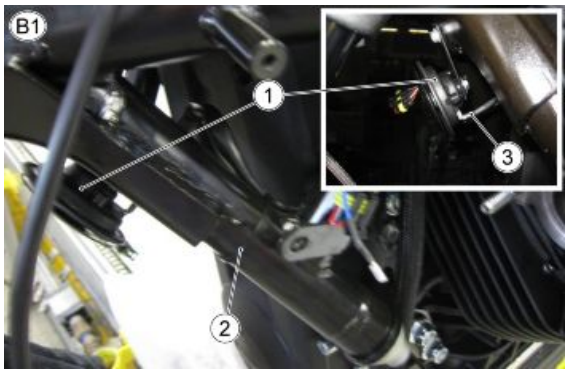


TABLE B2: MAIN CABLE HARNESS ON THE CHASSIS

1. Clamp.
2. The main cable harness, in the central area of the motorbike, passes inside the chassis.

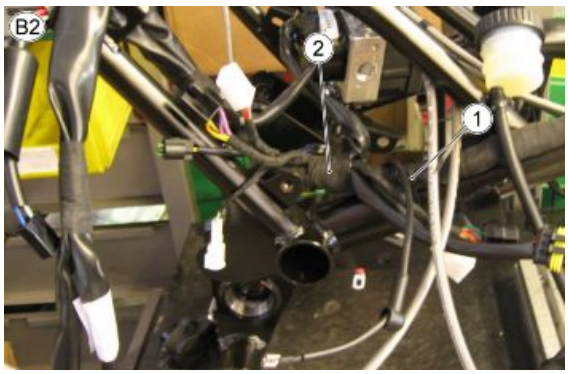


TABLE B3: MAIN CABLE HARNESS ON THE CHASSIS

1. ECU control unit.

Connect the ECU connectors like in the figure, being careful to attach the slides to the bottom.

2. ECU ground.

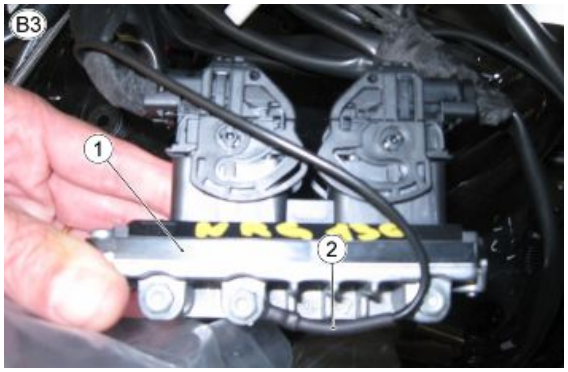


TABLE B4: MAIN CABLE HARNESS ON THE CHASSIS

1. Clamp.

2. GPS pre-installation.

TABLE B5: MAIN CABLE HARNESS ON THE CHASSIS

1. Arrange the connectors of the right light switch device to the connection.

2. The instrument panel branch must be passed through the upper triangle of the chassis.

3. The lambda sensor branch, front turn indicator and coil must be passed through the lower triangle of the chassis.

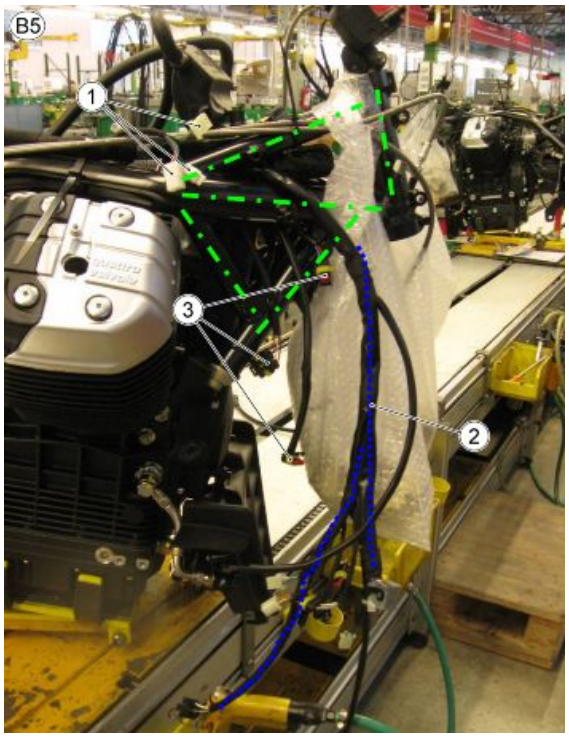


TABLE C: COILS

1. Left coil.

2. Right coil.

2. Coil connectors.

3. Ground terminals.

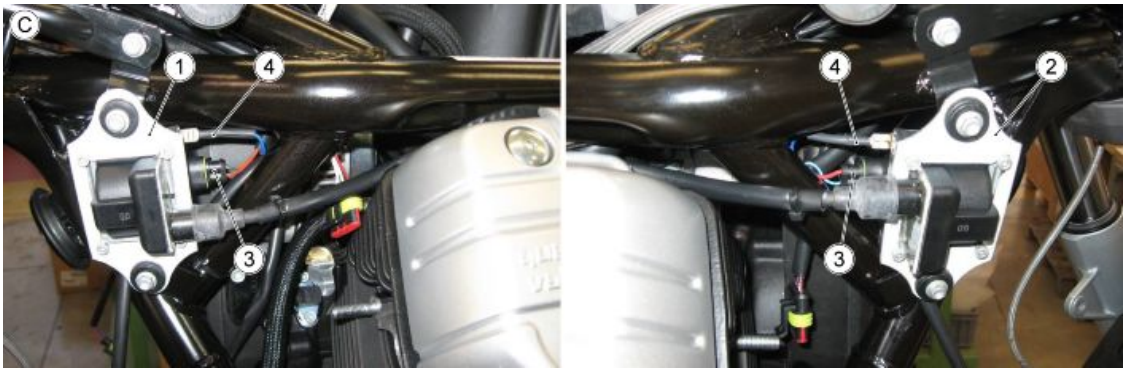


TABLE C1: COILS

1. Laying of the H.V. cable

Connect the spark plug hood to the other end of the H.V. cable and repeat the laying on the left side.

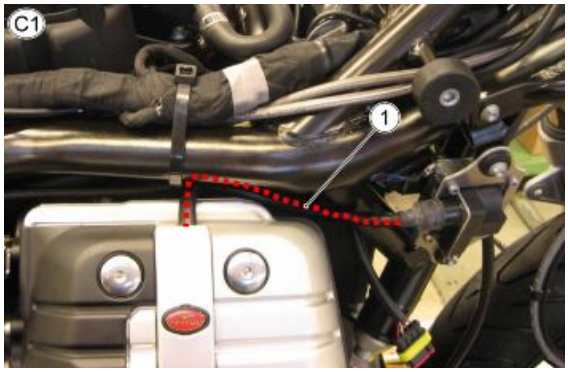


TABLE D: MAIN CABLE HARNESS

1. Injection branch.
2. Injection sub-branch.
3. Grey sheathing.

From the injection branch select the sub-branch with three connectors of which one blue (engine cylinder head temperature) and direct it towards the right side of the motorbike.

Spread the injection branch inside the V of the engine, so that the grey belt is positioned at the height of the two bolts.

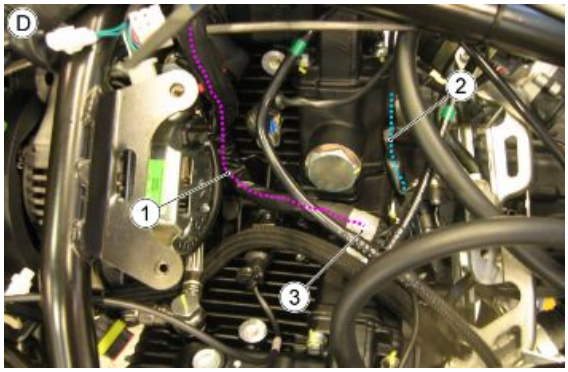


TABLE E: ENGINE CYLINDER HEAD TEMPERATURE

1. Engine cylinder head connector.

TABLE F: THROTTLE SENSOR

1. Connect the throttle sensor making sure that the hook of the connector anchors onto the rear lock present on the component.

TABLE G

1. Pick up.
2. Front ABS sensor connector.

TABLE H: OIL PRESSURE SENSOR

1. Oil pressure sensor.
2. Grey sheathing of the oil pressure sensor cable harness reference.

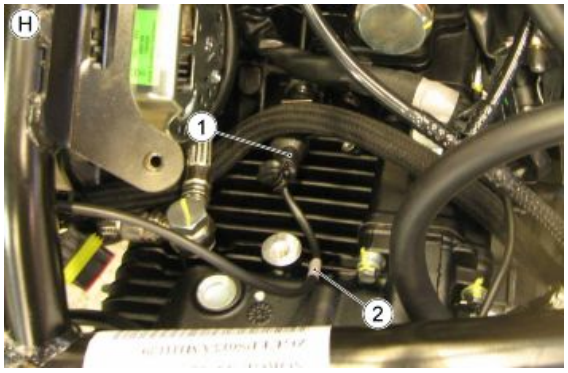


TABLE I: INJECTORS

1. Right injector connector.
2. Left injector connector.

TABLE J: STEPPER MOTOR

1. Engine stepper connector.

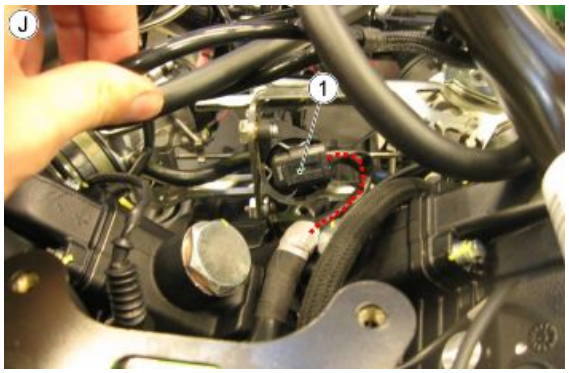


TABLE K

1. Key connector.
2. Clutch switch connector.
3. Heated hand grips connector.
4. Electric fan cable harness connector.
5. Clamp.

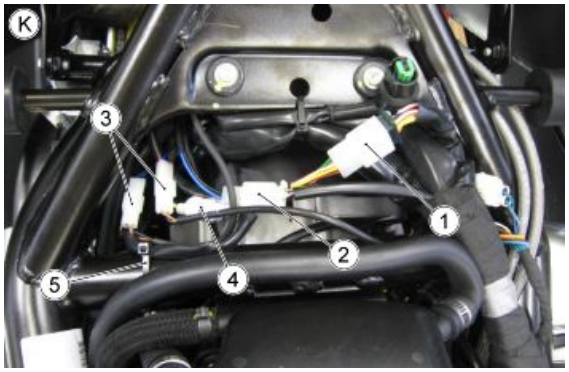


TABLE L

1. Alternator eyelet.
2. Generator connector
3. Alternator.
4. Right device connectors.
5. Alternator eyelet hood.

After having tightened the eyelet fit the alternator hood

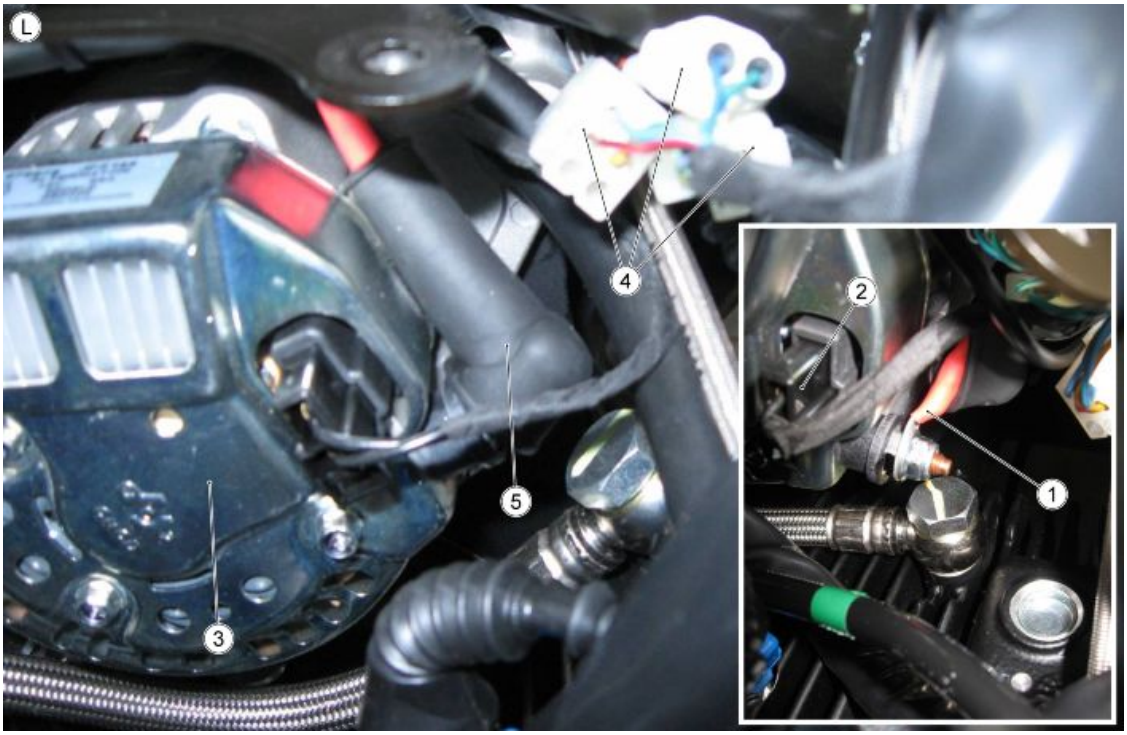


TABLE M

1. Fall sensor.
2. Injection relay 2.
3. Injection relay 1.
4. Start-up relay.
5. Maintenance relay.

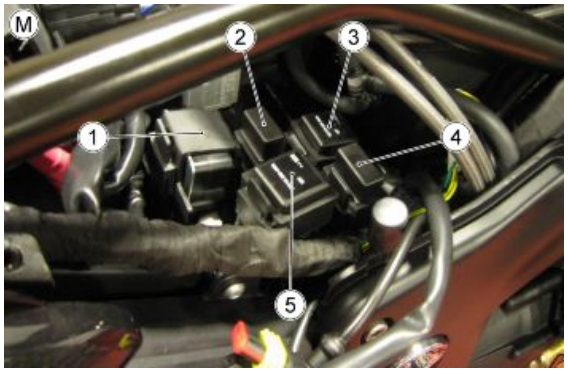


TABLE N

1. Fuel pump connector.
2. Rear ABS sensor connector.
3. Rear stop switch connector.

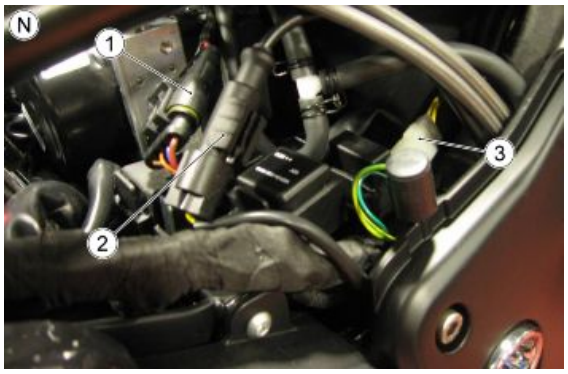


TABLE O

1. Fixing stud bolt and anti-vibration washers.
2. Negative battery cable harness - ground.
3. Side stand switch connector.
4. Engine ground eyelet (main cable harness).

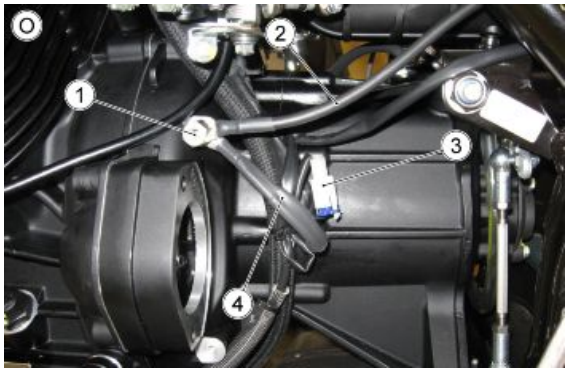


TABLE P

1. Starter motor.
2. Clamp.
3. Battery ground cable harness path - engine ground.

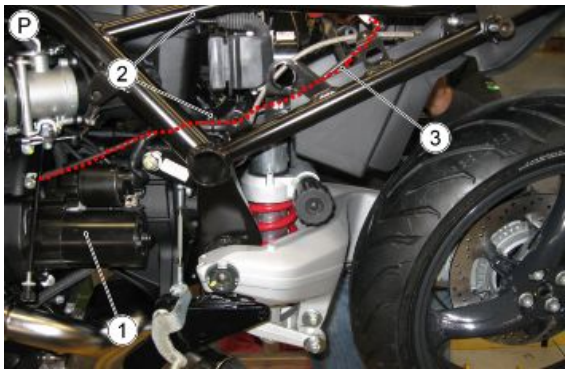


TABLE Q

1. Starter motor connector.
2. Starter motor eyelet.
3. Clamp.
4. ABS ECU connector.

The hood of the ABS ECU connector must be bent toward the front of motorcycle.

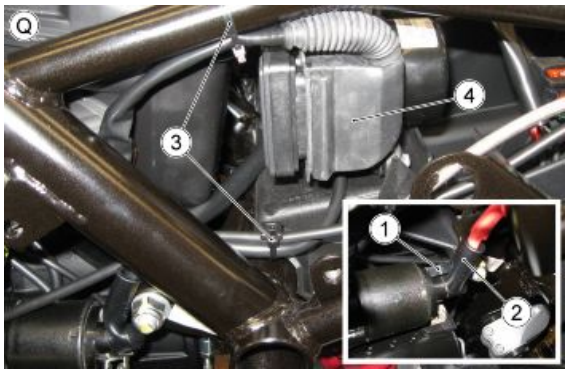


TABLE R

1. Neutral switch connector (faston).

TABLE S

1. Air temperature connector (filter box).

TABLE T: LAMBDA SENSOR

1. Right lambda connector.
2. Left lambda connector.
3. Clamps.
4. Clamp with which the electric fan cable harness must be held.
5. Right lambda sensor.
6. Left lambda sensor.

Each lambda cable must be connected with two clamps.

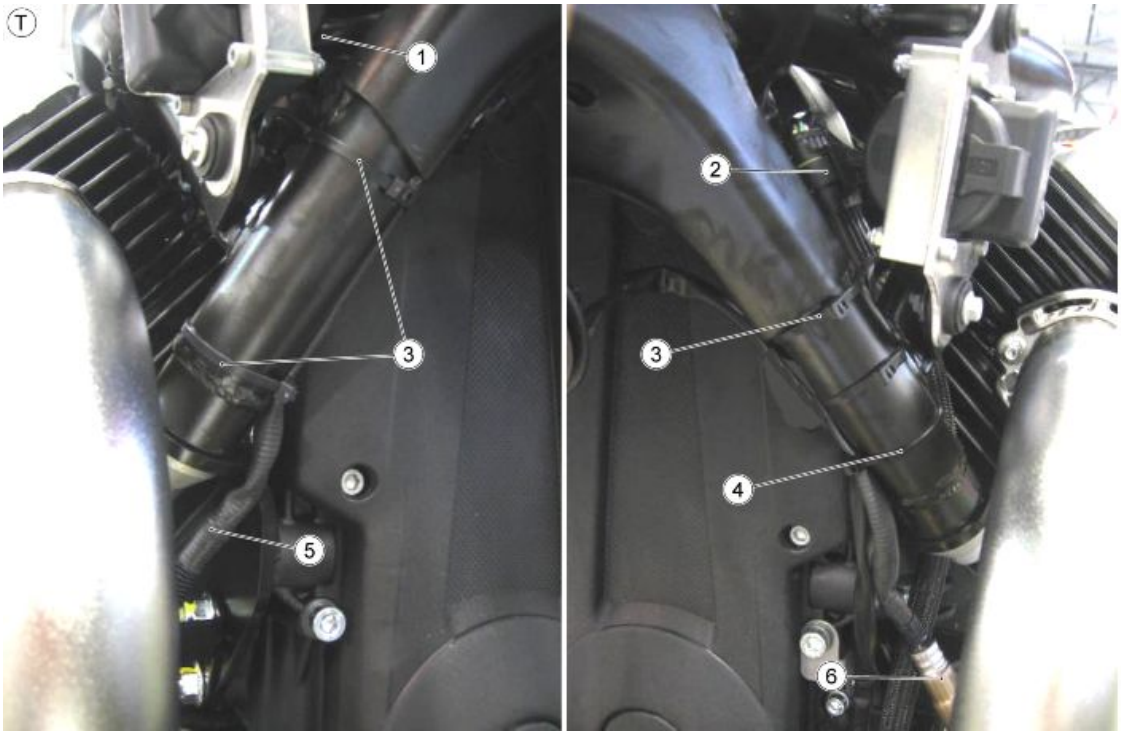


TABLE U: PROCEDURE FOR THE CORRECT INSERTION OF THE ABS CONTROL UNIT CONNECTOR

- Place the connector on the opposite side of the control unit and lower the driving lever until the "click" that signals the end of the stroke is heard.

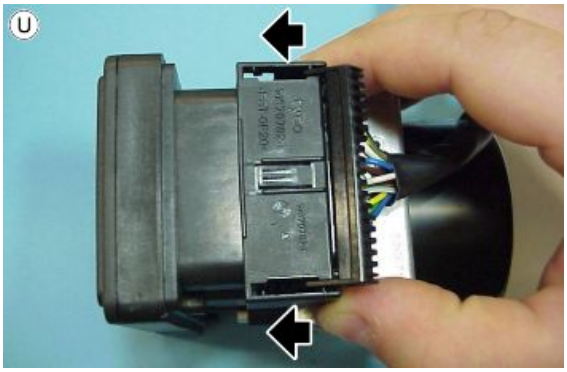


TABLE U1: CORRECT ASSEMBLY

- When the connector is fully inserted, the distance between the connector and the ABS control unit must be 7.5 mm (0.29 in).

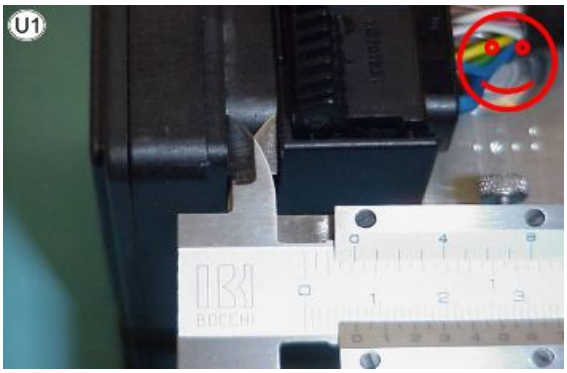
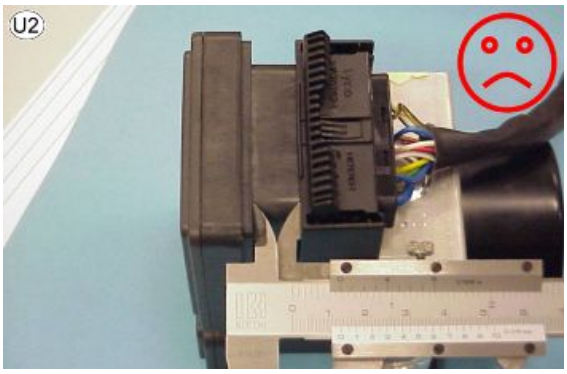


TABLE U2: WRONG ASSEMBLY

- If the initial position of the connector and the pulling level is not as the one previously shown, the connector will not hook correctly and the distance measured will be higher than approximately 12 mm (0.47 in). In this case, repeat the connection operations.



Back side

TABLE A

1. Clamp.
2. Plug socket.
3. Fit the hood carefully.

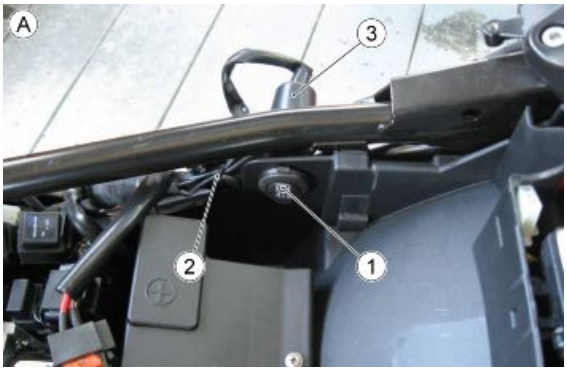


TABLE B

1. Clamp.

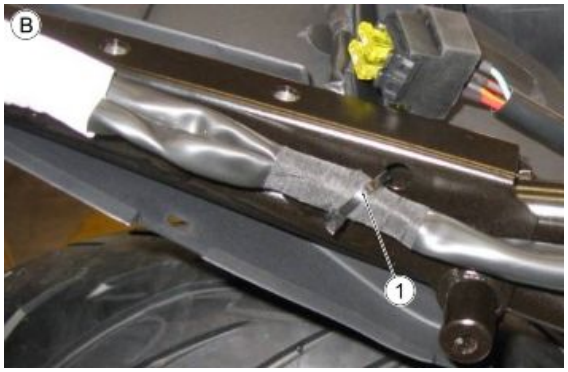


TABLE C

1. Clamp.
2. License plate lamp, taillight AND rear turn indicator connectors.

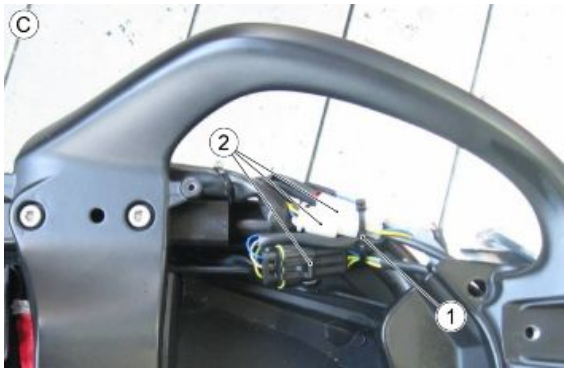


TABLE D

1. Battery.
2. Positive pole (red heat-shrinking).
3. Negative pole.

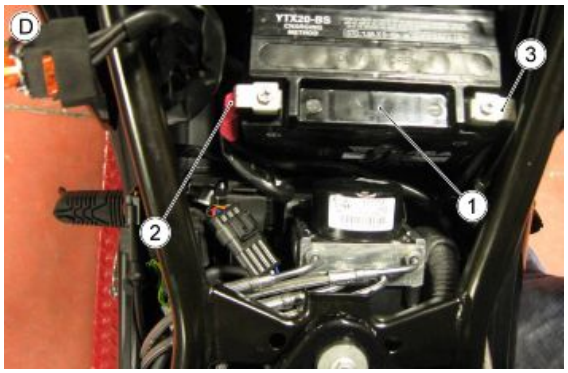


TABLE E

1. Secondary fuse box, ECU diagnosis connectors and instrument panel diagnosis.

TABLE F

1. Main fuses 1.
2. Main fuses 2.

TABLE G: REAR ABS SENSOR

1. Cable grommets

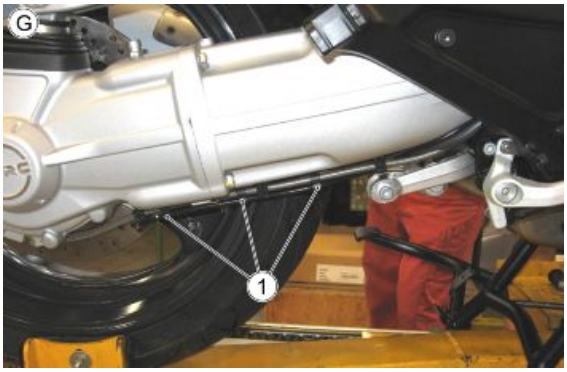
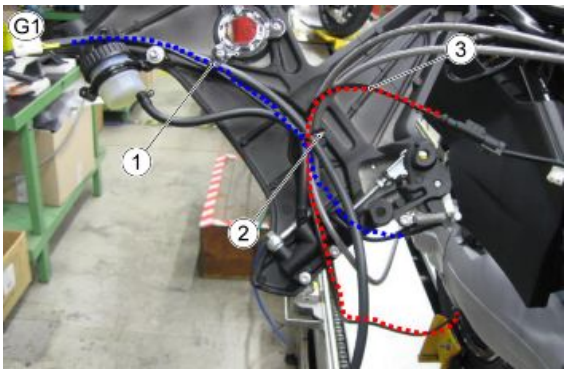
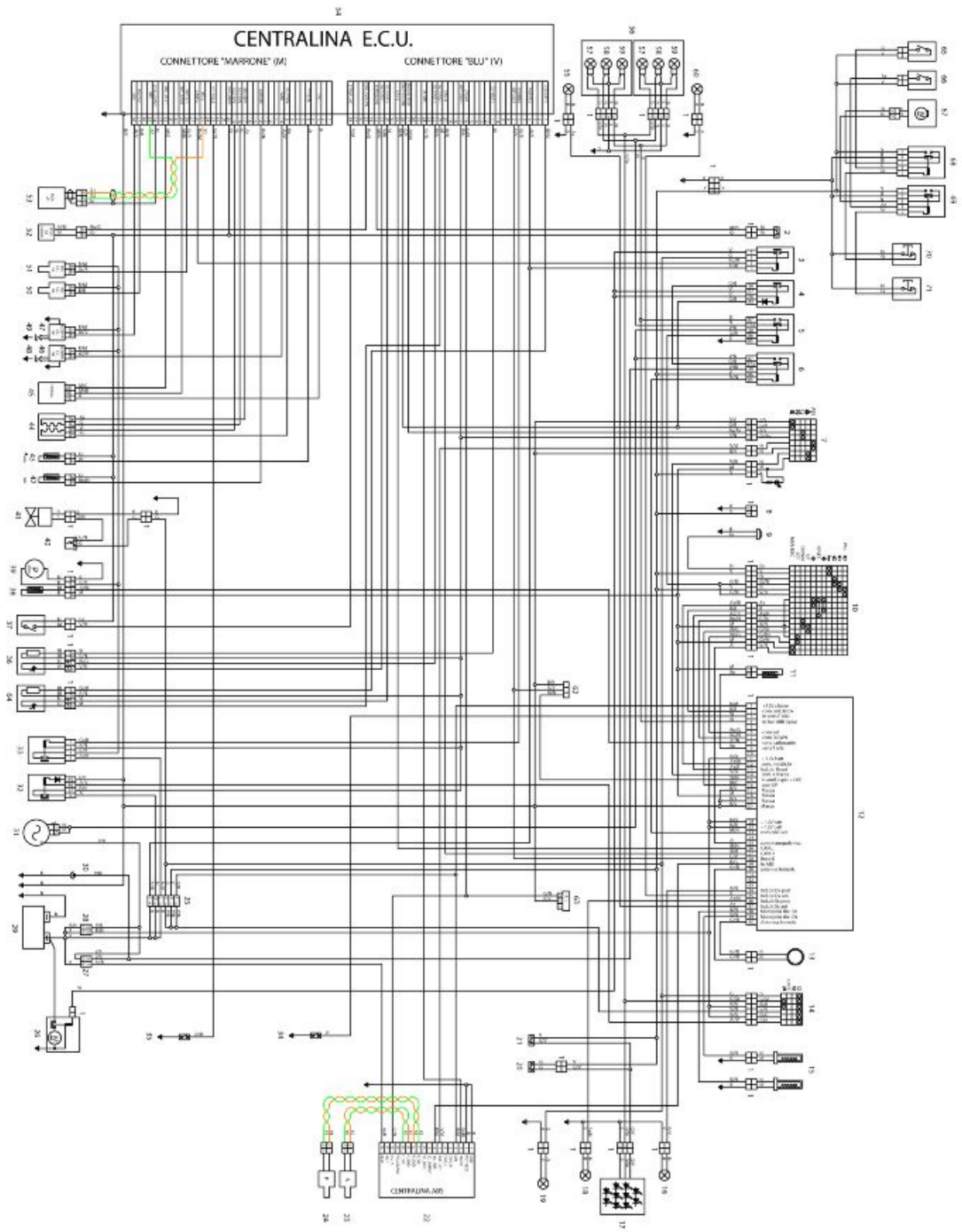


TABLE G1: REAR ABS SENSOR

1. Rear brake switch cable harness.
2. Clamp.
3. Rear ABS sensor cable harness.



General wiring diagram



1. Multiple connectors
2. Clutch switch
3. Start-up relay
4. Start-up maintenance relay
5. High-/low beam Relay lights

6. Light logic relay
7. Right light switch
8. Power supply for GPS
9. Horn
10. Left light switch
11. Ambient air temperature sensor
12. Instrument panel
13. Immobilizer aerial
14. Ignition switch
15. Heated handgrips
16. Rear right turn indicator
17. Taillight (LED)
18. Left rear turn indicator
19. License plate light bulb
20. Rear stop switch
21. Front stop switch
22. ABS Control unit
23. Front wheel speed sensor
24. Rear wheel speed sensor
25. Secondary fuses
26. Starter motor
27. Main fuses 2
28. Main fuses 1
29. Battery
30. 12 V Plug socket
31. Alternator
32. Main injection relay
33. Secondary injection relay
34. Oil pressure sensor
35. Neutral sensor
36. Lambda sensor 1 (SX)
37. Side stand switch
38. Fuel level sensor
39. Fuel pump
40. Water Temperature Sensor
41. Electric fan
42. Intake air temperature sensor
43. Engine temperature sensor

44.Idle motor
45.Throttle position sensor
46.Right cylinder coil
47.Left cylinder coil
48.Right spark plug
49.Left spark plug
50.Right cylinder injector
51.Left cylinder injector
52.Fall sensor
53.Pick-up
54.ECU.
55.Front left turn indicator
56.Complete front headlamp
57.Tail light bulb
58.Low beam bulb
59.High beam bulb
60.Front right turn indicator
61.-
62.Instrument panel diagnosis
63.ECU Diagnosis.

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
Ro pink

Checks and inspections

Dashboard

Diagnosis

Changing the CODE

If you know the code, just enter it and then a new code that will be automatically stored in the memory.

If the vehicle is new, the user code is: 00000

Resetting the CODE

This function is used to set a new code when the old one is not available; in this case, at least two of the programmed keys have to be inserted in the ignition lock.

After the first key has been inserted, the second one is requested with the following message:

INSERT KEY II

If the second key is not inserted within 20 seconds, the operation is finished.

After recognising the second key, the new code is required with the message:

ENTER NEW CODE

Once the operation is finished, the instrument panel goes back to the SET-UP menu.

DIAGNOSIS

Access to this menu (diagnosis functions), for the technical service only, after requesting a service code.

It will read: ENTER THE SERVICE CODE This vehicle code is: **10695**

The functions in this menu are:

- Exit
- ECU diagnosis
- Instrument Panel Errors
- Error Clearing
- Reset Service
- Update
- Change Keys
- km / Miles

ECU ERRORS

The instrument panel receives only the current errors from the control unit.

Description Error code

Throttle Valve Error DC V DC ECU 10

Throttle Valve Error DC Gnd ECU 11

Engine Temperature Error DC V DC ECU 14

Engine Temperature Error DC Gnd ECU 15

Air Temperature Error DC V DC ECU 16

Air Temperature Error DC Gnd ECU 17

Low Battery Error ECU 20

Lambda Probe Error ECU 21

Coil 1 Error DC V DC ECU 22

Coil 1 Error DC Gnd ECU 23

Coil 2 Error DC V DC ECU 24

Coil 2 Error DC Gnd ECU 25

Injector 1 Error DC V DC ECU 26

Injector 1 Error DC Gnd ECU 27

Injector 2 Error DC V DC ECU 30

Pump Relay Error ECU 36

Local Loopback Error ECU 37

Start-up Remote Error DC V DC ECU 44

Remote Error Start-up DC Gnd ECU 45

Canister Error DC V DC ECU 46

Canister Error DC Gnd ECU 47

Battery Error Hig ECU 50

Generic ECU Error ECU 51

Signal Panel Error ECU 54

Self-adaptability Value Error ECU 55

Vehicle Speed Error ECU 56

Stepper Error AC ECU 60

Stepper Error DC V DC ECU 61

Stepper Error DC Gnd ECU 62

Not recognised error ECU 00

INSTRUMENT PANEL ERRORS

In this mode a chart is displayed showing potential errors in the immobilizer and its sensors.

This is the error decoding chart:

Description: Immobilizer failure: Key code read but not recognised. Error code: DSB 01

Description: Immobilizer failure: Key code not read (Key not inserted or transponder broken) Error code: DSB 02

Description: Immobilizer failure: Aerial not working (Open or short-circuited). Error code: DSB 03

Description: Immobilizer failure: Internal controller failure. Error code: DSB 04

Description: - Error code: DSB 05

Description: Air temperature sensor failure. Error code: DSB 06

Description: Oil sensor failure. Error code: DSB 07

Description: Oil pressure failure. Error code: DSB 08

The instrument panel keeps all previous errors stored in its **memory**.

DELETE ERRORS

This option deletes instrument panel errors only, a further confirmation is requested.

INSTRUMENT PANEL SOFTWARE UPGRADE

This function is used to program the instrument panel again with a new software through Navigator.

The Display reads: "Instrument panel disconnected. Now connect the diagnosis instrument"; the instrument panel will connect normally after the key is extracted-inserted.

The white connector is placed under the saddle, beside the fuse box, close to the diagnosis connector for the injection system.

Use the Ditech connector in the Navigator **Aprilia-Moto Guzzi** package to connect to the Navigator cable.

KEY CHANGE FUNCTION

This function can be used:

1) if one key is lost; the dealer can disable this key;

2) to activate up to 4 keys;

3) should a new key lock be necessary and thus program the new set of keys.

In the first phase the user code must be entered and, after confirming the inserted key (key I) has been programmed, the other keys must be entered too.

The procedure finishes once the 4 keys have been programmed or after 20 seconds.

Should a new key lock be necessary, the procedure is: once the key is set to ON but the instrument panel does not recognise it, the user code is requested: enter the user code.

Now enter MENU, DIAGNOSIS (entering the service code), KEY CHANGE and program the new keys.

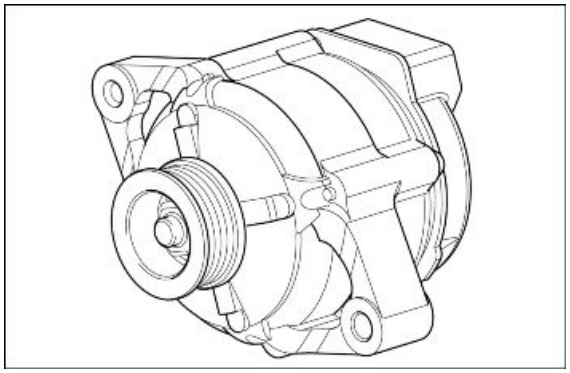
Battery recharge circuit

Checking the stator

Single-phase generator with regulated voltage

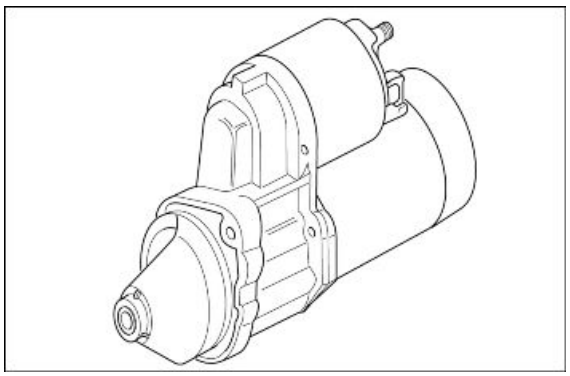
Maximum load 40A (550W)

Charging voltage 14.2 - 14.8 V (5000 rpm)



Start-up system check

pick-up input about 100 A



level indicators

Petrol pump:

Input: 3.5 A (to be measured between pins 1 and 2 with 12V voltage)

Fuel level sensor:

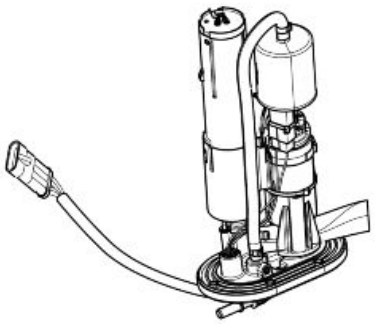
Resistance (to be measured between pins 3 and 4)

250-300 Ohm with fuel level equal to 0 litre

100 Ohm with fuel level equal to 11.25 litres (20.43 pt)

10-20 Ohm with fuel level equal to 22.5 litres (40.86 pt)

The low fuel warning light turns on with values over 230 Ohm.



In case there is anomaly on the fuel probe, the low fuel warning light flashes on the instrument panel.

The alarm warning light on the instrument panel does not light up and the word Service is not displayed.

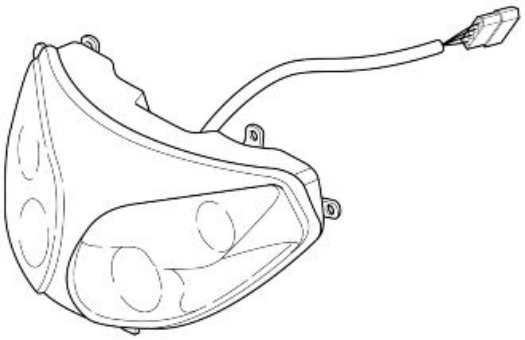
Lights list

FRONT HEADLAMP

Tail light: 12V - 5W

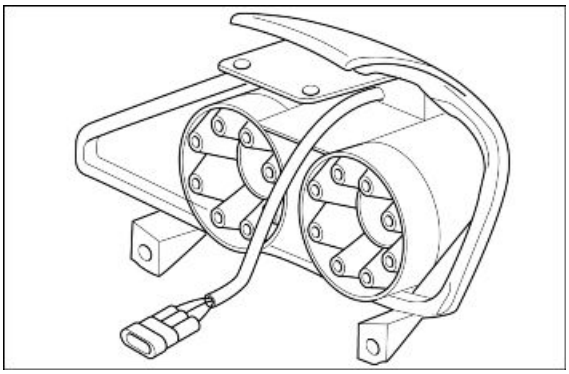
Low beam light: 12V - 55W H3

High beam light: 12V - 65W H1

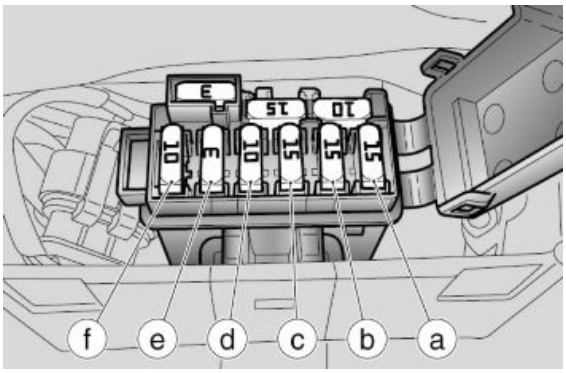


REAR LIGHT

LED

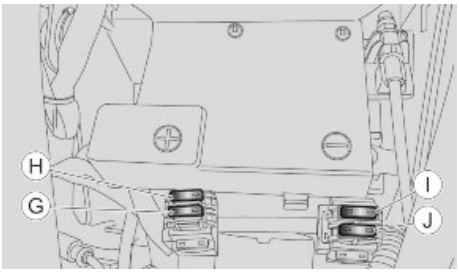


Fuses



SECONDARY FUSES DISTRIBUTION

	Specification	Desc./Quantity
1	(a) 15A fuse	Stop, horn, GPS, HAZARD button backlight, light relay coils, high beam flash, electric windshield motor (if fitted).
2	(b) 15A fuse	Daylight running lights, number plate light, starter motor, electric fan, starter relay
3	(c) 15A fuse	Fuel pump, coils, injectors
4	(d) 10A fuse	Oxygen sensor 1 and 2 heater, secondary injection relay
5	(e) 3A fuse	Permanent positive, ECU power supply, ignition relay coil
6	(f) 10A fuse	Key-on positive, ABS ECU activation, instrument panel activation
7	3A - 10A - 15A	Spare fuses

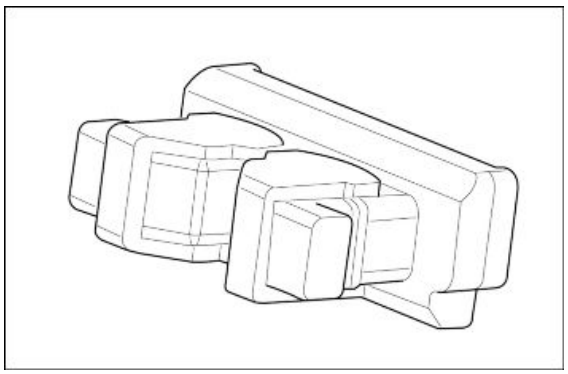


MAIN FUSES - DISTRIBUTION

	Specification	Desc./Quantity
1	(G) 40A fuse	Battery recharge
2	(H) 30A fuse	Main motorcycle fuse
3	(I) 20A fuse	Low beam - high beam fuse
4	(J) 20A fuse	Main ABS fuse
5	20A (QUANTITY' 2) - 30A - 40A	Spare fuses

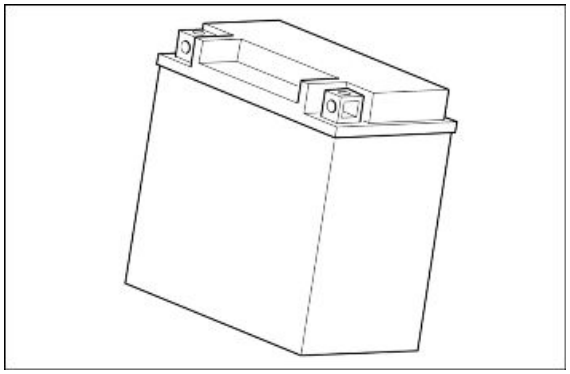
Control unit

Model: Magneti Marelli IAW 5 AM2



Battery

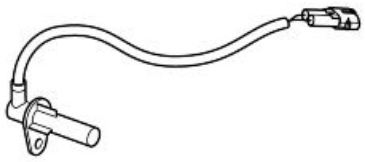
12 V - 18 Ampere/hour



Speed sensor

FRONT

FUNCTION: To indicate the vehicle speed by reading the front wheel turning speed.



OPERATION / OPERATING PRINCIPLE: Magnetoresistive sensor: a square-wave pulse is generated with voltage approx. between 11.55 V and 11.25 V

WIRING DIAGRAM Level in wiring diagram: ABS.

REMOVAL

LOCATION ON THE VEHICLE:on the fork, right stem, next to the brake calliper support.

CONNECTOR LOCATION (if available): under the fuel tank, front position.

PINS

- PIN 1- Ground connection (white)
- PIN 2 - Power supply voltage/Output signal (white/brown)

NAVIGATOR: PARAMETERS

Speed sensor

Vehicle speed: km/h

FRONT SPEED SENSOR, ELECTRICAL ERRORS

5D90 electric malfunction: Electrical fault in sensor or cable harness.

Troubleshooting: Check the sensor connector and the ABS control unit connector. If it is not OK, restore the connectors; if it is OK, check continuity of the cable between sensor PIN 2 on the cable harness side and PIN 14 ABS control unit connector. If there is no continuity, restore them. If there is, PIN 2 of the sensor on the cable harness side, with the sensor disconnected and key set to ON, must have 12V voltage approximately: if there is no voltage, check PIN 2 for continuity with the vehicle ground connection: if it is grounded, restore the cable harness. If OK, replace the control unit. If PIN 2 has approx. 12 V, check continuity of the cable between PIN 1 of the sensor on the cable harness side and PIN 13 of the ABS control unit connector. If this is not OK, restore the cable harness. If it is OK, replace the sensor.

LOGIC ERRORS

Speed sensor

5D91 the signal works irregularly: faulty sensor or signal interference.

Troubleshooting: Check speed sensor retainer. If it is not OK, restore it. If it is OK, check if the tone wheel is dirty, deformed or wrongly fixed. If any of this happens, replace the tone wheel. Otherwise, replace the speed sensor.

5D92 the signal decreases periodically: Possible tone wheel fault due to deformations or dirt; possible alterations on the wheel bearing surface. In very rare cases, abnormal tone wheel vibrations.

Troubleshooting: Check if the tone wheel is dirty, deformed or wrongly fixed. If the tone wheel is not OK, replace it. If it is OK, check for possible faults in the wheel bearings and if it is not OK, replace the bearings.

5D93 missing signal or speed measured too low in relation to the rear wheel: faulty sensor or missing sensor/tone wheel. Or excessive distance between the sensor and the tone wheel or tone wheel with wrong number of teeth.

Troubleshooting: Check that the speed sensor and the tone wheel are installed. If they are not, install them. If they are, check the speed sensor retainer. If it is not OK, restore it. If it is, check if the tone wheel has the correct number of teeth or if it is dirty, deformed or wrongly fixed. If it is not OK, replace the tone wheel and if it is OK, replace the speed sensor.

5D94 no acceleration after pressure reduction: Faulty sensor or missing sensor/tone wheel or excessive distance between the sensor and the tone wheel.

Troubleshooting: Check that the speed sensor and the tone wheel are installed. If they are not, install them. If they are, check the speed sensor retainer. If it is not OK, restore it. If it is, check if the tone wheel has the correct number of teeth or if it is dirty, deformed or wrongly fixed. If it is not OK, replace the tone wheel and if it is OK, replace the speed sensor.

5D95 excessive speed measured: Faulty sensor or tone wheel, or tone wheel with wrong number of teeth or wrong tyre size.

Troubleshooting: Check that the speed sensor and the tone wheel are installed. If they are not, install them. If they are, check the speed sensor retainer. If it is not OK, restore it. If it is, check if the tone wheel has the correct number of teeth or if it is dirty, deformed or wrongly fixed. If it is not OK, replace the tone wheel and if it is OK, check that the tyre size is the correct one. If it is not OK, replace it. If it is OK, check that the tyre pressure is the correct one. If it is not OK, restore it; if it is OK, replace the speed sensor.

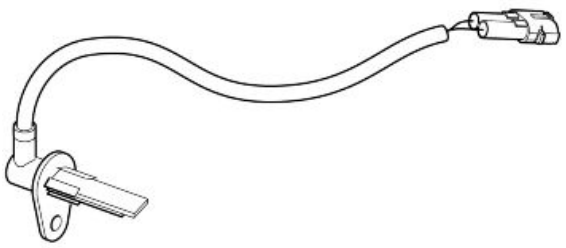
REAR

FUNCTION: It is used by the ABS module, and then by the ECU and the instrument panel.

OPERATION / OPERATING PRINCIPLE: Differential Hall effect sensor.

ELECTRICAL CIRCUIT DIAGRAM- Level in wiring diagram: ABS.

REMOVAL



LOCATION ON THE VEHICLE: Under the bevel gear set box, right side.

CONNECTOR LOCATION (if available): Under the saddle, right side.

PIN-OUT:

- PIN1 - Ground
- PIN2 - Signal

NAVIGATOR

Parameters: Speed (km/h) - Vehicle speed.

ELECTRICAL ERRORS

Speed sensor

5DA0 electric malfunction: Electrical fault in sensor or cable harness.

Troubleshooting: Perform the check procedure of the sensor connector and of the ABS control unit connector, if not OK restore the connectors, if OK check the continuity of the yellow cable between cable harness side sensor PIN 2 and ABS control unit connector PIN 11. If there is no continuity, restore them. If there is, PIN 2 of the sensor on the cable harness side, with the sensor disconnected and key set to ON, must have 12V voltage approximately: if there is no voltage, check PIN 2 for continuity with the vehicle ground connection: if it is grounded, restore the cable harness. If OK, replace the control unit. If PIN 2 has approx. 12 V, check continuity of the yellow/brown cable between PIN 1 of the sensor on the cable harness side and PIN 12 of the ABS control unit connector. If this is not OK, restore the cable harness. If it is OK, replace the sensor.

LOGIC ERRORS

Speed sensor

5DA1 the signal works irregularly:faulty sensor or signal interference.

Troubleshooting: Check speed sensor retainer. If it is not OK, restore it. If it is OK, check if the tone wheel is dirty, deformed or wrongly fixed. If any of this happens, replace the tone wheel. Otherwise, replace the speed sensor.

5DA2 the signal decreases periodically: Possible tone wheel fault due to deformations or dirt; possible alterations on the wheel bearing surface. In very rare cases, abnormal tone wheel vibrations.

Troubleshooting: Check if the tone wheel is dirty, deformed or wrongly fixed. If the tone wheel is not OK, replace it. If it is OK, check for possible faults in the wheel bearings and if it is not OK, replace the bearings.

5DA3 no signal or speed measured too low in relation to the front wheel: Faulty sensor or missing sensor/tone wheel. Or excessive distance between the sensor and the tone wheel or tone wheel with wrong number of teeth.

Troubleshooting: Check that the speed sensor and the tone wheel are installed. If they are not, install them. If they are, check the speed sensor retainer. If it is not OK, restore it. If it is, check if the tone

wheel has the correct number of teeth or if it is dirty, deformed or wrongly fixed. If it is not OK, replace the tone wheel and if it is OK, replace the speed sensor.

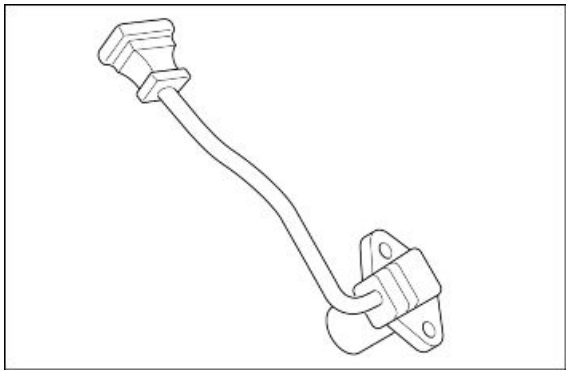
5DA4 missing acceleration after pressure reduction: Faulty sensor or missing sensor/tone wheel or excessive distance between the sensor and the tone wheel.

Troubleshooting: Check that the speed sensor and the tone wheel are installed. If they are not, install them. If they are, check the speed sensor retainer. If it is not OK, restore it. If it is, check if the tone wheel has the correct number of teeth or if it is dirty, deformed or wrongly fixed. If it is not OK, replace the tone wheel and if it is OK, replace the speed sensor.

5DA5 excessive measured speed: Faulty sensor or tone wheel, or tone wheel with wrong number of teeth or wrong tyre size.

Troubleshooting: Check that the speed sensor and the tone wheel are installed. If they are not, install them. If they are, check the speed sensor retainer. If it is not OK, restore it. If it is, check if the tone wheel has the correct number of teeth or if it is dirty, deformed or wrongly fixed. If it is not OK, replace the tone wheel and if it is OK, check that the tyre size is the correct one. If it is not OK, replace it. If it is OK, check that the tyre pressure is the correct one. If it is not OK, restore it; if it is OK, replace the speed sensor.

Engine rpm sensor



Function

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 electrical circuit diagram:

Engine speed sensor

Location:

- Sensor: Front left side of the engine, under the generator.
- Connector: Under the fuel tank.

Electrical characteristics:

- Winding resistance 650 Ohm +/- 15%
- Output alternating voltage, value range: minimum: 0.5 V - maximum: 5 V

PIN:

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

NAVIGATOR: 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.

NAVIGATOR: 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 25 to PIN 35 of connector A (BROWN) Check the sensor connector and the injection control unit connector A (BROWN): it they are not OK, restore. If OK, check continuity of the two cables leading to PINS 25 and 35 of the control unit connector: if there is not continuity, restore the cable harness; if there is continuity, check the interruption on the sensor and replace it.

WARNING If the electric circuit is short-circuited, no error is displayed. Check the sensor electrical specifications: If they are not correct, replace the sensor. If correct, check supply insulation and ground connection insulation of both cables. Perform the tests from the sensor connector towards the sensor. If they are not OK, restore the cable harness or replace the sensor. If OK, perform the tests for pins 25 and 35 of the Marelli control unit connector A (BROWN) towards the cable harness.

Air gap value:

Place the sensor plus the corresponding spacers; the air gap should be between 0.7 and 0.9 mm (0.027 - 0.035 in).

Throttle position sensor

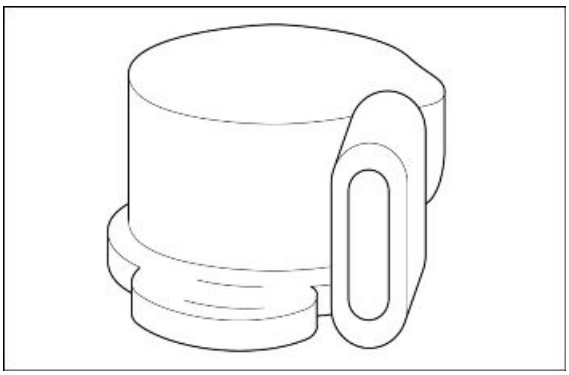
Function

In charge of telling the control unit the position of the throttle valves.

Operation / Operating principle

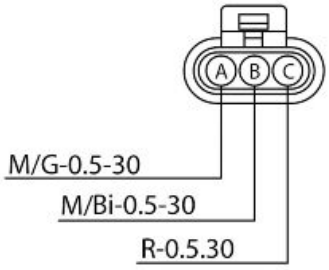
The throttle valve position sensor works as a variable resistance according to the throttle rotation.

Level in electrical circuit diagram: Throttle and idle motor



Location:

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



Electrical characteristics:

- PINS A-C: throttle closed approx. 2.5 kOhm; throttle open approx. 1.5 kOhm.
- PINS A-B: approx. 1.1 kOhm

Pin-out:

- PIN A: ground connection
- PIN B: supply voltage +5V
- PIN C: potentiometer signal

THE CONNECTION DIAGRAMS ARE IN THE ELECTRICAL SYSTEM SECTIONS; PAY ATTENTION TO THESE DIAGRAMS AS THEY SHOW THE CONNECTOR/COMPONENT AS VIEWED FROM THE CABLE HARNESS SIDE, THAT IS LOOKING AT THE CABLES WHEN GOING OUT OF THE "MAIN" CABLE HARNESS AND INTO THE CONNECTOR/COMPONENT.

CAUTION

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NAVIGATOR: FUEL INJECTION SYSTEM

NAVIGATOR: PARAMETERS

Throttle

Example value: 4.9°

NAVIGATOR: STATUSES

Throttle position

Example value: Released/Pressed/Full load

Indicates if the throttle potentiometer is open or closed in the released position.

NAVIGATOR: ERRORS

Throttle actuator position sensor P0120

Example value: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 3 of connector A (BROWN).
- 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 continuity between PIN 3 of

connector A (BROWN) and PIN C of the sensor (red 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, check the resistance. If resistance is over 2.5 kOhm, it means the red cable is shorted to positive and the cable harness should be restored

- shorted to negative: disconnect the sensor connector and check the ground insulation of the red cable (from throttle sensor connector or control unit connector): if there is continuity to ground, restore the cable harness; if it is ground insulated, the resistance between PIN A and PIN C is below 1.3 kOhm; therefore, the throttle body should be replaced

NAVIGATOR: ADJUSTMENT

Throttle position autodetection: It allows the control unit to detect the closed throttle position; just press the Enter key.

Self-adjustable parameters reset: Lambda probe self-adaptability parameters reset: 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.

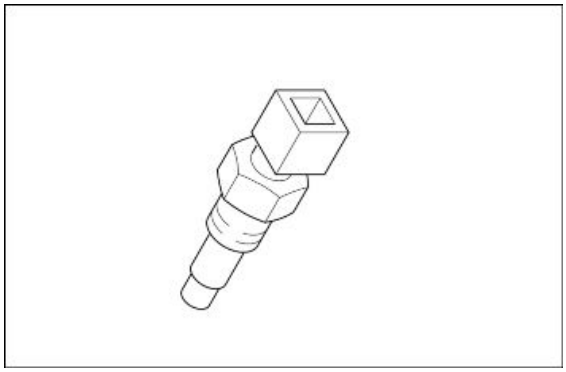
NAVIGATOR: RESET PROCEDURE

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 position autodetection.

Engine temperature sensor

Function

tells the engine temperature to the control unit so as to optimise its operation.



Operation / Operating principle

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

Level in electrical circuit diagram: Temperature sensors

Location:

- sensor: inside the "V"
- Connector: on the sensor

Electrical characteristics:

ENGINE TEMPERATURE SENSOR RESISTANCE

	Specification	Desc./Quantity
1	Resistance at -40 °C (-40 °F)	100.950 kOhm
2	Resistance at -30 °C (-22 °F)	53.100 kOhm
3	Resistance at -20 °C (-4 °F)	29.120 kOhm
4	Resistance at -10 °C (14 °F)	16.600 kOhm
5	Resistance at 0 °C (32 °F)	9.750 kOhm

	Specification	Desc./Quantity
6	Resistance at +10 °C (50 °F)	5.970 kOhm
7	Resistance at +20 °C (68 °F)	3.750 kOhm
8	Resistance at +30 °C (86 °F)	2.420 kOhm
9	Resistance at +40 °C (104 °F)	1.600 kOhm
10	Resistance at +50 °C (122 °F)	1.080 kOhm
11	Resistance at +60 °C (140 °F)	0.750 kOhm
12	Resistance at +70 °C (158 °F)	0.530 kOhm
13	Resistance at +80 °C (176 °F)	0.380 kOhm
14	Resistance at +90 °C (194 °F)	0.280 kOhm
15	Resistance at +100 °C (212 °F)	0.204 kOhm
16	Resistance at +110 °C (230 °F)	0.153 kOhm
17	Resistance at +120 °C (257 °F)	0.102 kOhm

Pin-out:

- PIN 1: Ground connection
- PIN 2:0-5 V signal

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NAVIGATOR: FUEL INJECTION SYSTEM

NAVIGATOR: PARAMETERS

Engine temperature

In case of recovery, this value is set by the control unit.

NAVIGATOR: ERRORS

engine temperature sensor P0115 - 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 5 of connector A (BROWN).
- If shorted to negative: voltage equal to zero has been detected at PIN 5 of the BROWN connector.

Troubleshooting

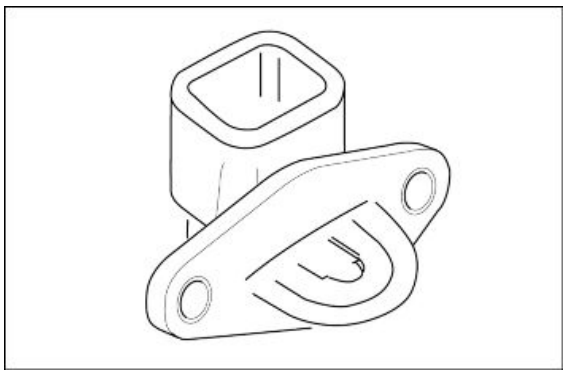
- If the circuit is open, shorted to positive: check the sensor connector and the Marelli control unit connector. If they are not OK, restore the cable harness; if OK, check the continuity of the sensor; if it is not OK, replace the sensor; if it is OK, check continuity between PIN 5 of the BROWN connector and PIN 2 of sensor: restore cable harness if there is not continuity; if it is OK, reconnect the control unit connector and, with key set to key ON, check the continuity between the sensor connector PIN 1 and the vehicle ground connection: if there is not continuity, restore the cable harness; if there is continuity, it means that the cause of the error is that the cable is shorted to positive and now the cable harness between the

BROWN PIN 5 and PIN 2 of the sensor should be restored. If the air temperature sensor error is displayed at the same time, this means that the grey cable common for both sensors is shorted to positive.

- If shorted to negative, check sensor correct resistance: if resistance is null, replace the sensor; if resistance is correct, it means that the orange cable has ground connection: restore the cable harness.

NOTES No error is detected if the sensor does not work correctly or the control unit connector or sensor terminals are rusty: then check through Navigator if the temperature indicated is the same as the engine 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

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 electrical circuit diagram: Temperature sensors

Location:

- sensor: on filter casing
- connector: on the sensor

Electrical characteristics:

AIR TEMPERATURE SENSOR RESISTANCE

	Specification	Desc./Quantity
1	Resistance at -40 °C (-40 °F)	100.950 kOhm
2	Resistance at 0 °C (32 °F)	9.750 kOhm
3	Resistance at 10 °C (50 °F)	5.970 kOhm
4	Resistance at 20 °C (68 °F)	3.750 kOhm
5	Resistance at 30 °C (86 °F)	2.420 kOhm
6	Resistance at 40 °C (104 °F)	1.600 kOhm
7	Resistance at 90 °C (194 °F)	0.280 kOhm

Pin-out:

- PIN 1: Ground connection
- PIN 2: 0-5 V signal

NAVIGATOR: PARAMETERS

Air temperature

In case of failure, temperature is set at 25 °C (77 °F)

NAVIGATOR: ERRORS

air temperature sensor P0110 - open circuit, shorted to positive / shorted to negative.

Error cause

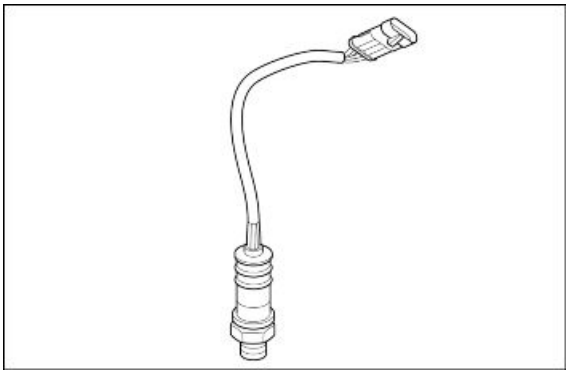
- If the circuit is open, shorted to positive: excessive voltage has been detected at PIN 14 of the BROWN connector. If shorted to negative: voltage equal to zero has been detected at PIN 14 of the BROWN connector

Troubleshooting

- If the circuit is open, shorted to positive: check the sensor connector and the Marelli control unit connector. If they are not OK, restore the cable harness; if OK, check the continuity of the sensor; if it is not OK, replace the sensor; if it is OK, check continuity between PIN 14 of the BROWN connector and PIN 2 of sensor: restore cable harness if there is not continuity; if it is OK, reconnect the control unit connector and, with key set to key ON, check the continuity between the sensor connector PIN 1 and the vehicle ground connection: if there is not continuity, restore the cable harness; if there is continuity, it means that the cause of the error is that the cable is shorted to positive and now the cable harness between the BROWN PIN 14 and PIN 2 of the sensor should be restored. If the engine temperature sensor error is displayed at the same time, this means that the grey cable common for both sensors is shorted to positive.
- 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 the cable harness

NOTES No error is detected if the sensor does not work correctly or the control unit connector or sensor terminals are rusty: then check through Navigator 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

In charge of telling the control unit whether the mixture 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 electrical circuit diagram: Lambda sensor

Location:

- Sensor: on the exhaust conducts
- Connector: near the probe

Electrical characteristics:

Heater circuit: 12 -14 Ω 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)

NAVIGATOR: PARAMETERS

Lambda sensor

example value: 0 - 1000 mV

If there is a short circuit at + 5 V or above, the value read is approx. 5.000 mV. If there is a short circuit to ground instead, the value read is equal to 0 mV and the Lambda Sensor Correction parameter shows 25%: no error is displayed, though.

Lambda sensor correction

example value: 1.00

In closed loop, the value must be close to 0 % (values not within the +10 % and -10 % range may indicate a fault):. In an open circuit, the lambda sensor signal is too low. Therefore, the control unit takes it as a lean mixture condition and will try to enrich it. The value read will be +25%.

NAVIGATOR: ELECTRICAL ERRORS

Left lambda sensor P0130 - Shorted to positive.

Error cause

- Excessive voltage (battery voltage) has been detected at PINS 32 and 22 of the BLUE connector.

Troubleshooting

- shorted to positive: with the key set to ON, disconnect the sensor connector and measure voltage at PIN 1 on the cable harness side (white/yellow cable): if there is voltage (5 or 12 V), restore the cable harness; it there is no voltage, measure voltage at PIN 2, cable harness side, (green/white cable) and if there is voltage, restore the cable harness; if there is no voltage, replace the lambda sensor

Left lambda sensor heating P0135 - shorted to positive / open circuit, shorted to negative.

Error cause

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

Troubleshooting

- shorted to positive: disconnect the probe connector and check the sensor correct resistance: replace the sensor if not OK; if it is OK, restore the cable harness.
- circuit is open, shorted to negative: check the continuity from probe connector (PIN 3 and 4) towards the probe: if not OK, replace the probe; if it is correct, check the sensor connector and the Marelli control unit connector. If not OK, restore. If OK, and with key set to ON and sensor connector disconnected, check if there is battery voltage at PIN 4: if not ok, check the red/black cable (cable harness side) between the probe connector and the auxiliary injection relay (No. 33 in the wiring diagram, located under the saddle, left rear relay in the relay group attached to the fall sensor; CHECK, however, the identification of the relay with the colour of the cables). If there are also coil and injector errors, check the relay itself and its excitation and power line; if there is voltage at PIN 4, check the white cable ground insulation, cable harness side (PIN 3): if it is not OK, restore the cable harness. If OK, check continuity of the white cable, cable harness side (between PIN 3 of the sensor connector and PIN 11 of the BLUE connector) and restore the cable harness.

LOGIC ERRORS

Left lambda sensor P0134- voltage without variation.

Error cause

- An abnormal behaviour of the voltage at PIN 22 of the BLUE connector has been detected: the voltage, that should vary over time, keeps a constant value instead.

Troubleshooting

- check circuit continuity of the lambda sensor connector (PIN 1 PIN2) toward the probe: replace the probe if there is no continuity; if there is continuity, check the sensor connector

and the Marelli control unit connector: If not OK, restore. If OK, check continuity between the BLUE connector PIN 22 and PIN 32 and restore the cable harness.

ELECTRICAL ERRORS

Right lambda sensor P0136 - Shorted to positive.

Error cause

- Excessive voltage (battery voltage) has been detected at PINS 21 and 31 of the BLUE connector.

Troubleshooting

- shorted to positive: with key set to ON, disconnect the sensor connector and measure PIN 1 voltage on the cable harness side (purple cable): if there is voltage (5 or 12 V), restore the cable harness; it there is no voltage, measure voltage at PIN 2, cable harness side, (brown cable) and if there is voltage, restore the cable harness; if there is no voltage, replace the lambda sensor.

Right lambda sensor heating P0141 - shorted to positive / open circuit, shorted to negative.

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 1 of the BLUE connector.
- If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 1 of the BLUE connector.

Troubleshooting

- shorted to positive: disconnect the probe connector and check the sensor correct resistance: replace the sensor if not OK; if it is OK, restore the cable harness.
- circuit is open, shorted to negative: check the continuity from probe connector (PIN 3 and 4) towards the probe: if not OK, replace the probe; if it is correct, check the sensor connector and the Marelli control unit connector. If not OK, restore. If OK, and with key set to ON and sensor connector disconnected, check if there is battery voltage at PIN 4: if not ok, check the red/black cable (cable harness side) between the probe connector and the auxiliary injection relay (No. 33 in the wiring diagram, located under the saddle, left rear relay in the relay group attached to the fall sensor; CHECK, however, the identification of the relay with the colour of the cables). If there are also coil and injector errors, check the relay itself and its excitation and power line; if there is voltage at PIN 4, check the black/white cable ground insulation, cable harness side (PIN 3): if it is not OK, restore the cable harness. If OK, check continuity of the white/black cable, cable harness side (between PIN 3 of the sensor connector and PIN 1 of the BLUE connector) and restore the cable harness.

LOGIC ERRORS

Lambda sensor P0140 - voltage without variation.

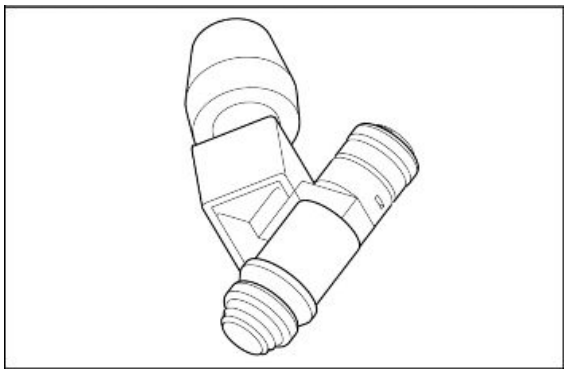
Error cause

- An abnormal behaviour of the voltage at PIN 31 of the BLUE connector has been detected: the voltage, that should vary over time, keeps a constant value instead.

Troubleshooting

- check circuit continuity of the lambda sensor connector (PIN 1 PIN2) toward the probe: replace the lambda sensor if there is no continuity; if there is continuity, check the sensor connector and the Marelli control unit connector: If not OK, restore. If OK, check continuity between the BLUE connector PIN 31 and PIN 21 and restore the cable harness.

Injector



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 electrical circuit diagram: Coils and injectors

Location:

- on the intake manifold
- connector: on injector

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

Pin-out:

"+": Supply:

" ": Ground connection

NAVIGATOR:FUEL INJECTION SYSTEM

NAVIGATOR: PARAMETERS

Injection time

NAVIGATOR: ACTIVATION

Left injector: operation for 4 ms, 5 times

The auxiliary injection relay (no. 33 in the wiring diagram, placed under the saddle, left rear relay in the relay group attached to the fall sensor; 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

NAVIGATOR: ERRORS

Left injector P0201 - shorted to positive / shorted to negative / open circuit.

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 28 of the BROWN connector.
- If shorted to negative: no voltage has been detected.
- If the circuit is open: an interruption has been detected

Troubleshooting

- Shorted to positive: disconnect the injector connector, take 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 no voltage, replace the injector
- If shorted to negative: disconnect the injector connector, take the key to ON and check if the grey/red cable has continuity to the ground connection: if there is continuity to ground, 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 they are not OK, restore. If OK, check cable continuity between PIN 28 of the BROWN connector and PIN 2- of the component and restore the cable harness

NAVIGATOR: ACTIVATION

Right injector: Operation for 4 ms, 5 times

The auxiliary injection relay (no. 33 in the wiring diagram, placed under the saddle, left rear relay in the relay group attached to the fall sensor; CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the white/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.

NAVIGATOR: ERRORS

Right injector P0202 - shorted to positive / shorted to negative / open circuit.

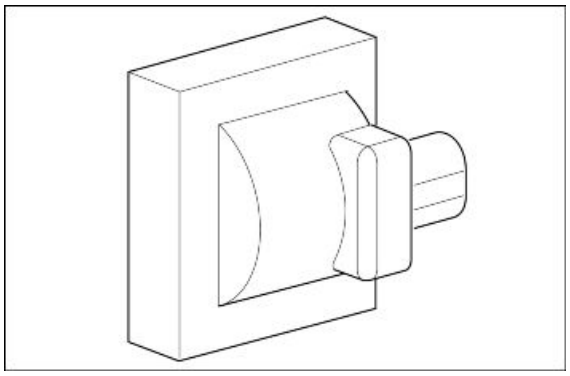
Error cause

- If shorted to positive: excessive voltage has been detected at PIN 33 of the BROWN connector.
- If shorted to negative: no voltage has been detected.
- If the circuit is open: an interruption has been detected

Troubleshooting

- Shorted to positive: disconnect the injector connector, take the key to ON and check if there is voltage on the blue/red cable: if there is voltage, restore the cable harness. If there is no voltage, replace the injector
- If shorted to negative: disconnect the injector connector, take the key to ON and check if the blue/red cable has continuity to the ground connection: if there is continuity to ground, 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 they are not OK, restore. If OK, check cable continuity between PIN 33 of the BROWN connector and PIN 2- of the component and restore the cable harness

Coil



Function

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

Operation / Operating principle

Inductive discharge system

Level in electrical circuit diagram: Coils and injectors

Location:

- In front of the fuel tank, left and right side
- Connector: on the coils

Electrical characteristics:

- Primary winding resistance: 550 mΩ ± 10%, at approx. 23 °C (73.4 °F).
- Secondary winding resistance: 3 mΩ ± 10%, at approx. 23 °C (73.4 °F).
- Tube resistance: 5 kΩ.

Pin-out:

1. Power supply + Vbatt
2. Circuit ground

NAVIGATOR: PARAMETERS

Left coil ignition advance.

NAVIGATOR: ACTIVATION

Left coil:

The auxiliary injection relay (no. 33 in the wiring diagram, placed under the saddle, left rear relay in the relay group attached to the fall sensor; CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the green/orange 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

NAVIGATOR: ERRORS

Left coil P0351- shorted to positive / open circuit, shorted to negative

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 38 of the BROWN connector.
- If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 38 of the BROWN connector

Troubleshooting

- Shorted to positive: disconnect the coil connector, set the key to ON, activate the coil with Navigator 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, shorted to negative: check the coil connector and the Marelli control unit connector. If they are not OK, restore; if everything is OK, check cable continuity between PIN 2 of the coil connector and PIN 38 of the BROWN connector. If there is not continuity, restore the cable harness; if there is cable continuity, with the key set to KEY ON, check the cable ground insulation (from coil connector or control unit connector). If this is not OK, restore the cable harness.

NAVIGATOR: PARAMETERS

Right coil ignition advance.

NAVIGATOR: ACTIVATION

Right coil:

The auxiliary injection relay (no. 33 in the wiring diagram, placed under the saddle, left rear relay in the relay group attached to the fall sensor; CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the sky blue/green 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

NAVIGATOR: ERRORS

Right coil P0352 - shorted to positive / open circuit, shorted to negative.

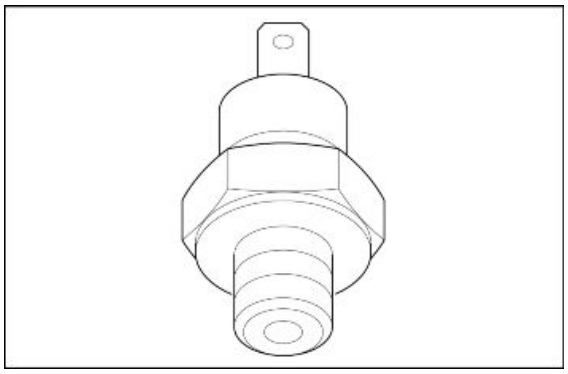
Error cause

- If shorted to positive: excessive voltage has been detected at PIN 10 of the BROWN connector.
- If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 10 of the BROWN connector

Troubleshooting

- shorted to positive: disconnect the coil connector, set the key to ON, activate the coil with Navigator 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, shorted to negative: check the coil connector and the Marelli control unit connector. If they are not OK, restore; if everything is OK, check cable continuity between PIN 2 of the coil connector and PIN 10 of the BROWN connector. If there is not continuity, restore the cable harness; if there is cable continuity, with the key set to KEY ON, check the cable ground insulation (from coil connector or control unit connector). If this is not OK, restore the cable harness.

Engine oil pressure sensor



Function: Indicates the instrument panel if there is enough oil pressure (0.35 +/- 0.15 bar) (5.1 +/- 2.18 PSI) in the engine.

Operation / Operating principle: normally closed switch. With oil pressure above 0.35 +/-0.15 bar (5.1 +/- 2.18 PSI), open circuit.

Level in wiring diagram:fuel reserve and oil pressure.

Location:

- Sensor: in between the engine "V", a little to the left, under the generator
- Connector: on the sensor.

Pin-out: Voltage 12V

Instrument panel

Oil sensor failure DSB 07

Error cause

- An oil sensor fault is signalled when, with engine off, it is detected that the sensor circuit is open. The test is performed only once when the key is set to ON. There is an error when the general warning light turns on.

Troubleshooting

- Check the sensor connector and the instrument panel connector (PIN 3): if they are not OK, restore. If OK, check continuity of the purple cable between the sensor connector and the instrument panel connector PIN 3: if not OK, restore the cable harness; if OK, replace the sensor.

Oil pressure failure DSB 08

Error cause

- An oil sensor fault is signalled when, with engine running, it is detected that the sensor circuit is closed. There is an error when the general warning light turns on.

Troubleshooting

- Detach the sensor connector and check the purple cable is ground insulated: if there is continuity to ground, restore the cable harness; if it is ground insulated, replace the switch. It this error persists, use a pressure gauge to check the pressure of the oil in the engine circuit

Neutral sensor

Function

it tells the gear position to the control unit: in neutral or in gear.

Operation / Operating principle

for gear in neutral, the circuit is closed to ground connection: then, via CAN, the control unit sends the signal to the instrument panel which turns on the neutral speed warning light.

Level in electrical circuit diagram:start-up enabling switches

Location:

- Sensor: rear / upper side of the gearbox
- Connector: on the sensor

Electrical characteristics:

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

Pin-out:

- PIN 1: Voltage 12V

NAVIGATOR: STATUSES

Gear in neutral

Example value:yes/no

DIAGNOSIS

- Indication on the instrument panel always gear engaged: check the control unit connector and the sensor connector: if they are not OK, restore the cable harness; if OK, disconnect

the connector and, with gear in neutral, check continuity to ground of the terminal, sensor side: if there is not continuity, replace the sensor (after checking cable harness continuity on the sensor side and the correct mechanical position); if there is, check cable continuity between the sensor connector and PIN 23 of the BROWN connector: if there is no continuity, restore the cable harness. If there is, replace the instrument panel if the vehicle performance is correct (the engine starts with gear in neutral but the neutral warning light is off) or replace the control unit if the vehicle performance is not correct (the engine does not start with gear in neutral).

- Indication on the instrument panel always gear in neutral: disconnect the terminals from the sensor and check if there is continuity with ground connection at PIN toward the sensor, with gear engaged: if there is continuity, replace the sensor. If it is ground insulated, it means that the grey/black cable from PIN 1 of the sensor to PIN 23 of the BROWN connector 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

If the gear is engaged but the clutch is pulled, i.e. circuit closed to ground, vehicle start-up is enabled anyway.

Level in electrical circuit diagram: Start-up enabling switches.

Location:

- sensor: under clutch lever
- Connector: on the sensor

Electrical characteristics:

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

Pin-out:

1. Voltage 12V
2. Ground connection

NAVIGATOR: STATUSES

Clutch

Example value: Yes/No

The statuses regularly viewed are YES / NO

DIAGNOSIS

Troubleshooting:

- Indication on Navigator always No: check the correct position of the cable terminals on the sensor and the correct connection of the cables on the terminals. If they are not correct, restore the cable harness; if correct, disconnect the two terminals from the sensor and check continuity to ground of PIN 2 (cable harness side): if there is no continuity, restore the cable harness; if there is, replace the sensor. Check continuity of the brown/purple cable between PIN 1 of the sensor and PIN 33 of the BLUE connector, cable harness side: if there is no continuity, restore the cable harness; if there is, replace the sensor. With the key set to ON, check that 12 Volt is fed to PIN 33 of the BLUE connector
- Indication on Navigator always Yes: disconnect the terminals from the sensor and check if there is continuity between the two PINS, with clutch released: if there is continuity, replace the sensor. If the circuit is open, it means that the brown/purple cable from PIN 1 of the sensor to PIN 33 of the BLUE connector is shorted to ground: restore the cable harness

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 electrical circuit 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:

1. Ground connection
2. Voltage 12 V (brown, sensor side)

NAVIGATOR: STATUSES

Side stand

Example value:retracted / extended

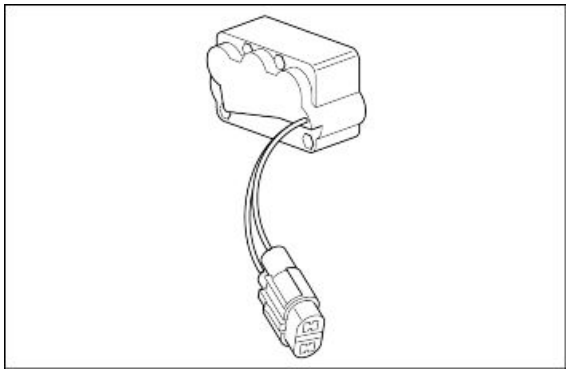
DIAGNOSIS

- Indication on Navigator always EXTENDED: check the side stand sensor connector and the ECU connector: if they are not OK, restore; if OK, disconnect both terminals from the sensor and check continuity to ground of PIN 1 (grey cable harness side): if there is not continuity,

restore the cable harness; if there is, check continuity of the green/brown cable: if it is not OK, restore; if OK, replace the sensor.

- Indication on Navigator always RETRACTED: disconnect the terminals from the sensor and check if there is continuity between the two PINS, with stand down: if there is continuity, replace the sensor; if the circuit is open, it means that the brown/green cable (cable harness side) from PIN 2 of the sensor to PIN 38 of the BLUE connector is shorted to ground: restore the cable harness.

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 earthing, it disables the fuel pump circuit and the engine start-up circuit via the injection relay.

Level in electrical circuit diagram: Start-up enabling switches.

Location:

- Sensor: under the saddle, right side
- Connector: near the sensor

Electrical characteristics:

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

Pin-out:

1. Voltage 12V
2. Ground connection

NAVIGATOR: STATUSES

Fall sensor

Example value: Normal / Tip over

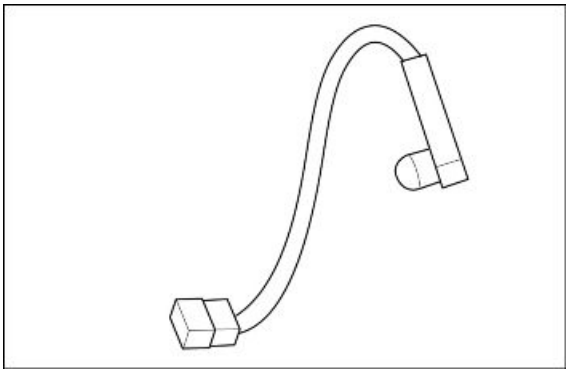
DIAGNOSIS

- Indication on Navigator always Normal, even when 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 no continuity, replace the sensor; if there is, check the connector. If not OK, restore the cable harness; if OK, check continuity to ground of PIN 2: if there is no

continuity, restore the cable harness; if there is, with key set to KEY ON, check if there is 12V voltage at PIN 1. If there is not, check the Marelli control unit connector (PIN 35 of the BLUE connector)

- Indication on Navigator always Tip over: 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, it means that, with key set to KEY ON, there is no 12V voltage at PIN 1: 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 electrical circuit diagram: Temperature sensors

Location:

- Sensor: under the instrument panel
- Connector: under the instrument panel

Electrical characteristics:

- Resistance at 0 °C (32 °F): 32.5 kOhm +/- 5%
- Resistance at 25 °C (77 °F): 10.0 kOhm +/- 5%

Pin-out:

1. Voltage 5V
2. Ground connection

Instrument panel

Air temperature sensor failure DSB 06

Error cause

- An oil sensor failure is signalled when it is detected that the sensor circuit is open or shorted to positive

Troubleshooting

- Check the sensor connector and the instrument panel connector (PINS 9 and 18): If they are not OK, restore. If OK, check continuity of the pink cable between the sensor connector and the instrument panel connector PIN 10: if it is not OK, restore the cable harness; if OK,

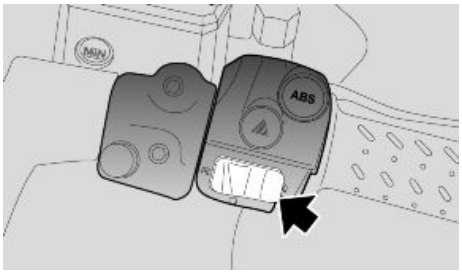
check the correct sensor resistance: if it is not OK, replace the sensor; if it is OK, check continuity of the brown cable between the sensor connector and PIN 18 of the instrument panel connector: If not OK, restore the cable harness; if OK, with key set to ON, check if there is voltage at the sensor 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).

Notes

If a short circuit to ground is detected at PIN 9 of the instrument panel connector, the display will show a full scale air temperature indication of 60 °C (140 °F).

Check the ground 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 it is 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 27 of the BLUE connector.

Level in electrical circuit diagram:start-up enabling switches.

Location:

- right light switch.
- connector: right side, near the coil.

Electrical characteristics:

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

PIN:

- sky blue/orange cable: 0V if engine kill
  in STOP; 12V if engine kill in RUN
- red/black cable: Voltage 12V

NAVIGATOR: STATUSES

Run / stop switch

Example value:Run/Stop

DIAGNOSIS

- Indication on Navigator always STOP: disconnect the connector and, with the switch set to RUN, check if there is continuity towards the switch of the green/blue (PIN 4) cables and the grey/sky blue (PIN 2) cable (sensor side): 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, with the key set to ON, check if there is voltage on the red/black cable (cable harness side): if there is no voltage, restore the cable harness; if there is, check the ground insulation of the sky blue/orange cable (cable harness side): if there is continuity to ground, restore the cable harness; if it is OK, take the key to OFF and check that the BLUE connector is in good conditions and if there is continuity of the sky blue/orange cable between the connector in question and PIN 27 of the BLUE connector: if not OK, restore the cable harness; if OK, replace the Marelli control unit.
- Indication on Navigator always RUN: disconnect the connector and, with the switch set to STOP, check if there is continuity between the two cables of the (PIN 4 and PIN 2) switch (sensor side): if there is continuity, replace the switch; if there is not, it means that, with the key set to KEY ON, the sky blue/orange cable is shorted to positive: restore the cable harness.

Connectors

ECU

BROWN connector pin configuration

Pin Use

1 Not used

2 Not used

3 Ignition potentiometer signal.

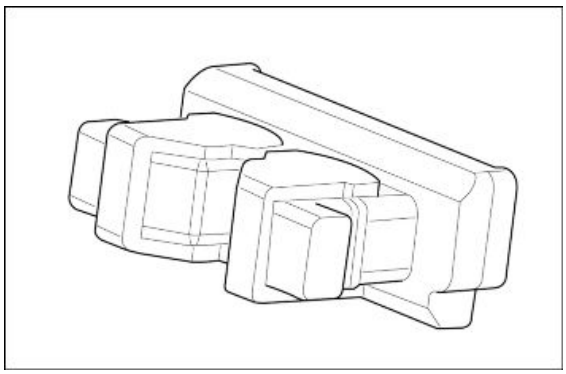
4 Not used

5 Engine temperature signal

6 Not used

7 Not used

8 Not used



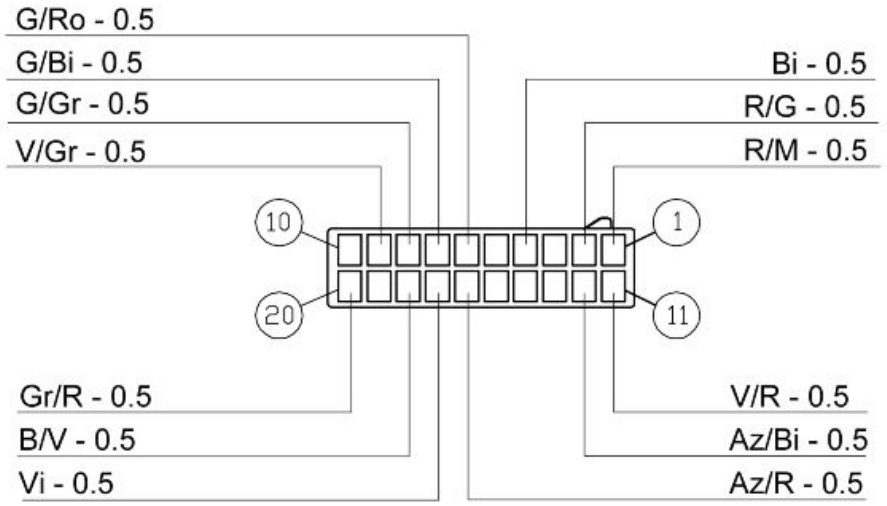
9 Stepper motor (+)
10 Right cylinder coil control
11 Not used
12 Not used
13 Not used
14 Air temperature signal
15 Not used
16 Not used
17 Stepper motor (+)
18 Stepper motor (-)
19 Stepper motor (-)
20 5V power supply (NTC sensors)
21 Not used
22 Not used
23 Neutral sensor signal
24 Not used
25 Engine revolution sensor signal
26 Start-up relay control
27 Not used
28 Left cylinder injector control
29 Ignition potentiometer negative.
30 Not used
31 Not used
32 Ignition potentiometer power supply.
33 Not used
34 Revolution sensor anti-jamming cable
35 Engine revolution sensor signal
36 Not used
37 Right cylinder injector control
38 Left cylinder coil control

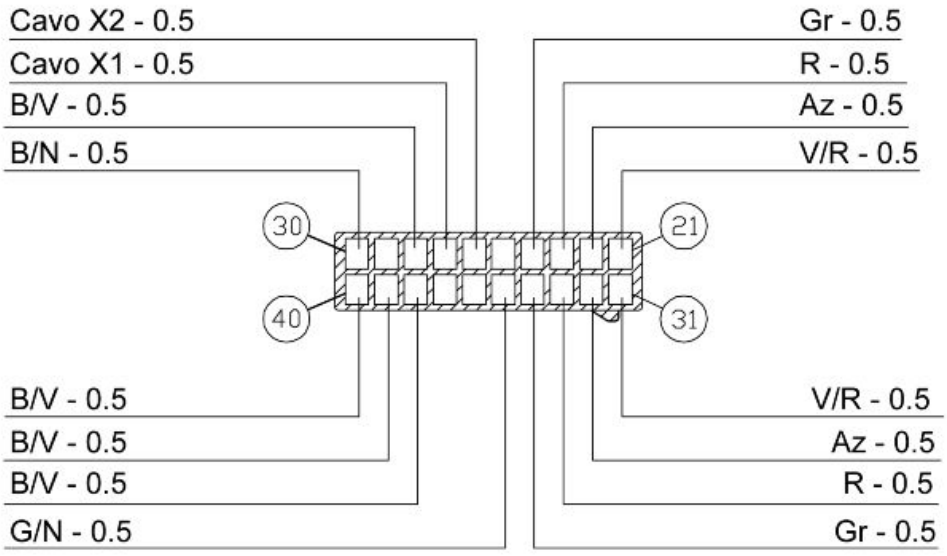
BLUE connector pin configuration

Pin Use
1 Oxygen probe negative control 2 (right)
2 Not used
3 Not used
4 Power supply protected from instrument panel
5 Not used
6 Pin 86 auxiliary relay control

7 Immobilizer line
8 Not used
9 Not used
10 Not used
11 Oxygen probe negative control 1 (left)
12 Not used
13 Not used
14 Not used
15 Not used
16 K line (diagnosis)
17 Power supply from main relay
18 Not used
19 Not used
20 CAN - H line (ccm/instrument panel)
21 Lambda sensor 2 input (right)(-)
22 Lambda sensor 1 input (left)(+)
23 Not used
24 Vehicle speed signal input
25 Not used
26 Not used
27 "Engine stop" signal input
28 Ignition signal input
29 CAN - L line (ccm/instrument panel)
30 Not used
31 Lambda sensor 2 input (right)(+)
32 Lambda sensor 1 input (left)(-)
33 Clutch sensor signal
34 Not used
35 Fall sensor signal
36 Not used
37 Not used
38 Side stand sensor signal

Dashboard





PIN USE

1 + KEY

2 RIGHT TURN INDICATOR CONTROL

3 OIL PRESSURE SENSOR

4 HIGH BEAM LIGHT INPUT

5 -
6 SELECT 1
7 SELECT 2
8 FUEL LEVEL SENSOR
9 AIR TEMPERATURE SENSOR
10 -
11 + BATTERY
12 LEFT TURN INDICATOR CONTROL
13 RESET TURN INDICATORS
14 HAZARD
15 ANTITHEFT DEVICE LED (IF CONNECTED)
16 SELECT 3
17 SENSORS EARTH CONNECTION
18 GENERAL EARTH CONNECTION
19 GENERAL EARTH CONNECTION
20 GENERAL EARTH CONNECTION
21 + BATTERY
22 + BATTERY
23 LOW BEAM LIGHT RELAY ACTIVATION
24 -
25 HEATED HANDGRIP CONTROL
26 CAN L
27 CAN H
28 K LINE
29 ABS INPUT
30 AERIAL 1
31 -
32 -
33 -
34 RIGHT REAR TURN INDICATOR ACTIVATION
35 RIGHT FRONT TURN INDICATOR ACTIVATION
36 LEFT REAR TURN INDICATOR ACTIVATION
37 LEFT FRONT TURN INDICATOR ACTIVATION
38 LEFT HEATED HANDGRIP ACTIVATION
39 RIGHT HEATED HANDGRIP ACTIVATION
40 AERIAL 2

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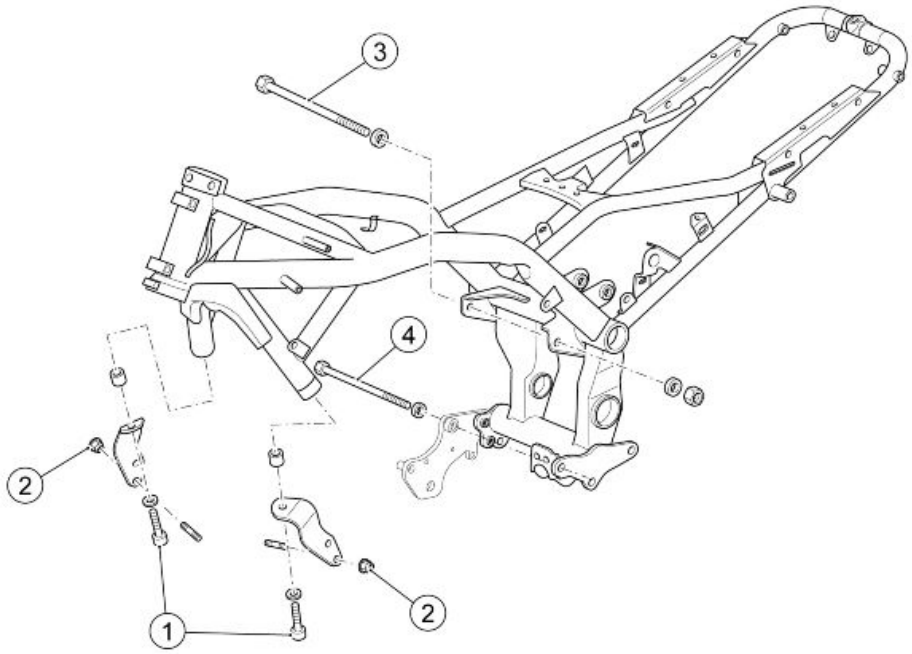


FRAME

pos.	Description	Type	Quantity	Torque	Notes
1	Plate to chassis fixing screw	M12x50	2	50 Nm (36.87 lbf ft)	-
2	Plate to engine fixing nut	M10	4	80 Nm (59 lbf ft)	-
3	Gear to chassis upper fixing pin	M12	1	80 Nm (59 lbf ft)	-
4	Gear to chassis lower fixing pin	M12x270	1	80 Nm (59 lbf ft)	-

Vehicle preparation

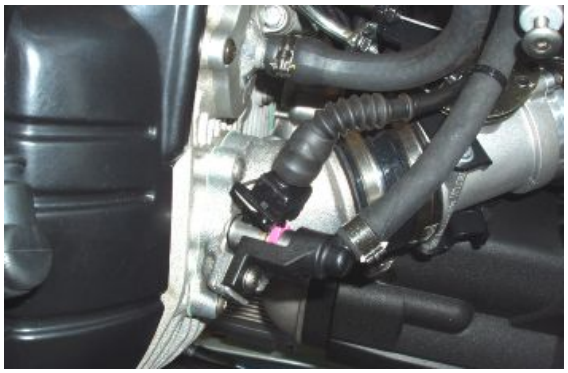
Before removing the engine block, proceed as follows:

- From the back, secure the vehicle with belts attached to a hoist.
- From the front, secure the vehicle with belts attached to the handlebar and fixed to the work bench.
- Place the engine service stand under the oil sump.
- Disconnect the battery.
- Remove the upper fairings and the fairing lug.
- Remove the exhaust system, the swingarm with cardan shaft and the fuel tank.
- Remove the air filter box.

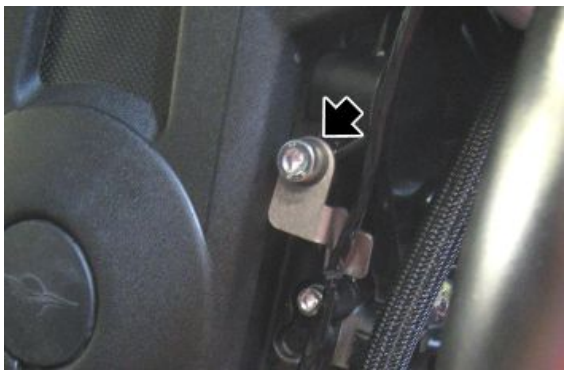
Removing the engine from the vehicle

- Disconnect the spark plug tubes.

- Working on both sides disconnect the injector connectors.



- Undo and remove the cable guide screw on the generator cover.

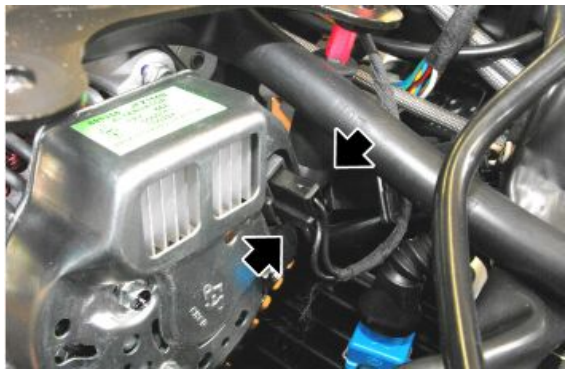


- Disconnect the throttle cables

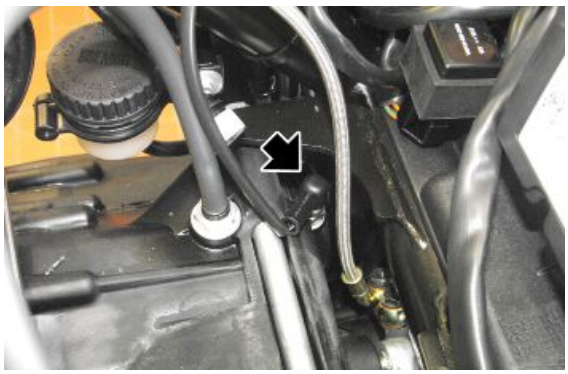
- Disconnect the engine temperature sensor connector

- Disconnect the revolution sensor connector.

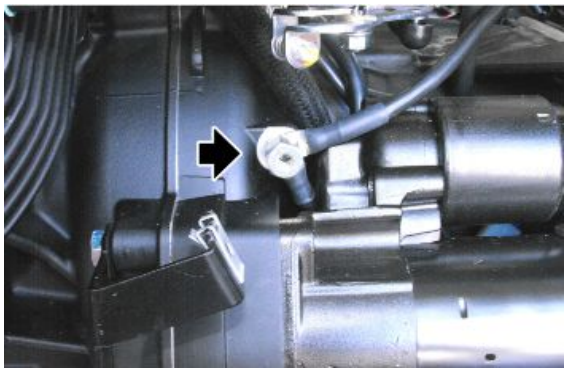
- Disconnect the alternator connectors.



- Disconnect the gear in neutral sensor connector.



- Unscrew and remove the stud bolt.
- Disconnect the ground leads.



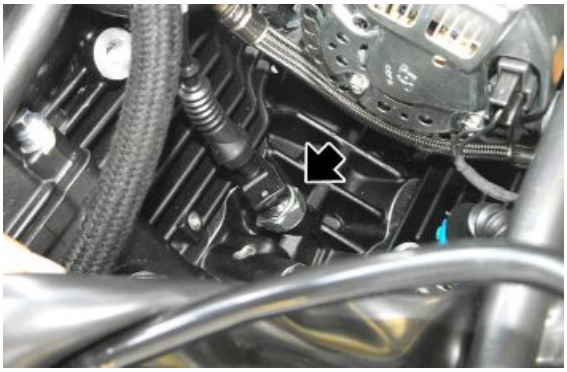
- Disconnect the connectors of the starter motor.

- Unscrew and remove the three screws and remove the clutch control cylinder.
- Lock the cylinder using a clamp to prevent oil leaks.

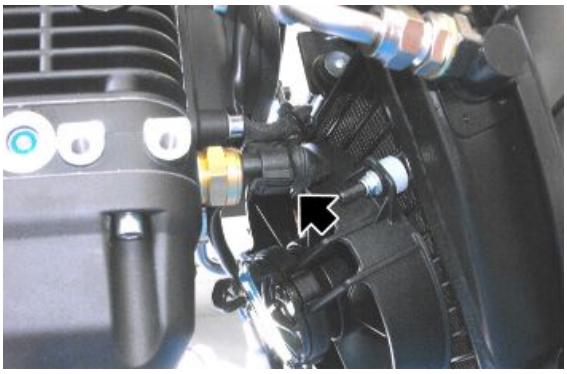
- Slide off the gearbox oil breather pipe.

- Disconnect the stand sensor connector and release it from the clamps.

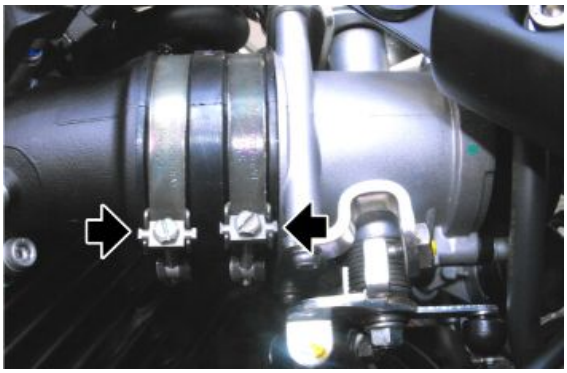
- Disconnect the oil pressure sensor connector.



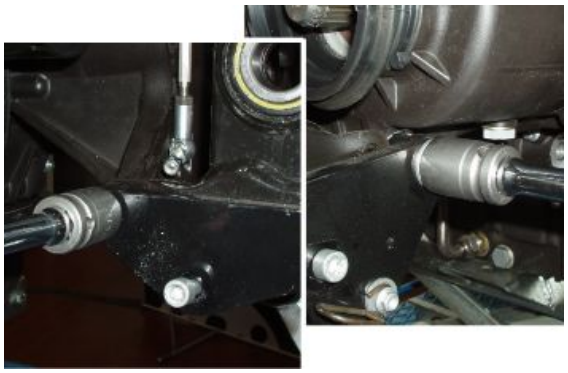
- Disconnect the oil temperature sensor connector.



- Working from both sides, loosen the intake manifold clamps.

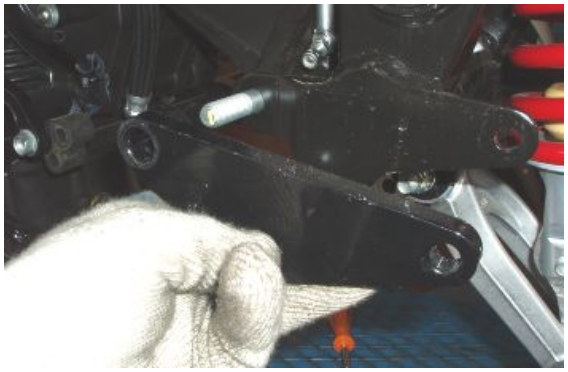


- Unscrew and remove the lower nut fixing the engine and collect the washer.
- Remove the lower pin and collect the washer.
- Remove the plates.



CAUTION

PERFORM THE OPERATIONS BELOW AIDED BY A SECOND OPERATOR.



- Working on both sides, unscrew and remove the front screw and collect the washer.

- Unscrew and remove the upper nut fixing the engine and collect the washer.
- Remove the upper pin and collect the washer.

- Lower the engine completely.
- Lift the rear part of the vehicle.
- Release the front belts.
- Hold the rear part of the vehicle, remove the chassis from the engine.

Installing the engine to the vehicle

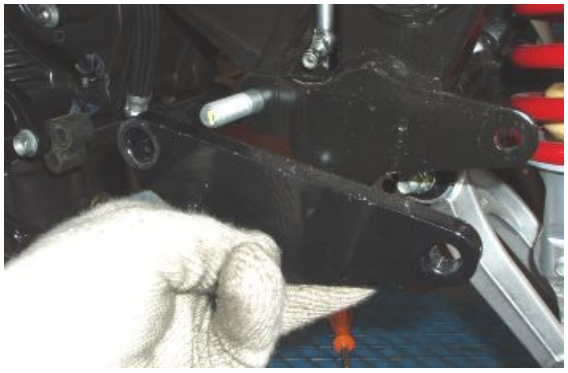
- Place the vehicle chassis over the engine with the gear.
- From the back, secure the chassis with belts and a hoist.
- From the front, secure the vehicle with belts attached to the handlebar and fixed to the work bench.
- Lift the engine placing it in position.

AT LEAST UNTIL THE LOWER ENGINE BOLT IS TIGHTENED, PERFORM THE OPERATIONS DESCRIBED AIDED BY A SECOND OPERATOR.

- Working from the left side, fit the engine upper bolt with the washer.
- From the opposite side, fit the washer and screw the nut.

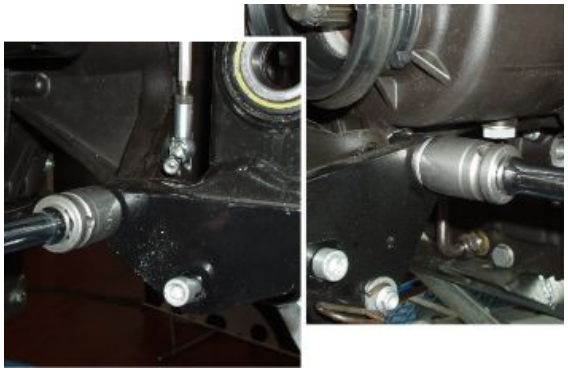
- Working on both sides, insert the washer and screw the screw without tighten it.

- Working on both sides, place the plates

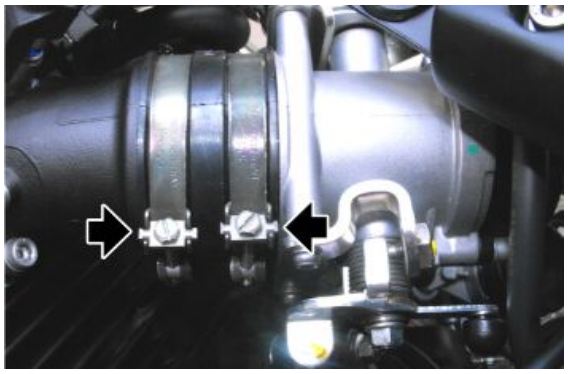


- Working from the left side, fit the engine lower bolt with the washer.
- From the opposite side, fit the washer and tighten the nut.

- Working on both sides, tighten the front screw to the prescribed torque.

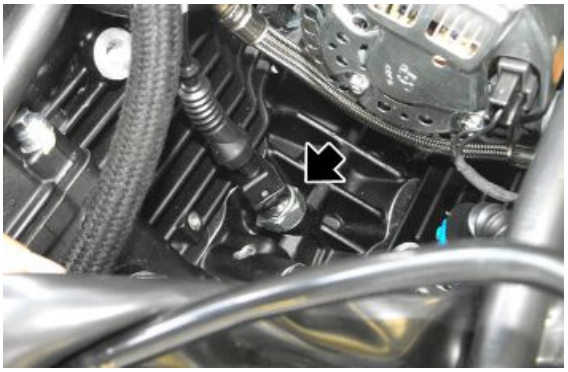


- Fit the throttle body onto the intake manifolds.
- Tighten the clamps on both sides to the specified torque

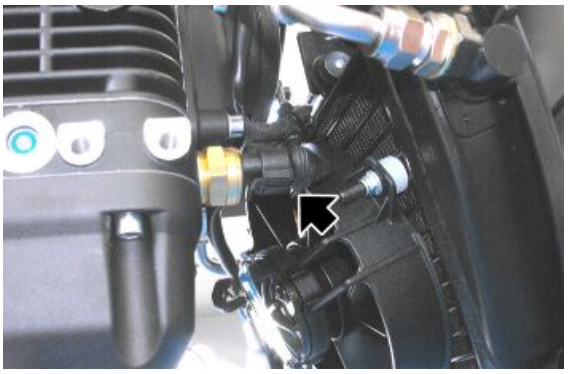


- Connect the stand sensor connector and fix it to the engine with new clamps.

- Connect the oil pressure sensor.



- Connect the oil temperature sensor.

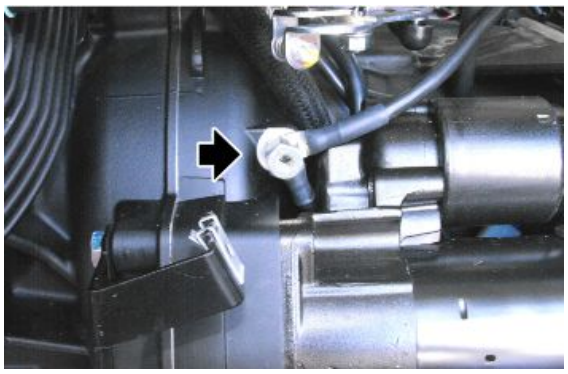


- Fit the gearbox oil breather pipe.

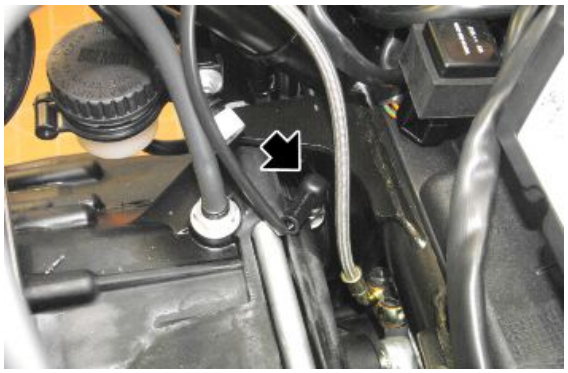
- Fit the clutch control cylinder.
- Tighten the three screws.

- Connect the starter motor connectors.

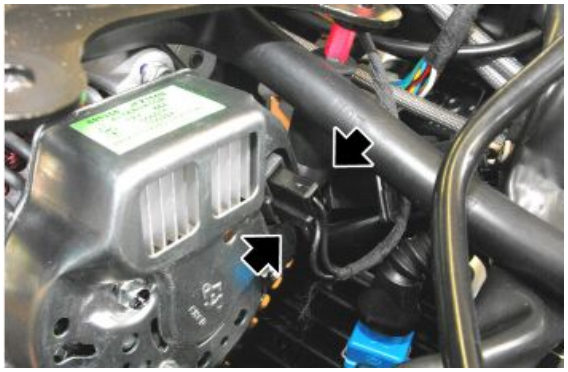
- Connect the ground leads and tighten the stud bolt.



- Connect the neutral sensor connector.



- Connect the alternator connectors.

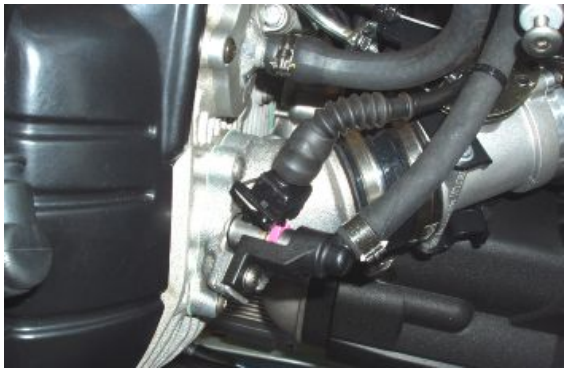


- Connect the revolution sensor connector.

- Connect the engine temperature sensor connector.

- Connect and adjust the throttle grip cable clearance.

- Place the swingarm with cardan shaft and the rear wheel.
- Working on both sides, connect the injector connectors.
- Working from both sides, connect the spark plug tube.
- Install the fuel tank.
- Position the upper fairings and the fairing lug.
- Install the complete exhaust.
- Re-connect the battery.
- Fit the saddle.



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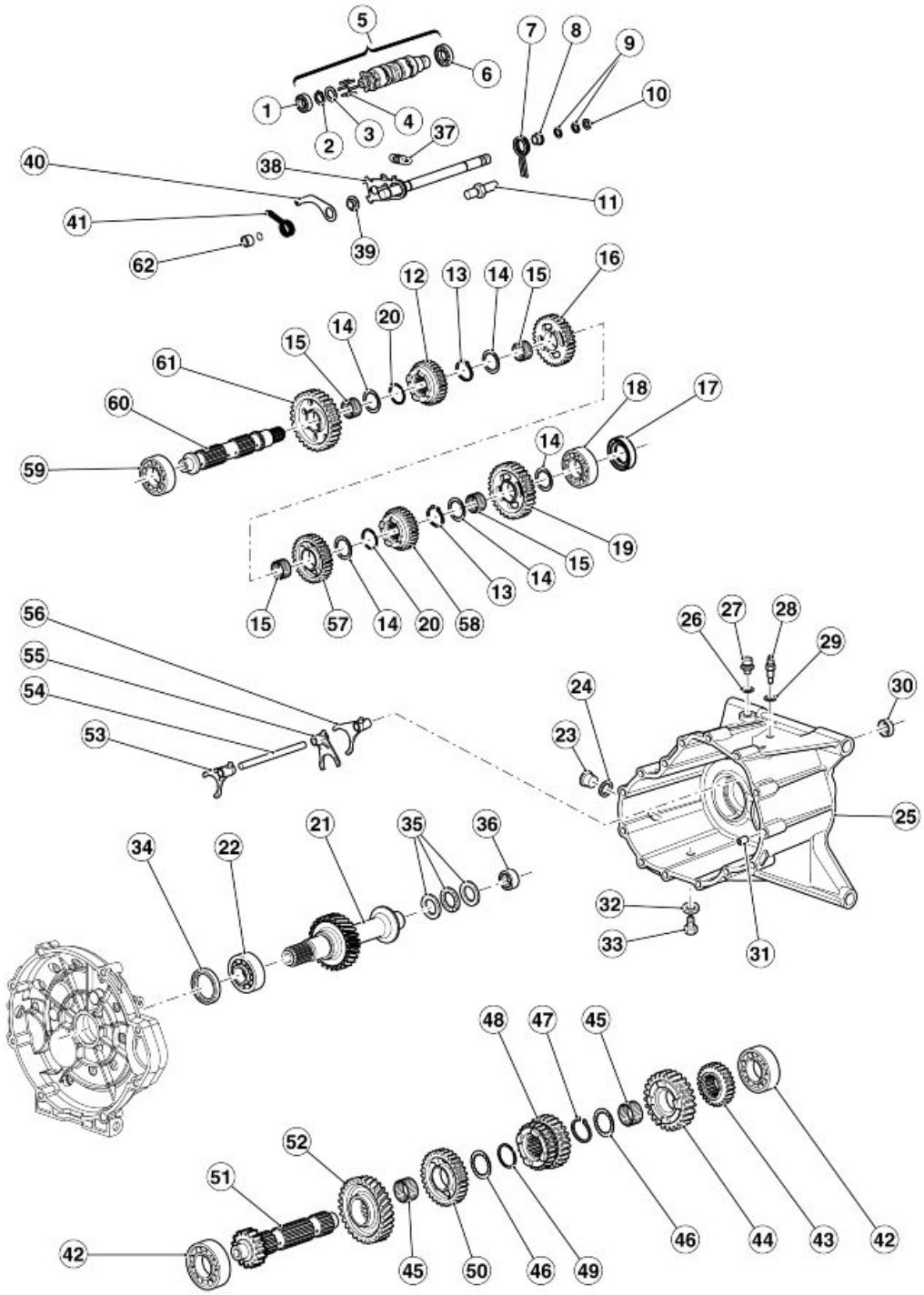
Gearbox

Diagram



Key:

1. Ball bearing

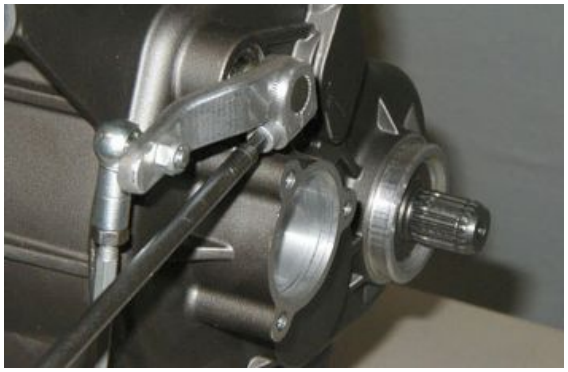
2. Circlip
3. Thickness
4. Pin
5. Complete desmodromic
6. Ball bearing
7. Spring
8. Spacer
9. Circlip
10. Fifth wheel
11. Linking pin
12. Gear
13. Circlip
14. Thrust washer
15. Ball bearing cage
16. Gear
17. Sealing ring
18. Ball bearing
19. Gear
20. Circlip
21. Clutch shaft
22. Ball bearing
23. Oil plug
24. Washer
25. Gearbox
26. Aluminium washer
27. Breather cap
28. Neutral sensor
29. Gasket
30. Sealing ring
31. Bushing
32. Gasket
33. Oil drainage plug
34. Sealing ring
35. Thrust bearing
36. Roller bearing
37. Spring
38. Complete pre-selector
39. Bushing

40.Index lever
41.Spring
42.Ball bearing
43.Gear
44.Gear
45.Ball bearing cage
46.Thrust washer
47.Circlip
48.Gear
49.Circlip
50.Gear
51.Main shaft
52.Transmission gear
53.Fork (5th - 1st)
54.Fork shaft
55.Fork (3rd - 4th)
56.Fork (2nd - 4th)
57.Gear
58.Gear
59.Ball bearing
60.Transmission shaft
61.Gear
62.Spacer

Gearbox

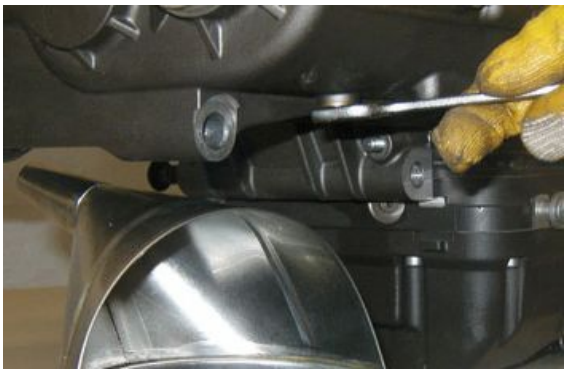
Removing the gearbox

- Remove the starter motor.
- Make sure the transmission is in idle.
- Undo and remove the screw and remove the gearbox lever.

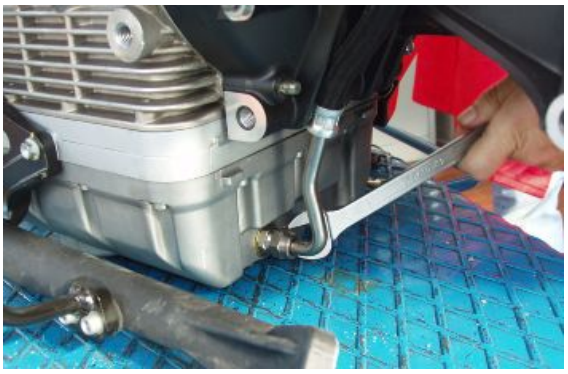


- Unscrew and remove the gearbox oil filler cap.

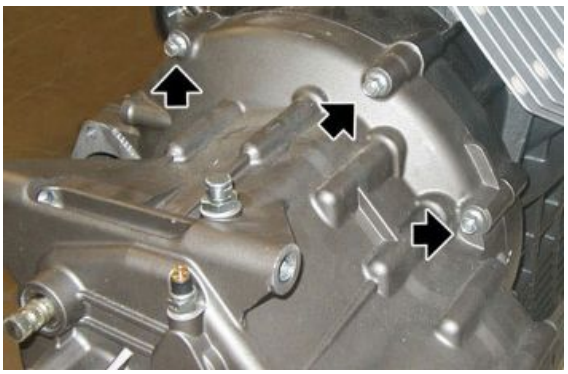
- Place a container of suitable capacity under it, unscrew and remove the cap and then bleed all gearbox oil.



- Loosen and turn the oil pipe joint on the sump.



- Undo and remove the three screws.



- Undo and remove the two screws.

- Undo and remove the screw.

- Remove the gearbox.

See also

Removing the starter motor
Replacement

Gearbox shafts

Disassembling the gearbox

- Remove the gearbox.

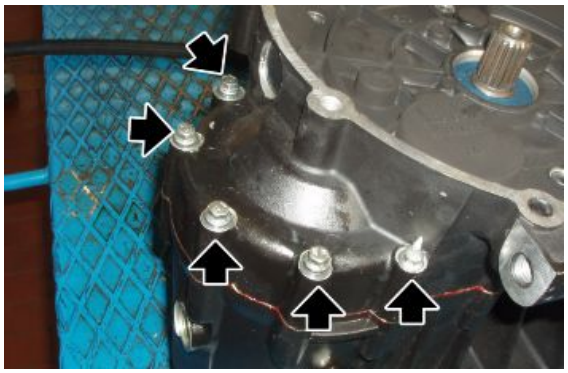
- Unscrew and slide off the odometer gear and collect the abutment washer that is inside the gearbox.

- From the outside, slide off the thrust cylinder and collect the O-Ring and the washer.

- Remove the thrust bearing and the washer.

- Slide off the rod with the two bushings.

- Undo and remove the five external screws.



- Place the gearbox on the specific gearbox support tool and on a vice.

Specific tooling

05.90.25.30 Gearbox support

- Undo and remove the nine internal screws.

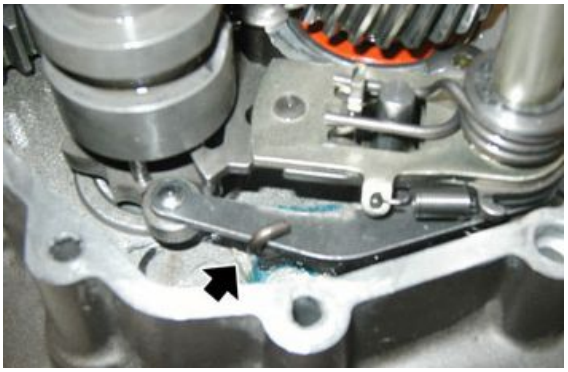
- Open the gearbox using the specific tool.

Specific tooling

05.91.25.30 Gearbox opening

- Remove the bearings from the gearbox if necessary.

- Release the spring.



- Pressing the selector, slide off the whole transmission lever.

- Use rubber bands to tie down the transmission shaft unit and extract it.

- Once the transmission shaft unit is in on a bench, remove the rubber bands, being careful with the group.
- Detach the shafts and label the forks before removal.

- Remove the forks and collect the shaft.

- Replace bearings if necessary and remove the clutch shaft.

See also

Removing the gearbox

Removing the primary shaft

- Remove the main shaft.
- Operate on the main shaft from the second gear side.

- Remove the gear of the second gear and collect the ball bearing cage.

- Remove the gear of the sixth gear and collect the shoulder washer.

- Remove the circlip.

- Remove the gear of the third and fourth gears.

- Remove the circlip and collect the shoulder washer.

- Remove the gear of the fifth gear and collect the ball bearing cage.

- Heat the shaft with a specific heater and remove the helical transmission gear.

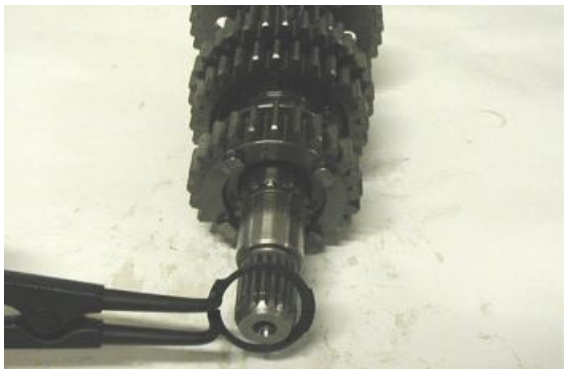
Removing the secondary shaft

- Remove the transmission shaft.
- Operate on the shaft from the grooved side.

- Remove the shoulder washer.

- Remove the gear of the second gear and collect the ball bearing cage and the shoulder washer.

- Remove the circlip.



- Remove the gear of the sixth gear.

- Remove the circlip and collect the shoulder washer.

- Remove the gear of the fourth gear and collect the ball bearing cage.

- Remove the gear of the third gear and collect the ball bearing cage and the shoulder washer.

- Remove the circlip.

- Remove the gear of the fifth gear.

- Remove the circlip, the shoulder washer and remove the gear of the first gear, collect the ball bearing cage.
- Remove the bearing if necessary.

See also

Disassembling the gearbox

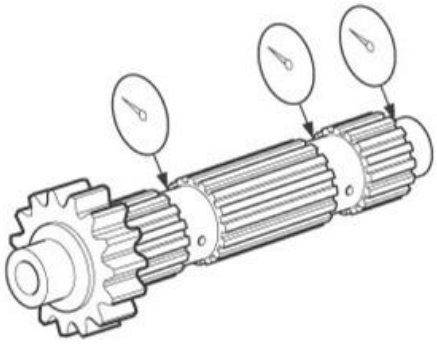
Checking the primary shaft

Measure coaxiality of the main shaft with a dial gauge and a centring device and replace it if not complying with specifications.

Characteristic

Shaft coaxiality limit

0.08 mm (0.0031 in)



Check transmission gears for signs of pitting and wear and replace damaged gears if necessary.
Check the gear fitting teeth for cracks, damage and wear and replace those damaged if necessary.
Check the transmission gears movement and, if it is not regular, replace the damaged part.

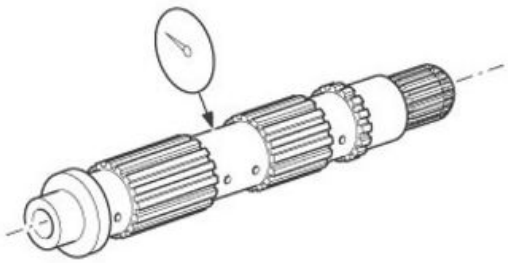
Checking the secondary shaft

Measure the coaxiality of the transmission shaft with a dial gauge and a centring device and replace it if not complying with specifications.

Characteristic

Shaft coaxiality limit

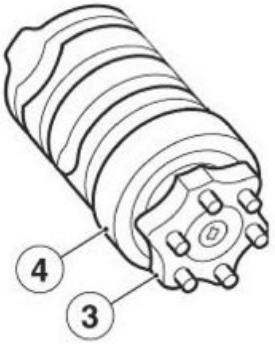
0.08 mm (0.0031 in)



Check transmission gears for signs of pitting and wear and replace damaged gears if necessary.
Check the gear fitting teeth for cracks, damage and wear and replace those damaged if necessary.
Check the transmission gears movement and, if it is not regular, replace the damaged part.

Checking the desmodromic drum

Check gear drum for damage, scratches and wear and replace the desmodromic if necessary.
Check the desmodromic segment «**3**» for damage and wear and replace it if necessary.
Check the desmodromic bearing «**4**» for damage and cracks and replace it if necessary.

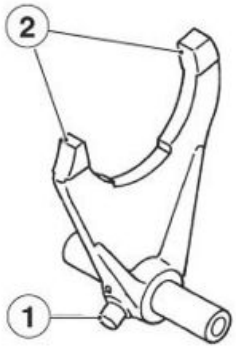


Checking the forks

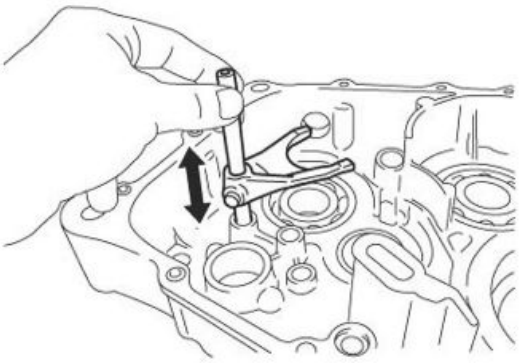
NOTE

THE FOLLOWING PROCEDURE IS VALID FOR ALL GEARBOX FORKS.

- Check the transmission fork cam roller «1» and the transmission fork tooth «2» for damage, deformation and wear.
- Replace the transmission fork if necessary.



- Check the transmission fork movement and if it is not regular, replace the transmission forks.



See also

Disassembling the gearbox

Fitting the primary shaft

NOTE

TO REFIT, FOLLOW THE SAME INSTRUCTIONS AS FOR REMOVAL BUT IN REVERSE ORDER. REMEMBER TO REPLACE ALL SEALING RINGS, CIRCLIPS AND SAFETY RINGS PREVIOUSLY REMOVED.

See also

Removing the

primary shaft

Fitting the secondary shaft

NOTE

TO REFIT, FOLLOW THE SAME INSTRUCTIONS AS FOR REMOVAL BUT IN REVERSE ORDER. REMEMBER TO REPLACE ALL SEALING RINGS, CIRCLIPS AND SAFETY RINGS PREVIOUSLY REMOVED.

See also

Removing the secondary shaft

Assembling the gearbox

NOTE

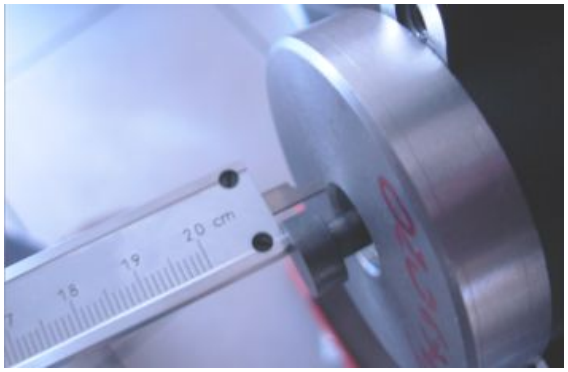
TO REFIT, FOLLOW THE SAME INSTRUCTIONS AS FOR REMOVAL BUT IN REVERSE ORDER. REMEMBER TO REPLACE ALL SEALING RINGS, CIRCLIPS AND SAFETY RINGS PREVIOUSLY REMOVED.

If the clutch is replaced, measure the length of the clutch control rod in order to use the correct rod.

Measure as follows:

- Fit the new clutch on the crankshaft.
- Fit the clutch control bowl in the gear-box.

- Fit the gearbox on the engine block.
- Fit the tool in the gearbox to determine the clutch control rod length.
- Measure rod protrusion using a depth gauge (see picture).
- According to the value found, select the correct rod based on the following table:



Specific tooling

020678Y Tool for clutch rod checking

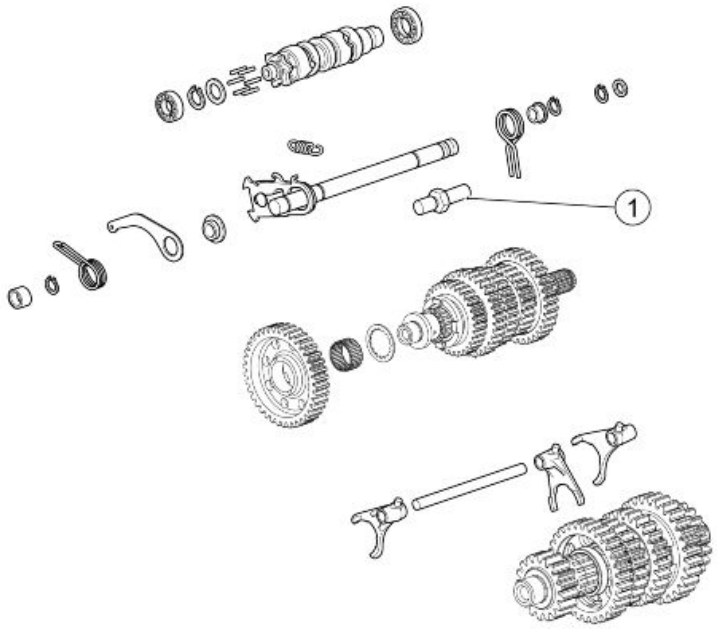
CLUTCH CONTROL ROD SELECTION

Specification	Desc./Quantity
Protrusion: 9.8 - 11.2 mm (0.386 - 0.441 in)	Clutch control rod length (code 976593) = 183 mm (7.205 in)
Protrusion: 8.3 - 9.7 mm (0.327 - 0.382 in)	Clutch control rod length (code 976594) = 184.5 mm (7.264 in)
Protrusion: 6.8 - 8.2 mm (0.268 - 0.323 in)	Clutch control rod length (code 976595) = 186 mm (7.323 in)
Protrusion: 5.3 - 6.7 mm (0.209 - 0.264 in)	Clutch control rod length (code 976596) = 187.5 mm (7.382 in)

See also

Disassembling the gearbox

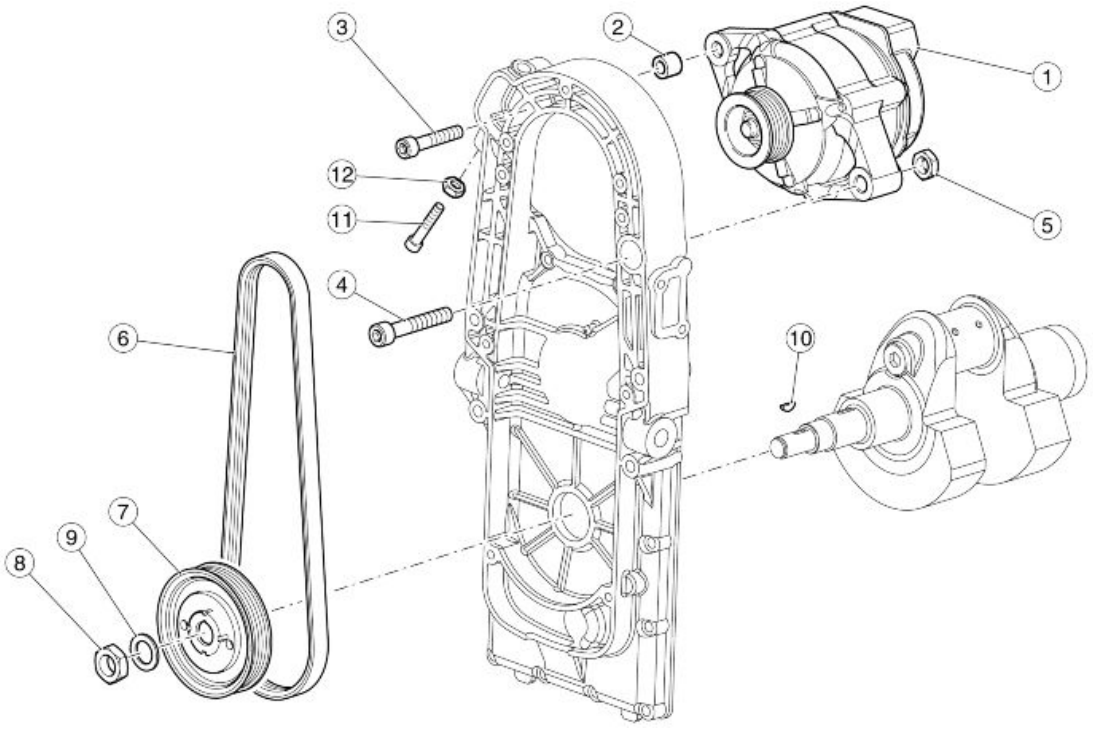
Gear selector



GEAR INTERNAL CONTROLS

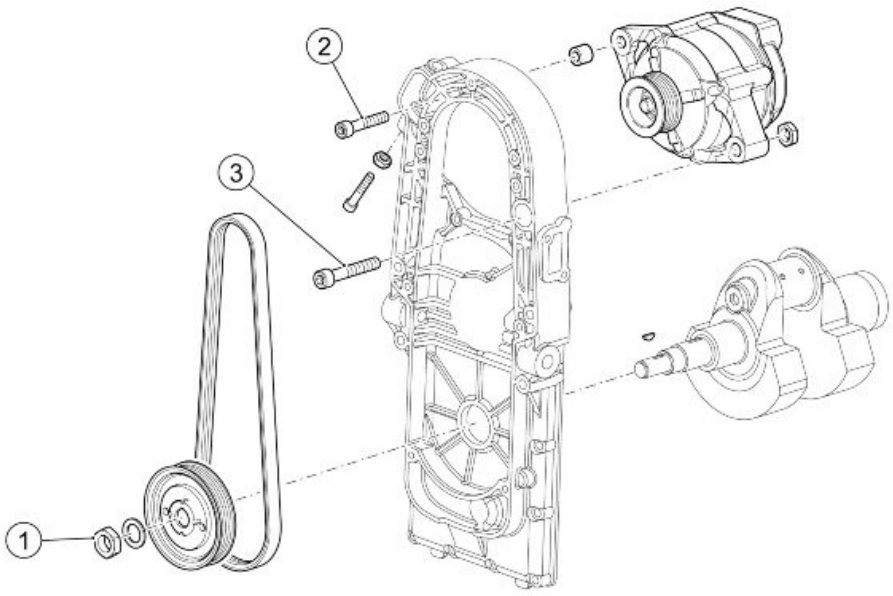
pos.	Description	Type	Quantity	Torque	Notes
1	Spring guide pin	-	1	24 Nm (17.70 lbf ft)	Loctite 243

Generator



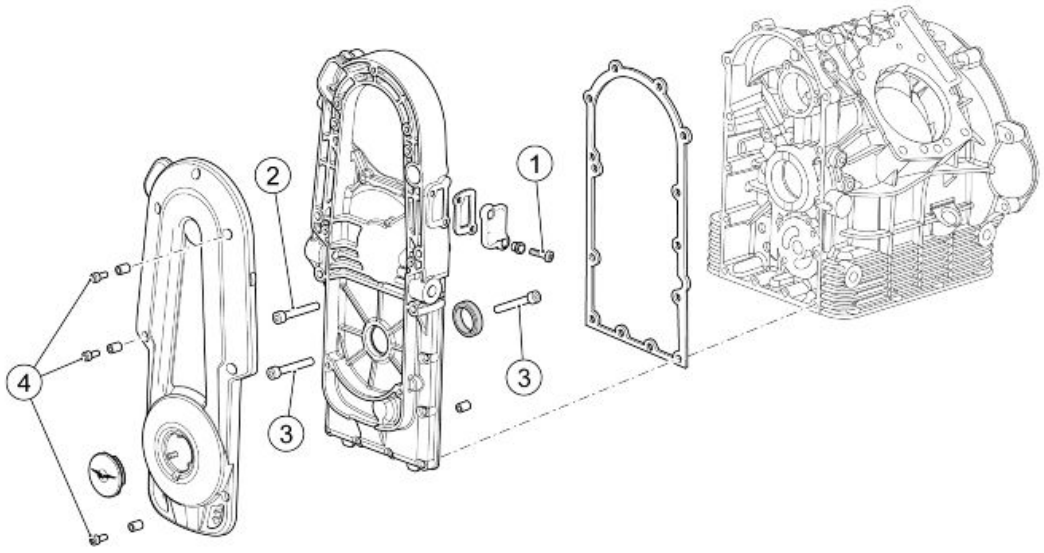
Key:

1. Alternator
2. Spacer
3. Screw
4. Screw
5. Nut
6. Belt
7. Generator control pulley
8. Nut
9. Washer
10. Magneto flywheel cotter
11. Screw
12. Nut



ALTERNATOR

pos.	Description	Type	Quantity	Torque	Notes
1	Generator control pulley locking nut	M16	1	80 Nm (59.00 lbf ft)	Loctite 243
2	Generator upper fixing screw	M8	1	22 Nm (16.23 lbf ft)	-
3	Generator lower fixing screw	M10x60	1	30 Nm (22.13 lbf ft)	-



GENERATOR COVER

pos.	Description	Type	Quantity	Torque	Notes
1	Timing system cover cap fixing screw	M6x20	2	10 Nm (7.37 lbf ft)	Loctite 243

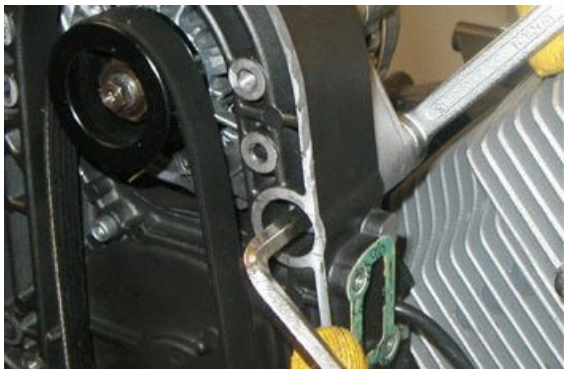
pos.	Description	Type	Quantity	Torque	Notes
2	Timing system cover fixing screw	M8x55	4	25 Nm (18.44 lbf ft)	-
3	Timing system cover fixing screw	M6x30	9	12 Nm (8.85 lbf ft)	-
4	Generator cover fixing screw	M6x16	5	12 Nm (8.85 lbf ft)	-

Removing the generator

- Remove the fuel tank.
- Remove the control unit from its seat.
- Disconnect the alternator connectors.
- Undo and remove the five screws and collect the bushings.

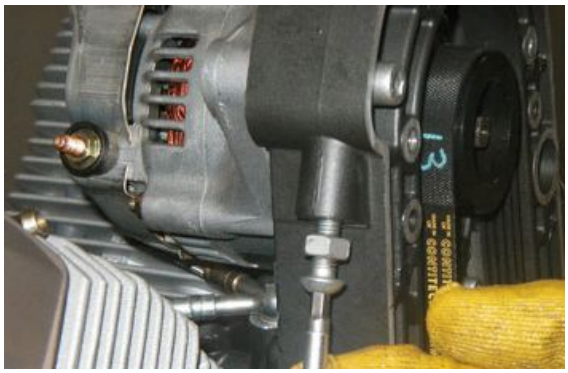
- Remove the cover.

- Unscrew the nut and collect the screw.

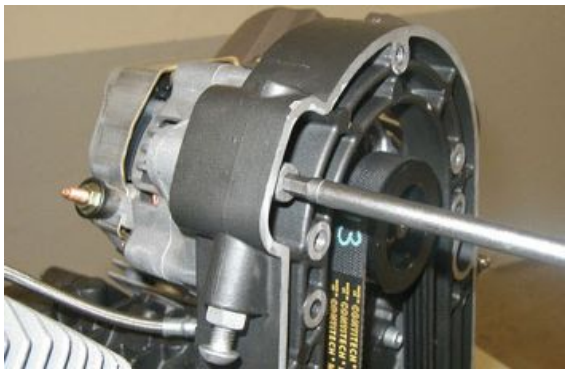


- Loosen the screw.

- Loosen the nut and undo the set screw so that the alternator slides down.



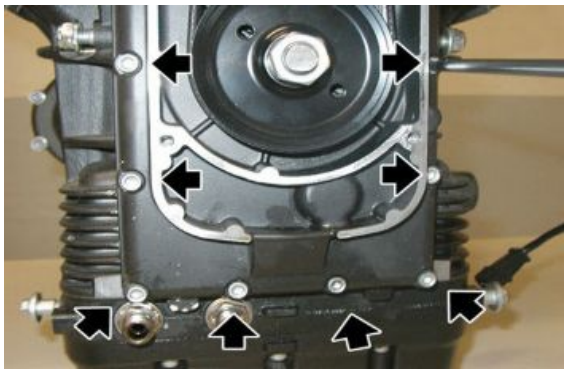
- Completely loosen and remove the screw.



- Remove the belt and the alternator with pulley.

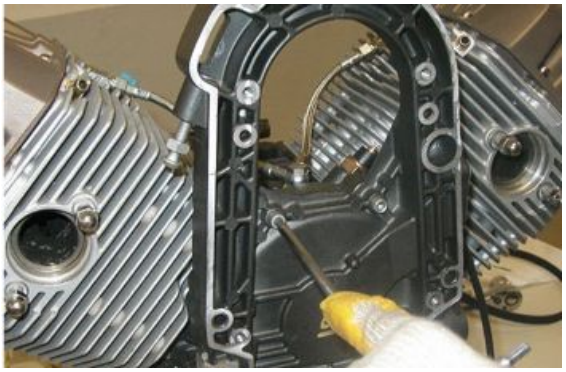
- Using a compressed air gun, unscrew and remove the nut and collect the spacer.
- Remove the lower pulley.

- Undo and remove the eight screws.



- Undo and remove the two screws.

- Undo and remove the two screws.



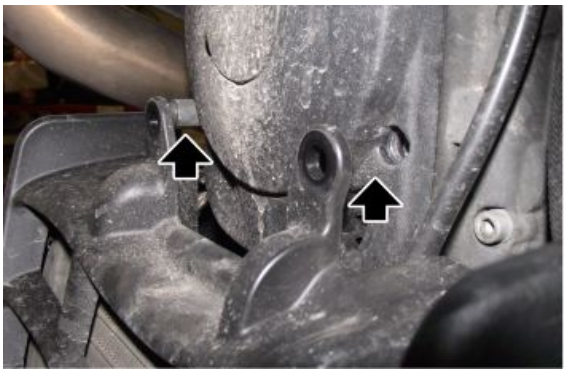
- Remove the alternator frame.
- Remove the sealing ring if necessary.

See also

Fuel tank

Tensioning the belt

- Remove the left fairing lug.
- Undo and remove the two front fixing screws of the oil radiator.
- Collect the spacers.



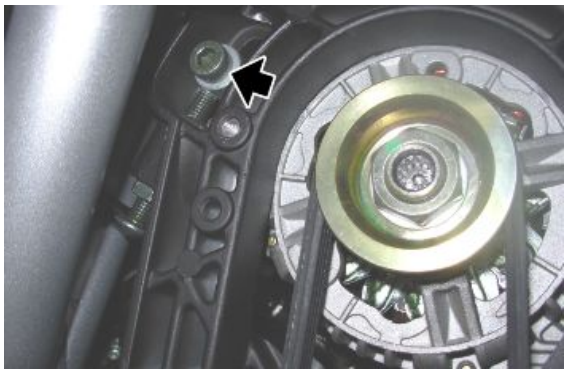
- Undo and remove the five screws fixing the alternator belt cover.
- Remove the oil radiator lower support bracket and the alternator belt cover.

Locking torques (N*m)

Alternator belt cover screw (radiator bracket retainer) TCEI M6x40 (2) 10 Nm (7.38 lbf ft) Alternator belt cover screw - TCEI M6x16 (4) 10 Nm (7.38 lbf ft)

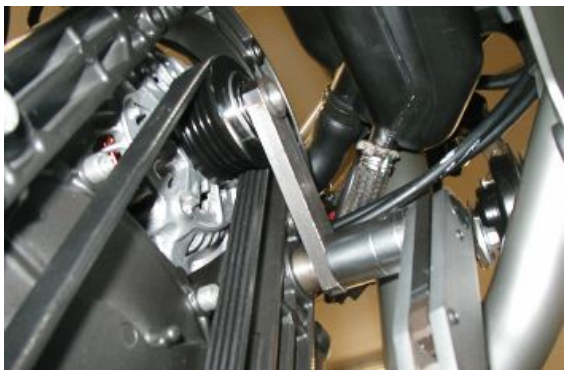
- Remove the generator belt cover by lightly loosening the oil radiator.

- Loosen the screw.



- Loosen the nut and undo the set screw so that the alternator slides down.

- Using the belt tensioning tool, tension the belt to the prescribed torque.
- Screw the set screw.
- Tighten the lock nut.



Specific tooling

020677Y Generator belt tensioner, lever for belt tensioning

Locking torques (N*m)

Belt tension **50 Nm (36.88 lbf ft)**

See also

Engine oil cooler

Installing the generator

- If the sealing ring has been previously removed, replace it using the punch of the timing system cover sealing ring.

Specific tooling

05.92.72.30 Timing system cover sealing ring punch

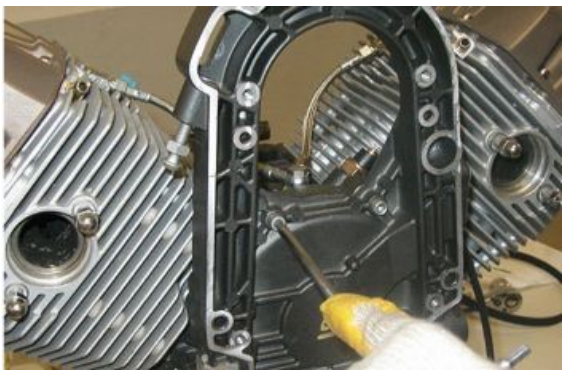
- Place the bolt and the pin in the generator cover.

- Replace the gasket and place the alternator frame using the front cover insertion cone.
- Remove the insertion cone afterwards.

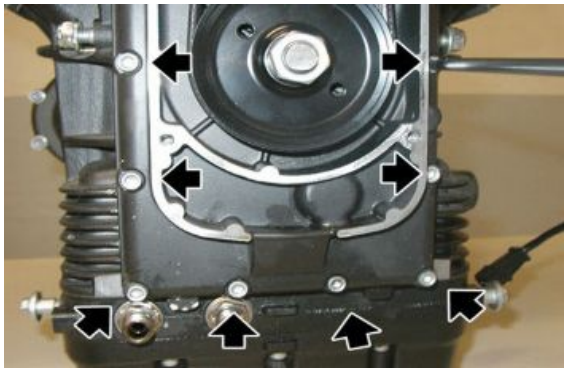
Specific tooling

05.91.17.30 Front cover insertion cone

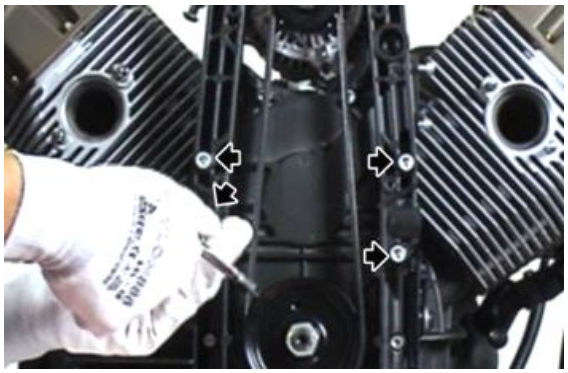
- Tighten the two screws.



- Tighten the eight lower screws.
- Operating diagonally and in stages, tighten the ten fixing screws on the alternator fitting.



- Tighten the four screws, operating diagonally and in stages.

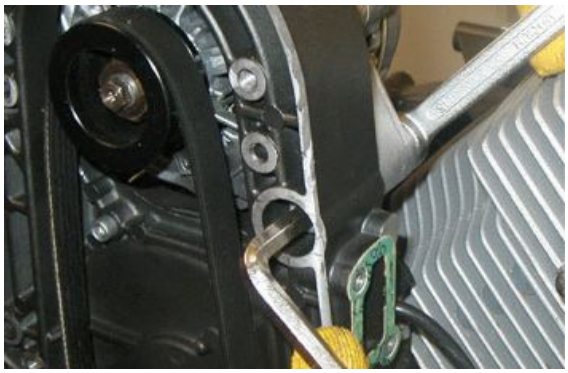


- Position the lower pulley and the spacer.
- Tighten the nut to the prescribed torque.

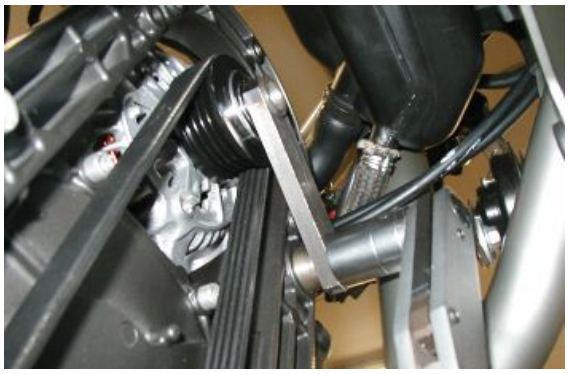
- Position the alternator and the timing system belt.

- Position the screw and pre-tighten it.

- Position the screw and tighten the nut.



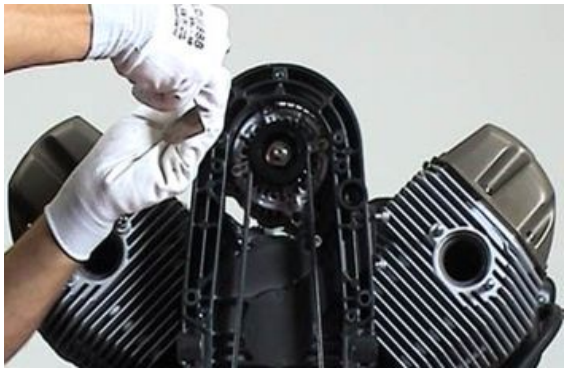
- Using the belt tensioning tool, tension the belt to the prescribed torque and tighten the set screw.
- Remove the belt tensioning tool.
- Lock the set screw in position by screwing the lock nut.



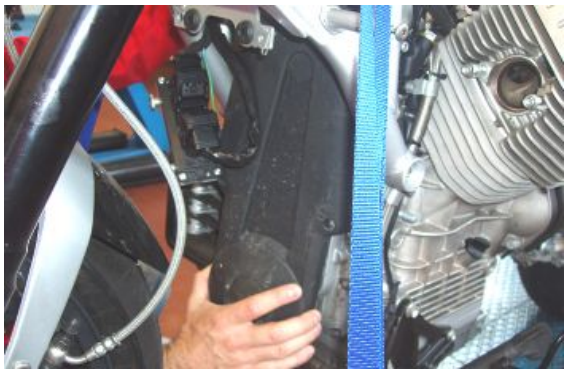
Specific tooling

020677Y Generator belt tensioner, lever for belt tensioning

- Tighten the alternator fixing screws.



- Place the alternator belt cover.
- Tighten the five screws operating diagonally and in stages.



Starter motor

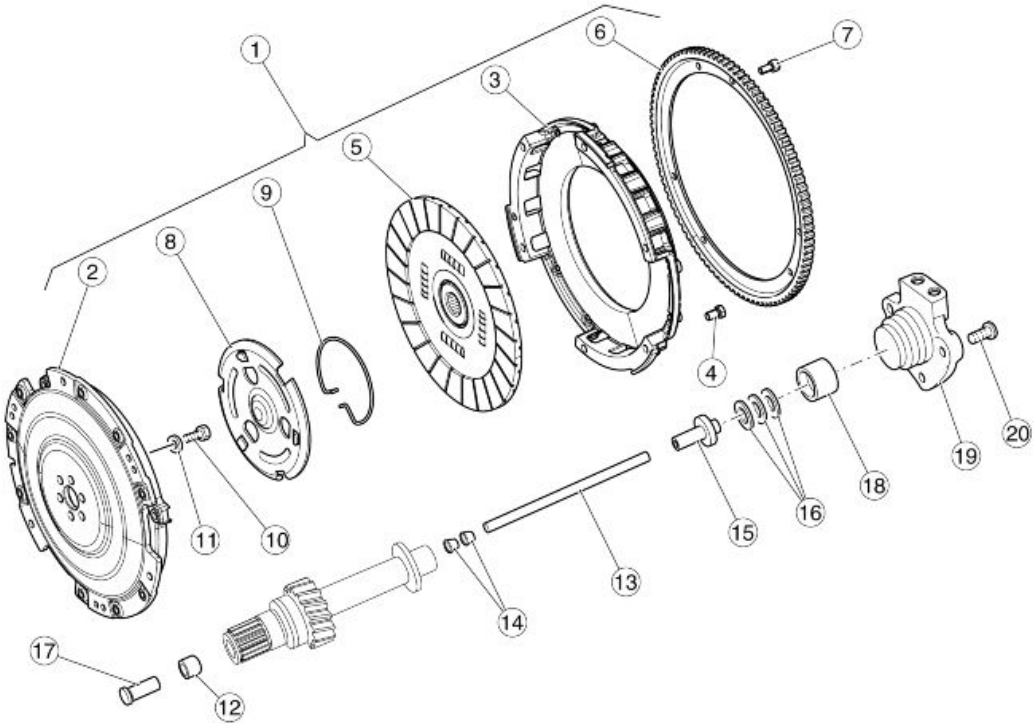
Removing the starter motor

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

- Slide off the starter motor.

Clutch side

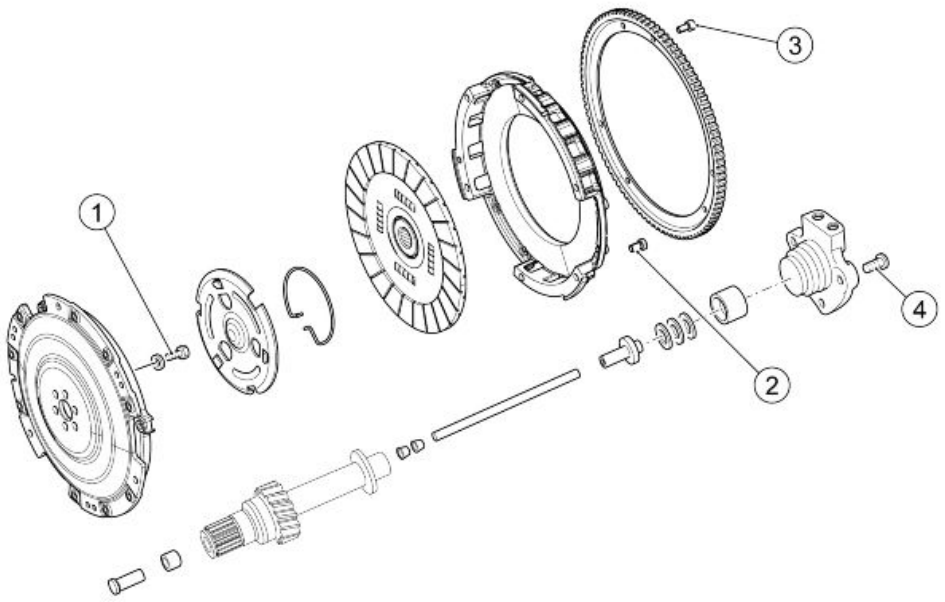
Disassembling the clutch



Key:

1. Complete clutch
2. Clutch
3. Clutch bell
4. TCEI screw
5. Clutch plate
6. Sprocket
7. TCEI screw
8. Clutch thrust plate

9. Ring
10. TE flanged screw
11. Conical washer
12. Bushing
13. Rod
14. Bushing
15. Intermediate body
16. Thrust bearing
17. Clutch control bowl
18. Thrust cylinder
19. Clutch control cylinder
20. TE flanged screw

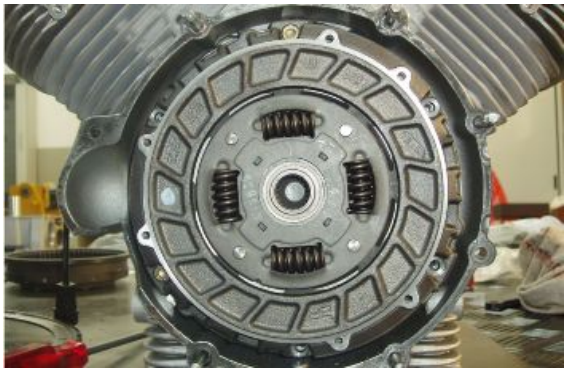


CLUTCH

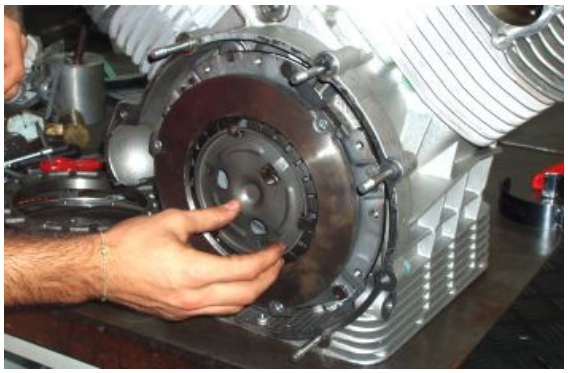
pos.	Description	Type	Quantity	Torque	Notes
1	Clutch to crankshaft fixing screw	-	6	42 Nm (30.98 lbf ft)	Tighten with cross sequence
2	Clutch external flange fixing screw on flywheel	M7x16	6	20 Nm (14.75 lbf ft)	Loctite 243
3	Start-up crown fixing screw on flywheel	-	6	10 Nm (7.37 lbf ft)	Loctite 243
4	Clutch control cylinder fixing screw	-	3	10 Nm (7.37 lbf ft)	Loctite 243

- Remove the complete gearbox.
- Unscrew and remove the six screws.
- Remove the start-up crown gear.

- Remove the clutch bell and the friction disc.



- Remove the retainer ring.
- Remove the clutch pressure plate.



- Undo and remove the six screws and collect the belleville springs.
- Remove the clutch plate.

See also

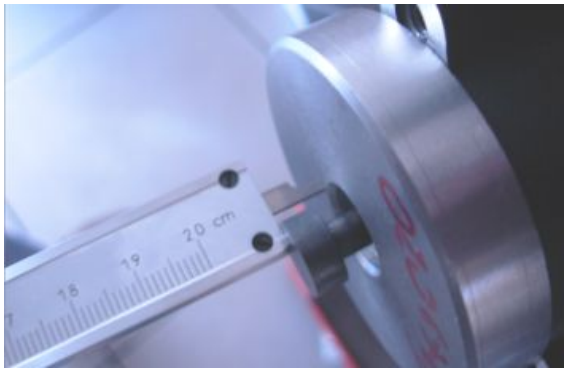
Removing the gearbox

Checking the clutch actuator

If the clutch is replaced, measure the length of the clutch control rod in order to use the correct rod. Measure as follows:

- Fit the new clutch on the crankshaft.
- Fit the clutch control bowl in the gear-box.

- Fit the gearbox on the engine block.
- Fit the tool in the gearbox to determine the clutch control rod length.
- Measure rod protrusion using a depth gauge (see picture).
- According to the value found, select the correct rod based on the following table:



Specific tooling

020678Y Tool for clutch rod checking

CLUTCH CONTROL ROD SELECTION

Specification	Desc./Quantity
Protrusion: 9.8 - 11.2 mm (0.386 - 0.441 in)	Clutch control rod length (code 976593) = 183 mm (7.205 in)
Protrusion: 8.3 - 9.7 mm (0.327 - 0.382 in)	Clutch control rod length (code 976594) = 184.5 mm (7.264 in)
Protrusion: 6.8 - 8.2 mm (0.268 - 0.323 in)	Clutch control rod length (code 976595) = 186 mm (7.323 in)
Protrusion: 5.3 - 6.7 mm (0.209 - 0.264 in)	Clutch control rod length (code 976596) = 187.5 mm (7.382 in)

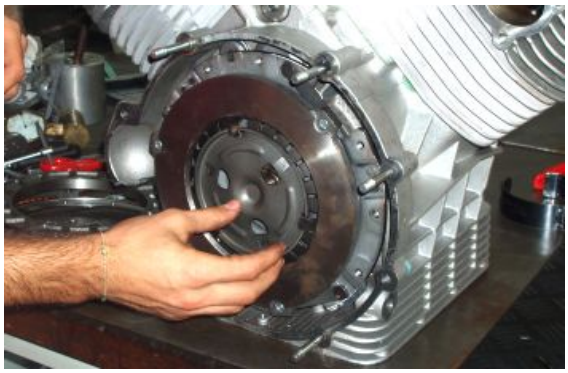
Assembling the clutch

- Lock crankshaft rotation with the crankpin facing upwards.
- Place the clutch disc with the reference facing upwards.
- Fasten the clutch disc on the crank-shaft with the six screws, Loctite 243 and the belleville springs.

- Place the clutch pressure plate.
- Fit the tool to centre and compress the plate.
- Fully tighten the two centring tool screws.

Specific tooling

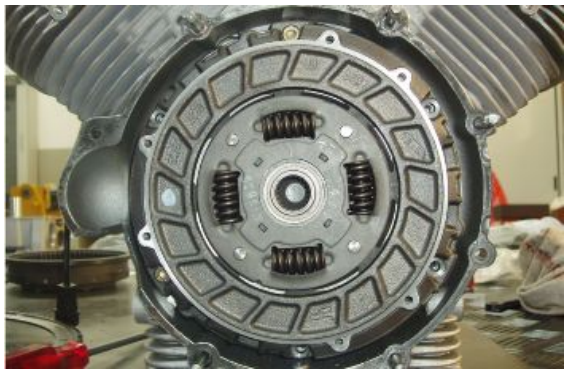
020672Y Clutch spring centre and pusher



- Once the centring tool is fitted, lock the plate with the snap ring.
- Undo and remove the two screws fixing the tool.
- Remove the special tool.

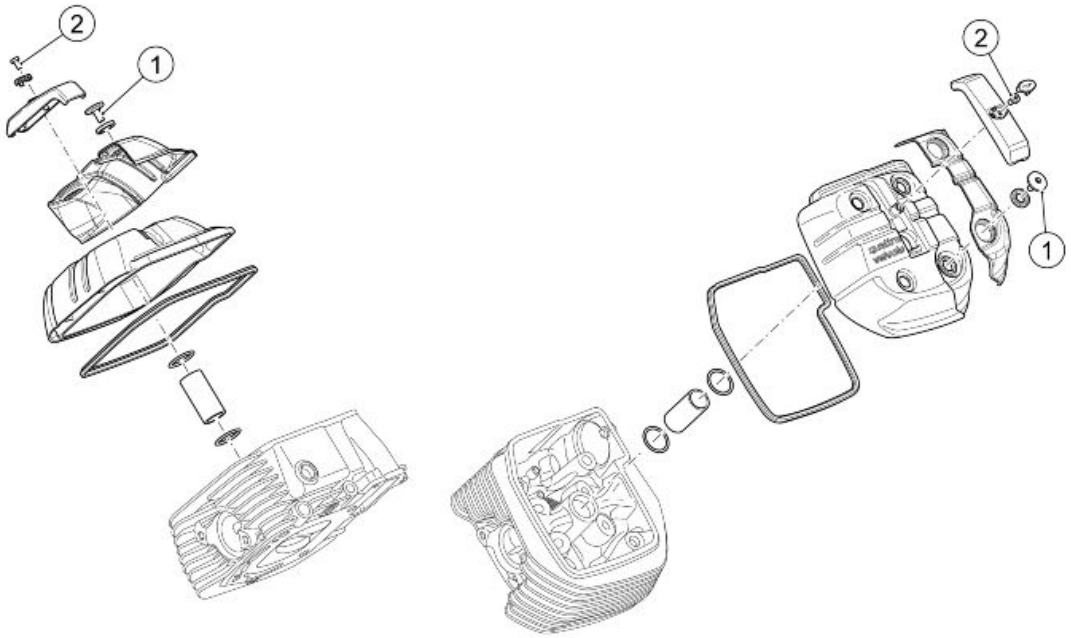
- Place the friction disc; centre it.

- Place the clutch bell with the reference facing upwards.



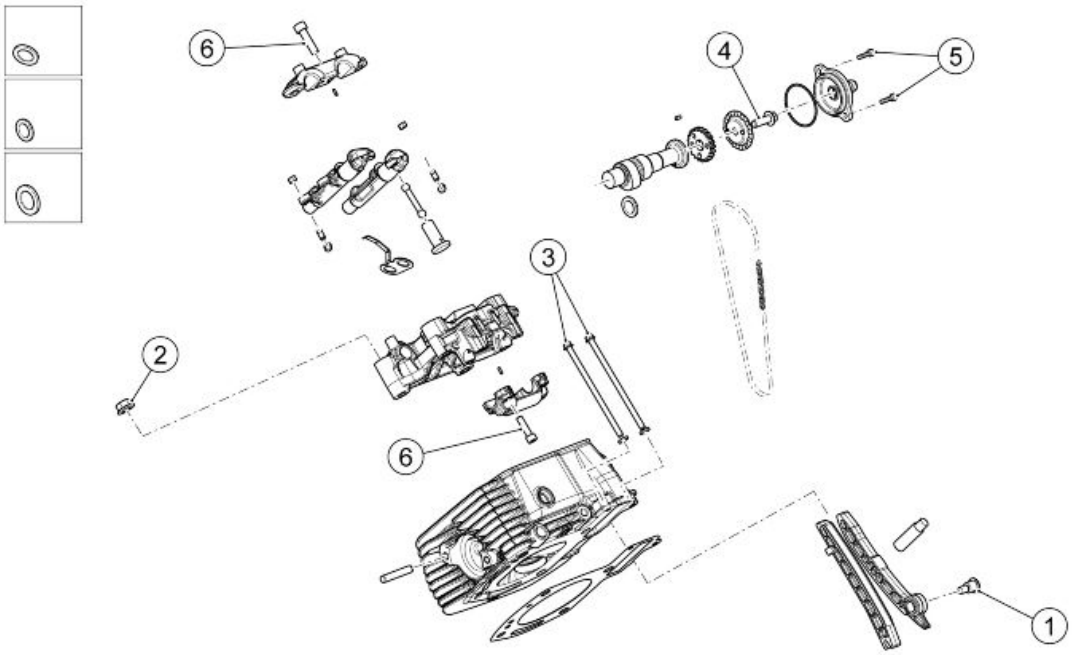
- Place the start-up crown gear with the reference facing upwards.
- Tighten the six screws to the prescribed torque operating diagonally and in stages.

Heads



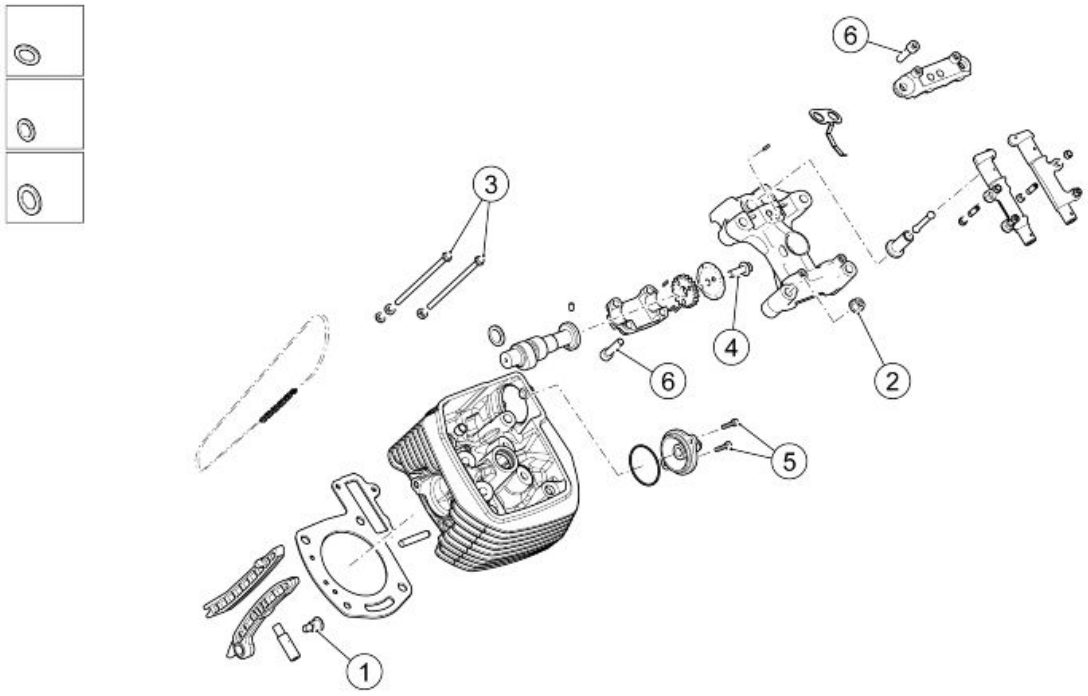
CYLINDER HEAD COVERS

pos.	Description	Type	Quantity	Torque	Notes
1	Special cylinder head fixing screw	-	8	8 Nm (5.90 lbf ft)	Locked with cross sequence
2	Spark plug cover fixing screw	M5x10	2	8 Nm (5.90 lbf ft)	-



RIGHT CYLINDER HEAD

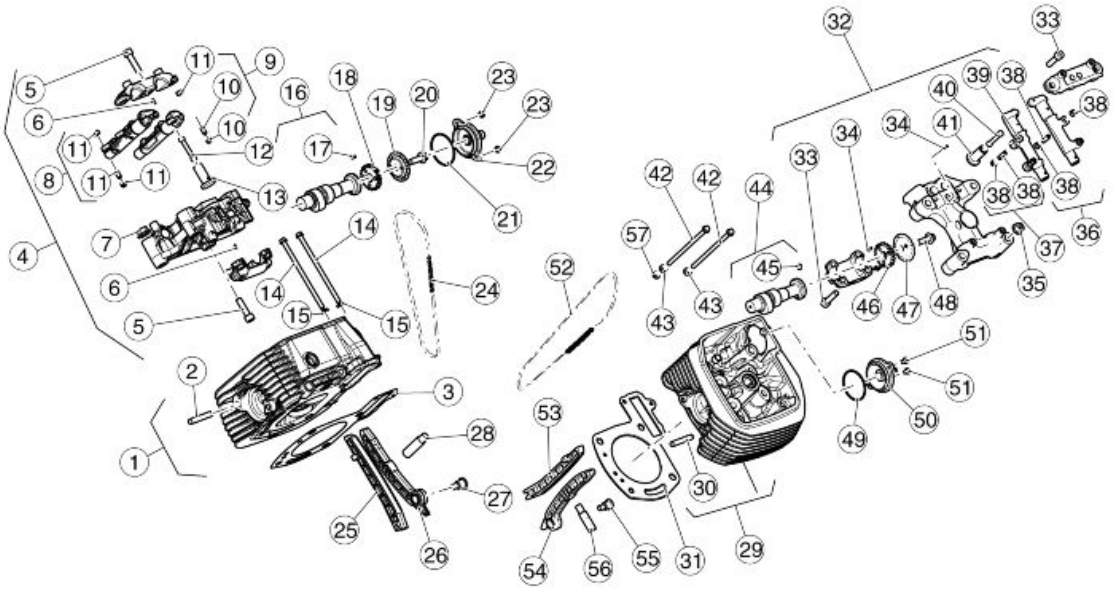
pos.	Description	Type	Quantity	Torque	Notes
1	Movable chain tensioner pad fixing screw	-	1	20 Nm (14.75 lbf ft)	Loctite 243
2	Head tightening nut	M10x1.25	4	15 Nm (11.06 lbf ft)	Engine Oil Pre-tightening
2	Head tightening nut	M10x1.25	4	42 Nm (30.98 lbf ft)	Final tightening
3	Head tightening screws (chain compartment)	M6x120	2	10 Nm (7.37 lbf ft)	-
4	Plate locking screw and timing gear	-	1	30 Nm (22.13 lbf ft)	Loctite 243
5	Timing cover fixing screw on the cylinder head	M5x10	2	8 Nm (5.90 lbf ft)	-
6	Camshaft support fixing screw	-	6	18 Nm (13.28 lbf ft)	-



LEFT CYLINDER HEAD

pos.	Description	Type	Quantity	Torque	Notes
1	Movable chain tensioner pad fixing screw	-	1	20 Nm (14.75 lbf ft)	Loctite 243
2	Head tightening nut	M10x1.25	4	15 Nm (11.06 lbf ft)	Engine Oil Pre-tightening
2	Head tightening nut	M10x1.25	4	42 Nm (30.98 lbf ft)	Final tightening
3	Head tightening screws (chain compartment)	M6x120	2	10 Nm (7.37 lbf ft)	-
4	Plate locking screw and timing gear	-	1	30 Nm (22.13 lbf ft)	Loctite 243
5	Timing cover fixing screw on the cylinder head	M5x10	2	8 Nm (5.90 lbf ft)	-
6	Camshaft support fixing screw	-	6	18 Nm (13.28 lbf ft)	-

Head and timing



Key:

1. Right cylinder head
2. Stud bolt
3. Cylinder head gasket
4. Right rocking lever support
5. Screw
6. Pin
7. Nut
8. Right exhaust, left intake rocking lever
9. Left exhaust, right intake rocking lever
10. Set screw
11. Nut
12. Rocking lever rod
13. Tappet bowl
14. Flanged screw
15. Spacer
16. Camshaft
17. Pin
18. Timing system gear
19. Breather plate
20. TE flanged screw
21. O-ring

22.Complete breather cover
23.TBEI screw
24.Timing system chain
25.Chain guide slider
26.Chain tensioner pad
27.Chain tensioner screw
28.Right chain tensioner
29.Left cylinder head
30.Stud bolt
31.Cylinder head gasket
32.Left rocking lever support
33.Screw
34.Pin
35.Nut
36.Right exhaust, left intake rocking lever
37.Left exhaust, right intake rocking lever
38.Set screw
39.Nut
40.Rocking lever rod
41.Tappet bowl
42.Flanged screw
43.Spacer
44.Camshaft
45.Pin
46.Timing system gear
47.Breather plate
48.TE flanged screw
49.O-ring
50.Complete breather cover
51.TBEI screw
52.Timing system chain
53.Chain guide slider
54.Chain tensioner pad
55.Chain tensioner screw
56.Left chain tensioner
57.Spacer

Removing the head cover

NOTE

THE OPERATIONS DESCRIBED BELOW REFER TO ONE HEAD REMOVING ONLY BUT APPLY TO BOTH HEADS.

- Disconnect the spark plug tube.

- Unscrew and remove the four head cover fixing screws and collect the sealing O-rings.
- Remove the head cover together with the gasket.

Removing the cylinder head

CAUTION

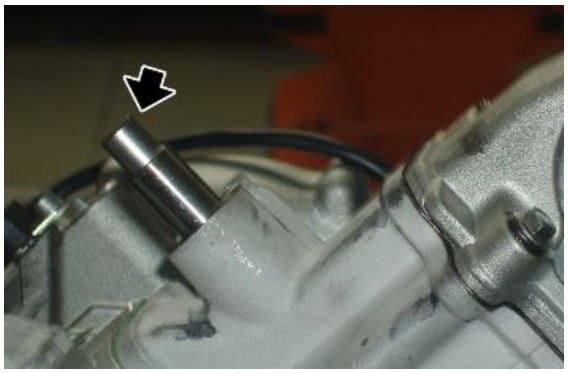
WHEN REMOVING THE COMPONENTS, MARK THE POSITION OF EACH PART VERY CAREFULLY IN ORDER TO PLACE THEM IN THEIR ORIGINAL POSITION UPON FITTING.

- Remove the head cover.
- Unscrew and remove the two screws
- Remove the cap.

- Unscrew and remove the screw.
- Remove the timing system upper gear bulkhead.

For the right head:

- Unscrew and remove the chain tensioner cap.
- Remove the right chain tensioner.

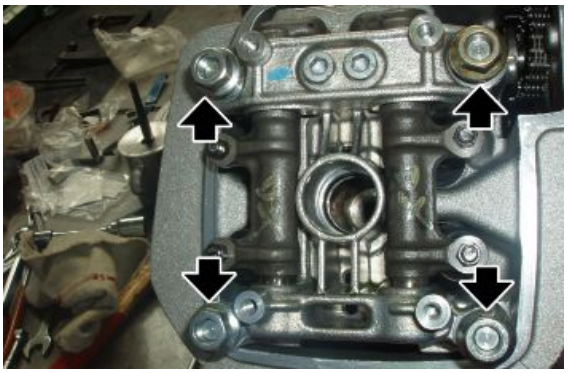


For the left head:

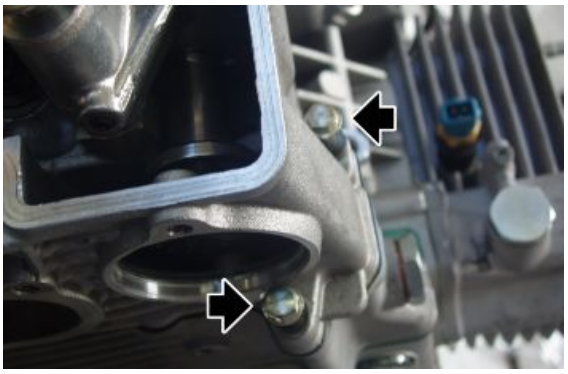
- Unscrew and remove the screw and the washer.
- Relief oil pressure from the left chain tensioner.

- Slide off the timing system gear from the chain to remove it from the cam-shaft.

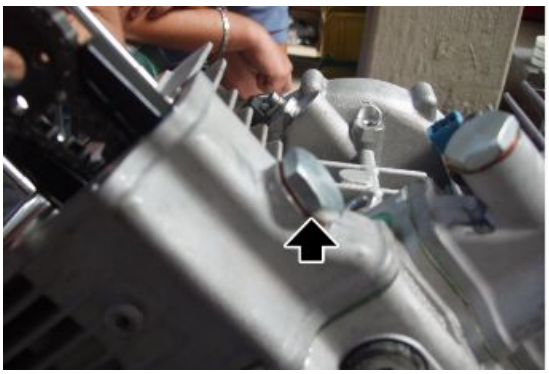
- Unscrew and remove the four nuts on the stud bolts.
- Remove the complete cam cap.



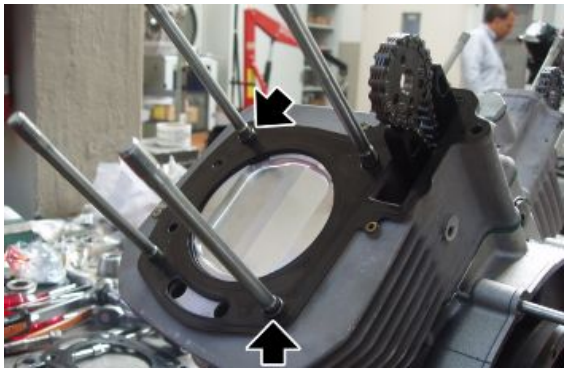
- Unscrew and remove the two screws.
- Remove the head.



- Fit the timing system upper gear back to the chain.
- Fit the chain tensioner cap temporarily and keep the chain taut on the service shaft.



- Collect the two head dowel pins.
- Collect the gasket between the head and the cylinder.



See also

Removing the head cover

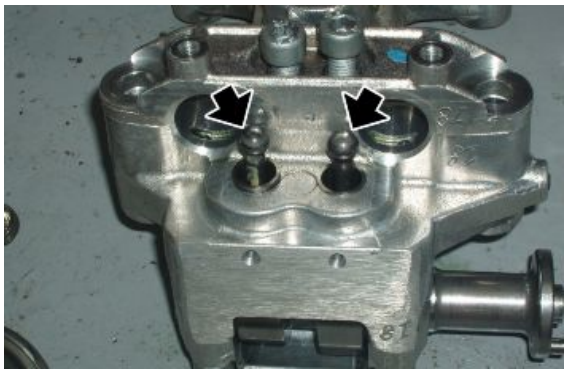
Cylinder head

Removing the overhead camshaft

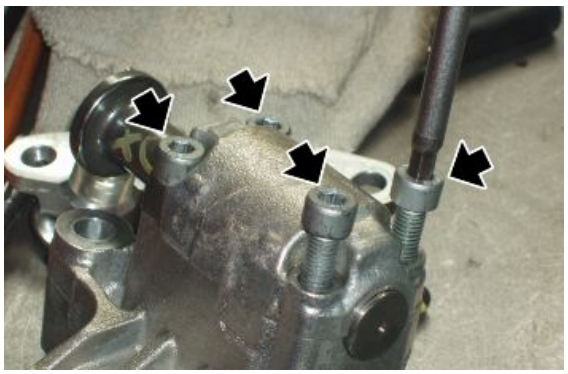
CAUTION

WHEN REMOVING THE COMPONENTS, MARK THE POSITION OF EACH PART VERY CAREFULLY IN ORDER TO PLACE THEM IN THEIR ORIGINAL POSITION UPON FITTING.

- Remove the two rocking levers from the cam cap.
- Remove the two rods.

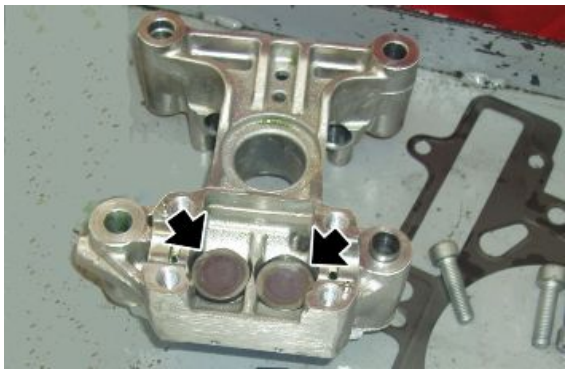


- Undo and remove the four screws.
- Remove the U-bolt.



- Remove the camshaft.

- Remove the bowls from the cam cap, and mark their position so as not inter-change them when refitting.



See also

Removing the rocker arms

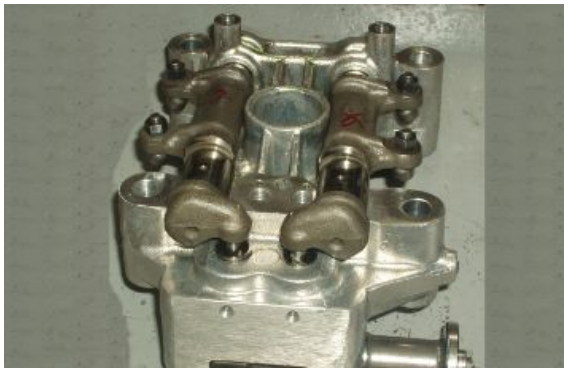
Removing the rocker arms

CAUTION

WHEN REMOVING THE COMPONENTS, MARK THE POSITION OF EACH PART VERY CARE-FULLY IN ORDER TO PLACE THEM IN THEIR ORIGINAL POSITION UPON FITTING.

- Remove the cam cap from the stud bolts.
- Undo and remove the two screws.
- Remove the U-bolt.

- Remove the two rocking levers from the cam cap.



See also

Removing the cylinder head

Removing the valves

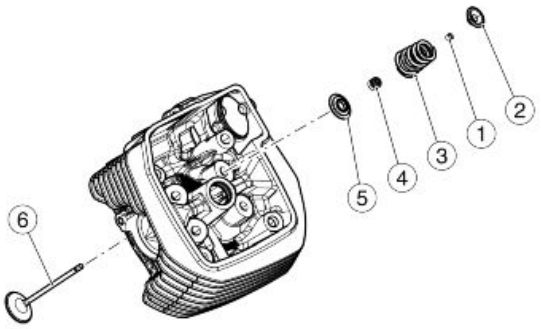
- Remove the head.
- Place the special tool on the upper cap and at the centre of the head of the valve to be removed.

Specific tooling

10.90.72.00 Tool for valve removal and refitting

AP9100838 Tool for valve pressure plate

- Tighten the tool screw until fitted, and then hit the tool head (where the upper cap works) with a mallet so that the two cotters (1) get detached from the upper cap (2).
- Once the two cotters (1) are detached, screw these cotters until they can be slid off the valve seats; unscrew the tool and remove it from the head.
- Slide off the upper cap (2).
- Remove the spring (3).
- Remove the lower cap (5) and the valve guide oil seal (4), if necessary.
- Remove the valve (6) from inside the head.



Checking the valve guides

Use a punch to extract the valve guides from the heads.

The valve guides should be replaced only if the clearance between them and the stem cannot be eliminated by simply replacing the valves.

To refit the valve guides on the head, follow this procedure:

- Heat the head in an oven at about 60°C (140°F).
- Lubricate the valve guide.
- Fit the circlips.
- Press the valve guide with a punch.
- Use a reamer to bore the holes the valve stems slide through so that the inside diameter is at the prescribed value. The interference between the seat on the head and the valve guide must be 0.046 - 0.075 mm (0.0018 - 0.0030 in)

VALVE GUIDE COUPLING - VALVES (INLET)

Specification	Desc./Quantity
Valve guide inside diameter	5.0 ÷ 5.012 mm (0.19685 ÷ 0.19732 in)
Valve stem diameter	4.972 ÷ 4.987 mm (0.19574 ÷ 0.19633 in)
Fitting clearance	0.013 ÷ 0.040 mm (0.00051 ÷ 0.00157 in)

VALVE GUIDE COUPLING - VALVES (OUTLET)

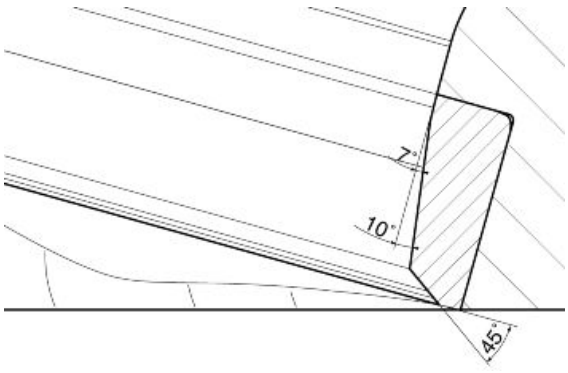
Specification	Desc./Quantity
Valve guide inside diameter	5.0 ÷ 5.012 mm (0.19685 ÷ 0.19732 in)
Valve stem diameter	4.960 ÷ 4.975 mm (0.19527 ÷ 0.19587 in)
Fitting clearance	0.025 ÷ 0.052 mm (0.00098 ÷ 0.00205 in)

Checking the cylinder head

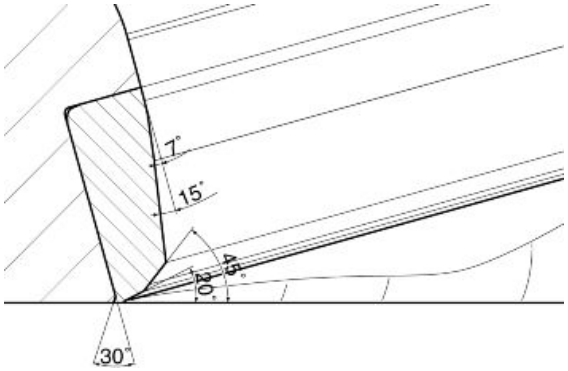
Check that:

- the faying surfaces with the cover and the cylinder are not scored or damaged, jeopardising a perfect sealing.
- Check that the tolerance between the valve guide holes and the valve stems is within the prescribed limits.
- Check the valve seats are in good conditions.

INLET VALVE SEAT DETAIL DRAWING



OUTLET VALVE SEAT DETAIL DRAWING



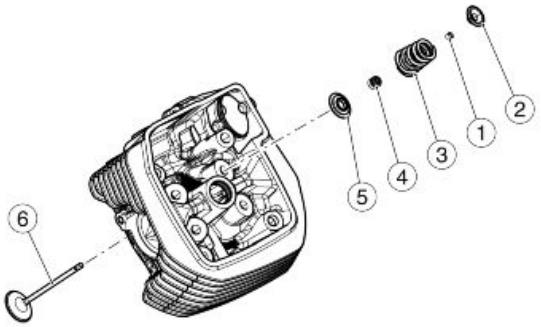
- If the width of the mark on the valve seat is larger than the prescribed limits, true the seats with a 45° milling cutter and then grind.
- Replace the head in case of excessive wear or damage.

Installing the valves

NOTE

THE FOLLOWING OPERATIONS REFER TO REMOVING ONLY ONE HEAD BUT APPLY TO BOTH HEADS.

- Place the valve guide oil seal (4) in the head.
- Place the lower cap (5).
- Place the valve (6) inside the head.
- Place the spring (3).
- Fit the upper cap (2).
- Place the two cotters (1) on the seats in the valves.
- By compressing the spring (3) with the special tool, fit the valve cotters.



Specific tooling

10.90.72.00 Tool for valve removal and refitting

AP9100838 Tool for valve pressure plate

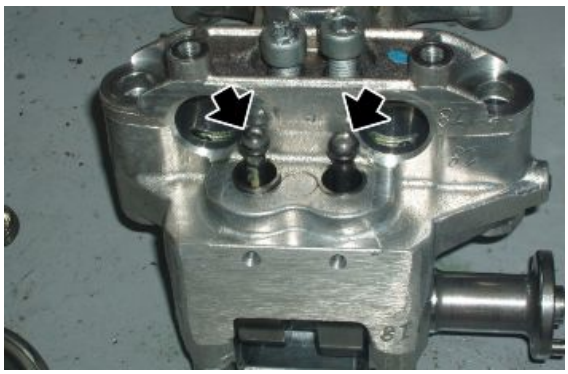
- Remove the special tool

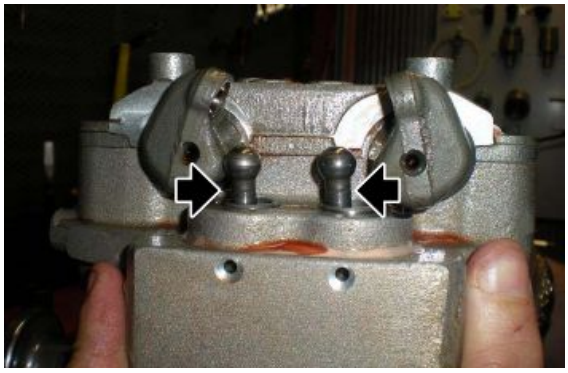
Installing the rocker arms

- Fit the camshaft.
- Fit the two rods.

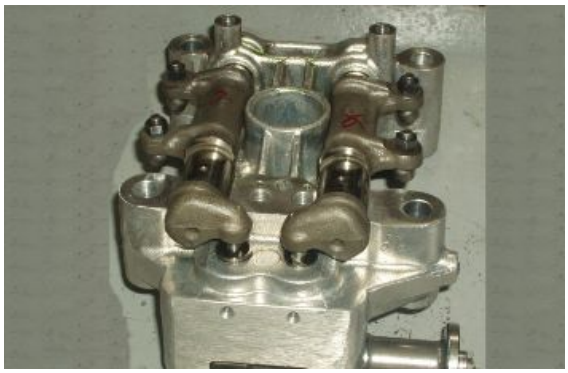
WARNING

MAKE SURE THAT THE NOTCH ON THE DIPSTICK BODY FACES THE ROCKING LEVER.





- Place the two rocking levers in the cam tower seats.



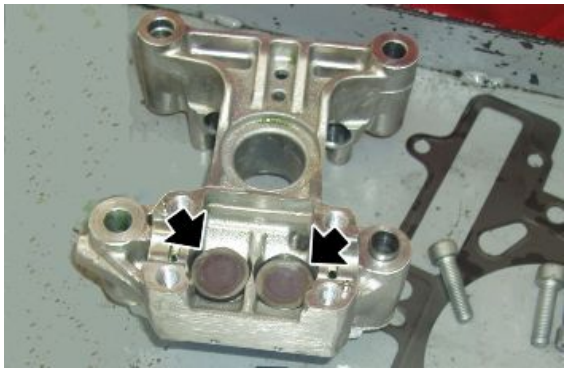
- Place the U-bolt on the rocking levers making sure the two reference pins match the seats on the cam tower.
- Tighten the two screws operating diagonally and in stages.

See also

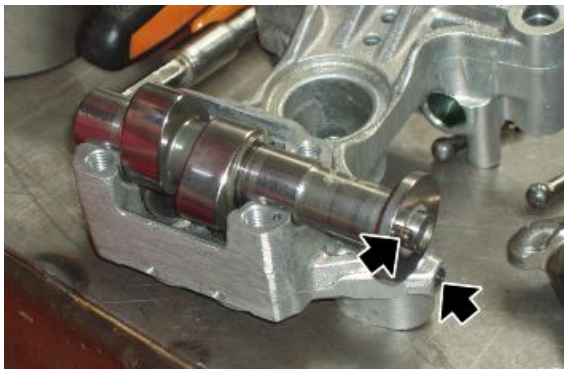
Installing the overhead camshaft

Installing the overhead camshaft

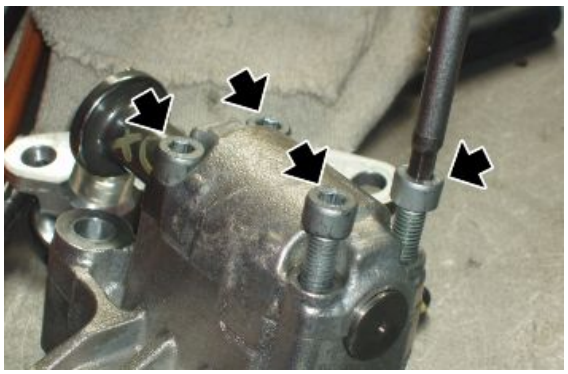
- Place the bowls in the cam tower, if those previously removed are refitted be careful not to interchange them.



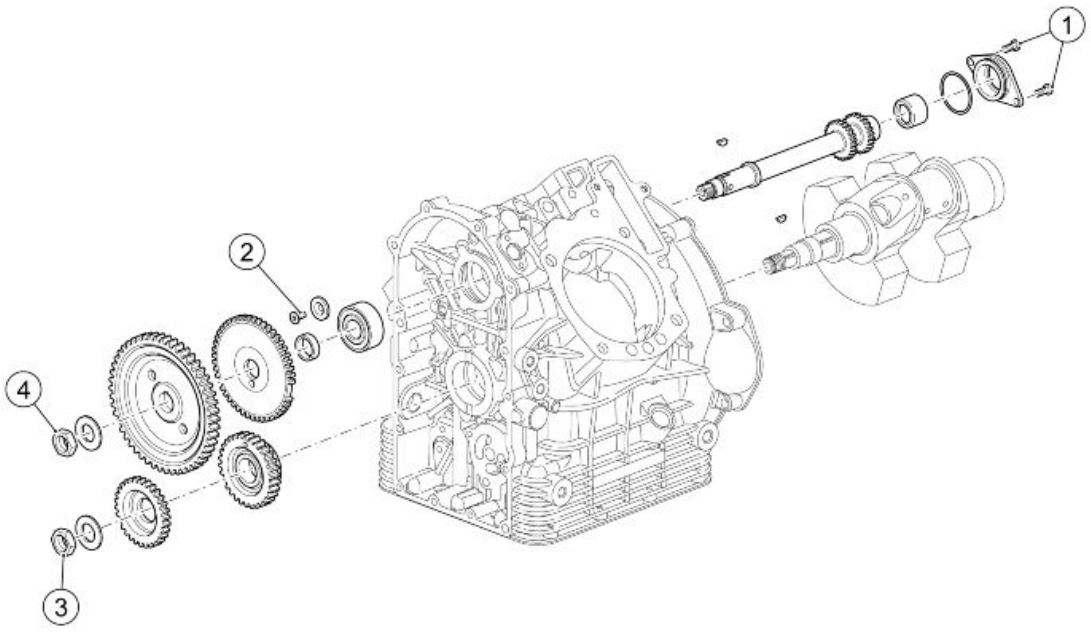
- Place the camshaft with the gear seat on the dowel side.



- Place the U-bolt on the camshaft making sure the two reference pins match the seats on the cam tower.
- Tighten the four screws operating diagonally and in stages.



Timing



TIMING SYSTEM CONTROL

pos.	Description	Type	Quantity	Torque	Notes
1	Control, timing system, shaft support flange fixing screw	M6x14	2	8 Nm (5.90 lbf ft)	-
2	Bearing fixing screw	M6x16	1	10 Nm (7.37 lbf ft)	Loctite 243
3	Driving gears locking nut on the crankshaft	M25	1	200 Nm (147.51 lbf ft)	Loctite 601
4	Timing system driven gear locking nut	M18	1	25 Nm (18.44 lbf ft)	Pre-tightening
4	Timing system driven gear locking nut	M18	1	150 Nm (110.63 lbf ft)	Final tightening

Removing the phonic wheel

- Remove the generator and the timing system cover.
- Unscrew and remove the nut and collect the washer.
- Remove the timing system gear on the service shaft.

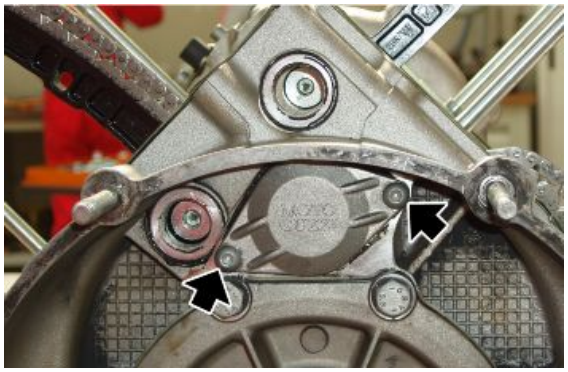
- Remove the timing sensor and any shim washers.
- Remove the tone wheel.
- Remove the cotter and shim washer from the service shaft.

See also

Removing the generator

Service shaft removal

- Remove the tone wheel.
- Remove both cylinders.
- Undo and remove the two screws.
- Remove the service shaft closing cap.



- Mark the timing chains so as not to invert the direction of rotation upon fitting.
- Slide off the service shaft from the chains.
- Remove both chains.

See also

Removing the phonic wheel

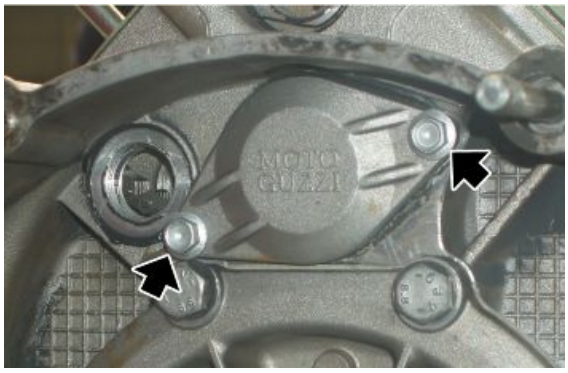
Installing the service shaft

- Place the service shaft bearing (if previously removed) on the crankcase.
- Fix it to the seat with the lock washer and screw.

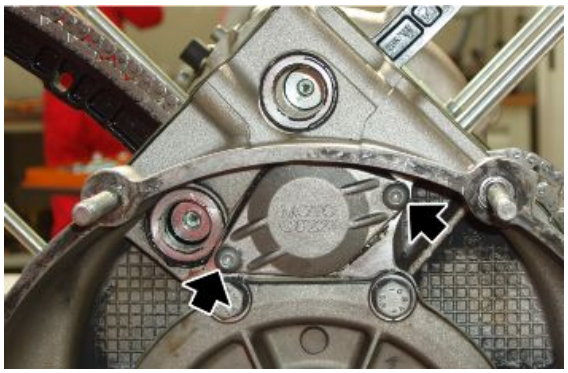
- Fit the timing chains according to the references marked at the removal phase.
- Lubricate the service shaft.
- Insert the service shaft in its crankcase seat by sliding it through the two chains.
- Fit each chain to the corresponding service shaft gear.

- Fit the roller cage and a new O-ring on the service shaft closing cap.

- Partially fit the service shaft closing cap.
- To screw the cap until it stops, use two M6 flanged screws larger than the original screws.
- Tighten the two M6 flanged screws operating in stages until the cap stops against the crankcase.
- Undo and remove the two M6 flanged screws.



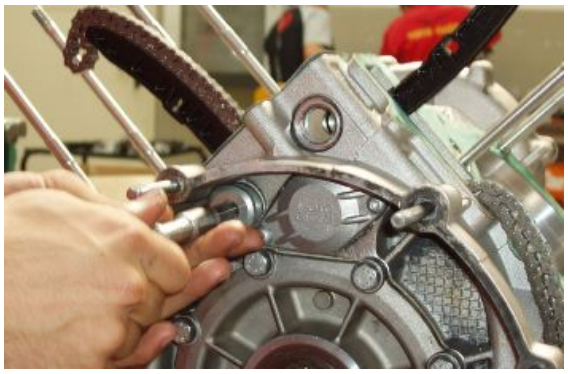
- Tighten the cap with the two original TBEI screws.



Installing sliders

- Fit the crankshaft and the service shaft on the crankcase.
- Fit the fixed chain sliders and tighten the fixing screws.

- Tighten the chain caps with O-rings.
- The operations related to the movable chain sliders are described in the cylinder fitting section.



See also

Installing the crankshaft
Installing the service shaft

Cam timing

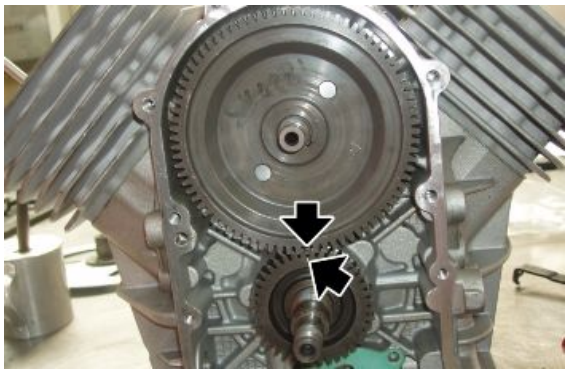
- Fit the crankshaft and the service shaft on the crankcase.
- Fit the cylinders.
- Turn the crankshaft until the left cylinder piston reaches the top dead centre (TDC).
- Fit the cotter and the shim washer on the service shaft.
- Fit the tone wheel with the chamfered side facing the crankcase on the service shaft.

- Lock crankshaft rotation.
- Unscrew and remove the nut fixing the crankshaft gear.
- Remove the oil pump control gear.

Specific tooling

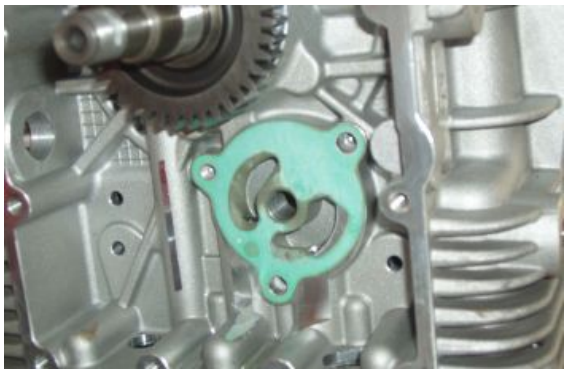
12.91.18.01 Tool to lock the flywheel and the starting ring gear

- Fit the timing system gear and align the reference with that on the crankshaft gear. Turn the crankshaft to align the two gears.

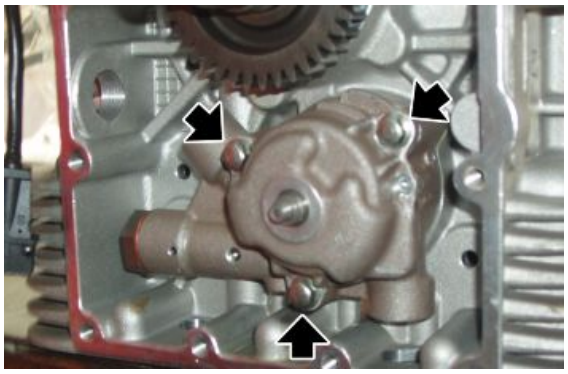


- After shimming the timing sensor properly, proceed to fit it.
- Fit the washer and tighten the timing system gear fixing nut of the service shaft.

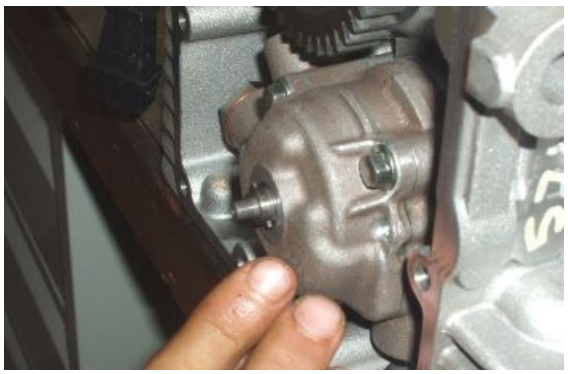
- Place a new gasket between the crankcase and the oil pump.



- Place the oil pump.
- Tighten the three screws fixing the oil pump.

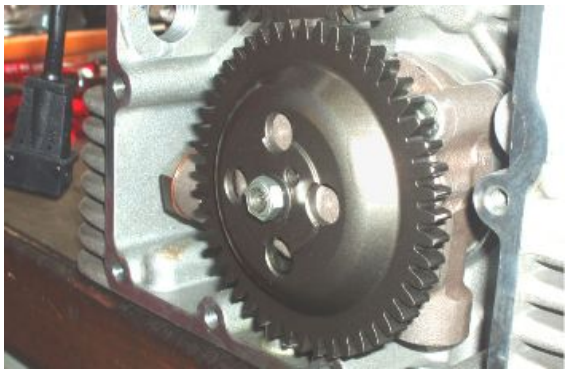


- Place the driving pin on the oil pump shaft.



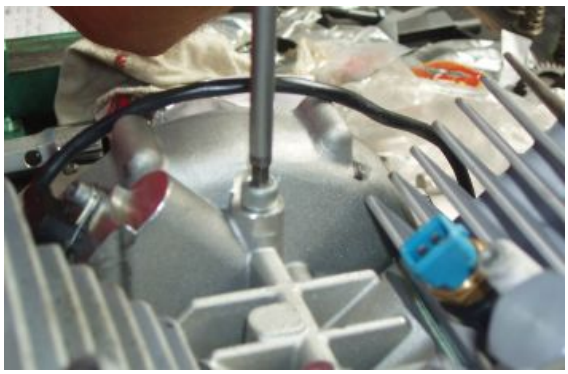
- Place the gear on the oil pump shaft.

- Place the washer on the oil pump shaft.
- Tighten the nut to the specified torque.



- Place the oil pump control gear on the crankshaft and align its reference with that marked during the removal phase on the oil pump driven gear.
- Tighten the nut to the specified torque.

- Tighten the screw with the washer to the prescribed torque.

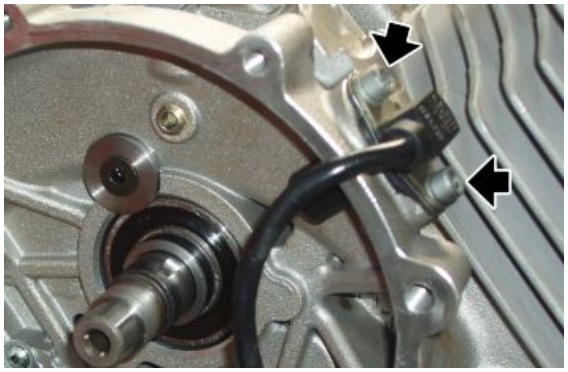


See also

Installing the crankshaft
Installing the service shaft
Measuring air gap

Measuring air gap

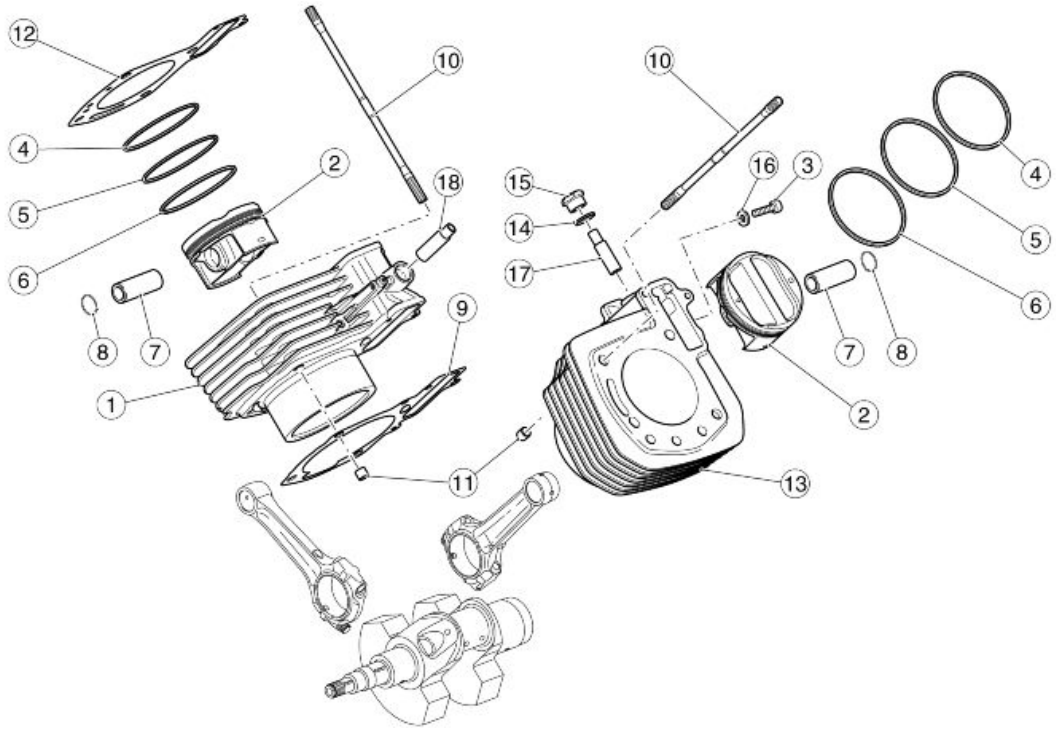
- Undo and remove the two screws and remove the sensor.



- Insert a suitable plain washer on the sensor and note its thickness.

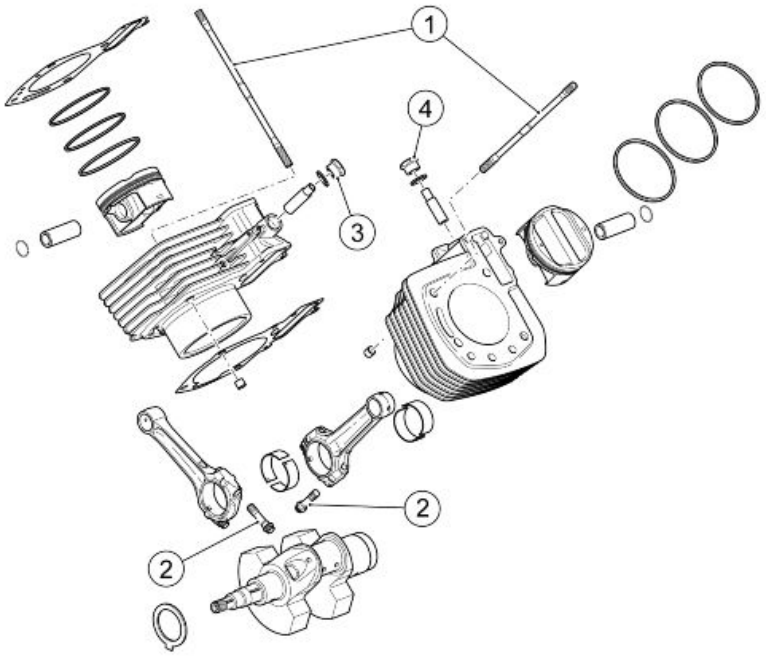
- Place the sensor on the crankcase and move it until it makes contact with the tone wheel.
- Measure the clearance between the fixing plate and the crankcase with a thickness gauge. Subtract the plain washer value from this measurement to obtain the clearance between the sensor and the tone wheel.
- Remove the washer and fit the sensor after applying adequate sealing paste on the fixing plate, then tighten the screws to the prescribed torque.

Cylinder-piston assembly



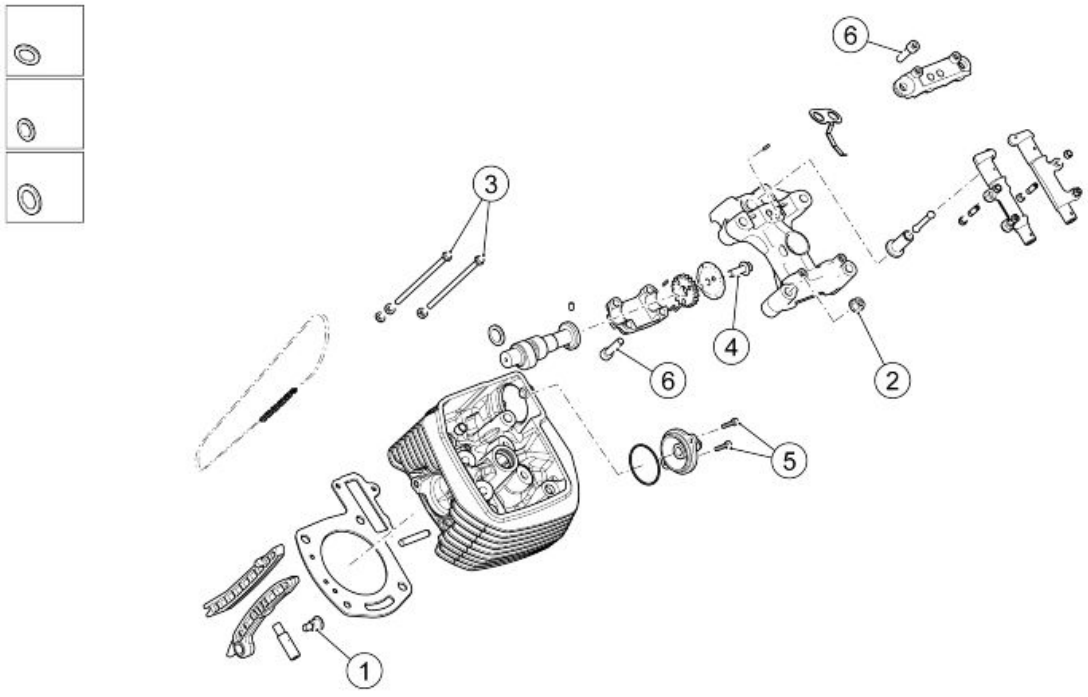
Key:

1. Right cylinder
2. Piston
3. Screw
4. Top piston ring
5. Middle piston ring
6. Oil scraper piston ring
7. Pin
8. Retainer ring
9. Cylinder base gasket
10. Stud bolt
11. Pin
12. Cylinder head gasket
13. Left cylinder
14. Washer
15. Chain tensioner cap
16. Washer
17. Left chain tensioner
18. Right chain tensioner



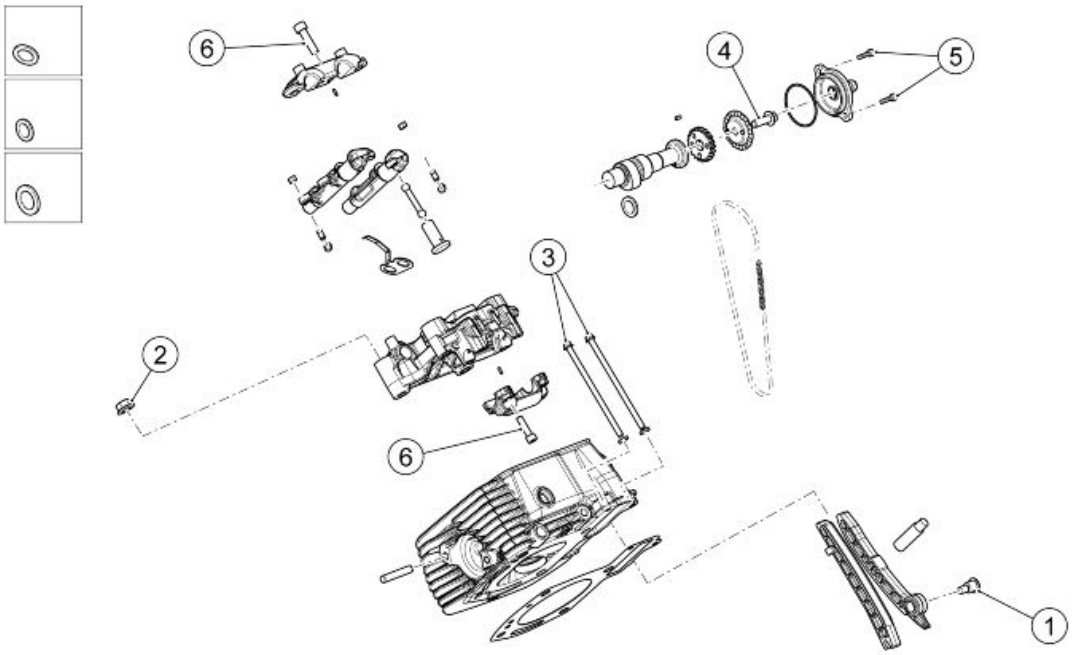
CONNECTING ROD ASSEMBLY - CYLINDERS

pos.	Description	Type	Quantity	Torque	Notes
1	Thermal group fixing stud bolt	M10x1.25	8	5 Nm (3.69 lbf ft)	Loctite 243
2	Connecting rod screws	-	4	40 Nm (29.50 lbf ft)	Pre-tightening
2	Connecting rod screws	-	4	80 Nm (59.00 lbf ft)	Final tightening
3	Right hydraulic tensioner cover	-	1	42 Nm (30.98 lbf ft)	-
4	Left hydraulic tensioner cover	-	1	30 Nm (22.13 lbf ft)	-



LEFT CYLINDER HEAD

pos.	Description	Type	Quantity	Torque	Notes
1	Movable chain tensioner pad fixing screw	-	1	20 Nm (14.75 lbf ft)	Loctite 243
2	Head tightening nut	M10x1.25	4	15 Nm (11.06 lbf ft)	Engine Oil Pre-tightening
2	Head tightening nut	M10x1.25	4	42 Nm (30.98 lbf ft)	Final tightening
3	Head tightening screws (chain compartment)	M6x120	2	10 Nm (7.37 lbf ft)	-
4	Plate locking screw and timing gear	-	1	30 Nm (22.13 lbf ft)	Loctite 243
5	Timing cover fixing screw on the cylinder head	M5x10	2	8 Nm (5.90 lbf ft)	-
6	Camshaft support fixing screw	-	6	18 Nm (13.28 lbf ft)	-



RIGHT CYLINDER HEAD

pos.	Description	Type	Quantity	Torque	Notes
1	Movable chain tensioner pad fixing screw	-	1	20 Nm (14.75 lbf ft)	Loctite 243
2	Head tightening nut	M10x1.25	4	15 Nm (11.06 lbf ft)	Engine Oil Pre-tightening
2	Head tightening nut	M10x1.25	4	42 Nm (30.98 lbf ft)	Final tightening
3	Head tightening screws (chain compartment)	M6x120	2	10 Nm (7.37 lbf ft)	-
4	Plate locking screw and timing gear	-	1	30 Nm (22.13 lbf ft)	Loctite 243
5	Timing cover fixing screw on the cylinder head	M5x10	2	8 Nm (5.90 lbf ft)	-
6	Camshaft support fixing screw	-	6	18 Nm (13.28 lbf ft)	-

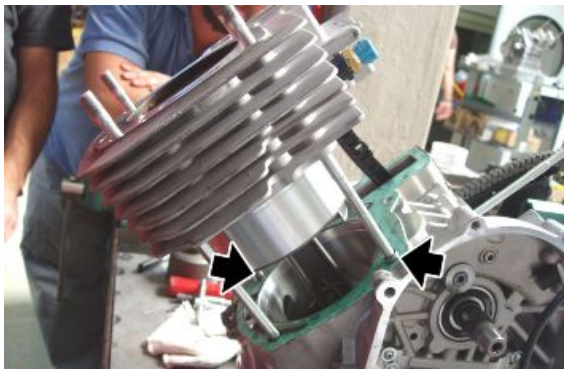
Removing the cylinder

NOTE

THE OPERATIONS DESCRIBED BELOW REFER TO ONE HEAD REMOVING ONLY BUT APPLY TO BOTH HEADS.

- Remove the head, the gasket between the head and the cylinder and the two dowel pins.
- Slide off the movable chain slider.
- Remove the cylinder from the stud bolts.

- Remove the two dowel pins on the stud bolts.
- Remove the two gaskets between the crankcase and the cylinder.
- Cover the crankcase opening with a clean cloth.



See also

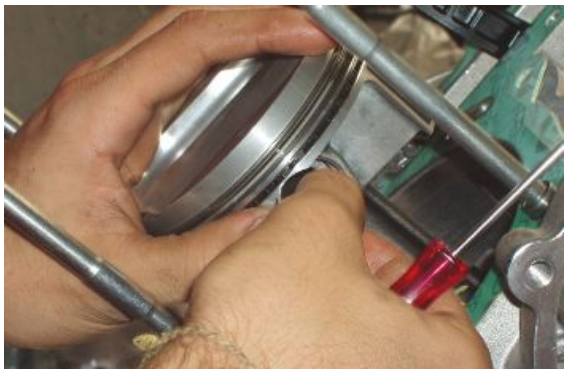
Removing the cylinder head

Disassembling the piston

NOTE

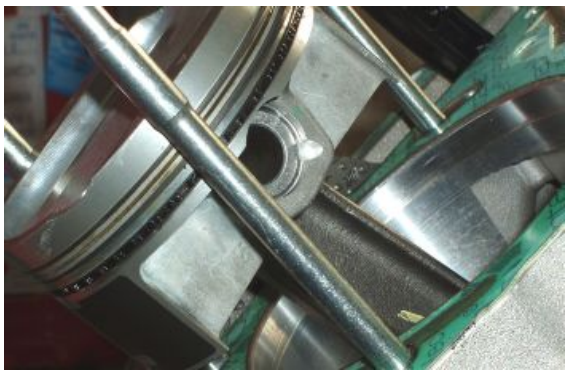
THE OPERATIONS DESCRIBED BELOW REFER TO ONE HEAD REMOVING ONLY BUT APPLY TO BOTH HEADS.

- Remove the cylinder.
- Cover the crankcase opening with a clean cloth.
- Release the snap ring.



- Remove the pin.

- Mark the piston crown on the exhaust side so as to remember the refitting position.
- Remove the piston.



Fitting the piston

NOTE

THE OPERATIONS DESCRIBED BELOW REFER TO REMOVING ONLY ONE HEAD BUT APPLY TO BOTH HEADS.

- The reference on the piston ring must be facing the piston crown.
- Fit the piston rings on the piston: - the oil scraper in the lower slot; - the thicker smooth ring in the intermediate slot; - the less thick smooth ring in the upper slot.
- The piston rings must be offset at 120° one from the other.
- Fit one of the two pin snap rings on the piston.
- Lock crankshaft rotation.

Specific tooling

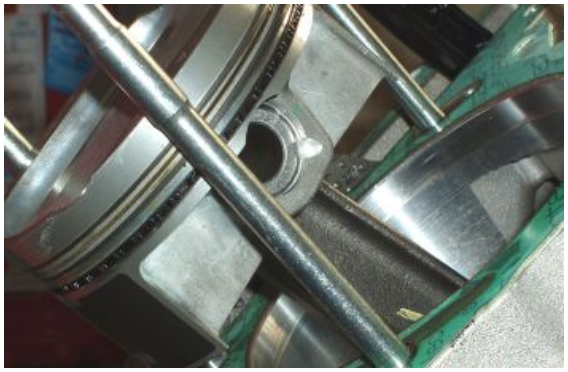
12.91.18.01 Tool to lock the flywheel and the starting ring gear

- Fit the piston.

NOTE

CHECK THE PISTON DIRECTION ACCORDING TO THE REFERENCES MARKED ON THE PISTON CROWN. DO NOT ASSEMBLE PISTONS AND CYLINDERS OF DIFFERENT SELECTOR TYPES.

- Insert the pin.



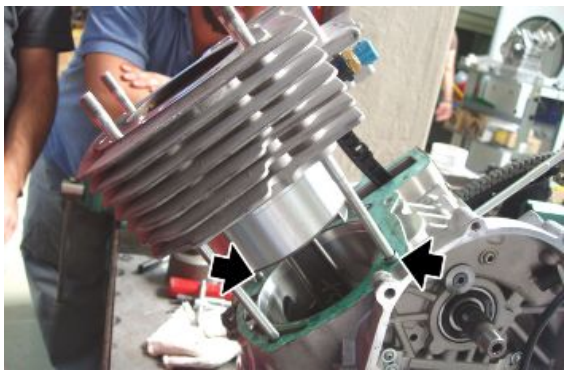
- Insert the snap ring.

Specific tooling

020470Y Pin snap ring fitting tool

Installing the cylinder

RIGHT CYLINDER



- Fit the piston.
- Remove the cloth used to prevent foreign bodies from getting into the crankcase.
- Turn the rings so that the coupling ends are 120 degrees from each other.
- Place a new metal gasket between the crankcase and the cylinder. Place the two dowel pins on the stud bolts. Lubricate the piston and the cylinder. Lock connecting rod motion with the fork tool. Using the suitable piston ring clamp tool, place the cylinder and fit the chain in the timing system plate.

CAUTION

DURING THIS OPERATION, PAY ATTENTION NOT TO DAMAGE THE PISTON.

Specific tooling

020674Y Piston ring clamp

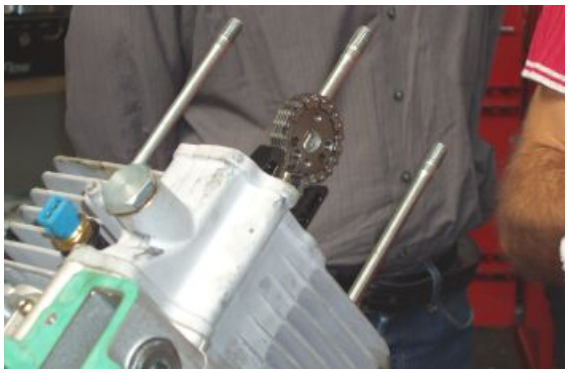
020716Y Connecting rod locking

- Remove the piston ring clamp tool and finish positioning the cylinder.

Specific tooling

020674Y Piston ring clamp

- Fit the movable chain slider.
- Fit the upper gear.
- Fit the chain tensioner and the chain tensioner cap temporarily and keep the chain taut on the service shaft.



LEFT CYLINDER

- Fit the piston.
- Remove the cloth used to prevent foreign bodies from getting into the crankcase.
- Turn the rings so that the coupling ends are 120 degrees from each other.
- Place a new metal gasket between the crankcase and the cylinder.
- Place the two dowel pins on the stud bolts.
- Undo the screw which will be used to time the upper gear.

- Check that the oil in the left cylinder chain tensioner has been drained off by compressing it. If the operation is difficult, use a pin drive to push the central hole so that the oil is drained off from the circuit.

- Fit the chain tensioner in the cylinder.
- Lubricate the piston and the cylinder.
- Lock connecting rod motion with the fork tool.
- Using the suitable piston ring clamp tool, place the cylinder and fit the chain in the timing system plate.

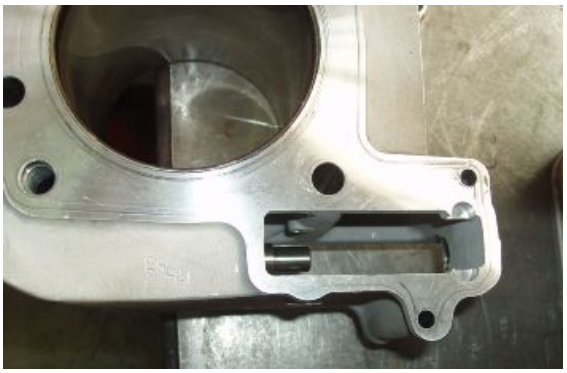
CAUTION

DURING THIS OPERATION, PAY ATTENTION NOT TO DAMAGE THE PISTON.

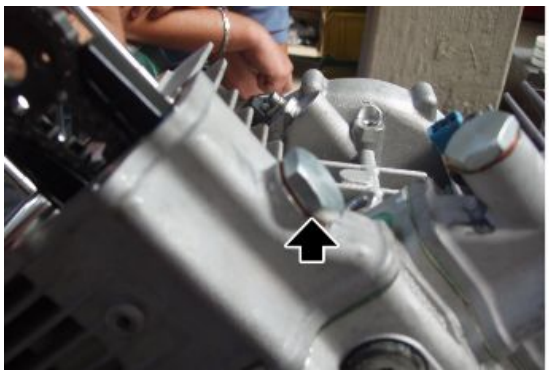
Specific tooling

020674Y Piston ring clamp

020716Y Connecting rod locking



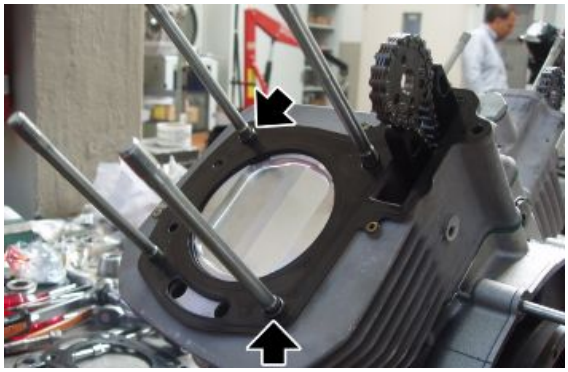
- Fit the movable chain slider.
- Fit the upper gear.
- Fit the chain tensioner cap temporarily and keep the chain taut on the service shaft.



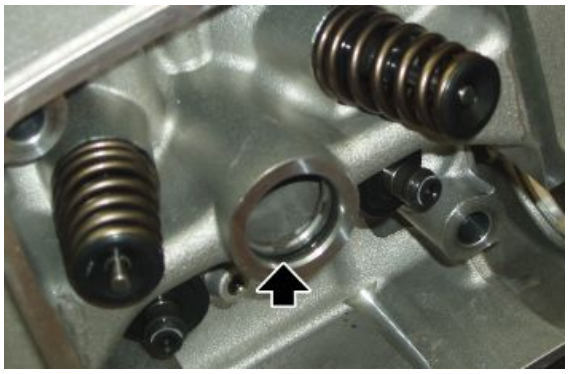
Installing the cylinder head

- Fit the valves in the head, if previously removed.
- Take the left cylinder piston to TDC and lock crankshaft rotation.
- Determine the thickness of the gasket to be fitted between the head and the cylinder as described in the section: Shimming system.

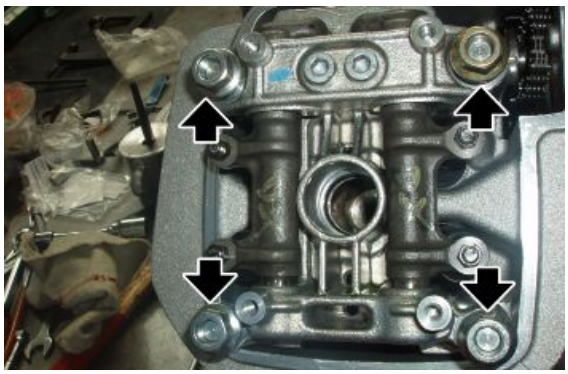
- Place the two dowel pins.
- Fit the gasket with the correct thickness between the head and the cylinder.
- Fit the left cylinder head.



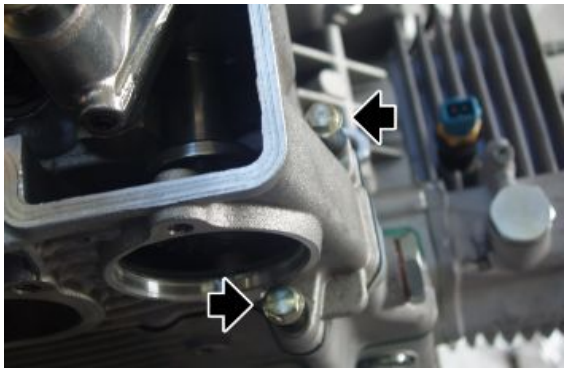
- Fit a new O-ring in the spark plug hole.
- Fit the complete cam cap.



- Fix the cam cap with the four nuts on the stud bolts.



- Fix the head with the two screws.
- Tighten nuts and screws to the prescribed torque operating diagonally and in stages.
- Loosen the valve set screws.



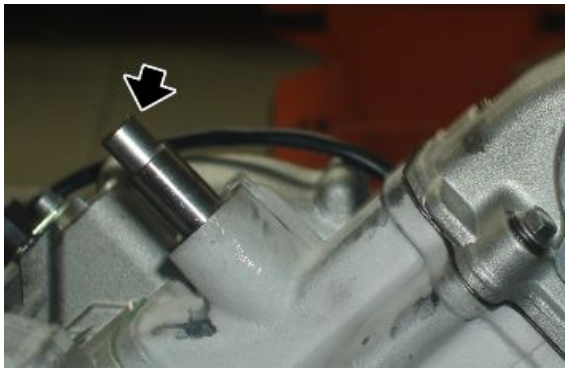
- Using a thin screwdriver relief oil pressure from the left cylinder chain tensioner.

- Screw two screws in the threaded holes of the timing system upper gear.
- Rotate the camshaft so that its pin is aimed towards the hole in the timing system chain.
- Place the gear in the chain.
- On the left camshaft pin, fit the hole marked with the letter "L" of the timing system gear.

- Block the left chain tensioner hole with screw and washer.
- Rotate the crankshaft by 90°so that the right cylinder piston reaches the TDC; lock crankshaft rotation.
- Also determine the thickness of the gasket for the right cylinder, to be fitted between the head and the cylinder as described in the section: Shimming system.
- Place the two dowel pins.

- Fit the gasket with the correct thickness between the head and the cylinder.
- Fit the right cylinder head.

- Unscrew and remove the right chain tensioner cap.



- Screw two screws in the threaded holes of the timing system upper gear.
- Rotate the camshaft so that its pin is aimed towards the hole in the timing system chain.
- Place the gear in the chain.
- On the right camshaft pin, fit the hole marked with the letter "R" of the timing system gear.

- Screw the cap of the right chain tensioner.
- Undo and remove the screws used to place the gear on the camshaft.
- Place the bulkhead and align the holes with the timing system gear.
- Fix the bulkhead on the timing system gear using a screw with Loctite on the thread.
- Tighten the screw to the prescribed torque.
- Also place the bulkhead of the other head.

- Place the cap.
- Tighten the two screws to the prescribed torque.
- Also place the cap of the other head.
- Adjust valve clearance.

See also

Checking the valve clearance

Installing the head cover

- Replace the gasket and install the head cover.

- Place the plastic half-cover.
- Replace the four rubber rings.
- Tighten the four screws to the prescribed torque.

- Place the spark plug tube.

Crankcase - crankshaft

Removing the crankshaft

- Remove the clutch.
- Remove the tone wheel and the oil pump gear.
- Working from the generator side, unscrew and remove the nut.
- Remove both gears.

- Remove the connecting rods.

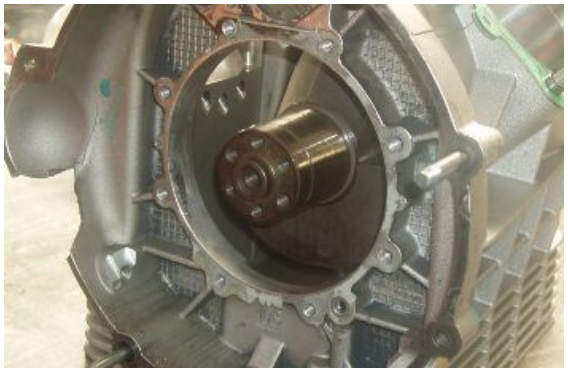
- Undo and remove the eight fixing screws and collect the washers.

- Hold the crankshaft during flange removal.
- Using the suitable special tool, remove the crankshaft flange.
- Remove the sealing ring from the flange, if necessary.

Specific tooling

12.91.36.00 Tool to remove the flywheel-side flange

- Remove the crankshaft afterwards.



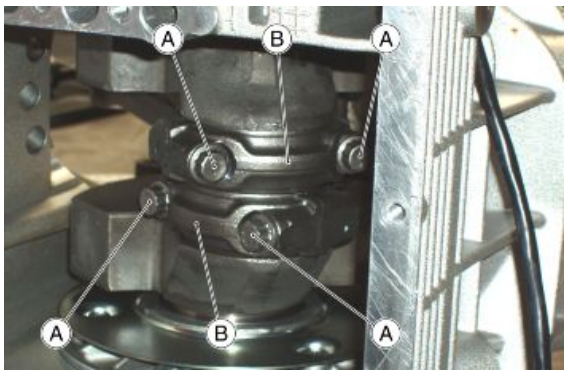
- Collect the shim washer from inside the crankcase.

See also

Disassembling the clutch
Removing the phonic wheel

Disassembling the connecting rod

- Remove both heads.
- Remove the cylinders and the pistons.
- Remove the oil sump.
- Undo the coupling screws (A) inside the crankcase and remove the connecting rods (B).



See also

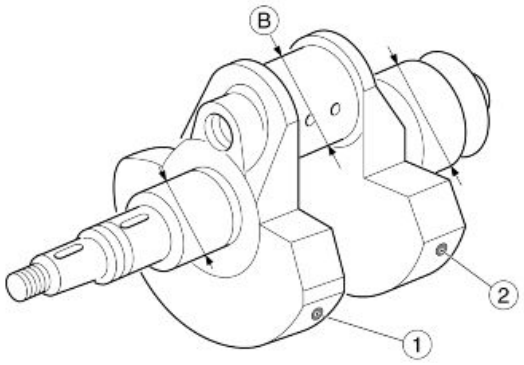
Removing the flywheel
Disassembling the piston
Removing the cylinder
Removing the cylinder head

Inspecting the crankshaft components

Check the surfaces of the main journals; if they are scored or oval-shaped, reface them (observing the undersize charts), and replace the main bushing/s.

Reference (1) indicates the position where the coloured reference is applied to select diameter (B).

Reference (2) indicates the position where the coloured reference is applied to select balancing.



CRANKSHAFT SEAT (TIMING SYSTEM SIDE)

Specification	Desc./Quantity
Diameter of crankshaft main journal, timing system side	37.975 - 37.959 mm (1.49507 - 1.49444 in)
Inside diameter of crankshaft bushing, timing system side	38.016 - 38.0 mm (1.49669 - 1.49606 in)
Clearance between bushing and main journal (timing system side)	0.025 - 0.057 mm (0.00098 - 0.00224 in)

CRANKSHAFT SEAT (CLUTCH SIDE)

Specification	Desc./Quantity
Diameter of crankshaft main journal, clutch side	53.97 - 53.961 mm (2.12480 - 2.12444 in)
Inside diameter of crankshaft bushing on clutch-side flange	54.019 - 54.0 mm (2.12673 - 2.12598 in)
Clearance between bushing and main journal (clutch side)	0.030 - 0.058 mm (0.00118 - 0.00228 in)

CRANKPIN DIAMETER (B)

Specification	Desc./Quantity
'Blue' bushing half-shell regular production	44.008 ÷ 44.014 mm (1.73259 ÷ 1.73283 in)
'Red' bushing half-shell regular production	44.014 ÷ 44.020 mm (1.73283 ÷ 1.73307 in)

BALANCING SELECTION COLOURS (2)

Specification	Desc./Quantity
Crankshaft selection colour (2) brown	Type 1 to be used with brown connecting rods. Balance with a **1558 g (54.96 oz) +/- 0.25%** weight fitted on the crankpin (B). Maximum imbalance allowed for each shoulder: **2 g (0.07 oz)**.
Crankshaft selection colour (2) green	Type 2 to be used with green connecting rods. Balance with a **1575 g (55.56 oz) +/- 0.25%** weight fitted on the crankpin (B). Maximum imbalance allowed for each shoulder: **2 g (0.07 oz)**.
Crankshaft selection colour (2) black	Type 2 to be used with black connecting rods. Balance with a **1592 g (56.16 oz) +/- 0.25%** weight fitted on the crankpin (B). Maximum imbalance allowed for each shoulder: **2 g (0.07 oz)**.

Checking the connecting rod

When examining the connecting rods, check that:

- Bushing conditions and bushings-pins clearance;
- Shaft parallelism;
- Connecting rod bearings.

These are thin shell bearings, anti-friction alloy that does not allow for any adaptation; replace them immediately if seizing or wear marks are found.

Upon replacing the bearings it may be necessary to ream the crankshaft pin.

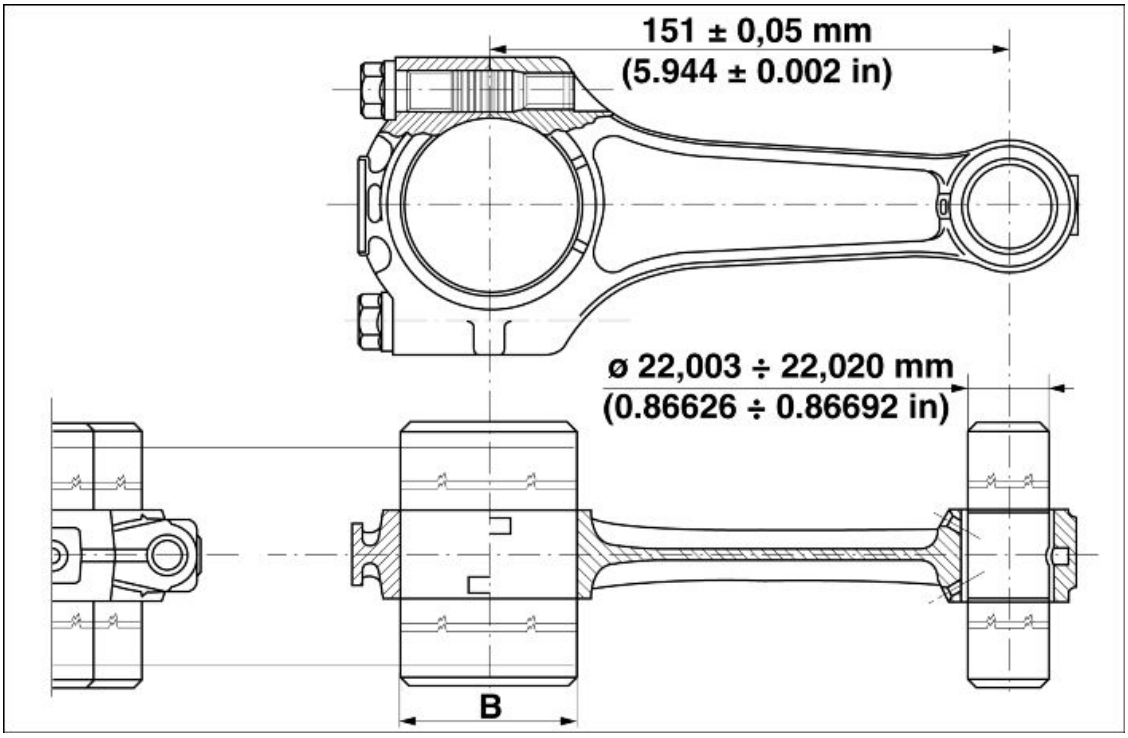
Before reaming the crankpin, measure the pin diameter (B) comparing it with the maximum wear allowed, as indicated in the figure; this defines what kind of undersizing the bearing should have and to which diameter the pin (B) should be reamed.

Checking shaft parallelism

Check shafts for squaring before fitting them.

It is therefore necessary to check that the head holes and the rod small end are parallel and on the same plane.

The maximum parallelism and plane error of the two head shafts and connecting rod small end should be +/- 0.10 mm (0.00393 inch).



CONNECTING ROD BEARING THICKNESS

Specification	Desc./Quantity
Regular 'Blue' connecting rod bearing (production)	1.539 - 1.544 mm (0.06059 - 0.06079 in)
Regular 'Red' connecting rod bearing (production)	1.535 - 1.540 mm (0.06043 - 0.06063 in)

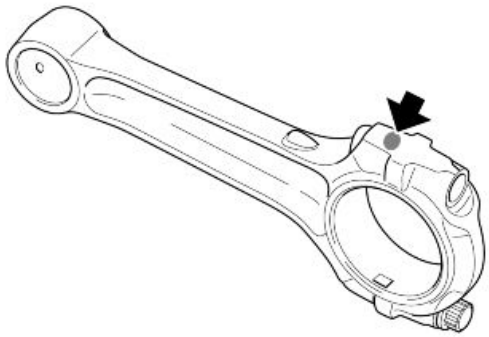
CRANKPIN DIAMETER (B)

Specification	Desc./Quantity
'Blue' bushing half-shell regular production	44.008 ÷ 44.014 mm (1.73259 ÷ 1.73283 in)
'Red' bushing half-shell regular production	44.014 ÷ 44.020 mm (1.73283 ÷ 1.73307 in)

PIN-BUSHING COUPLING DATA

Specification	Desc./Quantity
Fitted and machined bushing - inside Ø	22.003 - 22.020 mm (0.86626 - 0.86692 in)
Pin diameter	21.998 - 21.994 mm (0.86606 - 0.86590 in)
Clearance between pin and bushing	0.005 - 0.026 mm (0.000197 - 0.001024 in)

The connecting rods have a marked area for weight selection.
The weight indicated in the chart includes screws, dowels and the bushing.



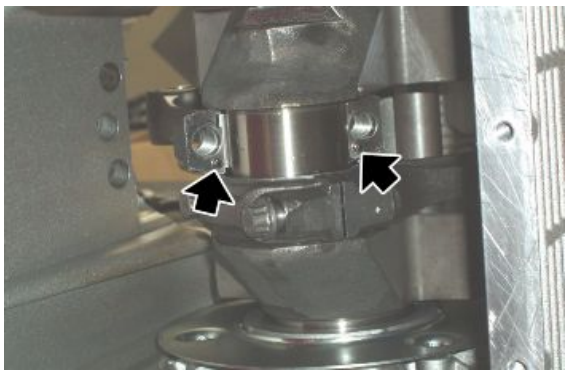
CONNECTING ROD WEIGHT SELECTION

Specification	Desc./Quantity
Connecting rod - brown	0.588 - 0.598 mm (0.02074 - 0.02109 in)
Connecting rod - green	0.598 - 0.608 mm (0.02109 - 0.02145 in)
Connecting rod - black	0.608 - 0.618 mm (0.02145 - 0.02180 in)

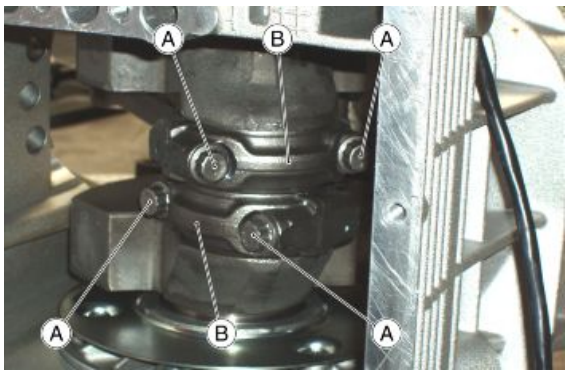
Assembling the connecting rod

- Lubricate the crankpin on which the connecting rods are to be fixed.
- If the connecting rods are not replaced, be careful not to interchange the right connecting rod with the left one and vice versa.

To place the connecting rods: the two pins must be facing the crankcase internal side.



- Place the connecting rods and the caps (B) on the crankshaft and fasten them with new screws (A).
- Remember these recommendations:



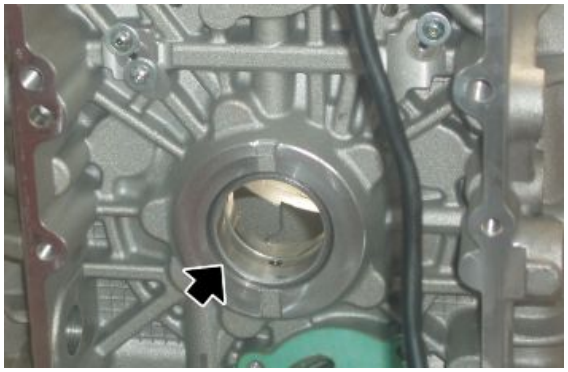
- The screws fixing the connecting rods to the crankshaft must be replaced with new ones at the following refitting as they are subject to high loads and stress;
- The fitting clearance between bearing and connecting rod pin is 0.028 mm (0.0011 inch) minimum and 0.052 mm (0.0020 inch) maximum;
- The clearance between the shim washers of the connecting rod and those of the crankshaft is comprised between 0.30 mm (0.01181 in) and 0.50 mm (0.01968 in);
- Lock the screws (A) on the caps (B) with a torque wrench at the prescribed torque.

PAY ATTENTION TO CRANKSHAFT ROTATION WHEN ONLY THE CONNECTING RODS ARE FITTED BECAUSE IT COULD HIT THE TWO LUBRICATION JETS INSIDE THE CRANKCASE.

Installing the crankshaft

- Fit the shim washer inside the crankcase with the chamfered side facing the generator side.

- Lubricate the crankshaft bushing on the crankcase, generator side.



- Use the sealing ring fitting tool on the flywheel-side flange to fit the sealing ring on the flange.

Specific tooling

19.92.71.00 Tool to fit the seal ring on the flywheel-side flange

- Fit a new gasket between the crankcase and the crankshaft flange, flywheel side.

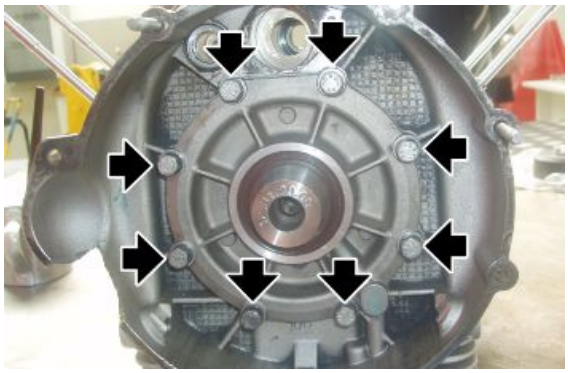
- Fit the crankshaft on the crankcase, flywheel side.
- Mark the crankshaft on the flywheel side with the crankpin facing upwards.
- Place the suitable sealing ring centring tool on the crankshaft.

Specific tooling

12.91.20.00 Tool to fit the flywheel-side flange together with seal ring on the crankshaft

- Place the flywheel-side flange on the crankshaft and check if the dowel pin with the O-ring is correctly placed.
- When fitting the flange on the crankcase, make sure that the three dowel pins match the seats on the crankcase.

- Apply Teflon tape on the two lower fixing screws at the back in order to prevent oil leaks.
- Screw the eight flange screws on the flywheel side proceeding diagonally.

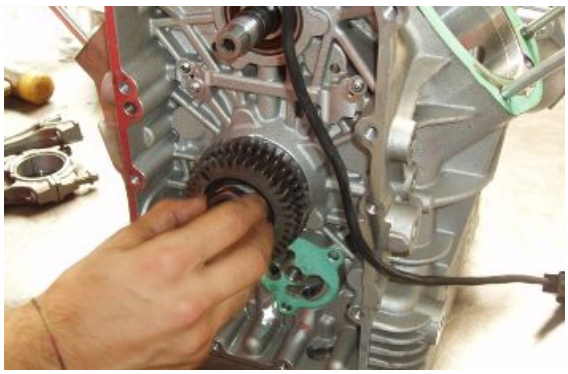


- Remove the sealing ring centring tool from the crankshaft.

Specific tooling

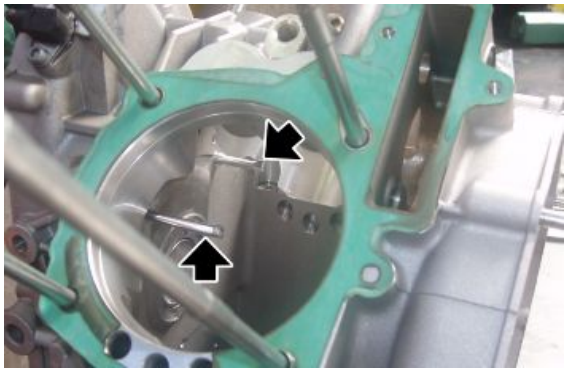
12.91.20.00 Tool to fit the flywheel-side flange together with seal ring on the crankshaft

- To avoid that the shim washer inside the crankcase moves out of its seat, fit the two gears and the nut on the crankshaft on the generator side.

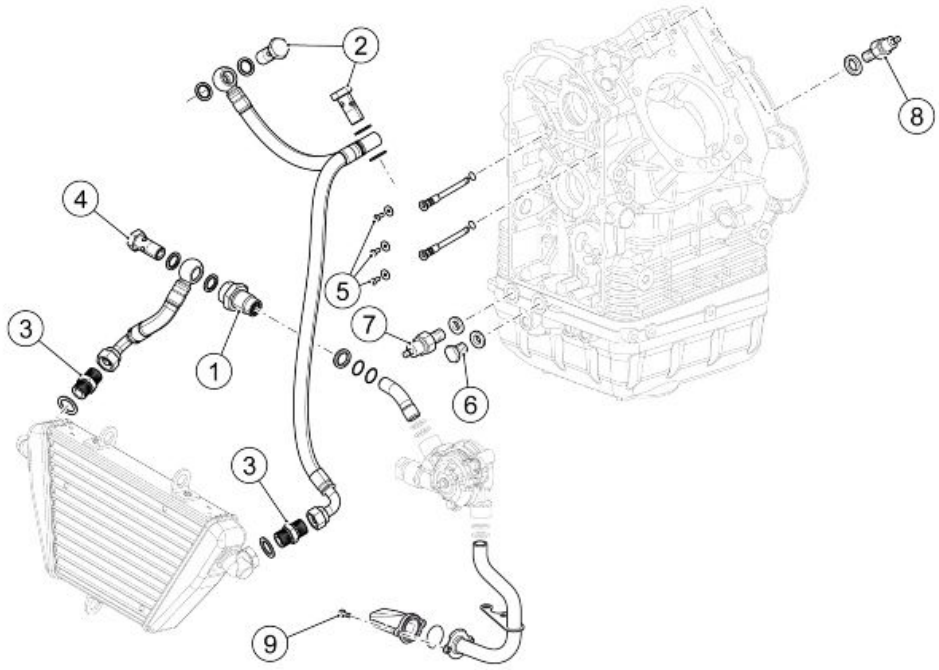


Refitting the crankcase halves

In case the lubrication jets are removed, replace them with two new of the same type. Check that the O-ring is fitted on the jets.
Do not interchange them upon refitting because they have a different length.

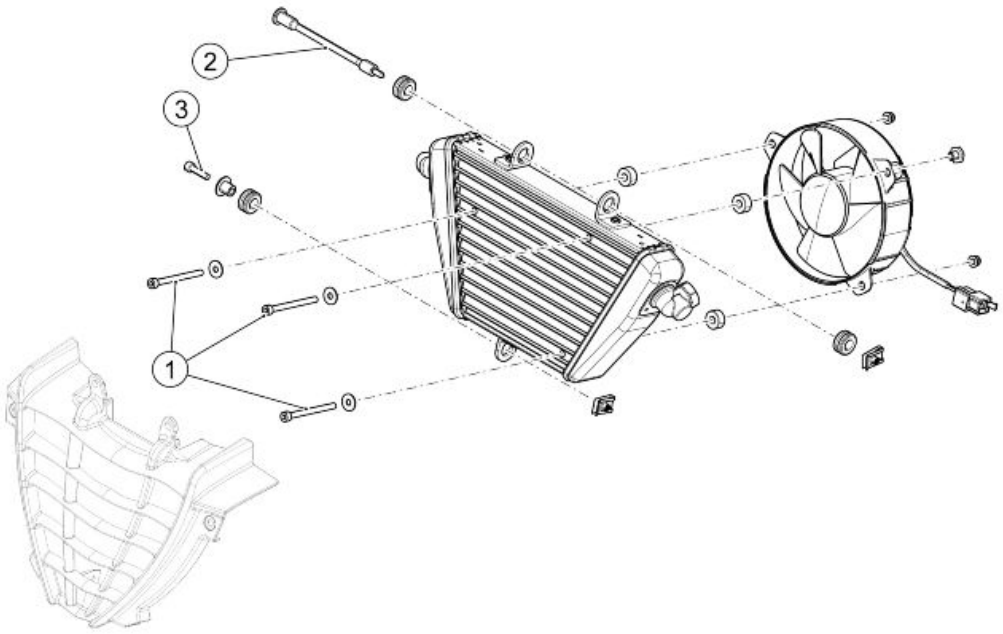


Lubrication



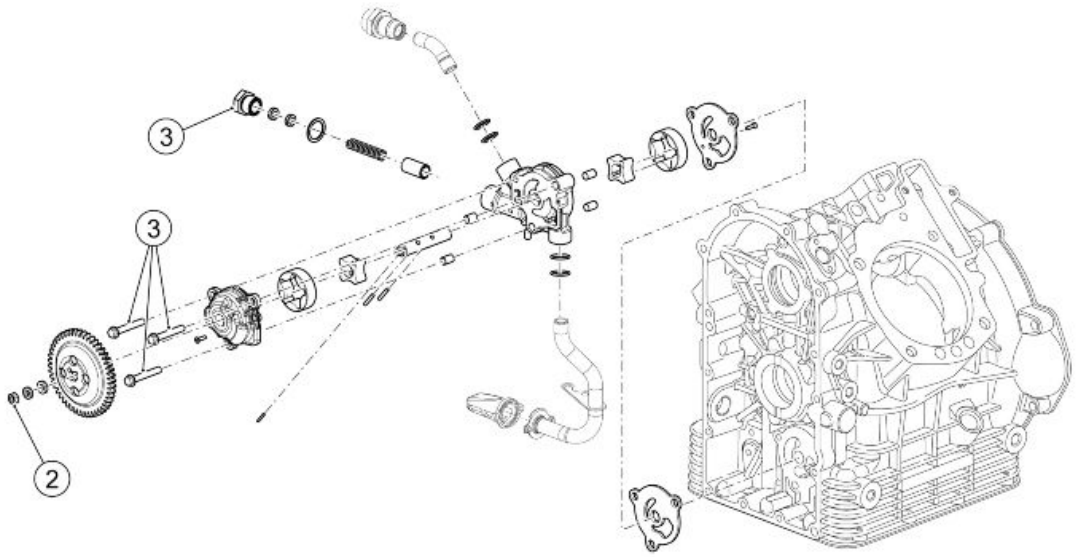
LUBRICATION SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Pump outlet oil pipe nipple	M14x1.5	1	40 Nm (29.50 lbf ft)	-
2	Slot screw for oil pipe on the cylinder head	M14x1.5	2	20 Nm (14.75 lbf ft)	-
3	Nipple on the radiator and the oil pipe	M16x1.5	2	20 Nm (14.75 lbf ft)	Apply vaseline oil
4	Oil delivery pipe to radiator slot screw	M14x1.5	1	35 Nm (25.81 lbf ft)	-
5	Jets fixing screw	-	3	Using a "T" spanner, close by hand	Loctite 243
6	Cover on the flange under the crankcase	-	1	20 Nm (14.75 lbf ft)	-
7	Thermal switch	-	1	20 Nm (14.75 lbf ft)	-
8	Minimum oil pressure sensor	M12	1	25 Nm (18.44 lbf ft)	-
9	Intake oil filter fixing screw	-	2	4 Nm (2.95 lbf ft)	-



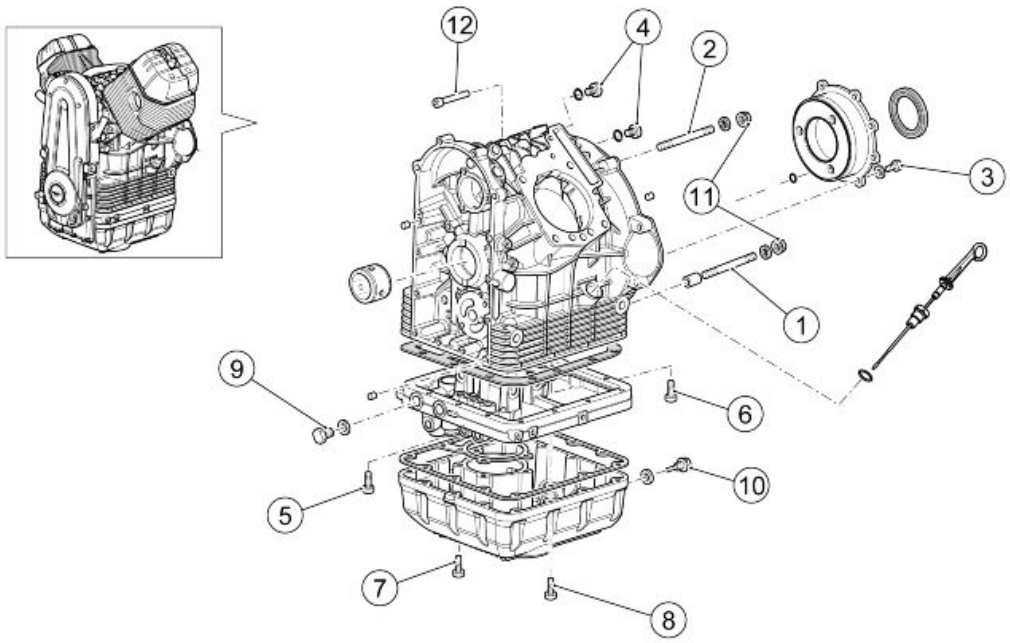
OIL RADIATOR

pos.	Description	Type	Quantity	Torque	Notes
1	Solenoid valve to radiator fixing screw	M5x60	3	4 Nm (2.95 lbf ft)	-
2	Radiator fixing pin on the grille	M5	1	4 Nm (2.95 lbf ft)	-
3	Radiator to grille fixing screw	M5	1	4 Nm (2.95 lbf ft)	-



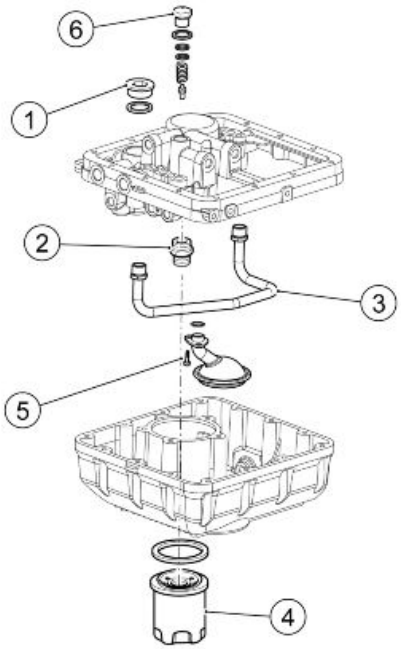
OIL PUMP

pos.	Description	Type	Quantity	Torque	Notes
1	Oil pump fixing screw	M6x45	3	10 Nm (7.37 lbf ft)	Loctite 243
2	Oil pump driven gear locking nut	M6	1	8 Nm (5.90 lbf ft)	Loctite 243
3	Oil pressure valve cap	-	1	40 Nm (29.50 lbf ft)	-



CRANKCASE AND OIL SUMP

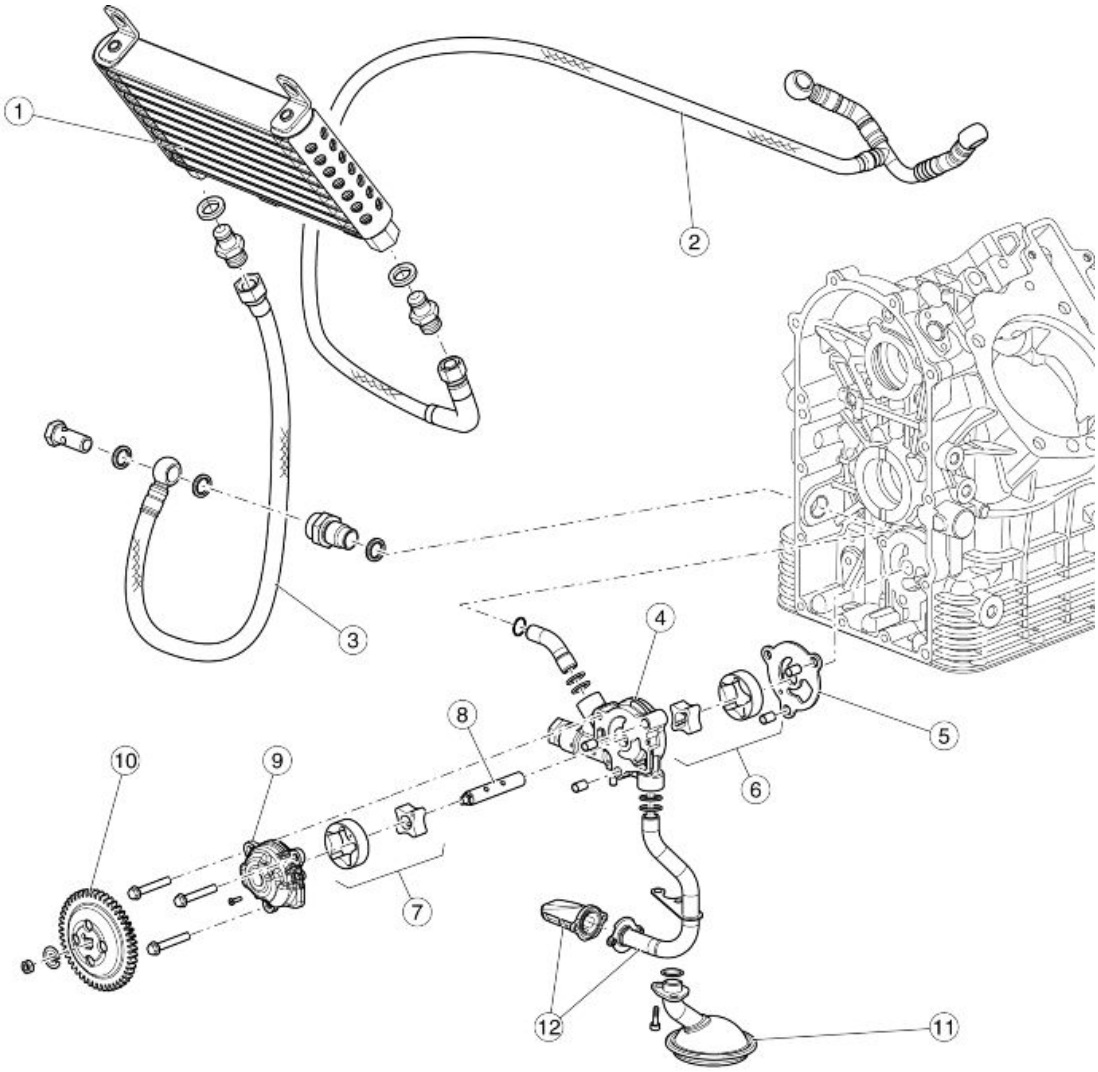
pos.	Description	Type	Quantity	Torque	Notes
1	Stud bolt	M8x75	2	10 Nm (7.37 lbf ft)	-
2	Stud bolt	M8x66	3	10 Nm (7.37 lbf ft)	-
3	Crankshaft rear support flange fixing screw	M8x25	8	26 Nm (19.18 lbf ft)	-
4	Oil cap on the crankcase	-	2	25 Nm (18.44 lbf ft)	-
5	Flange fixing screw under the crankcase	M6x60	2	10 Nm (7.37 lbf ft)	-
6	Flange fixing screw under the crankcase	-	2	10 Nm (7.37 lbf ft)	-
7	Oil sump fixing screw (filter contour)	M6x35	4	10 Nm (7.37 lbf ft)	-
8	Oil sump fixing screw	M6	14	10 Nm (7.37 lbf ft)	-
9	Cover on the flange under the crankcase	-	2	20 Nm (14.75 lbf ft)	-
10	Magnetic oil drainage cap	-	1	20 Nm (14.75 lbf ft)	-
11	Gear to engine fixing nut	M8	5	20 Nm (14.75 lbf ft)	-
12	Gear to engine fixing screw	-	1	20 Nm (14.75 lbf ft)	Loctite 542



OIL SUMP COMPONENTS

pos.	Description	Type	Quantity	Torque	Notes
1	Cover on the flange under the crankcase	-	1	40 Nm (29.50 lbf ft)	-
2	Oil filter joint	-	1	10 Nm (7.37 lbf ft)	Loctite 243
3	Oil sump pipe	-	1	20 Nm (14.75 lbf ft)	Loctite 648
4	Oil filter	-	1	15 Nm (11.06 lbf ft)	Engine oil
5	Rose pipe fixing screw	M6	-	10 Nm (7.37 lbf ft)	-
6	Maximum pressure valve cover	M18	1	40 Nm (29.50 lbf ft)	-

Conceptual diagrams



Key:

1. Oil cooling radiator
2. Oil delivery pipe to heads
3. Oil delivery pipe to radiator
4. Oil pump body
5. Oil pump gasket
6. Rotor for lubrication
7. Rotor for cooling
8. Rotor control shaft
9. Oil pump cover
10. Oil pump control gear
11. Lubrication oil intake filter
12. Cooling oil intake filter

The oil pump is operated by the gear (10) which receives the motion directly from the crankshaft. The gear (10) is mounted on the shaft (8), on which two rotors are fitted: one for engine cooling (7) and another for lubrication (6).

Cooling:

The rotor (7) takes in oil from the sump through the filter (12); the oil is sent to the radiator (1) through the hoses (3). Oil passes through the radiator (1) dispersing part of the heat and reaches the heads through the hoses (2). Oil goes down to the sump again and joins the oil used for lubrication.

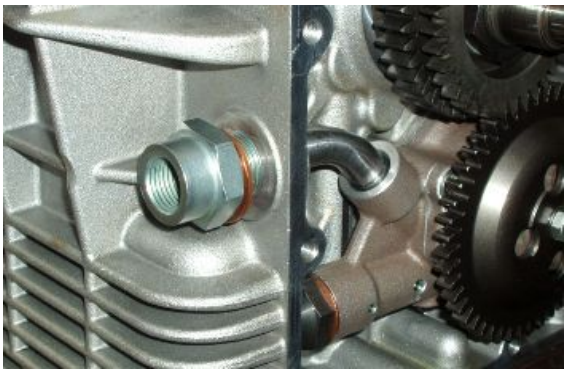
Lubrication:

The rotor (6) takes in oil from the sump through the filter (11); the oil is sent through special ducts in the crankcase to all the parts to be lubricated. Oil goes down to the sump again and joins the oil used for cooling.

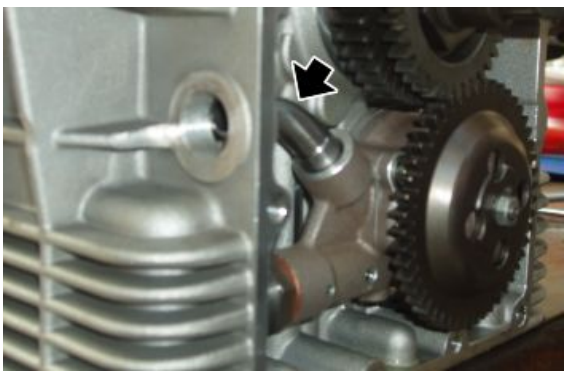
Oil pump

Removing

- Drain off the engine oil.
- Remove the generator and the timing system cover.
- Unscrew and remove the nipple.
- Collect the gasket.

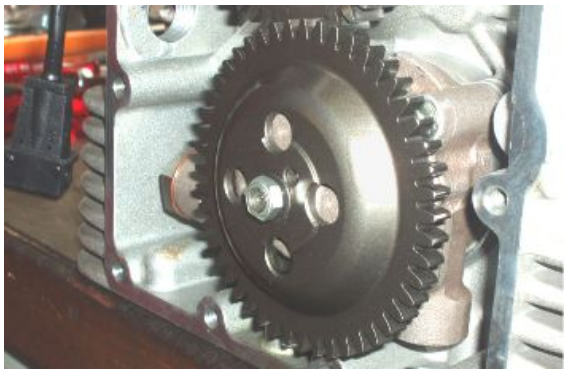


- Remove the nipple - oil pump fitting.



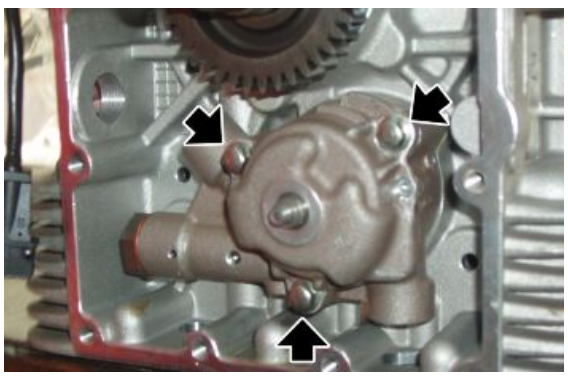
- Bring the left cylinder piston to the TDC in combustion phase.
- Mark a reference on the oil pump control gear and another on the driven gear so as to place them correctly again upon refitting.
- Unscrew and remove the nut on the crankshaft.
- Remove the oil pump control gear.
- Screw the nut again so that the internal shim washer does not fall in the crankshaft crankcase.

- Unscrew and remove the driven gear nut.
- Collect the washer.
- Remove the oil pump driven gear.

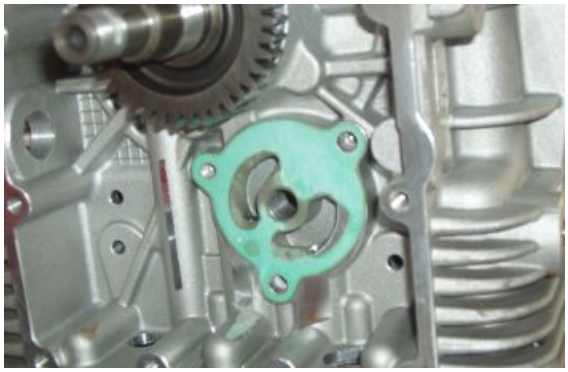


- Remove the driving pin.

- Undo and remove the three screws.
- Remove the oil pump.



- Remove the gasket between the crankcase and the oil pump.

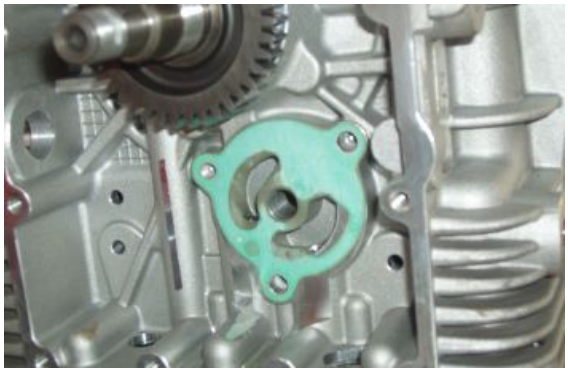


See also

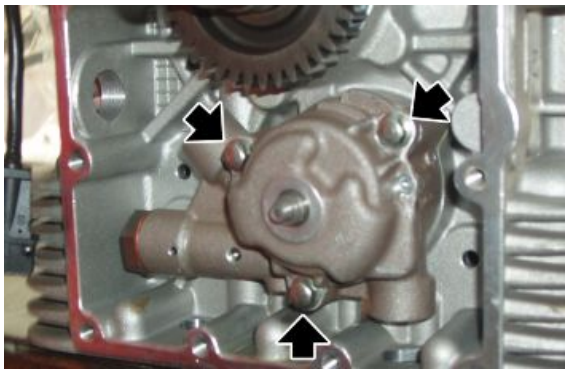
Removing the generator

Installing

- Place a new gasket between the crankcase and the oil pump.



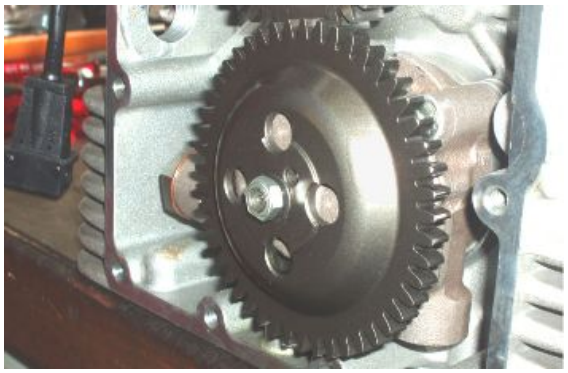
- Place the oil pump.
- Tighten the three screws fixing the oil pump.



- Place the driving pin on the oil pump shaft.

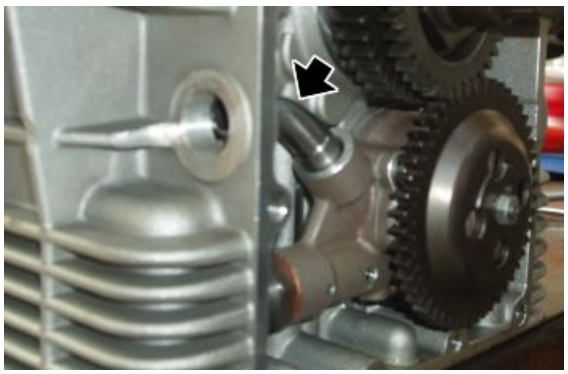
- Place the gear on the oil pump shaft.

- Place the washer on the oil pump shaft.
- Tighten the nut to the specified torque.

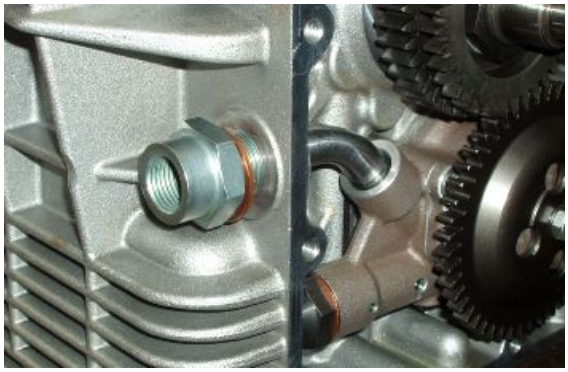


- Place the oil pump control gear on the crankshaft and align its reference with that marked during the removal phase on the oil pump driven gear.
- Tighten the nut to the specified torque.

- Insert the joint in the oil pump.



- Fit the nipple with the gasket on the crankcase.
- Tighten the nipple to the prescribed torque.



Removing the oil sump

NOTE

TO REMOVE THE OIL SUMP, PLACE A SUITABLE CONTAINER UNDER IT TO COLLECT THE USED OIL AND DRAIN OUT ALL OIL.

- If necessary, the filter can be removed with the suitable special tool.

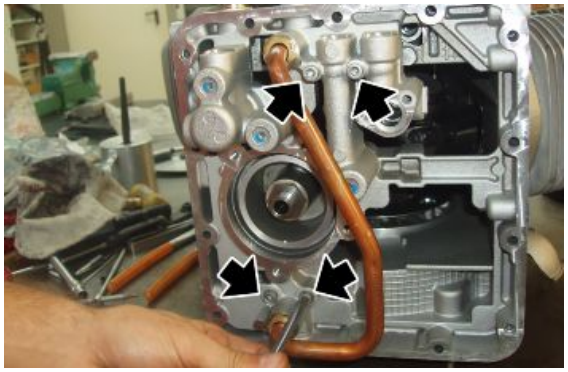
Specific tooling

01.92.91.00 Wrench for removing the cover on sump and filter

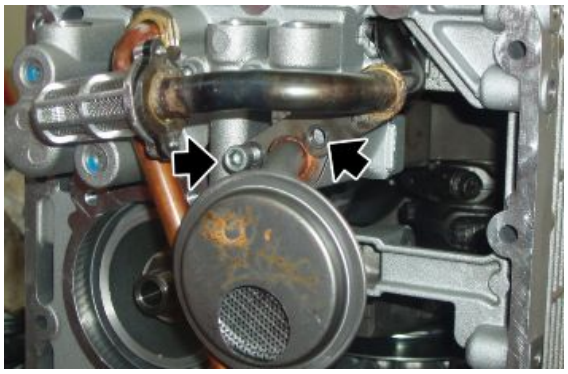
- Unscrew and remove the oil level plug and collect the O-Ring.

- Undo and remove the fourteen screws fixing the oil sump to the engine crank-case.

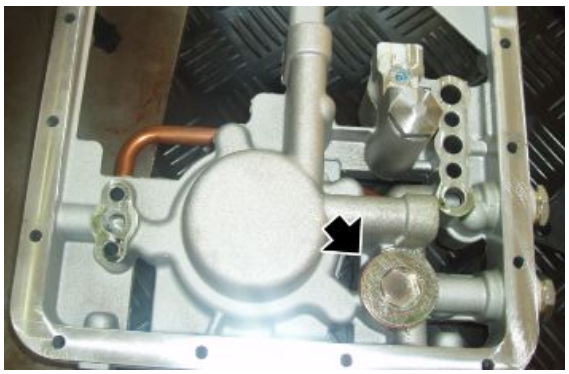
- Undo and remove the four screws.
- Remove the flange.



- Undo and remove the two screws.
- Remove both filters.

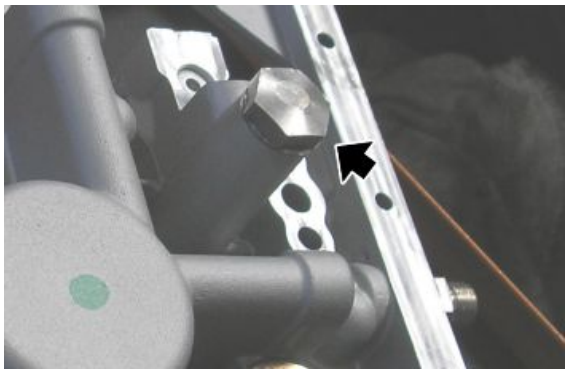


- Unscrew and remove the plug.



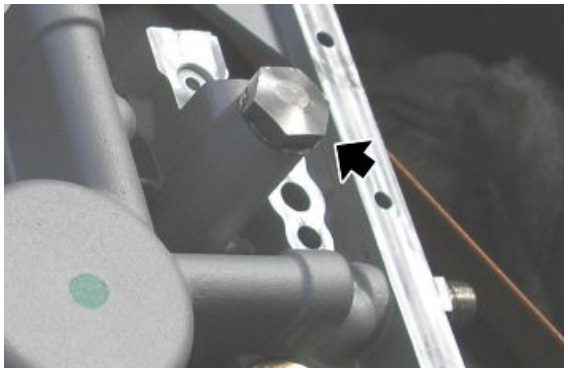
- Remove the thermostatic valve.

- Unscrew and remove the pressure relief valve plug.
- Remove the pressure relief valve components



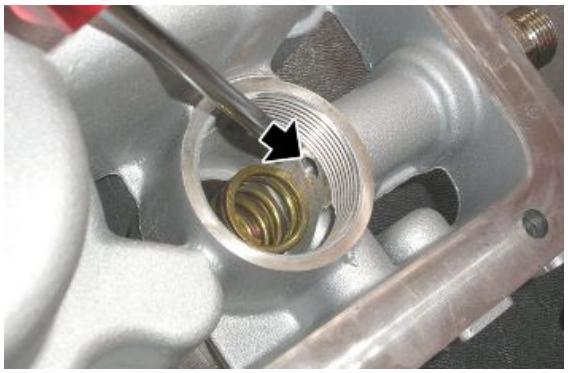
Refitting the oil sump

- Place the pressure relief valve components correctly.
- Screw the pressure relief valve plug.

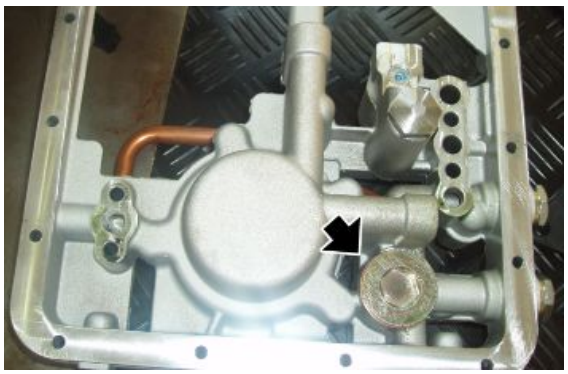


- Place the thermostatic valve.

CHECK THAT THE ENGINE OIL PASSAGE HOLE IS NOT CLOGGED.

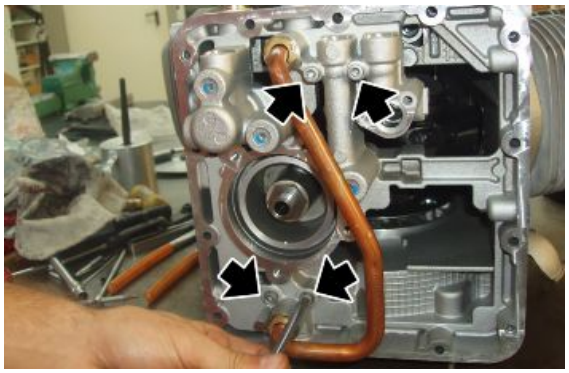


- Tighten the thermostatic valve plug.



- Place a new gasket between the crank-case and the flange.

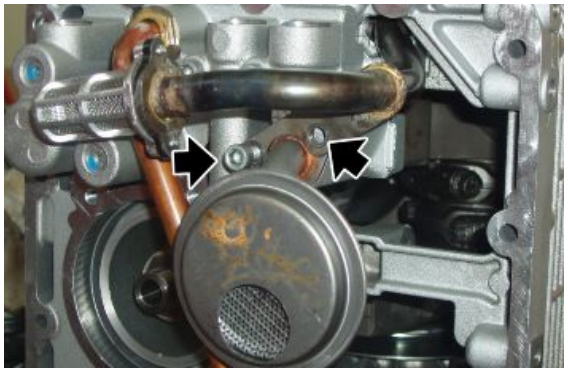
- Fit the flange.
- Fix the flange with the four screws.



- Fit the lubrication oil intake filter.

- Check that the O-rings are fitted on the oil pump.
- Fit the cooling oil intake filter.

- Fix both filters and tighten the two screws to the prescribed torque.

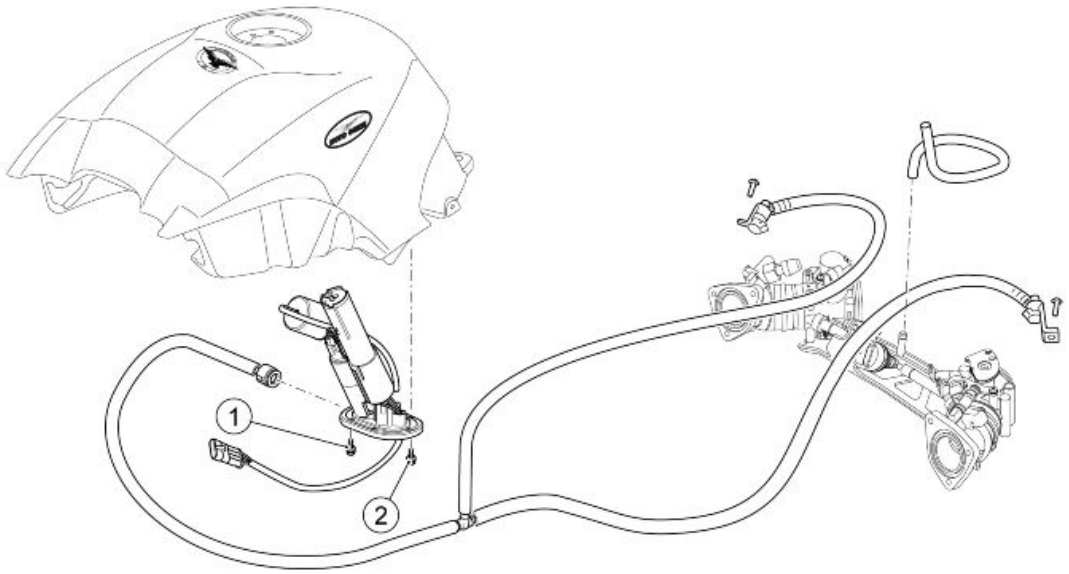


- Fit a new oil filter and tighten it to the prescribed torque.

- Place a new gasket between the flange and the sump.

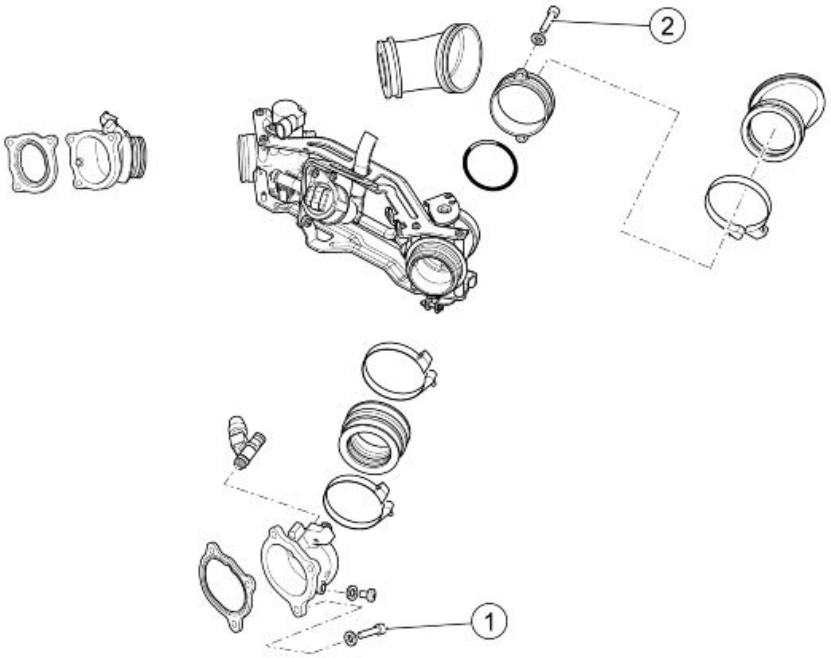
- Place the oil sump.
- Tighten the fourteen screws to the prescribed torque.
- Add engine oil up to the correct level.

INDEX OF TOPICS



FUEL SUPPLY SYSTEM

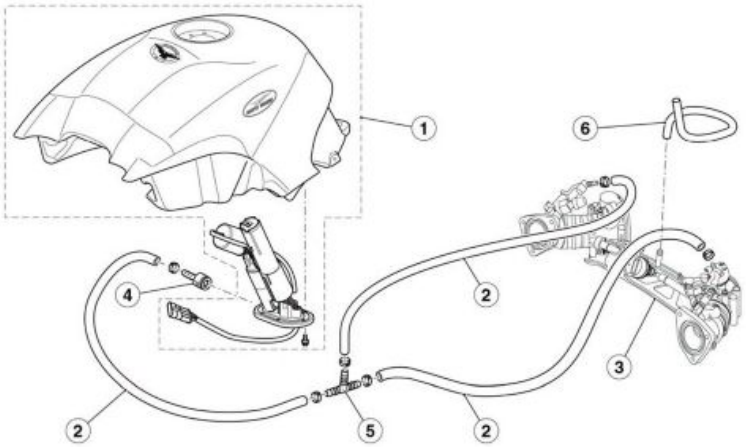
pos.	Description	Type	Quantity	Torque	Notes
1	Fuel pump support fixing screw to the tank	M5x20	2	5 Nm (3.68 lbf ft)	-
2	Fuel pump support fixing screw to the tank	M5x16	4	6 Nm (4.42 lbf ft)	-



THROTTLE BODY

pos.	Description	Type	Quantity	Torque	Notes
1	Intake pipe fixing screw	-	6	10 Nm (7.37 lbf ft)	-
2	Flange fixing screw on the throttle body	M5x12	2	6 Nm (4.42 lbf ft)	-

Circuit diagram

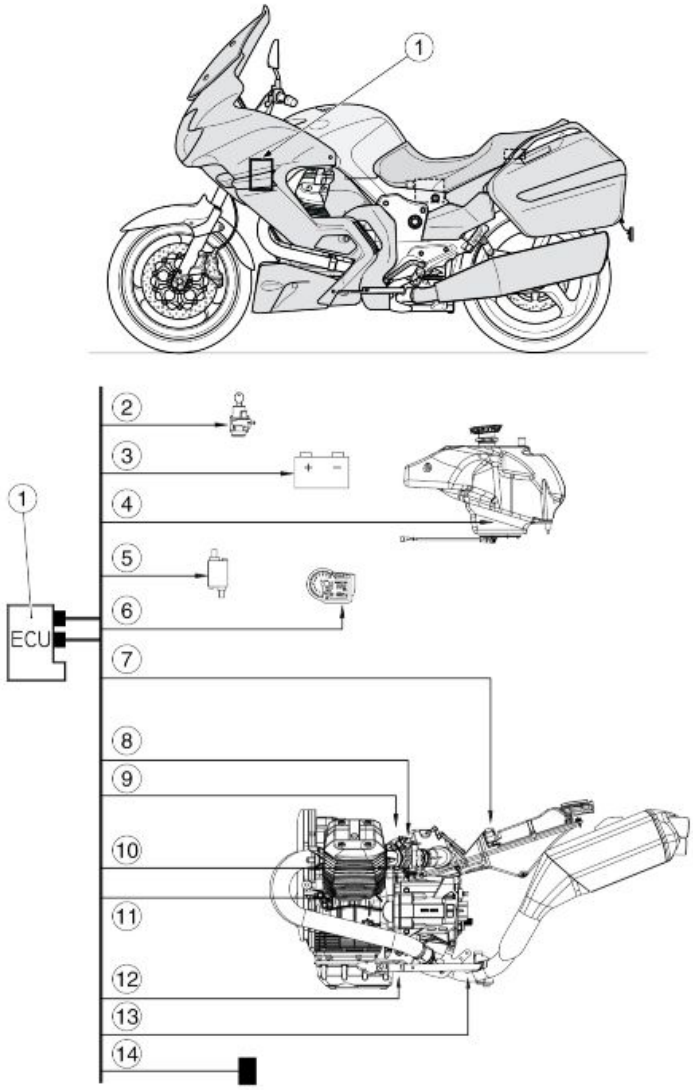


Key:

1. Full fuel tank
2. Fuel pipe
3. Throttle body
4. Joint
5. Three-way joint
6. Pipe

Injection

Diagram



Key:

1. Control unit
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. Engine temperature sensor
11. Crankshaft position sensor

12. Lambda probe
13. Side stand
14. Fall sensor

THROTTLE BODY PIPES LAYING

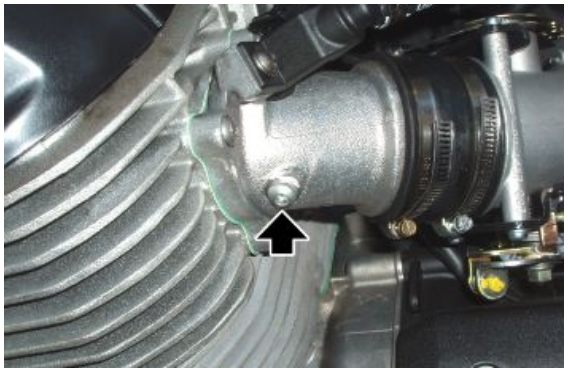
Pipes from the throttle body to the idle motor should be laid so that the shaped part is inserted in the air filter casing.

The shortest part of the fuel pipe connected to the throttle bodies should be placed on the right.

Cylinders synchronisation

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

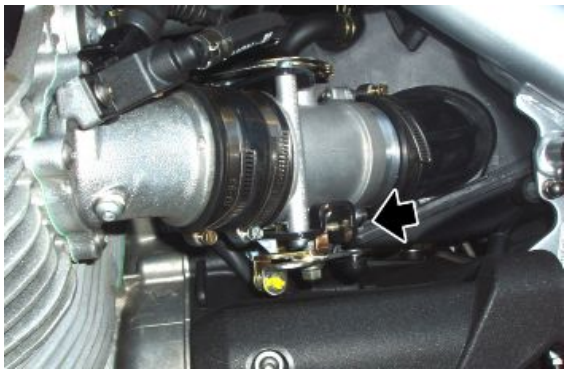
- Turn on the scanner.
- Screw the joints connecting the vacuometer pipes on the inlet pipe holes.
- Connect the vacuometer pipes to the relative joints.
- Set the key to ON.
- Make sure there are no errors in the control unit; otherwise, solve them and repeat the procedure.



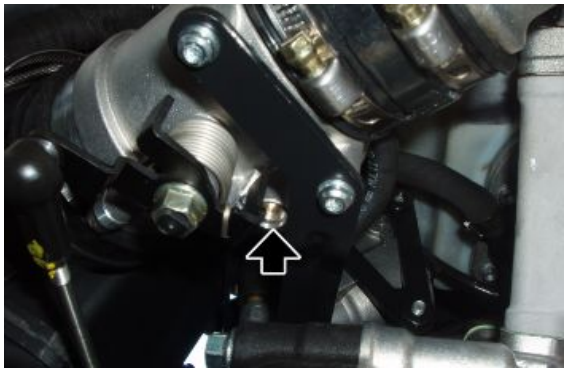
- Make sure the left throttle is fully in.

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

- Position the instrument on the "adjustments" screen page.
- Autodetect the throttle position.



- Turn the key to "OFF" and leave it for at least 30 seconds.
- Turn the key back to "ON" and restore the instrument session.
- Check that the "Throttle" value reading is 4.7 +/- 0.2°. If the value is incorrect, replace the control unit and repeat the procedure from the start.
- Completely close the two by-pass screws on the throttle bodies.
- Start the engine.
- Take the engine to the prescribed temperature: 60 °C (140 °F).
- Make the engine rev at 2000/3000 rpm and with the vacuometer check that the



difference between the two pressures is 1 cm Hg (1.33 kPa) maximum.

If this condition is detected:

- take the engine back to idle and check the depression values so that they are aligned between the two cylinders. Otherwise, open only the screw with higher depression, using the by-pass screws, to compensate.

If there is a larger difference:

- act on the set screw of the throttle body connecting rod to reduce the pressure difference in the two pipes.
- Repeat the procedure "Throttle position self-acquisition" as explained above.
- Take the engine back to idle and check the depression values so that they are aligned between the two cylinders.
- Otherwise, open only the screw with higher depression, using the by-pass screws, to compensate.

Recovery function

If the signal of the following sensors is interrupted, the control unit determines some values to keep the engine running or it uses a different parameter. The instrument panel and the Navigator also signal the problem.

RECOVERY FUNCTION

Specification	Desc./Quantity
air temperature	25 °C (77 °F)
engine temperature	30 °C (86 °F) with linear increase from the air temperature at ignition
barometric pressure	1010 hPa
throttle valve potentiometer	2.9° at idle, otherwise variable.
idle motor	fixed value variable depending on the vehicle

Using Navigator for injection system

Injection system

ECU INFO screen page

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

INFO ECU SCREEN PAGE

Specification	Desc./Quantity
Mapping	-

PARAMETERS screen page

This screen page 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.)

PARAMETERS SCREEN PAGE

Specification	Desc./Quantity
Engine rpm	Engine revolutions per minute: the minimum value is set by the control unit cannot be adjusted
Injection time	- ms
Ignition advance	- °
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
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.
Atmospheric pressure	1015 mPa (approximate values) The sensor is inside the instrument panel
Lambda probe	100 - 900 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 'Statuses' screen page) this value should be close to 0%.
Vehicle speed	- km/h
Target engine revs	1150 rpm (approximate values) Parameter valid at idle, setting depends especially on the engine temperature: the control unit will try to keep the engine running at this revs, acting on the ignition advance and the Stepper motor
Stepper base	70 - 100 (approximate values) Steps corresponding to the Stepper motor reference position
CL Stepper	70 - 150 (approximate values) Steps set by the control unit for the Stepper motor. At idle, steps so that the engine keeps the target engine revs set by the control unit
Stepper regulator	Difference between current steps of motor at idle and those at the reference position
Virtual throttle angle from Stepper	0° With engine not at idle speed, this value indicates the throttle degrees corresponding to the Stepper motor air flow

STATUS screen page

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).

STATUSES

Specification	Desc./Quantity
Engine status	ON/run/power-latch/stopped operation conditions
Throttle position	Released / pressed indicates if the throttle potentiometer is open or closed
Stand	Retracted / extended indicates the position of the side stand (only with gear engaged)
Ignition	Enabled / disabled indicates if the control unit consents engine start-up
RUN / STOP switch	Run / stop indicates the position of the safety switch
Clutch	No / Yes indicates the clutch sensor status
Gear engaged	No / Yes indicates the gear sensor status
fall sensor	Normal / Tip over indicates the vehicle fall sensor status
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
Synchronisation	Synchronised / Not synchronised Indicates if the control unit detects the revolution sensor signal correctly

ACTIVATION screen page

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

ACTIVATION

Specification	Desc./Quantity
Left coil	operation for 2.5 m, 5 times
Right coil	operation for 2.5 m, 5 times
Left injector	Operation for 4 m, 5 times
Right injector	Operation for 4 m, 5 times
Error clearing	By pressing the 'enter' button, the stored errors (MEM) become part of the historical data (STO). In the next connection between the Navigator and the control unit, the historical errors (STO) are no longer shown
Fuel pump	Operation for 30"
Stepper control	<span style="FONT-SIZE: 12pt; FONT-FAMILY: "Times New Roman"; mso-fareast-font-family: "Times New Roman"; mso-ansi-language: IT; mso-fareast-language: IT; mso-bidi-language: AR-SA">For 4" advancement command of 32 steps, for the next 4" retrocession command of 32 steps and so on for 30"

ERRORS screen page

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

ERRORS

Specification	Desc./Quantity
Pressure sensor	Possible short circuit in the earth lead, battery or open circuit: recovery function noticeable for customer. Careful with the air pressure sensor in the instrument panel
Air temperature	Possible short circuit in the earth lead, battery or open circuit: recovery function hardly noticeable for customer.
Engine temperature	Possible short circuit in the earth lead, battery or open circuit: recovery function.
Throttle actuator position sensor	Possible short circuit in the earth lead, battery or open circuit: recovery function noticeable for customer.

Specification	Desc./Quantity
Lambda probe	Possible short circuit on the earth lead, battery or open circuit or plausibility: recovery function hardly noticeable for customer.
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
Fuel pump relay	Possible short circuit in the earth lead, battery or open circuit: the engine does not start.
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.
Idle regulator	Possible short circuit in the earth lead, battery or open circuit: recovery function noticeable for the customer due to no idle management
Battery voltage	Battery voltage detected is too low (7V) or too high (16V) for a certain period
Starter diagnosis	Possible short circuit in the earth lead, battery or open circuit.
Engine revolution sensor	Possible open circuit.
Lambda heater	Possible short circuit in the earth lead, battery or lambda probe heating circuit open.
SPEED SENSOR	
CAN line diagnosis	<span style="FONT-SIZE: 12pt; FONT-FAMILY: "Times New Roman"; mso-fareast-font-family: "Times New Roman"; mso-ansi-language: IT; mso-fareast-language: IT; mso-bidi-language: AR-SA">Possible error on line CAN: short circuit or line break or no signal or plausibility error detected.
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
Microprocessor	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

SETTINGS screen page

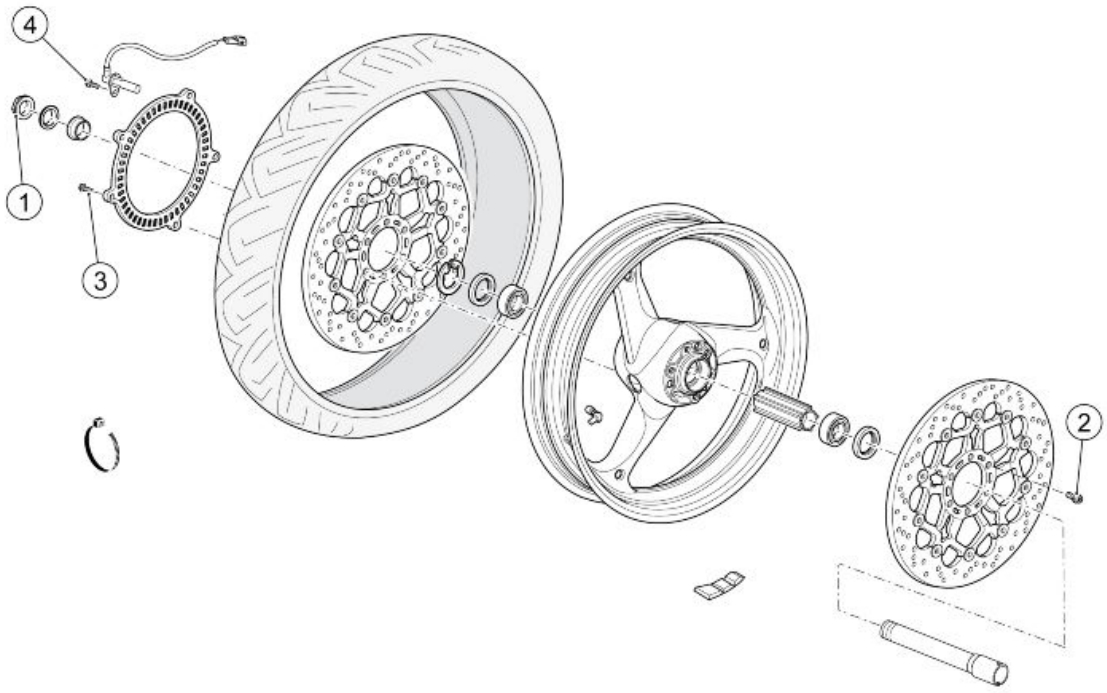
This screen page is used to adjust some control unit parameters.

ADJUSTMENTS

Specification	Desc./Quantity
Throttle positioner autodetection	Allows the control unit to detect the closed throttle position: just press the enter button

INDEX OF TOPICS

Front

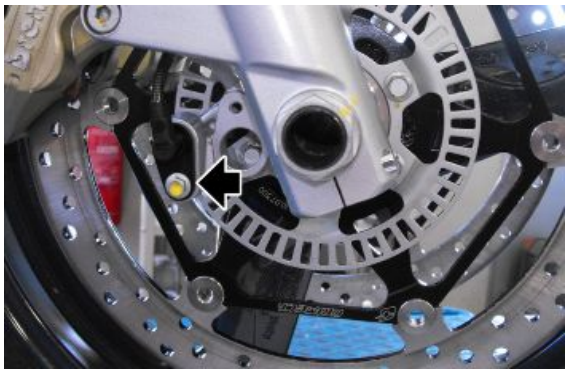


FRONT WHEEL

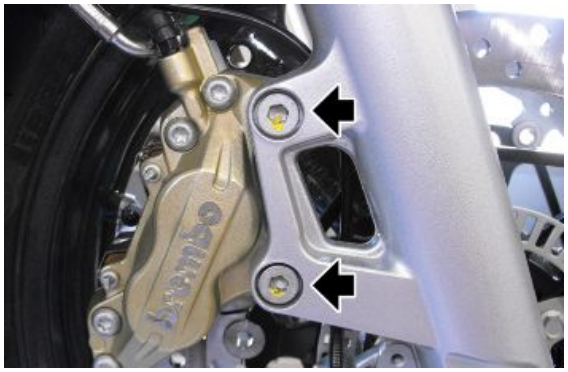
pos.	Description	Type	Quantity	Torque	Notes
1	Front wheel spindle nut	M25	1	80 Nm (59.00 lbf ft)	-
2	Front brake disc fixing screw	M8x20	12	25 Nm (18.44 lbf ft)	Loctite 243
3	Front tone wheel fixing screw	-	5	4 Nm (2.95 lbf ft)	Loctite 243
4	Front ABS sensor fixing screw	M6	1	10 Nm (7.37 lbf ft)	-

Removing the front wheel

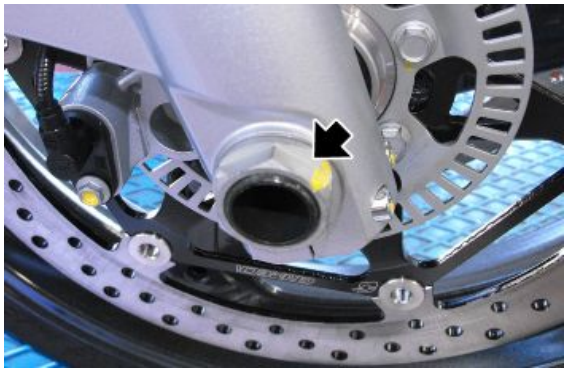
- Unscrew the speed sensor screw, release the cable harness from the clamps.
- Remove the speed sensor.



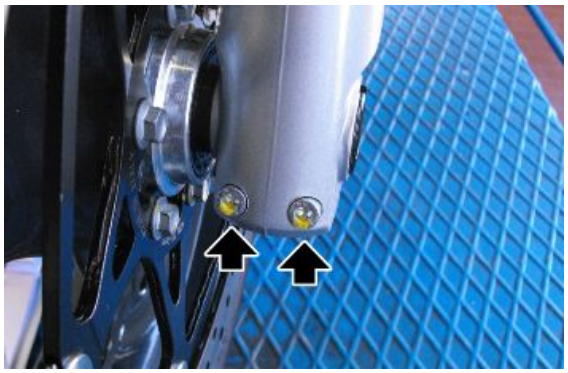
- Unscrew the screws fixing the front brake callipers and remove them from their seat.



- Support the front part of the vehicle.
- Remove the nut fixing the wheel pin.
- Collect the sealing washer.

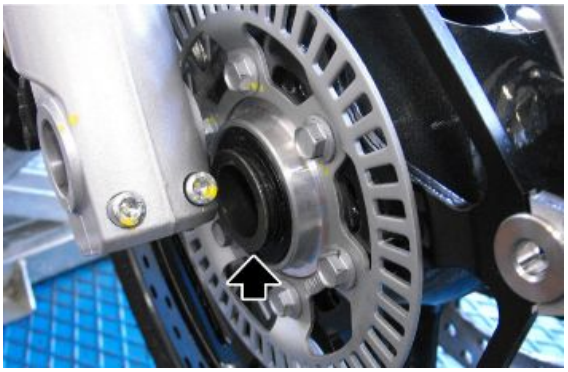


- Loosen the screws on the wheel pin terminals.



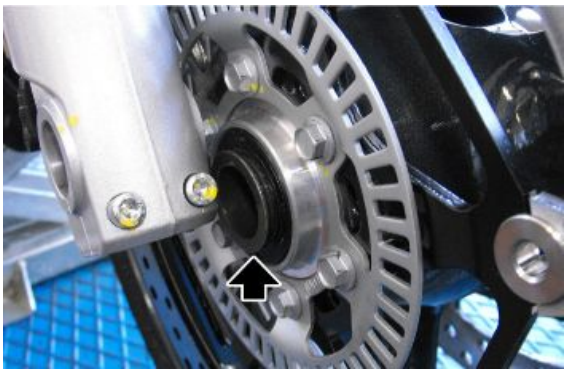
- Remove the wheel pin by inserting a screwdriver in the holes on the pin.

- During extraction, support the wheel and then remove it.
- Collect the spacer from the front wheel right side.



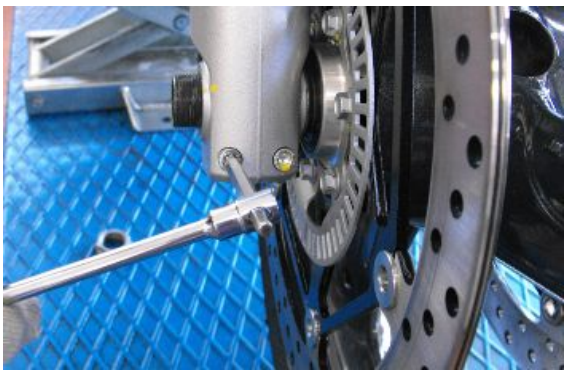
Installing the front wheel

- Position the wheel together with the right side spacer.

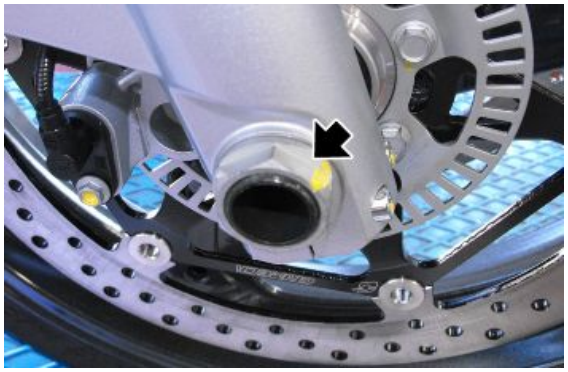


- Insert the pin

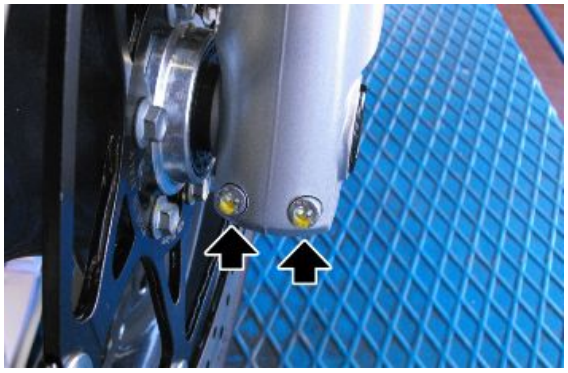
- Screw the screws of the clamp (nut side) to lock the rotation of the wheel axle.



- Insert the sealing washer onto the wheel axle.
- Tighten the wheel axle fixing nut to the specified torque
- Make sure that the stanchions are aligned by working with the fork.



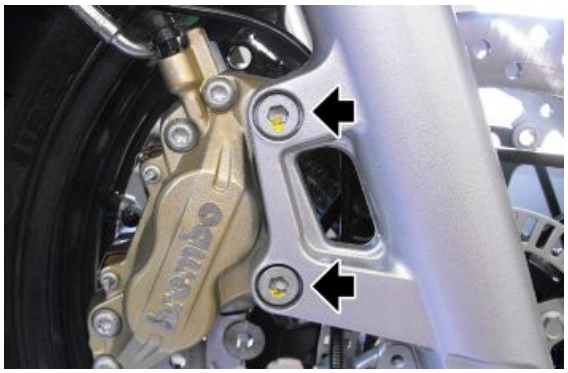
• Tighten the terminal screws that lock the wheel pin to the prescribed torque.



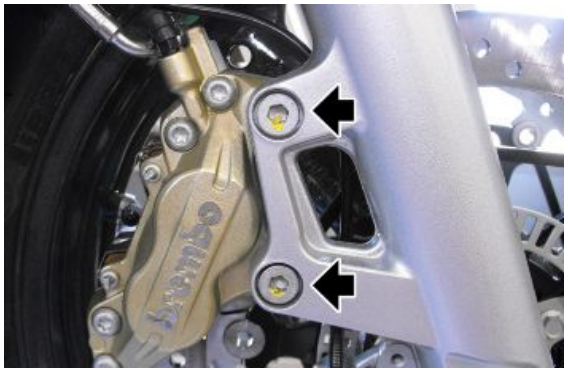
- Fit the brake callipers tightening the fixing screws to the prescribed torque.

CAUTION

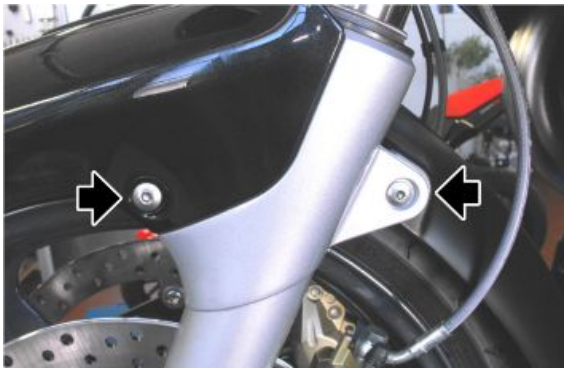
AFTER FITTING THE BRAKE CALLIPERS, OPERATE THE FRONT BRAKE LEVER SEVERAL TIMES



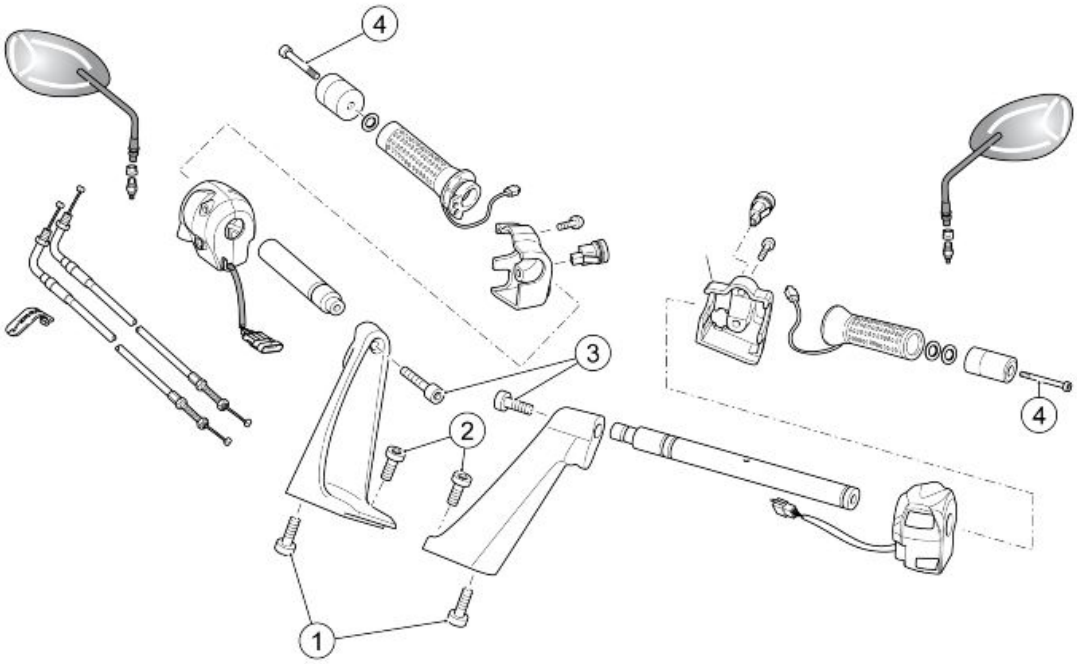
- Fit the speed sensor.
- Tighten the speed sensor screw.
- Secure the speed sensor cable harness with clamps.



- Fit the front mud guard.



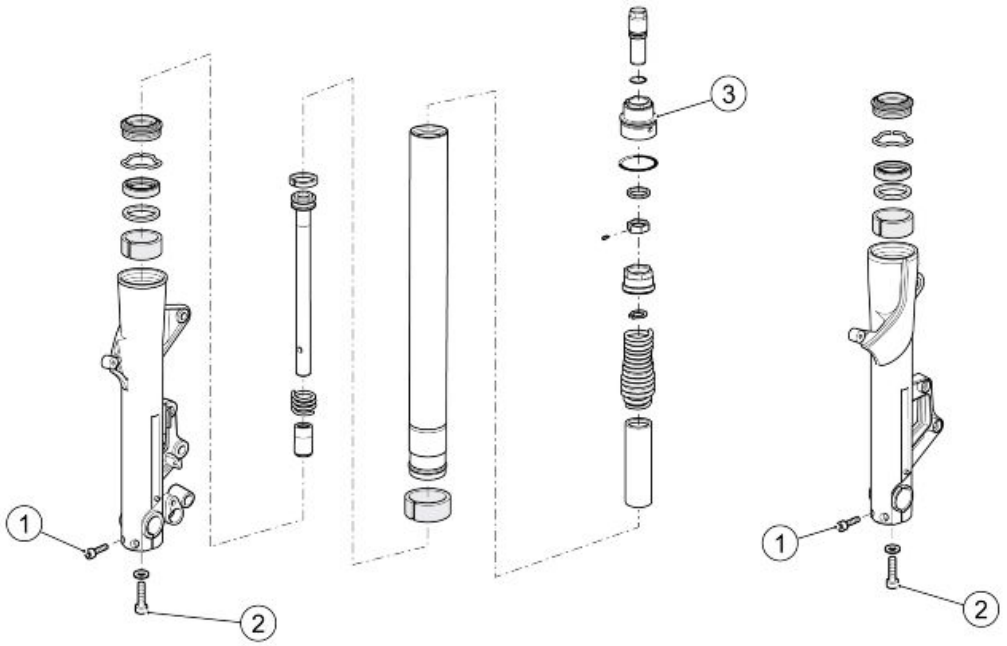
Handlebar



HANDLEBAR AND CONTROLS

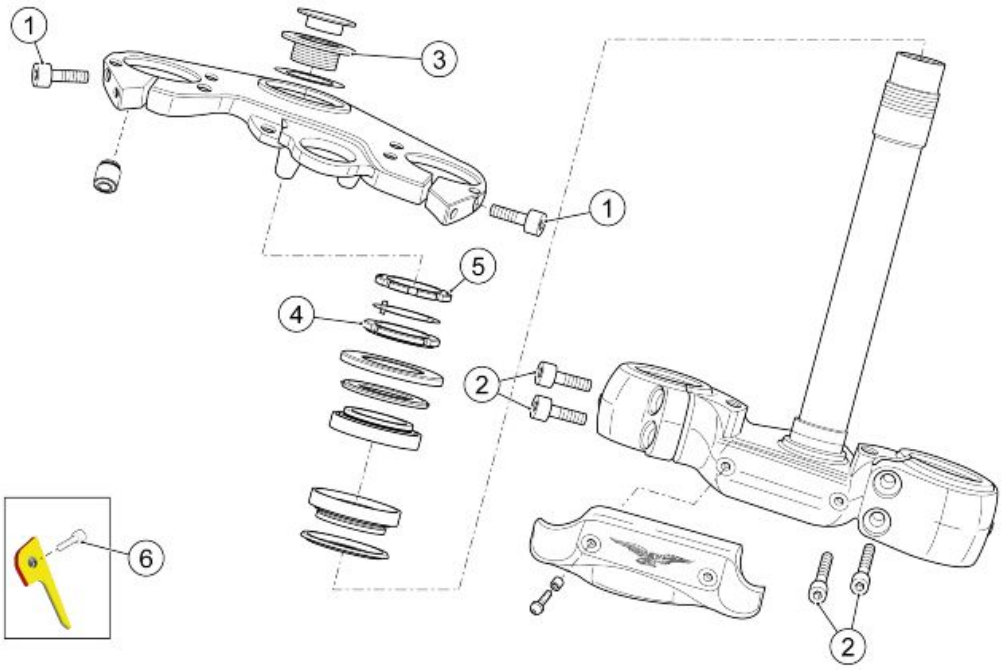
pos.	Description	Type	Quantity	Torque	Notes
2	Half-handlebar lower fixing screw on the upper steering yoke	M8x25	2	25 Nm (18.44 lbf ft)	-
2	Half-handlebar upper fixing screw on the upper steering yoke	M8x25 STAINLESS STEEL	4	20 Nm (14.75 lbf ft)	Loctite 243
3	Handlebar pipe fixing screw on the half-handlebar	M8x30	2	18 Nm (13.27 lbf ft)	Loctite 243
4	Counterweight fixing screw	M6x70	2	10 Nm (7.37 lbf ft)	Loctite 243

Front fork



FRONT FORK

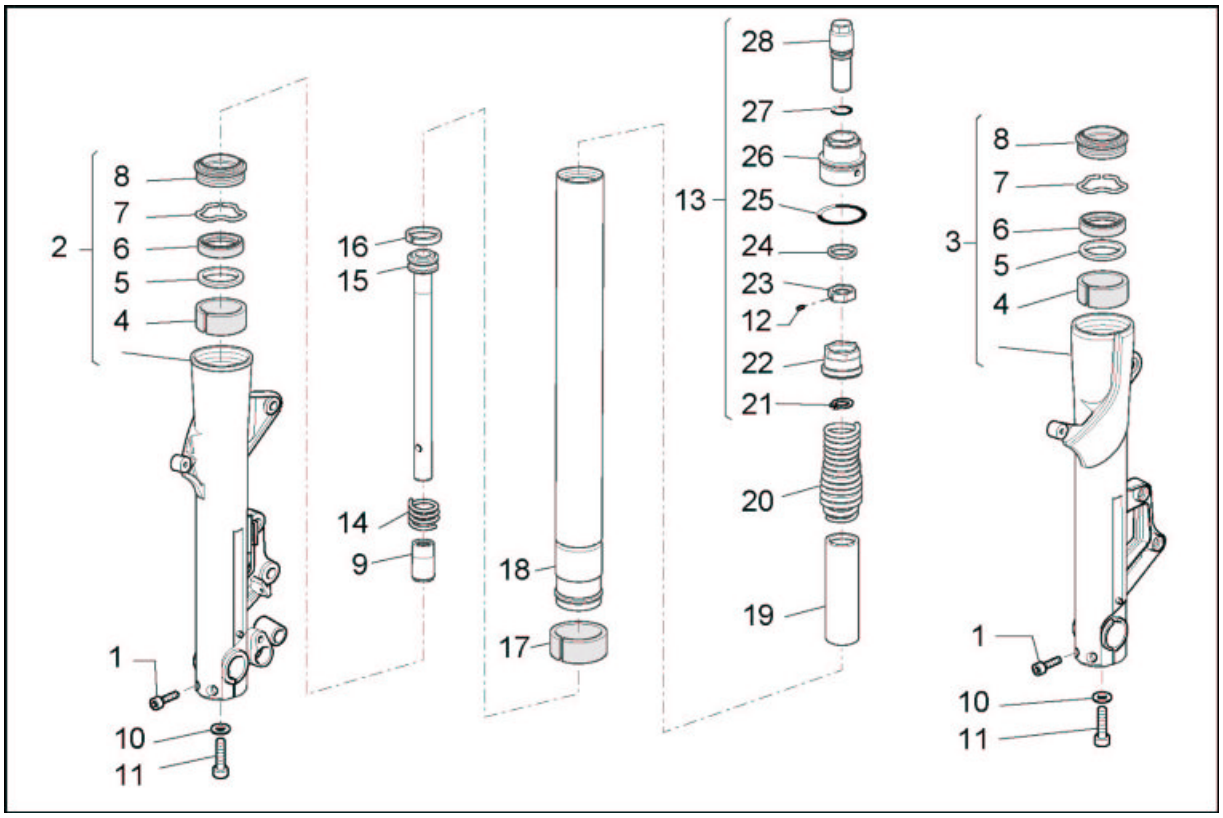
pos.	Description	Type	Quantity	Torque	Notes
1	Wheel axle locking screw on the fork leg	M6	4	10 Nm (7.37 lbf ft)	-
2	Piston fixing screw to the sleeve	M10x35	2	50 Nm (36.87 lbf ft)	-
3	Fork cap	-	2	20 Nm (14.75 lbf ft)	-



STEERING YOKE

pos.	Description	Type	Quantity	Torque	Notes
1	Fork stanchion fixing screw on the upper plate	M8x30	2	25 Nm (18.44 lbf ft)	-
2	Fork stanchion fixing screw on the lower plate	M8x25	4	25 Nm (18.44 lbf ft)	-
3	Upper yoke fixing cap	M29	1	100 Nm (73.76 lbf ft)	-
4	Headstock ring nut	M35	1	40 Nm (29.50 lbf ft)	-
5	Headstock counter-lock ring	M35	1	-	Manually screw
6	Pipe stop plate fixing screw to the steering base	M6x18	1	10 Nm (7.37 lbf ft)	-

Diagram



KEY:

1. Screw

2. Right sleeve

3. Left sleeve

4. Upper bushing

5. Cap

6. Sealing ring

7. Locking ring

8. Dust guard

9. Buffer

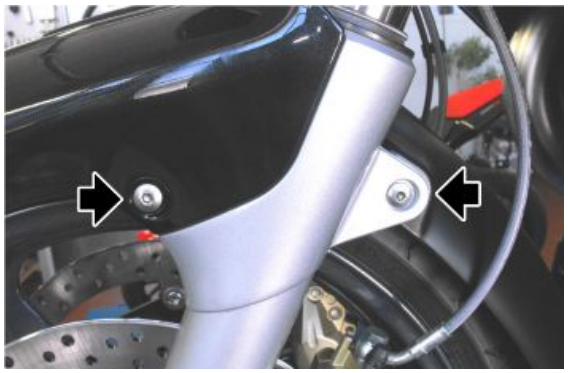
10. Washer

11. Screw

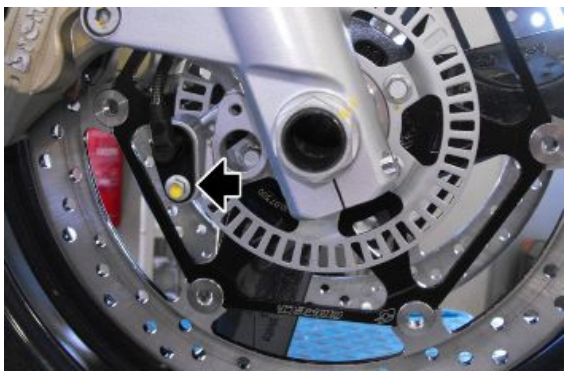
12. Pin
13. Complete cover
14. Counter spring
15. Complete pumping member
16. Ring
17. Lower bushing
18. Stem
19. Preload tube
20. Spring
21. Locking ring
22. Bushing
23. Nut
24. Fifth wheel
25. O-Ring
26. Cap body
27. O-Ring
28. Rigging pin

Removing the fork legs

- Undo the screws fixing the front mud-guard and remove it.
- Hold the motorcycle front section.
- Remove the front wheel.



- Unscrew the speed sensor screw, release the cable harness from the clamps.
- Remove the speed sensor.

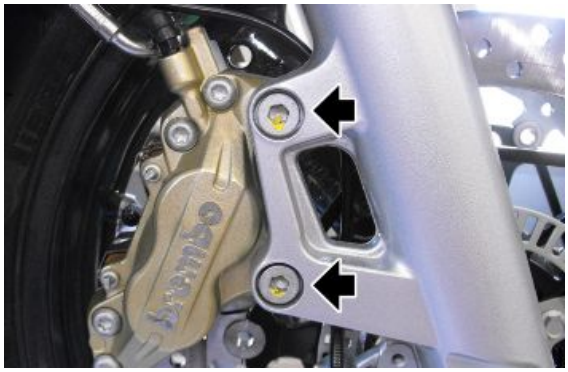


See also

Removing the

front wheel

- Unscrew the fixing screws of the front brakes callipers and remove them from their seats.

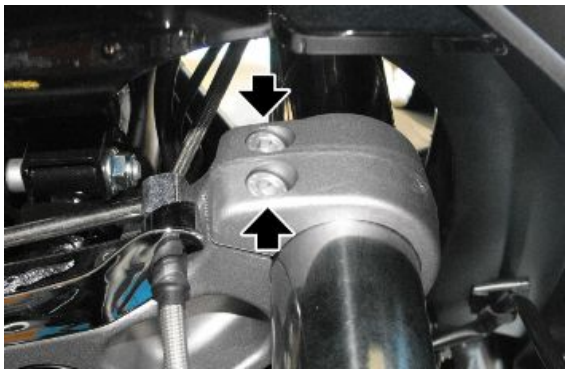


- Support the stanchion and loosen the screws on the upper and then the lower plate.

See also

Removing the front wheel

- Remove the fork stem.



Draining oil

To drain out the oil follow these operations:

• Remove the fork.

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

• Be careful not damage the O-Ring during extraction.

• Press the stem inside the wheel holder sleeve.

• Remove the spring.

• Be careful not damage the O-Ring during extraction.

• Press the stem inside the wheel holder sleeve.

• Remove the spring.

• Drain out all the oil inside the stem.

• Collect the preload tube.

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, refill the stem; otherwise, replace the damaged elements.

Disassembling the fork

- Drain out all the oil in the stem.
- Block the wheel holder sleeve with a vice.
- Unscrew the bottom screw and remove it together with its gasket.

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

CAUTION

BE CAREFUL NOT TO DAMAGE THE SLEEVE RIM AND THE DUST SCRAPER.

- Remove the locking ring inside the sleeve using a thin screwdriver.

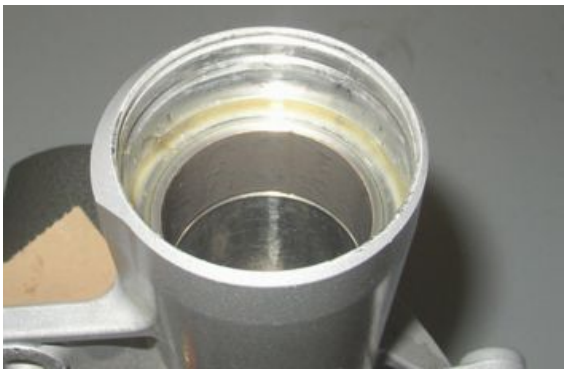
CAUTION

BE CAREFUL NOT TO DAMAGE THE SLEEVE RIM.

- Slide off the stem from the wheel holder sleeve together with the lower bushing, sealing ring, cap, upper bushing and the entire pumping member.

NOTE

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



Checking the components

Stem

Check the sliding surface for scorings and/or scratches.

These scorings can be eliminated by rubbing them with wet sandpaper (grain 1).

If the scorings are deep, replace the stem.

Use a dial gauge to check that the stem bending is below the limit value.

If over the value, replace the stem.

CAUTION

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

Characteristic

Bending limit:

0.2 mm (0.00787 in)

Sleeve

Check that there are no damages and/or cracks; otherwise, replace it.

Spring

Check the spring is in good conditions.

Check that the following components are in good conditions:

- upper bushing;
- lower bushing;
- piston.

If there are signs of excessive wear or damage, replace the affected component.

CAUTION

REMOVE ANY IMPURITY IN THE BUSHINGS, TAKING CARE NOT TO SCRATCH THEIR SURFACE.

Replace the following components with new ones:

- seal ring;

- dust gaiter;

- O-Ring on the cap.

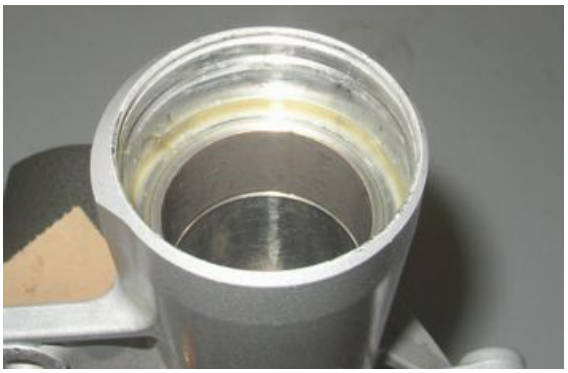
Reassembling the fork

CAUTION

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

- Carry out any necessary service operation.
- On the stem, fit the entire pumping unit together with counter spring and ring.

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



- Insert the lower sliding bushing in the seat on the stem.
- Refit the stem in the wheel holder fork leg pressing it until it stops.

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

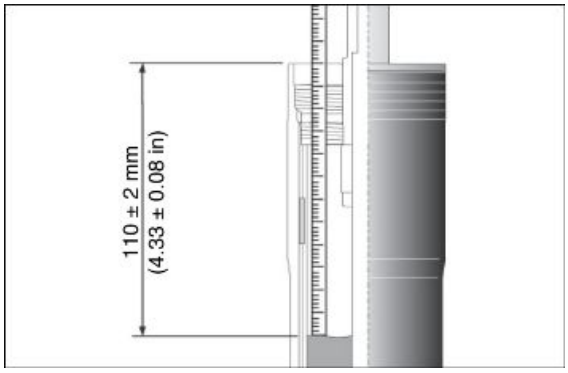
- Insert the cap and the well lubricated sealing ring in the stem.
- Use a suitable inserting tool to push the sealing ring in the fork leg until it stops.

- Fit the locking ring.

- Fit the dust scraper.

Filling oil

- Place the sleeve upright in a vice fitted with protection jaws.
- Compress the sleeve in the stanchion.
- 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

Quantity of single stanchion oil:

540 ± 2 cm³ (32.9 ± 0.1 cu in).

Oil level (from sleeve rim, without the spring and preloading pipe)

110 +/- 2 mm (4.33 +/- 0.08 in)

• Insert the preload tube and the spring.

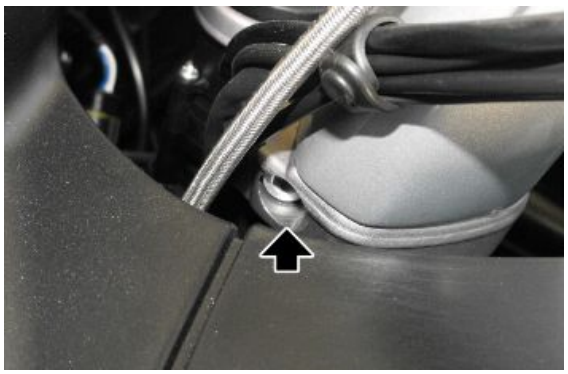
- Place the cap on the bearing tube taking care not to damage the O-ring.

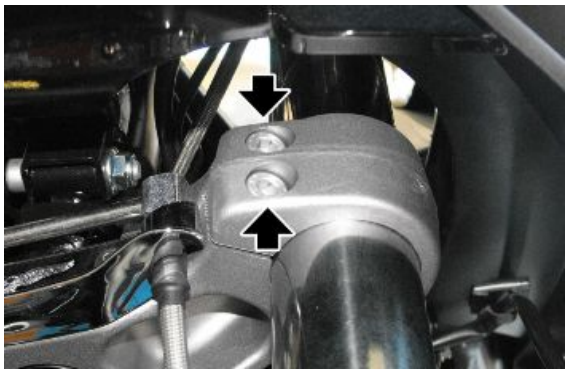
- Then, tighten the cap to the prescribed torque.

Installing the fork legs

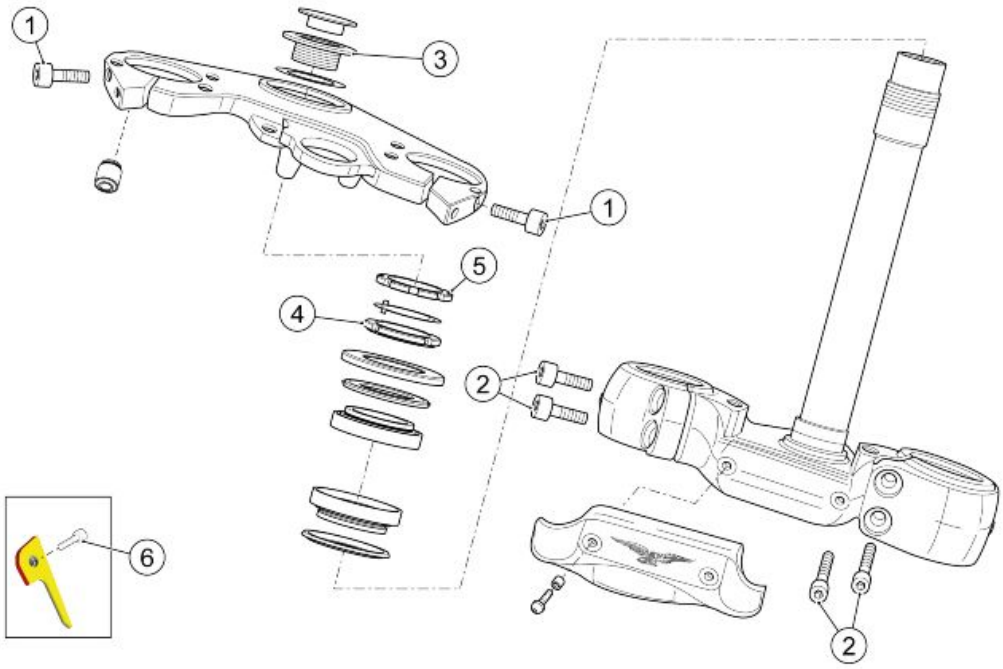
- Insert the stanchion in position.
- Insert the wheel pin so that the stems are aligned.

- Tighten the screws on the fork plates to the prescribed torque.
- Slide off the wheel axle.





Steering bearing



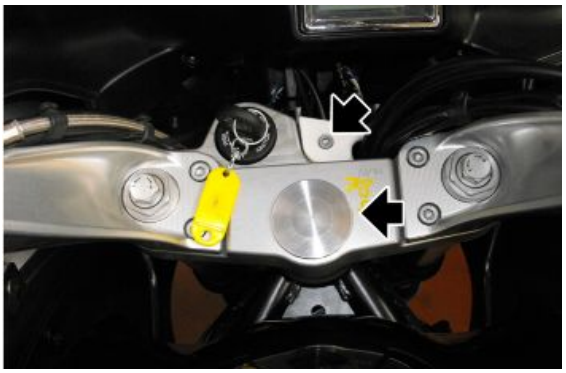
STEERING YOKE

pos.	Description	Type	Quantity	Torque	Notes
1	Fork stanchion fixing screw on the upper plate	M8x30	2	25 Nm (18.44 lbf ft)	-
2	Fork stanchion fixing screw on the lower plate	M8x25	4	25 Nm (18.44 lbf ft)	-
3	Upper yoke fixing cap	M29	1	100 Nm (73.76 lbf ft)	-
4	Headstock ring nut	M35	1	40 Nm (29.50 lbf ft)	-
5	Headstock counter-lock ring	M35	1	-	Manually screw
6	Pipe stop plate fixing screw to the steering base	M6x18	1	10 Nm (7.37 lbf ft)	-

Adjusting play

- Remove the two Side covers removal of the control panel by unscrewing the two fixing screws and releasing the internal peg.

- Unscrew the screws on the cable retainer plate.
- Operating on both half-handlebars, remove the lower fixing screw to the fork plate.
- Remove the upper plate closing cap.



- Unscrew and remove the fixing screws on both sides of the upper plate.

- Unscrew the headstock fixing bolt to the upper plate.

- Collect the shim washer.

- Unscrew and remove the four fixing screws of the half-handlebar to the plate.

- Remove both half-handlebars, leaving them tied to the cables.

- Rivet the safety washer on the head-stock.

CAUTION

UPON REFITTING REPLACE THE SAFETY WASHER WITH A NEW ONE.

- Undo the upper ring nut

CAUTION

UPON REFITTING TIGHTEN THE UPPER RING NUT MANUALLY AND THEN FORCE IT SLIGHTLY UNTIL THE NOTCHES ARE ALIGNED WITH THE RING NUTS.

Specific tooling

020884Y 46 mm wrench for steering ring nut

- Remove the safety washer.

- Adjust the steering bearing preload with the special tool.

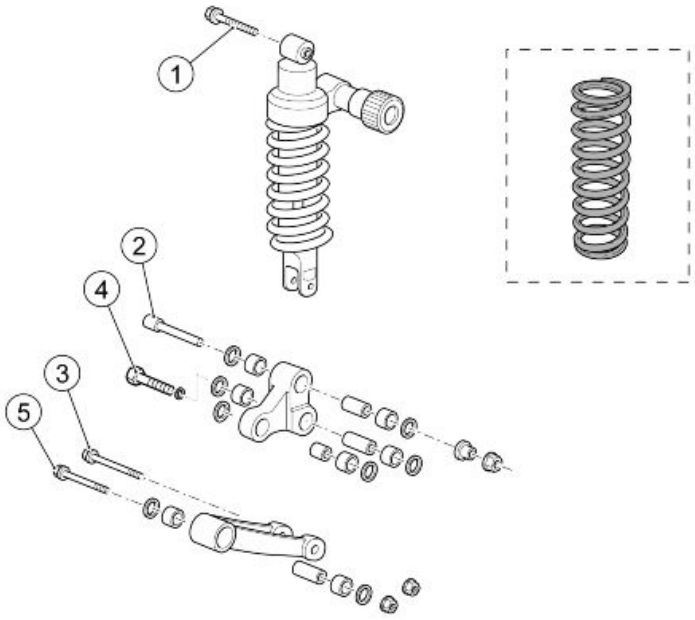
NOTE

GET THE ADEQUATE SPECIAL TOOL.

Specific tooling

020884Y 46 mm wrench for steering ring nut

Shock absorbers



REAR SUSPENSION

pos.	Description	Type	Quantity	Torque	Notes
1	Shock absorber to chassis fixing screw	M10x80	1	50 Nm (36.87 lbf ft)	-
2	Shock absorber to double connecting rod fixing screw	M10x82	1	40 Nm (29.50 lbf ft)	-
3	Shock absorber to single connecting rod fixing screw	M10x95	1	50 Nm (36.87 lbf ft)	-
4	Double connecting rod to swingarm fixing screw	M10x47	1	50 Nm (36.87 lbf ft)	-
5	Screw fastening single linkage to chassis	M10x85	1	50 Nm (36.87 lbf ft)	-

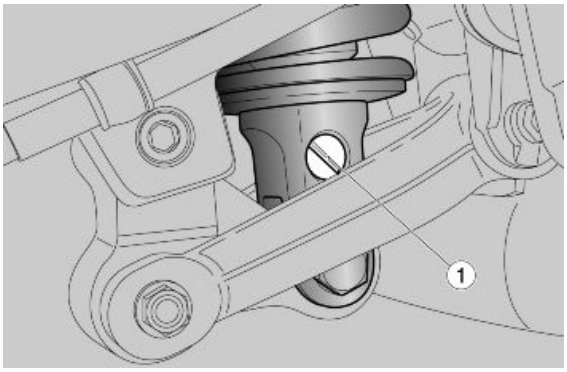
Adjusting

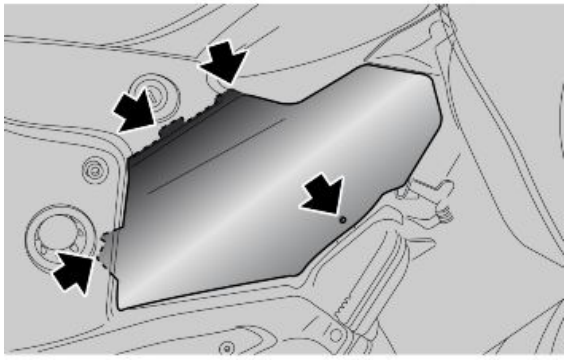
The rear suspension consists of a spring-shock absorber unit linked to the frame via Silent-block and to the rear fork via a linkage system.

To set vehicle suspension, the shock absorber has:

- a set screw (1) to adjust the hydraulic rebound damping;
- a set knob (2) to adjust spring (3) preloading.

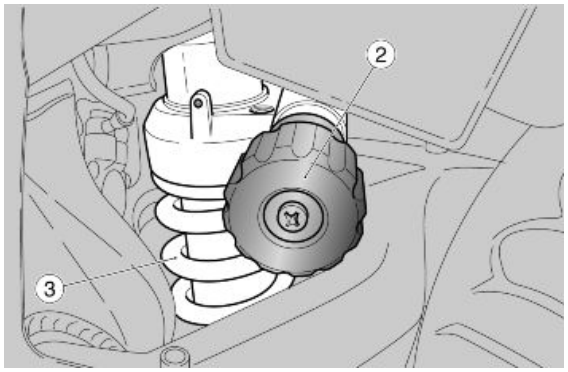
To access the adjustment dial (2), remove the left hand rear shield, easing it out of its fastenings.





Standard rear shock absorber setting is adjusted to suit most high and low speed riding conditions, to transport the rider plus luggage.

However, this set can be modified for specific needs according to vehicle use.



BEFORE MAKING ANY ADJUSTMENTS, WAIT FOR THE ENGINE AND SILENCER TO COOL COMPLETELY.

ADJUSTMENTS

Regular adjustment (standard):

- rider only.

Half load adjustment:

- (for example, rider with passenger or with luggage).

Maximum load adjustment:

- (e.g. rider, passenger and luggage).

CAUTION

SET SPRING PRELOADING AND SHOCK ABSORBER REBOUND DAMPING ACCORDING TO THE VEHICLE USE CONDITIONS. HYDRAULIC REBOUND DAMPING MUST ALWAYS BE INCREASED TOGETHER WITH SPRING PRELOAD TO PREVENT UNDESIRABLE BOUNCING. IF NECESSARY, CONTACT AN Official Moto Guzzi Dealer. TRY RIDING THE VEHICLE ON THE STREET UNTIL THE OPTIMUM ADJUSTMENT IS OBTAINED.

SHOCK ABSORBER SETTING TABLE

Regular load adjustments are the standard settings by manufacturer

REAR SHOCK ABSORBER ADJUSTMENT

Specification	Desc./Quantity
Preload - regular load conditions	25 clicks from fully unloaded
Preload - half-load conditions	35 clicks from fully unloaded
Preload - maximum load conditions	completely screwed
Rebound - regular load conditions	10 clicks starting with the screw (1) fully tightened
Rebound - half -load conditions	10 clicks starting with the screw (1) fully tightened
Rebound - maximum load conditions	6 clicks starting with the screw (1) fully tightened

(1) THE SETTING SHOWN IN THE TABLE MAY NEED TO BE MODIFIED ACCORDING TO THE TYRE AND ROAD TYPE.

NOTE

(2) IF FITTED.

Removing

- Remove the saddle.
- Remove the side fairings.
- Screw in the preloading knob until reaching the end of the stroke.

- Remove the preloading knob by un-screwing the central screw.

See also

Bodywork

- Unscrew the connecting rod screws and remove the pin.

- Remove the lower screw of the single shock absorber.

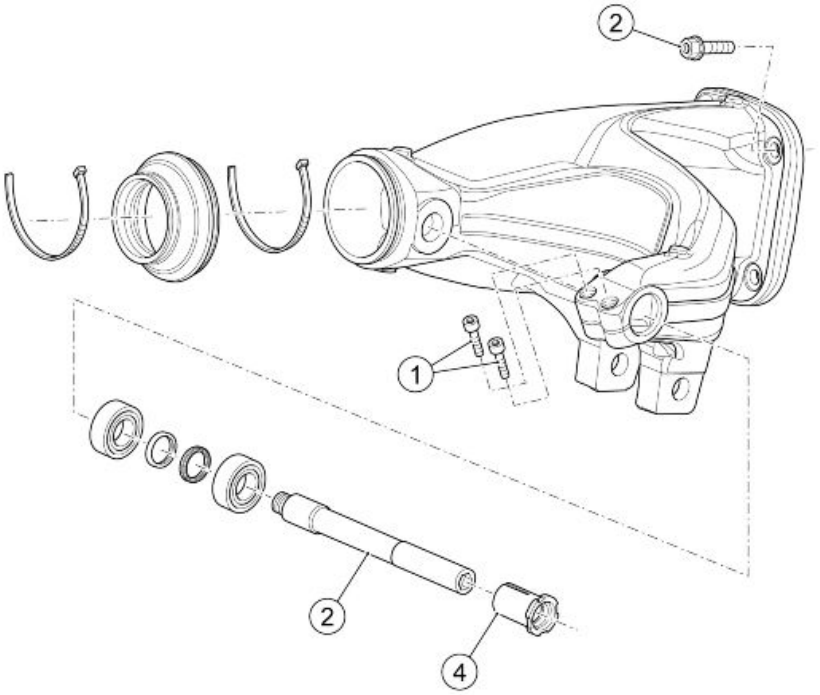
CAUTION

BEFORE REMOVING THE LOWER SCREW OF THE SINGLE SHOCK ABSORBER, HOLT THE SWINGARM-WHEEL UNIT.

- Remove the upper screw of the single shock absorber.
- Remove the single shock absorber, being careful not to damage the motorbike components.

INDEX OF TOPICS

Swinging arm



REAR SWINGARM

pos.	Description	Type	Quantity	Torque	Notes
1	Swingarm clamp fixing screw on the bushing	M6x25	2	10 Nm (7.37 lbf ft)	-
2	2 - Swingarm fixing screw on the transmission housing	M10x35	4	50 Nm (36.87 lbf ft)	-
3	Swingarm pin on the swingarm	M12	1	60 Nm (44.25 lbf ft)	-
4	Preloading bushing to the swingarm pin	M25	1	10 Nm (7.37 lbf ft)	-

Removing

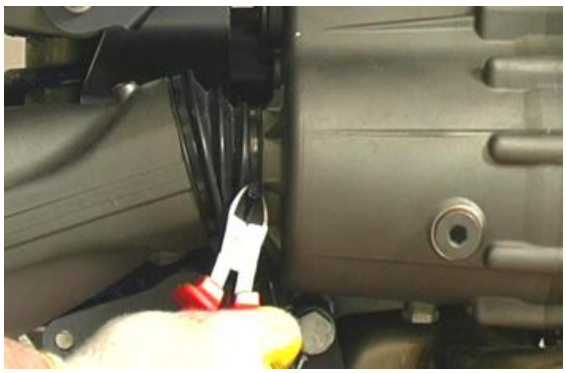
- To remove the swingarm, first remove both footrest supporting plates and the exhaust silencer.
- Slide off the rear brake calliper from the disc and release the brake pipe.
- Remove the cover.

- Engage the first gear.
- Unscrew and remove the four screws, collecting the spacers and the dust protection ring.

- Remove the rear wheel.

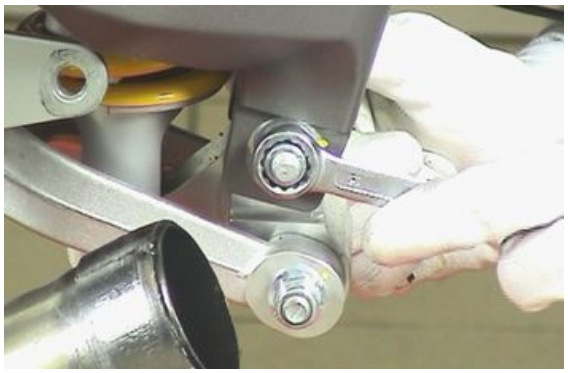
- Unscrew and remove the nut fixing the reaction rod.
- Remove the screw.
- Fix the reaction rod to the chassis with a clamp.

- Remove the clamp from the dust guard cap.



- Loosen the two swingarm terminal screws.

- Unscrew and remove the fixing nut of the connecting rod assembly and collect the screw.



- Disconnect the speed sensor connector and release the cable from the clamps on the chassis.

- Loosen the ring nut.

Specific tooling

14.91.26.03 Hook spanner for fixing ring nut of the clutch shaft internal body

- Helped by a second operator, remove the pin and remove the swingarm together with the cardan shaft.

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 fork pin threads and the fork 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 sleeve outer toothing and grooves are not damaged.

Installing

- Spread a thin layer of lubricating grease all along the swingarm pin.
- Fit the ring nut in the swingarm pin and screw it manually.

- Working from both sides, grease the cardan shaft cables with the recommended product from the recommended products table.
- Block the swingarm, insert the universal joint, align the holes and, at the same time, helped by a second operator, insert the pin completely.
- Tighten the swingarm pin.

- Use the suitable box-spanner to tighten the ring nut.

Specific tooling

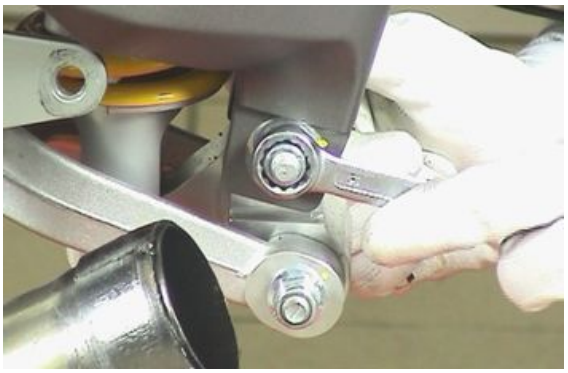
14.91.26.03 Hook spanner for fixing ring nut of the clutch shaft internal body

- Tighten the two screws of the swingarm clamp.

- Fit the dust guard cap in the gearbox.
- Lock the dust guard cap with a new clamp.

- Place the reaction rod into its seat.
- Insert the screw.
- Screw the nut fixing the reaction rod.

- Place the connecting rod assembly on the swingarm.
- Insert the screw.
- Tighten the fixing nut of the connecting rod assembly.



- Connect the speed sensor connector and fix the cable to the chassis with clamps.

See also

Recommended products chart

- Place the dust-protection ring between the rim and the cardan shaft taking care to mount it with the collar facing the transmission unit.

- Place the rear wheel on the swingarm.
- Tighten the four screws with their spacers and the dust-protection ring.
- Place the cover.
- Place the rear brake calliper on the disc and the brake pipe on the swingarm.

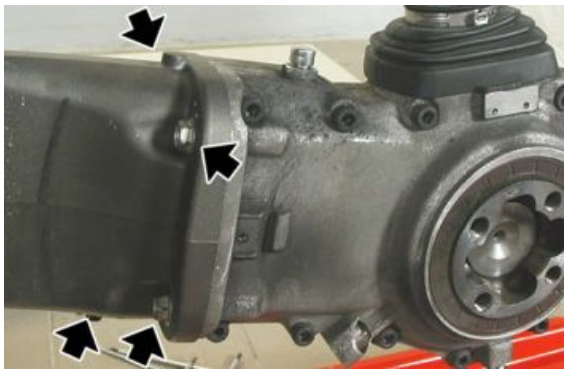
Bevel gears

Removing

- To remove the gearbox, first remove the exhaust silencer and the rear wheel.

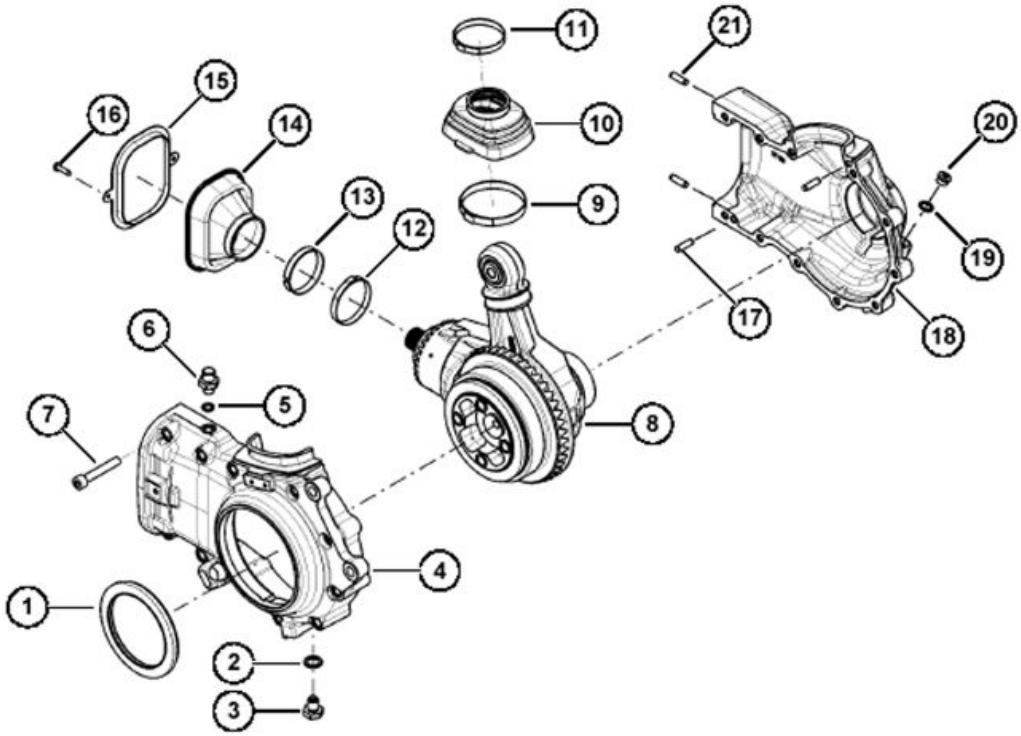
- Unscrew and remove the nut fixing the reaction rod.
- Remove the screw.
- Fasten the reaction rod to the chassis with a clamp.

- Undo and remove the four screws.



- Remove the transmission casing sliding off the universal joint.

Checking



Casing unit removal

Remove the cover (20).

Remove the plug (3) to drain out the oil.

Lift the cap (10).

Remove the clamps (9) and (11).

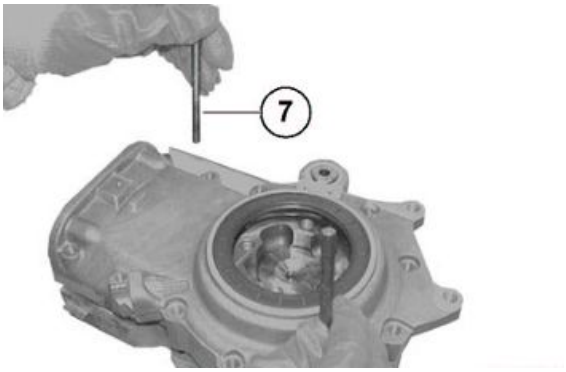
Remove the cap (14).

Remove the screws (16).

Collect the ring (15).

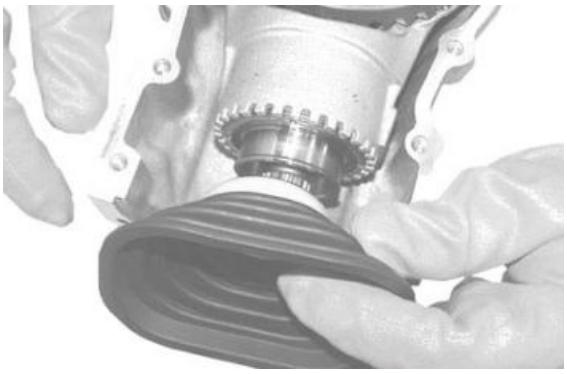
Remove the screws (7).

Remove the casing (4).

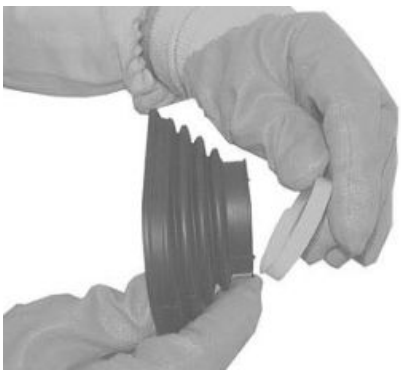


Remove the clamp (12).

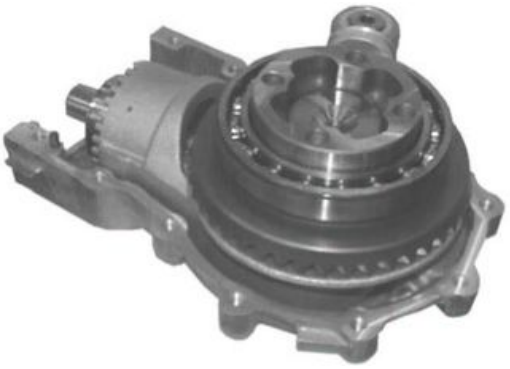
Remove the cap (14).



Collect the ring (13).

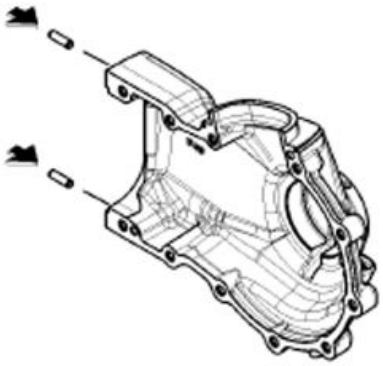


Remove the support unit (8).



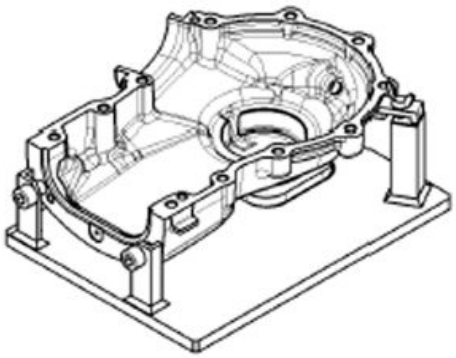
Casing unit fitting

Assemble the dowel pins to the casing with the buffer and a hammer.



Assemble the casing to the special fastening tool.

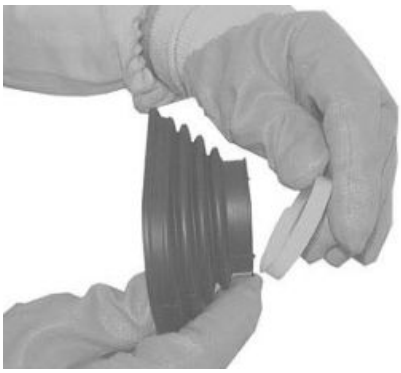
Clean the casing faying surfaces carefully.



Heat the casing.

Insert the support group in the casing.

Assemble the cap and the ring.



Fit the cap on the support.

Fit the clamp.

Screw the clamp with the specific pliers.

Apply the prescribed sealant to the casing.

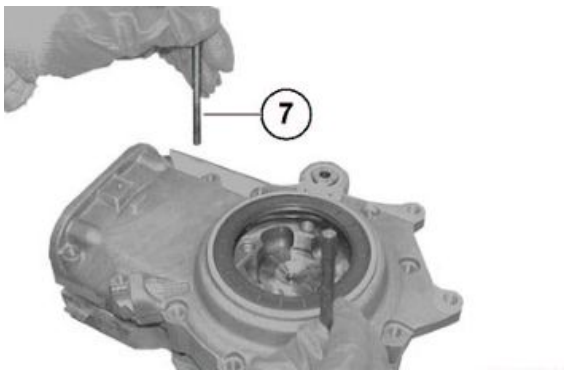
Fit a new sealing ring using the buffer.

Lubricate the sealing ring.

Assemble two centring stud bolts with M8 thread in the threaded holes of the casing as shown in the picture.

Fit the casing.

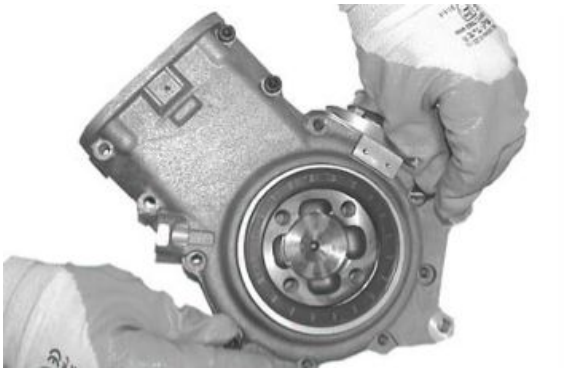
Remove the two dowel pins.



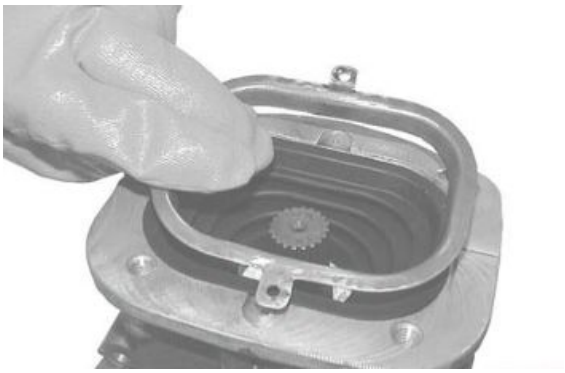
Assemble the fixing screws (7).

Tighten the screws (7) to the prescribed torque.

Remove excessive sealant.



Assemble the ring to the casing.



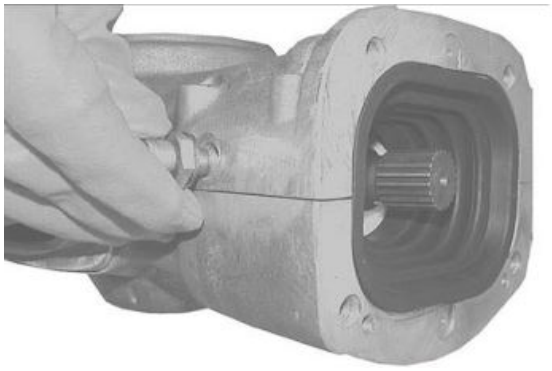
Tighten the fixing screws to the prescribed torque.

Fit the cap with the washer.

Screw the cap to the prescribed torque.

Fit the breather with the washer.

Screw the breather to the prescribed torque.

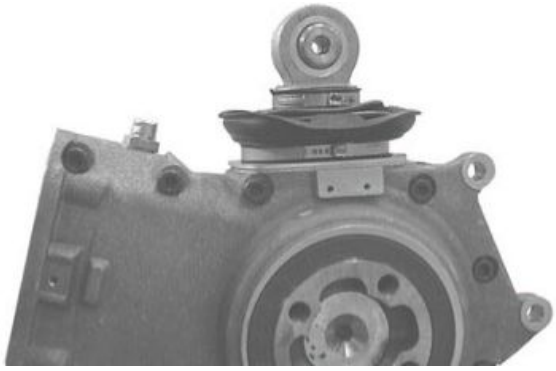


Fill the transmission with the prescribed oil.

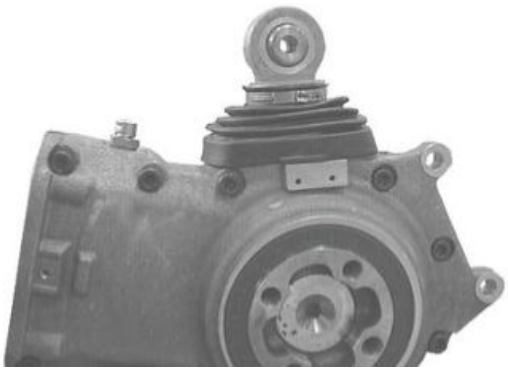
Fit the cap with the washer.

Screw the cap to the prescribed torque.

Assemble the cap with the clamps.



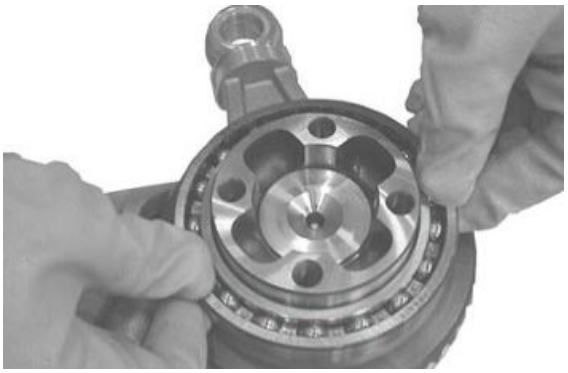
Fit the cap in its seat.



Gruppo asse ruota

Removal

Remove the bearing from the wheel axle with a suitable extractor.



Turn the unit over.

Remove the bearing from the wheel axle with a suitable extractor.

FITTING

Heat the bearings to 100°C (212 °F).

Assemble the bearings to the wheel axle.

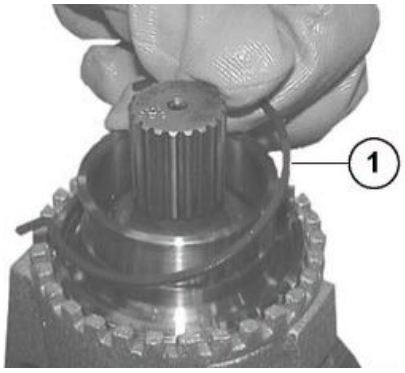
Turn the unit over.

Assemble the bearings to the wheel axle.

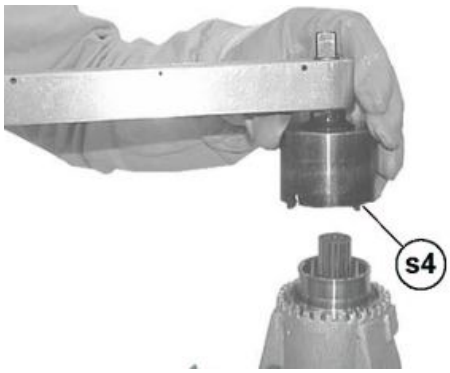
Pinion unit

Removal

Remove the stop ring (1) from the ring nut.



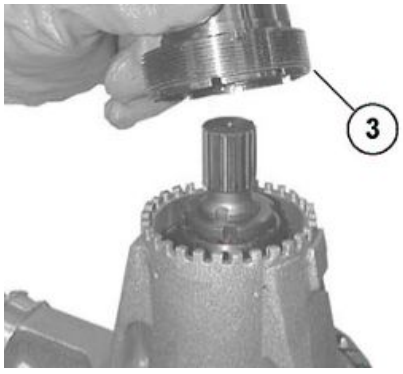
Unscrew the ring nut (2) with the special spanner (s4).



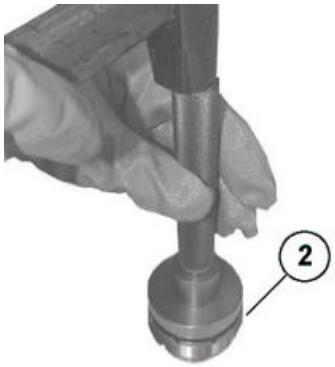
Remove the ring nut (2) and remove the sealing ring from the ring nut.

NOTE

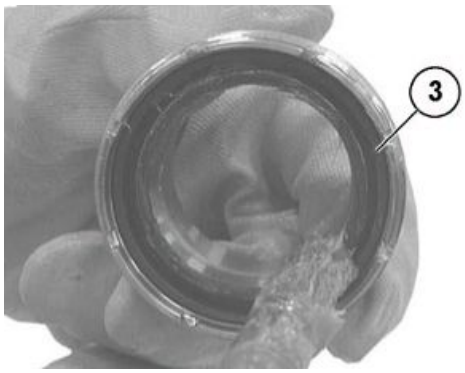
THIS OPERATION DESTROYS THE SEALING RING.



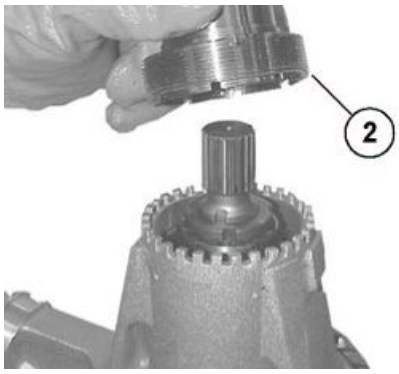
Assemble the sealing ring (3) to the ring nut (2) with the buffer CA715855 (see Fig.1) and a hammer.



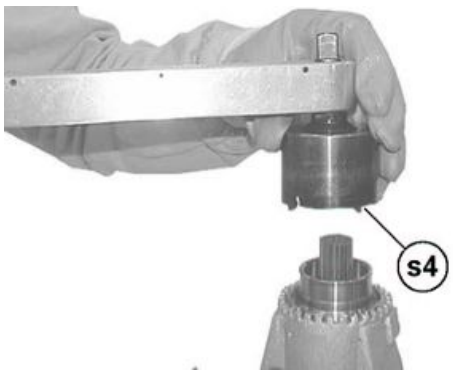
Lubricate the sealing ring (3).



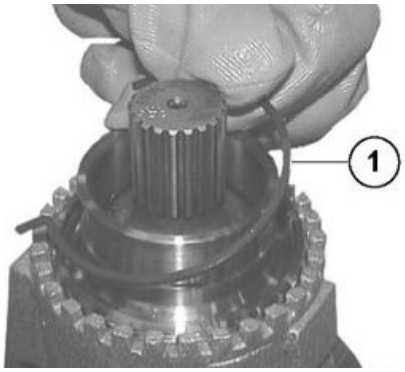
Assemble the ring nut (2).



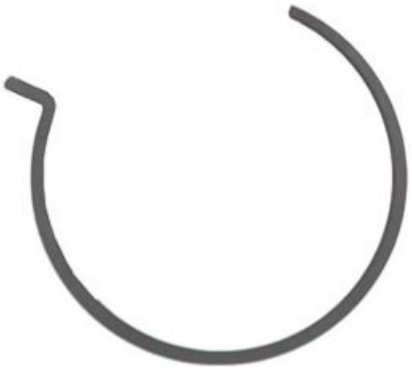
Tighten the ring nut (2) with the special spanner (s4) to the prescribe torque.



Insert the stop ring (1) in the ring nut (2) in the indicated direction.

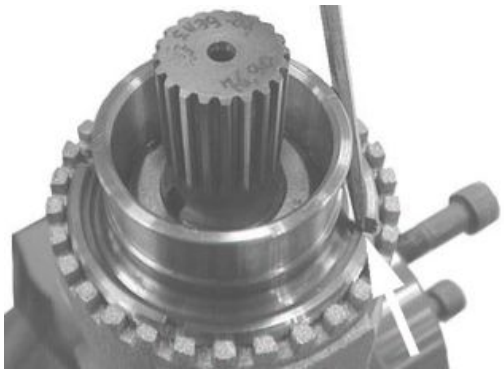


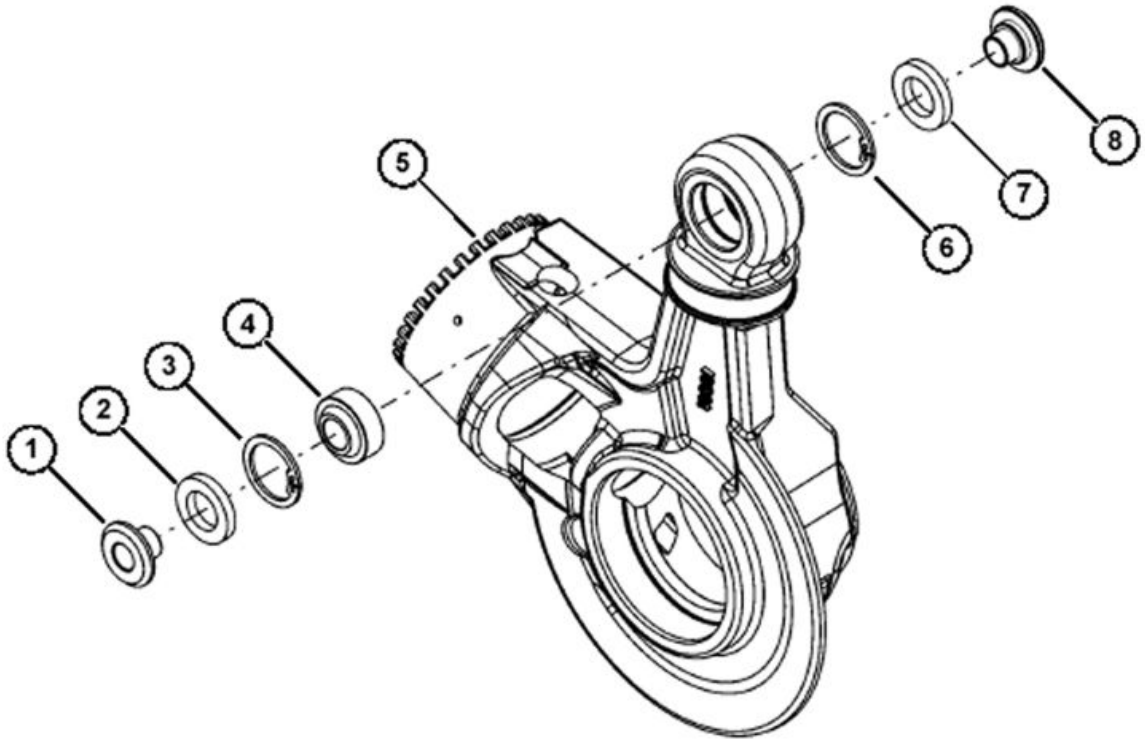
Assembly position of the stop ring (1).



CAUTION

MAKE SURE THE STOP RING IS IN ITS SEAT.





Support unit

Removal

Remove the bushing (1) with a punch.

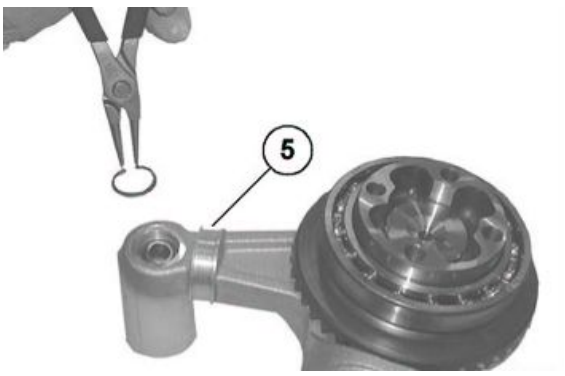
Turn the support (5) over and remove the other bushing (8).

Remove the sealing rings (2) and (7) with a screw-driver.

Remove the stop rings (3) and (6) from the support (5) with suitable pliers.

NOTE

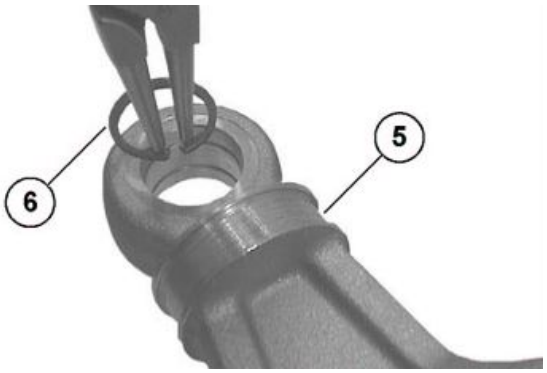
THIS OPERATION DESTROYS THE SEALING RING.



Remove the ball joint (4) with a suitable buffer and a rubber hammer.

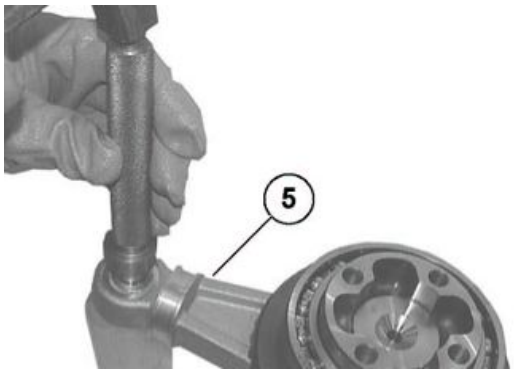
FITTING

Fit the stop ring (6) in the support (5) with suitable pliers.

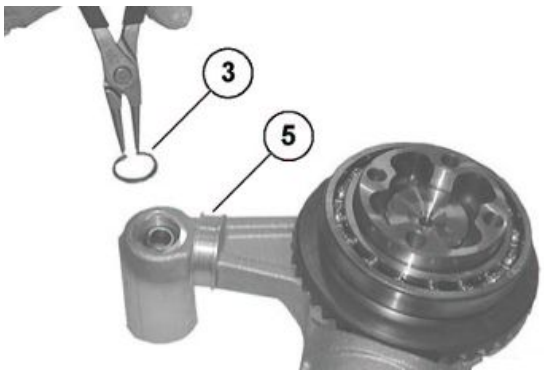


Turn the support (5) over.

Assemble the ball joint (4) with the buffer and a rubber hammer.



Fit the stop ring (3) in the support (5) with suitable pliers.



Manually assemble the new sealing rings (2) and (7).

Assemble the bushing (1).

Drive the bushing (1) in with a plastic hammer.

Turn the support (5) over and assemble the other bushing (8).

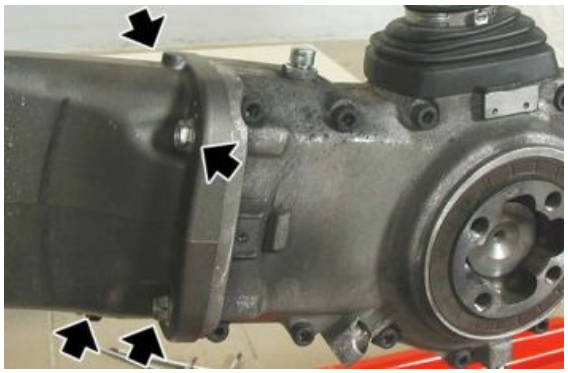
TROUBLESHOOTING

Possible Cause	Operation
1. Fitting error of the radial seal or seal damaged 2. Sliding surface of the wheel axle seal spoiled or damaged	1. Replace the sealing ring and fit it correctly with the suitable tool 2. Replace the wheel axle
1. Casing not sealed 2. Closing screws of the casing shells not tightened to the prescribed torque	1. Open the casing shells, clean the surfaces, seal and reassemble the casing shells 2. Tighten the closing screws to the correct torque
1. Dirt between the sealing ring and the casing 2. A used sealing ring has been fitted 3. Plug not tightened to the prescribed torque	1. Clean and tighten to the correct torque 2. Replace the sealing ring 3. Tighten the plug to the correct torque
1. Cap damaged 2. Retaining clamp or closing cover loose 3. Fitting error of the radial seal or seal damaged 4. Sliding surface of the wheel spacer spoiled or damaged	1. Replace the cap 2. Screw the clamp with suitable pliers 3. Replace the sealing ring and fit it correctly with the suitable tool 4. Replace the spacer
1. Cap damaged 2. Internal retaining clamp or external closing clamp loose	1. Replace the cap 2. Screw the internal or external clamp with suitable pliers
1. Bevel gear pair fitting error 2. Bevel gear pair toothing spoiled or damaged	1. Replace the bevel gear pair
1. Ball bearings on the wheel axle damaged	1. Replace the wheel bearings

Installing

- Insert the transmission casing on the swingarm making sure that the universal joint engages correctly.

- Tighten the four screws to the prescribed torque operating diagonally.

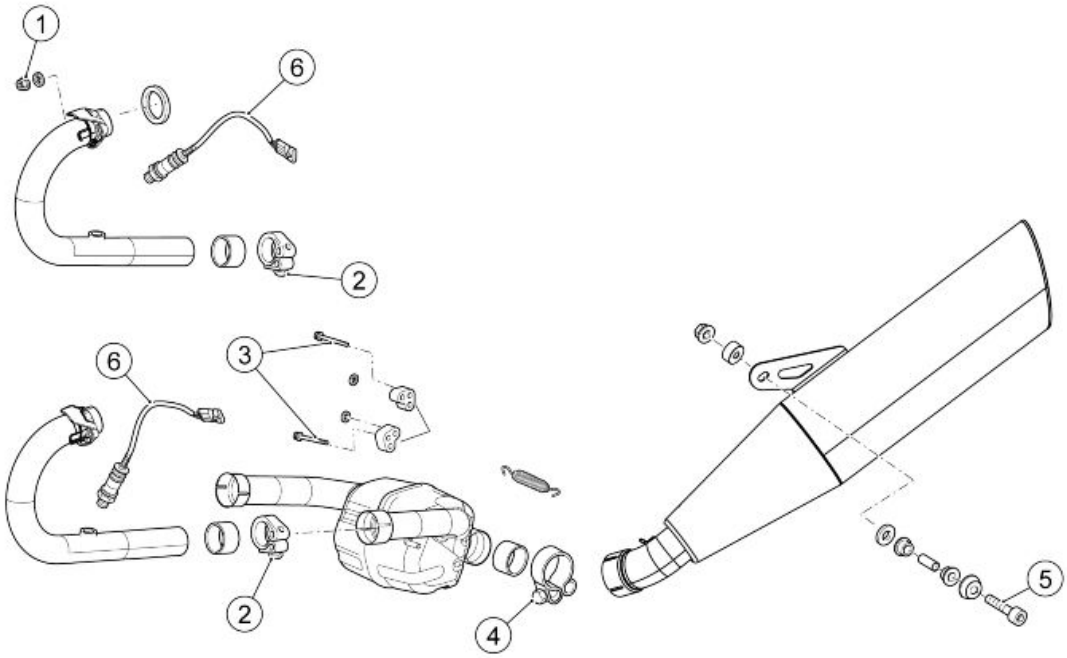


- Place the reaction rod into its seat.
- Insert the screw.
- Screw the nut fixing the reaction rod.

- Place the dust-protection ring between the rim and the cardan shaft taking care to mount it with the collar facing the transmission unit.

- Place the rear wheel on the fork.
- Tighten the four screws with their spacers and the dust-protection ring.
- Place the cover.
- Place the rear brake calliper on the disc and the brake pipe on the fork.
- Place the speed sensor and fasten the cable harness with the clamps.

Exhaust



EXHAUST SYSTEM

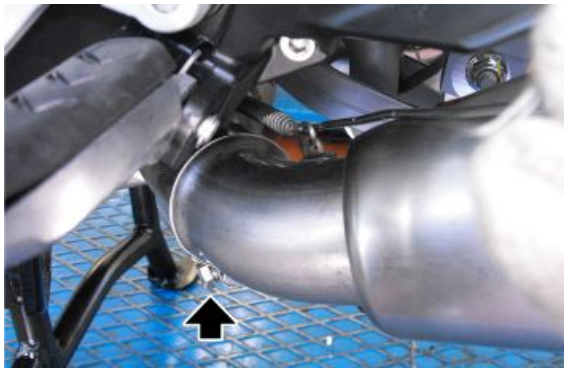
pos.	Description	Type	Quantity	Torque	Notes
1	Exhaust pipe fixing nut to the engine	M8	4	25 Nm (18.44 lbf ft)	-
2	Exhaust pipe fixing clamp screw to the compensator	M6	2	20 Nm (14.75 lbf ft)	Clamp
3	Compensator fixing screw to the plate	M10	2	25 Nm (18.44 lbf ft)	-
4	Compensator fixing clamp screw to the muffler	M8	1	20 Nm (14.75 lbf ft)	Clamp
5	Muffler fixing screw to the support	M8x45	1	25 Nm (18.44 lbf ft)	-
6	Lambda sensor on the exhaust pipe	M18	2	38 Nm (28.03 lbf ft)	-

Removing the tail pipe

CAUTION

THE ENGINE AND THE EXHAUST SYSTEM COMPONENTS CAN GET VERY HOT AND REMAIN SO FOR SOME TIME EVEN AFTER THE ENGINE IS TURNED OFF. WEAR INSULATING GLOVES BEFORE HANDLING THESE PARTS OR WAIT UNTIL THE ENGINE AND THE EXHAUST SYSTEM COOL DOWN.

- Release and remove the spring between the exhaust end and the catalytic converter.
- Loosen the clamp between the exhaust end and the catalytic converter.

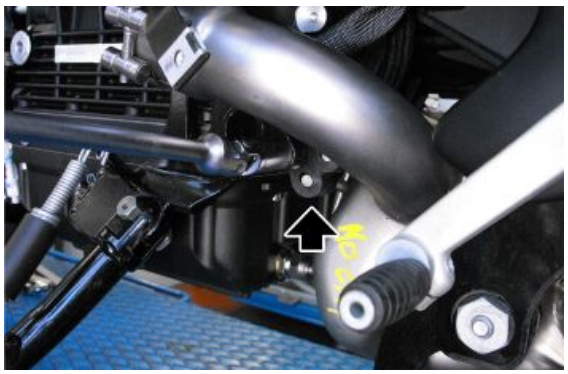


- Unscrew and remove the muffler fixing nut and collect the screw and the bushing.
- Remove the exhaust end.

Removing the manifold - tail pipe

- Remove both exhaust manifolds.
- Remove the exhaust end.
- Unscrew and remove the anti-vibration rubber ring fixing screws on both sides.

- With the assistance of a second operator, hold the vehicle upright and with small movements remove the manifold - end joint.



See also

Removing the
exhaust manifold

Removing the tail pipe

Removing the exhaust manifold

CAUTION

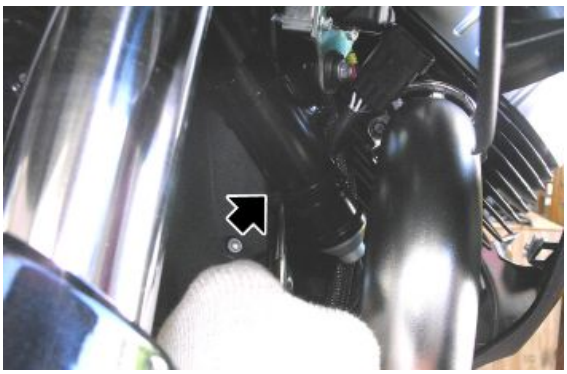
THE ENGINE AND THE EXHAUST SYSTEM COMPONENTS CAN GET VERY HOT AND REMAIN SO FOR SOME TIME EVEN AFTER THE ENGINE IS TURNED OFF. WEAR INSULATING GLOVES BEFORE HANDLING THESE PARTS OR WAIT UNTIL THE ENGINE AND THE EXHAUST SYSTEM COOL DOWN.

NOTE

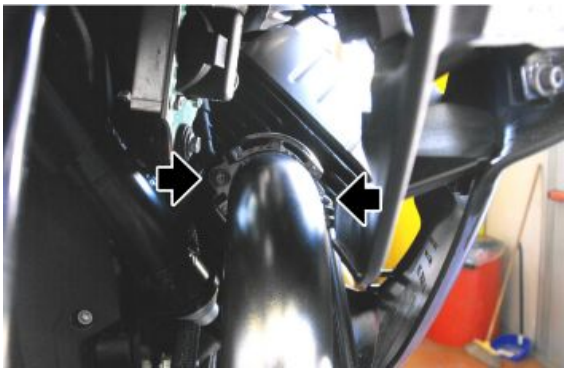
THE FOLLOWING PROCEDURE IS VALID FOR BOTH MANIFOLDS.

- Disconnect the Lambda sensor connector.

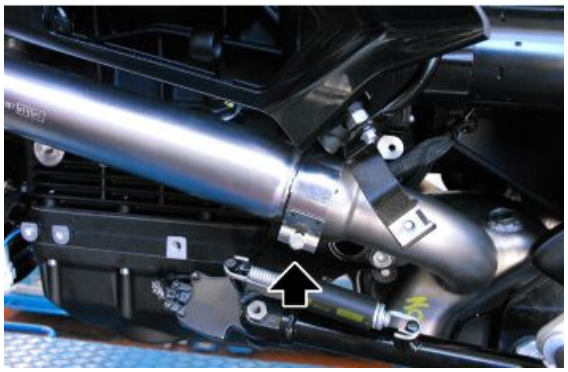
- Cut the clamp indicated.



- Unscrew and remove the two nuts on the head exhaust stud bolts.
- Retrieve the washers.



- Loosen the clamp.
- Remove the exhaust manifold.



Removing the lambda sensor

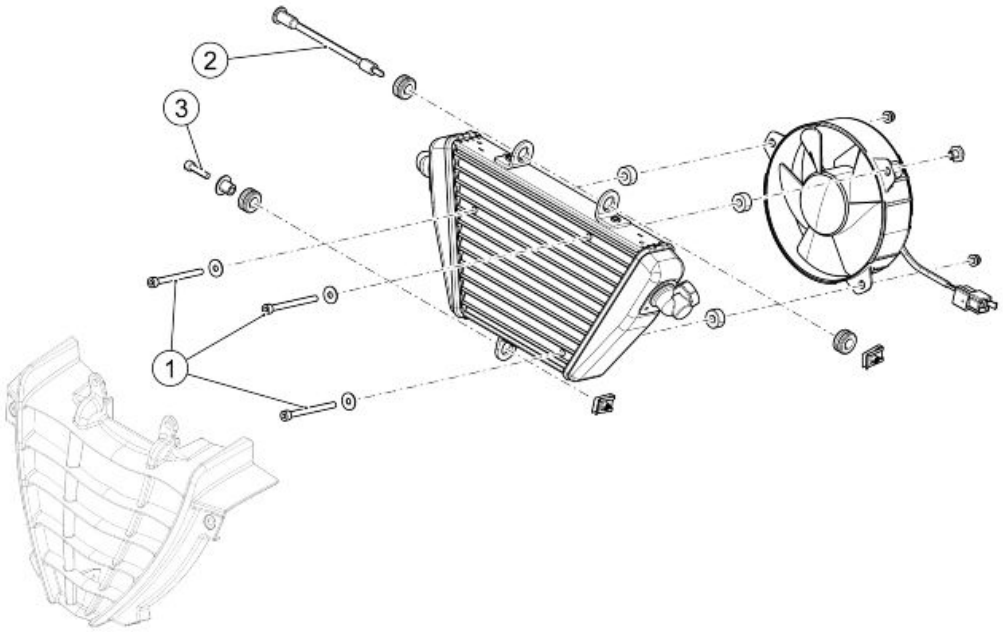
- Unscrew and remove the lambda sensor.

- Remove the exhaust manifold.

See also

Removing the
exhaust manifold

Engine oil cooler

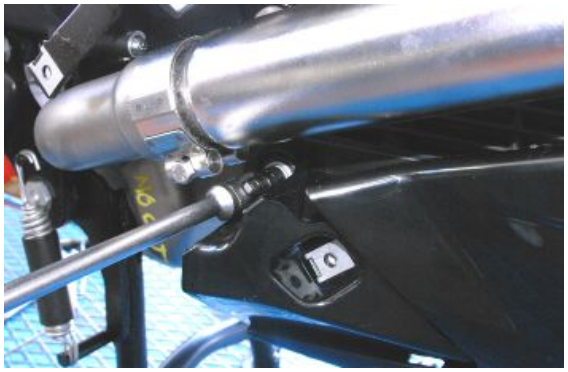


OIL RADIATOR

pos.	Description	Type	Quantity	Torque	Notes
1	Solenoid valve to radiator fixing screw	M5x60	3	4 Nm (2.95 lbf ft)	-
2	Radiator fixing pin on the grille	M5	1	4 Nm (2.95 lbf ft)	-
3	Radiator to grille fixing screw	M5	1	4 Nm (2.95 lbf ft)	-

- Remove the right side fairing.
- Operating from both sides of the lug, unscrew the front and lower screws.

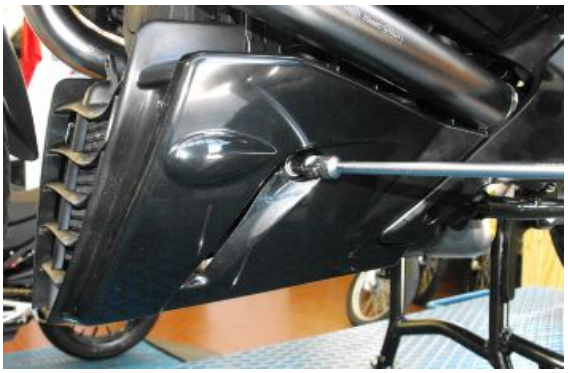
- Unscrew the two right fairing lug side fixing screws.



- Remove the right fairing lug and recover the internal bushing.

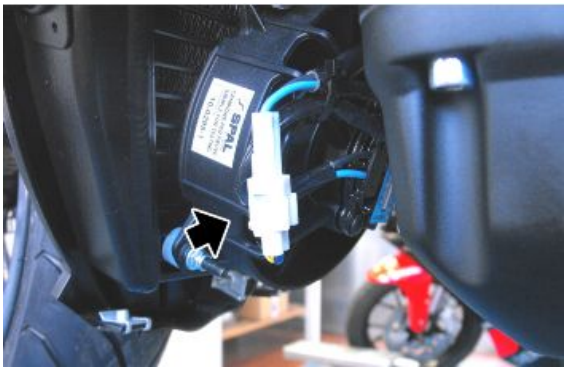
- Working on the left side, unscrew and remove the left side fairing lower fixing screw.

- Unscrew and remove the side fixing screw of the left fairing lug.
- Remove the left fairing lug.
- Drain the engine oil.

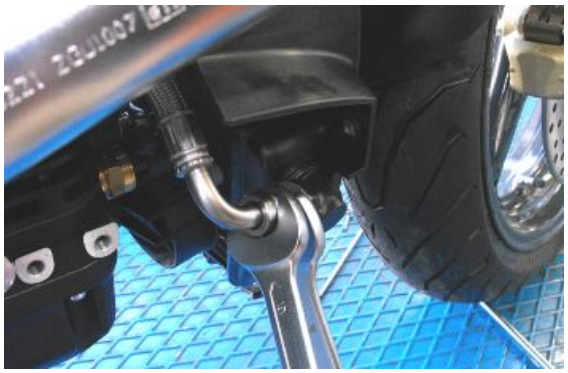


- Undo and remove the two front fixing screws of the oil radiator.
- Collect the spacers.

- Disconnect the fan motor connector and release the cables from the indicated clamp.



- Unscrew the joints of the oil pipe on the radiator.
- Remove the radiator oil together with the fan and duct.

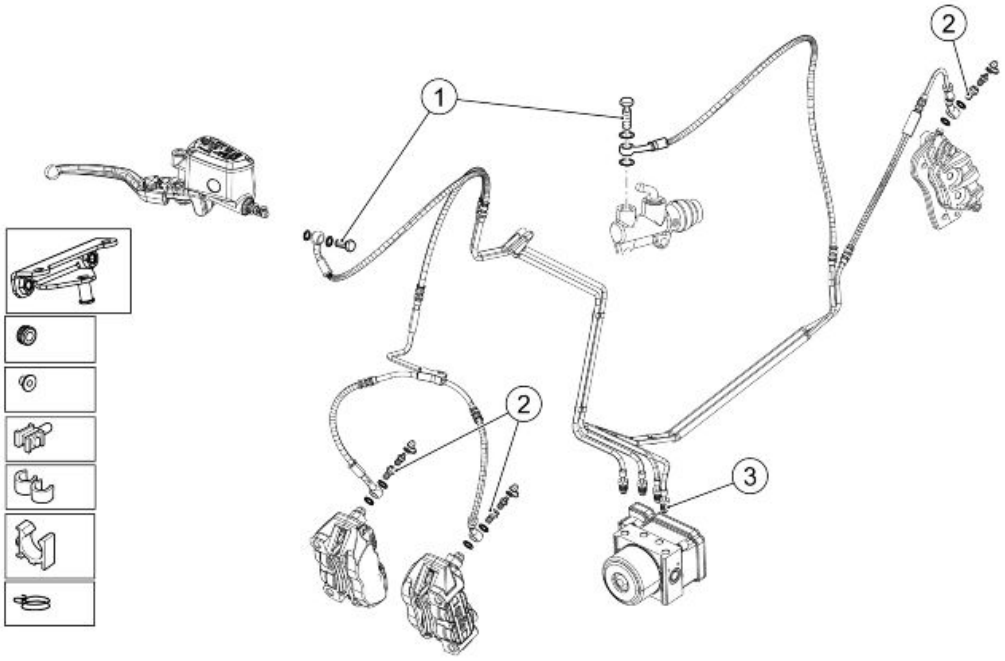


See also

Replacement

Side fairings

INDEX OF TOPICS

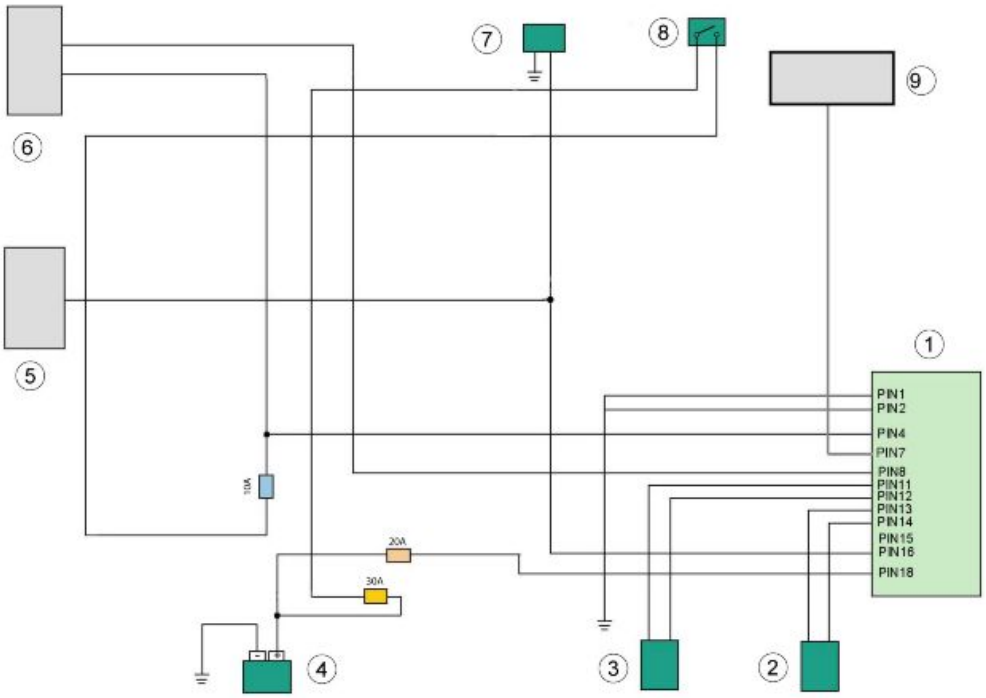


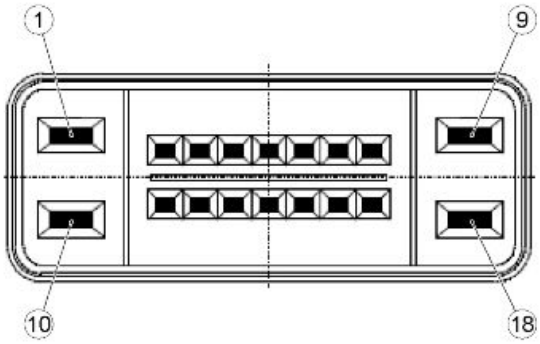
BRAKE SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Brake pipe slot screw on the pump	M10	2	25 Nm (18.44 lbf ft)	-
2	Joint with brake pipes retainer bleeding on the calliper	M10	3	25 Nm (18.44 lbf ft)	-
3	Brake pipes joint on the ABS hydraulic unit	-	4	25 Nm (18.44 lbf ft)	-

Interventions rules

ABS





Key:

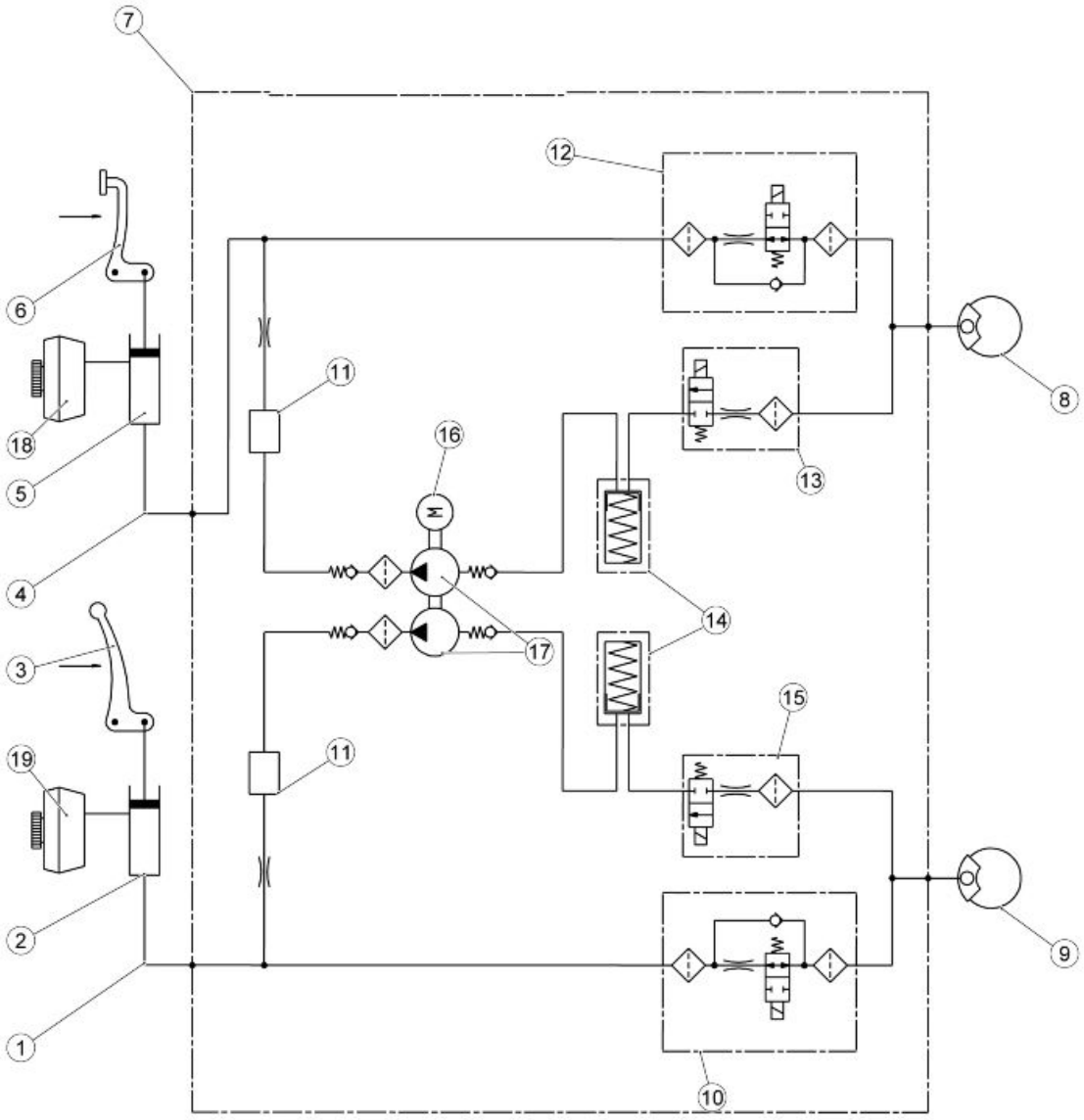
1. ABS ECU control unit
2. Front ABS sensor
3. Rear ABS sensor
4. Battery
5. ECU
6. Instrument panel
7. K line (diagnosis)
8. Key
9. Right Light Switch

ABS ECU control unit pin configuration:

- PIN 1 - GND - Earth

- PIN 2 - PCC1 - Vehicle identification ground connection
- PIN 3 - Speed signal to the ECU control unit
- PIN 4 - IGN - Key
- PIN 7 - ABS OFF - ABS Deactivation button
- PIN 8 - WL.ABS - Alarm warning light
- PIN 11 - R_SIGN - Rear ABS sensor signal
- PIN 12 - R_GND - Rear ABS sensor ground connection
- PIN 13 - F_GND - Front ABS sensor ground connection
- PIN 14 - F_SIG - Front ABS sensor signal
- PIN 15 - PCC2 - Vehicle identification ground
- PIN 16 - ISO_K - K line (diagnosis)
- PIN 18 - KL30 - Power supply

Operating diagram



ABS functional diagram key

1. Front system circuit
2. Front brake pump
3. Front brake lever
4. Rear system circuit

5. Rear brake pump
6. Rear brake pedal control
7. ABS CONTROL UNIT
8. Rear brake calliper
9. Front calliper (2 callipers)
10. Front brake circuit intake solenoid valve (normally open)
11. Humidifier
12. Rear brake circuit intake solenoid valve (normally open)
13. Rear brake exhaust circuit solenoid valve (normally closed)
14. Rear/front brake circuit low pressure accumulator
15. Front brake exhaust circuit solenoid valve (normally closed)
16. DC electric motor
17. Double circuit hydraulic pump (ABS)
18. Rear brake reservoir
19. Front brake reservoir

ABS OPERATION

General specifications:

The front circuit is similar to the rear circuit.

- The ABS inlet valve (10 - 12) is normally open and it is closed only when the system intervenes to avoid wheel locking.
- The outlet valve (13 - 15) is normally closed and it is opened only when the system intervenes to avoid wheel locking.
- When the system is in standby, the ABS processor never stops monitoring the speed of the wheels in order to assess potential wheel slippage.
- When in standby, the system does not intervene at all when the rider brakes; the braking system is the same as the one without ABS.

Stages in ABS cycle (the following operations refer to the front circuit but are also applicable to the rear one):

A - Brake activation: the rider starts braking as he would usually do.

B - Pressure reduction: it coincides with danger recognition (wheel slippage above threshold): the system closes the inlet valve (10-12) and opens the outlet valve (13-15) temporarily.

At this stage the rider cannot increase the pressure on the callipers (8-9) and the system reduces the pressure on the callipers partially. The excess fluid temporarily fills the front reservoir (18-19) until the ABS pump (17) self-activates and delivers the fluid back to the brake pump (2-5).

C - Pressure maintained: the pressure in the callipers (8-9) remains low until total recovery of speed / wheel grip.

The system restores the fluid taken from the calliper (8-9) in the section of the system between the brake pump (2-5) and the ABS inlet valve (10-12).

D - Pressure restored: by opening the inlet valve (10-12) momentarily, the pressure of the callipers (8-9) is increased until maximum deceleration is reached. Then, the system gives the control over the braking back to the rider.

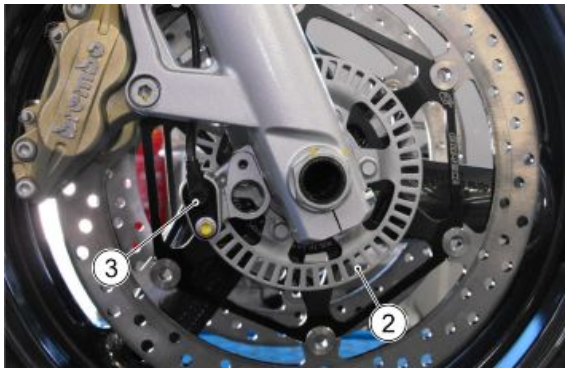
E - If the wheel does not reach complete grip, the system continues operating as before until complete grip is obtained or until the vehicle stops. An error can be detected if the duration of the pressure reduction phase exceeds the pre-set time limit.

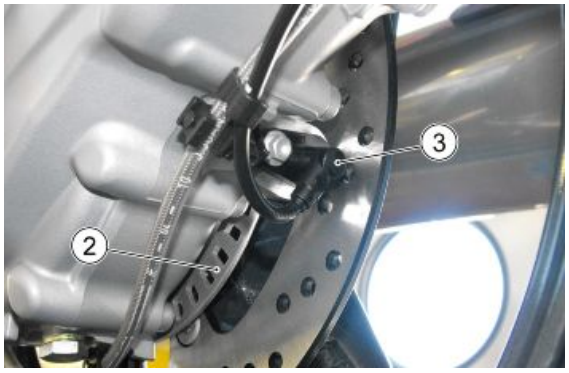
ABS SYSTEM DESCRIPTION

The ABS system is a device to avoid wheels locking in case of emergency braking, increasing vehicle braking stability when compared to a traditional braking system.

Sometimes when the brake is operated, the tyre locks with a consequent loss of grip, which makes it difficult to control the vehicle.

A position sensor (3) on the tone wheel (2), forming an integral unit with the vehicle wheel, "reads" the status of the vehicle wheel spotting any possible lock.



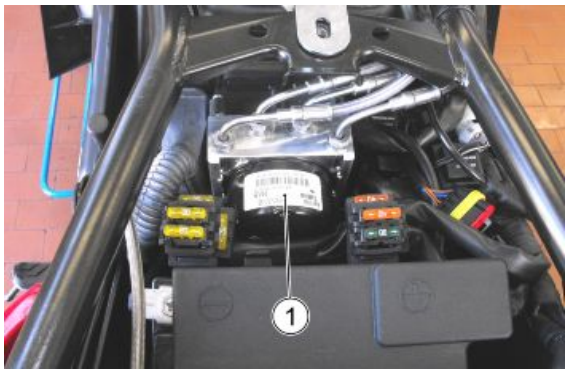


A control unit (1) signals this out and adjusts the pressure in the braking circuit accordingly.

CAUTION

WHEN THE ABS STARTS WORKING, A PULSING IS FELT ON THE BRAKE LEVER.

THE WHEEL ANTILOCK BRAKING SYSTEM DOES NOT PREVENT FALLS WHILE ON A BEND. AN EMERGENCY BRAKING WITH THE VEHICLE INCLINED, HANDLE BAR TURNED, ON UNEVEN OR SLIPPERY ROADS, OR WITH POOR GRIP CREATES LACK OF STABILITY DIFFICULT TO HANDLE. THEREFORE, RIDE CAREFULLY AND SENSIBLY AND ALWAYS BRAKE GRADUALLY. BRAKING WHILE TURNING A CORNER IS SUBJECT TO LAWS OF PHYSICS WHICH NOT EVEN ABS CAN ELIMINATE.



When sensors (3) detect a significant speed difference between the rear and the front wheels (for example, when rearing up on the back wheel), the ABS system could take this as a dangerous situation. In this case, 2 things may occur:

- the ABS system intervenes by releasing pressure from the calliper until the wheel turns again at the same speed of the other wheel; it is not possible to brake for an instant.
- if the speed difference lasts long, the system may detect an error and deactivates the ABS system. As a consequence, the system works as any regular braking system.

Riding with an active ABS system

- At engine starter, the ABS warning light (5) on the instrument panel (4) flashes until the vehicle exceeds 5 km/h (3.1 mph).

If the ABS warning light remains on when the vehicle is running, it means that a fault has been detected and the ABS system has been automatically deactivated.

Riding with a deactivated ABS system

The warning light (5) turns on permanently, the system was deactivated.

ABS device deactivation

To deactivate the system, proceed as follows:

- Start the engine.
- With the vehicle at a standstill, press and hold the button. After roughly three seconds, the indicator light ABS (5) on the instrument panel (4) becomes steadily on.
- Release the button immediately.
- Now the ABS warning light (5) on the instrument panel (4) continues to be on; the ABS system is then completely deactivated.

ABS system reactivation

- With the vehicle at a standstill, press and hold the button. After roughly three seconds, the indicator light ABS (5) on the instrument panel (4) will start to flash.
- Release the button immediately.

- Once riding, the ABS system will be re-activated only after riding faster than 5 km/h (3.1 mi/h) and the ABS warning light (5) on the instrument panel (4) turns off.

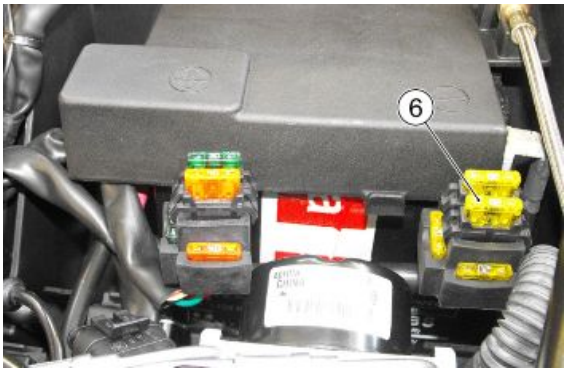
CAUTION

IF THE ABS SWITCH IS PRESSED FOR MORE THAN TEN SECONDS, THE SYSTEM DETECTS A FAILURE. TO ACTIVATE THE ABS SYSTEM AGAIN TURN THE IGNITION SWITCH TO "OFF" AND THEN TO "ON".

IN CASE OF FAILURE OR WITH ABS DISCONNECTED, THE VEHICLE OPERATES AS IF IT DID NOT HAVE THIS SYSTEM.

20 A fuse (ABS Main fuse) (6)

Protects: ABS Control unit.



Guide to diagnosis

PREMISE

Each time the key is ON, if, at least one current or stored* error is detected, the ABS warning light turns on permanently.

The ABS system is deactivated!

The system operates perfectly just as any other braking system without ABS

*** The diagnosis requires exceeding the 5 km/h (3.1 mph).**

Each time the key is ON, if at least one current or stored* error of the ABS system is not detected:

- the ABS warning light flashes.

When the 5 km/h (3.1 mph) are exceeded:

- if errors are not detected: the ABS warning light turns off
- if at least one malfunction is detected: the ABS warning light turns on permanently.

The ABS system is deactivated!

The system operates perfectly just as any other braking system without ABS.

The detection of malfunctions may require more or less time according to the type of failure.
Error detection logic foresees that for the errors to be diagnosed one or more conditions must persist within a given time.
If during this given time one of the conditions is missing but then it comes back, the timer is reset and the system is no longer able to diagnose the error.
The ABS system is still inactive.

Example:

- error code **5D93** requires some minutes before it is diagnosed during the given time: the ABS warning light ABS keeps flashing.

ABS FAULTS - GUIDE TO THE DIAGNOSIS

1. ABS WARNING LIGHT ON

2- CONNECT NAVIGATOR

DOES NAVIGATOR COMMUNICATE? (NO, go to 3; YES, go to 4)

3.PERFORM THESE CHECKS:

- A. Ground connection PIN 1
- B. +12V at PIN 18
- C. +12V at PIN 4 with key ON

4. **ARE THERE ANY ERRORS? (YES, go to 5; NO, go to 6)**

5. CONSULT THE ERRORS TABLE

6. ABS WARNING LIGHT ACTIVATION

ACTIVE?(YES, go to 7; NO, go to 8)

7. CONTACT TECHNICAL SERVICE

8. CHECK:

- A. Cable continuity between PIN 8 of the ABS control unit connector and PIN29 of the instrument panel.
- B. Check connectors - refer to the operations described in the chapter

If the previous checks are OK, the causes might be:

- C. ABS control unit malfunction
- D. Instrument panel malfunction

Using Navigator for the abs

ECU INFO screen page

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

INFO ECU SCREEN PAGE MOD2

Characteristic	Value/example	Unit of measurement	Notes
Vehicle manufacturing date			
Chassis number			
Software version			
Vehicle code	Norge / Stelvio		The vehicle code stored in the control unit is read.
Vehicle identification according to the status of Pin 2 and 15 of the ABS control unit connector	Norge / Stelvio		Depending on the detected connection of PIN 2 and PIN 15, it corresponds to a different type of vehicle, the possible indications are: Norge/Stelvio identified by ECU. See the following table

NOTE: the "X" in the table identifies the connector pin is grounded.

ABS CONNECTOR IS GROUNDED

Vehicle	PIN 2	PIN 15
Stelvio 1200 4V ABS		X
Norge 1200 4V ABS	X	

PARAMETERS screen page

This screen page 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.)

PARAMETERS

Characteristic	Value/example	Unit of measurement	Notes
Front wheel speed	0	km/h	With stopped wheel, 0 Km/h is displayed
Rear wheel speed	0	km/h	With stopped wheel, 0 Km/h is displayed
Battery voltage	11.9	V	

ACTIVATION screen page

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

ACTIVATION

Characteristic	Value/example	Unit of measurement	Notes
Front brake bleeding procedure			Useful in case of lever sponginess although the bleeding has been done as in a regular braking system
Rear brake bleeding procedure			Useful in case of lever sponginess although the bleeding has been done as in a regular braking system
ABS warning light			During the test the warning light stays on
Ambient parameter error reading (1)			The ambient parameters are 4: Number of error detections, Operation cycles from the last detection, Battery voltage, Speed.
Ambient parameter error reading (2)			Number of error detections: number of times the error has been detected by the control unit;
Ambient parameter error reading (3)			for example, if it indicates 2, it means that the error has been detected (ATT), then it has not been detected for a while (sent to the MEM) and then it has been detected again.
Ambient parameter error reading (4)			Operation cycles from the last reading: a cycle is counted if the following occurs: key ON and speed over 20 km/h.
Ambient parameter error reading (5)			If for example 5 is shown, it means that the last time the error has been measured was 5 cycles ago.
Error clearing (1)			Press "enter" to transfer errors from the memory (MEM) to the historical record (STO).
Error clearing (2)			In the next connection between Navigator and the control unit, the historical errors (STO) are no longer shown.

ERRORS screen page

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

ERRORS

Characteristic	Value/example	Unit of measurement	Notes
Front speed sensor: 5D90 electric malfunction			Electrical fault in sensor or cable harness
Front speed sensor: 5D91 the signal works irregularly			Faulty sensor or signal interference
Front speed sensor: 5D92 the signal decreases periodically			Possible tone wheel fault due to deformations or dirt; possible alterations on the wheel bearing surface. In very rare cases, abnormal tone wheel vibrations
Front speed sensor: no signal or speed measured too low in relation to the rear wheel 5D93			Faulty sensor or missing sensor/tone wheel or excessive distance between the sensor and the tone wheel or tone wheel with wrong number of teeth
Front speed sensor: 5D94 no acceleration after pressure reduction			Faulty sensor or missing sensor/tone wheel or excessive distance between the sensor and the tone wheel
Front speed sensor: 5D95 excessive measured speed			Faulty sensor/tone wheel, or tone wheel with wrong number of teeth or wrong tyre size
Rear speed sensor: 5DA0 electric malfunction			Electrical fault in sensor or cable harness
Rear speed sensor: 5DA1 the signal works irregularly			Faulty sensor or signal interference
Rear speed sensor: 5DA2 the signal decreases periodically			Possible tone wheel fault due to deformations or dirt; possible alterations on the wheel bearing surface. In very rare cases, abnormal tone wheel vibrations
Rear speed sensor: 5DA3 no signal or speed measured too low in relation to the front wheel			Faulty sensor or missing sensor/tone wheel or excessive distance between the sensor and the tone wheel or tone wheel with wrong number of teeth
Rear speed sensor: 5DA4 no acceleration after pressure reduction			Faulty sensor or missing sensor/tone wheel or excessive distance between the sensor and the tone wheel
Rear speed sensor: excessive measured speed 5DA5			Faulty sensor or tone wheel with wrong number of teeth or wrong tyre size
Control unit: missing valve calibration 5DD2			Possible control unit fault
Control unit 5DD3			Possible control unit fault
Recirculation pump 5DF0			Possible control unit fault
Recirculation pump 5DF1			Possible control unit fault
Control unit 5DF2			Possible control unit fault
Low electric voltage - long period measurement 5DF3			Voltage too low measured for 30 seconds at PIN 18 of the ABS control unit:
Control unit 5DF5			Possible control unit fault
High electric voltage 5DF7			Excessive voltage measured at PIN 18 of the ABS control unit
Vehicle code 5E59			Inconsistency detected between memory coding (INFO ECU/Vehicle code) and what is measured at cable harness identification PIN (INFO ECU screen page, Vehicle identification line - Pins 2-15 of ABS control unit)
Control unit F000			Possible control unit fault
CAN line: D347 electric malfunction			Open circuit, short circuit in the ground lead or to battery of one or both wires of CAN line. Possible short circuit between the two cables.
CAN line: 5E11 electric malfunction			Open circuit, short circuit in the ground lead or to battery of one or both wires of CAN line. Possible short circuit between the two cables.
0xF01F control unit			Possible control unit fault
5E5A ABS switch			

SETTINGS screen page

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

ADJUSTMENTS

Characteristic	Value/example	Unit of measurement	Notes
Coding (1)			Used for re-coding the control unit or coding a new one.
Coding (2)			Vehicle identification is done according to the connection of PINS 2 and 15 of the ABS control unit connector and is stored in the control unit memory.
Coding (3)			The identification can be read in the INFO ECU screen page in the line: Vehicle code.

NOTE: the "X" in the table identifies the connector pin is grounded.

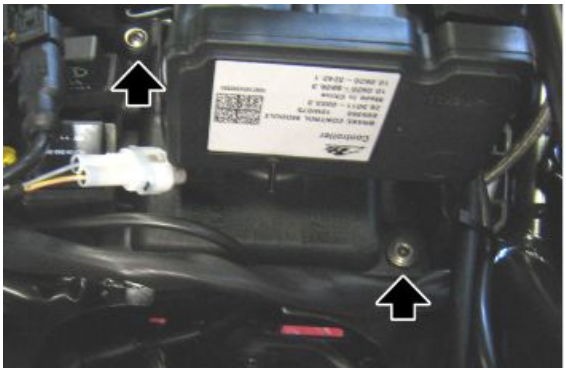
ABS CONNECTOR IS GROUNDED

Vehicle	PIN 2	PIN 15
Stelvio 1200 4V ABS		X
Norge 1200 4V ABS	X	

Modulator

- Remove the fuel tank.
- With a felt-tip pen, mark a reference on the pipes and on the ABS control unit to avoid inverting them when refitting.
- Protect with a clean cloth the plastic materials near the ABS control unit.
- Loosen the nuts and remove the pipes.
- Cover the pipes to prevent brake fluid spilling.

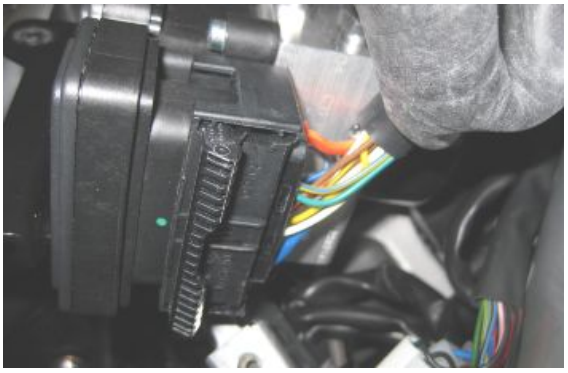
- Undo and remove the two control unit fixing screws.



See also

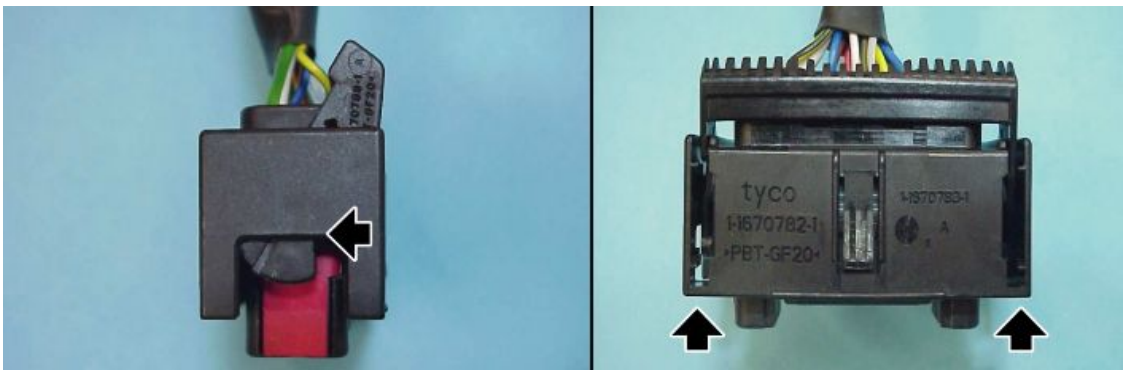
Fuel tank

- Disconnect the ABS control unit connector.
- Remove the ABS control unit.

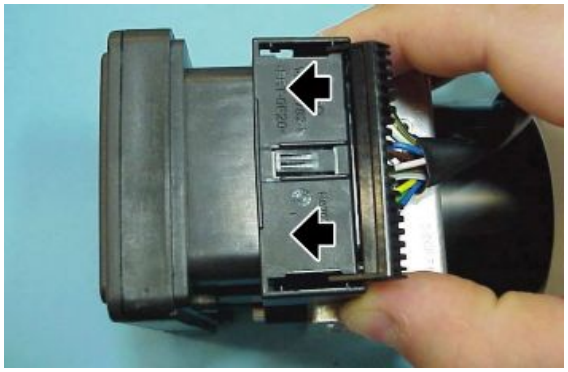


INSERTION PROCEDURE OF ABS CONTROL UNIT CONNECTOR

- Check the initial position of the lever that couples the connector.

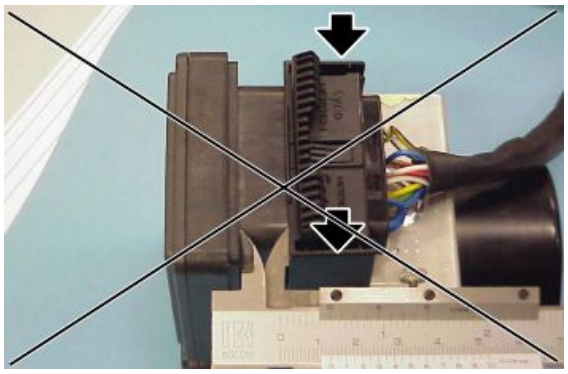


- When the connector is fully inserted, the distance between the connector and the ABS control unit must be 7.5 mm (0.29 in).



- If the initial position of the connector and the driving lever is not that shown in fig. 1, the connector will not be properly coupled and the distance measured will be greater (12 mm approx. (0.47 in)). In this case repeat the operation as described in the two previous points.

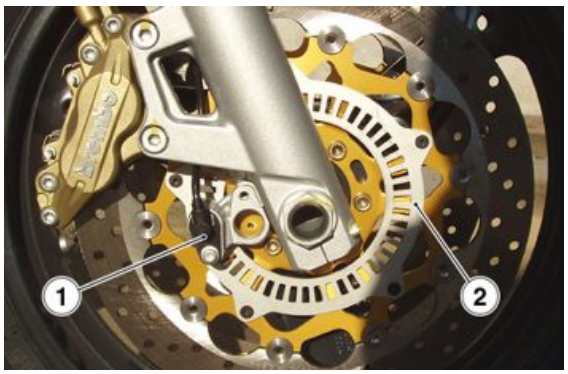
It is advisable to create a template to check the correct connector insertion.



- Fit the protection casing.

Component maintenance

The vehicle is fitted with a two-channel ABS system, i.e. it works on both the front and the rear wheel.
Check periodically and each time the wheels are refitted, the tone wheel (2) or the sensor (1) replaced, that the wheel distance is constant at each 360°. Use a thickness gauge to check the distance between sensor (1) and tone wheel (2) at three points at a 120° span. The values should be between:



0.3 - 2.00 mm (0.012 - 0.079 in) for the front one;

0.3 - 2.00 mm (0.012 - 0.079 in) for the rear one;

CAUTION

IF A VALUE BEYOND THE TOLERANCE RANGE IS MEASURED, REPLACE THE SENSOR (1) AND/OR THE TONE WHEEL (2) AND REPEAT THE CHECKS; MAKE SURE THAT THE VALUES ARE WITHIN THE TOLERANCE LIMITS.

TONE WHEELS (2) CLEANING

It is important to check that all the tone wheels (2) are always clean. Otherwise,: gently remove any possible dirt deposits with a cloth or metal brush. Avoid using solvents, abrasives and air or water jets directly on the tone wheel (2).

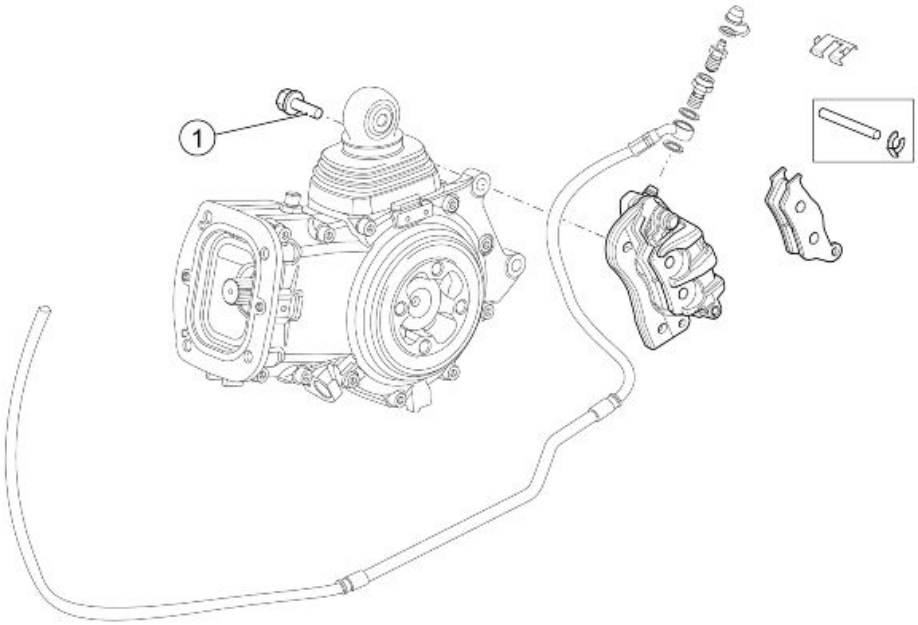
TONE WHEEL SENSOR REPLACEMENT

Disconnect the tone wheel sensor connector (1) from the main wire. Unscrew and remove the screw and remove the tone wheel sensor (1).

CAUTION

BEFORE REFITTING, MAKE SURE THAT THE FAYING SURFACES BETWEEN THE SENSOR (1) AND THE SEAT ITSELF DO NOT SHOW SIGNS OF DAMAGE AND ARE COMPLETELY CLEAN. ALWAYS CHECK THE DISTANCE BETWEEN THE SENSOR (1) AND THE TONE WHEEL (2).

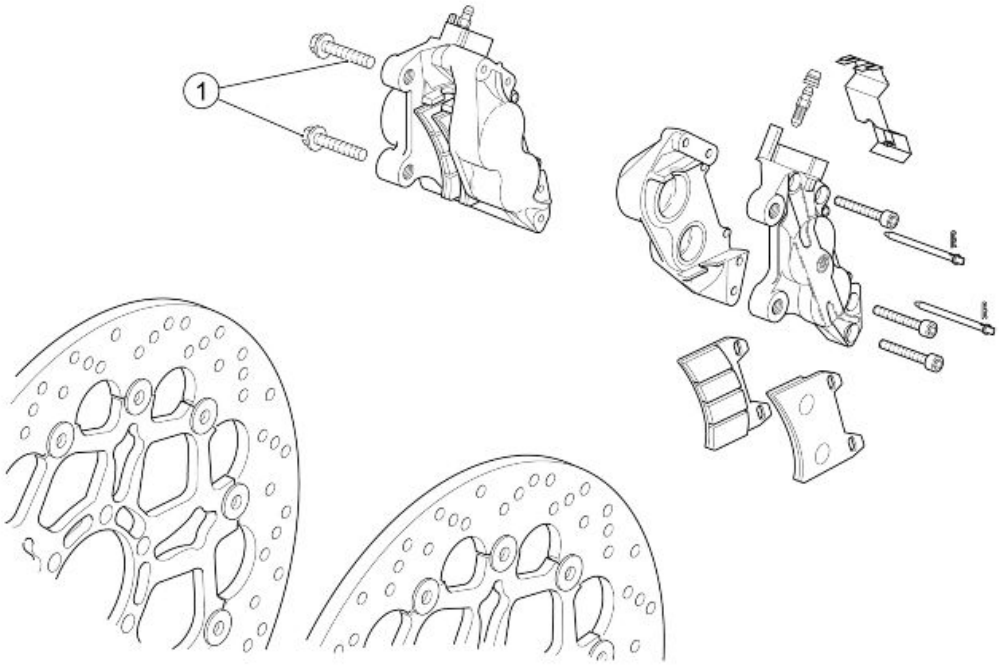
Rear brake calliper



REAR BRAKE CALLIPER

pos.	Description	Type	Quantity	Torque	Notes
1	Rear brake calliper fixing screw	M10	2	50 Nm (36.87 lbf ft)	-

Front brake calliper



FRONT BRAKE CALLIPERS

pos.	Description	Type	Quantity	Torque	Notes
1	Front brake calliper fixing screws	M10	4	50 Nm (36.87 lbf ft)	-

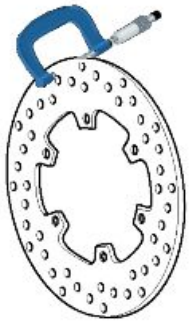
Rear brake disc

Disc Inspection

CAUTION

THE BRAKE DISC SHAPE DOES NOT CHANGE THE OPERATING AND MAINTENANCE SPECIFICATIONS OF THE SYSTEM.

- The following operations are to be carried out with brake disc fitted on the wheel.
- Check the disc for wear by measuring the minimum thickness with a micrometer in different points. If the minimum thickness, even in a single point of the disc, is less than the minimum value, replace the disc.



Disc thickness minimum value: 4.5 mm (0.18 in)

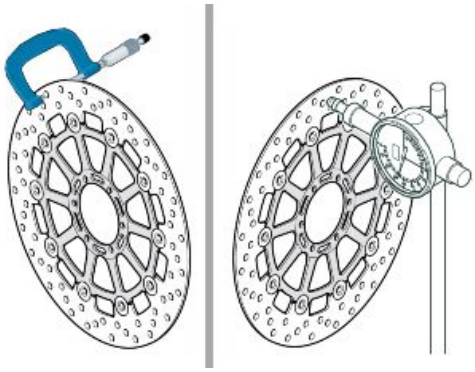
Front brake disc

Disc Inspection

CAUTION

THE FRONT BRAKE DISC SHAPE DOES NOT CHANGE THE OPERATING AND MAINTENANCE SPECIFICATIONS OF THE SYSTEM.

- The following operations must be carried out with the brake discs fitted on the wheel; they refer to a single disc, but are valid for both.
- Check the disc for wear by measuring the minimum thickness with a micrometer in different points. If the minimum thickness, even in a single point of the disc, is less than the minimum value, replace the disc.



Disc thickness minimum value: 4 mm (0.16 in)

Front brake pads

Removal

- Turn the pins and remove both split pins.

- Remove both pins.

- Remove the vibration-damping plate.

- Extract one pad at a time.

CAUTION

AFTER REMOVING THE PADS, DO NOT OPERATE THE BRAKE LEVER OR THE CALLIPER PLUNGERS COULD GO OUT OF THEIR SEATS RESULTING IN BRAKE FLUID LEAKS.

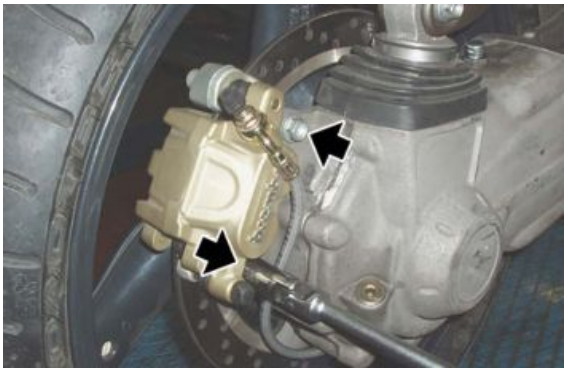
NOTE

FOR REFITTING, FOLLOW THE PROCEDURE IN THE RE-VERSE ORDER

Rear brake pads

Removal

- Undo and remove the two screws.
- Remove the brake calliper from the disc.
- Turn the pin and pull out the split pin.
- Remove the split pin.



- Remove the pin.

- Extract one pad at a time.

CAUTION

AFTER REMOVING THE PADS, DO NOT OPERATE THE BRAKE LEVER OR THE CALLIPER PLUNGERS COULD GO OUT OF THEIR SEATS RESULTING IN BRAKE FLUID LEAKS.

- Insert two new pads, placing them so that the holes are aligned with the calliper holes.

CAUTION

ALWAYS REPLACE BOTH PADS AND MAKE SURE THEY ARE CORRECTLY POSITIONED INSIDE THE CALLIPER.

- Insert the pin.
- Place the split pin.
- Check the brake fluid level in the reservoir.

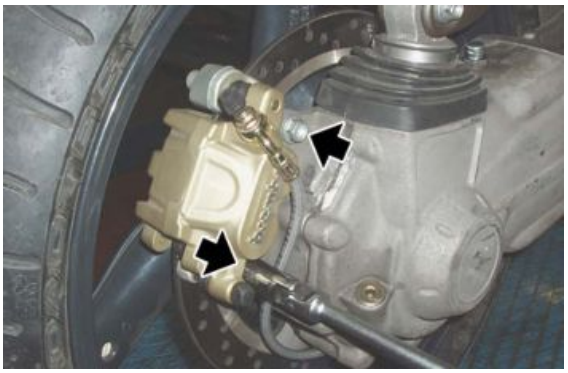
Installing

- Insert two new pads, placing them so that the holes are aligned with the caliper holes.

CAUTION

ALWAYS REPLACE BOTH PADS AND MAKE SURE THEY ARE CORRECTLY POSITIONED INSIDE THE CALLIPER.

- Insert the pin.
- Position the split pin.
- Insert the brake calliper into the disc by screwing in the two screws.
- Abut the plungers against the pads, acting on the brake pump pedal several times.
- Check the brake fluid level in the reservoir.



Bleeding the braking system

VEHICLE PREPARATION

- It is important to check that there is always enough brake fluid in the reservoir.
- Using a bleed device facilitates these operations while, in the meantime, the "Brake fluid replacement" operations are performed.
- In this case, the bleed process must be accompanied by further pedal strokes and with the bleed device connected (about 5 for each wheel circuit).

BRAKE PUMP REPLACEMENT

PRELIMINARY OPERATIONS

- Replace the damaged brake pump with a new one.
- Connect the brake pipe to the new brake pump.
- Fill the reservoir with new brake fluid.

CAUTION

PERFORM THE REGULAR BRAKING SYSTEM BLEEDING, AS DESCRIBED AT THE END OF THE CHAPTER.

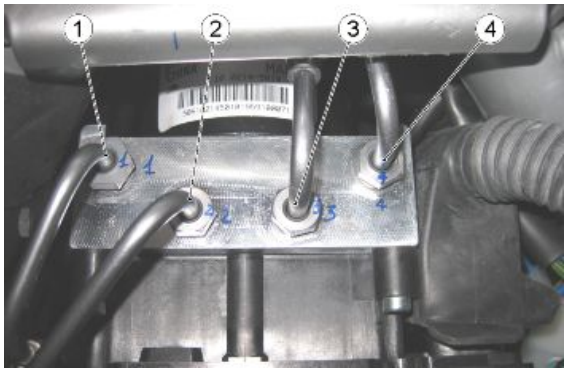
- Always fill the reservoir up to the reference "MAX" and refit the cap.
- Check the stroke and the sensitivity of both the lever and the brake pedal.
- If, after bleeding, the pedal or the lever stroke is too long, check that there are no leaks in the braking system and if everything is ok, continue bleeding operations using Navigator as described.
- Detach the bleed hoses and close the bleed screws again to the correct tightening torque.

See also

Front
Rear

REPLACE THE ABS CONTROL UNIT

VEHICLE PREPARATION



- Connect the bleed bottle to the bleed screws of the front and rear callipers and open it.
- Fully press down the lever and the brake pedal and fix them into position with the respective locking devices.
- Close the bleed screws of the front and rear callipers and remove the bleed bottle.
- Remove the damaged ABS control unit.

Note: First of all, detach the brake pipes that go from the ABS control unit to the brake pump (1-4) and immediately seal the opened unions of the ABS control unit with protective caps. Afterwards, remove pipes (2-3) that go from the ABS control unit to the brakes and also seal these unions with protective caps.

- Install the new ABS control unit, previously filled up.
- So that the brake fluid remains in the ABS control unit, first remove the protective caps of the braking circuit unions and connect the respective pipes.

Once all the braking circuits have been connected, remove the protective caps from the braking pump unions and connect the braking pump pipes to the ABS control unit.

- Unlock the lever and the brake pedal.
- Remove the reservoir cap and fill it with new brake fluid up to the reference "MAX".

CAUTION

PERFORM THE REGULAR BRAKING SYSTEM BLEEDING, AS DESCRIBED AT THE END OF THE CHAPTER.

- Always fill the reservoir up to the reference "MAX" and refit the cap.

- Check the stroke and the sensitivity of both the lever and the brake pedal.
- If, after bleeding, the pedal or the lever stroke is too long, check that there are no leaks in the braking system and if everything is ok, continue bleeding operations using Navigator as described.
- Detach the bleed hoses and close the bleed screws again to the correct tightening torque.

See also

Front
Rear

CALLIPERS REPLACEMENT

VEHICLE PREPARATION - The operations are described for the front system, but they are also valid for both braking systems.

- Connect the bleed bottles to the bleed screw of the front calliper and open it.
- Fully press down the brake lever and fasten it into position with a locking device so as to avoid fluid flowing out from the open system.
- Close the bleed screws of the front calliper and remove the bleed bottle.
- Replace the damaged calliper with a new one.
- Unlock the brake lever.
- Remove the reservoir cap and fill it with new brake fluid up to the reference "MAX".

CAUTION

PERFORM THE REGULAR BRAKING SYSTEM BLEEDING, AS DESCRIBED AT THE END OF THE CHAPTER.

- Always fill the reservoir up to the reference "MAX" and refit the cap.
- Check the stroke and the sensitivity of both the lever and the brake pedal.
- If, after bleeding, the pedal or the lever stroke is too long, check that there are no leaks in the braking system and if everything is ok, continue bleeding operations using Navigator as described.
- Detach the bleed hoses and close the bleed screws again to the correct tightening torque.

See also

Front
Rear

BLEEDING SYSTEM WITH NAVIGATOR

This type of bleeding has to be carried out if after all the checks the brake lever and the pedal are still spongy.

The operations described here are valid for both systems even though the description refers to the front system.

FRONT

- With Navigator properly connected, select the function "FRONT BRAKE BLEEDING PROCEDURE".
- The pump starts rotating.
- While the pump is performing a rotation cycle, operate and release the front brake lever until the message Navigator cycle completion is received.
- This procedure allows the air to turn and to accumulate.
- Once the procedure with Navigator is finished, perform the REGULAR BLEEDING to remove the air from the system completely.

CAUTION

PERFORM THE REGULAR BRAKING SYSTEM BLEEDING, AS DESCRIBED AT THE END OF THE CHAPTER.

See also

Front
Rear

Front

Any air trapped in the hydraulic circuit acts as a cushion, absorbing much of the pressure applied by the brake pump and minimising the braking power of the calliper.

The presence of air is signalled by the "sponginess" of the brake control and poor braking efficiency.

CONSIDERING THE DANGER FOR VEHICLE AND RIDER, IT IS STRICTLY NECESSARY, AFTER REFITTING BRAKES AND RESTORING THE BREAKING SYSTEM TO THE REGULAR USE CONDITIONS, THAT THE HYDRAULIC CIRCUIT BE AIR PURGED.

NOTE

THE FOLLOWING OPERATIONS REFER TO ONLY ONE FRONT BRAKE CALLIPER BUT APPLY TO BOTH CALLIPERS. THE VEHICLE MUST BE ON LEVEL GROUND TO BE PURGED. WHILE PURGING THE HYDRAULIC SYSTEM, FILL THE RESERVOIR WITH THE NECESSARY QUANTITY OF BRAKE FLUID. CHECK THAT, DURING THE OPERATION, THERE IS ALWAYS BRAKE FLUID IN THE RESERVOIR.

REGULAR AIR BLEEDING SYSTEM

- Remove the rubber protection cover from the bleed valve.
- Insert the transparent plastic pipe in the front brake calliper bleed valve and slide the other end of this pipe in a container to collect the fluid.
- Remove the front brake fluid reservoir cap.
- Quickly press and release the front brake lever several times and then keep it fully pressed.
- Loosen the bleed valve 1/4 of a turn so that the brake fluid flows into the container. This will release the tension on the brake lever and will make it reach the end of stroke.
- Close the bleed valve before the lever reaches its end of stroke.
- Repeat the operation until the fluid draining into the container is air-bubble free.

NOTE

WHILE PURGING THE HYDRAULIC SYSTEM, FILL THE RESERVOIR WITH THE NECESSARY QUANTITY OF BRAKE FLUID. CHECK THAT, DURING THE OPERATION, THERE IS ALWAYS BRAKE FLUID IN THE RESERVOIR.

- Screw the bleeding valve and remove the pipe.
- Top-up the reservoir until the correct brake fluid level is obtained.
- Refit and block the front brake oil reservoir cap.
- Refit the rubber protection cover.

Rear

Any air trapped in the hydraulic circuit acts as a cushion, absorbing much of the pressure applied by the brake pump and minimising the braking power of the calliper.

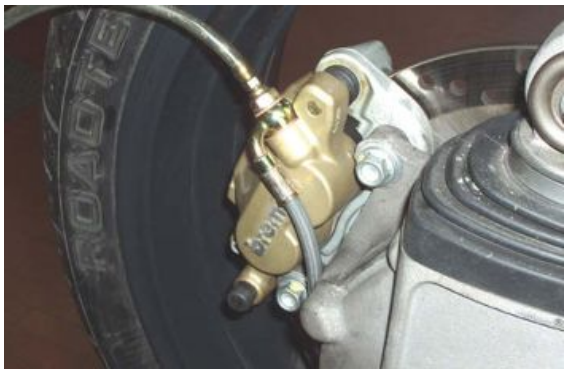
The presence of air is signalled by the "sponginess" of the brake control and poor braking efficiency.

CAUTION

CONSIDERING THE DANGER FOR VEHICLE AND RIDER, IT IS STRICTLY NECESSARY, AFTER REFITTING BRAKES AND RESTORING THE BRAKING SYSTEM TO THE REGULAR USE CONDITIONS, THAT THE HYDRAULIC CIRCUIT BE AIR PURGED. THE VEHICLE MUST BE ON LEVEL GROUND TO BE PURGED. WHILE PURGING THE HYDRAULIC SYSTEM, FILL THE RESERVOIR

WITH THE NECESSARY QUANTITY OF BRAKE FLUID. CHECK THAT, DURING THE OPERATION, THERE IS ALWAYS BRAKE FLUID IN THE RESERVOIR.

REGULAR AIR BLEEDING SYSTEM



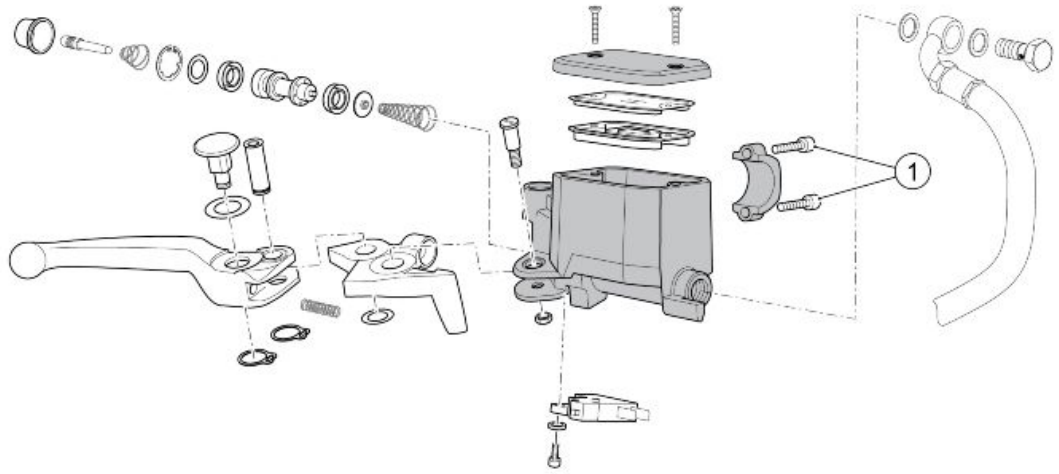
- Remove the rubber protection cover from the bleed valve.
- Insert the transparent plastic pipe in the front brake calliper bleed valve and slide the other end of this pipe in a container to collect the fluid.
- Remove the front brake fluid reservoir cap.
- Quickly press and release the front brake lever several times and then keep it fully pressed.
- Loosen the bleed valve 1/4 of a turn so that the brake fluid flows into the container. This will release the tension on the brake lever and will make it reach the end of stroke.
- Close the bleed valve before the lever reaches its end of stroke.
- Repeat the operation until the fluid draining into the container is air-bubble free.

NOTE

WHILE PURGING THE HYDRAULIC SYSTEM, FILL THE RESERVOIR WITH THE NECESSARY QUANTITY OF BRAKE FLUID. CHECK THAT, DURING THE OPERATION, THERE IS ALWAYS BRAKE FLUID IN THE RESERVOIR.

- Screw the bleed valve and remove the pipe.
- Top-up the reservoir until the right brake fluid level is obtained.
- Refit and lock the rear brake oil reservoir cap.
- Refit the rubber protection cover.

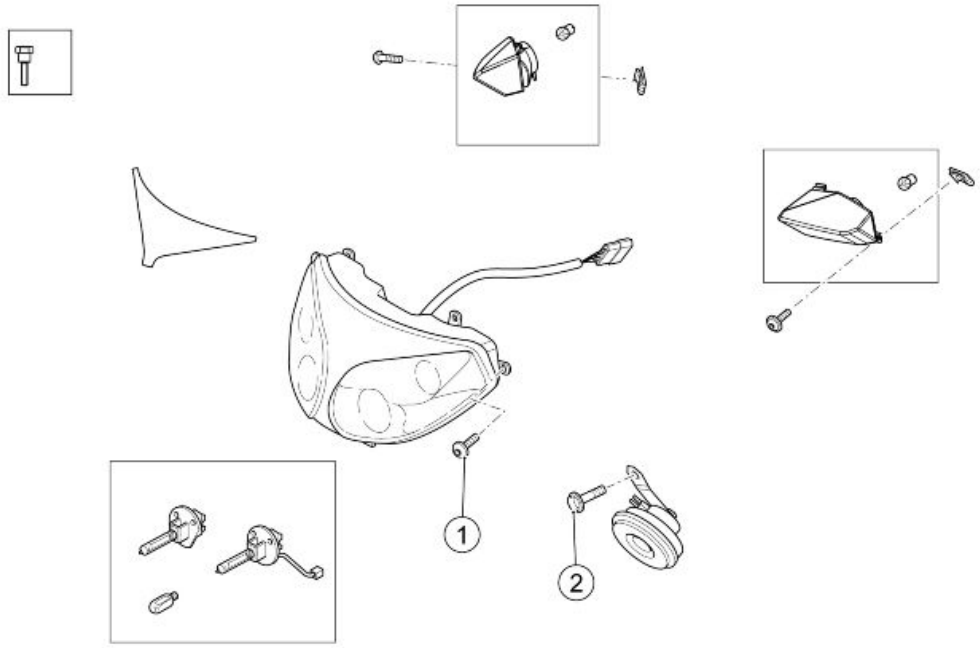
Front brake pump



FRONT BRAKE LEVER

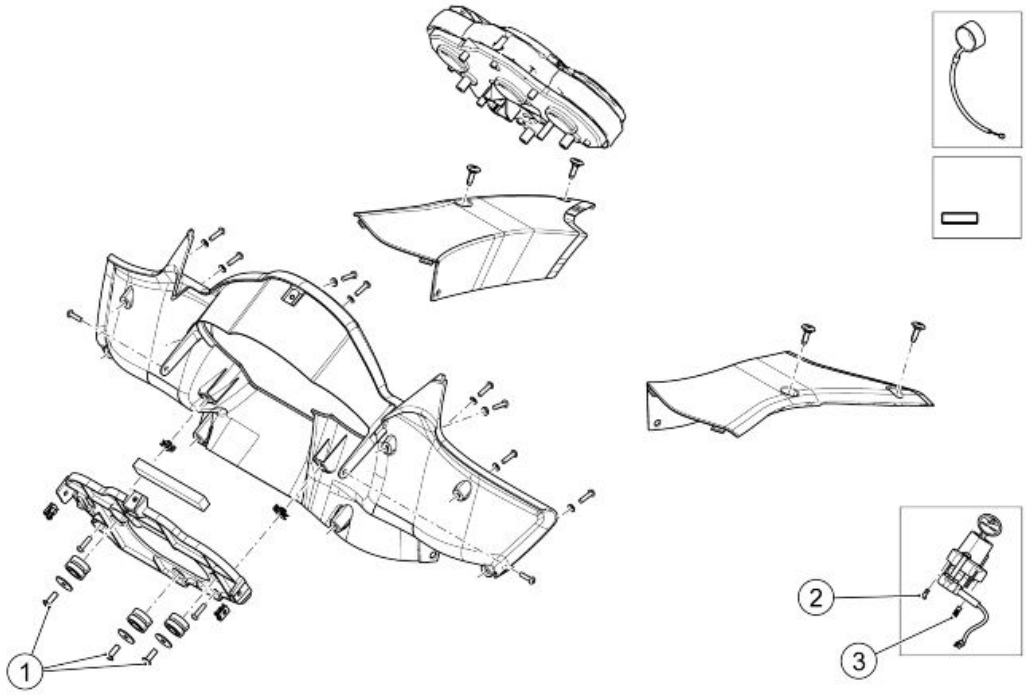
pos.	Description	Type	Quantity	Torque	Notes
1	Front brake pump U-bolt fixing screw	M6	2	10 Nm (7.37 lbf ft)	Sequence 1-2-1

INDEX OF TOPICS



FRONT LIGHTS

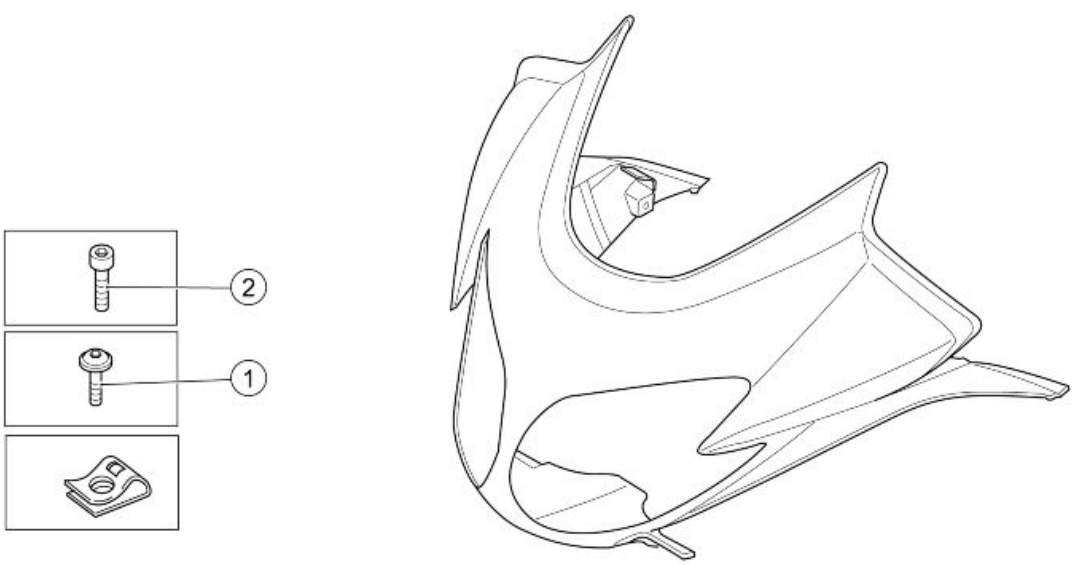
pos.	Description	Type	Quantity	Torque	Notes
1	Headlamp fixing screw	M5	4	6 Nm (4.42 lbf ft)	-
2	Horn fixing screw	M6	1	10 Nm (7.37 lbf ft)	-



INSTRUMENT PANEL

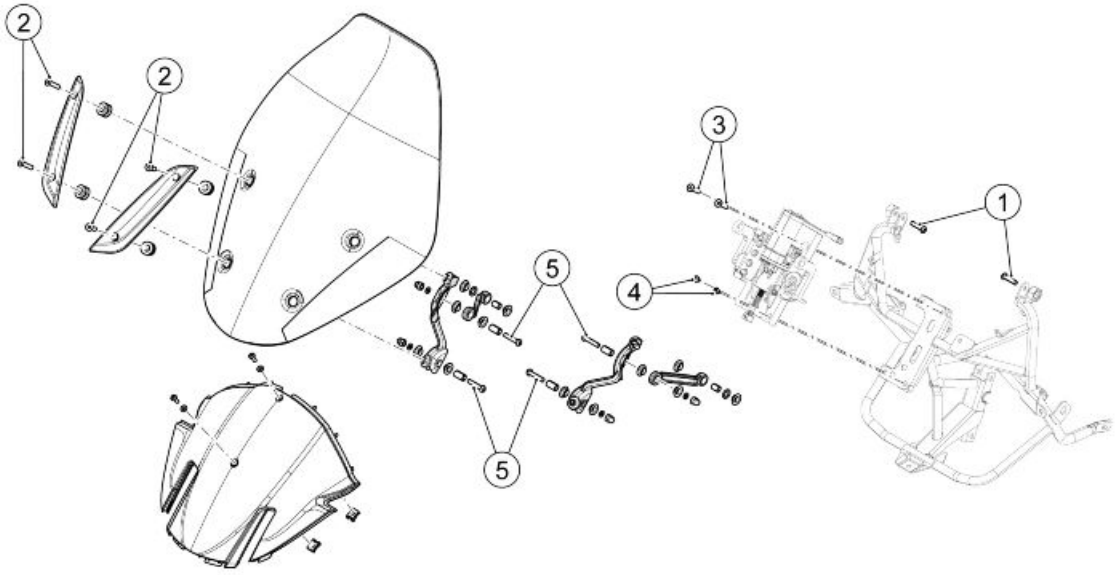
pos.	Description	Type	Quantity	Torque	Notes
1	Instrument panel fixing screw	SWP M5x14	3	3 Nm (2.21 lbf ft)	-

pos.	Description	Type	Quantity	Torque	Notes
2	Ignition lock fixing screw	M8x30	1	25 Nm (18.44 lbf ft)	-
3	Ignition lock shear head fixing screw	M8x28	1	-	At the point of failure



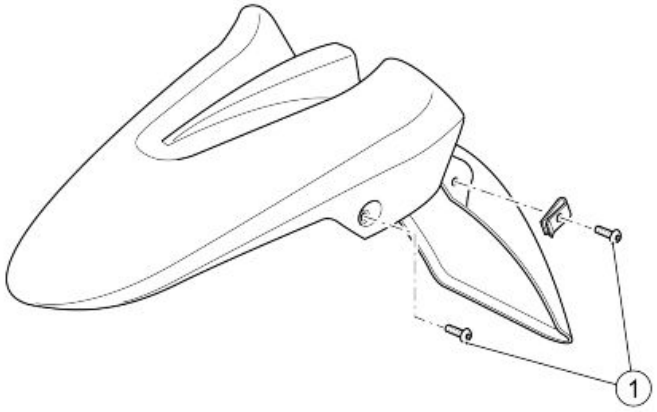
WINDSHIELD

pos.	Description	Type	Quantity	Torque	Notes
1	Top fairing fixing screw	M5x9	8	4 Nm (2.95 lbf ft)	-
2	Top fairing fixing screw	M5x16	2	4 Nm (2.95 lbf ft)	-



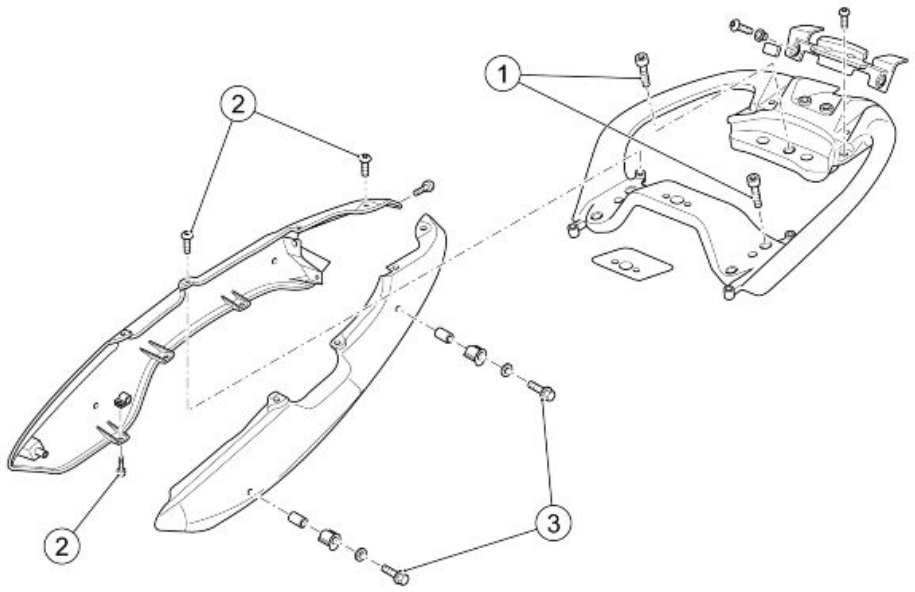
WINDSHIELD

pos.	Description	Type	Quantity	Torque	Notes
1	Windshield link rod fixing screw on the frame	M6x25	2	10 Nm (7.37 lbf ft)	-
2	Aesthetic support fixing screw	M5	4	4 Nm (2.95 lbf ft)	-
3	Engine guide lock to frame upper fixing screw	M6	2	10 Nm (7.37 lbf ft)	-
4	Engine guide lock to frame lower fixing screw	M6	2	10 Nm (7.37 lbf ft)	-
5	Windshield support fixing screw	M6	4	10 Nm (7.37 lbf ft)	-



FRONT MUDGUARD

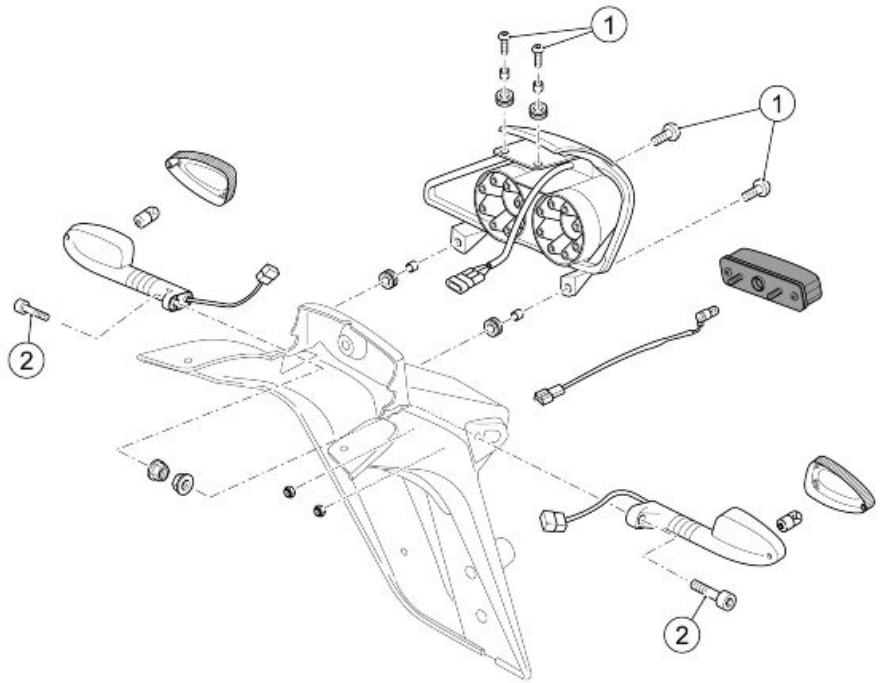
pos.	Description	Type	Quantity	Torque	Notes
1	Front mudguard fixing screw	M5x12	4	4 Nm (2.95 lbf ft)	-



TAIL

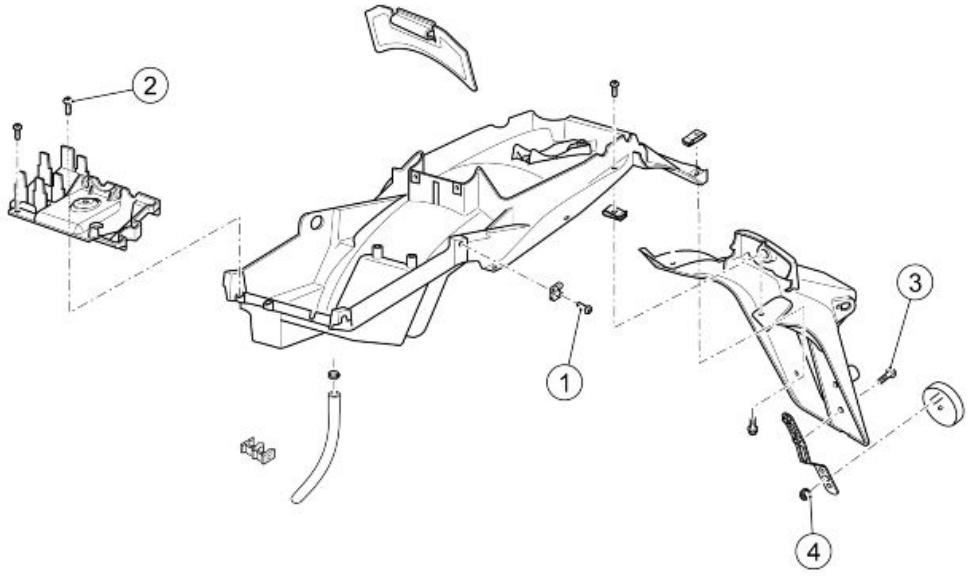
Tail

pos.	Description	Type	Quantity	Torque	Notes
1	Handgrip to chassis fixing screw	M8x25	5	25 Nm (18.44ft)	-
2	Tail to handgrip and to rear fairings fixing screw	M5x9	10	4 Nm (2.95 lbf ft)	-
3	Hooks and tail fairing to chassis fixing screw	M8	4	20 Nm (14.75 lbf ft)	-



REAR LIGHTS

pos.	Description	Type	Quantity	Torque	Notes
1	Handgrip taillight fixing screw	M5x16	4	4 Nm (2.95 lbf ft)	-
2	Rear turn indicator fixing screw	M6	2	2 Nm (1.47 lbf ft)	-



SPLASH GUARD

pos.	Description	Type	Quantity	Torque	Notes
1	Splash guard fixing screw to the chassis	M6	6	10 Nm (7.37 lbf ft)	Loctite 243
2	ABS support fixing screw to the splash guard	SWP M5x20	3	3 Nm (2.21 lbf ft)	-
3	Retroreflector support fixing screw to the license plate	M5x10	2	4 Nm (2.95 lbf ft)	-
4	Retroreflector fixing nut retainer to the support	M5	1	4 Nm (2.95 lbf ft)	-

Headlight fairing

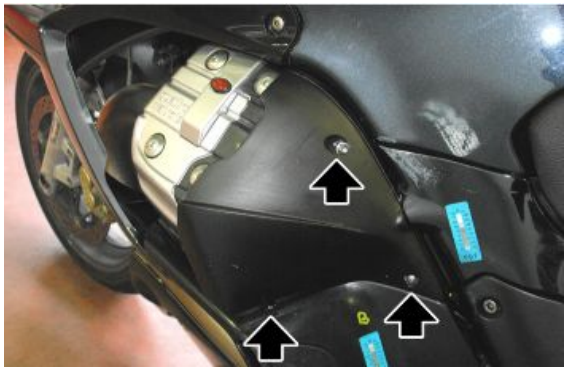
- Undo and remove the four screws indicated.
- Remove the two locks.

- Remove the top fairing glass.

Side fairings

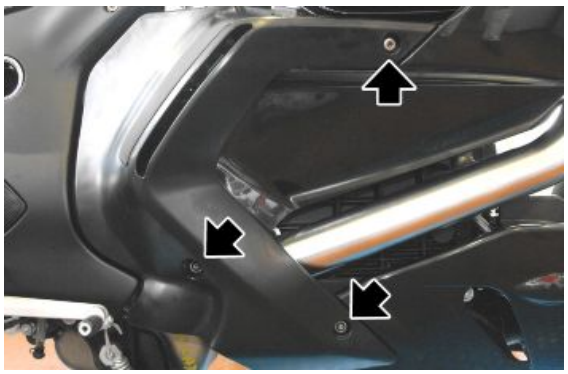
HEAD GUARD

- Undo and remove the three fixing screws.
- Remove the head guard.



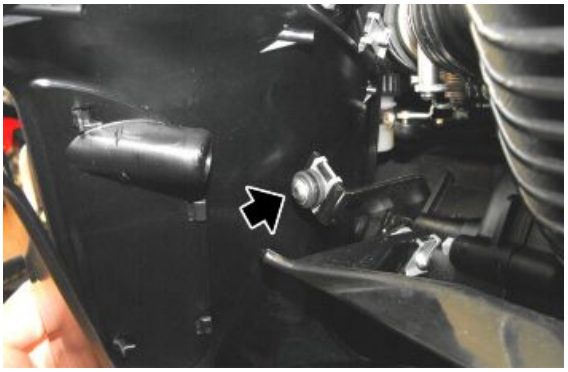
RIGHT SIDE FAIRING

- Remove the head guard.
- Undo and remove the three screws indicated.



- Remove the front fitting of the fairing.

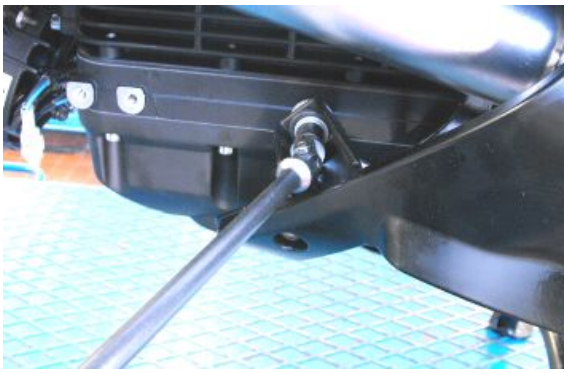
- Remove the fairing, by pulling it from the centring screw.



LEFT SIDE FAIRING

- Remove the left fairing lug.
- Remove the head guard.
- Remove the fairing cover.

- Undo and remove the two screws indicated.



- Unscrew and remove the lower screw.
- Remove the left side fairing.

Air box

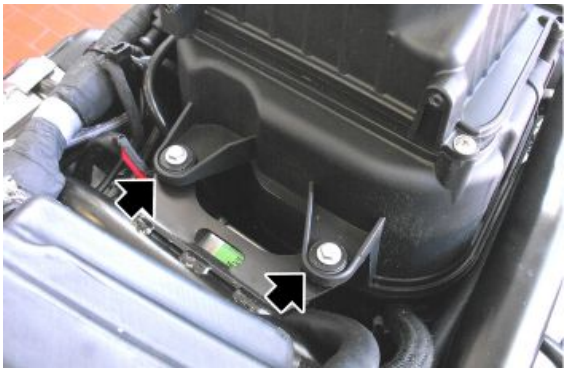
- Remove the fuel tank.
- Disconnect the connector from the air temperature sensor.

- Remove the oil breather pipe.

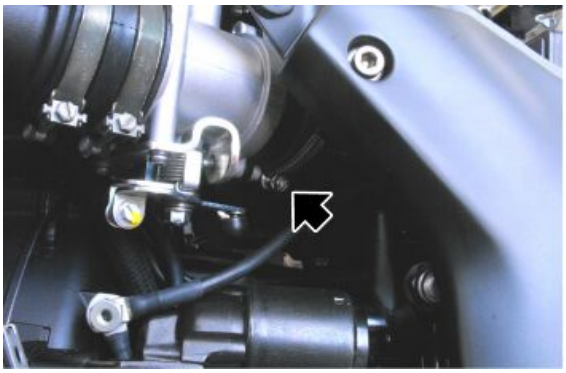
- Unscrew and remove the two screws from the oil vapour recovery reservoir.

- Unscrew and remove the tube guide screw on the air filter casing.

- Move the oil vapour recovery reservoir aside.
- Unscrew and remove the two front screws from the air filter casing.



- Operating from both sides, loosen the clamp and slide off the sleeve from the throttle body.



- Lift the air filter casing and slide off the fuel depression pipe.
- Remove the air filter casing.

Lower cowl

See also

Engine oil cooler

Fuel tank

- Remove the saddle.
- Working from both sides, undo and remove the screw.

- Operating from both sides, lift the side fairing to remove it and slide it off the pin.

- Working from both sides, undo and remove the front screw.

- Undo and remove the rear screw.

- Lift the fuel tank and remove the pipes from the "T" joint.

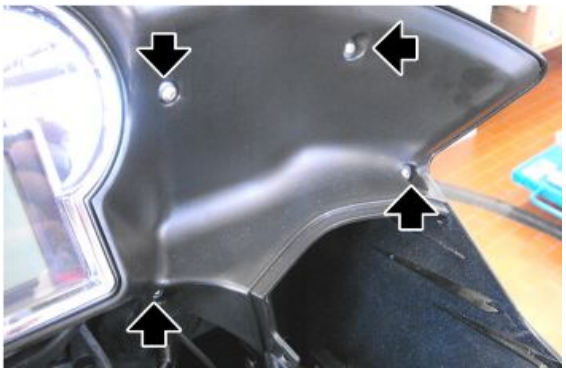
- Disconnect the connector.

- Disconnect the fuel pipe.

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

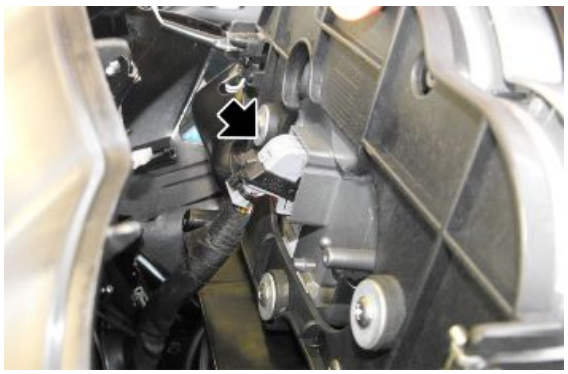
Instrument cluster cover

- Remove the two side covers of the control panel.
- Remove the top fairing glass.
- Operating from both sides, unscrew the four screws indicated.



- Undo and remove the upper front screw.

- Lift the control panel together with the instrument panel.
- Disconnect the air temperature sensor connector.



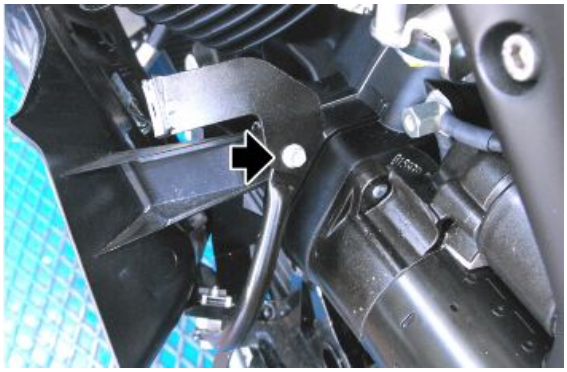
- Disconnect the connector together with the instrument panel.
- Remove the control panel together with the instrument panel.

See also

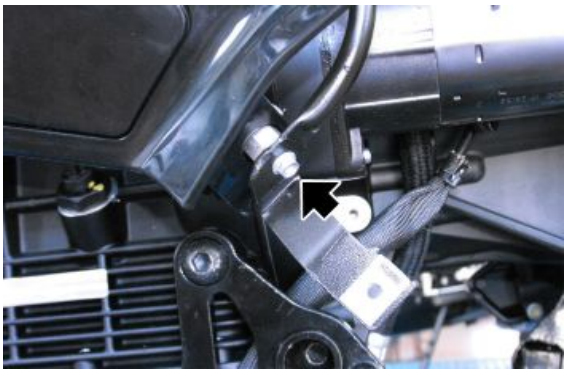
Steering bearing

Headlight fairing

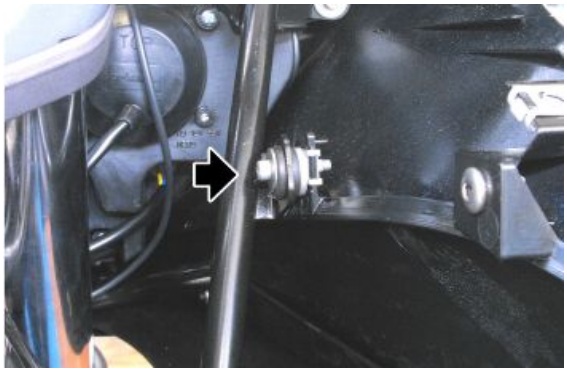
- Remove the left side fairing.
- Remove the fuel tank.
- Remove the control panel with the instrument panel.
- Working from both sides, unscrew and remove the two screws indicated.



- If necessary, remove the stud bolts from each side, unscrewing it from the fairing.

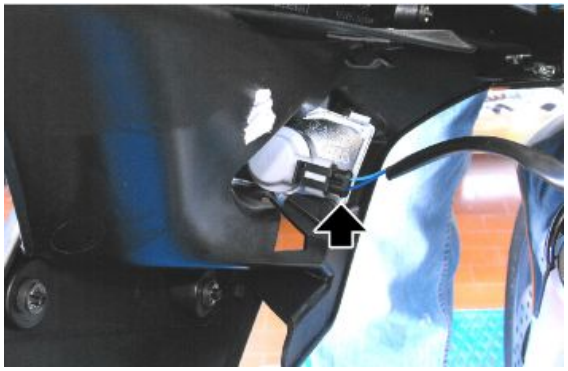


- Working from both sides, undo and remove the internal screw.

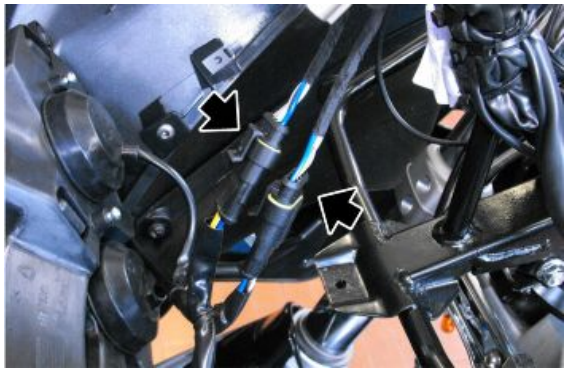


- Unscrew and remove the screw below the front headlamp.

- Disconnect the connectors of the turn indicators.



- Disconnect the two connectors from the front headlight.
- Remove the upper fairings together with the headlight.



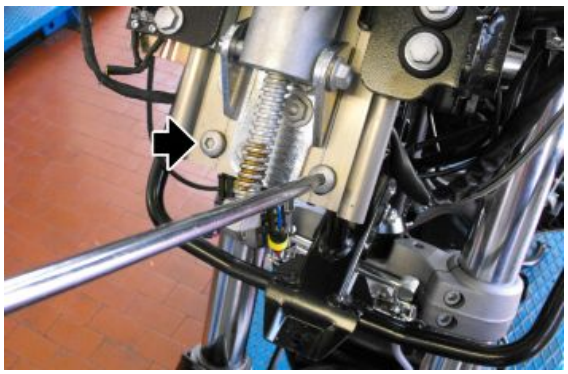
See also

Side fairings

Fuel tank

Adjustable windscreen

- Remove the upper fairings.
- Undo and remove the two lower screws.



- Undo and remove the two upper screws.

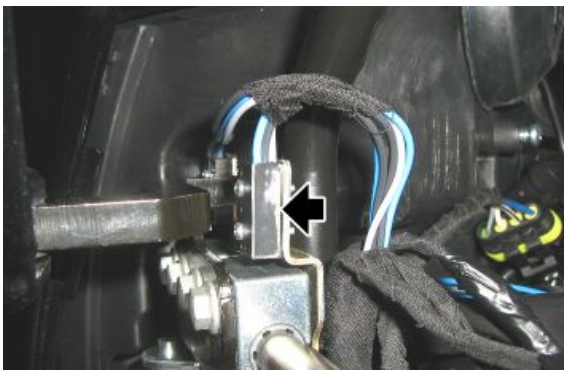
- Working from both sides, unscrew and remove the upper windshield fixing screws.

- Disconnect the windshield driving engine connector.

- Unscrew and remove the two fixing screws and detach the two windshield end of the strokes, leaving them connected to the system.

NOTE

WHEN REFITTING, FIT THE END OF STROKE DOWNWARDS WITH THE SHORTEST CABLE.



See also

Instrument cluster cover

INDEX OF TOPICS

Carry out the listed checks before delivering the motorcycle.

WARNING

HANDLE FUEL WITH CARE.

Aesthetic inspection

- Paintwork
- Fitting of Plastic Parts
- Scratches
- Dirt

Tightening torques inspection

- Safety fasteners:

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 starter
- 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 MEDICAL ATTENTION IMMEDIATELY.
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.

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)

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

CHECK AND ADJUST TYRE PRESSURE WITH TYRES AT AMBIENT TEMPERATURE.

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