



SERVICE STATION MANUAL

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Moto Guzzi Audace



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THE VALUE OF SERVICE

As a result of continuous updates and specific technical training programmes for Moto Guzzi products, only **Moto Guzzi** Official Network mechanics know this vehicle fully and have the specific tools necessary to carry out maintenance and repair operations correctly.

The reliability of the vehicle also depends on its mechanical conditions. Checking the vehicle before riding it, its regular maintenance and the use of **original Moto Guzzi spare parts** only are essential factors!

For information on the nearest **Official Dealer and/or Service Centre** consult our website:

www.motoguzzi.com

Only by requesting Moto Guzzi original spare parts can you be sure of purchasing products that were developed and tested during the actual vehicle design stage. All Moto Guzzi original spare parts undergo quality control procedures to guarantee reliability and durability.

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Not all versions/models shown in this publication are available in all countries. The availability of individual versions should be checked with the Official Moto Guzzi sales network.

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Piaggio & C. S.p.A. Viale Rinaldo Piaggio, 25 - 56025 PONTEDERA (PI), Italy

www.piaggio.com

SERVICE STATION MANUAL

Moto Guzzi Audace

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

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

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

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



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



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



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



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CHARACTERISTICS

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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 run the engine 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



**THE FUEL USED TO POWER INTERNAL COMBUSTION ENGINES IS HIGHLY FLAMMABLE AND MAY BE EXPLOSIVE UNDER CERTAIN CONDITIONS. IT IS THEREFORE RECOMMENDED TO CARRY OUT REFUELLING AND MAINTENANCE PROCEDURES IN A VENTILATED AREA WITH THE ENGINE SWITCHED OFF. DO NOT SMOKE DURING REFUELLING AND NEAR FUEL VAPOURS, AVOIDING ANY CONTACT WITH NAKED FLAMES, SPARKS OR OTHER SOURCES WHICH MAY CAUSE THEM TO IGNITE OR EXPLODE.
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. When handling these components, wear 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 PROTECTIVE IMPERMEABLE 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**



THE BRAKE FLUID MAY DAMAGE PAINTED, PVC OR RUBBER SURFACES. WHEN SERVICING THE BRAKING SYSTEM, PROTECT THESE COMPONENTS WITH A CLEAN CLOTH. ALWAYS WEAR PROTECTIVE GOGGLES WHEN SERVICING THE BRAKING SYSTEM. THE BRAKE FLUID IS EXTREMELY DANGEROUS TO THE 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, IT CAN CAUSE BURNS WHEN IN 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. IF THE FLUID GETS IN CONTACT WITH YOUR EYES, WASH WITH ABUNDANT WATER FOR FIFTEEN MINUTES AND CONSULT AN EYE SPECIALIST 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 TO BE ACTIVATED.

Maintenance rules

GENERAL PRECAUTIONS AND INFORMATION

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

BEFORE REMOVING 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.

REASSEMBLY OF COMPONENTS

CAUTION

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

- Only use ORIGINAL Aprilia SPARE PARTS.
- Comply with lubricant and consumables use guidelines.
- Lubricate parts (whenever possible) before reassembling them.
- When tightening nuts and screws, start either from the components with the largest diameter or from the innermost components, proceeding 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), cotter pins and screws with new parts if the thread is damaged.
- When assembling the bearings, make sure to lubricate them well.
- Check that each component is assembled correctly.
- After a repair or routine maintenance, carry out pre-ride checks and test the vehicle on private grounds or in an area with low traffic.
- Clean all mating surfaces, oil seal rims and gaskets before refitting. Smear a thin layer of lithium-based grease on the oil seal rims. Reassemble oil seals and bearings with the brand or batch 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 cable harness:

Press the relevant safety hooks, if any.

- 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

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

NOTE

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

TIGHTENING TORQUES

CAUTION

DO NOT FORGET THAT THE TIGHTENING TORQUES OF ALL FASTENING ELEMENTS ON WHEELS, BRAKES, WHEEL BOLTS 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 PARTS ON A REGULAR BASIS AND AL-

WAYS USE A TORQUE WRENCH TO REASSEMBLE THESE COMPONENTS. FAILURE TO COMPLY WITH THESE RECOMMENDATIONS MAY CAUSE ONE OF THESE COMPONENTS TO GET LOOSE AND EVEN DETACHED, THUS BLOCKING A WHEEL, OR OTHERWISE COMPROMISE VEHICLE HANDLING. THIS CAN LEAD TO FALLS, WITH THE RISK OF SERIOUS INJURY OR DEATH.

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 PLATES 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 RUNNING IN PERIOD.

Follow these guidelines:

- 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 FRAME NUMBER IMMEDIATELY VOIDS THE WARRANTY.

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

ZGULVB000FMXXXXXX

KEY:

ZGU: WMI (World manufacturer identifier) code;

LV: model;

B00: version variation;

0: free digit

F: variable year of manufacture (F - for 2015)

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

XXXXXX: serial number (6 digits);

CHASSIS NUMBER

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



ENGINE NUMBER

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



Dimensions and mass

WEIGHT AND DIMENSIONS

Specification	Desc./Quantity
Maximum length (Audace)	2455 mm (96.65 in)
Maximum width at handlebar (Audace)	920 mm (36.22 in)
Maximum height (Audace)	1145 mm (45.08 in)
Seat height	740 mm (29.13 in)
Minimum earth clearance	165 mm (6.50 in)
Wheelbase (Audace)	1695 mm (66.73 in)
Kerb weight (Audace)	314 kg (692.25 lb)

Engine

ENGINE

Specification	Desc./Quantity
Type	traverse-mounted twin-cylinder four-stroke V 90°
Cylinder number	2
Cylinder arrangement	V 90°
Bore / stroke	104 x 81.2 mm (4.09 x 3.20 in)
Engine capacity	1379.6 cm ³ (84.19 cu.in)

Specification	Desc./Quantity
Compression ratio	10.5: 1
Electric	starter
Engine idle speed	1250 +/- 100 rpm
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 diagram	single overhead camshaft with roller tappets and rocker-operated valves

Transmission

TRANSMISSION

Specification	Desc./Quantity
Primary drive	Helical gears, ratio 26/35 = 1:1.346
Gearbox	Mechanical, 6 speeds with foot lever on the left hand side of the engine
Gear ratios, 1st gear	17/38 = 1:2.235
Gear ratios, 2nd gear	20/34 = 1:1.7
Gear ratios, 3rd gear	23/31 = 1:1.347
Gear ratios, 4th gear	26/29 = 1:1.115
Gear ratios, 5th gear	31/30 = 1:0.967
Gear ratios, 6th gear	30/24 = 1:0.800
Final drive	cardan shaft and bevel gear set
Ratio	10/36 = 1:3.600

Capacities

CAPACITIES

Specification	Desc./Quantity
Engine oil	Oil change and oil filter replacement: 4010 cm ³ (244.70 cu.in)
Gearbox oil	430 cm ³ (26.24 cu.in) in case of replacement
Gearbox oil	500 cm ³ (30.51 cu.in) in case of revision
Transmission oil	250 cm ³ (15.26 cu.in)
Fuel (reserve included)	20.5 +/- 0.5 l (4.51 +/- 0.11 UK gal) (5.41 +/- 0.13 gal US)
Fuel reserve	5 l (1.10 UK gal) (1.32 gal US)
Seats	2
Maximum weight limit	547 kg (1205.93 lb)

Electrical system

ELECTRICAL SYSTEM

Specification	Desc./Quantity
Spark plug	NGK LMAR8F
Electrode gap	0.6 - 0.7 mm (0.024 - 0.028 in)
Battery	YTX20-BS 12 V - 18 Ampere/hour
Alternator (permanent magnet type)	12 V - 550 W
Main fuses	40- 30- 10A
Secondary fuses	15 (4) - 7.5 (2) A
Front daylight running lights (Audace)	12V - 5W
Low/high beam light (halogen) (Audace)	12 V - 55 W / 60 W H4
Front turn indicator light	12 V - 10 W (orange RY 10 W bulb)
Rear turn indicator light (Audace)	9+9 low intensity LEDs
Tail lights /stop lights (Audace)	6+6 low intensity LEDs
Supplementary headlamps (if fitted)	12V - 35W H8
Dashboard lighting	LED

Specification	Desc./Quantity
License plate light	12V - 5 W
Cruise control warning light	LED
ABS Warning Light	LED
MGCT warning light	LED
Turn indicator warning light	LED
Low fuel warning light	LED
High beam warning light	LED
Neutral gear warning light	LED
General warning light	LED
Warning light MI (Euro 4/if active)	LED

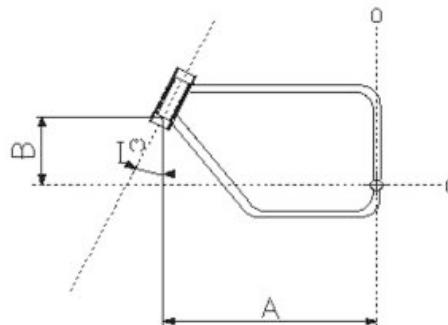
Frame and suspensions

CHASSIS

Specification	Desc./Quantity
Type	Closed double cradle tubular steel frame with elasto-kinematics engine fixing system for the vibration isolator.
Headstock angle (Audace)	33°
Front (Audace)	45 mm (1.77 in) diameter hydraulic telescopic fork with radial brake calliper mounting bracket.
Front wheel travel (Audace)	110 mm (4.33 in)
Rear (Audace)	Swingarm with double shock absorbers with adjustable spring preloading and hydraulic rebound damping
Rear wheel travel (Audace)	120 mm (4.72 in)

SIZES A AND B

Specification	Desc./Quantity
Size A	760.0 mm (29.92 in)
Size B	332.0 mm (13.07 in)



Brakes

BRAKES

Specification	Desc./Quantity
Front	Ø 320-mm (12.6 in) stainless steel double floating disc, radial callipers with 4 opposed pistons.
Rear	Ø 282-mm (11.1 in) stainless steel disc, floating calliper with 2 different pins.

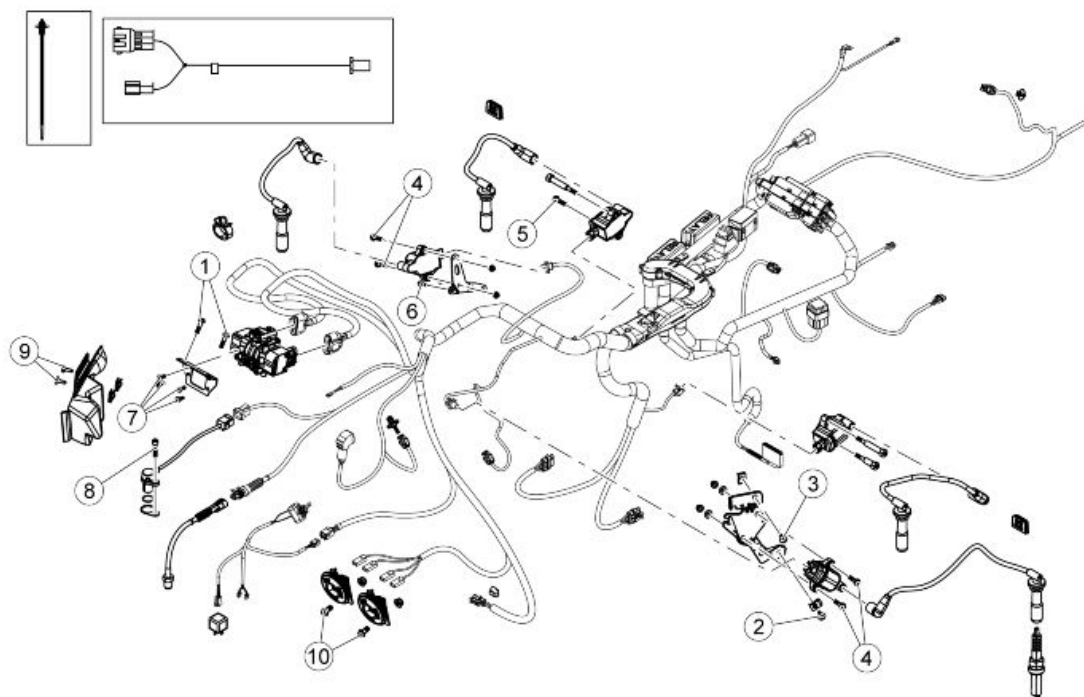
Wheels and tyres

WHEELS AND TYRES

Specification	Desc./Quantity
Type (Audace)	Alloy wheels for tubeless tyres
Front wheel rim (Audace)	3.50" x 18"
Rear wheel rim (Audace)	6.00" x 16"
Tyres (Audace)	Dunlop D 251
Front (Audace)	130/70 R18 (63H)
Inflation pressure (front)	2.5 bar (250 kPa) (36.3 PSI)
Inflation pressure with passenger (front)	2.5 bar (250 kPa) (36.3 PSI)
Rear (Audace)	200/60 R16 (79H)
Inflation pressure (rear)	2.7 bar (270 kPa) (39.2 PSI)
Inflation pressure with passenger (rear)	2.7 bar (270 kPa) (39.2 PSI)

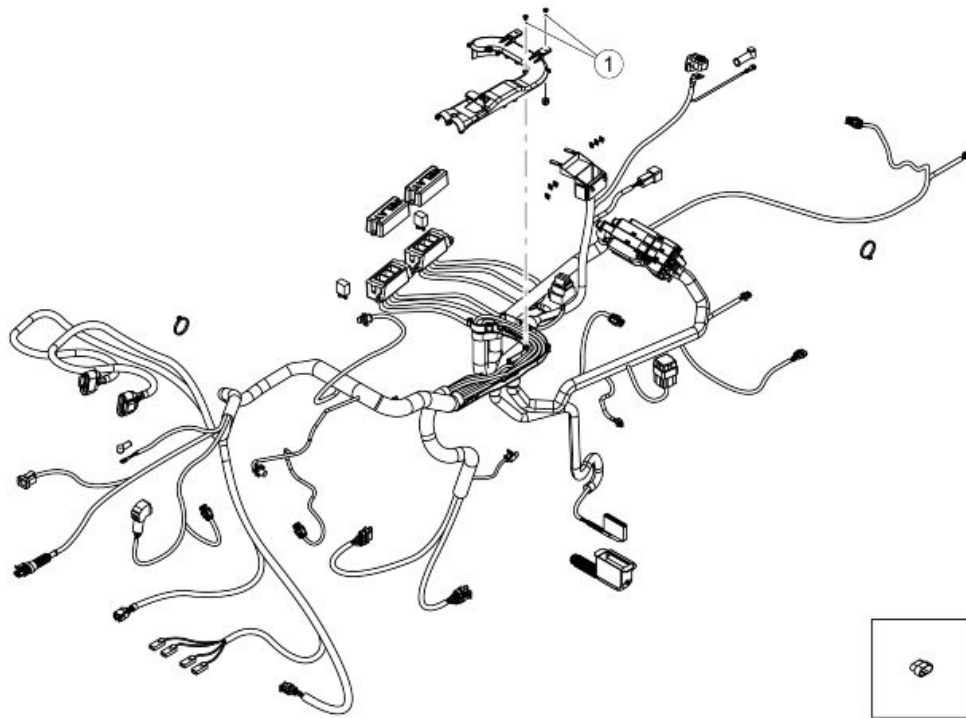
Tightening Torques

ELECTRICAL SYSTEM



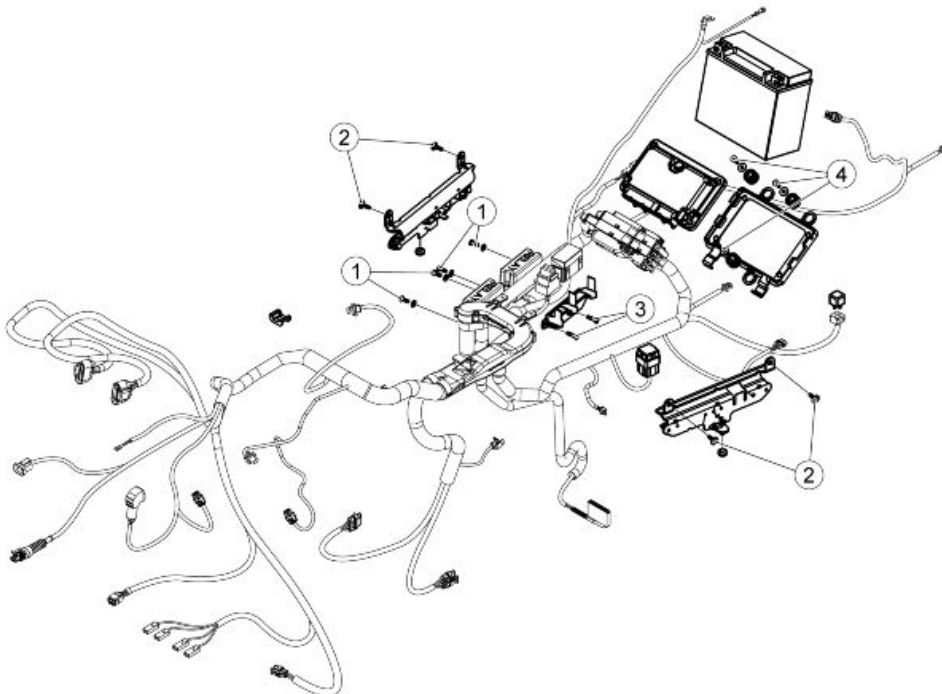
FRONT PART ELECTRICAL SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing sensor plate to chassis	M6x25	2	10 Nm (7.38 lb ft)	-
2	Screws fixing upper coil to chassis	M5x12	1	6 Nm (4.43 lb ft)	-
3	Screw fixing lower coil to chassis	M5x15	1	6 Nm (4.43 lb ft)	-
4	Screws fixing coil to support	M6x30	4	10 Nm (7.38 lb ft)	-
5	Coil fixing screw	M6x25	1	10 Nm (7.38 lb ft)	-
6	Screws fixing coil support to chassis	M6x16	2	10 Nm (7.38 lb ft)	-
7	Screws fixing sensor to plate	M5x14	4	2.5 Nm (1.84 lb ft)	-
8	Tone wheel sensor fixing screw	M6x16	1	10 Nm (7.38 lb ft)	-
9	Box fixing screws	M5x12	2	6 Nm (4.42 lb ft)	-
10	Horn fixing screws	M6x16 stainless steel	2	10 Nm (7.37 lb ft)	-



CENTRAL PART ELECTRICAL SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Conduit fastening screws	Self-tapp. 3.9x14	8	3 Nm (2.21 lb ft)	-



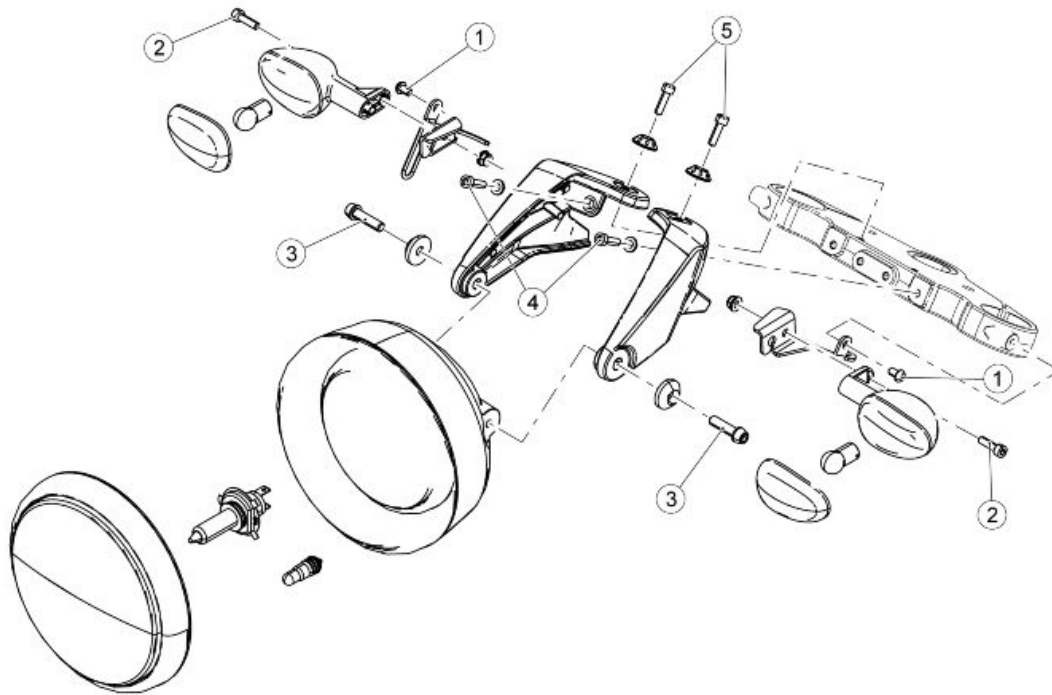
REAR PART ELECTRICAL SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Relay bracket fixing screws	M5x12	4	6 Nm (4.42 lb ft)	-
2	Bracket self-threading fixing screws	M5x14	4	2.5 Nm (1.84 lb ft)	-

pos.	Description	Type	Quantity	Torque	Notes
3	Fuse box bracket fixing screws	M5x20	2	3 Nm (2.21 lb ft)	-
4	ECU bracket self-threading fixing screws	M5x14	3	2.5 Nm (1.84 lb ft)	-

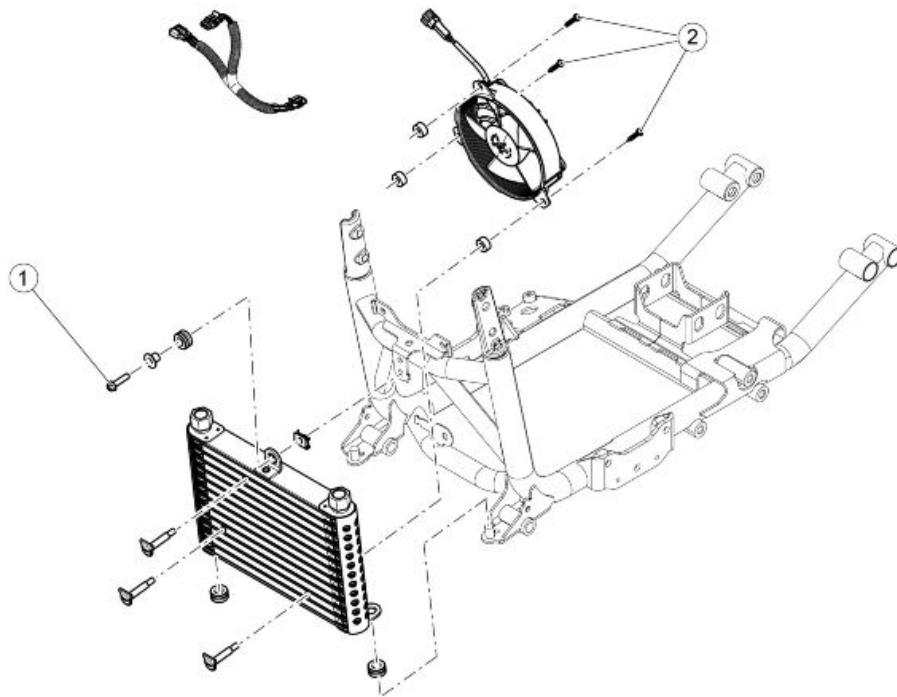
Chassis

Front side



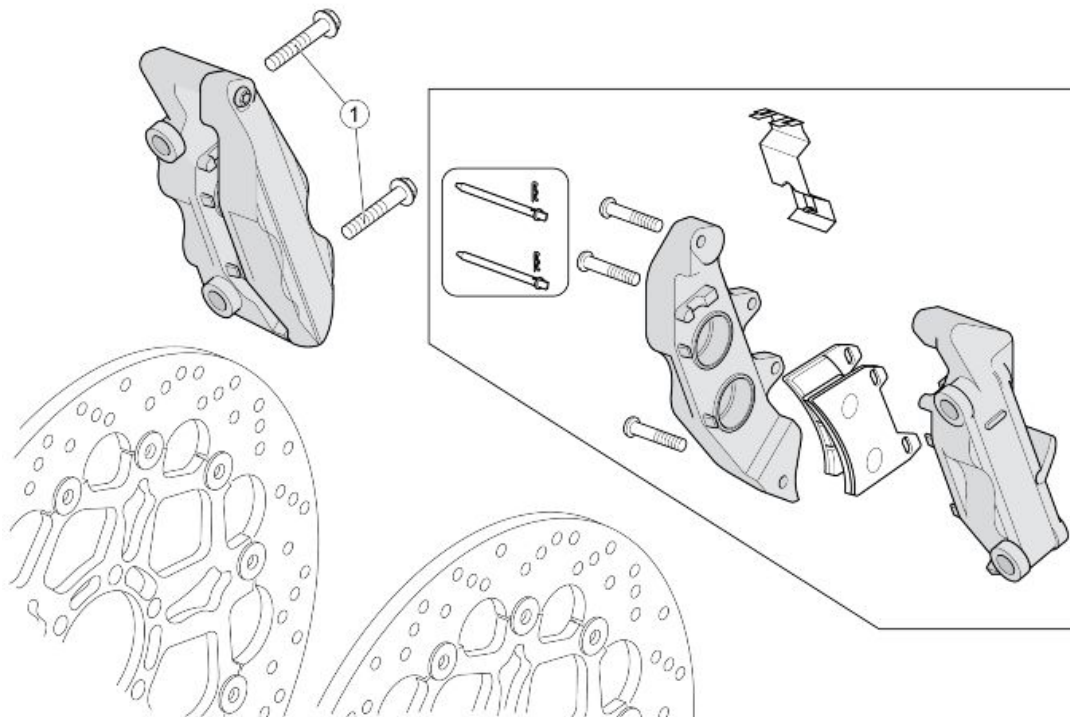
FRONT HEADLAMP

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fastening the turn indicator to the upper steering yoke	M6x10	2	10 Nm (7.38 lb ft)	-
2	Screws fixing the turn indicator to the support bracket	M6x18	2	10 Nm (7.38 lb ft)	-
3	Screws fixing headlamp to supports	M8x30	2	25 Nm (18.44 lb ft)	-
4	Screws fixing lights front supports to steering yoke	M6x20	2	10 Nm (7.38 lb ft)	-
5	Screws fixing lights upper supports to steering yoke	M6x20	2	10 Nm (7.38 lb ft)	-



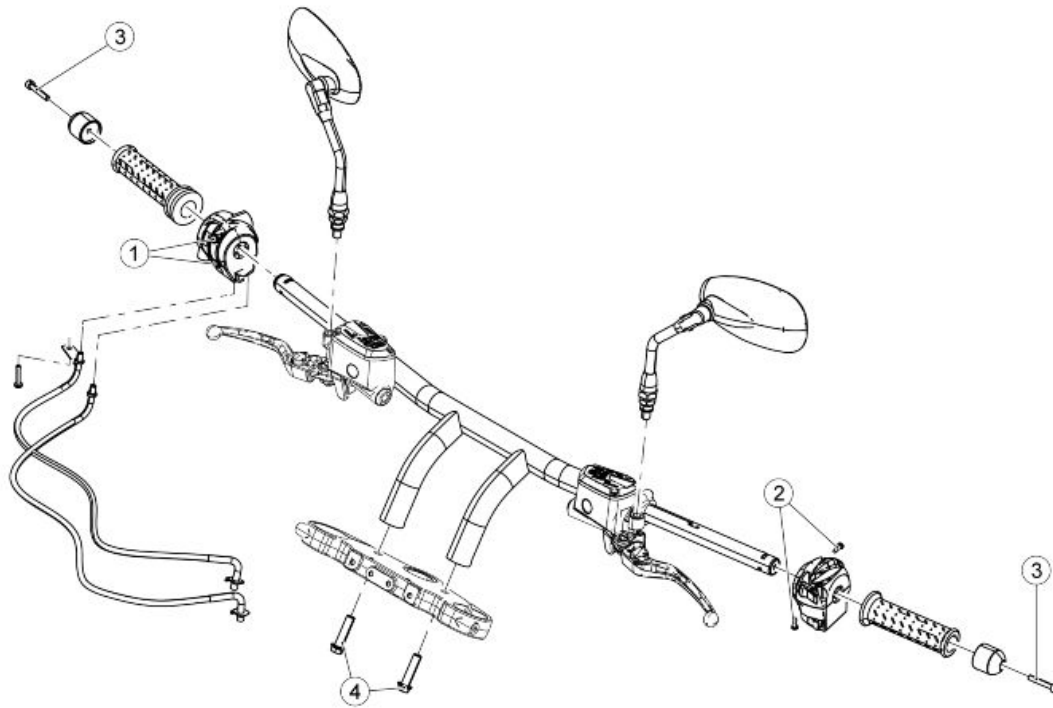
OIL RADIATOR

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing oil radiator to chassis	M6x25	1	10 Nm (7.38 lb ft)	-
2	Screws fixing electric fan to oil radiator	4.2x20	3	2.5 Nm (1.84 lb ft)	-



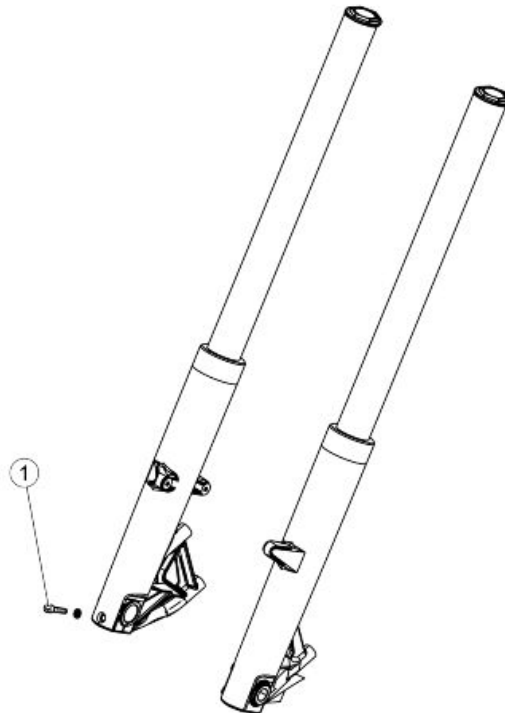
FRONT BRAKE CALLIPER

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing brake callipers to stanchions	M10x55	4	50 Nm (36.88 lb ft)	-



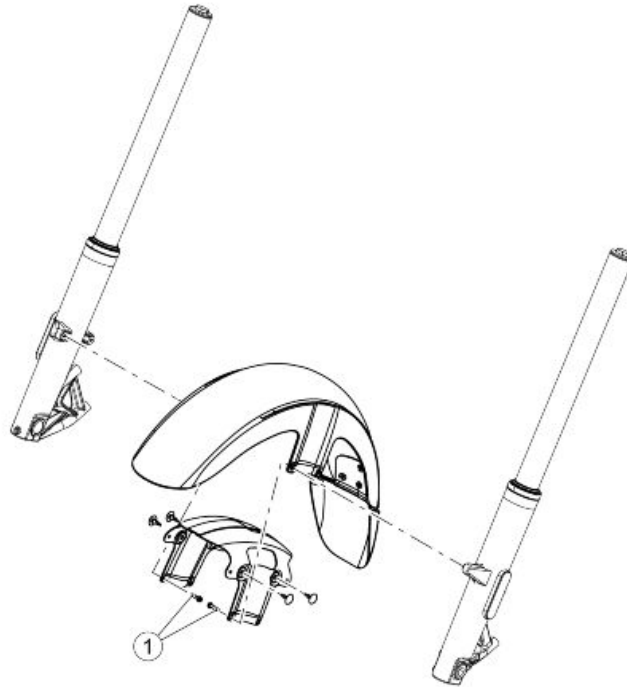
HANDLEBAR AND CONTROLS

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing right switch to handlebar	-	2	1.5 Nm (1.11 lb ft)	-
2	Screws fixing left switch to handlebar	-	2	1.5 Nm (1.11 lb ft)	-
3	Screws fixing anti-vibration to handlebar	M6x35	2	10 Nm (7.38 lb ft)	-
4	Screws fastening handlebar to upper plate	M10x40	2	50 Nm (36.88 lb ft)	Loct. 243



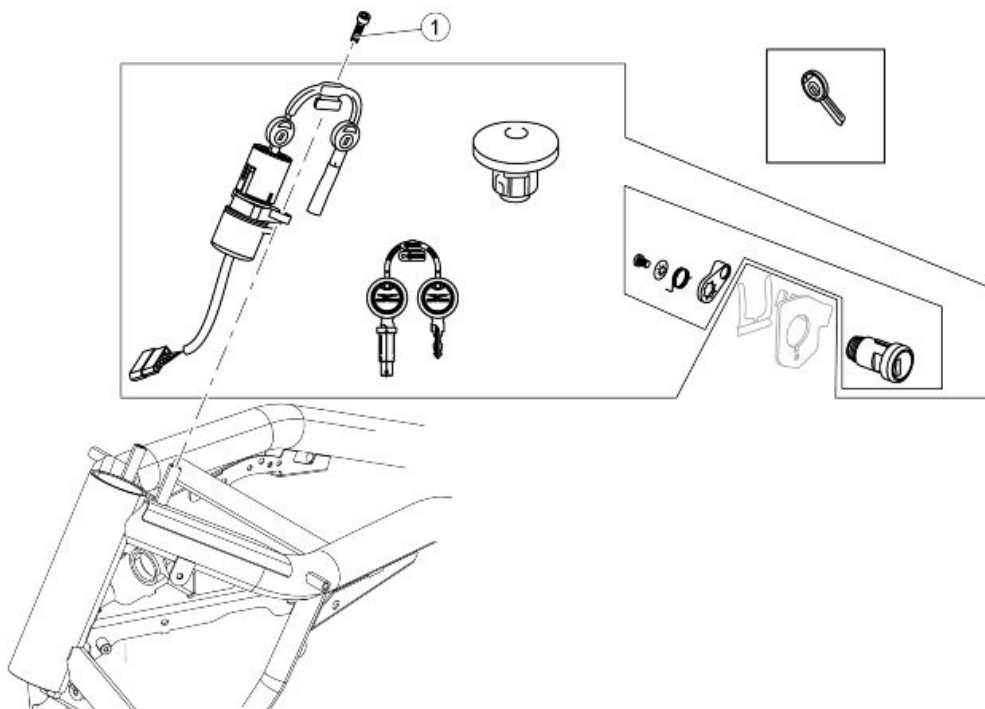
FORK

pos.	Description	Type	Quantity	Torque	Notes
1	Fork stem clamp tightening screw	M8x45	1	25 Nm (18.44 lb ft)	-



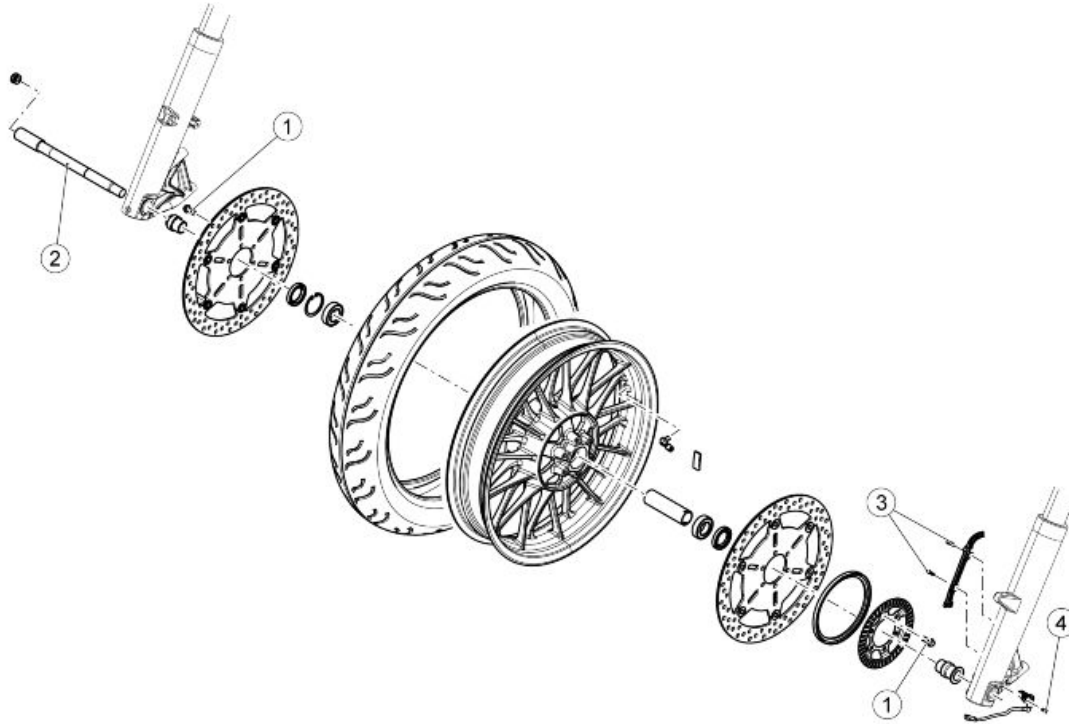
FRONT MUDGUARD

pos.	Description	Type	Quantity	Torque	Notes
1	Front mudguard fixing screws	M5x20	4	6 Nm (4.43 lb ft)	-



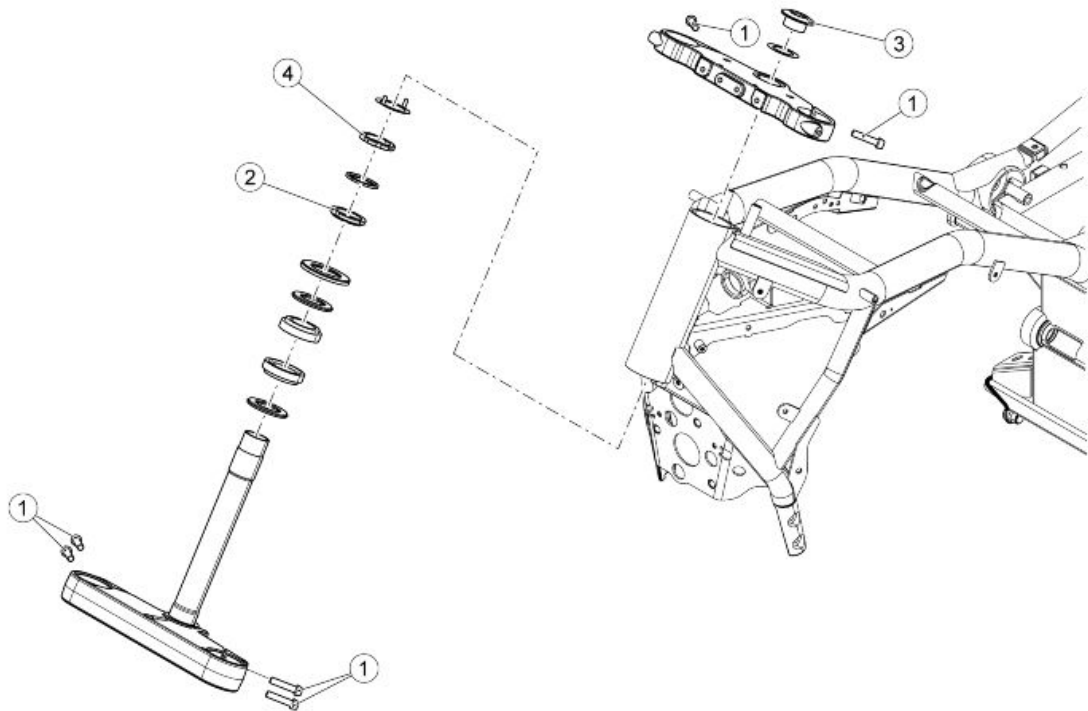
LOCKS

pos.	Description	Type	Quantity	Torque	Notes
1	Screw fixing steering lock switch to chassis	M8x14	2	25 Nm (18.44 lb ft)	-



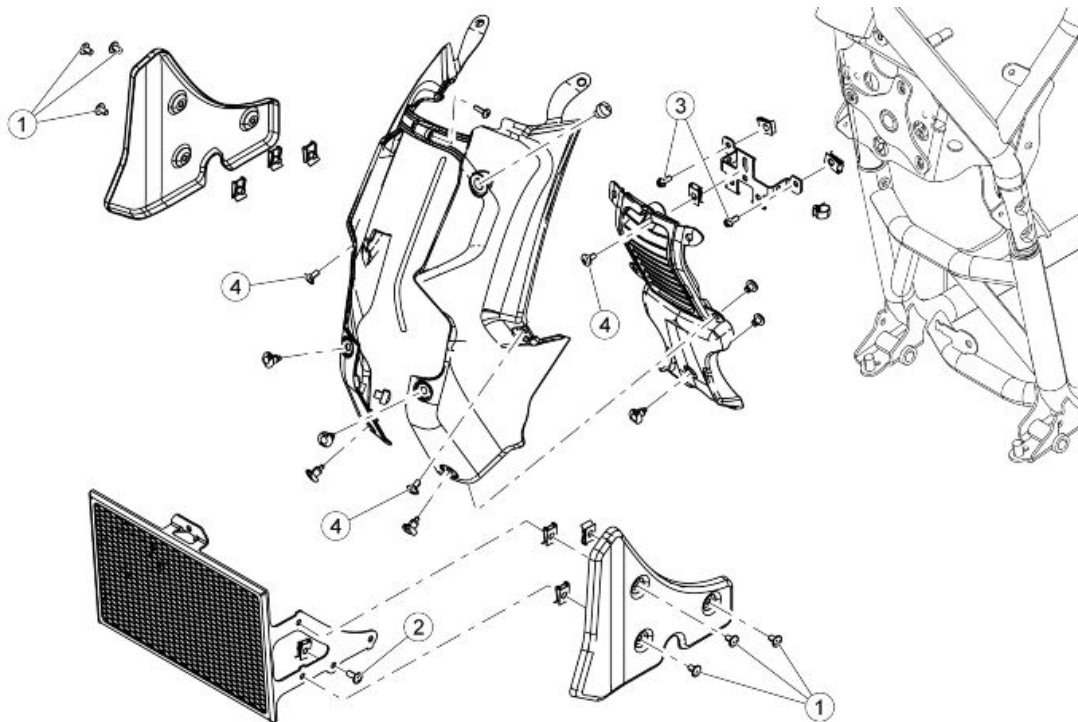
FRONT WHEEL

pos.	Description	Type	Quantity	Torque	Notes
1	Brake discs and tone wheel fixing screws	M8x22	12	25 Nm (18.44 lb ft)	-
2	Wheel axle	-	1	80 Nm (59.00 lb ft)	-
3	ABS cable guide fastening screws	M4x10	2	3 Nm (2.21 lb ft)	-
4	Screws fixing ABS sensor to stem	M5x16	1	6 Nm (4.43 lb ft)	Loctite 243



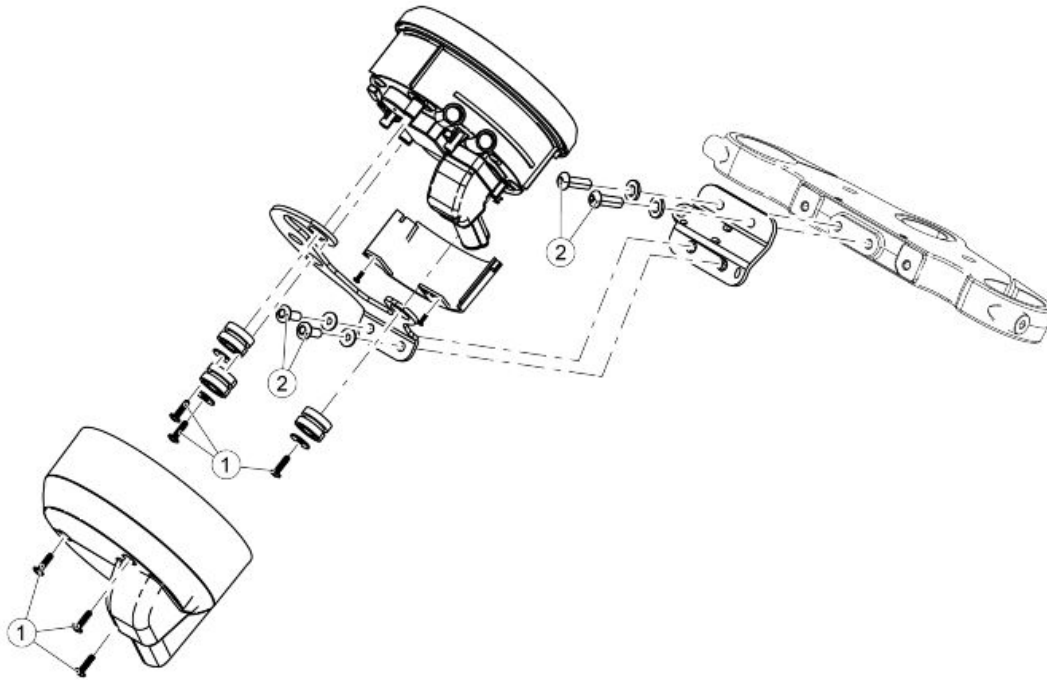
STEERING

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing forks to plate	M8x35	6	20 Nm (14.75 lb ft)	-
2	Lower ring nut	-	1	50 Nm (36.87 lb ft)	Pretightening to 60 Nm (44.25 lb ft)
3	Upper yoke fixing bushing	-	1	100 Nm (73.76 lb ft)	-
4	Counter-lock ring	-	1	Manual	-



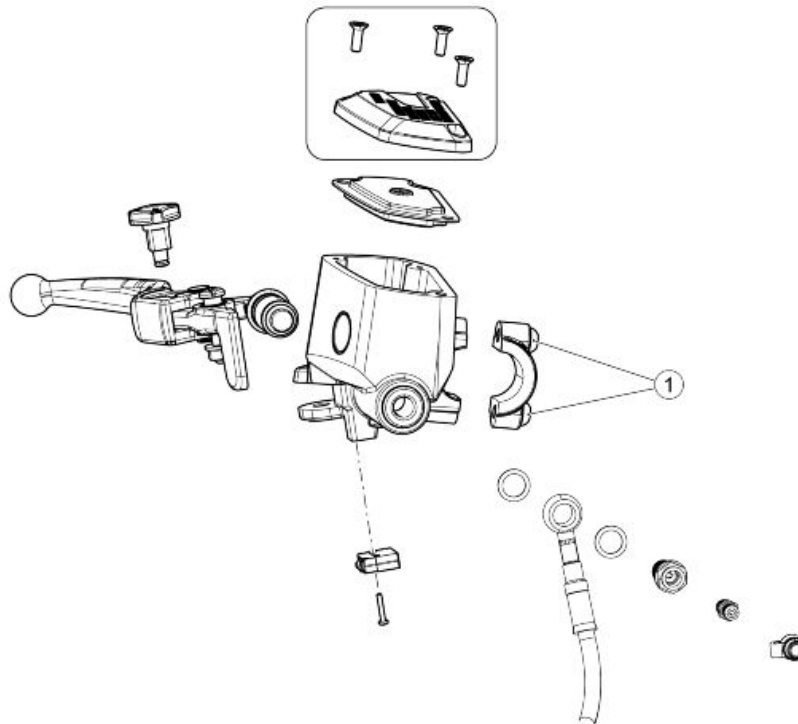
GUARDS

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing deflectors to radiator grille	M6x10	6	10 Nm (7.38 lb ft)	-
2	Screw fixing radiator grille to chassis	M6x16	2	10 Nm (7.38 lb ft)	-
3	Screws fixing bracket to chassis	M5x12	2	6 Nm (4.43 lb ft)	-
4	Guards fixing screw	M5x9	3	6 Nm (4.43 lb ft)	-



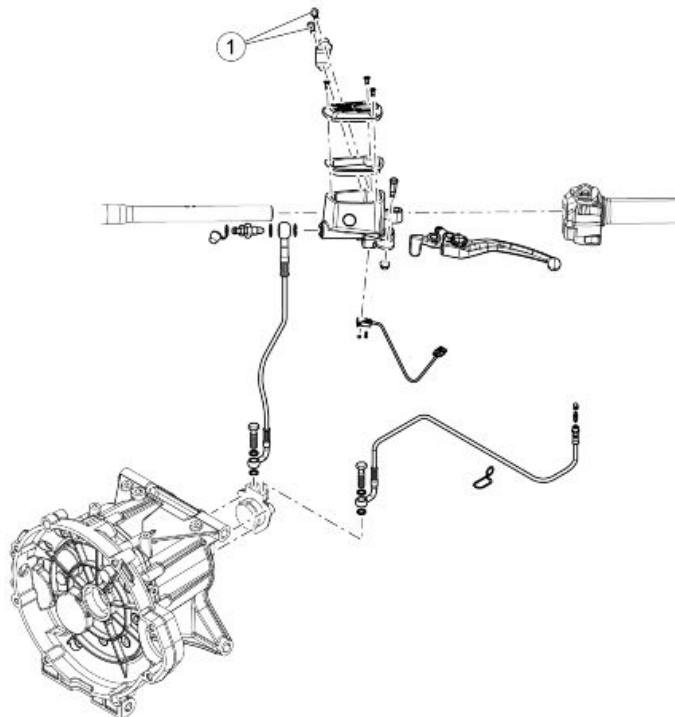
INSTRUMENT PANEL

pos.	Description	Type	Quantity	Torque	Notes
1	Instrument panel and cover fixing screws	Self-tapp. screw 3.9x14	6	1.2 Nm (0.89 lb ft)	-
2	Instrument panel support fixing screws	M6x18	4	10 Nm (7.38 lb ft)	-



FRONT BRAKE PUMP

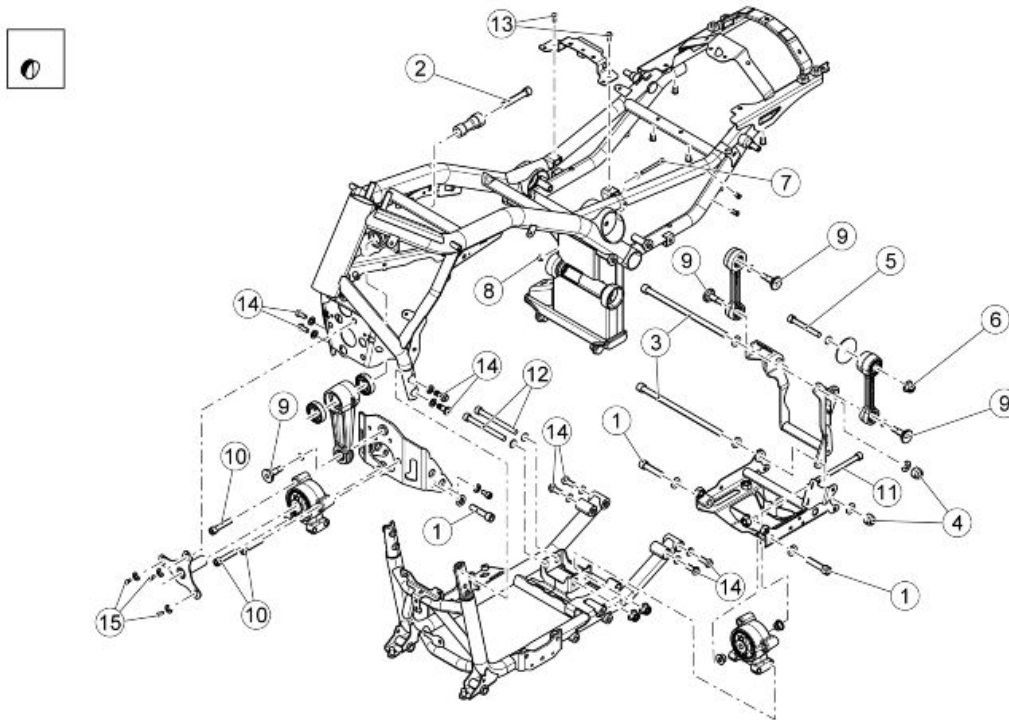
pos.	Description	Type	Quantity	Torque	Notes
1	Brake pump to handlebar fixing screw	-	2	10 Nm (7.38 lb ft)	-



CLUTCH CONTROL PUMP

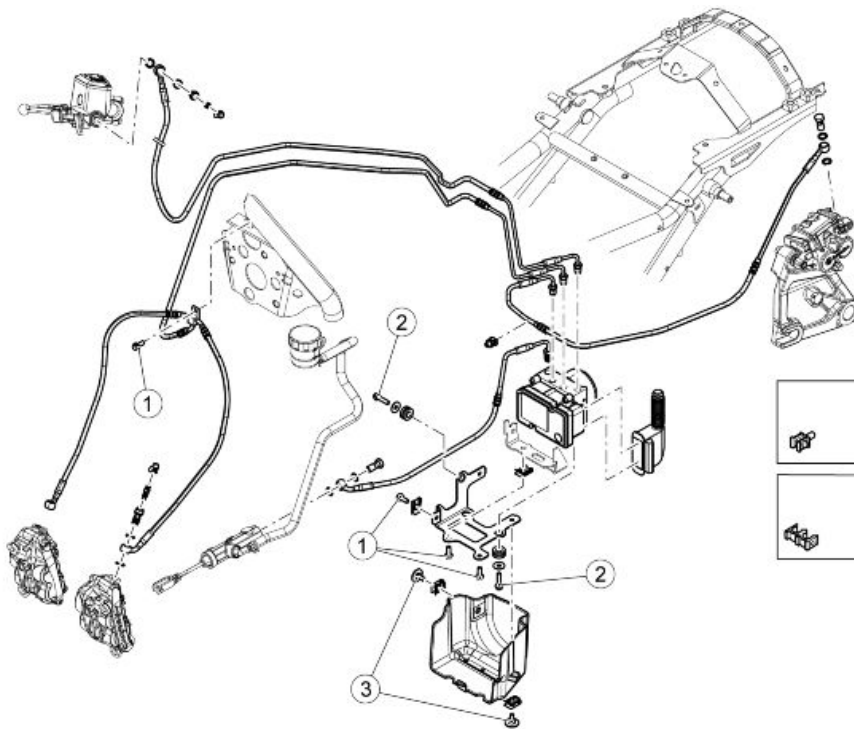
pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing clutch control pump to handlebar	-	2	10 Nm (7.38 lb ft)	-

Central part



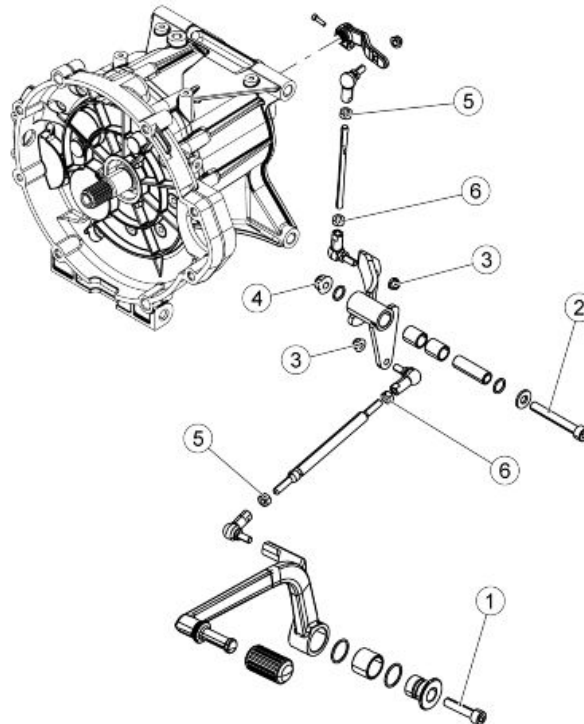
CHASSIS

pos.	Description	Type	Quantity	Torque	Notes
1	Supports fixing screw	M12x45	2	50 Nm (36.88 lb ft)	-
2	Front connecting rod fixing screw	M12x70	1	80 Nm (59.00 lb ft)	-
3	Engine pin	-	2	50 Nm (36.88 lb ft)	-
4	Engine pin retainer nut	M12	2	80 Nm (59.00 lb ft)	-
5	Connecting rod fixing screw	M10x80	1	50 Nm (36.88 lb ft)	-
6	Connecting rod screw retainer nut	M10	1	50 Nm (36.88 lb ft)	-
7	Rear fixing screw	M6x60	1	5 Nm (3.68 lb ft)	-
8	Retainer nut	M6	1	10 Nm (7.38 lb ft)	-
9	Connecting rod fixing pins	-	4	50 Nm (36.88 lb ft)	-
10	Front silent block fixing screws	M10x50	3	50 Nm (36.88 lb ft)	-
11	Rear silent block fixing screw	M10x90	1	50 Nm (36.88 lb ft)	-
12	Screws fixing silent block to frame	M10x110	2	50 Nm (36.88 lb ft)	-
13	Upper frame fixing screw	M6x16	2	10 Nm (7.38 lb ft)	-
14	Lower chassis fixing screws	M10x30	8	50 Nm (36.88 lb ft)	-
15	Screws fixing silent block to chassis	M10x20	3	50 Nm (36.88 lb ft)	-



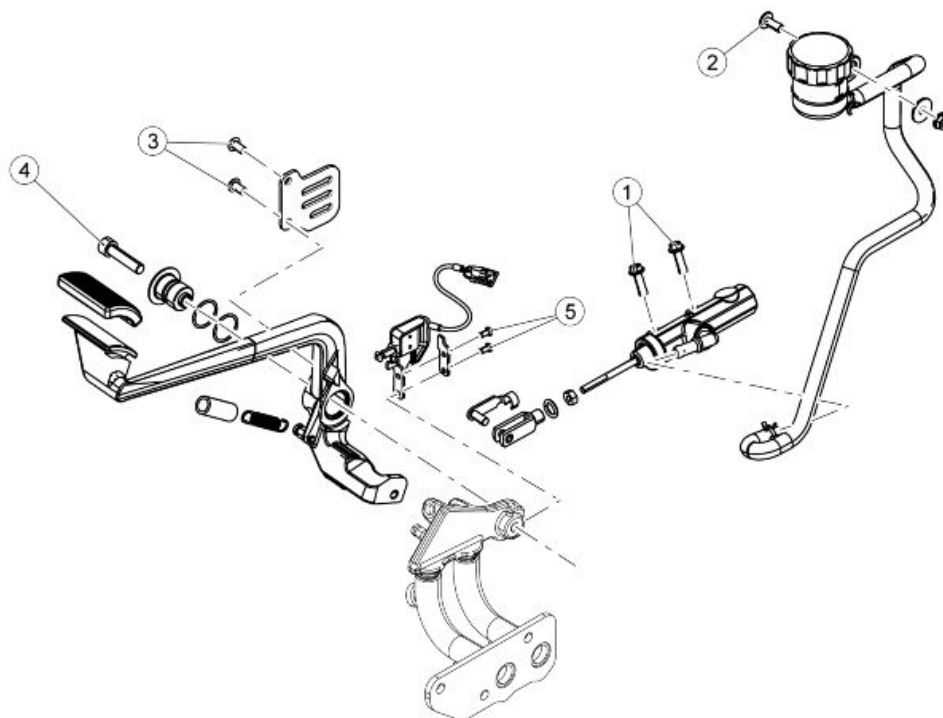
ABS BRAKING SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing control unit support and pipe to chassis	M6x16	4	10 Nm (7.38 lb ft)	-
2	ABS control unit support plate fixing screws	M6x25	3	10 Nm (7.38 lb ft)	-
3	Control unit cover fastening screws	-	2	6 Nm (4.43)	-



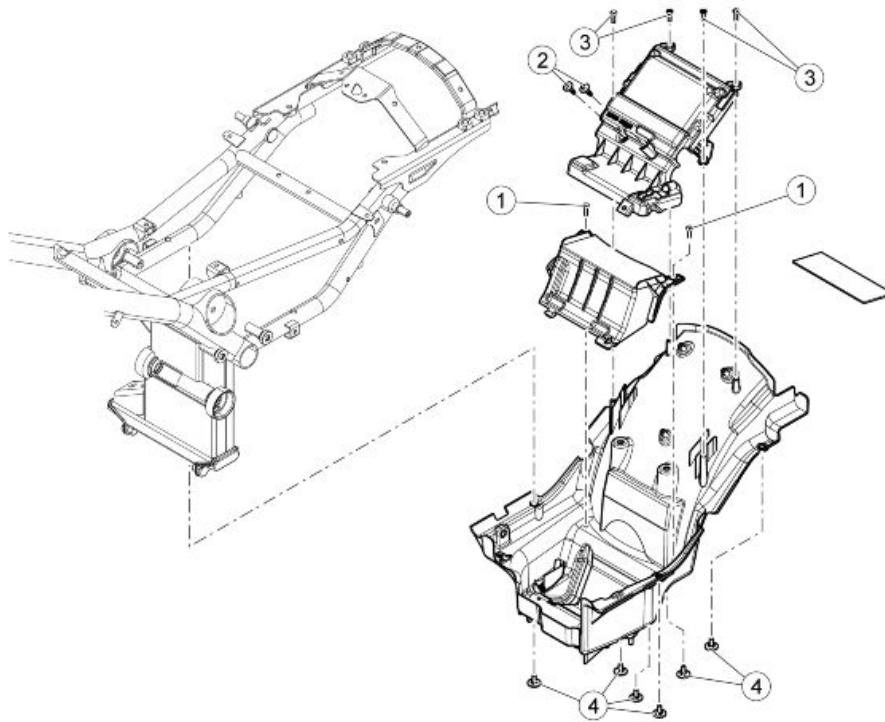
GEAR LEVER

pos.	Description	Type	Quantity	Torque	Notes
1	Screw fixing lever to footrest support	M8x35	1	25 Nm (18.44 lb ft)	-
2	Screw fixing gearbox transmission lever to bracket	M8x60	1	25 Nm (18.44 lb ft)	-
3	Right ball joint fastening nuts	M6x1	2	10 Nm (7.38 lb ft)	-
4	Transmission lever fastening nut	M8	1	25 Nm (18.44 lb ft)	-
5	Left joint adjustment nut	M6	2	Manual	-
6	Right joint adjustment nut	M6	2	Manual	-



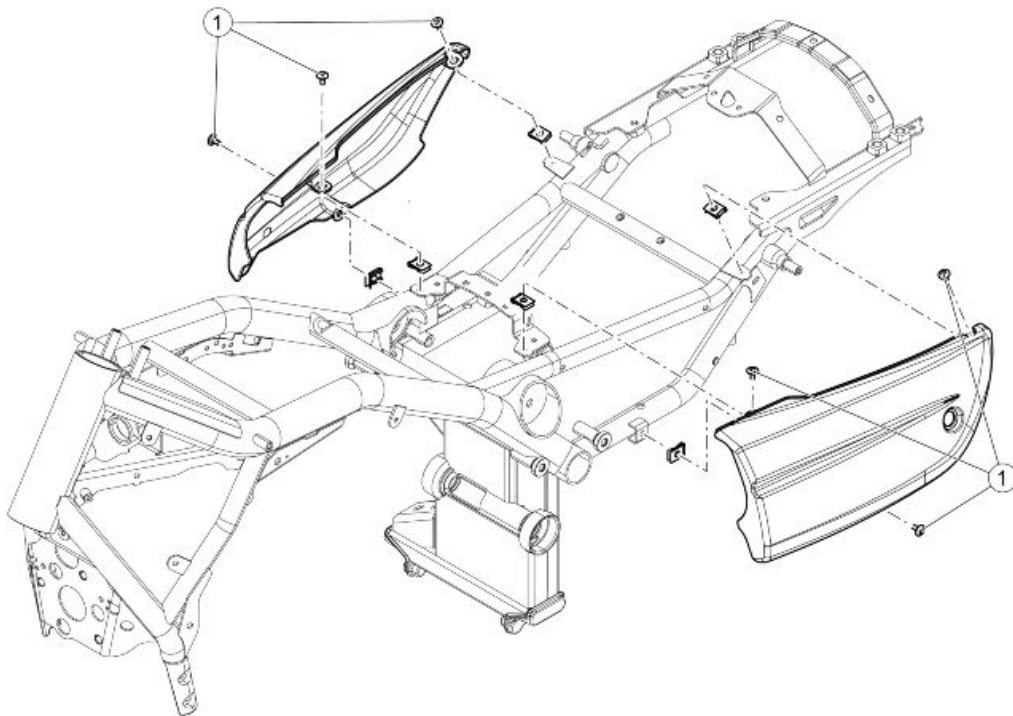
REAR BRAKE PUMP

pos.	Description	Type	Quantity	Torque	Notes
1	Screw fixing brake pump to chassis	M6x20	2	10 Nm (7.38 lb ft)	Loctite 243
2	Brake pump oil tank fixing screw	M6x16	1	8 Nm (5.90 lb ft)	-
3	Screws fixing heelrest to brake lever	M5x10	2	6 Nm (4.43 lb ft)	Loctite 2040
4	Screw fixing brake lever to footrest support	M8x35	1	25 Nm (18.44 lb ft)	-
5	Screws fixing switch to brake lever	M4x12	2	10 Nm (7.38 lb ft)	-



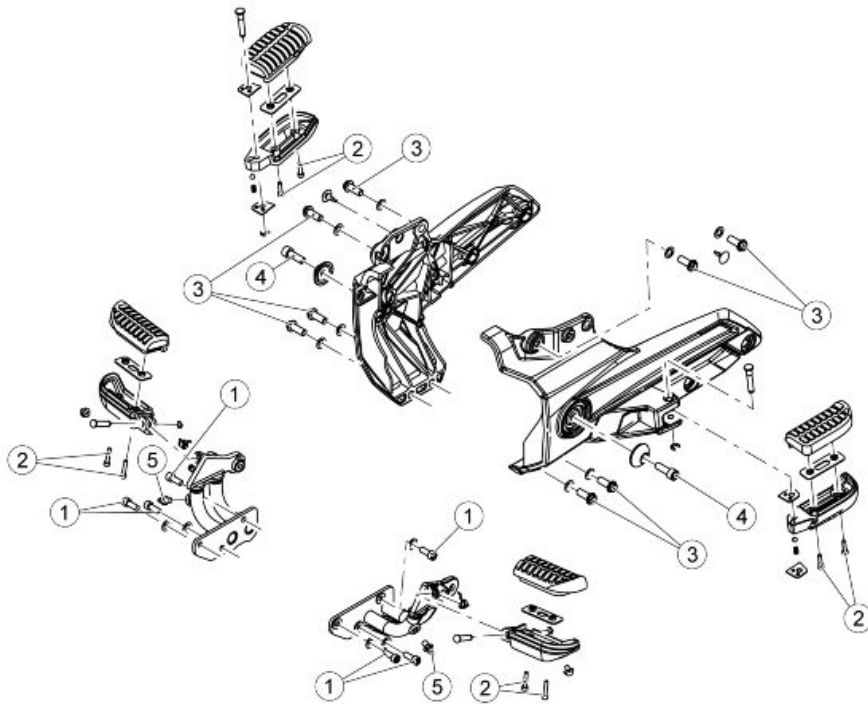
UNDER SADDLE

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing battery support to saddle lower closing	M5x20	2	3 Nm (2.21 lb ft)	-
2	Battery cover fastening screws	M5x12	2	6 Nm (4.43 lb ft)	-
3	Screws fixing battery cover to saddle lower closing	M5x14	4	3 Nm (2.21 lb ft)	-
4	Screws fixing lower closing to chassis	-	6	6 Nm (4.43 lb ft)	-



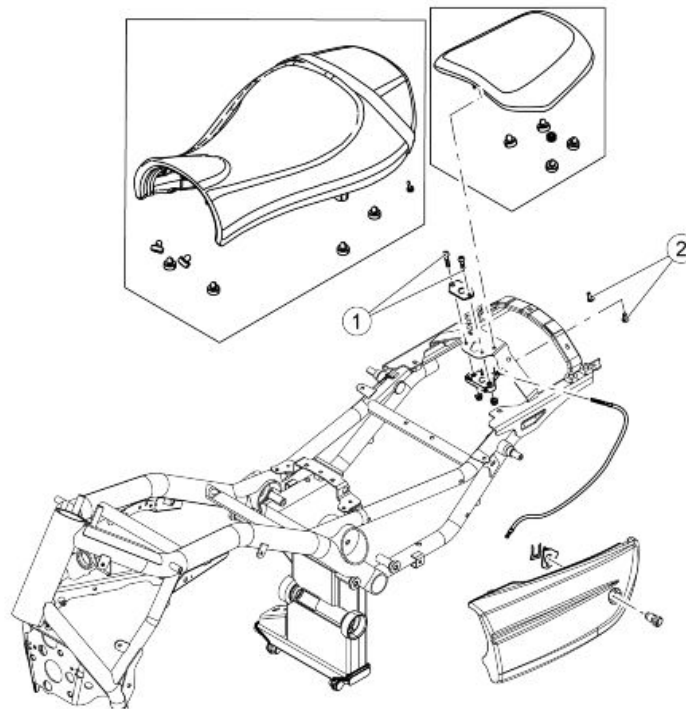
CENTRAL BODYWORK

pos.	Description	Type	Quantity	Torque	Notes
1	Side fairing fixing screws	M5x9	6	6 Nm (4.43 lb ft)	-



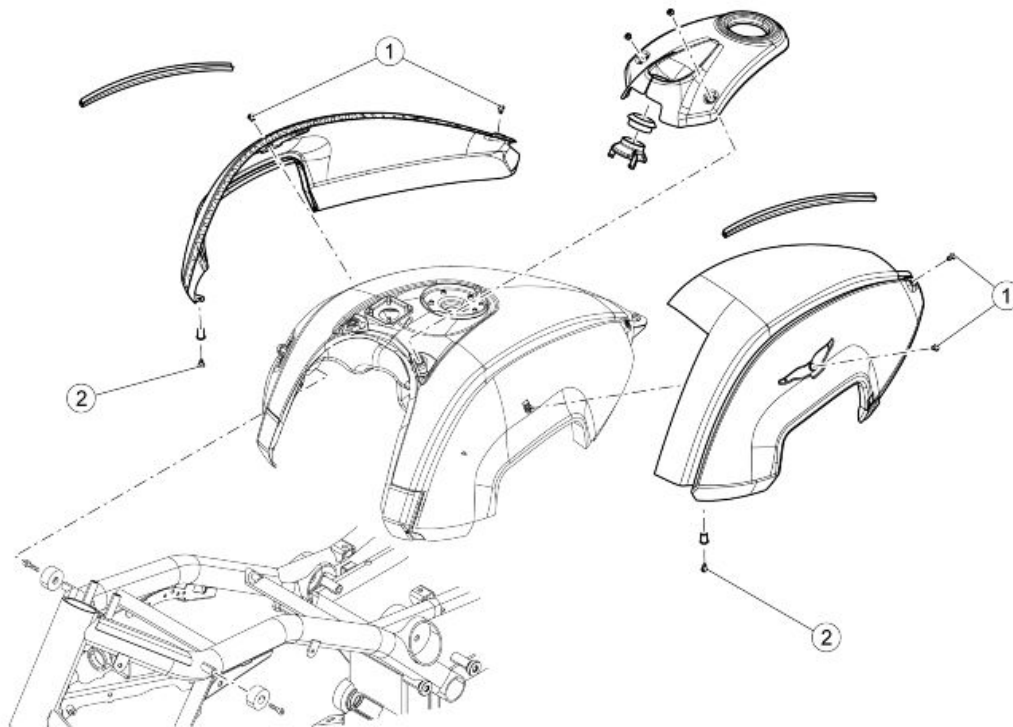
FOOTREST UNIT

pos.	Description	Type	Quantity	Torque	Notes
1	Screw fixing footrest support to chassis	M8x20	6	25 Nm (18.44 lb ft)	Loctite 243
2	Passenger footrest to rubber ring fixing screws	M5x20	8	6 Nm (4.43 lb ft)	-
3	Passenger footrest support fixing screw	M10x1.25	8	50 Nm (36.88 lb ft)	-
4	Screw fixing ring nut to footrest support	M10x30	2	25 Nm (18.44 lb ft)	-
5	Threaded pin	-	2	20 Nm (14.75 lb ft)	-



SADDLE

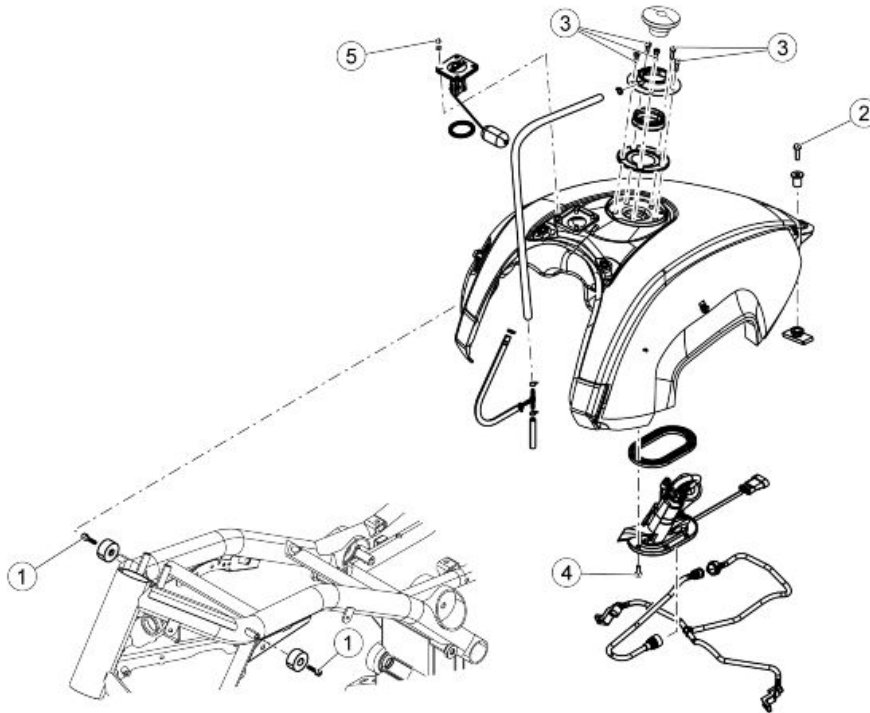
pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing saddle fixing plate to chassis	M6x25	2	10 Nm (7.38 lb ft)	-
2	Screws fixing saddle support to chassis	M6x16	2	10 Nm (7.38 lb ft)	-



TANK COVER

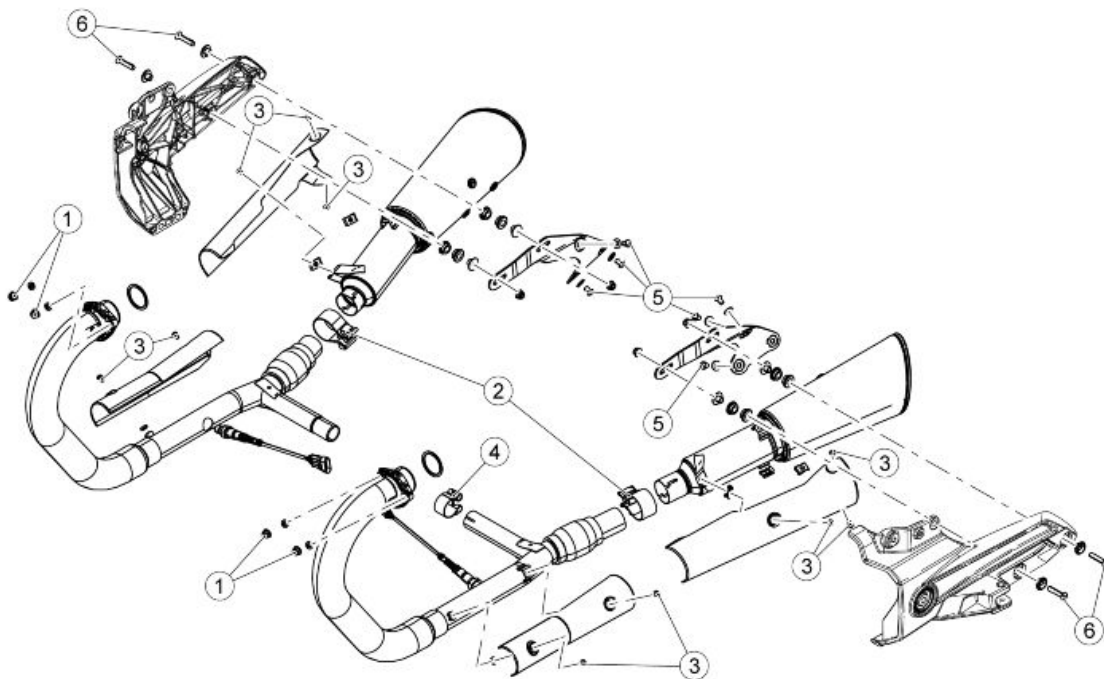
pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing grips to tank	M5x10	4	6 Nm (4.43 lb ft)	-

pos.	Description	Type	Quantity	Torque	Notes
2	Grips and instrument panel fixing screws	M5x16	4	5 Nm (3.69 lb ft)	-



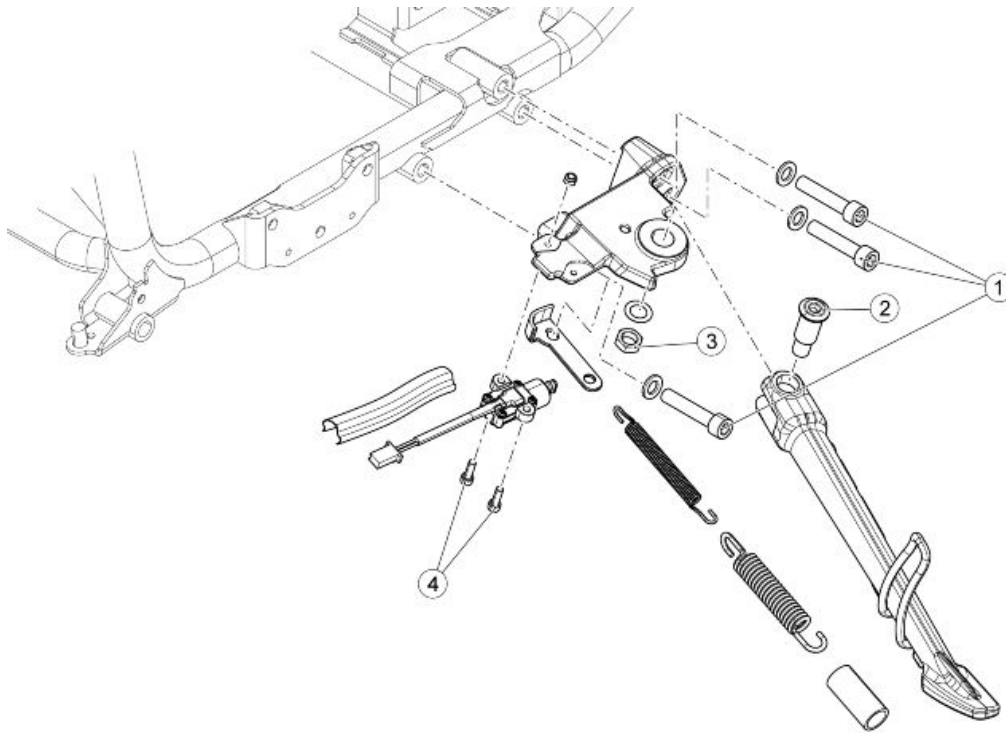
FUEL TANK

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing rubber rings to chassis	M8x16	2	25 Nm (18.44 lb ft)	-
2	Screws fixing tank to saddle support	M6x30	1	10 Nm (7.38 lb ft)	-
3	Screws fixing fuel cap flange to tank	M5x14	5	6 Nm (4.43 lb ft)	-
4	Screws fixing fuel pump to tank	M5x16	6	6 Nm (4.43 lb ft)	-
5	Nut fixing fuel level sensor to tank	M5	4	5 Nm (3.69 lb ft)	-



DISCHARGE

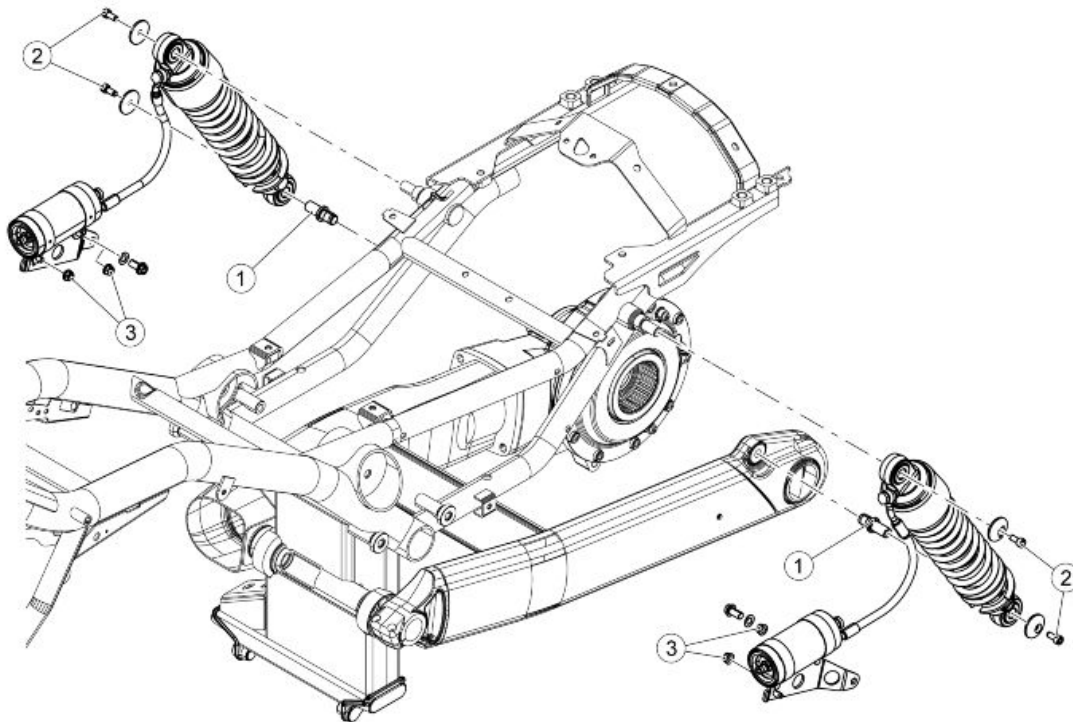
pos.	Description	Type	Quantity	Torque	Notes
1	Nuts fixing manifolds to heads	M8	4	25 Nm (18.44 lb ft)	-
2	Mufflers fixing clamp	-	2	30 Nm (22.13 lb ft)	-
3	Heat shield fastening screws	M6x10	10	10 Nm (7.38 lb ft)	-
4	Exhaust manifolds central retainer clamp	-	1	20 Nm (14.75 lb ft)	-
5	Screws fixing mufflers support to mufflers	M8x12	6	25 Nm (18.44 lb ft)	Loctite 243
6	Screws fixing mufflers support to footrest support	M8x40	4	25 Nm (18.44 lb ft)	-



STAND

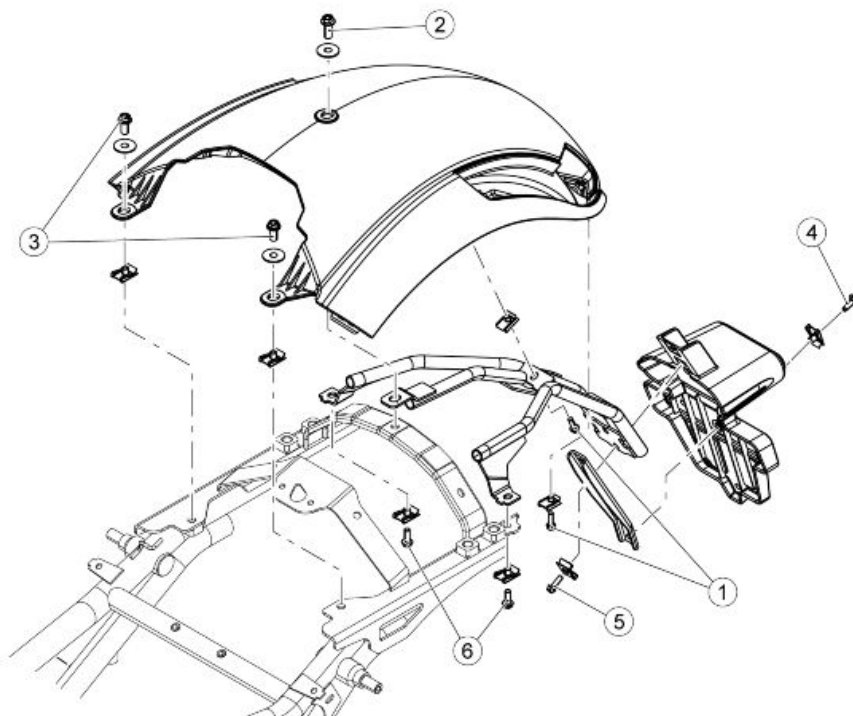
pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing stand plate to chassis	M10x40	3	50 Nm (36.88 lb ft)	Loctite 243
2	Stand bolt	-	1	25 Nm (51.61 lb ft)	-
3	Stand pin bolt	M12x1.25	1	70 Nm (51.61 lb ft)	-
4	Screw fixing stand button to plate	M5x16	2	6 Nm (4.43 lb ft)	-

Back side



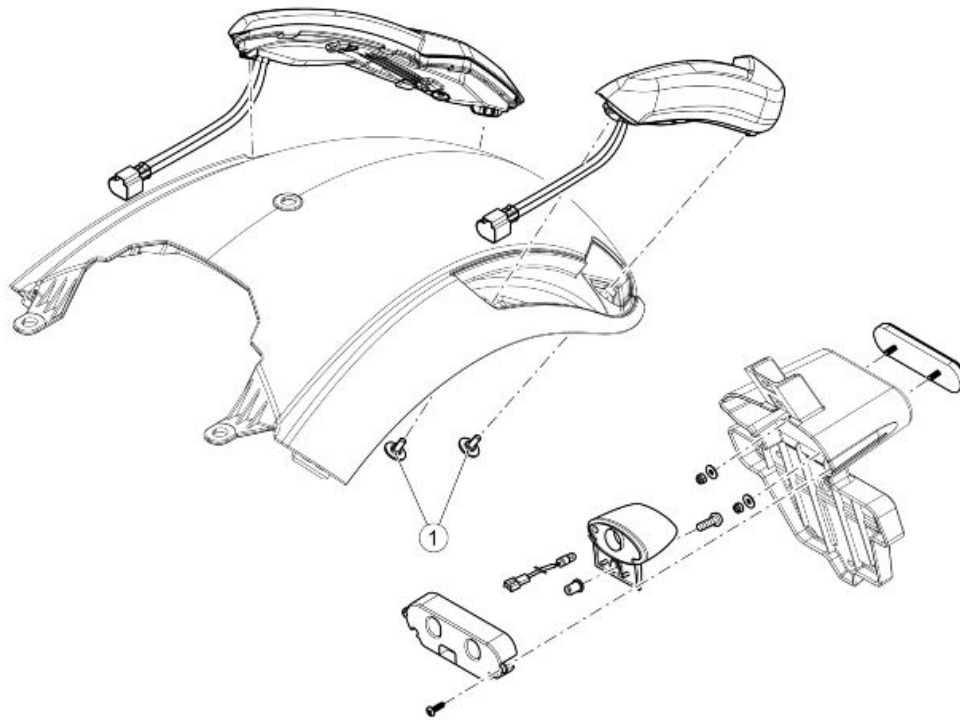
REAR SHOCK ABSORBERS

pos.	Description	Type	Quantity	Torque	Notes
1	Pins	-	2	40 Nm (29.50 lb ft)	-
2	Shock absorber fixing screws	M6x14	4	10 Nm (7.38 lb ft)	-
3	Nuts fixing shock absorber tank to footrest plate	M8	4	25 Nm (18.44 lb ft)	-



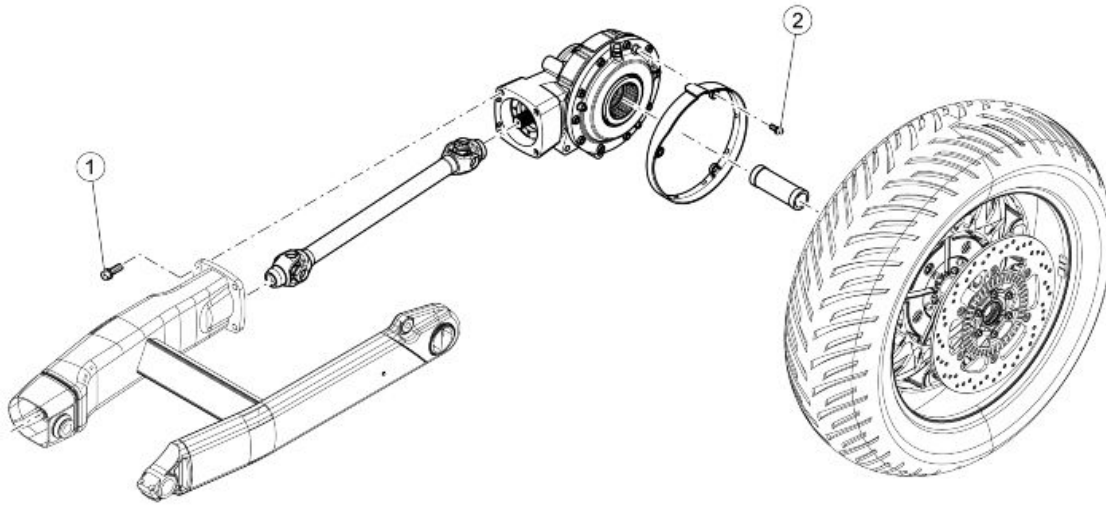
REAR MUDGUARD

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing mudguard to frame	M6x16	2	6 Nm (4.43 lb ft)	-
2	Screw fixing mudguard to chassis	M8x25	1	25 Nm (18.44 lb ft)	-
3	Mudguard side fixing screws	M8x25	2	25 Nm (18.44 lb ft)	-
4	Screw fixing licence plate holder to bracket	M5x12	1	4 Nm (2.95 lb ft)	-
5	Screws fixing licence plate holder to frame	M5x16	2	4 Nm (2.95 lb ft)	-
6	Screws fixing frame to chassis	M6x20	2	10 Nm (7.38 lb ft)	-



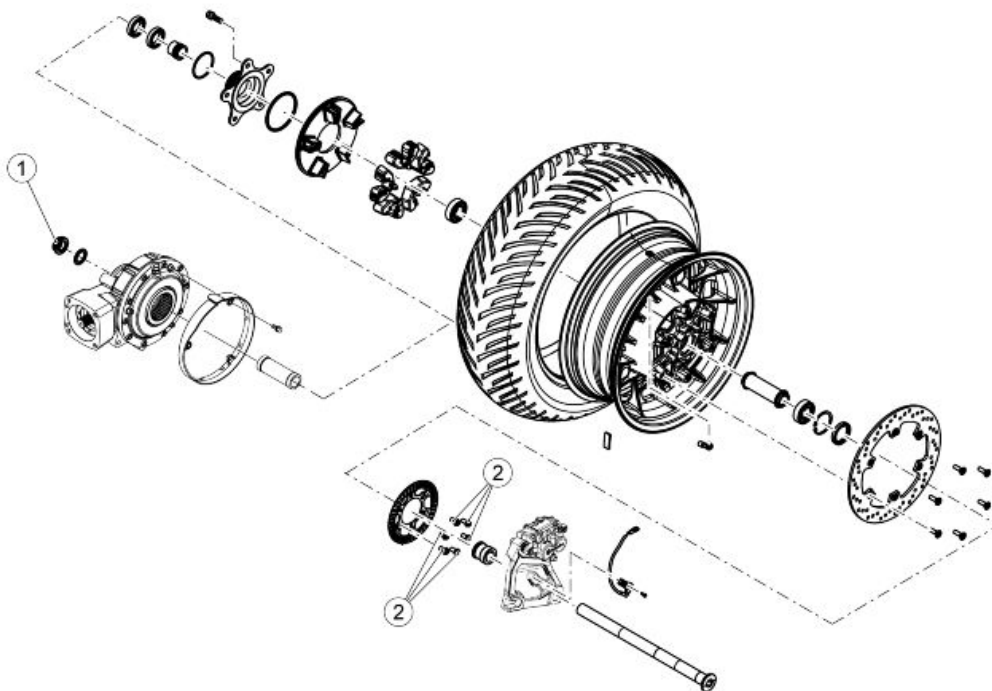
REAR LIGHTS

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing taillight to mudguard	M5x9	4	10 Nm (7.38 lb ft)	-



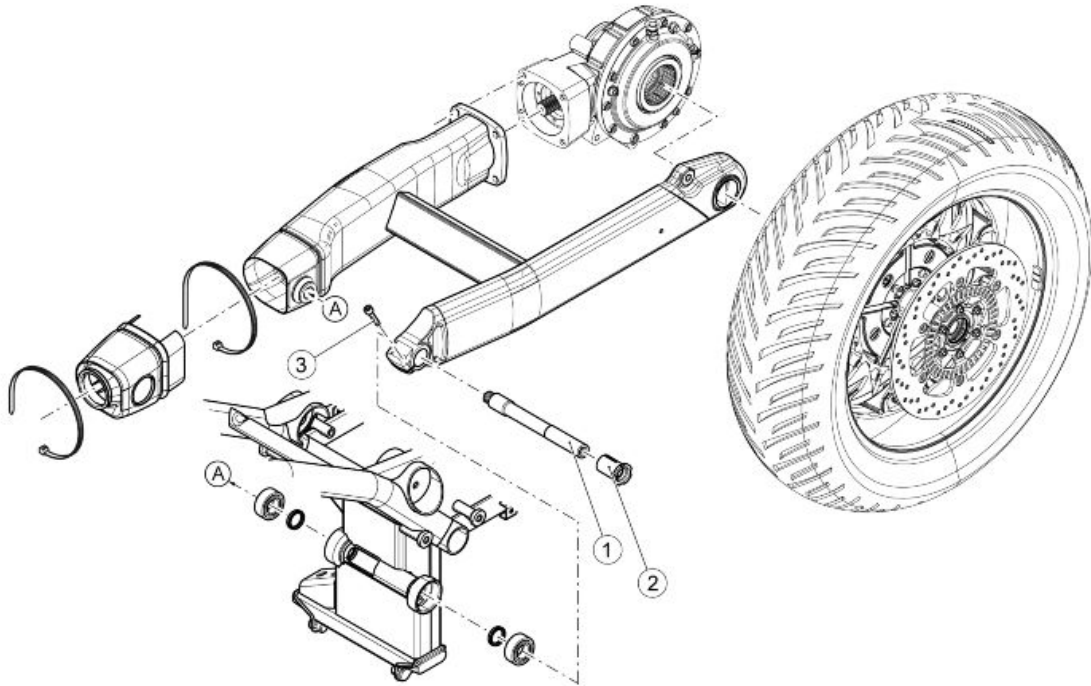
REAR TRANSMISSION

pos.	Description	Type	Quantity	Torque	Notes
1	Screw fixing transmission housing to swing-arm	M10x35	4	50 Nm (36.88 lb ft)	-
2	Screw fixing cover to transmission housing	M5x12	3	6 Nm (4.43 lb ft)	-



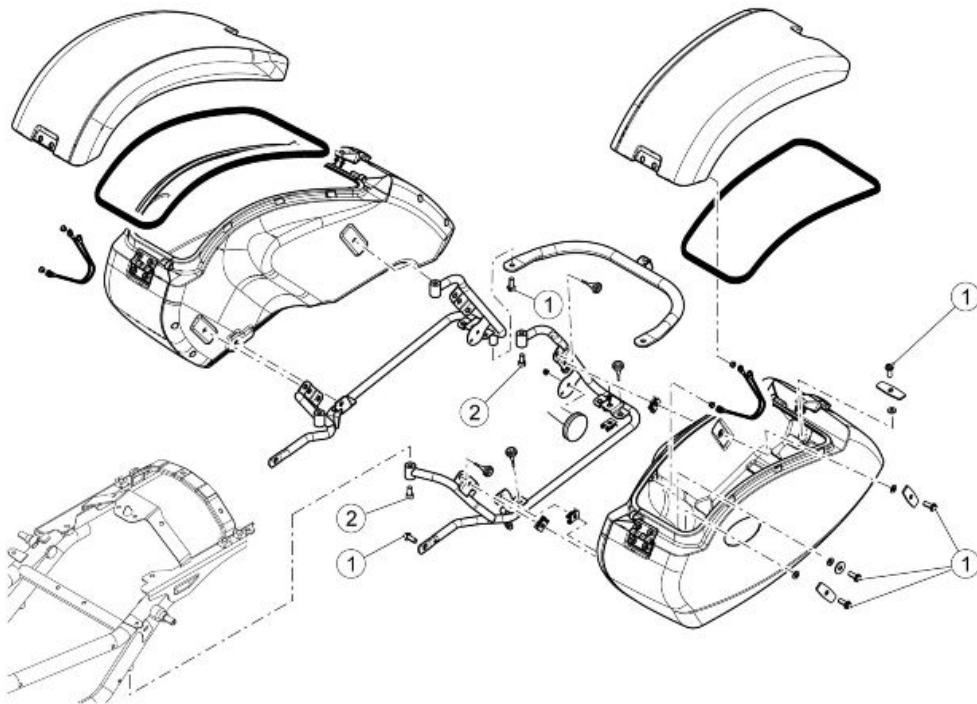
REAR WHEEL

pos.	Description	Type	Quantity	Torque	Notes
1	Wheel axle nut	M25x1.5	1	100 Nm (73.77 lb ft)	-
2	Tone wheel flange screws	M8x20	6	25 Nm (18.44 lb ft)	-
3	Screw fixing ABS sensor to brake calliper	M5x15	1	6 Nm (4.43 lb ft)	Loctite 243



FORK

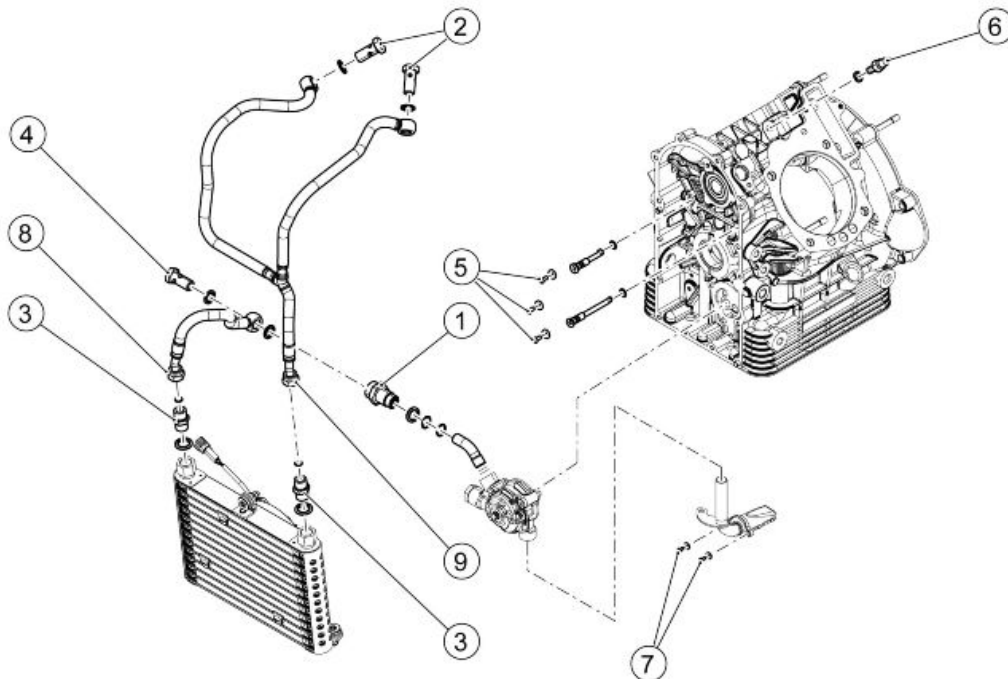
pos.	Description	Type	Quantity	Torque	Notes
1	Swingarm pin	-	1	60 Nm (44.25 lb ft)	-
2	Preloading bushing	-	1	10 Nm (7.38 lb ft)	-
3	Clamp screws	M6x25	2	10 Nm (7.38 lb ft)	-



PANNIERS KIT

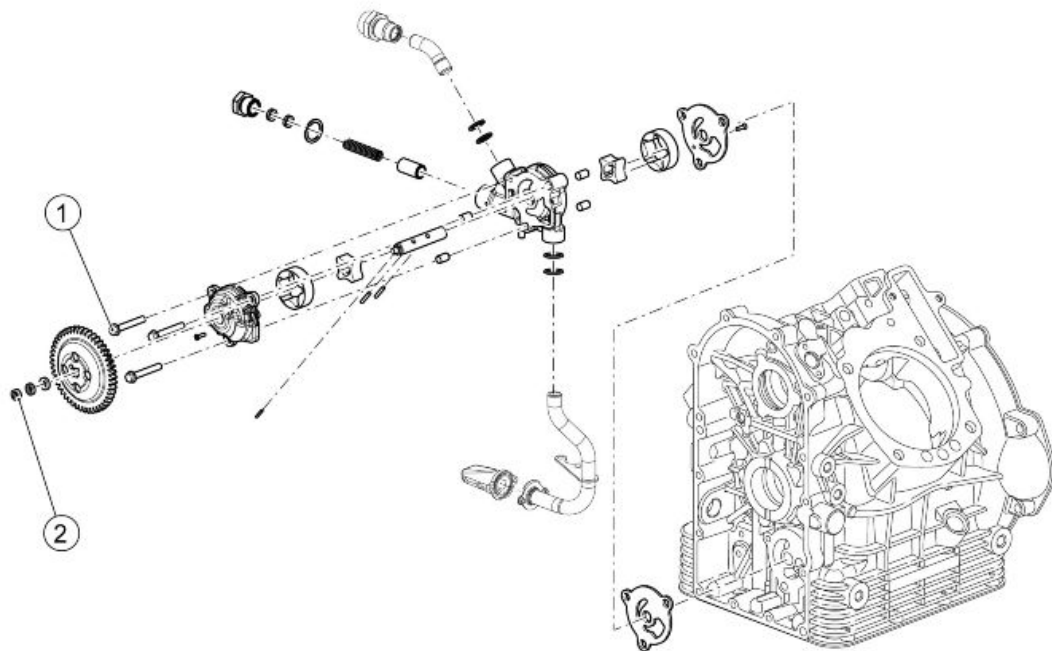
pos.	Description	Type	Quantity	Torque	Notes
1	Panniers supports fixing screws	M8x20	10	24 Nm (17.4 lb ft)	-
2	Panniers supports fixing screws	M8x16	4	24 Nm (17.4 lb ft)	-

Engine



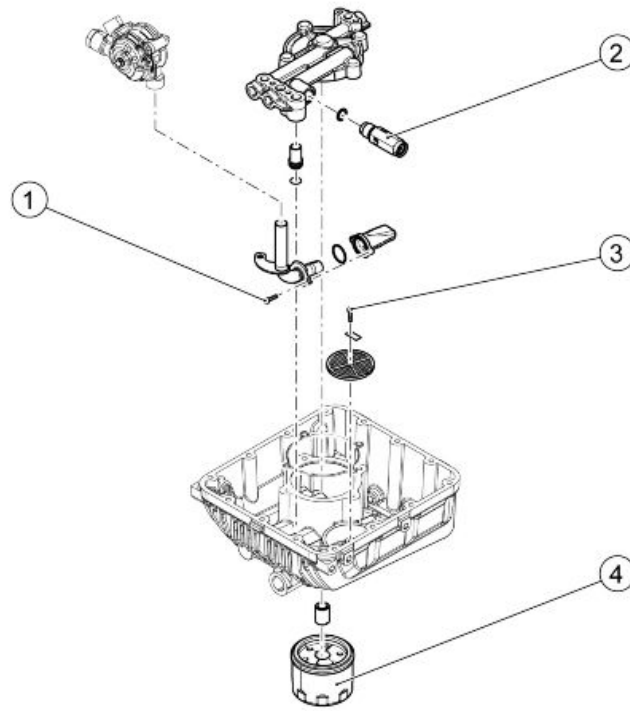
LUBRICATION SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Pump outlet oil pipe nipple	M14x1.5	1	40 Nm (29.50 lb ft)	-
2	Slot screw for oil pipe on the cylinder head	M14x1.5	2	20 Nm (14.75 lb ft)	-
3	Nipple on the radiator and the oil pipe	M16x1.5	2	20 Nm (14.75 lb ft)	Apply Vaseline oil
4	Oil delivery pipe to radiator slot screw	M14x1.5	1	35 Nm (25.81 lb ft)	-
5	Oil jets fixing screw	-	3	By hand	Loctite 243
6	Minimum oil pressure sensor	M10	1	15 Nm (11.06 lb ft)	-
7	Intake oil filter fixing screw	M4x10	2	3 Nm (2.21 lb ft)	Loctite 243
8	Oil delivery pipe to radiator	-	1	20 Nm (14.75 lb ft)	-
9	Oil delivery pipe to heads	-	1	20 Nm (14.75 lb ft)	-



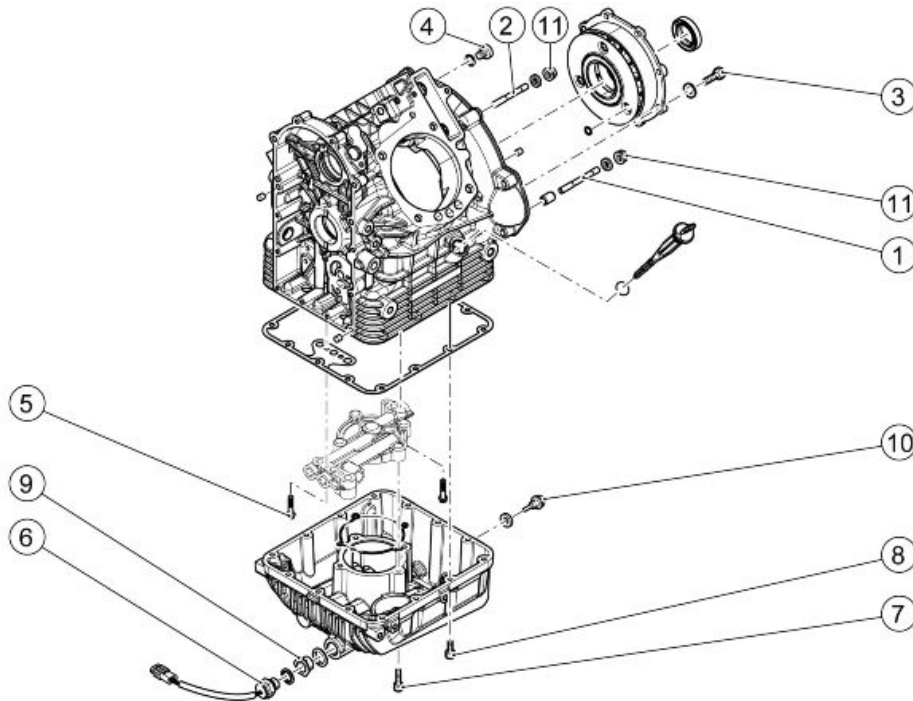
OIL PUMP

pos.	Description	Type	Quantity	Torque	Notes
1	Oil pump fixing screws	M6x45	3	9 11 Nm (6.64 8.11 lb ft)	Loctite 243
2	Low nut for oil pump	M6x0.75	1	8 Nm (5.90 lb ft)	Loctite 243



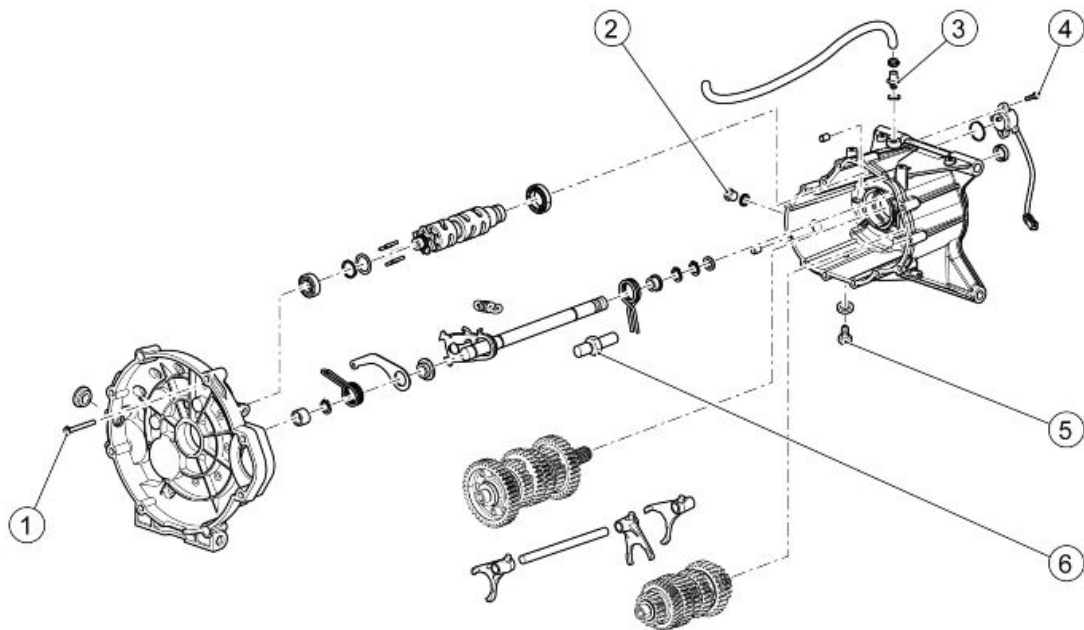
OIL SUMP COMPONENTS

pos.	Description	Type	Quantity	Torque	Notes
1	Cooling oil intake filter fixing screw	M4x10	2	By hand	-
2	Complete oil pressure control valve	-	1	20 Nm (14.75 lb ft)	Loctite 243
3	Mesh type oil filter fixing screw	M6x14	1	6 Nm (4.42 lb ft)	-
4	Oil filter	-	1	15 Nm (11.06 lb ft)	Engine oil



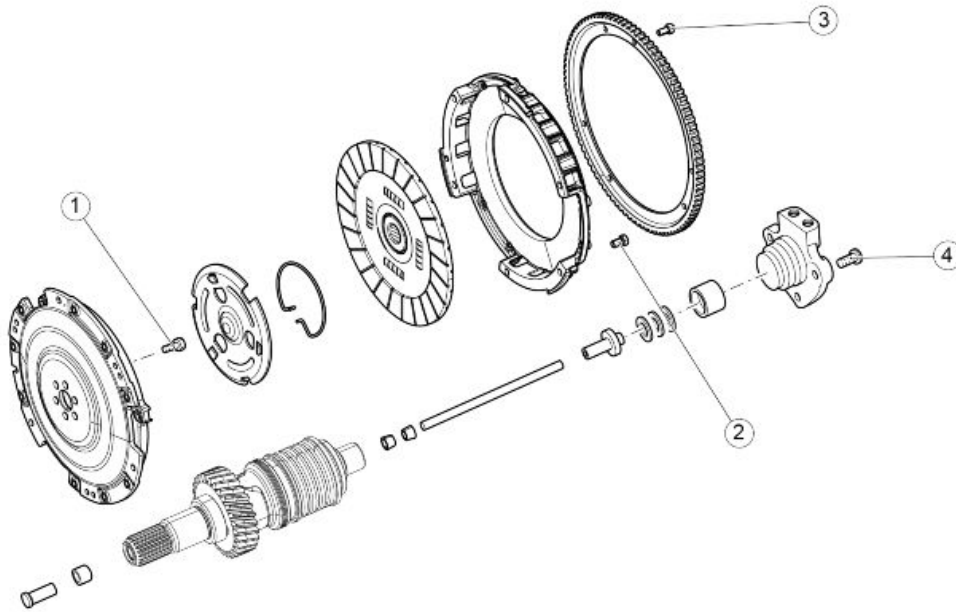
CRANKCASE AND OIL SUMP

pos.	Description	Type	Quantity	Torque	Notes
1	Stud bolt	M8x75	2	10 Nm (7.37 lb ft)	-
2	Stud bolt	M8x66	3	10 Nm (7.37 lb ft)	-
3	Crankshaft rear support flange fixing screw	M8x25	8	26 Nm (19.18 lb ft)	-
4	Oil cap on the crankcase	-	2	25 Nm (18.44 lb ft)	-
5	Oil filter support flange fixing screw	M6x45	4	10 Nm (7.37 lb ft)	-
6	Thermal switch	M6x1.5	1	20 Nm (14.75 lb ft)	-
7	Sump to flange fixing screw	M6x35	4	10 Nm (7.37 lb ft)	-
8	Oil sump to crankcase fixing screw	M6x30	14	10 Nm (7.37 lb ft)	-
9	Thermal switch interface connection	-	1	20 Nm (14.75 lb ft)	Loctite 542
10	Magnetic oil drainage cap	-	1	20 Nm (14.75 lb ft)	-
11	Gear to engine fixing nut	M8	5	20 Nm (14.75 lb ft)	-



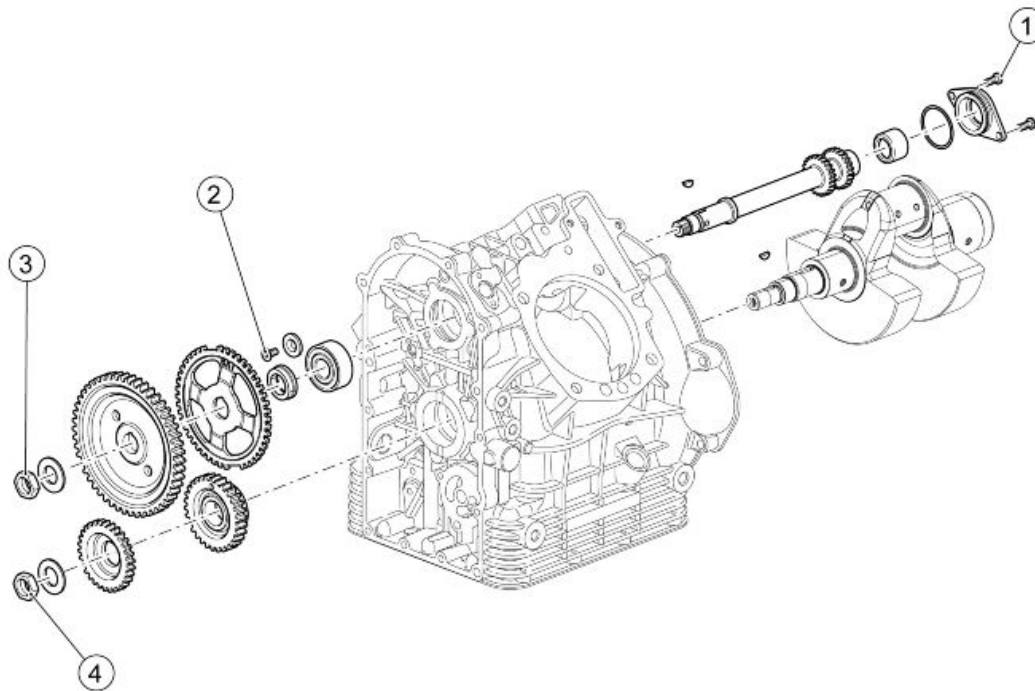
GEARBOX

pos.	Description	Type	Quantity	Torque	Notes
1	Clutch housing to gearbox fixing screws	M6x55	14	13 Nm (9.59 lb ft)	-
2	Gearbox cap	M18x1.5	1	28 Nm (20.65 lb ft)	-
3	Breather stud bolt	M10x1.5	1	8 Nm (5.90 lb ft)	Loctite 243
4	Gear sensor fixing screw	M5x16	2	4.9 - 6 Nm (3.61 - 4.42 lb ft)	Loctite 243
5	Magnetic gearbox oil drainage cap	-	1	24 Nm (17.70 lb ft)	-
6	Spring guide pin	-	1	24 Nm (17.70 lb ft)	Loctite 243



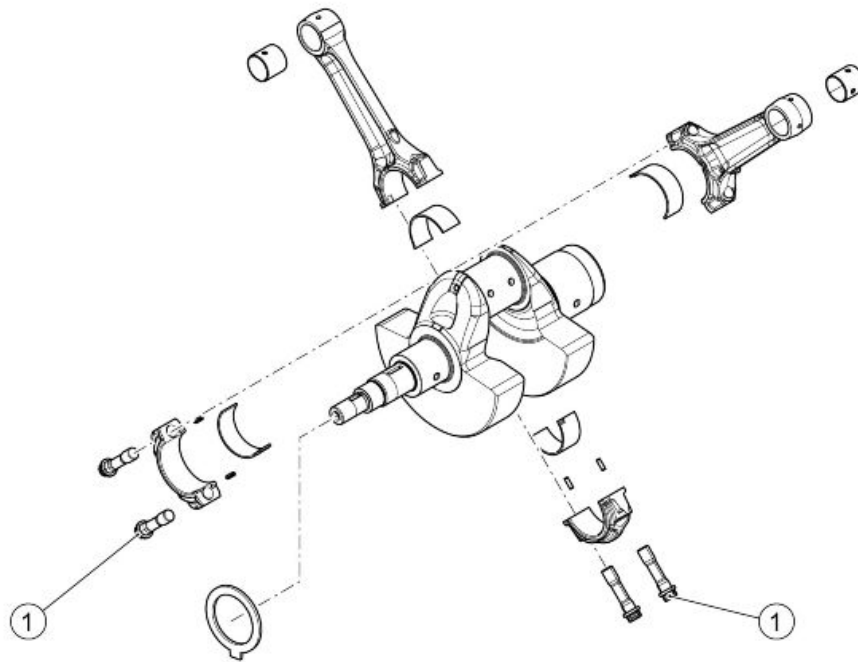
CLUTCH

pos.	Description	Type	Quantity	Torque	Notes
1	Flywheel on crankshaft fixing screw	M8x25	6	42 Nm (30.98 lb ft)	Loctite 243
2	Clutch external flange fixing screw on flywheel	M7x16	6	20 Nm (14.75 lb ft)	Loctite 243
3	Start-up crown fixing screw on flywheel	M6x12	6	10 Nm (7.37 lb ft)	-
4	Clutch control cylinder fixing screw	M6x20	3	10 Nm (7.38 lb ft)	Loctite 243



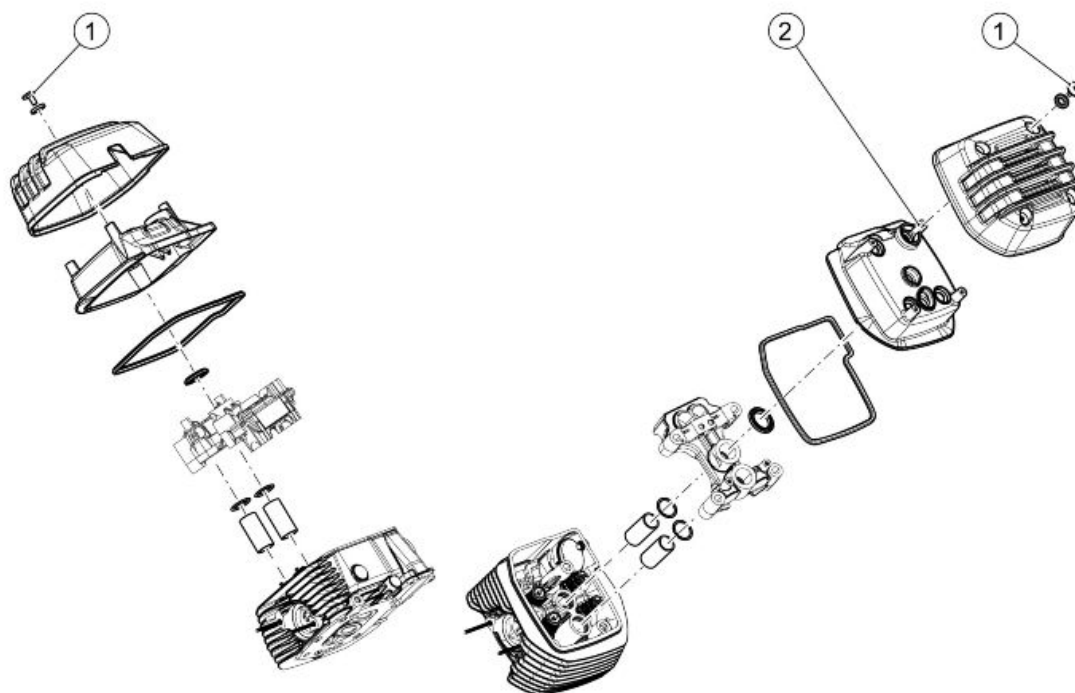
TIMING SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Idle shaft flange fixing screws	M6x14	2	7 - 8 Nm (5.16 - 5.90 lb ft)	Loctite 542 only on through hole
2	Bearing on idle shaft fixing screw	M6x16	1	8 - 10 Nm (5.90 - 7.37 lb ft)	Loctite 243
3	Idle shaft locking nut	M18x1.5	1	150 Nm (110.63 lb ft)	-
4	Crankshaft locking nut	M25x1.5	2	200 Nm (147.51 lb ft)	-



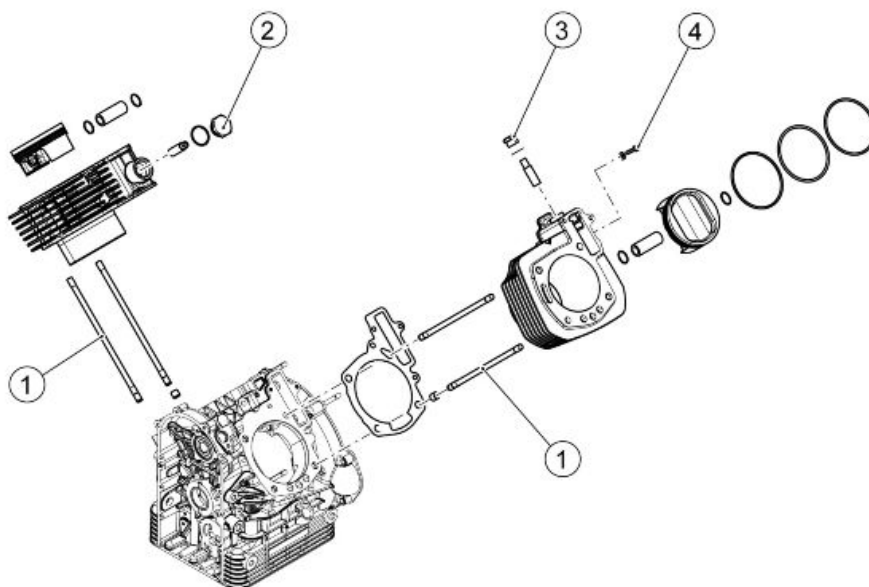
CRANKSHAFT

pos.	Description	Type	Quantity	Torque	Notes
1	Connecting rod screws	M10x1	4	Pre-torque 40 Nm (29.50 lb ft). Final torque 80 Nm (59.00 lb ft)	-



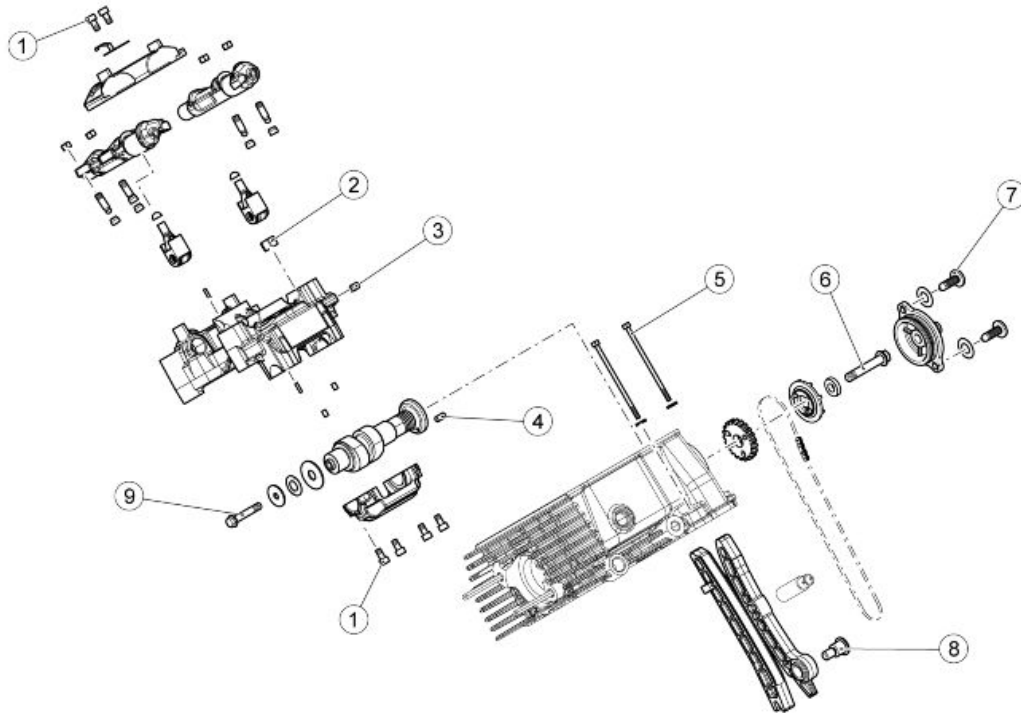
HEADS COVERS

pos.	Description	Type	Quantity	Torque	Notes
1	External head cover fixing screws	-	4	9 Nm (6.64 lb ft)	Locked with cross sequence
2	Internal head cover fixing screws	-	4	9 Nm (6.64 lb ft)	Locked with cross sequence



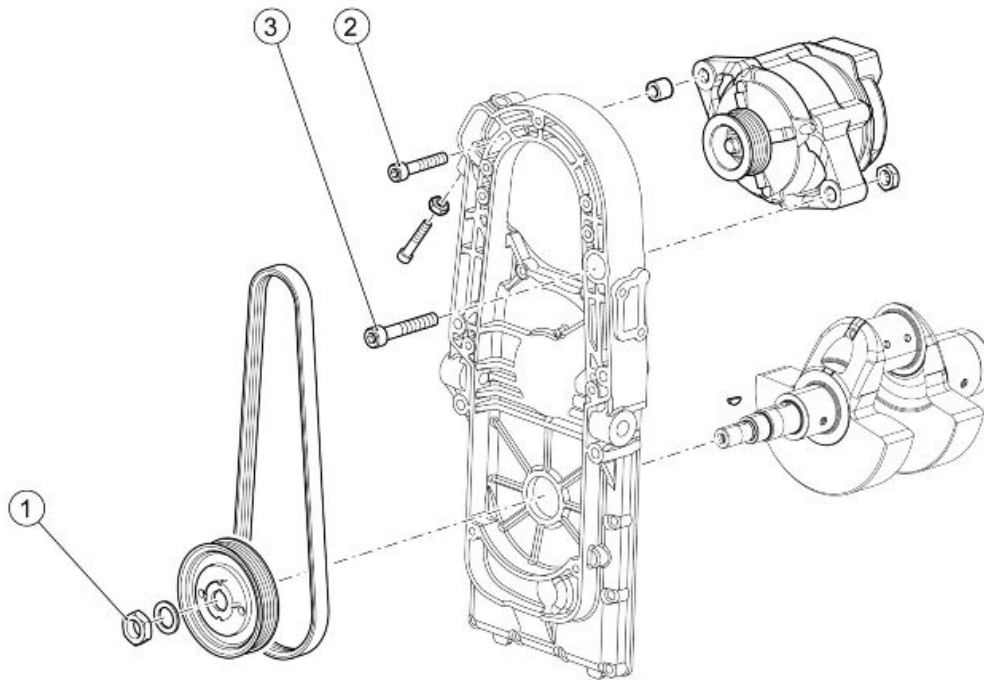
PISTON CYLINDER

pos.	Description	Type	Quantity	Torque	Notes
1	Tie rod on crankcase	M10x1.25	8	5 Nm (3.69 lb ft)	-
2	Right tensioner cover	M30x1.5	1	40 Nm (29.50 lb ft)	-
3	Left tensioner cover	M20x1.5	1	30 Nm (22.13 lb ft)	-
4	Left cylinder cover screw	M6x10	1	10 - 12 Nm (7.37 - 8.50 lb ft)	Loctite 542



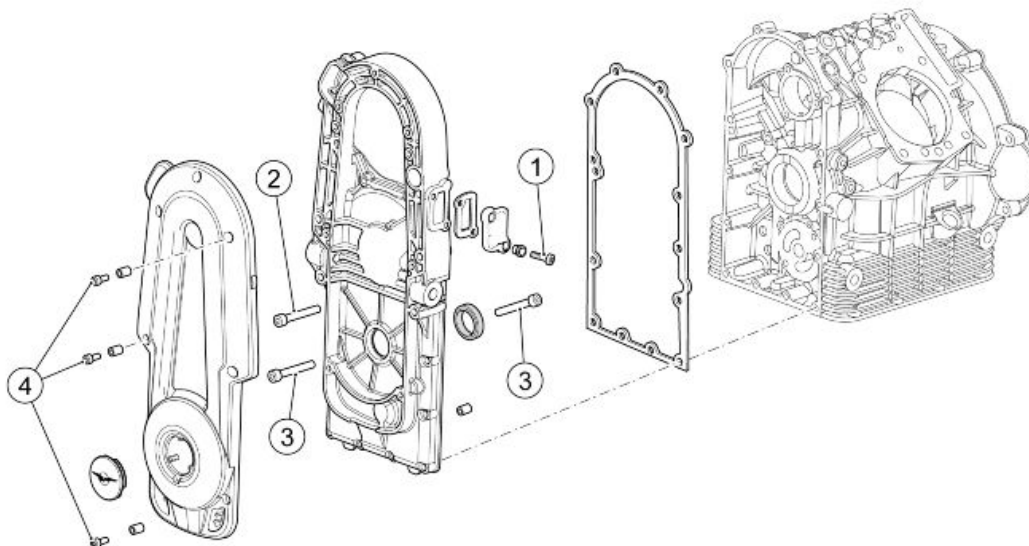
CYLINDERS TIMING

pos.	Description	Type	Quantity	Torque	Notes
1	Camshaft / rocker support fixing screws	M8x30	12	16 - 18 Nm (11.80 - 13.28 lb ft)	-
2	Nut for tie rod	M10x1.25	8	Pretorque 15 Nm (11.06 lb ft) Final torque 42 Nm (30.98 lb ft)	-
3	Cap	M6x10	2	10 - 12 Nm (7.37 - 8.50 lb ft)	Loctite 542
4	Reference dowel on camshaft	-	1	Interference insert	Loctite 542
5	Long screw for chain compartment on head	M6x120	4	10 Nm (7.37 lb ft)	-
6	Screws for sprocket timing on camshaft	M8x1	2	30 Nm (22.13 lb ft)	Loctite 243
7	Screws for blow-by cap on head	M5x16	4	6 - 8 Nm (4.42 - 5.90 lb ft)	-
8	Chain tensioner rod spacer screws	M8x24.5	2	20 Nm (14.75 lb ft)	-
9	Cup spring to camshaft fixing screws	M6x25	2	11 - 13 Nm (8.11 - 9.59 lb ft)	-



ALTERNATOR

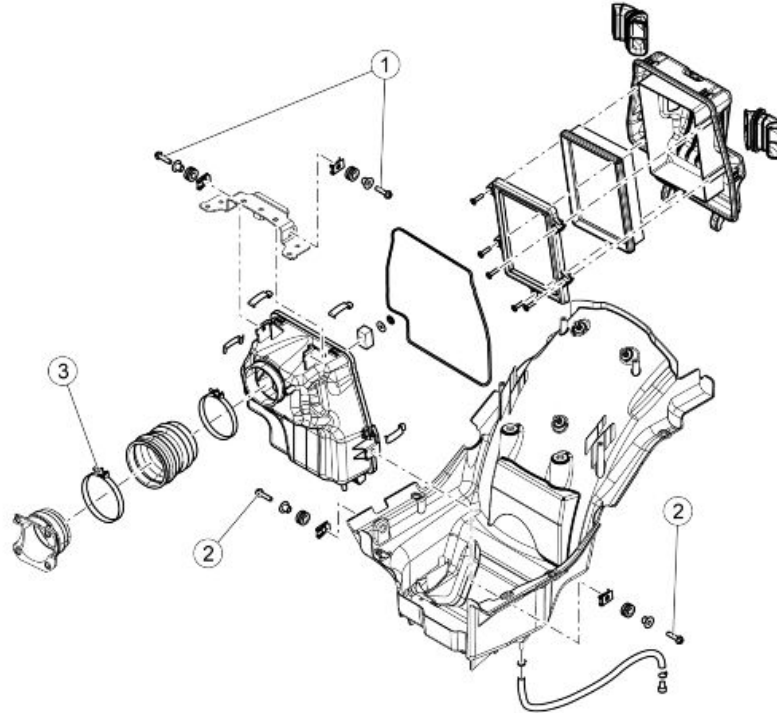
pos.	Description	Type	Quantity	Torque	Notes
1	Generator control pulley locking nut	M16	1	100 Nm (73.76 lb ft)	Loctite 243
2	Generator upper fixing screw	M8	1	22 Nm (16.23 lb ft)	-
3	Generator lower fixing screw	M10x60	1	30 Nm (22.13 lb ft)	-



GENERATOR COVER

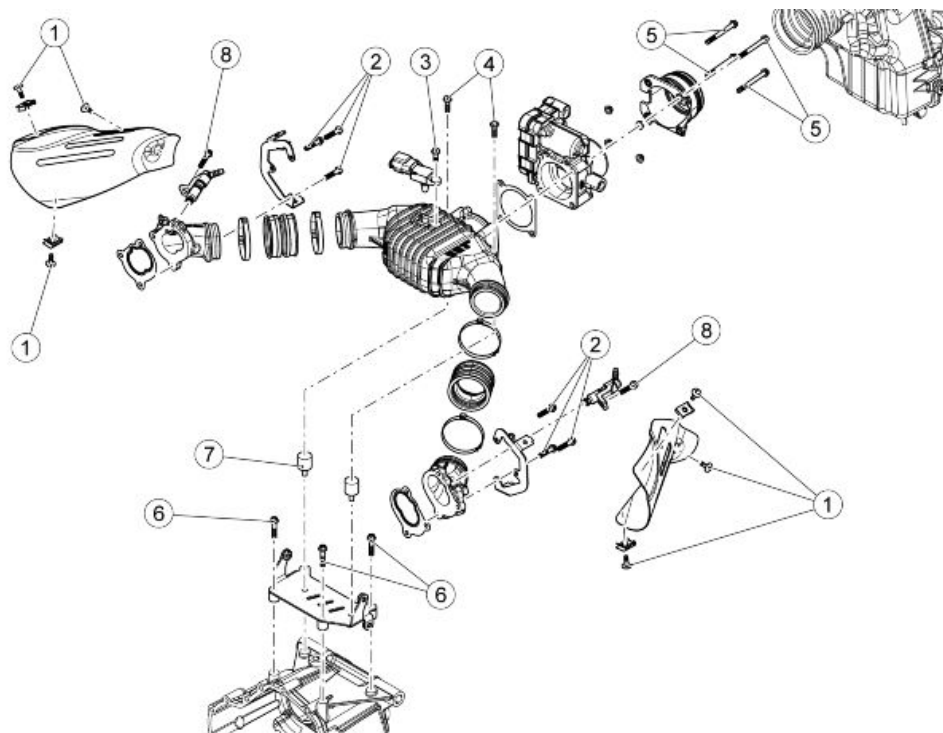
pos.	Description	Type	Quantity	Torque	Notes
1	Timing system cover cap fixing screw	M6x20	2	10 Nm (7.38 lb ft)	Loctite 243

pos.	Description	Type	Quantity	Torque	Notes
2	Timing system cover fixing screw	M8x55	4	25 Nm (18.44 lb ft)	-
3	Timing system cover fixing screw	M6x30	9	10 ÷ 12 Nm (7.38 ÷ 8.85 lb ft)	-
4	Generator cover fixing screw	M6x16	6	10 ÷ 12 Nm (7.38 ÷ 8.85 lb ft)	-



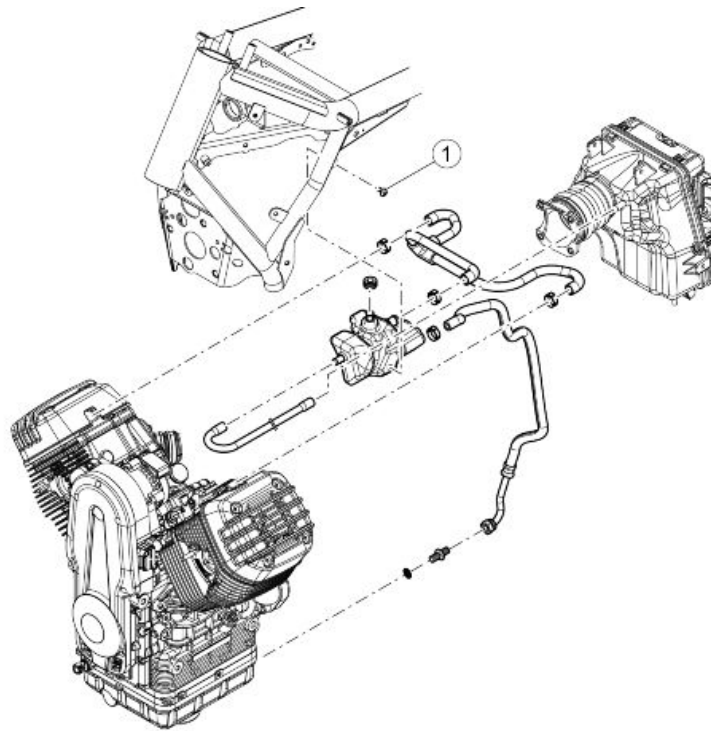
AIR FILTER

pos.	Description	Type	Quantity	Torque	Notes
1	Screw fixing filter box to chassis	M6x20	2	10 Nm (7.38 lb ft)	-
2	Screw fixing filter box to chassis	M6x25	2	10 Nm (7.38 lb ft)	-
3	Clamp fixing sleeve to throttle body	-	1	Manual	-



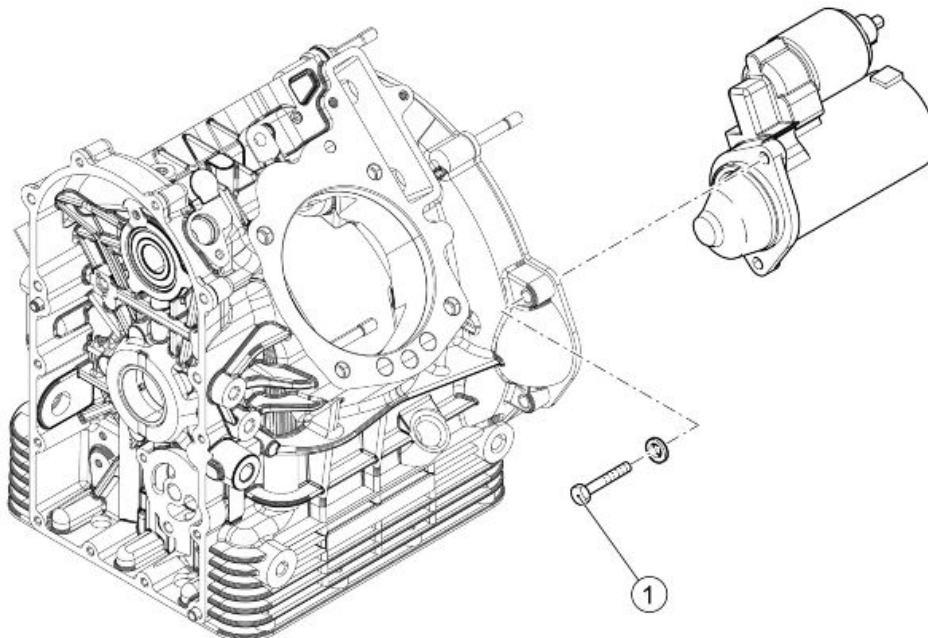
THROTTLE BODY

pos.	Description	Type	Quantity	Torque	Notes
1	Guards fixing screws	M5x15	6	6 Nm (4.43 lb ft)	-
2	Admission joints fixing screws	-	6	10 Nm (7.38 lb ft)	-
3	Air temperature sensor fixing screw	M6x16	1	10 Nm (7.38 lb ft)	-
4	Compensator volume fixing screw	M6x16	2	10 Nm (7.38 lb ft)	-
5	Throttle body manifold fixing screws	M6x60	4	10 Nm (7.38 lb ft)	-
6	Bracket fixing screws	M6x28	4	8.5 ÷ 10 Nm (6.27 ÷ 7.38 lb ft)	Loctite 243
7	Silent block	M6	2	Hand tighten	Loctite 243
8	Screws fixing injectors to admission joints	-	2	7 Nm (5.16 lb ft)	By hand



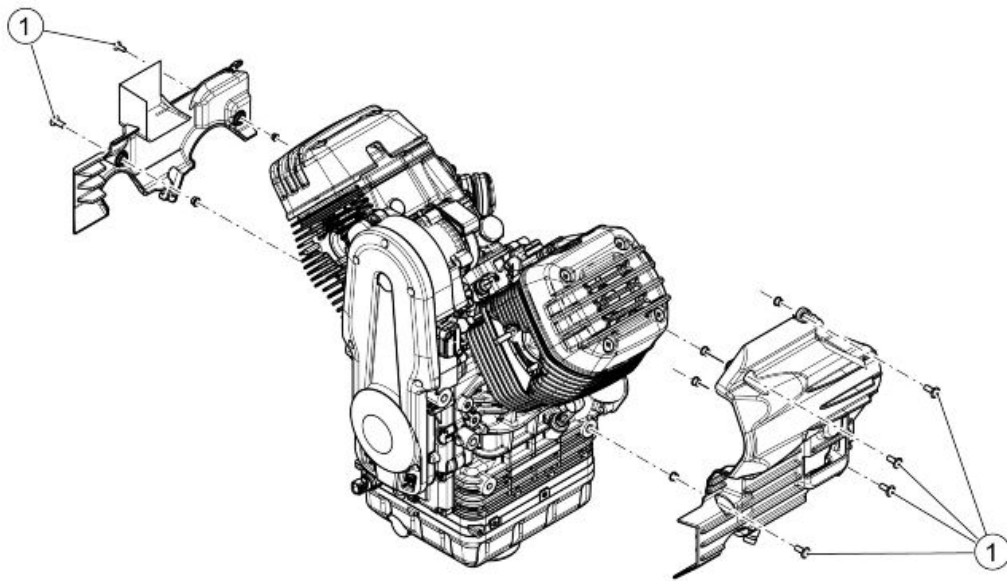
BLOW-BY SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Blow-By tank fixing screw	M5x9	1	6 Nm (4.43 lb ft)	-



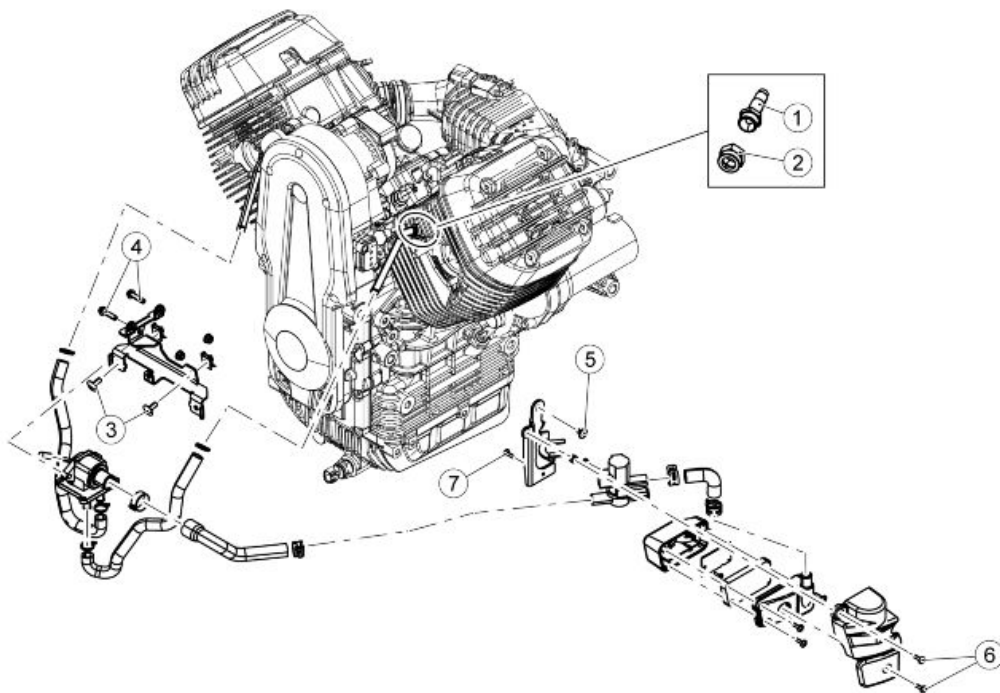
STARTER MOTOR

pos.	Description	Type	Quantity	Torque	Notes
1	Starter motor fixing screws	M8x75	2	25 Nm (18.44 lb ft)	-



ENGINE COVER

pos.	Description	Type	Quantity	Torque	Notes
1	Engine cover fixing screws	M6x16 stainless steel	6	10 Nm (7.37 lb ft)	-



SECONDARY AIR SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Secondary air fitting pipe	-	2	14 ÷ 16 Nm (10.33 ÷ 11.80 lb ft)	Loctite 648
2	Secondary air fitting pipe fixing nut	M16	2	12 Nm (8.85 lb ft)	-
3	Screw fixing reed valve bracket support to frame	M6x16	2	10 Nm (7.38 lb ft)	-
4	Screw fixing reed valve to bracket support	M6x25	2	10 Nm (7.38 lb ft)	-
5	Screw fixing solenoid valve to chassis	M5x9	1	6 Nm (4.43 lb ft)	-
6	Solenoid valve cover fixing screws	Self-tapp. 4.2x16	2	3 Nm (2.21 lb ft)	-
7	Screw fixing SAS filter housing to support bracket	Self-tapp. 4.2x16	1	3 Nm (2.21 lb ft)	-

Overhaul data

Assembly clearances

Cylinder - piston assy.

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

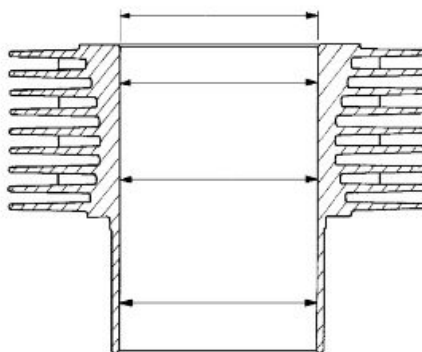
Check that cylinders and pistons are of the same selection types (D, E, F).

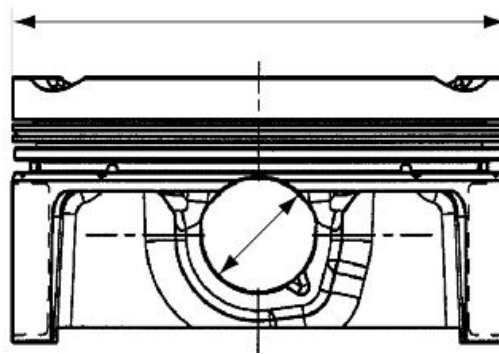
Check clearance between cylinders and pistons on the selected diameter; if it exceeds the value specified, it is necessary to replace cylinders and pistons.

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

CYLINDER COUPLING CLEARANCE -

ABB REVI ATIO N	CYLINDER Ø	PISTON Ø	FITTING CLEARANCE
D	104.000-104.010 mm (4.0944-4.0948 in)	103.935-103.945 mm (4.0919-4.0923 in)	0.055-0.075 mm (0.00216-0.00295 in)
E	104.010-104.020 mm (4.0948-4.0952 in)	103.945-103.955 mm (4.0923-4.0927 in)	0.055-0.075 mm (0.00216-0.00295 in)
F	104.020-104.030 mm (4.0952-4.0956 in)	103.955-103.965 mm (4.0927-4.0930 in)	0.055-0.075 mm (0.00216-0.00295 in)





PIN - PISTON COUPLING

Specification	Desc./Quantity
Pin diameter	21.998 - 21.994 mm (0.86606 - 0.86590 in)
Pin hole diameter on piston	22.020 - 22.015 mm (0.86693 - 0.86673 in)
Clearance between pin and holes on piston	0.017 - 0.026 mm (0.00067 - 0.00102 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 - 0.070 mm (0.00118 - 0.00275 in)
Middle ring	0.020 - 0.060 mm (0.00079 - 0.00236 in)
Oil scraper ring	0.010 - 0.180 mm (0.00039 - 0.00709 in)

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

- Upper piston ring 0.20 - 0.32 mm (0.0079 - 0.0126 in)
- Intermediate piston ring 0.35 - 0.50 mm (0.0138 - 0.0197 in)
- Oil scraper piston ring: 0.2 - 0.7 mm (0.0079 - 0.0275 in).

Slot packing system

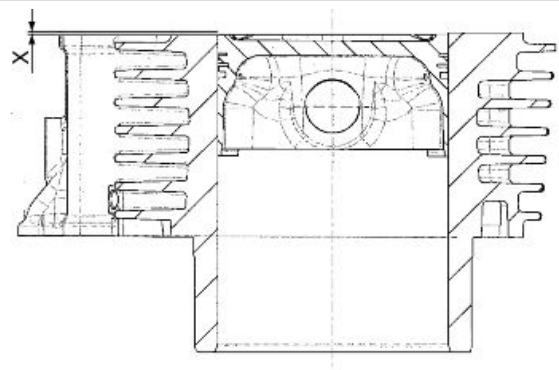
- Fit both pistons on the connecting rods.
- Working from both sides, fit the gasket between the crankcase and the cylinder on the crankcase.
- Fit both cylinders.
- Take the left cylinder piston to TDC and lock crankshaft rotation.



Specific tooling

020675Y Service shaft gear lock

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



Specific tooling

020676Y Dial gauge 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.
- Position the tool on the right cylinder stud bolts to determine the quota (X)

Specific tooling

020676Y Dial gauge 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) -0.34 / -0.52 mm (-0.0134 / -0.0204 in)	gasket thickness 0.6 mm (0.0236 in).
Value (X) -0.14 / -0.34 mm (-0.0055 / -0.0133 in)	gasket thickness 0.8 mm (0.0314 in).
Value (X) -0.06 / -0.14 mm (-0.0023 / -0.0055 in)	gasket thickness 1 mm (0.0393 in).



TO SELECT THE GASKET REFER TO THE CODE NUMBER WRITTEN ON IT.



IN CASE OF REPLACEMENT OF ONE OR MORE COMPONENTS IN THE THERMAL GROUP (PIS-TON, CYLINDER, PIN) OR OF AT LEAST ONE CRANKSHAFT CONNECTING ROD OR BUSHINGS, THE QUOTA (X) MUST BE REMEASURED IN ORDER TO SELECT THE APPROPRIATE GASKET.

Recommended products chart

Piaggio & C. S.p.A. prescribes eni products for the scheduled maintenance of its vehicles



RECOMMENDED PRODUCTS TABLE

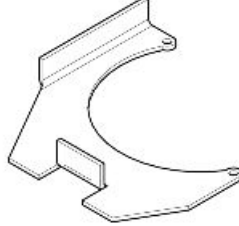
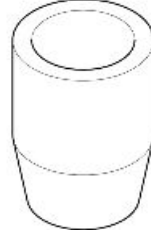
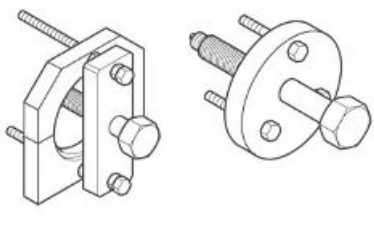

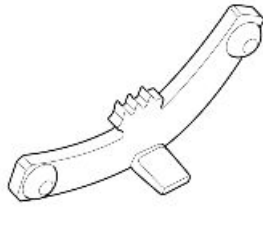
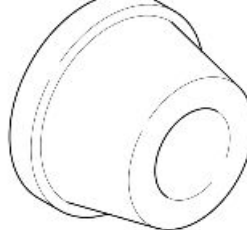
Product	Description	Specifications
ENI i-RIDE PG RACING 10W-60	Engine oil	SAE 10W - 60. As an alternative for recommended oils, top-branded oils that meet or exceed the requirements of CCMC G-4 A.P.I. SG specifications can be used.
AGIP GEAR SAE 80 W 90	Transmission oil	API GL-4
AGIP GEAR MG/S SAE 85 W 90	Gearbox oil	API GL-5
FUCHS TITAN SAF 1091	Fork oil	-
AGIP GREASE SM2	Lithium grease with molybdenum for bearings and other points to lubricate	NLGI 2
Neutral grease or petroleum jelly.	Battery poles	
AGIP BRAKE 4	Brake / Clutch fluid	SAE J 1703 -FMVSS 116 - DOT 3/4 - ISO 4925 - CUNA NC 956 DOT 4 synthetic fluid

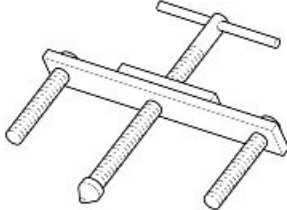
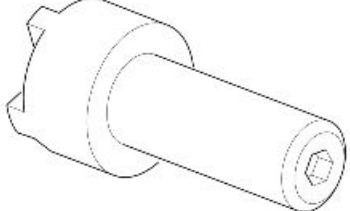
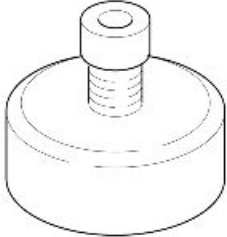
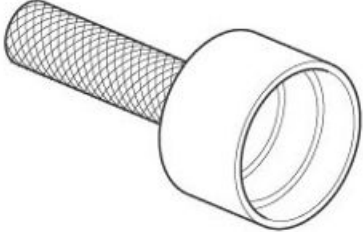


INDEX OF TOPICS

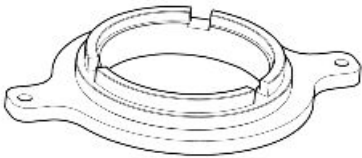
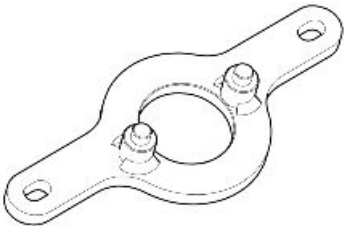
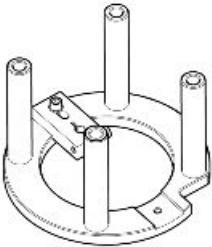
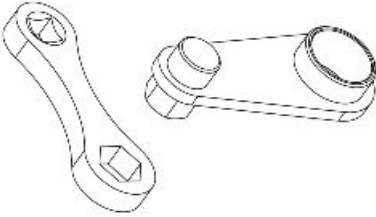
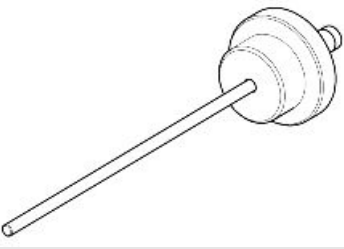
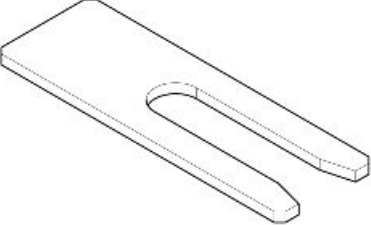
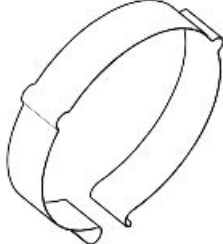
SSPECIAL TOOLS

S-TOOLS

ENGINE

Stores code	Description	
GU05902530	Gearbox support	
GU05911730	Front cover insertion cone	
GU05912530	Gearbox opening	
GU05927230	Timing system cover sealing ring punch	
GU12911801	Tool to lock the flywheel and the starting ring gear	
GU12912000	Tool to fit the flywheel-side flange together with seal ring on the crankshaft	

Stores code	Description	
GU12913600	Tool to remove the flywheel-side flange	
GU14912603	Hook spanner for fixing ring nut of the clutch shaft internal body	
GU14927100	Tool to fit the sealing ring on the flywheel-side flange	
GU19927100	Tool to fit the seal ring on the flywheel-side flange	
020382Y	Tool for removing valve cotters fitted with part 012	
020470Y	Pin snap ring fitting tool	

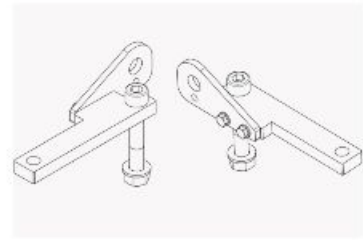
Stores code	Description	
020672Y	Clutch spring centre and pusher	
020675Y	Service shaft gear lock	
020676Y	Dial gauge support for piston position checking	
020677Y	Generator belt tensioner, lever for belt tensioning	
020678Y	Tool for clutch rod checking	
020716Y	Connecting rod locking	
020945Y	Piston ring clamp	

Stores code

Description

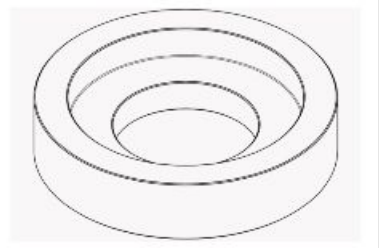
020953Y

Cam shaft lock for fixing



020954Y

Centring cam shaft cup spring



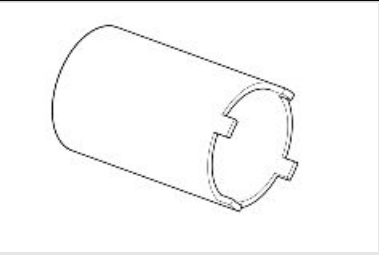
CHASSIS

Stores code

Description

AP8140190

Tool for steering tightening



020376Y

Adaptor handle



020359Y


42 x 47mm Adaptor




020360Y

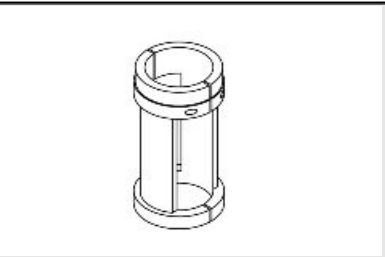
Adaptor 52x54 mm



Stores code	Description	
001467Y001	Pliers to extract Ø 25-mm bearings	


001467Y035	Bearing housing, external ø 47 mm	
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FRONT FORK

Stores code	Description	
AP8140145	Tool for oil seals fitting	

020981Y	Stanchion support	
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DIAGNOSIS INSTRUMENT

Stores code	Description	
020922Y	P.A.D.S.	

INDEX OF TOPICS

MAINTENANCE

MAIN

Scheduled maintenance table

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.

NOTE

THE TIMES LISTED ON THE SCHEDULED MAINTENANCE TABLE INCLUDE TIME DEDICATED TO MANAGEMENT ACTIVITIES.

Routine maintenance table

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) Periodic lubrication of the stand with spray grease is recommended after particularly hard use (dirt from salt, dust, etc.) or after long periods of inactivity.

(6) Lubricate if you are riding in the rain, on wet roads or after the vehicle has been washed.

(7) Replace at whichever of the following occurs first: 40000 km (24854 mi) or 4 years

ROUTINE MAINTENANCE TABLE

km x 1,000 (mi x 1,000)	1.5 (0.9)	10 (6.2)	20 (12.4)	30 (18.6)	40 (28.4)	50 (31.1)	60 (37.3)	70 (43.5)	80 (49.7)
Exhaust pipe flange bolts	I		I		I		I		I
Spark plugs		I	R	I	R	I	R	I	R
Stand (5)		I	I	I	I	I	I	I	I
Control cables and controls (4)	I	I	I	I	I	I	I	I	I
Alternator belt						R			
Steering bearings and steering clearance	I	I	I	I	I	I	I	I	I
Wheel bearings		I	I	I	I	I	I	I	I
Diagnosis by tool	I	I	I	I	I	I	I	I	I
Brake discs	I	I	I	I	I	I	I	I	I
Air filter		R	R	R	R	R	R	R	R
Engine oil filter	R	R	R	R	R	R	R	R	R
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
Fork oil (7)					R				R
Engine oil	R	R	R	R	R	R	R	R	R
Final drive oil						R			
Clutch lever pin (6)	L	L	L	L	L	L	L	L	L
Tyres - pressure / wear (1)	I	I	I	I	I	I	I	I	I
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
Suspension	I		I		I		I		I
Filter box drainage tube		I	I	I	I	I	I	I	I
Fuel lines (3)		I	I	I	I	I	I	I	I

km x 1,000 (mi x 1,000)	1.5 (0.9)	10 (6.2)	20 (12.4)	30 (18.6)	40 (28.4)	50 (31.1)	60 (37.3)	70 (43.5)	80 (49.7)
Brake lines (3)									
Brake pad wear (1)									
Labour time (minutes)	110	150	170	160	260	380	170	160	260

CAUTION

AT EVERY SCHEDULED SERVICE, USE THE DIAGNOSTIC TOOL TO CHECK FOR ANY ERRORS AND CHECK THAT ALL PARAMETERS ARE CORRECT. ENSURE THAT THE VEHICLE CALIBRATION HAS BEEN UPDATED TO LATEST VERSION AVAILABLE, AFTER UPDATING THE DIAGNOSTIC TOOL.

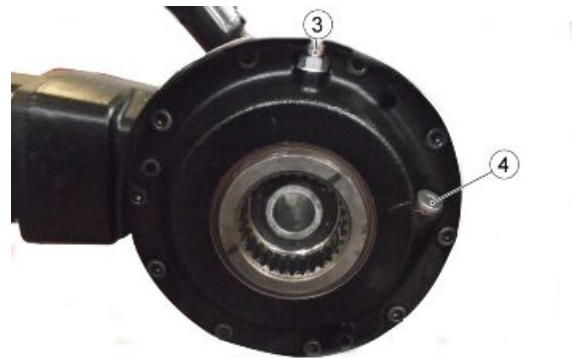
Transmission fluid

Check

- Remove the rear wheel.
- Undo and remove the three fixing screws (1) of the protection shield (2).
- Remove the protection shield (2).



- Keep the vehicle upright with both wheels on the ground.
- Unscrew and remove the level plug (4).
- The level is correct if the oil is close to the hole of the cap/dipstick (4).
- If the oil is lower than specified, top-up until it reaches the cap/dipstick hole (4).

**CAUTION**

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

See also

[Removing the rear wheel](#)

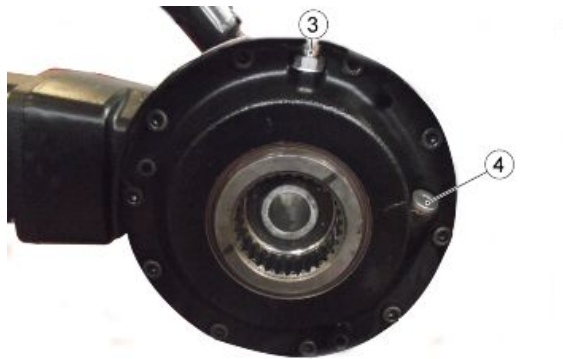
Replacement

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 an over 400 cm³ (25 cu.in) capacity under the drainage plug (5).
- Unscrew and remove the drainage plug (5).
- Unscrew and remove the breather cap (3).
- 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 (5).
- Remove any metal scrap attached to the drainage plug (5) magnet.
- Screw and tighten the drainage plug (5).
- Pour new oil through the fill opening (4) until it reaches the cap/dipstick hole (4).

**CAUTION**

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

- Screw and tighten the caps (3 - 4).

Engine oil**Check****CAUTION**

ENGINE MUST BE WARM TO CHECK ENGINE OIL LEVEL.

NOTE

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

- Shut off the engine.
- Keep the vehicle upright with both wheels on the ground.
- Unscrew the filler plug / oil dipstick.
- Remove and clean the oil dipstick.
- Re-insert the oil dipstick without tightening it.
- Remove the oil dipstick again and check the oil level.



'MAX' = maximum level.

'MIN' = minimum level.

- The oil level is correct when it is close to the 'MAX' mark. Otherwise, top-up with engine oil.

CAUTION

DO NOT ADD ADDITIVES OR OTHER SUBSTANCES 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 + 4000 cm³ (244 cu.in) capacity under the drainage plug (2).
- Unscrew and remove the drainage plug (2).
- Empty and drain the oil filler plug / engine oil level dipstick (1).
- Drain the oil into the container; allow several minutes for oil to drain out completely.
- Refit the oil filler plug / engine oil level dipstick (1).
- 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).



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.

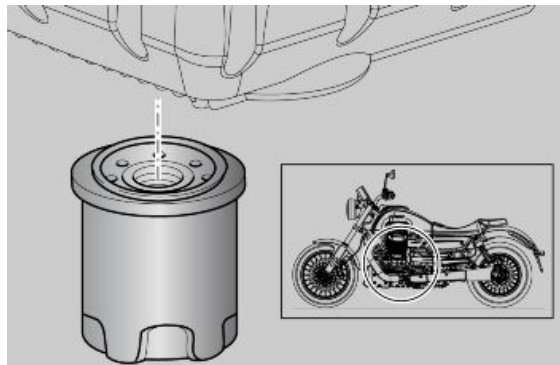
Engine oil filter

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.

Gearbox Oil

Inspection

CHECK AND TOPPING-UP

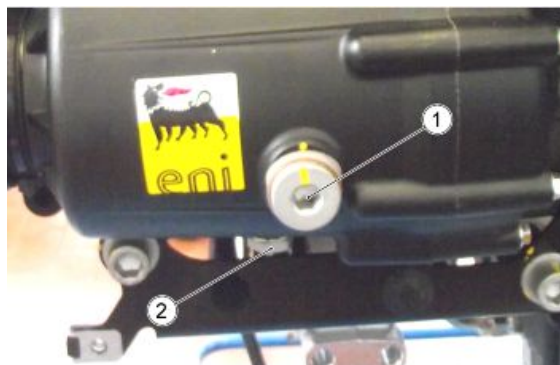
CAUTION

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

NOTE

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

- Shut off the engine.
- Keep the vehicle upright with both wheels on the ground.
- Undo and remove the dipstick opening (1) located on the right side of the gearbox.
- The level is correct if the oil is close to the hole of the dipstick (1).



If necessary:

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

CAUTION

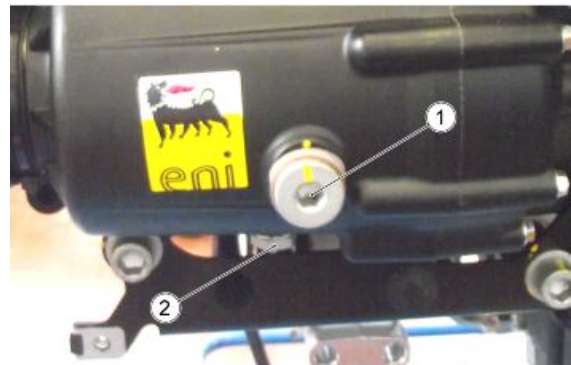
DO NOT ADD ADDITIVES OR OTHER SUBSTANCES TO THE FLUID. WHEN USING A FUNNEL OR ANY OTHER ELEMENT, MAKE SURE IT IS PERFECTLY CLEAN.

Replacement

NOTE

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

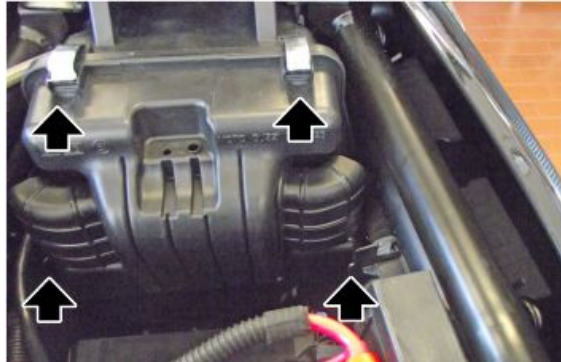
- Place a container with suitable capacity under the drainage plug (2).
- Unscrew and remove the drainage plug (2).
- Unscrew and remove the filler plug (1).
- Drain the oil into the container; allow several minutes for oil to drain out completely.
- Check and if necessary, replace the sealing washers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

**CAUTION**

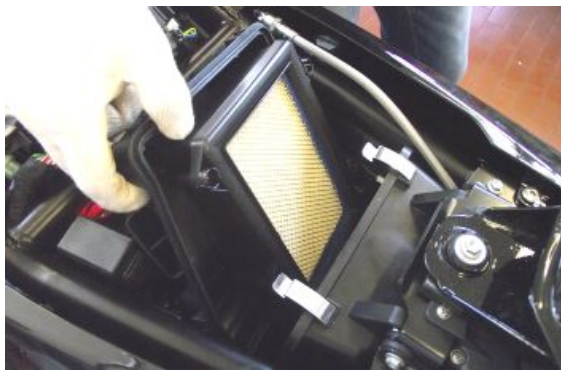
DO NOT ADD ADDITIVES OR OTHER SUBSTANCES TO THE FLUID. WHEN USING A FUNNEL OR ANY OTHER ELEMENT, MAKE SURE IT IS PERFECTLY CLEAN.

Air filter

- Remove the saddle.
- Release the four fixing clips of the upper shell filter box.



- Lift the filter housing cover.



- Remove the air filter.
- Plug the intake duct with a clean cloth to prevent any foreign objects from entering the intake manifold.



**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.**

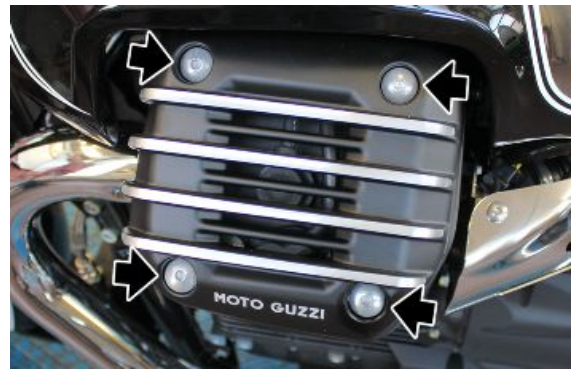
Checking the valve clearance

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).

- Remove the head cover protection by undoing and removing the four fixing screws.
- Remove the two spark plug caps.



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

MIN = minimum level

MAX = maximum level

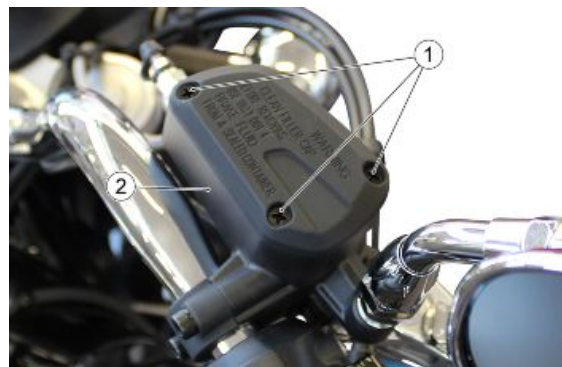
If the fluid does not reach at least the "**MIN**" reference mark:

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

Top-up

Front brake:

- Unscrew and remove the three fixing screws (1) of the brake fluid tank cover (2).
- Lift and remove the cover (3).
- Remove the under-cover (4).
- Remove the diaphragm (5).
- Top-up brake fluid tank.



Rear brake:

- Unscrew and remove the cap (5).
- Remove the under-cover (6).
- Remove the diaphragm (7).
- Top-up the tank with brake fluid to the correct level, which is between the two "MIN" and "MAX" reference marks.



RISK OF BRAKE FLUID SPILLING. DO NOT OPERATE THE BRAKE LEVER IF THE BRAKE FLUID RESERVOIR CAP IS LOOSE OR HAS BEEN REMOVED.

CAUTION



AVOID PROLONGED AIR EXPOSURE OF THE BRAKE FLUID. BRAKE FLUID IS HYGROSCOPIC AND ABSORBS MOISTURE WHEN IN CONTACT WITH AIR. LEAVE THE BRAKE FLUID RESERVOIR OPEN ONLY FOR THE TIME NEEDED TO COMPLETE THE TOPPING-UP PROCEDURE.



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

DO NOT ADD ADDITIVES OR OTHER SUBSTANCES TO THE FLUID.

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



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

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

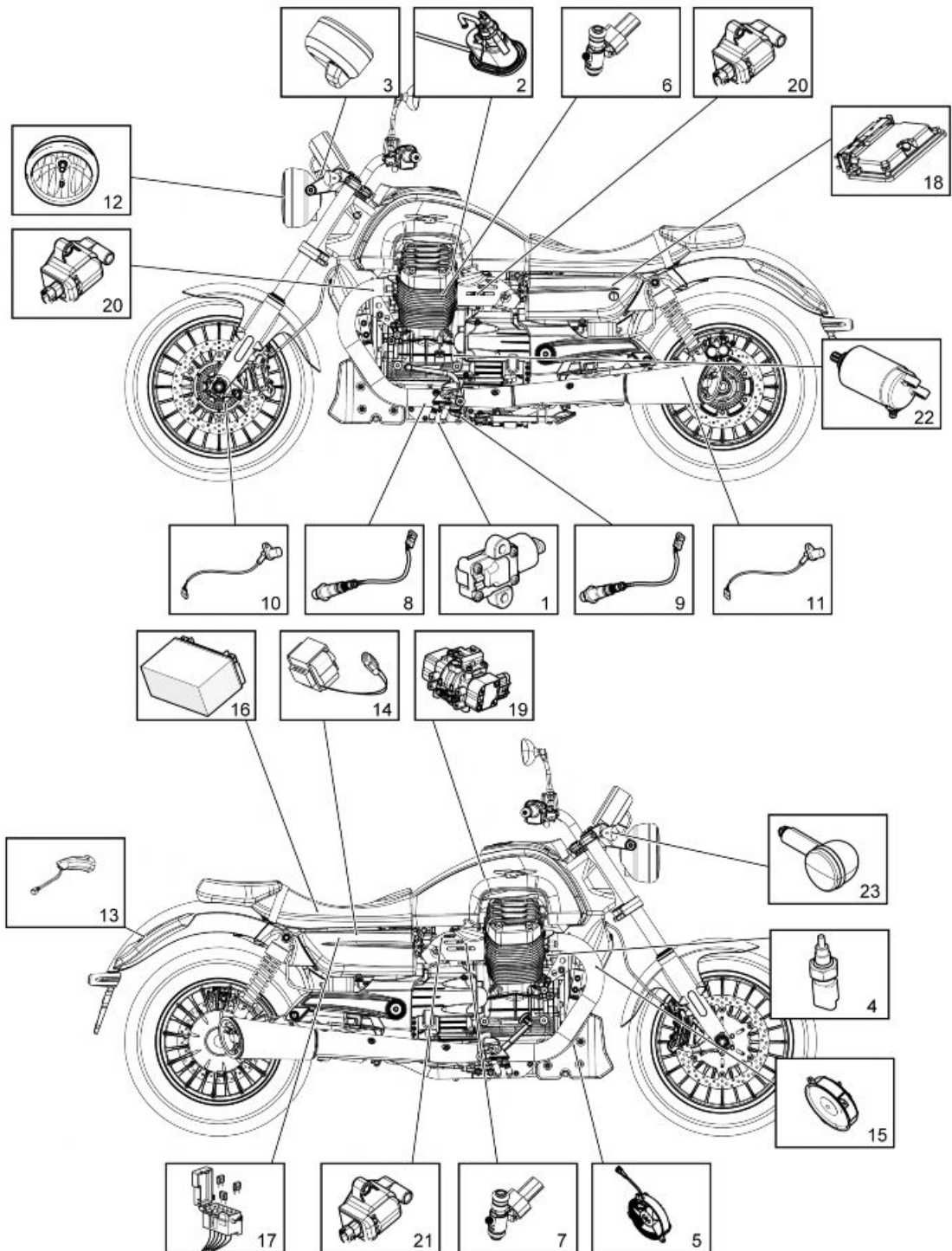
CHECK BRAKING EFFICIENCY. IN CASE OF EXCESSIVE TRAVEL OF THE BRAKE LEVER OR POOR PERFORMANCE OF THE BRAKING SYSTEM, TAKE YOUR VEHICLE TO AN Official Moto Guzzi Dealer, AS IT MAY BE NECESSARY TO PURGE THE AIR IN THE SYSTEM.

INDEX OF TOPICS

ELECTRICAL SYSTEM

ELE SYS

Components arrangement



KEY:

1. Side stand sensor:
2. Fuel pump.
3. Instrument panel.

4. Engine temperature sensor.
 5. Cooling fan.
 6. Left injector.
 7. Right injector.
 8. Lambda probe
 9. Lambda probe
 10. Front speed sensor.
 11. Rear speed sensor.
 12. Headlamp.
 13. Turn indicators and taillight.
 14. Fall sensor.
 15. Horn.
 16. Battery.
 17. Fuses.
 18. Control unit.
 19. Demand Sensor.
 20. Left coils.
 21. Right coils.
 22. Starter motor.
 23. Front turn indicators.
-

Electrical system installation

INTRODUCTION

Scope and applicability

This document aims at defining the cable harness routing in order to achieve the vehicle reliability targets.

Materials used and corresponding quantities

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

- 1 Main cable harness
- 1 Battery - engine negative ground cable
- 1 Main injection relay
- 1 Relay Mounting Rubber Block
- 1 Fan cable harness
- 1 License plate light cable harness
- 1 Fog light switch with wiring
- 1 12V 30A Relay
- 1 Relay Mounting Rubber Block

- 1 Complete antitheft kit

The consumable parts like clamps or possible cable grommets are indicated in the images

Motorcycle division

The wiring timing 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

It is extremely important that any security-locks for the following connectors are properly connected and correctly tightened to ensure proper engine, and therefore proper vehicle, operation.

- Instrument panel connector
- Master and Slave Demand Connectors
- Pick Up connector and alternator
- Side Stand Switch Connector
- Coils connectors
- Control unit connectors
- Fuel pump connector
- Immobilizer aerial key connector
- Right Light Switch Connectors
- Left Light Switch Connectors
- ABS connector and correct positioning of the cap
- Front and rear speed sensor connector
- Auxiliary and primary fuses (rubber housing correct positioning and closing)
- Throttle motor connector
- T-Map Sensor connector
- Check fixing of the grounds on the engine body (left side)
- Check correct running of the Battery-Starter Relay cable
- Check fixing of the positive cable on the starter motor and positioning of the hood

The connectors in the list are circled in the different pictures. The listed connectors are considered more critical than the others because their disconnection could cause the vehicle to stop or malfunction. Obviously, the correct connection of the other connectors is also important and essential for proper vehicle operation.

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.

The operations for preassembly of the main cable harness on the frame are described in the tables below.

TABLE A

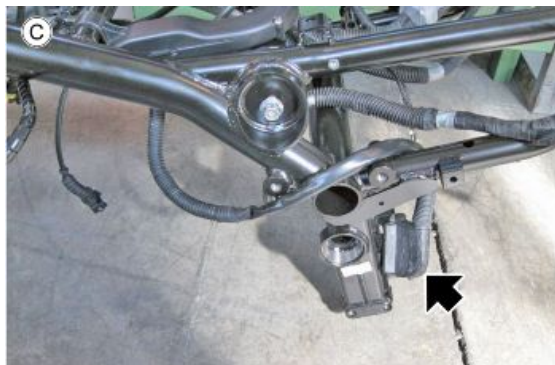
1. Large clamps.

**TABLE B**

Pass the main cable harness as shown in figure.

**TABLE C**

Pass the main cable harness as shown in figure.

**TABLE D**

1. Large clamps.

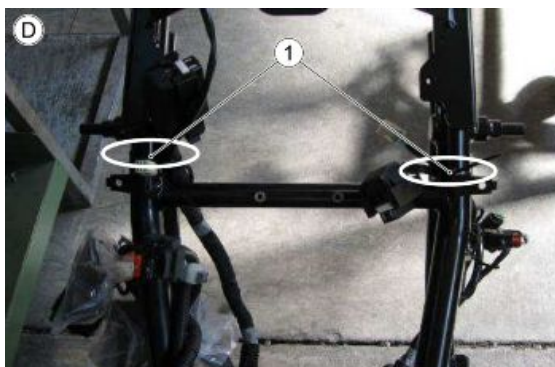


TABLE E

Pass the main cable harness as shown in figure.



TABLE F

Pass the main cable harness as shown in figure.



Front side

TABLE A - THERMAL SWITCH SENSOR

1. Thermal switch.
2. Thermal switch connector
3. Thermal switch cable harness
4. Medium clamp

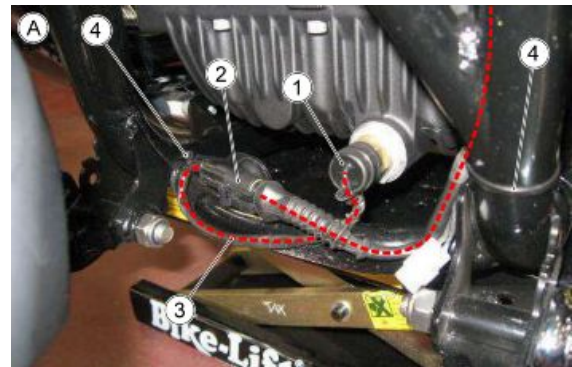


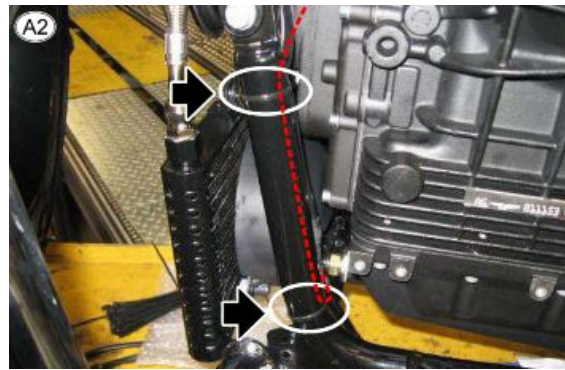
TABLE A1 - THERMAL SWITCH SENSOR

- Clamp the thermal switch cable harness as indicated



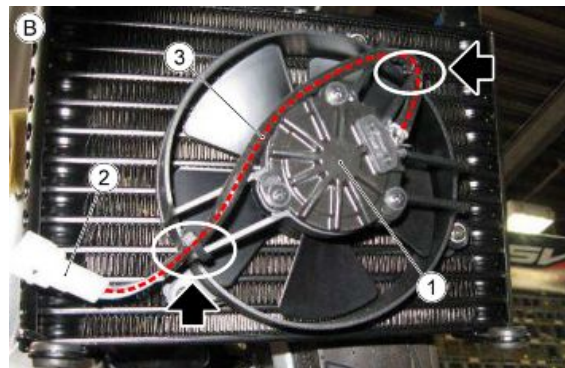
TABLE A2 - THERMAL SWITCH SENSOR

- Clamp the thermal switch cable harness at the indicated points

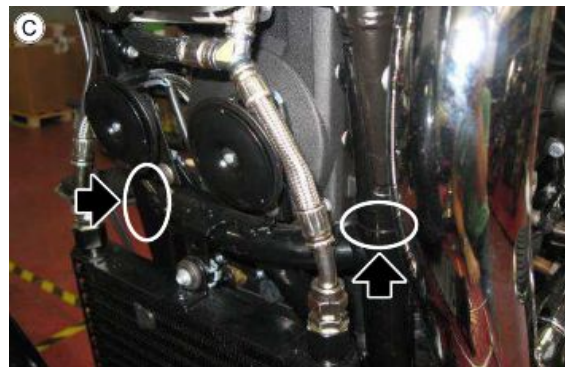
**TABLE B - FAN**

1. Fan
2. Fan connector
3. Fan cable harness

- Clamp the cable harness at the indicated point to prevent damage to it through the fan

**TABLE C - FAN**

- Clamp the cable harness at the indicated points

**TABLE D - FAN**

- Clamp the cable harness at the indicated point



TABLE E - RIGHT SIDE STEERING COLUMN AREA

1. Medium clamp.

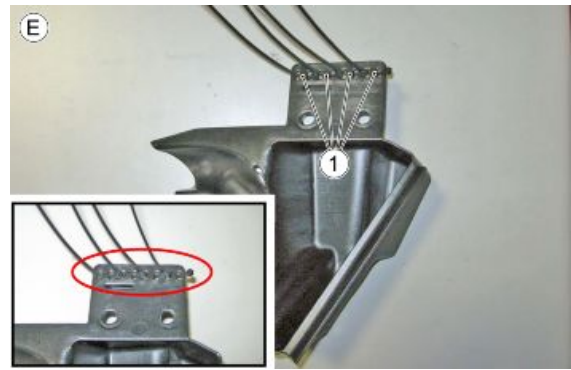


TABLE F - RIGHT SIDE STEERING COLUMN AREA

1. Medium clamp.



TABLE G - RIGHT SIDE STEERING COLUMN AREA

1. Medium clamp.
2. Key connector.
3. Speed sensor.
4. Immobilizer aerial.

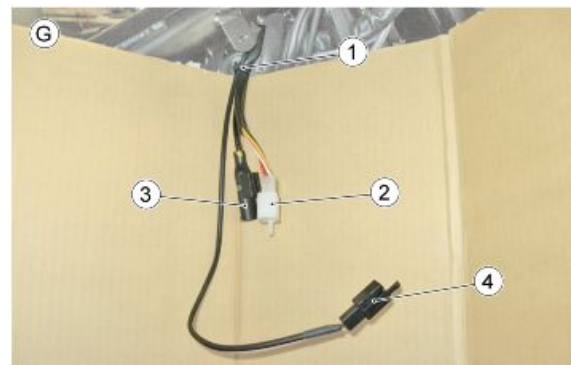


TABLE H - RIGHT SIDE STEERING COLUMN AREA

1. Medium clamp.
2. Clutch switch.
3. Left light switch.



TABLE I - RIGHT SIDE STEERING COLUMN AREA

1. Medium clamp.
2. Right light switch.
3. Front stop switch.

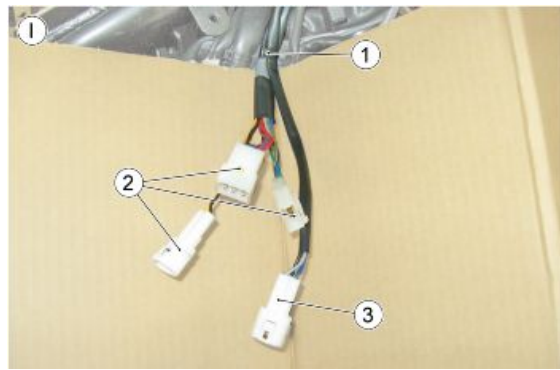


TABLE J - RIGHT SIDE STEERING COLUMN AREA

1. Medium clamp.
2. Turn indicators.
3. Headlamp.

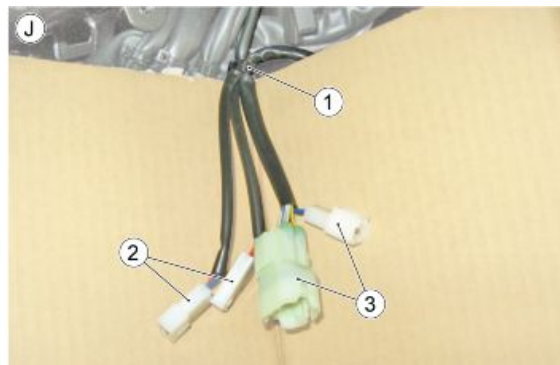


TABLE K - RIGHT SIDE STEERING COLUMN AREA

1. Key and immobilizer aerial connector.
2. Front wheel speed sensor connector.

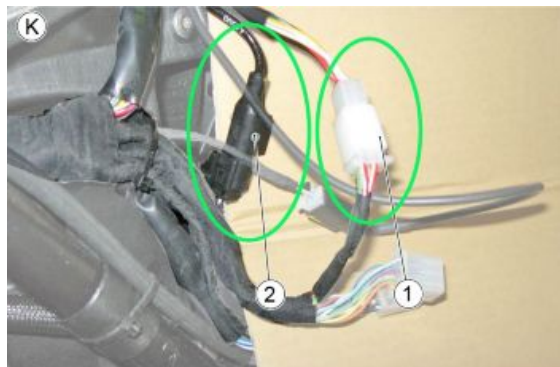


TABLE L - RIGHT SIDE STEERING COLUMN AREA

1. Clutch switch connectors.
2. Left light switch connectors.

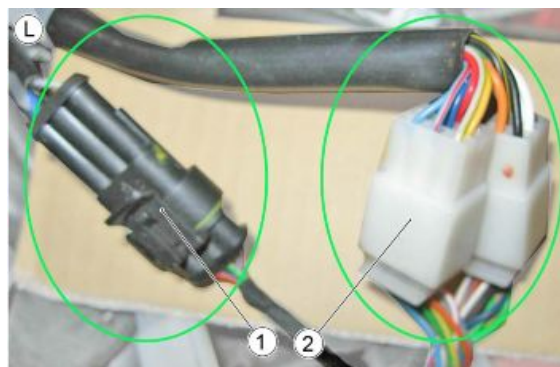
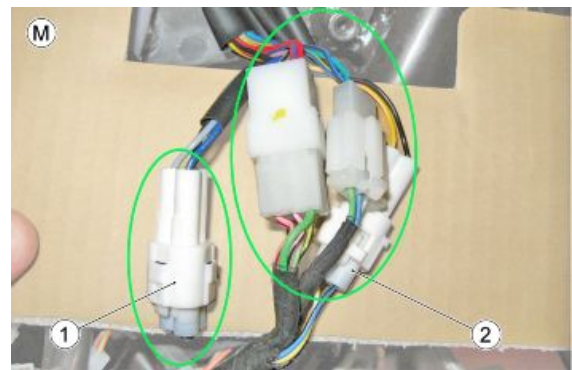


TABLE M - RIGHT SIDE STEERING COLUMN AREA

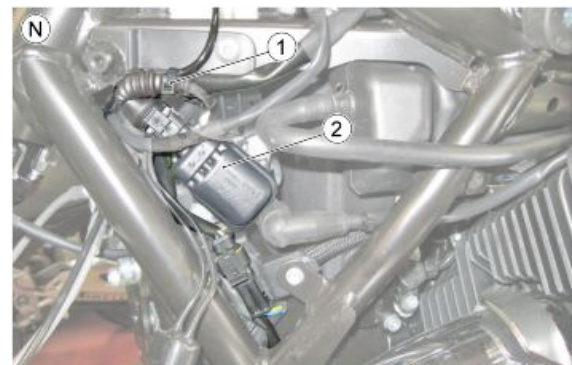
1. Front stop switch connector.
2. Right light switch connector.


TABLE M1 - RIGHT SIDE STEERING COLUMN AREA

- Clamp the light switch cable harness over the reference on the red belt for the version "Custom" and over the reference on the grey belt for the version "Touring"


TABLE N - LEFT SIDE STEERING COLUMN AREA

1. Medium clamp.
2. Left coil connector.


TABLE N1 - LEFT SIDE STEERING COLUMN AREA

1. Fog light pre-installation connector
 - If the fog lights are not set up, fix the connector for the pre-installation as shown in the picture.



TABLE O - LEFT SIDE FORK AREA

- 1. Cable grommet.

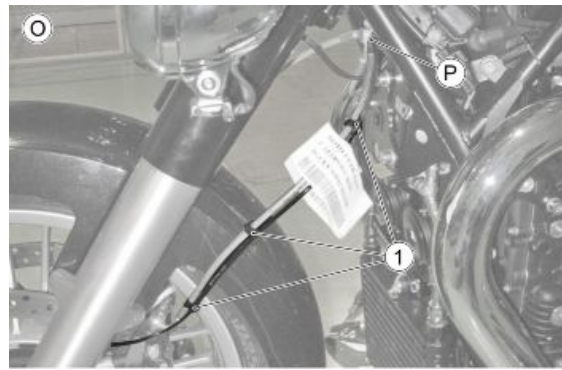


TABLE P - LEFT SIDE FORK AREA

- 1. Cable grommet.



TABLE Q - LEFT SIDE FORK AREA

- 1. Small clamp.



TABLE R - INSTRUMENT PANEL FASTENING

- 1. Medium clamp.



TABLE S - PRE-INSTALLATION AIR TEMPERATURE SENSOR

- 1. Medium clamp.

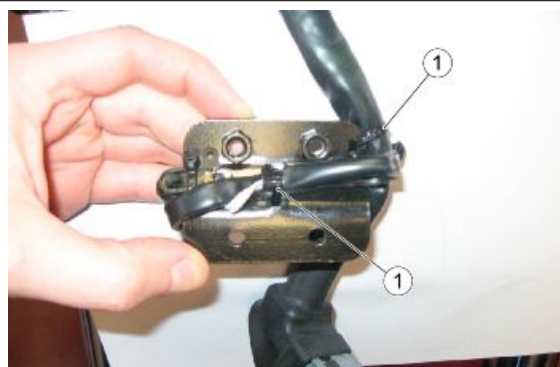


TABLE S1 - INSTALLATION AIR TEMPERATURE SENSOR

- 1. Medium clamp.
- 2. Sensor.

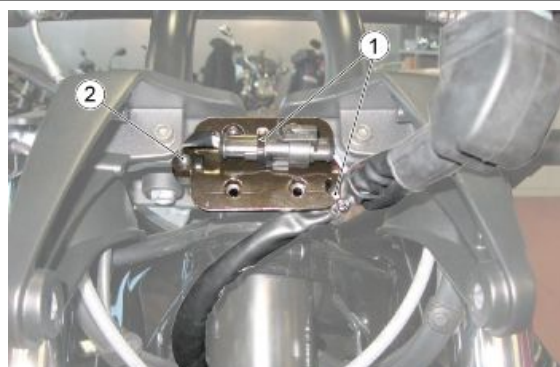


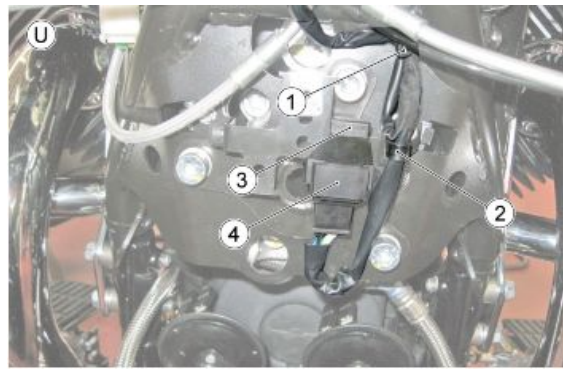
TABLE T - FOG LIGHTS

- 1. Fog lights kit connection.

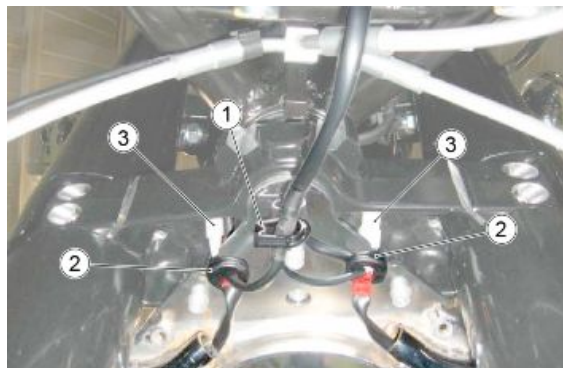


TABLE U - FOG LIGHTS

1. Medium clamp (to hold the branch that goes toward the headlights).
2. Clip.
3. 12V 30A relay.
4. Relay mounting rubber block.

**TABLE V - FOG LIGHTS**

1. Cable guide.
2. Rubber ring.
3. Insert the light connections in the rubber rings and assemble them as shown in the figure.

**TABLE X - LEFT HANDLEBAR ZONE**

1. Clutch switch.
2. Cable guide.



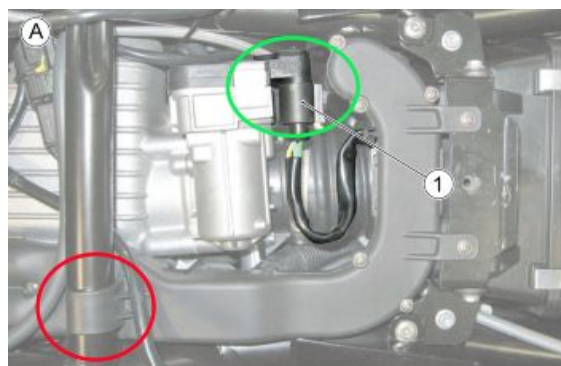
TABLE Y - RIGHT HANDLEBAR ZONE

1. Front stop switch.
2. Cable guide.

**Central part****TABLE A - FRAME AREA
(UNDER THE TANK)**

1. Throttle motor connector.

Fit the duct to the frame as shown in the figure.

**TABLE B - FRAME AREA
(UNDER THE TANK)**

1. T°Map connector.

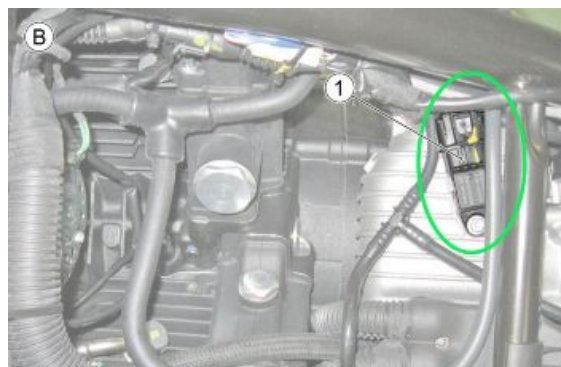


TABLE C - FRAME AREA
(FRAME LEFT EXTERNAL SIDE)

1. Satellite anti-theft connector (if fitted).
 - Clamp the connector for the satellite anti-theft to the main cable harness



TABLE C1 - FRAME AREA
(FRAME RIGHT EXTERNAL SIDE)

1. Fall sensor (if fitted).
 - During installation pay attention to the positioning arrow that must be always facing upwards

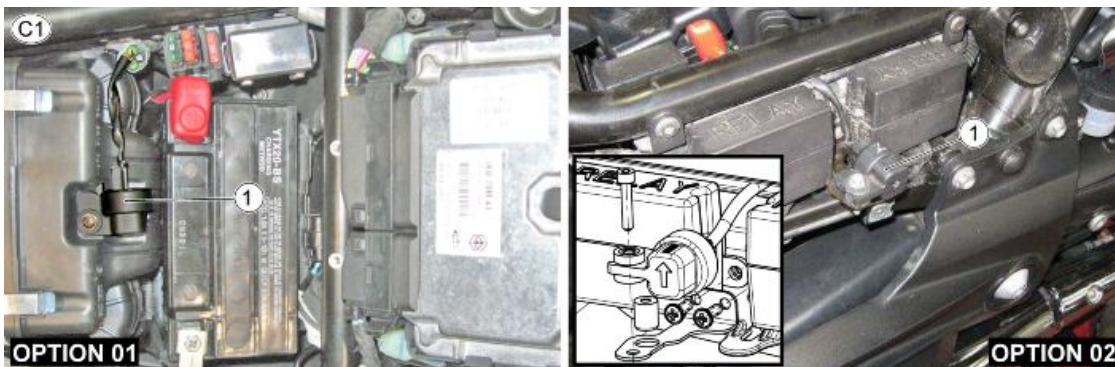


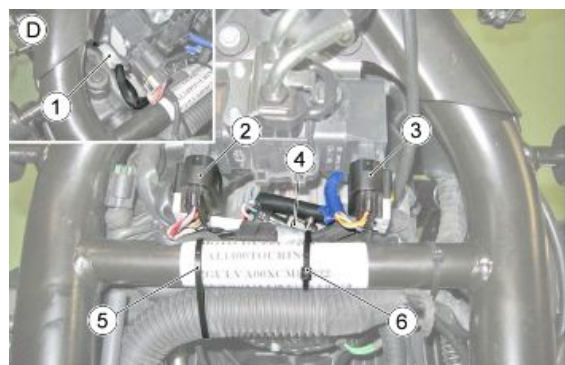
TABLE C2 - FRAME AREA
(FRAME RIGHT INTERNAL SIDE)

1. Fall sensor connector (if fitted)



TABLE D - FRAME AREA
(UNDER THE TANK)

1. Fog light connector (optional).
2. Slave Demand Connector.
3. Master Demand Connector.
4. Pick-up connector.
5. Big clamp.
6. Medium clamp.



**TABLE D1 - FRAME AREA
(FRAME RIGHT INTERNAL SIDE)**

1. Gear sensor connector.
2. Medium clamps.

**TABLE E - FRAME AREA
(UNDER THE TANK)**

1. Big clamp.

**TABLE F - FRAME AREA
(UNDER THE TANK)**

1. Medium clamp.
2. Navigator pre-installation.

**TABLE G - DIRECT CONNECTIONS TO THE
ENGINE**

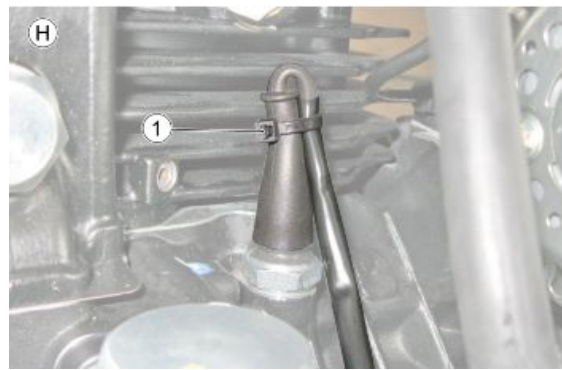
- Alternator connections.



TABLE H - DIRECT CONNECTIONS TO THE ENGINE

Engine temperature.

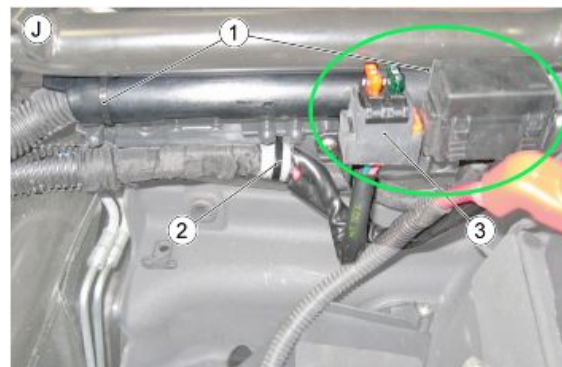
1. Medium clamp.


TABLE I - BATTERY AREA

1. Bluedash plug pre-installation connector (if fitted)


**TABLE J - BATTERY AREA
(RIGHT SIDE FAIRING, INTERNAL VIEW)**

1. Medium clamp.
2. Medium clamp.
3. Fuses.

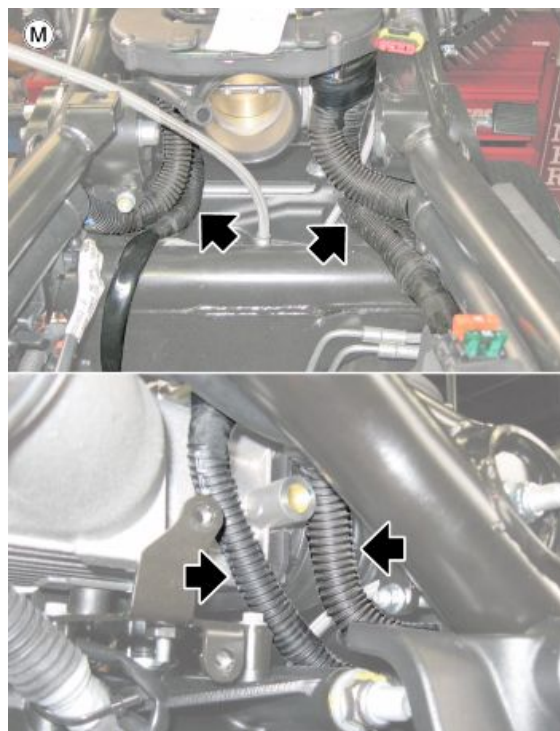

**TABLE K - BATTERY AREA
(LEFT SIDE FAIRING, EXTERNAL VIEW)**

1. Medium clamp.
2. Small clamp.
3. Relay.
4. Auxiliary fuse.
5. Rear speed sensor.

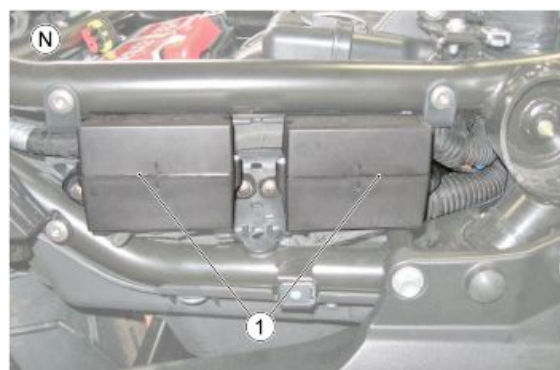


TABLE K - BATTERY AREA

1. Control unit connectors.

**TABLE M - CORRECT PASSING OF CORRUGATED PIPES****TABLE N - BATTERY AREA
(RIGHT SIDE FAIRING, EXTERNAL VIEW)**

1. Relay



**TABLE O - BATTERY AREA
(LEFT SIDE FAIRING, INTERNAL VIEW)**

1. Medium clamp.
2. ABS branch, must remain in its housing.

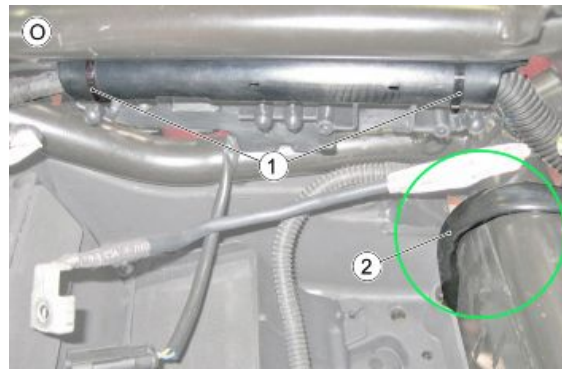


TABLE P - STARTER MOTOR AREA

1. Left coil.
2. Medium clamp.
3. Rear stop connector.
4. Side stand connector.
5. Engine ground.
6. Clamp with support.
7. Lambda Probe Connector.

In the engine ground cable, the two crimp connectors must be placed "back to back" as shown in the photo in order to favour the electrical contact of the surfaces.

Check correct fixing of the engine ground screw with the torque wrench.

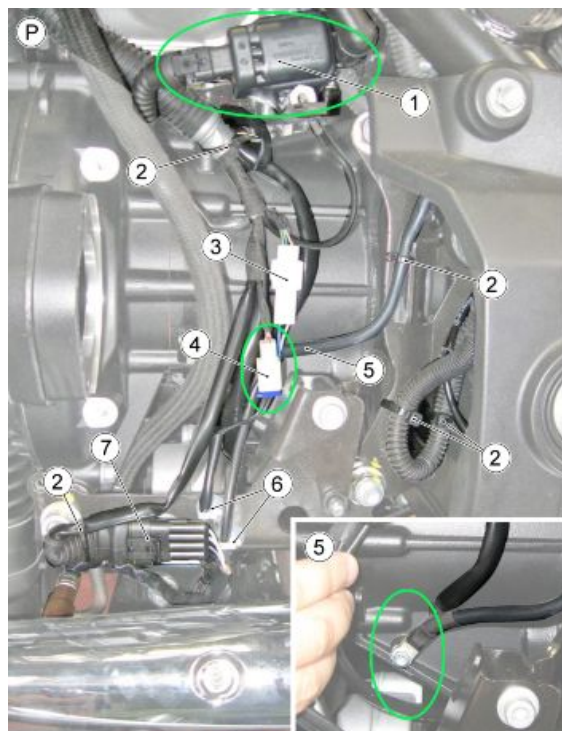


TABLE P1 - STARTER MOTOR AREA

- The battery - engine ground cable must be firmly fixed with a clamp as shown in the picture, and enter in the battery compartment passing through the rod and the frame

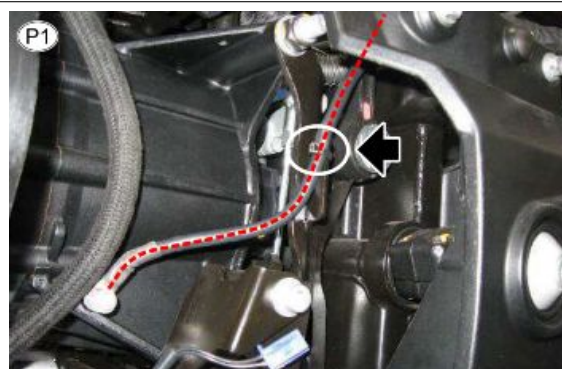


TABLE P2 - STARTER MOTOR AREA

- The battery - engine ground cable must pass under the cable harness branch



TABLE Q - STARTER MOTOR AREA

Starter motor clamp

1. Medium clamps.



TABLE R - STARTER MOTOR AREA

1. Right coil connector.



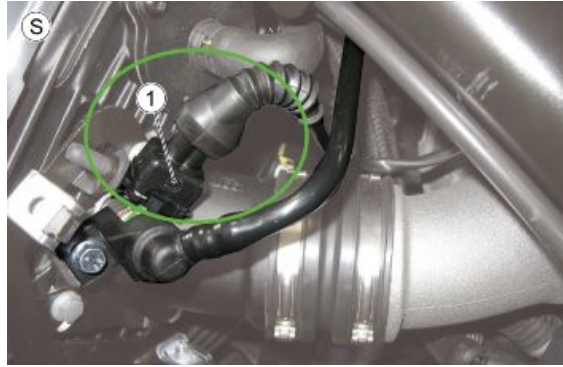
TABLE R1 - STARTER MOTOR AREA

1. Left coil
 2. Left coil connector.
- Clamp the cable harness at the indicated point

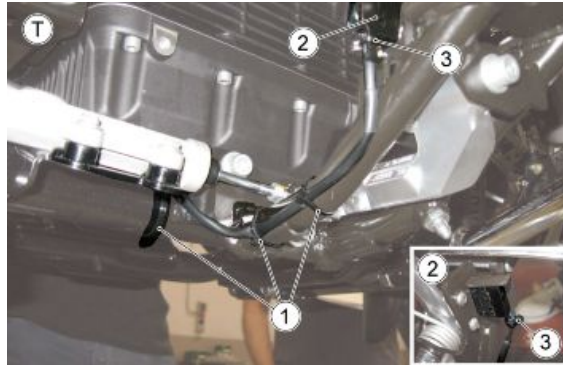


TABLE S - STARTER MOTOR AREA

1. Left injector connector.

**TABLE T - REAR STOP SWITCH**

1. Medium clamps.
2. Rear stop switch.
3. Small clamp.

**TABLE U - REAR STOP SWITCH**

1. Medium clamps.

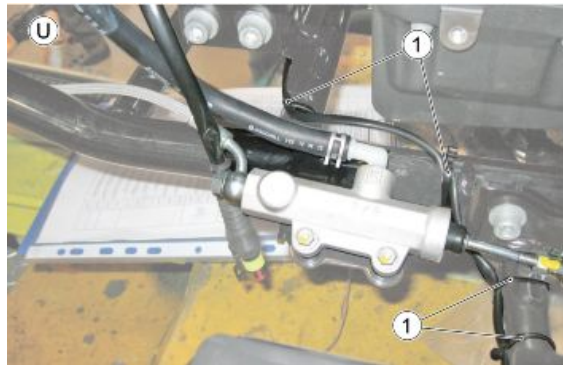
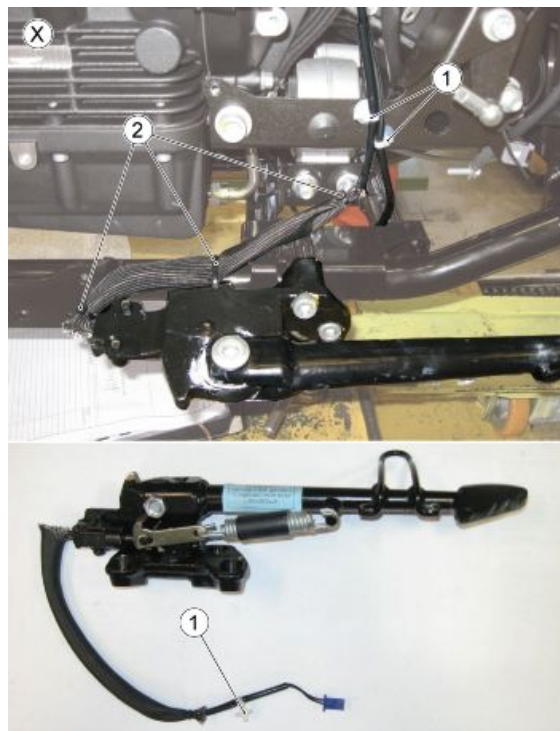


TABLE X - SIDE STAND

1. Clamp with support.
2. Medium clamp.

**TABLE W - REAR STOP SWITCH**

1. Clamp with support.

**TABLE Y - RIGHT LAMBDA FASTENING**

1. Medium clamp.
2. Right lambda.

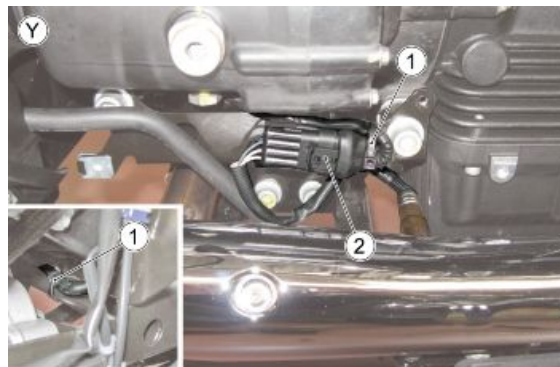
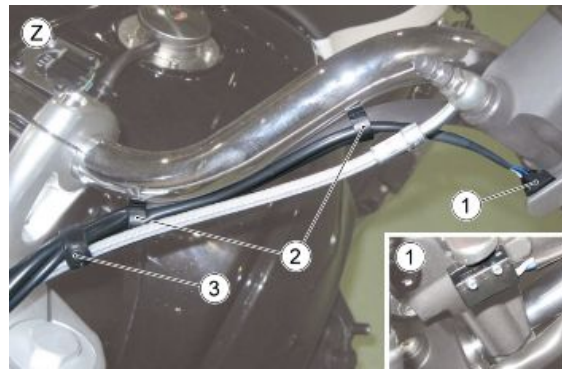


TABLE Z - HANDLEBAR AREA

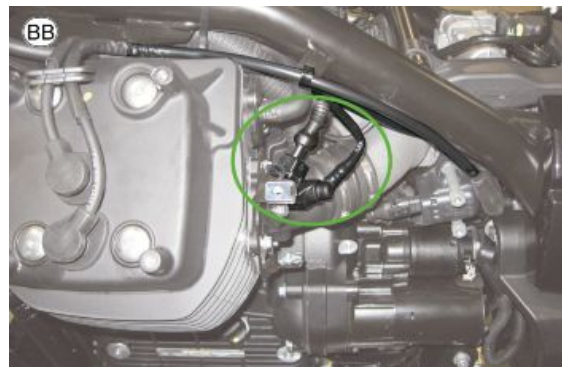
1. Clutch switch.
2. Clip.
3. Cable guide.

**TABLE AA - HANDLEBAR AREA**

1. Front stop switch.
2. Clip.
3. Cable guide.

**TABLE BB - LEFT SIDE H.V. CABLES**

Left injector connector.

**TABLE CC - RIGHT SIDE H.V. CABLES**

Right injector and coil connector.



Back side

TABLE A - TAILLIGHT LICENSE PLATE LIGHT

- 1. Retaining clip.



TABLE B - TAILLIGHT LICENSE PLATE LIGHT

- 1. Medium clamp.

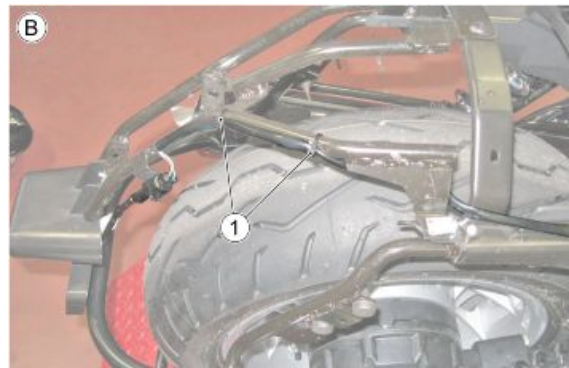


TABLE B1 - TAILLIGHT LICENSE PLATE LIGHT

- 1. Medium clamp.

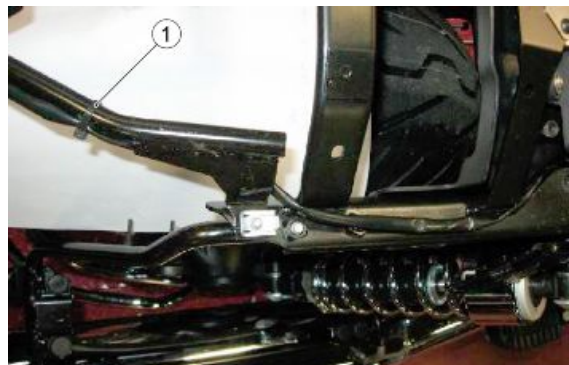
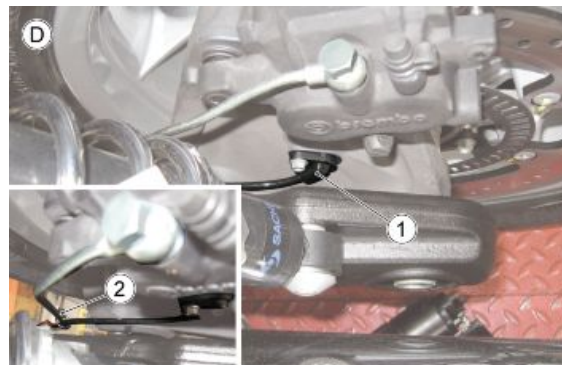


TABLE C - TAILLIGHT LICENSE PLATE LIGHT

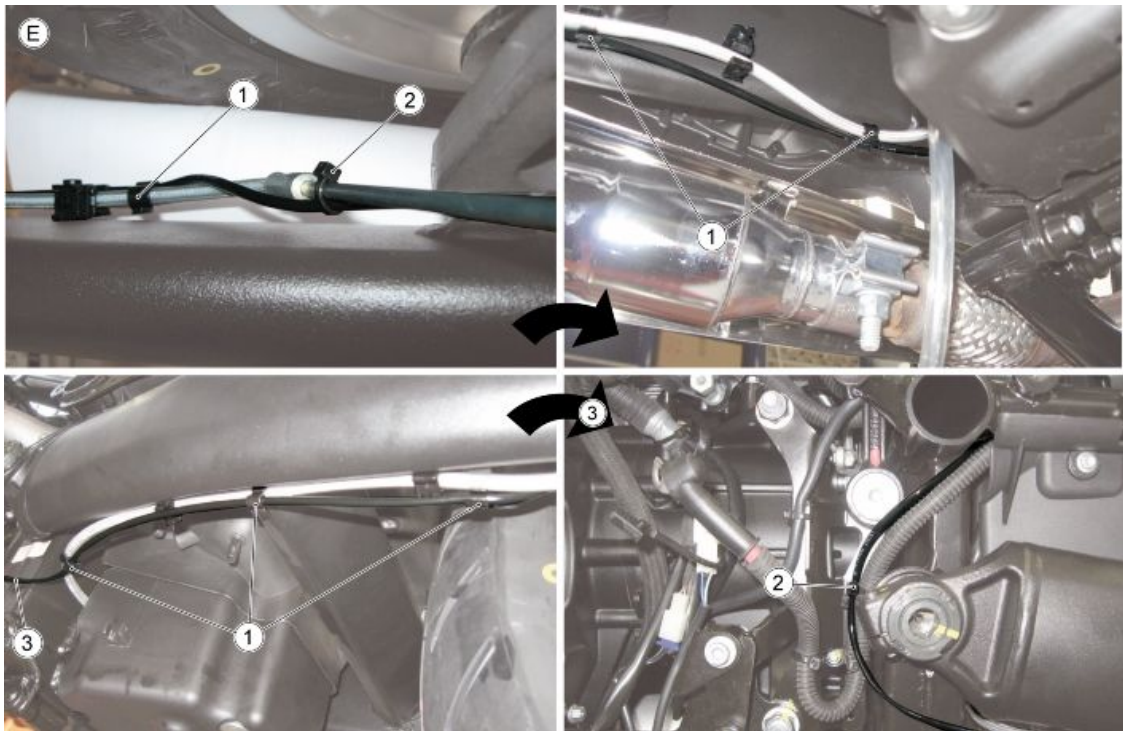
1. Hold the cable harness as shown in the figure.

**TABLE D - REAR WHEEL SPEED SENSOR**

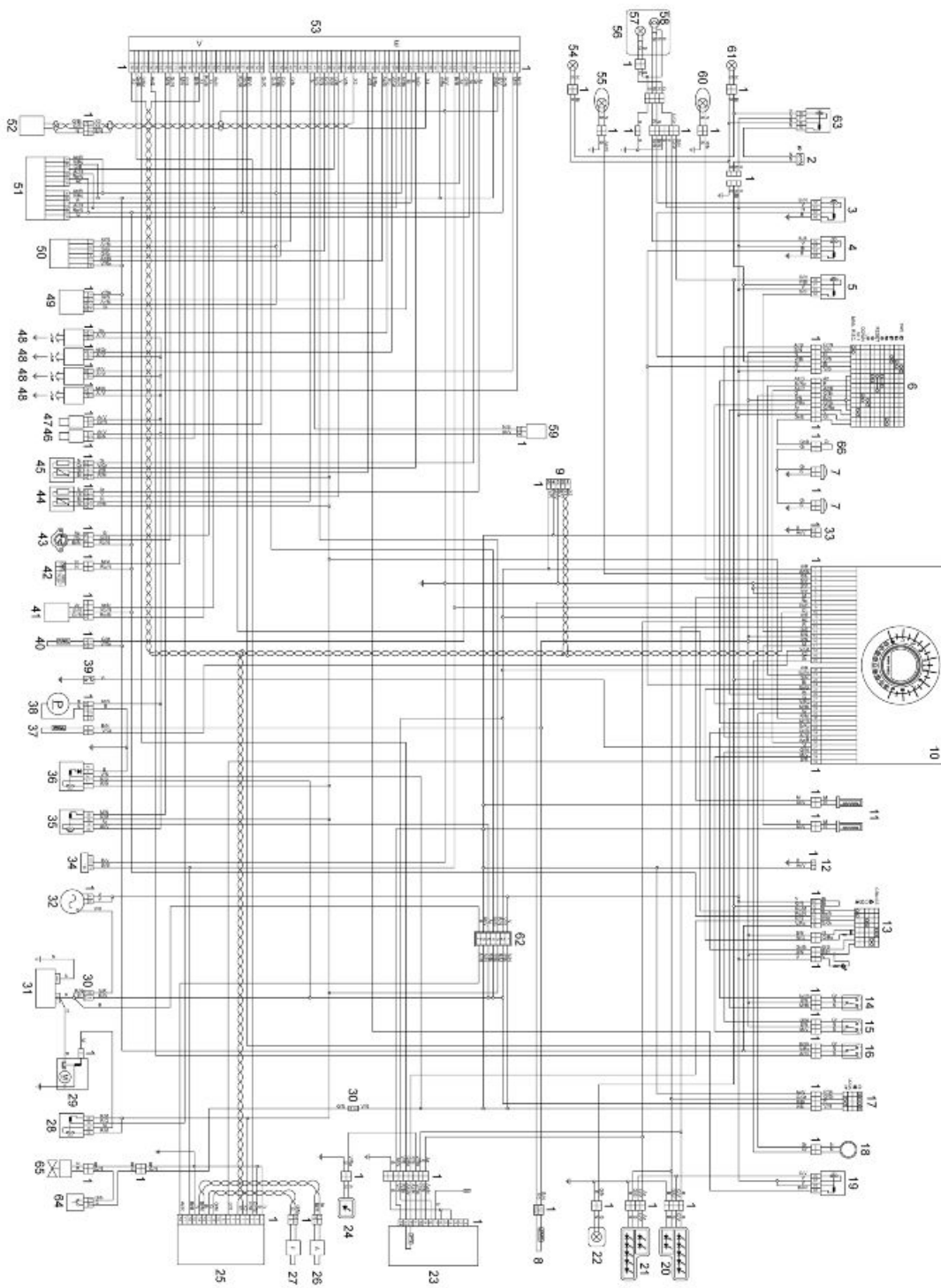
1. Rear speed sensor.
2. Medium clamp.

**TABLE E - REAR WHEEL SPEED SENSOR**

1. Cable grommet.
2. Medium clamp.
3. Rear speed sensor cable harness.



General wiring diagram



key:

- 1. MULTIPLE CONNECTORS
- 2. FOG LAMP SWITCH (WHERE PROVIDED)
- 3. LOW BEAM LIGHT RELAY
- 4. HIGH BEAM LIGHT RELAY

5. LIGHT LOGIC RELAY
6. LEFT LIGHT SWITCH
7. HORN
8. AIR TEMPERATURE SENSOR
9. BLUEDASH PRE-INSTALLATION
10. INSTRUMENT PANEL
11. HEATED HANDGRIPS
12. POWER SUPPLY FOR GPS
13. RIGHT LIGHT SWITCH
14. 14 FRONT STOP SWITCH
15. REAR STOP SWITCH
16. CLUTCH SWITCH
17. IGNITION SWITCH
18. IMMOBILIZER AERIAL
19. RECOVERY LOGIC RELAY
20. RIGHT TAILLIGHT
21. LEFT TAILLIGHT
22. LICENSE PLATE BULB
23. ANTI THEFT CONTROL UNIT (IF FITTED)
24. ANTITHEFT LED
25. ABS CONTROL UNIT
26. FRONT ABS SENSOR
27. REAR ABS SENSOR
28. START-UP RELAY
29. STARTER MOTOR
30. MAIN FUSES
31. BATTERY
32. ALTERNATOR
33. HEATED SADDLE SOCKET
34. DIAGNOSIS CONNECTOR
35. AUXILIARY INJECTION RELAY
36. MAIN INJECTION RELAY
37. FUEL RESERVE SENSOR
38. FUEL PUMP
39. OIL PRESSURE SENSOR
40. ENGINE TEMPERATURE SENSOR
41. FALL SENSOR (IF FITTED)
42. SIDE STAND SWITCH

- 43.GEAR SENSOR
- 44.LAMBDA SENSOR 2 (Right)
- 45.LAMBDA SENSOR 1 (Left)
- 46.RIGHT CYLINDER INJECTOR
- 47.LEFT CYLINDER INJECTOR
- 48.COIL
- 49.MAP SENSOR
- 50.MOTORISED THROTTLE
- 51.HANDGRIPS POSITION SENSOR
- 52.ENGINE SPEED SENSOR
- 53.7SM CONTROL UNIT
- 54.LEFT FOG LIGHT (IF APPLICABLE)
- 55.FRONT LEFT TURN INDICATOR
- 56.COMPLETE HEADLAMP
- 57.POSITION LIGHTS
- 58.LOW/HIGH BEAM HEADLIGHT
- 59.SECONDARY AIR SYSTEM
- 60.FRONT RIGHT TURN INDICATOR
- 61.RIGHT FOG LIGHT (IF APPLICABLE)
- 62.AUXILIARY FUSES
- 63.FOG LAMP RELAY
- 64.THERMAL SWITCH
- 65.FAN
- 66.COBRA PRE-INSTALLATION FOR ANTI-THEFT DEVICE

Cable colour key:

- 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

Checks and inspections

GENERAL CONCEPTS OF ELECTRICAL TROUBLESHOOTING

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.

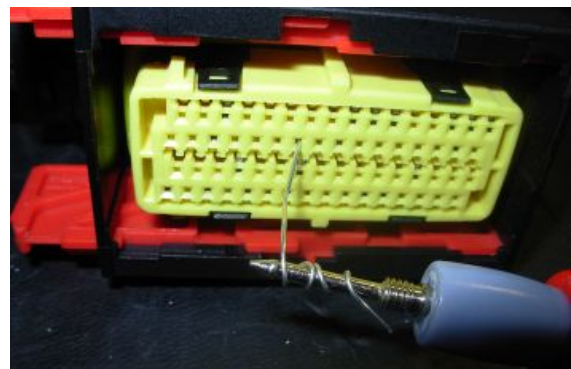
CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING PROCEDURE ON THE VEHICLE, CHECK THAT THE BATTERY VOLTAGE IS ABOVE 12V.

CONNECTOR CHECK PROCEDURE

The procedure includes the following checks:

1. Observation and check of the connector correct position on the component or on the coupling connector, making sure that the locking catch is released.
2. Observation of the terminals on the connector: no rust marks or dirt should be present and it is important to check terminal correct positioning on the connector (i.e., all terminals aligned at the same depth) and terminal integrity (i.e., that terminals are not loose, open/bent, etc.). For connectors whose terminals are not visible (e.g. Marelli control unit) use a metal cable of suitable diameter and introduce it carefully in the connector slot at the same depth as for the other terminals of the connector.



CAUTION

IN CASE OF TEMPORAL MALFUNCTIONING, CARRY OUT ALL DUE CHECKS LOOKING FOR FAULT BY MOVING SLIGHTLY THE CABLE HARNESS BEING INSPECTED.

3. Pulling the cables slightly from the back of the connector in order to check the correct position of terminals on the connector and of the cable on the terminal.

CONTINUITY check

Check goal: this control is to check that there are not any circuit interruptions nor excessive resistance, for instance caused by rust, on the two terminals being inspected.

Tester: set the tester on the "continuity" symbol and place the tester probes on the two circuit ends: the tester emits a sound signal only if there is continuity; the tester can also be set to the Ohm symbol to check that the circuit resistance is null or a few tenths of an Ohm.

CAUTION: THE CIRCUIT SHOULD NOT BE ENERGISED, OTHERWISE THE TEST IS IRRELEVANT.

GROUND CONNECTION check

Check goal: this control is to check if a cable or a circuit is in contact with the vehicle ground (-) connection.

Tester: set the tester on the "continuity" symbol and place one tester probe on the vehicle ground connection (or on the battery - terminal) and the other probe on the cable being inspected: the tester sends out a sound signal only if there is continuity. The tester can also be set to the Ohm symbol to check that the circuit resistance is null or a few tenths of an Ohm.

CAUTION! IF THERE IS A GROUND CONNECTION COMING FROM THE CONTROL UNIT, MAKE SURE THAT DURING THE TEST THE CONTROL UNIT IS GROUND CONNECTED TO THE CIRCUIT.

VOLTAGE check

Check goal: this control is to check if a cable is energised, i.e. if it receives power supply from the battery or the control unit.

Tester: set the tester on the direct current symbol and place the tester red probe on the cable being inspected and the black probe on the vehicle ground connection (or on the battery - terminal).

CAUTION

IN CASE OF TEMPORAL MALFUNCTIONING, CARRY OUT ALL DUE CHECKS LOOKING FOR FAULT BY MOVING SLIGHTLY THE CABLE HARNESS BEING INSPECTED.

GENERAL CONCEPTS OF ELECTRICAL TROUBLESHOOTING

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

BEFORE CARRYING OUT ANY TROUBLESHOOTING PROCEDURE ON THE VEHICLE, CHECK THAT THE BATTERY VOLTAGE IS ABOVE 12V.

CONNECTOR CHECK PROCEDURE

The procedure includes the following checks:

1. Observation and check of the connector correct position on the component or on the coupling connector, making sure that the locking catch is released.
2. Observation of the terminals on the connector: no rust marks or dirt should be present and it is important to check terminal correct positioning on the connector (i.e., all terminals aligned at the



same depth) and terminal integrity (i.e., that terminals are not loose, open/bent, etc.). For connectors whose terminals are not visible (e.g. Marelli control unit) use a metal cable of suitable diameter and introduce it carefully in the connector slot at the same depth as for the other terminals of the connector.

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3. Pulling the cables slightly from the back of the connector in order to check the correct position of terminals on the connector and of the cable on the terminal.

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GROUND CONNECTION check

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CAUTION! IF THERE IS A GROUND CONNECTION COMING FROM THE CONTROL UNIT, MAKE SURE THAT DURING THE TEST THE CONTROL UNIT IS GROUND CONNECTED TO THE CIRCUIT.

VOLTAGE check

Check goal: this control is to check if a cable is energised, i.e. if it receives power supply from the battery or the control unit.

Tester: set the tester on the direct current symbol and place the tester red probe on the cable being inspected and the black probe on the vehicle ground connection (or on the battery - terminal).

CAUTION

IN CASE OF TEMPORAL MALFUNCTIONING, CARRY OUT ALL DUE CHECKS LOOKING FOR FAULT BY MOVING SLIGHTLY THE CABLE HARNESS BEING INSPECTED.

Immobiliser

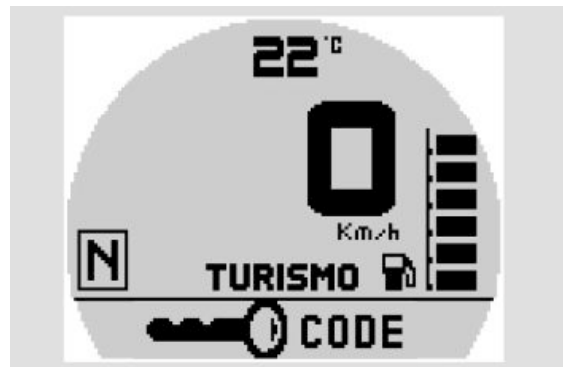
All the functions for the modification, storage or reset of the immobilizer codes can be performed by the Dealer, while some instrument panel settings can also be performed by the customer.

The user has the possibility to insert or modify the user code with the MODE switch placed on the left light switch.

When starting the vehicle and approximately ten seconds after the key is set to ON, the instrument panel requests a personal five-digit code to be entered. This request is no longer displayed once the personal code is entered. It is important to remember the personal code because:

- The vehicle can be started if the immobilizer system is faulty.
- The instrument panel need not be replaced should the ignition switch be changed.
- New keys can be programmed

The instrument panel has an immobilizer which prevents start-up in case the system does not identify a key which has been programmed before. The vehicle is supplied with two keys already programmed. The instrument panel accepts a maximum of four keys at the same time



(functions that can be performed by the user)

CODE MODIFICATION

This function is used to modify an old code. Once you have entered this function, the following message is displayed:

"INSERT YOUR OLD USER CODE"



After recognising the old code, the new code is requested and the display shows the following message:

"INSERT YOUR NEW USER CODE"

If it is the first time a code is stored, only the new code is requested.



After inserting the code it remains displayed until the instrument panel is switched off.

(functions can be checked out by the dealer)

NOTE

THE FUNCTIONS OF THE "STORAGE KEYS", "USER CODE RESET" AND "ODOMETER CODING", CAN BE DONE ONLY WHEN NO ELECTRICAL ERRORS ARE PRESENT.

NOTE

THE "KEY STORAGE" FUNCTION CAN BE CARRIED OUT ONLY IF THE USER CODE IS OTHER THAN "00000"

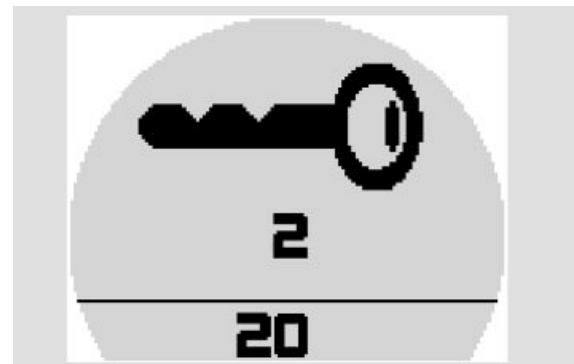
Keys storage

To modify the stored keys or to add other keys, it is necessary to use the diagnosis tool.

After connecting the motorcycle with the diagnosis tool, turn on the instrument panel and enter the user code, if requested.

In the screen page "Activations" - "Modify stored keys" - "Complete activation" start the procedure of the keys storage;

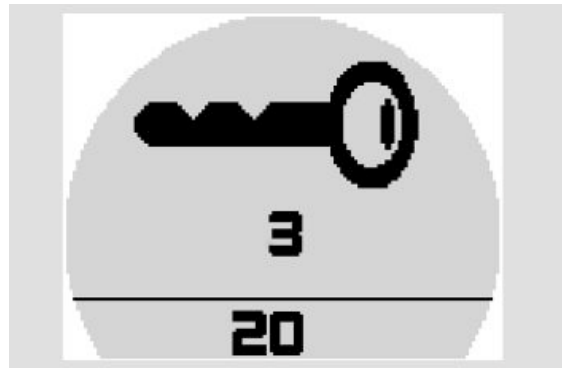
The storage of the first key takes place instantly and afterwards it is requested to enter the second key that is to be done within 20 seconds reverse counting.



NOTE

BY PRESSING THE OFF KEY TO EXTRACT THE FIRST KEY AND TO ENTER THE SECOND ONE, THE INSTRUMENT PANEL REMAINS ON TO BE ABLE TO CONTROL THE STATUS OF THE REVERSE COUNTING.

After the storage of the second key it is requested to enter another key (if in possession) and the reverse counting restarts. It is possible to store a maximum of four keys.



At the end of the counting, the storage of the keys is complete.

If only one key is stored, at the next start-up of the instrument panel, the main alarm warning light will turn on and the key symbol flashes.

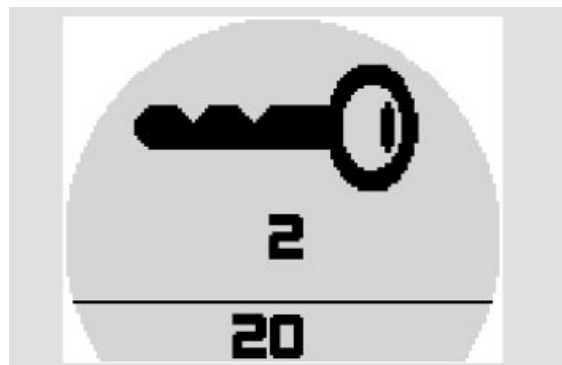
User code restorations (reset)

It is possible to reset the user code having at least two keys by performing the next operation from the diagnosis tool:

After connecting the diagnosis tool, turn on the instrument panel and from the "Activations" - "User code restoration" screen page, start the procedure.

The identification of the first key takes place immediately, then it is requested to enter the second key to be performed within 20 seconds reverse count.

After the identification of at least two keys, the user code is cleared to zero and the entering of the new code procedure starts immediately.



Odometer coding

It is possible to increase the mileage data at the instrument panel if necessary, for example after the instrument panel replacement.

From the diagnosis tool, in the interface "Activations" - "Odometer coding", start the procedure and follow the indications of the tool.

NOTE**THE MILEAGE CANNOT BE DECREASED**

Dashboard

SELECTING kph - mph UNIT OF MEASUREMENT

- Connect the diagnostics instrument to the Marelli (7SM) engine control unit and start a diagnostics session.
 - Go to the "adjustments" page and set the unit of measurement to kph or mph.
 - Close the diagnostics session in progress and start a new one with the Continental dashboard.
 - Go to the "adjustments" page and carry out a "Vehicle configuration reset".
 - Turn the key off and back on
 - Turn the key back on, check in the dashboard diagnostics section for any saved errors and delete any which may be present.
 - Access the Marelli (7SM) engine control unit diagnostics and check for any saved errors, deleting any which may be present.
-

Diagnosis

The instrument panel errors are detected through the diagnostics instrument. Therefore it must be connected to the vehicle.

In the following the errors generated by the instrument panel are listed.

OIL SENSOR

Error code B0001 (OIL SENSOR ERROR)

Oil sensor alarm disconnected:

Alarms that are verified when the sensor is disconnected. When detected, the diagnostics instrument shows the error only if this is still active after having performed two TRIP followed by a third key switching OFF-ON.

Identification

Oil indicator light (red) fix.

Troubleshooting

Detach the connector of the sensor and check the ground insulation of the purple cable: if there is continuity with the ground restore the cable harness, if it is ground insulated replace the switch.

Error code B0002 (OIL PRESSURE ERROR)

Engine oil low pressure alarm:

Alarm that is verified when with engine on there is a low pressure of the engine oil. Just above 600 rpm.

Identification

Oil warning light (red) flashing.

Troubleshooting

Check the engine and its operation before continuing with the verifications related to the sensor. Check the sensor connector and the instrument panel connector PIN 37: if not OK, restore, if it is OK, check the continuity of the purple cable between the sensor connector and the instrument panel connector PIN 37: if not OK, restore the cable harness; if OK, replace the sensor.

CONFIGURATION

Error code B0000 (CODE ERROR)

The configuration stored in the instrument panel is not within the one detected in the vehicle on which it is fitted (e.g. configuration unit of measurement mph/kmh).

Identification

Warning light (red) on plus key icon.

Troubleshooting

Check the mapping of the injection control unit and the configuration of the instrument panel, if necessary, repeat it.

Error code B0008 (FAILED CAN RECEPTION)

The instrument panel is coded at the first key on, if the CAN line fails, the error is activated

Identification

Warning light (red) on plus key icon.

Troubleshooting

Check the good condition and the cable continuity of the CAN line:

- between instrument panel PIN 19, ABS control unit PIN 5 and injection control unit PIN 80
- between instrument panel PIN 10, ABS control unit PIN 6 and injection control unit PIN 66

Error code B0009 (FAILED CAN TRANSMISSION)

The instrument panel is coded at the first key on, if the received data is not within the one stored, the error is activated

Identification

Warning light (red) on plus key icon.

Troubleshooting

Check the good condition and the cable continuity of the CAN line:

- between instrument panel PIN 19, ABS control unit PIN 5 and injection control unit PIN 80
- between instrument panel PIN 10, ABS control unit PIN 6 and injection control unit PIN 66

Error code B0010 (ENGINE OVERTEMPERATURE)

Excessive engine temperature has been detected.

Identification

Warning light (red) on plus key icon.

Troubleshooting

Check the engine and its operation before continuing with the verifications related to the sensor. Perform the check of the instrument panel, injection control unit and sensor connectors. Check the good condition and the wiring continuity:

- between injection control unit PIN 12 and sensor PIN 1 (Yellow/Brown cable)
- between injection control unit PIN 6 -17 and sensor PIN 2 (Green/Pink cable)

FUEL SENSOR

Error code B0012 (FUEL SENSOR ERROR)

The fuel probe is disconnected.

Identification

Flashing reserve warning light.

Troubleshooting

Perform the check of the instrument panel and sensor connectors. Check the good condition and the wiring continuity:

- between instrument panel PIN 18 and Green/Grey sensor cable
- between instrument panel PIN 15-16 and Blue/Black sensor cable

HEATED HANDGRIPS

Error code B0011 (HANDGRIP BUTTON BLOCKED ERROR)

Alarm handgrip button blocked:

Alarm that is verified when, because of different reasons, the starter button is blocked.

Identification

Handgrip cannot be activated.

Troubleshooting

Perform the check of the instrument panel and button connectors. Check the good condition and the wiring continuity:

- between instrument panel PIN 35 and Orange/Blue button cable
- between instrument panel PIN 15-16 and Blue/Black button cable

ON/OFF CRUISE BUTTON

Error code B0200 (SHORTED BUTTON ERROR)

Error code B0201 (INDEFINITE BUTTON ERROR)

Error code B0202 (OPEN BUTTON ERROR)

Troubleshooting

Check at the ends of the button the correct resistance value in the different conditions:

- with released button ~ 4120 Ω
- with pressed button ~ 3900 Ω

Perform the check of the instrument panel and button connectors. Check the good condition and the wiring continuity:

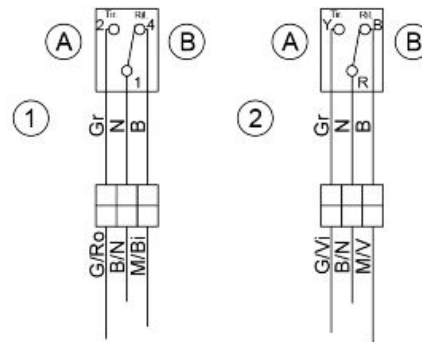
- between instrument panel PIN 25 and White/Yellow button cable
- between instrument panel PIN 15-16 and Blue/Black button cable

BRAKE SWITCH

1. Front disc
2. Rear drum

key:

- A. Brake tightened
- B. Brake released



Error code B0203 (FRONT BRAKE ON THE LINE NORMALLY CLOSED ERROR)

Troubleshooting

Perform the check of the instrument panel and button connectors. Check the good condition and the wiring continuity:

- between instrument panel PIN 29 and Brown/White button cable
- between instrument panel PIN 15-16 and Blue/Black button cable

Error code B0204 (FRONT BRAKE ON THE LINE NORMALLY OPEN ERROR)

Troubleshooting

Perform the check of the instrument panel and button connectors. Check the good condition and the wiring continuity:

- between instrument panel PIN 33 and Yellow/Pink button cable
- between instrument panel PIN 15-16 and Blue/Black button cable

Error code B0205 (REAR BRAKE ON THE LINE NORMALLY CLOSED ERROR)

Troubleshooting

Perform the check of the instrument panel and button connectors. Check the good condition and the wiring continuity:

- between instrument panel PIN 39 and Brown/Green button cable
- between instrument panel PIN 15-16 and Blue/Black button cable

Error code B0206 (REAR BRAKE ON THE LINE NORMALLY OPENED ERROR)

Troubleshooting

Perform the check of the instrument panel and button connectors. Check the good condition and the wiring continuity:

- between instrument panel PIN 38 and Yellow/Purple button cable
- between instrument panel PIN 15-16 and Blue/Black button cable

The instrument panel controls the brake switches and sends through the CAN line the status relative to the control unit that activates the stop, the same applies for the cruise button.

IMMOBILIZER AERIAL**Function**

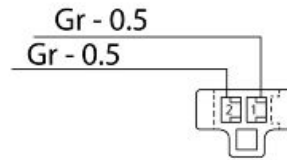
detects the transponder code in the key and sends it to the instrument panel

Level in electrical circuit diagram:

Immobilizer

Location:

- on the vehicle: in the instrument panel
- connector: grey two-way, under the right side steering column

**Electrical specifications**

- 14 Ohm

Pin out

not significant

IMMOBILIZER ERRORS**Error code B0003 (KEY CODE READ BUT NOT RECOGNISED)**

The key has the working transponder, but it is not within the recognised ones.

Troubleshooting

Store the new key.

Error code B0004 (KEY CODE NOT READABLE)

The key has no transponder or the transponder is damaged.

Troubleshooting

Replace the key and store it.

Error code B0005 (AERIAL NOT WORKING, OPEN OR SHORT-CIRCUITED)

An electric interruption or a ground short circuit or voltage to the circuit have been detected.

Troubleshooting

Perform the check of the injector on the wiring and of the instrument panel connector. If not OK, restore; if OK, check electrical characteristics and aerial circuit continuity from the instrument panel connector on PIN 20 and 30: if not OK, restore cable harness; if OK, check circuit ground insulation: if not ground insulated, restore cable harness; if insulated, with key ON, with instrument panel connector disconnected, check that there is not voltage at the circuit ends: if there is voltage, restore the cable harness

Error code B0006 (INSIDE ERROR)

There is a fault in the instrument panel.

Troubleshooting

Replace the instrument panel.

Error code B0007 (ONLY ONE KEY STORED)

The number of stored keys is less than two

Identification

Warning light (red) fix plus key icon.

Start-up system check

Function

Communicates to the control unit the will to start-up the engine.

Operation / Operating principle

Press the start-up button to close the specific circuit taking the PIN 58 of the control unit to a voltage equal to zero (ground closing).

Level in electrical circuit diagram:

Start-up signal

Location:

- on the vehicle: right light switch.
- connector: under right side steering column.

Electrical specifications:

- key released: the circuit is open
- key pressed: the circuit is closed

Pin out:

4: voltage + 5V

5: ground connection

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL TROUBLESHOOTING CONCEPTS FOR ELECTRICAL DEVICES AT THE BEGINNING OF THE CHECK AND CONTROL SECTION IN THE ELECTRICAL SYSTEM CHAPTER.

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

Starter relay P0615

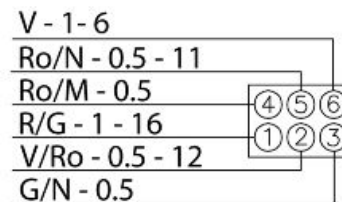
- shorted to positive / open circuit, shorted to negative.

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 58; if the circuit is open, shorted to negative: voltage equal to zero has been detected.

DIAGNOSTICS TOOL: LOGIC ERRORS

Starter switch P0169



- signal not valid.

Error cause

- Fault in the switch (lock) of the engine start-up. The instrument panel does not indicate the presence of this error even in the ATT status.

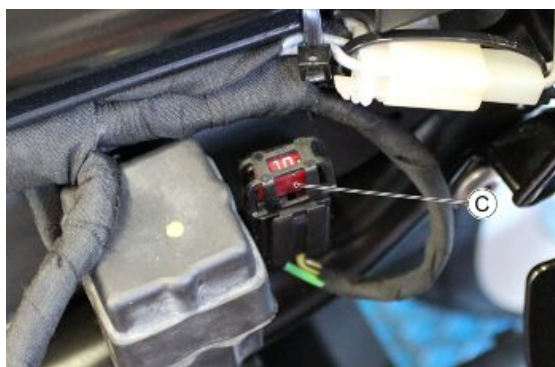
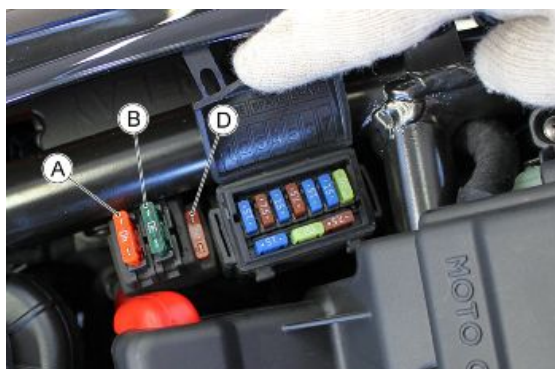
Troubleshooting

- Check the locking cause and restore.

Fuses

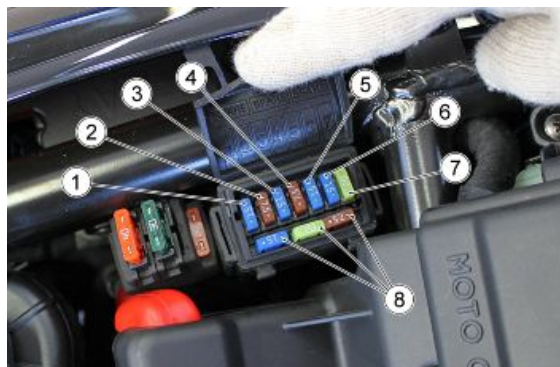
MAIN FUSES - DISTRIBUTION

Specification	Desc./Quantity
A) 40A fuse	Battery recharge fuse
B) 30A fuse	Primary injection, key, parking lights fuse (auxiliary fuses 2, 4, 5 power)
C) 10A fuse	Electric fan fuse
D) spare fuses	Spare fuses



AUXILIARY FUSES DISTRIBUTION

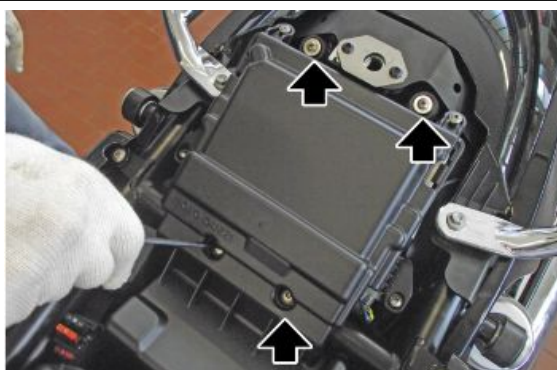
Specification	Desc./Quantity
1) 15A fuse	High beam/low beam, passing, stop light, fog light, daylight running lights, hazard button illumination, horn fuse
2) 7.5A fuse	Instrument panel power, antitheft power fuse
3) 15A fuse	ECU live positive fuse
4) 7.5A fuse	ECU permanent positive fuse
5) 15A fuse	Coils, injectors, fuel pump protection fuse
6) 15A fuse	Power socket, GPS socket, heated handgrips fuse
7) 20A fuse	ABS power fuse
8) Spare fuses	Spare fuses



Control unit

Removal

- Remove the saddle.
- Undo and remove the four fixing screws of the battery cover.
- Remove the battery cover



- Disconnect both control unit connectors



- Undo and remove the three screws (1).
- Remove the control unit.



NOTE

WHEN REFITTING THE CONNECTORS, THE SLIDES MUST MOVE FREELY TO THE END OF STROKE, WHICH HELPS WITH THE INSERTION OF THE CONNECTOR: YOU MUST HEAR THE RELEASE OF THE RETAINING TANG AT THE END OF STROKE.

CONTROL UNIT - Diagnosis**Function**

it controls the Ride by wire system, the injection/ignition, the system safety checks and the self-diagnosis function

Level in electrical circuit diagram:

Each level in which the main component involves the control unit

Location:

- on the vehicle: above the battery
- connector: on the ECU 52 PIN ENGINE connector (figure 1), 28 PIN VEHICLE connector (figure 2)

Pin out: See the CONNECTORS section

DIAGNOSTICS TOOL: PARAMETERS ISO Screen page

(screen/example value with key set to ON)

- Drawing number / -
- Marelli spare part code / IAW7SMHW430
- Hardware number / 00
- Mapping / -
- Software version number / 0000
- Type-approval Code / -
- ISO Code / -
- Marelli software code / -
- Control unit series number (NIP) / 7SMPRA119 - Identifies the single control unit
- Person in charge for last programming / - Indicates the serial number of the DIAGNOSTICS TOOL that has carried out the last control unit remapping

DIAGNOSTICS TOOL: PARAMETERS

Nominal idle speed

- Example value with key ON: 1600 rpm

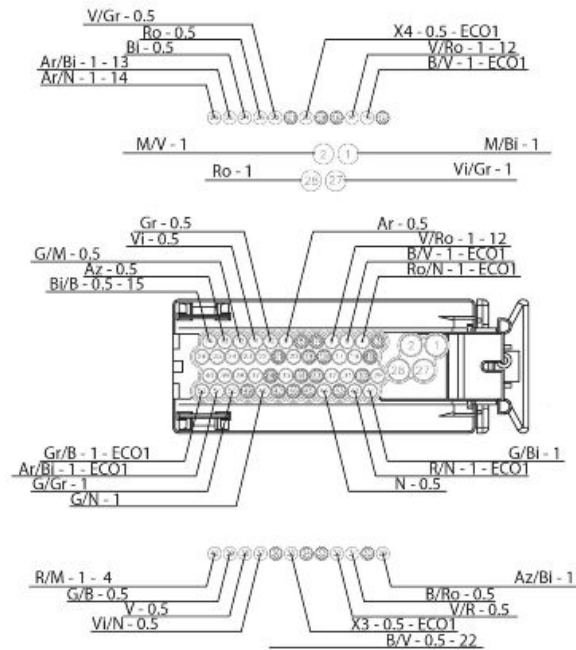
Adjustable fuel supply

Adjustable fuel correction

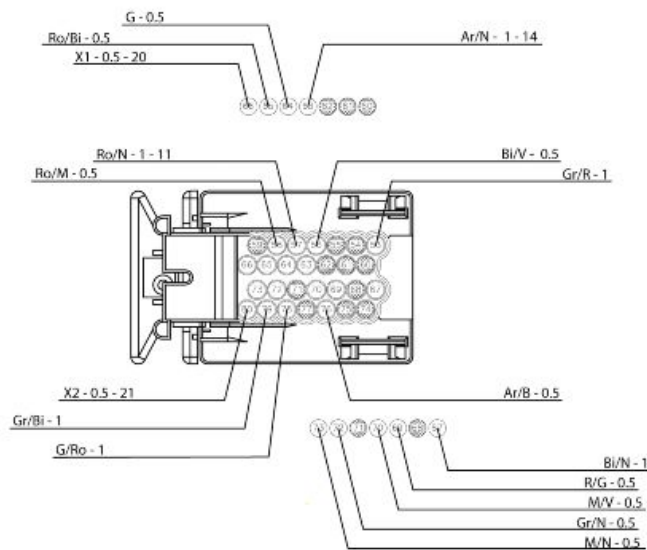
CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL TROUBLESHOOTING CONCEPTS FOR ELECTRICAL DEVICES AT THE BEGINNING OF THE CHECK AND CONTROL SECTION IN THE ELECTRICAL SYSTEM CHAPTER.

①



②



DIAGNOSTICS TOOL: STATUSES

Engine status

- Indefinite_Key ON_Running engine_Stopped_Power latch_Power latch 2_Power latch finished

Engine mode

- Indefinite_Start-up_Stable_Idle_Acceleration_Deceleration_Enters Cut Off_Cut Off_Exits Cut Off

Immobilizer signal

- yes/no
- Indicates whether the control unit has received the consent by the instrument panel regarding the immobilizer: coded key or user code entered manually. Potential errors will be shown on the Instrument Panel Errors screen page, on the DIAGNOSIS section of the instrument panel

Start up enabling

- yes/no
- Indicates whether the control unit will enable start-up when requested: in case the safety measures are not respected (side stand, neutral sensor and clutch in correct position) or the fall sensor is inverted or if the immobilizer does not send the start-up consent to the control unit, the status is NO

DIAGNOSTICS TOOL: ACTIVATION

Stop light

- The stop light logic relay is energised (No. 19 on the electrical circuit diagram, position to the right of the battery, in any case VERIFY identification of the relay with the colour of the cables)

Error clearing

Ambient parameter reading

- Throttle valve position objective angle
- Rear throttle valve position
- Front throttle valve position
- Engine Temp. before Recovery
- Cylinders intake average pressure
- Engine rpm
- Indicated average torque
- Engine status - Indefinite_Key ON_Running engine_Stopped_Power latch_Power latch 2_Power latch finished
- Odometer
- Mapping selection - Indefinite/Track/Sport/Road

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

EEPROM Error P0601

- circuit not operational

Error cause

- Replace injection ECU. The instrument panel does not indicate the presence of this error even in the ATT status

RAM Error P0604

- circuit not operational

Error cause

- Replace injection ECU. The instrument panel does not indicate the presence of this error even in the ATT status

ROM Error P0605

- circuit not operational

Error cause

- Replace injection ECU. The instrument panel does not indicate the presence of this error even in the ATT status

A/D converter P060B

- circuit not operational

Error cause

- Replace injection ECU

Stop lights relay error P1301

- short circuit to positive/ short circuit to negative / open circuit

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 31. If shorted to negative: no voltage has been detected. If the circuit is open: an interruption has been detected

Troubleshooting

- If shorted to positive: check the relay electrical specifications are correct by disconnecting it from the cable harness. If they are not correct, replace the relay; if OK, restore the cable harness (Blue/Pink cable)
- If shorted to negative: check the relay electrical specifications are correct by disconnecting it from the cable harness. If they are not correct, replace the relay; if OK, restore the cable harness (Blue/Pink cable)
- If the circuit is open: check the relay electrical characteristics are correct by disconnecting it from the cable harness; if not OK, replace the relay, if OK, check relay connector, engine-vehicle cable harness connector and ENGINE connector of the Marelli control unit: if not OK, restore; if OK, check continuity of cable harness (Blue/Pink cable)

DIAGNOSTICS TOOL: LOGIC ERRORS

MGCT (Moto Guzzi Controllo Trazione) functional error P1608

- Wrong MGCT scheduling / Wrong CheckSum of the software on Flash / Low control unit power voltage

Error cause

- Since the safety system has detected a serious security failure, the control unit has disabled the MGCT system.

Troubleshooting

Contact technical service.

Level 2 safety reset P160C

Error cause

- As the level 2 safety system (comparison between requested torque and calculated torque) has detected a fault, the control unit has reset engine (C gravity). The instrument panel does not indicate the presence of this error even in the ATT status.

Troubleshooting

- Continue fault search for the other errors detected

Safety engine stop P060C

Error cause

- Since the safety system has detected a serious fault, the control unit has shut off the engine

Troubleshooting

- Continue fault search for the other errors detected.

Saved data file (for safety) P1607

- Filled

Error cause

- This indication appears only if the Level 2 safety has reset the engine (C gravity). The instrument panel does not indicate the presence of this error even in the ATT status

Troubleshooting

- Continue fault search for the other errors detected.

CAUTION

DELETING ALL THE SAVED DATA WHEN THE VEHICLE IS BEING MANUFACTURED (INCLUDING THE SELF-ADJUSTABLE PARAMETERS), THEN YOU MUST SELECT: HANDLE SELF-LEARNING AND VERIFY THAT THE TWO "THROTTLE VALVE AUTOMATIC SELF-LEARNING" STATUS IS "CARRIED OUT".

See also

[Cylinders synchronisation](#)

Saved data file download

Error cause

- The BUFRSVXX.BIN file is saved in the diagnostics instrument memory card or in your hard disk PC, if you are using Piaggio Software: data regarding the control unit serial number and the serial number of the diagnosis instrument that has carried out the download is also included in the file

Saved data file deletion

Error cause

- Deletion enabled only if the file is downloaded after setting KEY ON

NEW CONTROL UNIT ACTIVATION PROCEDURE and REPROGRAMMING

After installing the control unit for the first time, or after REPROGRAMMING the control unit with a different or more updated mapping, turn the key to ON and wait 3 seconds; during this time the control unit carries out throttle position acquisition. Connect to the diagnostics instrument and check that the status for "Throttle self-learning" is "Carried out" and the status for "Handle self-learning" is "Not carried out" (the latter status entails Urgent service being displayed on the instrument panel). If Throttle Self-learning shows "Not carried out", go to stage 1. If it shows "Carried out", go to stage 2. Phase 1: current errors have probably been detected by the control unit: solve these malfunctions and check the two statuses. Throttle Self-learning can also be checked from the Parameter adjustment (screwdriver and hammer) screen page. Stage 2: Carry out the Handle Self-learning from the Parameter adjustment (screwdriver and hammer) screen page and check that Handle Self-learning status is Carried out. If not OK the voltage detected on the throttle is out of scale (check with diagnosis instrument) or current errors have been probably detected by the control unit: solve these malfunctions and repeat the procedure

Battery**Function**

Electrically supply the vehicle: the YTX20-BS battery is already activated.

Level in electrical circuit diagram:

Battery recharge

Location:

- on the vehicle: under the saddle
- connector: on the battery



Electrical specifications: 12 V / 18 Ah

Pin out:

1. Positive pole (red): approx. 12.6 V
2. negative pole (black): ground connection

DIAGNOSTICS INSTRUMENT: PARAMETERS**Battery voltage**

- Example value with key ON: 12.0 V
- Example value with engine on: 14.2 V

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

Battery voltage pre Recovery

- Example value with key ON: 12.0 V
- Example value with engine on: 14.2 V

Value drawn from the signal read without taking into account any recovery

CAUTION

BE CAREFUL WITH THE POSITIVE BATTERY CABLE - IT HAS TO GO UNDER THE TOP OF THE FRAME.

CAUTION

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DIAGNOSTICS INSTRUMENT: LOGIC ERRORS

Battery voltage P0560

- too high/too low

Error cause

- If too high: too high a voltage has been detected at PIN 52. If too low: too low a voltage has been detected at PIN 52. The instrument panel does not indicate the presence of this error even in the ATT status.

Troubleshooting

- If too high: verify correct operation of the alternator.
- If too low: carry out the verification procedure for the alternator connector, the engine - vehicle cabling harness connector and the ECU connector (paying particular attention to any oxidation): if not OK, restore. If OK, check that cable resistance between the alternator cable and the control unit is a few tenths of Ohm: if not OK, restore cable harness; if OK, check correct operation of the electrical alternator: restore if not OK.

Speed sensor

VEHICLE FRONT SPEED SENSOR

Function:

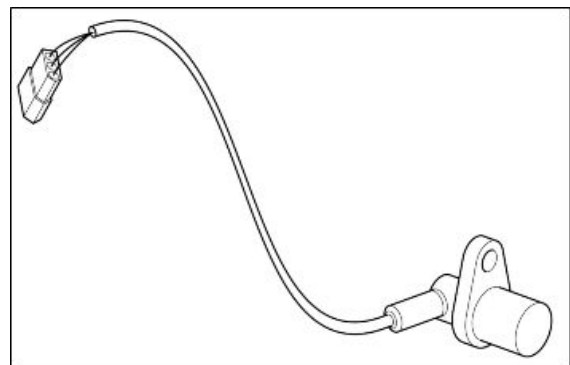
To generate a signal that the ABS control unit converts into wheel speed.

Operation / Operating principle:

Magneto-resistive sensor: a square-wave pulse is generated with voltage between about 11.55V and about 11.25V between PIN13 and PIN14.

Electrical circuit diagram - Level in wiring diagram:

ABS.



Location on the vehicle:

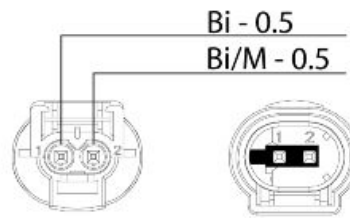
On the fork, left stanchion, near the brake calliper mounting bracket.

Connector location:

Under right side steering column.

Pin-out:

- PIN1 - Negative power/Negative signal (white cable)
- PIN2 - Positive power/Positive signal (white/brown cable)

**DIAGNOSIS INSTRUMENT**

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

ELECTRICAL ERRORS**Speed sensor**

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

Troubleshooting: Check the sensor connector and the ABS control unit connector. If they are not OK, restore the connectors. If they are OK, check continuity of the white/brown cable between PIN 2 of the sensor on the cable harness side and PIN 14 of the 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 the continuity of the white cable between PIN 1 of the sensor on the cable harness side and PIN 13 of the ABS control unit connector. If there is no continuity, restore the cable harness. If there is, replace the logic errors sensor.

P0501 Front wheel speed signal/sensor.

Connect to the ABS control unit diagnostics.

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.

VEHICLE REAR SPEED SENSOR

Function:

To generate a signal that the ABS control unit converts into wheel speed.

Operation / Operating principle:

Magneto-resistive sensor: a square-wave pulse is generated with voltage between about 11.55V and about 11.25V between PIN11 and PIN12.

Electrical circuit diagram - Level in wiring diagram:

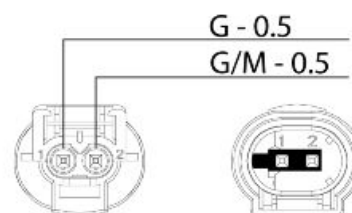
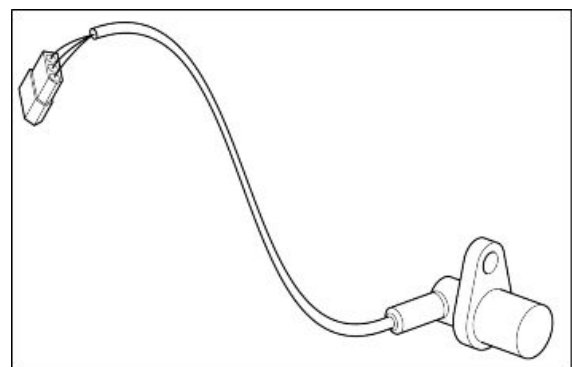
ABS control unit.

Location on the vehicle:

Swingarm, right side, on the brake calliper support plate.

Connector location (if available):

Left side fairing (external).



Pin-out:

- PIN1 - Negative power/Negative signal
(yellow cable)
- PIN2 - Positive power/Positive signal
(yellow/brown cable)

DIAGNOSTIC TOOL

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

ELECTRICAL ERRORS**Speed sensor**

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

Troubleshooting:Check the sensor connector and the ABS control unit connector. If they are not OK, restore the connectors. If they are OK, check continuity of the yellow/brown cable between PIN 2 of the sensor on the cable harness side and PIN 11 of the 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 yellow 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.

P2158 Rear wheel speed signal/sensor

Connect to the ABS control unit diagnostics.

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 Mar-elli 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:

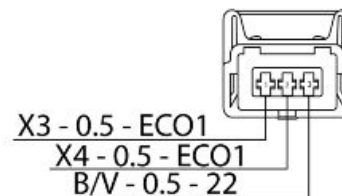
- on the vehicle: front left part of the engine under the alternator
- connector: under fuel tank

Electrical specifications:

0.79 kohm at ambient temperature

Pin out:

1. negative signal
2. positive signal
3. shielding with ground connection



DIAGNOSTICS INSTRUMENT:PARAMETERS**Engine rpm:** rpm**CAUTION**

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DIAGNOSTIC TOOL: STATUSES

Synchronised panel

- No_under analysis_standby_Yes

DIAGNOSTIC TOOL: ELECTRICAL ERRORS**CAUTION**

IF THE ELECTRIC CIRCUIT IS INTERRUPTED OR SHORT-CIRCUITED, NO ERROR IS DISPLAYED. CHECK THE ENGINE SPEED SENSOR CONNECTOR AND THE MARELLI CONTROL UNIT CONNECTOR: IF NOT OK, RESTORE; IF OK, CHECK THE CORRECT ELECTRIC CHARACTERISTICS OF THE SENSOR: IF NOT OK, REPLACE THE SENSOR. IF OK, CHECK THAT THERE IS CONTINUITY ON BOTH CABLES, SUPPLY INSULATION AND GROUND INSULATION. CARRY OUT THE TESTS FROM THE SENSOR CONNECTOR TO THE SENSOR. IF NOT OK, RESTORE THE CABLE HARNESS/REPLACE THE SENSOR. IF OK, PERFORM THE TEST FROM PIN 20 AND 35 OF THE MARELLI CONTROL UNIT ENGINE CONNECTOR.

DIAGNOSTIC TOOL: LOGIC ERRORS

Engine speed sensor P0336

- signal not valid

Error cause

- Probable bad contact in the electric circuit detected at PIN 20 - 35 of the ENGINE connector

Troubleshooting

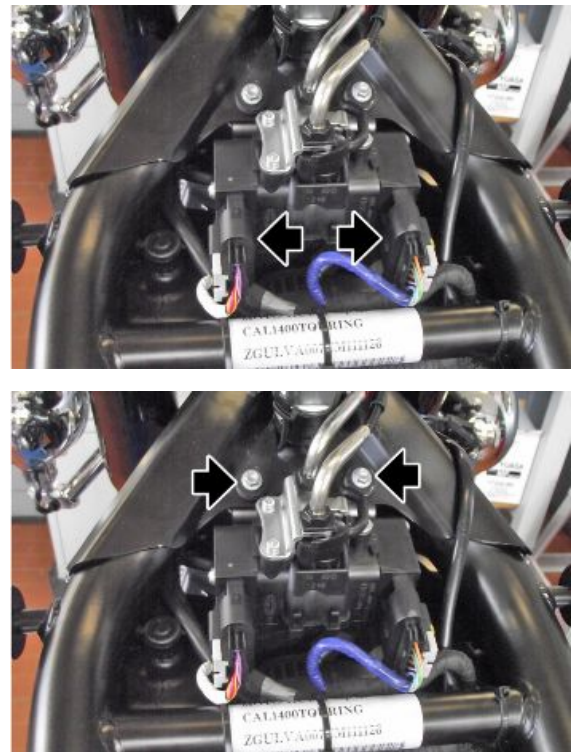
- Check the electric circuit is in good conditions and the flywheel teeth cleaning and correct positioning of the sensor in its own housing: if it is not, replace it. If it is OK, replace the sensor

Twistgrip position sensor**Removal**

- Remove the tank.
- Loosen the throttle cable nuts.
- Remove the cables pulling them out.



- Disconnect the two connections.
- Undo the two fixing screws of the hand-grip position sensor.



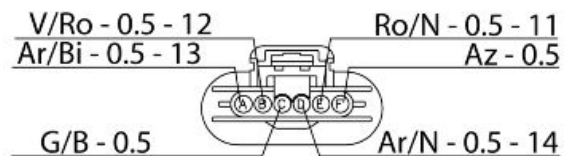
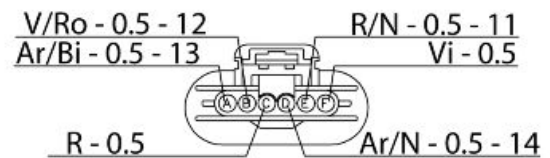
THROTTLE GRIP POSITION SENSOR

Function

The throttle grip is the part to which the throttle control cables arrive; its task is to translate the rider's power request (Demand) into an electrical signal to be sent to the electronic control unit.

Operation / Operating principle

The two throttle cables (opening and closing) actuate on a scroll mounted on a shaft which is sent back to its home position by a return spring. On the shaft covers there are 2 double track potentiometers (4 control tracks) by means of which the torque demand is read (and checked). The 4 potentiometers are tinned and magnetically controlled (contactless); they cannot be overhauled nor replaced



Level in electrical circuit diagram: Throttle grip position sensor.

Location:

- on the vehicle: under the fuel tank
- connector: on the sensor

Electrical specifications:

- Not detected by a multimeter as they are contactless: read the voltage of the 4 tracks by the diagnostics instrument.

MASTER connector (blue)

- A: Track A power (orange/white cable)
- B: Track A ground (green/pink cable)
- C: Track A signal (red cable)
- D: Track B power(orange/black cable)
- E: Track B ground (red/black cable)
- F: Track B signal (purple cable)

SLAVE connector (white)

- A: Track C power (orange/white cable)
- B: Track C ground (green/pink cable)
- C: Track C signal (yellow/blue cable)
- D: Track D power (orange/black cable)
- E: Track D ground (red/black cable)
- F: Track D signal (light blue cable)

DIAGNOSTICS INSTRUMENT: PARAMETERS

Blue front connector throttle grip position sensor - track A

- Sample value with throttle released: 1044 mV

Voltage value of the front potentiometer - track A

Blue front connector throttle grip position sensor - track B

- Sample value with throttle released: 967 mV

Voltage value times 2 of the front potentiometer track B

White rear connector throttle grip position sensor - track C

- Sample value with throttle released: 3757 mV

Voltage value of the rear potentiometer track C

White rear connector throttle grip position sensor - track D

- Sample value with throttle released: 3796 mV
- Example value with engine on: -

Throttle grip opening percentage

- Example value with key ON: 0 mV
- Example value with engine on: -

The sum of the voltage between A and C must be about 5V

With a released throttle grip, the value read should be 0%, whereas 100 % should be read with throttle grip fully twisted.

DIAGNOSTICS INSTRUMENT: STATUSES

Throttle grip

- Slightly twisted_choked_fully twisted

Handle self-learning

- carried out/not carried out

CAUTION

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DIAGNOSTIC TOOL: ELECTRICAL ERRORS

Blue front connector throttle grip position sensor - track A P0225

- short circuit to positive / open circuit, short circuit to negative

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 39 of the ENGINE connector. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 39 of the ENGINE connector.

Troubleshooting

- shorted to positive: check the value shown by the parameter of the BLUE front connector Throttle Grip Position Sensor - track A: disconnect the connector and read the value indicated by the diagnostics tool: if the voltage does not vary, there is a short circuit in the cable wiring; replace the throttle grip sensor if the voltage drops to zero.
- if the circuit is open, shorted to negative: check the throttle grip sensor connector and the Marelli control unit connector. If not OK, restore. If OK, check circuit continuity between the two cable terminals. If not OK, restore; if OK, check the cable ground insulation (from the throttle grip sensor connector or the control unit connector): if the cable is not ground insulated, restore the wiring. If it is ground insulated, and with the key set to ON, check that there is power supply for the potentiometer PIN A and that PIN C is connected to ground. If both are correct, replace the throttle grip sensor; if not, check the continuity of the cable that is not functioning properly: if there is continuity, replace the control unit; if not, restore the wiring

Blue front connector throttle grip position sensor - track B P2130

- short circuit to positive / open circuit, short circuit to negative

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 13 of the ENGINE connector. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 13 of the ENGINE connector

Troubleshooting

- short circuit to positive: check the value shown by the parameter of the BLUE front connector Throttle Grip position Sensor track B: disconnect the connector and read the value indicated

by the diagnostics tool: if the voltage does not vary, there is a short circuit in the cable wiring; replace the throttle grip sensor if the voltage drops to zero.

- if the circuit is open, shorted to negative: check the throttle grip sensor connector and the Marelli control unit connector. If not OK, restore. If OK, check circuit continuity between the two cable terminals. If not OK, restore; if OK, check the cable ground insulation (from the throttle grip sensor connector or the control unit connector): if the cable is not ground insulated, restore the wiring. If it is ground insulated, and with the switch key set to ON, check that there is power supply for the potentiometer PIN D and that PIN F is connected to ground. If both are correct, replace the throttle grip sensor; if not, check the continuity of the cable that is not functioning properly: if there is continuity, replace the control unit; if not, restore the wiring

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

White rear connector throttle grip position sensor - track C P1225

- short circuit to positive / open circuit, short circuit to negative

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 23 of the ENGINE connector. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 23 of the ENGINE connector

Troubleshooting

- shorted to positive: check the value shown by the parameter of the white rear connector Throttle Grip Position Sensor - track C: disconnect the connector and read the value indicated by the diagnostics tool: if the voltage does not vary, there is a short circuit in the cable wiring; replace the throttle grip sensor if the voltage drops to zero.
- if the circuit is open, shorted to negative: with open circuit, short it to negative: check the throttle grip sensor connector and the Marelli control unit connector. If not OK, restore. If OK, check circuit continuity between the two cable terminals. If not OK, restore; if OK, check the cable ground insulation (from the throttle grip sensor connector or the control unit connector): if the cable is not ground insulated, restore the wiring. If it is ground insulated, and with the key set to ON, check that there is power supply for the potentiometer PIN A and that PIN C is connected to ground. If both are correct, replace the throttle grip sensor; if not, check the continuity of the cable that is not functioning properly: if there is continuity, replace the control unit; if not, restore the wiring

White rear connector throttle grip position sensor - track D P1226

- short circuit to positive / open circuit, short circuit to negative

Error cause

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

Troubleshooting

- shorted to positive: check the value shown by the parameter of the white rear connector Throttle Grip Position Sensor - track D: disconnect the connector and read the value indicated by the diagnostics tool: if the voltage does not vary, there is a short circuit in the cable wiring; replace the throttle grip sensor if the voltage drops to zero.
- if the circuit is open, shorted to negative: check the throttle grip sensor connector and the Marelli control unit connector. If not OK, restore. If OK, check circuit continuity between the two cable terminals. If not OK, restore; if OK, check the cable ground insulation (from the throttle grip sensor connector or the control unit connector): if the cable is not ground insulated, restore the wiring. If it is ground insulated, and with the switch key set to ON, check that there is power supply for the potentiometer PIN D and that PIN F is connected to ground. If both are correct, replace the throttle grip sensor; if not, check the continuity of the cable that is not functioning properly: if there is continuity, replace the control unit; if not, restore the wiring

DIAGNOSTICS TOOL: LOGIC ERRORS

Blue front connector throttle grip position (tracks A-B) P1227

- inconsistent signal

Error cause

- Two illogical voltage signals have been detected at PIN 13 and 39 of the ENGINE connector (tracks A-B)

Troubleshooting

- Check the parameters of the blue front connector Throttle Grip Position Sensor - tracks A and B: if one of the two values clearly deviates from 600-1400 mV, it means that this potentiometer is defective. Check the throttle grip sensor connector and the control unit connector: if not OK, restore. If OK, check that cable resistance between the throttle grip sensor connector and the control unit is a few tenths of Ohm: if this is not the case, restore wiring. If the value is correct, replace the complete throttle grip sensor

White rear connector throttle grip position (tracks C-D) P1228

- inconsistent signal

Error cause

- Two illogical voltage signals have been detected at PIN 23 and 11 of the ENGINE connector (tracks A-B)

Troubleshooting

- Check the parameters of the white rear connector Throttle Grip Position Sensor - tracks C and D: if one of the two values clearly deviates from 600-1400 mV, it means that this potentiometer is defective. Check the throttle grip sensor connector and the control unit connector: if not OK, restore. If OK, check that cable resistance between the throttle grip sensor connector and the control unit is a few tenths of Ohm: if this is not the case, restore wiring. If the value is correct, replace the complete throttle grip sensor

Throttle grip position P1229

- inconsistent signal

Error cause

- The value of the front side sensor (tracks A-B) does not coincide with the value of the rear sensor (tracks C-D)

Troubleshooting

- Replace the throttle grip sensor

DIAGNOSTICS TOOL: ADJUSTABLE PARAMETERS

Handle self-learning: -

RESET PROCEDURE

- If Marelli control unit or its mapping are replaced or if you carry out control unit EEPROM zero setting or if you replace the throttle grip sensor, it is necessary to carry out the Handle self-learning procedure with the diagnostics tool: once the check is completed, make sure that the Handle self-learning status indicates: carried out

CAUTION

THE TWO CONNECTORS WHICH GET TO THE THROTTLE GRIP SENSOR ARE ALIKE BUT THEY SHOULD NEVER BE INVERTED. MARK OR CHECK THE CONNECTOR MARKING BEFORE REMOVING THEM (BLUE STAMP + BLUE BAND). THE CONNECTOR AND THE BLUE BAND SHOULD BE PLACED AT THE FRONT. THE CONNECTOR AND THE WHITE BAND SHOULD BE PLACED AT THE BACK.

Intake pressure sensor

Function

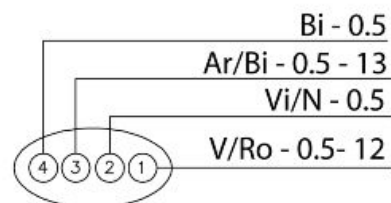
The pressure sensor is essential for calculating the torque produced, for calculating the ambient pressure and for correct ignition timing during start-up.

Operation / Operating principle

Diaphragm sensor which translates the diaphragm position into electrical voltage when in contact with the intake air.

Level in electrical circuit diagram:

Intake air pressure sensor



Location:

- on the vehicle: under the fuel tank on the compensator.
- connector: on the sensor.

Electrical specifications: -**Pin out:**

1. Ground connection
2. Temperature signal
3. Power supply 5V
4. Signal

**DIAGNOSTICS INSTRUMENT: PARAMETERS**

Reference pressure Intake above sea level

- Example value with key ON: 1009 mbar
- Example value with engine on: 670 mbar
- NOTE: pressure estimated by the control unit according to the throttle position

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL TROUBLESHOOTING CONCEPTS FOR ELECTRICAL DEVICES AT THE BEGINNING OF THE CHECK AND CONTROL SECTION IN THE ELECTRICAL SYSTEM CHAPTER.

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

P0105 cylinder air pressure sensor

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 24. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 24.

Troubleshooting

- If shorted to positive: verify that the parameter of the front cylinder air Pressure Sensor on the diagnostics tool is approx. 1200 mbar; disconnect the sensor connector: if the value does not vary, it means that the cable is shorted between the control unit connector and the sensor connector: restore the cable harness; Replace the sensor if the value varies.
- If the circuit is open, shorted to negative: check the Marelli control unit connector and the sensor connector; if not OK, restore. If everything is OK, with key set to OFF, check if there is continuity between the PIN 24 of the Marelli control unit and the sensor connector PIN 4: if there is no continuity, restore the cable harness. If there is continuity, check the cable ground insulation: if there is continuity to ground, restore the cable harness; if not, with key set to ON check that the voltage on sensor connector PIN 3 is approx. 5 V: if not OK, set the key to OFF and check continuity between the ENGINE connector PIN 51 and the sensor

connector PIN 3: if not OK, restore the cable harness; if OK, replace the control unit; if there is 5V voltage at PIN 3, and with key set to ON, check the continuity to ground of the sensor connector PIN 4: if not OK, restore the cable harness; if OK, replace the sensor.

DIAGNOSTICS TOOL: LOGIC ERRORS

P0107 air pressure sensor

- signal not valid.

Error cause

- According to the engine operation data (rpm, throttle valve, etc.) an average value for the intake pressure is estimated: if the value read deviates by a given percentage, this error is activated. The most frequent causes can be: abnormal resistance in the sensor circuit (for example, rusted terminals) or sensor with poor performance.

Troubleshooting

- Check the Marelli control unit connector and the sensor connector; if not OK, restore. If everything is OK, check that resistance between ENGINE connector PIN 24 and sensor connector PIN 4 is a few tenths of an Ohm; if it is above that value, restore cable harness. Replace the sensor if it is correct.

Error due to unexpected air intake in the manifold P1600

- signal not valid.

Error cause

- A small difference between the estimated pressure and the measured pressure has been detected: the measured pressure is higher than the estimated one (intake manifold conditions).

Troubleshooting

- Check the conditions of the intake manifold and cleanliness of the hole for pressure reading.

Estimated cylinder manifold intake pressure error P1602

- too high pressure/too low pressure.

Error cause

- A substantial difference between the estimated pressure and the measured pressure has been detected (for example, the hole for pressure reading is clogged or sensor screw is loose).

Troubleshooting

- Check the conditions of the intake manifold and cleanliness of the hole for reading the pressure: there is an evident defect in the intake and pressure reading systems.

Manifold pressure too low error P1604

- signal not valid.

Error cause

- A small difference between the estimated pressure and the measured pressure has been detected: the measured pressure is below the estimated one (for example, smeared throttle body).

Troubleshooting

- Check the conditions of the intake manifold and cleanliness of the hole for pressure reading.

DIAGNOSTIC TOOL: ELECTRICAL 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 37 of the ENGINE connector. If shorted to negative: voltage equal to zero has been detected. The instrument panel does not indicate the presence of this error even in the ATT status.

Troubleshooting

- If the circuit is open, shorted to positive: check the sensor connector and the Marelli control unit connector. If they are OK, check sensor continuity: replace the sensor if not OK; if OK, check continuity between the ENGINE connector PIN 37 and the sensor PIN 2: 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 OK, it means that the error cause is that the cable is shorted to positive and it is necessary to restore the cable harness between ENGINE PIN 37 and sensor PIN 2; check the sensor connector and the Marelli control unit connector. If not OK, restore the cable harness. If OK, check continuity between the ENGINE connector PIN 6 or 17 and the sensor connector PIN 1: restore the cable harness if there is not continuity. If there is, it means that the control unit does not supply the ground connection and therefore should be replaced
 - If shorted to negative, check sensor correct resistance: if resistance = 0, replace the sensor; if resistance is correct, it means that the Purple/Black cable has ground connection: restore the cable harness
-

Engine temperature sensor

Function

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

Operation / Operating principle

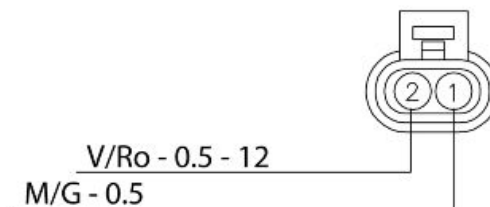
NTC type sensor (resistance sensor, inversely variable with temperature).

Level in electrical circuit diagram: Temperature sensors

Location:

- Sensor: within the engine "V"
- Connector: on the sensor

Electrical specifications:



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

CAUTION

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DIAGNOSTICS INSTRUMENT: FUEL INJECTION SYSTEM

DIAGNOSTICS INSTRUMENT: PARAMETERS

Engine temperature

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

DIAGNOSTICS INSTRUMENT: 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 12 of the ENGINE connector.
- If shorted to negative: equal voltage has been detected at PIN 12 of the ENGINE connector.

Troubleshooting

- If the circuit is open, shorted to positive: check sensor connector and Marelli control unit connector; if not OK, restore cable harness; if OK, check sensor continuity; if it is not OK, replace the sensor; if it is OK, check the continuity between the ENGINE connector PIN 12 and the sensor PIN 12: 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 2 and the vehicle ground connection: if there is no continuity, restore the cabling. If there is continuity, it means that the error cause is that the cable is shorted to positive and it is necessary to restore the cable harness between ENGINE PIN 12 and sensor PIN 1; 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.

DIAGNOSTICS INSTRUMENT: LOGIC ERRORS

engine temperature sensor P0116

- signal not valid

Error cause

- An excessive temperature variation has been detected: for example, the cause may be a contact resistance between the terminals. The instrument panel does not indicate the presence of this error even in the ATT status.

Troubleshooting

- Check the sensor connector and the ENGINE control unit connector;

NOTES No error is detected if the sensor does not work correctly or the control unit connector or sensor terminals are rusty: then use the diagnostics instrument to check 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

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 probe

Left lambda position:

- on the vehicle: exhaust muffler under the rear head along the exhaust
- connector: left side above the footrest

Right lambda position:

- on the vehicle: exhaust muffler under the rear head along the exhaust
- connector: right side above the footrest

Electrical specifications

- Heater circuit: 7-9 Ω at Ambient temp.

Pin out for both sensors:

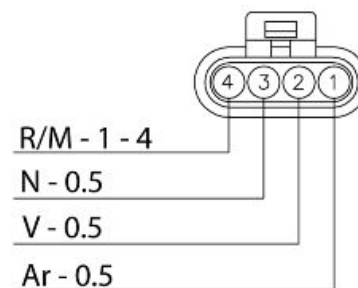
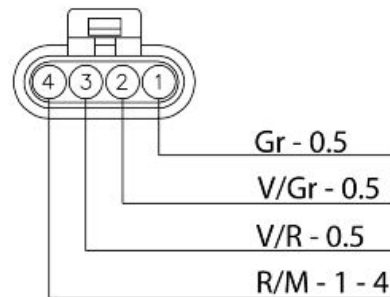
1. Sensor signal + (black wire)
2. Sensor signal - (grey wire)
3. Heater ground connection (white cable)
4. Heater power supply (white cable)

DIAGNOSTICS TOOL:PARAMETERS

Oxygen sensor

- Example value with key ON: 0 mV
- Example value with engine on:
100--900 mV

If there is a short circuit at + 5 V or above, the oxygen sensor parameter is not equal to the value



read by the control unit; a recovery value is displayed instead

Lambda sensor correction

- Example value with key ON: 1.00 mV
- Example value with engine on: 0.90 - 1.10mV

In closed loop, the value must be close to 1.00 (values not within the 0.90 - 1.10 interval indicate a fault): for example, value 0.75 corresponds to +25% with respect to the reference injection time; 1.25 corresponds to -25%. In an open circuit, the oxygen sensor signal is too low. Therefore, the control unit takes it as a lean combustion condition and will try to enrich it. The value read will be 0.75: once this correction has been tried, the value shifts to 1.00 fixed and the Oxygen sensor error is signalled

CAUTION

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DIAGNOSTICS TOOL: STATUSES

Oxygen sensor: Start-up_Lean_Rich_Fault due to rich value_Fault due to lean value

- If the probe connector is removed (voltage almost equal to zero), the status is Fault due to lean value

Lambda check: Open loop/Closed loop/Rich in closed loop/Lean in closed loop/enriched

- Closed loop indicates that the control unit is using the oxygen sensor signal to keep the combustion as close as possible to the stoichiometric value.

DIAGNOSTICS TOOL: ACTIVATION

Oxygen sensor heating

- The auxiliary injection relay (No. 28 in the electrical circuit diagram, right side, in the two relay box; CHECK, however, the identification of the relay with the colour of the cables) is energised and the heating circuit is closed to ground 5 times (pin 3 on the lambda probe connector). The continuity of the wiring is necessary for correct activation: no error indications are displayed in case of lack of activation

DIAGNOSTICS TOOL: ELECTRICAL ERRORS

'left cylinder lambda probe P0130

- shorted to positive

Error cause

- Excessive voltage (battery voltage) has been detected at PIN 10 and 22 of the ENGINE connector. Caution: the 'Oxygen sensor' parameter is not the real value that is read; a recovery value is displayed instead. The instrument panel does not indicate the presence of this error even in the ATT status.

Troubleshooting

- shorted to positive: with key set to ON, disconnect the sensor connector and measure PIN 1 voltage on the cable harness side (grey cable): if there is voltage (5 or 12 V), restore the cable harness; if there is not, replace the oxygen sensor

'Heating left cylinder lambda probe P0135

- short circuit to positive/ open circuit, short circuit to negative

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 32 of the ENGINE connector. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 32 of the ENGINE connector. The instrument panel does not indicate the presence of this error even in the ATT status.

Troubleshooting

- If 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 (Green/Red cable)
- If circuit is open, shorted to negative: check circuit continuity from probe connector (PIN 3 and 4) toward the probe: if it is not OK, replace the probe; if it is OK, check the sensor connector and the Marelli control unit connector: if it is not OK, restore; if it is OK, with key set to ON and sensor connector disconnected, check if there is battery voltage at PIN 4: if it is not OK, check the Red/Brown cable continuity between the probe connector and the auxiliary injection relay (No. 28 in the electrical circuit diagram, placed in the front relay box, left side; CHECK, however, the identification of the relay with the colour of the cables). If there are also coil, lower and upper injector and secondary air errors, check the relay and its excitation and power line; if there is voltage at PIN 4, check the Green/Red cable ground insulation (PIN 3): if not OK, restore the cable harness. If it is OK, check the continuity of the Green/Red cable (between the sensor connector PIN 3 and the ENGINE PIN 32) and restore the cable harness.

WARNING

The control unit does not detect the following malfunctions of the oxygen sensor circuit according to the signal: interrupted circuit, shorted to ground or sensor malfunction (for example non variable voltage). In case of fault indication, carry out the following troubleshooting.

Troubleshooting

- Check circuit continuity from probe connector (PIN 1 and PIN 2) toward the probe: replace the oxygen 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 ENGINE connector PIN 22 and PIN 10 and restore the cable harness.

'right cylinder lambda probe P0150

- shorted to positive

Error cause

- Excessive voltage (battery voltage) has been detected at PIN 9 and 38 of the ENGINE connector. Caution: the 'Oxygen sensor' parameter is not the real value that is read; a recovery value is displayed instead. The instrument panel does not indicate the presence of this error even in the ATT status.

Troubleshooting

- shorted to positive: with key set to ON, disconnect the sensor connector and measure PIN 1 voltage on the cable harness side (grey cable): if there is voltage (5 or 12 V), restore the cable harness; if there is not, replace the oxygen sensor

'Heating right cylinder lambda probe P0155

- short circuit to positive/ open circuit, short circuit to negative

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 38 of the ENGINE connector. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 38 of the ENGINE connector. The instrument panel does not indicate the presence of this error even in the ATT status.

Troubleshooting

- If 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 (Black cable)
- If circuit is open, shorted to negative: check circuit continuity from probe connector (PIN 3 and 4) toward the probe: if it is not OK, replace the probe; if it is OK, check the sensor connector and the Marelli control unit connector: if it is not OK, restore; if it is OK, with key set to ON and sensor connector disconnected, check if there is battery voltage at PIN 4: if it is not OK, check the Red/Brown cable continuity between the probe connector and the auxiliary injection relay (No. 28 in the electrical circuit diagram, placed in the front relay box, left side; CHECK, however, the identification of the relay with the colour of the cables). If there are also coil, lower and upper injector and secondary air errors, check the relay and its excitation and power line; if there is voltage at PIN 4, check the Black cable ground insulation (PIN 3): if not OK, restore the cable harness. If it is OK, check the continuity of

the Black cable (between the sensor connector PIN 3 and the ENGINE PIN 38) and restore the cable harness.

WARNING

The control unit does not detect the following malfunctions of the oxygen sensor circuit according to the signal: interrupted circuit, shorted to ground or sensor malfunction (for example non variable voltage). In case of fault indication, carry out the following troubleshooting.

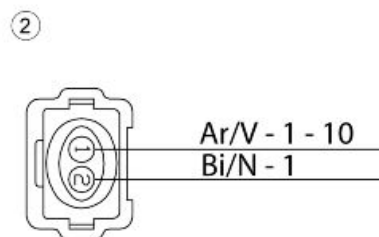
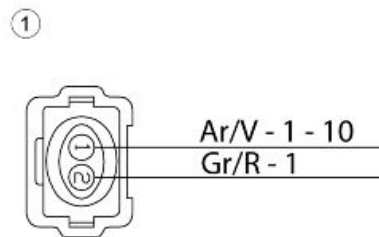
Troubleshooting

- Check circuit continuity from probe connector (PIN 1 and PIN 2) toward the probe: replace the oxygen 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 ENGINE connector PIN 38 and PIN 9 and restore the cable harness.

Injector

Injectors key:

1. Left injector
2. Right injector



INJECTOR

Function

Provide the correct amount of fuel at the correct time.

Operation / Operating principle

Injector coil is energised for the petrol passage to open

Level in electrical circuit diagram:

Coils and injectors

Location:

- on the vehicle: intake manifold on the cylinder
- connector: on injectors

Electrical specifications:

14.8Ω ± 5% (at ambient temp)

Pin out left cylinder:

1. Power (orange/green cable)
2. Ground (grey/red cable)

Pin out right cylinder:

1. Power (orange/green cable)
2. Ground (white/black cable)

DIAGNOSTICS TOOL: PARAMETERS

Left cylinder injection time

- Example value with engine on: 1.9 ms

Right cylinder injection time

- Example value with engine on: 1.9 ms

CAUTION

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DIAGNOSTICS TOOL: ACTIVATION

'Left cylinder injector

- The auxiliary injection relay (No. 35 in the electrical circuit diagram, placed in the front relay box, left side; CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the injector cable connected to control unit 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

'Right cylinder injector

- The auxiliary injection relay (No. 35 in the electrical circuit diagram, placed in the front relay box, left side; CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the injector cable connected to control unit 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

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

'Left cylinder injector: P0205

- short circuit to positive/ short circuit to negative / open circuit

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 53. If shorted to negative: no voltage has been detected. If the circuit is open: an interruption has been detected

Troubleshooting

- If shorted to positive: disconnect the injector connector, set key to ON, activate the component with the DIAGNOSTIC TOOL and check the voltage on the Grey/Red cable on the injector connector (if there is voltage): if there is voltage, restore the filter box cable harness. If there is no voltage, replace the sensor
- If shorted to negative: disconnect the injector connector, set the key to ON and check if there is a ground connection on the Grey/Red cable: if there connection, restore the cable harness. If there is no connection, replace the injector
- If the circuit is open: check the component correct electrical characteristic: if it is not the correct one, replace the component; if it is correct, check the connector on the component and the Marelli control unit connector: if not OK, restore. If OK, check cable continuity between PIN 53 and component PIN 2 and restore the cable harness

'Right cylinder injector P0206

- short circuit to positive/ short circuit to negative / open circuit

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 67. If shorted to negative: no voltage has been detected. If the circuit is open: an interruption has been detected

Troubleshooting

- If shorted to positive: disconnect the injector connector, set key to ON, activate the component with the diagnostic tool and check the voltage on the White/Black cable on the injector connector (if there is voltage): if there is voltage, restore the filter box cable harness. If there is no voltage, replace the sensor
 - If shorted to negative: disconnect the injector connector, set the key to ON and check if there is a ground connection on the White/Black cable: if there connection, restore the cable harness. If there is no connection, replace the injector
 - If the circuit is open: check the component correct electrical characteristic: if it is not the correct one, replace the component; if it is correct, check the connector on the component and the Marelli control unit connector: if not OK, restore. If OK, check cable continuity between the ENGINE PIN 67 and component PIN 2 and restore the cable harness
-

Fuel pump

Function

Fuel pump: keeps pressure of the injectors supply duct.

Level in electrical circuit diagram:

Injection load relay

Location:

- on the vehicle: under the tank.
- connector: near the fuel pump (2 ways, black).

Electrical specifications:

PIN 1-2: 0.5 - 1 ohm;

Pin out:

1. + 12 V (orange/green cable)
2. Ground (blue cable)

CAUTION

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DIAGNOSTICS INSTRUMENT: ACTIVATION

Fuel pump

NOTE: The auxiliary injection relay (No. 35 on the electrical circuit diagram, in the two relay box, however VERIFY the identification of the relay with the colour of the cables) is energised for 30 seconds. The continuity of the wiring is necessary for correct activation: no error indications are displayed in case of lack of activation

DIAGNOSTICS INSTRUMENT: ELECTRICAL ERRORS

fuel pump relay control P0230

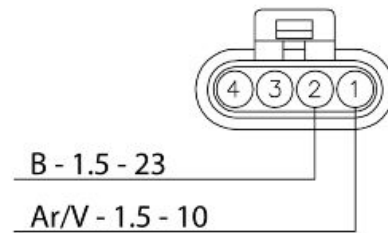
- shorted to positive / open circuit, shorted to negative.

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 73 of the VEHICLE connector. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 73 of the VEHICLE connector.

Troubleshooting

- If shorted to positive: check whether the relay electrical specifications are correct by disconnecting it from the cable harness. If are not OK, replace the relay; if OK, restore the cable harness (Brown/Black cable).



- If the circuit is open, shorted to negative: check the relay electrical characteristics are correct by disconnecting it from the cable harness; if it is not OK, replace the relay, if it is OK, check relay connector, engine-vehicle cable harness connector and VEHICLE connector of the Marelli control unit: if not OK, restore; if OK, check continuity of cable harness (Brown/Black cable)

Coil

Function

Spark generation

Operation / Operating principle

Inductive discharge system

Level in electrical circuit diagram:

coils and injectors

Location:

- connector: on the sensor
 - on the vehicle:
1. LEFT CYLINDER SIDE COIL, left side, on the frame ABOVE THE STARTER MOTOR.
 2. RIGHT CYLINDER SIDE COIL, right side above the rear brake reservoir.
 3. LEFT CYLINDER CENTRAL COIL, left side in front of the cylinder under the steering column.
 4. RIGHT CYLINDER CENTRAL COIL, right side immediately behind the right cylinder.

Electrical specifications:

0.7 - 0.9 Ω at ambient temperature

Pin out:

1. Fuel system
2. Ground connection

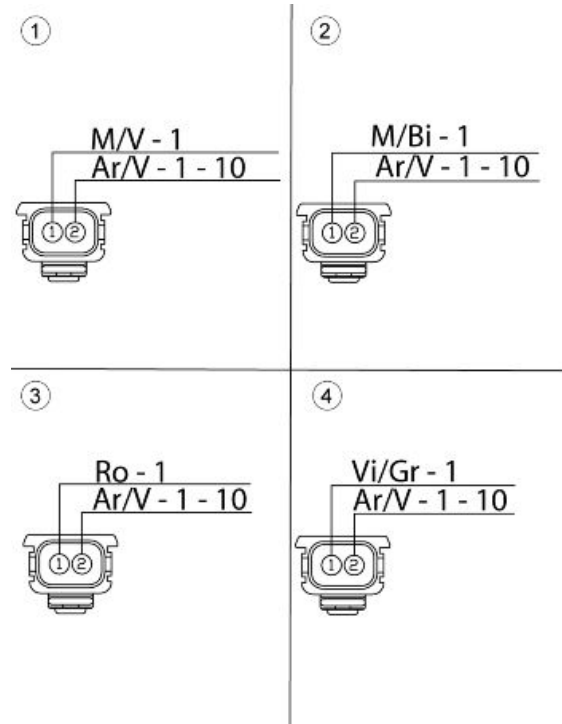
DIAGNOSTICS INSTRUMENT: PARAMETERS

Example value with key ON: Current ignition advance

Example value with engine on: Indicates the cylinder advance where combustion will take place.

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL TROUBLESHOOTING



CONCEPTS FOR ELECTRICAL DEVICES AT THE BEGINNING OF THE CHECK AND CONTROL SECTION IN THE ELECTRICAL SYSTEM CHAPTER.



DIAGNOSTICS INSTRUMENT: ACTIVATION

Left Cylinder Central Coil

The auxiliary relay (No. 35 in the wiring diagram, placed in the front relay box, left side; CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the coil Pink cable is closed to ground for 2 ms per second. Disconnect the 4-way connector of the fuel pump to be able to hear the relay and injector activation. The continuity of the wiring is necessary for correct activation: no error indications are displayed in case of lack of activation.

Right Cylinder Central Coil

The auxiliary relay (No. 35 in the wiring diagram, placed in the front relay box, left side; CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the coil Purple/Grey cable 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.

Left Cylinder Side Coil

The auxiliary injection relay (No. 35 in the wiring diagram, placed in the front relay box, left side; CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the coil Brown/Green cable is closed to ground for 2 ms per second. Disconnect the 4-way connector of the fuel pump to be able to hear the relay and injector activation. The continuity of the wiring is necessary for correct activation: no error indications are displayed in case of lack of activation.

Right Cylinder Side Coil

The auxiliary injection relay (No. 35 in the wiring diagram, placed in the front relay box, left side; CHECK, however, the identification of the relay with the colour of the cables) is energised for 5 seconds and the coil Brown/White cable 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.

DIAGNOSTICS INSTRUMENT: LOGIC ERRORS

Left cylinder central coil P0351

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 28 of the ENGINE connector. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 28 of the ENGINE connector.

Troubleshooting

- If shorted to positive: disconnect the coil connector, set the key to ON, activate the coil with the diagnostics instrument and check voltage at connector PIN 28: if there is voltage, restore the cable harness; if voltage = 0, replace the coil.
- If the circuit is open, shorted to negative: check electric characteristics of the coil: if not OK, replace the coil, if OK check the coil connector and the Marelli control unit connector; if not OK, restore, if OK, check cable continuity between the two cable terminals: if there is not continuity, restore the cable harness; if there is cable continuity, with key set to ON, check the ground insulation of the cable (from coil connector or control unit connector), if not OK, restore cable harness.

Right cylinder central coil P0352

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 27 of the ENGINE connector. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 27 of the ENGINE connector

Troubleshooting

- If shorted to positive: disconnect the coil connector, set the key to ON, activate the coil with the diagnostics instrument and check voltage at connector PIN 27: if there is voltage, restore the cable harness; if voltage = 0, replace the coil.
- If the circuit is open, shorted to negative: check electric characteristics of the coil: if not OK, replace the coil, if OK check the coil connector and the Marelli control unit connector; if not OK, restore, if OK, check cable continuity between the two cable terminals: if there is not continuity, restore the cable harness; if there is cable continuity, with key set to ON, check the ground insulation of the cable (from coil connector or control unit connector), if not OK, restore cable harness.

Left cylinder side coil P0353

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

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 2 of the ENGINE connector. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 2 of the ENGINE connector.

Troubleshooting

- If shorted to positive: disconnect the coil connector, set the key to ON, activate the coil with the diagnostics instrument 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 electric characteristics of the coil: if not OK, replace the coil, if OK check the coil connector and the Marelli control unit connector; if not OK, restore, if OK, check cable continuity between the two cable terminals: if there is not continuity, restore the cable harness; if there is cable continuity, with key set to ON, check the ground insulation of the cable (from coil connector or control unit connector), if not OK, restore cable harness.

Right cylinder side coil P0354

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

Error cause

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

Troubleshooting

- If shorted to positive: disconnect the coil connector, set the key to ON, activate the coil with the diagnostics instrument and check voltage at connector PIN 1: if there is voltage, restore the cable harness; if voltage = 0, replace the coil.
- If the circuit is open, shorted to negative: check electric characteristics of the coil: if not OK, replace the coil, if OK check the coil connector and the Marelli control unit connector; if not

OK, restore, if OK, check cable continuity between the two cable terminals: if there is not continuity, restore the cable harness; if there is cable continuity, with key set to ON, check the cable ground insulation (from coil connector or control unit connector), if not OK, restore cable harness

Throttle body

Function

To send the throttle position to the injection control unit and to activate the throttle itself based on the request from the control unit

Operation / Operating principle

All the unit internal components (potentiometer and electric motor) are contactless; therefore, no electrical diagnosis is possible for the throttle body, but for the circuits connected to it only.

Level in electrical circuit diagram:

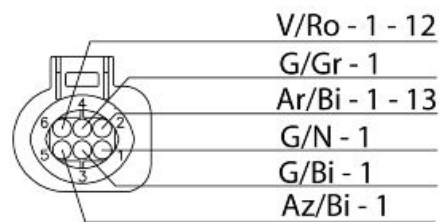
Throttle and handgrip sensor control (Demand)

Location:

- on the vehicle: under the fuel tank
- connector: on the throttle body

Pin out:

1. potentiometer signal 1 (yellow/black cable)
2. + 5 V voltage (Orange/white cable)
3. throttle drive command (+) (yellow/white cable)
4. potentiometer signal 2 (yellow/grey cable)
5. throttle drive command (+) (light blue/white cable)
6. ground (green/pink cable)



DIAGNOSTICS INSTRUMENT: PARAMETERS

Throttle correction

- Example value with key ON: 0.0°
- Example value with hot engine at idle: -0.5°

An acceptable value is between -1.5° and + 1.5°

Throttle Potentiometer 1 (degrees)

- Example value with key ON: 6°7°

- Example value with engine at idle: engine hot 5.5°, engine cold 6,5°

Throttle Potentiometer 1 (voltage)

- Example value with key ON: 800 mV
- Example value with engine on: engine hot 760 mV, engine cold 800 mV

Throttle Potentiometer 2 (degrees)

- Example value with key ON: 5.5°
- Example value with engine on: engine hot 5.5°, engine cold 6.5°

Throttle Potentiometer 2 (voltage)

- Example value with key ON: 4200 mV
- Example value with engine on: engine hot 4240 mV, engine cold 4200 mV

Throttle Limp Home position

- Example value with key ON: 824 mV at 6.7°

Voltage stored in the control unit corresponding to the Limp home position

Throttle lower position

- Example value with key ON: 480-510 mV

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL TROUBLESHOOTING CONCEPTS FOR ELECTRICAL DEVICES AT THE BEGINNING OF THE CHECK AND CONTROL SECTION IN THE ELECTRICAL SYSTEM CHAPTER.

DIAGNOSTICS TOOL: STATUSES

Throttle valve automatic self-acquisition

- ice/ interrupted/carried out/limp home/closed throttle valve stop/springs check/limp home self-acquisition/initialise

Indicates if self-acquisition carried out by control unit has/has not been carried out: it is essential to know if the last self-acquisition with key ON has been successful

Throttle self-learning with diagnostics instrument

- carried out/not carried out

Indicates whether the self-acquisition process through the diagnostics tool has/has not been carried out: if it has been carried out once, will always be carried out unless EEPROM control unit zero setting is carried out

DIAGNOSTICS TOOL: ELECTRICAL ERRORS

'sensor potentiometer 1 throttle valve position P0120

- short circuit to positive / open circuit, short circuit to negative

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 48. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 48

Troubleshooting

- If shorted to positive: check the value indicated by the Throttle valve Potentiometer 1 parameter (voltage): disconnect the connector and read the value indicated by the diagnostics tool: if the voltage does not vary, there is a short circuit in the cable; replace the throttle body if the voltage drops to zero
- If the circuit is open, shorted to negative: check the throttle body connector and the control unit connector. If not OK, restore; if everything is OK, check circuit continuity between the two terminals. If not OK, restore the cable harness; if OK, check the circuit ground insulation (from throttle valve sensor connector or control unit connector). If it is ground insulated, check that there is power (+5 V) at the throttle body connector PIN 2, and that PIN 6 is connected to ground. If both are correct, replace the throttle body

'sensor potentiometer 2 throttle valve position P0220

- short circuit to positive / open circuit, short circuit to negative

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 50. If the circuit is open, shorted to negative: voltage equal to zero has been detected at PIN 50

Troubleshooting

- If shorted to positive: check the value indicated by the Throttle valve Potentiometer 2 parameter (voltage): disconnect the connector and read the value indicated by the diagnostic tool: if the voltage does not vary, there is a short circuit in the cable; replace the throttle body if the voltage drops to zero
- If the circuit is open, shorted to negative: check the throttle body connector and the control unit connector. If not OK, restore; if everything is OK, check circuit continuity between the two terminals. If not OK, restore the cable harness; if OK, check the circuit ground insulation (from throttle valve sensor connector or control unit connector). If it is ground insulated, check that there is power (+5 V) at the throttle body connector PIN 2, and that PIN 6 is connected to ground. If both are correct, replace the throttle body

Front throttle valve control circuit P0166

- short circuit to positive / short circuit to negative / open circuit, overvoltage, excessive internal temperature

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 29 - 41. If shorted to negative: no voltage has been detected. If the circuit is open: an interruption or excessive ampere input or control unit overheating has been detected

Troubleshooting

- If shorted to positive: disconnect the throttle body connector, set key to ON and check voltage at PIN 3: if the voltage read is higher or equal to 5V, there is a short circuit on the cable harness; replace the throttle body if the voltage is null
- If shorted to negative: disconnect the throttle body connector, set the key to ON and check if PIN 3 is in continuity with the vehicle ground connection: if there is continuity, restore the cable harness; if there is not continuity, replace the throttle body
- If the circuit is open, there is overvoltage or excessive internal temperature: check the throttle body connector and the control unit connector: if not OK, restore; if OK, disconnect the throttle body connector and control unit connector and check if there is cables continuity; if there is no continuity, restore the cable harness. If there is continuity, with the throttle body connector connected, check that the resistance, from the throttle valve control unit connector, between PIN 29 and 41 is within 1 and 2.5 Ohm; if it is not, replace the throttle body; if it is, check that the throttle body is not mechanically blocked: if blocked, solve the problem and replace the body; if it is not, replace the control unit

DIAGNOSTICS TOOL: LOGIC ERRORS

'sensor potentiometer 1 throttle valve position P0121

- signal not valid

Error cause

- Signal not within the expected value drawn according to the values of the intake pressure

Troubleshooting

- Check the Throttle Valve Potentiometer 1 parameter (voltage) to understand which signal the control unit receives. Check the throttle body connector as well as the control unit connector. Check that cable resistance between the throttle body connector (PIN 1) and the control unit (PIN48) is a few tenths of an Ohm. If this is not the case, restore the cable harness. If the value is correct, replace the complete throttle body

'sensor potentiometer 2 throttle valve position P0221

- signal not valid

Error cause

- Signal not within the expected value drawn according to the values of the intake pressure

Troubleshooting

- Check the Throttle Potentiometer 2 parameter (voltage) to understand which signal the control unit receives. Check the throttle body connector as well as the control unit connector. Check that cable resistance between the throttle body connector (PIN 4) and the control unit (PIN 50) is a few tenths of an Ohm. If this is not the case, restore the cable harness. If the value is correct, replace the complete throttle body

throttle valve position potentiometer P2135

- inconsistent signal

Error cause

- Potentiometer 1 and potentiometer 2 do not show a logical value: the sum of the two voltages should be constant. The cause may be a malfunction in one of the two sensors or an abnormal resistance in one of the two circuits

Troubleshooting

- Check the throttle body connector as well as the control unit connector. Check that cable resistance between the throttle body connector (PIN 1) and the control unit (PIN 48) is a few tenths of an Ohm. Check that cable resistance between the throttle body connector (PIN 4) and the control unit (PIN 50) is a few tenths of an Ohm. If one of the two is different, restore the cable harness. If correct, replace the complete throttle body

Throttle valve Limp Home self-acquisition P1400

- failed test

Error cause

- Throttle valve position, kept by the springs, not within the expected range (at each key ON). The instrument panel does not indicate the presence of this error even in the ATT status

Troubleshooting

- Check if the throttle body and the intake duct are clean. If OK, replace the throttle body

Throttle valve mechanical springs self-acquisition (opening) P1401

- failed test

Error cause

- Return time of the throttle valve, kept in position by the springs, not within the expected limits: the causes can be a deterioration of the performance of the springs or excessive throttle valve friction (at each key ON)

Troubleshooting

- Check if the throttle body and the intake duct are clean. If OK, replace the throttle body

Throttle valve mechanical springs self-acquisition (reclosing) P1405

- failed test

Error cause

- Return time of the throttle valve, kept in position by the springs, not within the expected limits: the causes can be a deterioration of the performance of the springs or excessive throttle valve friction (at each key ON)

Troubleshooting

- Check if the throttle body and the intake duct are clean. If OK, replace the throttle body

Throttle valve mechanical idle position self-acquisition P1402

- failed test

Error cause

- Position of the throttle valve stop not within the expected field (at each key ON)

Troubleshooting

- Check if the throttle body and the intake duct are clean. If OK, replace the throttle body

'Detection of throttle valve Recovery conditions (Air temp, Water temp) P1403

- possible presence of ice

Error cause

- A correct throttle valve rotation cannot be detected given low ambient and engine temperatures: some ice may have formed in the duct (at each key ON). The instrument panel does not indicate the presence of this error even in the ATT status

Troubleshooting

- Check that the throttle body is clean and that there is no ice or condensation in the intake duct. If OK, replace the throttle body

'Throttle valve power supply voltage during self-acquisition P1404

- low power supply voltage

Error cause

- The throttle valve power supply voltage is too low to carry out the self-acquisition test correctly (at each key ON). The instrument panel does not indicate the presence of this error even in the ATT status

Troubleshooting

- Delete errors hindering throttle self-learning.

'Throttle valve position error P0638

- misalignment between control and activation

Error cause

- The throttle valve mechanical control may be damaged

Troubleshooting

- Replace the throttle body
-

DIAGNOSTICS INSTRUMENT: ADJUSTABLE PARAMETERS

Throttle self-acquisition

NOTE

THROTTLE BODY ACTIVATION TAKES PLACE EVERY TIME THE KEY IS SET TO ON: CORRECT ACTIVATION IS INDICATED WHEN THE STOP LIGHTS TURN ON: IF DURING ACTIVATION, THE ENGINE IS STARTED, THE ACTIVATION IS NOT COMPLETED AND THE STOP LIGHTS DO NOT TURN ON. EVERY 150 KEY-ONS, HOWEVER, THE THROTTLE VALVES ARE FORCED TO ACTI-

VATION. IF START-UP IS ATTEMPTED DURING THIS ACTIVATION (WHICH REQUIRES 3 SECONDS), THE ENGINE WILL NOT START.

FITTING: MECHANICAL/ELECTRICAL REFIT

RESET PROCEDURE

If the throttle body has been replaced, after key ON do not start the engine for the next 3 seconds, during which the control unit carries out throttle self-acquisition: then verify that the "Automatic throttle self-acquisition" status indicates: "carried out". If indication is not "Carried out", delete possible errors on the vehicle and then, with key set to ON, check that the statuses are "Carried out". If necessary carry out, from the adjustable parameters screen (screwdriver and hammer) "Throttle self-acquisition" and verify that the "Throttle self-acquisition with diagnostics instrument" status indicates: "Carried out" and that the "Automatic throttle self-acquisition" status indicates: "carried out"

Engine oil pressure sensor

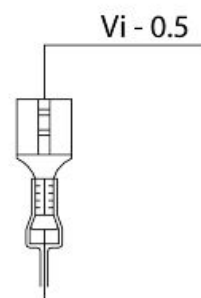
ENGINE OIL PRESSURE SENSOR

Function: it indicates to the instrument panel if there is enough oil pressure (0.5 ± 0.2 bar (7.25 ± 2.9 PSI)) in the engine.

Operation / Operating principle: normally closed switch. With oil pressure above 0.5 ± 0.2 bar (7.25 ± 2.9 PSI), open circuit.

Location on the vehicle: right side of the vehicle, under the oil sump

Pin-out: Voltage 5V



Neutral sensor

Function

It tells the gear position to the control unit, from the 1st gear to the 6th gear, and if the gear is neutral or riding.

Operation / Operating principle

The sensor has 2 circuits: one to indicate the engaged gear, whose resistance varies according to the gear engaged: in this way, the injection ECU, according to detected electric voltage, identifies the engaged gear and sends the information via CAN to the instrument panel; the other indicates neutral gear, whose voltage is taken to zero if in neutral position.

Level in electrical circuit diagram:

Start-up enabling switches

Location:

- on the vehicle: rear part, above the gearbox.
- connector: near the sensor.

Electrical specifications:

PIN 64: gear indication: closed circuit (continuity);
gear engaged: open circuit (infinite resistance).

Gear engaged circuit resistance: 1st gear: 0.56 kohm, 2nd gear 0.82 kohm, 3rd gear 1.5 kohm, 4th gear 2.74 kohm, 5th gear 6.81 kohm, 6th gear 15 kohm.

Pin out:

White/Black: ground from ECU, Light Blue: + 12V from ECU (gear), Pink: + 5V from ECU (gears).

CAUTION

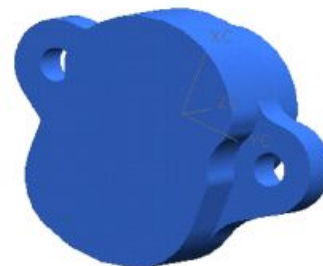
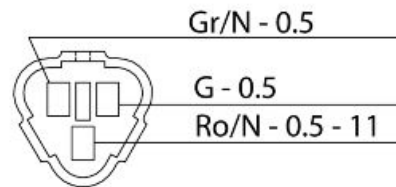
BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL TROUBLESHOOTING CONCEPTS FOR ELECTRICAL DEVICES AT THE BEGINNING OF THE CHECK AND CONTROL SECTION IN THE ELECTRICAL SYSTEM CHAPTER.

DIAGNOSTICS INSTRUMENT: STATUSES

Gearbox in neutral

- Yes/No

Gear engaged: 0 - 1 - 2 - 3 - 4 - 5 - 6



DIAGNOSTICS INSTRUMENT: ELECTRICAL ERRORS

Gear sensor P0461

- shorted to positive or open circuit / shorted to negative.

Error cause

- If the circuit is open, shorted to positive: excessive voltage has been detected at PIN 72. If shorted to negative: voltage equal to zero has been detected at PIN 72.

Troubleshooting

- If the circuit is open, shorted to positive: the error is detected with gear engaged only. Check the sensor connector and the VEHICLE connector of the control unit: if not OK, restore; if they are OK, check the continuity of the Grey/Black cable between the two connectors: if not OK, restore; if they are OK, with key set to ON and control unit connector disconnected, check from the control unit side if the cable is in voltage: if it is in voltage, disconnect the sensor connector and check if the cable is in voltage: if it is in voltage, restore the cable harness; if it is not in voltage, replace the sensor (there is an interruption or shorted to positive of the Pink/Black cable in the section from the sensor connector to the sensor or inside the sensor).
- If shorted to negative: disconnect the sensor connector and with key set to ON, check Grey/Black cable voltage: if equal to zero, restore the cable harness; if equal to approx. 5 V, replace the sensor (there is short circuit to ground of the Pink/Black cable in the section from the sensor connector to the sensor or inside the sensor).

Clutch lever sensor**Function**

It tells the clutch lever position to the control unit.

Operation / Operating principle

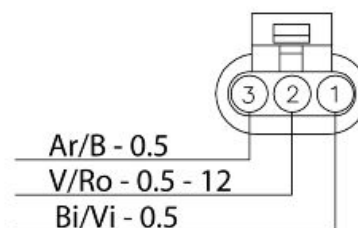
If there is gear engaged but the clutch is pulled, i.e. circuit closed to ground, vehicle start-up is not enabled.

Level in electrical circuit diagram:

Start-up enabling switches

Location:

- on the vehicle: under the clutch lever.
- connector: Under the steering column, right side.

Electrical specifications:

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

Pin out:

1. normally closed switch (white/purple cable)
2. ground (green/pink cable)
3. normally open switch (orange/blue cable)

CAUTION

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DIAGNOSTICS INSTRUMENT: STATUSES

Clutch

- Indefinite_Released_Pulled

WARNING The statuses regularly viewed are Released and Pulled.

- indication on the diagnostics instrument always Released: check the sensor connector and the control unit connector (special attention to PIN56): if not OK, restore cable harness; if OK, disconnect both terminals from the sensor and check, with key set to ON, continuity to ground of PIN 2 (Green/Pink cable): if there is no continuity, restore the cable harness; if there is, replace the sensor.
- indication on the diagnostics instrument always Pulled: check the sensor connector and the control unit connector (special attention to PIN76): if not OK, restore cable harness; if OK, disconnect both terminals from the sensor and check, with key set to ON, continuity to ground of PIN 2 (Green/Pink cable): if there is no continuity, restore the cable harness; if there is, replace the sensor.

Side stand sensor**Function**

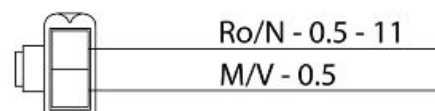
it tells the side stand position to the control unit

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:

- on the vehicle: on the stand
- connector: behind the starter motor

Pin out:

1. ground (pink/black cable)
2. 12V Voltage (brown/green cable)

Electrical specifications:

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

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL TROUBLESHOOTING CONCEPTS FOR ELECTRICAL DEVICES AT THE BEGINNING OF THE CHECK AND CONTROL SECTION IN THE ELECTRICAL SYSTEM CHAPTER.

DIAGNOSTICS INSTRUMENT: STATUSES

Side stand sensor: up/down

- indication on the diagnostics instrument always down: check the connector: if not OK, restore; if it is OK, disconnect the two terminals from the sensor and check continuity to ground of PIN 1: if there is no continuity, restore the cable harness; if there is, replace the sensor
- indication on the diagnostics instrument always up: 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 from sensor PIN 2 to VEHICLE connector PIN 70 is short circuit to ground: restore the cable harness

Bank angle sensor**Function**

It tells the vehicle position to the control unit

Operation / Operating principle

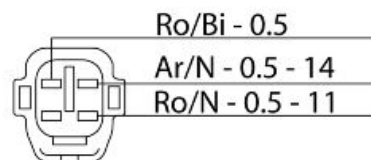
The sensor converts the vehicle position signal to electrical voltage.

Level in electrical circuit diagram:

Start-up enabling switches

Location:

- on the vehicle: under the saddle, above the battery.



- connector: near the sensor.

Electrical specifications:**Pin out:**

1. 5V Power (orange/black cable)
2. Ground (pink/black cable)
3. Output signal (pink/white cable)

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL TROUBLESHOOTING CONCEPTS FOR ELECTRICAL DEVICES AT THE BEGINNING OF THE CHECK AND CONTROL SECTION IN THE ELECTRICAL SYSTEM CHAPTER.

SAS valve actuator**Function**

Quickly warms up the catalytic converter and keeps the combustion rich in some critical conditions

Operation / Operating principle

The valve coil is excited to open the air passage of the filter box to the exhaust manifold

Level in electrical circuit diagram:

Secondary air system

Location:

- on the vehicle: under the head, left side
- connector: on the valve

Electrical specifications:

Resistance at ambient temperature: $21 \pm 1 \Omega$

Pin out:

1. Power supply V batt
2. Ground connection

DIAGNOSTICS TOOL:PARAMETERS**Secondary air valve duty cycle**

- Example value with key ON: 0 %
- Example value with engine on: %

Used only at 0 or 100%

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL TROUBLESHOOTING CONCEPTS FOR ELECTRICAL DEVICES AT THE BEGIN-



NING OF THE CHECK AND CONTROL SECTION IN THE ELECTRICAL SYSTEM CHAPTER.

DIAGNOSTICS TOOL: LOGIC ERRORS

Secondary air valve control P0410

- short circuit to positive/ short circuit to negative / open circuit

Error cause

- If shorted to positive: excessive voltage has been detected at PIN 43. If shorted to negative/ open circuit: no voltage has been detected. The instrument panel does not indicate the presence of this error even in the ATT status.

Troubleshooting

- If shorted to positive: disconnect the component, set the key to ON, start the vehicle and check if the error symptom is still "shorted to positive": it means that short circuit is between black/white cable and a cable in voltage, therefore restore cable harness; if the error symptom is short circuit to ground, it means that short circuit is inside the valve and therefore, you must replace the component.
- If shorted to negative or open circuit: check the component connector and control unit connector: if not OK, restore; if OK, check the continuity of the black/white cable between the two connectors: if not OK, restore cable harness; if OK, with key ON, check if there is voltage at PIN 1: if there is not voltage, check orange/green cable; if there is voltage, check component electrical characteristics and replace the component

RUN/STOP switch

Function

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

Operation / Operating principle

If the rider wants to shut off the engine or to disable engine start-up, the switch should be open, i.e.

VEHICLE connector PIN 58 of the Marelli control unit must not be connected to ground.

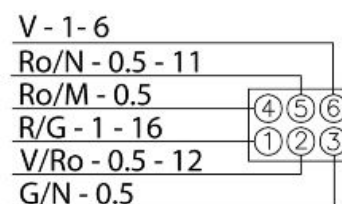
Level in electrical circuit diagram:

Start-up enabling switches

Location:

- on the vehicle: right light switch.
- connector: under right side steering column.

Electrical specifications:



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

Pin out:

1 ground (pink/black cable)

2 power 5 V (pink/brown cable)

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL TROUBLESHOOTING CONCEPTS FOR ELECTRICAL DEVICES AT THE BEGINNING OF THE CHECK AND CONTROL SECTION IN THE ELECTRICAL SYSTEM CHAPTER.

DIAGNOSTICS INSTRUMENT: STATUSES

RUN / STOP switch

- Run/Stop

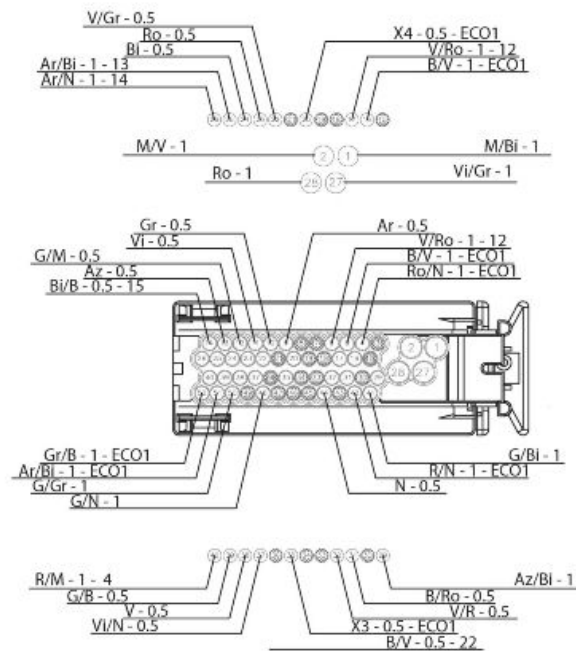
NOTES

- indication on the diagnostics instrument always STOP: disconnect the connector and verify with the RUN switch whether there is continuity toward the two Pink/Black and Pink/Brown cables switch: If there is not continuity, replace the sensor; if there is continuity, check the connector: if not OK restore the cabling, if OK verify the presence of voltage on the Pink/Brown cable with the key ON: if absent, restore cabling, if present verify insulation from ground of the Pink/Brown cable: If there is continuity with ground connection, restore the cable harness; if OK, set the key to OFF and check the VEHICLE connector and the engine-vehicle cable harness connector: if it is not OK, restore; if it is OK, check the continuity of the Pink/Brown cable between the switch and the VEHICLE connector PIN 58: if not OK, restore the cable harness; if OK, replace the Marelli control unit.
- indication on the diagnostics instrument always RUN: disconnect the connector and, with the switch set to STOP, check if there is continuity between the two cables of the switch: if present replace the switch, if absent this means that, with the key ON, the Pink/Brown cable (between the switch and the control unit connector PIN 58) is short circuited to positive: restore the cable harness.

Connectors

ECU

①

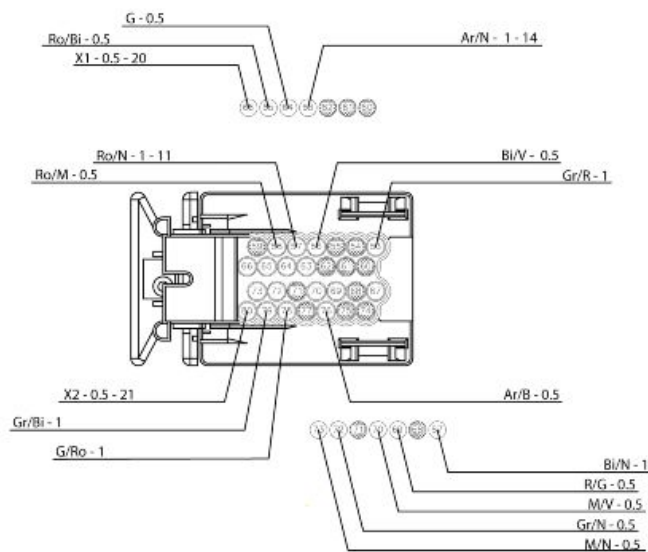
**Engine pinout key:**Right cylinder side spark plug coil command output **PIN 1**Left cylinder side spark plug coil command output **PIN 2**Sensors ground 2 **PIN 4**Power ground **PIN 5**Sensors ground 1 **PIN 6**Right Lambda sensor input (+) **PIN 9**Left Lambda sensor input (+) **PIN 10**Track D handgrip input **PIN 11**Engine temperature **PIN 12**Track B handgrip input **PIN 13**Serial line K for diagnostics **PIN 14**

PIN 16 Ground connection

Sensors ground 1 **PIN 17**Engine rpm sensor input (-) **PIN 20**Left Lambda sensor input (+) **PIN 22**Track C handgrip input **PIN 23**Intake pressure sensor input **PIN 24**Reference voltage output + 5V: tracks A-C, throttle and pressure sensor (MAP) **PIN 25**Reference voltage output + 5V: tracks B-D, and fall sensor **PIN 26**Right cylinder central spark plug coil command output **PIN 27**Left cylinder central spark plug coil command output **PIN 28**

- Output for throttle motor drive (-) **PIN 29**
- Recovery logic relay command output (STOP light) **PIN 31**
- Left Lambda heater command output **PIN 32**
- Engine rpm sensor input (+) **PIN 35**
- Air temperature sensor input **PIN 37**
- Right Lambda sensor input (-) **PIN 38**
- Track A handgrip input **PIN 39**
- Key input **PIN 40**
- Output for throttle motor drive (+) **PIN 41**
- Key input **PIN 42**
- Right Lambda heater command output **PIN 44**
- Throttle potentiometer 1 signal input **PIN 48**
- Throttle potentiometer 2 signal input **PIN 50**
- Reference voltage output + 5V: tracks A-C, throttle and pressure sensor (MAP) **PIN 51**
- Direct power supply to control unit **PIN 52**

②

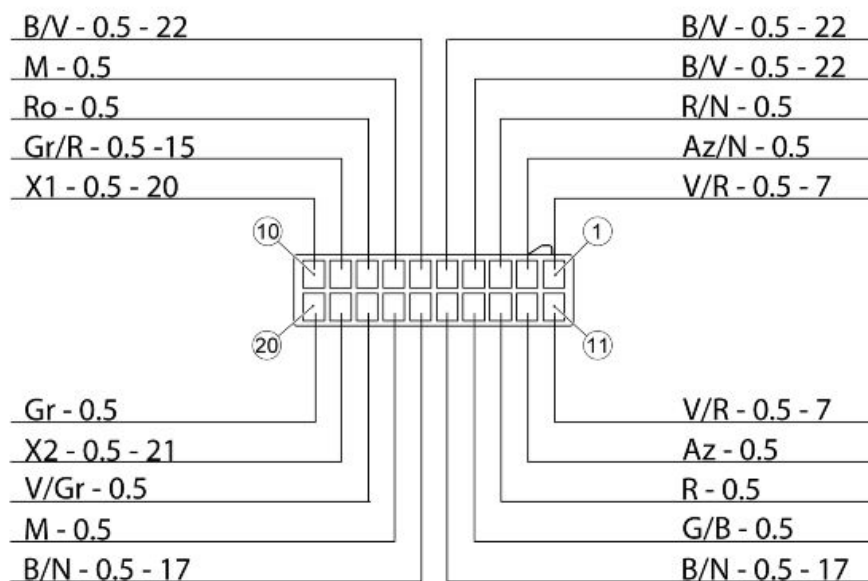


Vehicle pinout key:

- Left cylinder injector command output **PIN 53**
- Normally closed clutch switch input **PIN 56**
- Sensors ground 2 **PIN 57**
- Start engine button input **PIN 58**
- Reference voltage output + 5V: tracks B-D, and fall sensor **PIN 63**
- Neutral input **PIN 64**

Fall sensor input **PIN 65**
 CAN L line (high speed) **PIN 66**
 Right cylinder injector command output **PIN 67**
 Starter relay command output **PIN 69**
 Side stand input **PIN 70**
 Gear sensor input **PIN 72**
 Injection auxiliary relay command output **PIN 73**
 Normally open clutch switch input **PIN 76**
 "Engine stop" input **PIN 78**
 Vehicle speed input **PIN 79**
 CAN H line (high speed) **PIN 80**

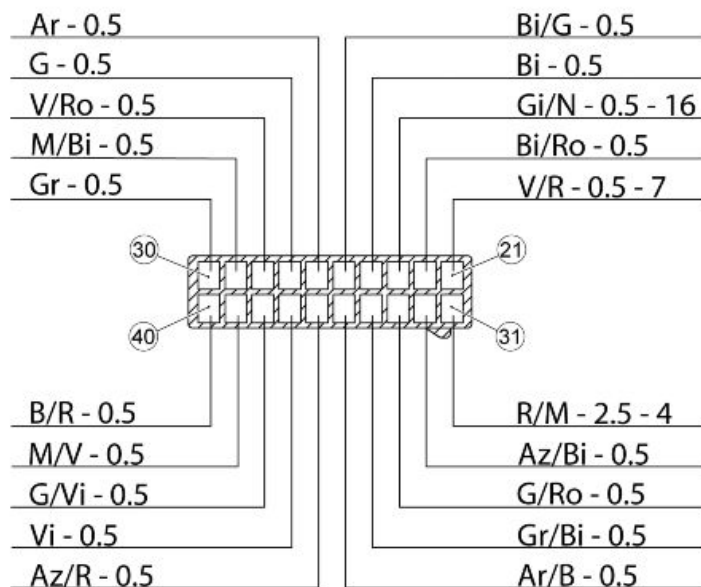
Dashboard



Grey-bodied instrument panel pinout key:

Battery positive **PIN 1**
 Front left turn indicator output **PIN 2**
 Front right turn indicator output **PIN 3**
PIN 4 Ground connection
PIN 5 Ground connection
PIN 6 Ground connection
 Left handgrip **PIN 7**
 Air temperature **PIN 8**

- Serial line K for diagnostics **PIN 9**
- CAN L line (high speed) **PIN 10**
- Battery positive **PIN 11**
- Left rear turn indicator output **PIN 12**
- Right rear turn indicator output **PIN 13**
- Lights relay **PIN 14**
- Sensors ground **PIN 15**
- Sensors ground **PIN 16**
- Right handgrip **PIN 17**
- Fuel sensor **PIN 18**
- CAN H line (high speed) **PIN 19**
- A aerial **PIN 20**



Black-bodied instrument panel pinout key:

- Battery positive **PIN 21**
- Right turn indicator command **PIN 22**
- DRL input **PIN 23**
- High beam input **PIN 24**
- Cruise Control button input **PIN 25**
- Confirm command **PIN 26**
- Down command **PIN 27**
- Up command **PIN 28**
- Normally closed front stop switch input **PIN 29**

B aerial **PIN 30**

Key positive **PIN 31**

Left turn indicator command **PIN 32**

Normally open front stop switch input **PIN 33**

Hazard input **PIN 34**

Handgrip command **PIN 35**

Turn indicator reset command **PIN 36**

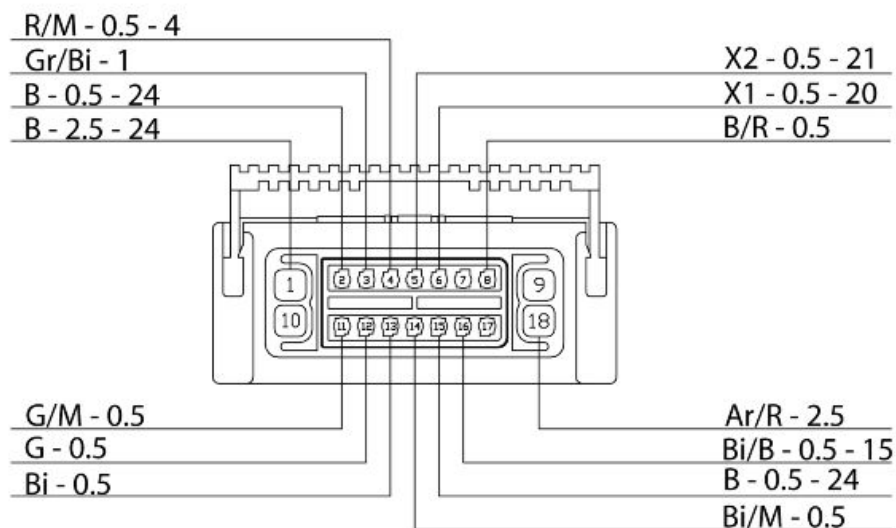
Oil pressure **PIN 37**

Normally open rear stop switch input **PIN 38**

Normally closed rear stop switch input **PIN 39**

ABS warning light **PIN 40**

ABS Modulator



ABS control unit pin out key:

PIN 1 Ground connection

Vehicle identification (1) **PIN 2**

Vehicle speed output **PIN 3**

Key input **PIN 4**

CAN H line (high speed) **PIN 5**

CAN L line (low speed) **PIN 6**

ABS warning light **PIN 8**

Rear speed sensor signal **PIN 11**

Rear speed sensor ground **PIN 12**

Front speed sensor ground **PIN 13**

Front speed sensor signal **PIN 14**

Vehicle identification (2) **PIN 15**

Serial K line for diagnostics **PIN 16**

Battery power **PIN 18**

Can line

Function

It allows communication between the Marelli injection ECU and the instrument panel.

Operation / operating principle

CAN SYSTEM ADVANTAGES

A CAN (controller Area network) line is a connection among the vehicle several electronic devices, organised as a computer network (Internet). The CAN network has greatly simplified the electrical system layout and consequently, its complexity. With this communication line, needless duplication of several sensors present on the motorbike has been obviated. The sensor signals are shared by the two electronic elaboration units (instrument panel and control unit).

- Cable number reduction: The CAN line travels through a twisted cable to several nodes.
- These nodes can also isolate the errors without causing a system breakdown (FaultsConfination).
- Immunity to interference: the signal travels through two cables and the signal reading is differential (voltage difference between the two signals on both cables). If the two signals are disturbed by an external factor, their difference remains unaltered.
- Communication speed: messages travel at a speed of 250 kbps (data arrive at nodes every 20 ms, i.e. 50 times/second).

CAN PROTOCOL (CONT. NETWORK AREA)

The communication protocol is CSMA/CD (Carrier Sense Multiple Access w/ Collision Detection).

In order to transmit, every nod must first check that the BUS (the connection among all devices) is free before attempting to send a message with BUS (Carrier Sense).

If during this period there is no activity on BUS, every nod has the same chance to send a message (Multiple Access). If two nodes start transmitting simultaneously, the nodes recognise the "collision" (Collision Detection) and initiate an exchange action based on message priority (messages remain unaltered during exchange and there is no delay for high priority messages).

CAN protocol is based on messages and not on addresses. The message itself is divided into several parts (frames), each of which has a meaning: message priority, data contained, error detection, reception confirmation, etc.

Every network node receives all the messages sent through the BUS (with reception confirmation or error messages) and each node decides if the message is to be processed or rejected. Besides, every node can request information from the other nodes (RTR = Remote Transmit Request).

Level in electrical circuit diagram:

CAN line

Electrical specifications:

- between PIN 66 and 80 of the control unit: approximately 130 Ohm
- between PIN 10 and 19 of the instrument panel: approximately 120 Ohm

Pin out:

- Line L: cable X1 between Marelli control unit PIN 66 and instrument panel black body connector PIN 10.
- Line H: cable X2 between Marelli control unit PIN 80 and instrument panel black body connector PIN 19.

CAUTION

BEFORE CARRYING OUT ANY TROUBLESHOOTING, CAREFULLY READ THE GENERAL TROUBLESHOOTING CONCEPTS FOR ELECTRICAL DEVICES AT THE BEGINNING OF THE CHECK AND CONTROL SECTION IN THE ELECTRICAL SYSTEM CHAPTER.

DIAGNOSTIC TOOL: ELECTRICAL ERRORS

CAN line "Mute Node" U0002

- Mute Node.

Error cause

- The injection ECU cannot send CAN signals; it receives signals from the instrument panel: the control unit may need replacing.

Troubleshooting

- Replace the Marelli control unit.

CAN line without signals U0001

- Bus Off.

Error cause

- No communication on CAN line (PIN 66 and/or PIN 80): problem on the whole network (for example, battery cut-off or short circuited or shorted to ground).

Troubleshooting

- check the Marelli control unit VEHICLE connector and the engine-vehicle cable harness connector: if not OK, restore; if OK, check the ground insulation of the two CAN lines from PIN 66 and PIN 80 of the VEHICLE connector: if not OK, restore cable harness; if OK, check the continuity of the two CAN lines from Marelli control unit VEHICLE connector to the instrument panel connector: if not OK restore cabling, if OK check that the two lines are not

short circuited to positive testing from each of the 2 connectors (Marelli control unit, instrument panel connector) with 1 connector at a time disconnected and turning the key to the ON position: If not OK, restore; if OK, replace the Marelli control unit.

CAN line towards instrument panel U0140

- no signal.

Error cause

- No signal is received from the instrument panel.

Troubleshooting

- Check the connector of the instrument panel: if not OK, restore; if OK, check the continuity of the two lines from the instrument panel connector to the VEHICLE connector of the Marelli control unit: if not OK, restore the cable harness; if OK, replace the instrument panel.
-

CAN line towards instrument panel U1140.

- Intermittent signal or communication error.

Error cause

- Probable bad contact in the CAN line.

Troubleshooting

- Carry out the Vehicle connector check on pins 66 and 80, if NOT OK restore, if OK carry out the check procedure on pins 10 and 19 and the instrument panel connector, if NOT OK restore, if OK check general operation of the Marelli control unit and the instrument panel, in case of faults replace the component in question

CAN line to ABS control unit U0121

- Missing signal or invalid signal.

Error cause

- Probable bad contact in the CAN line.

Troubleshooting

- Carry out the Vehicle connector check on pins 66 and 80, if NOT OK restore, if OK carry out the check procedure on pins 5 and 6 and the ABS control unit connector, if NOT OK restore, if OK check general operation of the Marelli control unit and the ABS control unit, in case of faults replace the component in question.
-

DIAGNOSTIC TOOL: LOGIC ERRORS

CAN line to ABS control unit U1121

- No signal/Configuration error

Error cause

- If there is no signal, no signal is received from the ABS control unit. In case of configuration error, some devices are present (e.g. ABS) that were not foreseen in the vehicle configuration stored in the control unit.

Troubleshooting

- Signal absent - Carry out the check procedure on pins 5 and 6 of the ABS control unit, pins 66 and 80 of the Marelli control unit vehicle connector, if NOT OK restore, if OK with key off disconnect the ABS control unit connector, if NOT OK replace cabling, if OK check correct power supply pin 18 (12V) and ground at pin 1 of the ABS control unit, if NOT OK restore cabling, if OK replace the ABS control unit
- Configuration error - Open the diagnostic tool devices status page to check if the control unit setting is actually consistent with the motorcycle setting. Example: if the bike has an ABS control unit the correct state that should be found in the diagnostic tool device status screen will be: MGTC (traction control) PRESENT. In the event of a bike with ABS control unit present and indication of the diagnostic tool of: MGTC (traction control) NOT PRESENT, update the control unit.

Rear wheel radius acquisition P1800

- CAN error during acquisition/Invalid value.

Error cause

- In case of CAN error during acquisition, system warns that the procedure can not be completed due to a communication problem on the CAN line. In case of invalid value, it means that on key-ON an error of transcription occurred - from the non-volatile memory (EEPROM) to the volatile one (RAM) - of the value concerning the rear wheel radius. In this case the default value is used.
-

INDEX OF TOPICS

ENGINE FROM VEHICLE

ENG VE

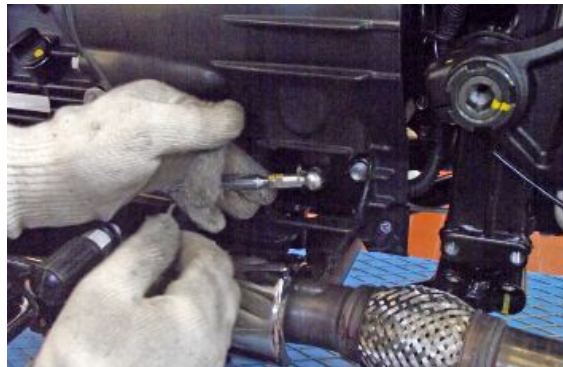
Vehicle preparation

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.
 - Remove the exhaust system, the swingarm with cardan shaft, fuel tank and the rear shock absorber and the two footrest brackets.
-

Removing the engine from the vehicle

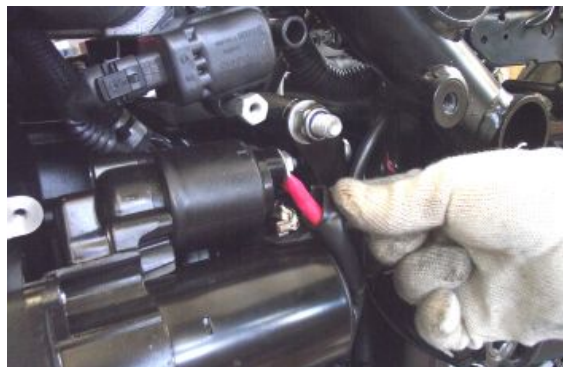
- Acting on the left side of the vehicle, remove the gear shift lever.



- Remove the protective cover of the starter motor by unscrewing the four fixing screws.



- Disconnect the positive cable and remove the starter motor by removing the two fixing screws.

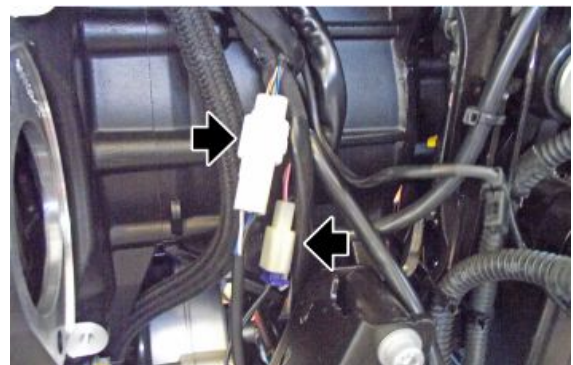




- Disconnect the cable located behind the starter motor.
- Disconnect the ground cable.



- Disconnect the stand sensor connector and rear stop switch.
- Release it from the clamps.



- Working from both sides, disconnect the engine oil breather tube.



- Working from both sides, disconnect the injector connectors.
- Working from both sides, unscrew the retaining screw of the injector and remove it.



- Disconnect the alternator connectors.



- Disconnect the oil pressure sensor connector.



- Disconnect the engine temperature sensor connector.

- Disconnect the speed sensor connector.

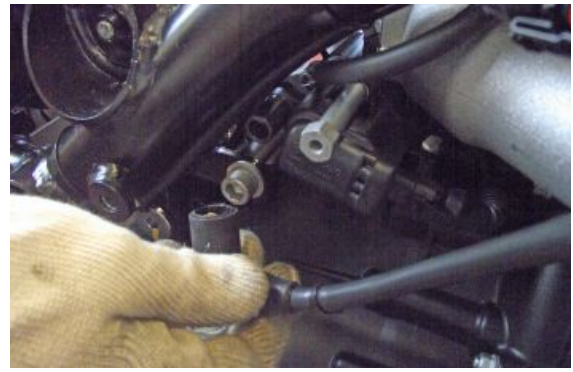


- Disconnect the ride by wire connectors.

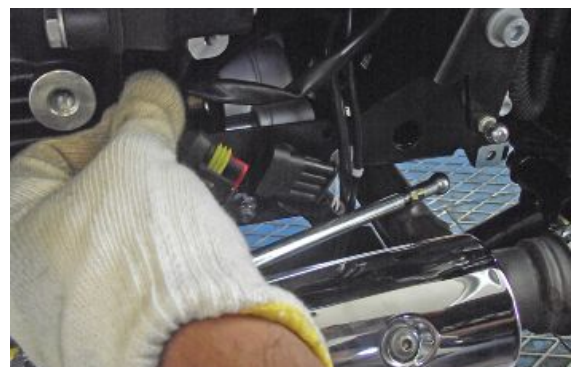


- Working from both sides, disconnect the connectors of the coils and cables of the plug caps.





- Working from both sides, disconnect the lambda probe connectors.



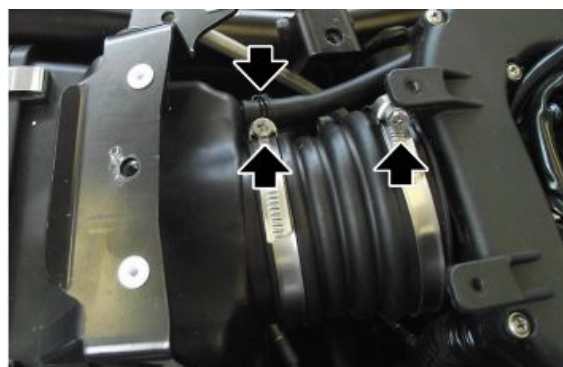
- Undo and remove the fixing screw of the oil radiator to the frame.

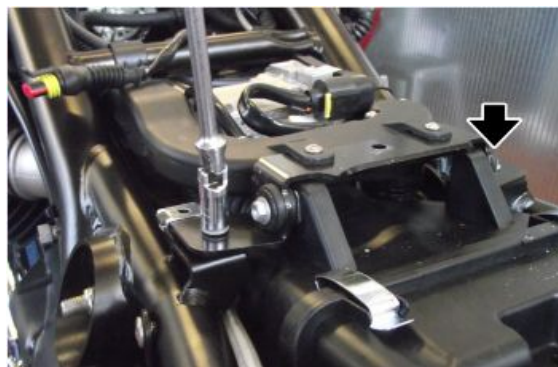


- Disconnect the two connectors located behind the oil radiator.



- Loosen the two fixing screws of the filter box and the tube shown in the figure.
- Undo the two fixing screws of the side bracket and the upper screws of the duct.
- Remove the rear of the air box and air filter.





- Remove the filter box.



- Remove the connector of the throttle body.

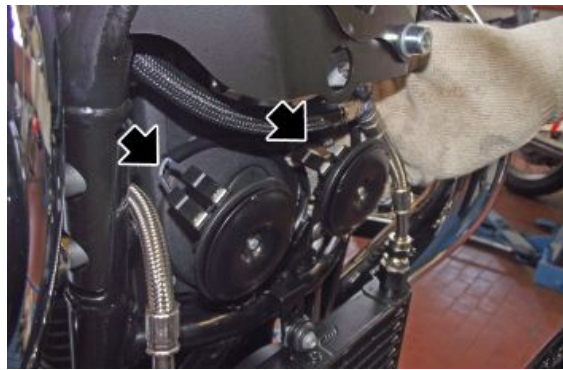


- Undo the four fixing screws and remove the throttle body.



- After disconnecting all the connectors, remove the various fixing clamps of the cables.

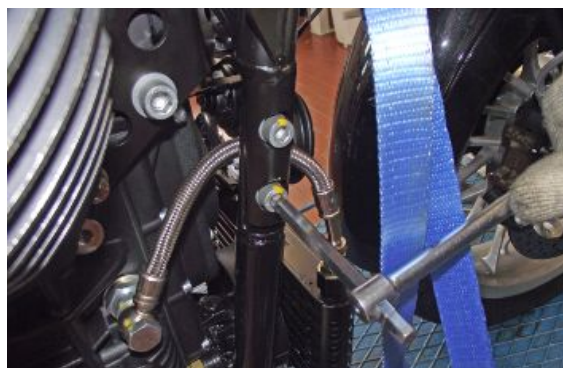
- Disconnect the horn connectors.



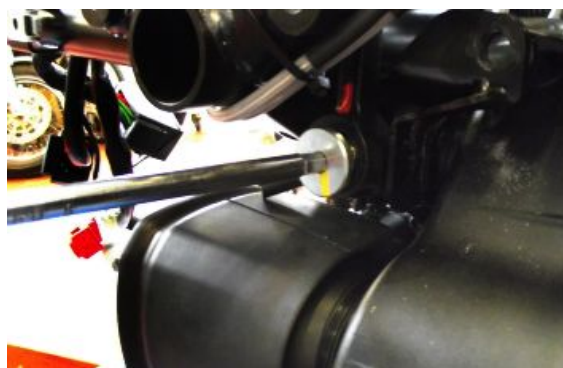
- Support the engine with suitable equipment.
- Working from both sides, remove the rear fixing screws of the cradle.

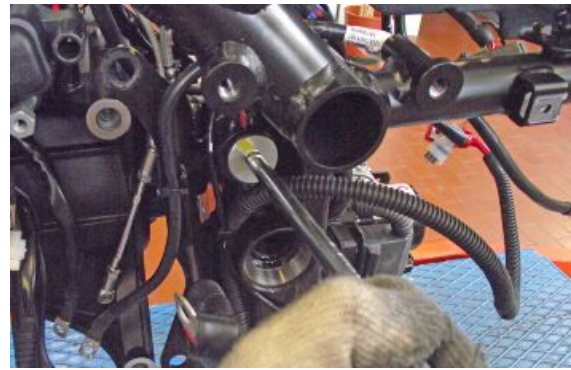


- Working from both sides, remove the front fixing screws of the cradle.

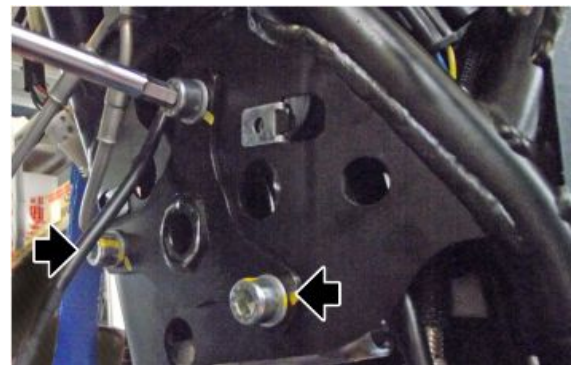


- Working from both sides undo the screws fixing the engine to the connecting rods.

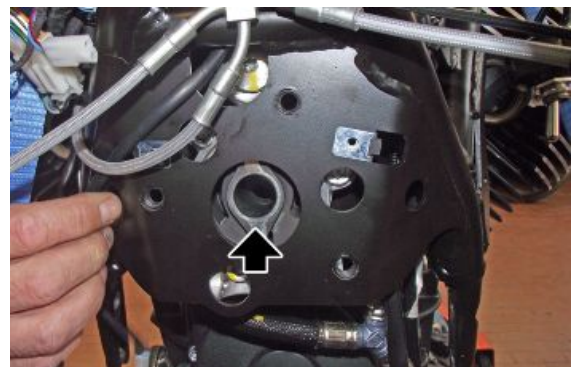




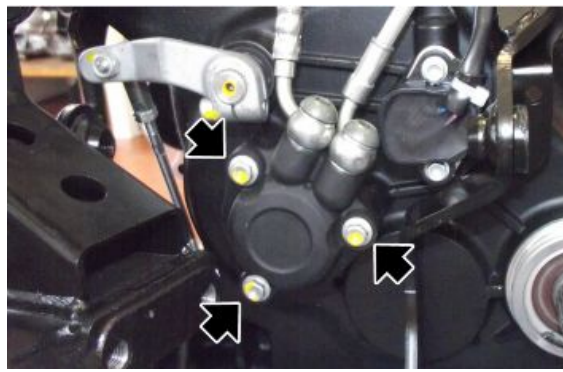
- Undo the three fixing screws of the silent block support.
- Remove the silent block.



- Unscrew the front fixing screw that secures the engine to the silent block,



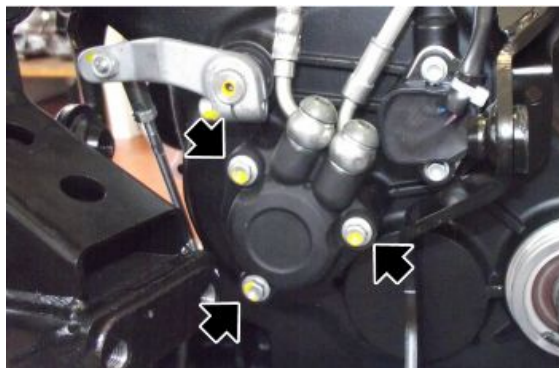
- Move the engine from the frame so as to be able to access the clutch control cylinder.
- Undo and remove the three fixing screws and move the clutch control cylinder.
- Lock the cylinder using a clamp in order to avoid the leakage of oil.
- Remove the engine from the frame.



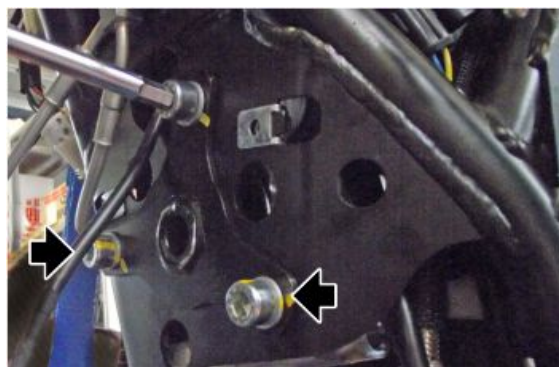
Installing the engine to the vehicle

- Place the vehicle chassis over the engine with the gear.
- From the back, secure the chassis with belts attached to 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.
- Install the clutch control cylinder by tightening the three fixing screws.

- Insert the front pin that secures the engine to the silent block.

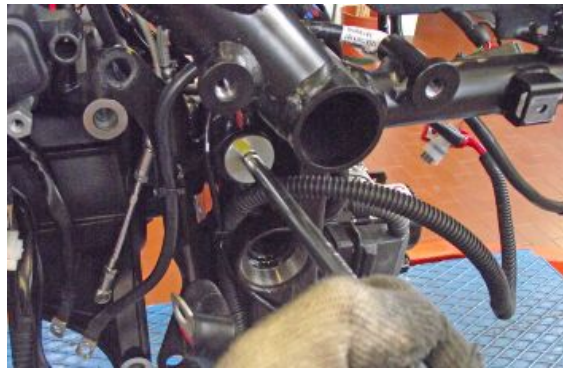


- Fix the silent block support by tightening the three fixing screws.

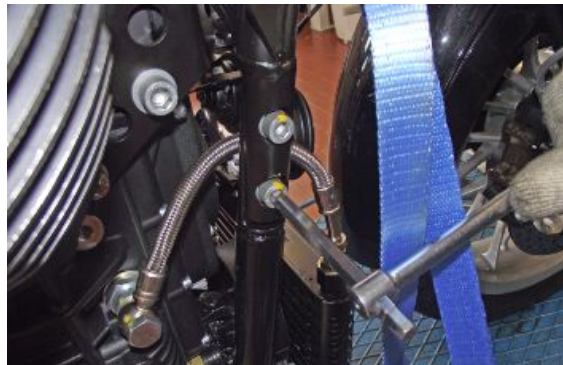


- Working from both sides, insert the engine/connecting rod fixing pins.

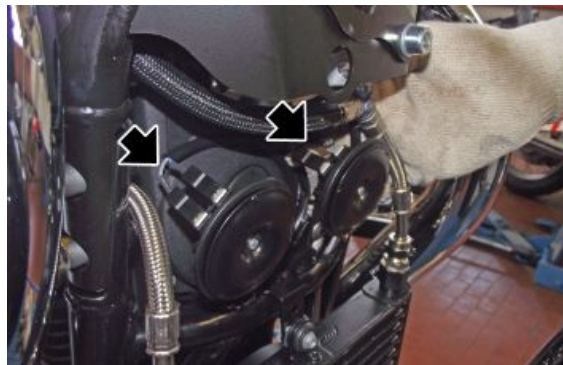




- Working from both sides, position the front and rear fixing screws of the cradle.



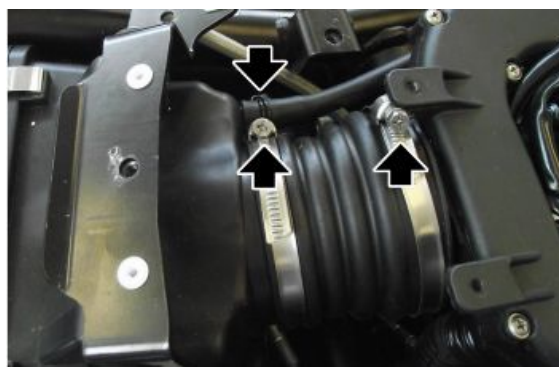
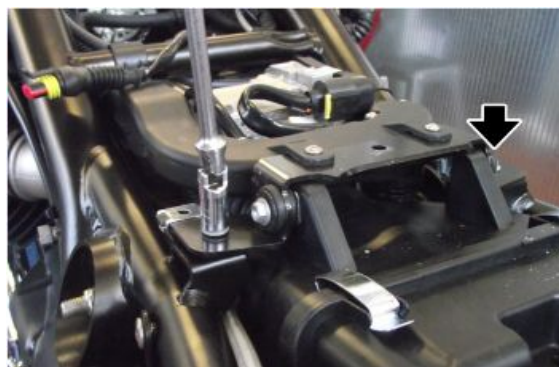
- Connect the horn connectors.



- Position throttle body and secure it using the four screws.
- Connect the connector.



- Install the air filter box.
- Secure it with the two fixing screws and the two clamps.



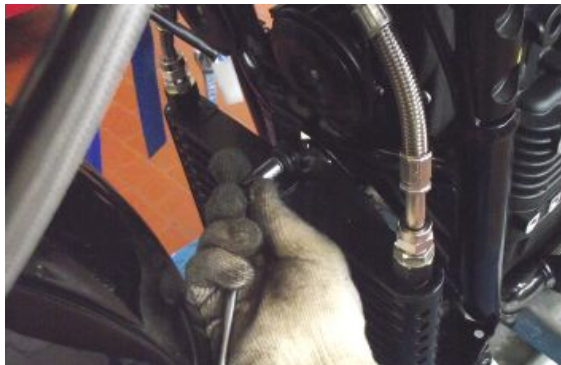
- Connect the tube as shown in the figure.



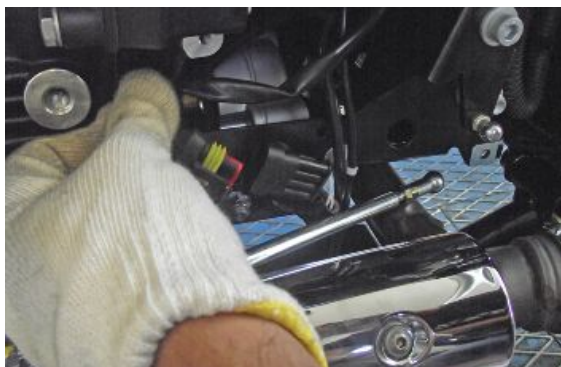
- Connect the connectors located inside the oil radiator.



- Install the oil radiator securing it with its lower joints and with the upper fixing screw.

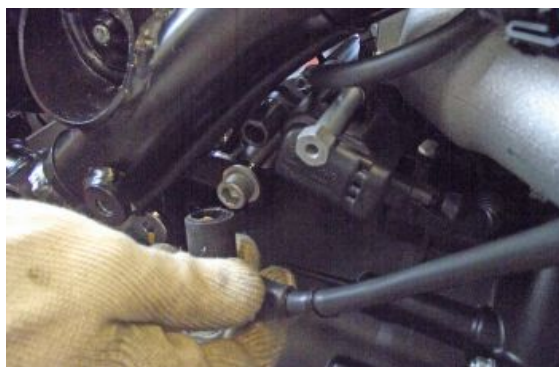


- Connect the connectors of the lambda probes.





- Connect the connectors of the coils and the cables of the plug caps.





- Connect the connectors of the ride by wire and that of the engine speed sensor.



- Connect the connectors of the engine temperature sensor and the oil pressure sensor.



- Connect the alternator.



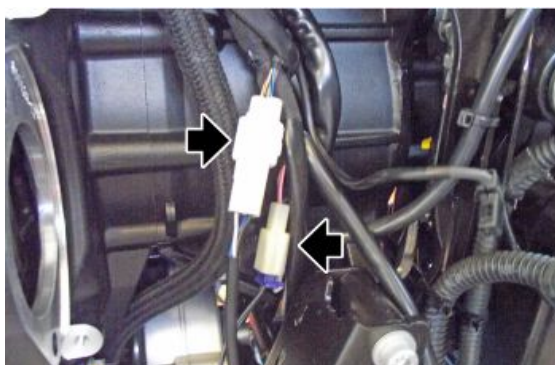
- Operating from both sides, install the injectors, tightening the fixing screw.
- Connect the connectors.



- Working from both sides, connect the engine breather tube.

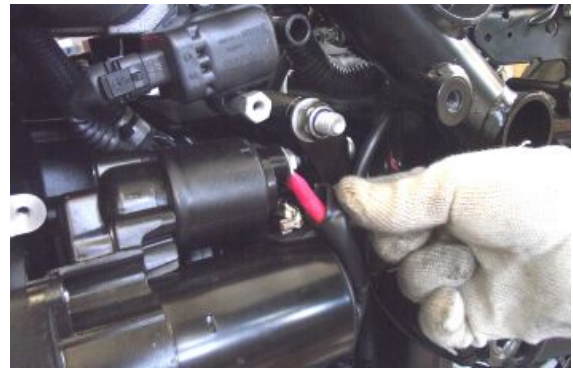


- Connect the stand sensor connector and rear stop switch.



- Connect the cable located behind the starter motor
- Install the starter motor fixing it with the two fixing screws.
- Connect the ground cable and the positive cable.



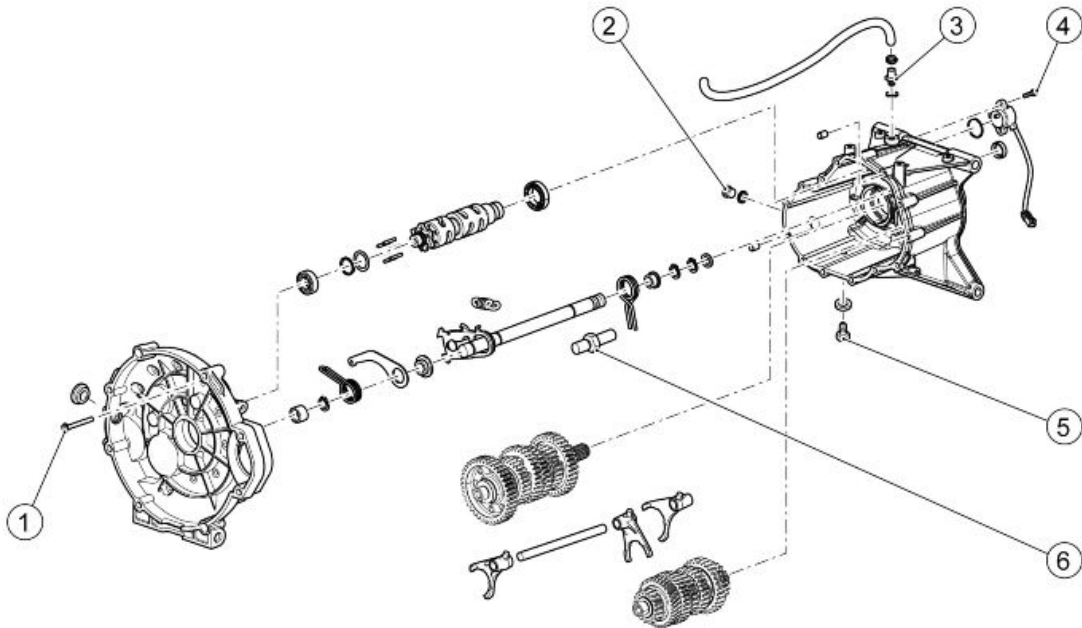


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ENGINE

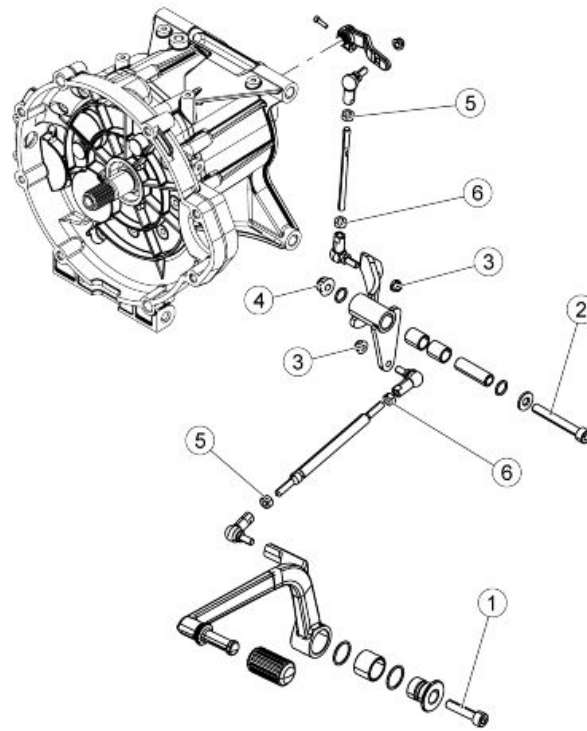
ENG

Gearbox



GEARBOX

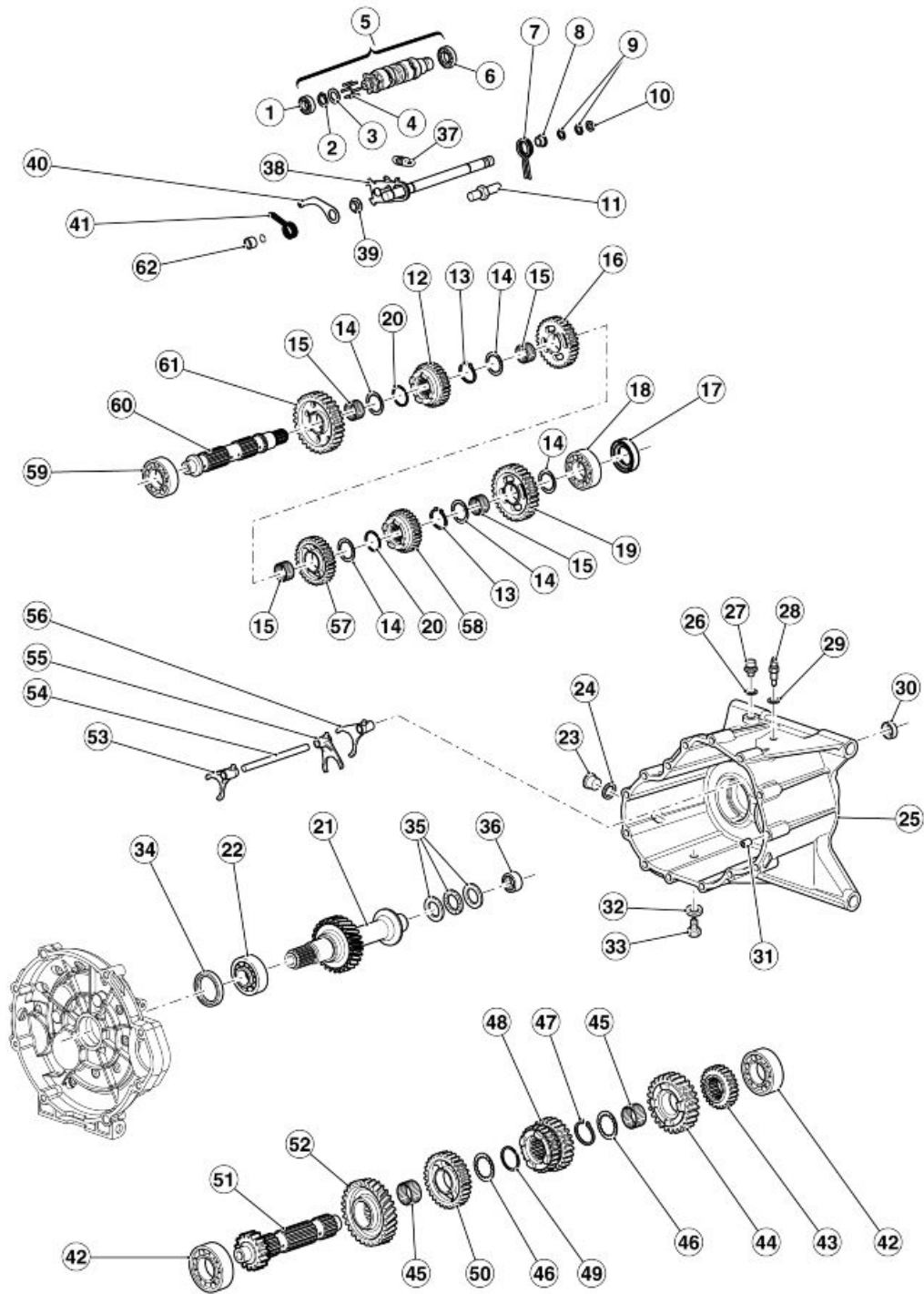
pos.	Description	Type	Quantity	Torque	Notes
1	Clutch housing to gearbox fixing screws	M6x55	14	13 Nm (9.59 lb ft)	-
2	Gearbox cap	M18x1.5	1	28 Nm (20.65 lb ft)	-
3	Breather stud bolt	M10x1.5	1	8 Nm (5.90 lb ft)	Loctite 243
4	Gear sensor fixing screw	M5x16	2	4.9 - 6 Nm (3.61 - 4.42 lb ft)	Loctite 243
5	Magnetic gearbox oil drainage cap	-	1	24 Nm (17.70 lb ft)	-
6	Spring guide pin	-	1	24 Nm (17.70 lb ft)	Loctite 243



GEAR LEVER

pos.	Description	Type	Quantity	Torque	Notes
1	Screw fixing lever to footrest support	M8x35	1	25 Nm (18.44 lb ft)	-
2	Screw fixing gearbox transmission lever to bracket	M8x60	1	25 Nm (18.44 lb ft)	-
3	Right ball joint fastening nuts	M6x1	2	10 Nm (7.38 lb ft)	-
4	Transmission lever fastening nut	M8	1	25 Nm (18.44 lb ft)	-
5	Left joint adjustment nut	M6	2	Manual	-
6	Right joint adjustment nut	M6	2	Manual	-

Diagram



key:

- 1. Ball bearing
- 2. Circlip
- 3. Thickness
- 4. Pin

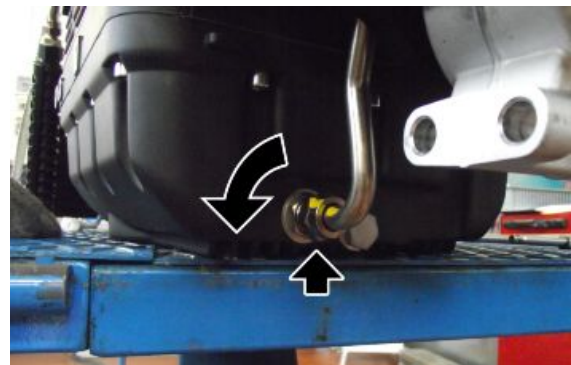
5. Complete desmodromic
6. Ball bearing
7. Spring
8. Spacer
9. Circlip
10. Fifth wheel
11. Linking pin
12. Gear
13. Circlip
14. Thrust washer
15. Roller cage
16. Gear
17. Seal ring
18. Ball bearing
19. Gear
20. Circlip
21. Clutch shaft
22. Ball bearing
23. Oil plug
24. Washer
25. Gearbox
26. Aluminium washer
27. Breather cap
28. Neutral sensor
29. Gasket
30. Seal ring
31. Bushing
32. Gasket
33. Oil drainage plug
34. Seal 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. Roller cage
- 46. Thrust washer
- 47. Circlip
- 48. Gear
- 49. Circlip
- 50. Gear
- 51. Primary 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

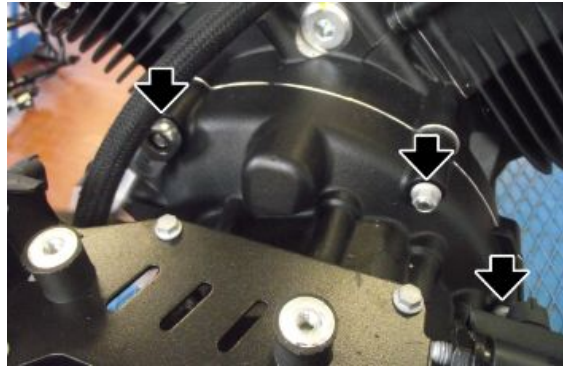
Gearbox

Removing the gearbox

- Remove the starter motor in engine removal phase
- Make sure the transmission is in neutral gear
- Loosen and turn the oil pipe joint on the sump.



- Unscrew and remove the three screws



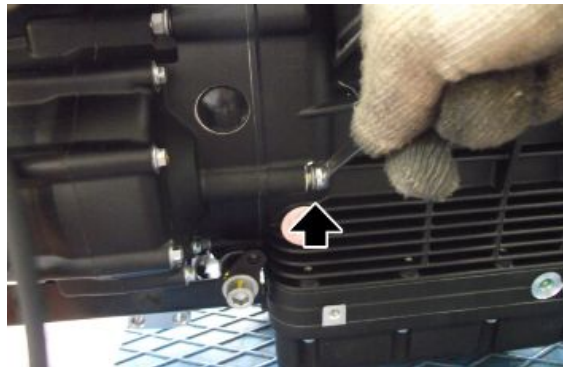
See also

[Removing the starter motor](#)
[Replacement](#)

- Unscrew and remove the two lower screws



- Unscrew and remove the screw



- Remove the gearbox.

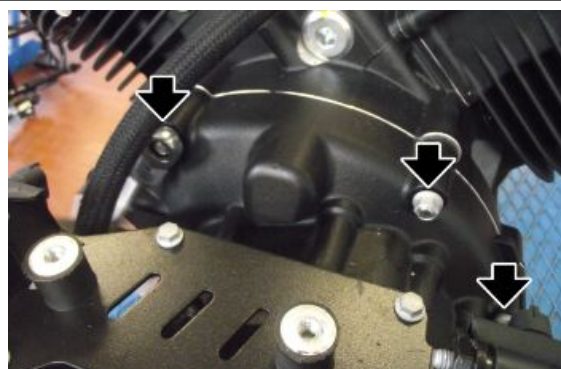


Installing the gearbox

- Position the gearbox



- Tighten the three upper nuts



- Tighten the two lower nuts



- Tighten the side nut



Gearbox shafts

Disassembling the gearbox

- Remove the gearbox.



- Undo the two screws and remove the gear sensor.



- 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**

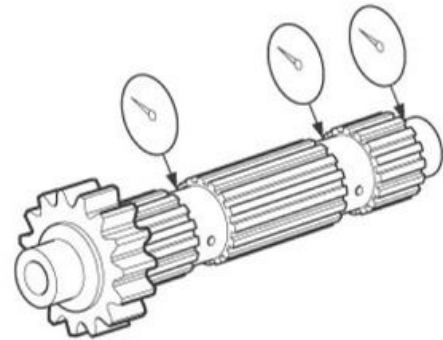
[Disassembling the gearbox](#)

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)



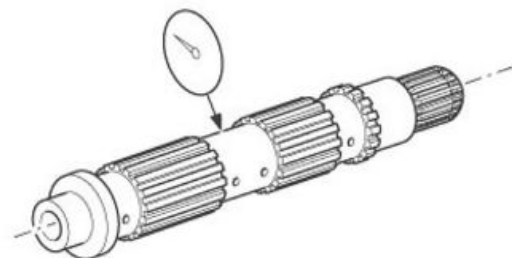
Check transmission gears for signs of pitting and wear and replace damaged gears if necessary. Check the gear fitting teeth for cracks, damage and wear and replace those damaged if necessary. Check the transmission gears movement and, if it is not regular, replace the damaged part.

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 control rod 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.

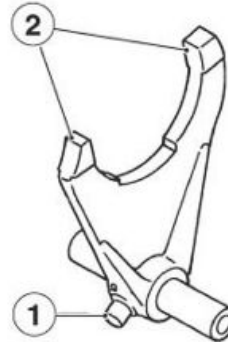


Checking the forks

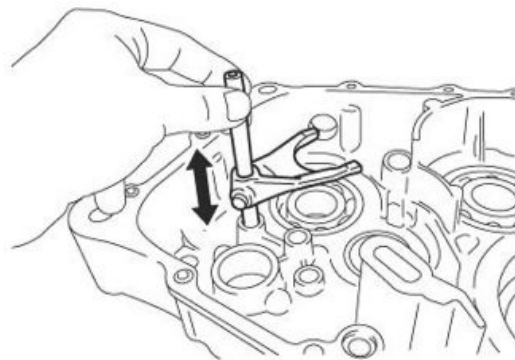
NOTE

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 gearbox.



- 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

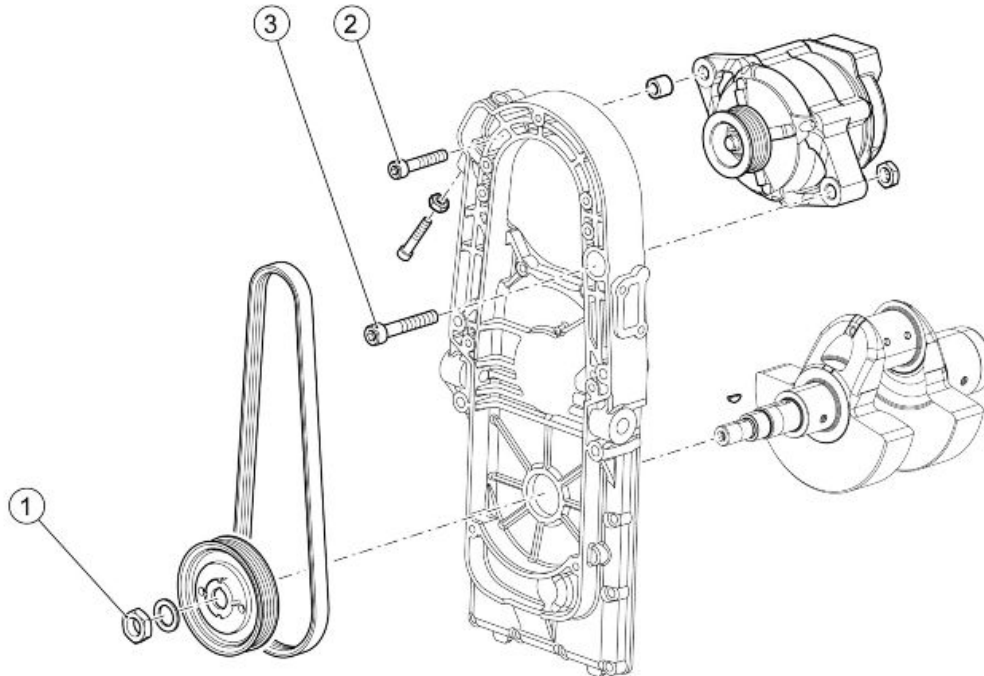
CLUTCH CONTROL ROD SELECTION

Specification	Desc./Quantity
Protrusion: 9.8 - 11.2 mm (0.386 - 0.441 in)	Clutch control rod length = 183 mm (7.205 in)
Protrusion: 9 - 9.7 mm (0.354 - 0.382 in)	Clutch control rod length = 184.5 mm (7.264 in)
Protrusion: 8.25 - 8.95 mm (0.325 - 0.352 in)	Clutch control rod length = 185 mm (7.283 in)
Protrusion: 7.5 - 8.2 mm (0.295 - 0.323 in)	Clutch control rod length = 185.5 mm (7.303 in)
Protrusion: 6.75 - 7.45 mm (0.266 - 0.293 in)	Clutch control rod length = 186 mm (7.323 in)
Protrusion: 5.3 - 6.7 mm (0.209 - 0.264 in)	Clutch control rod length = 187.5 mm (7.382 in)

See also

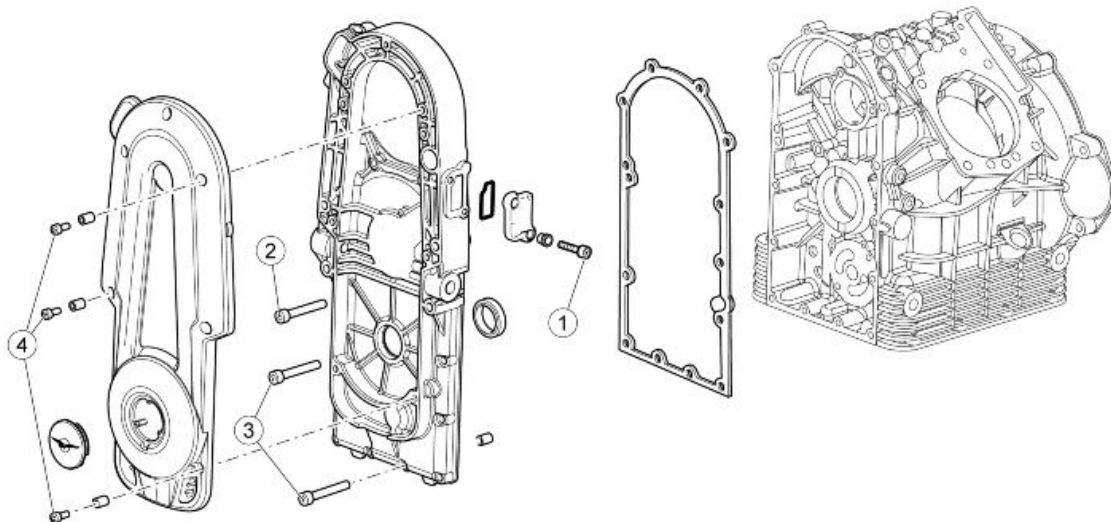
Disassembling the gearbox

Generator



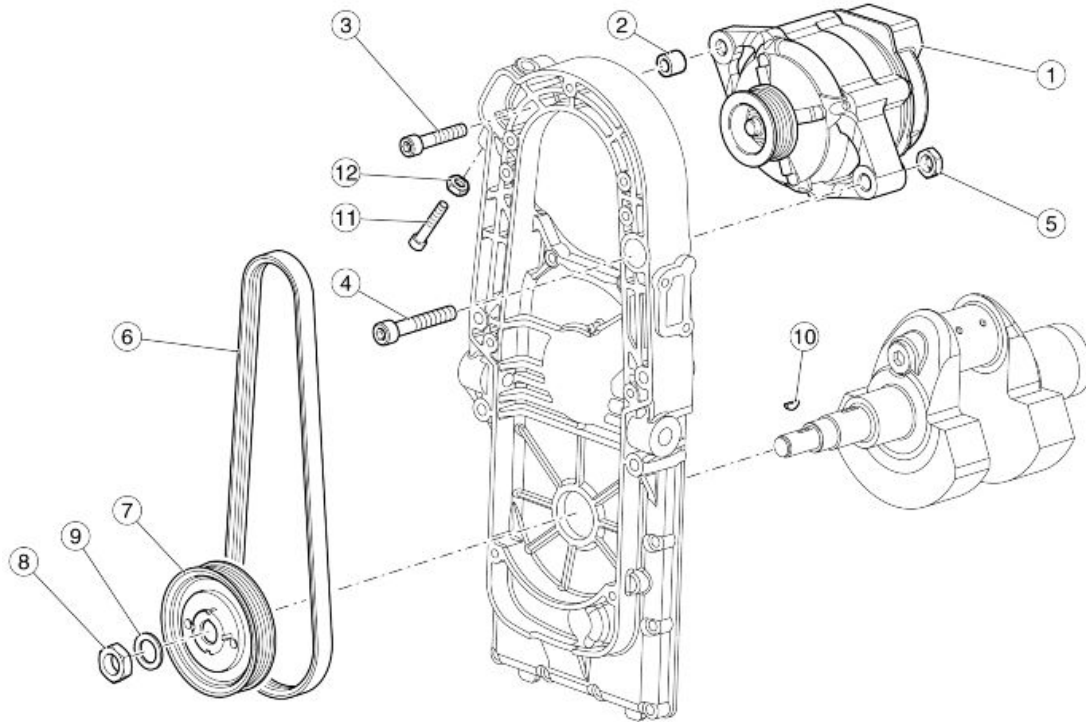
ALTERNATOR

pos.	Description	Type	Quantity	Torque	Notes
1	Generator control pulley locking nut	M16	1	100 Nm (73.76 lb ft)	Loctite 243
2	Generator upper fixing screw	M8	1	22 Nm (16.23 lb ft)	-
3	Generator lower fixing screw	M10x60	1	30 Nm (22.13 lb ft)	-



GENERATOR COVER

pos.	Description	Type	Quantity	Torque	Notes
1	Timing system cover cap fixing screw	M6x20	2	10 Nm (7.38 lb ft)	Loctite 243
2	Timing system cover fixing screw	M8x55	4	25 Nm (18.44 lb ft)	-
3	Timing system cover fixing screw	M6x30	9	10 ÷ 12 Nm (7.38 ÷ 8.85 lb ft)	-
4	Generator cover fixing screw	M6x16	6	10 ÷ 12 Nm (7.38 ÷ 8.85 lb ft)	-



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

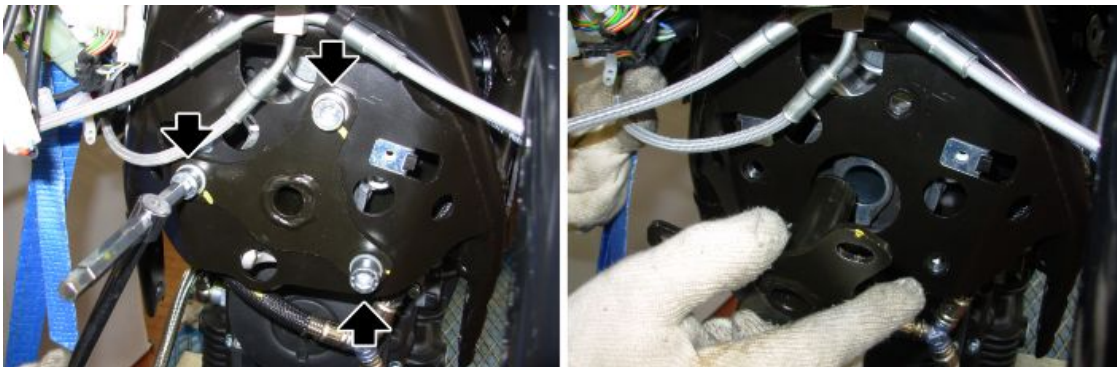
Tensioning the belt

Before being able to start the belt tightening operation it is necessary to remove some components of the motorcycle, including the following in sequence:

- Saddle removal;
- Battery removal;
- Removal of steering column fairings;
- Removal of tank cap cover;
- Tank removal;
- Removal of side fairings;
- Removal of silencers;
- Removal of starter motor cover;
- Removal of exhaust pipe;
- Loosen the oil radiator to be able to remove the cradle;
- Remove the left coil;
- Remove the right side light switch connectors box;

Proceed with the following operations:

- Remove the fixing screws of the silent block support bracket and remove it;



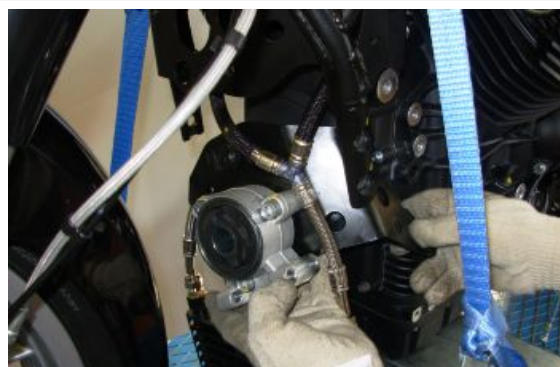
- Remove the front bracket fixing screw from the engine support connecting rod.



- Remove the four screws that fix the front bracket.



- Remove the front bracket with silent block from the lower part paying attention not to damage the alternator cover.



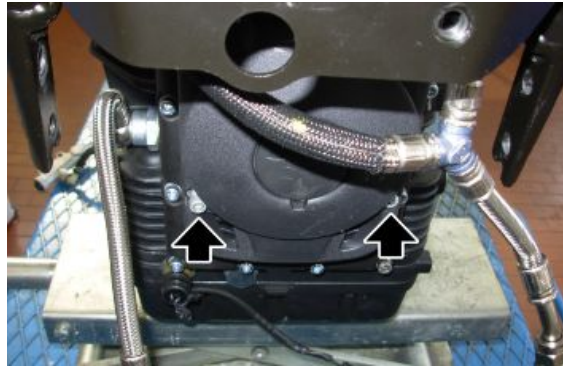
- Remove the three upper screws of the alternator cover.



- Remove the central screws of the alternator cover.



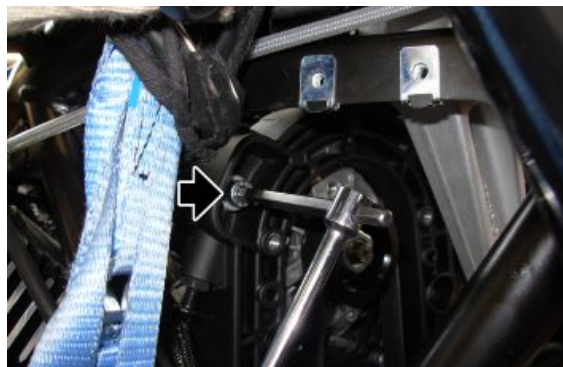
- Remove the lower screws of the alternator cover.



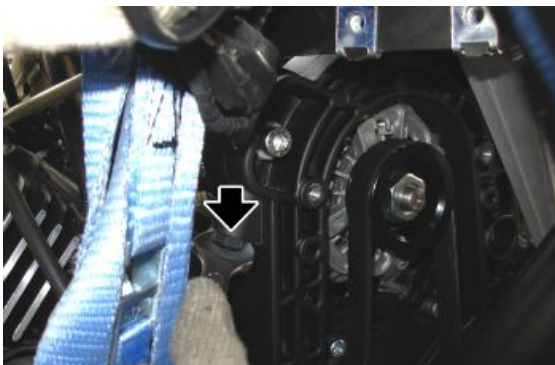
- Remove the alternator cover by pulling it off from the lower part, paying attention not to damage it.



- Loosen the screw.



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



- Position the wrench on the specific belt tensioning tool and then apply it entirely on the engine to properly tension the belt.

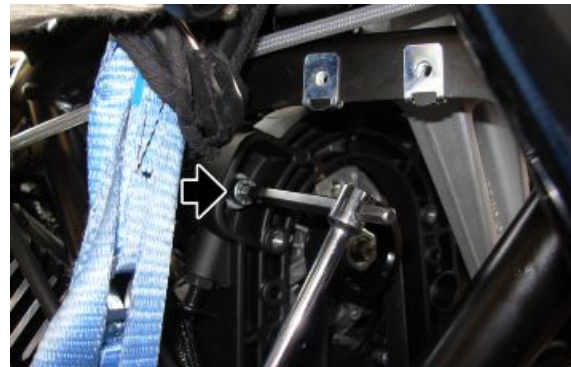
Specific tooling

020677Y Generator belt tensioner, lever for belt tensioning

- Tighten the belt to a torque of 50 Nm (36.88 lb ft).
- Tighten the adjuster and tighten the locknut.

Removing the generator

- Remove the screw.



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



- Remove the belt and the alternator with pulley.



Installing the generator

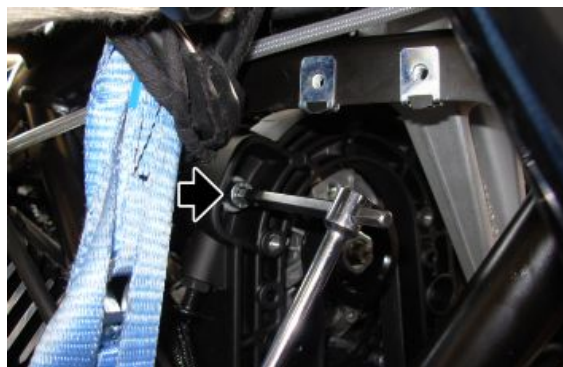
- Insert the alternator as shown in the figure



- After correctly inserting the belt, on the pulleys tighten the screw with the relative nut



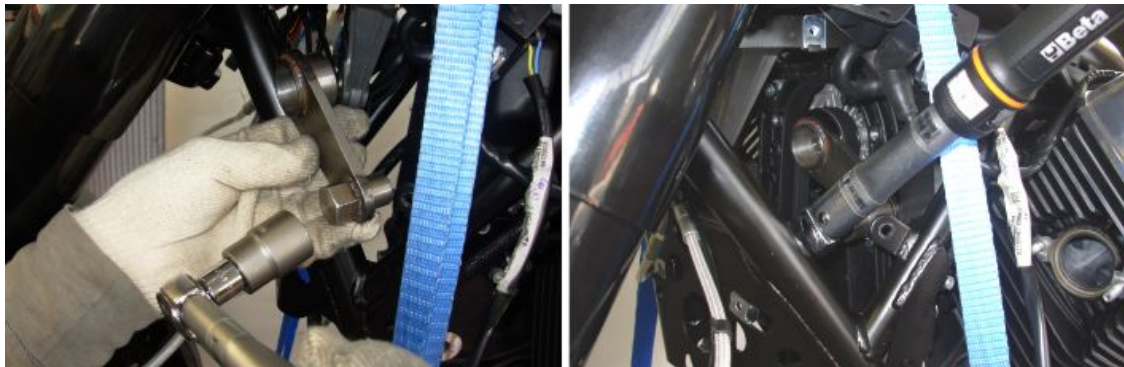
- Position the screw and pre-tighten it.



- 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

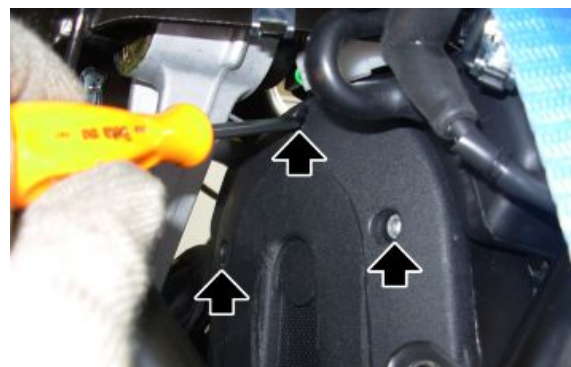
020677Y Generator belt tensioner, lever for belt tensioning



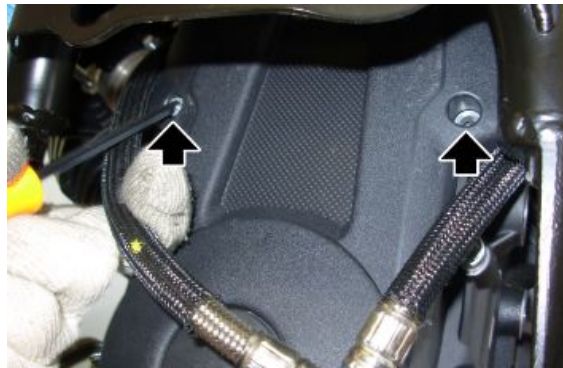
- Tighten the alternator fixing screws.
- Insert the alternator cover from below taking care not to scratch it as shown in the figure



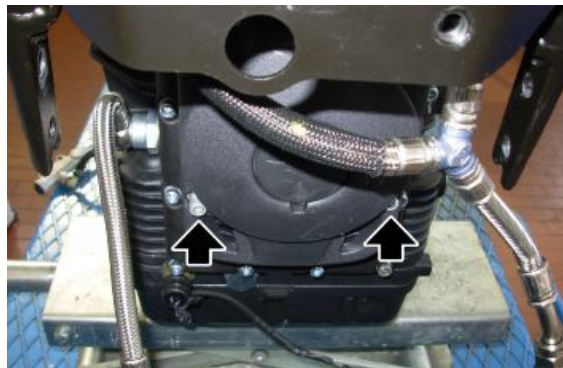
- Insert the upper screws



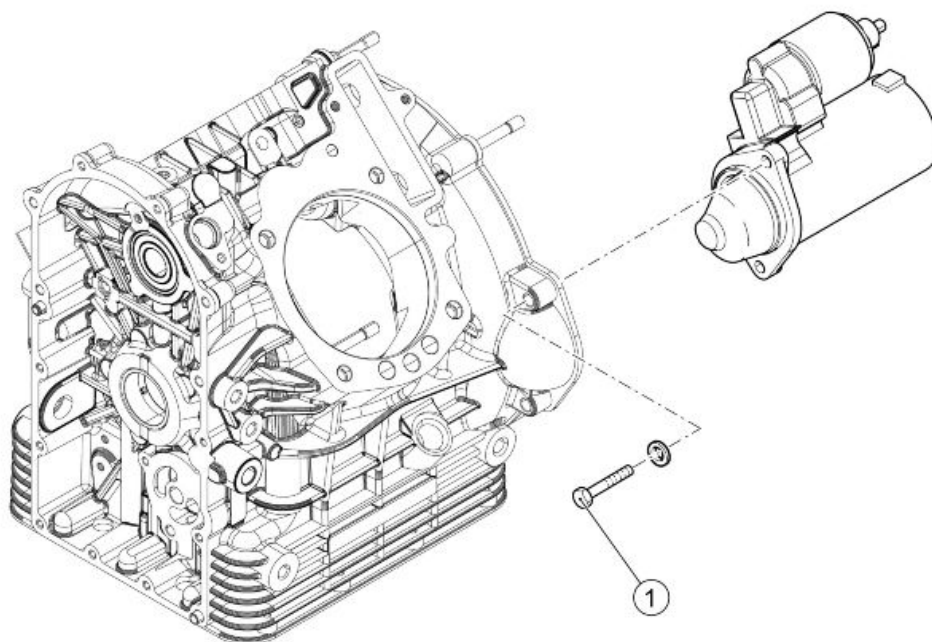
- Insert the central screws



- Insert the lower screws
- Tighten all the screws of the cover



Starter motor



STARTER MOTOR

pos.	Description	Type	Quantity	Torque	Notes
1	Starter motor fixing screws	M8x75	2	25 Nm (18.44 lb ft)	-

Removing the starter motor

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

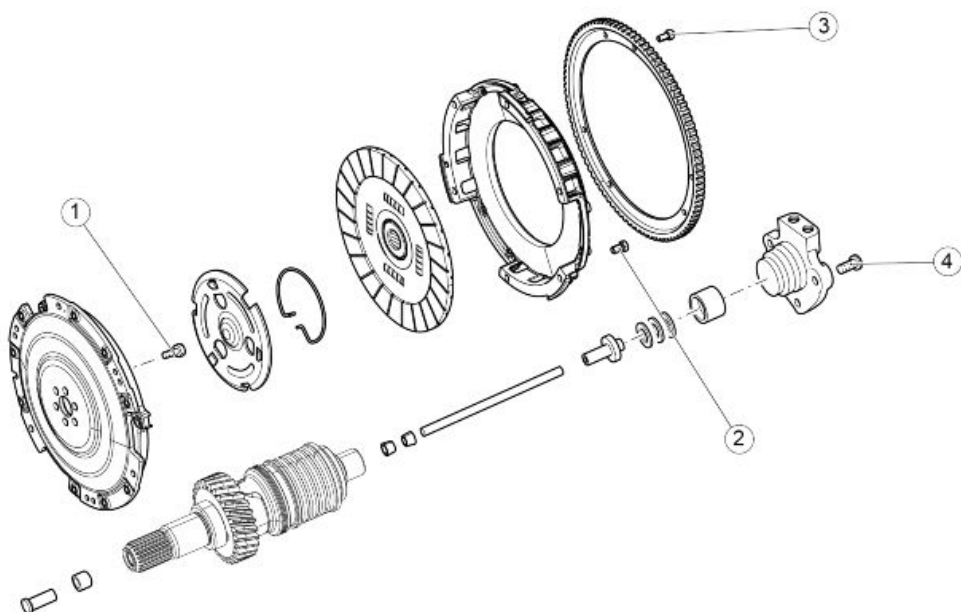


- Slide off the starter motor.



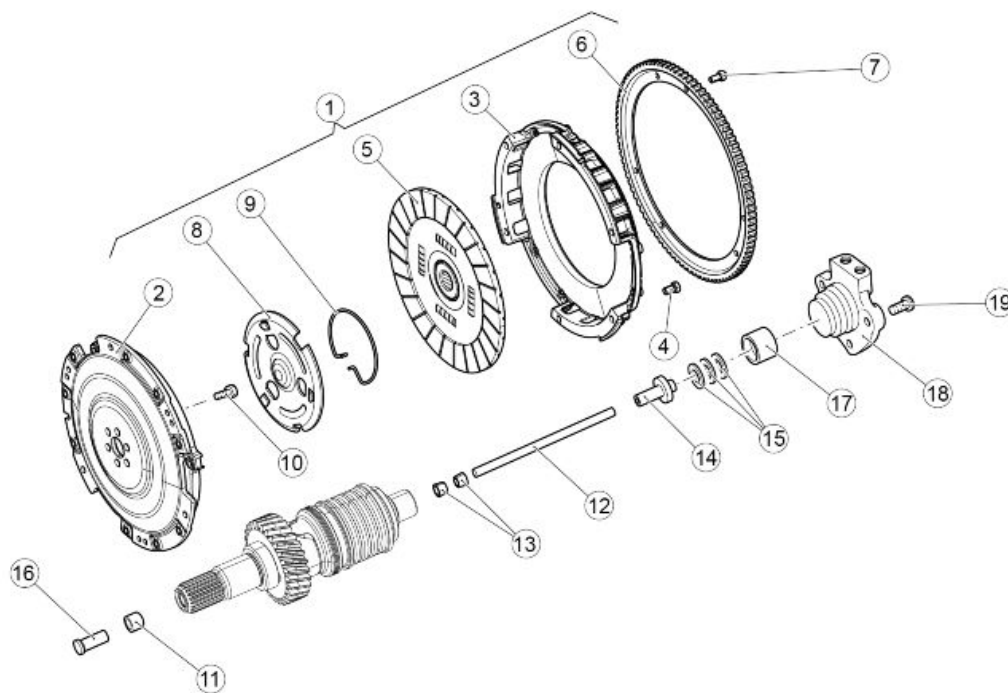
Clutch side

Disassembling the clutch



CLUTCH

pos.	Description	Type	Quantity	Torque	Notes
1	Flywheel on crankshaft fixing screw	M8x25	6	42 Nm (30.98 lb ft)	Loctite 243
2	Clutch external flange fixing screw on flywheel	M7x16	6	20 Nm (14.75 lb ft)	Loctite 243
3	Start-up crown fixing screw on flywheel	M6x12	6	10 Nm (7.37 lb ft)	-
4	Clutch control cylinder fixing screw	-	3	10 Nm (7.37 lb ft)	Loctite 243

**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. Bushing
12. Rod
13. Bushing
14. Intermediate body
15. Thrust bearing
16. Clutch control bowl

17.Thrust cylinder

18.Clutch control cylinder

19.TE flanged screw

- Remove the complete gearbox.
- Undo and remove the six screws (1).
- Remove the start-up crown gear.



- Remove the clutch bell and the friction disc by undoing the six screws (2).



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



- Unscrew and remove the six screws.
- Remove the clutch plate.

CAUTION

DURING REMOVAL/FITTING OF THE SCREWS DO NOT USE WASHERS IF PREVIOUSLY INSTALLED.

**See also**

[Removing the gearbox](#)

Checking the clutch actuator

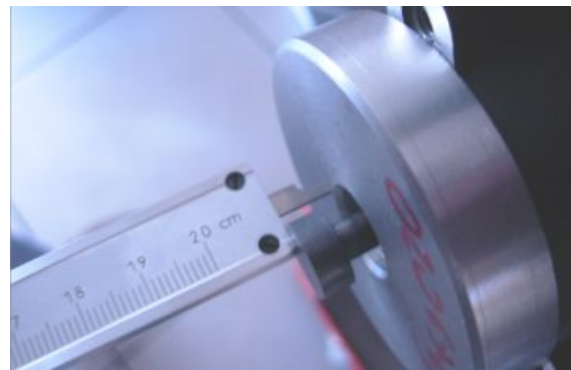
If the clutch is replaced, measure the length of the clutch control rod in order to use the correct rod.

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 = 183 mm (7.205 in)
Protrusion: 9 - 9.7 mm (0.354 - 0.382 in)	Clutch control rod length = 184.5 mm (7.264 in)
Protrusion: 8.25 - 8.95 mm (0.325 - 0.352 in)	Clutch control rod length = 185 mm (7.283 in)
Protrusion: 7.5 - 8.2 mm (0.295 - 0.323 in)	Clutch control rod length = 185.5 mm (7.303 in)
Protrusion: 6.75 - 7.45 mm (0.266 - 0.293 in)	Clutch control rod length = 186 mm (7.323 in)
Protrusion: 5.3 - 6.7 mm (0.209 - 0.264 in)	Clutch control rod length = 187.5 mm (7.382 in)

Assembling the clutch

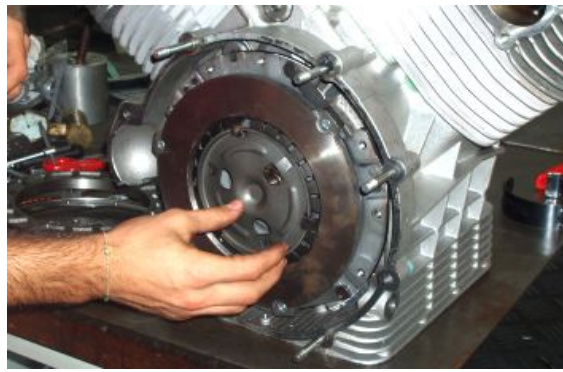
- Lock crankshaft rotation with the crankpin facing upwards.
- Place the clutch plate with the reference facing upwards.
- Fasten the clutch plate on the crankshaft with the six screws with Loctite 243.



CAUTION

DURING REMOVAL/FITTING OF THE SCREWS DO NOT USE WASHERS IF PREVIOUSLY INSTALLED.

- 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**

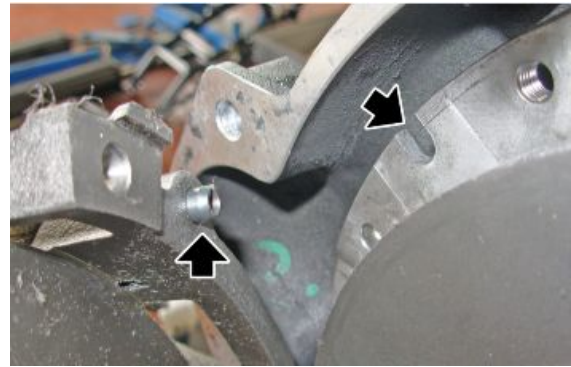
- Once the centring tool is fitted, lock the plate with the snap ring.
- Undo and remove the two screws fixing the tool.
- Remove the special tool.



- Place the friction disc; centre it.



- Insert the friction disc in the cap by matching the centring with the slot in the cap.



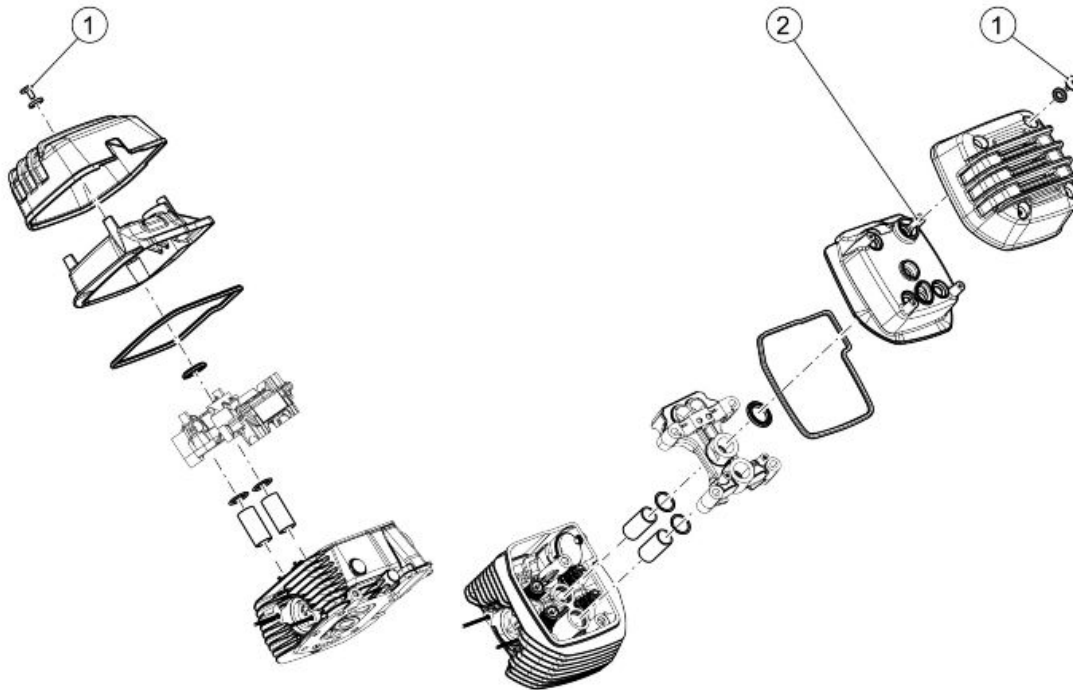
- Fit the clutch bell.



- Place the starter sprocket.
- Tighten the six screws to the prescribed torque operating diagonally and in stages.

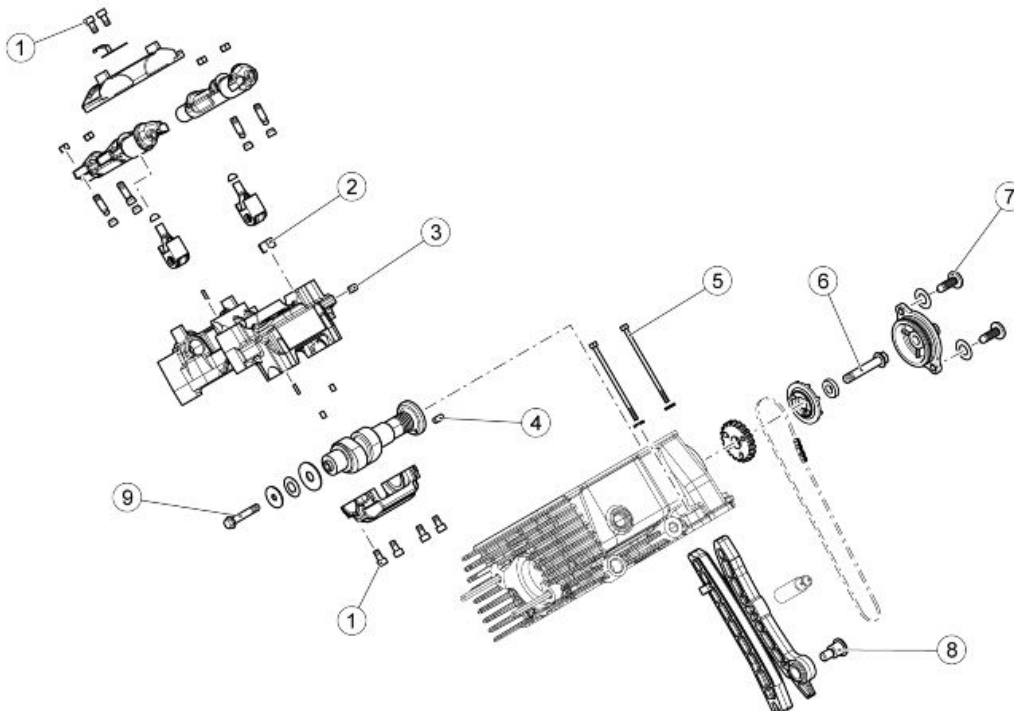


Heads



CYLINDER HEAD COVERS

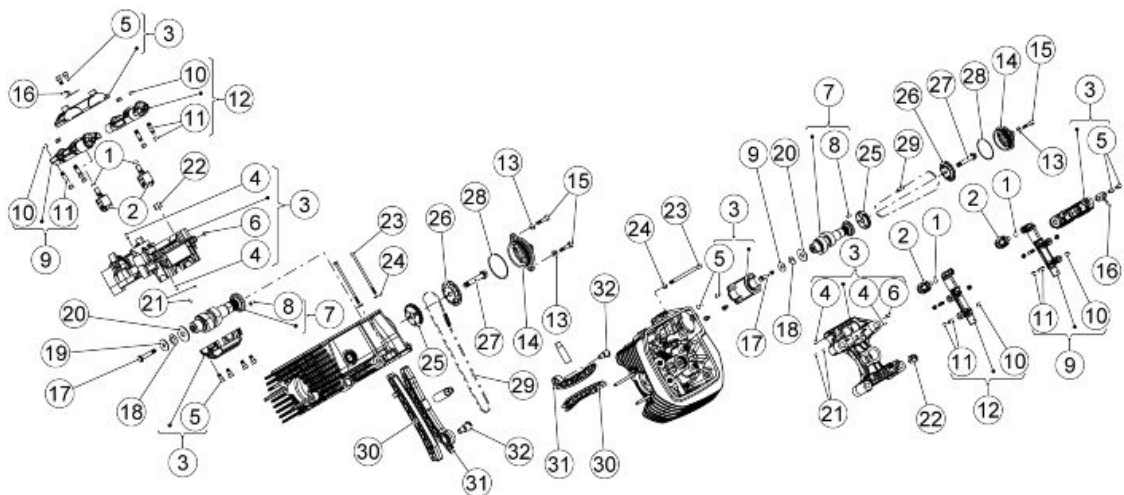
pos.	Description	Type	Quantity	Torque	Notes
1	Special aesthetic head cover fixing screw	-	8	8 Nm (5.90 lb ft)	Locked with cross sequence
2	Special head cover screw	-	8	8 Nm (5.90 lb ft)	Locked with cross sequence



CYLINDERS TIMING

pos.	Description	Type	Quantity	Torque	Notes
1	Camshaft / rocker support fixing screws	M8x30	12	16 - 18 Nm (11.80 - 13.28 lb ft)	-
2	Nut for tie rod	M10x1.25	8	Pretorque 15 Nm (11.06 lb ft) Final torque 42 Nm (30.98 lb ft)	-
3	Cap	M6x10	2	10 - 12 Nm (7.37 - 8.50 lb ft)	Loctite 542
4	Reference dowel on camshaft	-	1	Interference insert	Loctite 542
5	Long screw for chain compartment on head	M6x120	4	10 Nm (7.37 lb ft)	-
6	Screws for sprocket timing on camshaft	M8x1	2	30 Nm (22.13 lb ft)	Loctite 243
7	Screws for blow-by cap on head	M5x16	4	6 - 8 Nm (4.42 - 5.90 lb ft)	-
8	Chain tensioner rod spacer screws	M8x24.5	2	20 Nm (14.75 lb ft)	-
9	Cup spring to camshaft fixing screws	M6x25	2	11 - 13 Nm (8.11 - 9.59 lb ft)	-

Head and timing



key:

- 1. Pad
- 2. Hydraulic tappet
- 3. Right rocker axle support
- 4. Pin D. 2.5
- 5. Screw M8x30
- 6. Threaded cap M6x10
- 7. Camshaft
- 8. Pin

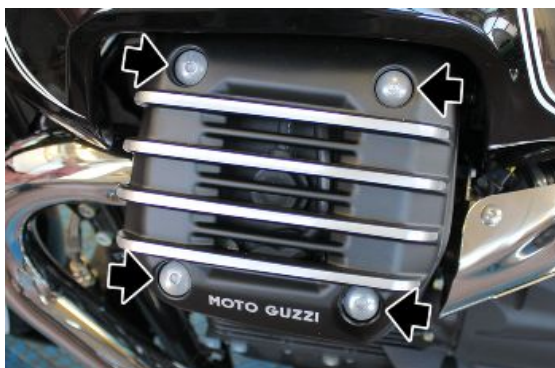
9. Intake and exhaust com. rockers
10. Rocker adjustment nut
11. Adjustment screw
12. Intake and exhaust com. rockers
13. 5.3x10x0.5 spring washer
14. Complete breather cover
15. Screw
16. Plate
17. TE flanged screw M6x25
18. Cup spring
19. Shim washer
20. Shim washer
21. Roller
22. Nut M10x1.25 6H
23. Flanged screw M6x120
24. Flat washer 12x6.1x2
25. Timing system gear
26. Breather plate
27. Flanged screw
28. Seal ring 2.62x46.52
29. Timing chain
30. Chain guide slider
31. Chain tensioner pad
32. Spacer screw M8

Removing the head cover

NOTE

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

- Remove the cover of the head by undoing the four fixing screws.



- Disconnect the two spark plug caps.

CAUTION



BE CAREFUL NOT TO INVERT TWO SPARK PLUG CAPS.

- Unscrew and remove the four head cover fixing screws and collect the sealing O-rings.



- Remove the head cover together with the gaskets.



- Remove the two spark plugs.



Removing the cylinder head

- Unscrew and remove the two fixing screws in the points in the figure.



- Remove the blow-by spout.



- Undo the external fixing screws of the head.

CAUTION



PAY ATTENTION WHEN MOUNTING TO THE SCREW INDICATED ON THE RIGHT CYLINDER BECAUSE IT IS THE ONLY ONE WITH DUAL SPACERS.



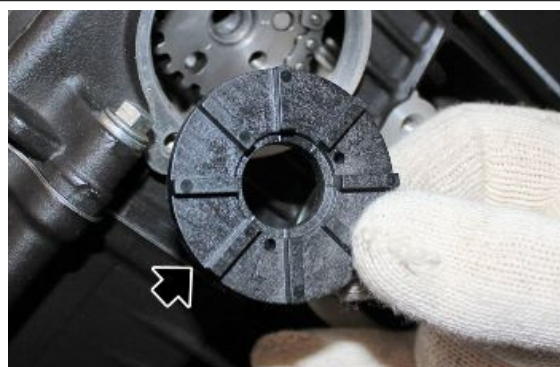
- Undo and remove the centrifugal separator fixing screw.



- Remove the spacer.



- Remove the centrifugal separator.



- Discharge the left chain tensioner from the oil pressure undoing the screw shown.



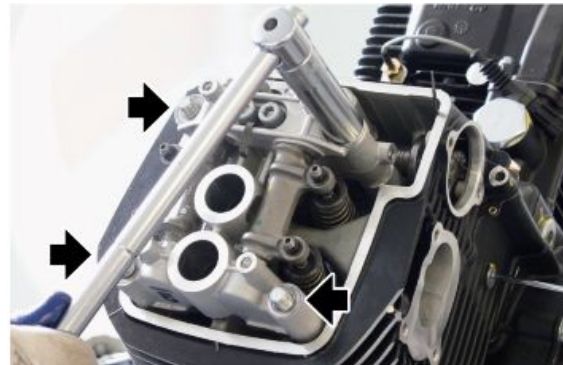
- With the help of a screwdriver act on the chain tensioner slider so as to discharge the thrust of the tensioner and simultaneously insert a pin in said hole so as to block the return.



- Remove the crown of the timing system thus releasing the camshaft.



- Undo the nuts securing the cam tower and the head unit.
- Remove the complete head of the cam tower timing system.



- Undo the fixing screws of the rocker bridge



- Remove the rocker bridge.



- Remove the rockers.



- Use the screws as shown in the figure to extract the cam tower.



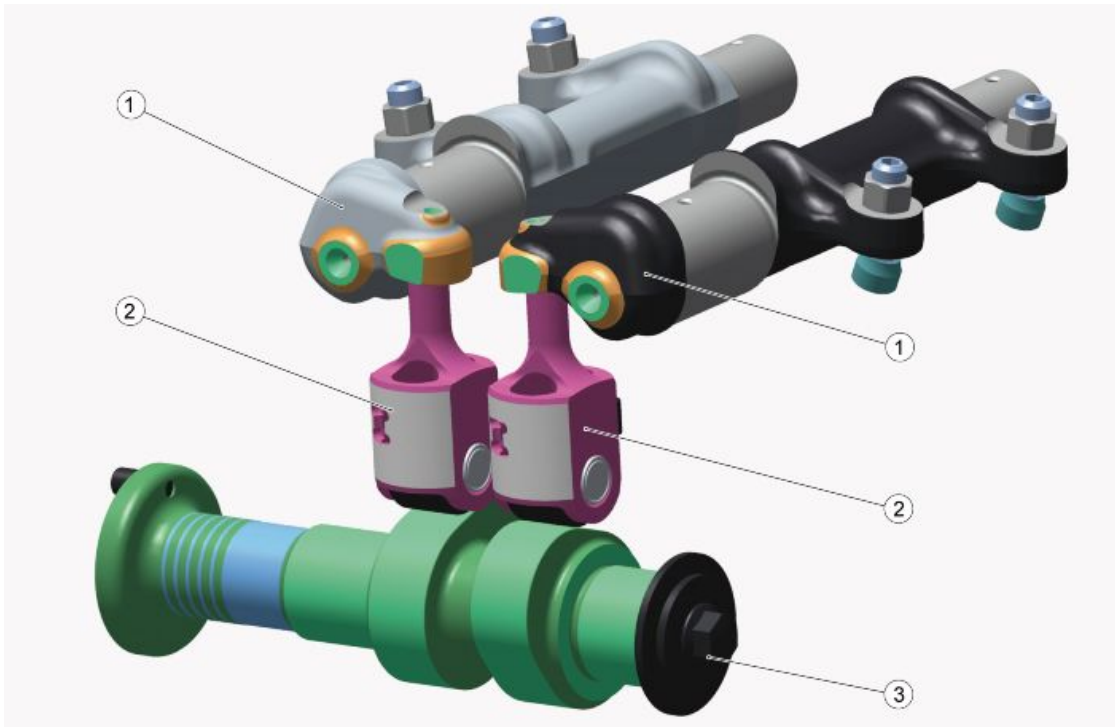
- Remove the timing system cam tower complete with the camshaft.



See also

[Removing the head cover](#)

Cylinder head



key:

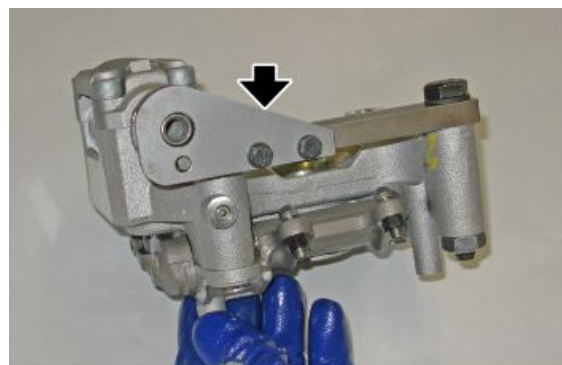
1. Rockers.
2. Hydraulic tappets with rollers.
3. Camshaft.

Removing the overhead camshaft

- Using the special tool hold the camshaft.

Specific tooling

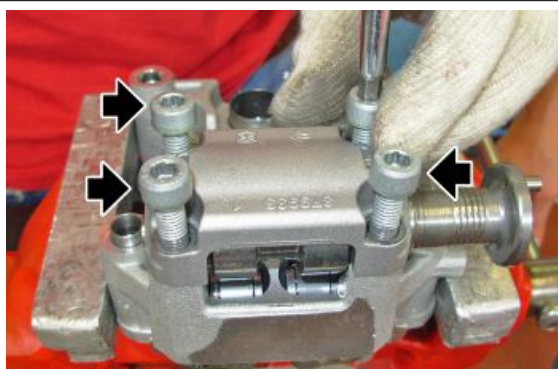
020953Y Cam shaft lock for fixing



- Unscrew and remove the camshaft fixing screw.



- Undo and remove the four fixing screws of the cover of the seat of the cam shaft.



- Remove the camshaft from its seat.



- Remove the hydraulic tappets with rollers from their seats.

**See also**

[Removing the rocker arms](#)

Removing the rocker arms

- Undo the fixing screws of the rocker bridge



- Remove the rocker bridge.



- Remove the rockers.



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.

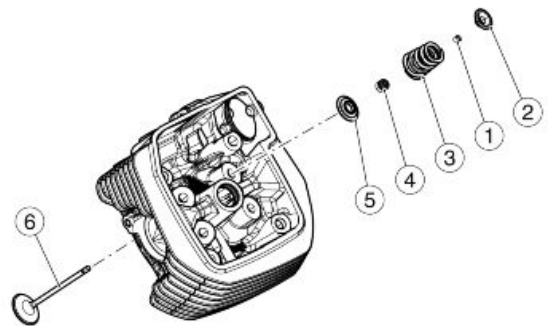
Specific tooling

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 approximately 60°C (140°F).
- Lubricate the valve guide.
- Fit the circlips.
- Press a punch with the valve guides.

- 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)

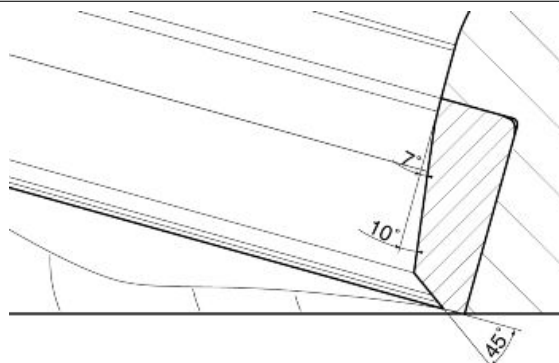
Specification	Desc./Quantity
Valve guide inside diameter	5.0 - 5.012 mm (0.19685 - 0.19732 in)
Valve stem diameter	4.960 - 4.975 mm (0.19527 - 0.19587 in)
Fitting clearance	0.025 - 0.052 mm (0.00098 - 0.00205 in)

Checking the cylinder head

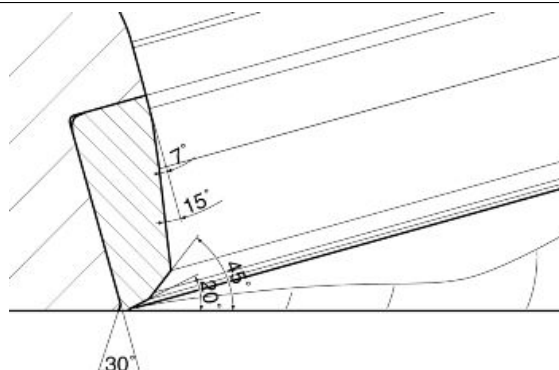
Check that:

- The planes of contact with the cover and with the cylinder are not scored or damaged so as to compromise a perfect seal.
- Check that the clearance between the valve guide holes and valve stanchions is within the prescribed limits.
- Check the status of the valve seats.

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.

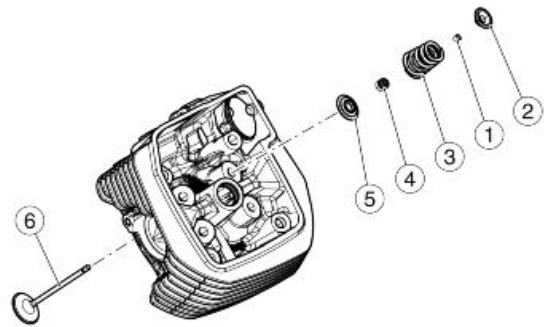
- Replace the head in case of excessive wear or damage.

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

- Insert the roller hydraulic tappets.
- Fit the camshaft

- Place the half spheres (1) into the appropriate seats (2) of the rocker.



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



- Position the U-bolt on the rockers.
- Position the ground plate and tighten the two screws.

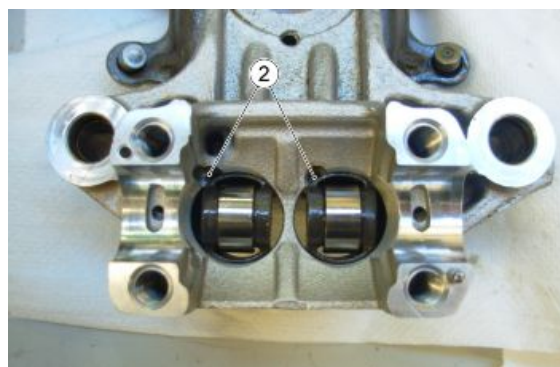
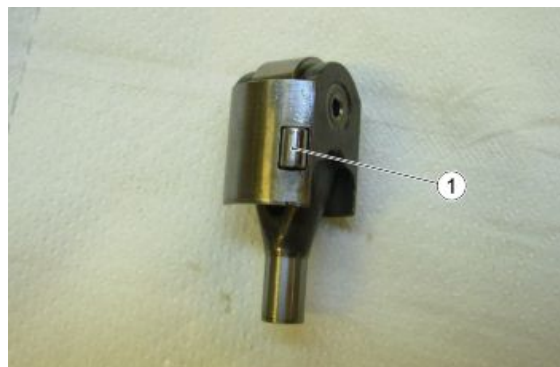


See also

[Installing the overhead camshaft](#)

Installing the overhead camshaft

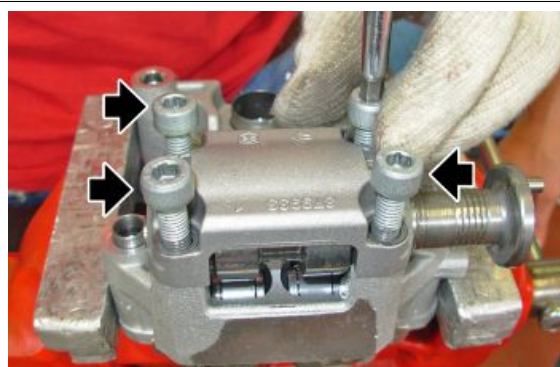
- Insert the roller hydraulic tappets making sure that the roller (1) in the appropriate milling (2) of the cam tower coincides.



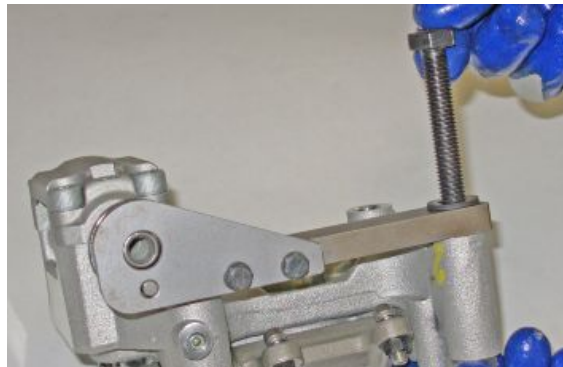
- Position the cam shaft paying attention to the direction.



- Position the U-bolt on the camshaft matching up the reference pins.
- Tighten the four fixing screws to the prescribed torque, proceeding diagonally.



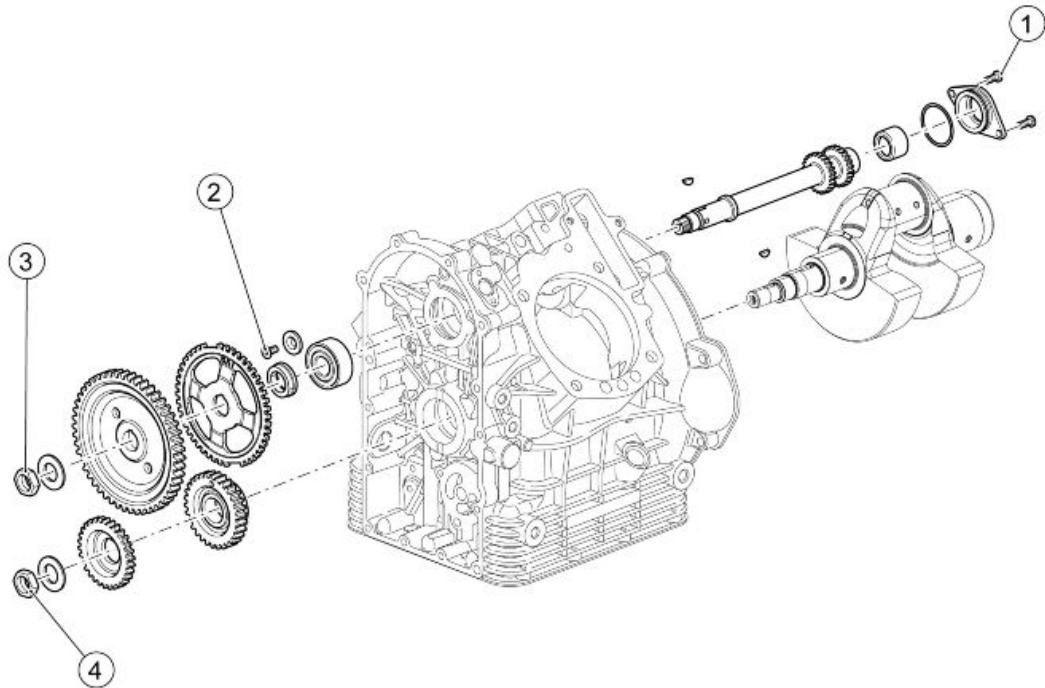
- Remove the bushing so as to be able to fix the tool.
- Be careful when removing it not to damage it.

Specific tooling**020953Y Cam shaft lock for fixing**

- Tighten the camshaft fixing screw.
- Between the two washers, there is a cup spring which recovers the axial clearance of the shaft. The spring must necessarily be centred using the appropriate tool.

Specific tooling**020954Y Centring cam shaft cup spring**

Timing



TIMING SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Idle shaft flange fixing screws	M6x14	2	7 - 8 Nm (5.16 - 5.90 lb ft)	Loctite 542 only on through hole
2	Bearing on idle shaft fixing screw	M6x16	1	8 - 10 Nm (5.90 - 7.37 lb ft)	Loctite 243
3	Idle shaft locking nut	M18x1.5	1	150 Nm (110.63 lb ft)	-
4	Crankshaft locking nut	M25x1.5	2	200 Nm (147.51 lb ft)	-

Removing the phonic wheel

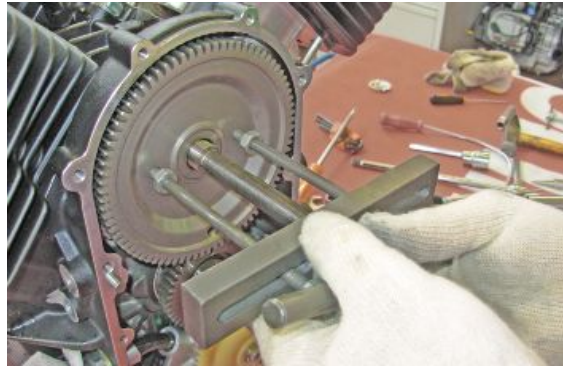
- First remove the generator and the timing system cover.
- Using the special tool, unscrew and remove the nut securing the timing system gear on the service shaft.



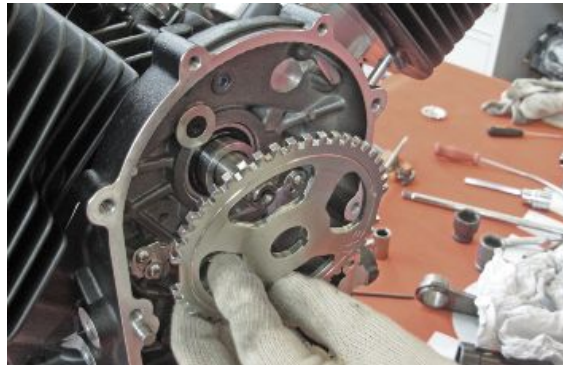
Specific tooling

020675Y Service shaft gear lock

- Using the special tool, remove the timing system gear.

Specific tooling**12.91.36.00 Tool to remove the flywheel-side flange**

- Remove the tone wheel.
- Recover the cotter and the shim washer.



- Undo and remove the timing sensor fixing screw.
- Remove the timing sensor and its O-Ring

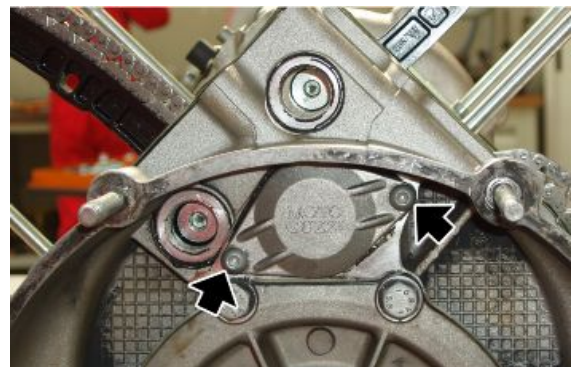


See also

[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.



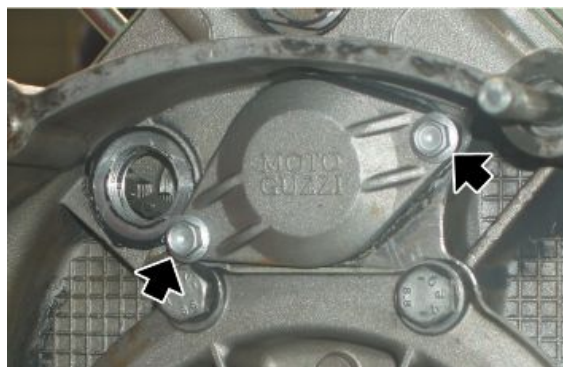
- Fit the timing chains according to the references marked at the removal phase.
- Lubricate the service shaft.
- Insert the service shaft in its crankcase seat by sliding it through the two chains.
- Fit each chain to the corresponding service shaft gear.



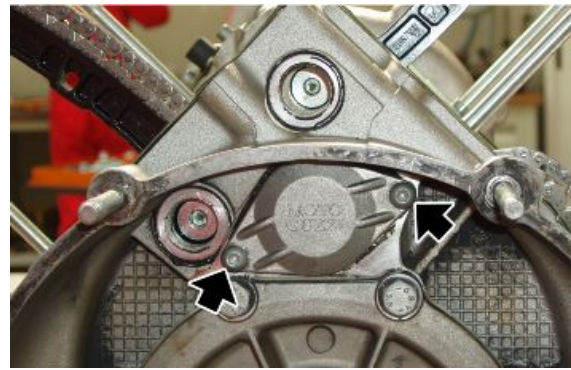
- Fit the roller cage and a new O-ring on the service shaft closing cap.



- 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.

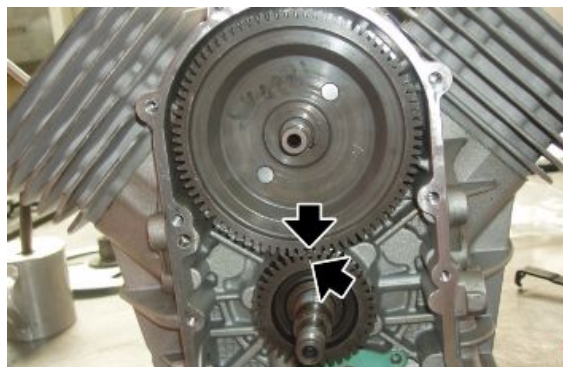


Specific tooling

12.91.18.01 Tool to lock the flywheel and the starting ring gear



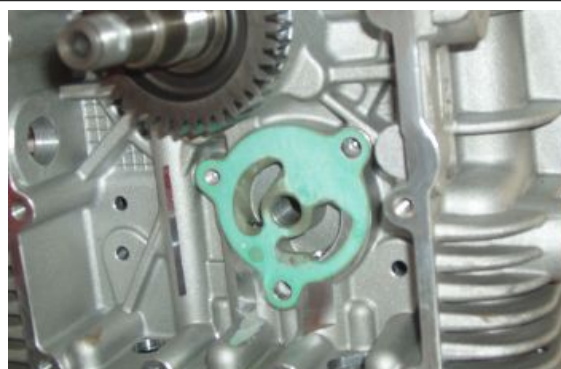
- Fit the timing system gear and align the reference with that on the crankshaft gear. Turn the crankshaft to align the two gears.



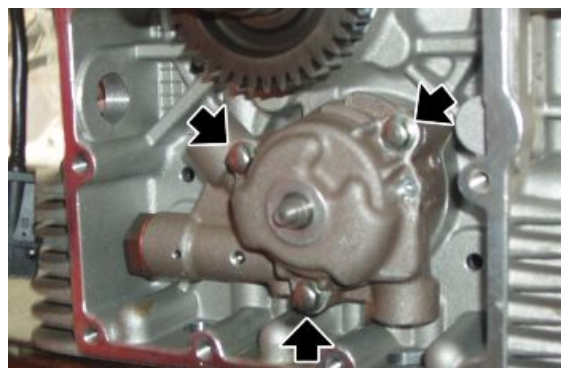
- After shimming the timing sensor properly, proceed to fit it.
- Fit the washer and tighten the timing system gear fixing nut of the service shaft.



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



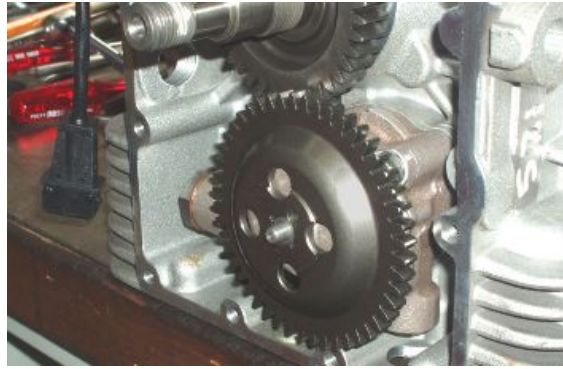
- Fit the oil pump.
- Tighten the three oil pump fixing screws.



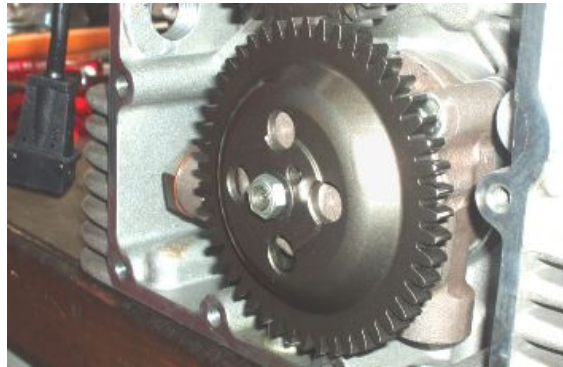
- Place the driving pin on the oil pump shaft.



- 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.

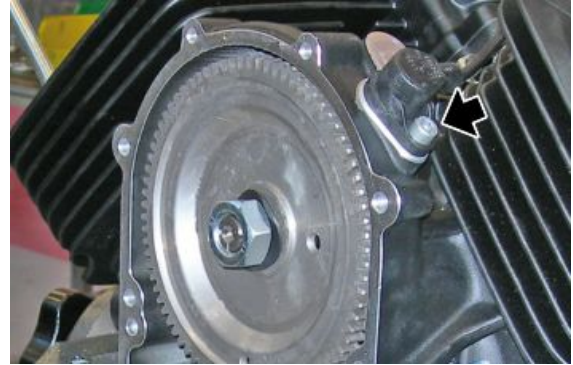


See also

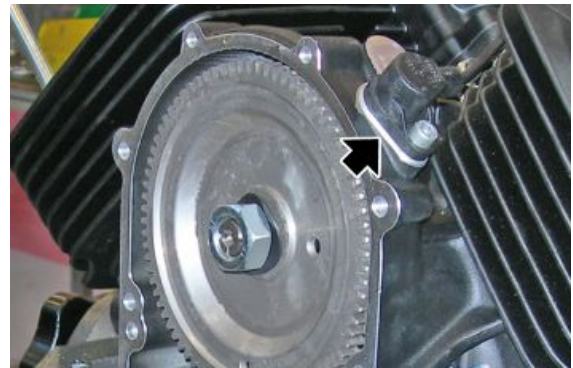
[Installing the crankshaft](#)
[Installing the service shaft](#)
[Measuring air gap](#)

Measuring air gap

- Undo the screw and remove the engine speed sensor.

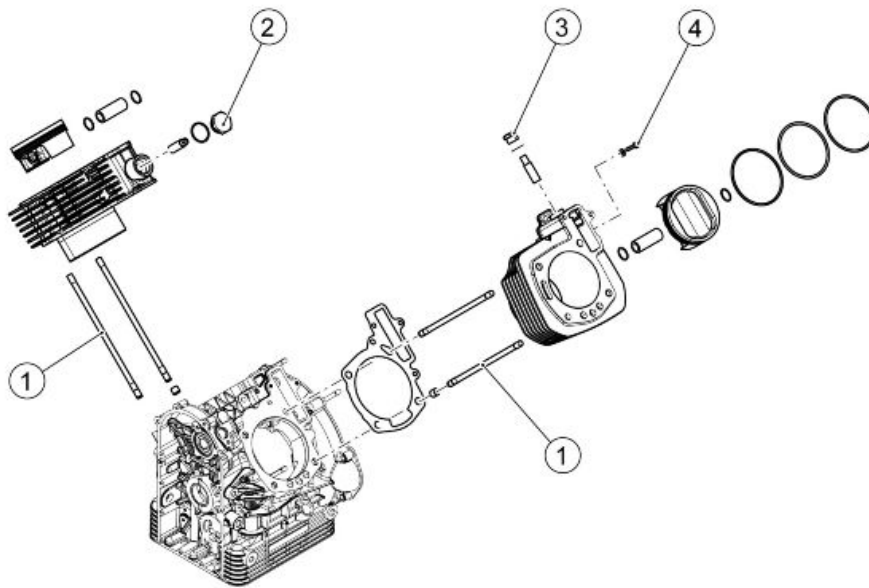


- Space the sensor with a 1 mm (0.0394 in) thick adjustment plate.



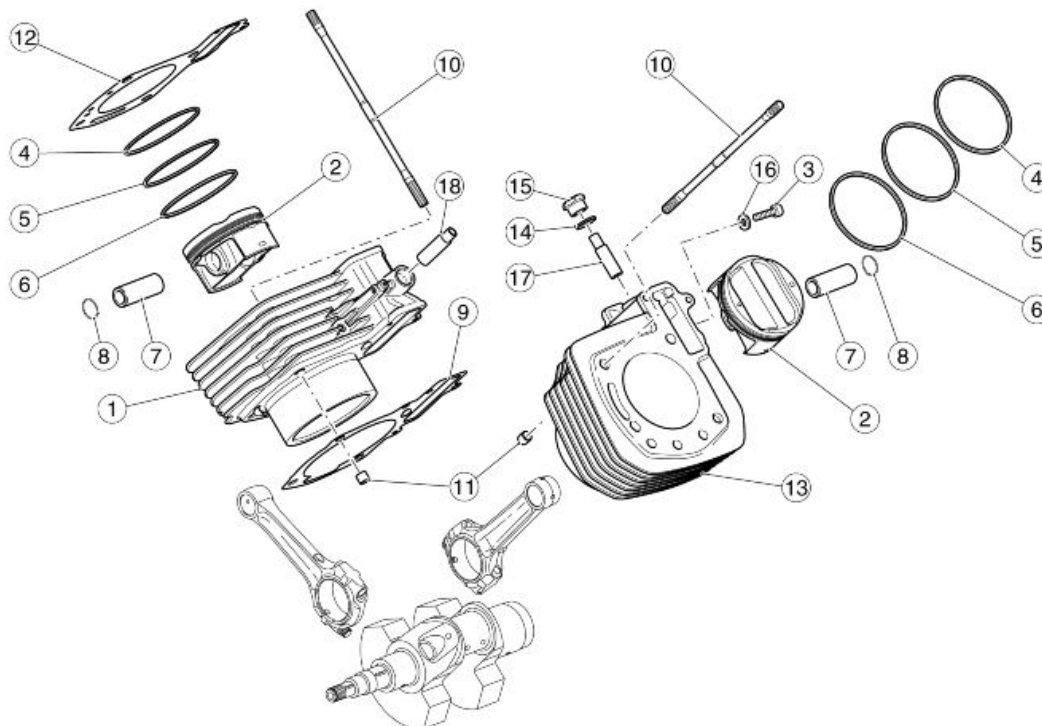
- Measure the distance between the engine speed sensor and the tone wheel. If the distance measured is:
 - 0.55 - 0.7 mm (0.0216 - 0.0275 in), the 1 mm (0.0394 in) adjustment plate must be replaced with a 1.2 mm (0.0472 in) thick plate;
 - 0.71 - 0.9 mm (0.0279 - 0.0354 in), the measurement is correct, therefore keep the 1 mm (0.0394 in) plate;
 - 0.91 - 1.05 mm (0.0358 - 0.0413 in), the 1 mm (0.0394 in) adjustment plate must be replaced with a 0.8 mm (0.0315 in) thick plate.
-

Cylinder-piston assembly



PISTON CYLINDER

pos.	Description	Type	Quantity	Torque	Notes
1	Tie rod on crankcase	M10x1.25	8	5 Nm (3.69 lb ft)	-
2	Right tensioner cover	M30x1.5	1	40 Nm (29.50 lb ft)	-
3	Left tensioner cover	M20x1.5	1	30 Nm (22.13 lb ft)	-
4	Left cylinder cover screw	M6x10	1	10 - 12 Nm (7.37 - 8.50 lb ft)	Loctite 542



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

Removing the cylinder

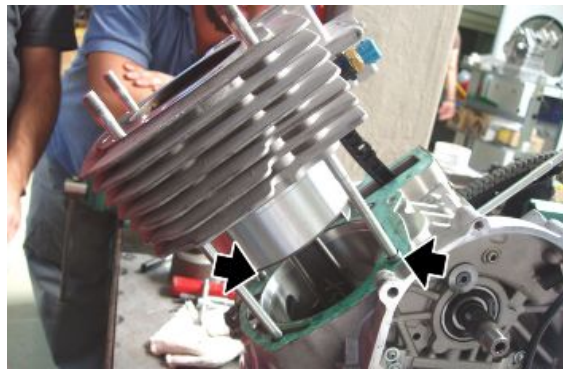
NOTE

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 ORIENTATION OF THE PISTON ACCORDING TO THE REFERENCES AT THE TOP. DO NOT ASSEMBLE PISTONS AND CYLINDERS OF DIFFERENT SELECTOR TYPES.

- Insert the pin.



- Insert the snap ring.

Specific tooling

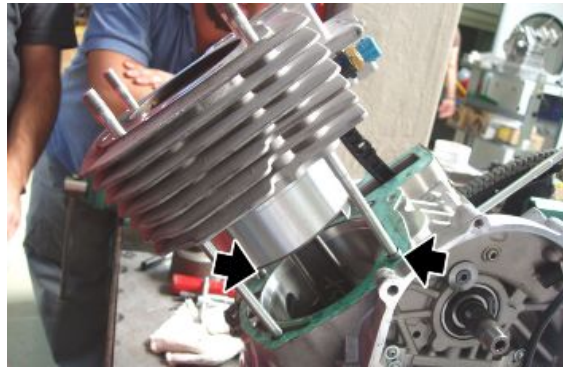
020470Y Pin snap ring fitting tool



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

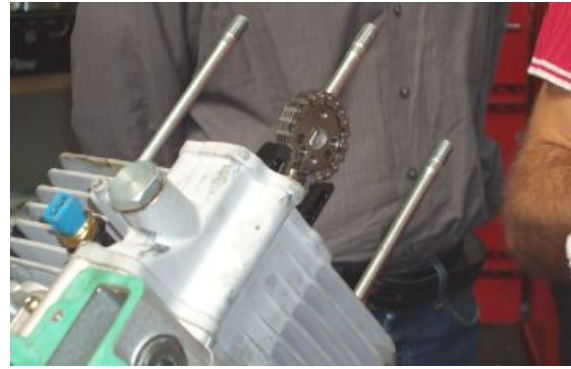
- Remove the piston ring clamp tool and finish positioning the cylinder.

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

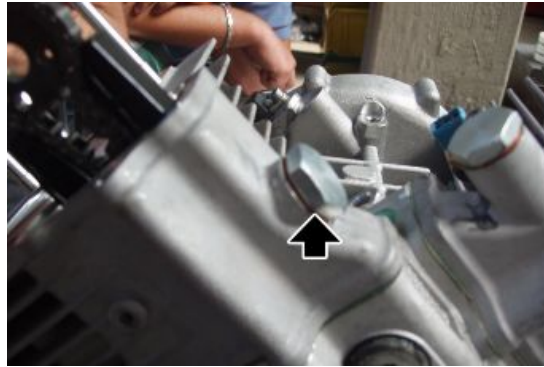
DURING THIS OPERATION, PAY ATTENTION NOT TO DAMAGE THE PISTON.

Specific tooling

020674Y Piston ring clamp

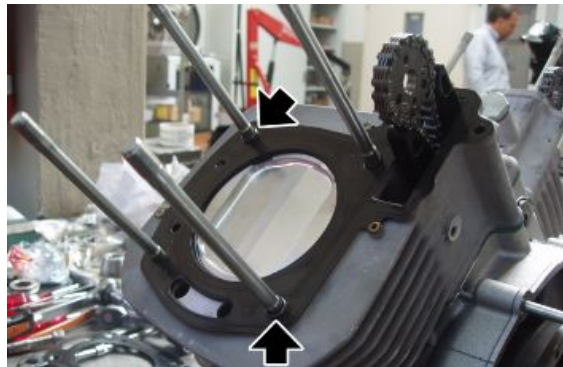
020716Y Connecting rod locking

- 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

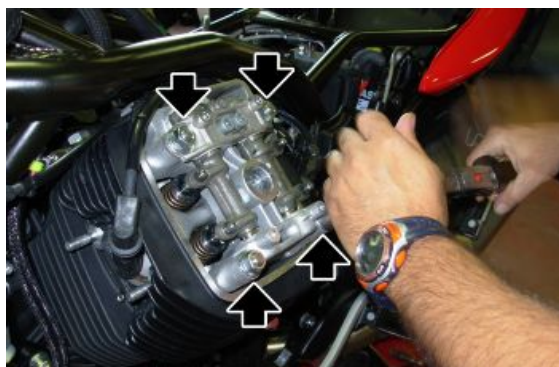
- Fit the valves in the head, if previously removed.
- Take the left cylinder piston to TDC and lock crankshaft rotation.
- Determine the thickness of the gasket to be fitted between the head and the cylinder as described in the section: Shimming system.
- Place the two dowel pins.
- Fit the gasket with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



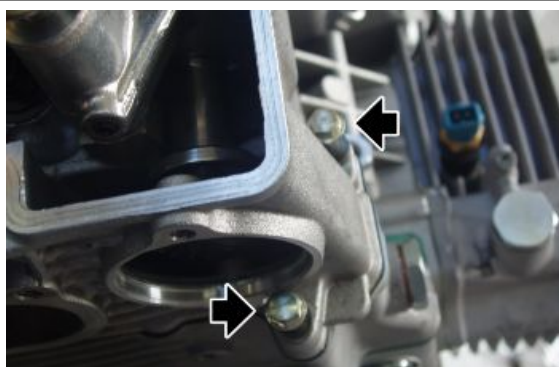
- Fit a new O-ring in the spark plug hole.
- Fit the complete cam cap.



- 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 clockwise by 270° from the timing system side 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.



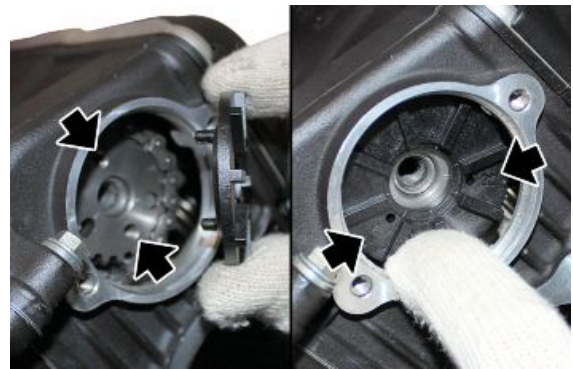
- Unscrew and remove the right chain tensioner cap.



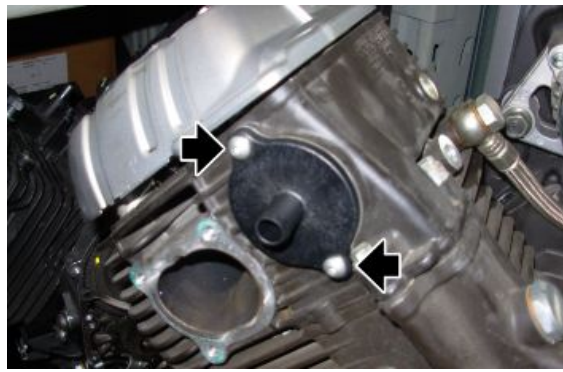
- Screw two screws in the threaded holes of the timing system upper gear.
- Rotate the camshaft so that its pin is aimed towards the hole in the timing system chain.
- Place the gear in the chain.
- On the right camshaft pin, fit the hole marked with the letter "R" of the timing system gear.



- Screw the cap of the right chain tensioner.
- Undo and remove the screws used to place the gear on the camshaft.
- Place the centrifugal separator aligning the reference pins with timing system gear and so as to show the two reference letters L - R parallel to the direction of the chain, L left side, R right side.
- Insert the spacer.
- Fix the centrifugal separator on the timing system gear using a screw with Loctite on the thread.
- Tighten the screw to the prescribed torque.
- Also place the centrifugal separator 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

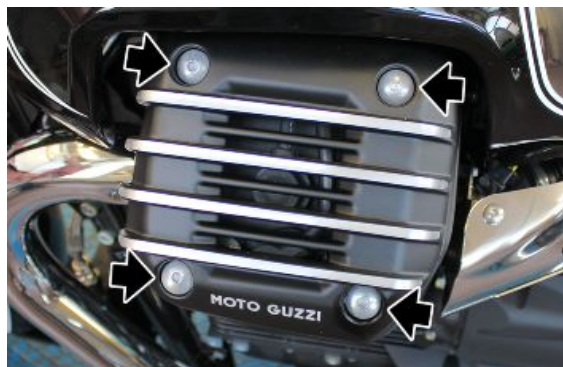
- Replace the gaskets and install the head cover.



- Replace the four rubber rings.
- Tighten the four screws to the prescribed torque.



- Position the two plug caps of the spark plug.
- Position the head cover and tighten the four screws to the prescribed torque.



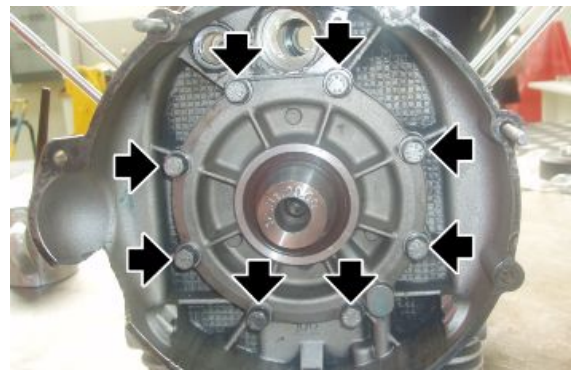
Crankcase - crankshaft

Removing the crankshaft

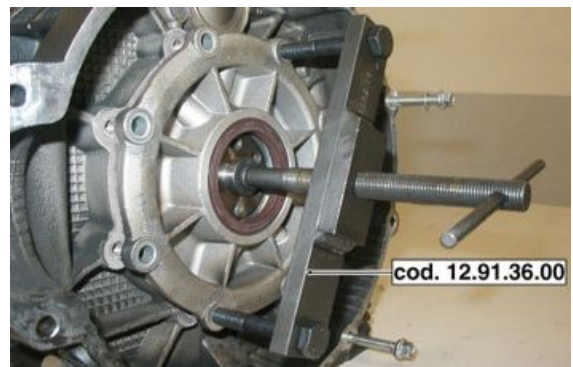
- Remove the clutch.
- Remove the tone wheel and the oil pump gear.
- Working from the generator side, unscrew and remove the nut.
- Remove both gears.



- Remove the connecting rods.
- Undo and remove the eight fixing screws and collect the washers.



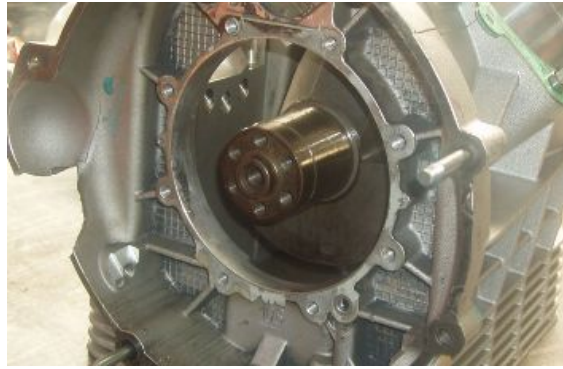
- Hold the crankshaft during flange removal.
- Using the suitable special tool, remove the crankshaft flange.
- Remove the sealing ring from the flange, if necessary.



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.

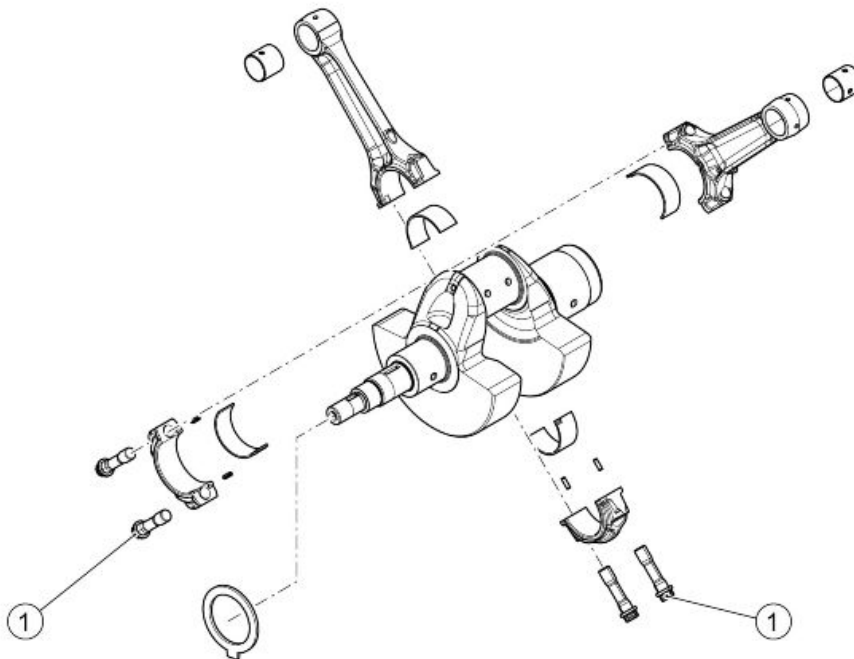


See also

[Disassembling the clutch](#)

[Removing the phonic wheel](#)

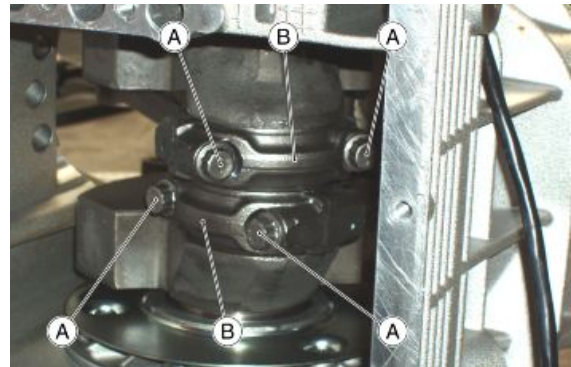
Disassembling the connecting rod



CRANKSHAFT

pos.	Description	Type	Quantity	Torque	Notes
1	Connecting rod screws	M10x1	4	Pre-torque 40 Nm (29.50 lb ft). Final torque 80 Nm (59.00 lb ft)	-

- 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).



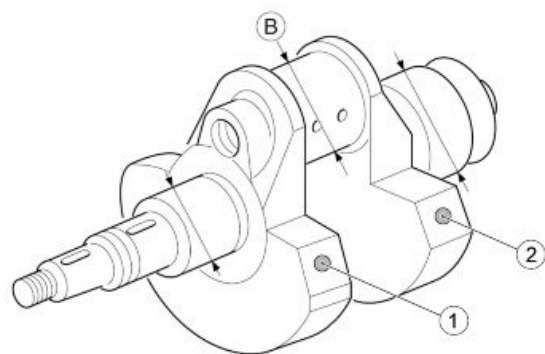
See also

- [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 bushings.

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 - 53.951 mm (2.12480 - 2.12405 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 - 0.068 mm (0.00118 - 0.00267 in)

CRANKPIN DIAMETER (B)

Specification	Desc./Quantity
'Blue' crankpin diameter	44.016 - 44.022 mm (1.73290 - 1.73314 in)
'Orange' crankpin diameter	44.022 - 44.028 mm (1.73314 - 1.733381 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 1601 g (56.47 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 1618 g (57.07 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 1635 g (57.67 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.

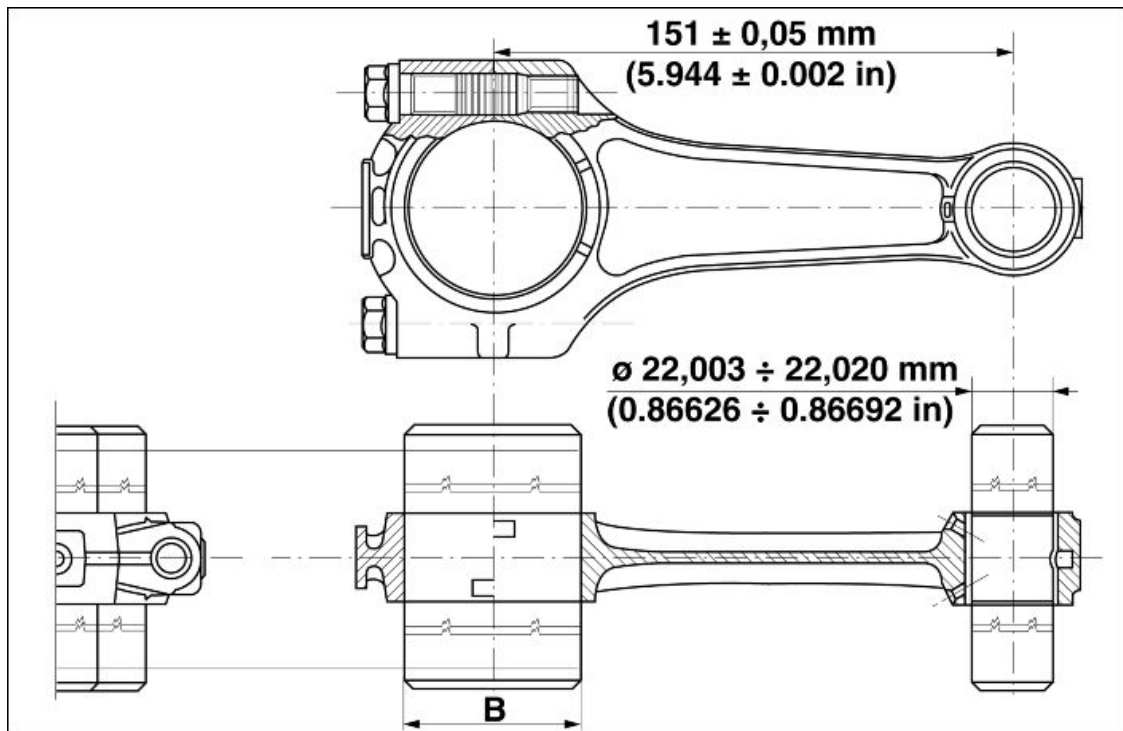
Before reaming the crankpin, measure the pin diameter (B) comparing it with the maximum wear allowed, as indicated in the figure; this defines what kind of undersizing the bearing should have and to which diameter the pin (B) should be reamed.

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 BUSHING 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)

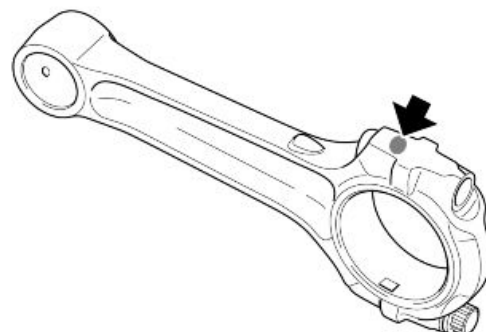
Specification	Desc./Quantity
'Blue' crankpin diameter	44.016 - 44.022 mm (1.73290 - 1.73314 in)
'Orange' crankpin diameter	44.022 - 44.028 mm (1.73314 - 1.73381 in)

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.

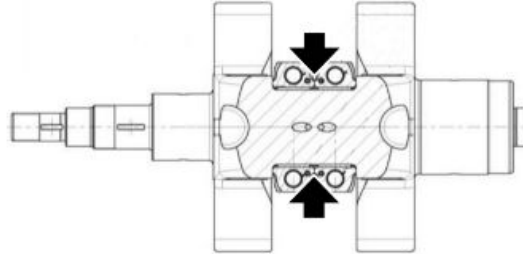


CONNECTING ROD WEIGHT SELECTION

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

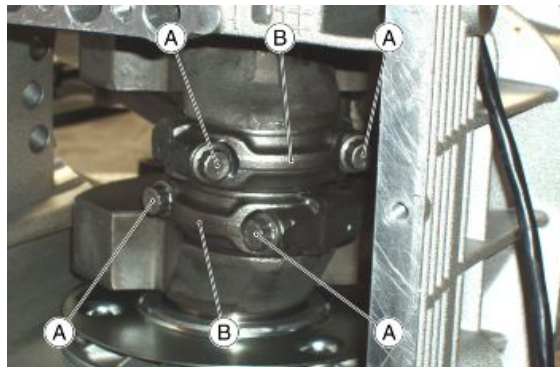
Assembling the connecting rod

- 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.



The connecting rods must be mounted so that the faces of the big ends adjacent to the pair of pins are in contact.

- 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 0.020 mm (0.0078 inch) minimum and 0.044 mm (0.00173 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

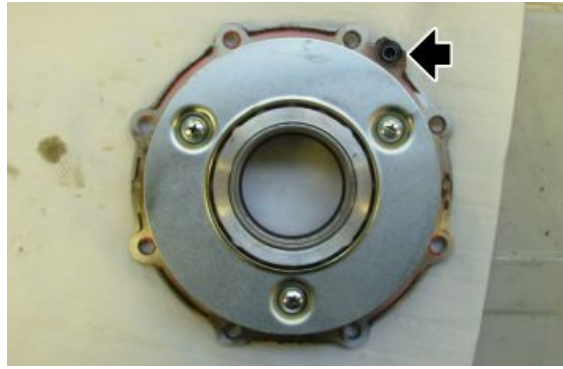
- Prepare loctite 510 between the crankcase and the crankshaft flange, on the flywheel side.
- Fit the crankshaft on the crankcase, flywheel side.
- Mark the crankshaft on the flywheel side with the crankpin facing upwards.
- Place the suitable sealing ring centring tool on the crankshaft.



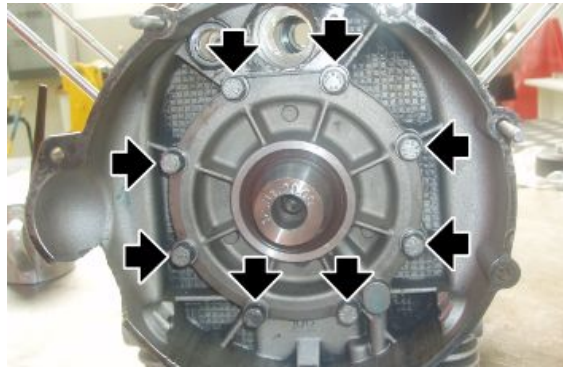
Specific tooling

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.



- 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

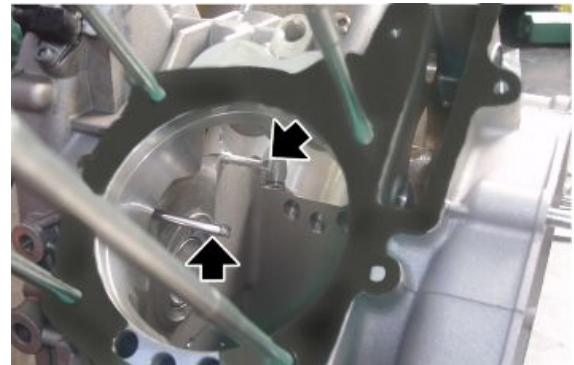
- To avoid that shim inside the crankcase moves from its seat; fit on the crankshaft, on the alternator side, the two gears and the nut.



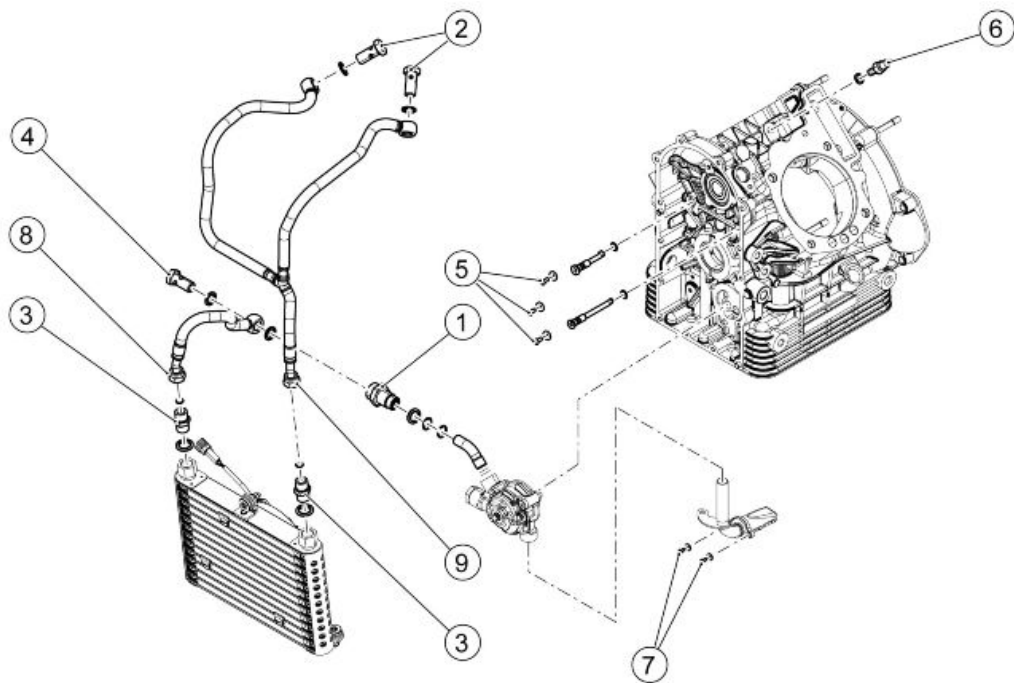
Refitting the crankcase halves

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.

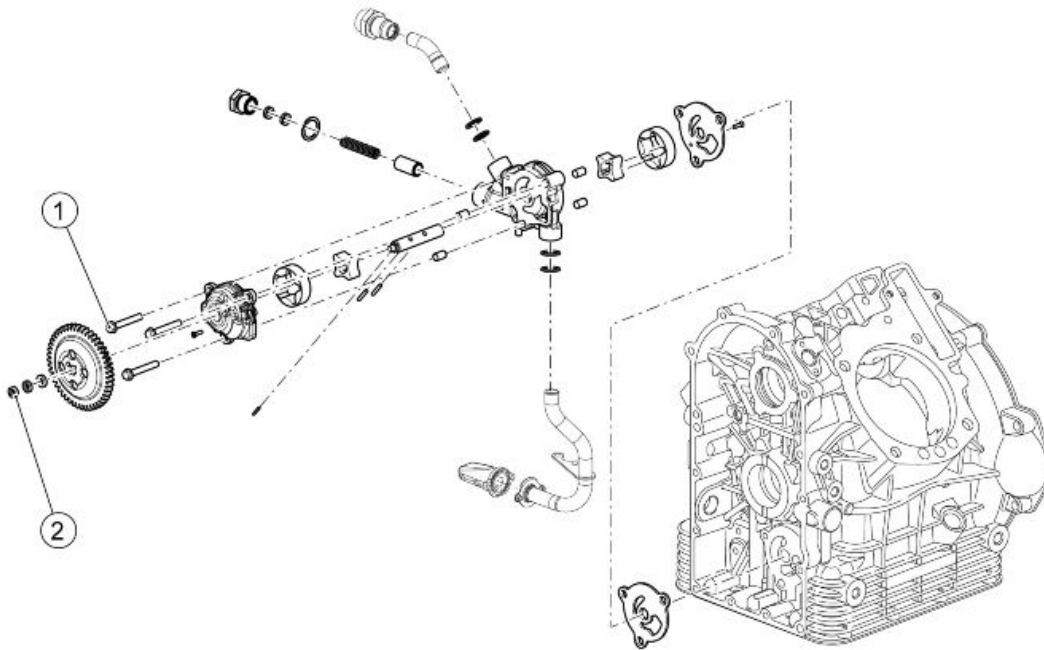


Lubrication



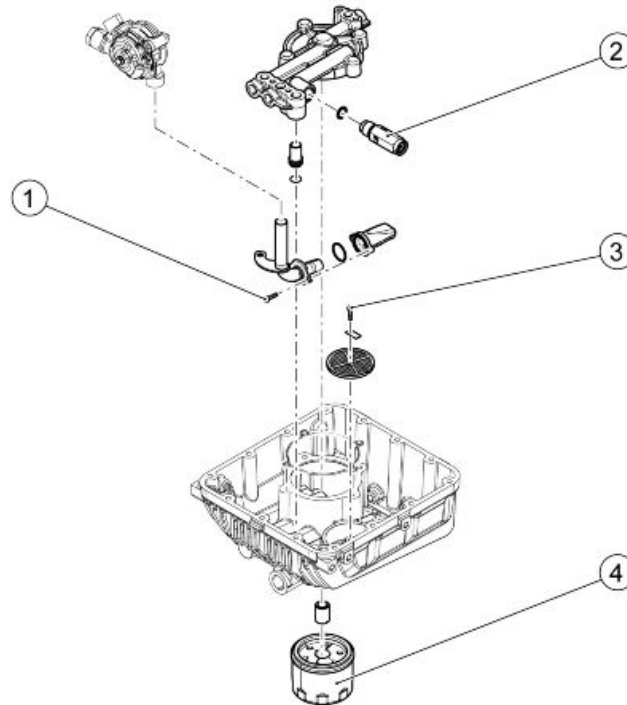
LUBRICATION SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Pump outlet oil pipe nipple	M14x1.5	1	40 Nm (29.50 lb ft)	-
2	Slot screw for oil pipe on the cylinder head	M14x1.5	2	20 Nm (14.75 lb ft)	-
3	Nipple on the radiator and the oil pipe	M16x1.5	2	20 Nm (14.75 lb ft)	Apply Vaseline oil
4	Oil delivery pipe to radiator slot screw	M14x1.5	1	35 Nm (25.81 lb ft)	-
5	Oil jets fixing screw	-	3	By hand	Loctite 243
6	Minimum oil pressure sensor	M10	1	15 Nm (11.06 lb ft)	-
7	Intake oil filter fixing screw	M4x10	2	3 Nm (2.21 lb ft)	Loctite 243
8	Oil delivery pipe to radiator	-	1	20 Nm (14.75 lb ft)	-
9	Oil delivery pipe to heads	-	1	20 Nm (14.75 lb ft)	-



OIL PUMP

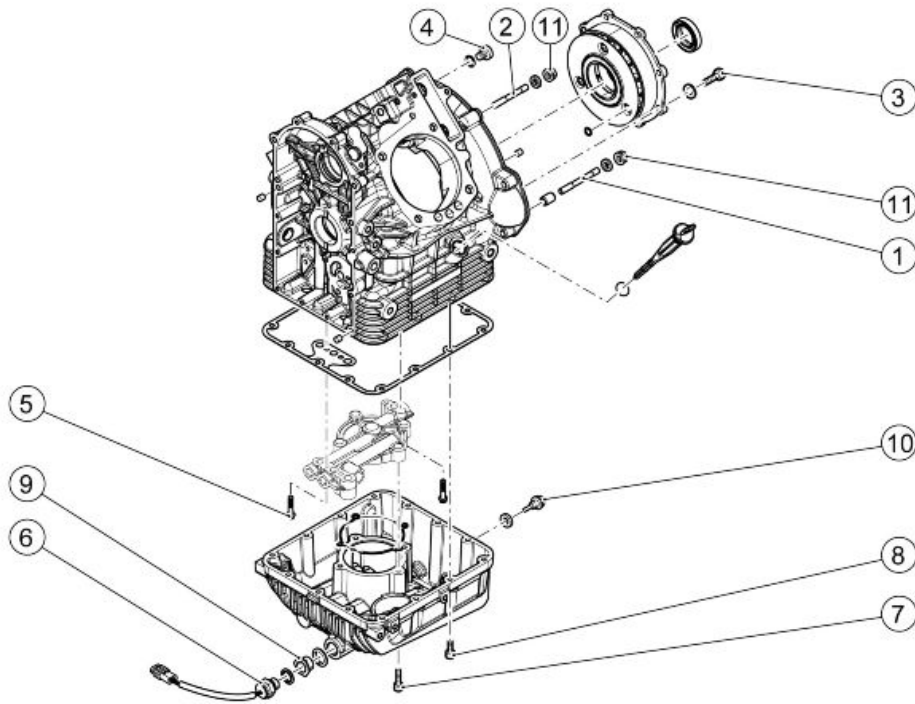
pos.	Description	Type	Quantity	Torque	Notes
1	Oil pump fixing screws	M6x45	3	9 11 Nm (6.64 8.11 lb ft)	Loctite 243
2	Low nut for oil pump	M6x0.75	1	8 Nm (5.90 lb ft)	Loctite 243



OIL SUMP COMPONENTS

pos.	Description	Type	Quantity	Torque	Notes
1	Cooling oil intake filter fixing screw	M4x10	2	By hand	-
2	Complete oil pressure control valve	-	1	20 Nm (14.75 lb ft)	Loctite 243

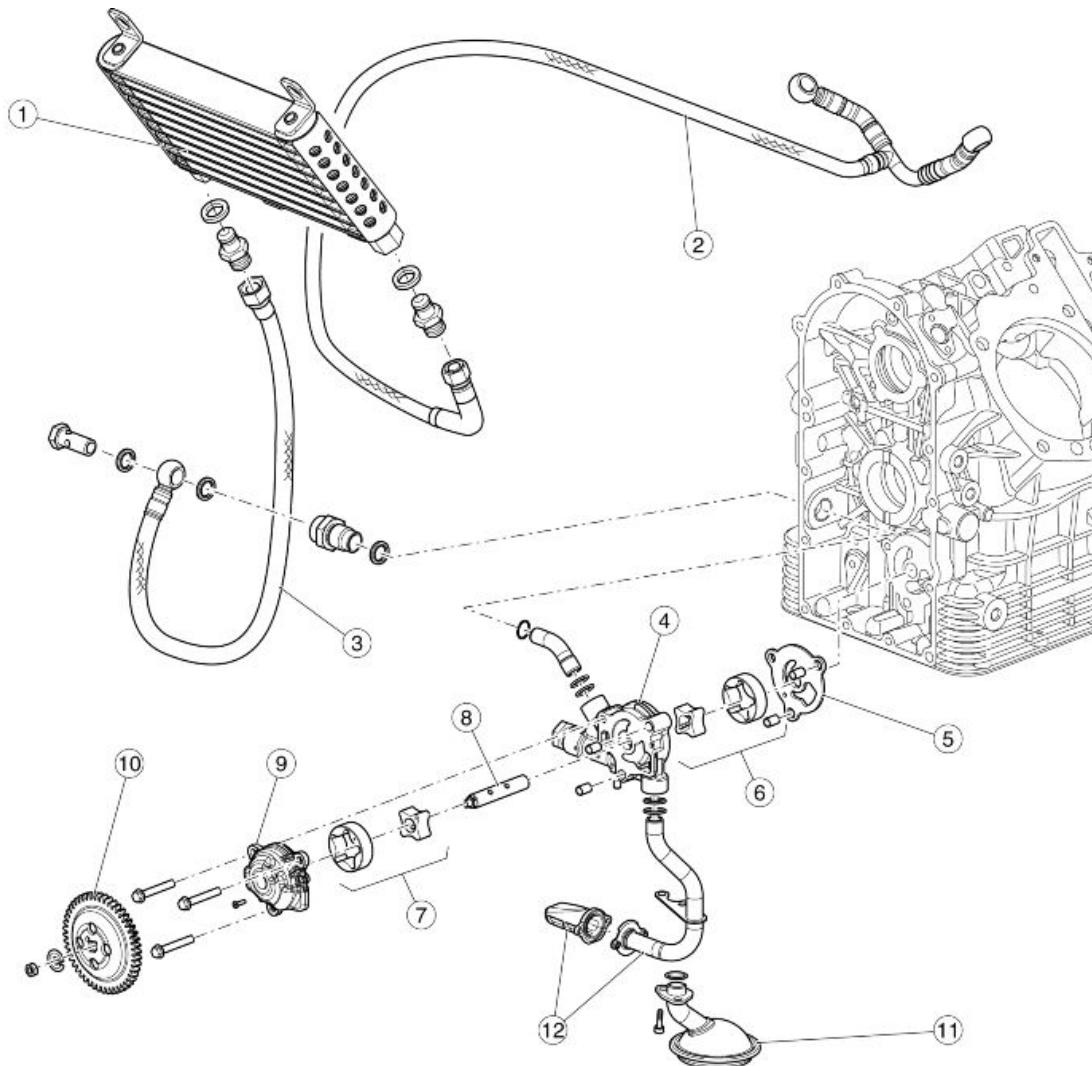
pos.	Description	Type	Quantity	Torque	Notes
3	Mesh type oil filter fixing screw	M6x14	1	6 Nm (4.42 lb ft)	-
4	Oil filter	-	1	15 Nm (11.06 lb ft)	Engine oil



CRANKCASE AND OIL SUMP

pos.	Description	Type	Quantity	Torque	Notes
1	Stud bolt	M8x75	2	10 Nm (7.37 lb ft)	-
2	Stud bolt	M8x66	3	10 Nm (7.37 lb ft)	-
3	Crankshaft rear support flange fixing screw	M8x25	8	26 Nm (19.18 lb ft)	-
4	Oil cap on the crankcase	-	2	25 Nm (18.44 lb ft)	-
5	Oil filter support flange fixing screw	M6x45	4	10 Nm (7.37 lb ft)	-
6	Thermal switch	M6x1.5	1	20 Nm (14.75 lb ft)	-
7	Sump to flange fixing screw	M6x35	4	10 Nm (7.37 lb ft)	-
8	Oil sump to crankcase fixing screw	M6x30	14	10 Nm (7.37 lb ft)	-
9	Thermal switch interface connection	-	1	20 Nm (14.75 lb ft)	Loctite 542
10	Magnetic oil drainage cap	-	1	20 Nm (14.75 lb ft)	-
11	Gear to engine fixing nut	M8	5	20 Nm (14.75 lb ft)	-

Conceptual diagrams



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:

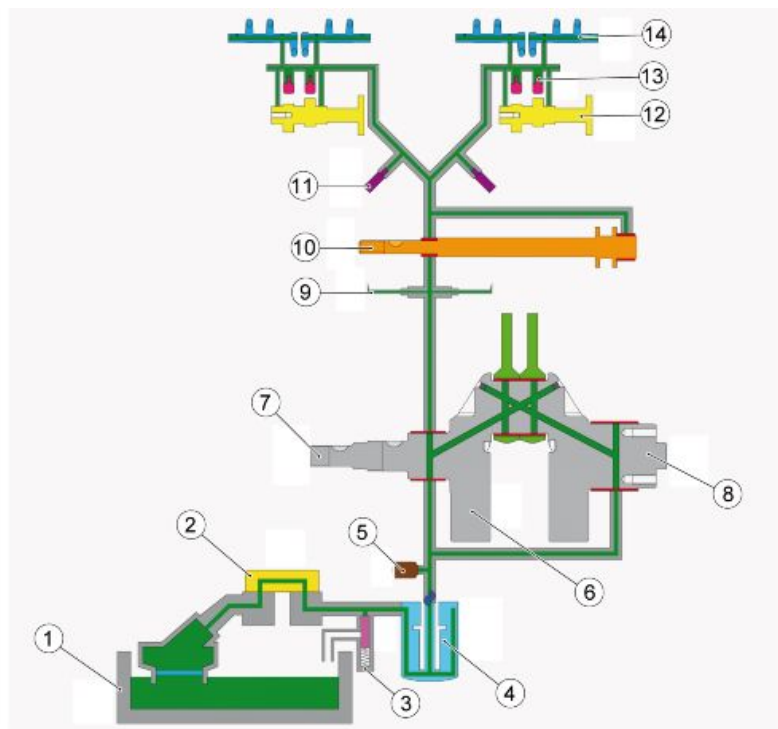
The rotor (6) takes in oil from the sump through the filter (11); the oil is sent through special ducts in the crankcase to all the parts to be lubricated. Oil goes down to the sump again and joins the oil used for cooling.

key:

1. Oil 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

General characteristics



Lubrication circuit diagram key:

1. Oil sump
2. Lubrication pump
3. By-pass valve
4. Oil filter
5. Minimum oil pressure sensor
6. Crankshaft
7. Alternator side

8. Flywheel-side
9. Piston cooling jets
10. Auxiliary shaft
11. Chain tensioner
12. Camshaft
13. Hydraulic tappet with roller
14. Rocker axes

Oil pump

Removing

- 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.



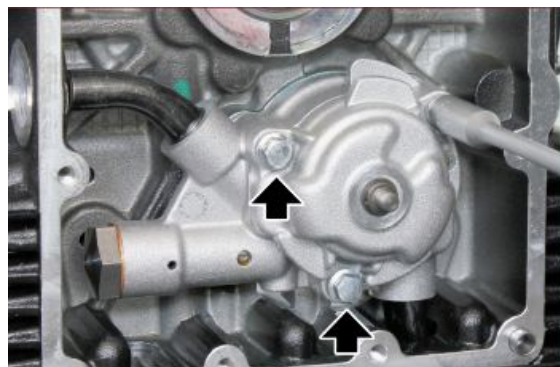
- Remove the driving pin.



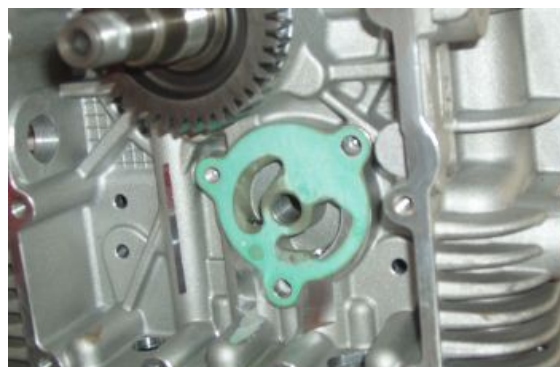
- Drain the engine oil.
- Remove the generator and the timing system cover.
- Unscrew and remove the nipple.
- Collect the gasket.



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



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



See also

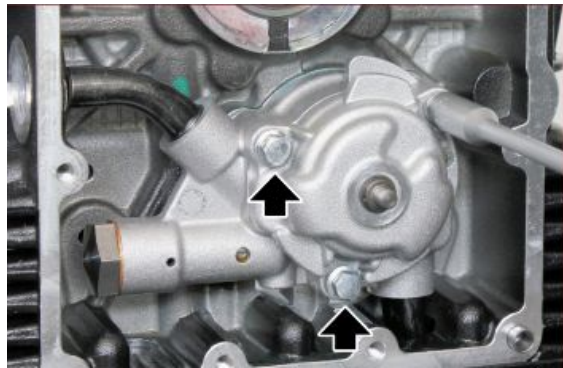
[Removing the generator](#)

Installing

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



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



- 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.

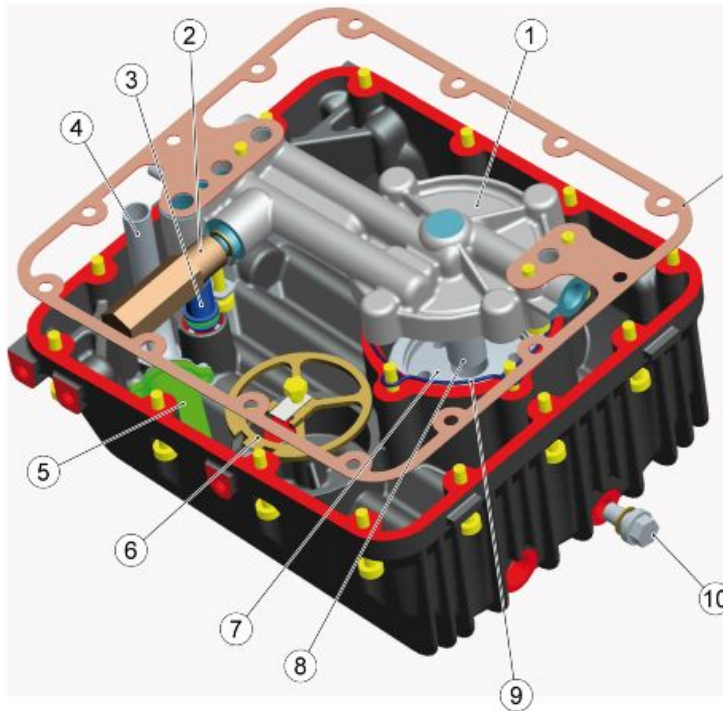


- Place the oil pump control gear on the crankshaft and align its reference with that marked during the removal phase on the oil pump driven gear.
- Tighten the nut to the specified torque.

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



Removing the oil sump

**key:**

1. Flange
2. Pressure adjuster valve
3. Flange inlet pipe
4. Pump inlet pipe
5. Pump inlet filter
6. Oil filter
7. Cartridge-type oil filter
8. Joint
9. Special gasket
10. Exhaust cap
11. Oil sump gasket

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.

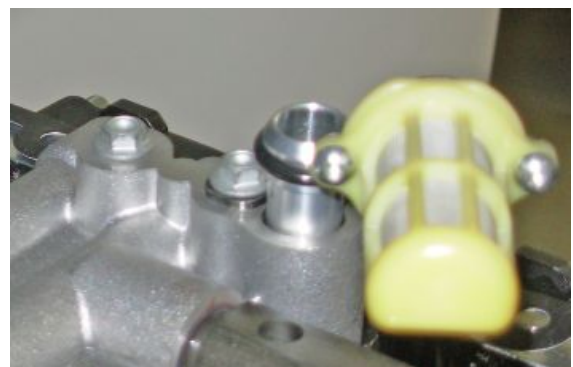
- Unscrew and remove the oil level plug and collect the O-Ring.



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



- Unscrew and remove the four screws.
- Remove the pump inlet filter.
- Remove the flange.





- Unscrew and remove the filter fixing screw.
- Remove the filter.



- Remove the overpressure valve.



Refitting the oil sump

- Position the gasket of the overpressure valve.



- Apply threadlock on the overpressure valve.
- Tighten it to the prescribed torque.



- Make sure that the OR is in good condition, otherwise replace it.
- Position the joint.



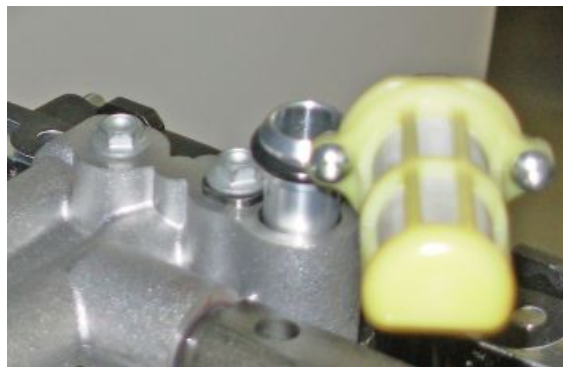
- Insert the joint in the oil sump, making sure the OR is in good condition.
- Replace the OR if necessary.



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



- Insert the flange, the intake filter.
- Secure the flange and the filter with the four screws.



- Fit the filter and tighten it to the specified torque.



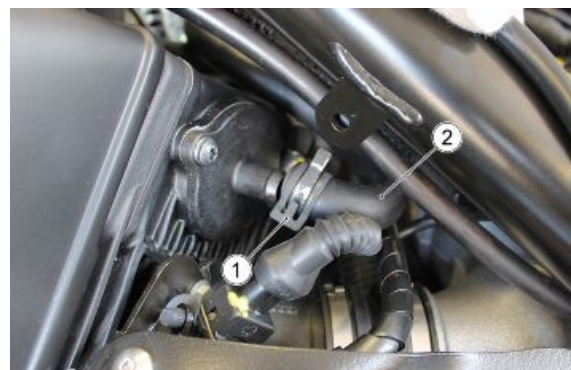
- Place the oil sump.
- Tighten the fourteen screws to the prescribed torque.
- Add engine oil up to the correct level.



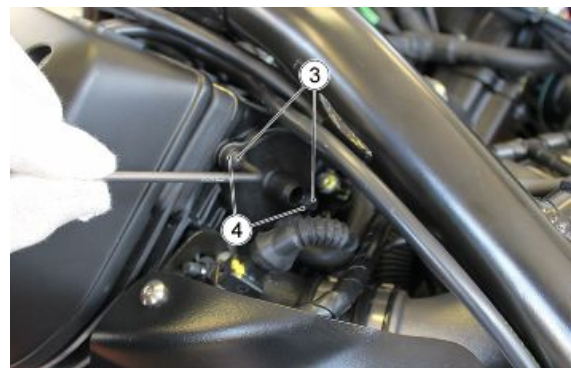
Blow-by

BLOW-BY COVER REMOVAL

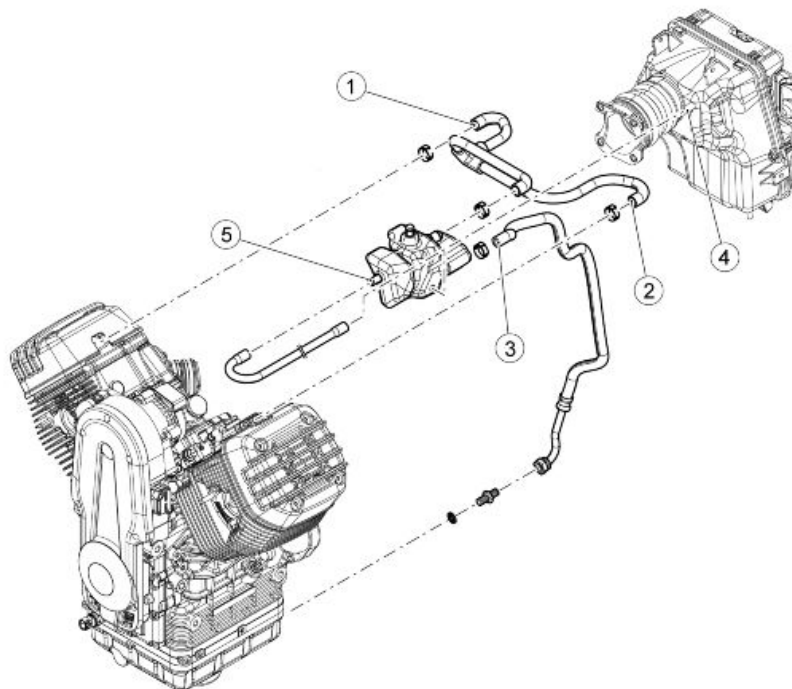
- Remove the pipe holder (1).
- Slide off the pipe (2).



- Unscrew and remove the two screws (3).
- Collect the two washers (4).



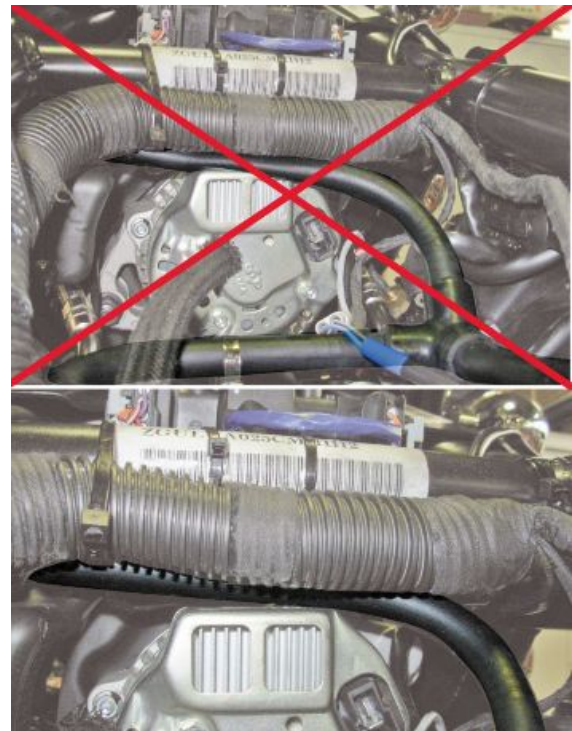
- Remove the blow-by cover (5).



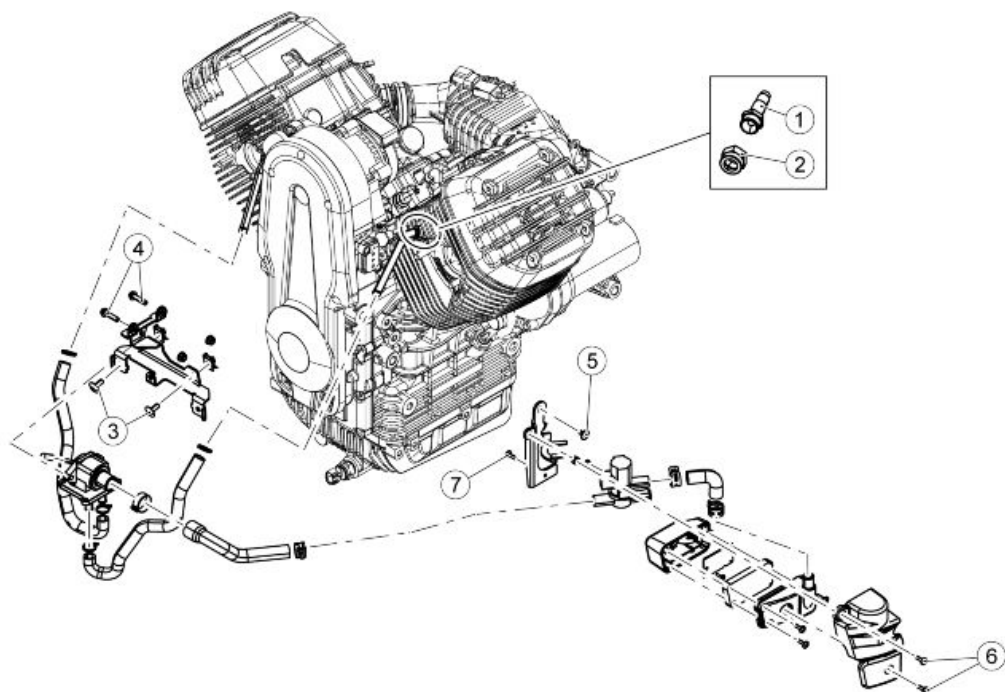
The Blow By system allows for oil vapours to be recycled. The law requires that these gas and oil vapours cannot be released into the atmosphere for environmental reasons. Therefore, there are systems for the recirculation of these gas-oil vapours inside the intake ducts to burn them in the subsequent active phases of the engine. This system separates the engine oil into oil vapour and the liquid part. The oil vapours coming from the joints (1) and (2), are filtered and enter into the filter box through the joint (4)(5), while the liquid portion returns to the oil sump by means of the joint (3).



IN ORDER TO PREVENT THE BLOW BY PIPE FROM BEING CRUSHED BETWEEN THE ALTERNATOR AND THE CORRUGATED PIPE, TAKE PARTICULAR CARE SO THAT IT IS POSITIONED AS ILLUSTRATED IN THE FIGURE.



SAS valve



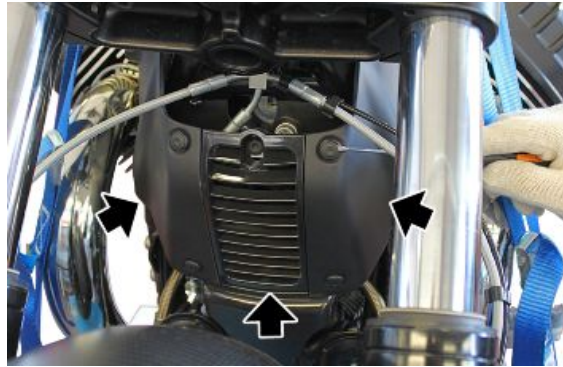
SECONDARY AIR SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Secondary air fitting pipe	-	2	14 ÷ 16 Nm (10.33 ÷ 11.80 lb ft)	Loctite 648
2	Secondary air fitting pipe fixing nut	M16	2	12 Nm (8.85 lb ft)	-

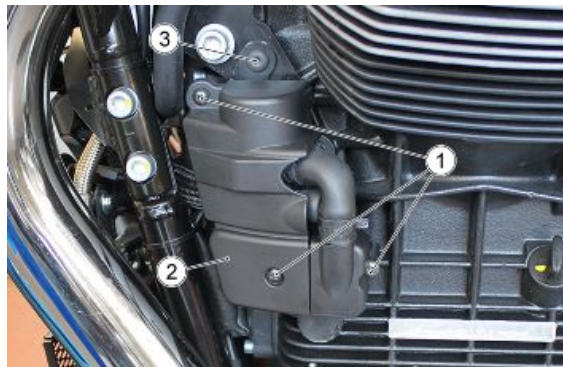
pos.	Description	Type	Quantity	Torque	Notes
3	Screw fixing reed valve bracket support to frame	M6x16	2	10 Nm (7.38 lb ft)	-
4	Screw fixing reed valve to bracket support	M6x25	2	10 Nm (7.38 lb ft)	-
5	Screw fixing solenoid valve to chassis	M5x9	1	6 Nm (4.43 lb ft)	-
6	Solenoid valve cover fixing screws	Self-tapp. 4.2x16	2	3 Nm (2.21 lb ft)	-
7	Screw fixing SAS filter housing to support bracket	Self-tapp. 4.2x16	1	3 Nm (2.21 lb ft)	-

SECONDARY AIR SYSTEM REMOVAL

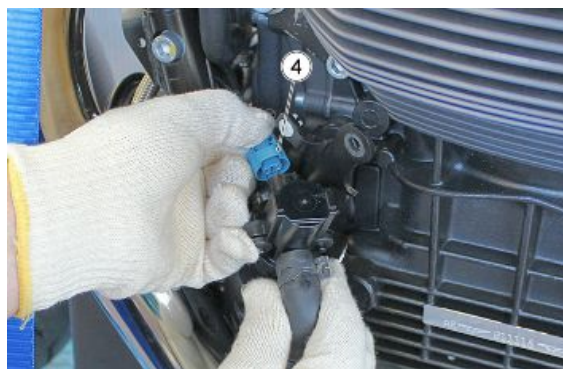
- Remove the two side covers and the central cover indicated in the figure.



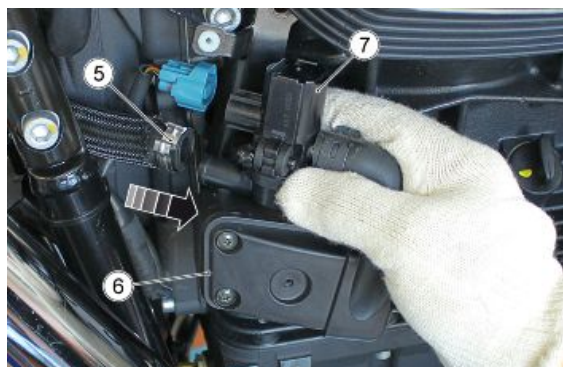
- Unscrew and remove the three fixing screws (1) of the secondary air housing cover (2).
- Remove the secondary air housing cover (2).
- Undo and remove the fixing screw (3) of the support bracket.



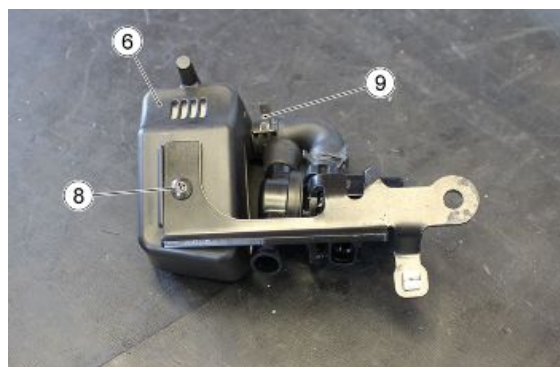
- Disconnect the connector (4).



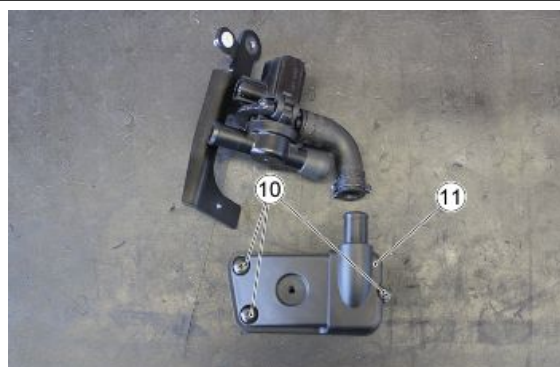
- Loosen the clamp (5).
- Remove the secondary air housing (6) complete together with the SAS valve (7) as indicated in the figure.



- Undo and remove the screw (8) fixing the secondary air housing (6) to the support bracket.
- Loosen the clamp (9).
- Completely remove the secondary air housing (6).



- Undo and remove the three fixing screws (10).
- Remove the secondary air housing cover (11).



- Remove the air filter (12).



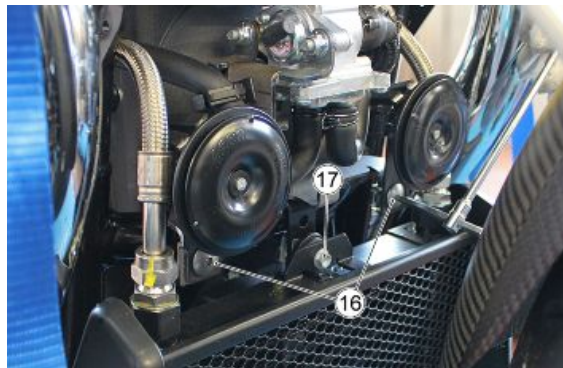
- Undo and remove the fixing screw (13).
- Remove the plate (14).



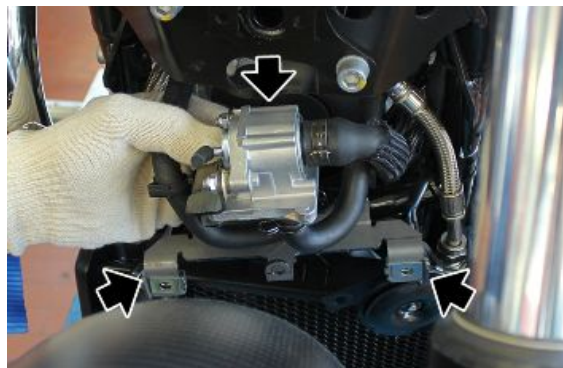
- Remove the SAS valve (15) from the support bracket as indicated in the figure.



- Undo and remove the two fixing screws (16) of the horn.
- Unscrew and remove the screw (17).



- Remove the SAS valve together with the bracket as indicated in the figure.



- Remove the two clamps (18).



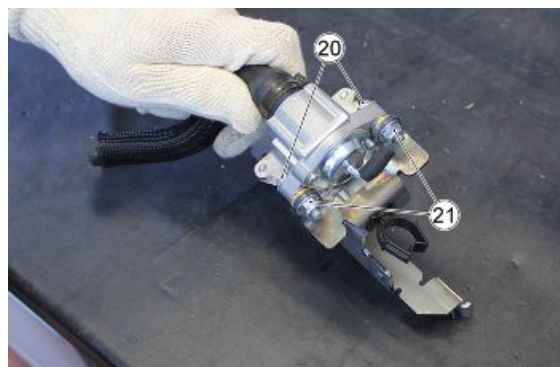
- Unhook the pipe from the cable grommet as indicated in the figure.



- Remove the SAS valve (19) together with the support bracket.



- Undo and remove the two screws (20) and the two fixing nuts (21).



- Remove the SAS valve (19) as indicated in the figure.



See also

Radiator cover

SECONDARY AIR SYSTEM FITTING REMOVAL

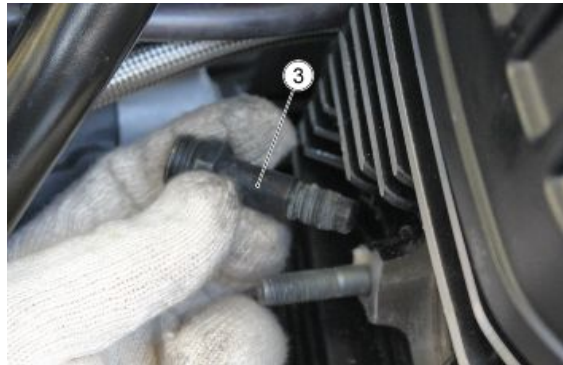
- Unscrew the nut (1).



- Release the pipe (2) from the secondary air system fitting pipe (3).



- Undo and remove the secondary air system fitting pipe (3).

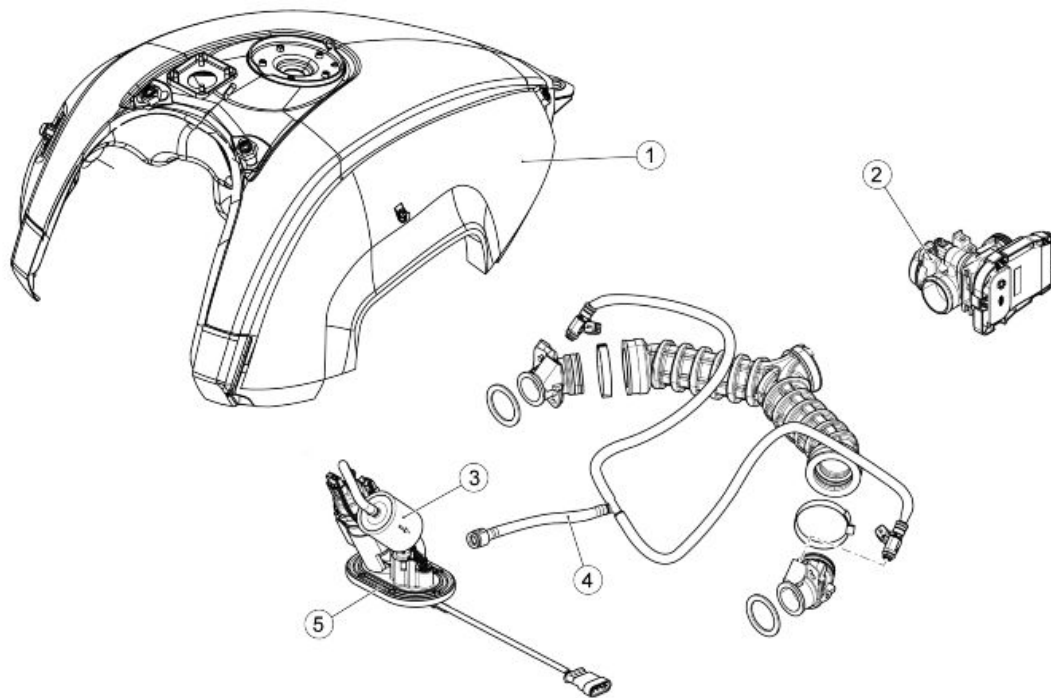


INDEX OF TOPICS

POWER SUPPLY

P SUPP

Circuit diagram

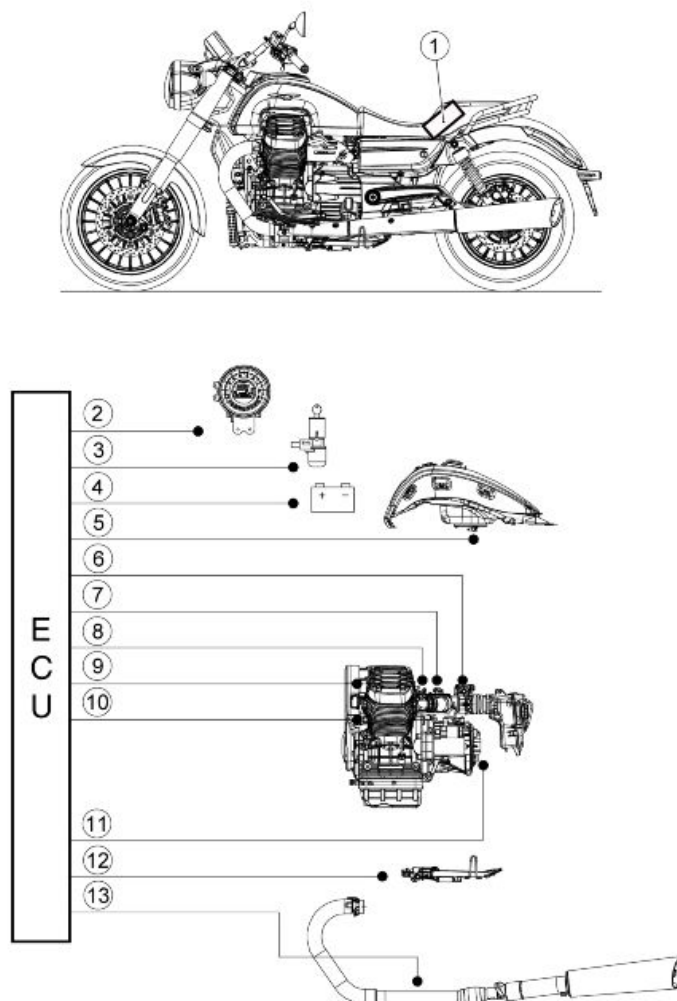


key:

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

Injection

Diagram



key:

1. Control unit position
2. Instrument panel
3. Ignition switch
4. Battery
5. Fuel pump
6. Throttle valve position sensor
7. Air pressure sensor and intake air
8. Injectors
9. Engine temperature sensor
10. Crankshaft position sensor
11. Gear sensor
12. Side stand

13.Lambda probe

ECU INFO screen page

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

NOTE

THE FIGURE ONLY SHOWS THE ICON THAT APPEARS IN THE NAVIGATOR.



INFO ECU SCREEN PAGE

Specification	Desc./Quantity
Mapping	-

PARAMETERS screen page

On this screen the parameters ready by the various sensors are shown (engine rpm, engine temperature, ...) and their units of measurement



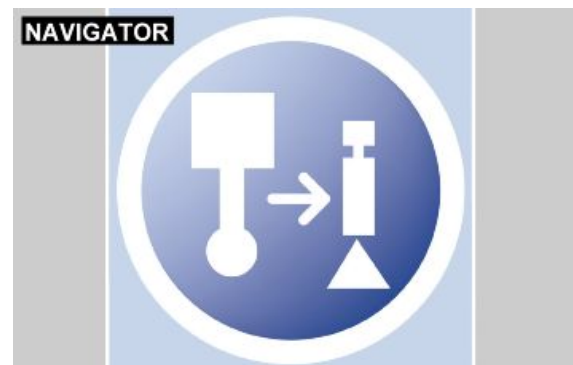
ENGINE PARAMETER READING SCREEN PAGE

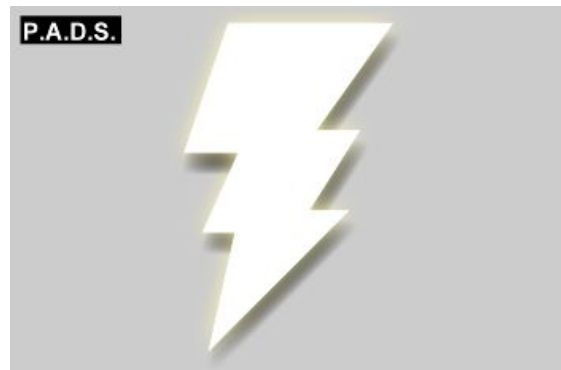
Navigator characteristic	P.A.D.S. characteristic	Unit of measurement
Engine rpm	Engine rpm	rpm
Left lambda probe voltage	Left lambda probe voltage	mV
Right lambda probe voltage	Right lambda probe voltage	mV
Left cylinder title correction	Left cylinder title correction	%
Right cylinder title correction	Right cylinder title correction	%

Navigator characteristic	P.A.D.S. characteristic	Unit of measurement
Throttle grip opening percentage	Throttle grip opening percentage	%
Throttle valve position potentiometer 1	Throttle valve position potentiometer 1	°
Throttle position correction	Throttle position correction	°
Left cylinder ignition advance (central spark plug)	Left cylinder ignition advance (central spark plug)	°
Left cylinder ignition advance (side spark plug)	Left cylinder ignition advance (side spark plug)	°
Right cylinder ignition advance (central spark plug)	Right cylinder ignition advance (central spark plug)	°
Right cylinder ignition advance (side spark plug)	Right cylinder ignition advance (side spark plug)	°
Left cylinder fuel adaptive correction	Left cylinder fuel adaptive correction	-
Right cylinder fuel adaptive correction	Right cylinder fuel adaptive correction	-
Engine temperature	Engine temperature	°C
Air temperature	Air temperature	°C
Battery voltage	Battery voltage	V
Engine temperature at start-up	Engine temperature at start-up	°C
Blue connector throttle grip position sensor - track A	Blue connector throttle grip position sensor - track A	mV
Blue connector throttle grip position sensor - track B	Blue connector throttle grip position sensor - track B	mV
White connector throttle grip position sensor - track C	White connector throttle grip position sensor - track C	mV
White connector throttle grip position sensor - track D	White connector throttle grip position sensor - track D	mV
Throttle potentiometer 1 voltage	Throttle potentiometer 1 voltage	mV
Throttle potentiometer 2 voltage	Throttle potentiometer 2 voltage	mV
Throttle valve position potentiometer 2	Throttle valve position potentiometer 2	°
Intake pressure	Intake pressure	mBar
Intake reference pressure	Intake reference pressure	mBar
Left cylinder injection time	Left cylinder injection time	ms
Right cylinder injection time	Right cylinder injection time	ms
Nominal idle speed	Nominal idle speed	rpm
Throttle Limp Home position	Throttle Limp Home position	mV
Throttle lower position	Throttle lower position	mV
Vehicle speed	Vehicle speed	km/h
Front wheel speed	Front wheel speed	km/h
Rear wheel circumference	Rear wheel circumference	mm
Final drive gear ratio	Final drive gear ratio	-

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.



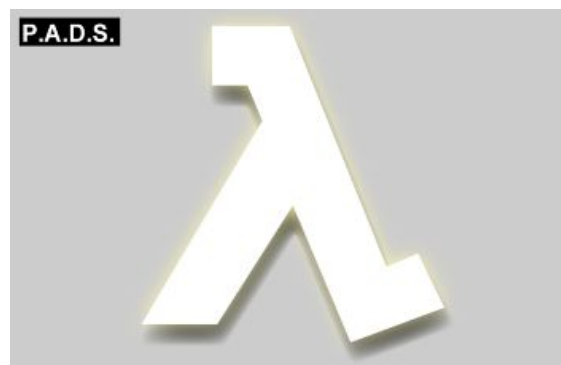


DEVICES ACTIVATION

Navigator characteristic	P.A.D.S. characteristic	Description / Value
Right cylinder central coil	Right cylinder central coil	-
Left cylinder central coil	Left cylinder central coil	-
Right cylinder side coil	Right cylinder side coil	-
Left cylinder side coil	Left cylinder side coil	-
Right cylinder injector	Right cylinder injector	-
Left cylinder injector	Left cylinder injector	-
Deleting stored errors	Deleting stored errors	-
Freezes and saves the parameter and states values	Freezes and saves the parameter and states values	-
Rpm indicator	Rpm indicator	-
Errors ambient parameters reading	Errors ambient parameters reading	-
STOP light	STOP light	-
Fuel pump	Fuel pump	-
Right Lambda probe heater	Right Lambda probe heater	-
Left Lambda probe heater	Left Lambda probe heater	-

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).

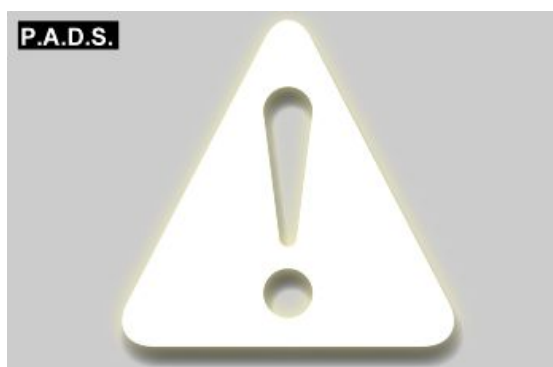


DEVICE STATUS

Navigator characteristic	P.A.D.S. characteristic	Navigator Description / Value	P.A.D.S Description / Value
Left cylinder title control	Left cylinder title control	Open loop/Closed loop/Rich in half closed loop/Lean in half closed loop	Open loop/Closed loop/Rich in half closed loop/Lean in half closed loop
Right cylinder title control	Right cylinder title control	Open loop/Closed loop/Rich in half closed loop/Lean in half closed loop	Open loop/Closed loop/Rich in half closed loop/Lean in half closed loop
Left lambda probe	Left lambda probe	Operative/Inoperative (Rich)/Inoperative (Lean)/Inoperative (Start-up)	Operative/Inoperative (Rich)/Inoperative (Lean)/Inoperative (Start-up)
Right Lambda probe	Right Lambda probe	Operative/Inoperative (Rich)/Inoperative (Lean)/Inoperative (Start-up)	Operative/Inoperative (Rich)/Inoperative (Lean)/Inoperative (Start-up)
Left cylinder title	Left cylinder title	Rich/Lean/Not detected	Rich/Lean/Not detected
Right cylinder title	Right cylinder title	Rich/Lean/Not detected	Rich/Lean/Not detected
Engine status	Engine status	Indefinite/Key ON/Running engine/Stopped/Power latch/Power latch 2/Power latch finished	Indefinite/Key ON/Running engine/Stopped/Power latch/Power latch 2/Power latch finished
Engine mode	Engine mode	Indefinite/Start-up/Stable/Idle/Acceleration/Deceleration/Enters Cut Off/Cut Off/Exits Cut Off	Indefinite/Start-up/Stable/Idle/Acceleration/Deceleration/Enters Cut Off/Cut Off/Exits Cut Off
Handle self-learning	Handle self-learning	Carried out/Not carried out	Carried out/Not carried out
Throttle self-acquisition	Throttle self-acquisition	Ice/Interrupted/Carried out/Limp home/Closed throttle stop/Springs check/Limp home self-acquisition/Initialise	Ice/Interrupted/Carried out/Limp home/Closed throttle stop/Springs check/Limp home self-acquisition/Initialise
Throttle self-learning with diagnostics instrument	Throttle self-learning with diagnostics instrument	Carried out/Not carried out	Carried out/Not carried out
Start up enabling	Start up enabling	Yes/No	Yes/No
Immobilizer signal	Immobilizer signal	Yes/No	Yes/No
Gearbox in neutral	Gearbox in neutral	Yes/No	Yes/No
Side stand	Side stand	Down/Up	Down/Up
fall sensor	fall sensor	Normal / Tip over	Normal / Tip over
RUN / STOP switch	RUN / STOP switch	Run/Stop	Run/Stop
Clutch	Clutch	Pulled/Released	Pulled/Released
Gear engaged	Gear engaged	0/1/2/3/4/5/6/Indefinite	0/1/2/3/4/5/6/Indefinite
Throttle grip	Throttle grip	Slightly twisted/Choked/Fully twisted	Slightly twisted/Choked/Fully twisted
Rpm sensor signals panel	Rpm sensor signals panel	Synchronized/Partially synchronized/Not synchronized	Synchronized/Partially synchronized/Not synchronized
+ Button (during MGCT settings)	+ Button (during MGCT settings)	Pressed/Released	Pressed/Released
- Button (during MGCT settings)	- Button (during MGCT settings)	Pressed/Released	Pressed/Released
Moto Guzzi Controllo Trazione (in turn)	Moto Guzzi Controllo Trazione (in turn)	Present/Not present	Present/Not present
Moto Guzzi Quick Shift	Moto Guzzi Quick Shift	Present/Not present	Present/Not present
ABS	ABS	Present/Not present	Present/Not present
Front brake lever	Front brake lever	Pulled/Released	Pulled/Released
rear brake pedal	rear brake pedal	Pressed/Released	Pressed/Released
Cruise control button	Cruise control button	Pressed/Released	Pressed/Released
Cruise control	Cruise control	Enabled/Disabled/Set	Enabled/Disabled/Set
Cruise control + button	Cruise control + button	Pressed/Released	Pressed/Released
Button - cruise control	Button - cruise control	Pressed/Released	Pressed/Released
Moto Guzzi Cruise Control (MGCC)	Moto Guzzi Cruise Control (MGCC)	Present/Not present	Present/Not present
Speedometer unit of measurement	Speedometer unit of measurement	kph / mph	kph / mph
Vehicle configuration	Vehicle configuration	Valid/Not valid	Valid/Not valid

ERRORS screen page

This screen page displays any errors detected in the vehicle (ATT) or stored in the control unit (MEM) and you can check that the cancellation of error (STO) has taken place.



ERRORS DISPLAY

Err or	Navigator characteristic	P.A.D.S. characteristic	Navigator Description / Value	P.A.D.S Description / Value
P0105	Cylinder air pressure sensor	Cylinder air pressure sensor	Short circuit to positive/ short circuit to ground or open circuit	Short circuit to positive/ short circuit to ground or open circuit
P0107	Air pressure sensor	Air pressure sensor	Signal not valid	Signal not valid
P0110	Air temperature sensor	Air temperature sensor	Short circuit to positive or open circuit/ short circuit to ground	Short circuit to positive or open circuit/ short circuit to ground
P0115	Engine temperature sensor	Engine temperature sensor	Short circuit to positive or open circuit/ short circuit to ground	Short circuit to positive or open circuit/ short circuit to ground
P0116	Engine temperature sensor	Engine temperature sensor	Signal not valid	Signal not valid
P0120	Throttle position 1 potentiometer sensor 2	Throttle valve sensor potentiometer 2	Short circuit to positive/ short circuit to ground or open circuit	Short circuit to positive/ short circuit to ground or open circuit
P0121	Plausibility potentiometer 1	Plausibility potentiometer 1	Signal not valid	Signal not valid
P0122	Sensor potentiometer 2 throttle position	Sensor potentiometer 2 throttle position	Short circuit to positive/ short circuit to ground or open circuit	Short circuit to positive/ short circuit to ground or open circuit
P0123	Plausibility potentiometer 2	Plausibility potentiometer 2	Signal not valid	Signal not valid
P0124	Throttle position sensors consistency	Throttle position sensors consistency	Inconsistent signal	Inconsistent signal

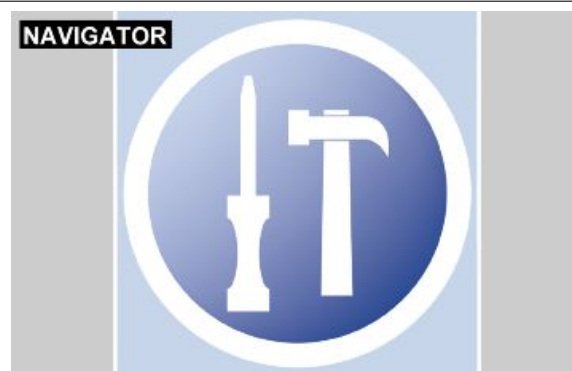
Err or	Navigator characteristic	P.A.D.S. characteristic	Navigator Description / Value	P.A.D.S Description / Value
P0130	Left cylinder lambda probe	Left cylinder lambda probe	Short circuit to positive	Short circuit to positive
P0135	Heating left cylinder lambda probe	Heating left cylinder lambda probe	Short circuit to positive/ short circuit to ground or open circuit	Short circuit to positive/ short circuit to ground or open circuit
P0136	Right cylinder lambda probe	Right cylinder lambda probe	Short circuit to positive	Short circuit to positive
P0141	Heating right cylinder lambda probe	Heating right cylinder lambda probe	Short circuit to positive/ short circuit to ground or open circuit	Short circuit to positive/ short circuit to ground or open circuit
P0150	Throttle Grip Position Sensor Pot. A	Throttle Grip Position Sensor Pot. A	Short circuit to positive/ short circuit to ground or open circuit	Short circuit to positive/ short circuit to ground or open circuit
P0151	Throttle Grip Position Sensor Pot. B	Throttle Grip Position Sensor Pot. B	Short circuit to positive/ short circuit to ground or open circuit	Short circuit to positive/ short circuit to ground or open circuit
P0152	Throttle Grip Position Sensor Pot. C	Throttle Grip Position Sensor Pot. C	Short circuit to positive/ short circuit to ground or open circuit	Short circuit to positive/ short circuit to ground or open circuit
P0153	Throttle Grip Position Sensor Pot. D	Throttle Grip Position Sensor Pot. D	Short circuit to positive/ short circuit to ground or open circuit	Short circuit to positive/ short circuit to ground or open circuit
P0154	Throttle Grip Position Redundancy tracks A-B	Throttle Grip Position Redundancy tracks A-B	Inconsistent signal	Inconsistent signal
P0155	Throttle Grip Position Redundancy tracks C-D	Throttle Grip Position Redundancy tracks C-D	Inconsistent signal	Inconsistent signal
P0156	Throttle grip position consistency	Throttle grip position consistency	Inconsistent signal	Inconsistent signal
P0160	Throttle Limp Home self-acquisition	Throttle Limp Home self-acquisition	Failed test	Failed test
P0161	Throttle mechanical springs self-acquisition	Throttle mechanical springs self-acquisition	Failed test	Failed test
P0162	Throttle mechanical idle position self-acquisition	Throttle mechanical idle position self-acquisition	Failed test	Failed test
P0163	Throttle Recovery conditions detection	Throttle Recovery conditions detection	Possible presence of ice	Possible presence of ice
P0164	Throttle power supply voltage during self-acquisition	Throttle power supply voltage during self-acquisition	Low power supply voltage	Low power supply voltage
P0167	Throttle position error	Throttle position error	Misalignment between control and activation	Misalignment between control and activation
P0169	Starter switch	Starter switch	Signal not valid	Signal not valid
P0170	Starter	Starter	Short circuit to positive/ short circuit to ground or open circuit	Short circuit to positive/ short circuit to ground or open circuit
P0205	Left cylinder injector	Left cylinder injector	Short circuit to positive/ short circuit to ground or open circuit	Short circuit to positive/ short circuit to ground or open circuit
P0206	Right cylinder injector	Right cylinder injector	Short circuit to positive/ short circuit to ground or open circuit	Short circuit to positive/ short circuit to ground or open circuit
P0210	Error due to unexpected air intake in the manifold	Error due to unexpected air intake in the manifold	Signal not valid	Signal not valid

Err or	Navigator characteristic	P.A.D.S. characteristic	Navigator Description / Value	P.A.D.S Description / Value
P0215	Cylinder manifold intake pressure error	Cylinder manifold intake pressure error	Pressure too high/pressure too low	Pressure too high/pressure too low
P0217	Manifold pressure too low error	Manifold pressure too low error	Signal not valid	Signal not valid
P0230	Fuel pump relay control	Fuel pump relay control	Short circuit to positive/ short circuit to ground or open circuit	Short circuit to positive/ short circuit to ground or open circuit
P0351	Engine speed sensor (Functional diagnosis)	Engine speed sensor (Functional diagnosis)	Signal not valid	Signal not valid
P0351	Left cylinder coil	Left cylinder coil	Short circuit to positive/ short circuit to ground or open circuit	Short circuit to positive/ short circuit to ground or open circuit
P0352	Right cylinder central coil	Right cylinder central coil	Short circuit to positive/ short circuit to ground or open circuit	Short circuit to positive/ short circuit to ground or open circuit
P0353	Left cylinder side coil	Left cylinder side coil	Short circuit to positive/ short circuit to ground or open circuit	Short circuit to positive/ short circuit to ground or open circuit
P0354	Right cylinder side coil	Right cylinder side coil	Short circuit to positive/ short circuit to ground or open circuit	Short circuit to positive/ short circuit to ground or open circuit
P0461	Analogue gear sensor	Analogue gear sensor	Short circuit to positive or open circuit/ short circuit to ground	Short circuit to positive or open circuit/ short circuit to ground
P0502	Rear wheel speed sensor/ signal	Rear wheel speed sensor/ signal	Connect to the ABS control unit diagnostics	Connect to the ABS control unit diagnostics
P0510	Rear wheel radius acquisition	Rear wheel radius acquisition	CAN error during acquisition/Invalid value	CAN error during acquisition/Invalid value
P0560	Battery voltage	Battery voltage	Too high/Too low	Too high/Too low
P0601	EEPROM error	EEPROM error	Circuit not operational	Circuit not operational
P0604	RAM error	RAM error	Circuit not operational	Circuit not operational
P0605	ROM error	ROM error	Circuit not operational	Circuit not operational
P0607	A/D converter	A/D converter	Circuit not operational	Circuit not operational
P0608	Level 2 safety reset	Level 2 safety reset	With level 2 safety fault the control unit carries out a reset	With level 2 safety fault the control unit carries out a reset
P0609	Safety engine stop	Safety engine stop	With grave error the control unit switches off the engine	With grave error the control unit switches off the engine
P0610	Stop light relay error	Stop light relay error	Short circuit to positive/ short circuit to ground/open circuit	Short circuit to positive/ short circuit to ground/open circuit
P0611	Data file saved (for safety)	Data file saved (for safety)	Filled	Filled
U1601	Mute Node	Mute Node	Mute Node	Mute Node
U1602	No signals	No signals	Bus Off	Bus Off

Err or	Navigator characteristic	P.A.D.S. characteristic	Navigator Description / Value	P.A.D.S Description / Value
U1701	NQS - No Dashboard Node	NQS - No Dashboard Node	Signal absent	Signal absent
U1702	NQS - Dashboard Frame Counter	NQS - Dashboard Frame Counter	Intermittent signal or communication error	Intermittent signal or communication error
U1711	ABS control unit	ABS control unit	No signal/Configuration error	No signal/Configuration error
U1712	ABS Control Unit Frame Counter	ABS Control Unit Frame Counter	Intermittent signal or communication error	Intermittent signal or communication error

SETTINGS screen page

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



ADJUSTABLE PARAMETERS

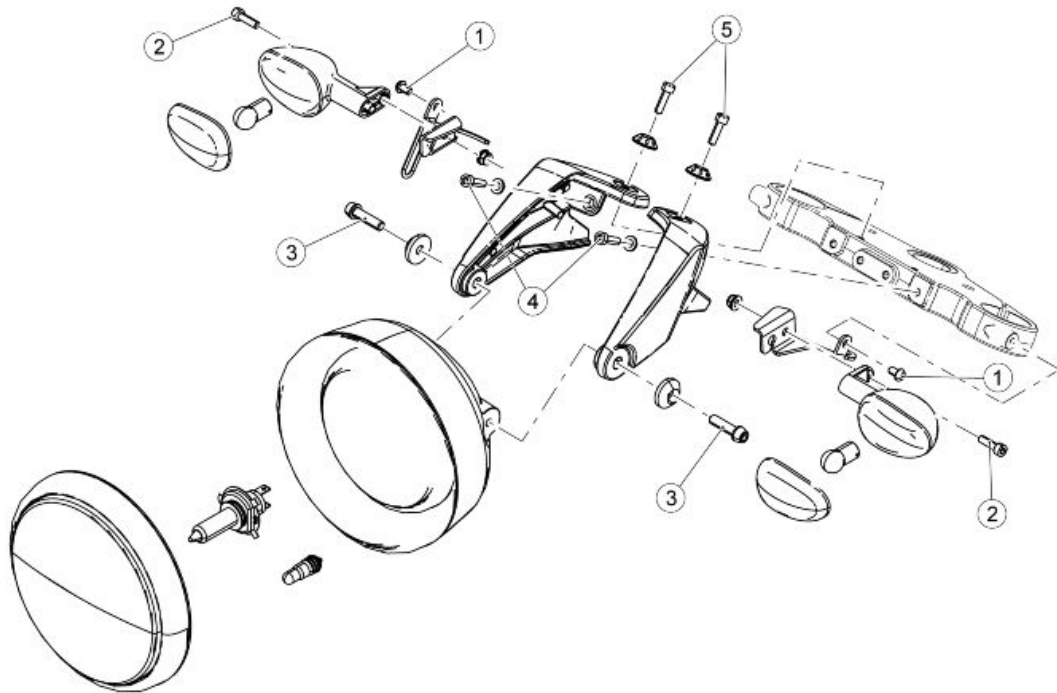
Navigator characteristic	P.A.D.S. characteristic	Description / Value
MGCT (cruise control)	MGCT (cruise control)	-
Speedometer unit of measurement setting	Speedometer unit of measurement setting	-
MGCT (traction control)	MGCT (traction control)	-
Handle self-learning	Handle self-learning	-

INDEX OF TOPICS

SSUSPENSIONS

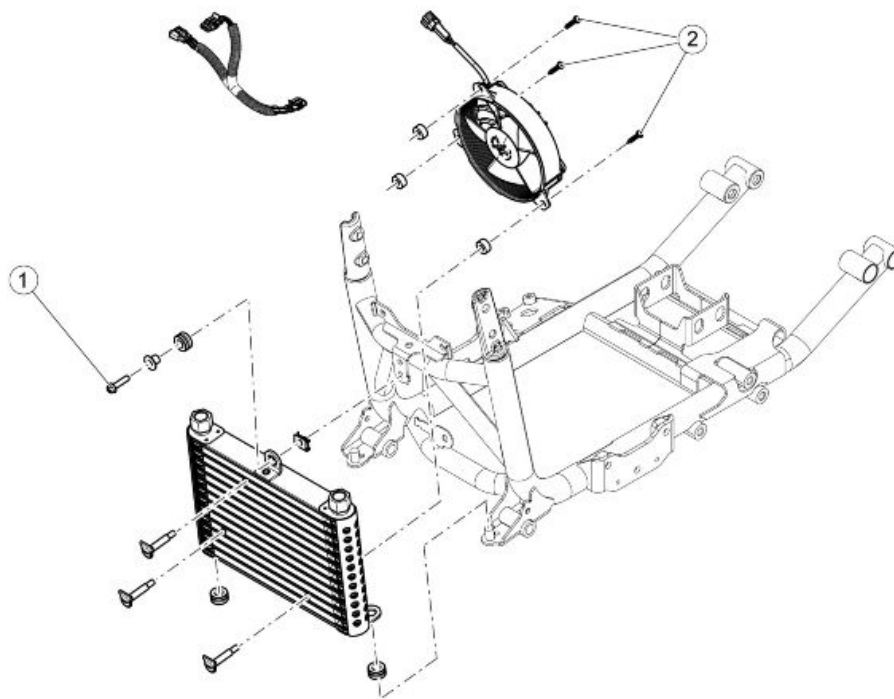
SUSP

Handlebar



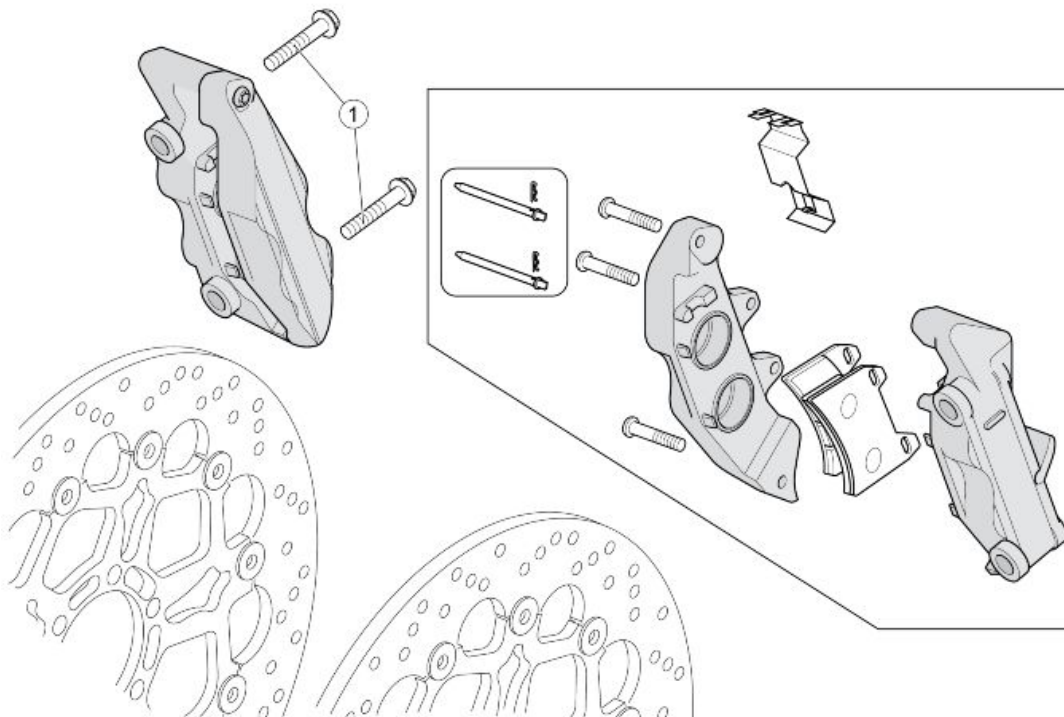
FRONT HEADLAMP

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fastening the turn indicator to the upper steering yoke	M6x10	2	10 Nm (7.38 lb ft)	-
2	Screws fixing the turn indicator to the support bracket	M6x18	2	10 Nm (7.38 lb ft)	-
3	Screws fixing headlamp to supports	M8x30	2	25 Nm (18.44 lb ft)	-
4	Screws fixing lights front supports to steering yoke	M6x20	2	10 Nm (7.38 lb ft)	-
5	Screws fixing lights upper supports to steering yoke	M6x20	2	10 Nm (7.38 lb ft)	-



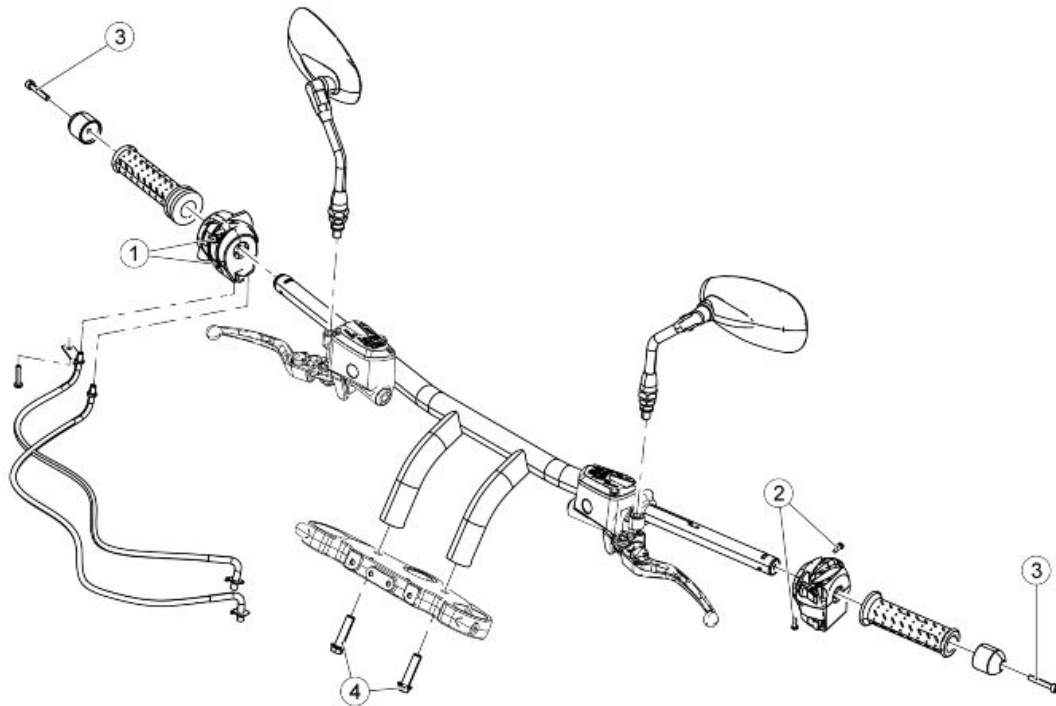
OIL RADIATOR

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing oil radiator to chassis	M6x25	1	10 Nm (7.38 lb ft)	-
2	Screws fixing electric fan to oil radiator	4.2x20	3	2.5 Nm (1.84 lb ft)	-



FRONT BRAKE CALLIPER

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing brake callipers to stanchions	M10x55	4	50 Nm (36.88 lb ft)	-



HANDLEBAR AND CONTROLS

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing right switch to handlebar	-	2	1.5 Nm (1.11 lb ft)	-
2	Screws fixing left switch to handlebar	-	2	1.5 Nm (1.11 lb ft)	-
3	Screws fixing anti-vibration to handlebar	M6x35	2	10 Nm (7.38 lb ft)	-
4	Screws fastening handlebar to upper plate	M10x40	2	50 Nm (36.88 lb ft)	Loct. 243

REMOVAL OF COMMANDS TO HANDLEBAR

- Undo and remove the two fixing screws of the clutch pump bracelet.
- Remove the pump.

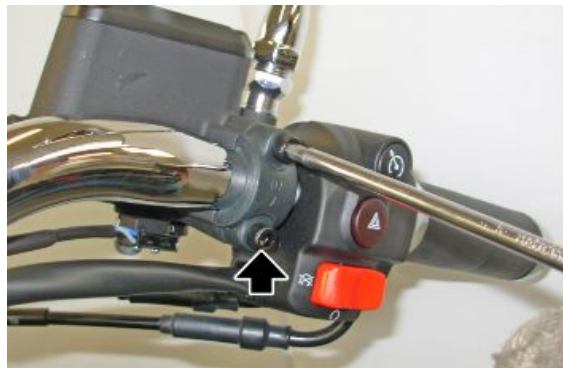


- Undo and remove the three fixing screws of the left switch.
- Remove the switch.

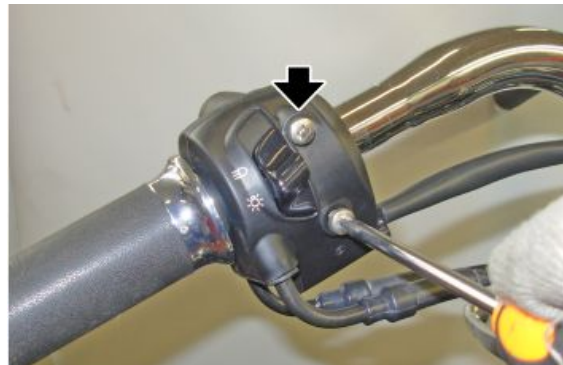




- Undo and remove the two fixing screws of the front brake pump bracelet.
- Remove the pump.



- Undo and remove the two fixing screws of the right switch.
- Remove the switch.



Removing

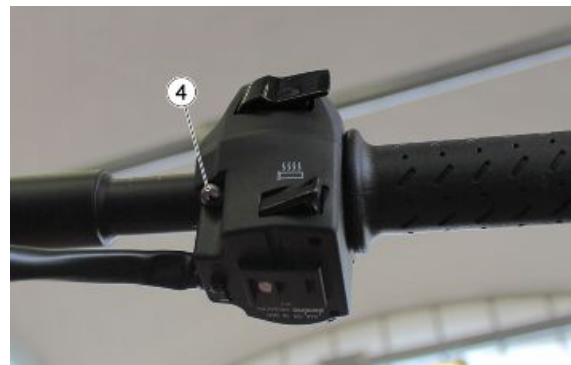
- Undo and remove the two fixing screws (1).
- Remove the U-bolt (2).



- Remove the clutch pump complete (3).



- Unscrew and remove the screw (4).



- Unscrew and remove the screw (5).



- Remove the switch (6).



- Unscrew and remove the two screws (7).
- Remove the U-bolt (8).
- Remove the front brake master cylinder complete (9).



- Unscrew and remove the two screws (10).



- Unlatch and remove the gas control cables from their seat (11).
- Remove the switch (12).



- Unscrew and remove the two fixing screws in the points in the figure.



- Remove the handlebar (13).



Installing

- To fix the handlebar on the steering yoke, use a torque wrench with a bushing of 13, socket 3/8, with a maximum external diameter ≤ 18 mm (0.71 in) as shown in the image



- Operating on the side and turning the steering wheel to bring the head of the screw in optimal position for its tightening, insert the bushing and make sure that it is completely and orthogonally inserted regarding its head.

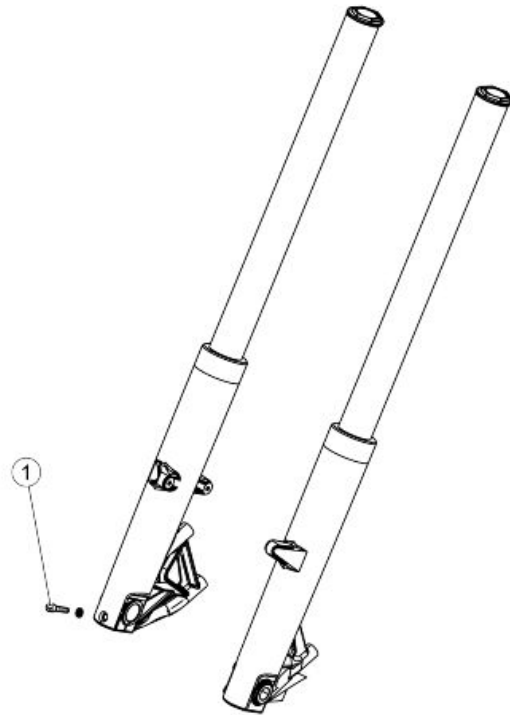


CAUTION

A WRONG DIAMETER OF THE BUSHING COULD REDUCE THE EFFECTIVE CLOSING TORQUE DUE TO THE FRICTION EFFECT BETWEEN BUSHING AND THE SEAT ON THE PLATE.

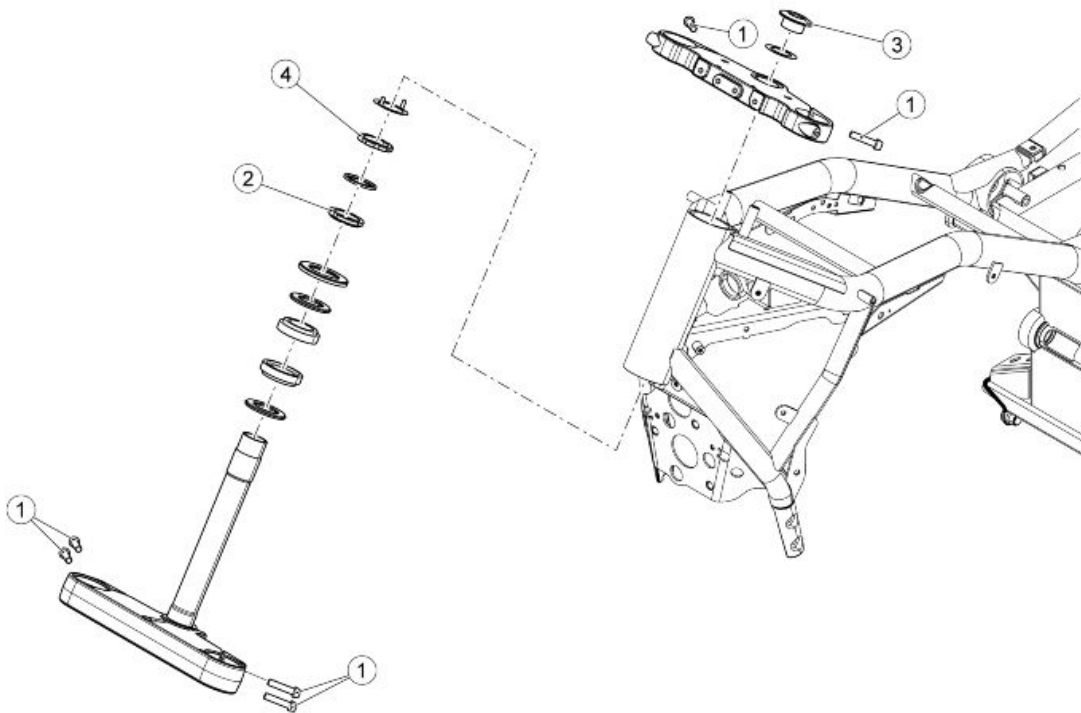
- Tighten the two M10 fixing screws of the steering wheel with a torque of 50 Nm (36.88 lbf ft) applying Loctite 243

Front fork



FORK

pos.	Description	Type	Quantity	Torque	Notes
1	Fork stem clamp tightening screw	M8x45	1	25 Nm (18.44 lb ft)	-

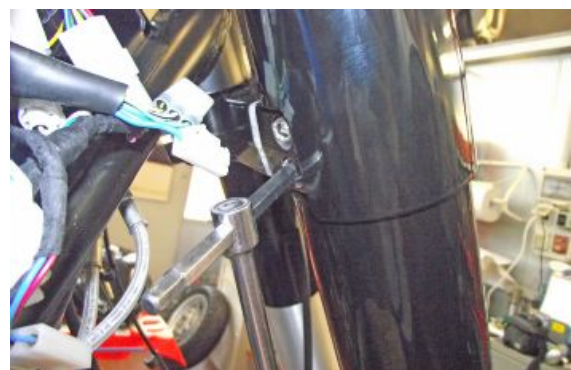


STEERING

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing forks to plate	M8x35	6	20 Nm (14.75 lb ft)	-
2	Lower ring nut	-	1	50 Nm (36.87 lb ft)	Pretightening to 60 Nm (44.25 lb ft)
3	Upper yoke fixing bushing	-	1	100 Nm (73.76 lb ft)	-
4	Counter-lock ring	-	1	Manual	-

Removing the fork legs

- Rest the vehicle on its centre stand.
- Secure the rear part of the vehicle through belts in order to lift the front wheel.
- Remove the mudguard.
- Remove the front wheel.
- Support the stanchion and loosen the screws on the upper and then the lower plate.



- Remove the ABS sensor.
- Remove the stanchion.

See also

[Removing the front wheel](#)

Draining oil

- lock the fork in a vice using the special tool.

Specific tooling

020981Y Stanchion support



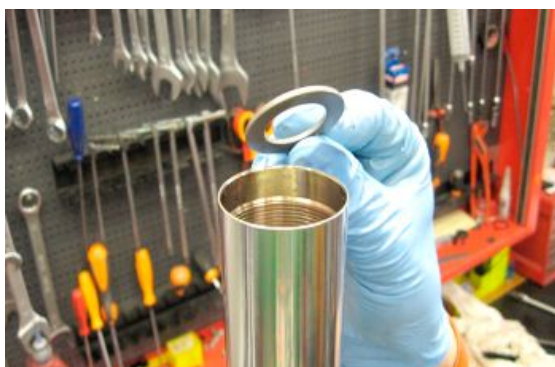
- Remove the cap.



- Remove the preload pipe.



- Remove the spacer washer.



- Remove the spring.



- Using a special container of suitable capacity for the amount of oil present inside the fork.
- Drain the oil from the fork.



Disassembling the fork

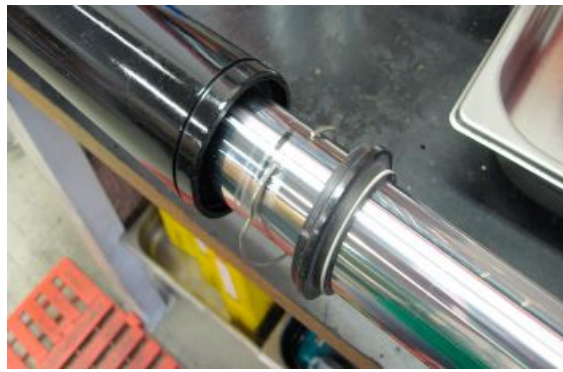
- Discharge all the oil from the sleeve.
- Tighten the fork sleeve in a vice.
- Using the special extensions, lock the internal piston with an Allen key.



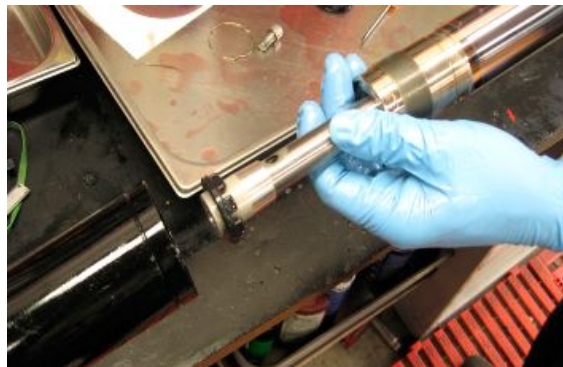
- Remove the piston fixing screw located on the sleeve foot.



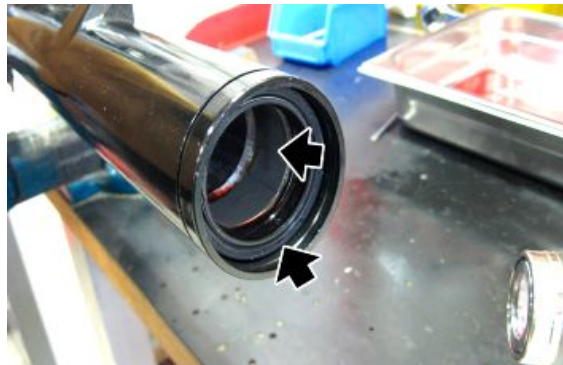
- Remove the dust gaiter and the elastic retainer ring.



- Remove the stem complete with the piston.



- Remove the oil seal and the inside spacer.



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

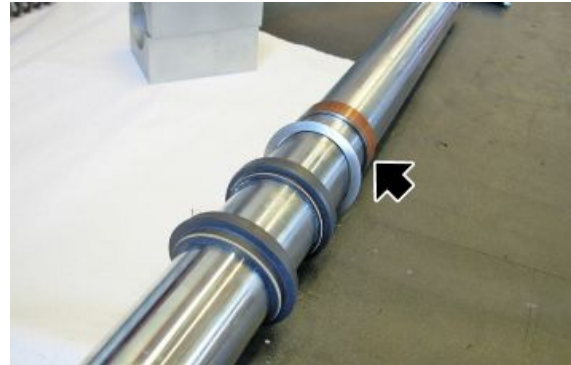
Check that there are no damages and/or cracks; otherwise, replace it.

Spring

Check the spring is in good conditions.

Check that the following components are in good conditions:

- upper bushing;



- lower bushing;



- piston.

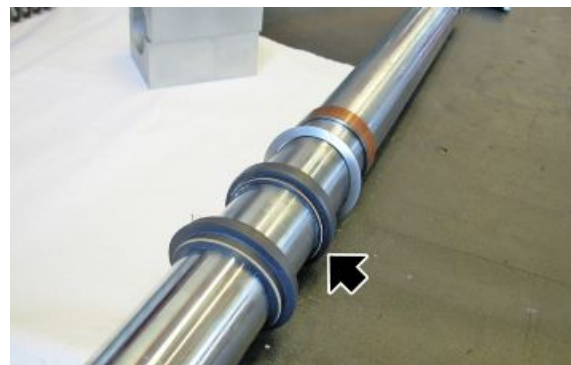
If there are signs of excessive wear or damage, replace the affected component.

CAUTION

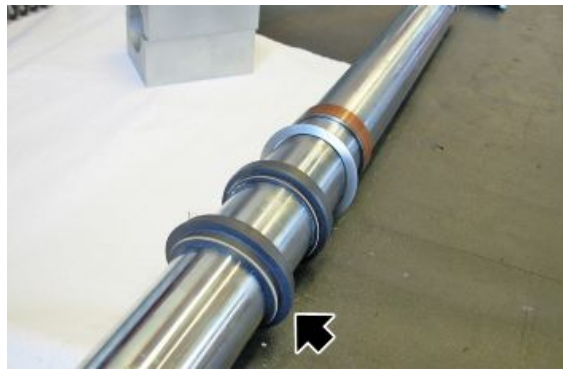
REMOVE ANY IMPURITY IN THE BUSHINGS, TAKING CARE NOT TO SCRATCH THEIR SURFACE.

Replace the following components with new ones:

- seal ring;



- dust gaiter;



- O-Ring on the cap.



Reassembling the fork

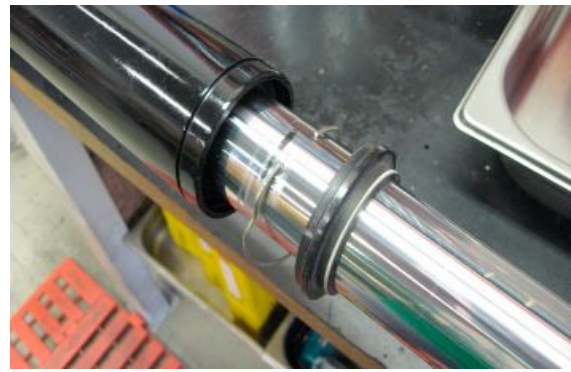
- Lock the sleeve in the vice.
- Lubricate the stanchion sliding edges with fork oil or grease for seals.
- Install the inside spacer, the oil seal, the elastic retainer ring and the dust gaiter on the stem. Pay attention to mount them in the correct order.
- Place the stem, complete with piston, inside the sleeve. Insert the inside spacer in its seat and with the prescribed tool, bring the oil seal in position.



Specific tooling

AP8140145 Tool for oil seals fitting

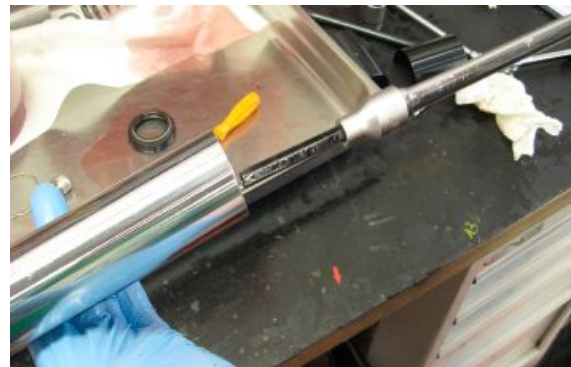
- Insert the elastic retainer ring in its position and install the oil seal on the sleeve.



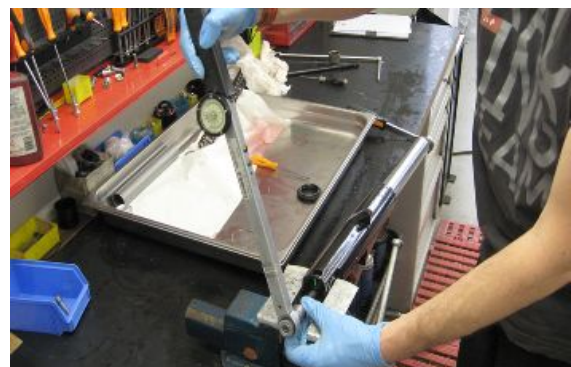
- Apply medium thread lock to the screw fixing the piston to the fork sleeve foot.
- Tighten, in a non-definitive way, the screw fixing the piston to the fork sleeve foot.



- Using the special extensions, lock the piston with an Allen key.

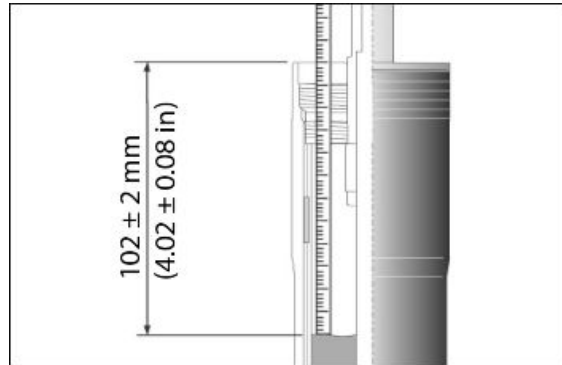


- Keeping the piston locked, tighten the screw fixing the piston to the fork sleeve foot to the prescribed torque.



Filling oil

- Place the sleeve upright in a vice fitted with protection shoes.
- Pour part of the fork oil into the stem.
- 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 stem rim.



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

Characteristic

Fork oil

594 +/- 2 cc (36.25 +/- 0.12 cu in) (for each stem)

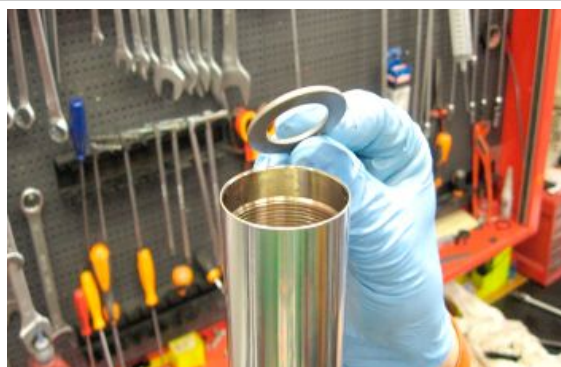
Oil level (from sleeve rim, without the spring and with pumping member fully down)

102 +/- 2 mm (4.02 +/- 0.08 in).

- Fit the spring into the stem.



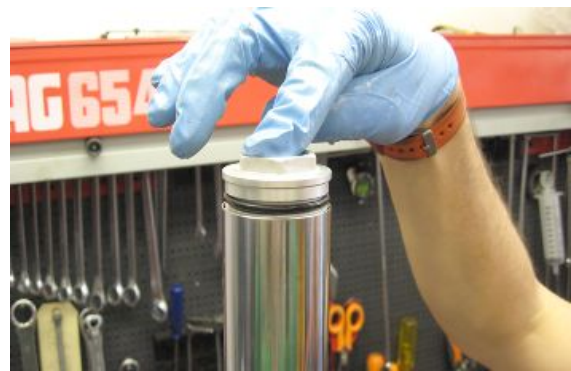
- Insert the spacer washer in the stem.



- Insert the preload pipe in the stem.



- Using the appropriate tool, fasten the stem in the vice, keeping it in vertical position.
- Apply oil for forks to the O-ring of the cap. Then fit the cap on the stem and tighten it to the prescribed torque.



Specific tooling

020981Y Stanchion support

Installing the fork legs

- Insert the stanchion in position. Insert the wheel axle so that the stems are aligned.
- Tighten the screws on the fork plates to the prescribed torque.



- Mount the front wheel.
- Before tightening torque the clamp screw, turn the fork a few trips in order to perfectly align the sleeve.



Removing

- First remove the handlebar, the front wheel.
- Working from both sides undo the screws fixing the upper plates to the forks.



- Unscrew and remove the bushing fixing the upper plate to washer.



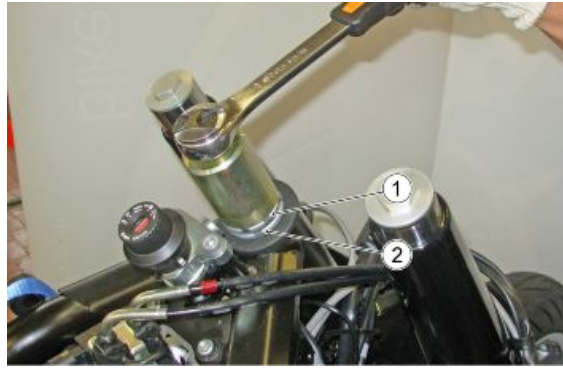
- Remove the upper plate.
- Remove the OR from the forks and the upper cover.
- Undo and remove the screws fixing the lower plate to the fork.



- Retrieve the safety plate.



- Using the special tool loosen the upper ring nut (1) and the lower ring nut (2).
- Retrieve the rubber spacer (3) placed between the two ring nuts.
- Be careful to properly hold the lower plate.



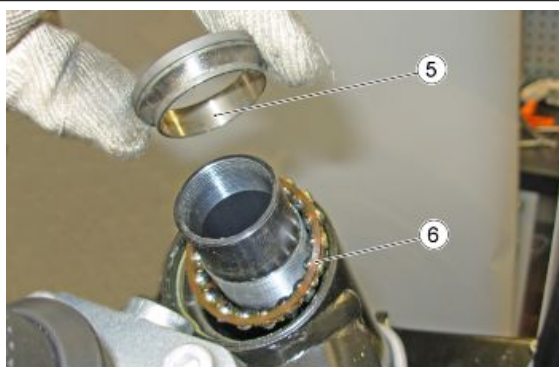
- Remove the two dust gaiter rings.



- Remove the spacer located in the lower plate.



- Remove the axial ball bearing (5)(6).
- Remove the lower plate.



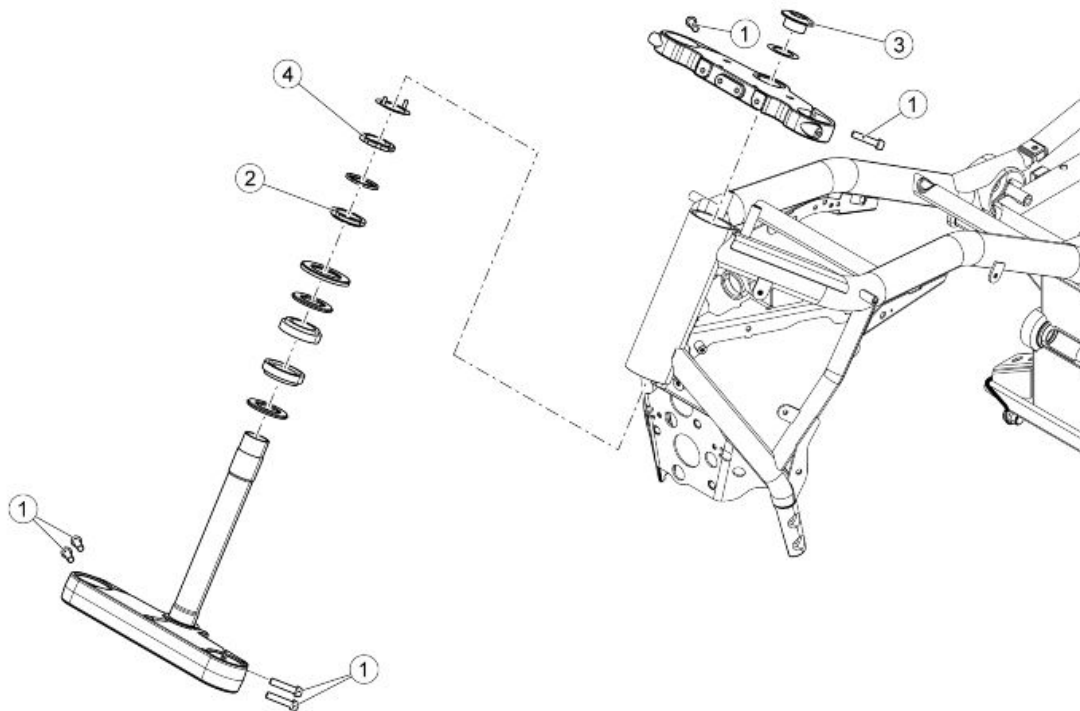
- Working from both sides, undo and remove the two fixing screws of the fork lower cover.
- Remove the fork by unscrewing the fixing screws to the lower plate.



See also

[Removing
Removing the
front wheel](#)

Steering bearing



STEERING

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing forks to plate	M8x35	6	20 Nm (14.75 lb ft)	-
2	Lower ring nut	-	1	50 Nm (36.87 lb ft)	Pretightening to 60 Nm (44.25 lb ft)
3	Upper yoke fixing bushing	-	1	100 Nm (73.76 lb ft)	-
4	Counter-lock ring	-	1	Manual	-

Adjusting play

- First remove the upper steering plate.
- Remove the safety washer, unscrew and remove the counter-lock ring (1) then remove the rubber support (3) and finally loosen the lower ring nut (2) to proceed with the steering clearance adjustment.





- Adjust the preloading of the steering bearings by tightening the lower ring nut to the prescribed torque.
- Turn the steering 3-4 times completely from right to left and then check correct tightening torque of such ring nut.



- Fit the upper ring nut, tightening it manually, plus about 90 degrees so that the grooves are lined up.
- Position the safety washer, reiterating the tabs on the ring nuts.
- Rivet the tongues on the upper ring nut.

See also[Removing](#)

Disassembling

- Using the special tool remove the upper bearing.
- Subsequently, after removing the upper bearing hit it from bottom upwards, using the appropriate tool, to extract the lower one.

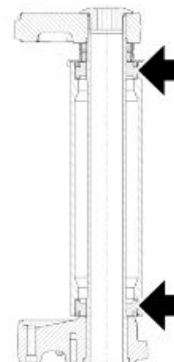


Assembling

- Using the special tool install the two bearings, first the lower then the upper one.

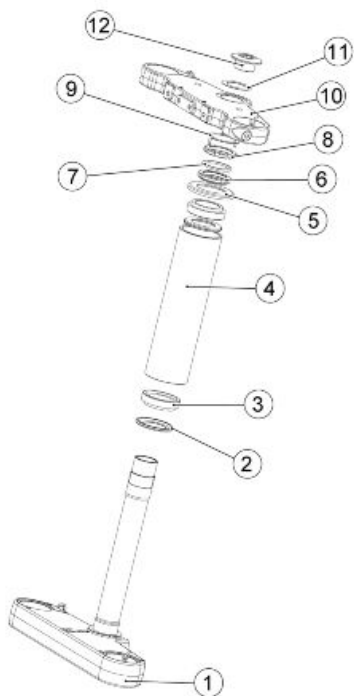


- Lubricate the two bearings with grease.

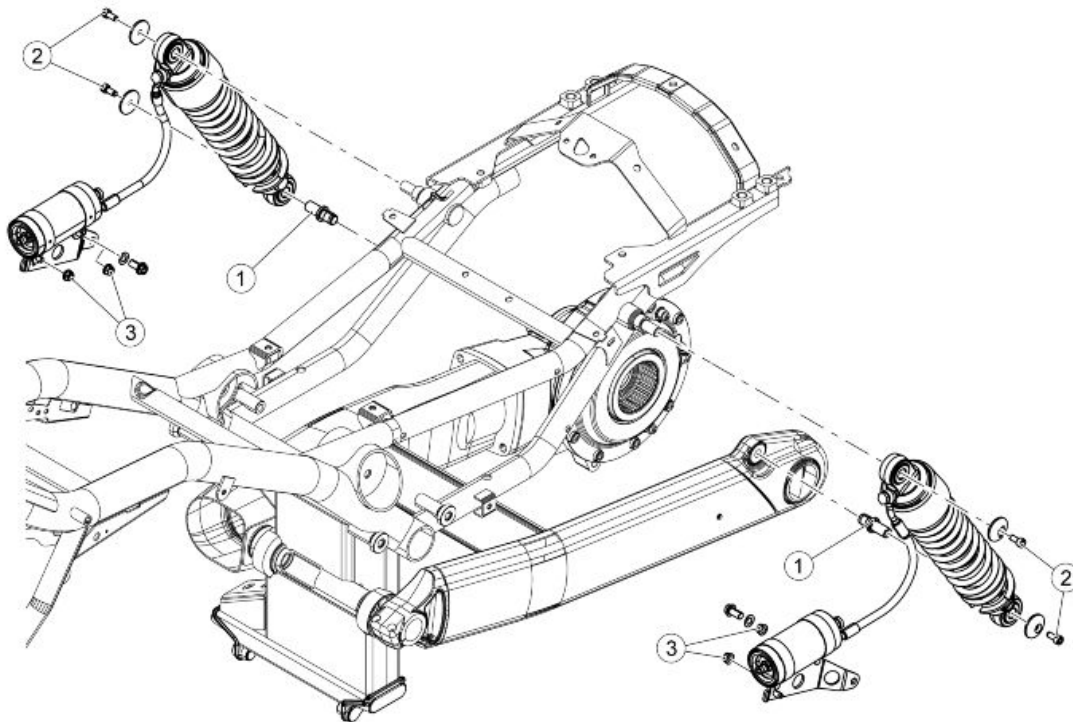


ASSEMBLY PROCEDURE:

- Assemble the components from (1) to (5).
- Insert the upper oil seal and make sure the straight section of the column (A) is secured.
- Tighten the ring nut (6) to the specified torque before the dust gaiter (5), then unscrew the abovementioned ring nut and retighten it.
- Fit the dust gaiter (5) from the back (B).
- Insert the rubber washer (7) and tighten the counter-lock ring (8) manually until making contact with the washer (7).
- Align the grooves of the tighten counter-lock ring (8) with the slots of the ring nut (6).
- Assemble the remaining components and tighten the cap (12) to the specified torque.



Shock absorbers



REAR SHOCK ABSORBERS

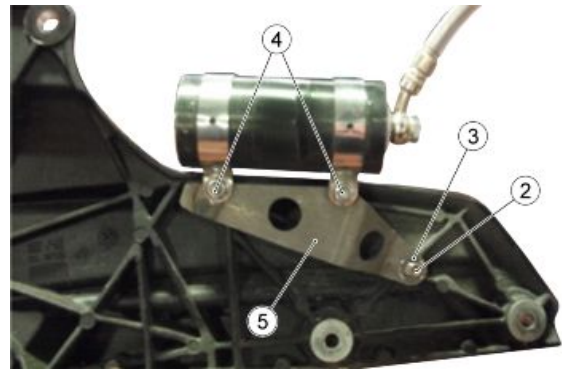
pos.	Description	Type	Quantity	Torque	Notes
1	Pins	-	2	40 Nm (29.50 lb ft)	-
2	Shock absorber fixing screws	M6x14	4	10 Nm (7.38 lb ft)	-
3	Nuts fixing shock absorber tank to footrest plate	M8	4	25 Nm (18.44 lb ft)	-

Removing

- The following procedure is visible from one side of the motorcycle, but is valid for both rear shock absorbers.
- Remove the silencer.
- Undo and remove the two fixing screws (1).



- Remove the passenger footrest.
- Unscrew and remove the screw (2) and then the washer (3).
- Unscrew and remove the two fixing nuts of the shock absorber tank (4).
- Collect the supporting clamp (5).



Installing

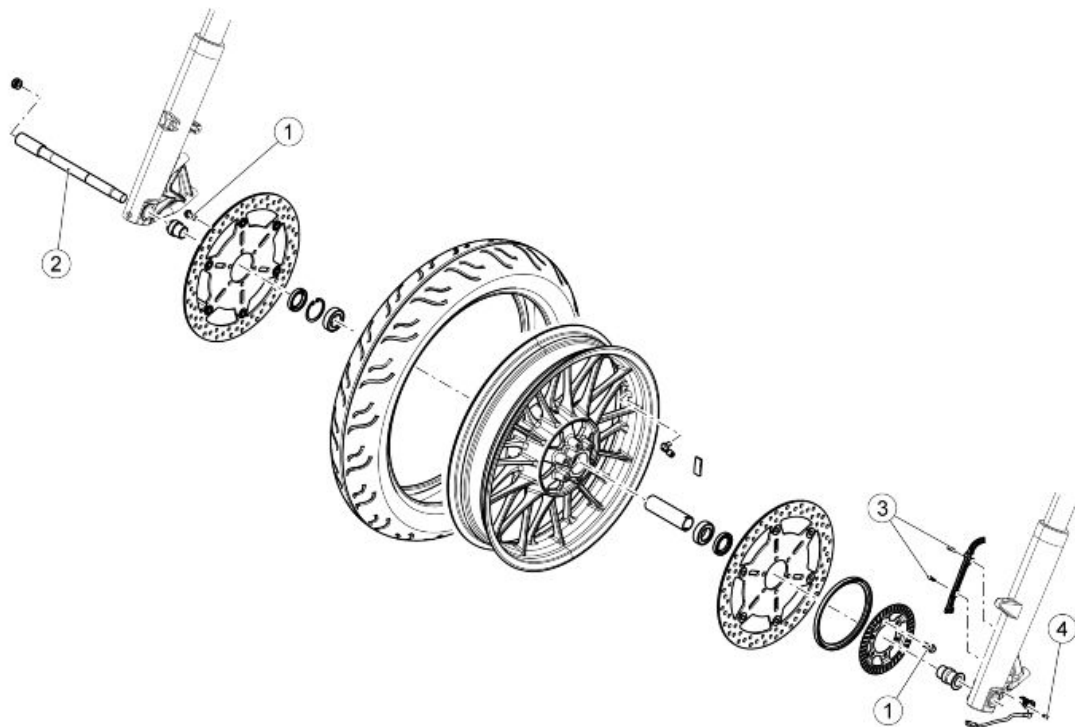
- To refit, follow the steps but in reverse order.

INDEX OF TOPICS

CHASSIS

CHAS

Front wheel



FRONT WHEEL

pos.	Description	Type	Quantity	Torque	Notes
1	Brake discs and tone wheel fixing screws	M8x22	12	25 Nm (18.44 lb ft)	-
2	Wheel axle	-	1	80 Nm (59.00 lb ft)	-
3	ABS cable guide fastening screws	M4x10	2	3 Nm (2.21 lb ft)	-
4	Screws fixing ABS sensor to stem	M5x16	1	6 Nm (4.43 lb ft)	Loctite 243

Removal

- Working from both sides, undo and remove the two fixing screws from the front brake callipers and remove them from their seats.



- Hold the motorcycle front section.
- Loosen the screw on the wheel axle clamp.



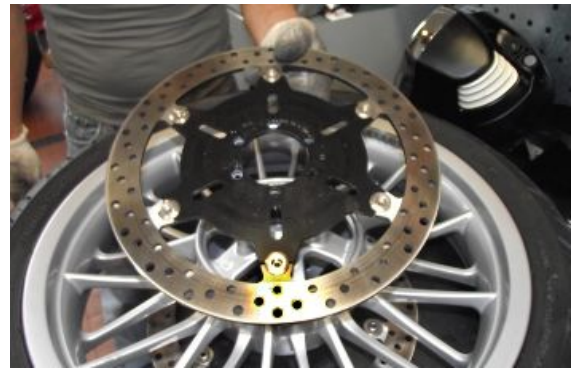
FRONT WHEEL REMOVAL

- Remove the spacer.



- Undo and remove the six fixing screws (1) of the tone wheel and the front disc.
- Remove the tone wheel and the front disc.

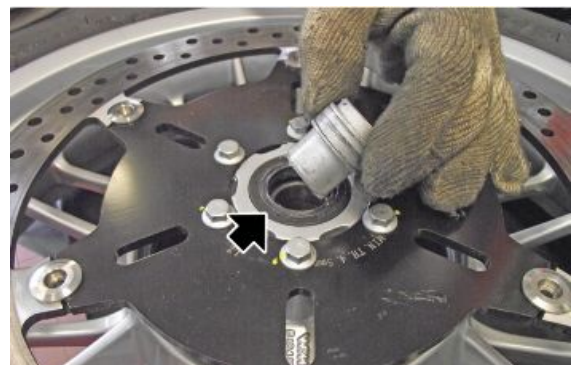


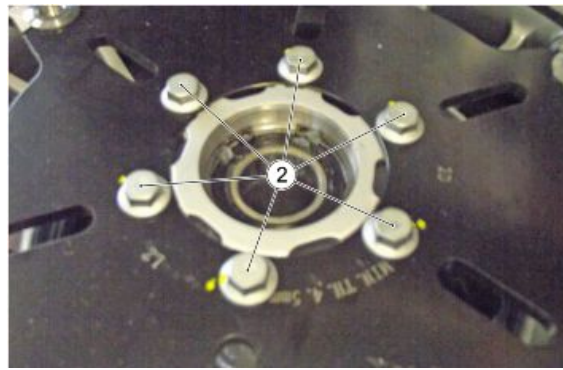


- Undo and remove the wheel axle.
- During the pin extraction operation, support the wheel and then remove it.



- Working on the opposite side remove the spacer.
- Remove the dust gaiter.
- Undo and remove the six fixing screws (2) of the front disc and remove it.



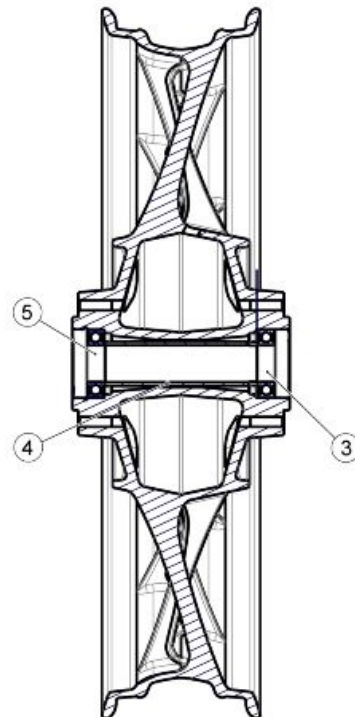


- Remove the Seeger ring.
- Using the special tool remove the bearing and the spacer.





- After removing the bearing (3) and the spacer (4), operate from the opposite side and remove the bearing (5).



Checking

FRONT WHEEL BEARINGS

Carry out the check with the bearings fitted on the wheel.



CHECK THAT ALL PARTS ARE IN GOOD CONDITION, ESPECIALLY THOSE LISTED AS FOLLOWS.

ROTATION CHECK

- Manually rotate the inside ring of each bearing. Rotation must be constant, smooth and noiseless.

If one or both bearings do not fall within the control parameters:

- Replace both wheel bearings.

RADIAL AND AXIAL CLEARANCE CHECK

- Check the radial and axial clearance.

Axial clearance: a minimum axial clearance is allowed.

Radial clearance: none.

If one or both bearings do not fall within the control parameters:

- Replace both wheel bearings.



ALWAYS REPLACE BOTH BEARINGS.

ALWAYS REPLACE THE BEARINGS WITH OTHERS OF THE SAME TYPE.

GASKETS

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

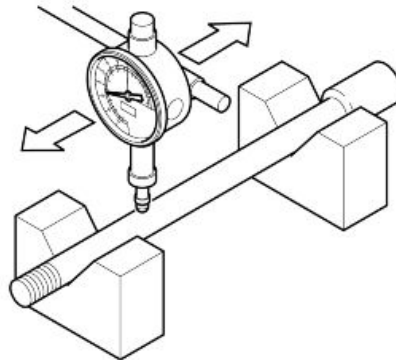


ALWAYS REPLACE BOTH GASKETS.

ALWAYS REPLACE THE GASKETS WITH OTHERS OF THE SAME TYPE.

WHEEL AXLE

- Use a dial gauge to check the wheel axle eccentricity. Replace the wheel axle if the eccentricity exceeds the limit value.

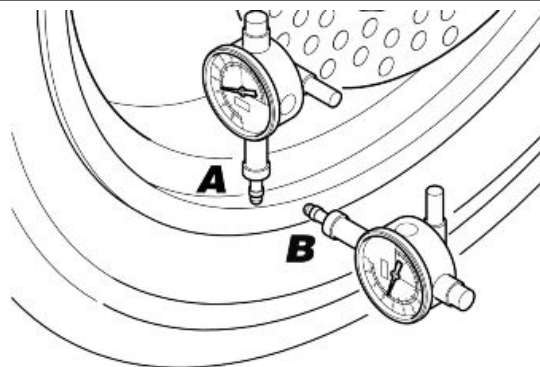


Characteristic

Maximum eccentricity:

0.20 mm (0.0079 in)

- Using a dial gauge, check that the radial (A) and the axial (B) eccentricities of the rim do not exceed the limit value. An excessive eccentricity is usually caused by worn or damaged bearings. Replace the rim if, after replacing the bearings, the value is not within the specified limit.

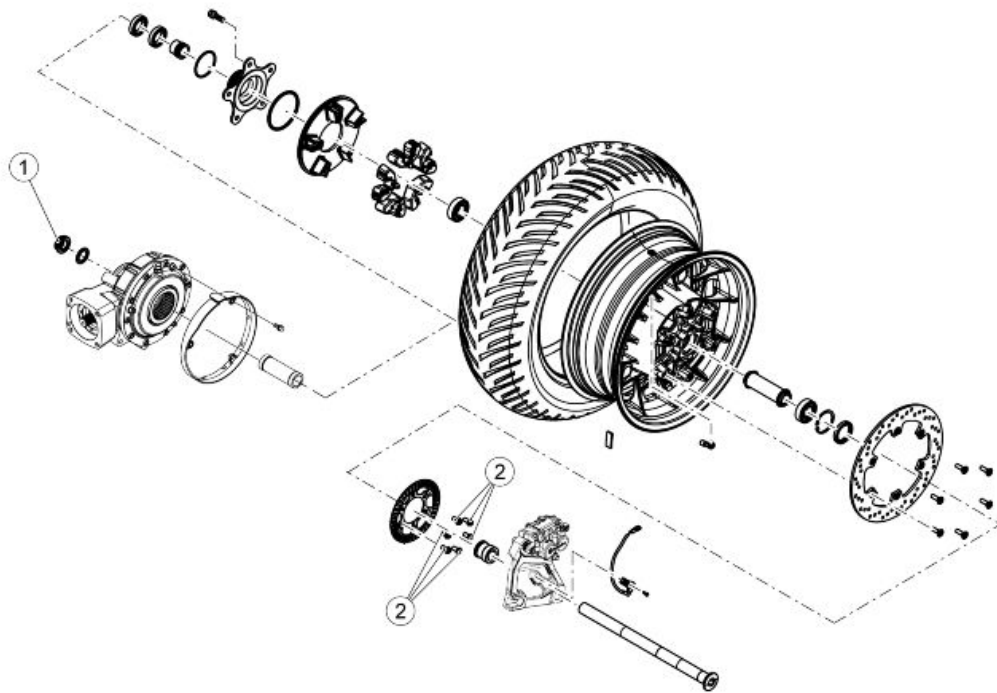


Characteristic

Maximum radial and axial eccentricity:

0.5 mm (0.0197 in)

Rear wheel



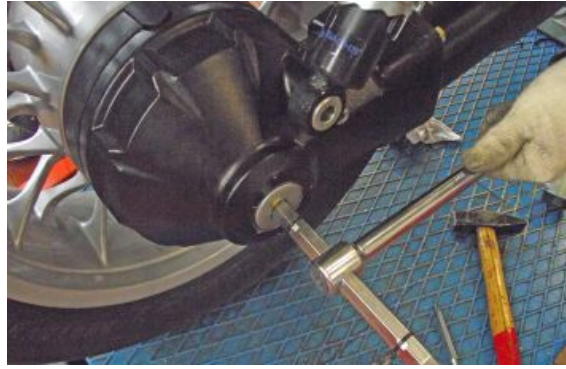
REAR WHEEL

pos.	Description	Type	Quantity	Torque	Notes
1	Wheel axle nut	M25x1.5	1	100 Nm (73.77 lb ft)	-
2	Tone wheel flange screws	M8x20	6	25 Nm (18.44 lb ft)	-
3	Screw fixing ABS sensor to brake calliper	M5x15	1	6 Nm (4.43 lb ft)	Loctite 243

Rimozione

- Support the vehicle rear part using a suitable stand.
- Unscrew the fastening nut while holding the pin from the opposite side.





- Remove the pin and remove the rear wheel.



REMOVAL OF REAR WHEEL

- Remove the lock of the flexible coupling disc.



- Unscrew and remove the five screws (1).
- Remove the flange paying attention to the spacer.



- Remove the flexible coupling disc.



- Operating from the opposite side undo and remove the six fixing screws (2) of the tone wheel.
- Remove the tone wheel.





- Remove the dust gaiter and the seeger ring locking the bearings.



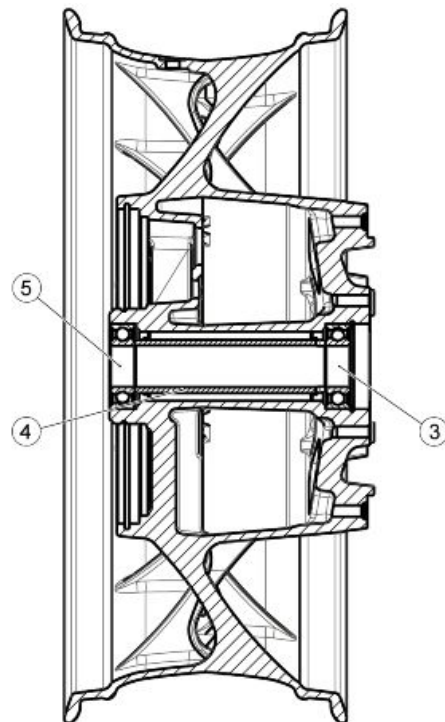
- Undo and remove the six fixing screws of the rear disc.
- Remove the rear disc.



- using the special tool, remove the bearings.



- After removing the bearing (3) and the spacer (4), operating from the opposite side and using the special tool, remove the bearing (5).



Checking



CHECK THAT ALL PARTS ARE IN GOOD CONDITION, ESPECIALLY THOSE LISTED AS FOLLOWS.

REAR WHEEL BEARINGS

Carry out the check with the bearings fitted on the wheel.

ROTATION CHECK

- Manually rotate the inside ring of each bearing. Rotation must be constant, smooth and noiseless.

If one or both bearings do not fall within the control parameters:

- Replace both wheel bearings.



**ALWAYS REPLACE BOTH BEARINGS.
ALWAYS REPLACE THE BEARINGS WITH OTHERS OF THE SAME TYPE.**

- Check the radial and axial clearance.

Axial clearance: a minimum axial clearance is allowed.

Radial clearance: none.

If one or both bearings do not fall within the control parameters:

- Replace both wheel bearings.

REAR WHEEL GASKETS

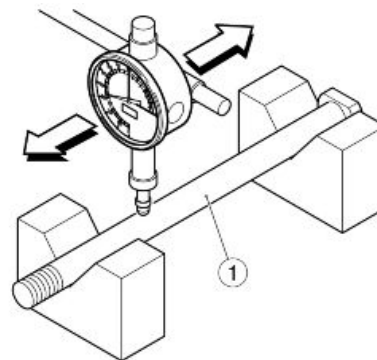
- Check that the gaskets are in good conditions; replace them if they show signs of damage or excessive wear.



**ALWAYS REPLACE BOTH GASKETS.
ALWAYS REPLACE THE GASKETS WITH OTHERS OF THE SAME TYPE.**

REAR WHEEL AXLE

- Use a dial gauge to check the wheel axle eccentricity (1). Replace the wheel axle if the eccentricity exceeds the limit value (1).



Characteristic

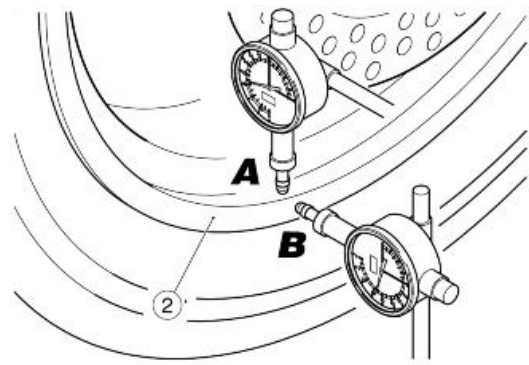
Maximum eccentricity:

0.20 mm (0.0079 in)

REAR WHEEL RIM

- Using a dial gauge, check that the radial (A) and the axial eccentricity (B) of the rim (2) do not exceed the limit value.

An excessive eccentricity is usually caused by worn or damaged bearings. Replace the rim (2) if after replacing the bearings, the value is not within the specified limit.



Characteristic

Maximum radial and axial eccentricity:

0.5 mm (0.0197 in)

FINAL DRIVE UNIT BEARINGS

Carry out the check with the bearings fitted on the final drive unit.

ROTATION CHECK

- Remove the left spacer.
- Remove the right spacer.
- Manually rotate the inside ring of each bearing. Rotation must be constant, smooth and noiseless.

If one or both bearings do not fall within the control parameters:

- Replace both bearings of the final drive unit.

RADIAL AND AXIAL CLEARANCE CHECK

- Check the radial and axial clearance. Axial clearance: a minimum axial clearance is allowed.
Radial clearance: none.

If one or both bearings do not fall within the control parameters:

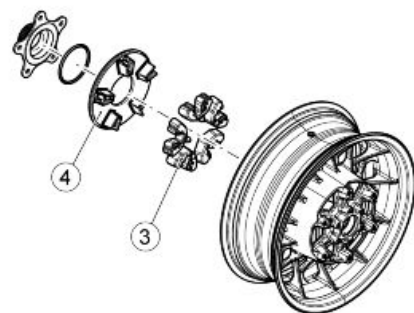
- Replace both bearings of the final drive unit.

FLEXIBLE COUPLING

Check that the flexible couplings (3) are not damaged or excessively worn.

To check:

- Position the complete final drive unit on the wheel.
- Manually rotate in both directions the flexible coupling disc (4) and check the clearance between the flexible cou-



pling rubber rings and the coupling holder.

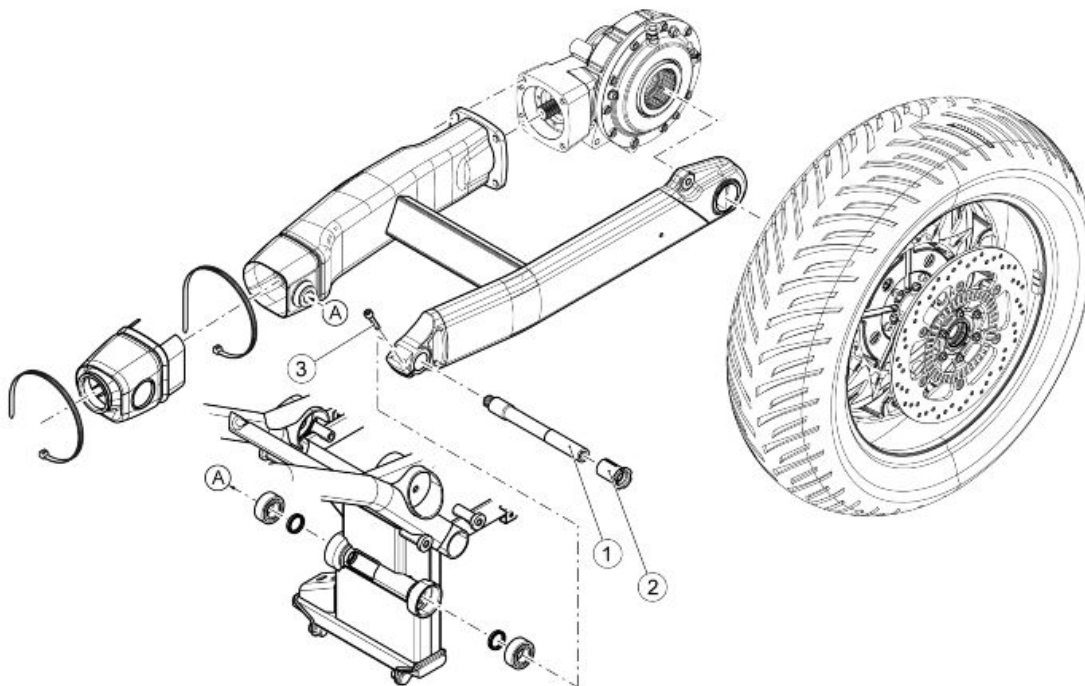
If there is excessive clearance:

- Replace all the flexible couplings (3).



ALWAYS REPLACE ALL THE FLEXIBLE COUPLINGS WITH OTHERS OF THE SAME TYPE.

Swinging arm



FORK

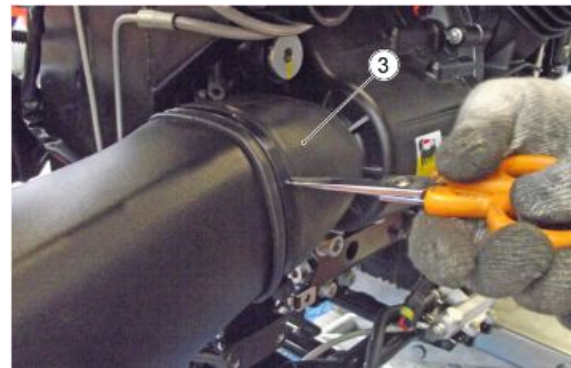
pos.	Description	Type	Quantity	Torque	Notes
1	Swingarm pin	-	1	60 Nm (44.25 lb ft)	-
2	Preloading bushing	-	1	10 Nm (7.38 lb ft)	-
3	Clamp screws	M6x25	2	10 Nm (7.38 lb ft)	-

Removing

- First remove the rear wheel.
- Working from both sides, undo the screw (1) of the rear shock absorber.
- Undo and remove the four fixing screws (2) of the bevel gear set.



- Remove the clamp that fixes the dust gaiter (3) to the swingarm.



- Unscrew and remove the pin, making sure that the swingarm does not fall.





Cardan shaft

Removing

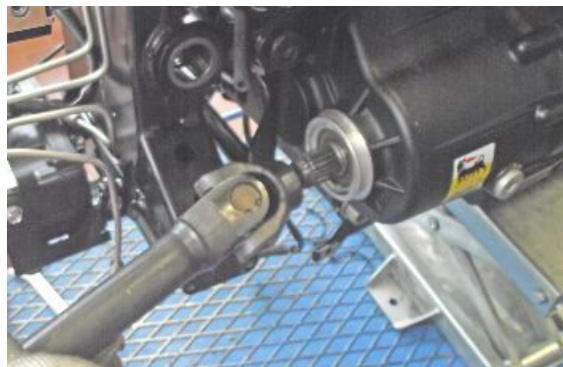
- First remove the swingarm.
- Remove the rubber protection.



- Using a screwdriver, remove the universal joint.



- Remove the cardan shaft.

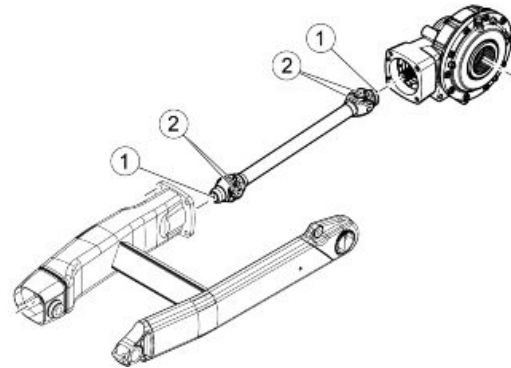


Checking

Carefully check:

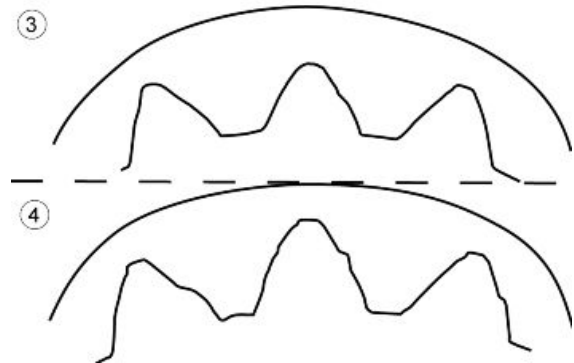
The splines on the cardan shaft (1) must be intact, free from grain or dents.

Check that the joints (2) are not hardened or excessively loose, otherwise replace it.

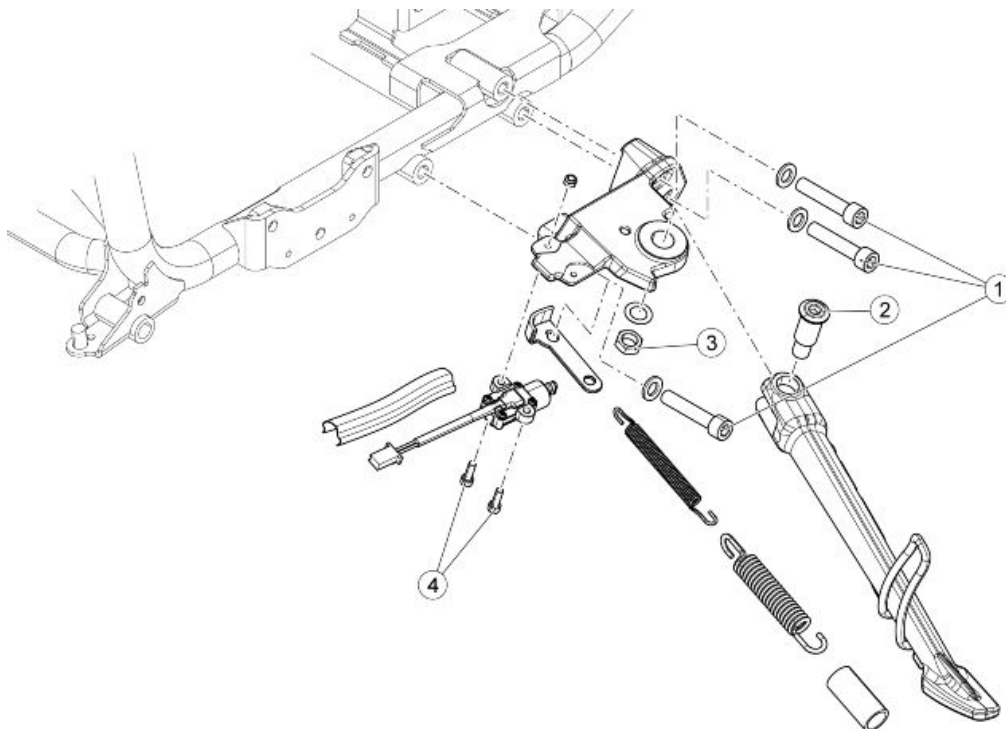


In the figure are shown two worn toothing profiles:

- Profile (3) shows acceptable wear, the cardan shaft should not be replaced.
- Profile (4) shows unacceptable wear, the cardan shaft must be replaced.



Stand



STAND					
pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing stand plate to chassis	M10x40	3	50 Nm (36.88 lb ft)	Loctite 243
2	Stand bolt	-	1	25 Nm (51.61 lb ft)	-
3	Stand pin bolt	M12x1.25	1	70 Nm (51.61 lb ft)	-
4	Screw fixing stand button to plate	M5x16	2	6 Nm (4.43 lb ft)	-

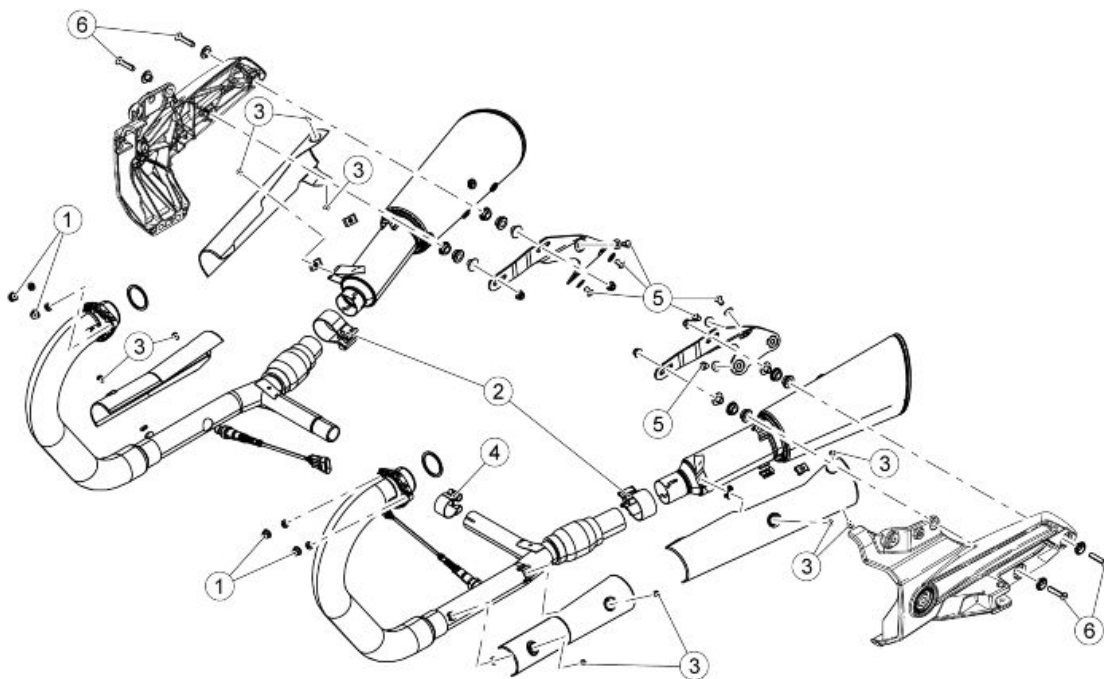
Side stand

- Remove the clamp.
- Disconnect the stand connector.
- Unscrew and remove the three screws.



- Remove the side stand.

Exhaust



DISCHARGE

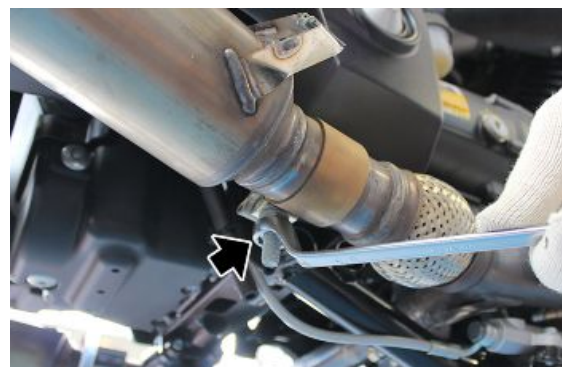
pos.	Description	Type	Quantity	Torque	Notes
1	Nuts fixing manifolds to heads	M8	4	25 Nm (18.44 lb ft)	-
2	Mufflers fixing clamp	-	2	30 Nm (22.13 lb ft)	-
3	Heat shield fastening screws	M6x10	10	10 Nm (7.38 lb ft)	-
4	Exhaust manifolds central retainer clamp	-	1	20 Nm (14.75 lb ft)	-
5	Screws fixing mufflers support to mufflers	M8x12	6	25 Nm (18.44 lb ft)	Loctite 243
6	Screws fixing mufflers support to footrest support	M8x40	4	25 Nm (18.44 lb ft)	-

Removing the manifold - tail pipe

- The following procedure is visible from one side of the motorcycle, but is valid for both silencers.
- Undo and remove the three fixing screws (1).
- Remove the heat guard (2).



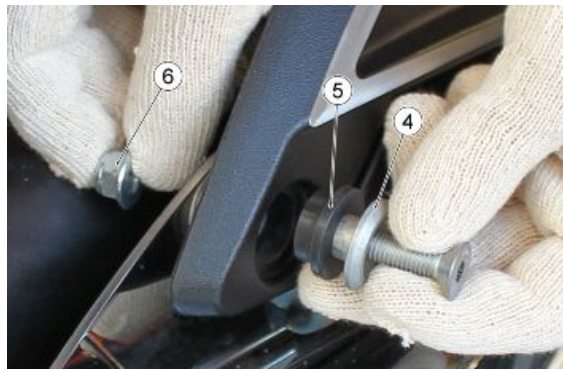
- Loosen the nut of the clamp as indicated in the figure.



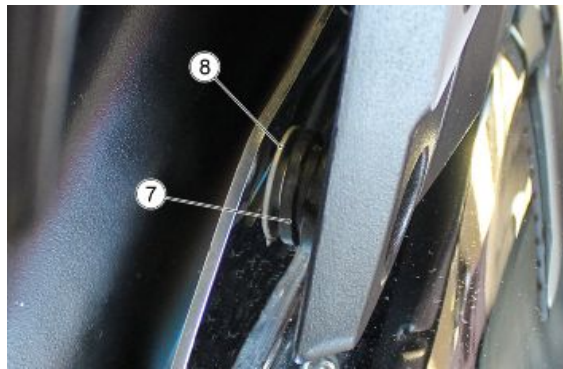
- Unscrew and remove the two screws (3).



- Collect the two rubber pads (4).
- Collect the spacers (5).
- Collect the nuts (6).



- Remove the two rubber pads (7) and the two bushings (8).



- Remove the silencer (9) in the direction shown in the figure.



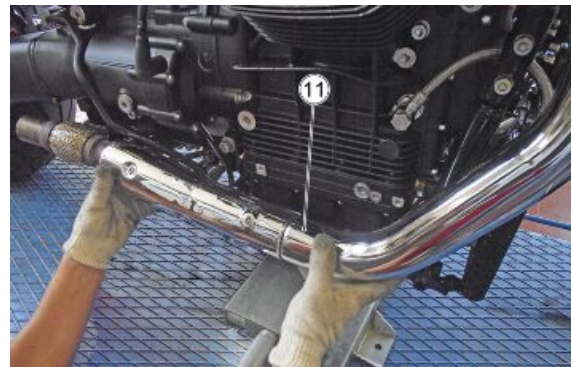
- Loosen the manifold bottom fastener clamp as in the figure.



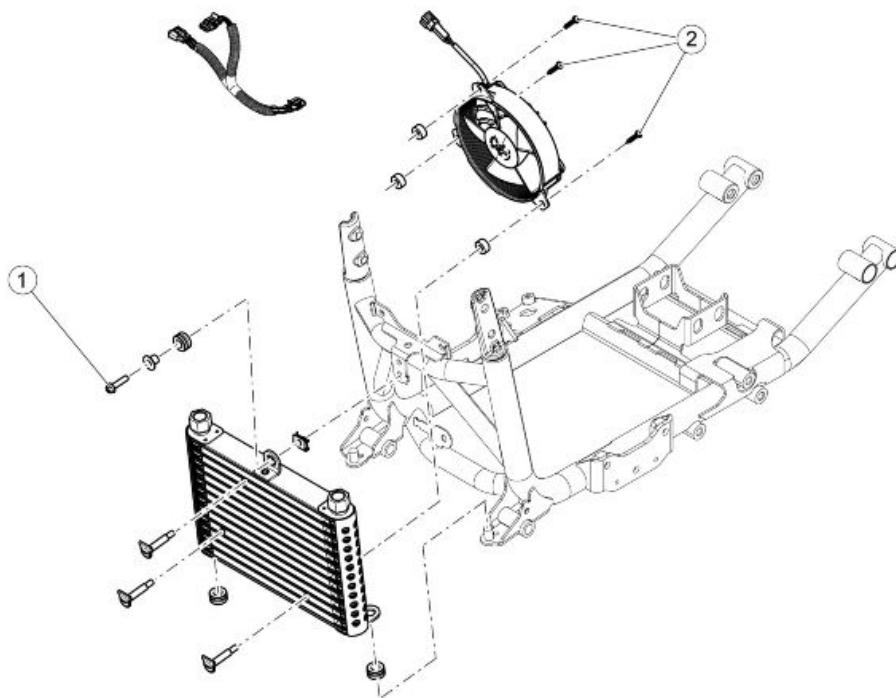
- Unscrew and remove the two fixing nuts (10) and recover the two washers in the points shown in the figure.



- Remove the manifold (11).



Engine oil cooler



OIL RADIATOR

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing oil radiator to chassis	M6x25	1	10 Nm (7.38 lb ft)	-

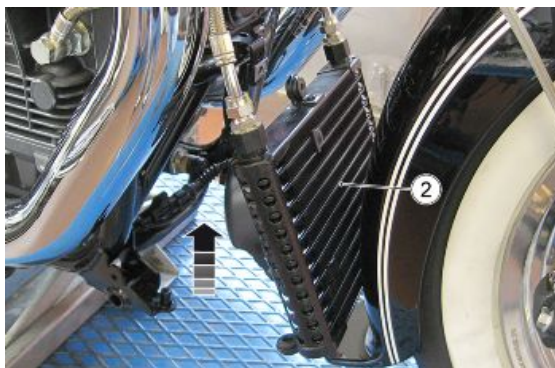
pos.	Description	Type	Quantity	Torque	Notes
2	Screws fixing electric fan to oil radiator	4.2x20	3	2.5 Nm (1.84 lb ft)	-

Removing

- Remove the radiator cover.
- Place a container of suitable capacity under the vehicle.
- Undo and remove the fixing screw (1).



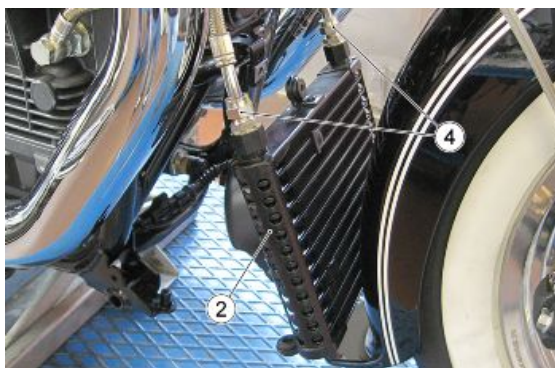
- Lift and remove the oil radiator (2) from the support as in the figure.



- Disconnect the connector (3) of the electric fan.



- Unscrew the two oil pipes (4) and remove the radiator (2).



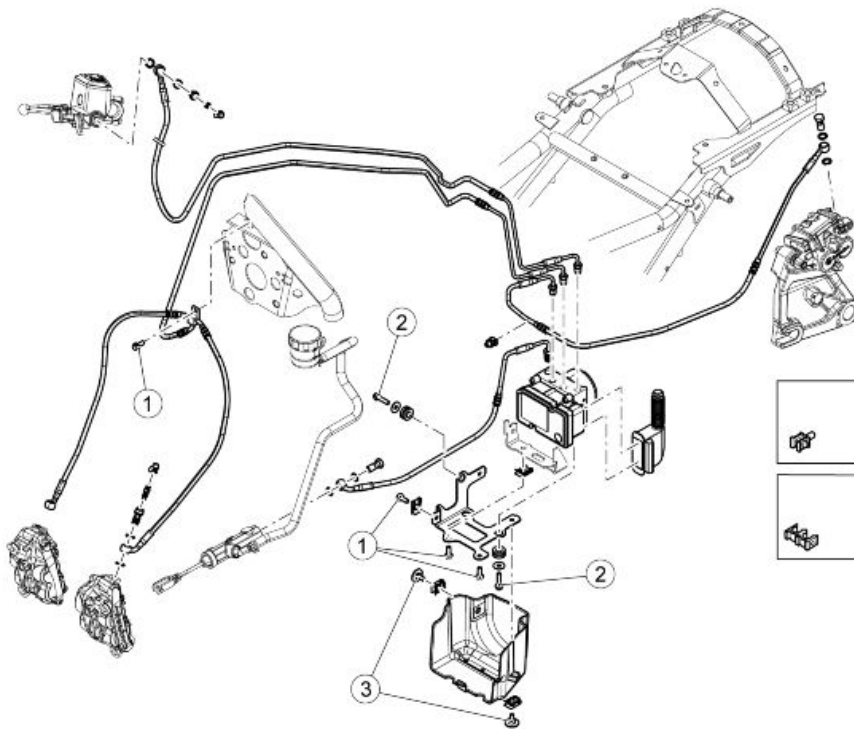
See also

Radiator cover

INDEX OF TOPICS

BRAKING SYSTEM

BRAK SYS



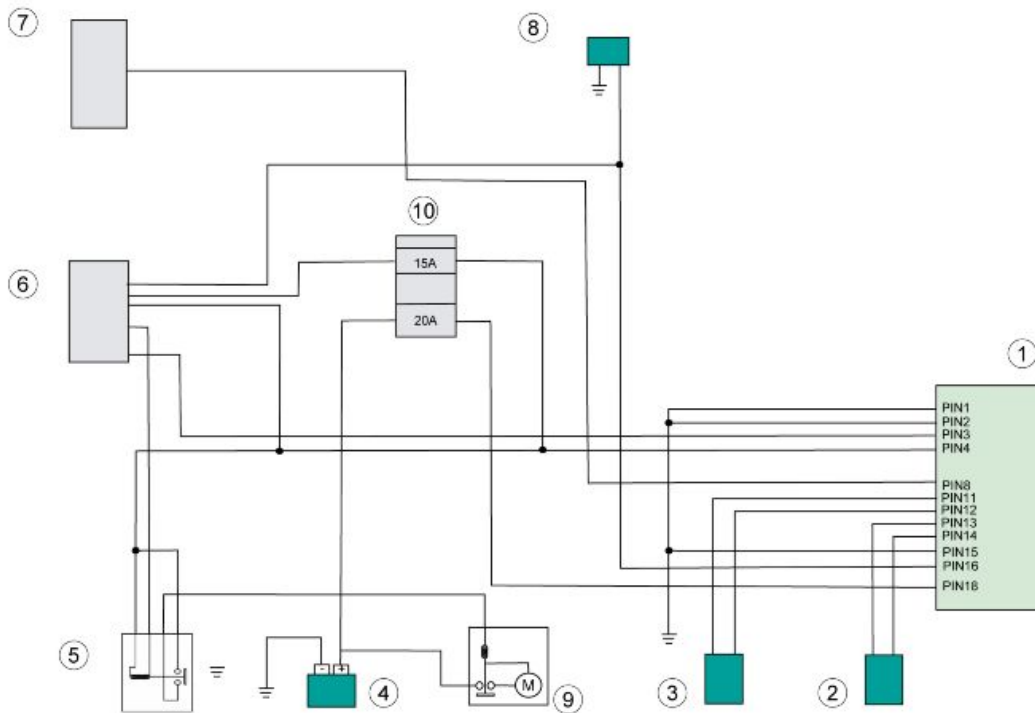
ABS BRAKING SYSTEM

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing control unit support and pipe to chassis	M6x16	4	10 Nm (7.38 lb ft)	-
2	ABS control unit support plate fixing screws	M6x25	3	10 Nm (7.38 lb ft)	-
3	Control unit cover fastening screws	-	2	6 Nm (4.43)	-

Interventions rules

CAUTION

THE FRONT BRAKE DISC SHAPE DOES NOT CHANGE THE OPERATING AND MAINTENANCE SPECIFICATIONS OF THE SYSTEM.

ABS**key:**

1. ABS ECU control unit
2. Front ABS sensor
3. Rear ABS sensor
4. Battery
5. Start-up relay
6. ECU
7. Instrument panel
8. K line (diagnosis)
9. Starter motor
10. Fuses

ABS control unit pin out key:

PIN 1 Ground connection

Vehicle identification (1) **PIN 2**

Vehicle speed output **PIN 3**

Key input **PIN 4**

CAN H line (high speed) **PIN 5**

CAN L line (low speed) **PIN 6**

ABS warning light **PIN 8**

Rear speed sensor signal **PIN 11**

Rear speed sensor ground **PIN 12**

Front speed sensor ground **PIN 13**

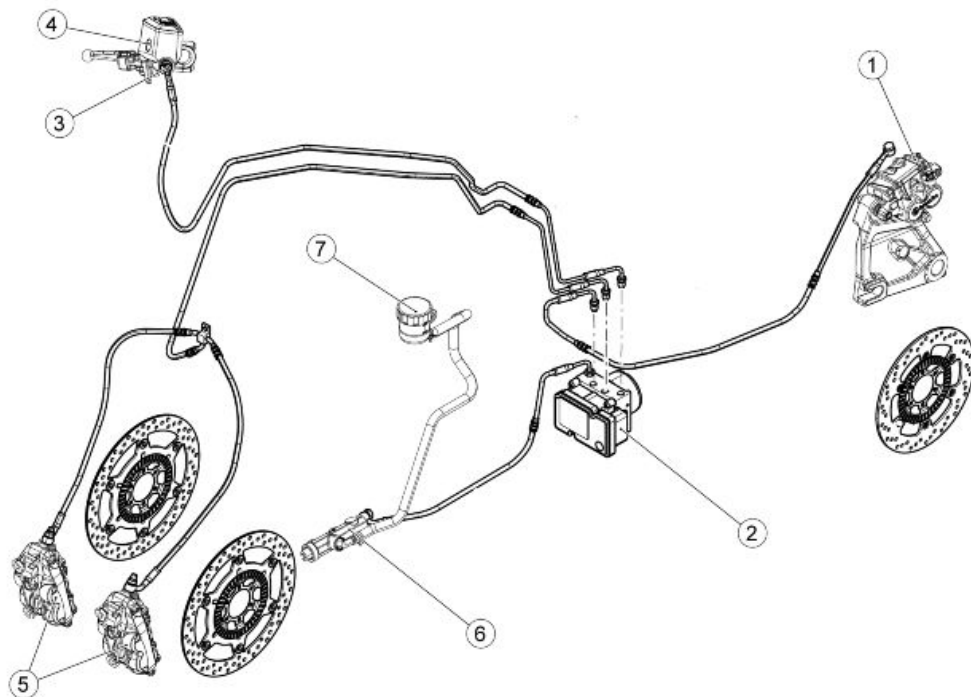
Front speed sensor signal **PIN 14**

Vehicle identification (2) **PIN 15**

Serial K line for diagnostics **PIN 16**

Battery power **PIN 18**

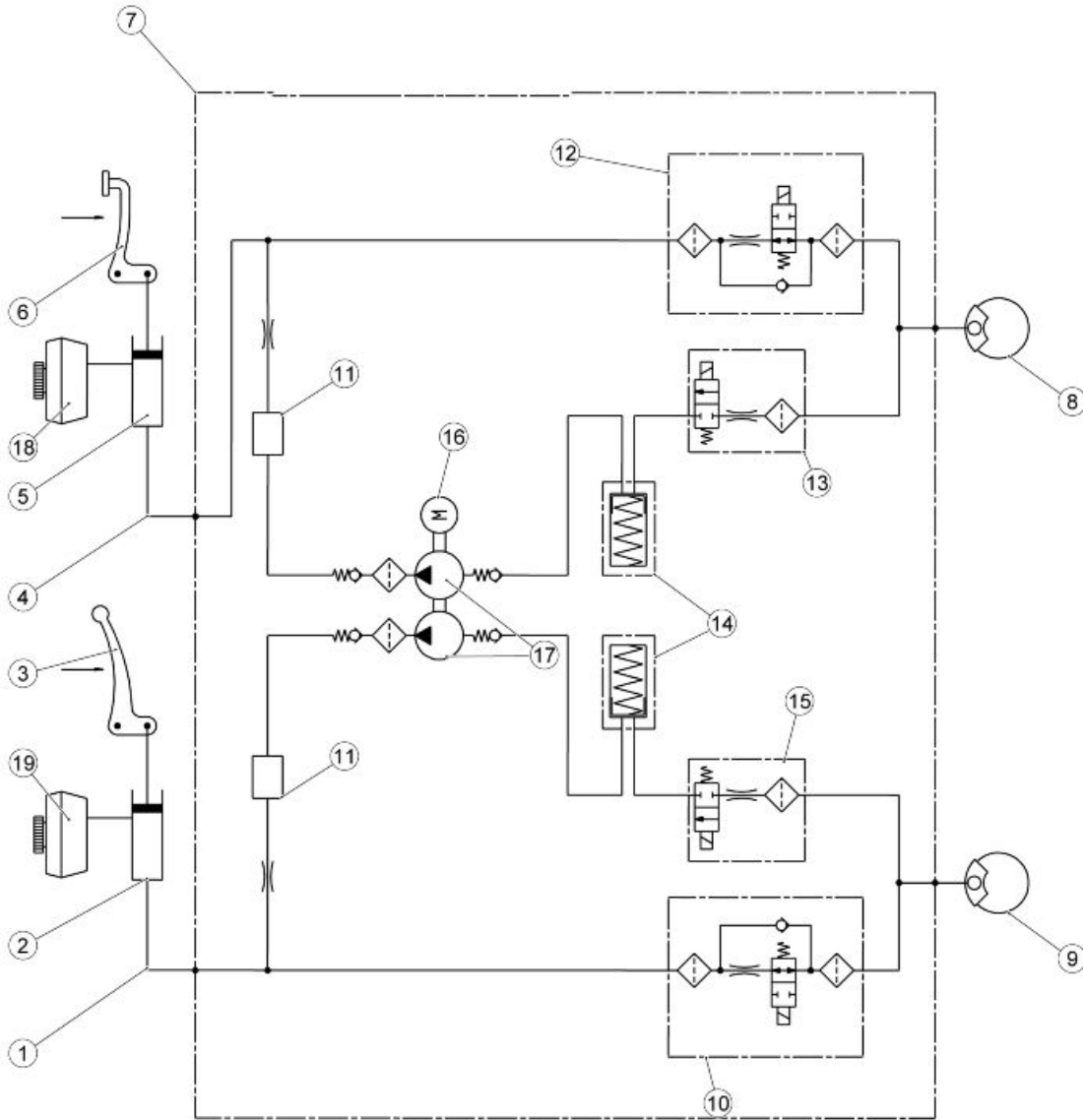
Foreword



key:

1. Rear brake calliper
2. Modulator
3. Front bleed valve
4. Front brake reservoir
5. Front brake callipers
6. Rear brake pump
7. Rear brake reservoir

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.

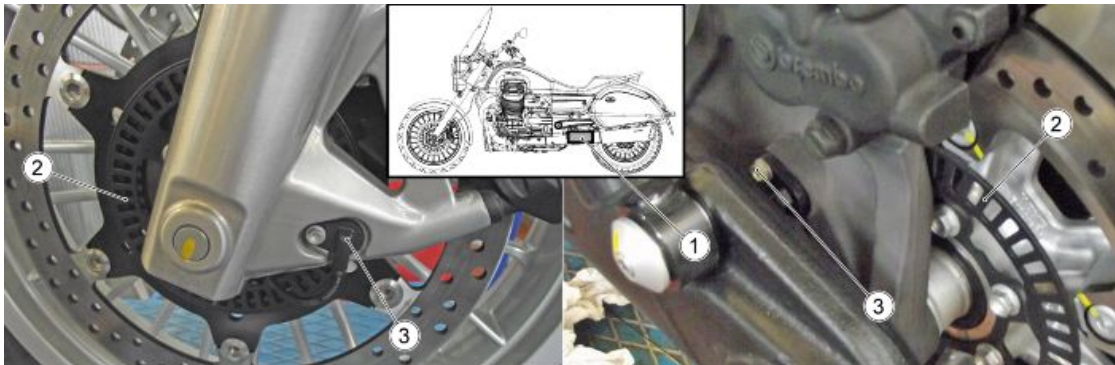
A control unit (1) signals this out and adjusts the pressure in the braking circuit accordingly.

NOTE

WHEN THE ABS SYSTEM STARTS WORKING, A VIBRATION 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 UN-EVEN 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 the 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, two 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 deactivate the ABS system. As a consequence, the system works like 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.

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 automatically

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 disabled!

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 continues to be 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 DIAGNOSTICS INSTRUMENT

DOES THE DIAGNOSTICS INSTRUMENT COMMUNICATE? (NO, point 3; YES, point 4)

3. PERFORM THESE CHECKS:

- A. Ground connection PIN 1
- B. +12V at PIN 18

4. ARE THERE ANY ERRORS? YES, go to point 5; NO, go to 6)

5. CONSULT THE ERRORS TABLE

6. ABS WARNING LIGHT ACTIVATION

IS IT ACTIVATED? (YES, point 7; NO, point 8)

7. CONTACT TECHNICAL SERVICE

8. PERFORM THESE CHECKS:

- A. Cable continuity between PIN 8 of the ABS control unit connector and PIN40 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

ECU INFO screen page

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

NOTE

THE FIGURE ONLY SHOWS THE ICON THAT APPEARS IN THE NAVIGATOR.



INFO ECU SCREEN PAGE

P.A.D.S./Navigator characteristic	Value/example	Unit of measurement	Notes
Vehicle manufacturing date			
Frame number			

P.A.D.S./Navigator characteristic	Value/example	Unit of measurement	Notes
Software version			
Vehicle code			The vehicle code stored in the control unit is read.
Vehicle identification according to state of Pins 2 and 15			A different type of vehicle is associated with each configuration of PIN 2 and PIN 15 connections or the injection control unit vehicle code reader.

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.)

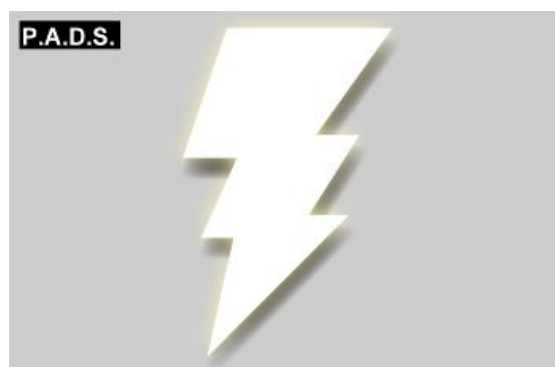


PARAMETERS

P.A.D.S./Navigator 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.

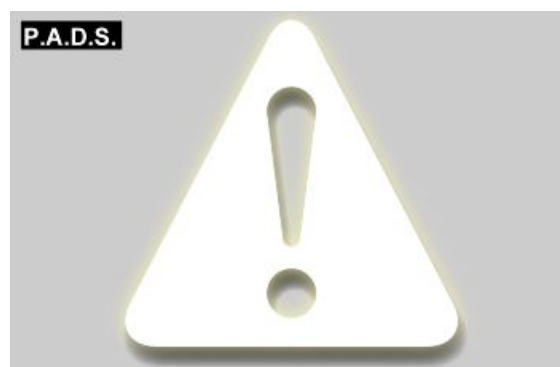


ACTIVATION

P.A.D.S./Navigator 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 flashes
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)			At the next connection between diagnostics instrument and the control unit, the historical errors (STO) will no longer appear.

ERRORS screen page

This screen page displays any errors detected in the vehicle (ATT) or stored in the control unit (MEM) and you can check that the cancellation of error (STO) has taken place.



ERRORS

P.A.D.S./Navigator 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

P.A.D.S./Navigator characteristic	Value/example	Unit of measurement	Notes
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.



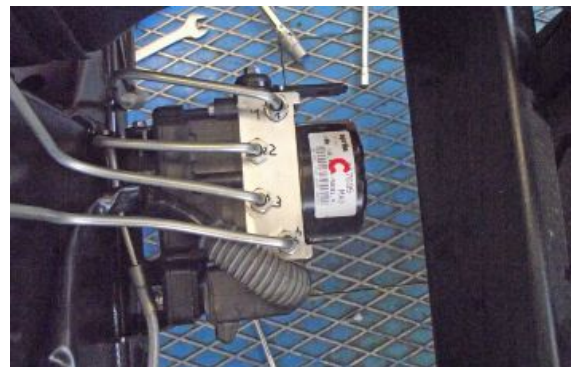
ADJUSTMENTS

P.A.D.S./Navigator characteristic	Value/example	Unit of measurement	Notes
Coding (1)			Used for re-coding the control unit or coding a new one.
Coding (2)			The identification of the vehicle is carried out based on the injection control unit reading.
Coding (3)			The identification can be read in the INFO ECU screen page in the line: Vehicle code.

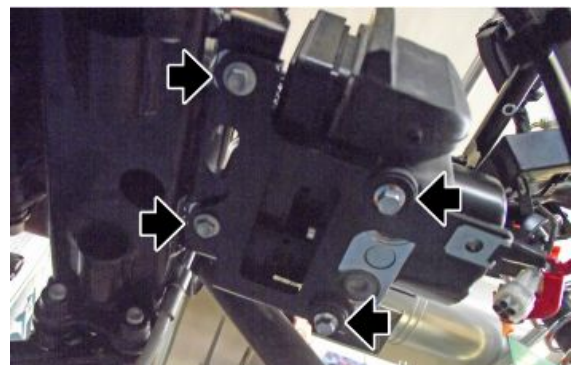
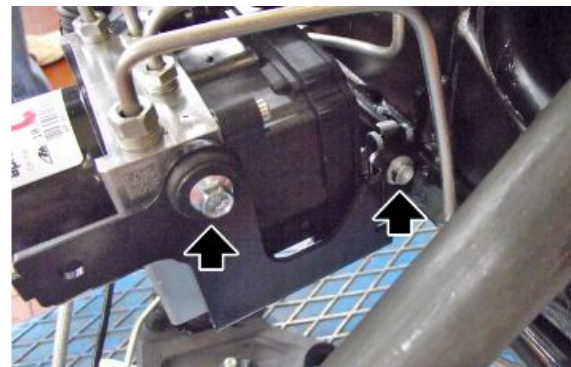
Modulator

- Remove the plastic cover of the ABS system.
- Cut the clamp that fastens the wiring.

- 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 side fixing screws.
- Unscrew and remove the four lower fixing screws.



- Disconnect the ABS control unit connector.
- Remove the ABS control unit.

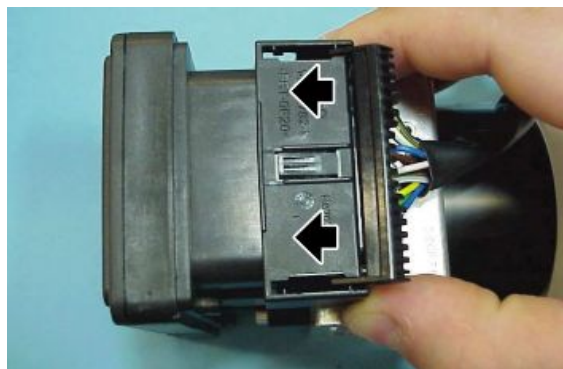


INSERTION PROCEDURE OF ABS CONTROL UNIT CONNECTOR

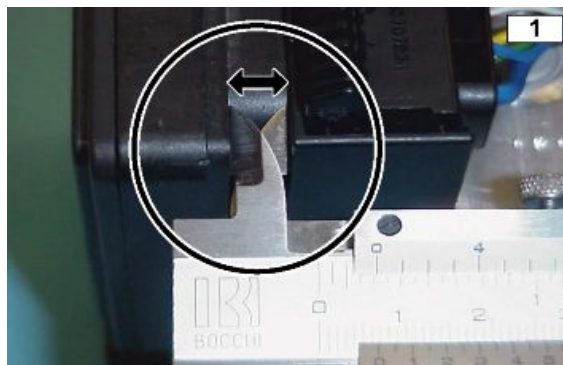
- Check the initial position of the lever that couples the connector.



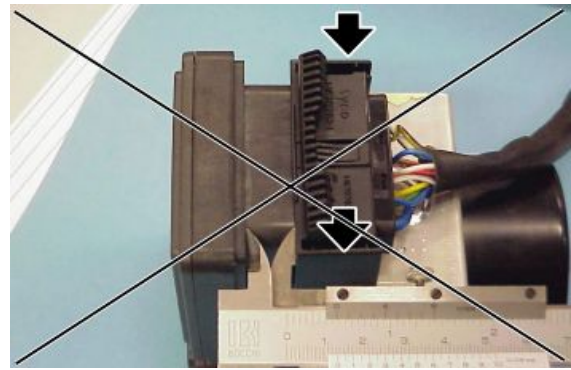
- When the connector is fully inserted, the distance between the connector and the ABS control unit must be 7.5 mm (0.29 in).



- 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.



ZONE 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).

ZONE 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).

Disc Inspection

REAR

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)

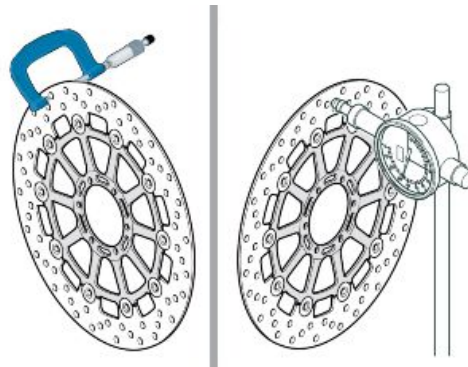
Disc Inspection

FRONT

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)

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

Disc oscillation tolerance: 0.15 mm (0.0059 in),
with respect to the wheel centre line.

Front brake pads

Removal

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



- Turn the pins and remove both cotter pins.



- Remove both pins.



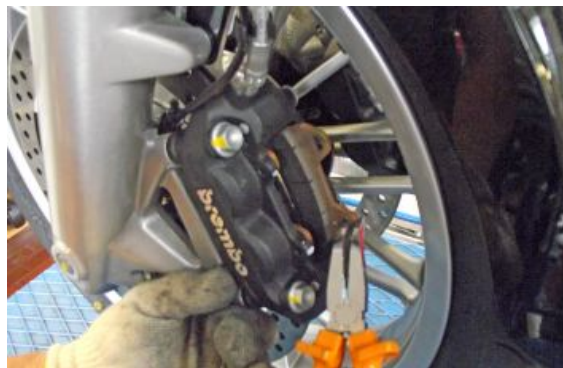
- Remove the vibration-damping plate.



- 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.



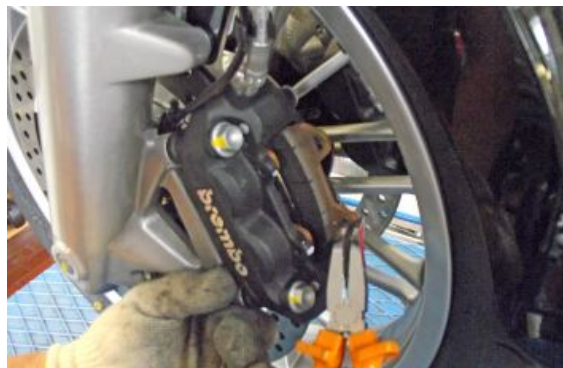
Installing

- 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.



- Position the anti-vibration plate.
- Insert both pins.
- Position both split pins.
- Abut the plungers against the pads, acting on the brake pump lever several times.
- Check the brake fluid level in the reservoir.





Rear brake pads

Removal

- Remove the lock and 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.

**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 lock.
- 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.

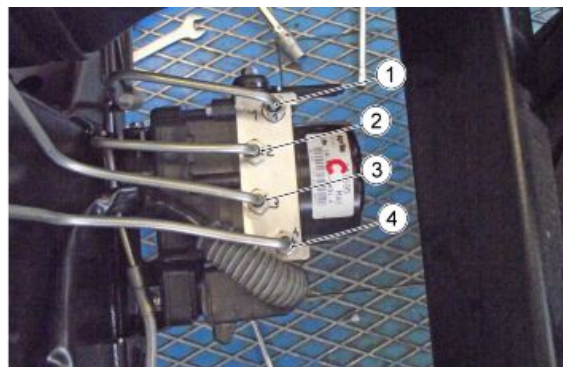
- Always fill the reservoir up to the reference "MAX" and refit the cap.
- Check the stroke and the sensitivity of both the lever and the brake pedal.
- If, after bleeding, the pedal or the lever stroke is too long, check that there are no leaks in the braking system and if everything is OK, continue bleeding operations using the diagnostics instrument 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 the diagnostics instrument as described.
- Detach the bleed hoses and close the bleed screws again to the correct tightening torque.

See also

[Front](#)
[Rear](#)

BLEEDING SYSTEM WITH DIAGNOSTICS INSTRUMENT

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 diagnostics instrument 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 diagnostics instrument cycle completion is received.
- This procedure allows the air to turn and to accumulate.
- Once the procedure with diagnostics instrument 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 by poor braking efficiency.

CAUTION

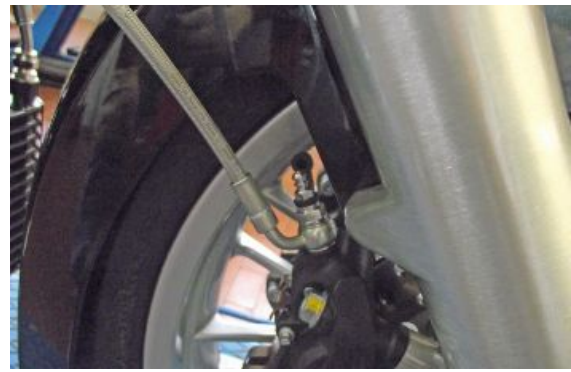
CONSIDERING THE DANGER FOR VEHICLE AND RIDER, IT IS STRICTLY NECESSARY, AFTER REFITTING BRAKES AND RESTORING THE BRAKING SYSTEM TO THE REGULAR USE CONDITIONS, THAT THE HYDRAULIC CIRCUIT BE AIR PURGED.

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 oil reservoir cap.
- Operate the brake lever and then open the bleed valve on the calliper 1/4 of a turn to let the air out.
- Close the bleed again before reaching the lever end of the stroke and repeat the operation until there is no air.
- Repeat the procedure for both callipers.
- 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 by 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.

NOTE

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 rear brake calliper bleed valve and insert the other end of this pipe into a container to collect the fluid.
- Remove the rear brake oil reservoir cap.
- Operate the brake lever and then open the bleed valve on the calliper 1/4 of a turn to let the air out.
- Close the bleed again before reaching the lever end of the stroke and repeat the operation until there is no air.

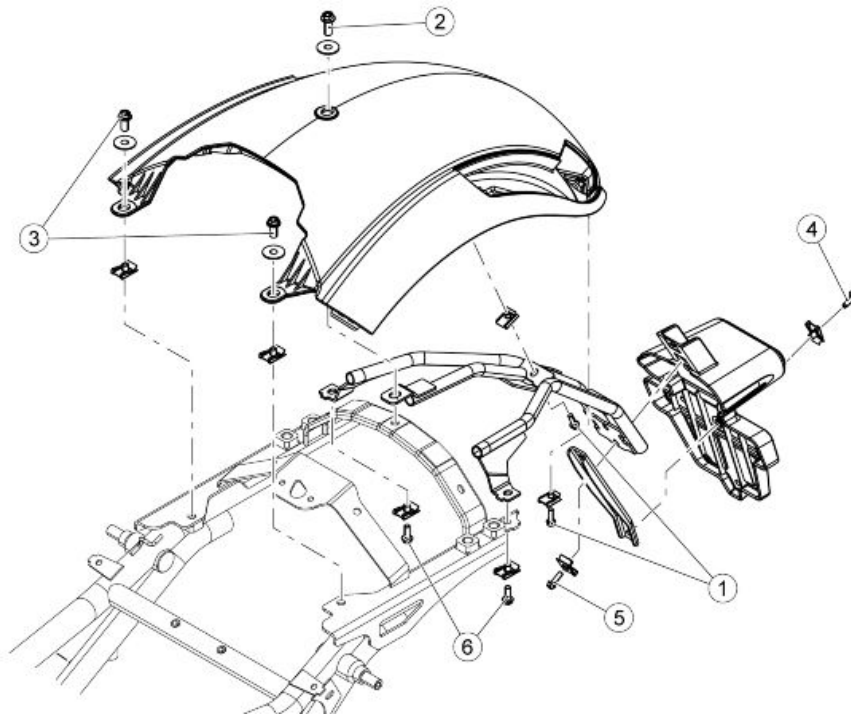


- Screw the bleeding valve and remove the pipe.
- Top-up the reservoir until the correct brake fluid level is obtained.
- Refit and lock the rear brake oil reservoir cap.
- Refit the rubber protection cover.

INDEX OF TOPICS

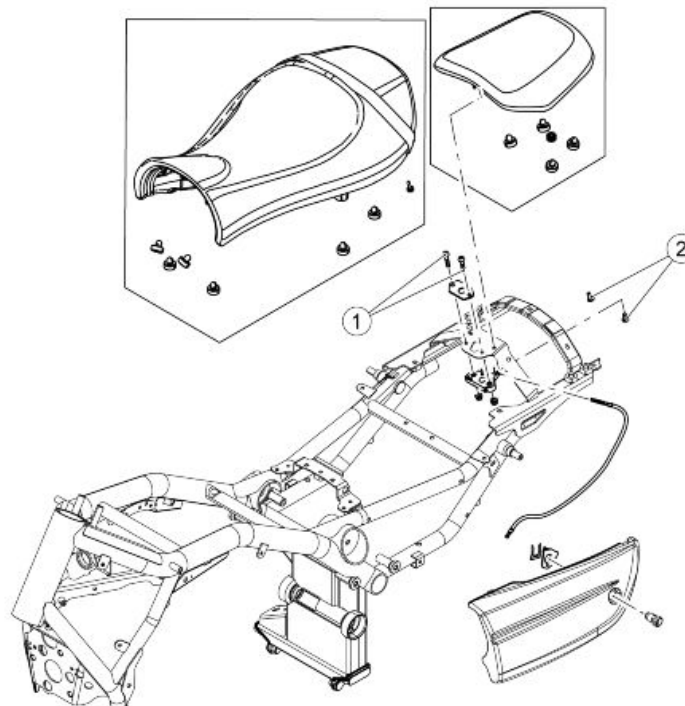
BODYWORK

BODYW



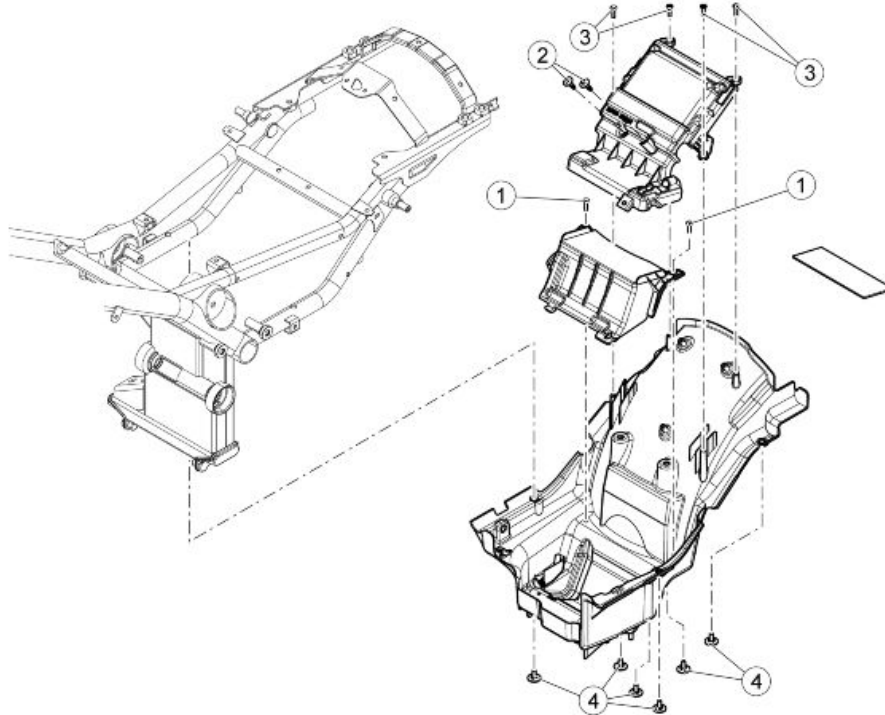
REAR MUDGUARD

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing mudguard to frame	M6x16	2	6 Nm (4.43 lb ft)	-
2	Screw fixing mudguard to chassis	M8x25	1	25 Nm (18.44 lb ft)	-
3	Mudguard side fixing screws	M8x25	2	25 Nm (18.44 lb ft)	-
4	Screw fixing licence plate holder to bracket	M5x12	1	4 Nm (2.95 lb ft)	-
5	Screws fixing licence plate holder to frame	M5x16	2	4 Nm (2.95 lb ft)	-
6	Screws fixing frame to chassis	M6x20	2	10 Nm (7.38 lb ft)	-



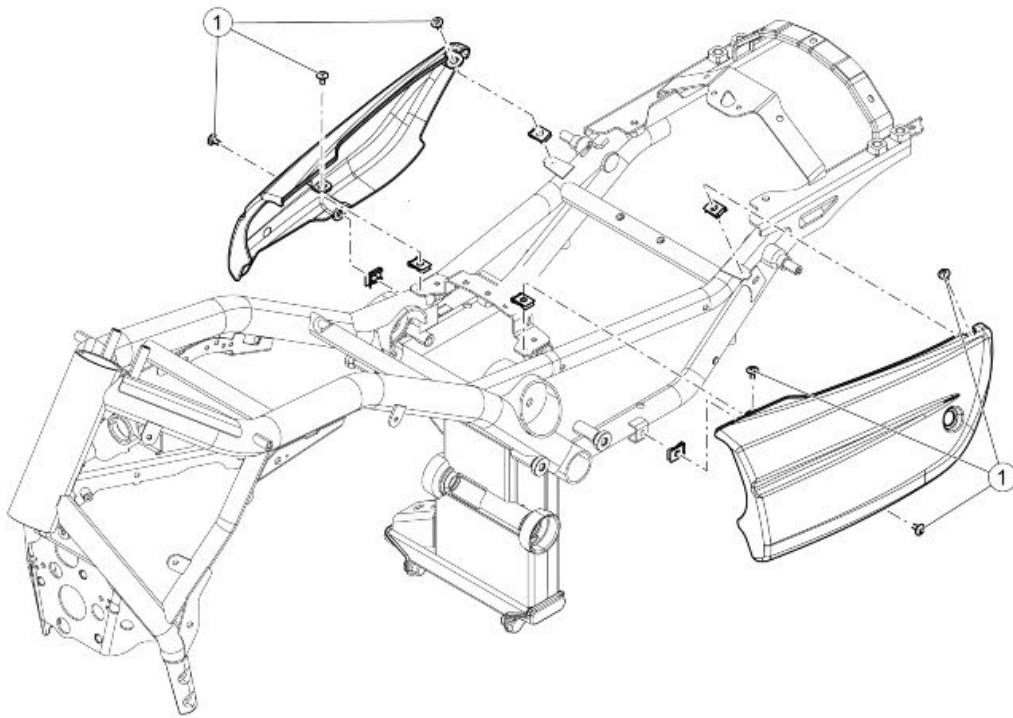
SADDLE

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing saddle fixing plate to chassis	M6x25	2	10 Nm (7.38 lb ft)	-
2	Screws fixing saddle support to chassis	M6x16	2	10 Nm (7.38 lb ft)	-



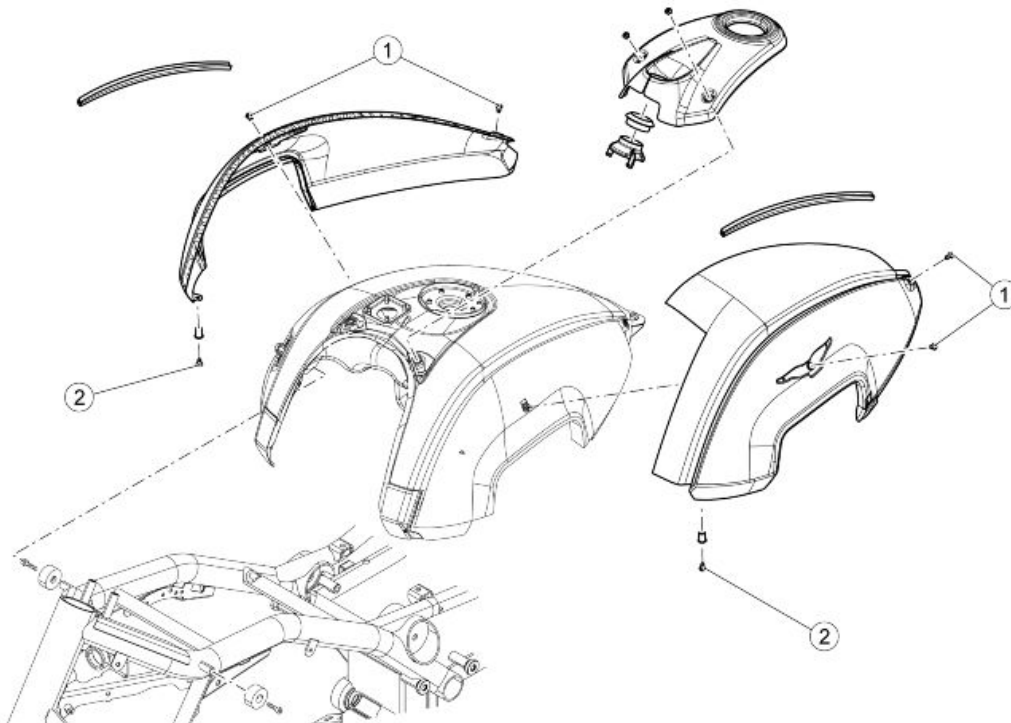
UNDER SADDLE

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing battery support to saddle lower closing	M5x20	2	3 Nm (2.21 lb ft)	-
2	Battery cover fastening screws	M5x12	2	6 Nm (4.43 lb ft)	-
3	Screws fixing battery cover to saddle lower closing	M5x14	4	3 Nm (2.21 lb ft)	-
4	Screws fixing lower closing to chassis	-	6	6 Nm (4.43 lb ft)	-



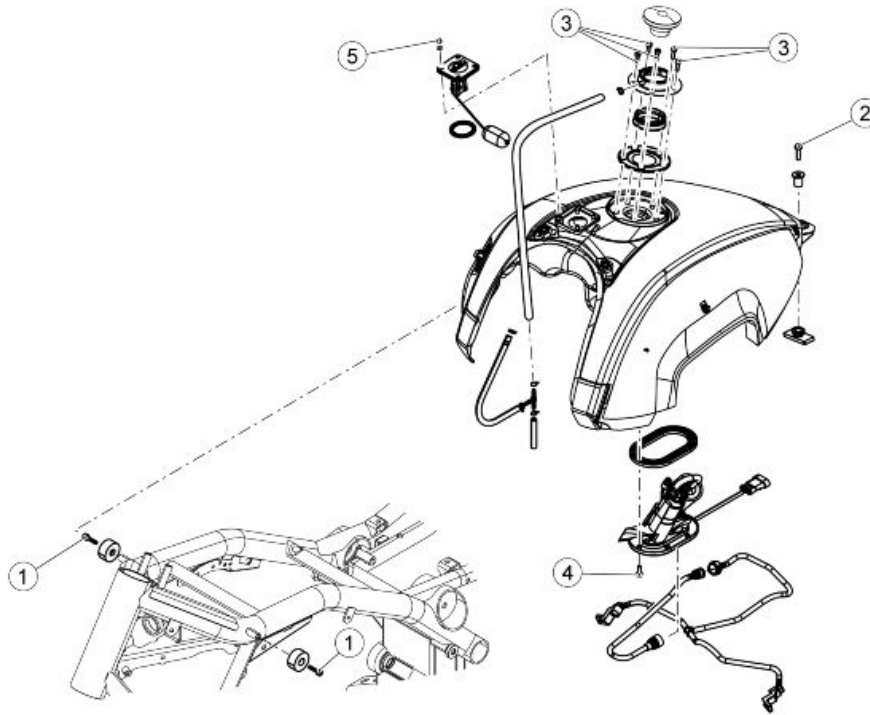
CENTRAL BODYWORK

pos.	Description	Type	Quantity	Torque	Notes
1	Side fairing fixing screws	M5x9	6	6 Nm (4.43 lb ft)	-



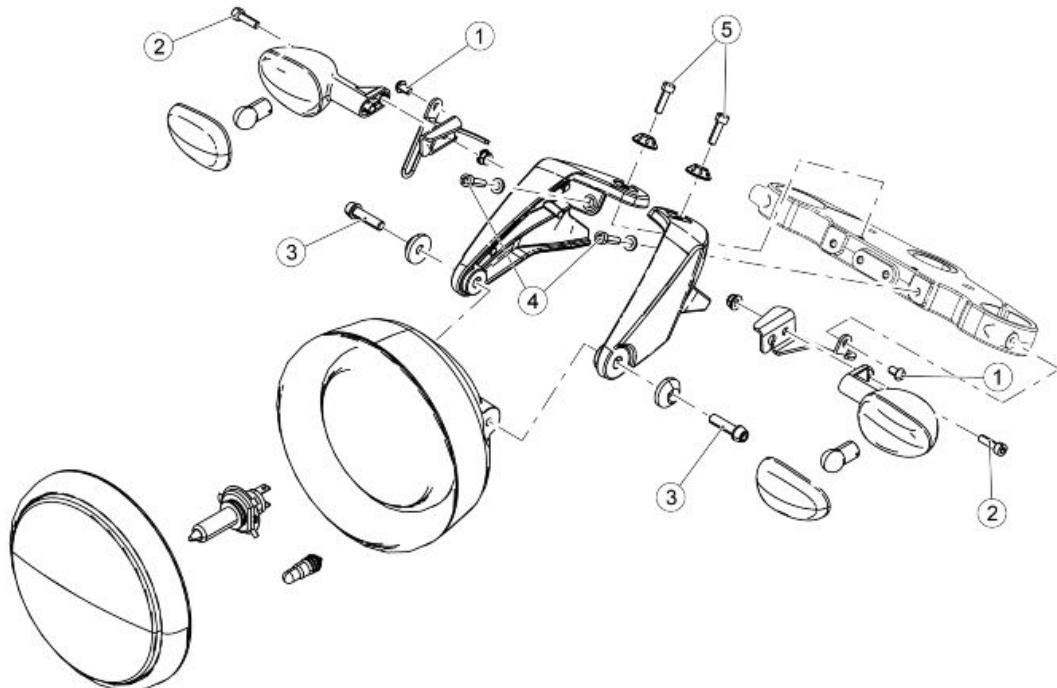
TANK COVER

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing grips to tank	M5x10	4	6 Nm (4.43 lb ft)	-
2	Grips and instrument panel fixing screws	M5x16	4	5 Nm (3.69 lb ft)	-



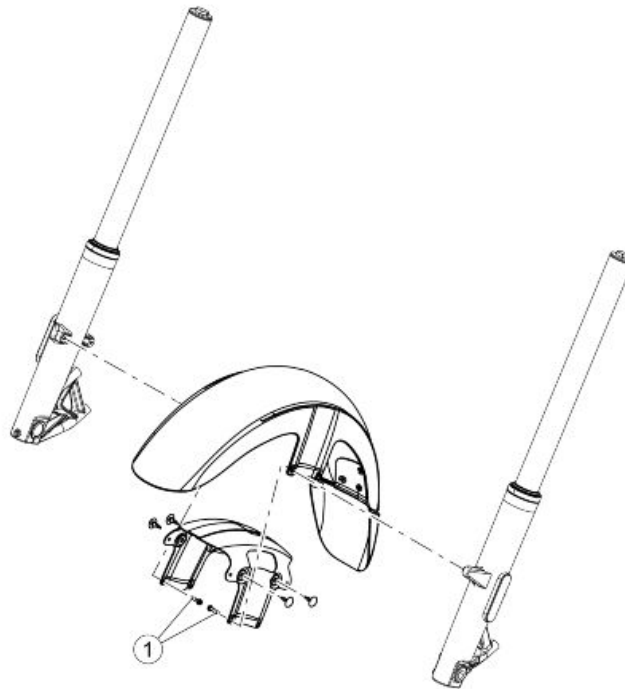
FUEL TANK

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing rubber rings to chassis	M8x16	2	25 Nm (18.44 lb ft)	-
2	Screws fixing tank to saddle support	M6x30	1	10 Nm (7.38 lb ft)	-
3	Screws fixing fuel cap flange to tank	M5x14	5	6 Nm (4.43 lb ft)	-
4	Screws fixing fuel pump to tank	M5x16	6	6 Nm (4.43 lb ft)	-
5	Nut fixing fuel level sensor to tank	M5	4	5 Nm (3.69 lb ft)	-

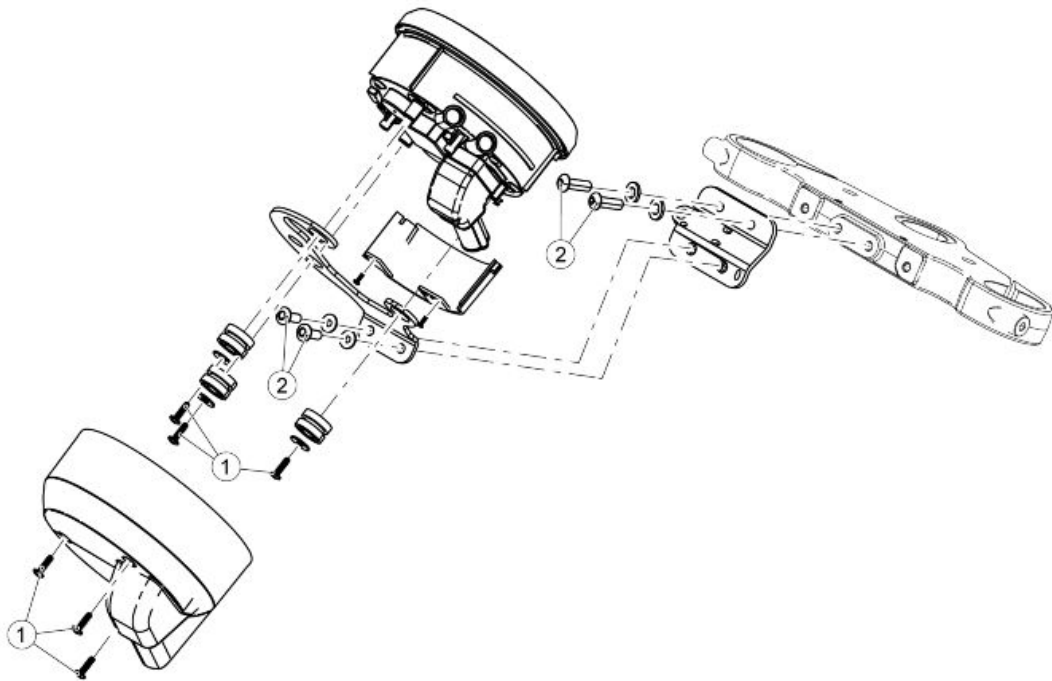


FRONT HEADLAMP

pos.	Description	Type	Quantity	Torque	Notes
1	Screws fastening the turn indicator to the upper steering yoke	M6x10	2	10 Nm (7.38 lb ft)	-
2	Screws fixing the turn indicator to the support bracket	M6x18	2	10 Nm (7.38 lb ft)	-
3	Screws fixing headlamp to supports	M8x30	2	25 Nm (18.44 lb ft)	-
4	Screws fixing lights front supports to steering yoke	M6x20	2	10 Nm (7.38 lb ft)	-
5	Screws fixing lights upper supports to steering yoke	M6x20	2	10 Nm (7.38 lb ft)	-

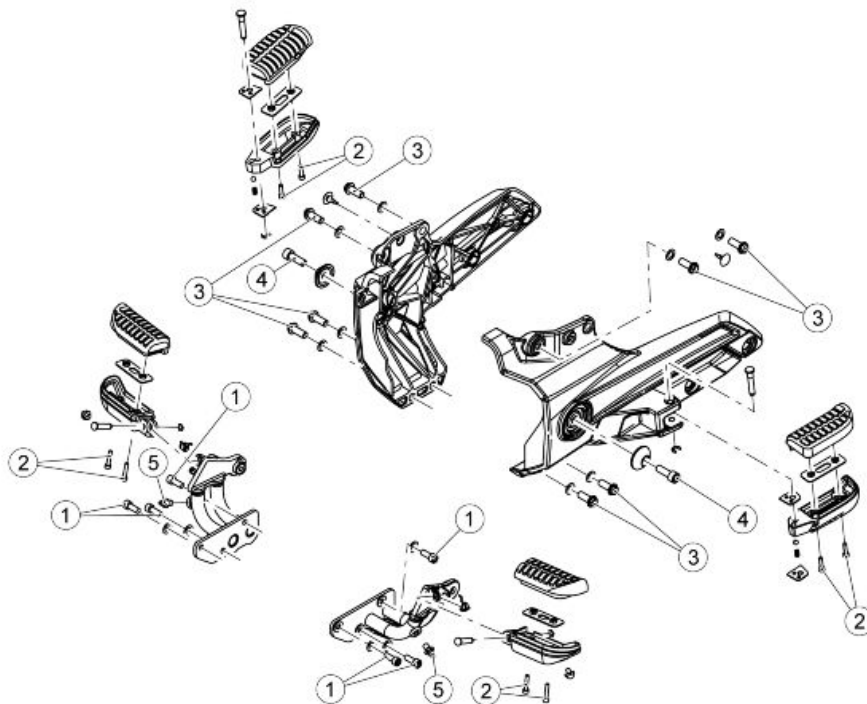
**FRONT MUDGUARD**

pos.	Description	Type	Quantity	Torque	Notes
1	Front mudguard fixing screws	M5x20	4	6 Nm (4.43 lb ft)	-



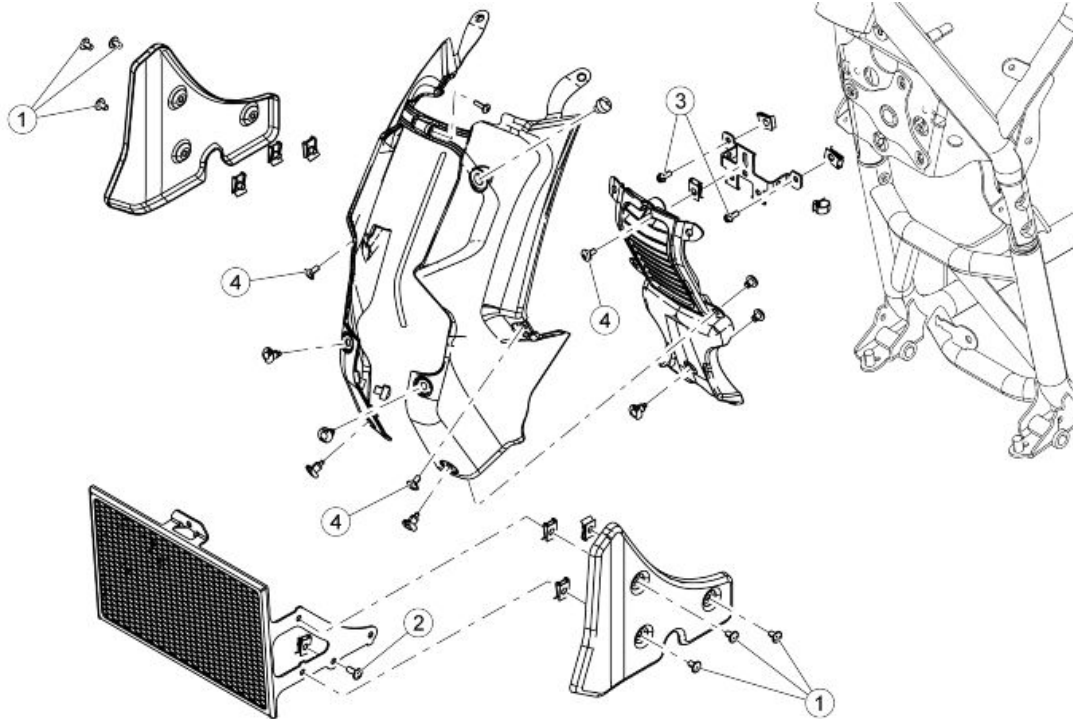
INSTRUMENT PANEL

pos.	Description	Type	Quantity	Torque	Notes
1	Instrument panel and cover fixing screws	Self-tapp. screw 3.9x14	6	1.2 Nm (0.89 lb ft)	-
2	Instrument panel support fixing screws	M6x18	4	10 Nm (7.38 lb ft)	-



FOOTREST UNIT

pos.	Description	Type	Quantity	Torque	Notes
1	Screw fixing footrest support to chassis	M8x20	6	25 Nm (18.44 lb ft)	Loctite 243
2	Passenger footrest to rubber ring fixing screws	M5x20	8	6 Nm (4.43 lb ft)	-
3	Passenger footrest support fixing screw	M10x1.25	8	50 Nm (36.88 lb ft)	-
4	Screw fixing ring nut to footrest support	M10x30	2	25 Nm (18.44 lb ft)	-
5	Threaded pin	-	2	20 Nm (14.75 lb ft)	-



GUARDS

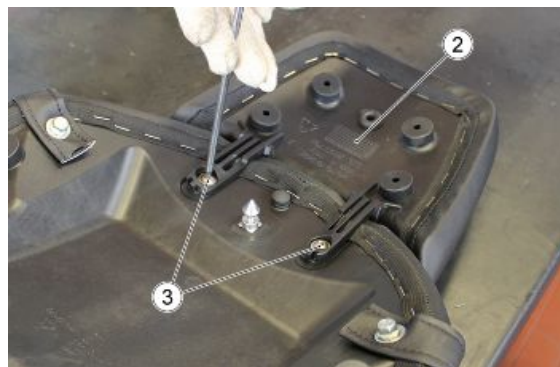
pos.	Description	Type	Quantity	Torque	Notes
1	Screws fixing deflectors to radiator grille	M6x10	6	10 Nm (7.38 lb ft)	-
2	Screw fixing radiator grille to chassis	M6x16	2	10 Nm (7.38 lb ft)	-
3	Screws fixing bracket to chassis	M5x12	2	6 Nm (4.43 lb ft)	-
4	Guards fixing screw	M5x9	3	6 Nm (4.43 lb ft)	-

Seat

- Remove the rider seat (1) together with the passenger seat (2).



- Undo and remove the two fixing screws (3).
- Remove the passenger saddle (2).



Instrument panel

- Undo and remove the two front fixing screws of the instrument panel; during operation, take care to support it adequately.



- Undo and remove the three fixing screws (1).
- Remove the rear cover.

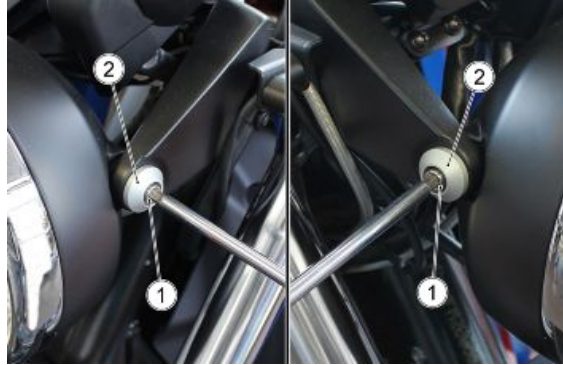


- Disconnect the connector.
- Remove the instrument panel.



Headlight assy.

- Working from both sides of the motorcycle, undo and remove the two fixing screws (1).
- Collect the two washers (2).



- Disconnect the connector (3).
- Remove the headlamp (4).



HEADLAMP SUPPORTS

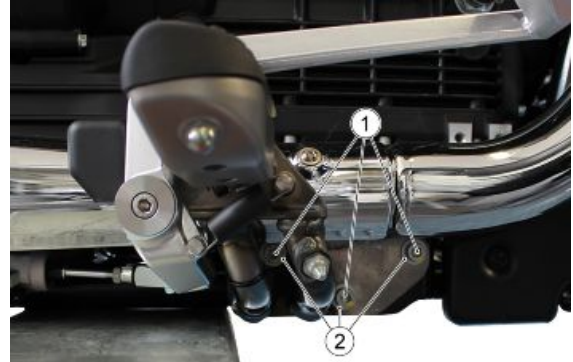
The following procedure is described for one single support, but is valid for both.

- Unscrew and remove the rear screw.
- Unscrew and remove the front screw, remove the support.

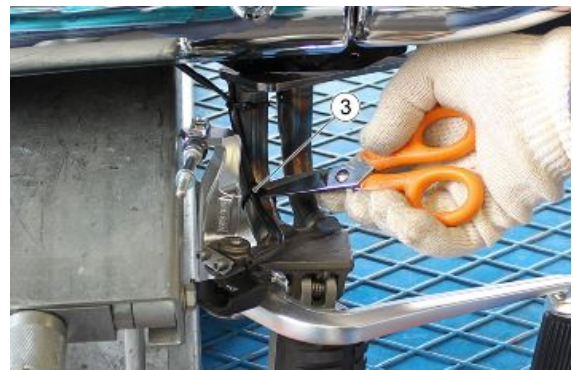


Footrest

- The following procedure is visible from one side of the motorcycle, but is valid for both footrests.
- Undo and remove the three fixing screws (1).
- Then collect the three washers (2).



- Remove the clamp (3).

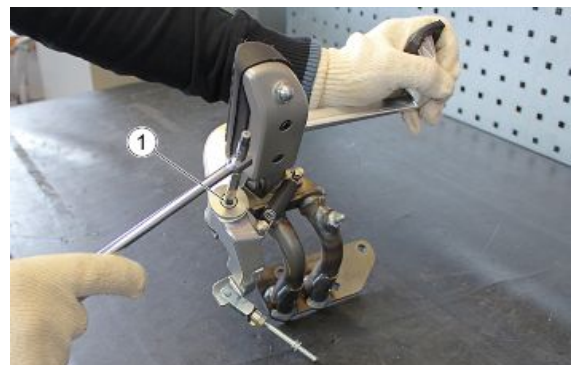


- Unscrew and remove the two screws (4).
- Remove the rear brake sensor (5).
- Remove the complete footrest (6).



REAR BRAKE LEVER REMOVAL

- Unscrew and remove the screw (1).



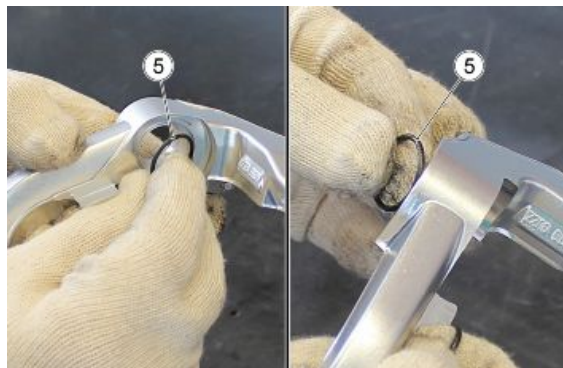
- Unlatch the spring (2) from the rear brake lever (3).
- Remove the rear brake lever from the supporting clamp (3)



- Remove the fixing bearing (4).



- Remove the two OR-rings (5) from both sides of the brake lever (3).

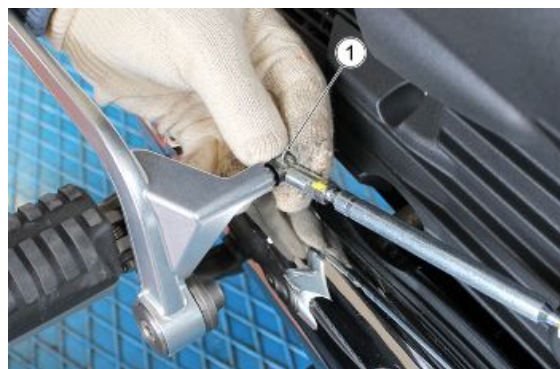


- Remove the spring (2).

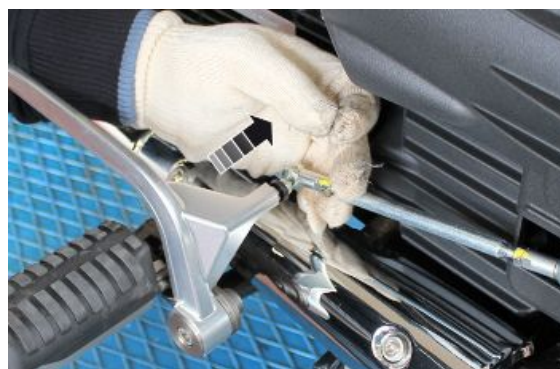


GEAR LEVER REMOVAL

- Remove the clip (1).



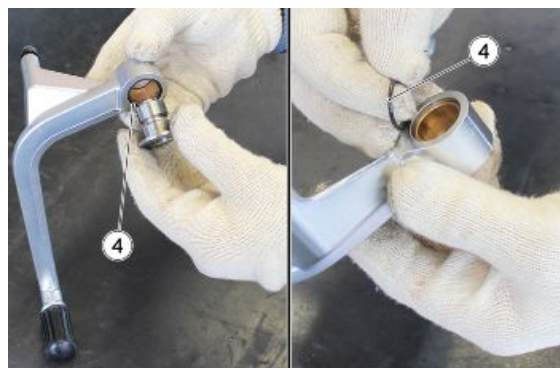
- Unlatch the joint from the gearbox lever as in the figure.



- Undo and remove the fixing screw (2).
- Remove the gearbox lever (3).

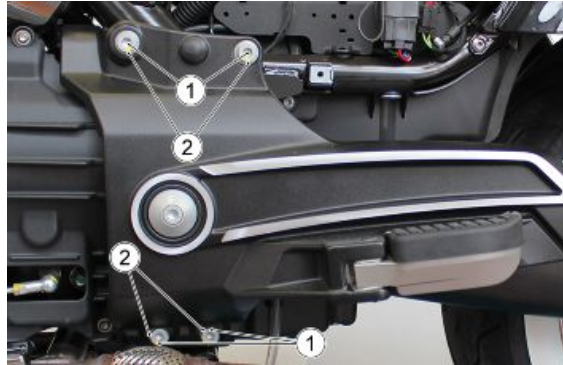


- Remove the two OR-rings (4) from both sides of the gearbox lever (3).



PASSENGER FOOTREST REMOVAL

- The following procedure is visible from one side of the motorcycle, but is valid for both passenger footrest plates.
- Remove the silencer.
- Unscrew and remove the four fixing screws (1).
- Collect the four washers (2).
- Remove the footrest plate (3).

**See also**

[Removing the manifold - tail pipe](#)

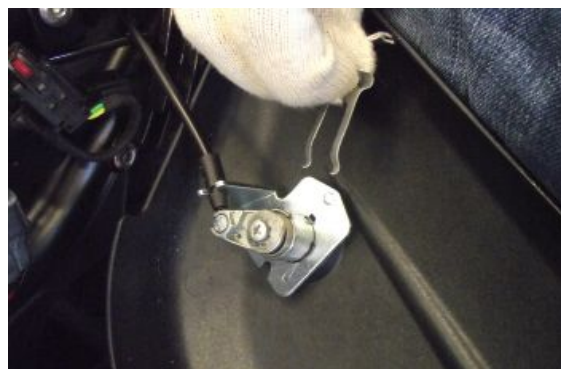
Side body panels

- Operating from both sides, unscrew and remove the fixing screw.
- Remove the side fairing.

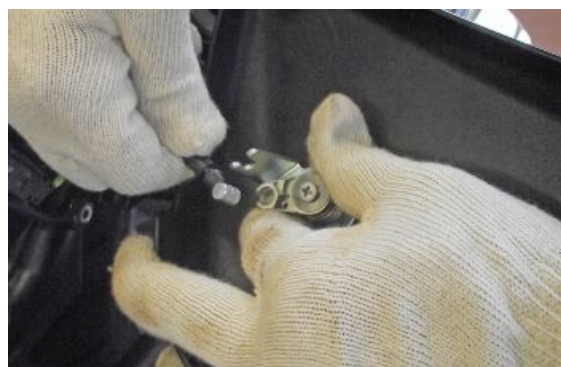


SADDLE RELEASE CONTROL REMOVAL

- Remove the fork spring.



- Disconnect the saddle release cable.
- Remove the cable support plate.



-
- Remove the ignition switch assembly.



License plate holder

- Disconnect the rear light assembly connector indicated in the figure.



- Undo and remove the two fixing screws (1).



- Remove licence plate support as indicated in the figure.



- Unscrew and remove the screw (2).



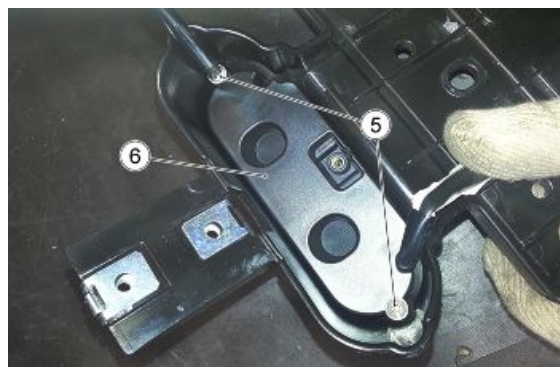
- Remove the supporting clamp (3).



- Unscrew and remove the screw (4).



- Unscrew and remove the two screws (5).
- Remove the cover (6).



- Remove the license plate light (8).



- Remove the license plate light (8).



Rear mudguard

- First remove the rear handle.
- Disconnect the connector of the license plate light.



- Unscrew and remove the lower fixing screw.



See also

[Rear grab rail](#)

- Working from both sides, release the two side locks.



- Disconnect the two connectors of the rear turn indicators.
- Remove the rear mudguard.



- Undo and remove the turn indicator fixing screws.
- Remove the wiring by its fasteners.
- Remove the turn indicator.





Fuel tank

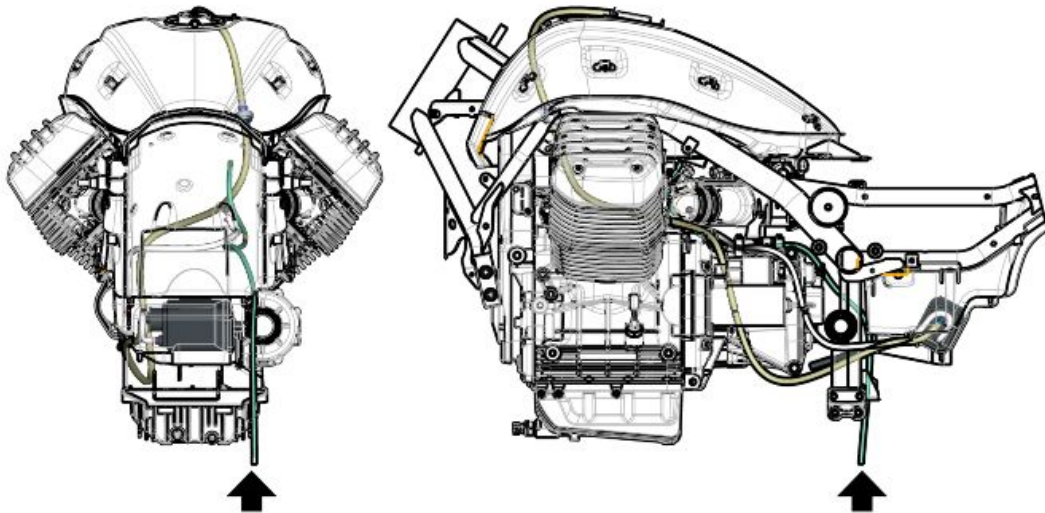
During the removal and refitting of the tank be very careful, in fact two types can be found:

1. Model "1"
2. Model "2" (Tank fitted on the USA version)

In this case the difference is the number of breather pipes that are on the fuel pump side. In model "1" are two pipes while in model "2" there is one.



The other difference is the breather pipes routing. In model "1" the two pipes come together in "Y" union (see image). While in model "2" the pipe routing is shown in the second image.



- Undo and remove the two fixing screws of the tank cap cover.
- Remove the cover.



- Disconnect the two connectors of the fuel level sensor.



- Working from both sides, undo and remove the two side screws.



- Unscrew and remove the rear screw.



- Slightly lift the tank so as to be able to reach the connector.
- Disconnect the connector of the fuel pump.



- Disconnect the fuel pipe.

CAUTION



PAY ATTENTION TO THE LEAKAGE OF FUEL EVEN IF IN A MINIMUM QUANTITY.



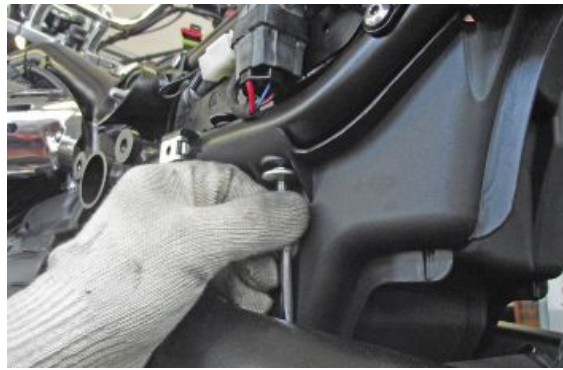
- Disconnect the two breather pipes (1) located under the tank.
- Remove the tank.



Rear wheelhouse

- First remove the control unit, license plate support and side panniers support.
- Working from both sides, undo and remove the two side fixing screws.





- Unscrew and remove the two rear screws.



See also

License plate holder
[Pannier mounting](#)

- Working from both sides, undo and remove the two screws on the side of the rear shock absorber.



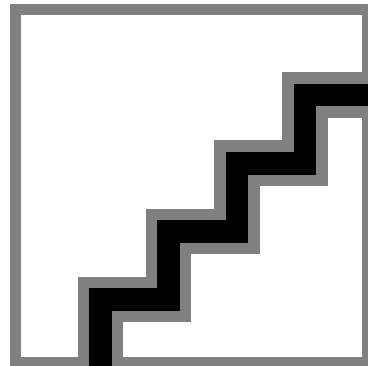
- Undo and remove the fixing screws in the lower protection part of the ABS control unit.
- Remove the rear wheel housing by pulling it off from the rear.



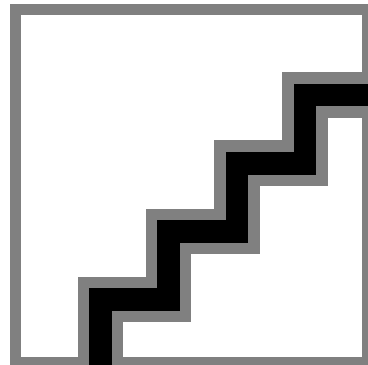


Front mudguard

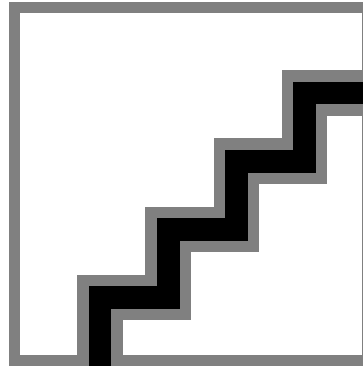
- Unscrew and remove the four fastening screws from the inner part of the fork stanchions as in the figure.



- Remove the front mudguard (1).



- Slightly broaden the front mudguard (1) in the points indicated in the figure.
- Remove the supporting clamp (2).

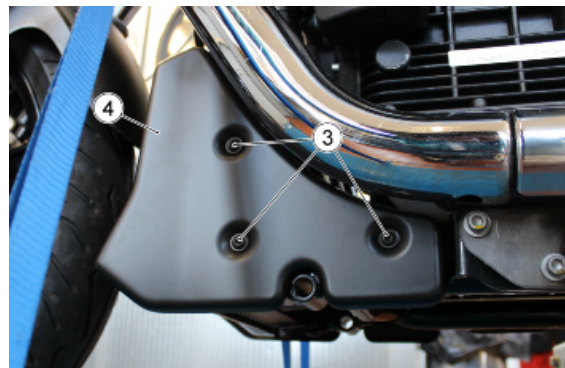


Radiator cover

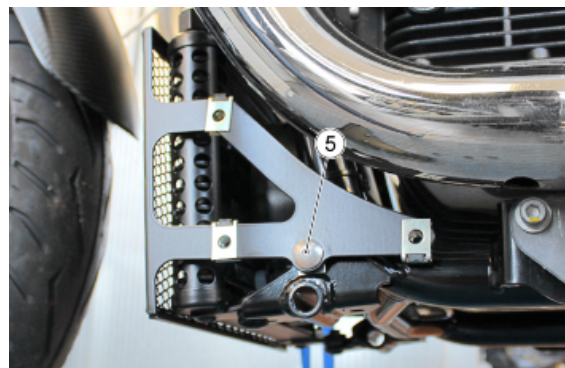
- Undo and remove the three fixing screws (1).
- Remove the bulkhead (2).



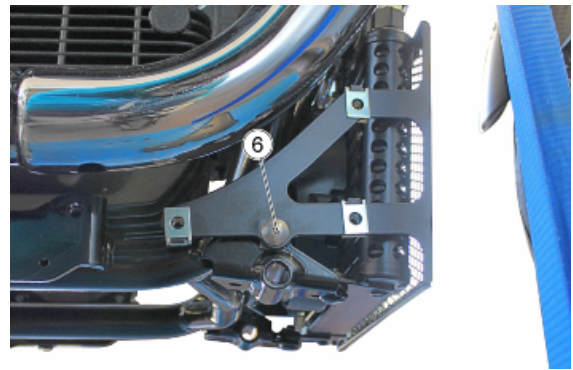
- Undo and remove the three fixing screws (3).
- Remove the bulkhead (4).



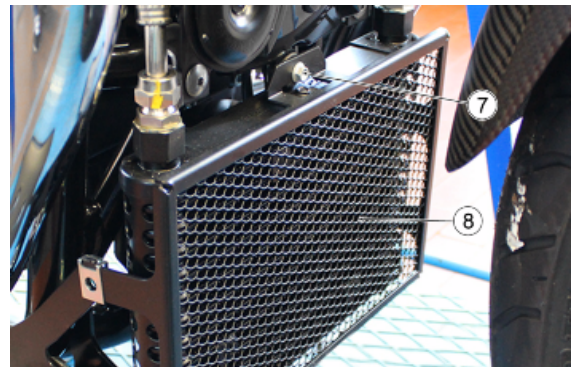
- Unscrew and remove the screw (5).



- Unscrew and remove the screw (6).

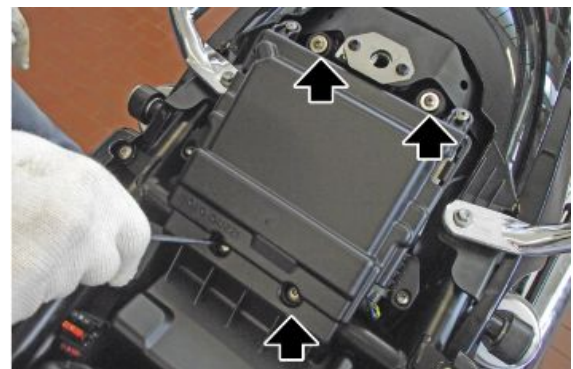


- Undo and remove the fixing screw (7).
- Remove the radiator grille (8).



Battery

- Unscrew and remove the four screws in the figure.
- Remove the battery cover.



- Disconnect the two battery cables starting from the negative and then move to the positive.

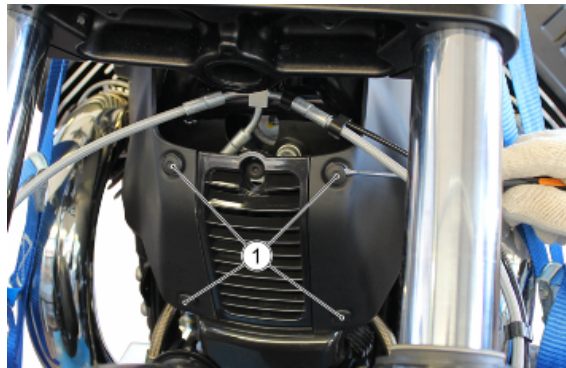


- Remove the battery.

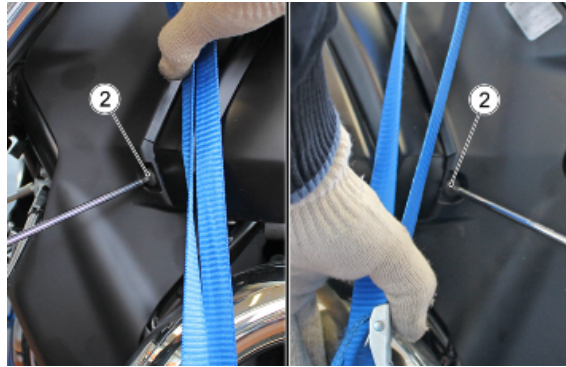


Side air deflectors

- Remove the tank cover.
- Remove the four plastic inserts (1).



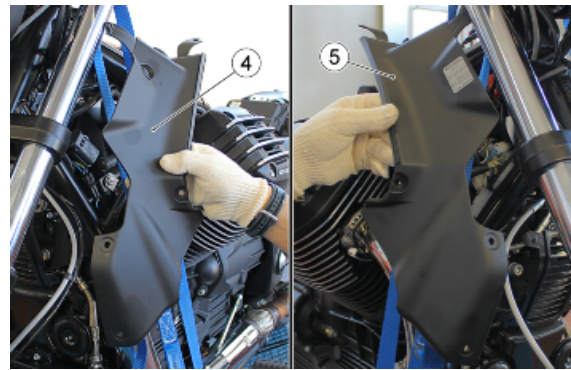
- Working from both sides of the motorcycle, undo and remove the two fixing screws (2).



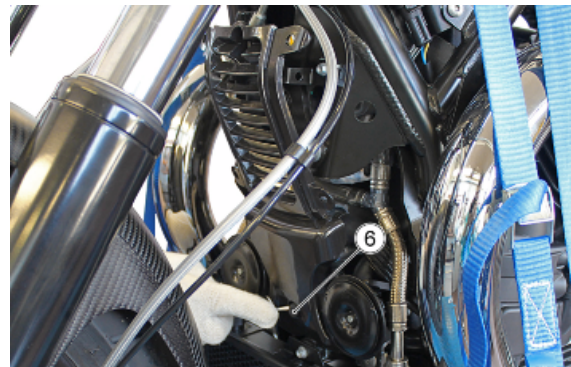
- Unscrew and remove the screw (3).



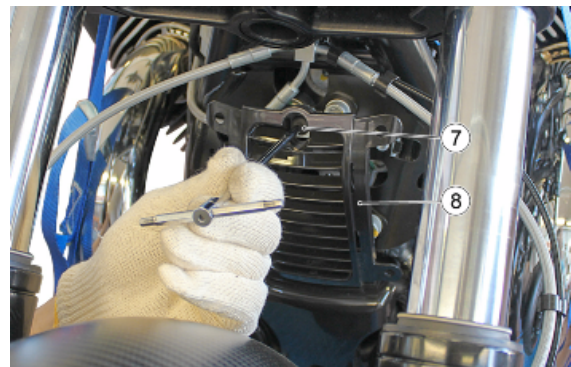
- Collect the cover (4) and (5) on both sides of the motorcycle.



- Remove the plastic insert (6).



- Undo and remove the fixing screw (7).
- Remove the central cover (8).



INDEX OF TOPICS

PRE-DELIVERY

PRE DE

Carry out the listed checks before delivering the motorcycle.

WARNING

HANDLE FUEL WITH CARE.

CAUTION

USE THE DIAGNOSTIC TOOL TO CHECK FOR ANY ERRORS AND CHECK THAT ALL PARAMETERS ARE CORRECT.

ENSURE THAT THE VEHICLE CALIBRATION HAS BEEN UPDATED TO LATEST VERSION AVAILABLE, AFTER UPDATING THE DIAGNOSTIC TOOL.

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

WHEN INSTALLING THE BATTERY, ATTACH THE POSITIVE LEAD FIRST AND THEN THE NEGATIVE ONE, AND PERFORM THE REVERSE OPERATION DURING 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. IF IT ACCIDENTALLY COMES INTO CONTACT WITH YOUR EYES OR SKIN, WASH WITH ABUNDANT WATER FOR APPROX. 15 MIN. AND SEEK IMMEDIATE MEDICAL ATTENTION. IF ACCIDENTALLY SWALLOWED, IMMEDIATELY DRINK LARGE QUANTITIES OF WATER OR VEGETABLE OIL. SEEK IMMEDIATE MEDICAL ATTENTION. BATTERIES PRODUCE EXPLOSIVE GASES; KEEP CLEAR OF NAKED FLAMES, SPARKS OR CIGARETTES. VENTILATE THE AREA WHEN RECHARGING INDOORS. ALWAYS WEAR EYE PROTECTION WHEN WORKING IN THE PROXIMITY OF BATTERIES. KEEP OUT OF THE REACH OF CHILDREN

CAUTION

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

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

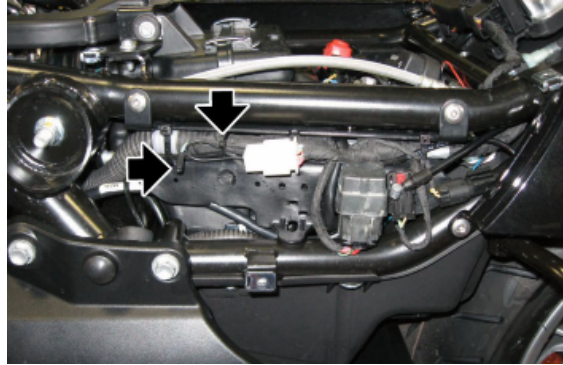


CHECK AND ADJUST TYRE PRESSURE WITH TYRES AT AMBIENT TEMPERATURE.

Specific operations for the vehicle

ANTI-THEFT DEVICE

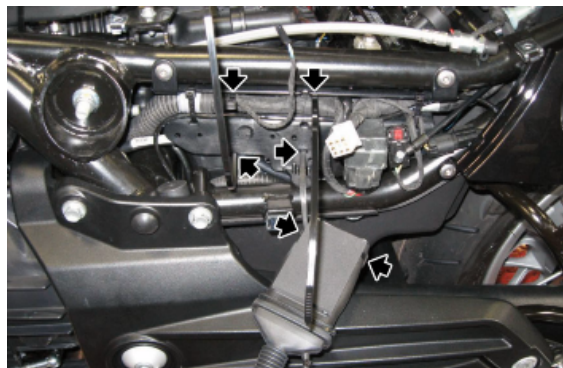
- Remove the left fairing.
- Cut the indicated clamp and free the LED connector.



- Take half of the adhesive backed foam in the anti-theft device kit and stick it to the bottom of the anti-theft control unit.



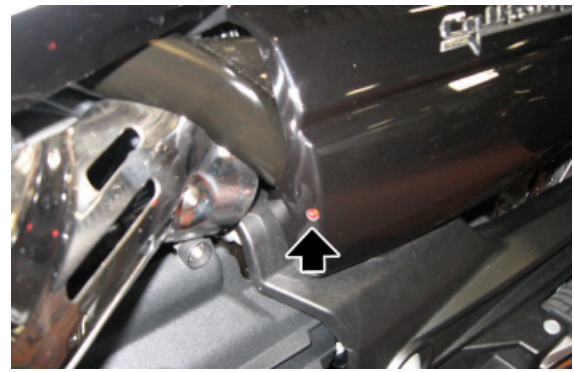
- Position the clamps in the specific seats prepared on the mounting plastic.
- Pass the right clamp through the two slots on the anti-theft device control unit.



- Pull the clamps, securing the control unit to the bracket.
- Connect the control unit and LED connectors to the specific cable harness on the bike and attach the adhesive LED on the internal side of the left side fairing.



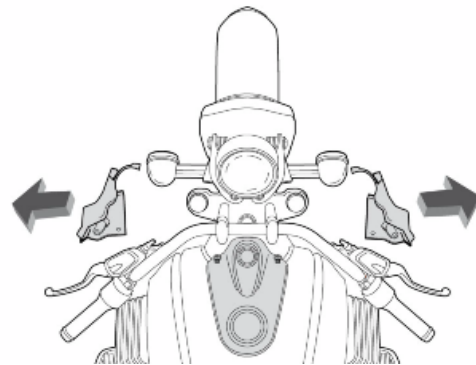
- Install the left side fairing on the bike.



HEATED HANDGRIPS KIT

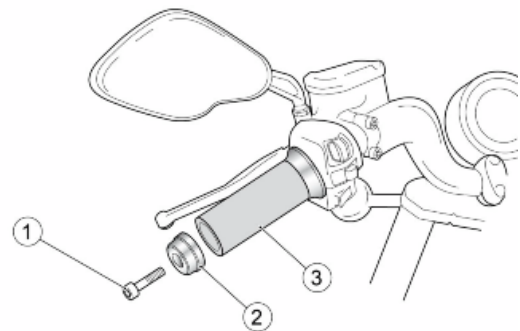
pos.	Description	Type	Quantity	Torque	Notes
1	Counterweighted fastening screws	M6x30	2	10 Nm (7.37 lb ft)	-

- Remove both side fairings first.

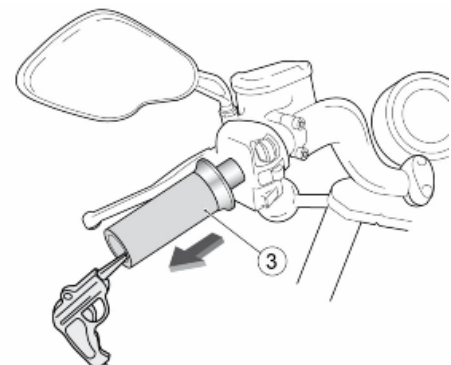


LEFT HEATED HANDGRIP INSTALLATION

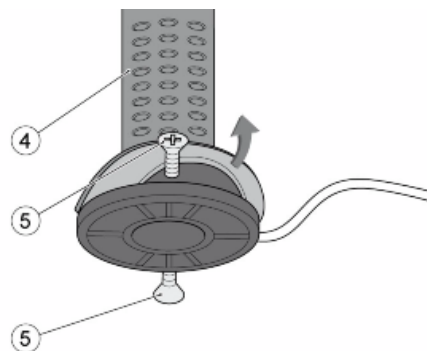
- Remove the counterweight (2), undoing the screw (1).



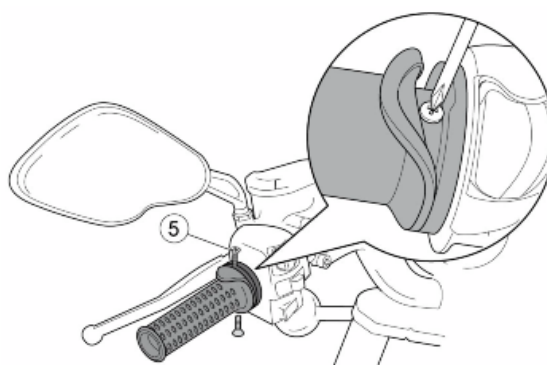
- Using compressed air, remove the handgrip from the handlebar (3).



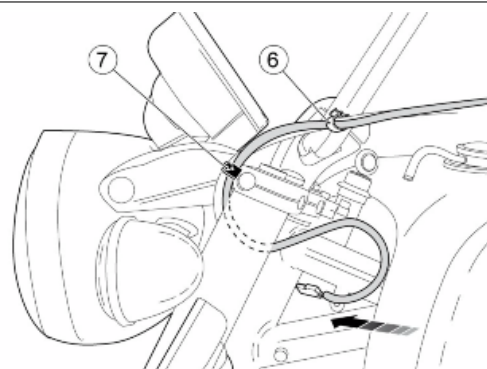
- Collect the fixing screws (5) from the heatable handgrip (4).



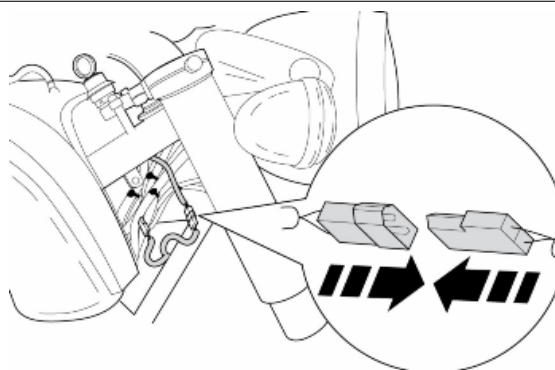
- Position the heatable handgrip all the way, taking care to align the holes on the grip with those on the handlebar, and screw in the fixing screws (5).



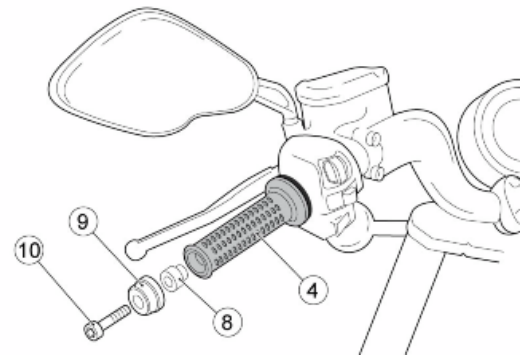
- Replace the two cable grommets with the ones in the kit (6). Also, take care to insert the cabling of the heatable handgrip in the rubber cable grommet (7).



- Pass the cable behind the steering column and connect it to one of the two available connectors.

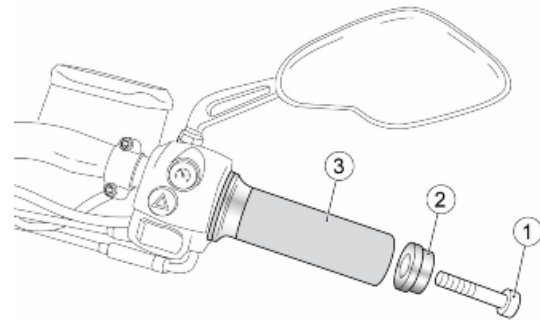


- Insert and secure to the handlebar using the screw (10), the spacer (8) and the counterweight (9).

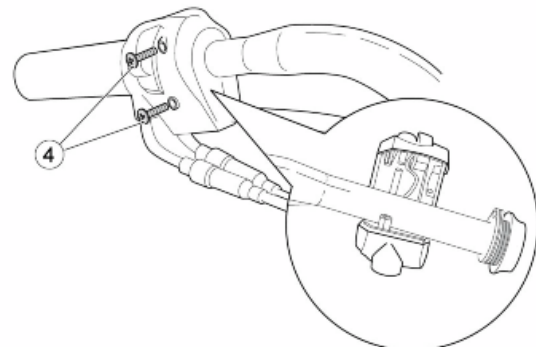


RIGHT HEATED HANDGRIP INSTALLATION

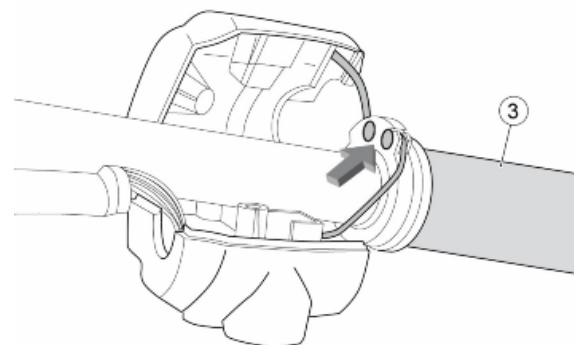
- Remove the brake master cylinder first.
- Remove the counterweight (2), undoing the screw (1).



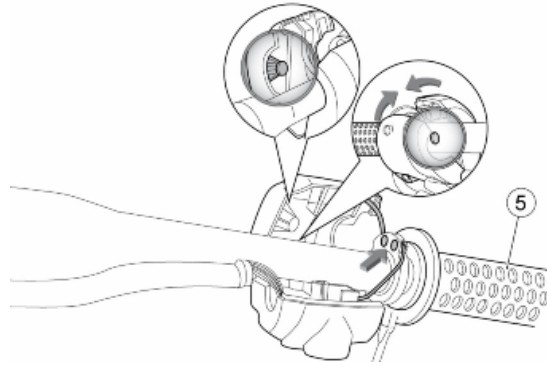
- Open the accelerator block, removing the two screws (4).



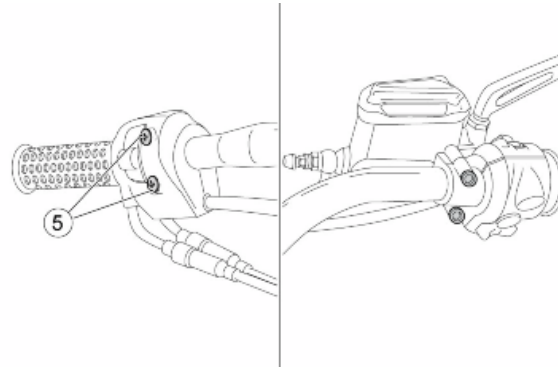
- Disconnect both the gas control cables and slide the grip off (3).



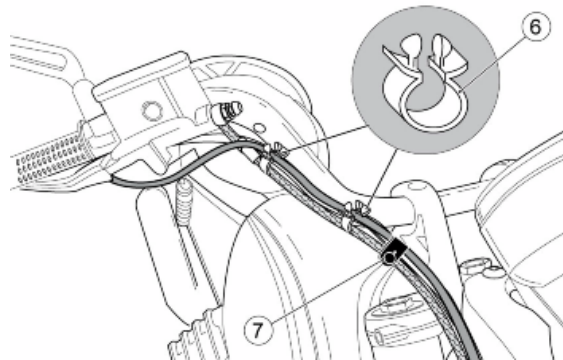
- Insert the heatable handgrip (5) in the handlebar and connect the gas cables which were removed from the block earlier.
- Close the accelerator control block, taking care to insert the peg in the dedicated hole on the handlebar.



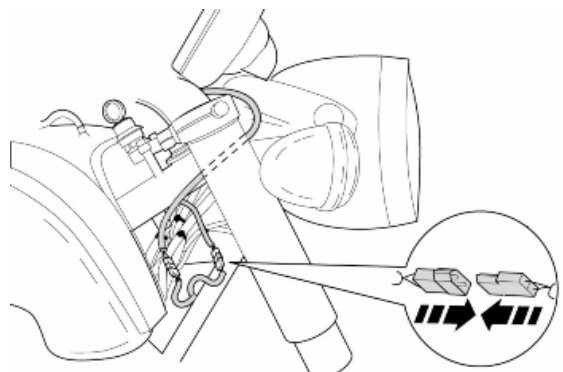
- Tighten the two screws (4).
- Refit the brake master cylinder.



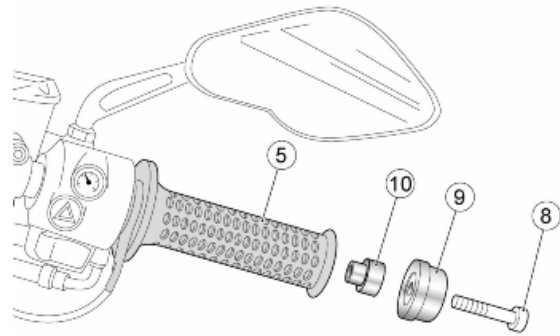
- Replace the two cable grommets with the ones in the kit (6). Also, take care to insert the cabling of the heatable handgrip in the rubber cable grommet (7).



- Pass the cable by the right fork as shown in the figure and connect it to the connector.

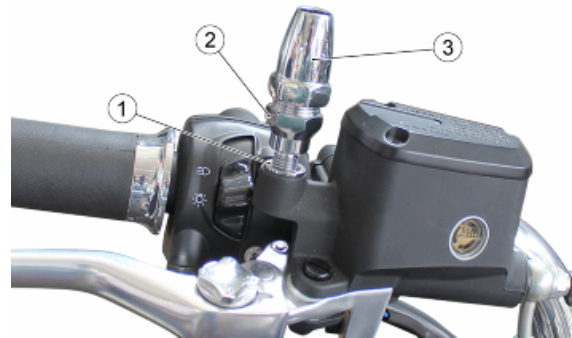


- Insert and secure to the handlebar using the screw (8), the spacer (10) and the counterweight (9).

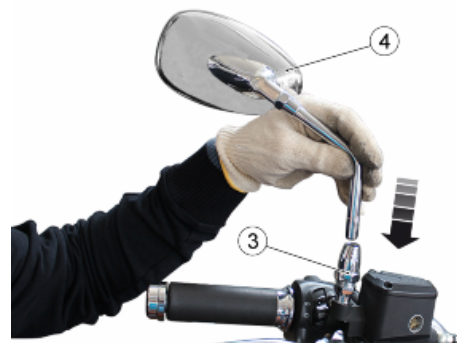


REAR-VIEW MIRRORS

- Fit the washer (1) and nut (2).
- Screw in the nut (2).
- Fit and screw in the counter-nut (3) without tightening completely.



- Fit the mirror inside the counter-nut (3) as in the figure.



- Tighten the nut (2) and counter-nut (3) as in the figure.



NUMBER PLATE MOUNT

- Place the licence plate support correctly as indicated in the figure.
- Fit and tighten the two fixing screws (1).



- Connect the rear light assembly connector as indicated in the figure.



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