MANUALE STAZIONE DI SERVIZIO

1Q000844

Vespa sei giorni 300 hpe

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Vespa sei giorni 300 hpe

Questo manuale per stazioni di servizio è stato realizzato da Piaggio & C. Spa per essere utilizzato dalle officine dei concessionari e sub-agenzie Piaggio-Gilera. Si presuppone che chi utilizza questa pubblicazione per la manutenzione e la riparazione dei veicoli Piaggio, abbia una conoscenza base dei principi della meccanica e dei procedimenti inerenti la tecnica della riparazione dei veicoli. Le variazioni importanti nelle caratteristiche dei veicoli o nelle specifiche operazioni di riparazione verranno comunicate attraverso aggiornamenti di questo manuale. Non si può comunque realizzare un lavoro completamente soddisfacente se non si dispone degli impianti e delle attrezzature necessarie, ed è per questo che vi invitiamo a consultare le pagine di questo manuale riguardanti l'attrezzatura specifica e il catalogo degli attrezzi specifici.

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

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

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

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

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

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

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GENERAL MANDATORY REQUIREMENTS | NORM

General information

This section contains general information regarding the vehicle and the use of the manual, as well as important notes regarding safety.

IMPORTANT WARNINGS AND NOTES

Each symbol has a precise meaning, as illustrated below.

- WARNING: - This symbol indicates risks for the health of the operator and of the nearby persons if the described procedures are performed incorrectly.
- CAUTION:- This symbol indicates that the component on which works are being performed may be damaged if the described procedures are performed incorrectly.
- NOTE: - This paragraph provides additional instructions for the ongoing procedure, so that the operation may be performed in an efficient manner.

REACH REGULATION WARNINGS :

To protect the health and safety of the PROFESSIONAL CLIENT, as provided by the:

- (EC) Regulation No. 1907/2006 (REACh);
- 2000/53/EC (END of LIFE VEHICLES);
- SCIP Database Directive (art.9, par.1 lett.i) of the framework directive regarding waste, as modified by the Directive 2018/851

The technical personnel operating during the ordinary and special maintenance activities has the obligation to always wear the personal protection equipment:

1. chemical protection gloves if the specific type is not explicitly indicated, or, if required, special gloves according to the substance used;
2. mask, possibly a chemically active one, if specifically required;
3. protective goggles.

The above indications represent an alternative for the prescriptions of other regulations and of the legislation in force in the specific countries. Regarding the use of other PPE, governed by the laws regarding the safety at work, the relevant legislation in force apply.

GENERAL SAFETY WARNINGS :

1. Always wear protective goggles and proper clothing.
2. Always use a safety support to operate under the vehicle.
3. Check that the ignition switch is always OFF, unless the procedure indicates otherwise.
4. Pull the hand brake (if applicable) before starting working on the vehicle.
5. Start the engine only in well ventilated places, to avoid the risks related to the carbon oxide.
6. Keep a safe distance from the mobile parts during the operation of the engine, especially from the fans and belts.
7. To avoid burns, avoid contact with the hot metallic parts, such as the radiator, exhaust manifold, exhaust pipe, catalytic converter and silencer.
8. Do not smoke during maintenance operations.
9. To avoid any injuries, do not wear rings, watches, jewellery and loose clothing before starting to work on the vehicle.
10. Keep your hands and other objects away from the blades of the radiator's fan (if present)!
11. The cooling fan (if present) is fitted on the radiator and may start any time due to a temperature increase of the cooling fluid. It is important to check that the cooling fan's starter motor is disconnected from the wiring harness before starting the works.

The measurement units used in the manual are imperial UNITS of measurement. (International system for UNITS). Example: 24.5-34.3 Nm

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Carry out the listed tests before delivering the vehicle.

Warning - Handle fuel with care.

Aesthetic inspection

Appearance check:

- Paintwork
- Fitting of plastics
- Scratches
- Dirt

Tightening torques inspection

Lock check

Check to make sure that the marking in coloured mark is present on the:

- Safety fasteners
- Fastening screws

Safety fasteners:

- Front shock absorber lower fastener
- Rear shock absorber lower fastener
- Swinging arm pin - Engine
- Front wheel brake calliper
- Rear wheel brake calliper
- Coolant delivery and return pipe ties on the coolant pump cover

Electrical system

• Main switch
• Lights: high beam lights, low beam lights, tail lights and their warning lights
- Headlight adjustment according to the regulations currently in force
• Brake light operation by using the RH and LF brake lever
• Turn indicators and their warning lights
• Instrument lighting
• instruments: fuel and temperature indicator
•Instrument panel lights
• Horn
• Electric starter
• Engine stopping with emergency stop switch
• electric saddle opening button

TO ENSURE MAXIMUM PERFORMANCE, THE BATTERY MUST BE CHARGED BEFORE USE. INADEQUATELY CHARGING THE BATTERY WITH A LOW ELECTROLYTE LEVEL BEFORE IT IS USED FOR THE FIRST TIME WITH SHORTEN THE LIFE OF THE BATTERY.

CAUTION

WHEN INSTALLING THE BATTERY, ATTACH THE POSITIVE LEAD FIRST AND THEN THE NEGATIVE ONE.

WARNING

BATTERY ELECTROLYTE IS TOXIC AND IT MAY CAUSE SERIOUS BURNS. IT CONTAINS SULPHURIC ACID. AVOID CONTACT WITH 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 GAS; 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 THAT RECOMMENDED. USING A FUSE OF UNSUITABLE RATING MAY SERIOUSLY DAMAGE THE VEHICLE OR EVEN CAUSE A FIRE.

The vehicle is equipped with an OBD (On-Board Diagnostics) port, compliant with the Euro 5 directives and which allows the connection between the vehicle and the diagnostic tool.

N.B.

AT EACH SCHEDULED MAINTENANCE A VERIFICATION MUST BE PERFORMED WITH THE DIAGNOSTIC TOOL TO CHECK IF THERE ARE ERRORS AND THE IF THE PARAMETERS ARE CORRECT. ENSURE THAT THE VEHICLE CALIBRATION IS UP TO DATE AFTER UPDATING THE DIAGNOSTIC TOOL.

Levels check

Level check:

- Hydraulic brake system liquid level
- Rear hub oil level
- Engine coolant level
- Engine oil level

Road test

Test ride:

- Cold start
- Instrument operations
- Response to throttle control
- Stability on acceleration and braking
- Front and rear brake efficiency
- Front and rear suspension efficiency

- Abnormal noise

Static test

Static control after the test drive:

• Hot engine restart

• Minimum seal (turning the handlebar)

• Uniform steering rotation

• Possible losses

• electric radiator fan operation

CAUTION

CHECK AND ADJUST TYRE PRESSURE WITH TYRES AT AMBIENT TEMPERATURE.

CAUTION

NEVER EXCEED THE RECOMMENDED INFLATION PRESSURES SINCE THE TYRES MAY BURST.

Functional inspection

Functional Checks:

• Hydraulic braking system: lever travel

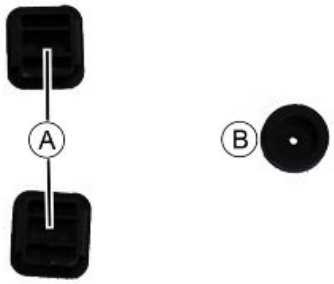
• Clutch: proper functioning check

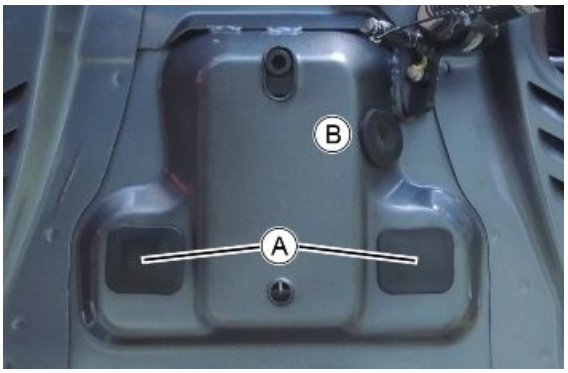
• Engine: proper general functioning and no abnormal noise check

• Other: document checks, chassis and engine number check, tools and equipment (if present), licence plate fitting, lock check, tyre pressure check, rear-view mirror and any accessory fitting

Specific operations for the vehicle

Install the underbody caps as shown in the figure.

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This section describes the general specifications of the vehicle.

Rules

This section describes general safety rules for any maintenance operations performed on the vehicle.

Safety rules

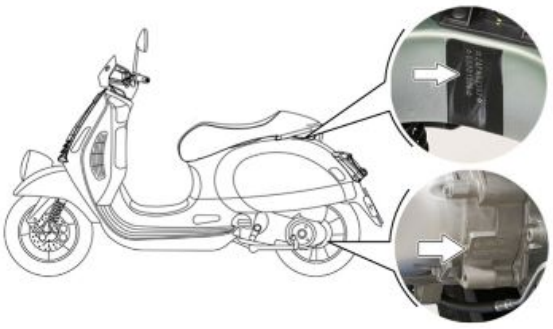
- If work can only be done on the vehicle with the engine running, make sure that the premises are well ventilated, using special extractors if necessary; never let the engine run in an enclosed area. Exhaust fumes are toxic.
- The battery electrolyte contains sulphuric acid. Protect your eyes, clothes and skin. Sulphuric acid is highly corrosive; in the event of contact with your eyes or skin, rinse thoroughly with abundant water and seek immediate medical attention.
- The battery produces hydrogen, a gas that can be highly explosive. Do not smoke and avoid sparks or flames near the battery, especially when charging it.
- Fuel is highly flammable and it can be explosive given some conditions. Do not smoke in the working area, and avoid naked flames or sparks.
- Clean the brake pads in a well-ventilated area, directing the jet of compressed air carefully to avoid the risk of inhaling dust produced by worn friction material. Even though the latter contains no asbestos, inhaling dust is harmful.

Maintenance rules

- Use original PIAGGIO spare parts and lubricants recommended by the Manufacturer. Non-original or non-conforming spare parts may damage the vehicle.
- Use only the appropriate tools designed for this vehicle.
- Always use new gaskets, seal rings and cotter pins when reassembling.
- After removal, clean the components using non-flammable or low flash-point solvents. Lubricate all the work surfaces, except tapered couplings, before refitting these parts.
- After refitting, make sure that all the components have been installed correctly and work properly.
- Use only equipment with metric sizes for removal, service and reassembly operations. Metric bolts, nuts and screws are not interchangeable with coupling members using English measurements. Using unsuitable coupling members and tools may damage the vehicle.
- When carrying out maintenance operations on the vehicle that involve the electrical system, make sure the electrical connections have been made properly, particularly the ground and battery connections.

Vehicle identification

The identification numbers consist of a prefix stamped on the chassis and on the engine, followed by a number. They must be quoted when ordering spare parts. We recommend that you check that the prefix and chassis number stamped on the vehicle correspond with those in the vehicle documents.



CAUTION

NOTE THAT ALTERING SERIAL NUMBERS MAY BE PUNISHABLE WITH SEVERE LEGAL PENALTIES (IMPOUNDING OF VEHICLE, ETC.).

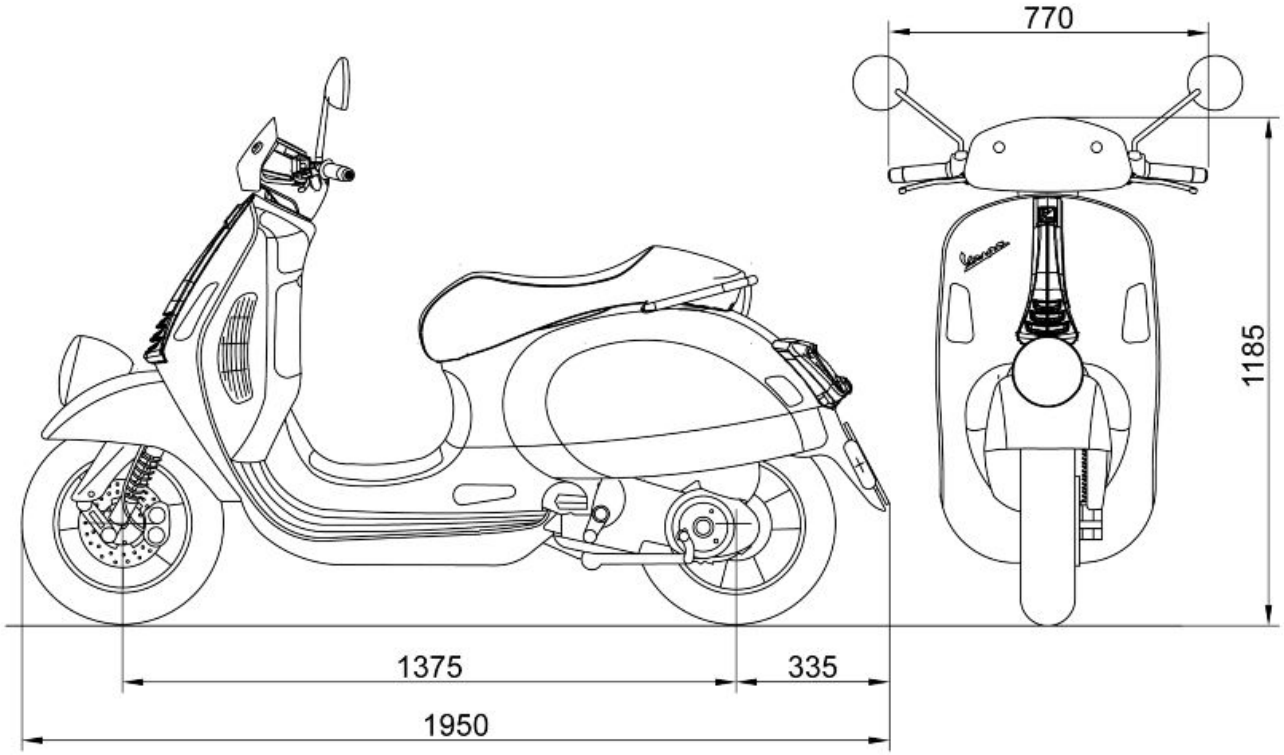
FRAME IDENTIFICATION NUMBER:

Lift the saddle and remove the helmet compartment. The chassis identification number is stamped on the chassis' rear crossbeam.

ENGINE IDENTIFICATION NUMBER:

The engine identification number is stamped in the rear part of the engine near the shock absorber lower support.

Vehicle data



VEHICLE DATA

Specification	Desc./Quantity
Frame	Stamped plate supporting body.
Front suspension	Single arm suspension (cantilever wheel) fitted with a dual-chamber hydraulic shock absorber with coaxial spring.
Rear suspension	Two double-acting shock absorbers, adjustable to four positions at pre-loading.
Front brake	Ø 220 mm hydraulically operated disc brake controlled from RH handlebar lever; braking assisted by ABS system.
Rear brake	Ø 220 mm hydraulically operated disc brake controlled from LH handlebar lever; braking assisted by ABS system.
Wheel rims type	Light alloy.
Front rim	12" x 3.00
Rear rim	12" x 3.00
Front tire	120/70 - 12" 51P Tubeless
Rear tire	Tubeless 130/70 - 12" 62P
Front tire pressure (with passenger)	1.8 bar (-)
Rear tire pressure (with passenger)	2.0 bar (2.2 bar)
Kerb weight	160 kg
Maximum weight limit	340 kg
Battery	12V-10Ah

Engine Data

ENGINE SPECIFICATIONS

Specification	Desc./Quantity
Type	Single cylinder 4-stroke
Engine capacity	278 cm³
Bore x Stroke	75x63 mm
Compression ratio	11 ± 0.5: 1

Specification	Desc./Quantity
Idle engine speed	1,700 ± 100 rpm
Timing system	4 valves, single overhead camshaft, chain-driven.
Valve clearance (cold engine)	Intake: 0.10 ± 0.02 mm Exhaust: 0.10 ± 0.02 mm
Maximum power	17.5 kW at 8250 rpm
Maximum torque	26.0 Nm at 5250 rpm
Transmission	CVT expandable pulley continuously variable transmission with torque server, V-belt, self-ventilating dry automatic centrifugal clutch and transmission housing with forced-circulation air cooling.
Final drive reduction gear	Gear reduction unit in oil bath.
Lubrication	Engine lubrication with lobe pump (inside crankcase), chain-driven, with double filter: mesh and paper.
Cooling	Forced coolant circulation system.
Starting	Electric
Ignition	Electronic inductive discharge ignition, high efficiency, with separate HV coil.
Ignition advance	α/N three-dimensional map managed by control unit
Spark plug	NGK MR7BI-8
Power supply	Electronic injection with Ø 32-mm throttle body and electric fuel pump.
Fuel	Unleaded gasoline E10 (95 R.O.N.)
Exhaust silencer	Absorption-type exhaust silencer with a 3-way catalytic converter and lambda probe.
Emissions compliance	EURO 5

Capacities

CAPACITY

Specification	Desc./Quantity
Engine oil	1.3 l
Transmission oil	250 cm^3
Cooling system fluid	~ 2 l
Fuel tank	8.5 ± 0.5 litres

MEASUREMENT UNITS CONVERSION - FROM THE ANGLO-SAXON SYSTEM TO THE INTERNATIONAL SYSTEM (I.S.).

Specification	Desc./Quantity
1 Inch (in)	25.4 Millimetres (mm)
1 Foot (ft)	0.305 Metres (m)
1 Mile (mi)	1.609 Kilometres (km)
1 US gallon (gal US)	3.785 Litres (l)
1 Pound (lb)	0.454 Kilograms (Kg)
1 Cubic inch (in^3)	16.4 Cubic centimetres (cm^3)
1 Pound per foot (lb ft)	1.356 Newton metres (N m)
1 Mile per hour (mi/h)	1.602 Kilometres per hour (km/h)
1 Pound per square foot (PSI)	0.069 (bar)
1 Fahrenheit (°F)	32+(9/5) Celsius (°C)

Tightening Torques

FRONT SUSPENSION TIGHTENING TORQUES

Name	Torque in Nm
Lower lock-nut - Steering tube	11.7 - 13.7 Nm
Upper lock-nut - Steering tube	34.3 - 39.2 Nm
Handlebars - Steering tube	50 - 55 Nm
Front wheel - Front wheel hub	19 - 24 Nm
Throttle control sleeve - Handlebar	3 - 4 Nm
Front shock absorber (lower fastening) - Steering tube	19 - 26 Nm
Front shock absorber (upper fastening) - Steering tube	19 - 24 Nm
Front shock absorber - Shock absorber plate	19 - 29 Nm

Name	Torque in Nm
Front wheel hub - Front wheel axle	74 - 88 Nm
ABS sensor - ABS support bracket	4.5 - 5 Nm
Odometer transmission - Front wheel hub	4 - 6 Nm

REAR SUSPENSION TIGHTENING TORQUES

Name	Torque in Nm
Swinging arm (engine side) - Engine	67 - 75 Nm
Swinging arm (frame side) - Frame	76 - 83 Nm
Silent block bracket - Frame	42 - 52 Nm
Swinging arm (engine side) - Swinging arm (frame side)	40 - 45 Nm
Rear shock absorber (lower) - Silencer support bracket	40 - 45 Nm
Rear shock absorber (lower) - Shock absorber support bracket	40 - 45 Nm
Shock absorber support bracket - Engine	20 - 25 Nm
Rear shock absorber (upper) - Frame	20 - 25 Nm
Rear wheel hub - Rear wheel axle	104 - 126 Nm
Rear wheel - Rear wheel hub	20 - 25 Nm
Silencer support arm - Engine	20 - 25 Nm
ABS sensor - Silencer support bracket	5 - 6 Nm
Central stand - Engine	40 - 45 Nm
Side stand support bracket - Frame	6 - 10 Nm
Side stand - Side stand support bracket	35 - 40 Nm
Side stand button - Side stand support bracket	5 - 7 Nm
Ground cable - Frame	7.5 - 9.5 Nm
Ground braid - Frame	7.5 - 9.5 Nm
Ground cable - Engine	11 - 13 Nm
Starter motor ground cable - Frame	11 - 12.5 Nm

BRAKE SYSTEM TIGHTENING TORQUES

Name	Torque in Nm
Front brake calliper - Front shock absorber support	19 - 24 Nm
Rear brake calliper - Crankcase	20 - 25 Nm
Brake pump - Handlebars	7 - 10 Nm
Front brake pipe coupling - Front brake calliper	19 - 24 Nm
Rear brake pipe coupling - Rear brake calliper	20 - 25 Nm
Front brake pipe - Brake pump	20 - 25 Nm
Brake disc - Wheel hub	8 - 10 Nm
Brake pump pipe - ABS control unit	17 - 20 Nm
Front calliper brake pipe - ABS control unit	17 - 20 Nm
Rear calliper brake pipe - Rear brake pipe coupling	13 - 17 Nm
Rear brake pipe coupling - ABS control unit	17 - 20 Nm

BODYWORK TIGHTENING TORQUES

Name	Torque in Nm
Saddle - Frame	8 - 10 Nm
Handle - Frame	8 - 10 Nm
Rear handle cover - Handle	1 - 1.7 Nm
Saddle support cover - Frame	8 - 10 Nm
Rear view mirrors - Handlebars	29 - 31 Nm
Rear handlebar cover - Front handlebar cover	1 - 1.7 Nm
Panel lights - Rear handlebar cover	1 - 1.7 Nm
Headlamp - Headlamp cover	5 - 6 Nm
Front direction indicator - Leg shield	1 - 1.7 Nm
Central frame cover - Footrest	1 - 1.7 Nm
Expansion chamber cover - Leg shield back plate	1 - 1.7 Nm
Leg shield back plate (upper external fastening) - Leg shield	1 - 1.7 Nm
Leg shield back plate (upper internal fastening) - Leg shield	1 - 1.7 Nm
Leg shield back plate (lower internal fastening) - Footrest	1 - 1.7 Nm
Leg shield back plate (lower external fastening) - Footrest	1 - 1.7 Nm
Leg shield back plate (central fastening) - Frame	4.5 - 7 Nm
Rear light assembly - Frame	4.5 - 7 Nm
Rear direction indicator - Frame	1 - 1.7 Nm
Footrest (central fastening) - Frame	4.5 - 7 Nm
Footrest (lateral fastening) - Frame	1 - 1.7 Nm
Footrest (rear fastening) - Frame	4.5 - 7 Nm
Passenger footrest - Frame	17 - 22 Nm

Name	Torque in Nm
Lateral cover (front fastening) - Footrest	1 - 1.7 Nm
Lateral cover (rear fastening) - Frame	4.5 - 7 Nm
Spoiler terminal - Footrest	1 - 1.7 Nm
Fuel pipe clamp - Fuel tank	4.5 - 7 Nm
Fuel tank (front fastening) - Frame	8 - 10 Nm
Fuel tank (rear fastening) - Frame	8 - 10 Nm
Fuel tank (upper fastening) - Frame	8 - 10 Nm
Front splash guard (front fastening) - Front mudguard	2 - 4 Nm
Front splash guard (rear fastening) - Front mudguard	2 - 4 Nm
Headlamp cover (central fastening) - Front mudguard	7 - 10 Nm
Headlamp cover (front fastening) - Front mudguard	2 - 4 Nm
Headlamp cover (rear fastening) - Front mudguard	7 - 10 Nm
Front mudguard - Steering tube	5 - 6 Nm
Front mudguard support bracket - Suspension flange	8 - 10 Nm
Front mudguard support bracket - Steering tube	8 - 10 Nm
Suspension flange - Headlight support bracket	8 - 10 Nm
Headlamp retainer bracket - Headlight support bracket	8 - 10 Nm
Steering tube protection (lower fastening) - Steering tube	4 - 7 Nm
Steering tube protection (lower fastening) - Front mudguard	2 - 4 Nm
Front central cover - Frame	1 - 1.7 Nm
Front windshield - Windshield support	4.5 - 7 Nm
battery fastening bracket - Frame	4.5 - 7 Nm

TRANSMISSION

Name	Torque in Nm
Belt support roller screw	11 to 13
Clutch unit nut on driven pulley	45 - 50
Driver pulley nut	75 - 83
Transmission cover screws	11 - 13 Nm
Driven pulley shaft nut	54 - 60
Rear hub cover screws	24 to 27

LUBRICATION

Name	Torque in Nm
Hub oil drainage plug	15 to 17
Oil filter on crankcase fitting	27 - 33
Engine oil drainage plug/ mesh filter	24 to 30
Oil filter	4 - 6
Oil pump cover screws	7 - 9
Screws fixing oil pump to the crankcase	5 to 6
Oil pump command sprocket screw	10 - 14
Oil pump cover plate screws	4 - 6
Oil sump screws	10 - 14
Minimum oil pressure sensor	12 - 14

CYLINDER HEAD

Name	Torque in Nm
Spark plug	12 - 14
Cylinder head cover screws	6 - 7
Nuts fixing head to cylinder	7±1 + 10±1 + 90° + 90° + 90°
Head fixing side screws	11 - 12
Starter ground screw	7 to 8.5
Tappet adjustment check nut	6 - 8
Inlet manifold screws	11 to 13
Timing chain tensioner slider screw	10 - 14
Starter counterweight support screw	11 to 15
Timing chain tensioner support screw	11 to 13
Timing chain tensioner central screw	5 to 6
Camshaft retention plate screw	4 - 6

FLYWHEEL

Name	Torque in Nm
Flywheel cover screw	11 to 13
Stator assembly screws	3 - 4 (Apply LOCTITE medium type 242 threadlock)

Name	Torque in Nm
Flywheel nut	94 - 102
Pick-up fixing screws	3 - 4
Screw fixing freewheel to flywheel	13 - 15

COOLING

Name	Torque in Nm
Water pump rotor cover	3 - 4
Thermostat cover screws	3 - 4
Bleeder screw	3

CRANKSHAFT AND CASE

Name	Torque in Nm
Internal engine crankcase bulkhead (transmission-side half shaft) screws	4 - 6
Engine-crankcase coupling screws	11 to 13
Starter screws	11 to 13
Crankcase timing cover screws	3.5 - 4.5 (Apply LOCTITE medium type 242 threadlock)

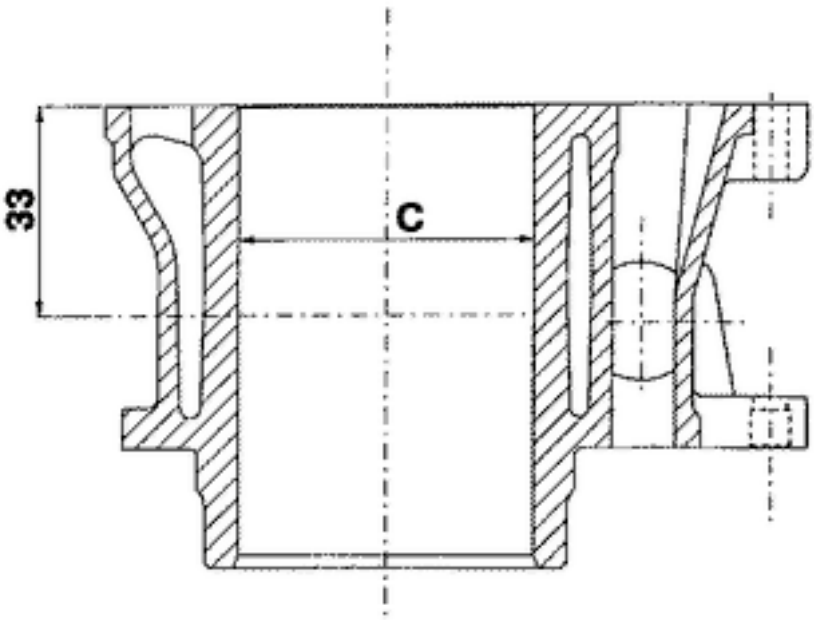
SILENCER

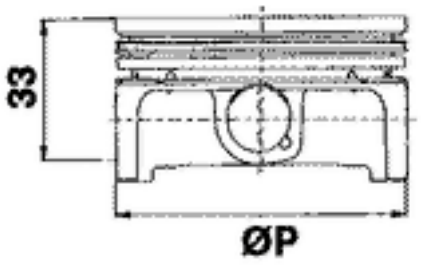
Name	Torque in Nm
Silencer heat guard fixing screw	4 - 5
Screw used to fasten silencer to supporting arm	20 - 25
Lambda probe tightening on exhaust manifold	40 - 50
Manifold/silencer joint tightening torque	12 - 13
Manifold - silencer diaphragm tightening clamp	16 - 18

Overhaul data

Assembly clearances

Cylinder - piston assy.





CYLINDER - PISTON

Specification	Desc./Quantity
Plunger diameter	74.967 +0.014 -0.014 mm
Cylinder diameter	75 +0.038 +0.01 mm

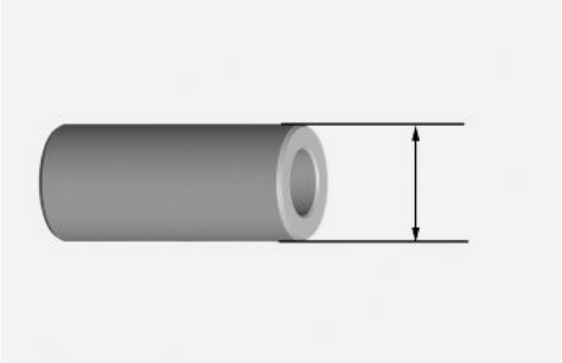
COUPLING CATEGORIES

Name	Initials	Cylinder	Piston	Play on fitting
cylinder - piston	M	75.01 ÷ 75.017	74.953 ÷ 74.960	0.050 ÷ 0.064
cylinder - piston	N	75.017 ÷ 75.024	74.960 ÷ 74.967	0.050 ÷ 0.064
cylinder - piston	O	75.024 ÷ 75.031	74.967 ÷ 74.974	0.050 ÷ 0.064
cylinder - piston	P	75.031 ÷ 75.038	74.974 ÷ 74.981	0.050 ÷ 0.064

N.B.

THE PISTON MUST BE INSTALLED WITH THE ARROW FACING TOWARDS THE EXHAUST SIDE, THE PISTON RINGS MUST BE INSTALLED WITH THE WORD «TOP» OR THE STAMPED MARK FACING UPWARDS.

- Check the pin external diameter.

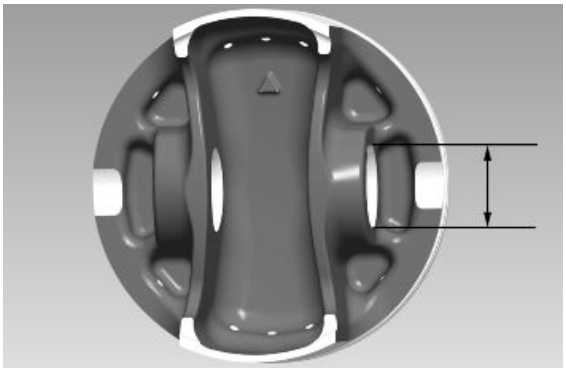


Characteristic

Pin external diameter

16 +0 -0.004 mm

- Measure the diameter of the bearings on the piston.



Characteristic

Standard diameter

16 +0.006 +0.001 mm

- Calculate the piston pin coupling clearance.

N.B.

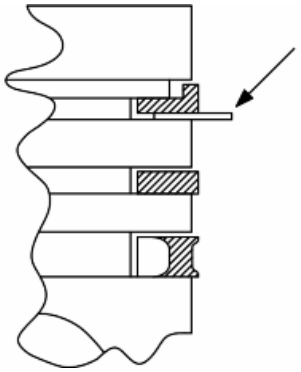
THE PIN HOUSINGS HAVE 2 LUBRICATION CHANNELS. FOR THIS REASON, MEASUREMENT MUST BE MADE ACCORDING TO THE PISTON AXIS

Characteristic

Standard clearance:

0.001 - 0.010 mm

- Carefully clean the seal housings.
- Measure the coupling clearance between the sealing rings and the piston grooves using suitable sensors, as shown in the diagram.
- If the clearance is greater than that indicated in the table, replace the piston.



N.B.

MEASURE THE CLEARANCE BY INSERTING THE BLADE OF THE FEELER THICKNESS GAUGE FROM THE SECOND SEAL SIDE.

Fitting clearance

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

- Check that the head coupling surface is not worn or misshapen.
- Pistons and cylinders are classified according to diameter. The coupling is carried out in pairs (M-M, N-N, O-O, P-P).

Characteristic

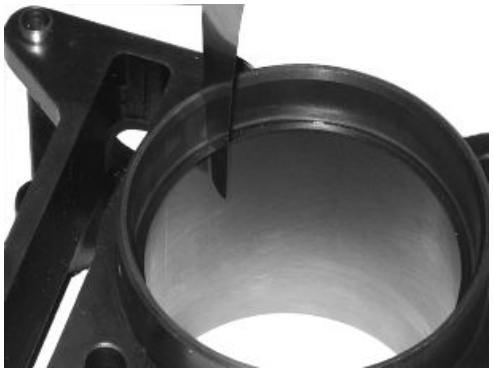
Maximum allowable run-out:

0.001 in 0.05 mm

Piston rings

Sealing rings

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



N.B.

BEFORE REPLACING ONLY THE PISTON RINGS, MAKE SURE THAT COUPLING CLEARANCE BETWEEN THE SEAL RINGS AND ITS GROOVES, AND THAT BETWEEN THE PISTON AND THE CYLINDER ARE AS SPECIFIED. IN

ANY CASE, NEW PISTON SEALING RINGS USED IN COMBINATION WITH A USED CYLINDER MAY HAVE DIFFERENT BEDDING CONDITIONS THAN THE STANDARD ONES.

Characteristic

Top piston ring

Standard opening: 0.15 to 0.30 mm

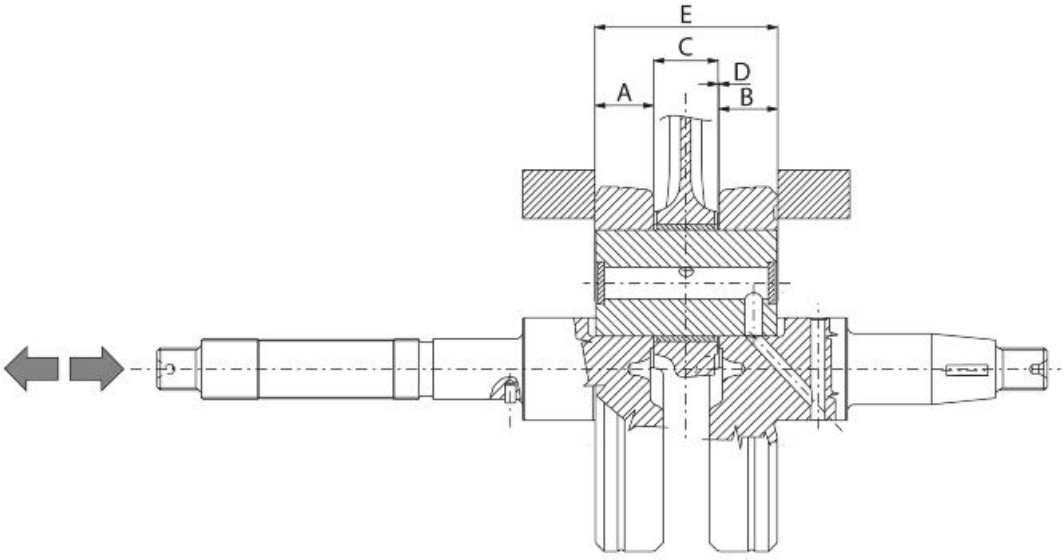
Middle piston ring

Standard opening: 0.20 - 0.40 mm

scraper ring

Standard opening: 0.20 - 0.40 mm

Crankcase - crankshaft - connecting rod

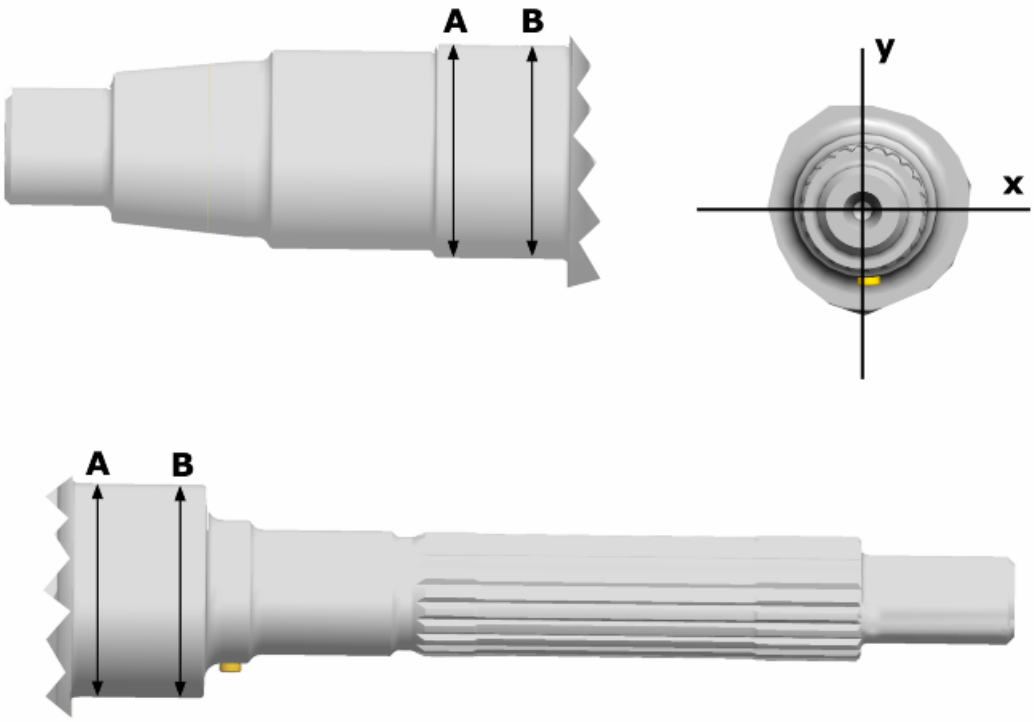


AXIAL CLEARANCE BETWEEN CRANKSHAFT AND CONNECTING ROD

Name	Description	Dimensions	Initials	Quantity
Transmissionside half-shaft		16.6 +0-0.05	A	D = 0.20 - 0.50
Flywheel-side halfshaft		16.6 +0-0.05	B	D = 0.20 - 0.50
Connecting rod		18 -0.10 -0.15	C	D = 0.20 - 0.50
Spacer tool		51.4 +0.05	E	D = 0.20 - 0.50

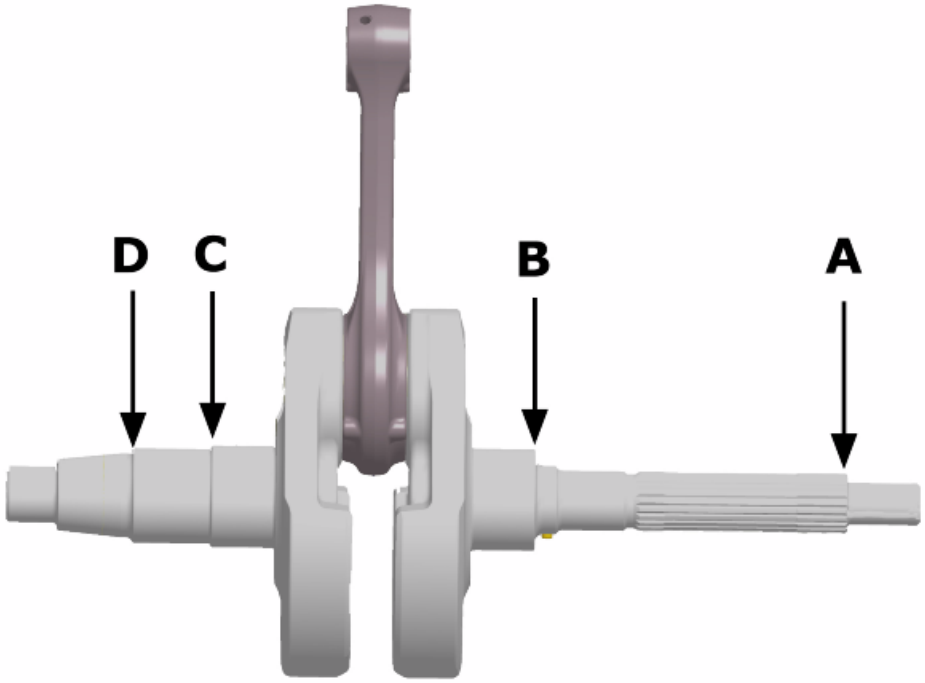
Diameter of crankshaft bearings.

Measure the bearings on both axes x-y.



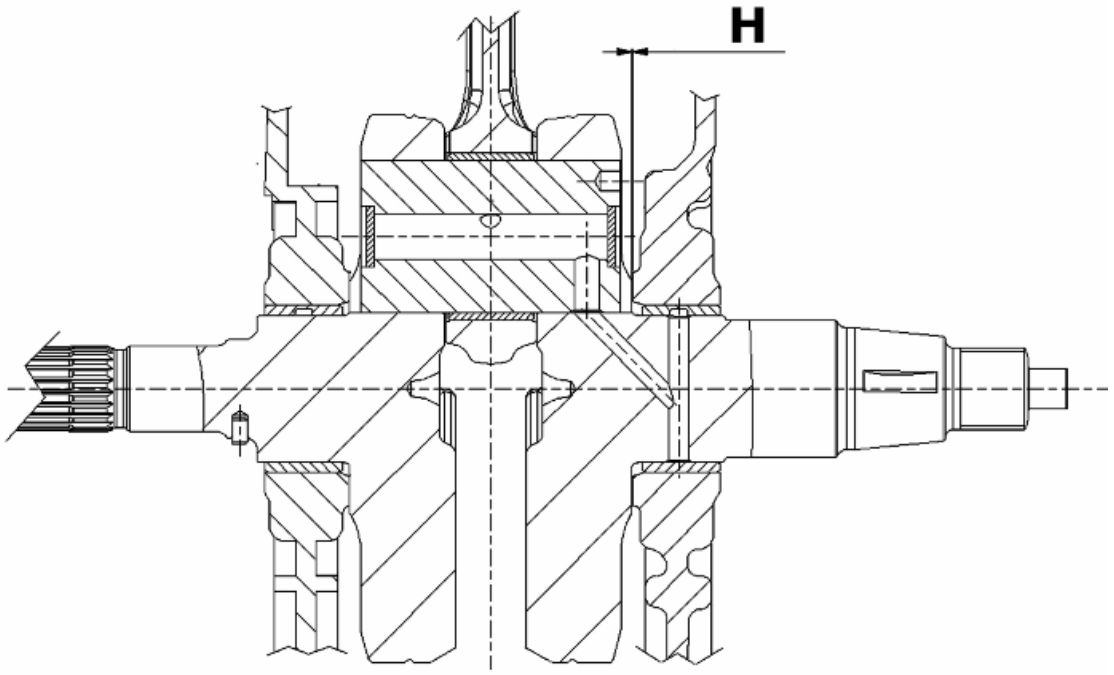
CRANKSHAFT

Specification	Desc./Quantity
Crankshaft bearings: Standard diameter: Cat. 1	28.998 ÷ 29.004 mm
Crankshaft bearings: Standard diameter: Cat. 2	29.004 ÷ 29.010 mm



MAX. ADMISSIBLE DISPLACEMENT

Specification	Desc./Quantity
A =	0.15 mm
B =	0.010 mm
C =	0.010 mm
D =	0.10 mm

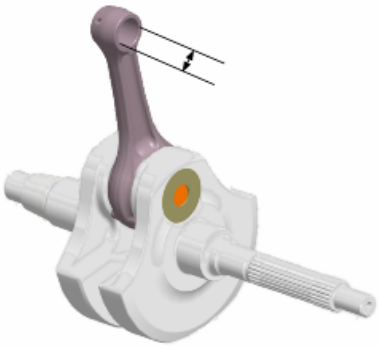


Characteristic

Crankshaft-crankcase axial clearance (H)

0.15 ÷ 0.43 mm

- Using a bore gauge, measure the connecting rod small end diameter.



N.B.

IF THE CONNECTING ROD SMALL END DIAMETER EXCEEDS THE STANDARD DIAMETER, EXHIBITS WEAR OR OVERHEATING, PROCEED TO REPLACE THE CRANKSHAFT AS DESCRIBED IN THE CRANKCASE AND CRANKSHAFT CHAPTER.

Characteristic

Standard diameter

16 +0.025 +0.015 mm

- To obtain a good bushing lubrication it is necessary to have both an optimal lubricating pressure and a good oil flow rate; the bushings must be correctly positioned so as not to obstruct the oil supply channels.
- The main bushings are comprised of two half-bearings, one with holes and channels for lubrication whereas the other is solid.
- The solid half-bearing is intended to stand the thrusts caused by combustion, and for this reason it is arranged opposite the cylinder.
- To prevent shutters in the oil feeding channels, the matching surface of the two half-bearings must be perfectly orthogonal to the cylinder axis, as shown in the figure.
- The oil feeding channel section is also affected by the bushings driving depth compared with the crankshaft axial clearance of the limiting surface.
- Check the inside diameter of the main bushings in the three directions indicated in the diagram.
- Repeat the measurements for the other bushing half. see diagram.
- There are three crankcase versions: with BLUE, YELLOW or GREEN bushings.
- There is only one type of main bushing housing hole in the crankcase. The standard bushing diameter after driving is variable on the basis of a coupling selection.
- There are 2 categories of bushing seats in the crankcase - Cat 1 and Cat 2 - just like those for the crankshaft.
- The main bushings are subdivided into 3 categories according to thickness; see table below:

BEARINGS

TYPE	IDENTIFICATION	CRANKSHAFT HALF-BEARING
B	BLUE	1.973 - 1.976
C	YELLOW	1.976 - 1.979
E	GREEN	1.979 - 1.982

COUPLINGS

BUSHING CATEGORY	CRANKCASE HALVES CATEGORY	BUSHING INSIDE DIAMETER AFTER FITTING
B	2	29.024 ÷ 29.054

BUSHING CATEGORY	CRANKCASE HALVES CATEGORY	BUSHING INSIDE DIAMETER AFTER FITTING
C	1	29.024 ÷ 29.054
	2	29.018 ÷ 29.048
E	1	29.018 ÷ 29.048

Combine the crankshaft with two crankwebs category 1 with a crankcase category 1 (or cat. 2 with cat. 2) A spare crankcase cannot be combined with a crankshaft with mixed categories. The spare crankshaft has half-shafts of the same category.

CATEGORIES

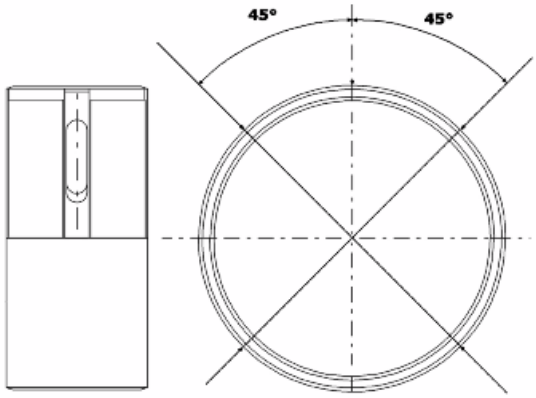
CRANKCASE HALVES	ENGINE HALF-SHAFT	BUSHING
Cat. 1	Cat. 1	E
Cat. 2	Cat. 2	B
Cat. 1	Cat. 2	C
Cat. 2	Cat. 1	C

N.B.

DO NOT TAKE THE MEASUREMENT ON THE TWO HALF-SHELL COUPLING SURFACE SINCE THE ENDS ARE RELIEVED TO ALLOW BENDING DURING THE DRIVING OPERATION.

N.B.

SPARE CRANKCASES ARE SELECTED WITH CRANKCASE HALVES OF THE SAME CATEGORY AND ARE FITTED WITH CATEGORY C (YELLOW) BUSHINGS



Characteristic

Crankshaft-bushing maximum clearance admitted:

0.08 mm

Diameter of crankcase without bushing

CAT 1: 32.959 - 32.965 mm

CAT 2: 32.953 - 32.959 mm

Cylinder Head

Before performing head service operations, thoroughly clean all coupling surfaces. Note the position of the springs and the valves so as not to change the original position during refitting

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

Characteristic

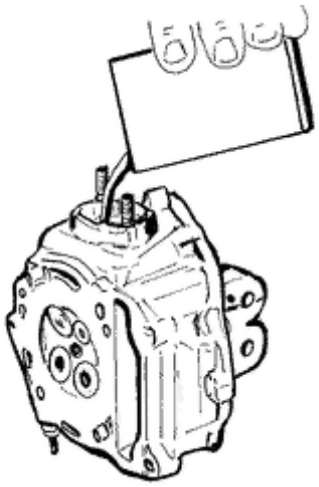
Maximum allowable run-out:

0.1 mm

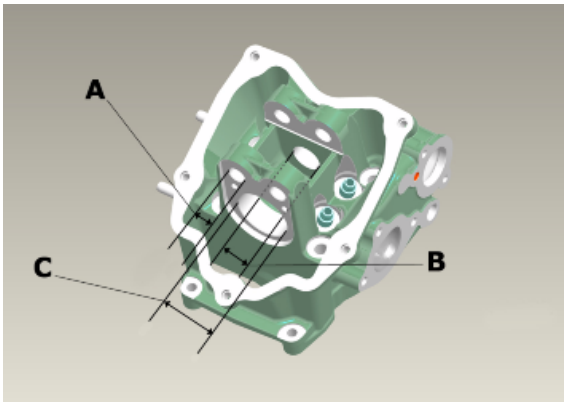
- In case of faults, replace the head.
- Check the sealing surfaces for the intake and exhaust manifold.
- Check that the camshaft and the rocker pin capacities exhibit no wear.

- Check that the head cover shows no signs of wear.
- Check that the coolant seal plug exhibits no oxidation.

- Insert the valves into the cylinder head.
- Alternatively check the intake and exhaust valves.
- The test is carried out by filling the manifold with petrol and checking that the head does not ooze through the valves when these are just pressed with the fingers.



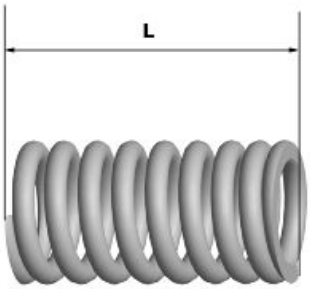
Measure the camshaft bearing seats and rocking lever support pins with a bore meter



HEAD BEARINGS

Specification	Desc./Quantity
bearing «A»	Ø 12.000 - 12.018
bearing «B»	Ø 20.000 - 20.021
bearing «C»	Ø 37.000 - 37.025

Measure the unloaded spring length



Characteristic

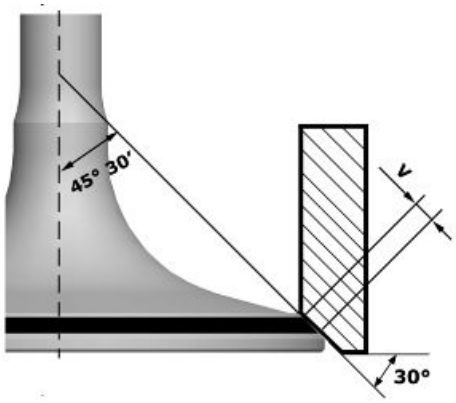
Standard length

40.2 mm

Allowable limit after use:

38.2 mm

- Clean the valve seats of any carbon residues.
- Using the Prussian blue, check the width of the impression on the valve seat "**V**".



Characteristic

Standard value:

1 - 1.3 mm

Limit allowed:

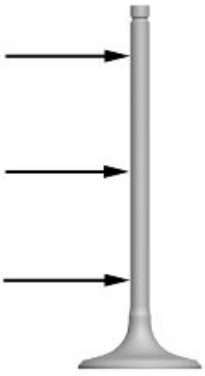
1.6 mm

- If the impression width on the valve seat is larger than the prescribed limits, true the seats with a 45° mill and then grind.
- In case of excessive wear or damage, replace the head.

STANDARD VALVE LENGTH

Specification	Desc./Quantity
Valve check: Standard length	Intake: 94.6 mm
Valve check: Standard length	Exhaust: 94.4 mm

- Measure the diameter of the valve stems in the three positions indicated in the diagram.



STANDARD DIAMETER

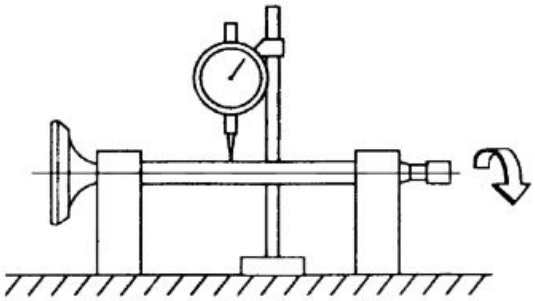
Specification	Desc./Quantity
Intake:	4.987 - 4.972 mm
Exhaust:	4.975 - 4.960 mm

MINIMUM DIAMETER PERMITTED

Specification	Desc./Quantity
Intake:	4.96 mm
Exhaust:	4.945 mm

- Calculate the clearance between the valve and the valve guide.

- Check the deviation of the valve stem by resting it on a «**V**» shaped abutment and measuring the extent of the deformation with a dial gauge.

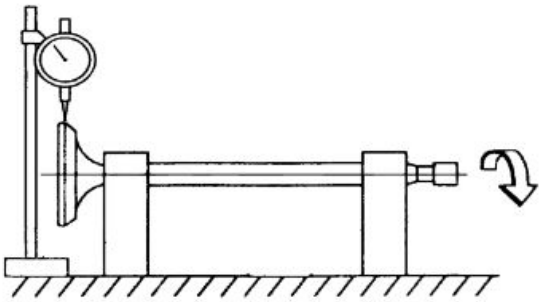


Characteristic

Limit value admitted:

0.1 mm

- Check the concentricity of the valve head by placing a dial gauge at right angles to the valve head and rotating it on the «**V**» shaped support.

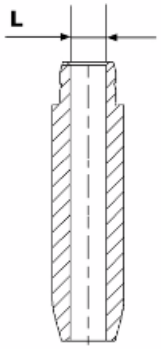


Characteristic

Limit allowed:

0.03 mm

Measure the valve guide.



Characteristic

Valve guide:

5 +0.012 mm

- After measuring the valve guide diameter and the valve stem diameter, check clearance between guide and stem.

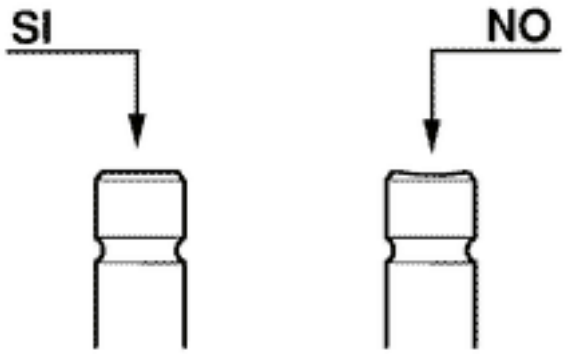
INTAKE

Specification	Desc./Quantity
Standard clearance:	0.013 - 0.04 mm
Limit allowed:	0.08 mm

EXHAUST

Specification	Desc./Quantity
Standard clearance:	0.025 - 0.052 mm
Limit allowed:	0.09 mm

- Check that there are no signs of wear on the mating surface with the set screw articulated terminal.



- If no anomalies are found during the above checks, you can use the same valves. To obtain better sealing performance, grind the valve seats. Grind the valves gently with a fine-grained lapping compound. During the grinding, keep the cylinder head with the valve axes in a horizontal position. This will prevent the lapping compound residues from penetrating between the valve stem and the guide (see figure).

CAUTION

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

CAUTION

DO NOT REVERSE THE FITTING POSITIONS OF THE VALVES (RIGHT - LEFT).

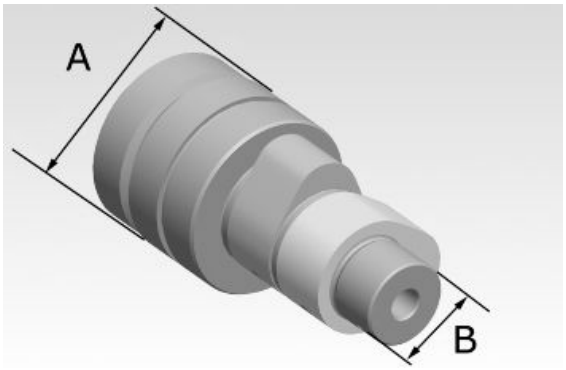
- Check that the camshaft bearings exhibit no scores or abnormal wear.
- Using a micrometer, measure the camshaft bearings.

STANDARD DIAMETER

Specification	Desc./Quantity
Camshaft check: Standard diameter	Bearing A Ø: 36.95 - 36.975 mm
Camshaft check: Standard diameter	Bearing B diameter: 19.959 - 19.98 mm

MINIMUM DIAMETER PERMITTED

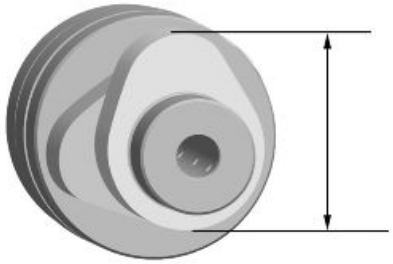
Specification	Desc./Quantity
Camshaft check: Minimum diameter permitted	Bearing A Ø: 36.94 mm
Camshaft check: Minimum diameter permitted	Bearing B diameter: 19.950 mm



-Using a gauge, measure the cam height.

STANDARD HEIGHT

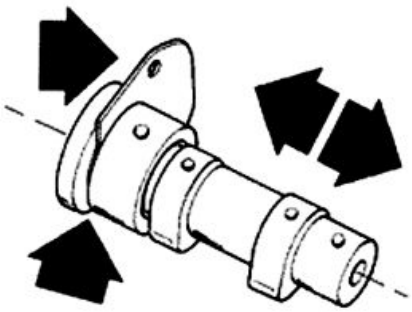
Specification	Desc./Quantity
Camshaft check: Standard height	Intake: 30.285 mm
Camshaft check: Standard height	Exhaust: 29.209 mm



Check the axial clearance of the camshaft

CAMSHAFT AXIAL CLEARANCE

Specification	Desc./Quantity
Camshaft check: Standard axial clearance:	0.11 - 0.41 mm
Camshaft check: Maximum admissible axial clearance:	0.42 mm



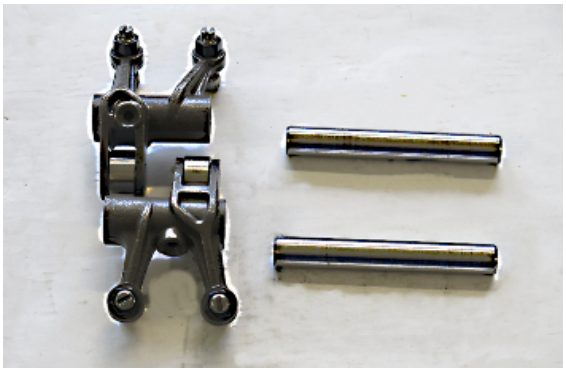
- Measure the external diameter of the rocking lever pins
- Check the rocker pins do not show signs of wear or scoring.

- Measure the internal diameter of each rocker

Check there are no signs of wear on the pad from contact with the cam and on the jointed adjustment plate.

DIAMETER OF PINS AND ROCKING LEVERS

Specification	Desc./Quantity
Rocking lever inside diameter: Standard diameter	Ø 12.000 - 12.011 mm
Rocking lever pin diameter: Standard diameter	Ø 11.977 - 11.985 mm



CLASSIFICATION OF DECOMPRESSION PIN/SCREW KNOB - CAMSHAFT

Decompression pin/screw knob

- Class identification sign: A - B - C
- Stamp of the class identification sign: pin end on screw knob side

Camshaft

- Class identification sign: A - B - C
- Stamp of the class identification sign: camshaft - sprocket timing view

CLASS MATCHING

	Decompression screw knob (pin) - Class A	Decompression screw knob (pin) - Class B	Decompression screw knob (pin) - Class C
Camshaft - Class A	A - A	NO	NO
Camshaft - Class B	NO	B - B	NO
Camshaft - Class C	NO	NO	C - C

Check the combustion chamber's pressure during the ignition so that it ranges between the accepted values listed below and also check the engine's revolutions.

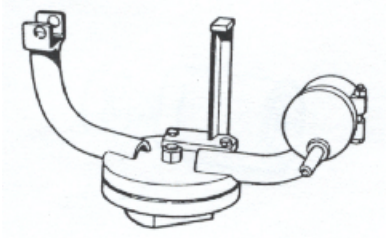
Perform the check when the battery is loaded, at room temperature and use a pressure gauge to detect the (relative) pressure during the ignition and the corresponding engine revolutions.

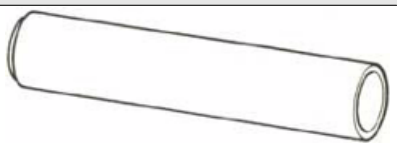
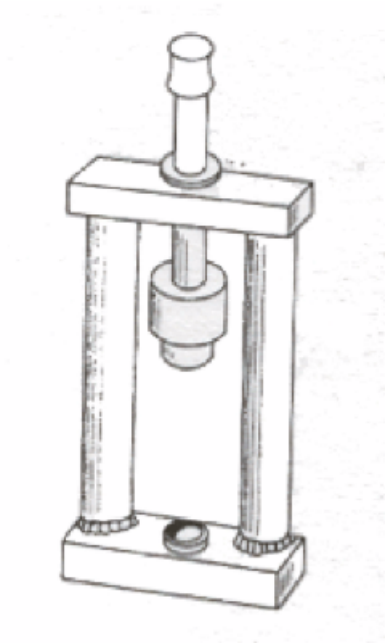
PRESSURE CHECK IN THE COMBUSTION CHAMBER DURING IGNITION

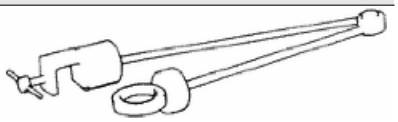
	Engine speed (RPM)	Relative pressure (bar)
MIN	400	4,5
MAX	600	8,0

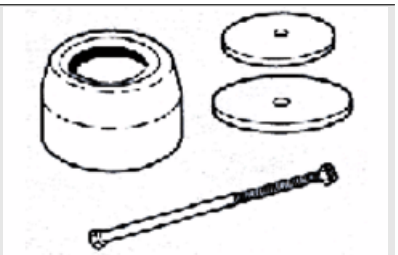
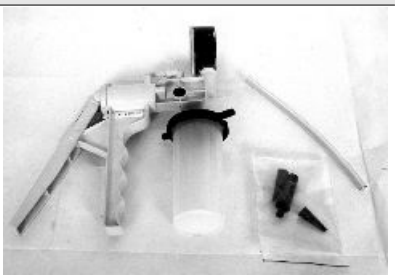
INDEX OF TOPICS

SPECIFIC TOOLS

Stores code	Description	
001330Y	Tool for fitting steering seats	
001467Y017	Bell for bearings, OD 39 mm	
001467Y014	Calliper to extract ø 15-mm bearings	
001467Y035	Bearing housing, external ø 47 mm	
001467Y013	Calliper to extract ø 15-mm bearings	
005095Y	Engine support	

Stores code	Description	
002465Y	Calliper for circlips	
006029Y	Punch for fitting steering bearing on the steering tube	
020004Y	Punch for removing steering bearings from headstock	
020021Y	Front suspension service tool	
020036Y	Punch	
020038Y	Punch	

Stores code	Description	
020055Y	Wrench for steering tube ring nut	
020074Y	Support base for checking crankshaft alignment	
020115Y	punch ø 18	
020150Y	Air heater mounting	
020151Y	Air heater	
020193Y	Oil pressure gauge	

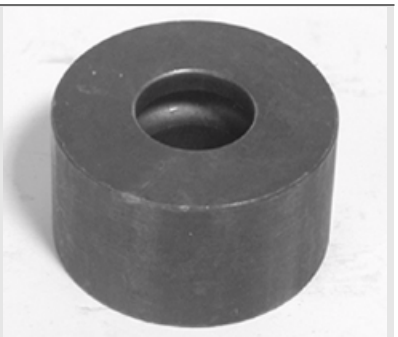
Stores code	Description	
020244Y	punch ø 15	
020262Y	Crankcase splitting plate	
020271Y	Tool for removing-fitting silent bloc	
020263Y	Driven pulley assembly sheath	
020306Y	Punch valve seal rings fitting	
020329Y	Mity-Vac vacuum pump	

Stores code	Description	
020330Y	Stroboscopic light to check timing	
020331Y	Digital multimeter	
020332Y	Digital rpm indicator	
020335Y	Magnetic mounting for dial gauge	

Stores code	Description	
020357Y	32 x 35-mm Adaptor	
020359S	42 x 47 mm Adaptor	
020360S	52 x 55 mm adaptor	
020363Y	20-mm guide	
020364Y	25-mm guide	
020365Y	22 mm guide	

Stores code	Description	
020375Y	28 x 30 mm adaptor	
020376Y	Adaptor handle	
020382Y	Valve cotters equipped with part 012 removal tool	
020382Y011	adapter for valve removal tool	
020393Y	Piston fitting ring	
020412Y	15-mm guide	

Stores code	Description	
020423Y	Driven pulley lock wrench	
020424Y	Driven pulley roller casing fitting punch	
020426Y	Piston fitting fork	
020431Y	Valve oil seal extractor	
020434Y	Union for oil pressure measurement	
020441S	26 x 28 mm adaptor	

Stores code	Description	
020444Y	Tool for installing/removing clutch on/ from driven pulley	
020454Y	Tool for fitting the pin snap rings (200 - 250)	
020456Y	Ø 24 mm adaptor	
020467Y	Flywheel extractor	
020477Y	Adapter 37 mm	
020480Y	Fuel pressure measurement kit	

Stores code	Description	
020483Y	30-mm guide	
020489Y	Hub cover support stud bolt kit	
020621Y	A.T cable pick-up adapter	
020622Y	Transmission-side oil seal punch	
020627Y	Flywheel lock tool	
020648Y	Single battery charger	

Stores code	Description	
020922Y	Diagnosis Tool	
021021Y	Drive pulley lock	
021017Y	EOBD E5 diagnostics cable	

INDEX OF TOPICS

This section describes the general specifications of the vehicle.

Maintenance chart

SCHEDULED MAINTENANCE TABLE

I: *CHECK AND CLEAN, ADJUST, LUBRICATE OR REPLACE IF NECESSARY.*
C: *CLEAN,* ***R:*** *REPLACE,* ***A:*** *ADJUST,* ***L:*** *LUBRICATE*
(*): Check the engine oil level and if necessary, top up at 5.000 Km (3.1 miles)

km x 1,000 (mi x 1,000)	1 (0.6)	5 (3.1)	10 (6.2)	20 (12.4)	30 (18.6)	40 (24.8)	50 (31)	60 (37.2)	EVERY 24 MONTHS	EVERY 12 MONTHS
Safety blocks	I		I		I		I	I		
Spark plug				R		R		R		
Centre stand			L	L	L	L	L	L	L	L
Drive belt			R	R	R	R	R	R		
Throttle control	I		I	I	I	I	I	I	I	I
Complete roller housing			I	I	I	I	I	I		
Diagnosis by tool	I		I	I	I	I	I	I	I	I
Air filter			R	R	R	R	R	R		
CVT Filter			I	I	I	I	I	I		
Engine oil filter	R		R	R	R	R	R	R	R	R
Valve clearance			A	A	A	A	A	A		
Electrical system and battery	I		I	I	I	I	I	I		
Braking system	I		I	I	I	I	I	I	I	I
Coolant	I		I	I	I	I	I	I	I	R
Brake Fluid	I		I	I	I	I	I	I	I	R
Engine oil (*)	R	I	R	R	R	R	R	R	R	R
Hub oil	R		I	R	I	R	I	R	I	I
Headlight direction adjustment			I	I	I	I	I	I		
Brake pads			I	I	I	I	I	I	I	I
Sliding shoes / CVT rollers			R	R	R	R	R	R		
Tire pressure and wear	I		I	I	I	I	I	I	I	I
Vehicle road test	I		I	I	I	I	I	I	I	I
Suspensions			I	I	I	I	I	I	I	I
Steering	A		A	A	A	A	A	A	I	I
Time required (minutes)	70	10	160	160	160	160	160	200	60	60

N.B.

AT EACH SCHEDULED SERVICE, USE THE DIAGNOSTIC TOOL TO CHECK FOR ERRORS AND CHECK THAT ALL PARAMETERS ARE CORRECT.
ENSURE THAT THE VEHICLE CALIBRATION IS UP TO DATE AFTER UPDATING THE DIAGNOSTIC TOOL.

CAUTION

AFTER THE PROVIDED MAINTENANCE PROGRAM IS INDICATED TO PROCEED WITH THE MAINTENANCE OF THE VEHICLE STARTING FROM THE SERVICE OF 5,000 Km (3,106 mi) OR 5 MONTHS.

Recommended products

Piaggio Group recommends the use of products from its Castrol official partner for the scheduled maintenance of its vehicles.

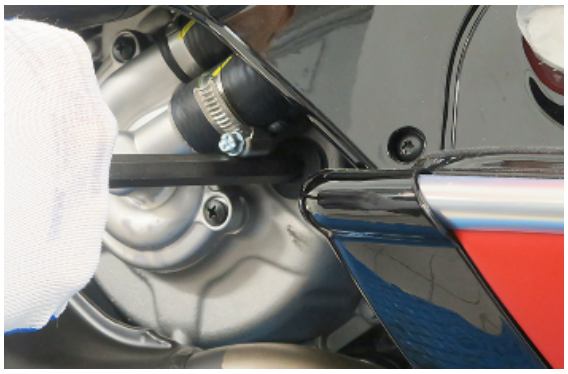
Only use lubricants and fluids which meet or exceed the performance characteristics specified.

This also applies when topping up only.

TABLE OF RECOMMENDED PRODUCTS

Product	Description	Specifications
Engine oil 5W -40	Synthetic-based lubricant for four-stroke engines.	SAE 5W-40; JASO MA, MA2; API SL; ACEA A3
Transmission oil 80W-90	Lubricant for gearboxes and transmissions.	SAE 80W-90 API GL-4
Anti-freeze liquid, ready to use, colour red	Ethylene glycol antifreeze liquid with organic inhibition additives. Red, ready to use.	ASTM D 3306 - ASTM D 4656 - ASTM D 4985 - CUNA NC 956-16
DOT 4 brake fluid	Synthetic brake fluid.	SAE J 1703; FMVSS 116; ISO 4925; CUNA NC 956 DOT4
Water repellent spray grease	Water repellent pouring calcium spray grease.	White, soap base spray grease with NLGI 2 Calcium complex; ISO-L-XBCIB2

Checking the spark advance

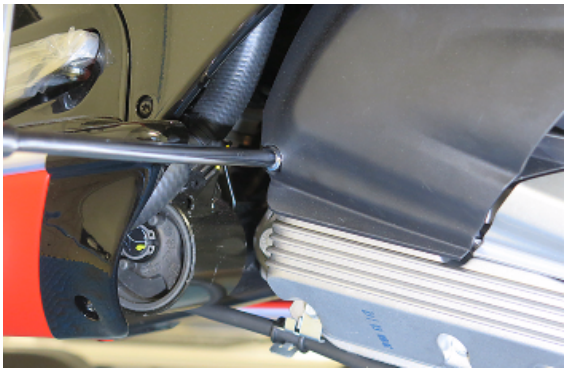


The ignition advance is determined electronically on the basis of parameters known by the control unit. For this reason it is not possible to interpret the reference values based on the engine rpm. The ignition advance value is detectable at any time using the diagnostic tool. It is possible to check whether the ignition advance determined by the injection system matches the value actually activated on the engine, by means of the stroboscopic light.

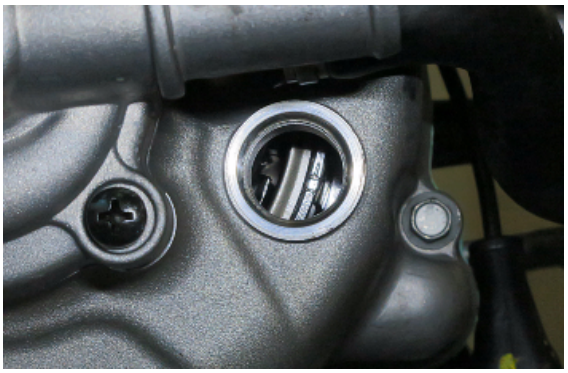
Proceed as follows:

- Remove the spark plug.
- Remove the plastic cap from the flywheel cover.

- Remove the transmission compartment air intake cover.

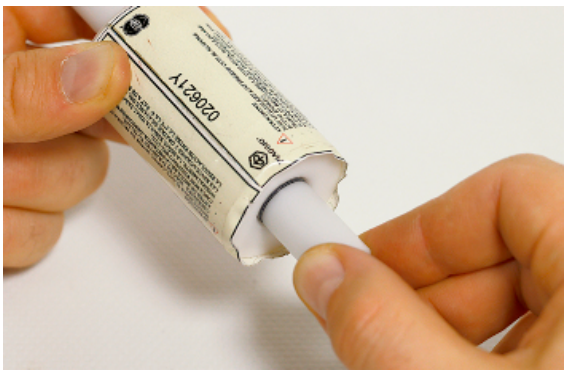


- Rotate the drive pulley fan until the reference marks on the flywheel and the flywheel cover are aligned.

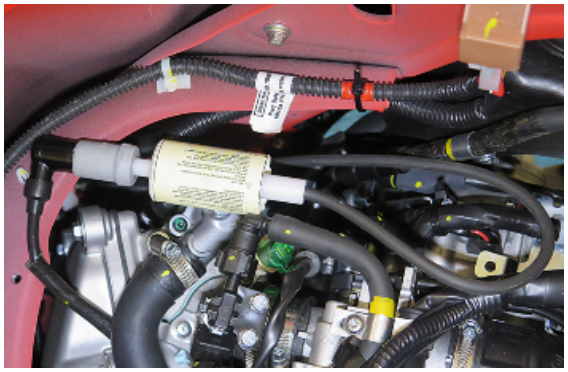


- Reposition the reference mark on the transmission side between the fan and the transmission cover.
- Refit the spark plug.
- Refit the plastic cap on the flywheel cover.

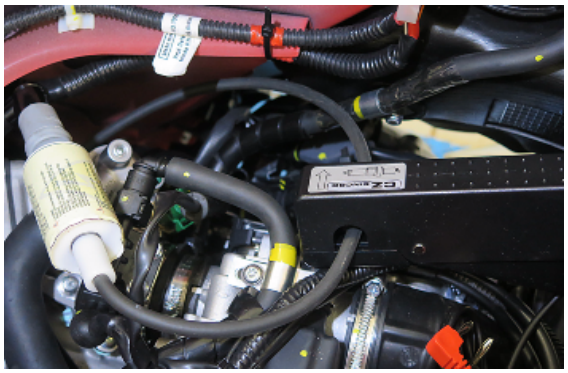
- Adjust the spark gap so that it is in the contact position (no notches visible).



- Install the spark gap on the engine between the spark plug and the spark plug hood.



- Connect the induction clamp on the spark gap cable respecting the proper polarity (the arrow on the clamp must be pointing at the spark plug).
- Connect the diagnostic tool, start the engine and select «parameters» from the menu.
- Set the stroboscopic light control to the traditional four-stroke engine position (1 spark, 2 revs).



- Check that the measured rpm and ignition advance values match those indicated by the diagnostic tool.

If the values do not match, check:

- the distribution timing.
- the engine speed sensor.
- the injection control unit.

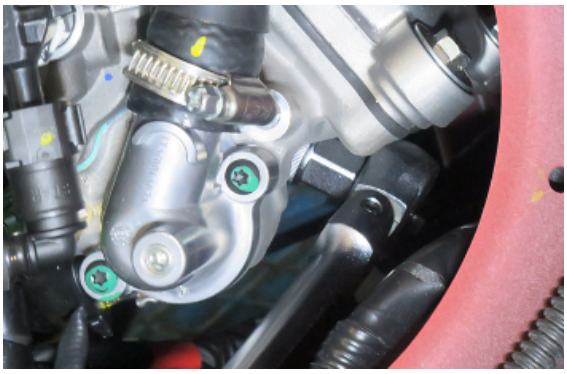
Spark plug

Proceed as follows:

Lift the saddle and remove the helmet compartment.

Disconnect the spark-plug cap, detaching the H.V. cable from the safety bracket by rotating it clockwise.

Undo the spark plug using the specific spark plug spanner.



Remove the spark plug.

When refitting, place the spark plug into the hole at the required angle and finger tighten it as far as it will go.Use the wrench only to tighten it.

Insert the cap on the spark-plug, securing it to the safety bracket.

CAUTION

THE SPARK PLUGS MUST BE DISMANTLED WHEN THE ENGINE IS COLD. SPARK PLUG MAINTENANCE IS DESCRIBED IN THE SCHEDULED MAINTENANCE TABLE. THE USE OF NON-CONFORMING ELECTRONIC CONTROL UNITS AND ELECTRONIC IGNITIONS AND SPARK PLUGS OTHER THAN THOSE RECOMMENDED MAY SERIOUSLY DAMAGE THE ENGINE..

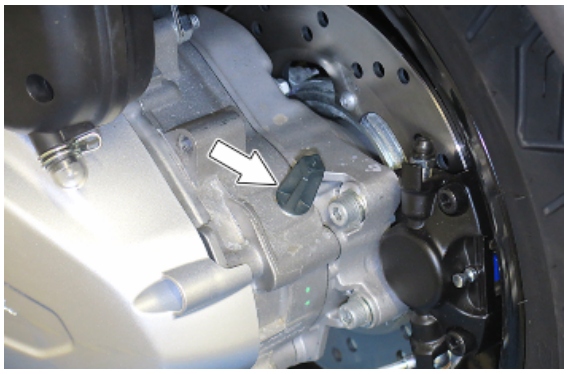
N.B.

USING SPARK PLUGS OTHER THAN THE INDICATED TYPE OR SHIELD-LESS SPARK PLUG CAPS CAN CAUSE ELECTRICAL SYSTEM FAILURES.

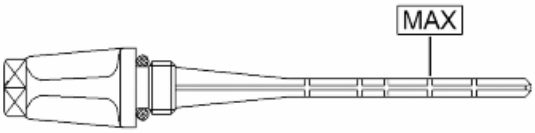
Hub oil

Check

- Rest the vehicle on its centre stand on level ground.
- Unscrew the oil dipstick, dry it with a clean cloth and reinsert it, **screwing it fully into place.**

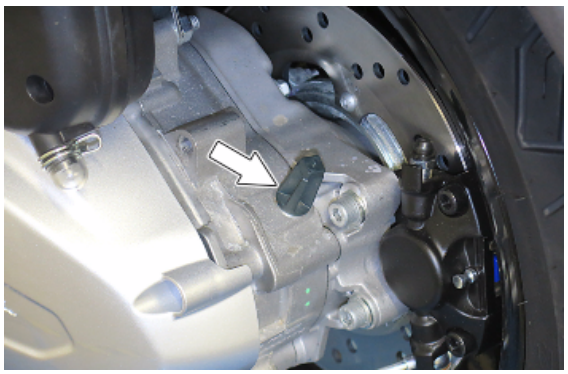


- Unscrew the dipstick and check that the oil level corresponds to the «**MAX**» mark as indicated in figure; if the level is below this mark, top-up the hub oil.
-Screw up the oil dipstick again and make sure it is locked properly into place.

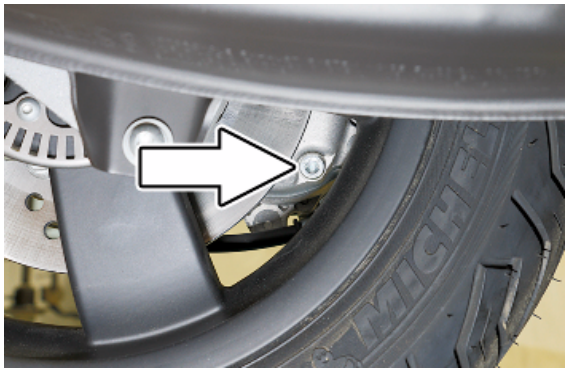


Replacement

Rest the vehicle on its centre stand on level ground.
- Unscrew the hub oil dipstick.



- Unscrew the drainage screw and drain all the oil into a suitable container.
- Tighten the drainage screw, applying the pre-defined torque, and refill the hub using the recommended product.

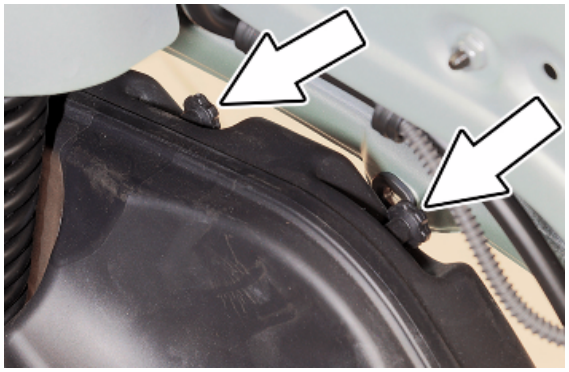


Air filter

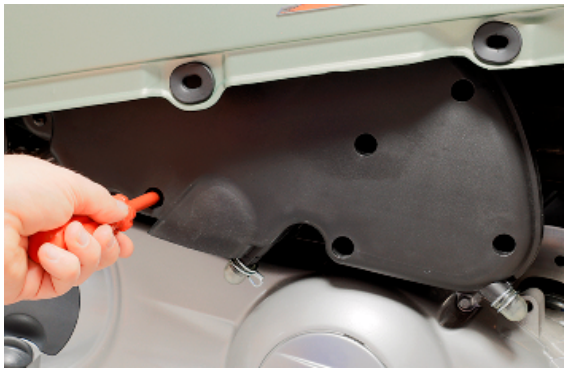
Proceed as follows:
- Remove the left side fairing.

- Lift the saddle and remove the helmet compartment.

- Unscrew the knobs, which are accessible after removing the helmet compartment.



- Unscrew the air filter cover fastening screws.



- Remove the cover from the air filter.

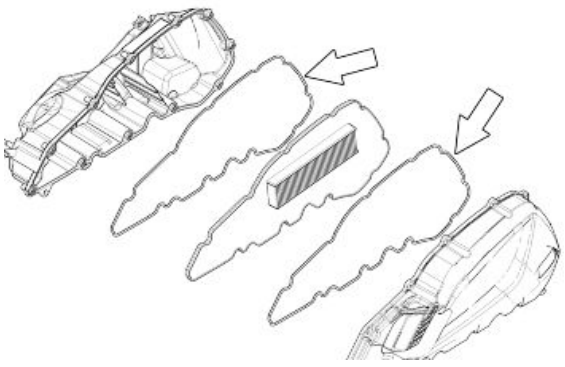
- Replace the filter element.

CAUTION

REPLACE THE AIR FILTER IN ACCORDANCE WITH THE INSTRUCTIONS PROVIDED IN THE SCHEDULED MAINTENANCE TABLE. IN THE EVENT OF HEAVY DUTY USAGE, THE MAINTENANCE OPERATIONS MUST BE CARRIED OUT MORE FREQUENTLY ON THE VEHICLE, IN ORDER TO AVOID DAMAGING THE ENGINE.

WARNING

ALWAYS USE NEW GASKETS / O -RINGS; WHENEVER NEEDED, REMOVE THE AIR FILTER CASE OR REPLACE THE FILTER ELEMENT. FAILURE TO COMPLY WITH THIS NOTE MAY CAUSE SEALING PROBLEMS AT THE FILTER ELEMENT AND THEREFORE MAY DAMAGE AND WEAR THE ENGINE.



Engine oil

In four-stroke engines, the engine oil is used to lubricate the timing elements, the bench bearings and the head-engine block-piston assembly. **An insufficient quantity of oil can cause serious damage to the engine**.

In all four stroke engines, the deterioration of the oil characteristics, or a certain consumption should be considered normal, especially if during the run-in period. Consumption levels in particular can be influenced by the conditions of use (e.g.: oil consumption increases when driving at "full throttle".

Replacement

Change the engine oil and replace the filter in accordance with the instructions provided in the scheduled maintenance table.
- Unscrew the dipstick so that the oil drains from the engine more efficiently.

- Unscrew the engine oil drainage cap «**A**» and remove the mesh filter, allow the oil to drain into a suitable container.
- Unscrew the engine oil filter «**B**».

- Check the condition of the o-rings on the drainage cap and the mesh filter.
- Lubricate the o-rings, insert the mesh filter in its housing and tighten the drainage cap, applying the pre-defined torque.

- Lubricate the engine oil filter o-ring and secure it in its housing, applying the pre-defined tightening torque.

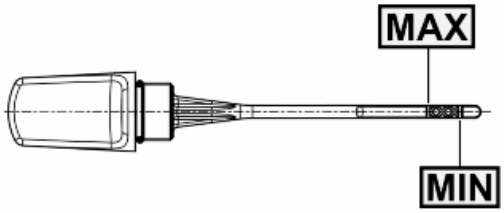
- Restore the engine oil level using the recommended product.
Start the engine, leave it running for a few minutes and switch it off again. Check the level again after approximately five minutes and top up if necessary. Do not exceed the **MAX** level mark.

N.B.

THE ENGINE MUST BE HOT WHEN THE OIL IS CHANGED.

WARNING

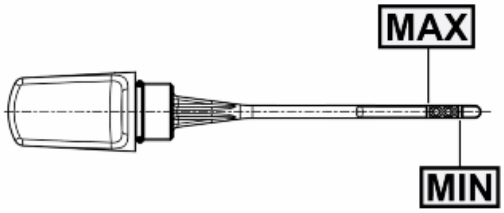
USED OIL CONTAINS ENVIRONMENTALLY HARMFUL SUBSTANCES



Check

This check must be carried out when the engine is cold, if necessary, wait for 10 minutes after switching the engine off.
- Rest the vehicle on its centre stand on level ground.
- Unscrew the oil dipstick, dry it with a clean cloth and reinsert it, **screwing it fully into place.**

- Unscrew the dipstick and check that the oil level is between the «**MIN**» and «**MAX**» marks indicated in figure; if the level is below the «**MIN**» mark, top-up the engine oil, **taking care never to exceed the** «**MAX**» level mark.
-Screw up the oil dipstick again and make sure it is locked properly into place.

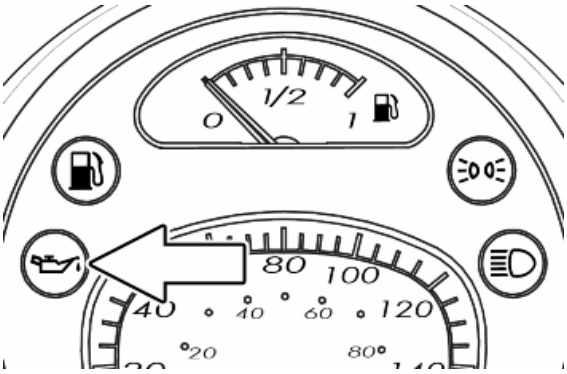


Engine oil filter

The engine oil filter must be changed in accordance with the instructions provided in the scheduled maintenance table. Lubricate the o-ring before replacing the oil filter.

Oil pressure warning light

The vehicle is equipped with a tell-tale light on the instrument cluster that lights up when the key is turned to the «**ON**» position. However, this light should come off once the engine has been started. **If the light turns on during braking, at idling speed or while turning a corner, it is necessary to check the oil level and the lubrication system.**



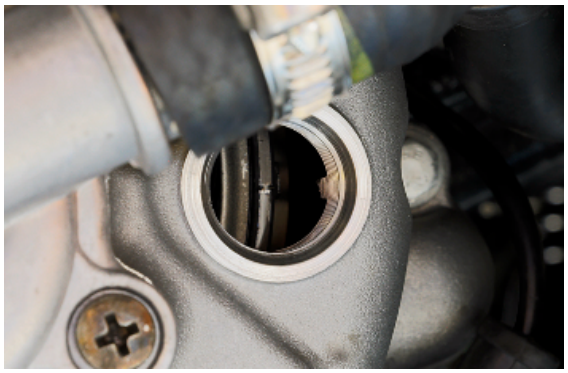
Checking the ignition timing

Proceed as follows:

- Lift the saddle and remove the helmet compartment.

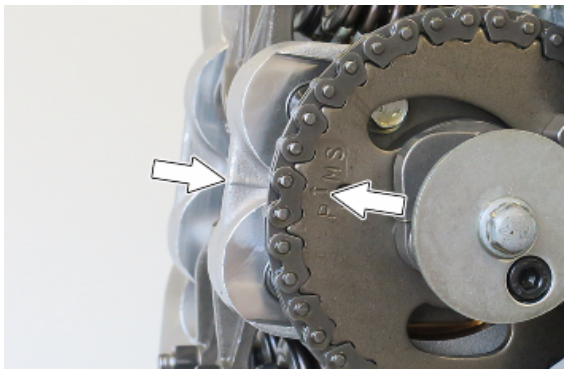
- Unscrew the inspection cap on the flywheel side cover.

- Loosen the ignition spark plug and align the reference marks on the flywheel and the crankcase by rotating the crankshaft.



- Remove the big end cover.

Make sure that the 4V reference point on the camshaft control crown gear is aligned with the reference mark on the big end. If the reference is positioned diametrically opposite the reference mark on the big end, perform a complete rotation of the crankshaft.



Checking the valve clearance

Checking the valve clearance should be carried out according to the scheduled maintenance table.

Place the vehicle on the centre stand above a suitable lift so that the front wheel can be locked.

Disconnect the battery cables.

Remove the helmet compartment.

Remove the side fairings and the footrest terminals.

Remove the silencer.

Lift the rear of the body using a suitable device.

Remove the screws fixing the filter box to the engine.

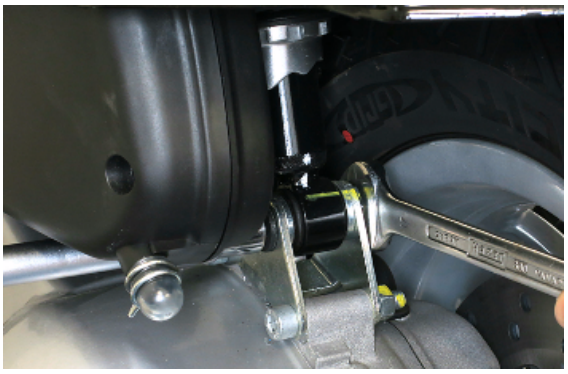
Acting on the device, lift the body shell of the vehicle

Raise the stand from the floor and then lower the vehicle until the rear wheel touches the supporting surface.

Unscrew and remove the right shock absorber lower fixing nut.

Lift the filter box.

Unscrew and remove the lower fixing bolt of the left shock absorber.

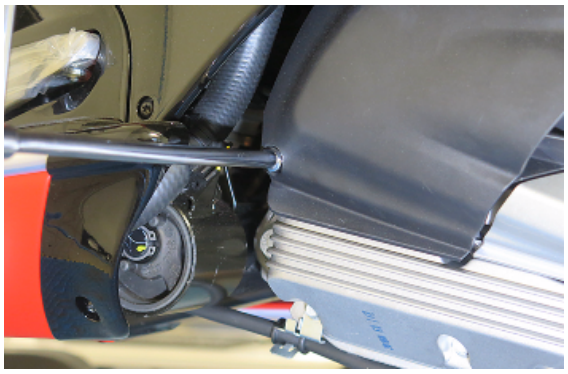


Disconnect the spark plug tube.

Disconnect the throttle control transmissions

Unscrew the fuel pipe clamp fixing nut.

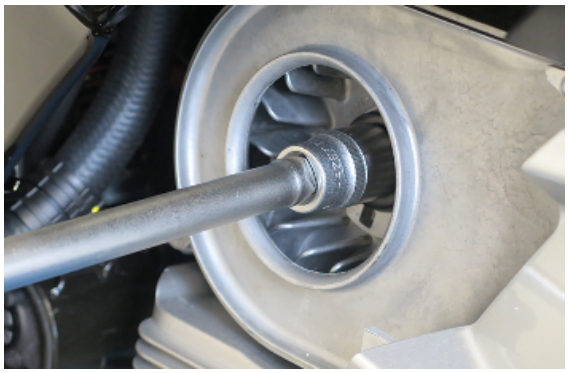
Unscrew and remove the transmission cover's fastening screws.



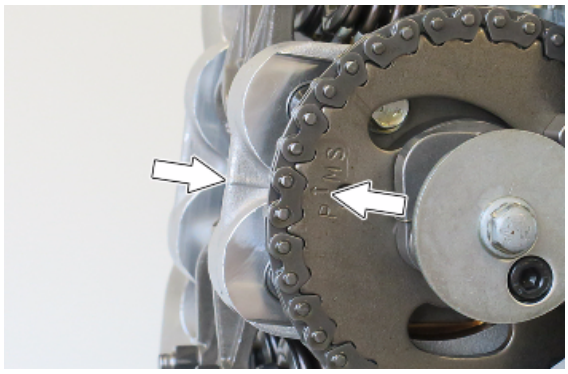
Remove the transmission cover.

Using the lifting device, lift the body of the vehicle, the engine rotates slightly between the rear wheel and the swingarm.
The big end raises making the tapper cover accessible.
Undo and remove the screws that secure the tappet cover.
Remove the tappet cover.

Act on the crankshaft to move the piston to the upper dead centre.



Verify the alignment of the reference on the big end with the one on the camshaft sprocket.

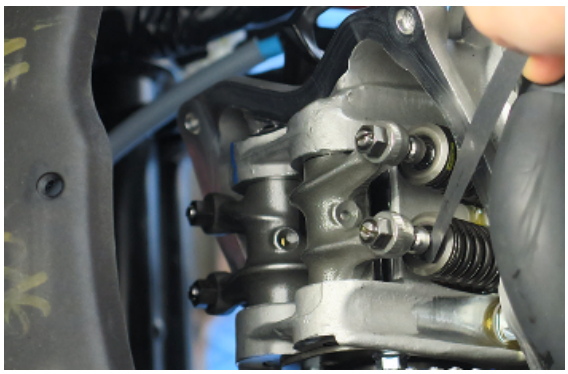


Using a feeler gauge, check the clearance between the adjuster and the valve.

Characteristic

Valve clearance (cold engine)

Intake: 0.10 ± 0.02 mm Exhaust: 0.10 ± 0.02 mm



If an incorrect value is found, adjust it back to the prescribed value.

Fit the tappet cover.

Insert and tighten the fastening screws at the recommended torque.

Locking torques (N*m)

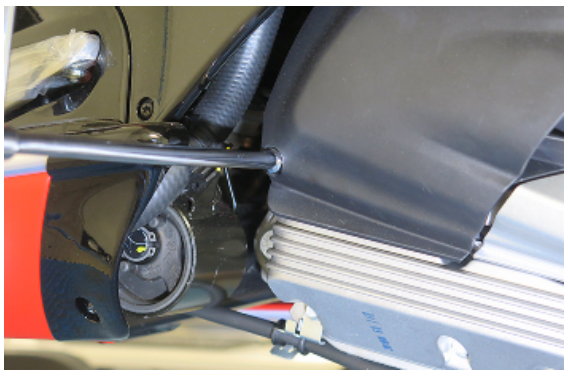
Tappet cover screws **6 - 7 Nm**

Position the transmission cover.

Insert and tighten the fixing screws of the transmission cover to the prescribed torque.

Locking torques (N*m)

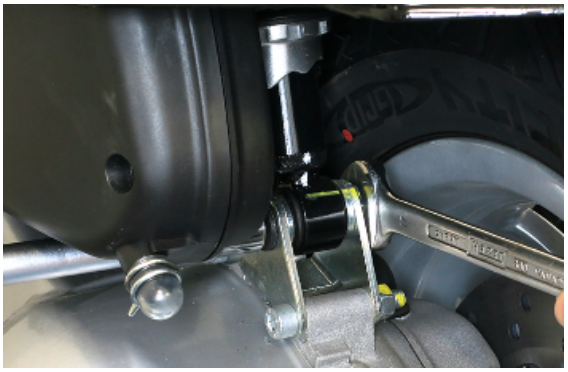
Transmission cover screws **11 - 13 Nm**



Acting on the lifting device, lower the vehicle body to align the lower coupling of the shock absorber with the corresponding coupling on the engine. Insert and fasten the fixing bolt at the prescribed torque .

Locking torques (N*m)

Rear shock absorber - Engine **40 - 45 Nm**

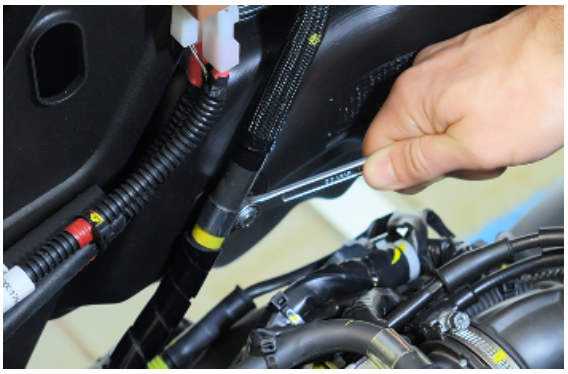


Insert the lower fixing bolt of the right shock absorber and tighten to the specified torque.

Locking torques (N*m)

Rear shock absorber - Silencer support bracket **40 - 45 Nm**

Insert and tighten the fuel pipe clamp fixing nut.



Insert the throttle control cable in the support bracket.

Insert the spark plug tube

Position the air filter box.

Insert and tighten the screws fixing the filter box to the engine.

Using the lifting device, place the vehicle back on the centre stand.

Disconnect the lifting equipment .

Insert the helmet compartment.

fit the silencer.

Assemble the side fairings and the footrest terminals.

Connect the battery cables.

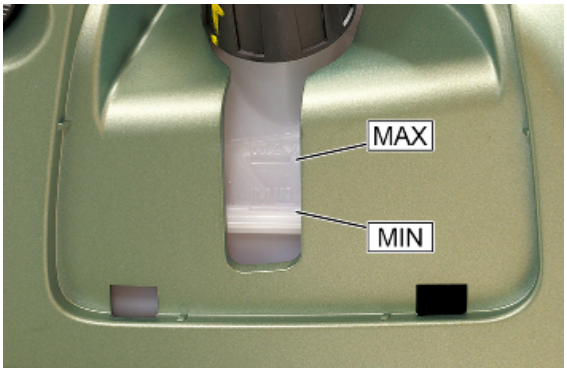
Cooling system

Level check

check the fluid when the engine is cold, according to the scheduled maintenance table, in the way shown below:

- Position the vehicle on the central stand.
- Unscrew the expansion chamber cover fastening screw.

- Check that the coolant level is between the "**MIN**" and "**MAX**" indications on the tank.



Top-up

If necessary, top the cooling system up, with the engine cold, if you find the liquid is too close to the minimum level. If it becomes necessary to top-up the coolant level at frequent intervals, or you find that the expansion chamber is completely dry, check the cooling system to find the cause of the problem. Replace the coolant, using the recommended product, in accordance with the instructions provided in the scheduled maintenance table. For instructions on how to drain the system, refer to the dedicated section of the chapter covering the «**Cooling System**».

WARNING

TO AVOID THE RISK OF SCALDING, DO NOT UNSCREW THE EXPANSION TANK COVER WHILE THE ENGINE IS STILL HOT.

WARNING

TO PREVENT AVOID HARMFUL FLUID LEAKAGE WHILE RIDING, ENSURE THAT THE LEVEL NEVER EXCEEDS THE MAXIMUM VALUE.
TO ENSURE CORRECT ENGINE OPERATION, KEEP THE RADIATOR GRILLE CLEAN.

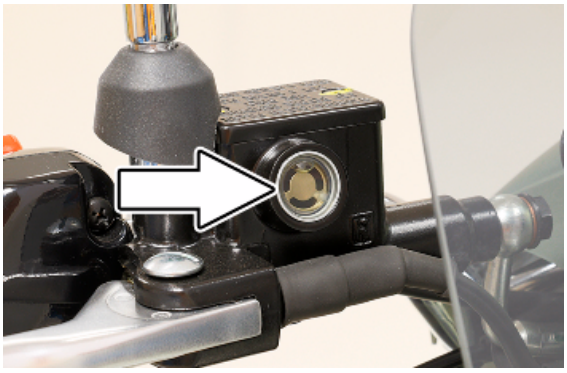
Braking system

Level check

Rest the vehicle on its centre stand and with the handlebars perfectly horizontal.

Check the liquid level through the relative inspection sight glass.

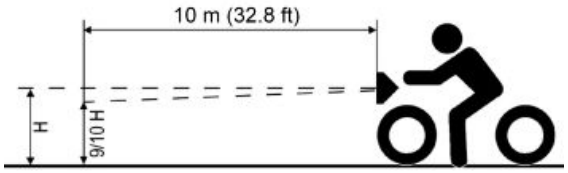
If the sight glass is full, the brake fluid level is correct. If the brake fluid is near the «**MIN**» reference, top-up



Headlight adjustment

Proceed as follows:

1. Position the vehicle in running order and with the tyres inflated to the prescribed pressure, onto a flat surface 10 m away from a half-lit white screen; ensure that the longitudinal axis of the vehicle is perpendicular to the screen;



2. Turn on the headlight and check that the boundary of the light beam projected onto the screen is not higher than 9/10 or lower than 7/10 of the distance between the centre of the headlight and the ground;

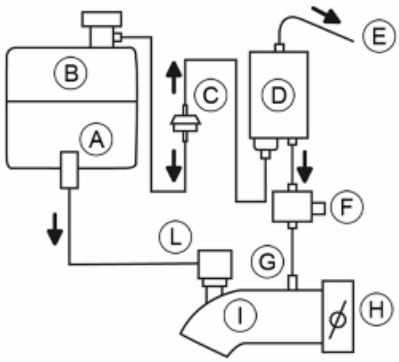
3. If this is not the case, adjust the headlight by turning the screw.

N.B.

THE PROCEDURE DESCRIBED IS THAT ESTABLISHED BY EUROPEAN STANDARDS FOR THE MAXIMUM AND MINIMUM HEIGHT OF THE LIGHT BEAM. REFER TO THE STATUTORY REGULATIONS IN FORCE IN EVERY COUNTRY WHERE THE VEHICLE IS USED.

Anti-evaporation system

The vehicle is equipped with the "Canister", main component of the system for the control of evaporative emissions, compliant with the current standards.



A. Fuel pump

B. Fuel tank

C. Two-way fuel vapour ventilation valve

D.Canister

E.Air purge pipe into atmosphere

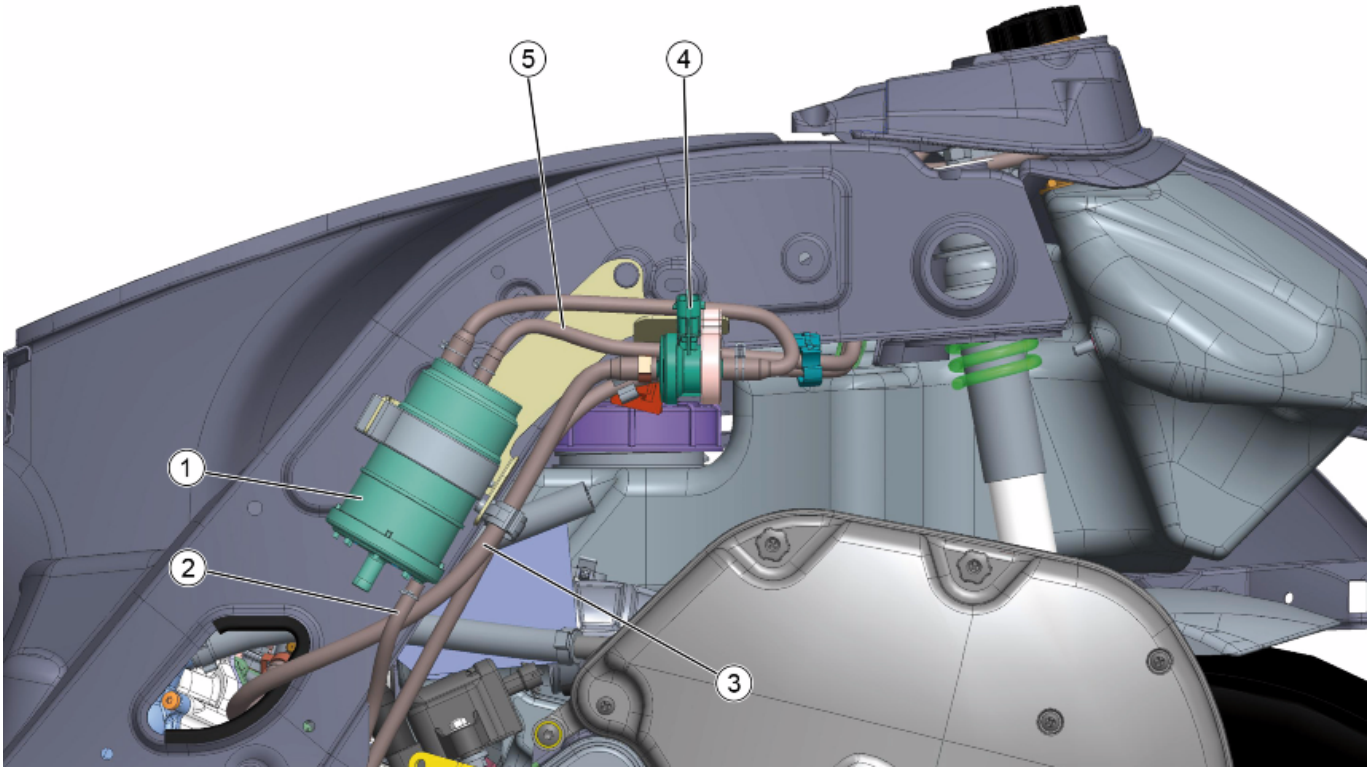
F.One-way electronic fuel vapour purge control valve (controlled by ECU)

G. Vacuum fitting

H. Throttle body

I. Air induction fitting

L. Injector



The evaporative emissions control system is located on the rear left hand side of the vehicle.

Key:

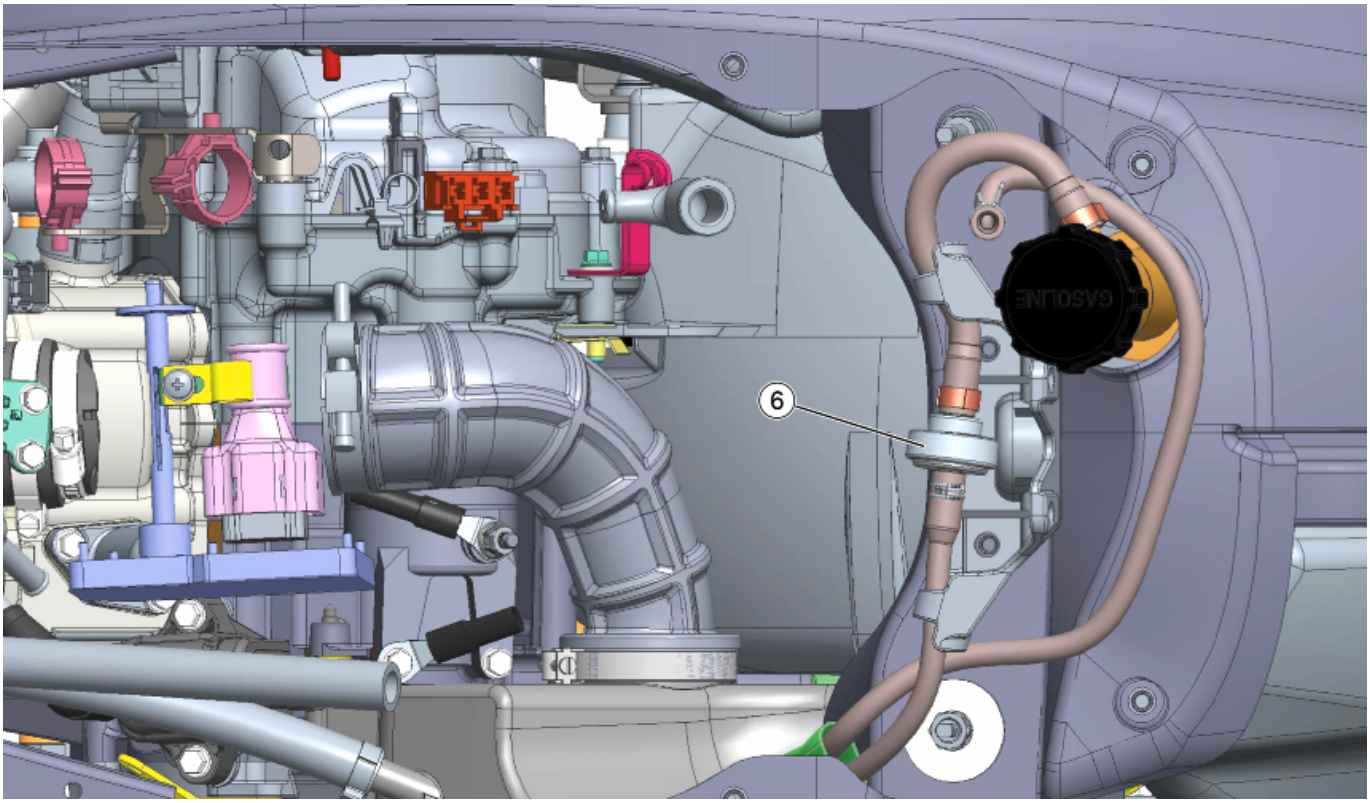
1 Canister

2 Bleeder pipe

3 Pipe for connecting the canister to the inlet fitting

4 Canister valve

5 Pipe for connecting the fuel tank to the canister

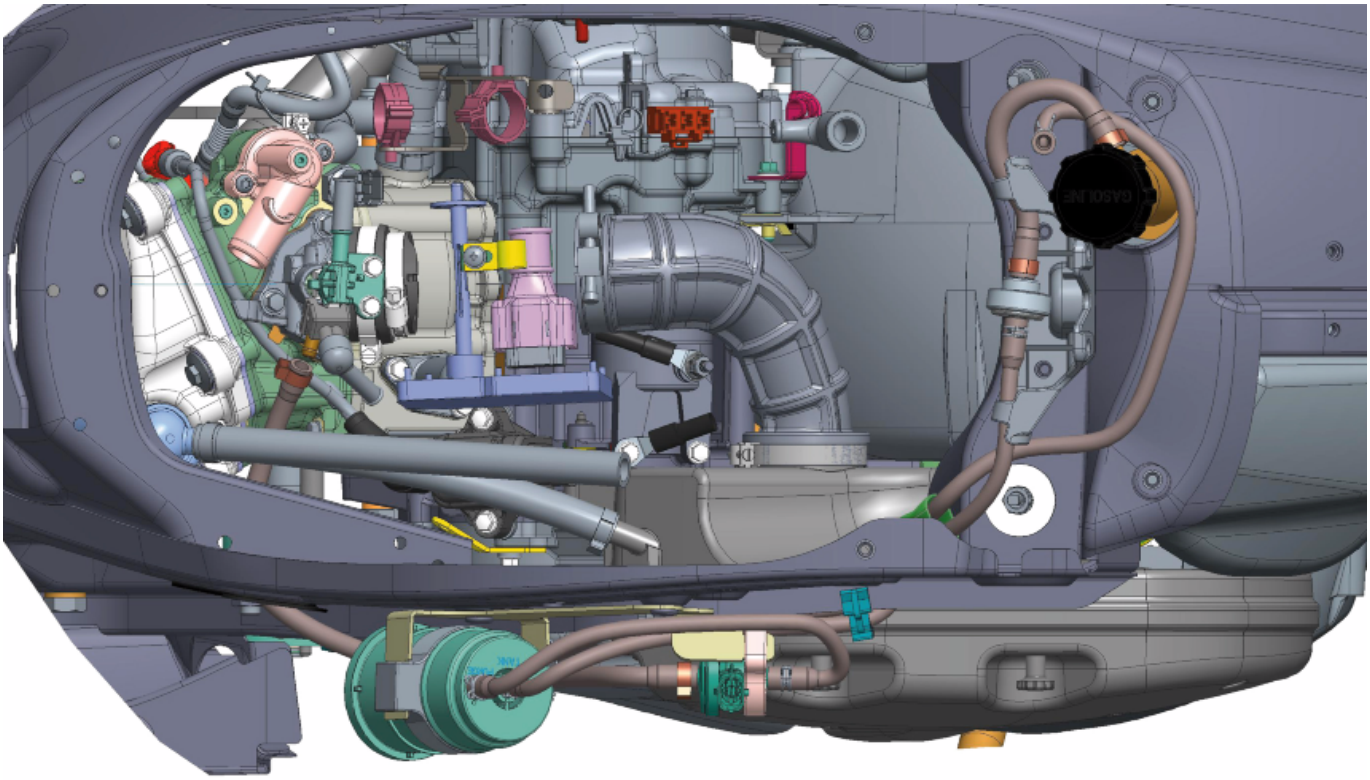


Key:

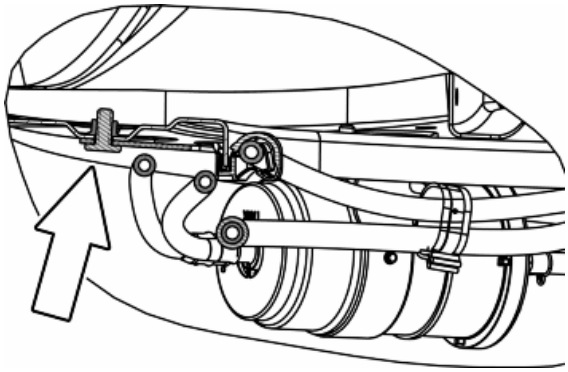
6 Breather valve

Removing system components

Remove the helmet compartment to gain access to the components of the evaporative emissions control system.

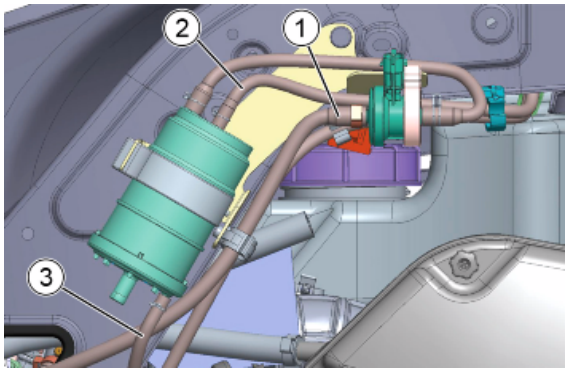


After having removed the clamps, unscrew the fastening screw to release the system and bring the components inside the engine compartment.



Refitting system components

Upon reassembling the components, use caution when connecting the pipes to the canister.



1. canister - insertion coupling connection pipe.

2. tank - canister connection pipe.

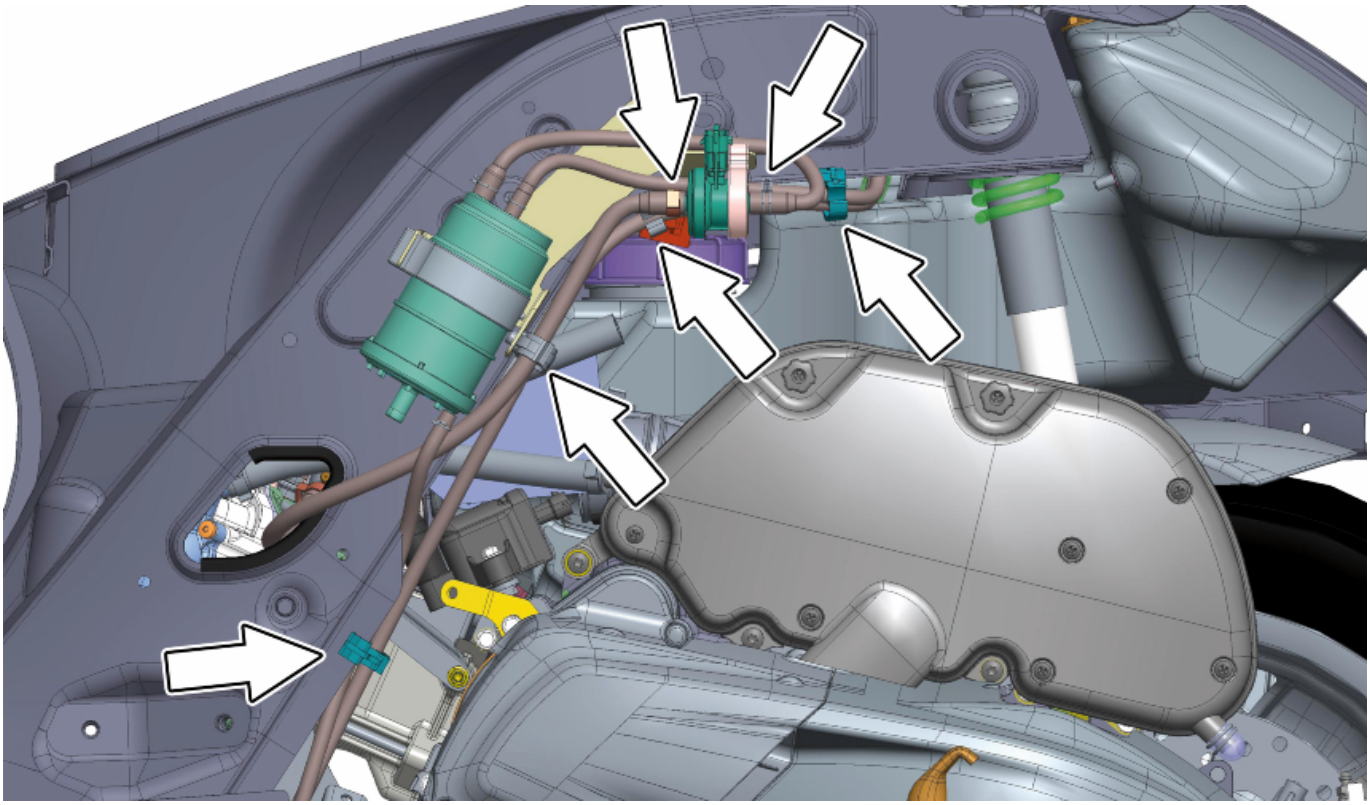
3. Bleeder pipe.

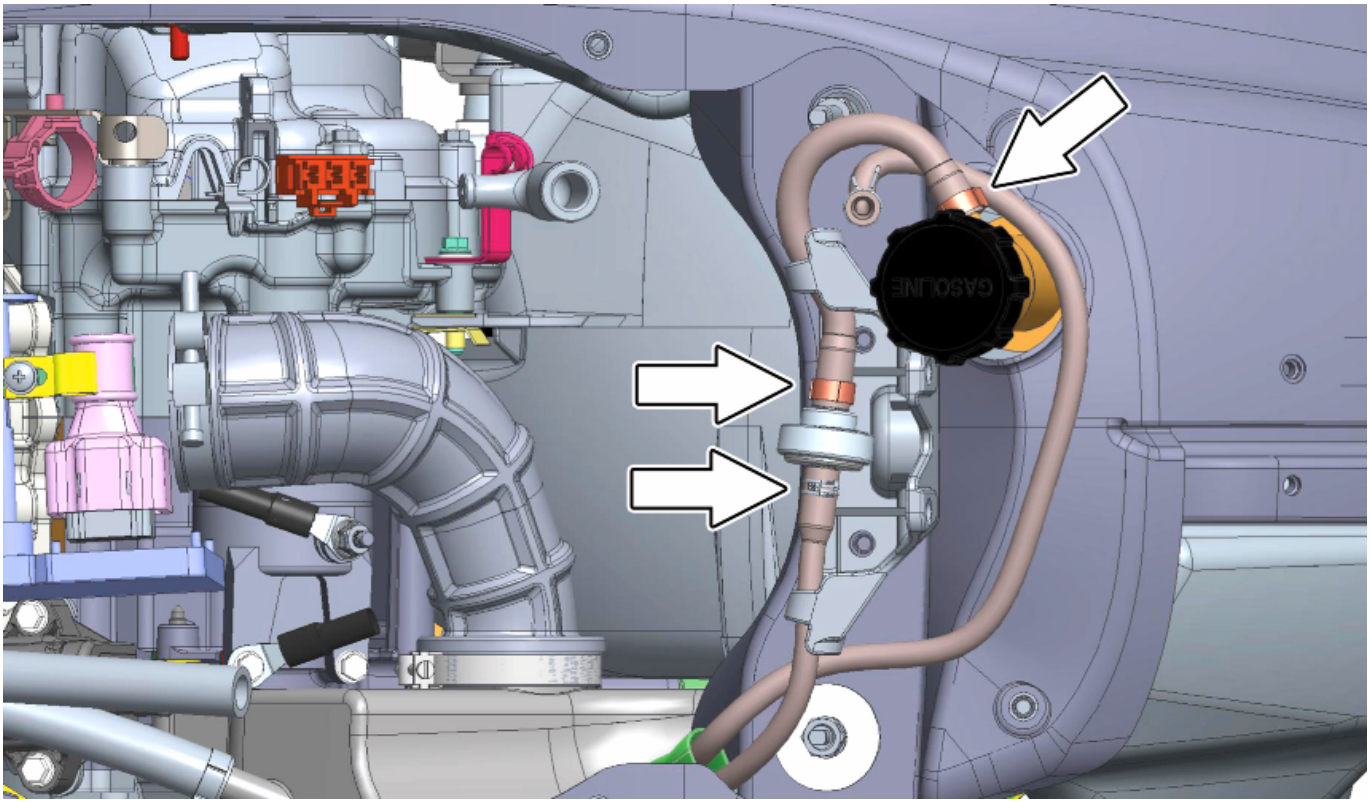
Refit the components by properly inserting the pipes and securing them with new metal clamps.

CAUTION

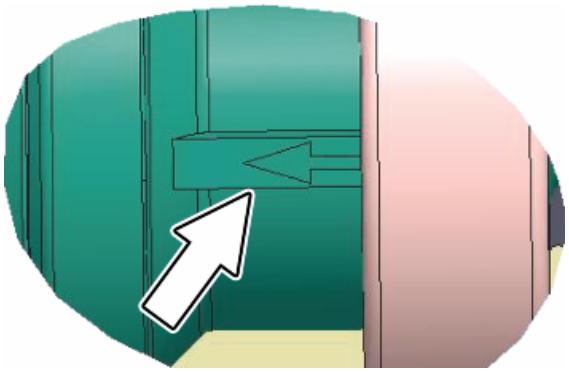
TAKE CARE TO ENSURE THE PROPER DIRECTION OF THE COMPONENTS' INSTALLATION: IF INSTALLED IN REVERSE, THEY COULD COMPROMISE THE FUNCTIONALITY OF THE ENTIRE EVAPORATING SYSTEM.

After having installed the components, secure the pipes with new ties.





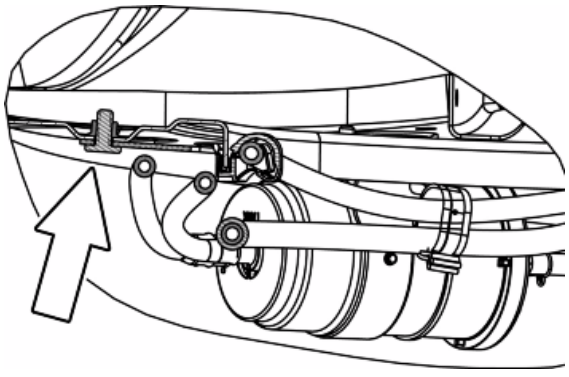
Upon refitting the canister valve, observe the direction of the arrow toward the engine.



Refit the canister support bracket on the chassis and tighten the fastening screws.

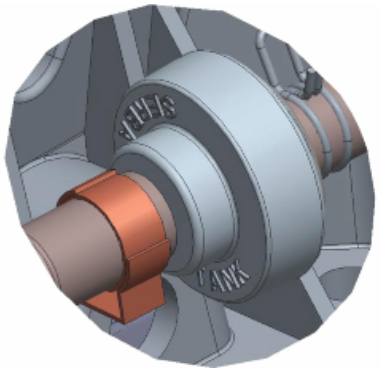
Locking torques (N*m)

Canister - Frame support bracket **12.0 ± 1.0 Nm**



Make sure that the orientation of the breather valve is correct.

If you detect different pressures, replace the valve.



Characteristic

Discharge pressure

80/100 mbar

Intake pressure

≤ 20 mbar

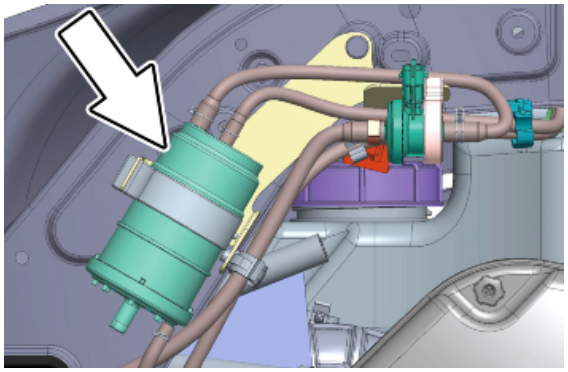
Canister inspection

The canister is essential to treat the hydrocarbons present in the volume of gas that escapes from the tank when there is an increase in internal pressure (tank heating induced by the cooling radiator, by the motor or by the external environment).

Although the amount of hydrocarbons coming from the tank is small enough to avoid the saturation of the canister, it is necessary to regenerate the activated carbon by means of a reversed flow of ambient air sucked by the engine.

These vacuums of pollution and carbon regeneration take place at each cycle of use of the vehicle.

To control the canister, it is necessary to proceed with its removal while keeping the 2 pipes connected.



- Shake the Canister and make sure there is no noise.
- Using a compressed air gun, blow alternately in 3 ducts and make sure that pressure does not build inside the canister.
- Check that the air flow is kept free and that no carbon residues escape out of any pipe.

If you detect noise, clogging or loss of carbon, replace the canister.

INDEX OF TOPICS

This section makes it possible to find what solutions to apply when troubleshooting.

For each failure, a list of the possible causes and pertaining operations is given.

Engine

Excessive oil consumption/Exhaust smoke

EXCESSIVE CONSUMPTION

Possible Cause	Operation
Wrong valve adjustment	Adjust the valve clearance properly
Overheated valves	Remove the head and the valves, grind or replace the valves
Misshapen/worn valve seats	Replace the head unit
Worn cylinder, Worn or broken piston rings	Replace the piston cylinder assembly or piston rings
Worn or broken piston rings or piston rings that have not been fitted properly	Replace the piston cylinder unit or just the piston rings
Oil leaks from the couplings or from the gaskets	Check and replace the gaskets or restore the coupling seal
Worn valve oil seal	Replace the valve oil seal
Worn valve guides	Check and replace the head unit if required

Insufficient lubrication pressure

LOW LUBRICATION PRESSURE

Possible Cause	Operation
By-Pass remains open	Check the By-Pass and replace if required. Carefully clean the By-Pass area.
Oil pump with excessive clearance	Perform the dimensional checks on the oil pump components
Oil filter too dirty	Replace the cartridge filter
Oil level too low	Restore the level adding the recommended oil type

Transmission and brakes

Clutch grabbing or performing inadequately

IRREGULAR CLUTCH PERFORMANCE OR SLIPPAGE

Possible Cause	Operation
Faulty clutch	Check that there is no grease on the masses. Check that the clutch mass contact surface with the bell is mainly in the centre with equivalent characteristics on the three masses. Check that the clutch housing is not scored or worn in an anomalous way

Insufficient braking

INEFFICIENT BRAKING SYSTEM

Possible Cause	Operation
Inefficient braking system	Check the pad wear (1.5 MIN). Check that the brake discs are not worn, scored or warped. Check the correct level of fluid in the pumps and replace brake fluid if necessary. Check there is no air in the circuits; if necessary, bleed the air. Check that the front brake calliper moves in axis with the disc.
Fluid leakage in hydraulic braking system	Failing elastic fittings, plunger or brake pump seals, replace

Possible Cause	Operation
Brake disc slack or distorted	Check the brake disc screws are locked; measure the axial shift of the disc with a dial gauge and with wheel mounted on the vehicle

Brakes overheating

BRAKES OVERHEATING

Possible Cause	Operation
Defective plunger sliding	Check calliper and replace any damaged part.
Brake disc slack or distorted	Check the brake disc screws are locked; use a dial gauge and a wheel mounted on the vehicle to measure the axial shift of the disc.
Clogged compensation holes on the pump	Clean carefully and blast with compressed air.
Swollen or glued rubber gaskets	Replace gaskets.

Steering and suspensions

Heavy steering

STEERING HARDENING

Possible Cause	Operation
Steering hardening	Check the tightening of the top and bottom ring nuts. If irregularities continue in turning the steering even after making the above adjustments, check the seats in which the ball bearings rotate: replace them if they are recessed or if the balls are flattened.

Excessive steering play

EXCESSIVE STEERING CLEARANCE

Possible Cause	Operation
Torque not conforming	Check the tightening of the top and bottom ring nuts. If irregularities continue in turning the steering even after making the above adjustments, check the seats in which the ball bearings rotate: replace them if they are recessed or if the balls are flattened.

Noisy suspension

NOISY SUSPENSION

Possible Cause	Operation
Faults in the suspension system	If the front suspension is noisy, check: the efficiency of the front shock absorbers; the condition of the ball bearings and relevant lock-nuts, the limit switch rubber buffers and the movement bushings. In conclusion, check the tightening torque of the wheel hub, the brake calliper, the shock absorber disc in the attachment to the hub and the steering tube.

Suspension oil leakage

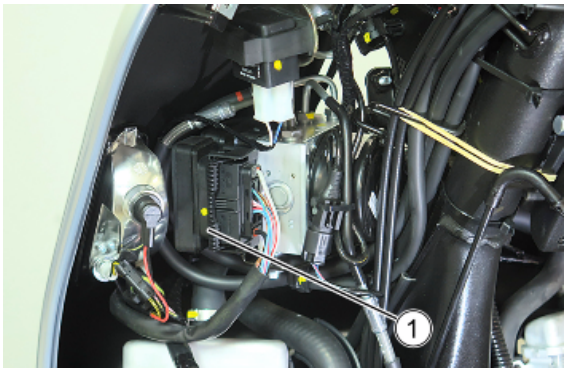
OIL LEAKAGE FROM SUSPENSION

Possible Cause	Operation
Faulty or broken seals	Replace the shock absorber. Check the condition of wear of the steering covers and the adjustments.

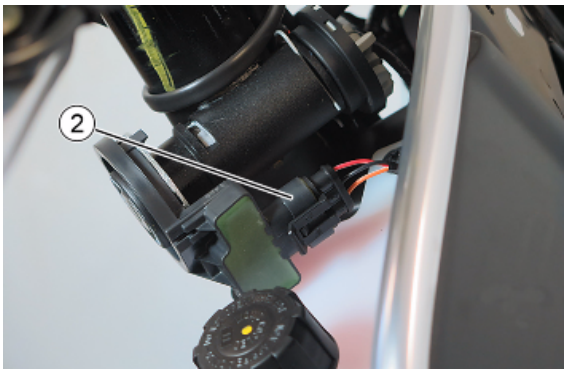
INDEX OF TOPICS

Components arrangement

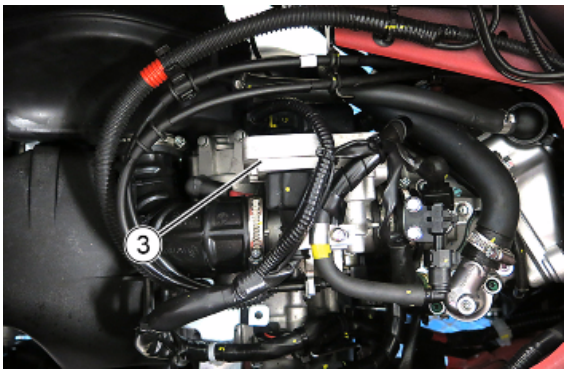
1. ABS control unit: Remove the leg shield back plate to reach it.



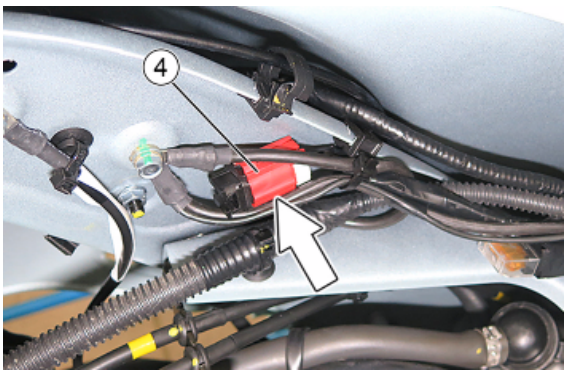
2. Immobilizer antenna: Remove the leg shield back plate to reach it.



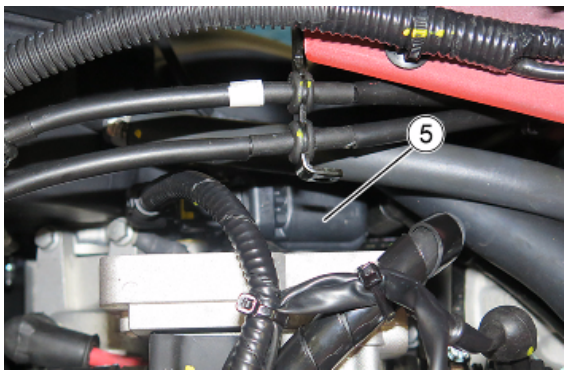
3. Electronic injection control unit: To access remove the helmet compartment.



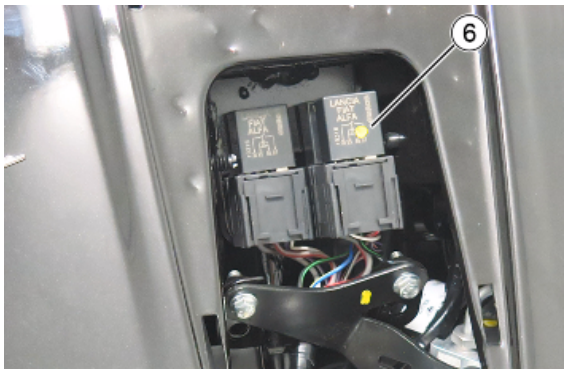
4. Diagnostics connector: To access remove the helmet compartment.



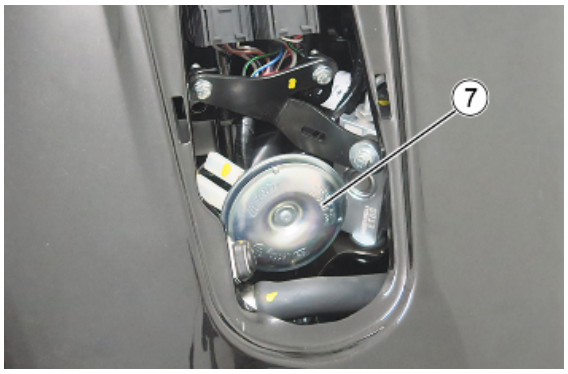
5. H.V. coil: Located above the transmission cover, remove the battery to gain access to it.



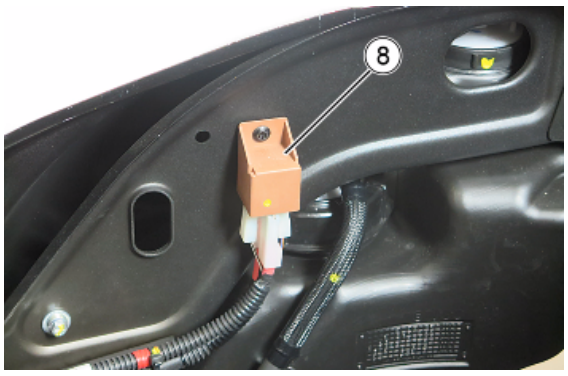
6. relays: Remove the central front cover to reach them.



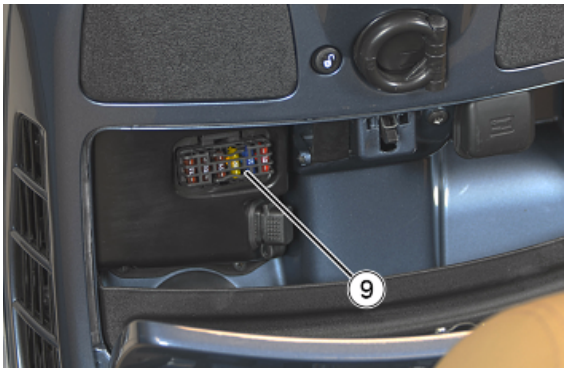
7. Horn: Remove the central front cover to reach them.



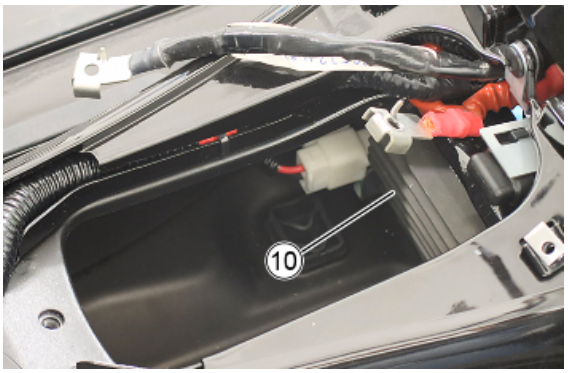
8. Starter relay: To access remove the helmet compartment.



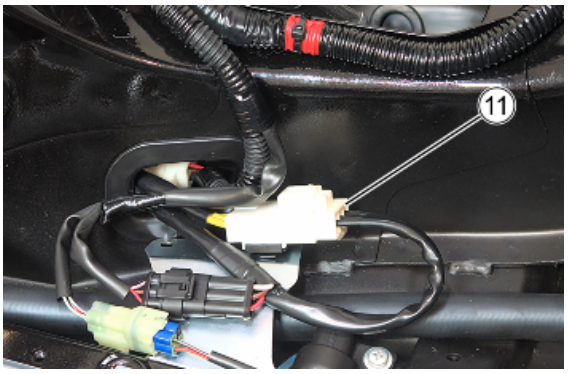
9. Fuses: Open the top box to reach them



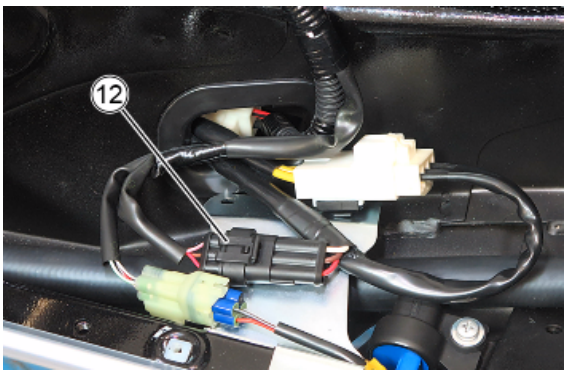
10. Voltage regulator: to access remove the battery.



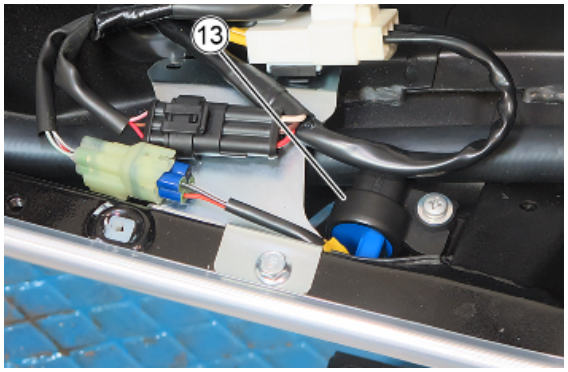
11. Magneto flywheel connector: remove the footrest to reach it.



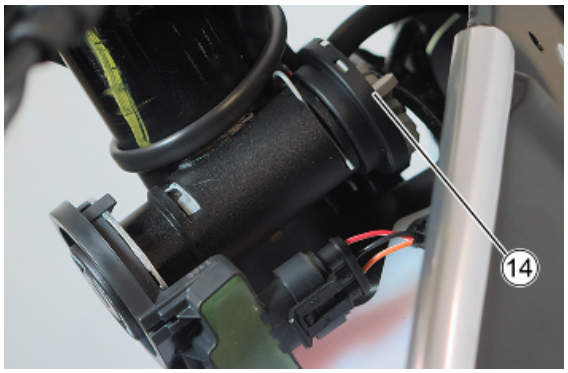
12. Pick-up connector: remove the footrest to reach it.



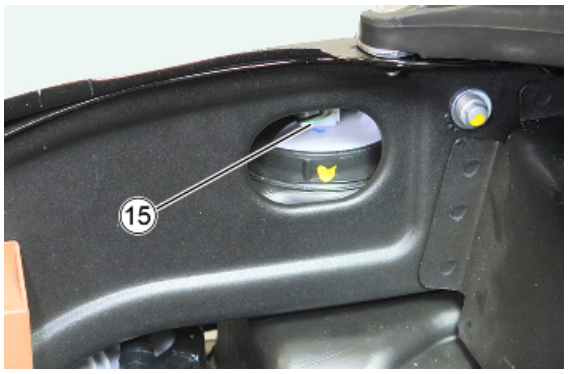
13. Roll-over sensor: Remove the footrest to reach it.



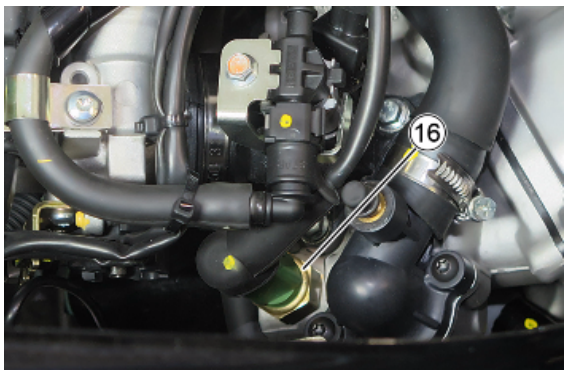
14. Ignition switch contacts: Remove the leg shield back plate to reach it.



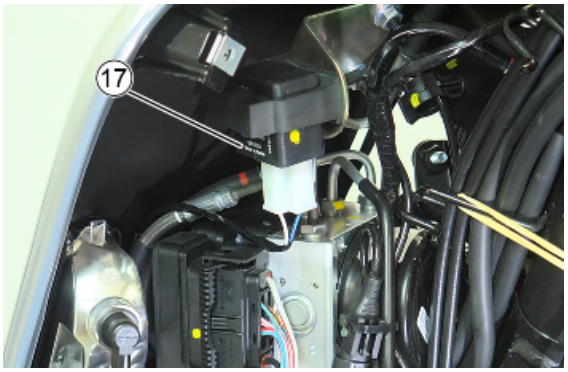
15. fuel level sensor: To access remove the helmet compartment.



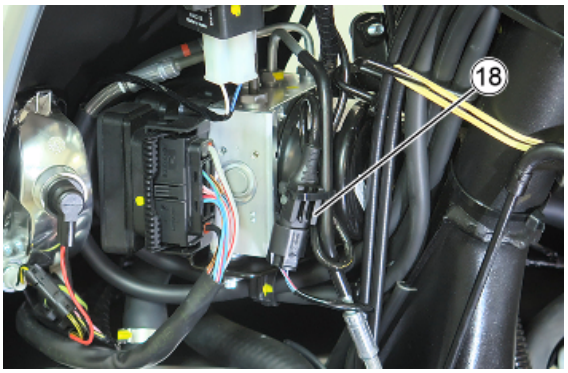
16. Coolant temperature sensor: To access remove the helmet compartment.



17. Direction indicator device: Remove the leg shield back plate to reach it.

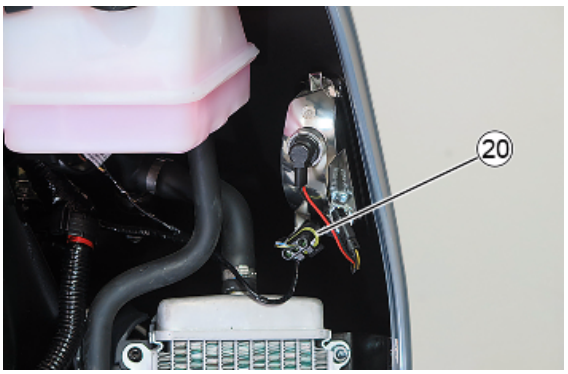


18. front phonic wheel sensor connector: Remove the leg shield back plate to reach it.

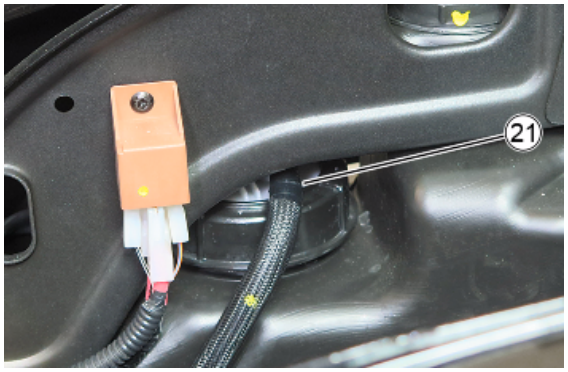


19. Front left turn signal and daylight running light connector: Remove the leg shield back plate to reach it.

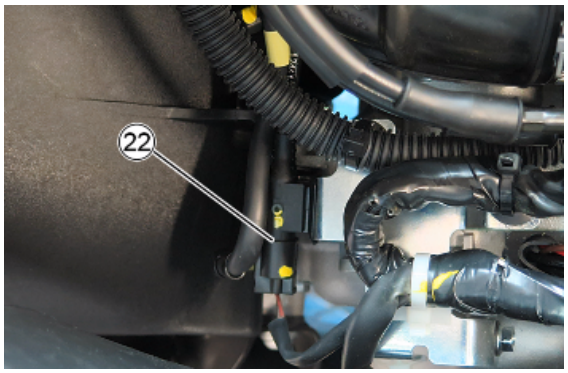
20. Front right turn signal and daylight running light connector: Remove the leg shield back plate to reach it.



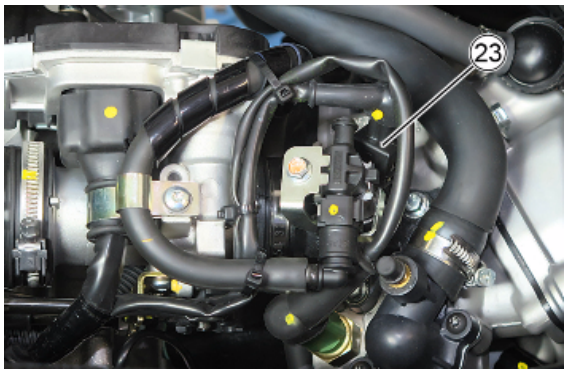
21. Fuel pump: To access remove the helmet compartment.



22. rear phonic wheel sensor connector: To access remove the helmet compartment.

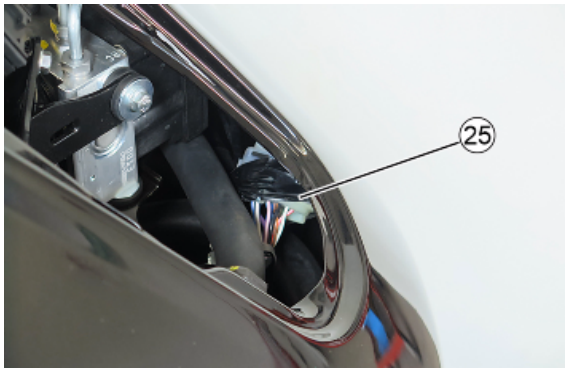


23. Injector: To access remove the helmet compartment.



24. Bike finder device: Remove the leg shield back plate to reach it.

25. Accessories connector: Remove the central front cover to reach them.

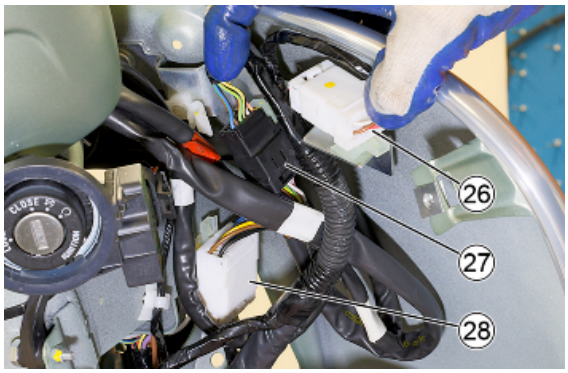


26. Right hand handlebar device connector

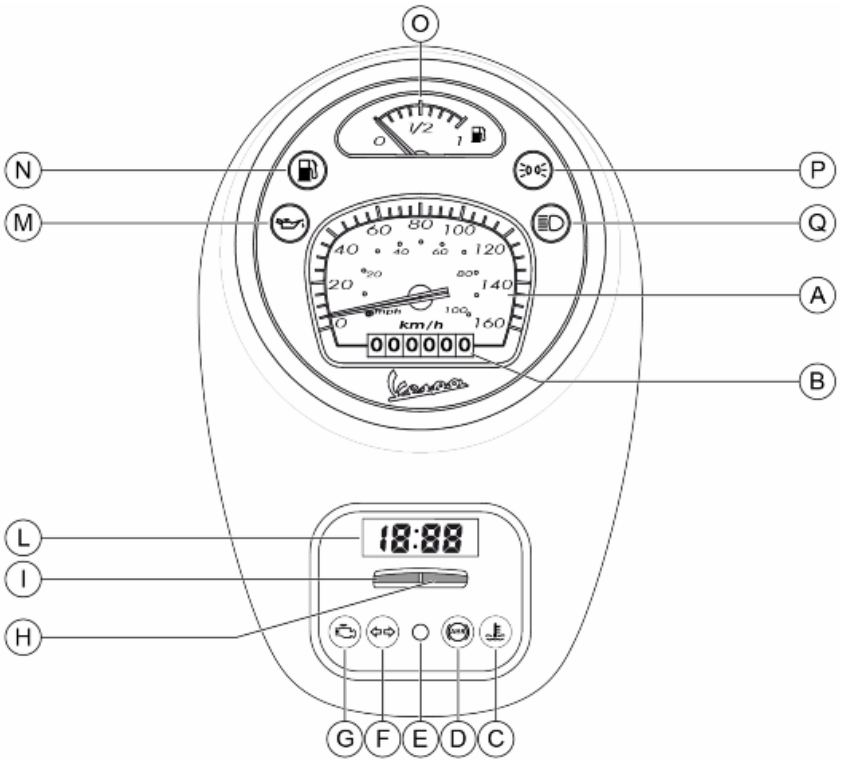
27. Warning light unit connector

28. Left hand handlebar device connector

Remove the leg shield back plate to reach it.



Instrument panel



A = Speedometer

B = Odometer

C = Engine temperature warning light

D = ABS warning light

E = Immobilizer indicator light

F = Turn indicator warning light

F = Engine control warning light

H = Clock function set-up button

I = Clock function selector button

L = Clock

M = Low engine oil pressure warning lamp

N = Reserve fuel tank warning light

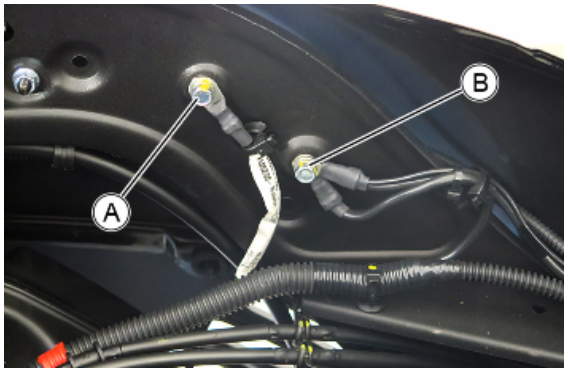
O = Fuel gauge

P = Low beam headlight warning light

Q = High beam headlight warning light

Ground points

There are two ground connections on the vehicle:
The engine ground, indicated with the letter "**A**".
The chassis ground, indicated with the letter "**B**".
Located in the rear left of the vehicle, to access them remove the helmet compartment.



Checks and inspections

Immobiliser

The electronic ignition system is controlled by the injection electronic control unit with the integrated Immobilizer system. The immobilizer is an anti-theft system which allows the vehicle to work only if it is activated by means of the coded keys that the control unit recognises. The code is stored in a transponder installed in the body of the key. This allows the driver clear operation without having to do anything other than just turning the key.
The Immobilizer system consists of the following components: - injection electronic control unit. - immobilizer antenna - master key with built-in transponder - reserve key - diagnostic led on the instrument panel
The diagnosis LED also works as a theft-deterrent blinker. This function is activated every time the ignition switch is turned to the "OFF" position, or the emergency stop switch is turned to the "OFF" position. It remains activated for 48 hours in order not to affect the battery charge. When the ignition

switch is turned to "ON", it interrupts the function of the Immobilizer lamp and a start enable lamp comes "ON". The length of time the lamp remains for depends on the control unit settings.
The diagnostic LED is normally mounted on the instrument panel and receives its power supply directly from the battery. It is controlled by the injection electronic control unit via a negative signal. If the LED is extinguished, irrespective of the position of the ignition switch and/or the instrument panel does not initialise, check: - that the emergency stop button functions correctly; - the connection line used to manage the diagnostic LED, between the injection electronic control unit and the instrument panel; - the connection line between the injection electronic control unit and the emergency stop switch.

NOTE: CONSULT THE SPECIFIC ELECTRICAL CIRCUIT DIAGRAM FOR THE VEHICLE WHEN CARRYING OUT THE FOLLOWING OPERATIONS

Emergency stop button check

1. Disconnect the emergency stop button electrical connector and carry out a continuity check on the connection lines to the injection electronic control unit; 2. Carry out a continuity check on the connection line between emergency stop button and ground. 3. Using a multimeter, check that the emergency stop button functions correctly; connect the terminals of the multimeter between the two pins on the switch that are connected to ground and the injection electronic control unit. Press the button and check that it functions correctly.

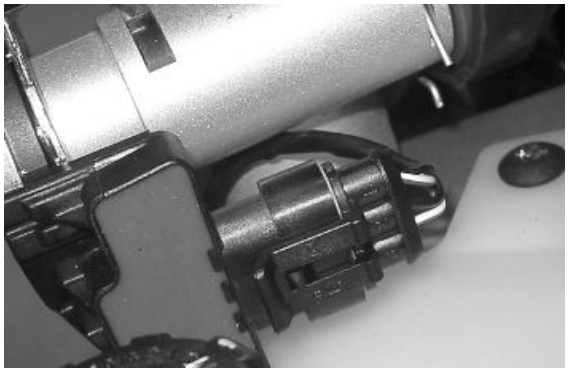
Electronic injection control unit check

1. Disconnect the connector from the injection electronic control unit. 2. Make sure that the connection line between the injection electronic control unit and the instrument panel (diagnostic LED management line) is not shorted to the battery. 3. Carry out a continuity test on the connection line between the injection electronic control unit and the instrument pane (diagnostic LED management line).
If no faults are found, replace the injection electronic control unit.

Instrument panel check

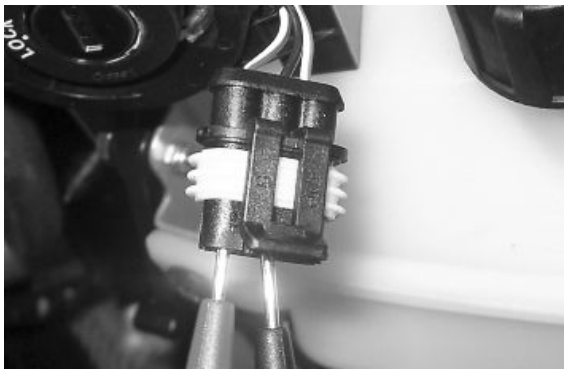
1. Disconnect the instrument panel electrical connector. 2. Make sure that the connection line between the injection electronic control unit and the instrument panel (diagnostic LED management line) is not shorted to the battery. 3. Carry out a continuity test on the connection line between the engine electronic control unit and the instrument pane (diagnostic LED management line).
If no other faults are found, replace the instrument panel.

After removing the leg shield back plate, remove the electrical connection from the antenna as shown in the picture.



Remove the protective base from the connector.

With the ignition switch at «**ON**» check if there is battery voltage between the Red-White and Black cables.

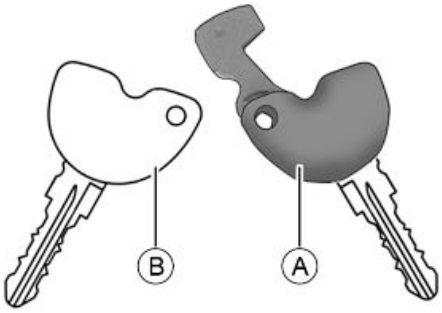


Virgin circuit

When the ignition system is not encoded, any key can operate the engine limited to 2,000 rpm. The keys can only be recognised if the control unit has been programmed properly.
The memorisation procedure of a new control unit provides for the recognition of the MASTER as the first key to be saved: **this becomes particularly important because it is the only key that enables the control unit to be wiped clean and reprogrammed for the memorisation of the service keys.**

The Master and service keys must be used to code the system as follows:
- Insert the Master key «**A**», switch to «**ON**» and maintain this position for 2 seconds (limit values 1 - 3 seconds).
- Insert the service key «**B**» and switch to «**ON**» for 2 seconds.

If you have duplicate copies of the service key, repeat the operation for each key.
- Insert the Master key again and turn it to «**ON** » for 2 seconds.



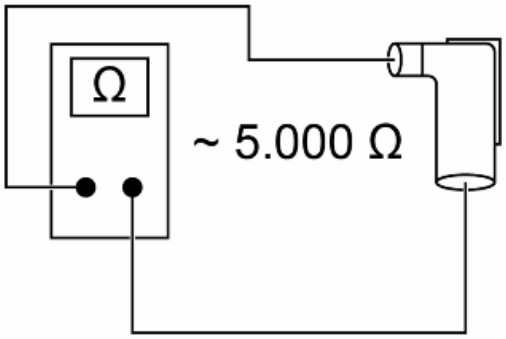
The maximum time to change keys is 10 seconds.
A maximum of **3 service keys** can be programmed at one time.
The times and the procedure must be followed exactly, otherwise repeat from the beginning.

Once the system has been programmed, master key transponder, decoder and control unit are strictly matched.

With this link established, it is now possible to encode new service keys, in the event of losses, replacements, etc.

Each new programming deletes the previous one so, in order to add or eliminate keys, you must repeat the procedure using all the keys you intend to keep using.

If a service key becomes uncoded, the efficiency of the high voltage circuit shielding must be thoroughly inspected. In any case it is advisable to use resistive spark plugs.



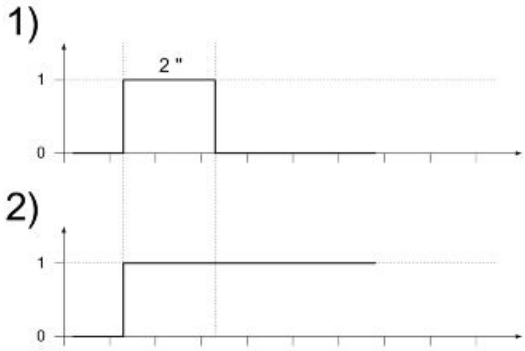
Characteristic

Shielded cap resistance

~ 5,000 Ω

Diagnostic codes

The Immobilizer system is tested each time the Ignition switch is turned from «OFF» to «ON». During this diagnosis phase a number of control unit statuses can be identified and various light codes displayed. Regardless of the code transmitted, if at the end of the diagnosis the LED remains off permanently, the ignition is enabled. If, however, the LED remains on permanently, it means the ignition is inhibited:

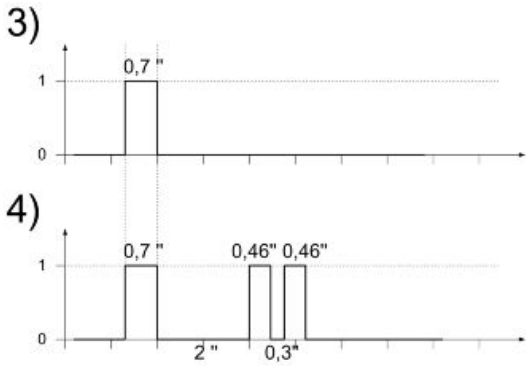


1. Previously unused control unit - key inserted: a single 2 second flash is displayed, after which the LED remains off permanently. The keys can be stored to memory, the vehicle can be started but with a limitation imposed on the number of revs.

2. Previously unused control unit - transponder absent or cannot be used: the LED is on permanently. In this condition no operations are possible including the start up of the vehicle.

3. **Programmed control unit - the service key in (normal condition of use)**: a single 0.7-second flash is displayed, after which the LED remains off steadily. The engine can be started.

4. **Programmed control unit - Master key in**: a 0.7-sec flash is displayed followed by the LED remaining off for 2 sec and then by short 0.46-sec flashes, the same number of times as there are keys stored in the memory including the Master key. When the diagnosis has been completed, the LED remains permanently OFF. The engine can be started.

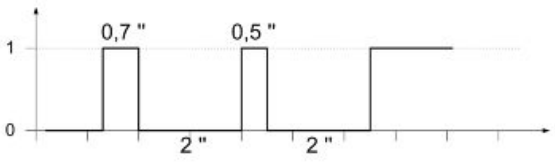


5. Programmed control unit - fault detected: a light code is displayed according to the fault detected, after which the LED remains on steadily. The engine cannot be started. The codes that can be transmitted are:

- 1-flash code
- 2-flash code
- 3-flash code

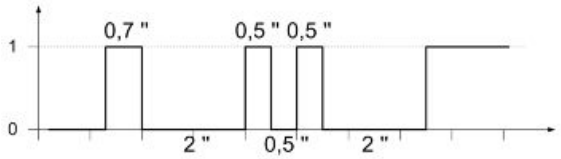
Diagnostic code - 1 flash

A one-flash code indicates a system where the serial line is not present or is not detected. Check the Immobilizer antenna wiring and change it if necessary.



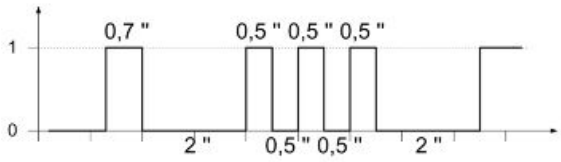
Diagnostic code - 2 flashes

A two-flash code shows a system where the control unit does not show the transponder signal. This might depend on the inefficiency of the Immobilizer antenna or the transponder.
Turn the switch to ON using several keys: if the code is repeated even with the Master key, check the antenna wiring and change it if necessary. If this is not the case, replace the defective key and/or reprogram the control unit. Replace the control unit if the problem continues.



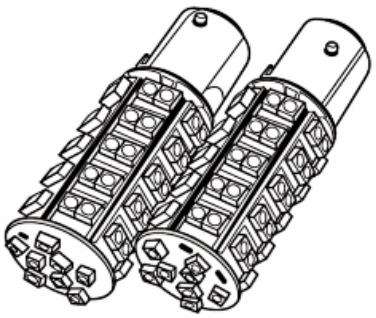
Diagnostic code - 3 flashes

A three-flash code indicates a system where the control unit does not recognise the key. Turn the switch to ON using several keys: if the error code is repeated even with the Master key, replace the control unit. If this is not the case, reprogram the decoder.



Lights list

This section lists the bulb types required for the vehicle's equipment.



BULBS

	Specification	Desc./Quantity
1	High beam/low beam bulb (for right-hand riding)	**Type**: Halogen (H4) **Power**: 12V - 55W/60W **Quantity**: 1
2	High beam/low beam bulb (for left-hand riding)	**Type**: Halogen (S2) **Power**: 12V - 35W/35W **Quantity**: 1

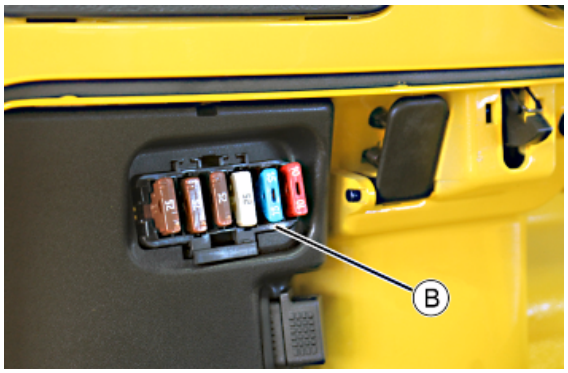
	Specification	Desc./Quantity
3	Front side light bulb (front headlamp)	**Type**: All glass **Power**: 12V - 5W **Quantity**: 1
4	Front side light bulb lamp (front shield)	**Type**: LED **Power**: - **Quantity**: 2
5	Front and rear turn indicator bulbs	**Type**: All glass **Power**: 12V - 6W **Quantity**: 4
6	Rear tail light bulb	**Type**: LED **Quantity**: 2
7	Stop light bulb	**Type:** LED **Quantity:** 1
8	Licence plate light bulb	**Type**: LED **Quantity**: 2

Fuses

The electrical system is equipped with:

1. one fuse «**A**», located in the battery compartment;

2. six protection fuses «**B**» located in the glove compartment to the left;



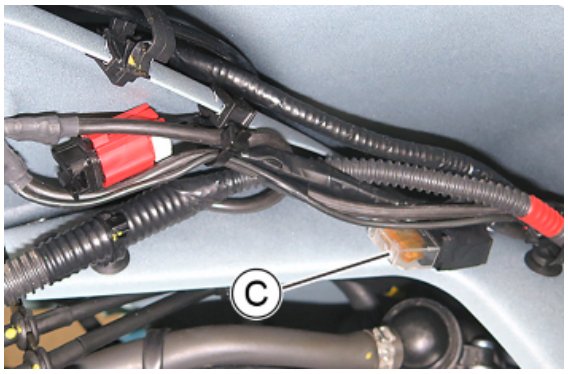
3. one fuse «**C**» located under the seat, accessible by extracting the helmet compartment.

The tables show the position and characteristics of the fuses on the vehicle.

CAUTION

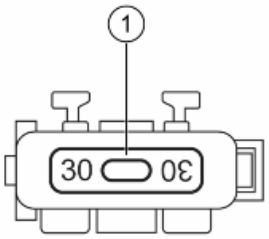
BEFORE REPLACING THE BLOWN FUSE, TRY TO ELIMINATE THE FAULT THAT HAS CAUSED IT TO BLOW. NEVER TRY TO REPLACE A FUSE USING DIFFERENT MATERIAL (FOR EXAMPLE A PIECE OF ELECTRIC WIRE).

CAUTION



MODIFICATIONS OR REPAIRS TO THE ELECTRICAL SYSTEM, PERFORMED INCORRECTLY OR WITHOUT STRICT ATTENTION TO THE TECHNICAL SPECIFICATIONS OF THE SYSTEM CAN CAUSE MALFUNCTIONING AND RISK OF FIRE.

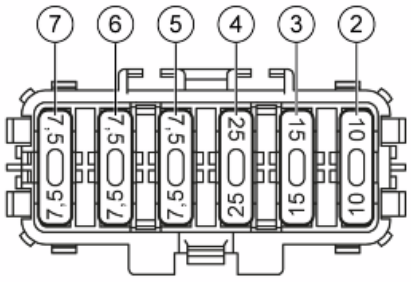
Fuse «**A**».



FUSE «A»

	Specification	Desc./Quantity
1	Fuse no. 1	**Capacity**: 30 A **Protected circuits**: battery recharge, fuses No. 2-3-4. **Protected circuits (key-on power)**: Fuses No. 5-6-7.

Fuse «**B**».

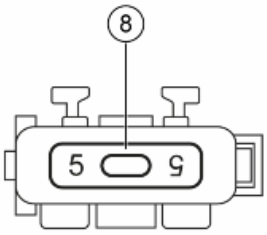


FUSE «B»

	Specification	Desc./Quantity
1	Fuse no. 2	**Capacity**: 10 A **Protected circuits**: engine control unit, injection loads relay (contacts), lambda probe heater, canister solenoid valve, electric fan relay (coil).
2	Fuse no. 3	**Capacity**: 15 A **Protected circuits**: electric fan (via relay), fuse No. 8, instrument cluster, headlamp (via relay), accessories provision. **Protected circuits (key-on power)**: electrical saddle opening.
3	Fuse no. 4	**Capacity**: 25 A **Protected circuits**: ABS ECU.
4	Fuse no. 5	**Capacity**: 7.5 A **Protected circuits (key-on power)**: ABS control unit, engine control unit, immobilizer aerial, tilting sensor, ignition button, injection load relay.
5	Fuse no. 6	**Capacity:** 7.5 A **Protected circuits (key-on power)**: key-on power for horn, light selector switch, horn, brake lights, flasher unit.
6	Fuse no. 7	**Capacity**: 7.5 A

	Specification	Desc./Quantity
		Protected circuits (key-on power): daylight running lights, license plate light, OBD port, USB port, pre-wiring for accessories,instrument panel.

Fuse «**C**».



FUSE «C»

	Specification	Desc./Quantity
1	Fuse no. 8	**Capacity**: 5 A **Protected circuits**: OBD port.

Sealed battery

If the vehicle is provided with a sealed battery, the only maintenance required is the check of its charge and recharging, if necessary.

These operations should be carried out before delivering the vehicle, and on a six-month basis while the vehicle is stored in open circuit.

Besides upon pre-delivery it is therefore necessary to check the battery charge and recharge it, if required, before storing the vehicle and afterwards every six months.

INSTRUCTIONS FOR BATTERY REFRESH AFTER OPEN CIRCUIT STORAGE

1) Voltage check

Before installing the battery on the vehicle, check the open circuit voltage with a standard tester.

- If voltage exceeds 12.60 V, the battery can be installed without any renewal recharge.
- If voltage is below 12.60 V, a renewal recharge is required as explained in 2).

2) Constant voltage battery charge mode

- Constant voltage charge equal to 14.40 - 14.70V
- Initial charge voltage equal to 0.3 - 0.5 for Nominal capacity
- Charge time:

10 - 12 h recommended

Minimum 6 h

Maximum 24 h

3) Constant current battery charge mode

- Charge current equal to 1/10 of the battery rated capacity
- Charge time: Maximum 5 h

Battery installation

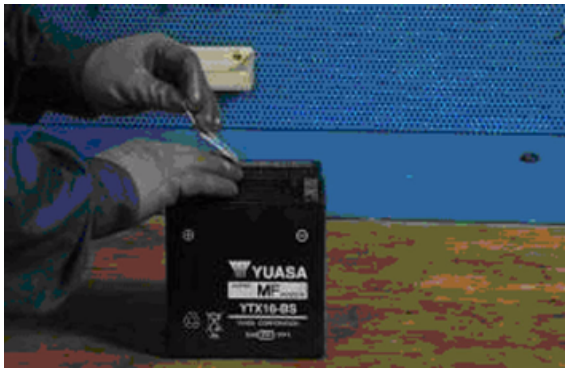
VRLA battery (valve-regulated lead-acid battery) Maintenance Free (MF)

WARNING

BATTERY ELECTROLYTE IS TOXIC AND IT MAY CAUSE SERIOUS BURNS. IT CONTAINS SULPHURIC ACID. AVOID CONTACT WITH 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.
IN THE EVENT OF ACCIDENTAL INGESTION OF THE LIQUID, IMMEDIATELY DRINK LARGE QUANTITIES OF WATER OR MILK. MAGNESIUM MILK, BATTERED EGG OR VEGETABLE OIL. SEEK IMMEDIATE MEDICAL ATTENTION.
BATTERIES PRODUCE EXPLOSIVE GAS; 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.

1) Battery preparation

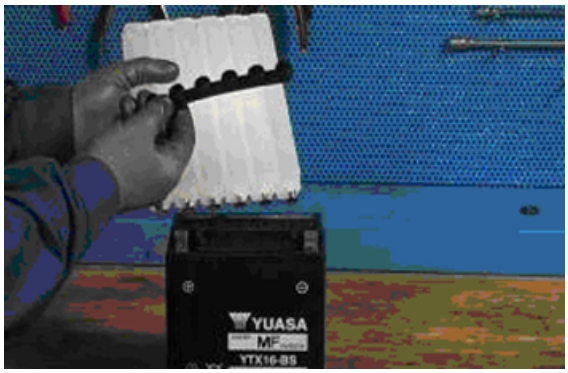
Position the battery on a flat surface. Remove the adhesive sheet closing cells and proceed as quickly as possible to run the subsequent activation phases.



2) Electrolyte preparation.

Remove the container of the electrolyte from the pack. Remove and preserve cover strips from the container, in fact, the strip will later be used as a closing cover.

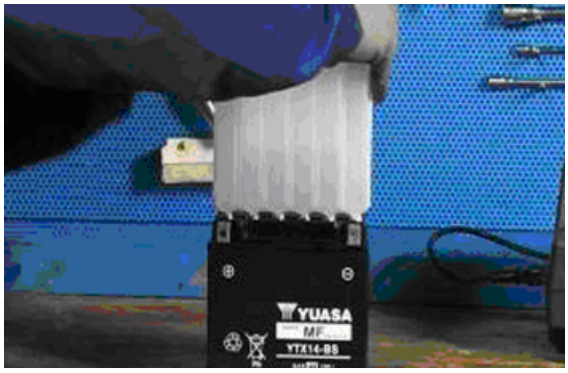
Note: Do not pierce the sealing of the container or the container itself because inside there is sulphuric acid.



3) Procedure for filling the battery with acid.

Position the electrolyte container upside down with the six areas sealed in line with the six battery filler holes. Push the container down with enough force to break the seals. The electrolyte should start to flow inside the battery.

Note: Do not tilt the container to prevent the flow of electrolyte from pausing or stopping.



4) Control the flow of electrolyte

Make sure air bubbles are rising from all six filling holes. Leave the container in this position for 20 minutes or more.

Note: If there are no air bubbles coming out of the filling holes, lightly tap the bottom of the container two or three times. Do not remove the container from the battery.

5) Take out the container.

Make sure all the electrolyte in the battery is drained. Gently tap the bottom of the container if electrolyte remains in the container. Only once the container is completely empty, gently remove the container itself from the battery. Leave the battery to rest, without sealing the six cells, for at least 1 hour before charging.

6) Recharging the new battery

With the above-mentioned procedure, the battery will have gained around 70% - 75% of its total electrical capacity. Before installing the battery on the vehicle, it must be fully charged and then must be recharged.

If the battery is to be installed on the vehicle prior to this pre-charged one, the battery will not be able to exceed 75% charge without jeopardising its useful life on vehicle.

The dry charge battery MF like the completely loaded YTX, must have a zero load voltage between 12.8 - 13.15 V Bring the battery to full charge, using the 020648Y battery charger:

a - select the type of battery with the red switch on the left of the panel battery charger panel

b - select NEW on the yellow timer

c - connect the clamps of the battery charger to the battery poles (black clamp to negative pole (-) and red clamp to positive pole (+)).

d - Press the red button, as shown in figure.

e - Press the "MF" black button to activate the battery recharge **Maintenance Free** as shown in figure.

f - Check the ignition of the green LED indicated with a red arrow in figure.

g - The activation cycle of the new battery lasts for 30 minutes after the ignition of the recharge LED has taken place

h - Disconnect the clamps from the battery and check the voltage, if voltages are detected of less than 12.8 V, proceed with a new recharge of the battery starting from point c of the recharge procedure of **the new battery**, otherwise go to point i

i - The battery is now properly activated, disconnect the battery charger from the power supply and unplug the terminals from the battery.

7) Battery closing.

Insert the airtight cover strips into the filling holes.

Press horizontally with both hands and make sure that the strip is levelled with the top part of the battery.

Note: To do this, do not use sharp objects that could damage the closing strip, use gloves to protect your hands and do not bring your face close to the battery.

The filling process is now complete.

Do not remove the strip of caps under any circumstances, do not add water or electrolyte.

Assembly procedure of the battery on the vehicle.

Connectors

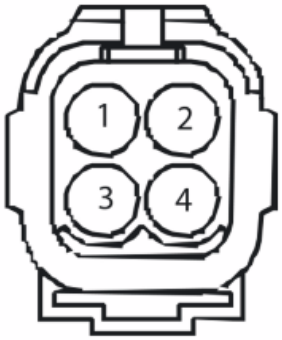
ROLL-OVER SENSOR CONNECTOR

1. Not connected

2. GrVe **-** Ground reference from injection electronic control unit

3. RsBi - Ignition switch controlled power supply

4. GrNe - Signal output for injection electronic control unit

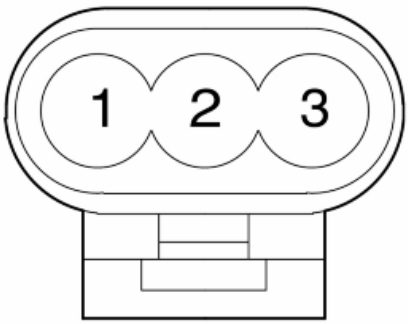


OIL PRESSURE PICK-UP/SENSOR CONNECTOR

1. Rs **-** Signal (+) from injection electronic control unit

2. Ma - Signal (-) from injection electronic control unit

3. RoBi - Engine oil pressure indicator command signal



RIGHT HAND HANDLEBAR DEVICE CONNECTOR

1. Bi - Ignition key-controlled power supply (right hand STOP button)

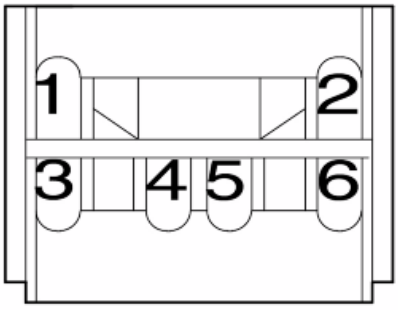
2. BiNe - Starter relay coil and STOP light command signal (+) output

3. MaRs - Engine start signal output (+) for injection electronic control unit

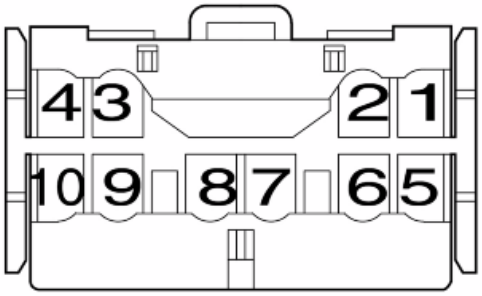
4. RsBi - Ignition controlled power supply

5. GrVe - Ground reference from injection electronic control unit

6. VeNe - Engine stop signal output (-) for injection electronic control unit



LEFT HAND HANDLEBAR DEVICE CONNECTOR



1. BiNe - Starter relay coil and STOP light command signal (+) output

2. Bi - Ignition key-controlled power supply (left hand STOP button)

3. Bi - Ignition key-controlled power supply (horn function)

4. GiRo - Horn command signal (+) output

5. Ro - Left hand direction indicator lights signal (+) output

6. BLNe - Signal input from flasher

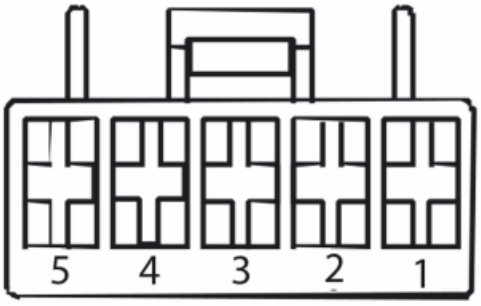
7. BiBL - Right hand direction indicator lights signal (+) output

8. GiNe - High-beam headlights relay coil command signal (+) output

9. Bi - Ignition key-controlled power supply (high-beam low-beam headlights function)

10. MaBi - Low-beam headlights relay coil command signal (+) output

IGNITION SWITCH CONNECTOR



1. Gr **-** Battery power supply input

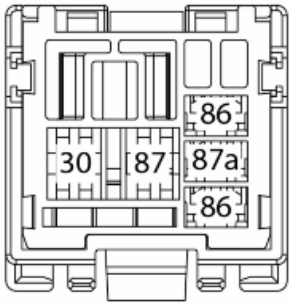
2. Not connected

3. BLNe - Ignition switched power feed output for saddle release button

4. Ar - Ignition key-controlled power supply output

5. RsNe - Battery power supply input

LOW-BEAM HEAD LIGHTS RELAY CONNECTOR



30. Gr - Battery power supply

85. Ne - Ground

86. MaBi - Signal (+) input from external lights switch

87. Ma - Low-beam headlights ON command signal (+) output

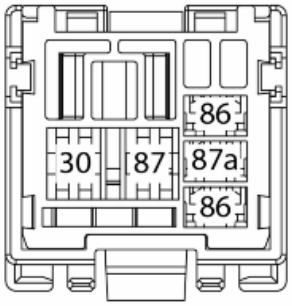
HIGH-BEAM HEAD LIGHTS RELAY CONNECTOR

30. Gr - Battery power supply

85. Ne - Ground

86. GiNe - Signal (+) input from external lights switch

87. Vi - High-beam headlights ON command signal (+) output

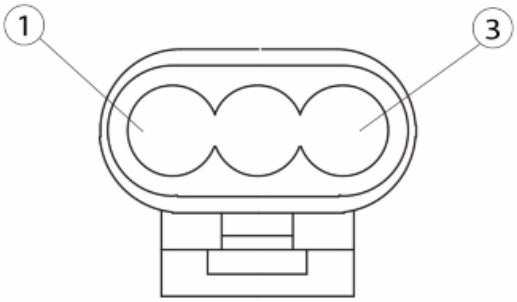


FRONT RIGHT DIRECTION INDICATOR LIGHT CONNECTOR

1. BiBL - Signal (+) input from direction indicator switch

2. GiNe - Ignition key-controlled power supply (parking lights)

3. Ne - Ground

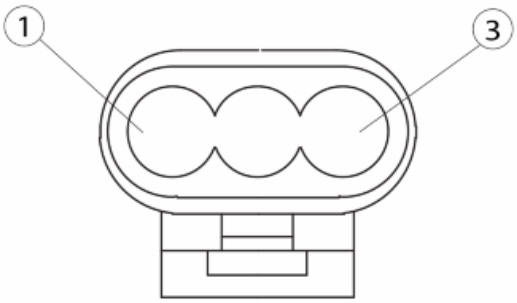


FRONT LEFT DIRECTION INDICATOR CONNECTOR

1. Ro - Signal (+) input from direction indicator switch

2. GiNe - Ignition key-controlled power supply (parking lights)

3. Ne - Ground



VOLTAGE REGULATOR CONNECTOR

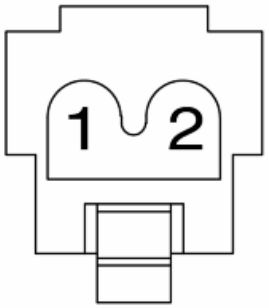
1. RsNe - Battery power supply

2. Ne - Ground

ELECTRIC FAN CONNECTOR

1. Ne - Ground

2. Rs - Signal input (+) from electric fan relay

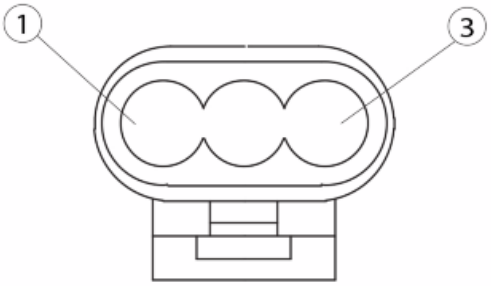


IMMOBILIZER ANTENNA CONNECTOR

1. RsBi - Ignition controlled power supply

2. Ne - Ground

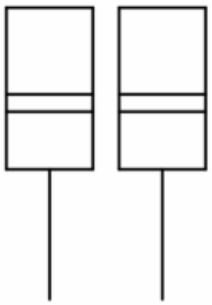
3. ArBi - Signal output for injection electronic control unit (start enable)



HORN CONNECTOR

1. Ne - Ground

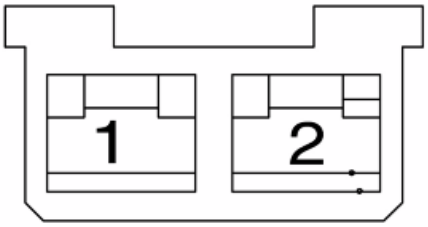
2. GiRo - Signal (+) input from horn button



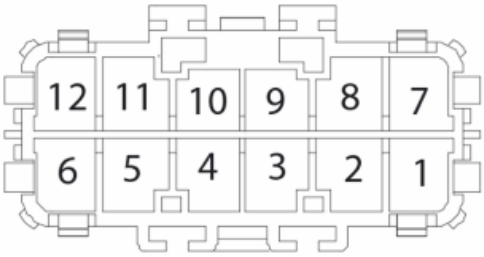
SADDLE OPENING BUTTON CONNECTOR

1. BLNe - Ignition controlled power supply

2. BL - Saddle opening motor actuator command signal (+) output



FUSE BOX CONNECTOR



1. BiNe - Battery power supply output (injection control unit, injection loads relay)

2. Gr - Battery power supply output (electric fan relay, low-beam headlights relay, high-beam headlights relay, accessories pre-installation connector, ignition switch, immobilizer indicator management instrument panel, OBD socket)

3. GrRs - Battery power supply output (ABS control unit)

4. RsBi - Ignition key-controlled power supply output (ABS control unit, immobilizer antenna, injection loads relay coil, engine start button, injection electronic control unit, tilt sensor)

5. Bi - Ignition key-controlled power supply output (external lights switch, horn button, left and right hand STOP buttons, USB port, blinker, accessories pre-installation connector)

6. GiNe - Ignition key-controlled power supply output (taillight, front light assemblies, instrument panel, indicators assembly, OBD socket)

7. RsNe - Battery power supply input

8. RsNe - Battery power supply input

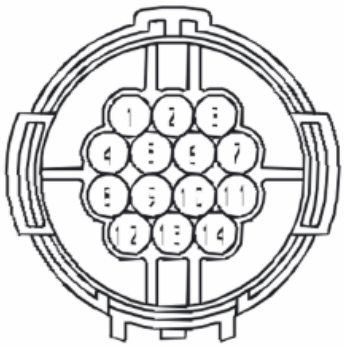
9. RsNe - Battery power supply input

10. Ar - Ignition key-controlled power supply

11. Ar - Ignition key-controlled power supply

12. Ar - Ignition key-controlled power supply

WIRING FOR ACCESSORIES - CONNECTOR



1. Ne **-** Ground

2. BiVe - Fuel gauge

3. RoRs - CAN H line

4. RoBi - CAN L line

5. ArNe - ISO K line

6. Not connected

7. Gr **-** Battery power supply

8. Bi **-** Ignition controlled power supply

9. Not connected

10. Ro **-** Signal input from saddle opening button

11. Ro **-** Left hand direction indicators

12. BiBL **-** Right hand direction indicators

13. Vi **-** High beam lights

14. Az **-** Vehicle speed

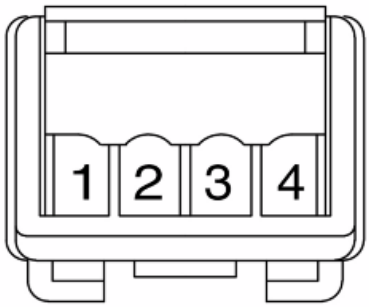
HEADLIGHT CONNECTOR

1. Not connected

2. Ma - High-beam headlights ON command signal (+) input

3. Vi - Low-beam headlights ON command signal (+) input

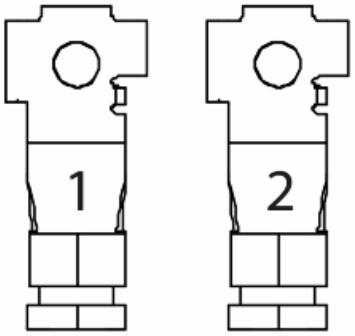
4. Ne - Ground



BATTERY CONNECTOR

1. Rs - Power supply output (main fuse 30A, starter motor relay contact)

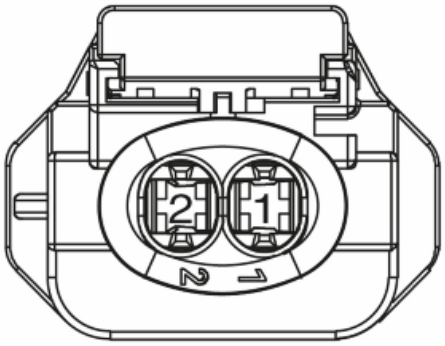
2. Ne - Ground



HV COIL CONNECTOR.

1. RoNe - Signal (-) input from injection electronic control unit

2. NeVe - Power supply input from injection loads relay



LAMBDA PROBE CONNECTOR

1. Signal (+) for injection electronic control unit

2. Signal (-) for injection electronic control unit

3. NeVe - Power supply input from injection loads relay (lambda probe heater)

4. AzRs - Ground reference from injection electronic control unit (lambda probe heater)

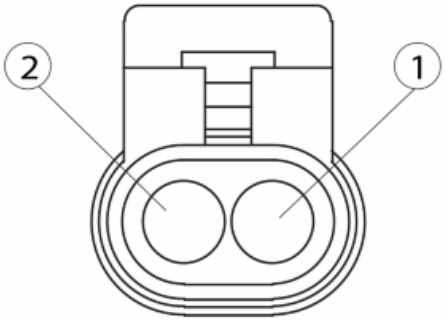
ENGINE/CHASSIS GROUND CONNECTOR

- Ne - Chassis/engine ground

REAR LEFT DIRECTION INDICATOR LIGHT CONNECTOR

1. Ne - Ground

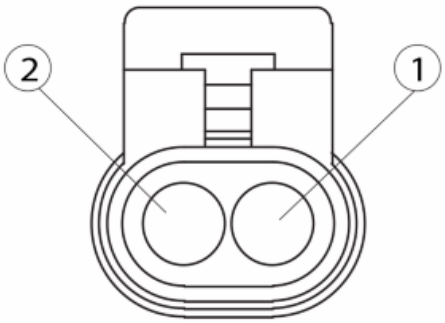
2. Ro - Signal (+) input from direction indicator switch



REAR RIGHT DIRECTION INDICATOR LIGHT CONNECTOR

1. Ne - Ground

2. BiBL - Signal (+) input from direction indicator switch

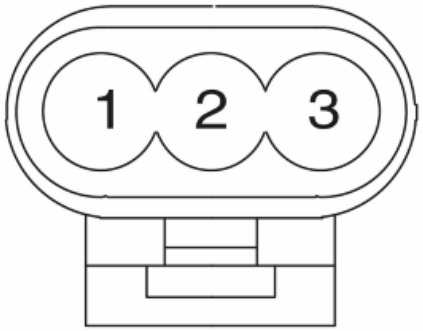


TAILLIGHT CONNECTOR

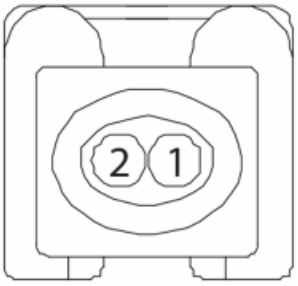
1. GiNe - Ignition key-controlled power supply (parking lights)

2. Ne - Ground

3. BiNe - STOP light activation signal (+) input



INJECTOR CONNECTOR



1. NeVe - Power supply input from injection loads relay

2. RsGi - Signal (-) input from injection electronic control unit

COOLANT TEMPERATURE SENSOR CONNECTOR

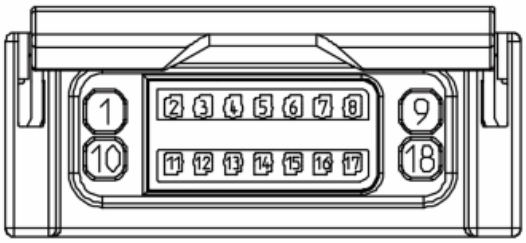
1. GrVe - Ground reference from injection electronic control unit

2. Not connected

3. AzVe - Signal output for injection electronic control unit

4. Not connected

ABS CONTROL UNIT CONNECTOR



1. Not connected

2. RoRs - CAN H

3. BLVe - ABS indicator command signal (-) output

4. RsBi - Ignition controlled power supply

5. ArNe - ISO_K

6. MaRs - Signal from rear ABS sensor

7. Not connected

8. AzRs - Signal from front ABS sensor

9. Not connected

10. Ne - Ground

11. RoBi - CAN L

12. Not connected

13. Az - Vehicle speed signal output

14. Ne - Ground PCC_2

15. MaNe - Ground reference for rear ABS sensor

16. Ne - Ground_PCC1

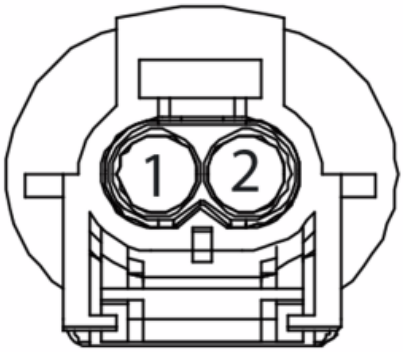
17. AzNe - Ground reference for front ABS sensor

18. GrRs - Battery power supply

FRONT ABS SENSOR CONNECTOR

1. AzNe - Ground reference from ABS control unit

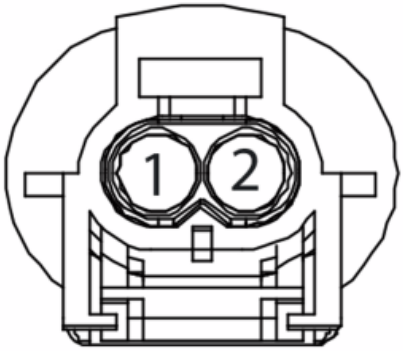
2. AzRs - Signal for ABS control unit



REAR ABS SENSOR CONNECTOR

1. MaNe - Ground reference from ABS control unit

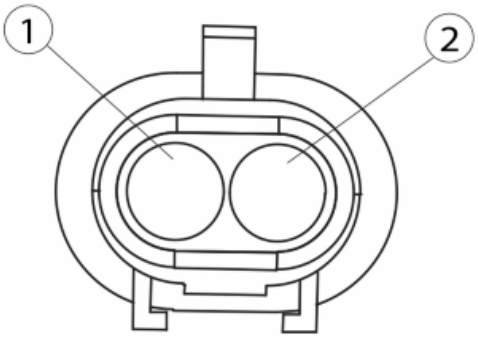
2. MaRs - Signal for ABS control unit



USB PORT CONNECTOR

1. Bi - Ignition controlled power supply

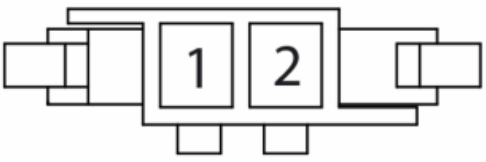
2. Ne - Ground



SADDLE ACTUATOR CONNECTOR

1. Ne - Ground

2. BL - Signal (+) input from saddle opening button



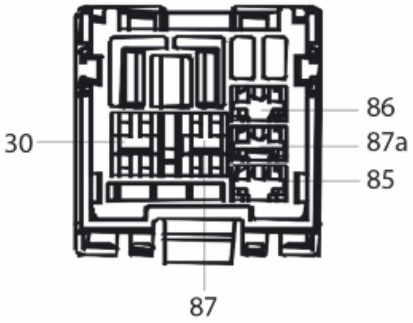
INJECTION LOAD RELAY CONNECTOR

30. BiNe - Battery power supply input

85. NeVi - Signal (-) input from injection electronic control unit (coil command)

86. RsBi - Ignition key-controlled power supply

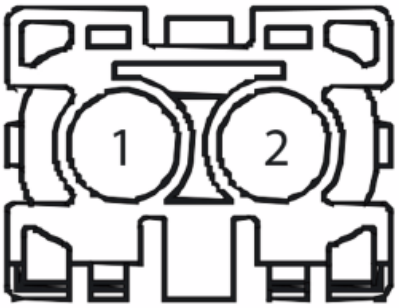
87. NeVe - Power supply output for injection loads



MAIN FUSE CONNECTOR

1. Rs - Battery power supply input

2. RsNe - Protected battery power feed output



OBD SOCKET CONNECTOR

1. GiNe - Ignition controlled power supply

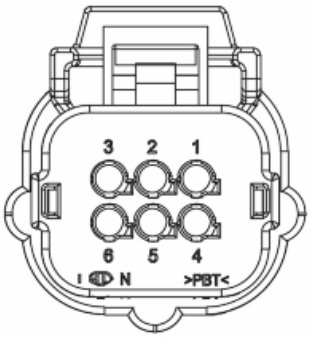
2. RoRs - CAN H

3. Ne - Ground

4. RsGi - Battery power supply

5. RoBi - CAN L

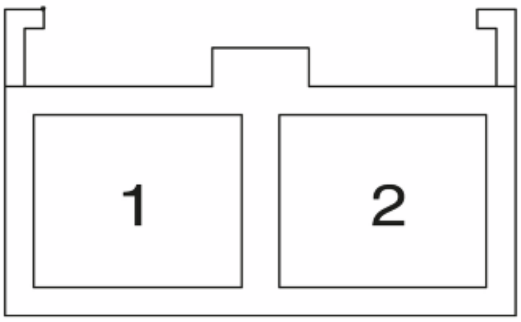
6. ArNe - K Line



OBD SOCKET FUSE CONNECTOR

1. RsGi - Power supply output for OBD socket

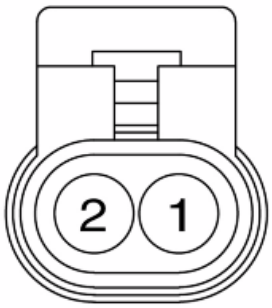
2. Gr - Battery power supply



FUEL PUMP CONNECTOR

1. Ne - Ground

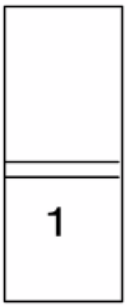
2. NeVe - Power supply input from injection loads relay



STARTER RELAY CONNECTOR

30. Rs - Battery power supply

87. Power supply output for starter motor



FUEL LEVEL TRANSMITTER CONNECTOR

1. BiVe - Signal output for instrument panel and accessories pre-installation connector

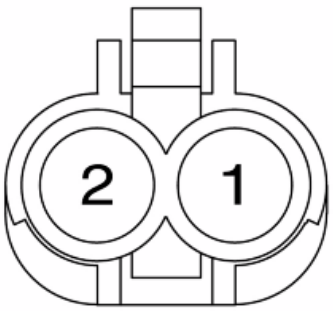
2. Ne - Ground

3. GiVe - Power supply input from instrument panel (reserve indicator management)

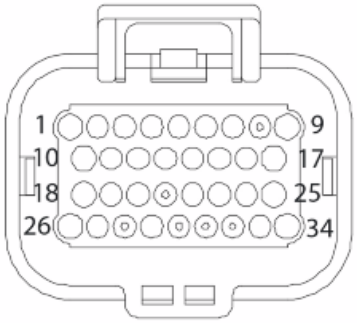
STAND SENSOR CONNECTOR

1. MaRs - Signal (-) for injection electronic control unit

2. GrVe - Ground reference from injection electronic control unit



INJECTION ECU CONNECTOR



1. RoNe - Coil command signal output (-)

2. Not connected

3. Not connected

4. VeNe - Engine stop switch signal input

5. MaRs - Ignition button signal input

6. RsBi - Ignition controlled power supply

7. Ne - Power ground

8. Not connected

9. BiNe - Battery power supply

10. ArBL - Starter relay coil command signal (-) output

11. AzNe- Lambda probe (+)

12. BiVe - Lambda probe (-)

13. AzVe - Engine temperature sensor signal input

14. ArBi - Immobilizer (start enable) signal input

15. GrVe - Ground reference for sensors

16. Not connected

17. RsVe - Immobilizer indicator on command signal (-) output

18. GrNe - Signal input from tilt sensor

19. MaRs - Stand button signal (-) input

20. Ma - Pick-up (-)

21. Not connected

22. NeVi - Injection loads relay coil command signal (-) output

23. Ne - Power ground

24. BLGi - Engine electric fan relay coil command signal (-) output

25. MaNe - Injection indicator command signal (-) command

26. RoRs - CAN H

27. RoBi - CAN L

28. Not connected

29. Rs - Pick-up (+)

30. Not connected

31. AzRs - Ground reference for lambda probe heater

32. BiRs - Canister valve

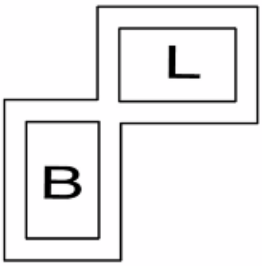
33. VeGi - Coolant temperature indicator command signal (-) output

34. RsGi - Injector power supply

BLINKER CONNECTOR

L. BLNe - Signal output for blinkers switch

B. Bi - Ignition controlled power supply



INSTRUMENT PANEL CONNECTOR

1. GiNe - Ignition key-controlled power supply for fuel level indicator

2. BiVe - Fuel level indicator command signal input from fuel level sender

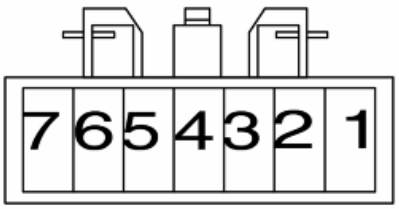
3. GiVe - Fuel reserve indicator command signal input from fuel level sender

4. RoBi - Oil indicator command signal input from engine oil pressure sensor

5. Vi - High-beam headlights indicator command signal input from high-beam headlights relay

6. GiNe - Ignition key-controlled power supply for instrument panel lighting and parking lights indicator

7. Ne - Ground



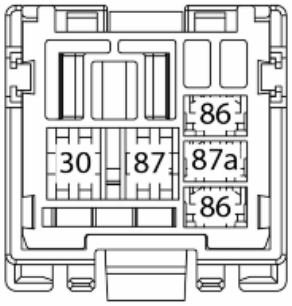
ELECTRIC FAN RELAY CONNECTOR

30. Gr - Battery power supply

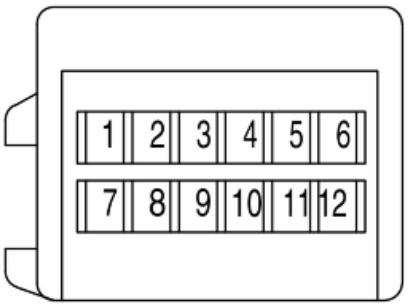
85. BLGi - Coil command signal (-) input from injection electronic control unit

86. NeVe - Coil power supply input from injection loads relay

87. Rs - Power supply output for electric fan motor



INDICATOR LIGHTS UNIT CONNECTOR



1. Ro - Left hand direction indicators warning light signal (+) input from direction indicators switch

2. BiBL - Right hand direction indicators warning light signal (+) input from direction indicators switch

3. GiNe - Ignition key-controlled power supply for water temperature indicator

4. VeGi - Water temperature indicator command signal (-) input from injection electronic control unit

5. MaNe - MIL indicator command signal (-) input from injection electronic control unit

6. BLVe - ABS indicator command signal (-) input from ABS control unit

7. Ne - Ground for clock lighting

8. GiNe - Ignition key-controlled power supply for clock lighting

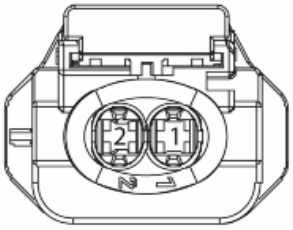
9. RsVe - Immobilizer indicator command signal (-) input from injection electronic control unit

10. Gr - Battery power supply for Immobilizer indicator

11. Not connected

12. Not connected

Canister Valve



1. (Red/White) Signal output for MIUG4 control unit

2. (Black/Green) - Reference ground

Diagnostic instrument

APPLY LOCTITE FORTE 263 ON THE SCREW FIXING THE PISTON COOLING NOZZLE.

ERROR CODES

PCODE	Description
P0108	Pressure sensor - SC to Vbatt
P0107	Pressure sensor - SC to Gnd
P0132	Lambda probe - SC to Vbatt

PCODE	Description
P0130	Lambda probe - SC to Gnd
P0133	Lambda probe - Signal not plausible
P0134	Lambda probe - OC
P0118	Engine temperature sensor - SC to Vbatt
P0117	Engine temperature sensor - SC to Gnd
P0113	Air temperature sensor - SC to Vbatt
P0112	Air temperature sensor - SC to Gnd
P0563	Battery voltage - SC to Vbatt
P0562	Battery voltage - SC to Gnd
P0336	Engine revolution sensor (operational) - Implausible signal
P0262	Injector - SC to Vbatt
P0261	Injector - SC to Gnd
P0201	Injector - OC
P2301	Coil - SC to Vbatt
P2300	Coil - SC to Gnd
P0232	Fuel pump relay - SC to Vbatt
P0231	Fuel pump relay - SC to Gnd
P1652	MIL warning lamp - SC to Vbatt
P1651	MIL warning lamp - SC to Gnd
P0650	MIL warning lamp - OC
P1964	ASR warning lamp (anti-slip control) - SC to Vbatt
P1965	ASR warning lamp (anti-slip control) - SC to Gnd
P1965	ASR warning lamp (anti-slip control) - OC
P0692	Cooling fan relay - SC to Vbatt
P0691	Cooling fan relay - SC to Gnd
P0480	Cooling fan relay - OC
P0032	Lambda probe heater - SC to Vbatt
P0031	Lambda probe heater - SC to Gnd
P0030	Lambda probe heater - OC
P0606	ECU microprocessor - signal not plausible
P0123	Throttle valve position sensor - SC to Vbatt
P0120	Throttle valve position sensor - SC to Gnd
P1800	Rear wheel radius acquisition - signal not plausible
U0001	Bus off on CAN - SC to Gnd
U0002	NCM node absent - signal not plausible
U0121	CAN line diagnosis (ABS node) - OC
U1121	CAN line diagnosis (ABS node) - signal not plausible
P130A	Headlights relay - SC to Vbatt
P130B	Headlights relay - SC to Gnd
P130C	Headlights relay - OC
P0509	Stepper motor control - SC to Vbatt
P0508	Stepper motor control - SC to Gnd
P0505	Stepper motor control - OC
P0511	Stepper motor control - Implausible signal
U1185	Immobilizer error - SC to Gnd
U0185	Immobilizer error - OC
U0486	Immobilizer error - signal not plausible
P0512	Starter button - signal not plausible
P0217	Engine overtemperature state - signal not plausible
P0604	ECU RAM test - signal not plausible
P0601	ECU EEPROM test - signal not plausible
P0459	Canister purge valve - SC to Vbatt
P0458	Canister purge valve - OC or SC to Gnd
P1308	Wheel radius not acquired - signal not plausible
P0301	Misfire - signal not plausible
P0301	Misfire - OC
P0171	Lean air/fuel mixture - signal not plausible
P0172	Rich air/fuel mixture - signal not plausible
P0114	Air temperature sensor - OC
P0111	Air temperature sensor - signal not plausible
P0119	Engine temperature sensor - OC
P0116	Engine temperature sensor - signal not plausible
P1206	Pressure sensor - OC
P1106	Pressure sensor - signal not plausible
P1761	Electric tip-over sensor - SC to Vbatt
P1762	Electric tip-over sensor - SC to Gnd

PCODE	Description
P1101	Throttle valve position sensor - signal not plausible
P1108	Manifold pressure too low - signal not plausible
P1607	Data buffer - signal not plausible

INDEX OF TOPICS

Questa sezione descrive le operazioni da effettuare per lo smontaggio del motore dal veicolo.

Questa sezione descrive le operazioni da effettuare per lo smontaggio del motore dal veicolo.

FRAME ASSEMBLY

Name	Torque in Nm
Swinging arm pin - engine	64 - 72
swinging arm bolt - body shell	76 to 83
Engine and vehicle side swinging arm junction bolt	33 - 41
Bolt of the Silent block support plate	42 to 52
Central stand bolt	32 - 40
Side stand fixing bolt	35 - 40

REAR SUSPENSION

Name	Torque in Nm
Retainer for left shock absorber to crankcase support plate	20 - 25
Shock absorber lower fitting	40 - 45
Shock absorber upper fitting	20 - 25
Rear wheel axle	104 ÷ 126
Screw fixing wheel to hub	20 - 25
Screws for silencer - shock absorber support arm on engine	20 - 25 (The two screws must be tightened after having done so with the rear wheel axle nut at the specified torque. Safety fasteners: see «Pre-delivery Operations»)
Engine- and vehicle-side swinging arm junction bolt	40 - 45

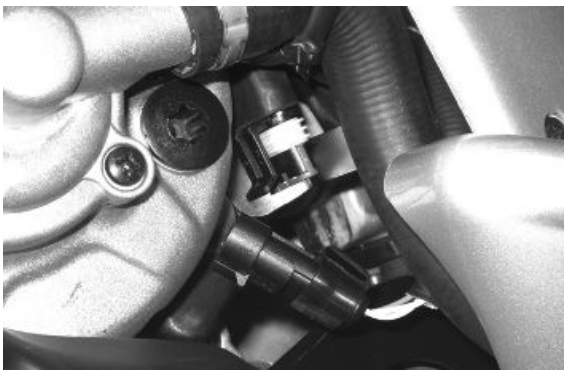
SILENCER

Name	Torque in Nm
Silencer heat guard fixing screw	4 - 5
Screw used to fasten silencer to supporting arm	20 - 25
Lambda probe tightening on exhaust manifold	40 - 50
Manifold/silencer joint tightening torque	12 - 13
Manifold - silencer diaphragm tightening clamp	16 - 18

Exhaust assy. Removal

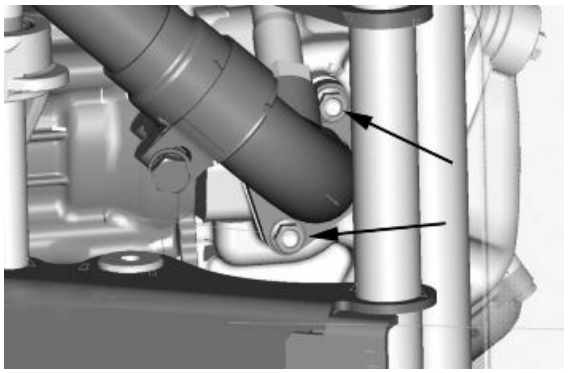
- Remove the left and right fairing and spoiler terminals.

- Remove the Lambda probe from its support and disconnect it.



Remove the lambda probe cable retainer clamp from the coolant pipe shown in the photo

- Undo the two exhaust manifold fixings on the head. To unscrew the nuts that fix the silencer flange to the head properly, use a jointed wrench that allows, according to the travel direction, to get also at the right nut. That is difficult to do with a traditional straight wrench.



- Undo the three screws that fix the muffler to the support arm.
- Remove the complete silencer.

- Remove the lambda probe from the manifold.

CAUTION

WARNING

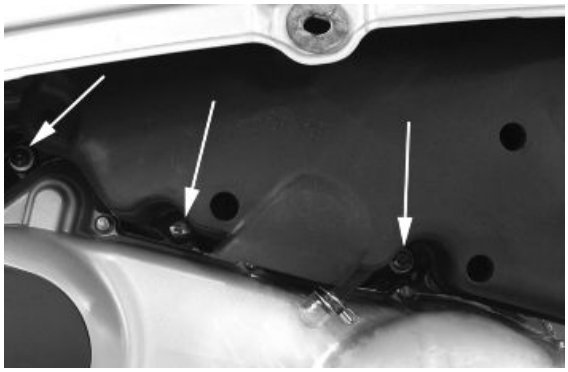
SHOULD IT BE NECESSARY TO REMOVE ONLY THE SILENCER TIP, ALWAYS REPLACE THE GRAPHITE GASKET BETWEEN THE PRIMARY PIPE AND SILENCER.

Removal of the engine from the vehicle

CAUTION

SUPPORT THE VEHICLE ADEQUATELY.

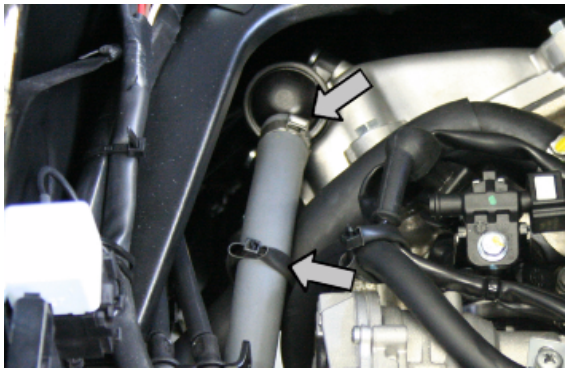
- Disconnect the battery.
- Remove the helmet compartment.
- Remove the side fairings and the spoiler terminals.
- Remove the rear brake calliper.
- Remove the air cleaner from the housing by unscrewing the three screws indicated in the photograph.



CAUTION

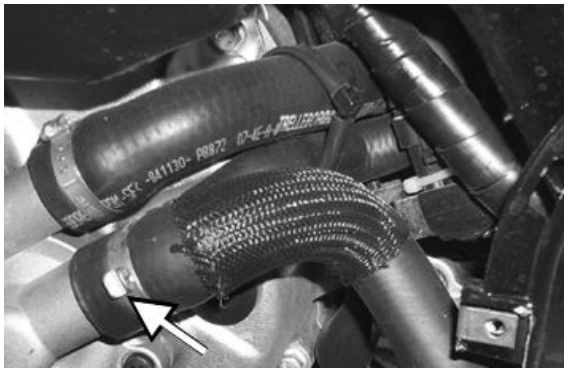
THIS OPERATION MUST BE CARRIED OUT WHEN THE ENGINE IS COLD.

- Remove the clamp from the blow-by pipe and take the pipe out; remove the retainer clamp.
- Remove the clamp indicated in the photograph and disconnect the sleeve connecting it to the throttle body.

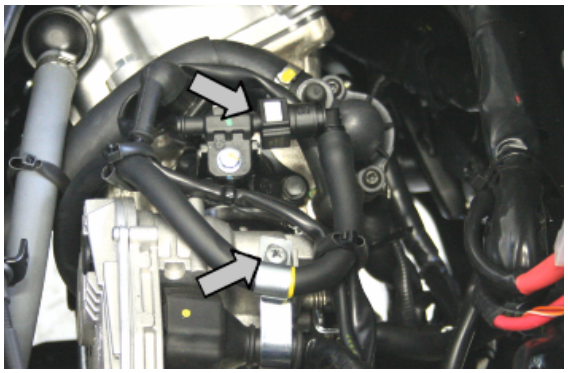


- Get a + 2.5 l container to collect the coolant.

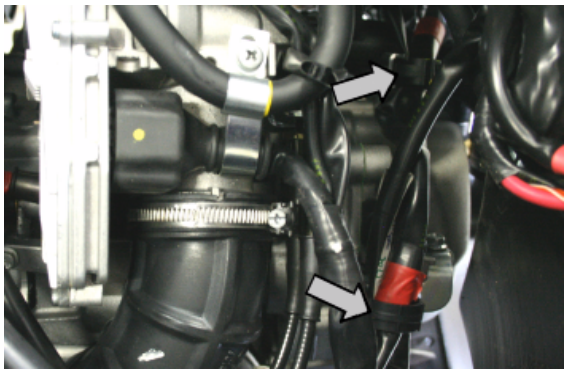
- Remove the coolant inlet pipe to the motor as indicated in the photograph.



- Disconnect the fuel pipe from the injector and remove the screw locking the retainer clamp.
- Disconnect the injector wiring and the throttle body control unit wiring.



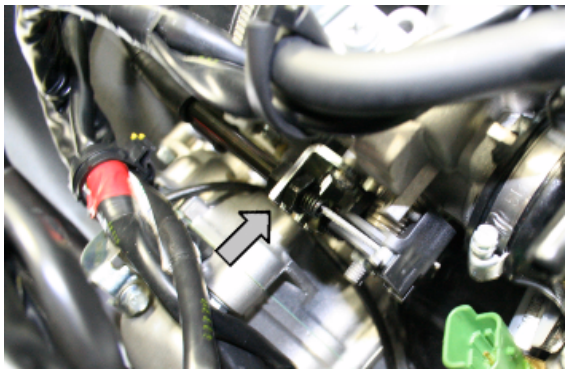
- Disconnect the cable harnesses from the two clamps indicated.



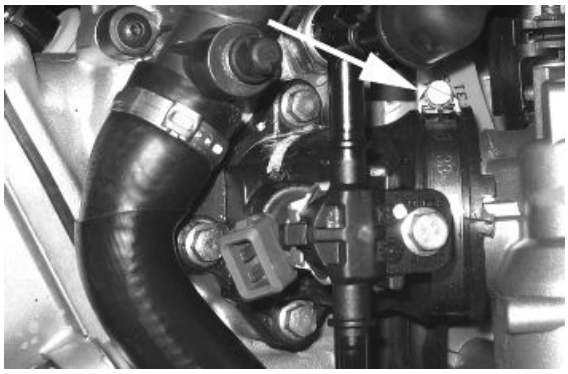
- Remove the coolant outlet pipe from the engine as indicated.

- Remove the spark plug cap.
- Remove the coolant temperature sensor connector indicated in the picture.

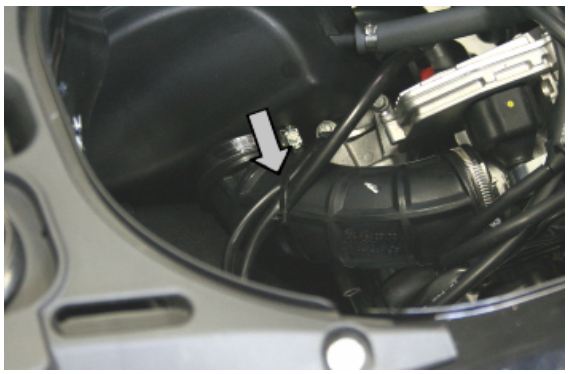
- Remove the throttle control cables from the throttle body by undoing the nuts indicated in the photograph.



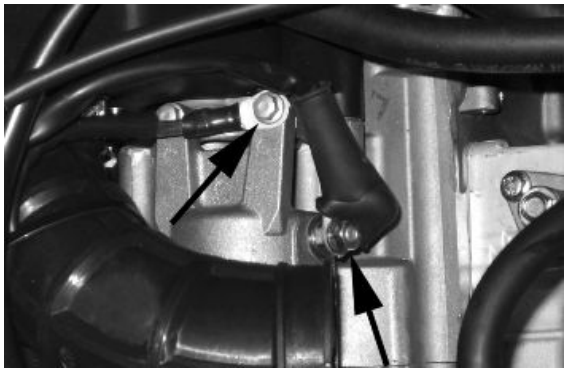
- Loosen the clamp indicated in the photograph and remove the throttle body.



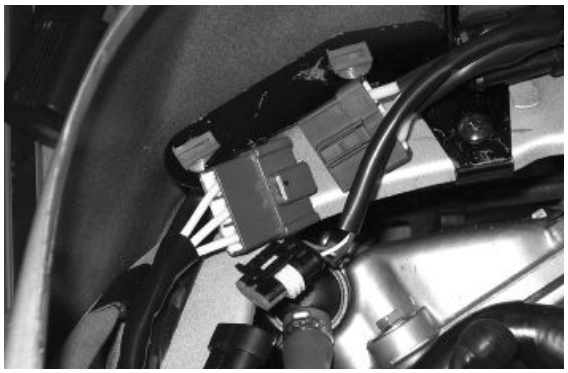
- Remove the clamp retaining the starter motor from the sleeve.

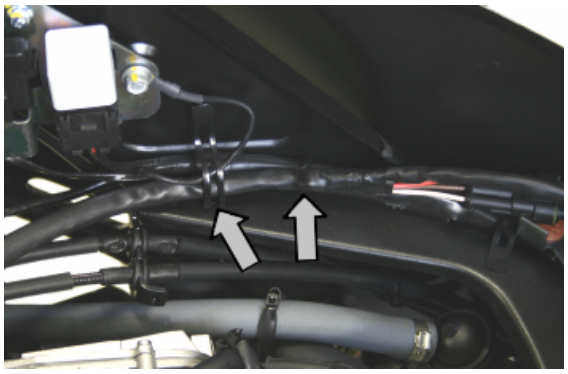


- Remove the positive and negative wiring from the starter motor as shown in the picture.



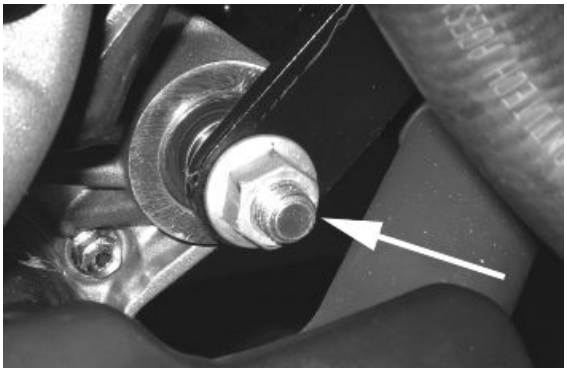
- Disconnect the connectors from the flywheel wiring as shown in the photo.
- Release the cables from the retainer clamps.

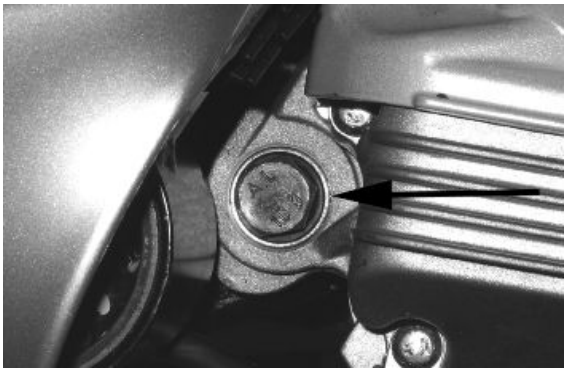




- Remove the four retainers of the rear brake pipes from the crankcase.
- Remove the rear shock absorbers.

- Remove the engine-swinging arm fixing pin by undoing the nut and operating on the head of the pin as shown in the photograph.
- The engine is now free.

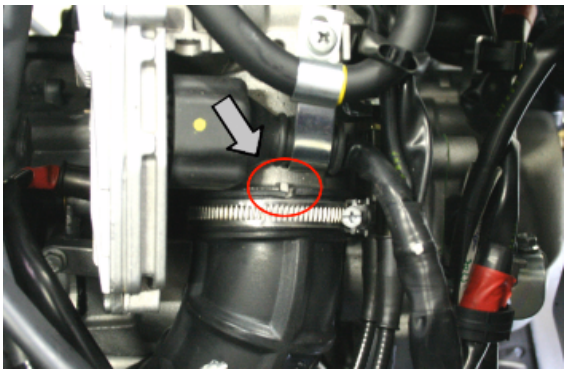


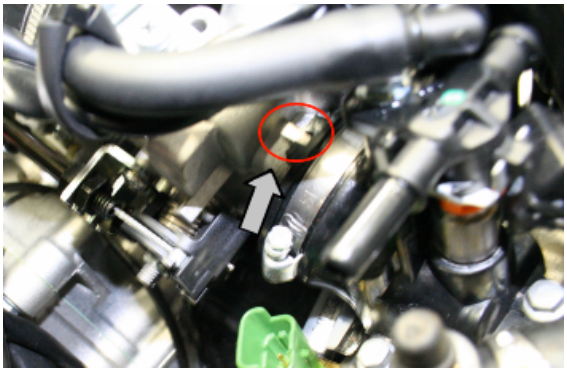


Upon refitting the engine to the vehicle, carry out the removal operations but in reverse order, and respect the tightening torques shown in the «Specifications» Chapter.
- Check that there is a small clearance when the valve is in abutment against the set screw.
- Check the engine oil level and if necessary, top it up with the recommended type.
- Fill and bleed the cooling circuit.
- Check accelerator and electric devices for correct functioning.
- Pay particular attention to the sleeve, be careful to position the throttle body reference marks as indicated in the photograph.

CAUTION

PAY PARTICULAR ATTENTION TO POSITIONING THE THROTTLE CONTROL TRANSMISSION PROPERLY.





INDEX OF TOPICS

ENGINE	ENG

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

SILENCER

Name	Torque in Nm
Silencer heat guard fixing screw	4 - 5
Screw used to fasten silencer to supporting arm	20 - 25
Lambda probe tightening on exhaust manifold	40 - 50
Manifold/silencer joint tightening torque	12 - 13
Manifold - silencer diaphragm tightening clamp	16 - 18

LUBRICATION

Name	Torque in Nm
Hub oil drainage plug	15 to 17
Oil filter on crankcase fitting	27 - 33
Engine oil drainage plug/ mesh filter	24 to 30
Oil filter	4 - 6
Oil pump cover screws	7 - 9
Screws fixing oil pump to the crankcase	5 to 6
Oil pump command sprocket screw	10 - 14
Oil pump cover plate screws	4 - 6
Oil sump screws	10 - 14
Minimum oil pressure sensor	12 - 14

CYLINDER HEAD

Name	Torque in Nm
Spark plug	12 - 14
Cylinder head cover screws	6 - 7
Nuts fixing head to cylinder	7±1 + 10±1 + 90° + 90° + 90°
Head fixing side screws	11 - 12
Starter ground screw	7 to 8.5
Tappet adjustment check nut	6 - 8
Inlet manifold screws	11 to 13
Timing chain tensioner slider screw	10 - 14
Starter counterweight support screw	11 to 15
Timing chain tensioner support screw	11 to 13
Timing chain tensioner central screw	5 to 6
Camshaft retention plate screw	4 - 6

TRANSMISSION

Name	Torque in Nm
Belt support roller screw	11 to 13
Clutch unit nut on driven pulley	45 - 50
Driver pulley nut	75 - 83
Transmission cover screws	11 - 13 Nm
Driven pulley shaft nut	54 - 60
Rear hub cover screws	24 to 27

FLYWHEEL

Name	Torque in Nm
Flywheel cover screw	11 to 13
Stator assembly screws	3 - 4 (Apply LOCTITE medium type 242 threadlock)
Flywheel nut	94 - 102
Pick-up fixing screws	3 - 4
Screw fixing freewheel to flywheel	13 - 15

CRANKSHAFT AND CASE

Name	Torque in Nm
Internal engine crankcase bulkhead (transmission-side half shaft) screws	4 - 6
Engine-crankcase coupling screws	11 to 13
Starter screws	11 to 13
Crankcase timing cover screws	3.5 - 4.5 (Apply LOCTITE medium type 242 threadlock)

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Name	Torque in Nm
Crankcase timing cover screws	3.5 - 4.5 (Apply LOCTITE medium type 242 threadlock)

Automatic transmission

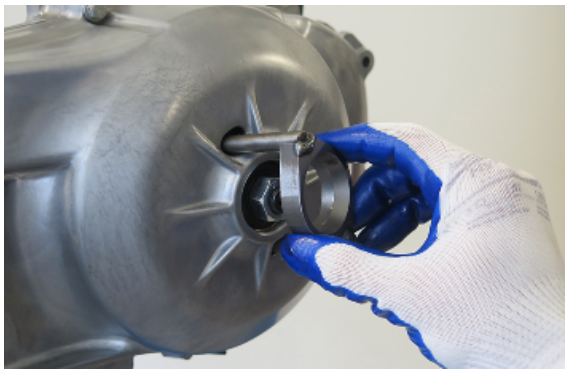
Transmission cover

To remove the transmission cover, proceed as follows:

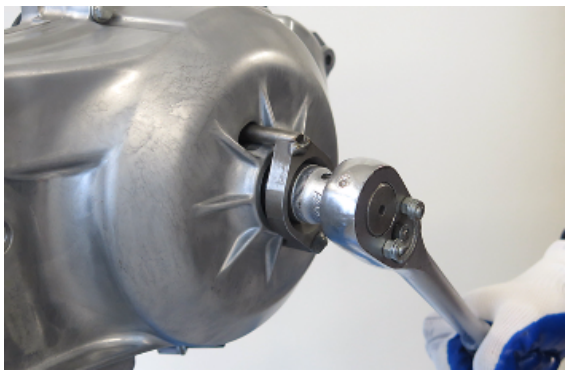
- Block clutch housing rotation using the appropriate tool.

Specific tooling

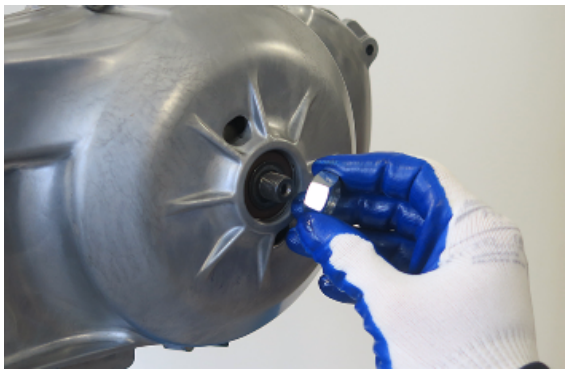
020423Y Driven pulley lock wrench



- Unscrew the fixing nut.

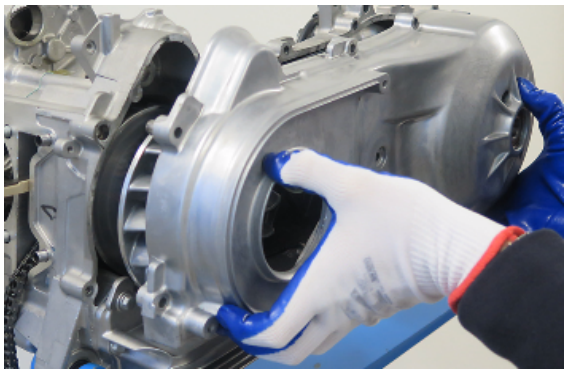


- Remove the nut and the washer.



- Unscrew and remove the transmission cover's fixing screws.

- Remove the transmission cover.



Removing the driven pulley shaft bearing

To remove the driven pulley shaft support bearing, proceed as follows:

- Remove the Seeger ring inside the transmission cover.

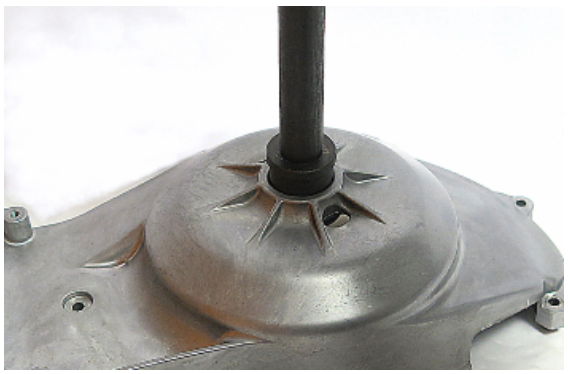
- Remove the bearing using the specific tool.

Specific tooling

020376Y Adaptor handle

020375Y 28 x 30 mm adaptor

020412Y 15-mm guide



Refitting the driven pulley shaft bearing

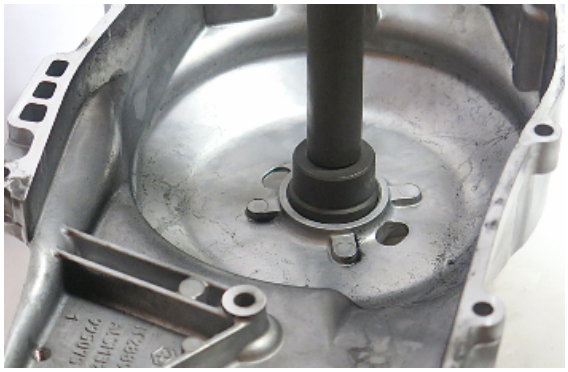
- Heat the transmission cover from the inside.
- Insert a new bearing using the specific tool.

Specific tooling

020376Y Adaptor handle

020375Y 28 x 30 mm adaptor

020412Y 15-mm guide



- Fit the Seeger ring.

Removing the driven pulley

- Remove the clutch housing and the driven pulley assembly.

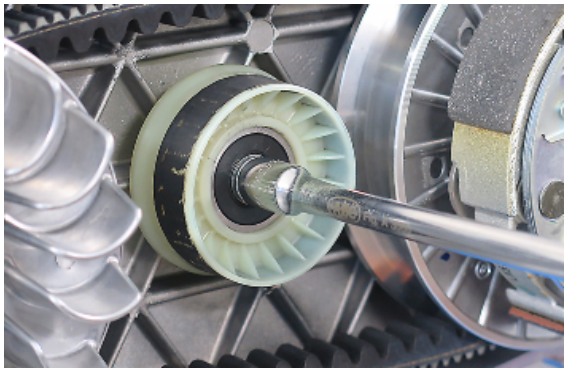
N.B.

THE UNIT CAN ALSO BE REMOVED WITH THE DRIVING PULLEY MOUNTED.

Baffle roller

Plastic roller

- Check that the roller does not show signs of wear and that it turns freely.
- Remove the special clamping screws as indicated in the picture



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

Locking torques (N*m)

Anti-flapping roller 12 - 16

Inspecting the clutch drum

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

Characteristic

Clutch housing max. value

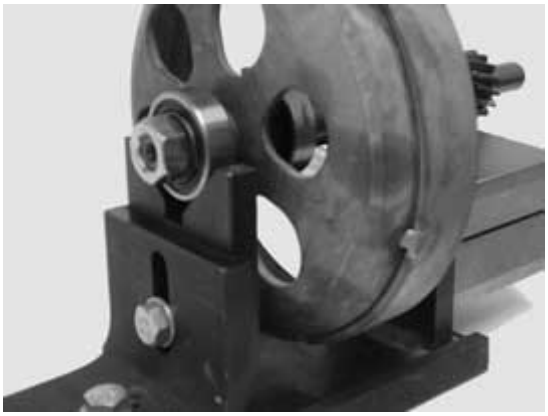
Max. value: Ø 134.5 mm

clutch housing standard value

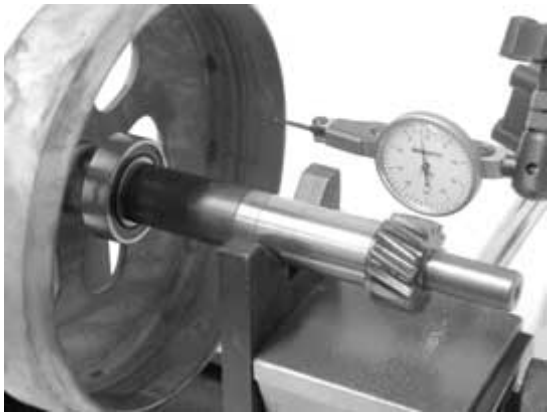
Standard value: Ø 134 - 134.2 mm

Checking the bell working surface eccentricity

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



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



Specific tooling

020074Y Support base for checking crankshaft alignment

020335Y Magnetic mounting for dial gauge

Characteristic

clutch housing check: Limit eccentricity.

Admissible limit eccentricity: 0.15 mm

Removing the clutch

To remove the driven pulley unit, proceed as follows:

- Fit the specific driven pulley spring compressor tool, fixing it firmly in a vice.

Specific tooling

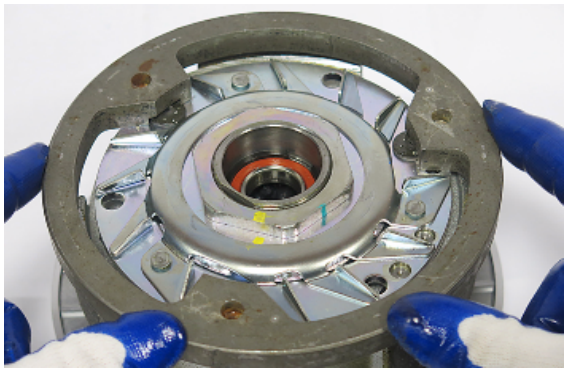
020444Y Tool for installing/removing clutch on/from driven pulley

- Insert the long pins in the **"F"** position, screwed from the external side of the tool.

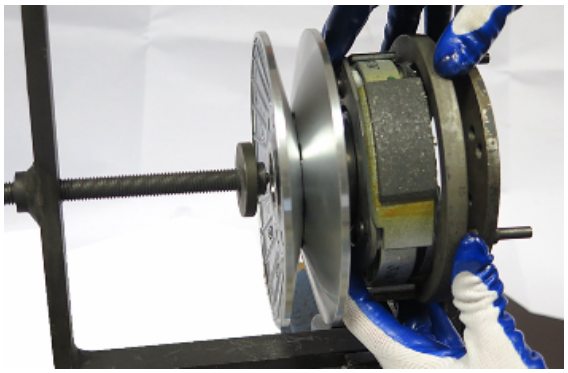
- Fit the adapter ring on the clutch.

Specific tooling

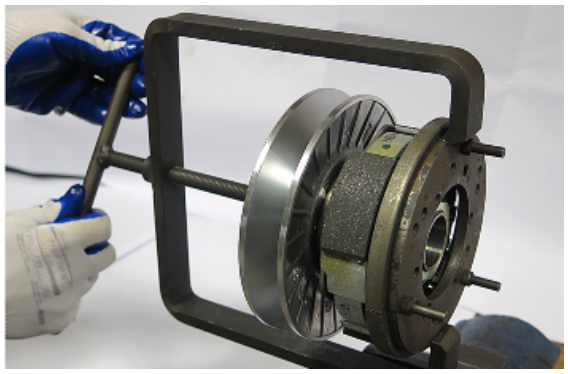
020444Y008 adapter ring



- Fit the driven pulley assembly on the tool together with the adapter ring.



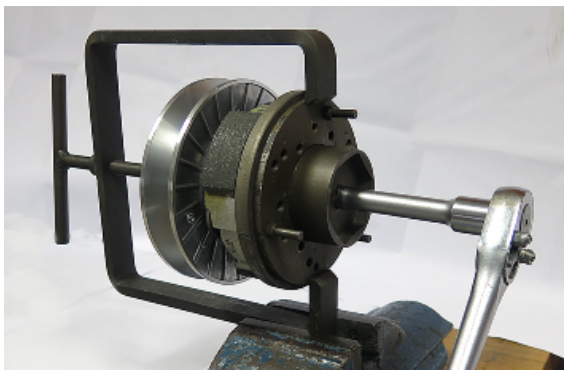
- Tightening the screw mechanism of the tool, compress the return spring.



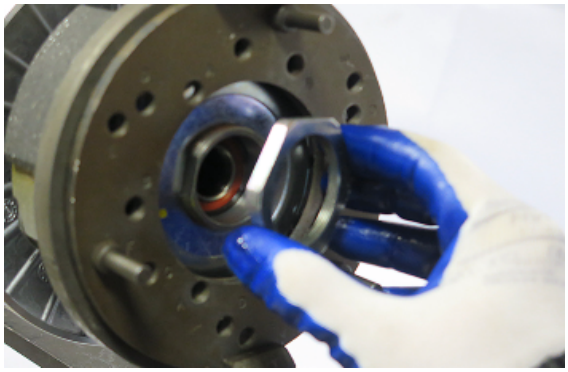
- Using the specific 46x55 wrench, unscrew the clutch fixing hexagonal fixing ring.

Specific tooling

020444Y009 wrench 46 x 55



- Remove the hexagonal ring nut.
- Loosen the screw mechanism of the tool and separate the driven pulley components



Inspecting the clutch

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

N.B.

UPON RUNNING-IN, THE MASSES MUST EXHIBIT A CENTRAL FACING SURFACE AND MUST NOT BE DIFFERENT FROM ONE ANOTHER.
VARIOUS CONDITIONS CAN CAUSE THE CLUTCH TO TEAR.

CAUTION

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

Characteristic

Check minimum thickness

1 mm

Pin retaining collar

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

N.B.

USE TWO SCREWDRIVERS IF YOU HAVE ANY DIFFICULTY.

N.B.

BE CAREFUL NOT TO PUSH THE SCREWDRIVERS IN TOO FAR TO AVOID DAMAGE THAT COULD COMPROMISE THE O-RING SEAL.

- Remove the 4 torque server pins and pull the pulley halves apart.

Inspecting the driven fixed half-pulley

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

Characteristic

Half-pulley minimum diameter

Minimum admissible diameter: Ø 40.96 mm

Half-pulley standard diameter

Standard diameter: Ø 40.985 mm

Wear limit

0.3 mm

Removing the driven half-pulley bearing

- Check there are no signs of wear and/or noisiness; - Replace with a new one if there are.
- Remove the retainer ring using two flat blade screwdrivers.
- Support the pulley bushing adequately from the threaded side using a wooden surface.
- Using a hammer and pin, knock the ball bearing out as shown in the figure.

- Support the pulley properly using the bell as shown in the figure.

Specific tooling

001467Y035 Bearing housing, external ø 47 mm

- Remove the roller bearing using the modular punch.

Specific tooling

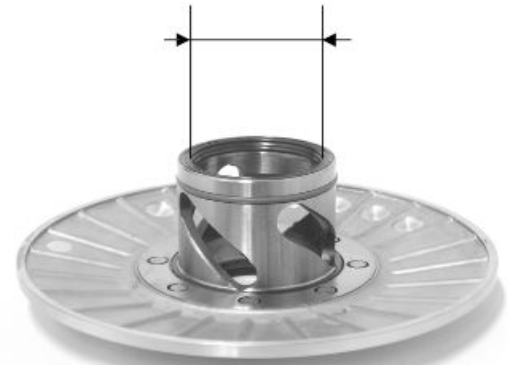
020376Y Adaptor handle

020456Y Ø 24 mm adaptor

020363Y 20-mm guide

Inspecting the driven sliding half-pulley

- Remove the two seal rings and the two O-rings
- Measure the movable half-pulley bushing inside diameter.
- Check the contact surface with the belt to make sure there are no flaws.
- Check the riveted joints are functional.
- Check the evenness of the belt contact surface.



MOVABLE DRIVEN HALF-PULLEY DIMENSIONS

Specification	Desc./Quantity
Wear limit	0.3 mm
standard diameter	Ø 41.000 - 41.035 mm
maximum allowable diameter	Ø 41.08 mm

Refitting the driven half-pulley bearing

- Support the pulley bushing adequately from the threaded side using a wooden surface.
- Fit a new roller bearing as shown in the figure.
- For the fitting of the new ball bearing, follow the example in the figure using a modular punch.

Fit the retainer ring

WARNING

N.B.

FIT THE BALL BEARING WITH THE VISIBLE SHIELDING

Specific tooling

020376Y Adaptor handle

020375Y 28 x 30 mm adaptor

020424Y Driven pulley roller casing fitting punch

Refitting the driven pulley

- Insert the new oil seals and O-rings on the movable half-pulley.
- Lightly grease the O-rings «**A**» shown in the figure.
- Fit the half-pulley over the bushing using the specific tool.
- Check that the pins are not worn and proceed to refitting them in their slots.
- Refit the torque server closure collar.
- Using a curved-spout grease gun, lubricate the driven pulley unit with approximately 6 grams of grease. Apply grease through one of the holes in the bushing until it comes out through the hole on the opposite side. This operation is necessary to avoid the presence of grease beyond the O-rings.

N.B.

THE TORQUE SERVER CAN BE GREASED WHETHER WITH BEARINGS FITTED OR WHEN THEY ARE BEING REPLACED; UNDERTAKING THE OPERATION WHEN THE BEARINGS ARE BEING SERVICED MIGHT BE EASIER.

Specific tooling

020263Y Driven pulley assembly sheath

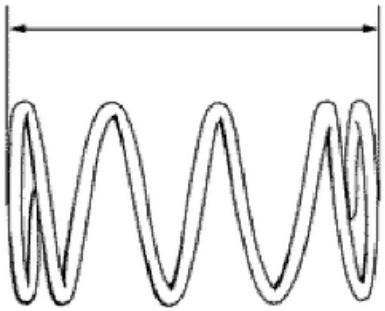
Recommended products

Molybdenum disulphide grease Lithium grease with molybdenum disulphide

Grey black grease.

Inspecting the clutch spring

- Measure the length of the spring when it is relaxed.



Characteristic

Standard length

123 mm

Acceptable limit after use:

118 mm

Refitting the clutch

To fit the clutch unit to the driven pulley, proceed as follows:

- Place the specific tool in the vice with the control screw on the vertical axis.

Specific tooling

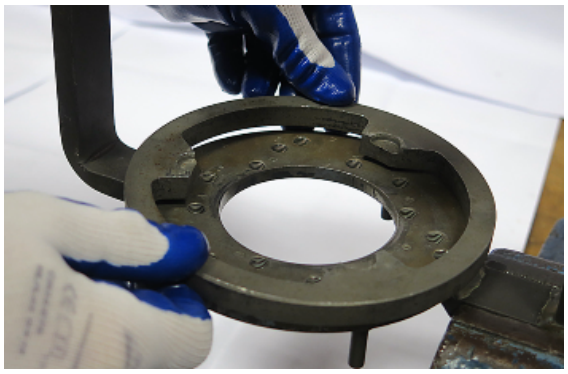
020444Y Tool for installing/removing clutch on/from driven pulley

- Prepare the tool, with the long pins inserted in the **"F"** position, screwed from the external side.

- Put the adapter ring on the tool.

Specific tooling

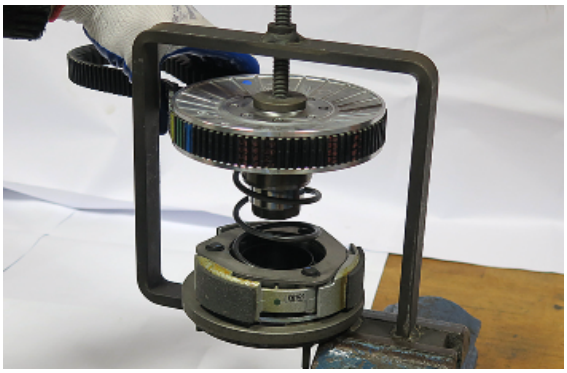
020444Y008 adapter ring



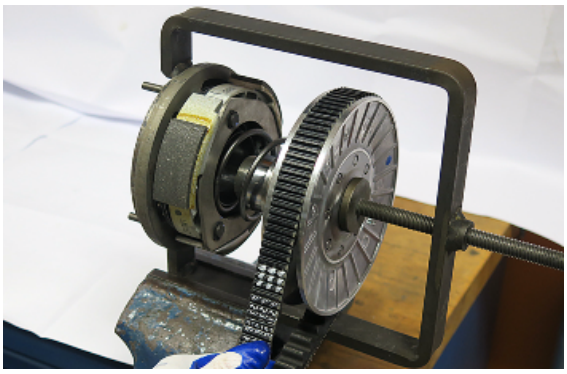
- Insert the clutch on the adapter ring.

- Lubricate the end of the spring that abuts against the torque server closing collar.
- Insert the spring with its plastic holder in contact with the clutch.

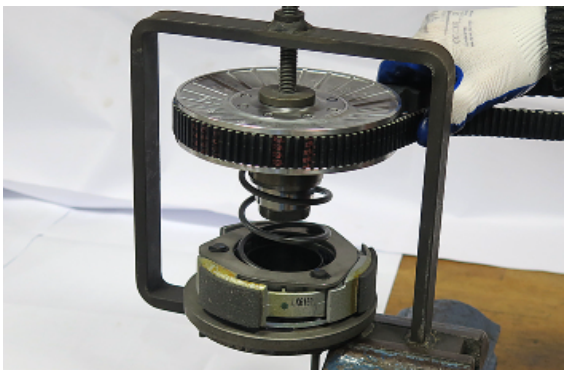
- Insert the drive belt into the pulley unit according to their direction of rotation.



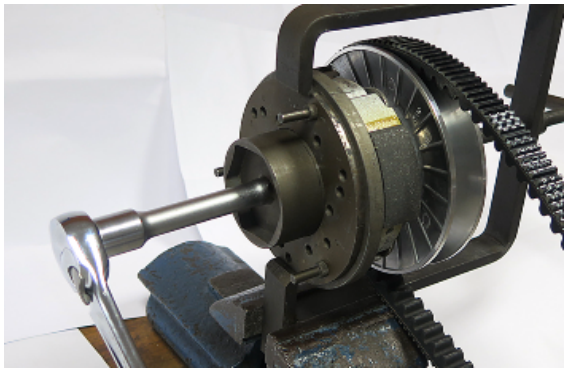
- Insert the pulley unit with the belt into the tool.



- Make sure that the clutch is fully inserted in the adapter ring.
- Slightly pre-load the spring.



- Place the tool in the clamp with the control screw on the horizontal axis.
- Fully pre-load the spring.
- Insert the hexagonal nut and tighten it to the prescribed torque using the specific 46x55 wrench.



N.B.

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

N.B.

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

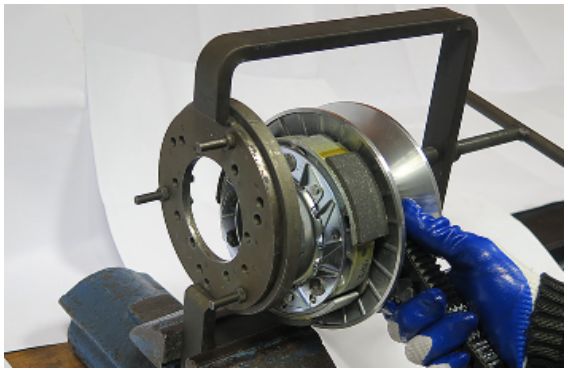
Specific tooling

020444Y009 wrench 46 x 55

Locking torques (N*m)

Centrifugal clutch - Driven pulley **48.0 ± 2.0 Nm**

- Pre-load the clutch return spring with a traction/rotation combined action and place the belt in the smaller diameter rolling position.
- Remove the driven pulley /belt unit from the tool.

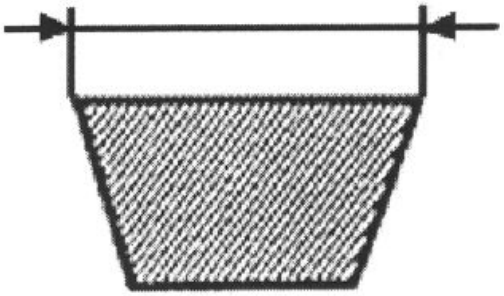


Refitting the driven pulley

- Refit the clutch bell.

Drive-belt

- Check that the drive belt is not damaged.
- Check belt for correct width.

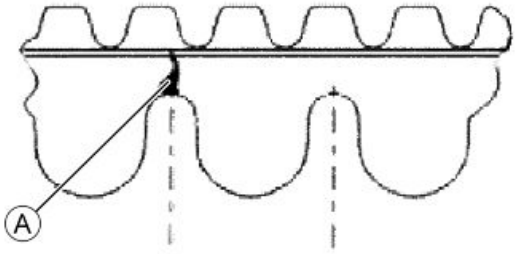


Characteristic

Drive belt - minimum width

21,0 mm

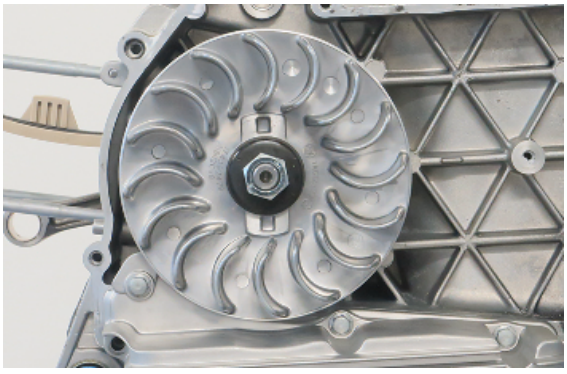
During the wear checks foreseen in the scheduled maintenance services, check that the rim bottom of the toothing does not show signs of incisions or cracking (see figure): The rim bottom of the tooth must not have incisions or cracking; if it does, change the belt.



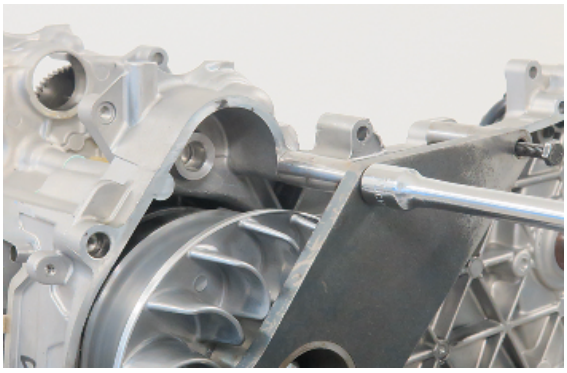
Removing the driving pulley

To remove the drive pulley, proceed as follows:

- Turn the crankshaft until the cavities of the pulley are on a vertical axis.



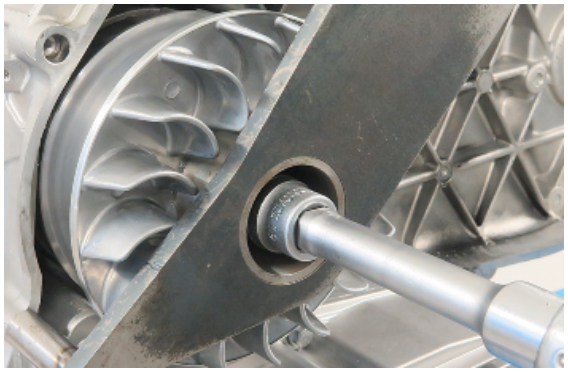
- Block the drive pulley using a specific tool.



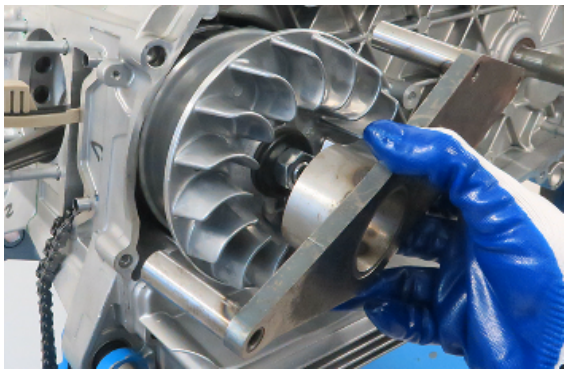
Specific tooling

021021Y Drive pulley lock

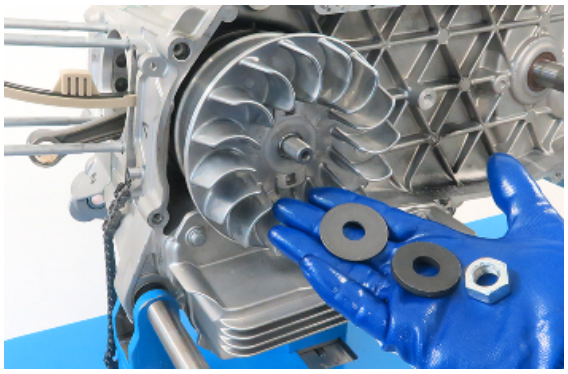
- Unscrew the pulley fixing nut.



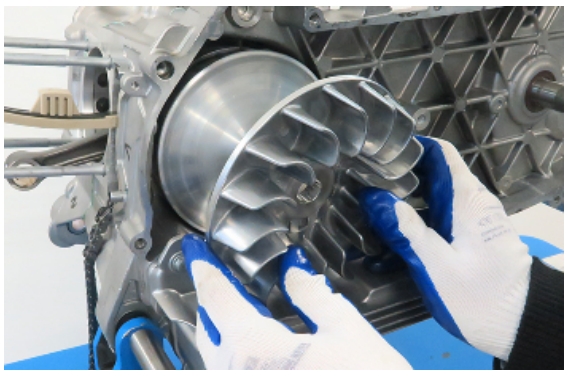
- Unscrew the screws and remove the tool.



- Remove the nut, the spring washer and the flat washer.



- Remove the stationary drive pulley half



- Remove the entire roller housing.

Inspecting the rollers case

- Check that the internal bushing shown in the figure is not abnormally worn and measure inner diameter A.
- Measure outer diameter B of the pulley sliding bushing shown in the figure.
- Check that the rollers are not damaged or worn.
- Check the sliding shoes for the variator backplate are not worn.
- Check the wear of the roller housings and of the belt facing surfaces on both pulley halves.
- Check that stationary driving pulley does not show signs of abnormal wear on the grooved edge and on the surface in contact with the belt.
- Check that the O-ring is not pushed out of shape.

CAUTION

DO NOT LUBRICATE OR CLEAN SINTERED BUSHINGS

Characteristic

Maximum allowable clearance of the mobile half-pulley bushing - sliding bushing

0.15 mm

Roller: Standard Diameter

Diameter 20.5 - 20.7 mm

Roller: Minimum diameter permitted

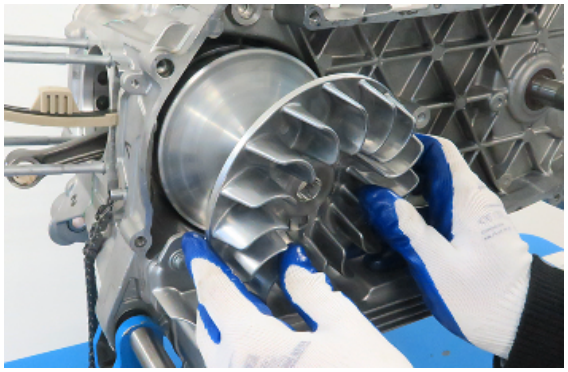
Ø 20 mm

Refitting the driving pulley

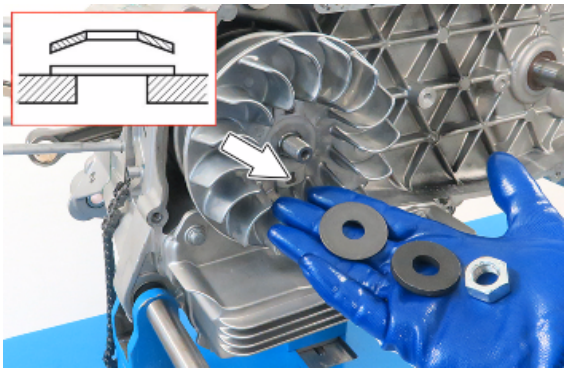
To fit the drive pulley, proceed as follows:

- Insert the entire roller housing.

- Insert the stationary drive pulley half



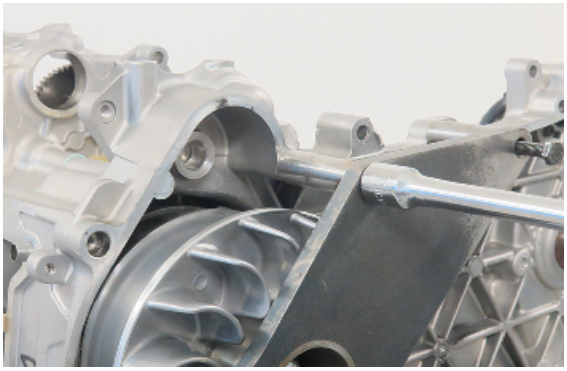
- Insert the flat washer, the spring washer and the nut.
- Pay specific attention to the orientation of the spring washer.



- Fit the specific tool.

Specific tooling

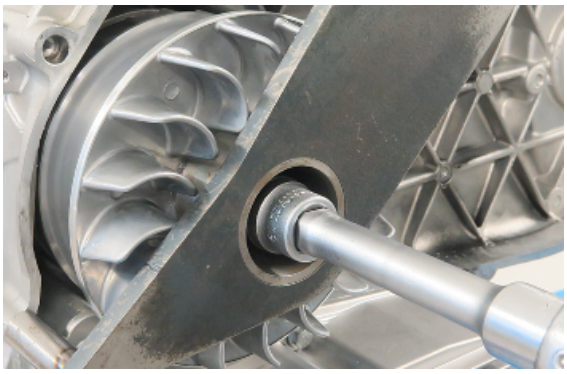
021021Y Drive pulley lock



- Tighten the fixing nut to the specified torque.

Locking torques (N*m)

Stationary drive pulley - Crankshaft **79.0 ± 4.0 Nm**



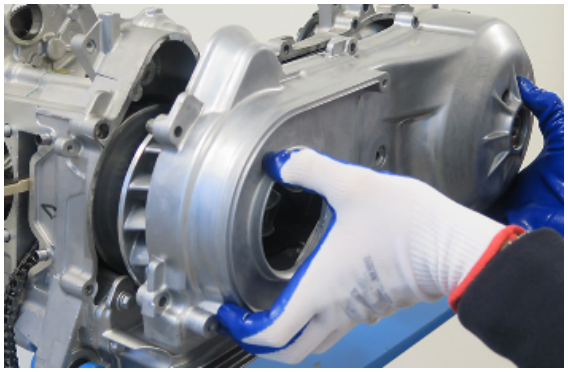
- Remove the special tool.

Specific tooling

021021Y Drive pulley lock

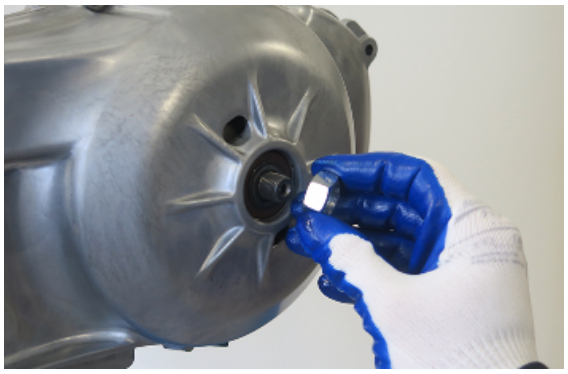
Refitting the transmission cover

- Make sure the alignment dowels are present.
- Put the transmission cover.



- Insert and tighten the fixing screws of the transmission cover to the prescribed torque.

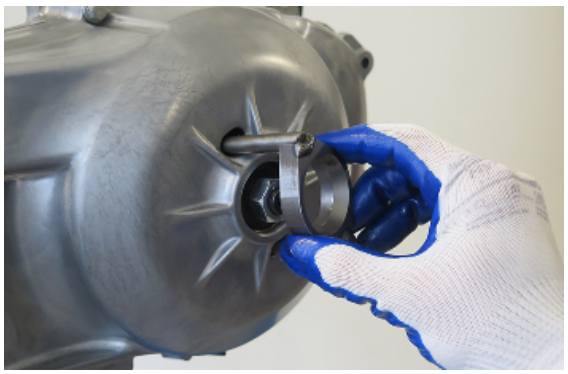
- Put the washer and the fixing nut.



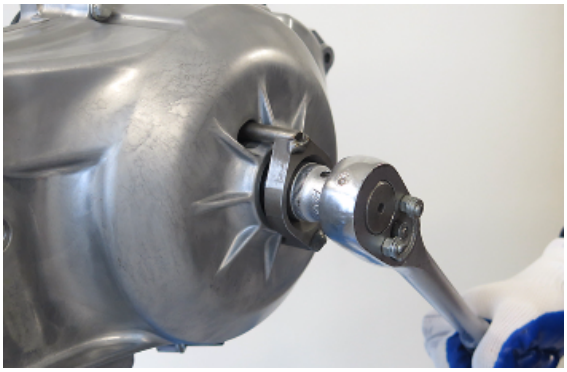
- Block clutch housing rotation using the appropriate tool.

Specific tooling

020423Y Driven pulley lock wrench



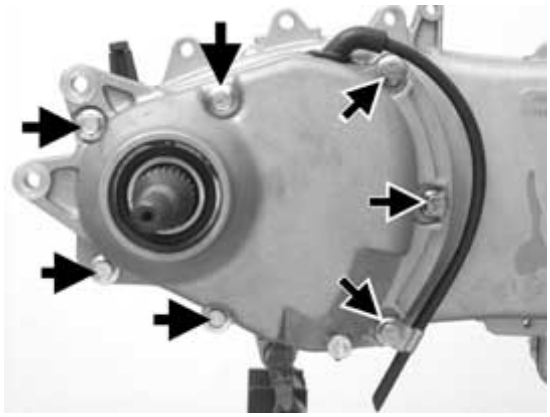
- Tighten the fixing nut to the specified torque.



End gear

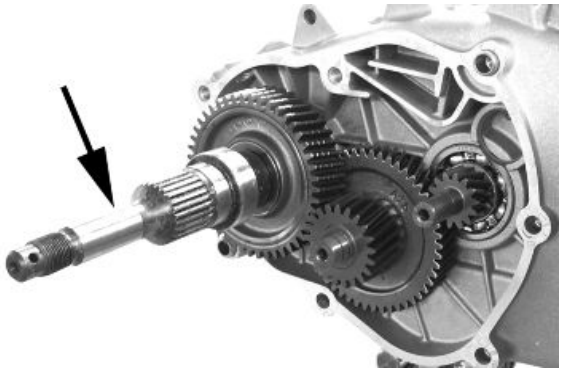
Removing the hub cover

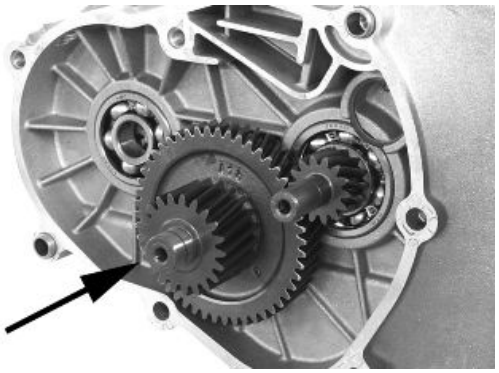
- Empty the rear hub through the oil drainage plug.
- Remove the 7 flanged screws indicated in the figure.
- Remove the hub cover and its gasket.



Removing the wheel axle

- Remove the wheel axis complete with gear.
- Remove the intermediate gear.





Removing the hub bearings

- Check the state of the bearings being examined (wear, clearance and noisiness). If faults are detected, do the following.
- Use the specific bearing extractor to remove the three 15 mm bearings (2 in the crankcase and 1 in the hub cover)

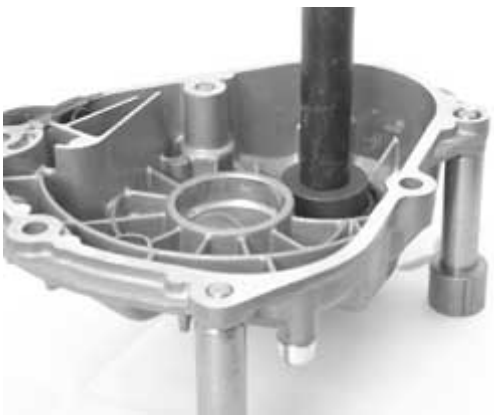
Specific tooling

001467Y013 Calliper to extract ø 15-mm bearings

Removing the wheel axle bearings

- Take out the clip on the outside of the hub cover.
- Support the hub cover and expel the bearing.

By means of the appropriate tools, remove the oil seal as in the figure.



Specific tooling

020376Y Adaptor handle

020477Y Adapter 37 mm

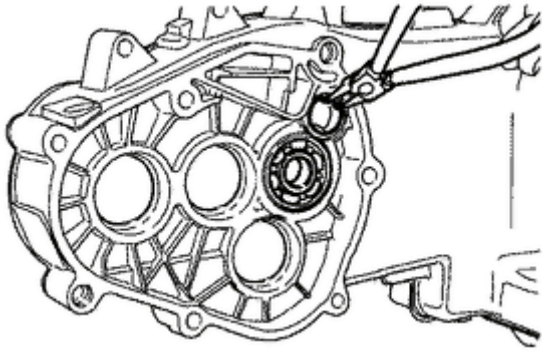
020483Y 30-mm guide

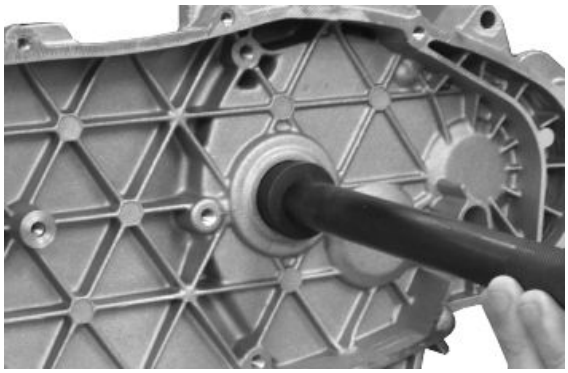
020359S 42 x 47 mm Adaptor

020489Y Hub cover support stud bolt kit

Removing the driven pulley shaft bearing

- As you need to remove the driven pulley shaft, its bearing and oil seal, remove the transmission cover as described above.
- Extract the driven pulley shaft from its bearing.
- Remove the oil seal using a screwdriver, working from inside the bearing and being careful not to damage the housing, make it come out of the belt transmission side.
- Remove the Seeger ring shown in the figure
- Remove the driven pulley shaft bearing using the modular punch.





Specific tooling

020376Y Adaptor handle

020375Y 28 x 30 mm adaptor

020363Y 20-mm guide

Inspecting the hub shaft

- Check the three shafts for wear or distortion of the toothed surfaces, the bearing housings, and the oil seal housings.
- If faults are found, replace the damaged components.

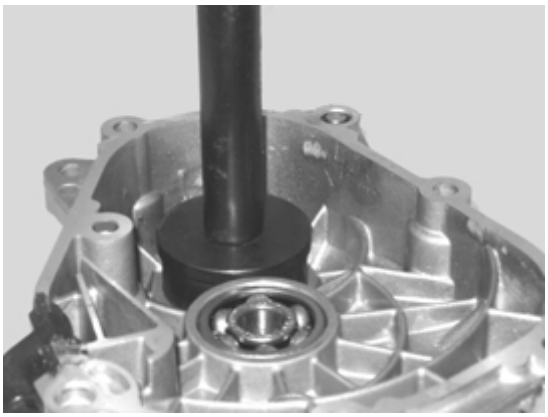
Inspecting the hub cover

- Check that the fitting surface is not dented or distorted.
- Check the bearing bearings.
- In case of faults, replace the damaged components.

Refitting the wheel axle bearing

- Support the hub cover on a wooden surface.
- Heat the crankcase cover with the specific heat gun.
- Fit the wheel shaft bearing with a modular punch as shown in the figure.
- Fit the Seeger ring.
- Fit the oil seal with seal lip towards the inside of the hub and place it flush with the internal surface by means of the appropriate tool used from the 52-mm side**.**

The 52-mm side of the adapter must be turned towards the bearing.



Specific tooling

020376Y Adaptor handle

020360S 52 x 55 mm adaptor

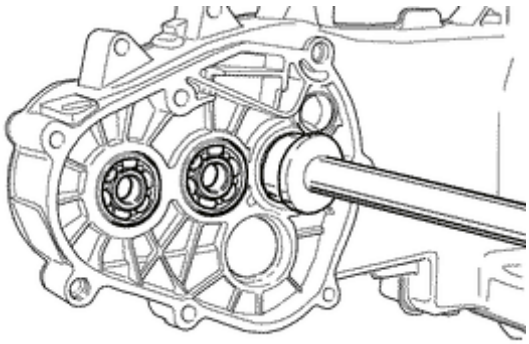
020483Y 30-mm guide

Refitting the hub cover bearings

In order to fit the hub box bearings, the engine crankcase and the cover must be heated with the special heat gun.

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

- The 42 mm side of the adapter must be turned towards the bearing.



Specific tooling

020150Y Air heater mounting

020151Y Air heater

020376Y Adaptor handle

020359S 42 x 47 mm Adaptor

020412Y 15-mm guide

N.B.

TO FIT THE BEARING ON THE COVER, ADEQUATELY SUPPORT THE COVER WITH THE STUD BOLT KIT.

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

N.B.

IF THE BEARING HAS AN ASYMMETRICAL BALL RETAINER, PLACE IT SO THAT THE BALLS ARE VISIBLE FROM THE HUB INNER SIDE.

Specific tooling

020376Y Adaptor handle

020359S 42 x 47 mm Adaptor

020363Y 20-mm guide

N.B.

WHEN FITTING THE BEARINGS ON THE ENGINE CRANKCASE, SUPPORT THE CRANKCASE PREFERABLY ON A SURFACE TO ALLOW THE BEARINGS TO BE DRIVEN VERTICALLY.

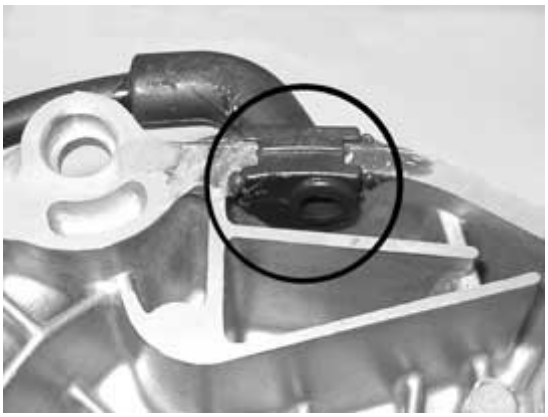
- Refit the Seeger ring with the opening facing the bearing and fit a new oil seal flush with the crankcase from the pulley side.

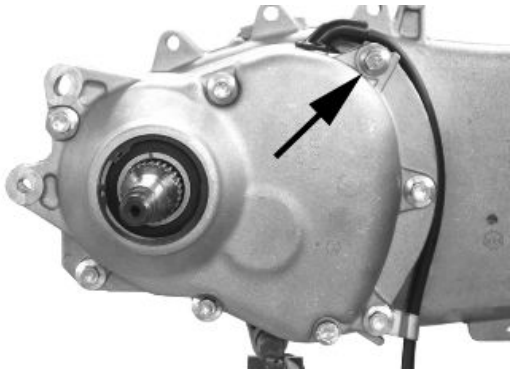
Refitting the hub bearings

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

Refitting the ub cover

- Fit a new gasket together with the alignment dowels.
- Seal the gasket of the breather pipe using black silicone sealant.
- Fit the gearbox cover, making sure the breather pipe is in the correct position.
- Position the shorter screw that can also be recognised from the different colour as shown in the figure.
- Fix the breather tube support by means of the lower screw.
- Fit the remaining screws and tighten the seven screws to the prescribed torque.



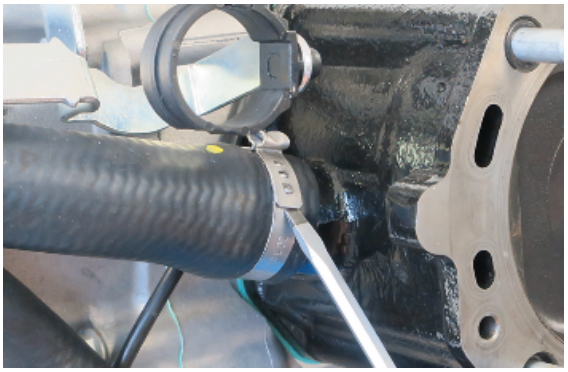


Flywheel cover

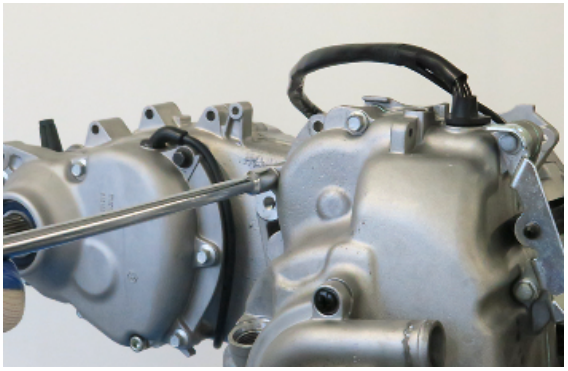
Removing the hub cover

To remove the flywheel cover, proceed as follows:

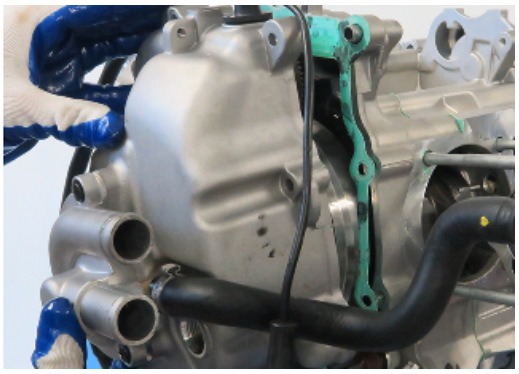
- Remove the clip fixing the sleeve to the cylinder.



- Remove the fixing screws of the flywheel cover.

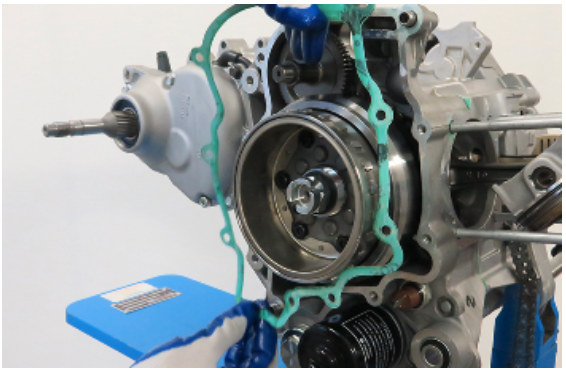


- Remove the flywheel cover.



- Remove the keying spring of the water pump shaft.

- remove the cover gasket.



Removing the stator

- Remove the two pick-up screws and the screw holding the wiring support and the three stator clamping screws shown in the figure.
- Remove the stator and its cable harness.

Refitting the stator

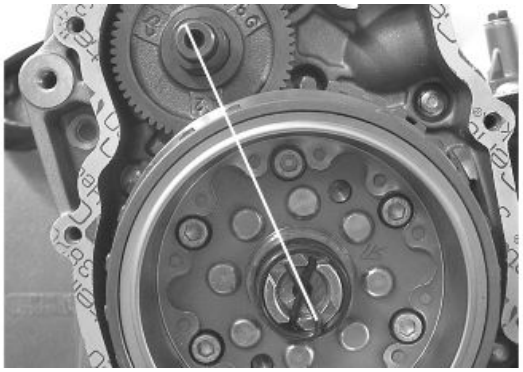
- Refit the stator and flywheel carrying out the removal procedure in reverse, tightening the retainers to the specified torque.

Locking torques (N*m)

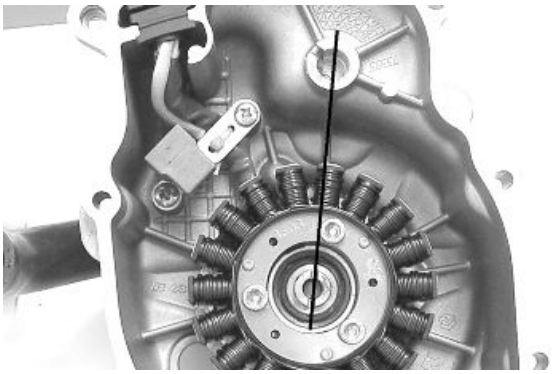
Stator assembly screws (°) 3 - 4

Refitting the flywheel cover

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



- Orient the water pump shaft with reference to the transmission gear seat as shown in the picture.



- Refit the cover over the engine and tighten the screws to the prescribed torque.
- Carry out the removal steps but in the reverse order.

CAUTION

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

Locking torques (N*m)

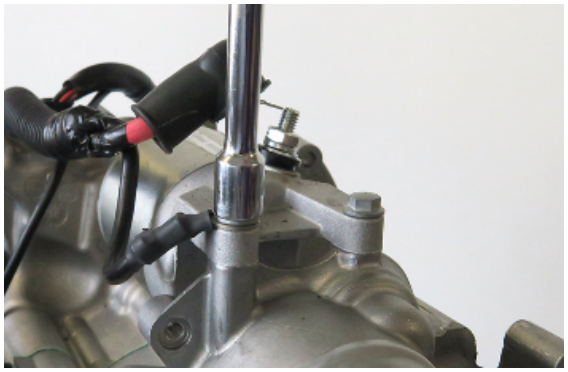
Flywheel cover screws 11 - 13

Flywheel and starting

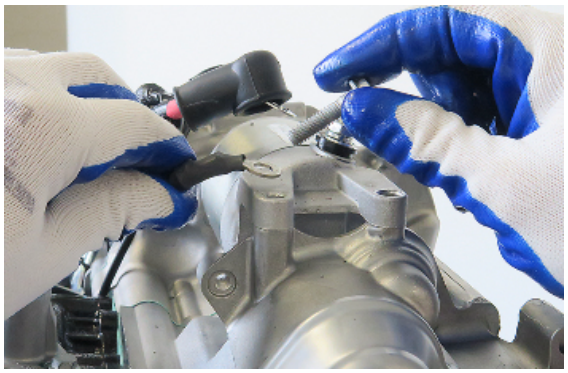
Removing the starter motor

- Disconnect the positive connector for electrical system connection to the starter motor.

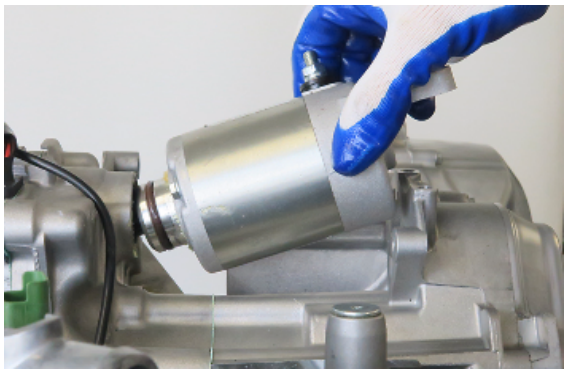
- Unscrew the starter motor's fixing screws.



- Remove the screws and the negative connector.

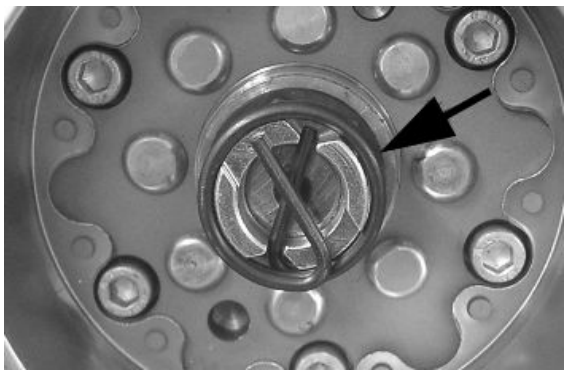


- Remove the starter motor.

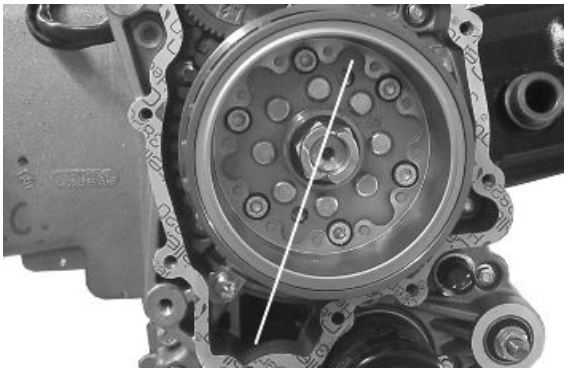


Removing the flywheel magneto

- Remove the water pump shaft and crankshaft spline clip



- Line up the two holes in the flywheel as shown in the picture



- Screw in the guide bushing that is part of the special flywheel stop tool on the flywheel as shown in the picture

- Insert the special flywheel stop tool on the flywheel as shown in the picture

Specific tooling

020627Y Flywheel lock tool

- Remove the flywheel nut with its washer
- Do up the flywheel nut by three or four threads so that the flywheel does not fall accidentally on extraction
- Screw the extractor onto the flywheel and extract it as shown in the picture

Specific tooling

020467Y Flywheel extractor

Inspecting the flywheel components

- Check the integrity of the internal plastic parts of the flywheel and the Pick-up control plate.

Refitting the free wheel

- Make sure the freewheel contact surfaces are in good condition.
- Thoroughly clean the free wheel to remove LOCTITE residue.
- Degrease the threading of the holes in the free wheel and the clamping screws.
- Apply the recommended product to the end of the screws.

Recommended products

Loctite 243 Medium strength thread-locking sealant.

Blue

- Fit the freewheel on the magneto flywheel making sure that the ground side is in contact with the flywheel itself, i.e. with wheel Seeger ring visible.
- Lock the six clamping screws in criss-cross fashion to the prescribed torque.

Locking torques (N*m)

Screw fixing freewheel to flywheel **13 - 15**

- Oil the free wheel "rollers".

Refitting the flywheel magneto

- Insert the free wheel on the flywheel as shown in the picture
- Then refit the flywheel with free wheel and transmission gear

- Using the special flywheel lock wrench, tighten up the flywheel fixing nut to the prescribed torque
- Refit the retention plate

Specific tooling

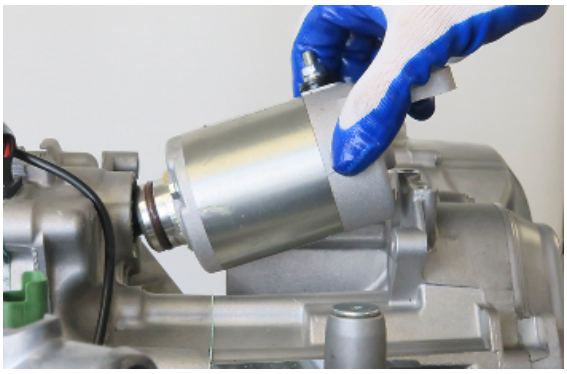
020627Y Flywheel lock tool

Locking torques (N*m)

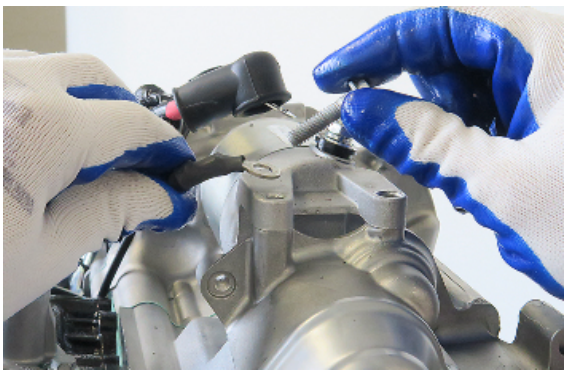
Flywheel nut 94 - 102

Refitting the starter motor

- Insert the starter motor in its seat.



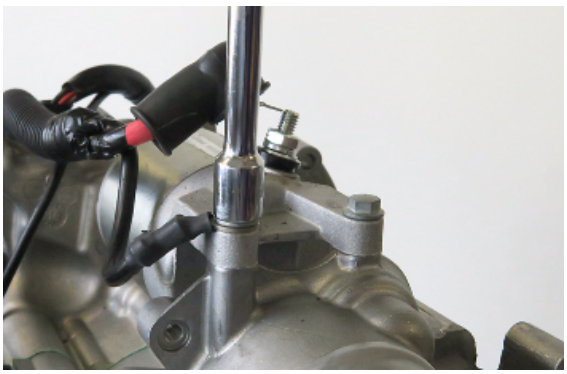
- Insert the fixing screws and the negative connector.



- Tighten the starter motor fixing screws to the recommended torque.

Locking torques (N*m)

Starter motor - Crankcase 12,0 ± 1,0

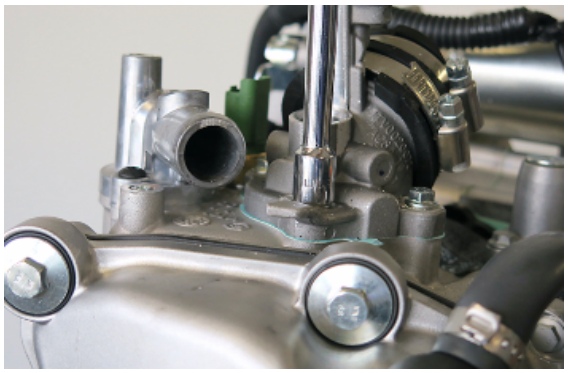


- Connect the positive connector for electrical system connection to the starter motor.

Cylinder assy. and timing system

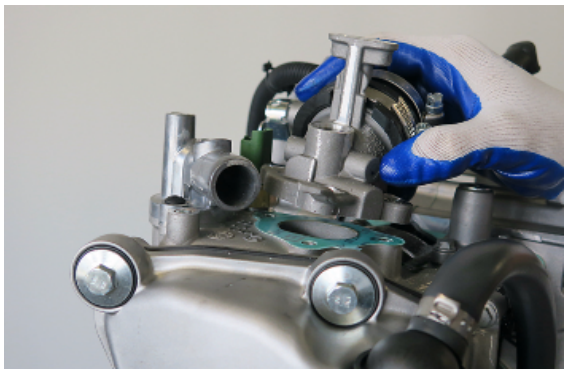
Removing the intake manifold

- Remove the throttle body and the injector.
- Unscrew the manifold fastening screws.

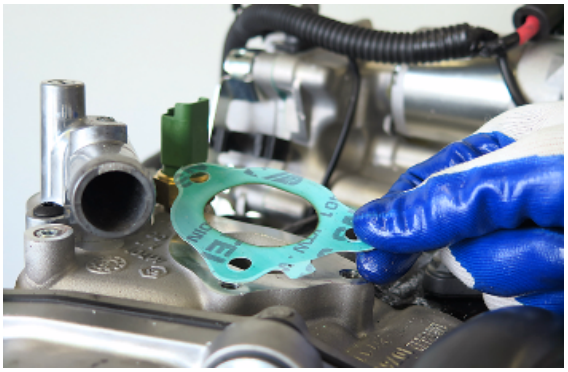


- Remove the fixing screws.

- Remove the manifold.

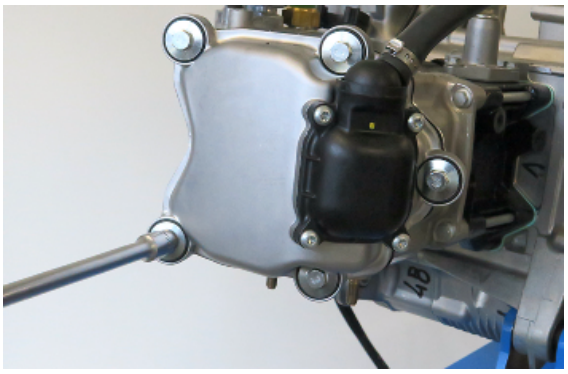


- Remove the gasket.



Removing the rocker-arms cover

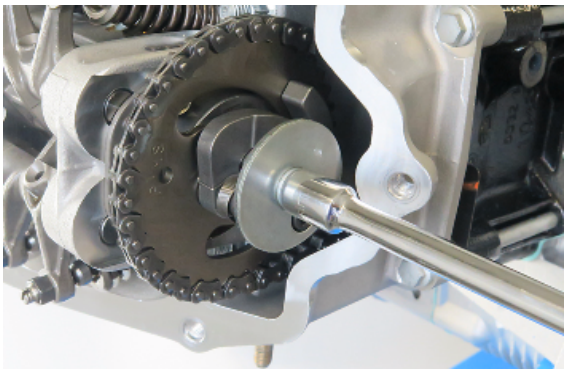
- Remove the 5 screws indicated in the figure



Removing the timing system drive

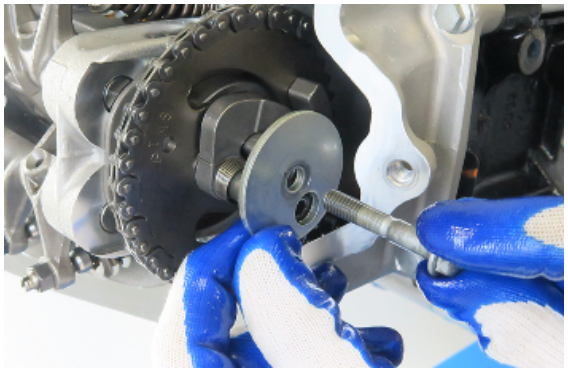
First remove the parts listed below:

- Transmission cover
- Driving pulley
- Oil sump
- Oil pump pulley cover
- O-ring from the crankshaft and the pinion separating washer

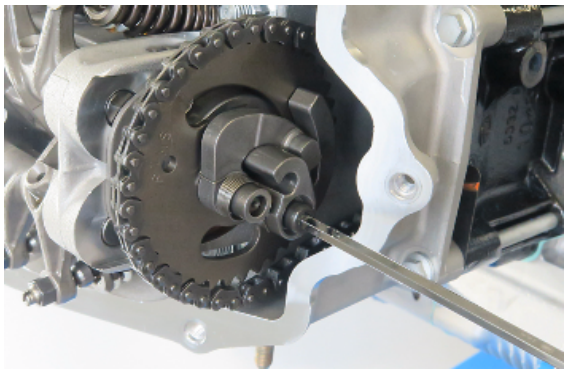


- Remove the tappet cover.
- Undo the central screw.

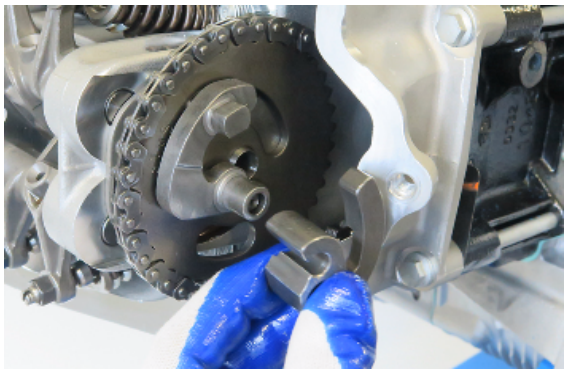
- Remove the central screw and the washer.



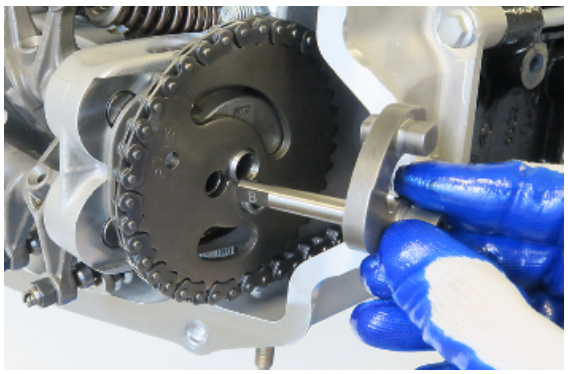
- Unscrew and remove the screw fastening the counterweight.



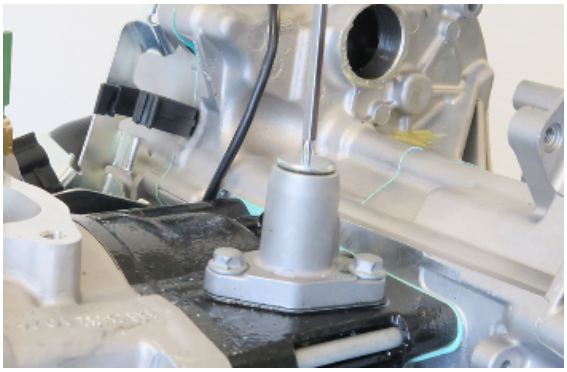
- Remove the spring and the counterweight.



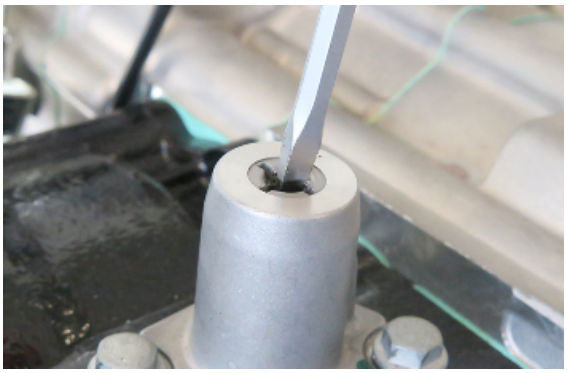
Remove the decompression counterweight.



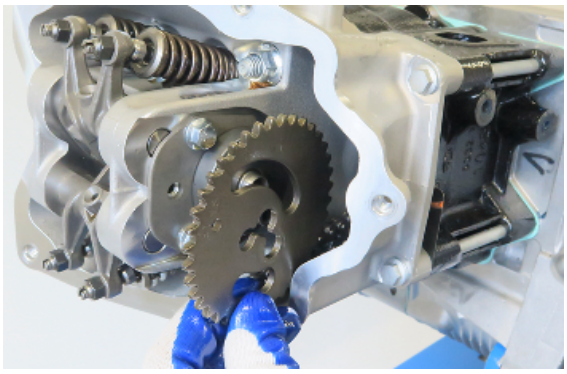
- Remove the distribution system's screw plug.



- Using a small screwdriver, loosen the chain tensioner by turning anticlockwise.



- Remove the timing system sprocket.

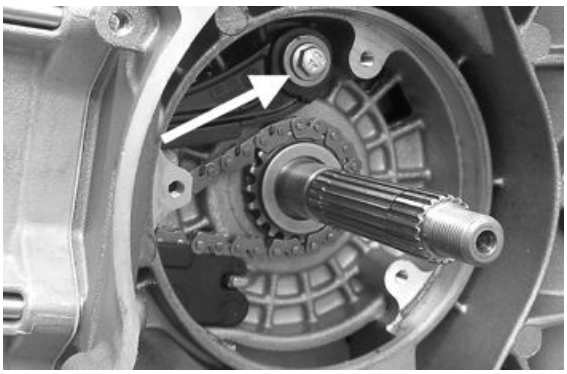


- Remove the control sprocket wheel and the timing chain.
- Remove the screws indicated in the figure, the spacer bar and the tensioner slider.

The tensioner pad must be removed from the transmission side. As regards the lower chain guide slider, it may only be removed after the head has been removed.

N.B.

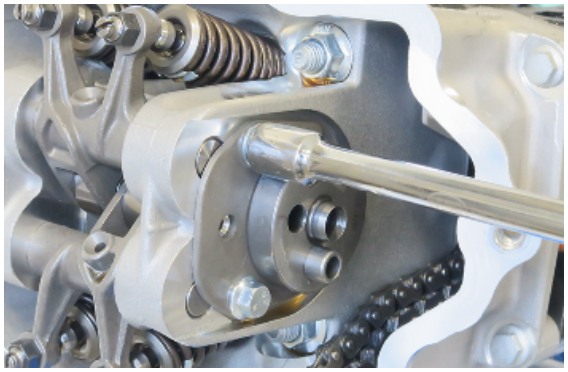
IT IS ADVISABLE TO MARK THE CHAIN IN ORDER TO ENSURE THAT THE INITIAL DIRECTION OF ROTATION IS MAINTAINED



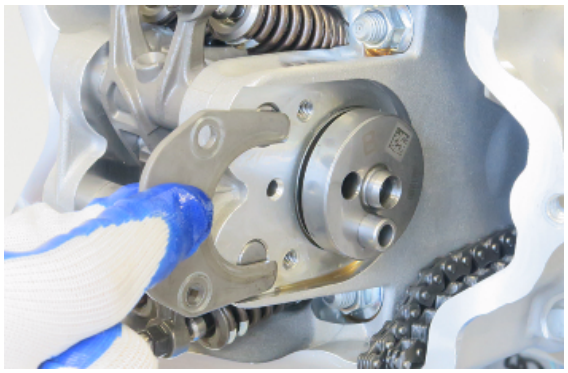
Removing the cam shaft

To remove the camshaft proceed as follows:

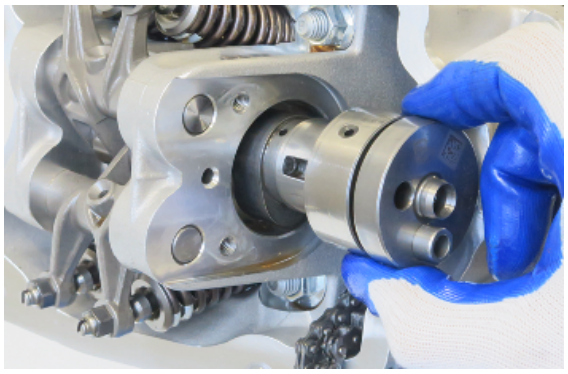
- Remove the tappet cover.
- Remove the timing system sprocket.
- Unscrew and remove the fixing screws of the camshaft retaining bracket.



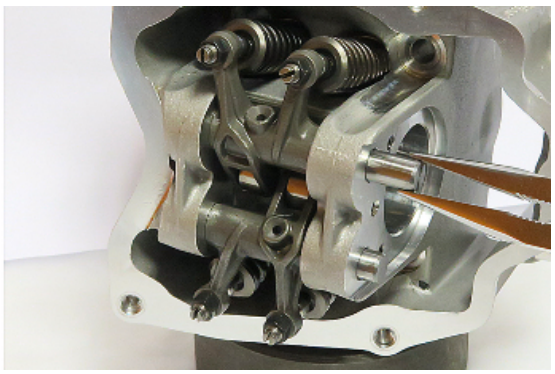
- Remove the camshaft retaining plate.



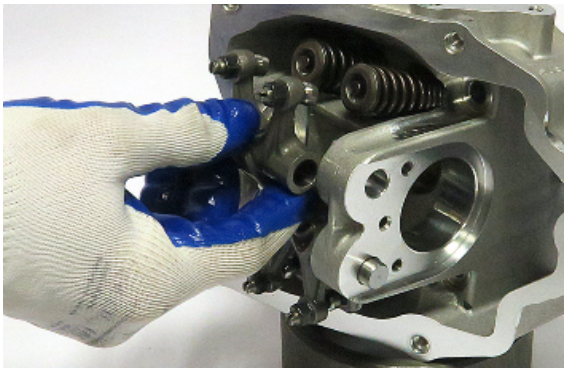
- Remove the camshaft.



- Remove the rocker pins.

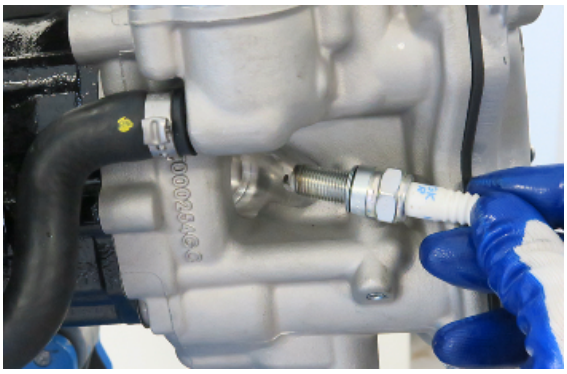


- Remove the rockers.

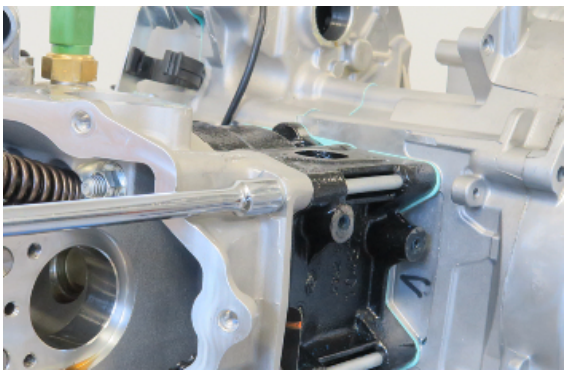


Removing the cylinder head

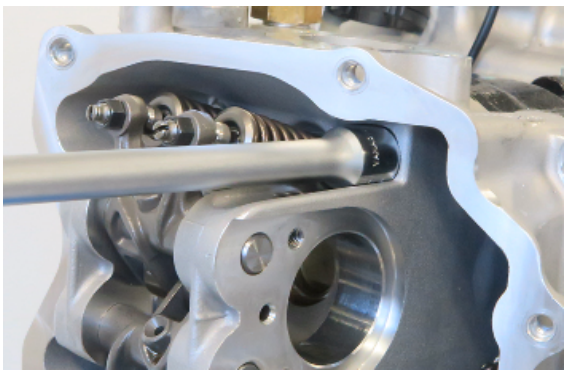
- Remove the tappet cover.
- Remove the timing system components.
- Remove the spark plug.



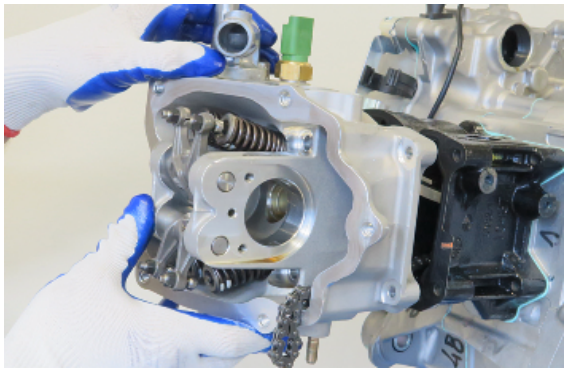
- Unscrew and remove the fixing screws on the timing system side.



- Operating in crossed sequence and in several stages, loosen the fixing nuts of the head.



- Remove the cylinder head.



Removing the valves

- Using the appropriate tool fitted with an adaptor, remove the cotters, caps, springs and valves.
- Remove the oil guards with the appropriate tool
- Remove the lower spring supports.

CAUTION

REPLACE THE VALVES IN SUCH A WAY AS TO RECOGNISE THEIR ORIGINAL POSITION ON THE HEAD.

Specific tooling

020382Y011 adapter for valve removal tool

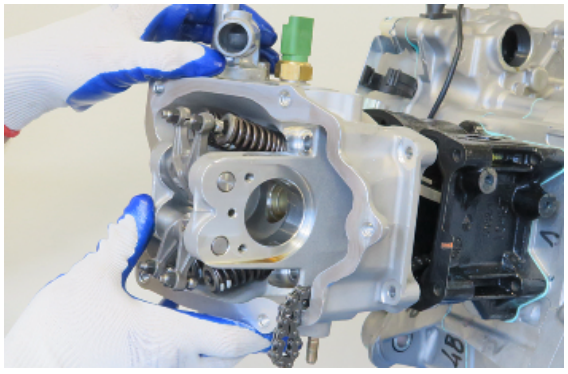
020382Y Valve cotters equipped with part 012 removal tool

020431Y Valve oil seal extractor

Removing the cylinder - piston assy.

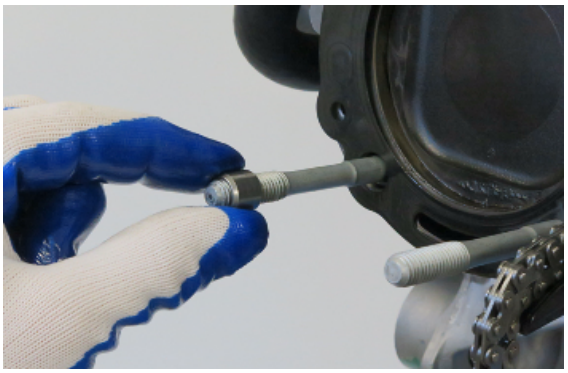
To remove the cylinder and the piston, proceed as follows:

- Remove the cylinder head.

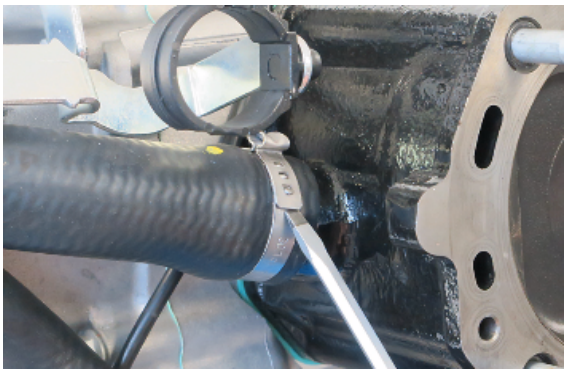


- Remove the chain tensioner sliding shoe.

- Remove the alignment dowels and the O-Rings.



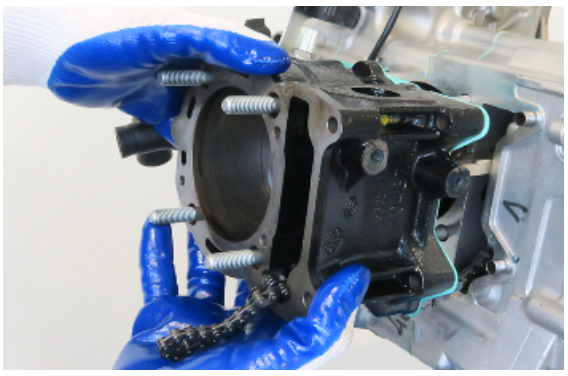
- Remove the clamp and disconnect the sleeve of the cooling system.



- Pull out the cylinder.

CAUTION

TO PREVENT DAMAGING THE PISTON, SUPPORT IT WHILE REMOVING THE CYLINDER.



- Remove the piston.

Inspecting the small end

N.B.

TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

Crankcase - crankshaft - connecting rod

Inspecting the wrist pin

N.B.

TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

Cylinder - piston assy.

Inspecting the piston

N.B.

TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

Cylinder - piston assy.

Inspecting the cylinder

N.B.

TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

Cylinder - piston assy.

Inspecting the piston rings

N.B.

TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

Piston rings

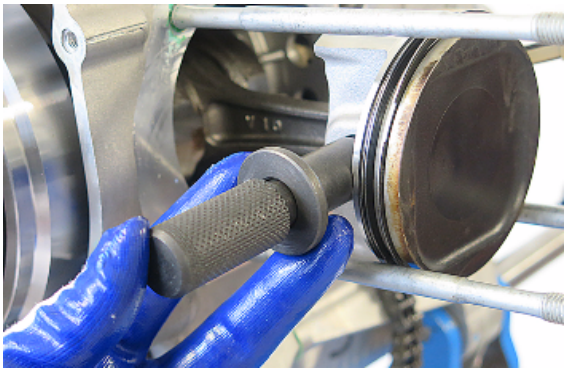
Removing the piston

- Fit the piston and wrist pin onto the connecting rod, aligning the piston arrow the arrow facing towards the exhaust.
- Fit the pin retainer ring onto the appropriate tool
- With opening in the position indicated on the tool

S = left

D= right

- Place the wrist pin retainer ring into position using a punch.
- Fit the pin retainer ring using the plug as shown in the figure.



N.B.

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

CAUTION

USING A HAMMER MIGHT DAMAGE THE STOPS' HOUSING.

Specific tooling

020454Y Tool for fitting the pin snap rings

Refitting the piston rings

- Place the scraper ring spring on the piston.
- Install the scraper ring keeping the opening opposed to the spring junction and with the writing "top" facing the piston crown. The chamfered side of the oil scraper ring should always be facing the piston crown.
- Fit the second lining with the identification letter or the writing "top" facing the piston crown. In any case, the step must be facing opposite the piston crown.
- Install the first compression ring in the direction imposed by the housing.
- It is advisable to use a fitter to facilitate the installation of the linings.

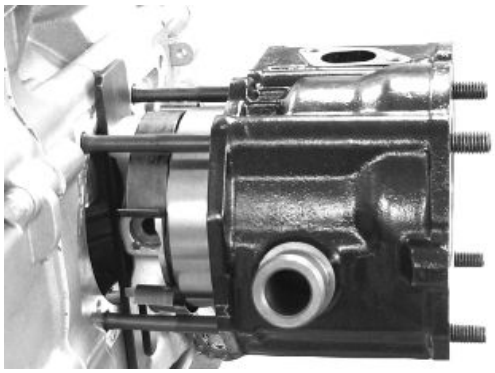
N.B.

THE TWO PISTON RINGS ARE MADE WITH A TAPERED CYLINDRICAL CONTACT CROSS-SECTION. THIS IS TO ACHIEVE A BETTER BEDDING.

- Misalign the lining openings at 120° as shown in the figure.
- Lubricate the components with engine oil.
- The engine uses the first compression lining with an L section.

Refitting the cylinder

- Insert the cylinder base gasket with the thickness determined above.
- Using the fork support and the piston ring retaining band, refit the cylinder as shown in the figure.



N.B.

BEFORE FITTING THE CYLINDER, CAREFULLY BLOW OUT THE LUBRICATION DUCT AND OIL THE CYLINDER BARREL.

Specific tooling

020426Y Piston fitting fork

020393Y Piston fitting ring

Inspecting the cylinder head

N.B.

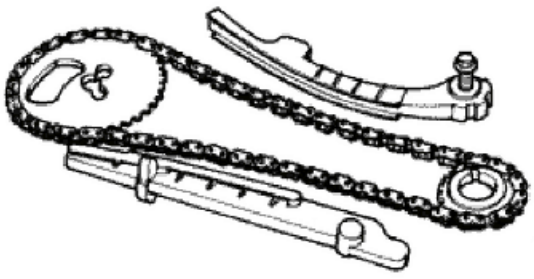
TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

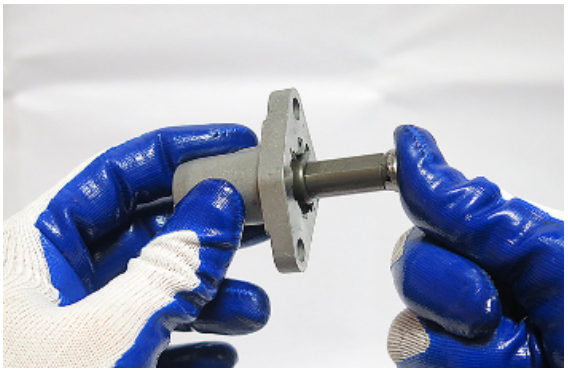
Cylinder Head

Inspecting the timing system components

- check that the fixed chain tensioner sliding shoe and the mobile chain tensioner sliding shoe are not excessively worn.
- Check that the pinion, the chain and the timing system sprocket are not excessively worn.
- If they are, replace them.



- check the correct operation of the tensioner; once opened, press to check that the plunger does not return.



Inspecting the valve sealings

N.B.

TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

Cylinder Head

Inspecting the valves

N.B.

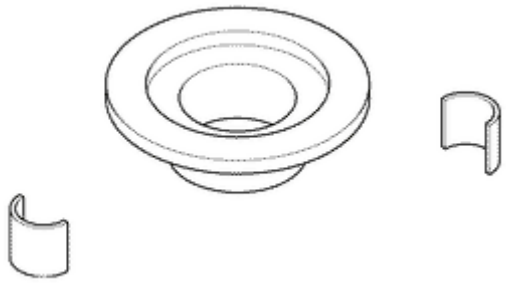
TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

Cylinder Head

Inspecting the springs and half-cones

- Check that the upper and lower supporting spring washers, the cotters and the oil seal show exhibit no signs of abnormal wear. Replace a component when worn.



- Measure the unloaded spring length.

N.B.

TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

Cylinder Head

Refitting the valves

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

N.B.

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

Specific tooling

020306Y Punch valve seal rings fitting

020382Y Valve cotters equipped with part 012 removal tool

020382Y011 adapter for valve removal tool

Inspecting the cam shaft

N.B.

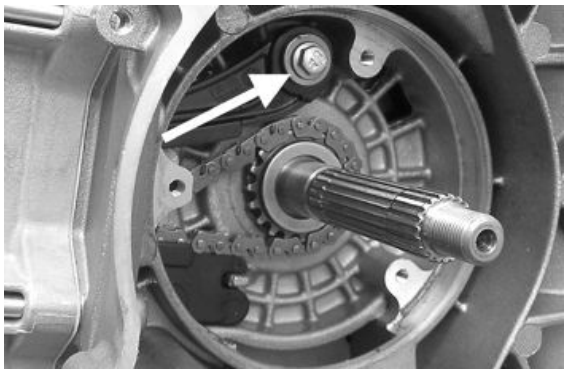
TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

Cylinder Head

Refitting the head and timing system components

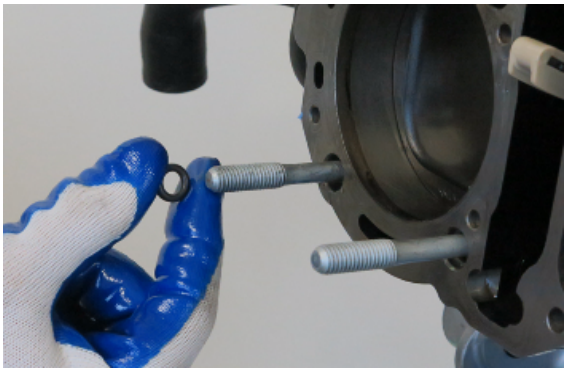
- Fit the control pinion and the timing chain on the crankshaft.
- Insert the mobile chain tensioner sliding shoe.
- Insert the fastening screw and tighten to the specified torque.



Locking torques (N*m)

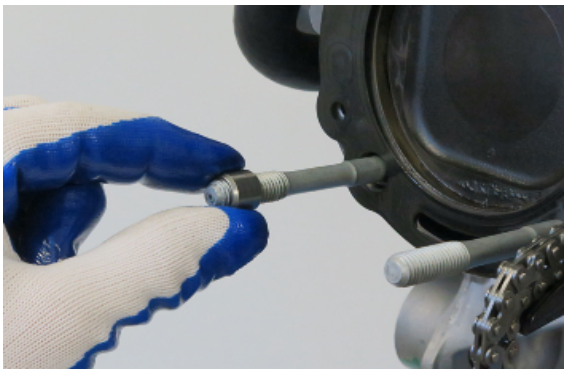
Mobile chain tensioner sliding shoe - Crankcase **12.0 ± 1.0 Nm**

- Lubricate the O-rings and insert them on the stud bolts

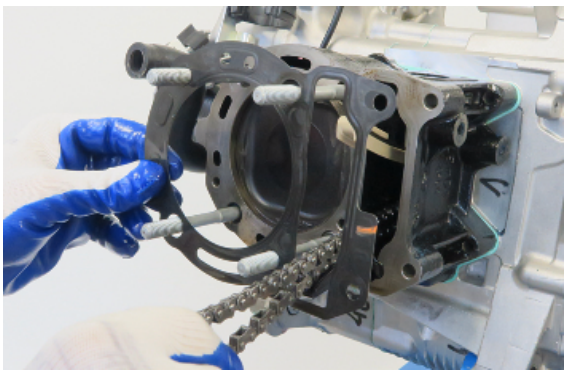


- Insert the fixed chain tensioner sliding shoe.

- Insert the two alignment dowels between the head and the cylinder.



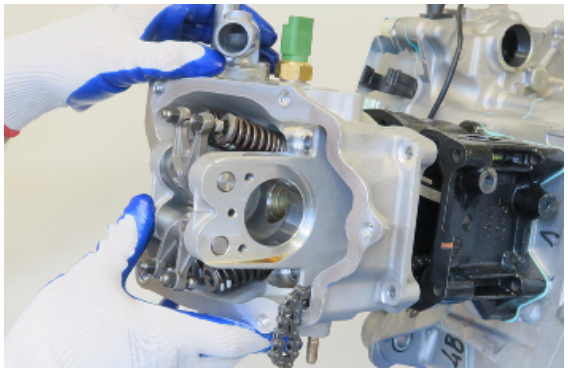
- Insert the head gasket.



- Insert the head.

N.B.

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



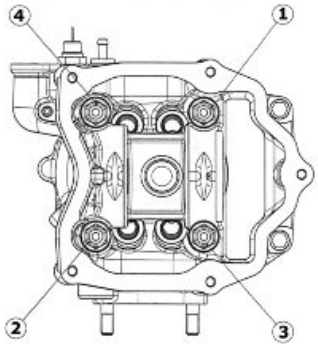
- Lubricate the stud bolt threading.

- Fit the head fixing nuts.

- Following the order shown in the figure, tighten the head fixing nuts to the prescribed torque.

Locking torques (N*m)

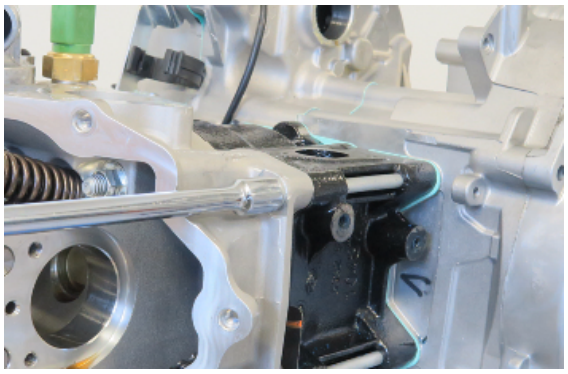
Head - Cylinder (pre-stage) 7.0 ± 1.0 Nm **Head - cylinder** 10.0 ± 1.0 Nm **Head - Cylinder (Angle rotation)** 270°



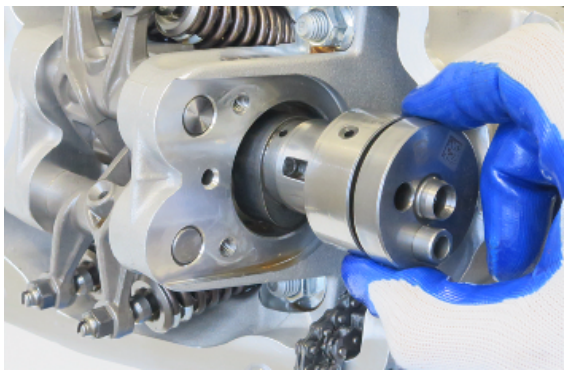
- Insert the screws on the timing system chain side and tighten them to specified torque.

Locking torques (N*m)

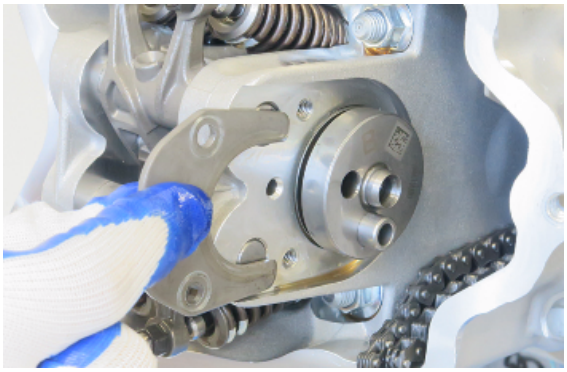
Head - Crankcase 12.0 ± 1.0 Nm



- Lubricate the two housings and insert the camshaft in its seat with the cam teeth opposing the rockers.



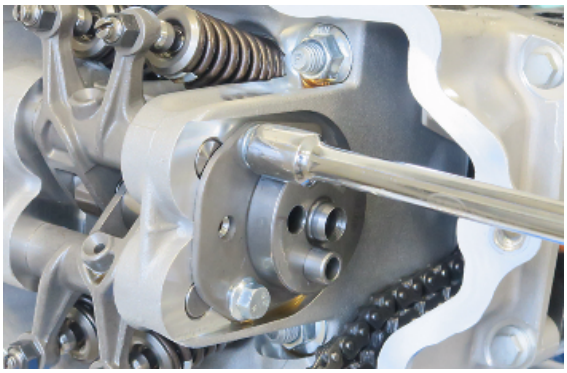
- Insert the camshaft retaining plate.



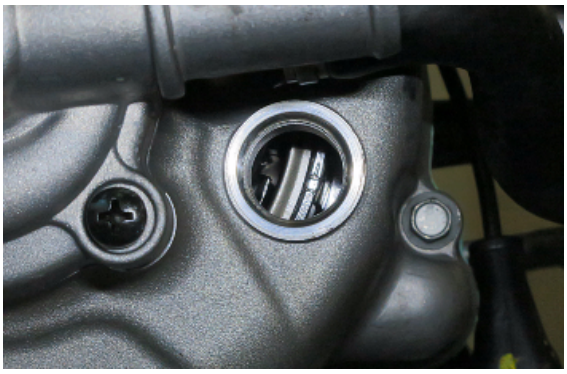
- Insert and tighten the camshaft retaining plate fixing screws, applying the recommended torque.

Locking torques (N*m)

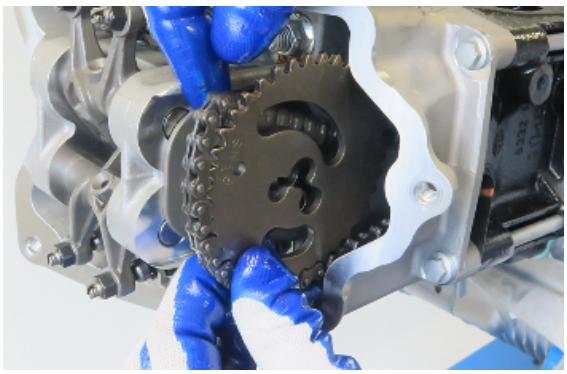
Camshaft retaining plate - Head **5.0 ± 1.0 Nm**



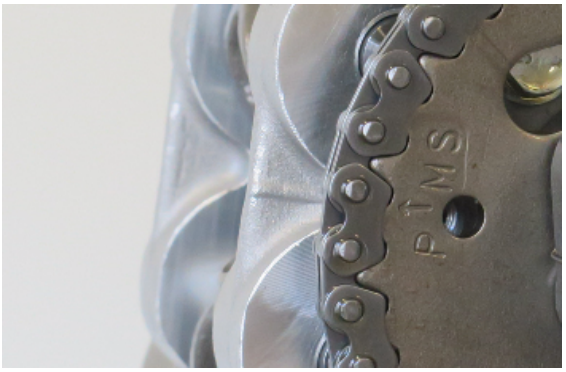
- Bring the piston to the TDC by aligning the reference marks on the flywheel and the flywheel cover.



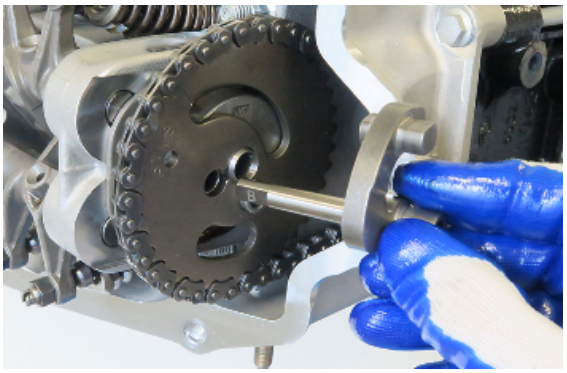
- Fit the timing system sprocket.



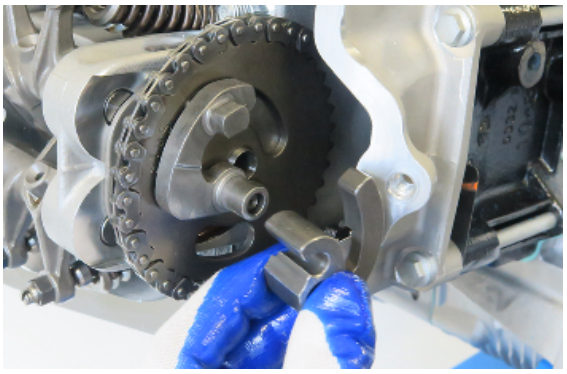
- Align the reference marks on the sprocket and head, without moving the timing chain.



- Insert the decompression counterweight.



- Fit the counterweight.

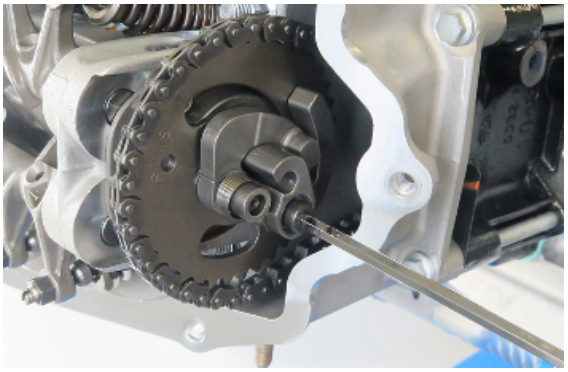


- Pre-load the spring and insert it in its seat.

- Insert the screw fastening the counterweight and tighten to the specified torque.

Locking torques (N*m)

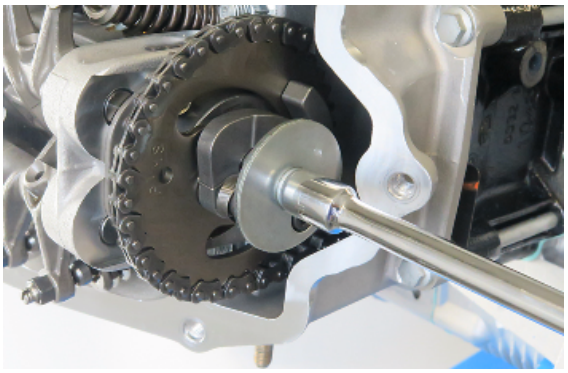
Decompression counterweight - Camshaft 8.0 ± 1.0 Nm



- Fit the washer.
- Insert the fixing screw and tighten to the specified torque.

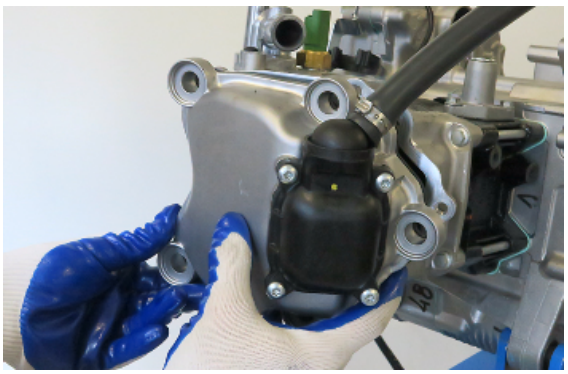
Locking torques (N*m)

Compression release weight - Camshaft 13.0 ± 2.0 Nm



Refitting the rocker-arms cover

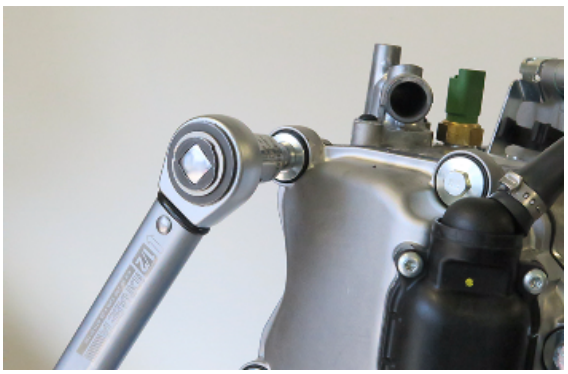
- Fit the tappet cover paying particular attention to the correct positioning of the gasket.



- Insert and tighten the fixing screws, applying the recommended torque.

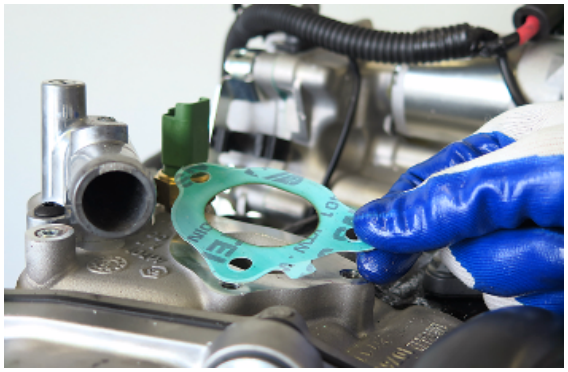
Locking torques (N*m)

Tappet cover - Head 6.5 ± 1.0 Nm

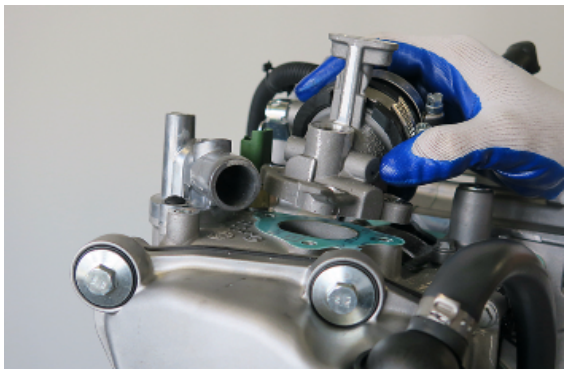


Refitting the intake manifold

- Fit a new gasket.



- Put the manifold.

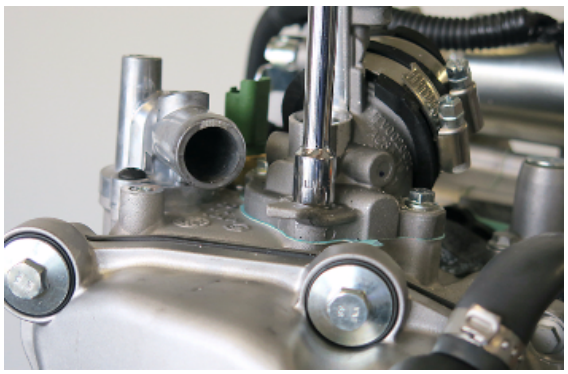


- Insert the fastening screws

- Tighten the manifold fixing screws to the prescribed torque.
- Refit the throttle body and the injector.

Locking torques (N*m)

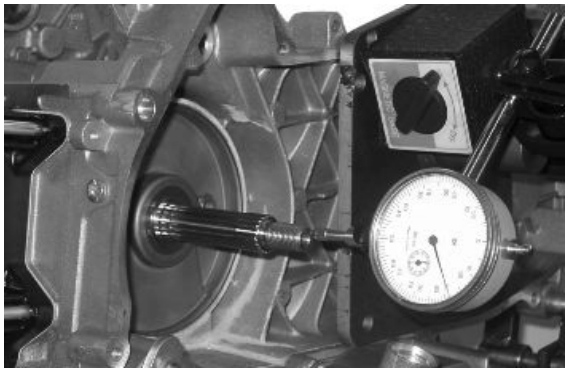
Intake manifold - Head 12.0 ± 1.0 Nm



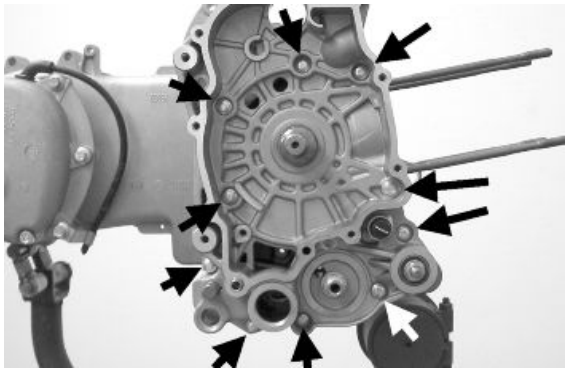
Crankcase - crankshaft

Splitting the crankcase halves

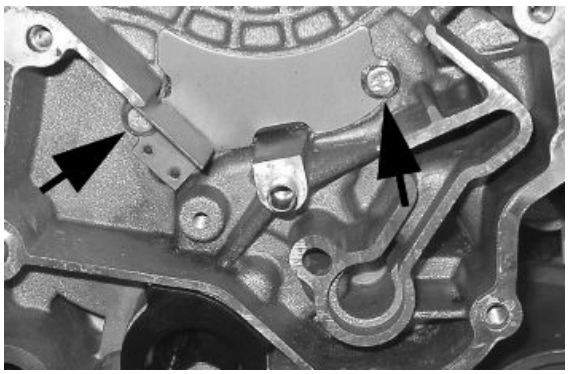
- Before opening the crankcase, it is advisable to check the axial clearance of the crankshaft. To do this, use a plate and a support with appropriate tool dial gauge.



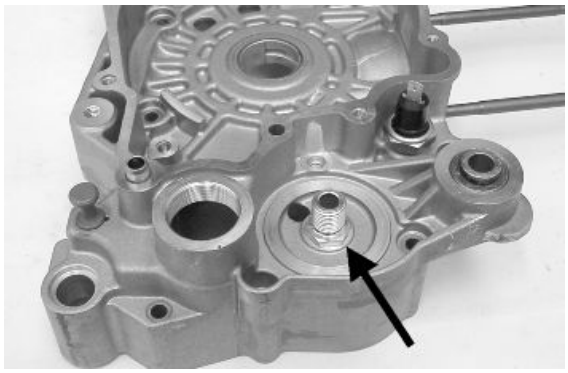
- Upper clearances are an indication of wear on the surfaces of the crankshaft casing support.
- Remove the 10 crankshaft coupling screws.
- Separate the crankcase while keeping the crankshaft in one of the two halves of the crankcase.
- Remove the crankshaft.
- Remove the half crankcase coupling gasket.
- Remove the two screws and the internal shield shown in the diagram.



- Remove the oil seal on the flywheel side.
- Remove the oil filter fitting shown in the diagram.
- Check the axial clearance on the connecting rod.
- Check the radial clearance on the connecting rod.
-Check the surfaces that limit the axial free-play are not scored and measure the width of the crankshaft between these surfaces, as shown in the diagram.



- If the axial clearance between crankshaft and crankcase is exceeding and the crankshaft does not have any defect, the problem must be due to either excessive wear or wrong machining on the crankcase.
- Check the diameters of both the bearings of the crankshaft in accordance with the axes and surfaces shown in the figure. The half-shafts are classified in two categories Cat. 1 and Cat. 2 as shown the chart below.



CAUTION

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

CAUTION

WHILE OPENING THE CRANKCASES AND REMOVING THE CRANKSHAFT, CHECK THAT THE THREADED SHAFT ENDS DO NOT INTERFERE WITH THE MAIN BUSH-

INGS. FAILURE TO OBSERVE THIS PRECAUTION CAN DAMAGE THE MAIN BUSHINGS.

CAUTION

KEEP THE CRANKSHAFT IN ONE OF THE TWO HALVES OF THE CRANKCASE WHEN SEPARATING IT. IF YOU FAIL TO DO THIS, THE CRANKSHAFT MIGHT ACCIDENTALLY FALL.

N.B.

WHEN MEASURING THE WIDTH OF THE CRANKSHAFT, MAKE SURE THAT THE MEASUREMENTS ARE NOT MODIFIED BY THE RADIUSES OF FITTINGS WITH THE CRANKSHAFT BEARINGS.

N.B.

TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

Crankcase - crankshaft - connecting rod

Inspecting the crankshaft alignment

N.B.

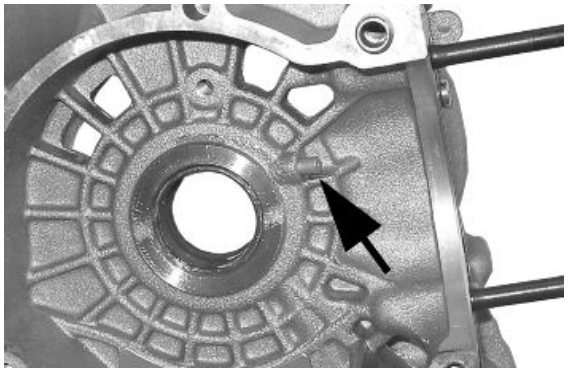
TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

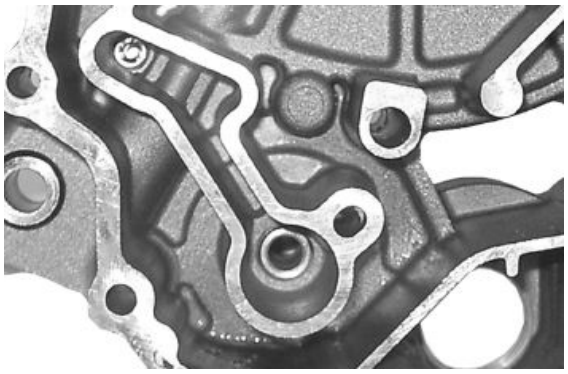
See also

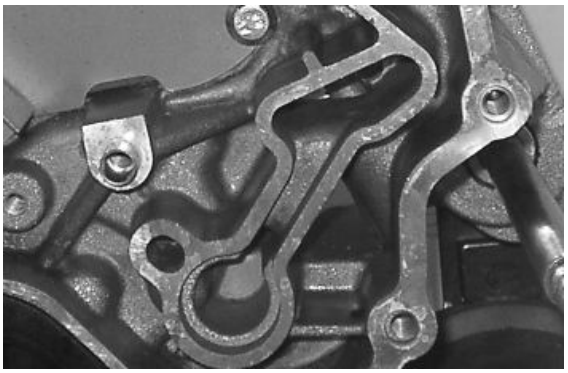
Crankcase - crankshaft - connecting rod

Inspecting the crankcase halves

- Before proceeding to check the crankcase halves, thoroughly clean all surfaces and oil ducts.
- On the transmission-side crankcase half, take particular care when handling the oil pump compartment and the oil ducts, the by-pass duct, the main bushings and the cooling jet on the transmission side (see diagram).
- Take particular care, also, that there are no signs wear in the oil by-pass valve housing (see Chapter Lubrication), as this could prevent a good seal in the piston, which regulates the oil pressure.
- On the flywheel side crankcase half, take particular care cleaning the oil ducts for the main bushings, the oil duct for the jet that lubricates the cylinder head and the oil drainage duct at the flywheel side oil seal.







- Inspect the coupling surfaces on the crankcase halves for scratches or deformation, taking particular care with the cylinder/crankcase surfaces and the crankcase halves surfaces.
- Defects in the crankcase coupling gasket between the crankcase halves or the mating surfaces shown in the diagram, could cause a drop in the oil pressure lubricating the main bushings and connecting rod.
- Check the main bearing seats that limit axial clearance in the crankshaft show no signs of wear. The dimension between these seats is measured by way of the procedure described previously for measuring the crankshaft axial clearance and dimensions.

N.B.

THE JET IS FED THROUGH THE MAIN BUSHINGS. PROPER OPERATION OF THIS COMPONENT IMPROVES PISTON CROWN COOLING. CLOGGING HAS EFFECTS THAT ARE DIFFICULT TO DETECT (PISTON TEMPERATURE INCREASE). FAILURE OR LEAKS CAN CAUSE A CONSIDERABLE DROP IN THE LUBRICATION PRESSURE FOR MAIN BUSHINGS AND CONNECTING ROD.

N.B.

THE HEAD LUBRICATION CHANNEL IS PROVIDED WITH A SHUTTER JET;: THIS GIVES A "LOW PRESSURE" HEAD LUBRICATION; THIS CHOICE WAS MADE TO REDUCE THE OIL TEMPERATURE IN THE SUMP. THE JET CLOGGING IMPAIRS THE HEAD LUBRICATION AND THE TIMING MECHANISMS. A JET FAILURE CAUSES A DECREASE OF THE MAIN BUSHING AND CONNECTING ROD LUBRICATION PRESSURE.

Inspecting the crankshaft plain bearings

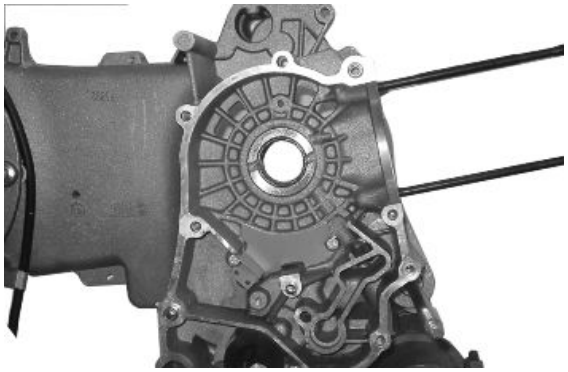
- To obtain a good bushing lubrication it is necessary to have both an optimal lubricating pressure and a good oil flow rate; the bushings must be correctly positioned so as not to obstruct the oil supply channels.
- The main bushings are comprised of two half-bearings, one with holes and channels for lubrication whereas the other is solid.

Characteristic

Lubrication pressure

3.5 - 4 bar

- The solid half-bearing is intended to stand the thrusts caused by combustion, and for this reason it is arranged opposite the cylinder.
- To prevent shutters in the oil feeding channels, the matching surface of the two half-bearings must be perfectly orthogonal to the cylinder axis, as shown in the figure.
- The oil feeding channel section is also affected by the bushings driving depth compared with the crankshaft axial clearance of the limiting surface.



N.B.

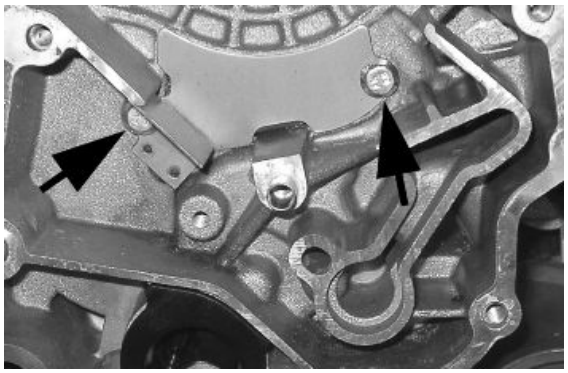
TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

Crankcase - crankshaft - connecting rod

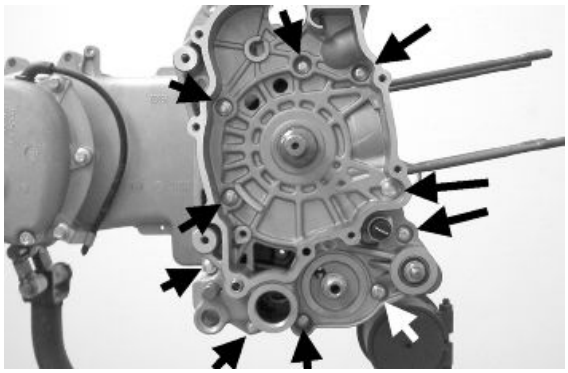
Refitting the crankcase halves

- Fit the internal shield by locking the two screws to the prescribed torque.
- Fit the oil filter fitting and tighten it to the prescribed torque
- Position the oil pre-filter element as shown in the picture.
- Place a new gasket on one of the crankcase halves, preferably on the transmission side, together with the alignment dowels.
- Lubricate the main bushings and insert the crankshaft in the transmission side crankcase half.
- Reassemble both crankcase halves.
- Fit the 10 screws and tighten them to the specified torque.
- Fit a new O-ring on the pre-filter and lubricate it.
- Insert the filter on the engine with the relative cap. Tighten to the prescribed torque.



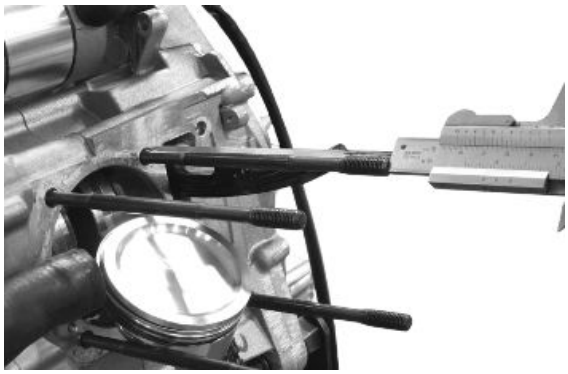
Locking torques (N*m)

Internal engine crankcase bulkhead (transmission-side half shaft) screws 4 - 6 Engine-crankcase coupling screws 11 ÷ 13 Oil filter on crankcase fitting 27 - 33 Engine oil drainage plug/ mesh filter 24 to 30



Studs

Check that the stud bolts have not worked loose from their seat in the crankcase.
Check the depth of stud bolt driving with a gauge, as indicated in the picture. If it varies significantly from the driving depth indicated, it means that the stud bolt has yielded.
In this case, replace it.

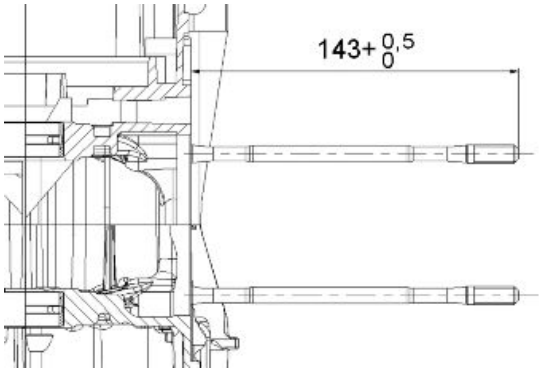


By working on two fitted cylinder head fixing nuts, nut and lock nut, as shown in the picture, remove the stud bolt from its seat.

Clean the threaded seat on the carter thoroughly.

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

Tighten up to the depth of the driving indicated.



Recommended products

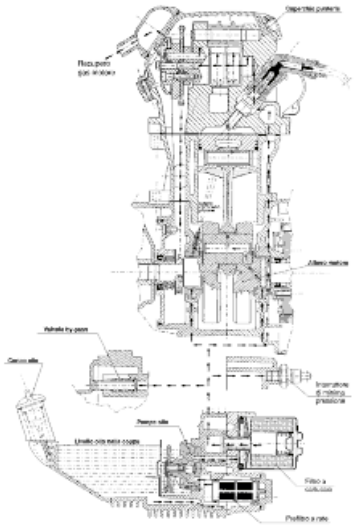
Loctite 270 High resistant threadlock.

green

Lubrication

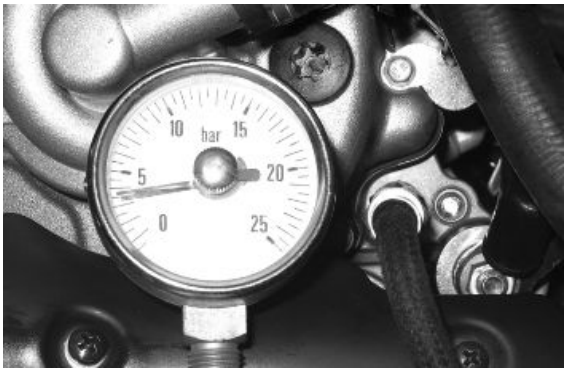
Conceptual diagrams

LUBRICATION CIRCUIT



Oil pressure check

- Remove the electrical minimum oil pressure switch connection and remove the switch.
- Check that the oil pressure reading is between 0.5 and 1.2 atm with the engine idling at 1650 rpm and the oil at the required temperature (wait for at least one electric ventilation).
- Check that the oil pressure is between 3.2 and 4.2 atm with the engine running at 6,000 rpm and the oil at the required temperature.
- Remove the appropriate tools once the measurement is complete, refit the oil pressure switch and washer, tightening it to the specified torque and fit the flywheel cover.
- If the oil pressure is not within the specified limits, in the following order, check: the oil filter, the oil by-pass valve, the oil pump and the crankshaft seals.



N.B.

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

Characteristic

Oil pressure

Minimum pressure admitted at 6,000 rpm: 3.2 atm.

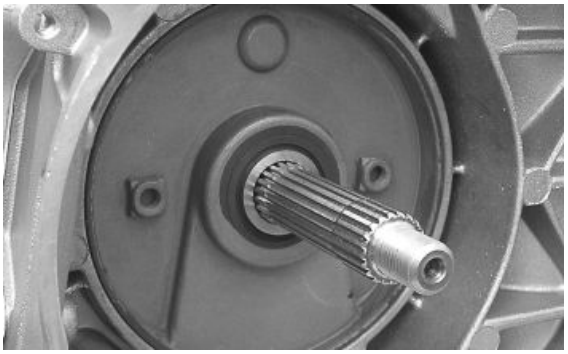
Locking torques (N*m)

Minimum oil pressure sensor **12 ÷ 14**

Crankshaft oil seals

Removal

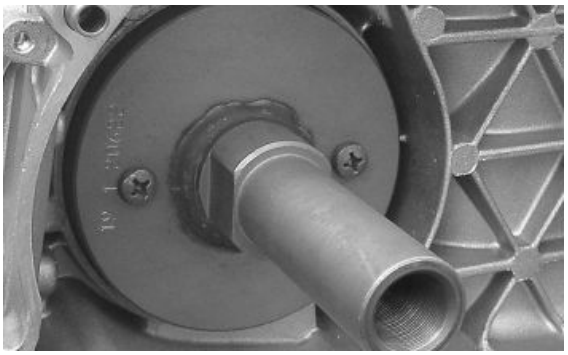
- Remove the transmission cover and the complete drive pulley beforehand



- Install the base of the appropriate tool on the oil seal using the screws provided

Specific tooling

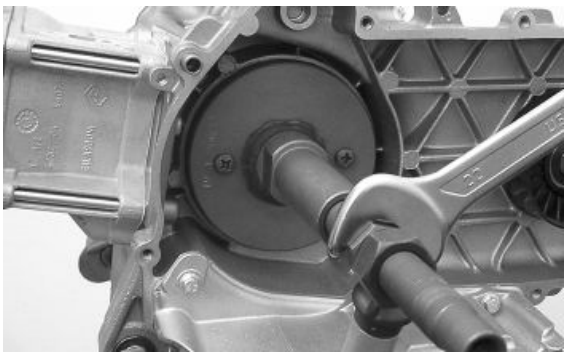
020622Y Transmission-side oil seal punch



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

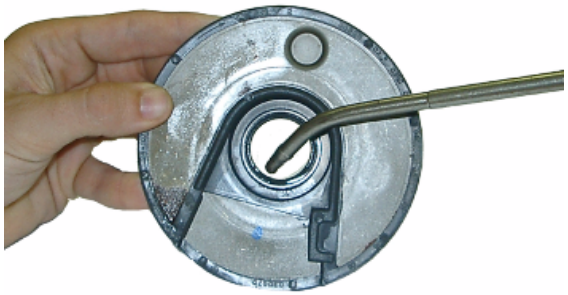
Specific tooling

020622Y Transmission-side oil seal punch



Refitting

- Always use a new oil seal upon refitting
- Prepare the new oil seal by lubricating the sealing lip
- Pre-assemble the oil seal with the appropriate tool by positioning the screws.
- Insert the sheath over the crankshaft
- Insert the tool with the oil seal on the crankshaft until it comes into contact with the crankcase
- Insert the adaptor bushing of the tool in the hole on the crankcase.



- Orientate the oil seal by inserting the bracket which is part of the appropriate tool
- Tighten the threaded bar onto the crankshaft as far as it will go
- Use the nut to move the base of the tool until you can see the end of the oil seal driving stroke
- Remove all the tool components following the procedure but in reverse order.

CAUTION

DO NOT LUBRICATE THE KEYING SURFACE ONTO THE ENGINE CRANKCASE

CAUTION

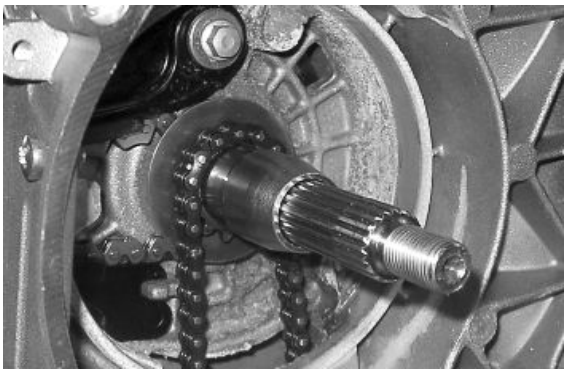
ORIENT THE OIL SEAL BY POSITIONING THE CHAIN HOUSING CHANNEL FACING DOWNWARDS. WHEN THE POSITION IS REACHED, DO NOT RETRACT THE OIL SEAL. FAILURE TO COMPLY WITH THIS RULE CAN CAUSE A WRONG POSITIONING OF THE OIL SEAL SHEATH

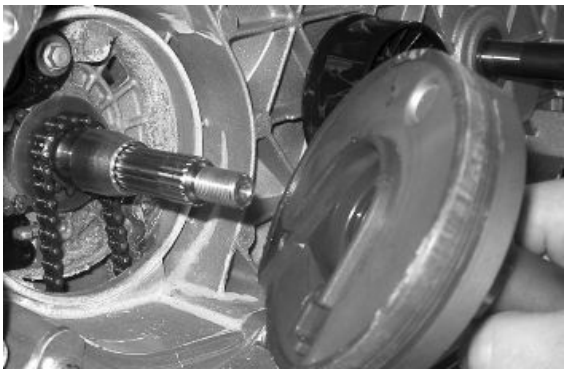
CAUTION

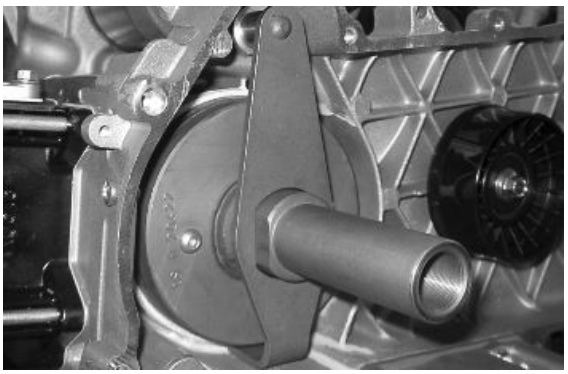
FAILURE TO COMPLY WITH THIS ASSEMBLY PROCEDURE CAN SERIOUSLY DAMAGE THE ENGINE DUE TO THE WRONG TENSIONING OF THE OIL PUMP CONTROL CHAIN

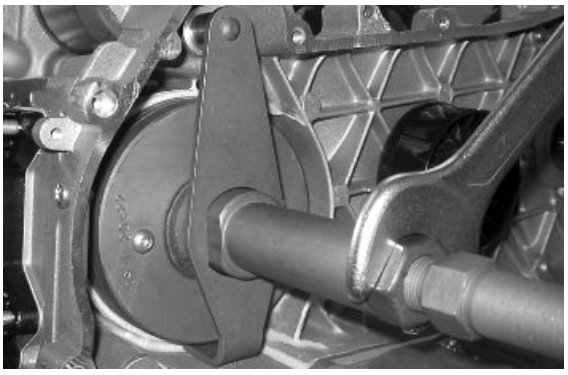
Specific tooling

020622Y Transmission-side oil seal punch





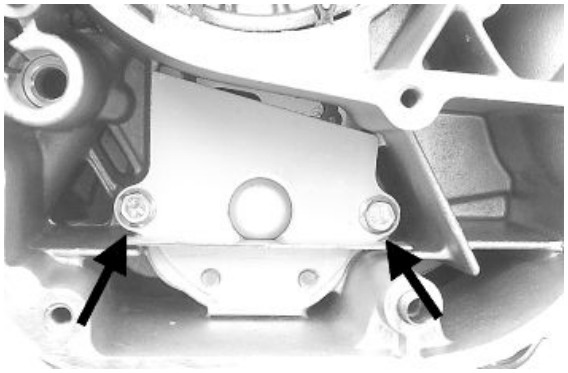




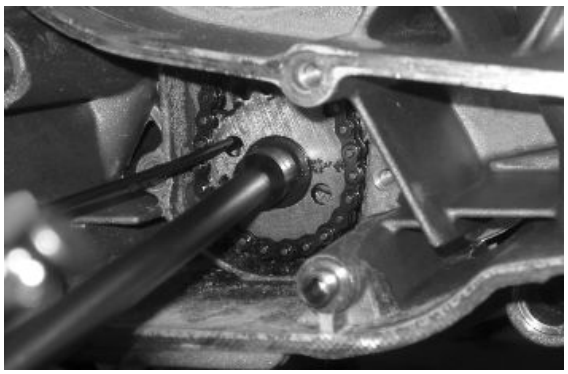
Oil pump

Removal

- Undo the two clamping screws in the figure and remove the cover over the pump control sprocket.



- Block the rotation of the oil pump driving pulley by inserting a screwdriver through one of its holes
- Remove the central screw with cup washer, as shown in the diagram.
- Remove the chain with the sprocket.
- Remove the control sprocket wheel and its O-ring.
- Remove the oil pump by undoing the two screws in the figure.
- Remove the oil pump seal.

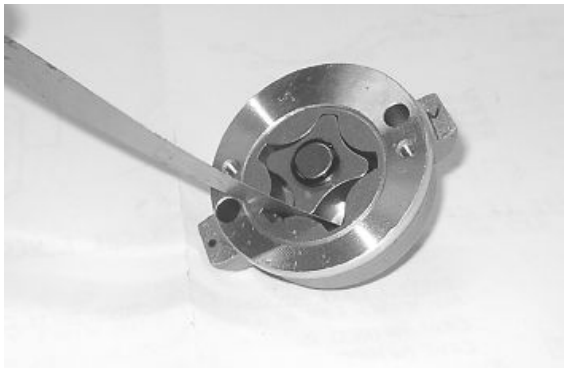


N.B.

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

Inspection

- Remove the two screws and the oil pump cover.
- Remove the cir-clip retaining the innermost rotor.
- Remove and wash the rotors thoroughly with petrol and compressed air.
- Reassemble the rotors in the pump body, keeping the two reference marks visible. Replace the retainer ring.
- Check the clearance between the rotors in the position shown in the diagram using a feeler gauge



Measure the distance between the outer rotor and the pump body (see figure).

- Check the axial clearance of the rotors using a trued bar as shown in the figure.

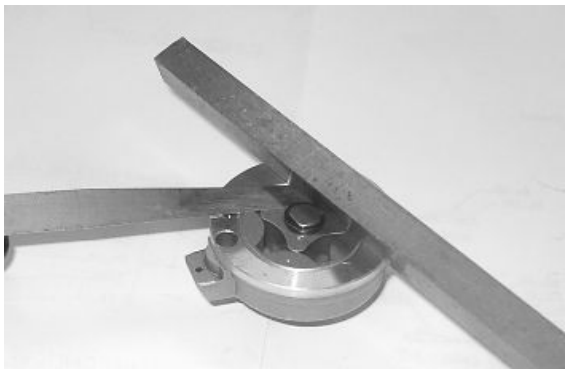
Characteristic

Axial rotor clearance

Limit value admitted: 0.09 mm

Distance between the outer rotor and the pump body

Admissible limit clearance: 0.20 mm

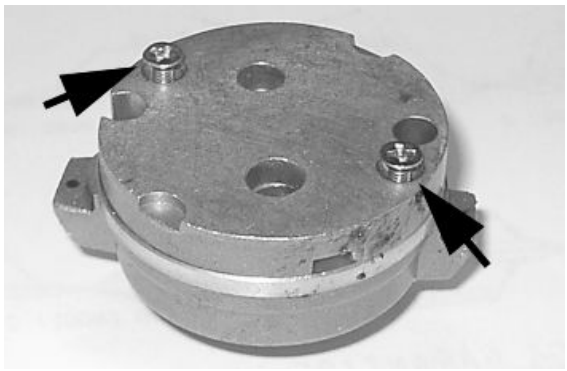


Distance between the rotors

Admissible limit clearance: 0.12 mm

Refitting

- Check there are no signs of wear on the oil pump shaft or body.



- Check there are no signs of scoring or wear on the oil pump cover.
- If you detect non-conforming measurements or scoring, replace the faulty parts or the unit.
- Fit the pump cover in the position that permits the crankcase clamping screws to be aligned.
- Make sure the gasket is positioned properly and refit the pump on the engine crankcase. The pump can only be fitted in one position. - Tighten the screws to the prescribed torque.

- Fit the sprocket wheel with a new O-ring.
- Fit the chain.
- Fit the central screw and the cup washer. Tighten to the prescribed torque.
-Fit the oil pump cover, by tightening the two screws to the prescribed torque.

N.B.

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

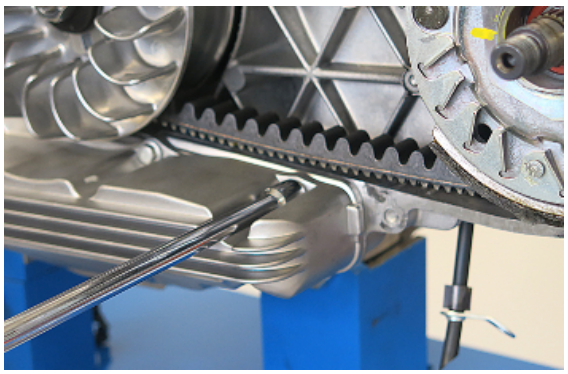
Locking torques (N*m)

Screws fixing oil pump to the crankcase 5 to 6
Oil pump command sprocket screw 10 - 14 **Oil pump cover screws** 0.7 - 0.9

Removing the oil sump

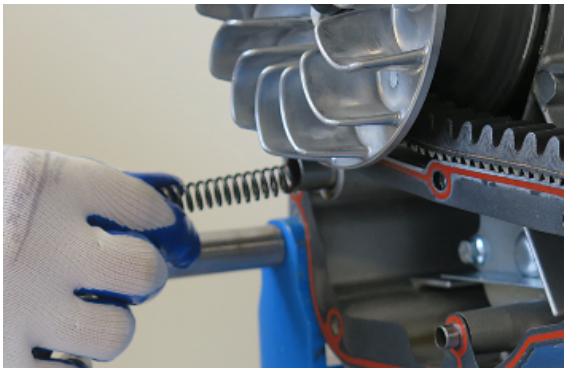
To remove the oil sump, proceed as follows:

- Drain all the engine oil.
- Remove the transmission cover.
- Unscrew and remove the fixing screws.

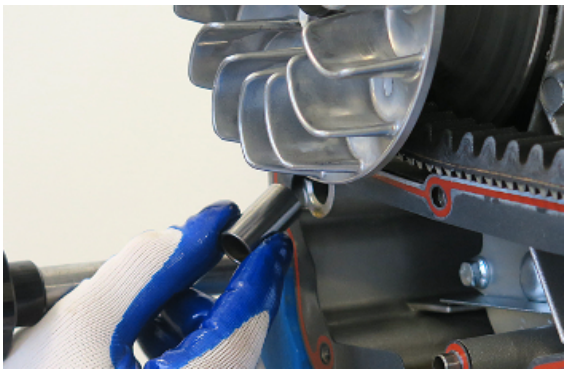


- Remove the oil sump.

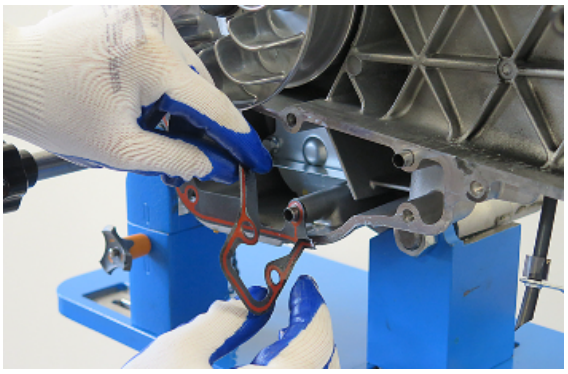
- Remove the valve spring.



- Remove the valve piston.

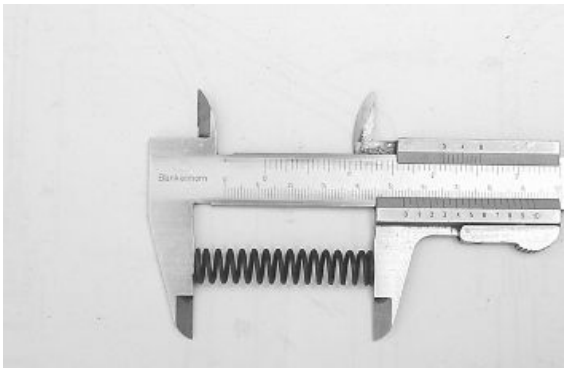


- Remove the oil sump gasket.



Inspecting the by-pass valve

- Check the unloaded spring length.
- Check that the small piston is not scored.
- Ensure that it slides freely on the crankcase and that it guarantees a good seal.
- If not, eliminate any impurities or replace defective parts.



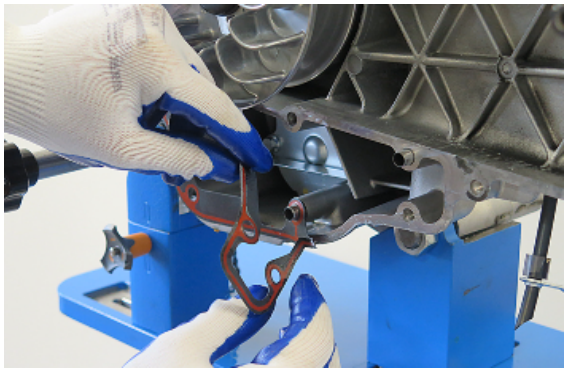
Characteristic

By-pass check up:Standard length

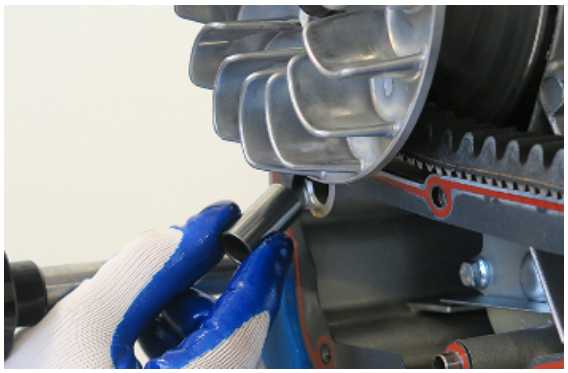
54.2 mm

Refitting the oil sump

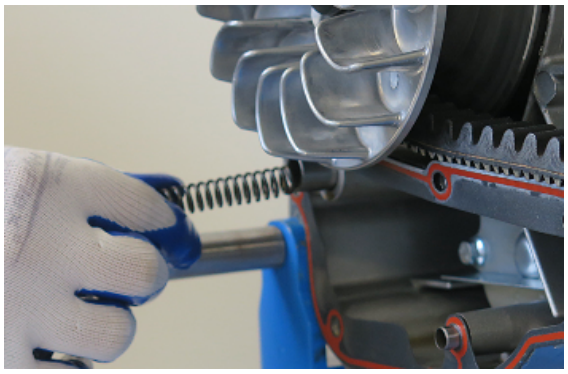
- Fit a new oil sump gasket.



- Insert the valve piston.

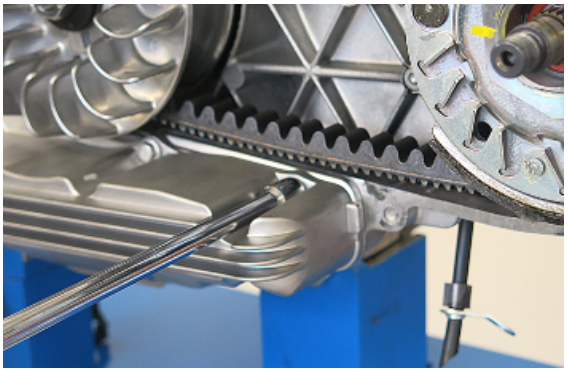


- Insert the valve spring.



- Insert the alignment dowels.
- Insert the oil sump taking care to insert the spring into the appendage in the sump.

- Insert and tighten the fixing screws, applying the recommended torque.
- Refit the transmission cover.



Locking torques (N*m)

Oil sump - Crankcase **12.0 ± 1.0 Nm**

INDEX OF TOPICS

MIU injection system

This vehicle is fitted with an integrated injection and ignition system.

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

The injection and ignition are timed on the four-stroke cycle by means of a tone wheel keyed on to the crankshaft (24-2 teeth) and pick-up sensor.

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

- Coolant temperature
- Intake air temperature
- Lambda probe

The system implements cold engine idle fuel/air mixture correction with a stepper motor on a by-pass circuit of the throttle valve. The control unit manages the Stepper motor and the injector opening time, thereby ensuring the idle steadiness and the proper mixture.

In all conditions of use, mixture preparation is managed by modifying the injector opening time.

The fuel system pressure is kept constant in relation to ambient pressure.

The **fuel system circuit** consists of:

- Fuel pump
- Fuel filter
- Injector
- Pressure regulator

The pump, the filter and the regulator are placed inside the fuel tank on a single support.

The injector is connected by a pipe with fast-release fittings. The pressure regulator is located at the beginning of the circuit.

The fuel pump is controlled by the MIU control unit; this ensures safety of the vehicle.

The **ignition circuit** consists of:

- H.V. coil
- H.V. cable.
- Shielded cap
- MIU control unit
- Spark plug

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

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

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

Of course, this cannot happen when the rpm-timing signal is missing, or when the failure involves the control circuits:

- Fuel pump

- H.V. coil
- Injector

The control unit is fitted with a self-diagnosis system connected to a warning light on the instrument panel.

Failures are detected and restored by the diagnostic tester.
In any case, when the fault is no longer present, data storage is automatically wiped clean after 16 cycles of use (cold starting, running at regular engine temperature, stop).
The diagnostic tester is also required to adjust the idle mixture.

Specific tooling

020922Y Diagnosis Tool

The MIU injection-ignition system carries out checks on the rpm indicator and the electric fan for radiator cooling.
The MIU control unit has a decoder for the anti-theft immobilizer system.
The MIU control unit is connected to a diagnostic LED on the instrument panel, that also carries out the deterrent flashing functions.

The MIU control unit power supply is furthermore controlled by the emergency switch; that is to provide further safety for the vehicle.

Precautions

1. Before repairing any part of the injection system, check if any faults have been stored. Do not disconnect the battery before checking for faults.
2. The fuel supply system is pressurised at 300 kPa (3 BAR). Before disconnecting the fast-release fitting of the fuel supply pipe, check that there are no naked flames. Do not smoke. Act with caution to avoid spraying fuel to your eyes.
3. When repairing electric components, the battery must always be disconnected unless it is strictly necessary for the battery to be connected.
4. When functional checks are performed, make sure that the battery voltage exceeds 12V.
5. Before attempting to start the vehicle, ensure that there are at least two litres of fuel in the tank. Failure to respect this norm will damage the fuel pump.
6. If a long period is envisaged with the vehicle not in use, fill the tank to at least the halfway mark. This will ensure the pump will be covered by fuel.
7. When washing the vehicle, do not spray excessive water on electric components and wiring harnesses.
8. In the event of ignition problems, begin troubleshooting from the battery and the injection system connections.
9. Before disconnecting the MIU control unit connector, perform the following steps in the order shown:
- Set the switch to «OFF»

- Disconnect the battery

Failure to respect this norm may damage the control unit.

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

11. In order to not cause damage, disconnect and reconnect the connectors of the MIU system only after proven necessary. Before reconnecting, check that the connectors are dry.

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

13. At the end of every check performed with the diagnostic tester, remember to protect the system connector with its cap. Failure to observe this precaution may damage the MIU control unit.

14. Before reconnecting the quick couplers of the power supply system, check that the terminals are perfectly clean.

Troubleshooting tips

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

Before troubleshooting the MIU system, carry out the following checks:

A: Power supply

a. Battery voltage

b. Blown fuse

c. Relays

d. Connectors

B: Frame ground connection

C: Fuel system

a. Faulty fuel pump

b. Dirty fuel filter

D: Ignition system

a. Faulty spark plug

b. Faulty coil

c. Faulty shielded cap

E: Intake circuit

a. Air filter dirty

b. b. Dirty by-pass circuit

c. Faulty stepper motor

F: Others

a. Wrong timing system

b. Wrong idle mixture

c. Incorrect reset of the throttle valve position sensor

2 MIU system failure may be caused by loose connectors. Make sure that all connections have been correctly made.

Check the connectors taking into consideration the following point:

A check that the terminals are not bent.

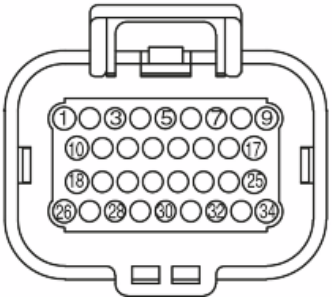
B check that the connectors have been properly connected.

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

3 Check the entire system before replacing the MIUIf the fault is fixed by replacing the MIU control unit, install the original control unit again and check if the fault occurs again.

4 For troubleshooting, use a multimeter with an internal resistance of more than 10 KW/V. Unsuitable instruments can damage the MIU ECU. The instruments to be preferred have a definition over 0.1V and 0.5W and an accuracy over 2%.

Terminals setup



MIUG4 control unit

1. (Pink/Black) H.V. coil signal output (-)

2. Not connected

3. (Blue/Brown) ASR warning light command signal output

4. (Green/Black) Signal input (-) from engine stop button

5. (Brown/Red) Signal input (+) from the start button

6. (Red/White) Key-on power input (from fuse F4)

7. (Black) Power ground

8. Not connected

9. (White/Black) Battery power input (from fuse F1)

10. (Orange/Blue) Starter relay coil command signal output (-)

11. (Light blue/Black) Lambda probe (+)

12. (White/Green) Lambda probe (-)

13. (Light blue/Green) Engine temperature sensor signal input

14. (Orange/White) "ENABLE" signal input from the immobilizer antenna

15. (Grey/Green) Sensor ground reference

16. Not connected

17. (Red/Green) Immobilizer warning light control signal output (-)

18. (Grey/Black) Tilting sensor signal input

19. (Brown/Red) Signal input (-) from the stand button

20. (Brown) Pickup (-)

21. (Light blue/White) Signal input (-) from the ASR button

22. (Black/Purple) Injection loads coil command signal output (-)

23. (Black) Power ground

24. (Blue/Yellow) Electric fan relay coil command signal output (-)

25. (Brown/Black) MIL warning light control signal output (-)

26. (Pink/Red) CAN H line

27. (Pink/White) CAN L Line

28. Not connected

29. (Red) Pickup (+)

30. Not connected

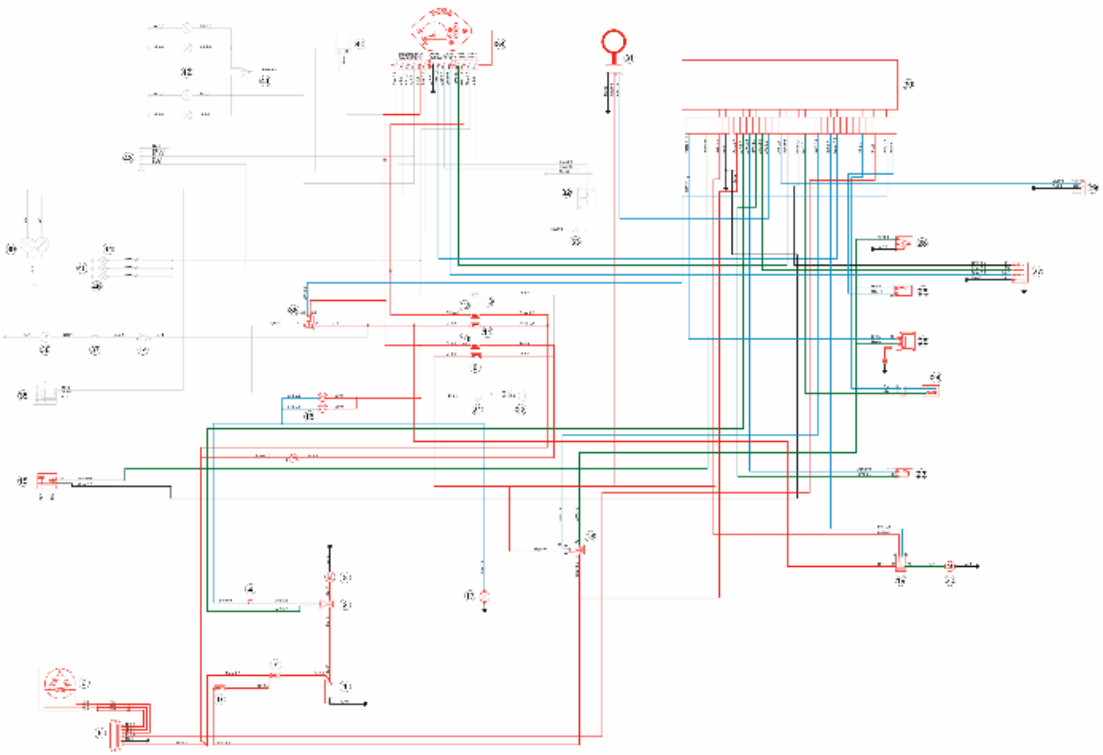
31. (Light blue/red) Ground reference for lambda probe heater

32. Not connected

33. (Purple/White) Lights relay coil command signal output (-)

34. (Red/Yellow) Injector command signal output (-)

EMS circuit diagram



1. Battery 12V - 12 Ah
2. Starter relay
3. Starter motor
4. Starter button

5. Voltage regulator
6. Magneto flywheel
7. Fuse No.1 - 30A
8. Fuse No. 5 - 7.5A
9. Fuse No. 2 - 15A
10. Fuse No. 6 - 7.5A
11. Fuse No. 3 - 15A
12. Fuse No. 4 - 7.5A
14. Ignition switch contacts
15. Engine stop switch
16. 2 stop buttons
17. Brake lamp 12v-16w
18. Injection load relay
19. Electric fan relay
20. Radiator electric fan
23. Lambda probe
24. Engine speed sensor
25. H.V. coil
26. Fuel injector
27. Engine temperature sensor
28. Fuel pump
29. Diagnosis socket
30. Electronic injection control unit
31. Immobilizer antenna
34. Instrument panel
36. Headlight relay

Troubleshooting procedure

Engine does not start

ENGINE DOES NOT START EVEN IF PULLED

Possible Cause	Operation
Immobilizer enabling signal	System not encoded System not efficient, repair according to the indications of the self-diagnosis
Faults detected by self-diagnosis	Pump relay H.V. coil. Injector Engine speed timing sensor
Fuel system	Fuel in the tank Fuel pump activation Fuel pressure (low)

Possible Cause	Operation
	Injector flow (low)
Power to spark plug	Shielded spark plug cap H.V. coil (secondary insulation)
Parameter reliability	Coolant temperature Distribution timing adjustment - injection start Intake air temperature
End of compression pressure	End of compression pressure

Starting difficulties

ENGINE STARTER PROBLEMS

Possible Cause	Operation
Faults detected by self-diagnosis	Pump relay H.V. coil Injector Engine speed timing sensor Air temperature Coolant temperature
Starter speed	Starter motor and relay Battery Ground connections
End of compression pressure	End of compression pressure
Power to spark plug	Spark plug Shielded cap H.V. coil. Engine speed timing sensor Ignition advance
Fuel system	Fuel pressure (low) Injector flow (low) Injector sealing (poor)
Correctness of the parameters	Coolant temperature Intake air temperature Stepper throttle valve position (steps and actual opening) Cleaning of the auxiliary air pipe and throttle valve; air filter efficiency

Engine stops at idle

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

Possible Cause	Operation
Faults detected by self-diagnosis	Pump relay H.V. coil Injector Engine speed timing sensor Air temperature Coolant temperature
Ignition efficiency	Spark plug Ignition timing
Correctness of the parameters	Throttle valve position sensor Stepper Coolant temperature sensor Intake air temperature sensor
Intake system cleaning	Air filter Diffuser and throttle valve Additional air pipe and Stepper
Intake system sealing (infiltrations)	Intake manifold - head Throttle body - manifold Intake sleeve Filter housing
Fuel system (low pressure)	Fuel pump Pressure regulator Fuel filter Injector flow

Engine does not rev down

ENGINE DOES NOT RETURN TO IDLING SPEED/IDLING SPEED TOO HIGH

Possible Cause	Operation
Faults detected by self-diagnosis	Pump relay H.V. coil Injector Engine speed timing sensor Air temperature Coolant temperature
Ignition efficiency	Ignition timing
Correctness of the parameters	Throttle valve position sensor Stepper Coolant temperature sensor Intake air temperature sensor
Intake system sealing (infiltrations)	Intake manifold - head Throttle body - manifold Intake sleeve Filter housing
Fuel system (low pressure)	Fuel pump Pressure regulator Fuel filter Injector flow

Exhaust backfires in deceleration

EXHAUST BACKFIRING WHEN DECELERATING

Possible Cause	Operation
Faults detected by self-diagnosis	Pump relay H.V. coil Injector Engine speed timing sensor Air temperature Coolant temperature Lambda probe
Correctness of the parameters	Throttle valve position sensor Stepper Coolant temperature sensor Intake air temperature sensor
Intake system sealing (infiltrations)	Intake manifold - head Throttle body - manifold Intake sleeve Filter housing
Fuel system (low pressure)	Fuel pump Pressure regulator Fuel filter Injector flow
Exhaust system sealing (infiltrations)	Manifold - head Manifold - silencer silencer welding

Engine revs irregularly

ENGINE IRREGULAR PERFORMANCE WITH VALVE SLIGHTLY OPEN

Possible Cause	Operation
Intake system cleaning	Air filter Diffuser and throttle valve Additional air pipe and Stepper
Intake system sealing	Intake sleeve Filter housing

Possible Cause	Operation
Ignition system	Spark plug wear check
Parameter reliability	Throttle valve position signal Coolant temperature indicator Intake air temperature signal Ignition advance
TPS reset successful	TPS reset successful
Faults detected by self-diagnosis	Pump relay H.V. coil Injector Engine speed timing sensor Air temperature Coolant temperature Lambda probe

Poor performance at full throttle

POOR ENGINE PERFORMANCE AT FULL POWER/ ENGINE IRREGULAR PERFORMANCE ON PICK-UP

Possible Cause	Operation
Faults detected by self-diagnosis	Pump relay H.V. coil Injector Engine speed timing sensor Air temperature Coolant temperature Lambda probe
Power to spark plug	Spark plug Shielded cap H.V. cable H.V. coil
Intake system	Air filter Filter box (sealing) Intake sleeve (sealing)
Parameter reliability	Throttle valve position signal Coolant temperature indicator Intake air temperature signal Ignition advance
Fuel system	Fuel level in the tank Fuel pressure Fuel filter Injector flow

Engine knocking

PRESENCE OF KNOCKING (COMBUSTION SHOCKS)

Possible Cause	Operation
Faults detected by self-diagnosis	Pump relay H.V. coil Injector Engine speed timing sensor Air temperature Coolant temperature Lambda probe
Ignition efficiency	Spark plug
Parameter reliability	Throttle valve position signal Coolant temperature indicator Intake air temperature signal Ignition advance
Intake system sealing	Intake sleeve Filter housing
TPS reset successful	TPS reset successful
Fuel system	Fuel pressure

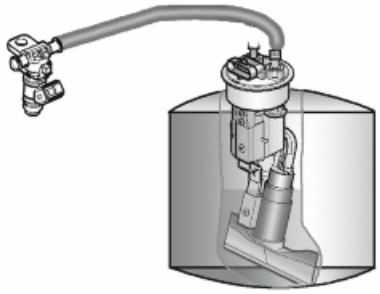
Possible Cause	Operation
	Fuel filter Injector flow Fuel quality
Selection of the cylinder base gasket thickness	Selection of the cylinder base gasket thickness

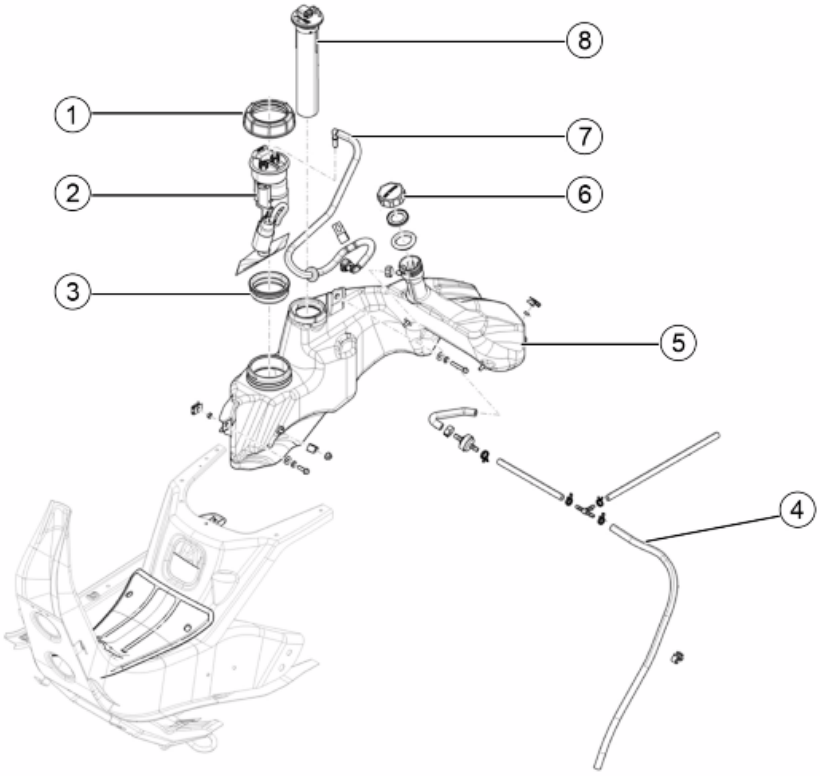
Fuel supply system

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

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

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





Key:

1. Fuel pump ring nut

2. Fuel pump

3. Fuel pump gasket

4. Complete vent pipe

5. Fuel tank

6. Fuel tank cap

7. Fuel delivery pipe

8. Fuel gauge

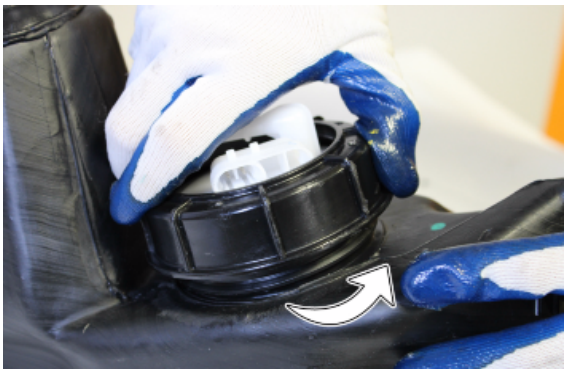
REMOVING THE COMPLETE FUEL PUMP

Remove the fuel tank.

CAUTION

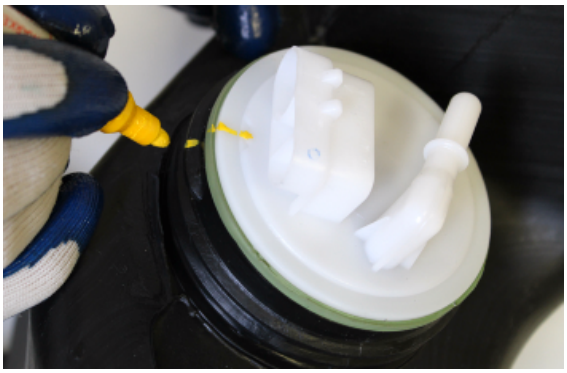
FUEL IS HIGHLY FLAMMABLE. DO NOT SMOKE AND KEEP ALL NAKED FLAME AND SOURCES OF SPARKING OUT OF THE AREA: FIRE HAZARD. DO NOT INHALE THE FUEL SMOKE. DO NOT ALLOW FUEL TO COME INTO CONTACT WITH PLASTIC COMPONENTS OR THE BODY-WORK OF THE VEHICLE.

Unscrew and remove the fastener ring of the fuel pump, rotating it counter-clockwise.



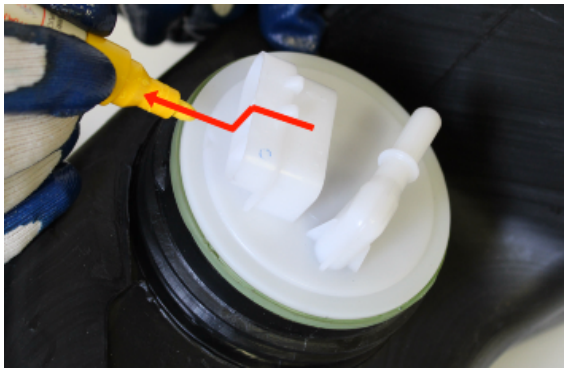
Remove the fuel pump fastening ring.

Mark the correct orientation of the fuel pump relative to its seat on the tank with a marker pen.

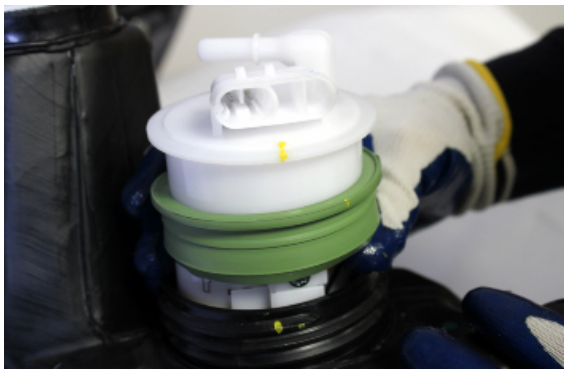


NOTE:

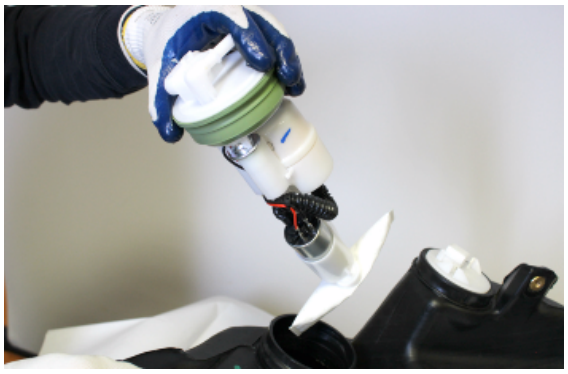
Apply the marking on the fuel pump and the relative seat as shown in the figure.



Lift the fuel pump and rock it back and forth and side to side to disengage it from the gasket.



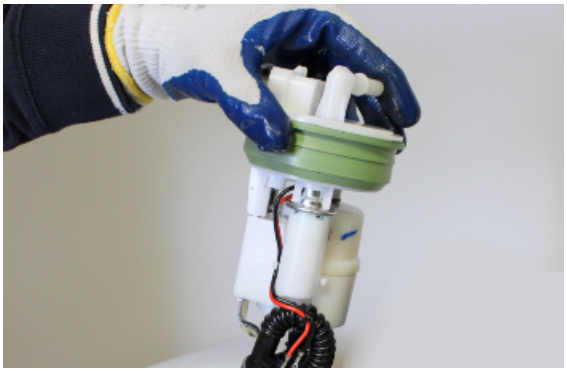
Disengage the sealing gasket from the tank and extract the complete fuel pump assembly.



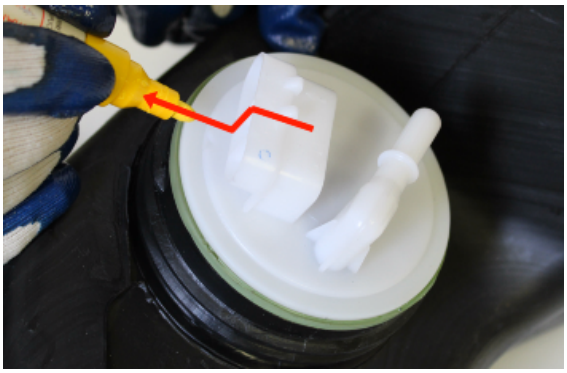
FITTING THE COMPLETE FUEL PUMP

Fit the new sealing gasket on the body of the fuel pump.

Slide the gasket and position it temporarily in its housing on the upper part of the fuel pump.



Apply the assembly marking to new fuel pump as shown in the figure.



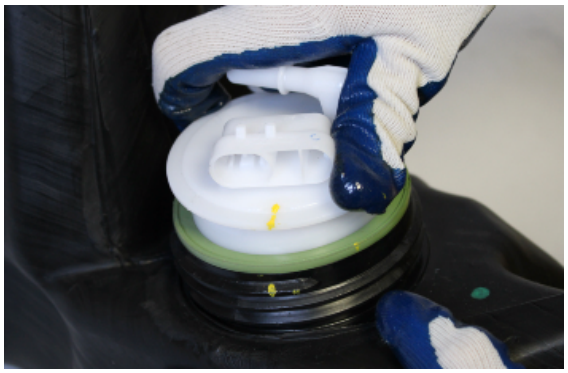
Place the complete fuel pump inside the tank.

NOTE:

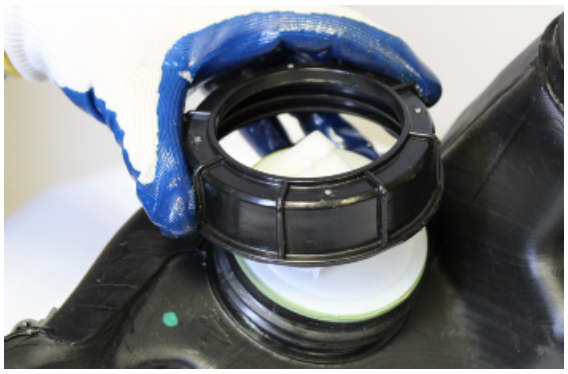
Ensure that the fuel pump is oriented correctly by aligning the markings made previously on the pump and the respective housing

Fit the gasket, pushing downwards to ensure that it is flush with the surface of the tank.

Push the fuel pump downwards to bring it against the gasket.



Fit the fastener ring of the fuel pump.



Tighten the fastener ring of the fuel pump firmly, turning clockwise.

Refit the fuel tank on the vehicle.

WARNING

MAKE SURE THAT THE FASTENER RING IS TIGHTENED COMPLETELY.

REMOVING THE COMPLETE FUEL LEVEL SENSOR

Unscrew the fuel level sensor, turning anticlockwise; use the specific tool included with the vehicle if necessary.

Specific tooling

020442Y Pulley lock wrench

Remove the fuel level sensor from the fuel tank.

CAUTION

FUEL IS HIGHLY FLAMMABLE. DO NOT SMOKE AND KEEP ALL NAKED FLAME AND SOURCES OF SPARKING OUT OF THE AREA: FIRE HAZARD. DO NOT INHALE THE FUEL SMOKE. DO NOT ALLOW FUEL TO COME INTO CONTACT WITH PLASTIC COMPONENTS OR THE BODYWORK OF THE VEHICLE.

FITTING THE COMPLETE FUEL LEVEL SENSOR

Fit the fuel level sensor, complete with sealing gasket inside the tank.

Tighten the fuel level sensor, turning clockwise; use the specific tool included with the vehicle if necessary.

Refit the fuel tank on the vehicle.

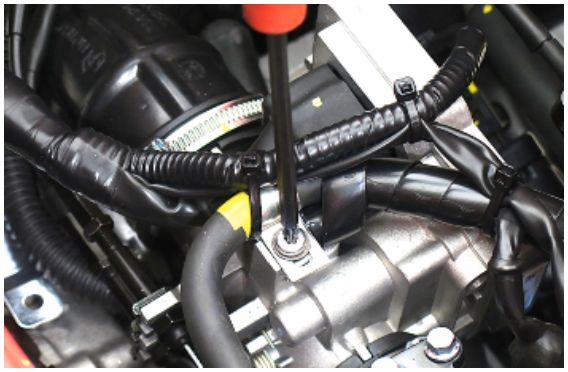
Specific tooling

020442Y Pulley lock wrench

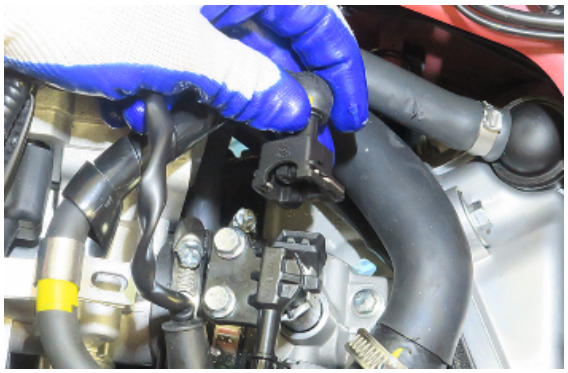
Removing the butterfly valve

To remove the throttle body, proceed as follows:

- Unscrew and remove the fuel pipe clamp fastening screw.



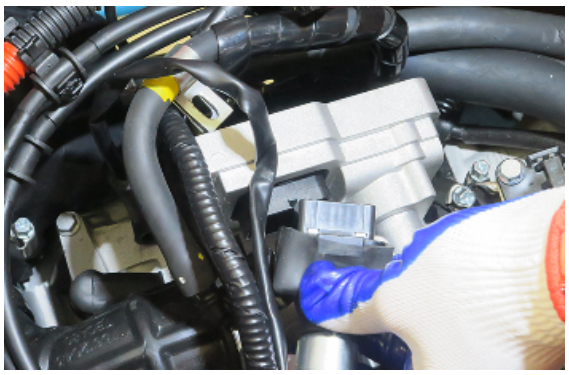
- Disconnect the injector connector.



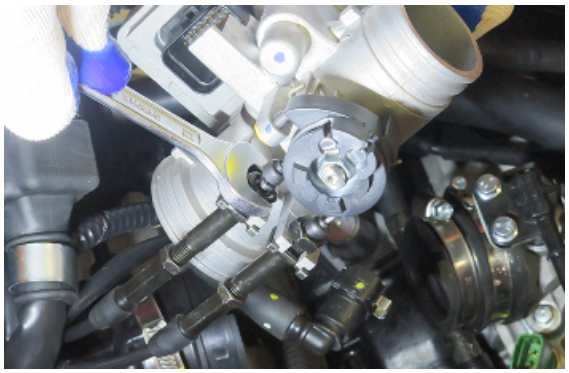
- Disconnect the engine temperature sensor connector.

- Loosen the clamps of the intake manifold and of the filter box connection sleeve.

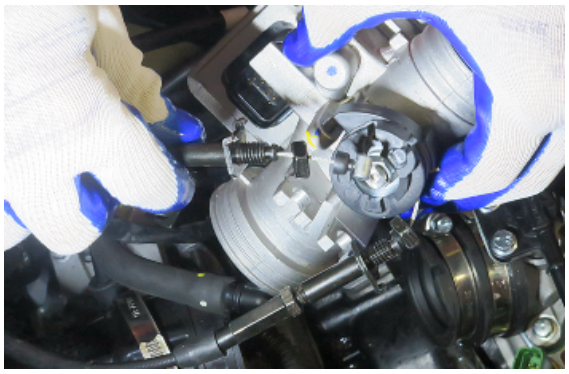
- Disconnect the connector of the control unit.



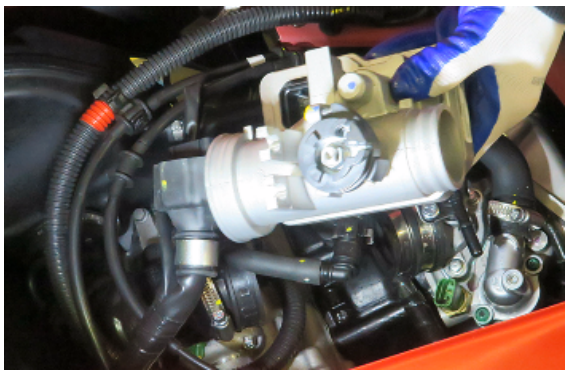
-Loosen the fixing nuts of the throttle control transmissions.



- Disconnect the throttle control cables.

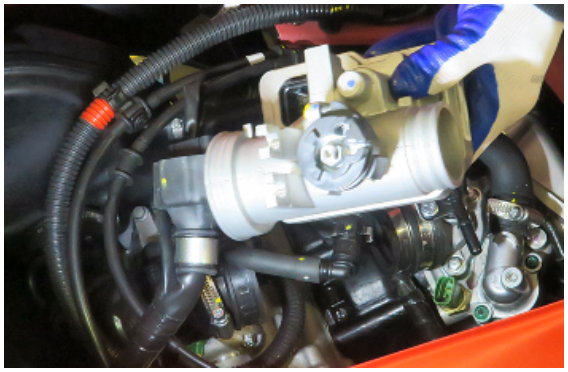


- Remove the throttle body.

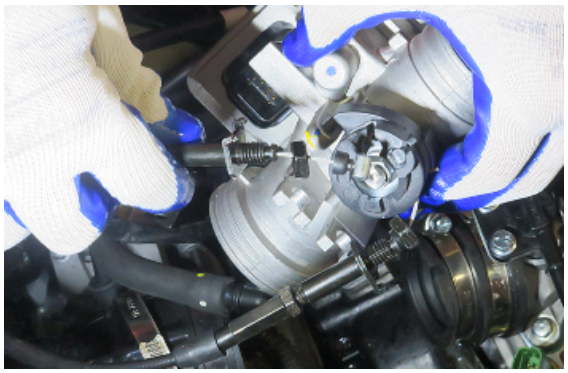


Refitting the butterfly valve

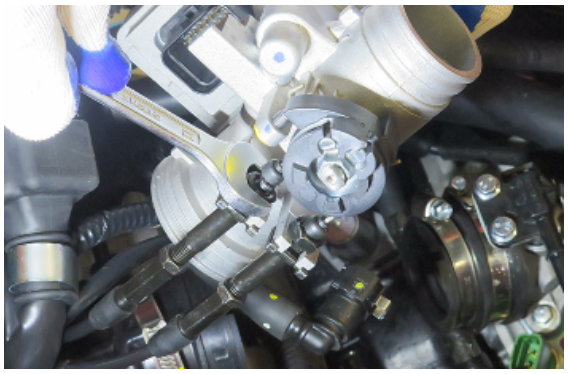
- put the throttle body.



- Connect the throttle control cables.

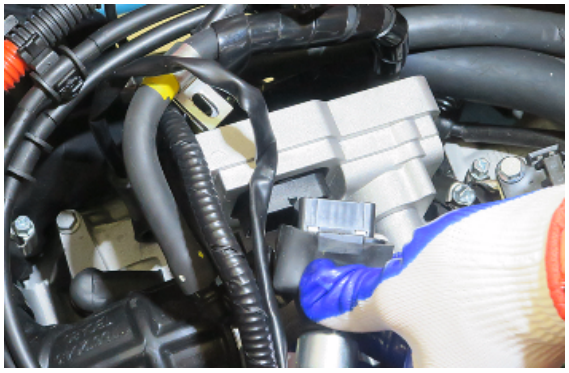


-Tighten the fixing nuts of the throttle control transmissions.



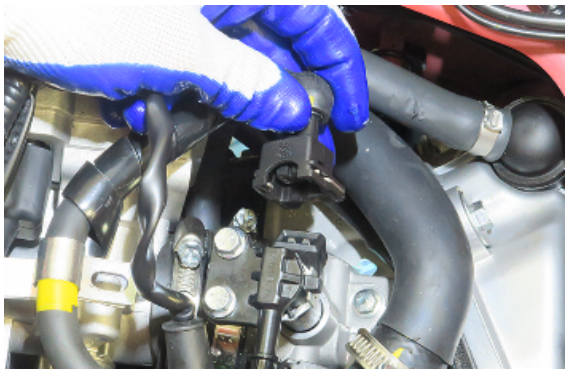
- Put the throttle body in the intake manifold and in the connection pipe to the filter box.
- Tighten the clamps.

- Connect the control unit connector.

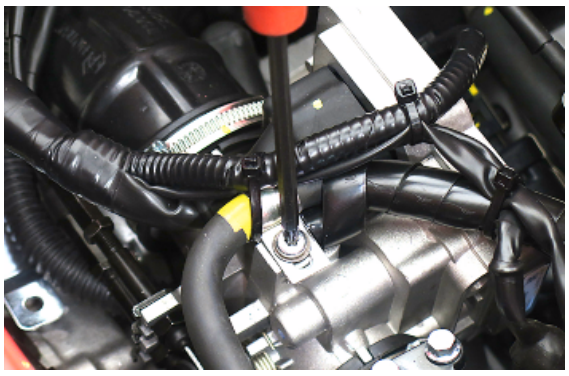


- Connect the engine temperature sensor connector.

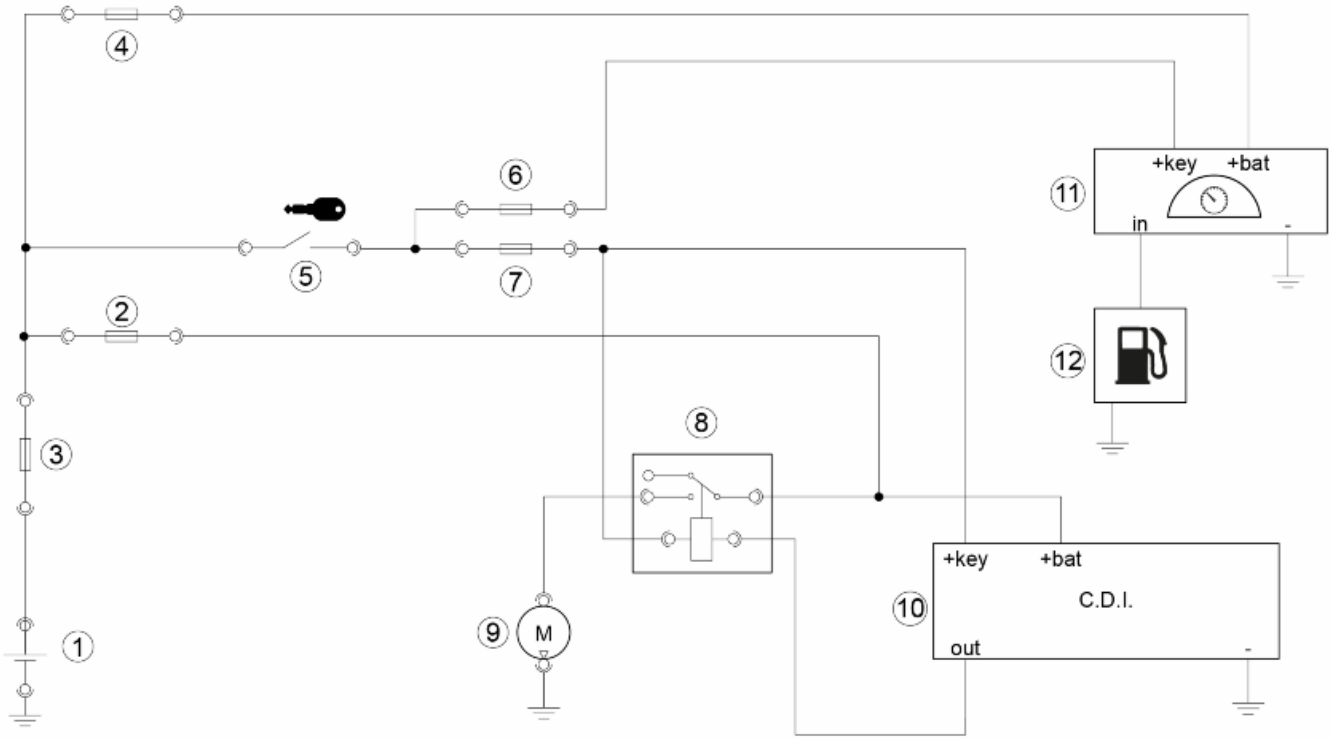
- Connect the injector connector.



- Insert and tighten the screw that fastens the fuel pipe clamp.



Pump supply circuit



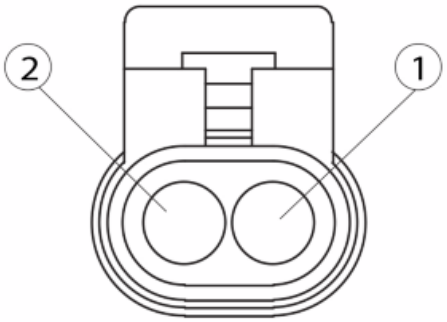
1. Battery 12V
2. Fuse no.7 - 10A
3. Fuse no.1 - 30A
4. Fuse No. 5; 15A
5. Ignition switch
6. Fuse no.2 - 7.5A
7. Fuse no.4 - 7.5A
8. Injection load relay
9. Fuel pump
10. Electronic injection control unit
11. Instrument panel
12. Fuel level indicator

When switched to "ON", the fuel pump starts to rotate for two seconds and then stops. When the engine starts, in the presence of rpm timing signal the pump is continuously supplied.

ELECTRICAL DATA

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

1. Disconnect the fuel pump electrical connector.
2. Turn the ignition switch to «ON».
3. Check that there is a voltage present between pin 2 and ground on the fuel pump connector for approximately 2 seconds.
4. Carry out a continuity check on the connection line between pin 2 on the fuel pump connector and pin 87 on the injection loads relay.
5. Carry out a continuity check on the connection line between pin 1 on the fuel pump connector and ground



Circuit leak test

Install the specific tool for checking the fuel pressure, with the pipe fitted with the gauge.

Check during regular operation by placing the appropriate tool between the pump and the injector. With the battery voltage> 12 V check that the fuel pressure is 3.0 BAR and that the input current is 1.4 to 1.8 A

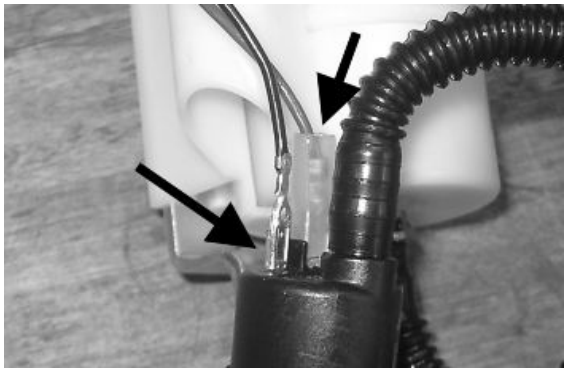
With the battery voltage > 12 V, check the pump flow rate by disconnecting from the injector the pipe equipped with the pressure gauge of the appropriate tool. Prepare a graded burette with flow rate of approximately 1 L. Rotate the pump using the active diagnosis of the palm top computer. Using a pair of long flat needle-nose pliers, choke the fuel pipe making the pressure stabilise at approx. 3.0 BAR. Check that within 15 seconds the pump has a flow rate of approx. 120 cm^3.

Specific tooling

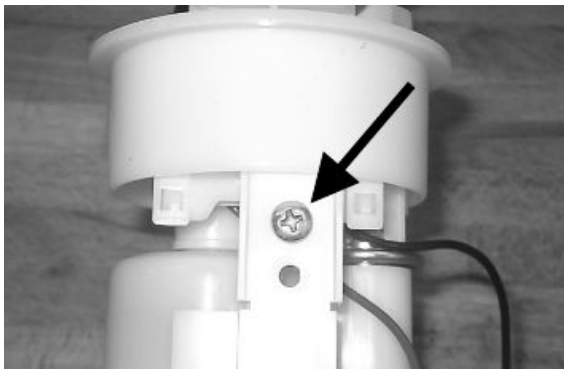
020480Y Fuel pressure measurement kit

Fuel filter check

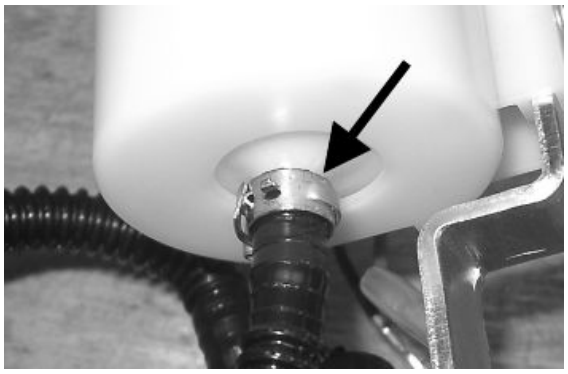
Disconnect the terminals of the electrical pump



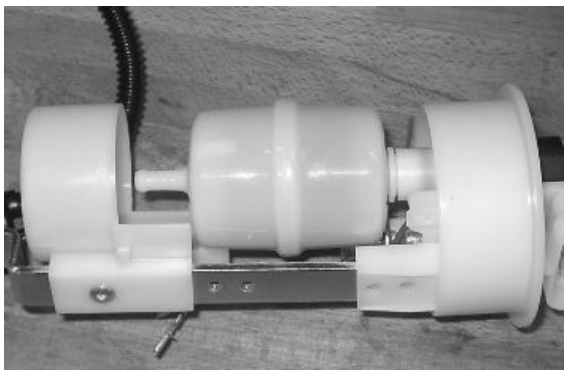
Remove the screw shown in the picture



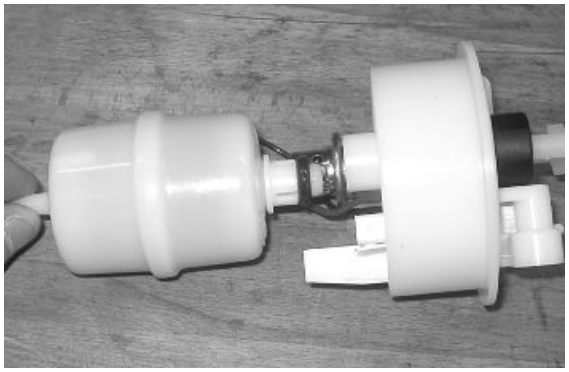
Remove the clamp fixing the piping to the filter shown in the photograph



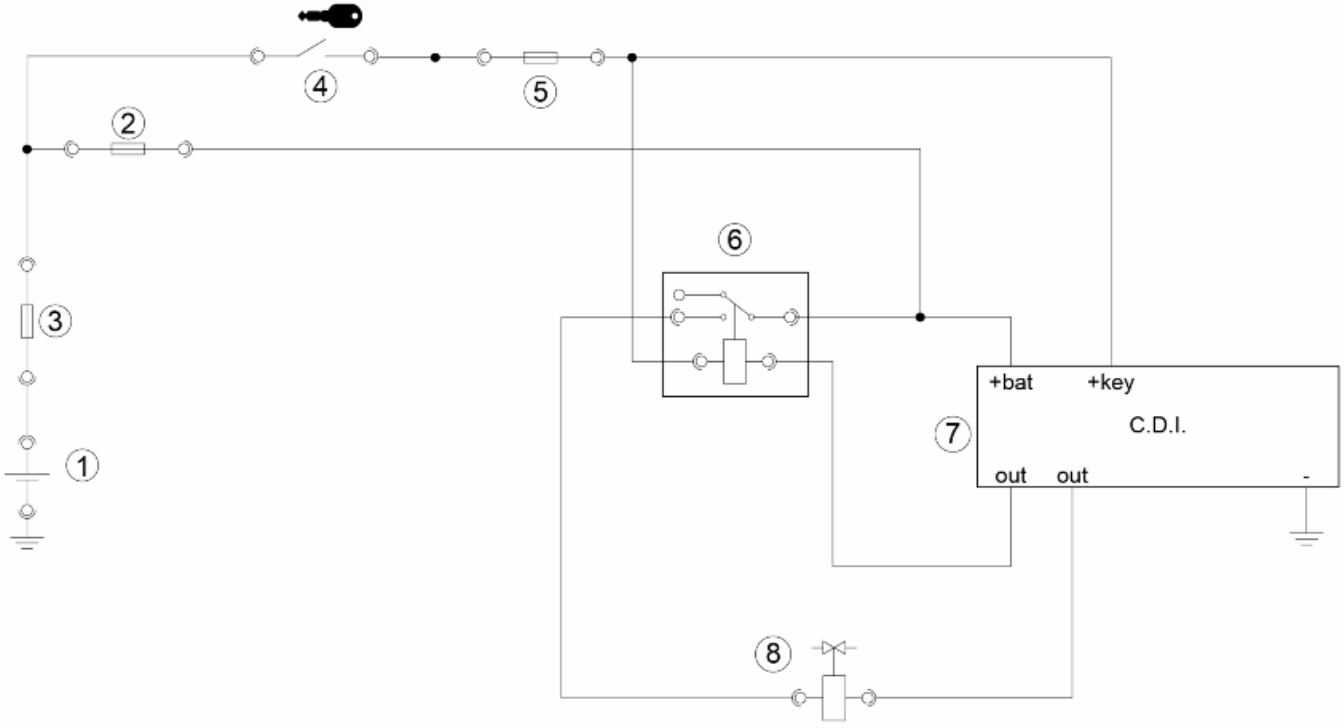
Separate the lower part of the pump mounting as shown in the picture.



Remove the filter from the pump mounting



Inspecting the injector circuit

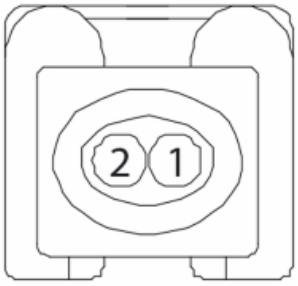


1. Battery
2. Fuse n° 7 -10A
3. Fuse no.1 - 30A
4. Ignition switch
5. Fuse no.4 - 7.5A
6. Injection load relay
7. Electronic injection control unit
8. Injector

Checking the resistance at the injector ends: 14.5 ± 5% Ohm

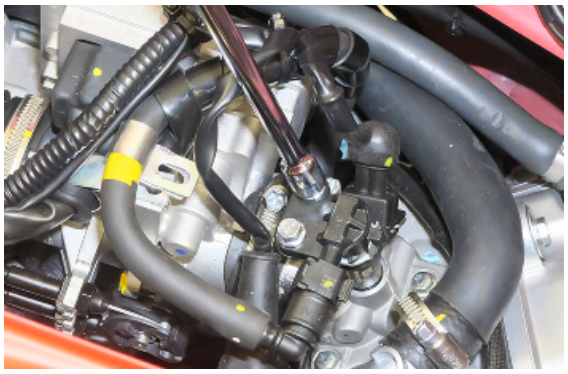
With the control unit and the injector disconnected, check for continuity between pin 34 on the control unit connector and pin 2 on the injector connector.

Switch to «**ON**» and check that, with the injector disconnected and the control unit connected, there is a voltage present between pin 1 on the injector connector and ground.



Inspecting the injector hydraulics

To check the injector, proceed as follows:
- Unscrew and remove the screws that fasten the injector to the intake manifold.



- Remove the injector from the intake manifold.

- Install the specific tool to check the fuel pressure and put the manifold on a graduated container of at least 100 cm³.
- Connect the injector with the supplied cable for the injection tester.
- Connect the cable terminals to an auxiliary battery and activate the fuel pump with the diagnostics active.

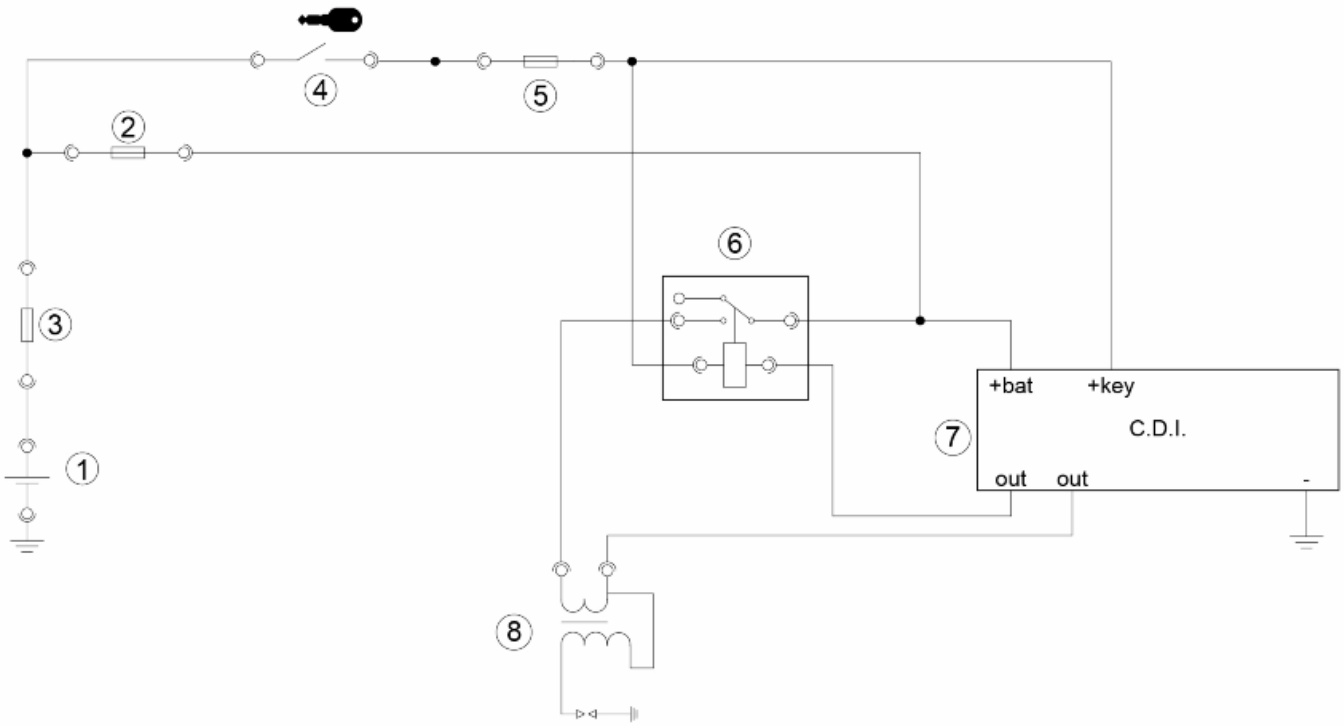
Specific tooling

020480Y Fuel pressure measurement kit

- Check that within 15 approx. 44 cm³ of fuel is delivered with an adjustment pressure of approx. 3 BAR.

Proceed with the injector seal test.
Dry the injector outlet with a blast of compressed air. Activate the fuel pump. Wait for one minute, making sure there are no leaks coming from the injector. Slight oozing is normal.
Value limit = 1 drop per minute

HT coil



1. Battery
2. Fuse n° 7 -10A

3. Fuse no.1 - 30A
4. Ignition switch
5. Fuse no.4 - 7.5A
6. Injection load relay
7. Electronic injection control unit
8. H.V. coil

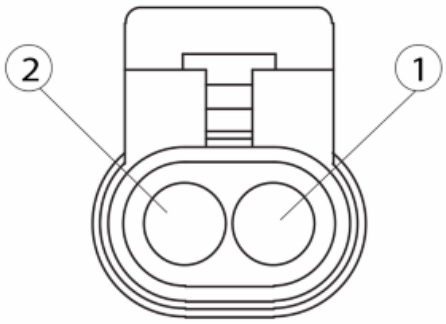
The system is integrated with the injection and it is a high-efficiency inductive type ignition.
The control unit manages two significant parameters:
- Ignition advance
This is optimised at once according to the engine revs, engine load, temperature and ambient pressure.
- Magnetisation time
The coil magnetisation time is controlled by the control unit. The ignition power is increased during the engine start-up phase.
The injection system recognises the 4-stroke cycle so ignition is only commanded in the compression phase.

Specific tooling

020331Y Digital multimeter

With the control unit and the coil disconnected, check for continuity between pin 1 on the control unit connector and pin 2 on the coil connector.

Switch to «**ON**» and check that, with the coil disconnected and the control unit connected, there is a voltage present between pin 1 on the coil connector and ground.



Zeroing the throttle

Resetting the throttle valve position signal (T.P.S reset)
The MIU control unit is supplied with a throttle valve position sensor that is pre-calibrated.
Pre-calibration entails regulating the minimum opening of the throttle valve to obtain a certain flow of air under pre-set reference conditions.
Pre-calibration ensures optimal air flow to control idling.
This regulation must not be tampered with in any way whatsoever.
The injection system will complete the management of the idling through the Stepper motor and the variation of the ignition advance.

The throttle body after the pre-calibration has an opened valve with an angle that can vary depending on the tolerances of the machining of the pipe and the valve itself.
The valve position sensor can also assume various fitting positions. For these reasons the mV of the sensor with the valve at idle can vary from one throttle body to another.
To obtain the optimum fuel mixture, especially at small openings of the throttle valve, it is essential to match the throttle body with the control unit following the procedure known as TPS resetting.
With this operation we inform the control unit, as the starting point, of the mV value corresponding to the pre-calibrated position.
To reset, proceed as follows.

Connect the diagnostic tester.

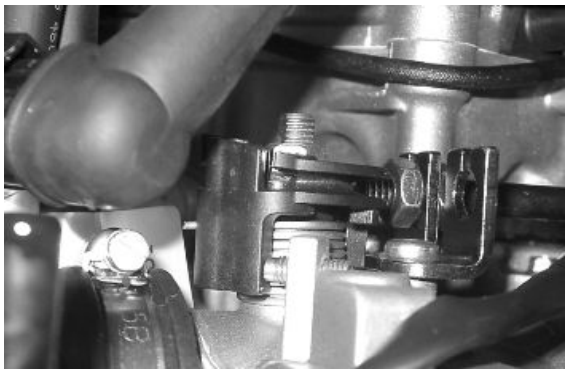
Switch to «**ON**».

Select the functions of the diagnostic tester on «**TPS RESET**».

Specific tooling

020922Y Diagnosis Tool

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



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

Reset should be performed in the following cases:

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

N.B.

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

Given that the TPS resetting is also done when the control unit is replaced, place the control unit - filter box bellows at 45° during the refitting operation as shown in the picture.

INDEX OF TOPICS

Front

FRONT SUSPENSION TIGHTENING TORQUES

Name	Torque in Nm
Lower lock-nut - Steering tube	11.7 - 13.7 Nm
Upper lock-nut - Steering tube	34.3 - 39.2 Nm
Handlebars - Steering tube	50 - 55 Nm
Front wheel - Front wheel hub	19 - 24 Nm
Throttle control sleeve - Handlebar	3 - 4 Nm
Front shock absorber (lower fastening) - Steering tube	19 - 26 Nm
Front shock absorber (upper fastening) - Steering tube	19 - 24 Nm
Front shock absorber - Shock absorber plate	19 - 29 Nm
Front wheel hub - Front wheel axle	74 - 88 Nm
ABS sensor - ABS support bracket	4.5 - 5 Nm
Odometer transmission - Front wheel hub	4 - 6 Nm

STEERING ASSEMBLY

Name	Torque in Nm
Upper steering ring nut	35 - 40
Lower steering ring nut	12 - 14
Handlebar fixing screw	50 - 55
Fixing screws for the handlebar control unit U-bolts	7 - 10

FRONT SUSPENSION

Name	Torque in Nm
Screw fixing the shock absorber to the shock absorber - calliper attachment plate	20 to 27
Wheel axle nut	74 - 88
Wheel screw	20 - 25
Screw fixing rear mudguard to steering	5 - 6.5
shock absorber upper clamp	20 to 30

Removing the front wheel

Rest the vehicle on its centre stand.

Suitably secure the rear part of the vehicle by raising the front slightly.

Loosen the screws fixing the wheel rim to the hub.

Remove the front wheel.

Front wheel hub overhaul

REMOVING THE FRONT WHEEL HUB

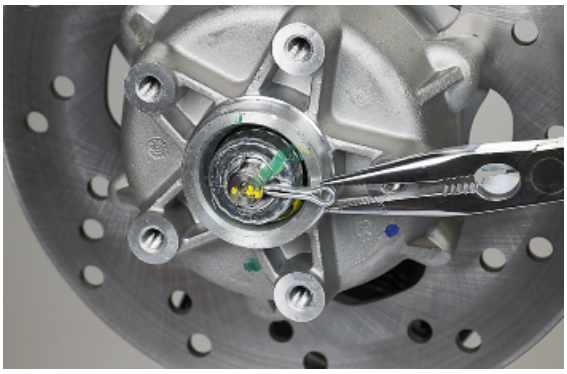
Rest the vehicle on its centre stand.

Suitably secure the rear part of the vehicle by raising the front slightly.

Remove the front wheel.

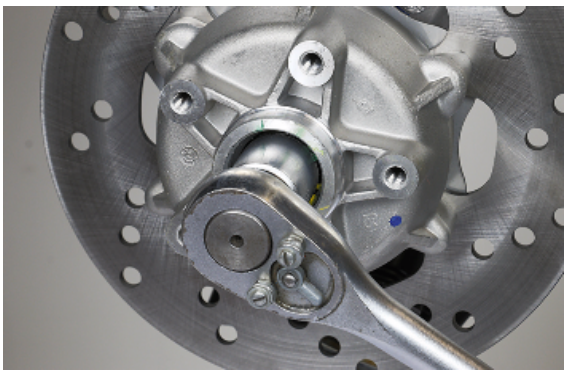
Remove the front brake calliper.

Remove the safety cotter pin bending the flaps.



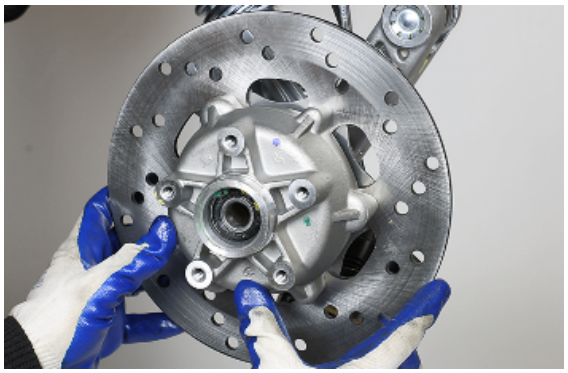
Remove the safety cap.

Unscrew the nut fixing the front wheel hub to the wheel axis.



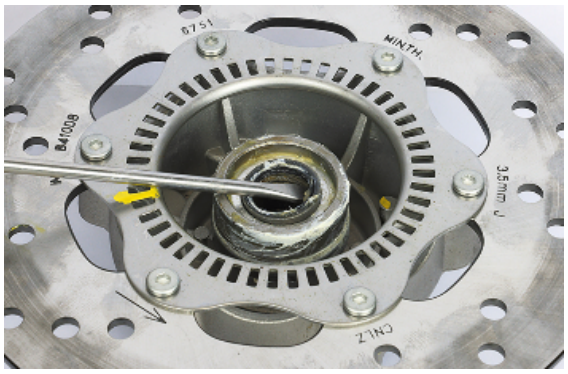
Remove the nut.

Remove the front wheel hub from its seat.



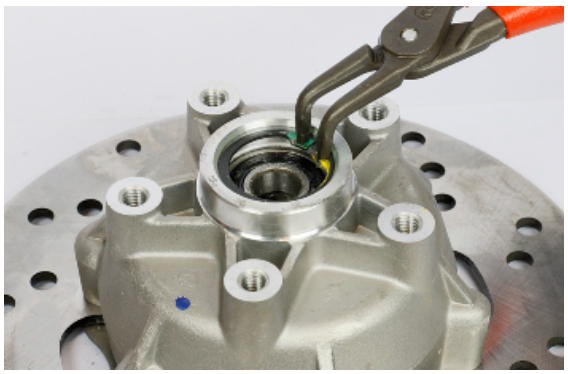
FRONT WHEEL HUB SERVICE

Remove the oil seal on the brake disc side using a flat-head screwdriver.



Turn the hub on the wheel side.

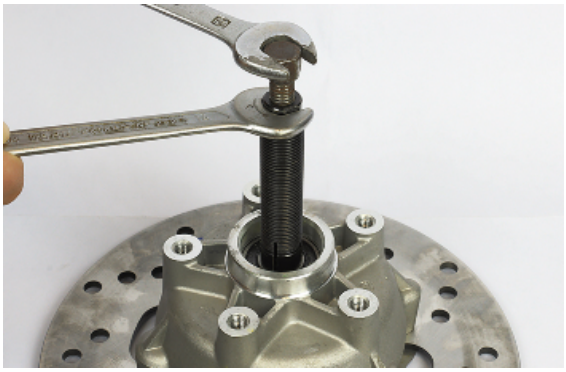
Using the relative clamps, remove the Seeger ring.



Engage the specific tool on the inner ring of the bearing on the wheel side.

Specific tooling

001467Y Extractor for bearings for holes

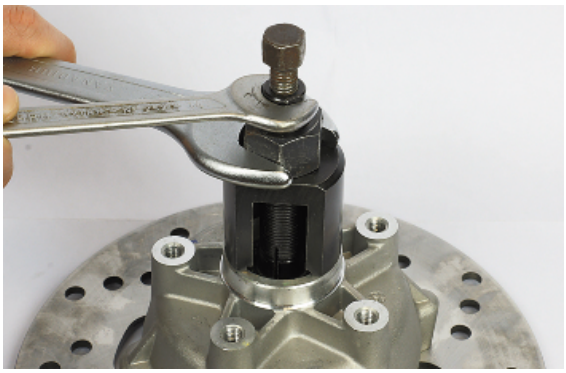


Remove the bearing using the specific tool.

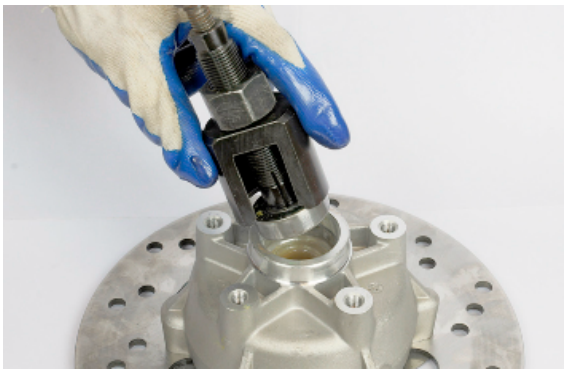
Specific tooling

001467Y Extractor for bearings for holes

001467Y017 Bell Ø 35



Remove the bearing and the specific tool.



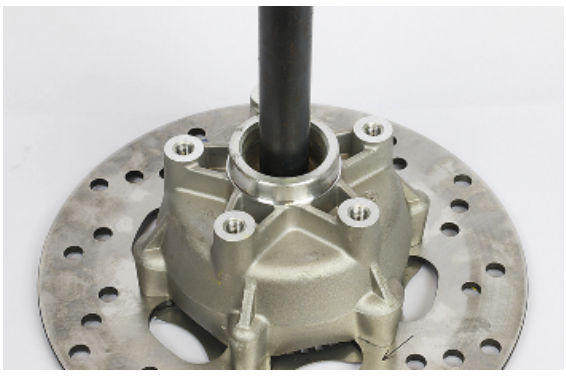
Remove the roller bearing using the specific tool.

Specific tooling

020376Y Adaptor handle

020456Y Ø 24 mm adaptor

020363Y 20-mm guide



Check the seat of the bearing.

Heat the bearing's seat on the hub using the specific tool.

Specific tooling

020151Y Air heater

Using the specific tool, place the new ball bearing in its seat with the shielding facing up.

Specific tooling

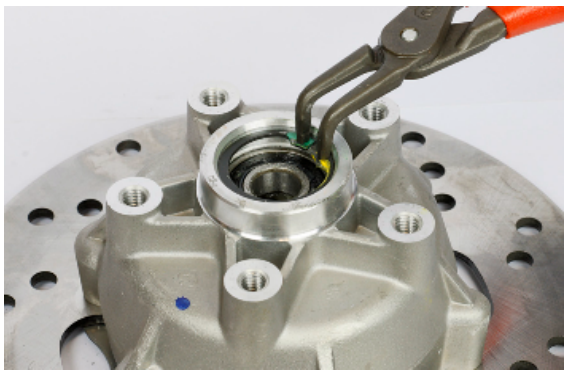
020376Y Adaptor handle

020357Y 32 x 35-mm Adaptor

020412Y 15-mm guide

Put the bearing all the way into its seat.

Put in the Seeger ring.



Turn the hub on the opposite side.

Using the specific tool, insert the roller bearing all the way in.

Apply the recommended product in the chamber between the ball bearing and the roller bearing.

Specific tooling

020038Y Punch

Recommended products

Lubricant grease Lithium and medium fibre yellow brown coloured grease suitable for various uses.

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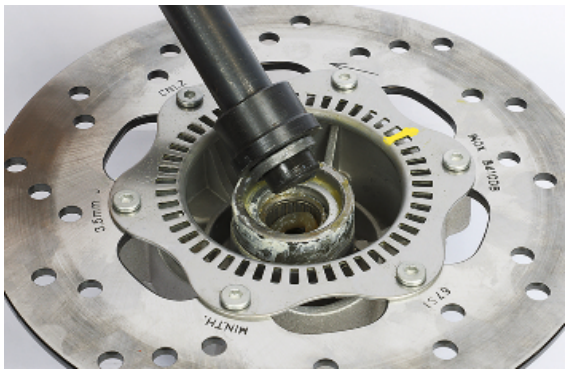
Using the specific tool, put a new oil seal in its seat.

Specific tooling

020376Y Adaptor handle

020357Y 32 x 35-mm Adaptor

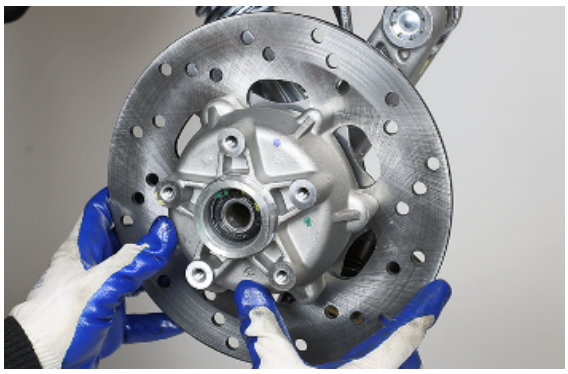
020412Y 15-mm guide



Put the oil seal all the way into its seat.

FITTING THE FRONT WHEEL HUB

Place the wheel hub on the front wheel axle.



Screw on the fixing nut on the wheel axle.

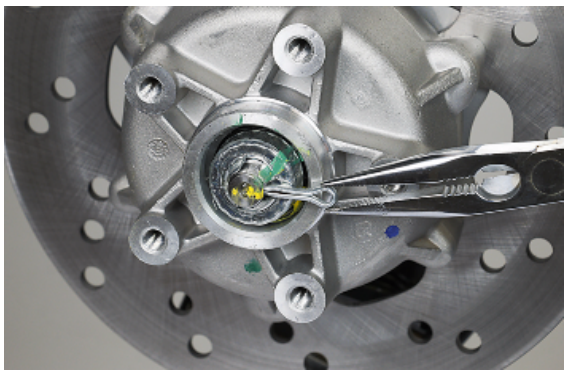
Tighten the fixing nut on the wheel axle to the prescribed torque.

Put on the safety cap so that the hole for the cotter pin is visible.

Insert the safety cotter pin and fold the flaps outwards.

Refit the front brake calliper.

Fit the front wheel.



Refitting the front wheel

Put back the front wheel on the wheel hub.

Tighten to the recommended torque the screws fixing the front wheel to the hub.

Handlebar

Removal

Remove the rear-view mirrors.

Remove the windscreen.

Remove the front centre cover.

Remove the rear handlebar cover.

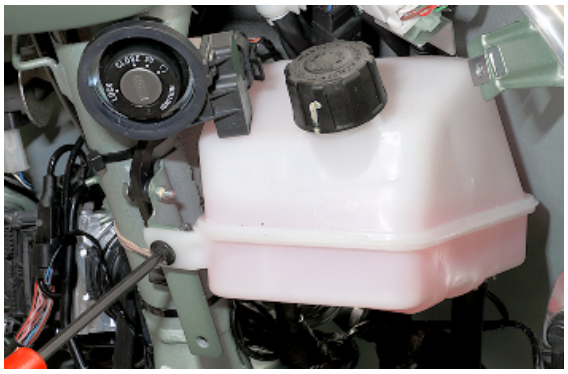
Remove the leg shield back plate.

Disconnect the stop light switch connectors from both brake pumps.

Remove the brake pumps as described in this manual, in the section "**braking system > front/ rear pump > removal**".

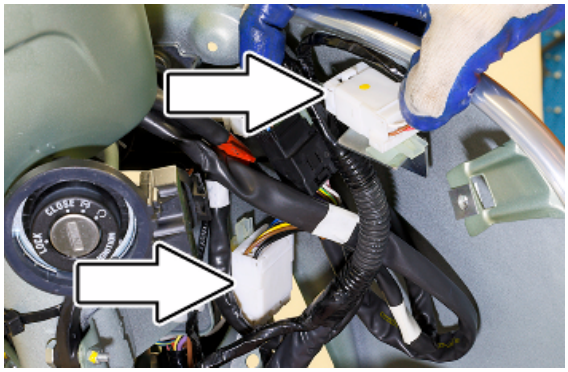
Suitably protect the couplings and secure them so they are tilted upward to keep air from entering.

Unscrew the screws used to fasten the expansion chamber and move it away from its housing **without disconnecting the pipes**.



Detach the electrical wiring harness retaining clamp.

Disconnect the indicated connectors from the left and right hand handlebar electrical devices.



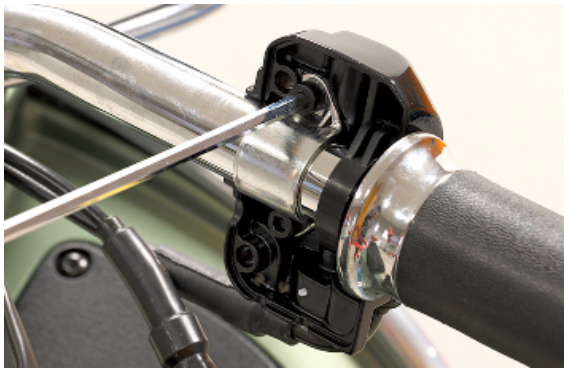
Unscrew the screws used to fasten the right hand electrical device.

Detach the throttle gas control closure transmission from the sleeve cam.

Rotate the cable by 90° and slide it out of the electrical device.

Slide the right hand device off the handlebar.

Unscrew the screws used to fasten the front device retaining U-bolt.



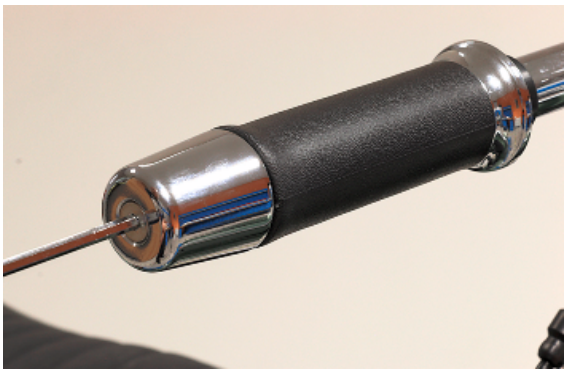
Detach the throttle gas control aperture cable from the sleeve cam.

Unscrew the screw used to fasten the gas command cable retaining plate.

Slide the gas command cable from the device.

Unscrew the screws used to fasten the left hand electrical device and slide it off the handlebar.

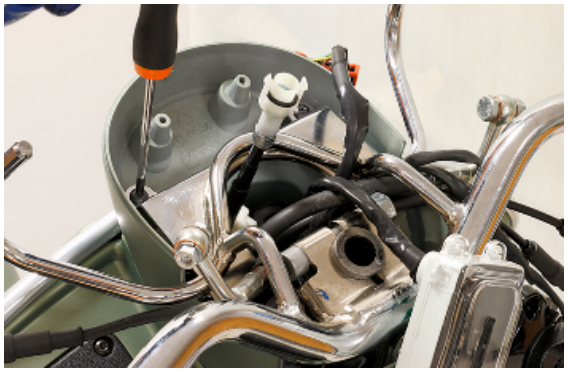
Unscrew the terminal screws from both ends of the handlebar and remove it.



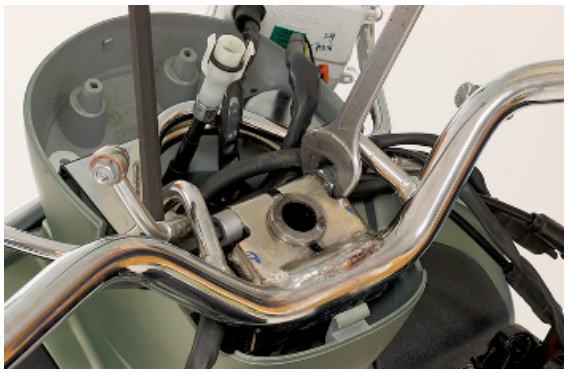
Slide the gas command sleeve out.

Remove the left hand knob using a jet of compressed air.

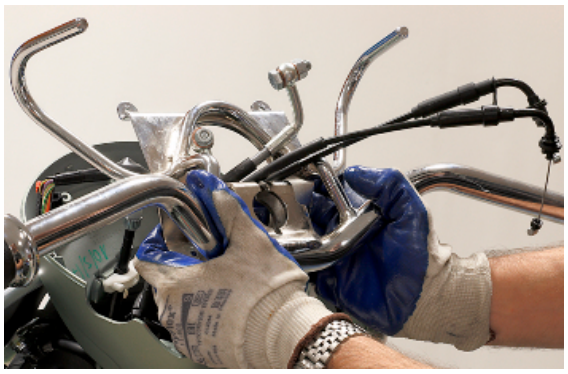
Unscrew the screws used to fasten the front handlebar cover to the handlebar frame.



Unscrew the screw used to fasten the handlebar to the steering tube.

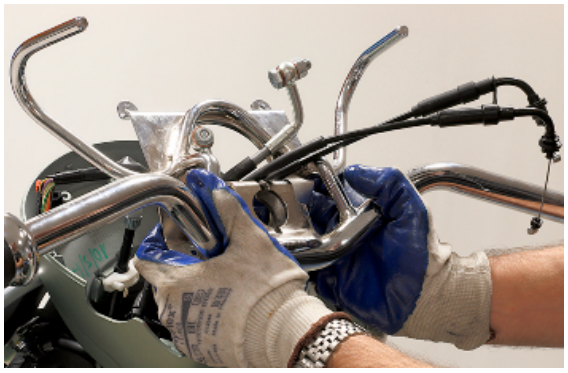


Make a note of the layout of the brake pipes, the gas command transmission cables and the various wiring harnesses, in order to ensure they are positioned correctly during reassembly.
Remove the handlebars

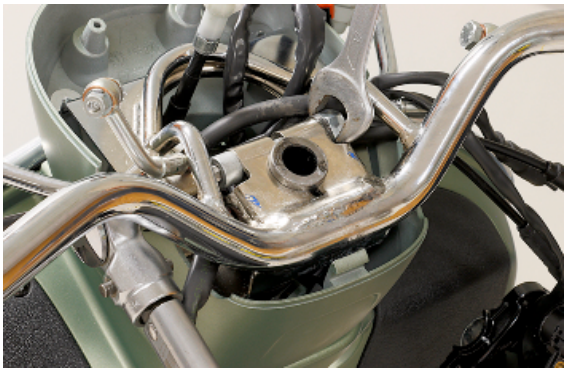


Refitting

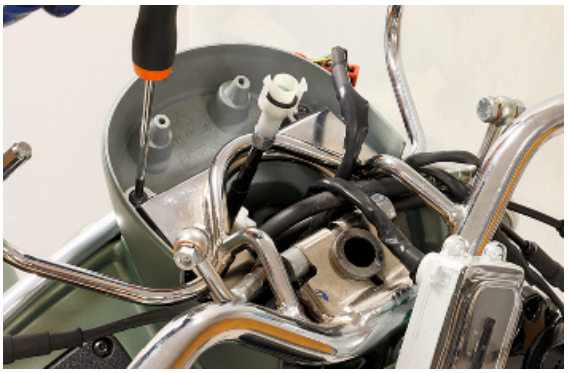
Reposition the brake pipes, the gas command transmission cables and the various wiring harnesses correctly inside the handlebar.
Reposition the handlebars on the steering tube.



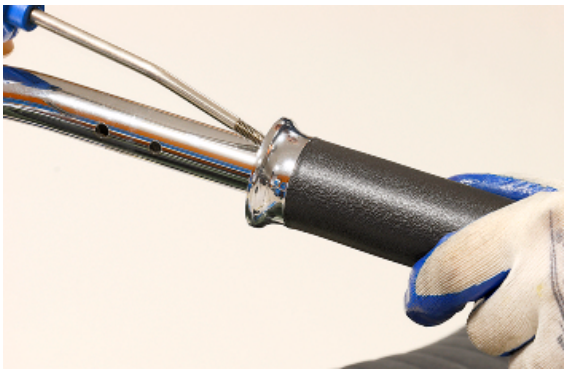
The screw used to fasten the handlebar to the steering tube, applying the recommended torque.



Tighten the screws used to fasten the front handlebar cover to the handlebar.

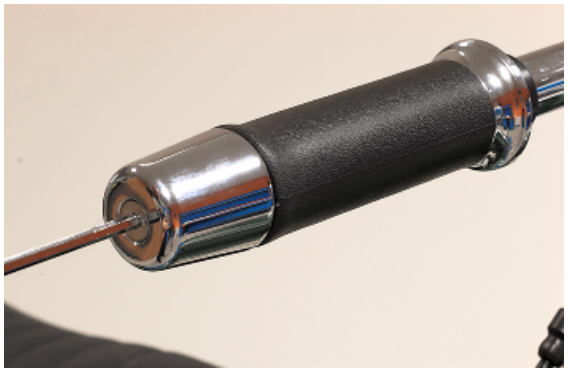


Using a jet of compressed air, reposition the right hand knob on the handlebar.



Insert the throttle sleeve on the handlebar.

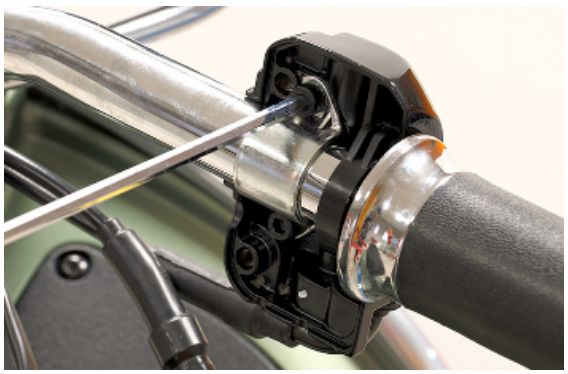
Working on both sides of the handlebars, tighten the screws used to fasten the handlebar terminals, applying the recommended torque.



Reposition the gas command throttle aperture transmission on the right hand handlebar support and tighten the fastening screw.

Reposition the transmission on the gas command sleeve cam.

Tighten the screws used to fasten the U-bolt to the right hand support, applying the recommended torque.



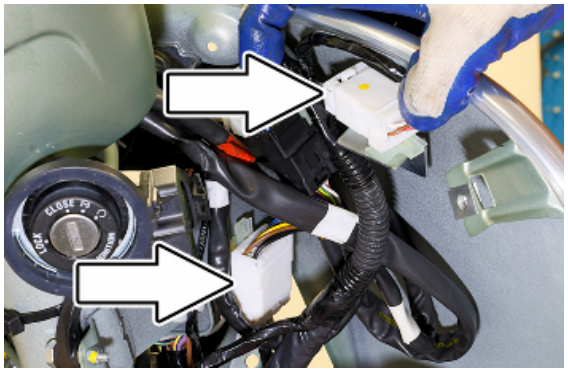
Insert the gas command closure transmission on the right hand electrical device and rotate it by 90°.

Reposition the transmission on the gas command sleeve cam.

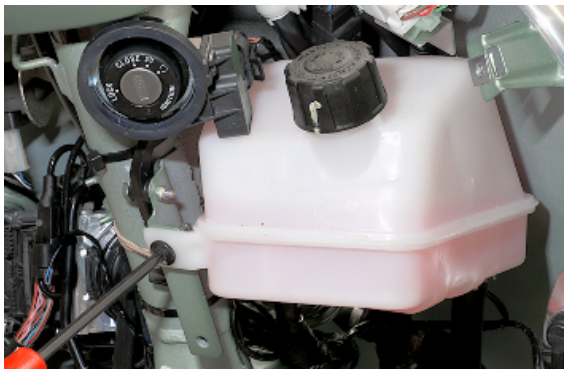
Reposition the device wiring harness and the gas command transmission cables correctly.
Tighten the screws used to fasten the right hand electrical device to the handlebar, applying the recommended torque.

Reposition the device wiring harness correctly.
Tighten the screws used to fasten the left hand electrical device to the handlebar, applying the recommended torque.

Reposition the device wiring harnesses inside the clamps and connect the connectors.



Reposition the expansion chamber and tighten the fastening screws, applying the recommended torque.



Fit the brake pumps as described in this manual, in the section "**braking system > front/rear pump > fitting**".

Connect the stop light switch connectors on both brake pumps.

Reassemble the leg shield back plate.

Refit the rear handlebar cover.

Refit the windscreen.

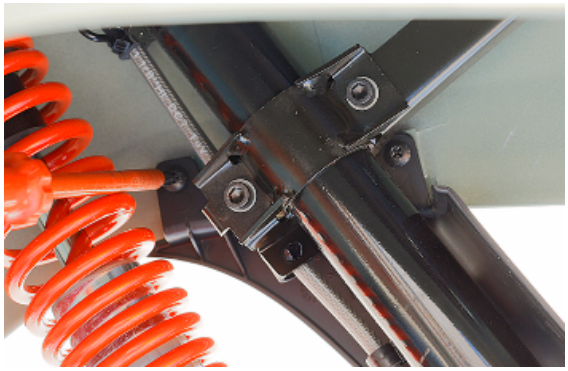
Refit the rear-view mirrors.

Steering column

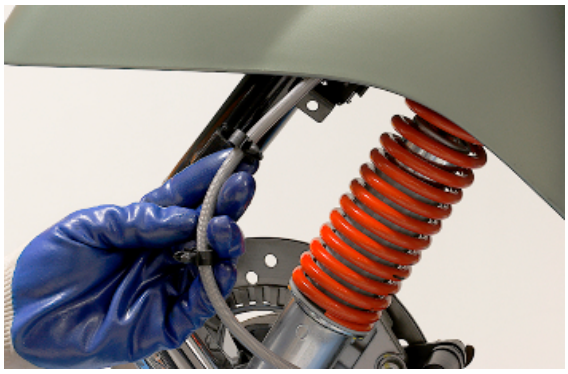
Removal

Adequately support the front part of the vehicle.
Remove the windscreen.
Remove the front centre cover.
Remove the rear handlebar cover.
Remove the front wheel.
Unscrew the front suspension cover external fastening screws.

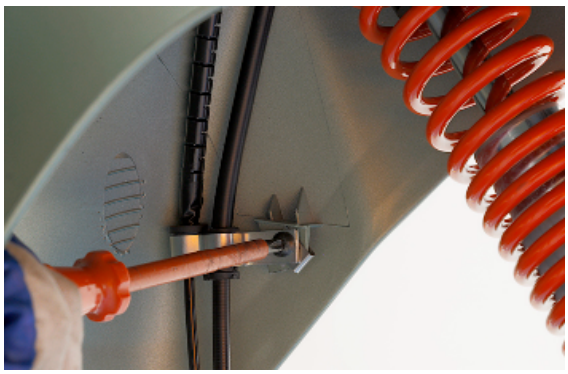
Unscrew the front suspension cover inner fastening screws, and remove the cover.



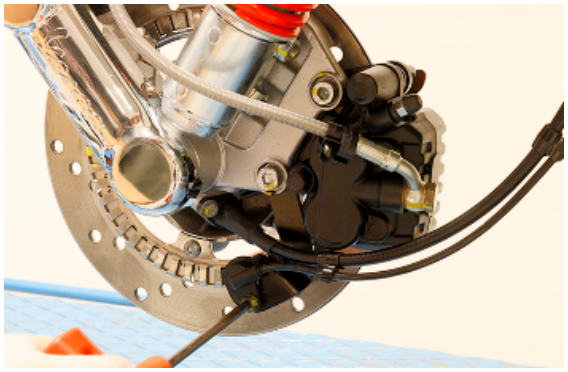
Free the brake pipe from the respective clamps mounted on the steering tube.



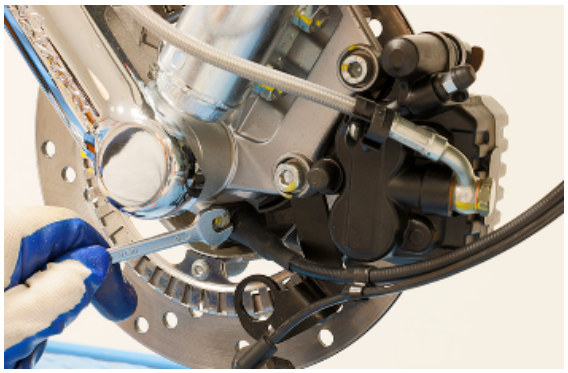
Unscrew the screw used to fasten the odometer transmission cables and able sensor cable retaining clamps.



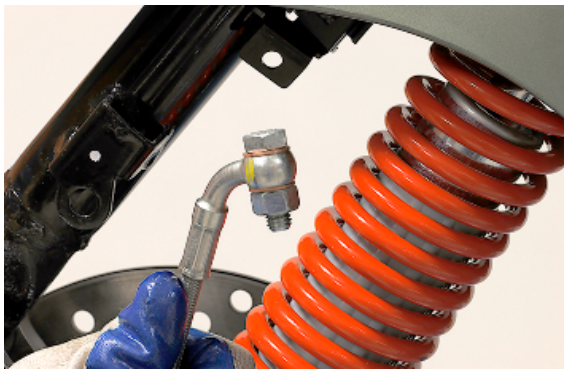
Unscrew the screw used to fasten the ABS sensor to the support.



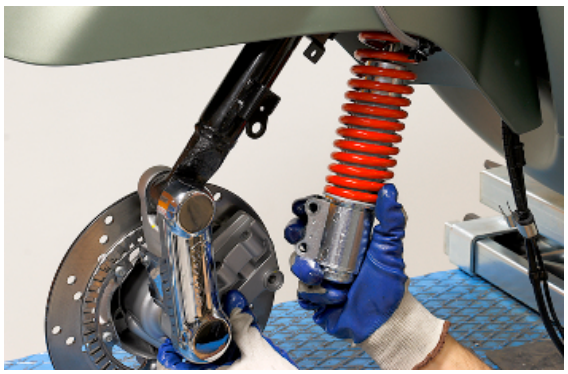
Unscrew the screw used to fasten the odometer transmission to the wheel hub.



Remove the front brake calliper as described in this manual, in the section "**braking system > front brake calliper > removal**".
Protect the coupling.



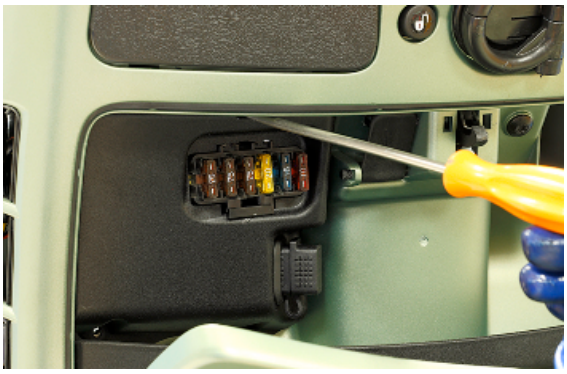
Remove the front shock absorber as described in this manual, in the section "**suspensions > front > front shock absorber > removal**".



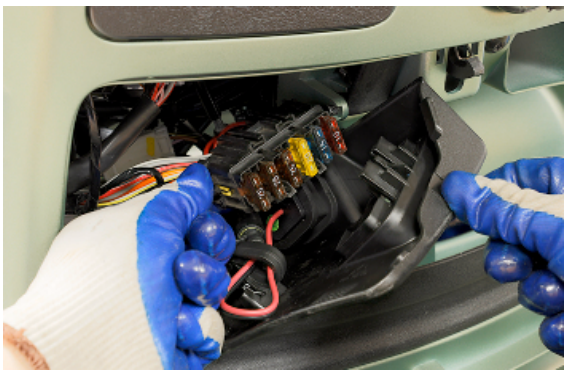
Open the front top-box and remove the lid from the fusebox.

Unscrew the screws used to fasten the top-box lid.

Using a flat-head screwdriver, release the retaining lever and detach the lid.

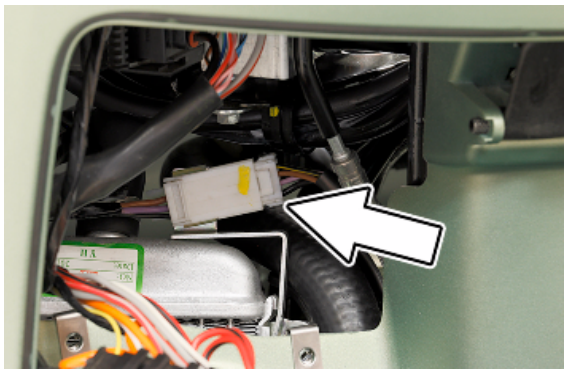


Remove the fusebox from the lid.

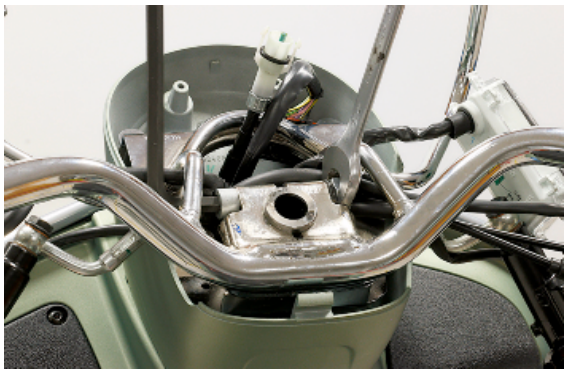


Disconnect the USB port connector.

Disconnect the front light assembly connector.



Disconnect the left hand brake pump from the handlebar and unscrew the screw used to fasten the steering tube to the handlebar.
Tilt the handlebar forwards.



Reposition the protective collar.

Unscrew the upper ring nut, using the special tool.

Specific tooling

020055Y Wrench for steering tube ring nut

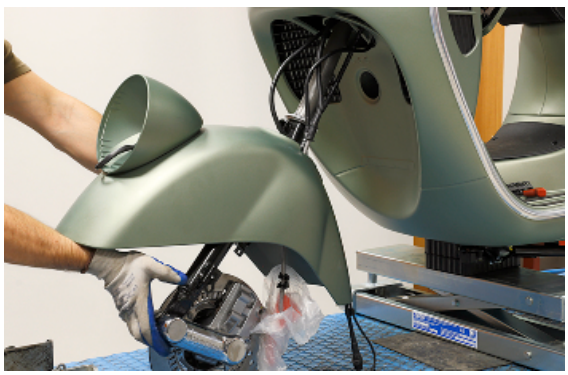
Remove the washer.

Unscrew the lower ring nut, using the special tool.
Remove the ball cage from the upper steering bearing.

Specific tooling

020055Y Wrench for steering tube ring nut

Remove the steering tube from below.
Carefully slide out the brake pipes, the odometer transmission and the phonic wheel and front head-lamp wiring harnesses.



Overhaul

Servicing the front suspension-steering assembly, described below, deals mainly with replacing parts (pin- NADELLA roller bushings - sealing rings unit and dust gaiter) which connect the steering tube to the front wheel holder swinging hub.

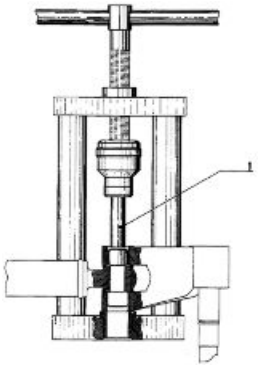
N.B.

BEFORE PROCEEDING WITH THE DESCRIBED SERVICE, CHECK THAT THE STEERING TUBE AND THE WHEEL HOLDER HUB ARE IN EXCELLENT CONDITIONS: ONLY THEN IS THE SERVICE JUSTIFIABLE.
MOREOVER, REMEMBER THE STEERING TUBE SHOULD BE REPLACED WITH A NEW ONE WHEN DEFORMED.

a = Ø 12 Punch

b = Sharp-edged end

Use a suitable punch with the dimensions indicated on the figure; hit with a mallet until the wedging washer is crushed and then extract it with the help of a pointed end.



Repeat the operation for the second washer using the punch on the side opposite to the one shown in the figure.

Use the tool fitted with part 1 as shown in the figure and move the tool hand-grip until the pin and the NADELLA are simultaneously ejected in the direction opposite the tool thrusting force.

After removing the pin and the first NADELLA, the swinging hub gets detached from the steering tube.

To remove the second NADELLA, use the tool fitted with part 2 instead of part 1, on the side opposite the one shown in the figure.

N.B.

DURING THE REMOVAL OPERATIONS DESCRIBED ABOVE, THE ROLLER BUSHINGS ARE DESTROYED WHEN THE EXTRACTOR IS USED. UPON REFITTING, IT IS THEREFORE NECESSARY TO USE NEW BUSHINGS AS WELL AS A NEW PIN, NEW SEALING RINGS AND DUST GAITER.

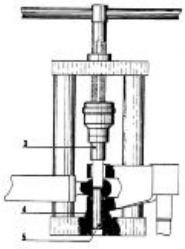
Specific tooling

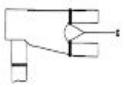
020021Y Front suspension service tool

Connect the swinging hub to the steering tube with the guiding pin.

- Use the tool fitted with part 3 on the stem and part 4.

Lubricate the pin with recommended grease and insert it temporarily on the swinging hub, move the tool hand-grip until part 3 is fully inserted on the steering tube.





After fitting the pin, insert the two spacers, slightly hitting them with the mallet.

N.B.

BEFORE PROCEEDING WITH THE DESCRIBED FITTING, PLACE THE TWO DUST GAITER RINGS ON THE SWINGING HUB AS SHOWN IN THE FIGURE.

Specific tooling

020021Y Front suspension service tool

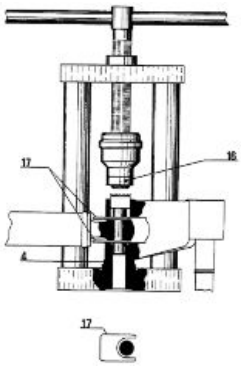
Recommended products

Molybdenum disulphide grease Lithium grease with molybdenum disulphide.

Grey black grease

Insert the sealing ring on the pin and the roller bushing with its wedging washer at the same time.

- Remove the tool and the part 5 (guide), which has been partially ejected during the previous pin fitting phase, and leave part 4 always fitted.
- Replace part 3 with part 16 (on the stem).
- By moving the tool hand-grip, push the wedging washer - roller bushing - seal ring unit, placing part 16 until it stops on the swinging hub.
- Repeat the above operation using the tool with part 16 and part 22, instead of part 4, always fitted to the stem, on the side opposite that indicated in the figure to fit the second wedging washer - roller bushing - sealing ring unit.



WARNING

BEFORE PROCEEDING WITH THE DESCRIBED PRE-FITTING, DIP THE SEALING RINGS IN MINERAL OIL AND THE "NADELLA" ROLLER BUSHINGS (PREVIOUSLY WASHED IN PURE PETROL OR NEUTRAL PETROLEUM TO ELIMINATE THE ANTI-RUST PROTECTION), HALF-FILLED WITH GREASE.

Specific tooling

020021Y Front suspension service tool

Recommended products

Multi-purpose grease "Multi-purpose" lithium and medium fibre-based yellow brown grease suitable for various uses.

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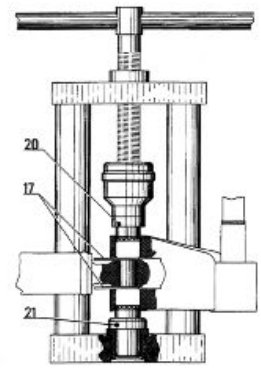
- Use the tool fitted with part 20 on its stem and part 21 on the tool base as shown in the figure.
- By moving the tool hand-grip, push the two NADELLA bushings until their internal bottoms make contact with the pin end.
- Use the tool fitted with parts 3 and 4 to fit the pin, and press moving the tool hand-grip, until wedging the washers on the swinging hub.
- Now, remove the two spacers (parts 17 and 16) and, once the space between the NADELLAs - steering tube and swinging hub - has been fully filled with grease, move the dust gaiter rings until they are placed in that space.
- By wedging the washers as described above, the front suspension unit refitting stage is finished.



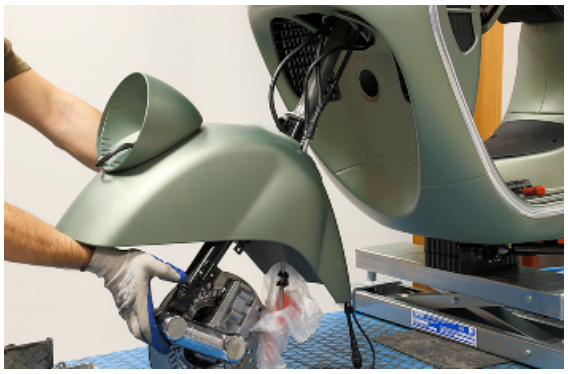
Recommended products

Multi-purpose grease "Multi-purpose" lithium and medium fibre-based yellow brown grease suitable for various uses.

ISO L-X-BCHA 3 - DIN 51 825 K3K -20

Refitting

Reposition the brake pipes, the odometer transmission and the phonic wheel and front headlamp wiring harnesses correctly.
Insert the steering tube, complete with the lower steering bearing ball cage.



Reposition the upper steering bearing ball cage, using the recommended product.
Using the specific tool, tighten the lower ring nut, applying the recommended torque.

Specific tooling

020055Y Wrench for steering tube ring nut

Recommended products

Calcium based grease Calcium grease

Smooth-textured appearance; Ivory coloured

Specification TL 9150 066, symbol NATO G 460

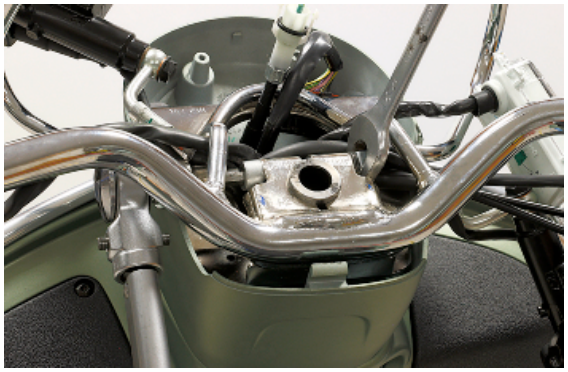
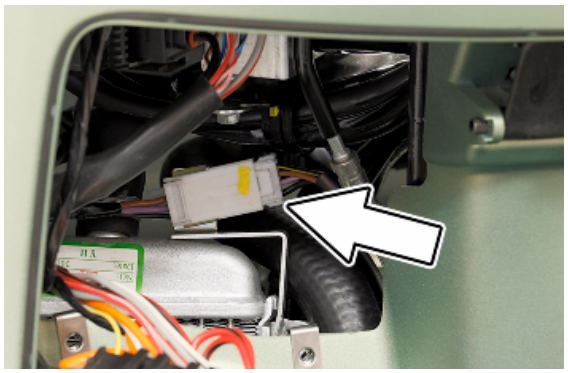
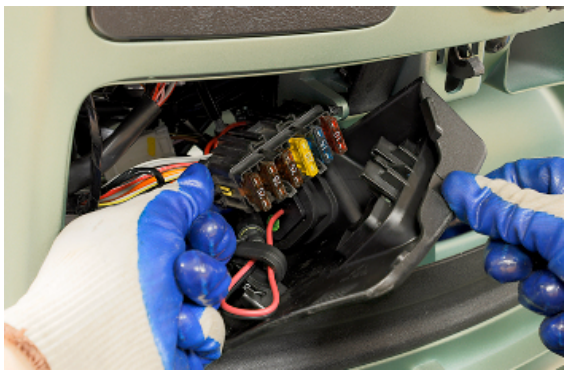
Insert the washer.

Using the specific tool, tighten the upper ring nut, applying the recommended torque.

Specific tooling

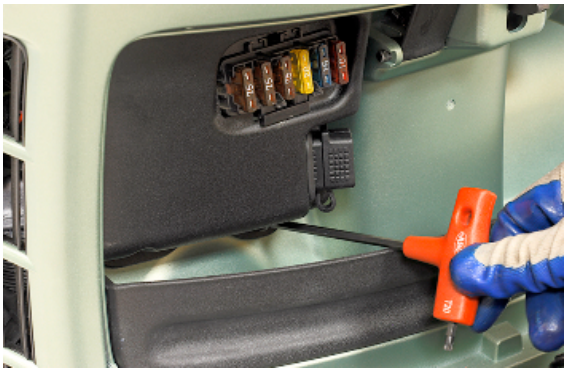
020055Y Wrench for steering tube ring nut

Reposition the protective collar.

The screw used to fasten the handlebar to the steering tube, applying the recommended torque.	
Connect the front headlamp connector.	
Connect the USB port connector.	
Reposition the fusebox in its housing.	

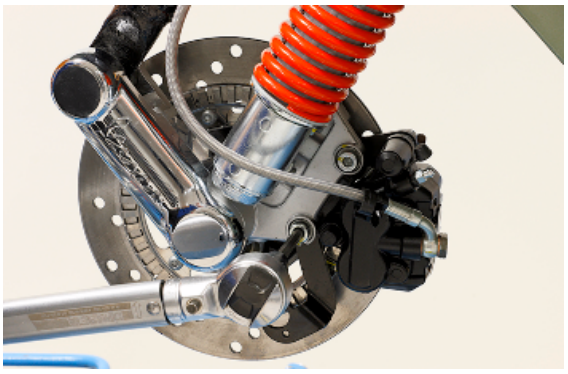
Tighten the screws used to fasten the top-box lid.

Replace the lid on the fusebox.



Refit the front shock absorber as described in this manual, in the section "**suspensions > front > front shock absorber > fitting**".

Refit the front brake calliper as described in this manual, in the section "**braking system > front brake calliper > fitting**".



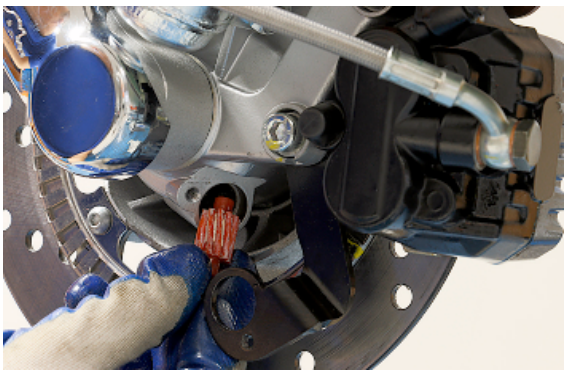
Grease the odometer movement pick-up sprocket using the recommended product, and reposition it in its housing.

Recommended products

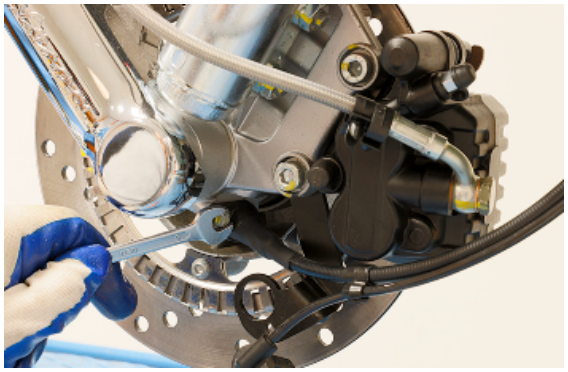
Calcium based grease Calcium grease

Smooth-textured appearance; Ivory coloured

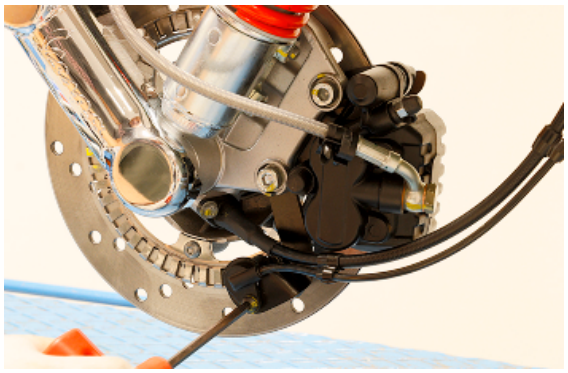
Specification TL 9150 066, symbol NATO G 460



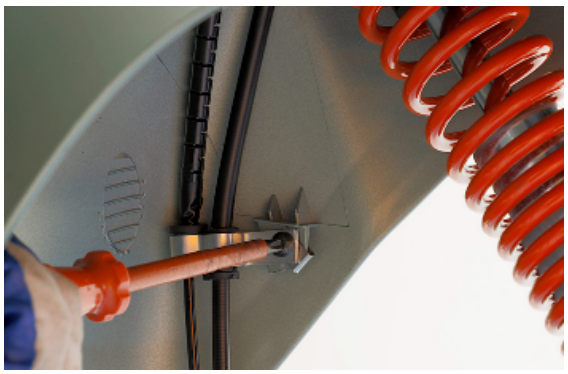
Insert the odometer transmission in its housing and tighten the fastening screw.



Reposition the ABS sensor in its housing and tighten the fastening screw.
Measure the distance "**Y**" between the ABS sensor and the phonic wheel.
If the distance "**Y**" is:
- < 0.1 mm, insert 2 calibrated washers
- 0.1 mm < Y < 0.8 mm, insert 1 calibrated washer
- 0.8 mm < Y < 1.7 mm, do not insert any calibrated washers

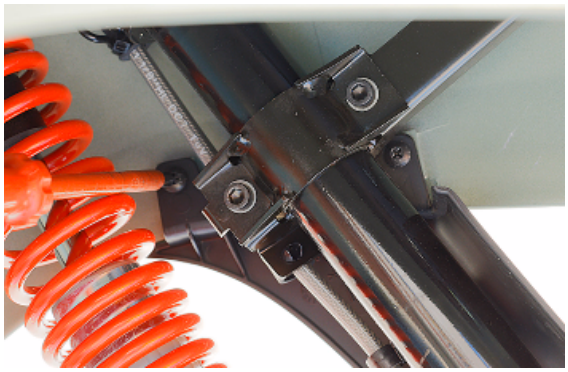


Reposition the ABS sensor siring harness and the brake pipe, and tighten the retaining clamp on the front mudguard.



fasten the brake piping to the steering tube.

Tighten the internal fastening screws on the front suspension cover.



Tighten the external fastening screw on the front suspension cover.

Fit the front wheel.

Refit the rear handlebar cover.

Refit the front centre cover.

Refit the windscreen.

Front shock absorber

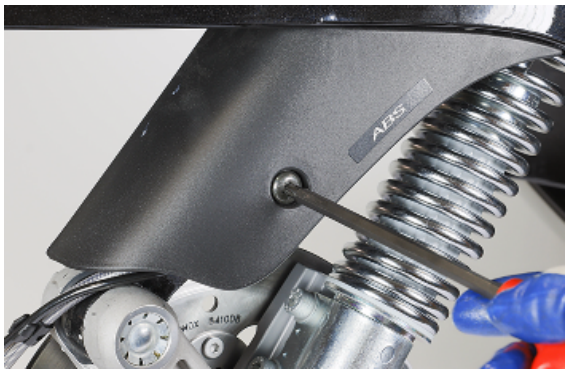
Removal

Rest the vehicle on its centre stand.

Remove the front wheel.

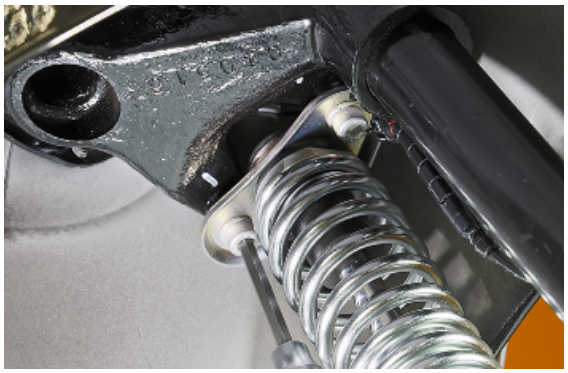
Unscrew the inside screws fixing the cover of the steering tube to the front mudguard.

Unscrew the outside screw fixing the steering tube cover and remove it.

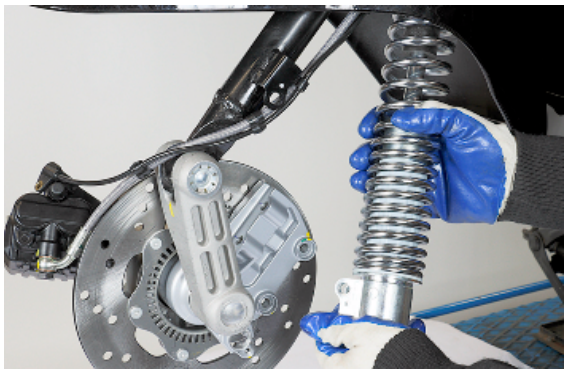


Unscrew the lower screws fixing the shock absorber to the support.

Unscrew the upper screws fixing the shock absorber to the steering tube.

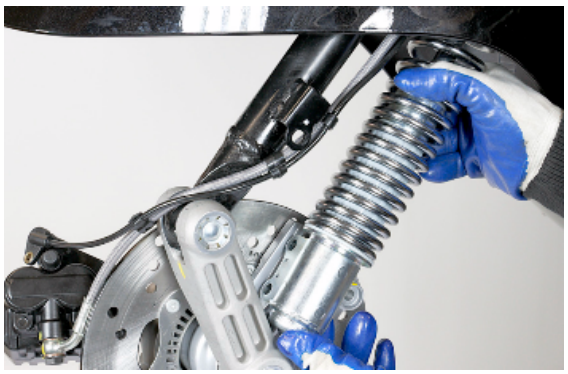


Remove the shock absorber.

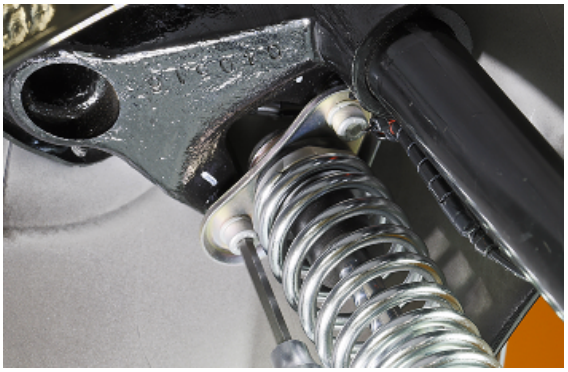


Refitting

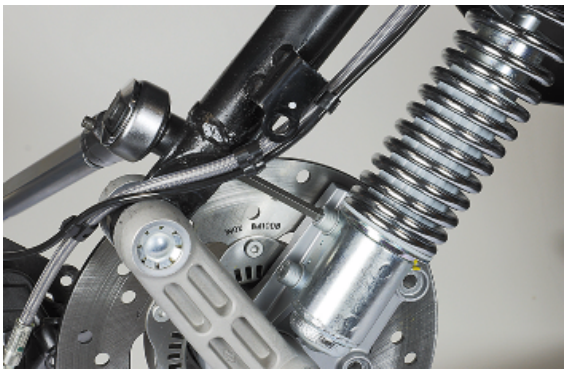
Reposition the shock absorber in its seat.



Tighten the upper screws fixing the shock absorber to steering tube with the prescribed torque.



Tighten the lower screws fixing the shock absorber to the support with the prescribed torque.



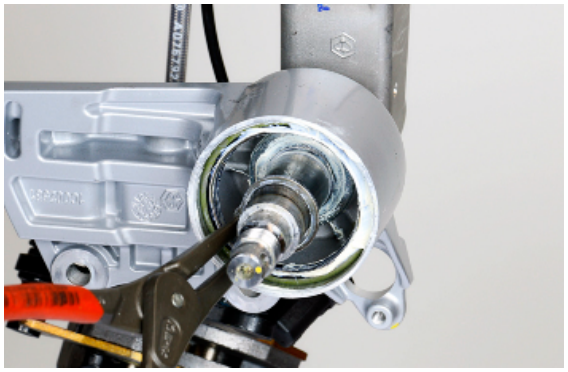
Reposition the cover of the steering tube and tighten the outside screw to the prescribed torque.

Tighten the inside screws of the cover of the steering tube to the front mudguard with the prescribed torque.

Shock-absorber - calliper bracket

Removal

Rest the vehicle on its centre stand.
Remove the front wheel.
Remove the front brake calliper.
Remove the speed sensor.
Remove the front wheel hub.
Remove the front shock absorber.
Remove the Seeger ring



Remove the special washer.

Remove the brake calliper-shock absorber support.

Recuperate the adjustment washer and the O-ring.

Overhaul

Using a flat-head screwdriver, remove the hub side dust gaiter.

Using a flat-head screwdriver, remove the dust gaiter on the shock absorber side.

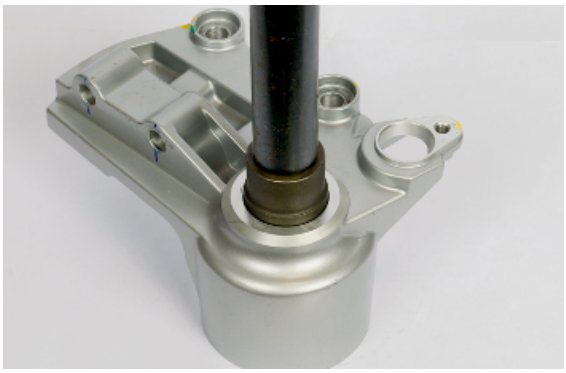
Using the specific tool, remove the roller cages.

Specific tooling

020365Y 22 mm guide

020376Y Adaptor handle

020441S 26 x 28 mm adaptor



After checking the roller cage seat on the support, use the specific tool to install a new roller cage on the wheel hub side.

Specific tooling

020037Y Punch

Using the specific tool, install a roller cage on the front shock absorber side.

Specific tooling

020036Y Punch

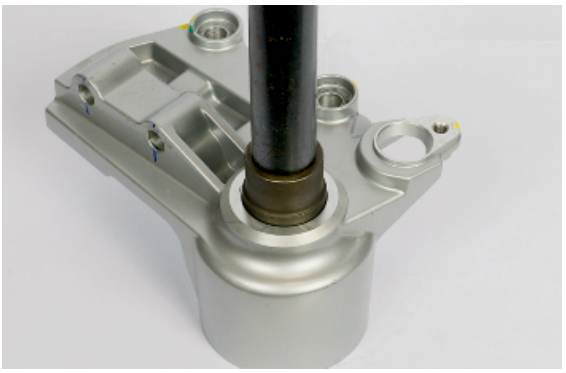
Using the specific tool, install a dust gaiter on the shock absorber side.

Specific tooling

020365Y 22 mm guide

020376Y Adaptor handle

020441S 26 x 28 mm adaptor

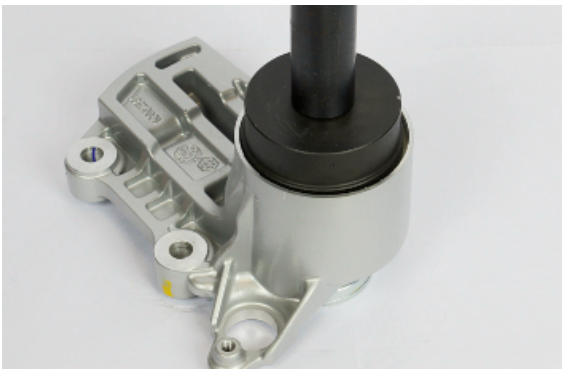


Using the specific tool, install a new dust gaiter on the wheel hub side.

Specific tooling

020360S 52 x 55 mm adaptor

020376Y Adaptor handle



Refitting

Insert a new adjustment washer and a new O-ring.

Insert the brake calliper-shock absorber on the wheel axle after greasing the seats of the roller cages with the recommended product.

Recommended products

Calcium based grease Calcium grease

Smooth-textured appearance; Ivory coloured

Specification TL 9150 066, symbol NATO G 460

Insert the special washer on the front wheel axle and make sure it is fully into its seat.

insert the locking Seeger ring of the support.

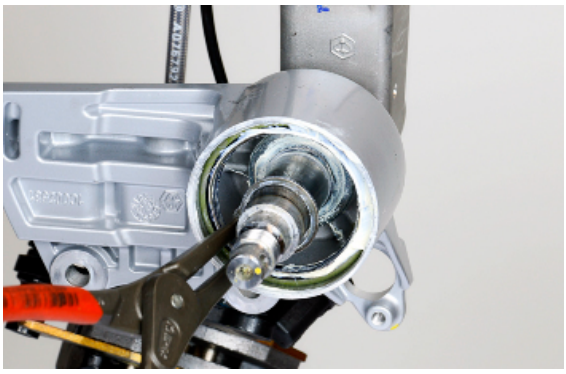
Refit the front shock absorber.

Refit the front wheel hub.

Refit the speed sensor.

Refit the front brake calliper.

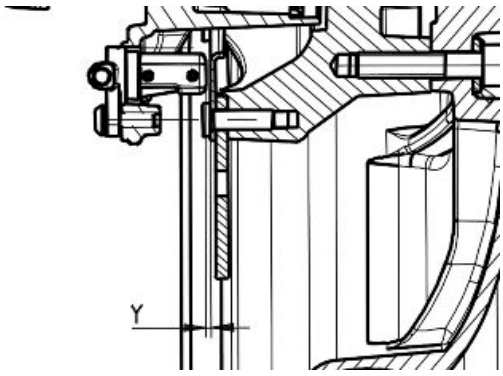
Fit the front wheel.



Check the "**Y**" distance between the speed sensor and the tone wheel:

If the "**Y**" distance is less than 0.7 mm, add an appropriate calibrated washer.

If the "**Y**" distance is greater than 1.9 mm, remove a calibrated washer.



Steering bearing

Removal

Remove the lower ball cage from the steering tube.

Remove the lower plate of the steering bearing from the steering tube.

Using the specific tool, remove the track of the lower steering bearing on the steering headstock.

Specific tooling

020004Y Punch for removing steering bearings from headstock

Using the specific tool, remove the track of the upper steering bearing on the steering headstock.

Specific tooling

020004Y Punch for removing steering bearings from headstock

Refitting

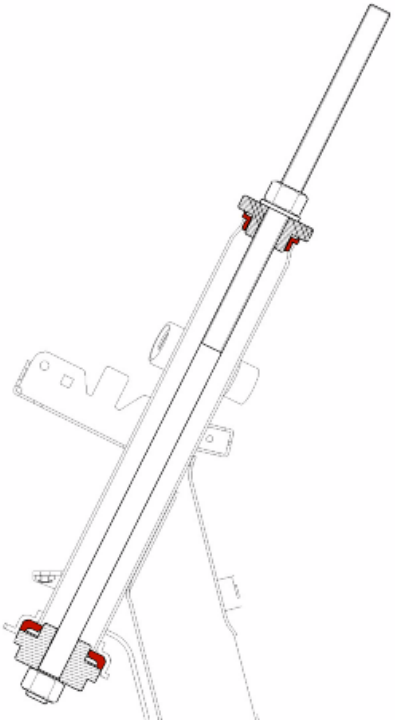
Insert the specific tool and the upper track of the lower steering bearing into the steering headstock.

Specific tooling

001330Y Tool for fitting steering seats

Insert the lower plate of the upper steering bearing into the specific tool and tighten the nut.

Make sure the tracks go all the way onto the steering headstock.



Using the specific tool, refit the lower plate of the steering tube bearing.

Specific tooling

020459Y Punch for fitting the bearing on the steering tube

Grease the track of the seat of the steering bearing with the recommended product.

Reposition the ball cage and refit the steering tube onto the headstock.

Recommended products

Calcium based grease Calcium grease

Smooth-textured appearance; Ivory coloured

Specification TL 9150 066, symbol NATO G 460

Rear

REAR SUSPENSION TIGHTENING TORQUES

Name	Torque in Nm
Swinging arm (engine side) - Engine	67 - 75 Nm
Swinging arm (frame side) - Frame	76 - 83 Nm
Silent block bracket - Frame	42 - 52 Nm
Swinging arm (engine side) - Swinging arm (frame side)	40 - 45 Nm
Rear shock absorber (lower) - Silencer support bracket	40 - 45 Nm
Rear shock absorber (lower) - Shock absorber support bracket	40 - 45 Nm
Shock absorber support bracket - Engine	20 - 25 Nm
Rear shock absorber (upper) - Frame	20 - 25 Nm
Rear wheel hub - Rear wheel axle	104 - 126 Nm
Rear wheel - Rear wheel hub	20 - 25 Nm
Silencer support arm - Engine	20 - 25 Nm
ABS sensor - Silencer support bracket	5 - 6 Nm
Central stand - Engine	40 - 45 Nm
Side stand support bracket - Frame	6 - 10 Nm
Side stand - Side stand support bracket	35 - 40 Nm
Side stand button - Side stand support bracket	5 - 7 Nm
Ground cable - Frame	7.5 - 9.5 Nm
Ground braid - Frame	7.5 - 9.5 Nm
Ground cable - Engine	11 - 13 Nm
Starter motor ground cable - Frame	11 - 12.5 Nm

REAR SUSPENSION

Name	Torque in Nm
Retainer for left shock absorber to crankcase support plate	20 - 25
Shock absorber lower fitting	40 - 45
Shock absorber upper fitting	20 - 25
Rear wheel axle	104 ÷ 126
Screw fixing wheel to hub	20 - 25

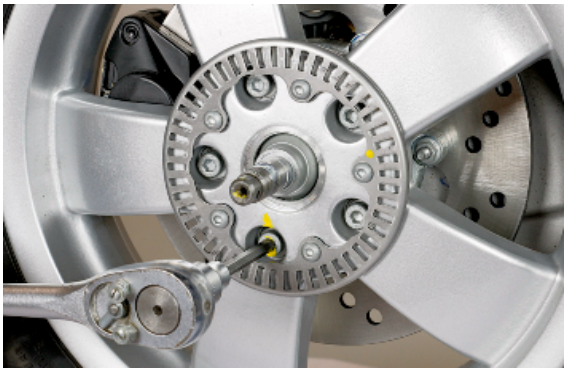
Name	Torque in Nm
Screws for silencer - shock absorber support arm on engine	20 - 25 (The two screws must be tightened after having done so with the rear wheel axle nut at the specified torque. Safety fasteners: see «Pre-delivery Operations»)
Engine- and vehicle-side swinging arm junction bolt	40 - 45

Removing the rear wheel

Remove the complete silencer.

Remove the silencer mounting bracket.

Remove the screws fixing the rear wheel to the wheel hub.



Remove the rear wheel.

Refitting the rear wheel

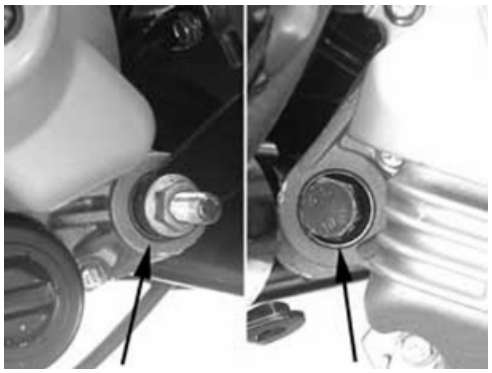
Refit the rear wheel on the wheel hub.

Tighten the screws fixing the rear wheel to the wheel hub to the specified torque.
Refit the silencer support bracket.
Refit the silencer.

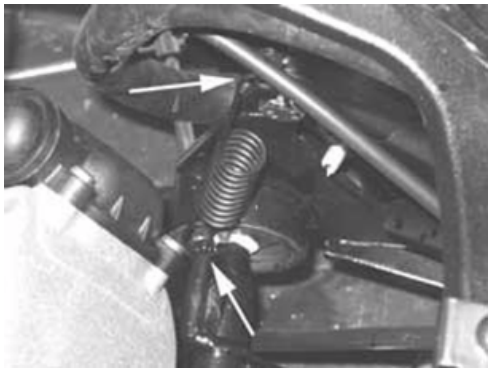
Swing-arm

Removal

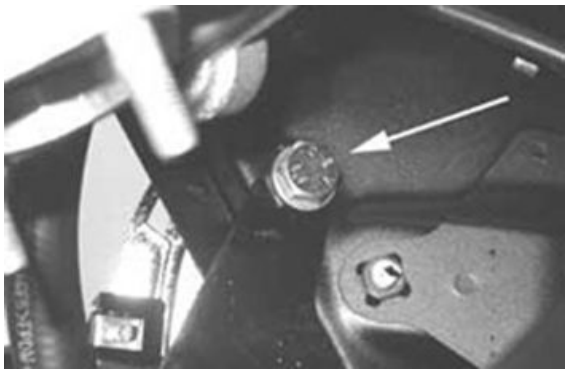
- Place the vehicle on its centre stand;
- Remove the engine housing
- Remove the swinging arm/engine fitting shown in the picture
- Move the engine back



- Remove the spring anchoring the swinging arm to the chassis as shown in the picture



- Remove the two screws fixing the buffer support bracket to the chassis



- Remove the left and right caps located under the footrest to reach the pin fixing the swinging arm to the body.
- Remove the pin. Then remove the swinging arm

- Check the entire swinging arm assembly.
- Check all the centring bushing components and silent block rubber buffers.
- Replace the work components that cause excessive clearance on the rear suspension.

Overhaul

- Check there is no sticking in the movement of the connection of the swinging arm on the engine side to the swinging arm on the chassis side.
- Check the axial clearance between the two swinging arms using a feeler gauge

Characteristic

Standard clearance

0.40 - 0.60 mm

Allowable limit after use:

1.5 mm

- In order to check the clearance of the swinging arm on the frame side, prepare a retainer using the fixing pin of the swinging arm on the frame and two rings from the special tool 020229Y. Alternatively, use two washers with 12-mm inside diameter for pins, minimum 30-mm outside diameter and 4-mm thick at least.

- Check there is no sticking in the rotation.
- Check the axial clearance of the swinging arm on the chassis side

Characteristic

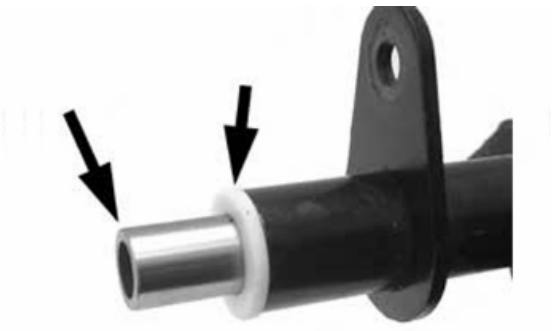
Standard clearance

0.40 - 0.60 mm

Allowable limit after use:

1.5 mm

- Separate the swinging arm on the engine side from the vehicle side arm.
- Remove the plastic bushings and the internal spacer shown in the picture



- Using a suitable pin remove the roller casings as shown in the pictures

- Using an appropriate tool plant new roller casings, being careful to position the bearings with the seal rings facing outwards

Specific tooling

020244Y punch ø 15

020115Y punch ø 18

Characteristic

Length of the swinging arm tube on the engine side:

L 175.3 + 0.3 0

Length of the internal swinging arm spacer on the engine side:

L 183 + 0.3 0

Engine side swinging arm plastic bushing shim:

3.5 ± 0.05 mm

Chassis side swinging arm plastic bushing shim:

3.5 ± 0.05 mm

Length of the internal swinging arm spacer on the chassis side:

290 ± 0.1 mm

Length of the swinging arm tube on the chassis side:

283 ± 0.1 mm

- Lubricate roller casings and the plastic bushings with grease
- Insert the spacers
- Assemble the two arms with the relative bolt in the position shown in the picture
- Adjust the bolt as shown in the picture
- Position the chassis side swinging arm with the most protruding part pointing towards the silent block side as shown in the picture

Recommended products

Calcium based grease Calcium grease

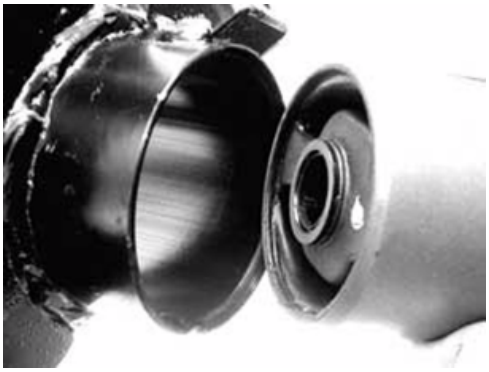
Ivory coloured calcium grease; TL 9150 066; NATO G 460

- Make sure the silent bloc is not broken. If it is, replace the coupling
- Remove the Seeger ring shown in the picture

- Remove the full silent bloc bracket
- Undo the silent bloc ring shown in the picture

- Hold the full silent bloc bracket in the clamp
- Using the appropriate tool, remove the silent bloc from the bracket from the side corresponding to the inside of the vehicle. This is to guarantee the tool is centred properly on the support

- Install a new silent bloc, making sure it aligns properly with the reference tooth.
- Fit the silent blocs, making sure the chamfered part of the silent bloc matches the chamfered part of the bracket



- Using the appropriate tool, fit the silent bloc as shown in the picture

Refitting

- To refit, perform the removal operations in reverse.
- Grease the bearings and the rolling parts with the recommended grease.

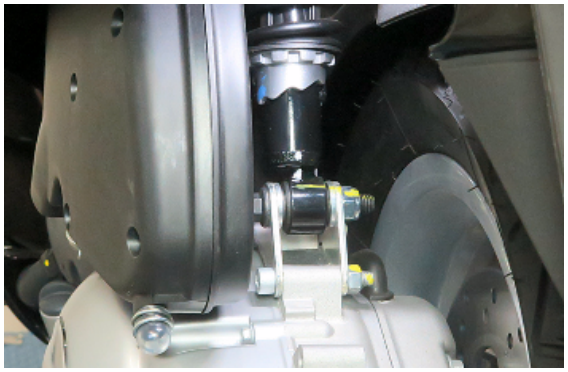
- Complete the fitting procedure by tightening the bolts, applying the recommended torque values.

Shock absorbers

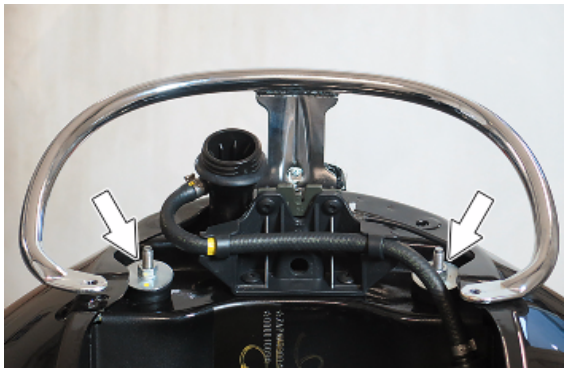
Removal

Proceed as follows:
- set the vehicle on its centre stand and support it adequately.
- Remove the luggage rack.
- Remove the silencer.
- Unscrew and remove the right shock absorber lower fixing nut.

- Unscrew and remove the left shock absorber lower fixing screw.



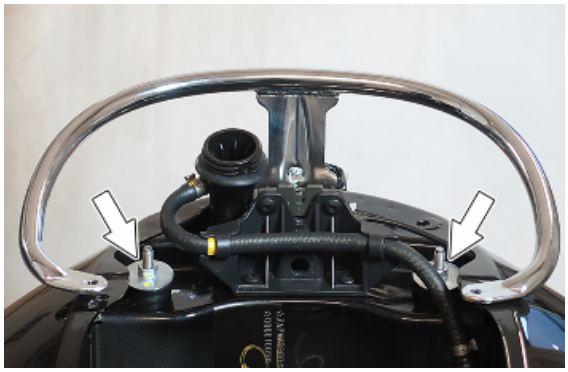
- Support the shock absorbers and unscrew its top fixing nuts.



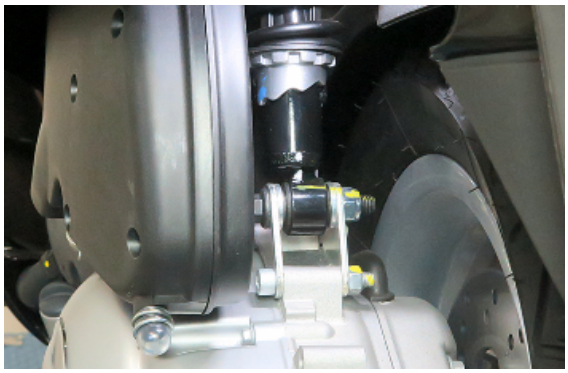
Refitting

For fitting, proceed as follows:

- Insert the top attachment of the rear shock absorbers into the seat in the chassis.
- Tighten the nuts to the specified torque.



- Insert the lower fixing bolt of the left shock absorber.
- Tighten the bolt to the specified torque.



- Insert the lower fixing bolt of the right shock absorber and tighten to the specified torque.
- Fit the silencer.
- Fit the luggage rack.

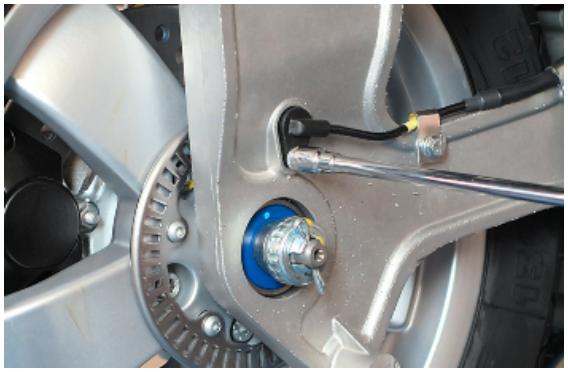
Exhaust bracket

Removal

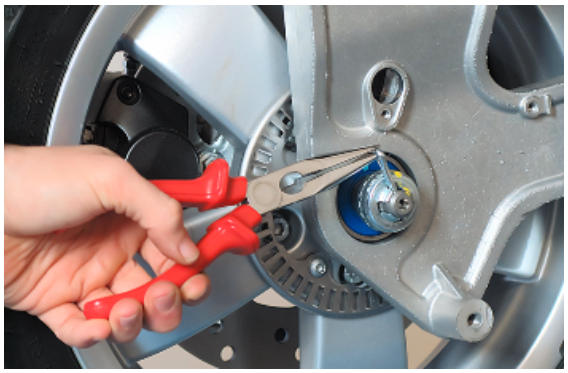
To remove the silencer support bracket, proceed as follows:

- set the vehicle on its centre stand and support it adequately.
- remove the silencer.

- Unscrew and remove the screw fixing the rear ABS sensor and the screws of the retention clamps of the relative cable.

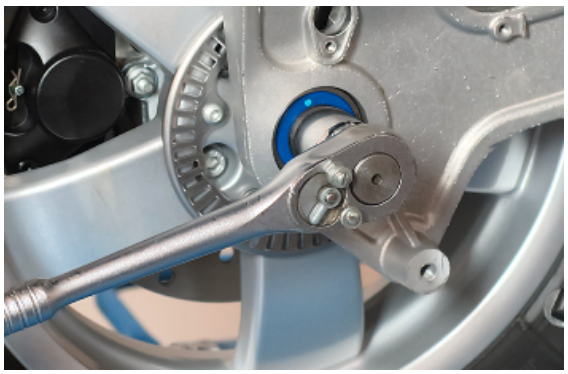


- Remove the split pin.



- Remove the cap.

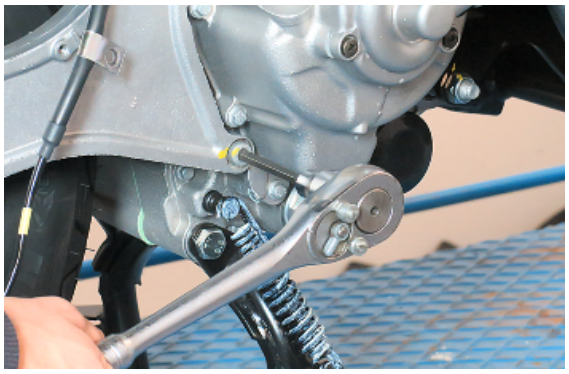
- Unscrew and remove the rear wheel nut.



- Remove the spacer.

- Unscrew and remove the right shock absorber nut.

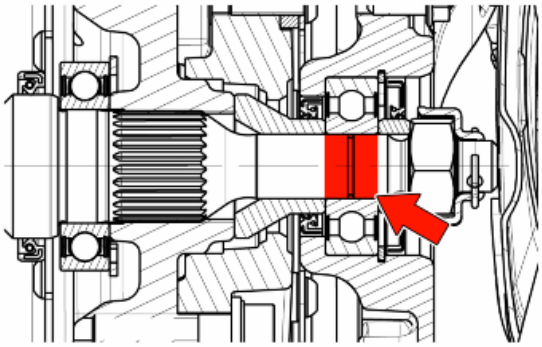
- Unscrew and remove the screws fixing the bracket to the engine.



- The silencer support bracket is now free and it can be disconnected from the engine.

Refitting

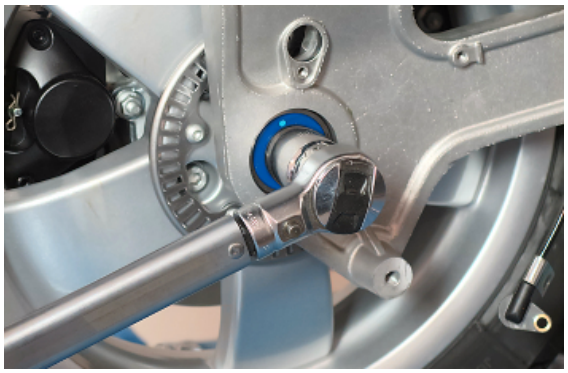
using the recommended product, lubricate the contact surfaces between the wheel axle and the bearing on the bracket, as indicated in figure. **Take care not to apply the grease to the threaded portion of the wheel axle.**



To fit the silencer support bracket, proceed as follows:

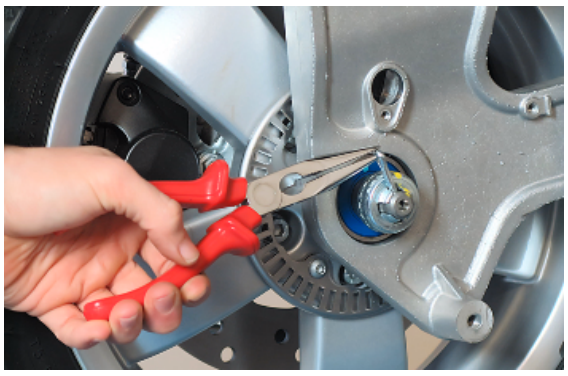
- Place the bracket on the engine inserting it onto the wheel pin.
- Insert the spacer.

- Insert the rear wheel nut and tighten to the specified torque.

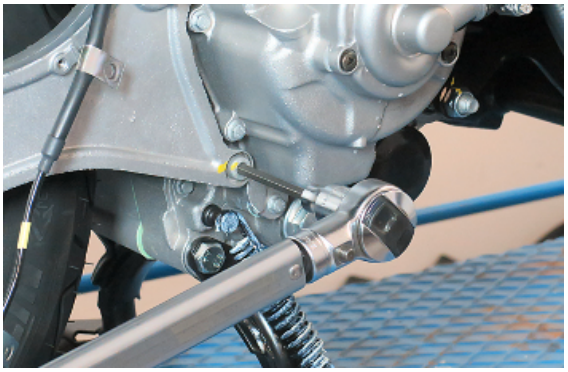


- Insert the cap nut.

- Insert the cotter pin and bend its ends outwards.

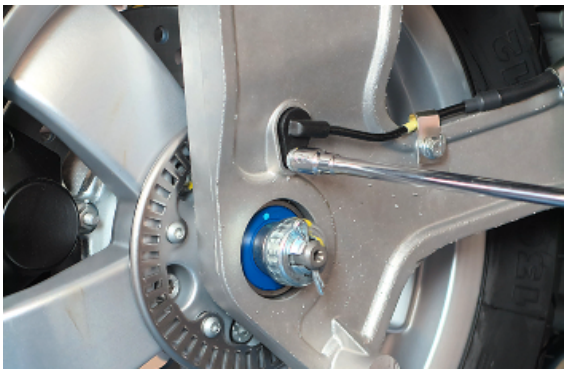


- Insert and tighten the screws fixing the bracket to the engine carter to the specified torque.

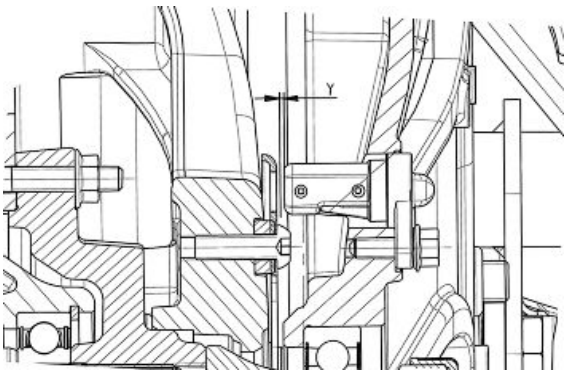


- Insert the lower fixing bolt of the right shock absorber and tighten to the specified torque.

- Insert the rear wheel ABS sensor in its seat and tighten the fixing screws.



After assembling the sensor in its seat, measure the distance **"Y"** between the sensor and the tone wheel with a feeler gauge.
If the "Y" measurement is less than 0.4 mm, assemble a calibrated washer between the sensor and the silencer support bracket.



- Fit the silencer.

Centre-stand

REMOVAL

- Support the vehicle adequately.
- Remove the two return springs from the centre stand.
- Undo the nut shown in the figure.
- Remove the pin from the right side.
- Remove the centre stand.

FITTING

- On refitting tighten the nut to the specified torque.

Side stand

REMOVAL

- Uncouple the centre stand return spring;

Remove the screw shown in the photograph

FITTING

To refit, carry out the removal operations in reverse order and comply with the specified torque.

INDEX OF TOPICS

This section is dedicated to the description of the brake system components.

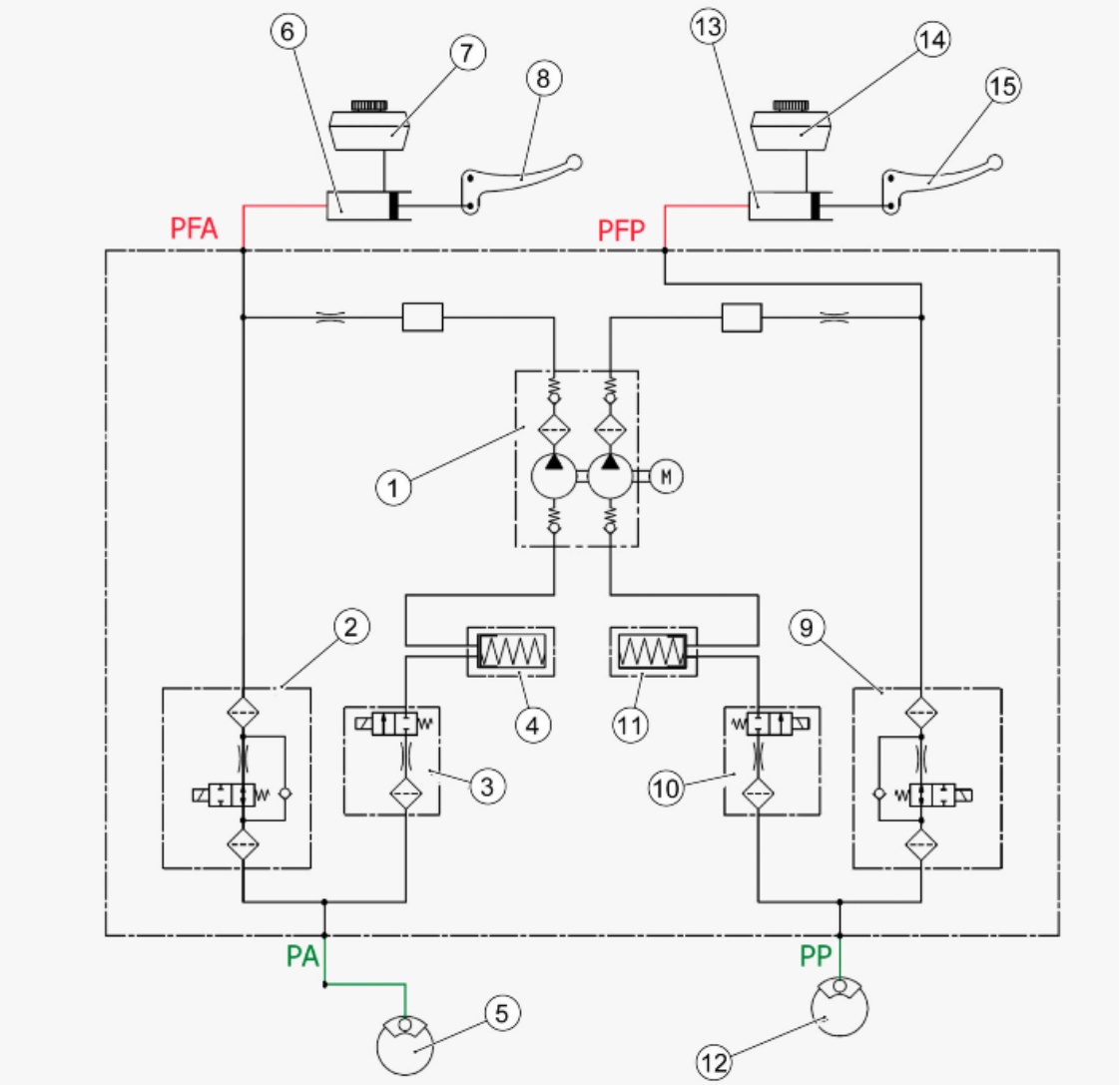
FRONT BRAKE

Name	Torque in Nm
Brake fluid pump-hose joint	20 - 25
Brake fluid pipe-calliper fitting	19 - 24
Screw fixing calliper to the shock absorber - calliper plate attachment	24 to 27
Disc tightening screw	6 (Apply LOCTITE 242 threadlock, medium strength)
Oil bleed screw	12 - 16
Pad fastening pin	19.6 - 24.5
Brake pump reservoir screws	1.5 - 2
Brake disc screws	8 to 10

REAR BRAKE

Name	Torque in Nm
Brake fluid pump-hose joint	20 - 25
Brake fluid pipe-calliper fitting	20 - 25
Rear disc tightening bolt	11 to 13
Oil bleed screw	12-16
Calliper to engine tightening screw	20 - 25
Brake pump reservoir screws	1.5 - 2
Callipers fitting screw	30 - 33 Nm

ABS



Key:

1. Recirculation pumps
2. Front brake circuit inlet solenoid valve
3. Front brake circuit outlet solenoid valve
4. Front brake circuit low pressure accumulator
5. Front Calliper (PA Pump)
6. Front Brake (PFA)
7. Front Brake Tank
8. Front brake control lever
9. Rear brake circuit inlet solenoid valve
10. Rear brake circuit outlet solenoid valve
11. Rear brake circuit low pressure accumulator
12. Rear Calliper (PP)
13. Rear Brake Pump (PFP)

14.Rear Brake Tank

15.Rear brake lever

OPERATION OF THE ABS

General considerations

- The front circuit is the same as the rear one.
- The ABS intake valve (2 - 9) is normally open and is closed only when the system intervenes to prevent locking.
- The exhaust valve (10 - 3) is normally closed and is only opened when the system intervenes to prevent locking.
- With the system in stand-by mode, the ABS processor controls the wheel speed instant by instant to assess any slippage of the wheels.
- While in stand-by, the system does not intervene in any way on the braking of the rider, the braking system is identical to the one without ABS.
- ABS Cycle phases (the following operations refer to the front circuit but they are also valid for the rear):

A - Start braking: the rider starts braking as he would usually do.

B - Pressure reduction: coincides with the recognition of the dangerous situation (wheel slippage exceeds the threshold): The system closes the intake valve (2 - 9) and temporarily opens the exhaust valve (10 - 3). In this phase, the rider cannot increase the pressure of the callipers (12 - 5) and the system reduces the pressure in the callipers. The excess fluid temporarily fills the front tank (14 - 7) until the ABS pump (1) self-operates by driving the fluid in the direction of brake pump (6 - 13).

C - Maintaining pressure: the pressure in the callipers (12 - 5) remains low until the full restoration of speed / grip of the wheel. The system returns the fluid removed from the calliper (12 - 5) to the system section between the brake pump (6 - 13) and the ABS intake valve (2 - 9).

D - Pressure restoration: through the temporary openings of the intake valve (2 - 9), pressure from the callipers (12 - 5) is increased until the maximum deceleration has been reached, the system then re-assigns braking control to the rider.

E - In the event that the wheel does not regain full grip, the system continues to operate as before until it is restored or until the vehicle stops. An error may be generated, however, if the pressure reduction stage persists for longer than a predetermined limit.

Modulator

REMOVAL

CAUTION

IT IS EXTREMELY IMPORTANT TO CAREFULLY FOLLOW THE REMOVAL AND REASSEMBLY PROCEDURES DESCRIBED BELOW. THESE PROCEDURES MAKE IT POSSIBLE TO AVOID AIR

FROM ENTERING THE BRAKING CIRCUIT AND ESPECIALLY IN THE ABS MODULATOR WHILE REPLACING THE COMPONENTS.

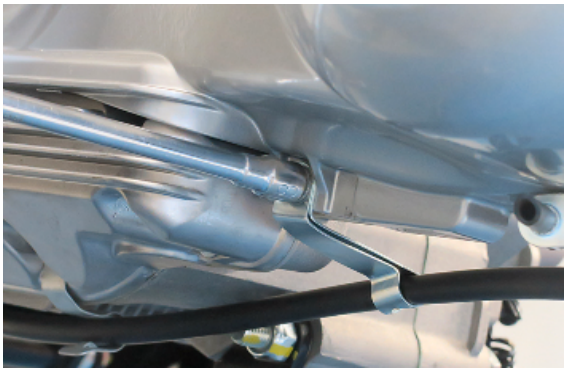
Support the vehicle adequately.

Remove the leg shield back plate.

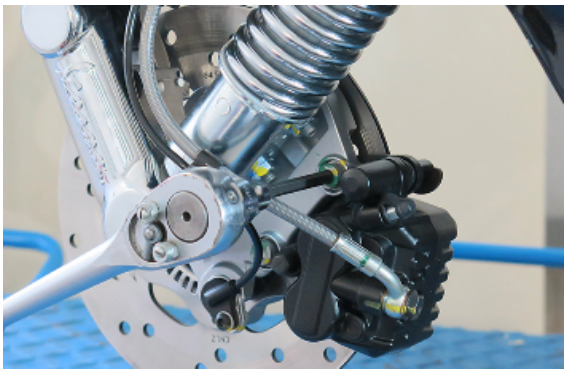
Remove the front centre cover.

Remove the wheels.

Unscrew the screws on the rear brake hose fastening clamps.

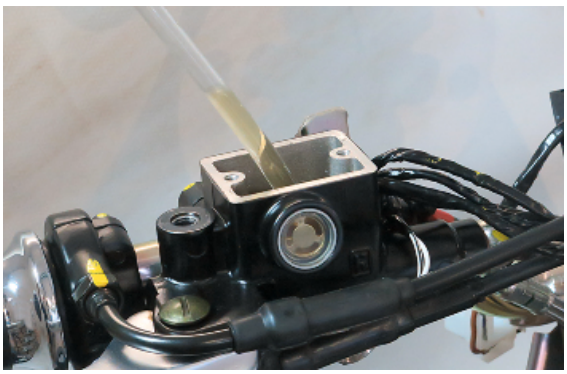


Unscrew and remove the front brake calliper fixing screws and remove it from the support.



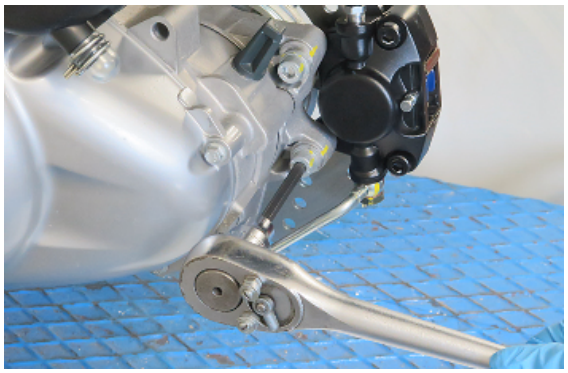
With new pads or pads in a good condition, operate the brake pump repeatedly to bring the pads in contact with each other.

Refill the front brake pump tank and fit the cap.

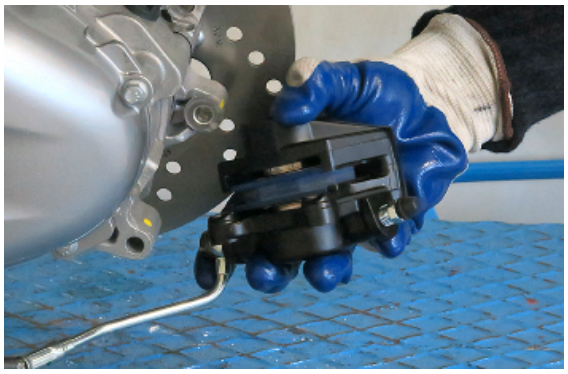


Operate the brake lever just beyond the point of closing communication with the tank.
Block the position of the lever by fastening it.

Undo the fixing screws of the rear brake calliper to the engine.



With new pads or pads in a good condition, operate the brake pump repeatedly to bring the pads in contact with each other.



Refill the rear brake pump tank and fit the cap.

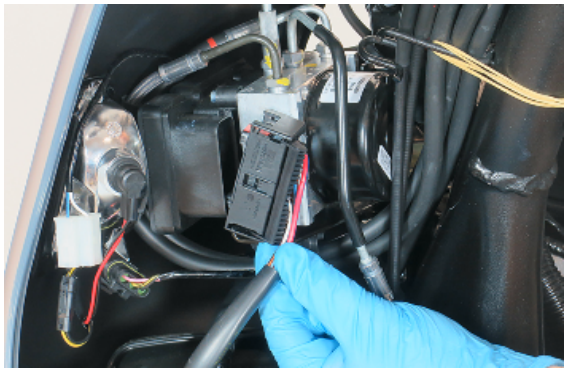
Operate the brake lever just beyond the point of closing communication with the tank.
Block the position of the lever by fastening it.

Unscrew the fixing nuts and remove the turn indicators device including bracket.

Disconnect the front tone wheel sensor connector.

Open the hydraulic hoses fastening clamp.

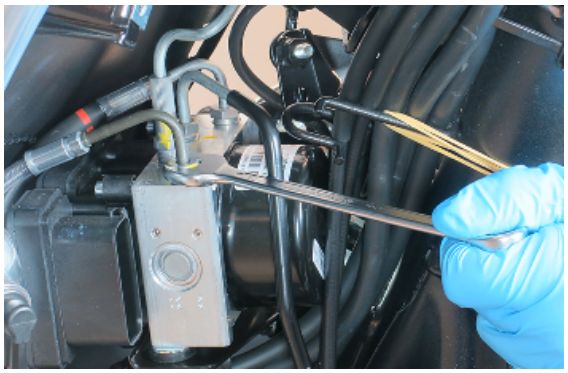
Disconnect the modulator connector.



Unscrew the connectors fastening the circuit pipes entering and exiting the modulator.

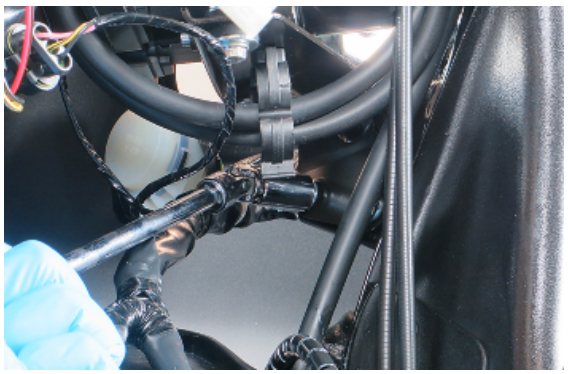
N.B.

PAY ATTENTION TO THE LOSS OF BRAKE FLUID DURING THE REMOVAL OF THE PIPING FROM THE MODULATOR. USE A SMALL CONTAINER AND A CLOTH.



Through the front opening of the shield, unscrew and remove the modulator fixing screw to the side support bracket.

Undo and remove the fastening nuts of the modulator lower support bracket



Remove the modulator complete with lower support bracket.

Separate the ABS modulator from the lower support bracket by unscrewing the fastening screws.

FITTING

Install the new modulator on the support bracket, tightening the fastening screws to the specified torque.

Insert the ABS modulator complete with bracket in its seat.

Through the front opening of the shield, insert and tighten the modulator fixing screw at the prescribed torque to the side support bracket.

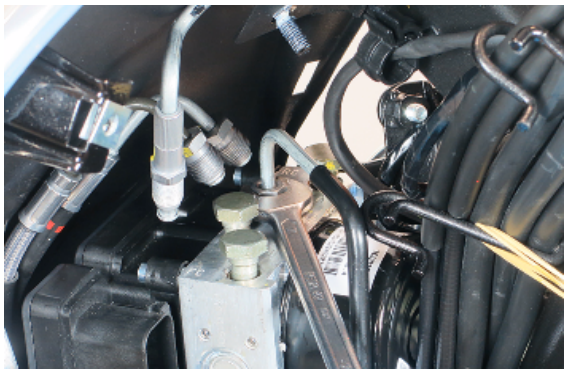
Unscrew the seal plug on the RW outlet of the modulator.

N.B.

PAY ATTENTION TO THE LOSS OF BRAKE FLUID DURING THE REMOVAL OF THE PIPING FROM THE MODULATOR. USE A SMALL CONTAINER AND A CLOTH.

Connect the pipe supplying the rear calliper to the RW outlet on the modulator.

Screw in the connector all the way and then loosen it half a turn.



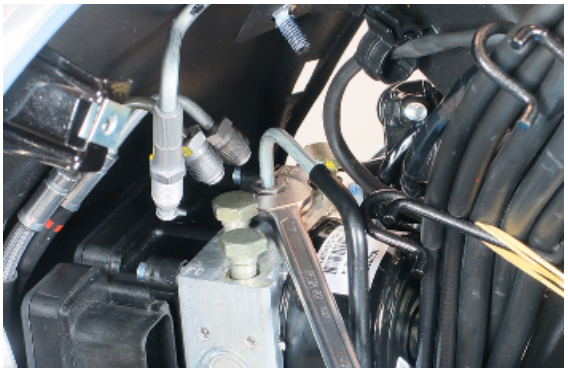
Slowly move away the rear calliper pads.

Until the brake fluid exits the slow connector.

Block the connector on the modulator while the fluid is exiting.

CAUTION

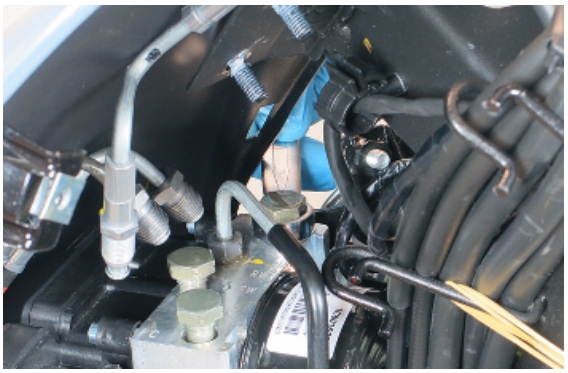
THE CONNECTOR MUST BE TIGHTENED BEFORE REMOVING THE THRUST FROM THE PADS. OTHERWISE, AIR ENTERS THE PIPE.



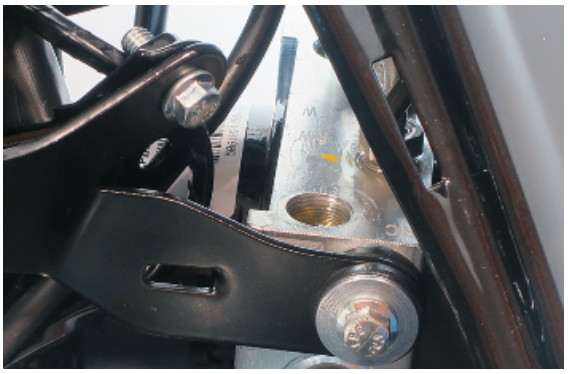
Unscrew the seal plug on the RC inlet of the modulator.

N.B.

PAY ATTENTION TO THE LOSS OF BRAKE FLUID DURING THE REMOVAL OF THE PIPING FROM THE MODULATOR. USE A SMALL CONTAINER AND A CLOTH.



Move the rear calliper pads further away until the brake fluid exits from the seat of the RC inlet.



Connect the rear brake master cylinder delivery pipe to the RC outlet on the modulator.

Screw in the connector all the way and then loosen it half a turn.

Pull the rear brake lever until brake fluid and air slowly exit the RC connector.

Block the connector while the brake fluid is exiting.

CAUTION

THE CONNECTOR MUST BE TIGHTENED BEFORE RELEASING THE BRAKE PUMP LEVER. OTHERWISE THE PUMP INTAKES AIR IN THE PIPE.

Free the rear brake pump lever.

Check and if necessary top up the level of the brake fluid in the brake pump tank.

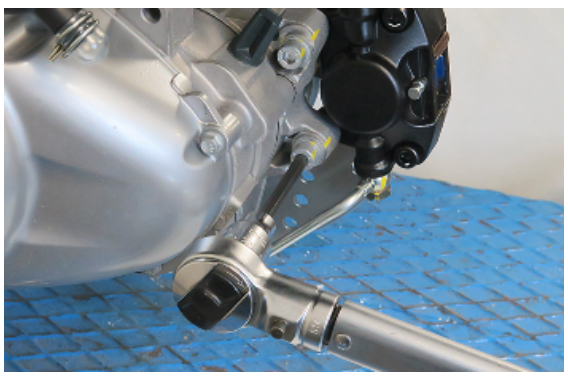
Close the tank cap.

Refit the rear brake calliper on the disc, tightening the screws to the specified torque.

Actuate the brake pump lever, recovering the distance of the pads.

Check the system's efficiency.

If the work was performed properly, the brake must be efficient.

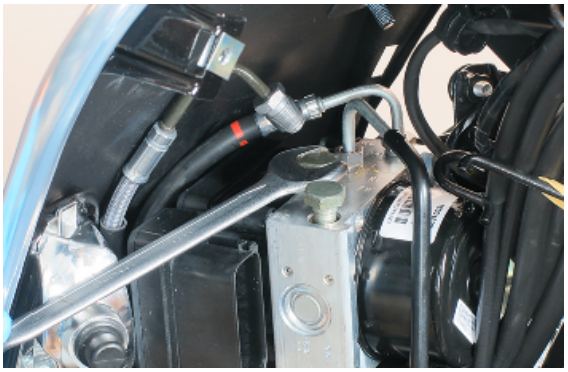


Proceed in the same manner to connect the front brake pipes.

Unscrew the seal plug on the FW outlet of the modulator.

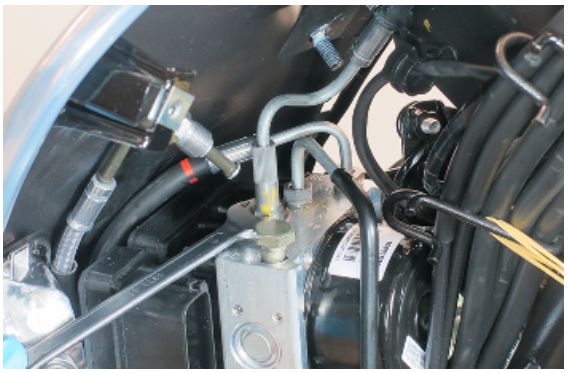
N.B.

PAY ATTENTION TO THE LOSS OF BRAKE FLUID DURING THE REMOVAL OF THE PIPING FROM THE MODULATOR. USE A SMALL CONTAINER AND A CLOTH.



- Connect the pipe supplying the front calliper to the FW outlet on the modulator.

Screw in the connector all the way and then loosen it half a turn.



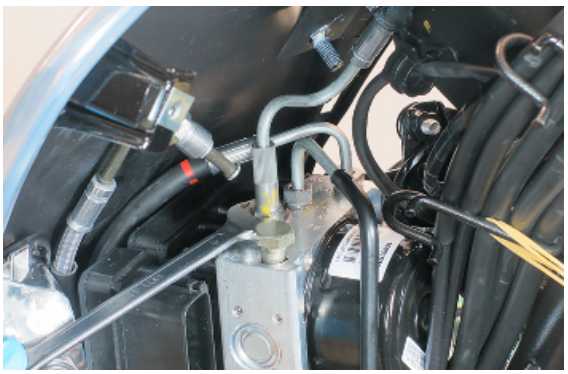
Slowly move away the front calliper pads.

Until the brake fluid exits the slow connector.

Block the connector on the modulator while the fluid is exiting.

CAUTION

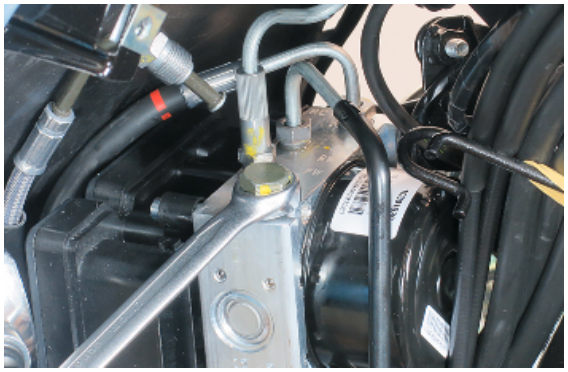
THE CONNECTOR MUST BE TIGHTENED BEFORE REMOVING THE THRUST FROM THE PADS. OTHERWISE, AIR ENTERS THE PIPE.



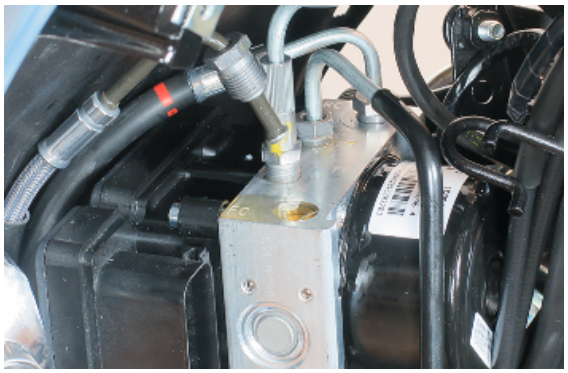
Unscrew the seal plug on the FC inlet of the modulator.

N.B.

PAY ATTENTION TO THE LOSS OF BRAKE FLUID DURING THE REMOVAL OF THE PIPING FROM THE MODULATOR. USE A SMALL CONTAINER AND A CLOTH.

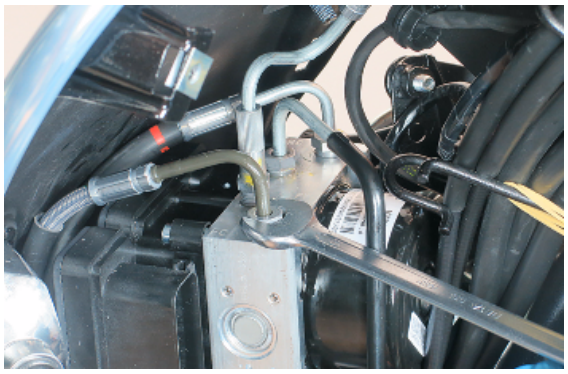


Move the front calliper pads further away until the brake fluid exits from the seat of the FC inlet.



Connect the front brake master cylinder delivery pipe to the FC outlet on the modulator.

Screw in the connector all the way and then loosen it half a turn.

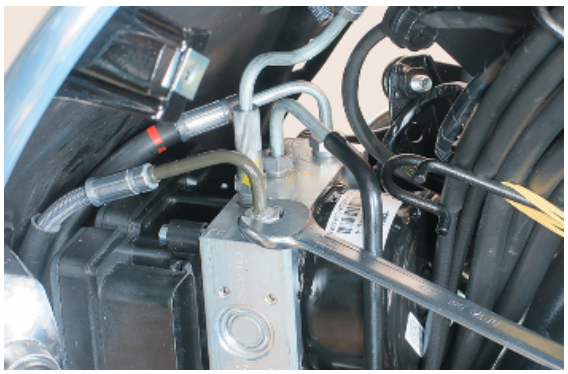


Pull the front brake lever until brake fluid and air slowly exit the FC connector.

Block the connector while the brake fluid is exiting.

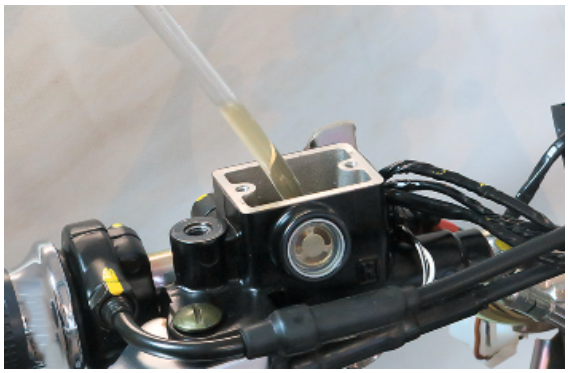
CAUTION

THE CONNECTOR MUST BE TIGHTENED BEFORE RELEASING THE BRAKE PUMP LEVER. OTHERWISE THE PUMP INTAKES AIR IN THE PIPE.

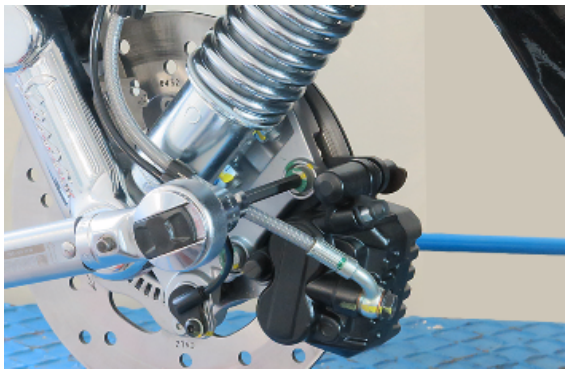


Free the front brake pump lever.

Check and if necessary top up the level of the brake fluid in the brake pump tank.
Close the tank cap.



Refit the front brake calliper on the disc, tightening the screws to the specified torque.
Actuate the brake pump lever, recovering the distance of the pads.
Check the system's efficiency.
If the work was performed properly, the brake must be efficient.



Block the hydraulic hoses with the appropriate clamp

Connect the connector to the modulator until the click of the stop tooth is heard.

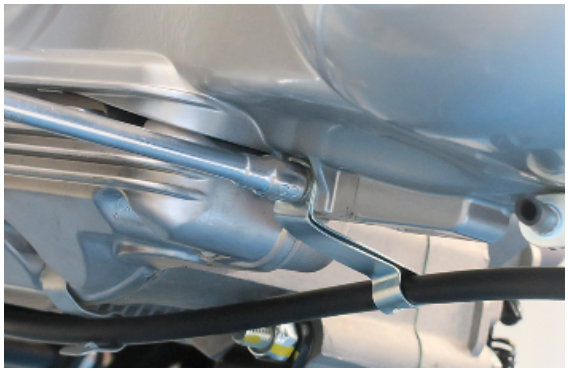
Connect the front tone wheel sensor connector.

Connect the direction indicator device connector

Position the direction indicator device complete with bracket in its seat

Insert and tighten the bracket fixing nuts.

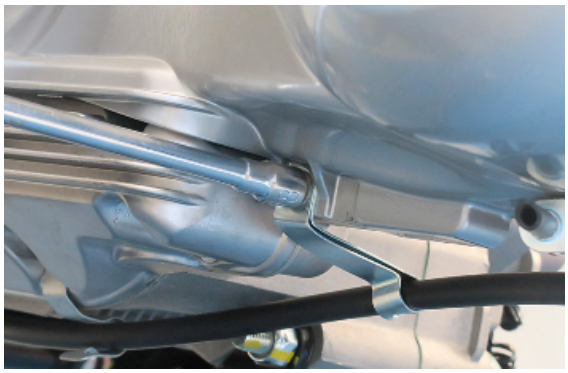
Insert and tighten the screws of the rear brake pipe fastening clamps.
Assemble the wheels.
Assemble the front centre cover.
Assemble the leg shield back plate.



Rear brake calliper

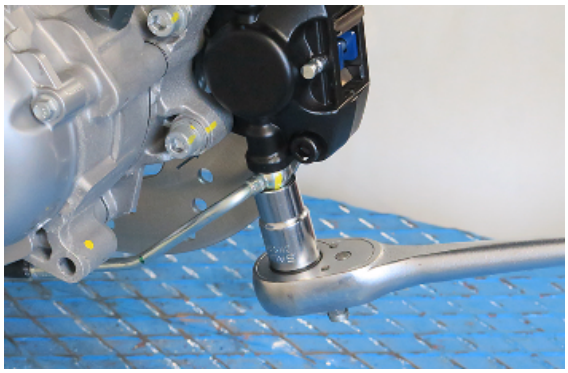
Removal

Remove the silencer.
Remove the silencer supporting arm.
Remove the rear wheel.
Unscrew the screws on the rear brake hose fastening clamps.

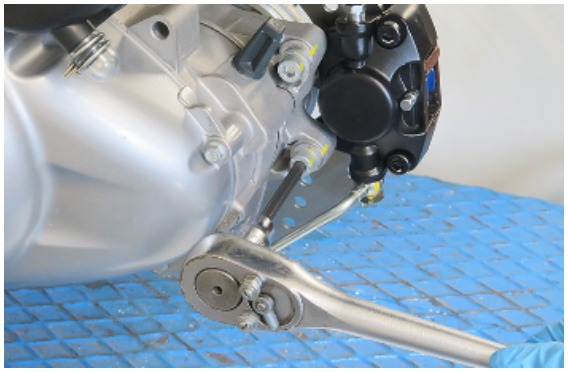


Operate the brake lever just beyond the point of closing communication with the tank.
Block the position of the lever by fastening it.

Previously loosen the screw fastening the pipe connector to the calliper.



Undo the fixing screws of the rear brake calliper to the engine.



Extract the calliper from the disc and turn it so that the end part of the pipe is tilted upwards.
Maintaining this position, remove the calliper by acting on the connector with the relative copper washers.

WARNING

KEEP THE END OF THE PIPE TILTED UPWARD.

Suitably protect the connector and secure it so it is tilted upward to keep air from entering.
Immediately proceed with installing the new brake calliper.

CAUTION

BRAKE FLUID IS HYGROSCOPIC; THAT IS, IT ABSORBS MOISTURE FROM THE AIR. IT IS IMPORTANT TO COMPLETE THESE OPERATIONS AS QUICKLY AS POSSIBLE TO AVOID THE DEGRADATION OF THE CHARACTERISTICS OF THE FLUID.

Refitting

Keeping the end of the pipe upwards, connect the new calliper using the connector and the new copper washers.
Keeping the calliper aligned with the vehicle, temporarily block the connector to maintain a seal.

Fasten or maintain the calliper in the up position and free the pump lever.

WARNING

TO RELEASE THE BRAKE LEVER, CUT THE WIRE OF THE FASTENING IN ORDER TO OPEN THE COMMUNICATION WITH THE TANK. AVOID ANY ADDITIONAL OPERATION OF THE BRAKE LEVER.

Keeping the calliper up, connect the drain pipe and open the bleed valve connector.

Allow the air to flow out until only brake fluid exits.

CAUTION

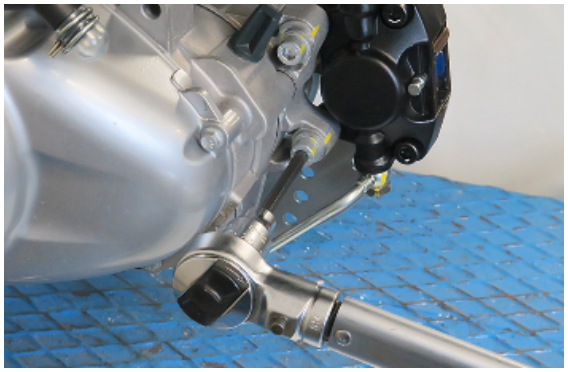
THIS BLEEDING PHASE MUST TAKE PLACE BY MEANS OF GRAVITY. DO NOT ACTIVATE THE PUMP LEVER.

Check and if necessary top up the tank level.

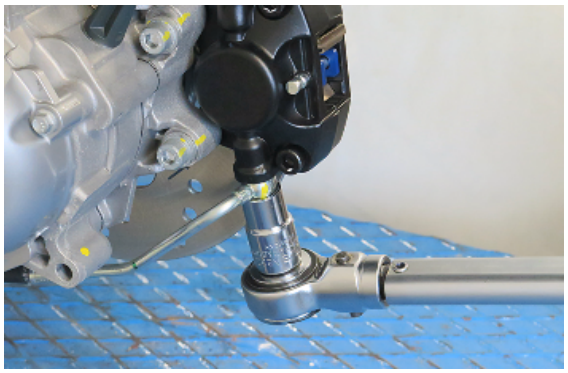
Lower the calliper to the position shown in the photo and open the bleed valve connector again.

Let the air flow out and close the bleed valve connector when the level of the brake fluid in the drain pipe has risen at least 10 cm without the outflow of air.

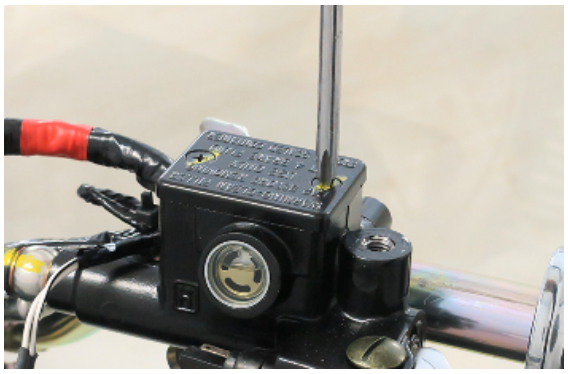
Install the brake calliper on the disc and tighten the fastening screws on the engine to the specified torque.



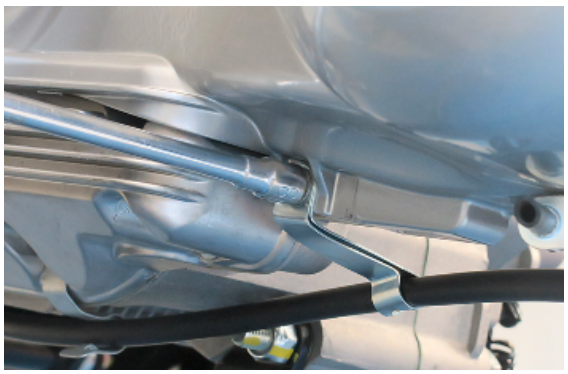
Loosen the connector fastening the pipe as little as possible to settle the pipe in the neutral position. Finally block the connector to the specified torque.



Refill the level of the brake fluid and close the tank cover.



Fix the rear brake pipe fastening clamps with the appropriate screws.
Fit the rear wheel.
Assemble the silencer supporting arm.
fit the silencer.



Check the system's efficiency.
If the work was performed properly, the brake must be efficient.

Front brake calliper

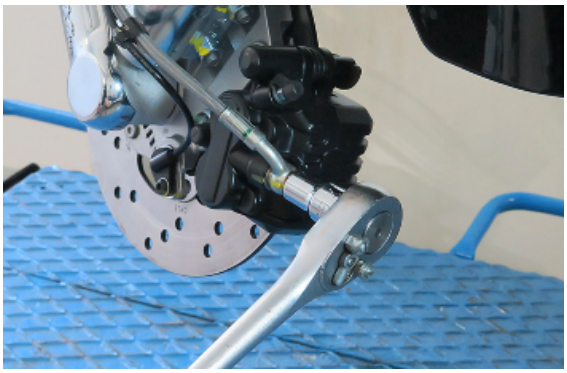
Removal

Remove the front wheel.

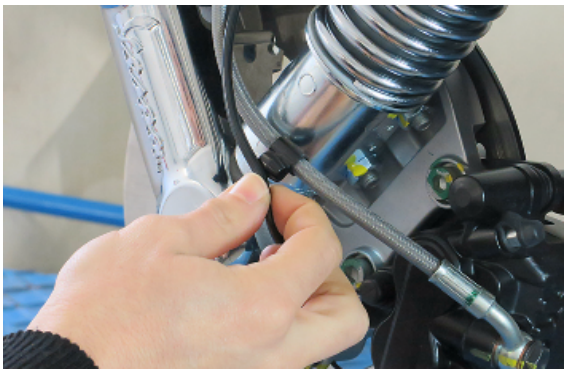
Operate the brake lever just beyond the point of closing communication with the tank.

Block the position of the lever by fastening it.

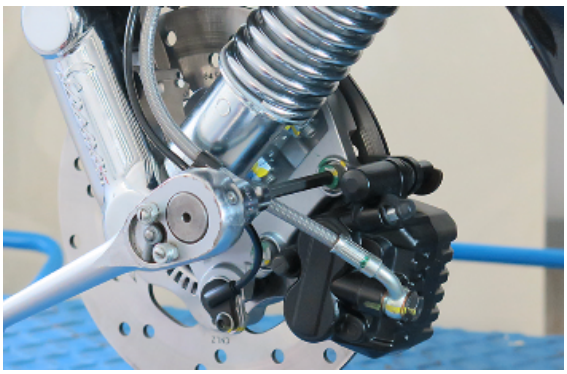
Previously loosen the screw fastening the pipe connector to the calliper.



Disconnect the front wheel sensor cable retaining clamps.



Unscrew and remove the front brake calliper fixing screws and remove it from the support.



Lift the calliper so that the end part of the pipe is tilted upwards.
Maintaining this position, remove the calliper by acting on the connector with the relative copper washers.

Refitting

Without lowering the pipe, connect the new calliper using the connector and the new copper washers.
Keeping the calliper aligned with the vehicle, temporarily block the connector to maintain a seal.

Fasten or maintain the calliper in the up position and free the pump lever.

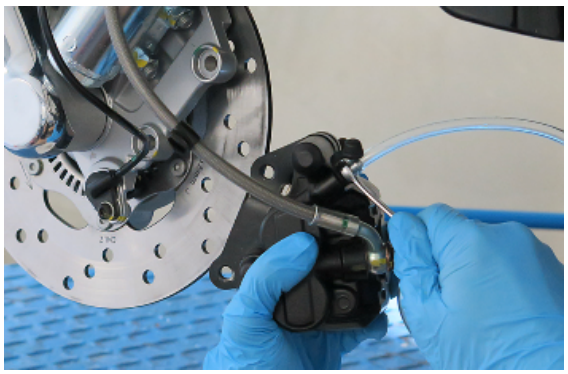
WARNING

TO RELEASE THE BRAKE LEVER, CUT THE WIRE OF THE FASTENING IN ORDER TO OPEN THE COMMUNICATION WITH THE TANK. AVOID ANY ADDITIONAL OPERATION OF THE BRAKE LEVER.

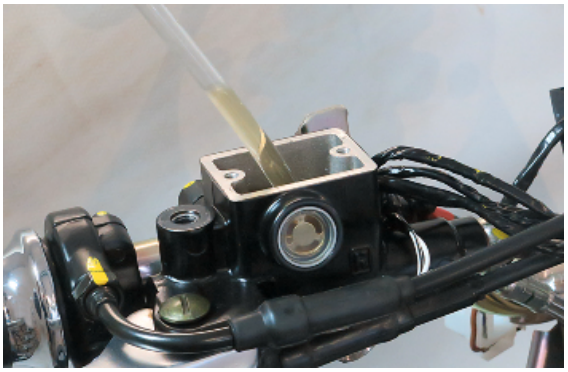
Keeping the calliper up, connect the drain pipe and open the bleed valve connector.
Allow the air to flow out until only brake fluid exits.

CAUTION

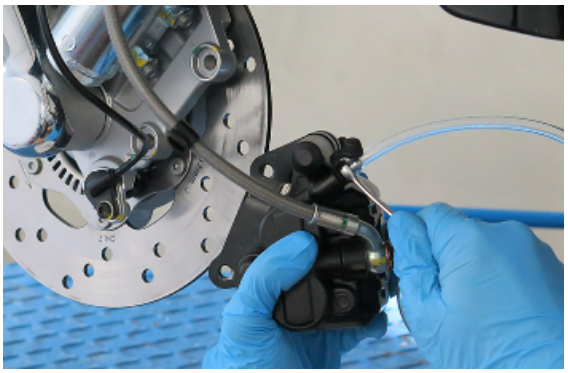
THIS BLEEDING PHASE MUST TAKE PLACE BY MEANS OF GRAVITY. DO NOT ACTIVATE THE PUMP LEVER.



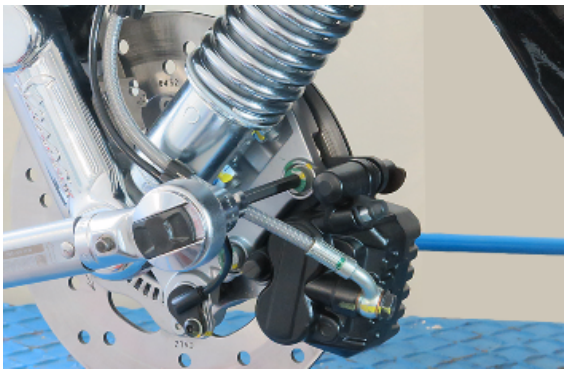
Check and if necessary top up the tank level.



Lower the calliper in the driving direction and slightly inclined to the right so the bleed screw is in the highest point of the calliper.
Reopen the bleed valve connector and let the air flow out.
- Close the bleed valve connector when the level of the brake fluid in the drain pipe has risen at least 10 cm without the outflow of air.



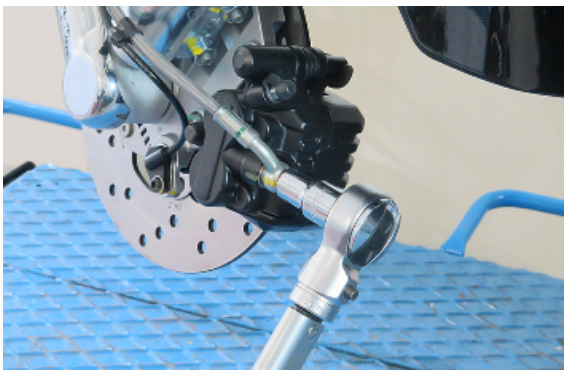
Separate the pads, if necessary, and install the brake calliper on the disc
Fasten the screws fastening the support to the specified torque.



Loosen the connector fastening the pipe as little as possible to settle the pipe in the neutral position.
Finally block the connector to the specified torque.

WARNING

KEEP THE PIPE IN POSITION WHEN TIGHTENING THE CONNECTOR.



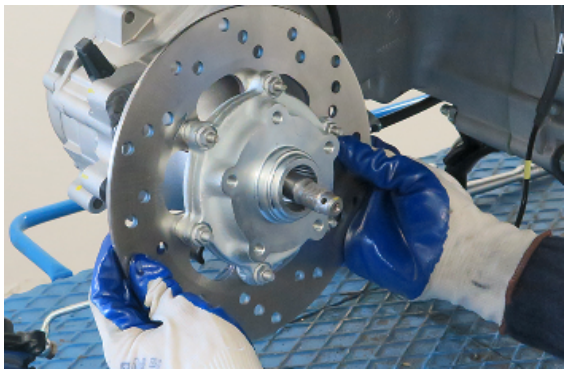
Refill the level of the brake fluid and close the tank cover.

Rear brake disc

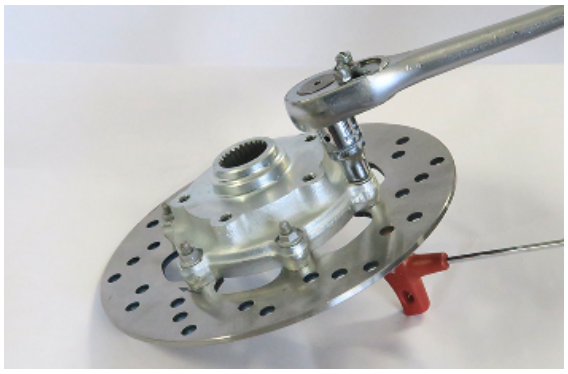
Removal

Remove the rear brake calliper.
Remove the tapered spacer.

Remove the rear wheel hub with the brake disc.

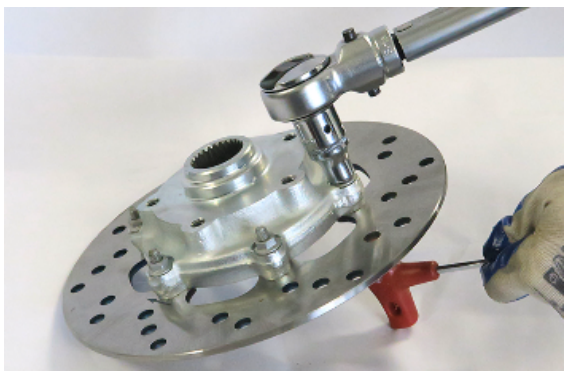


Unscrew and remove the screws fastening the brake disc to the rear wheel hub.
Remove the disc.



Refitting

Position the brake disc on the rear wheel hub.
Insert and tighten the fastening screws at the recommended torque.



Insert the rear wheel hub with the brake disc on the wheel axle.

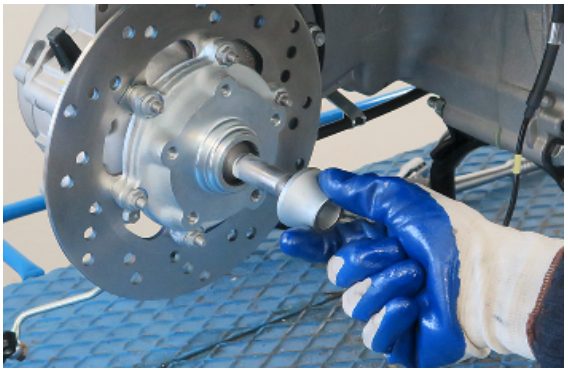
Insert the tapered spacer.

Assemble the brake calliper.

Fit the rear wheel.

Assemble the silencer supporting arm.

fit the silencer.



Disc Inspection

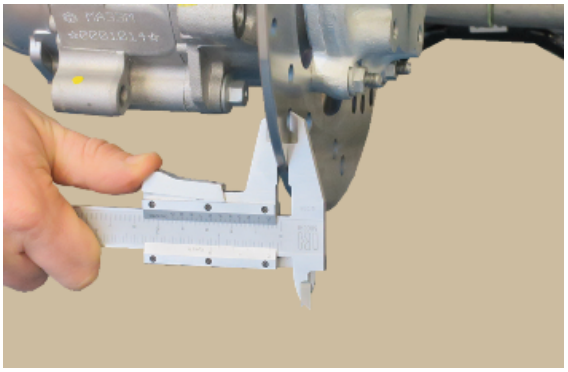
Remove the front wheel.

Check the thickness of the disc with an appropriate measuring instrument.

Characteristic

Standard thickness of rear disc

3.90 - 4.20 mm



- Repeat the measurement in at least 6 points on the disk.
- Check that the brake disc unit rotates smoothly using a special tool attached to the brake calliper support as shown in the photo.
- In order to secure the appropriate tool adequately use a metal plate with M8 threaded hole and fix it to one of the two rear brake calliper attachment points
- Fix the flange to the wheel axle using the original nut and spacer and an Æ 17mm bearing

N.B.

FOR A CORRECT READING, MAKE THE DRIVEN PULLEY AXLE ROTATE IN ORDER TO ROTATE THE DISC.

Specific tooling

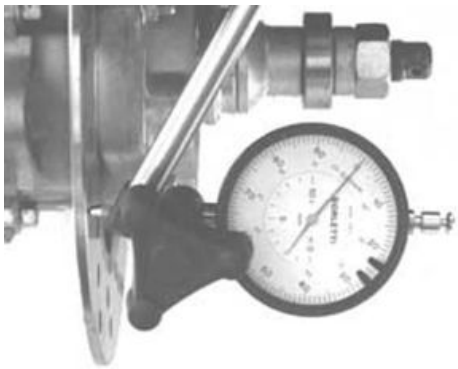
020335Y Magnetic mounting for dial gauge

Characteristic

Max. deviation allowed:

0.1 mm

- If incorrect values are measured, replace the disc. If the anomaly persists, replace the hub.



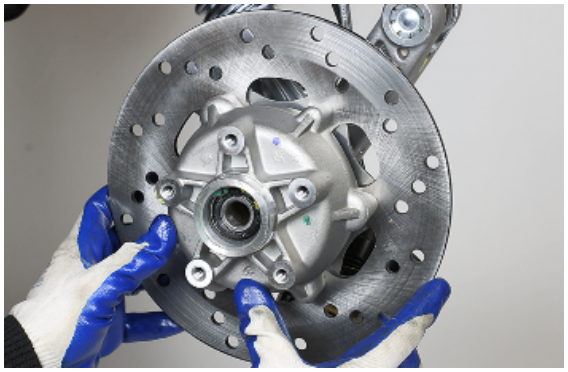
Front brake disc

Removal

Remove the front wheel.

Remove the front brake calliper.

Remove the front wheel hub with the disc.

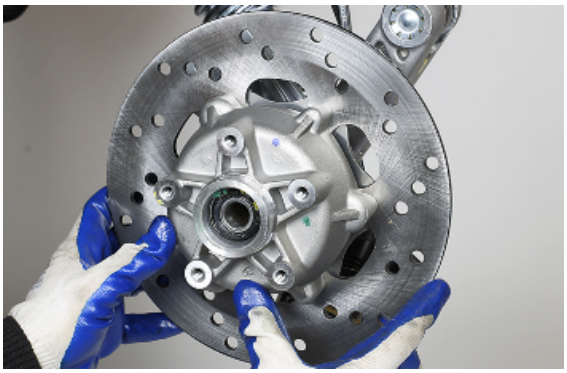


Unscrew the screws fastening the brake disc and the phonic wheel to the hub and remove them.

Refitting

Fit the brake disc and tone wheel on the hub.
Insert and tighten the fastening screws at the recommended torque.

Insert the front wheel hub with the brake disc on the wheel axle.



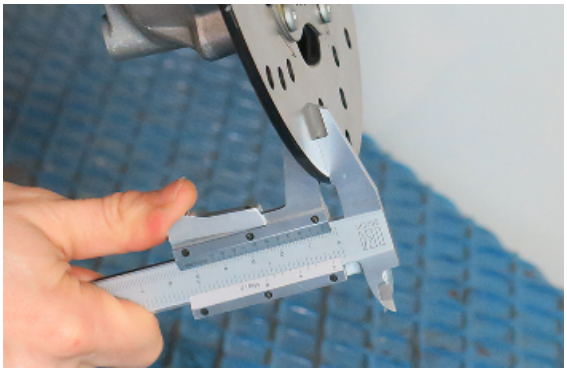
Disc Inspection

Remove the front wheel.
Check the thickness of the disc with an appropriate measuring instrument.

Characteristic

Standard thickness of rear disc

3.90 - 4.20 mm



- Repeat the measurement in at least 6 points on the disk.
- Check that the brake disc unit rotates smoothly using a special tool attached to the brake calliper support as shown in the photo.
- In order to secure the appropriate tool adequately use a metal plate with M8 threaded hole and fix it to one of the two rear brake calliper attachment points
- Fix the flange to the wheel axle using the original nut and spacer and an Æ 17mm bearing

N.B.

FOR A CORRECT READING, MAKE THE DRIVEN PULLEY AXLE ROTATE IN ORDER TO ROTATE THE DISC.

Specific tooling

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Max. deviation allowed:

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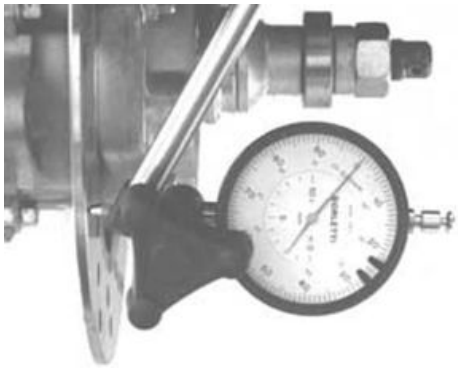
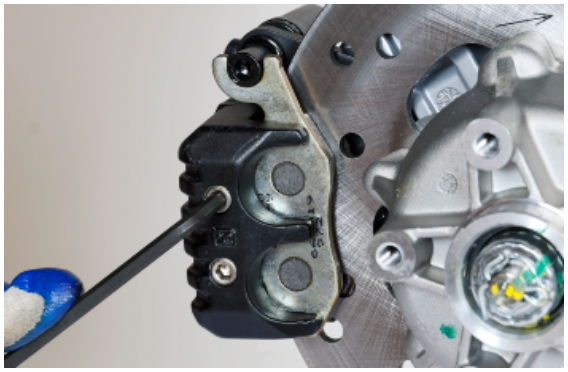
- If incorrect values are measured, replace the disc. If the anomaly persists, replace the hub.



Front brake pads

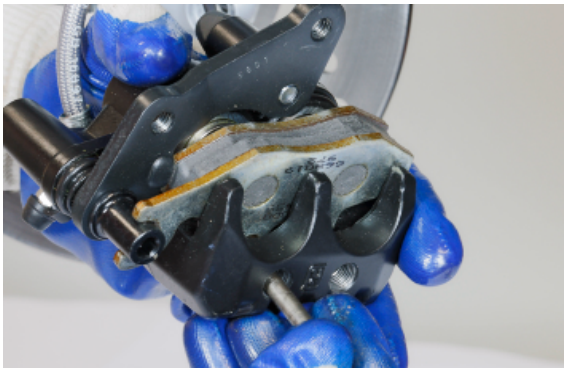
Removal

Rest the vehicle on its centre stand.
Suitably secure the rear part of the vehicle by raising the front slightly.
Remove the front wheel.
Loosen, without removing, the screws fixing the front brake pads.



Disconnect the wiring of the tone wheel sensor from the clamp, unscrew the screws fixing the front brake calliper to the support bracket and remove it.

Completely unscrew the screws and remove them, keeping the brake pads in position.



Remove the brake pads.

CAUTION

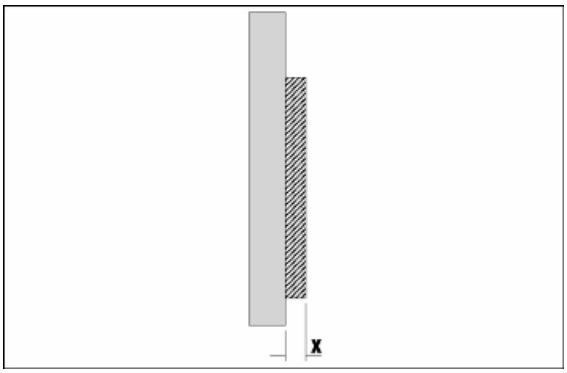
BE EXTREMELY CAREFUL NOT TO PULL THE BRAKE LEVER AFTER REMOVING THE PADS. THIS OPERATION COULD CAUSE THE CYLINDERS TO EXIT THE BRAKE CALLIPER AS WELL AS THE BRAKE FLUID TO ESCAPE.

- Check the thickness of the wear material and, if below the minimum value, replace the pads.

Characteristic

Friction material minimum permissible thickness

1.5 mm

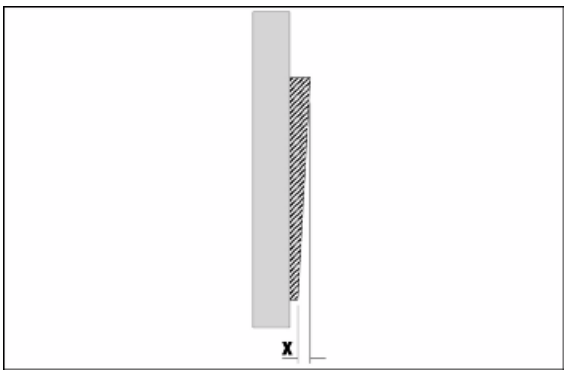


- Also check that the wear of the friction material is uniform and make sure it does not exceed the indicated tolerance. Otherwise, replace the pads.

Characteristic

Maximum permissible thickness tolerance for wear material

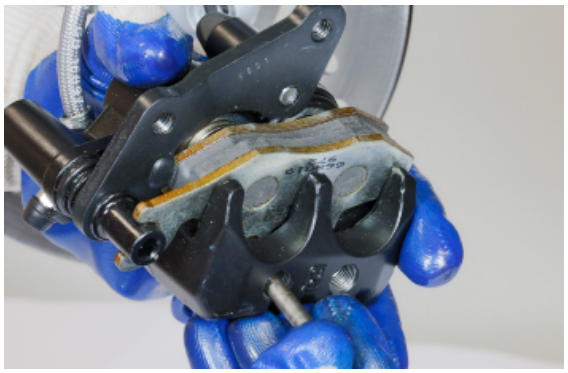
0.5 mm



Refitting

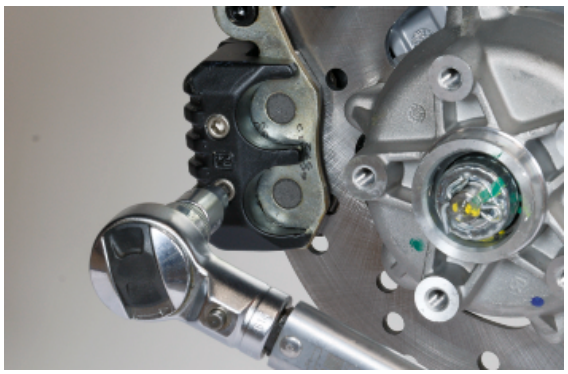
Put the new brake pads inside the clamp.

Screw in the fastening screws of the brake pads on the clamp.



Put the brake calliper on the support bracket and tighten the fixing screws to the specified torque.
Put the wiring harness of the tone wheel sensor in its clamp.

Tighten the fixing screws of the brake pads to the clamp at the specified torque.
Fit the front wheel.



Rear brake pads

Removal

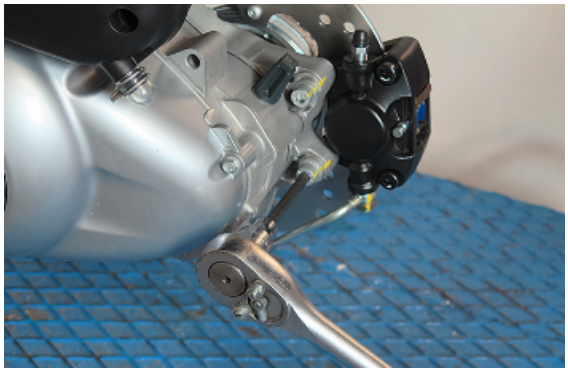
Rest the vehicle on its centre stand.

Remove the complete silencer.

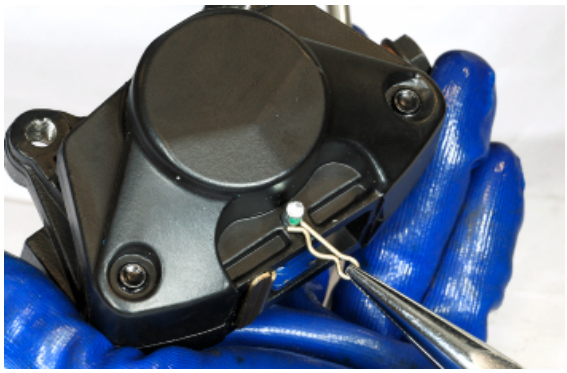
Remove the silencer support bracket.

Remove the rear wheel.

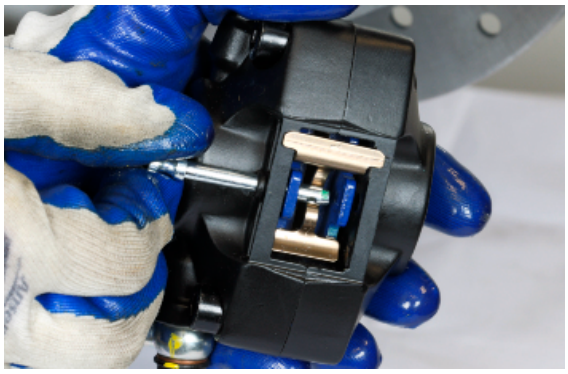
Unscrew the screws fixing the rear brake calliper to the engine and remove it.



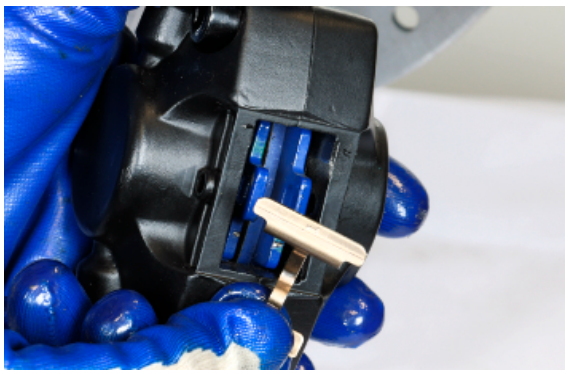
Remove the stop spring from the fastening pin of the brake pads.



Extract the fastening pin of the brake pads.



Remove the compression spring.



Take the brake pads out of the rear brake calliper.

CAUTION

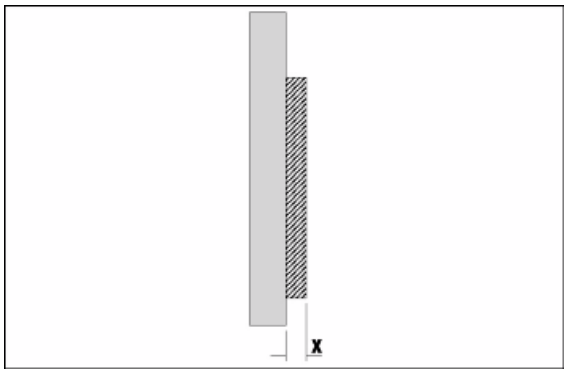
BE EXTREMELY CAREFUL NOT TO PULL THE BRAKE LEVER AFTER REMOVING THE PADS. THIS OPERATION COULD CAUSE THE CYLINDERS TO EXIT THE BRAKE CALLIPER AS WELL AS THE BRAKE FLUID TO ESCAPE.

- Check the thickness of the wear material and, if below the minimum value, replace the pads.

Characteristic

Friction material minimum permissible thickness

1.5 mm

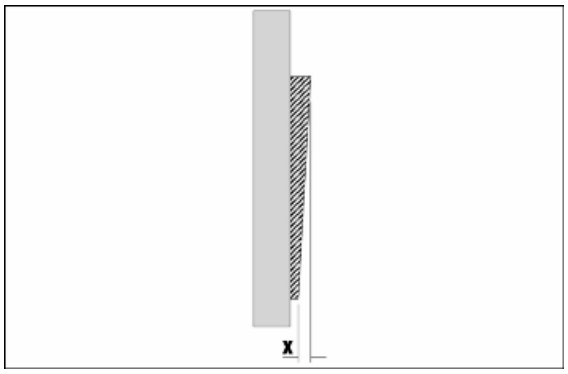


- Also check that the wear of the friction material is uniform and make sure it does not exceed the indicated tolerance. Otherwise, replace the pads.

Characteristic

Maximum permissible thickness tolerance for wear material

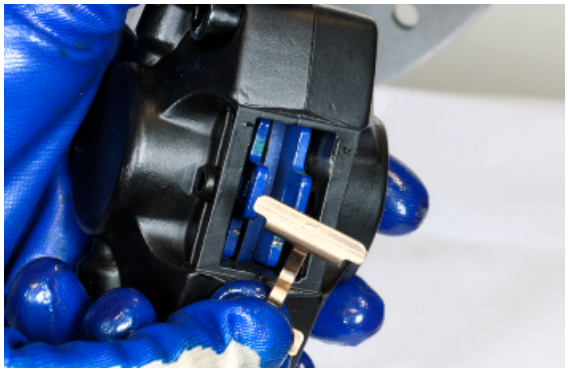
0.5 mm



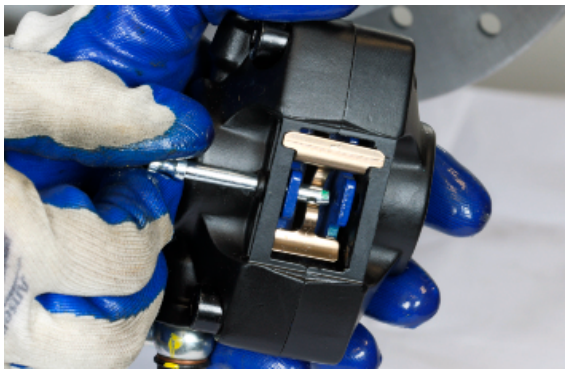
Refitting

Put the new brake pads inside the clamp.

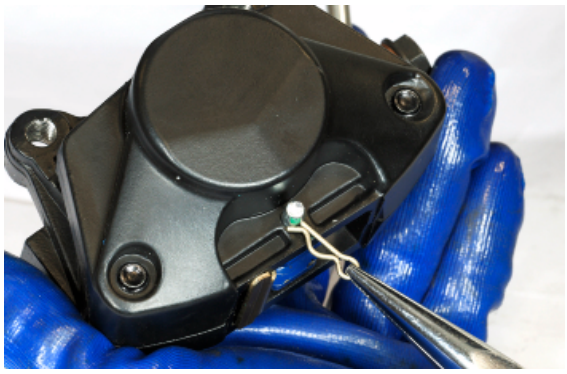
Put the compression spring back inside the brake calliper.



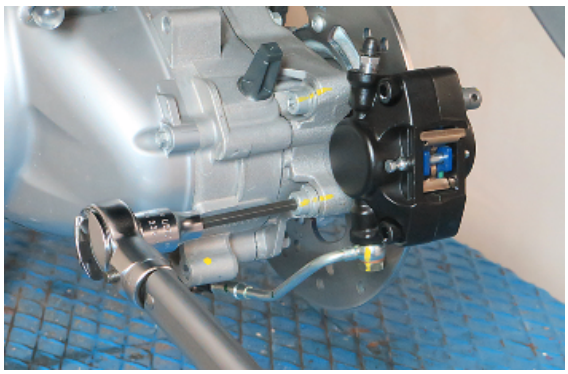
Insert the fastening pin of the brake pads.



Insert the stop spring on the fastening pin of the brake pads.



Put back the brake calliper in it seat and tighten the fixing screws to the specified torque.
Refit the rear wheel.
Refit the silencer support bracket.
Refit the complete silencer.



Fill

Rear - combined

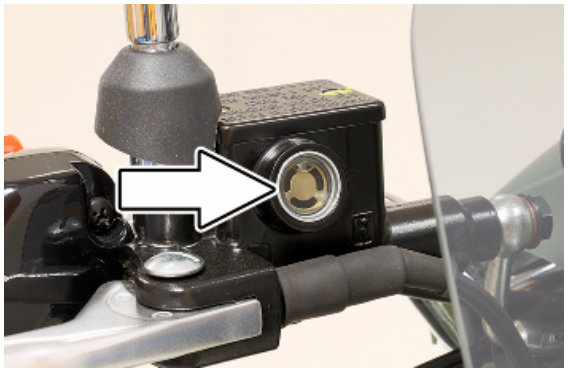
For this procedure, see section «**Misc. documents**».

Front

For this procedure, see section «**Misc. documents**».

Brake fluid level check

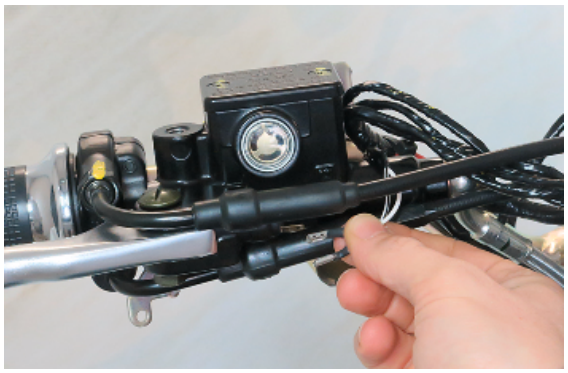
Rest the vehicle on its centre stand and with the handlebars perfectly horizontal.
Check the liquid level through the relative inspection sight glass.
If the sight glass is full, the brake fluid level is correct. If the brake fluid is near the «**MIN**» reference, top-up



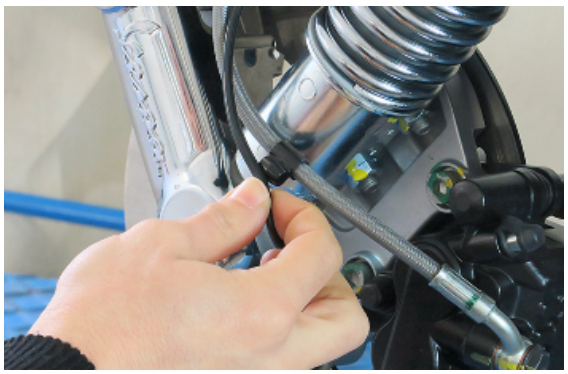
Front brake pump

Removal

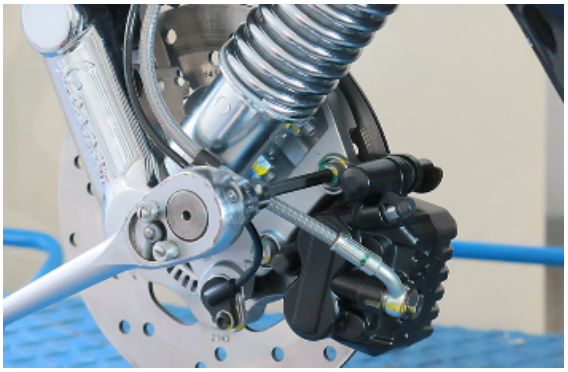
Remove the front wheel.
Disconnect the stop light switch connectors.



Disconnect the front wheel sensor cable retaining clamps.

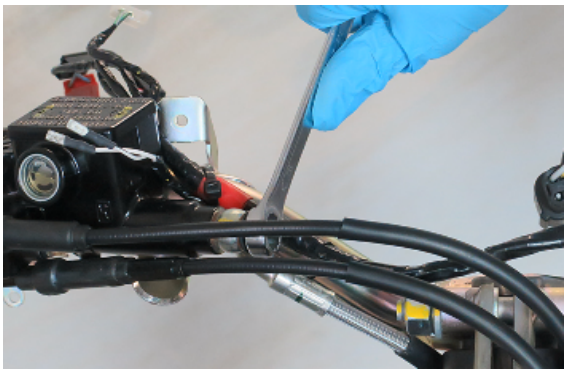


Unscrew and remove the front brake calliper fixing screws and remove it from the support.

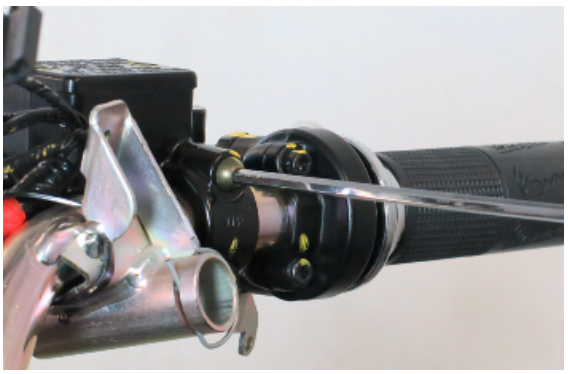


With new pads or pads in a good condition, operate the brake pump repeatedly to bring the pads in contact with each other.

Previously loosen the brake pump connector.

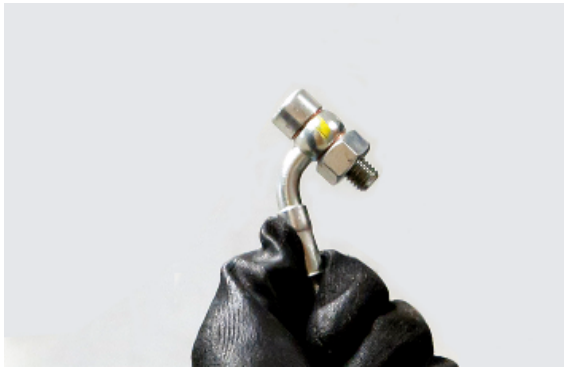


Unscrew the screws of the U-bolt fastening the pump.



Position the pump as shown in the photo and remove the connector with the copper washers.

Suitably protect the connector and secure it so it is tilted upward to keep air from entering.



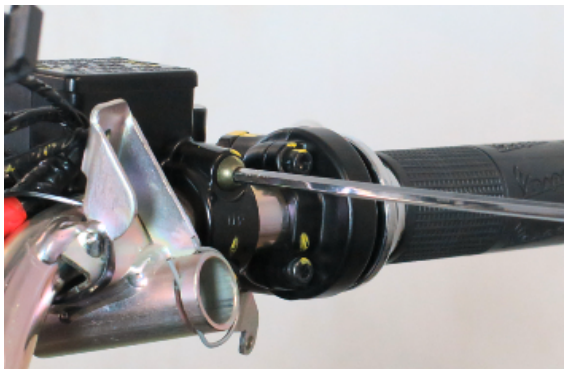
Immediately proceed with installing the new brake pump.

CAUTION

BRAKE FLUID IS HYGROSCOPIC; THAT IS, IT ABSORBS MOISTURE FROM THE AIR. IT IS IMPORTANT TO COMPLETE THESE OPERATIONS AS QUICKLY AS POSSIBLE TO AVOID THE DEGRADATION OF THE CHARACTERISTICS OF THE FLUID.

Refitting

Install the new pump on the handlebars, paying attention to the correct position of the U-bolt. Block the screws temporarily.



Remove the tank cover and tighten the pipe fastening connector to the specified torque using new copper washers.

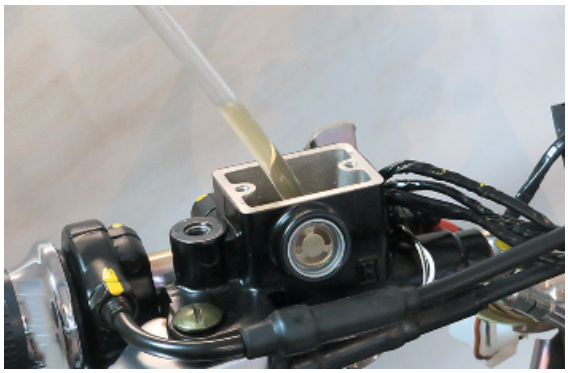
Position the handlebars so that the pump tank is levelled horizontally.

Top up with DOT4 brake fluid to the maximum level.

Recommended products

DOT 4 brake fluid Synthetic brake fluid.

SAE J 1703; FMVSS 116; ISO 4925; CUNA NC 956 DOT4



Operate the brake pump lever repeatedly, making the air bubble in the tank.

CAUTION

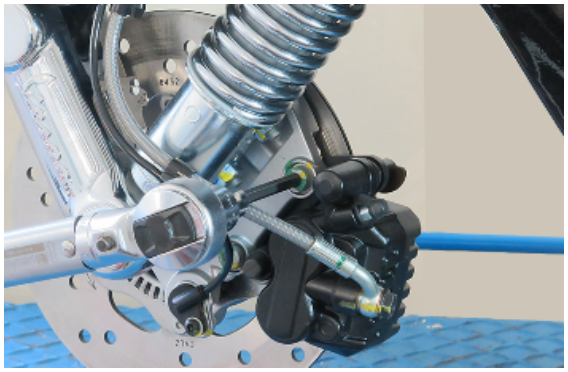
PERFORM THE OPERATION WITH THE HANDLEBARS TURNED IN THE MAXIMUM POSITION AWAY FROM THE BRAKE PUMP.

When the air finished bubbling in the tank, move the pads away in order to send the brake fluid to the pump.

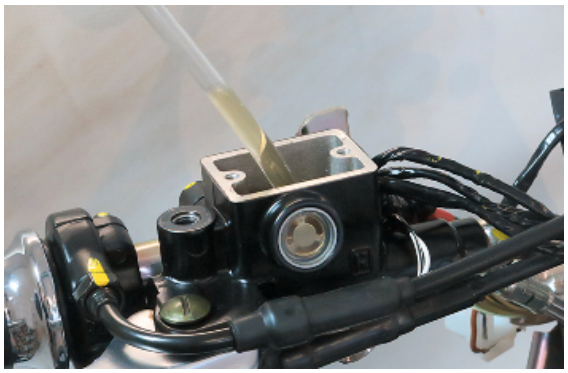
During this operation, there will be a backflow of air in the tank.

Operate the pump lever until the pads are in contact with each other and repeat the procedure until the air stops exiting.

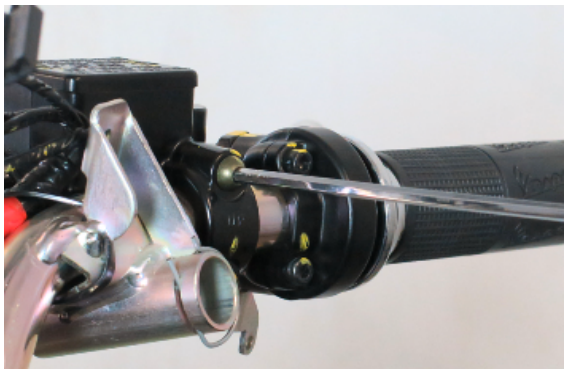
Refit the calliper on the support and tighten the screws to the specified torque.



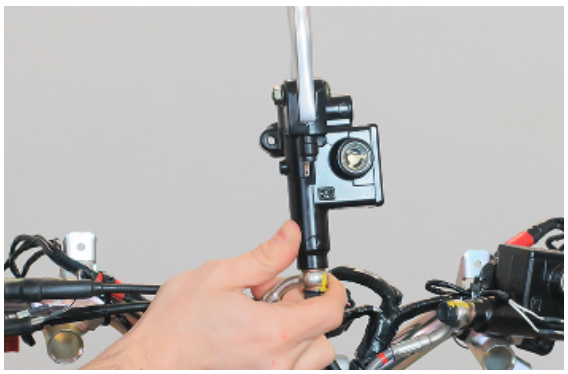
Restore the working distance of the pads and top up the brake fluid level to the maximum.



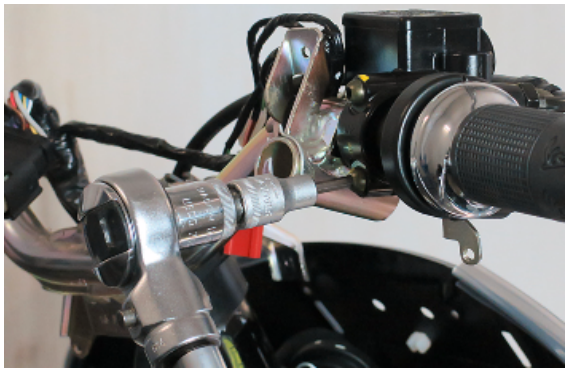
Close the pump cover and remove the screws with the U-bolt fastened to the handlebars.



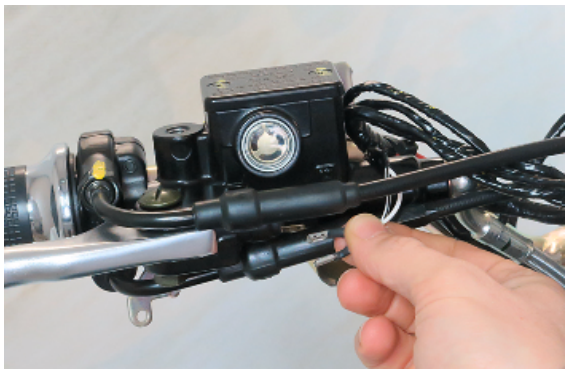
Lift the pump so it is upright and repeatedly operate the control lever.
This operation is required so the residual air contained in the pump cylinder will exit.
For an optimal result, slightly vary the position of the pump each time the lever is operated.



Install the pump on the handlebars, paying attention to the correct orientation of the U-bolt.
Gradually tighten the fastening screws to the specified torque.



Connect the stop light switch connector.

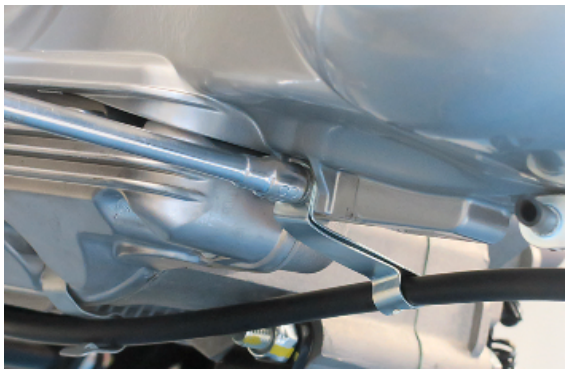


Rear brake pump - combined

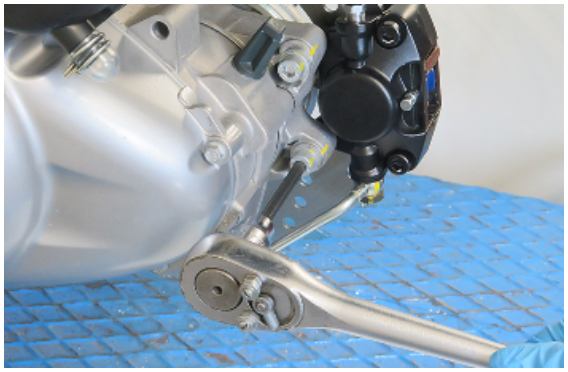
Removal

Remove the rear wheel.
Disconnect the stop light switch cables.

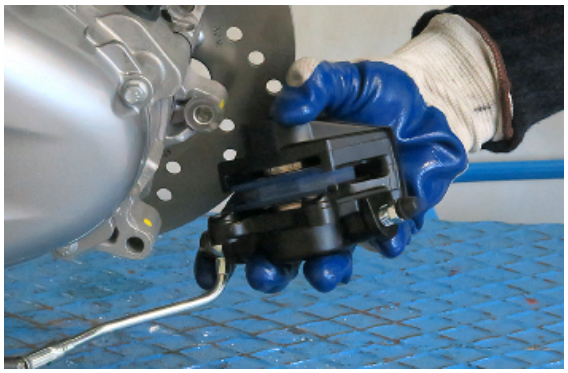
Unscrew the screw on the clamp fastening the rear brake hose to the engine.



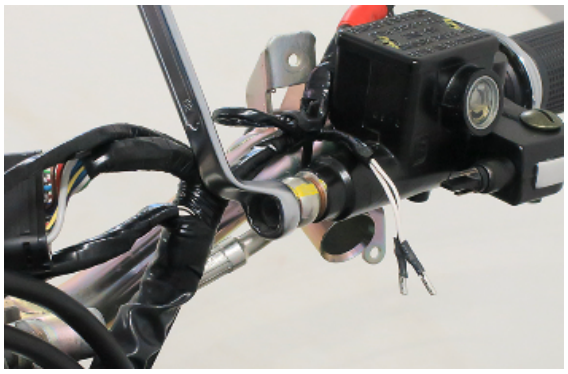
Undo the fixing screws of the rear brake calliper to the engine.



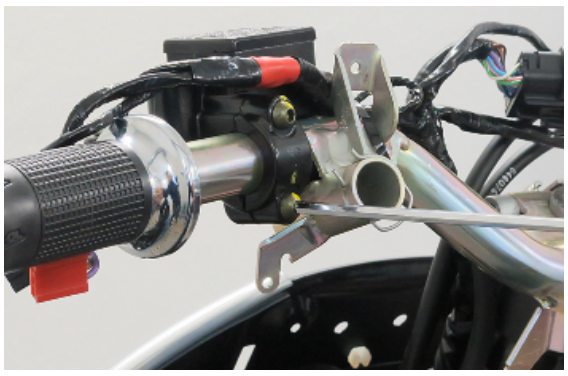
With new pads or pads in a good condition, operate the brake pump repeatedly to bring the pads in contact with each other.



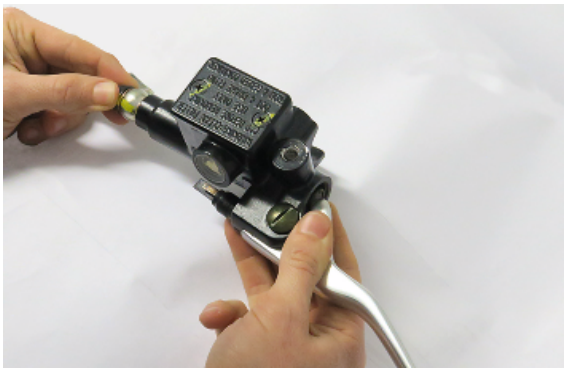
Previously loosen the brake pump connector.



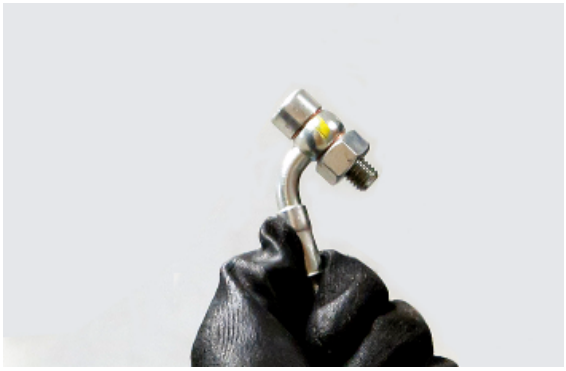
Unscrew the screws of the U-bolt fastening the pump.



Disconnect the pump from the handlebar, position it as shown in the photo and remove the connector with the copper washers.



Suitably protect the connector and secure it so it is tilted upward to keep air from entering.



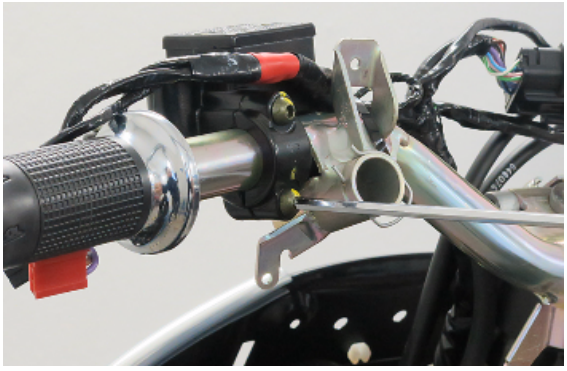
Immediately proceed with installing the new brake pump.

CAUTION

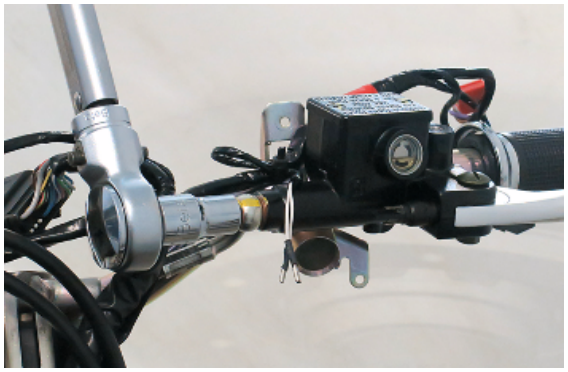
BRAKE FLUID IS HYGROSCOPIC; THAT IS, IT ABSORBS MOISTURE FROM THE AIR. IT IS IMPORTANT TO COMPLETE THESE OPERATIONS AS QUICKLY AS POSSIBLE TO AVOID THE DEGRADATION OF THE CHARACTERISTICS OF THE FLUID.

Refitting

Install the new pump on the handlebars, paying attention to the correct position of the U-bolt. Block the screws temporarily.



Remove the tank cover and tighten the pipe fastening connector to the specified torque using new copper washers.



Position the handlebars so that the pump tank is levelled horizontally.

Top up with DOT4 brake fluid to the maximum level.

Recommended products

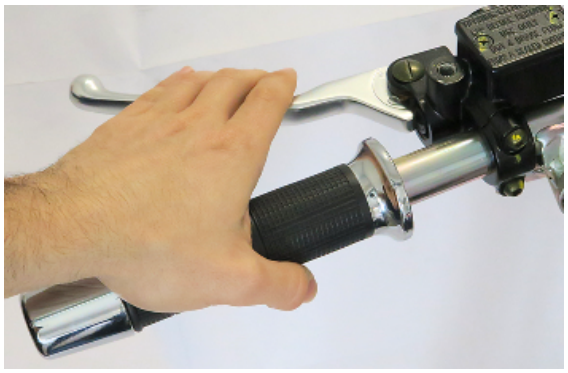
DOT 4 brake fluid Synthetic brake fluid.

SAE J 1703; FMVSS 116; ISO 4925; CUNA NC 956 DOT4

Operate the brake pump lever repeatedly, making the air bubble in the tank.

CAUTION

PERFORM THE OPERATION WITH THE HANDLEBARS TURNED IN THE MAXIMUM POSITION AWAY FROM THE BRAKE PUMP.

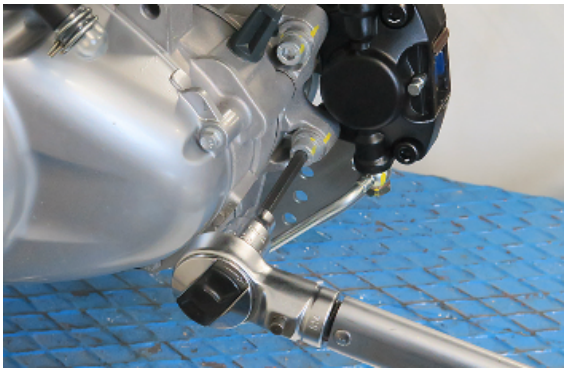


When the air finished bubbling in the tank, move the pads away in order to send the brake fluid to the pump.

During this operation, there will be a backflow of air in the tank.

Operate the pump until the pads are in contact with each other and repeat the procedure until the air stops exiting.

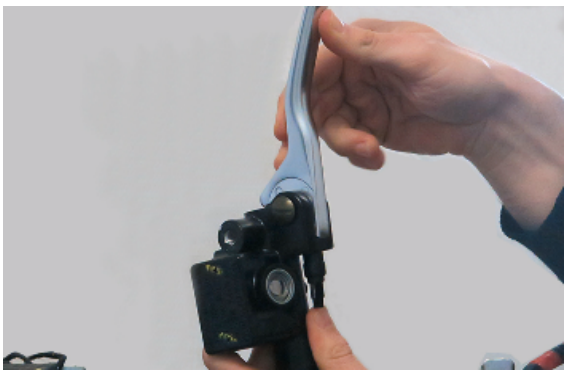
Refit the calliper on the engine and tighten the screws to the specified torque.



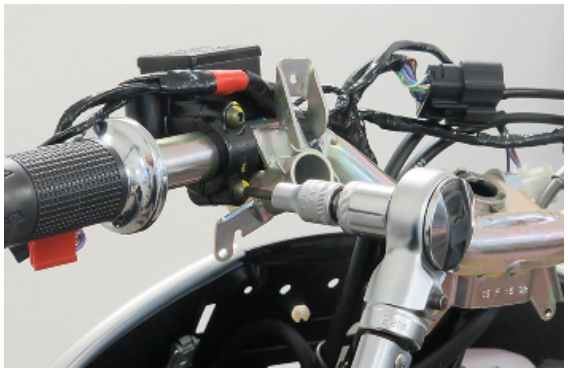
Restore the working distance of the pads and top up the brake fluid level to the maximum.

Close the pump cover and remove the screws with the U-bolt fastened to the handlebars.

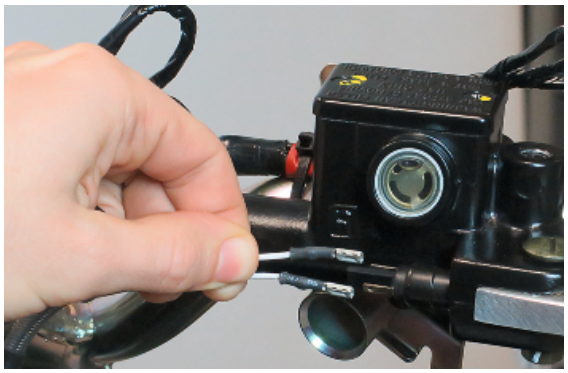
Lift the pump so it is upright and repeatedly operate the control lever.
This operation is required so the residual air contained in the pump cylinder will exit.
For an optimal result, slightly vary the position of the pump each time the lever is operated.



Install the pump on the handlebars, paying attention to the correct orientation of the U-bolt.
Tighten the fastening screws to the prescribed torque.



Connect the stop light switch connectors.

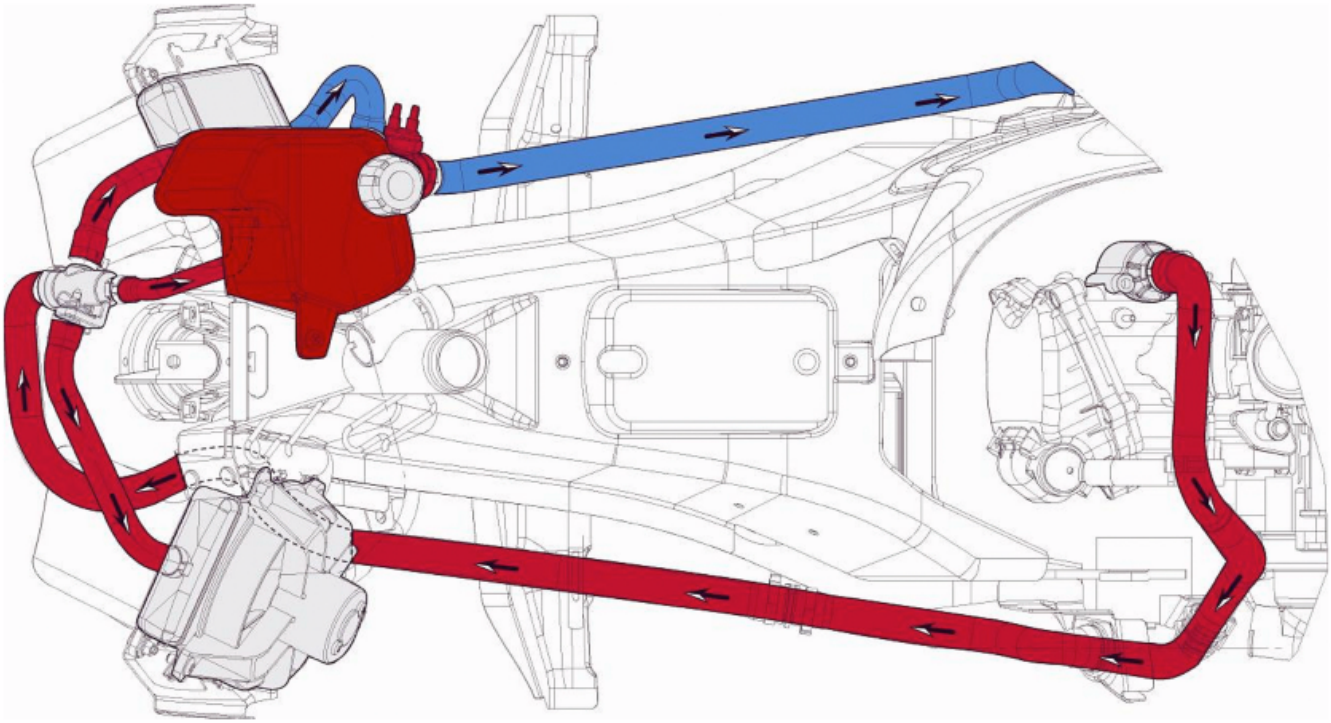


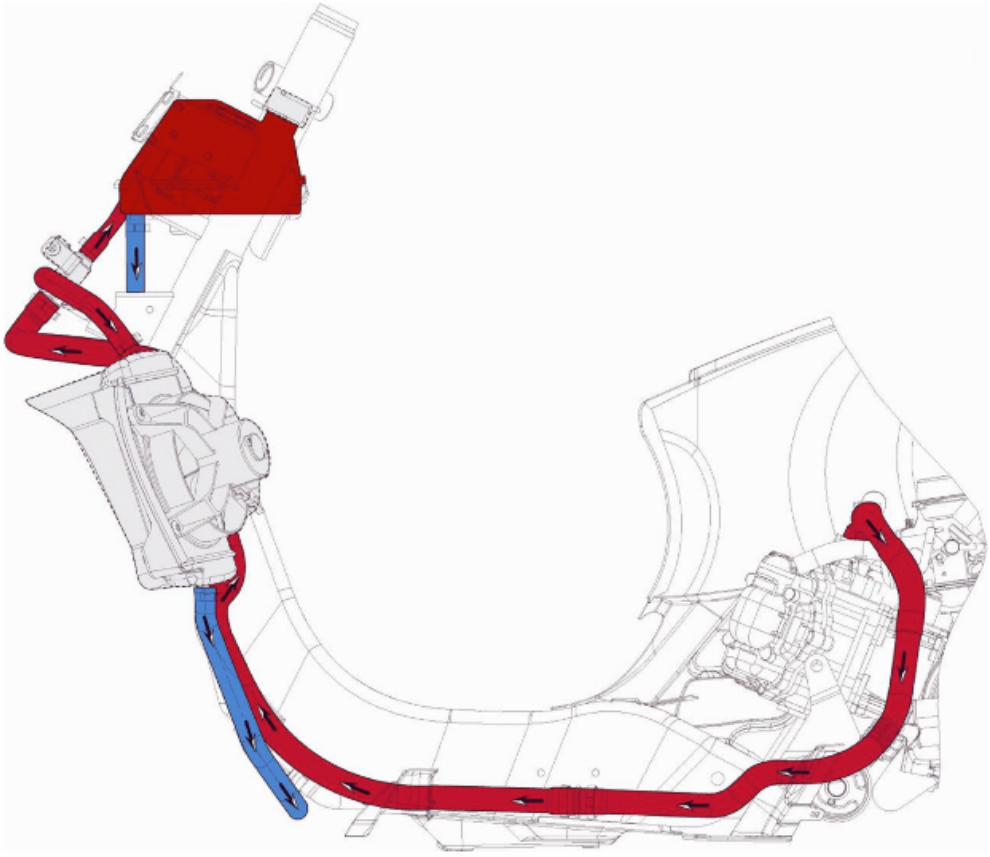
INDEX OF TOPICS

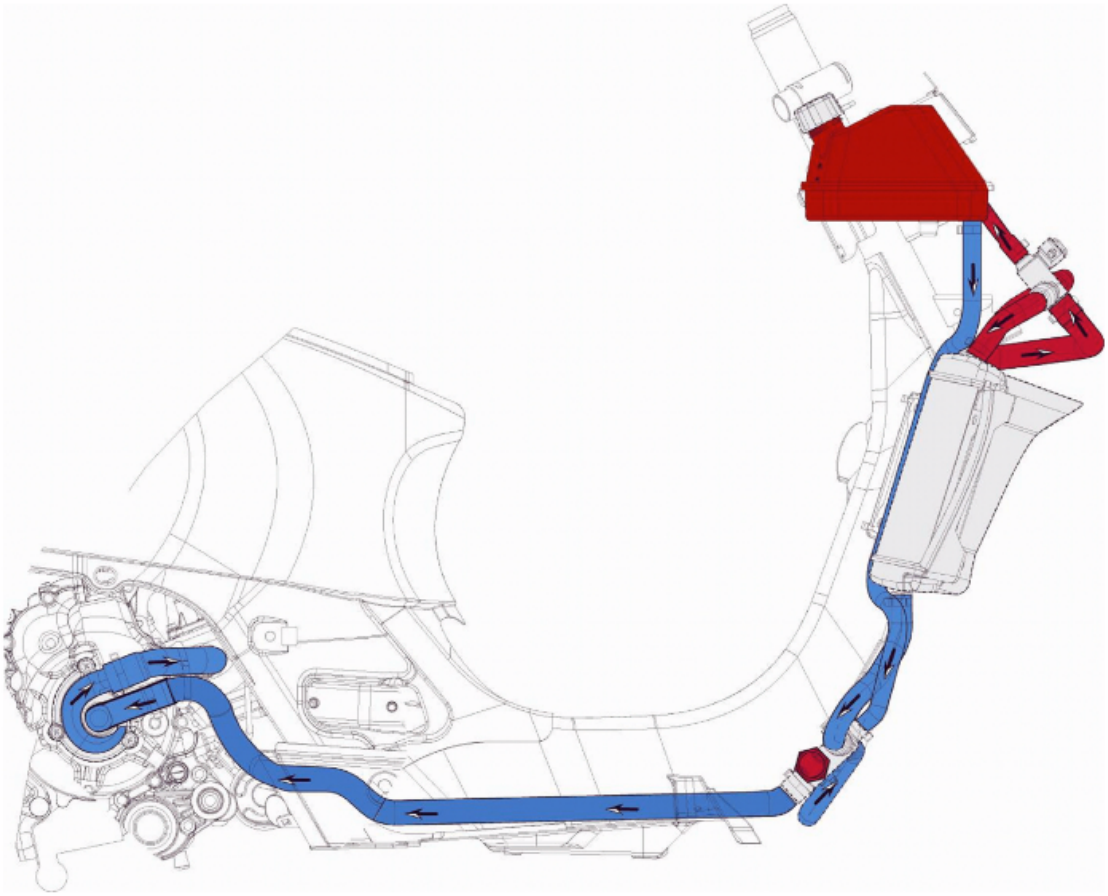
COOLING

Name	Torque in Nm
Water pump rotor cover	3 - 4
Thermostat cover screws	3 - 4
Bleeder screw	3

Circuit diagram







System bleed

WARNING

NEVER UNSCREW THE EXPANSION TANK CAP BEFORE THE COOLING SYSTEM HAS COOLED.

Remove the expansion tank cover at the top right on the shield.

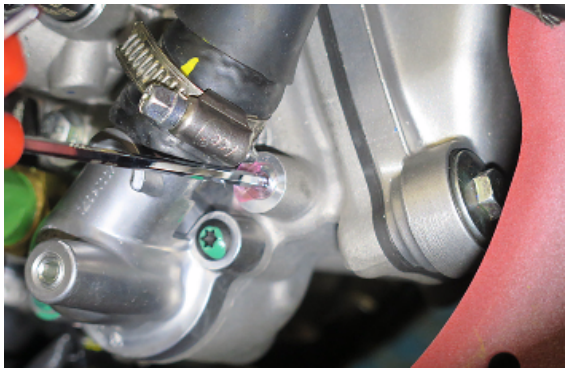
Fill the cooling system until reaching the "**MAX**" level of the expansion tank.

Recommended products

Anti-freeze liquid, ready to use, colour red Ethylene glycol antifreeze liquid with organic inhibition additives. Red, ready to use.

ASTM D 3306 - ASTM D 4656 - ASTM D 4985 - CUNA NC 956-16

- Loosen the bleed screw on the big end.
- Add more coolant in the expansion tank until the coolant overflows from the bleeder hole.
- Tighten the bleed screw.



- Loosen the bleed screw situated at the top of the thermostat cover .
- Add more coolant in the expansion tank until the coolant overflows from the bleeder hole.
- Tighten the bleed screw.

Restore the "**MAX**" level of the expansion tank

Tighten with force the expansion tank cap.

WARNING

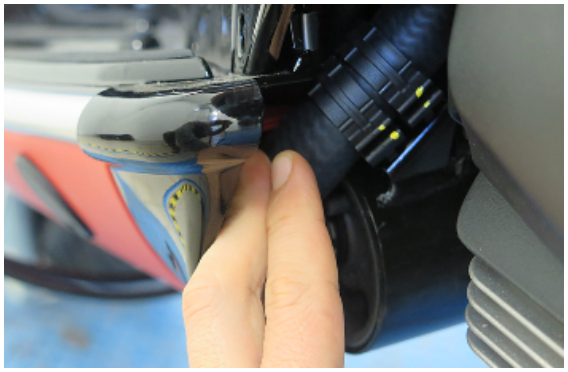
NEVER UNSCREW THE EXPANSION TANK CAP BEFORE THE COOLING SYSTEM HAS COOLED.

Start the engine at idle speed.

CAUTION

NEVER UNSCREW THE COOLING SYSTEM BLEED SCREW WITH THE ENGINE RUNNING OR HOT.

With the engine idling, place a hand close to the water outlet hose from the engine.



The opening of the thermostat is confirmed as soon as a sudden rise in the temperature of the circulating liquid in the hose is detected.

With the thermostat open, slowly rotate the accelerator handle.
Take the engine to medium revs and maintain it for about 10 seconds.

Return the engine to idle and wait for the electric fan to start.

Wait for the electric fan to stop and turn off the engine.

CAUTION

NEVER UNSCREW THE COOLING SYSTEM BLEED SCREW WITH THE ENGINE RUNNING OR HOT.

WARNING

NEVER UNSCREW THE EXPANSION TANK CAP BEFORE THE COOLING SYSTEM HAS COOLED.

Wait for the complete cooling of the system and restore the "**MAX**" level of the coolant

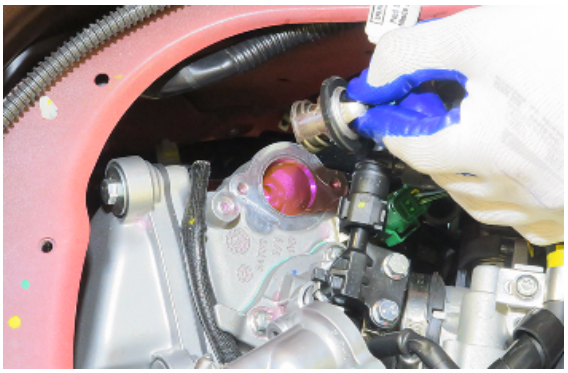
Thermostat

Removal

To remove the thermostat, proceed as follows:

- Remove the helmet compartment.
- Place a + 2.0 l container under the vehicle to collect the coolant.
- Unscrew and remove the cover fastening screws

- Lift and remove the thermostat cover.



Check

1) Visually inspect that the thermostat is not damaged.

2) Fill a metal container with approx. 1 litre of water.

Immerse the thermostat, and keep it in the centre of the container.

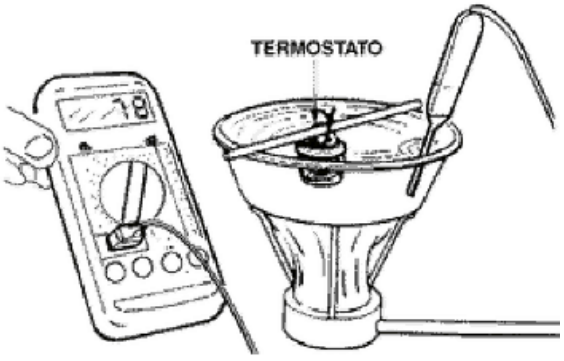
Immerse the multimeter temperature probe, and keep it close to the thermostat.

Heat up the container using the thermal gun.

Check the temperature at which the thermostat starts to open:

Heat up until the thermostat is completely open

3) Replace the thermostat if it is not working properly.



CAUTION

TO EXECUTE THE TEST CORRECTLY, MAKE SURE NEITHER THE THERMOSTAT NOR THE THERMOMETER TOUCHES THE CONTAINER.

Specific tooling

020331Y Digital multimeter

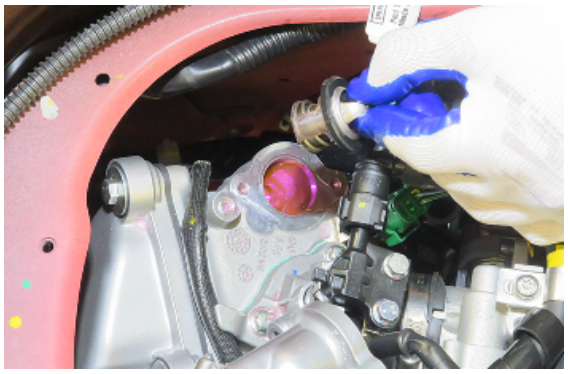
020151Y Air heater

THERMOSTAT

Specification	Desc./Quantity
Type	Wax-type, with deviator
Starts opening at	85±2°C

Refitting

- Insert the thermostat in the head.
- Position the cover.



- Insert the cover fixing screws and tighten them to the specified torque.
- Fill the system and bleed it.

Locking torques (N*m)

Thermostat cover screws 3 - 4

INDEX OF TOPICS

This section è is dedicated to the operations that can be carried out on the vehicle's bodywork.

BODYWORK TIGHTENING TORQUES

Name	Torque in Nm
Saddle - Frame	8 - 10 Nm
Handle - Frame	8 - 10 Nm
Rear handle cover - Handle	1 - 1.7 Nm
Saddle support cover - Frame	8 - 10 Nm
Rear view mirrors - Handlebars	29 - 31 Nm
Rear handlebar cover - Front handlebar cover	1 - 1.7 Nm
Panel lights - Rear handlebar cover	1 - 1.7 Nm
Headlamp - Headlamp cover	5 - 6 Nm
Front direction indicator - Leg shield	1 - 1.7 Nm
Central frame cover - Footrest	1 - 1.7 Nm
Expansion chamber cover - Leg shield back plate	1 - 1.7 Nm
Leg shield back plate (upper external fastening) - Leg shield	1 - 1.7 Nm
Leg shield back plate (upper internal fastening) - Leg shield	1 - 1.7 Nm
Leg shield back plate (lower internal fastening) - Footrest	1 - 1.7 Nm
Leg shield back plate (lower external fastening) - Footrest	1 - 1.7 Nm
Leg shield back plate (central fastening) - Frame	4.5 - 7 Nm
Rear light assembly - Frame	4.5 - 7 Nm
Rear direction indicator - Frame	1 - 1.7 Nm
Footrest (central fastening) - Frame	4.5 - 7 Nm
Footrest (lateral fastening) - Frame	1 - 1.7 Nm
Footrest (rear fastening) - Frame	4.5 - 7 Nm
Passenger footrest - Frame	17 - 22 Nm
Lateral cover (front fastening) - Footrest	1 - 1.7 Nm
Lateral cover (rear fastening) - Frame	4.5 - 7 Nm
Spoiler terminal - Footrest	1 - 1.7 Nm
Fuel pipe clamp - Fuel tank	4.5 - 7 Nm
Fuel tank (front fastening) - Frame	8 - 10 Nm
Fuel tank (rear fastening) - Frame	8 - 10 Nm
Fuel tank (upper fastening) - Frame	8 - 10 Nm
Front splash guard (front fastening) - Front mudguard	2 - 4 Nm
Front splash guard (rear fastening) - Front mudguard	2 - 4 Nm
Headlamp cover (central fastening) - Front mudguard	7 - 10 Nm
Headlamp cover (front fastening) - Front mudguard	2 - 4 Nm
Headlamp cover (rear fastening) - Front mudguard	7 - 10 Nm
Front mudguard - Steering tube	5 - 6 Nm
Front mudguard support bracket - Suspension flange	8 - 10 Nm
Front mudguard support bracket - Steering tube	8 - 10 Nm
Suspension flange - Headlight support bracket	8 - 10 Nm
Headlamp retainer bracket - Headlight support bracket	8 - 10 Nm
Steering tube protection (lower fastening) - Steering tube	4 - 7 Nm
Steering tube protection (lower fastening) - Front mudguard	2 - 4 Nm
Front central cover - Frame	1 - 1.7 Nm
Front windshield - Windshield support	4.5 - 7 Nm
battery fastening bracket - Frame	4.5 - 7 Nm

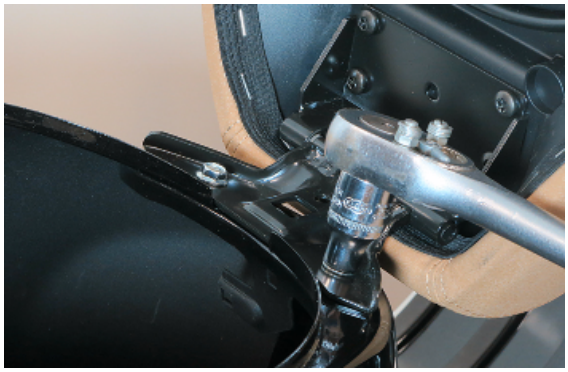
Seat

REMOVAL

Remove the helmet compartment.

Support the saddle, undo and remove the saddle fixing screws.

Remove the saddle.



FITTING

Position the saddle

Support the saddle, insert and tighten the saddle fixing screws.

Insert the helmet compartment.

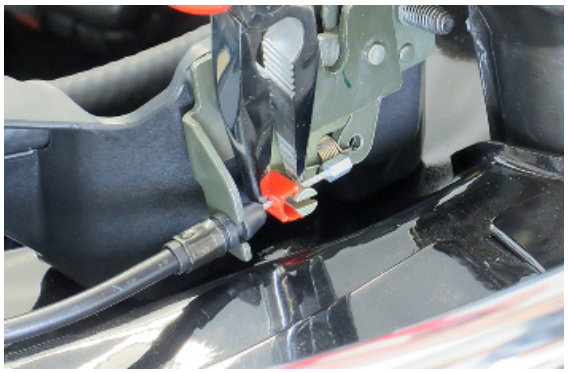
SADDLE OPENING DEVICE REMOVAL

Remove the helmet compartment.

Remove the plastic cover above the luggage rack.

Free the electrical wiring from the retaining ties.

Disconnect the cable from the saddle's lock.

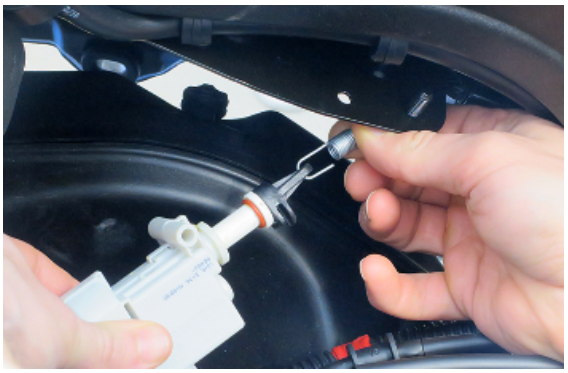


Unscrew and remove the fastening nuts from the saddle opening device's bracket.

Move the saddle opening device complete with the bracket downward and disconnect the electrical connector.

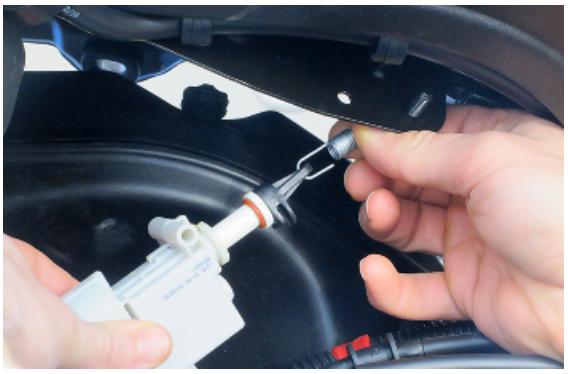
Unscrew and remove the bolts fastening the device to the bracket.

Disconnect the device from the spring.



SADDLE OPENING DEVICE ASSEMBLY

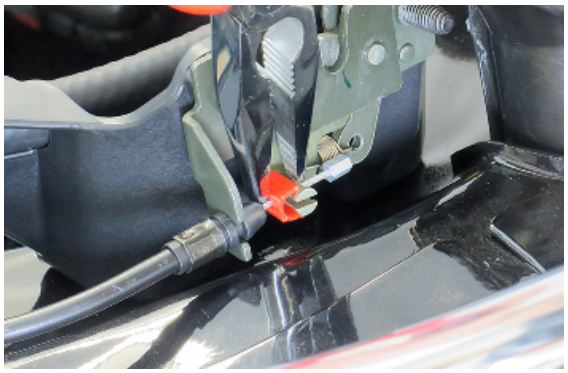
Connect the device to the spring.



Insert and tighten the bolts for fastening the device to the bracket.

Connect the device's electrical connector and insert the saddle opening device complete with the bracket into its lodging.

Connect the cable to the saddle's lock.



apply and tighten the nuts for fastening the saddle opening device's bracket.

Insert the electrical wiring into the retaining ties.

Mount the plastic cover above the luggage rack.

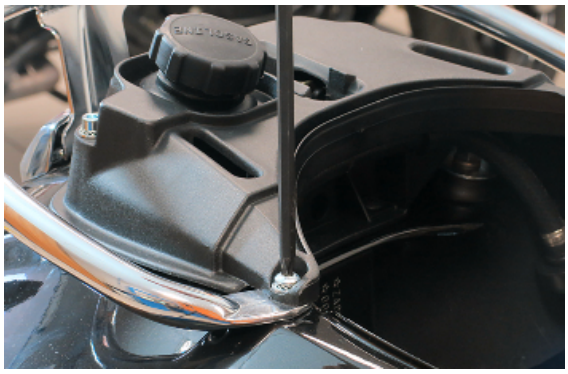
Insert the helmet compartment.

Rear rack

REMOVAL

Remove the helmet compartment.

Undo and remove the fixing screws of the luggage rack and the plastic cover.



Remove the fuel tank cap.

Remove the plastic cover.

Unscrew and remove the fixing screw of the luggage rack screws cover.
Remove the cover of the rear screws of the luggage rack.

Unscrew and remove the rear fixing screws of the luggage rack.
Remove the luggage rack.

FITTING

Position the luggage rack.
Insert and tighten the rear fixing screws of the luggage rack.

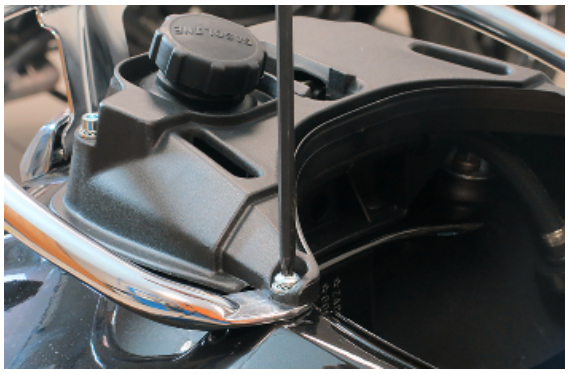
Position the cover of the rear screws of the luggage rack.
Insert and tighten the fixing screw of the luggage rack screws cover.

Position the plastic cover.

Screw on the fuel tank cap.

Insert and tighten the fastening screws for the luggage rack and the plastic cover.

Insert the helmet compartment.



Driving mirrors

REMOVAL

Rest the vehicle on its centre stand.

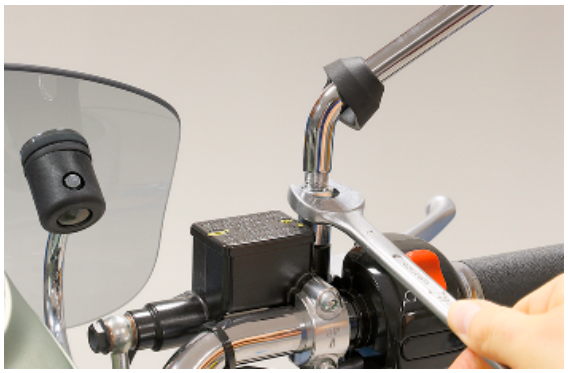
Move the protection rubber.

Unscrew the fixing counter nut and unscrew the mirror using the rod.

FITTING

Screw the mirror into its seat using the rod.

Tighten the fixing counter nut to the specified torque.



Put back protection rubber.

Rear handlebar cover

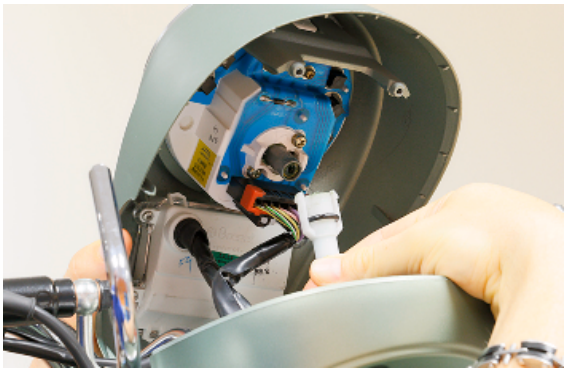
REMOVING THE REAR HANDLEBAR COVER:

Remove the windscreen.

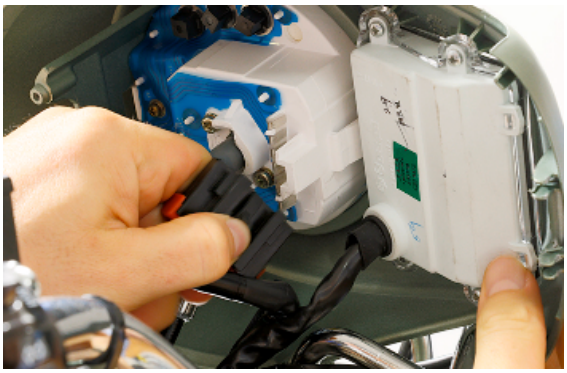
Remove the front centre cover.

Unscrew the rear cover fastening screws.

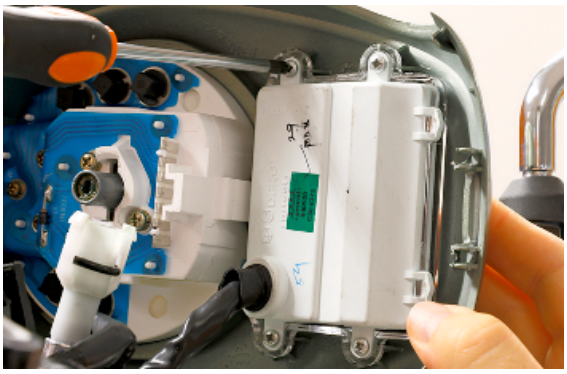
Lift the rear cover and disconnect the cable from the odometer.



Disconnect the instrument assembly connector.

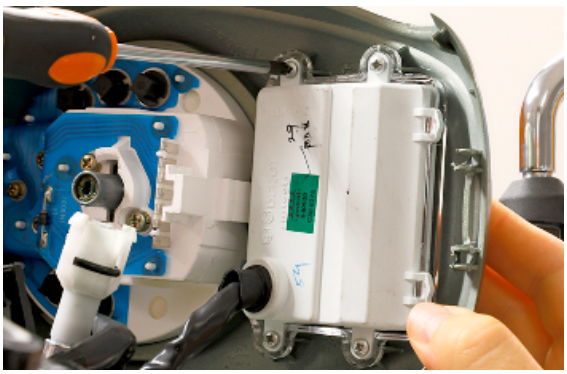


Unscrew the panel lights assembly fastening screws and remove the complete instrument panel cover.

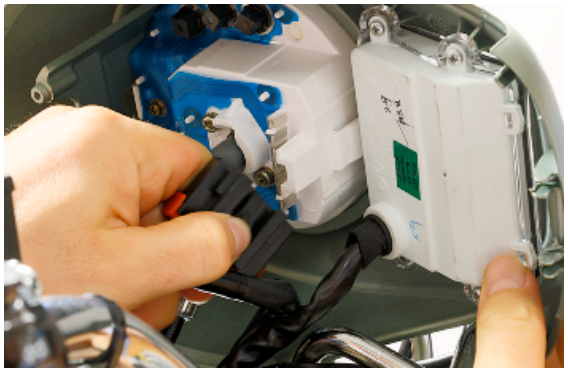


ASSEMBLING THE REAR HANDLEBAR COVER:

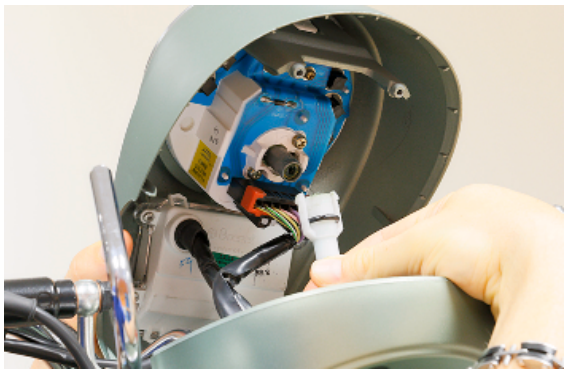
Place the complete instrument panel cover in position and tighten the panel lights assembly fastening screws.



Connect the connector of the instrument unit.



Connect the odometer transmission cable to the instrument unit, checking that the clamps are fastened correctly.

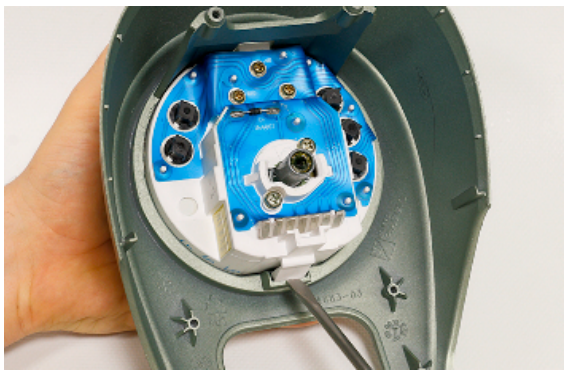


Tighten the bottom screws fastening the rear cover to the front cover, applying the pre-defined torque.
Refit the front centre cover.
Refit the windscreen.

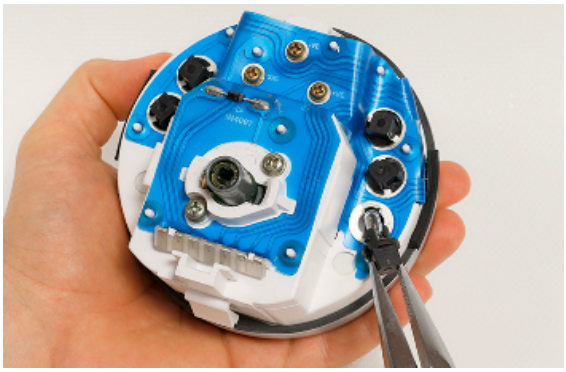
Instrument panel

REMOVING THE INSTRUMENT PANEL:

Remove the rear handlebar cover.
Press the locking lever gently and remove the instrument panel from the cover.



Rotate the instrument panel lighting lamp holder anticlockwise and extract it.

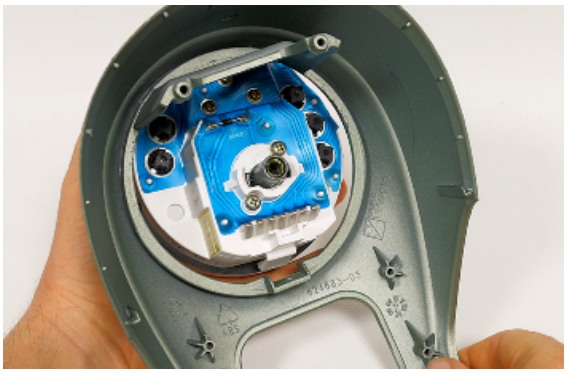


Remove the instrument panel sealing gasket.

ASSEMBLING THE INSTRUMENT PANEL:

Reposition the instrument panel in its housing.

Refit the rear handlebar cover.

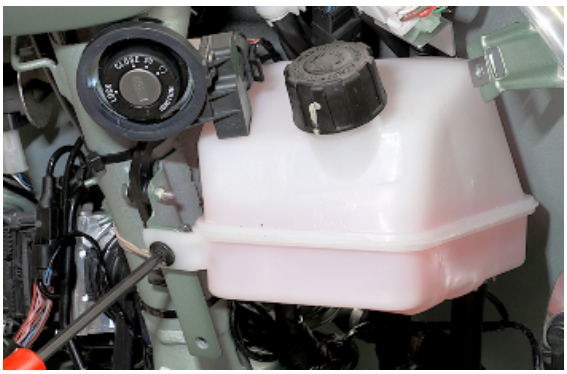


REMOVING THE PANEL LIGHTS ASSEMBLY:

Remove the rear handlebar cover.

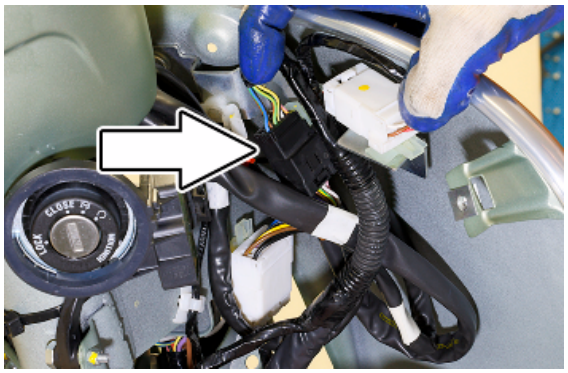
Remove the leg shield back plate.

Unscrew the screws used to fasten the expansion chamber and move it away from the vehicle body.

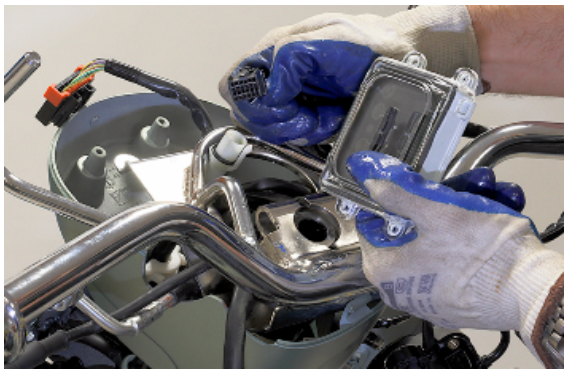


Release the cable retaining clamp.

Free the corresponding wiring harness and disconnect the panel lights assembly connector.



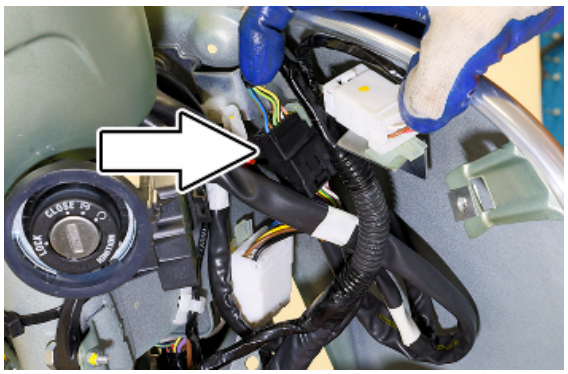
Extract the wiring harness from the handlebar and remove the panel lights assembly.



ASSEMBLING THE PANEL LIGHTS ASSEMBLY:

Insert the panel lights assembly wiring harness in its housing and connect the connector.

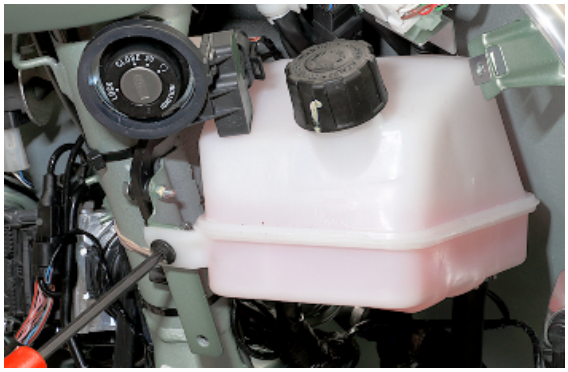
Close the cable retaining clamp so that it secures the panel lights assembly and right and left electrical device wiring harnesses in position.



Reposition the expansion chamber in its housing and tighten the fastening screws, applying the pre-defined torque.

Refit the rear handlebar cover.

Reassemble the leg shield back plate.



Front handlebar cover

REMOVING THE FRONT HANDLEBAR COVER:

Remove the windscreen.

Remove the front centre cover.

Remove the rear handlebar cover.

Remove the handlebars

Unscrew the screws used to fasten the odometer transmission cable retaining clamp.

Slide the front handlebar cover off.

ASSEMBLING THE FRONT HANDLEBAR COVER:

Reposition the front handlebar cover in its housing.

Tighten the screws used to fasten the odometer transmission cable retaining clamp.

Refit the handlebars.

Refit the rear handlebar cover.

Refit the front centre cover.

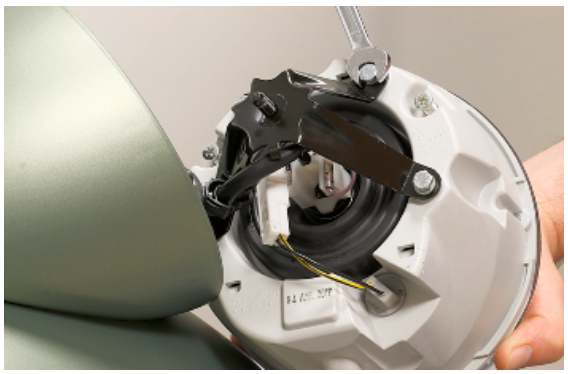
Refit the windscreen.

Headlight assy.

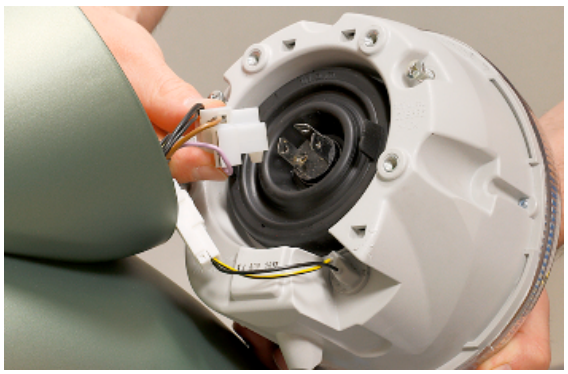
REMOVING THE FRONT LIGHT ASSEMBLY

Unscrew the fastening nut and slide the front headlamp assembly out.

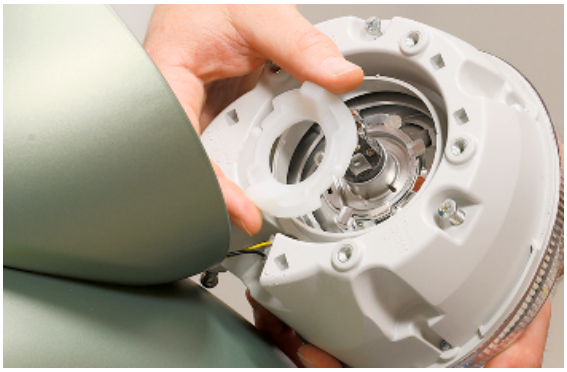
Undo the screws used to fasten the headlamp assembly support bracket.



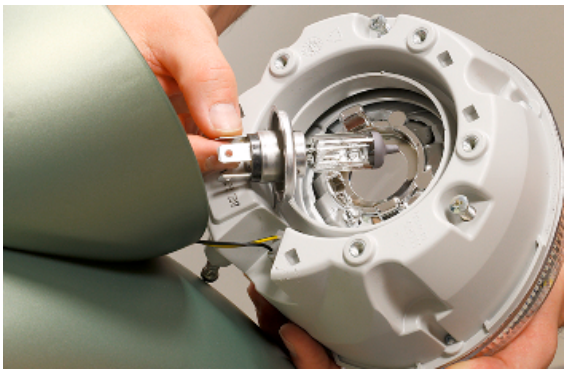
Disconnect the high/low beam headlight connectors.



Remove the rubber protection, and rotate the high/ low beam headlight lamp fastening lock-nut anti-clockwise.



Remove the high/low beam headlights lamp.



To replace the side light lamp, extract the lamp-holder.

REMOVING THE FRONT DIRECTION INDICATORS:

To replace the lamps in the front indicators, unscrew the fastening screws and extract the lamp-holder.

Rotate the lamp-holder anticlockwise and extract the lamp.

FOR EUROPEAN VERSION:

Integrated in the front turn indicators are the daylight running lights of «**LED**» type. In the event of a fault, replace the complete direction indicator unit.

Frame central cover

Rest the vehicle on its centre stand.

Unscrew the screws fixing the middle cover to the footrest and remove it.

When refitting, tighten the fixing screws to the specified torque.

Knee-guard

REMOVAL

Remove the handlebar covers.

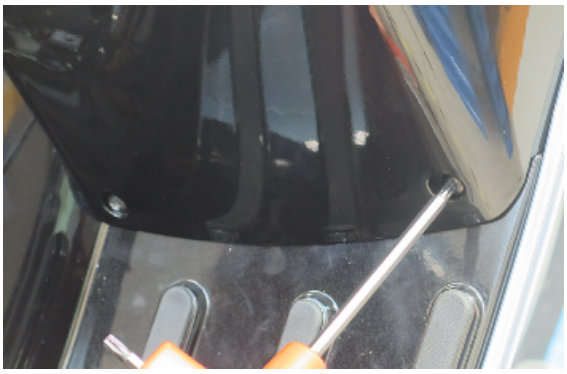
Remove the front centre cover.

Remove the expansion tank cover and the left side cover by unscrewing the fixing screws.

Undo and remove the screws under the expansion tank cover and under the left side cover.

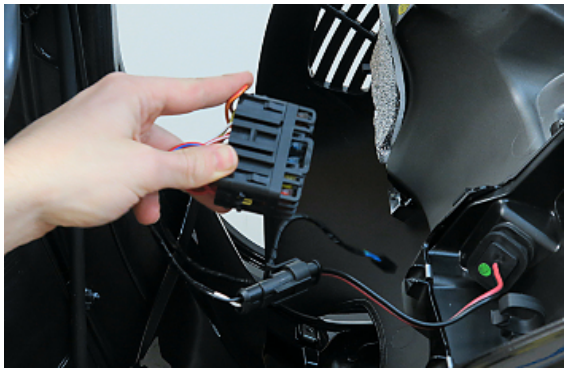
Unscrew and remove the screws on the shield.

Unscrew and remove the screws near the footrest.

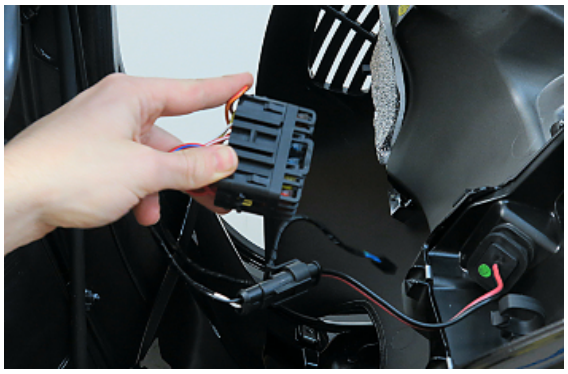


Unscrew and remove the central screw inside the glove box.

Detach the leg shield back plate from the body.
Disconnect the connector for the USB port and the connector for the saddle opening button.
Disconnect the fuse terminal block from the leg shield back plate.
disconnect the emergency saddle opening transmission.
The leg shield back plate is now free and can be removed.



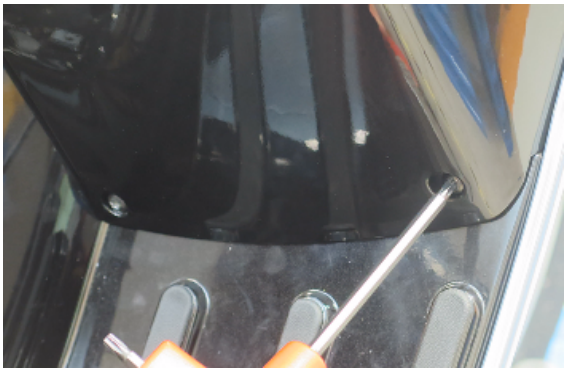
FITTING
Position the leg shield back plate on the body.
Connect the emergency saddle opening transmission.
Insert the fuse terminal block into its lodging inside the leg shield back plate.
Connect the connector for the USB port and the connector for the saddle opening button.



Insert and tighten the central screw inside the glove box.

Insert and tighten the screws under the expansion tank cover and under the left side cover.

insert and tighten the screws near the footrest.



insert and tighten the screws on the shield.

Assemble the expansion tank cover and the left side cover.

Insert and tighten the fixing screws.

Assemble the front centre cover.

Fit the handlebar covers.

Taillight assy.

REMOVAL

To remove the rear light assembly, unscrew and remove the fastening screw.

Disconnect the connector.

FITTING

Support the light assembly and connect the connector.

Insert the light assembly into its lodging.

Insert and tighten the fastening screw.

REMOVAL

To remove the rear turn signal device, unscrew and remove the fastening screw.

Remove the turn signal device, support it, and disconnect the connector.

FITTING

Connect the connector and insert the turn signal device into its lodging.

Insert and tighten the fastening screw.

Footrest

REMOVAL

Remove the leg shield back plate.

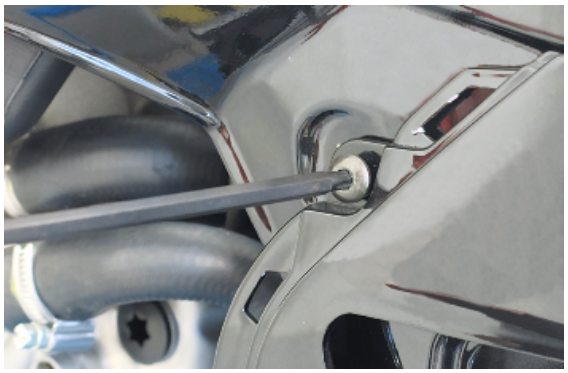
Remove the battery compartment cover and the battery.

Remove the side fairings

Remove the centre screw under the battery compartment cover.

Unscrew and remove the fixing screws of the passenger footrests.
Remove the footrests.

Remove the left and right footrest fixing screw.

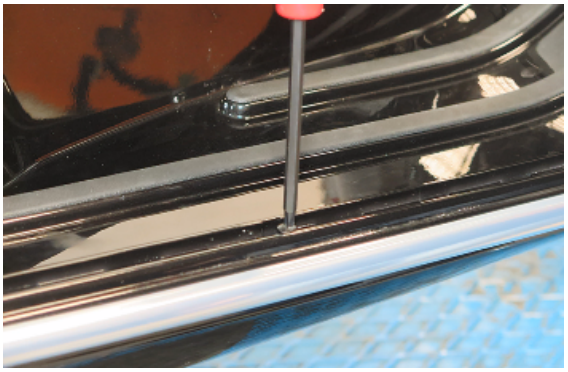


Remove the left and right lower cover fixing screws.
Remove the lower covers.

Remove the non-slip rubber strips of the footrest.

Remove the screws positioned under the non-slip rubber strip.

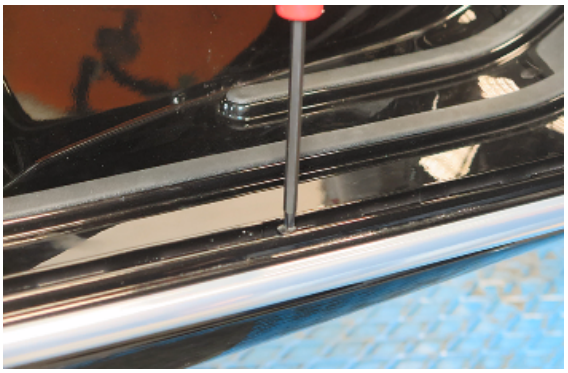
Remove the footrest



FITTING

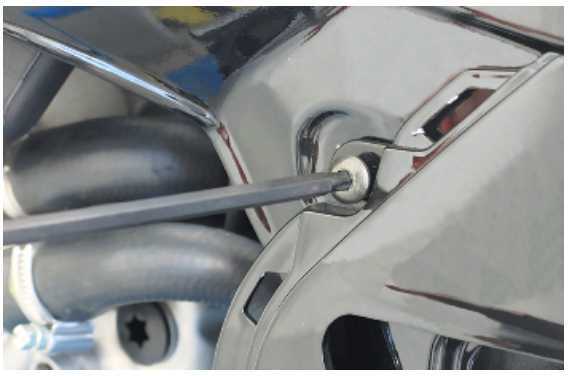
position the footrest on the frame.

Insert and tighten the screws positioned under the non-slip rubber strip.



Insert the central screw.

Insert and tighten the left and right footrest fixing screw.



assemble the lower covers.

Insert and tighten the left and right lower cover fixing screws.

Assemble the passenger footrests

Insert and tighten the footrest fixing screws.

Insert the non-slip rubber strips on the footrest.

Assemble the side fairings

Assemble the battery compartment cover and the battery.

Assemble the leg shield back plate.

Helmet bay

Rest the vehicle on its centre stand.

Lift the saddle and remove the helmet compartment by lifting it up.

Fuel tank

REMOVAL

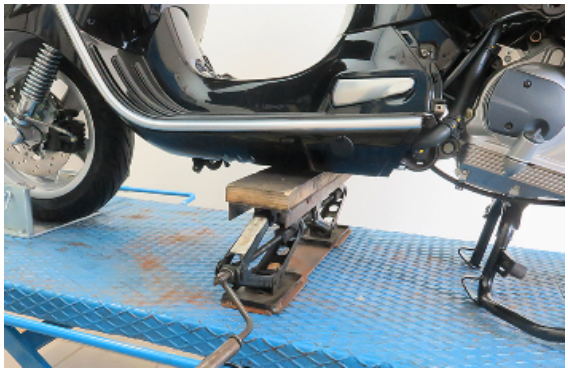
Support the vehicle adequately.

insert a suitable lifting device beneath the body.

Remove the helmet compartment.

Remove the side fairings.

remove the silencer.



Secure the rear of the vehicle with a suitable hoist.

Remove the plastic cover above the luggage rack.

Remove the rear light assembly and the right rear turn signal device.

Disconnect the rear shock absorbers' lower attachments.

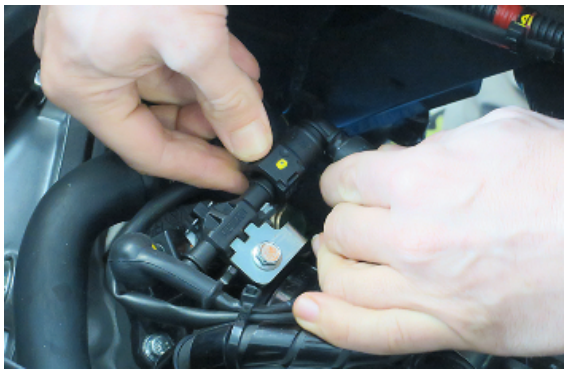
Using the hoist, lift the vehicle to increase the space between the body and the engine.

CAUTION

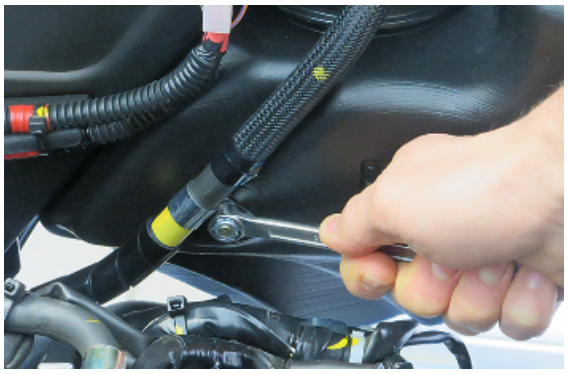
MAKE SURE THAT THE ELECTRIC CABLES AND PIPES ARE NOT SUBJECTED TO EXCESSIVE TENSION WHEN USING THE HOIST.

Undo and remove the fixing screw of the fuel delivery hose to the injector

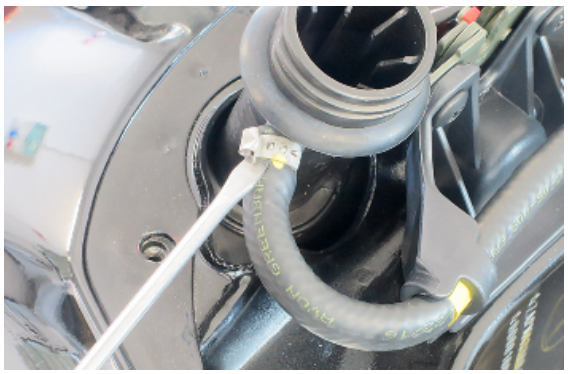
Disconnect the fuel pipe fitting.



Unscrew and remove the fuel pipe clamp fastening nut.



Remove the clamp and disconnect the pipe at the mouth of the tank.



Unscrew and remove the tank's front fastening screw.

Unscrew and remove the rear fastening screw underneath the rear light assembly's chrome-plated frame.

Support the tank.
unscrew and remove the tank fastening screw near the right rear shock absorber's attachment.
remove the tank by disconnecting the connectors for the fuel pump and the fuel level indicator.

FITTING

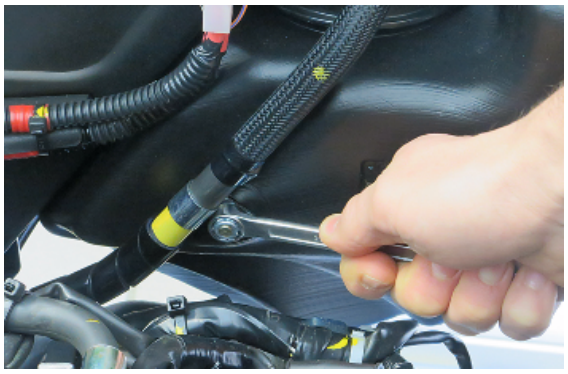
Connect the connectors for the fuel pump and the fuel level indicator, and insert the tank into its lodging.
Insert and tighten the tank fastening screw near the right rear shock absorber's attachment.

Insert and tighten the tank's rear fastening screw near the rear light assembly's lodging.

Insert and tighten the tank's front fastening screw.

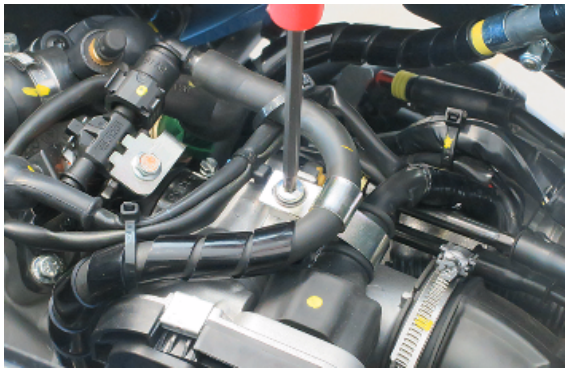
Position the fuel pipe clamp.

Insert and tighten the fixing nut



Connect the fuel pipe fitting.

Insert and tighten the clamp fixing screw of the fuel delivery hose to the injector



Using the hoist, lower the vehicle's body so that the rear shock absorbers' attachments are aligned.

Connect the rear shock absorbers.

Lower the vehicle using the hoist.

Remove the lifting device from underneath the body.

fit the silencer.

Mount the rear light assembly and the right rear turn signal device.

connect the pipe at the mouth of the fuel tank and secure it with a new metallic clamp.

Mount the plastic cover on the luggage rack

Mount the side fairings.

Insert the helmet compartment.

Front mudguard

REMOVING THE FRONT MUDGUARD

Remove the windscreen.

Remove the front centre cover.

Remove the rear handlebar cover.

Remove the light assembly.

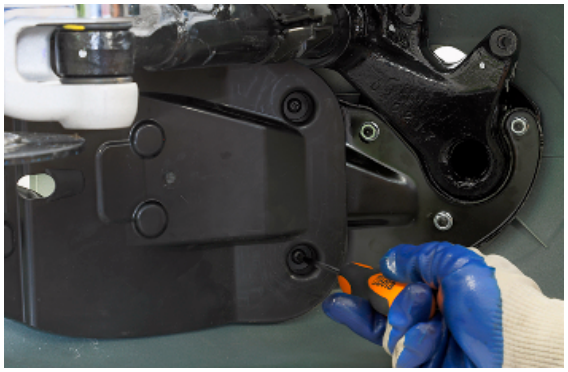
Remove the front wheel.

Remove the front shock absorber.

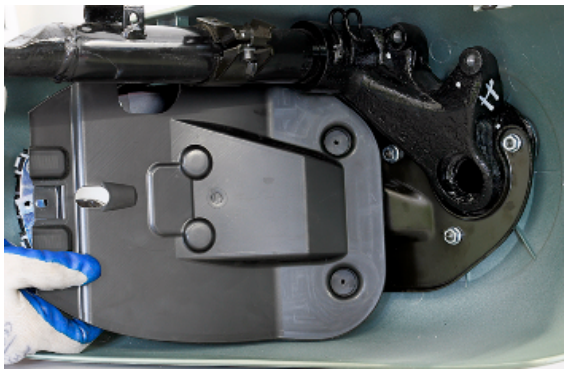
Remove the steering tube

Unscrew the front splash guard fastening screw.

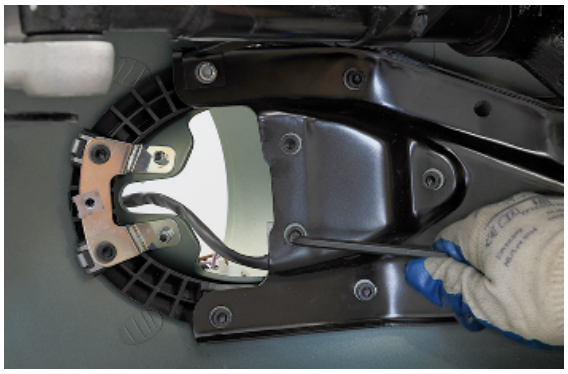
Unscrew the front splash guard fastening screws.



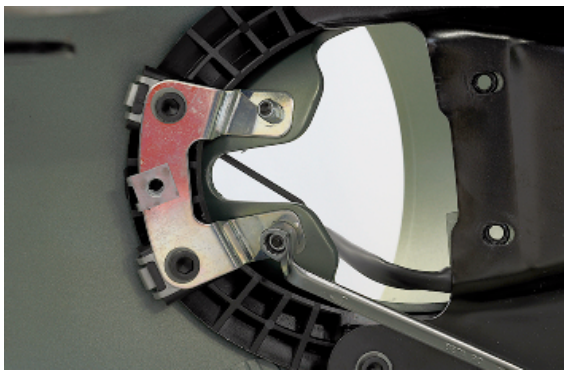
Remove the front splash guard



Unscrew the central headlamp cover fastening screws.

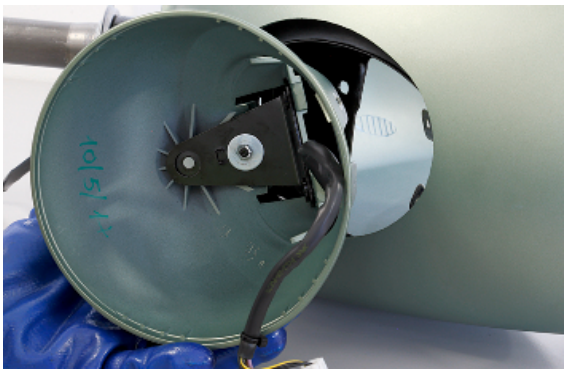


Unscrew the front headlamp cover fastening bolts.

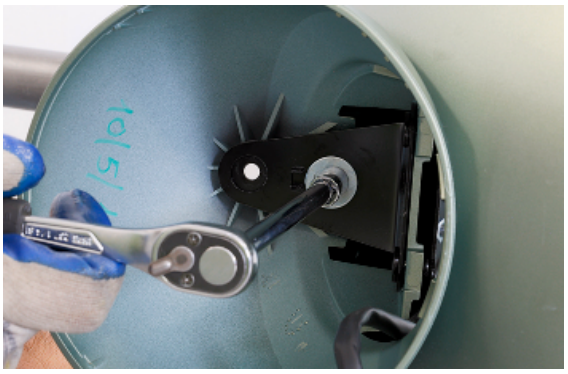


Unscrew the rear headlamp cover fastening screw.

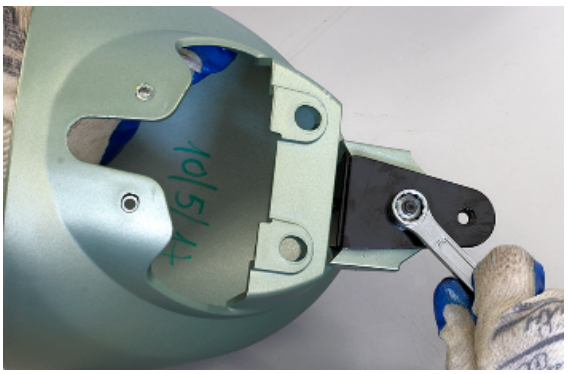
Remove the headlamp cover.



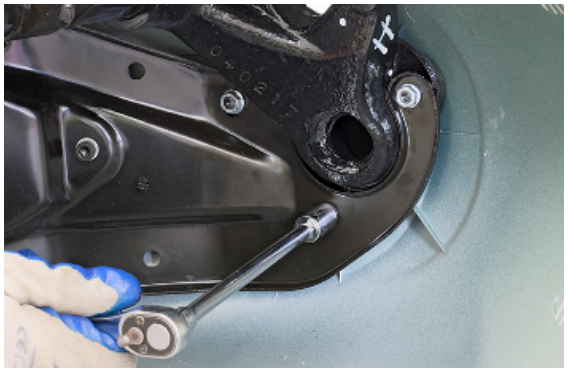
Unscrew the front headlamp support bracket fastening nut and remove it.



Unscrew the front headlamp support bracket retaining bracket fastening nut and remove it.



Unscrew the bolts that fasten the front mudguard to the steering tube.

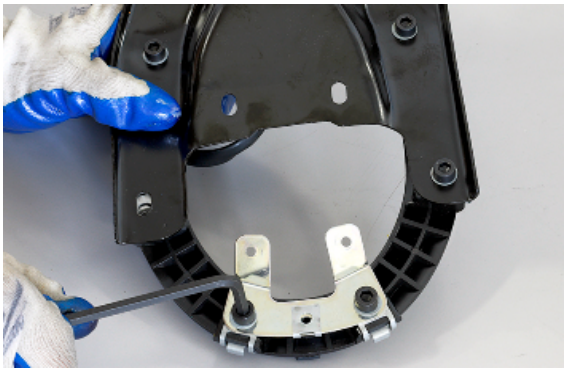


Slide the front mudguard off the steering tube.

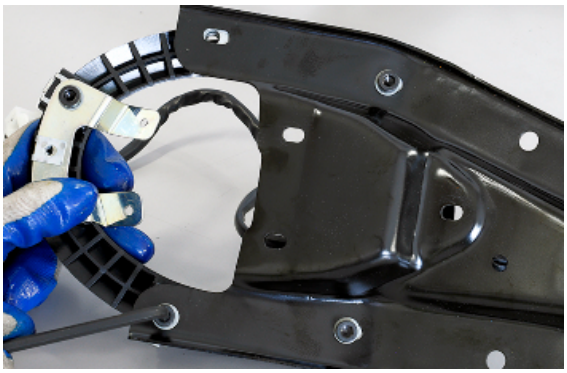
Unscrew the screw used to fasten the support bracket to the suspension flange.

Remove the complete headlight support bracket.

Unscrew the retaining bracket fastening screws and remove it.



Unscrew the screws used to fasten the flange suspension to the support bracket.

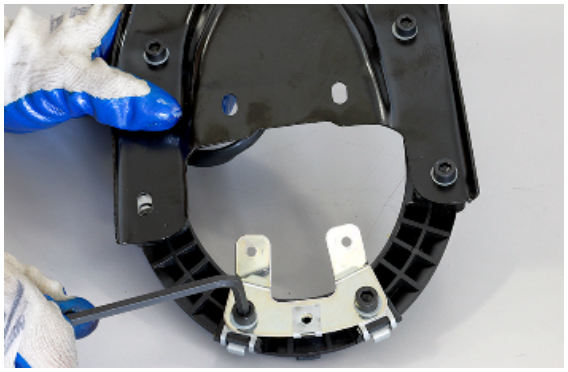


Undo the screws used to fasten the support bracket to the steering tube.

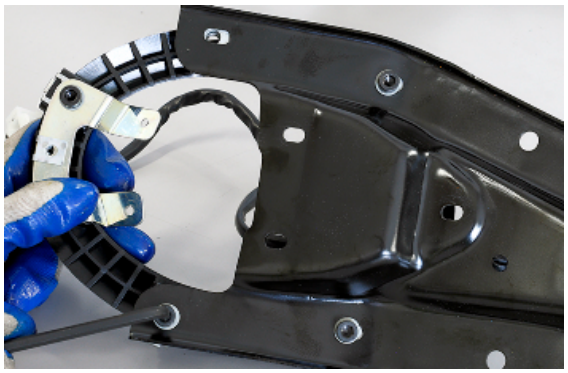
ASSEMBLING THE FRONT MUDGUARD

Insert the screws used to fasten the support bracket to the steering tube, without tightening them.

Tighten the screws used to fasten the retaining bracket to the flange.

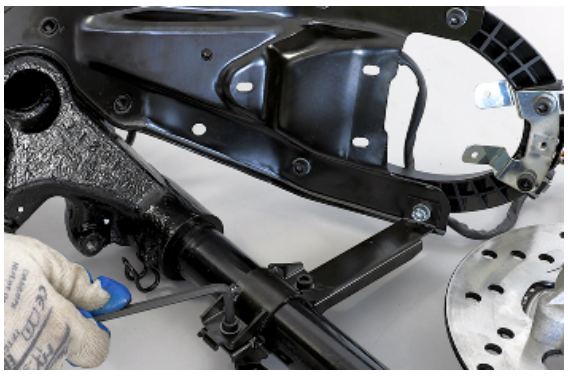


Fasten the complete flange to the headlight support bracket.



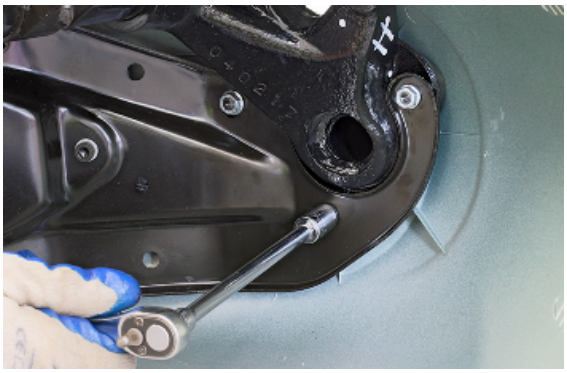
Tighten the screw used to fasten the bracket to the headlight support.

Apply the final tightening torque to the screws used to fasten the support bracket to the steering tube.

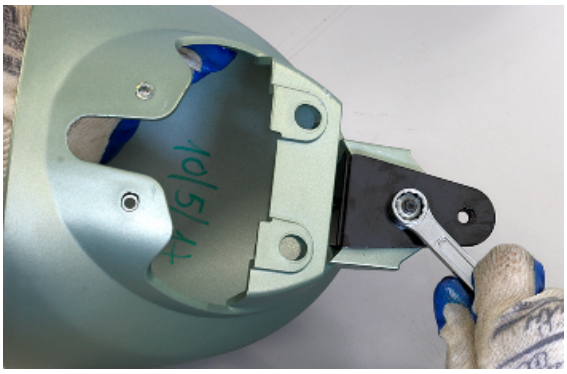


Insert the front mudguard in its housing.

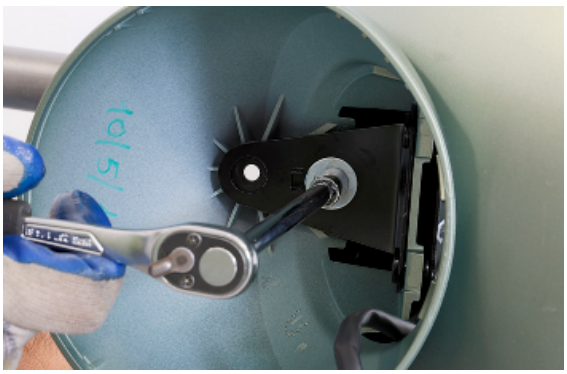
Insert and tighten the bolts used to fasten the mudguard to the headlight support bracket.



Tighten the nut used to fasten the headlamp retaining bracket to the cover.

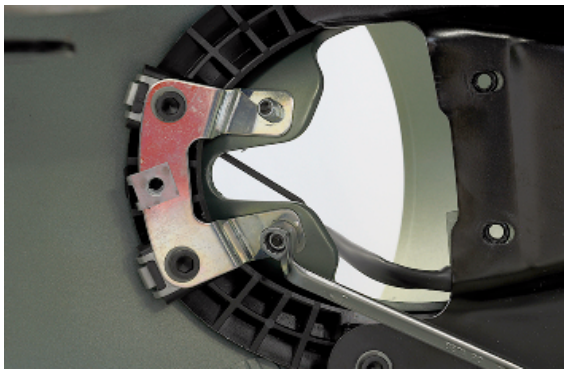


Insert the headlamp support bracket in its housing and tighten the nut used to fasten it to the retaining bracket.

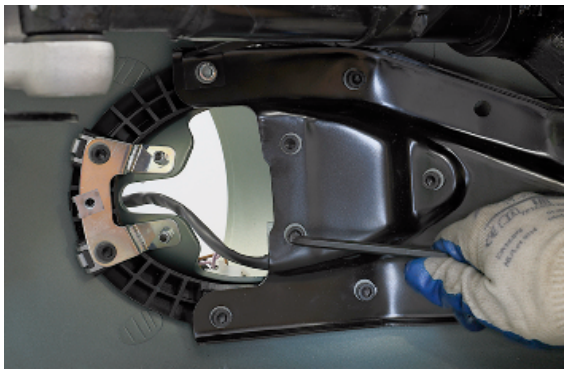


Insert the headlamp cover in its housing and tighten the rear fastening screw.

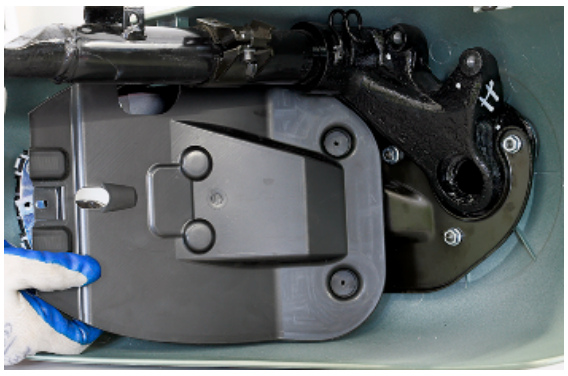
Tighten the front headlamp cover fastening bolts.



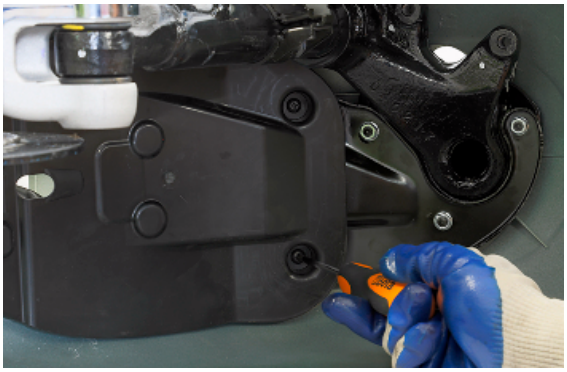
Tighten the central headlamp cover fastening screws.



Insert the front splash guard in its housing.



Insert the screws used to fasten the front splash guard to the headlight support bracket.

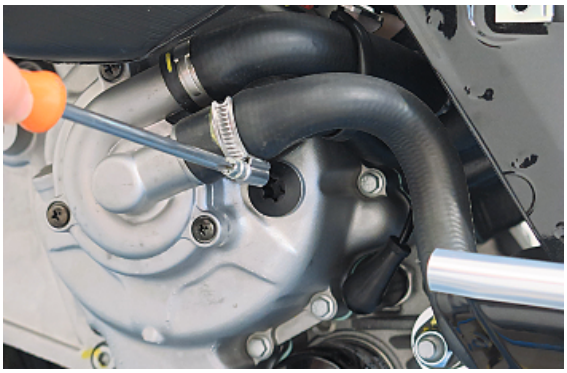


Tighten the front splash guard central fastening screw.
Refit the steering tube
Refit the front shock absorber.
Fit the front wheel.
Refit the light assembly.
Refit the rear handlebar cover.
Refit the front centre cover.
Refit the windscreen.

Radiator fan

REMOVAL

- In order to carry out any operation on the radiator unit, flow out the coolant in the coolant delivery pipe in the pump.

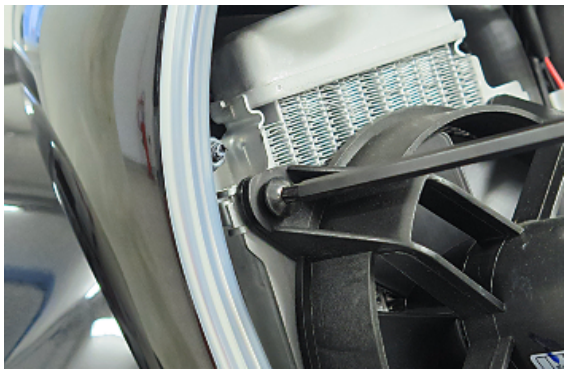


Remove the leg shield back plate.
Remove the cooling hoses plastic retaining clamps.

Unscrew and remove the nuts and screw fastening the right radiator.

Disconnect the electric fan connector.

Unscrew and remove the electric fan fixing screws to the left radiator.



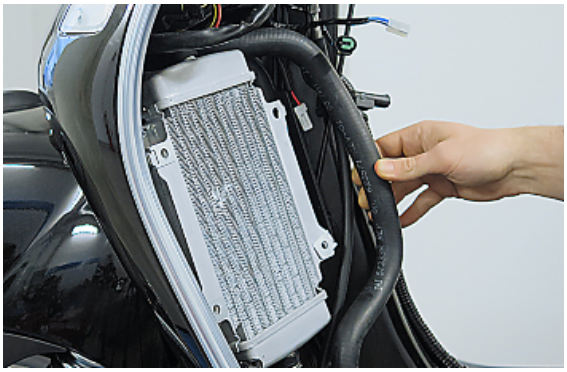
Remove the electric fan.

Remove the hose from its seat.

Unscrew and remove the nuts and screw fastening the left radiator.

Remove the clamps of the connection hoses to the right and left radiators.

Remove the radiators.



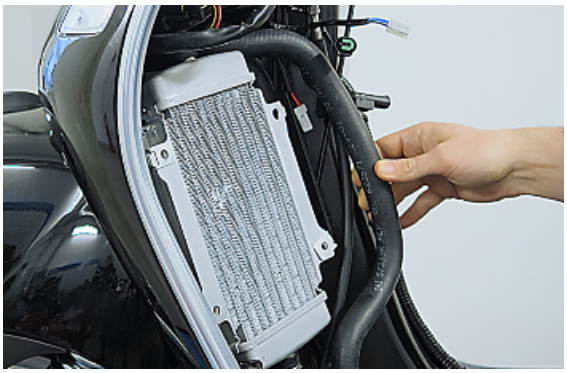
FITTING

Position the radiators in their seats.

Insert the fluid inlet and outlet hoses to the radiators.

Fasten the connection hoses to the right and left radiators with new clamps.

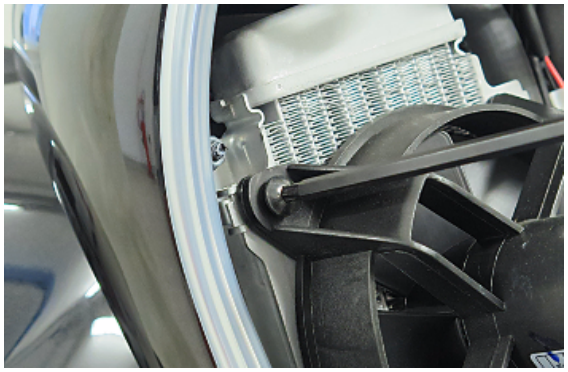
Insert the hose in its seat.



Position the electric fan in its housing on the left radiator.

Connect the electric fan connector.

Insert and tighten the electric fan fixing screws to the left radiator.



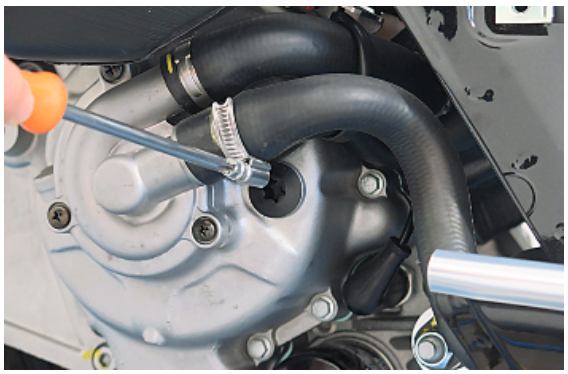
Insert and tighten the nuts and screw fastening the right radiator.

Insert the new cooling hoses plastic retaining clamps.

Reassemble the leg shield back plate.

Fasten the fluid inlet hose to the pump.

Fill the system.



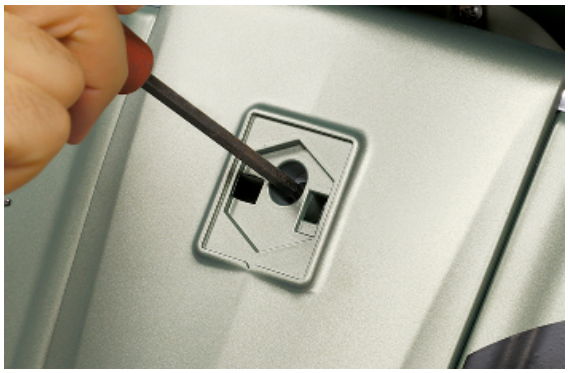
Front central cover

REMOVAL

Rest the vehicle on its centre stand.

Using a flat-head screwdriver, remove the clip-on badge.

Unscrew the screw fixing the central cover to the frame.



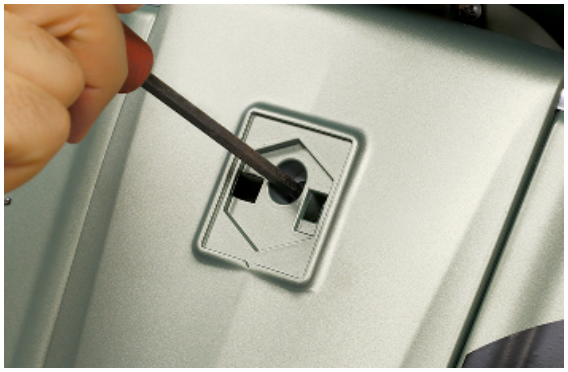
Slide the central cover upwards to disengage the latches and remove it.

FITTING

Place the central cover in its seat.

Make sure to engage the latches correctly, pushing the cover downwards

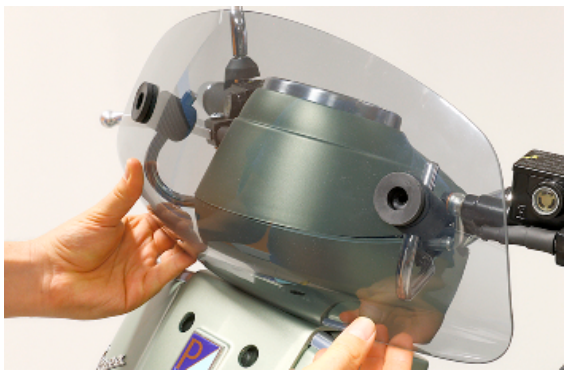
Tighten the screw fixing the central cover to the chassis at the specified torque.
Put back the clip-on badge.



Flyscreen

REMOVING THE WINDSHIELD:
Unscrew the screws used to fasten the windshield to its support on both sides. Remove the chrome-plated washer.

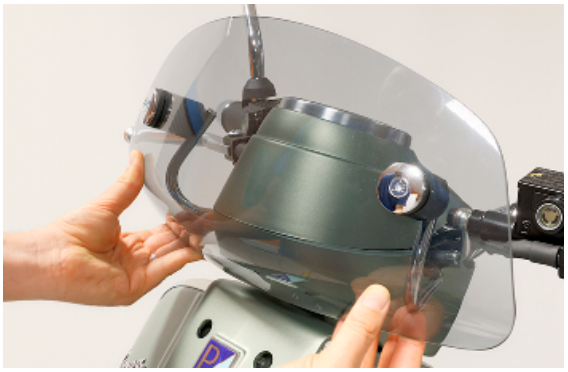
Remove the windscreen.



Remove the rubber support, complete with bushing, from both sides.

ASSEMBLING THE WINDSHIELD:

Pre-assemble the windshield with the fastening bushings and position it on the support brackets.



Tighten the screws used to fasten the windshield to the brackets, applying the pre-defined tightening torque.

Battery

REMOVAL

Rest the vehicle on its centre stand.

Remove the chassis central cover.

Unscrew the fixing screws of the battery bracket.

Remove the battery bracket.

Unscrew the fixing screw of the negative pole «-» and disconnect it.

Unscrew the fixing screw of the positive pole «+» and disconnect it.

CAUTION

IT IS EXTREMELY IMPORTANT TO OBSERVE THE INDICATED DISCONNECTION SEQUENCE OF THE CABLES TO AVOID SHORT-CIRCUITS.

Remove the battery from its housing.

FITTING

Check the state of the battery charge.

Follow the instructions in this manual.

Insert the new battery in its seat as shown in the figure.

Screw in the fixing screw of the positive pole «**+**» to the battery.

Screw in the fixing screw of the negative pole «**-**» to the battery.

CAUTION

IT IS IMPORTANT TO OBSERVE THE INDICATED CONNECTION SEQUENCE OF THE CABLES TO THE BATTERY TO AVOID SHORT-CIRCUITS. FIRST CONNECT THE POSITIVE CABLE «+» AND THEN THE NEGATIVE CABLE«-».

CAUTION

DO NOT REVERSE THE POLARITY: RISK OF SHORT CIRCUIT AND DAMAGE TO THE ELECTRICAL SYSTEM.

WARNING

USED BATTERIES ARE HARMFUL TO THE ENVIRONMENT. COLLECTION AND DISPOSAL SHOULD BE CARRIED OUT IN COMPLIANCE WITH REGULATIONS IN FORCE.

Put back the battery bracket and tighten the fixing screws to the specified torque.

Put back the chassis central cover.

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