
SERVICE STATION MANUAL

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BV 350



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SERVICE STATION MANUAL

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This service station manual has been drawn up by Piaggio & C. Spa to be used by the workshops of Piaggio dealers. It is assumed that the user of this manual for maintaining and repairing Piaggio vehicles has a basic knowledge of mechanical principles and vehicle repair technique procedures. Any significant changes to vehicle characteristics or to specific repair operations will be communicated by updates to this manual. Nevertheless, no mounting work can be satisfactory if the necessary equipment and tools are unavailable. It is therefore advisable to read the sections of this manual concerning special tools, along with the special tool catalogue.

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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CHARACTERISTICS

CHAR

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 in such a way that you do not breathe in the dust produced by the wear of the 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 spares may damage the vehicle.
 - Use only the appropriate tools designed for this vehicle.
 - Always use new gaskets, sealing rings and split pins upon refitting.
 - 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

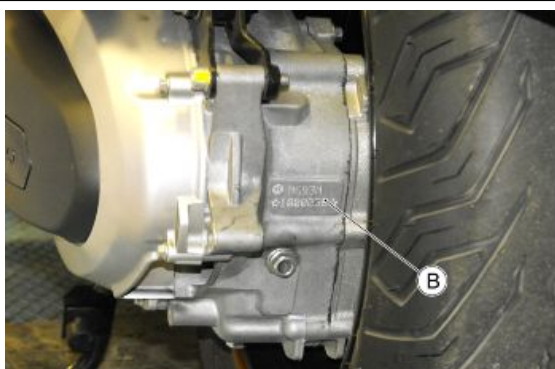
Chassis number

To read the chassis number, remove the port **A** in the front case.

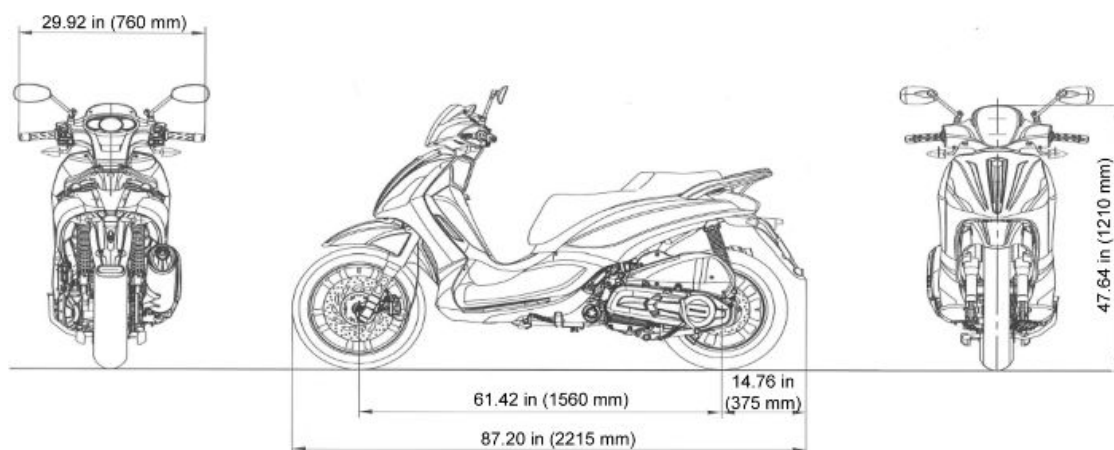


Engine number

The engine number «**B**» is stamped near the rear left shock absorber lower support.



Dimensions and mass



WEIGHTS AND DIMENSIONS

Specification	Desc./Quantity
Length	87.20 in (2,215 mm)
Width	29.92 in (760 mm)
Wheelbase	61.42 in (1,560 mm)
Height	47.64 in (1,210 mm)
Kerb weight	395 lb ± 17 lb (179 Kg ± 8 Kg)
Maximum weight allowed	827 lb (375 Kg)

Engine**ENGINE SPECIFICATIONS**

Specification	Desc./Quantity
Type	Single-cylinder, 4-stroke
Engine capacity	20.18 in³ (330 cc)
Bore x stroke	3.07 × 2.72 in (78 × 69 mm)
Compression ratio	12.0±0.5
Engine idle speed	1700±100 rpm
Timing system	Four valves, single overhead camshaft, chain-driven.
Valve clearance (when cold)	intake: 0.004 in (0.10 mm) exhaust: 0.006 in (0.15 mm)
Max power to the shaft	24.5 kW at 8250 rpm
MAX. torque	23.82 lb ft (32.3 Nm) at 6,250 rpm
Transmission	With continuously variable transmission, torque server, V belt, centrifugal automatic clutch in oil bath.
Final reduction	Gear reduction unit in oil bath.
Lubrication	Engine lubrication with trochoidal pump (inside the crankcase), oil filter and pressure adjustment by-pass.
Cooling	Forced coolant circulation system.
Starter	Electric
Ignition	Electronic, inductive, high efficiency ignition, integrated with the injection system, with variable advance and separate H.V. coil.
Ignition advance	Three-dimensional map managed by control unit
Fuel system	IAWM3G electronic injection with 1.50 Ø (38 mm) diameter throttle body, electric fuel pump.
Spark plug	NGK CR7EKB
Fuel	Unleaded petrol 90 (M+R) /2 minimum octane
Silencer	Absorption-type exhaust silencer with a three-way catalytic converter and lambda probe to the exhaust.
Emissions compliance	EURO 3

Transmission**TRANSMISSION**

Specification	Desc./Quantity
Transmission	With continuously variable transmission, torque server, V belt, centrifugal automatic clutch in oil bath.
Final reduction gear	Gear reduction unit in oil bath.

Capacities**CAPACITY**

Specification	Desc./Quantity
Engine oil	approx. 0.39 USgal (0.33 UKgal) (1.5 l)
Transmission oil	approx. 0.13 USgal (0.11 UKgal) (500 cc)
Fuel tank capacity	3.43 ± 0.26 USgal (2.86 ± 0.22 UKgal) (13 ± 1 l)
Cooling system fluid	0.38 USgal (0.46 gal) (1.75 l)

Electrical system

ELECTRICAL SYSTEM

Specification	Desc./Quantity
Starter	Electric
Ignition	Electronic, inductive, high efficiency ignition, integrated with the injection system, with variable advance and separate H.V. coil.
Ignition advance	Three-dimensional map managed by control unit
Spark plug	NGK CR7EKB
Alternative spark plug	-
Battery	12V-12Ah
Generator	alternating current

Frame and suspensions

CHASSIS AND SUSPENSION

Specification	Desc./Quantity
Chassis	Tubular and steel sheets.
Front suspension	Hydraulic telescopic fork with Ø 1.38 (35-mm) stem.
Rear suspension	Two double-acting shock absorbers, adjustable to four positions at preloading.

Brakes

BRAKES

Specification	Desc./Quantity
Front brake	Ø 11.81 (300 mm) disc brake with hydraulic control activated by handlebar right-side lever.
Integral brake	Ø 9.45 (240 mm) Rear disc brake with hydraulic control activated by handlebar right-side lever; the front disc is served by a pressure filler valve.

Wheels and tyres

WHEELS AND TYRES

Specification	Desc./Quantity
Wheel rim type	Light alloy wheel rims.
Front wheel rim	3.00" x 16"
Rear wheel rim	4.00"x14"
Front tyre	110/70 - 16" M/C 52S Tubeless
Rear tyre	150/70 - 14" M/C 66S Tubeless
Front tyre pressure (with passenger)	31.9 psi (31.9 psi) (2.2 bar (2.2 bar))
Rear tyre pressure (with passenger)	34.8 psi (37.7 psi) (2.4 bar (2.6 bar))

N.B.

CHECK AND ADJUST TYRE PRESSURE WITH TYRES AT AMBIENT TEMPERATURE. REGULATE PRESSURE ACCORDING TO THE WEIGHT OF BOTH RIDER AND ACCESSORIES

Tightening Torques

BODYWORK

Name	Torque in Nm
Fixing screws closing the front headlamp cover	(0.73÷1.25) lb ft (1÷1.7) Nm

Name	Torque in Nm
Instrument panel fixing screws	(0.73÷1.25) lb ft (1÷1.7) Nm
Front cover - rear cover fixing screws	(0.73÷1.25) lb ft (1÷1.7) Nm
Handlebar cover fixing screws	(0.73÷1.25) lb ft (1÷1.7) Nm
Headlight lower fixing screws	(1.47÷2.95) lb ft (2÷4) Nm
Headlight upper fixing screws	(1.47÷2.95) lb ft (2÷4) Nm
Forks cover side fixing screws	(0.73÷1.45) lb ft (1÷2) Nm
Front upper mudguard side fixing nuts	(2.95÷4.79) lb ft (4÷6.5) Nm
Forks cover rear fixing screws	(3.31÷5.16) lb ft (4.5÷7) Nm

FRONT BRAKE

Name	Torque in Nm
Brake fluid pump-hose fitting	(11.08÷14.75) lb ft (16÷20) Nm
Bearing lock screw	(6.64÷8.11) lb ft (9÷11) Nm
Oil bleed screw	(8.85÷11.80) lb ft (12÷16) Nm
Pad fastening pin	(14.45÷18.07) lb ft (19.6÷24.5) Nm
Screw tightening calliper to support	(17.70÷19.91) lb ft (24÷27) Nm
Brake disc screws	(5.90÷7.73) lb ft (8÷10) Nm
Brake fluid pipe-calliper fitting	(14.75÷18.43) lb ft (20÷25) Nm
Screws fixing the distribution mechanism	(7.73÷8.11) lb ft (10÷11) Nm
Front calliper pipe tightening - distribution mechanism	(14.75÷18.43) lb ft (20÷25) Nm
Brake pipes fixing screw at the distribution mechanism	(14.75÷18.43) lb ft (20÷25) Nm
Front pump pipe grommet screw - clamp	(7.73÷8.11) lb ft (10÷11) Nm
Distribution mechanism pipe screw - front brake pump	(14.75÷18.43) lb ft (20 ÷ 25) Nm

REAR BRAKE

Name	Torque in Nm
Rear brake calliper-pipe fitting	(14.75÷18.43) lb ft (20÷25) Nm
Rigid / flexible pipe fitting	(9.58÷13.27) lb ft (13÷18) Nm
Rear brake pump-pipe fitting	(11.80÷14.75) lb ft (16÷20) Nm
Rear brake fixing screws	(14.75÷18.43) lb ft (20÷25) Nm
Brake disc screws	(5.90÷7.73) lb ft (8÷10) Nm
Pad fastening pin	(14.45÷18.07) lb ft (19.6÷24.5) Nm
Brake pump fixing screw	(30.97÷37.61) lb ft (42÷51) Nm
Pipe grommet fixing brake valve screw - rear calliper	(7.37÷8.11) lb ft (10÷11) Nm
Pipe grommet fixing brake valve screw - rear calliper	(7.37÷8.11) lb ft (10÷11) Nm

ELECTRICAL SYSTEM

Name	Torque in Nm
Side stand sensor fixing screws	(3.68÷5.16) lb ft (5÷7) Nm
Locking the spark plug	(7.37÷8.85) lb ft (10÷12) Nm
Rear wheel engine speed sensor tightening screw	(5.16÷7.37) lb ft (7÷10) Nm

SILENCER

Name	Torque in Nm
Silencer heat guard fixing screw	(2.95÷3.68) lb ft (4÷5) Nm
Screw for fixing silencer to supporting arm	(14.75÷18.43) lb ft (20÷25) Nm
Lambda probe tightening on exhaust manifold	(29.50÷36.87) lb ft (40÷50) Nm
Exhaust manifold-silencer clamp tightening	(8.85÷9.58) lb ft (12÷13) Nm
Nuts fixing the exhaust manifold to the head	(11.80÷13.27) lb ft (16÷18) Nm
Joint pipe	(Setting load 440.92-1322.77 lb - LOCTITE 603) (Setting load 200-600 Kg - LOCTITE 603)

FLYWHEEL

Name	Torque in Nm
Flywheel cover screw	(8.11÷9.59) lb ft (11÷13) Nm
Flywheel fixing nut	(73.76÷81.13) lb ft (100÷110) Nm
Screw fixing freewheel to flywheel	(9.59÷11.06) lb ft (13÷15) Nm
Starter sprocket check fixing screw	(3.68÷4.42) lb ft (5÷6) Nm
Starter motor fixing screws	(8.11÷9.58) lb ft (11÷13) Nm
Starter crown plate fixing screws	(3.69÷4.42) lb ft (5÷6) Nm

FLYWHEEL COVER

Name	Torque in Nm
Pick-up screws	(2.21÷2.95)lb ft (3÷4)Nm
Stator fixing screws	(5.90÷7.38)lb ft (8÷10)Nm
Stator cable plates clamping screws	(2.21÷2.95)lb ft (3÷4)Nm
Oil drain screw	(14.75÷17.70)lb ft (20÷24)Nm
Flywheel cover retainer screws (2 screws) - PRETIGHTENING	(3.69÷4.42)lb ft (5÷6)Nm
Flywheel cover retainer screws (12 screws) - TIGHTENING	(8.11÷9.59)lb ft (11÷13)Nm
TCEI M6x25 flywheel side cover retainer screw	(5.9 ÷ 7.37) lb ft (8 ÷ 10) Nm
TCIC M5x10 flywheel cover retainer screw	(2.21 ÷ 2.95) lb ft (3 ÷ 4) Nm
Fixing clamps of head pump cover by-pass pipe	(1.11÷1.40)lb ft (1.5÷1.9)Nm
Water pump cover fixing screw M5	(2.21÷2.95)lb ft (3÷4)Nm
Water pump cover fixing screw M6	(8.11÷9.59)lb ft (11÷13)Nm
Impeller on the pump shaft	(2.95÷4.42)lb ft (4÷6)Nm
Water pump impeller cover screws	(2.21÷2.95)lb ft (3÷4)Nm
Water pump impeller driving link	(9.59÷11.06)lb ft (13÷15)Nm
Coil fixing screw	(8.11÷9.59)lb ft (11÷13)Nm

CRANKCASE

Name	Torque in Nm
Calibrated fixing dowel	(3.69÷5.16)lb ft (5÷7)Nm
Bearing lock screw	(6.64÷8.11)lb ft (9÷11)Nm
Oil filter cover	(17.70÷22.13)lb ft (24÷30)Nm
Oil pump command sprocket screw	(6.64÷8.11)lb ft (9 ÷11)Nm
Oil pump chain slider locking screws	(3.69÷4.42)lb ft (5÷6)Nm
Engine oil level shaft	(0.95÷1.25)lb ft (1.3÷1.7)Nm
Engine-crankcase coupling screws	(8.11÷9.59)lb ft (11÷13)Nm

HEAD AND CYLINDER

Name	Torque in Nm
Injector locking screw on the big end	(3.69÷4.42)lb ft (5÷6)Nm
Head cover screws	(4.42÷5.16)lb ft (6÷7)Nm
Cylinder head nut (PRE-TIGHTENING)	(4.42÷5.90)lb ft (6÷8)Nm
Cylinder head nut (TIGHTENING)	(6.64÷8.11)lb ft (9÷11)Nm (Tighten to the specified torque then rotate 270.0°±5.0°)
Cylinder stud bolt fitting	See section ENGINE/LUBRICATION/STUD BOLT
Screws fixing cylinder head to crankcase	(14.75÷17.70)lb ft (20÷24)Nm
Timing system gear fixing screw	(8.11÷11.06)lb ft (11÷15)Nm
Big end / throttle body union fitting clamps	(0.96÷1.25)lb ft (1.3÷1.7)Nm
Tensioner spring retaining screw	(3.69÷4.42)lb ft (5÷6)Nm
Fastener chain tensioner	(8.11÷9.59)lb ft (11÷13)Nm
Chain tensioner rod fastener screw	(7.37÷8.85)lb ft (10÷12)Nm
E.I. threaded dowel	(3.69÷5.90)lb ft (5÷8)Nm
Thermostat cover screws	(2.21÷2.95)lb ft (3÷4)Nm
Water temperature sensor	(15.49÷16.96)lb ft (21÷23)Nm
Starter sprocket locking	(8.11÷11.06)lb ft (11÷15)Nm
Bleed screw	(1.47÷2.21)lb ft (2÷3)Nm
Pressure reducer ground washer fastening screw	(5.16÷6.27)lb ft (7÷8.5)Nm
Camshaft retainer plate screw	(3.32÷4.06)lb ft (4.5÷5.5)Nm
Pressure reducer counterweight retainer screw	(5.16÷6.27)lb ft (7÷8.5)Nm
Mount the locking chain tensioner with 2 screws	8.11÷9.59)lb ft (11÷13)Nm
Locking the chain tensioner support hood	(3.69÷4.42)lb ft (5÷6)Nm

TRANSMISSION AND FINAL REDUCTION

Name	Torque in Nm
Transmission cover screws	(8.11÷9.59)lb ft (11÷13)Nm
Clutch cover retainer screws	(8.11÷9.59)lb ft (11÷13)Nm
Driven pulley shaft nut	(88.51÷95.88)lb ft (120÷130)Nm
Driven pulley M10x1.25 screw	(54.58÷59.00)lb ft (74÷80)Nm
Driven pulley ring nut	(36.88÷44.25)lb ft (50÷60)Nm
Nut M14x1.5 securing the driving pulley	(88.51÷95.88)lb ft (120÷130)Nm
Final reduction cover screws	(17.70÷19.91)lb ft (24÷27)Nm

Name	Torque in Nm
M12x1.25 gear clutch shaft retainer nut	(70.07÷77.44)lb ft (95÷105)Nm
Oil relief screw	(11.06÷12.54)lb ft (15÷17)Nm
Reduction unit oil drainage screw	(11.06÷12.54)lb ft (15÷17)Nm
Bearing lock screw	(6.64÷8.11)lb ft (9÷11)Nm
Clutch output shaft nut	(88.51 ÷ 95.88) lb ft (120 ÷ 130) Nm
Driven pulley nut	(36.88 ÷ 44.25) lb ft (50 ÷ 60) Nm

FRONT SUSPENSION

Name	Torque in Nm
Front wheel axle	(33.19÷36.88)lb ft (45÷50)Nm
Calliper mounting bracket screw	7.37 lb ft (10Nm) (Tighten after inserting the front wheel axle) Check that there is no breakage.
front mudguard to plate fixing screw	(3.32÷5.16)lb ft (4.5÷7)Nm
Fixing screw for mudguard plate to fork	(6.64÷8.11)lb ft (9÷11)Nm
Stem support clamp tightening screws	Apply a torque of (18.44÷25.08)lb ft (25÷34)Nm to the lower screw «1» Lock the upper screw «2» to a torque of (18.44÷25.08)lb ft (25÷34)Nm Lock the lower screw «1» to a torque of (18.44÷25.08)lb ft (25÷34)Nm
Fork locking screws cap	(11.06÷22.13)lb ft (15÷30)Nm
Hydraulic rod fixing screw	(18.44÷25.81*)lb ft (25÷35*)Nm

REAR SUSPENSION

Name	Torque in Nm
Rear wheel axle	(76.71÷92.93)lb ft (104÷126)Nm
Fixing screw for wheel rim to hub	(25.08÷28.03)lb ft (34÷38)Nm
Shock absorber lower clamping	(23.97÷29.13)lb ft (32.5÷39.5)Nm
Silencer supporting arm to engine screws (*)	(14.75÷18.44)lb ft (20÷25)Nm
Upper shock absorber fixing - self locking nut M10	(29.50÷32.45)lb ft (40÷44)Nm
Shock absorber mounting bracket fixing	(14.75÷17.70)lb ft (20÷24)Nm
M16x13 wheel retaining nut	(75.23÷91.46)lb ft (102÷124)Nm

STEERING

Name	Torque in Nm
Handlebar fixing screw	(36.88÷40.57)lb ft (50÷55)Nm
Fixing screws for the handlebar control unit U-bolts	(5.16÷7.38)lb ft (7÷10)Nm
Steering tube upper ring nut	(29.50÷33.19)lb ft (40÷45)Nm
Steering tube lower ring nut	(10.33÷12.54)lb ft (14÷17)Nm
Throttle grip cables right control fastener screw	(2.21÷2.95)lb ft (3÷4)Nm
Hand grip counterweight retainer screw	(6.64÷8.11)lb ft (9÷11)Nm
Mirrors fastening long nut	(14.75÷18.44)lb ft (20÷25)Nm
Rear flange fastening screw	(0.37÷0.59)lb ft (0.5÷0.8)Nm

CHASSIS

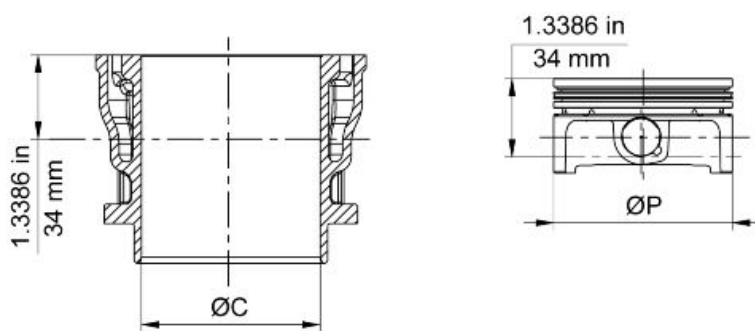
Name	Torque in Nm
Centre stand bolt	(29.50÷33.19)lb ft (40÷45)Nm
Side stand fixing bolt	(29.50÷33.19)lb ft (40÷45)Nm
Throttle cable pipe grommet screw	(7.38÷8.11)lb ft (10÷11)Nm
Clip / pipe grommet fastening screw	(7.38÷8.11)lb ft (10÷11)Nm

SWINGING ARM

Name	Torque in Nm
Self-locking retainer nut M10 upper pin (left side)	(50.15÷55.32)lb ft (68÷75)Nm
Self-locking retainer nut M10 bottom lower silent block support bracket	(36.88÷40.57)lb ft (50÷55)Nm
Self-locking retainer nut M10 pin (right side)	(30.24÷33.19)lb ft (41÷45)Nm
Self-locking retainer nut M10 motor attachment (right side)	(40.57÷44.25)lb ft (55÷60)Nm
Retainer nut of silent block support bracket (left side)	(65.64÷79.66)lb ft (89÷108)Nm
Lower pin bushing	(3.76÷5.09)lb ft (5.1÷6.9)Nm

LUBRICATION

Name	Torque in Nm
Crankcase timing cover screws	(8.11÷9.59)lb ft (11÷13)Nm
Screw fixing oil pump to the crankcase	(3.69÷4.43)lb ft (5÷6)Nm
Pump rod screw	(9.59÷11.06)lb ft (13÷15)Nm
Minimum oil pressure sensor locking	(8.85÷10.33)lb ft (12÷14)Nm (LOCTITE 5091 Edge closure between metal body and plastic block)

Overhaul data**Assembly clearances****Cylinder - piston assy.****CYLINDER - PISTON**

Specification	Desc./Quantity
Piston diameter (ØP)	3.0695±0.00059 in (77.967±0.014 mm)
Piston diameter (ØC)	3.0708(+0.0015 +0.0004)in (78(+0.038 +0.01)mm)

COUPLING CATEGORIES

Name	Initials	Cylinder	Piston	Play on fitting
cylinder-piston	M	(3.071251÷3.071526)in (78.010÷78.017)mm	(3.069006÷3.069282)in (77.953÷77.960)mm	(0.001969÷0.002519)in (0.050 ÷ 0.064)mm
cylinder-piston	N	(3.071526÷3.071802)in (78.017÷78.024)mm	(3.069282÷3.069558)in (77.960 ÷ 77.967)mm	(0.001969÷0.002519)in (0.050 ÷ 0.064)mm
cylinder-piston	O	(3.071802÷3.072077)in (78.024÷78.031)mm	(3.069558÷3.069833)in (77.967÷77.974)mm	(0.001969÷0.002519)in (0.050 ÷ 0.064)mm
cylinder-piston	P	(3.072077÷3.072353)in (78.031÷78.038)mm	(3.069833÷3.070109)in (77.974 ÷ 77.981)mm	(0.001969÷0.002519)in (0.050 ÷ 0.064)mm

N.B.

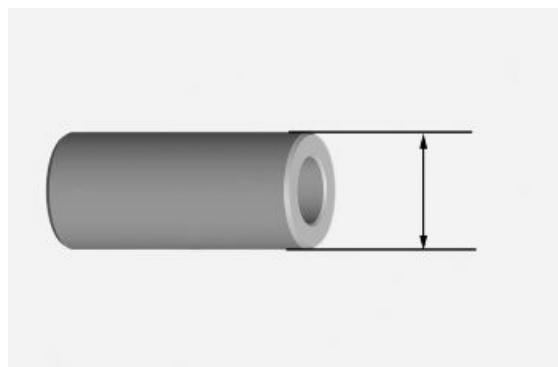
THE PISTON MUST BE INSTALLED WITH THE ARROW FACING TOWARDS THE EXHAUST SIDE, THE PISTON RINGS MUST BE INSTALLED WITH THE WORD «TOP» OR THE STAMPED MARK FACING UPWARDS.

- Measure the outer diameter of the gudgeon pin.

Characteristic

Pin external diameter

0.66929(+0 -0.000157)in (17.000 (+0 -0.004))mm

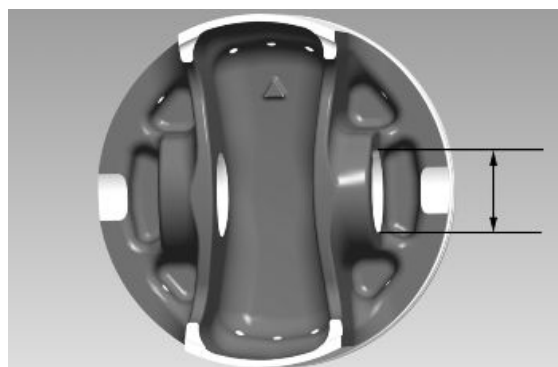


- Measure the diameter of the housings on the piston.

Characteristic

Standard diameter

0.66929(+0.00024 +0.000039)in (17(+0.006
+0.001)mm)



- Calculate the piston pin coupling clearance.

N.B.

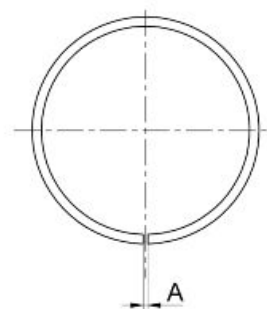
THE PIN HOUSINGS HAVE 2 LUBRICATION CHANNELS. FOR THIS REASON, MEASUREMENT MUST BE MADE ACCORDING TO THE PISTON AXIS

Characteristic

Pin standard clearance:

(0.0000394÷0.000394)in ((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.
- Check the clearance upon mounting (A) of the bands:

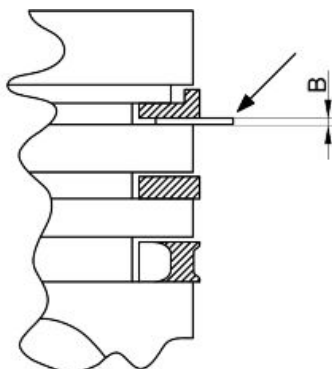


N.B.

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

ASSEMBLY CLEARANCE OF BANDS - SEAL RINGS

DESIGNATION	SIZES	ASSEMBLY CLEARANCES (A)	STANDARD COUPLING CLEARANCE (B)
1st compression ring	3.07x0.04 in (78x1 mm)	0.006÷0.01 in (0.15÷0.35 mm)	0.002÷0.001 in (0.06÷0.033 mm)
2nd compression ring	3.07x0.04 in (78x1 mm)	0.012÷0.019 in (0.30÷0.50 mm)	0.002÷0.001 in (0.06÷0.033 mm)
Oil ring segments	3.07x0.08 in (78x2 mm)	0.006÷0.017 in (0.15÷0.45 mm)	0.002÷0.001 in (0.06÷0.033 mm)



- Check that the head coupling surface is not worn or misshapen.

- Pistons and cylinders are classified according to their diameter. The coupling must be made with those of the same type (M-M, N-N, O-O, P-P).

Characteristic

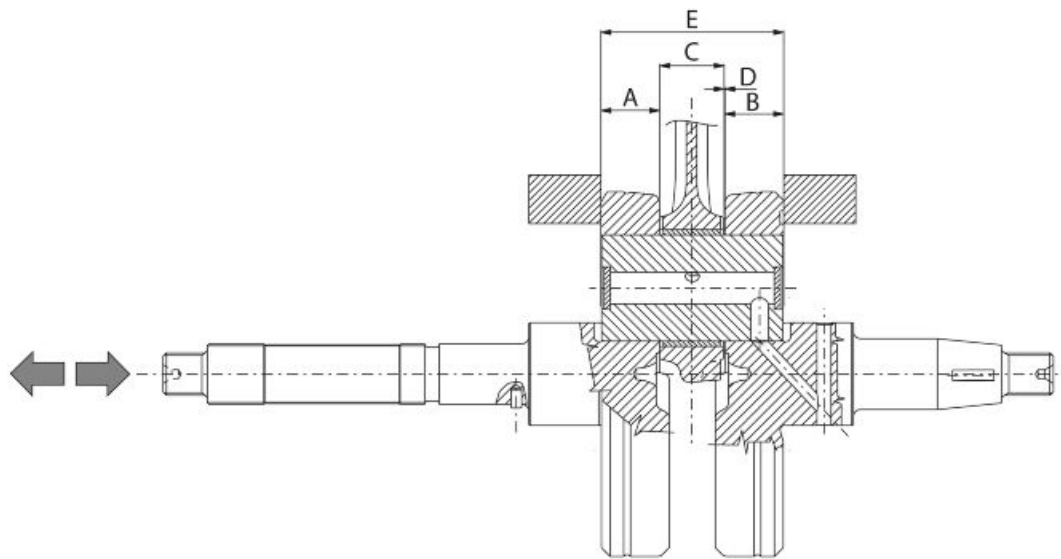
Maximum allowable run-out:

0.001 over 0.05 mm

**Crankcase - crankshaft - connecting rod****CRANKSHAFT**

Titolo	Durata/Valore	Testo Breve (< 4000 car.)	Indirizzo Immagine
Crankshaft		Axial clearance between crankshaft and connecting rod	

Axial clearance between crankshaft and connecting rod

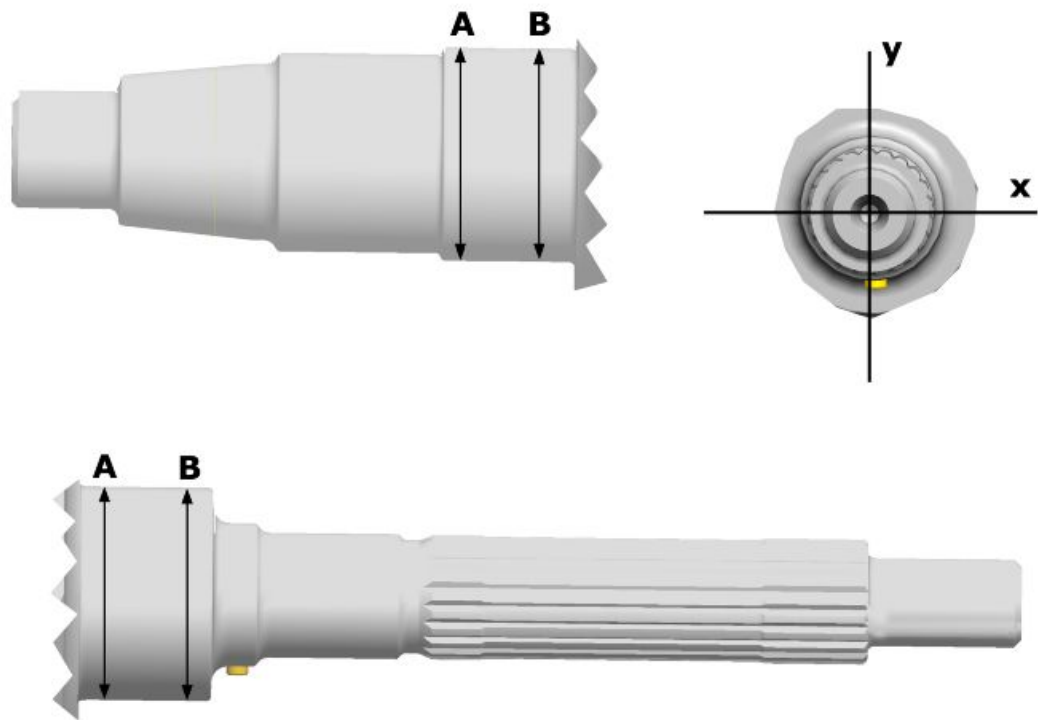


AXIAL CLEARANCE BETWEEN CRANKSHAFT AND CONNECTING ROD

Name	Code	Sizes	Assembly clearance
Half-shaft, transmission side	A	0.72 (+0; -0.002) in 18.4 (+0; -0.05) mm	D=0.007÷0.01 in (0.20÷0.50 mm)
Flywheel-side half shaft	B	0.72 (+0; -0.002) in 18.4 (+0; -0.05) mm	D= 0.008÷0.019 in 0.20÷0.50 mm
Connecting rod	C	0.7 (-0.003; -0.005) in 19 (-0.10; -0.15) mm	D= 0.007÷0.019 in 0.20÷0.50 mm
Spacer tool	E	2.20 (+0; +0.001) in 56 (+0; +0.05) mm	D= 0.007÷0.019 in 0.20÷0.50 mm

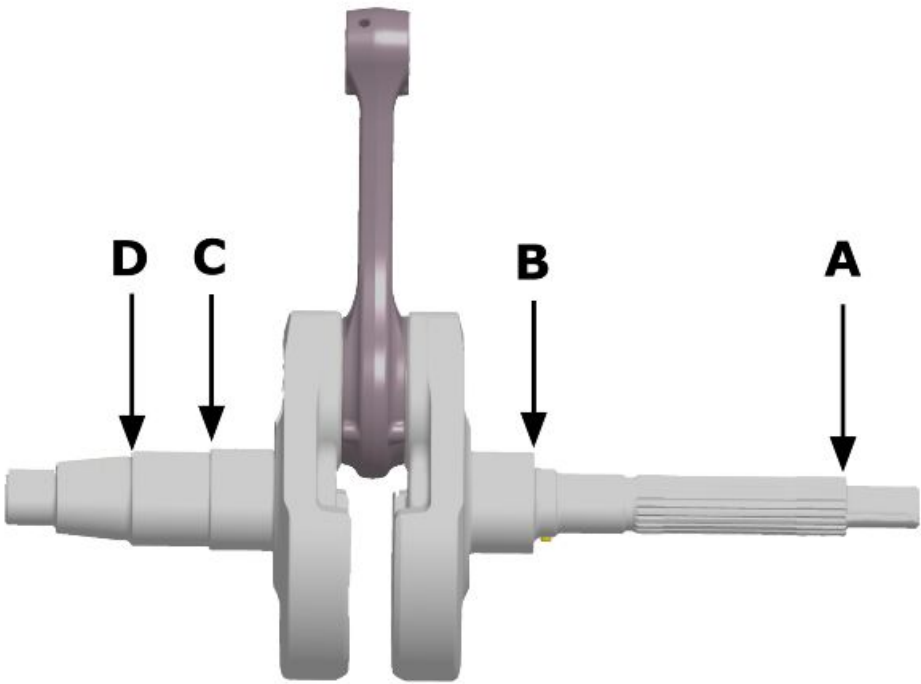
Diameter of crankshaft bearings.

Measure the bearings on both axes x-y.



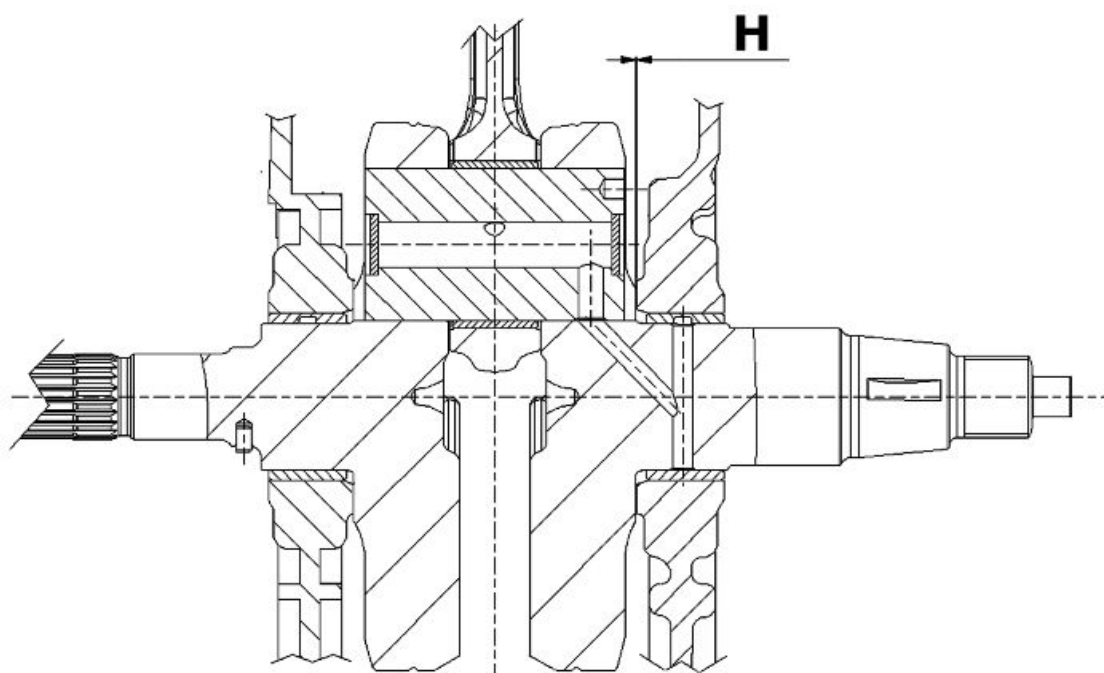
CRANKSHAFT

Specification	Desc./Quantity
Crankshaft bearings: Standard diameter: Cat. 1	(1.4174÷1.4176)in (36.003÷36.009)mm
Crankshaft bearings: Standard diameter: Cat. 2	(1.4176÷1.4179)in (36.009÷36.015)mm



MAX. ADMISSIBLE DISPLACEMENT

Specification	Desc./Quantity
A =	(0.007)in (0.2)mm
B =	(0.0003)in (0.010)mm
C =	(0.0003)in (0.010)mm
D =	(0.003)in (0.10)mm



Characteristic

Crankshaft-crankcase axial clearance (H)

(0.005÷0.016)in (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 (with fitted bushing)

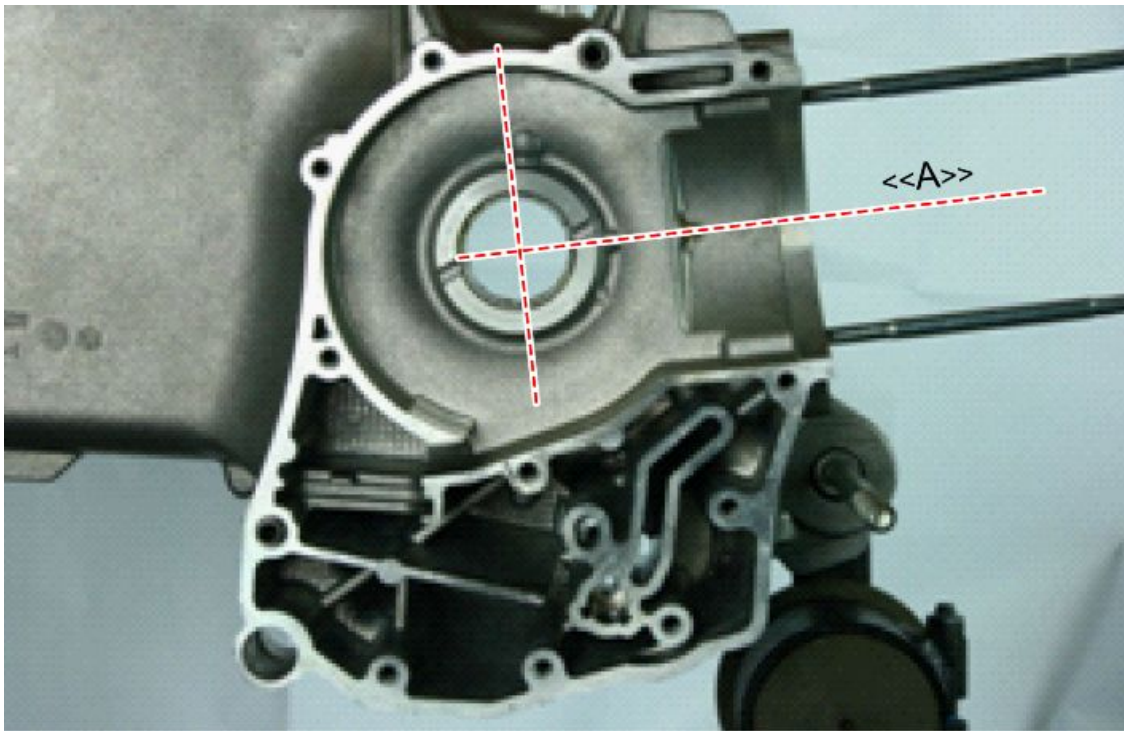
Ø0.006(+0.0005 +0.0009)in Ø17(+0.015 +0.025)
mm

- 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.

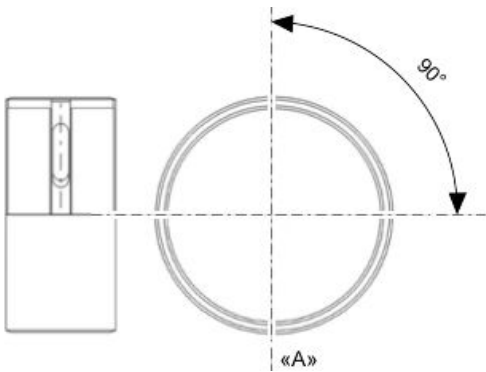
Characteristic

«A»

AXIS CYLINDER



- The main bushings have 2 half-bearings, 1 with and 1 without the lubrication channel.
- 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 photo.



Characteristic

<<A>>

AXIS CYLINDER

BUSHINGS

TYPE	IDENTIFICATION	CRANKSHAFT HALF-BEARING
B	BLUE	(0.0775÷0.0777)in (1.970÷1.974)mm
C	YELLOW	(0.0777÷0.0778)in (1.974÷1.978)mm
E	GREEN	(0.0778÷0.0780)in (1.978÷1.982)mm

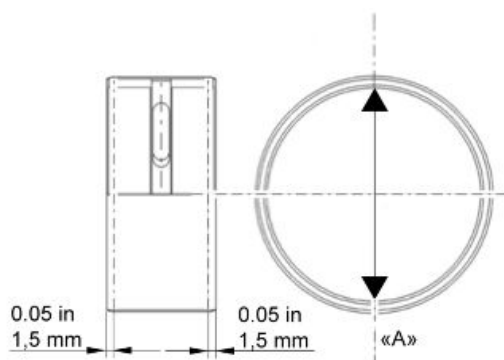
- The section of the oil feeding channels is also influenced by the driving depth of the bushings.
- Visually check the wear of the bushings: in the coupling ends shown in the photo the bushing usually keeps the original look, check in the rest of the bushing if there is evident removal of material. If this occurs as stated, proceed to replace the crankcase halves.

**N.B.**

SMALL MARKS AND SCRATCHES OF THE SHAFT ROTATION ARE NORMAL SIGNS OF ENGINE USAGE, AND DO NOT AFFECT THE CORRECT FUNCTIONING.

Measurement of crankcase halves - crankshaft coupling clearance.

- The nominal diameters of the bushings, even if of the same coupling category, may differ by hundredths due to the plastic slackening of the material of the crankcase due to the driving load.
- Measure along the axis of the «A» cylinder, using a bore meter at two depths indicated in the figure, the diameter of the bushings.
- After measuring the two diameters, take the average.

**Characteristic****«A»****AXIS CYLINDER**

- After measuring the crankshaft, check the maximum clearance allowed.

Characteristic**Crankshaft-bushing maximum clearance admitted:**

(0.003)in (0.08)mm

- The bushings housing hole in the crankcase half is divided into two categories depending on the size, Category 1 and Category 2.

DIAMETER OF CRANKCASE WITHOUT BUSHING

Specification	Desc./Quantity
CAT 1	(1.57295÷1.57318)in (39.953÷39.959)mm
CAT 2	(1.57318÷1.57342)in (39.959÷39.965)mm

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

- According to the classification of the shaft CAT.1 - CAT.2 combine a complete crankcase pre-fitted with suitable bushings according to the starting shaft.

CATEGORIES

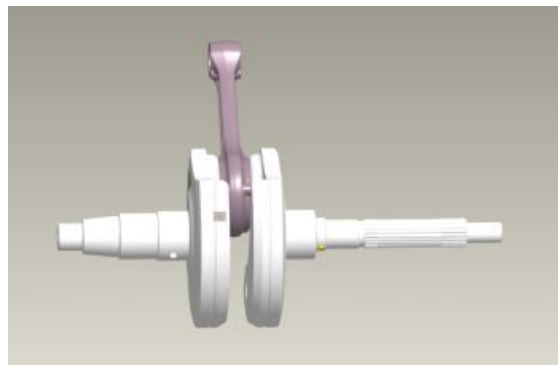
CRANKCASE HALVES	ENGINE HALF-SHAFT	BUSHING
Cat. 1	Cat. 1	C
Cat. 2	Cat. 2	C
Cat. 1	Cat. 2	B
Cat. 2	Cat. 1	E

THE CRANKSHAFT is available in two **CATEGORIES**:

Characteristic

Crankshaft category:

CAT. 1 - CAT. 2



CRANKSHAFT CATEGORY IDENTIFICATION:

The identification is indicated on the counterweight shoulder «*1 - *2», if carried out with micropinholing. Otherwise, «1 - 2» if done manually with an electric pen. The spare part identification is located on the package with a **drawing number** plus **FC1/FC2** or **(001/002)**.

If a crankshaft comprising two half-shafts of different categories needs to be replaced, also replace both crankcase halves, combining the two components (Shaft and Crankcase) featuring the same category.

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

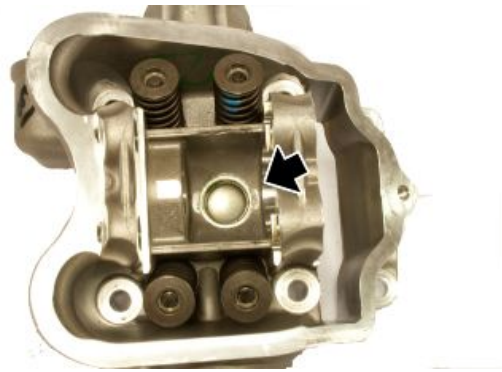
- Using a trued bar and a feeler gauge check that the cylinder head surface is not worn or distorted.

Characteristic

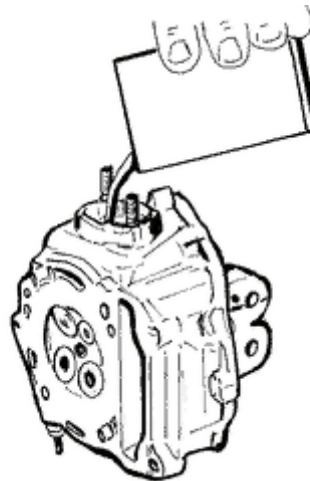
Maximum allowable run-out:

0.001 over 0.05 mm

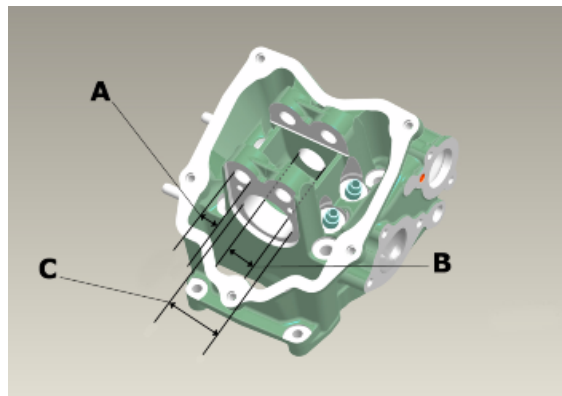
- In case of faults, replace the head.
- Check the sealing surfaces for the exhaust manifold.
- Check that the camshaft and the rocking lever pin capacities exhibit no wear.
- Check that the head cover show no signs of wear.
- Check that there is no cooling liquid leakage from the seals.



- 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»	$\varnothing(0.511 \div 0.512)$ in $\varnothing(13.000 \div 13.018)$ mm
bearing «B»	$\varnothing(0.787 \div 0.788)$ in $\varnothing(20.000 \div 20.021)$ mm
bearing «C»	$\varnothing(1.456 \div 1.457)$ in $\varnothing(37.000 \div 37.025)$ mm

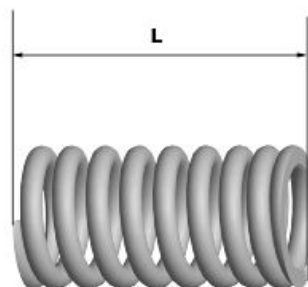
Measure the unloaded spring length

Characteristic**Standard length**

(1.602)in (40.7)mm

Allowable limit after use:

(1.543)in (39.2)mm



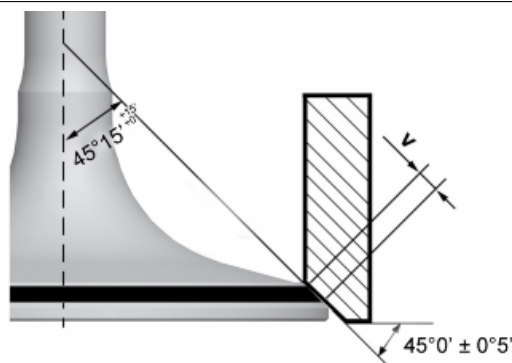
- Clean the valve seats of any carbon residues.
- Using the Prussian blue, check the width of the impression on the valve seat "V".

Characteristic**Standard value:**

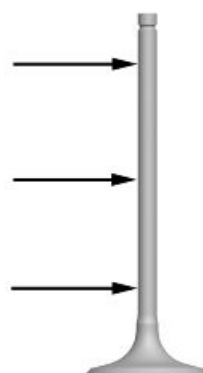
(0.039÷0.051)in (1 ÷ 1.3)mm

Admissible limit:

(0.062)in (1.6)mm



- If the width of the mark on the valve seat is larger than the prescribed limits, true the seats with a 45° milling cutter and then grind.
- In case of excessive wear or damage, replace the head.
- Measure the diameter of the valve stems in the three positions indicated in the diagram.

**STANDARD DIAMETER**

Specification	Desc./Quantity
Intake:	(0.1951÷0.1957)in (4.957÷4.972)mm
Exhaust:	(0.1942÷0.1948)in (4.935÷4.950)mm

MINIMUM ADMISSIBLE DIAMETER

Specification	Desc./Quantity
Intake:	(0.194)in (4.942)mm
Exhaust:	(0.192)in (4.92)mm

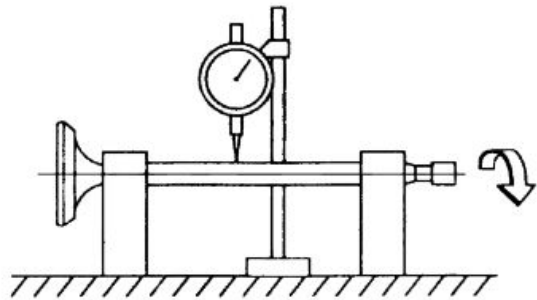
- Calculate the clearance between valve and valve guide.

- 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

Admissible limit:

(0.0007)in (0.02)mm

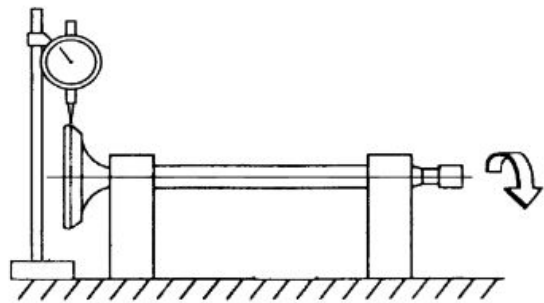


- Check the oscillation of the valve head by arranging a dial gauge at right angle relative to the valve head and rotate it on a "V" shaped abutment.

Characteristic

Admissible limit:

(0.007)in (0.2)mm

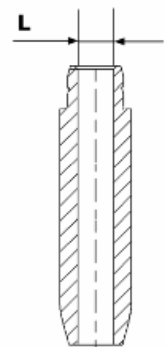


Measure the valve guide.

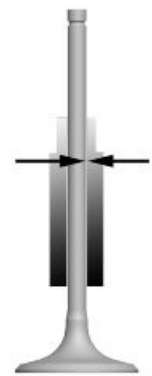
Characteristic

Valve guide:

0.196(+0 +0.0004)in 5(+0 +0.012)mm



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



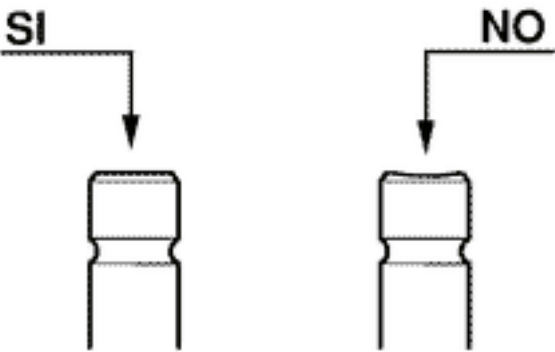
INTAKE

Specification	Desc./Quantity
Standard clearance:	(0.001÷0.002)in (0.028÷0.055)mm
Admissible limit:	(0.003)in (0.08)mm

EXHAUST

Specification	Desc./Quantity
Standard clearance:	(0.001÷0.003)in (0.05÷0.077)mm
Admissible limit:	(0.003)in (0.1)mm

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



- If no faults 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 FAYING SURFACE, DO NOT KEEP ROTATING 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).

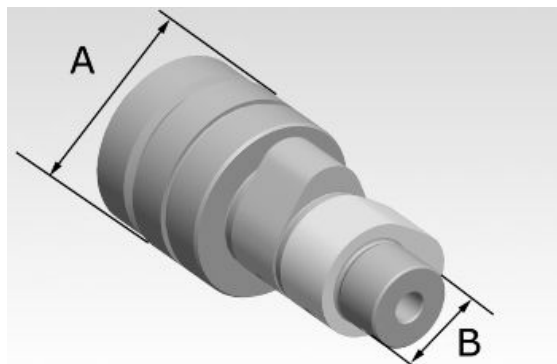
- Check that the camshaft bearings exhibit no scores or abnormal wear.
- Using a micrometer, measure the camshaft bearings.

STANDARD DIAMETER

Specification	Desc./Quantity
Camshaft check: Standard diameter	Bearing A Ø: (1.454÷1.455)in (36.95÷36.975)mm
Camshaft check: Standard diameter	Bearing B diameter: (0.785÷0.786)in (19.959÷19.98)mm

MINIMUM ADMISSIBLE DIAMETER

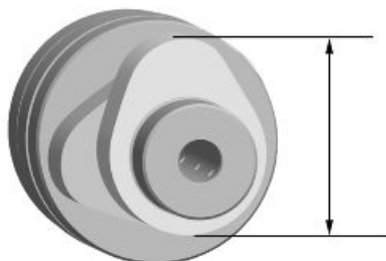
Specification	Desc./Quantity
Camshaft check: Minimum admissible diameter	Bearing A Ø: (1.454)in (36.94)mm
Camshaft check: Minimum admissible diameter	Bearing B diameter: (0.785)in (19.950)mm



- Using a gauge, measure the height of the cams.

STANDARD HEIGHT

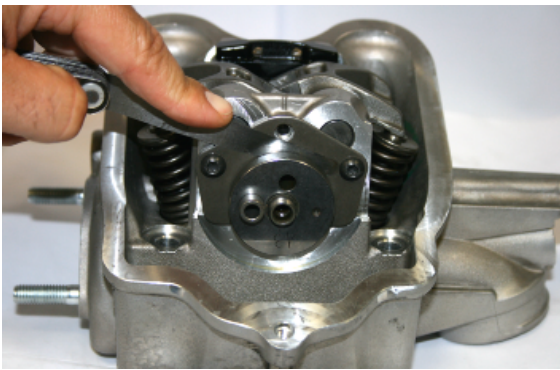
Specification	Desc./Quantity
Camshaft check: Wear limit	Exhaust: (1.178)in (29.945)mm
Camshaft check: Wear limit	Intake: (1.218)in (30.948)mm
Camshaft check: Standard height	Intake: (1.220±0.001)in (31.008±0.03)mm
Camshaft check: Standard height	Exhaust: (1.181±0.001)in (30.005±0.03)mm



Check the axial clearance of the camshaft

CAMSHAFT AXIAL CLEARANCE

Specification	Desc./Quantity
Camshaft check: Standard axial clearance:	(0.003±0.016)in (0.09±0.41)mm

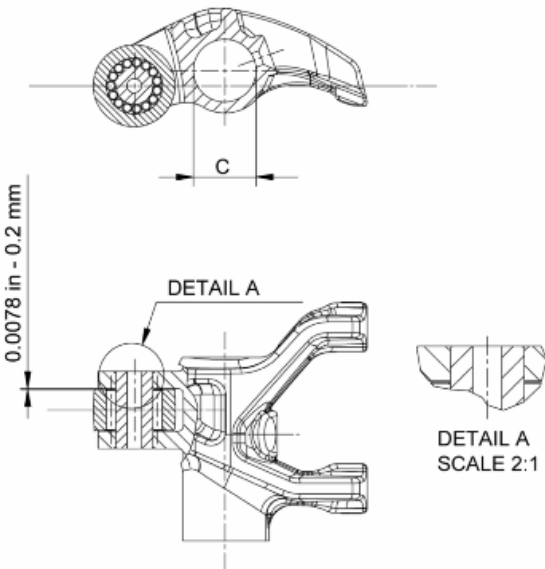


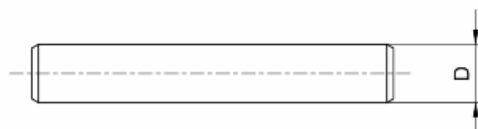
- Measure the outside diameter of the rocking lever pins
- Check the rocking lever pins do not show signs of wear or scoring.
- Measure the internal diameter of each rocker.

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

ROCKING LEVERS AND PIN DIAMETER:

Specification	Desc./Quantity
Rocking lever inside diameter: Standard diameter (C)	Ø(0.512÷0.513)in Ø(13.015÷13.035)mm
Rocking lever pin diameter: Standard diameter (D)	Ø(0.510÷0.511)in Ø(12.977÷12.985)mm
Nominal clearance	(0.001÷0.002)in (0.030÷0.058)mm
Maximum clearance allowed	(0.003)in (0.08)mm



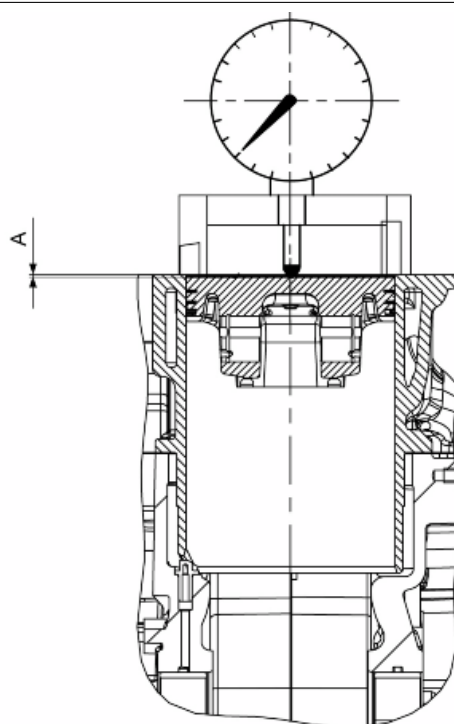


Slot packing system

Characteristic

Compression ratio

(11.7÷12.3) : 1



Measurement "A" to be taken is a value of piston re-entry, it indicates by how much the plane formed by the piston crown falls below the plane formed by the top of the cylinder. The further the piston falls inside the cylinder, the less the base gasket to be applied (to recover the compression ratio) and vice versa.

N.B.

MEASUREMENT "A" MUST BE TAKEN WITHOUT ANY GASKET FITTED BETWEEN THE CRANK-CASE AND CYLINDER AND AFTER RESETTNG THE DIAL GAUGE, EQUIPPED WITH A SUPPORT, ON A GROUND PLANE

ENGINE 350 SHIMMING

Name	Measure A	Thickness
Shimming	(0.0305÷0.0344)in ((0.775 ÷ 0.875)mm)	0.00787in (0.2mm)
Shimming	(0.0246÷0.0305)in ((0.625÷0.775)mm)	0.0118in (0.3mm)
Shimming	(0.02067÷0.02461)in ((0.525÷0.625)mm)	0.0157in (0.4mm)

Products

RECOMMENDED PRODUCTS TABLE

Product	Description	Specifications
AGIP GEAR SAE 80W-90	Lubricant for gearboxes and transmissions.	API GL-4
AGIP FILTER OIL	Special product for the treatment of foam filters.	-
AGIP GP 330	Water repellent stringy calcium spray grease.	R.I.D./A.D.R. 2 10°b) 2 R.I.Na. 2.42 - I.A.T.A. 2 - I.M.D.G. class 2 UN 1950 Page 9022 EM 25-89
eni i-Ride PG 15W-50	Synthetic-based lubricant for four stroke engines.	JASO MA, MA2 - API SJ - ACEA A3
AGIP BRAKE 4	Brake fluid.	Synthetic fluid SAE J 1703 -FMVSS 116 - DOT 3/4 - ISO 4925 - CUNA NC 956 DOT 4
AGIP PERMANENT SPEZIAL	Ethylene glycol-based antifreeze fluid with organic inhibition additives. Red, ready to use.	ASTM D 3306 - ASTM D 4656 - ASTM D 4985 - CUNA NC 956-16

UNIT OF MEASURE - CONVERSION - ENGLISH SYSTEM TO INTERNATIONAL SYSTEM (IS).

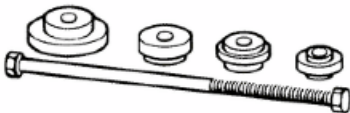
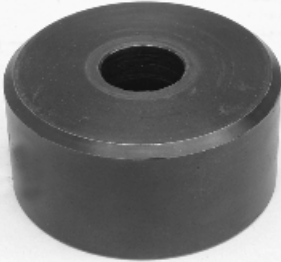
Specification	Desc./Quantity
1 Inch (in)	25.4 Millimetres (mm)
1 Foot (ft)	0.305 Meter (m)
1 Mile (mi)	1.609 Kilometre (km)
1 US Gallon (USgal)	3.785 Litre (l)
1 Pound (lb)	0.454 Kilogram (kg)
1 Cubic inch (in³)	16.4 Cubic centimetres (cm³)
1 Foot pound (lb ft)	1,356 Newton meter (Nm)
1 Miles per hour (mi/h)	1.602 Kilometres per hour (km/h)
1 Pound per square inch (PSI)	0.069 (bar)
1 Fahrenheit (°F)	32+(9/5) Celsius (°C)

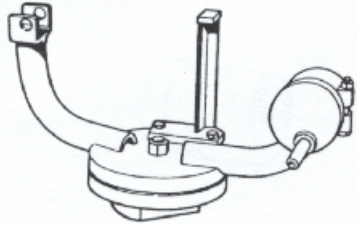
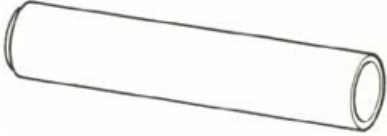
INDEX OF TOPICS

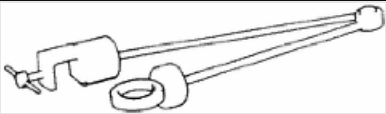
TOOLING

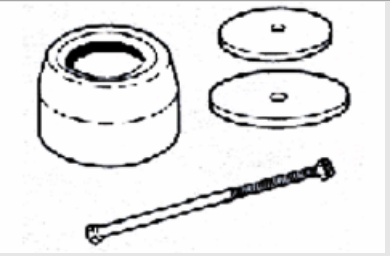
TOOL

SPECIFIC TOOLS

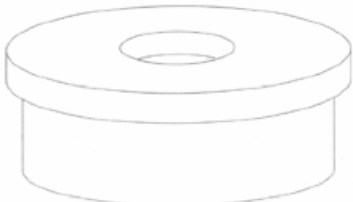
Stores code	Description	
001330Y	Tool for fitting steering seats	
001467Y002	Driver for OD 73 mm bearing	
001467Y005	Screw	
001467Y006	Pliers to extract 20 mm bearings	
001467Y007	Driver for OD 54-mm bearings	
001467Y013	Pliers to extract ø 15-mm bearings	

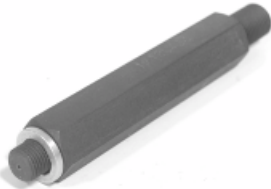
Stores code	Description	
001467Y014	Pliers to extract ø 15-mm bearings	
001467Y017	Driver for OD 36 mm bearings	
001467Y035	Bearing housing, outside ø 47 mm	
002465Y	Pliers for circlips	
005095Y	Engine support	
006029Y	Punch for fitting fifth steering bearing on steering tube	
020004Y	Punch for removing fifth wheels from headstock	

Stores code	Description	
020055Y	Wrench for steering tube ring nut	
020074Y	Support base for checking crankshaft alignment	
020084Y	20-mm diameter punch	
020150Y	Air heater support	
020115Y	Ø 18 punch	
020151Y	Air heater	

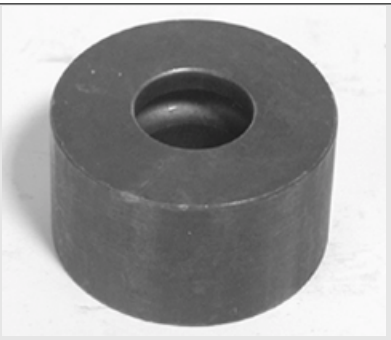
Stores code	Description	
020163Y	Crankcase splitting plate	
020193Y	Oil pressure check gauge	
020244Y	15-mm diameter punch	
020271Y	Tool for removing-fitting silent bloc	
020306Y	Punch for assembling valve seal rings	
020329Y	Mity-Vac vacuum-operated pump	

Stores code	Description	
020330Y	Stroboscopic light to check timing	
020331Y	Digital multimeter	
020332Y	Digital rpm indicator	
020335Y	Magnetic support for dial gauge	
020357Y	32x35-mm Adaptor	
020358Y	37x40-mm Adaptor	

Stores code	Description	
020359Y	42x47-mm Adaptor	
020360Y	52x55-mm Adaptor	
020363Y	20-mm guide	
020375Y	28 x 30 mm adaptor	
020376Y	Adaptor handle	
020382Y	Valve cotters equipped with part 012 re- moval tool	

Stores code	Description	
020382Y011	adapter for valve removal tool	
020382Y012	bush (valve removing tool)	
020412Y	15-mm guide	
020426Y	Piston fitting fork	
020431Y	Valve oil seal extractor	
020434Y	Oil pressure check fitting	

Stores code	Description	
020439Y	17-mm guide	
020442Y	Pulley lock wrench	
020444Y	Tool for fitting/ removing the driven pulley clutch	
020444Y009	wrench 46 x 55	
020456Y	Ø 24-mm adaptor	
020458Y	Puller for lower bearing on steering tube	

Stores code	Description	
020467Y	Flywheel extractor	
020477Y	37 mm adaptor	
020480Y	Petrol pressure check kit	
020483Y	30-mm guide	
020487Y	Fork oil seal extractor	
020489Y	Hub cover support stud bolt kit	

Stores code	Description	
020512Y	Piston fitting fork	
020621Y	HV cable extraction adaptor	
020627Y	Flywheel lock wrench	
020648Y	Single battery charger	
020922Y	Diagnosis Tool	
020916Y	Support plate	
020917Y	Driven pulley lock	

Stores code	Description	
020918Y	Clutch retainer	
020919Y	Clutch discs disassembly tool	
020920Y	Piston assembly band	
020921Y	Piston position checking tool	
020927Y	Retainer	

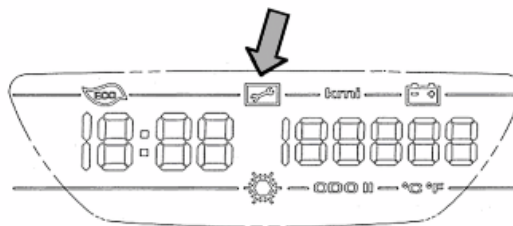
INDEX OF TOPICS

MAINTENANCE

MAIN

RESET SERVICE WARNING LIGHT

At vehicle ignition, immediately after the ignition check, if there are less than 187.5 miles (300 km) to the next scheduled service, the corresponding icon flashes for 5 seconds. Once the service mileage has been reached, the icon remains steadily on until it is reset.



The resetting of the service is done by holding down the MODE key to the key connection for more than 10 seconds. For the first 5 seconds, the instrument panel will not give any signal, for the next 5 seconds the key icon will blink at a frequency of 1Hz. If the button is released before the 10 seconds, the service is not reset.

Maintenance chart**SCHEDULED MAINTENANCE TABLE**

I: CHECK AND CLEAN, ADJUST, LUBRICATE OR REPLACE IF NECESSARY.

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

** Perform maintenance more frequently when riding in unusually wet or dusty areas*

*** Check, however, the level every time you use your vehicle*

**** Perform maintenance more frequently if you drive mainly at full acceleration*

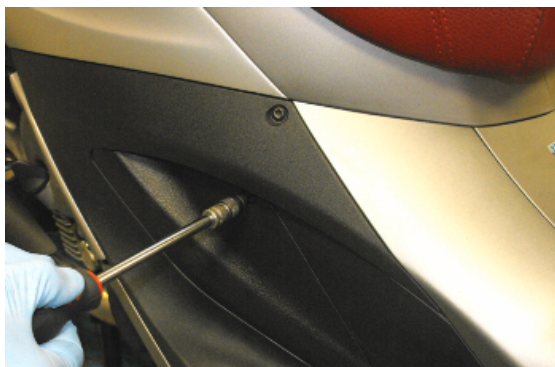
**** Replace every 2 years*

mi (km) x 1,000	1(0.62)	10(6.21)	20(12.42)	30(18.64)	40(24.85)	50(31.07)	60(37.28)
Safety fasteners	I	I	I	I	I	I	I
Spark plug		R	R	R	R	R	R
Centre stand bracket	L	L	L	L	L	L	L
Drive belt			R		R		R
Throttle control	I	I	I	I	I	I	I
Roller housing / Roller counter			C/I		C/I		C/I
Engine air filter (*)		C	C	C	C	C	C
Engine oil filter	R	R	R	R	R	R	R
Belt compartment filter(*)		C	C	C	C	C	C
Valve clearance					I		
Electrical system and battery	I	I	I	I	I	I	I
Coolant (****)	I	I	I	I	I	I	I
Brake fluid (****)	I	I	I	I	I	I	I
Engine oil (**)	R	R	R	R	R	R	R
Hub oil	R				I		
Brake pads	I	I	I	I	I	I	I
CVT sliders and rollers			R		R		R
Tyre pressure and wear	I	I	I	I	I	I	I
Vehicle road test	I	I	I	I	I	I	I
Crankcase breather (***)			C		C		C
Suspension	I	I	I	I	I	I	I
Steering	A	I	I	I	I	I	I
Labour (minutes)	70	70	200	70	230	70	200

Spark plug

Proceed as follows:

- Remove the case that grants access to the spark plug located on the right side fairing by unscrewing the indicated screw.
- Disconnect cap «A» from the spark plug HV cable by turning it clockwise until releasing it from the retainer.
- Unscrew the spark plug using the wrench supplied.
- When refitting, place the spark plug into the hole at the corresponding angle and finger tighten it as far as it will go. Use the wrench only to tighten it.
- Place cap «A» fully over the spark plug, making sure it is in the retainer again.



WARNING



SPARK PLUG MUST BE REMOVED WHEN THE ENGINE IS COLD. REPLACE THE SPARK PLUG AS INDICATED IN THE SCHEDULED MAINTENANCE TABLE. THE USE OF ELECTRONIC CENTRAL UNITS AND OF NON-COMPLIANT ELECTRONIC IGNITIONS OR SPARK PLUGS OTHER THAN THOSE PRESCRIBED MAY SERIOUSLY DAMAGE THE ENGINE.

N.B.

USE OF SPARK PLUGS OTHER THAN THE INDICATED TYPE OR UNSHIELDED SPARK PLUG CAPS CAN LEAD TO FAULTS IN THE VEHICLE 'S ELECTRICAL SYSTEM.

Characteristic

Spark plug

NGK CR7EKB

Locking torques (N*m)

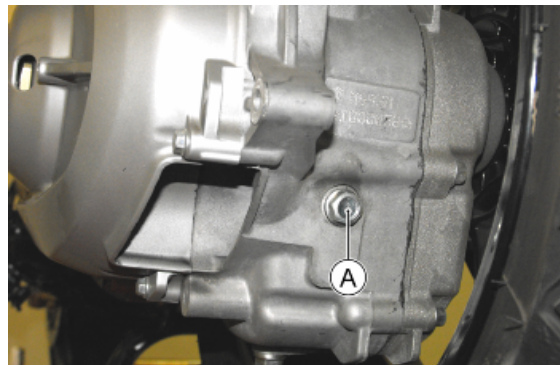
Locking the spark plug 7.37÷8.85 lb ft (10÷12 Nm)

Hub oil

Check

Check the oil in the rear hub. To check the rear hub oil level, proceed as follows:

1. Rest the vehicle onto its centre stand, on level ground.
2. Unscrew the screw «A» and if oil comes out or touches the screw hole the level is correct. Otherwise, top up the oil.
3. Screw the screw back in, checking that it is locked in place.



CAUTION



RIDING THE VEHICLE WITH INSUFFICIENT HUB LUBRICATION OR WITH CONTAMINATED OR IMPROPER LUBRICANTS ACCELERATES THE WEAR AND TEAR OF THE MOVING PARTS AND CAN CAUSE SERIOUS DAMAGE.

CAUTION



USED OIL CAN HARM THE ENVIRONMENT. COLLECTION AND DISPOSAL SHOULD BE CARRIED OUT IN COMPLIANCE WITH REGULATIONS IN FORCE.

CAUTION



UPON REPLACING HUB OIL, AVOID THE OIL COMING INTO CONTACT WITH THE REAR WHEEL AND TYRE.

CAUTION



WHEN REPLACING THE HUB OIL DO NOT LET THE OIL COME INTO CONTACT WITH THE REAR BRAKE DISC.

CAUTION



FOR OIL REPLACEMENT, CONTACT ANY AUTHORISED SERVICE CENTRE AS THEY ARE EQUIPPED TO DISPOSE OF USED OILS IN AN ENVIRONMENTALLY FRIENDLY AND LEGAL WAY.

Recommended products

AGIP GEAR SAE 80W-90 Lubricant for gearboxes and transmissions.

API GL-4

Characteristic

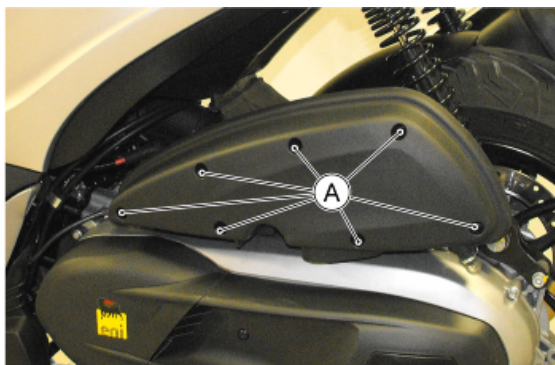
Transmission oil

approx. 0.13 USgal (0.11 UKgal) (500 cc)

Air filter

To reach the air filter:

- Undo the seven screws«A» and remove the air filter cover.



AIR FILTER CLEANING

- Clean the air filter as described.

1. Blow with compressed air from the white cotton side.
2. Wash with mild soap and water, without bending or twisting the filter, then dry with compressed air.
3. Soak in a solution of 50% unleaded petrol and specified oil, using a brush.



CAUTION



IF THE VEHICLE IS USED ON DUSTY ROADS IT IS NECESSARY TO CARRY OUT MAINTENANCE CHECKS OF THE AIR FILTER MORE OFTEN TO AVOID DAMAGING THE ENGINE.

Recommended products

AGIP FILTER OIL Special product for the treatment of foam filters.

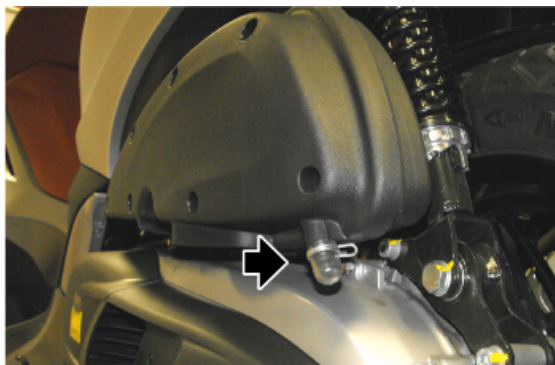
-

4. Check the lower part of the bleed cap for dirt.

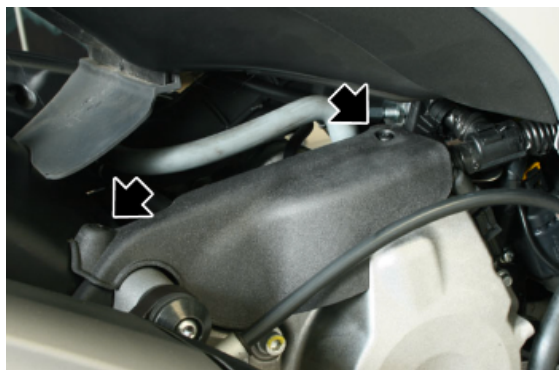


REMOVE ANY DEPOSIT THAT MAY HAVE FORMED IN THE BLEED PIPE, COMING FROM THE FILTER BOX. PROCEED AS FOLLOWS:

1. remove the cap;
2. discharge the contents into a container and send it to a recycling bank.



5. Working from the right side of the vehicle, unscrew the two indicated screws and remove the plastic cover.

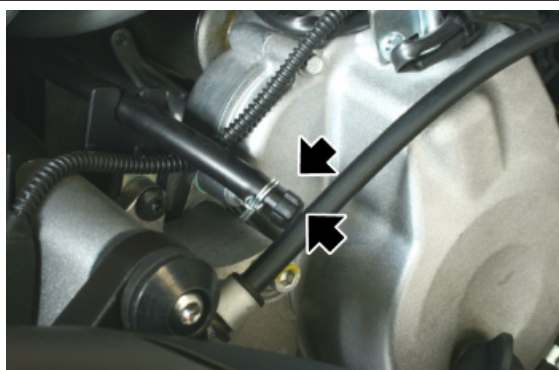


6. Remove the clamp to allow the removal of the cap to check for the presence of oil due to condensation of vapours.



REMOVE ANY DEPOSIT THAT MAY HAVE FORMED IN THE BLEED PIPE, COMING FROM THE FILTER BOX. PROCEED AS FOLLOWS:

1. remove the cap;
2. discharge the contents into a container and send it to a recycling bank.



Engine oil

Replacement

- Remove the oil filling cap/dipstick «A».
- Unscrew the oil drainage cap «B» shown in the figure and drain out all the oil.
- Screw in the drainage cap again and fill with the prescribed oil.

Recommended products

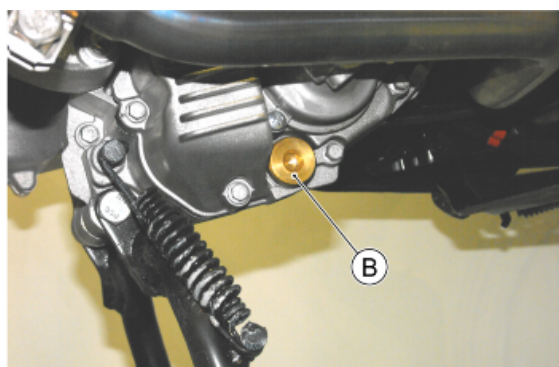
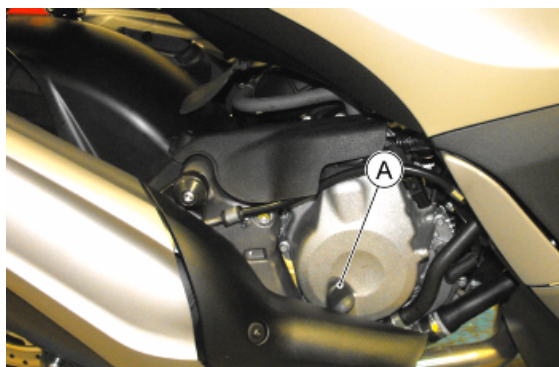
eni i-Ride PG 15W-50 Synthetic-based lubricant for four stroke engines.

JASO MA, MA2 - API SJ - ACEA A3

Characteristic

Engine oil

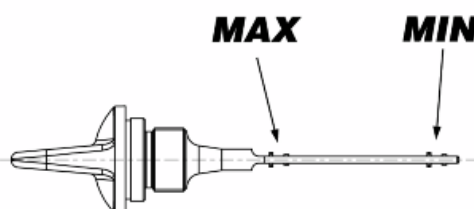
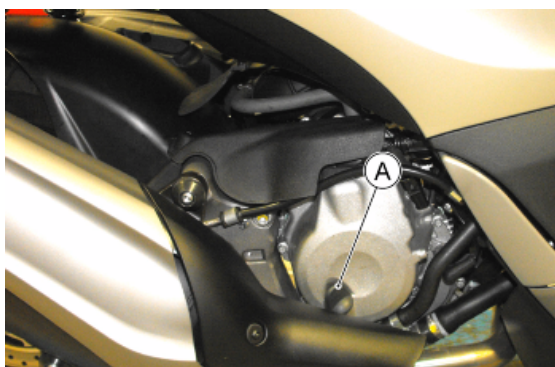
about 1.5 l



Check

Every time the vehicle is used, visually inspect the level of the engine oil when the engine is cold (after **completely unscrewing** the oil cap/dipstick). The oil level should be somewhere between the MAX and MIN index marks on the level rod; «A»; while the oil is being checked, the vehicle must be resting on its centre stand on an even, horizontal surface.

If the check is carried out after the vehicle has been used, and therefore with a hot engine, the level will be lower; in order to carry out a correct check, wait at least 10 minutes after the engine has been stopped so as to get the correct level.



Engine oil filter

The oil filter must be replaced every time the oil is changed.

Use new oil of the recommended type for topping up and changing purposes and comply with the regulations regarding timing and mileage, as described in the periodic maintenance table.

Make sure the pre-filter and drainage plug O-rings are in good conditions.

Lubricate them and refit the mesh filter and the oil drainage plug, screwing them up to the prescribed torque. Refit the new oil filter being careful to lubricate the O-ring before fitting it.

Change the engine oil.

WARNING



IN ORDER TO PREVENT ABNORMAL FORMATIONS OF DIRT DUE TO THE RELEASE OF GREASE, WE RECOMMEND FIRST LUBRICATING THE SEAL RING STOPS WITH A BRUSH.

Recommended products

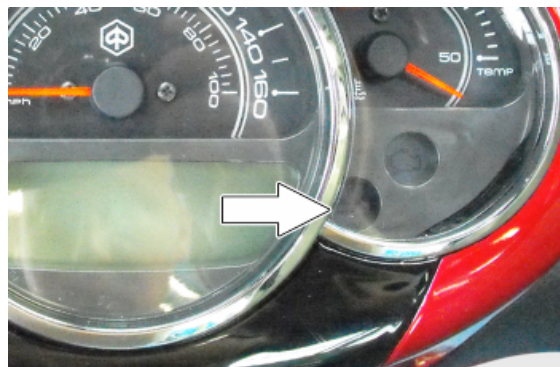
eni i-Ride PG 15W-50 Synthetic-based lubricant for four stroke engines.

JASO MA, MA2 - API SJ - ACEA A3

Oil pressure warning light

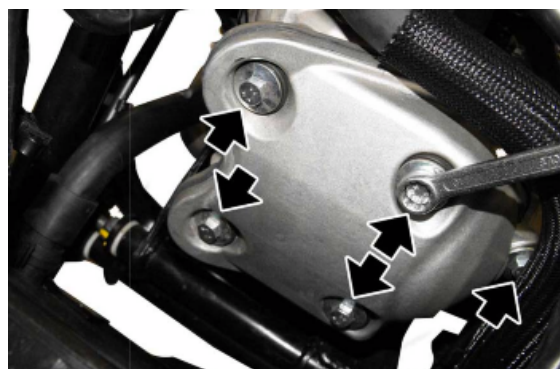
The vehicle is equipped with a telltale light on the dashboard that lights up when the key is turned to the «ON» position. However, this light should switch off once the engine has started.

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 valve clearance

- Check that the engine is at top dead center (TDC).
- To gain access to the cylinder head cover, first remove the helmet compartment and the left rider footrest.
- Unscrew the five screws on the cover and retrieve the gaskets.



- Using a feeler gauge check the valve clearance.

CAUTION

- USE THE FEELER GAUGE Laterally, in line with the valves, in order to prevent accidental bending of the blade that may affect the measurements.



- If values are found that are not in compliance, proceed with the adjustment of the valve clearance, as described under "**Engine/Fitting the head and timing system components.**"

Characteristic

Valve clearance (when cold)

intake: 0.004 in (0.10 mm)

exhaust: 0.006 in (0.15 mm)

See also

[Footrest](#)

[Helmet bay](#)

[Inspecting the valves](#)

Cooling system

Level check

Check coolant when the engine is cold and as indicated in the scheduled maintenance tables, following the steps below.

- Set the vehicle upright on the stand and remove the cover by undoing screw.

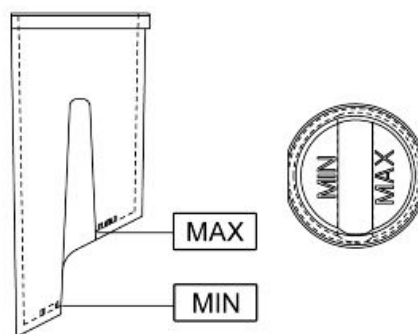


- Remove the expansion tank cap by turning it anticlockwise.



- Look inside the expansion tank and check that the level is between **MIN** and **MAX**. Top-up when the liquid does not reach the level **MIN**.

If the level is not correct, proceed to top-up when the engine is cold. If the coolant needs to be topped up frequently or the expansion tank is completely dry, check the cooling system to find the cause of the problem.



WARNING



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

WARNING



IN ORDER TO AVOID HARMFUL FLUID LEAKS WHILE RIDING, IT IS IMPORTANT TO MAKE SURE THAT THE LEVEL

DOES NOT EXCEED THE REFERENCE TONGUE TOO MUCH.
TO ENSURE CORRECT ENGINE OPERATION, KEEP THE RADIATOR GRILLE CLEAN.

Recommended products

AGIP PERMANENT SPEZIAL Ethylene glycol-based antifreeze fluid with organic inhibition additives. Red, ready to use.

ASTM D 3306 - ASTM D 4656 - ASTM D 4985 -
CUNA NC 956-16

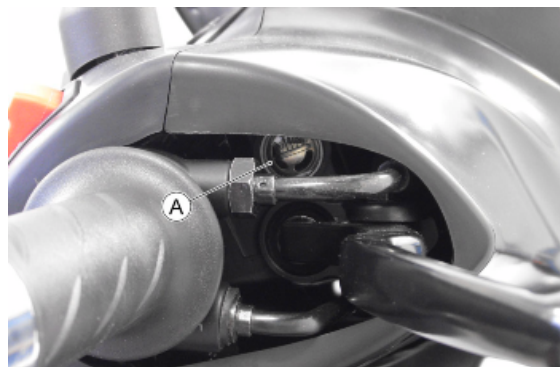
Braking system

Level check

The front and rear brake fluid reservoirs are both positioned on the handlebar. Proceed as follows:

- Rest the vehicle onto the centre stand, with the handlebar centred.
- Check the fluid level through the sight glass «A».

A certain lowering of the level is caused by wear on the brake pads.



Top-up

- Remove the front handlebar cover in advance and move the rear handlebar cover.

- Unscrew the two "G" screws and remove the "H" cover from the brake pump to restore the optimal level.

WARNING

BRAKING CIRCUIT FLUID IS HIGHLY CORROSIVE; MAKE SURE THAT IT DOES NOT COME INTO CONTACT WITH THE PAINTWORK.

CAUTION

ONLY USE DOT 4-CLASSIFIED BRAKE FLUID.

WARNING

THE BRAKE FLUID IS HAZARDOUS: IN CASE OF ACCIDENTAL CONTACT, WASH OFF WITH WATER.

WARNING

THE BRAKING CIRCUIT LIQUID IS HYGROSCOPIC, AND ABSORBS THE HUMIDITY OF SURROUNDING AIR. IF THE HUMIDITY IN THE BRAKING FLUID EXCEEDS A CERTAIN VALUE, IT WILL LEAD TO INEFFICIENT BRAKING. NEVER USE BRAKING FLUID KEPT IN CONTAINERS THAT HAVE ALREADY BEEN OPENED, OR PARTIALLY USED.



Recommended products

Brake fluid Brake fluid.

Synthetic fluid SAE J 1703 -FMVSS 116 - DOT 3/4

- ISO 4925 - CUNA NC 956 DOT 4

See also

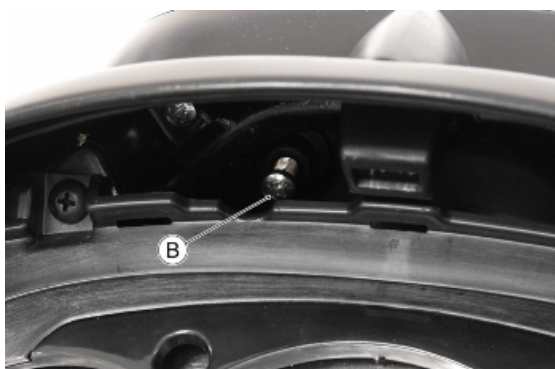
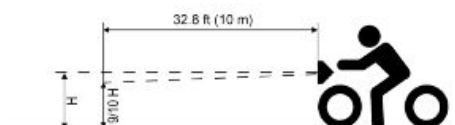
[Front handlebar cover](#)

[Rear handlebar cover](#)

Headlight adjustment

Proceed as follows:

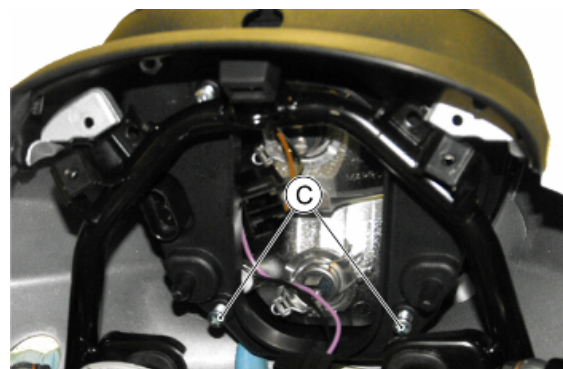
1. Position the vehicle in running order and with the tyres inflated to the prescribed pressure, onto a flat surface 32.8 ft (10 m) away from a half-lit white screen; ensure that the longitudinal axis of the vehicle is perpendicular to the screen;
2. Turn on the headlight and check that the boundary 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. Otherwise, loosen the screws fixing the projector to the support and adjust the direction.

**N.B.**

THE ABOVE PROCEDURE COMPLIES WITH THE EUROPEAN STANDARDS REGARDING MAXIMUM AND MINIMUM HEIGHT OF LIGHT BEAMS. REFER TO THE STATUTORY REGULATIONS IN FORCE IN EVERY COUNTRY WHERE THE VEHICLE IS USED.

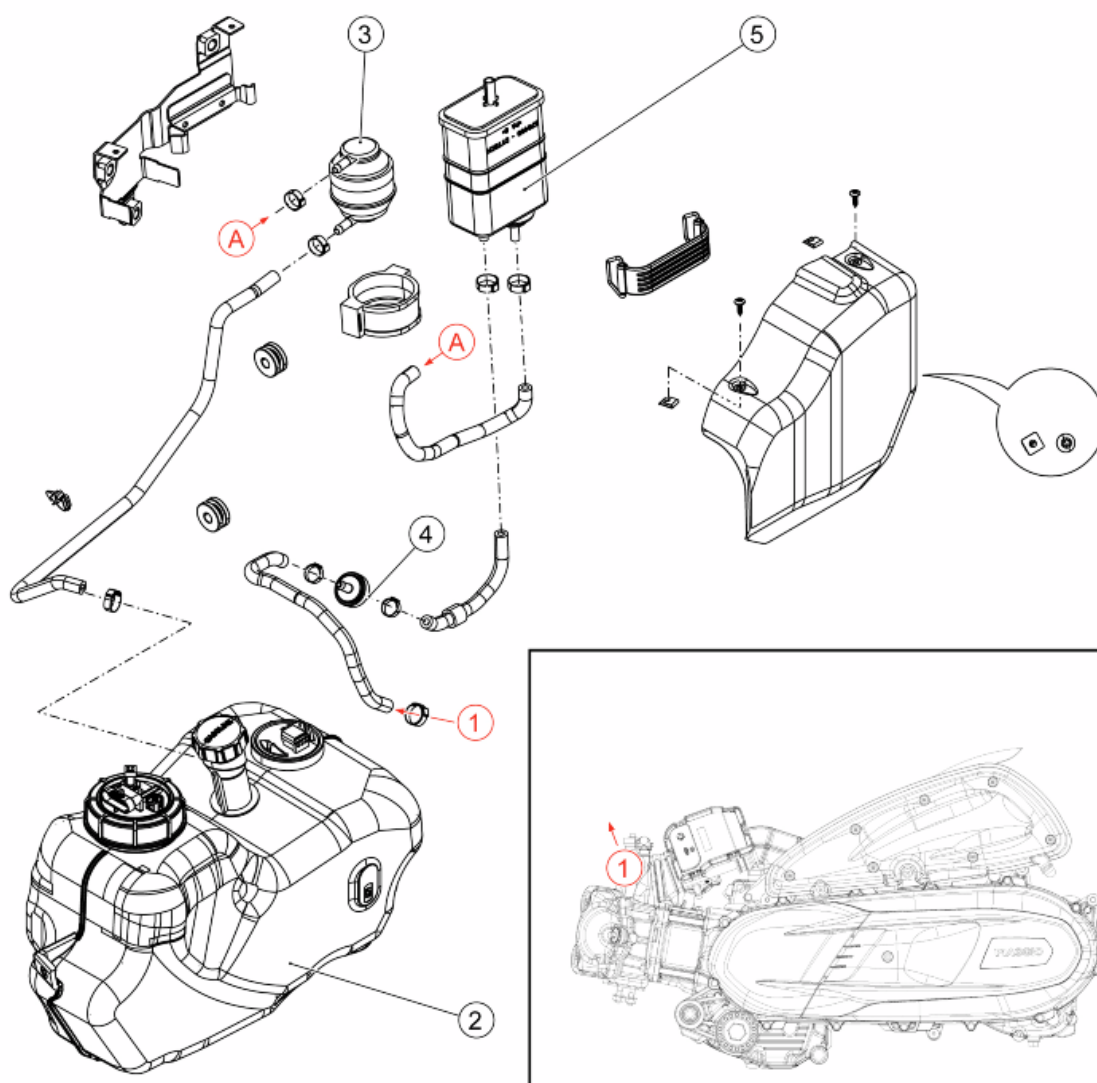
- Working on the appropriate screws and fittings, as described in the paragraph "Brake fluid top-up", move the instrument panel cover to gain visibility of the adjuster screws (C) of horizontal adjustment of the light beams.

- Screwing the right adjuster screw, the beam is oriented to the left.
- Screwing the left adjuster screw, the beam is oriented to the right.



Always operate simultaneously on both adjuster screws, in order to have a smoother adjustment.

Anti-evaporation system



Anti-evapourating system diagram key

1. From the intake
2. Fuel tank
3. Roll-over valve
4. Safety valve
5. Canister

Removing system components

- To access the anti-evapourating system, lift the saddle and remove the three screws of the system cover inside the helmet compartment.



CANISTER

- Release the flexible retainer strap.
- Release the clamps and by pulling out the pipes, remove the canister.



ROLL-OVER VALVE

- Release the canister flexible retainer strap and removing the two metal clamp, pull out the pipes.
- Remove the roll-over valve by pulling it out from the support.



SAFETY VALVE

- Remove the two metal clamps and remove the pipes.
- Remove the safety valve.



Refitting system components

- Refit the components by properly inserting the pipes and securing them with new metal clamps.
- Pay attention to the proper installation of components. The safety valve and the Roll-over valve, if mounted in reverse, compromise the operation of the entire anti-evapourating system.



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).

The volume of air is limited by the operation of the ventilation valve (Roll-over).

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 vacuum 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.

Safety valve check

The cleaning of the canister is achieved via a controlled flow of air from the vacuum socket in the intake manifold.

To ensure that the engine works properly, it is necessary that the flow of air is not too intense, this is achieved by means of a restricted section 0.0354in (0.9 mm) formed in the socket on the intake manifold.

The relative connecting pipe with the canister, includes the installation of the safety valve.

This is a one-way valve which ensures the passage of air in the direction of the manifold when the control vacuum is greater than 2.9PSI (20kPa) (200mbar).

The vacuum of the engine at idle, causes a slight flow of air easily compensated by the idle speed adjustment parameters.

When the vehicle is stopped, the safety valve will be closed due to the lack of control vacuum therefore, any expansion of the fuel tank, will not cause pollution of the intake manifold, and then cause flooding of the engine.

To control the valve, it is preferable to it, alternatively just access the manifold side pipe.

- Connect the MITY-VAC pump on the engine side duct.
- Select the pump command on the "vacuum" position, then slowly apply vacuum up to the valve threshold check opening.



If you detect different pressures, replace the valve.

N.B. An opening vacuum that is too high, causes a lack of regeneration of the activated carbon; vice versa, an opening vacuum that is too low, increases the flow of air to the engine causing the thinning of idle.

Characteristic

Standard opening vacuum

(2.90÷3.77)PSI (20÷26)kPa (200÷260)mbar

Roll-over valve check

The valve must enable the following results:

- Aeration of the tank while riding (the ambient air enters the tank in relation to the volume of fuel used).
- Pressurisation of the tank (while riding or during a break, you may experience increases in the temperature inside the tank. The valve must pressurize the tank to limit the escape of fuel vapour to the canister).
- Prevent pollution of the canister with the liquid fuel (in case of fall of the vehicle, the valve must block the connection with the canister).

To control the valve, it is necessary to remove it from the vehicle.

For the check, it is planned to use a MITY-VAC pump and a piece of tube, then proceed as follows:

- Connect the MITY-VAC pump to the lower joint of the safety valve (white).
- Select the "vacuum" control position and keeping the valve in the vertical axis, check that it is possible to intake air without movements of the gauge needle.
- Switch the control of the pump to "pressure" and, keeping the valve in the vertical axis, check that it is possible to pressurise the valve up to values slightly below 1.45PSI(~0.87PSI) 10kPa(~6kPa) 100mbar(~60mbar).



N.B. The setting pressure is easily recognisable in that, when it is reached, the valve discharges the air emitting a little noise.

- Position the valve in the horizontal axis and check that you can pressurise it to values well above the setting pressure (eg. 7.25PSI (50 kPa) (0.5bar) without guaranteeing the maintenance).

If you detect abnormal behaviour, replace the valve.

N.B. Any malfunction of the valve can cause deformation of the fuel tank or aggravate the working conditions of the canister.

INDEX OF TOPICS

TROUBLESHOOTING

TROUBL

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

Poor performance

POOR PERFORMANCE

Possible Cause	Operation
Fuel pump	Check the injection load solenoid
Excess of scales in the combustion chamber	Descale the cylinder, the piston, the head and the valves
Incorrect timing or worn timing system elements	Time the system again or replace the worn parts
Muffler obstructed	Replace
Air filter blocked or dirty	Remove the sponge, wash with water and car shampoo, then soak it in a mixture of 50% petrol and 50% specific oil. Press with your hand without squeezing, allow it to drip dry and refit.
Oil level exceeds maximum	Check for causes and fill to reach the correct level
Lack of compression: parts, cylinder and valves worn	Replace the worn parts
Drive belt worn	Replace
Inefficient automatic transmission	Check the rollers, the pulley movement and make sure the drive belt is in good conditions; replace the damaged parts and lubricate the moveable driven pulley with specific grease.
Clutch slipping	Check the clutch system and/or the bell and replace if necessary
Overheated valves	Remove the head and the valves, grind or replace the valves
Wrong valve adjustment	Adjust the valve clearance properly
Valve seat distorted	Replace the head unit

Starting difficulties

DIFFICULT STARTING

Possible Cause	Operation
Rpm too low at start-up or engine and start-up system damaged	Check the starter motor, the system and the torque limiter
Incorrect valve sealing or valve adjustment	Inspect the head and/or restore the correct clearance
Engine flooded	Try starting-up with the throttle fully open. If the engine fails to start, remove the spark plug, dry it and before refitting, make the engine turn so as to expel the fuel excess taking care to connect the cap to the spark plug, and this in turn to the ground. If the fuel tank is empty, refuel and start up.
Air filter blocked or dirty	Remove the sponge, wash with water and car shampoo, then soak it in a mixture of 50% petrol and 50% specific oil. Press with your hand without squeezing, allow it to drip dry and refit.
Faulty spark plug or incorrect ignition advance	Replace the spark plug or check the ignition circuit components
Flat battery	Check the charge of the battery, if there are any sulphur marks, replace and use the new battery following the instructions shown in the chapter
Intake coupling cracked or clamps incorrectly tightened	Replace the intake coupling and check the clamps are tightened

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

Possible Cause	Operation
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 guard	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
The motor runs but the vehicle does not move	- Check that the belt shows no signs of wear and is not damaged or bent. - Check that the mobile half-pulley shows no signs of wear and is not damaged on the faying surface with the belt. - Check that the sliding bushing of the mobile pulley shows no signs of wear and is not damaged on the faying surface with the shaft and in the shaped seats of the pins. - Check the correct positioning of the fixing appendices of the torque server on the mobile pulley. - Check that the clearance recovery springs and clutch springs show no signs of wear and are not damaged. - Check that there is no damage to the final reduction gear.
The clutch slips	- Check that the torque server spring shows no signs of wear and is not damaged or bent. - Check the correct positioning of the fixing appendices of the torque server on the mobile pulley. - Check the sliding of the mobile half-pulley. - Check that the discs clearance recovery springs show no signs of damage or wear. - Check the clutch discs for damage or signs of wear.
Difficulty in starting	- Check that the clutch assembly works properly. - Check that the belt shows no signs of wear and is not damaged or bent. - Make sure there is no oil on the inner surfaces of the pulleys and belt. - Check that the mobile pulley works and slides properly. - Check that the mobile pulley shows no signs of wear of damage on the contact surface with the shaft and in the shaped seats of the pins. - Check that the torque driver pins rotate correctly. - Check that the clutch discs show no signs of wear or damage.

Insufficient braking

INEFFICIENT BRAKING SYSTEM

Possible Cause	Operation
Inefficient braking system	Check the pad wear (0.0492 in (1.5 min) MIN). Check that the brake discs are not worn, scored or warped. Check the correct level of fluid in the pumps and change 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
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	Replace the calliper.
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 deviation of the disc.
Clogged compensation holes on the pump Swollen or stuck rubber gaskets	Clean carefully and blast with compressed air Replace the calliper.

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 rotation seats and the steering fifth wheels.

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 rotation seats and the steering fifth wheels.

Noisy suspension

NOISY SUSPENSION

Possible Cause	Operation
Faults in the suspension system	If the front suspension is noisy, check: tightening torques, headstock components, inspect forks.

Suspension oil leakage

OIL LEAKAGE FROM SUSPENSION

Possible Cause	Operation
Faulty or broken seals	Replace the shock absorber

INDEX OF TOPICS

ELECTRICAL SYSTEM

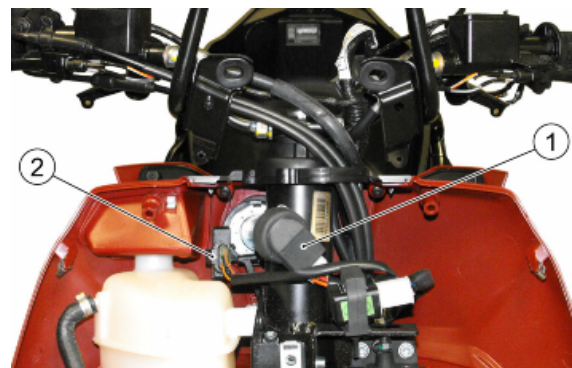
ELE SYS

Components arrangement

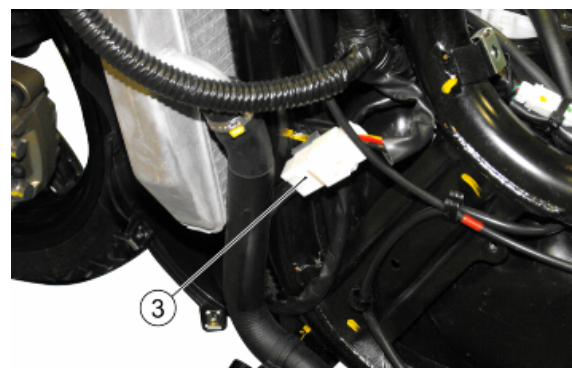


1. Starter switch: remove the front shield to reach them.

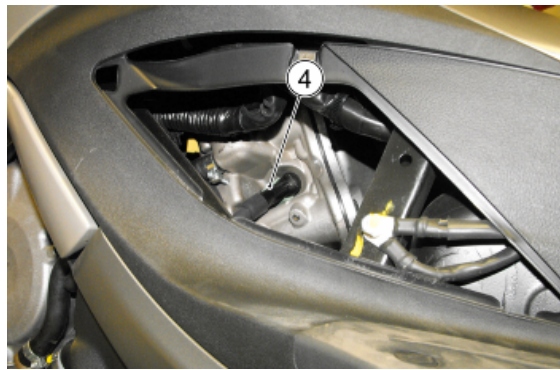
2. Immobilizer antenna: remove the front shield to reach them.



3. Regulator connector: remove the complete left footrest to reach it.



4. Spark plug: remove the spark plug inspection cover to access the spark plug.

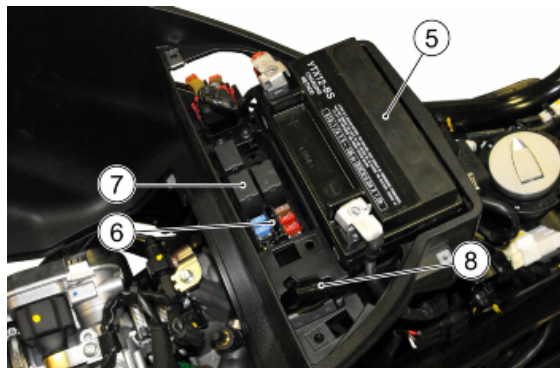


5. Battery: lift the saddle and remove the battery cover to access the battery.

6. Fuses: lift the saddle and remove the battery cover to access the battery.

7. relays: lift the saddle and remove the battery cover to access the battery.

8. Diagnostic socket: lift the saddle and remove the battery cover to access the battery.



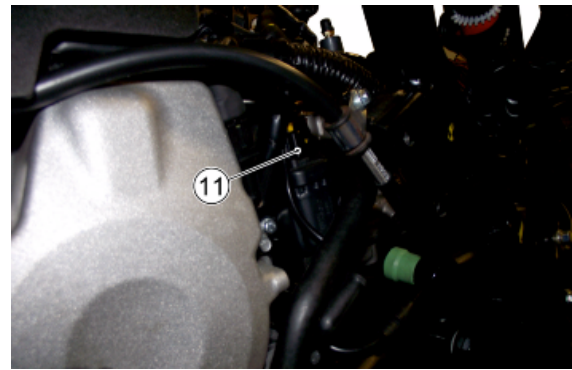
9. ECU: lift the saddle and after removing the canister assembly, remove the engine inspection cover.



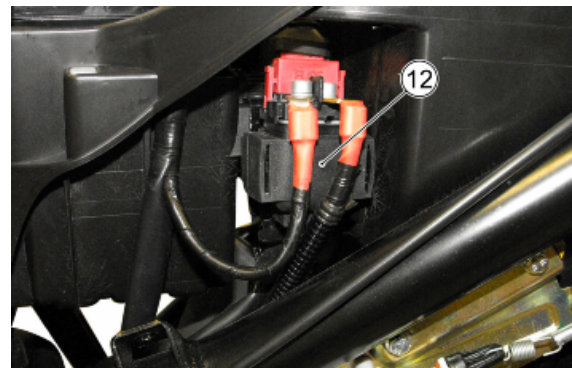
10. Saddle actuator: to reach it, remove the left fairing.



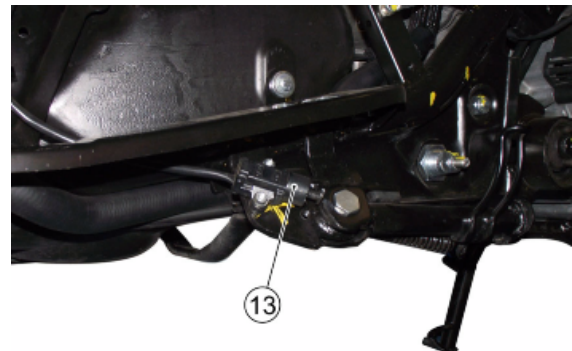
11. H.V. coil: remove the helmet compartment to reach it.



12. Starter relay: to reach it, remove the left fairing.



13. Stand button: remove the left footrest to reach it.



14. Stator connector: remove the central chassis cover to reach them.

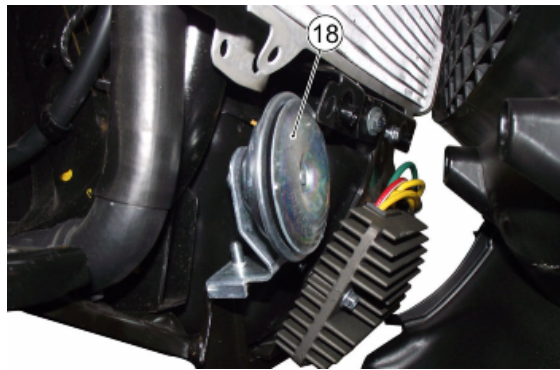
15. Roll-over sensor: remove the central chassis cover to reach them.

16. Fuel pump: remove the central chassis cover to reach them.

17. Fuel level transmitter: remove the central chassis cover to reach them.



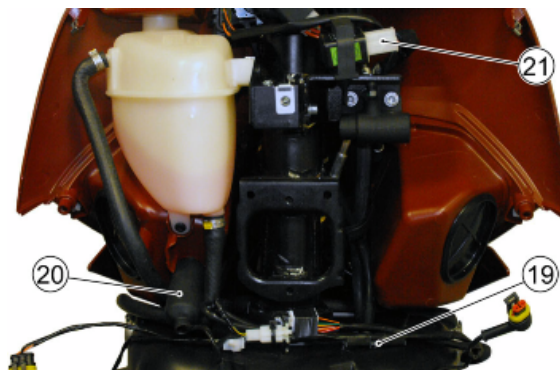
18. Horn: remove the front wheel housing to reach it.



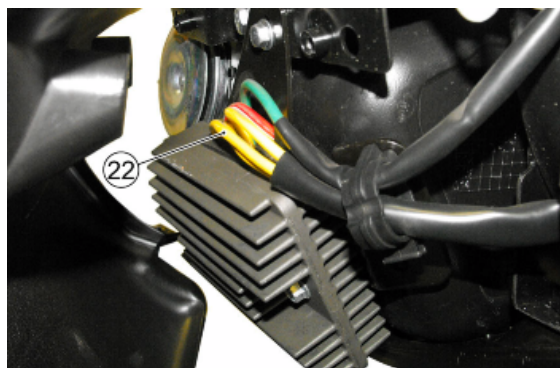
19. Temperature sensor: remove the front shield to reach them.

20. LV socket: remove the front shield to reach them.

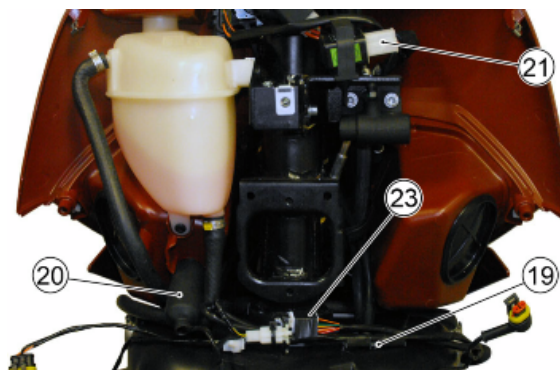
21. Turn indicator device: remove the front shield to reach them.



22. Regulator: remove the front shield to reach them.



23. Antitheft pre-installation connector: remove the front shield to reach them.



Ground points

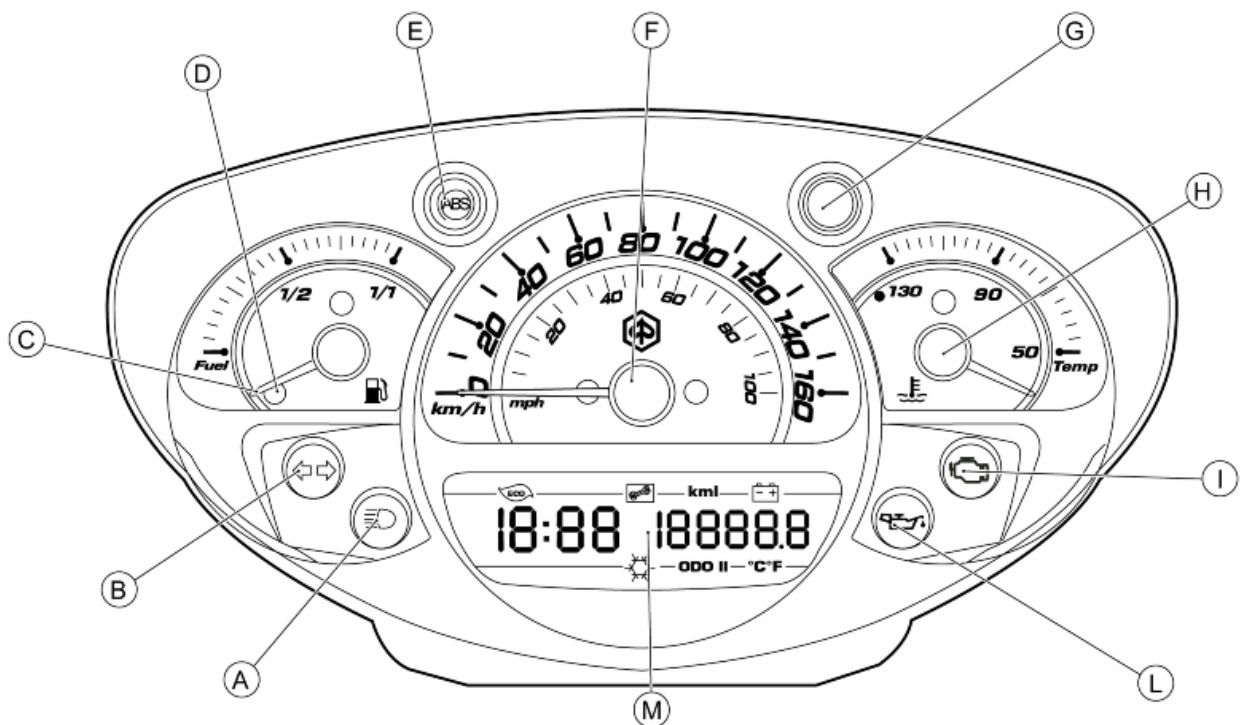
- Chassis ground point «A». To reach them, remove the right footrest.



- Chassis ground point «B» and engine ground «C». Remove the left footrest to reach them.



Instrument panel



A= High beam warning light

B = Turn indicator warning lights

C = Fuel gauge

D = Low fuel warning light

E = ABS warning light (if present)

F = Speedometer

G = Immobilizer LED

H = Coolant temperature gauge

I = Engine control telltale light

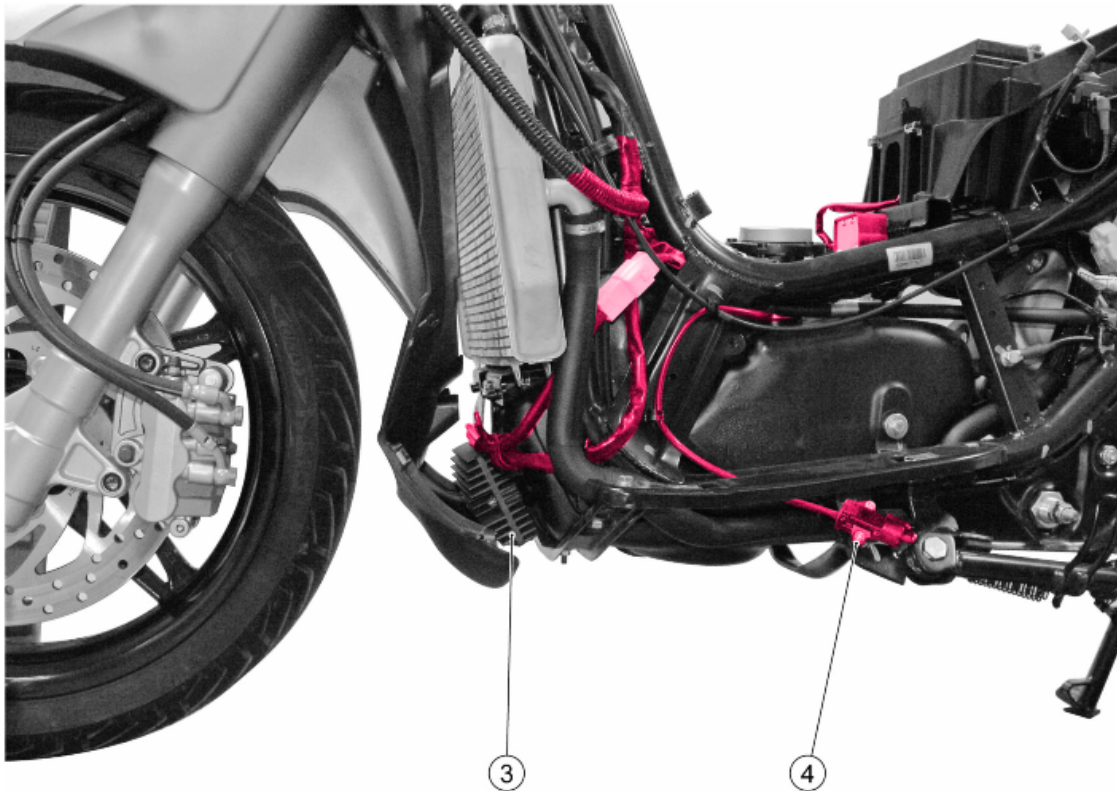
L = Engine oil pressure warning light

M = Digital display

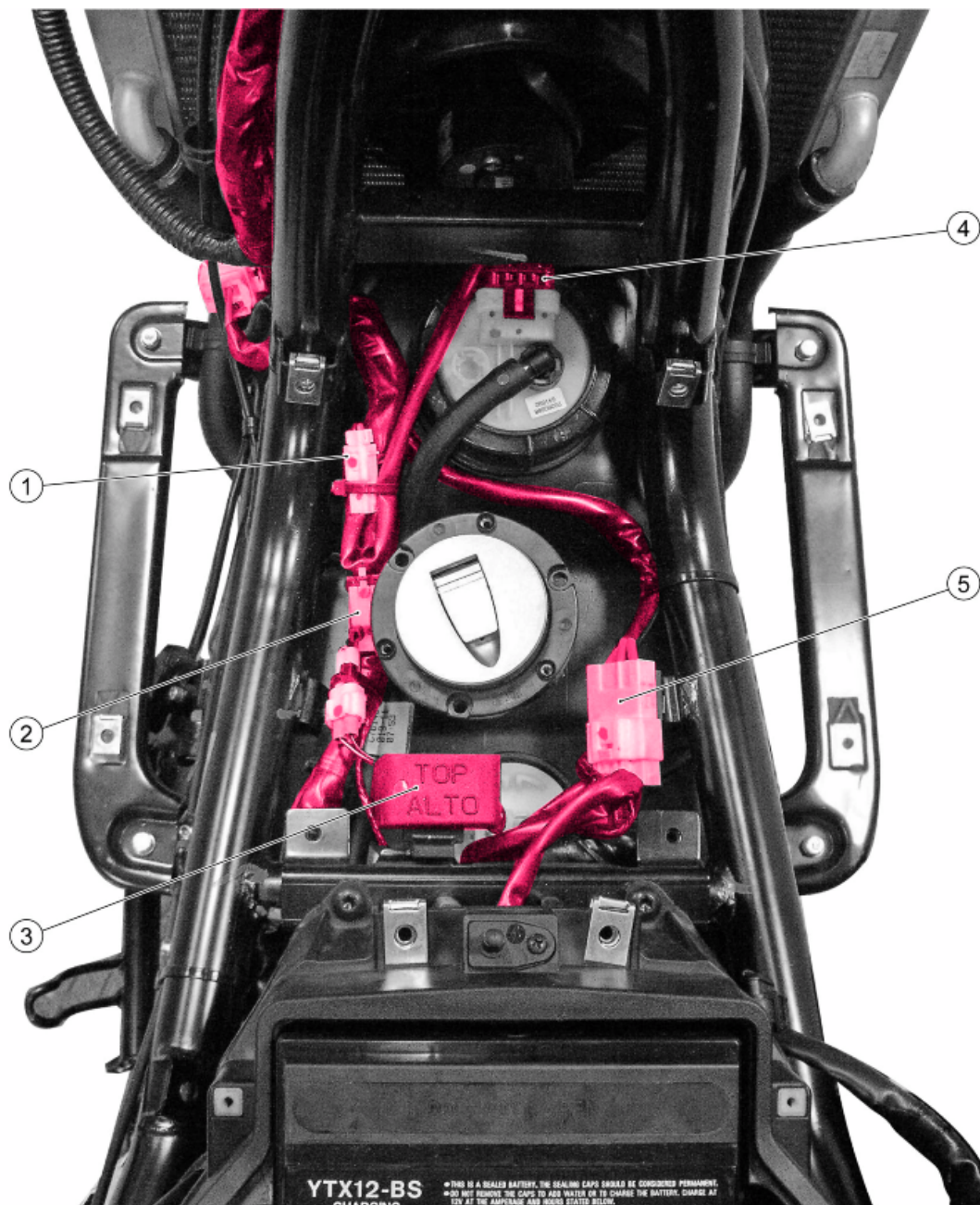
Electrical system installation

Front side

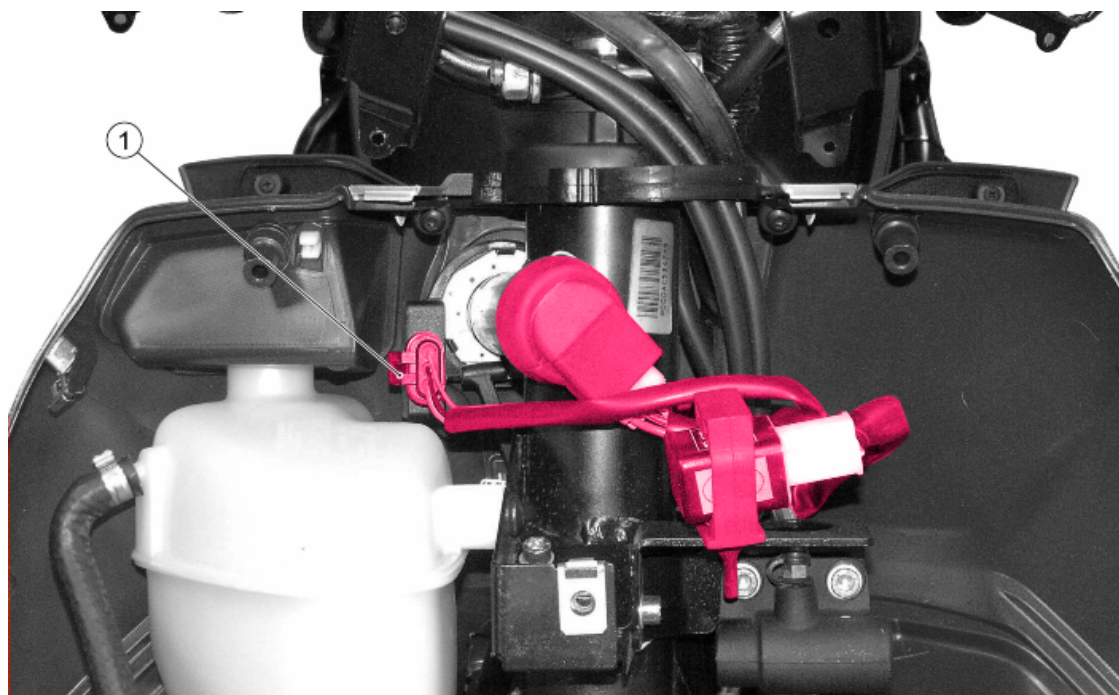




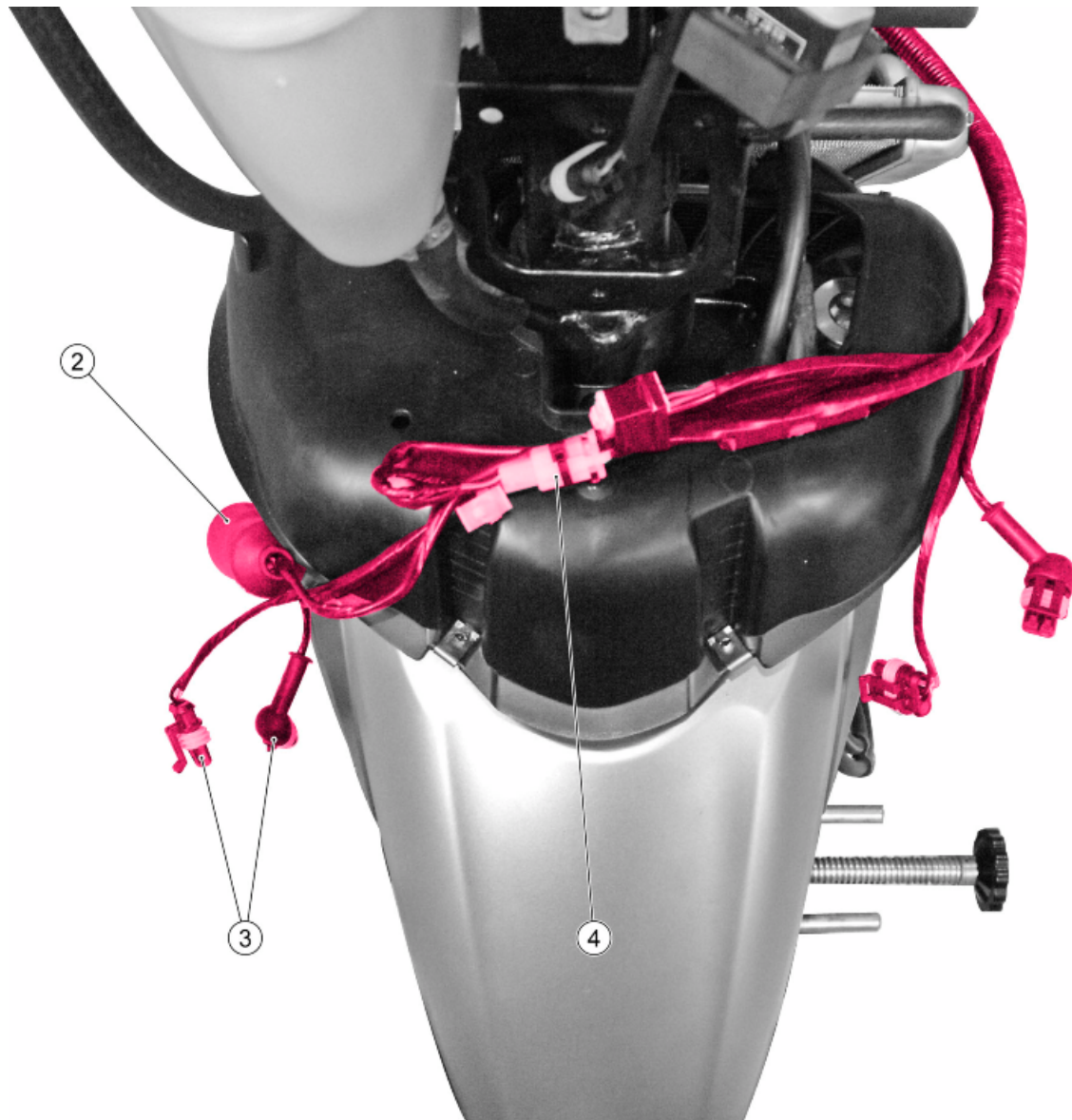
1. Ignition switch hood
2. Turn indicator control device
3. Voltage regulator
4. Side stand switch
5. Roll-over sensor
6. At the front LH turn indicator and daylight running lights



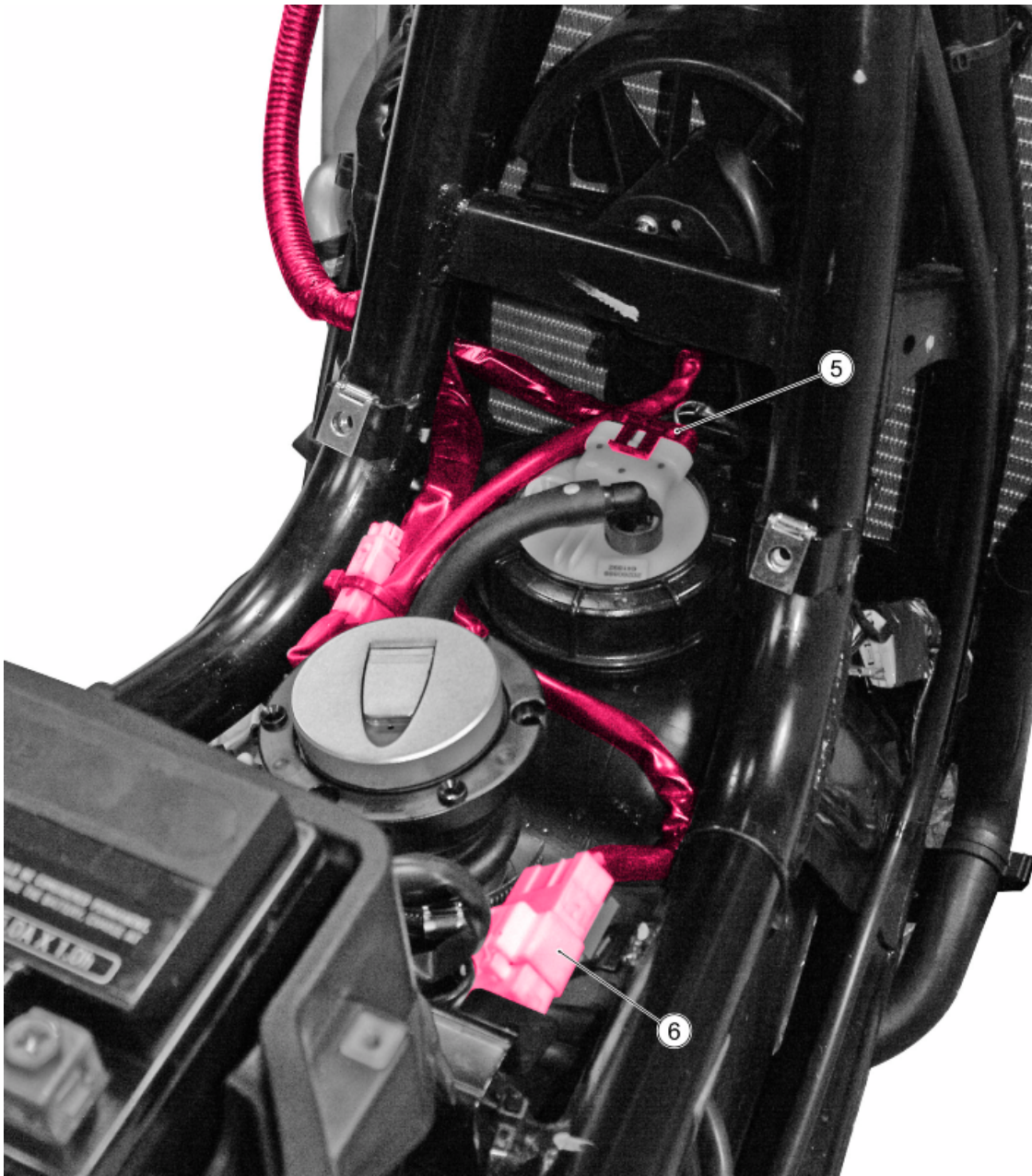
1. Electric fan connection
 2. Side stand connection
 3. Roll-over sensor
 4. Fuel pump
 5. Flywheel - regulator connection
-



1. Immobilizer antenna

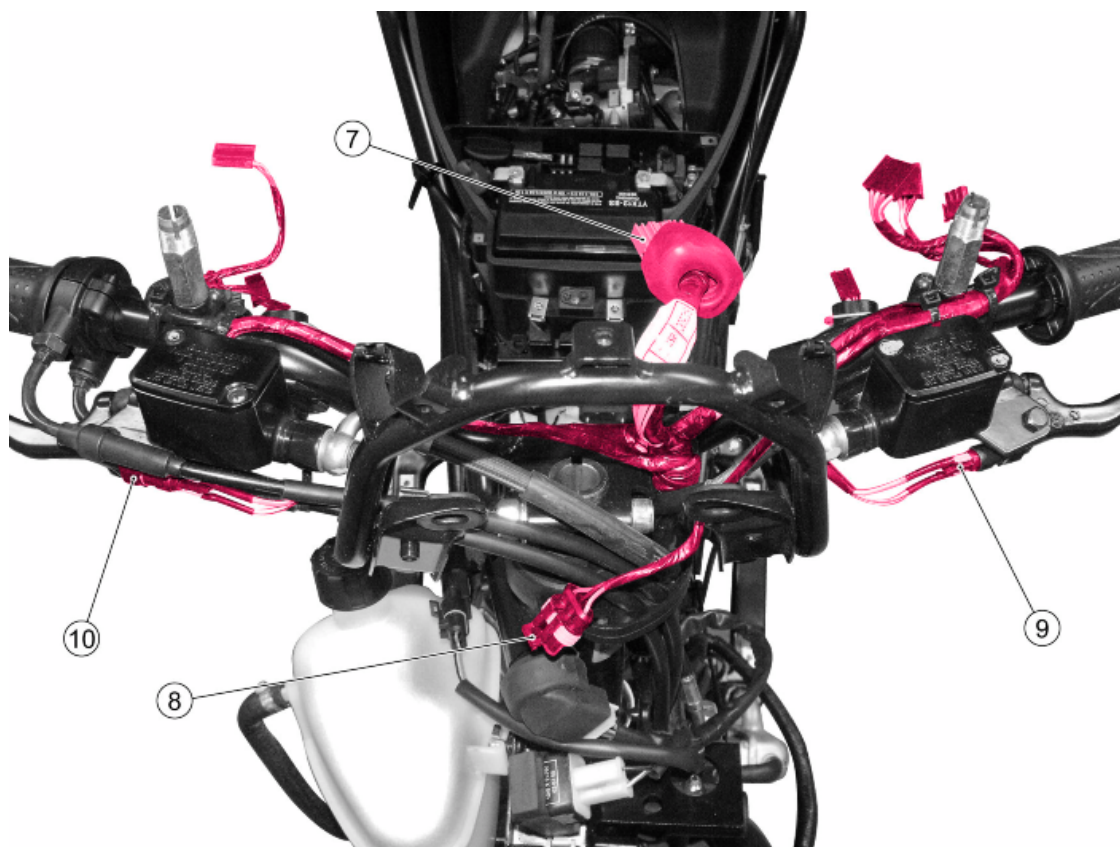


- 2. Low voltage power socket accessories in the front top box
- 3. At the front right turn indicator and daylight running lights
- 4. External air temperature sensor



5. Fuel pump connection

6. Stator connection



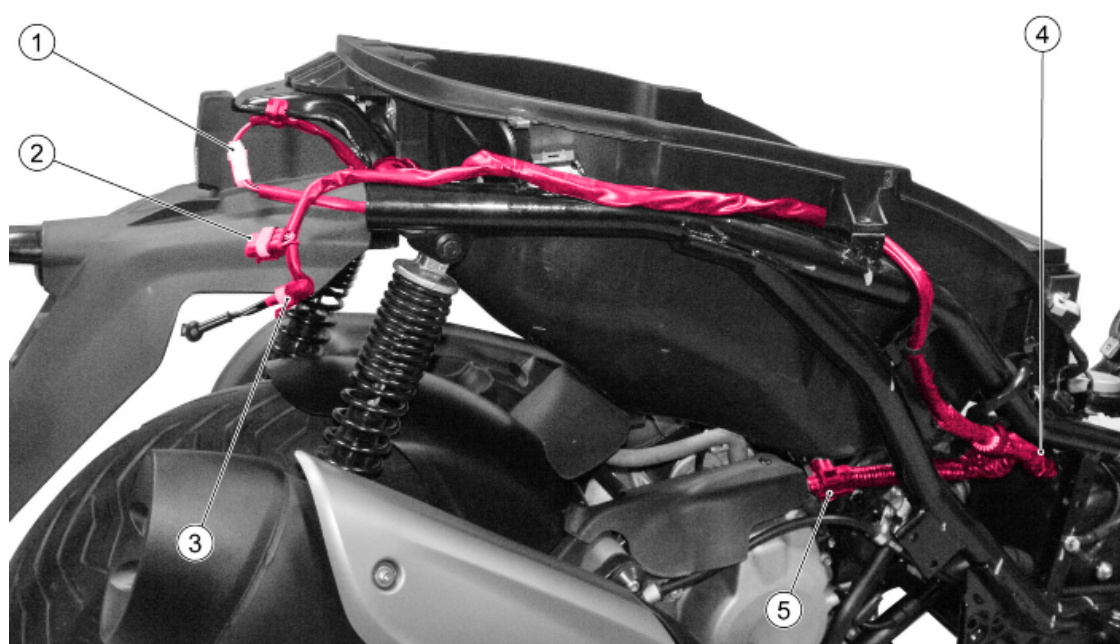
7. At instrument panel

8. At headlight

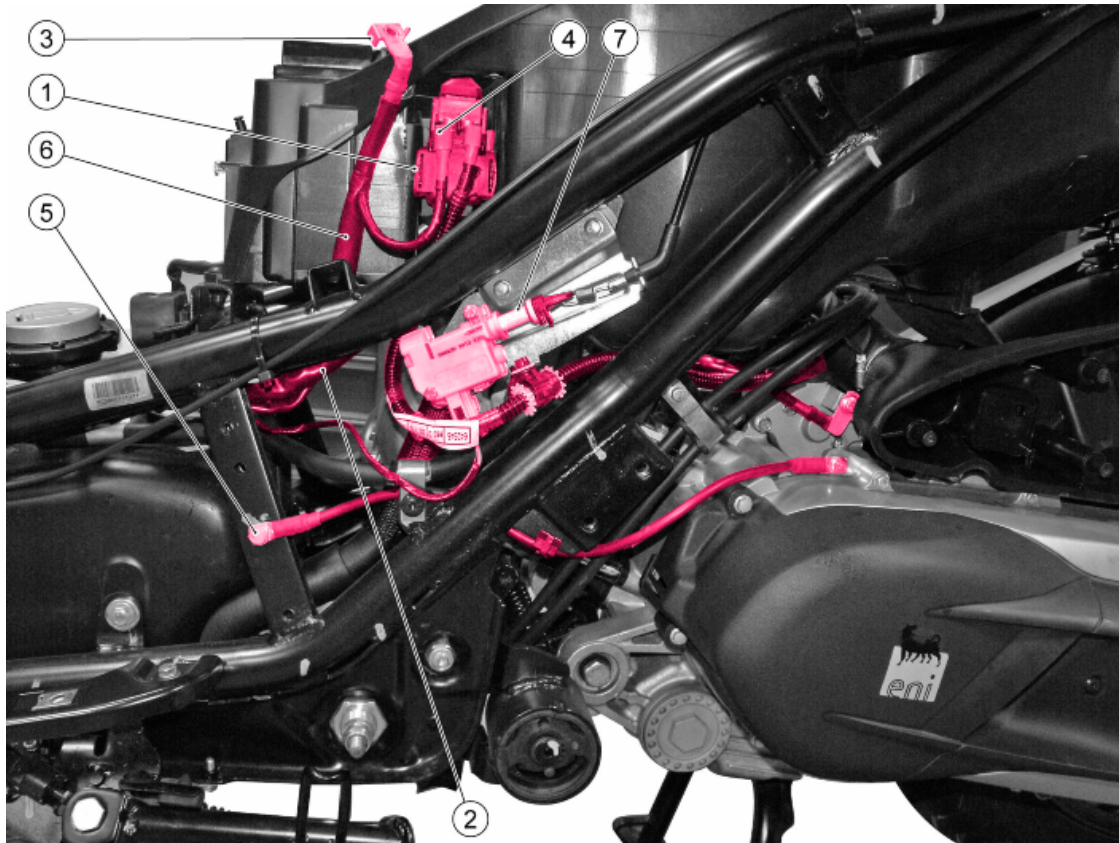
9. At left stop button

10. At right stop button

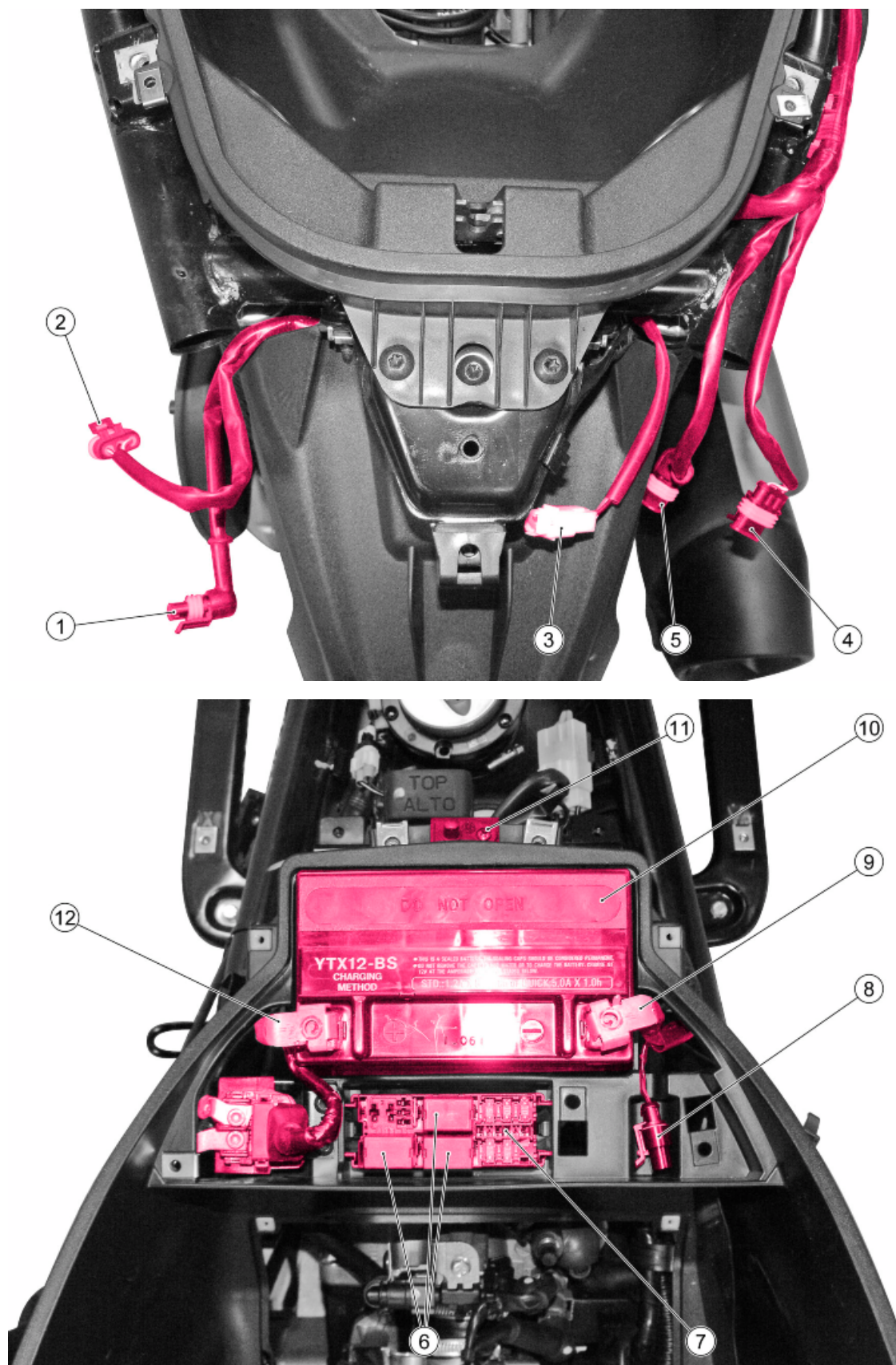
Back side



1. License plate light connection
2. To the right headlamp
3. To the right turn indicator
4. Pick-up connection
5. Cables to the motor



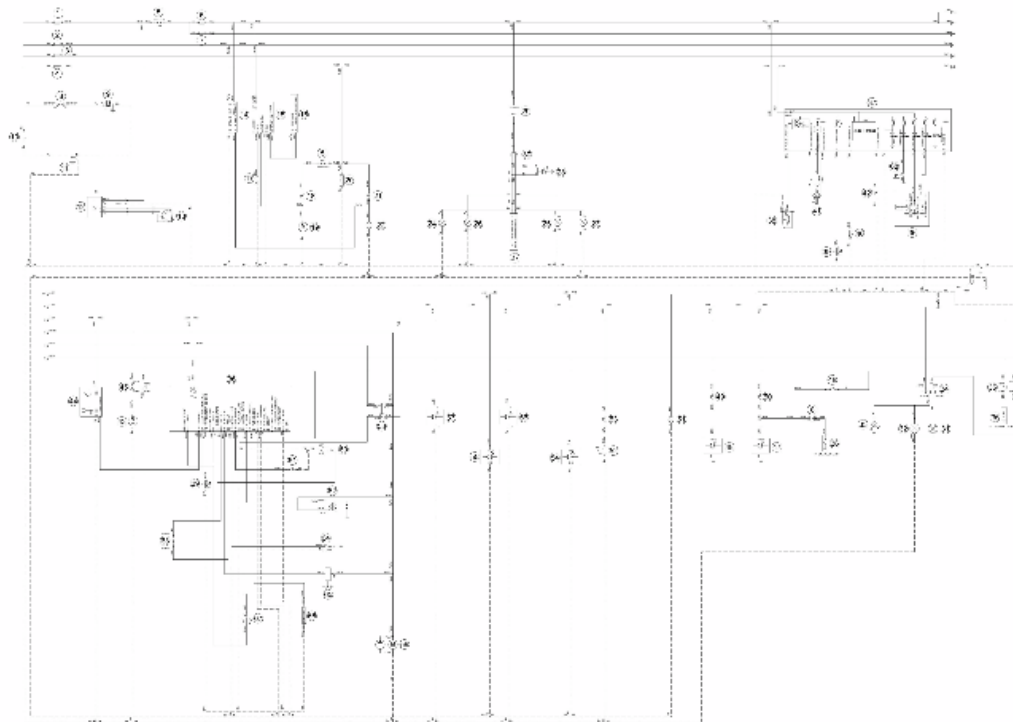
1. Starter relay
2. To the fuse holder terminal block
3. Battery positive
4. To the starter relay
5. Ground point
6. Starter motor positive cable
7. Saddle opening actuator



1. To the left turn indicator

2. To the left headlamp
3. License plate light connection
4. To the right turn indicator
5. To the right headlamp
6. Micro-relay
7. Rear fuse-box
8. Diagnostics socket
9. Negative battery pole
10. Battery 12V 10Ah
11. Helmet compartment light switch
12. Positive battery pole

Conceptual diagrams



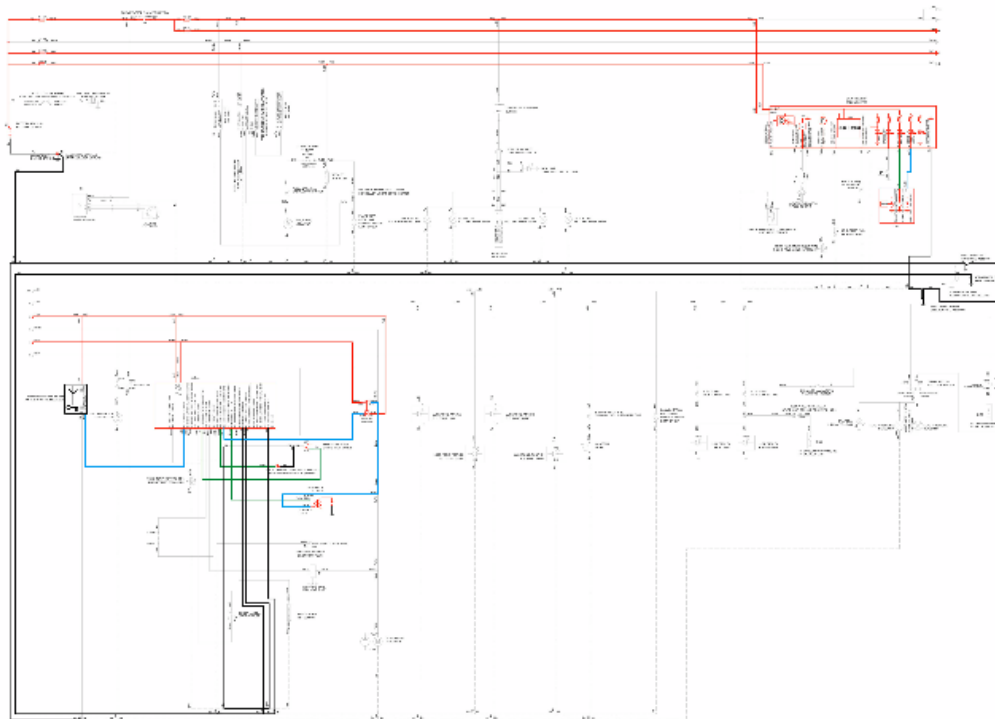
BASIC CIRCUIT DIAGRAM LEGEND:

- 1.F01-30A
- 2.F02-15A
- 3.F03-10A
- 4.F04-15A
- 5.Starter switch
- 6.F05-10A

- 7.F06-5A
- 8.Starter relay
- 9.Starter motor
- 10.12V - 10 Ah Battery
- 11.Chassis ground
- 12. Regulator
- 13. Flywheel
- 14. Antitheft
- 15. Actuator control receiver pre-installation
- 16.Antitheft
- 17.Reset receiver radio
- 18.Saddle button
- 19.Actuator
- 20.LV socket
- 21.Helmet compartment light button
- 22.Light unit
- 23.Rear right turn indicator
- 24.Rear left turn indicator
- 25.Front right turn indicator
- 26.Front left turn indicator
- 27.Antitheft
- 28.Turn indicator warning light
- 29.Turn indicator switch
- 30. turn indicator control
- 31.Low beam bulb
- 32.High beam bulb
- 33.High beam warning light
- 34.Light switch
- 35.Headlight relay
- 36.Electronic control unit
- 37.Instrument panel
- 38.Fuel gauge
- 39.Engine temperature sensor
- 40.Ambient temperature sensor
- 41.Speed sensor
- 42.Mode button
- 43.Electric fan
- 44.Immobilizer antenna

- 45. Electric fan relay
 - 46. Starter button
 - 47. Right stop light bulb
 - 48. Left stop light bulb
 - 49. Stop button
 - 50. Stop button
 - 51. License plate light bulb
 - 52. Horn
 - 53. Horn button
 - 54. Rear right daylight running light bulb
 - 55. Rear left daylight running light bulb
 - 56. Front right turn indicator bulb
 - 57. Front left turn indicator bulb
 - 58. Injection load solenoid
 - 59. Fuel pump
 - 60. engine stop switch
 - 61. Stand button (raised position)
 - 62. H.V. coil
 - 63. Pickup
 - 64. Diagnostics socket
 - 65. Fuel injector
 - 66. Roll-over sensor
 - 67. Lambda probe
 - 68. Oil pressure sensor
-

Ignition



BASIC CIRCUIT DIAGRAM LEGEND:

- 1.F01-30A
- 3.F03-10A
- 4.F04-15A
- 5.Starter switch
- 6.F05-10A
- 7.F06-5A
- 10.12V - 10 Ah Battery
- 11.Chassis ground
- 36.Electronic control unit
- 37.Instrument panel
- 39.Engine temperature sensor
- 43.Electric fan
- 44.Immobilizer antenna
- 45.Electric fan relay
- 58.Injection load solenoid
- 59.Fuel pump
- 60.engine stop switch

61.Stand button (raised position)

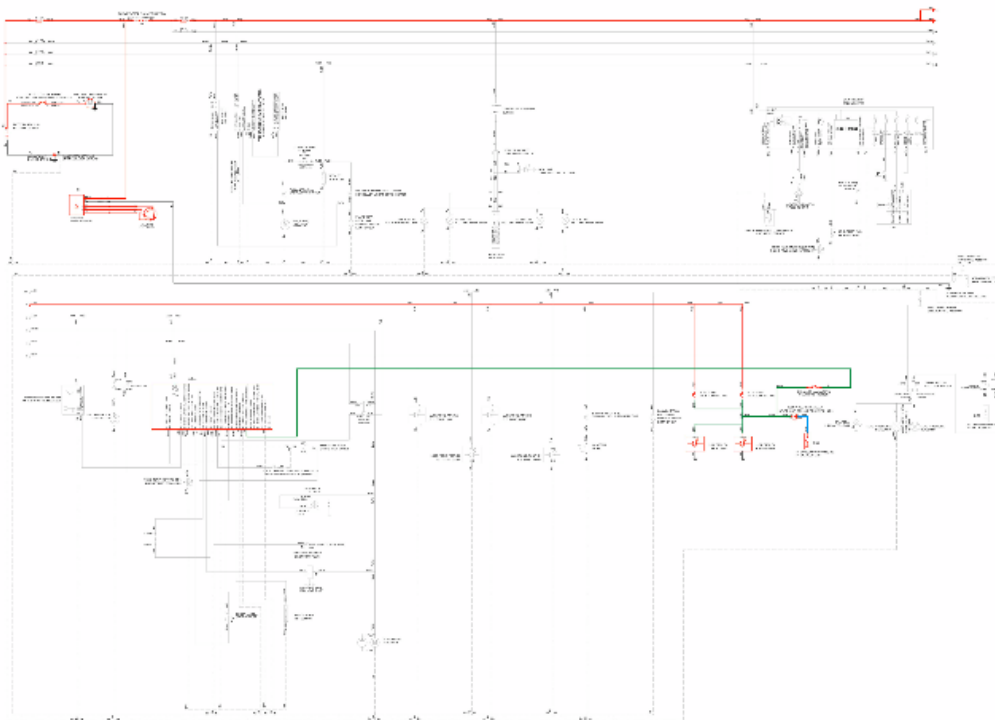
62.H.V. coil

63.Pick-up

65.Fuel injector

67.Lambda probe

Battery recharge and starting



BASIC CIRCUIT DIAGRAM LEGEND:

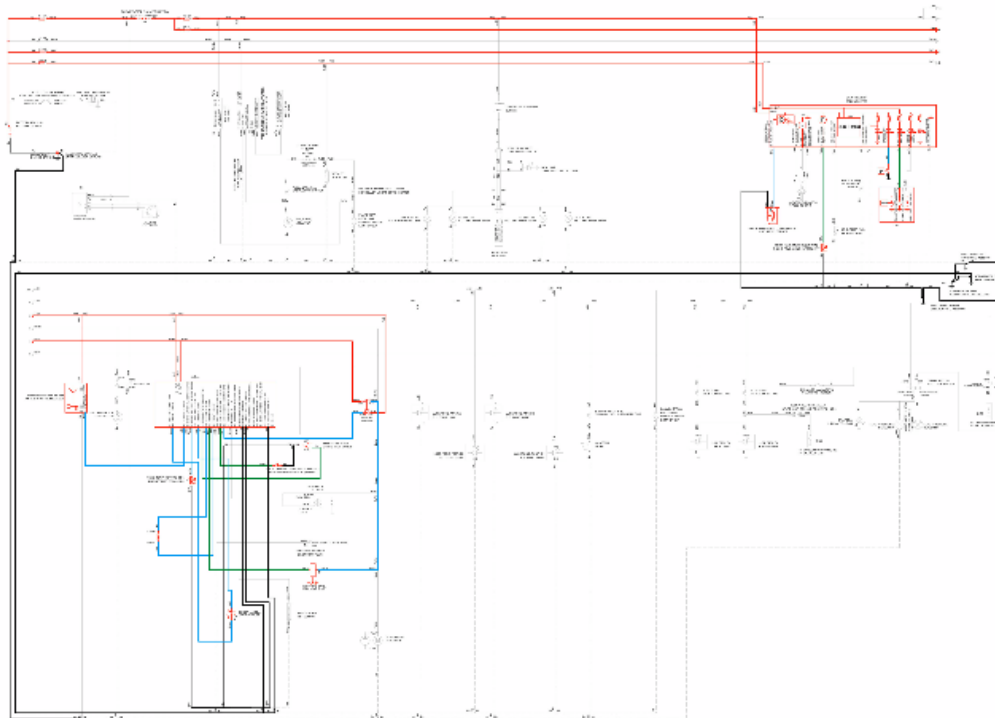
- 1.F01-30A
- 5.Starter switch
- 6.F05-10A
- 8.Starter relay
- 9.Starter motor
- 10.12V - 10 Ah Battery
- 11.Chassis ground
- 12. Regulator
- 13. Flywheel
- 36.Electronic control unit
- 46.Starter button
- 47.Right stop light bulb

48. Left stop light bulb

49. Stop button

50. Stop button

Level indicators and enable signals section

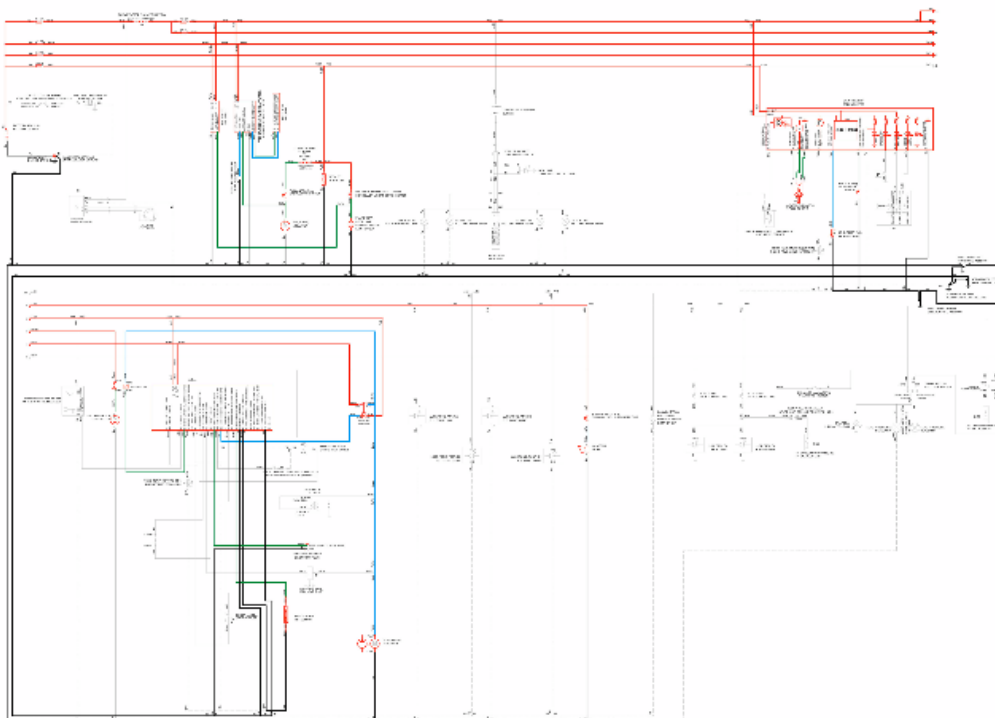


BASIC CIRCUIT DIAGRAM LEGEND:

- 1.F01-30A
- 3.F03-10A
- 4.F04-15A
- 5.Starter switch
- 6.F05-10A
- 7.F06-5A
- 10.12V - 10 Ah Battery
- 11.Chassis ground
- 36.Electronic control unit
- 37.Instrument panel
- 38.Fuel gauge
- 39.Engine temperature sensor
- 44.Immobilizer antenna
- 58.Injection load solenoid

- 60. engine stop switch
- 61. Stand button (raised position)
- 63. Pickup
- 65. Fuel injector
- 67. Lambda probe
- 68. Oil pressure sensor

Devices and accessories

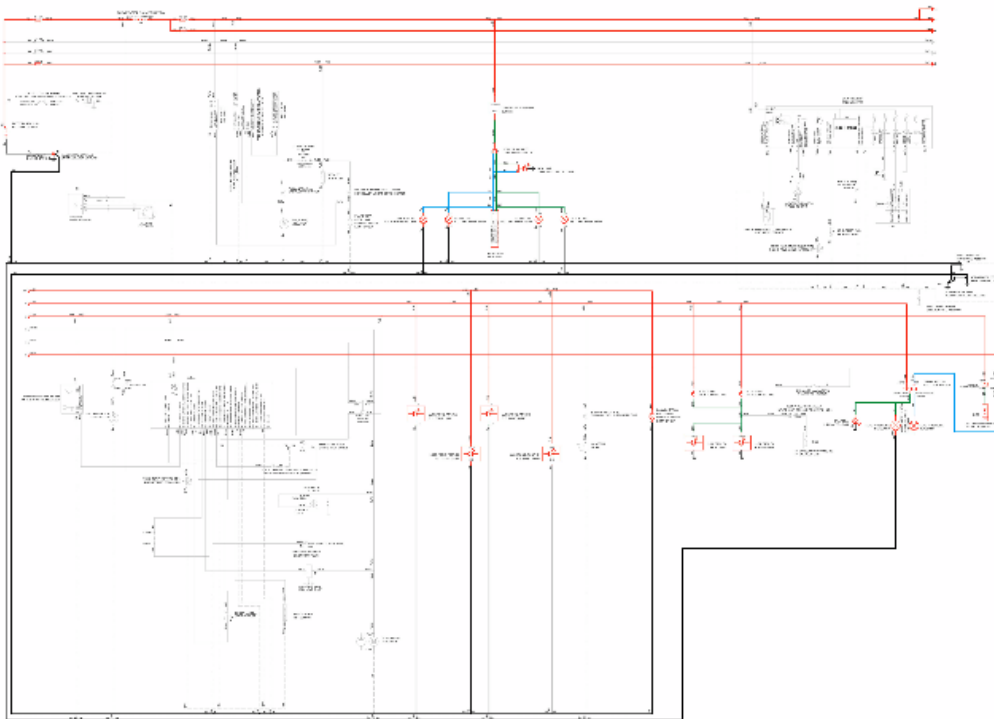


BASIC CIRCUIT DIAGRAM LEGEND:

- 1.F01-30A
- 2.F02-15A
- 3.F03-10A
- 4.F04-15A
- 5.Starter switch
- 6.F05-10A
- 7.F06-5A
- 10.12V - 10 Ah Battery
- 11.Chassis ground
- 14. Antitheft
- 15. Actuator control receiver pre-installation

- 16.**Antitheft
 - 17.**Reset receiver radio
 - 18.**Saddle button
 - 19.**Actuator
 - 20.**LV socket
 - 21.**Helmet compartment light button
 - 22.**Light unit
 - 36.**Electrical control unit
 - 37.**Instrument panel
 - 40.**Ambient temperature sensor
 - 41.**Speed sensor
 - 42.**Mode button
 - 43.**Electric fan
 - 45.**Electric fan relay
 - 52.**Horn
 - 53.**Horn button
 - 58.**Injection load solenoid
 - 59.**Fuel pump
 - 64.**Diagnostics socket
 - 66.**Roll-over sensor
-

Lights and turn indicators



BASIC CIRCUIT DIAGRAM LEGEND:

- 1.F01-30A
- 4.F04-15A
- 5.Starter switch
- 6.F05-10A
- 7.F06-5A
- 10.12V - 10 Ah Battery
- 11.Chassis ground
- 23.Rear right turn indicator
- 24.Rear left turn indicator
- 25.Front right turn indicator
- 26.Front left turn indicator
- 27.Antitheft
- 28.Turn indicator warning light
- 29.Turn indicator switch
- 30. turn indicator control
- 31.Low beam bulb
- 32.High beam bulb

- 33.High beam warning light
 - 34.Light switch
 - 35.Headlight relay
 - 36.Electronic control unit
 - 47.Right stop light bulb
 - 48.Left stop light bulb
 - 49.Stop button
 - 50.Stop button
 - 51.License plate light bulb
 - 54.Rear right daylight running light bulb
 - 55.Rear left daylight running light bulb
 - 56.Front right turn indicator bulb
 - 57.Front left turn indicator bulb
-

Checks and inspections

This section is dedicated to the checks on the electrical system components.

Immobiliser

The electronic ignition system is controlled by the control unit with the integrated Immobilizer system. The immobiliser is an antitheft system which allows the vehicle to function only if it is activated by means of the coded keys that the control unit recognises. The code is integrated in a transponder in the key block. 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:

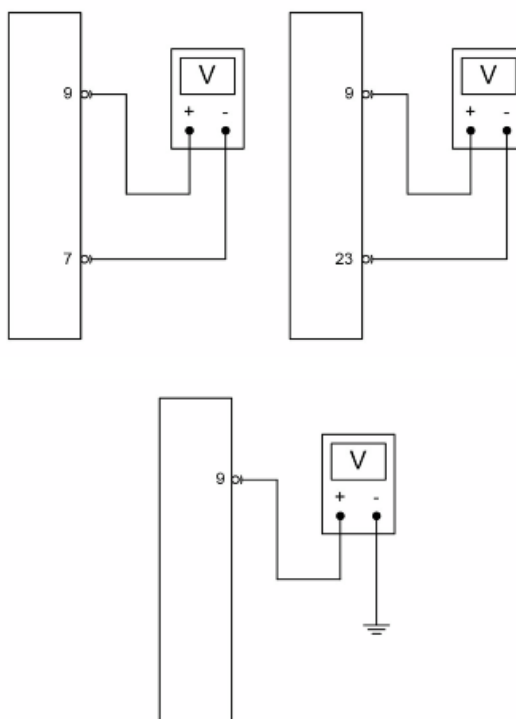
- an electronic control unit
- immobilizer antenna
- master key with built-in transponder
- service key with built-in transponder
- diagnosis LED

The diagnosis LED also works as a theft-deterrent blinker. This function is activated every time the key switch is set to «OFF» or the engine emergency cut-off switch is set to «OFF». It remains activated for 48 hours in order not to affect the battery charge. When the ignition switch is turned to «ON», the deterring blinker function is deactivated. Subsequently, a flash confirms the switching to «ON». The duration of the flash depends on the programming of the electronic control unit. If the LED is off regardless of the position of the ignition switch and/or the instrument panel is not initiated, check if:

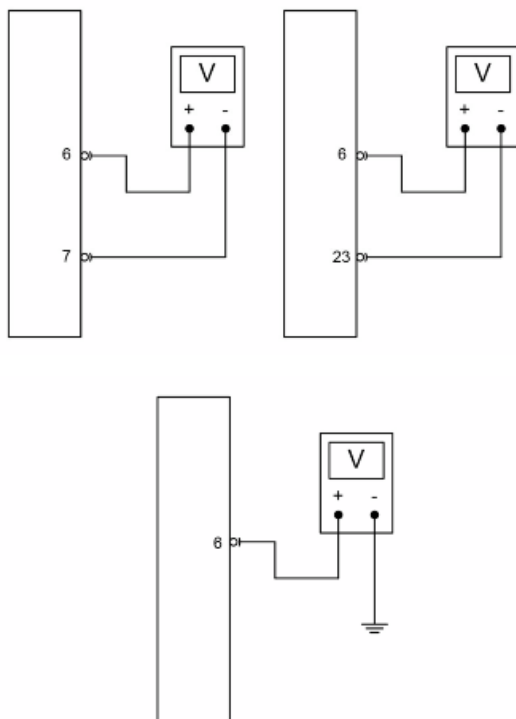
- there is battery voltage
- fuses 1, 3, 4, 6 are in working order
- there is power to the control unit as specified below:

With the key switch set to OFF:

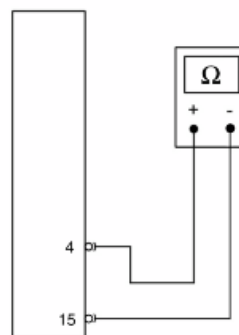
- if there is battery voltage between terminals 9-7, 9-23 and terminal 9-chassis ground (fixed power supply). If there is no voltage check that fuse 3 and its cable are in working order.

**With the key switch in the OFF position:**

if there is battery voltage between terminals 6-7, 6-23 and terminal 6-chassis ground (fixed power supply). If there is no voltage, check the key switch contacts, and that fuses no. 1 and 6 and their cable harnesses are in working order.



- Continuity tests between terminals 4 and 15 with the emergency switch set to «RUN». If there is no continuity check the contacts of the switch.



After removing the leg shield back plate, remove the electrical connection from the aerial 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 Orange-Blue and Black cables.

Virgin circuit

When the ignition system is not encrypted, any key will start the engine but limited to 2000 rpm. The keys can only be recognised if the control unit has been programmed properly. The data storage procedure for a previously not programmed control unit provides for the recognition of the Master as the first key to be stored to memory: 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, turn it to «ON» and keep this position for two seconds (lower and upper limits 1 to 3 seconds).
- Insert the service key and turn it to «ON» for 2 seconds.

- If you have copies of the key, repeat the operation with 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 7 service keys can be programmed at one time.

It is essential to adhere to the times and the procedure. If you do not, start again from the beginning.

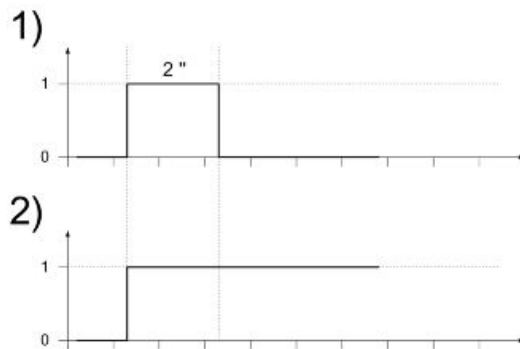
Once the system has been programmed, the Master key transponder is strictly matched with the control unit. With this link established, it is now possible to encode new service keys, in the event of losses, replacements, etc. Each new programming deletes the previous one; to add or delete a key it is therefore necessary to repeat the procedure using all the keys that you intend to keep in use. 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 resistor spark plugs.

Diagnostic codes

The Immobilizer system is tested each time the key 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 permanently ON; in this condition, no operations are possible, not even starting the vehicle.



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

4. Programmed control unit - Master key inserted: 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.

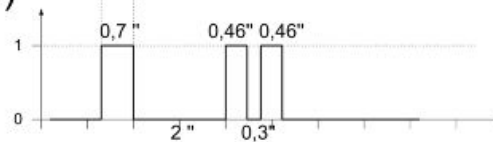
5. Programmed control unit - fault detected: a light code is displayed according to the fault detected, after which the LED remains on permanently. The engine cannot be started. The codes that can be transmitted are:

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

3)

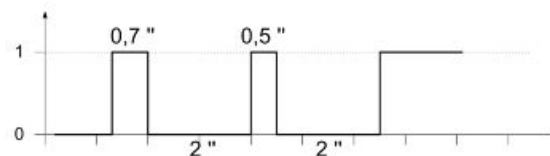


4)



Diagnostic code - 1 flash

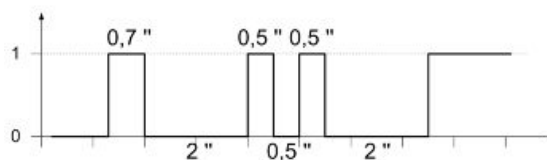
A one-flash code indicates a system where the serial line is not present or is not detected. Check the Immobilizer aerial wiring and change it if necessary.



Diagnostic code - 2 flashes

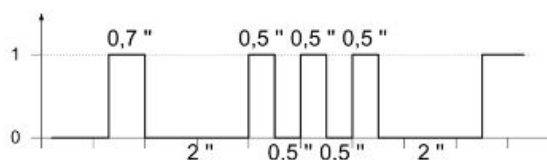
A two-flash code shows a system where the control unit does not show the transponder signal. This might depend on the inefficiency of the immobiliser aerial or the transponder.

Turn the switch to «ON» using several keys: if the code is repeated even with the Master key, check the aerial wiring and change it if necessary. If this is not the case, replace the defective key and/or reprogram the control unit.



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.



Ignition circuit

No spark plug

WARNING

ALL CONTINUITY TESTS MUST BE CARRIED OUT WITH THE CORRESPONDING CONNECTORS DISCONNECTED.

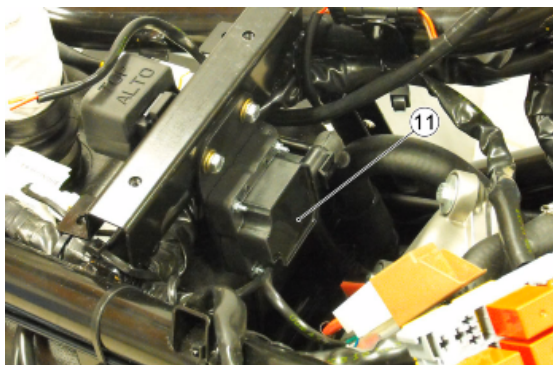
HV coil primary resistance value:

Disconnect the connector of the HV coil and measure the resistance between the two terminals.

Characteristic

HV coil resistance primary value:

~ 670 m Ω $\pm$ 10%



Battery recharge circuit

The charging circuit consists of three-phase alternator and a permanent magneto flywheel.

The generator is directly connected to the voltage regulator.

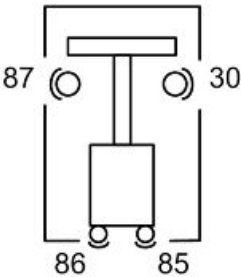
This, in its turn, is connected directly to the ground and the battery positive terminal passing through the 30A protective fuse.

The three-phase alternator provides good recharge power and at low revs a good compromise is achieved between generated power and idle stability.

Remote controls check

To check the operation of a solenoid:

- 1) Check that, given regular conditions, there is no continuity between terminals 87 and 30.
- 2) Apply a 12V voltage to power terminals 86 and 85 of the solenoid.
- 3) With the solenoid fed, check that there is continuity between terminals 87 and 30.
- 4) If these conditions are not met, the solenoid is surely damaged and, therefore, it should be replaced.



Switches check

To check buttons and switches, check that, according to their position, the continuity of contacts is correct as indicated in the following charts.

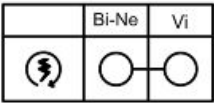
KEY

Ar: Orange Az: Sky Blue Bi: White Bl: Blue Gi: Yellow Gr: Grey Ma: Brown Ne: Black Ro: Pink Rs: Red Ve: Green Vi: Purple

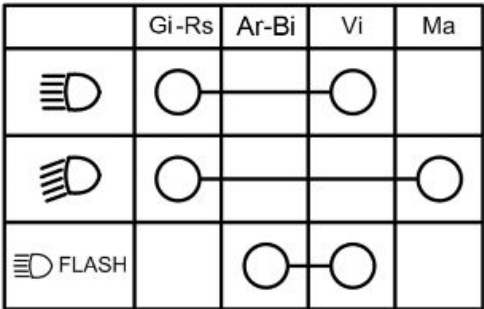
ENGINE STOP SWITCH

	Gr-Ve	Ar	

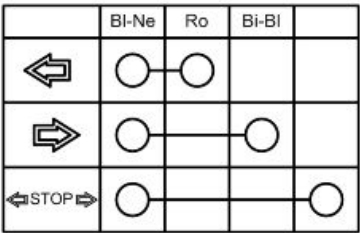
STARTER BUTTON



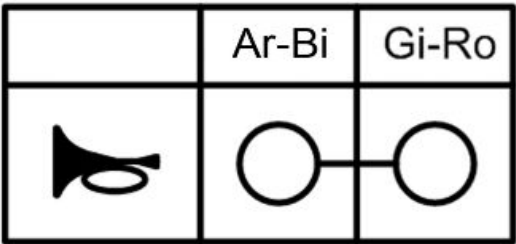
LIGHT SWITCH



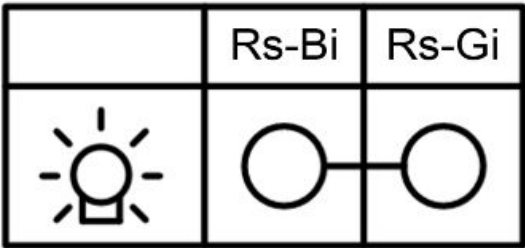
TURN INDICATOR SWITCH



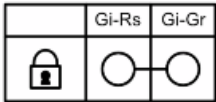
HORN BUTTON



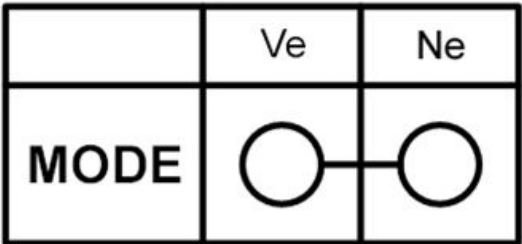
HELMET COMPARTMENT LIGHT SWITCH



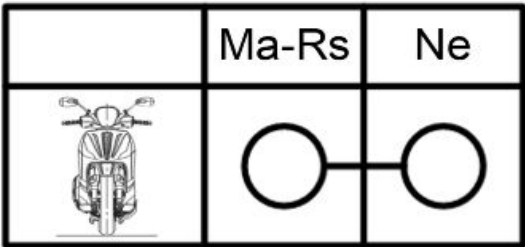
SADDLE OPENING SWITCH



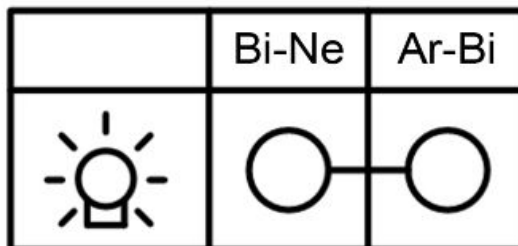
MODE BUTTON



STAND BUTTON



STOP BUTTONS



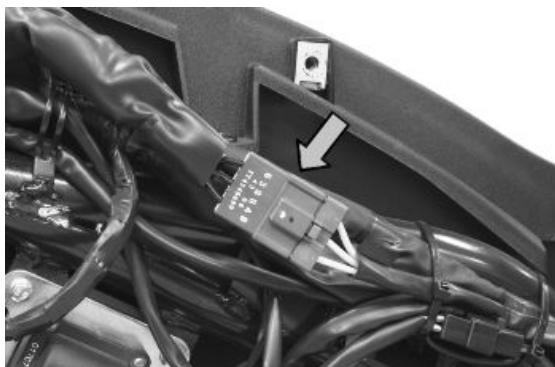
Stator check

Checking the stator windings

WARNING

THIS CHECK-UP CAN BE MADE WITH THE STATOR PROPERLY INSTALLED.

- 1) Remove the right side panel.
- 2) Disconnect the connector between stator and regulator with the three yellow cables as shown in the picture.
- 3) Measure the resistance between each of the yellow terminals and the other two.
- 4) Check that there is insulation between the each yellow cable and the ground.



Electric characteristic

Resistance:

0.2 - 1 Ω

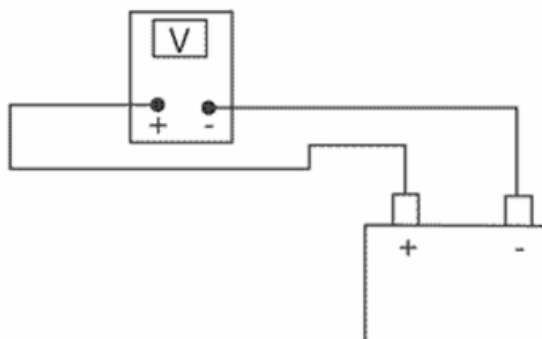
Voltage regulator check

With a perfectly charged battery and lights off, measure voltage at the battery poles with a high running engine.

Voltage should not exceed 15 Volt.

In case higher voltages are detected, replace the regulator.

In case of voltage values lower than 14 Volt, check the stator and the corresponding cable harness.



Characteristic

Voltage

14 ÷ 15V at 5,000 rpm with lights off

Recharge system voltage check

Look for any leakage

- 1) Access the battery by removing its cover under the saddle.
- 2) Check that the battery does not show signs of losing fluid before checking the output voltage.
- 3) Turn the ignition key to «OFF», connect the multimeter leads between the battery negative pole (-) and the Black cable. Only then disconnect the Black cable from the battery negative pole (-).
- 4) With the ignition key always «OFF», the reading indicated by the ammeter must be must be ≤ 0.5 mA.

Charging current check

WARNING

BEFORE CARRYING OUT THE CHECK, MAKE SURE THAT THE BATTERY IS IN GOOD WORKING ORDER.

- 1) Place the vehicle on its centre stand
- 2) With the battery correctly connected to the circuit, place the multimeter leads between the battery terminals..
- 3) Turn on the engine, increase the engine rpm and, at the same time, measure the voltage.

Characteristic

Voltage

14 ÷ 15V at 5,000 rpm with lights off

Maximum current output check.

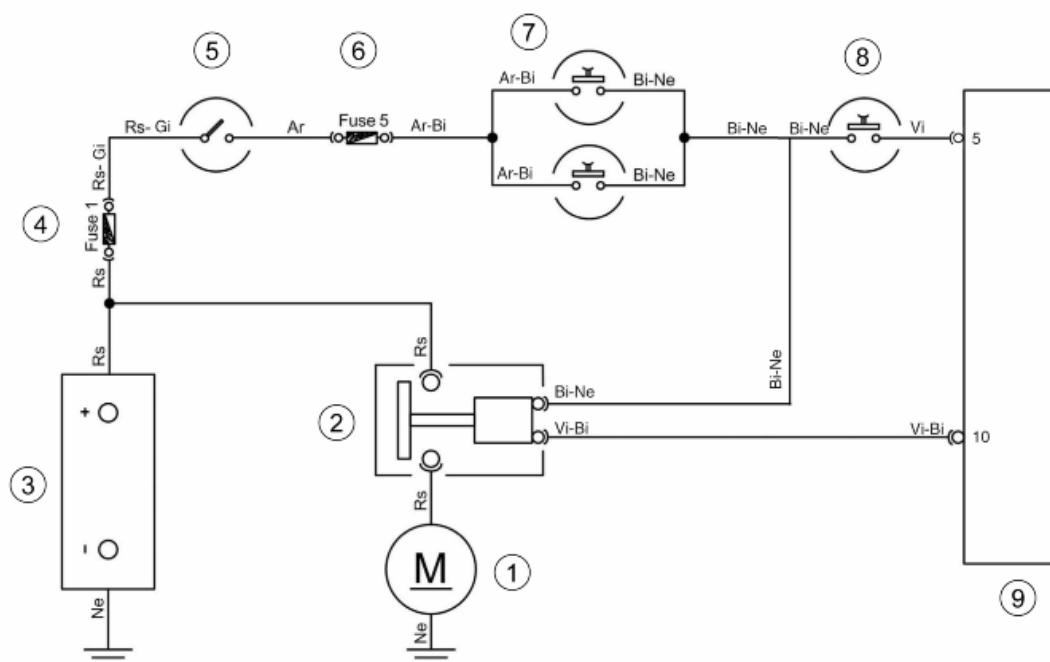
- With the engine off and the panel at «ON» with the lights on, allow the battery voltage to stop at 12V.
- Connect ammeter pliers to the 2 recharge positive poles in output from the regulator.
- Start the engine and rev it up to a high engine speed while reading the value on the pincer.

With an efficient battery a value must be detected: $> 20A$

VOLTAGE REGULATOR/RECTIFIER

Specification	Desc./Quantity
Type	Non-adjustable three-phase transistor
Voltage	14 ÷ 15V at 5,000 rpm with lights off

Starter motor



KEY

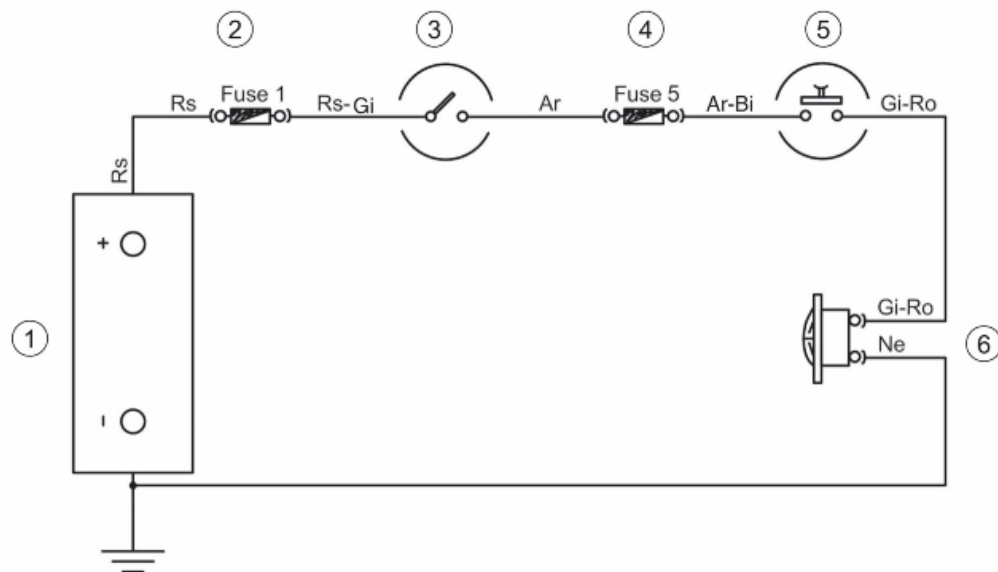
1. Starter motor
2. Starter relay
3. Battery
4. Fuse No. 1
5. Ignition switch contacts
6. Fuse No. 5
7. Stop buttons
8. Starter button
9. Injection ECU

WARNING

ALL CONTINUITY TESTS MUST BE CARRIED OUT WITH THE CORRESPONDING CONNECTORS DISCONNECTED.

- 1) Check if there is continuity of the Red cable connecting the battery, the start-up solenoid and the starter motor.
- 2) Check fuses No. 1 and 5, the ignition key contacts, the stop buttons and the starter button.
- 3) Check the start-up solenoid.
- 4) If components are in good condition, check that the cable harness connecting them is not interrupted.
- 5) Check if there is continuity of the Purple-White cable between the start-up relay and the control unit connector.

Horn control



KEY

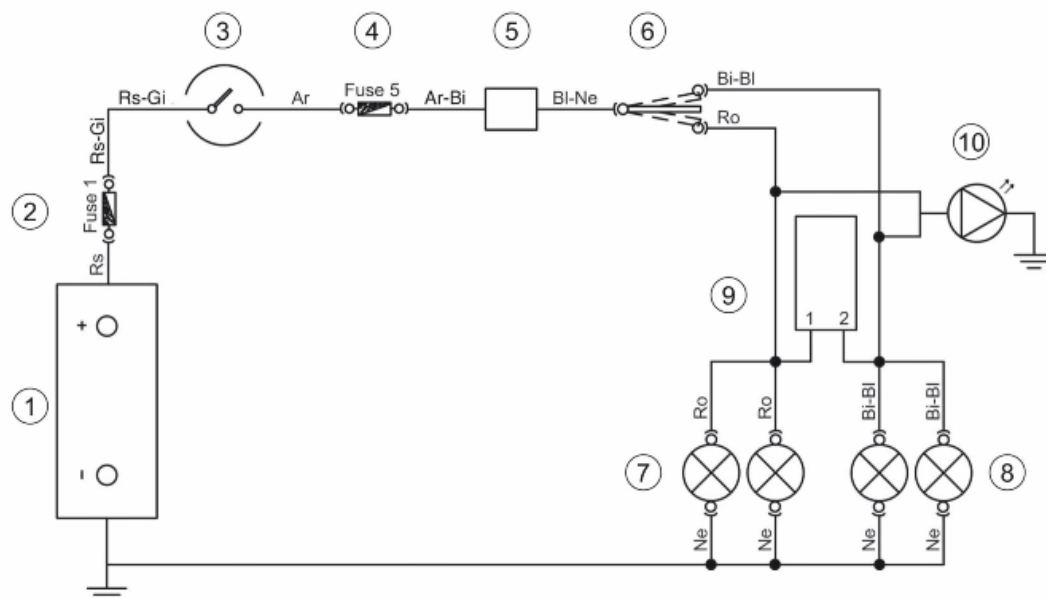
1. Battery
2. Fuse No. 1
3. Ignition switch contacts
4. Fuse No. 5
5. Horn button
6. Horn

WARNING

ALL CONTINUITY TESTS MUST BE CARRIED OUT WITH THE CORRESPONDING CONNECTORS DISCONNECTED.

- 1) Check fuses No. 1 and 5, the ignition key contacts and the horn button.
- 2) If the components are not damaged, check wiring for continuity.
- 3) Check that the Yellow-Pink cable between the horn and horn button is not interrupted.
- 4) Check that the Black cable of the horn is grounded.

Turn signals system check



KEY

1. Battery
2. Fuse No. 1
3. Ignition switch contacts
4. Fuse No. 5
5. Turn indicator control device
6. Turn indicator switch
7. Left turn indicators
8. Right turn indicators
9. Antitheft
10. Warning light bulb

WARNING

ALL CONTINUITY TESTS MUST BE CARRIED OUT WITH THE CORRESPONDING CONNECTORS DISCONNECTED.

- 1) Check the working order of bulbs.
- 2) Check fuses No. 1 and 5 and the ignition key contacts.
- 3) Check if there is intermittent voltage between the Blue-Black cable of the turn indicator control device and the ground connection.
- 4) If there is no voltage, check that the cable harness is not interrupted.
- 5) Check the turn indicator switch.
- 6) Check that the Blue-Black cable between the turn indicator control device and the turn indicator switch is not interrupted.

- 7) Check that the Pink and White-Blue cables connecting the bulbs and the turn indicator switches are not interrupted.
- 8) Check the bulbs ground connection.

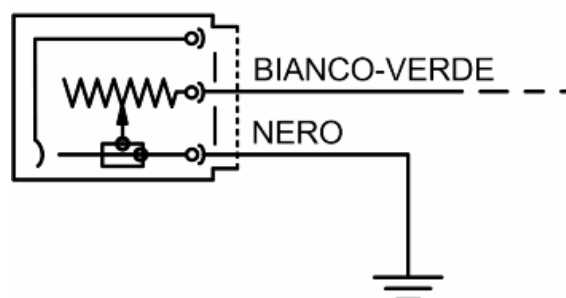
level indicators

WARNING

ALL CONTINUITY TESTS MUST BE CARRIED OUT WITH THE CORRESPONDING CONNECTORS DISCONNECTED.

If faults are detected:

- 1) With a multimeter, check resistance values between the White-Green cable and the Black cable of the fuel level transmitter by moving the arm with the float.
- 2) If the transmitter operates correctly but the indication on the instrument panel is not exact, check that the cable harnesses between them are not interrupted.



Electric characteristic

Resistance value when the tank is full

$\leq 7 \Omega$

Resistance value when the tank is empty

$90 \pm 13/-3 \Omega$

Lights list

BULBS

	Specification	Desc./Quantity
1	Low beam light bulb	Type: Halogen H7 Quantity: 1 Power: 12V - 55W
2	High beam light bulb	Type: Halogen H7 Quantity: 1 Power: 12V - 55W
3	Front tail light bulb	Type: LED Quantity: 1 Right - 1 Left Power: -
4	Front turn indicator light bulb	Type: Spherical BAU 15s Quantity: 1 Right - 1 Left Power: 12V - 10W
5	Stop light/rear daylight running light bulb	Type: LED Quantity: 1 Right - 1 Left Power: -
6	Rear turn indicator light bulb	Type: Spherical BAU 15s Quantity: 1 Right - 1 Left Power: 12V - 10W
7	License plate light bulb	Type: All glass W5W Quantity: 1 Power: 12V - 5W

	Specification	Desc./Quantity
8	Helmet compartment light bulb	Type: Cylindrical C5W Quantity: 1 Power: 12V - 5W
9	Instrument panel lighting bulb	Type: LED Quantity: 4 Power: -

Line for daylight running lights and instrument panel lighting line

In the event of a malfunction, check:

- Efficiency of the bulbs
- Fuses No. 1 and 5
- Ignition key contacts
- Cable harness continuity

High beam/low beam light line

In the event of a malfunction, check:

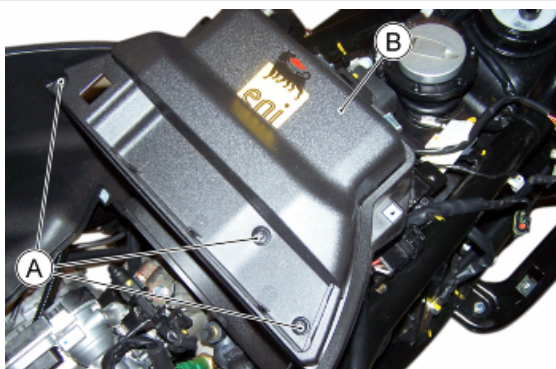
- Efficiency of the bulbs
- Light switch
- Headlight from solenoid
- Fuses No. 1, 4, 5 and 6
- Ignition key contacts
- Cable harness continuity

Fuses

The electrical system is equipped with a 30A main fuse, located on the start-up relay and 5 protection fuses located under the saddle. Open the saddle as described above.

Unscrew the three screws «A» and remove the cover «B»

The chart shows the position and specifications of the fuses in the vehicle.



CAUTION



BEFORE REPLACING A BLOWN FUSE, FIND AND SOLVE THE FAILURE THAT CAUSED IT TO BLOW. NEVER TRY TO REPLACE THE FUSE WITH ANY OTHER MATERIAL (E.G., A PIECE OF ELECTRIC WIRE).

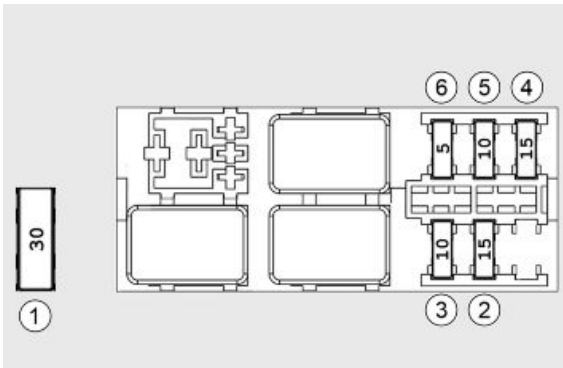
CAUTION



MODIFICATIONS OR REPAIRS TO THE ELECTRICAL SYSTEM, PERFORMED INCORRECTLY OR WITHOUT STRICT ATTENTION TO THE TECHNICAL SPECIFICATIONS OF



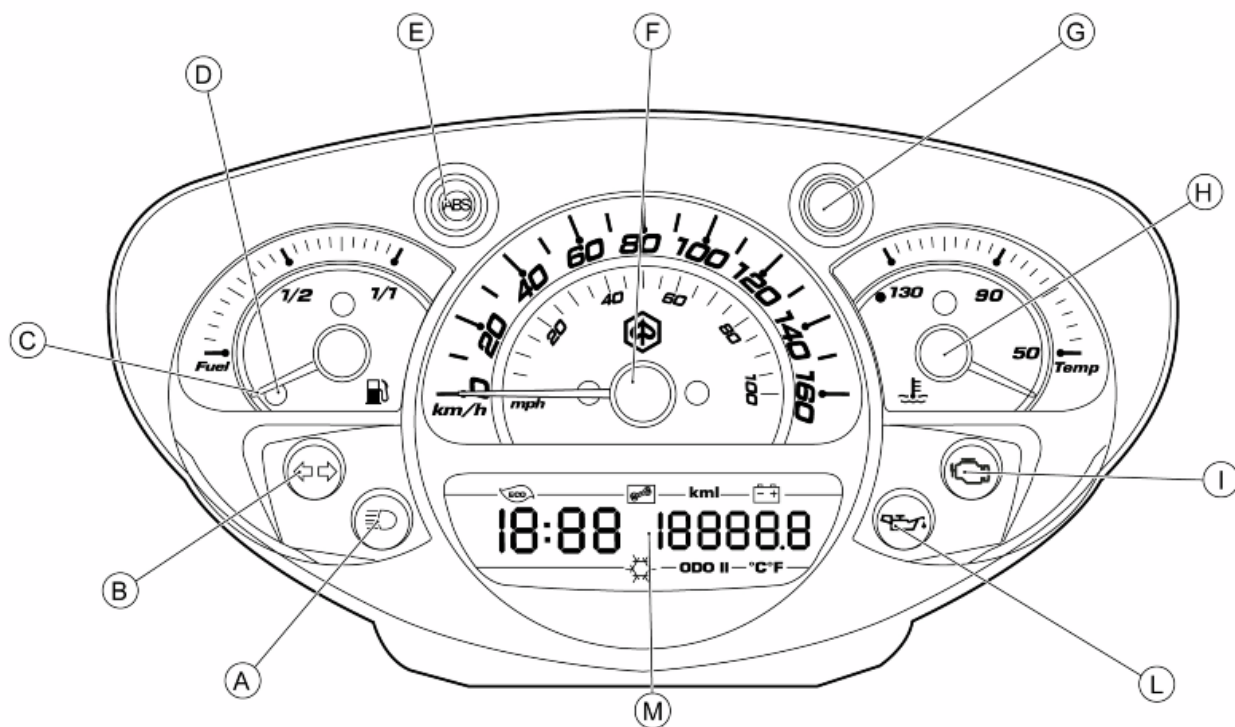
THE SYSTEM CAN CAUSE MALFUNCTIONING AND RISK OF FIRE.



FUSES

Specification	Desc./Quantity
Fuse No. 1	Capacity: 30 A Protected circuits: general, recharge battery Live: fuses No. 5 and 6
Fuse No. 2	Capacity: 15 A Protected circuits: battery-powered: antitheft pre-installation, saddle release control unit pre-installation, electric fan relay (contact)
Fuse No. 3	Capacity: 10 A Protected circuits: electronic control unit, injection load solenoid, (contact)
Fuse No. 4	Capacity: 15 A Protected circuits: battery-powered headlight relay (contact), instrument panel, battery-powered LV socket, helmet compartment bulb, key powered saddle release actuator
Fuse No. 5	Capacity: 10 A Protected circuits: key powered: antitheft pre-installation, saddle release control unit pre-installation, turn indicator control device, high-beam flash, instrument panel, daylight running lights, horn, stop lights, start-up enabling switch, license plate light
Fuse No. 6	Capacity: 5A Protected circuits: Protected circuits: headlight relay key powered (coil), immobilizer antenna, electronic control unit, injection load solenoid (coil)

Dashboard



- A= High beam warning light
- B = Turn indicator warning lights
- C = Fuel gauge
- D = Low fuel warning light
- E = ABS warning light (if present)
- F= Speedometer
- G = Immobilizer LED
- H = Coolant temperature gauge
- I = Engine control telltale light
- L = Engine oil pressure warning light
- M = Digital display

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

10 to 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 YOUR EYES, SKIN AND CLOTHING. IN CASE OF CONTACT WITH YOUR EYES OR SKIN, RINSE WITH ABUNDANT WATER FOR ABOUT 15 MINUTES 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.

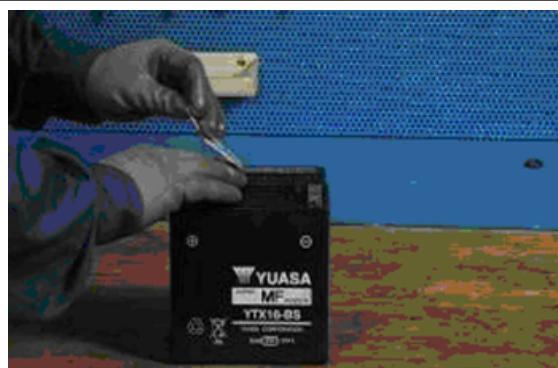
BATTERIES PRODUCE EXPLOSIVE GASES; KEEP CLEAR OF NAKED FLAMES, SPARKS OR CIGARETTES; VENTILATE THE AREA WHEN RECHARGING INDOORS.

ALWAYS PROTECT YOUR EYES WHEN WORKING CLOSE TO BATTERIES.

KEEP OUT OF THE REACH OF CHILDREN

1) Battery preparation

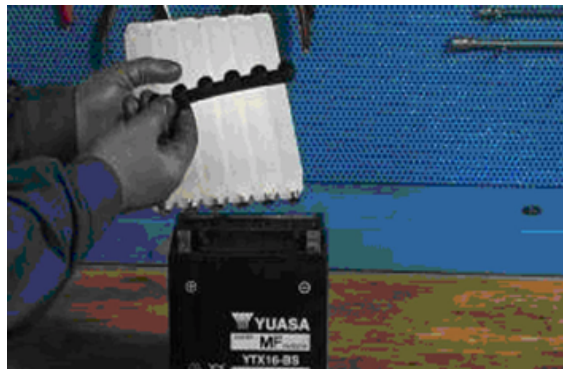
Position the battery on a flat surface. Remove the adhesive sheet closing cells and proceed as quickly as possible to run the subsequent activation phases.



2) Electrolyte preparation.

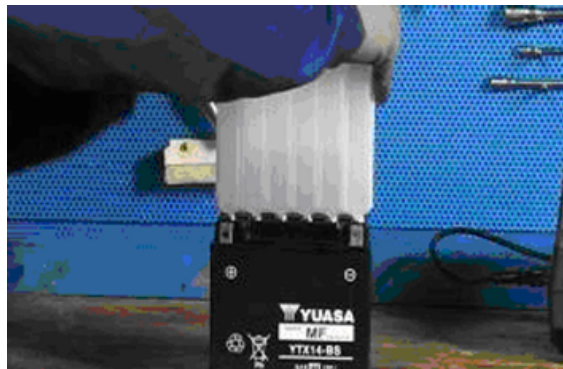
Remove the container of the electrolyte from the pack. Remove and preserve cover strips from the container, in fact, the strip will later be used as a closing cover.

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. Now, gently pull the container out from the battery, only do this when the container is completely empty, and proceed immediately to the next point.

6) 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.

Place the battery down for 1 to 2 hours prior to the charging from the battery.

7) 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 no-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

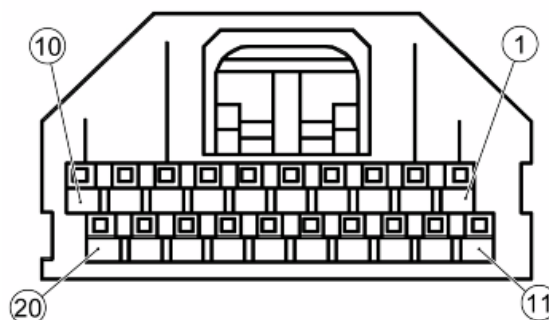


i - The battery is now completely activated, disconnect the battery charger from the fuel supply grid, disconnect the clamps from the battery and proceed to fitting the battery on the vehicle.

Connectors

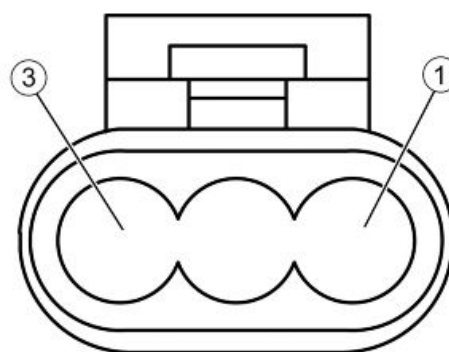
INSTRUMENT PANEL CONNECTOR

1. Oil pressure sensor (White)
2. P.B. Mode (Green)
3. Left turn indicator warning light (Pink)
4. Right turn indicator warning light (White-Blue)
5. High-beam warning light (Purple)
6. Not connected
7. Not connected
8. Ground speed sensor (Black-Purple)
9. Not connected
10. Fuel system speed sensor (Brown)
11. Air temperature sensor (Yellow-Blue)
12. Low fuel warning light (White-Green)
13. Engine temperature sensor (Yellow-Red)
14. Speed sensor (Grey)
15. Not connected
16. Injection warning light (Brown-White)
17. Ground lead (Black)
18. Immobilizer (Yellow)
19. Ignition switched live power supply (Orange-White)
20. Battery-powered (Red-Blue)



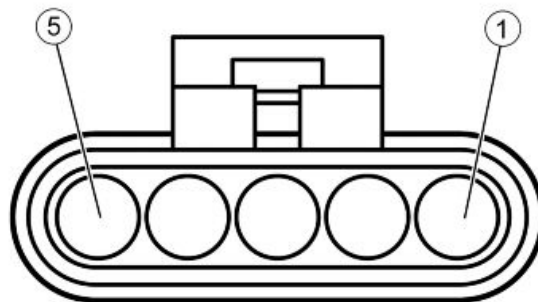
IMMOBILIZER ANTENNA CONNECTOR

1. Ignition switched live (Orange-Blue)
2. Ground lead (Black)
3. Injection ECU (Orange-White)

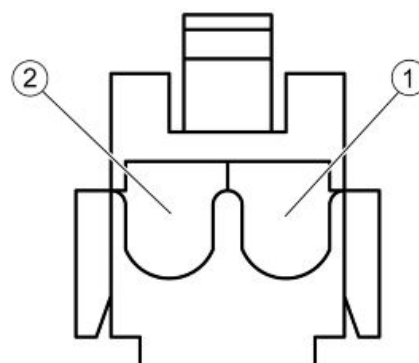


FUEL PUMP CONNECTOR

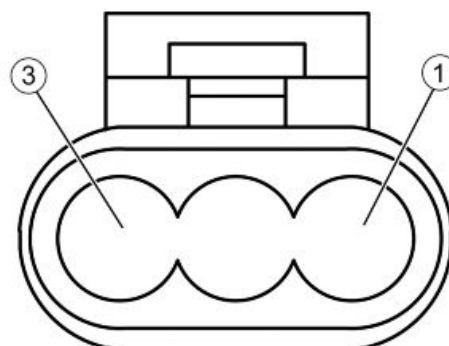
1. Not connected
2. Ground lead (Black)
3. Not connected
4. Not connected
5. Power from relay (Black-Green)

**ELECTRIC FAN CONNECTOR**

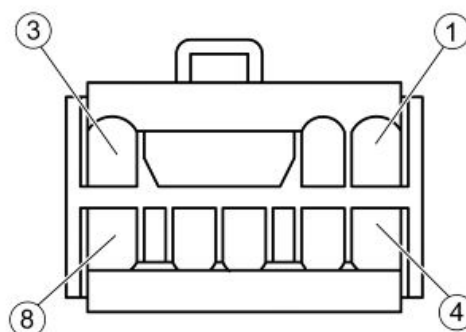
1. Ground lead (Black)
2. Fuel system via relay (Red-Green)

**PICKUP CONNECTOR**

1. Engine speed sensor ECU positive (Red)
2. Engine speed sensor ECU negative (Brown)
3. Oil pressure sensor (White)

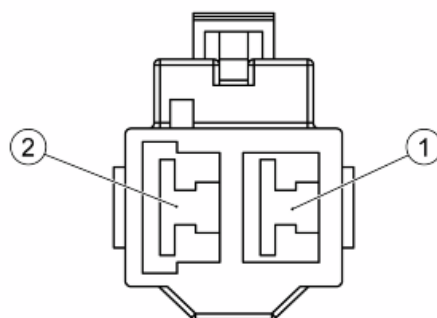
**ANTITHEFT DEVICE PRE-INSTALLATION CONNECTOR**

1. Left turn indicator bulbs (Pink)
2. Right turn indicator bulbs (White-Blue)
3. Ground lead (Black)
4. Battery-powered (Red-Black)
5. Ignition switched live (Orange-White)
6. Helmet compartment light (Red-Yellow)
7. Channel selection (Green-Blue)
8. Serial line (Orange-Black)

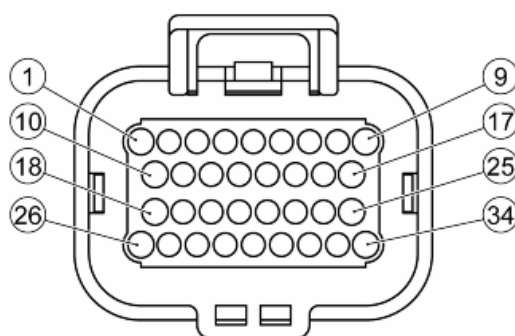


VOLTAGE REGULATOR CONNECTOR

1. Battery positive (Red-Yellow)
2. Ground lead (Black)

**INJECTION ELECTRONIC CONTROL UNIT CONNECTOR**

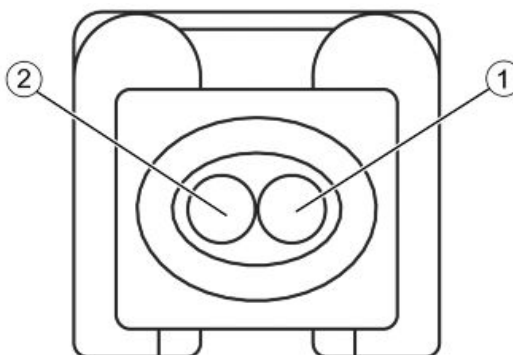
1. AT Coil - (Red-Black)
2. Not connected
3. Rollover protection switch (Grey - Black)
4. Engine switch (Orange)
5. Starter switch (Purple)
6. + Key (Orange - Blue)
7. Ground 1 (Black)
8. Not connected
9. + Battery (Red - White)
10. Start-up enabling switch (Purple-White)
11. Lambda probe + (Green - Blue)
12. Lambda probe - (Light Blue - Black)
13. Water temperature sensor (Sky blue-Green)
14. Antenna (Orange-White)
15. Ground sensors (Grey-Green)
16. Diagnostic K line (Orange - Black)
17. Immobilizer LED (Yellow)
18. Not connected
19. Side stand (Brown - Red)
20. Engine speed sensor (Brown)
21. Not connected
22. Injection loads relay (Black-Purple)
23. Ground 2 (Black)
24. Electric fan relay (Green-White)
25. Injection telltale light LED (Brown - White)
26. Not connected
27. Not connected



- 28. Not connected
- 29. Engine rpm sensor + (Red)
- 30. Not connected
- 31. Not connected
- 32. Not connected
- 33. Lights relay (White - Black)
- 34. Injector (Red-Yellow)

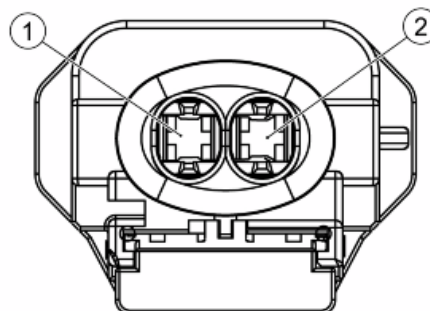
INJECTOR CONNECTOR

- 1. Power from relay (Black-Green)
- 2. Negative from control unit (Yellow-Red)



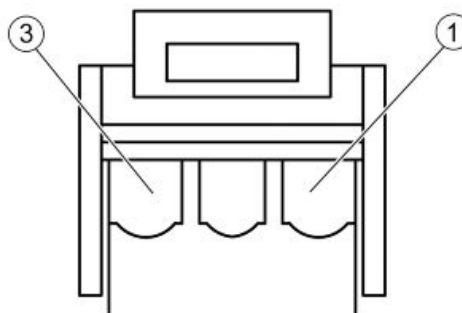
HV COIL CONNECTOR

- 1. Negative from control unit (Red-Black)
- 2. Power from relay (Black-Green)



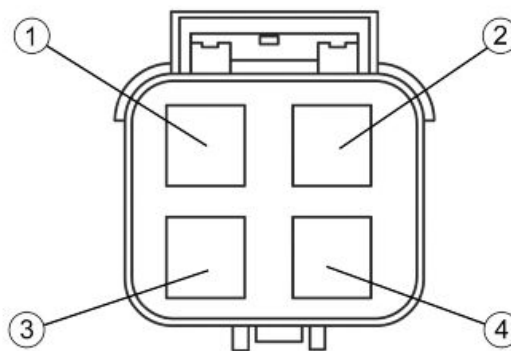
FUEL LEVEL TRANSMITTER CONNECTOR

- 1. Fuel level indicator (White-Green)
- 2. Ground lead (Black)



COOLANT TEMPERATURE SENSOR CONNECTOR

1. Injection ECU (Sky blue-Green)
2. Instrument panel (Yellow-Red)
3. Ground lead (Grey-Green)
4. Ground lead (Black)



Diagnostic instrument

STARTER COMMAND

Function

Commands engine starting through the injection control unit.

Operation / Operating principle

The starter button, the brake switches, the starter command relay and the injection control unit between PIN 5 and 10 are involved.

ELECTRICAL ERRORS

Starter command P0170 - shorted to positive.

Error cause

Shorted to positive: excessive voltage at PIN 10 of the control unit connector.

Troubleshooting

Short circuit to positive:

- This malfunction is detected with a brake activated and the starter button pressed (voltage of 12V read at PIN 5)
- If the battery voltage does not drop (thanks to the absorption of the starter command relay excitation coil) the control unit understands that PIN 10 is shorted to battery.
- Restore the cabling (if the short is in the cabling) or the relay (if the short is in the relay).

ENGINE TEMPERATURE SENSOR

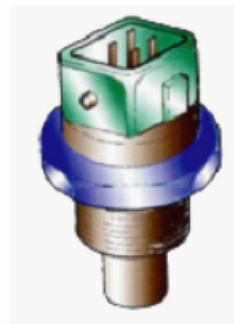
Function

Serves the purpose of communicating the engine temperature to the control unit in order to optimise performance.

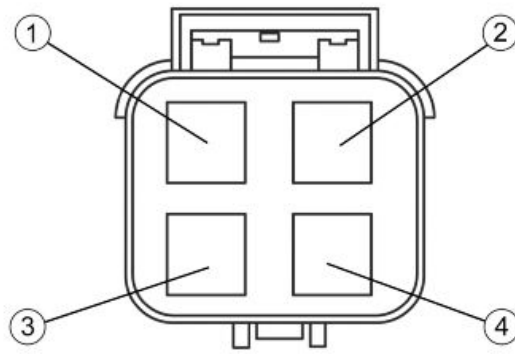
Operation / Operating principle

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

Pinout:



1. Injection ECU
2. Instrument panel
3. Control unit ground
4. Ground lead



Engine temperature sensor P0115 - open circuit or shorted to positive / shorted to negative.

Error cause

Open circuit or shorted to positive: interruption of the circuit or excessive voltage at PIN 13 of the control unit connector. Shorted to negative: null voltage between PIN 13 and 15 of the control unit connector.

Troubleshooting

Open circuit:

- Disconnect the connector of the control unit.
- Measure the resistance value of the sensor at different temperatures between PIN 13 and 15.
- Disconnect the sensor connector.
- Verify continuity of the cabling between the sensor connector and the control unit connector: Control unit PIN 13 - sensor PIN 1 and control unit PIN 15 - sensor PIN 3. Restore the cabling if necessary.
- If the cabling is intact but the sensor resistance value is incorrect, this means that the sensor is faulty and must be replaced, otherwise proceed with the checks.

Short circuit to positive:

- With the sensor connector and the control unit disconnected, verify that the fault is shorted with the battery positive of sensor connector PIN 1 (or control unit PIN 13) and restore the cabling.

Short circuit to negative:

- Disconnect the sensor connector.
- Check the sensor connector PIN 1 ground insulation.
- If there is no ground insulation restore the cabling.
- If PIN 1 is insulated from the ground and the error persists, this means that there is a probable fault in the control unit.

LAMBDA PROBE

Function

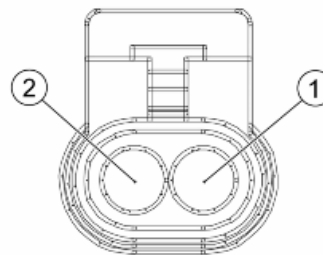
In charge of telling the control unit whether the mixture is lean or rich.

Operation / Operating principle

Based on the difference of oxygen in the exhaust fumes and the environment, this generates voltage which is read and interpreted by the injection control unit.

Pinout:

1. Signal to the control unit (+)
2. Signal to the control unit (-)



ELECTRICAL ERRORS

Check the air-fuel ratio / Lambda probe P0130 - short circuit to positive / open circuit, short circuit to negative or carburetion excessively lean / signal not plausible for abnormal title correction or probe signal fault.

Error cause

Short circuit to positive: excessive voltage to PIN 11 or PIN 12 of the control unit connector. Open circuit or short circuit to negative: interruption of the circuit or zero voltage between the pins 11 and 12 of the control unit connector.

Troubleshooting

Short circuit to positive:

- Disconnect the control unit connector and the sensor connector.
- Verify that there is no short circuit with the battery positive on the PIN 1 of the sensor connector (corresponding to the PIN 11 of the control unit connector); in the presence of short circuit, restore the cable harness.
- Verify that there is no short circuit with the battery positive on the PIN 2 of the sensor connector (corresponding to the PIN 12 of the control unit connector); in the presence of short circuit, restore the cable harness.

Open circuit:

- Disconnect the control unit connector and the sensor connector.
- Check the continuity of the cable harness between the sensor connector and control unit connector: PIN 11 of the control unit - PIN 1 of the sensor and PIN 12 of the control unit - PIN 2 of the sensor. If necessary, restore the cable harness.
- If the cable harness is intact and the error persists, proceed with the following checks.

Short circuit to negative:

- Disconnect the sensor connector and the control unit connector.

- Check the insulation from the ground of PIN 1 of the sensor connector. If there is no insulation, restore the cable harness.
- Check the insulation from the ground of PIN 2 of the sensor connector. If there is no insulation, restore the cable harness.
- If PIN 1 and 2 are insulated from ground and the error persists, it means that there is a probable defect in the control unit.

INJECTOR

Function

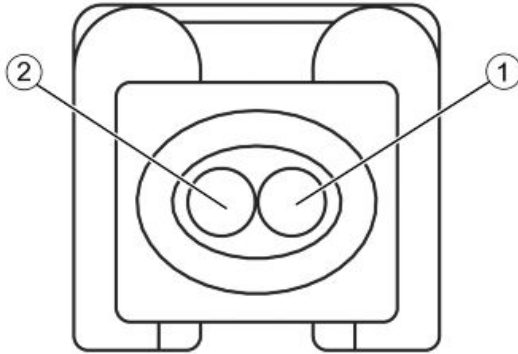
Provide the correct amount of fuel at the correct time.

Operation / Operating principle

Injector coil is excited for the petrol passage to open.

Pinout:

1. Power from relay
2. Ground from control unit



ELECTRICAL ERRORS

Injector P0201 - short circuit to positive / short circuit to negative / open circuit.

Error cause

Short circuit to positive: excessive voltage to PIN 34 of the control unit connector.

Short circuit to negative: zero voltage to the PIN 1 of the injector connector.

Open circuit: circuit interruption.

Troubleshooting

Short circuit to positive:

- Disconnect the injector connector, turn ignition switch to ON and activate the component using the diagnostic tool.
- Verify the absence of voltage at the injector connector PIN 2; if present restore the cable harness, otherwise proceed with the following checks.

Short circuit to negative:

- Disconnect the injector connector, turn ignition switch to ON and activate the component using the diagnostic tool.
- Verify the presence of voltage at the ends of the injector connector; if there is no voltage, restore the cable harness, otherwise proceed with the following checks.

Open circuit:

- Perform the check of the injector and control unit connectors.

- Verify continuity of the cable harness between the control unit connector and the injector connector (control unit PIN 34 - injector PIN 2). If there is no continuity, restore the cable harness.

FUEL PUMP

ELECTRICAL ERRORS

Fuel pump relay P0230 - shorted to positive / shorted to negative / open circuit.

Error cause

Shorted to positive: excessive voltage at PIN 22 of the control unit connector.

Shorted to negative: null voltage at PIN 85 of the injection relay.

The circuit is open: interruption of the circuit.

Troubleshooting

Shorted to positive:

- Disconnect the injection relay (No. 58 on the electrical circuit diagram), turn the key to the ON position and activate the relay through the diagnostics instrument.
- Verify the presence of voltage between relay connector PIN 86 and 85 toward the cabling.
- If no voltage is read, disconnect the control unit and verify insulation from battery positive of the relay PIN 86 (or control unit PIN 22). Restore the cabling if necessary.

Shorted to negative:

- Disconnect the injection relay (No. 58 on the electrical circuit diagram) and the control unit.
- Verify ground insulation of the relay connector PIN 86 and 85 toward the cabling: if there is no insulation, restore the cabling.

The circuit is open:

- Disconnect the injection relay (No. 58 on the electrical circuit diagram) and the control unit.
- Verify continuity of the cabling between the relay and control unit: Relay PIN 86 - control unit PIN 22. Restore the cabling if necessary.

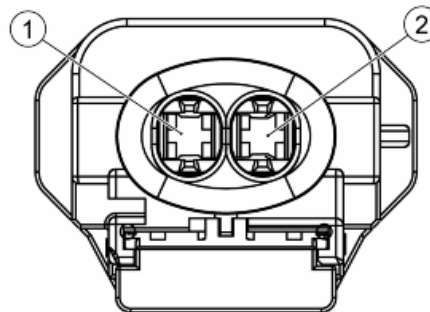
COIL

Function

Allows generation of the electrical discharge on the spark plug, with an increase of voltage.

Pin-out:

1. Activation by control unit (control unit side PIN 1)
2. Relay powered (PIN 87 relay side)



ELECTRICAL ERRORS

H.V. Coil P0351 - shorted to positive / open circuit or shorted to negative.

Error cause

Shorted to positive: excessive voltage at PIN 1 of the control unit connector.

Circuit open or shorted to negative: interruption of the circuit or null voltage at PIN 1 of the control unit connector.

Troubleshooting

Shorted to positive:

- Disconnect the coil connector, turn the key to ON and activate the component through the diagnostics instrument.
- Verify the presence of voltage on the coil connector PIN 1: if present, restore the cabling, otherwise replace the coil.

The circuit is open:

- Carry out the check procedure of the coil and control unit connectors.
- Verify continuity of the cabling between the coil and control unit: Coil PIN 1 - control unit PIN 1. In the absence of continuity restore the cabling.
- Verify, with the key turned ON, the presence of voltage on the coil connector PIN 2: If no voltage is read, verify the continuity of the cabling between coil and injection relay (No. 35 on the electrical circuit diagram): Coil PIN 2 - relay PIN 87.
- If the above tests provided a positive result, the coil should be replaced.

Shorted to negative:

- Disconnect the control unit connector and the coil connector.
- Verify the coil connector PIN 1 ground insulation (or control unit connector PIN 1). Restore the cabling if necessary.

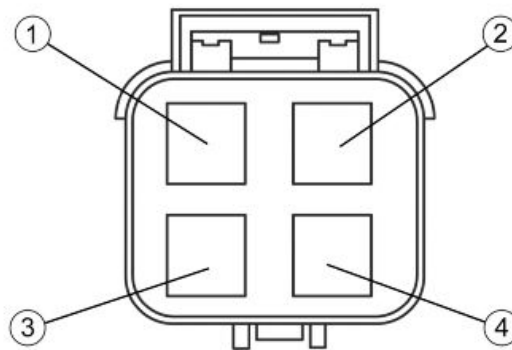
ELECTRIC FAN CIRCUIT

Function

Radiator fan and coolant - Operation. Operation / Principle of operation The control unit closes the fan control relay excitation circuit to ground until the temperature drops.

Pin-out:

1. Injection ECU (Sky blue-Green)
2. Instrument panel (Yellow-Red)
3. Ground lead (Grey-Green)
4. Ground lead (Black)



ELECTRICAL ERRORS

Fan relay P0480 - shorted to positive / shorted to negative / open circuit.

Error cause

Shorted to positive: excessive voltage at PIN 24 of the control unit connector.

Shorted to negative: null voltage at PIN 24 of the control unit connector.

The circuit is open: interruption of the circuit.

Troubleshooting

Shorted to positive:

- Disconnect the fan control relay (No. 45 on the electrical circuit diagram) and, turning the key to the ON position, measure the voltage read at the relay connector PIN 85 toward the cabling: if the voltage is 12V restore the cabling. If the voltage is zero replace the relay.

Shorted to negative:

- Disconnect the fan control relay (No. 45 on the electrical circuit diagram) and the control unit.
- Verify ground insulation of the cable between the fan control relay (PIN 85) and the control unit (PIN 24). Restore the cabling if necessary.

The circuit is open:

- Carry out the check procedure of the control unit and relay connectors.
 - Verify electrical continuity of the cable between the relay connector (PIN 85) and the control unit connector (PIN 24).
 - Verify electrical continuity of the cable between the relay connector (PIN 30) and the secondary fuse holders.
 - Verify continuity between relay PIN 85 and PIN 86. If there is no continuity replace the relay.
-

INDEX OF TOPICS

ENGINE FROM VEHICLE

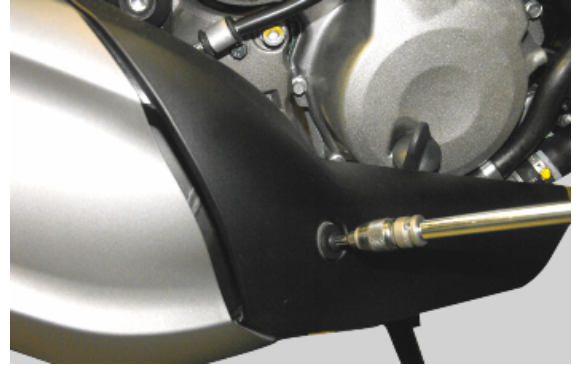
ENG VE

This section describes the operations to carry out when removing the engine from the vehicle.

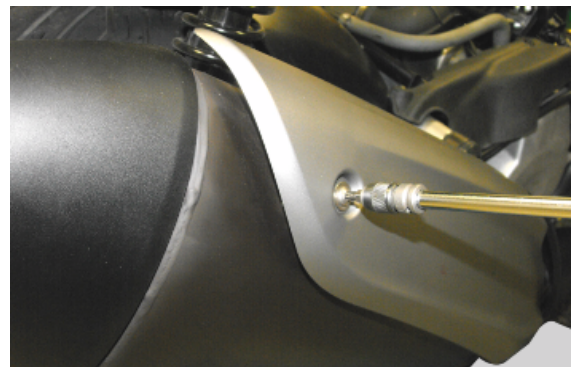
Exhaust assy. Removal

SILENCER REMOVAL

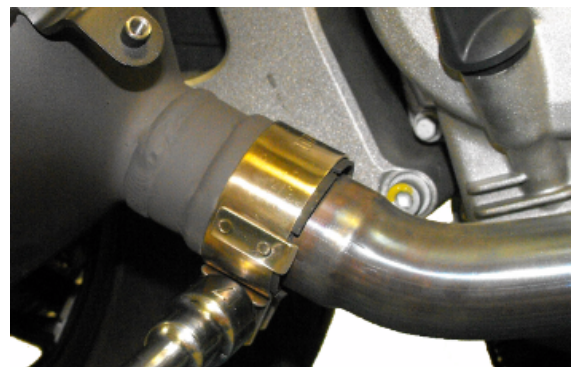
- Undo the front screw.



- Unscrew the rear screw and remove the heat shield.



- Loosen the silencer clamp and remove towards the front.



- While supporting the silencer, loosen the three fixing screws and retrieve their collars.
- Remove the silencer.



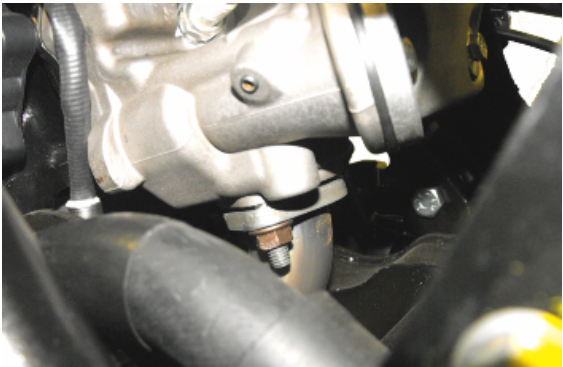


REMOVAL OF EXHAUST MANIFOLD

- Remove the exhaust silencer.
- Remove the right rider footrest.
- Disconnect the lambda probe connector.



- 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.



FITTING

To fit, follow the removal steps but in reverse order; be careful to tighten to the specified torques.

N.B.
ALWAYS REPLACE THE GRAPHITE BUSHING BETWEEN THE MANIFOLD AND THE SILENCER.

SILENCER

Name	Torque in Nm
Silencer heat guard fixing screw	(2.95÷3.68)lb ft (4÷5)Nm
Screw for fixing silencer to supporting arm	(14.75÷18.43)lb ft (20÷25)Nm
Lambda probe tightening on exhaust manifold	(29.50÷36.87)lb ft (40÷50)Nm
Exhaust manifold-silencer clamp tightening	(8.85÷9.58)lb ft (12÷13)Nm
Nuts fixing the exhaust manifold to the head	(11.80÷13.27)lb ft (16÷18)Nm
Joint pipe	(Setting load 440.92-1322.77 lb - LOCTITE 603) (Setting load 200-600 Kg - LOCTITE 603)

Removal of the engine from the vehicle

- Position the vehicle on the centre stand to be able to adequately support it with belts and hoist on the front and rear side.
- Place a suitable support under the engine.
- Empty the cooling system.
- Remove the complete exhaust, the helmet compartment, the rear side fairings, footrests, rear wheel, rear mudguard, the starter motor and the filter box, exhaust support bracket.



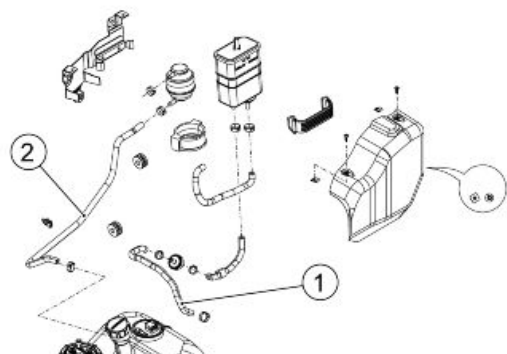
- Release the left shock absorber by screwing the lower tightening screw.



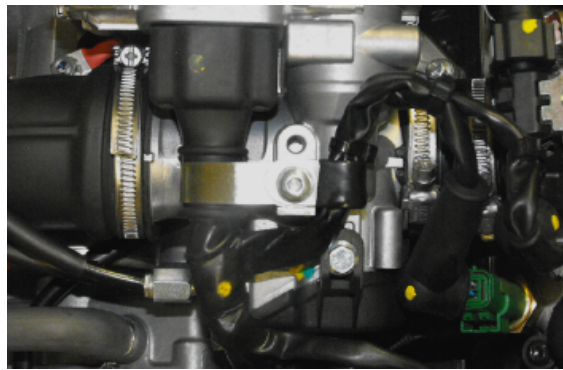
- Remove the engine ground on the left side.



- Releasing the clamps, remove the Canister safety valve vacuum pipe (1) and the vapour recovery pipe (2).



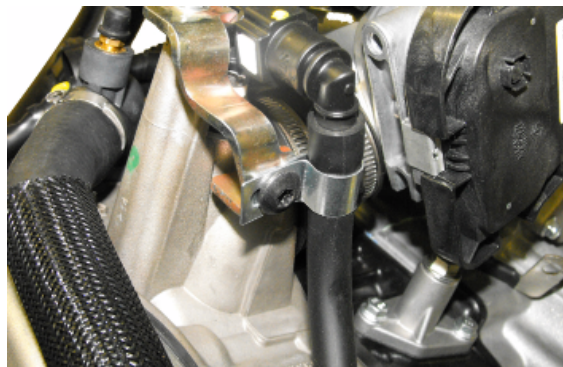
- Remove the screw and the cable grommets.



- Unscrew the two fixing screws and slide off the thermostat.



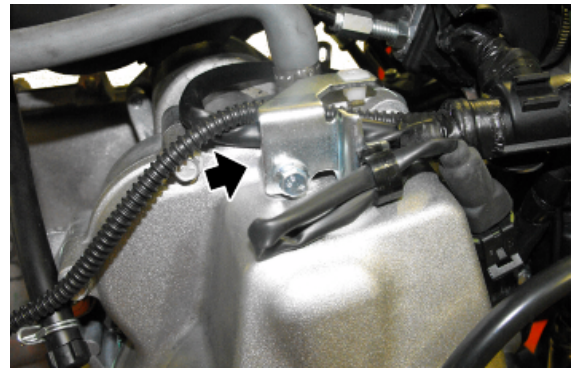
- Loosen the fixing screw and release the injector cable from the cable grommet.



- Disconnect the injectors and the head temperature sensor.



- Loosen the fixing screw and remove the cable grommets on the right side of the vehicle.



- Disconnect the oil pressure sensor.

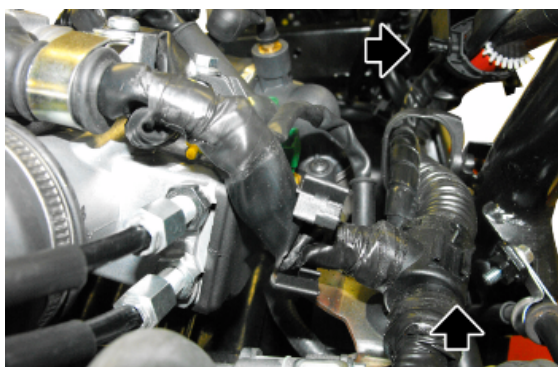
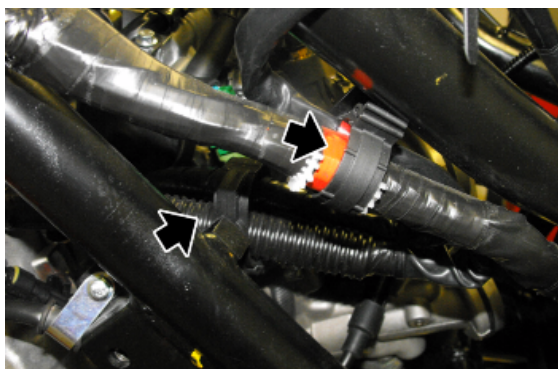


- Disconnect the lambda probe connector.

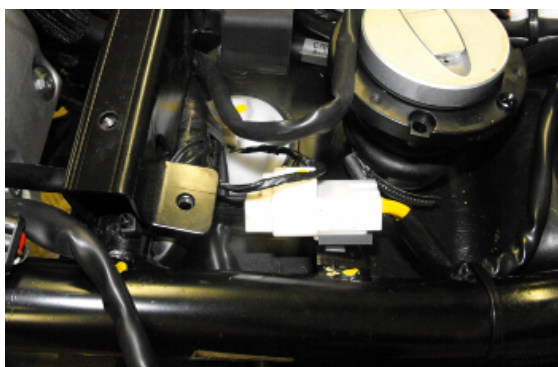


- Operating on the right side of the vehicle, release the electrical system from the clamps and cable grommets.





- Disconnect the regulator connector.



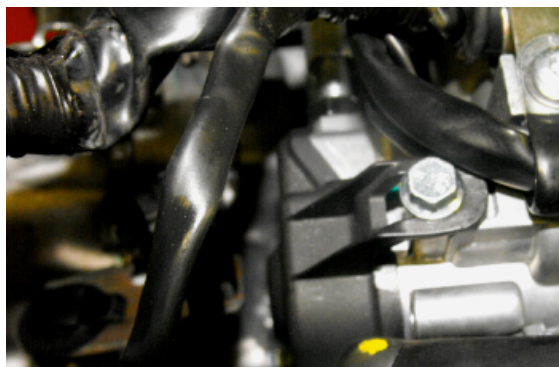
- Working from the right side of the chassis, disconnect the pick-up connector.



- Disconnect the coil connector



-
- Unscrew the screw and remove the throttle grip cables cover.



-
- Loosen the adjuster screws and disconnect the throttle grip cables.



-
- Operating on the right side of the vehicle, tighten the nut and retrieve the washer.
 - Remove the pin from the left side.



- Operating with care and with the necessary precautions, remove the engine from the vehicle.
 - If necessary, remove the swinging arm as described in the section "Suspensions/Swinging arm".
- When refitting the engine onto the vehicle, carry out the removal operations but in reverse order and respect the tightening torques shown in the Specifications Chapter.

- 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.

CAUTION

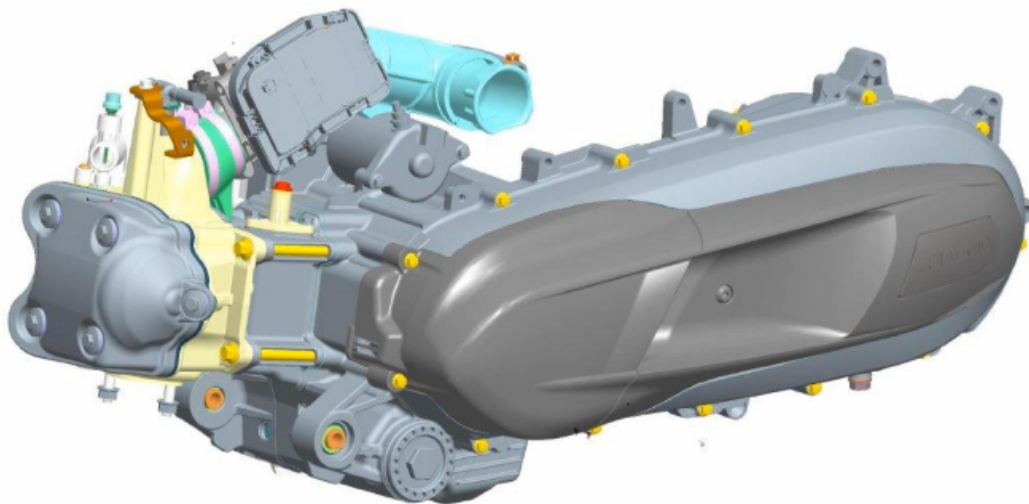
PAY PARTICULAR ATTENTION TO POSITIONING THE THROTTLE CONTROL TRANSMISSION PROPERLY.

INDEX OF TOPICS

ENGINE

ENG

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



Automatic transmission

Transmission cover

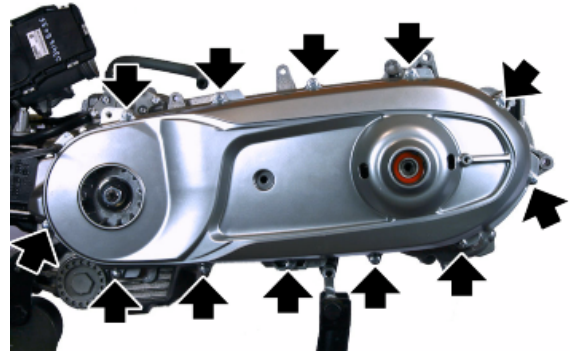
- Remove the air duct.
- Insert the specific tools, rotate the engine until the driven pulley stops and remove the screw, recovering the washer.

Specific tooling

020917Y Driven pulley lock



- Unscrew the eleven screws fixing the engine and remove the transmission cover.

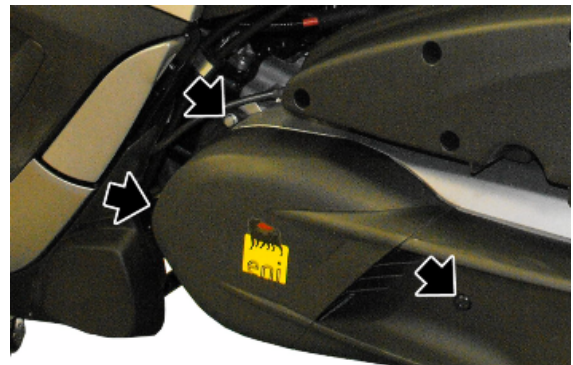
**See also**[Air duct](#)

Air duct

- Remove the plastic cover.



- Unscrew the four screws indicated and remove the duct.



Removing the driven pulley shaft bearing

- Remove the Seeger ring.

CAUTION

PLACE THE COVER ON A SURFACE, REMOVING OR EXCLUDING THE ALIGNMENT DOWELS.



- Using the housing to support the cover of the transmission, interpose a few layers of heavy cloth so as not to damage the outer surface of the cover.
- Using appropriate tools, remove the bearing.

Specific tooling

020376Y Adaptor handle

020357Y 32x35-mm Adaptor

020439Y 17-mm guide

001467Y002 Driver for OD 73 mm bearing



Refitting the driven pulley shaft bearing

- Use the heat gun to heat the inner part of the lid.

CAUTION

DO NOT HEAT EXCESSIVELY SO AS NOT TO DAMAGE THE PAINTWORK.

Specific tooling

020151Y Air heater



Using the equipment, mount a new bearing, apply grease on the adapter and on the guide in order to maintain the position of the bearing during operation on the vertical axis.

Specific tooling

020376Y Adaptor handle

020358Y 37x40-mm Adaptor

020439Y 17-mm guide



- Insert the Seeger ring.
- Insert the alignment dowels if removed during disassembly.

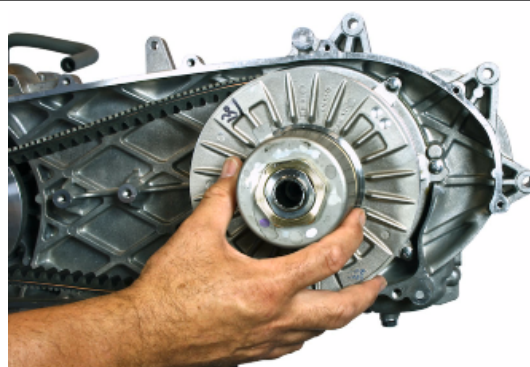


Removing the driven pulley

- Remove the stationary driving half-pulley.
- Remove the driven pulley complete with belt.

WARNING

AS A RESULT OF THE OPERATION THERE MAY BE A LIGHT "HAMMERING" BETWEEN THE KNURLING OF THE PULLEY AXLE. THIS CAN MAKE REMOVAL BY HAND DIFFICULT.
IN CASE OF NEED USE AN EXTRACTOR.



Inspecting the clutch drum

- To remove the housing from the driven pulley shaft it is necessary to remove the complete clutch assembly from the engine as described in section «Disassembling the clutch».
- Remove the protection caulking.



- Using the specific tool to maintain the clutch housing in position, unscrew the nut to recover the washer.

Specific tooling

020917Y Driven pulley lock





- Remove the housing from the shaft.



- To fit, follow the removal steps but in reverse order, being careful to tighten to the specified torque.

CAUTION

ALWAYS USE A NEW NUT FOR RETAINING THE CLUTCH OUTPUT SHAFT, THEN PROCEED TO THE CAULKING.

Locking torques (N*m)

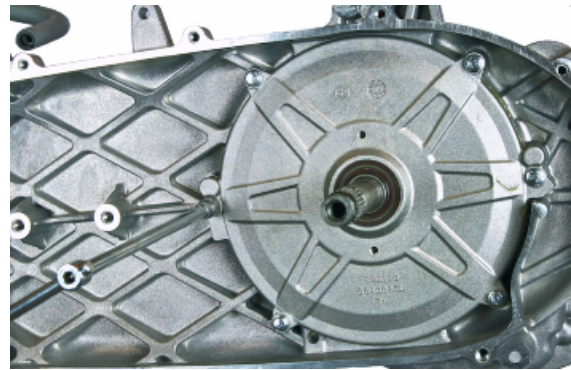
Clutch output shaft nut (88.51 ÷ 95.88) lb ft (120 ÷ 130) Nm

Removing the clutch

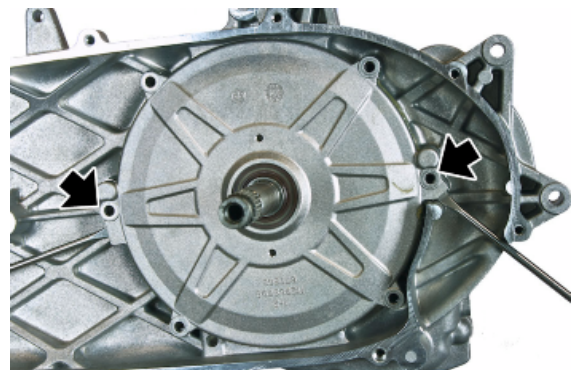
- To remove the clutch assembly it is necessary to remove the inlet pinion to the final reduction unit, operating as described in the section «**Dismounting the hub cover**».



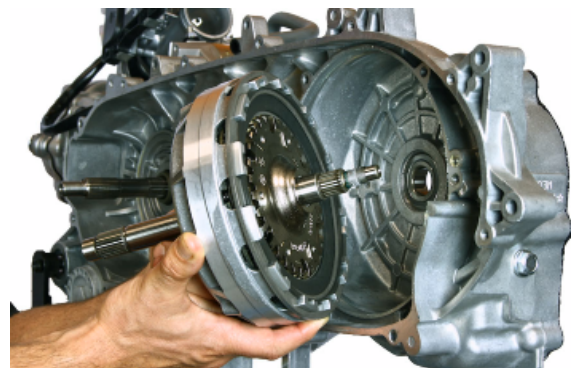
- Working from the automatic transmission side, remove the driven pulley.
- Unscrew the six fixing screws from the clutch cover.



- By using two screwdrivers work on the appendices and remove the cover taking care not to drop the clutch assembly.



- Remove the clutch assembly.



See also

[Removing the hub cover](#)

Inspecting the clutch

COVER REVISION

- Adequately support the cover and using a screwdriver remove the seal ring.

Specific tooling

001467Y007 Driver for OD 54-mm bearings



-
- Working from the opposite side, supporting the cover, proceed to the removal of the bearing.

Specific tooling**001467Y007 Driver for OD 54-mm bearings****020376Y Adaptor handle****020358Y 37x40-mm Adaptor**

-
- Heat the crankcase by means of specific tools and then insert a new bearing.
 - Using the equipment plant a new bearing, apply grease on the adapter and guide in order to maintain the position of the bearing during operation on the vertical axis.

Specific tooling**020151Y Air heater****020376Y Adaptor handle****020360Y 52x55-mm Adaptor****020364Y 25-mm guide**

-
- Insert a new seal ring and grease the seal lips.

Specific tooling**020376Y Adaptor handle****020360Y 52x55-mm Adaptor**

-
- Replace the outer O-ring and grease properly.

WARNING

IN ORDER TO PREVENT ABNORMAL FORMATIONS OF DIRT DUE TO THE RELEASE OF GREASE, WE RECOMMEND FIRST LUBRICATING THE SEAL RING STOPS WITH A BRUSH.

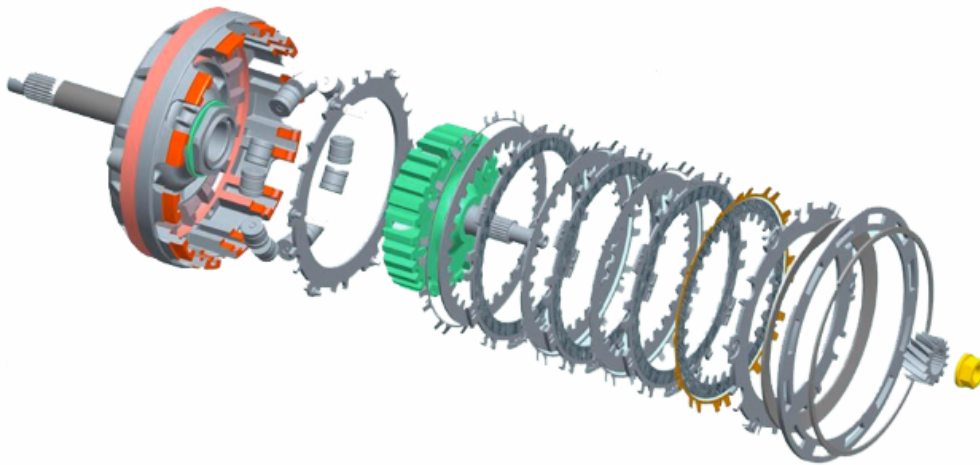


DISASSEMBLY

- Insert the clutch assembly in the special tool and tighten the three wing nuts until you hear the end of stroke.
- Prepare two aluminium protections in the vice and tighten the shaft of the driven pulley.

Specific tooling

020919Y Clutch discs disassembly tool



- Using pliers remove the lock circlips.



-
- Disengage the upper ring of the specific tool.
 - Remove the outer ring with the seat for the Belleville spring.
 - Remove the Belleville spring.



-
- Remove the spring door upper disc.



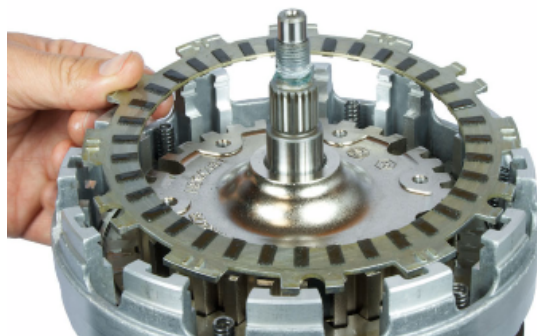
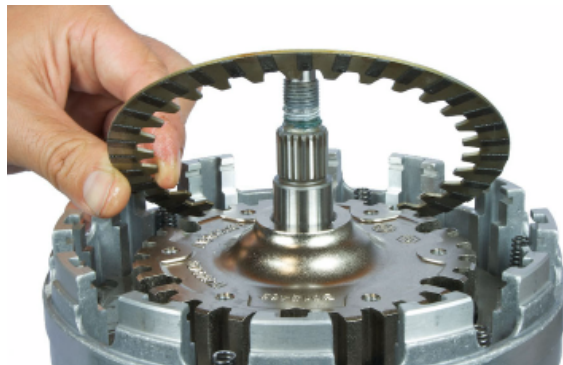
-
- Remove the discs separation spring.
 - Remove the semi-trimmed duct disc (trimmed on one side).
 - Remove a conductor disc.
 - Remove the discs clearance recovery spring
 - Remove a duct metallic disc.
 - Remove a conductor disc (trimmed on both sides).







- Remove the discs clearance recovery spring
- Remove a non-trimmed duct metallic disc.
- Remove a conductor disc (trimmed on both sides).
- Remove the discs clearance recovery spring
- Remove the semi-trimmed duct disc (trimmed on one side).



**CAUTION**

THE CLEARANCE RECOVERY SPRING DISCS ARE FITTED INDIVIDUALLY. THE FIRST IN THE ASSEMBLY PHASE MUST BE POSITIONED TOWARDS THE INSIDE OF THE HOUSING, AS SHOWN IN FIGURE.



- Remove the hub.
- Remove the shaft.



- Remove the lower spring holder disc complete with the six springs.



- Remove the rollers.



- Check that there is no abnormal wear on the rollers, the support channels for rollers and those for discs.

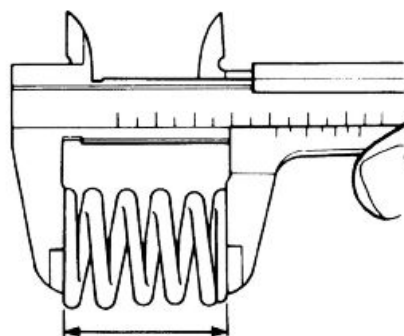


CLUTCH SPRING REVISION**Characteristic****Clutch springs**

Free spring measurement **0.0623 in (15.3 mm)**

Clutch spring wear limit

0.59 in (15.0 mm)

**CLEARANCE RECOVERY SPRING REVISION**

Check for any deformation or abnormal wear.

Characteristic**Clearance recovery spring «A» standard dimensions**

(0.1260±0.0039)in; (3.2±0.1)mm)

Clearance recovery spring wear limit

0.1102 in (2.8 mm)

**CLUTCH DISCS REVISION**

Check the clutch discs for damage or signs of wear: In this case, replace them all.

Measure the thickness of the discs in four positions, and if they do not meet specifications, replace them all.

Characteristic**Clutch discs thickness**

Conductor disc thickness «B» = **(0.11811±0.00315)in ((3.00±0.08)mm)**

Trimmed disc duct thickness «C» = **(0.07677±0.001968)in ((1.95±0.05)mm)**

Trimmed disc duct thickness «D» = **(0.05512±0.001378)in ((1.400±0.035) mm)**

CLUTCH DISCS REVISION

Check the clutch discs for damage or signs of wear: In this case, replace them all.

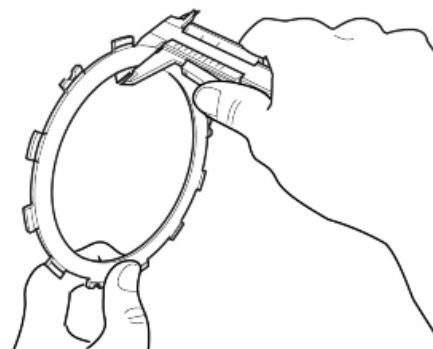
Measure the thickness of the discs in four positions, and if they do not meet specifications, replace them all.

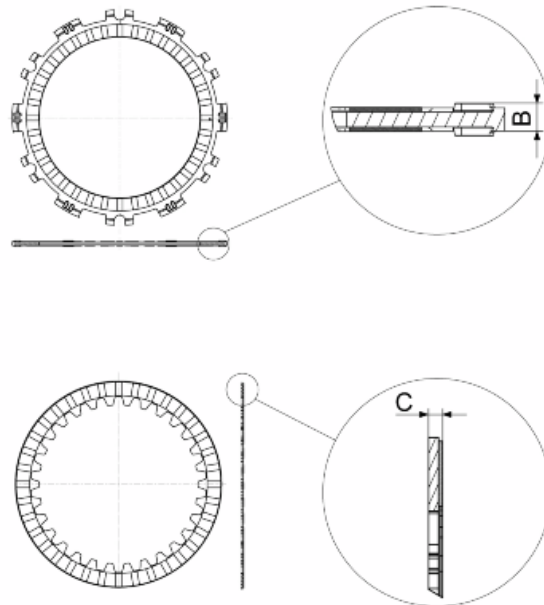
Characteristic**Clutch discs thickness**

Conductor disc thickness «B» = **(0.11811 ±0.00315)in ((3.00±0.08)mm)**

Trimmed disc duct thickness «C» = **(0.07677±0.001968)in ((1.95±0.05)mm)**

Trimmed disc duct thickness «D» = **(0.05512±0.001378)in ((1.400±0.035) mm)**





DISCS WEAR LIMIT

If the discs exceed the following wear limits, replace them all.

Characteristic

Clutch discs wear limit

Conductor disc wear limits «B» = **0.10236 in (2.6 mm)**

Trimmed duct disc wear limits «C» = **0.06693 in (1.7 mm)**

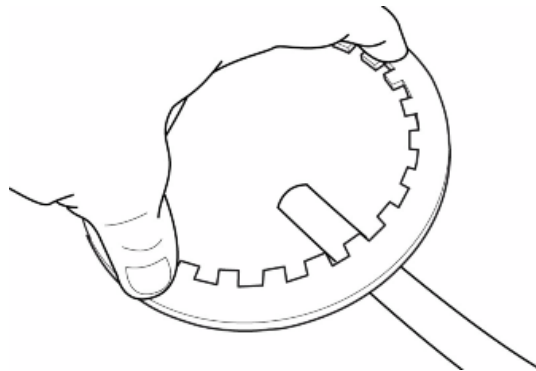
CLUTCH DISCS REVISION: MAXIMUM DEFORMATION

Measure the maximum deformation of the discs by positioning them on a reference plane and checking with a feeler gauge. If out of specification, replace them all.

Characteristic

Clutch discs maximum deformation

Max. duct disc unevenness «D» = **0.00787 in (0.2 mm)**



REASSEMBLY

- Working in reverse order to the removal, insert the components while taking care to follow the following guidelines:
- Place the rollers as shown in the photo, after every two leave a clearance so that each pair has its opposite for proper balance.

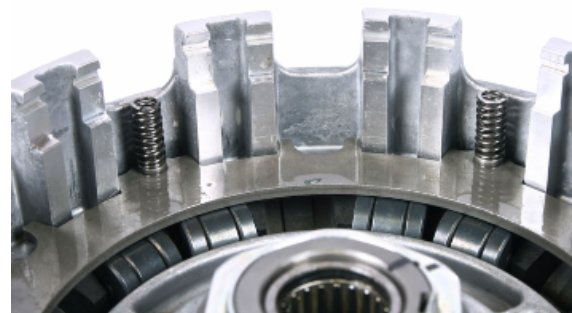


- Lubricate the parts of the clutch pack with the recommended product.

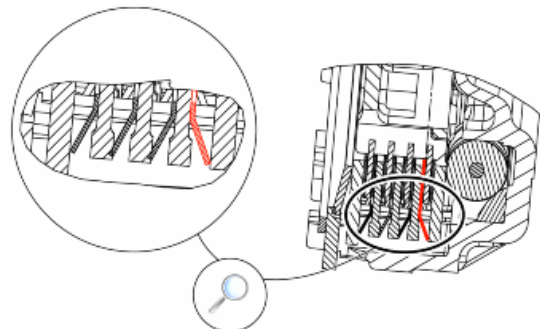
Recommended products

AGIP GEAR SAE 80W-90 Lubricant for gear-boxes and transmissions.

API GL-4

**CAUTION**

THE CLEARANCE RECOVERY SPRING DISCS ARE FITTED INDIVIDUALLY.
THE FIRST IN THE ASSEMBLY PHASE MUST BE POSITIONED TOWARDS THE INSIDE OF THE HOUSING, AS SHOWN IN FIGURE.



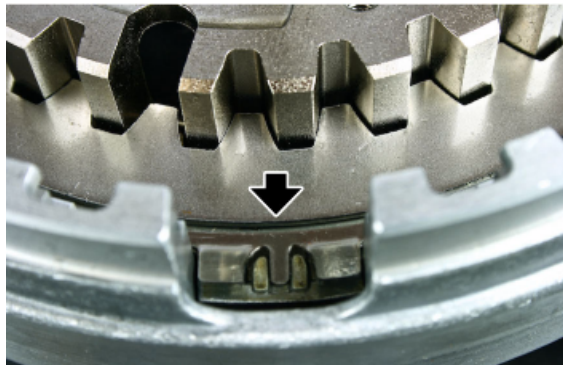
- Insert the semi-trimmed disc with the trimmed surface facing the lower support disc



- Respect the indicated position of the discs clearance recovery spring.

CAUTION

THE CLEARANCE RECOVERY SPRING DISCS ARE FITTED INDIVIDUALLY. THE LAST IN THE ASSEMBLY PHASE MUST BE POSITIONED TOWARDS THE INSIDE OF THE HOUSING, AS SHOWN IN FIGURE.



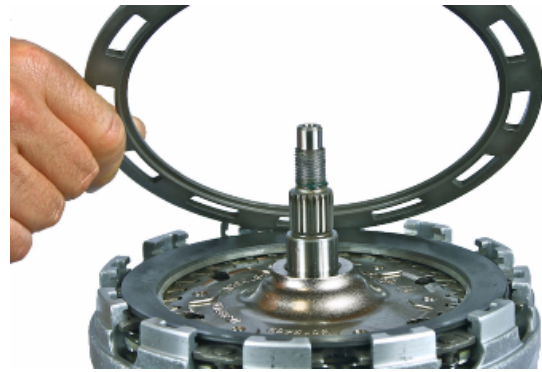
- Insert the semi-trimmed disc with the trimmed surface facing the upper support disc



- Insert the upper support disc in the spring.



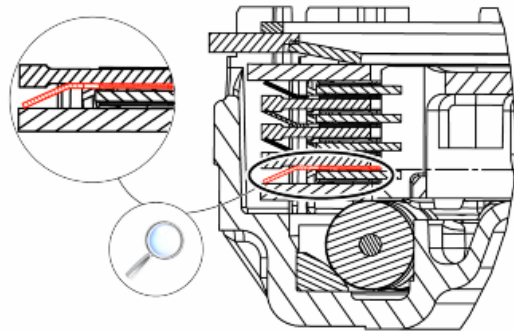
- Insert the Belleville spring facing upwards, taking care to insert it properly into the seat in the closure ring.



- Fit the specific tool to compress the clutch pack and place the retaining ring at the specified location.

Specific tooling

020919Y Clutch discs disassembly tool

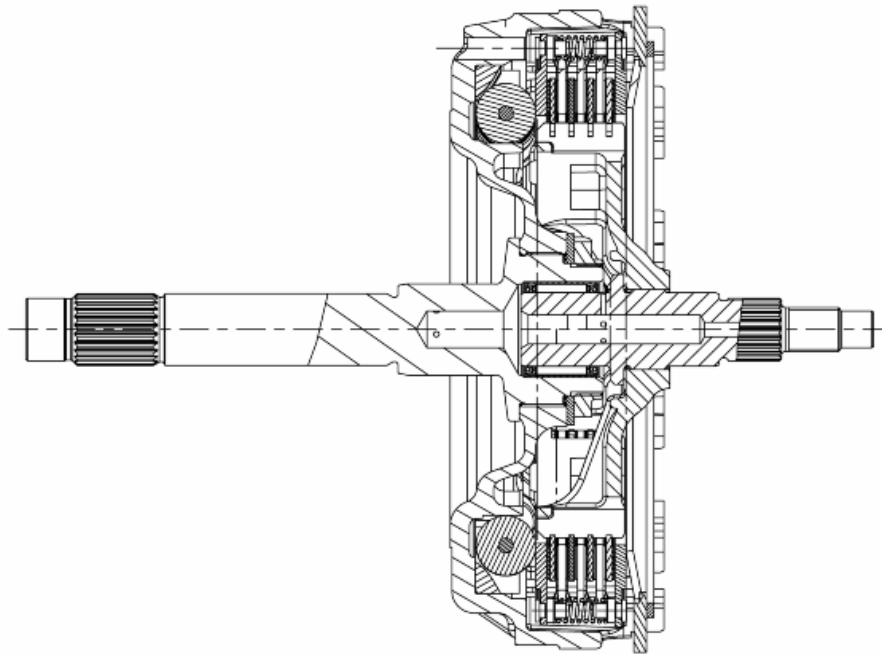


FINAL CHECK

Once the clutch is assembled, turn by hand the exit axis to the final reduction.

The rotation must be free.

If you feel resistance in the movement, or if you detect impediments, disassemble the clutch again and check the correct installation.



CLUTCH OUTPUT SHAFT ROLLER CASING INSPECTION

- Using specific tools, remove the roller casing

Specific tooling

001467Y006 Pliers to extract 20 mm bearings

001467Y007 Driver for OD 54-mm bearings



- Insert a new roller casing and set it with specific tools.

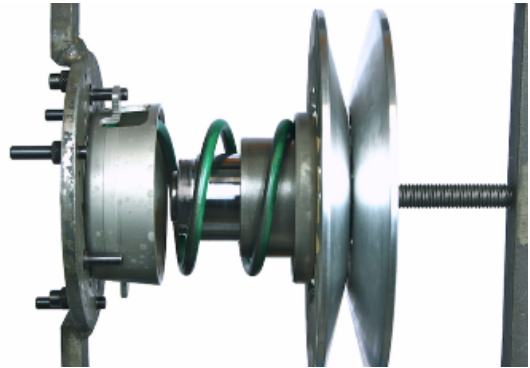
Specific tooling

020084Y 20-mm diameter punch



Pin retaining collar

- Use the tool equipped with medium length pins in "C" position screwing them from the inside of the tool.
- Install the driven pulley into the tool providing the support of an appendix against a pin.
- Ensure the centring of the driven pulley by means of the key inserted on the nut.

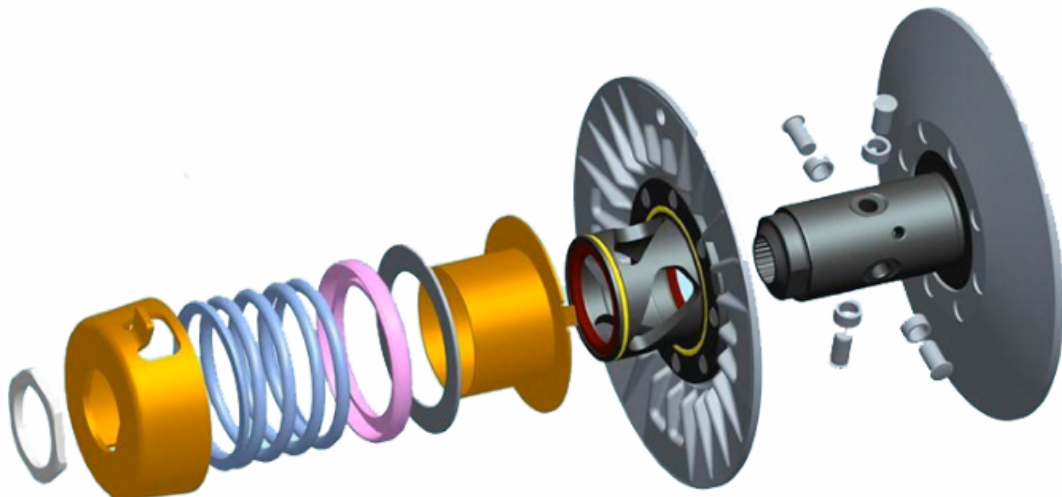
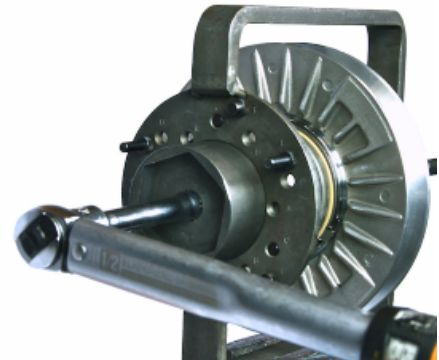


Specific tooling

020444Y Tool for fitting/ removing the driven pulley clutch

020444Y009 wrench 46 x 55

- Turn the key to unscrew the nut.
- Adjust the specific tool command screw to release the torque server spring.



- Remove the following components in this order:

- upper cap;
- spring;
- lower spring support;
- synthetic ring.



- Using two screwdrivers lift the locking sheath of the torque server and remove it.



- Remove the two O-rings and replace them, making sure to lubricate them during installation.



- Thoroughly clean the slots and pins.
- Check that the bushings on the pins and the slots of the torque server are free from wear and rotate freely.
- Then grease with recommended product using a syringe, in order to inject the oil directly into the holes in the bushing.

**CAUTION**

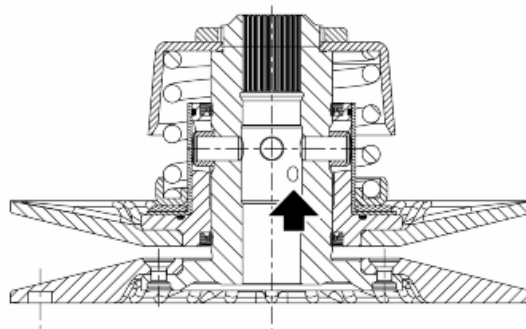
THE TORQUE SERVER PINS ARE SET ON THE BUSHING WITH INTERFERENCE, AND ARE THEREFORE NOT REMOVABLE. WHEN IT IS NECESSARY TO REPLACE THE INTERNAL SEAL RINGS OR THE PULLEY SURFACES IF THERE IS ABNORMAL WEAR, REPLACE THE DRIVEN PULLEY UNIT.

Recommended products**MONTBLANC MOLYBDENUM GREASE -**

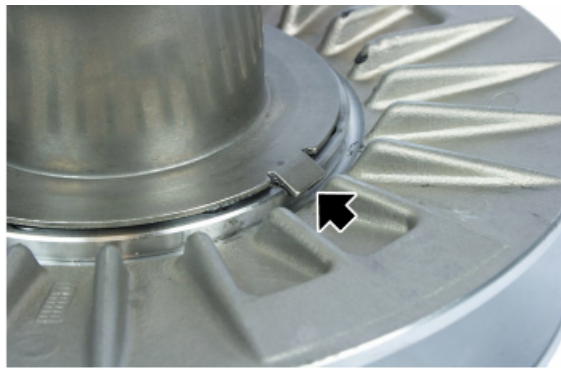
Grease with molybdenum disulphide

N.B.

GREASE USING THE CHANNELS IN THE PULLEY.



- Insert the closure sheath of the torque server taking care to respect the positioning of the appendices in their corresponding seats.



Refitting the driven pulley

- Insert the synthetic ring.



- Insert the lower spring support.



- Insert the spring, lubricating the ends.



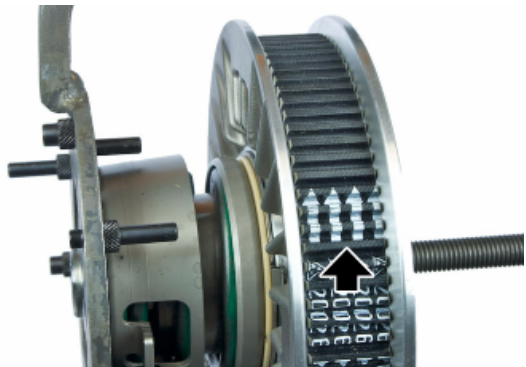
- Insert the upper cap.



- Insert the belt paying attention to the direction of rotation.

Specific tooling

020444Y Tool for fitting/ removing the driven pulley clutch



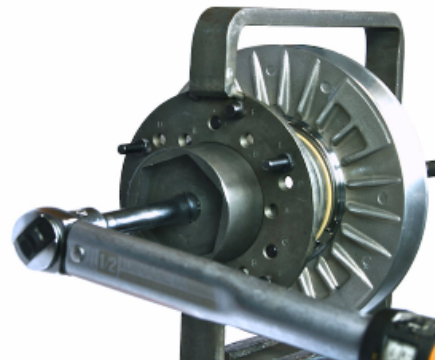
- Turn the control screw of the specific tool and spring preloading.
- Insert the fixing nut and using the specific wrench, tighten to torque.

Specific tooling

020444Y009 wrench 46 x 55

Locking torques (N*m)

Driven pulley nut (36.88 ÷ 44.25) lb ft (50 ÷ 60) Nm



Inspecting the clutch spring

- Check the free length of the spring of the mobile driven half-pulley.

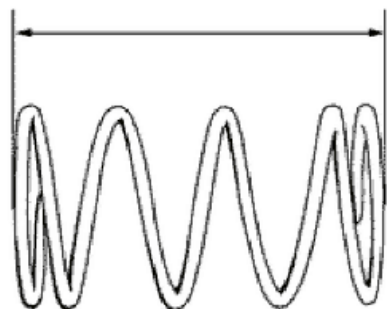
Characteristic

Unloaded spring length

3.9960 in (101.5 mm)

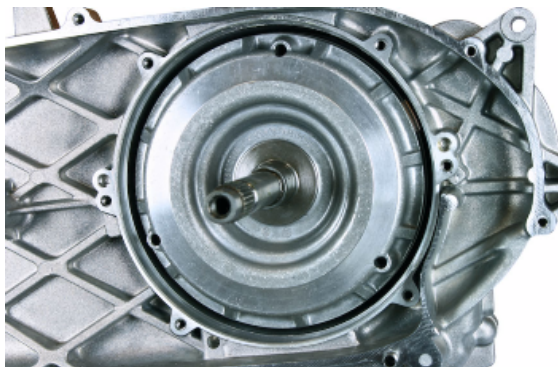
Acceptable limit after use

3.8582 in (98 mm)



Refitting the clutch

- Insert the complete clutch assembly.



- Insert the clutch cover and tighten the six screws to the specified torque.

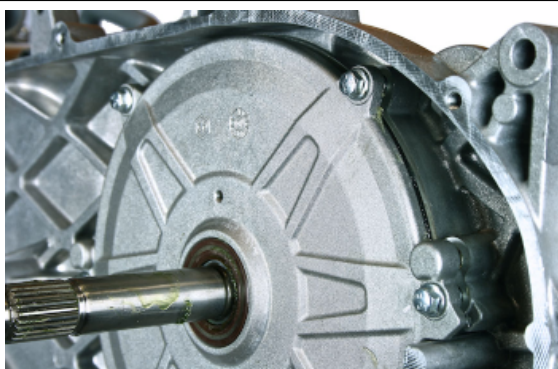
WARNING



IN ORDER TO PREVENT ABNORMAL FORMATIONS OF DIRT DUE TO THE RELEASE OF GREASE, WE RECOMMEND FIRST LUBRICATING THE SEAL RING STOPS WITH A BRUSH.

WARNING

THE OUTER O-RING MUST BE PROPERLY GREASED. DUE TO THE HIGH STRENGTH OF THE O-RING IT IS RECOMMENDED TO TIGHTEN IN CROSSED SEQUENCE UNTIL COMPLETING THE INSERTION.



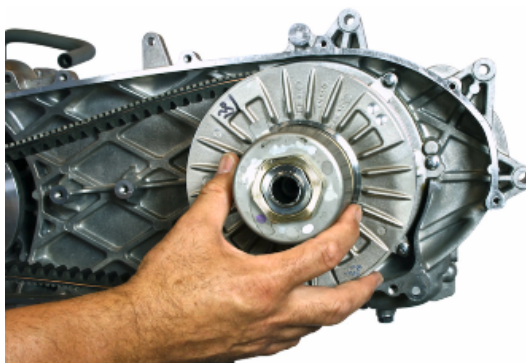
Locking torques (N*m)

**Clutch cover retainer screws (8.11÷9.59)lb ft
(11÷13)Nm**

- Working as described in section «**Fitting the hub cover**» proceed to the locking of the clutch assembly.

Refitting the driven pulley

- Insert the driven pulley, complete with belt, on the shaft.



Drive-belt

- Make sure the drive belt is not damaged and does not show abnormal wear.

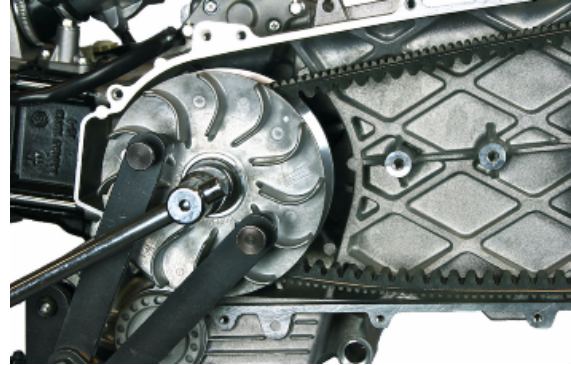
- Replace as indicated in the scheduled maintenance table.
-

Removing the driving pulley

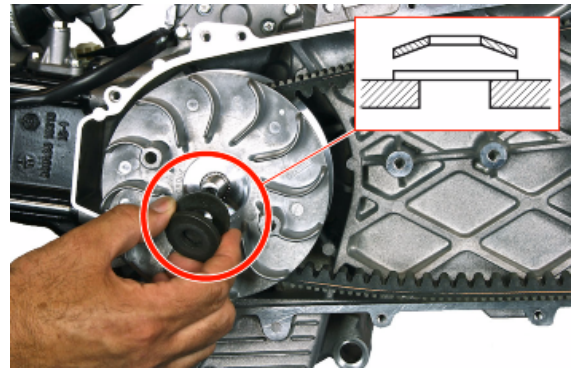
- Using specific tools, lock the driving pulley and loosen the flanged nut.

Specific tooling

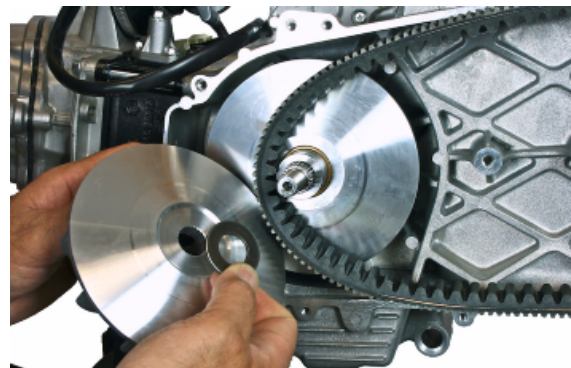
020442Y Pulley lock wrench



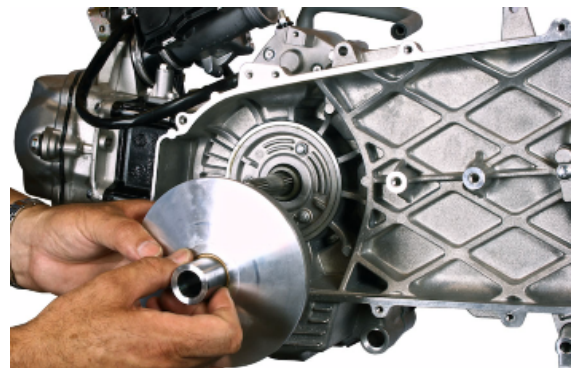
- Remove the flat washer and the cup washer.



- Remove the stationary half-pulley and the washer.



- Disengage the belt.
- Remove the complete 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 guide shoes for the variator back-plate are not worn.
- Check the wear of the roller housings and of the belt faying 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.

CAUTION

DO NOT LUBRICATE OR CLEAN SINTERED BUSHINGS

Characteristic

movable driving half-pulley bushing: Standard Diameter

1.1811(+0 +0.000826) in (30(+0 +0.021)mm)

movable driving half-pulley bushing: Maximum allowable diameter

Ø1.0283in (26.12mm)

Sliding bushing: Standard Diameter

Ø1.18110(-0.00079 +0.00161)in (Ø30 (-0.02 +0.041)mm)

Sliding bushing: Minimum admissible diameter

Ø1.021in (25.95 mm)

Roller: Standard diameter

(Ø0.9842±0.0039)in ((Ø25 mm ±0.1)mm)



Refitting the driving pulley

- Perform the operations in reverse order of disassembly.

CAUTION

INSERT THE ROLLERS WITH THE LARGEST SUPPORT SURFACE ACCORDING TO THE DIRECTION OF ROTATION.



- Tighten the torque using the specific tool to lock the pulley.

Specific tooling

020442Y Pulley lock wrench

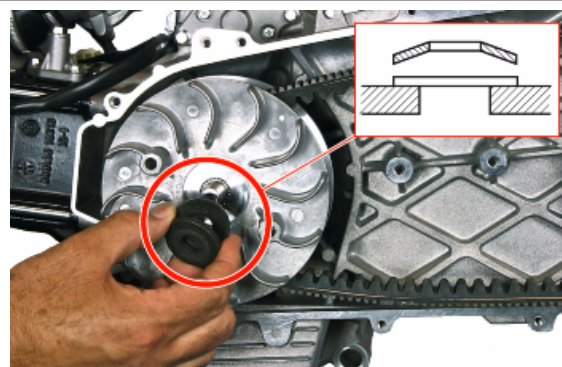
Locking torques (N*m)

Nut M14x1.5 securing the driving pulley
(88.51÷95.88)lb ft (120÷130)Nm



CAUTION

DURING THE INSTALLATION PAY SPECIAL ATTENTION TO THE ASSEMBLY OF THE BELLEVILLE SPRING, AS SHOWN IN FIGURE.



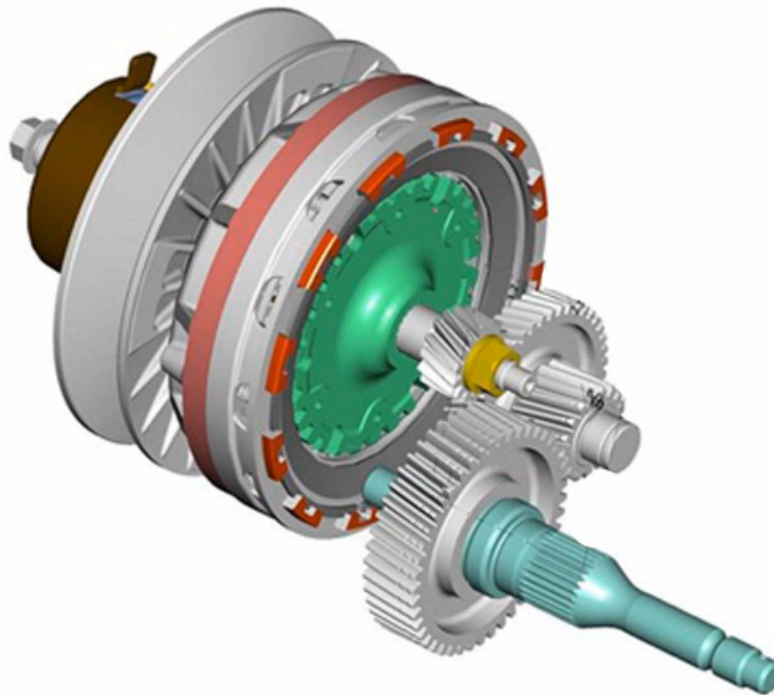
Refitting the transmission cover

- Perform the operations in reverse order of disassembly.

Locking torques (N*m)

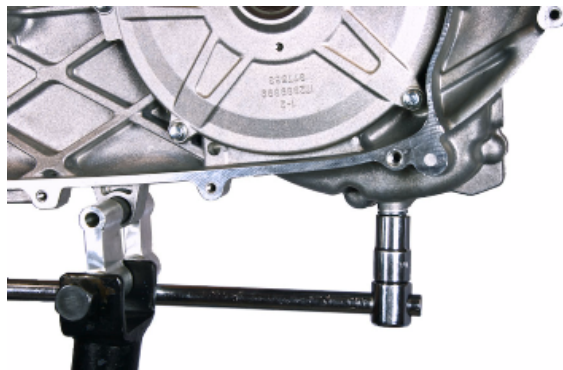
Transmission cover screws (8.11÷9.59)lb ft (11÷13)Nm Driven pulley M10x1.25 screw
(54.58÷59.00)lb ft (74÷80)Nm

End gear



Removing the hub cover

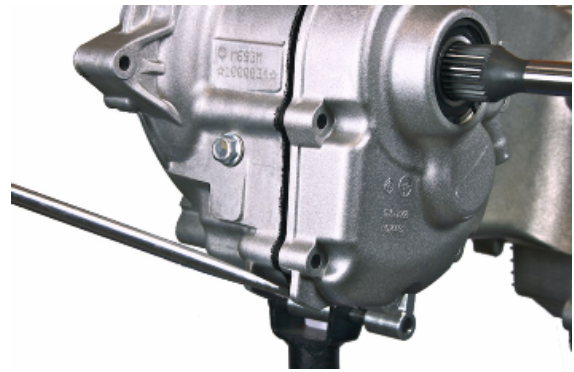
- Use a container large enough to recover the final reduction oil. Unscrew the indicated screw and re-cover the aluminium seal.
- Unscrew the oil filler screw in order to facilitate bleeding.



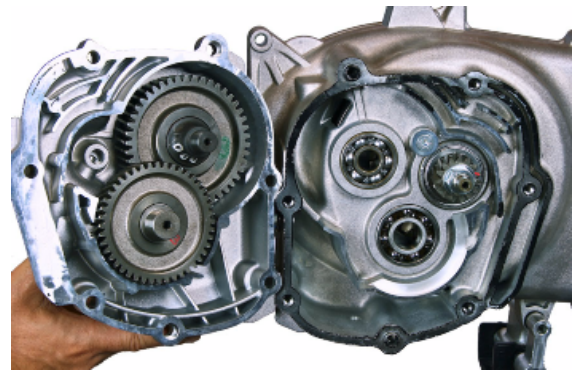
- Unscrew the seven hub cap fixing screws.



- Using a suitable screwdriver use leverage on the upper and lower appendices to detach the sealant.



- Remove the final reduction cap complete with the wheel axle, being careful not to drop the intermediate gear.



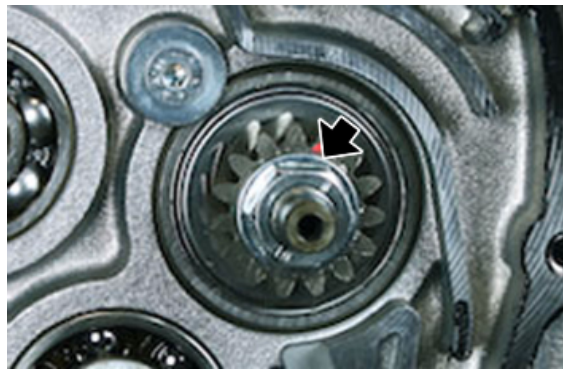
- Remove the final reduction cap.
- Turn the shaft of the driven pulley until aligning a slot with the axis of the intermediate bearing and insert the specific tool.

Specific tooling

020918Y Clutch retainer



- Remove the nut and incorporated washer securing the pinion.



- The pinion is symmetrical: mark the outer surface to avoid reversed reassembly.
- Remove the pinion and the specific tool.

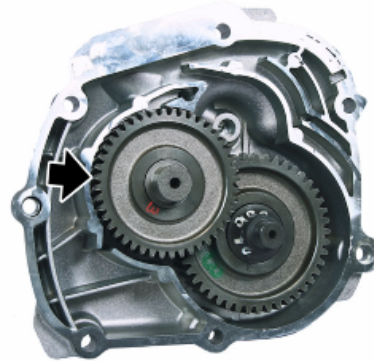
CAUTION

CLEAN THE THREAD FROM ANY RESIDUAL THREAD-LOCK.

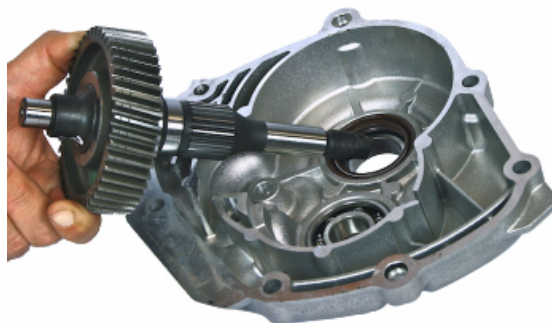


Removing the wheel axle

- Remove the intermediate gear.



- Remove the wheel axle.



Removing the hub bearings

REMOVAL

Removing the clutch shaft bearing

- Remove the screw and countersunk washer.
- Using the specific tools remove the bearing.

Specific tooling

020376Y Adaptor handle

020357Y 32x35-mm Adaptor

020363Y 20-mm guide



Removing the Wheel axle bearing

- Using the specific tools remove the bearing.

Specific tooling

020376Y Adaptor handle

020357Y 32x35-mm Adaptor

020363Y 20-mm guide



Removing the intermediate gear bearing

- Using the specific tools remove the bearing.

Specific tooling

020376Y Adaptor handle

020456Y Ø 24-mm adaptor

020412Y 15-mm guide



FITTING

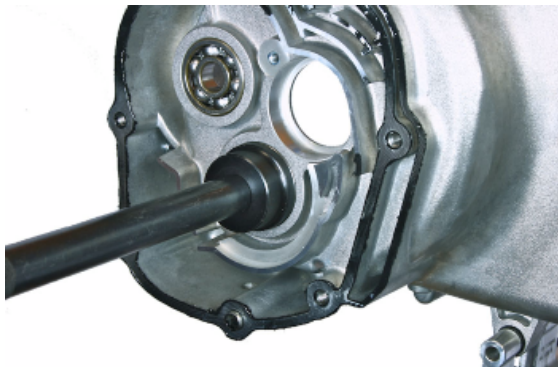
- Heat the crankcase by means of the specific tool and then insert the bearings.

Specific tooling

020151Y Air heater

Fitting the Wheel axle bearing

- Using the equipment set a new bearing.

Specific tooling**020376Y Adaptor handle****020359Y 42x47-mm Adaptor****020363Y 20-mm guide****Fitting the Clutch shaft bearing**

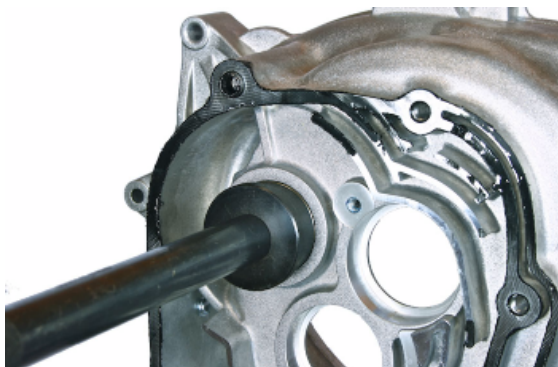
- Using the equipment set a new bearing.

Specific tooling**020376Y Adaptor handle****020360Y 52x55-mm Adaptor****020363Y 20-mm guide****Fitting the Intermediate gear bearing**

- Using the equipment set a new bearing.

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****020359Y 42x47-mm Adaptor****020412Y 15-mm guide**

- After completing the insertions, tighten the lock screw of the clutch shaft bearing, respecting the direction of the washer and apply the recommended product.

Recommended products**Loctite 242 product description**

Apply LOCTITE medium type 242 threadlock

Locking torques (N*m)**Bearing lock screw (6.64÷8.11)lb ft (9÷11)Nm**

Inspecting the hub shaft

- Check the three shafts and the intermediate gear for wear or distortion of the toothed surfaces, the bearing housings, and the oil seal housings.
- In case of faults, replace the damaged parts.

Characteristic

Driven pulley shaft standard sizes

A: 0.9842(-0.00039 -0.00079)in (25(-0.01 -0.02)mm)

B: 0.7716(-0.0079 -0.0123)in (19.6(-0.20 -0.33)mm)

Clutch output shaft standard sizes

C: 0.7874(-0 -0.005)in (20 (-0 -0.013)mm)

D: 0.7574(-0.0004 -0.0008)in (20(-0.01 -0.02)mm)

Wheel axle

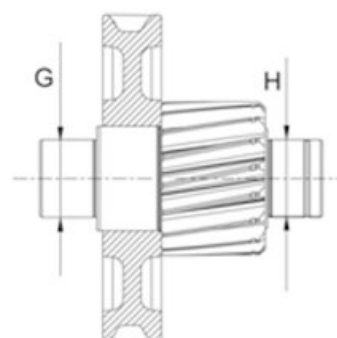
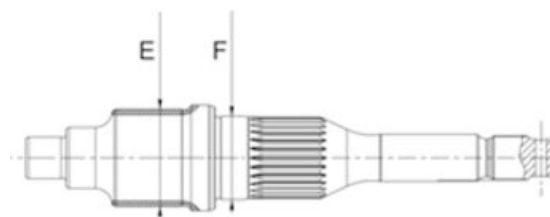
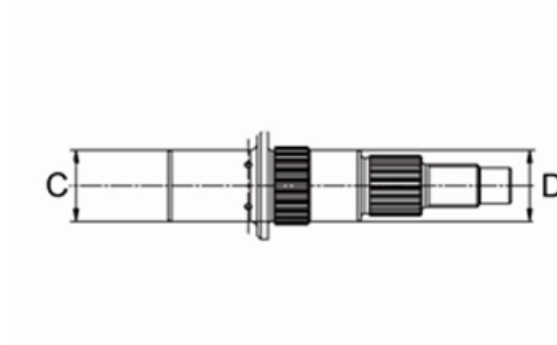
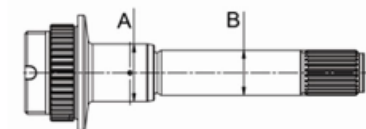
E: 1.3779(-0 -0.013)in (35(-0 -0.013)mm)

F: 1.1811(-0.0051 -0.0102)in (30(-0.13 -0.26)mm)

Intermediate gear

G: 0.7874(-0.0004 -0.0008)in (20(-0.01 -0.02)mm)

H: 0.7874(-0.0004 -0.0008)in (20(-0.01 -0.02)mm)



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.
- Check the thorough cleaning of lubrication duct.

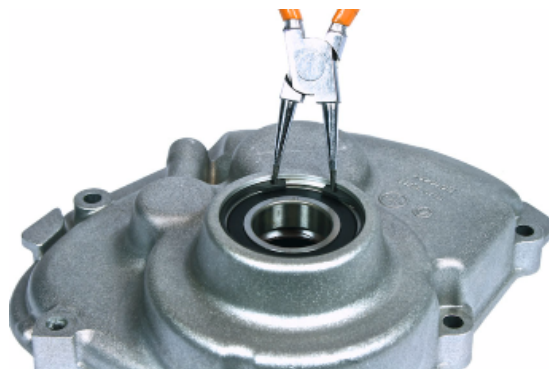


Refitting the hub cover bearings

REMOVAL

Removing the Wheel axle bearing

- Remove the Seeger ring.



- Using the specific tools, support the hub cover.
- Using the specific tools remove the bearing.

N.B.

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

Specific tooling

020489Y Hub cover support stud bolt kit

020376Y Adaptor handle

020357Y 32x35-mm Adaptor

020483Y 30-mm guide

- Remove the hub cover from the stud bolts and using the specific tools pull out the oil seal.

Specific tooling

020376Y Adaptor handle

020359Y 42x47-mm Adaptor



Removing the intermediate gear bearing

- Take out the bearing using the specific tool.

Specific tooling

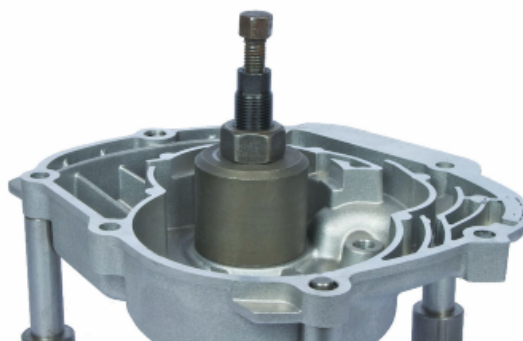
001467Y003 Nut

001467Y004 Lug / Taper pin

001467Y005 Screw

001467Y006 Pliers to extract 20 mm bearings

001467Y035 Bearing housing, outside $\varnothing$ 47 mm

**FITTING****Fitting the Intermediate gear bearing**

- Heat the crankcase by means of the specific tool and then insert the bearings.

Specific tooling

020151Y Air heater



- Using the equipment set a new bearing.

Specific tooling

020376Y Adaptor handle

020359Y 42x47-mm Adaptor

020363Y 20-mm guide

**Fitting the Wheel axle bearing**

- Using the equipment plant a new bearing, apply grease on the adapter and guide in order to maintain the position of the bearing during operation on the vertical axis.

Specific tooling

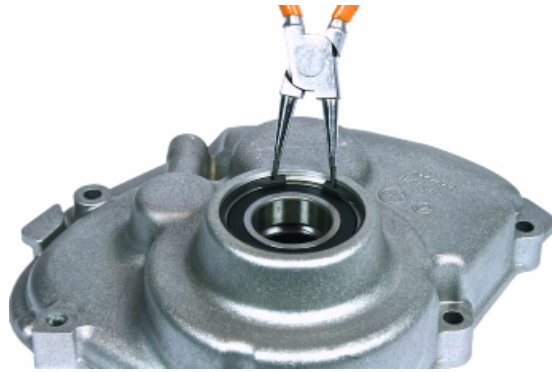
020376Y Adaptor handle

020360Y 52x55-mm Adaptor

020483Y 30-mm guide



- Fit the seeger ring.



- Insert a new seal ring with the seal facing the inside of the hub by means of the appropriate tool.
- Grease the sealing lips.

Specific tooling

020376Y Adaptor handle

020360Y 52x55-mm Adaptor



Refitting the hub bearings

Insert the gears in the cover in order to prevent abnormal movements during insertion into the engine. - Insert the wheel axis.



- Insert the intermediate gear.



Refitting the ub cover

- Working in reverse order to the removal and using the specific tool, insert the control pinion, use the recommended product and tighten the torque.

CAUTION

FOR THE INSTALLATION, ALWAYS USE NEW NUTS ALREADY PROVIDED WITH SCOTCH GRIP.

Specific tooling

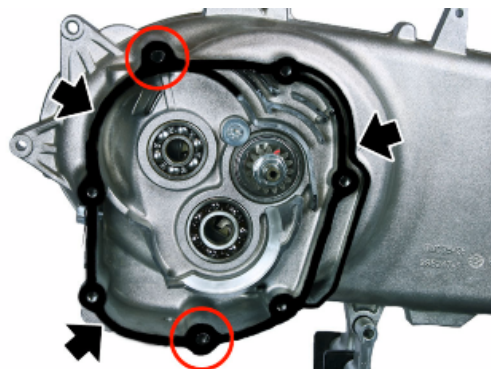
020918Y Clutch retainer

Locking torques (N*m)

M12x1.25 gear clutch shaft retainer nut
(70.07÷77.44)lb ft (95÷105)Nm



- Pay attention to the correct positioning of the alignment dowels.
- Thoroughly clean the surfaces of the engine crankcase and reduction cover and seal, with the recommended product, the matching surface around the entire outer perimeter of the duct that leads to the breather.



CAUTION



AN IMPROPER SEALING OF THE VENTILATION CIRCUIT MEANS A LOSS OF OIL INTO THE AUTOMATIC TRANSMISSION HOUSING.

Recommended products

THREE BOND TB1207B Liquid sealant

Liquid gasket Three Bond TB1207B

- Remove the gasket.

- Insert the gears of the reduction unit in the reduction cover and tighten the screws to the specified torque, tightening in crossed sequence.
- Check the correct the tightening drainage screw.

Locking torques (N*m)

Final reduction cover screws (17.70÷19.91)lb ft
(24÷27)Nm **Reduction unit oil drainage screw**
(11.06÷12.54)lb ft (15÷17)Nm



CAUTION



THE FOLLOWING OIL REDUCTION FILLING PROCEDURE MUST BE CARRIED OUT ONLY WITH THE MOTOR FITTED ON THE VEHICLE, ON THE CENTRE STAND IN FLAT LAND.

- Restore the level of oil inside duction unit with the recommended product, acting on the filler screw until touching.
- Tighten to the specified torque.

Recommended products

AGIP GEAR SAE 80W-90 Lubricant for gear-boxes and transmissions.

API GL-4

Characteristic

Final reduction unit oil

approx 0.122cuin (500cc)

Locking torques (N*m)

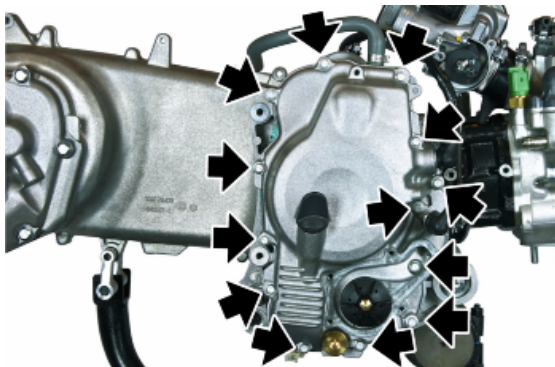
Oil relief screw (11.06÷12.54)lb ft (15÷17)Nm



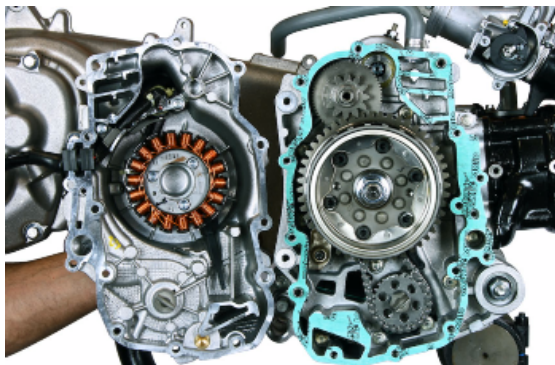
Flywheel cover

Removing the hub cover

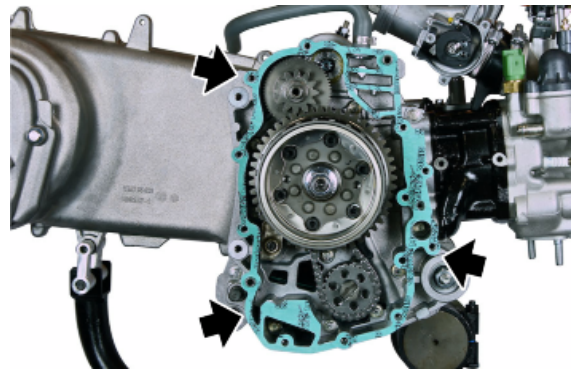
- Perform the actions described in the section «**Removing the flywheel cover components**».
- Unscrew the 13 fixing screws of the flywheel cover.



- Remove the cover.

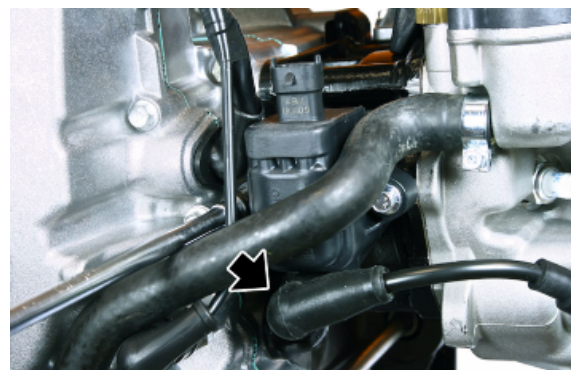


- Remove the gasket.

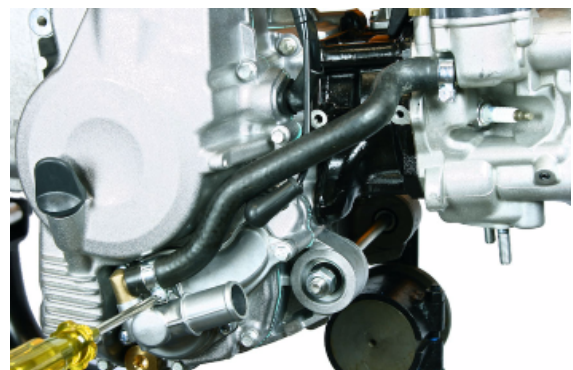


Removing the flywheel cover components

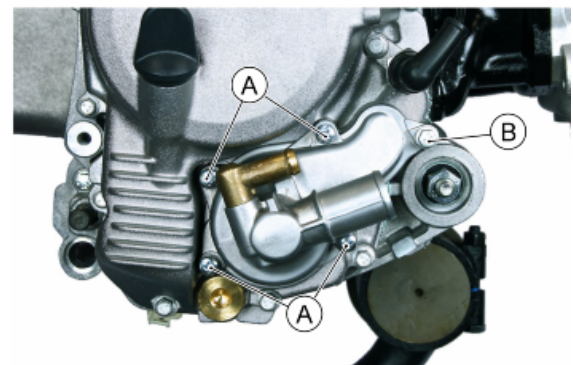
- Disconnect the spark plug cap.
- Undo the two fixing screws of the coil.



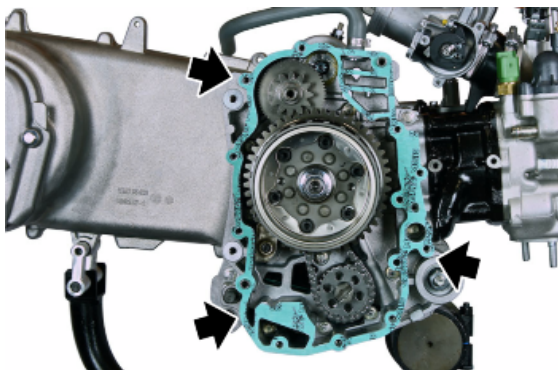
- Loosen the two clamps and remove the coolant internal recirculation pipe.



- Undo the four screws «A» and the fixing screw «B» of the coolant pump cover.



- Remove the cover and the relative gasket.



- The flywheel cover can be removed without unscrewing the impeller.
- Should it be necessary to remove the impeller, loosen the moulded nut.

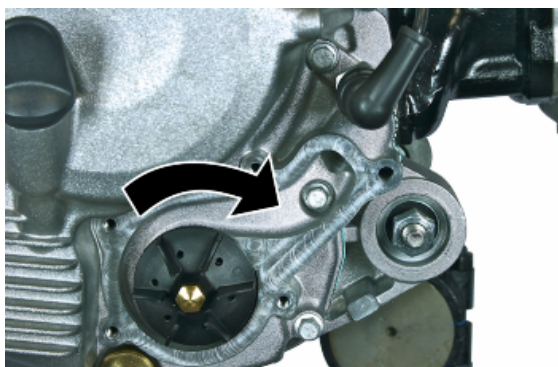
CAUTION

THE THREAD IS ANTICLOCKWISE.

CAUTION

IF THE EFFORT REQUIRED TO UNSCREW THE IMPELLER IS HIGHER THAN THE NORMAL LOCKING TORQUE, REFERENCE SHOULD BE MADE TO THE REMOVAL OF THE DISMOUNTED FLYWHEEL COVER IMPELLER.

FAILURE TO FOLLOW THIS WARNING WILL CAUSE ABNORMAL AXIAL THRUST THAT CAN CAUSE DAMAGE TO THE CERAMIC SEAL.



Removing the stator

- Remove the flywheel cover.
- Unscrew the three flywheel fixing screws and the four pick-up fixing screws and cable harness retainer screws.



- Remove the flywheel and the pick-up complete with cable harness.

Refitting the stator

- Refit the stator and flywheel carrying out the removal procedure in reverse, tightening the retainers to the specified torque.
- Respect the operation of the pick-up.

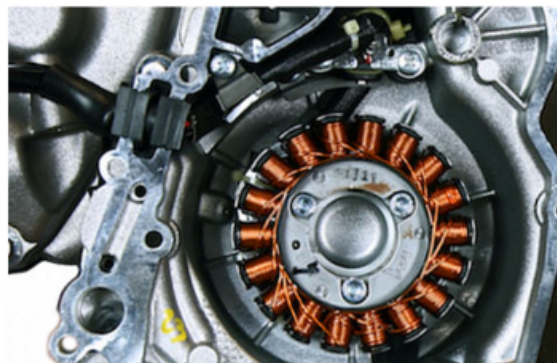
Characteristic

Pick-up rotor measurement

(0.0157÷0.0295)in (0.4÷0.75)mm

Locking torques (N*m)

Stator fixing screws (5.90÷7.38)lb ft (8÷10)Nm **Pick-up screws** (2.21÷2.95)lb ft (3÷4)Nm



Refitting the flywheel cover components

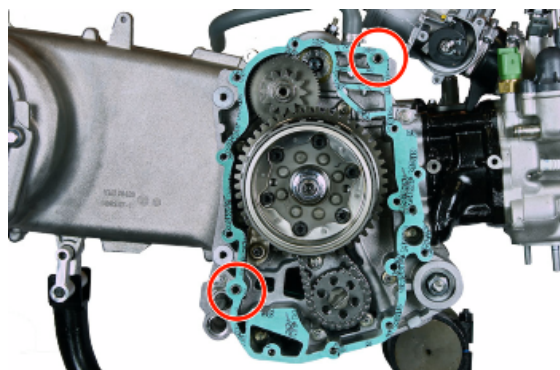
- Perform the procedure in reverse order of disassembly, taking care to tighten to specified torque.

Locking torques (N*m)

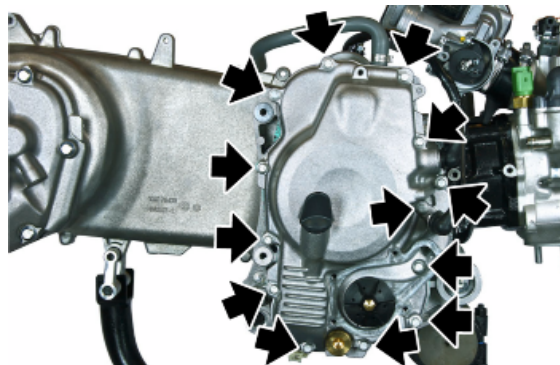
Pick-up screws 3 ÷ 4 **Coil fixing screw** 11 to 13 **Oil drain screw** 20 to 24

Refitting the flywheel cover

- Fit the gasket and be careful with the two alignment dowels.



- Paying attention to the alignment of the coolant pump shaft insert the crankcase with the command screw.
- Tighten the screws and tighten to the specified torque.



Locking torques (N*m)

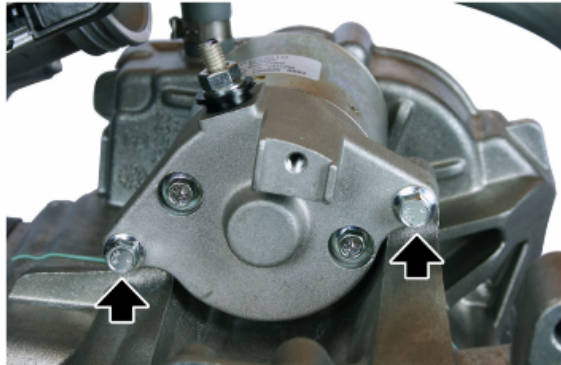
Cylinder head nut (PRE-TIGHTENING)

(4.42÷5.90)lb ft (6÷8)Nm **Cylinder head nut (TIGHTENING)** (6.64÷8.11)lb ft (9÷11)Nm (Tighten to the specified torque then rotate 270.0°±5.0°) **TCIC M5x10 flywheel cover retainer screw** (2.21 ÷ 2.95) lb ft (3 ÷ 4) Nm

Flywheel and starting

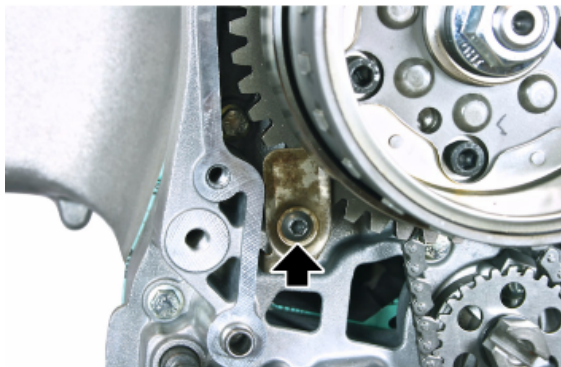
Removing the starter motor

- Undo the two fixing screws and remove the starter motor.



Removing the flywheel magneto

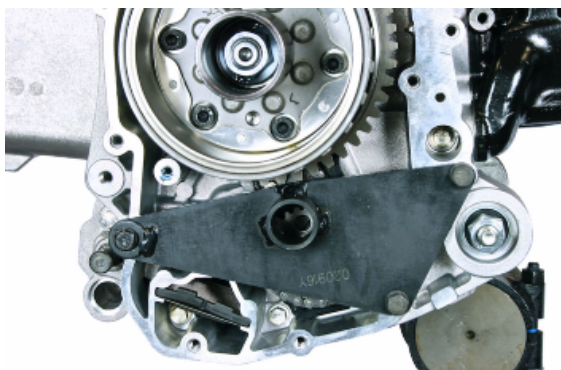
- Undo the screw indicated and remove the plate.



- Install the support plate.

Specific tooling

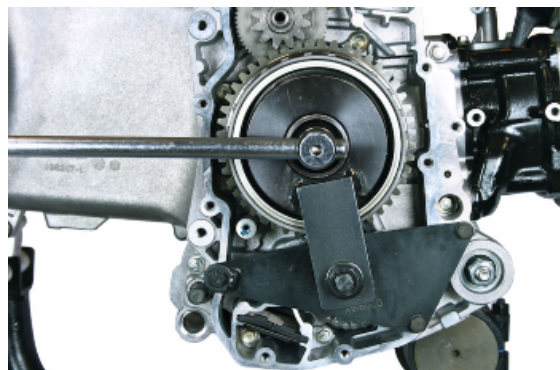
020916Y Support plate



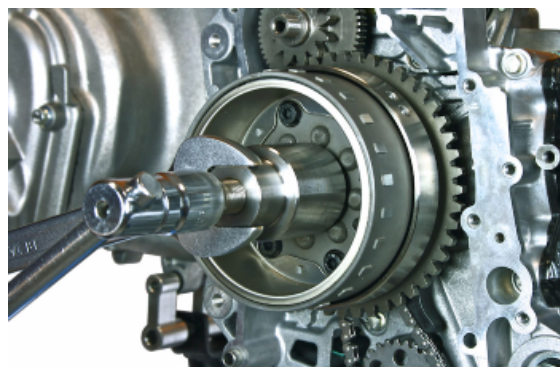
- Install the specific tool and unscrew the retainer nut of the flywheel, recovering the washer.

Specific tooling

020627Y Flywheel lock wrench



- Act on the extractor to remove the flywheel together with the starting sprocket.
- 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 during extraction
- Screw the extractor onto the flywheel and extract it as shown in the picture



CAUTION



SCREWING UP THE NUT WITHOUT WASHER HELPS PROTECT THE THREAD AGAINST THE STRAIN EXERTED BY THE EXTRACTOR AND ALSO PREVENTS DROPPING THE FLYWHEEL ACCIDENTALLY UPON EXTRACTING IT. POTENTIAL DROPS MAY DAMAGE THE CERAMIC INSERTS.

Specific tooling

020467Y Flywheel extractor

- Remove the tool and unscrew the nut.
- Remove the complete flywheel paying attention to recover the tongue.



Inspecting the flywheel components

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

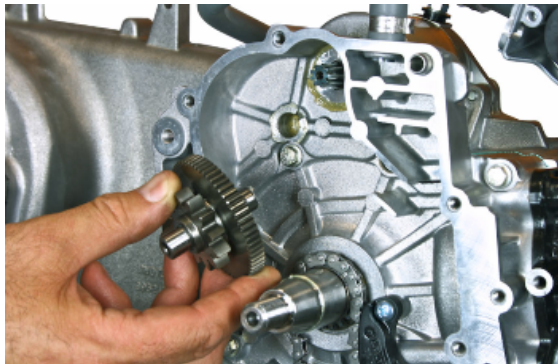
Starter gear rim

See also

Removing the flywheel magneto

Intermediate gear

- Remove the flywheel.
- Remove the intermediate gear from its housing.



- Visually inspect the surfaces, if there is no abnormal wear, grease the housing thoroughly and insert the intermediate gear.

Refitting the free wheel

- Make sure the freewheel faying 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 threadlock

Medium Loctite 243 threadlock

- 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
Screw fixing freewheel to flywheel (9.59÷11.06)lb ft (13÷15)
Nm



- Oil the free wheel "rollers".



Refitting the flywheel magneto

- Perform the procedure in reverse order of disassembly, taking care to tighten to specified torque.

Locking torques (N*m)

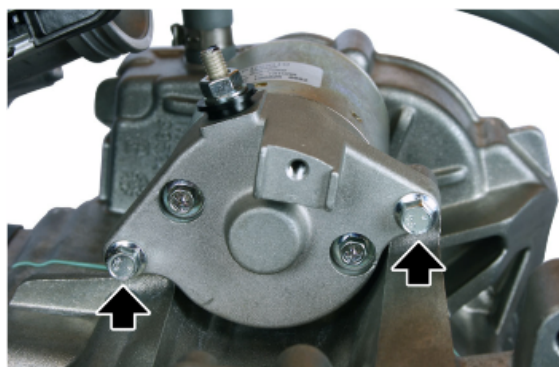
Starter crown plate fixing screws (3.69÷4.42)lb ft (5÷6)Nm Flywheel fixing nut (73.76÷81.13)lb ft (100÷110)Nm

Refitting the starter motor

- Fit a new O-ring on the starter motor and lubricate it.
- Fit the starter motor on the crankcase and lock the 2 screws to the prescribed torque.

Locking torques (N*m)

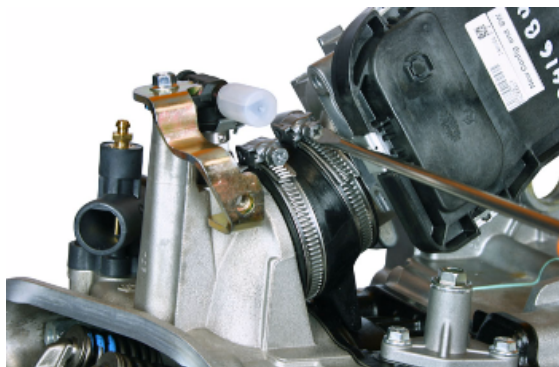
**Starter motor screws (8.11÷9.59)lb ft (11÷13)Nm
Starter motor fixing screws (8.11÷9.58)lb ft (11÷13)Nm**

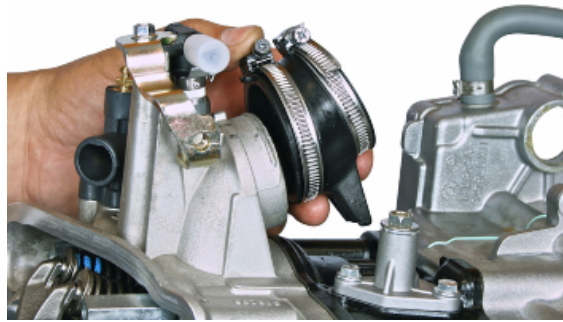


Cylinder assy. and timing system

Removing the intake manifold

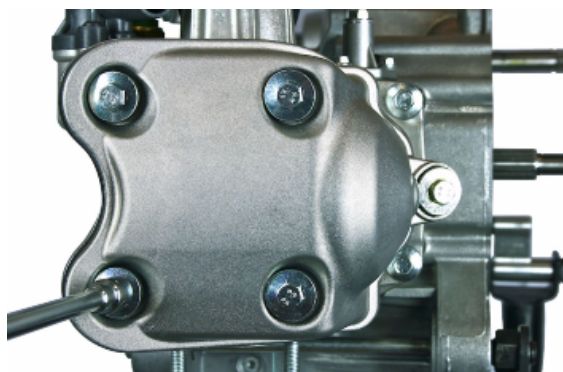
- The intake manifold is housed in the cylinder head, loosen the clamps and remove the sleeve connecting to the throttle body.





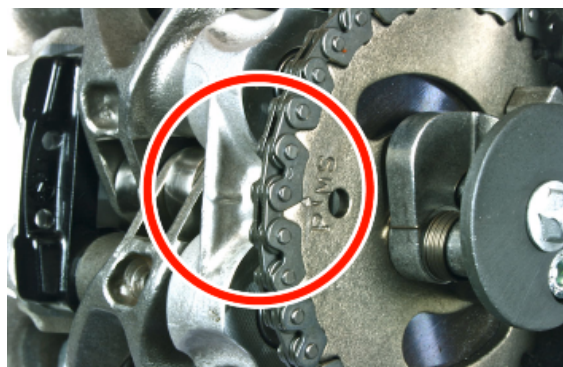
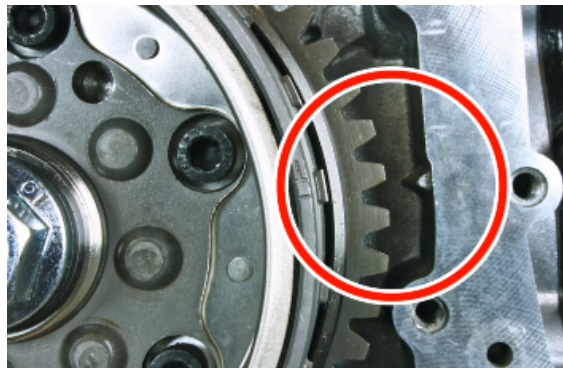
Removing the rocker-arms cover

- Unscrew the five screws and remove the screws complete with the rubber buffers.

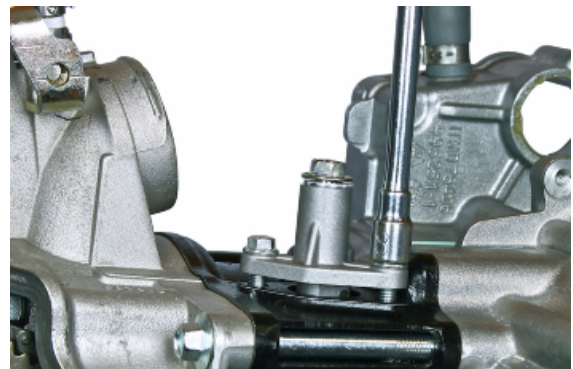
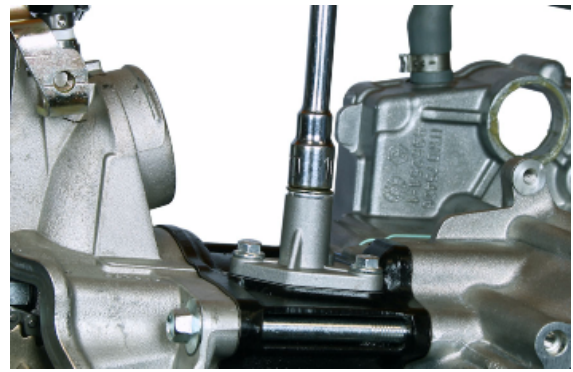


Removing the timing system drive

- Before working on the timing system it is recommended to place the engine at TDC in compression, aligning the references as shown in the figure.



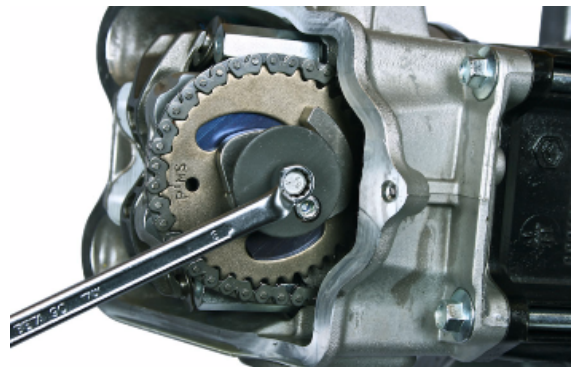
- First loosen the tensioner and unscrew the fixing screws.
- Remove the tensioner complete with gasket.



-
- Loosen the screw



-
- Undo the fixing screw and remove the washer.





- Remove the complete mass of the return spring.



- Unscrew the screw and remove the counter-weight.



- Disengage the chain from the sprocket and remove the camshaft control sprocket.



- Remove the plate.



After removing the head the camshaft control components can be removed:

- Remove the inspection cover as described in sec. «**Lubrication/Main bushing oil seals removal**».
- Remove the oil pump command as described in section «**Lubrication/Oil pump/Disassembly**».
- Undo the chain tensioner pad fixing screw, remove the bushing and the slider.



- Remove the chain guide slider.



- Release the timing chain from the crankshaft

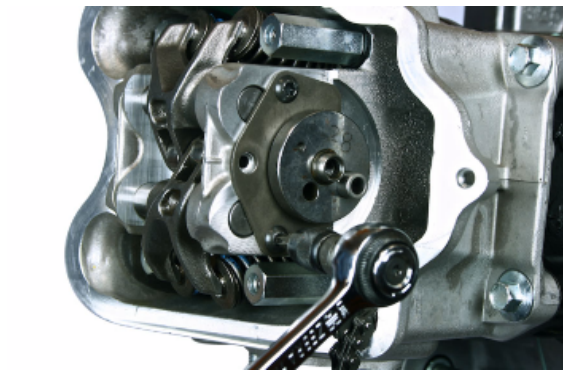


- Remove the control gear.

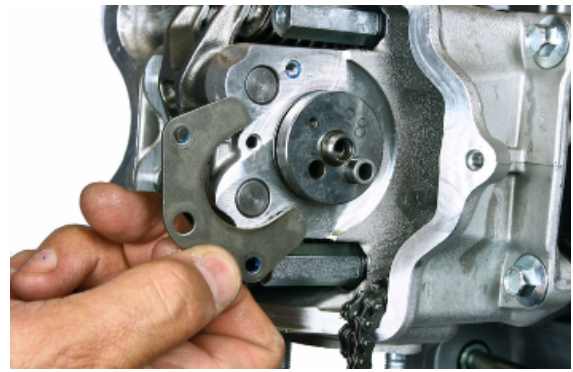


Removing the cam shaft

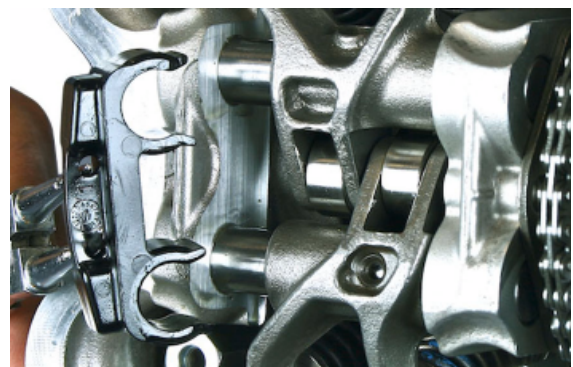
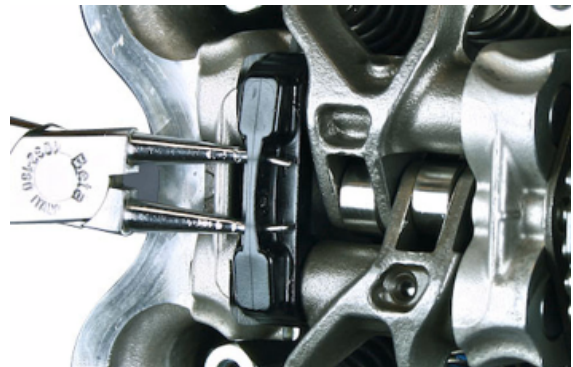
- Unscrew the two screws of the camshaft lock.



- Remove the lock and the camshaft.



- Remove the lock of the rockers to allow them to slide on the pins to access the calibrated pads.



- Remove the calibrated pads

CAUTION

PROPERLY REPLACE THE PADS AND ROCKERS SO AS TO PRESERVE THE COUPLINGS.

CAUTION

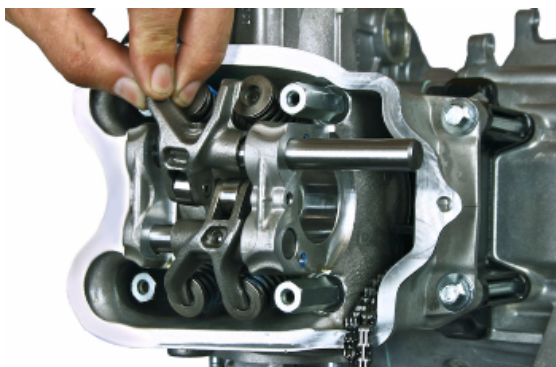
IF NECESSARY USE A TELESCOPIC MAGNET TO REMOVE THE PADS, PAY PARTICULAR ATTENTION THAT THEY DO NOT FALL IN THE TRANSMISSION HOUSING.



- Remove the pins and the rockers.

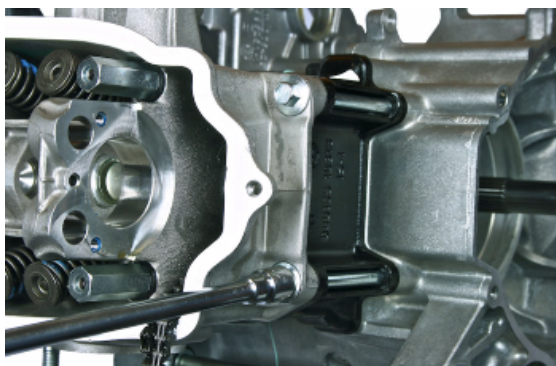
N.B.

IF NEEDED, THE HEAD MAY BE REMOVED WITH THE CAMSHAFT, ROCKER PINS AND FIXING BRACKET. THE HEAD CAN ALSO BE REMOVED WITHOUT REMOVING THE CHAIN AND THE CRANKSHAFT CHAIN TENSIONER.

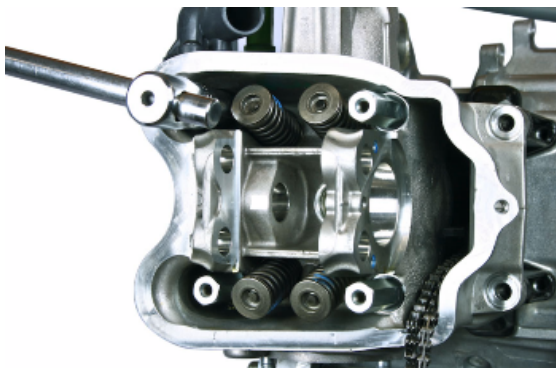


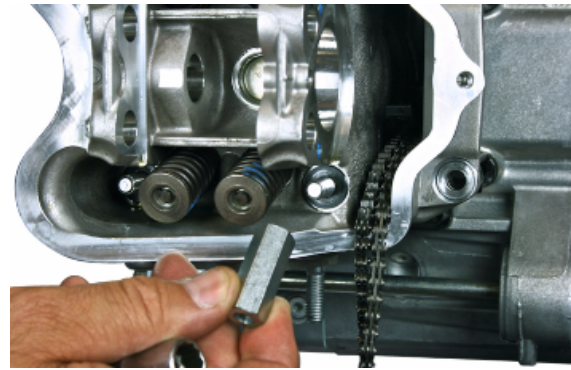
Removing the cylinder head

- Undo the two external screws.



- Gradually loosen the four columns in crossed sequence, recovering the washers.

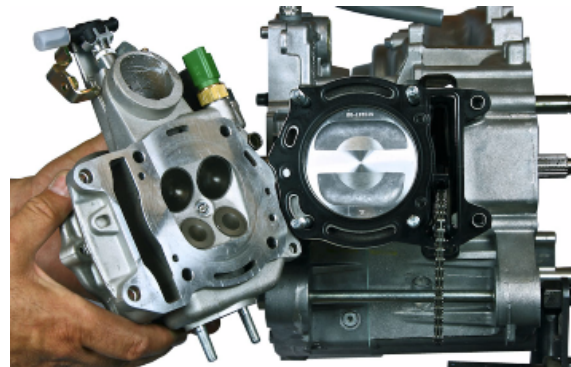




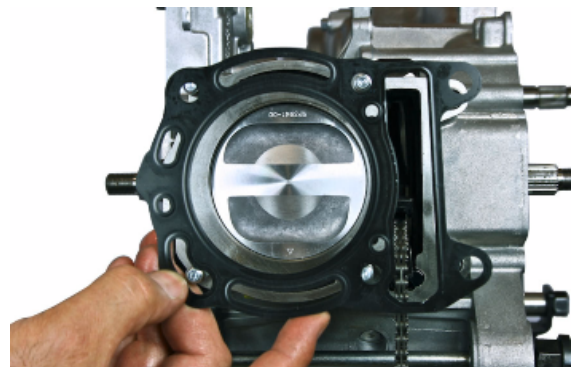
- Remove the cylinder head.

N.B.

IF NEEDED, THE HEAD MAY BE REMOVED WITH THE CAMSHAFT, PINS AND ROCKING LEVERS WITHOUT REMOVING THE DRIVING PULLEY UNIT. REMEMBER TO HOLD THE TIMING CHAIN WITH A PIECE OF METAL CABLE AND TO ADJUST THE CHAIN TIGHTENER UPON RE-FITTING.



- Remove the gasket.



Removing the valves

- Use the specific tool to remove the cotters, cap and spring.

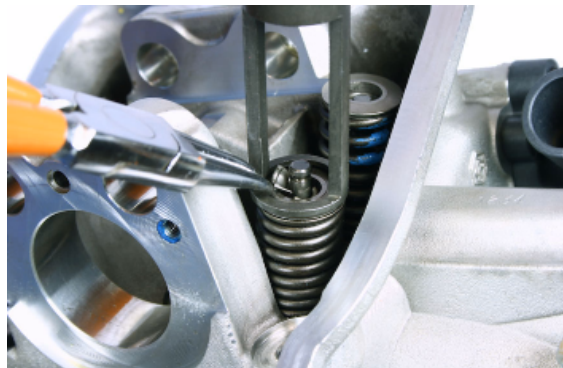
CAUTION

PROPERLY REPLACE THE PADS AND ROCKERS SO AS TO PRESERVE THE COUPLINGS.

Specific tooling

020382Y Tool to extract valve cotters

020382Y012 bush (valve removing tool)



-
- Use the specific tool to remove the valve oil seal.

Specific tooling

020431Y Valve oil seal extractor



-
- Slide off the valve and remove the lower support.



Removing the cylinder - piston assy.

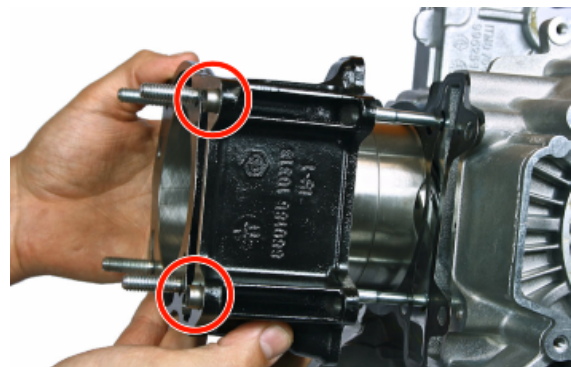
-
- Remove the cylinder, paying attention to the cylinder - head alignment dowels.

N.B.

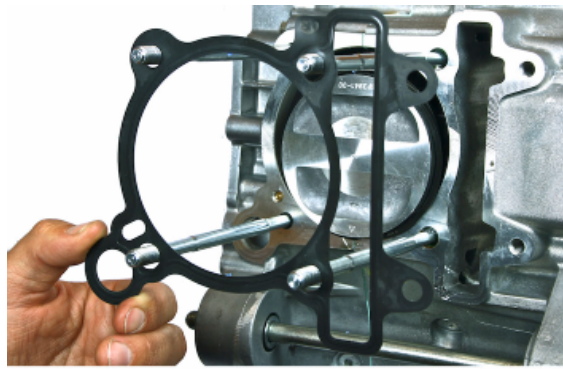
IN ORDER NOT TO DAMAGE THE BASE GASKET WITH THE PISTON LOCK FORK 020512Y DURING THE MOUNTING PHASE, IT IS RECOMMENDED TO INSERT THE ALIGNMENT DOWELS OF THE CYLINDER - CRANKCASE UNDER THE CYLINDER DURING THE ASSEMBLY.

CAUTION

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



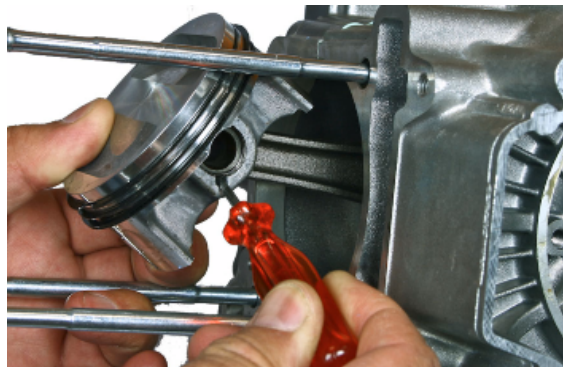
-
- Remove the base gasket.



-
- Remove the retainer rings and remove the piston.

N.B.

BE CAREFUL NOT TO DAMAGE THE SEALING RINGS DURING REMOVAL.



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 piston rings

N.B.

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

See also

[Piston rings](#)

Removing the piston

- Insert the pin.
- Insert the retainer rings.

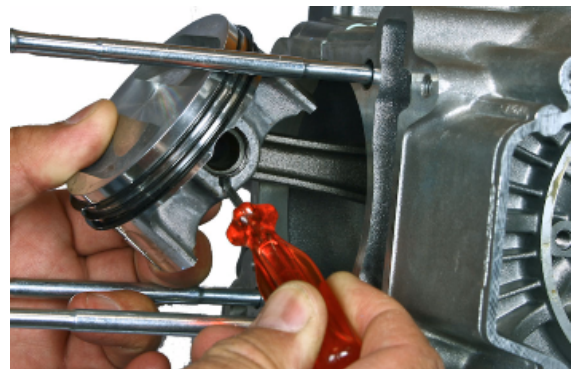
CAUTION

POSITION THE ARROW PRINTED ON THE PISTON CROWN TOWARDS THE EXHAUST OPENING. THE WRIST PIN SNAP RINGS MUST BE POSITIONED ON THE PISTON WITH THE SPECIFIC TOOL

CAUTION



AT EVERY NEW MOUNTING USE RETAINER RING PINS.





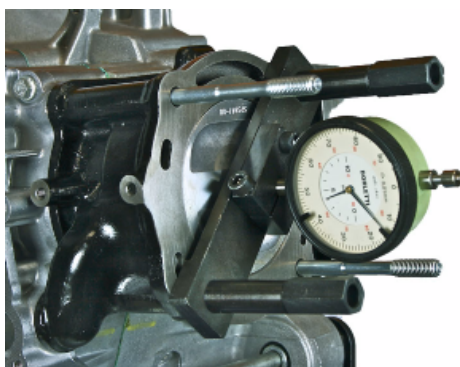
Choosing the gasket

- Provisionally fit the piston into the cylinder, without any base gasket.
- Assemble a dial gauge on the specific tool.

Specific tooling

020921Y Piston position checking tool

- Using an abutment plane, reset the dial gauge with a preload of a few millimetres.
- Finally fix the dial gauge.
- Check the perfect sliding of the feeler pin.
- Install the tool on the cylinder without changing the dial gauge position.
- Lock the tool using the original head fixing nuts.
- Rotate the crankshaft up to the TDC (the inversion point of the dial gauge rotation)
- Measure the deviation from the reset value.



- By means of the table, see the Specifications chapter identify the cylinder base gasket thickness to be used for refitting. Correctly identify the cylinder base gasket thickness to keep the correct compression ratio.
- Remove the special tool and the cylinder.

See also

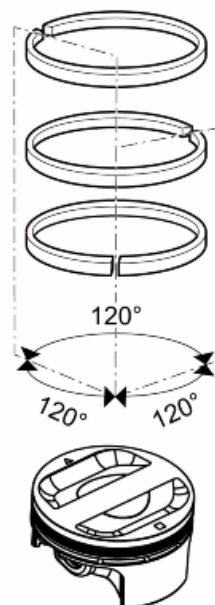
[Slot packing system](#)

Refitting the piston rings

- Pistons (like cylinders) are supplied in 4 categories: M,N,O,P, must be mounted so that the reference arrow is pointing towards the exhaust duct. The letter is found at the centre of the piston.
- Fit the sealing rings with the word TOP or the identification letter facing upwards. In any case, the step must be facing opposite the piston crown.
- Sealing rings are manufactured with a cylinder contact conical cross-section and piston gaps must be offset by 120° in order to obtain a better bedding.
- Lubricate rings with engine oil when fitting them.

CAUTION

AT EVERY NEW MOUNTING USE RETAINER RING PINS.



Refitting the cylinder

- Insert the piston lock in the flywheel side piston, directing the bands in the indicated position, lubricate with the recommended product and place the piston in the specific tool.

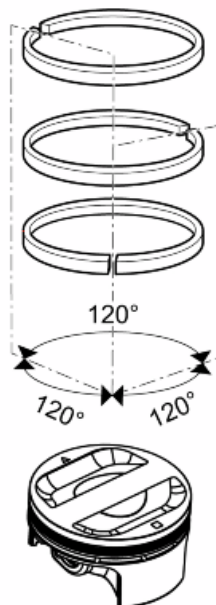
Specific tooling

020927Y Piston assembly band

Recommended products

eni i-Ride PG 15W-50 Synthetic-based lubricant for four stroke engines.

JASO MA, MA2 - API SJ - ACEA A3



- Acting on the piston, insert it in the specified tool until half of the seat of the piston goes out from the lower part.





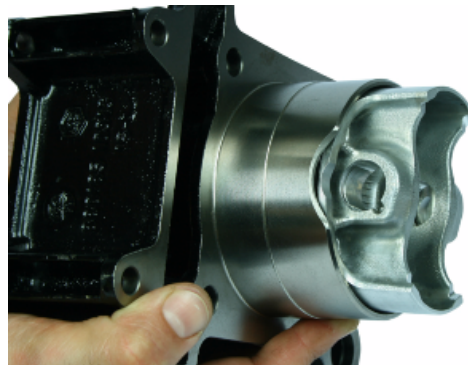
- Lubricate the cylinder with the recommended product.
- Place the piston installed in the tool in the cylinder, the lower part will be the guide.
- Use a handle positioned in the centre of the piston and in one movement push the piston inside the cylinder.

**Recommended products**

eni i-Ride PG 15W-50 Synthetic-based lubricant for four stroke engines.

JASO MA, MA2 - API SJ - ACEA A3

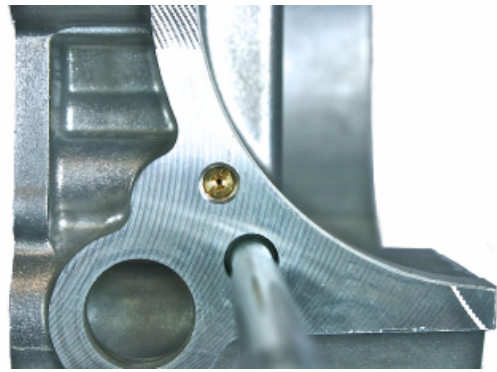
- Insert the piston, position it so that you can carry out the fitting the connecting rod, until the seat of the pin goes out from the lower part.



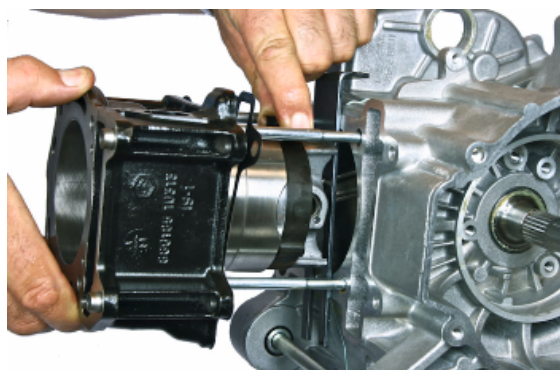
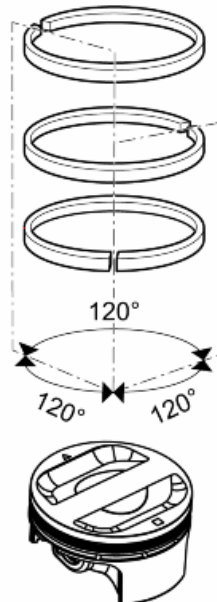
N.B.

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

- Check the position of the dowels and insert the gasket with the previously determined thickness.



In addition to the above procedure, the piston can be fitted with another special tool:



Inspecting the cylinder head

N.B.

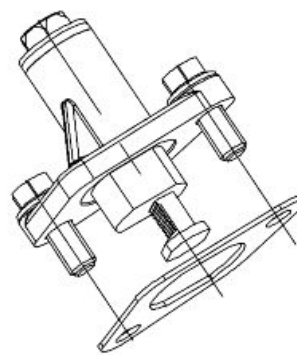
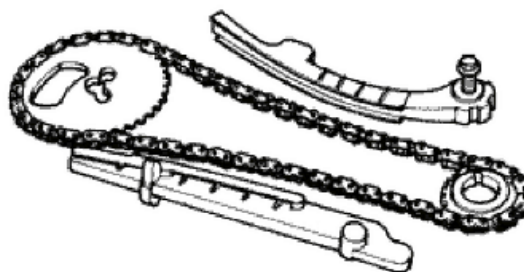
TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

[Cylinder Head](#)

Inspecting the timing system components

- Check that the guide slider and the tensioner slider are not worn out.
- Ensure that the camshaft control pulley chain assembly and the sprocket wheel are not worn.
- If you detect wear, replace the parts or, if the chain, sprocket wheel and pulley are worn, replace the whole unit.
- Remove the centre screw with the washer and the tensioner spring. Check that the one-way mechanism is not worn.
- Check the condition of the tensioner spring.
- If examples of wear are found, replace the whole unit.



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.

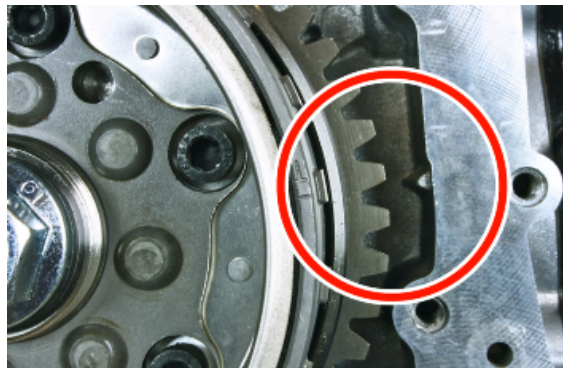
TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

[Cylinder Head](#)

VALVE CLEARANCE CHECK

- Remove the cover.
- Position the engine to the TDC in compression



- Using a feeler gauge check the valve clearance.

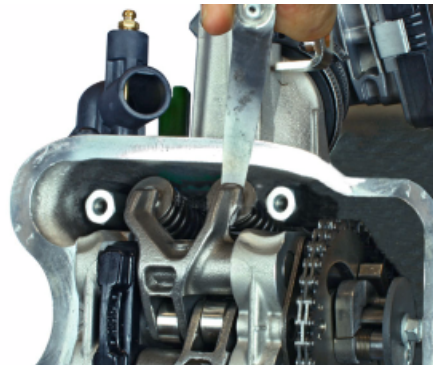
CAUTION

- USE THE FEELER GAUGE Laterally, in line with the valves, in order to prevent accidental bending of the blade that may affect the measurements.

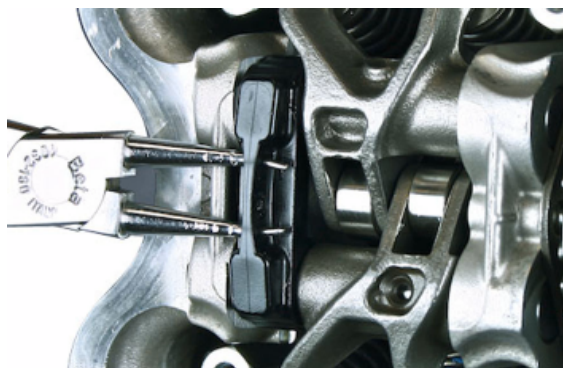
Characteristic**Valve clearance (when cold)**

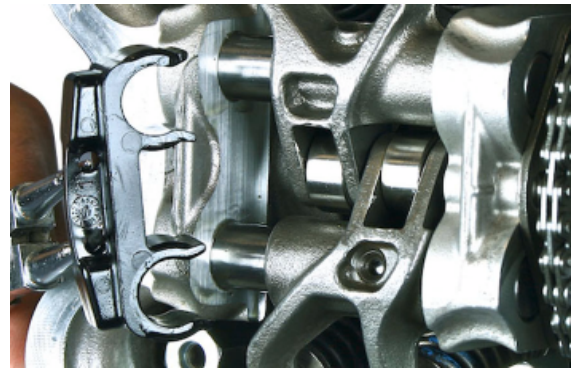
Intake: 0.00393in (0.10 mm)

Exhaust: 0.00590in (0.15 mm)



- Detecting incorrect values, proceed with the replacement of the calibrated pad. To perform this operation you must remove the rockers lock.
- Using pliers, remove the lock.





- Move the rocker and replace the interested pad, correcting the clearance in the pre-set value.

N.B.

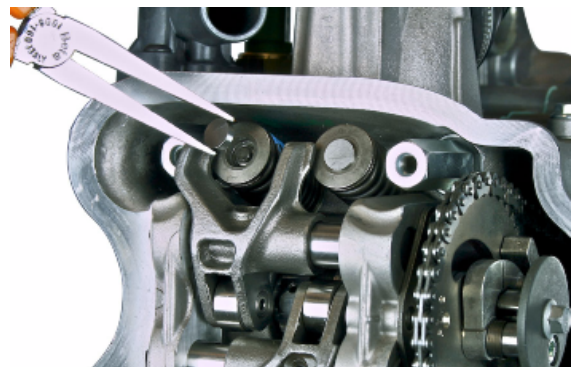
INSERT THE CALIBRATED PADS WITH THE WORDS SIDE VALVE IN ORDER TO PRESERVE THE INDICATION OF THICKNESS OVER TIME.

THE OUTLET ROCKER SLIDES ON THE AXIS ONLY AFTER THE INTAKE ROCKER HAS BEEN MOVED. MAKE SURE THAT THE PADS DO NOT FALL INSIDE THE ENGINE COMPARTMENT.

Characteristic**Valve clearance (when cold)**

Intake: 0.00393in (0.10 mm)

Exhaust: 0.00590in (0.15 mm)



- Insert the rockers lock.
- Fit the valve cover.



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.



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 POSITIONS THE VALVES ARE FITTED IN FIT THE VALVE SPONGES WITH THE REFERENCE COLOUR ON COTTER SIDE (TURNS WITH GREATER PITCH).

Specific tooling

020306Y Punch for assembling valve seal rings

020382Y Valve cotters equipped with part 012 removal tool

020382Y012 bush (valve removing tool)



Inspecting the cam shaft

N.B.

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

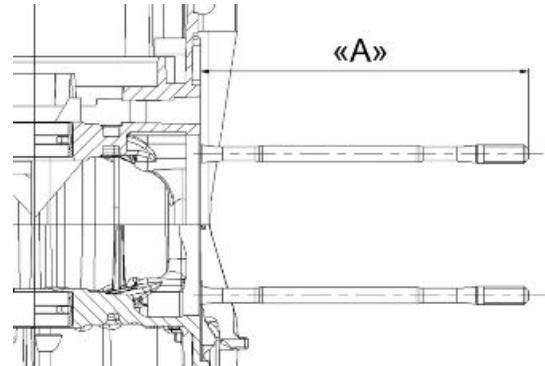
See also

Cylinder Head

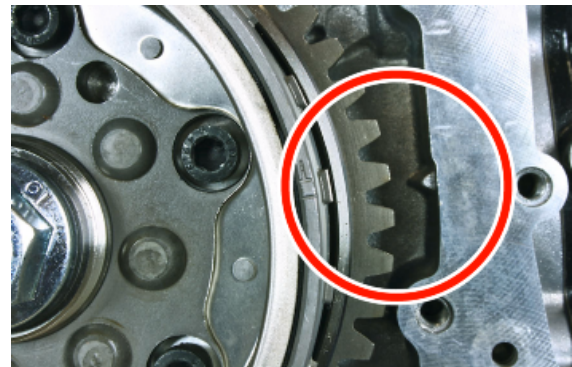
Refitting the head and timing system components

CAUTION

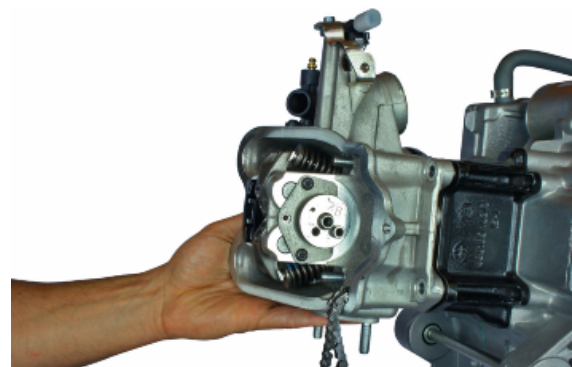
AT EACH REMOVAL OF THE CYLINDER HEAD IT IS NECESSARY TO REPLACE THE STUD BOLTS. FOR FITTING QUOTA SEE THE SECTION "MOTOR/STUD BOLT SHAFT CRANKCASE"



- Position the crankshaft to the TDC in compression



- Insert the head gasket and check the correct operation of the alignment dowels.
- Insert the chain guide slider.
- Insert the head.
- Lubricate the stud bolt threads with engine oil.



- Tighten the nuts to pre-torque as indicated.
- Tighten up the nuts by rotating $270.0 \pm 5.0^\circ$ with crossed sequence.
- Fit the two screws on the outside of the timing chain side and tighten them to the specified torque.

N.B.

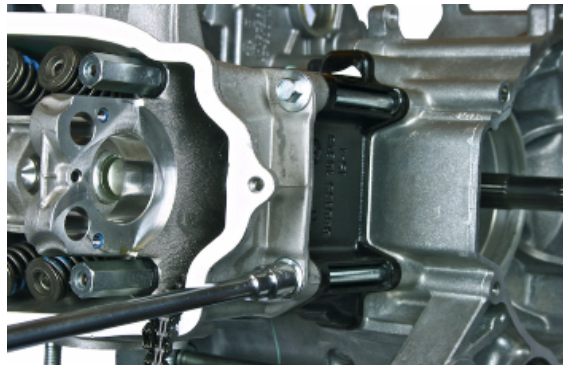
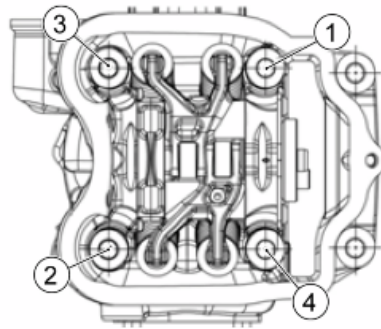
BEFORE INSTALLING THE HEAD, MAKE SURE THAT THE LUBRICATION CHANNEL IS CLEAN USING A COMPRESSED AIR JET.

CAUTION

ALWAYS USE A NEW HEAD GASKET UPON REFITTING.

Locking torques (N*m)

Screws fixing cylinder head to crankcase (14.75÷17.70)lb ft (20÷24)Nm **Cylinder head nut (PRE-TIGHTENING)** (4.42÷5.90)lb ft (6÷8)Nm **Cylinder head nut (TIGHTENING)** (6.64÷8.11)lb ft (9÷11)Nm (Tighten to the specified torque then rotate $270.0^\circ \pm 5.0^\circ$)



Fit the pins and rocking levers.

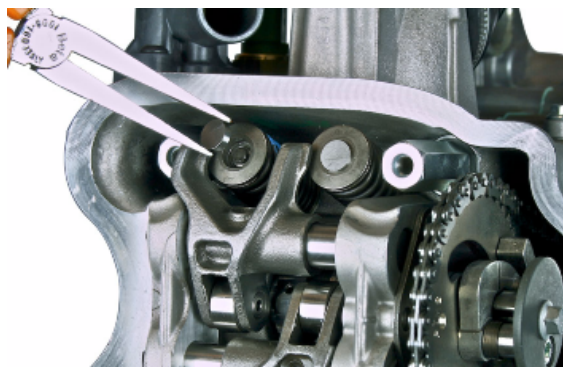
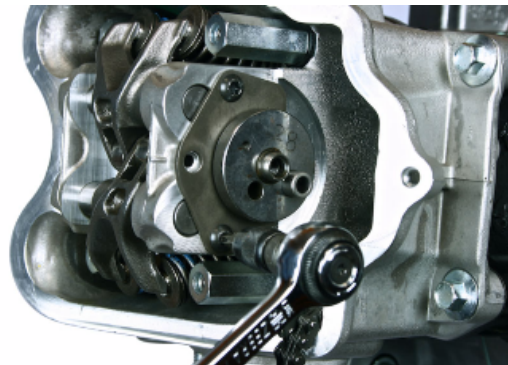
- Lubricate the two rockers through the upper holes.
- Lubricate the two housings and insert the camshaft in the cylinder head with the cams opposing the rockers.
- Insert the calibrated pads and block the sliding of the rockers by inserting the lock.
- Insert the retention plate and tighten the three screws locking them to the specified torque. Clean any threadlock remains from the seats, do not use threadlock, the new screws to use during mounting have scotch-grip application.

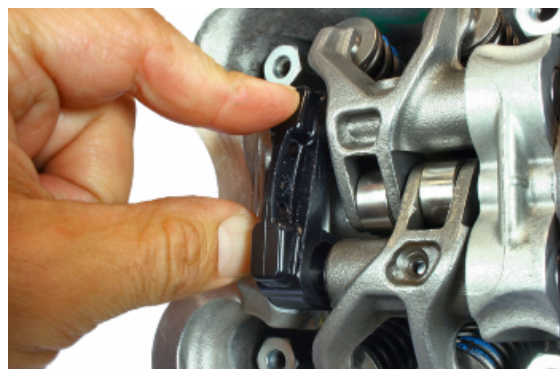
CAUTION

FOR THE INSTALLATION, ALWAYS USE NEW NUTS ALREADY PROVIDED WITH SCOTCH GRIP.

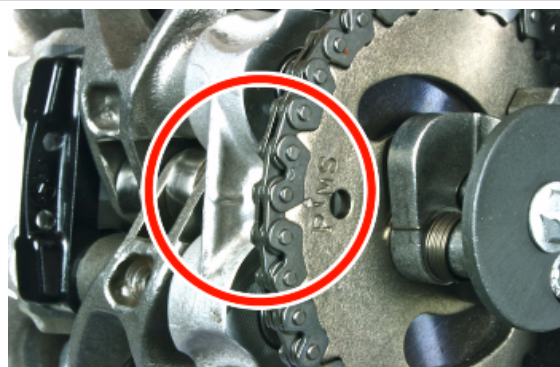
Locking torques (N*m)

Camshaft retainer plate screw (3.32÷4.06)lb ft (4.5÷5.5)Nm



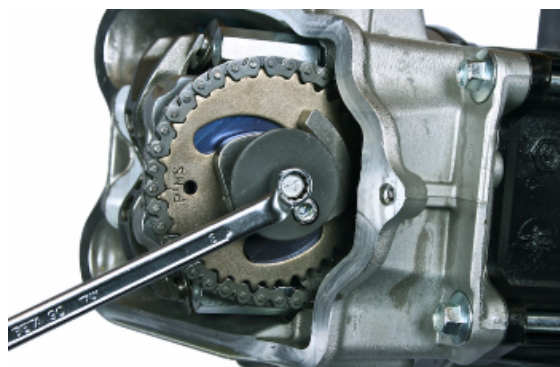


- Working in reverse order, assemble the camshaft command components, respecting the phase position.
- To tighten the decompressor, bring the mass screw to a stop and, holding it tightly, tighten the central locking screw of the starter crown.
- Then tighten the central screw.



Locking torques (N*m)

Pressure reducer counterweight retainer screw (5.16÷6.27)lb ft (7÷8.5)Nm
Timing system gear fixing screw (8.11÷11.06)lb ft (11÷15)Nm



Set the tensioner cursor to the rest position.

- Fit the chain tensioner on the cylinder, using a new gasket, and tight the two screws to the specified torque.
- Insert the chain tensioning screw, together with the spring and washer, tightening it to the prescribed torque.

Locking torques (N*m)

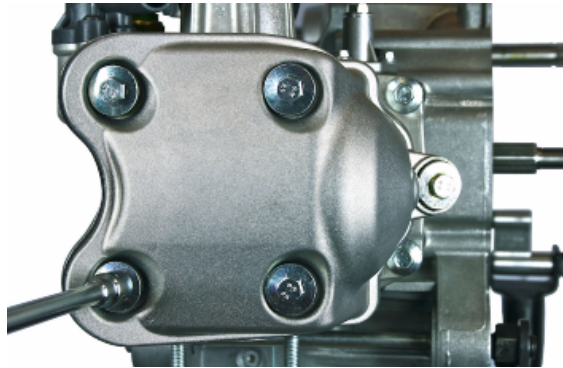
Mount the locking chain tensioner with 2 screws 8.11÷9.59)lb ft (11÷13)Nm
Locking the chain tensioner support hood (3.69÷4.42)lb ft (5÷6)Nm

Refitting the rocker-arms cover

- Refit the cylinder head cover and tighten the 5 clamping screws to the prescribed torque.
- Pay attention to the integrity of rubber gaskets, replace them if necessary.
- Make sure the gasket is positioned properly.

Locking torques (N*m)

Head cover screws (4.42÷5.16)lb ft (6÷7)Nm

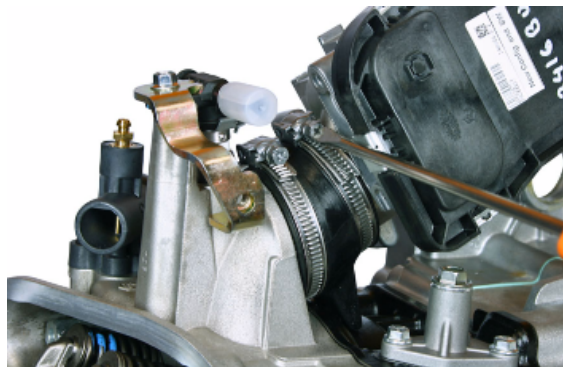


Refitting the intake manifold

- Insert the joint sleeve between the manifold and the control unit on the cylinder head, insert the throttle body and tighten the screws to the specified torque.

Locking torques (N*m)

Big end / throttle body union fitting clamps (0.96÷1.25)lb ft (1.3÷1.7)Nm



Crankcase - crankshaft

Splitting the crankcase halves

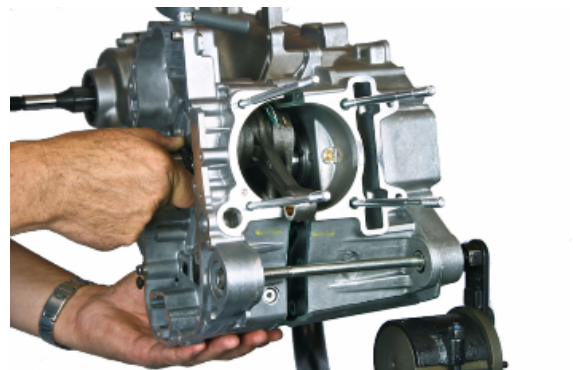
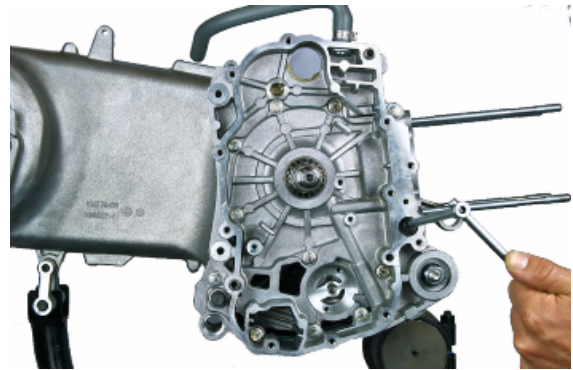
- Undo the twelve crankcase coupling screws.
- Separate the crankcase halves while keeping the crankshaft in one of these two halves.
- Only after the halves have been separated, can the crankshaft be checked.

CAUTION

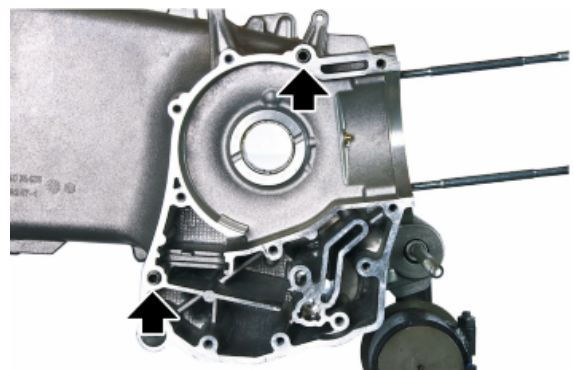
WHILE OPENING THE CRANKCASES AND REMOVING THE CRANKSHAFT, CHECK THAT THE THREADED SHAFT ENDS DO NOT INTERFERE WITH THE MAIN BUSHINGS. FAILURE TO OBSERVE THIS PRECAUTION CAN DAMAGE THE MAIN BUSHINGS.

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.



- Remove the gasket and be careful with the alignment dowels.



- Remove the by-pass and the oil bulkhead.



- After removing the oil bulkhead, blow and clean thoroughly before fitting.



Inspecting the crankshaft components

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 fly-wheel 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.

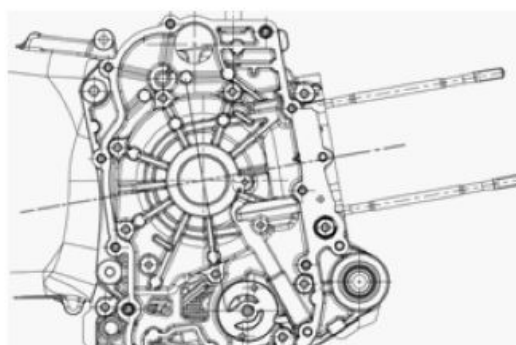
THE HEAD LUBRICATION CHANNEL IS PROVIDED WITH A SHUTTER JET; THIS GIVES A "LOW PRESSURE" HEAD LUBRICATION; THIS CHOICE WAS MADE TO REDUCE THE OIL TEMPERATURE IN THE SUMP. THE JET CLOGGING IMPAIRS THE HEAD LUBRICATION AND THE TIMING MECHANISMS. A JET FAILURE CAUSES A DECREASE OF THE MAIN BUSHING AND CONNECTING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



Inspecting the crankshaft plain bearings

- To obtain a good bushing lubrication it is necessary to have both an optimal lubricating pressure 46.41 PSI(320 kPa)(3.2 bar) and a good oil flow rate; the bushings must be correctly positioned so as not to obstruct the oil supply channels.

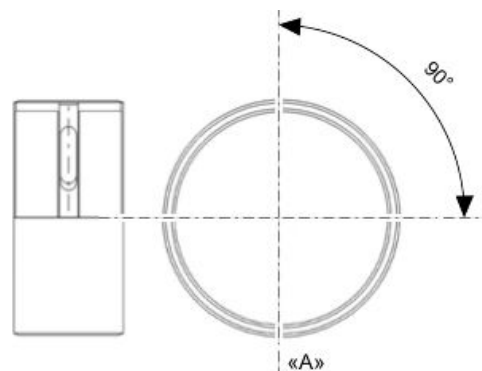
- The main bushings are comprised of two half-bearings, one with holes and channels for lubrication whereas the other is solid.



Characteristic

«A»

AXIS CYLINDER



- 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](#)

Coupling chart

N.B.

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

See also

[Crankcase - crankshaft - connecting rod](#)

Refitting the crankcase halves

- Follow the removal steps but in reverse order; be careful to respect the prescribed tightening torques.
- Insert the by-pass and the oil bulkhead.
- Insert a new gasket and be careful with the alignment dowels.
- Maintaining the crankshaft inserted in the fly-wheel side crankcase, couple the crankcase halves.
- Insert the screws and tighten to specified torque.

**CAUTION**

**CAREFULLY CHECK THE CLEANING OF THE BY-PASS DUCT.
CHECK THAT THE PISTON SLIDES BY HAND, FREELY
AND WITHOUT STICKING.**

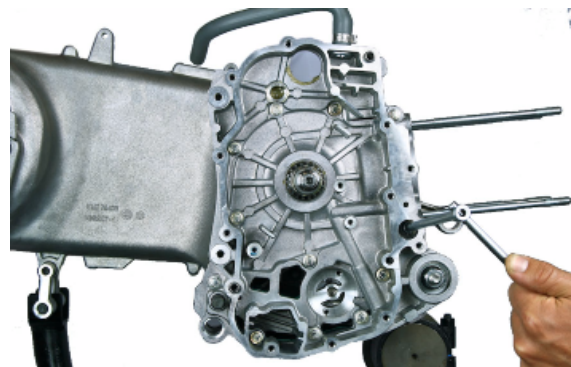
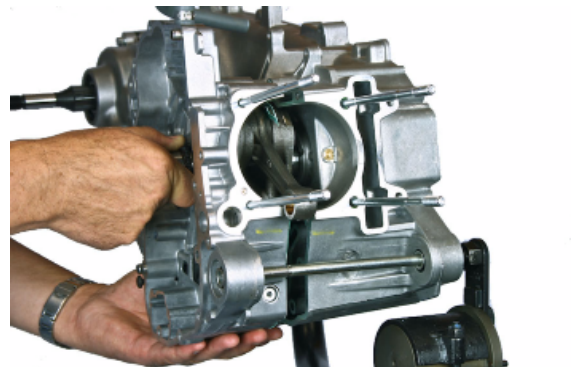
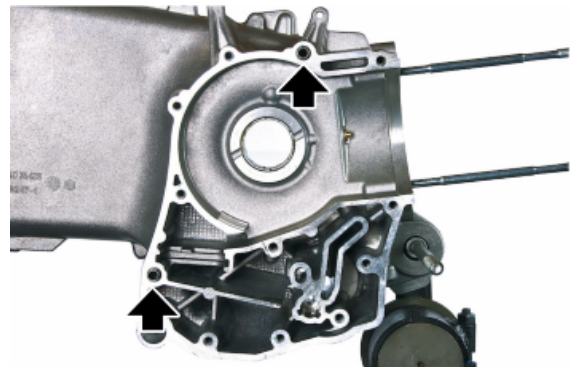
CAUTION



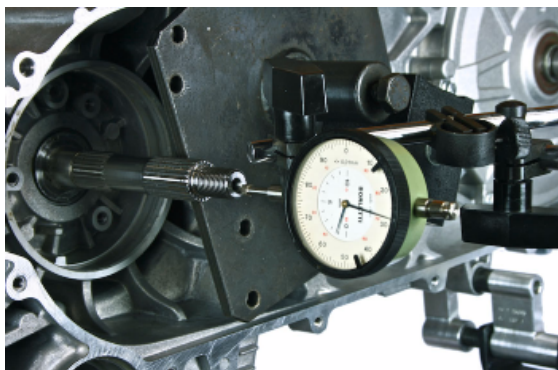
IT IS ADVISABLE TO INSERT THE CRANKSHAFT IN THE FLYWHEEL SIDE CRANKCASE HALF TO PREVENT, WITH ACCIDENTAL MOVEMENTS DURING INSERTION, THE OIL PUMP CONTROL TOOTHING FROM DAMAGING THE BUSHINGS.

Locking torques (N*m)

**Engine-crankcase coupling screws (8.11÷9.59)lb
ft (11÷13)Nm**



- Complete the coupling operations with the verification of the crankshaft axial clearance.
- Using specific tools to support the dial gauge, verify that the fitting clearance is within the limits.
- Higher clearances are signs of wear of the crankshaft - crankcase supporting surfaces.



Specific tooling

020163Y Crankcase splitting plate

020335Y Magnetic support for dial gauge

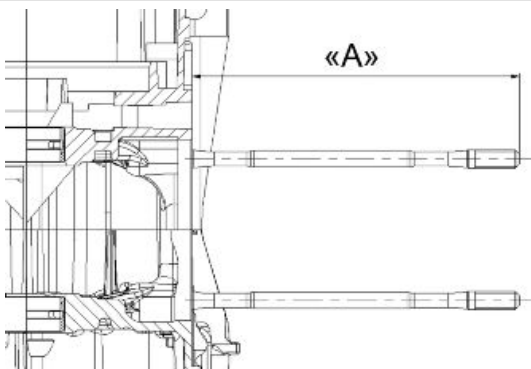
Characteristic

Crankshaft-crankcase axial clearance (H)

(0.005÷0.016)in (0.15 ÷ 0.43)mm

Studs

- Using two nuts, fitted as nut and lock nut type, remove and then drive from the seat.
- Proceed with a thorough cleaning of the threaded seat on the crankcase.
- Screw the new stud bolts up to the driving depth indicated.



N.B.

THE STUD BOLTS MUST BE REPLACED AT EACH REMOVAL OF THE CYLINDER HEAD.

N.B.

NEW STUD BOLTS DO NOT NEED THREADLOCK, AS THEY COME EQUIPPED WITH SCOTCH-GRIP.

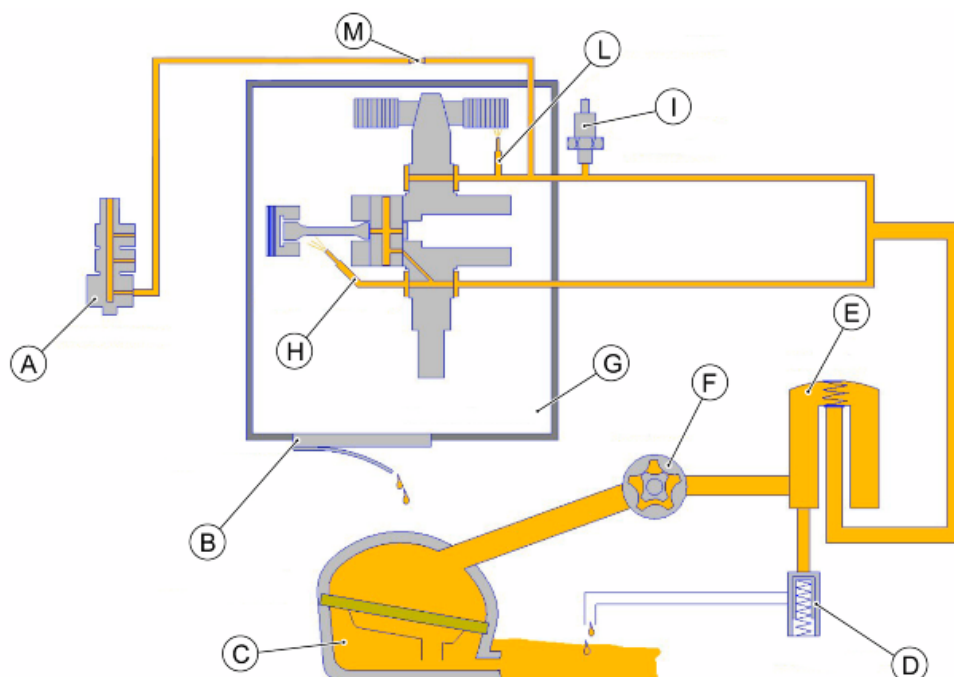
Characteristic

Driving depth of stud bolts «A»

(5.4921÷0.0197)in (139.5+0.5)mm

Lubrication

Conceptual diagrams



The lobe pump «F» sucks the oil from the sump, through the mesh pre-filter «C», it pushes it into the cartridge filter «E» where there is also a safety valve «D».

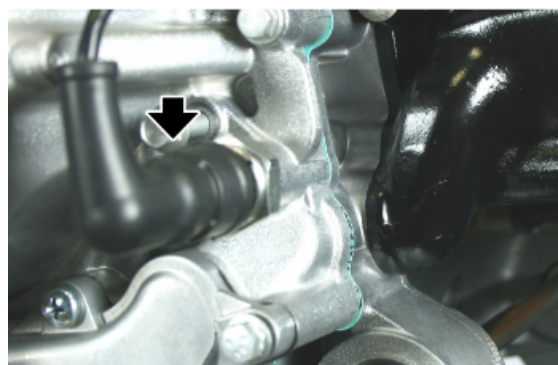
Through the suitable passages found in the crankcases, the oil enters the crank chamber «G» where the main bearings are lubricated and the big end (with high pressure), the piston pin and connecting rod small end via spray «H».

Afterwards, the oil, through a nozzle «M» whose function is to reduce the flow rate, reaches the timing system where it lubricates the camshaft «A» and from there, the valves and rockers. The oil passes through the timing chain duct and returns to the sump «B» by gravity.

In the system there is a minimal oil pressure sensor «I» and a spray that serves to lubricate the stator «L».

Oil pressure check

- Remove the electrical minimum oil pressure switch connection and remove the switch.
- Check that the oil pressure reading is between (7.25÷17.40)PSI (50÷120)kPa (0.5 ÷ 1.2)bar with the engine idling at 1,650 rpm and the oil at the required temperature (wait for at least one electric ventilation).



- Check that the oil pressure reading is between (46.41÷60.91)PSI (320÷420)kPa (3,2÷4,2)bar with the engine idling 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**

Operating pressure

- At 1,650 rpm(g/min): (7.25÷17.40)PSI (50÷10)kPa (0.5÷1.2) bar
- A 6,000 rpm(g/min): (46.41÷60.92)PSI (320÷420)kPa (3.2÷4.2)bar

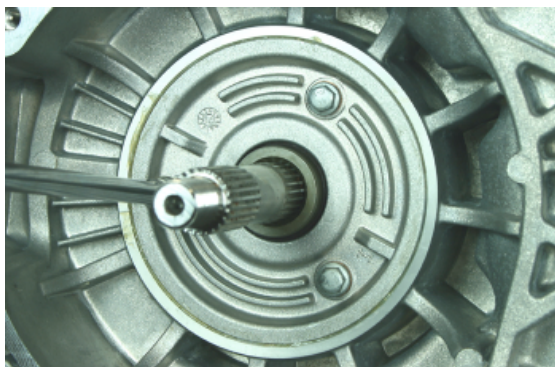
Locking torques (N*m)**Minimum oil pressure sensor locking**

(8.85÷10.33)lb ft (12÷14)Nm (LOCTITE 5091 Edge closure between metal body and plastic block)

Crankshaft oil seals

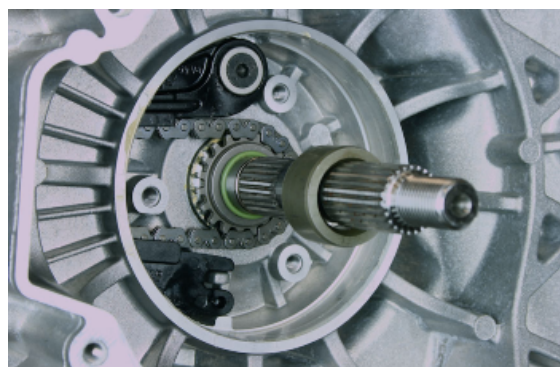
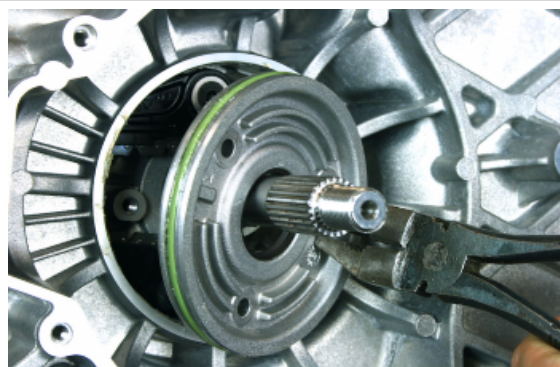
Removal

- Unscrew the three screws and remove them, complete with the copper gaskets.

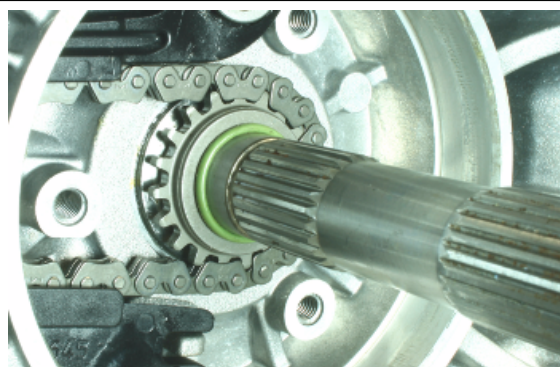




- Using pliers remove the door by acting on the appendices.



- Remove the spacer and the O-ring.



Refitting

- Insert the components making sure to thoroughly grease the O-ring and the fork oil seal.
- Follow the steps in reverse order taking care to tighten to torque.

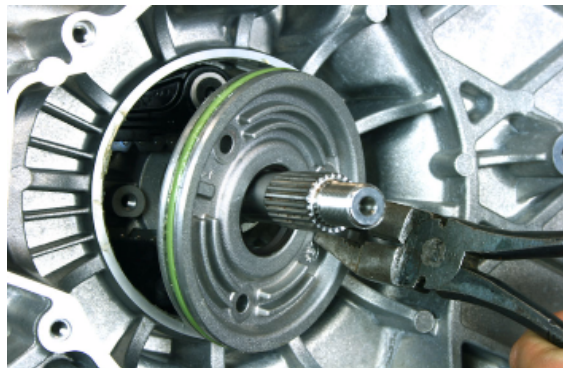
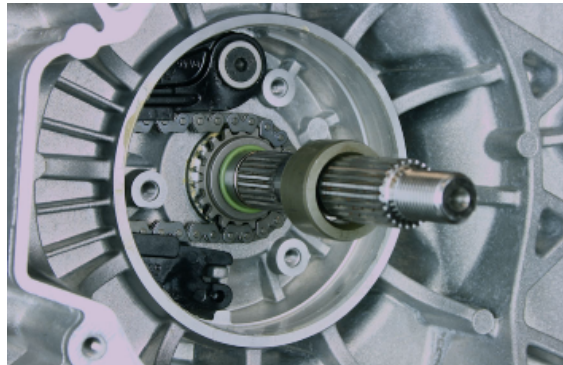
WARNING



IN ORDER TO PREVENT ABNORMAL FORMATIONS OF DIRT DUE TO THE RELEASE OF GREASE, WE RECOMMEND FIRST LUBRICATING THE SEAL RING STOPS WITH A BRUSH.

Locking torques (N*m)

Crankcase timing cover screws (8.11÷9.59)lb ft
(11÷13)Nm



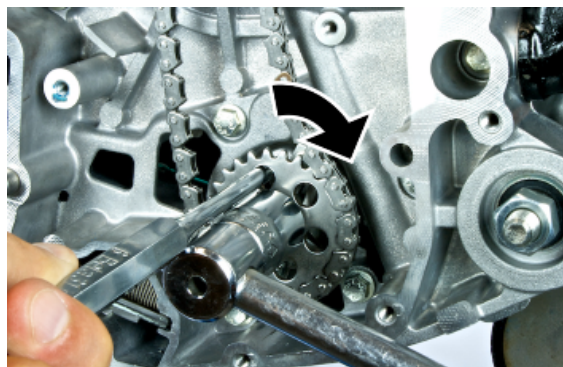
Oil pump

Removal

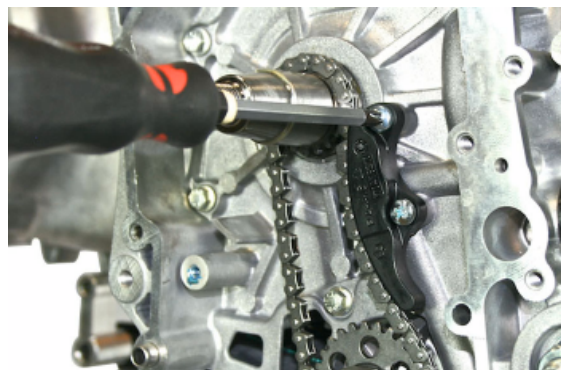
- Remove the flywheel.
- Preventing rotation, unscrew the water pump command screw and collect the washer.

CAUTION

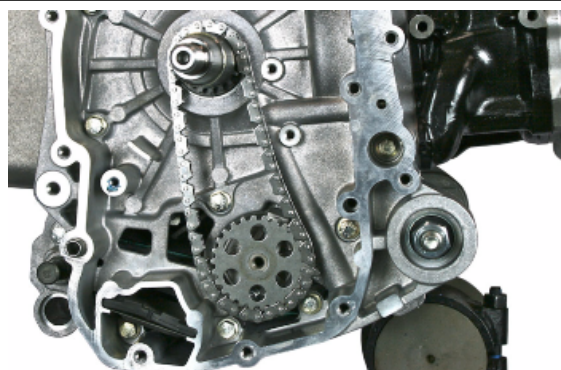
THE THREAD IS ANTICLOCKWISE.



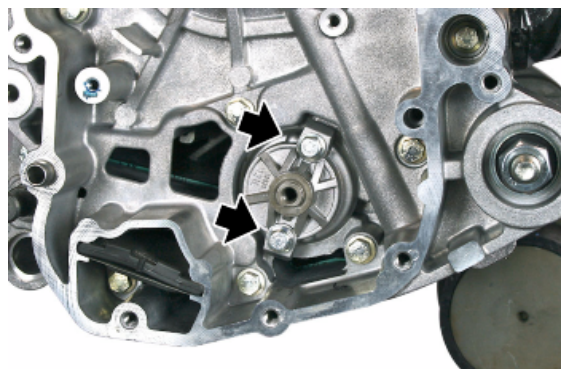
- Unscrew the two screws and remove the tensioner pad



- Remove the oil pump command sprocket complete with chain.



- Unscrew the two screws and remove the oil pump.



Inspection

- Remove the two screws and remove the oil pump cover.
- Remove and wash the rotors thoroughly with petrol and compressed air.
- Reassemble the rotors in the pump body, keeping the two reference marks visible.
- Using a feeler gauge, check the distance between the rotors in the position shown in the figure.
- Check the distance between the outer rotor and pump body, see figure.



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

Characteristic**Axial rotor clearance**

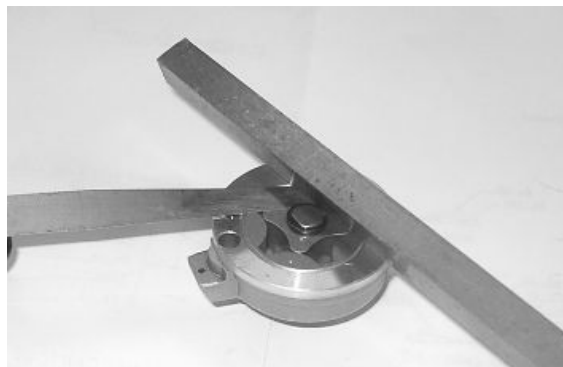
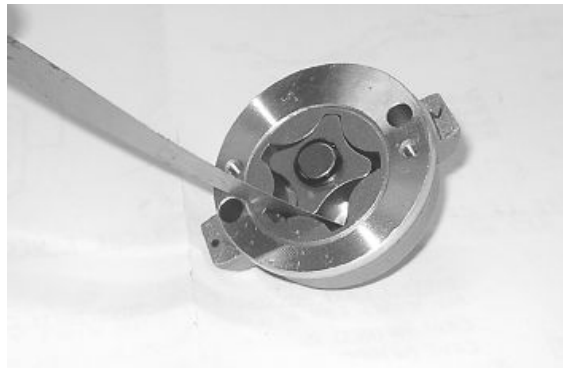
Limit values admitted: 0.00354in (0.09mm)

Distance between the outer rotor and the pump body

Admissible limit clearance: 0.00787in (0.20mm)

Distance between the rotors

Admissible limit clearance: 0.00472in (0.12mm)



Refitting

- Follow the steps in reverse order to the removal, tightening the screws to the specified torque.
- Insert the oil pump.
- Insert the control sprocket and the chain.
- Insert the tensioner slider and tighten the two screws using the recommended product.

N.B.

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

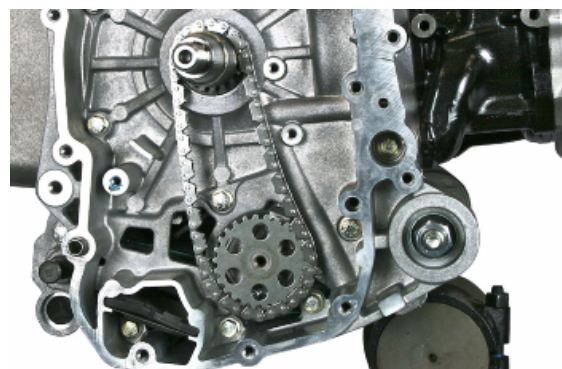
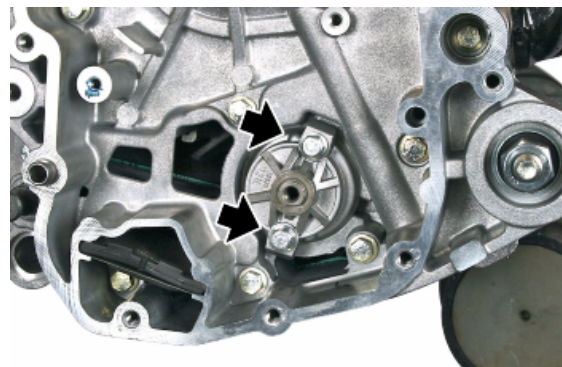
Recommended products

Loctite 243 Medium-strength threadlock

Medium Loctite 243 threadlock

Locking torques (N*m)

Screw fixing oil pump to the crankcase
(3.69÷4.43)lb ft (5÷6)Nm



- Preventing rotation, tighten the water pump command screw complete with washer.

CAUTION

THE THREAD IS ANTICLOCKWISE.

Locking torques (N*m)

Oil pump command sprocket screw (6.64÷8.11)lb ft (9 ÷11)Nm



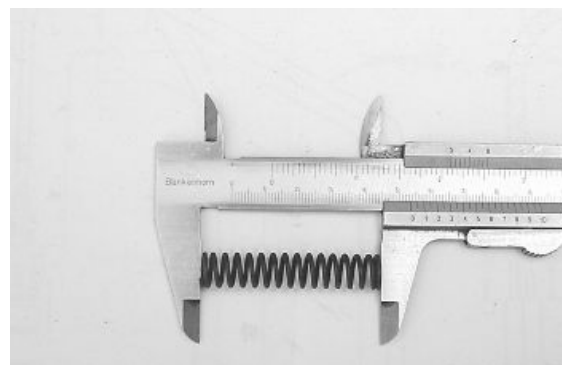
Inspecting the by-pass valve

- 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

Standard length

2.063in (52.4mm)



Piston standard diameter

0.5063÷0.5056in (12.861+12.843mm)

Water pump

Removal

- Before removing the flywheel cover, loosen the impeller.

CAUTION

THE THREAD IS ANTICLOCKWISE.

CAUTION

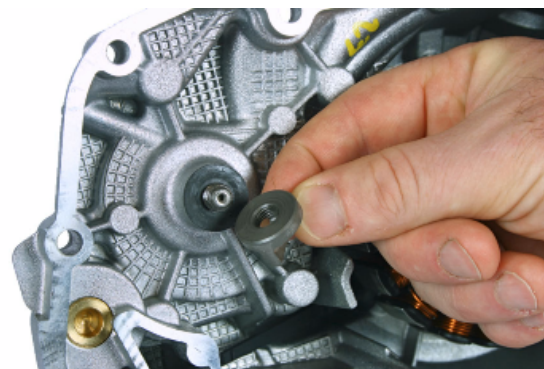
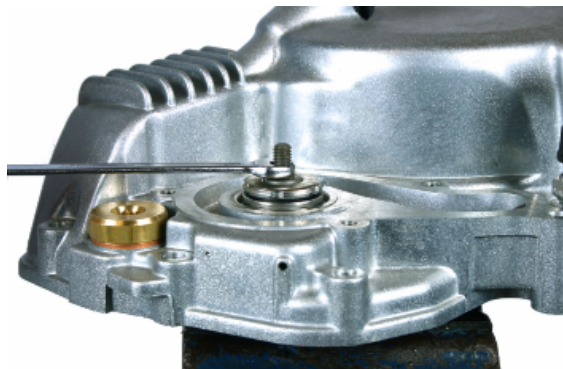
IF THE LOCKING TORQUE IS EXCESSIVE, DO NOT INSIST WITH THE OPERATION BUT CARRY IT OUT AFTER THE REMOVAL OF THE FLYWHEEL COVER. AFTER REMOVING THE FLYWHEEL COVER, LOCK THE IMPELLER (DRIVE SIDE OF MOTORCYCLE) IN THE CLAMP AND, ACTING FROM THE OPPOSITE SIDE, LOOSEN THE IMPELLER SHAFT (LEFT-HAND THREAD).



- Keeping the cover locked in a vice, unscrew the impeller shaft drive. During removal, support the flywheel crankcase. Remove the drive and the shim washer underneath.

CAUTION

THE THREAD IS ANTICLOCKWISE.

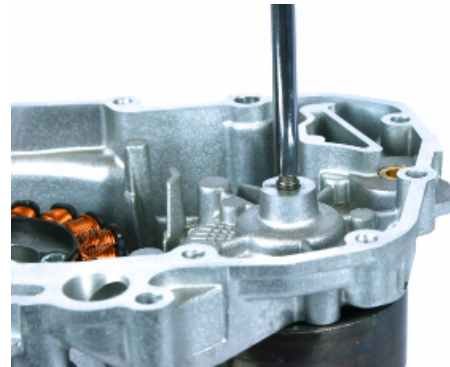




- Using the special tool and appropriate supports, ensure a proper support surface. Using a hammer and a plug (of diameter less than 8 mm and being careful not to damage the shaft seat) remove the shaft and ceramic seal.

Specific tooling

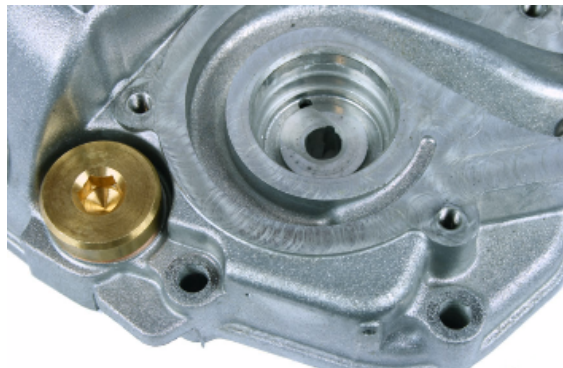
001467Y002 Driver for OD 73 mm bearing



- Supporting the ceramic seal properly, remove the impeller shaft, acting from the mobile side of the seal.



- Using a screwdriver, remove the seal ring from the flywheel cover.
- Check that the shaft housing hole on the crank-case does not show abnormal wear. Make sure the ceramic seal seat does not show signs of scoring. Check the cleaning of the drain and lubrication holes.



Fitting

- Lubricate the new seal ring with grease and insert it in the flywheel cover.

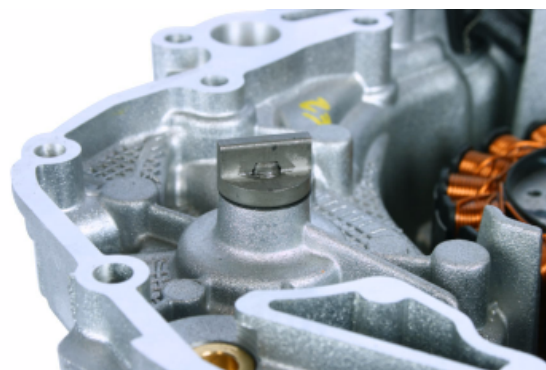
Specific tooling

020376Y Adaptor handle

020375Y 28 x 30 mm adaptor



- Grease the shaft and insert it in the seat. Insert the shim washer and manually start-up the drive.



- Locking the drive in a vice, properly lock the shaft.
- Check that the shaft rotates freely (considering the friction of the oil seal) and that the axial clearance is noticeable but not excessive.

Locking torques (N*m)

**Water pump impeller driving link (9.59÷11.06)lb ft
(13÷15)Nm**



- Insert the new ceramic seal using the specific tool.
- Start the tool.
- Insert the new ceramic seal.
- Insert the housing of the tool and tighten the nut with a wrench while holding the central pin locked. Screw until the seal stops on the crankcase.
- The special tool provides for processing that ensures the proper preloading of the ceramic seal.
- Remove the tool.



Specific tooling

020661Y Water pump overall seal replacement kit

- Insert and screw the impeller to the specified torque.

Locking torques (N*m)

Impeller on the pump shaft (2.95÷4.42)lb ft (4÷6)Nm



INDEX OF TOPICS

INJECTION	INJEC
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COMPONENT LAYOUT

	Specification	Desc./Quantity
1	Battery	12V - 10Ah
2	Diagnostics socket connector	
3	Electric fan remote control	
4	Injection load remote control	
5	Water temperature sensor	
6	Throttle body and electronic injection control unit (MIU)	
7	Fuel injector	
8	HV coil	
9	Lambda Probe	
10	Fuel pump	
11	Engine Speed sensor	

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.

Combustion 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 combustion.

In all conditions of use, mixture preparation is managed by modifying the injector opening time.
The fuel 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 two pipes provided with quick couplings. This allows obtaining a continuous circulation, thereby avoiding the risk of fuel boiling. The pressure regulator is situated at the end of the circuit.

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

The **ignition circuit** consists of:

- HV coil
- HV 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.

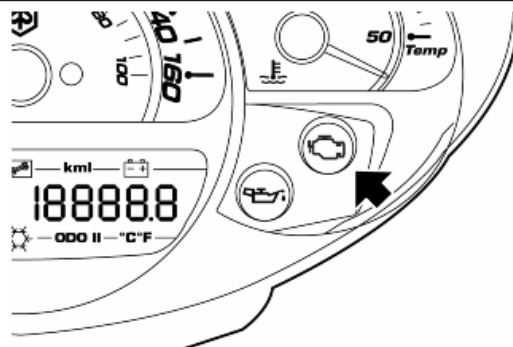
The MIU injection-ignition system controls engine functions by means of a pre-set program.

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
- HV coil
- Injector

The control unit is provided with a self-diagnosis system connected to an indicator light in the instrument panel.



Failures are detected and restored by the diagnostic tester.

In any case, when the fault is no longer present, the data storage is automatically cleared after 16 cycles of use (cold start, running at regular engine temperature, stop).

The diagnostic tester is also required to adjust the idle mixture.

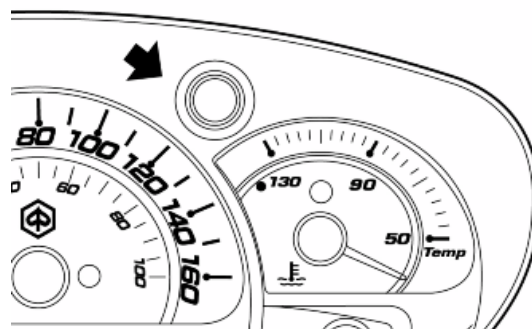
Specific tooling

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; to allow further safety of the vehicle.

Precautions

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: Electrical power supply

- a. Battery voltage
- b. Burnt fuse
- c. Remote control switches
- d. Connectors

B: Chassis ground

C: Fuel system

- a. Faulty fuel pump
- b. Dirty fuel filter

D: Ignition system

- a. Faulty spark plug
- b. Faulty coil
- c. Faulty screened cap

E: Intake circuit

- a. Air filter dirty
- b. Dirty by-pass circuit
- c. Faulty stepper motor

F: Other

- a. Wrong distribution timing
- b. Incorrect idle speed carburetion
- c. Incorrect reset of the throttle valve position sensor

2 MIU system faults 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 MIU. If the fault is fixed by replacing the MIU, install the original control unit again and check if the fault occurs again.

4 Use a multimeter with an internal resistance of more than 10K Ohm /V when troubleshooting. Instruments that are not suitable might damage the MIU central control unit. Use instruments with definitions over 0.1V and 0.5 W, the precision must be greater than 2%.

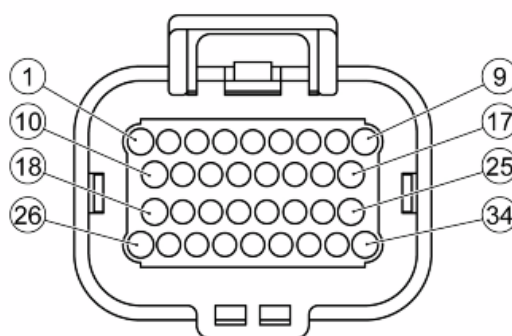
-
1. Before repairing any part of the injection system, check if any faults have been stored. Do not disconnect the battery before checking for faults.
 2. The fuel supply system is pressurised at 36.26PSI (250KPa) (2.5bar). Before disconnecting the fast-release fitting of the fuel supply pipe, check 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.
 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 batteryFailure 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.

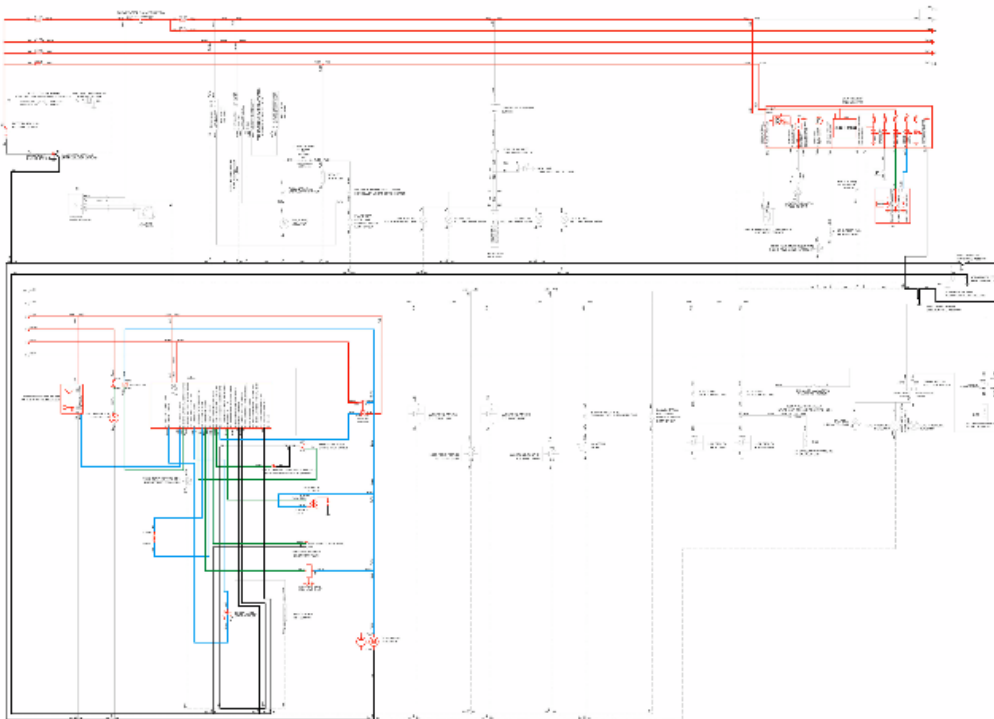
Terminals setup



TERMINAL LAYOUT

	Specification	Desc./Quantity
1	HV coil	(Red-Black)
2	-	
3	Tip over switch	(Grey - Black)
4	Engine switch	(Orange)
5	Starter switch	(Purple)
6	+Live supply	(Orange - Blue)
7	Ground lead 1	(Black)
8	-	
9	+ Battery	(Red - White)
10	Starter enable	(Purple-White)
11	+ Lambda probe	(Green - Blue)
12	- Lambda probe	(Light blue - Black)
13	Water temperature sensor	(Light blue - Green)
14	Antenna	(Orange - White)
15	Sensor ground	(Grey - Green)
16	"K" line diagnostics	(Orange - Black)
17	Immobilizer LED	(Yellow)
18	-	
19	Side stand	(Brown - Red)
20	Engine speed sensor -	(Brown)
21	-	
22	Injection load solenoid	(Black- Purple)
23	Ground lead 2	(Black)
24	Electric fan relay	(Green- White)
25	Led injection telltale light	(Brown - White)
26	-	
27	-	
28	-	
29	Engine speed sensor +	(Red)
30	-	
31	-	
32	-	
33	Light relay	(White - Black)
34	Injector	(Red - Yellow)

EMS circuit diagram



BASIC CIRCUIT DIAGRAM LEGEND:

- 1.F01-30A
- 3.F03-10A
- 4.F04-15A
- 5.Starter switch
- 6.F05-10A
- 7.F06-5A
- 10.12V - 10 Ah Battery
- 11.Chassis ground
- 36.Electronic control unit
- 37.Instrument panel
- 39.Engine temperature sensor
- 43.Electric fan
- 44.Immobilizer antenna
- 45.Electric fan relay
- 58.Injection load solenoid
- 59.Fuel pump
- 60.engine stop switch

61.Stand button (raised position)

62.H.V. coil

63.Pick-up

65.Fuel injector

67.Lambda probe

Troubleshooting procedure

Engine does not start

ENGINE DOES NOT START IF ONLY PULLED

Possible Cause	Operation
Immobiliser enabling signal	System not encoded System not efficient, repair according to the indications of the self-diagnosis
Presence of faults detected by the self diagnosis	Pump relay HV coil Injector Revolution timing sensor
Fuel system	Fuel in the tank Fuel pump activation Fuel pressure (low) Injector capacity (low)
Power to the spark plug	Shielded spark plug cap HV coil (secondary insulation)
Parameter reliability	Coolant temperature Distribution timing - injection ignition Intake air temperature
End of compression pressure	End of compression pressure

Starting difficulties

ENGINE STARTER PROBLEMS

Possible Cause	Operation
Presence of faults detected by the self diagnosis	Pump relay HV coil Injector Revolution timing sensor Air temperature Coolant temperature
Start-up speed	Starter motor and solenoid Battery Ground connections
End of compression pressure	End of compression pressure
Power to the spark plug	Spark plug Shielded cap HV coil Speed-timing sensor Ignition advance
Fuel system	Fuel pressure (low) Injector capacity (low) Injector sealing (poor)
Correctness of the parameters	Coolant temperature Stepper throttle valve position intake air temperature (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
Presence of faults detected by the self diagnosis	Pump relay HV coil Injector Revolution 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 box
Fuel system (low pressure)	Fuel pump Pressure regulator Fuel filter Injector capacity

Engine does not rev down

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

Possible Cause	Operation
Presence of faults detected by the self diagnosis	Pump relay HV coil Injector Revolution 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 box
Fuel system (low pressure)	Fuel pump Pressure regulator Fuel filter Injector capacity

Exhaust backfires in deceleration

EXHAUST BACKFIRES WHEN DECELERATING

Possible Cause	Operation
Presence of faults detected by the self diagnosis	Pump relay HV coil Injector Revolution timing sensor Air temperature

Possible Cause	Operation
Correctness of the parameters	Coolant temperature
	Lambda probe
	Throttle valve position sensor
Intake system sealing (infiltrations)	Stepper
	Coolant temperature sensor
	Intake air temperature sensor
	Intake manifold - head
Fuel system (low pressure)	Throttle body - manifold
	Intake sleeve
	Filter box
	Fuel pump
Exhaust system sealing (infiltrations)	Pressure regulator
	Fuel filter
	Injector capacity
	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 box
Ignition system	Spark plug wear check
Parameter reliability	Throttle valve position signal
	Coolant temperature indicator
	Intake air temperature indicator
	Ignition advance
TPS reset successful	TPS reset successful
Presence of faults detected by the self diagnosis	Pump relay
	HV coil
	Injector
	Revolution timing sensor
	Air temperature
	Coolant temperature
	Lambda probe

Poor performance at full throttle

POOR ENGINE PERFORMANCE AT FULL POWER/ ENGINE IRREGULAR PERFORMANCE ON PICKUP

Possible Cause	Operation
Presence of faults detected by the self diagnosis	Pump relay
	HV coil
	Injector
	Revolution timing sensor
	Air temperature
	Coolant temperature
	Lambda probe
Spark plug power supply	Spark plug
	Shielded cap
	HV cable
	HV coil
Intake system	Air filter
	Filter box (sealing)
	Intake sleeve (sealing)
Parameter reliability	Throttle valve position signal
	Coolant temperature indicator

Possible Cause	Operation
	Intake air temperature indicator Ignition advance
Fuel system	Fuel level in the tank Fuel pressure Fuel filter Injector capacity

Engine knocking

PRESENCE OF KNOCKING (COMBUSTION SHOCKS)

Possible Cause	Operation
Presence of faults detected by the self diagnosis	Pump relay HV coil Injector Revolution timing sensor Air temperature Coolant temperature Lambda probe
Ignition efficiency	Spark plug
Parameter reliability	Throttle valve position signal Coolant temperature indicator Intake air temperature indicator Ignition advance
Intake system sealing	Intake sleeve Filter box
TPS reset successful	TPS reset successful
Fuel system	Fuel pressure Fuel filter Injector capacity Fuel quality
Selection of the cylinder base gasket thickness	Selection of the cylinder base gasket thickness

Fuel supply system

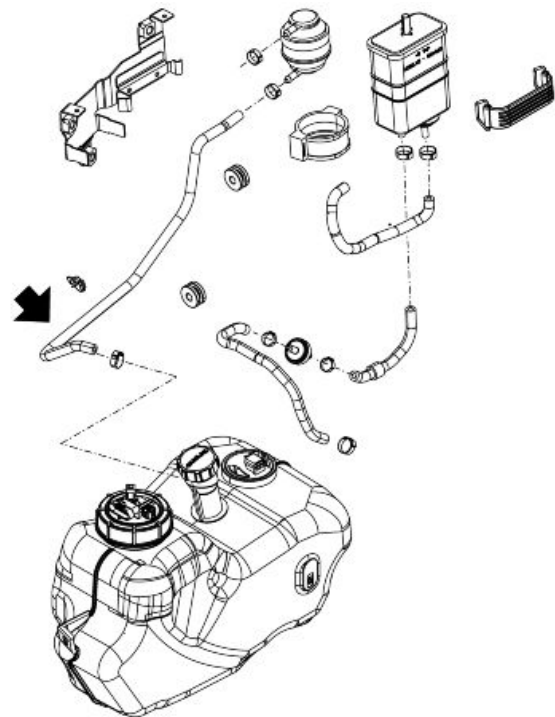
The fuel supply circuit includes the electric pump, the filter, the pressure regulator, the electro-injector and the fuel delivery pipes.

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.

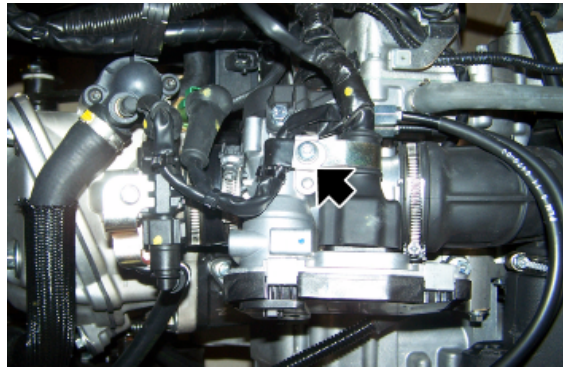


- The pipe for recovering vapour from the canister also flows into the fuel tank, mounted in the helmet compartment.



Removing the butterfly valve

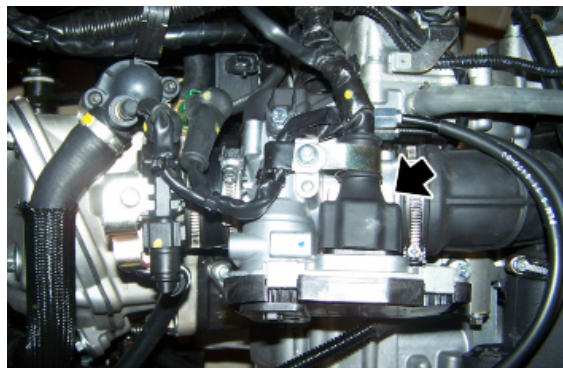
Remove the cable harness fixing screw, injector, lambda probe and MIU control unit indicated in the figure.



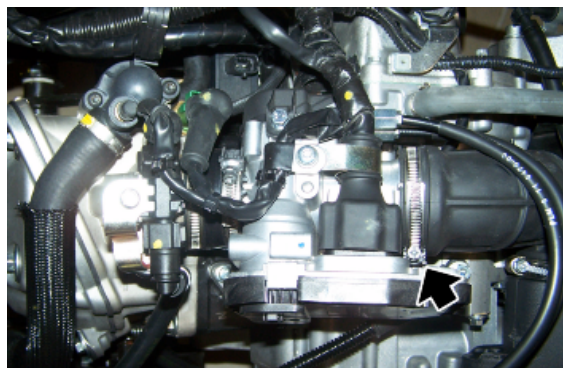
Remove the throttle body fastening clamp to the manifold.



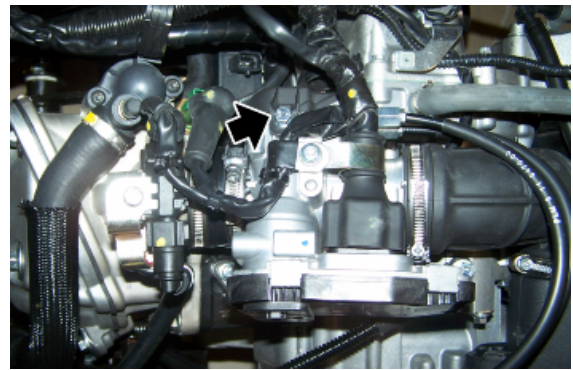
Remove the MIU ECU connector.



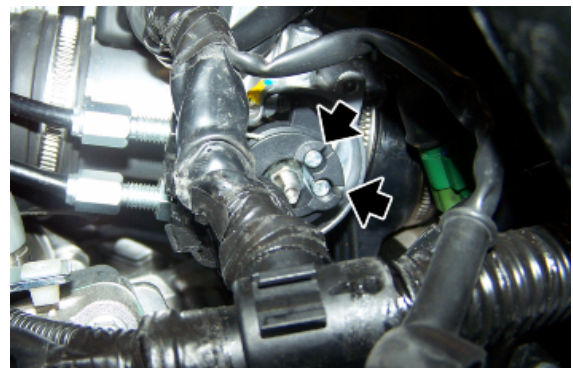
Remove the clip fixing the throttle body to the air cleaner bellows.



Remove the cover of the throttle control clamp, unscrewing the screw indicated in the figure.



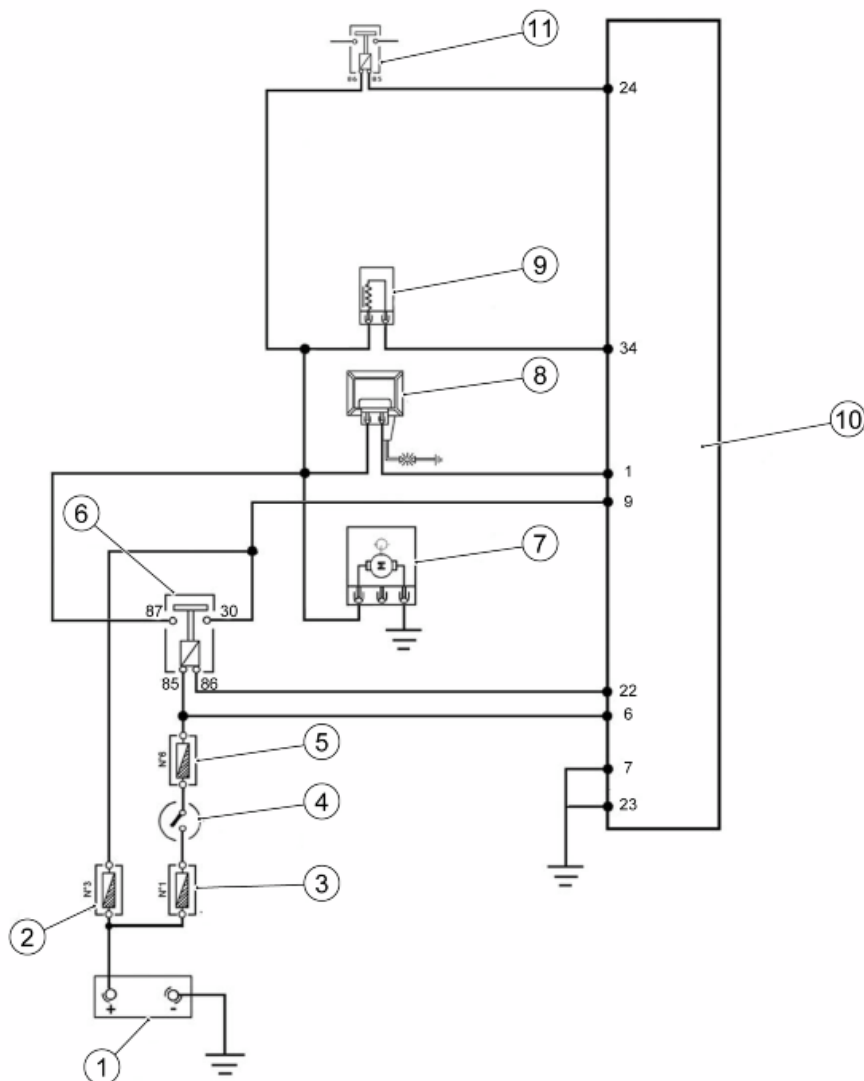
Remove the gas command fitting as indicated in the picture



Refitting the butterfly valve

- To refit, perform the removal operations in reverse.

Pump supply circuit



INJECTION LOADS

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse No. 3	10 A
3	Fuse No. 1	30 A
4	Ignition key contacts	
5	Fuse No. 6	5A
6	Injection load remote control	
7	Fuel pump	
8	HV coil	
9	Fuel injector	
10	Injection ECU	
11	Electric fan remote control	

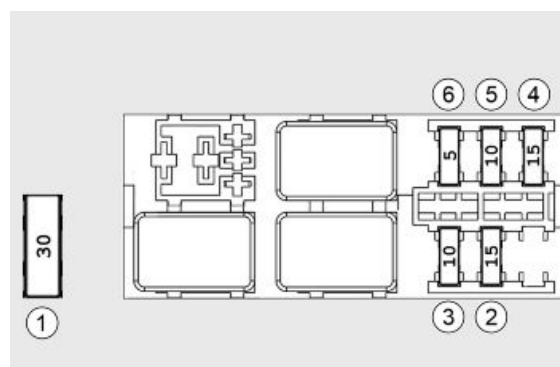
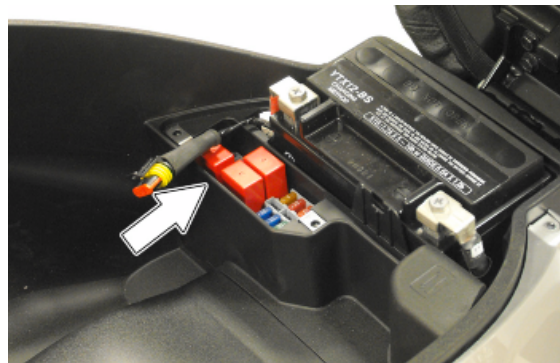
When switched to «ON», the fuel pump starts to rotate for 2 seconds and then stops. When the engine starts, in the presence of rpm timing signal the pump is continuously supplied.

ELECTRICAL DATA

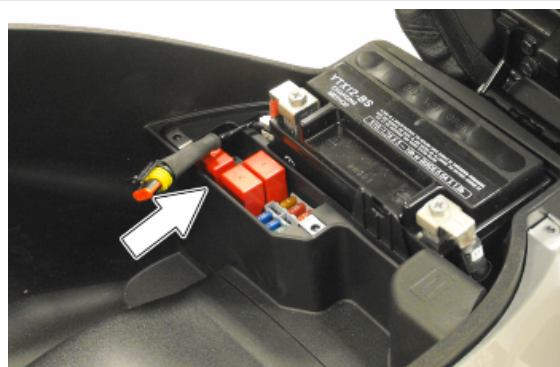
- Pump winding resistance ~ 1.5 Ohm

- Input current during regular operation 1.4 - 1.8 A
- Input current to the closed hydraulic circuit ~ 2 A (to be checked with appropriate tool for fuel pressure control choking the circuit on the return pipe)

Check function of fuses No. 3 and 6 for the ECU and injection load solenoid.



Check the efficiency of the injection load solenoid.
Check the resistance of the energising coil between pins 86 and 85: 40 to 80 Ohm
Apply a voltage of 12V to pins 86 and 85; make sure that there is continuity between pins 30 and 87 of the relay.



WARNING

TO INDICATE THE RELAY OF THE DESIRED FUNCTION, REFER TO THE PIN-CABLE COLOUR RELATIONSHIP WITH THE ATTACHED ELECTRIC SYSTEM DIAGRAM.





Check the power supply line of the injection load solenoid energising coil: switching to «ON» check the presence of battery tension, for 2 seconds, between the Orange-Blue cable and the Black-Purple cable of the relay base. Otherwise check the continuity of the Orange-Blue cable between the fuse-box and the relay base and of the Black-Purple cable between pin 22 of the control unit and the relay base.

N.B.

CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (RELAYS, CONTROL UNIT, FUSES ETC.).

Check the presence of fixed voltage between the Red-White cable of the relay base and ground. Otherwise, check the continuity of the Red-White cable between the fuse-box (No. 3, 10 A) and the relay base.

N.B.

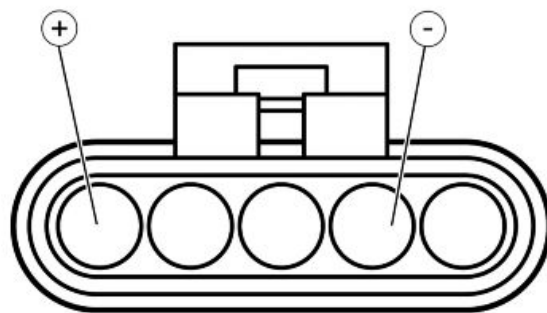
CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (RELAYS, CONTROL UNIT, FUSES ETC.).



After switching to «ON», check that there is battery voltage, for about 2 seconds, between the Black-Green cable of the pump connector and the ground lead with the pump connector disconnected. Otherwise, check the continuity of the Black-Green cable between the pump connector and the solenoid base.

Check the efficiency of the ground line of the fuel pump by measuring the continuity between the pump connector black cable, system side, and the ground.

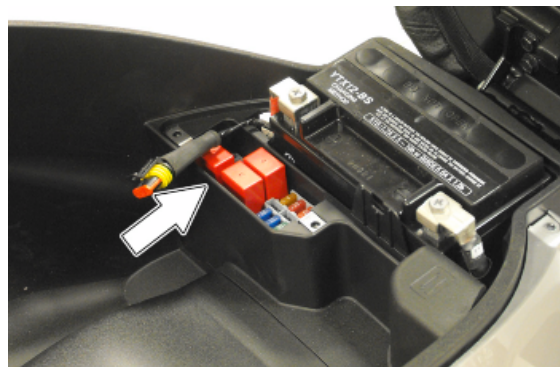
If, when switching to «ON», the pump continues to turn after 2 seconds of activation, check, with the control unit disconnected and the injection load re-



lay disconnected, that the Black-Purple cable (pin 22) is insulated from the ground.

Specific tooling

020331Y Digital multimeter



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 36.26 PSI (250kPa) (2.5bar) and that the input current is $1.4 \div 1.8A$



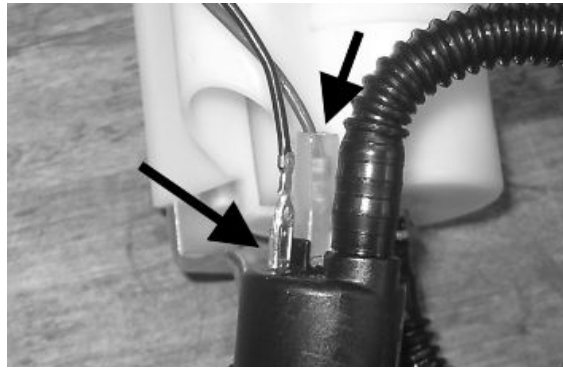
With the battery voltage > 12 V, check the pump flow rate by disconnecting from the injector the pipe equipped with the pressure gauge of the appropriate tool. Prepare a graduated burette with a capacity of approx. 0.264 USgal) (0.220 UKgal) (1l). Turn the pump with active diagnosis of the PDA. Using a pair of long flat needle-nose pliers, choke the fuel pipe making the pressure stabilise at approx. 36.259PSI (250kPa) (2.5bar). Check that within 15 seconds the pump has a flow rate of approx. 6.71cuin (110 cc).

Specific tooling

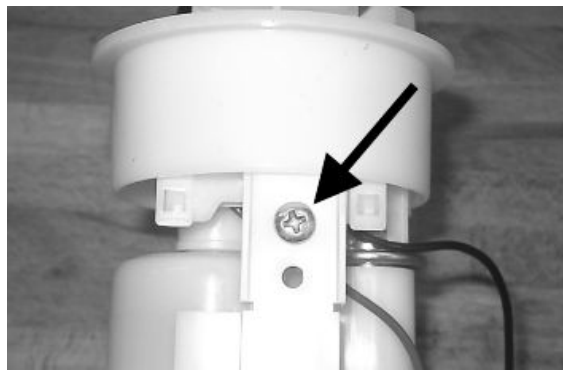
020480Y Petrol pressure check kit

Fuel filter check

Disconnect the terminals from the electric pump



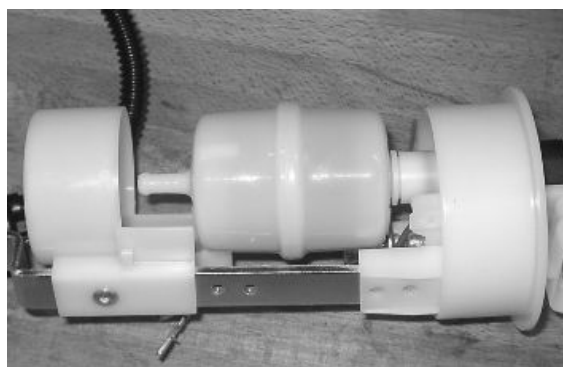
Remove the screw shown in the picture



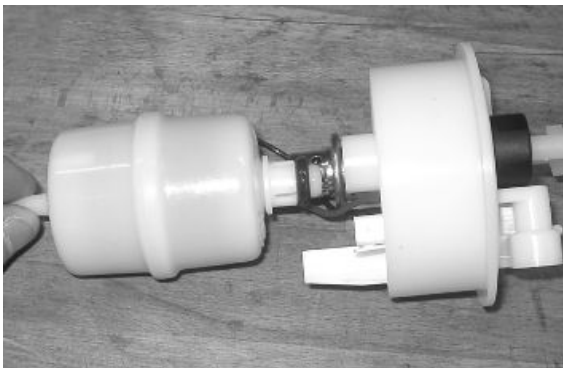
Remove the clip fixing the piping to the filter shown in the picture



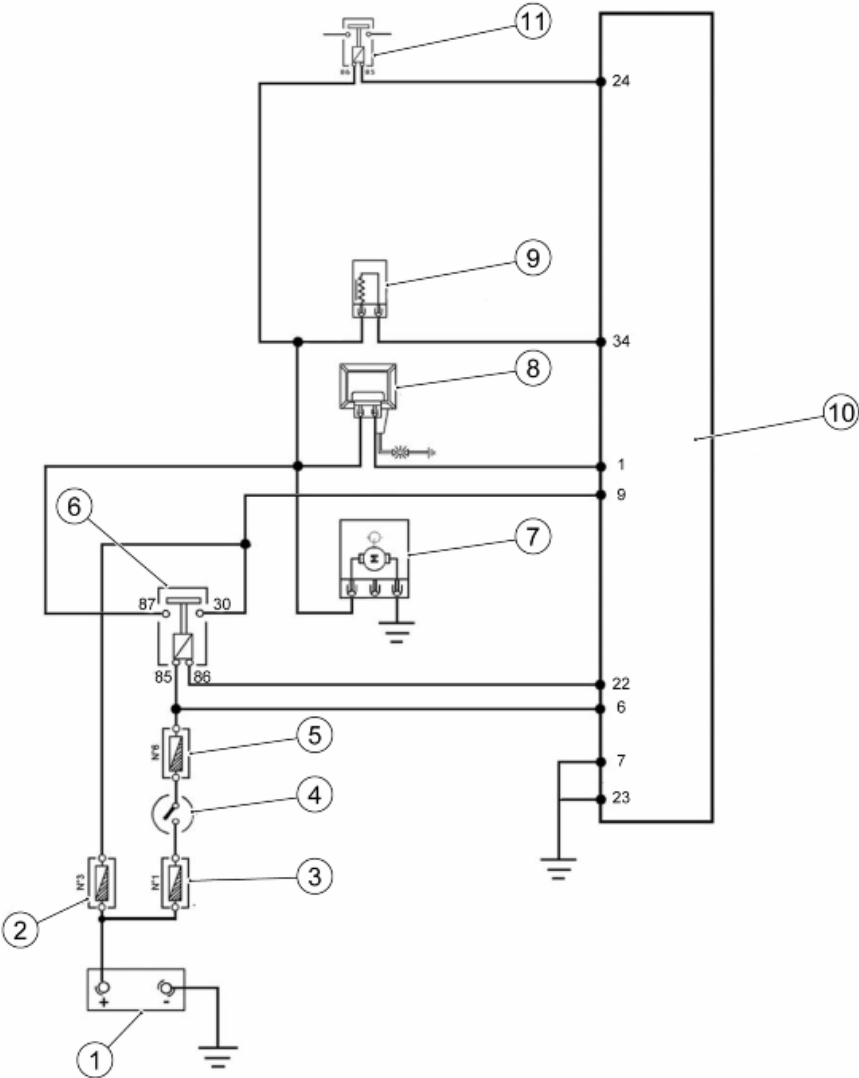
Separate the lower part of the pump mounting as shown in the picture.



Remove the filter from the pump mounting



Inspecting the injector circuit



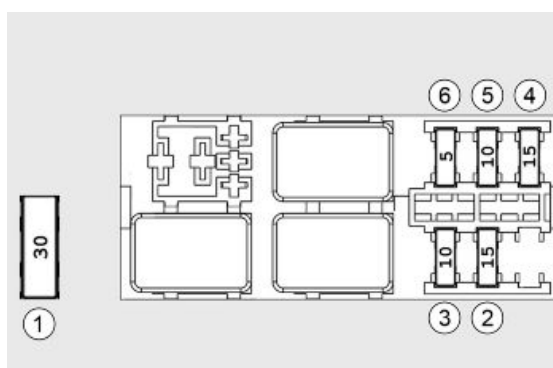
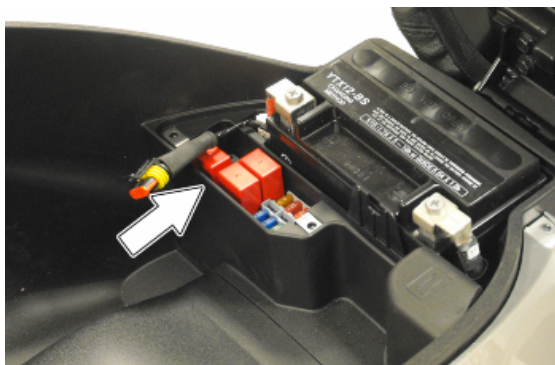
INJECTION LOADS

Specification	Desc./Quantity
1 Battery	12V - 12 Ah
2 Fuse No. 3	10 A
3 Fuse No. 1	30 A

	Specification	Desc./Quantity
4	Ignition key contacts	
5	Fuse No. 6	5A
6	Injection load remote control	
7	Fuel pump	
8	HV coil	
9	Fuel injector	
10	Injection ECU	
11	Electric fan remote control	

Checking the resistance at the injector ends: $14.5 \pm 5\%$ Ohm

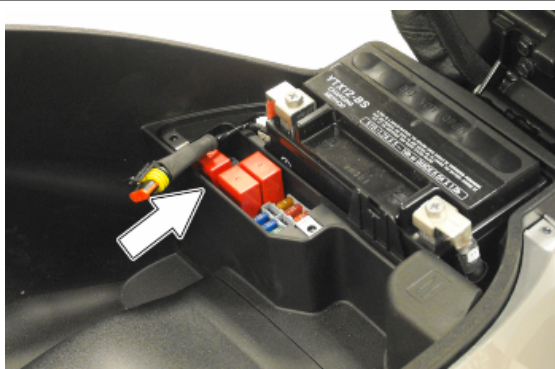
Check function of fuses No. 3 and 6 for the ECU and injection load solenoid.



Check the efficiency of the injection load solenoid.

Check the resistance of the energising coil between pins 86 and 85: 40 to 80 Ohm

Apply a voltage of 12V to pins 86 and 85; make sure that there is continuity between pins 30 and 87 of the relay.



WARNING

**TO INDICATE THE RELAY OF THE DESIRED FUNCTION,
REFER TO THE PIN-CABLE COLOUR RELATIONSHIP
WITH THE ATTACHED ELECTRIC SYSTEM DIAGRAM.**



Check the power supply line of the injection load solenoid energising coil: switching to «ON» check the presence of battery tension, for 2 seconds, between the Orange-Blue cable and the Black-Purple cable of the relay base. Otherwise check the continuity of the Orange-Blue cable between the fuse-box and the relay base and of the Black-Purple cable between pin 22 of the control unit and the relay base.

N.B.

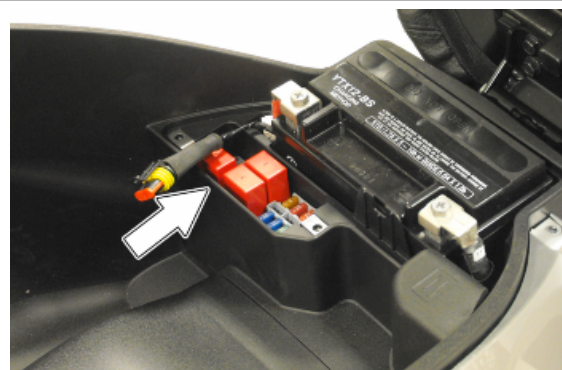
CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (RELAYS, CONTROL UNIT, FUSES ETC.).

Check the presence of fixed voltage between the Red-White cable of the relay base and ground.

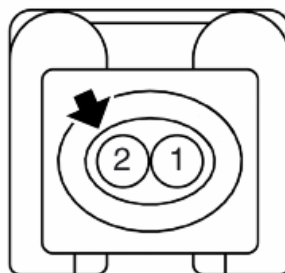
Otherwise, check the continuity of the Red-White cable between the fuse-box (No. 3, 10 A) and the relay base.

N.B.

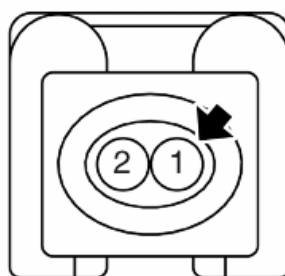
CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (RELAYS, CONTROL UNIT, FUSES ETC.).



With the control unit and the injector disconnected, check if there is continuity in the Red-Yellow cable between pin 34 of the control unit connector and the injector connector



Switch to «ON» and check if there is voltage, with injector disconnected and control unit connected, between the Black-Green cable of the injector connector and the ground lead



With injector disconnected and the injector load solenoid disconnected, check the continuity of the Black-Green cable between the injector connector and solenoid base.

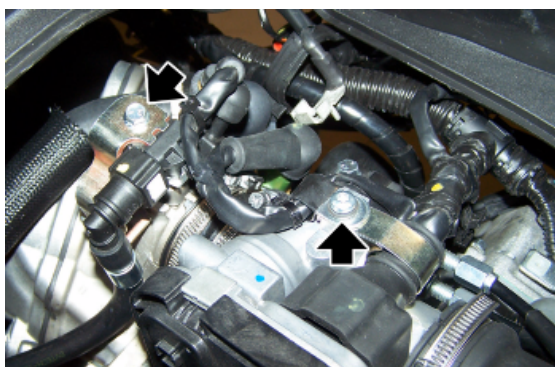
Inspecting the injector hydraulics

Lift the saddle and remove the access cover to the engine compartment by unscrewing the two screws indicated.



Remove the cable harness fixing screw, injector, lambda probe and MIU control unit indicated in the figure.

Remove the injector, by unscrewing the screw indicated in figure.



Install the specific tool to control the fuel pressure and position the manifold on a graduated container of at least 6.71cuin (100cc). Connect the injector with the cable as part of the kit for the injection tester. Connect the clamps of the cable to an auxiliary battery. Activate the fuel pump with the active diagnosis. Check that in 15 seconds an amount of fuel of about 2.441in (40 cc) is disbursed with an adjustment pressure of about 36.26PSI (250kPa) (2.5 bar).



Specific tooling

020480Y Petrol pressure check kit

Components location

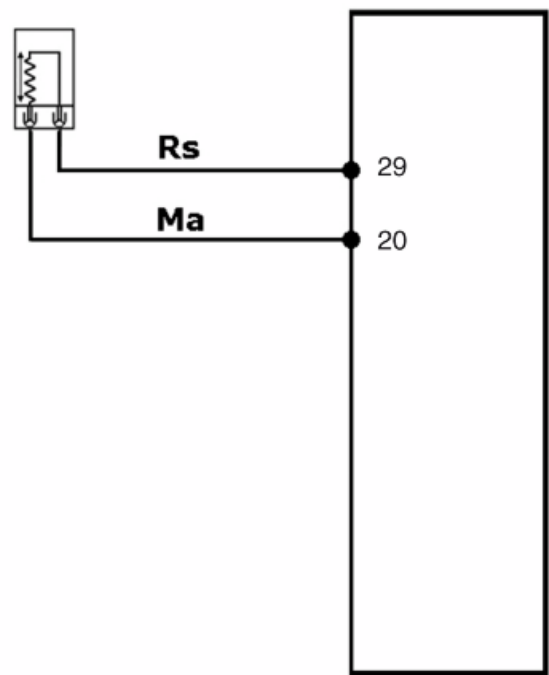


COMPONENT LAYOUT

Specification		Desc./Quantity
1	Battery	12V - 10Ah
2	Diagnostics socket connector	
3	Electric fan remote control	
4	Injection load remote control	
5	Water temperature sensor	
6	Throttle body and electronic injection control unit (MIU)	
7	Fuel injector	
8	HV coil	
9	Lambda Probe	
10	Fuel pump	

	Specification	Desc./Quantity
11	Engine Speed sensor	

Tachometer



Disconnect the fuel pipe connector. Start up the engine and wait for it to stop. With the wiring connected to the control unit and system try to start up the engine and check that the voltage between pins 29 and 20 is around 2.8 V

Check the continuity between pin 29 of the control unit and the red connector of the engine cable speed sensor and between pin 20 of the control unit and the brown cable of the engine speed sensor connector.

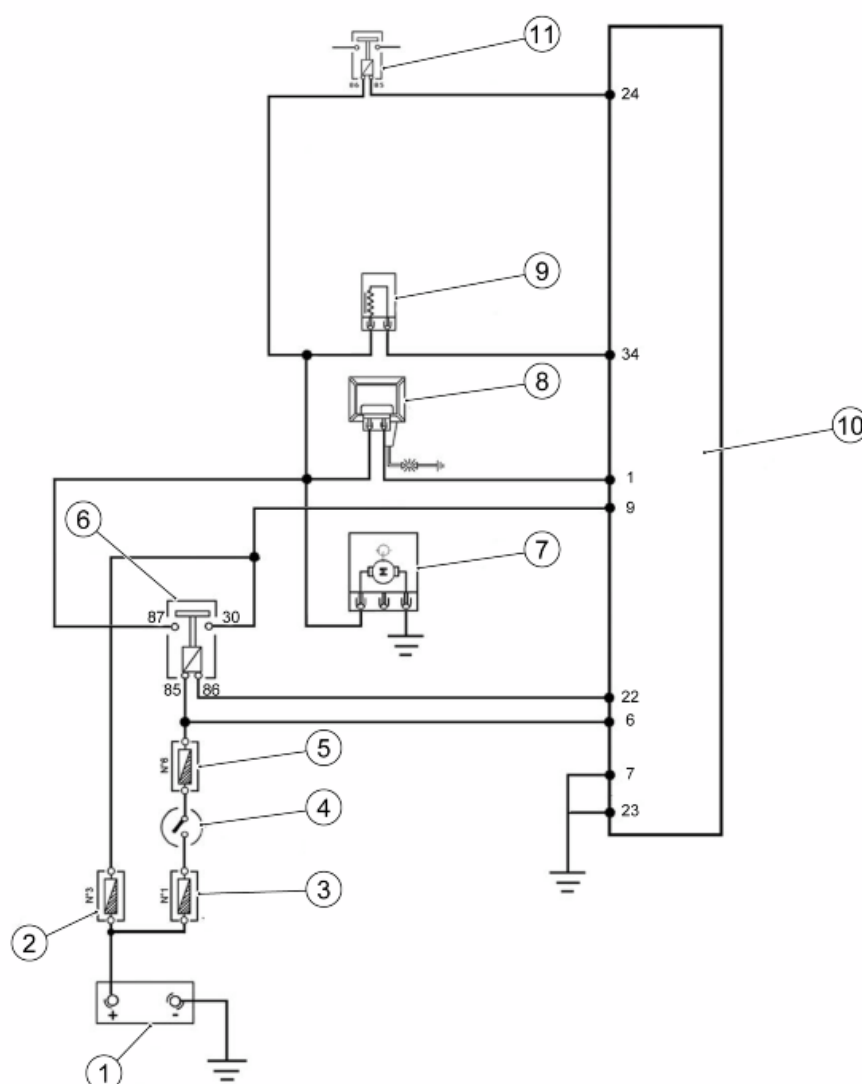


Check that the pins 20 and 29 of the control unit are isolated from each other and insulated from the ground.

Specific tooling

020331Y Digital multimeter

HT coil



INJECTION LOADS

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse No. 3	10 A
3	Fuse No. 1	30 A
4	Ignition key contacts	
5	Fuse No. 6	5A
6	Injection load remote control	
7	Fuel pump	
8	HV coil	
9	Fuel injector	
10	Injection ECU	
11	Electric fan remote control	

The ignition system is integrated with the injection and it is a high-efficiency inductive type ignition.

The control unit manages two important parameters:

- Ignition advance

This is optimised according to the engine rpm, to the engine load, temperature and ambient pressure

With the engine at idle, the ignition advance is optimised to stabilise the speed at $1,450 \pm 50$ rpm.

- Magnetisation time

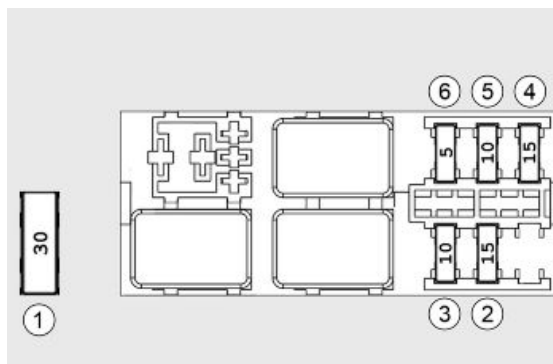
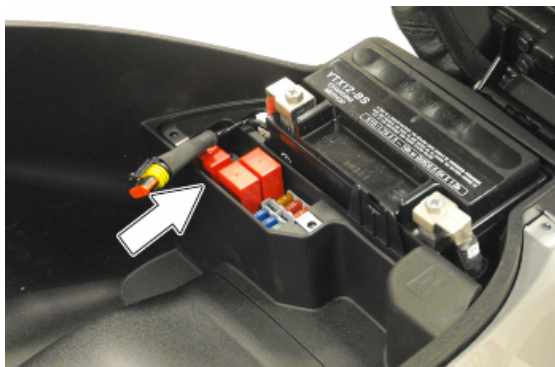
The coil magnetisation time is controlled by the control unit. The ignition power is increased during the engine start-up phase.

The injection system recognises the 4-stroke cycle and therefore, ignition is only controlled during compression.

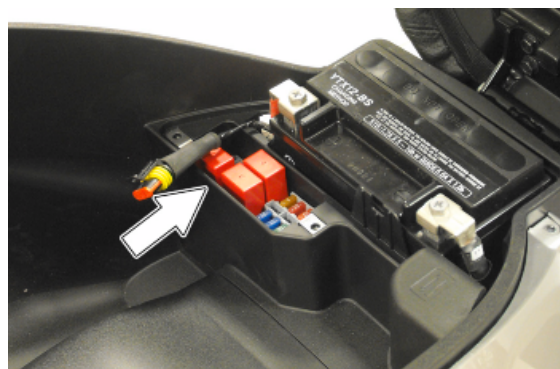
Specific tooling

020331Y Digital multimeter

Check function of fuses No. 3 and 6 for the ECU and injection load solenoid.



Check the efficiency of the injection load solenoid.
Check the resistance of the energising coil between pins 86 and 85: 40 to 80 Ohm
Apply a voltage of 12V to pins 86 and 85; make sure that there is continuity between pins 30 and 87 of the relay.

**WARNING**

TO INDICATE THE RELAY OF THE DESIRED FUNCTION,
REFER TO THE PIN-CABLE COLOUR RELATIONSHIP
WITH THE ATTACHED ELECTRIC SYSTEM DIAGRAM.



Check the power supply line of the injection load solenoid energising coil: switching to «ON» check the presence of battery tension, for 2 seconds, between the Orange-Blue cable and the Black-Purple cable of the relay base. Otherwise check the continuity of the Orange-Blue cable between the fuse-box and the relay base and of the Black-Purple cable between pin 22 of the control unit and the relay base.

N.B.

CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (RELAYS, CONTROL UNIT, FUSES ETC.).

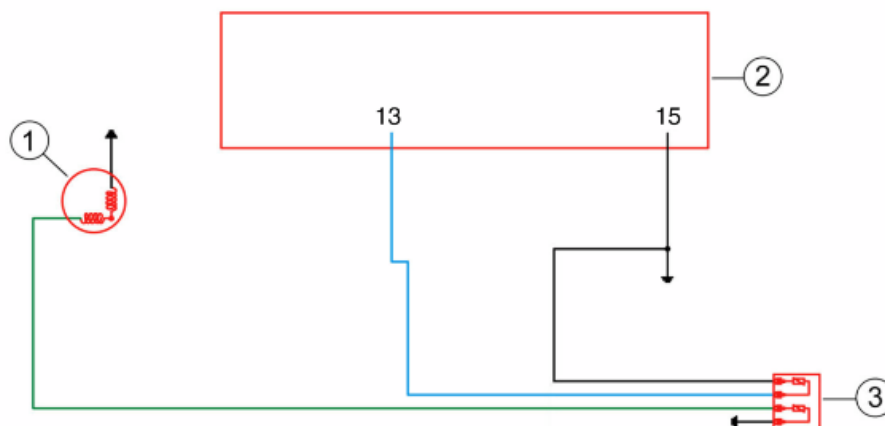
Check the presence of fixed voltage between the Red-White cable of the relay base and ground. Otherwise, check the continuity of the Red-White cable between the fuse-box (No. 3, 10 A) and the relay base.

N.B.

CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (RELAYS, CONTROL UNIT, FUSES ETC.).



Coolant temperature sensor



TEMPERATURE SENSOR

	Specification	Desc./Quantity
1	Instrument panel	
2	Injection ECU	
3	Water temperature sensor	

With the connector on the control unit side disconnected and the coolant temperature sensor connector connected, check that the resistance values between pin 13 and the ground lead correspond with the engine temperature.

$$20^{\circ} = 2500 \pm 100 \, \Omega$$

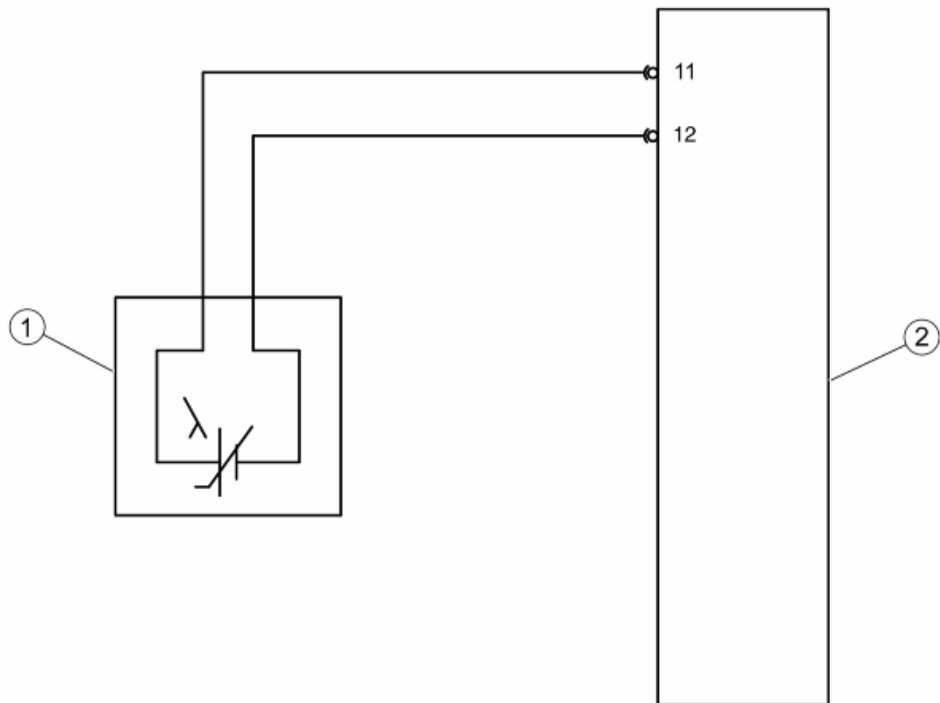
$$80^{\circ} = 308 \pm 6 \, \Omega$$

With the connector on the control unit side disconnected and the coolant temperature connector disconnected, check the insulation between the light-blue/green cable and ground lead.

Specific tooling

020331Y Digital multimeter

Lambda probe



LAMBDA PROBE

	Specification	Desc./Quantity
1	Lambda Probe	
2	Injection ECU	

PIN RELATIONSHIP

PIN	PIN	Component	Reference value
12	11	Lambda sensor	~ 0V with throttle valve closed; ~ 1V with throttle valve fully opened

The lambda probe or oxygen sensor is a sensor which provides information about the oxygen content in the exhaust fumes. The signal generated is not of the proportional but of the ON/OFF type, i.e. whether there is oxygen or not. The probe is positioned on the exhaust manifold before the catalytic converter in an area where the gas temperature is always high. The temperature at which the probe works is at least 350°C at 600°C and it has a reaction time of just 50 milliseconds. The signal generated passes from a high value to a low one with a mixture with $\lambda=1$.

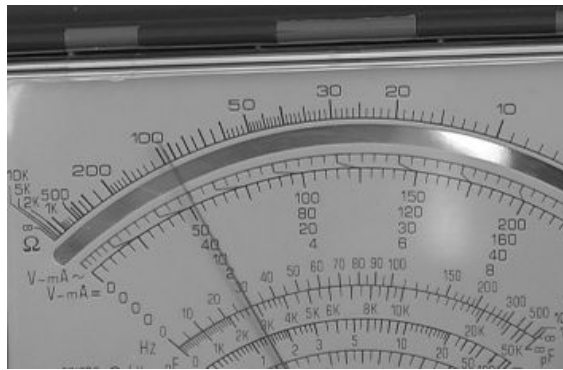
SIGNAL CONTROL

With the engine running at idle speed, check that the voltage oscillates between 0V and 1V

With the throttle valve completely open, the voltage is approx. 1V.

During the closing phase, the voltage is approx. 0V.

If the voltage remains constant, the sensor may be damaged. Remove the sensor and check that there are no oil or carbon deposits inside it..



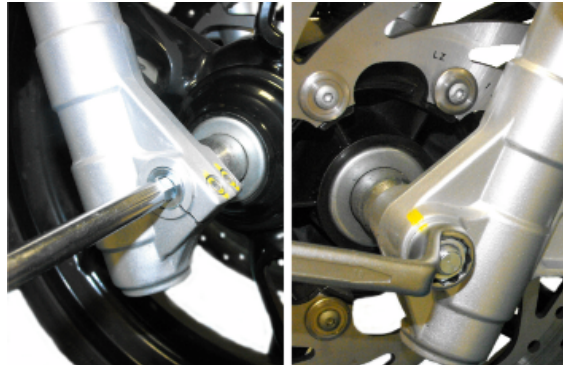
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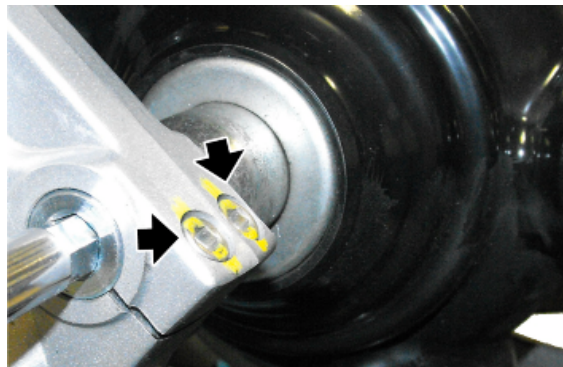
Front

Removing the front wheel

- Remove the front brake calliper.
- Support the vehicle from the front side.
- Loosen the wheel axle lock-nut.



- Loosen the two wheel axle safety screws on the fork leg, on the right side.



- Remove the wheel axle from the right side, and supporting the wheel, remove it.

See also

[Removal](#)

Front wheel hub overhaul

- Support the wheel with two wooden shims that make it possible to avoid scratching in the case of contact with the rim.
- Working on both sides, remove the external spacer and the cap.



- Remove the seeger ring positioned on the brake disc side.



- Check the wheel bearings for signs of wear and, if necessary, proceed as described in the following operations.
- Heat the bearing seat on the brake disc side using the heat gun.



- Turn over the wheel and working on the opposite side, using punch and a rubber hammer, tap on the internal spacer until the brake disc side bearing is extracted.
- Collect the internal spacer.



- Using the suitable bearing extraction kit, remove the second bearing.

Specific tooling

001467Y003 Nut

001467Y004 Lug / Taper pin

001467Y005 Screw

001467Y009 Bell for OD 42-mm bearings



**Fitting the hub**

- Heat the bearing seat on the brake disc side using the heat gun.
- Insert the bearing in its seat using the appropriate special tools.

Specific tooling

020376Y Adaptor handle

020358Y 37x40-mm Adaptor

020363Y 20-mm guide



- Working on the opposite side of the wheel, insert the spacer and heat the right bearing seat with the aid of a heat gun.



- Using the special tools indicated, push the left bearing into the seat using the spacer as a guide.

Specific tooling

020376Y Adaptor handle

020358Y 37x40-mm Adaptor



- Position the seeger ring on the brake disc side.

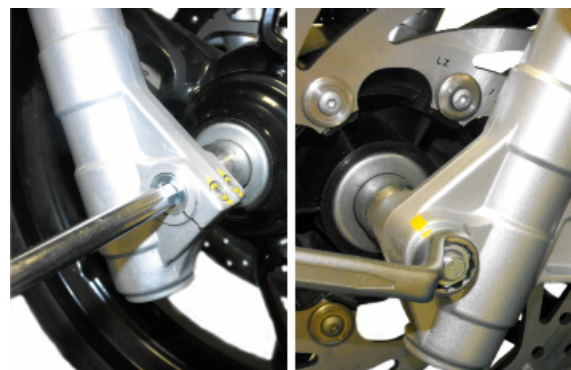


- Working on both sides, position the cap and external spacer.



Refitting the front wheel

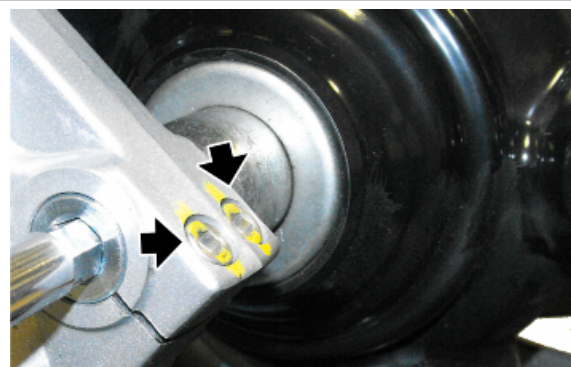
- Working on the right side of the vehicle, place the wheel between the forks and insert the wheel axle, after it is greased.
- Tighten the wheel axle nut to the specified torque.



- Tighten the two safety screw on the leg to the prescribed torque.

Locking torques (N*m)

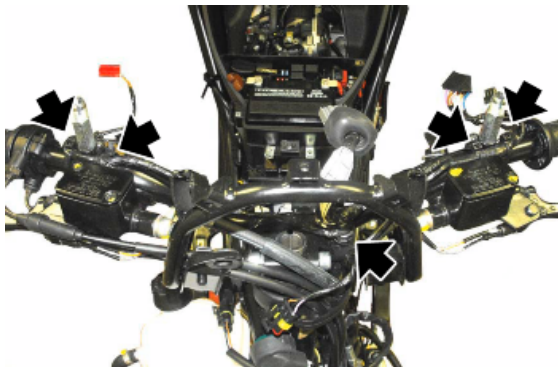
Front wheel axle (33.19÷36.88)lb ft (45÷50)Nm **Calliper mounting bracket screw** 7.37 lb ft (10Nm) (Tighten after inserting the front wheel axle) Check that there is no breakage.



Handlebar

Removal

- Remove the front and rear handlebar covers.
- Unleash the handlebar from the clamps and cable grommet of the electrical and braking systems.



- Remove the pin mounting the handlebar to the steering tube.
- Remove the handlebar and place it on the front of the vehicle.



Refitting

- (*) Lubricate the nuts with engine oil before installation

Locking torques (N*m)

Handlebar fixing screw (36.88÷40.57)lb ft (50÷55)Nm



- Install the handlebar on the steering tube, paying attention to the centring, aligning the recess on the handlebar with that on the steering tube as shown in the figure.

- Tighten the handlebar fixing screw on the steering tube to the prescribed torque.

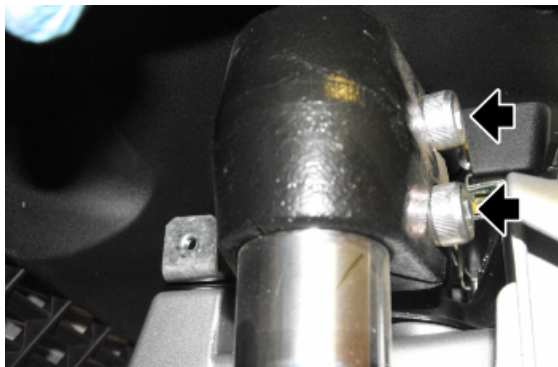
-
- Replace the cable harness in the pipe grommet.
 - Replace the clamps.



Front fork

Removal

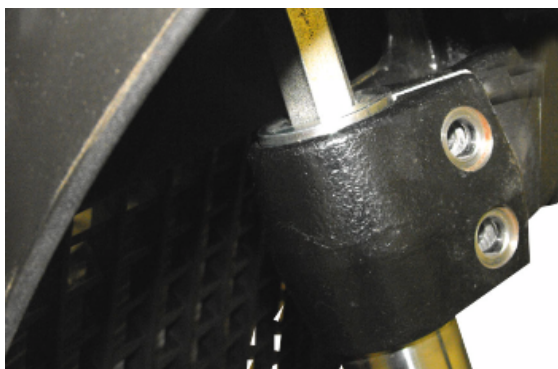
- Position the vehicle on centre stand.
- Place a hoist to support the front of the vehicle, adequately secured to the handlebar, in order to secure the vehicle during the removal of the forks.
- Remove the front wheel and the front mudguard.
- Pull the wheelhouse upwards.
- Loosen the two tightening screws of the stem supporting clamp.



- Unscrew the stem closing cap and slide off the complete fork leg from the corresponding support, keeping it in a vertical position.

CAUTION

THE STEM CLOSING CAP KEEPS THE MAIN SPRING PRE-LOADED. KEEP THE CAP PROPERLY FITTED DURING THE REMOVAL FINAL STAGE TO AVOID ACCIDENTS.



Overhaul

- Support the fork in a vice.
- Remove the main spring and drain the oil from the fork leg.



- Undo the lower screw and collect the washer. Collect any residual oil that may not have been previously drained.



- Remove the stem dust guard with a screwdriver.



- Remove the circlip retaining the oil seal.



- Take out the stem.



- Check there are no signs of wear or seizing between the stem and the fork leg. Otherwise, replace the damaged parts.

Characteristic**Maximum fork leg diameter**

1.38in (35.10mm)

Minimum stem diameter

1.3740in (34.90mm)

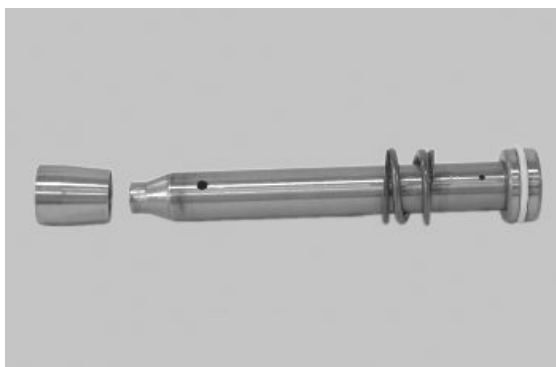
- Take out the oil seal using the appropriate tools.
- Fit the tie rod into the oil seal.
- Insert in sequence the two half-rings for Ø1.378in (Ø35mm) stems.

Specific tooling**020487Y Fork oil seal extractor**

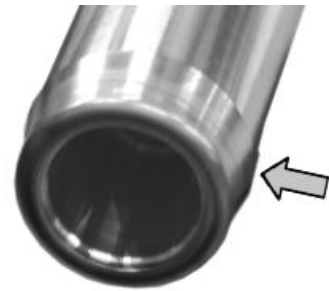
- Hold the tie rod manually so that it does not fall into the fork leg and/or that both half-rings are not in their position.
- Fit the bell.
- Tighten the nut until it stops.
- Act on the tool until the oil seal is completely removed.

Specific tooling**020487Y Fork oil seal extractor**

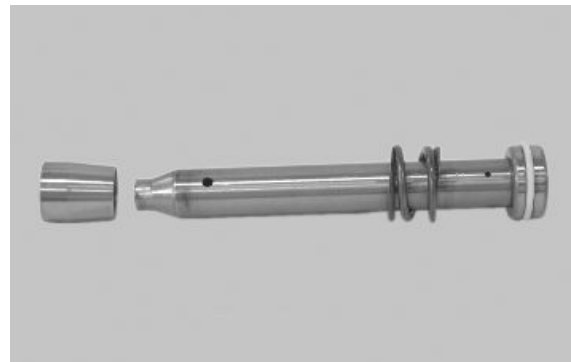
- Remove the hydraulic rod with the corresponding sealing gasket, the spring and the stop bushing.

**COMPONENT CHECK****CAUTION****CLEAN ALL THE COMPONENTS THOROUGHLY.**

- Check that the fork leg is not cracked or broken in the attachments.
- Check that the stem is not scored, dented or distorted.
- Check that the stop bushing for the hydraulic rod is correctly fixed through caulking.



- Check that hydraulic rod caulking, the return spring to the unloaded the end of stroke and the hydraulic rod sealing ring are in good conditions.



- Check that the main spring exhibits no signs of yielding or abnormal wear.



- Check that the closing cap O-ring of the stem is in good conditions.



Refitting

- First grease the splitting chamber of the two sealing lips of a new oil seal.
- Fit the sealing ring on the stem and keep the identification words facing upwards.
- Drive the oil seal as far as it will go using the appropriate tool.

Specific tooling

020376Y Adaptor handle

020359Y 42x47-mm Adaptor

- Pre-fit the stem with the hydraulic rod, the spring and the stop bushing.
- Fit the pre-assembled components inside the fork leg.



-
- Fit the oil seal retaining circlip.



-
- Grease and fit a new dust gaiter.



- Refill the fork leg with the recommended product to the prescribed amount.

Recommended products

AGIP FORK 7.5 W Oil for fork.

-

Characteristic

Oil quantity per stem

(7.99±0.183)in (131±3)cc

-
- Bleed the hydraulic rod by actuating the stem repeatedly.
 - Fit the spring into the stem.

CAUTION



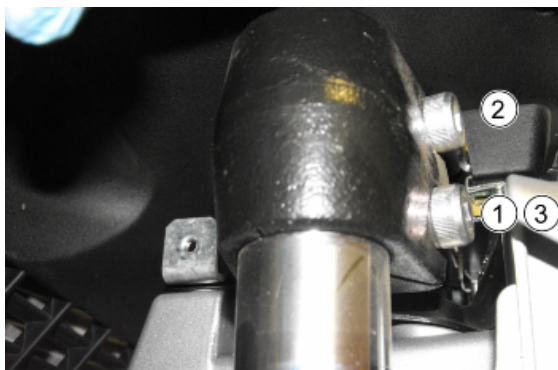
FIT THE SPRING WITH THE SMALLER PITCH TO THE UPPER PART OF THE STEM.



- Fit the fork leg together with the stem on the fork supporting clamp until it stops.
- Tighten the two screws to the prescribed torque in the sequence indicated in the picture.

Locking torques (N*m)

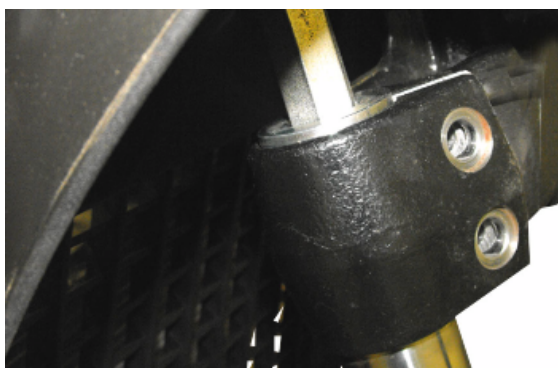
Stem support clamp tightening screws Apply a torque of (18.44÷25.08)lb ft (25÷34)Nm to the lower screw «1» Lock the upper screw «2» to a torque of (18.44÷25.08) lb ft (25÷34)Nm Lock the lower screw «1» to a torque of (18.44÷25.08)lb ft (25÷34)Nm



- Lubricate the closing cap O-ring of the stem.
- Preload the spring, fit the closing cap and tighten to the prescribed torque.

Locking torques (N*m)

Fork locking screws cap (11.06÷22.13)lb ft (15÷30) Nm



- Repeat the procedure for the other fork leg.

N.B.

IF BOTH FORK LEGS ARE SERVICED AT THE SAME TIME, BE CAREFUL NOT TO INVERT THE RIGHT FORK LEG WITH THE LEFT ONE.

- Fit the hydraulic rod fixing screw with the copper sealing washer and tighten to the prescribed torque using the recommended product.

CAUTION

ALWAYS USE NEW COPPER WASHER.

Locking torques (N*m)

Hydraulic rod fixing screw (18.44÷25.81*)lb ft (25÷35*)Nm

Steering column

Removal

- Remove the front and rear covers of the handlebar.
- Remove the handlebar and place it in front.



- Remove by releasing the cable passages and sliding the protection collar upwards.



Using the special tool, loosen and remove the upper ring nut, the spacer washer and the counterlock ring.

- Extract the fork.

N.B.

TAKE CARE TO SUPPORT THE FORK SO AS TO PREVENT IT FROM COMING OFF ABRUPTLY

Specific tooling

020055Y Wrench for steering tube ring nut



See also

[Removal](#)

[Front handlebar cover](#)

[Rear handlebar cover](#)

Refitting

- Fit the lower steering bearing on the steering tube.
- Fit the fork together with the lower steering bearing on the headstock and hold it so that it does not fall.

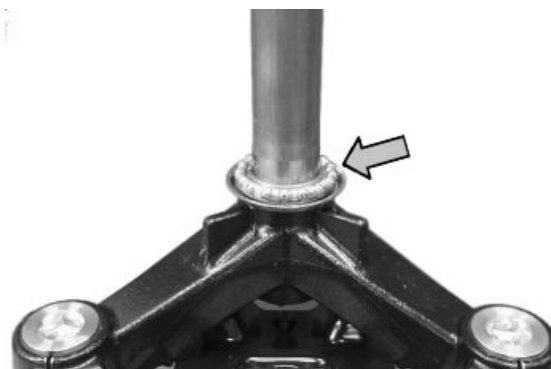
N.B.

LUBRICATE THE STEERING FIFTH WHEEL TRACKS WITH RECOMMENDED GREASE BEFORE USE.

Recommended products

AGIP GREASE PV2 Ivory smooth-textured, slightly-stringy anhydrous calcium-base grease.

TL 9150 066, NATO G 460 symbol



- Fit the upper steering bearing.

CAUTION

INSERT THE UPPER STEERING BEARING WITH THE CAGE FACING UPWARDS.



- Fit the steering bearing upper seat.



- Fit the cover plate.



- Insert the lower tightening ring nut, screw until it stops and, with the specific tool, tighten to the prescribed torque.

Specific tooling

020055Y Wrench for steering tube ring nut

Locking torques (N*m)

**Steering tube lower ring nut (10.33÷12.54)lb ft
(14÷17)Nm**



- Fit the spacer between the two ring nuts on the steering tube in the position indicated.



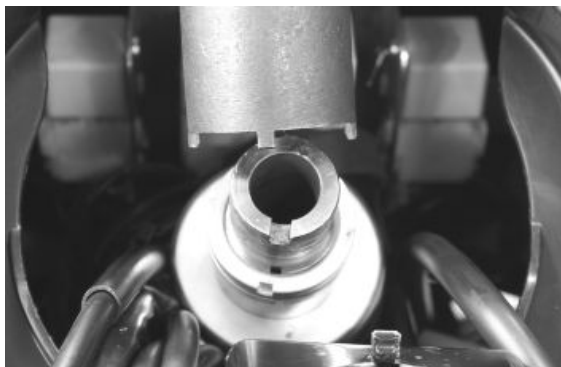
- Insert the upper tightening ring nut, screw until it stops and, with the specific tool, tighten to the indicated torque.

Specific tooling

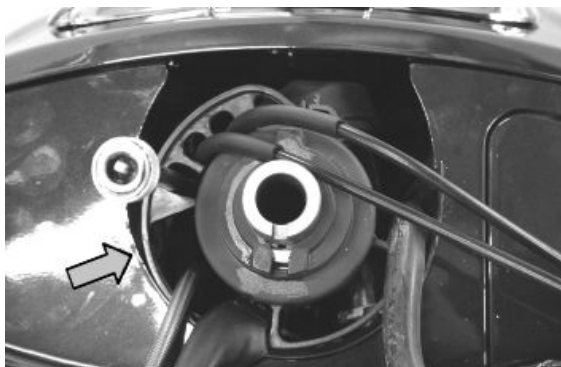
020055Y Wrench for steering tube ring nut

Locking torques (N*m)

**Steering tube upper ring nut (29.50÷33.19)lb ft
(40÷45)Nm**



Insert the collar shown in the figure and restore the cable passage as shown in the figure.



- Fit the front wheel.

Steering bearing

Removal

- Clean thoroughly and visually inspect if the components are in good conditions.
- Check the upper steering bearing for wear.



- Check the lower steering bearing for wear.



- Visually inspect that the steering fifth wheel tracks, the headstock and the steering tube exhibit no scores or abnormal wear. Otherwise, replace them.

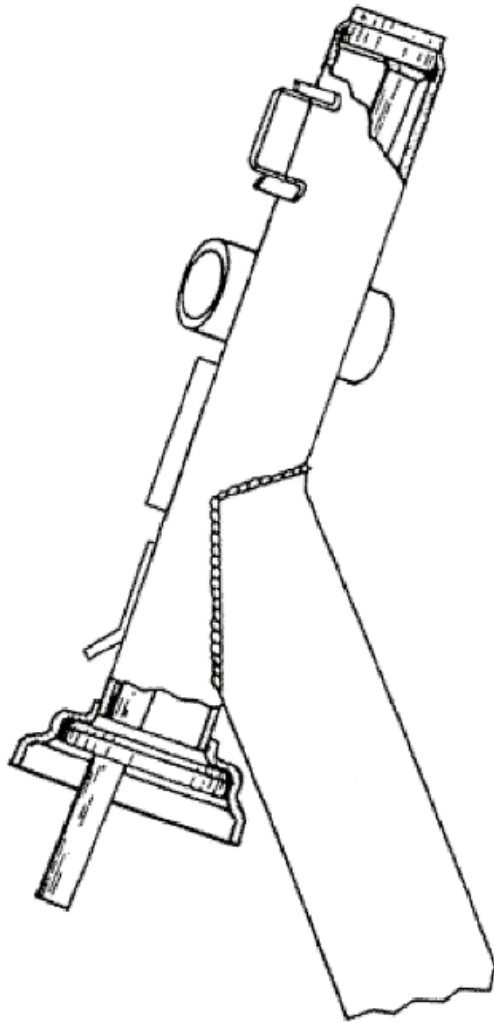
STEERING FIFTH WHEEL TRACK REMOVAL

- Remove the steering fifth wheel tracks on the chassis with the specific tool, following the indicated procedure.
- Fit the specific tool from the lower part of the headstock until it makes contact with the upper track.
- Hit with force the specific tool, placing it at different points diametrically opposed so as to remove the upper track.



Specific tooling

020004Y Punch for removing fifth wheels from headstock



- Repeat the procedure for the lower steering bearing track.

- Remove the lower steering bearing seat on the steering tube using the specific tool.

Specific tooling

020004Y Punch for removing fifth wheels from headstock



Refitting

STEERING FIFTH WHEEL TRACK FITTING

- Thoroughly clean the track seats on the headstock and the steering tube.
- Fit the new tracks of the headstock with the specific tool.
- Screw the nut until the tracks are fully inserted.

N.B.

LUBRICATE THE STEERING FIFTH WHEEL TRACKS WITH RECOMMENDED GREASE BEFORE USE.

Specific tooling

001330Y Tool for fitting steering seats

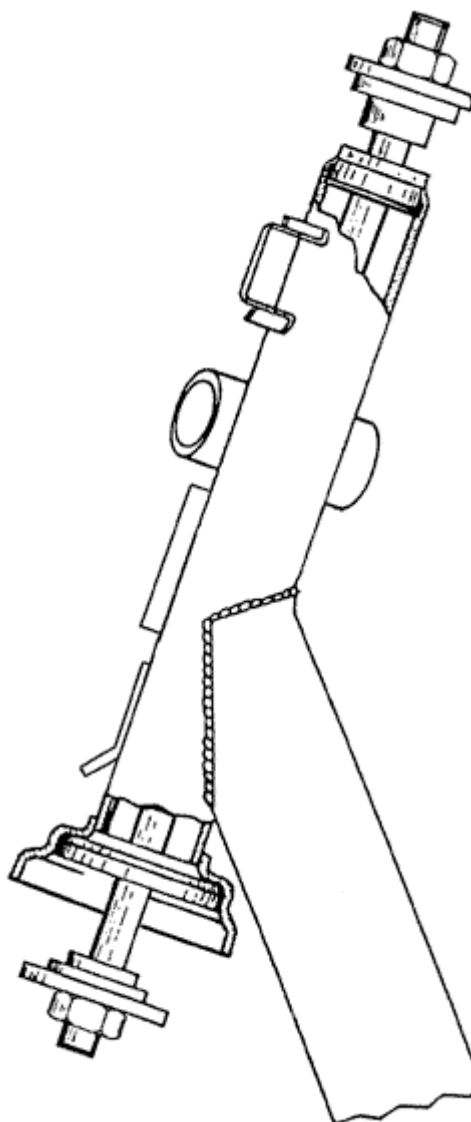
001330Y014 Tool for fitting steering seats

001330Y015 Tool for fitting steering seats

Recommended products

AGIP GREASE PV2 Ivory smooth-textured, slightly-stringy anhydrous calcium-base grease.

TL 9150 066, NATO G 460 symbol



- Fit the lower steering bearing seat on the steering tube.
- Using a tube of the measurements specified, bring the bottom seat to a stop,
 - Ø Internal 1.397in (35.5mm).
 - Ø External 1.496in (38mm).
 - Length 13.779in (350mm).

N.B.

LUBRICATE THE STEERING FIFTH WHEEL TRACKS WITH RECOMMENDED GREASE BEFORE USE.

Recommended products



AGIP GREASE PV2 Ivory smooth-textured, slightly-stringy anhydrous calcium-base grease.

TL 9150 066, NATO G 460 symbol

Rear

Removing the rear wheel

- Remove the silencer mounting bracket;
- Retrieve the conical spacer and remove the wheel.



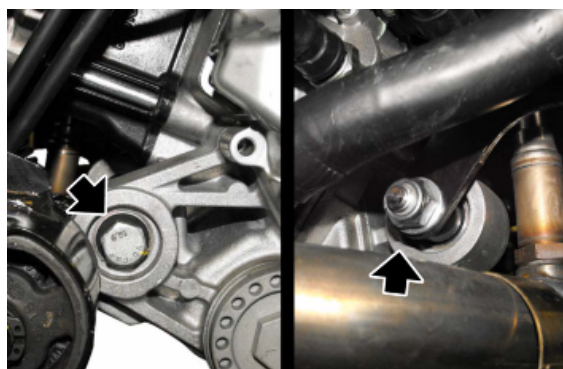
Refitting the rear wheel

- Carry out the removal operations but in reverse order, observing the prescribed tightening torques.

Swing-arm

Removal

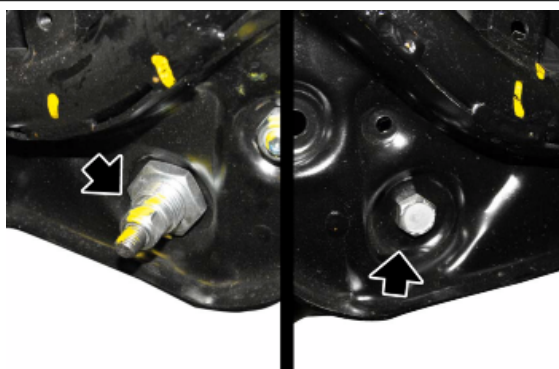
- Place the vehicle on its centre stand;
- Support the engine adequately;
- Loosen the nut shown in the figure and pull out the pin from the left-hand side.



- Loosen the swinging arm tightening nut, positioned on the pin, inner left side.



- Loosen the nut and lock nut on the left-hand side of the vehicle (see figure) and unscrew the pin from the opposite side.



- Unscrew the inner nut until the complete removal of the same.
- Then slide off the pin from the right-hand side of the vehicle.
- Release the spring.



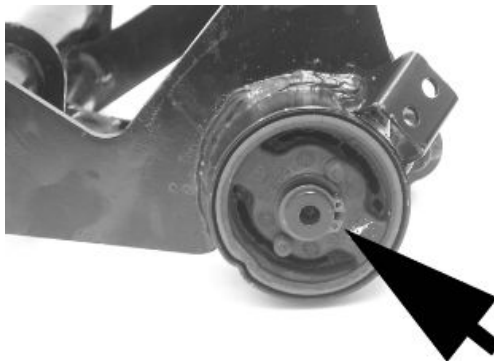
- It is now possible to remove the swinging arm complete with retainer brackets to the engine.

- If necessary break down the swinging arm by removing the retainer brackets to the engine, once the swinging arm is complete, unscrew the nut on the right side and remove the pin, recuperating the washers.
- Release the swinging arm from the brackets fixing it to the engine.

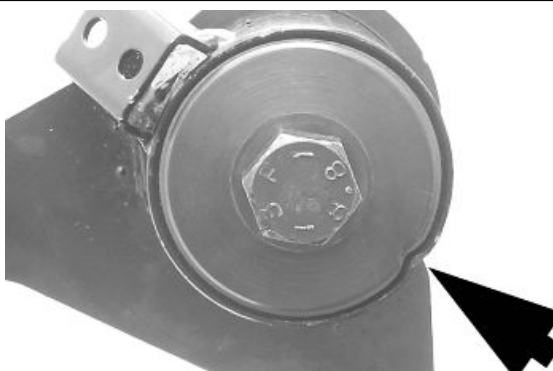


Overhaul

- Check that the silent bloc is not damaged. If it is, replace the coupling.
- Remove the Seeger ring shown in the picture



- Remove the full silent bloc bracket
- 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

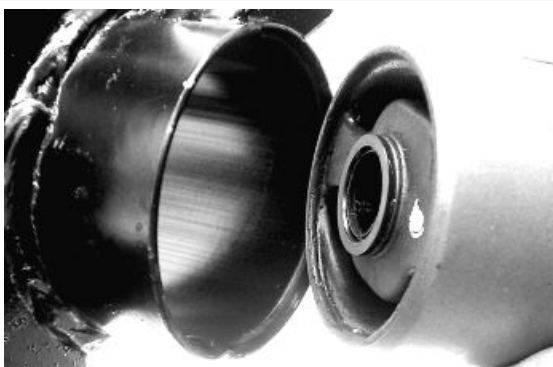


Specific tooling

020271Y Tool for removing-fitting silent bloc



- 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

Specific tooling

020271Y Tool for removing-fitting silent bloc



- 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

Allowable limit after use:

0.0394in (1mm)

Standard clearance

(0.0157÷0.0276)in (0.40÷0.70)mm

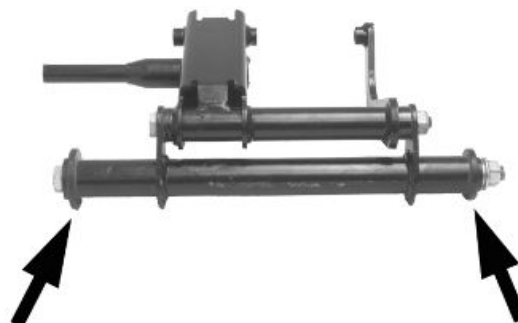


- In order to check the clearance of the swinging arm on the chassis side, prepare a retainer using the fixing pin of the swinging arm on the chassis and two rings from the special tool 020229Y.

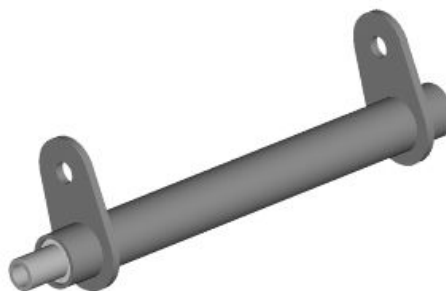
Alternatively use two washers with:

Øinternal for pins = 0.472in (12 mm)

Ø idle external = 1.181in (30mm) and min.thickness = 0.157in (4mm)



- Separate the swinging arm on the engine side from the vehicle side arm.
- Remove 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

020115Y Ø 18 punch

020244Y 15-mm diameter punch

SWINGING ARM SERVICE

Specification	Desc./Quantity
Length of the internal swinging arm spacer on the chassis side	9.27in (235.5)mm
Length of the swinging arm tube on the chassis side	8.97in (228mm)
Length of the internal swinging arm spacer on the engine side	7.79in (198mm)
Length of the swinging arm tube on the engine side	7.492in (190.3mm)

- Lubricate the roller bearing housings 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

AGIP GREASE PV2 Ivory smooth-textured, slightly-stringy anhydrous calcium-base grease.

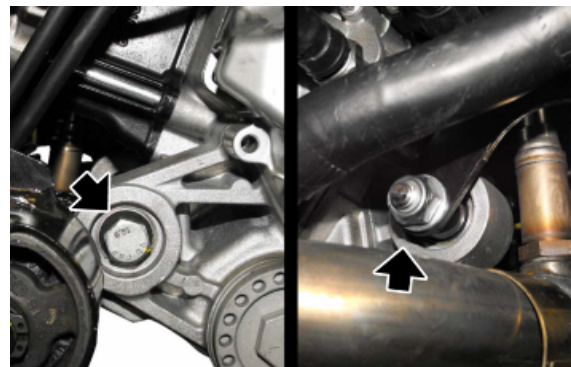
TL 9150 066, NATO G 460 symbol

Refitting

- Pre-fit the mounting brackets by inserting the pin from the left side and tightening the nut to the specified torque.



- Insert the washers and the rear pin from the right side of the vehicle and tighten the nut to the specified torque.



- Insert the pin from the right side of the vehicle and pretighten the inner nut to the frame, on the left side.



- Tighten the nut and finish tightening the inner nut to the specified torques.
- Tighten the lock nut to the specified torque.



- Fit the spring.



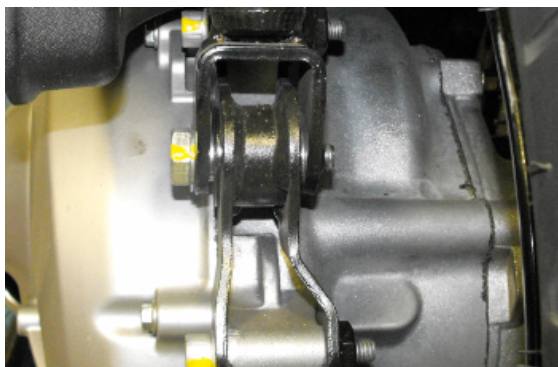
SWINGING ARM

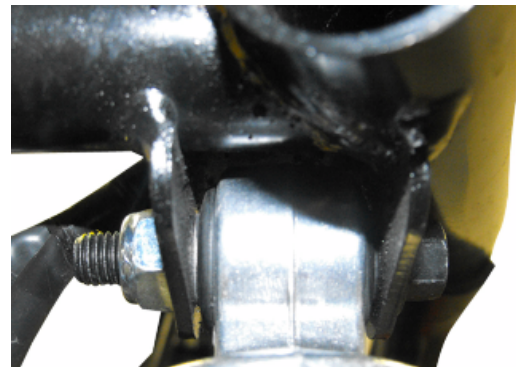
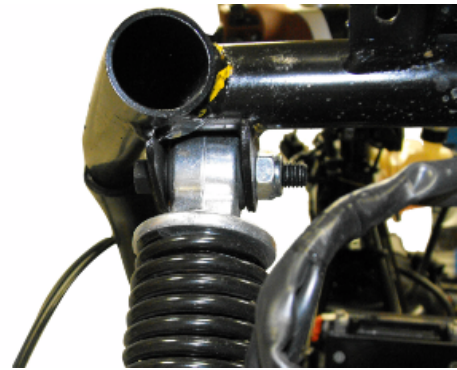
Name	Torque in Nm
Self-locking retainer nut M10 upper pin (left side)	(50.15÷55.32)lb ft (68÷75)Nm
Self-locking retainer nut M10 bottom lower silent block support bracket	(36.88÷40.57)lb ft (50÷55)Nm
Self-locking retainer nut M10 pin (right side)	(30.24÷33.19)lb ft (41÷45)Nm
Self-locking retainer nut M10 motor attachment (right side)	(40.57÷44.25)lb ft (55÷60)Nm
Retainer nut of silent block support bracket (left side)	(65.64÷79.66)lb ft (89÷108)Nm
Lower pin bushing	(3.76÷5.09)lb ft (5.1÷6.9)Nm

Shock absorbers

Removal

- Position the vehicle on centre stand.
- Remove the exhaust silencer, the rear side panels and the rear mudguard.
- Working on the shock absorber to be removed, unscrew the screw fixing the bottom side and retrieve the two washers.
- Supporting the shock absorber, unscrew the upper screw and retrieve the nut.
- Remove the shock absorber.



**See also**[Side fairings](#)[Exhaust assy. Removal](#)[Rear mudguard](#)

Refitting

Carry out the previous operations but in reverse order.

- Execute the removal procedures of the rear shock absorber in reverse order.
- Tighten screws and nuts to the required tightening torque.

Locking torques (N*m)

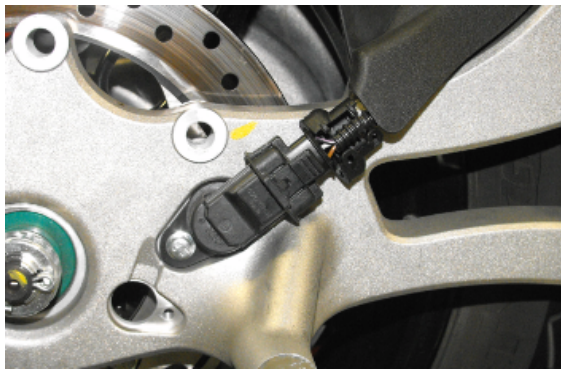
Shock absorber lower clamping (23.97÷29.13)lb ft (32.5÷39.5)Nm Upper shock absorber fixing - self locking nut M10 (29.50÷32.45)lb ft (40÷44)Nm

Exhaust bracket

Removal

- Before dismantling, secure the vehicle on the centre stand, on a flat surface.

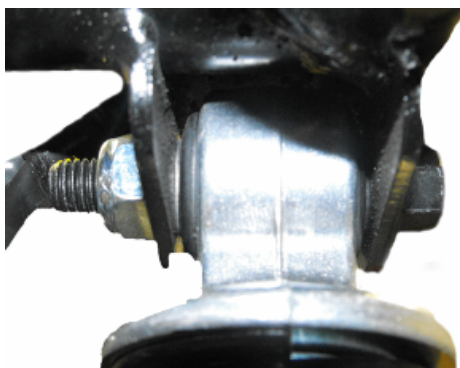
- Remove the silencer;
- Disconnect the connector from the speed sensor;



- Unscrew and remove the lower screw fixing the right rear shock absorber and collect the washer.



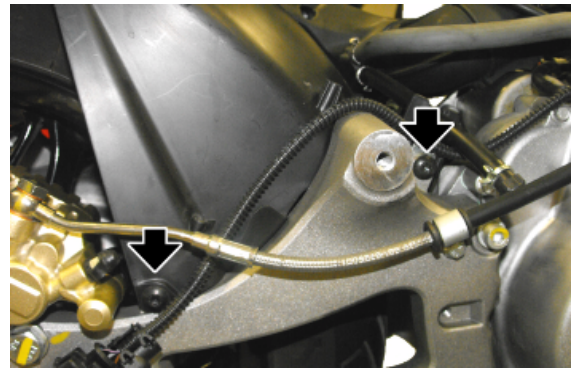
- Loosen the upper clamp of the right shock absorber and fix it above the chassis.



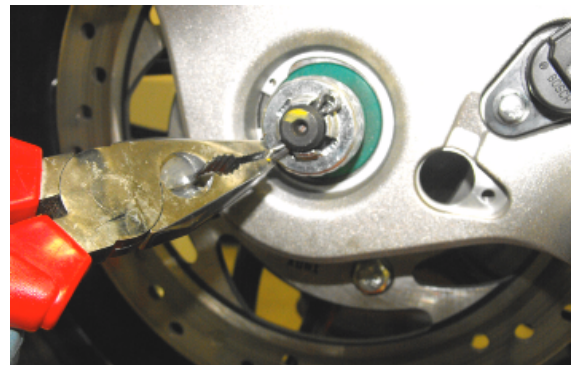
- Remove the screw and the cable grommet.



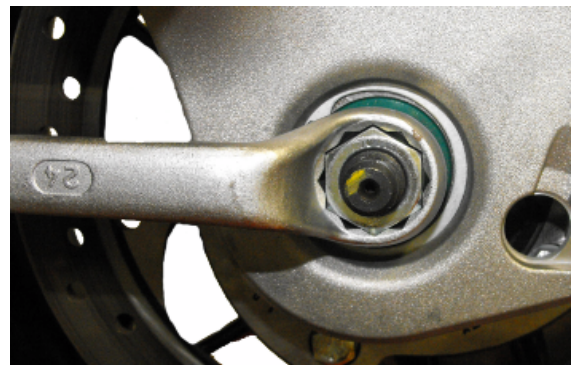
- Unscrew the two rear mudguard fixing screws, on the right side of the vehicle.



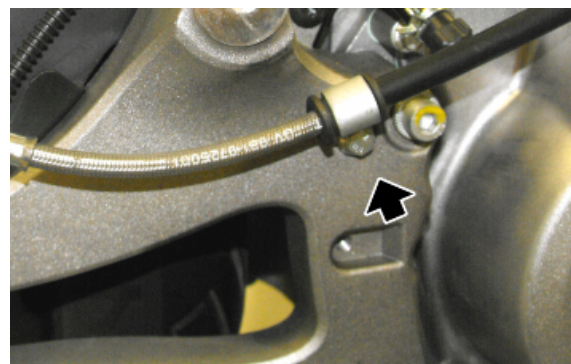
- Remove the safety cotter pin, aligning it with the recess on the bracket.
- Remove the nut cover cap.



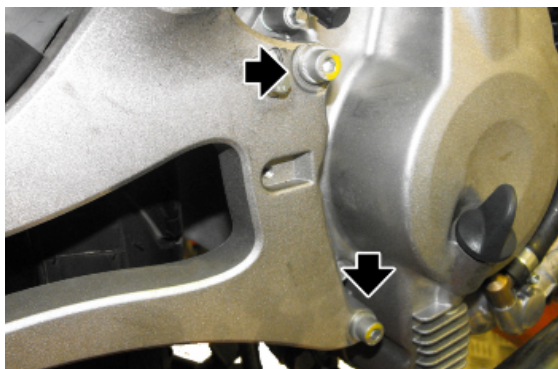
- Brake the rear wheel, locking the lever.
- Unscrew the nut securing the rear wheel and recover the spacer.



- Unscrew and remove the screw and release the pipe grommet.



- Release the rear brake lever and then remove the rear brake calliper.
- Unscrew the two screws fastening the silencer mounting bracket to the engine and collect the washers.
- Remove the bracket.



Overhaul

Plate disassembly

- Working on the outside, remove the snap ring.
- Adequately support the exhaust mounting bracket.
- By means of a specific punch, remove the bearing from the seat.



Specific tooling

020359Y 42x47-mm Adaptor

020376Y Adaptor handle

020439Y 17-mm guide

Plate reassembly

- By means of a heat gun, heat the bearing seat and, through specific punch, insert a new one into the seat.
- Working on the outside, insert the snap ring



Specific tooling

020151Y Air heater

Refitting

To refit, carry out the removal operations in reverse order, observing the prescribed tightening torques.

N.B.



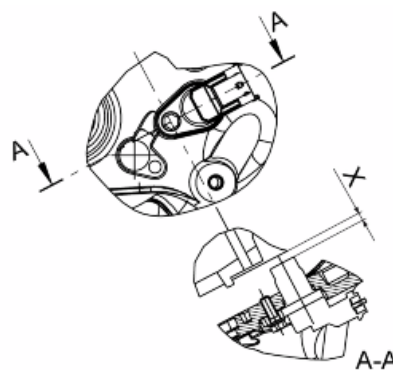
THE SILENCER SUPPORT ARM MUST BE TIGHTENED AFTER TIGHTENING THE WHEEL.

Locking torques (N*m)

Shock absorber mounting bracket fixing (14.75÷17.70)lb ft (20÷24)Nm M16x13 wheel retaining nut (75.23÷91.46)lb ft (102÷124)Nm

PAY PARTICULAR ATTENTION TO THE FITTING OF THE SPEED SENSOR; PROCEED AS FOLLOWS:

- install the speed sensor with its washer.
- Measure the height «X» with the aid of a feeler gauge and check that its value is correct.
- If the value of «X» exceeds the value of **0.0630in (1.6 mm)**, remove the interposed washer and perform the measurement again.



Locking torques (N*m)

Rear wheel engine speed sensor tightening screw (5.16÷7.37)lb ft (7÷10)Nm

Centre-stand

- Unscrew the nut and the pin from the right side.
- Remove the centre stand.
- During refitting, tighten the nut to the specified torque.



Locking torques (N*m)

Centre stand bolt (29.50÷33.19)lb ft (40÷45)Nm

Side stand

- Position the vehicle on centre stand.

Removal of the side stand

- Unhook the springs.
- Bring nut to its limit by unscrewing it.
- Unscrew the screw and remove the stand.

Fitting the side stand

- Perform the previous steps in reverse order.

Locking torques (N*m)

Side stand fixing bolt (29.50÷33.19)lb ft (40÷45)Nm



INDEX OF TOPICS

BRAKING SYSTEM

BRAK SYS

This section is dedicated to the description of the brake system components.

Interventions rules

WARNING

BRAKING SYSTEM FLUID IS CORROSIVE: ALWAYS WEAR PROTECTIVE GLOVES. IN THE EVENT OF ACCIDENTAL CONTACT WITH YOUR EYES, RINSE THE CONTACT AREA WELL WITH ABUNDANT WATER.

THE BRAKE FLUID DRAINED FROM THE SYSTEM IS HARMFUL TO THE ENVIRONMENT. COLLECTION AND DISPOSAL MUST BE CARRIED OUT IN COMPLIANCE WITH THE REGULATIONS IN FORCE. UNDER NORMAL DRIVING AND CLIMATIC CONDITIONS YOU SHOULD CHANGE THE FLUID EVERY TWO YEARS. IF BRAKES ARE USED INTENSELY AND/OR IN HARSH CONDITIONS, CHANGE THE FLUID MORE FREQUENTLY.

DURING INSTALLATION, THE PARTS TO BE REUSED MUST BE ABSOLUTELY CLEAN AND FREE FROM ANY TRACES OF OIL, FUEL AND GREASE: IT IS THEREFORE NECESSARY TO CLEAN THEM THOROUGH WITH DENATURED ALCOHOL.

N.B.

FOR TOPPING UP AND CHANGE, USE ONLY BRAKE FLUID DOT4 - NHTSA 116.

OBSERVE THE MAXIMUM DEGREE OF CLEANLINESS. HYDRAULIC FLUID IS EXTREMELY CORROSIVE FOR PAINTED SURFACES.

BRAKE FLUID IS HYGROSCOPIC; THAT IS, IT ABSORBS MOISTURE FROM THE SURROUNDING AIR.

IF THE MOISTURE CONTENT IN THE BRAKE FLUID EXCEEDS A CERTAIN VALUE, IT WILL RESULT IN POOR BRAKING EFFICIENCY DUE TO A LOW BOILING POINT OF THE FLUID.

N.B.

ALWAYS USE FLUID FROM SEALED CONTAINERS.

N.B.

RUBBER PARTS SHOULD NEVER BE LEFT IN ALCOHOL LONGER THAN 20 SECONDS. AFTER WASHING, THE PIECES MUST BE DRIED WITH A BLAST OF COMPRESSED AIR AND A CLEAN CLOTH.

THE SEAL RINGS MUST BE IMMERSSED IN THE OPERATING FLUID; THE USE OF PRF1 PROTECTIVE DEVICE IS ALLOWED.

WARNING

THE PRESENCE OF BRAKE FLUID ON THE DISC OR BRAKE PADS REDUCES BRAKING EFFICIENCY. IN THIS CASE, REPLACE THE PADS AND CLEAN THE DISC WITH A HIGH-QUALITY SOLVENT.

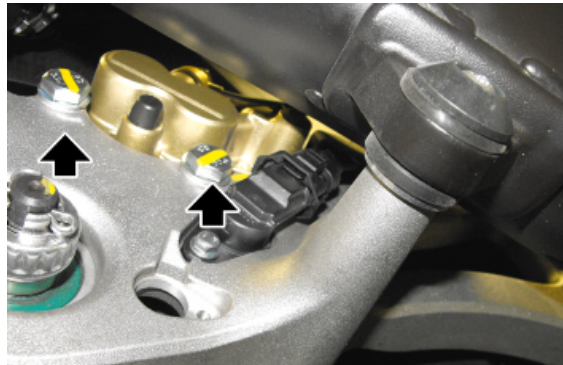
Rear brake calliper

Removal

- Remove the rear wheel.
- Remove the two rear brake calliper devices fastening them to the support as shown in the picture.

N.B.

SHOULD THE BRAKE CALLIPER BE REPLACED, BEFORE REMOVING THE FITTINGS FIXING THE CALLIPER TO THE SUPPORTING BRACKET, FIRST LOOSEN THE OIL HOSE FITTING AFTER HAVING EMPTIED THE SYSTEM OF THE CIRCUIT BEING INSPECTED.



Refitting

- Follow the removal procedures but in reverse order and tighten to the prescribed torques with the recommended product.

Recommended products**Loctite 243 Medium-strength threadlock**

Medium Loctite 243 threadlock

Locking torques (N*m)

Screw tightening calliper to support (17.70÷19.91)lb ft (24÷27)Nm

If the calliper is replaced:

CAUTION

ONCE REFITTING IS FINISHED, BLEED THE SYSTEM.

CAUTION

ALWAYS USE NEW COPPER WASHERS.

Locking torques (N*m)

Rear brake calliper-pipe fitting (14.75÷18.43)lb ft (20÷25)Nm

See also

[Rear - combined](#)

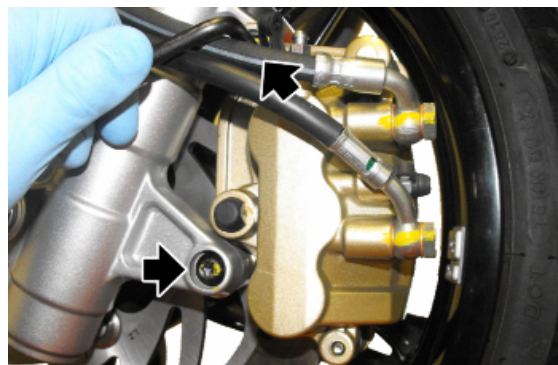
Front brake calliper

Removal

- Remove the two front brake calliper devices fastening to the support and recover the four washers.

N.B.

SHOULD IT BE NECESSARY TO REPLACE THE CALLIPER, FIRST LOOSEN THE FITTING CONNECTING THE PIPE TO THE BRAKE CALLIPER.



Refitting

- To fit the calliper, follow the above operations but in reverse order.

Locking torques (N*m)

Screw tightening calliper to support (17.70÷19.91)lb ft (24÷27)Nm

If the calliper is replaced:

CAUTION

ALWAYS USE NEW COPPER WASHERS.

CAUTION

ONCE REFITTING IS FINISHED, BLEED THE SYSTEM.

Locking torques (N*m)

Brake fluid pipe-calliper fitting (14.75÷18.43)lb ft (20÷25)Nm

See also

[Front](#)

Rear brake disc

Removal

REAR WHEEL WITH INTEGRATED HUB

- Remove the rear wheel.
- Act on the disc five fixing screws shown in the picture.



See also

[Removing the rear wheel](#)

Refitting

REAR WHEEL WITH INTEGRATED HUB

For fitting, position the disc correctly using the arrow stamped on it as reference.

N.B.

THE ARROW STAMPED ON THE DISC INDICATING THE RUNNING DIRECTION MUST BE FITTED TOWARDS THE OUTSIDE OF THE VEHICLE.



- Tighten the screws to the prescribed torque and apply the recommended product.

Recommended products

Loctite 243 Medium-strength threadlock

Medium Loctite 243 threadlock

Locking torques (N*m)

Brake disc screws (5.90÷7.73)lb ft (8÷10)Nm

Disc Inspection

Checking the disc is important; it must be perfectly clean, with no sign of rust, oil or grease or any other dirt, and must show no signs of deep scoring.

Characteristic

New rear disc thickness

0.157in (4.0mm)

Disc thickness at wear limit (rear)

0.138in (3.5mm)



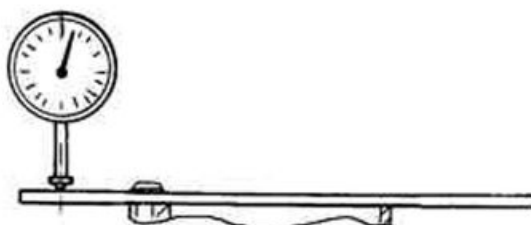
- Using the specific tool, check that the axial run-out of the brake surface is within the prescribed limits.

- If this is not the case, replace the disc and repeat the test.

WHEN INSTALLING, THOROUGHLY CLEAN THE DISC AND ITS SEAT ON THE HUB.

Characteristic

Max. axial run-out



0.00394in (0.1mm)

Front brake disc

Removal

- Remove the front wheel.
- Unscrew the six fixing screws and remove them, together with their collars and washers.
- Thoroughly clean the seats on the front wheel hub and on the disc.



See also

[Removing the front wheel](#)

Refitting

For fitting, position the disc correctly using the arrow stamped on it as reference.

- Position the collars and washers.
- Do up the screws to the prescribed torque and apply the recommended product

N.B.

THE ARROW STAMPED ON THE DISC INDICATING THE RUNNING DIRECTION MUST BE FITTED TOWARDS THE OUTSIDE OF THE VEHICLE.

Recommended products

Loctite 243 Medium-strength threadlock

Medium Loctite 243 threadlock

Locking torques (N*m)

Brake disc screws 8 ÷ 10 Brake disc screws (5.90÷7.73)lb ft (8÷10)Nm

Disc Inspection

Checking the disc is important; it must be perfectly clean, with no sign of rust, oil or grease or any other dirt, and must show no signs of deep scoring.

Characteristic

Thickness of a new front disc

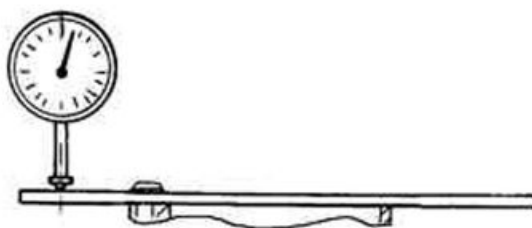
0.157in (4.0mm)

Disc thickness at wear limit (front)

0.138in (3.5mm)



- Using the specific tool, check that the axial run-out of the brake surface is within the prescribed limits.
- If this is not the case, replace the disc and repeat the test.



WHEN INSTALLING, THOROUGHLY CLEAN THE DISC AND ITS SEAT ON THE HUB.

Characteristic

Max. axial run-out

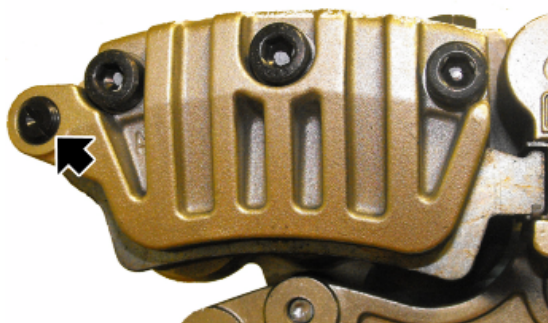
0.00394in (0.1mm)

Front brake pads

Removal

Proceed as follows:

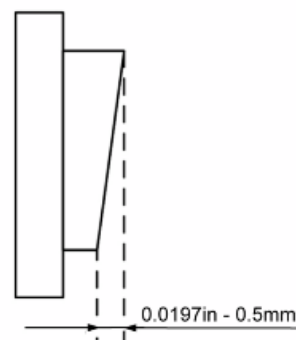
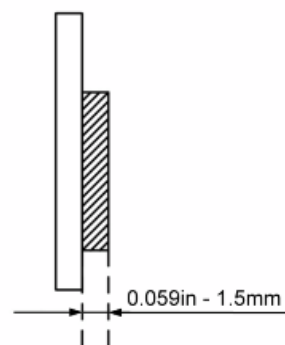
- Remove the front brake calliper.
- Unscrew the screws of the fixing pin of the pads.
- Remove the pads, being careful with the pad spring clamp.
- Check the thickness of the friction material of the pads.
- Replace the pads if the thickness is below the minimum value.
- The replacement must be made with greater residual thickness if the brake pad has not worn evenly. A 0.0197in (0.5mm) thickness difference in the residual friction material is permitted.



Characteristic

Minimum value

0.0197in (1.5mm)

**See also**[Front](#)

brake calliper

Refitting

To fit, proceed as follows:

- Insert the two pads in the callipers.
- Make sure to properly position the retainer spring, tighten the locking pin of the pads to the correct torque, applying the recommended product.
- Fit the calliper on its support, tightening the two screws to the prescribed torque.

N.B.

IF IT IS NOT POSSIBLE TO CORRECTLY POSITION THE CALLIPER ON THE DISC DURING FITTING, GENTLY EXPAND THE PADS.

**Recommended products****Loctite 243 Medium-strength threadlock**

Medium Loctite 243 threadlock

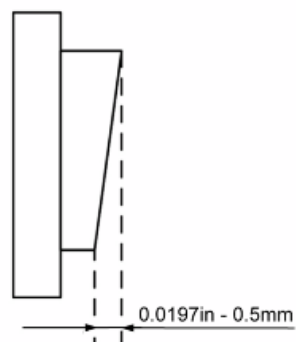
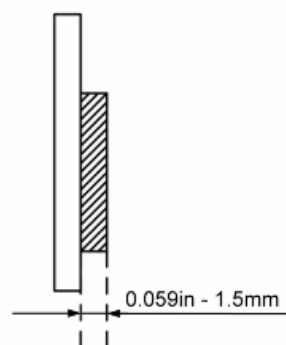
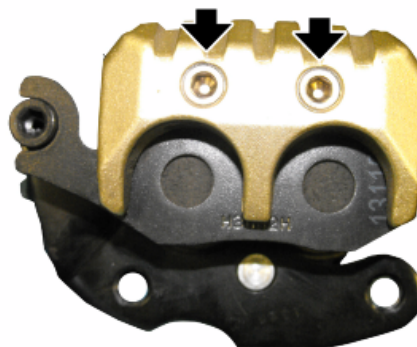
Locking torques (N*m)

Pad fastening pin (14.45÷18.07)lb ft (19.6÷24.5)Nm

Rear brake pads

Removal

- Remove the rear brake calliper
- Loosen the two pins shown in the figure that lock the two pads; be careful with the pad spring clamp.
- Remove the brake pads and check there are no faults or warping. Replace it if such anomalies are present.
- Check that the thickness of the friction material is more than 0.059in (1.5 mm). If it is, replace the coupling.
- The replacement must be made with greater residual thickness if the brake pad has not worn evenly. A 0.0197in (0.5mm) thickness difference in the residual friction material is permitted.



See also

[Removal](#)

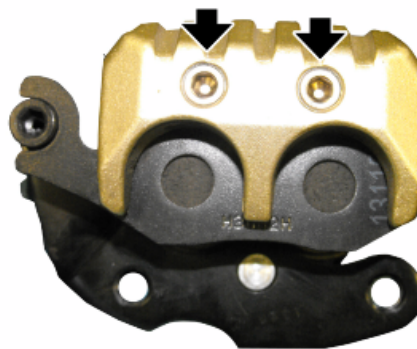
Refitting

To fit, proceed as follows:

- Insert the two pads in the callipers.
- Screw the two pad lock pins to the correct torque, and apply the recommended product.
- Fit the calliper on its support, tightening the two screws to the prescribed torque.

N.B.

IF IT IS NOT POSSIBLE TO CORRECTLY POSITION THE CALLIPER ON THE DISC DURING FITTING, GENTLY EXPAND THE PADS.



Recommended products

Loctite 243 Medium-strength threadlock

Medium Loctite 243 threadlock

Locking torques (N*m)

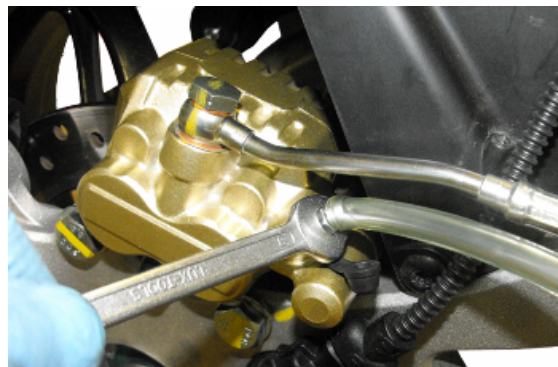
Screw tightening calliper to support (17.70÷19.91)

**lb ft (24÷27)Nm Pad fastening pin (14.45÷18.07)lb ft
(19.6÷24.5)Nm**

Fill

Rear - combined

- Remove the rubber cap from the bleed screw.
- Insert a rubber pipe in the bleed screw to permit the brake fluid to be recovered.
- With the brake lever, load the system and bring it up to the required pressure.
- Keeping the brake lever pulled, loosen the bleed screw to purge the air in the system. Then tighten the bleed screw



- Repeat the operation until only brake fluid comes out of the rubber pipe.
- Remove the fluid recovery pipe and refit the rubber cap over the bleed screw.
- Top up the brake fluid to the right level in the reservoir.

If necessary, bleeding can be done using a special vacuum pump

N.B.

DURING THE BLEEDING OPERATIONS, MAKE SURE THE BRAKE FLUID DOES NOT COME INTO CONTACT WITH THE BODYWORK SO AS NOT TO DAMAGE IT. FURTHERMORE, DURING THE BLEEDING OPERATIONS REGARDING THE BRAKE CALLIPERS, MAKE SURE THE BRAKE FLUID DOES NOT COME INTO CONTACT WITH THE DISC BRAKES AND WITH THE BRAKE PADS. FAILURE TO OBSERVE THIS PRECAUTION WILL ENDANGER THE PROPER WORKING AND EFFICIENCY OF THE BRAKING SYSTEM

Specific tooling

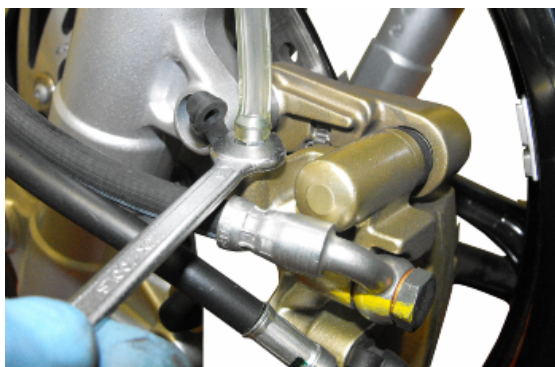
020329Y Mity-Vac vacuum-operated pump

Locking torques (N*m)

Circuit bleed calliper fitting (8.85÷11.80)lb ft (12÷16)Nm

Front

- Remove the rubber cap from the bleed screw.
- Insert a rubber pipe in the bleed screw to permit the brake fluid to be recovered.
- With the brake lever, load the system and bring it up to the required pressure.
- Keeping the brake lever pulled, loosen the bleed screw to purge the air in the system. Then tighten the bleed screw



- Repeat the operation until only brake fluid comes out of the rubber pipe.
- Remove the fluid recovery pipe and refit the rubber cap over the bleed screw.
- Top up the brake fluid to the right level in the reservoir.

If necessary, bleeding can be done using a special vacuum pump

N.B.

DURING THE BLEEDING OPERATIONS, MAKE SURE THE BRAKE FLUID DOES NOT COME INTO CONTACT WITH THE BODYWORK SO AS NOT TO DAMAGE IT. FURTHERMORE, DURING THE BLEEDING OPERATIONS REGARDING THE BRAKE CALLIPERS, MAKE SURE THE BRAKE FLUID DOES NOT COME INTO CONTACT WITH THE DISC BRAKES AND WITH THE BRAKE PADS. FAILURE TO OBSERVE THIS PRECAUTION WILL ENDANGER THE PROPER WORKING AND EFFICIENCY OF THE BRAKING SYSTEM

Specific tooling

020329Y Mity-Vac vacuum-operated pump

Locking torques (N*m)

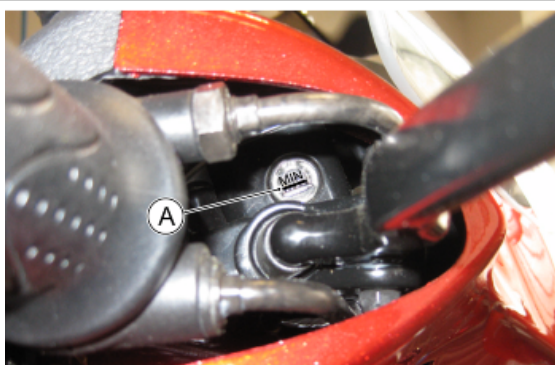
Circuit bleed calliper fitting (8.85÷11.80)lb ft (12÷16)Nm

Brake fluid level check

The front and rear brake fluid reservoirs are both positioned on the handlebar. Proceed as follows:

- Rest the vehicle onto the centre stand, with the handlebar centred.
- Check the fluid level through the sight glass «A».

A certain lowering of the level is caused by wear on the brake pads.



Front brake pump

Removal

- Remove the rear handlebar cover.
- Drain the braking system.
- Remove the clamps.
- Disconnect the brake fluid line from the pump, paying attention to a possible escape of remaining brake fluid.
- Remove the brake stop button from the lever.
- Undo the two U-bolt fixing screws.
- Remove the brake pump with the lever.



Refitting

- Upon refitting, perform the operation but in reverse order.
- Tighten the hydraulic line to the prescribed torque and purge the system.
- When the operation is over, tighten the brake fluid bleed screw to the prescribed torque.

N.B.

WHILE REFITTING, REPLACE THE COPPER GASKETS ON THEIR FITTINGS.

WARNING

BRAKE FLUID IS HYGROSCOPIC; THAT IS, IT ABSORBS MOISTURE FROM THE SURROUNDING AIR. IF THE LEVEL OF MOISTURE IN THE FLUID EXCEEDS A GIVEN VALUE, BRAKING WILL BE INEFFICIENT. THEREFORE, ALWAYS USE FLUID FROM SEALED CONTAINERS. UNDER NORMAL DRIVING AND CLIMATIC CONDITIONS YOU SHOULD CHANGE THIS FLUID EVERY TWO YEARS. IF BRAKES ARE USED INTENSELY AND/OR IN HARSH CONDITIONS, CHANGE THE FLUID MORE FREQUENTLY.

CAUTION

WHEN CARRYING OUT THE OPERATION, BRAKE FLUID MAY LEAK FROM BETWEEN THE BLEED SCREW AND ITS SEAT ON THE CALLIPER. CAREFULLY DRY THE CALLIPER AND DE-GREASE THE DISC SHOULD THERE BE BRAKE FLUID ON IT.

Locking torques (N*m)

Oil bleed screw (8.85÷11.80)lb ft (12÷16)Nm Hydraulic line fixing screw (11.80÷14.75)lb ft (16÷20)Nm Fixing screws for the handlebar control unit U-bolts (5.16÷7.38)lb ft (7÷10)Nm

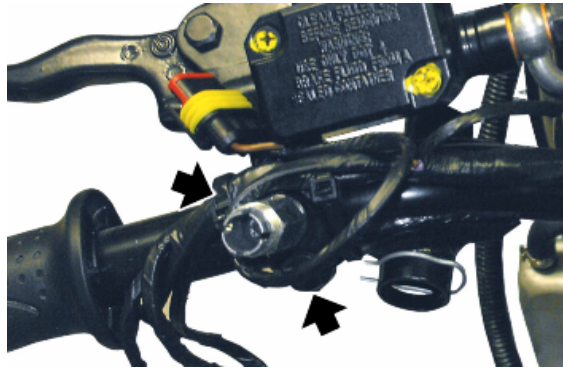
See also

[Front](#)

Rear brake pump - combined

Removal

- Remove the rear handlebar cover.
- Drain the braking system.
- Remove the clamps.
- Disconnect the brake fluid line from the pump, paying attention to a possible escape of remaining brake fluid.
- Remove the brake stop button from the lever.
- Undo the two U-bolt fixing screws.
- Remove the brake pump with the lever.



Refitting

- Upon refitting, perform the operation but in reverse order.
- Tighten the hydraulic line to the prescribed torque and purge the system.
- When the operation is over, tighten the brake fluid bleed screw to the prescribed torque.

N.B.

WHILE REFITTING, REPLACE THE COPPER GASKETS ON THEIR FITTINGS.

WARNING

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CAUTION

WHEN CARRYING OUT THE OPERATION, BRAKE FLUID MAY LEAK FROM BETWEEN THE BLEED SCREW AND ITS SEAT ON THE CALLIPER. CAREFULLY DRY THE CALLIPER AND DE-GREASE THE DISC SHOULD THERE BE BRAKE FLUID ON IT.

Locking torques (N*m)

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See also

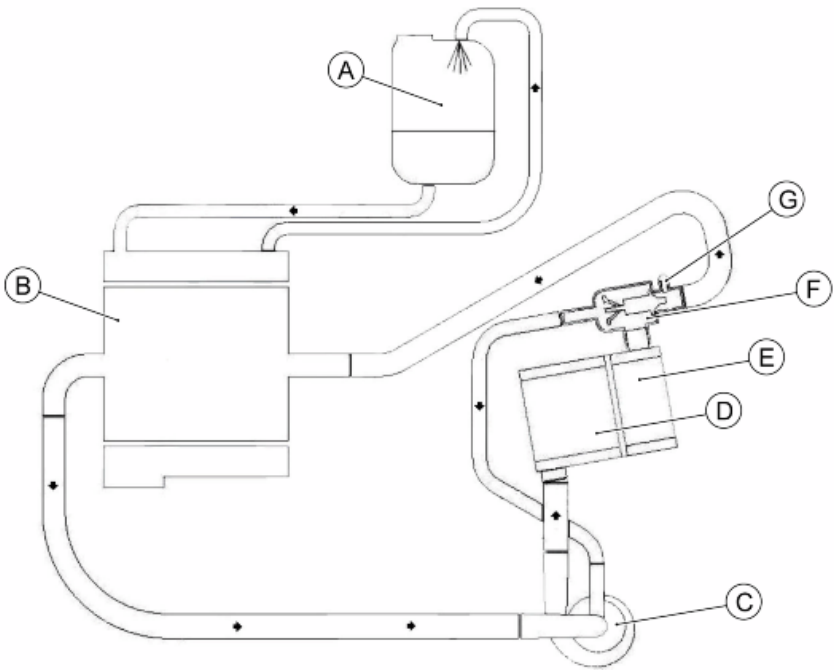
[Rear - combined](#)

INDEX OF TOPICS

COOLING SYSTEM

COOL SYS

Circuit diagram



KEY

- A = Expansion tank
- B = Radiator
- C = Water pump
- D = Cylinder
- E = Cylinder head
- F = Thermostat
- G = Breather

TECHNICAL SPECIFICATIONS

Specification	Desc./Quantity
Cooling system capacity	~0.53USgal (~0.44UKgal)(~2 l)
Recommended fluid	AGIP PERMANENT SPEZIAL (ready for use)
Sealing pressure	Cover set to 15.95PSI (110kPa) (1.1 bar)

THERMOSTAT

Specification	Desc./Quantity
Type	Wax-type, with deviator
Starts opening at	185±35.6°F(85±2°C)

ELECTRIC VENTILATION

Specification	Desc./Quantity
Electric ventilation starts at	221°F (105°C)
Electric ventilation stops at	212°F(100°C)

WATER PUMP

Specification	Desc./Quantity
Type	Centrifugal
Control	Electric, commanded by the control unit

RADIATOR

Specification	Desc./Quantity
Type	Aluminium, with horizontal circulation

EXPANSION TANK

Specification	Desc./Quantity
Calibration	Automatic bleeding, in parallel with the radiator

CAUTION

BE CAREFUL NOT TO REVERSE THE EXPANSION TANK PIPES. AT HIGH ENGINE SPEED, THE AIR CONTAINED IN THE TANK MAY ENTER INTO CIRCULATION, RUNNING THE RISK OF THE ENGINE SEIZING UP.

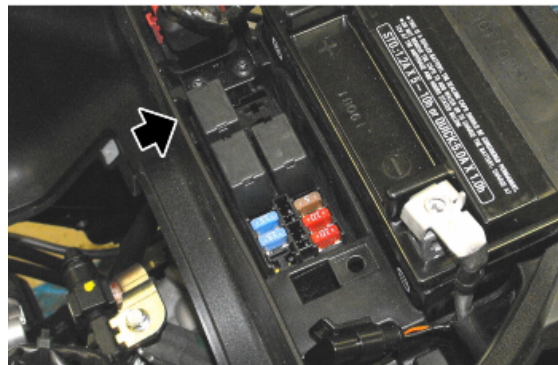
Electric fan check

- Check and, if necessary, restore the correct battery voltage.

Characteristic**Battery voltage**

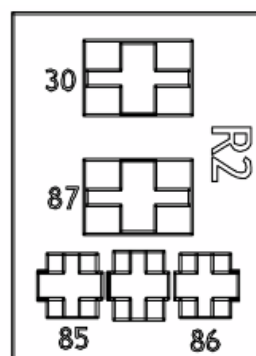
12V

- Check that the electric ventilation relay is working properly.

**WARNING**

TO INDICATE THE RELAY OF THE DESIRED FUNCTION, REFER TO THE PIN-CABLE COLOUR RELATIONSHIP WITH THE ATTACHED ELECTRIC SYSTEM DIAGRAM.

- If the relay is not working, replace it.
- If the relay is working, remove it and jump the green white - black green (85 - 86) wires. The electric ventilation starts if the ignition switch is set to «ON» and all components are working.



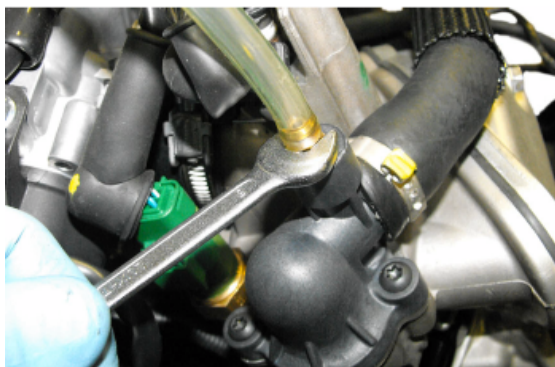
- In order to check the coolant temperature sensor, see the «Injection» chapter.

See also

[Remote controls check](#)

System bleed

- Start up the engine until the operating temperature is reached.
- Remove the rubber hood over the bleed valve
- Obtain a rubber tube that is of the right length to connect the valve to the expansion tank
- Place one end of the pipe on the bleed valve and the other in the expansion tank
- Loosen the screw by **two** turns until the communication hole is revealed with the head as shown in the picture
- Wait until only coolant comes out of the rubber pipe so as to eliminate any air bubbles inside the circuit.
- Tighten the bleed valve respecting the maximum torque.
- Bring the coolant up to the correct level inside the expansion tank



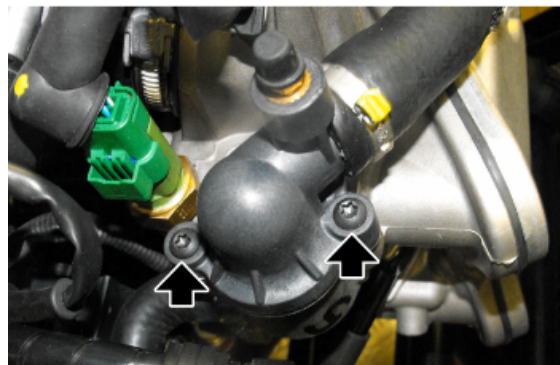
Locking torques (N*m)

Bleed screw (1.47÷2.21)lb ft (2÷3)Nm

Thermostat

Removal

- Remove the helmet compartment inspection cover.
- Place a 0.53USgal (0.44UKgal) (2.0l) container under the vehicle to collect the coolant.
- Undo the two screws indicated, lift the cover and remove the thermostat.



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	185±35.6°F(85±2°C)

Refitting

- Follow the removal steps but in reverse order; be careful to tighten screws to the prescribed torque.

Locking torques (N*m)

Thermostat cover screws (2.21÷2.95)lb ft (3÷4)Nm

- Once the cooling circuit is restored, refill using the recommended product and purge the circuit as expressly indicated in the «Cooling System» chapter.
-

INDEX OF TOPICS

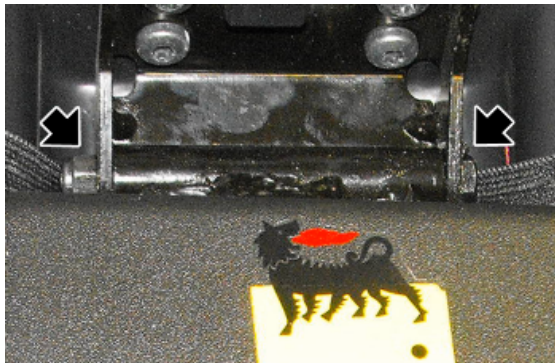
CHASSIS

CHAS

This section è is dedicated to the operations that can be carried out on the vehicle's bodywork.

Seat

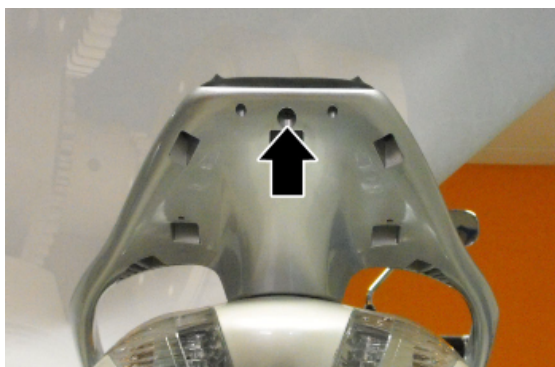
Undo the two screws indicated in the figure and retrieve the two bushings.



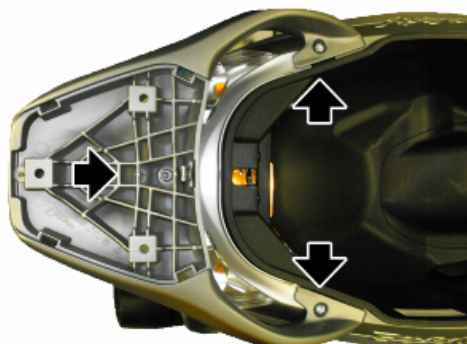
Rear rack

To remove the luggage rack:

- Lift the saddle;
- Unscrew the indicated screw and remove the plastic cover;



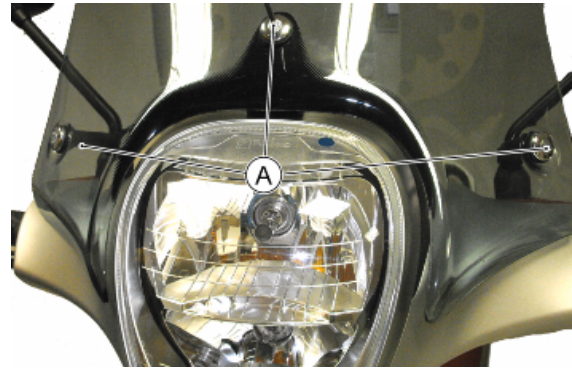
- Remove the two side screws.
- Unscrew the central screw and retrieve the two washers.
- Remove the luggage rack.



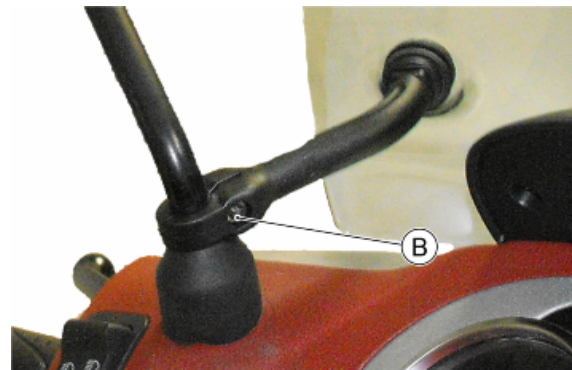
Rear handlebar cover

For topping-up, proceed as follows:

- Undo the three screws «A» and remove the wind-shield



- Loosen screw «B», slide the windshield support and rubber protection upwards

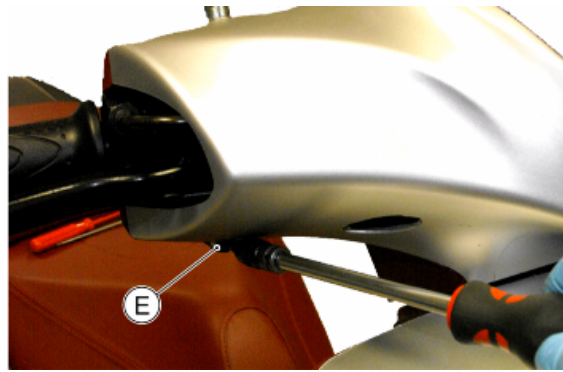


- Remove the mirrors unscrewing them from their seats
- Unscrew the two screws «C» and remove the pressure cover.



- Undo the two screws «D» and working from both sides of the vehicle, undo screw «E».

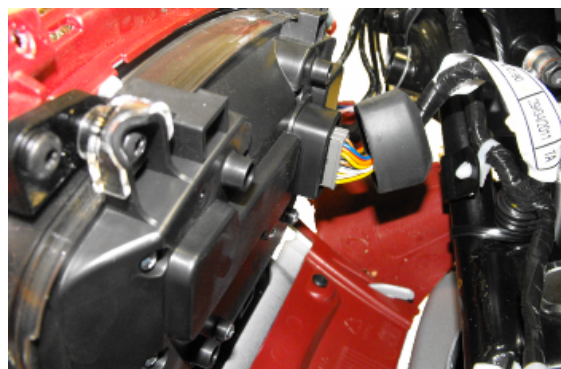




- Using a flat-headed screwdriver, detach the fastener tab as shown in the figure, accessing the tab via the indicated slit.
- Insert the screwdriver between the two covers, as indicated in the figure, and detach the upper fastener tab. Move the rear handlebar cover aside.

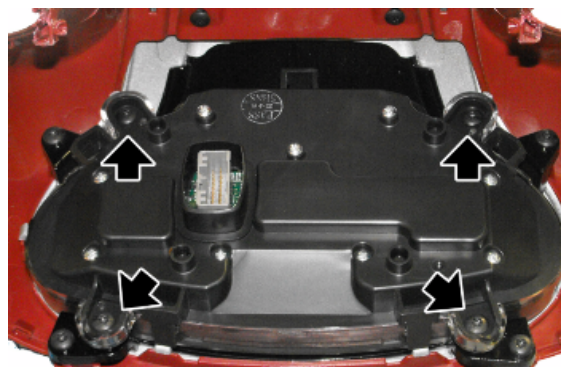


- Disconnect the connections of the instrument panel and buttons on the rear handlebar cover:
 - left side: Light switch with passing, Turn indicator switch, Horn button, Saddle opening button;
 - right side: RUN-OFF emergency stop switch, MODE Button, Starter button.
- Remove the rear handlebar cover.



Instrument panel

- Remove the rear handlebar cover;
- Undo the four screws indicated to remove the assembly.

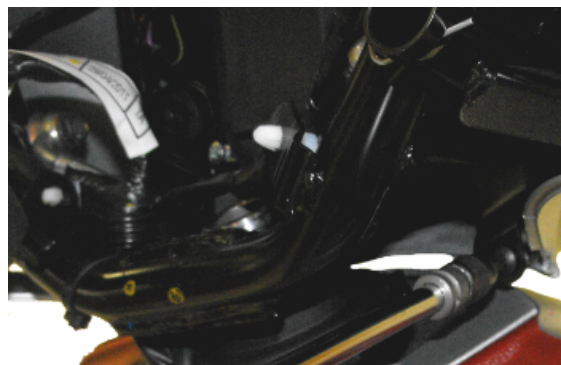


Front handlebar cover

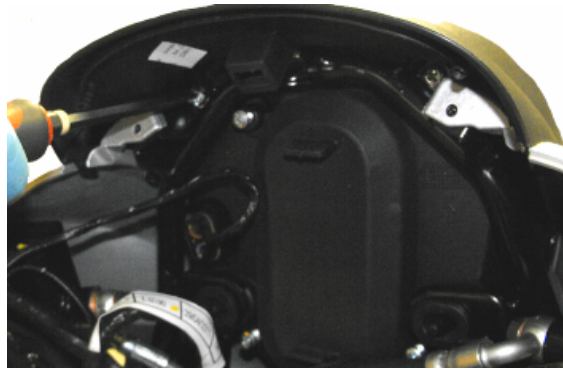
- Remove previously the rear handlebar cover.
- Working from both sides, unplug the bulb connectors.



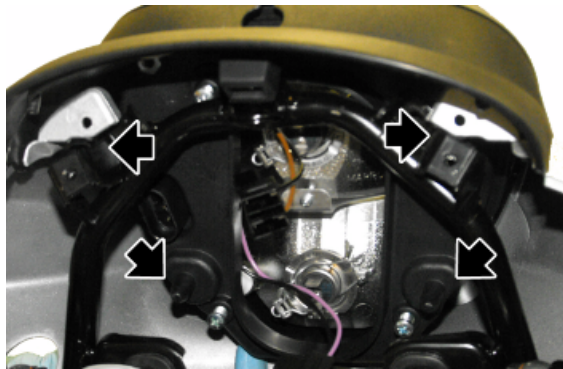
- Unscrew and remove the lower screws.



-
- Unscrew and remove the two upper screws.



-
- Remove the headlight assembly paying attention to the upper and lower fittings.

**See also**

[Rear handlebar cover](#)

-
- If necessary, release the handlebar cover from the front headlamp, unscrew the two lower screws, accessing two inspection holes and remove the front headlight.

**See also**

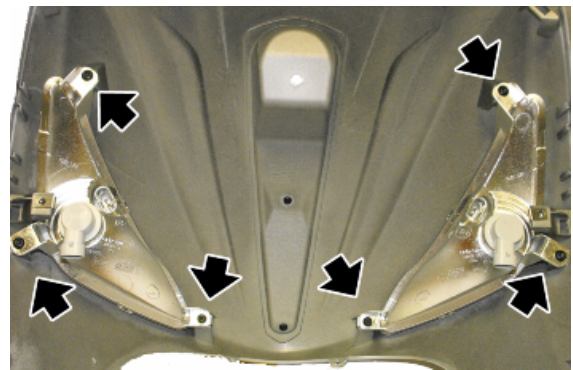
[Rear handlebar cover](#)

Headlight assy.

- Remove the rear handlebar cover.
- Working from both sides, connect the bulb connectors.
- Unscrew the two lower screws and remove the headlight from the front.



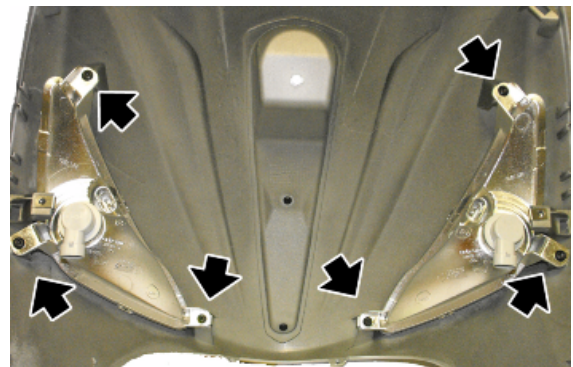
- If you need to remove the low beam bulbs and turn indicators, remove the front shield and unscrew the three screws from the desired unit.



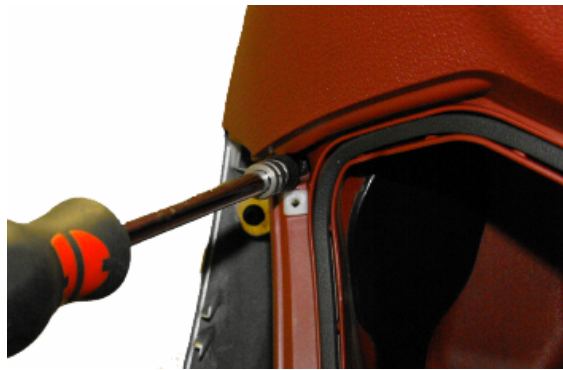
See also

[Rear handlebar cover](#)
[Legshield](#)

Legshield



- Unscrew the central screw located inside the glove-box.



To remove the front shield, proceed as follows:

- Remove the frame central cover;
- Undo the indicated screw on both sides of the vehicle;



- Remove the Piaggio clip-on badge and undo the screw underneath;



See also

[Frame central cover](#)

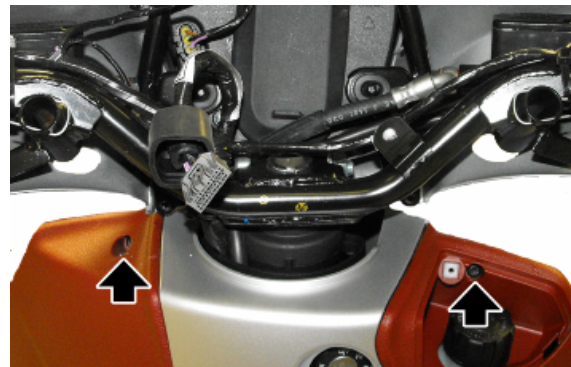
- Undo and remove the central screw.



- Unscrew and remove the screw and slide off the expansion tank cover.



- Undo the two upper fixing screws.



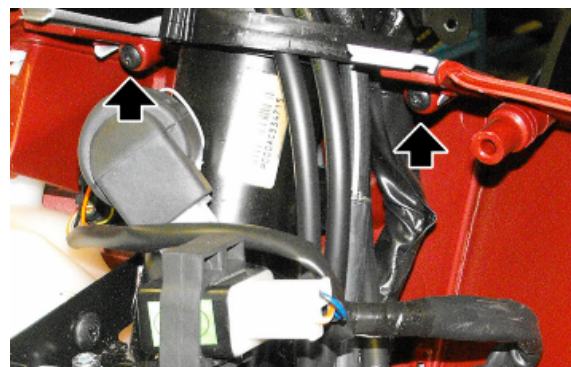
- Open the glove compartment and undo the indicated screw from both sides of the vehicle.
- Move the shield aside, releasing the fastener clips, and disconnect the connectors and lamp holders from the headlights;
- Unscrew the three screws indicated to remove the two headlights from the shield.



Knee-guard

To remove the leg shield back plate, proceed as follows:

- Remove the legshield;
- Unscrew the expansion tank cap;
- Unscrew the two screws indicated and release the two retainer tabs to remove the indicated cover;

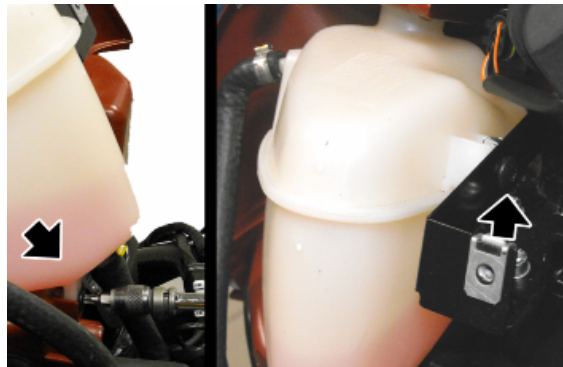


**See also**[Legshield](#)

- Unscrew the screw located above the emergency saddle release lever and the screw near the ignition key;



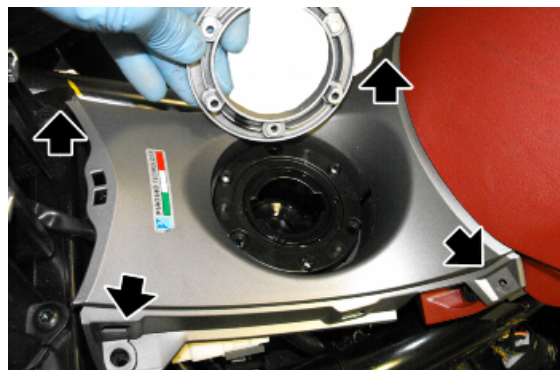
- Disconnect the LV socket connector and the coolant return pipe from the relative seat on the leg shield back plate;
- Unscrew the screw fastening the expansion tank to the leg shield back plate, taking care not to spill any coolant;

**See also**[Legshield](#)

- Disconnect the 12V plug socket connector



- Remove the cover and place a clean cloth at the entrance of the tank, so as not to accidentally introduce impurities.
- Unscrew the six screws of the tank flange and remove it.
- Unscrew the four screws of the tank cover and remove it, paying attention to the fittings with the internal front shield.
- Remove the clean cloth placed at the entrance of the tank and replace it with the cover.

**See also**[Legshield](#)

- Detach the emergency saddle release linkage from the lever as indicated in the figure;
- Remove the leg shield back plate.



- Undo the two screws indicated in the figure;



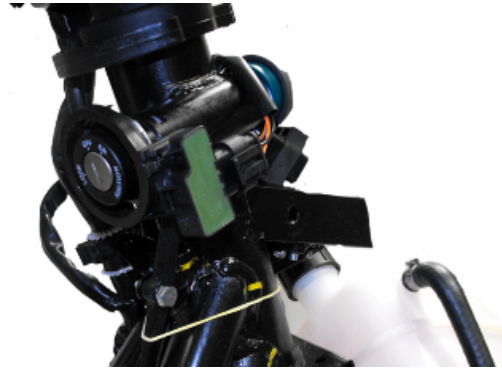
- Remove the leg shield back plate.

See also[Legshield](#)

Removing the ignition key-switch when on *off*

Proceed as follows to remove the lock when in the «OFF» position:

- Remove the leg shield back plate;
- Disconnect the connector as indicated in the figure and remove the immobilizer antenna, detaching from the lock body;



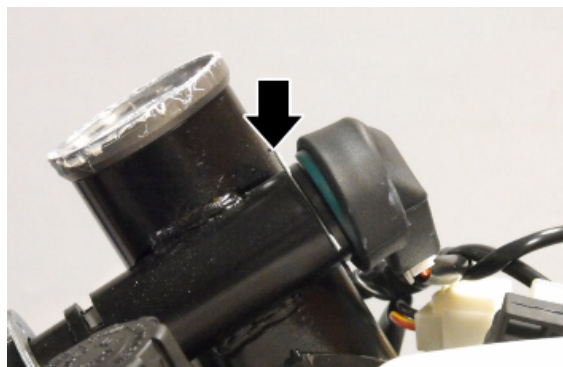
See also

[Knee-guard](#)

- Disconnect the lock key connector.



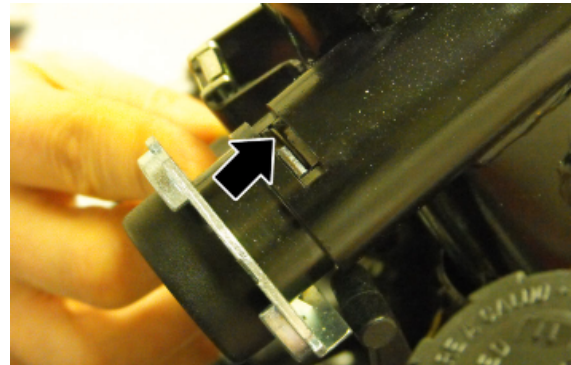
- Release the indicated clip and remove the ignition key;



See also

Knee-guard

- Press the lock body and remove the cylinder clip as indicated;
- Release the lock body and remove the cylinder.



- If necessary, remove the connector key lock from the cylinder.



See also

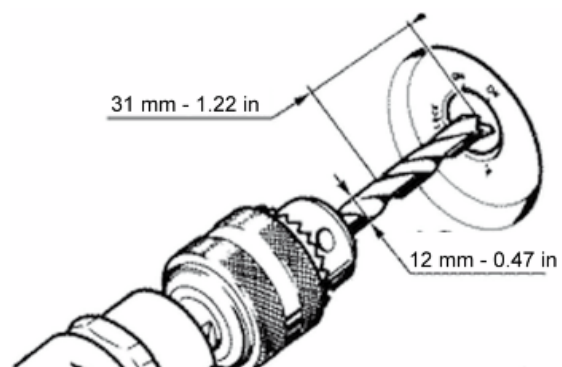
Knee-guard

Removing the ignition key-switch when on *lock*

In position "Lock", it is not possible to access the cylinder retaining spring. The spring must then be removed as shown in the figure, allowing the lock spring to be pressed out.

N.B.

TO REFIT THIS ITEM, THE VEHICLE STEERING LOCK MUST BE RELEASED WITH THE LOCK BODY (INTERNAL AND EXTERNAL PART) IN POSITION "OFF". PROCEED AS DESCRIBED IN THE PREVIOUS PARAGRAPH.



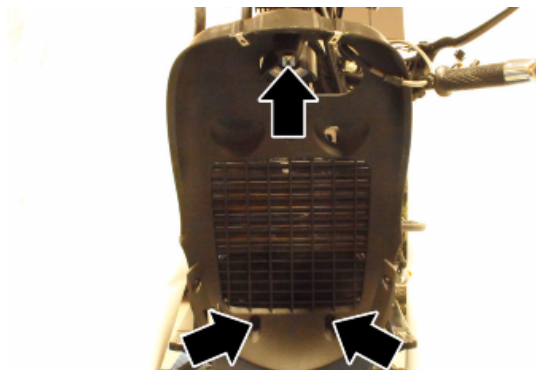
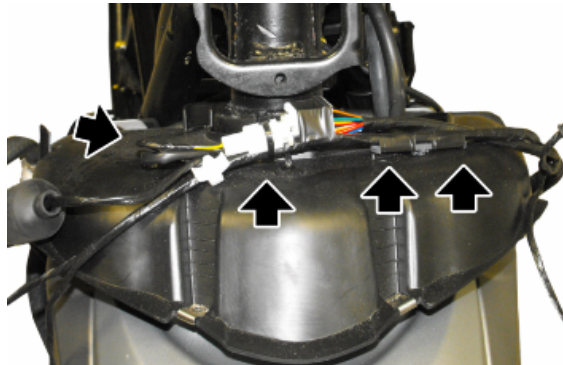
See also

Removing the ignition key-switch when on *off*

Front wheel housing

To remove the front wheel housing, proceed as follows:

- Remove the leg shield back plate;
- Remove the handlebar covers;
- Remove the fork;
- Release the indicated clamps from the wheel housing;
- Undo the three screws indicated and remove the wheel housing.



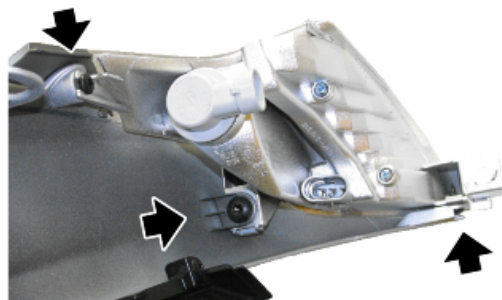
See also

[Knee-guard](#)

Taillight assy.

To remove the rear light assembly, proceed as follows:

- Remove the side fairings;
- Undo the three screws indicated in the figure.



See also

[Side fairings](#)

Footrest

PASSENGER FOOTREST

To remove the passenger footrests, work on both sides, as described:

- lower the passenger footrest and unscrew.

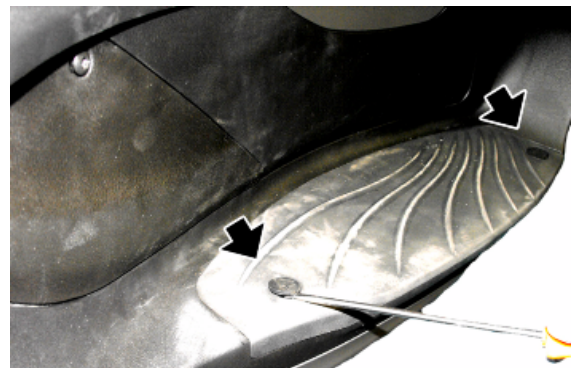


- Unscrew the two screws and remove the passenger footrest.



RIDER FOOTREST

- It is possible to remove in the same way the rider footrests, by loosening the two footrest fixing covers.



Side fairings

REMOVAL OF LOWER SIDE FAIRING

The operations described refer to one fairing but apply to both.

- Remove the rider and passenger footrests.
- Undo the two screws.

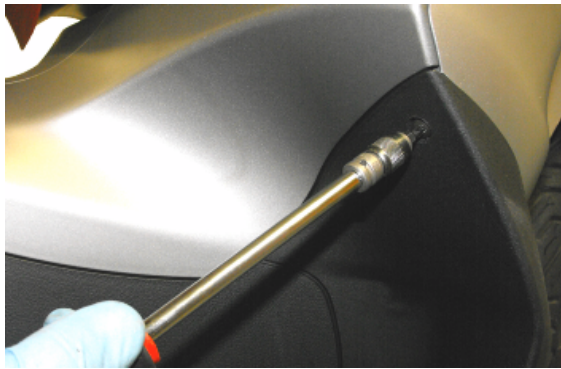


- Undo the screw.

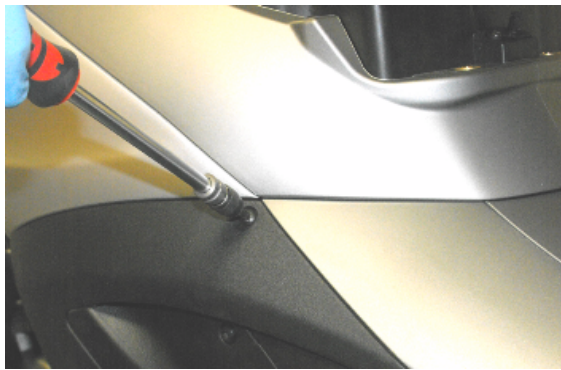
**See also**

[Footrest](#)

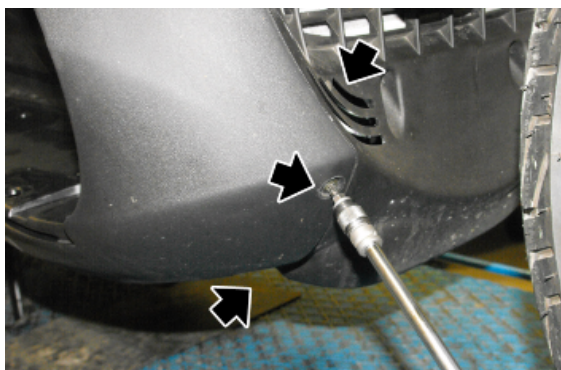
- Undo the screw fixing the front shield.



- Undo the screw fixing the rear fairing.



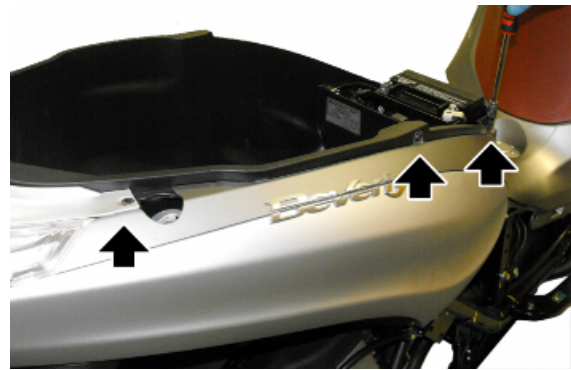
- Unscrew the lower fixing screws of the side fairing.



SIDE FAIRING

The following operations are described for just one, but apply to both the fairings.

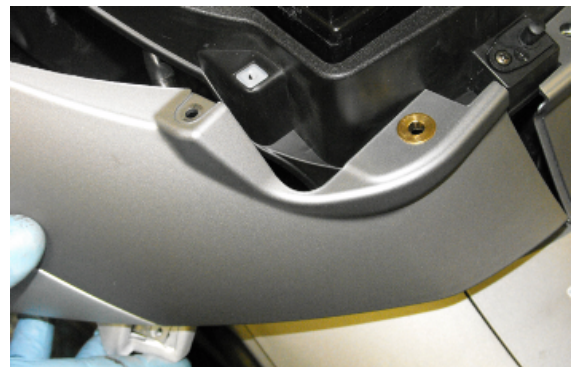
- Remove the rear central cover.
- Remove the saddle.
- Remove the lower side fairing
- Undo the three screws.



- Undo the rear central screw.



- Paying attention to the front union, gently slide the side fairing.



- Disconnect the turn indicator connector.



- Disconnect the connector of the taillight lamp.
- Remove the side fairing.

**See also**

[Seat](#)
[Rear rack](#)
[Side fairings](#)

FRONT FAIRING

- First, remove the lower side fairings and the rider footrests.
- Unscrew and remove the four screws.



- Undo the central screw.



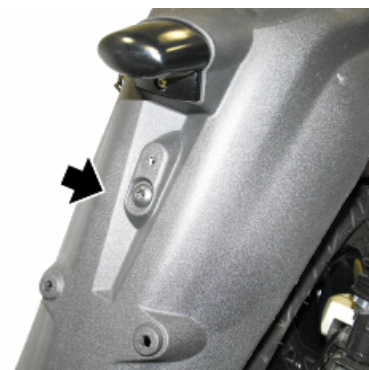
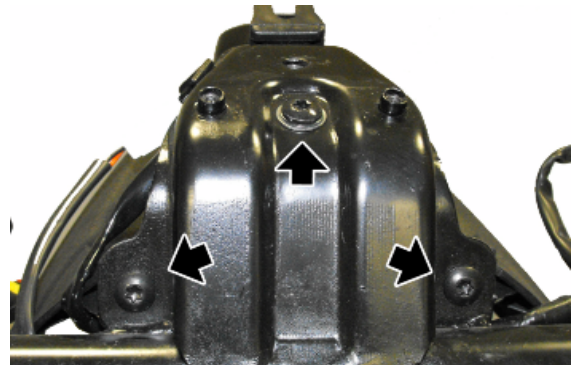
- Disconnect the connector of the taillight lamp.
- Remove the side fairing.



License plate holder

To remove the license plate mounting, proceed as follows:

- Remove the helmet compartment;
- Undo the three screws indicated;
- Unscrew the indicated screw and release the license plate light lamp holder.



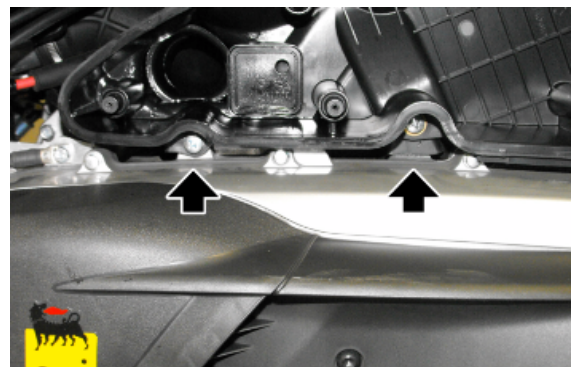
See also

[Helmet bay](#)

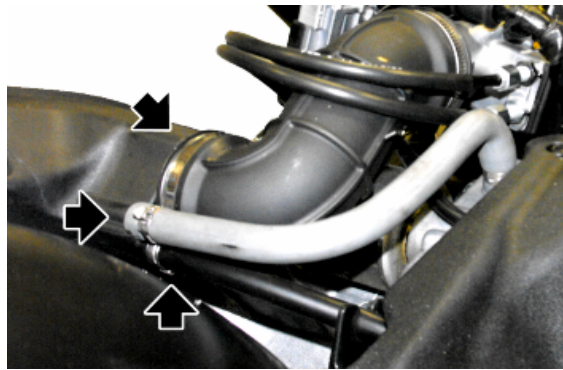
Air filter

If necessary to remove the filter box, proceed as follows:

- loosen the two fastening screws.

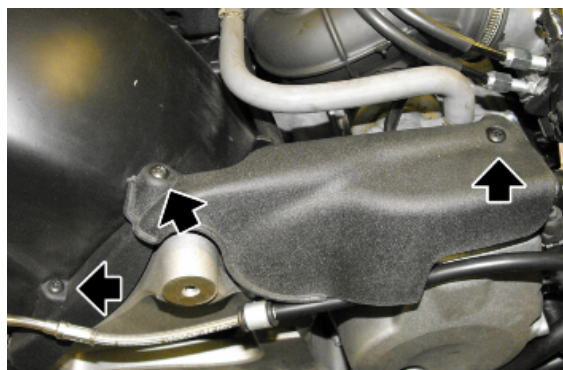


- Loosen three clamps and remove the pipes.
- Remove the filter box.



Rear mudguard

- To remove the rear mudguard, remove the cover and the cable grommet beforehand by unscrewing the three screws indicated.



- Unscrew the 2 fixing screws of the filter box on the left side of the vehicle and retrieve the four washers.



- Working on the right side of the vehicle, unscrew the fixing screw of the mudguard behind the brake caliper support plate.



- Unhook the bleeding hose vapour filter box, from the pipe grommet on the right side of the vehicle.



- Remove upwards rear mudguard paying attention to the union on the inner right side, at the front tightening of the filter box.



- Working on the right side of the vehicle, unscrew the fixing screw of the mudguard behind the brake caliper support plate.



- Unhook the bleeding hose vapour filter box, from the pipe grommet on the right side of the vehicle.



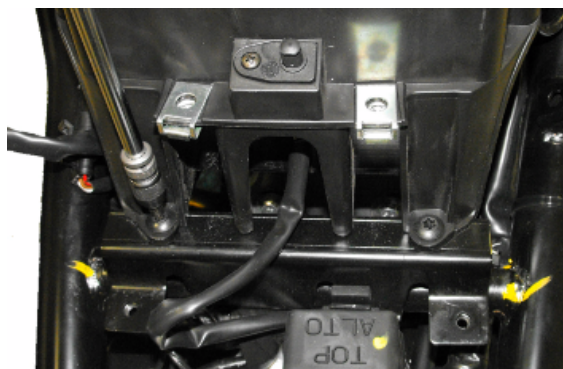
- Remove upwards rear mudguard paying attention to the union on the inner right side, at the front tightening of the filter box.



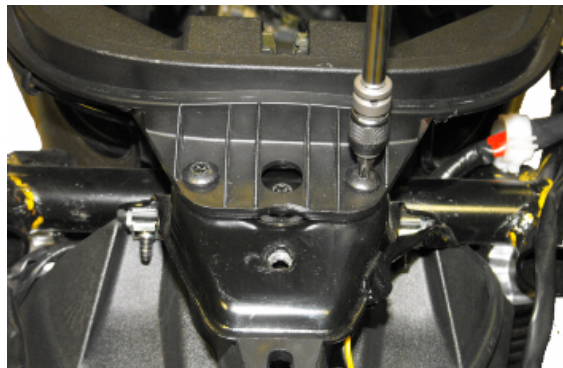
Helmet bay

To remove the front helmet compartment, proceed as follows:

- Remove the saddle.
- Remove the battery.
- Remove the side fairings.
- Unscrew and remove the two front screws fixing the compartment to the chassis.



- Unscrew the two rear screws;



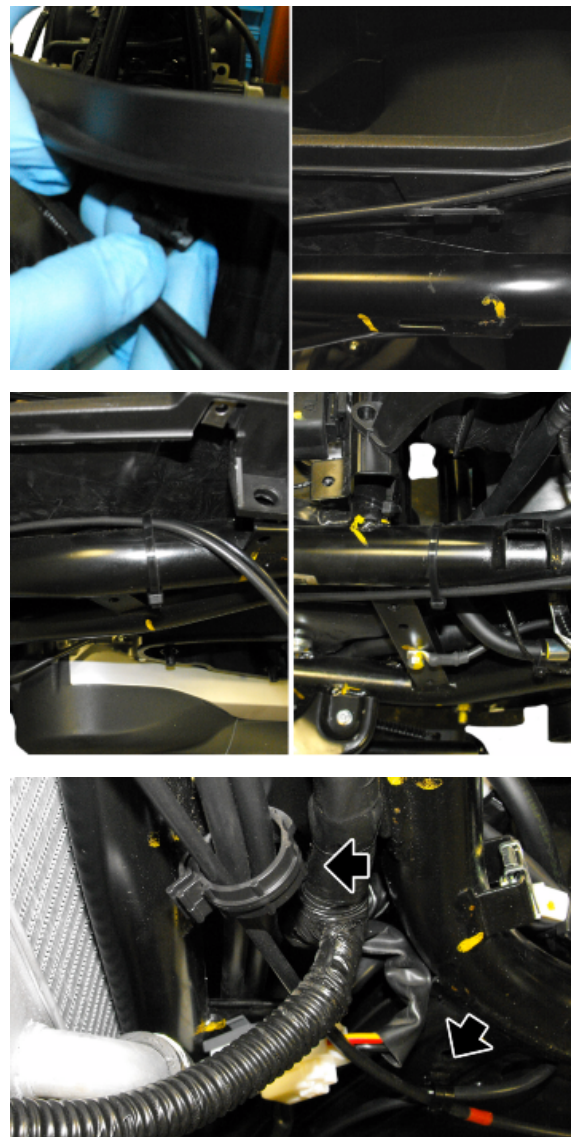
- Undo the indicated screw on both sides of the vehicle;

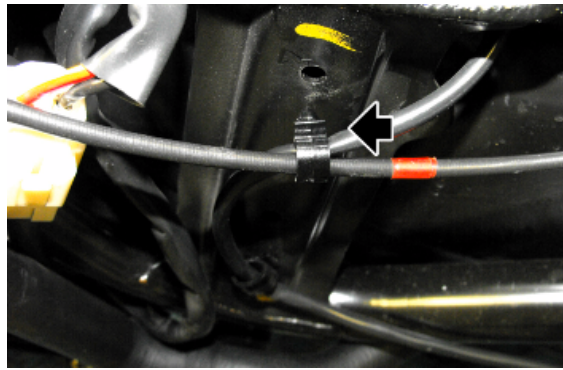


- Undo the two fixing screws of the saddle lock.

**See also**[Side fairings](#)

- Unleash the saddle lock cable from the steps on the outer left side of the helmet compartment, and from the cable grommet and the indicated clamps.





- Unscrew and remove the two fixing screws of the main relay.



- Disconnect the connector of the helmet compartment lamp.



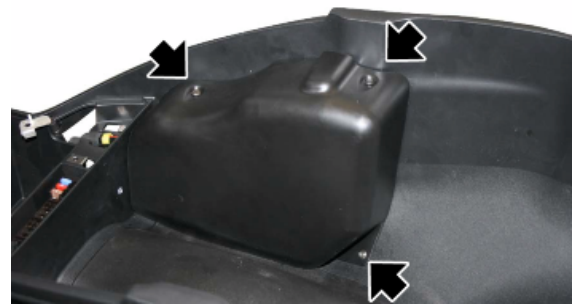
- Unscrew the screw on the right side and remove the clamp on the left side of the fuse box and relays.
- Remove the fuse box and relay on the lower part.



- Remove the components of the anti-evapourating system and free the compartment from the tubes.

N.B.

DURING INSTALLATION OF THE HELMET COMPARTMENT PROCEED IN REVERSE ORDER TO THAT DESCRIBED, PAYING PARTICULAR ATTENTION TO VERIFICATION AND INSTALLATION OPERATIONS OF COMPONENTS OF THE ANTI-EVAPOURATING SYSTEM.

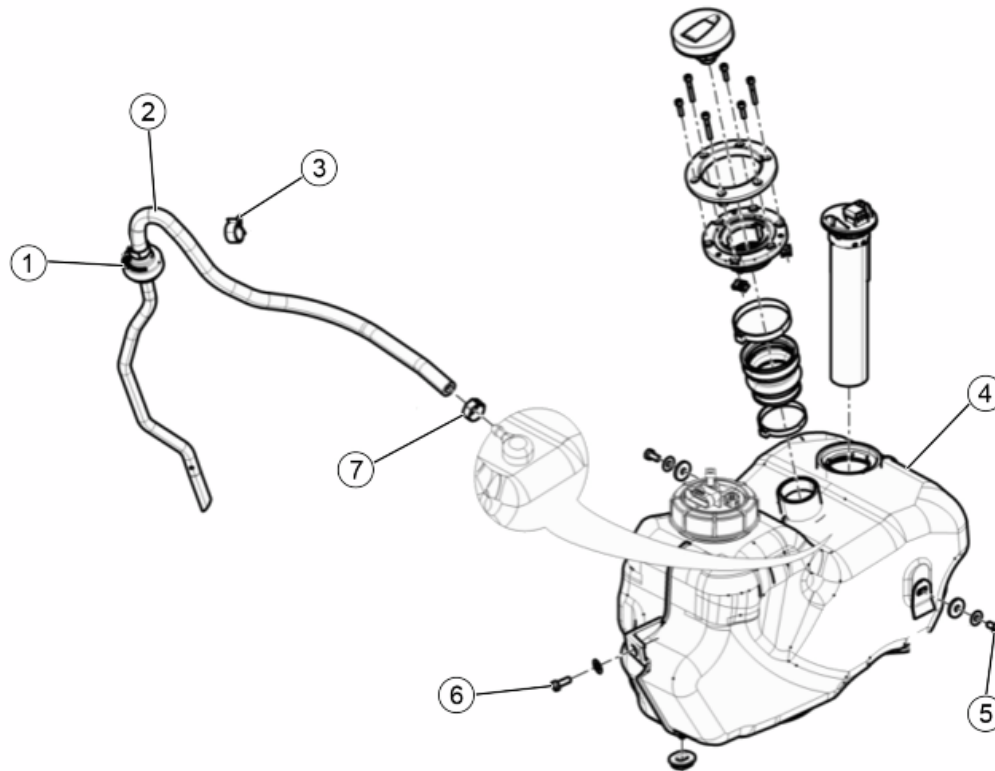


- Disconnect the connectors of the saddle switch for the compartment lighting.
- Remove the helmet compartment on the upper part.

**See also**

[Side fairings](#)
[Removing system components](#)
[Roll-over valve check](#)
[Safety valve check](#)
[Canister inspection](#)
[Refitting system components](#)

Fuel tank

**KEY:**

- 1. Safety valve
- 2. Breather pipe
- 3. Elastic clip
- 4. Fuel tank
- 5. Side fixing screws
- 6. Front fixing screws
- 7. Hose clamp

FUEL TANK REMOVAL:

Position the vehicle on the central stand and on a flat surface.

N.B.

THIS OPERATION SHOULD PREFERABLY BE PERFORMED WITH THE TANK EMPTY.

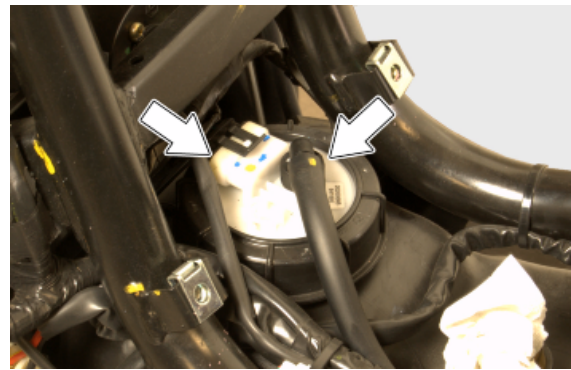
First remove:

- the lower side fairings;
- the footrests;
- the lower central cover;
- the leg shield back plate.

Disconnect the connector of the fuel pump and the fuel piping acting on the quick-release fitting.

WARNING

PAY ATTENTION TO THE SPILLING OF FUEL DUE TO PIPE PRESSURE.



Disconnect the connector of the level indicator.



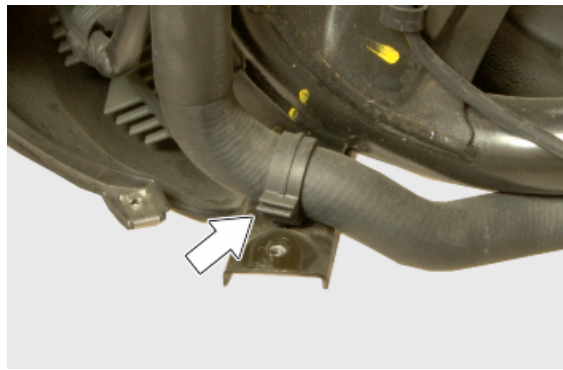
Remove the side screws fixing the tank to the frame.



Loosen the screws securing the support of the footrest to the frame and remove it.



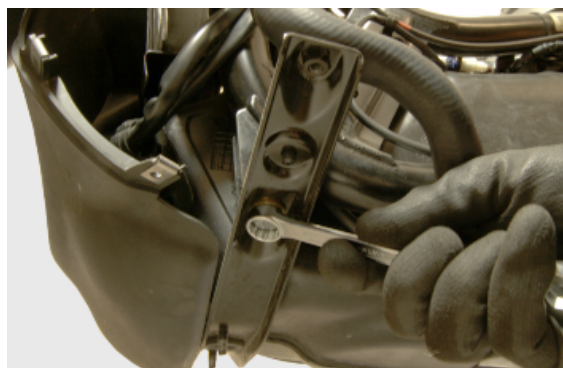
Release the coolant pipe from the front crosspiece by operating on the retaining clamp.



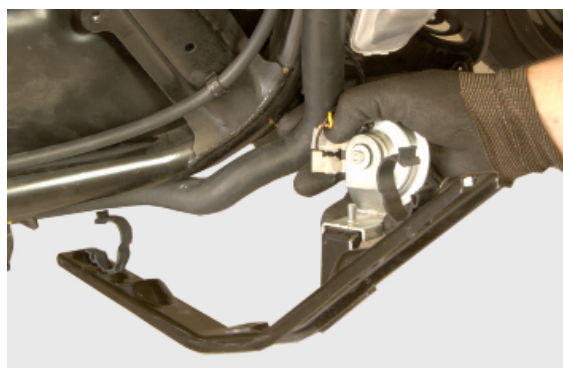
Undo the nuts locking the bracket of the voltage regulator to the front crosspiece.



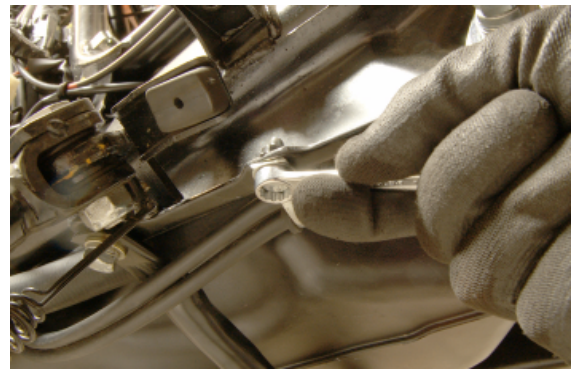
Undo the fixing screws of the front crosspiece to the frame.



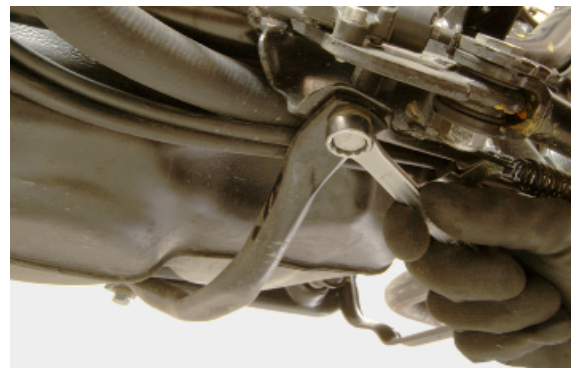
Remove the crosspiece by disconnecting the electrical connector of the horn.



From the left side, release the accelerator cables from the frame, loosening the fixing screw of the appropriate retaining clip.



Undo the fixing screws of the rear crosspiece to the frame and remove it.



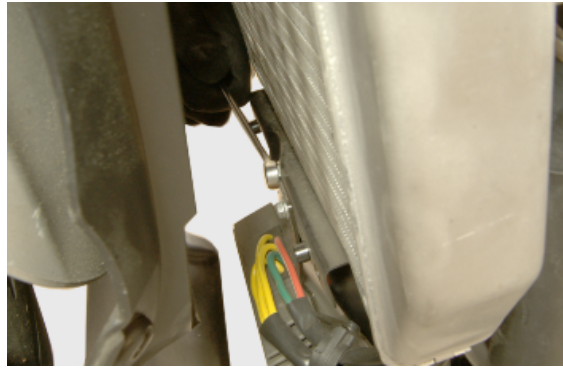
Unscrew the lower fixing screws of the front wheel housing.



In the event that the breather pipe is present, remove its elastic clip that fastens to the frame.

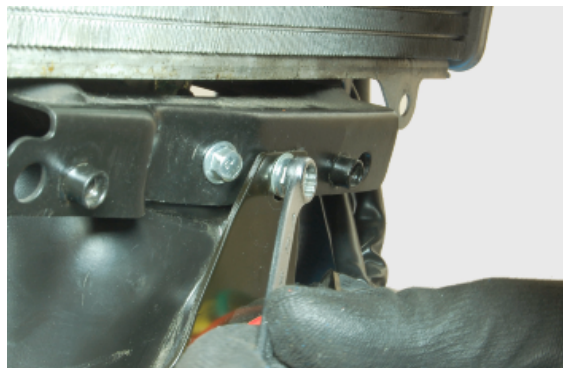


Undo the front fixing screw of the tank to the frame.



Undo the fixing screw of the voltage regulator and remove it.

Remove the tank, pulling it off from the bottom.



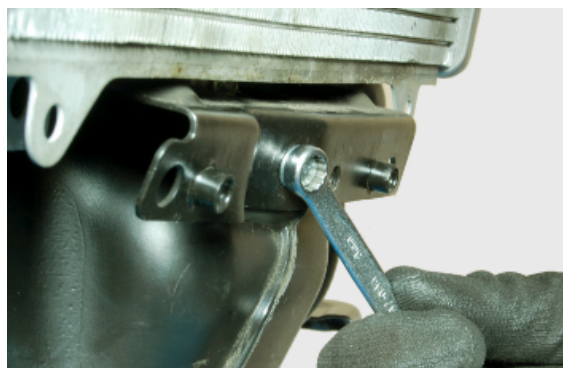
REMOVAL OF FUEL TANK

Fit the tank, inserting it from below.

Tighten the front fixing screw of the tank to the frame.

Locking torques (N*m)

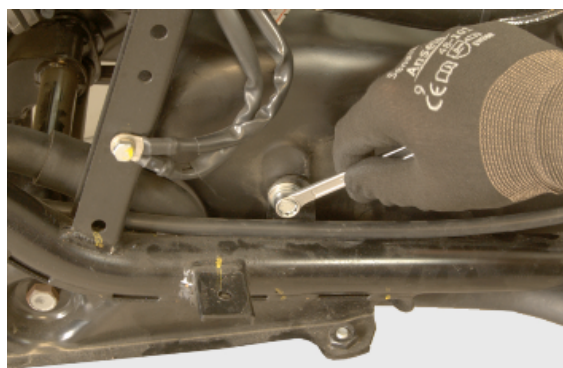
Tank front screw - frame $8 \div 10.5$



Tighten the side screws fixing the tank to the frame.

Locking torques (N*m)

Tank side screws - Frame $5.5 \div 7$



Loosely tighten the fixing screw of the voltage regulator bracket to the frame.



Connect the relative electrical connection to the horn.



Fit the front crosspiece making sure that the lower pin of the tank fits perfectly in the central slot provided on the said crosspiece.

Tighten the fixing screws of the front crosspiece to the frame.



Tighten the lock nuts of the bracket of the regulator to the front crosspiece.



After tightening the fixing screw of the bracket of the voltage regulator, tighten the lower screws of the front wheel housing.



Tighten the fixing screws of the rear crosspiece.

Locking torques (N*m)

Rear crosspiece screws - Frame 16 - 25



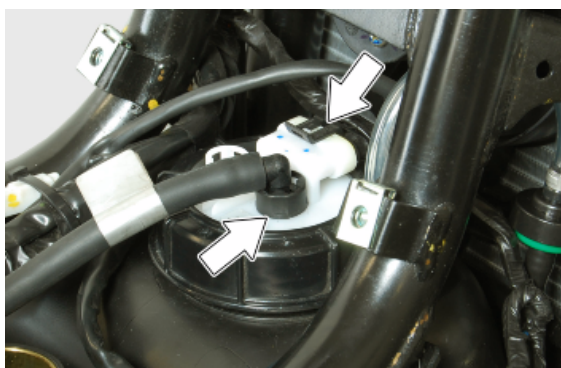
Tighten the screws of the footrest support.

Locking torques (N*m)

Footrest support screws 8 ÷ 10.5



Connect the connector of the fuel pump and the piping acting on the quick-release fitting.



Connect the connector of the level indicator.



If required, correctly position the breather pipe by following the steps below:

insert the transparent end of the breather pipe on the appropriate tank fitting and tighten the retaining clamp.

CAUTION

DURING INSTALLATION, MAKE SURE THAT THE PART OF PIPE CONNECTED TO THE TANK IS THE CLEAR ONE.



Lay the pipe along the right side of the vehicle making it adhere to the upper part of the fuel tank.



Hook the retaining clip on the rear hole of the inner bracket of the frame and lock the tube in correspondence with the yellow marking.



Bring the valve downwards and keep it from the inside to the crosspiece of the frame.

In this way it is ensured that the valve does not come into contact with the electric fan and the radiator.



Drain the black rubber tube towards the seat of the horn and insert it in the support bracket of the crosspiece fixing the footrests.



Finally, let out, toward the rear side of the vehicle, the end part of the black rubber pipe.

CAUTION

MAKE SURE THAT ALONG THE PATH THERE ARE NO CHOKES IN THE BREATHER PIPE.



Rear central cover

- Remove the luggage rack.
- Unscrew the two screws and remove the central rear cover, paying attention to the lower housing.



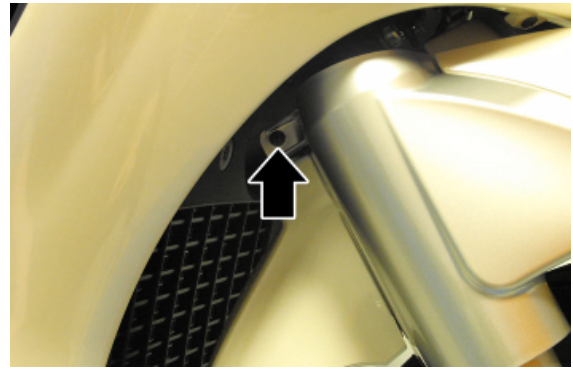
See also

[Rear rack](#)

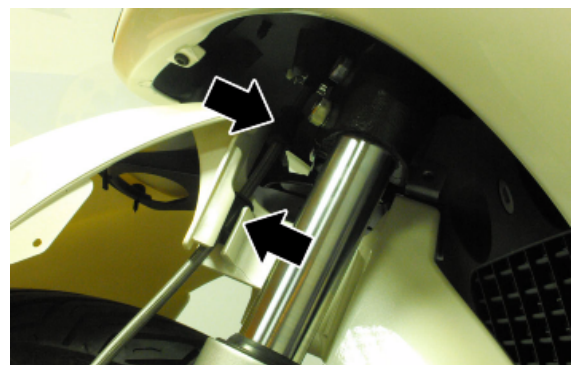
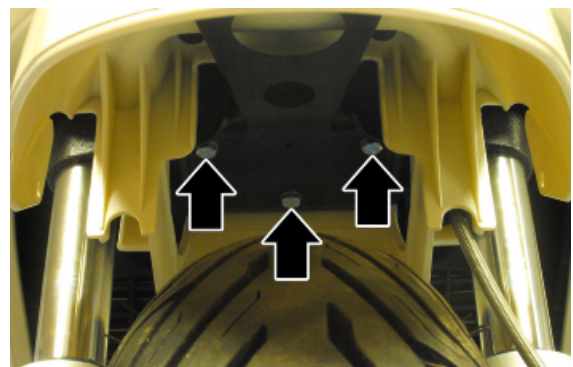
Front mudguard

To remove the front mudguard, proceed as follows:

- On both sides of the vehicle, unscrew the indicated screws and remove the stanchion guard;



- Unscrew the three bolts indicated inside the mudguard;
- Detach the brake hose from the two indicated seats and remove the mudguard, pulling from the front.

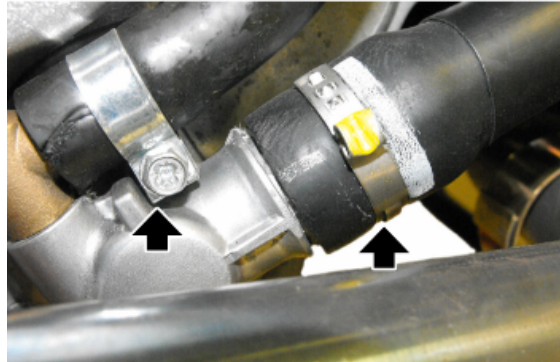


Radiator fan

To remove the radiator electric fan, proceed as follows:

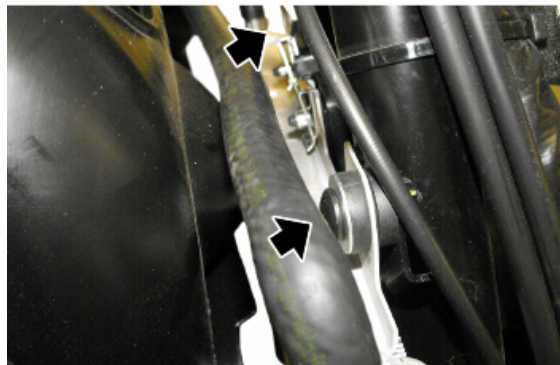
SYSTEM DRAINING

- Remove the right side faring to allow access;
- Obtain a suitably sized container and drain the cooling system by removing the two indicated clamps. Open the expansion tank cap to facilitate draining;

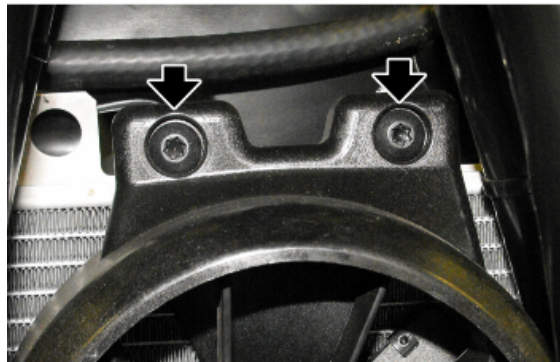


RADIATOR REMOVAL

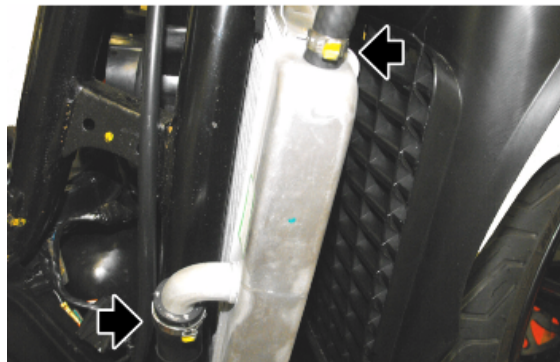
- Remove the internal shield in advance.
- Unscrew and remove the two fixing screws and their washers.



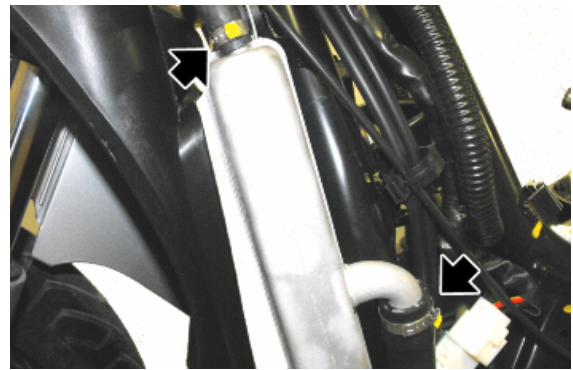
- Remove the fan cover by unscrewing and removing the two fixing screws.



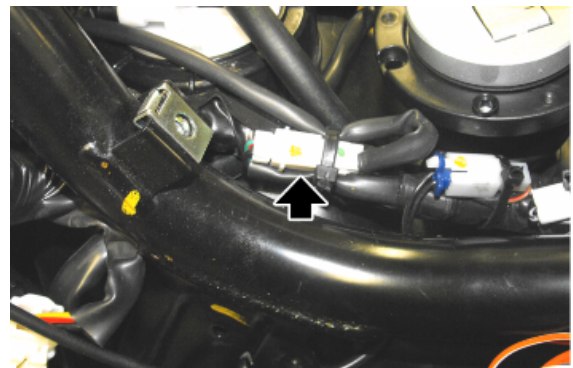
- working from the right side, unhook the two clamps.



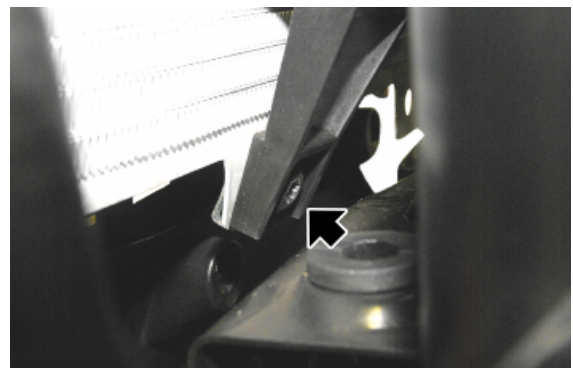
- working from the left side, unhook the two clamps.



- Remove the clamp and release the electric fan connector.



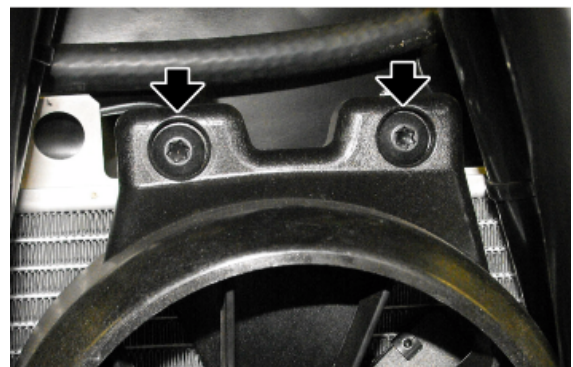
- Remove the radiator from its lower fittings.
- If it is necessary to remove the electric fan unscrew and remove the fixing screw.



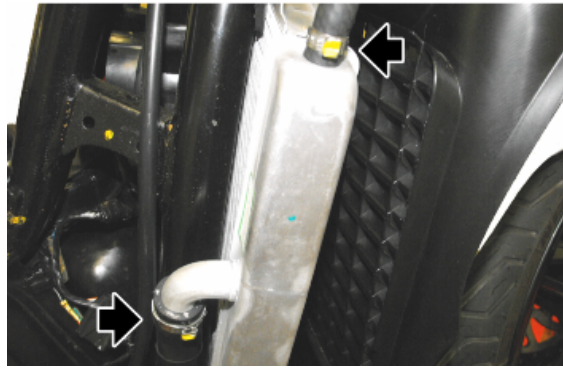
See also

[Front wheel housing](#)

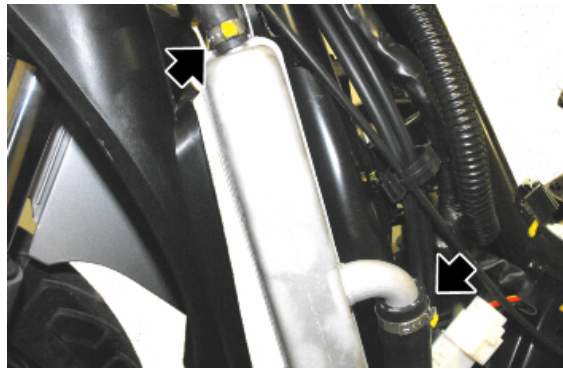
- Remove the fan cover by unscrewing and removing the two fixing screws.



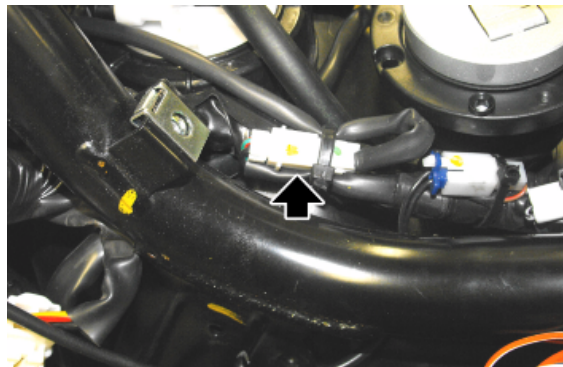
-
- working from the right side, unhook the two clamps.

**See also**[Front wheel housing](#)

-
- working from the left side, unhook the two clamps.

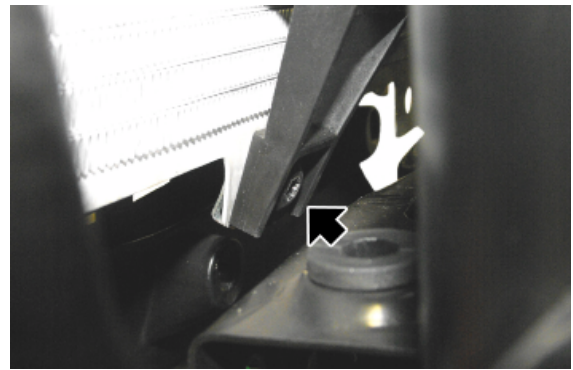


-
- Remove the clamp and release the electric fan connector.

**See also**[Front wheel housing](#)

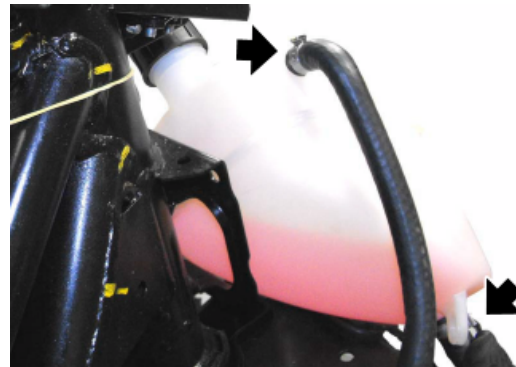
-
- Remove the radiator from its lower fittings.

- If it is necessary to remove the electric fan unscrew and remove the fixing screw.

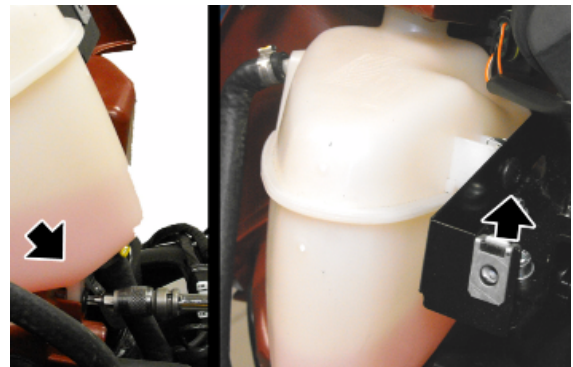
**See also**[Front wheel housing](#)

Expansion tank

- Remove the front shield and the leg shield back plate.
- Empty the cooling system.
- Remove the two clamps and disconnect the pipes from the expansion tank.

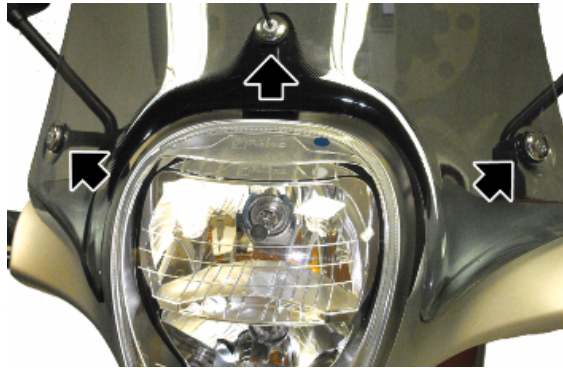


- Undo the two screws and remove the expansion tank.

**See also**[Knee-guard](#)[Legshield](#)

Flyscreen

To remove the windshield, unscrew and remove the three screws indicated, supporting it. Remove the top windshield.



- If necessary, remove the support by unscrewing the screw and sliding it upwards.



- Collect the collar.



Battery

To access the battery, proceed as follows:

- Position the vehicle on centre stand
- Open the saddle according to that described in the related section
- Exerting a light pressure on the indicated fitting, remove the cover of the toolkit compartment and the tools underneath



- Unscrew the three screws «A» and remove the cover «B»

The battery is the electrical device that requires the most frequent inspections and diligent maintenance.

The main points of maintenance to be observed are as follows:

WARNING

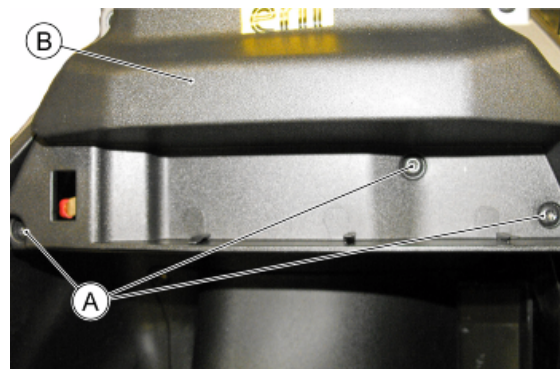
DO NOT DISCONNECT THE BATTERY CABLES WITH THE ENGINE RUNNING, THIS CAN CAUSE IRREPARABLE DAMAGE TO THE VEHICLE'S ELECTRONIC CONTROL UNIT.

WARNING

USED BATTERIES ARE HARMFUL FOR THE ENVIRONMENT. COLLECTION AND DISPOSAL SHOULD BE CARRIED OUT IN COMPLIANCE WITH REGULATIONS IN FORCE.

Characteristic**Battery**

SEALED 12V / 10Ah



INDEX OF TOPICS

PRE-DELIVERY

PRE DE

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

- Visually check that there is a yellow mark on the following clamps:

HANDLEBAR

- Rear brake pump break pipe fittings
- Front brake pump break pipe fittings

FRONT SUSPENSION

- Front wheel spindle nut
- Screw fixing wheel pin on right fork leg

FRONT BRAKE

- Screws fixing front brake callipers to forks
- Brake pipes to front brake callipers couplings

REAR SUSPENSION

- Rear wheel axle nut
- Screws tightening the fork pin cam
- Rear left suspension plate tightening screw
- Chassis suspensions retainer screws

REAR BRAKE

- Screws fixing rear brake calliper to supporting plate
- Brake pipe / rear brake calliper coupling

STAND

- Centre stand bolt nut

EXHAUST SUPPORT PLATE

- Engine plate fixing screws

ELECTRICAL SYSTEM

- Chassis ground retainer, left side

BODYWORK

- Chassis passenger handgrip retainer screws

Electrical system

- Battery
- Main switch
- Lights: high beam lights, low beam lights, taillights (front and rear) and relevant warning lights
 - Headlight adjustment according to the regulations currently in force
- Front and rear stop light buttons and bulb
- 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

CAUTION

TO ENSURE MAXIMUM PERFORMANCE, THE BATTERY MUST BE CHARGED BEFORE USE. INADEQUATE CHARGING OF THE BATTERY WITH A LOW LEVEL OF ELECTROLYTE BEFORE IT IS FIRST USED SHORTENS 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 YOUR EYES, SKIN AND CLOTHING.

IN CASE OF CONTACT WITH YOUR EYES OR SKIN, RINSE WITH ABUNDANT WATER FOR ABOUT 15 MINUTES AND SEEK IMMEDIATE MEDICAL ATTENTION.

IF IT ACCIDENTALLY SWALLOWED, IMMEDIATELY DRINK LARGE QUANTITIES OF WATER OR VEGETABLE OIL. SEEK IMMEDIATE MEDICAL ATTENTION.

BATTERIES PRODUCE EXPLOSIVE GASES; KEEP THEM AWAY FROM NAKED FLAMES, SPARKS AND CIGARETTES. IF THE BATTERY IS CHARGED IN A CLOSED PLACE, TAKE CARE TO ENSURE ADEQUATE VENTILATION. ALWAYS PROTECT YOUR EYES WHEN WORKING CLOSE TO BATTERIES.

KEEP OUT OF THE REACH OF CHILDREN

CAUTION

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

Levels check

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 the throttle control
 - Stability on acceleration and braking
 - Rear and front brake efficiency
 - Rear and front suspension efficiency
 - Abnormal noise
-

Static test

Static control after the test ride:

- 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 OR 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: papers check, chassis and engine number check, tools and equipment, licence plate fitting, lock check, tyre pressure check, rear-view mirror and any accessory fitting
-

Instruments start-up

A = Clock

B = «**SERVICE**» icon

C = Kilometre-mile indicator

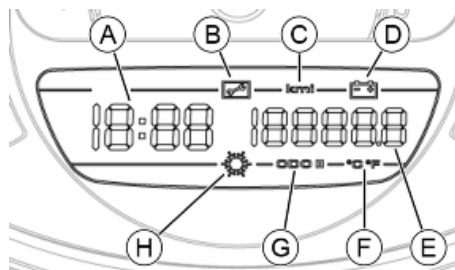
D = State of battery charge icon

E = Odometer indicator, partial odometer I and II, state of battery charge and cyclically selectable ambient temperature with the «**MODE**» button

F = Ambient temperature indicator in degrees Celsius or Fahrenheit

G = Indicator «**ODO**», «**ODO I**» or «**ODO II**»

H = Low ambient temperature icon



Pushing the "**MODE**" button for less than a second obtains, respectively, the functions of:

- Total Odometer «**ODO**»
- Partial Odometer «**ODO I**»
- Partial Odometer «**ODO II**»
- State of battery charge
- Ambient temperature «°»



To reset the trip odometer, move «**ODO I**» or «**ODO II**» and press for more than three seconds the button **MODE**.

TRIP COUNTER PARTIAL RESET

In the partial trip counter function, press and hold the **MODE** button for longer than 3 seconds and it will reset.

SELECT MILES - KM

When using the function measuring the voltage of the battery, holding down the **MODE** button for longer than 10 seconds will switch between reading in kilometres or miles for the odometer.

For the first 5 seconds the bearing will not give any signal, for the next 5 seconds the message of the unit of measurement (Km or miles) currently in use will blink at a frequency of 1Hz. If the button is re-



leased before 10 seconds the measurement unit is not changed.

Use the switch "MODE" to "ODO" mode

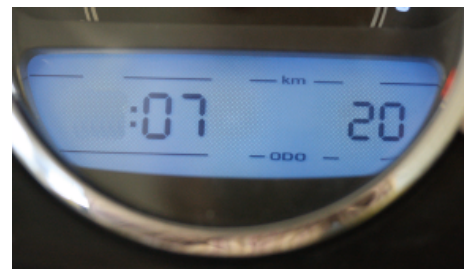
Hold the switch "MODE" for more than 3 seconds, the hours will be displayed. Hours will increase each time the "MODE" button is pressed.

Once the hour is adjusted, hold the switch "MODE" more than 3 seconds to display the minutes. Minutes will increase each time the "MODE" button is pressed.

If no key is pressed for 3 seconds, the system will leave the clock adjustment mode.

WARNING

FOR SAFETY REASONS, CLOCK ADJUSTMENT IS POSSIBLE EXCLUSIVELY WITH VEHICLE SPEED EQUAL TO 0 Km/h.



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