MANUALE STAZIONE DI SERVIZIO

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Vespa Primavera-Sprint 50 4T 3V i.e. E5

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

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

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

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

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

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

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

INDEX OF TOPICS

INDEX OF TOPICS

Aesthetic inspection

- Paintwork
- Fitting plastics parts
- Damage
- Dirt

Tightening torques inspection

Locking check

- All tightening torques
- External screw of covers

SAFETY FASTENERS

Name	Torque in Nm
Handlebar locking	40 - 50
Lower steering ring nut	8 to 10
Upper steering ring nut	30 to 40
Front wheel axle nut	75 to 90
Rear wheel nut	137 to 152
Rear shock absorber nut-engine	33 - 41 N·m
Shock absorber - chassis nut	20 - 25
Engine-swinging arm bolt	33 - 41
Frame-swinging arm bolt	44 to 52

Electrical system

- Check voltage at pre-delivery; it should be 12.6V minimum; otherwise, recharge the battery following the specifications indicated on the battery itself.

Check the following devices:

- Key switch
- Low beam light, high beam light, light warning lights, position light
- Headlight adjustment
- Rear light
- Stop light (front and rear brake, if required)
- Turn indicators and relevant warning lights
- Speedometer and instrument panel lighting
- Horn
- Starter button

CAUTION

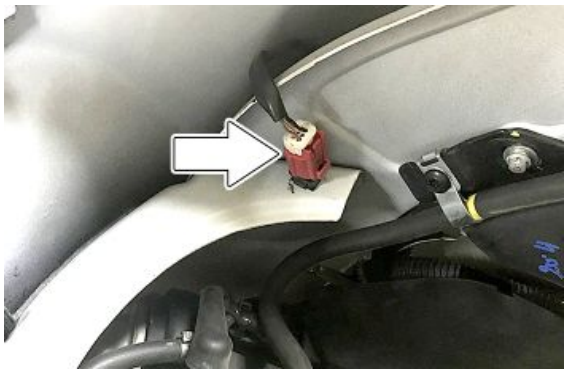
IN ORDER TO ENSURE MAXIMUM PERFORMANCE CHARGE THE BATTERY BEFORE USE ONLY IF VOLTAGE DROPS BELOW 12.7 V. FAILURE TO CHARGE THE BATTERY ADEQUATELY BEFORE IT IS FIRST USED SHORTENS BATTERY LIFE.
WHEN INSTALLING THE BATTERY, ATTACH THE POSITIVE LEAD FIRST AND THEN THE NEGATIVE ONE.

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

WARNING

KEEP THE BATTERY AWAY FROM NAKED FLAMES OR SPARKS WHILE IT IS CHARGED. REMOVE THE BATTERY FROM THE VEHICLE, DISCONNECTING THE NEGATIVE TERMINAL FIRST.
ALWAYS WEAR EYE PROTECTION WHEN WORKING IN THE PROXIMITY OF BATTERIES. KEEP OUT OF THE REACH OF CHILDREN. BATTERY ELECTROLYTE IS TOXIC AND IT MAY CAUSE SERIOUS BURNS. IT CONTAINS SULPHURIC ACID. AVOID CONTACT WITH EYES, SKIN AND CLOTHING. NEVER TRY TO FORCE OR DAMAGE THE OUTER CASING.
IN CASE OF CONTACT WITH EYES OR SKIN, RINSE WITH ABUNDANT WATER FOR ABOUT 15 MINUTES AND SEEK MEDICAL ATTENTION AT ONCE.
IF ACCIDENTALLY SWALLOWED, IMMEDIATELY DRINK LARGE QUANTITIES OF WATER OR VEGETABLE OIL. SEEK IMMEDIATE MEDICAL ATTENTION.

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



N.B.

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

Levels check

- Brake oil level
- Hub oil level
- Engine oil level

Road test

- Cold start.
- Speedometer activation check.
- Throttle control operation.
- Riding stability.
- Front and rear brake efficiency.
- Front and rear wheel shock absorber efficiency.
- Abnormal noise.
- Hot engine restart.
- Fluid leak (after test drive).

Functional inspection

- Brake lever travel.

- Throttle control adjustment and free travel.
- Uniform turning of the steering.

Others

- Tyre pressure
- Correct operation of all locks
- Mirrors and accessories fitting
- Tools supplied, user's manual, warranty certificate and customer services documents

CAUTION

CHECK AND ADJUST TYRE PRESSURE WITH TYRES AT AMBIENT TEMPERATURE.

CAUTION

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

WARNING

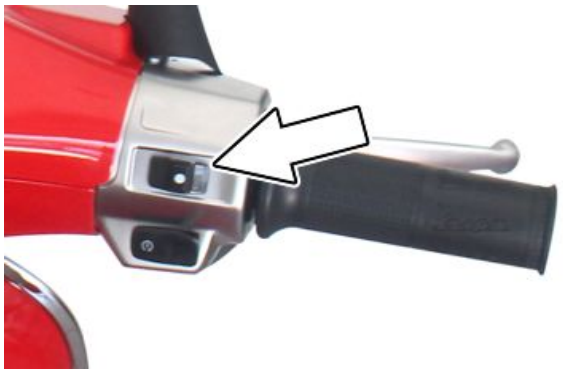
PROCEED WITH THE UTMOST CAUTION WHEN HANDLING PETROL.

Instruments start-up

UNIT OF MEASUREMENT

It is possible to change the unit of measure (from km to miles) following the procedure below:

- move the key to «**OFF**»;
- press the MODE key;
- Holding in the MODE button, turn the key to the «**ON**» position;
- after about 2 seconds release the MODE button.

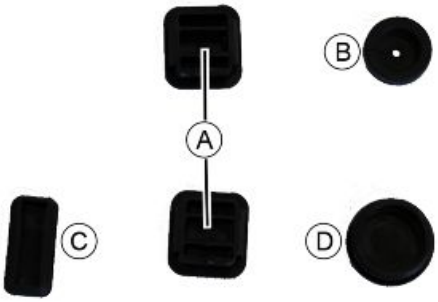


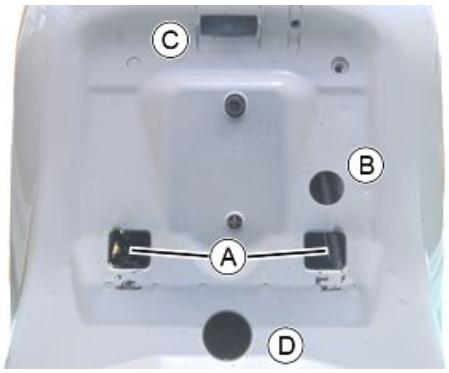
N.B.

THE FOLLOWING ARE DEFINED WHEN NAVIGATING THE DISPLAY:
- «BRIEF PRESS»: A PRESS OF THE INDICATED BUTTON, FOR A PERIOD OF LESS THAN TWO SECONDS;
- «PROLONGED PRESS»: A PRESS OF THE INDICATED BUTTON, FOR A PERIOD OF MORE THAN TWO SECONDS.

Specific operations for the vehicle

Install the underbody caps as shown in the figure.





FITTING THE REAR-VIEW MIRRORS

- Fit the rear-view mirrors, complete with the respective washers, two for each mirror.

Tighten the nut used to fasten the mirrors, applying the recommended torque.

Locking torques (N*m)

Rear view mirrors - Handlebars **29 - 31 Nm**

- Position the rubber cover over the fastening nuts.

INDEX OF TOPICS

N.B.

THE UNITS OF MEASUREMENT CONTAINED IN THIS CHAPTER ARE EXPRESSED IN TERMS OF THE DECIMAL METRIC SYSTEM. TO REFER TO THE UNIT OF MEASUREMENT EXPRESSED IN TERMS OF THE ANGLO-SAXON SYSTEM, SEE THE "CHARACTERISTICS" CHAPTER.

Rules

Safety rules

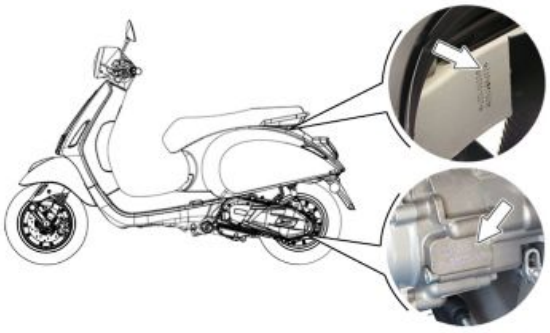
- If work can only be done on the vehicle with the engine running, make sure that the premises are well ventilated, using special extractors if necessary; never let the engine run in an enclosed area. Exhaust fumes are toxic.
- The battery electrolyte contains sulphuric acid. Protect your eyes, clothes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

Maintenance rules

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

Vehicle identification

Identification registration numbers are made up of a prefix and a number, stamped on the frame and on the engine. The serial number must always be indicated when ordering spare parts. We recommend checking that the frame registration number stamped on the vehicle corresponds with that on the vehicle documentation.



CAUTION

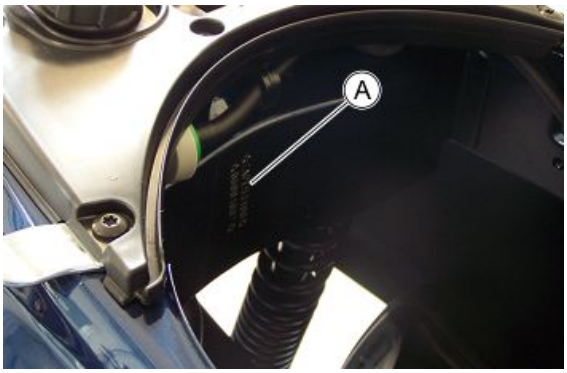
PLEASE REMIND THAT ALTERING IDENTIFICATION REGISTRATION NUMBERS CAN LEAD TO SERIOUS PENAL SANCTIONS (IMPOUNDING OF THE VEHICLE, ETC.).

Frame number

The chassis number «**A**» is stamped near the fuel tank.

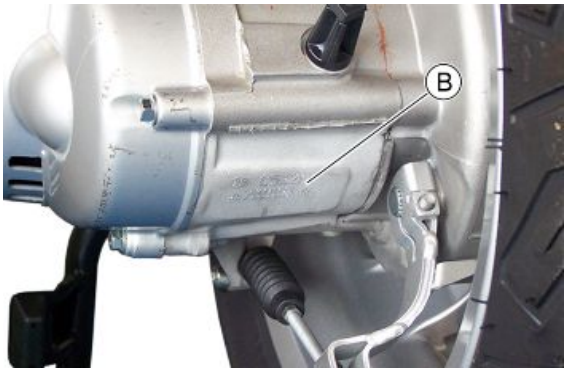
To read it, proceed as follows:

- lift the saddle;
- lift the helmet compartment by removing it.



Engine number

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



VEHICLE IDENTIFICATION

Specification	Desc./Quantity
Chassis prefix (Primavera)	ZAPCD0100
Chassis prefix (Sprint)	ZAPCD0101
Engine prefix	CD01M

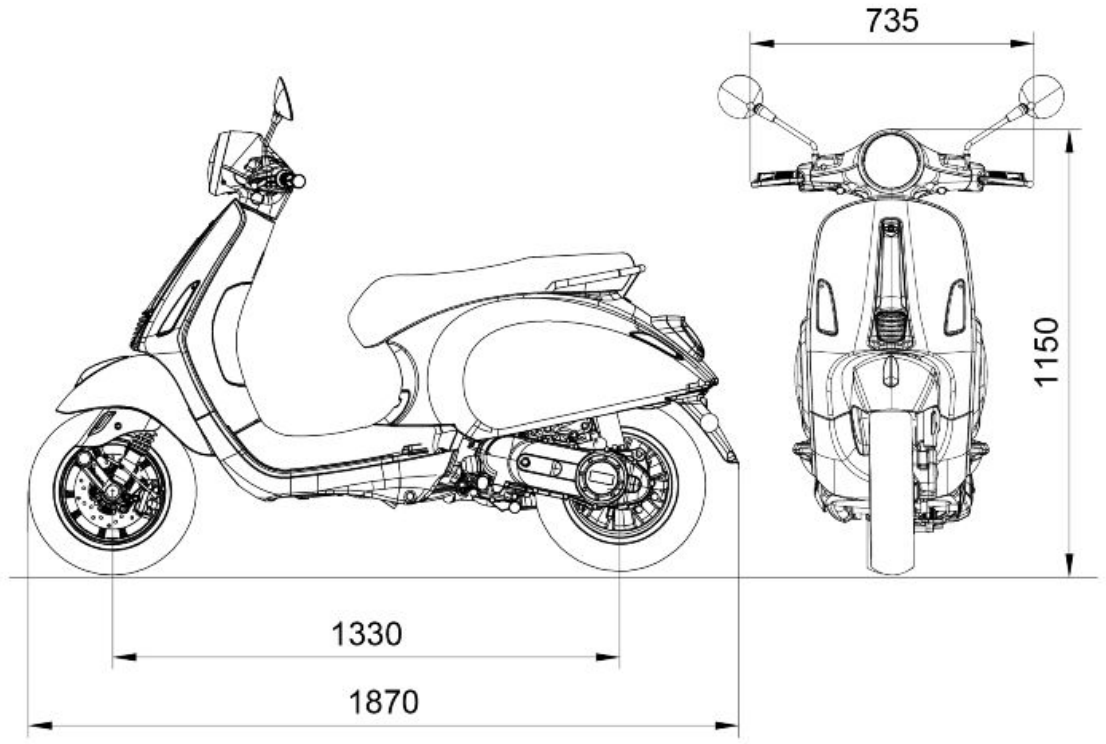
VEHICLE IDENTIFICATION (VERSION WITH 25 KM/H SPEED LIMIT)

Specification	Desc./Quantity
Chassis prefix (Primavera)	ZAPCD0200
Chassis prefix (Sprint)	ZAPCD0201
Engine prefix	CD02M

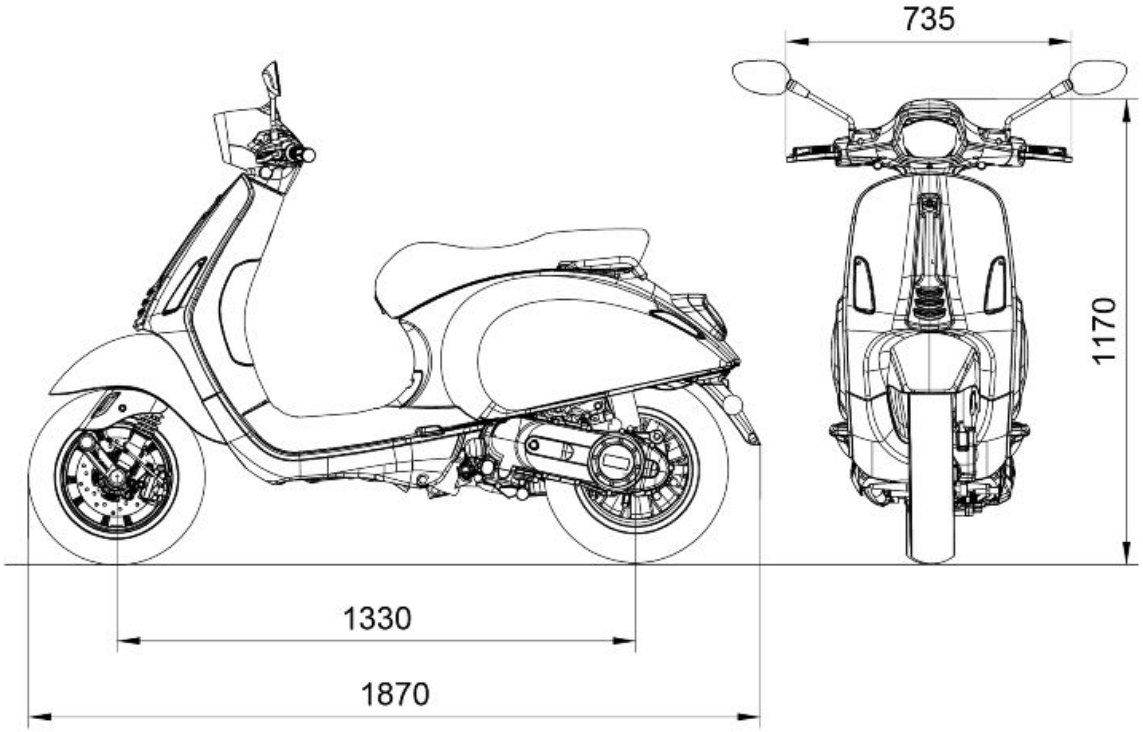
Valid only for Primavera-Sprint and Primavera RED

Vehicle data

PRIMAVERA VERSION



SPRINT VERSION



VEHICLE DATA

Specification	Desc./Quantity
Frame	Stamped plate body with welded structural reinforcements.
Front suspension	Single arm with helical spring and single double-acting hydraulic shock absorber.
Rear suspension	Single-chamber shock absorber.
Front brake	Ø 200 mm hydraulically operated disc brake controlled from RH handlebar lever.
Rear brake	Ø 140-mm drum brake with mechanical control controlled from LH handlebar lever.
Wheel rims type	Light alloy.
Front rim	12"x 3.00"
Rear rim	12"x 3.00"
Front tire	110/70 - 12" 47P
Rear tire	120/70 - 12" 58P
Front tire pressure (with passenger)	1.8 bar (1.8 bar)
Rear tire pressure (with passenger)	2.0 bar (2.2 bar)
Kerb weight	115 kg
Maximum weight limit	295 kg
Battery	Sealed, 12 V / 6 Ah

Engine Data

N.B.

THE DATA RELATED TO THE VERSION WITH THE 25 km/h SPEED LIMIT IS VALID ONLY FOR PRIMAVERA-SPRINT AND PRIMAVERA RED.

ENGINE SPECIFICATIONS

Specification	Desc./Quantity
Engine	Single-cylinder, 4-stroke Piaggio i-Get
Bore	39 mm
Travel	41,4 mm
Engine capacity	49 cm³
Max. power	2.2 kW at 7500 rpm
MAX torque	2.9 Nm at 7000 rpm
MAX power (version with max speed limited to 25 km/h)	1.5 kW at 5750 rpm
MAX torque (version with max speed limited to 25 km/h)	2.8 Nm at 4500 rpm
Compression ratio	12 ± 0.5: 1
Idle speed	2200 ± 100 rpm
Timing system	3 valves (2 inlet, 1 exhaust), single overhead camshaft, chain-driven.
Lubrication	Wet crankcase. Lobe pump controlled by chain with intake filtering.
Power supply	Electronic injection with Ø20 throttle body with separated control unit, two-jet injector.
Valve clearance (cold engine)	Intake: 0.10 mm Exhaust: 0.15 mm
Cooling	Forced air circulation cooling
Starting	Electric
Gearbox	Continuously variable transmission with torque server
Clutch	Automatic centrifugal dry with pad support stopper.
Fuel	Unleaded gasoline E10 (95 R.O.N.)
Spark plug	NGK MR8BI-8
Exhaust silencer	Absorption-type exhaust silencer with catalytic converter.
Emissions compliance	EURO 5

Capacities

CAPACITY

Specification	Desc./Quantity
Engine oil	~ 850 cm³
Transmission oil	100 cm³

Specification	Desc./Quantity
Fuel tank capacity	8.0 ± 0.5 litres

Tightening Torques

STEERING ASSEMBLY

Name	Torque in Nm
Upper steering ring nut	30 to 40 N*m (22.1 to 29.5 lbf*ft)
Lower steering ring nut	8 to 10 N*m (5.9 to 7.4 lbf*ft)
Handlebar locking	50 to 55 (36.9 to 40.6 lb*ft)

FRAME ASSEMBLY

Name	Torque in Nm
Engine-swinging arm bolt	33 to 41 (24.3 to 30.2 lb*ft)
Frame-swinging arm bolt	44 to 52 (32.4 to 38.3 lb*ft)
Shock absorber - chassis nut	20 to 25 (14.7 to 18.4 lb*ft)
Shock absorber nut-engine	33 to 41 (24.3 to 30.2 lb*ft)
Rear wheel nut	104 to 126 (76.7 to 92.9 lb*ft)

FRONT SUSPENSION

Name	Torque in Nm
Shock absorber upper nut	20 to 30 (14.7 to 22.1 lb*ft)
Front wheel axle nut	75 to 90 (55.3 to 66.4 lb*ft)
Shock absorber upper bracket bolts	20 to 25 (14.7 to 18.4 lb*ft)
Wheel rim screws	20 to 25 (14.7 to 18.4 lb*ft)
Shock absorber lower bolts (°)	20 to 27 (14.7 to 19.9 lb*ft)

(°) Lock these two bolts once the central upper nut of the shock absorber has been tightened.

N.B.

FOR SAFETY FASTENERS, SEE THE «PRE-DELIVERY» CHAPTER.

FRONT BRAKE

Name	Torque in Nm
Brake fluid pump-hose joint	8 to 12 (5.9 to 8.6 lb*ft)
Brake fluid pipe-calliper fitting	20 to 25 (14.7 to 18.4 lb*ft)
Screw tightening calliper to support	20 to 25 (14.8 to 18.4 lb*ft)
Brake disc screw	5 to 6.5 (3.7 to 4.8 lb*ft)
Oil bleed valve (on the calliper)	10 to 12 (7.4 to 8.9 lb*ft)
Handlebar pump	7 to 10 (5.2 to 7.4 lb*ft)

ENGINE

Name	Torque in Nm
Clutch unit - Driven pulley	55 - 60 Nm
Clutch housing - Driven pulley shaft	40 - 44 Nm
Drive pulley - Crankshaft	18 - 20 Nm + 90°
Transmission cover - Crankcase	11 - 13 Nm
Hub cover - Crankcase	24 - 26 Nm
Pick-up - Crankcase	3 - 4 Nm
Stator - Crankcase	3 - 4 Nm
Magneto flywheel - Crankshaft	52 - 58 Nm
Starter motor - Crankcase	11 - 13 Nm
Rocker axes lock plate - Head	3 - 4 Nm
Cylinder head nuts - Cylinder	6 - 7 + 90° + 90° (*)
Cylinder head screws - Crankcase	8 - 10 Nm
Chain tensioner pad - Crankcase	5 - 7 Nm
sprocket timing - Camshaft	12 - 14 Nm
Chain tensioner - Cylinder	8 - 10 Nm
Chain tensioner spring screw - Chain tensioner	5 - 6 Nm
Head cover - Head	8 - 10 Nm
Induction pipe - Cylinder	7 - 9 Nm
Flywheel-side crankcase half - Transmission-side crankcase	8 - 10 Nm

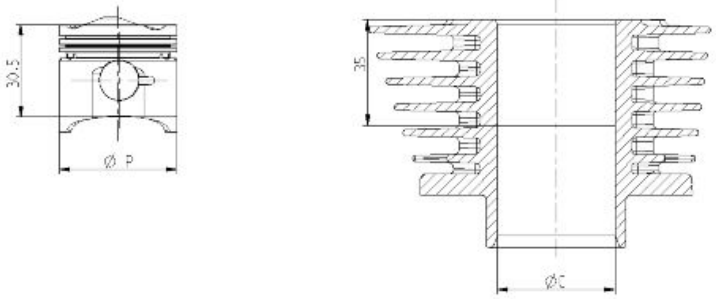
Name	Torque in Nm
Engine oil drainage plug - Crankcase	25 - 28 Nm
Door - Crankcase	4 - 5 Nm
Engine oil pump - Crankcase	5 - 6 Nm
Oil pump sprocket - Engine oil pump	8 - 10 Nm
Oil pump plate - Engine oil pump	0,7 - 0,9 Nm
Engine oil sump - Crankcase	8 - 10 Nm
Ignition spark plug - Cylinder	10 to 15 Nm
Rocker set screw counter-nut - Rockers	6 to 8 Nm
Hub oil drain screw - Crankcase	3 - 5 Nm

(*) To replace the stud bolts, tighten with 6 ÷ 7 Nm + 135° + 90° at crossed sequences.

Overhaul data

Assembly clearances

Cylinder - piston assy.



COUPLING BETWEEN PISTON AND CYLINDER

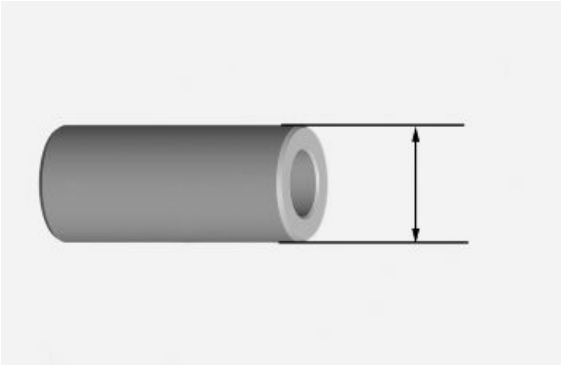
Name	Initials	Cylinder	Piston	Play on fitting
Cylinder	A	38.993 to 39.000	38.954 to 38.961	0.032 to 0.046
Cylinder	B	39.000 to 39.007	38.961 to 38.968	0.032 to 0.046
Piston	C	39.007 to 39.014	38.968 to 38.975	0.032 - 0.046
Piston	W	39.014 to 39.021	38.975 to 38.982	0.032 - 0.046
Cylinder 1st oversize	A1	39.193 to 39.200	39.154 to 39.161	0.032 - 0.046
Cylinder 1st oversize	B1	39.200 to 39.207	39.161 to 39.168	0.032 - 0.046
Piston 1st oversize	C1	39.207 to 39.214	39.168 to 39.175	0.032 - 0.046
Piston 1st oversize	D1	39.214 to 39.221	39.175 to 39.182	0.032 - 0.046
Cylinder 2nd oversize	A2	39.393 to 39.400	39.354 to 39.361	0.032 - 0.046
Cylinder 2nd oversize	B2	39.400 to 39.407	39.361 to 39.368	0.032 - 0.046
Piston 2nd oversize	C2	39.407 to 39.414	39.368 to 39.375	0.032 - 0.046
Piston 2nd oversize	D2	39.414 to 39.421	39.375 to 39.382	0.032 - 0.046
Cylinder 3rd oversize	A3	39.593 to 39.600	39.554 to 39.561	0.032 - 0.046
Cylinder 3rd oversize	B3	39.600 to 39.607	39.561 to 39.568	0.032 - 0.046
Piston 3rd oversize	C3	39.607 to 39.614	39.568 to 39.575	0.032 - 0.046

Name	Initials	Cylinder	Piston	Play on fitting
Piston 3rd oversize	D3	39.614 to 39.621	39.575 to 39.582	0.032 - 0.046

N.B.

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

- Check the pin external diameter.



Characteristic

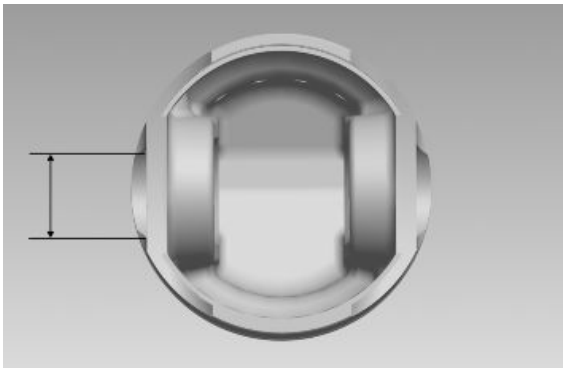
Pin external diameter

13 +0 -0.004 mm

Minimum admissible diameter: gudgeon pin

12.990 mm

- Measure the diameter of the bearings on the piston.



Characteristic

Pin seat diameter

13 +0.005 + 0.010 mm

- Calculate the piston pin coupling clearance.

N.B.

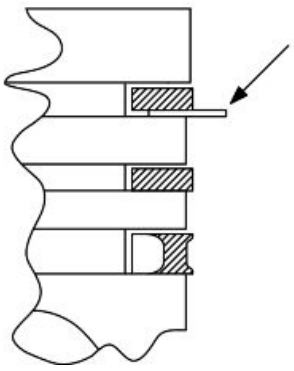
THE PIN HOUSINGS HAVE 2 LUBRICATION CHANNELS. FOR THIS REASON, MEASUREMENT MUST BE MADE ACCORDING TO THE PISTON AXIS

Characteristic

Standard clearance

0.005 - 0.014 mm

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



N.B.

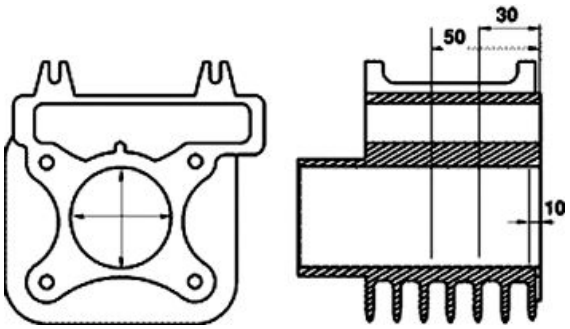
MEASURE THE CLEARANCE BY INSERTING THE BLADE OF THE FEELER THICKNESS GAUGE FROM THE SECOND SEAL SIDE.

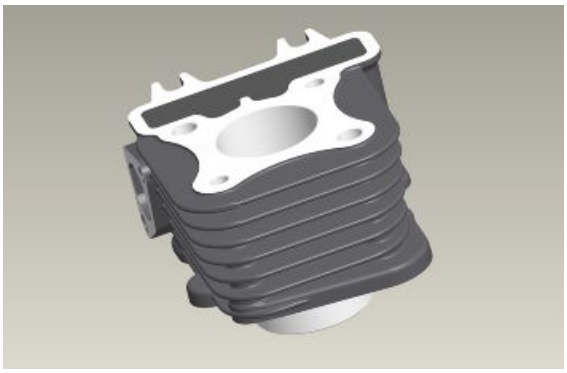
Fitting clearance

1st compression ring - standard coupling clearance 0.03 to 0.065 mm **1st compression ring - maximum clearance allowed after use** 0.07 mm

2nd compression ring - standard coupling clearance 0.02 to 0.055 mm **2nd compression ring - maximum clearance allowed after use** 0.06 mm **oil scraper ring - standard coupling clearance** 0.04 to 0.16 mm **oil scraper ring - maximum clearance allowed after use** 0.17 mm

- Using a bore meter, measure the inner cylinder diameter at three different points according to the directions shown in the figure.
- Check that the coupling surface with the head is not worn or misshapen.
- Pistons and cylinders are classified according to their diameter. The coupling is carried out in pairs (A-A, B-B, C-C, D-D).





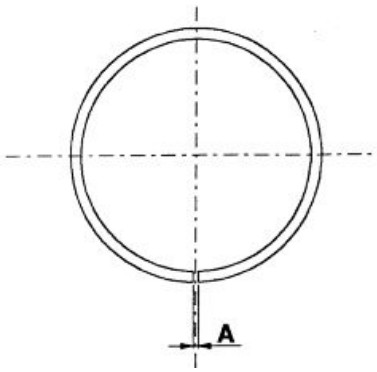
Characteristic

Maximum allowable run-out:

0.001 in 0.05 mm

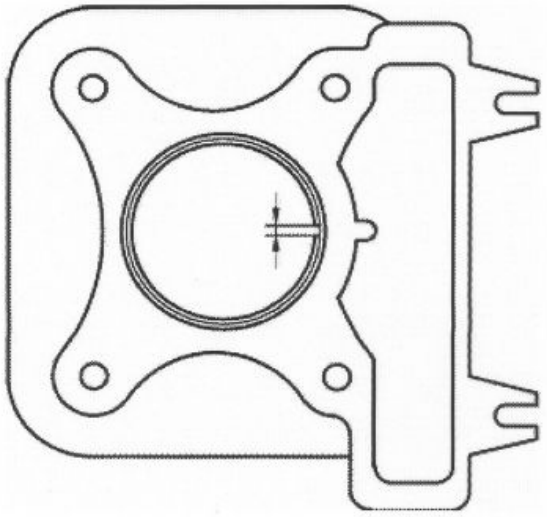
Piston rings

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



N.B.

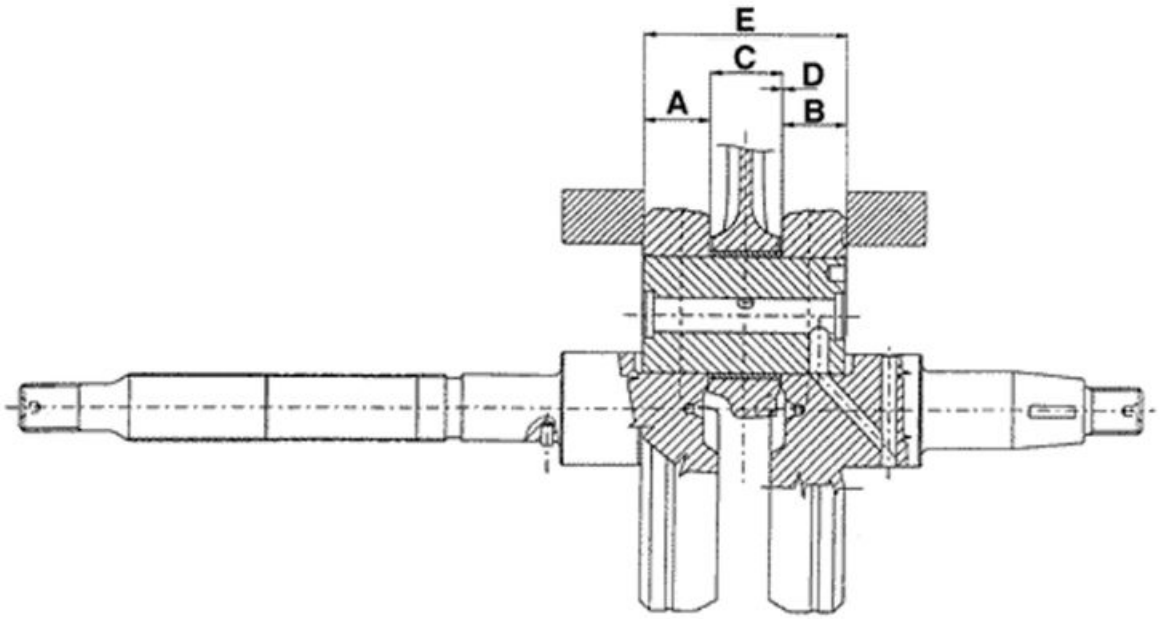
BEFORE REPLACING ONLY THE PISTON RINGS, MAKE SURE THAT COUPLING CLEARANCE BETWEEN THE SEAL RINGS AND ITS GROOVES, AND THAT BETWEEN THE PISTON AND THE CYLINDER ARE AS SPECIFIED. IN ANY CASE, NEW PISTON SEALING RINGS USED IN COMBINATION WITH A USED CYLINDER MAY HAVE DIFFERENT BEDDING CONDITIONS THAN THE STANDARD ONES.



SEALING RINGS

Name	Description	Dimensions	Initials	Quantity
1st Compression ring		39 x 1	A	0.08 to 0.20
2nd Compression ring		39 x 1	A	0.05 to 0.20
Oil scraper ring		39 x 2	A	0.20 - 0.70
1st Compression ring 1st Oversize		39.2 x 1	A	0.08 to 0.20
2nd Compression ring 1st Oversize		39.2 x 1	A	0.05 to 0.20
Oil scraper ring 1st Oversize		39.2 x 2	A	0.20 - 0.70
1st Compression ring 2nd Oversize		39.4 x 1	A	0.08 to 0.20
2nd Compression ring 2nd Oversize		39.4 x 1	A	0.05 to 0.20
Oil scraper ring 2nd Oversize		39.4 x 2	A	0.20 - 0.70
1st Compression ring 3rd Oversize		39.6 x 1	A	0.08 to 0.20
2nd Compression ring 3rd Oversize		39.6 x 1	A	0.05 to 0.20
Oil scraper ring 3rd Oversize		39.6 x 2	A	0.20 - 0.70

Crankcase - crankshaft - connecting rod



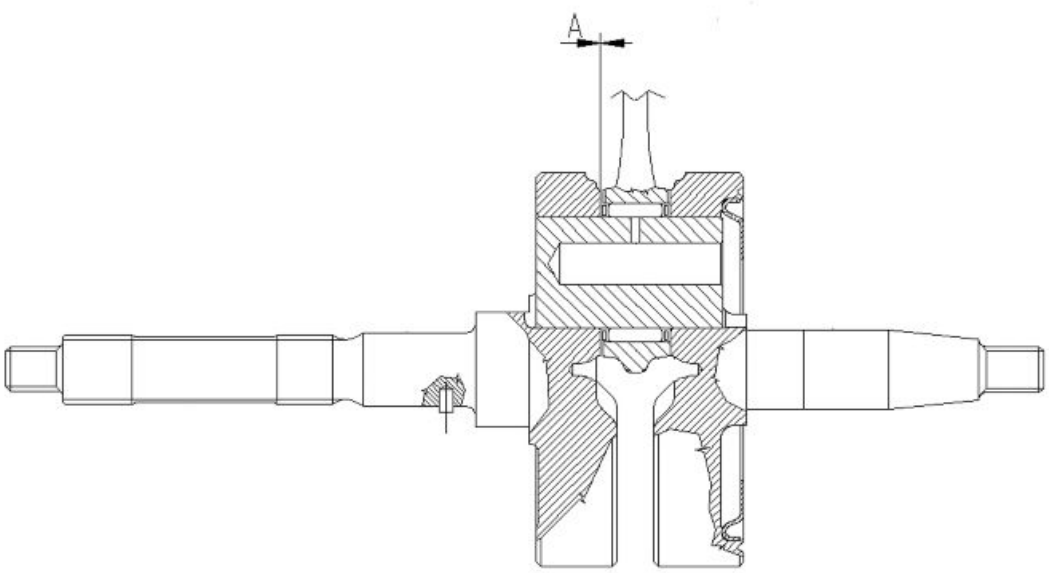
AXIAL CLEARANCE BETWEEN CRANKSHAFT AND CRANKCASE

Name	Description	Dimensions	Initials	Quantity
Transmissionside half-shaft		14 +0 -0.005	A	
Flywheel-side halfshaft		16 +0 -0.005	B	
Connecting rod		14.8 +0.05 -0	C	
Spacer tool		45.00 / Fits and clearances D = 0.15 - 0.30	E	

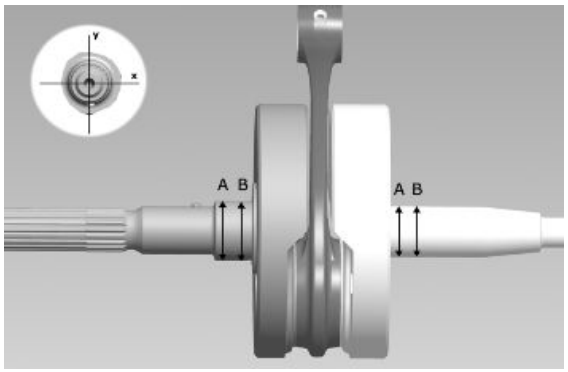
Characteristic

Clearance between crankshaft and connecting rod

A = 0.15 to 0.30 mm



Measure the bearings along X and Y axes



Characteristic

Crankshaft bearing, transmission side

20 -0.012 -0.025 mm

Crankshaft bearing, flywheel side

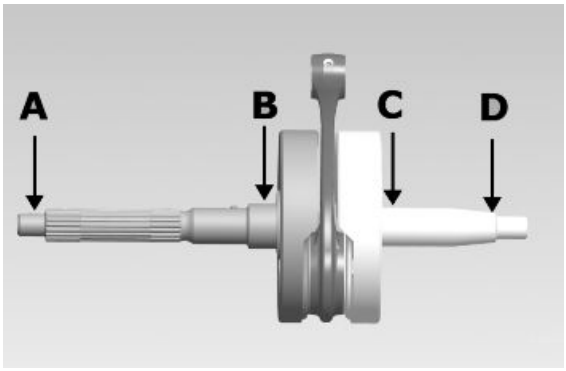
17 +0.007 0 mm

- Check that the crankshaft cone, the tab seat, the oil seal capacity, the toothed gear and the threaded tangs are in good working order.
- In case of failures, replace the crankshaft.

Specific tooling

020074Y Support base for checking crankshaft alignment

To install the crankshaft on the support and to measure the misalignment in the 4 points indicated in figure.



N.B.

IF VALUES OTHER THAN THOSE ALLOWED ARE DETECTED, TRY STRAIGHTENING THE CRANKSHAFT BY INSERTING A WOODEN WEDGE BETWEEN THE HALF SHAFTS OR BY CLOSING THEM WITH A VICE AS NEEDED. IF EVEN AFTER THIS OPERATION THE VALUES ARE NOT THOSE ADMITTED, REPLACE THE CRANKSHAFT.

Characteristic

Off-line maximum admitted - A

0.15 mm

Off-line maximum admitted - B

0.02 mm

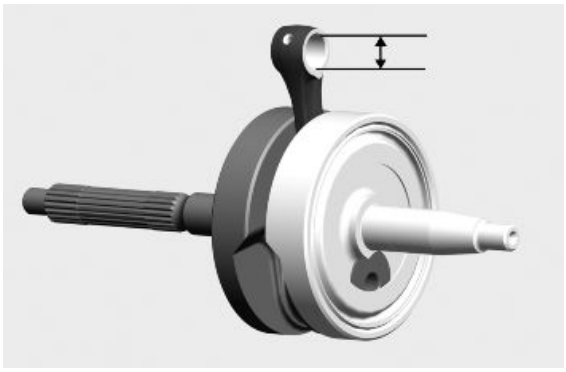
Off-line maximum admitted - C

0.02 mm

Off-line maximum admitted - D

0.10 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

Connecting rod small end diameter

13 +0.015 + 0.025 mm

Max. diameter admitted: Connecting rod small end check-up

13.030 mm

Calculate the coupling clearance between pin and connecting rod small end

Characteristic

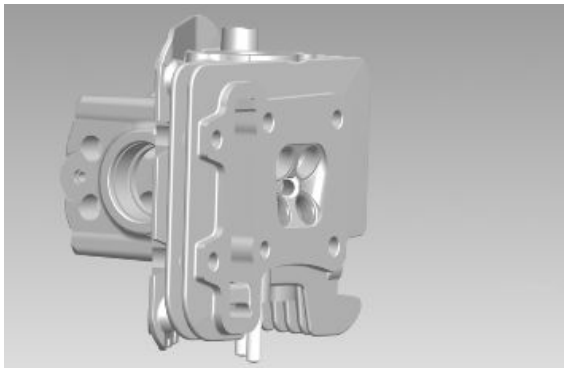
Pin - connecting rod clearance

0.015 - 0.029 mm

Cylinder Head

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

- Using a trued bar check that the cylinder head surface is not worn or distorted.
- Check that the camshaft and rocking lever pin bearings show no signs of wear.
- Check that the cylinder head cover surface, the intake manifold and the exhaust manifold are not worn.
- It is advisable to replace the head if any failure is found.

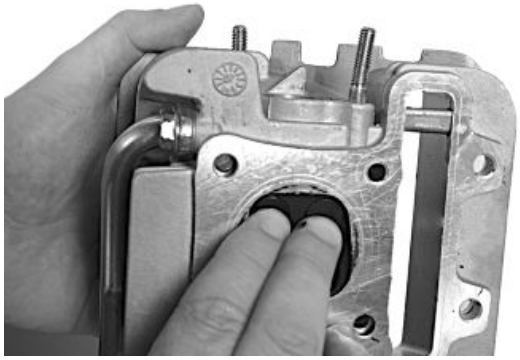


Characteristic

Maximum allowable run-out:

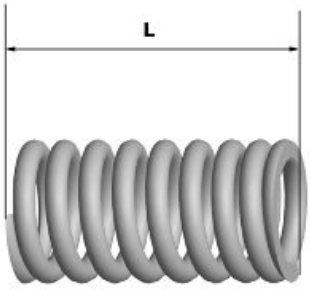
0.1 mm

- 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.

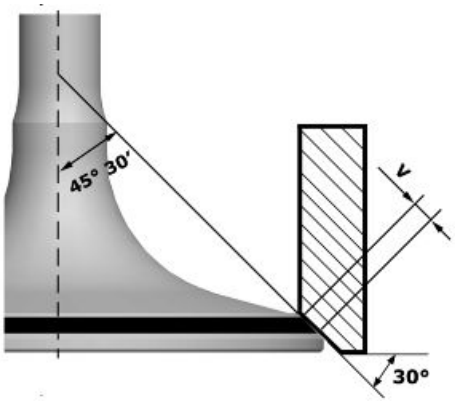


Measure the unloaded spring length.

- Standard length: 31.3 mm
- Limit allowed after use: 29.3



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



Characteristic

Standard value:

1 - 1.3 mm

Limit allowed:

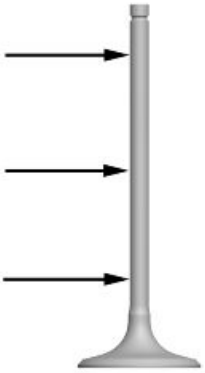
1.6 mm

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

STANDARD VALVE LENGTH

Specification	Desc./Quantity
Intake: Standard length	74.9 mm
Exhaust: Standard length	74.35 mm

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



STANDARD DIAMETER

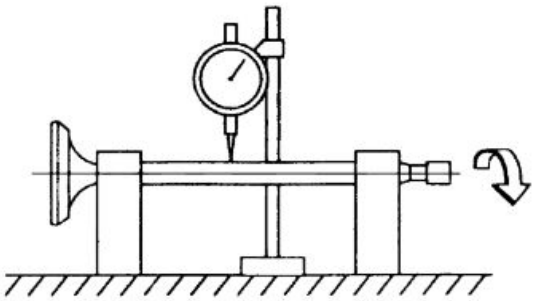
Specification	Desc./Quantity
Intake	3.970 to 3.985 mm
Exhaust	3.960 to 3.975 mm

MINIMUM DIAMETER PERMITTED

Specification	Desc./Quantity
Intake	3.958 mm
Exhaust	3.945 mm

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

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

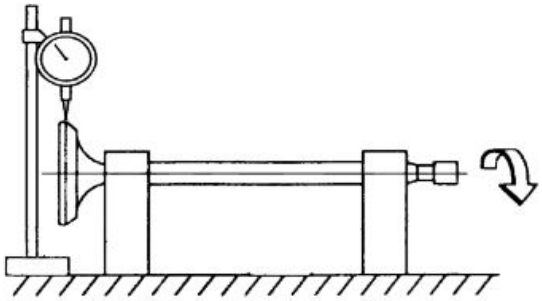


Characteristic

Limit allowed:

0.03 mm

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

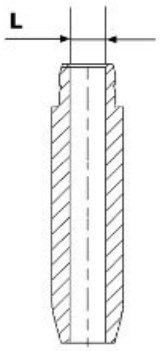


Characteristic

Limit value admitted:

0.1 mm

Measure the valve guides



VALVE GUIDE DIAMETER

Specification	Desc./Quantity
Valve guide	Standard diameter: 4 + 0.012 mm
Valve guide	Maximum admissible diameter: 4 + 0.022 mm

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

INTAKE

Specification	Desc./Quantity
Standard clearance	0.015 - 0.042 mm
Admissible limit	0.06 mm

EXHAUST

Specification	Desc./Quantity
Standard clearance	0.025 - 0.052 mm
Admissible limit	0.07 mm

- If no anomalies are found during the above checks, you can use the same valves. To obtain better sealing performance, grind the valve seats. Grind the valves gently with a fine-grained lapping compound. During the grinding, keep the cylinder head with the valve axes in a horizontal position. This will

prevent the lapping compound residues from penetrating between the valve stem and the guide (see figure).

CAUTION

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

CAUTION

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

- Inspect the camshaft for signs of abnormal wear on the cams.

Characteristic

Standard diameter - Bearing A:

Ø 12 +0.002 +0.010

mm **Standard diameter - Bearing B:**

Ø 16-0.015 -0.023 mm

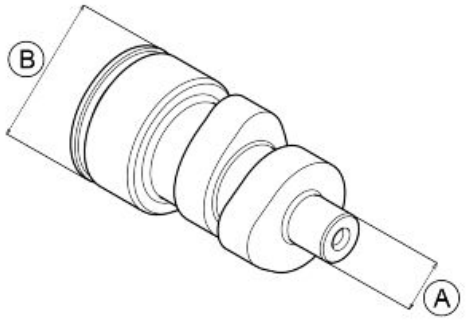
Minimum diameter admissible - Bearing A:

Ø 11.98 mm

Minimum diameter admissible - Bearing B:

Ø 15.96 mm

- Inspect the camshaft for signs of abnormal wear on the cams.



CAMSHAFT BEARINGS_50 4T E5

Specification	Desc./Quantity
Standard diameter - Bearing A:	Ø 9 mm 0 -0.009 mm
Standard diameter - Bearing B:	Ø 25 mm 0 -0.013 mm

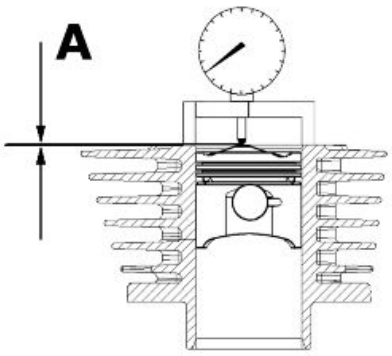
- Measure the external diameter of the rocking lever pins
- Check the rocker pins do not show signs of wear or scoring.
- Measure the internal diameter of each rocker
- Check that the pad in contact with the cam is not worn.

DIAMETER OF PINS AND ROCKING LEVERS

Specification	Desc./Quantity
Rocking levers - Inside diameter	11.015 to 11.035 mm
Rocking levers - Pins diameter	10.977 to 10.985 mm

Slot packing system

Shimming system Measure the protrusion **«A»**with piston to TDC and cylinder basis gasket fitted (0.5 mm) Depending on the measure **«A»** fit the big end/cylinder gasket indicated in the table.

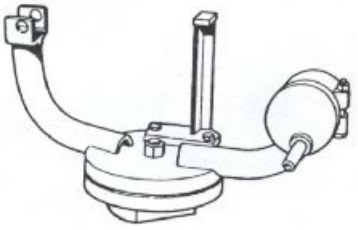


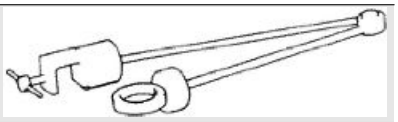
SHIMMING SYSTEM_E5

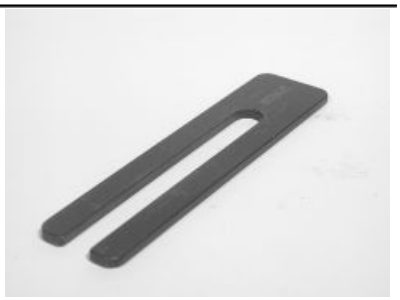
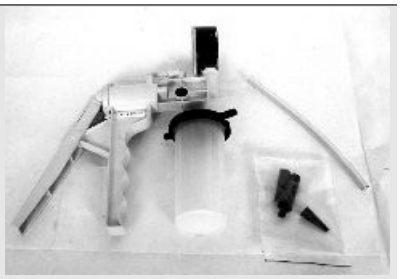
Measure A (mm)	Big end gasket thickness (mm)
+0,25/+0,35	0.4
+0,35/+0,45	0.5
+0,45/+0,55	0.6
+0,55/+0,65	0.7

INDEX OF TOPICS

TOOLS

Stores code	Description	
001467Y008	Clamp to extract 17 mm ø bearings	
001467Y029	Bell for 38-mm outside diameter bearings	
004499Y	Bearing extractor. Equipped with: 1 Bell, 2 Sleeve, 3 Screw, 6 Ring, 27 Half rings, 34 Half rings	
005095Y	Engine support	
008119Y009	Tube for installing shafts and axles	
020004Y	Punch for removing steering bearings from headstock	

Stores code	Description	
020055Y	Wrench for steering tube ring nut	
020074Y	Tool to align crankshaft	
020150Y	Air heater mounting	
020151Y	Air heater	
020162Y	Flywheel extractor	
020171Y	Punch for driven pulley roller bearing	
020265Y	Bearing fitting base	

Stores code	Description	
020288Y	Fork for fitting the piston on the cylinder	
020291Y	Tool to fit/remove valves	
020306Y	Punch valve seal rings fitting	
020329Y	Mity-Vac vacuum pump	
020330Y	Stroboscopic light to check timing	
020331Y	Digital multimeter	

Stores code	Description	
020332Y	Digital rpm indicator	
020334Y	Multiple battery charger	
020335Y	Magnetic mounting for dial gauge	
020340Y	Punch to fit flywheel and transmission oil seals	
020358Y	37 x 40 mm Adaptor	

Stores code	Description	
020359Y	42 x 47 mm Adaptor	
020360S	52 x 55 mm adaptor	
020362Y	12 mm guide	
020363Y	20-mm guide	
020364Y	25-mm guide	
020376Y	Adaptor handle	

Stores code	Description	
020431Y	Valve oil seal extractor	
020432Y	Tool for fitting the starter section spring.	
020439Y	17-mm guide	
020444Y	Tool to fit/remove the pin	
020448Y	Tool for fitting the pin snap rings	
020449Y	Support to check piston position	
020450Y	Tool for fitting/removing the camshaft	
020451Y	Driving pulley immobiliser tool	

Stores code	Description	
020452Y	Tube for removing and refitting the driven pulley shaft	
020456Y	Ø 24 mm adaptor	
020565Y	Flywheel lock calliper spanner	
020683Y	Valve pressing member	
020922Y	Diagnosis Tool	

INDEX OF TOPICS

N.B.

THE UNITS OF MEASUREMENT CONTAINED IN THIS CHAPTER ARE EXPRESSED IN TERMS OF THE DECIMAL METRIC SYSTEM. TO REFER TO THE UNIT OF MEASUREMENT EXPRESSED IN TERMS OF THE ANGLO-SAXON SYSTEM, SEE THE "CHARACTERISTICS" CHAPTER.

Maintenance chart

SCHEDULED MAINTENANCE TABLE

I:*CHECK AND CLEAN, ADJUST, LUBRICATE OR REPLACE IF NECESSARY.*
C:*CLEAN,* ***R:****REPLACE,* ***A:****ADJUST,* ***L:****LUBRICATE.*
** Check the level every 2,500 km (1,553 mi).*

km x 1,000 (mi x 1,000)	1 (0.6)	5 (3.1)	10 (6.2)	15 (9.3)	20 (12.4)	25 (15.5)	30 (18.6)	EVERY 12 MONTHS	EVERY 24 MONTHS
Safety blocks	I		I		I		I		
Spark plug			R		R		R		
Centre stand			I		I		I	L	L
Drive belt			R		R		R		
Throttle control	I		I		I		I	I	I
Rollers housing			I		I		I		
Diagnosis by tool	I	I	I	I	I	I	I	I	I
Air filter			R		R		R		
Oil filter (mesh)	C		C		C		C		
Valve clearance	A		A		A		A		
Clutch assembly					I				
Electrical system and battery	I	I	I	I	I	I	I		
Braking system	I		I		I		I	I	I
Cylinder cooling system						I		I	I
Brake Fluid	I	I	I	I	I	I	I	I	R
Engine oil *	R	I	R	I	R	I	R	R	R
Hub oil			I		I		I	I	I
Headlight direction adjustment			I		I		I		
Brake pads		I	I	I	I	I	I	I	I
Sliding shoes / CVT rollers			I		R		I		
Tire pressure and wear	I	I	I	I	I	I	I	I	I
Vehicle road test	I		I		I		I	I	I
Driven pulley - roller casings			I		L		I		
Suspensions			I		I		I	I	I
Steering	I		I		I		I	I	I
Front wheel bearing seal ring			L		L		L		
Pin_Rear drum brake set screw			L		L		L		
Transmission			L		L		L	I	I
Labour time (minutes)	50	30	140	30	140	30	140	60	60

N.B.

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

CAUTION

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

Recommended products

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

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

This also applies when topping up only.

TABLE OF RECOMMENDED PRODUCTS

Product	Description	Specifications
Engine oil 5W -40	Synthetic-based lubricant for four-stroke engines.	SAE 5W-40; JASO MA, MA2; API SL; ACEA A3
Transmission oil 80W-90	Lubricant for gearboxes and transmissions.	SAE 80W-90; API GL-4
DOT 4 brake fluid	Synthetic brake fluid.	SAE J 1703; FMVSS 116; ISO 4925; CUNA NC 956 DOT4
Lithium-based grease	Lithium-based grease, suitable for various uses.	Yellow grease ISO L-X-BCHA 3 - DIN 51 825 K3K -20
Water repellent spray grease	Water repellent pouring 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 Pag. 9022 EM 25-89

NOTE:

USE TWO DIFFERENT TYPES OF LUBRICANTS, ACCORDING TO THE CLIMATE OF THE AREAS WHERE THE VEHICLE IS USED:

ENGINE OIL 5W-40, TO BE USED WITH AMBIENT TEMPERATURES (-5°C < T < 40°C).

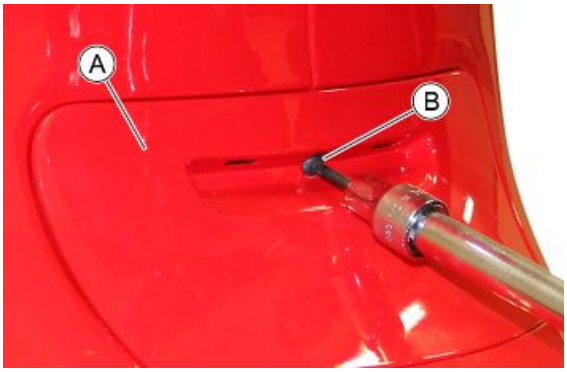
ENGINE OIL 0W-30, TO BE USED WITH AMBIENT TEMPERATURES (-15°C < T < 25°C).

Spark plug

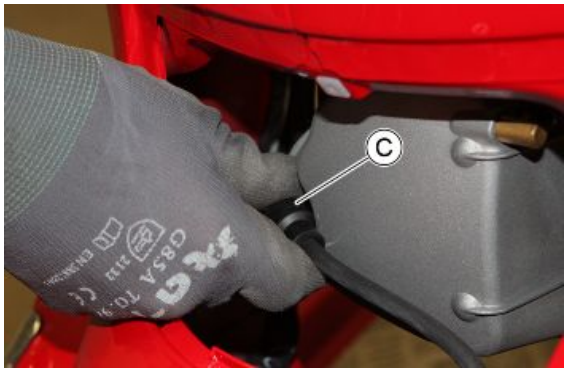
Removal

In order to inspect the spark plug, follow the operation described when the engine is cold:

- Slide off the spark plug inspection cover «**A**» by unscrewing the screw «**B**».



- Slide off the spark plug tube «**C**».
- Undo the spark plug with the specific spark plug spanner.



Fitting

- When refitting the plug, tighten it manually, being sure to insert it at the right angle. Use the wrench only to tighten it.
- Insert the spark plug tube «**C**».
- Place the inspection cover «**A**» and tighten the screw «**B**».

CAUTION

WHEN FITTING, ENSURE THAT THE SPARK PLUG CAP IS POSITIONED AS INDICATED IN THE FIGURE.

CAUTION

FOLLOW THESE PROCEDURES VERY CAREFULLY TO AVOID ANY SEVERE DAMAGE THAT MAY BE CAUSED BY THE VERY POWERFUL IGNITION SYSTEM.

CAUTION

THE SPARK PLUG MUST BE REMOVED WHEN THE ENGINE IS COLD. USING IGNITION ELECTRONIC CENTRAL UNITS OR SPARK PLUGS OTHER THAN THE TYPES PRESCRIBED (SEE «TECHNICAL DATA» SECTION) CAN CAUSE SERIOUS DAMAGE TO THE ENGINE.

CAUTION

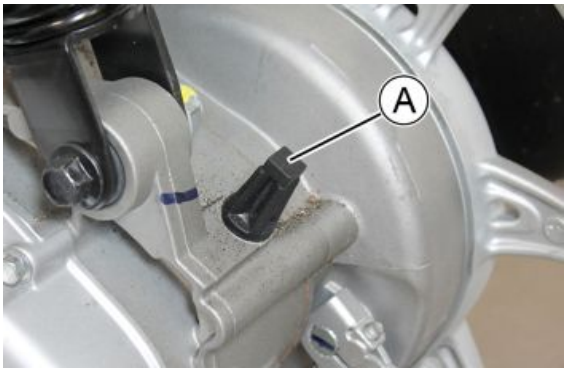
PROCEED WITH CAUTION.
DO NOT DAMAGE THE TABS AND/OR THEIR CORRESPONDING SLOTS. HANDLE THE PLASTIC AND PAINTED COMPONENTS WITH CARE, DO NOT SCRATCH OR IMPAIR THEM.

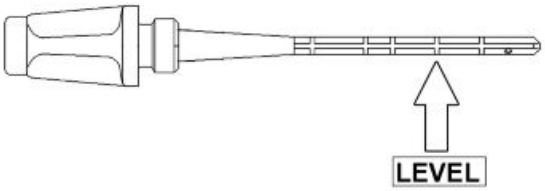
Hub oil

Check

To check the hub oil level, proceed as follows:

1. Park the vehicle on level ground and rest it on its stand;
2. Unscrew the oil dipstick «**A**», dry it with a clean cloth and then reinsert it, **screwing it fully into place**;
3. Unscrew the dipstick again and check that the oil level just reaches the **2nd notch from the bottom**;
4. Screw the dipstick back into place completely.





N.B.

THE NOTCHES ON THE HUB OIL LEVEL DIP STICK REFER TO OTHER COMPANY MODELS AND DO NOT HAVE ANY SPECIFIC FUNCTION ON THIS VEHICLE.

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

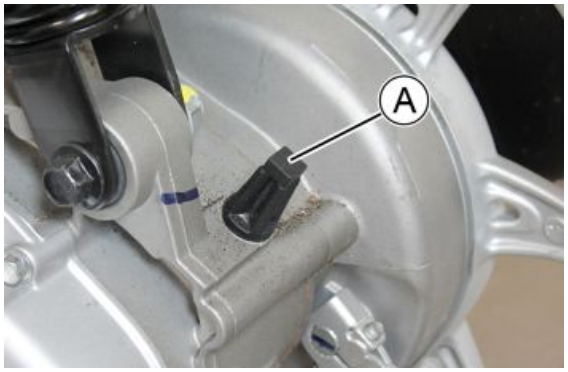
USED OIL IS HARMFUL TO THE ENVIRONMENT. COLLECTION AND DISPOSAL SHOULD BE CARRIED OUT IN COMPLIANCE WITH REGULATIONS IN FORCE.

CAUTION

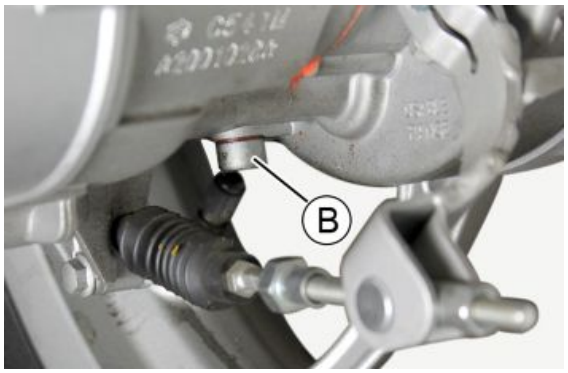
AN EXCESSIVE QUANTITY OF OIL CAN LEAD TO SPILL OVER, WHICH MAY CAUSE THE ENGINE AND THE WHEEL TO GET DIRTY.

Replacement

- Remove the filler plug / oil dipstick "A"

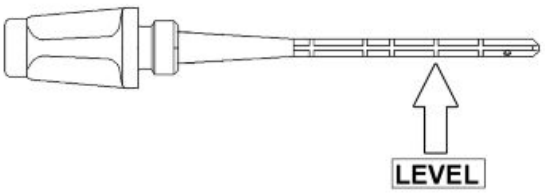


- Prepare an adequately sized container.
- Unscrew the oil drainage cap "B" and drain out all the oil.



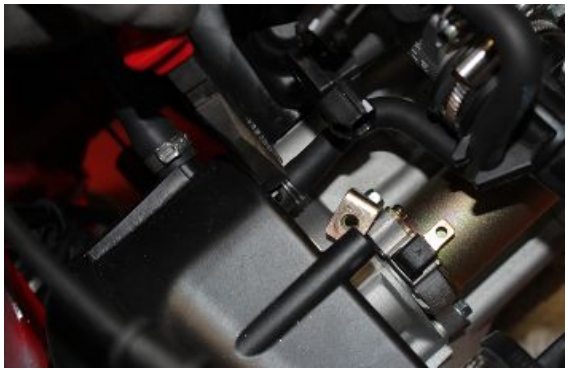
- Wait for oil to drain completely and fit the screw back tightening it to the specified torque.
- Fill with new oil from the top filler

Fully tighten the dipstick and check the oil level as indicated in the figure.



Air filter

- Remove the helmet compartment.
- Remove the two indicated clamps.



- Remove the two indicated fixing screws at the crankcase.

- Remove the clamp and disconnect the idle regulator pipe from the filter box.

- Remove the filter housing.

Engine oil

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

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

Replacement

Change oil and replace filter as indicated in the scheduled maintenance table. The engine must be emptied by draining off the oil through the drainage plug of the mesh filter, flywheel side; furthermore to facilitate oil drainage, loosen or remove the cap/dipstick. Once all the oil has drained through the drainage hole, remove the filter and clean it.

N.B.

THE ENGINE MUST BE HOT WHEN THE OIL IS CHANGED.

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

Lubricate them and refit the filter and the oil drainage plug, screwing them up to the prescribed torque.

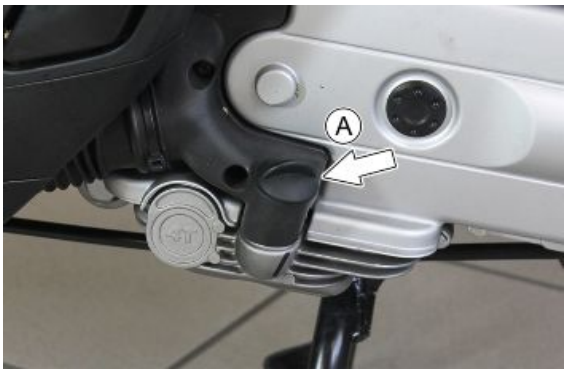
Change the engine oil.

Since a certain quantity of oil still remains in the circuit, oil must be filled from oil dipstick/cover.

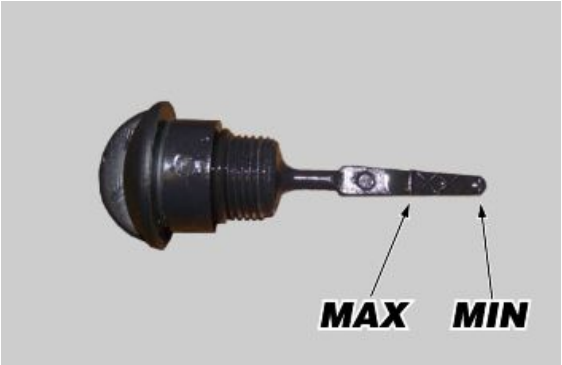
Then start up the vehicle, leave it running for a few minutes and switch it off: After about five minutes, check the level and, if necessary, top-up but never exceeding the **MAX** level reference mark. Use new oil of the recommended type for topping up and changing purposes.

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.

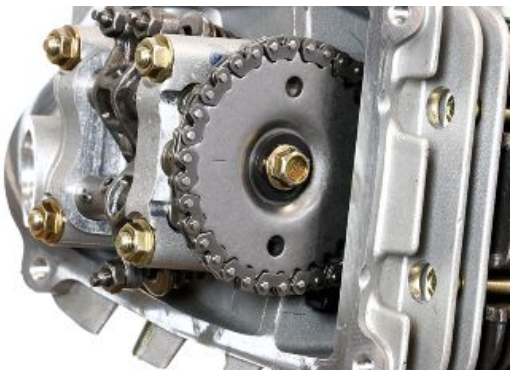


If the check is carried out after the vehicle has been used, and therefore with a hot engine, the level will be lower; in order to carry out a correct check, wait at least 10 minutes after the engine has been stopped so as to get the correct level.



Checking the valve clearance

To check valve clearance, check that the piston is to the TDC and that the reference indicated on the camshaft sprocket is horizontal.

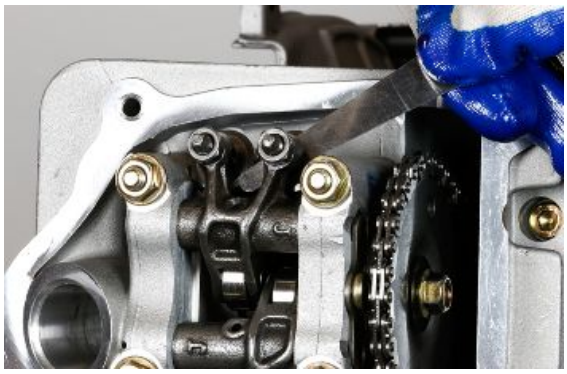


Use a feeler gauge to check that the clearance between the valve and the set screw corresponds with the indicated values.

Characteristic

Valve clearance (cold engine)

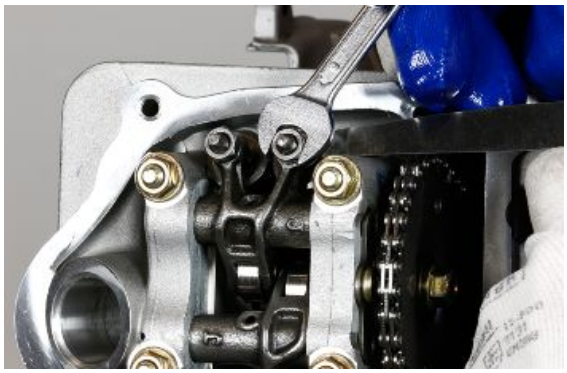
Intake: 0.10 mm Exhaust: 0.15 mm



When the valve clearance values, intake and exhaust respectively, are different from the ones indicated below, adjust them by loosening the lock nut and operating on the corresponding set screw, as shown in the figure.

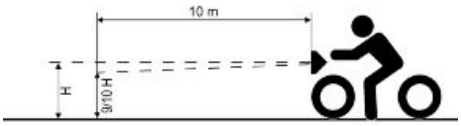
Locking torques (N*m)

Rocker set screw counter-nut - Rockers 6 to 8 Nm



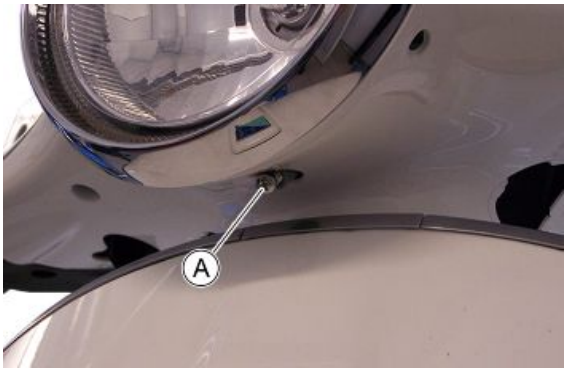
Headlight adjustment

Proceed as follows:



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

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



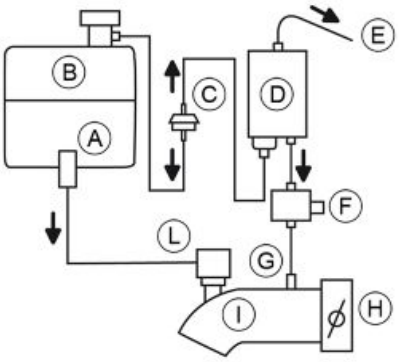
3. Otherwise, adjust the right headlight with screw «**A**».

N.B.

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

Anti-evaporation system

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



A. Fuel pump

B. Fuel tank

C. Two-way fuel vapour ventilation valve

D.Canister

E.Air purge pipe into atmosphere

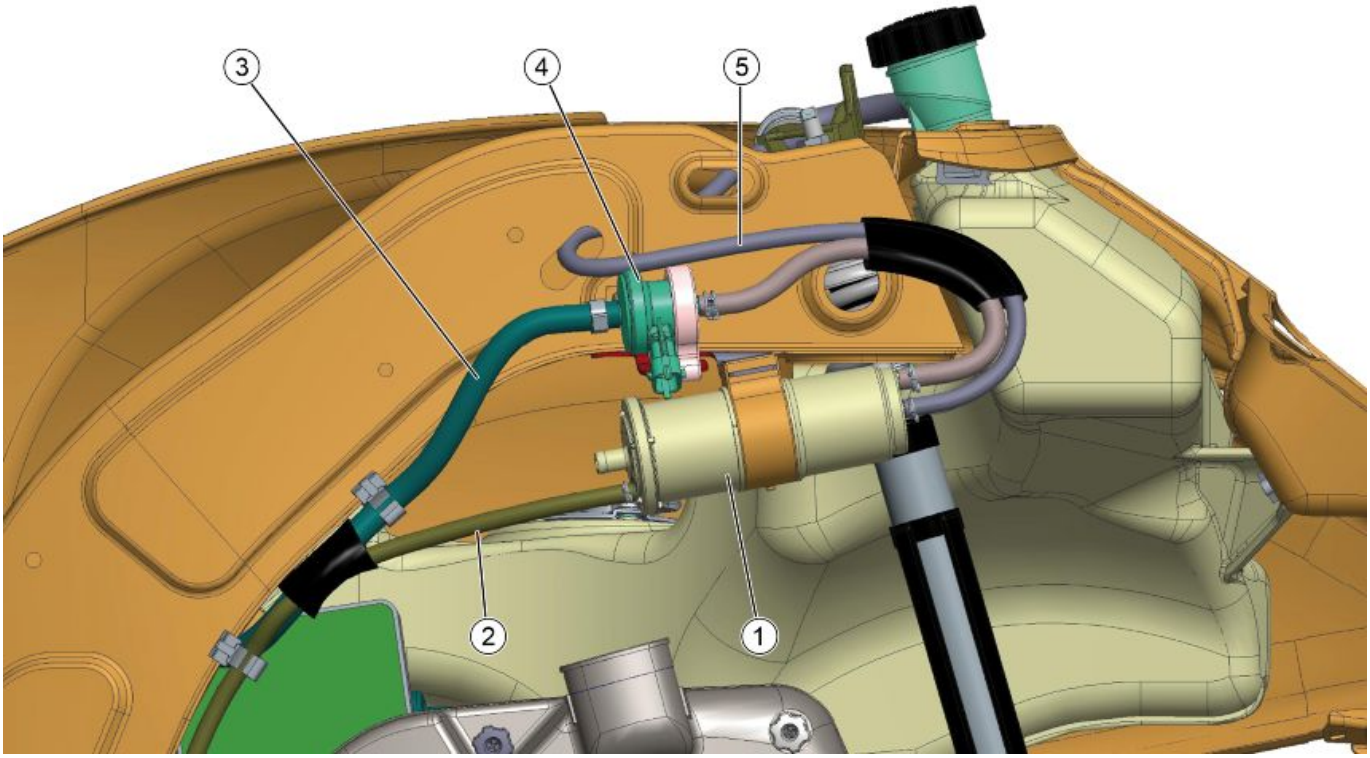
F.One-way electronic fuel vapour purge control valve (controlled by ECU)

G. Vacuum fitting

H. Throttle body

I. Air induction fitting

L. Injector



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

Key:

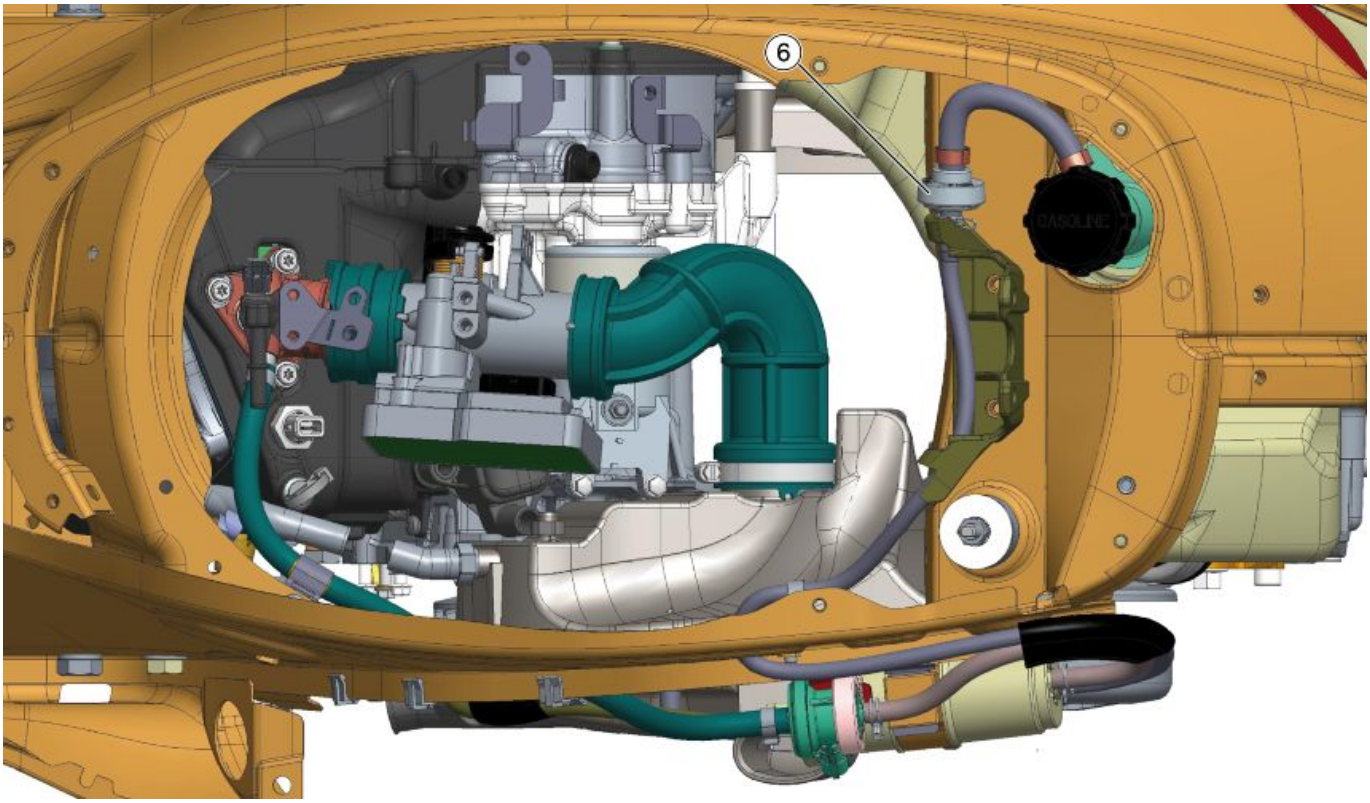
1 Canister

2 Bleed pipe

3 Pipe for connecting the canister to the intake coupling

4 Canister valve

5 Pipe for connecting the fuel tank to the canister

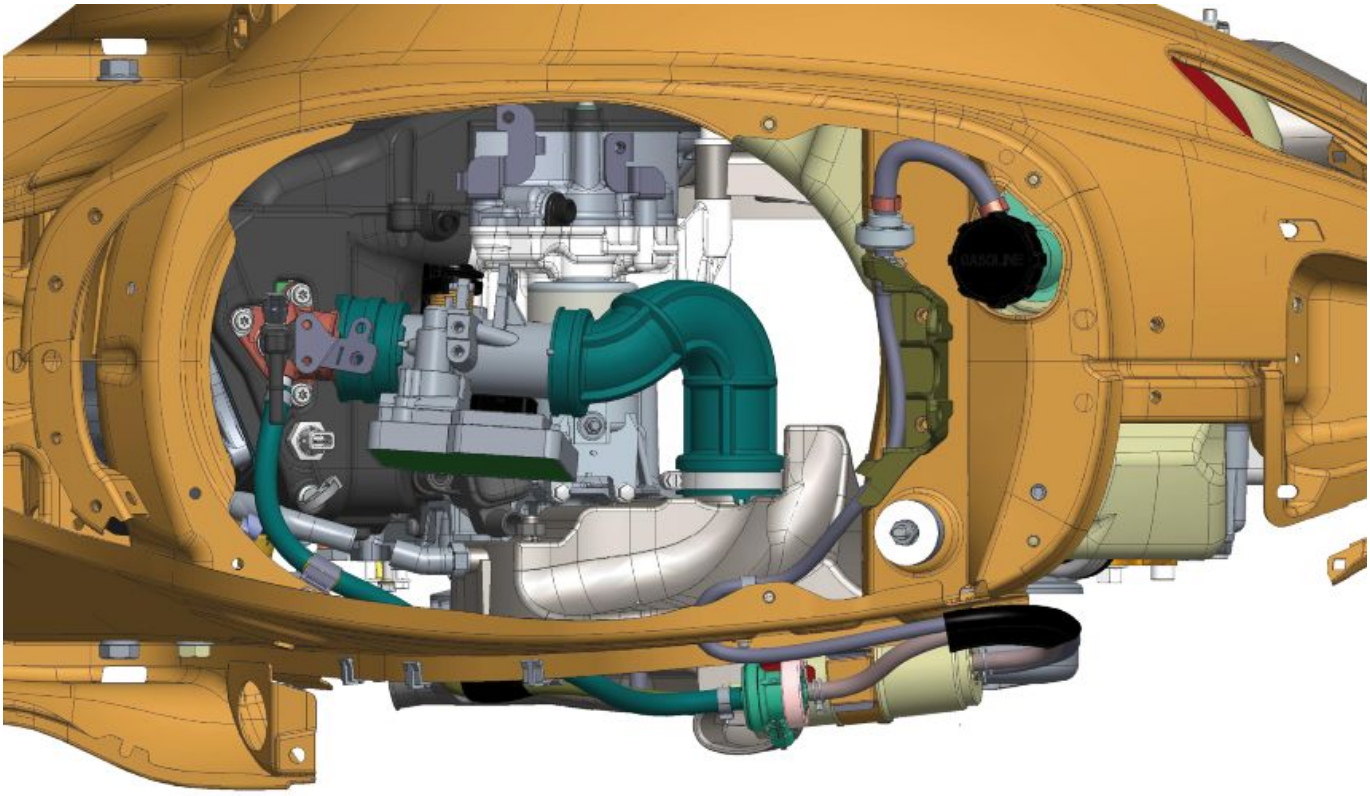


Key:

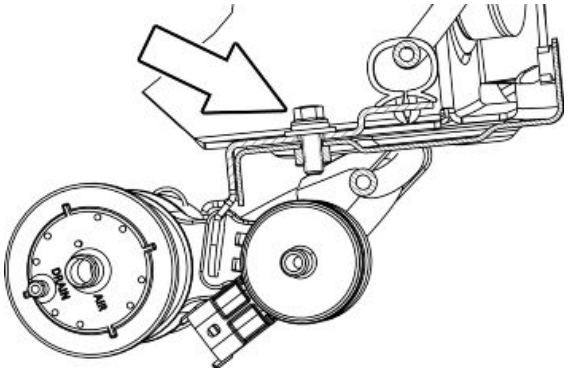
6 Breather valve

Removing system components

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

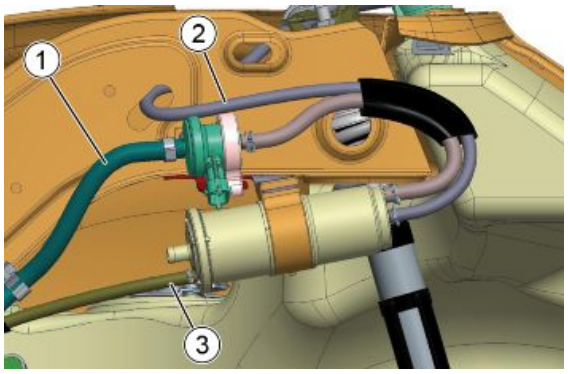


After having removed the clamps, unscrew the fastening screw to release the system and bring the components inside the engine compartment.



Refitting system components

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



1. canister - insertion coupling connection pipe.

2. tank - canister connection pipe.

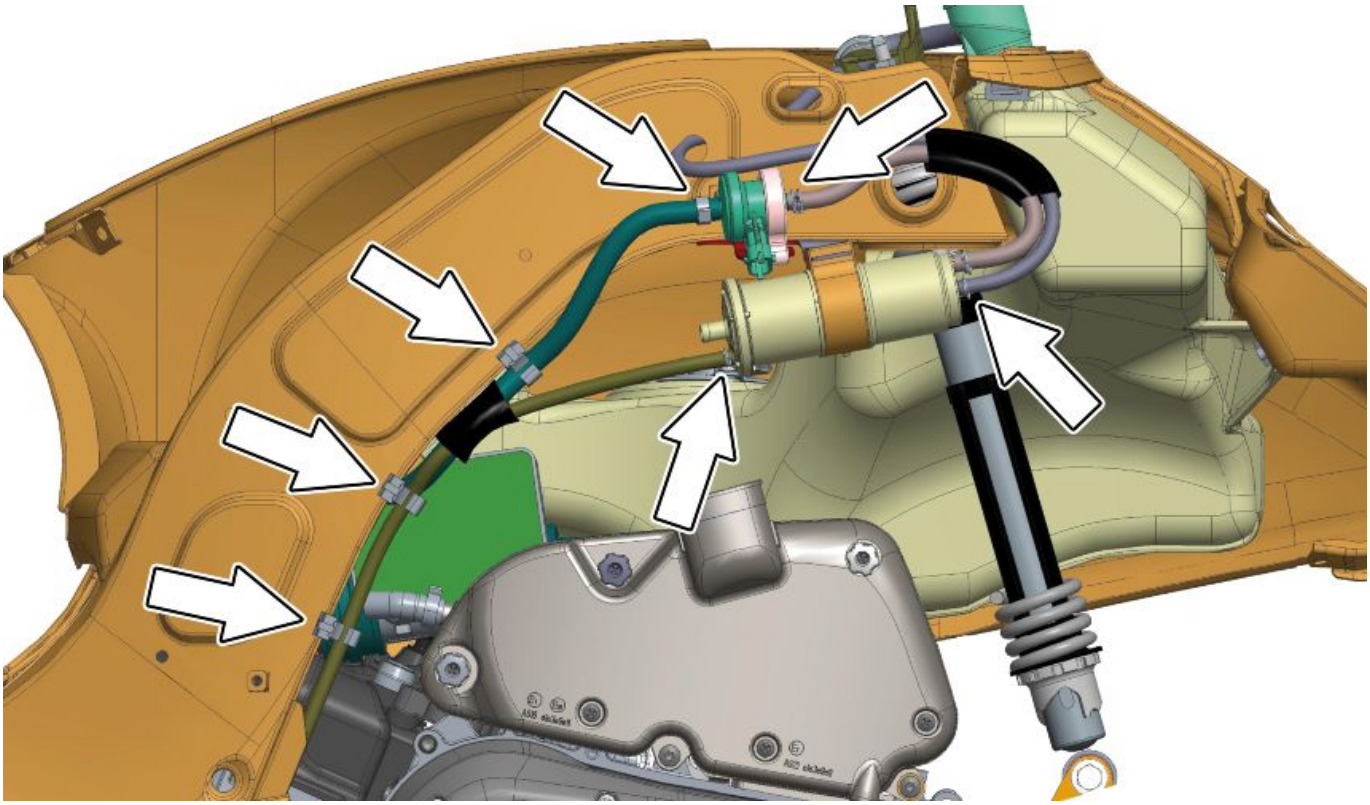
3. Bleeder pipe.

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

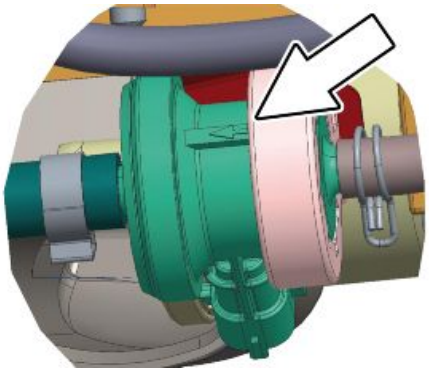
CAUTION

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

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



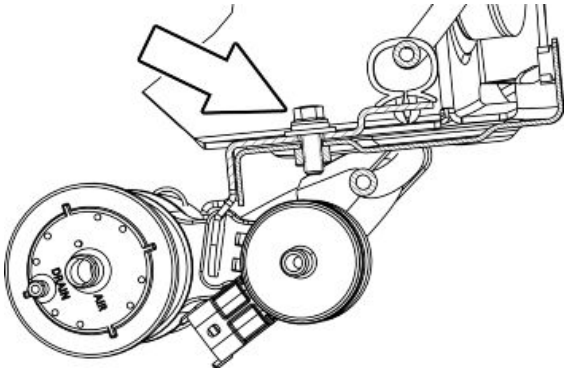
Upon refitting the canister valve, observe the direction of the arrow toward the engine.



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

Locking torques (N*m)

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



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

If you detect different pressures, replace the valve.

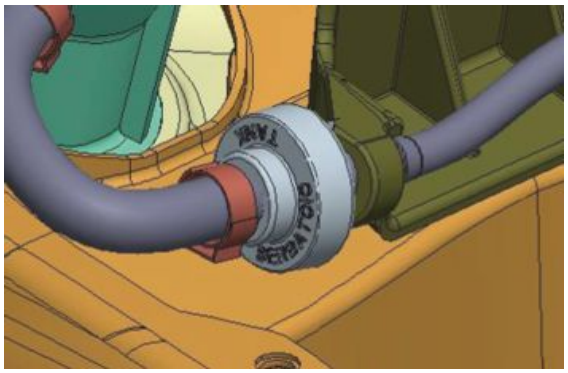
Characteristic

Discharge pressure

80/100 mbar

Intake pressure

≤ 20 mbar



Canister inspection

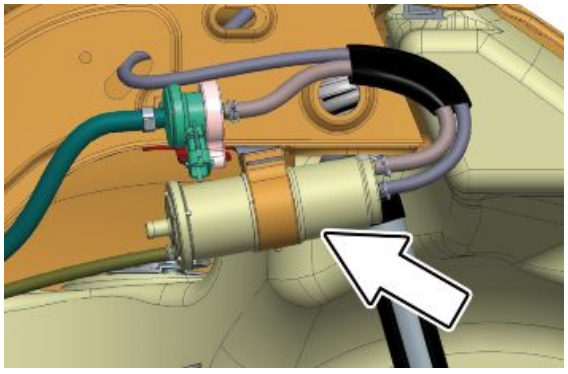
The canister is essential to treat the hydrocarbons present in the volume of gas that escapes from the tank when there is an increase in internal pressure (tank heating induced by the cooling radiator, by the motor or by the external environment).

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

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

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

- Shake the Canister and make sure there is no noise.
- Using a compressed air gun, blow alternately in 3 ducts and make sure that pressure does not build inside the canister.



- Check that the air flow is kept free and that no carbon residues escape out of any pipe.

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

INDEX OF TOPICS

Transmission and brakes

Clutch grabbing or performing inadequately

IRREGULAR CLUTCH PERFORMANCE OR SLIPPAGE

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

Insufficient braking

INEFFICIENT BRAKING

Possible Cause	Operation
Worn brake pads or shoes	Replace the brake pads or shoes and check for brake disk or drum wear conditions.
Air bubbles inside the hydraulic braking system	Carefully bleed the hydraulic braking system, (there must be no flexible movement of the brake lever).
Brake disc or drum deformed	Use a dial gauge to check the levelness of the disk with the wheel correctly fitted and the concentricity of the rear drum; check the brake disc screws are locked
Fluid leakage in hydraulic braking system	Elastic fittings, piston seals or brake pump breakdown, replace
Excessive clearance in the rear brake control cable	Adjust backlash with the appropriate adjuster on the shoe control lever
The brake fluid has lost its properties	Replace the front brake fluid and top up to the correct level in the pump
Return spring broken	Replace spring.
Shoe control bolt not lubricated	Lubricate with Z2 grease.

Brakes overheating

BRAKES OVERHEATING

Possible Cause	Operation
Defective plunger sliding	Check calliper and replace any damaged part.
Brake disc or drum deformed	Use a dial gauge to check the levelness of the disk with the wheel correctly fitted and the concentricity of the rear drum; check the brake disc screws are locked

Electrical system

Battery

BATTERY

Possible Cause	Operation
The battery is the electrical device in the system that requires the most frequent inspections and thorough maintenance.	The battery is the electrical device in the system that requires the most frequent inspections and thorough maintenance. If the vehicle is not used for some time (1 month or more) the battery needs to be recharged periodically. The battery runs down completely in the course of 5 - 6 months. If the battery is fitted on a motorcycle, be careful not to invert the connections, keeping in mind that the black earth wire is connected to the negative

Possible Cause	Operation
	terminal while the red wire is connected to the terminal marked +.

Turn signal lights malfunction

ELECTRICAL SYSTEM MALFUNCTION

Possible Cause	Operation
Turn indicators do not turn on	Check turn indicators device and/or wiring as described in the «Electrical system» chapter.

Steering and suspensions

Heavy steering

STEERING HARDENING

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

Excessive steering play

EXCESSIVE STEERING CLEARANCE

Possible Cause	Operation
Excessive steering clearance	Check the tightening of the top ring nut. If irregularities continue in turning the steering even after making the above adjustments, check the seats in which the ball bearings rotate: replace if they are recessed.

Noisy suspension

NOISY SUSPENSION

Possible Cause	Operation
Noisy suspension	If the front suspension is noisy, check: that the front shock absorber works properly and the ball bearings are good condition. In conclusion, check the tightening torque of the wheel hub, the brake calliper, the shock absorber disc in the attachment to the hub and the steering tube. Check that the swinging arm connecting the engine to the chassis and the rear shock absorber work properly

Suspension oil leakage

OIL LEAKAGE FROM SUSPENSION

Possible Cause	Operation
Oil leakage from suspension	Replace the damper.

INDEX OF TOPICS

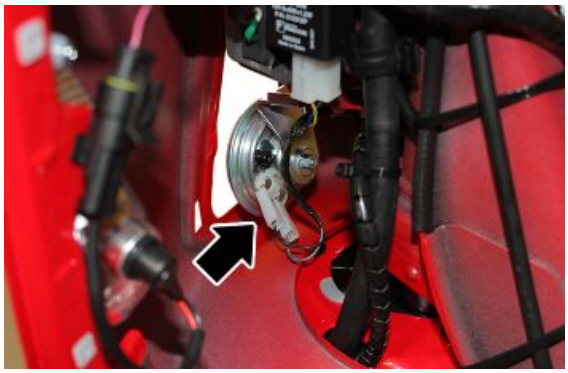
Components arrangement

Component layout on vehicle.

1. HORN

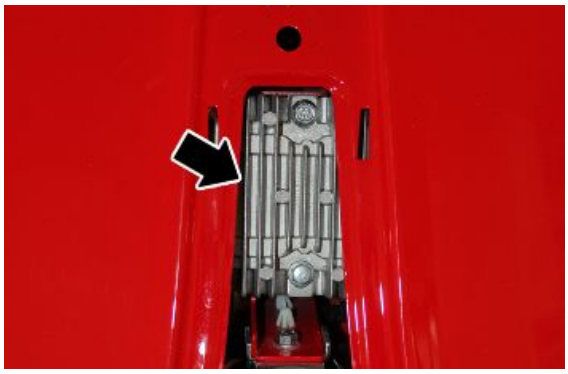
Remove the central front cover to reach them.

The connectors are located on the component, to access them, remove the leg shield back plate.

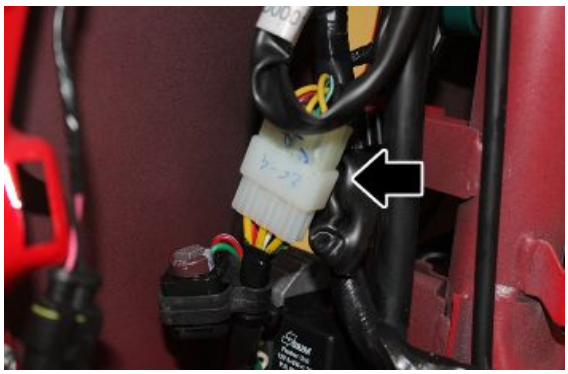


2. VOLTAGE REGULATOR

Remove the central front cover to reach them.

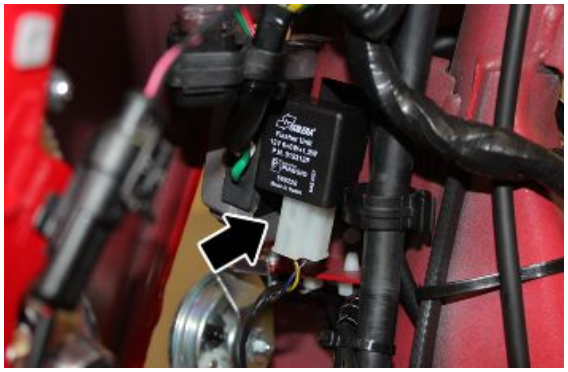


To access the connector it is necessary to remove the leg shield back plate.



3. INDICATOR LIGHTS RELAY

Remove the leg shield back plate to reach it.



4. INJECTION ECU

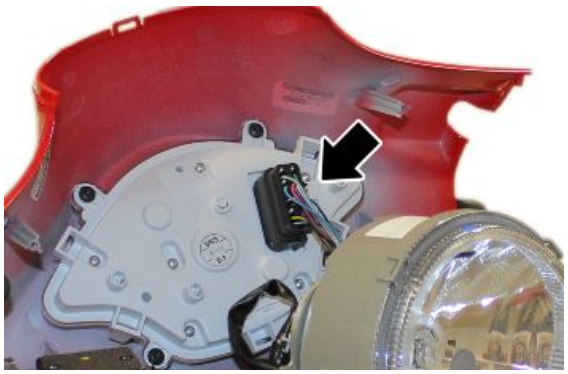
Remove the leg shield back plate to reach it.

5. IGNITION SWITCH

Remove the leg shield back plate to reach it.

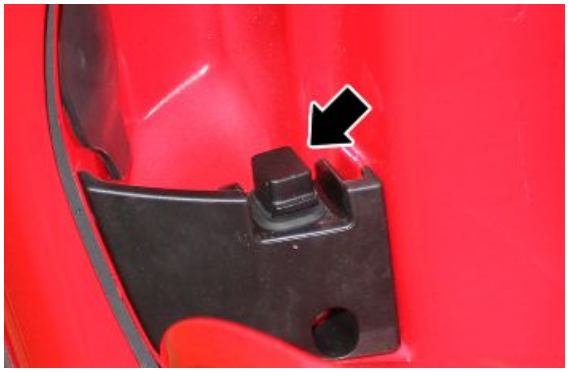
6. INSTRUMENT PANEL

Remove the upper handlebar cover to reach it.

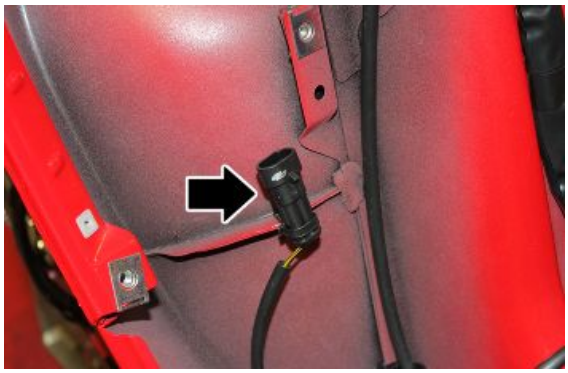


7. USB PORT

The USB port is located in the front top-box.



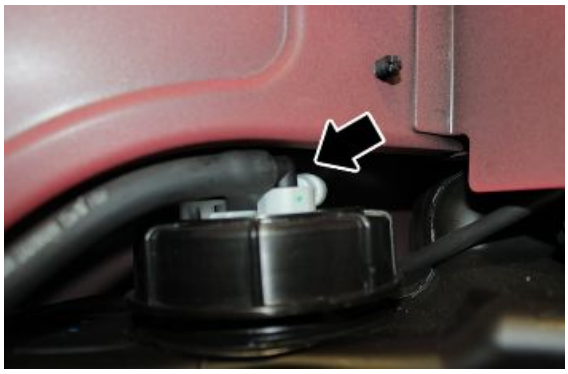
To access the connector it is necessary to remove the leg shield back plate.



8. FUEL PUMP

9. FUEL LEVEL TRANSMITTER

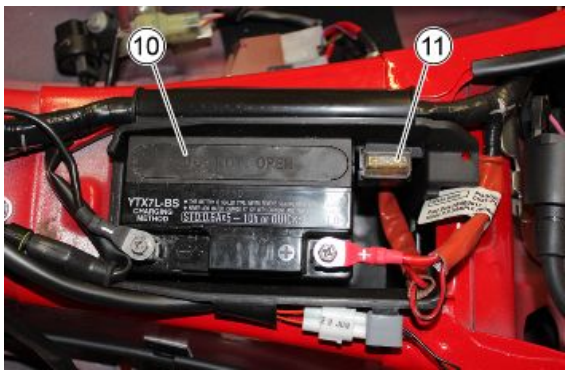
Remove the helmet compartment to reach it.



10. BATTERY

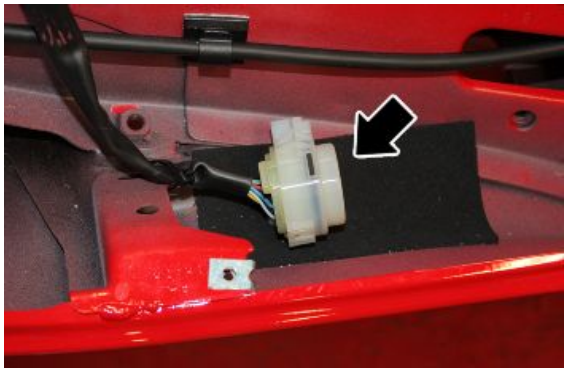
11. MAIN FUSE

Remove the battery compartment cover to reach it.



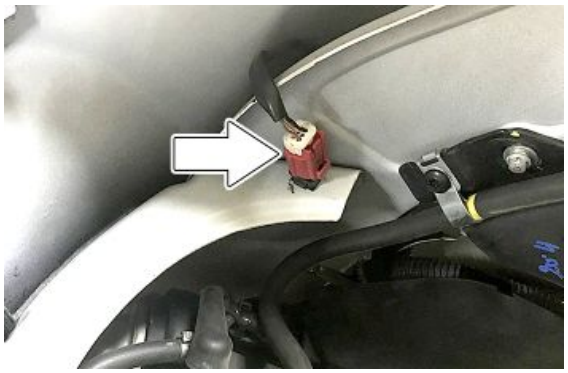
12. ACCESSORIES PRE-INSTALLATION

Remove the footrests to reach it.

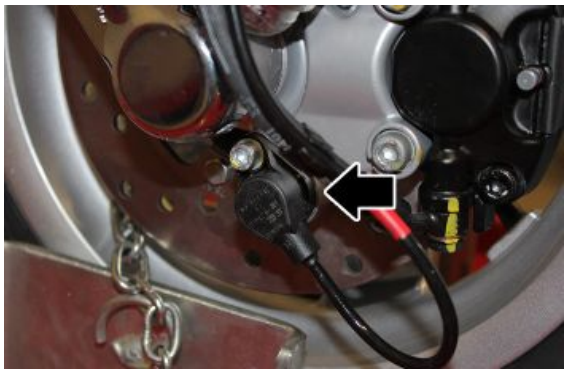


13. DIAGNOSTIC SOCKET

Remove the battery compartment cover to reach it.

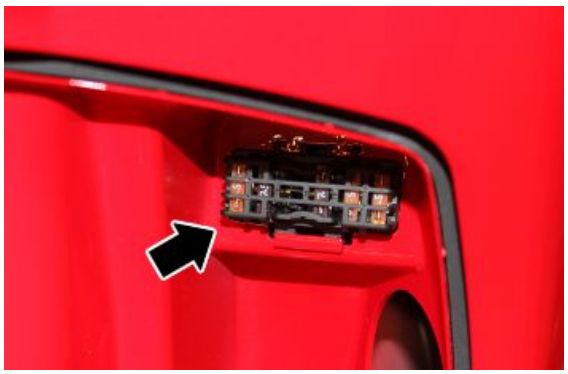


14. SPEED SENSOR



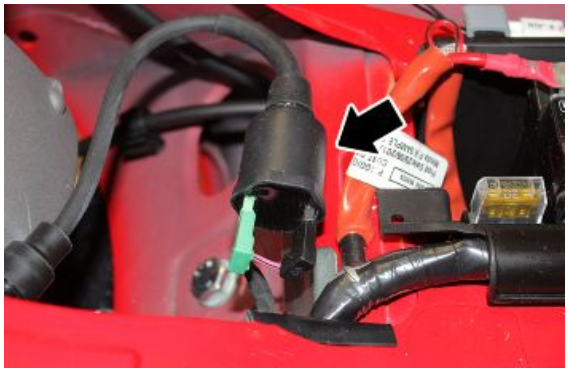
15. SECONDARY FUSES

The secondary fuses are located in the front top-box.



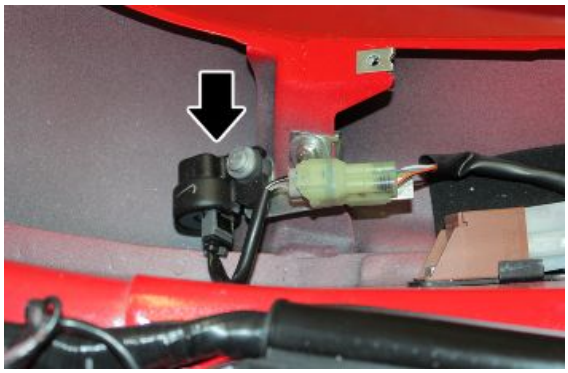
16. HV COIL

Remove the footrests to reach it.



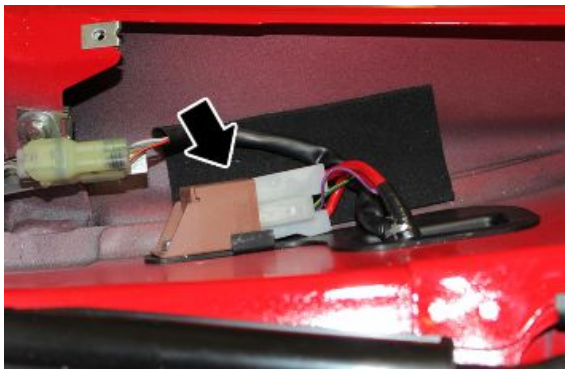
17. INCLINATION SENSOR

Remove the footrests to reach it.



18. START-UP RELAY

Remove the footrests to reach it.



19. LAMBDA PROBE

The component is mounted on the exhaust manifold, to access the connector, remove the helmet compartment.

20. MAGNETO FLYWHEEL

21. ENGINE SPEED SENSOR

The connector for the two components is located close to the cooling hood.

22. TPS

Remove the helmet compartment to reach it.

23. IDLE VALVE

Remove the helmet compartment to reach it.

24. ENGINE TEMPERATURE SENSOR

Remove the helmet compartment to reach it.

25. INJECTOR

Remove the helmet compartment to reach it.

Ground points

Location of earth points between electrical system and chassis.

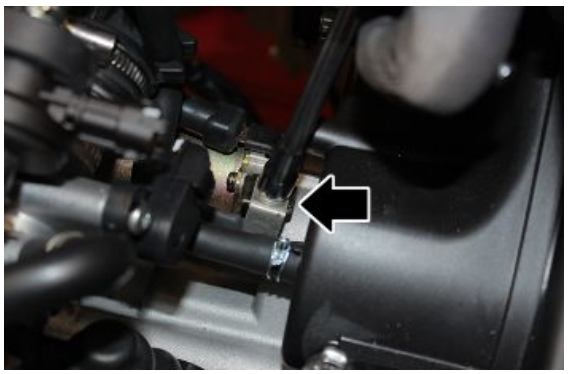
NOTE: The Manufacturer recommends checking that the earth points are secured correctly and free from oxidation, in order to ensure that all the electrical components fitted on the vehicle function correctly.

1. CHASSIS

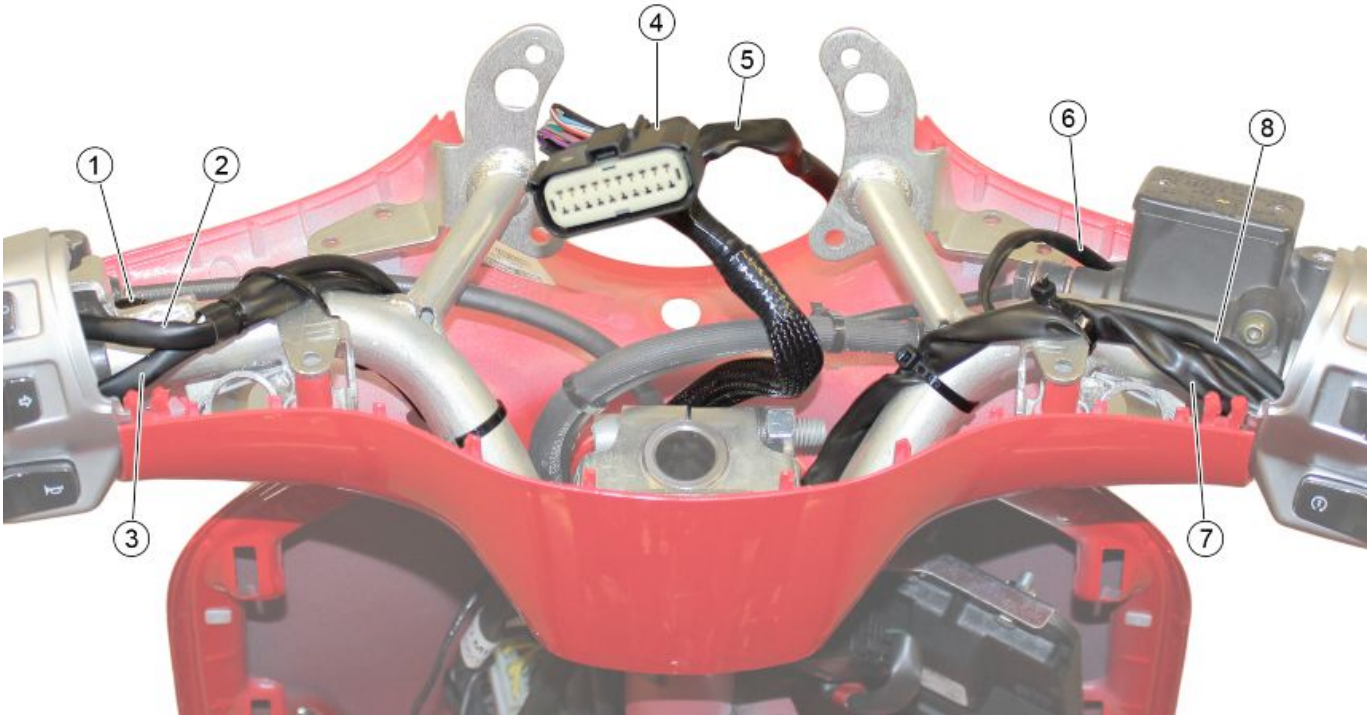
The earth point on the chassis is located close to the battery, to access it, remove the footrest platform.

2. ENGINE

The earth point on the engine is located on the starter motor, to access it, remove the helmet compartment.



Front side



1. To LH stop button

2. Column light switch wiring harness

3. Direction indicators and horn push-button switch wiring harness

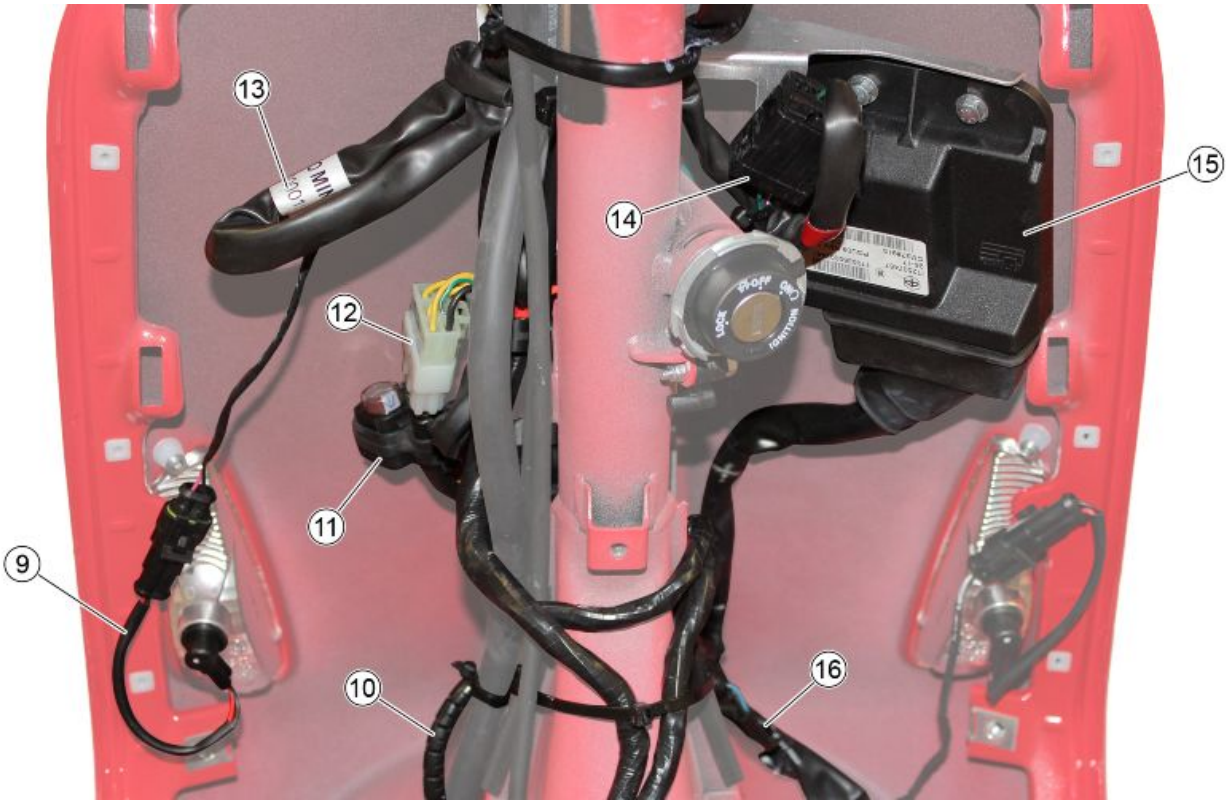
4. Instrument panel connector

5. Headlight cable harness

6. To RH stop button

7. Starter button wiring harness

8. MODE button wiring harness



9. LH front direction indicator wiring harness

10. Speed sensor wiring harness

11. Diode

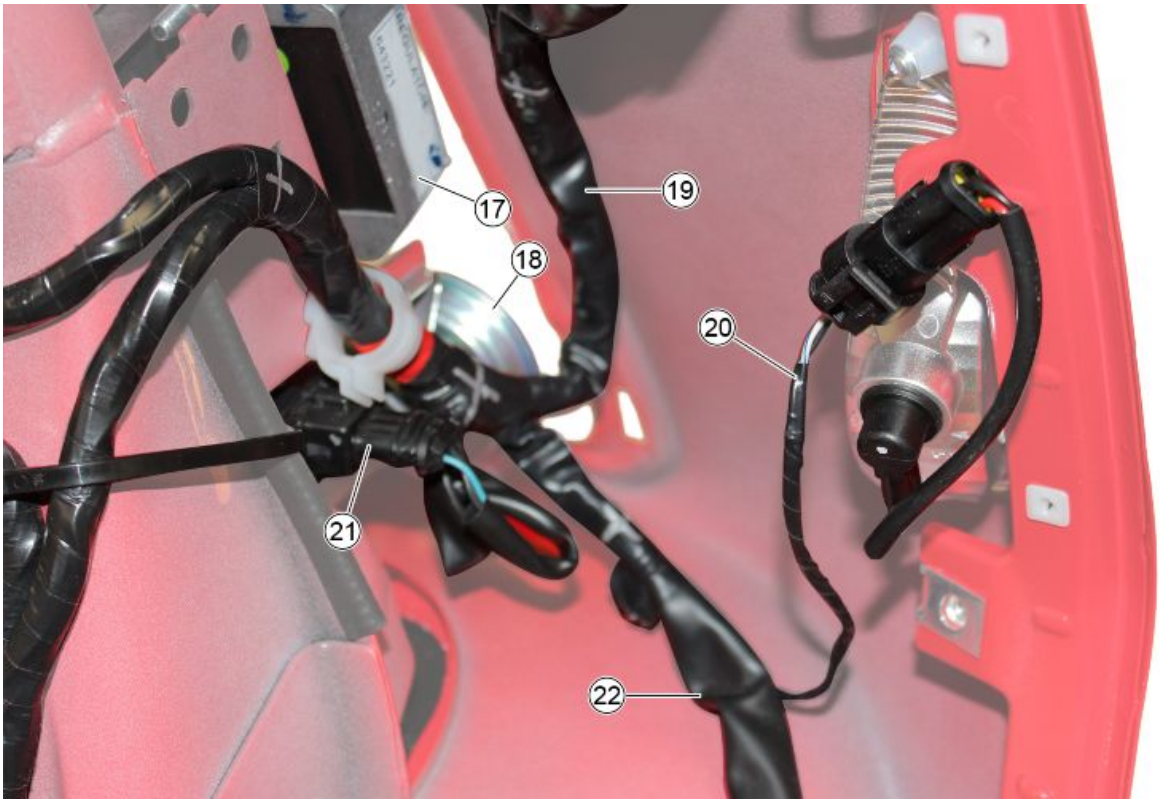
12. Voltage regulator connector

13. LH column light switch wiring harness

14. RH Column light switch connector

15. Injection ECU

16. Speed sensor, RH front direction indicator and secondary fuses wiring harness



17. Voltage regulator

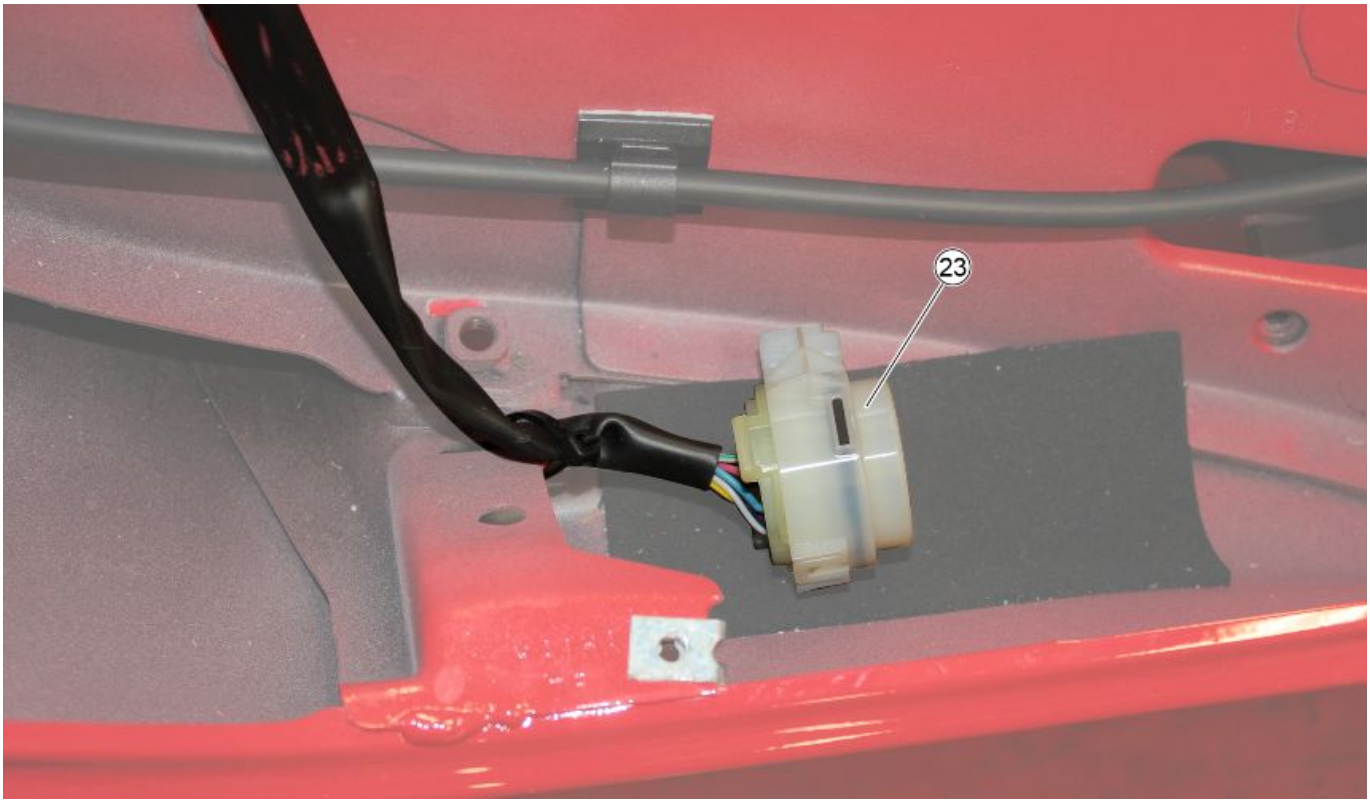
18. Horn

19. Control unit wiring harness

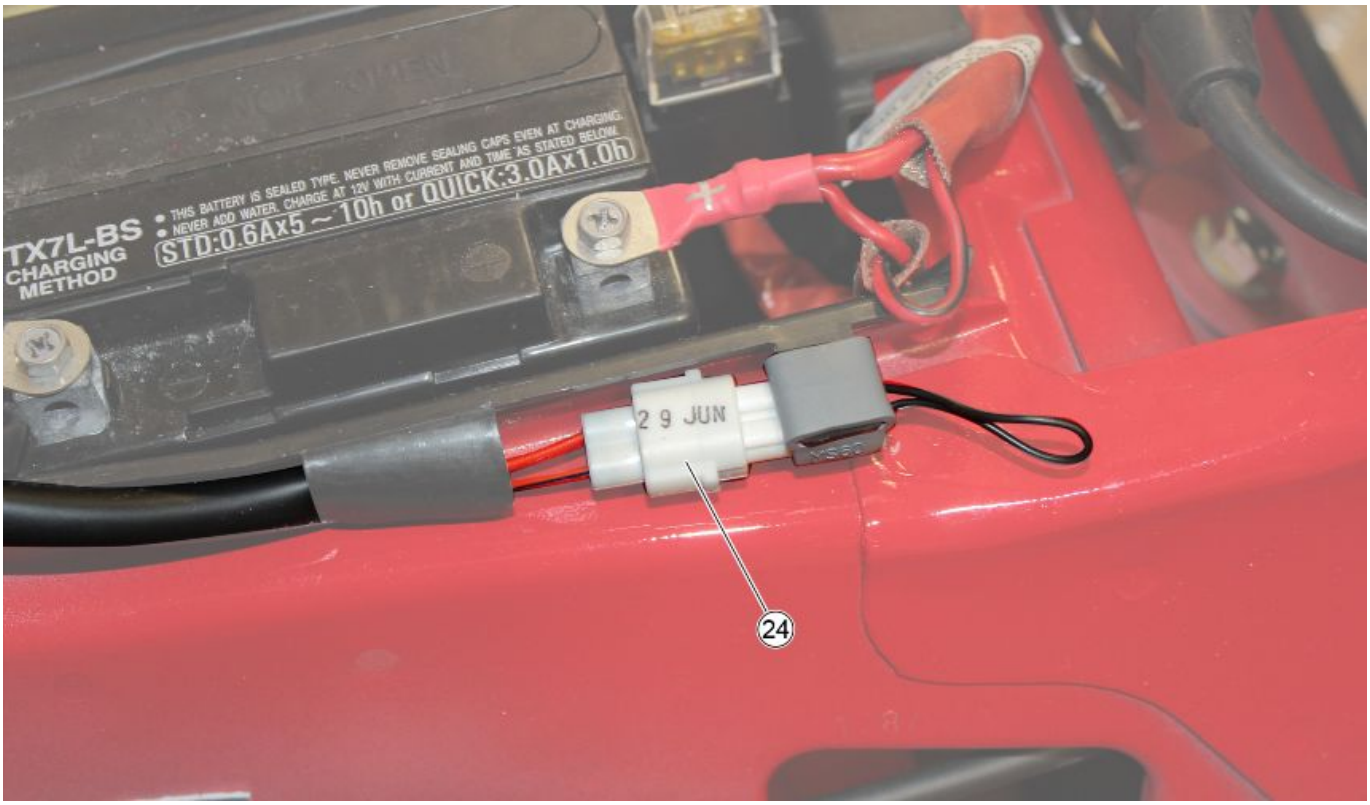
20. RH front direction indicator wiring harness

21. Speed sensor connector

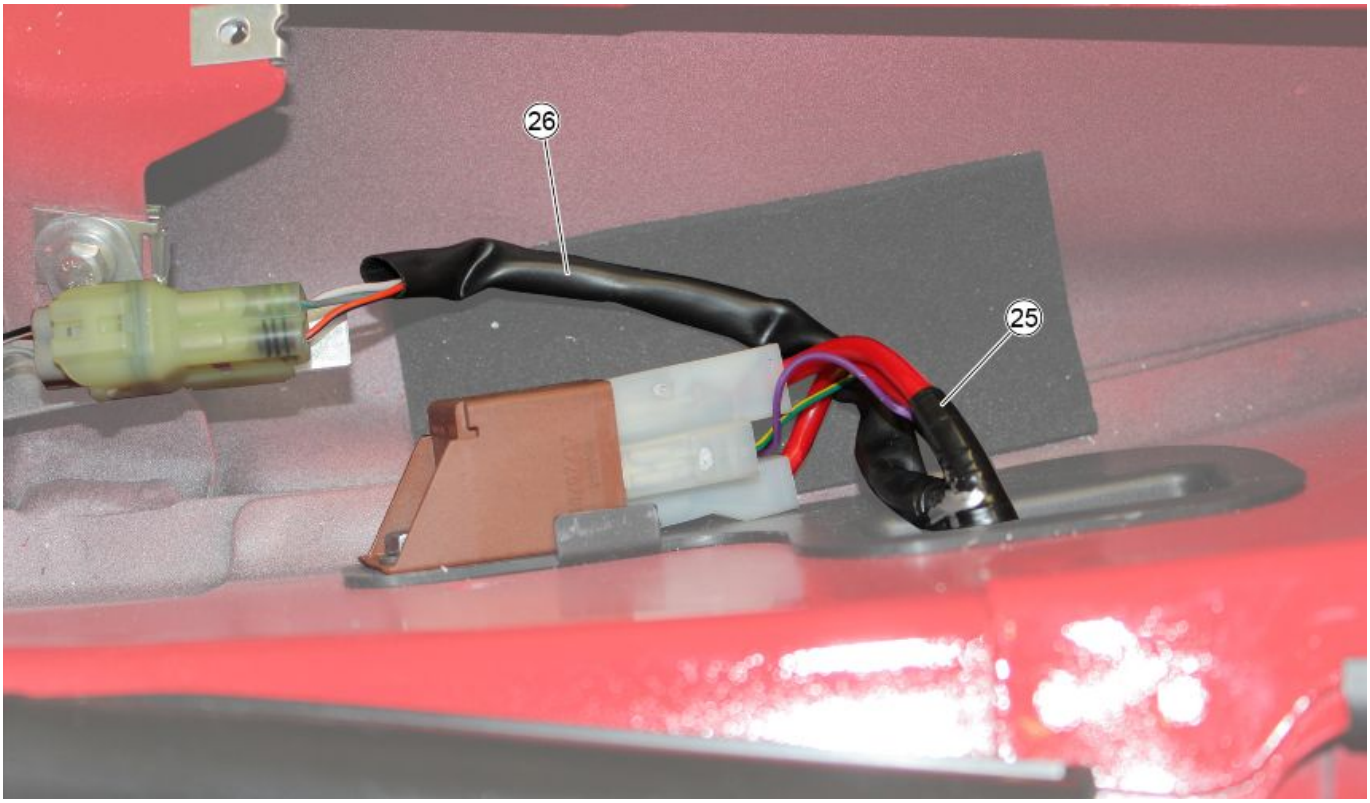
22. Secondary fuses wiring harness



23. Accessories pre-installation



24. Vehicle stand switch connector (not fitted on this version) with jumper



25. Starter relay wiring harness

26. Roll-over sensor wiring harness

Checks and inspections

Remote controls check

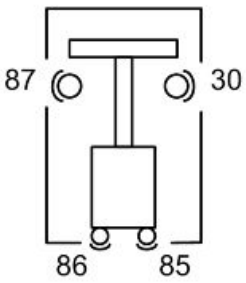
To check the operation of a relay:

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 relay.

3) With the relay fed, check that there is continuity between terminals 87 and 30.

4) If these conditions are not met, the relay is surely damaged and, therefore, it should be replaced.



Battery recharge circuit

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

The alternator is directly connected to the voltage regulator.

In turn, the voltage regulator is directly connected to the ground connection and to the battery positive terminal passing through the 20A No. 01 protection fuse.
The three-phase alternator provides good recharge power and at low revs a good compromise is achieved between generated power and idle stability.

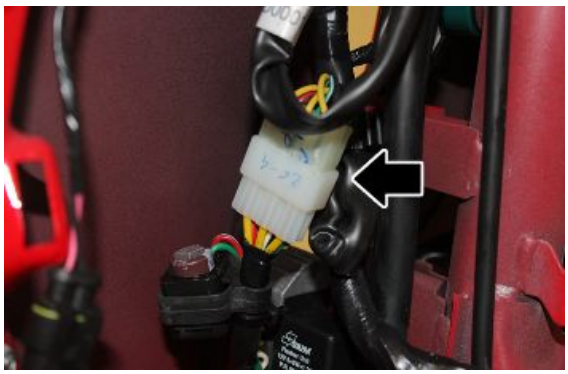
Stator check

Checking the stator windings

WARNING

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

- Remove the leg shield back plate.
- Disconnect the connector between stator and regulator with the three yellow cables as shown in the picture.
- Measure the resistance between each of the yellow terminals and the other two on the stator side.



Electric characteristic

Resistance:

0.2 - 1 Ω

- Check that there is insulation between the each yellow cable and the ground.
- If values are incorrect, replace the stator.

Recharge system voltage check

Look for any leakage

1) Access the battery by removing the specific cover.
2) Check that the battery does not show signs of losing fluid before checking the output voltage.
3) Turn the ignition key to position OFF, connect the terminals of the tester between the negative pole (-) of the battery and the black cable and only then disconnect the black cable from the negative pole (-) of the battery.
4) With the ignition key always at OFF, the reading indicated by the ammeter 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) Start the engine, ensure that the lights are all off (lights switch moved to the right), increase the engine speed and at the same time measure the voltage.

Electric characteristic

Voltage ranging between 14.0 and 15.0V at 5,000 rpm.

Maximum current output check

- With engine off and panel set to "ON" turn on the lights, by moving the lights switch to the left, and let the battery voltage set to 12V.
- Connect a ammeter clamp to the recharge positive pole (Red-Black cable) in output from the regulator.
- Keep the lights on and start the engine, bring it to normal speed and read the values on the ammeter. With an efficient battery a value must be detected: > 20A

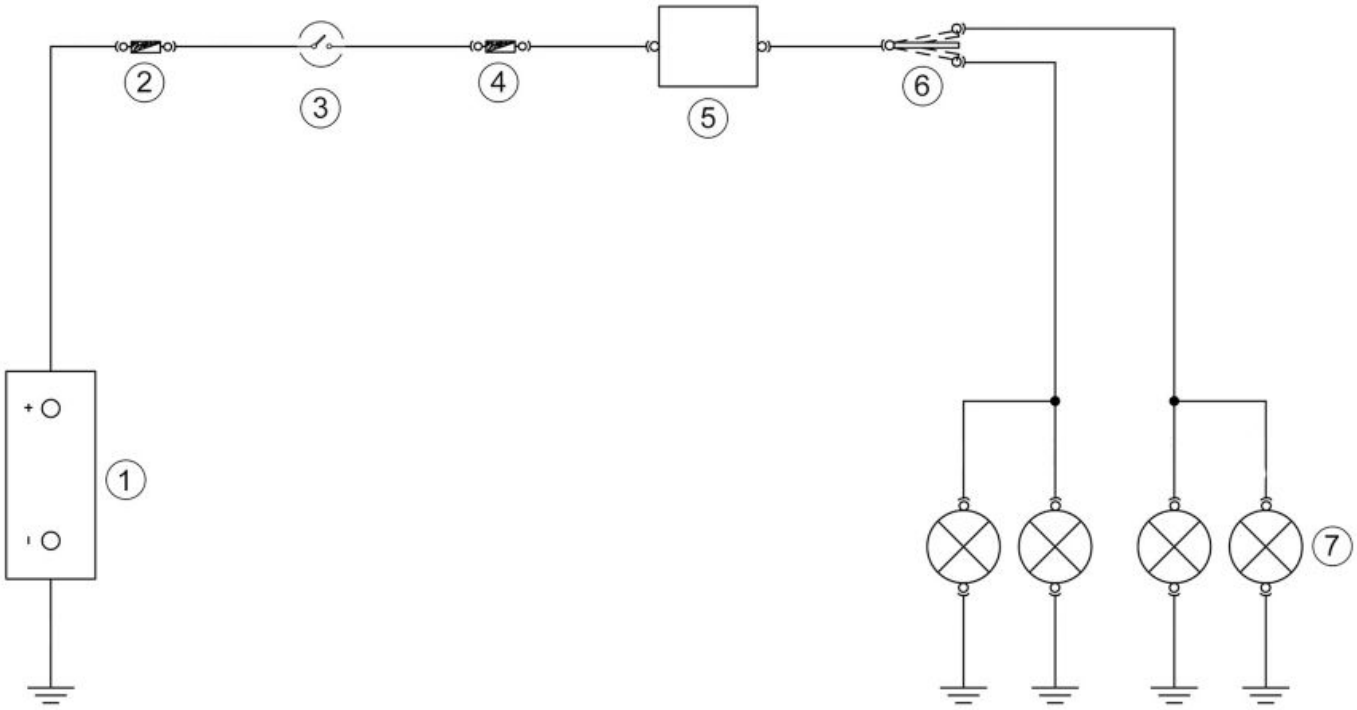
VOLTAGE REGULATOR/RECTIFIER

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

See also

Battery

Turn signals system check



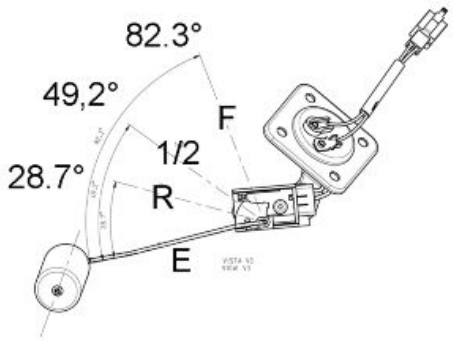
1. Battery
2. Fuse No. 1
3. Ignition switch
4. Fuse no. 2
5. Direction indicator device
6. Turn indicator switch

7. Turn indicators

level indicators

WARNING

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

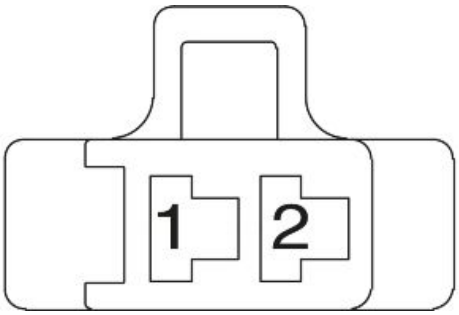


POSIZIONE GALLEGGIANTE Float position	F	1/2	R	E
RESISTENZA (Ω) Resistance	7±0.5	31	51.5	95±2

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 under different conditions.

2) If the transmitter operates correctly but the indication on the instrument panel is not exact, check that the wiring harnesses between the two components are not interrupted.



Lights list

BULBS

	Specification	Desc./Quantity
1	High beam / low beam bulb	**Type**: LED **Quantity**: 2
2	Stop light bulb	**Type:** LED **Quantity:** 1
3	rear daylight running light bulb	**Type:** incandescent **Power:** 12V - 10W **Quantity:** 1
4	Licence plate light bulb	**Type:** incandescent **Power:** 12V - 5W **Quantity:** 1

	Specification	Desc./Quantity
5	Front indicator light bulb	**Type:** Halogen, BAZ9s base, amber **Power:** 12V - 6W **Quantity:** 1 RH + 1 LH
6	Rear indicator light bulb	**Type:** Halogen, BAZ9s base, amber **Power:** 12V - 6W **Quantity:** 1 RH + 1 LH

Fuses

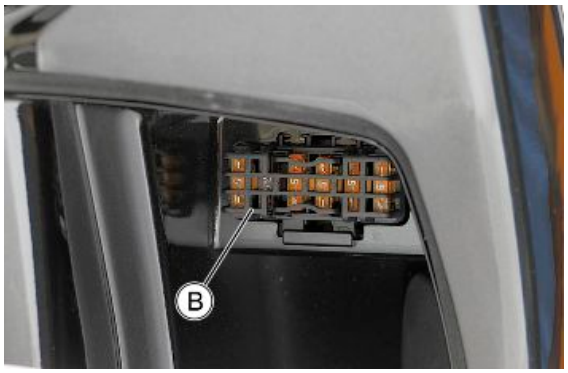
The electrical system has 1 main fuse located inside the battery compartment and 6 secondary fuses located inside the front case.

CAUTION

ELIMINATE THE CAUSE OF THE FAULT BEFORE REPLACING THE FUSE.
WE STRONGLY RECOMMEND THAT YOU CONTACT AN AUTHORISED SERVICE CENTRE.

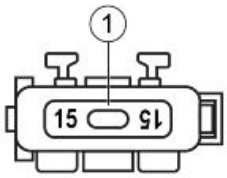
CAUTION

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.



MAIN FUSE

The chart shows the position and specifications of the main fuse in the vehicle.

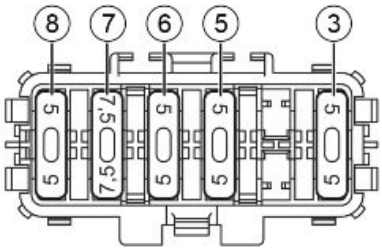


MAIN FUSE TABLE

	Specification	Desc./Quantity
1	Fuse 1	**Capacity:** 15A **Protected circuits:** main. **Ignition switched live:** fuses No. 3, 5, 6, 7 and 8.

SECONDARY FUSES

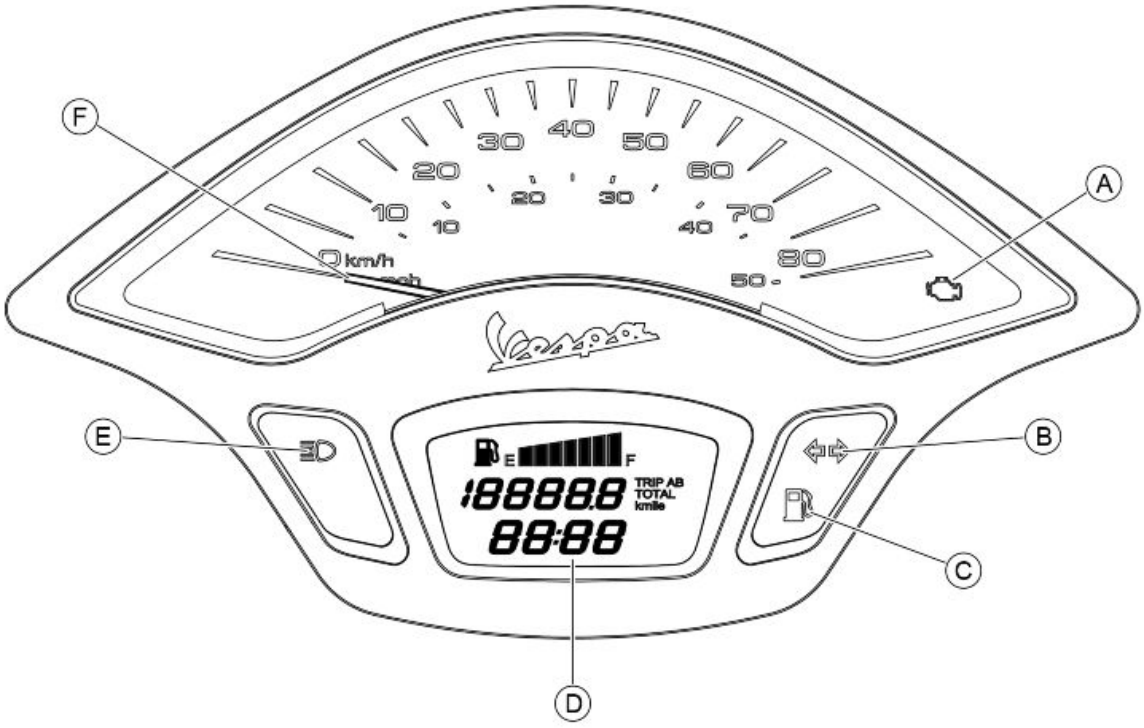
The location and characteristics of the vehicle's 6 secondary fuses are indicated in the table.



SECONDARY FUSES TABLE

	Specification	Desc./Quantity
1	Fuse 3	**Capacity:** 5A **Protected circuits:** battery powered, high beam and low beam lights.
2	Fuse 5	**Capacity:** 5A **Protected circuits:** ignition switched live, USB port, horn, position light, license plate light, accessory fittings, diagnostics socket.
3	Fuse 6	**Capacity:** 5A **Protected circuits:** ignition switched live, instrument panel, signal lights control device, horn, starter relay (coil), brake light.
4	Fuse 7	**Capacity:** 7.5 A **Protected circuits:** battery power supply, engine management control unit.
5	Fuse 8	**Capacity:** 5A **Protected circuits:** battery power supply, instrument panel, accessory fittings, diagnostics socket.

Dashboard



Key:

A = Engine control warning light

B = Turn signal indicator lamp

C = Fuel reserve warning light

D = Digital display

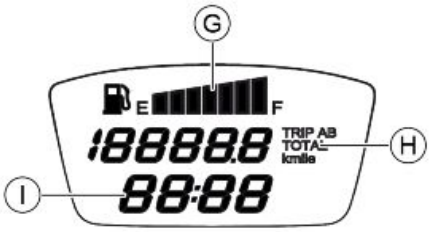
E = High-beam warning light

F= Speedometer

G = Fuel gauge with petrol symbol

H = Total or partial odometer

I = Clock



Sealed battery

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

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

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

INSTRUCTIONS FOR BATTERY REFRESH AFTER OPEN CIRCUIT STORAGE

1) Voltage check

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

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

2) Constant voltage battery charge mode

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

10 - 12 h recommended

Minimum 6 h

Maximum 24 h

3) Constant current battery charge mode

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

Battery installation

Where provided

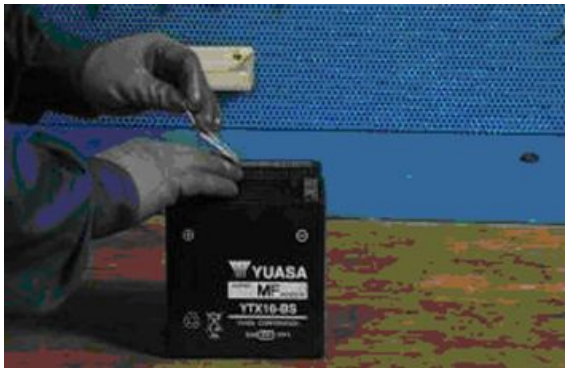
VRLA battery (valve-regulated lead-acid battery) Maintenance Free (MF)

WARNING

BATTERY ELECTROLYTE IS TOXIC AND IT MAY CAUSE SERIOUS BURNS. IT CONTAINS SULPHURIC ACID. AVOID CONTACT WITH EYES, SKIN AND CLOTHING. IF IT ACCIDENTALLY COMES INTO CONTACT WITH YOUR EYES OR SKIN, WASH WITH ABUNDANT WATER FOR APPROX. 15 MIN. AND SEEK IMMEDIATE MEDICAL ATTENTION.
IN THE EVENT OF ACCIDENTAL INGESTION OF THE LIQUID, IMMEDIATELY DRINK LARGE QUANTITIES OF WATER OR MILK. MAGNESIUM MILK, BATTERED EGG OR VEGETABLE OIL. SEEK IMMEDIATE MEDICAL ATTENTION.
BATTERIES PRODUCE EXPLOSIVE GAS; KEEP CLEAR OF NAKED FLAMES, SPARKS OR CIGARETTES; VENTILATE THE AREA WHEN RECHARGING INDOORS.
ALWAYS WEAR EYE PROTECTION WHEN WORKING IN THE PROXIMITY OF BATTERIES.
KEEP OUT OF THE REACH OF CHILDREN.

1) Battery preparation

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



2) Electrolyte preparation.

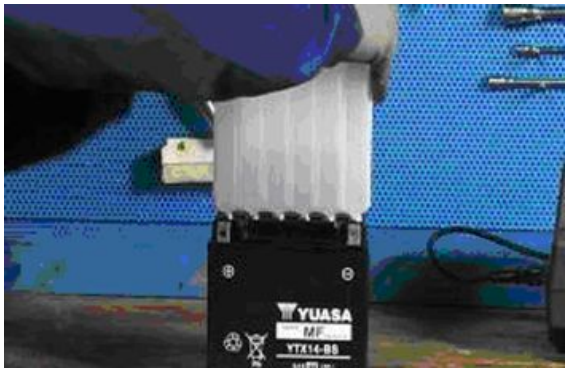
Remove the container of the electrolyte from the pack. Remove and preserve cover strips from the container, in fact, the strip will later be used as a closing cover.

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

3) Procedure for filling the battery with acid.

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

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



4) Control the flow of electrolyte

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

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

5) Take out the container.

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

6) Recharging the new battery

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

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

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

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

b - select NEW on the yellow timer

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

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

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

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

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

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

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

7) Battery closing.

Insert the airtight cover strips into the filling holes.

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

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

The filling process is now complete.

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

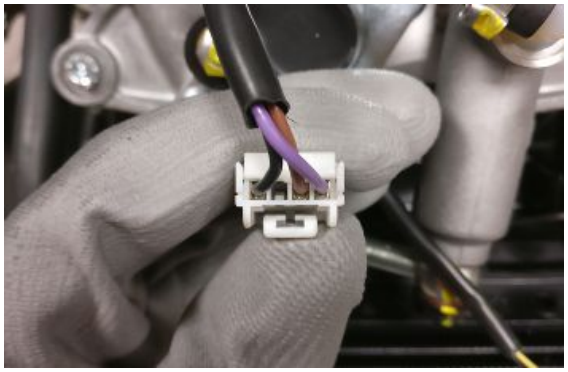
Assembly procedure of the battery on the vehicle.

Connectors

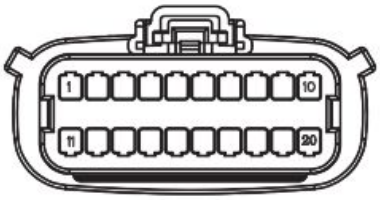
CAUTION

N.B.

THE DIAGRAM SHOWS THE LAYOUT OF THE CONNECTORS VIEWED FROM THE CABLE INLET SIDE, AS INDICATED IN THE EXAMPLE.



INSTRUMENT CLUSTER



1. Not connected

2. MODE button (Green)

3. Left turn indicator warning light (Pink)

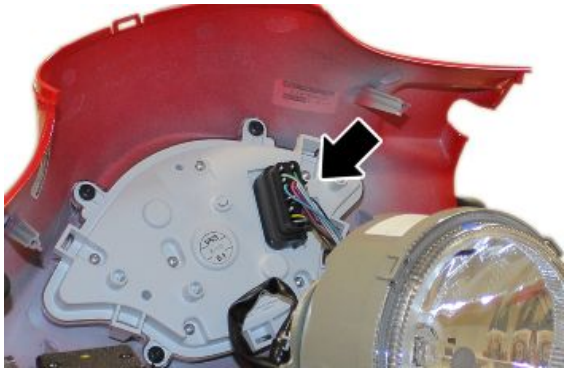
4. Right turn indicator warning light (White-Blue)

5. High beam warning light (Purple)

6. Not connected

7. Not connected

8. Speed sensor negative (Black-Green)



9. Not connected

10. Not connected

11. Not connected

12. Fuel level indicator (White - Green)

13. Not connected

14. Speed sensor signal (Sky blue)

15. Not connected

16. MIL warning light (Brown-Yellow)

17. Ground lead (Black)

18. Not connected

19. Ignition switched live (White)

20. Battery-powered (Grey-Red)

MAGNETO FLYWHEEL

A1. Voltage regulator (Yellow)

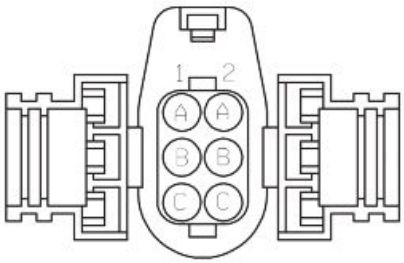
B1. Pick-Up - (Brown)

C1. Voltage regulator (Yellow)

A2. Ignition coil control (Red-Black)

B2. Voltage regulator (Yellow)

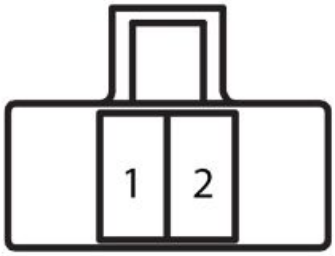
C2. Pickup + (Red)



FUEL LEVEL TRANSMITTER

1. Instrument panel (White-Green)

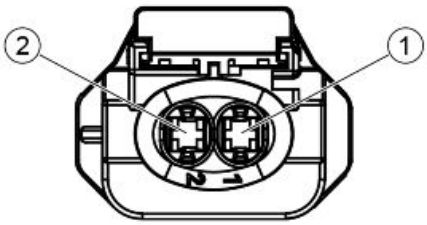
2. Ground lead (Black)



IDLE VALVE

1. Signal (-) from ECU (White-Red)

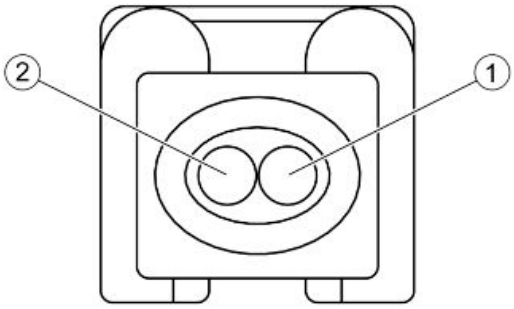
2. Power from control unit (Black-Purple)



ENGINE TEMPERATURE SENSOR

1. Signal for ECU (Orange-Green)

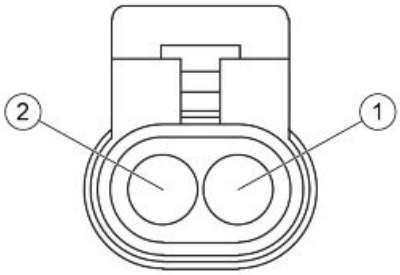
2. Negative from control unit (Grey-Green)

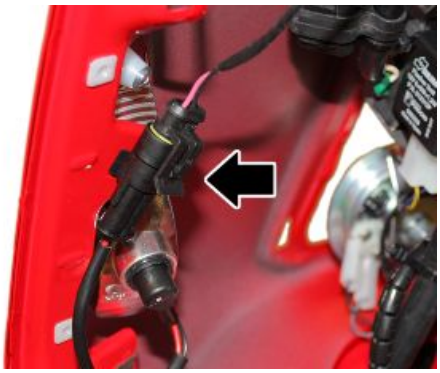


LH FRONT DIRECTION INDICATOR

1. Power supply (Pink)

2. Ground lead (Black)

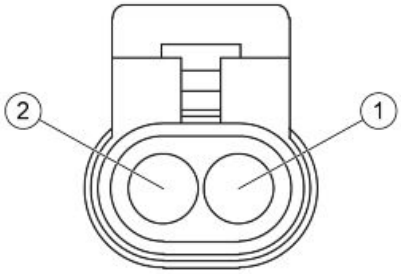




RH FRONT DIRECTION INDICATOR

1. Power supply (White-Blue)

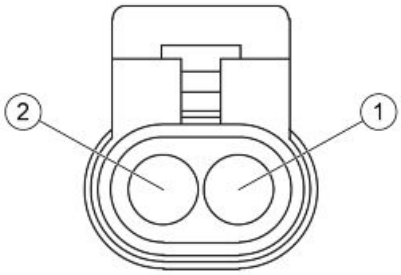
2. Ground lead (Black)



LH REAR DIRECTION INDICATOR

1. Power supply (Red)

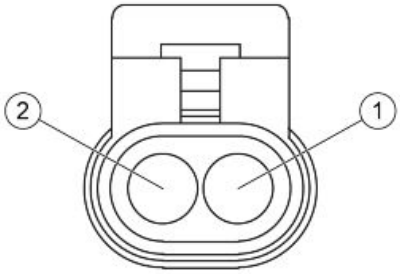
2. Ground lead (Black)



RH REAR DIRECTION INDICATOR

1. Power supply (White-Blue)

2. Ground lead (Black)



LAMBDA PROBE

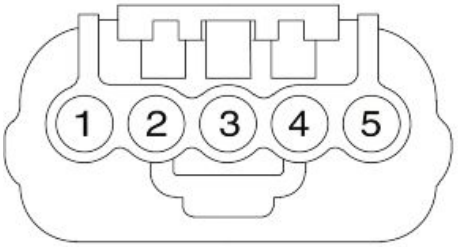
1. Probe signal (Green-Blue)

2. Lambda probe negative from control unit (Grey-Green)

3. Heater supply from control unit (Black-Purple)

4. Heater negative from control unit (White-Blue)

FUEL PUMP



1. Signal (-) from the control unit (Grey-Black)

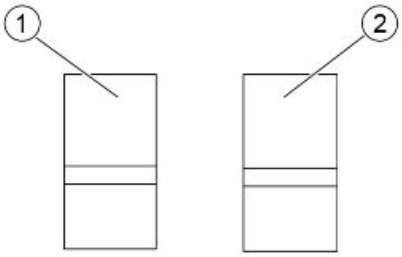
2. Activation from control unit (Black-Purple)

3. Not connected

4. Not connected

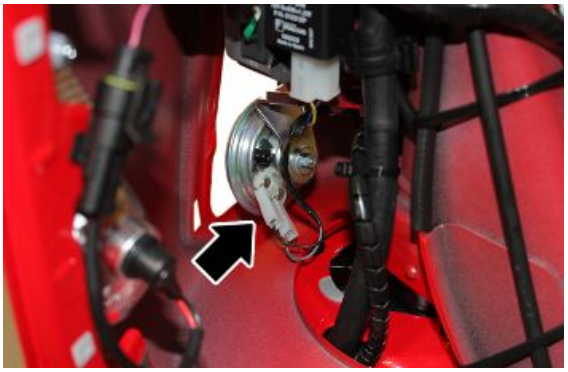
5. Not connected

HORN

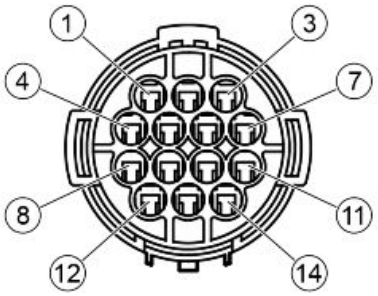


1. Power supply (Grey - Black)

2. Ground lead (Black)



ACCESSORIES PRE-INSTALLATION



1. Ground lead (Black)

2. Fuel level transmitter (White-Green)

3. CAN H line (Pink-Red)

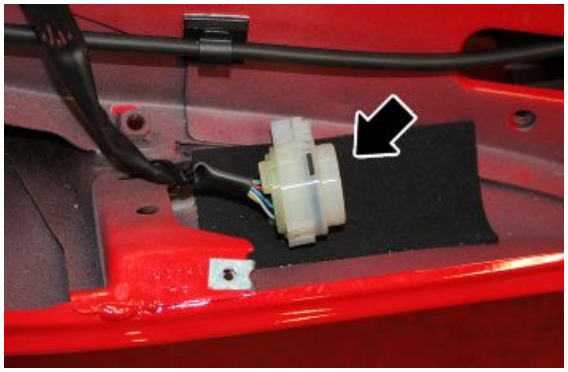
4. CAN L Line (Pink-White)

5. Not connected

6. Not connected

7. Battery-powered (Grey-Red)

8. Ignition switched live (Yellow-Black)



9. Not connected

10. Not connected

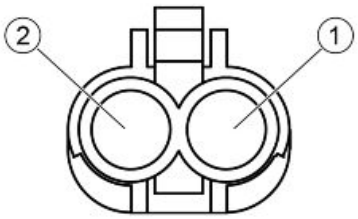
11. Left turn indicators (Pink)

12. Right turn indicators (White-Blue)

13. High-beam light (Purple)

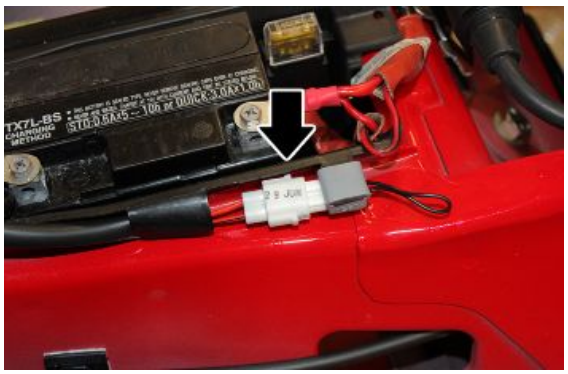
14. Speed sensor (Light blue)

STAND SWITCH



1. Signal for control unit (Brown-Red)

2. Ground lead (Grey-Green)



DIAGNOSTIC PORT

1. Ignition switched live power supply (Yellow-Black)

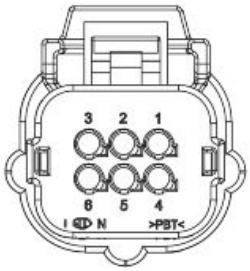
2. CAN H line (Pink-Red)

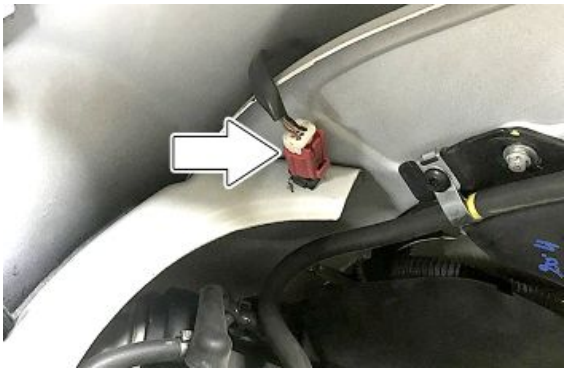
3. Ground lead (Black)

4. Battery power supply (Grey-Red)

5. CAN L Line (Pink-White)

6. Not connected



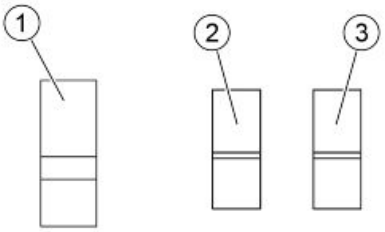


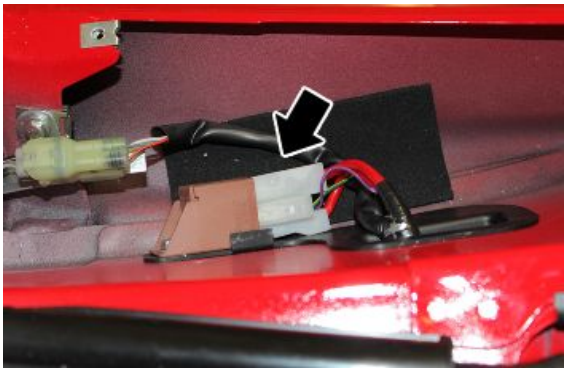
STARTER RELAY

1. Battery/Starter motor (Red)

2. Ignition button signal input (Purple)

3. Signal input from control unit (Green-White)

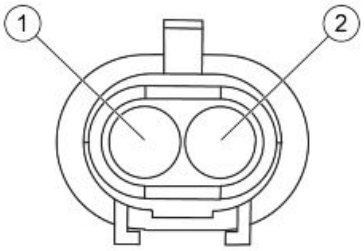


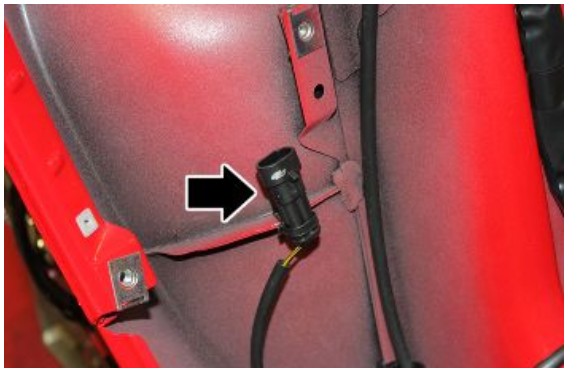


USB PORT

1. Ignition switched live (Yellow-Black)

2. Ground lead (Black)

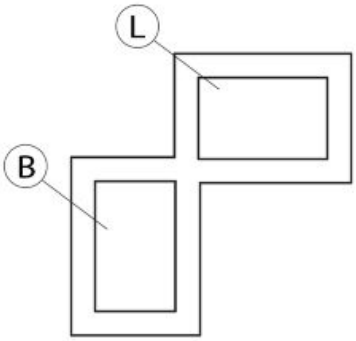




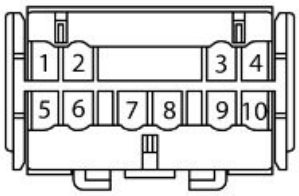
INDICATOR LIGHTS RELAY

B. Ignition switched live (Blue)

L. Turn indicator switch (Blue-Black)



RH COLUMN LIGHT SWITCH



1. Not connected

2. Not connected

3. Starter button (Purple)

4. RH Stop button (White-Black)

5. Not connected

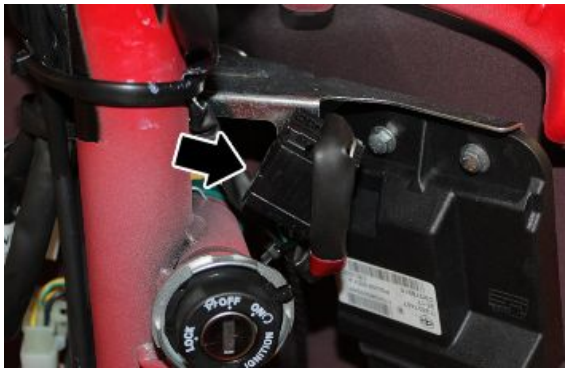
6. Not connected

7. +MODE button (Green)

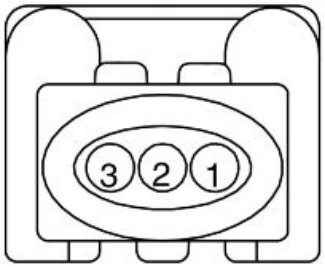
8. -MODE button (Black)

9. Not connected

10. Key-on power supply for the RH STOP button (White)



SPEED SENSOR

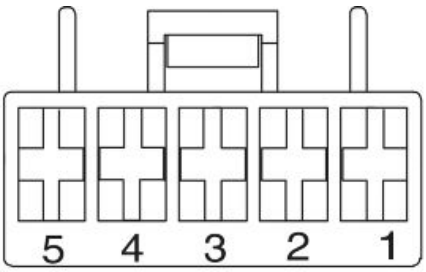


1. Signal (Sky blue)

2. Negative from instrument panel (Black-Green)

3. Shielding (Black)

IGNITION SWITCH



1. Not connected

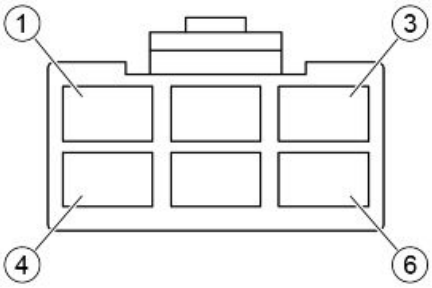
2. Not connected

3. Not connected

4. Battery power supply input (Red - Black)

5. Ignition key-controlled power supply output (Orange)

VOLTAGE REGULATOR



1. Main fuse (Red-Black)

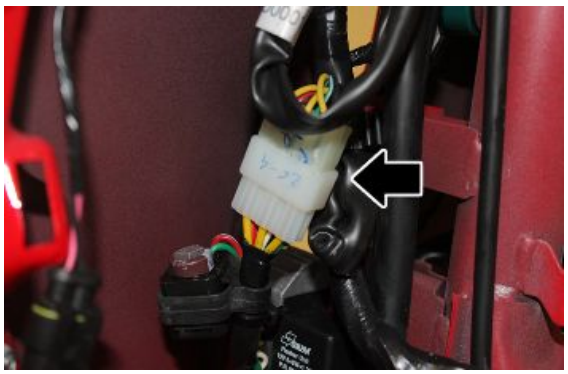
2. Control unit (White-Purple)

3. Ground lead (Black)

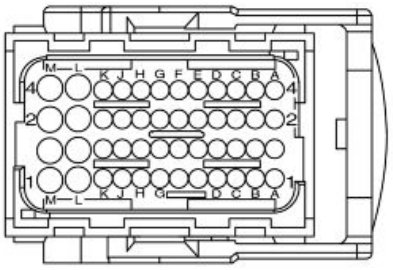
4. Magneto flywheel (Yellow)

5. Magneto flywheel (Yellow)

6. Magneto flywheel (Yellow)



INJECTION ECU



A1. Not connected

A2. Control (-) SAS valve (Pink-Green)

A3. STEPPER 2A (Brown-Black)

A4. STEPPER 2B (Light blue-Red)

B1. Control (-) for starter relay coil (Purple-White)

B2. Not connected

B3. PICK-UP (+) (Red)

B4. STEPPER 1B (Light blue-Black)

C1. Voltage regulator (CTRL) (White-Purple)

C2. Ground reference (Grey-Green)

C3. Not connected

C4. STEPPER 1A (Brown-Pink)

D1. Control (-) lights relay coil (White - Black)

D2. Not connected

D3. Not connected

D4. Not connected

E1:. Not connected

E2. Air temperature sensor (Green-Grey)

E3. Engine temperature (Orange-Green)

E4. Not connected

F1. Not connected

F2. Control (-) MIL warning lamp (Brown-Yellow)

F3. Lambda probe (+) (Green-Blue)

F4. Signal input from the stand button (Brown-Red)

G1. Signal from TPMS (Orange-White)

G2. Not connected

G3. Not connected

G4. PICK-UP (-) (Brown)

H1. Not connected

H2. MAP Sensor (Brown-Green)

H3. Not connected

H4. Sensor ground reference (Grey_Green)

J1. Ignition key-controlled power supply (Orange)

J2. Not connected

J3. Not connected

J4. Power ground (Black)

K1. Sensors reference power supply (Red-Green)

K2. CAN L Line (Pink-White)

K3. CAN H line (Pink-Red)

K4. Control (-) Canister valve (White-Red)

L1. Fuel pump control (Grey-Black)

L2. Control (-) injector (Red-Yellow)

L3. Signal (-) lambda probe heater (White-Blue)

L4. Power ground (Black)

M1. Injection loads power supply (Black-Purple)

M2. Battery power supply (Red-White)

M3. Not connected

M4. Ignition coil control (Pink-Black)

LH LIGHT SWITCH

1. High-beam light (Purple)

2. Low beam light (Brown)

3. Horn (Grey - Black)

4. Key-on power supply (White)

5. Signal from lights relay (Yellow)

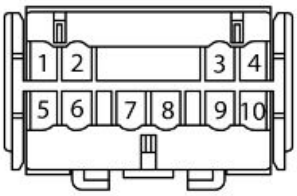
6. Key-on power supply for horn (White)

7. Right turn indicators (White-Blue)

8. Turn indicator switch (Blue-Black)

9. Left turn indicators (Pink)

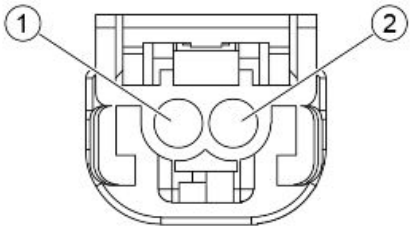
10. LH Stop button (White-Black)



INJECTOR

1. Control unit (Red-Yellow)

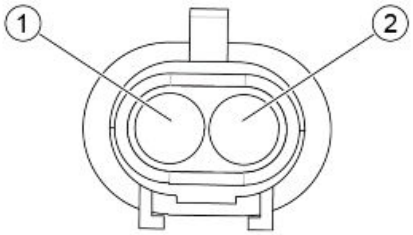
2. Power from control unit (Black - Green)

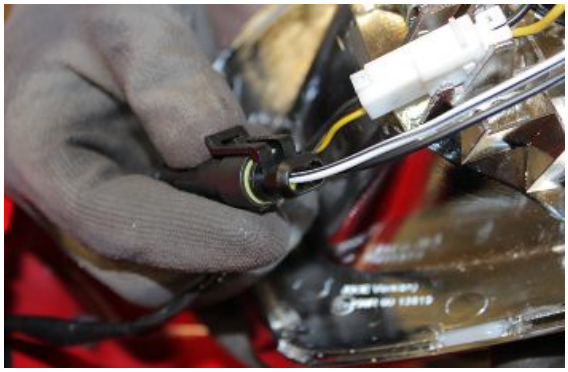


STOP LIGHT

1. Ground lead (Black)

2. Power supply (White - Black)

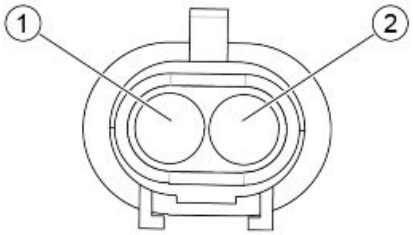


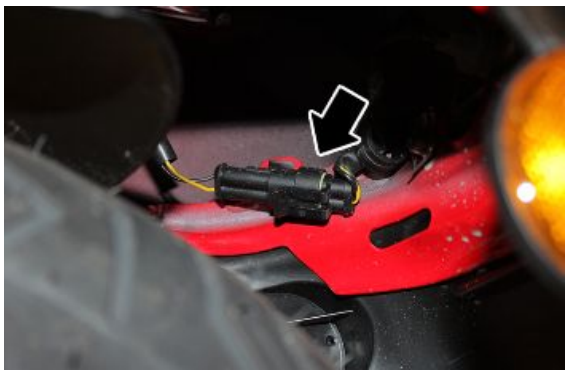


LICENCE PLATE LIGHT

1. Ground lead (Black)

2. Power supply (Yellow-Black)

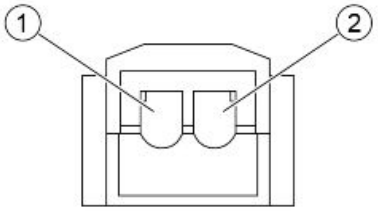




DAYLIGHT RUNNING LIGHT

1. Ground lead (Black)

2. Power supply (Yellow-Black)

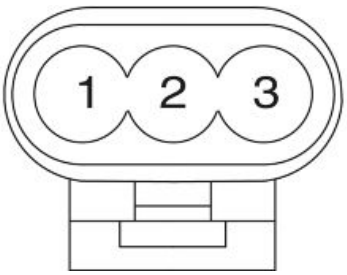


HEADLIGHT

1. Low beam light (Brown)

2. High-beam light (Purple)

3. Ground lead (Black)



FUSE BOX

1. Power supply input F03 (Red - Black)

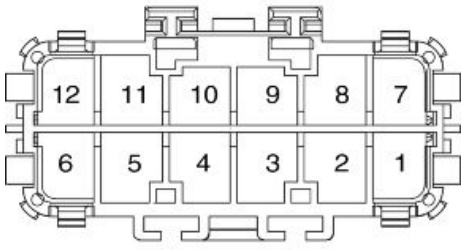
2. Not connected

3. Key-on power supply input F05 (Orange)

4. Key-on power supply input F06 (Orange)

5. Power supply input F07 (Red - Black)

6. Power supply input F08 (Red - Black)



7. Power supply output F03 (Yellow)

8. Not connected

9. Ignition key-controlled power supply output F05 (Yellow-Black)

10. Ignition key-controlled power supply output F06 (White)

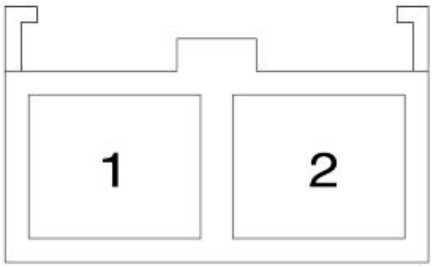
11. Power supply output F07 (Red-White)

12. Power supply output F08 (Grey-Red)

MAIN FUSE

1. Battery power supply input (Red)

2. Battery power supply output (Red-Black)



BATTERY POSITIVE

- Battery positive terminal (Red)

BATTERY NEGATIVE

- Battery negative terminal (Black)

FRAME GROUND

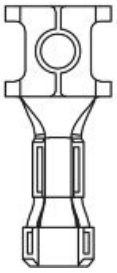
- Frame ground point (Black)

CHASSIS-ENGINE GROUND

- Engine/frame ground point (Black)

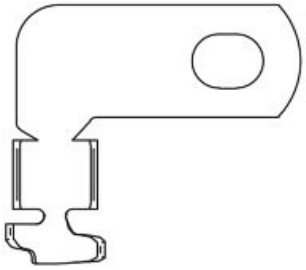
STARTER MOTOR POSITIVE

- Starter motor positive (Red)



STARTER MOTOR NEGATIVE

- Starter motor negative (Black)



STEPPER MOTOR

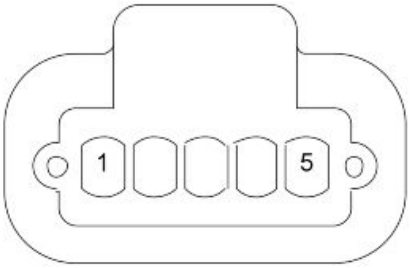
1. Signal 1B (Light blue-Black)

2. Signal 2B (Light blue-Red)

3. Not connected

4. Signal 2A (Brown-Black)

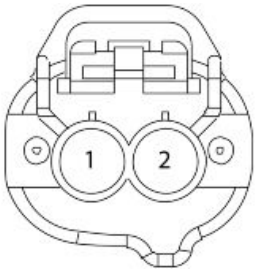
5. Signal 1A (Brown-Red)



SAS. VALVE.

1. Control (-) from control unit (Pink-Green)

2. Power from control unit (Black-Purple)



THROTTLE BODY

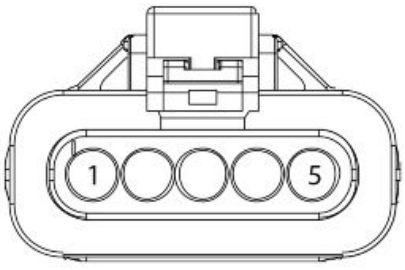
1. Ground lead (Black)

2. Air temperature sensor (Green-Grey)

3. MAP sensor signal (Brown-Green)

4. TP Signal (Orange-White)

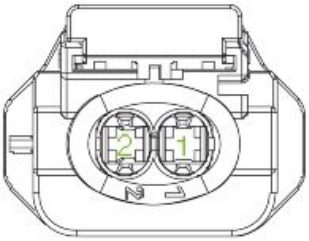
5. Power supply (Red-Green)



CANISTER VALVE

1. Signal output for injection control unit (White-Pink)

2. Power supply from injection loads (Black-Purple)



Diagnostic instrument

ERROR CODES

P-Code	Description
P0031	Low heater lambda probe voltage - Short circuit. Gnd, Open circuit.
P0032	High heater lambda probe voltage - Short circuit. Vbatt
P0072	Low ambient temperature sensor voltage - Short circuit. Ground
P0073	High ambient temperature sensor voltage - Short circuit. Vref, Open circuit.
P0107	Low air pressure sensor voltage - Short circuit. Gnd, Open circuit.
P0108	High air pressure sensor voltage - Short circuit. Vbatt
P0117	Low engine temperature sensor voltage - Short circuit. Ground
P0118	High engine temperature sensor voltage - Short circuit. Vbatt, Open circuit.
P0121	TPS sensor voltage input out of range
P0122	Low TPS sensor voltage - Short circuit. Gnd, Open circuit.
P0123	High TPS sensor voltage - Short circuit. Vbatt
P0132	High lambda probe voltage - Short circuit. Vbatt
P0134	Lambda probe - Signal not plausible
P0171	Probe locked on lean mixture
P0172	Probe locked on rich mixture - Lambda check disabled
P0231	Low fuel pump voltage - Short circuit. Gnd, Open circuit.
P0232	High fuel pump voltage - Short circuit. Vbatt
P0261	Low injector voltage - Short circuit. Gnd, Open circuit.
P0262	High injector voltage - short circuit. Vbatt or lambda probe in Open Loop
P0301	ECU no spark plug ignition
P0336	Crankshaft position sensor - signal not plausible
P0337	Crankshaft position sensor - signal low or short circuit. Ground
P0338	Crankshaft position sensor - Open circuit
P034A	Crankshaft phase error (signal not plausible)-new synchronisation
P0351	Coil: Open circuit - charging the condenser disabled for 5 sec
P0413	Secondary air valve - short circuit to ground, open circuit
P0414	Secondary air valve - short circuit to Vbatt
P0444	Exhaust valve control - Short circuit. Gnd, Open circuit.
P0445	Exhaust valve control - Short circuit. Vbatt
P0501	Vehicle speed sensor - Value not plausible
P0508	Low stepper voltage - Short circuit. Gnd, Open circuit.
P0509	High stepper voltage - Short circuit. Vbatt
P0511	Stepper motor - open circuit
P0513	Immobilizer - Unknown transponder
P0519	Stepper motor operation not correct - malfunction
P0562	Low power supply
P0563	High power supply
P0601	Checksum Data table not valid and start not possible
P0616	Injection loads relay - Short circuit. Gnd, Open circuit.
P0617	Injection loads relay - Short circuit. Vbatt
P0691	Electric fan - short circuit to ground, open circuit
P0692	Electric fan - short circuit to Vbatt
P06A6	Reference voltage out of range, Signal not plausible
P06B8	Eeprom zone Data not valid - restoring the default values
P0851	Side stand sensor - short circuit to ground
P0852	Side stand sensor - short circuit to Vbatt, open circuit
P0A7B	Power supply MIL warning light control module - No battery
P1003	Throttle body dirty - Signal too high
P1176	TPS setting (MAX) - not performed
P1350	ECU low temperature - below the threshold
P1562	ECU voltage - over the threshold
P1563	ECU voltage - below the threshold
P16B0	SBC device - Functional error
P2176	TPS setting (MIN) - not performed
P2195	Probe locked on lean mixture
P2196	Probe locked on rich mixture - Lambda check disabled
P2500	Battery recharge warning light - short circuit to ground, open circuit
P2501	Battery recharge warning light - short circuit to Vbatt
P2534	Low RUN-STOP input voltage - Short circuit. Ground
P2535	High RUN-STOP input voltage - Short circuit. Vbatt, Open circuit.
P263A	Low MIL warning light voltage - Short circuit. Gnd, Open circuit.

P-Code	Description
P263B	High MIL warning light voltage - Short circuit. Vbatt
C0061	Tilt sensor - Data not valid
B15D3	ASR switch - short circuit to ground
B15D4	ASR switch - short circuit to Vbatt, open circuit
B1623	ASR warning light - short circuit to ground, open circuit
B1624	ASR warning light - short circuit to Vbatt
B2500	Low headlight voltage - Short circuit. Gnd, Open circuit.
B2501	High headlight voltage - Short circuit. Vbatt
U0002	CAN Line fault
U0124	Tilt sensor - communication error
U0426	Immobilizer - Antenna not working or key without the transponder
U1001	SBS device - Communication error

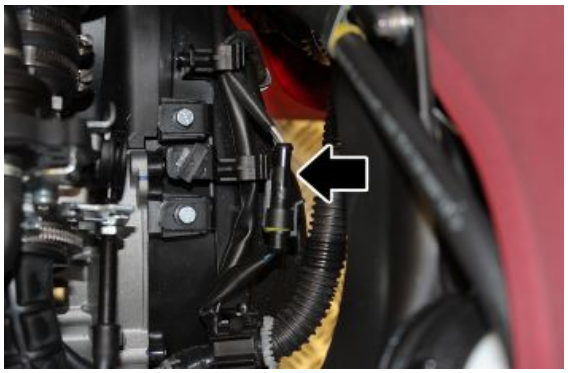
INDEX OF TOPICS

N.B.

THE UNITS OF MEASUREMENT CONTAINED IN THIS CHAPTER ARE EXPRESSED IN TERMS OF THE DECIMAL METRIC SYSTEM. TO REFER TO THE UNIT OF MEASUREMENT EXPRESSED IN TERMS OF THE ANGLO-SAXON SYSTEM, SEE THE "CHARACTERISTICS" CHAPTER.

Exhaust assy. Removal

- Remove the helmet compartment and detach the lambda probe connector from its support.

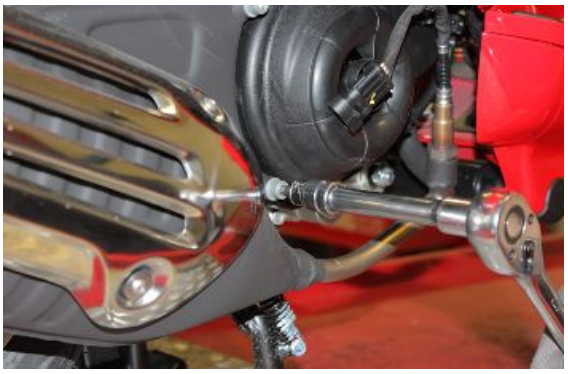


- Disconnect the lambda probe connector.

- Release the probe wiring from the two cable clamps mounted on the cooling hood.

- Remove the 2 fixing nuts from the manifold to the head

- Unscrew the two screws used to fasten the silencer to the case.



- Remove the complete silencer, making sure that the silencer support bracket does not interfere with the cooling hood.

- If necessary, remove the exhaust pipe sealing gasket in order to replace it.

- To remove the heat shield, unscrew the three retaining screws, taking care not to lose the washers.

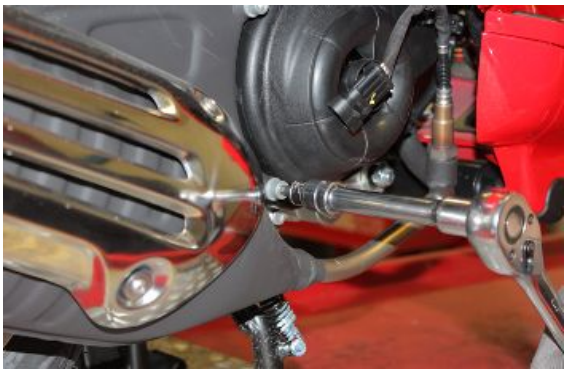
FITTING THE COMPLETE SILENCER

- If removed previously, replace the heat shield on the silencer, tightening the three fastening screws with the respective washers.

- If necessary, replace the exhaust pipe sealing gasket.

Position the complete silencer on the vehicle, making sure that the silencer support bracket does not interfere with the cooling hood.

- Tighten the two screws used to fasten the silencer to the case.

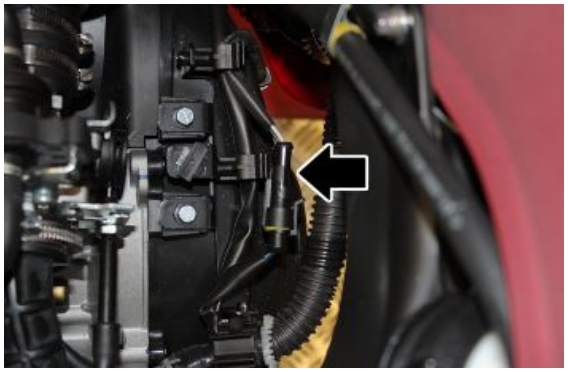


- Tighten the two nuts used to fasten the manifold to the big end.

- Secure the probe wiring to the two cable clamps mounted on the cooling hood.

- Connect the lambda probe connector.

- Secure the lambda probe connector to its support.



Removal of the engine from the vehicle

CAUTION

SUPPORT THE VEHICLE ADEQUATELY.

CAUTION

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

- Disconnect the battery.

- Disconnect the connector from the injector.

- Unscrew the screw used to fasten the fuel pipe support bracket.

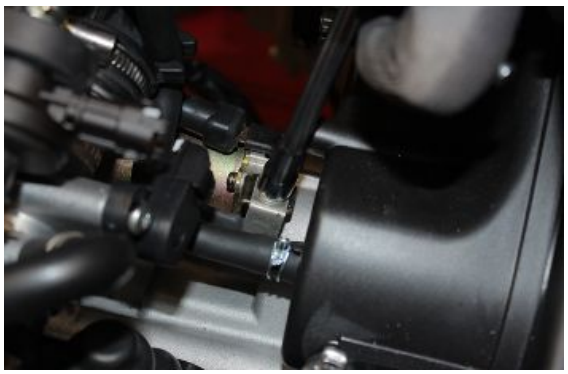
- Slide the fuel pipe retaining spring out, and then disconnect the injector.

- Disconnect the temperature sensor connector.

- Disconnect the Stepper motor connector.

- Disconnect the potentiometer connector.

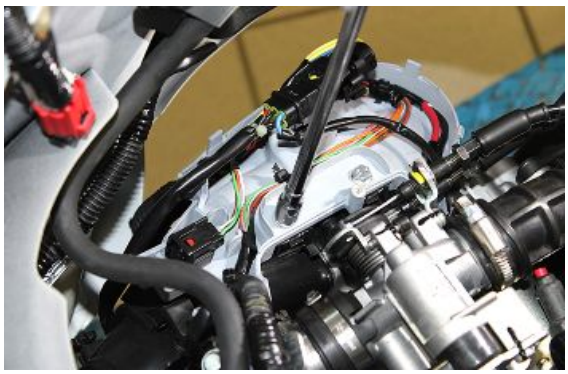
- Unscrew the fastening used to secure the earth point to the starter motor.



- Remove the rubber cover from the positive starter motor connection, then unscrew the fastening.

- Disconnect the flywheel connector.

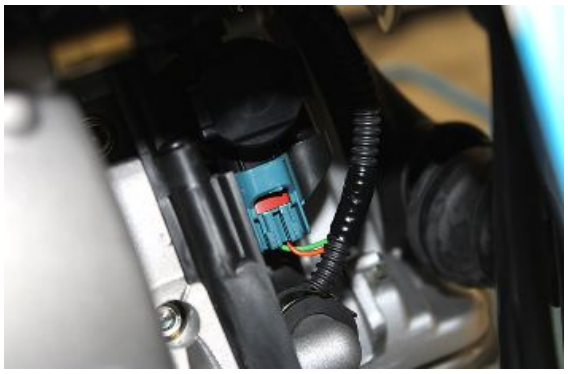
- Remove the flywheel wiring cable fastening.



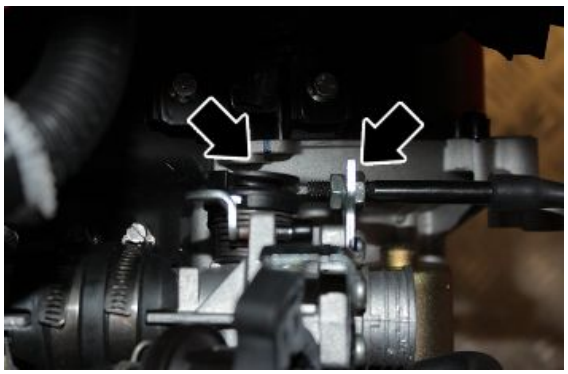
- The electrical wiring is now fully detached and may be extracted from the engine compartment.

- Remove the pipe clamp and disconnect the canister piping from the intake manifold.

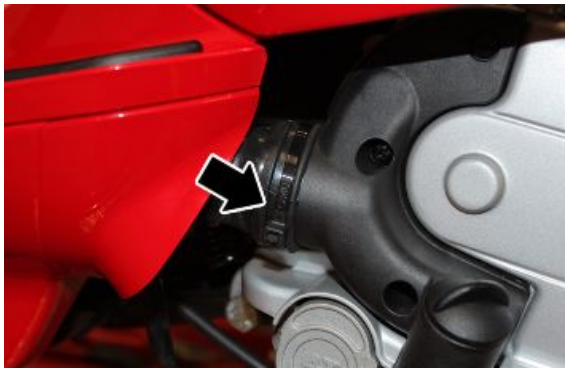
- Disconnect SAS valve connector.



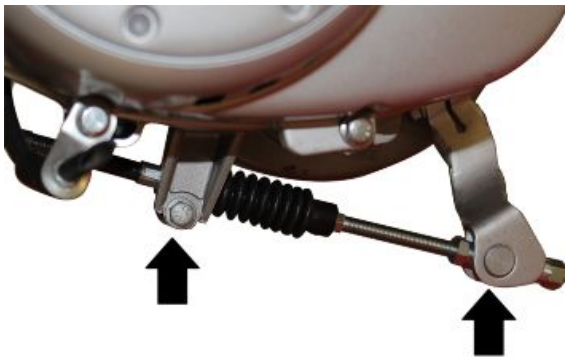
- Disconnect the gas command transmission.

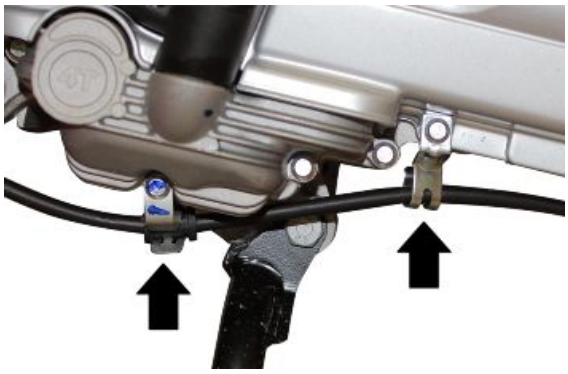


- Cut the clamp indicated and disconnect the air intake pipe.



- Release the rear brake mechanical transmission from the fastenings indicated.





- Block the nut on the right hand side so that it cannot rotate, and then unscrew and extract the swinging arm-engine bolt.

- Unscrew the lower shock absorber fastener on the engine.
- The engine is now free.

Installing engine in vehicle

- Position the engine on the vehicle and tighten the rear shock absorber lower fastening, applying the recommended torque.

Locking torques (N*m)

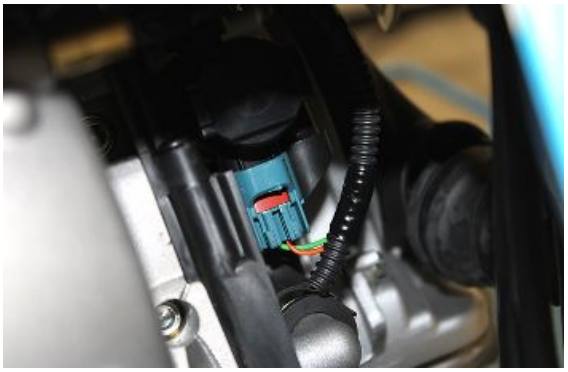
Shock absorber nut-engine **33 to 41 (24.3 to 30.2 lb*ft)**

- Tighten the swinging arm-engine fastening bolt, blocking the nut on the right hand side so that it cannot rotate, and applying the recommended torque.

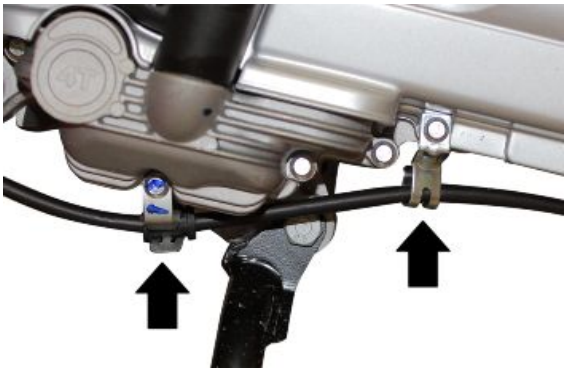
Locking torques (N*m)

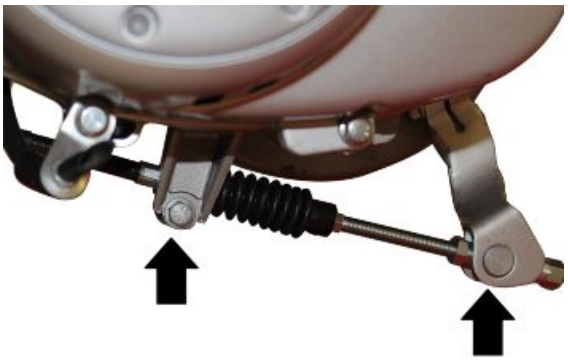
Engine-swinging arm bolt **33 to 41 (24.3 to 30.2 lb*ft)**

- Connect SAS valve connector.

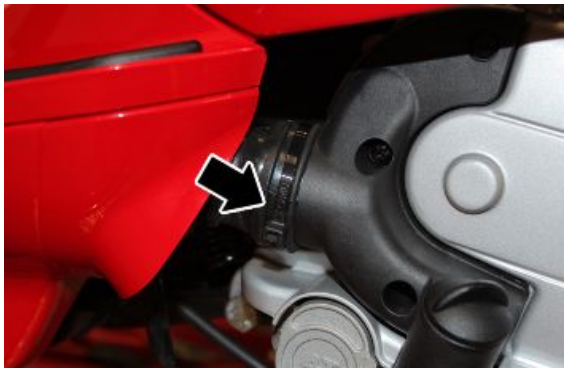


- Secure the rear brake mechanical to the fastenings indicated.



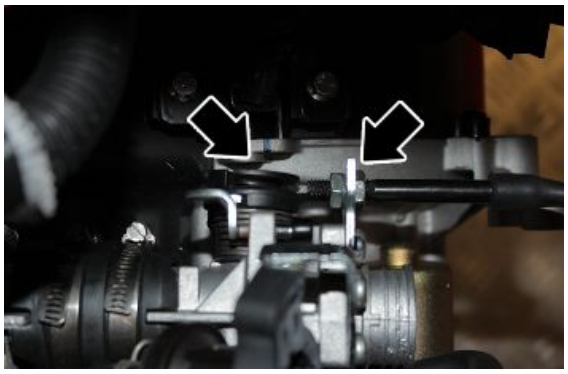


- Connect the air intake pipe and fit a new clamp.



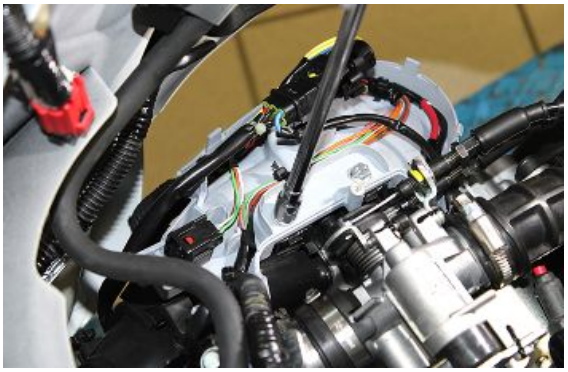
- Connect the canister piping to the intake manifold.
- Insert and tighten a new clamp.

- Connect the gas command transmission.



- Position the electrical wiring harness in the engine compartment.

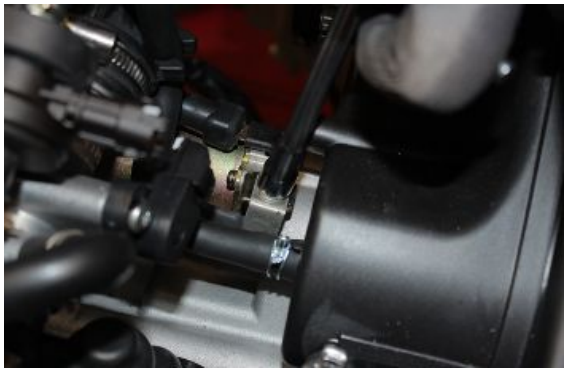
- Secure the flywheel wiring harness as shown in the photo.



- Connect the flywheel connector.

- Tighten the positive starter motor connection fastening, then fit rubber cover on the contact.

- Tighten the fastening used to secure the earth point to the starter motor.



- Connect the potentiometer connector.

- Connect the Stepper motor connector.

- Connect the temperature sensor connector.

- Connect the fuel pipe to the injector, then insert the retaining spring.

- Secure the fuel pipe support bracket as shown in the photo.

- Connect the injector connector.

- Connect the battery.

-Check the engine oil level and if necessary top it up with the recommended type.

- Check accelerator and electric devices for correct functioning.

CAUTION

PAY PARTICULAR ATTENTION TO POSITIONING THE THROTTLE CONTROL TRANSMISSION PROPERLY.

Recommended products

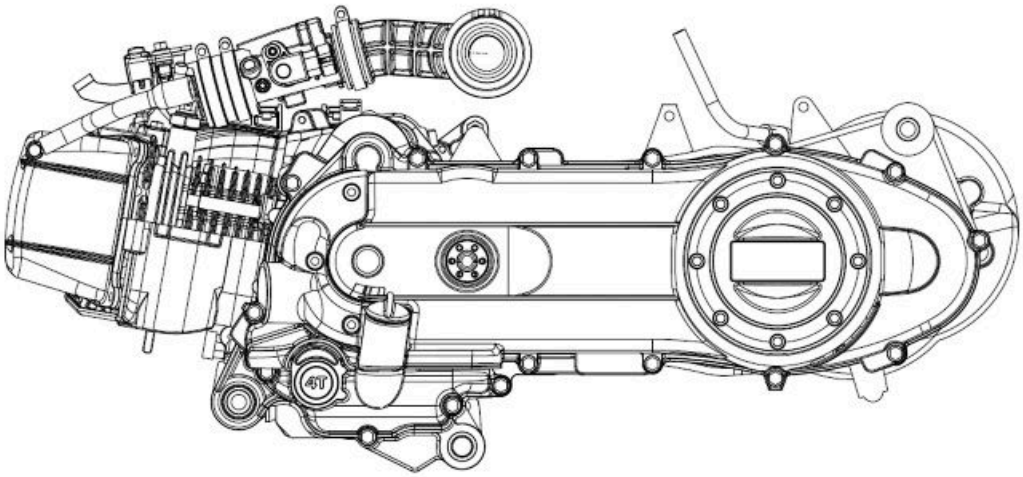
Engine oil 5W -40 Synthetic-based lubricant for four-stroke engines.

SAE 5W-40; JASO MA, MA2; API SL; ACEA A3

INDEX OF TOPICS

ENGINE	ENG

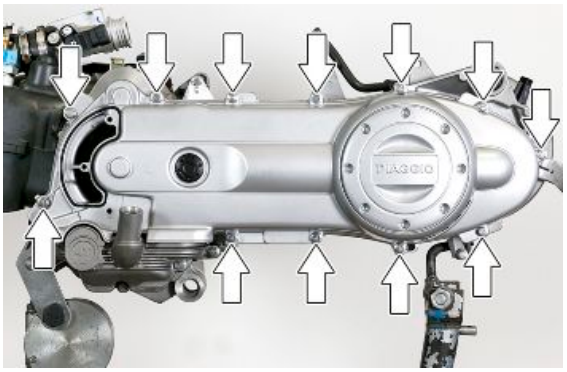
This section describes the operations to be carried out on the engine and the tools to be used.



Automatic transmission

Transmission cover

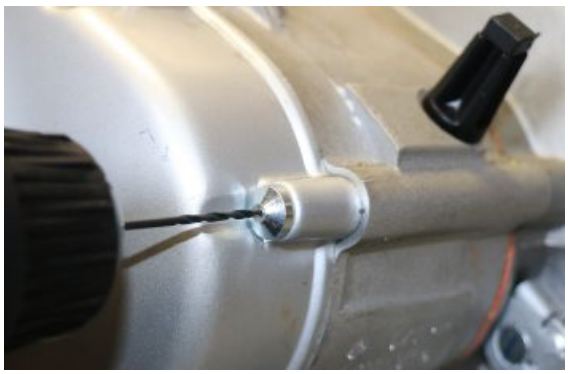
- Remove the air duct.
- Undo the screws fixing the transmission cover to the crankcase.



- there are two anti-tampering screws mounted on the transmission cover, to remove them, proceed as follows.

- Use an engraving burin or a punch to make a small incision in the head of the first screw to be removed.

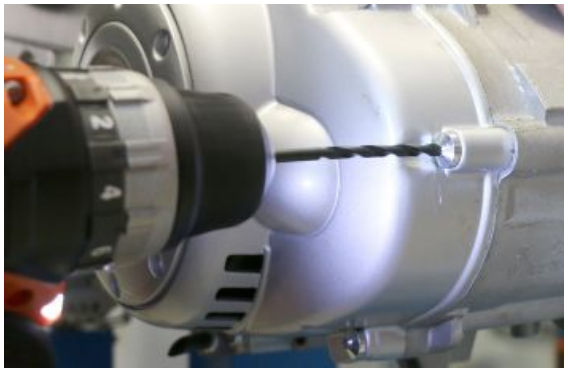
- Using a 2 mm diameter, helical bit for steel, drill a preparatory hole.

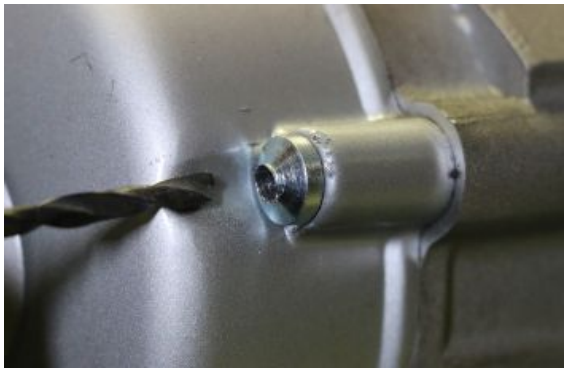


- Complete the hole, without drilling right through cover, using a 5 mm diameter, helical drill bit for steel

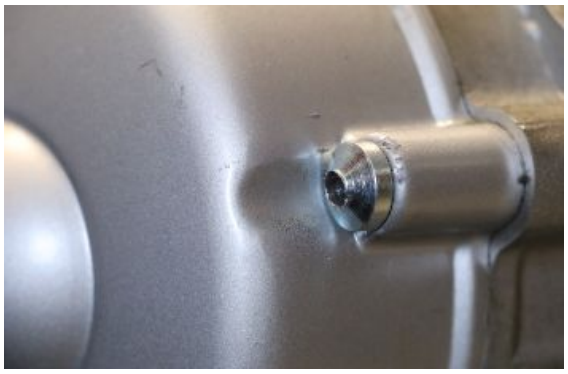
WARNING

WHILE DRILLING WITH THE HELICAL BIT, TAKE CARE NOT TO DAMAGE OR SCRATCH THE CASE.



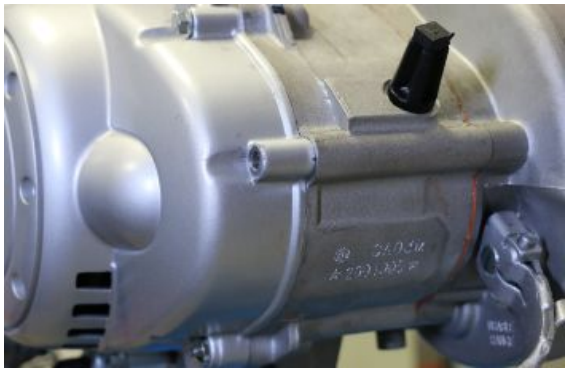


- the depth of the hole must be sufficient to accommodate the tapered left hand tap.



- Use a tapered left hand tap to unscrew the screw.

- Remove the screw.

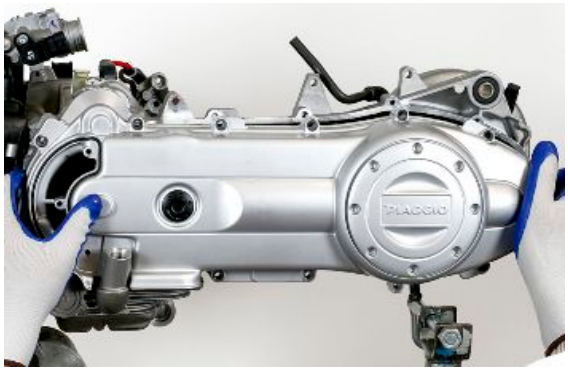


- Next, remove the second screw, followed by the complete transmission cover.

- Remove the transmission cover.

N.B.

USE A MALLET ON THE APPROPRIATE COUPLINGS TO REMOVE THE COVER.



Air duct

- Undo the engine oil dipstick and remove it.

- Loosen the air duct fixing screws.

- Remove the air duct.

Removing the driven pulley shaft bearing

- Slightly heat the crankshaft from the inside side to avoid damaging the coated surface and use the driven pulley shaft or a pin of the same diameter to remove the bearing.

N.B.

IN CASE OF DIFFICULTY A STANDARD 8MM-INSIDE DIAMETER EXTRACTOR CAN BE USED.

Refitting the driven pulley shaft bearing

Refit the bearing with the aid of a bushing with the same diameter as the external plate of the bearing after slightly heating the crankcase from the inside.

N.B.

WHEN REFITTING, ALWAYS REPLACE THE BEARING WITH A NEW ONE.

CAUTION

WHEN REMOVING/REFITTING THE BEARING, TAKE CARE NOT TO DAMAGE THE COVER PAINTED SURFACE.

Removing the driven pulley

- Remove the transmission cover.
- Lock the clutch housing using the specific tool and undo the driven pulley shaft lock nut.

Specific tooling

020565Y Flywheel lock calliper spanner

- Recover the flanged nut fixing the clutch housing on the driven pulley shaft.

- Remove the clutch bell.

- Remove the driven pulley assembly releasing the transmission belt.

N.B.

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

Inspecting the clutch drum

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

Characteristic

clutch housing diameter/standard value

Ø 107+0.2 +0 mm

clutch housing diameter/max. value allowed after use

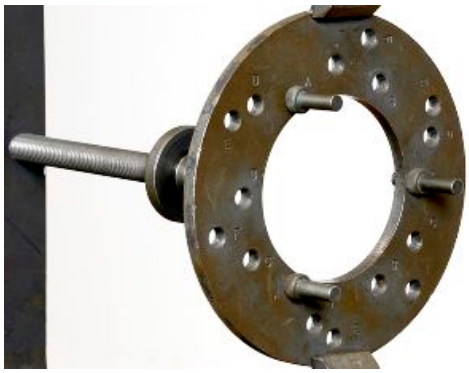
Ø 107.5 mm

Eccentricity measured /max.

0.20 mm

Removing the clutch

- Place the specific tool in a vice.
- Tighten the pins with the long side facing outward on the sprocket marked with the stamped letter «**A**».



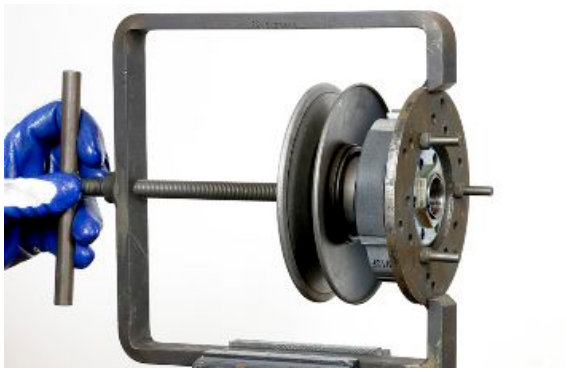
Specific tooling

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

- Insert the driven pulley unit inside the tool and support the central screw by slightly compressing the spring of the pulley unit.

CAUTION

THE TOOL WILL BE DEFORMED IF THE CENTRAL SCREW IS TIGHTENED UP TOO FAR.



- Using a socket wrench, release the clutch fixing ring nut.

- Undo and remove the ring nut.

- Disassemble the driven pulley unit.

Inspecting the clutch

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

N.B.

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

CAUTION

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

Characteristic

Check minimum thickness

1 mm

Pin retaining collar

- Remove the collar with the aid of 2 screwdrivers.

- Remove the three guide pins and the mobile half pulley.

Inspecting the driven fixed half-pulley

- Check that there are no signs of wear on the work surface of the belt. If there are, replace the half-pulley..
- Make sure the bearings do not show signs of unusual wear.
- Measure the outside diameter of the pulley bushing.

Characteristic

Stationary driven half-pulley/Standard diameter

Ø 33.965-33.985 mm

Stationary driven half-pulley / Minimum diameter admitted after use

Ø 33.96 mm

Removing the driven half-pulley bearing

- Remove the roller bearing with the special extractor inserted from the bottom of the fixed half-pulley.

CAUTION

POSITION THE HOLDING EDGE OF THE EXTRACTION PLIERS BETWEEN THE END OF THE BEARING AND THE BUILT IN SEAL RING.

Specific tooling

001467Y029 Bell for 38-mm outside diameter bearings

- Remove the ball bearing retention snap ring.
- Expel the ball bearing from the side of the clutch housing by means of the special tool.

N.B.

PROPERLY SUPPORT THE HALF-PULLEY SO AS NOT TO DEFORM THE SLIDING SURFACE OF THE DRIVE BELT

Specific tooling

020376Y Adaptor handle

020363Y 20-mm guide

Inspecting the driven sliding half-pulley

- Remove the 2 inner sealing rings and the two O-rings.
- Measure the inside diameter of the mobile half-pulley bushing.

Characteristic

Mobile driven half-pulley/ Maximum diameter admissible

Ø 34.08 mm

- Check the belt contact surfaces.
- Insert the new oil seal and O-rings on the mobile half-pulley.
- Fitting the half-pulley on the bushing.

Recommended products

Molybdenum disulphide grease Lithium grease with molybdenum disulphide

Grey black grease.

- Make sure the pins and collar are not worn, refit the pins and the collar.
- Use a greaser with a curved spout to lubricate the driven pulley unit with around 6 g of grease. This operation must be done through one of the holes inside the bushing until grease comes out of the opposite hole. This procedure is necessary to prevent the presence of grease beyond the O-ring.

Recommended products

Molybdenum disulphide grease Lithium grease with molybdenum disulphide

Grey black grease.

Refitting the driven half-pulley bearing

- Fit a new ball bearing with the specific tool.
- Fit the ball bearing retention snap ring.
- Fit the new roller bearing with the wording visible from the outside.

CAUTION

PROPERLY SUPPORT THE HALF-PULLEY TO PREVENT DAMAGE TO THE THREADED END WHILE THE BEARINGS ARE BEING FITTED.

Specific tooling

020376Y Adaptor handle

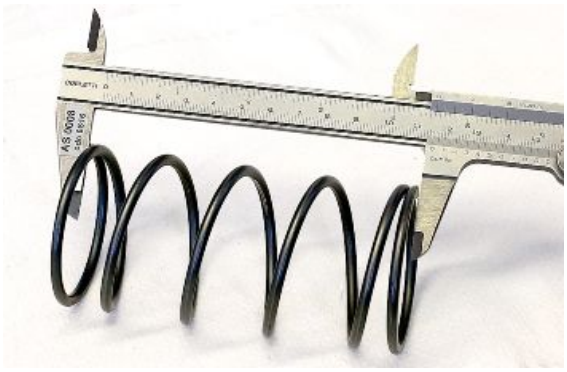
020456Y Ø 24 mm adaptor

020362Y 12 mm guide

020171Y Punch for Ø 17 mm roller bearing

Inspecting the clutch spring

- Check that the contrast spring of the driven pulley does not show signs of deformation
- Measure the free length of the spring



Characteristic

Standard length

120 mm

- Check the thickness of the clutch mass friction material.
-The masses must not show traces of lubricants; otherwise, check the driven pulley unit.

N.B.

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

CAUTION

DO NOT OPEN THE MASSES USING TOOLS SO AS TO PREVENT A VARIATION IN THE RETURN SPRING LOAD.

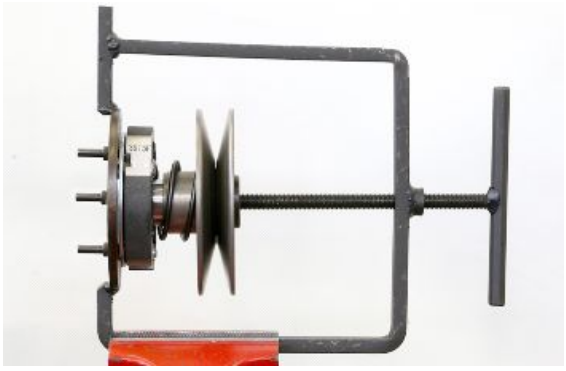
Characteristic

Minimum thickness permitted:

1 mm

Refitting the clutch

- Preassemble the driven pulley group with spring, sheath and clutch.
- Position the spring with the sheath
- Insert the components in the tool and preload the spring being careful not to damage the plastic sheath and the end of the threaded shank.



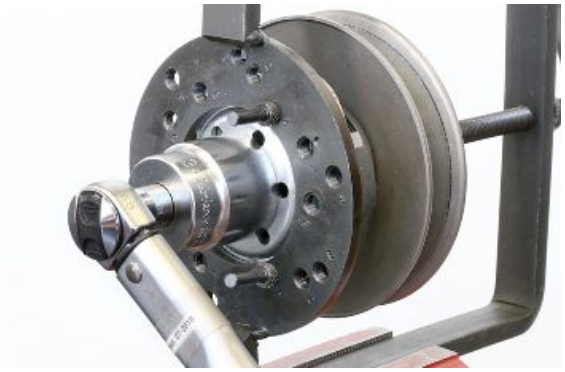
- Reassemble the nut securing the clutch and tighten to the prescribed torque.

CAUTION

SO AS NOT TO DAMAGE THE CLUTCH NUT USE A SOCKET WRENCH WITH SMALL CHAMFER.

CAUTION

POSITION THE NON-CHAMFERED SURFACES OF THE NUT IN CONTACT WITH THE CLUTCH



Locking torques (N*m)

Clutch unit - Driven pulley 55 - 60 Nm

Refitting the driven pulley

- Place the driven pulley assembly together with the transmission belt in its seat.

- Insert the clutch housing.

- Use a new nut fixing the clutch housing on the shaft.

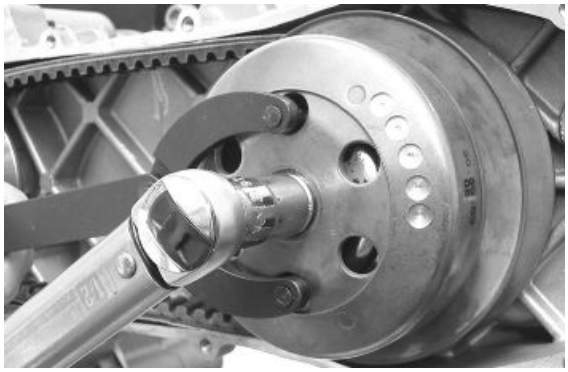
- Using the specific tool, tighten the clutch housing to the prescribed torque.

Specific tooling

020565Y Flywheel lock calliper spanner

Locking torques (N*m)

Clutch housing - Driven pulley shaft 40 - 44 Nm



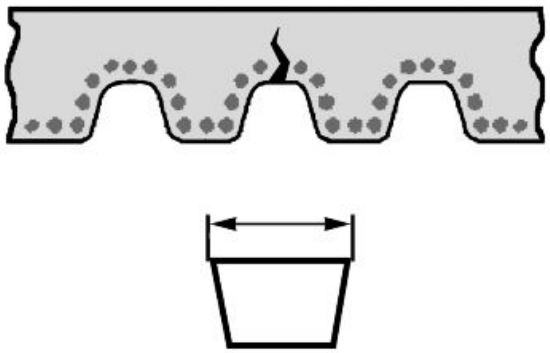
Drive-belt

- Make sure the drive belt is not damaged and does not have cracks in the toothed grooves.
- Check belt for correct width.

Characteristic

Drive belt/Minimum width

17.5 mm

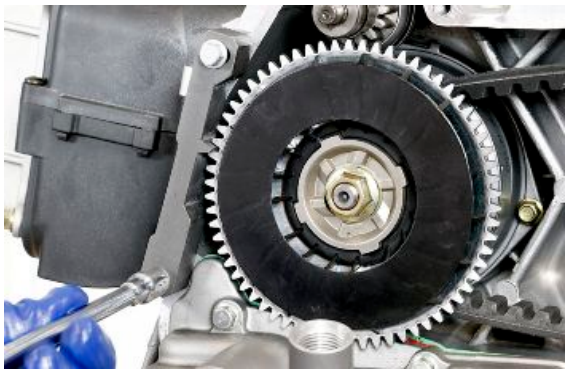


Removing the driving pulley

- Remove the transmission cover.
- Lock the drive pulley using the specific tool.

Specific tooling

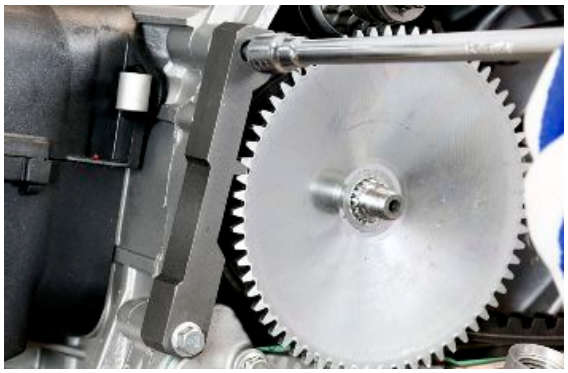
020451Y starting ring gear lock



- Unscrew the fixing nut of the fixed half-pulley.

- Remove the drive and the plastic fan.

- Remove the special tool.



- Remove the stationary half-pulley.

- Remove the bendix after having removed the drive belt.

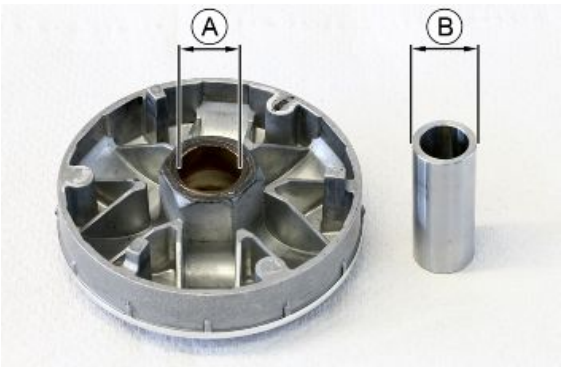
- Remove the movable half-pulley unit complete with rollers, back-plate and spacer free fitted on it.

- Disassemble the movable drive half-pulley unit and proceed with the check of the components.

Inspecting the rollers case

1) Check that the bushing and the sliding rings of the mobile pulley do not show signs of scoring or deformation.
2) Check the roller running tracks on the contact pulley; there must not be signs of wear and check the condition of the contact surface of the belt on the half-pulleys (mobile and stationary).
3) Check that the rollers do not show signs of marked faceting on the sliding surface and that the metallic fit does not come out of the plastic shell borders.
4) Check the integrity of the sliding shoes of the contact plate.

- Check that the internal bushing shown in the figure is not abnormally worn and measure inside diameter «**A**».
- Measure outside diameter «**B**» of the pulley sliding bushing shown in the figure.



CAUTION

DO NOT LUBRICATE OR CLEAN THE BUSHING.

Characteristic

Driving pulley / Maximum diameter:

20.12 mm

Driving pulley/ Standard diameter:

20.021 mm

Driving pulley bushing/ Standard diameter:

20 -0.020/-0.041mm

Refitting the driving pulley

- Manually move the movable driven half-pulley away by pulling it towards the clutch unit and fit the belt observing the direction of rotation of the first fitting.

N.B.

IT IS GOOD PRACTICE ALWAYS TO FIT THE BELT SO THAT THE WORDS CAN BE READ IN CASE IT DOES NOT SHOW A FITTING SIDE.

The weight of the rollers for the various engine versions is indicated in the table below.

DRIVE HALF-PULLEY ROLLERS WEIGHT

Liberty 50cc 3V i.e.	Liberty 50cc ie	Liberty 50cc ie USA
8.5 g	6.4 g	5.3 g

- Refit the components of the assembly (roller housing assembly with bushing, fixed half-pulley, cooling fan with drive, washer and nut).
- With the specific tool, tighten the lock nut to the prescribed torque and then perform a final 90° locking in order to prevent the rotation of the driving pulley.

N.B.

REPLACE THE NUT WITH A NEW ONE AT EVERY REFIT.

CAUTION

UPON FITTING THE DRIVING PULLEY UNIT IT IS OF UTMOST IMPORTANCE THAT THE BELT IS FREE INSIDE IN

ORDER TO AVOID WRONG TIGHTENING AND CONSEQUENTLY DAMAGING THE CRANKSHAFT KNURLING.

Specific tooling

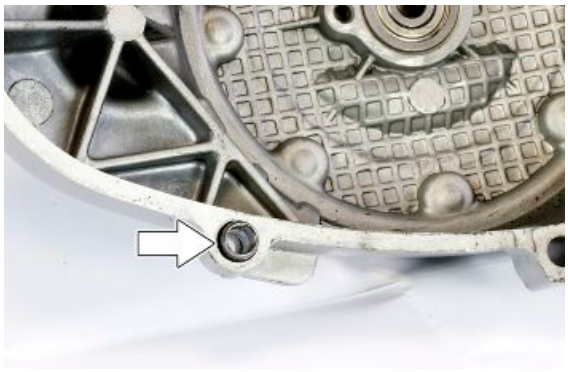
020451Y starting ring gear lock

Locking torques (N*m)

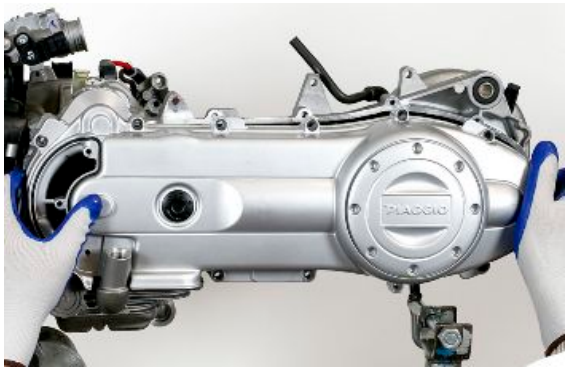
Drive pulley - Crankshaft 18 - 20 Nm + 90°

Refitting the transmission cover

- Make sure the centring dowels are in their seats.



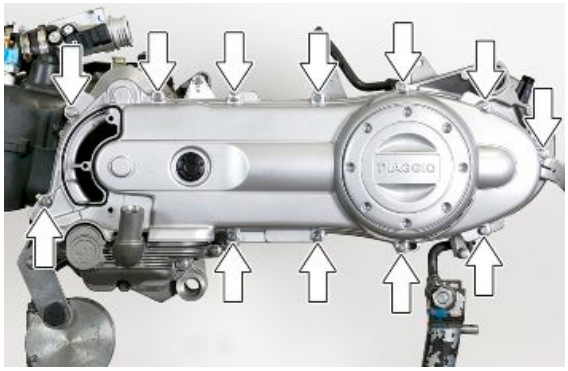
- Place the transmission cover in its seat after having checked the correct fitting of the transmission components.



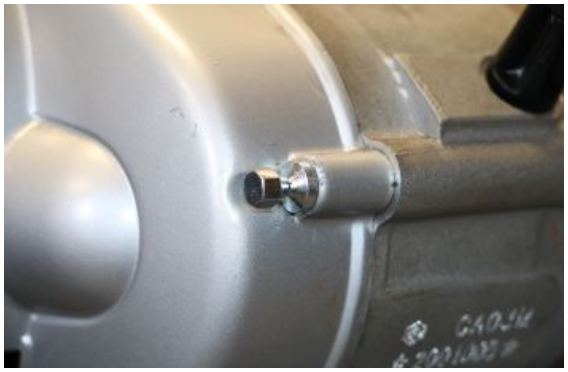
- Tighten the fixing screws of the transmission cover to the prescribed torque.

Locking torques (N*m)

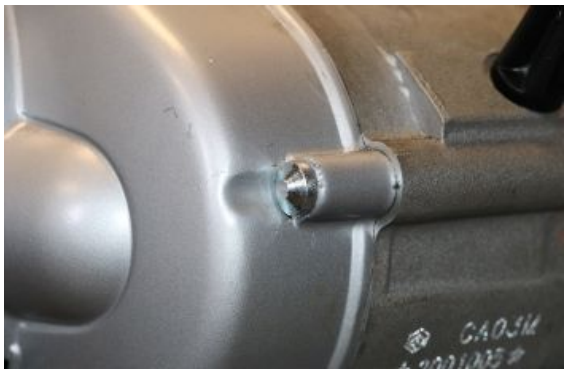
Transmission cover - Crankcase 11 - 13 Nm



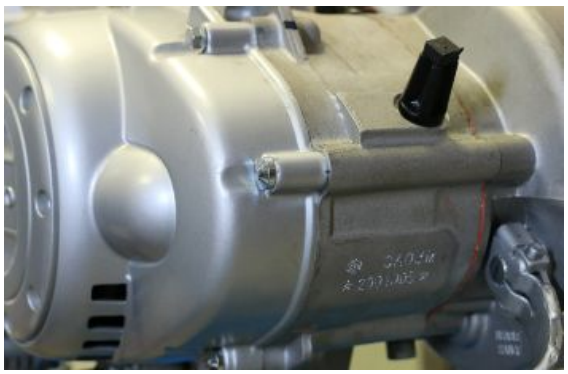
- To insert the anti-tampering screws, proceed as follows.



- using a socket wrench, tighten and lock the first screw until the head is detached.



- Repeat the above procedure for the second anti-tampering screw, thus restoring the vehicle to its original condition and completing the transmission cover mounting procedure.



- Reposition the air duct in its seat.

- Tighten the air duct fixing screws.

- Reposition the engine oil dipstick.

End gear

Removing the hub cover

- Drain the hub oil.
- Release the rear brake shoe retainer springs.

- Remove the rear brake shoes.

- Unscrew the hub cover fixing screws.

- Remove the hub cover.

- Recover the external shim washer on the intermediate gear.

- Remove the wheel axle from its seat.

- Remove the intermediate gear and recover the internal shim washer.

- Acting from the opposite side, remove the driven pulley shaft.

Removing the wheel axle bearings

- Remove the oil seal and the seeger ring.
- Fix the hub cover properly to avoid damaging the sealing surface with the housing
- Remove the wheel axle bearing using the specific tool

Specific tooling

020363Y 20-mm guide

020376Y Adaptor handle

020477Y Adapter 37 mm

Removing the driven pulley shaft bearing

- Removal of the seal ring of the driven pulley shaft on the transmission side.

- Remove the Seeger ring on the reduction gear unit side.

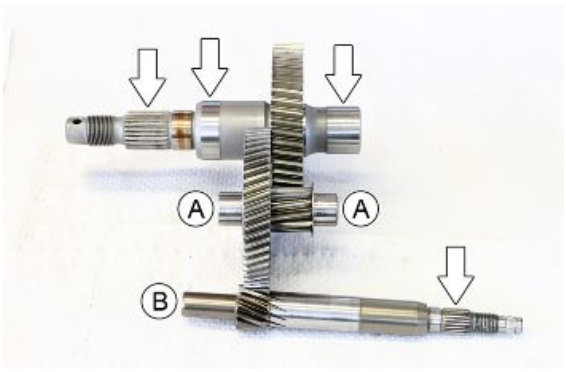
- Heat the bearing's seat of the driven pulley shaft using the specific tool.
- Remove the bearing.

Specific tooling

020151Y Air heater

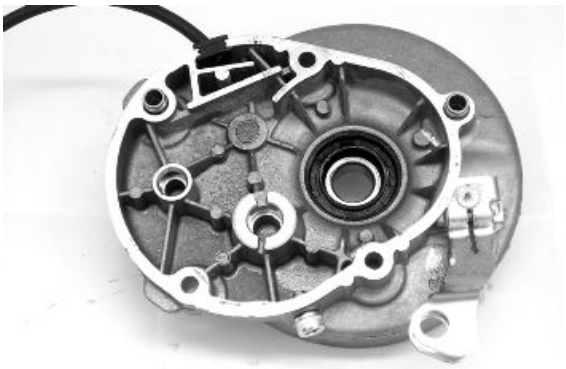
Inspecting the hub shaft

- Check the three shafts for wear or distortion of the toothed surfaces, the bearing housings, and the oil seal housings.
- If faults are found, replace the damaged components.
- Check capacity (A) of the transmission gear (wear, deformations, etc.)
- Check the pulley shaft seating: Superficial wear (B) may indicate irregularities in the crankcase seats or in the pulley shaft capacities



Inspecting the hub cover

- Check that the fitting surface is not dented or distorted.
- If faults are found, replace the hub cover.



Refitting the wheel axle bearing

- Support the hub cover on a wooden surface
- Heat up the hub cover using the thermal gun.
- Preassemble the bearing on the specific punch using grease and then insert the bearing in its seating
- Refit the seeger ring and the oil seal using the 42 x 47 mm adaptor

N.B.

POSITION THE OIL SEAL WITH THE SEALING LIP FACING THE HUB INTERNAL SIDE

Specific tooling

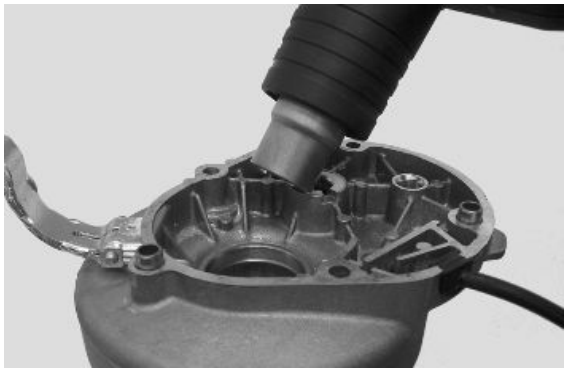
020150Y Air heater mounting

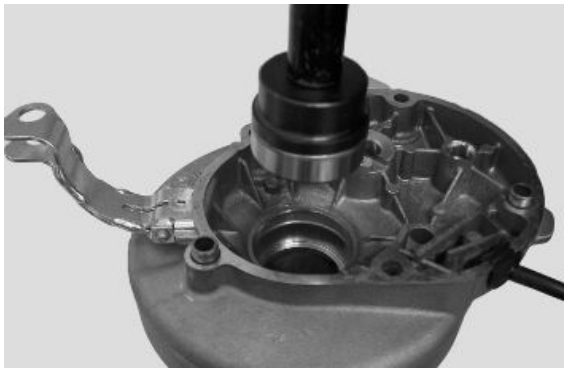
020151Y Air heater

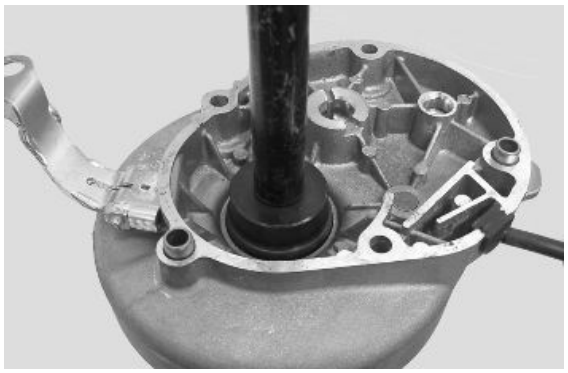
020376Y Adaptor handle

020363Y 20-mm guide

020359Y 42 x 47 mm Adaptor







Refitting the hub bearings

- Remove the wheel axle on the cover and pay attention not to damage the sealing lip of the oil seal
- Apply a thin layer of grease on the two shim washers of the intermediate gear and fit one on the cap so that it does not interfere with the wheel axle gear when placing the transmission shaft

Refitting the ub cover

- Apply product recommended for surfaces on the hub cap and refit cap on the crankcase.
- Tighten the screws to the prescribed torque.

N.B.

CLEAN THE CONTACT SURFACES OF THE HUB COVER AND THE HALF CRANKCASE OF RESIDUE FROM PREVIOUS GASKETS BEFORE APPLYING A NEW ONE.

Recommended products

Loctite 510 Medium-strength paste sealant.

Pink

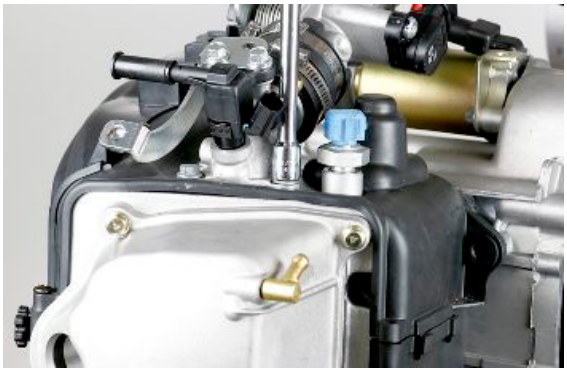
Locking torques (N*m)

Hub cover - Crankcase **24 - 26 Nm**

Flywheel cover

Cooling hood

- Loosen the admission joints fixing screws.

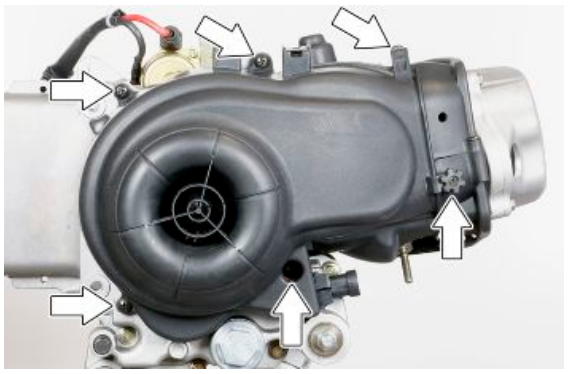


- Remove the admission joints complete with throttle body.

- Undo the engine temperature sensor.

- Remove the engine temperature sensor.

- Undo the cooling fan cover fixing screws.



- Remove the cooling fan cover.

- Unscrew the fixing screws of the intake side cover.

- Remove the intake side upper cover.

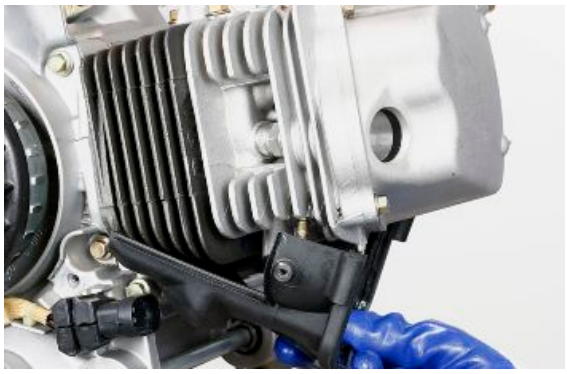
- Remove the exhaust side lower cover.
- To refit, proceed in reverse order.

N.B.

WHEN REFITTING THE COVER, TAKE CARE NOT TO DAMAGE THE STATOR WIRING.

CAUTION

TAKE CARE TO CORRECTLY POSITION THE FLYWHEEL CONNECTOR.

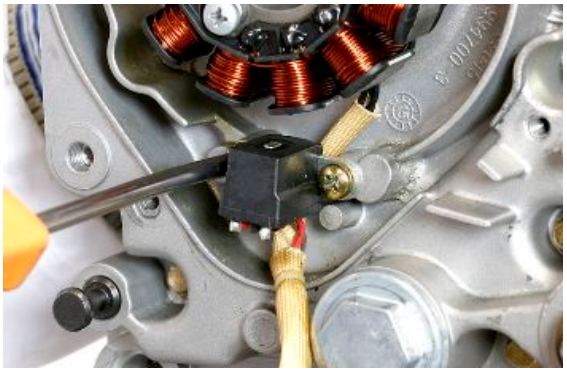


Cooling fan

- Remove the cooling fan by undoing the 3 screws fixing it to the rotor
- When refitting the fan, pay attention that the screw holes in the fan and the rotor coincide, then tighten screws at the specified torque.

Removing the stator

- Remove the magneto flywheel.
- Undo the fixing screws of the pick-up lock plate.



- Undo the screws fixing stator to the crankcase.

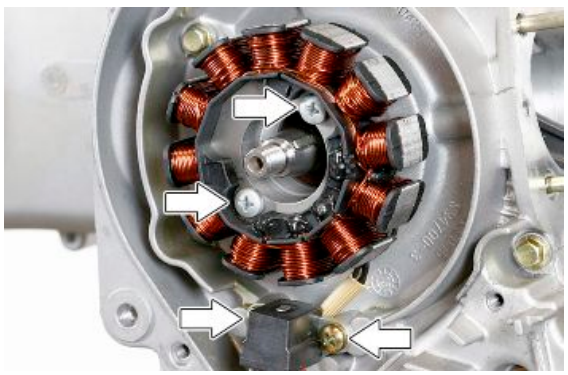
- Remove the stator.

Refitting the stator

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

N.B.

THE PICK-UP CABLE MUST BE POSITIONED ADHERING TO THE FUSION TONGUE ON THE CRANKSHAFT IN SUCH A WAY AS TO AVOID BEING CRUSHED BY THE FAN COVER ASSEMBLY.



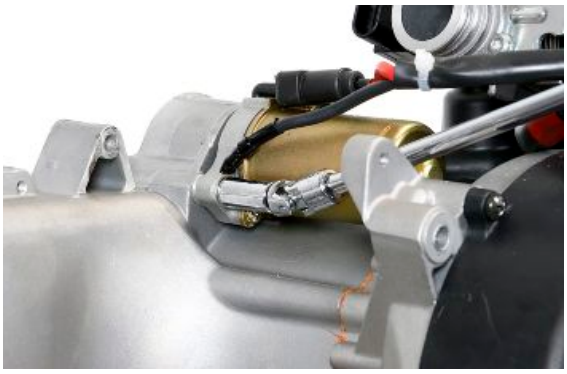
Locking torques (N*m)

Pick-up - Crankcase 3 - 4 Nm **Stator - Crankcase** 3 - 4 Nm

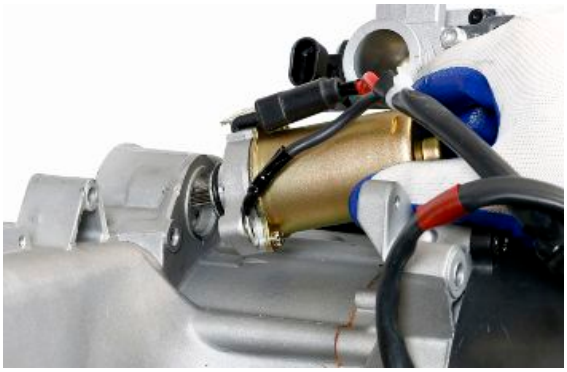
Flywheel and starting

Removing the starter motor

- Undo the screws fixing the starter motor to the crankcase.



- Remove the starter motor.



Removing the flywheel magneto

- Lock the rotation of the flywheel using the calliper spanner.
- Remove the nut.

CAUTION

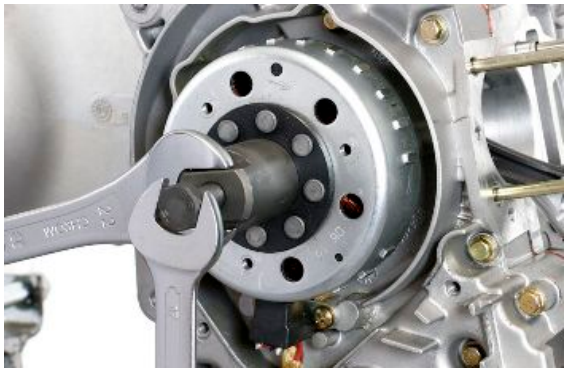
USING A CALLIPER SPANNER OTHER THAN THE ONE SUPPLIED COULD DAMAGE THE STATOR COILS.

- Extract the flywheel with the extractor.

Specific tooling

020565Y Flywheel lock calliper spanner

020162Y Flywheel extractor



Inspecting the flywheel components

- Check that the flywheel internal magnets are in good conditions.
- Check that the flywheel splines exhibit no loosening.
- Check there are no deformations that may cause rubbing on the stator and the Pick-Up.
- Check that the stator winding, its ferromagnetic support and the pick-up are in good conditions.

Starter gear rim

- Check the toothing is level and in good conditions

Intermediate gear

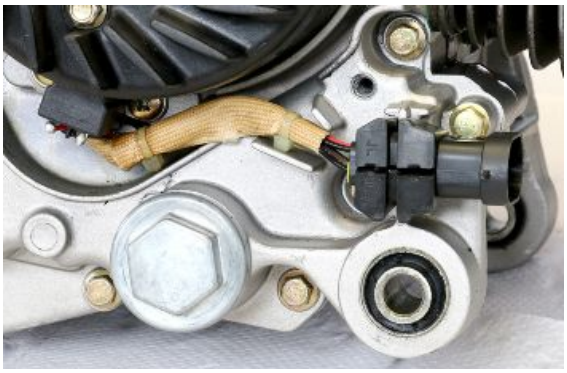
- Check that the keying toothing on the crown and the starter motor are in good conditions.
- Check that the Bendix opens and returns adequately.

Refitting the flywheel magneto

- Refit the stator and the pick-up being careful to pass the wiring through the appropriate crankcase couplings.
- Refit the flywheel to the crankshaft being careful to respect the keying, then lock rotation with the specific tool and tighten the nut to the prescribed torque.

N.B.

A VARIATION OF THE AIR GAP DISTANCE CAN LEAD TO A VARIATION IN THE IGNITION ADVANCE SUCH AS TO CAUSE PINGING, KNOCKING ETC



Specific tooling

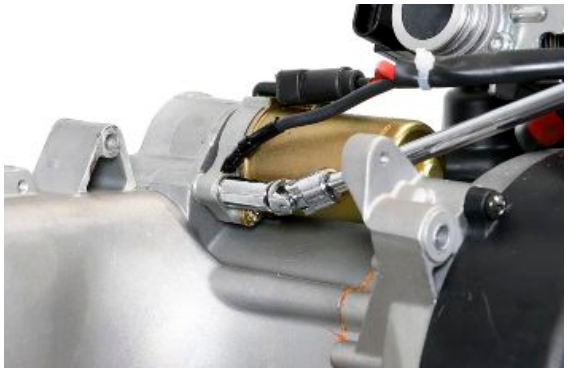
020565Y Flywheel lock calliper spanner

Locking torques (N*m)

Magneto flywheel - Crankshaft **52 - 58 Nm**

Refitting the starter motor

- Install the starter motor in its seating in the crankcase.
- Tighten the screw on the head side but do not lock it, screw the second screw inserting the earth cable (black), then tighten the 2 screws at the prescribed torque.
- Tighten the locking screw of the positive cable (red) on the side contact.



N.B.

REFIT THE REMAINING PARTS AS DESCRIBED IN THE CYLINDER HEAD, TIMING, LUBRICATION, FLYWHEEL AND TRANSMISSION CHAPTERS.

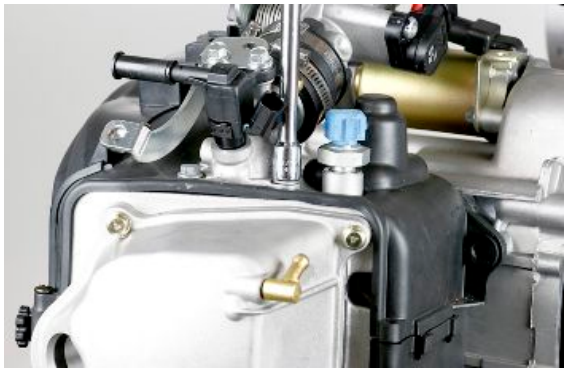
Locking torques (N*m)

Starter motor - Crankcase 11 - 13 Nm

Cylinder assy. and timing system

Removing the intake manifold

- Loosen the admission joints fixing screws.

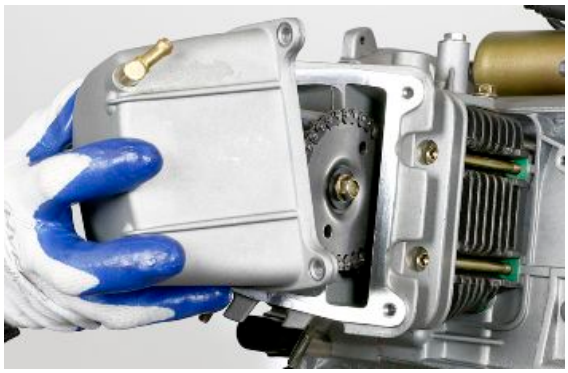


- Remove the admission joints complete with throttle body.

Removing the rocker-arms cover

- Remove the cooling cover.
- Undo the tappet cover fixing screws.

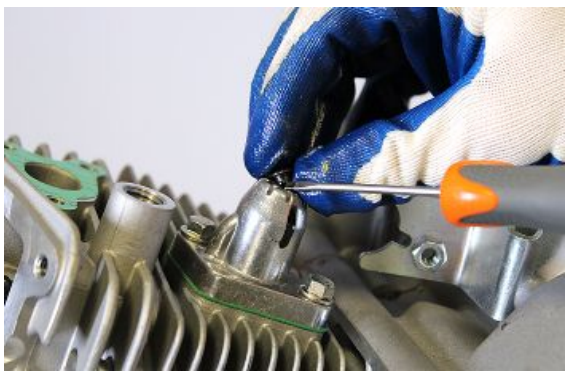
- Remove the tappet cover complete with O-ring and recover the spark plug adapter gasket.



Removing the timing system drive

- Disconnect the spark plug cap.
- Remove the cooling cover.
- Remove the tappet cover.

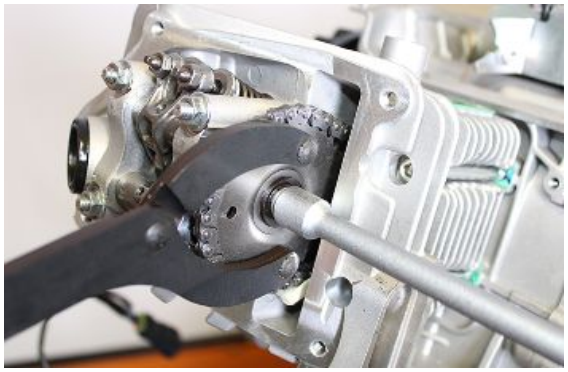
- Remove the rubber plug of the chain tensioner.



- Using the specific tool, undo the fixing screw of the timing system sprocket and collect the washer.

N.B.

TO FACILITATE REMOVING THE HEAD COMPONENTS, SET THE CRANKSHAFT TO THE TIMING POINT (TDC OF THE COMPRESSION END).



- Remove the transmission cover.
- Remove the driving pulley.
- Remove the oil pump.
- Remove the oil pump pinion seal O-ring.

CAUTION

IT IS ABSOLUTELY NECESSARY TO REMOVE THE O-RING BEFORE REMOVING THE SHIM WASHER TO AVOID PINCHING AND SUBSEQUENT REDUCTION OF EFFICIENCY.

- Remove the shim washer.

- Remove the timing system control pinion.
- Remove the timing chain and the fixed pad from the head.

- Undo the fixing screw of the chain tensioner pad and remove it from the head side.

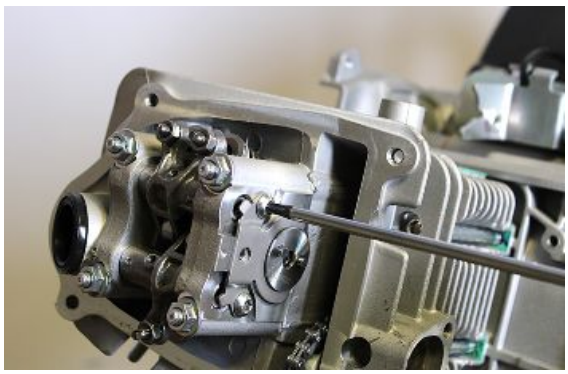
CAUTION

IT IS ADVISABLE TO MARK THE OUTSIDE OF THE TIMING CHAIN IN ORDER TO ENSURE, DURING REFITTING, THE SAME POSITIONING AND KEEPING THE ROTATION DIRECTION.

Removing the cam shaft

- Remove the timing system sprocket.

- Unscrew the fixing screws of the rocker axed and camshaft retainer plate.



- Remove the retaining plate.

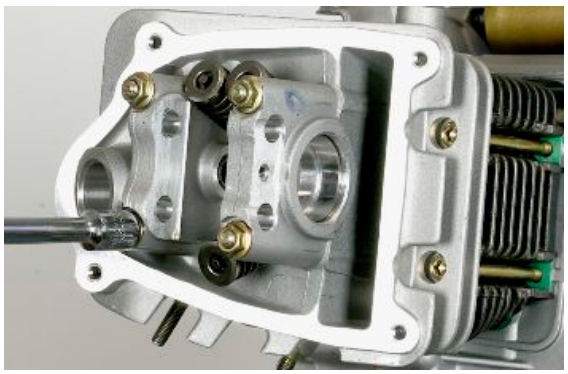
- Remove the axes and recover the rockers.

- Remove the camshaft.

Removing the cylinder head

- Remove the tappet cover.
- Remove the camshaft.
- Undo the external screws fixing the head to the cylinder.

- Gradually loosen the fixing nuts of the head on the cylinder in crossed sequence.



- Remove the head complete with valve.

- Remove the head gasket and recover the alignment dowels.

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 REFITTING.

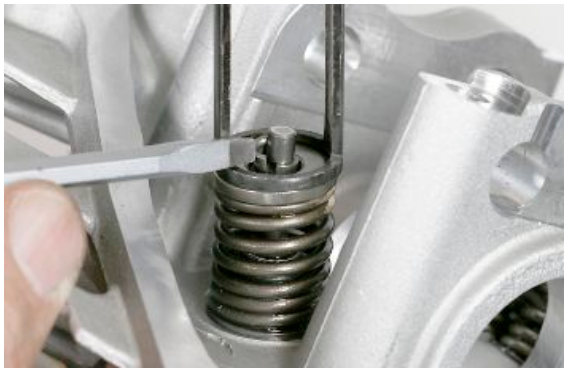
Removing the valves

- Remove the cylinder head.
- Fix the specific tool in a vice.
- Lock the movable cursor on the head of the valve to be removed and put the spring in compression.

Specific tooling

020382Y Valve cotters equipped with part 012 removal tool

- Slightly compress the spring until releasing the cotters fixing the upper cap and remove them using a magnet.



- Remove the tool supporting the released valve.
- Remove the upper cap.

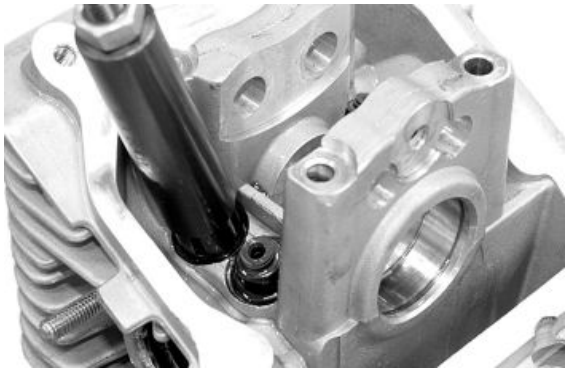
- Remove the valve spring.

- Acting from the opposite side, remove the valve from its seat.

- Remove the oil seals with the specific tool.
- Remove the lower cap.

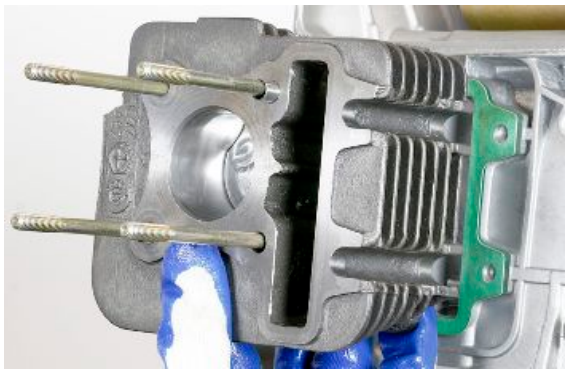
Specific tooling

020431Y Valve oil seal extractor



Removing the cylinder - piston assy.

- Remove the cylinder head.
- Pull out the cylinder.



- Remove the gasket on the cylinder base.

- Remove the snap ring, slide off the pin.

- Remove the piston.

- Remove the piston ring from the piston.

N.B.

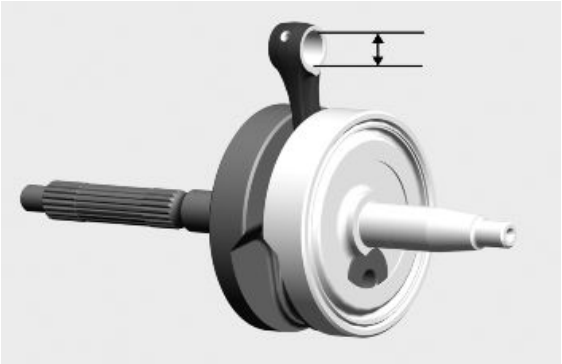
BE CAREFUL NOT TO DAMAGE THE PISTON RINGS DURING REMOVAL.

Inspecting the small end

- Measure the internal diameter of the connecting rod small end using an internal micrometer.

N.B.

IF THE DIAMETER OF THE CONNECTING ROD SMALL END EXCEEDS THE MAXIMUM DIAMETER ADMISSIBLE, SHOWS SIGNS OF WEAR OR OVERHEATING REPLACE THE CRANKSHAFT AS DESCRIBED IN THE "CRANKCASE AND CRANKSHAFT" CHAPTER".



Characteristic

Max. diameter admitted: Connecting rod small end check-up

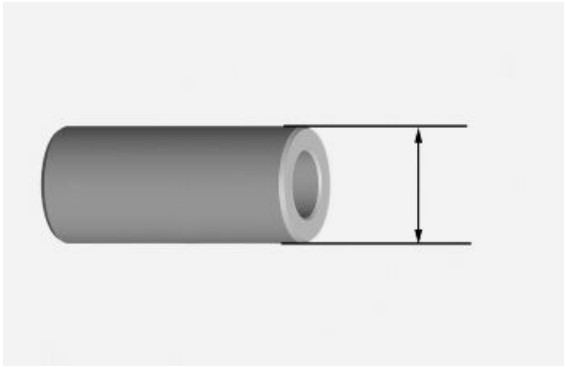
13.030 mm

Standard diameter: Connecting rod small end check-up

13 +0.025+0.015mm

Inspecting the wrist pin

- Measure the outer diameter of the gudgeon pin.



Characteristic

Standard diameter: gudgeon pin

13 -0 -0.004mm

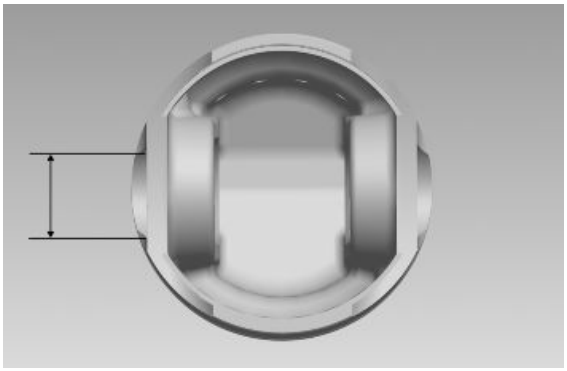
Minimum admissible diameter: gudgeon pin

12.990 mm

Inspecting the piston

- Measure the outside diameter of the piston, perpendicular to the gudgeon pin axis.
- Carry out the measurement at 27 from the piston crown.

- Measure the diameter of the pin on the piston.



N.B.

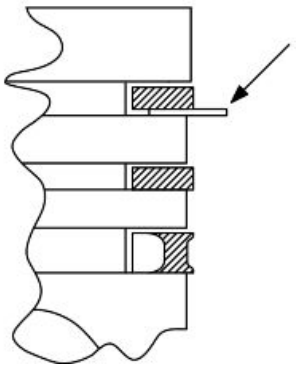
THE PIN HOUSINGS HAVE 2 LUBRICATION CHANNELS. FOR THIS REASON, MEASUREMENT MUST BE MADE ACCORDING TO THE PISTON AXIS

Characteristic

Pin seat diameter

13 +0.005 + 0.010 mm

- Carefully clean the seal housings.
- Measure the coupling clearance between the sealing rings and the piston grooves using a thickness gauge, as shown in the figure.
- If the clearances detected exceed the limits specified in the table, the piston and the piston rings should be replaced.



N.B.

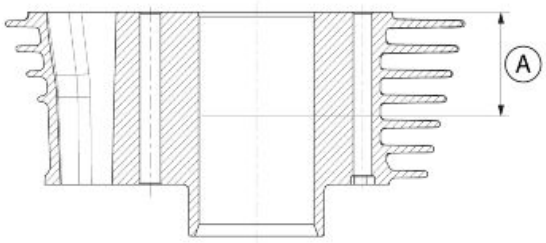
MEASURE THE CLEARANCE BY INSERTING THE BLADE OF THE FEELER THICKNESS GAUGE FROM THE SECOND SEAL SIDE.

PISTON

Name	Description	Dimensions	Initials	Quantity
Top piston ring		0.030 - 0.065 mm		0.080 mm
Middle piston ring		0.020 - 0.055 mm		0.070 mm
oil scraper		0.040 - 0.160 mm		0.20 mm

Inspecting the cylinder

- Using a bore gauge, measure the cylinder inner diameter to the quota «**A**» indicated in the figure.
- Check that the coupling surface with the head is not worn or misshapen.
- Pistons and cylinders are classified according to their diameter. The coupling is carried out in pairs (A-a, B-b, C-c, D-d).



Characteristic

Reference quota for the classification

34.95 mm

Maximum allowable run-out:

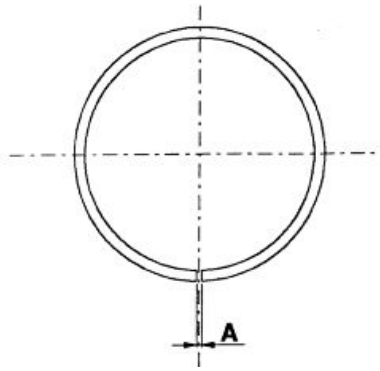
0.001 in 0.05 mm

COUPLING BETWEEN PISTON AND CYLINDER

Name	Initials	Cylinder	Piston	Play on fitting
Selection A-a	A-a	38.993 to 39.000	38.954 to 38.961	0.032 to 0.046
Selection B-b	B-b	39.000 to 39.007	38.961 to 38.968	0.032 to 0.046
Selection C-c	C-c	39.007 to 39.014	38.968 to 38.975	0.032 to 0.046
Selection D-d	D-d	39.014 to 39.021	38.975 to 38.982	0.032 to 0.046

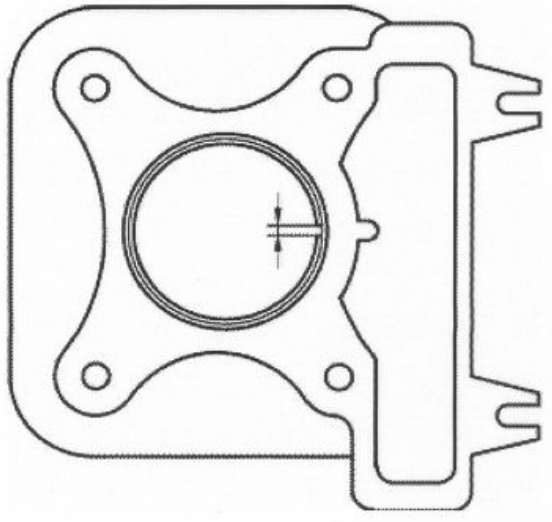
Inspecting the piston rings

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



N.B.

BEFORE REPLACING ONLY THE PISTON RINGS, MAKE SURE THAT COUPLING CLEARANCE BETWEEN THE SEAL RINGS AND ITS GROOVES, AND THAT BETWEEN THE PISTON AND THE CYLINDER ARE AS SPECIFIED. IN ANY CASE, NEW PISTON SEALING RINGS USED IN COMBINATION WITH A USED CYLINDER MAY HAVE DIFFERENT BEDDING CONDITIONS THAN THE STANDARD ONES.



SEALING RINGS

Name	Description	Dimensions	Initials	Quantity
1st Compression ring		39 x 1	A	0.08 to 0.20
2nd Compression ring		39 x 1	A	0.05 to 0.20
Oil scraper ring		39 x 2	A	0.20 - 0.70

Removing the piston

- Place the piston on the rod and insert the pin until it stops on the retainer ring on the opposite side.

CAUTION

POSITION THE ARROW PRINTED ON THE PISTON CROWN TOWARDS THE EXHAUST OPENING.

CAUTION

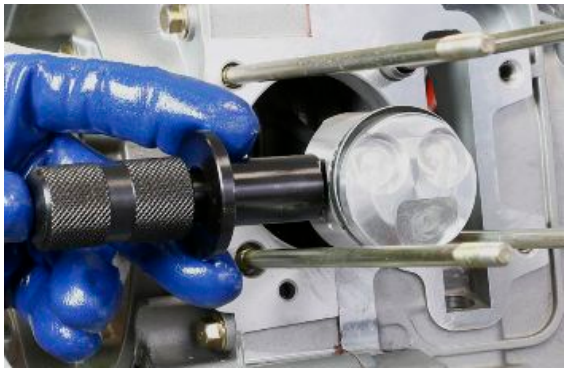
AT EVERY NEW MOUNTING USE RETAINER RING PINS.

- Insert the second retainer ring on the specific tool as shown in the figure.

Specific tooling

020448Y Tool for fitting the pin snap rings

- Place the ring into position using a punch.
- Rest the tool on the piston paying attention that the 90° chamfered side faces upwards as shown in the figure.
- Proceed with the fitting of the ring acting on the punch of the specific tool.



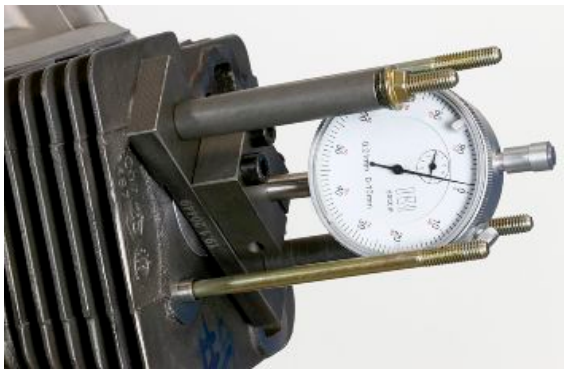
Choosing the gasket

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

Specific tooling

020449Y Support to check piston position

- Using an abutment plane, reset the dial gauge with a pre-load 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.



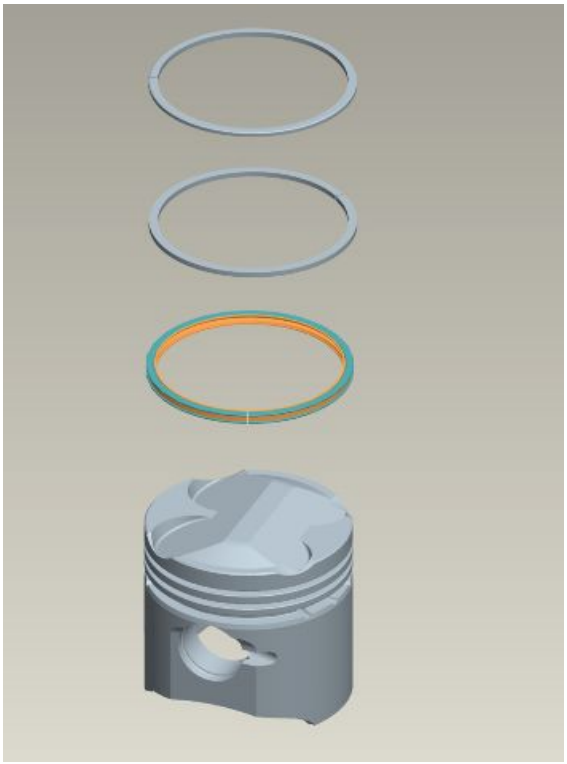
- By means of the table, see the Specifications chapter identify the cylinder base gasket thickness to be used for refitting. Correctly identify the cylinder base gasket thickness to keep the correct compression ratio.
- Remove the special tool and the cylinder.

Refitting the piston rings

- Fit the oil scraper ring starting from the spring, taking care that the spring ends do not superimpose. Fit the two piston rings so that their gaps and that of the oil scraper ring are never aligned.
- Fit the 2nd sealing ring with the identifying letter «**T**» facing towards the piston crown.
- Fit the 1st sealing ring with the reference letter «**T**» facing towards the piston crown.
- Misalign the lining openings at 120° as shown in the figure.
- Lubricate the components with engine oil.

N.B.

SO AS TO OBTAIN THE BEST CONFIGURATION THE 2 SEALING RINGS ARE MADE WITH A CONTACT CONICAL CYLINDER SECTION. AS A RESULT IT IS IMPORTANT TO RESPECT THE FITTING INSTRUCTION TO ASSEMBLY THE RINGS WITH THE "T" MARK FACING UPWARDS.



Refitting the cylinder

- Insert the cylinder base gasket with the thickness determined above.
- Fit the cylinder as shown in the figure.
- The piston can be kept out of the housing plane using the appropriate tool.

N.B.

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

Specific tooling

020288Y Fork for fitting the piston on the cylinder

If the four cylinder stud bolts should be replaced in this kind of engine, it is necessary to tighten the head nuts strictly following the procedure below.

The procedure is different from that indicated in the vehicle manuals:

Head tightening nut (only to replace stud bolts) 6÷7 N*m + 135° + 90°

The 45° rotation reduction of the key is necessary to avoid stud bolt stretching.

Inspecting the cylinder head

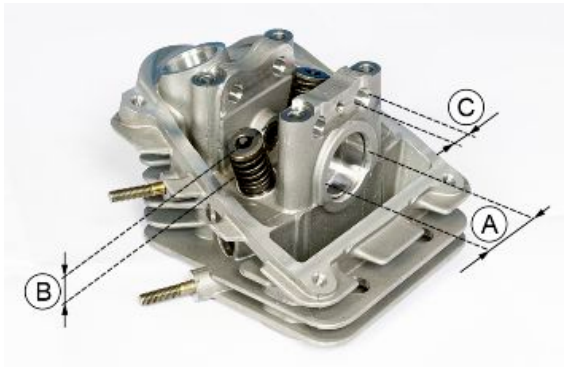
- Using a trued bar check that the cylinder head surface is not worn or distorted.
- Check that the camshaft and rocking lever pin bearings show no signs of wear.
- Check that the cylinder head cover surface, the intake manifold and the exhaust manifold are not worn.
- It is advisable to replace the head if any failure is found.

Characteristic

Maximum allowable run-out:

0.1 mm

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



CYLINDER HEAD CHECK

Specification	Desc./Quantity
Standard diameter (mm) A	Ø 32.2 - 32.3 mm
Standard diameter (mm) B	Ø 12.966 - 12.984 mm
Standard diameter (mm) C	Ø 10.0 - 10.015 mm

Inspecting the timing system components

- Check that the guide slider and the tensioner slider are not worn out.
- Ensure that the camshaft drive pulley, the chain assembly and the sprocket wheel are not worn.
- If sings of wear are found, replace the parts; if the chain, pinion or pulley are worn, replace the whole assembly.

- Remove the central screw 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

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

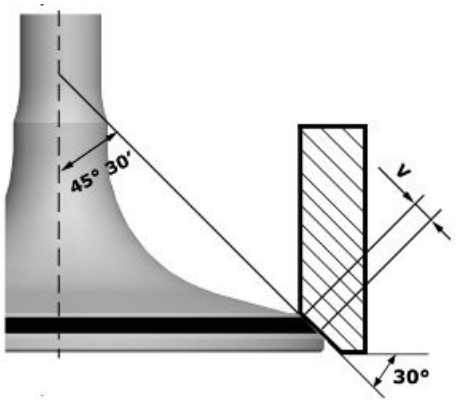
Characteristic

Standard value:

1 - 1.3 mm

Limit allowed:

1.6 mm

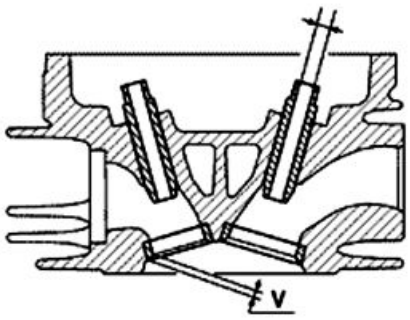


- If the impression width on the valve seat is larger than the prescribed limits, true the seats with a 45° mill and then grind.
- In case of excessive wear or damage, replace the head.

- 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.

Inspecting the valve housings

- Remove any carbon formation from the valve guides.
- Measure the inside diameter of each valve guide.
- Take the measurement at three different heights in the rocker arm push direction.



Characteristic

Exhaust guide: Standard diameter

5 +0+0.012mm

Exhaust guide: Wear limit

5.022 mm

Intake guide: Standard diameter:

5 +0+0.012mm

Intake guide: Wear limit

5.022 mm

- If the width of the impression on the valve seat or the diameter of the valve guide exceed the specified limits, replace the cylinder head.
- Check width of the impression on the valve seat «**V**»

Characteristic

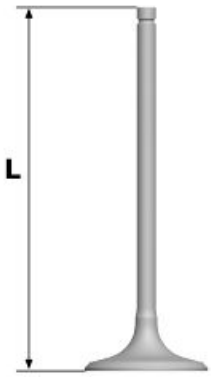
Wear limit:

Max. 1.6 mm.

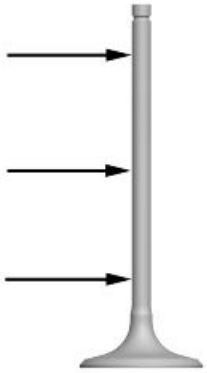
Inspecting the valves

STANDARD VALVE LENGTH

Specification	Desc./Quantity
Standard intake valve length	75.5 mm
Standard drainage valve length	75.02 mm



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



STANDARD DIAMETER

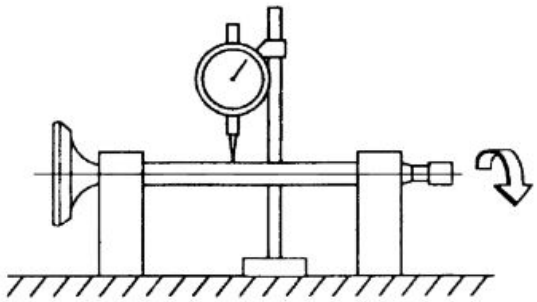
Specification	Desc./Quantity
Intake	3.970 to 3.985 mm
Exhaust	3.960 to 3.975 mm

MINIMUM DIAMETER PERMITTED

Specification	Desc./Quantity
Intake	3.958 mm
Exhaust	3.945 mm

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

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

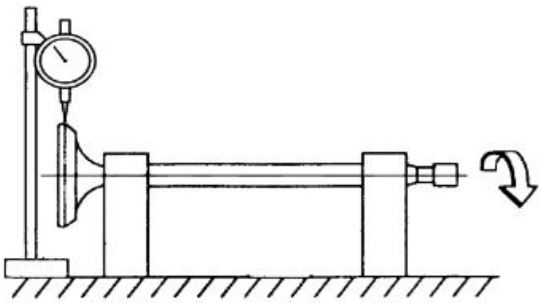


Characteristic

Limit allowed:

0.03 mm

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



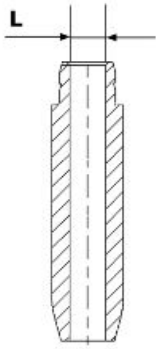
Characteristic

Limit value admitted:

0.1 mm

Inspecting the valve stem guide clearance

Measure the valve guides



VALVE GUIDE DIAMETER

Specification	Desc./Quantity
Valve guide	Standard diameter: 4 + 0.012 mm
Valve guide	Maximum admissible diameter: 4 + 0.022 mm

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

INTAKE

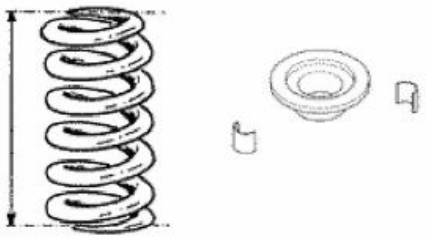
Specification	Desc./Quantity
Standard clearance	0.015 - 0.042 mm
Admissible limit	0.06 mm

EXHAUST

Specification	Desc./Quantity
Standard clearance	0.025 - 0.052 mm
Admissible limit	0.07 mm

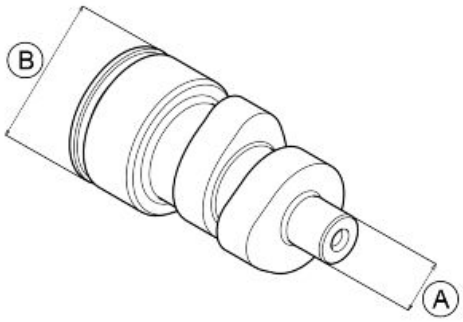
Inspecting the springs and half-cones

- Check that the upper spring caps and the cotter halves show no signs of abnormal wear.



Inspecting the cam shaft

- Inspect the camshaft for signs of abnormal wear on the cams.



CAMSHAFT BEARINGS_50 4T E5

Specification	Desc./Quantity
Standard diameter - Bearing A:	Ø 9 mm 0 -0.009 mm
Standard diameter - Bearing B:	Ø 25 mm 0 -0.013 mm

- Measure the external diameter of the rocking lever pins
- Check the rocker pins do not show signs of wear or scoring.
- Measure the internal diameter of each rocker
- Check that the pad in contact with the cam is not worn.

AXES AND ROCKERS DIAMETER

Specification	Desc./Quantity
Inside rockers diameter	Ø 10.0 - 10.015 mm
Rockers axes diameter	Ø 9.977 - 9.985 mm

Refitting the head and timing system components

- Thoroughly clean the contact surfaces.
- Insert a new head gasket.

- Insert the head on the cylinder paying attention to the correct position of the centring dowels.

- Partially tighten the fixing nuts of the head to the cylinder in crossed sequence.

- Partially tighten the external screws fixing the head to the cylinder.

- Insert the camshaft in its seat.

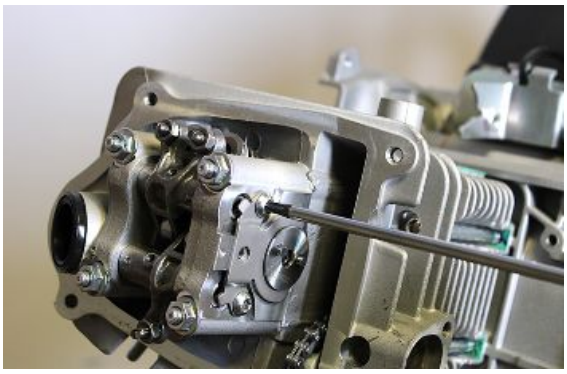
- Place the rockers and the rocker axes in their seats.

- Place the lock plate of the rocker axes in its seat.

- Tighten the fixing screw of the plate to the prescribed torque.

Locking torques (N*m)

Rocker axes lock plate - Head 3 - 4 Nm



- Finish the lock of the cylinder head tightening the four nuts of the head to an initial torque at two crossed sequences. Afterwards, tighten the nuts with turns of 90° each to be done at two crossed sequences.
- Finish the tightening of the head to the crankcase tightening the side screws to the prescribed torque.

CAUTION

SHOULD THE CRANKCASE OR THE CYLINDER STUD BOLTS BE REPLACED, IT IS NECESSARY TO CARRY OUT THE INITIAL TIGHTENING at 6 - 7 Nm PLUS OTHER TWO TURNS OF 135° AND OF 90° EACH AT CROSSED SEQUENCES.

Locking torques (N*m)

Cylinder head nuts - Cylinder 6 - 7 + 90° + 90° (*)
Cylinder head screws - Crankcase 8 - 10 Nm

Refitting the timing chain

- Insert the timing chain pads in their corresponding housings, the screw and the spacer as indicated in the figure.
- Tighten to the prescribed torque and check the tensioner pad moves adequately.
- Fit the timing system pinion to the crankshaft with the chamfered side facing the insertion (towards the main bearing).
- Loop the timing chain around the sprocket on the crankshaft.

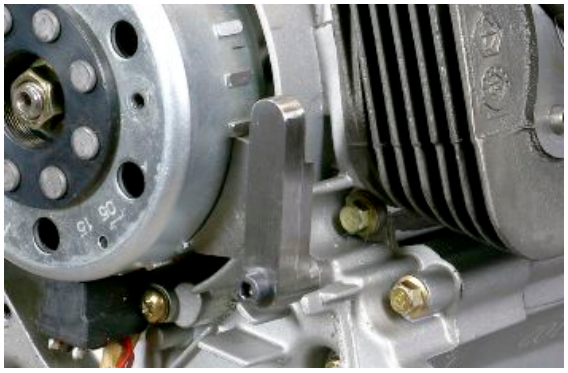
Locking torques (N*m)

Chain tensioner pad - Crankcase 5 - 7 Nm

- Place the piston to the TDC provisionally using the specific tool.

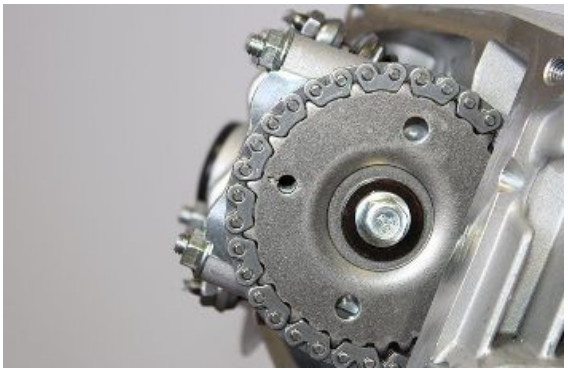
Specific tooling

020993Y Lock flywheel for distribution timing adjustment

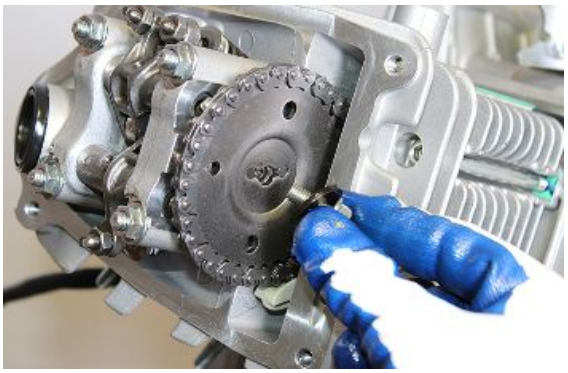


- Keeping the piston locked to the TDC, insert the chain on the timing sprocket, keeping the reference notch aligned with the cylinder axis and with the arrow pointing upward.

- Once the sprocket is fitted on the camshaft, use a reference pin (e.g. pin punch) to make sure that the hole on the sprocket is aligned with the hole on the head.



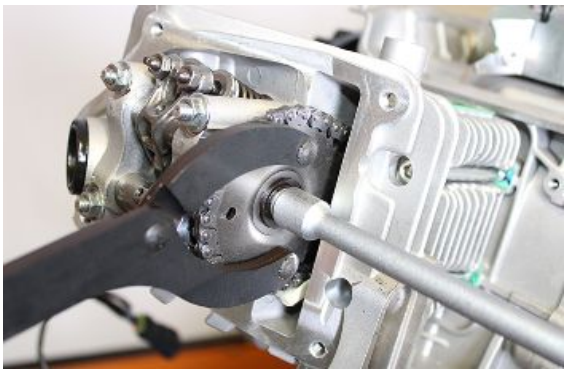
- After inserting the timing sprocket on the camshaft, fit and partially tighten the fixing screws.



- Slightly press on the chain tensioner pad to check that the timing system is correct.
- Using the specific tool, tighten the screw fixing the sprocket timing on the camshaft to the prescribed torque.

Locking torques (N*m)

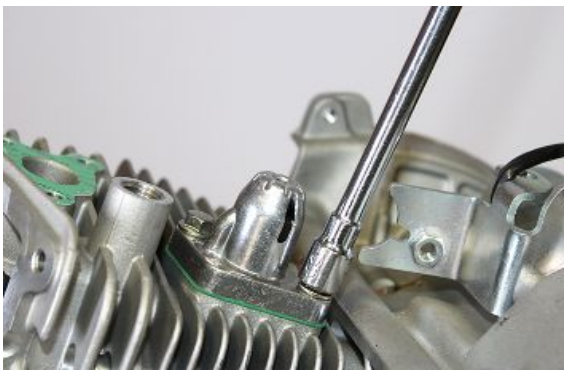
sprocket timing - Camshaft **12 - 14 Nm**



- Load the chain tensioner cursor.
- Insert the chain tensioner in its seat using the new gasket and tighten the fastening screws to the prescribed torque.

Locking torques (N*m)

Chain tensioner - Cylinder **8 - 10 Nm**



- Insert the plug on the chain tensioner.

Refitting the rocker-arms cover

- Carry out the removal operations but in reverse order and tighten the fixing screws to the prescribed torque.

N.B.

FIT A NEW O-RING ON THE TAPPET COVER.

Locking torques (N*m)

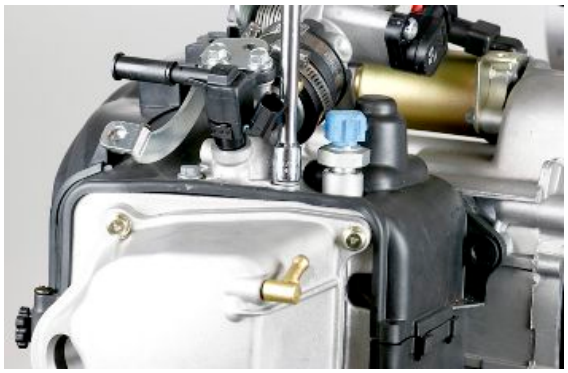
Head cover - Head **8 - 10 Nm**

Refitting the intake manifold

- Using a new gasket, place the induction pipe complete with throttle body in its seat.
- Tighten the fixing screws to the prescribed torque.

Locking torques (N*m)

Induction pipe - Cylinder **7 - 9 Nm**



Crankcase - crankshaft

- First remove the following units:

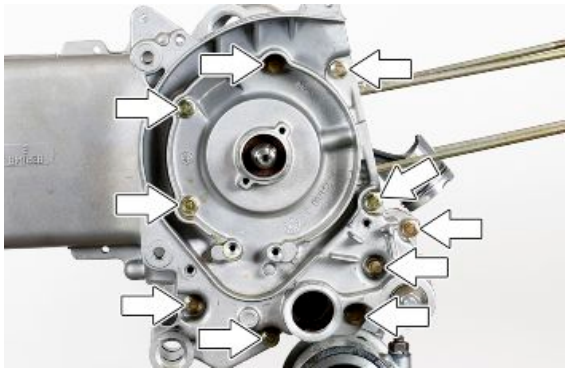
- Driving pulley
- Oil pump
- Flywheel complete with stator
- Cylinder-piston-head unit
- Starter motor

Splitting the crankcase halves

- Remove the ten crankshaft coupling screws.

-Separate the crankcase halves keeping the half casing driving shaft engaged on the transmission side.

- Remove the crankshaft.



CAUTION

IF YOU FAIL TO DO THIS, THE CRANKSHAFT MIGHT ACCIDENTALLY FALL.

- Remove the oil guard on the flywheel side.

CAUTION

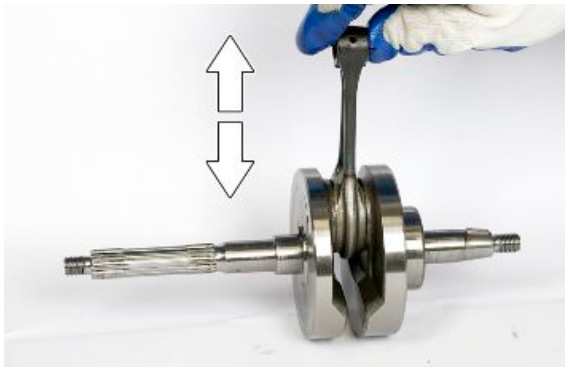
THE CENTRIFUGAL OIL FILTER IS IN THE FLYWHEEL AXLE SHAFT. DO NOT WASH WITH SOLVENTS OR BLOW COMPRESSED AIR SO THAT NO IMPURITIES LEAK OUT. A CENTRIFUGAL OIL FILTER'S LIFE IS THE SAME AS THE ENGINE'S AND IS MAINTENANCE FREE.

- Check the axial clearance on the connecting rod.

Fitting clearance

Standard connecting rod axial clearance 0.15 to 0.30 mm **Max. connecting rod clearance** 0.5 mm

- Check the correct radial clearance of the connecting rod by holding the driving shaft with your hands and, with a dial gauge fitted to the rod small end, measuring the clearance, move the connecting rod vertically as shown in the figure.



Fitting clearance

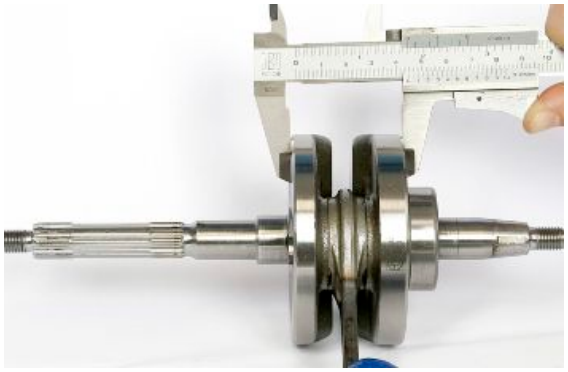
Connecting rod radial - standard clearance 0.006 - 0.018 mm **Connecting rod max. - radial clearance** 0.25 mm

- Check that the half shaft surfaces are not scored and with the aid of a gauge check the driving shaft width as indicated in the figure.

Characteristic

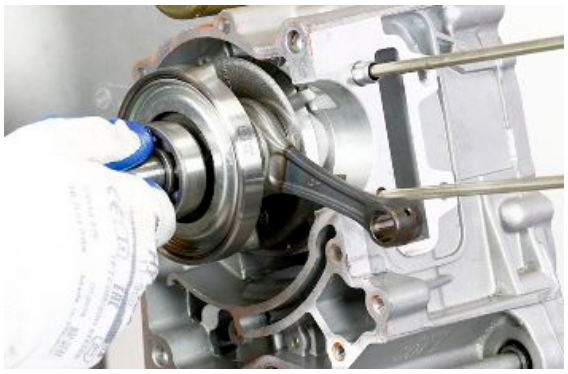
Standard measure

45 mm



Removing the crankshaft

- Remove the flywheel side crankcase-half.
- Remove the crankshaft.



Removing the crankshaft bearings

- Remove the flywheel bearing fitted on the driving shaft using the specific tool.

Specific tooling

004499Y Camshaft bearing extractor

004499Y001 Bell for bearing extractor

004499Y002 Bearing extractor screw

004499Y006 Ring for bearing extractor

004499Y034 Bearing extractor part

Refitting the crankshaft bearings

- Support the crankcase on a surface and place it with the driving shaft axle in a vertical position.
- Warm the crankcase at ~ 120° C with a thermal gun (and support).
- Fit the punch with guide and adaptor, place the bearing on the punch using grease (to keep it from falling).
-Insert the bearing in the crankcase; if needed, use a mallet but do so with extreme care so as not to damage the engine crankcase limit stop.

Specific tooling

020359Y 42 x 47 mm Adaptor

020364Y 25-mm guide

020376Y Adaptor handle

020360S 52 x 55 mm adaptor

- Heat a new main bearing in an oil bath at 120°.
- Place the driving shaft on the support base and insert the bearing with the aid of an adequate piece of tube if necessary.

N.B.

USE A NEW BEARING WHEN REFITTING.

WARNING

THE CENTRIFUGAL OIL FILTER IS IN THE FLYWHEEL AXLE SHAFT. DO NOT WASH WITH SOLVENTS OR BLOW COMPRESSED AIR SO THAT NO IMPURITIES LEAK OUT.

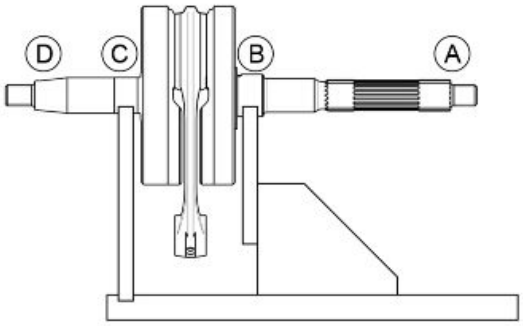
Specific tooling

020265Y Bearing fitting base

008119Y009 Tube for installing shafts and axles

Inspecting the crankshaft alignment

To install the crankshaft on the support and to measure the misalignment in the 4 points indicated in figure.



N.B.

IF VALUES OTHER THAN THOSE ALLOWED ARE DETECTED, TRY STRAIGHTENING THE CRANKSHAFT BY INSERTING A WOODEN WEDGE BETWEEN THE HALF SHAFTS OR BY CLOSING THEM WITH A VICE AS NEEDED. IF EVEN AFTER THIS OPERATION THE VALUES ARE NOT THOSE ADMITTED, REPLACE THE CRANKSHAFT.

Characteristic

Off-line maximum admitted - A

0.15 mm

Off-line maximum admitted - B

0.02 mm

Off-line maximum admitted - C

0.02 mm

Off-line maximum admitted - D

0.10 mm

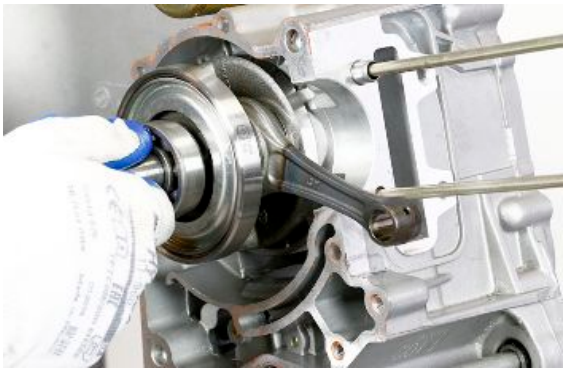
- Check that the crankshaft cone, the tab seat, the oil seal capacity, the toothed gear and the threaded tangs are in good working order.
- In case of failures, replace the crankshaft.

Specific tooling

020074Y Support base for checking crankshaft alignment

Refitting the crankcase halves

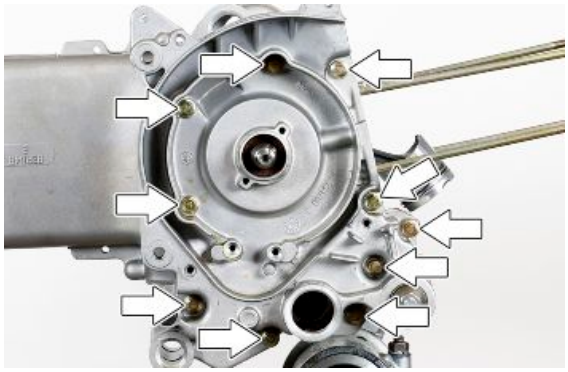
-Be careful to place the two centring dowels preferably on the flywheel side half casing.
-Insert the crankshaft on the half casing on the transmission side.



- Fit the gasket recommended for surfaces on the half casing on the transmission side after greasing the two faying surfaces carefully.

-Insert the flywheel half casing.

- Fit the screws and tighten them to the specified torque.



N.B.

WHEN FITTING THE HALF CASING AND THE CRANKSHAFT, TAKE CARE NO TO DAMAGE THE SHAFT THREADED TANGS.

Recommended products

Loctite 510 Medium-strength paste sealant.

Pink

Locking torques (N*m)

Flywheel-side crankcase half - Transmission-side crankcase **8 - 10 Nm**

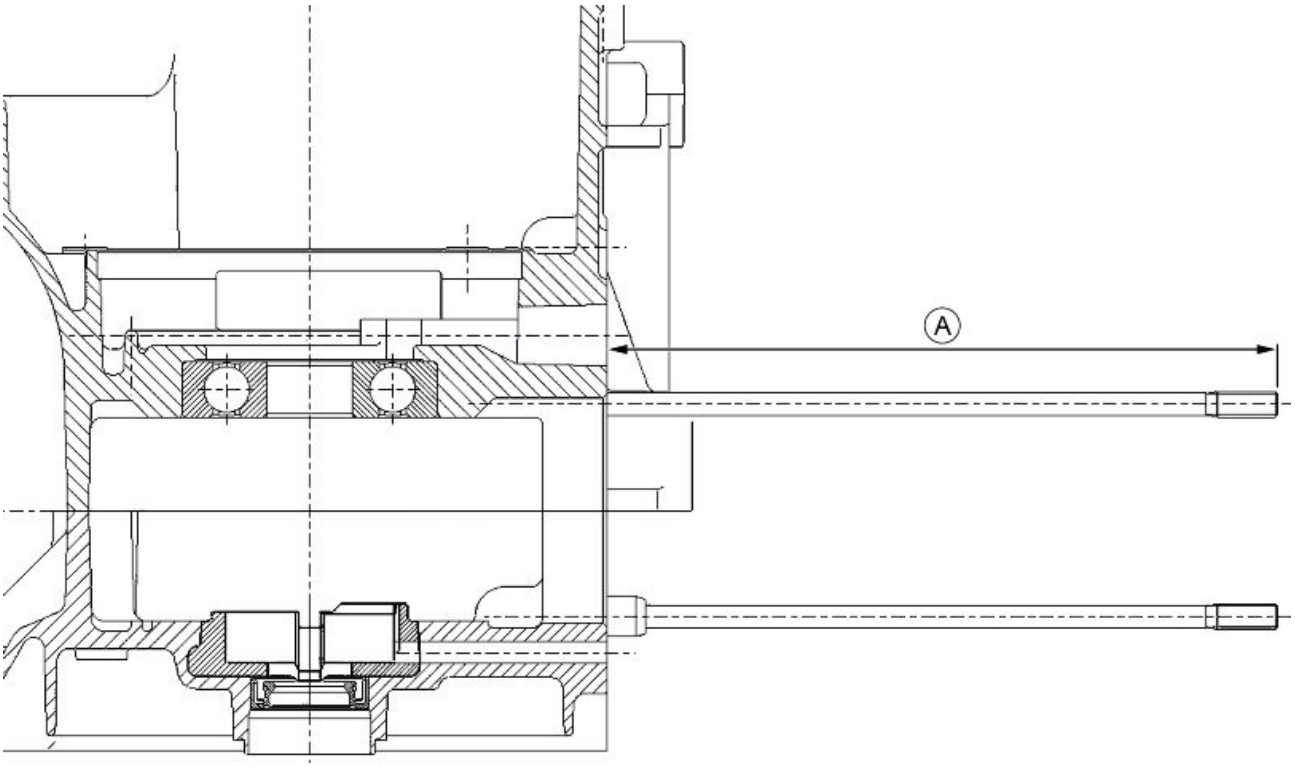
- Fit a new O-Ring on the mesh oil filter and on the drainage plug; lubricate.

- Insert the filter on the engine and lock the cap to the prescribed torque.

Locking torques (N*m)

Engine oil drainage plug - Crankcase **25 - 28 Nm**

Studs



- Using two nuts, fitted as nut and lock nut, 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.

CAUTION

SHOULD THE CRANKCASE OR THE CYLINDER STUD BOLTS BE REPLACED, IT IS NECESSARY TO CARRY OUT THE INITIAL TIGHTENING at 6 - 7 Nm PLUS OTHER TWO TURNS OF 135° AND OF 90° EACH AT CROSSED SEQUENCES.

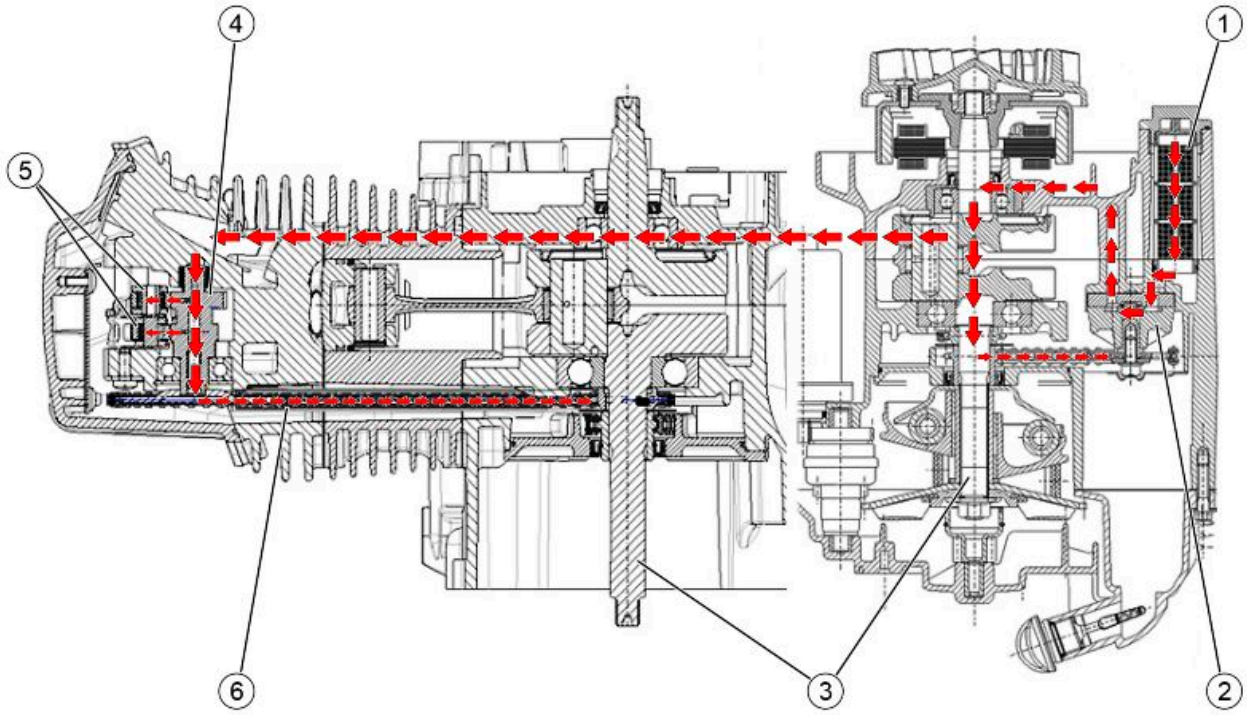
Characteristic

Driving depth of stud bolts «A»

158 mm + 0.5 mm

Lubrication

Conceptual diagrams



LUBRICATION BASIC CIRCUIT DIAGRAM LEGEND:

1. mesh filter

2. oil pump

3. crankshaft

4. camshaft

5. rockers

6. timing system chain

Crankshaft oil seals

Removal

- Check that the chain contrast pad is not worn.

-Otherwise, replace the pad or fit it inverted to make it work on the other side.

- Any operation on the chain cover oil seal should be carried out placing the cover on the workbench on the covering plate side of the oil pump chain.

-Remove the oil seal with a tube section of 30 mm in diameter (Ø 32 mm Max).

- Extract the flywheel oil seal from the crankcase being careful not to damage or score the crankcase.

Refitting

- Apply engine oil on the oil seal and it seating on the crankcase.
- From the outside and using the specific punch, place the oil seal fully down until it reaches the bottom of the seating in the crankcase.

N.B.

FAILURE TO USE THE SPECIFIC TOOL CAN RESULT IN AN INCORRECT DEPTH POSITION AND AS A CONSEQUENCE IN INADEQUATE OIL SEAL.

- Fit a new oil seal on the outer rim with the help of the specific tools below.
- Fit a new O-ring and lubricate it with grease.
- Install the cover on the engine crankcase, insert the three screws and place the cover in its position.
- Tighten the 3 screws to the prescribed torque.

Specific tooling

020376Y Adaptor handle

020358Y 37 x 40 mm Adaptor

Locking torques (N*m)

Door - Crankcase **4 - 5 Nm**

Oil pump

Removal

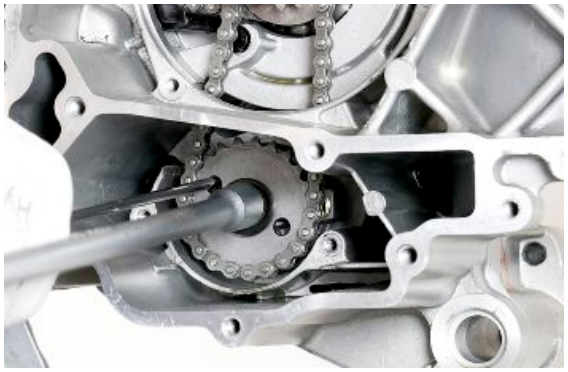
- Remove the driving pulley.
- Remove the engine oil sump.
- Undo the screws fixing the door to the crankcase.

- Remove the door using the appropriate fusion attachments.

- Remove the door complete with lubrication chain tensioner.

- Undo the engine oil baffle plate fixing screw and remove it.

- Lock the rotation of the oil pump control sprocket using an adequate pin and unscrew the central screw.



- Remove the engine oil pump control sprocket.

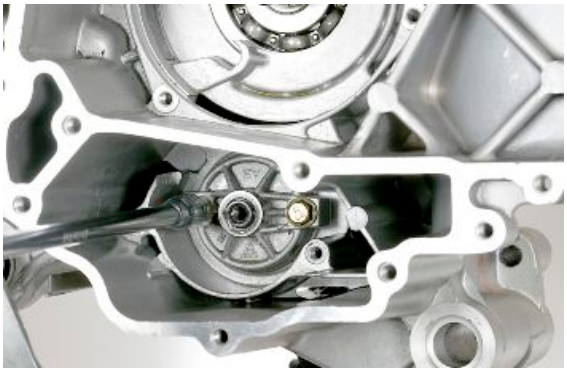
- Remove the lubrication chain.

CAUTION

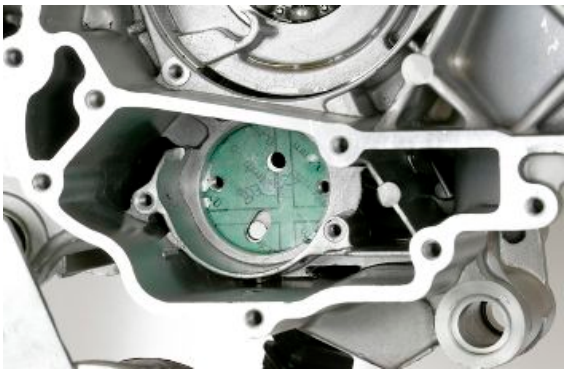
IT IS ADVISABLE TO MARK THE OUTSIDE OF THE LUBRICATION CHAIN IN ORDER TO ENSURE, DURING REFITTING, THE SAME POSITIONING AND KEEPING THE ROTATION DIRECTION.

- Remove the engine oil pump control pinion from the crankshaft.

- Undo the screws fixing the oil pump to the crankcase.



- Remove the gasket from its housing.

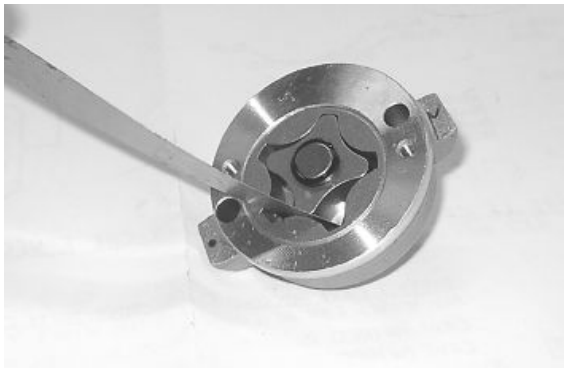


Inspection

- Remove the two screws and remove the oil pump cover.
- Remove and wash the rotors thoroughly with petrol and compressed air.

- Assemble the rotors in the pump body, keeping the two reference marks visible.

- Measure distance between rotors (inner rotor/ outer rotor) with a thickness gauge in the position shown in the picture.



Characteristic

Admissible maximum clearance 1

0.15 mm

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

Characteristic

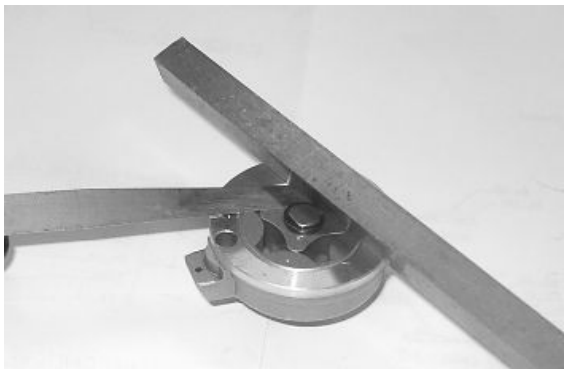
Admissible maximum clearance 2

0.20 mm

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

N.B.

MAKE SURE THE TRUED BAR IS POSITIONED PROPERLY ON THE TWO POINTS ON THE PUMP BODY.



Characteristic

Admissible maximum clearance 3

0.09 mm

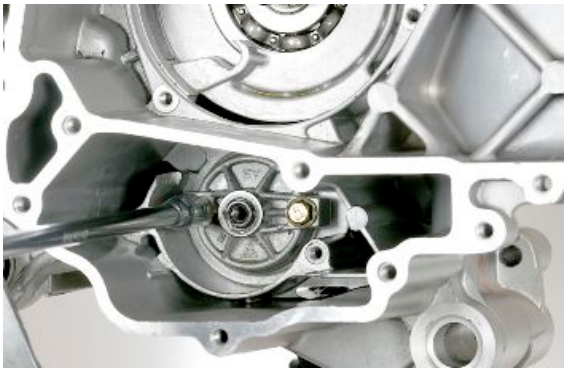
Refitting

- Insert a new gasket and the oil pump in its seat.

- Tighten the fixing screws of the engine oil pump to the prescribed torque.

Locking torques (N*m)

Engine oil pump - Crankcase 5 - 6 Nm



- Insert the oil pump control pinion on the crankshaft.

- Insert the lubrication chain paying attention to the previously during removal marked rotation direction.

- Fit the pump control sprocket on the chain and then on the oil pump.

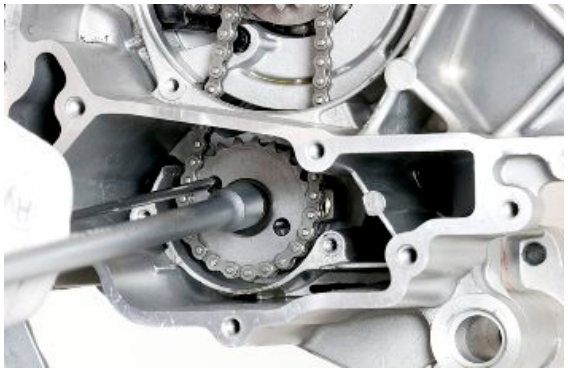
- Lock the rotation of the sprocket using adequate pin and tighten the screw and the cup washer to the prescribed torque.

N.B.

FIT THE CUP WASHER SO THAT ITS OUTER (CURVED) RIM TOUCHES THE PULLEY.

Locking torques (N*m)

Oil pump sprocket - Engine oil pump **8 - 10 Nm**



- Tighten the fixing screws of the oil baffle plate to the prescribed torque.

Locking torques (N*m)

Oil pump plate - Engine oil pump **0,7 - 0,9 Nm**

- Fit the door in its seat paying attention to forced fitting direction.

- Tighten the screws fixing the door on the crank-case to the prescribed torque.

Locking torques (N*m)

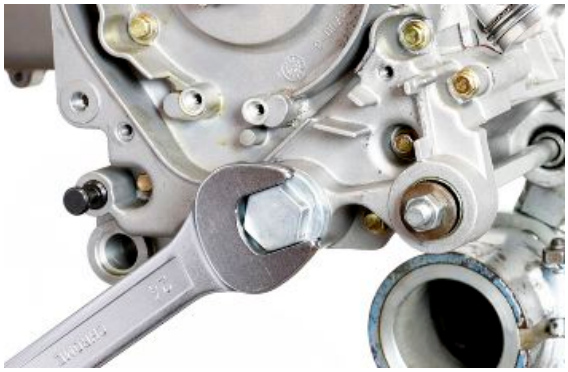
Door - Crankcase **4 - 5 Nm**

Removing the oil sump

- Remove the transmission cover.
- Unscrew the oil drainage plug and drain out all the engine oil into a suitable container.

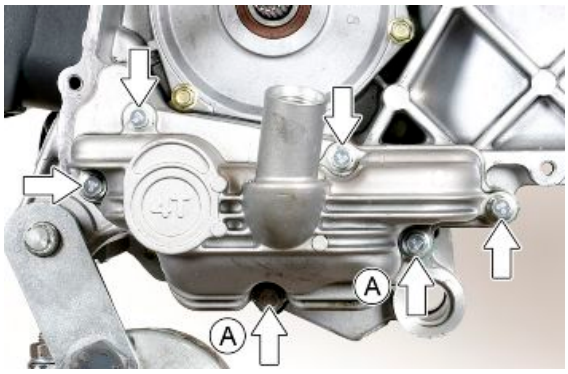
CAUTION

USED OILS CONTAIN SUBSTANCES HARMFUL TO THE ENVIRONMENT. DISPOSE OF USED OILS IN AN ENVIRONMENTALLY FRIENDLY AND LEGAL WAY.



- Extract the oil mesh filter from its seat.

- Undo the screws fixing the engine oil sump to the crankcase. The screws «**A**» are too long compared to the others, pay attention during refitting.



- Remove the oil sump and the gasket.

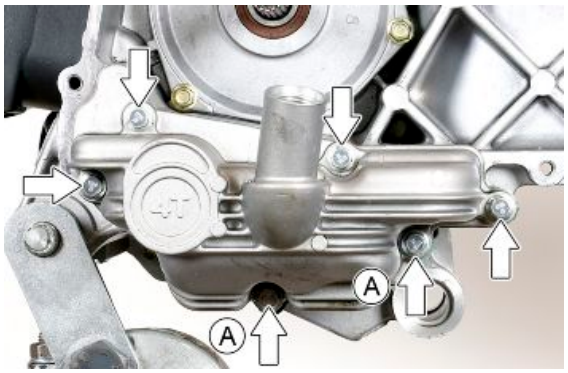
Refitting the oil sump

- Clean and grease the faying surfaces.
- Place the engine oil sump on its seat using a new gasket.

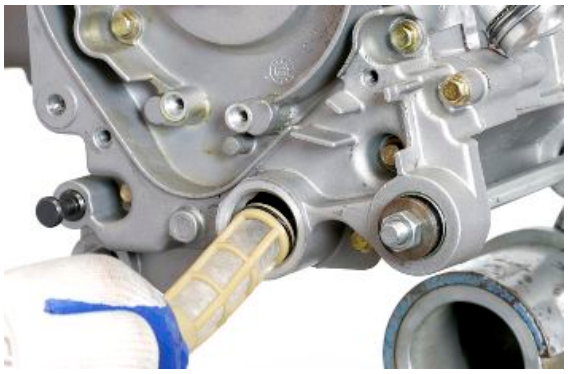
- Tighten the fixing screws of the engine oil sump to the prescribed torque. The screws «**A**» are too long compared to others.

Locking torques (N*m)

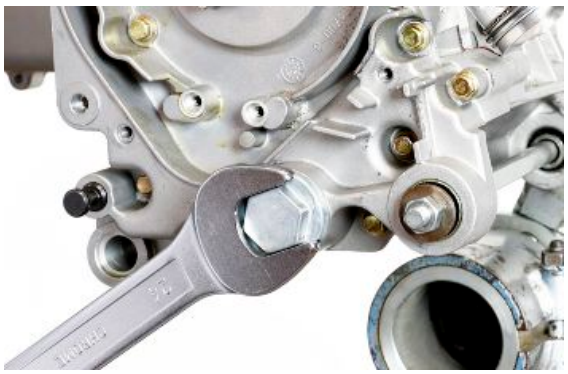
Engine oil sump - Crankcase **8 - 10 Nm**



- Check the oil and O-ring mesh filter condition, insert it in its seat checking the correct snap-on lock.



- Tighten the engine oil drainage cap to the prescribed torque.
- Proceed with the fitting of the transmission cover and top up the engine oil level using the recommended product.



Recommended products

Engine oil 5W -40 Synthetic-based lubricant for four-stroke engines.

SAE 5W-40; JASO MA, MA2; API SL; ACEA A3

Characteristic

Engine oil

~ 850 cm³

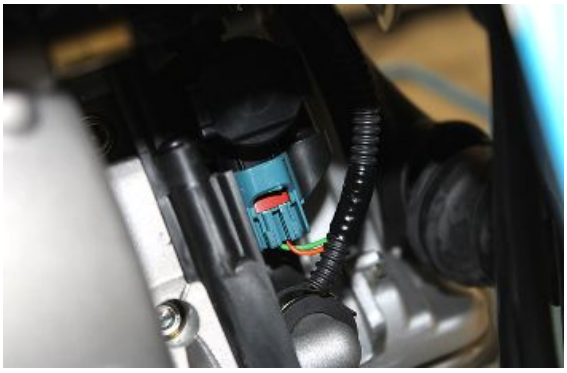
Locking torques (N*m)

Engine oil drainage plug - Crankcase **25 - 28 Nm**

SAS valve

To remove the SAS valve, proceed as follows:

- Remove the engine from the vehicle by disconnecting the SAS valve connector.



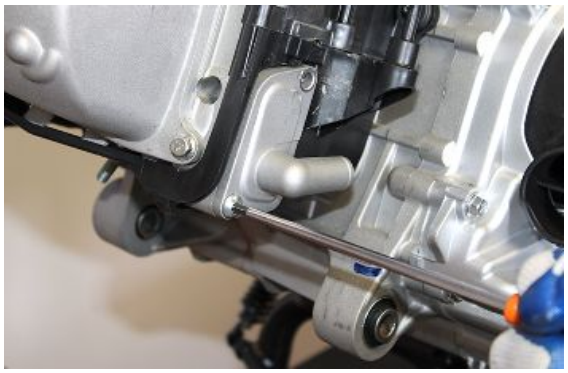
- Remove the pipe clamp on the connection pipe between SAS valve and air filter box.

- Disconnect the connection pipe between air filter box and SAS valve.

- Using the special callipers release the fastening clamp of the pipe to the reed valve cover.

- Remove the SAS valve.

- Unscrew and remove the reed valve cover fastening screws.



- Remove the reed valve cover.

- Remove the reed valve.

INDEX OF TOPICS

Precautions

Troubleshooting tips

1 An injection system failure is more likely to be due to the connections than to the components.

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

A: Power supply

a. Battery voltage

b. Blown fuse

c. Relays

d. Connectors

B: Frame ground connection

C: Fuel system

a. Faulty fuel pump

b. Dirty fuel filter

D: Ignition system

a. Faulty spark plug

b. Faulty coil

c. Faulty shielded cap

E: Intake circuit

a. Air filter dirty

b. b. Dirty by-pass circuit

c. Idle speed adjustment device

F: Others

a. Wrong timing system

b. Wrong idle mixture

c. Incorrect reset of the throttle valve position sensor

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

Check the connectors taking into consideration the following point:

A check that the terminals are not bent.

B check that the connectors have been properly connected.

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

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

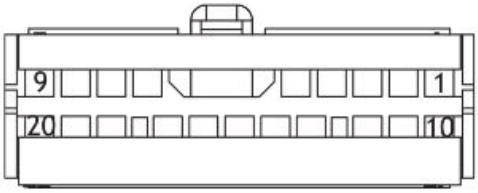
4 For troubleshooting, use a multimeter with an internal resistance of more than 10 KW/V. Improper instruments may damage the injection control unit. The instruments to be preferred have a definition over 0.1V and 0.5W and an accuracy over 2%.

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 supply system is pressurised at 250 kPa (2.5 BAR). Before disconnecting the fast-release fitting of the fuel supply pipe, check that there are no naked flames. Do not smoke. Act with caution to avoid spraying fuel to your eyes.
3. When repairing electric components, the battery must always be disconnected unless it is strictly necessary for the battery to be connected.
4. When functional checks are performed, make sure that the battery voltage exceeds 12V.
5. Before attempting to start the vehicle, ensure that there are at least two litres of fuel in the tank. Failure to respect this norm will damage the fuel pump.
6. If a long period is envisaged with the vehicle not in use, fill the tank to at least the halfway mark. This will ensure the pump will be covered by fuel.
7. When washing the vehicle, do not spray excessive water on electric components and wiring harnesses.
8. In the event of ignition problems, begin troubleshooting from the battery and the injection system connections.
9. Before disconnecting the connector of the injection control unit, perform the following steps in the order shown:
- Set the switch to «OFF»
- Disconnect the battery

Failure to respect this norm may damage the control unit.
10. Do not invert the poles when fitting the battery.
11. To avoid causing any damage, disconnect and reconnect the injection system connectors only if required. 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 injection control unit.
14. Before reconnecting the quick couplers of the power supply system, check that the terminals are perfectly clean.

Terminals setup

INJECTION ECU



1. Fuel pump command (Green)

2. MIL warning light (Brown-White)

3. Lambda probe heater (Light blue-Red)

4. Not connected

5. Battery power (Red-White)

6. Injector (Red-Yellow)

7. Ground sensors (Grey-Green)

8. H.V. coil (Pink-Black)

9. Injection loads power supply (Black-Green)

10. Diagnostic socket (Orange-Black)

11. Voltage regulator (Green-White)

12. Pick-up (Red)

13. Lambda probe (Green - Blue)

14. TPS signal (Orange-White)

15. Start enable (Orange)

16. Engine temperature sensor (Light blue-Green)

17. Idle valve (White-Black)

18. TPS power supply (Red-Black)

19. Ground lead (Black)

20. Ignition switched live (White)

Troubleshooting procedure

Engine does not start

ENGINE DOES NOT START EVEN IF PULLED

Possible Cause	Operation
Immobilizer enabling signal	System not encoded System not efficient, repair according to the indications of the self-diagnosis
Faults detected by self-diagnosis	Pump relay H.V. coil. Injector Engine speed timing sensor
Fuel system	Fuel in the tank Fuel pump activation Fuel pressure (low) Injector flow (low)
Power to spark plug	Shielded spark plug cap H.V. coil (secondary insulation)
Parameter reliability	Engine temperature Distribution timing adjustment - injection start Intake air temperature
End of compression pressure	End of compression pressure

Starting difficulties

ENGINE STARTER PROBLEMS

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

Engine stops at idle

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

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

Engine does not rev down

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

Possible Cause	Operation
Faults detected by self-diagnosis	Pump relay

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

Exhaust backfires in deceleration

EXHAUST BACKFIRING WHEN DECELERATING

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

Engine revs irregularly

ENGINE IRREGULAR PERFORMANCE WITH VALVE SLIGHTLY OPEN

Possible Cause	Operation
Intake system cleaning	Air filter Diffuser and throttle valve Stepper
Intake system sealing	Air cleaner joint Filter housing
Ignition system	Spark plug wear check
Parameter reliability	Throttle valve position signal Engine temperature signal Intake air temperature signal Ignition advance
TPS reset successful	TPS reset successful
Faults detected by self-diagnosis	Pump relay H.V. coil.

Possible Cause	Operation
	Injector Engine speed timing sensor Air temperature Engine temperature Lambda probe

Poor performance at full throttle

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

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

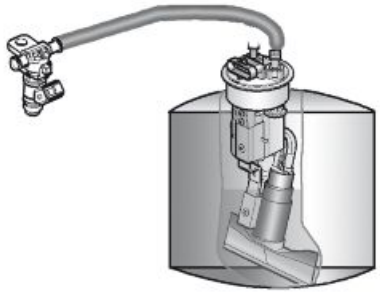
Engine knocking

PRESENCE OF KNOCKING (COMBUSTION SHOCKS)

Possible Cause	Operation
Faults detected by self-diagnosis	Pump relay H.V. coil. Injector Engine speed timing sensor Air temperature Engine temperature Lambda probe
Ignition efficiency	Spark plug
Parameter reliability	Throttle valve position signal Engine temperature signal Intake air temperature signal Ignition advance
Intake system sealing	Air cleaner joint Filter housing
TPS reset successful	TPS reset successful
Fuel system	Fuel pressure Fuel filter Injector flow Fuel quality
Selection of the cylinder base gasket thickness	Selection of the cylinder base gasket thickness

Fuel supply system

The fuel system circuit includes the electric pump, the filter, the pressure regulator, the electro-injector and the fuel delivery pipes.
The electrical pump is located in the tank from which the fuel is pumped and sent to the injector through the filter.
The pressure is controlled by the pressure regulator situated in the pump assembly in the tank.



Removing the injector

- Disconnect the connector from the injector.

- Unscrew the screw used to fasten the fuel pipe support bracket.

- Slide the fuel pipe retaining spring out, and then disconnect the injector.

- Unscrew and remove the injector to manifold fixing screws.

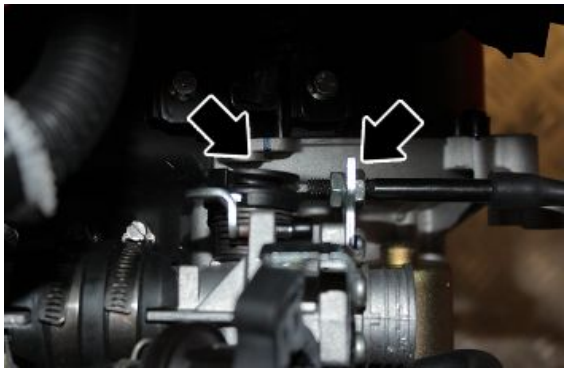
- Remove the injector.

Refitting the injector

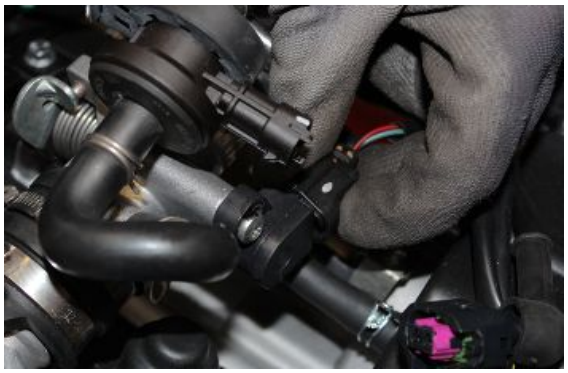
For refitting, perform the removal operations in reverse order and lubricate the sealing OR gasket with grease for internal application before fitting the injector on the manifold.

Removing the butterfly valve

- Disconnect the gas command transmission.



- Disconnect the potentiometer connector.



- Remove the clamp and disconnect the idle regulator pipe from the filter box.

- Loosen the clamp fastening the throttle body to the intake d.

- Disconnect the pipe from the throttle body.

- Clean the throttle body according to the scheduled maintenance.

WARNING

AFTER MAINTENANCE OPERATIONS, IT IS RECOMMENDED TO DELETE THE SELF-ADJUSTABLE PARAMETERS.

Recommended products

Detergent for throttle bodies Spray cleaner for throttle bodies

Detergent for throttle bodies

Refitting the butterfly valve

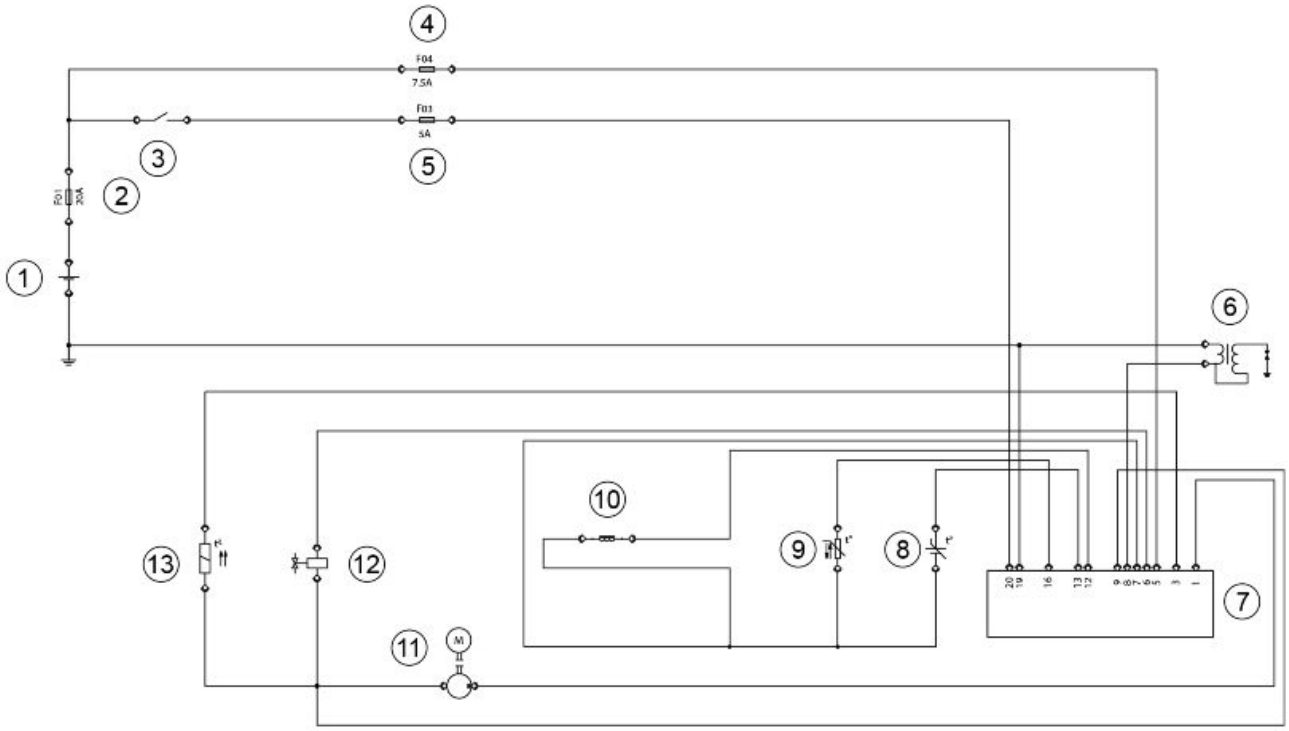
- To refit, follow the operations, but in reverse order, every time the throttle position sensor is disconnected it is necessary to calibrate the self-adjusting parameters.

Do not tamper with the stop screw under the throttle body.

CAUTION

DO NOT TAMPER WITH THE STOP SCREWS UNDER THE THROTTLE BODY, AS THE IDLE SPEED IS ADJUSTED IN THE FACTORY.

Pump supply circuit



1. Battery

2. Fuse No.1 - 20 A

3. Ignition switch

4. Fuse No.4 - 7,5 A

5. Fuse No.3 - 5 A

6. H.V. coil

7. Injection ECU

8. Lambda probe

9. Engine temperature sensor

10. Engine speed sensor

11. Fuel pump

12. Injector

13. Lambda probe heater

ELECTRICAL DATA

• Pump winding resistance ~ 1.5 ohm

• Input current during normal functioning 1.4 - 1.8 A.

• input current to the closed hydraulic circuit ~ 2 A (to be checked with specific tool for fuel pressure.)

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 2.5 BAR and that the input current is 1.4 - 1.8 A.

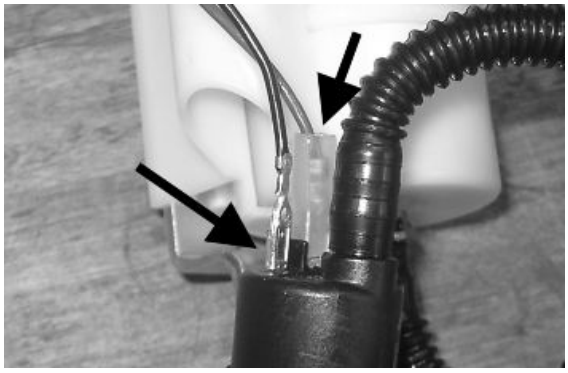
With the battery voltage > 12 V, check the pump flow rate by disconnecting from the injector the pipe equipped with the pressure gauge of the appropriate tool. Make a graded burette available with a flow rate of approximately 1 L. Rotate the pump using the active diagnosis of the palm top computer. Using a pair of long flat needle-nose pliers, choke the fuel pipe making the pressure stabilise at approx. 2.5 bar. Check that within 15 seconds the pump has a flow rate of approx. 110 cm^3.

Specific tooling

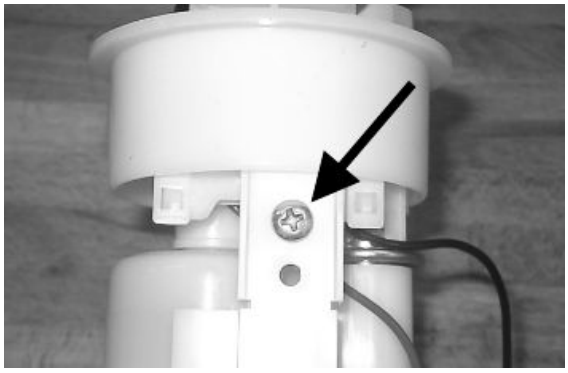
020480Y Fuel pressure measurement kit

Fuel filter check

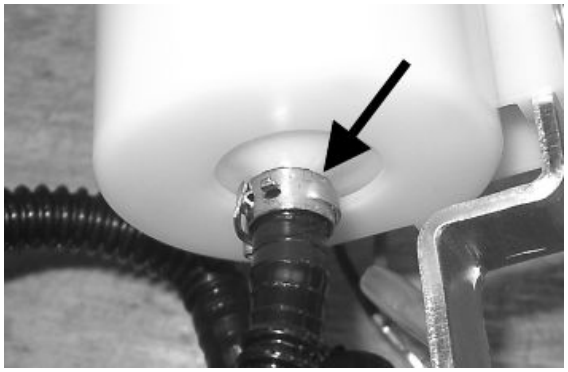
After removing from the tank, disconnect the electric pump terminals.



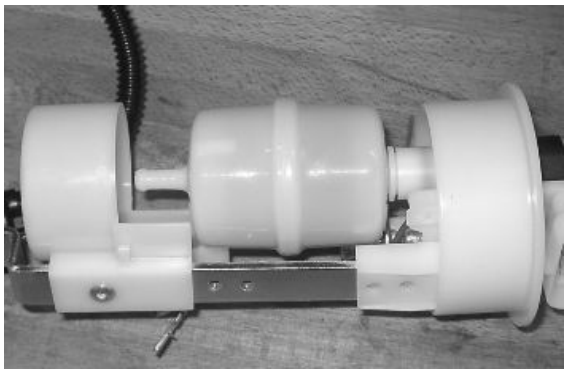
Remove the screw shown in the picture



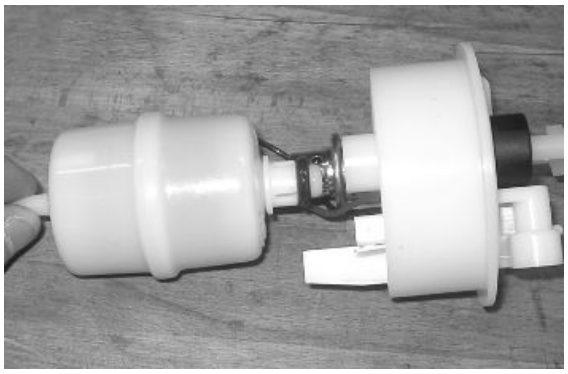
Remove the clamp fixing the piping to the filter shown in the photograph



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



Remove the filter from the pump mounting



Inspecting the injector hydraulics

- Remove the injector.

Install the specific tool to check the fuel pressure and position the injector on a graduated container of at least 100 cm³.

- Connect the clamps of the cable supplied to an auxiliary battery.

- Activate the fuel pump with diagnostics engaged and make sure that within fifteen seconds, approximately 40 cm³ of fuel is dispensed with a pressure of approximately 2.5 BAR.

Specific tooling

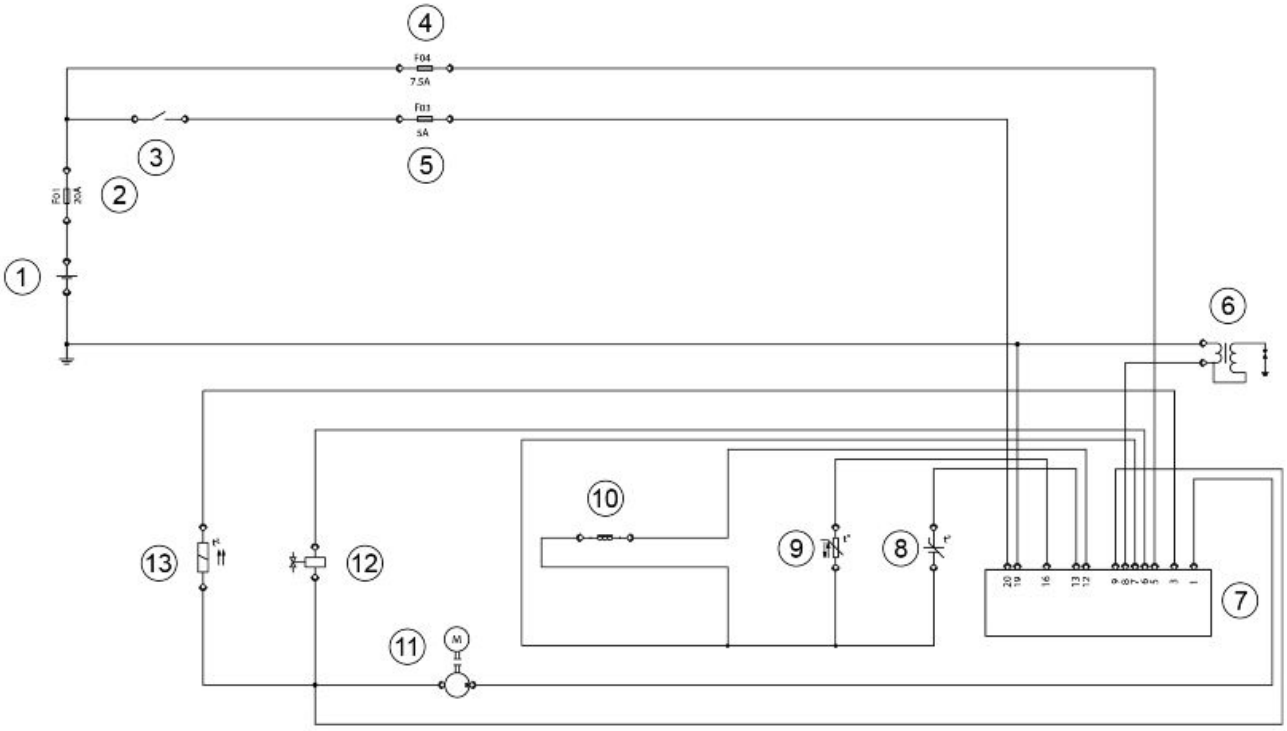
020480Y Fuel pressure measurement kit

Proceed with the injector seal test.

Dry the injector outlet with a blast of compressed air. Activate the fuel pump. Wait for one minute, making sure there are no leaks coming from the injector. Slight oozing is normal.

Value limit = 1 drop per minute

HT coil



1. Battery

2. Fuse No.1 - 20 A

3. Ignition switch

4. Fuse No.4 - 7,5 A

5. Fuse No.3 - 5 A

6. H.V. coil

7. Injection ECU

8. Lambda probe

9. Engine temperature sensor

10. Engine speed sensor

11. Fuel pump

12. Injector

13. Lambda probe heater

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

The control unit manages two significant parameters:

- Ignition advance

This is optimised at the moment in accordance with the engine revs, engine load, temperature and environmental pressure.

With the engine at idle, the ignition advance is optimised to stabilise the speed at 1,450 ± 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 so ignition is only commanded in the compression phase.

Specific tooling

020331Y Digital multimeter

Zeroing the throttle

Resetting the throttle valve position signal (T.P.S reset)

The throttle body is supplied with throttle valve position sensor and is pre-calibrated.

Pre-calibration entails regulating the minimum opening of the throttle valve to obtain a certain flow of air under pre-set reference conditions.

Pre-calibration ensures optimal air flow to control idling.

This regulation must not be tampered with in any way whatsoever.

The injection system will complete the management of the idling through the related device and the variation of the ignition advance.

The throttle body after the pre-calibration has an opened valve with an angle that can vary depending on the tolerances of the machining of the pipe and the valve itself.

The valve position sensor can also assume various fitting positions. For these reasons the mV of the sensor with the valve at idle can vary from one throttle body to another.

To obtain the optimum fuel mixture, especially at small openings of the throttle valve, it is essential to match the throttle body with the control unit following the procedure known as TPS resetting.

With this operation we inform the control unit, as the starting point, of the mV value corresponding to the pre-calibrated position.

To reset, proceed as follows.

Connect the diagnostic tester.

Switch to «**ON**».

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

Specific tooling

020922Y Diagnosis Tool

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

With the throttle completely closed, check that the cables have clearance in all steering positions and confirm the position at the diagnostic tool.

Keep the throttle in a completely open position and confirm the position at the diagnostic tool.

CAUTION

DO NOT TAMPER WITH THE STOP SCREWS UNDER THE THROTTLE BODY, AS THE IDLE SPEED IS ADJUSTED IN THE FACTORY.

INDEX OF TOPICS

N.B.

THE UNITS OF MEASUREMENT CONTAINED IN THIS CHAPTER ARE EXPRESSED IN TERMS OF THE DECIMAL METRIC SYSTEM. TO REFER TO THE UNIT OF MEASUREMENT EXPRESSED IN TERMS OF THE ANGLO-SAXON SYSTEM, SEE THE "CHARACTERISTICS" CHAPTER.

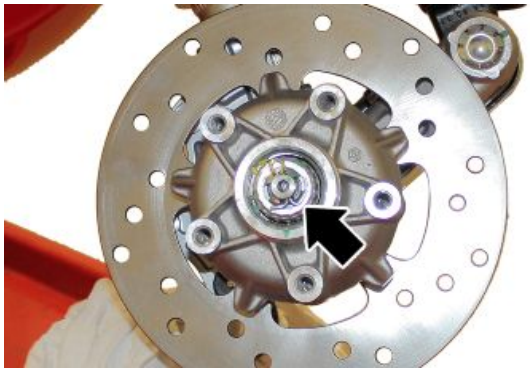
Front

Removing the front wheel

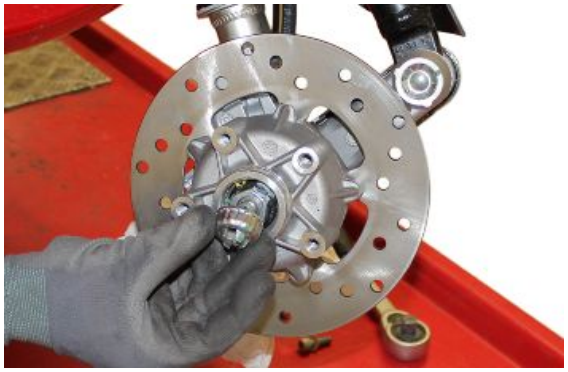
- Support the vehicle adequately.
- Loosen the five screws fixing the wheel to the hub.

- Remove the front wheel.

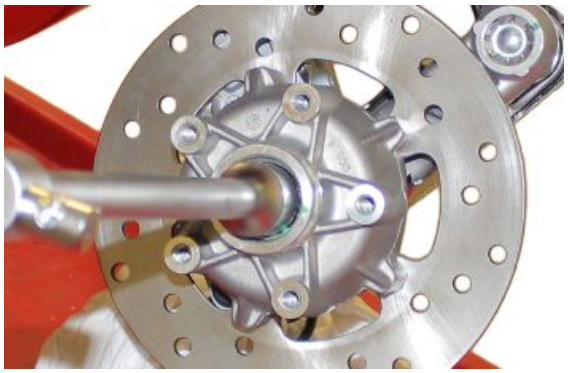
- To remove the wheel hub, first remove the front brake calliper, then proceed as follows.
- Remove the split pin.

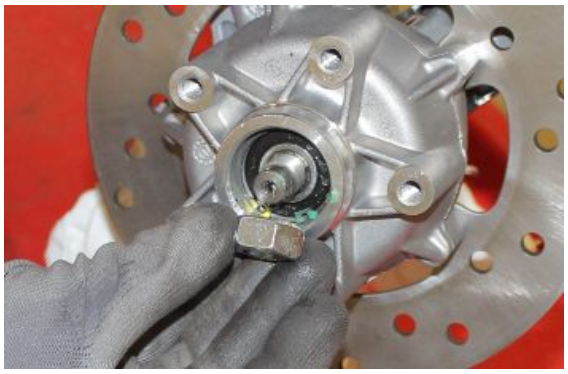


- Remove the cap.



- Unscrew the wheel hub retaining nut and remove it.





- Remove the wheel hub with the brake disc.

Front wheel hub overhaul

- Remove the ball bearing check Seeger ring indicated in the picture

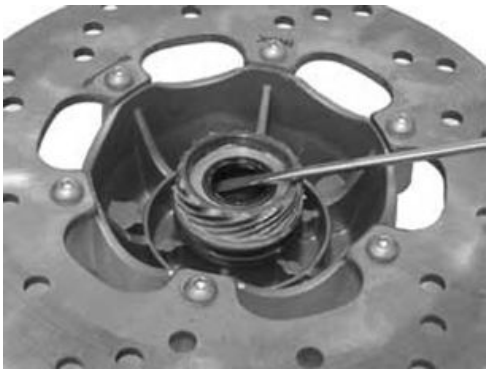
Extract the ball bearing using the specific tool

Specific tooling

001467Y014 Calliper to extract ø 15-mm bearings

001467Y017 Bell for bearings, OD 39 mm

- Remove the oil seal on the roller bearing side using a screwdriver



- Remove the roller bearing using the specific tool

Specific tooling

020376Y Adaptor handle

020456Y Ø 24 mm adaptor

020363Y 20-mm guide

- Heat the roller bearing seat with a heat gun
- Use the specific tool to introduce and push the bearing until it stops, with the shielded side facing out
- Refit the ball bearing check Seeger ring

Specific tooling

020151Y Air heater

020376Y Adaptor handle

020359Y 42 x 47 mm Adaptor

020412Y 15-mm guide

- Use the specific tool to fit and push the roller casing until it stops
- Refit the oil seal on the roller bearing side
- Lubricate the area between the roller bearing and the ball bearing

Specific tooling

020038Y Punch

Recommended products

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

ISO L-X-BCHA 3 - DIN 51 825 K3K -20

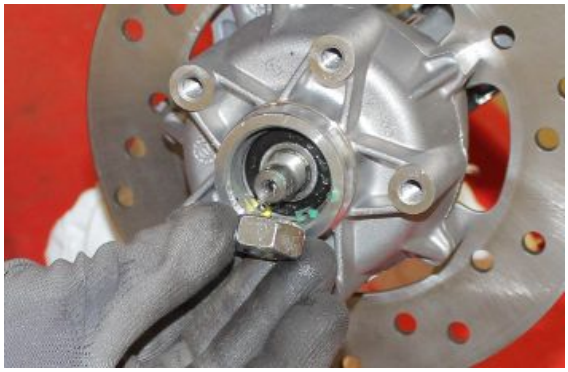
Refitting the front wheel

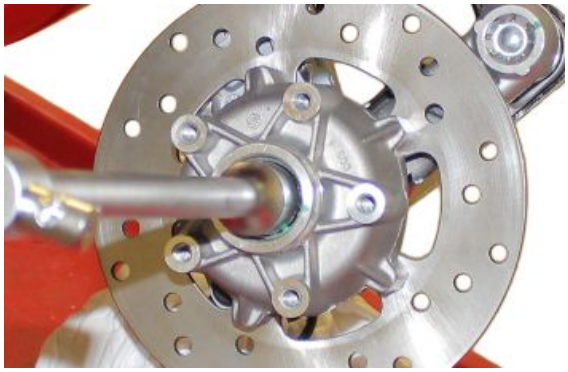
- Position the hub, complete with brake disc, on the wheel axle.

- Insert the wheel axle nut and tighten, applying the recommended torque.

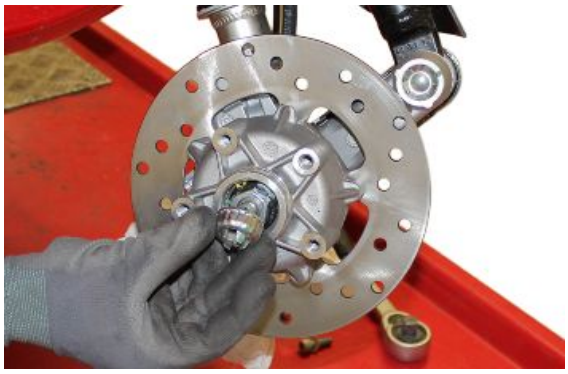
Locking torques (N*m)

Front wheel axle nut **75 to 90 (55.3 to 66.4 lb*ft)**

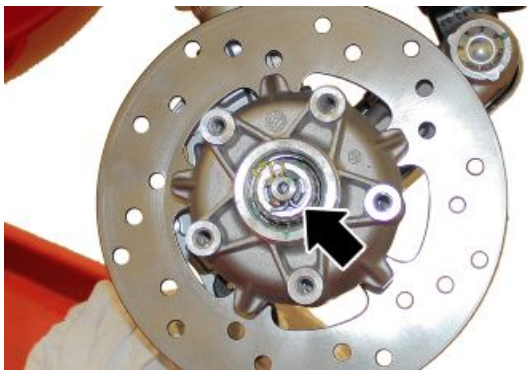




- Fit the cap.



- Fitter a new cotter pin.
- Reassemble the brake calliper.



- Position the wheel on the hub .

- Tighten the five screws used to fasten the rear wheel to the wheel hub, applying the recommended torque.

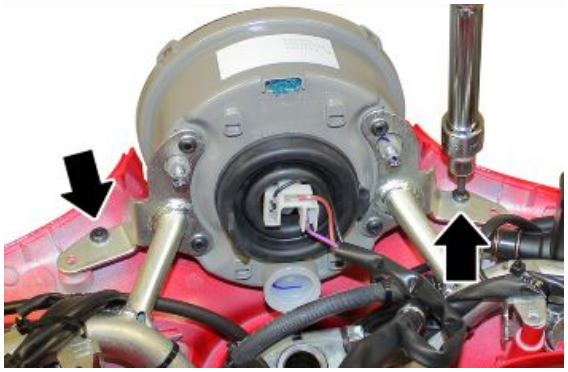
Locking torques (N*m)

Wheel rim screws 20 - 25

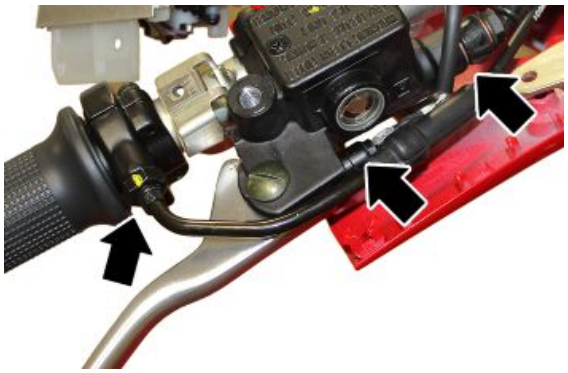
Handlebar

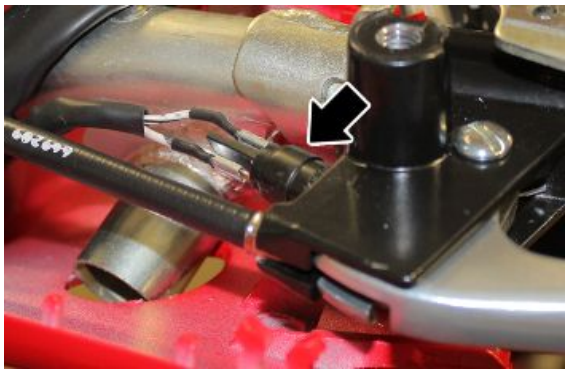
Removal

- Remove the upper handlebar cover.
- Unscrew the two fastenings indicated.

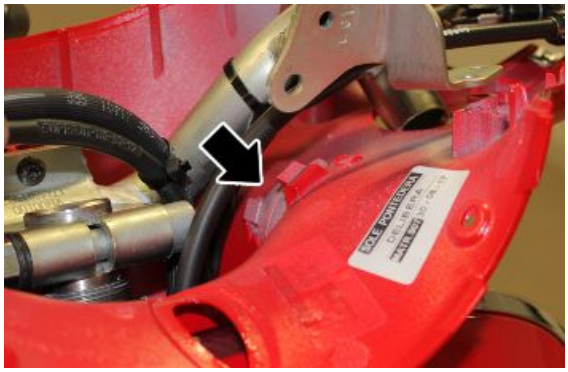


- Remove the light assembly.
- Remove the column light switch from the lower handlebar cover.
- Disconnect the brake pump and gas control transmissions.
- Disconnect the connectors on the brake lever push-buttons.





- Remove the access fastenings access plugs from either end of the handlebar.



- Block the nut on the right hand side so that it cannot rotate, and then unscrew the handlebar fastening bolt.
- Remove the handlebar.

WARNING

DO NOT LEAVE THE REMOVED INSTRUMENT DANGLING OR UPSIDE DOWN AS THIS COULD DAMAGE IT IRREPARABLY. FAILURE TO OBSERVE THIS INSTRUCTION CAUSES THE LOSS OF CALIBRATION OF THE INSTRUMENT PANEL WHICH, ALTHOUGH OPERATIONAL, INDICATES INCORRECT VALUES.

N.B.

IF THE HANDLEBAR IS BEING REMOVED TO REMOVE THE STEERING, TILT THE HANDLEBAR FORWARD TO AVOIDING DAMAGING THE TRANSMISSIONS.

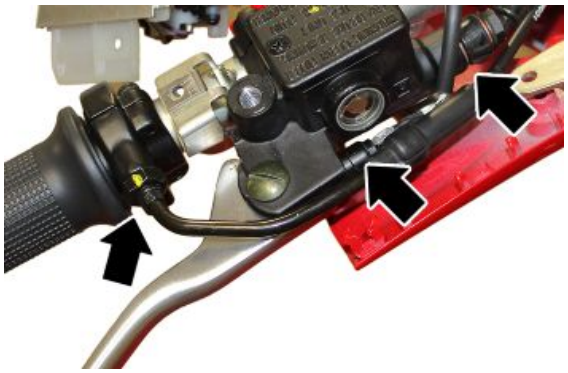
Refitting

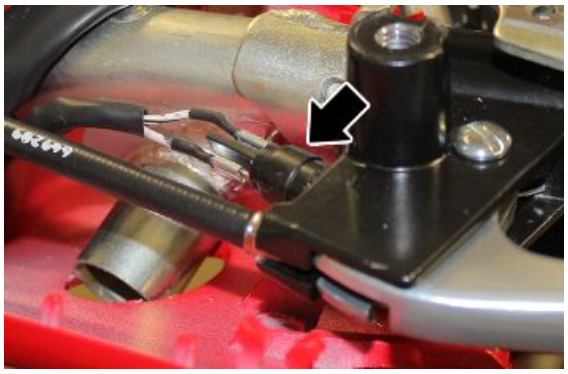
- Position the handlebar on the steering tube and insert the fastening bolt.
- Block the nut on the right hand side so that it cannot rotate, and then tighten applying the recommended torque.

Locking torques (N*m)

Handlebar lock nut 45 - 50

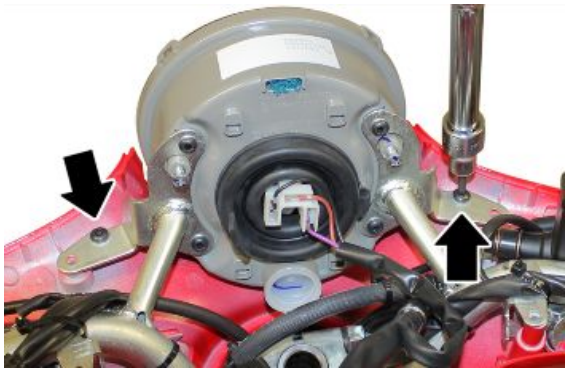
- Connect the brake pump and gas control transmissions.
- Connect the connectors on the brake lever push-buttons.
- Reinstall the front light assembly and column light switch.





- Replace the handlebar fastening access plugs.

- Tighten the two fastenings indicated.
- Replace the upper handlebar cover.



Steering column

Removal

- Suitably support the vehicle so the front wheel is lifted.
- Remove the front wheel.
- Remove the brake calliper and disconnect it from the brake tube.
- Remove the hub, shock absorber and the brake calliper and shock absorber support.

- Remove the handlebar.
- Release the brake transmission and the speed sensor cables from their respective fastenings.

- Undo the upper steering ring nut using the special tool.

Specific tooling

020055Y Wrench for steering tube ring nut

- Remove the shield.

- Undo the lower steering ring nut using the special tool.

Specific tooling

020055Y Wrench for steering tube ring nut

- Slide the steering tube, complete with fork, out from below.

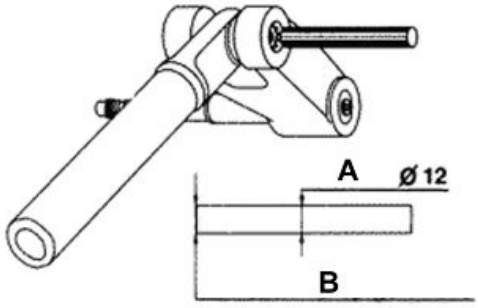
- Remove the front mudguard.

- take care not to disturb the two ball bearings shown in the photo.

Overhaul

-The front suspension service operation is useful to replace the connecting parts between the steering tube and the swinging hub of the front wheel holder, provided that the steering tube and the wheel holder hub are in excellent conditions.

- Press and remove the wedging washer with the help of a pointed end.
- For the second washer, repeat the operation using the punch on the side opposite to the one shown in the figure.

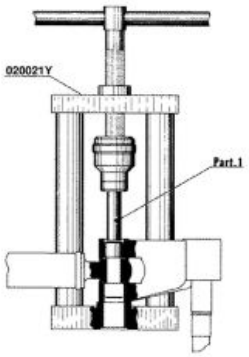


A = Ø12 Punch

B = Sharp-edged end

- Use the specific tool, fitted with part 1*, and operate the handgrip until the pin and the Nadella are simultaneously ejected in the direction opposite the tool thrusting force.
- To eject the second Nadella, use the tool fitted with part 2* instead of part 1, on the side opposite the one shown in the figure.

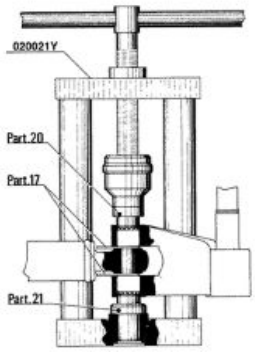
* Supplied with the tool



Specific tooling

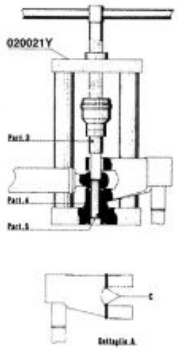
020021Y Front suspension service tool

- Use the tool fitted with part 20* and part 21* on its stem as shown in the figure.
- Push the two roller bearings with the handgrip until their bottoms make contact with the pin end.



- Fit both dust guard rings «**C**» on the swinging hub as shown in the detail drawing «**A**».
- Connect the swinging hub to the steering tube with the guide pin, part 5*.
- Use the specific tool fitted with part 3* on its stem and with part 4 at the bottom of the tool.
- Insert the previously greased pin on the swinging hub and with the tool handgrip, move part 3 until it stops on the steering tube.
- After fitting the pin, insert the two spacers, part 17*, slightly hitting with the mallet.

* Supplied with the tool



Specific tooling

020021Y Front suspension service tool

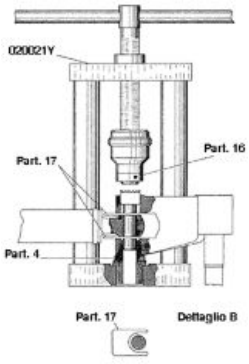
Recommended products

Calcium based grease Calcium grease

Smooth-textured appearance; Ivory coloured

Specification TL 9150 066, symbol NATO G 460

- Lubricate the sealing rings with mineral oil and half-fill the roller bearings with grease.
- Insert the sealing ring on the pin and the roller bushing with wedging washers at the same time.
- Remove the specific tool, then the part 5 (guiding) partially ejected in the previous assembly stage; leave part 4* always fitted.
- Replace part 3 with part 16* on the stem.
- Push, from the handgrip, the wedging washer - roller bearing - sealing ring unit, placing part 16 until it stops on the swinging hub.



- Repeat the operation described above using the tool fitted with part 16 and part 22* instead of part 4 on the stem, on the side opposite the one shown in the figure to refit the second wedging washer - roller bearing - sealing ring unit.

* Supplied with the tool

Specific tooling

020021Y Front suspension service tool

Recommended products

Calcium based grease Calcium grease

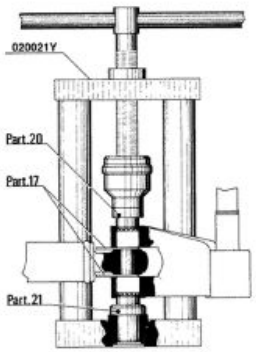
Smooth-textured appearance; Ivory coloured

Specification TL 9150 066, symbol NATO G 460

Use the tool fitted with parts 3 and 4, as indicated to fit the pin, and press operating the handgrip, until wedging the washers on the swinging hub.

- Remove the spacers, part 17, fill with grease the area between the steering tube and the swinging hub, and place the dust guard rings in that place.

* Supplied with the tool



N.B.

ASSEMBLE THE LOWER HOUSING ON HE STEERING TUBE WITH A TUBE SECTION OF AN ADEQUATE DIAME-TER.

Specific tooling

020021Y Front suspension service tool

001330Y Tool for fitting steering seats

Recommended products

Calcium based grease Calcium grease

Smooth-textured appearance; Ivory coloured

Specification TL 9150 066, symbol NATO G 460

Refitting

- Replace the front mudguard.

- Insert the steering tube, complete with fork and mudguard.

- Tighten the lower steering ring nut using the special tool.

Specific tooling

020055Y Wrench for steering tube ring nut

- Position the brake transmission and the speed sensor cables in the respective housings.

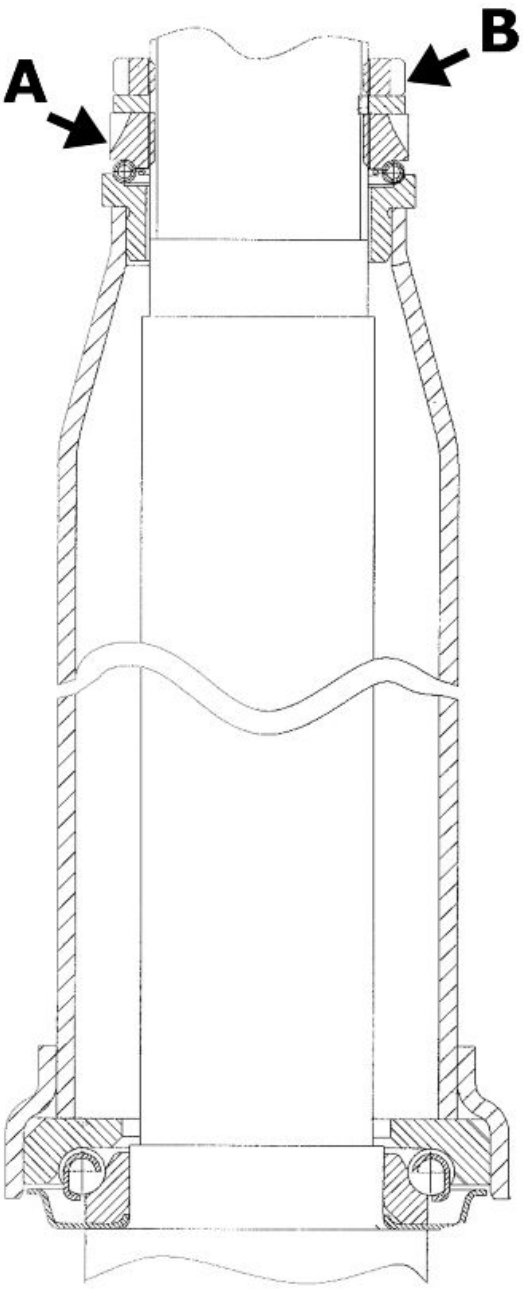
- Insert the shield.

- Tighten the upper steering ring nut using the special tool.
- Replace the handlebar, hub, shock absorber, and brake calliper and shock absorber support.
- Replace the brake calliper and connect it to the brake pipe.
- Install the front wheel.

Specific tooling

020055Y Wrench for steering tube ring nut

When fitting the fork, lubricate with the steering bearing tracks with the recommended grease. Tighten the lower ring nut **"A"** and the upper ring nut **"B"** to the specified torque



Recommended products

Calcium based grease Calcium grease

Smooth-textured appearance; Ivory coloured

Specification TL 9150 066, symbol NATO G 460

Locking torques (N*m)

Lower steering ring nut 8 to 10 Upper steering ring nut 35 - 40

CAUTION

USE NEW ROLLER BEARINGS, PIN, SEALING RINGS AND DUST GUARDS FOR REFITTING.

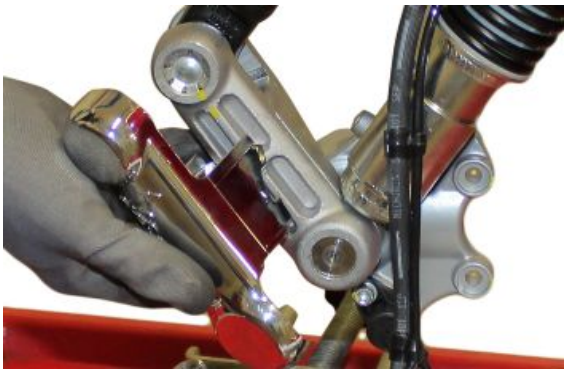
Front shock absorber

Removal

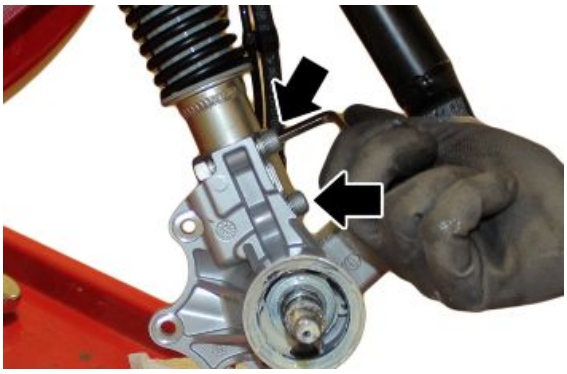
- Support the vehicle adequately.
- Remove the front wheel.
- Remove the wheel hub.
- Block the respective nut on the right hand side so that it cannot rotate, and then unscrew the shock absorber cover retaining screw.

- Slide the shock absorber cover off from below.

- Remove the cover on the oscillating hub.



- Unscrew the two lower shock absorber fastenings, and remove them.



- Unscrew the two upper fastenings and remove them.

- Remove the shock absorber.

Refitting

- Position the shock absorber.

- Tighten the two upper fastenings, applying the recommended torque.

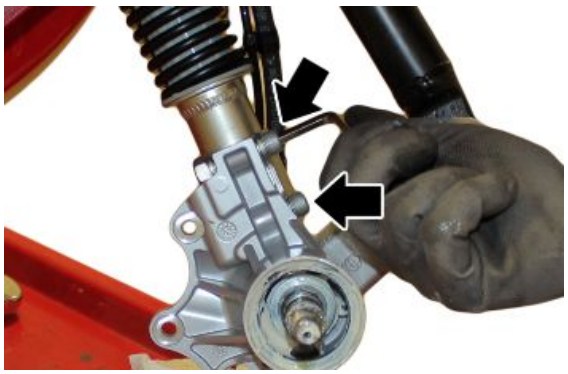
Locking torques (N*m)

shock absorber upper clamp **20 to 30**

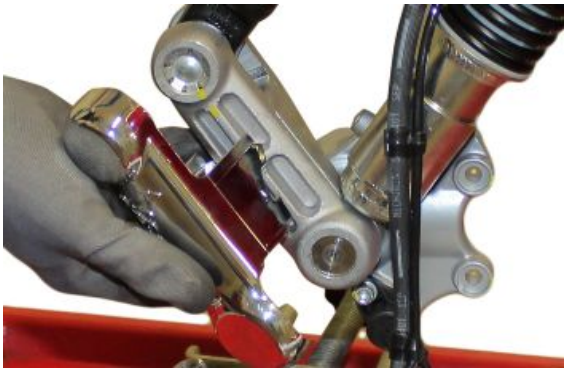
- Tighten the two lower fastenings, applying the recommended torque.

Locking torques (N*m)

lower shock absorber clamp **20 - 27**

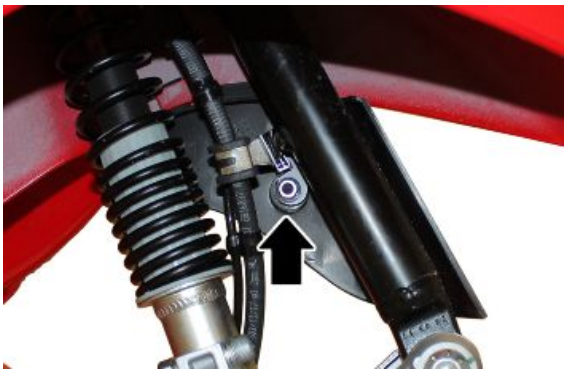


- Fit the cover on the oscillating hub.



- Insert the cover on the shock absorber from below.

- Block the respective nut on the right hand side so that it cannot rotate, and then tighten the shock absorber cover retaining screw.
- Reassemble the hub and the wheel.



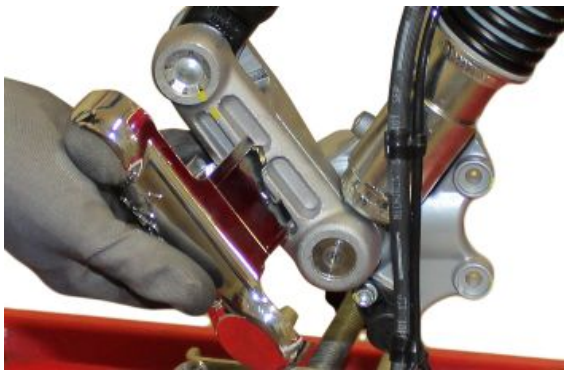
Shock-absorber - calliper bracket

Removal

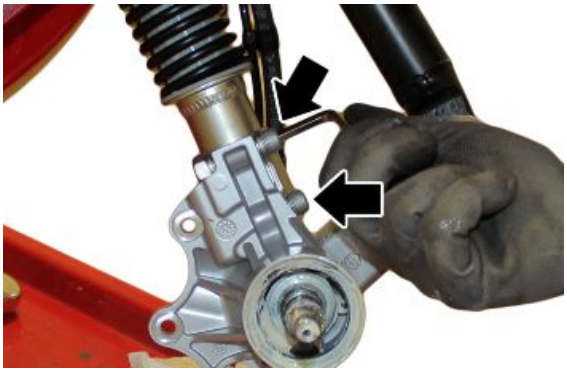
- Support the vehicle adequately.
- Remove the front wheel.
- Remove the wheel hub.
- Block the respective nut on the right hand side so that it cannot rotate, and then unscrew the shock absorber cover retaining screw.

- Slide the shock absorber cover off from below.

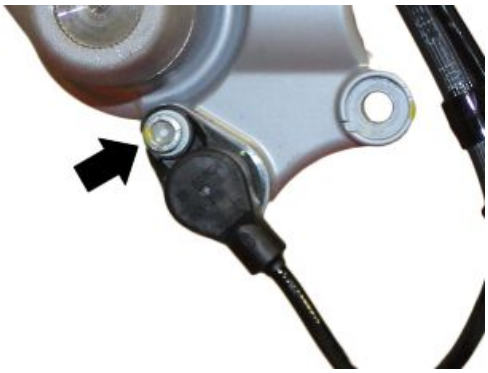
- Remove the cover on the oscillating hub.



- Unscrew the two lower shock absorber fastenings, and remove them.



- Unscrew the speed sensor fastening screw and remove it from the support.



- Remove the bracket locking Seeger ring

- Slide the bracket off the wheel axle, taking care not to lose the washer and o-ring are positioned behind it.

Overhaul

- Remove the two roller bearings from the bracket with the specific tool operating on the shock absorber attachment side as shown in the photograph

Specific tooling

020376Y Adaptor handle

020441Y 26 x 28 mm adaptor

020365Y 22 mm guide

- Remove the oil seal on the wheel hub side with the screwdriver as shown in the photograph

- Suitably hold the brake calliper - shock absorber attachment bracket
- Fit a new oil seal and move it until it stops using the specific tool

Specific tooling

020376Y Adaptor handle

020360S 52 x 55 mm adaptor

- Assemble a new roller bearing on the shock absorber side and move it until it stops using the specific tool

Specific tooling

020036Y Punch

- Suitably hold the brake calliper - shock absorber attachment bracket

- Assemble a new roller bearing on the wheel hub side and move it until it stops using the specific tool

Specific tooling

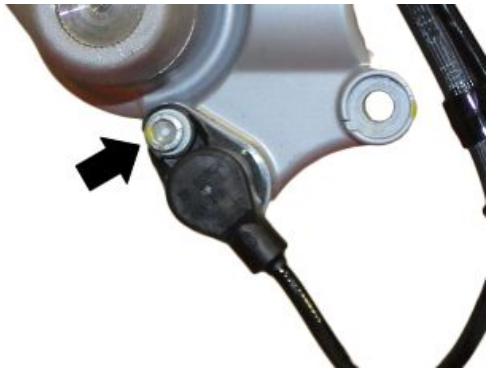
020037Y Punch

Refitting

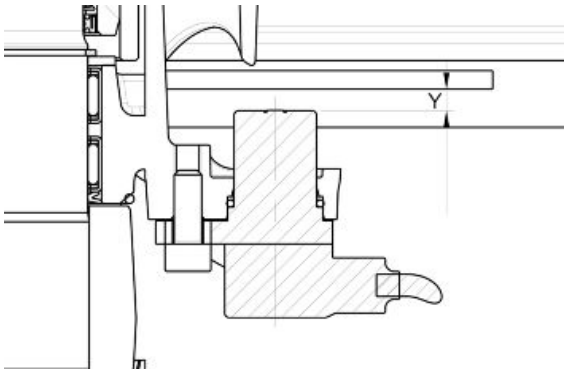
- Insert the bracket on the wheel axle, making sure that the washer and o-ring are positioned correctly.

- Mount the bracket locking Seeger ring

- Mount the speed sensor.



PAY PARTICULAR ATTENTION TO THE FITTING OF THE SPEED SENSOR; PROCEED AS FOLLOWS:



- Mount the sensor on its seat.
- Measure the distance «**Y**» between the brake disc and the sensor with a feeler gauge.
- Based on the measured distance, insert the calibration thickness number (from the spare parts catalogue) indicated in the table between sensor and support.

Characteristic

Calibration thickness

0.3 ± 0.03 mm

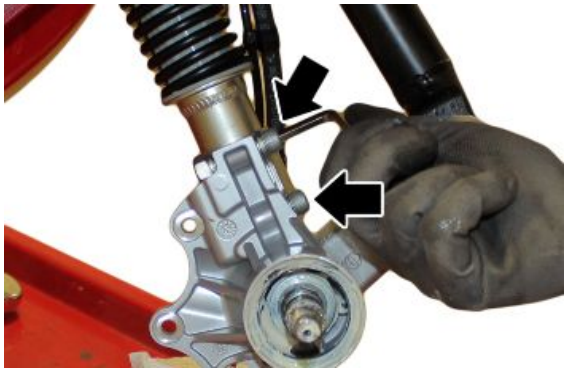
Locking torques (N*m)

Speed sensor fastener screw **8 to 10**

SPEED SENSOR MOUNTING

Distance (mm)	Calibration thickness number
Y = 4.7 - 5	1
Y = 4.4 - 4.6	2
Y = 4.3 - 4.1	3
Y = 4 - 3.8	4
Y = 3.7 - 3.5	5
Y = 3.4 - 3.2	6

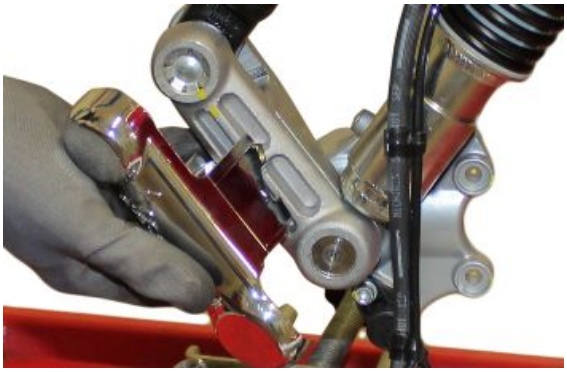
- Tighten the two lower fastenings, applying the recommended torque.



Locking torques (N*m)

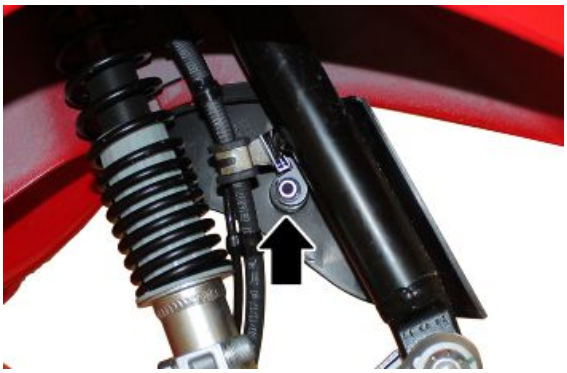
lower shock absorber clamp **20 - 27**

- Fit the cover on the oscillating hub.



- Insert the cover on the shock absorber from below.

- Block the respective nut on the right hand side so that it cannot rotate, and then tighten the shock absorber cover retaining screw.
- Reassemble the hub and the wheel.



Steering bearing

Removal

- Use the specific tool both to remove the lower seat of the upper bearing and to remove the upper seat of the lower bearing fitted on the chassis.

N.B.

TO REMOVE THE LOWER SEAT OF THE LOWER STEERING BEARING JUST USE A SCREW-DRIVER AS A LEVER BETWEEN THE SEATING AND THE SLEEVE.

Specific tooling

020004Y Punch for removing steering bearings from headstock

- Remove the fifth wheel fitting and the dust gaiter on the steering bearing as shown in figure, using the specific tool. Proceed giving a few taps with the mallet.

Specific tooling

020004Y Punch for removing steering bearings from headstock

- Refit the fifth wheel fitting and the dust gaiter on the steering bearing until they stop, using the specific tool.

Specific tooling

006029Y Punch for fitting steering bearing on the steering tube

Rear

Removing the rear wheel

FOR VERSION WITH CAP AND COTTER PIN (UNTIL 01/2020)

- Remove the cotter pin.

- Remove the cap.

- Unscrew the rear wheel retaining nut.

- Retrieve the washer underneath.

- Remove the rear wheel.

FOR VERSION WITH SELFBRAKING NUT (FROM 01/2020)

Depending on the fixing of the rear wheel used on the vehicle, two procedure variations are possible.
To remove the rear wheel it is necessary to remove the exhaust silencer.
Proceed as follows:

- Unscrew the fixing nut at the wheel axle.

- Remove the self-braking nut.

- Remove the washer.

- Remove the wheel.

Refitting the rear wheel

FOR VERSION WITH CAP AND COTTER PIN (UNTIL 01/2020)

- Position the rear wheel on the wheel axle.

- Insert the washer.

- Tighten the rear wheel retaining nut, applying the recommended torque.

Locking torques (N*m)

Rear wheel nut **104 to 126 (76.7 to 92.9 lb*ft)**

- Fit the cap.

- Fit a new cotter pin.

FOR VERSION WITH SELFBRAKING NUT (FROM 01/2020)

- Insert the rear wheel on the axle.

- Insert the washer.

- Insert the self-braking nut.

CAUTION

THE SELF-BRAKING NUT WITH METALLIC STAINLESS STEEL INSERT MUST BE REPLACED AT EVERY DISASSEMBLY AND REASSEMBLY OF THE REAR WHEEL.

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

Locking torques (N*m)

Rear wheel axle **104 to 126 (76.7 to 92.9 lb*ft)**

- Refit the exhaust silencer by inserting it in its seat.

Swing-arm

Removal

- Remove the cap from the lower part.

- Working on both sides, remove the cover caps.

- Working on the right side, unscrew the side fixing nut to the chassis and collect the washer.

- Working on the left side, remove the bolt.

- Disconnect the spring between the swing arm-engine bolt and the bolt on the chassis.

- Block the nut on the right hand side so that it cannot rotate, and then unscrew and extract the swinging arm-engine bolt.

- Remove the swinging arm from the vehicle; first release it from the engine side and then from the chassis side.

Overhaul

- Check that the silent-blocks are in good conditions.

- Otherwise, replace the swinging arm.

Refitting

- Tighten the swinging arm-engine fastening bolt, blocking the nut on the right hand side so that it cannot rotate, and applying the recommended torque.

Locking torques (N*m)

Engine-swinging arm bolt **33 to 41 (24.3 to 30.2 lb*ft)**

- Connect the spring between the swing arm-engine bolt and the bolt on the chassis.

- Tighten the swinging arm-chassis fastening bolt, blocking the nut on the right hand side so that it cannot rotate, and applying the recommended torque.

Locking torques (N*m)

Frame-swinging arm bolt **44 to 52 (32.4 to 38.3 lb*ft)**

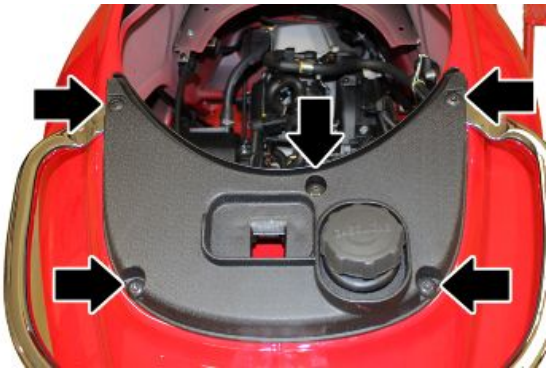
- Fit the covering caps on either end.

- Position the cap on the lower part.

Shock absorbers

Removal

- Remove the helmet compartment.
- Remove the five indicated screws.



- Unscrew the fuel tank filler cap momentarily.

- Remove the plastic cover, taking care not to disturb the fastenings of the pipes positioned underneath it.
- Replace the fuel tank filler cap.

- Adequately support the rear part of the vehicle.
- Undo the indicated upper fixing screw to the chassis.

- Unscrew the lower fixing bolt to the transmission crankcase.

Refitting

- Tighten the lower screw that fastens the shock absorber to the crankcase, applying the recommended torque.

Locking torques (N*m)

Shock absorber/engine bolt torque **33 - 41 N·m**

- Tighten the upper fastening screw, applying the recommended torque.

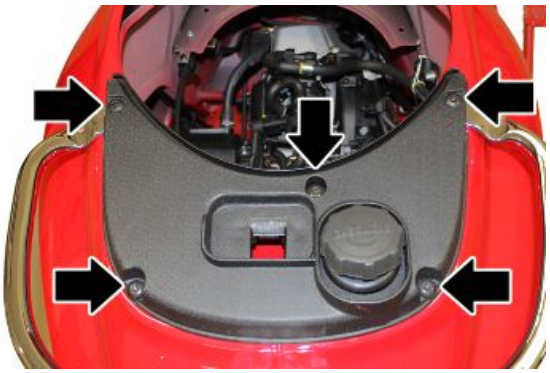
Locking torques (N*m)

Shock absorber/chassis nut torque **20 - 25 Nm**

- Unscrew the fuel tank filler cap momentarily.
- Replace the plastic cover, taking care not to disturb the fastenings of the pipes positioned underneath it.

- Replace the fuel tank filler cap.

- Tighten the five screws indicated.
- Replace the helmet compartment.



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N.B.

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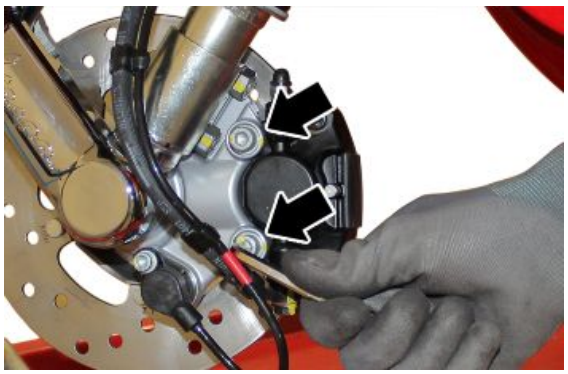
Front brake calliper

Removal

- Adequately support the vehicle and remove the front wheel.
- Undo the screws indicated.

N.B.

SHOULD IT BE NECESSARY TO REPLACE THE CALLIPER, FIRST LOOSEN THE JOINT 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 20 - 25

- If the calliper was replaced, bleed the system.

CAUTION

ALWAYS USE NEW COPPER WASHERS.

CAUTION

ONCE REFITTING IS FINISHED, BLEED THE SYSTEM.

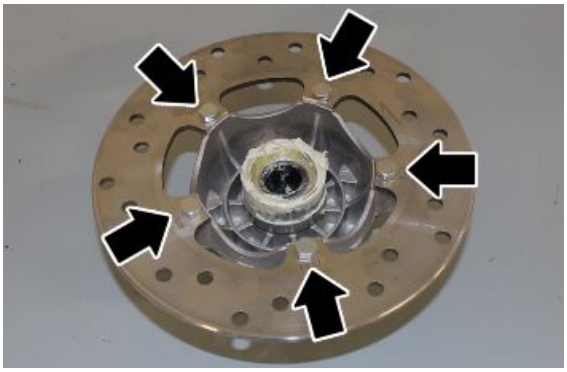
Locking torques (N*m)

Brake fluid pipe-calliper fitting 20 - 25

Front brake disc

Removal

- Remove the front wheel
- Remove the front brake calliper
- Remove the hub and the disc operating on the wheel axle nut
- Adequately support the hub with the disc and operating on the five screws shown in the photograph, remove the brake disc

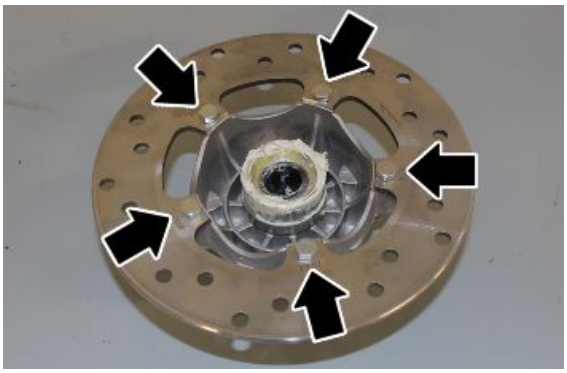


Refitting

- Carry out the operations in the reverse order from the removal being careful to respect the direction of disc rotation shown by the arrow printed on it
- Tighten the 5 screws to the specified torque

Locking torques (N*m)

Brake disc screw 5 to 6.5 (3.7 to 4.8 lb*ft)



Disc Inspection

- Remove the front wheel.
- Use a micrometer to check the disc thickness as shown in the photograph.
- Repeat the measurement in at least 6 points on the disk.
- Remove the front brake calliper.
- In order to secure the specific tool adequately use a metal plate with an M8 threaded hole and fix it to one of the two front brake calliper attachment points.
- Place the dial gauge on the disc outer edge.
- Make the wheel hub turn and check the disc deviation.

Specific tooling

020335Y Magnetic mounting for dial gauge

Characteristic

Standard thickness:

4 +0.2 -0.2 mm

Max. deviation allowed:

0.1 mm

Front brake pads

Removal

- Remove the brake calliper.
- Remove the Benzing snap ring of the pad pin.

- Slide off the pin paying attention to collect the retaining spring of the pads.

- Remove the pads.

Characteristic

Minimum value

1.5 mm

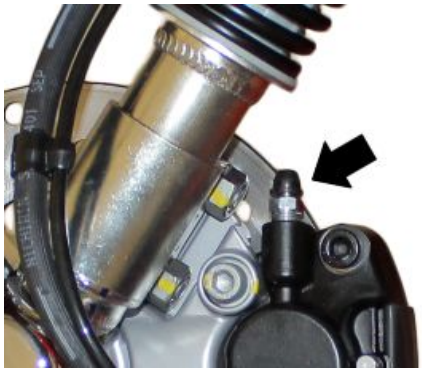
Refitting

- Follow the removal steps but in reverse order; check that the Benzing snap ring of the pads is in good conditions.

Fill

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 right-hand brake lever, load the system and bring it up to the required pressure.
- Keeping the right-hand brake lever pulled, loosen the bleed screw to purge the air. Then tighten the bleed screw.
- Release the brake lever.



- 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 BLEEDING FREQUENTLY CHECK THE LEVEL TO PREVENT AIR GETTING INTO THE SYSTEM THROUGH THE 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. CONTACT WITH BRAKE FLUID WILL COMPROMISE THE PERFORMANCE AND EFFICACY OF THE BRAKING SYSTEM.

Specific tooling

020329Y Mity-Vac vacuum pump

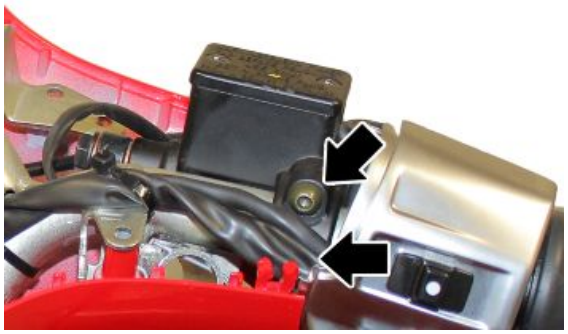
Locking torques (N*m)

System bleed calliper fitting: 20 - 25 Nm

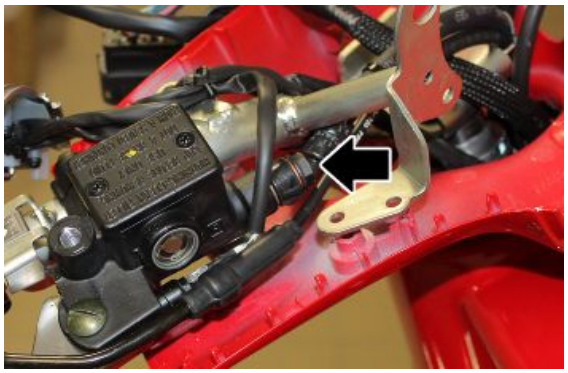
Front brake pump

Removal

- Remove the upper handlebar cover.
- Remove the two fixing screws from the brake pump to the handlebar indicated in the photo-graph.



- Remove the oil pipe fitting from the pump



Refitting

For refitting, follow the operations in reverse order observing the tightening torque.

Locking torques (N*m)

Oil pipe joint to the pump: 20 - 25 Brake pump fixing screws to the handlebar: 7 - 10 Nm

Rear drum brake

Once the silencer and the wheel have been re-moved, follow these steps:

1.Remove the shoe spring using the specific span-ner.

2. Remove the shoe with the aid of a lever.

3. Refit the new shoes giving a few taps with the mallet.

4. Attach the spring using the specific pliers.

Specific tooling

020325Y Pliers for brake-shoe springs

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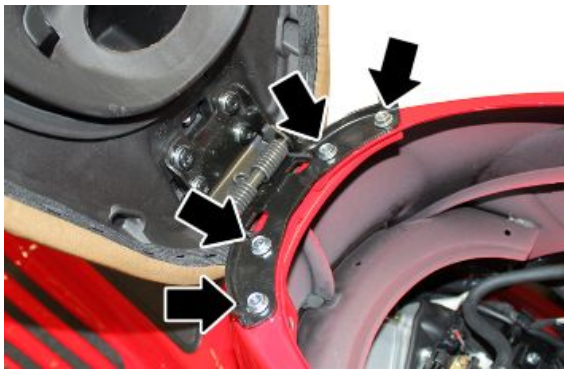
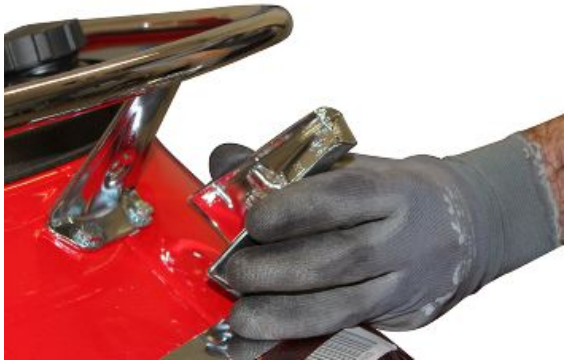
Seat

- Open the saddle.
- Remove the helmet compartment.
- Remove the four screws indicated.



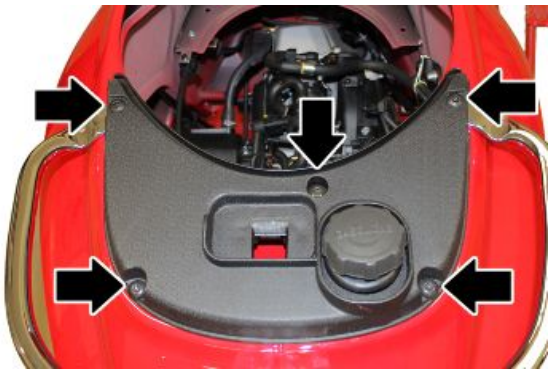
Rear rack

- Remove the screw and then the indicated cover.



- Remove the two screws indicated.

- Remove the helmet compartment.
- Remove the five indicated screws.

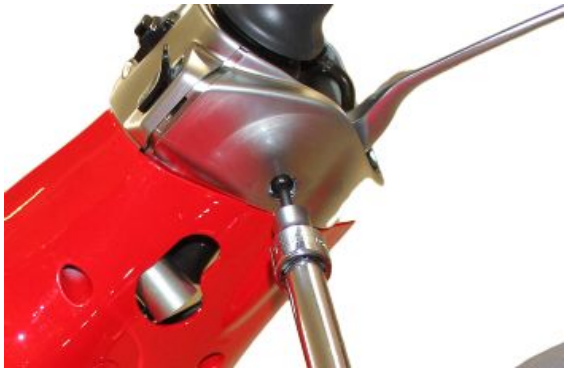


- Unscrew the fuel tank filler cap momentarily.

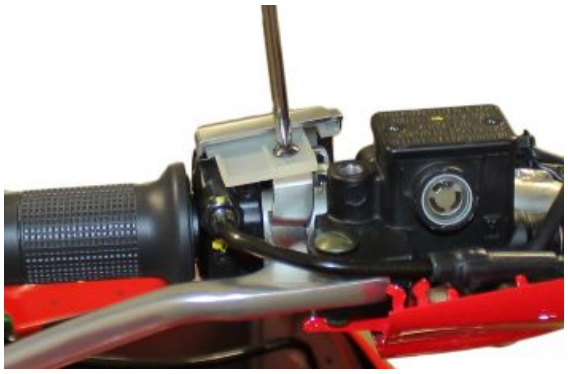
- Remove the plastic cover, taking care not to disturb the fastenings of the pipes positioned underneath it.
- Replace the fuel tank filler cap.

Rear handlebar cover

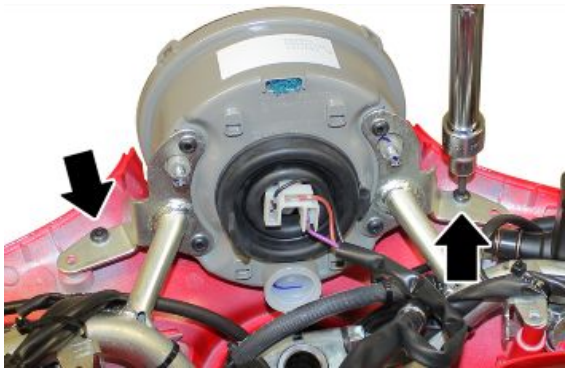
- Remove the upper handlebar cover.
- Working on both sides, undo the screw to remove the indicated plastic.



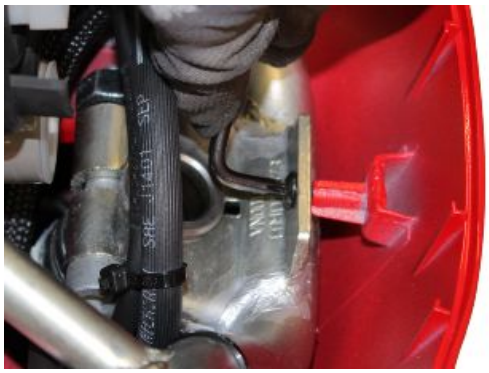
- On both sides, undo the two indicated screws to remove the control lock.



- Remove the handlebar.
- Remove the two screws indicated.



- Remove the indicated screw.



Instrument panel

- Remove the upper handlebar cover.
- Remove the four indicated screws fixing the instrument panel to the handlebar cover.

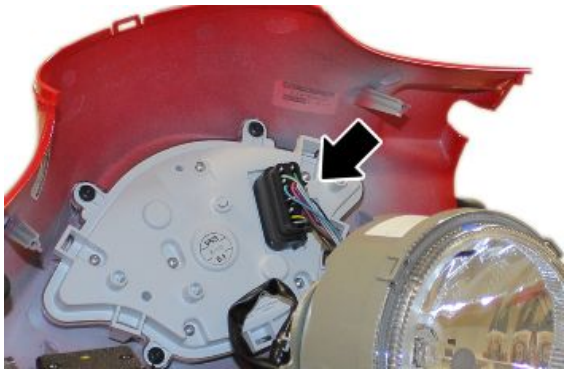
Front handlebar cover

- Remove the rear-view mirrors.
- Unscrew the indicated screw on both sides and the remove the headlight frame.

- Remove the indicated screw on both sides..

- Remove the two screws indicated.

- Disconnect the indicated connector and remove the handlebar cover complete with instrument panel.



FOR VERSION MY 2018

REMOVING THE FRONT HANDLEBAR COVER

Remove the rear-view mirrors.

Undo the screws fastening the headlight bezel.

Remove the bezel by sliding it off from the bottom.

Unscrew the front fastening screw from both sides of the handlebar.

Unscrew the rear fastening screw from both sides of the handlebar.

Release the fitting tabs of the front cover by pulling it up gently.

Disconnect the instrument assembly connector and remove the cover.

ASSEMBLING THE FRONT HANDLEBAR COVER

Connect the instrument assembly connector and reposition the cover.

Make sure that the fittings are correctly repositioned on the lower cover.

Screw the rear fastening screw from both sides of the handlebar.

Screw the front fastening screw from both sides of the handlebar.

Reposition the headlight bezel.

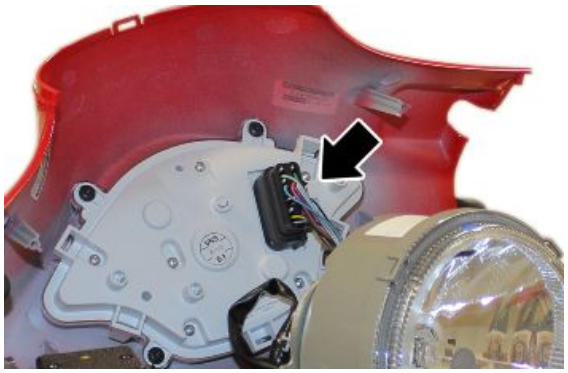
Screw the screw fastening the headlight bezel from both sides.

- Remove the rear-view mirrors.
- Unscrew the indicated screw on both sides and the remove the headlight frame.

- Remove the indicated screw on both sides..

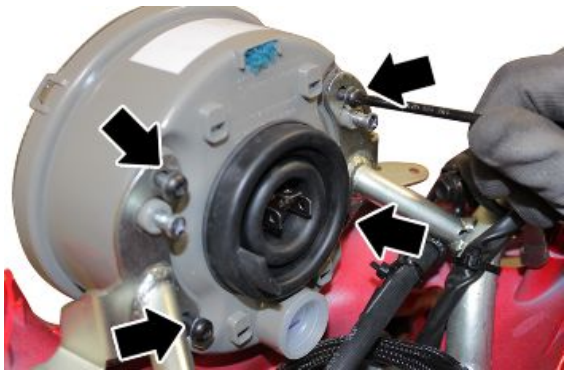
- Remove the two screws indicated.

- Disconnect the indicated connector and remove the handlebar cover complete with instrument panel.



Headlight assy.

- Remove the upper handlebar cover.
- Disconnect the connector of the light assembly and remove the four indicated screws.



FOR VERSION MY 2018

REMOVING THE FRONT LIGHT ASSEMBLY

Remove the front handlebar cover.

Disconnect the light assembly connector.

Unscrew the screws fastening the headlight from the handlebar support brackets.

Remove the headlight.

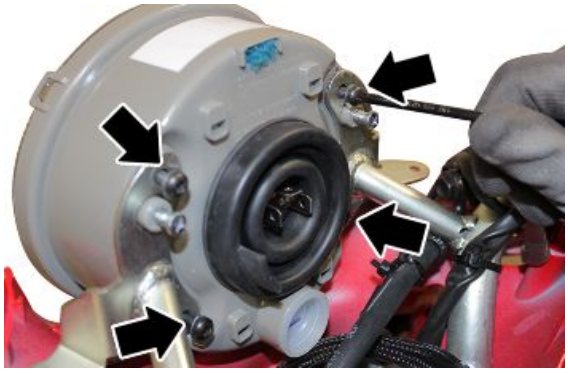
ASSEMBLING THE FRONT LIGHT ASSEMBLY

Tighten the screws fastening the headlight to the handlebar support brackets.

Connect the connector to the headlight.

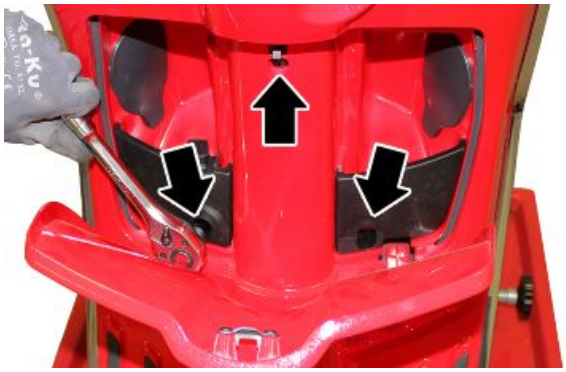
Refit the front handlebar cover.

- Remove the upper handlebar cover.
- Disconnect the connector of the light assembly and remove the four indicated screws.



Knee-guard

- Open the front case and remove the three indicated screws.



- Remove the two storage trays from inside the top-box.

- Detach the USB port from the left hand storage tray.

- On both sides remove the rubber cap of the turn indicator cover and the indicated underlying screw.

- By disengaging the fittings, remove the leg shield back plate towards the rear part of the vehicle.
- Slide off the fuse box from the front case.

- Disconnect the USB port connector and free the wiring harness so that it is possible to remove the leg shield back plate completely.

Taillight assy.

- Operating from the left side of the vehicle, undo the indicated toggle screw.

- Remove the light assembly by disengaging the fittings and disconnecting the two connectors.

FOR VERSION MY 2018

REMOVING THE REAR LIGHT ASSEMBLY

Working from inside the rear fender, unscrew the toggle screw fastening the rear light assembly.

If necessary, turn the lamp-holder anticlockwise and remove the parking light lamp.

Connect the LED stop light connector.

Disconnect the parking light lamp connector.

Remove the rear light assembly.

ASSEMBLING THE REAR LIGHT ASSEMBLY

Connect the parking and stop light connectors and reposition the rear light assembly.

Pay attention to the correct fixing of the fastening clips on the frame.

Tighten the toggle screw fastening the rear light assembly.

- Operating from the left side of the vehicle, undo the indicated toggle screw.

- Remove the light assembly by disengaging the fittings and disconnecting the two connectors.

License plate light

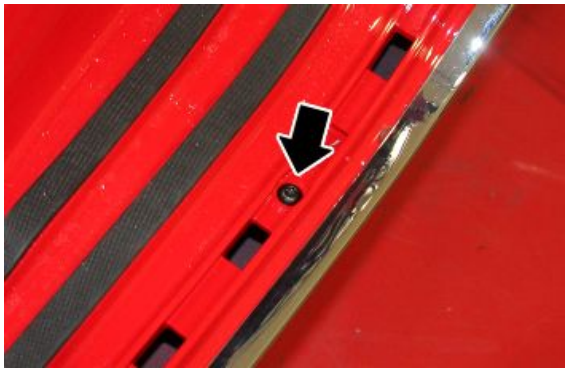
- Remove the licence plate light cover by unscrewing the two indicated screws and disconnect the bulb holder.

Footrest

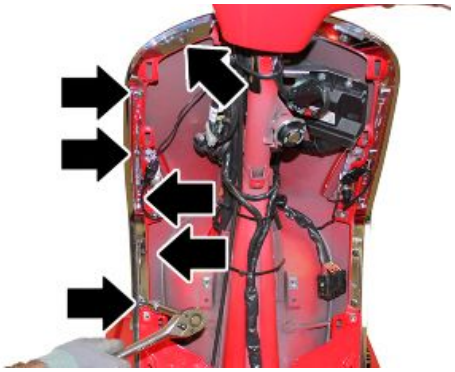
- Remove the leg shield back plate.
- Remove the spark plug inspection lid.
- Remove the two screws indicated.

- On both sides of the vehicle unscrew the indicated screw, then remove the plastic and the underlying screw.

- Working on both sides, by disengaging the fittings remove the outermost rubber cover and then the underlying screw.



- Undo the six indicated screws on both sides and remove the front shield frame.



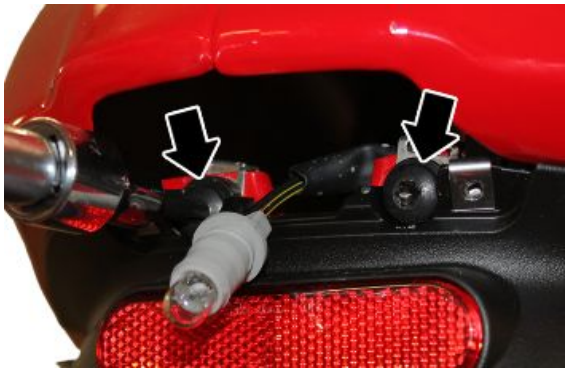
- By disengaging the fittings, remove the footrest by extracting it upwards.

License plate holder

- Remove the indicated screw on both sides of the licence plate holder.

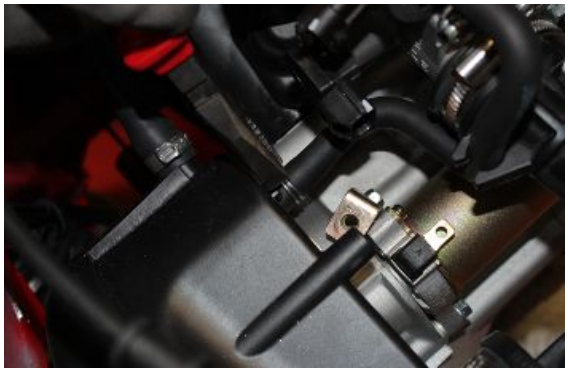
- Remove the licence plate light cover by unscrewing the two indicated screws and disconnect the bulb holder.

- Remove the two screws indicated.



Air filter

- Remove the helmet compartment.
- Remove the two indicated clamps.



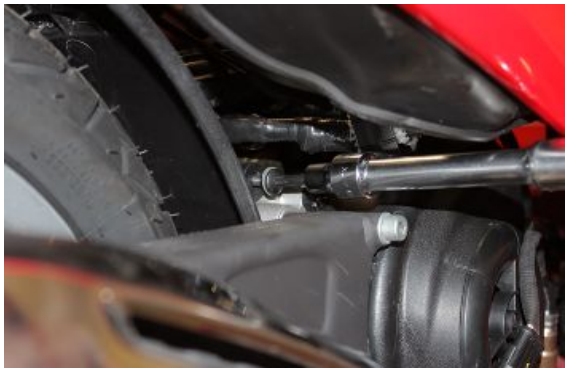
- Remove the two indicated fixing screws at the crankcase.

- Remove the clamp and disconnect the idle regulator pipe from the filter box.

- Remove the filter housing.

Rear mudguard

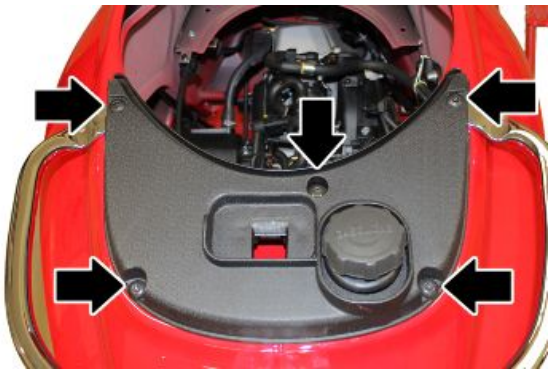
- Remove the rear wheel.
- Undo the screw indicated.



- Remove the two screws indicated.

Fuel tank

- Remove the helmet compartment.
- Remove the five indicated screws.



- Unscrew the fuel tank filler cap momentarily.

- Remove the plastic cover, taking care not to disturb the fastenings of the pipes positioned underneath it.
- Replace the fuel tank filler cap.

- Unscrew the screw used to fasten the fuel pipe support bracket.

- Slide the fuel pipe retaining spring out, and then disconnect the injector.

- Release the fuel pipe from the indicated fastening.

- Remove the rear wheel.
- Remove the rear light assembly and undo the indicated underlying screw.

- Remove the screw fixing the fuel piping and the one fixing the tank to the frame.

- Disconnect the pipe positioned on the fuel inlet, and then remove the indicated screw.
- Slide the fuel tank off from below, disconnecting the connectors from the level sender and the fuel pump.

Front mudguard

- First remove the steering tube and uncouple the front brake pipes from the calliper in order to remove the front mudguard.
- Then remove the three mudguard-steering tube clamps indicated in the figure.

Front central cover

- Remove the "PIAGGIO" clip-on badge.
- Undo the screw indicated in the figure.
- Remove the grille.