



SERVICE STATION MANUAL

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SR-GT 125-200



SERVICE STATION MANUAL

SR-GT 125-200

THE VALUE OF SERVICE

Due to continuous updates and technical training programmes specific to Aprilia products, only **Aprilia** Official Network mechanics know this vehicle fully and have the specific tools necessary to carry out maintenance and repair operations correctly.

The reliability of the vehicle also depends on its mechanical conditions. Checking the vehicle before riding it, performing maintenance correctly and using only **original Aprilia spare parts** are essential factors for the reliability of your vehicle!

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

www.aprilia.com

Only by requesting original Aprilia spare parts can you be of purchasing products that were developed and tested during the design and development of the vehicle itself. All Aprilia original spare parts undergo quality control procedures to guarantee reliability and durability.

The descriptions and images in this publication are given for illustrative purposes only.

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

www.piaggio.com

SERVICE STATION MANUAL SR-GT 125-200

Questo manuale fornisce le informazioni principali per le procedure di normale intervento sul veicolo. Questa pubblicazione è indirizzata ai **Concessionari Aprilia** e ai loro meccanici qualificati; molte nozioni sono state volutamente omesse, perché giudicate superflue. Non essendo possibile includere nozioni meccaniche complete in questa pubblicazione, le persone che utilizzano questo manuale devono essere in possesso sia di una preparazione meccanica di base, che di una conoscenza minima sulle procedure inerenti ai sistemi di riparazione dei veicoli. Senza queste conoscenze, la riparazione o il controllo del veicolo potrebbe essere inefficiente o pericolosa. Non essendo descritte dettagliatamente tutte le procedure per la riparazione e il controllo del veicolo, bisogna adottare particolare attenzione al fine di evitare danni ai componenti e alle persone. Per offrire al cliente maggiore soddisfazione dall'uso del veicolo, **Piaggio & C. s.p.a.** si impegna a migliorare continuamente i propri prodotti e la relativa documentazione. Le principali modifiche tecniche e modifiche alle procedure per le riparazioni del veicolo vengono comunicate a tutti i **Punti Vendita Aprilia e alle Filiali nel Mondo**. Tali modifiche verranno apportate nelle edizioni successive di questo manuale. Nel caso di necessità o dubbi sulle procedure di riparazione e di controllo, interpellare il **REPARTO ASSISTENZA Aprilia**, il quale sarà in grado di fornirvi qualsiasi informazione al riguardo, oltre a fornire eventuali comunicazioni su aggiornamenti e modifiche tecniche applicate al veicolo.

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

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

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



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



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



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



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TECHNICAL **D**ATA

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TOOLING

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COOLING **S**YSTEM

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PRE-DELIVERY

PRE DE

Tightening torques inspection

Checking tightness of fasteners:

Make sure that the marking is on the:

- Safety fasteners
- Fastening screws

Safety fasteners:

- Upper fastening of rear shock absorber
- Rear shock absorber lower fastener
- Brake calliper fixing
- Front wheel axle nut
- Wheel hub nut
- Swinging arm pin - Frame
- Swinging arm pin - Engine
- Engine arm pin - Frame arm
- Handlebar lock-nut
- Lower steering ring nut
- Upper steering ring nut

Electrical system

Electrical system:

- Key switch
- Headlamps: high beam lights, low beam lights, tail lights, parking lights and their warning lights
- Headlight adjustment according to regulations in force
- Rear light, parking light, stop light
- Front and rear stop light switches
- Turn indicators and their warning lights
- Instrument cluster lights
- Instrument cluster: fuel and temperature indicator
- Instrument panel warning lights
- Horn
- Starter

CAUTION

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

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.

CAUTION

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

WARNING

BATTERY ELECTROLYTE IS TOXIC AND IT MAY CAUSE SERIOUS BURNS. IT CONTAINS SULPHURIC ACID. AVOID CONTACT WITH EYES, SKIN AND CLOTHING.

IF IT ACCIDENTALLY COMES INTO CONTACT WITH YOUR EYES OR SKIN, WASH WITH ABUNDANT WATER FOR APPROX. 15 MIN. AND SEEK IMMEDIATE MEDICAL ATTENTION.

IF ACCIDENTALLY SWALLOWED, IMMEDIATELY DRINK LARGE QUANTITIES OF WATER OR VEGETABLE OIL. SEEK IMMEDIATE MEDICAL ATTENTION.

BATTERIES PRODUCE EXPLOSIVE GAS; KEEP CLEAR OF NAKED FLAMES, SPARKS OR CIGARETTES. VENTILATE THE AREA WHEN RECHARGING INDOORS. ALWAYS WEAR EYE PROTECTION WHEN WORKING IN THE PROXIMITY OF BATTERIES.

KEEP OUT OF THE REACH OF CHILDREN.

CAUTION

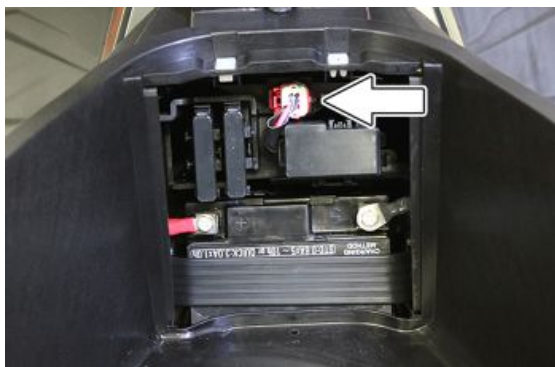
NEVER USE FUSES WITH A CAPACITY HIGHER THAN THAT RECOMMENDED. USING A FUSE OF UNSUITABLE RATING MAY SERIOUSLY DAMAGE THE VEHICLE OR EVEN CAUSE A FIRE.

The vehicle is equipped with an OBD (On-Board Diagnostics) socket placed in the case, in order to monitor its correct operation.

NOTE

WHEN REMOVING BATTERY POWER AND/OR EVENTUAL REPLACEMENT OF THE SAME, THE RED POSITIVE CABLE OF THE OBD SOCKET SHOULD BE CORRECTLY CONNECTED TO THE POSITIVE POLE.

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.



NOTE

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.

In case of battery replacement or simple removal, it is recommended to check the date and hour on the instrument cluster; reprogram, if necessary.



Levels check

Level check:

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

- Engine oil level
-

Functional inspection

Braking system (hydraulic)

- Lever travel

Braking system (mechanical)

- Lever travel

Clutch

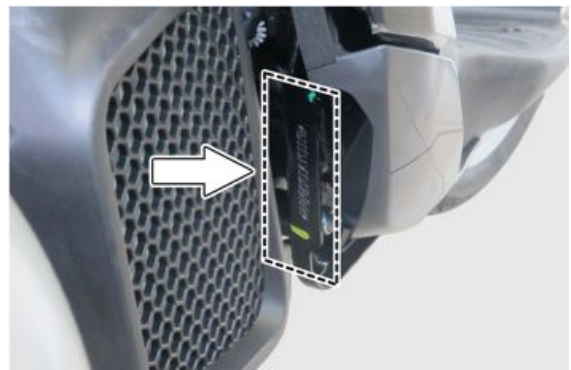
- Proper functioning check

Engine

- Check throttle control travel
-

Others

- Check documentation
 - Check the chassis and engine numbers
 - Tool kit
 - Licence plate fitting
-



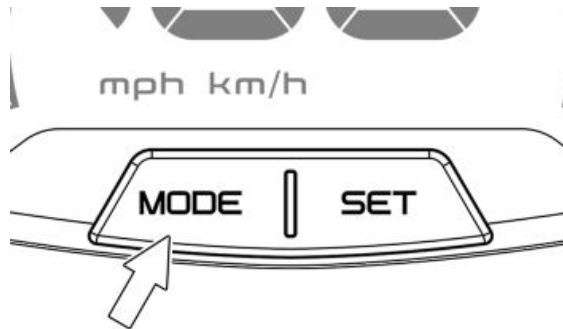
- Locks checking
 - Tyre pressure check
 - Fitting of mirrors and possible accessories
-



Instruments start-up

DIGITAL DISPLAY MEASUREMENT UNIT CONVERSION (Km-mi, l-gal, °C-°F)

- With the ignition switch turned to "OFF", press and hold the MODE button on the instrument cluster and simultaneously turn the ignition switch to "ON";
- release the button. The icons "mi", "km", "°C", "°F" will flash;
- briefly press the MODE button, until the desired icon is displayed (steady);
- press and hold the MODE for at least 1 to 5 seconds to change the unit of measurement;
- the consumption measurement unit will automatically change when "km" or "mi" is selected



NOTE

THE MEASUREMENT UNIT CONVERSION CAN TAKE PLACE ONLY WITH THE VEHICLE AT A STANDSTILL.

Specific operations for the vehicle

NOTE

BEFORE USING THE VEHICLE, ENSURE THAT IT IS EQUIPPED WITH THE LICENSE PLATE HOLDER WITH LATERAL REFLECTORS PROVIDED.



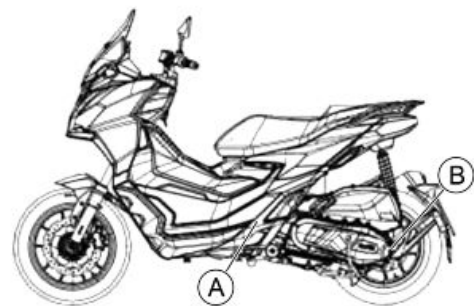
INDEX OF TOPICS

TECHNICAL DATA

DT

Vehicle identification

The identification registration number consists of a prefix followed by a number stamped on both the chassis and the engine. These numbers must always be quoted in the spare parts requests. We recommend checking that the frame registration number stamped on the vehicle corresponds with that on the vehicle documentation.



CAUTION



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

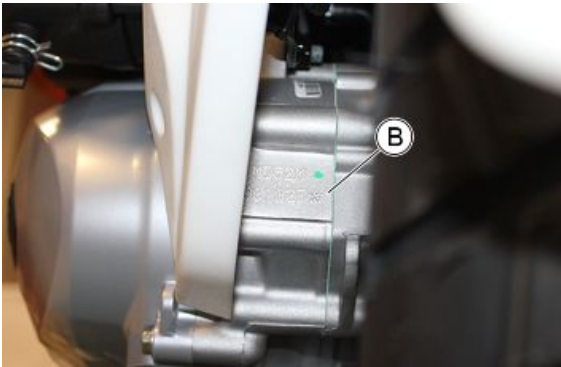
Frame number

The chassis number is stamped on the right side, near the passenger footboard.



Engine number

The engine number is stamped on the right side, near the rear shock absorber attachment.



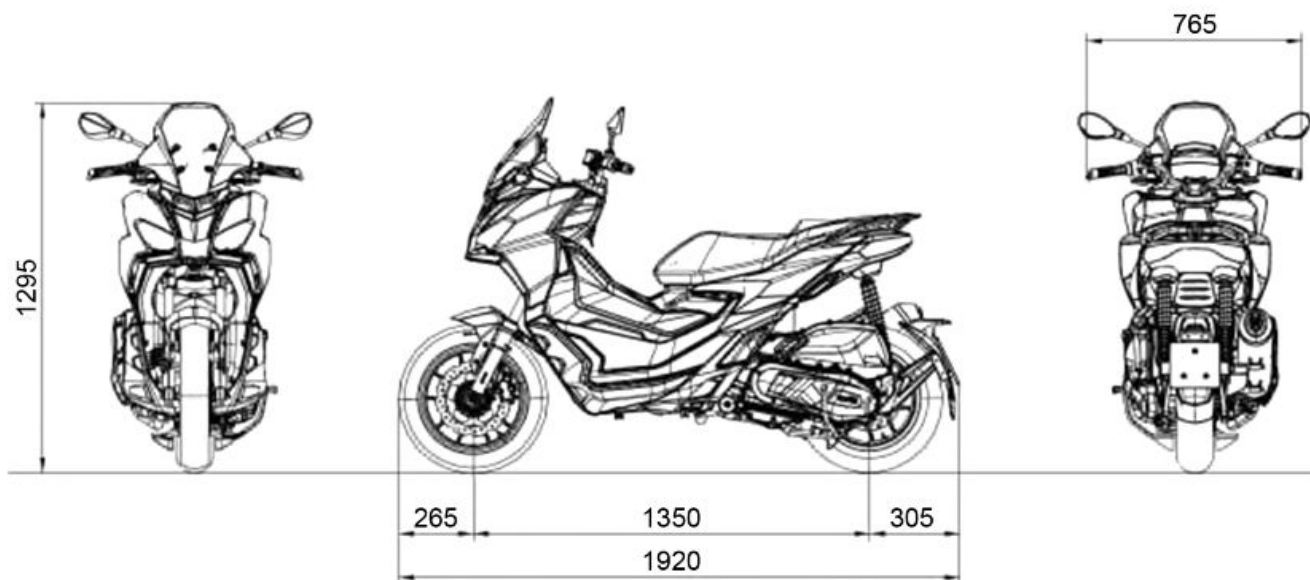
VEHICLE IDENTIFICATION (VERSION 125)

Specification	Desc./Quantity
Chassis prefix	RP8MD5100
Engine prefix	MD51M

VEHICLE IDENTIFICATION (VERSION 200)

Specification	Desc./Quantity
Chassis prefix	RP8MD5200
Engine prefix	MD52M

Dimensions and mass



VEHICLE SPECIFICATIONS

Specification	Desc./Quantity
Total length	1.920 mm
Total width	765 mm
Total height	1.295 mm
wheelbase	1.350 mm
Chassis	Tubular and steel sheets.
Front suspension	Hydraulic telescopic fork with Ø 33-mm stem.
Rear suspension	Two double-acting shock absorbers, adjustable to five positions at pre-loading.
Front brake	260 mm hydraulically operated disc brake controlled from RH handlebar lever.
Rear brake	220 mm hydraulically operated disc brake controlled from LH handlebar lever.
Wheel rims type	Light alloy.
Front wheel	2.50 x 14"
Rear wheel	3.00 x 13"
Front tire	110/80 - 14" M/C 53S
Rear tire	130/70 - 13" M/C 57S
Front tire pressure	2.0 bar
Rear tyre pressure	2.2 bar
Kerb weight (version 125)	144 kg
Kerb weight (version 200)	148 kg
Maximum weight limit	340 kg
Battery	12 V - 6 Ah sealed.

Engine

ENGINE SPECIFICATIONS 125

Specification	Desc./Quantity
Type	4-stroke single-cylinder Piaggio i-Get with Start&Stop system.
Engine capacity	125 cm ³
Bore per stroke	52,0 x 58.7 mm
Maximum power	11.0 kW at 8.750 rpm
Maximum torque	12.0 Nm at 6.500 rpm
Compression ratio	12,5 ± 0,5 : 1
Idle speed	1,800 ± 100 rpm
Timing	Single overhead camshaft with 4 valves.
Valve clearance (cold engine)	Intake: 0.10 mm Exhaust: 0.15 mm
Spark plug	NGK LMAR8AI-8
Fuel system	Electronic injection.
Lubrication	Wet crankcase.
Starting	Electric
Cooling	Forced coolant circulation system.
Gearbox	CVT continuously variable transmission with torque server.
Clutch	Automatic centrifugal dry clutch.
Fuel	Unleaded gasoline E10 (95 R.O.N.)
Exhaust silencer	Absorption-type exhaust silencer with catalytic converter.
Emissions compliance	EURO 5

ENGINE SPECIFICATIONS 200

Specification	Desc./Quantity
Type	4-stroke single-cylinder Piaggio i-Get with Start&Stop system.
Engine capacity	174 cm ³
Bore per stroke	61.5 x 58.7 mm
Maximum power	13.0 kW at 8.500 rpm
Maximum torque	16.5 Nm at 7.000 rpm
Compression ratio	12.0 ± 0.5 : 1
Idle speed	1750 ± 100 rpm
Timing	Single overhead camshaft with 4 valves.
Valve clearance (cold engine)	Intake: 0.10 mm Exhaust: 0.15 mm
Spark plug	NGK LMAR8AI-8
Fuel system	Electronic injection.
Lubrication	Wet crankcase.
Starting	Electric
Cooling	Forced coolant circulation system.
Gearbox	CVT continuously variable transmission with torque server.
Clutch	Automatic centrifugal dry clutch.
Fuel	Unleaded gasoline E10 (95 R.O.N.)
Exhaust silencer	Absorption-type exhaust silencer with catalytic converter.
Emissions compliance	EURO 5

Capacities

CAPACITY

Specification	Desc./Quantity
Engine oil	1300 cm ³
Hub oil	325 cm ³
Fuel tank	9.0 l ± 0.5
Cooling system fluid	0.7 l

Tightening Torques

If the following tables do not expressly indicate the tightening torque values, refer to the table with the generic torque values indicated below.

GENERAL TIGHTENING TORQUES

	M4	M5	M6	M8	M10	M12
Metric tightening torque: TE - TEFL - SHC - TBEI - TCC - TS	3 Nm (2.21 lbf ft)	6 Nm (4.43 lbf ft)	10 Nm (7.38 lbf ft)	25 Nm (18.44 lbf ft)	50 Nm (36.88 lbf ft)	80 Nm (59.00 lbf ft)

GENERAL TIGHTENING TORQUES FOR SELF TAPPING SCREWS FOR PLASTIC

	2.9 mm	3.9 mm	4.2 mm	5 mm
Tightening torque	2 Nm (1.48 lbf ft)	2 Nm (1.48 lbf ft)	3 Nm (2.21 lbf ft)	3 Nm (2.21 lbf ft)

LUBRICATION

Name	Torque in Nm
Crankcase timing cover screws	3.5 ÷ 4.5
Screws fixing oil pump to the crankcase	4 to 6
Pump rod screw	11 to 13
Minimum oil pressure sensor locking	12 - 14 (LOCTITE 5091 Edge closure between metal body and plastic block)

TRANSMISSION AND FINAL REDUCTION

Name	Torque in Nm
Transmission cover screws	11 to 13
Final reduction cover screws	24 to 27
Driven pulley fixing nut	53 - 59
Oil drain screw	14.7 - 16.7
Freewheel fixing screws	10 - 11
driving pulley retainer nut	75 - 83

HEAD AND CYLINDER

Name	Torque in Nm
Head cover screws	10.8 to 12.7
Cylinder head nut (PRE-TIGHTENING)	6 ÷ 8
Cylinder head nut (TIGHTENING)	9 - 11 (Tighten to the prescribed torque and then proceed with 270.0°±5.0° rotation)
Cylinder stud bolt fitting	See section ENGINE/LUBRICATION/STUD BOLT
Throttle body clamp screws	1.3 ÷ 1.7
Tensioner spring retaining screw	5 to 6
Fastener chain tensioner	11 to 13
Thermostat cover screws	3 to 4
Pressure reducer counterweight retainer screw	7 to 8.5
Injection manifold fixing screws	11 to 13
Valve clearance adjustment screw	6 - 9
Spark plug tightening	10 to 12
Timing system sprocket fixing screw	4 to 6
Screws fixing cylinder to crankcase	10.8 to 12.7
Head blow by	3 to 4

CRANKCASE

Name	Torque in Nm
Calibrated fixing dowel	5 to 7
Oil filter cover	24 to 30
Engine oil level shaft	1.3 ÷ 1.7
Engine-crankcase coupling screws	11 to 13
Rear brake screw	15 to 17
Oil sensor	12 to 14
Oil filter	5 to 6
Oil drain screw	14.7 - 16.7
Oil pump bulkhead screw	4 to 6
Freewheel fixing screws	10 - 11
Oil pump fastener screw	5 to 6
Oil pump command sprocket screw	10 - 14
Rotor cover	1 to 1.5
Rotor clamp	3 to 4

FLYWHEEL COVER

Name	Torque in Nm
Pick-up screws	3 to 4
Stator fixing screws	5 - 6 (Loctite 242)
Stator cable plates clamping screws	3 to 4
Fixing clamps of head pump cover by-pass pipe	1.3 ÷ 1.7
Coil fixing screw	11 to 13

FLYWHEEL

Name	Torque in Nm
Flywheel cover screw	11 to 13
Starter sprocket check fixing screw	5 to 6
Flywheel fixing nut	100 to 110

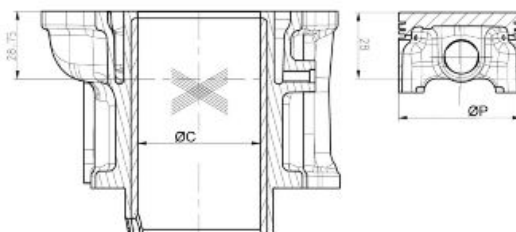
SILENCER

Name	Torque in Nm
Silencer to cylinder fixing screws	16 to 18
Screws fixing silencer to the crankcase	24 to 27
Silencer heat guard fixing screw	4 to 5
Lambda probe tightening on exhaust manifold	40 - 50

Overhaul data

Assembly clearances

Cylinder - piston assy.



CYLINDER - PISTON (125)

Specification	Desc./Quantity
Plunger diameter	51.961 (±0.014) mm
Cylinder diameter	52 (+0.008 -0.020) mm

CYLINDER - PISTON (200)

Specification	Desc./Quantity
Plunger diameter	61.461 (±0.014) mm
Cylinder diameter	61.5 (+0.008 -0.020) mm

COUPLING CATEGORIES (125)

Name	Initials	Cylinder	Piston	Play on fitting
cylinder-piston A (125)	A	51,980 - 51,987	51,947 - 51,954	0,026 - 0,040
cylinder-piston B (125)	B	51,987 - 51,994	51,954 - 51,961	0,026 - 0,040
cylinder-piston C (125)	C	51,994 - 52,001	51,961 - 51,968	0,026 - 0,040

Name	Initials	Cylinder	Piston	Play on fitting
cylinder-piston D (125)	D	52,001 - 52,008	51,968 - 51,975	0,026 - 0,040

COUPLING CATEGORIES (200)

Name	Initials	Cylinder	Piston	Play on fitting
cylinder-piston A (200)	A	61,480 - 61,487	61,447 - 61,454	0,026 - 0,040
cylinder-piston B (200)	B	61,487 - 61,494	61,464 - 61,461	0,026 - 0,040
cylinder-piston C (200)	C	61,494 - 61,501	61,461 - 61,468	0,026 - 0,040
cylinder-piston D (200)	D	61,501 - 61,508	61,468 - 61,475	0,026 - 0,040

NOTE

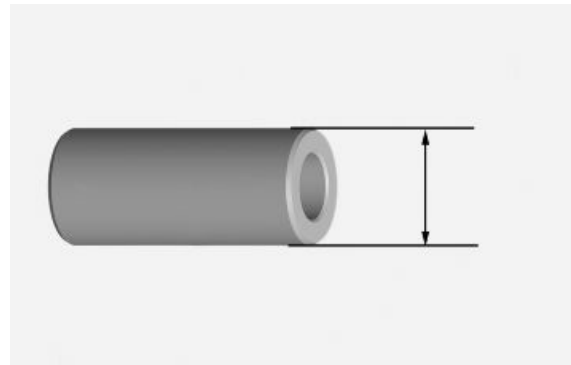
THE PISTON MUST BE INSTALLED WITH THE ARROW FACING TOWARDS THE EXHAUST SIDE, THE PISTON RINGS MUST BE INSTALLED WITH THE WORD «TOP» OR THE STAMPED MARK FACING UPWARDS.

- Check the wrist pin external diameter using a micrometer

Characteristic

Pin diameter

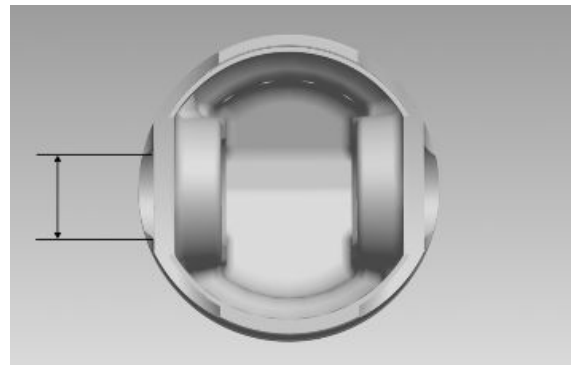
14 (+0 -0.004) mm



- Measure the outside diameter of the piston, perpendicular to the gudgeon pin axis.
- Carry out the measurement at 7 mm from the piston base.
- Measure the diameter of the crank pin seat on the piston.

NOTE

THE PIN HOUSINGS HAVE 2 LUBRICATION CHANNELS. THEREFORE MEASUREMENT OF THE DIAMETER MUST BE CARRIED OUT ACCORDING TO THE AXIS OF THE PISTON.

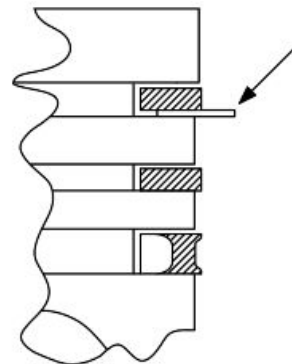


Characteristic

Pin seat diameter

14 +0.006 /+0.001 mm

- Clean the housing slots of the sealing rings thoroughly.
- Measure the clearance between the sealing rings and the piston grooves using a feeler 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.



NOTE

MEASURE THE CLEARANCE BY INSERTING THE FEELER GAUGE IN THE UNDERSIDE OF THE PISTON RINGS.

ASSEMBLY CLEARANCE OF PISTON RINGS - SEAL RINGS (125)

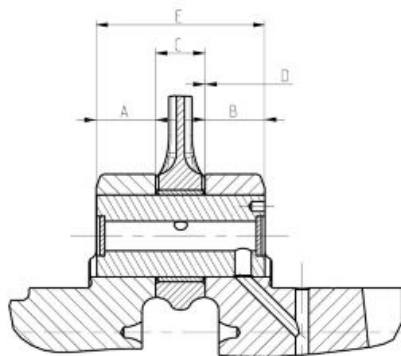
NAME	DIMENSIONS	ASSEMBLY CLEARANCES (A)
1° compression ring (mm)	52x0.8	0.20 - 0.35
2° compression ring (mm)	52x0.8	0.20 - 0.40
Oil scraper rings (mm)	52x1.5	0.20 - 0.70

ASSEMBLY CLEARANCE OF PISTON RINGS - SEAL RINGS (200)

NAME	DIMENSIONS	ASSEMBLY CLEARANCES (A)
1° compression ring (mm)	61,5x0.8	0.20 - 0.35
2° compression ring (mm)	61,5x0.8	0,40 to 0,60
Oil scraper rings (mm)	61,5x1.5	0.20 - 0.70

- Check that the head coupling surface is not worn or misshapen.
- Pistons and cylinders are classified according to diameter. The coupling is carried out in pairs (A-A, B-B, C-C, D-D).

Crankcase - crankshaft - connecting rod

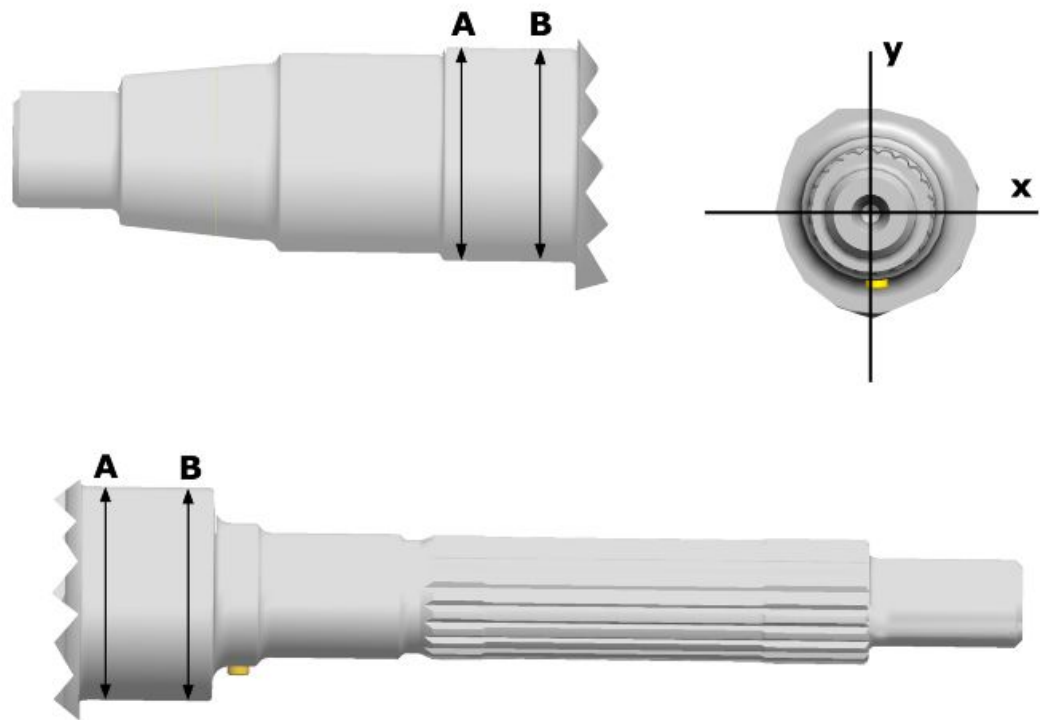


AXIAL CLEARANCE BETWEEN CRANKSHAFT AND CONNECTING ROD

Name	Code	Dimensions	Assembly clearance
Transmissionside half-shaft	A	18.1 (+0; -0.05) mm	D = 0.20 - 0.50
Flywheel-side halfshaft	B	18.1 (+0; -0.05) mm	D = 0.20 - 0.50
Connecting rod	C	15 (-0.10; -0.15) mm	D = 0.20 - 0.50
Spacer tool	E	51.4 (+0.05; +0) mm	D = 0.20 - 0.50

Diameter of crankshaft bearings.

Measure the bearings on both axes x-y.



CRANKSHAFT

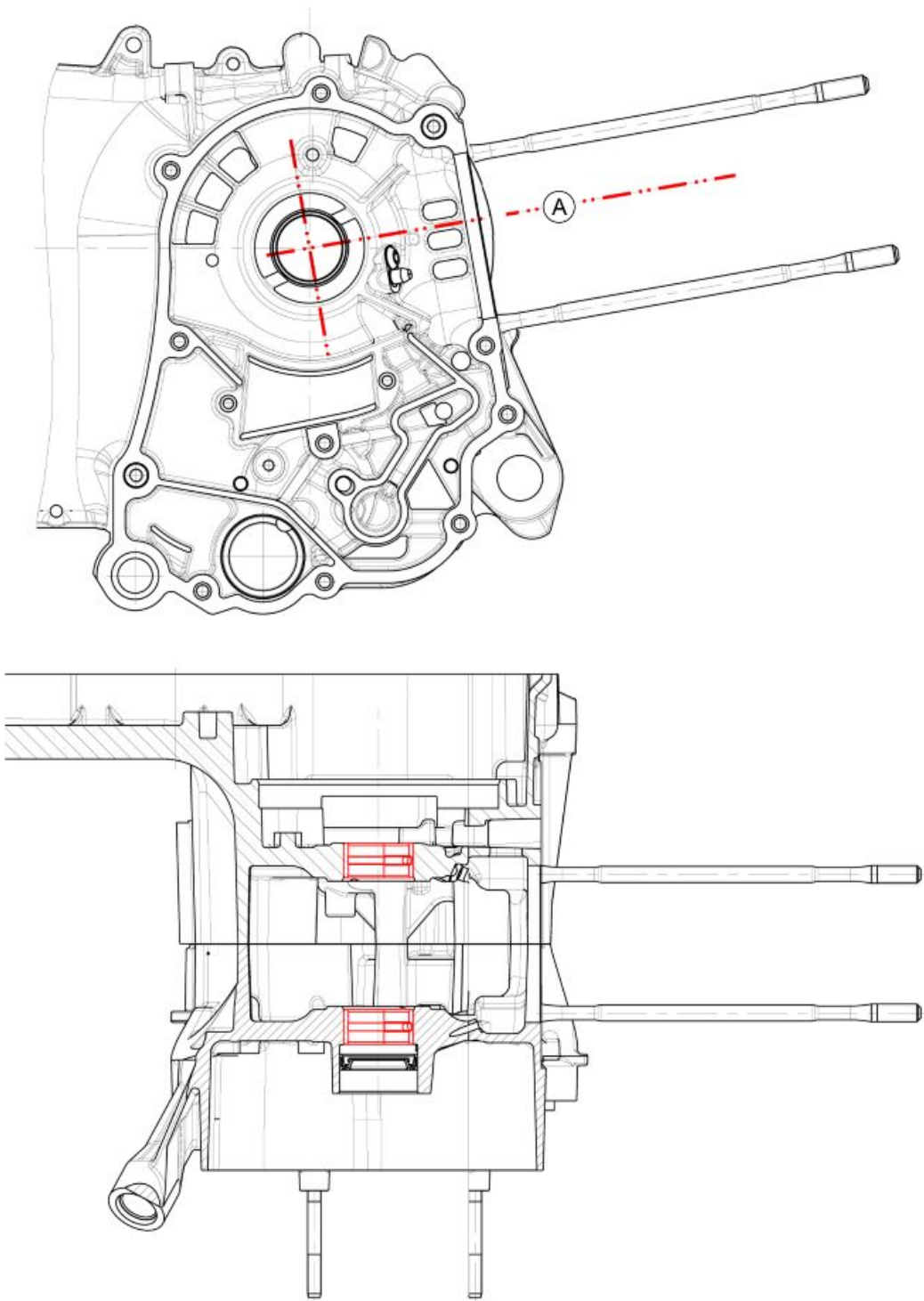
Specification	Desc./Quantity
Crankshaft bearings: Standard diameter: Cat. 1	26.998 - 27.004 mm
Crankshaft bearings: Standard diameter: Cat. 2	27.004 - 27.010 mm

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

Characteristic

«A»

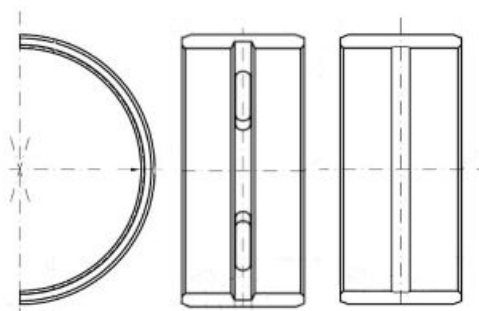
CYLINDER AXIS



BUSHINGS

TYPE	IDENTIFICATION	CRANKSHAFT HALF-BEARING
B	BLUE	1.971 - 1.976
C	YELLOW	1.974 - 1.979
E	GREEN	1.977 - 1.982

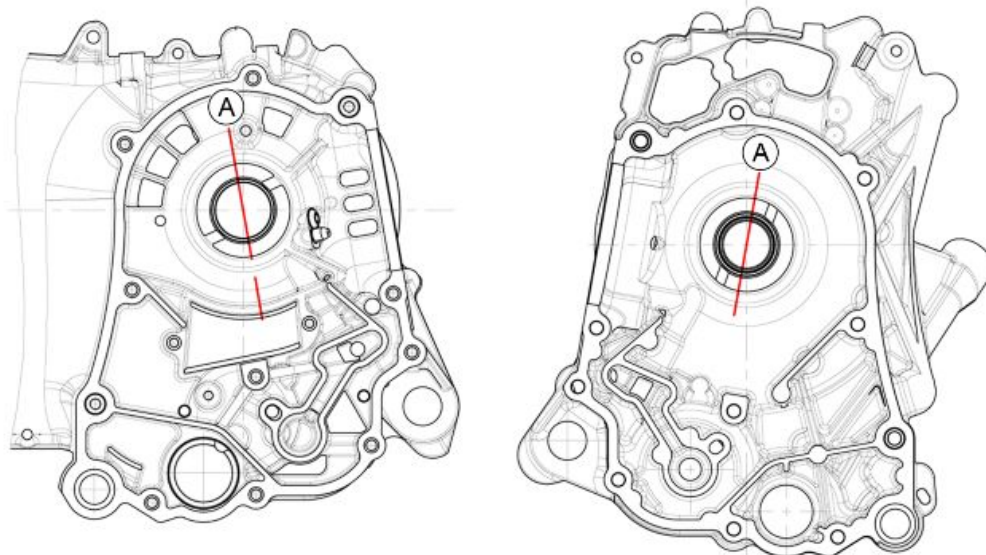
- To obtain a good bushing lubrication it is necessary to have both an optimal lubricating pressure and a good oil flow rate; the bushings must be correctly positioned so as not to obstruct the oil supply channels.
- The main bushings are made of 2 half bearings, one oil supply hole and lubrication channel and the other only with lubrication channel.



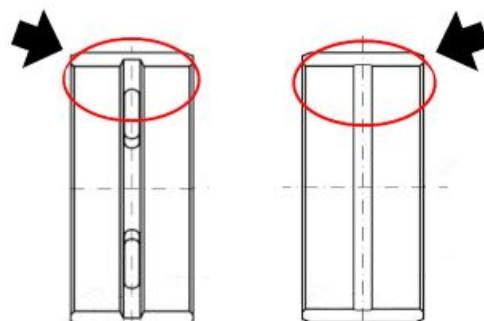
Characteristic

«A»

HAL BEARING CONNECTION LINE



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



NOTE

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

Measurement of crankcase halves - crankshaft coupling clearance

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

Characteristic

«A»

HAL BEARING CONNECTION LINE

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

DIAMETER OF CRANKCASE WITHOUT BUSHING

Specification	Desc./Quantity
CAT 1	30.959 - 30.965 mm
CAT 2	30.953 - 30.959 mm

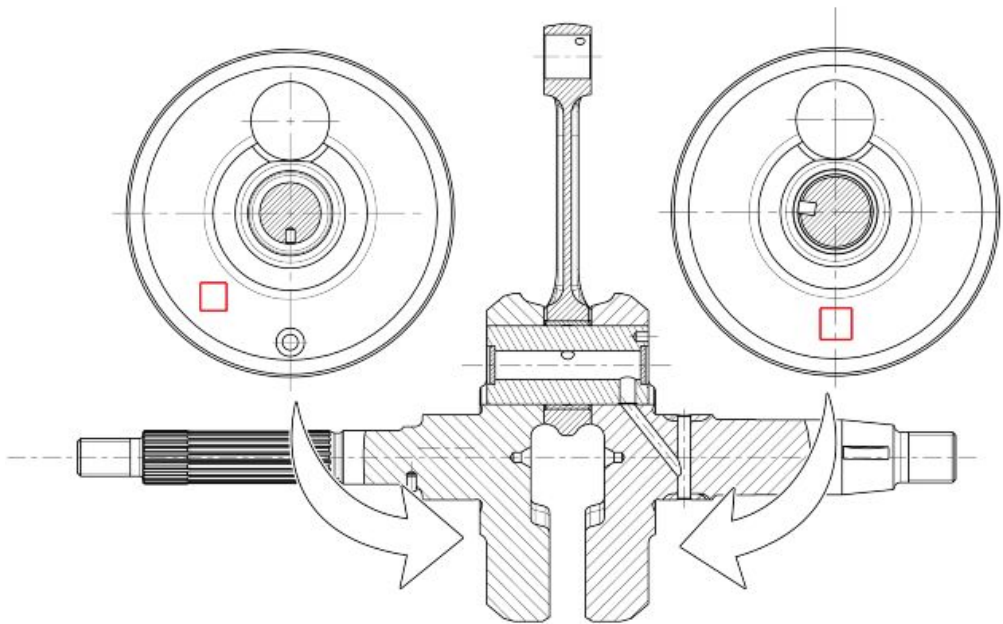
- Combine the shaft with two category 1 crankwebs with the category 1 crankcase (or cat. 2 with cat. 2). Furthermore a spare crankcase cannot be matched with a crankshaft with mixed categories. The spare crankshaft has half-shafts of the same category.
- According to the classification of the shaft CAT.1 - CAT.2 combine a complete crankcase pre-fitted with suitable bushings according to the starting shaft.

CATEGORIES

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

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

Characteristic**Crankshaft category:****CAT. 1 - CAT. 2**



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.

- In case of faults, replace the head.
- Check the sealing surfaces for the exhaust manifold.
- Check that the camshaft and the rocker pin capacities exhibit no wear.
- Check that the head cover shows no signs of wear.
- Check that there is no cooling liquid leakage from the seals.
- Using a trued bar and a feeler gauge, check that the cylinder head surface is not worn or distorted.

Characteristic

Maximum allowable run-out

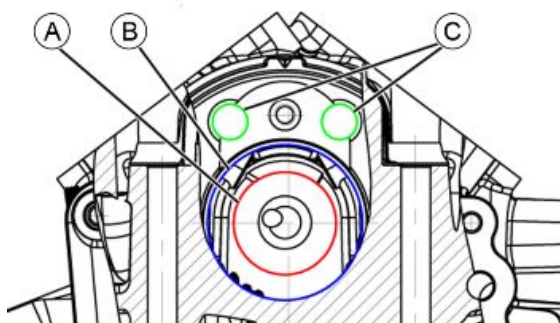
0.03 mm

- Insert the valves in the relative seats of the head.
- Alternatively check the intake and exhaust valves.
- Add petrol to the intake and exhaust ducts. Keeping the valves pressed against the seats with your fingers, check that petrol does not ooze between the valve and the seat.



HEAD BEARINGS

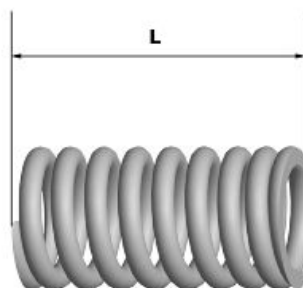
Specification	Desc./Quantity
bearing «A»	Ø 28.000 (+0.007 +0.028) mm
bearing «B»	Ø 47.000 (+0.041 +0.025) mm
bearing «C»	Ø 10.000 (+0.028 +0.013) mm



- Measure the length clearance of the valve springs.

Characteristic
Standard length

36.2 mm



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

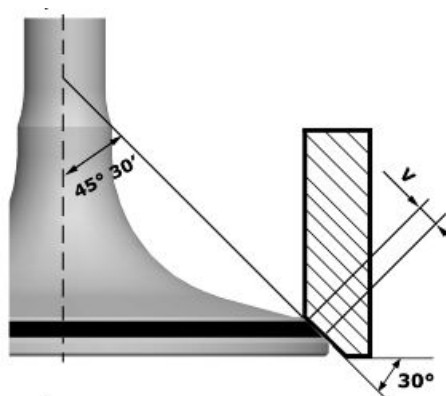
Characteristic
Standard value

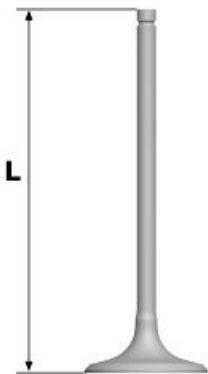
1 mm / 1.3 mm

Admissible limit

1.6 mm

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

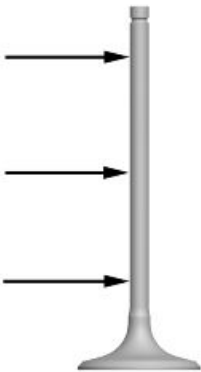




STANDARD LENGTH

Characteristic	Value
Intake valve	87,45 mm
Exhaust valve	88,5 mm

- Measure the diameter of the valve stems in the three positions indicated in the diagram.
- Calculate the clearance between the stem and the valve guide.



STANDARD DIAMETER

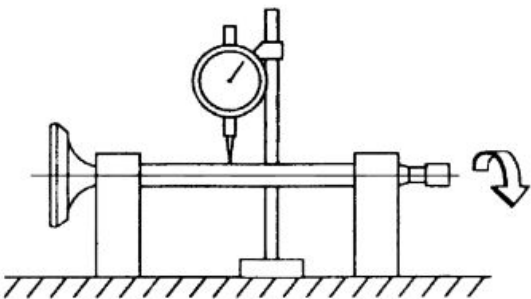
Characteristic	Value
Intake valve	3.970 - 3.985 mm
Exhaust valve	3.96 - 3.975 mm

MINIMUM DIAMETER PERMITTED

Characteristic	Value
Intake valve	3.958 mm
Exhaust valve	3.945 mm

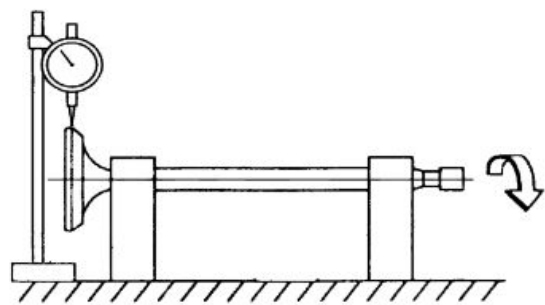
- Check the deviation of the valve stem by placing a dial gauge perpendicular to the valve stem, rotating it on a V-shaped support.

Characteristic
Maximum permitted deviation:
0.1 mm

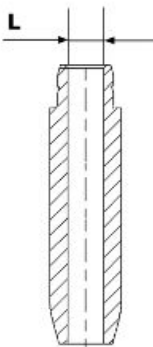


- Check the concentricity of the valve head by placing a dial gauge perpendicular to the valve head, rotating it on a V-shaped support.

Characteristic
Permitted concentricity deviation:
0.03 mm



- Measure the internal diameter of the valve guide.



VALVE GUIDE DIAMETER

Characteristic	Value
Standard Diameter	4 mm + 0.012 mm
Maximum diameter allowed	4 mm + 0.022 mm

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



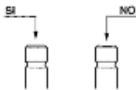
INTAKE

Characteristic	Value
standard clearance	0.015 mm - 0.042 mm
Admissible limit	0.06 mm

EXHAUST

Characteristic	Value
standard clearance	0.025 mm - 0.052 mm
Admissible limit	0.07 mm

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



- If no anomalies are found during the above checks, you can reuse the same valves. In order to obtain a better seal, it is advisable to grind the valve seats. For this operation, act delicately using fine-grained emery paste. During the grinding operation, keep the head in a horizontal position, in order to prevent the paste from penetrating between the guide and the valve stem, modifying the coupling clearance.

CAUTION

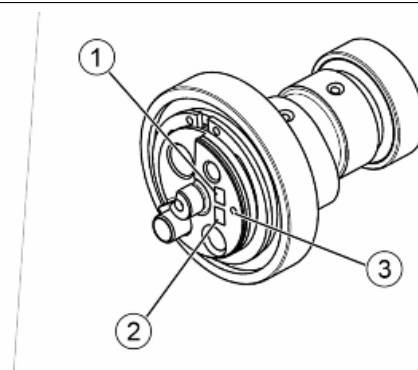
TO AVOID SCORING THE CONTACT SURFACE, DO NOT ROTATE THE VALVE WHEN NO EMERY PASTE IS LEFT. CAREFULLY WASH THE CYLINDER HEAD AND THE VALVES WITH A SUITABLE PRODUCT FOR THE TYPE OF EMERY PASTE BEING USED.

CAUTION

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

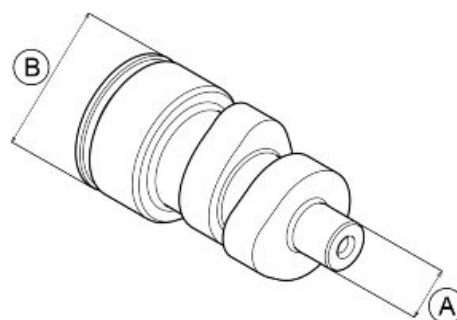
CAMSHAFT

The external side of the camshaft is provided with marks useful for its identification.

**Key:**

- 1.** Area dedicated to laser engraving printing; if there is an "H" letter, the camshaft is designed to be used on an **HPE** version engine.
- 2.** Area dedicated to laser engraving printing; letters "C" or "D" may exist, identifying the class of coupling with the decompressor mass.
- 3.** Area reserved for punch engraving; if there are no punches, the camshaft is designed to be used on 125 cc versions and if there are, the camshaft is designed to be used on 150 cc versions.

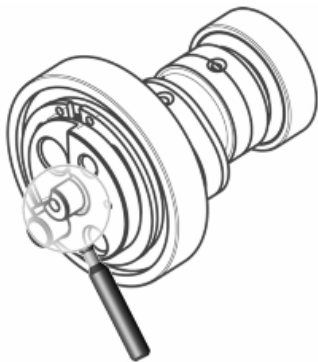
- Check that the camshaft bearings exhibit no scores or abnormal wear.
- Using a micrometer, measure the camshaft bearings.

**CAMSHAFT BEARINGS**

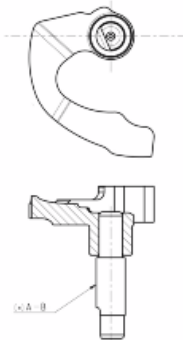
Characteristic	Value
Standard diameter - Bearing A:	12 mm 0,002 / 0,013 mm
Standard diameter - Bearing B	30 mm +0,002 / +0,015 mm

For the correct operation of the Start & Stop system, the cam axis and the decompressor mass must comply with the coupling class.

The colour of the cam axis is indicated in the figure.



The classification of the decompressor mass is indicated in the figure.



- Check that the rocker pins exhibit no damage and/or excessive wear.
- Measure the external diameter of the rocker pins.
- Check the internal diameter of the rocker arms.
- Check that there is no excessive damage and/or wear to the contact roller with the cam.



ROCKERS AND PINS DIAMETER

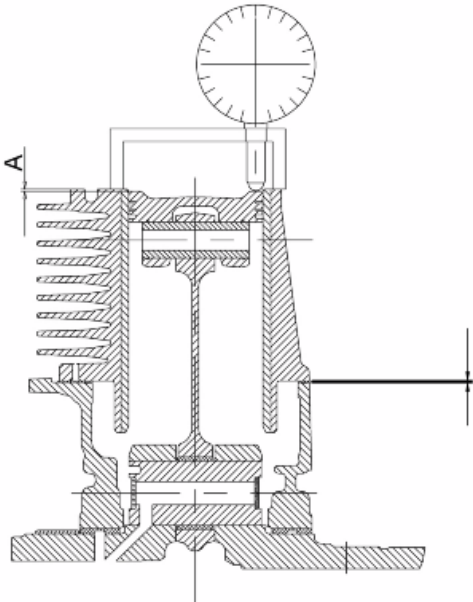
Characteristic	Value
Inside rockers diameter	10.013 mm - 10.031 mm
Rocker pins diameter	9.991 mm - 10.0 mm

Slot packing system

Characteristic

Compression ratio

12.5 :1



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

NOTE

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

ENGINE SHIMMING

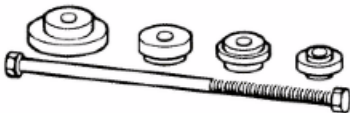



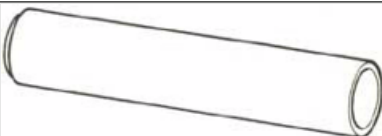

Name	Measure A	Thickness
Shimming 1	0 - -0.1	0.8 ± 0.05
Shimming 2	-0.1 - -0.3	0.6 ± 0.05
Shimming 3	-0.3 - -0.4	0.4 ± 0.05

INDEX OF TOPICS

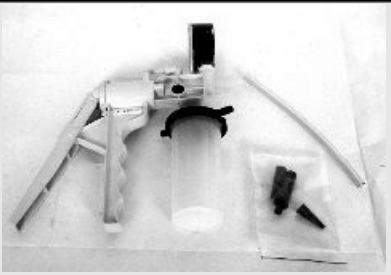




TOOLING



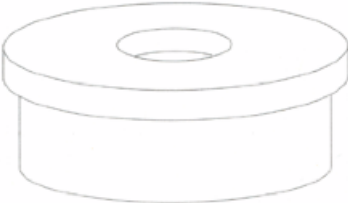



TOOL


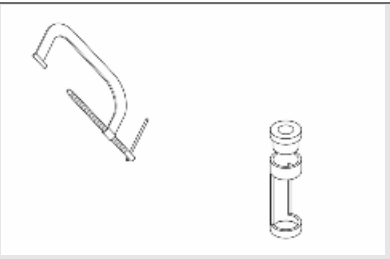


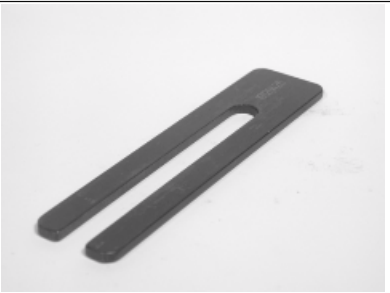
TOOLS TABLE

Stores code	Description	
001330Y	Tool for fitting steering seats	
001467Y008	Clamp to extract 17 mm ø bearings	
001467Y009	Bell for OD 42-mm bearings	
001467Y013	Calliper to extract ø 15-mm bearings	
006029Y	Punch for fitting steering bearing on the steering tube	
020004Y	Punch for removing steering bearings from headstock	






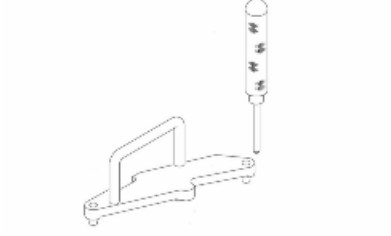

Stores code	Description	
020055Y	Wrench for steering tube ring nut	
020074Y	Support base for checking crankshaft alignment	
020151Y	Air heater	
020263Y	Driven pulley assembly sheath	
020271Y	Tool for removing-fitting silent bloc	
020287Y	Tool for installing seal rings	


Stores code	Description	
020329Y	Mity-Vac vacuum pump	
020331Y	Digital multimeter	
020332Y	Digital rpm indicator	
020335Y	Magnetic mounting for dial gauge	
020345Y	Union for oil pressure measurement	

Stores code	Description	
020357Y	32 x 35-mm Adaptor	
020358Y	37 x 40 mm Adaptor	
020359Y	42 x 47 mm Adaptor	
020360Y	52 x 55 mm adaptor	
020363Y	20 mm diam. punch for crankshaft oil seal	
020364Y	25-mm guide	
020375Y	28 x 30 mm adaptor	

Stores code	Description	
020376Y	Adaptor handle	
020382Y	Valve cotters equipped with part 012 re- moval tool	
020382Y011	Valve removal/installation tool	
020412Y	15-mm guide	
020424Y	Driven pulley roller casing fitting punch	
020426Y	Piston fitting fork	

Stores code	Description	
020439Y	17-mm guide	
020442Y	Pulley lock wrench	
020444Y	Tool for installing/removing clutch on/ from driven pulley	
020444Y009	wrench 46 x 55	
020444Y011	adapter ring	
020480Y	Fuel pressure measurement kit	

Stores code	Description	
020487Y	Fork oil seal extractor	
020922Y	Diagnostic tool	
020938Y	Drive pulley lock	
020942Y	Piston protrusion check tool	
020994Y	Driven pulley stop	
021006Y	Lock for engine timing R.I.S.S	
021007Y	Flywheel puller tool	

Stores code	Description	
021008Y	Punch	
021017Y	OBD cable for E5 vehicles	

INDEX OF TOPICS

MAINTENANCE

MAIN

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 5,000 km (3,106 mi)

km x 1,000 (mi x 1,000)	1 (0.6)	10 (6.2)	20 (12.4)	30 (18.6)	40 (24.8)	50 (31.0)	EVERY 12 MONTHS	EVERY 24 MONTHS
Safety fasteners	I	I	I	I	I	I	I	I
Spark plug			R		R			
Centre/side stand		L	L	L	L	L	L	L
Drive belt		I	R	I	R	I		
Throttle control	I	I	I	I	I	I	I	I
Rollers housing		I	I	I	I	I		
Diagnosis by tool	I	I	I	I	I	I	I	I
Air filter		R	R	R	R	R		
CVT Filter		C	C	C	C	C		
Engine oil filter	R	R	R	R	R	R	R	R
Valve clearance		A		A		A		
Clutch assembly			I		I			
Electrical system and battery	I	I	I	I	I	I	I	I
Brake system	I	I	I	I	I	I	I	I
Coolant level	I	I	I	R	I	I	I	R
Brake fluid	I	I	I	I	I	I	I	R
Engine oil*	R	R	R	R	R	R	R	R
Hub oil		I	I	R	I	I	I	I
Headlight direction adjustment		I	I	I	I	I		
Brake pads		I	I	I	I	I	I	I
Sliding shoes / CVT rollers		I	R	I	R	I		
Engine oil pre-filter	C	C	C	C	C	C	C	C
Tire pressure and wear	I	I	I	I	I	I	I	I
Test drive of vehicle on road	I	I	I	I	I	I	I	I
Radiator - External cleaning			C		C			
Suspension		I	I	I	I	I	I	I
Steering	I	I	I	I	I	I	I	I
Transmission		L	L	L	L	L	I	I
Labour time (minutes)	60	150	130	160	130	150	60	60

NOTE

AT EACH SCHEDULED SERVICE, USE THE DIAGNOSTIC TOOL TO CHECK FOR ERRORS AND CHECK THAT ALL PARAMETERS ARE CORRECT.

ENSURE THAT THE VEHICLE CALIBRATION IS UP TO DATE AFTER UPDATING THE DIAGNOSTIC TOOL.

NOTE

ONCE THE REQUIRED MAINTENANCE PROGRAM HAS BEEN COMPLETED, THE VEHICLE'S MAINTENANCE MUST BE CONTINUED STARTING WITH THE 10,000 Km (6,214 mi).

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 0W-30	Synthetic lubricant for four stroke engines (-15°C < T < 40°C)	SAE 0W-30 ACEA A5/B5-04 - VW 503 00, 506 00, 506 01
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
Anti-freeze liquid, ready to use, colour red	Glycol ethylene based antifreeze liquid with organic additive technology corrosion inhibitor. Colour red, ready to use.	ASTM D 3306 - ASTM D 4656 - ASTM D 4985 - CUNA NC 956-16
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 Page 9022 EM 25-89

VERSION 200

NOTE:

USE TWO DIFFERENT TYPES OF LUBRICANTS, ACCORDING TO THE CLIMATE OF THE AREAS WHERE THE VEHICLE IS USED:
ENGINE OIL 10W-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 < 20°C).



Spark plug

Replace the spark plug, following the indications provided in the scheduled maintenance table.

To remove the spark plug, proceed as follows:

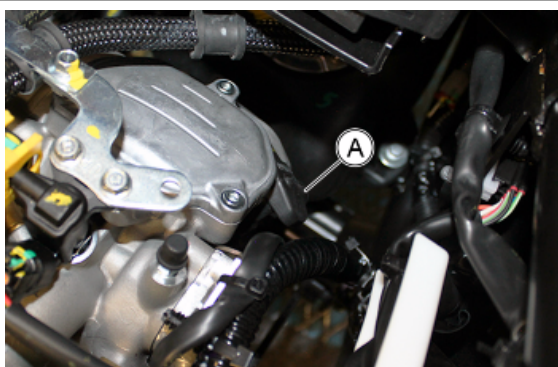
- Open the saddle and undo the five fixing screws of the under-saddle compartment.



- Remove the under-saddle compartment.



- Slide off the spark plug tube «A».
- Unscrew the spark plug with the specific box-spanner for spark plugs, check for wear and replace if necessary, or replace as indicated in the maintenance schedule. Check the air gap between the electrodes with a feeler gauge.



Characteristic

Electrode gap

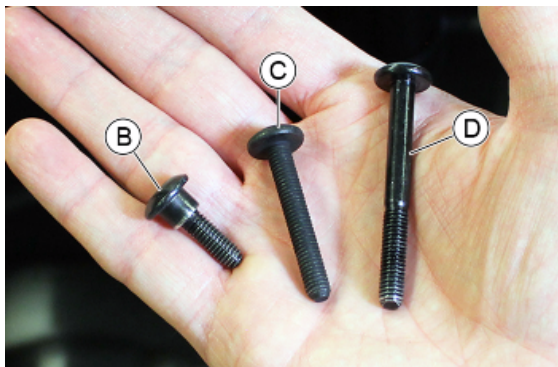
0.7 ÷ 0.8 mm

Electrode gap wear limit

1.10 mm.

REFITTING

- 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 «A».
- Place the under-saddle compartment and tighten the fixing screws to the specified torque:
 - N. 1 short screw «B» in the front part;



- N. 2 medium screws «C» in the middle part;
- N. 2 long screws «D» in the rear part.

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.

Locking torques (N*m)

Under-saddle compartment fixing screws 4.5 to 7



Hub oil

Check

Check oil level with the vehicle placed on the centre stand and on a flat surface.

Remove the rear mudguard beforehand as described in the «**Bodywork**» Chapter.



Undo the indicated screw and check for oil by inserting a shank/plug. The level should be just under the lower margin of the fill hole.

In case of oil leakage, carefully clean the transmission crankcase with a cloth.

CAUTION

REPLACE THE COPPER GASKET EACH TIME THE LEVEL CHECK AND/OR HUB OIL DRAINAGE SCREW IS UNSCREWED.

Locking torques (N*m)

Hub oil filler screw 15 to 17



Replacement

- Remove the hub oil level check screw.



- Place an adequately sized drain pan under the transmission casing directly below the wheel hub.
- Unscrew the oil drain screw and allow all the oil to drain.



- Tighten the oil drain screw to the specified torque.

CAUTION

REPLACE THE COPPER GASKET EACH TIME THE LEVEL CHECK AND/OR HUB OIL DRAINAGE SCREW IS UNSCREWED.

Locking torques (N*m)

Hub oil drain screw 15 to 17

- Fill with the specified quantity of oil via the level inspection hole.

Recommended products

Transmission oil 80W-90 Lubricant for gearboxes and transmissions.

SAE 80W-90; API GL-4

Characteristic

Hub oil325 cm³**Air filter**

To remove the air filter, proceed as follows:

- Unscrew and remove the air filter cover fixing screws.



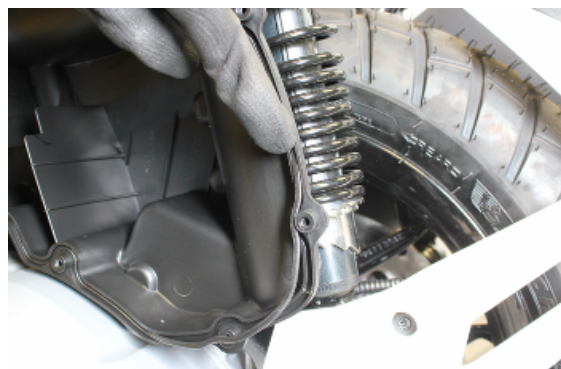
- Remove the filter box cover.



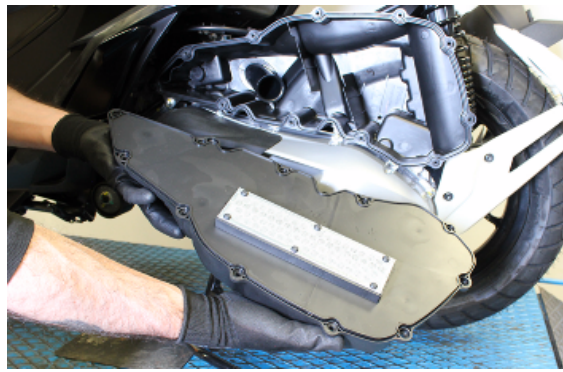
- Remove the filtering element.



- **Together with the filter element, ALSO replace the sealing gaskets** both on the profile of the filter box and the cover.



- Insert a new filter element in its seat.



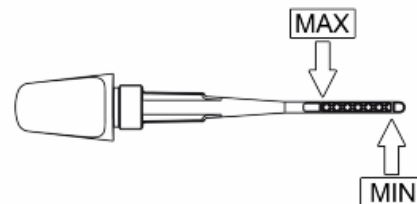
- Position the cover.
- Tighten the fastening screws of the air filter box cover.



Engine oil

Engine oil is used in four stroke engines to lubricate the distribution elements, the bench bearings and the thermal group. **An insufficient quantity of oil can cause serious damage to the engine.**

In all four stroke engines, a loss of efficiency in oil performance and a certain level of consumption should be considered normal. Consumption is specially affected by use conditions (e.g.: oil consumption increases when driving at "full throttle").



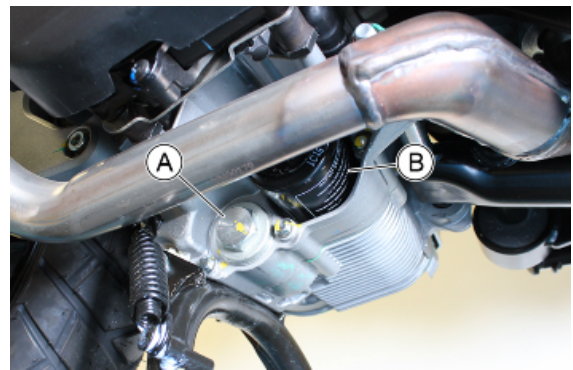
Replacement

Change the engine oil and replace the filter in accordance with the instructions provided in the scheduled maintenance table.

- Unscrew the filler cap/dipstick to allow the oil to drain more easily.



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



- Unscrew the engine oil filter «B».

- Check the condition of the O-rings on the drain plug and the mesh filter.



- Lubricate the O-rings, fit the mesh filter in its housing and tighten the drain plug to the specified torque.

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



- Restore the engine oil level using the recommended product.

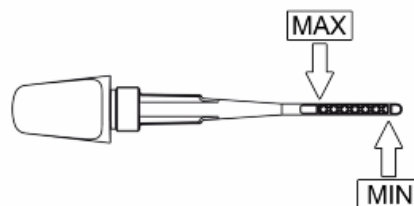
Start the engine, leave it running for a few minutes and switch it off again. Check the level again after approximately five minutes and top up if necessary. Do not exceed the **MAX** level mark.

NOTE

THE ENGINE MUST BE HOT WHEN THE OIL IS CHANGED.

WARNING

USED OIL CONTAINS SUBSTANCES WHICH CAN BE HARMFUL TO THE ENVIRONMENT.



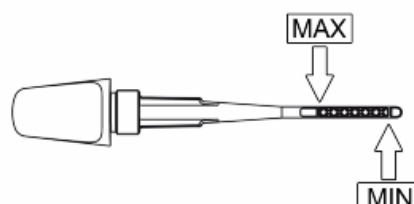
Check

This check must be carried out when the engine is cold, if necessary, wait for 10 minutes after switching the engine off.

- Rest the vehicle on its centre stand on level ground.
- Unscrew the oil dipstick, wipe it with a clean cloth and fit it back into place, **tightening completely**.



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



Checking the valve clearance

Remove the plastic parts beforehand as described in the «**Bodywork**» Chapter.



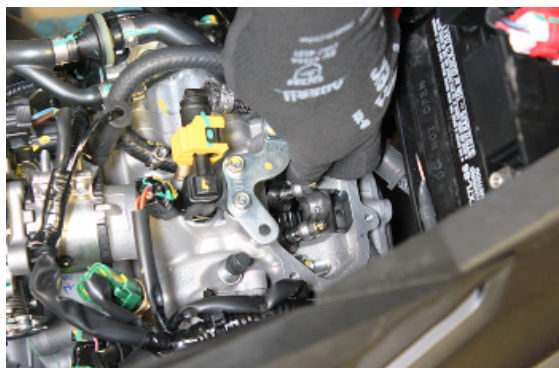
- Unscrew and remove the three fixing screws of both tappet covers.



- Remove the two covers including the gaskets.



- Use a feeler gauge to check that the clearance between the valve and the register 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 acting on the adjustment screw.



When reassembling, tighten the fastener screws to the specified torque.

Locking torques (N*m)

Tappet cover screws 5 - 6 Nm

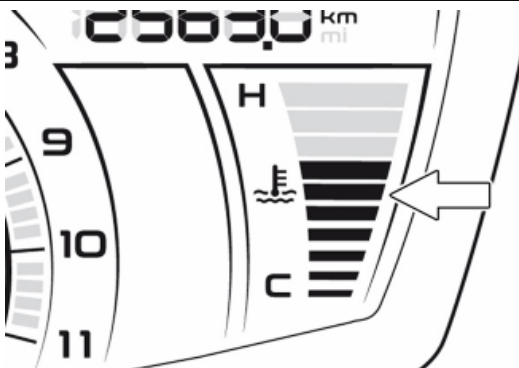


Cooling system

Engine cooling is forced liquid circulation. The coolant is composed of a mix of 50% de-mineralised water and an ethylene glycol-based anti-freeze with corrosion prevention components. The coolant included with the scooter is already mixed and ready for use.

For proper functioning of the engine, ensure that the temperature of the coolant is maintained at about 90°C.

When all the bars and the icon on the coolant level indicator start flashing, stop the engine immediately, let it cool down and check the liquid level. Check coolant when the engine is cold as indicated in the scheduled maintenance tables.



Level check

1. Place the vehicle in an upright position on the centre stand, open the saddle and remove the coolant tank cover indicated in the photo.
2. Remove the fuel tank cap «A».
3. Look inside and check that the liquid level reaches the base of the tank inlet, as shown in the photo.
4. If the coolant level is less, top-up when the engine is cold.

If the coolant needs to be topped up frequently or the coolant reservoir is completely empty, the cooling system must be checked to identify the cause of the problem.

Replace coolant as indicated in the scheduled maintenance table.

WARNING

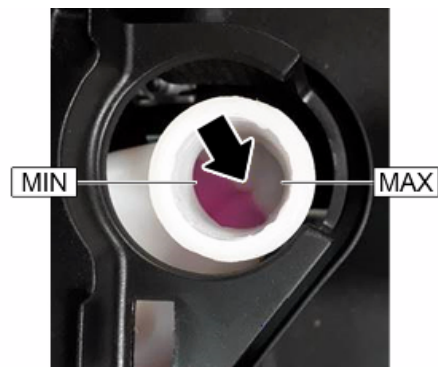
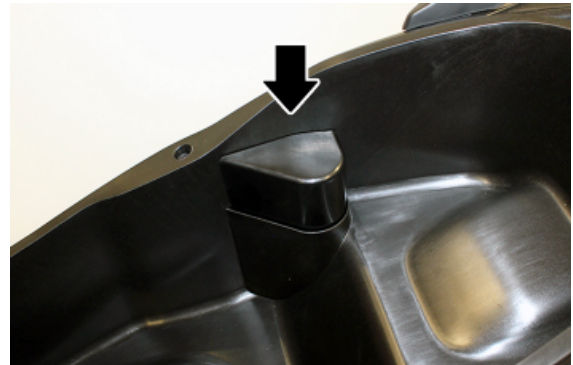


IN ORDER TO AVOID HARMFUL FLUID LEAKS WHILE RIDING, IT IS IMPORTANT TO MAKE SURE THAT THE LEVEL NEVER EXCEEDS THE INDICATED THRESHOLD. TO ENSURE CORRECT ENGINE OPERATION, KEEP THE RADIATOR GRILLE CLEAN.

WARNING



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



Level check

To control the brake fluid level, do the following:

- Place the bike on the centre stand with the handlebar pointing straight;
- check the fluid level using the respective sight glass «A».

A drop in the brake fluid level may be caused by pad wear.



Top-up

Remove the lid of the fluid reservoir, unscrewing the two relative screws, and top up with the specified fluid type only, taking care not to fill beyond the maximum level.

WARNING



ONLY USE DOT 4-CLASSIFIED BRAKE FLUID. BRAKE CIRCUIT FLUID IS HIGHLY CORROSIVE: DO NOT LET IT COME INTO CONTACT WITH PAINTED PARTS.



Headlight adjustment

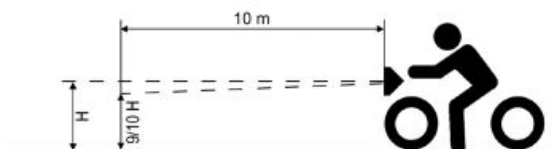
- Place the unloaded vehicle, with the tyres inflated to the recommended pressure, on flat, level ground at a distance of 10 m from a white screen situated in shade, ensuring that the horizontal centreline of the vehicle is at right angles to the surface of the screen.

- Turn on the headlight and make sure that the limit of the light beam projected on the screen does not exceed $\frac{9}{10}$ of the height of the centre of the headlamp from the ground and is no less than $\frac{7}{10}$.

Otherwise, adjust the headlight by means of the relative screws.

To access the left and right headlight adjustment screws, remove the plastic parts beforehand as described in the «**Bodywork**» Chapter:

- side covers;
- Upper leg shield back plate fastening.



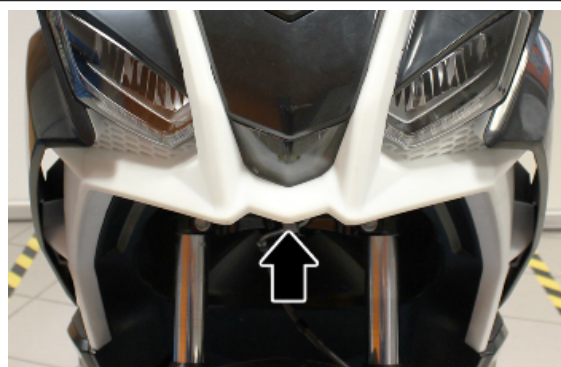
1. Left headlight adjustment screw;
2. Right headlight adjustment screw (accessible from the underside of the plastic using a stubby screwdriver or a 10 mm open-end wrench);



3. Central headlight adjustment screw (accessible from the front wheel compartment using a Phillips screwdriver).

NOTE

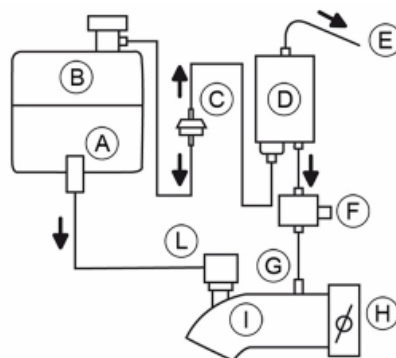
THE PROCEDURE DESCRIBED IS THAT ESTABLISHED BY EUROPEAN STANDARDS FOR THE MAXIMUM AND MINIMUM HEIGHT OF THE LIGHT BEAM. REFER TO THE STATUTORY REGULATIONS IN FORCE IN EVERY COUNTRY WHERE THE VEHICLE IS USED.



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



INDEX OF TOPICS

TROUBLESHOOTING

TROUBL

Poor performance

POOR PERFORMANCE

Possible Cause	Operation
Air filter blocked or dirty	Remove the sponge, wash with water and car shampoo, soak with specific oil for foam filter treatment. Press with your hand without squeezing, allow it to drip dry and refit
Excessive drive belt wear	Check it and replace, if necessary
Lack of compression: parts, cylinder and valves worn	Replace the worn parts
Engine oil level exceeds maximum	Check for causes and fill to reach the correct level
Excess of scales in the combustion chamber	Descale the cylinder, the piston, the head and the valves
Incorrect timing or worn timing system elements	Time the system again or replace the worn parts
Silencer obstructed	Replace
Inefficient automatic transmission	Check the rollers and the pulley movement, replace the damaged parts and lubricate the movable guide of the driven pulley with grease
Wrong valve adjustment	Adjust the valve clearance properly
Overheated valves	Remove the head and the valves, grind or replace the valves
Misshapen/worn valve seats	Replace the head unit
Worn cylinder, Worn or broken piston rings	Replace the piston cylinder assembly or just the piston rings

Starting difficulties

START-UP PROBLEMS

Possible Cause	Operation
Flat battery	Check the state of the battery. If it shows signs of sulphation, replace it and bring the new battery into service by charging it for not more than ten hours at a current of 1/10 of the capacity of the battery itself.
Faulty spark plug	Replace the spark plug
Incorrect valve sealing or valve adjustment	Inspect the head and/or restore the correct clearance.
Altered fuel characteristics	Drain off the fuel no longer up to standard; then, refill.
Air filter blocked or dirty	Remove the sponge, wash with water and car shampoo, soak with specific oil for foam filter treatment. Press with your hand without squeezing, allow it to drip dry and refit
Fuel pump fault	Check the pump.

Excessive oil consumption/Exhaust smoke

EXCESSIVE CONSUMPTION

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

Insufficient lubrication pressure

LOW LUBRICATION PRESSURE

Possible Cause	Operation
By-Pass remains open	Check the By-Pass and replace if required. Carefully clean the By-Pass area.

Possible Cause	Operation
Oil pump with excessive clearance	Perform the dimensional checks on the oil pump components.
Oil filter too dirty	Replace the cartridge filter
Oil level too low	Restore the level adding the recommended oil type

Clutch grabbing or performing inadequately

IRREGULAR CLUTCH PERFORMANCE OR SLIPPAGE

Possible Cause	Operation
Slippage or irregular functioning	Check that there is no grease on the masses. Check that the faying surface between the clutch masses and the clutch housing is mainly in the middle and with equivalent specifications on the three masses. Check that the clutch housing is not scored or worn abnormally.

Insufficient braking

INEFFICIENT OR NOISY BRAKING

Possible Cause	Operation
Worn brake pads or shoes	Replace the brake pads or shoes and check for brake disk or drum wear conditions.
Front brake disk loose or deformed	Check the brake disc screws are locked; measure the axial shift of the disc with a dial gauge and with wheel mounted on the vehicle.
Air bubbles inside the hydraulic braking system	Carefully bleed the hydraulic braking system, (there must be no flexible movement of the brake lever).
Fluid leakage in hydraulic braking system	Failing elastic fittings, plunger or brake pump seals, replace.
Excessive clearance in the rear brake control cable	Adjust the clearance with the appropriate adjuster located on the back part of the crankcase.

Brakes overheating

BRAKES OVERHEATING

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

Battery

BATTERY

Possible Cause	Operation
Battery	This is the device in the system that requires the most frequent attention and the most 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 ground wire is connected to the negative terminal while the red wire is connected to the terminal marked+. Follow the instructions in the ELECTRICAL SYSTEM chapter for the recharging of the batteries.

Controls

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 shock absorber in the stems works properly and the steering ball bearings are in good condition. Finally, check the locking torque of the wheel axle nut, the brake calliper and the disc. Check that the swinging arm connecting the engine to the frame and the rear shock absorber work properly.

Suspension oil leakage

OIL LEAKAGE FROM SUSPENSION

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

INDEX OF TOPICS

ELECTRICAL SYSTEM

ELE SYS

Lights list

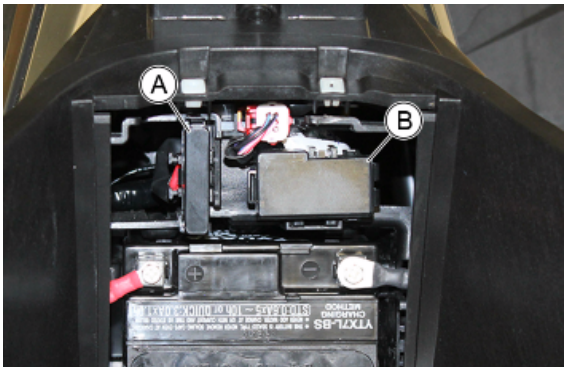
BULBS

	Specification	Desc./Quantity
1	High-/low beam bulb	Type: LED Power: - Quantity: -
2	Front side light bulb	Type: LED Power: - Quantity: -
3	Stop light/rear daylight running light bulb	Type: LED Power: - Quantity: -
4	Front indicator light bulb	Type: LED Power: - Quantity: 2
5	Rear indicator light bulb	Type: LED Power: - Quantity: 2
6	Licence plate light bulb	Type: LED Power: - Quantity: -

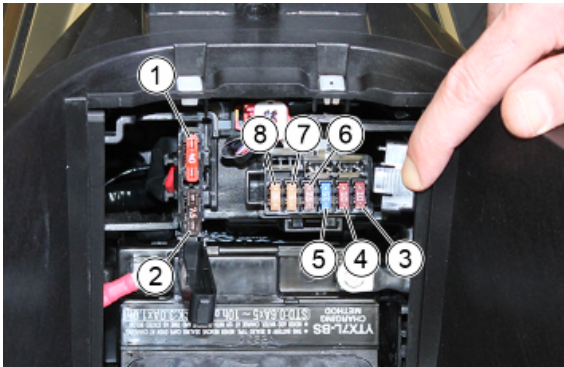
Fuses

VERSION 125

The electrical system is protected by eight fuses divided in two fuse holder boxes «A» and «B», located near the battery. To reach it, the battery compartment cover must be removed as indicated in the «Battery» section.



To open the fuse holder boxes, act on the relative coupling tabs.



FUSE BOX «A»

	Specification	Desc./Quantity
1	Fuse No. 1	Capacity: 40 A
2	Fuse No. 2	Protected circuits: Battery recharge. Capacity: 7.5 A

Specification		Desc./Quantity
		Protected circuits (key-on power): instrument cluster, turn signal flasher unit, brake lights, horn, turn signal selector switch.
FUSE BOX «B»		
Specification		Desc./Quantity
1	Fuse No. 3	Capacity: 10 A Protected circuits: injection control unit, injection load relay.
2	Fuse No. 4	Capacity: 10 A Protected circuits: instrument cluster, OBD port, saddle release actuator (relay controlled), PMP3, provision for accessories. Protected circuits (key-on power): Saddle opening button.
3	Fuse No. 5	Capacity: 15 A Protected circuits (key-on power): fuses 2, 6, 7, 8.
4	Fuse No. 6	Capacity: 7.5 A Protected circuits (key-on power): USB port, OBD port, PMP3, provision for accessories.
5	Fuse No. 7	Capacity: 5 A Protected circuits (key-on power): injection control unit, rectifier.
6	Fuse 8	Capacity: 5 A Protected circuits (key-on power): DRL lights, license plate light, main beam flash ('passing' function).

CAUTION

IN ORDER TO AVOID DAMAGING THE ELECTRICAL SYSTEM, NEVER DISCONNECT THE WIRING WHILE THE ENGINE IS RUNNING. DO NOT TIP THE VEHICLE TOO MUCH IN ORDER TO AVOID DANGEROUS LEAKAGE OF THE BATTERY ELECTROLYTE.

CAUTION

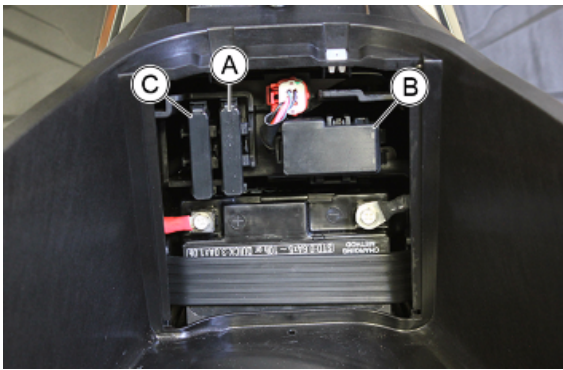
MODIFICATIONS OR REPAIRS TO THE ELECTRICAL SYSTEM, PERFORMED INCORRECTLY OR WITHOUT STRICT ATTENTION TO THE TECHNICAL SPECIFICATIONS OF THE SYSTEM CAN CAUSE MALFUNCTIONING AND RISK OF FIRE.

CAUTION

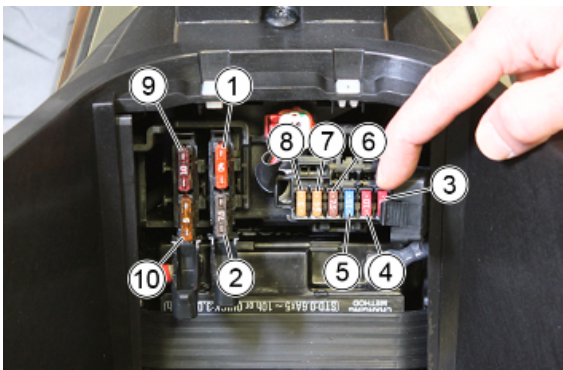
**PROCEED WITH CAUTION.
DO NOT DAMAGE THE TABS AND/OR THEIR CORRESPONDING SLOTS. HANDLE THE PLASTIC AND PAINTED COMPONENTS WITH CARE, DO NOT SCRATCH OR IMPAIR THEM.**

VERSION 200

The electrical system is protected by ten fuses divided in three fuse holder boxes «A», «B» and «C», located near the battery. To reach it, the battery compartment cover must be removed as indicated in the «Battery» section.



To open the fuse holder boxes, act on the relative coupling tabs.



FUSE BOX «A»

Specification		Desc./Quantity
1	Fuse No. 1	Capacity: 40 A Protected circuits: Battery recharge.
2	Fuse No. 2	Capacity: 7.5 A Protected circuits (key-on power): instrument cluster, turn signal flasher unit, brake lights, horn, turn signal selector switch.

FUSE BOX «B»

Specification		Desc./Quantity
1	Fuse No. 3	Capacity: 10 A Protected circuits: injection control unit, injection load relay.
2	Fuse No. 4	Capacity: 10 A Protected circuits: instrument cluster, OBD port, saddle release actuator (relay controlled), PMP3, provision for accessories. Protected circuits (key-on power): Saddle opening button.
3	Fuse No. 5	Capacity: 15 A Protected circuits (key-on power): fuses 2, 6, 7, 8.
4	Fuse No. 6	Capacity: 7.5 A Protected circuits (key-on power): USB port, OBD port, PMP3, provision for accessories.
5	Fuse No. 7	Capacity: 5 A Protected circuits (key-on power): injection control unit, ABS control unit.
6	Fuse 8	Capacity: 5 A Protected circuits (key-on power): DRL lights, license plate light, main beam flash ('passing' function).

FUSE BOX «C»

Specification		Desc./Quantity
1	Fuse No. 9	Capacity: 10 A Protected circuits: ABS control unit.

	Specification	Desc./Quantity
2	Fuse No. 10	Capacity: 5 A Protected circuits: ABS control unit.

CAUTION

IN ORDER TO AVOID DAMAGING THE ELECTRICAL SYSTEM, NEVER DISCONNECT THE WIRING WHILE THE ENGINE IS RUNNING. DO NOT TIP THE VEHICLE TOO MUCH IN ORDER TO AVOID DANGEROUS LEAKAGE OF THE BATTERY ELECTROLYTE.

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.

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.

Battery installation

Where available

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.

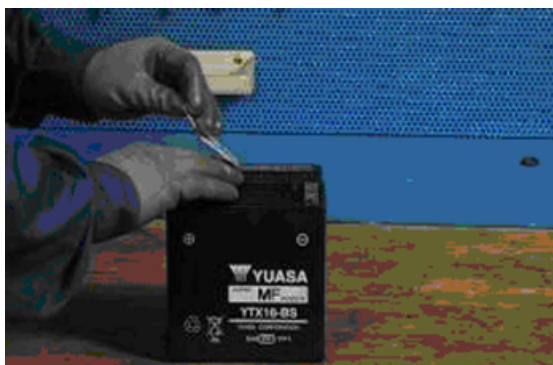
BATTERIES PRODUCE EXPLOSIVE GAS; KEEP CLEAR OF NAKED FLAMES, SPARKS OR CIGARETTES; VENTILATE THE AREA WHEN RECHARGING INDOORS.

ALWAYS WEAR EYE PROTECTION WHEN WORKING IN THE PROXIMITY OF BATTERIES.

KEEP OUT OF THE REACH OF CHILDREN.

1) Battery preparation

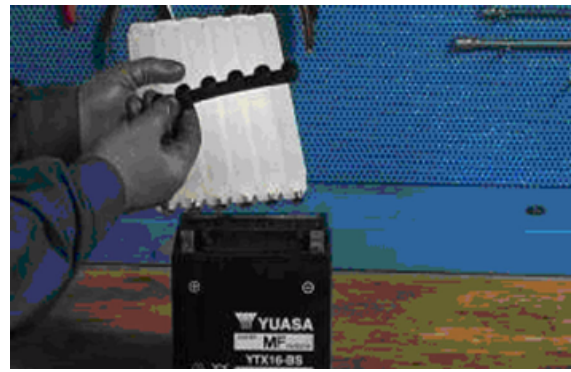
Position the battery on a flat surface. Remove the adhesive sheet closing cells and proceed as quickly as possible to run the subsequent activation phases.



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

6) Battery closing.

Insert the airtight cover strips into the filling holes. Press horizontally with both hands and make sure that the strip is levelled with the top part of the battery.

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

The filling process is now complete.

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

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

7) Recharging the new battery

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

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

The dry-charged MF batteries, like the completely charged YTX batteries must have a zero load voltage comprised between 12.8 - 13.15 V. Completely charge the battery using the charger 020648Y :

- a - select the type of battery with the red switch on the left of the panel battery charger panel
- b - select NEW on the yellow timer
- c - connect the clamps of the battery charger to the battery poles (black clamp to negative pole (-) and red clamp to positive pole (+)).

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



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



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



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



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



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

Connectors

VERSION 125

The electrical components of the vehicle are as follows:

- Immobilizer antenna
- Saddle opening actuator
- Battery
- H.V. coil.
- RISS 3.0 injection control unit
- Horn

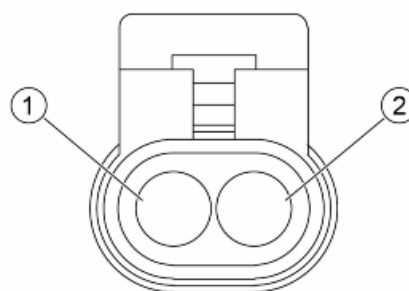
- RH handlebar controls
- LH handlebar controls
- Ignition switch
- Turn indicator control device
- Tail-light
- Fuse box «A»
- Fuse box «B»
- Instrument panel
- Front RH turn indicator
- Front LH turn indicator
- Fuel gauge
- Injector
- Licence plate lamp
- Engine/frame ground
- Frame ground
- PMP 3
- Fuel pump
- Accessories pre-installation
- Headlight
- OBD socket
- USB port
- Saddle release switch
- Side stand switch
- MAP sensor
- air temperature sensor
- Engine temperature sensor
- Engine speed sensor
- Lambda probe
- Rectifier
- Stepper motor
- Saddle opening actuator relay
- Injection load relay
- Purge valve
- Flywheel (phases)
- Flywheel (signals)

CAUTION**NOTE**

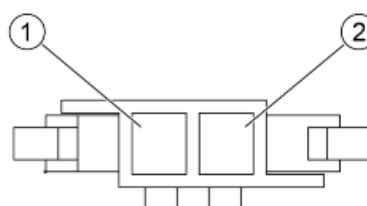
THE DIAGRAM SHOWS THE LAYOUT OF THE CONNECTORS VIEWED FROM THE CABLE ENTRY SIDE.

IMMOBILIZER ANTENNA

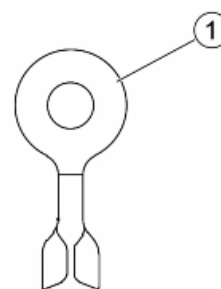
1. Injection ECU (Purple-White)
2. Injection ECU (Purple-Black)

**SADDLE OPENING ACTUATOR**

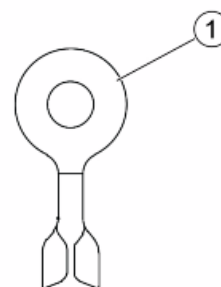
1. Ground lead (Black)
2. Positive (Blue)

**BATTERY**

1. Positive (Red)

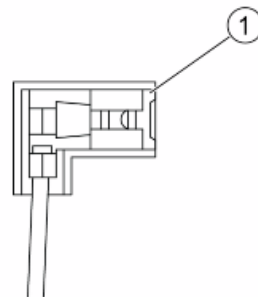


1. Negative (Black)

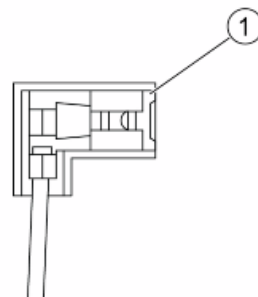


H.V. COIL.

1. Injection ECU (Pink-Black)

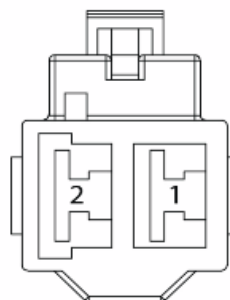


-
1. Ground lead (Black)



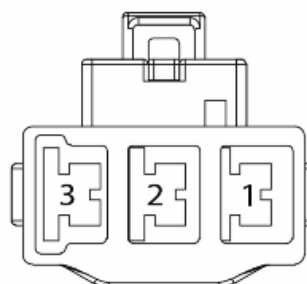
RISS 3.0 INJECTION CONTROL UNIT**Connector "A"**

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



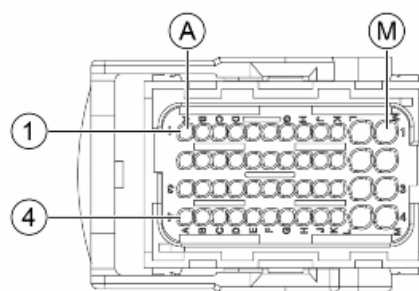
Connector "B"

1. Flywheel connector (phases) (Yellow)
2. Flywheel connector (phases) (Green)
3. Flywheel connector (phases) (Light blue)



Connector «C»

- A1.** Not connected
- A2.** "Start&Stop" indicator light (Pink-Green)
- A3.** Immobilizer antenna (Purple-Black)
- A4.** Immobilizer antenna (Purple-White)
- B1.** Not connected
- B2.** Flywheel connector (signals - DIR) (Grey-Green)
- B3.** MAP Sensor (TPS) (Orange-White)
- B4.** Side stand switch (White-Pink)
- C1.** Injection load solenoid (Red-Blue)
- C2.** Not connected
- C3.** Engine cut-out switch (Green-Orange)
- C4.** Flywheel connector (signals - PICKUP+) (Orange)
- D1.** Not connected
- D2.** Not connected
- D3.** Immobilizer LED (Yellow)
- D4.** Speed signal (Sky blue)
- E1.** Not connected
- E2.** MAP Sensor (TMAP) (Green-Grey)
- E3.** Engine temperature sensor (Light blue-Green)
- E4.** Not connected
- F1.** Not connected
- F2.** Sensors ground (Black-Green)
- F3.** Lambda probe (Green - Blue)
- F4.** Stop buttons (White-Black)
- G1.** Stepper motor (1B) (Light blue-Black)
- G2.** Not connected
- G3.** Not connected
- G4.** Start & Stop button (Light blue-White)
- H1.** Stepper motor (1A) (Brown-Pink)
- H2.** Flywheel connector (signals - HALL2) (Blue-Yellow)
- H3.** Flywheel connector (signals - HALL1) (White-Green)
- H4.** Starter button (Brown-Red)
- J1.** Stepper motor (2A) (Brown-Black)



- J2. Sensors power supply (Red-Green)
- J3. MAP Sensor (MAP) (Brown-Green)
- J4. Flywheel connector (signals - HALL3) (White-Grey)
- K1. Stepper motor (2B) (Light blue-Red)
- K2. CAN L Line (Pink-White)
- K3. CAN H line (Pink-Red)
- K4. Ignition switched live (White-Brown)
- L1. Lambda probe heater (Black-Purple)
- L2. Purge valve (White-Red)
- L3. Not connected
- L4. Injector (Red-Yellow)
- M1. Fuel pump (Green)
- M2. Coil (Pink-Black)
- M3. Battery power (Red-White)
- M4. Headlight (Brown-Purple)

HORN

- 1. Horn button (Yellow-Grey)

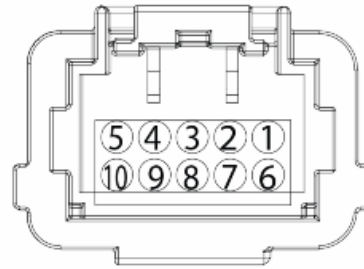


- 1. Ground lead (Black)

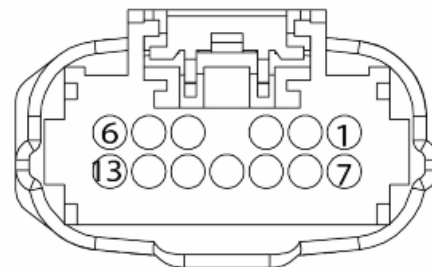


RH HANDLEBAR CONTROLS

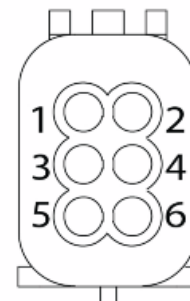
1. Not connected
2. Engine stop switch (ON) (Black-Green)
3. Engine cut-out switch (RUN) (Green-Orange)
4. Ignition button (-) (Black-Green)
5. Starter button (+) (Brown-Red)
6. Connectivity Button (-) (Black-Yellow)
7. Connectivity Button (+) (Grey-White)
8. Not connected
9. Stop buttons (+) (White)
10. Stop button (-) (White-Black)

**LH HANDLEBAR CONTROLS****Connector "A"**

1. Light selector switch (LO) (Brown)
2. Light selector switch (COM) (Brown-Purple)
3. Light selector switch (HI) (Purple)
4. Light selector switch (FLASH) (Yellow-Black)
5. Horn (+) (White)
6. Horn (-) (Yellow-Grey)
7. "Start & Stop" button (-) (Black-Green)
8. Start & Stop button (+) (Light blue-White)
9. Not connected
10. Not connected
11. Not connected
12. Stop button (-) (White-Black)
13. Stop buttons (+) (White)

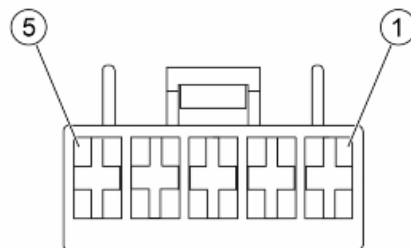
**Connector "B"**

1. Turn indicator switch (L) (White-Pink)
2. Turn indicator switch (COM) (White)
3. Turn indicator switch (OFF) (White-Red)
4. MODE button (-) (Black-Yellow)
5. Turn indicator switch (R) (White-Grey)
6. MODE button (+) (Green)

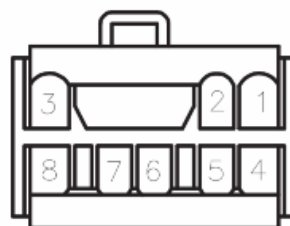


IGNITION SWITCH

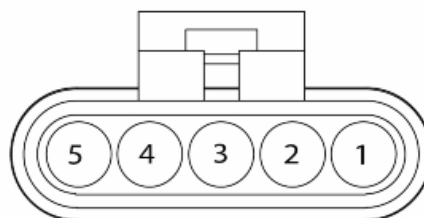
1. Fuse no. 4 (Black-Purple)
2. Not connected
3. Saddle opening switch (Green)
4. Fuse no. 5 (LOCK/OFF/OPEN) (Red-Black)
5. Fuses no. 2-6-7-8 (ON) (Orange)

**TURN INDICATOR CONTROL DEVICE**

1. Turn indicator switch (L) (White-Pink)
2. Ground lead (Black)
3. Left turn indicators (Pink)
4. Turn indicator switch (R) (White-Grey)
5. Turn indicator switch (OFF) (White-Red)
6. Not connected
7. Ignition switched live (White)
8. Right turn indicators (White-Blue)

**TAILLIGHT**

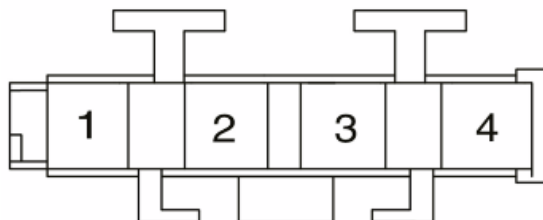
1. Parking light (Yellow-Black)
2. Right turn indicator (White - Blue)
3. Left turn indicator (Pink)
4. Ground lead (Black)
5. Brake light (White-Black)

**FUSE BOX «A»****Fuse No. 1**

1. Battery (Red)
2. Injection ECU (Red)

Fuse No. 2

3. Ignition switched live (Orange)
4. Protected circuits (White)



FUSE BOX «B»**Fuse No. 3**

- 1. Battery (Red)
- 8. Protected circuits (Red-White)

Fuse No. 4

- 2. Battery (Red)
- 9. Protected circuits (Black-Purple)

Fuse No. 5

- 3. Battery (Red)
- 10. Protected circuits (Red-Black)

Fuse No. 6

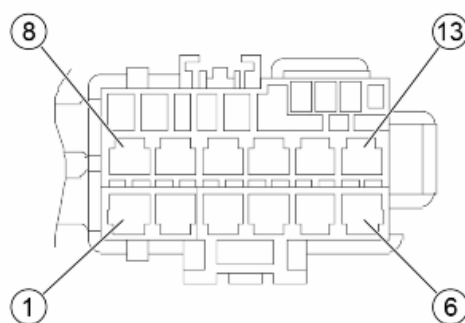
- 4. Ignition switch (Orange)
- 11. Protected circuits (Light Blue-Red)

Fuse No. 7

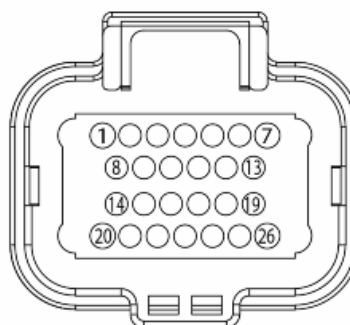
- 5. Ignition switch (Orange)
- 12. Protected circuits (White-Brown)

Fuse 8

- 6. Ignition switch (Orange)
- 13. Protected circuits (Yellow-Black)

**INSTRUMENT PANEL**

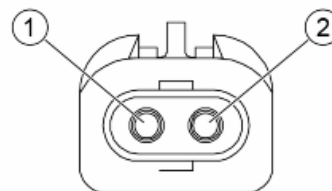
- 1. Not connected
- 2. Ground (Black-Yellow)
- 3. Ground (Black-Yellow)
- 4. Fuel level indicator (White - Green)
- 5. Air temperature sensor (Yellow-Pink)
- 6. Not connected
- 7. Not connected
- 8. Not connected
- 9. Power supply from Battery (Black-Purple)
- 10. MODE button (Green)
- 11. Not connected
- 12. Oil pressure sensor (White)
- 13. High beam warning light (Purple)
- 14. Ignition switched live (White)
- 15. Speed signal (Sky blue)
- 16. Right turn indicator warning light (White-Blue)
- 17. Left turn indicator warning light (Pink)



- 18. Immobilizer LED (Yellow)
- 19. Not connected
- 20. Ground lead (Black)
- 21. Sensors ground (Black-Yellow)
- 22. Not connected
- 23. Not connected
- 24. "Start&Stop" indicator light (Pink-Green)
- 25. CAN L Line (Pink-White)
- 26. CAN H line (Pink-Red)

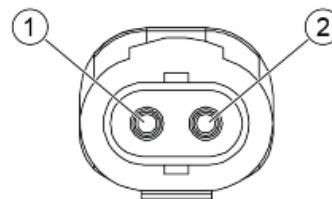
FRONT RH TURN INDICATOR

- 1. Power supply (White-Blue)
- 2. Ground lead (Black)



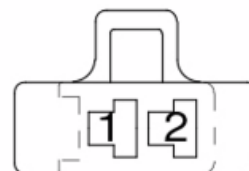
FRONT LH TURN INDICATOR

- 1. Power supply (Pink)
- 2. Ground lead (Black)



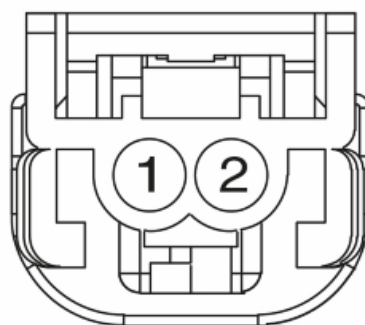
FUEL GAUGE

- 1. Signal (White-Green)
- 2. Negative from instrument panel (Black-Yellow)

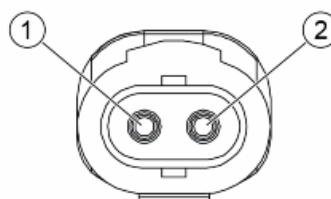


INJECTOR

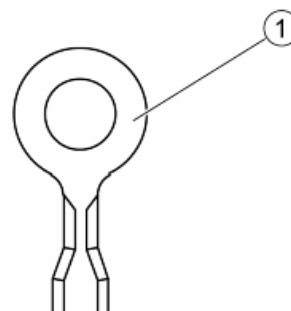
1. Negative from control unit (Red-Yellow)
2. Injection load relay (Red-Green)

**LICENCE PLATE LAMP**

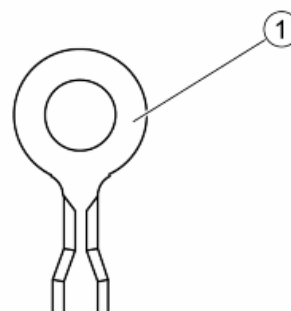
1. Power supply (Yellow-Black)
2. Ground lead (Black)

**ENGINE/FRAME GROUND**

1. Ground lead (Black)

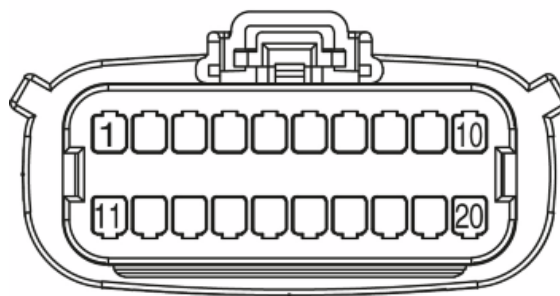
**FRAME GROUND**

1. Ground lead (Black)

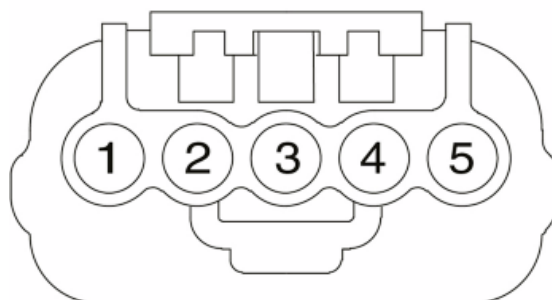


PMP 3

1. CAN H line (Pink-Red)
2. Ignition switched live (Light blue-Red)
3. Saddle opening actuator relay (Blue-Yellow)
4. Not connected
5. Light selector switch (Brown)
6. Turn indicator control device (White-Blue)
7. Turn indicator control device (Pink)
8. Horn button (Yellow-Grey)
9. Power supply from Battery (Black-Purple)
10. Not connected
11. CAN L Line (Pink-White)
12. Not connected
13. Connectivity Button (Grey-White)
14. Turn indicator control device (White-Pink)
15. Turn indicator control device (White-Grey)
16. Not connected
17. Stop buttons (White-Black)
18. Not connected
19. Negative from instrument panel (Black-Yellow)
20. Not connected

**FUEL PUMP**

1. Negative from control unit (Green)
2. Injection load relay (Red-Green)
3. Not connected
4. Not connected
5. Not connected

**ACCESSORIES PRE-INSTALLATION**

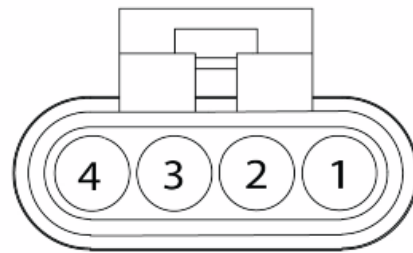
1. Ground lead (Black)
2. Fuel level (White-Green)
3. CAN H line (Pink-Red)
4. CAN L Line (Pink-White)
5. Not connected
6. Not connected
7. Power supply from Battery (Black-Purple)



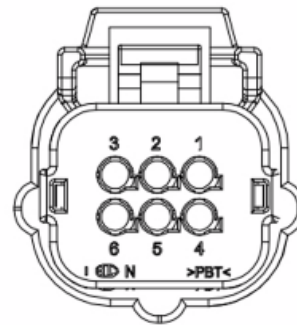
- 8. Ignition switched live (Light blue-Red)
 - 9. Not connected
 - 10. Saddle opening (Blue)
 - 11. Left turn indicators (White-Blue)
 - 12. Right turn indicators (Pink)
 - 13. High-beam light (Purple)
 - 14. Speed signal (Sky blue)
-

HEADLIGHT

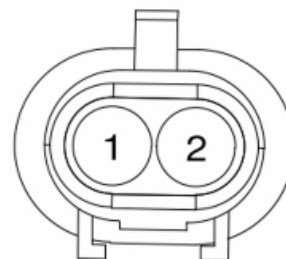
- 1. Low beam light (Brown)
- 2. High-beam light (Purple)
- 3. Ground lead (Black)
- 4. Parking light (Yellow-Black)

**OBD SOCKET**

- 1. Ignition switched live (Light blue-Red)
- 2. CAN H line (Pink-Red)
- 3. Ground lead (Black)
- 4. Power supply from Battery (Black-Purple)
- 5. CAN L Line (Pink-White)
- 6. Line K (Orange-Black)

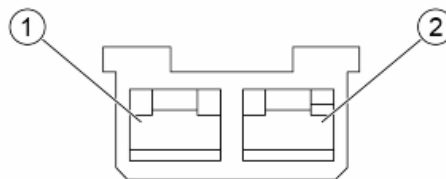
**USB PORT**

- 1. Ignition switched live (Light blue-Red)
- 2. Ground lead (Black)



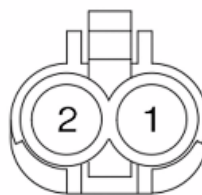
SADDLE RELEASE SWITCH

1. Ignition switched live (Green)
2. Saddle opening (Blue)



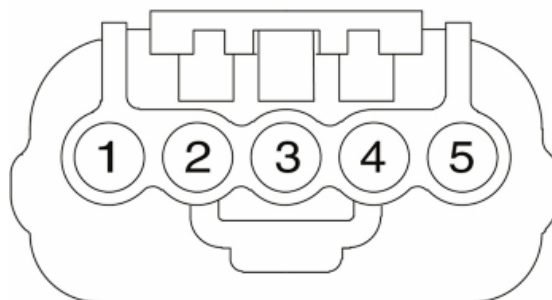
SIDE STAND SWITCH

1. Signal (White-Pink)
2. Negative from control unit (Black-Green)



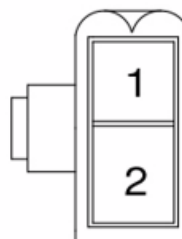
MAP SENSOR

1. MAP Signal (Brown-Green)
2. Power supply from the control unit (Red-Green)
3. TPS signal (Orange-White)
4. Negative from control unit (Black-Green)
5. TMAP signal (Green-Grey)



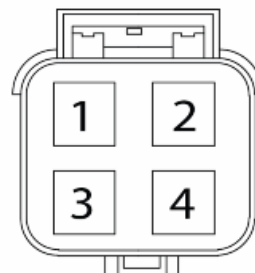
AIR TEMPERATURE SENSOR

1. Negative from instrument panel (Black-Yellow)
2. Signal (Yellow-Pink)

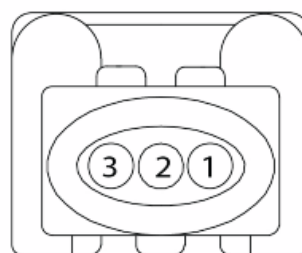


ENGINE TEMPERATURE SENSOR

1. Injection ECU (Light blue-Green)
2. Not connected
3. Negative from control unit (Black-Green)
4. Not connected

**SPEED SENSOR**

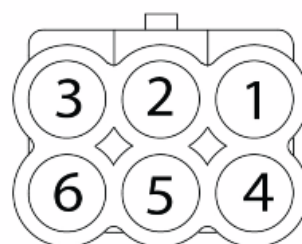
1. Signal (Brown)
2. Ground (Brown-Black)
3. Shielding (Black-Yellow)

**LAMBDA PROBE**

1. Control unit positive (Green-Blue)
2. Negative from control unit (Black-Green)
3. Heater positive from injection load relay (Red-Green)
4. Heater negative from control unit (Black-Purple)

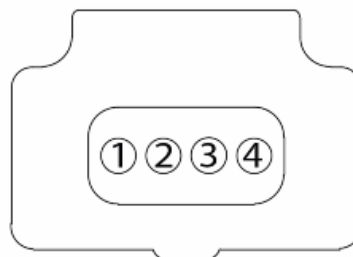
**RECTIFIER**

1. Speed sensor (+) (Brown)
2. Speed sensor (-) (Brown-Black)
3. Ignition switched live (White-Brown)
4. Speed signal (Sky blue)
5. Ground lead (Black)
6. Not connected

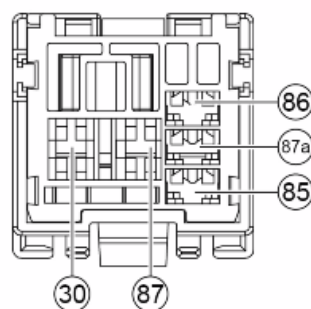


STEPPER MOTOR

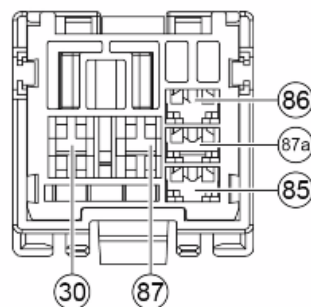
1. Injection ECU (1B) (Light blue-Black)
2. Injection ECU (2B) (Light blue-Red)
3. Injection ECU (2A) (Brown-Black)
4. Injection ECU (1A) (Brown-Pink)

**SADDLE OPENING ACTUATOR RELAY**

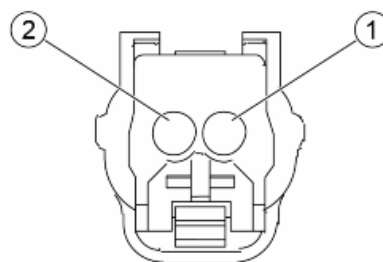
30. Power supply from Battery (Black-Purple)
87. Saddle opening (Blue)
85. Ground lead (Black)
86. Positive from PMP 3 (Blue-Yellow)

**INJECTION LOAD RELAY**

30. Battery power (Red-White)
87. Injection loads (Red-Green)
85. Negative from control unit (Red-Blue)
86. Battery power (Red-White)

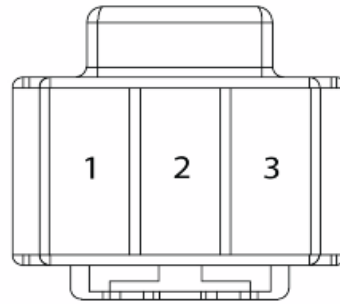
**PURGE VALVE**

1. Negative from control unit (White-Red)
2. Injection load relay (Red-Green)

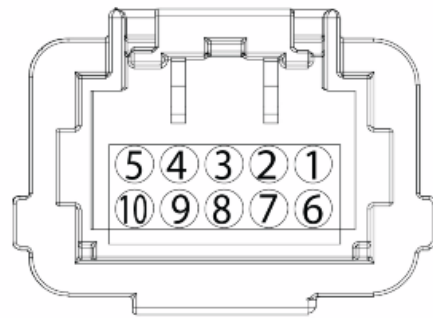


FLYWHEEL (PHASES)

1. injection ECU (Yellow)
2. injection ECU (Green)
3. Injection ECU (Light blue)

**FLYWHEEL (SIGNALS)**

1. Injection ECU (HALL1) (White-Green)
2. Injection ECU (HALL2) (Yellow-Blue)
3. Injection ECU (HALL3) (White-Grey)
4. Negative from control unit (Black-Green)
5. Injection ECU (PICKUP+) (Orange)
6. Negative from control unit (Black-Green)
7. injection ECU (DIR) (Grey-Green)
8. Power supply from the control unit (Red-Green)
9. Oil pressure sensor (White)
10. Not connected



VERSION 200

The electrical components of the vehicle are as follows:

- Immobilizer antenna
- Saddle opening actuator
- Battery
- H.V. coil.
- ABS control unit
- RISS 3.0 injection control unit
- Horn
- RH handlebar controls
- LH handlebar controls
- Ignition switch
- Turn indicator control device
- Tail-light
- Fuse box «A»
- Fuse box «B»
- Fuse box «C»

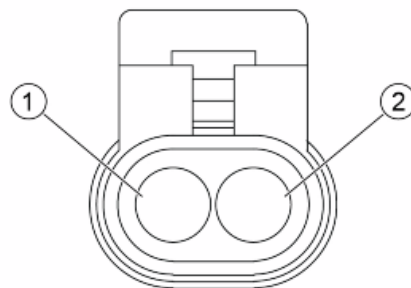
- Instrument panel
- Front RH turn indicator
- Front LH turn indicator
- Fuel gauge
- Injector
- Licence plate lamp
- Engine/frame ground
- Frame ground
- PMP 3
- Fuel pump
- Accessories pre-installation
- Headlight
- OBD socket
- USB port
- Saddle release switch
- Side stand switch
- MAP sensor
- air temperature sensor
- Engine temperature sensor
- Engine speed sensor
- Lambda probe
- Stepper motor
- Saddle opening actuator relay
- Injection load relay
- Purge valve
- Flywheel (phases)
- Flywheel (signals)

CAUTION**NOTE**

THE DIAGRAM SHOWS THE LAYOUT OF THE CONNECTORS VIEWED FROM THE CABLE ENTRY SIDE.

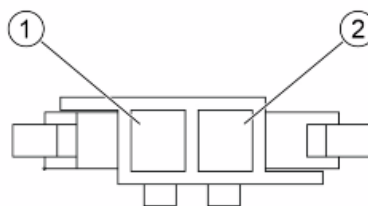
IMMOBILIZER ANTENNA

1. Injection ECU (Purple-White)
2. Injection ECU (Purple-Black)

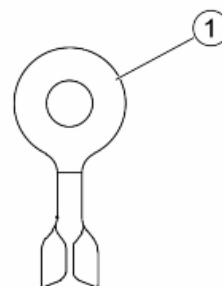


SADDLE OPENING ACTUATOR

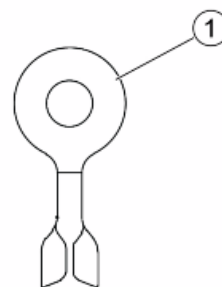
1. Ground lead (Black)
2. Positive (Blue)

**BATTERY**

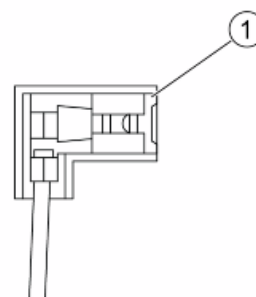
1. Positive (Red)

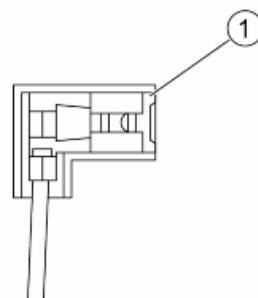


-
1. Negative (Black)

**H.V. COIL.**

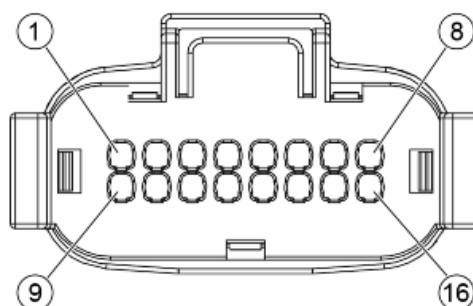
1. Injection ECU (Pink-Black)



1. Ground lead (Black)


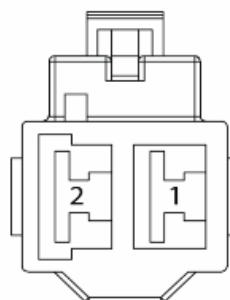
ABS CONTROL UNIT

1. Not connected
2. Speed sensor positive (Light Blue-Red)
3. CAN H line (Pink-Red)
4. CAN L Line (Pink-White)
5. Not connected
6. Line K (Orange-Black)
7. ABS warning light (Blue)
8. Battery-powered (Red-Blue)
9. Ground lead (Black)
10. Not connected
11. Speed sensor negative (Light Blue-Black)
12. Not connected
13. Not connected
14. Ignition switched live (White-Brown)
15. Speed signal (Sky blue)
16. Battery powered (Green-Red)



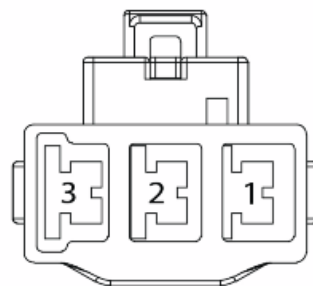
RISS 3.0 INJECTION CONTROL UNIT
Connector "A"

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

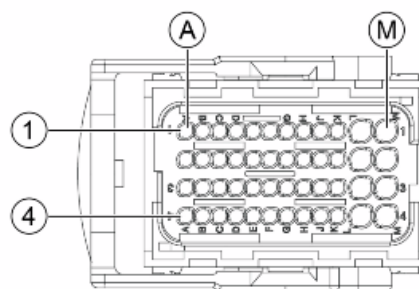


Connector "B"

1. Flywheel connector (phases) (Yellow)
2. Flywheel connector (phases) (Green)
3. Flywheel connector (phases) (Light blue)

**Connector «C»**

- A1. Not connected
- A2. "Start&Stop" indicator light (Pink-Green)
- A3. Immobilizer antenna (Purple-Black)
- A4. Immobilizer antenna (Purple-White)
- B1. Not connected
- B2. Flywheel connector (signals - DIR) (Grey-Green)
- B3. MAP Sensor (TPS) (Orange-White)
- B4. Side stand switch (White-Pink)
- C1. Injection load solenoid (Red-Blue)
- C2. Not connected
- C3. Engine cut-out switch (Green-Orange)
- C4. Flywheel connector (signals - PICKUP+) (Orange)
- D1. Not connected
- D2. Not connected
- D3. Immobilizer LED (Yellow)
- D4. Speed signal (Sky blue)
- E1. Not connected
- E2. MAP Sensor (TMAP) (Green-Grey)
- E3. Engine temperature sensor (Light blue-Green)
- E4. Not connected
- F1. Not connected
- F2. Sensors ground (Black-Green)
- F3. Lambda probe (Green - Blue)
- F4. Stop buttons (White-Black)
- G1. Stepper motor (1B) (Light blue-Black)
- G2. Not connected



- G3.** Not connected
- G4.** Start & Stop button (Light blue-White)
- H1.** Stepper motor (1A) (Brown-Pink)
- H2.** Flywheel connector (signals - HALL2) (Blue-Yellow)
- H3.** Flywheel connector (signals - HALL1) (White-Green)
- H4.** Starter button (Brown-Red)
- J1.** Stepper motor (2A) (Brown-Black)
- J2.** Sensors power supply (Red-Green)
- J3.** MAP Sensor (MAP) (Brown-Green)
- J4.** Flywheel connector (signals - HALL3) (White-Grey)
- K1.** Stepper motor (2B) (Light blue-Red)
- K2.** CAN L Line (Pink-White)
- K3.** CAN H line (Pink-Red)
- K4.** Ignition switched live (White-Brown)
- L1.** Lambda probe heater (Black-Purple)
- L2.** Purge valve (White-Red)
- L3.** Not connected
- L4.** Injector (Red-Yellow)
- M1.** Fuel pump (Green)
- M2.** Coil (Pink-Black)
- M3.** Battery power (Red-White)
- M4.** Headlight (Brown-Purple)

HORN

- 1. Horn button (Yellow-Grey)

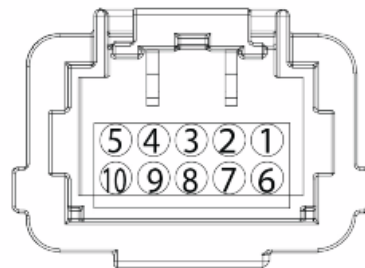


1. Ground lead (Black)



RH HANDLEBAR CONTROLS

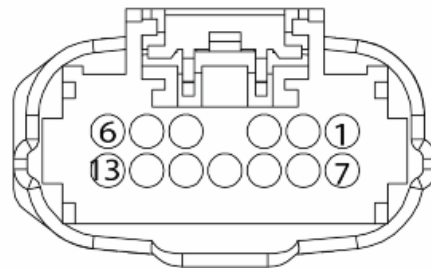
1. Not connected
2. Engine stop switch (ON) (Black-Green)
3. Engine cut-out switch (RUN) (Green-Orange)
4. Ignition button (-) (Black-Green)
5. Starter button (+) (Brown-Red)
6. Connectivity Button (-) (Black-Yellow)
7. Connectivity Button (+) (Grey-White)
8. Not connected
9. Stop buttons (+) (White)
10. Stop button (-) (White-Black)



LH HANDLEBAR CONTROLS

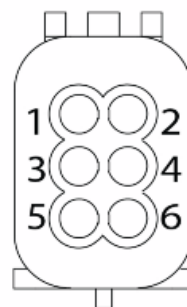
Connector "A"

1. Light selector switch (LO) (Brown)
2. Light selector switch (COM) (Brown-Purple)
3. Light selector switch (HI) (Purple)
4. Light selector switch (FLASH) (Yellow-Black)
5. Horn (+) (White)
6. Horn (-) (Yellow-Grey)
7. "Start & Stop" button (-) (Black-Green)
8. Start & Stop button (+) (Light blue-White)
9. Not connected
10. Not connected
11. Not connected
12. Stop button (-) (White-Black)
13. Stop buttons (+) (White)

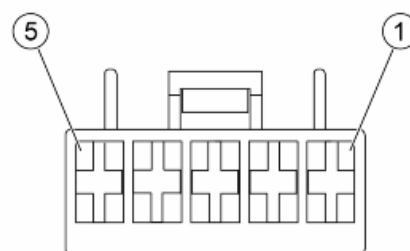


Connector "B"

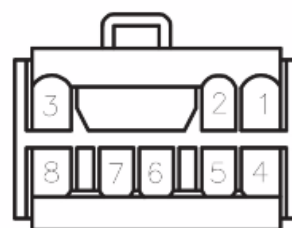
1. Turn indicator switch (L) (White-Pink)
2. Turn indicator switch (COM) (White)
3. Turn indicator switch (OFF) (White-Red)
4. MODE button (-) (Black-Yellow)
5. Turn indicator switch (R) (White-Grey)
6. MODE button (+) (Green)

**IGNITION SWITCH**

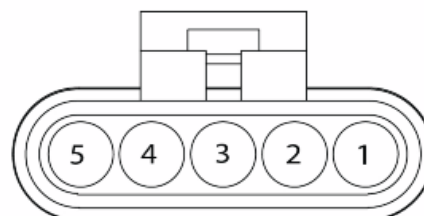
1. Fuse no. 4 (Black-Purple)
2. Not connected
3. Saddle opening switch (Green)
4. Fuse no. 5 (LOCK/OFF/OPEN) (Red-Black)
5. Fuses no. 2-6-7-8 (ON) (Orange)

**TURN INDICATOR CONTROL DEVICE**

1. Turn indicator switch (L) (White-Pink)
2. Ground lead (Black)
3. Left turn indicators (Pink)
4. Turn indicator switch (R) (White-Grey)
5. Turn indicator switch (OFF) (White-Red)
6. Not connected
7. Ignition switched live (White)
8. Right turn indicators (White-Blue)

**TAILLIGHT**

1. Parking light (Yellow-Black)
2. Right turn indicator (White - Blue)
3. Left turn indicator (Pink)
4. Ground lead (Black)
5. Brake light (White-Black)

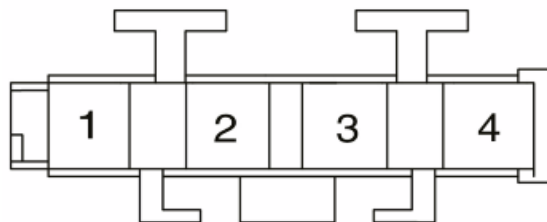


FUSE BOX «A»**Fuse No. 1**

- 1. Battery (Red)
- 2. Injection ECU (Red)

Fuse No. 2

- 3. Ignition switched live (Orange)
- 4. Protected circuits (White)

**FUSE BOX «B»****Fuse No. 3**

- 1. Battery (Red)
- 8. Protected circuits (Red-White)

Fuse No. 4

- 2. Battery (Red)
- 9. Protected circuits (Black-Purple)

Fuse No. 5

- 3. Battery (Red)
- 10. Protected circuits (Red-Black)

Fuse No. 6

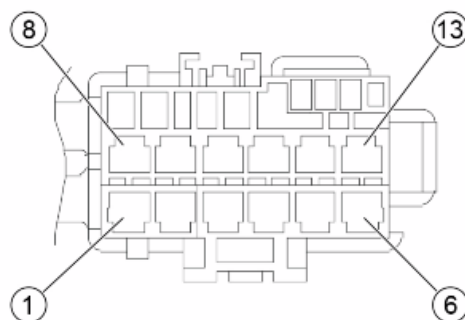
- 4. Ignition switch (Orange)
- 11. Protected circuits (Light Blue-Red)

Fuse No. 7

- 5. Ignition switch (Orange)
- 12. Protected circuits (White-Brown)

Fuse 8

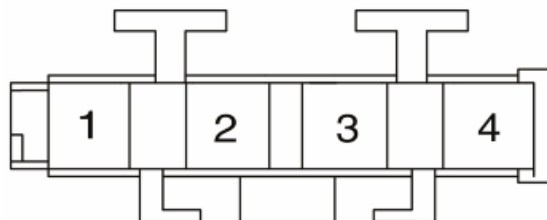
- 6. Ignition switch (Orange)
- 13. Protected circuits (Yellow-Black)

**FUSE BOX «C»****Fuse No. 9**

- 1. Battery (Red)
- 2. ABS control unit (Green-Red)

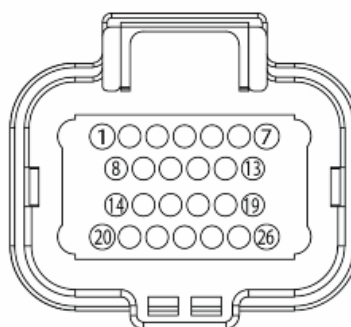
Fuse No. 10

- 3. Battery (Red)
- 4. ABS control unit (Red-Blue)

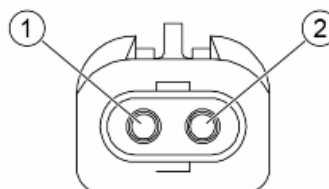


INSTRUMENT PANEL

1. Ground (Black-Yellow)
2. Ground (Black-Yellow)
3. Not connected
4. Fuel level indicator (White - Green)
5. Air temperature sensor (Yellow-Pink)
6. Not connected
7. Not connected
8. Not connected
9. Power supply from Battery (Black-Purple)
10. MODE button (Green)
11. Not connected
12. Oil pressure sensor (White)
13. High beam warning light (Purple)
14. Ignition switched live (White)
15. Speed signal (Sky blue)
16. Right turn indicator warning light (White-Blue)
17. Left turn indicator warning light (Pink)
18. Immobilizer LED (Yellow)
19. Not connected
20. Ground lead (Black)
21. Sensors ground (Black-Yellow)
22. Not connected
23. ABS warning light (Blue)
24. "Start&Stop" indicator light (Pink-Green)
25. CAN L Line (Pink-White)
26. CAN H line (Pink-Red)

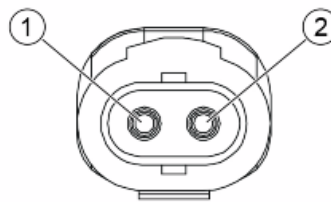
**FRONT RH TURN INDICATOR**

1. Power supply (White-Blue)
2. Ground lead (Black)

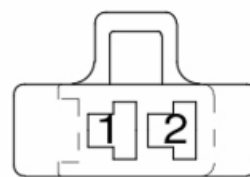


FRONT LH TURN INDICATOR

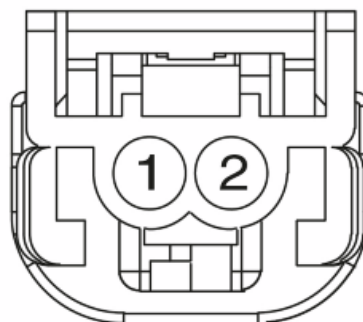
1. Power supply (Pink)
2. Ground lead (Black)

**FUEL GAUGE**

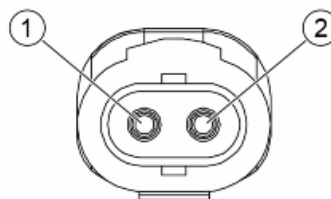
1. Signal (White-Green)
2. Negative from instrument panel (Black-Yellow)

**INJECTOR**

1. Negative from control unit (Red-Yellow)
2. Injection load relay (Red-Green)

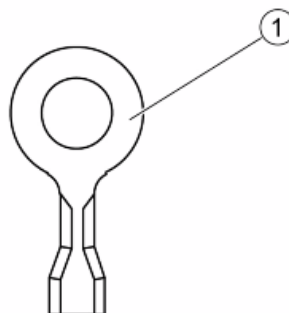
**LICENCE PLATE LAMP**

1. Power supply (Yellow-Black)
2. Ground lead (Black)

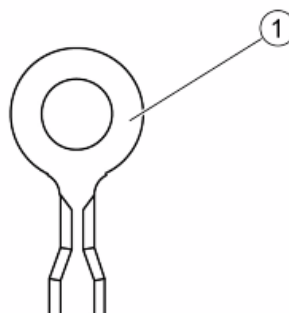


ENGINE/FRAME GROUND

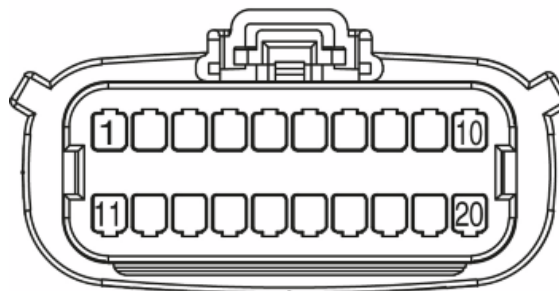
1. Ground lead (Black)

**FRAME GROUND**

1. Ground lead (Black)

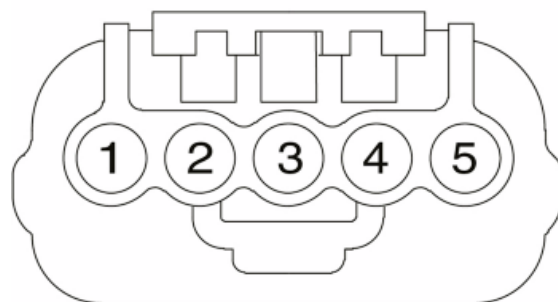
**PMP 3**

1. CAN H line (Pink-Red)
2. Ignition switched live (Light blue-Red)
3. Saddle opening actuator relay (Blue-Yellow)
4. Not connected
5. Light selector switch (Brown)
6. Turn indicator control device (White-Blue)
7. Turn indicator control device (Pink)
8. Horn button (Yellow-Grey)
9. Power supply from Battery (Black-Purple)
10. Not connected
11. CAN L Line (Pink-White)
12. Not connected
13. Connectivity Button (Grey-White)
14. Turn indicator control device (White-Pink)
15. Turn indicator control device (White-Grey)
16. Not connected
17. Stop buttons (White-Black)
18. Not connected
19. Negative from instrument panel (Black-Yellow)
20. Not connected



FUEL PUMP

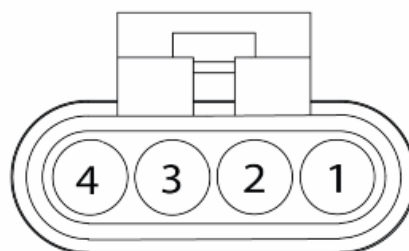
1. Negative from control unit (Green)
2. Injection load relay (Red-Green)
3. Not connected
4. Not connected
5. Not connected

**ACCESSORIES PRE-INSTALLATION**

1. Ground lead (Black)
2. Fuel level (White-Green)
3. CAN H line (Pink-Red)
4. CAN L Line (Pink-White)
5. Not connected
6. Not connected
7. Power supply from Battery (Black-Purple)
8. Ignition switched live (Light blue-Red)
9. Not connected
10. Saddle opening (Blue)
11. Left turn indicators (White-Blue)
12. Right turn indicators (Pink)
13. High-beam light (Purple)
14. Speed signal (Sky blue)

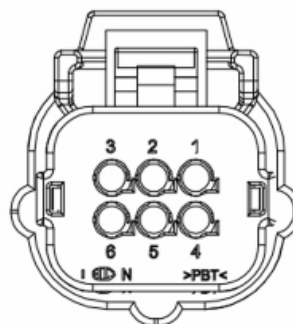
**HEADLIGHT**

1. Low beam light (Brown)
2. High-beam light (Purple)
3. Ground lead (Black)
4. Parking light (Yellow-Black)

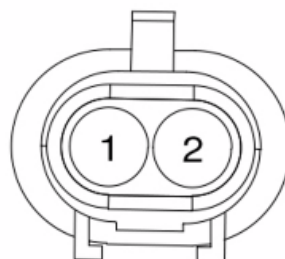


OBD SOCKET

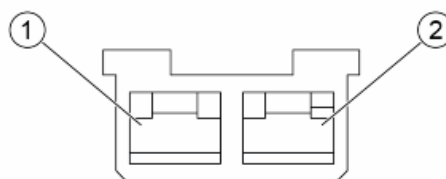
1. Ignition switched live (Light blue-Red)
2. CAN H line (Pink-Red)
3. Ground lead (Black)
4. Power supply from Battery (Black-Purple)
5. CAN L Line (Pink-White)
6. Line K (Orange-Black)

**USB PORT**

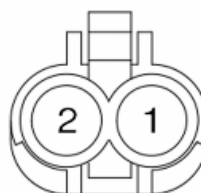
1. Ignition switched live (Light blue-Red)
2. Ground lead (Black)

**SADDLE RELEASE SWITCH**

1. Ignition switched live (Green)
2. Saddle opening (Blue)

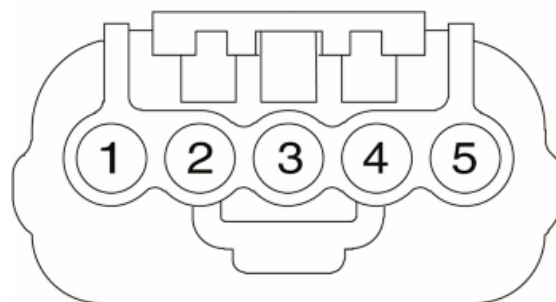
**SIDE STAND SWITCH**

1. Signal (White-Pink)
2. Negative from control unit (Black-Green)

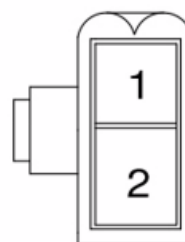


MAP SENSOR

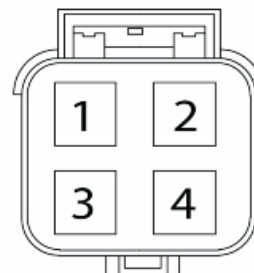
1. MAP Signal (Brown-Green)
2. Power supply from the control unit (Red-Green)
3. TPS signal (Orange-White)
4. Negative from control unit (Black-Green)
5. TMAP signal (Green-Grey)

**AIR TEMPERATURE SENSOR**

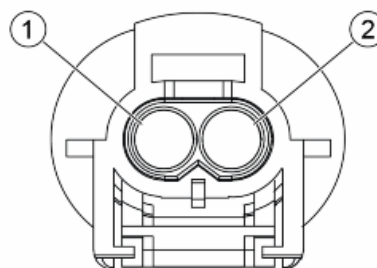
1. Negative from instrument panel (Black-Yellow)
2. Signal (Yellow-Pink)

**ENGINE TEMPERATURE SENSOR**

1. Injection ECU (Light blue-Green)
2. Not connected
3. Negative from control unit (Black-Green)
4. Not connected

**SPEED SENSOR**

1. Negative from ABS control unit (Light blue-Black)
2. ABS control unit positive (Light blue-Red)

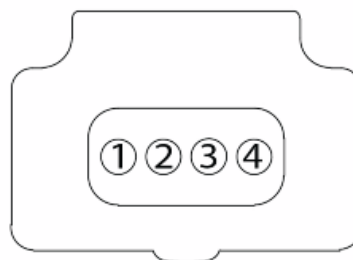


LAMBDA PROBE

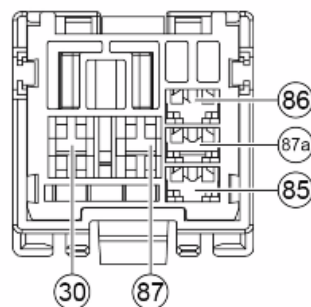
1. Control unit positive (Green-Blue)
2. Negative from control unit (Black-Green)
3. Heater positive from injection load relay (Red-Green)
4. Heater negative from control unit (Black-Purple)

**STEPPER MOTOR**

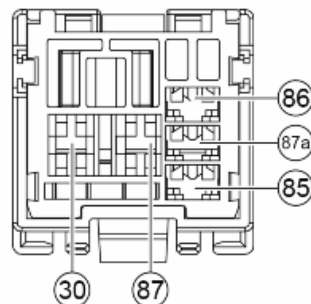
1. Injection ECU (1B) (Light blue-Black)
2. Injection ECU (2B) (Light blue-Red)
3. Injection ECU (2A) (Brown-Black)
4. Injection ECU (1A) (Brown-Pink)

**SADDLE OPENING ACTUATOR RELAY**

30. Power supply from Battery (Black-Purple)
87. Saddle opening (Blue)
85. Ground lead (Black)
86. Positive from PMP 3 (Blue-Yellow)

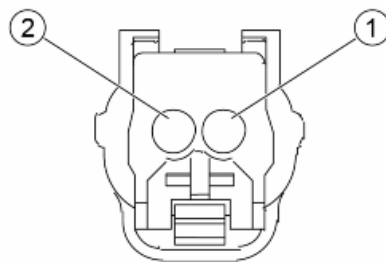
**INJECTION LOAD RELAY**

30. Battery power (Red-White)
87. Injection loads (Red-Green)
85. Negative from control unit (Red-Blue)
86. Battery power (Red-White)

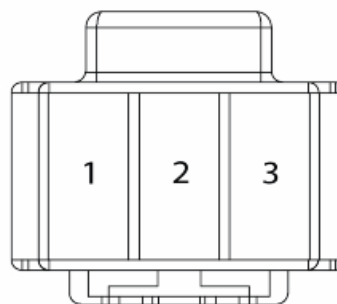


PURGE VALVE

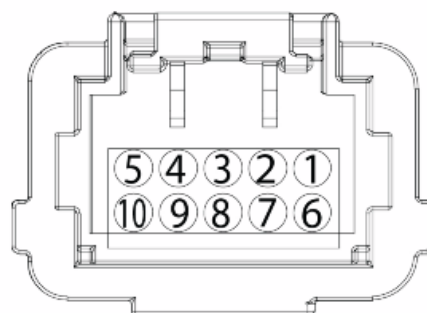
1. Negative from control unit (White-Red)
2. Injection load relay (Red-Green)

**FLYWHEEL (PHASES)**

1. injection ECU (Yellow)
2. injection ECU (Green)
3. Injection ECU (Light blue)

**FLYWHEEL (SIGNALS)**

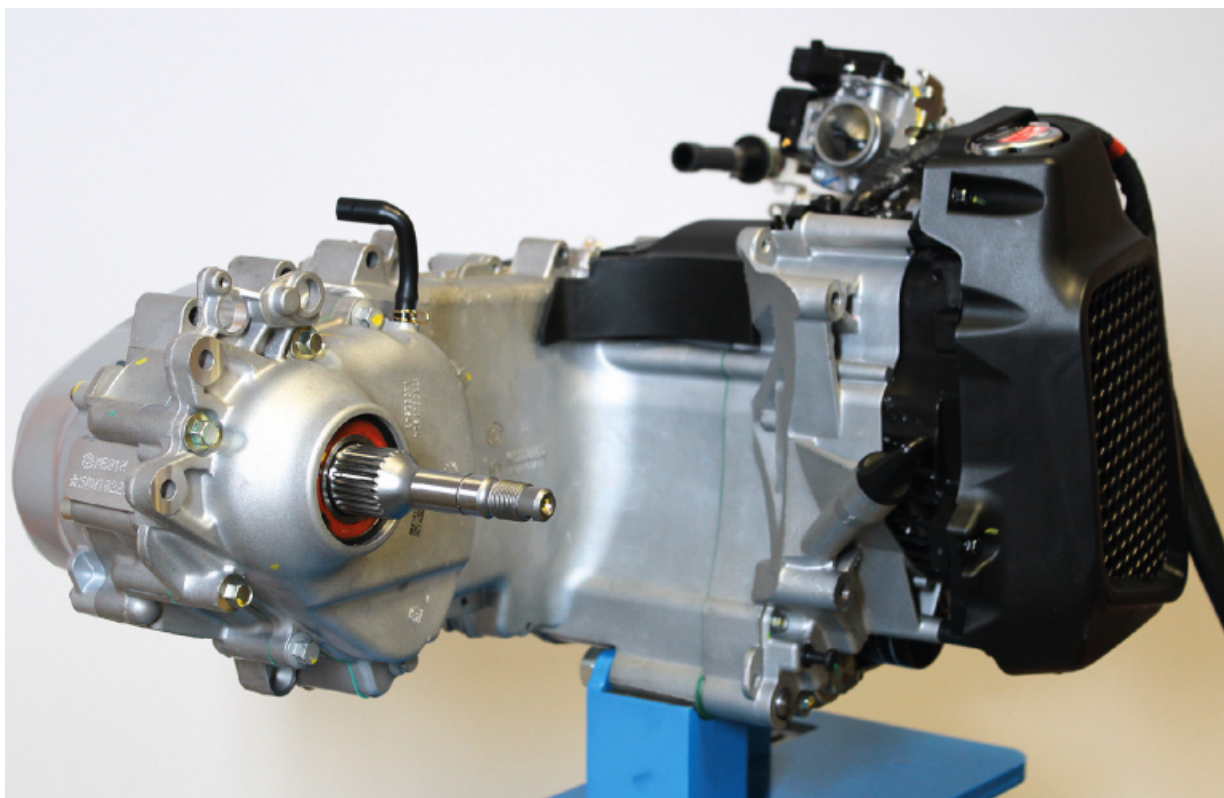
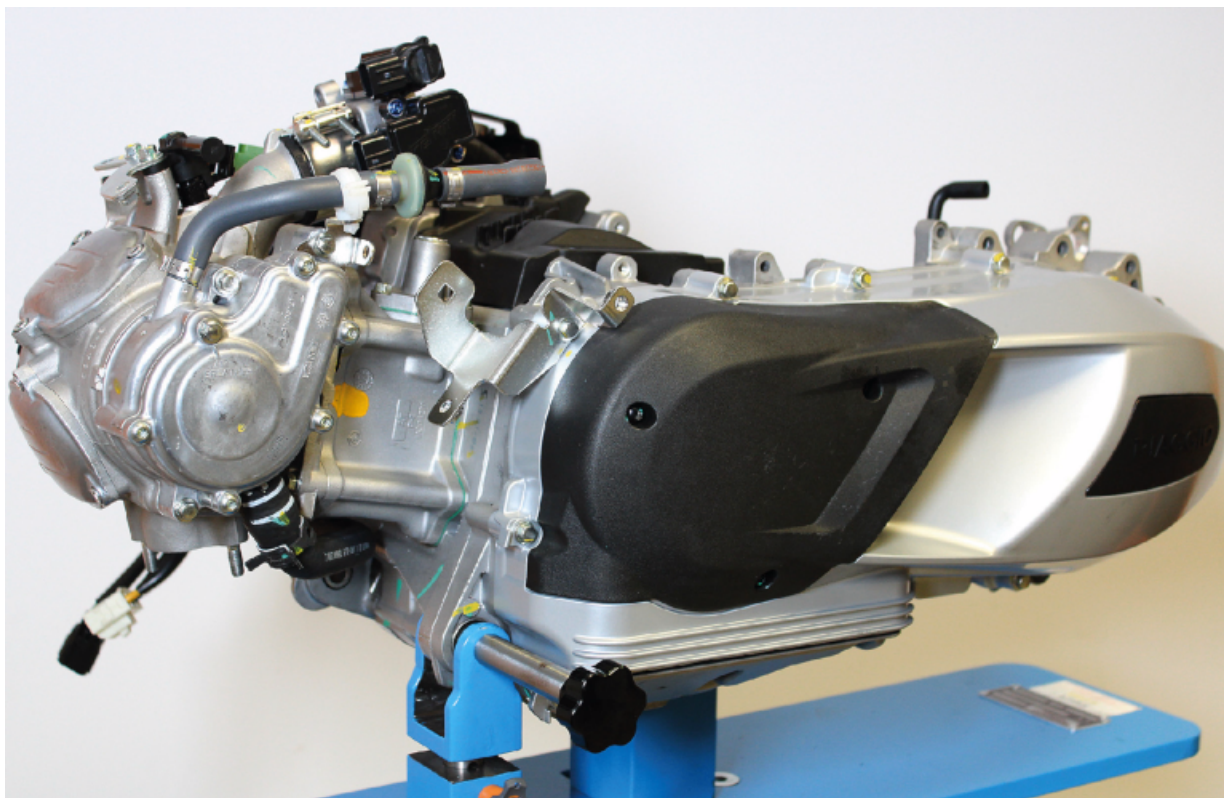
1. Injection ECU (HALL1) (White-Green)
2. Injection ECU (HALL2) (Yellow-Blue)
3. Injection ECU (HALL3) (White-Grey)
4. Negative from control unit (Black-Green)
5. Injection ECU (PICKUP+) (Orange)
6. Negative from control unit (Black-Green)
7. injection ECU (DIR) (Grey-Green)
8. Power supply from the control unit (Red-Green)
9. Oil pressure sensor (White)
10. Not connected

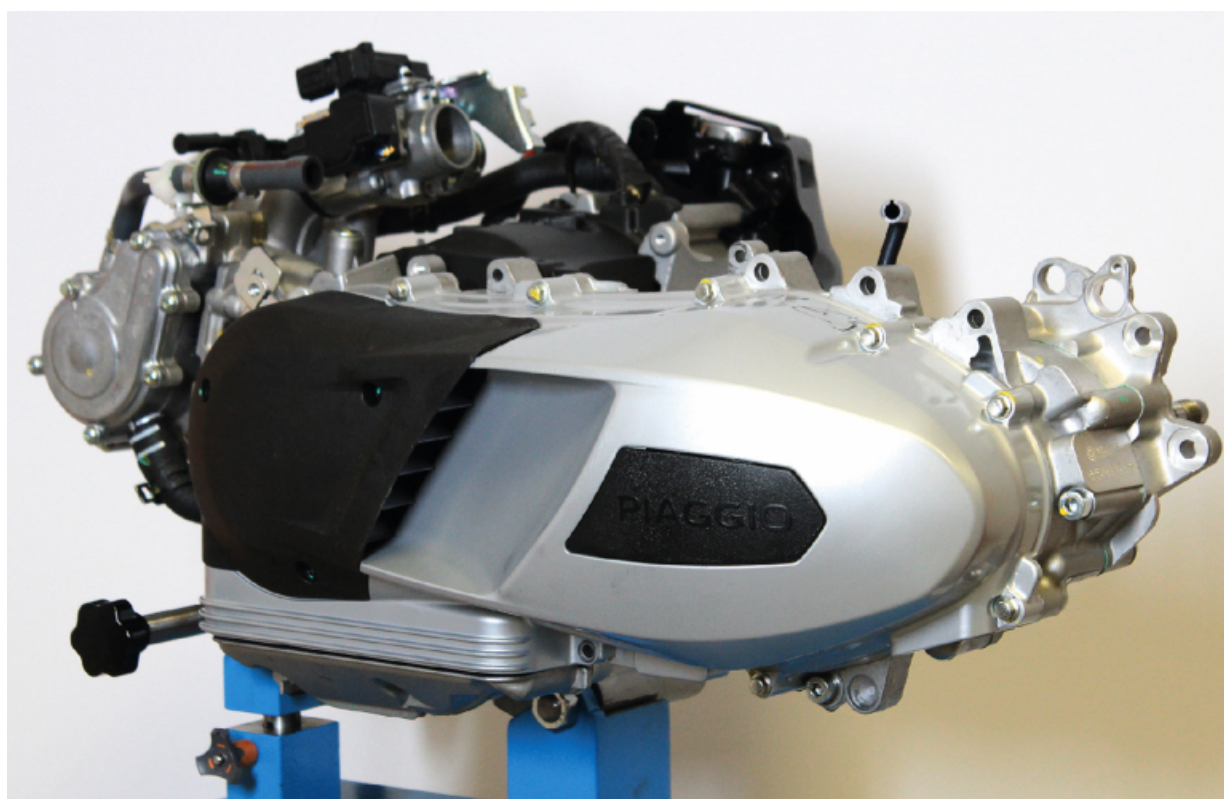


INDEX OF TOPICS

ENGINE

ENG





Transmission cover



To remove the transmission cover, proceed as follows:

- Remove the plastic plug.



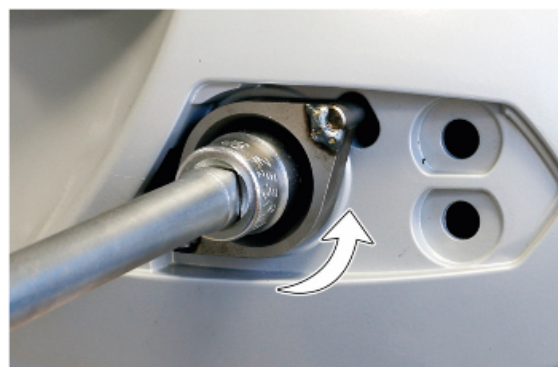
- Remove the air duct.
- Remove the plastic cover of the rear wheel axle.
- Insert the specific tools, rotate the engine until the driven pulley stops.

Specific tooling

020994Y Driven pulley stop



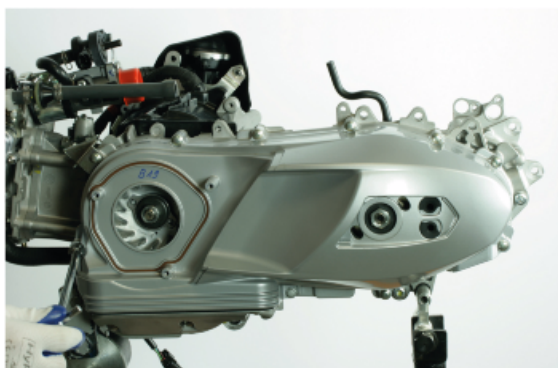
- Unscrew the wheel axle nut.



- Remove the specific tool, the wheel axle nut and collect the washer.



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



Air duct

- Remove the plastic cover.



- Unscrew the screws indicated and remove the duct.



Removing the driven pulley shaft bearing

- Remove the seeger stop ring of the bearing.



- Place the cover on ground level, removing the centring bushings from it, and support it adequately.
- Using a heat gun, heat the bearing seat.
- Using the specific tools, knock the bearing out of its seat.



Specific tooling

020376Y Adaptor handle

020357Y 32 x 35-mm Adaptor

020412Y 15-mm guide

020151Y Heat gun

Refitting the driven pulley shaft bearing

- Using a heat gun, heat the bearing seat.
- Using the special tool, set a new bearing. Apply grease to the bearing outer ring and to the crank-case seat in order to maintain the bearing position on the vertical axis during driving.

Specific tooling

020151Y Heat gun

020376Y Adaptor handle

020358Y 37 x 40 mm Adaptor

020412Y 15-mm guide

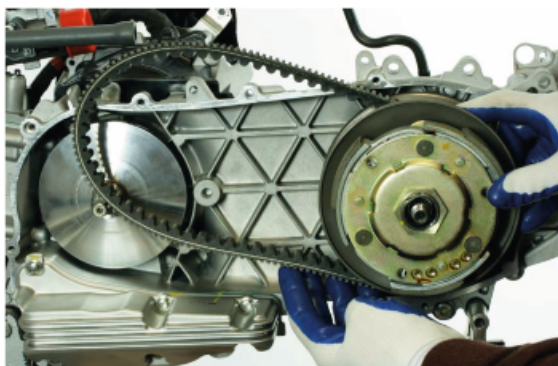
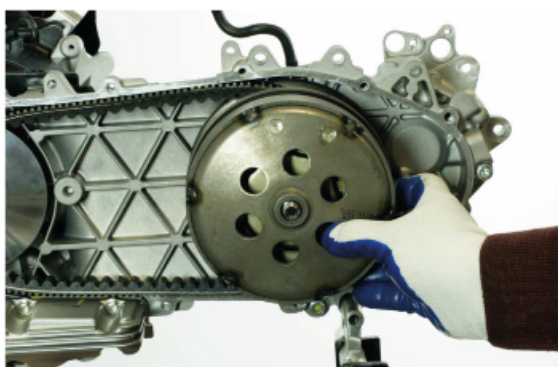


- Insert the Seeger ring.
- Insert the centring bushings, if previously removed.



Removing the driven pulley

- Remove the stationary driving half-pulley and the clutch housing.
- Remove the driven pulley together with the belt.



Inspecting the clutch drum

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

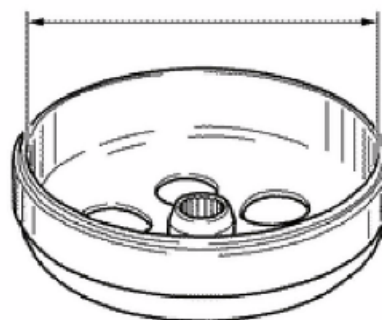
Characteristic

Clutch housing max. value

Max. value: Diameter 134.5 mm

clutch housing standard value

Standard value: Diameter 134 - 134.2 mm

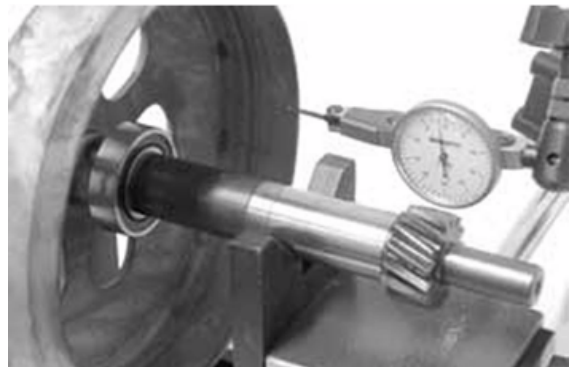


Check the bell working surface eccentricity

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



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

**Specific tooling**

020074Y Support base for checking crankshaft alignment

020335Y Magnetic mounting for dial gauge

Characteristic

clutch housing check: Limit eccentricity

Admissible limit eccentricity: 0.15 mm

Inspecting the clutch

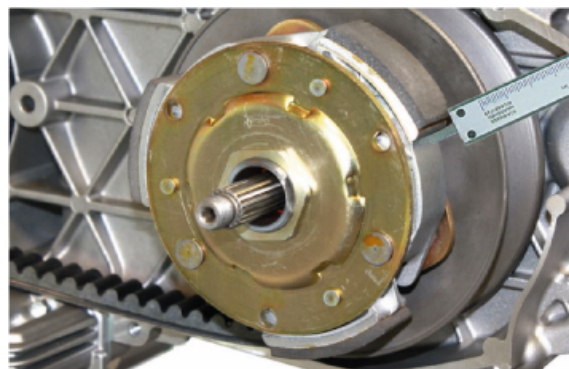
- Check the thickness of the clutch mass friction material.
- The masses must exhibit no traces of lubricants; in that case, check the driven pulley unit seals.

NOTE

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

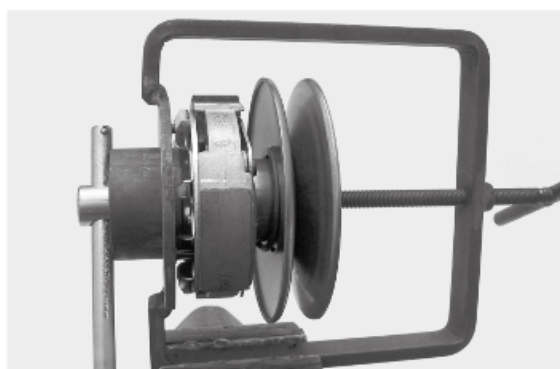
1 mm

Removing the clutch

- Prepare the locking tool for the driven pulley with the pins half-screwed in the tool set to "C".
- Introduce the adapter ring 11 with the chamfering facing the inside of the tool.



- Fit the driven pulley unit in the tool so as the bolt get into the masses clutch support holes. Afterwards make the support screw make contact with a minimum force.
- Using the specific wrench, inserted 46 mm from the side, remove the clutch central locking nut.



- Separate the components of the driven pulley.

CAUTION

THE TOOL MUST BE FIRMLY FIXED IN THE VICE AND THE CENTRAL SCREW MUST NOT BE TIGHTENED WITH EXCESSIVE TORQUE AS THIS MAY DAMAGE THE PULLEY OR DEFORM THE SPECIFIC TOOL.

Specific tooling

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

020444Y011 adapter ring

020444Y009 wrench 46 x 55



Removing the driven half-pulley bearing

- Remove the retainer ring using two flat blade screwdrivers.
- Using a hammer and pin, knock the ball bearing out as shown in the figure.
- Remove the bearing and the rollers with the specific extractor.

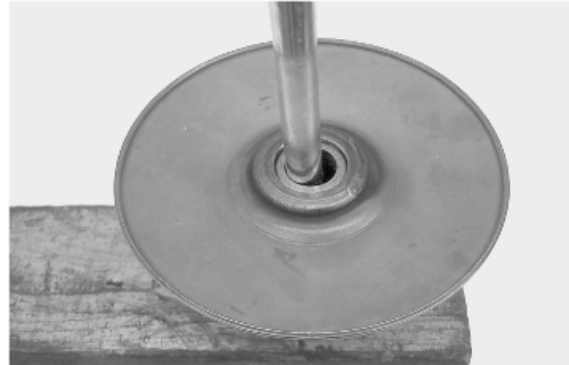
NOTE

REST THE DRIVEN PULLEY ON A WOODEN SURFACE TO AVOID DAMAGING ITS THREADED BUSHING DURING REMOVAL.

Specific tooling

001467Y008 Clamp to extract 17 mm \varnothing bearings

001467Y009 Bell for OD 42-mm bearings



Inspecting the driven fixed half-pulley

- Measure the outside diameter of the pulley bushing.

Characteristic

Standard diameter:

40.1 \pm 0.05 mm



Refitting the driven half-pulley bearing

- Assemble a new roller bearing using the specific punch, fit the bearing with the label facing outward and insert it completely up to the punch on the half-pulley.

NOTE

REST THE DRIVEN PULLEY ON A WOODEN SURFACE TO AVOID DAMAGING ITS THREADED BUSHING DURING FITTING.

Specific tooling

020424Y Driven pulley roller casing fitting punch



- To assemble the new ball bearing, insert it fully down in its seat with the specific punch and finally fit the seeger ring.

Specific tooling

020376Y Adaptor handle

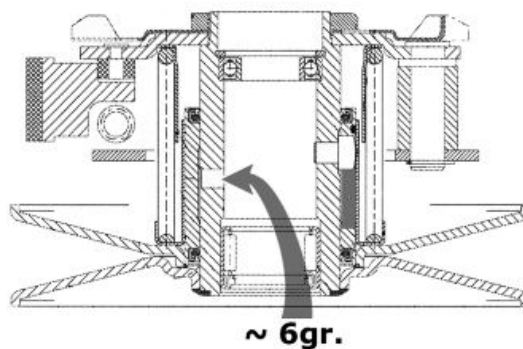
020357Y 32 x 35-mm Adaptor

020439Y 17-mm guide



Refitting the driven pulley

- Check that the faying surfaces of the 2 half-pulleys, with the belt do not show any signs of wear, damages or grease.
- Insert the new oil seals and O-rings on the movable half-pulley.
- Fit the half-pulley on the bushing with the appropriate protection sheath.
- Make sure the pins and collar are not worn, refit the pins and the collar.
- Using a curved-spout grease gun, lubricate the driven pulley unit with approximately 6 grams of grease. Apply grease through one of the holes in the bushing until it comes out through the hole on the opposite side. This operation is necessary to avoid the presence of grease beyond the O-rings.



Specific tooling

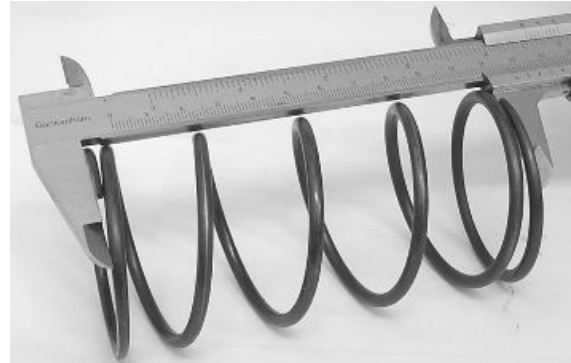
020263Y Driven pulley assembly sheath

Inspecting the clutch spring

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

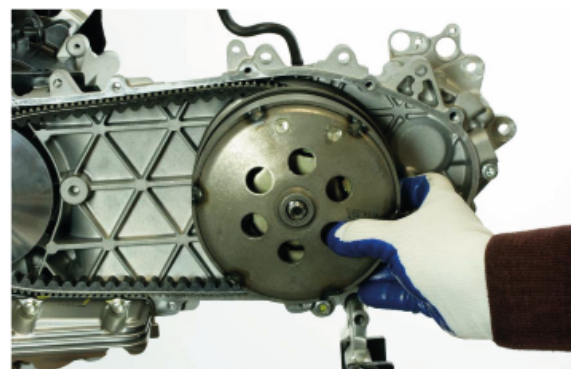
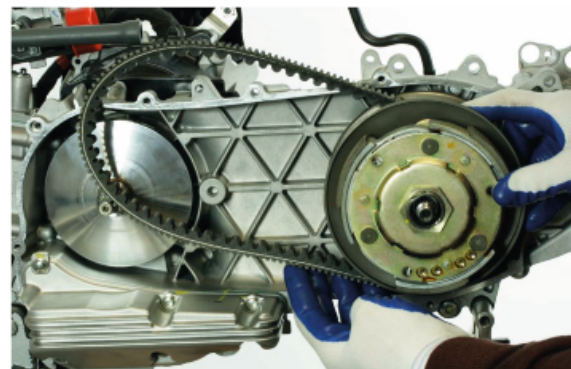
Characteristic**Standard length:**

88 mm



Refitting the driven pulley

- Carry out the disassembly operations in reverse order.



Drive-belt

- Make sure the drive belt is not damaged and does not show abnormal wear.
 - Replace according to the scheduled maintenance table.
-

Removing the driving pulley

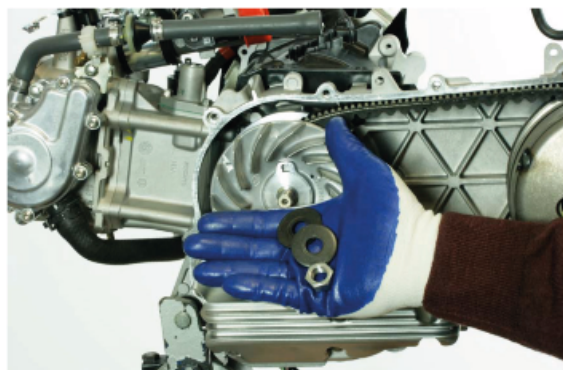
- Using specific tools, lock the driving pulley and loosen the nut.

Specific tooling

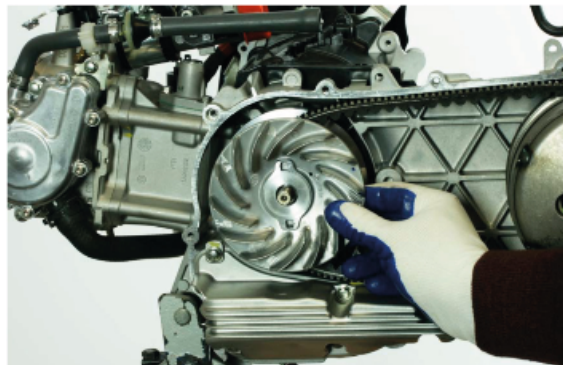
020938Y Drive pulley lock



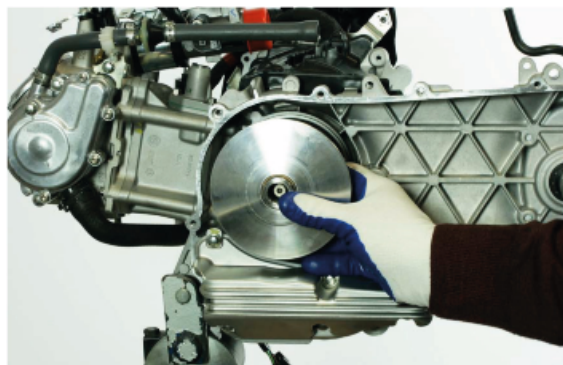
- remove the flat washer and the cup washer.



- remove the stationary half-pulley and the washer.

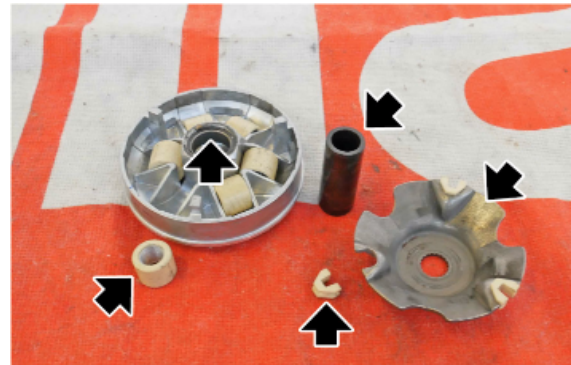


- disengage the belt.
- Remove the complete roller housing



Inspecting the rollers case

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



CAUTION

DO NOT LUBRICATE OR CLEAN SINTERED BUSHINGS

Characteristic

movable driving half-pulley bushing: Standard diameter

26.000 - 26.021 mm

Sliding bushing

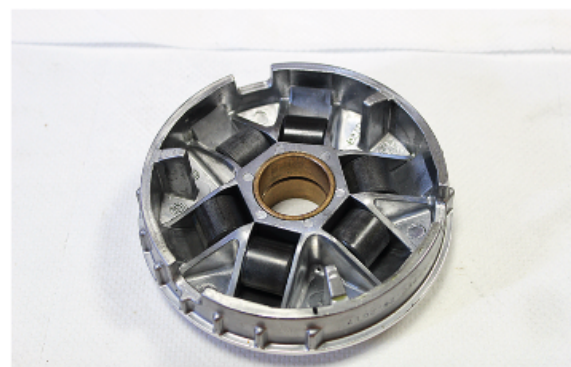
ø26 (-0.020 -0.041)mm

CVT rollers ø 19 mm

Wear limit ø 18.4 mm

Refitting the driving pulley

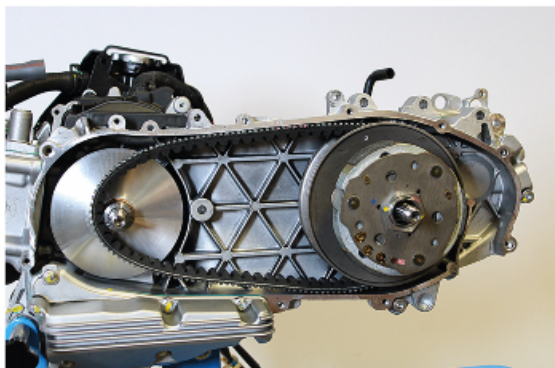
- Insert the rollers in the roller housing.



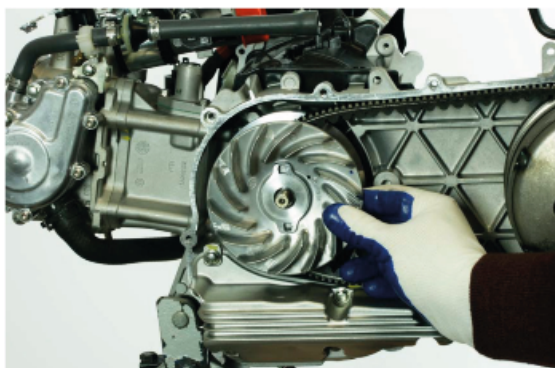
- Assemble the mobile drive pulley half (roller housing).
- Place the driven pulley and the drive belt

NOTE

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.

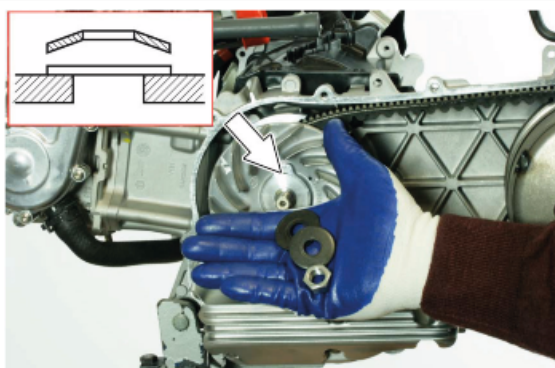


- Insert the stationary drive pulley half.



- Insert in the following order: the washer, the spring washer and the nut.

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



- Using the specific tool to lock the pulley, tighten it to the specific torque.

Specific tooling

020938Y Drive pulley lock

Locking torques (N*m)

driving pulley retainer nut 75-83

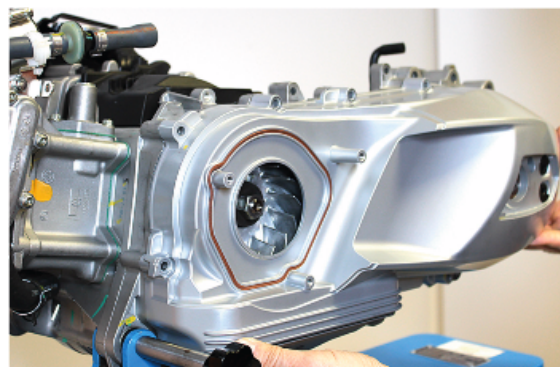


Refitting the transmission cover

Follow the removal steps but in reverse order; be careful to tighten screws to the prescribed torque.

Locking torques (N*m)

Transmission cover fastening screws 10,8 - 12,8



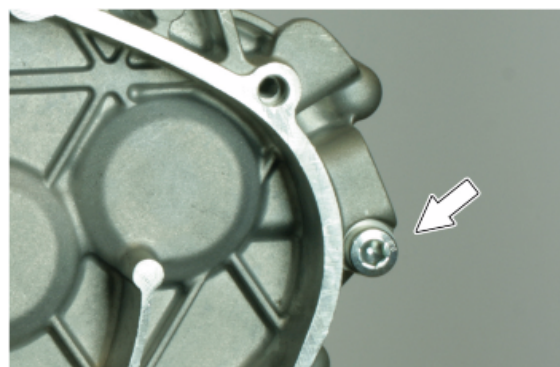
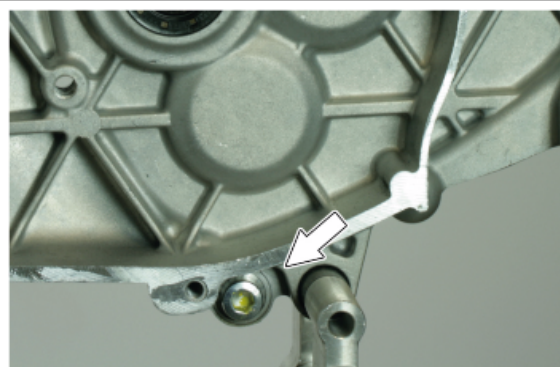
Removing the hub cover

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

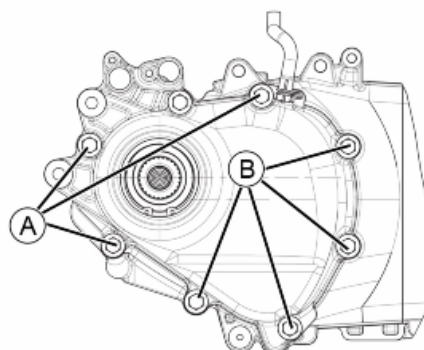
Characteristic

Hub oil quantity

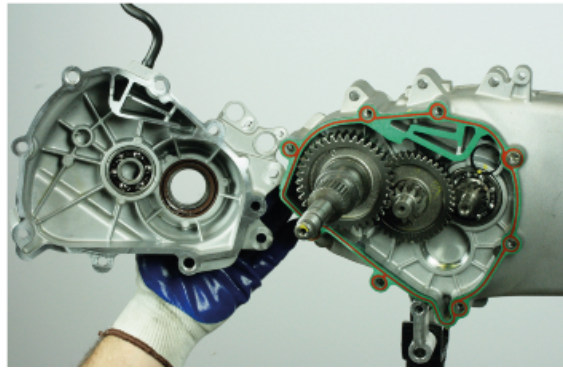
325 cm³



- Undo the three screws «A» and the four screws «B».



- Remove the final reduction cap paying attention to the gears.
- Remove the gasket paying attention to the positioning of the dowels.



Removing the hub bearings

Removing the clutch shaft bearing

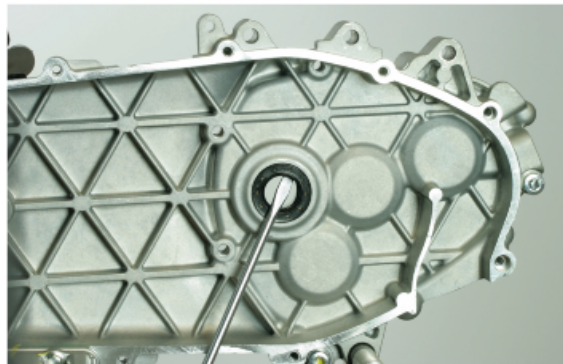
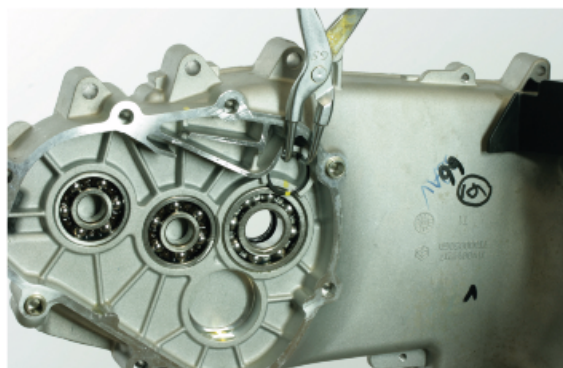
- Remove the Seeger ring.
- Remove the oil seal from the opposite side.
- Remove the bearing working from the external side and using the specific tools.

Specific tooling

020376Y Adaptor handle

020363Y 20-mm guide

020357Y 32 x 35-mm Adaptor



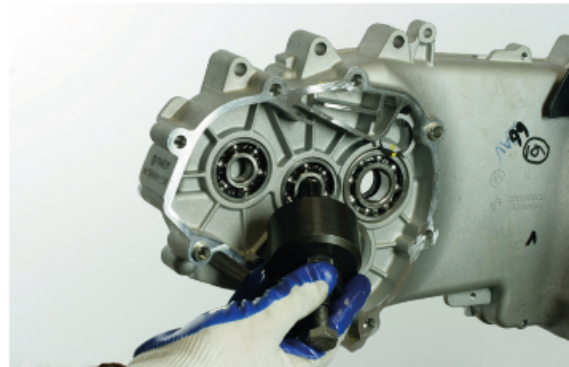
Fitting the Intermediate gear bearing

- Using the specific tools remove the bearing.

Specific tooling

001467Y009 Bell for OD 42-mm bearings

001467Y013 Calliper to extract ø 15-mm bearings

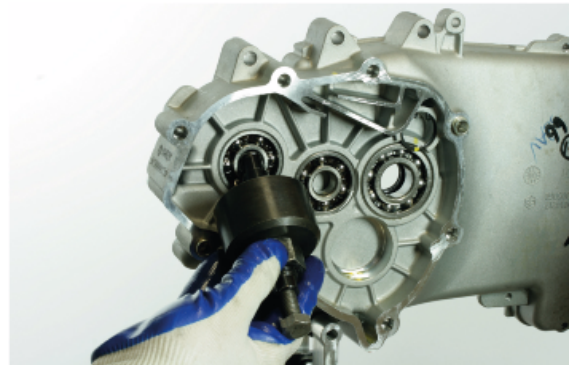
**Wheel axle bearing removal**

- Using the specific tools remove the bearing.

Specific tooling

001467Y009 Bell for OD 42-mm bearings

001467Y013 Calliper to extract ø 15-mm bearings



Removing the wheel axle bearings

- Support the hub cover properly to avoid damaging the sealing surface with the crankcase.
- Remove the Seeger ring from the outside.



- Operating on the inside, remove the oil seal.



- Remove the wheel axle bearing using the specific tool.

Specific tooling

020376Y Adaptor handle

020359Y 42 x 47 mm Adaptor

020483Y 30-mm guide



Fitting the Intermediate gear bearing

- Using the specific tools remove the bearing.

Specific tooling

001467Y009 Bell for OD 42-mm bearings

001467Y013 Calliper to extract \varnothing 15-mm bearings



Inspecting the hub shaft

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

Characteristic

Driven pulley shaft

A: 22 (-0,01 -0.02) mm

Wheel axle

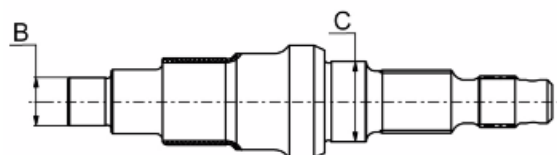
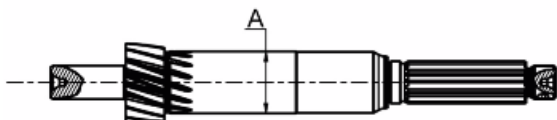
B: 15 (-0,010 -0.020) mm

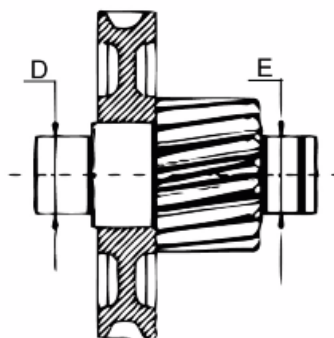
C: 25 (-0,007 -0.020) mm

Intermediate gear

D: 15 (-0,01 -0.02) mm

E: 15 (-0,01 -0.02) mm





Refitting the driven pulley shaft bearing

- Use the heat gun to heat the bearing seat.
- Set a new bearing using the specific equipment.
- Insert a locking seeger.

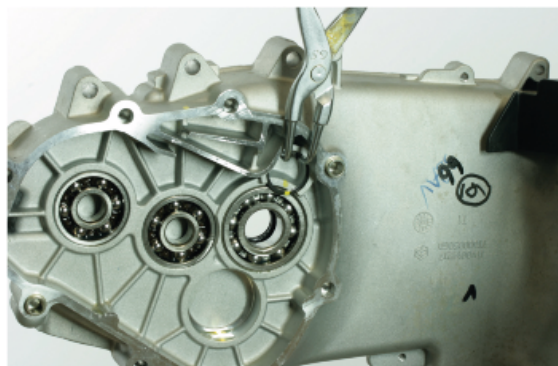
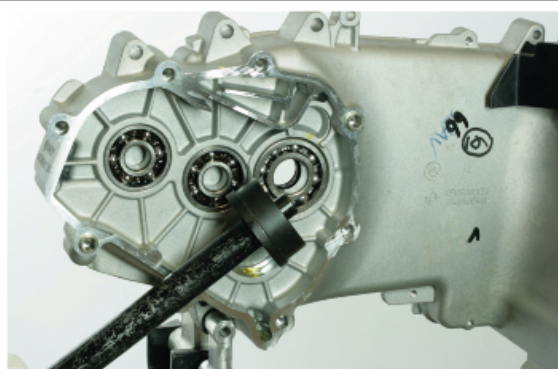
Specific tooling

020151Y Heat gun

020376Y Adaptor handle

020360Y 52 x 55 mm adaptor

020363Y 20-mm guide



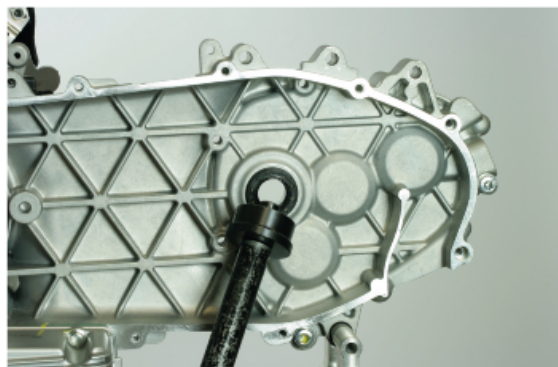
- Insert a new oil seal using the specific tool.

Specific tooling

020376Y Adaptor handle

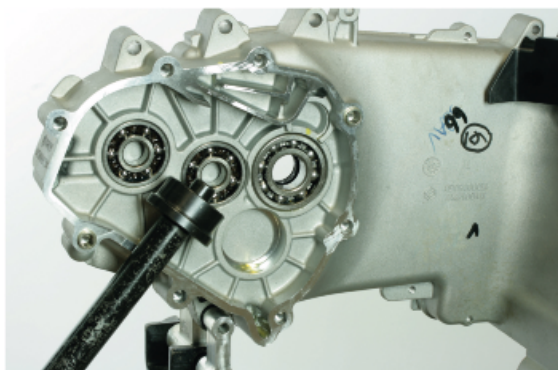
020363Y 20-mm guide

020357Y 32 x 35-mm Adaptor

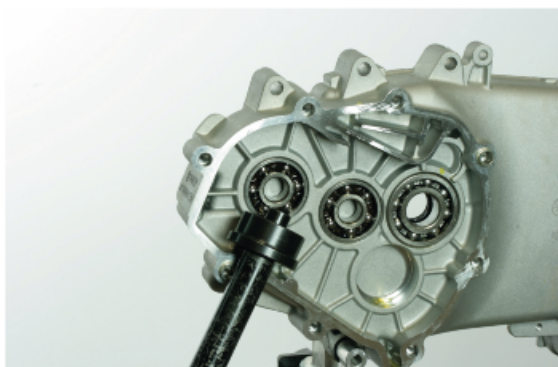


Fitting the transmission shaft bearing

- Use the heat gun to heat the bearing seat.
- Set a new bearing using the specific equipment.

Specific tooling**020151Y Heat gun****020376Y Adaptor handle****020359Y 42 x 47 mm Adaptor****020412Y 15-mm guide****Fitting the Wheel axle bearing**

- Use the heat gun to heat the bearing seat.
- Set a new bearing using the specific equipment.

Specific tooling**020151Y Heat gun****020376Y Adaptor handle****020359Y 42 x 47 mm Adaptor****020412Y 15-mm guide**

Refitting the hub cover bearings**Fitting the Wheel axle bearing**

- Use the heat gun to heat the bearing seat.
 - Set a new bearing using the specific equipment.
- Apply grease to the adapter and guide in order to maintain the bearing position on the vertical axis during operation.
- Insert a locking seeger.

Specific tooling**020151Y Heat gun****020376Y Adaptor handle****020360Y 52 x 55 mm adaptor****020363Y 20-mm guide**

- Insert a new oil seal using the specific tool.

Specific tooling

020376Y Adaptor handle

020360Y 52 x 55 mm adaptor

020483Y 30-mm guide



Fitting the transmission gear bearing

- Use the heat gun to heat the bearing seat.
- Set a new bearing using the specific equipment.

Specific tooling

020151Y Heat gun

020376Y Adaptor handle

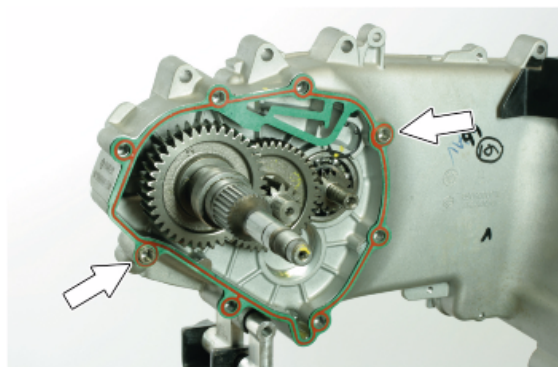
020359Y 42 x 47 mm Adaptor

020412Y 15-mm guide



Refitting the ub cover

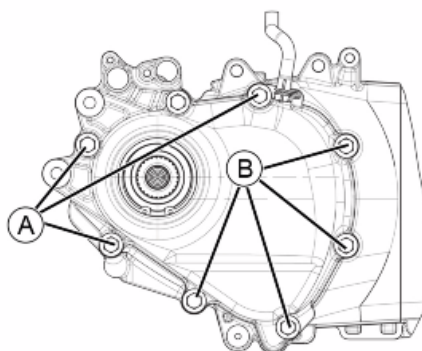
- Check the proper position of the centring bushings.
- Install a new gasket.
- Fit the gearbox cover, making sure the breather pipe is in the correct position



- Screw the hub cover fixing screws to the specified torque.

Locking torques (N*m)

Hub cover fixing screws 23 - 25



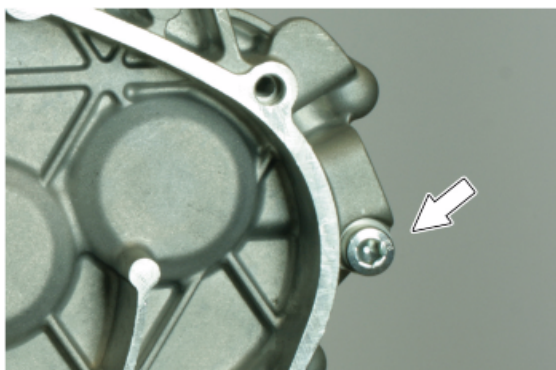
- Restore the level of oil inside reduction unit with the recommended product, acting from the filler screw.
- Tighten to the specified torque.

Characteristic**Hub oil quantity**

325 cm³

Locking torques (N*m)

Hub oil filler screw 15 to 17 Hub oil drain screw
15 to 17



Cooling hood

The radiator is protected by a plastic grille.

Removal

Unscrew and remove the fixing screws.



remove the protection grille.

**Fitting**

place the protection grille.



Insert and tighten the fixing screws.



Cooling fan

- Undo the three fastening screws at the flywheel.

CAUTION

ATTENTION THE FIXING IS GUARANTEED BY THE
THREADLOCK.



- For the fitting, tighten to the indicated torque applying the prescribed product.

Recommended products

Loctite 243 Medium strength thread-locking sealant. Loctite 243 Medium strength thread-locking sealant.

Blue

Locking torques (N*m)

Pick-up screw and cables retainer plate - flywheel position sensor - flywheel - flywheel fan 5 ÷ 6



Removing the stator

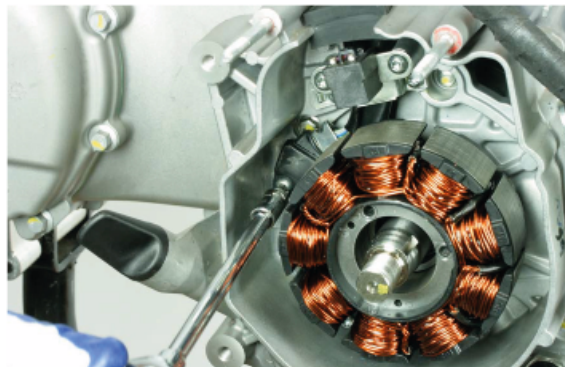
- Remove the flywheel.
- Cut the wiring harness sealing clamp.



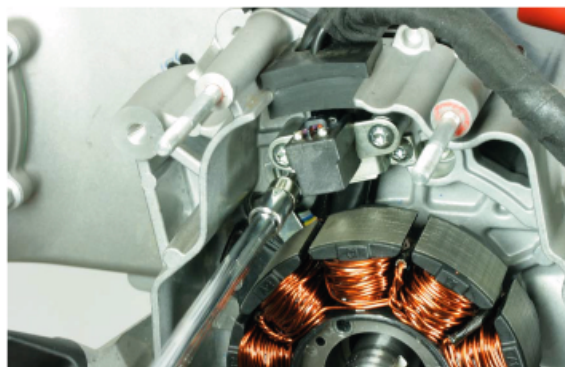
- Undo the three fastening screws.



- Undo the three fixing screws of the flywheel position sensor.



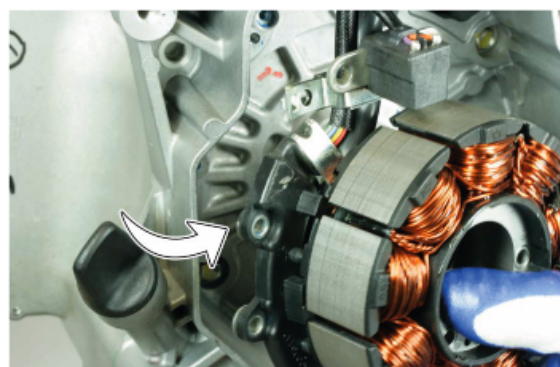
- Undo the two fixing screws of the cable retainer plate.



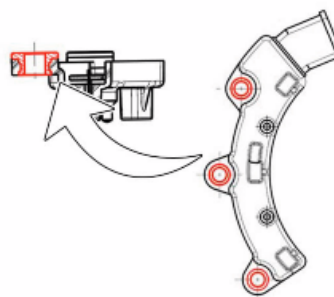
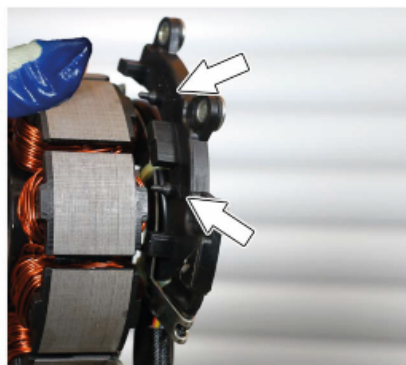
- Undo the two pick-up fixing screws.

**CAUTION**

BEFORE REMOVING THE UNIT TOGETHER WITH THE STATOR, PICK-UP AND POSITION SENSOR, MAKE SURE THAT THERE IS ADHESION OF LATTER TO THE ENGINE CRANKCASE.

**CAUTION**

DO NOT PULL THE STATOR WHEN THE POSITION SENSOR PRESENTS ADHESION TO THE ENGINE CRANKCASE IN ORDER TO AVOID THE RISK OF BREAKAGE OF THE CENTRING PINS.
IF NECESSARY, HANDLE THE BUSHINGS HIGHLIGHTED IN THE FIGURE.



Refitting the stator

- Carry out the disassembly operations in reverse order.
- Tighten to the indicated torque applying the specific product.

PAY ATTENTION TO THE FIXING OF THE PICK-UP, THE TORQUE TIGHTENING MUST OCCUR AFTER THE ADJUSTMENT OF THE AIR GAP DESCRIBED IN SECTION "FLYWHEEL AND MAGNET FLYWHEEL FITTING/START".

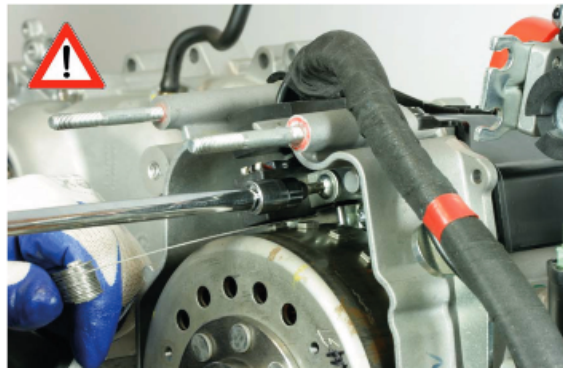
Recommended products

Loctite 243 Medium strength thread-locking sealant. Loctite 243 Medium strength thread-locking sealant.

Blue

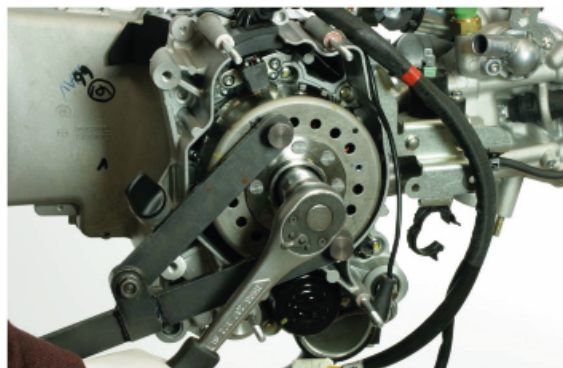
Locking torques (N*m)

Pick-up screw and cables retainer plate - flywheel position sensor - flywheel - flywheel fan 5 ÷ 6

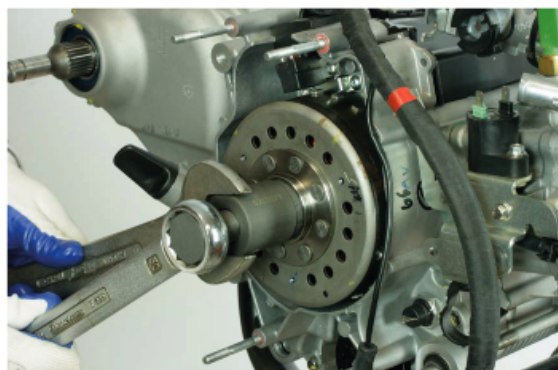


Removing the flywheel magneto

- Remove the cooling fan.
- Unscrew the nut and collect the washer.



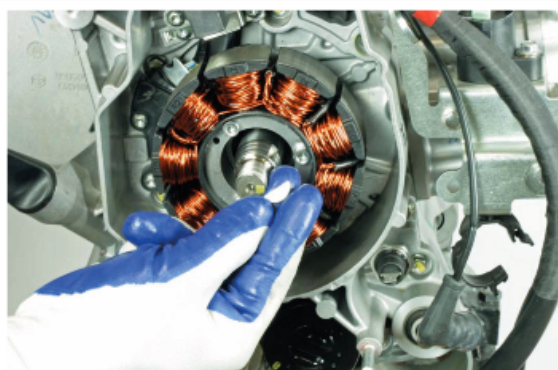
-
- Using the special tool, remove the flywheel.

Specific tooling**021007Y Flywheel puller tool**

-
- Manually grab the extractor, vigorously pull to win the magnetism resistance and remove the flywheel.



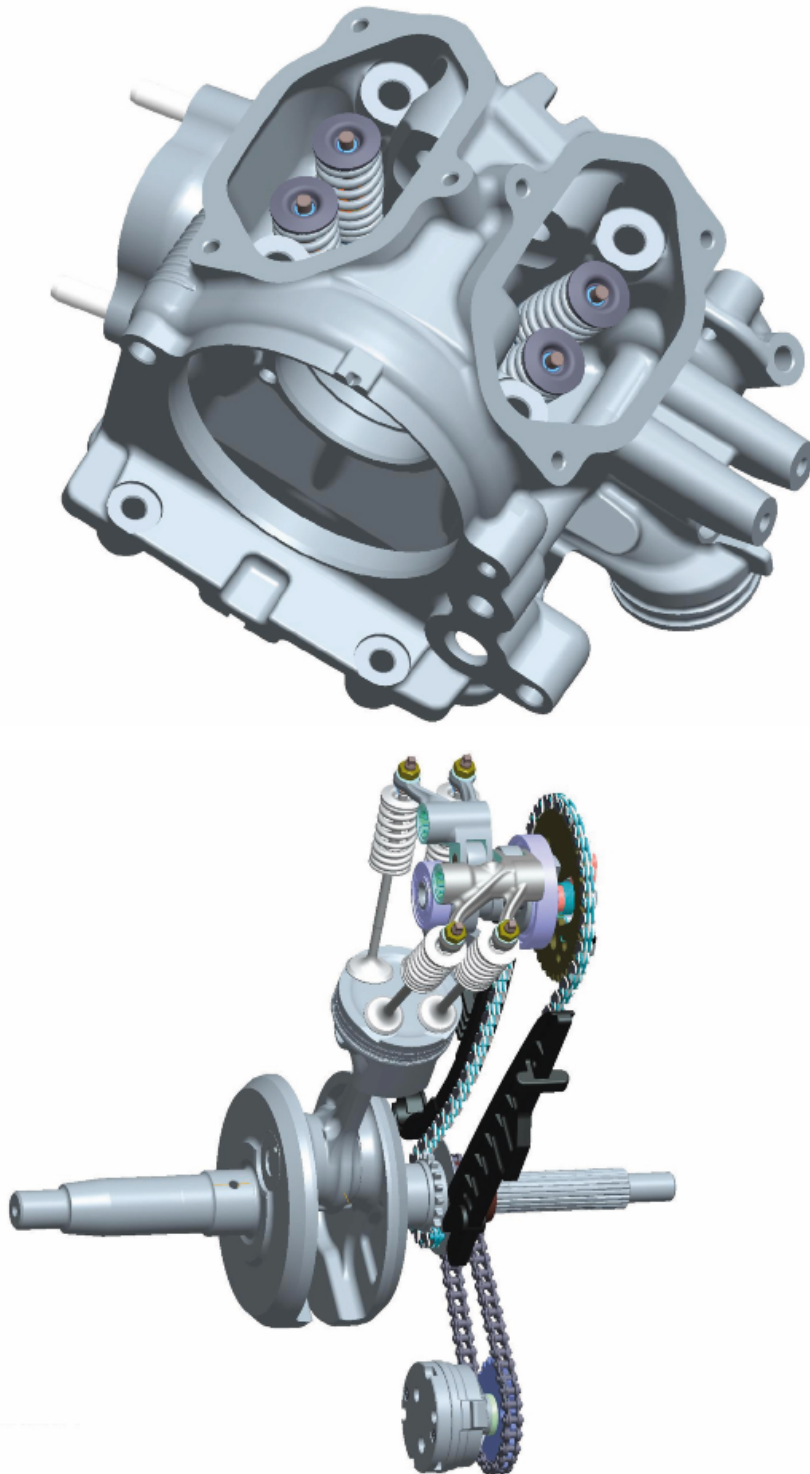
-
- Remove the cotter.



Refitting the flywheel magneto

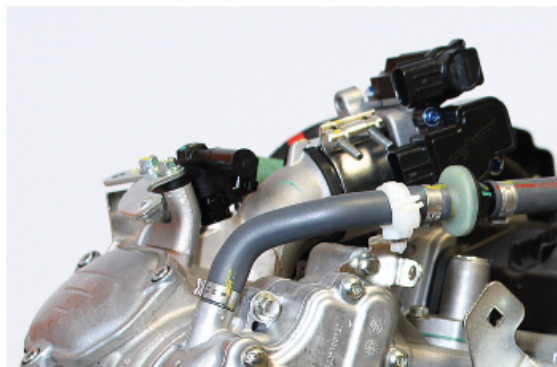
- Carry out the disassembly operations in reverse order.

Locking torques (N*m)**Flywheel fixing nut 75 - 83**

Cylinder assy. and timing system

Removing the intake manifold

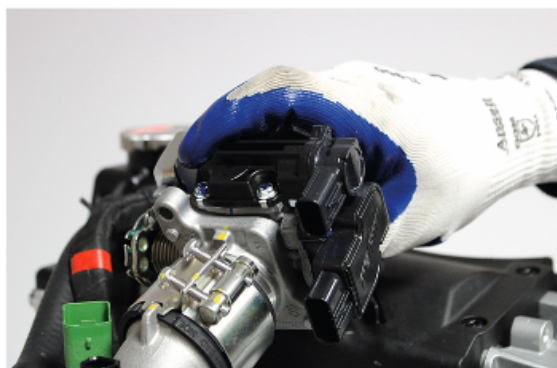
- The intake manifold is located on the big end.



- To remove the throttle body, loosen the metallic clamp screws located on the rubber coupling.

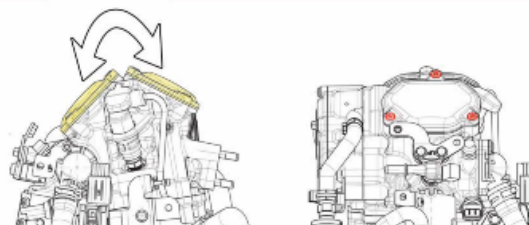


- Remove the throttle body by detaching it from the rubber coupling.



Removing the rocker-arms cover

- To remove the two valve covers, undo the three highlighted screws on both sides of the head.

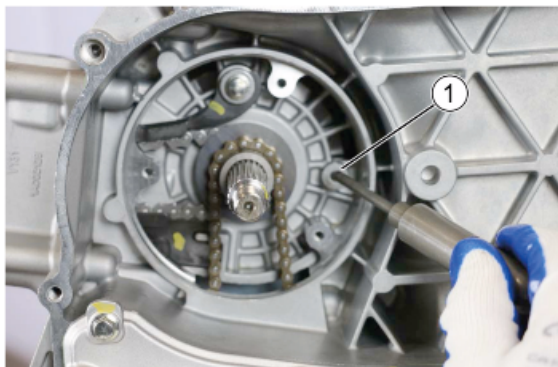


Removing the timing system drive

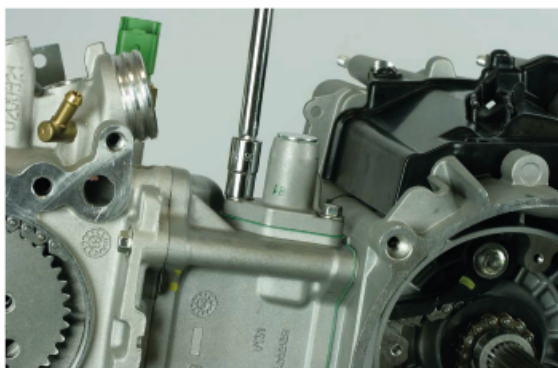
- Before performing interventions on the timing system, position the engine to the TDC in compression, then use the hole on the engine crankcase to insert the specific tool to lock the crankshaft.

Specific tooling

021006Y Lock for engine timing R.I.S.S



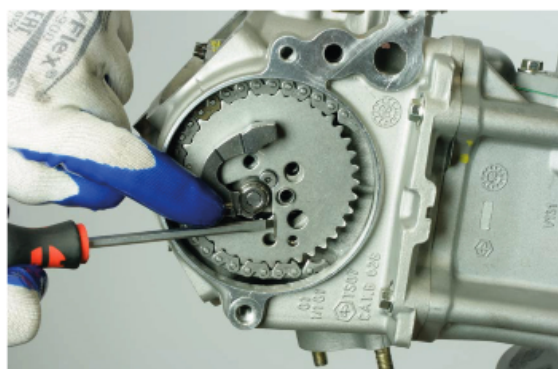
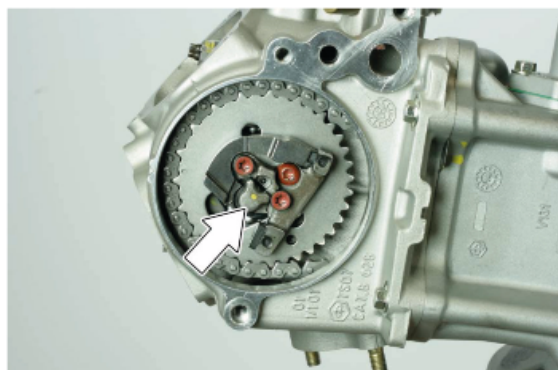
- First loosen the tensioner and unscrew the fixing screws.
- Remove the tensioner complete with gasket.



- Disassemble the coolant pump as described in section "**Water pump / removal**"
- Undo the three screws on the timing system gear.
- Remove the pressure reducer complete paying attention to disengage the spring from the sprocket.

CAUTION

ATTENTION THE FIXING IS GUARANTEED BY THE THREADLOCK.



- Disengage the timing system sprocket and remove the camshaft.
- Remove the cylinder as described in section «**Engine/Piston cylinder disassembly**»



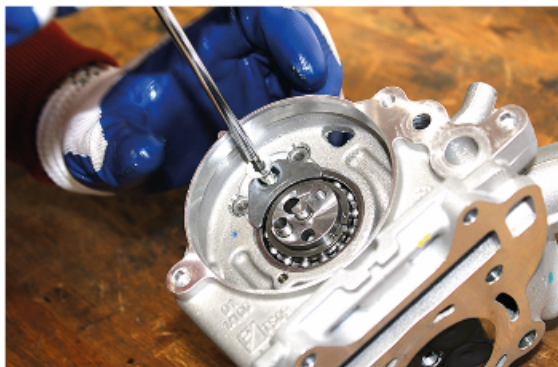
When the head is removed it is possible to remove the camshaft control components as described in the section «**Head-engine block-piston assembly / Head removal**».

Removing the cam shaft

- Undo the camshaft lock screw.

CAUTION

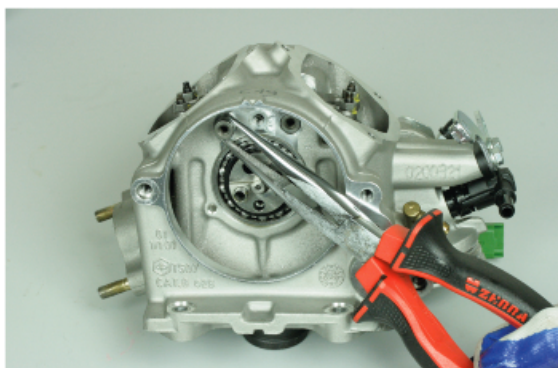
ATTENTION THE FIXING IS GUARANTEED BY THE THREADLOCK.



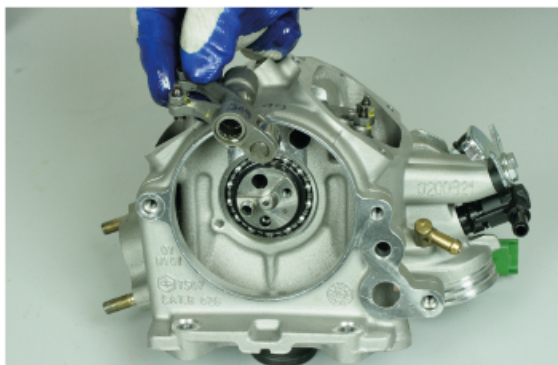
- Remove the camshaft lock plate.



- Remove the two pins.



- Remove the rockers.

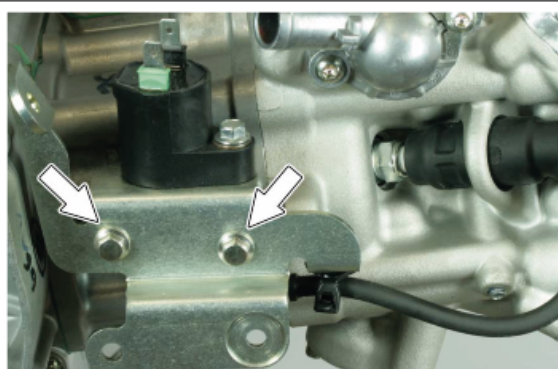


- Remove the camshaft.

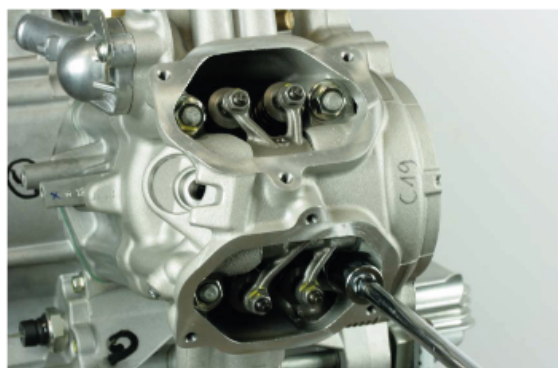


Removing the cylinder head

- Temporary remove the timing system sprocket, as described in section "**Head-engine block-piston assembly / Timing system control removal**"
- Remove the coil support fixing screws from the cylinder and remove the complete coil removing the tube from the spark plug.



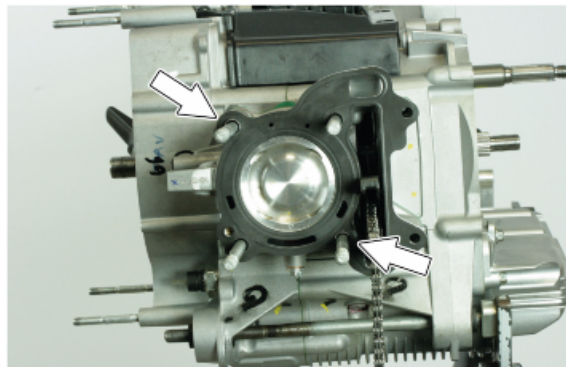
- First remove the valve covers as described in section "**Head-engine block-piston assembly and timing system / Tappet cover**".
- Undo the four fixing nuts inside the head and the two external screws timing system side.



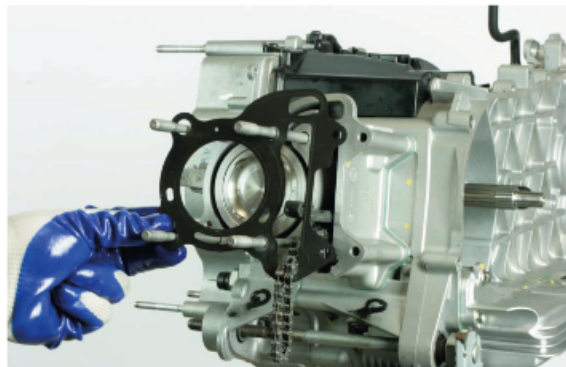
- Remove the cylinder head.



- Pay attention to the centring bushings.



- Remove the cylinder head gasket.



- Remove the inspection cover as described in sec. «**Lubrication/Main bushing oil seals removal**».
- Undo the chain tensioner pad fixing screw and remove it recovering the bush.
- Remove the tensioner slider.



- Remove the mobile chain guide slider.



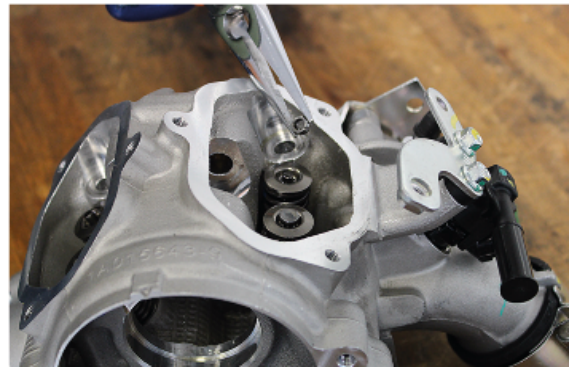
- Remove the fixed chain guide slider.



Removing the valves

Proceed as follows to remove the valves:

- Remove the valve terminals from the end of the intake valves.



- Place the valve removal specific tool in a vice.
- Insert the big end in the tool.

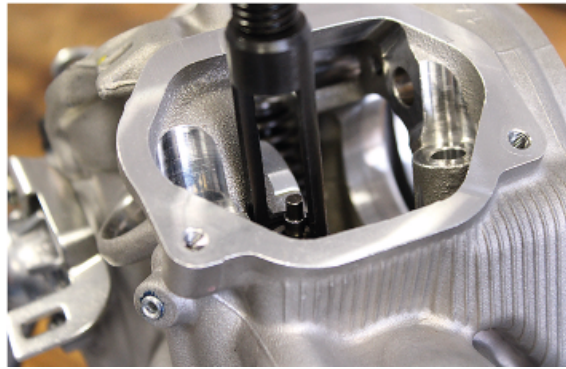
Specific tooling

020382Y Valve cotters equipped with part 012 removal tool

020382Y011 adapter for valve removal tool



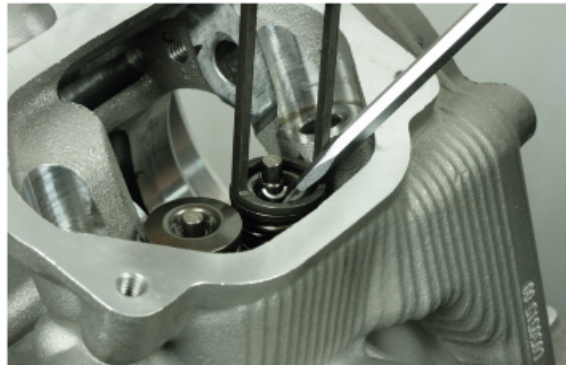
- Operate the tool and compress the spring.



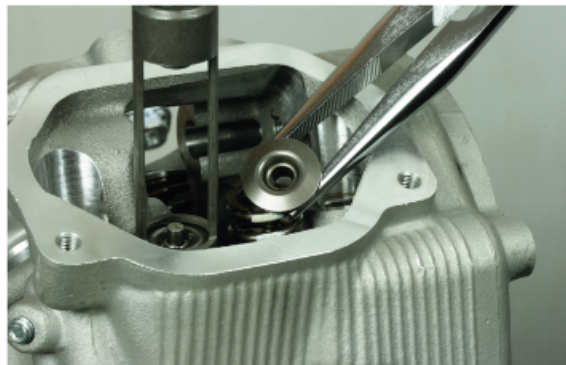
- Remove the cotter pins.

CAUTION

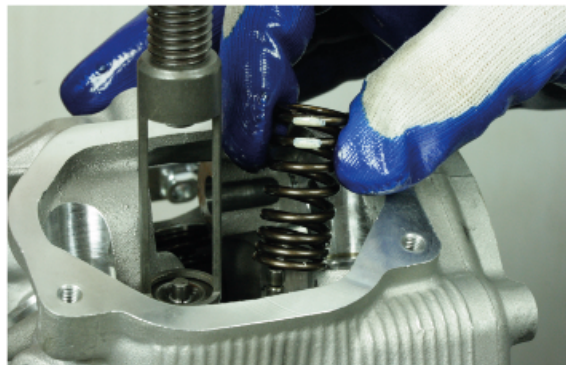
ARRANGE THE VALVES SO AS TO RECOGNISE THE ORIGINAL POSITION ON THE HEAD (FLYWHEEL SIDE AND TRANSMISSION SIDE).



- Operate the specific tool, releasing the pressure on the spring.
- Remove the big end from the tool.
- Remove the spring upper cap.



- Remove the spring.



- Remove the valve.



Removing the cylinder - piston assy.

- Remove the cylinder, paying attention to the cylinder-crankcase centring bushings.

CAUTION

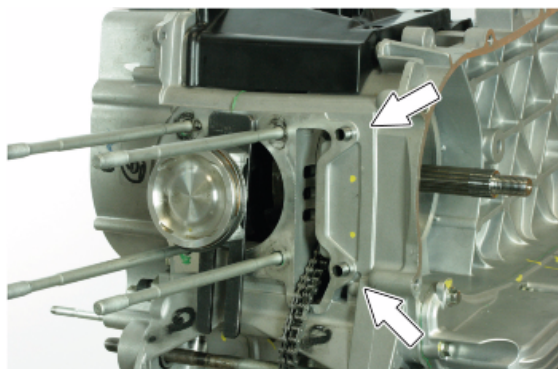
TO PREVENT DAMAGING THE PISTON, SUPPORT IT WHILE REMOVING THE CYLINDER.

NOTE

IN ORDER NOT TO DAMAGE THE BASE GASKET WITH THE PISTON LOCK FORK 020426Y DURING THE MOUNTING PHASE, IT IS RECOMMENDED TO INSERT THE CENTRING BUSHINGS OF THE CYLINDER - CRANKCASE UNDER THE CYLINDER DURING THE ASSEMBLY.



- Remove the base gasket.
- Remove the cylinder-crankcase centring bushings.



- Remove the retainer rings and remove the piston.

CAUTION

BE CAREFUL NOT TO DAMAGE THE SEALING RINGS DURING REMOVAL.



Inspecting the small end

NOTE

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

See also

Crankcase - crankshaft - connecting rod

Inspecting the wrist pin

NOTE

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

See also

Cylinder - piston assy.

Inspecting the piston

NOTE

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

See also

Cylinder - piston assy.

Inspecting the piston rings

NOTE

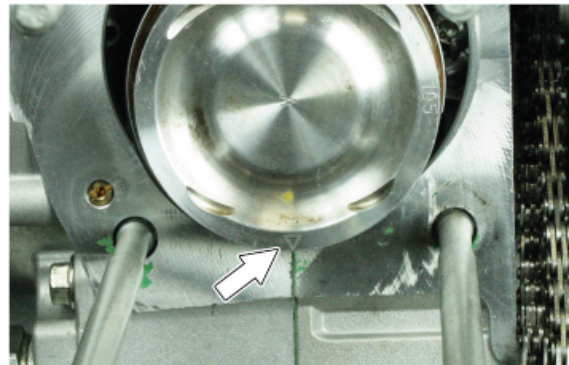
TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

Removing the piston

- Fit the piston and pin onto the connecting rod, aligning the piston with the arrow facing towards the exhaust valves.

CAUTION

AT EVERY FITTING USE NEW PIN RETAINER RINGS.



Choosing the gasket

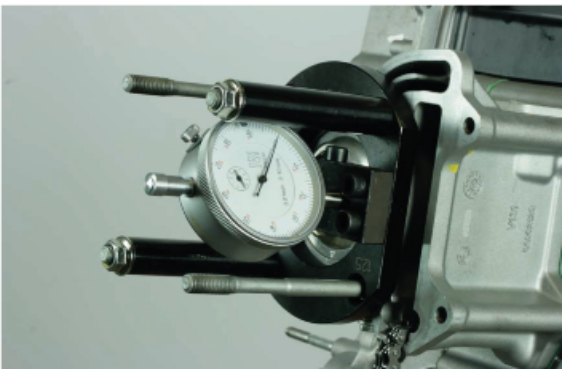
- Provisionally fit the piston into the cylinder, without any base gasket.
- Assemble a dial gauge on the specific tool.

Specific tooling

020942Y Piston protrusion check tool

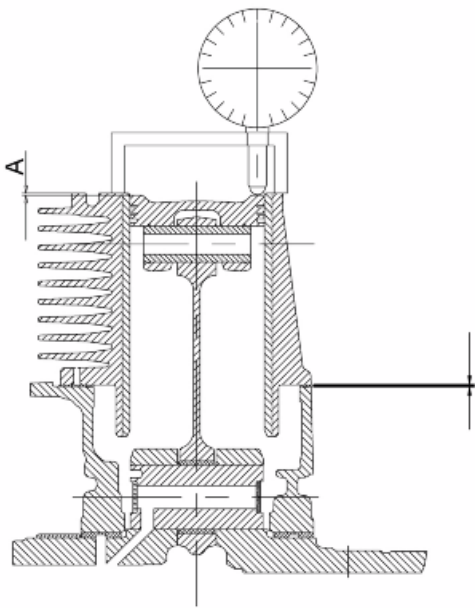
- Using an abutment plane, reset the dial gauge with a pre-load of a few millimetres.
- Finally fix the dial gauge.
- Check the perfect sliding of the feeler pin.
- Install the tool on the cylinder without changing the dial gauge position.
- Lock the tool using the original head fixing nuts.
- Rotate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





- Referring to 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.

Characteristic
Compression ratio
12.5 :1



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

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

ENGINE SHIMMING

Name	Measure A	Thickness
Shimming 1	0 - 0.1	0.8 ± 0.05

Name	Measure A	Thickness
Shimming 2	-0.1 - -0.3	0.6 ± 0.05
Shimming 3	-0.3 - -0.4	0.4 ± 0.05

See also

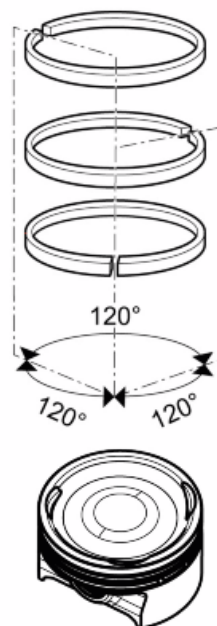
[Slot packing system](#)

Refitting the piston rings

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

CAUTION

AT EVERY FITTING USE NEW PIN RETAINER RINGS.



Refitting the cylinder

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

Specific tooling

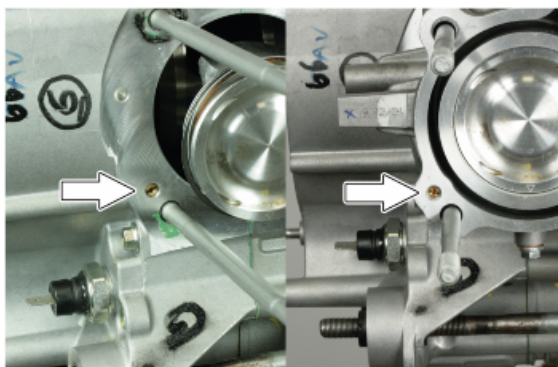
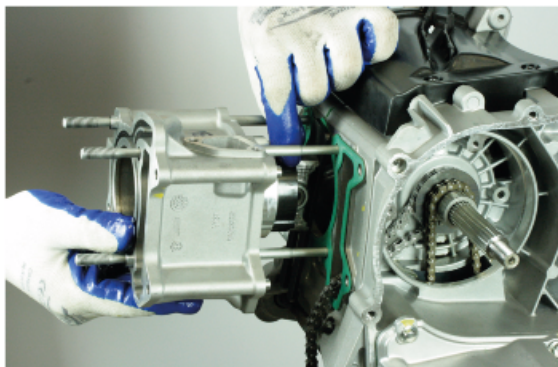
020426Y Piston fitting fork

020287Y Tool for installing seal rings

Recommended products

Engine oil 0W -30 Synthetic lubricant for four stroke engines (-15°C < T < 40°C)

SAE 0W-30 ACEA A5/B5-04 - VW 503 00, 506 00, 506 01



Inspecting the cylinder head

NOTE

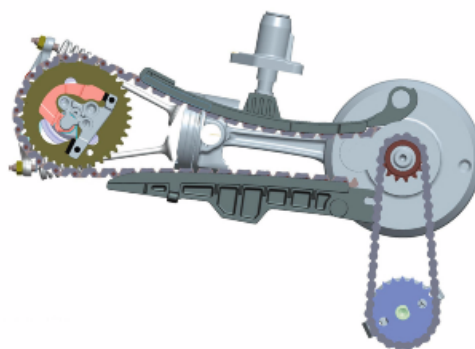
TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

Cylinder head

Inspecting the timing system components

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



- If examples of wear are found, replace the whole unit.
- When the components of the timing system are replaced, check the match of the correct pressure reducer ground.
- To match the pressure reducer ground refer to chapter "**Characteristics**"

Inspecting the valve sealings

NOTE

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

See also

Cylinder head

Inspecting the valves

NOTE

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

VALVE CLEARANCE CHECK

- Remove the valve covers.
- Position the engine to the TDC in compression.
- Using a feeler gauge check the valve clearance.
- To restore the values indicated, use the specific tool.

Specific tooling

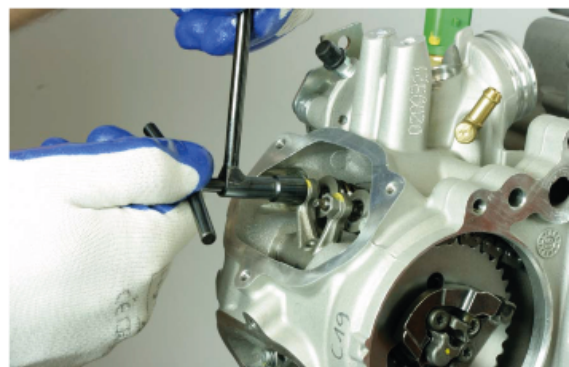
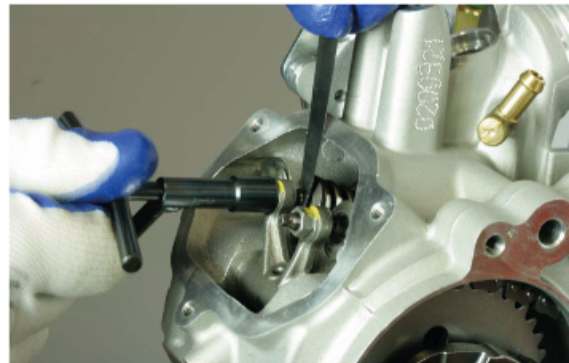
AP8140261 Valve clearance adjuster wrench

Characteristic

Valve clearance (cold engine)

Intake: 0.10 mm

Exhaust: 0.15 mm



Inspecting the springs and half-cones

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



NOTE

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

Refitting the valves

- Insert the valve.

NOTE

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



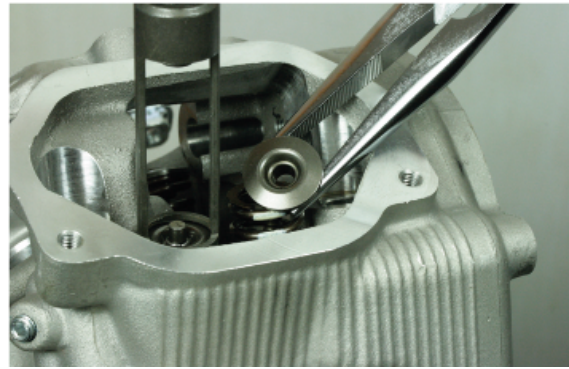
- Fit the spring.

CAUTION

MOUNT THE VALVE SPRINGS WITH THE WHITE COLOURED COIL FACING UPWARD.



- Insert the spring upper cap.



- Place the big end in the tool.
- Operate the tool to compress the spring.

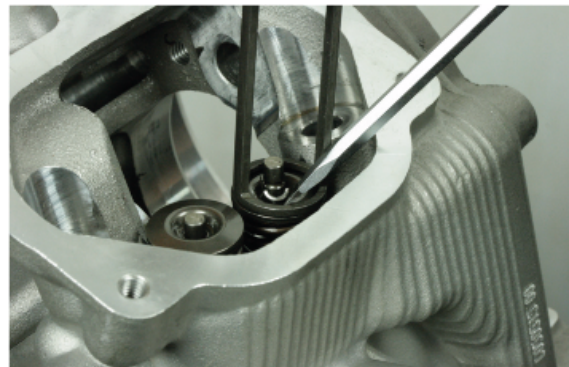
Specific tooling

020382Y Valve semi-cone extractor tool

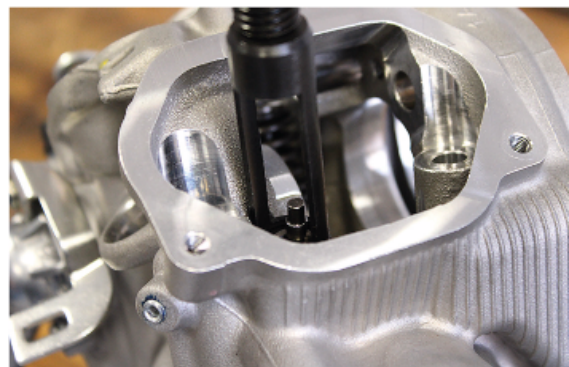
020382Y011 Valve removal/installation tool



- Insert the cotter pins.



- Operate the specific tool, releasing the pressure on the spring.
- Remove the big end from the tool.



- Insert the valve terminals from the end of the intake valves.



Inspecting the cam shaft

NOTE

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

To remove the bearings of the camshaft, proceed as follows:

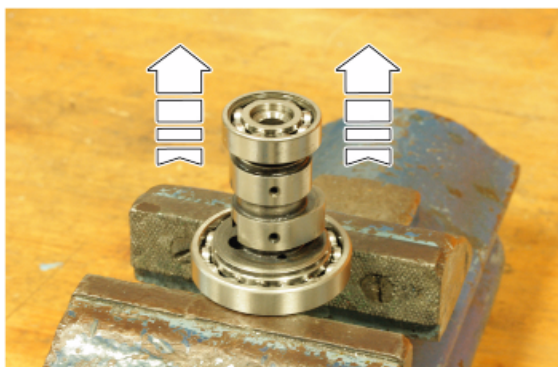
TIMING SYSTEM SIDE

- Hold the camshaft properly.
- Remove the Seeger ring.
- Remove the bearing using the press.



SPARK PLUG SIDE

- Hold the camshaft properly.
- Remove the bearing by levering.





To fit the bearings of the camshaft, proceed as follows:

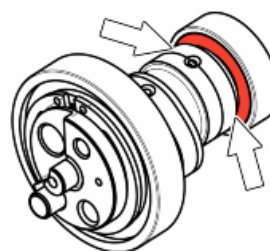
TIMING SYSTEM SIDE

- Hold the camshaft properly.
- Using the press, insert a new bearing and then the seeger ring.



SPARK PLUG SIDE

- Hold the camshaft properly.
- Using the press, insert a new bearing paying observing the introduction direction. The shielded side must be fitted inside the camshaft, as indicated in the figure.



Refitting the head and timing system components

- Tighten the nuts to an initial pre-torque of 9-11 Nm.
- Tighten up the nuts by rotating $270,0^{\circ} \pm 5,0^{\circ}$ with crossed sequence.
- Fit the two screws on the outside of the timing chain side and tighten them to the specified torque

CAUTION

DO NOT PERFORM 270° IN ONE ROTATION. PERFORMING THREE PROGRESSIVE ROTATIONS RESPECTING THE SEQUENCE INDICATED ON THE STUD BOLTS.

NOTE

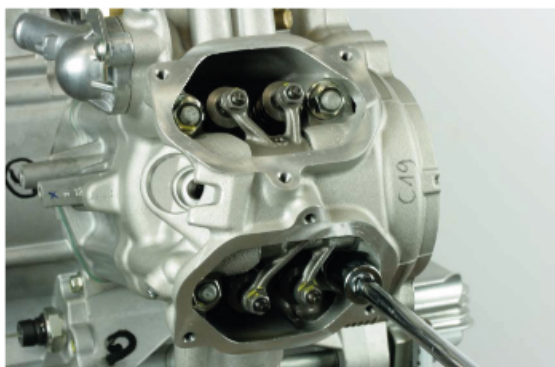
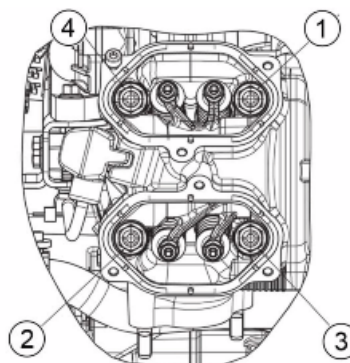
BEFORE INSTALLING THE HEAD, MAKE SURE THAT THE LUBRICATION CHANNEL IS CLEAN USING A COMPRESSED AIR JET.

CAUTION

ALWAYS USE A NEW HEAD GASKET UPON REFITTING.

Locking torques (N*m)

Cylinder head nut (TIGHTENING) 9 - 11 (Tighten to the prescribed torque and then proceed with $270,0^{\circ} \pm 5,0^{\circ}$ rotation) **Screws fixing cylinder to crankcase** 10.8 - 12.7

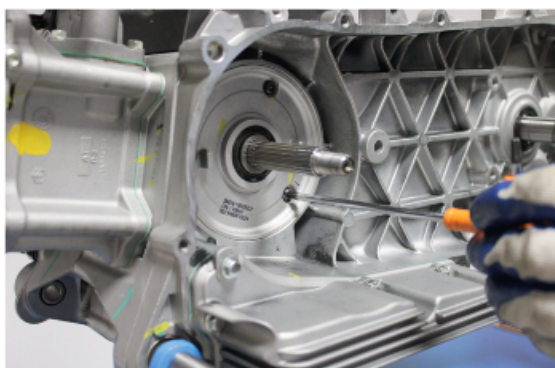


Refitting the timing chain

DISTRIBUTION TIMING

to obtain the correct timing of the distribution, proceed as follows:

- To fit the timing chain, follow the indications in section "**Crankshaft crankcase / Crankcase coupling**"
- also follow the instructions in section "**head-engine block-piston assembly and timing system /Cylinder fitting - Fitting the big end and**



the distribution components"; complete the fitting of components to be able to perform the timing correctly;

- remove the timing system aluminium cover;

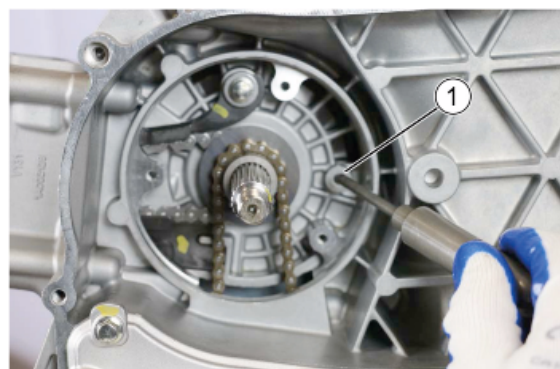
WARNING

THIS TIMING SYSTEM ALLOWS THE RECOVERY OF ALL MACHINING AND/OR INSTALLATION CLEARANCES IN ORDER TO GUARANTEE A PARTICULARLY ACCURATE TIMING. CAREFULLY OBSERVE THE FOLLOWING:

Specific tooling

021006Y Lock for engine timing R.I.S.S

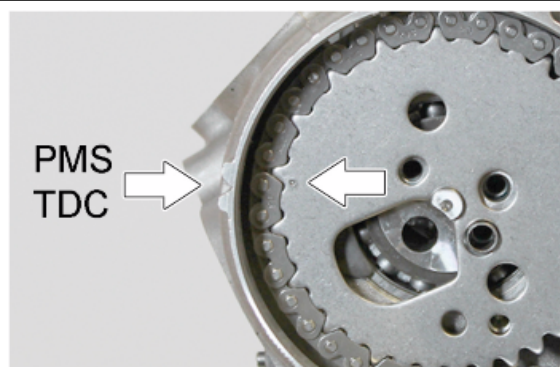
Lock the crankshaft at the Upper dead centre (PMS), inserting the punch of the specific tool in the hole (1);



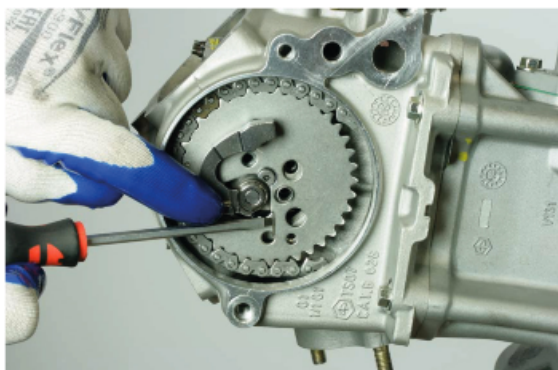
Assemble the sprocket with the prearranged timing chain and align the reference point on the sprocket with the one on the big end;



Make sure that the point on the sprocket and the reference on the cylinder head are aligned; this position indicates the Upper dead centre PMS;



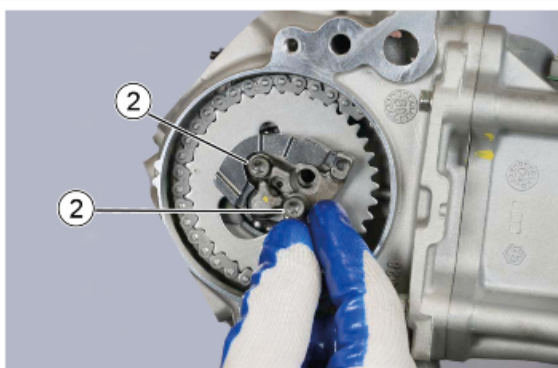
Assemble the decompressor mass and spring.



Insert the decompressor's drive support.



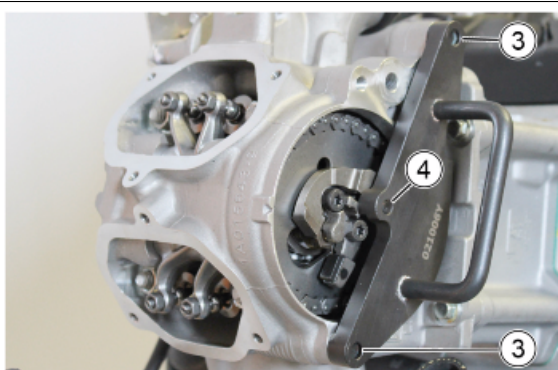
Manually screw the screws (2) with pre-applied thread lock, without fastening them.



Lock the camshaft in position, mounting the specific tool until the end and inserting the central pin in the hole (4) and the two reference pins in the holes (3).

Specific tooling

021006Y Lock for engine timing R.I.S.S



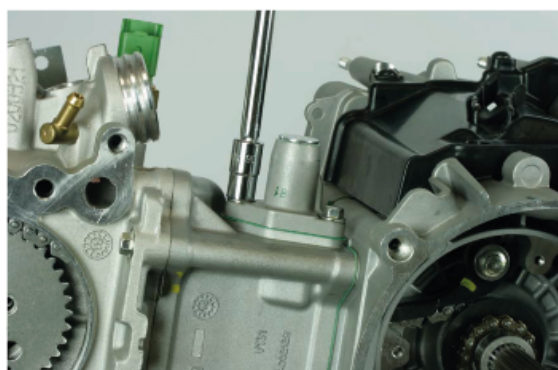
Preload the chain tensioner until it locks.



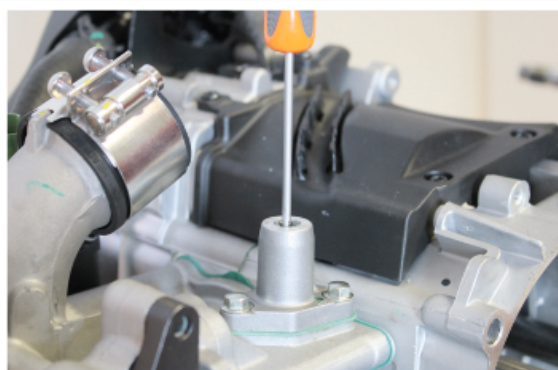
Place the gasket and mount the chain tensioner on the cylinder screwing them up to the prescribed torque.

Locking torques (N*m)

Chain tensioner - Cylinder 8 - 10 Nm



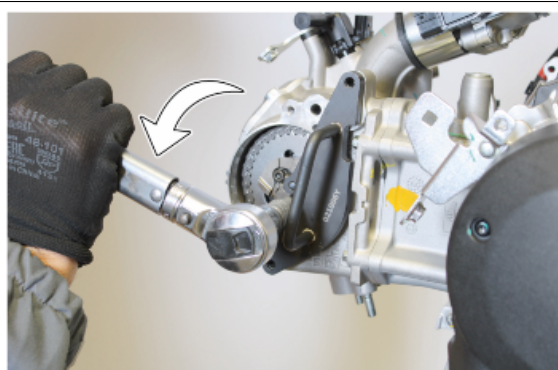
Release the chain tensioner piston, thus tensioning the timing chain and then screw and lock the cap.



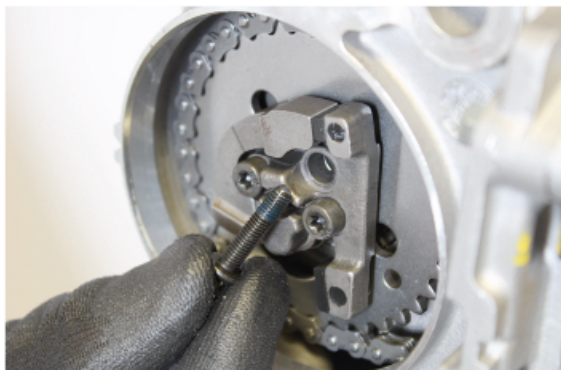
Fasten to the specified torque the fixing screws between the decompressor counterweight and the camshaft; this will allow the system to eliminate all clearances.

Locking torques (N*m)

Pressure reducer counterweight retainer screw 7 ÷ 8.5 Nm



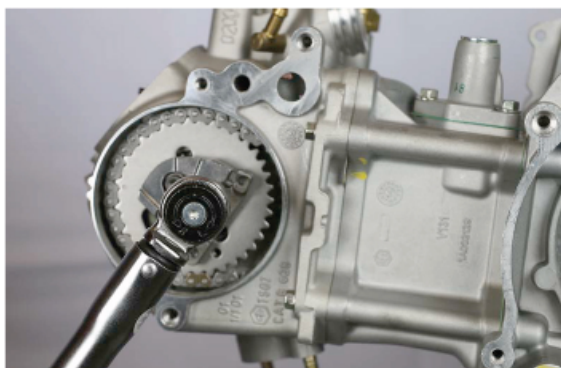
Remove the specific tool from the cylinder head and screw the unfastened fixing screw of the decompressor;



Tighten the fixing screws of the decompressor counterweight to the prescribed torque;

Locking torques (N*m)

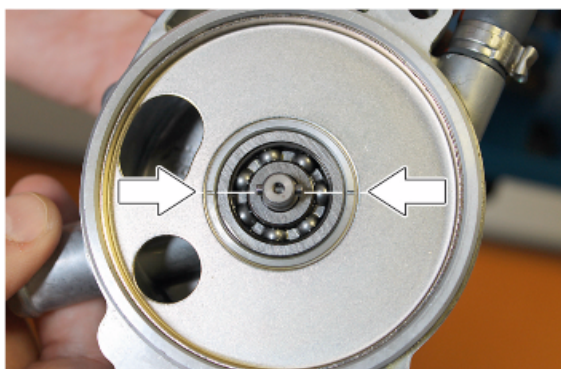
Pressure reducer counterweight retainer screw $7 \div 8.5$ Nm



Remove the punch of the specific tool mounted at the beginning of the procedure to fasten the crankshaft;



Align the references of the water pump before mounting it on the cylinder head;



Check the integrity of the sealing rings of the water pump's body and, if necessary, replace them with new O-rings; then tighten to the specified torque.

Locking torques (N*m)

Water pump's body screws - Cylinder head
10.8-12.7 Nm



Tighten the water pump cover to the specified torque.

Locking torques (N*m)

Water pump cover screws - Pump body 4.9-5.9 Nm



Inspecting the radial air gap

- Following the fitting of the flywheel, complete the tightening of the pick-up after the adjustment of the air gap.
- Using the feeler gauge to reset the indicated value.
- Tighten to torque using the threadlocker.

Recommended products

Loctite 243 Medium strength thread-locking sealant. Loctite 243 Medium strength thread-locking sealant.

Blue

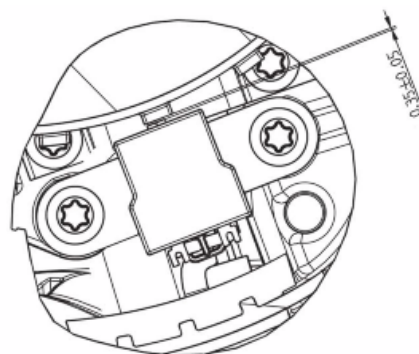
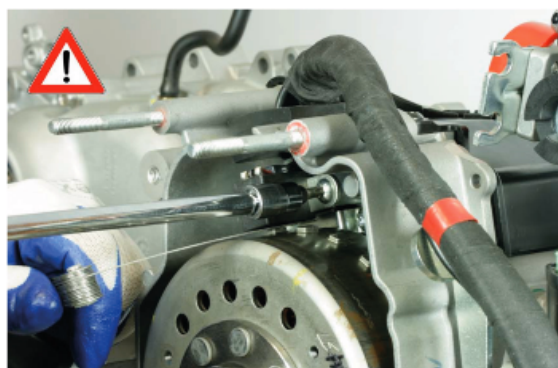
Characteristic

AIR GAP ENGINE R.I.S.S.

0.35mm \pm 0.05mm

Locking torques (N*m)

Pick-up screw and cables retainer plate - flywheel position sensor - flywheel - flywheel fan 5 - 6 Nm



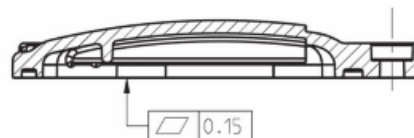
Refitting the rocker-arms cover

- Check the evenness of the covers, when they exceed the allowed limits, replace them.

Characteristic

Evenness limit

0.15mm



- Check the wear condition of the gaskets, if they are damaged and/or if there is oil leakage, replace them applying the recommended product.

Recommended products

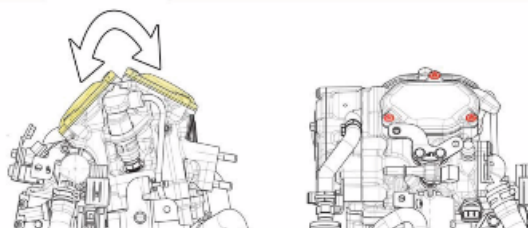
Calcium based grease Calcium based grease

Smooth-textured appearance; Ivory coloured Specification TL 9150 066, symbol NATO G 460

- Place the valve covers and tighten the screws to the indicated torque.

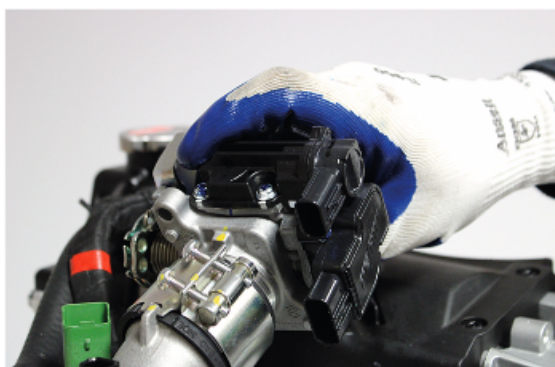
Locking torques (N*m)

Tapet cover screws 5 - 6 Nm



Refitting the intake manifold

- Insert the intake manifold in the rubber sleeve.



- Tighten the metallic clamp screws to the prescribed torque.

Locking torques (N*m)

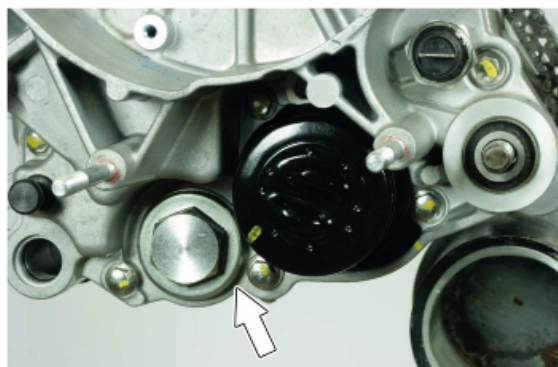
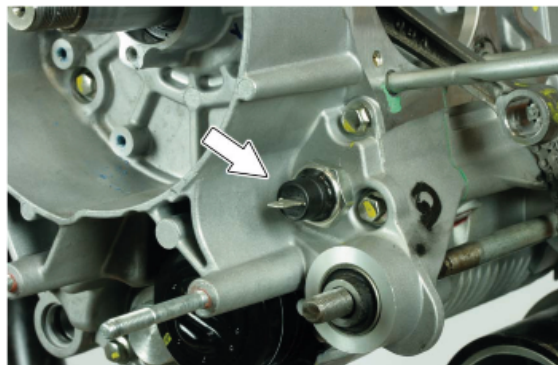
Inlet manifold screws 5 - 6 Nm

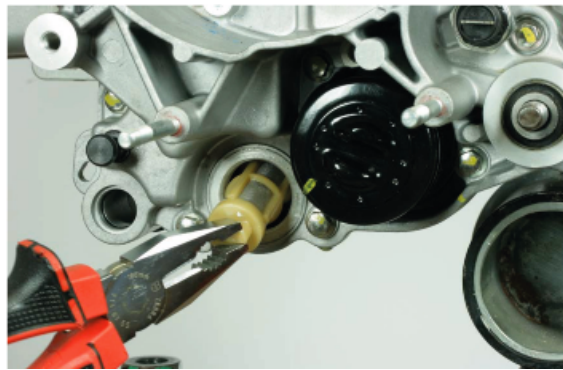
**Splitting the crankcase halves**

- Unscrew the four screws in the photo and remove the cable grommet plastic.



- Unscrew the oil minimum pressure sensor.
- Unscrew the screw cap of the mesh filter and remove it.
- Remove the cartridge oil filter.





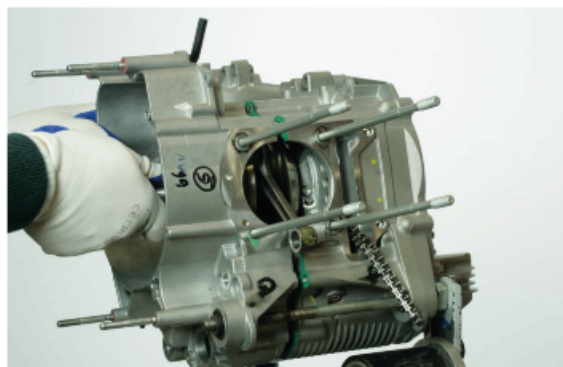
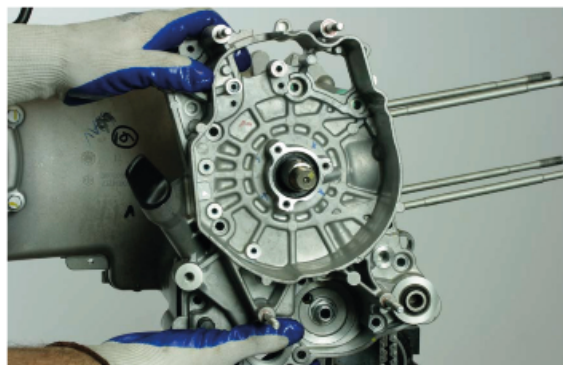
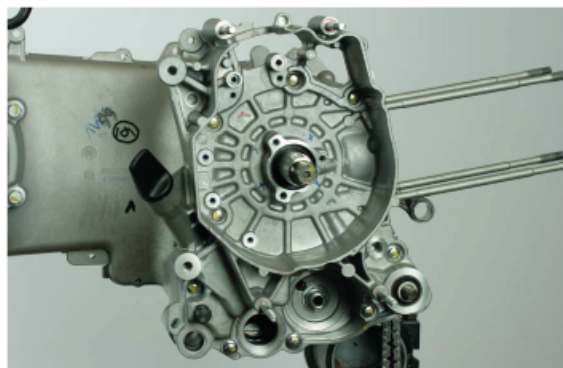
- Undo the nine crankcase coupling screws.
- Separate the crankcase halves while keeping the crankshaft in one of these two halves.
- Only after the halves have been separated, can the crankshaft be checked.

CAUTION

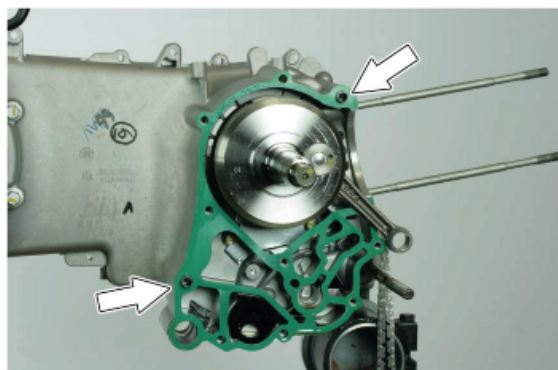
WHILE OPENING THE CRANKCASES AND REMOVING THE CRANKSHAFT, CHECK THAT THE THREADED SHAFT ENDS DO NOT INTERFERE WITH THE MAIN BUSHINGS. FAILURE TO OBSERVE THIS PRECAUTION CAN DAMAGE THE MAIN BUSHINGS.

CAUTION

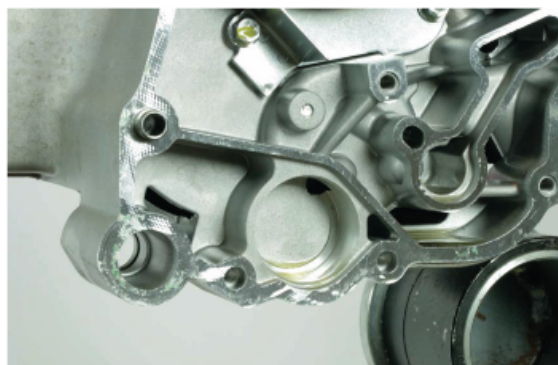
KEEP THE CRANKSHAFT IN ONE OF THE TWO HALVES OF THE CRANKCASE WHEN SEPARATING IT. THE NON-COMPLIANCE WITH THIS STANDARD CAN LEAD TO ACCIDENTAL FALLING OF THE CRANKSHAFT.



- Remove the gasket and be careful with the centering bushings.



- Remove the filter holder insert.



Inspecting the crankshaft components

NOTE

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

See also

Crankcase - crankshaft - connecting rod

Inspecting the crankshaft alignment

NOTE

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

See also

Crankcase - crankshaft - connecting rod

Inspecting the crankcase halves

- Before proceeding to check the crankcase halves, thoroughly clean all surfaces and oil ducts.
- On the transmission-side crankcase half, take particular care when handling the oil pump compartment and the oil ducts, the by-pass duct, the main bushings and the cooling jet on the transmission side. As already described in the lubrication chapter, it is especially important that the by-pass housing shows no wear that may impair the proper sealing of the lubrication pressure adjustment piston.
- On the flywheel side crankcase half, take particular care cleaning the oil ducts for the main bushings, the oil duct for the jet that lubricates the cylinder head and the oil drainage duct at the flywheel side oil seal.
- Inspect the coupling surfaces on the crankcase halves for scratches or deformation, taking particular care with the cylinder/crankcase surfaces and the crankcase halves surfaces.
- Defects in the crankcase coupling gasket between the crankcase halves or the mating surfaces shown in the diagram, could cause a drop in the oil pressure lubricating the main bushings and connecting rod.
- Check the main bearing seats that limit axial clearance in the crankshaft show no signs of wear. The dimension between these seats is measured by way of the procedure described previously for measuring the crankshaft axial clearance and dimensions.

NOTE

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

NOTE

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

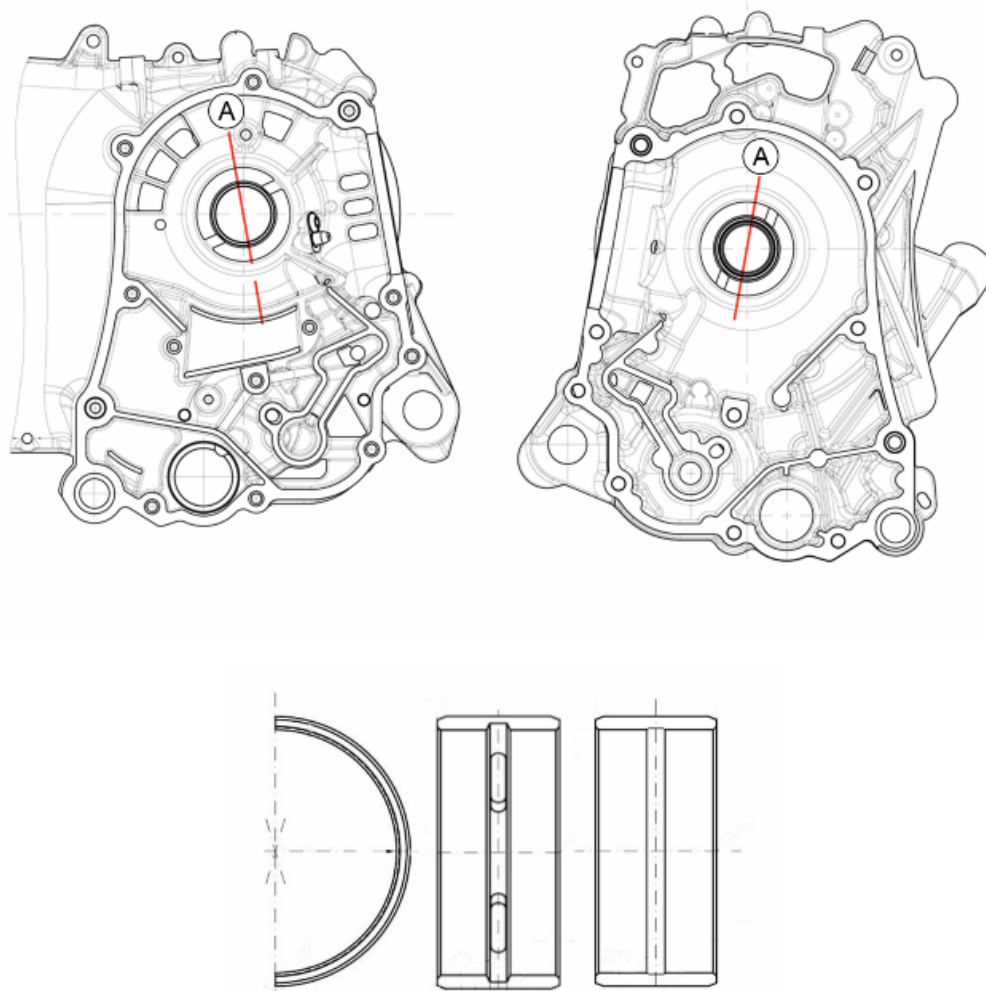
Inspecting the crankshaft plain bearings

- To obtain a good bushing lubrication it is necessary to have both an optimal lubricating pressure and a good oil flow rate; the bushings must be correctly positioned so as not to obstruct the oil supply channels.
- The main bushings are made of 2 half bearings, one oil supply hole and lubrication channel and the other only with lubrication channel.

Characteristic

«A»

HAL BEARING CONNECTION LINE



- The oil feeding channel section is also affected by the bushings driving depth compared with the crankshaft axial clearance of the limiting surface.

NOTE

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

Coupling chart

NOTE

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

See also

Crankcase - crankshaft - connecting rod

Refitting the crankcase halves

- Follow the removal steps but in reverse order; be careful to respect the prescribed tightening torques.
- Insert the by-pass.
- Insert a new gasket paying attention to the centring bushings.
- Maintaining the crankshaft inserted in the transmission side crankcase, couple the crankcase halves.
- Insert the screws and tighten them to specified torque.

CAUTION

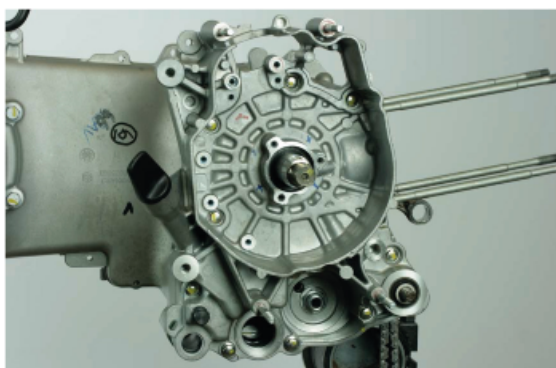
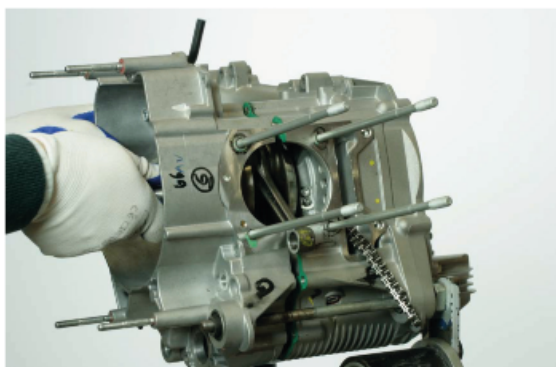
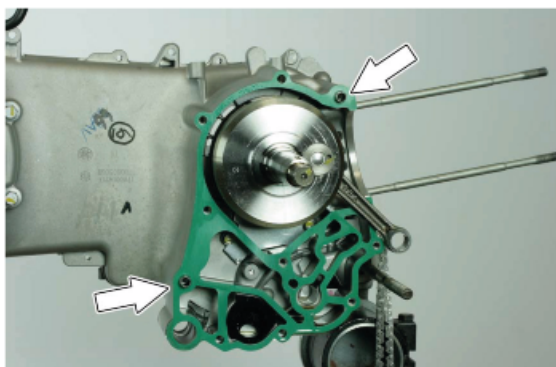
CAREFULLY CHECK THE CLEANING OF THE BY-PASS DUCT. CHECK THAT THE PISTON SLIDES BY HAND, FREELY AND WITHOUT STICKING.

CAUTION

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

Locking torques (N*m)

Crankcase coupling screws 11 - 13 Nm



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

Characteristic

Crankshaft-crankcase axial clearance

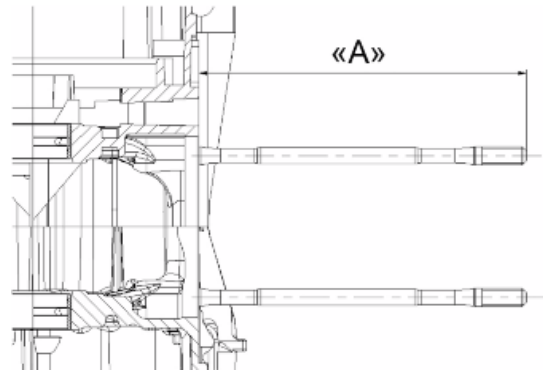
0.2 - 0.5 mm

Studs

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

NOTE

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



Characteristic

Driving depth of stud bolts «A»

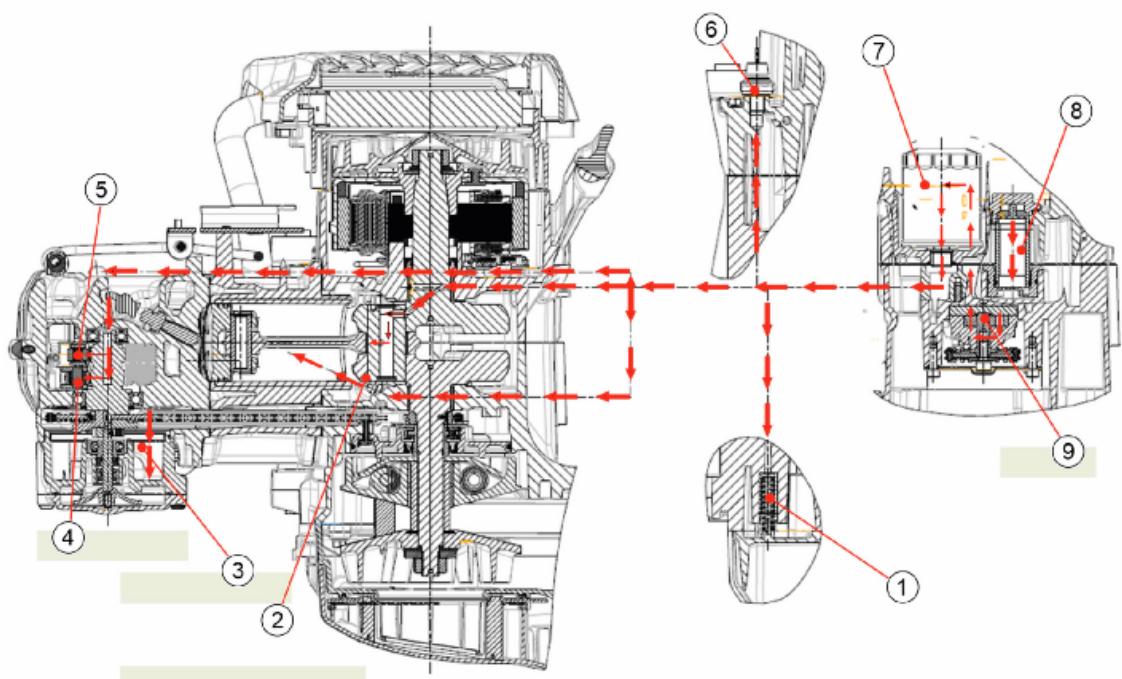
170 mm+ 0.5

Conceptual diagrams

The lobe pump «9» sucks the oil from the sump, through the mesh pre-filter «8», it pushes it into the cartridge filter «7» where there is also a safety valve «1».

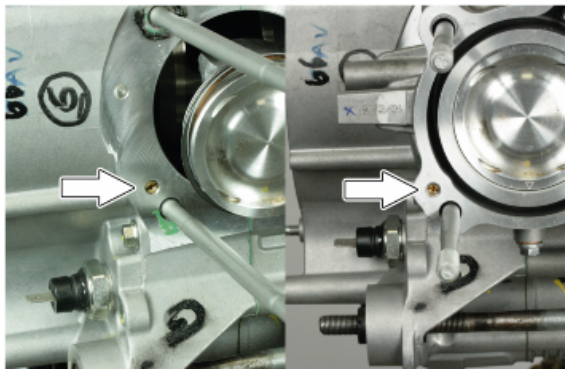
Through the suitable passages found in the crankcases, the oil enters the crank chamber, where the main bushings are lubricated. The big end, the piston pin and connecting rod small end via spray «2». From the engine crankcase, the pressurised oil reaches the distribution through a pipe, with calibrated nozzles, one in the crankcase and the other in the cylinder, as shown in the images. The pressurized oil lubricates the camshaft «5» and from it the valves and the rocker «4». Through the timing chain's pipe, the oil falls back in the sump, while the oil vapours leak out of the pipe's end «3» toward the air filter, through a non-return valve located on the pipe.

The plant is equipped with a minimum oil pressure sensor «6».

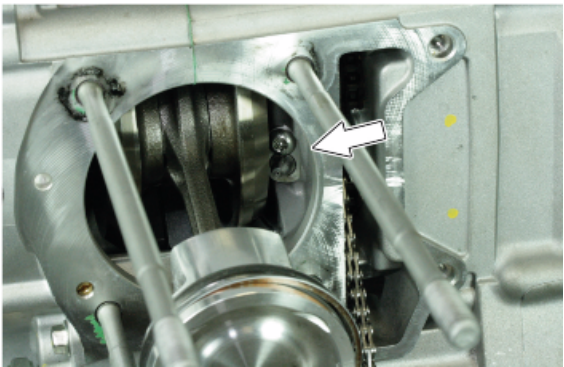


LUBRICATION CIRCUIT NOZZLES

Name	Torque in Nm
Piston cooling nozzle fixing screw	5 - 6 Nm
Carter calibrated nozzle	1 ÷ 2 Nm
Cylinder calibrated nozzle	1 ÷ 2 Nm



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



Oil pressure check

- Remove the air duct at the radiator.
- Remove the electrical minimum oil pressure switch connection and remove the switch. - Use the specific tool to install the oil gauge.
- With the engine idling at 1,750 rpm and the oil temperature at $\sim 90^{\circ}\text{C}$, check that the oil pressure is between 0.5 - 1.2 atm.
- With the engine idling at 5,000 rpm and the oil temperature at $\sim 90^{\circ}\text{C}$, check that the oil pressure is between 3.2 - 4.2 atm.
- Remove the appropriate tools once the measurement is complete, refit the oil pressure switch and washer, tightening it to the specified torque and fit the flywheel cover.
- If the oil pressure is not within the specified limits, in the following order, check: the oil filter, the oil by-pass valve, the oil pump and the crankshaft seals.

NOTE

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

Characteristic**Oil pressure**

Operating pressure

- At 1800 rpm: (0.5 - 1.2)bar
- At 5,000 rpm: (3.2 ÷ 4.2)bar

Locking torques (N*m)

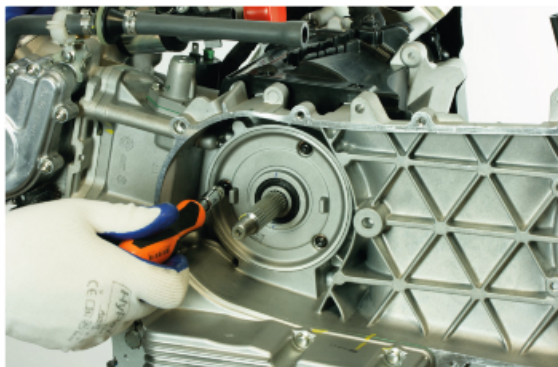
Minimum oil pressure sensor 10 Nm



Removal

TRANSMISSION SIDE

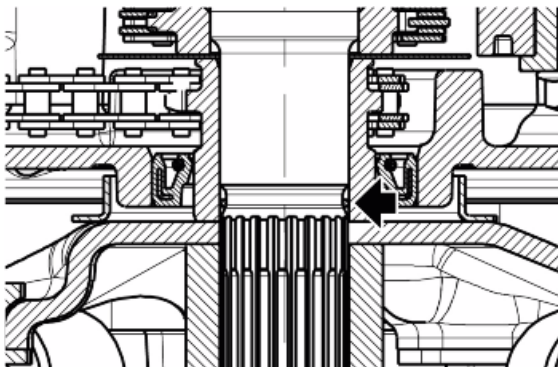
- Unscrew the three screws and remove them, complete with the copper gaskets.



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



- Remove the spacer and the O-ring.



FLYWHEEL SIDE

- Remove the flywheel side crankcase half.
- Operating from the external side, remove the oil seal pulling it with a curved tool.

**CAUTION**

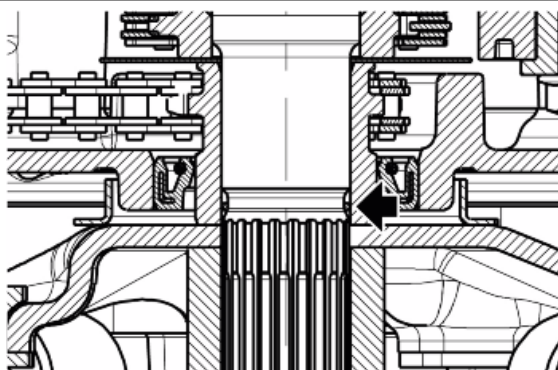
DO NOT REMOVE THE OIL SEAL BY PUSHING IT FROM THE INSIDE. THE NON-COMPLIANCE WITH THIS WARNING MAY CAUSE DAMAGING THE BUSHINGS.

**Refitting****TRANSMISSION SIDE**

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

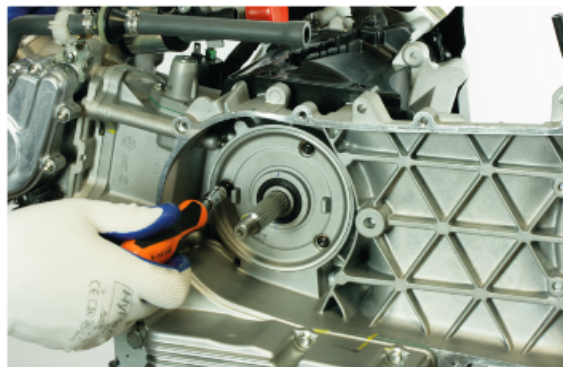
WARNING

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

**Locking torques (N*m)**

Crankcase timing cover screws 3,5 - 4,5 Nm





FLYWHEEL SIDE

- Insert a new oil seal in the half-crankcase.
- Using the specific tool to insert it all the way.

CAUTION

INSERT THE OIL SEAL ONLY WITH THE SPECIFIC TOOL TO RESPECT THE EXACT DEPTH OF THE PRESS-FITTING. THE NON-COMPLIANCE WITH THIS WARNING MAY CAUSE THE OBSTRUCTION OF THE LUBRICATION CHANNEL WITH RESULTING SERIOUS DAMAGE TO THE ENGINE.

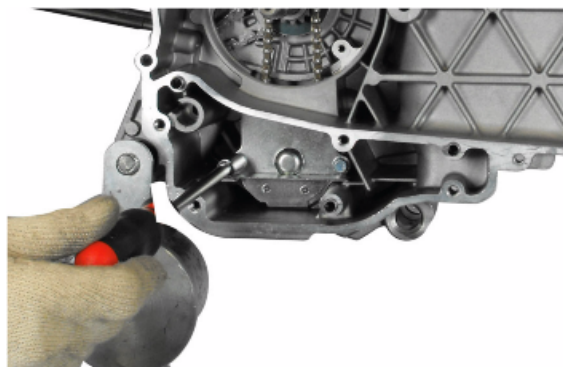


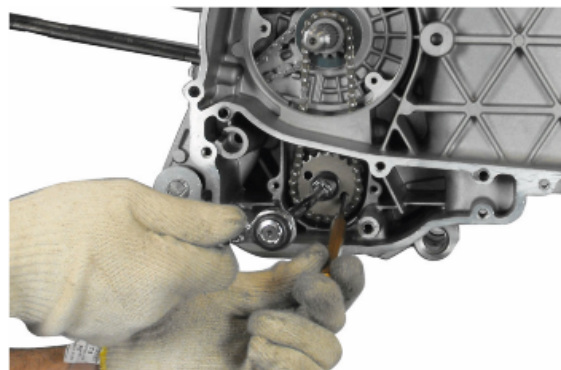
Specific tooling

021008Y Punch

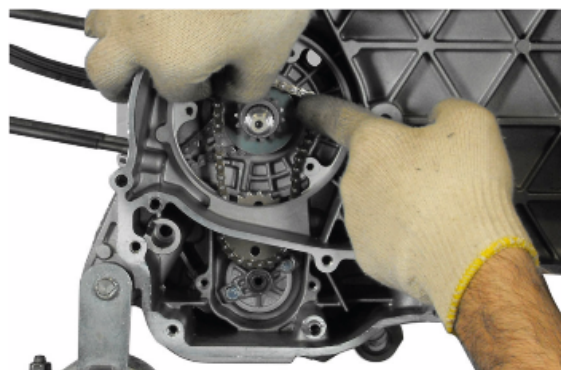
Removal

- Remove the oil sump and the by-pass.
- Remove the oil shield.
- Preventing rotation, unscrew the water pump command screw and collect the washer.

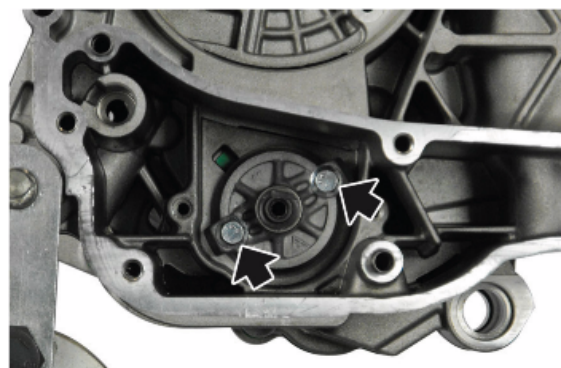




- Remove the oil pump command sprocket complete with chain.

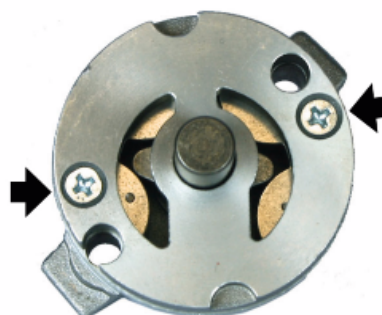


- Unscrew the two screws and remove the oil pump.



Inspection

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



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

Characteristic**Axial rotor clearance**

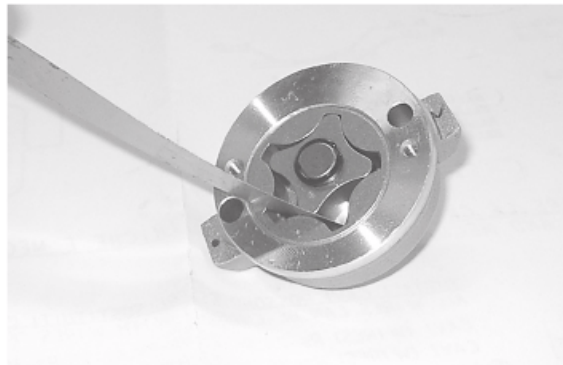
Limit value admitted: 0.09 mm

Distance between the outer rotor and the pump body

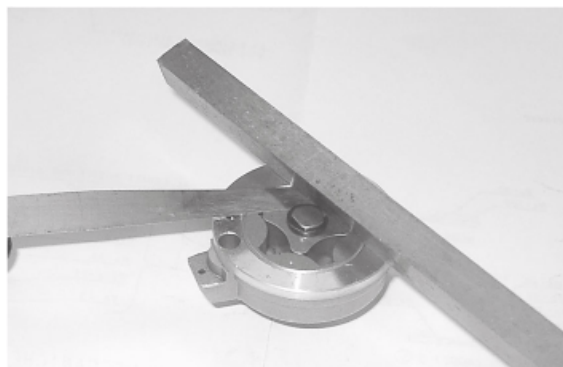
Admissible limit clearance: 0.20 mm

Distance between the rotors

Admissible limit clearance: 0.12 mm



-
- Planarity check.



Refitting

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

Recommended products

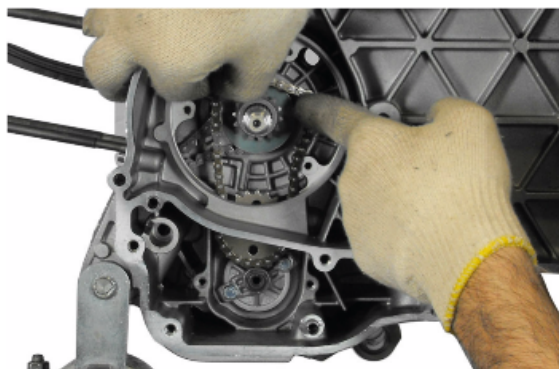
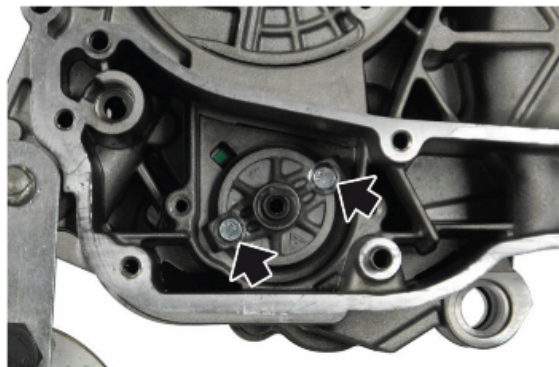
Loctite 243 Medium strength thread-locking sealant. Loctite 243 Medium strength thread-locking sealant.

Blue

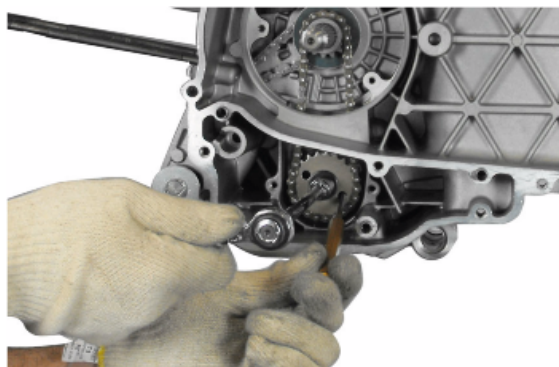
Locking torques (N*m)

Screws fixing oil pump to the crankcase 5 - 6 Nm

- Insert the control sprocket and the chain.



- Use a screwdriver to lock the sprocket rotation and screw the oil pump control screw.

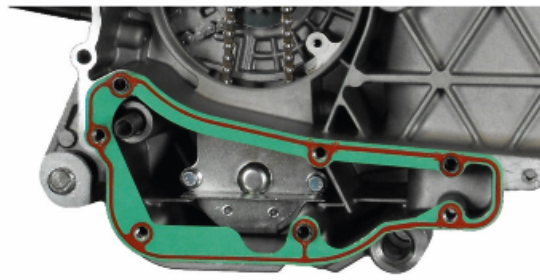


Removing the oil sump

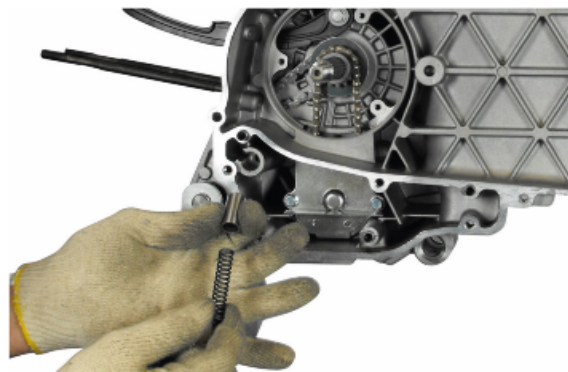
- Remove the oil filler plug, the transmission cover, the complete drive pulley assembly with belt and the sprocket wheel, as described in the Transmission chapter.
- Remove the seven screws indicated in the figure with the two rear brake transmission retainer brackets.



- Remove the gasket.



- Remove the spring and the by-pass piston.



Inspecting the by-pass valve

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

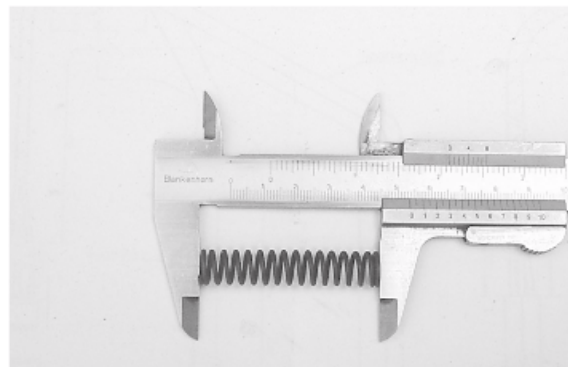
Characteristic

Standard length

52.4 mm

Piston standard diameter

12.861 - 12.843 mm



Refitting the oil sump

- Refit the by-pass piston in its housing.
- Insert the pressure-regulating spring.
- Fit a new sump seal.
- Refit the sump, taking care to locate the spring in the appropriate recess machined into the inside of the sump.
- Refit the rear brake transmission mounting brackets and the screws in the reverse order from which they were removed.
- Tighten the screws to the prescribed torque.
- Refit the driving pulley assembly, the drive belt, the sprocket wheel and the transmission cover, as described in the "Transmission" chapter.
- When testing the lubrication system, refer to the "Crankcase and Crankshaft" chapter, regarding lubrication of the connecting rod assembly

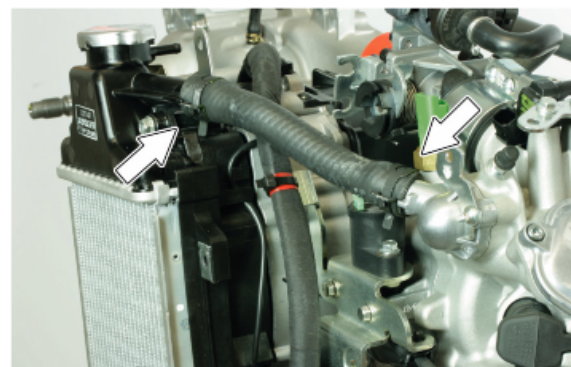


Locking torques (N*m)

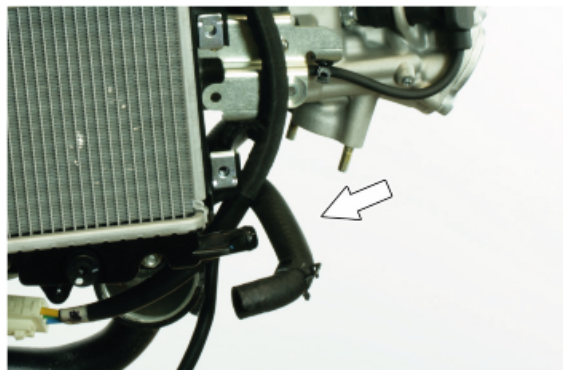
Oil sump fixing screws 11 - 13 Nm

Removal

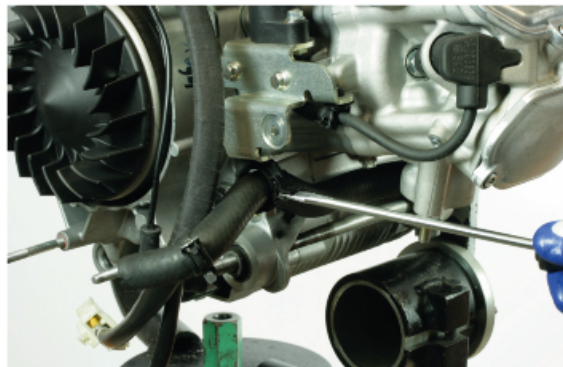
- Disconnect the two indicated clamps and remove the coolant inlet pipe to the radiator.



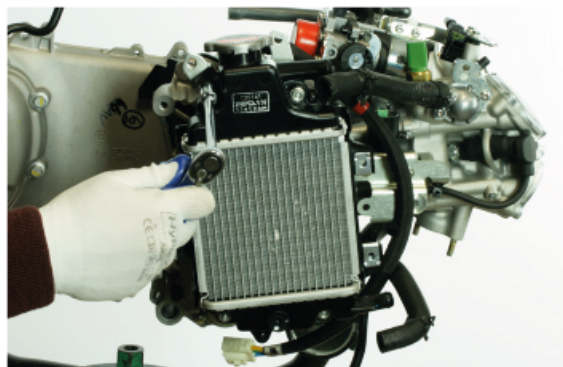
- Disconnect the coolant output clamp from the radiator.



- Disengage the pipe from the cable grommet clamp.



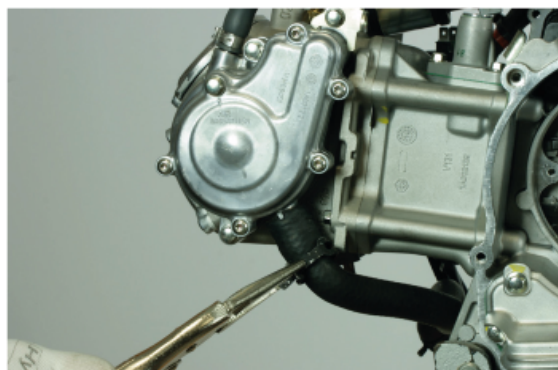
- Undo the four radiator fixing nuts and remove the complete radiator.



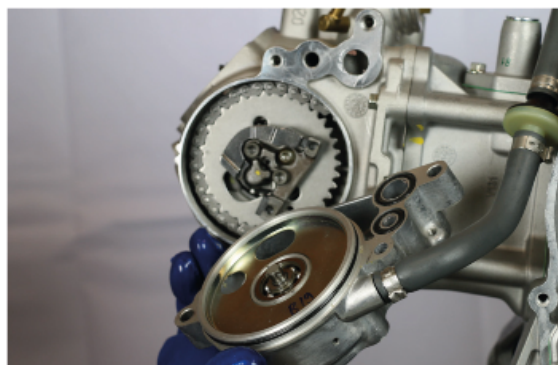
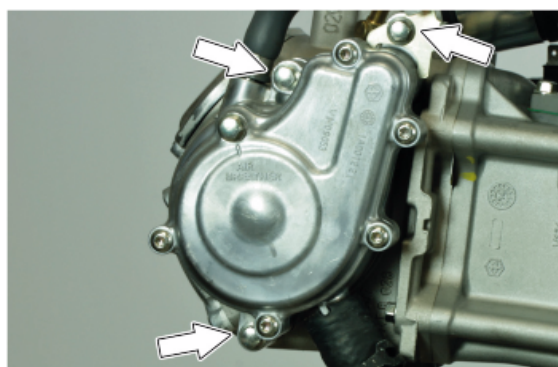
- Remove the four spacer bushings and the upper air duct fixing plate.



- Disconnect the clamp from the pump and remove the coolant output pipe from the radiator.



- Remove the three coolant pump fixing screws and remove the pump.



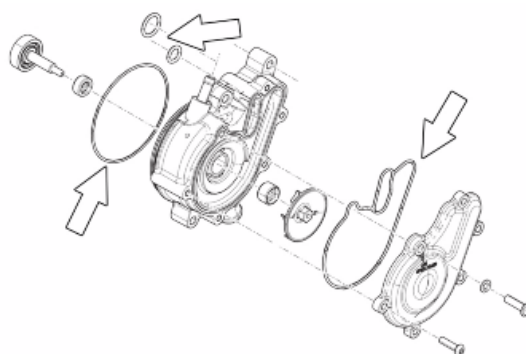
Assembly

- For the pump overhaul, see section "**Cooling system / water pump overhaul**".
- Before inserting the pump, lubricate the O-rings between the pump and head using the recommended product

Recommended products

Paraffin Rubber/metal lubricant Paraffin Rubber/metal lubricant

Solvent and silicone free spring paraffin.



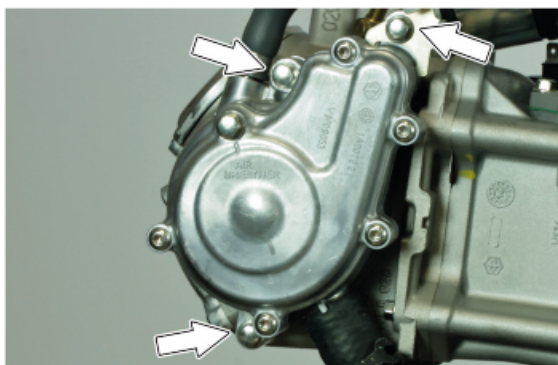
Align the references of the water pump before mounting it on the cylinder head.



Tighten the screws to the prescribed torque.

Locking torques (N*m)

Head - pump fastening screws 11 - 13 Nm
Cooling system purge screw - liquid pump 11 - 13 Nm



INDEX OF TOPICS

INJECTION

INJEC

Precautions

Precautions

1. Before repairing any part of the injection system, check if any faults have been stored. Do not disconnect the battery before checking for faults.
2. The 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 batteryFailure 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.

Troubleshooting tips

1 An injection system failure is more likely to be due to connections than to components. Before troubleshooting the injection system, carry out the following checks:

A: Electrical power supply

a. Battery voltage

- b. Blown fuse
- c. Relays
- d. Connectors
- B:** Frame ground
- 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:** Other
 - a. Wrong timing system
 - b. Wrong reset of the throttle valve position sensor

2 Injection system failure may be caused by loose connectors. Make sure that all connections are properly implemented. 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 if 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%.

Engine does not start

ENGINE DOES NOT START EVEN IF PULLED

Possible Cause	Operation
Immobilizer enabling signal	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)

Possible Cause	Operation
Power to spark plug	Spark plug Shielded cap HV 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	Battery Ground connections
End of compression pressure	End of compression pressure
Power to spark plug	Spark plug Shielded cap HV coil (secondary insulation)
Fuel system	Fuel pressure (low) Injector flow (low) Injector sealing (poor)
Correctness of the parameters	Engine temperature Intake air temperature Gas valve position Stepper (steps and effective opening) Gas valve cleaning Air filter efficiency

Engine stops at idle

ENGINE DOES NOT HOLD IDLING

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 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

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

ENGINE IRREGULAR PERFORMANCE WITH VALVE SLIGHTLY OPEN

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

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

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

Possible Cause	Operation
TPS reset successful	Filter housing
Fuel system	TPS reset successful
	Fuel pressure
	Fuel filter
	Injector flow
	Fuel quality
Selection of the cylinder base gasket thickness	Select the proper cylinder base gasket thickness

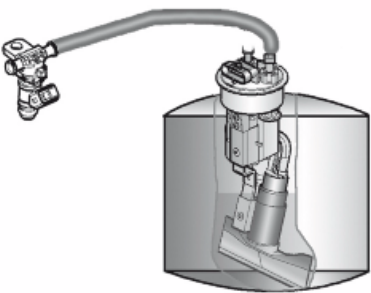
PRESENCE OF KNOCKING (COMBUSTION SHOCKS)

Fuel supply system

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

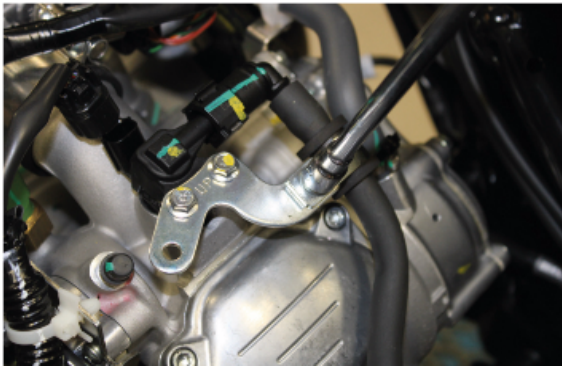
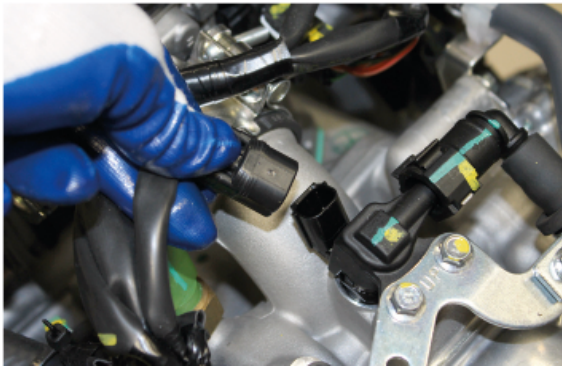
The electrical pump is located in the tank from which the fuel is pumped and sent to the injector through the filter.

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



Removing the injector

- Remove the helmet compartment.
 - Disconnect the electrical connector from the injector.
-
- Unscrew the fuel hose support clamp's fastening screw from the injector support bracket.



- Remove the fuel pipe support clamp's fastening screw from the injector support bracket.



- Release the spring clip from the fuel pipe connector.



- Press on the two side tabs of the connection and disconnect the fuel pipe from the injector.

CAUTION

AVOID PERFORMING THESE OPERATIONS WHILE THE ENGINE IS HOT.

CAUTION

BEWARE OF ANY FUEL LEAKAGE WHILE DISASSEMBLING THE HOSE.

CAUTION

ELIMINATE THE LEAKED FUEL, AND CLEAN THE PARTS IN THE VICINITY OF THE HOSE WITH A CLEAN CLOTH. WAIT FOR ALL THE FUEL TO EVAPORATE BEFORE STARTING THE ENGINE.



- Unscrew the fixing screws from the injector support bracket.



- Remove the fixing screws and the injector support bracket.



- Remove the injector from its lodging.

NOTE

THE INJECTOR MUST ONLY BE REMOVED FROM THE MANIFOLD AFTER ITS DEFECTIVENESS HAS BEEN VERIFIED. THE INJECTOR FUNCTIONALITY TESTS MUST BE PERFORMED WITH THE INJECTOR INSTALLED ON THE MANIFOLD (SEE "INJECTION").



Refitting the injector

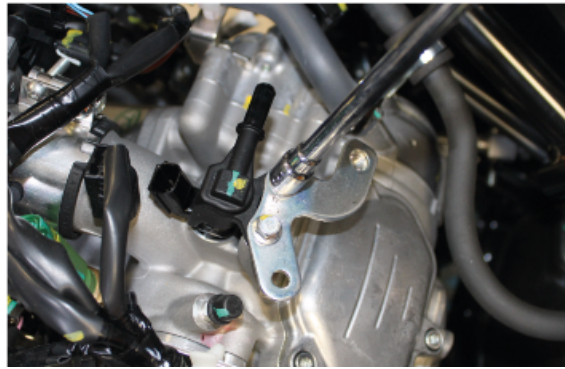
- Lubricate the sealing OR gasket with internal use grease before fitting the injector on the manifold.
- Refit the injector in its seat.



- Refit the fixing screws and the injector support bracket.



- Screw the fixing screws of the injector support bracket.



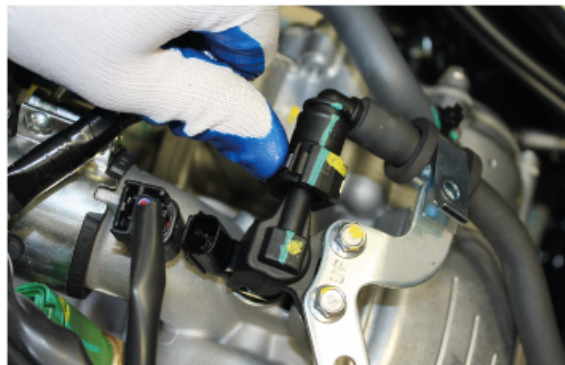
- Connect the fuel pipe to the injector.

CAUTION

AVOID PERFORMING THESE OPERATIONS WHILE THE ENGINE IS HOT.



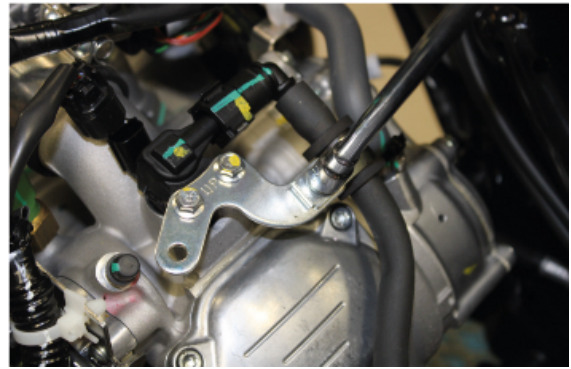
- Insert the safety spring clip of the fuel pipe connector.



- Insert the fixing screw used to fasten the fuel pipe support clamp to the injector support bracket.



- Fasten the fixing screw used to fasten the fuel pipe support clamp to the injector support bracket.

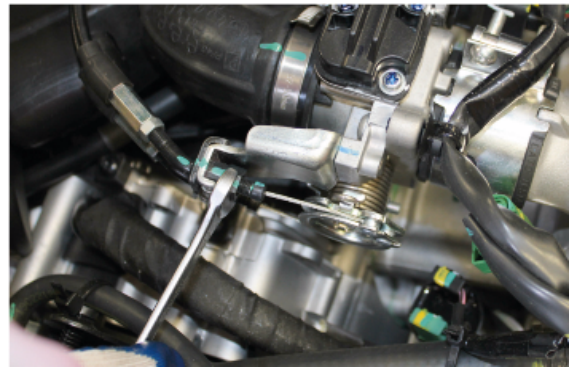


- Connect the electric injector connector.
- Refit the helmet compartment.

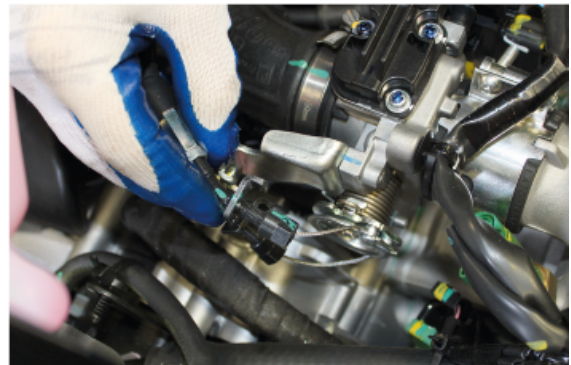


Removing the butterfly valve

- Loosen the gas control closure transmission lock nut.



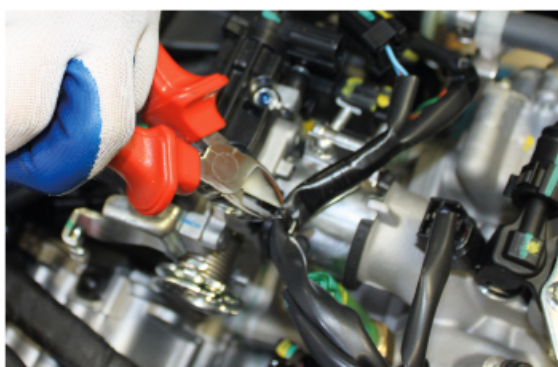
- Release the gas control closure transmission from the throttle valve control cam.
- Proceed in the same way for the gas control throttle valve opening transmission.



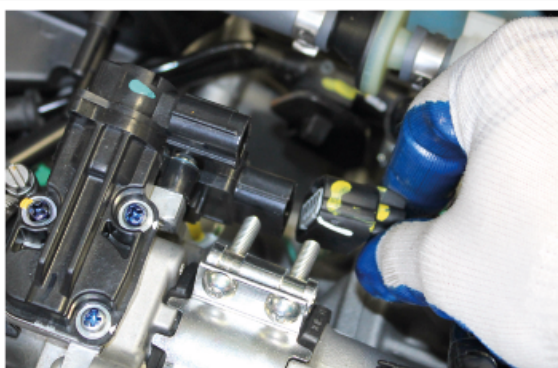
-
- Disconnect the STEPPER MOTOR sensor connector.



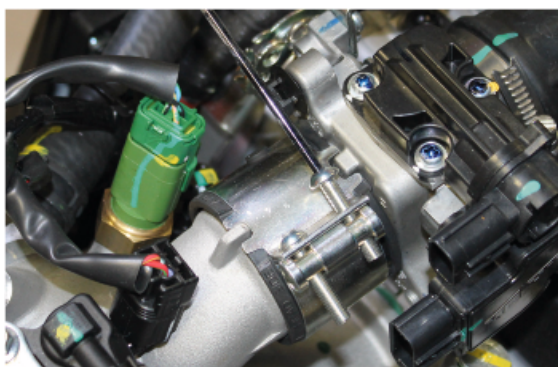
-
- Cut the wiring harness clamp.



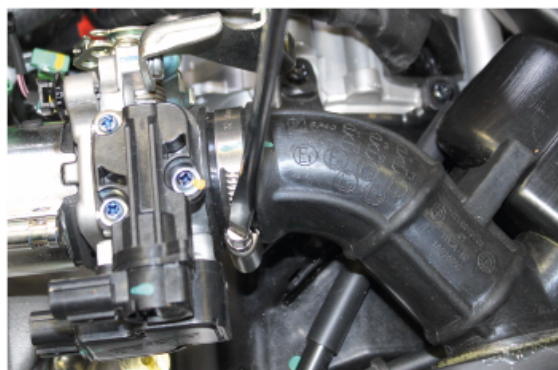
-
- Disconnect the TPS sensor connector.



-
- Loosen the locking clamp of the big end connection sleeve, operating on the two fixing screws.



- Loosen the fixing clamp of the connection sleeve to the filter case.



- Disconnect the air filter connection sleeve.



- Remove the throttle body.



- Clean the throttle body.

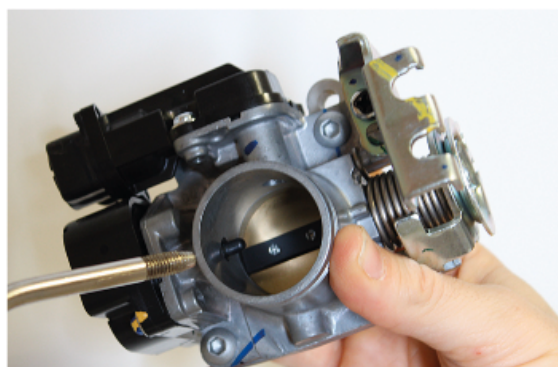
WARNING

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

Recommended products

Detergent for throttle bodies Spray cleaner Detergent for throttle bodies Spray cleaner for throttle bodies

Detergent for throttle bodies

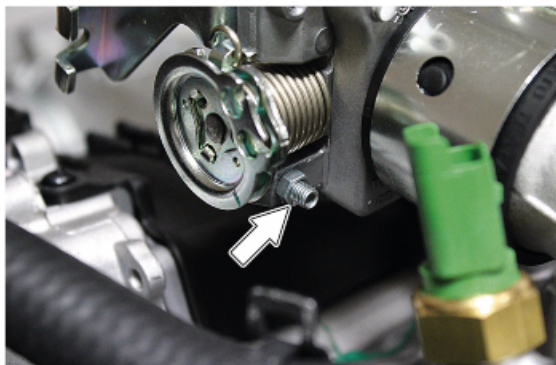


Refitting the butterfly valve

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.



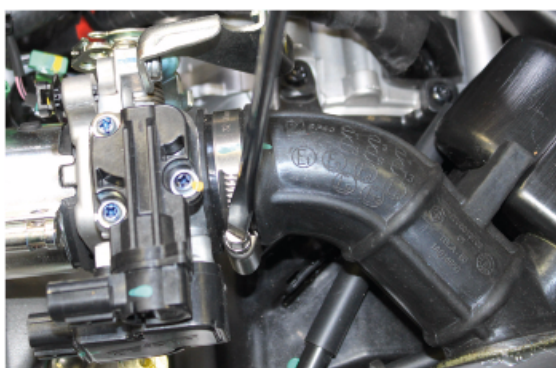
- Place the throttle body in its seat.



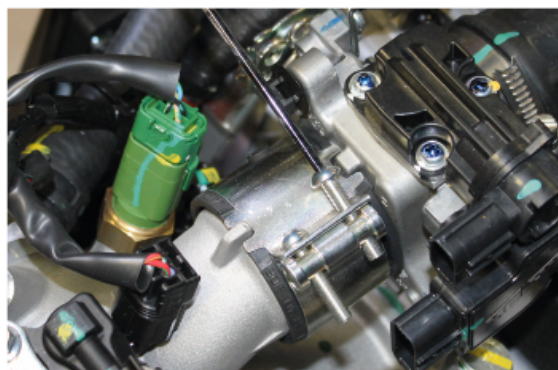
- Connect the throttle body to the air filter connection sleeve.



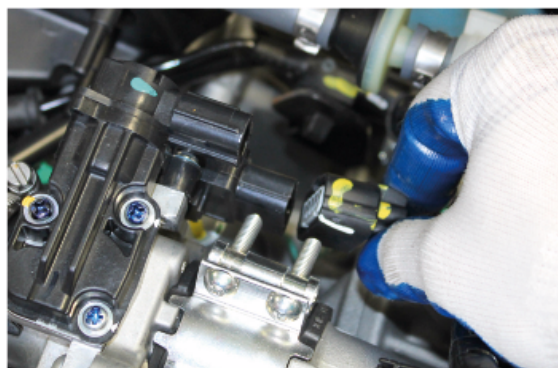
- Tighten the sleeve fastening clamp to the throttle body.



- Insert the connection sleeve on the big end and tighten the locking clamp, operating on the two fixing screws.



- Connect the TPS sensor connector.



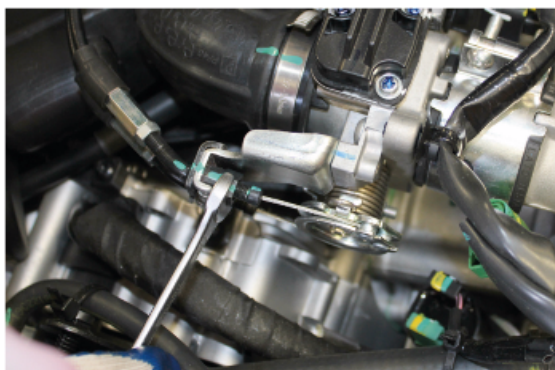
- Connect the STEPPER MOTOR sensor connector.



- Insert the gas control closure transmission on the throttle valve control cam.
- Proceed in the same way for the gas control throttle valve opening transmission.



- Tighten the gas control closure transmission lock nut.
- After refitting, delete the error and reset the adaptive parameters.
- Keep the engine running at idle speed for 15 minutes.



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 to 1.8 A



With the battery voltage > 12 V, check the pump flow rate by disconnecting from the injector the pipe equipped with the pressure gauge of the appropriate tool. 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 cm³.

Specific tooling

020480Y Fuel pressure measurement kit

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, approx-



imately 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



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.

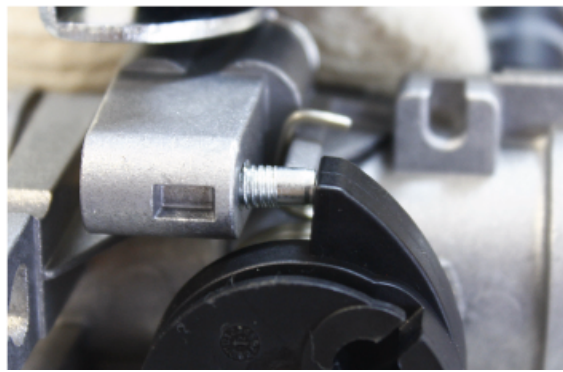
With this operation we inform the control unit, as the starting point, of the mV value corresponding to the pre-calibrated position.

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 Diagnostic 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

COOLING SYSTEM	COOL SYS
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RADIATOR**Removal**

To dismantle and remove the radiator, proceed as follows:

- Remove the protection grille.



- Remove the clamp from the radiator coolant outlet pipe.



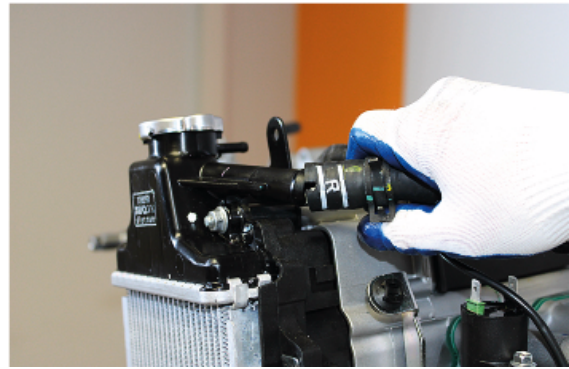
- Prepare an adequate container to collect the engine coolant.
- Disconnect the radiator coolant outlet pipe and drain the system.



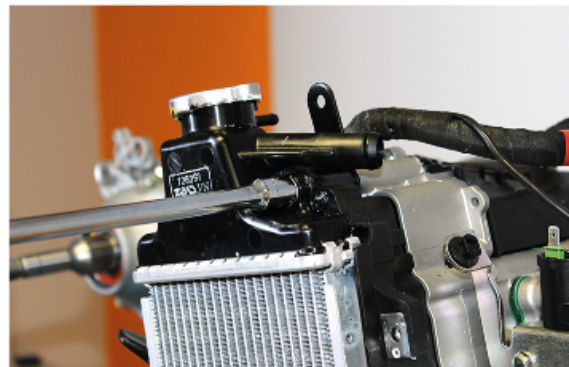
- Remove the clamp from the radiator coolant inlet pipe.



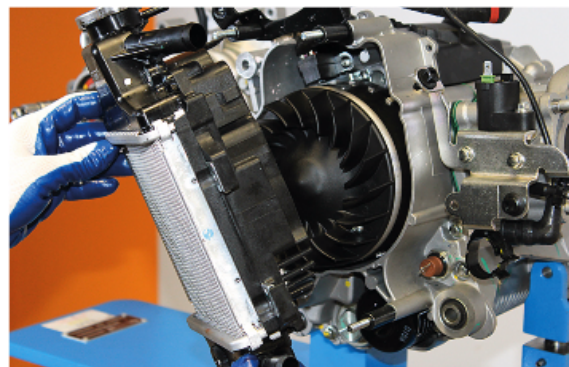
- Disconnect the coolant inlet pipe in the radiator.



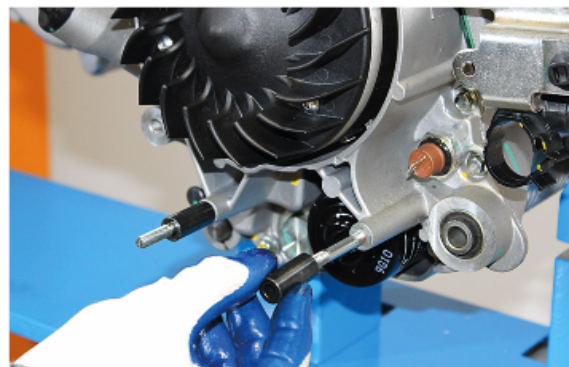
- Undo and remove the fastening nuts of the radiator.



- Remove the radiator.

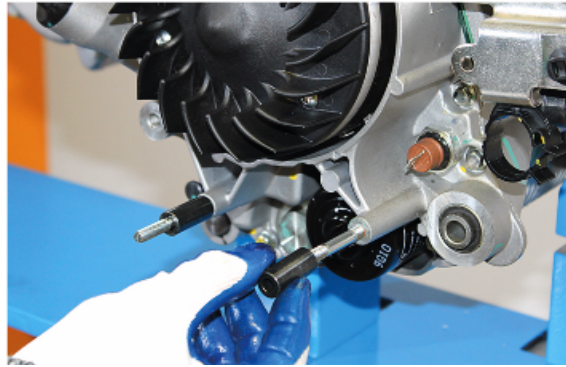


- Remove the metallic shims.

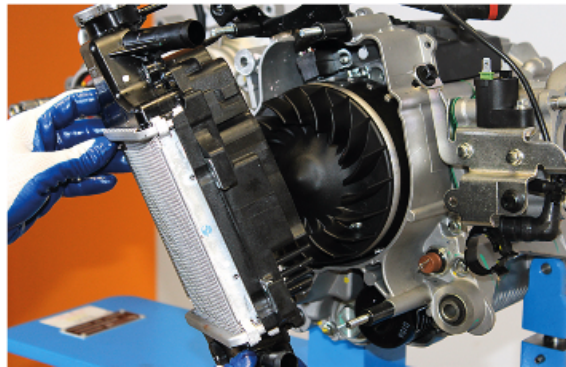


FITTING

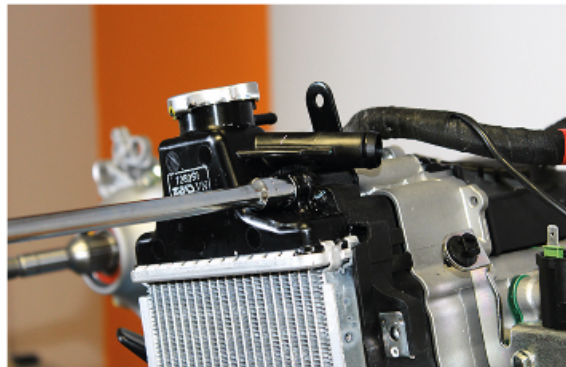
- Insert the metallic shims on the stud bolts.



- Fit the radiator.



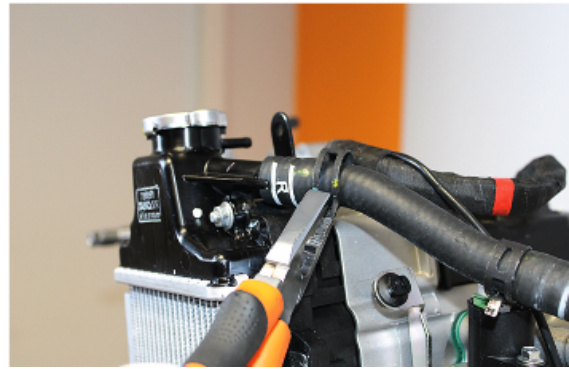
- Insert and tighten the fixing nuts of the radiator.



- Connect the radiator coolant inlet pipe.



- Fit the clamp on the radiator coolant inlet pipe.



- Connect the radiator coolant outlet pipe.



- Fit the clamp on the radiator coolant outlet pipe.
- Fill the system using the specific product.

Recommended products

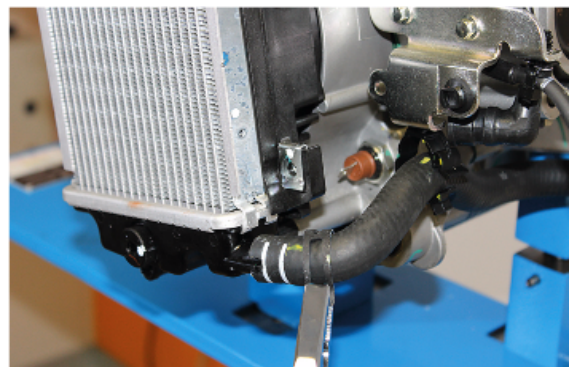
Anti-freeze liquid, ready to use, colour red Glycol ethylene based antifreeze liquid with organic additive technology corrosion inhibitor. Colour red, ready to use.

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

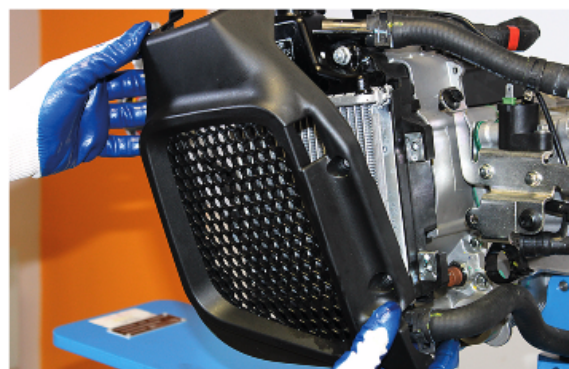
Characteristic

Cooling system fluid

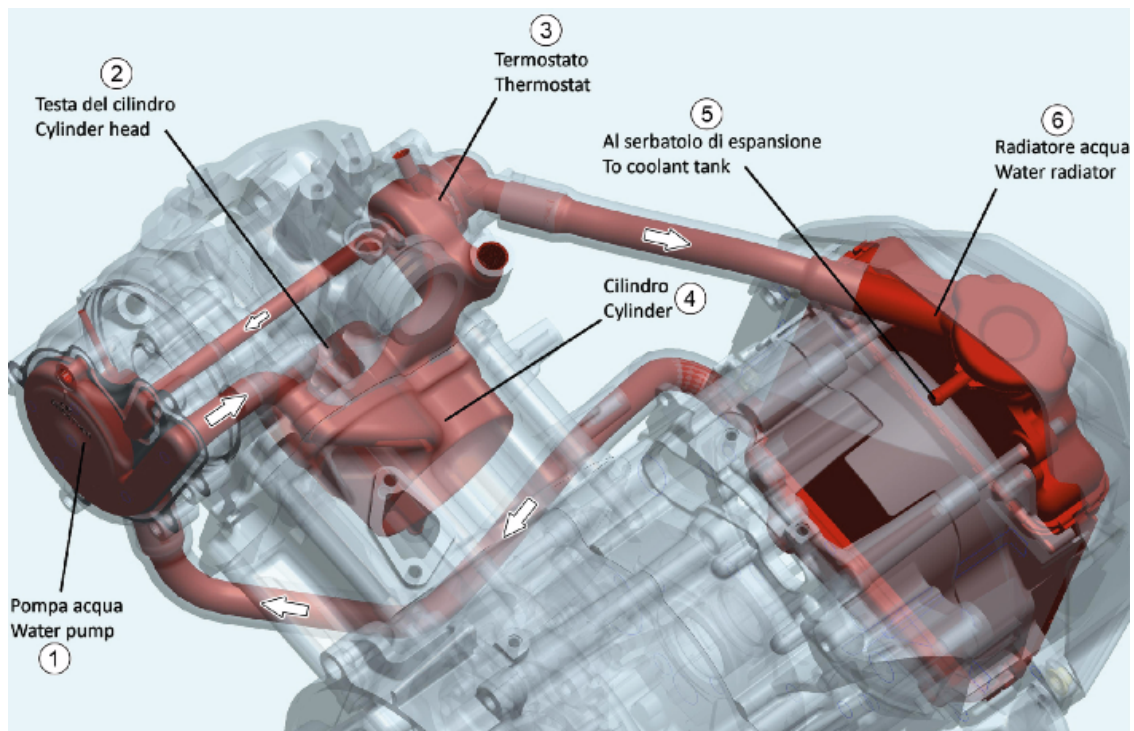
0.7 l



- Fit the protection grille.



Circuit diagram



Cooling system circuit diagram

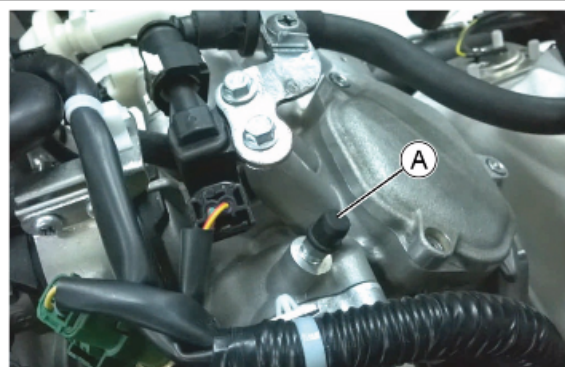
Key:

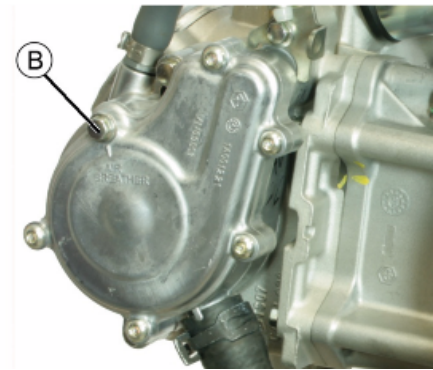
1. Water pump
2. Cylinder head
3. Thermostat
4. Cylinder
5. Coupling at the expansion tank
6. Water radiator

System bleed

SYSTEM FILLING AND BLEEDING

- Make sure to place the engine in the correct position so that the radiator cap is higher than the vent screw of the cylinder.
- Open the radiator cap.
- Open the vent screws on the engine «A» and «B».





- Completely refill the circuit filling liquid from the radiator (in order to facilitate the air flow, manually crush the connecting pipes between radiator and engine various times).
- Let the liquid escape from the vent screws «A» and «B». - Continue to refill the radiator keeping the level.
- Close the pump breather and lock to the prescribed torque «B».
- Connect a transparent pipe to the head breather (to verify the disappearance of air bubbles)
- Let more liquid escape from the head breather until the air bubbles disappear.
- Close the head breather and lock to the prescribed torque «A».
- Close the radiator cap
- Fill the expansion tank up to the maximum level.

Locking torques (N*m)

Cooling system purge screw - liquid pump 11 - 13 Nm Cooling system purge screw - big end 3 - 4 Nm

SYSTEM BLEED WITH FILLED CIRCUIT

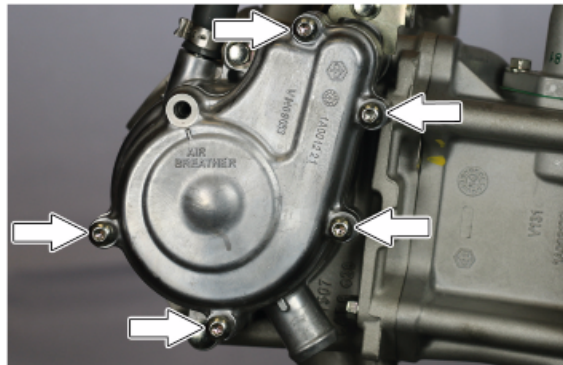
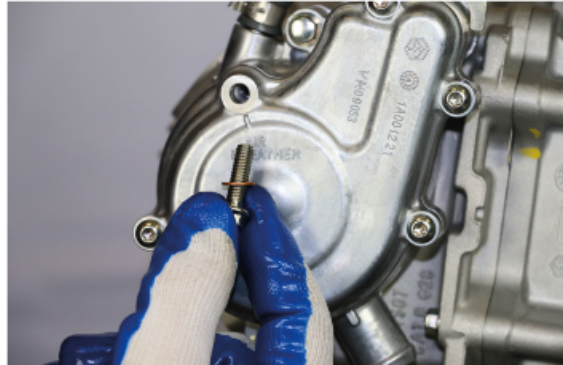
- Make sure to place the engine in the correct position so that the radiator cap is higher than the vent screw of the cylinder.
- Press the connecting pipe between the expansion tank close to the radiator.
- Open the radiator cap.
- Completely refill the circuit filling liquid from the radiator (in order to facilitate the air flow, manually crush the connecting pipes between radiator and engine various times).
- Open the vent screw "B" of the pump and let liquid escape.
- Continue to refill the radiator keeping the level.
- Close the pump breather and lock to the prescribed torque «B».
- Connect a transparent pipe to the head breather (to verify the disappearance of air bubbles)
- Let more liquid escape from the head breather until the air bubbles disappear.
- Close the head breather and lock to the prescribed torque «A».
- Close the radiator cap.
- Restore the connecting pipe between radiator and expansion tank.
- Fill the expansion tank up to the maximum level.
- Start the engine and after two minutes of heating check the level in the expansion tank.

Locking torques (N*m)

Cooling system purge screw - liquid pump 11 - 13 Nm Cooling system purge screw - big end 3 - 4 Nm

Water pump - overhaul

- Unscrew the bleed screw and check the status of the copper gasket. In case of abnormal wear, replace it.
- Unscrew the fastening screws and remove the pump cover.



- Unscrew the three screws fastening the pump to the head.
- Remove the seal OR.
- Unscrew the rotor.



- Position the complete coolant pump on the press.
- Screw in a new nut to protect the pump shaft thread on it.



- Heat the pump bearing seat using the specific tool for two minutes (2').
- Rotate the complete pump and using the previously screwed in nut, remove the pump shaft together with the bearing.

CAUTION

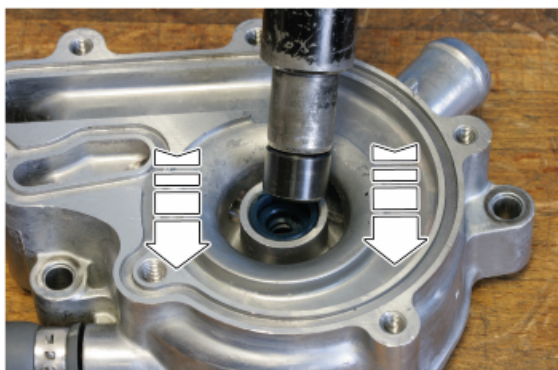
DO NOT WORK ON THE COOLANT PUMP SHAFT BEFORE HEATING THE SEAT. FAILURE TO OBSERVE THIS WARNING WILL RESULT IN REMOVING THE SHAFT WITHOUT THE BEARING DUE TO THE LACK OF THERMAL EXPANSION OF THE SEAT.

Specific tooling

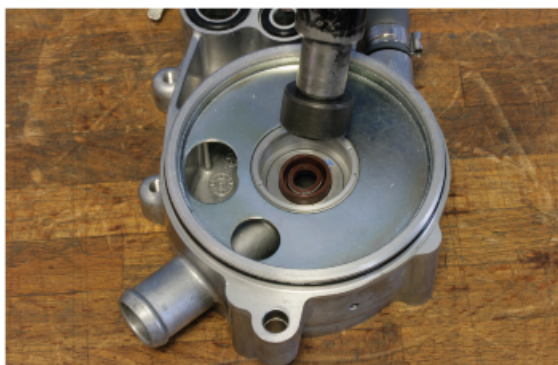
020151Y Heat gun



- Working on the work bench and using the specific tool, remove the two oil seals working from the usual side.

Specific tooling**020376Y Adaptor handle****020412Y 15-mm guide**

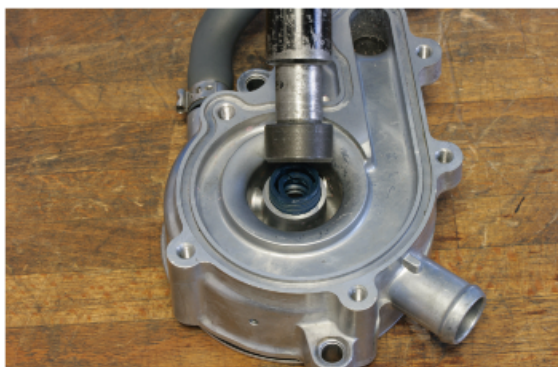
- Working from the inside, insert the new oil seal and drive it fully in using the specific tool.

Specific tooling**020376Y Adaptor handle****020364Y 25-mm guide**

- Working from the outside, observing the requirements insert the new oil seal and drive it fully in using the specific tool.

- Use the indicated product to fill the cavities inside the two oil seal lips.

THE PURPOSE OF THE PRODUCT IS TO LUBRICATE THE SHAFT. ONLY USE THE INDICATED PRODUCT. THE SPECIFIC GREASE MUST NOT EXIT FROM THE OUTER SEAL LIP. THE USE OF OTHER PRODUCTS DOES NOT GUARANTEE CORRECT OPERATION, DO NOT USE OTHER PRODUCTS THAT COULD DRIP OUT OF THE BREATHER HOLES THAT, WHEN



EXITING THE DRAIN HOLES COULD BE INTERPRETED AS LEAKS, CREATING "FALSE NEGATIVES". THE PRODUCT SHOWN IS THE ONLY ONE THAT EVAPORATES AT THE ENGINE OPERATING TEMPERATURE WITHOUT LEAVING STRIPS / DROPS.

Specific tooling

020376Y Adaptor handle

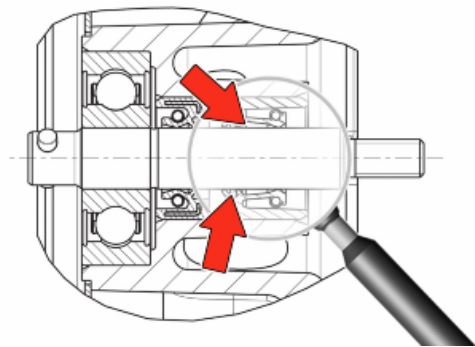
020364Y 25-mm guide

Recommended products

KLÜBERPLEX BEM 34-132 Special grease

KLÜBERPLEX BEM 34-132 Special grease

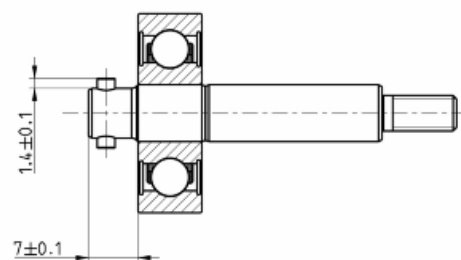
Combination of synthetic hydrocarbon oil, mineral oil and calcium complex soap.



- Insert the coolant pump shaft.
- Use the press on the OUTER race to drive it in fully



- Check the correct size and position of the shaft, according to the dimensions indicated in the figure.

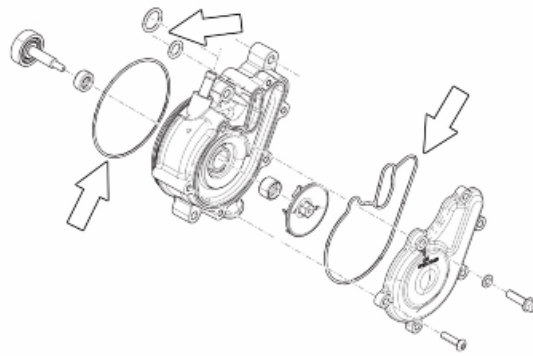


- Lubricate the parts upon assembly using the recommended product. Do not use other products as they do not guarantee correct operation.

Recommended products

Paraffin Rubber/metal lubricant Paraffin Rubber/metal lubricant

Solvent and silicone free spring paraffin.



- Complete the assembly by inserting the rotor, the seal gasket and the plug, tightening to the indicated torques.

Locking torques (N*m)

**Head - pump fastening screws 11 - 13 Nm Coolant rotor 5 ÷ 8 Nm Pump cover screws 5 - 6 Nm
Cooling system purge screw - liquid pump 11 - 13 Nm**

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